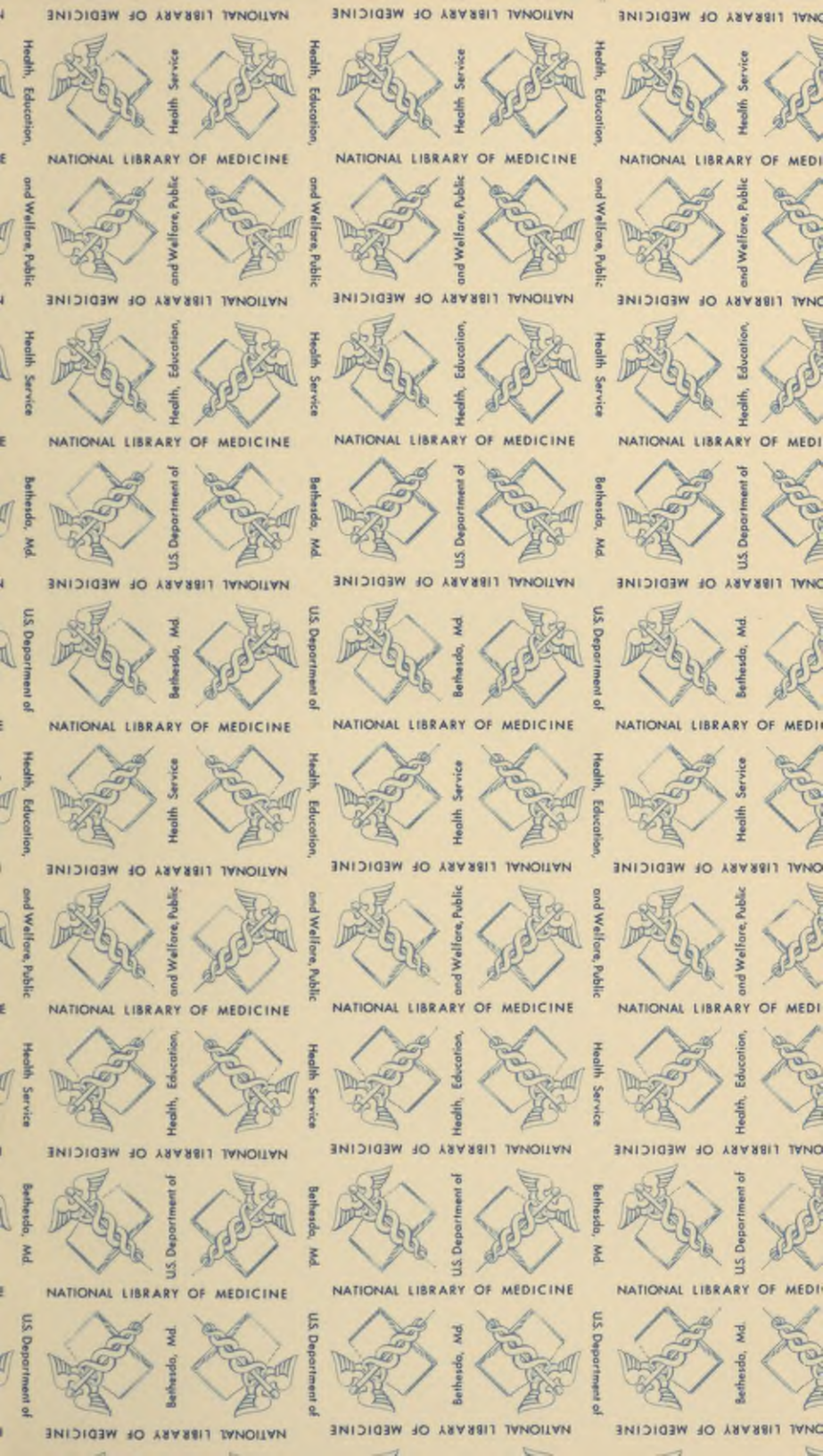
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CLINICAL LECTURES

ON

DISEASES OF THE NERVOUS SYSTEM.

BY

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REPORTED, EDITED, AND THE HISTORIES OF THE CASES PREPARED, WITH NOTES,

BY

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NIL DESPERANDUM.

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TO

JAMES R. WOOD, M. D., LL. D.,

EMERITUS PROFESSOR OF SURGERY IN THE BELLEVUE HOSPITAL MEDICAL COLLEGE, ETC., ETC.,

AND

CHARLES PHELPS, M. D.,

VISITING SURGEON TO ST. VINCENT'S HOSPITAL, ETC., ETC.,

AS A TOKEN OF RESPECT AND ADMIRATION,

DUE TO PURITY OF CHARACTER, SCIENTIFIC ATTAINMENTS,

AND PROFESSIONAL ZEAL

IN THEIR SEARCH AFTER TRUTH,

THIS WORK IS DEDICATED,

BY THEIR FORMER PUPIL

AND SINCERE FRIEND,

THE EDITOR.

PREFACE.

The following clinical lectures were delivered at the New York State Hospital for Diseases of the Nervous System, and at the Bellevue Hospital Medical College, by Prof. William A. Hammond, and I have collected them with the hope that they might serve to add something to the clinical literature of nervous diseases.

I have endeavored to report these lectures in full, and together with the histories of the cases, which were prepared by myself after careful study and prolonged observation, they constitute a clinical volume which, while it does not claim to be exhaustive, or to embrace all the diseases of the nervous system, will nevertheless be found to contain many of the more important affections of the kind that are commonly met with in practice.

As these lectures were intended especially for the benefit of students, the chief aim of the author has been to present merely practical views, fully illustrated by cases, with the results derived from treatment, as far as that was possible; and in so doing he has made no attempt to enter into the pathology or the morbid anatomy, but has confined himself to a full consideration of the symptoms, the causes, and the treatment of each affection, particularly in their relations to the cases.

If, in presenting this work to the public, I have succeeded in giving an accurate report of the substance of these lectures, together with a truthful history of the cases, and their clinical results as far as that was practicable, my object will have been attained.

My thanks are due to Dr. Hammond, for many valuable suggestions in the preparation of these pages.

T. M. B. Cross, M. D.

37 West Twenty-first St., New York, *June* 20, 1874.

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CLINICAL LECTURES

ON

DISEASES OF THE NERVOUS SYSTEM.

LECTURE I.

PARTIAL CEREBRAL ANÆMIA, THE RESULT OF THROMBOSIS AND EMBOLISM.

GENTLEMEN: The cases which I am enabled to present to you to-day illustrate a variety of disease which has lately attracted considerable attention, not only as regards the immediate symptoms, but likewise the remarkable secondary conditions which frequently result. Not many years ago the disease in question was confounded with cerebral hæmorrhage and other causes of apoplexy, but, thanks to the labors of Virchow and others, its pathology is now more clearly understood. I refer to partial cerebral anæmia produced by obstruction to the circulation of the brain by some cause existing within the cranium—generally, occlusion of one or more of the cerebral arteries.

This obliteration may be due to two cognate affections, namely, thrombosis and embolism. I will proceed now to read to you the history of the case of William Wice.

CASE I. *Ataxic Aphasia with Right Hemiplegia, the Result of Thrombosis.*—"William Wice, forty-one years of age, married, a native of Prussia. Has of late years been engaged in the shoe-business. His parents were long-lived, healthy people, and he does not remember among his kinfolk any that were

afflicted with diseases of the nervous system. He gives no history of ever having had either syphilis or acute articular rheumatism, but, on the contrary, says he has enjoyed remarkably fine health until the commencement of his present trouble. He is a man of intelligence, and has always led a very temperate life. During the month of March, 1868, he was seized with a dull pain in the right knee, accompanied with numbness. There soon followed formications and pricking sensations limited to the right foot, together with numbness and feelings of heat and cold, confined more especially to the toes of the right side. From the toes these abnormal sensations gradually extended upward, and at the end of two weeks had reached the shoulder, when the patient became aware that he was totally hemiplegic. During this attack his consciousness was unaffected, and his organs of special sense, excepting touch, were unimpaired. The 11th of May following, the patient suddenly lost the power of speech, but did not even experience the slightest disturbance of consciousness. His mind, as he avers, was clear, and, although he was unable to utter a single word, yet he understood perfectly whatever was said to him. He remained completely aphasic for four months, being only able during this time to utter a few sounds, which could not be interpreted into intelligible words.

"About September, 1868, he began to enunciate a few words, at first very slowly and indistinctly, and has gradually acquired more facility, although his power of coördination was very far from perfect when he first came under our observation. His paralysis remained nearly a year complete; when under treatment it began to improve. Six months after he was paralyzed he had an abscess on the right leg, above the ankle, which remained open for the period of a year.

"The patient was admitted to the out-door department of the New York State Hospital for Diseases of the Nervous System, August 22, 1870, and presented the following points of interest:

"There was hemiplegia of the right side of the body, including the arm and the leg, but the face was unaffected. There was no strabismus, no paralysis of the muscles of the eye, nor of those of expression. The pupils on both sides were very

much contracted, and yet readily dilated under the influence of atropia. The tongue did not deviate to either side. His eye-sight, hearing, and other special senses, were unimpaired, if we except tactile sensibility. His intellect was as clear as ever. There was no loss of the memory of words, no impairment of the motor power of the tongue, but simply a defect in the faculty of coördination of the muscles used in the act of speaking. The patient found more difficulty in pronouncing labials and linguals than gutturals. There was much atrophy of the muscles of the right side of the body, but the process of degeneration was considerably more advanced in the arm.

"The arm hung uselessly by the side of the patient, and, with the exception of a slight impulse which he could give voluntarily to the fingers of the right hand, muscular power appeared to be nearly abolished. He could not bend the arm on the forearm, nor raise the arm by means of the deltoid. Motor power, as measured by the dynamometer, in the right hand was scarcely appreciable. Tactile sensibility, electro-muscular sensibility, and contractility, together with temperature, were markedly diminished in the right arm, while sensibility to pain and deep pressure were normal.

"The leg was much paralyzed and everted, yet with very great difficulty the patient was able, with the assistance of a cane, to move very slowly about. He could not flex the leg on the thigh, and when he walked he kept the leg perfectly straight while he dragged the foot along with a shuffling gait, making it at times describe the arc of a circle. The toe was caught at nearly every step, owing to paresis of the extensor muscles of the leg. Here also there was diminution of tactile sensibility, electro-muscular sensibility, and contractility, while differences in temperature were easily detected. Bladder, rectum, and urine, normal. Heart-sounds natural. Lungs healthy. He could not whistle, when admitted, from want of power to purse up the lips, yet he could expectorate without difficulty. In talking he had a peculiar hesitating, stammering manner, highly characteristic of his disease, but he did not express that impatience and repetition of the same word so often found in patients suffering from amnesic aphasia. There were certain

sentences which he was totally unable to pronounce with any degree of accuracy, even after much effort, such as 'truly rural,' 'National Intelligencer,' 'Peter Piper,' and other words abounding in labials and linguals. After dilating both pupils with atropia the eyes were carefully examined by the ophthalmoscope on different occasions, and there was found a circle of atrophy around the porus opticus of each eye, together with more or less anæmia of the vessels of the retina."

Now, let us inquire what is the cause of the hemiplegia and difficulty of speech existing in this man. One point, which especially engages our attention at the very beginning of his history, is the slowness with which the loss of power and sensibility supervened. We argue from that one fact very definitely that the case is evidently not one of cerebral hæmorrhage. Reserving any further remarks relative to the diagnosis, let us inquire how nearly his symptoms coincide with those met with in thrombosis.

By thrombosis is understood a condition in which an artery, in consequence of a change taking place, undergoes narrowing of its calibre owing to the deposition of fibrine, from the blood. The clot thus formed is called a thrombus. One of the chief features connected with the development of the symptoms in thrombosis is slowness, and you can very readily understand why this should be the case. The symptoms which are observed are due to anæmia of those parts of the brain supplied by the diseased vessel, and as the morbid process by which the artery is eventually closed takes place gradually, there is therefore no sudden development of the symptoms.

These very frequently consist, in the first place, of pain in the head, vertigo, and more or less confusion of ideas. In several cases which have come under my notice the pupil of the affected side was dilated, and there were ptosis and strabismus; and there may be at a very early period in the progress of the disease marked difficulties in the faculty of speech, but there do not appear to have been in this instance any mental disturbances or others connected with the movements of the eye or of the tongue.

It is one of those cases in which the first evidence of dis-

ease is connected with the loss of power and sensibility in some distant part of the body.

Thus in Wice's case there were pain, numbness, formication, tingling, and other evidences of disordered sensibility in the right leg, accompanied with loss of power, and it frequently happens that these symptoms exist in very limited regions of the body, such as a single limb, or a part of a limb, or they may be restricted entirely to some portion of the face. In the case of a gentleman now under my care the paralysis is confined to the muscles supplied by the ulnar nerve, and those concerned in deglutition.

Now, in the case of Wice we notice further that the paralysis gradually extended up the limb until the whole side was involved, and that with this progress other notable symptoms made their appearance. We are therefore justified in concluding that the advance in the symptoms was the result of the gradual development of the morbid process within the cranium.

Certainly it is very remarkable that there should have been at no time any symptoms indicating derangement of the intellectual faculties, and none of those such as pain, vertigo, noises in the ears, or disturbances of vision, which are so commonly associated with brain-disease. One feature, however, is of very great interest, and that is the difficulty of speech, and it is likewise important to notice that the hemiplegia is on the right side. Hence we know with certainty that the brain-lesion is on the left side.

There is a very important artery in the brain, called the middle cerebral, which is lodged in the fissure of Sylvius. We are warranted, by a great many cases in point, in concluding that the organ of speech is somewhere in the region of this fissure, which, as you know, separates the anterior from the middle lobe of the brain.

Without presuming to define its location and extent with as absolute accuracy as some observers, I am satisfied that it is in the immediate vicinity of this fissure, and probably, as Broca has affirmed, in the posterior part of the third left frontal convolution, or, as later investigations would seem to show, in the island of Reil.

It is not my intention on the present occasion to enter into

a full consideration of the subject of aphasia, for I shall have abundant opportunities during the present session of showing you more strongly-marked cases; I will merely, therefore, say now that by aphasia we mean a difficulty of speech either resulting from a loss of the memory of words, or due to an impossibility of coördinating the muscles concerned in articulation so as to pronounce them.

In the present case there is no defect as regards the memory of words, the trouble is altogether with the muscles of speech. You must recollect, however, that paralysis of the tongue or lips may render the speech indistinct or impossible, but in this case there is no paralysis of those muscles. The patient is able to move his tongue in all possible directions, to open and shut his mouth, and to perform all the normal facial movements.

You observe, however, that when I ask him to say a word beginning with a labial letter, such as baker or piper, he is unable to do so. His mouth closes spasmodically, and no sound comes forth.

The gutturals he can pronounce without difficulty; the linguals are somewhat troublesome, but not quite so much so as the labials.

He, therefore, labors under what is called the ataxic form of aphasia. From the symptoms met with in this case, I think we are safe in concluding that the patient is affected with thrombosis of the left middle cerebral artery, and that in all probability the collateral circulation has been established to a considerable extent, for there is no lack of intelligence, and there has been no advancement in the symptoms since the occurrence of the aphasia, at which time we may presume the artery became entirely closed.

He therefore now suffers simply from the vestigia, or the remains, and from which he will continue to suffer unless subjected to proper treatment.

Perhaps, before proceeding to the treatment applicable to this case, I ought to say something more to you of the natural history of the disease in question, but I have no idea of considering fully, in the clinical lectures I shall give you here, much more than the practical points of the disease under

notice, and I have already indicated to you briefly most of the important features of its course.

I may, however, say that, as regards causes, thrombosis may be due to atheroma of the artery, by reason of which its elasticity is lessened and its lining membrane rendered rough. The circulation is therefore retarded, and this condition, with the roughened wall, favors the deposition of fibrine upon its internal surface. Again, compression may be exercised by tumors, whereby the calibre of the artery is diminished, and the fibrine thus allowed to accumulate, or the difficulty may exist in the heart, which, through fatty degeneration or other cause impairing its strength, lessens the force and rapidity of the circulation.

Among the predisposing causes are age, the disease being rare in persons under fifty years old, luxurious habits of living with insufficient exercise, and, perhaps, inordinate mental exertion.

The prognosis is generally unfavorable, from the fact that, although the disease may advance slowly, and may even be spontaneously arrested in its progress, the tendency to softening always exists. The inadequacy of any medical treatment to control the morbid process also renders the prognosis more grave. It is rare indeed that the powers of Nature are so effectual in restoring the functions of a brain impaired by thrombosis as they have been in the patient before us.

The treatment proper in this case should be directed to the relief of the paralysis, and the restoration of the power of speech. Two agents are especially indicated, namely, strychnia and electricity, and perhaps we may derive benefit from phosphorus. I shall therefore give him a hypodermic injection of about one-thirtieth of a grain of the sulphate of strychnia every alternate day, apply the induced or Faradaic current to the paralyzed arm and leg, and the constant current in such a manner as to cause it to act upon the brain, and enlarge its blood-vessels, and improve its nutrition. This can be done by placing one pole upon each mastoid process, or one upon the forehead, and the other upon the nape of the neck, or the negative pole over the sympathetic nerve, while the positive is rubbed up and down the back, from the second or third

cervical to the fifth or sixth dorsal vertebra. At the same time a mixture, consisting of half an ounce of the phosphorated oil, one ounce of the mucilage of acacia, and forty drops of the oil of bergamot, should be prepared, of which fifteen drops are to be given three times a day in water. Under this plan of treatment I shall expect his paralyzed limbs to improve, and his speech to become more perfect.

[Note.—The essential details of the treatment above indicated have been carefully carried out up to the present time (November 15th), and the case has so far been marked by gradual progressive improvement. Since October 26th the induced or Faradaic current has been applied with advantage to the muscles of the tongue and lips regularly three times a week. The condition of Wice is now as follows:

There is some hesitation in his speech, but he has much more command in coördinating the movements of the muscles of the tongue and lips than he had only a short time ago; he can now articulate quite distinctly the words "truly rural," "National Intelligencer," "baker," and "Peter Piper." He can purse up the lips, although as yet he cannot whistle. The pupils are both contracted, but have increased somewhat in size. The vessels of the retinæ are larger, more tortuous, and fuller, and the circulation therein has much improved. The degeneration of the porus opticus has not increased. The muscles of the right upper extremity have gained so considerably in power that the patient is now able to flex the forearm on the arm, raise the arm at a right angle to the body, and retain things quite readily when placed in his hand. When his arm is lifted above his head, he can keep it there voluntarily. The improvement in the leg is not less in degree than that in the arm and forearm. He can partially flex the leg, although very slowly. The foot is still everted, but not to such an extreme angle. When he walks, he lifts the toe well off the ground, and swings the leg much less than formerly. All the muscles of the diseased side respond to a weak Faradaic current. Sensibility is gradually returning, while the temperature and nutrition of the limbs are constantly increasing. The patient enjoys excellent health, and has so far recovered that he intends to make an attempt to earn his livelihood by

engaging in some light business, which only requires a moderate amount of activity.—T. M. B. C.]

We have another affection by which an artery may be closed, and for a complete idea of which we are indebted to Virchow, and that is the condition designated by him embolism. An embolus is a clot originally formed in some distant part of the body, on the cardiac or arterial walls, and which, becoming detached by the action of the blood, is carried by the current to the vessel in which it is subsequently found. Here it causes occlusion, producing effects similar to those due to a thrombus.

Now, you will observe, as regards embolism, that there does not necessarily exist any previous disease of the artery, which, on the contrary, may be and generally is entirely healthy, in which respect there is a marked difference between embolism and thrombosis. Emboli may originate in almost any part of the body, but they are generally the result of endocarditis involving the left side of the heart, and this in its turn is frequently a sequence of acute articular rheumatism. You have therefore a very interesting series of morbid phenomena, beginning with inflammation of the fibrous structures about a joint, and ending, in the case of cerebral embolism, with paralysis, coma, and other symptoms of disordered brain-action.

You will not have failed to notice, gentlemen, from the brief outline I have given you of the course of embolism, that the symptoms due to occlusion of the artery must be manifested with great suddenness. A man, for instance, has suffered from rheumatism, and subsequently from endocarditis; he has mitral or aortic regurgitation, from insufficiency of the valves, directly due to fibrinous concretions, preventing their perfect action. One of these concretions becomes detached, it enters the aorta, and there, following the stronger and more direct current, passes into the left common carotid artery, thence into the internal carotid, and then, still following the stronger and more direct current, enters the middle cerebral artery, where it lodges. Such is its ordinary direction. It may by chance go into the innominata and subsequently be

arrested in the right middle cerebral artery, or it may pass off through the subclavian, and then not enter the head at all.

But, of the emboli found in the brain, a very large proportion are discovered in the left middle cerebral artery.

The relations of the artery to the fissure of Sylvius and the anterior lobe of the brain, I have already indicated to you in my remarks on the previous case. With these prefatory remarks I will read the following history:

Case II. *Amnesic Aphasia, with Right Hemiplegia.*—"Richard Murphy, aged twenty-five years, married, born in New York, a weaver by occupation. There is no history of any neurosis in his family. He has never had syphilis or acute articular rheumatism. He says he has always enjoyed good health and been temperate in his habits. One day during November, 1868, he noticed on taking off his boot that his right foot was unusually numb and cold, but he paid little attention to the fact, as it soon passed away. Being affected about this time with a severe vesicular eruption of the face, he was persuaded to apply thereto a strong solution of sulphate of iron, which rapidly produced erysipelas of the whole of that surface. When the eysipelas had reached its acme, he had his first stroke of hemiplegia of the right side just as he was descending a flight of stone steps. Suddenly and without the least warning, excepting a quick severe vertigo, he fell, but immediately arose, and, not yet having recovered himself sufficiently to have command over his limbs, fell again. With assistance he walked a short distance to his house, when his friends discovered that he was paralyzed on the right side. His face and tongue were drawn to the left side, while speech and memory were slightly impaired. The condition of his eye was not noticed. Reasoning *a priori*, the patient attributed his paralysis to the solution of the sulphate of iron which he had used. He immediately began to improve very rapidly, and in December following motility having nearly completely returned, he was seized with a slight attack of delirium. During the month of February, 1869, the patient again suddenly became hemiplegic, with more marked sequelæ than in the previous seizure, but he did not wholly lose his consciousness.

His leg improved slowly, but much more than his arm. In April, 1869, he resumed his occupation, that of a weaver, in the factory, but had to do light work on account of the deficient muscular power in his right arm. In July he had a third seizure, but after falling he immediately went to work again. From this time until May, 1870, he busied himself about the factory, and attended regularly to his daily avocations. His appetite and nutrition did not seem to be impaired, and he appeared to enjoy very good health. In May, 1870, suddenly the patient again became paralyzed; this time the paralysis involved the right leg more than the arm, but, owing to the already existing paralysis of the right upper extremity, it is very likely that attention was not called thereto. There was no loss of consciousness. The muscles of the eye, face, and tongue, were not affected. With assistance he walked home, and in about a week had quite recovered from this attack. The treatment had been, up to this time, strychnine internally, with blisters behind the ears. During July last, while chopping wood, he was suddenly taken with an intense pain in the left side of his head, followed by vertigo; after falling, he arose, but again fell. On examination, his left pupil was found widely dilated. The patient was incoherent and delirious for four days. There was no apparent increased paralysis during this attack. After three weeks had elapsed, the patient went to work, but it was evident that his eye-sight and memory were much impaired. All these attacks were ushered in by a sudden severe vertigo, but were never followed by any convulsive movements.

"The patient was admitted to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, September 1, 1870, when he was found to be in the following condition: There was deficient muscular power on the right side, although very slight in degree. The right arm was more paralyzed than the leg. The patient, however, said he was as strong as ever in that part of the body. His face had a peculiar, meaningless expression, differing from the intelligent look of many aphasic patients. The right side of the face was not at that time paralyzed. There was the loss of the memory of words, but no paralysis of the muscles

of the eye or of the tongue, and no defect in the coördination of the muscles of the tongue used in the act of speaking. Eye-sight impaired. Patient could not read or write. He understood whatever was said to him perfectly, yet, if he were asked to repeat a complex sentence, the memory of the words had departed, and he could not recall them. Bladder and rectum were normal. Sensibility on the right side was normal. The patient is naturally left-handed, which may account for the difference in muscular power. A sister has heart-disease, and the patient himself has hypertrophy with aortic insufficiency. Lungs were healthy. His lips and face are livid, and at times when he is cold this condition becomes quite striking."

Now let me proceed to give you an outline description of an ordinary attack of cerebral embolism. In the first place, there are no premonitory symptoms: the individual is perhaps engaged in his ordinary avocations, or is perfectly quiet, when he suddenly becomes apoplectic, and falls to the ground. His breathing is stertorous, his pulse slow and full, and the insensibility more or less complete. As soon as he can be aroused to such an extent as to enable him to execute volitional movements, it is found that he is partially or entirely paralyzed on one side of his body. Such is the severe form of the attack, and from this there are almost innumerable gradations to seizures of less gravity. Thus it often happens that consciousness is not lost; the patient falls simply from paralysis; and this loss of power may extend throughout the whole of one side, be limited to one or the other limb, or to the muscles of the face, or be restricted entirely to the tongue.

The subsequent history is very similar to that of a case of hemiplegia from cerebral hemorrhage, but differs in the very important points that the paralysis and other symptoms are more or less transitory, and, as far as my experience extends, there are no muscular contractions. I have seen several cases in which the faculty of speech was alone involved, either as regarded the memory of words or the power to articulate them by coördination of the proper muscles.

The duration of the symptoms depends upon the rapidity with which the collateral circulation is established, and, if the

embolus be small and the physical powers of the patient good, they may last but for a very short time.

Trousseau, in his lecture upon aphasia, relates the case of one of his colleagues, who, while reading quietly in his library, suddenly discovered that he could not utter a single word. There was no paralysis anywhere, no loss of consciousness, and but slight confusion of ideas; at the end of twelve hours recovery was complete. There can be no reasonable doubt but that this was a case of cerebral embolism.

In the case of Murphy, there were five distinct attacks, all involving the right side, and accompanied with some difficulty of speech. From all there was tolerably complete recovery, so that even now there is scarcely a trace of paralysis in any part of his body; neither do there appear to be any mental symptoms except as regards the memory for words; in other respects, his memory is hardly at all impaired, his recollection of locality and circumstance is good, and his intelligence fully up to the average of his class. But if I ask him to repeat even a short sentence, such as "Will you go with me to the theatre?" or to say three or four consecutive words, as "tea, sugar, and coffee," you observe he is unable to do so. He utters the first word, stops, looks confused, and is unable to proceed; and yet there is no difficulty whatever in his enunciation: what he does say he says with perfect distinctness.

Now, from what I have said to you of embolism, and from a consideration of the history of this case, can there be a reasonable doubt that each attack of hemiplegia was due to an embolus—probably a small one lodging in the left middle cerebral artery—and that our assurance is rendered doubly sure by the fact that we find that condition existing in his heart which is best calculated to cause the formation of emboli on its lining membrane?

At times we have very great difficulty in distinguishing emboli from cerebral hæmorrhage. The phenomena of both conditions are often very similar, but the transient character of those due to embolism, the fact that the resultant hemiplegia is almost always on the right side, and that there is a history of rheumatism or organic disease of the heart in the case, will ordinarily enable us to make a correct diagnosis. In

the present case the treatment need not be very complex. I am inclined to think that phosphorus will prove beneficial, and that advantage may be gained by the passage of the primary current directly through the brain. At the same time much can be done for him by exercising his memory in regard to language. Several cases are on record, and one has occurred in my own experience, in which individuals much more aphasic than Murphy have again acquired the power of language by persistent and well-directed attempts to recollect words spoken to them.

On a subsequent occasion I shall bring this patient with others before you, and speak at greater length on the subject of aphasia.

LECTURE II.

ALTERNATE OR CROSS HEMIPLEGIA. CASE IN WHICH THERE WAS PROBABLE EXTRAVASATION OF BLOOD INTO THE PONS VAROLII.

No disease that I shall have to lecture upon to you is more important than cerebral hæmorrhage; we meet with it at all times, in all persons, and under all circumstances. It is a disease to which a certain class of individuals have reason to look forward with apprehension, for in an instant their lives may be destroyed, or they may be rendered imbecile or may be crippled for life.

It is only recently that medical writers have to any extent adopted the custom of naming a disease in accordance with its morbid anatomy; they have been too much in the habit of basing their nomenclature upon some one prominent symptom, which may be, and in fact generally is, common to several very different pathological states; thus, it was the case, and still is to a very great extent, that cerebral hæmorrhage was considered under the name of apoplexy; it would be just as proper to treat of phthisis under the designation of cough, for apoplexy is simply a symptom which we meet with in several very different cerebral affections, just as cough is not peculiar to any one disease of the lungs.

Cerebral hæmorrhage is a term applied to an extravasation

of blood occurring either in the tissue of the brain or in its ventricles. It does not include meningeal hæmorrhage, which takes place upon the surface of the brain, and differs from it in several other important particulars. The effusion of blood is due to the rupture of a cerebral blood-vessel, and this rupture is ordinarily the result of a diseased condition of the vascular parietes.

This much is perhaps necessary as an introduction to the very interesting history which I will now proceed to read to you:

Cerebral Hæmorrhage with Cross-Paralysis and Left Hemiplegia.—"John J. H. Fetter, forty-two years of age, married, born in Pennsylvania. Has always followed agricultural pursuits until within a few years, when he learned the bookbinding business, at which he has since worked. He is the father of fourteen children, of whom at the present time five are living. Eighteen years ago he had rheumatism, which succeeded a severe attack of gonorrhœa, since then he has had gonorrhœa several times and a soft chancre, but gives no history of syphilis.

"His mother's grandmother had paralysis at an advanced age, and with that exception his family, so far as he is aware, is perfectly free from any of the marked forms of disease of the nervous system; but it is a curious coincidence that, while he is paralyzed on the left side, his wife is hemiplegic on the right. He has been a temperate man in all respects, if we except, perhaps, venereal excess, for the sexual passions in this patient are very highly developed. He says he has labored very hard all his life, and confined himself very closely to business.

"If we exclude rheumatism, gonorrhœa, and bilious remittent fever, the patient enjoyed for thirty-three years the very best of health, which was not otherwise marred, until the onset of this attack of paralysis which occurred on the evening of the 11th of October, 1861, while Mr. Fetter, who was at this time convalescing from a bilious remittent fever, was sitting quietly by the fire, when his attention was called to his left leg and foot, which had become quite devoid of feeling; thinking that it was only the sensation of numbness which we

so often experience when pressure is made on the sciatic nerve while sitting, he arose and began to walk about, but discovered that it required more activity and a greater length of time for the leg to regain its accustomed sensibility than is usual when a person's foot is simply asleep as it is termed.

"After a while, however, this abnormal numb sensation disappeared, and the patient, feeling as well as ever, soon retired to rest, but was hardly asleep when he was aroused by the nurse for the purpose of fitting a key to a bureau drawer; he arose, executed her request, and returned to bed apparently without any difficulty, but shortly after this, desiring a glass of water, he called to the nurse, who, on arriving, was alarmed at the aspect of her patient, whose face was awry, and whose mouth was drawn to the left side. She now handed him a glass of water; he put the glass to what he supposed was his mouth, and as he imagined drank the contents, but soon discovered that he had poured the water all over himself and the bed. On moving about while in the dark, Fetter caught hold of his own left hand, but was not conscious of that fact, and would not be convinced until a light was brought and the truth proven, when the reality that he was paralyzed first flashed across his mind.

"On being examined after this attack, there was found to be loss of motility and sensibility on the left side of the body; the face was drawn to the left side, and this fact is still further corroborated by Mrs. Fetter, besides the testimony of the nurse and Mr. Fetter; the sensibility on the right side of the face was unimpaired. Vision in the left eye was so much affected that he could not read at all. There was no loss of consciousness, no premonitory symptoms whatever, excepting the sensation of numbness in the left leg and foot. His intellect was perfect, his memory was unaffected, and his special senses, excepting as regards the impairment of vision in his left eye and the anæsthesia on the diseased side, were natural. The bladder and rectum were at first normal, but after a while slight incontinence of urine followed.

"He remained in bed, unable to move, for about seven months before any change in his condition for the better took place, and then he began to improve, very gradually indeed,

and in time could go about by means of a crutch, which he continued to use for nearly a year, the leg during this period making the most progress. Then he laid aside the crutch and managed to walk with a cane, and in the due course of events he was able to move about without any artificial support, and has for the last seven years used nothing whatever to assist him in walking. During the early stage of the disease there was some amendment in the arm, but latterly there seems to have been none whatever. He has passed through the hands of many physicians, but without receiving much apparent benefit. While he was confined to his bed he had frequent nocturnal emissions, and, after he was able to be up and about, his virile power was abnormally exalted.

"About the middle of May, 1862, he commenced to have well-marked epileptic fits, which were attended with complete loss of consciousness and preceded by vertigo. These fits recurred at regular intervals twice a week for a period of nearly four years, when they began to decrease in frequency, although they did not change their type, as is often the case, and have continued to diminish until June, 1870, when he had an unusually severe attack, which was the last.

"The patient was admitted to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, September 19, 1870, when the following points pertaining to his condition were at that time ascertained:

"His heart and lungs are perfectly healthy, general health is excellent, appetite is good; bowels are regular; urine is normal and there is no incontinence; vision on the left side is as good now as ever; the left pupil is slightly dilated or the right slightly contracted. The tactile sensibility of the whole left side of the body is diminished to a great degree; the motility is impaired, but this depends more on the lack of nervous energy than on atrophy or want of contractility in the muscular fibre. There is no facial paralysis, no difficulty in moving the tongue, no impairment of speech. His intellect and memory are as perfect as ever. There is no change of character, nor undue display of emotional feeling, which is so often evinced in those suffering from cerebral hæmorrhage. The tactile sensibility on the right side of the face is normal. Special senses,

excepting the anæsthesia of the left side, unimpaired at present. Sexual appetite is increased. On examining the eyes by the ophthalmoscope, they are both found to be in a perfectly healthy condition.

"*Upper Extremity of the Left Side.*—The arm hangs powerlessly by his side, with the forearm fully extended, and the fingers are drawn more or less into the palm of the hand. He cannot flex the forearm nor extend the fingers in the slightest degree, but can manage to raise the whole extremity a little by means of the deltoid muscle. The shoulder is depressed and inclined inward. There is some rigidity about the muscles of the fingers and hands, owing to secondary changes which have taken place. There is no observable atrophy of the muscles of the arm and forearm, and, as far as muscular development is concerned, they seem to be well nourished. The tactile sensibility is considerably diminished, while motility is greatly impaired, and to a much greater extent here than in the leg. The dynamometer indicates no expenditure of power, and this is evidently more on account of the inability of the patient to grasp the instrument, owing to the rigidity of the fingers, than from total want of muscular force. The sensations of heat and cold are diminished; tickling the palm of the hand is not felt, nor are reflex movements excited thereby. The sensation of pain is increased, as evidenced by the application of the electric current, while the same means shows that muscular contractility is diminished. The temperature is diminished, but sensations of deep pressure are increased.

"*Lower Extremity of the Left Side.*—The patient has considerable strength in this limb, and is able to walk about, yet he limps and has little control in directing its movements. The foot is strongly adducted, and the toe catches whenever he goes about, and when sitting down he is totally unable to raise the diseased limb voluntarily so as to cross his legs. Tactile sensibility, together with the sensations of heat and cold, is diminished, and so is temperature. Muscular contractility, as shown by the galvanic current, is diminished. Tickling the sole of the foot is not felt, nor are reflex movements excited thereby. Sensibility to deep pressure, pain, and electricity, is increased. There is a difference by measurement in the legs,

which shows that the left is an inch and a half the smaller in circumference."

The point of greatest interest in relation to this case is the alternate hemiplegia or cross-paralysis, in regard to the previous existence of which there appears to be no doubt. The arm and leg of the left side were paralyzed, the face was drawn to the same side, which of course shows paralysis of the right facial nerve. You know this is an exception to the general rule, which is, that the face and the rest of the body are paralyzed on the same side, and I therefore ask your especial attention to the circumstance. I have seen but two similar cases in the whole course of my experience.

And, first, let me recall to your recollection certain points in the anatomy of the seventh pair, or facial nerve, which is the principal motor nerve of the muscles of the face, and the one affected in cases like the present.

The apparent origin of this nerve is from the side of the pons varolii, although its fibres can be traced much higher up, even as far as the floor of the fourth ventricle. They decussate somewhere above the pons, the exact point not having been ascertained, and the fact being denied *in toto* by some anatomists. A point, however, which I shall mention to you presently, shows that the decussation does really take place, and that the crossing over must be above the pons.

After leaving the side of the pons the facial passes through the aqueductus fallopii to the stylo-mastoid foramen, and is distributed to all the muscles of the face, excepting the pterygoid and the masseter. An extravasation of blood occurring in the pons on one side of the mesian line must paralyze the facial of the same side; so much for that division of the phenomena in this case.

The fibres of the anterior roots of the spinal nerves which are motor continue in the anterior columns, until they reach the lower part of the medulla oblongata, when they decussate, those of the right side passing to the left, and *vice versa*.

The fibres connected with the posterior roots likewise cross over to the opposite side of the cord, but they do so immediately after their entrance. Both sets therefore decussate be-

low the pons, and consequently a lesion of one side of this ganglion paralyzes both motion and sensation, on the opposite side of all that part of the body supplied by nerves arising below the point of decussation. But the crossing over of the facial nerves, as I have just told you, takes place above the pons, and consequently such a lesion must produce paralysis on the corresponding side of the face.

Now, the decussation, although difficult to see as an anatomical fact, is very conclusively proved by pathology, for an extravasation occurring in the corpus striatum of one side, for instance, paralyzes the opposite side of the body, face included, a fact which shows that the decussation of the facial has taken place below the seat of the lesion.

Another symptom present in this case indicates a lesion of the pons, and that is the epileptic paroxysms from which he has suffered. Although this phenomenon, if taken by itself, is not very definite, it is of importance when viewed in connection with the cross-paralysis.

And then a circumstance indicating the pons as the situation of the extravasation is the total loss of the faculty of reflex excitability, which you will recollect was especially mentioned in the history. Numerous experiments and observations serve to show that the pons is a grand centre of reflex action. Lallemand [1] mentions a case in which a child was born without cerebrum or cerebellum, and with no ganglion within the cranium excepting the pons varolii, and the medulla oblongata, and yet this child was able to suck, to make movements with its arms and legs, and apparently was possessed of as much muscular power as other children of its age. Many other similar cases are on record, and they certainly do show that reflex movements are not dependent on the higher ganglia of the brain for their manifestations.

This doctrine of cross-paralysis, pointing conclusively to lesion of the pons, is not universally admitted. Trousseau questions it on the basis of one case, in which the hemisphere was the seat of the extravasation, and I have myself seen one in which the hemisphere was apparently the only part of the

[1] Recherches anatomico-pathologiques sur l'encéphale et ses dépendances. Paris, 1824.

brain involved. Still a case or two should not be allowed to stand against the large number referred to by Gubler and Luys.

As regards the treatment of this case there is not much to say. The epileptic paroxysms seem to be gradually disappearing, the paralyzed muscles of the face have regained their contractility, and nothing remains to be done but to restore, as far as we can, power to the arm and leg. This we shall try to do by hypodermic injections of strychnia, in doses of a thirtieth of a grain every alternate day, and by the use of the primary galvanic current, until the contractility of the muscles is so far restored as to render the use of the induced current advisable.

[Note.—The treatment indicated above has been followed out in this case up to date, November 19, 1870, the patient every alternate day receiving a hypodermic injection of the thirty-second of a grain of strychnia, together with the application of the primary galvanic current to the paralyzed limbs three times a week. October 1st, the induced or Faradaic current having first produced contractions in the muscles of the forearm, hand, and fingers of the diseased side, this was employed from that date, in addition to the above means, as the conditions of the case demanded, sometimes one current being used, at others both. *October 31st.*—The tactile sensibility in both the arm and leg is beginning to return. In short, the improvement has been gradual and steady, and at the present time the condition of the patient is as follows: He can flex the forearm on the arm, touch his forehead with his left hand, flex and extend the fingers slightly. The toe does not drag, nor does he swing his leg very much. He can cross his legs without any difficulty. The foot is not adducted so much, and he can move it directly forward or backward, which he could not do two months ago. The muscles of both the leg and arm respond well to the Faradaic current, although muscular contractility is still diminished. The sensation of tickling is felt, but not so well as in the right leg, and the reflex excitability is abnormally impaired. Sensations of deep pressure, heat, and cold, are normal. Tactile sensibility has returned to a considerable degree. Sensibility to the electric

current is much increased. Temperature has increased. He has had no epileptic attack for five months, and his general health was never better than at present.—T. M. B. C.]

LECTURE III.[1]

CONGESTION OF THE SPINAL CORD.—CHRONIC INFLAMMATION OF THE SPINAL CORD.—REFLEX PARALYSIS.

At the previous clinical lectures, I brought before you several examples of paralysis—cases due to cerebral hæmorrhage, to embolism, and to thrombus. The cases which I shall present to-day are examples of spinal paralysis; and I wish you to pay particular attention to the diagnostic marks which distinguish them from those you have before seen. I will first read the histories of the three patients before you:

Case I.—"Rose Peyton, twenty-seven years of age, born in Ireland; mother of two children, both of whom are living; the elder has talipes valgus, while the younger is a fine, hearty child. Her family is very healthy, and there is no evidence of nervous diseases either in it or in any of its branches, so far as she is aware. The patient was a strong, active woman, and always did her own work until twelve weeks ago. In May there was a cessation of menstruation, and in July last she was seized with a deep, dull, aching pain in both legs, which appeared to her to be in the bones. There is no syphilitic taint in her history. There succeeded shortly after a severe pain in the back, which has continued up to the present time, but which has varied in intensity. Soon loss of motility, numbness, and anæsthesia, made their appearance in both legs, and in the course of two months she was totally unable to walk at all. At first her bowels were very costive, but soon this condition was superseded by incontinence of the rectum, which lasted for two weeks, varying in degree. There was also retention of urine. Sensations of formications, alternating with numbness, of heat and cold, of pricking by pins and needles,

[1] Reported phonographically by Dr. John Winslow.

were present not only in the feet and toes, but also in the hands and fingers. Patient noticed that, on rising in the morning, after a night's rest, her limbs were weaker, and that she had greater difficulty in moving about. The paralysis, after commencing in the lower extremities, rapidly extended to the upper. *August 25th.*—Was able to get out of bed for the first time in five weeks, and by means of a chair could move about a very little. Since then she had improved only so much as to be able to come to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, by being supported by a person on either side, and only then with extreme difficulty. She was admitted September 22, 1870, when she was found in the following condition: Motility and tactile sensibility in both legs greatly impaired, but the right leg is the weaker of the two. Left hand, as measured by the dynamometer, is much feebler in power than the right, and this to a more marked degree than any normal disparity. Sensations of formication, alternating with numbness, of heat and cold, pricking by pins and needles, and tingling, still continue in the feet and toes, as also in the hands and fingers. Pain in the back increased by pressure and percussion, but no burning sensation of applying heat and cold. The anæsthesia is more marked in the thighs than in the legs. Soreness in the soles of the feet. Bowels constipated. Bladder normal. Electro-muscular contractility and sensibility greatly diminished. No band around the waist. No spasms, twitchings, nor reflex movements in the legs. Pain in the lower extremities as at first. Changes in the degree of the paralysis from time to time. Temperature diminished. The circumference of the legs is diminished to a marked extent, owing to the atrophy of the muscles. Heart and lungs healthy. Urine not examined."

Case II.—"Joseph White, thirty-two years of age, born in Ireland, blacksmith by occupation; father of four children, all of whom are at the present time alive and well. He has never had syphilis, nor in fact any disease since his childhood. At times he has drunk to excess, but not habitually. His family line is free from the neuroses. The patient was a strong, hale man, having enjoyed the best of health, and always working

very hard and diligently at his business, until the 12th day of August, 1868, when he slipped and fell, striking the right side of his forehead at the outer canthus of the right eye against the edge of a tub, inflicting a severe lacerated wound. This remained open two months, and before healing was attacked with erysipelas, which was very severe and lasted a month. As soon as the erysipelas disappeared the wound of the face began to granulate and was quickly cicatrized. During this attack the patient was a greater part of the time confined to his bed. October 12, 1868, went to work as usual, and noticed that his hands trembled very much, and was every now and then seized with a severe attack of vertigo. His vision was more or less impaired, but in the course of a month was the same as ever. There was no loss of consciousness nor any involuntary muscular contractions during these seizures. He continued in this condition until July 1, 1869, when he was suddenly taken with a dull, aching pain in the lumbar region of the spine, which lasted for four weeks, and disappeared under the continued application of blisters. At this time there were no spasms in the muscles of the back. His attention was next called to numbness in the great toe of the right foot, which gradually extended to the ankle, and in the course of two weeks the whole leg became involved. He now became aware that motility was diminished in the right lower extremity. His bowels became very constipated, and a second attack of pain in the back supervened, which was not so acute as the former seizure. This pain remained steadily for a period of five months. *January* 1, 1870.—Was troubled for the first time with retention of urine. His left leg now began to grow weak, and this loss of power gradually increased. There was no abnormal sensation of numbness in it, as in the right. He remained in this state of incomplete paresis for a short time only, as the disease made such rapid progress that in March he was just able to get about, by means of a cane, with the greatest difficulty and exertion. The right leg was more paralyzed than the left, and tactile sensibility was diminished only in the former. Severe spasms and twitchings in the muscles of both legs now set in, and his attention was soon called to sensations of heat and cold, formications, swellings of the calves

of the legs, and prominence of the superficial veins of both lower limbs. For three months he remained in about the same state. *June 1st.*—He began to improve in walking, but was troubled very much with severe pains in both legs, which were at one time darting, at another dull aching, and seemed to start from the joints. *September 1st.*—Had a feeling of constriction or band around the waist, which has continued to the present time. He has improved in walking very gradually since June 1, 1870. He applied for admission to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, October 3, 1870, when the patient was found in the following condition: Motility impaired in both legs, but not to any very great extent. The left leg is weaker in muscular power than the right. Sensations of heat and cold, formications, prickings by pins and needles, in both limbs. Reflex power greatly exalted. Twitchings in both legs. Cord around the waist. Numbness in right leg. Retention of urine. Bowels constipated. Severe darting pains in the legs. Slight pain in the back not increased by pressure and percussion. No burning sensation along the spine by application of heat or cold. Tactile sensibility in both legs normal. Urine markedly acid. Cannot stand up with his eyes closed, for he immediately loses his balance. Cannot walk in the dark at all. His gait is peculiar, and is better appreciated by being seen than described. The remaining points of his condition at the present time are negative in character.

Case III.—"Elbert Baxter, forty years of age, single, born in the State of New York; showman by occupation.

"The patient had been a very healthy man until the year 1859, when his present disease commenced. He has always been remarkably temperate in his habits; having been addicted to no excesses of any kind. He has never had syphilis, nor suffered from any spinal injury. His father was attacked with hemiplegia of the left side when sixty-three years old, and his aunt on his mother's side was paralyzed when fifty years of age. All his other relations were free, as far as he is aware, from the neuroses. In the year 1859, having passed a night where he was obliged to sleep in a very damp place, he was

soon after this exposure seized with a dull aching pain in the small of his back, accompanied with nausea and vomiting. A short time having elapsed, there followed, first, loss of vigor; and, secondly, incontinence of urine, which was soon succeeded by a slight weakness of the lower extremities. This paresis of the legs gradually increased during a period of about six months, when it became almost complete paralysis. In July, 1860, he noticed that he was unable to exert volitional control over his rectum, and, if he did not immediately attend to the calls of Nature, his fæces passed involuntarily. This condition lasted several months, and varied in degree according to circumstances. At this time he entered the Kilkenny Hospital, in Ireland, where he was treated for three months for what was there called the creeping palsy, but, getting no better, he went to London, and after remaining there several months under treatment he became dissatisfied, as there seemed to be no improvement in his condition, and, giving up all hope of cure, he travelled in different parts of Europe until 1861, when he returned to New York. From July, 1860, to 1868, he was in a nearly helpless state, and was only able to get about with the assistance of a strong cane, and even then with great exertion. During the year 1867 he had a very severe attack of acute pain, limited to the lumbar region of the spine, and attended with violent spasms of the muscles of the back, which recurred at intervals for the period of four days, and were excited by the least movement on his part. He now recalls similar seizures which had taken place at intervals a long time ago, but they were not so intense in character. In 1868, under a tonic treatment, he began to improve in walking, and on admission to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, August 16, 1870, he was in the following condition:

"His right leg is not very much atrophied, while his left appears to be very well nourished. The muscles of the left leg respond very well to the induced current, while those of the right are not affected at all by it. The extensor muscles of the right leg are so greatly paralyzed that the patient is unable to raise the toe, and in consequence drags it along on the ground at every step. The right leg only seems to be involved,

yet there is difficulty in guiding the movement of the left, not on account of the want of motor power, but from the absence of muscular sensibility to direct it. Under these circumstances it is with great difficulty that he can get about, even with the assistance of his cane, and, as he walks, his right leg bends under him, giving it the appearance of being shorter than the left, while he hastens forward as fast as possible in order to maintain his equilibrium. The tactile sensibility is diminished on the left side, as shown by the asthesiometer, as high as the umbilicus, and exactly limited to that side. The sensibility to pain, to the electric current, and deep pressure, is impaired on the left side, while the sensation of tickling is unfelt. Differences of temperature are immediately detected in both legs. He cannot stand with his eyes closed, and cannot walk at all in the dark. The impairment of motility is confined exclusively to the right leg. The heart, lungs, and kidneys, are apparently healthy. There is incontinence of urine, with continual dribbling; the urine is very alkaline; the bowels are constipated; there is no stricture of the urethra, but atony of the bladder, with loss of sensibility of its mucous membrane. There is no pain in the back by pressure or percussion; heat or cold does not produce any burning sensations in any part of the spine; there is no feeling of constriction or band around the waist; there are no referred sensations whatever; there are no spasms in the legs. There has been no rapid nor gradual extension of the paralysis upward. There has been no sympathetic affection of the eyes."

"The treatment in this case has been a teaspoonful of Squibb's fluid extract of ergot, with fifteen drops of the tincture of belladonna, three times a day internally, and the application of the primary galvanic current to the paralyzed muscles every alternate day. From August 16th to October 5th his urine continued alkaline; it was examined very often, that passed on rising in the morning being the specimen generally tested. In order that no doubt should arise in regard to its reaction, his bladder was on several different occasions carefully syringed out, and the urine was then tested and found to be alkaline as soon as it was excreted from the kidneys. *October 6th.*—The urine was neutral, and on the 10th re-

markably acid, and it has continued acid up to the present time, November 21, 1870, although the patient is living under exactly similar circumstances as regards food and medicine. *October 10th.*—He passed a good, full stream, and did not dribble, owing to the beneficial effect of the belladonna. At this date the induced current, producing contractions in the right leg, was substituted for the primary galvanic. He has taken the fluid extract of ergot uninterruptedly up to the present time, but he ceased taking the tincture of belladonna. *October 18th.*—This patient has improved very much in walking since he first came under observation. He can at present move about quite readily without a cane, yet the right leg is still weak, and the toe occasionally catches as he walks. His gait is characterized by a peculiar manner of limping. The paralyzed muscles have considerably recovered their contractility, and respond beautifully to a weak Faradaic current. The urine does not dribble away, yet there is a desire to pass it more frequently than is natural. The legs are both well nourished, and measurement shows no difference in their circumference. Tactile sensibility, sensibility to pain, deep pressure, tickling, and the electric current, are now only very slightly diminished in the left lower extremity. There is no perceptible retardation in the transmission of sensitive impressions on either side, although there was on the left at the time of his admission."

Now, gentlemen, you have here three examples of organic disease of the spinal cord, giving rise to paraplegia, as it is called. Paraplegia is sometimes spoken of as a disease, but I wish you to understand that it is merely a symptom of a diseased condition, existing most generally in the spinal cord, but by no means invariably. The fault may lie with the sciatic nerves, for example. You will readily see that, if both of these nerves should happen to be cut, there would be paralysis of both legs, or one form of paraplegia. Cases also are on record in which it has been caused by cerebral disease. Paraplegia is, therefore, but a symptom of some lesion of the nervous system, producing paralysis below the point of injury or disease, and we form our ideas of the situation according to the muscles,

and other parts of the body which are affected. Thus, sometimes the lower extremities alone are paralyzed; sometimes they and the bladder or its sphincter are involved; sometimes the upper extremities participate, and so on.

Among the affections of the spinal cord, commonly known as organic, there are three frequently met with, to which we shall confine our attention to-day, which have several points in common, and which at times are difficult to distinguish from each other. The first of the three is congestion of the vessels of the cord or its membranes; the second, inflammation of the membranes—spinal meningitis; the third, inflammation of the cord itself—myelitis. The cases before you illustrate two of these conditions: the first patient is in all probability suffering from congestion of the spinal cord; the second and third from myelitis. It is not always easy to distinguish between the two affections; indeed, it is probably impossible, in some instances, to say whether we have to deal with a severe attack of congestion of the cord, or a mild one of myelitis; though, as between slight congestion and severe myelitis, no doubt could arise. The rules of diagnosis laid down in the books serve well enough for typical cases, but will be found insufficient and unsatisfactory in the majority of those which come under your notice.

In Rose Peyton's case, you observe there is no sense of constriction around the abdomen. This sensation of "a cord around the waist" is considered a pathognomonic symptom of inflammation of the medulla, but the idea is not strictly correct. I have found the symptom in cases of very bad congestion, and I think also in one case of simple irritation of the cord. It is true, however, that the sensation is felt in almost every case of inflammation of the cord. It is probably due to muscular spasm; and it indicates the upper limit of the paralysis. In some cases where the sciatic nerve is affected, and there is no trouble whatever with the spinal cord, we have a similar sense of constriction in the thigh, as if the limb were encased in armor. It is seen, not very rarely, in certain cases of sciatica, attended with loss of power.

You observe, too, another point. This patient has had no spasms or twitchings of the limbs, none of those aberrations of

motion so exceedingly common in myelitis. These spasmodic twitchings indicate irritation of the gray substance of the cord; or rather, whenever you see them you may be very certain that the gray matter is in some way involved; and it is not likely to be involved in congestion, unless this should become extreme, and enlarge the vessels to so great an extent as to exert very considerable compression upon the cord-substance. The twitchings depend strictly upon irritation of the gray matter; and this ordinarily happens only when the cord is inflamed, or subjected to pressure.

The woman has had trouble with her urine. This you find in all three conditions—congestion, meningitis, myelitis. In the last you are more apt to have retention; in the first, incontinence; but you may have both in either condition. Incontinence depends simply upon paralysis of the sphincter of the bladder, retention upon paralysis of the bladder itself. The bladder, as you know, is a hollow muscle deriving its nervous supply from the spinal cord, and the act of urination is due to its contraction, the sphincter being at the same time relaxed. If the cord is inflamed, or otherwise disordered at or above the point where the vesical nerves are given off, we shall have paralysis of one or the other of these sets of muscular fibres, or of both; for we may have both paralyzed together, the patient being unable either to retain his water or to expel it completely, and then the urine dribbles slowly off.

You find alkalinity of the urine laid down as one of the signs pathognomonic of myelitis; yet, in the case of White, the urine is markedly acid, although I have no doubt that he is suffering from inflammation of the cord, mainly of its posterior columns. The sign is therefore not invariably present, but it is very frequently. It may be that this patient will have alkaline urine by-and-by. The present acidity may perhaps be due to something in his diet. If a myelitic subject were taking mineral acids, for instance, they would be pretty sure to acidulate the urine. In another case which has been shown you, and which is now in hospital, of myelitis, complicated with cerebral paralysis, the urine is very decidedly alkaline. It may happen that the urine is found alkaline when the cord is perfectly sound, the alkalinity depending

directly upon paralysis of the bladder (or upon any other affection, as enlarged prostate, which prevents its complete evacuation). The small portion of urine remaining in the bladder after each act of micturition becomes decomposed; and by contact with this and with the vesical mucus, the normal urine, as it enters the bladder, is also speedily decomposed and rendered alkaline. But in myelitis the urine is secreted by the kidneys in an alkaline condition, and it is this which is the diagnostic feature. To make a proper examination in case of doubt, the bladder must be thoroughly evacuated, and well washed out with lukewarm water slightly acidulated, and then the first urine that flows must be taken for testing.

In the case of Baxter this course was pursued, and the fact was demonstrated that the marked alkalinity observed was an inherent quality of the urine as excreted by the kidneys. Neither White nor Baxter can stand with his eyes shut and his feet close together, and neither can walk in the dark. The text-books speak of these symptoms as absolutely diagnostic of locomotor ataxia, which is nothing more than myelitis affecting the posterior columns of the cord. The inflammatory condition subsequently degenerates into what is termed sclerosis, or hardening of the posterior columns. It used to be thought that locomotor ataxia was an affection of the cerebellum; but no one at all conversant with the recent advances in its pathology now holds that view. It is simply inflammation of the posterior columns. But this inability to stand or to walk without the aid of sight, is not indicative of any particular trouble of the cord, as until recently supposed; it merely indicates a want of sensibility in the soles of the feet, and may depend upon an affection of the nerves as well as upon a central lesion. The sense of pressure is also much diminished in these cases, and, with this double insensibility, the patient requires all the help of his eyes and ears to get along. By looking at his feet, or at the ground a little in front of them, he can judge of their position, and manage to walk pretty well; but the moment he shuts his eyes, he does not know where his feet are, and so he falls. This is the reason, then, that a person having any disease of the posterior

columns of the spinal cord, involving their integrity, or any other affection causing loss of sensibility in the soles of the feet, and loss of the sense of pressure, cannot stand or walk in the dark; he has nothing to guide his muscular sense.

There is another point in Baxter's case which is exceedingly interesting. You will recollect that it is stated, in the history I have just read, that sensibility is impaired in the left leg, the motility being unimpaired, while motility is diminished in the right leg, the sensibility being unaffected. Now, if you will recall your anatomical and physiological knowledge, you will recollect that the sensory roots of the spinal nerves are in the posterior columns, and that they decussate soon after entering, and that the motor roots are in the anterior columns and do not decussate till they reach the lower part of the medulla oblongata. It follows therefore that in Baxter one lateral half only of the cord is involved, and the symptoms show that this is the right half, including the anterior and posterior columns of that side.

I had recently a patient affected with locomotor ataxia, living at the Fifth Avenue Hotel. He was able to walk quite well along the sidewalk, but he felt the greatest apprehension at crossing the street. This showed the loss of self-confidence which is strongly characteristic of these patients. They are indisposed to attempt any little gymnastic exercises which once they would have essayed without hesitation—though to cross Broadway through a jam of vehicles might be said to be a gymnastic feat that would tax the best of us. I once watched this gentleman for fully fifteen minutes trying to make up his mind to go across. He could not do it, though there were during the time many openings, when, but for this want of confidence, he might have crossed with ease. On one occasion, coming down-stairs at the hotel, he did tolerably well until he got to the bottom step; then, putting his foot upon the marble pavement, he became suddenly alarmed at its slippery character; fell upon his hands and knees, and called aloud for help. I have often seen these patients, while crossing my own hall-floor, suddenly stop and settle down into a sitting posture. This lack of confidence, which is so marked a characteristic

of the ataxic patient, has not, so far as I am aware, been mentioned by any writer upon the subject.

Anæsthesia is met with both in inflammation and in congestion of the spinal cord, though I think more frequently in inflammation than in congestion; and you find it in both of the cases we have been examining. You may also have hyperæsthesia in these affections. After a time, if the inflammatory process goes on unchecked, these sensations cease; they cease, too, if the patient is getting cured. In the former case, as the disease advances, *ramollissement*, or softening of the cord, takes place, and it is no longer capable either of giving rise to, or of communicating, any sensation; the feeling of numbness, therefore, disappears, and with it goes the twitching of the muscles. In treating cases of myelitis, then, you must be on your guard against misinterpreting this into an evidence of convalescence when the patient is really getting worse. The other symptoms will, of course, settle the point.

It very generally happens, in cases of meningitis especially, that a prominent symptom, which may be regarded as quite characteristic, is the permanent tonic contraction of the flexor muscles of the limbs. In extreme cases, the heel is drawn up so as to touch the buttock, and the knee so as to touch the chin; more commonly, however, the flexion is not thus complete. I have seen a number of these cases, and have had several recently under my care. One of them, a very prominent merchant, in Grand Street, came to me about a year ago, with such violent contraction of the limbs that the leg was exactly parallel to the thigh, and the thigh bent upon the chest, the heels against the glutæi, the chin resting on the knees. When I first saw him he had been in that position for several weeks. In another very severe case, that of a gentleman from Ohio, the same position of extreme flexion had been maintained for several years. I succeeded in curing the disease entirely, but it was impossible to bring down the legs. The muscles, from long contraction, had become so shortened, that no reasonable degree of force could overcome their resistance. So I called in my friend Prof. Sayre, who cut the tendons of the gastrocnemii, of the iliæi, of the tensores vaginarum femorum, and some others, and then forcibly stretched

out the limbs. Even the skin had become so contracted that by this extension it was ruptured in the popliteal space, making a gap three inches wide. But, in spite of all this, the limbs would not stay down. The patient could not bear the fatigue of having them stretched by the weights which were applied, and the attempt had to be given up.

In that form of myelitis involving the posterior columns of the cord, it often happens that one of the first symptoms noticed is some disturbance of vision; generally that the patient sees double. This is due to paralysis of some of the orbital muscles. There may be simple ptosis, from paralysis of the levator palpebræ superioris; but more commonly some of the muscles which move the eyeball are affected, and double vision necessarily results. This symptom often comes on early, and then soon disappears. It is dependent upon the intimate connection between the spinal cord, the sympathetic nerve, and the muscles moving the eyeball—the sympathetic having connection with every spinal nerve, and transmitting the abnormal influences thence derived to the muscles. So with all the head-symptoms which we find in this disease—and they are often very grave; I have seen cases approaching idiocy—they all result from the effect on the brain of the connection of the sympathetic nerve with the diseased spinal cord.

Before pursuing this subject further, let me present to you this patient who has just come in, and of whose case we have no written history. The gentleman, Mr. Atkin, is a teacher, about forty-five years of age. It seems that he served in the army; at Petersburg was much exposed to the weather; had an attack of fever of some sort, attended with great exhaustion; and when he recovered found that he had to a great extent lost power over his legs. He now walks with much difficulty, and in a cursory view you would probably observe no marked difference between his gait and that of White, although there is a difference which study of the subject would lead you to notice. From the examination I have been able to make, I cannot discover that he has any organic disease of the cord. He is probably suffering from what is called reflex paralysis, an affection which may result from trouble of the bladder, from worms in the intestinal canal, from diphtheria, ty-

phoid fever, and probably various other diseased conditions. It is most likely immediately dependent upon a deficiency of blood in the cord, though this point is not yet settled. In that case the anæmia of the cord may be due to disorder of the sympathetic nerve. The name reflex paralysis is a bad one, but it is in common use, and I will not burden your memory with any other. This patient has no muscular twitchings, no anæsthesia or numbness, no loss of power, no difficulty with his urine, no sensation of constriction about the belly. These are in brief the characteristic marks of reflex paralysis—they are simply negative. The diagnosis depends upon the absence of the symptoms of the organic affections which I have brought before you.

Too often, from fixing attention on the single symptom of loss of motive power, these diverse affections—myelitis, meningitis, congestion, reflex paralysis—are confounded with each other, all mixed up in the so-called disease, paraplegia. How great the distinction is you will at once understand. In this last case there is no serious trouble of the cord, nothing which cannot almost certainly be cured. In the other cases, although there is a very strong probability that these particular patients will get well, the prognosis is by no means so favorable. In organic lesion, those who get well out of a hundred can be counted on the fingers of one hand; in reflex paralysis, ninety-nine out of one hundred recover.

I have said enough to indicate the main principles which should guide you in your diagnosis of these forms of paralysis, and have given a slight idea of the prognosis. We come now to the treatment. And here there is the utmost possible difference in the management of the two categories of paraplegic affections. In the organic lesions myelitis and meningitis (as well as in congestion) the indications are to diminish the irritability of the cord, and to lessen the amount of blood in it; in reflex paralysis, on the other hand, the indication is to increase its excitability, and to this end its blood-supply. Now, if you institute a given treatment for paraplegia, and apply it indifferently to the two classes of cases, you will be quite as likely to harm as to help your patients—indeed, you may do them irreparable damage.

It is a fortunate thing that the treatment of myelitis, meningitis, and congestion, is essentially the same, so that even where you are in doubt regarding the diagnosis, as between these, you need not hesitate as to your principles of action. The measures of treatment may be divided into the external and the internal.

Of the external means I give the first place to dry cups, applied every night, or every alternate night, on either side of the spine. Blisters I have long since given up, as I think they only do harm. The cupping tends, of course, to divert the blood from the cord to the superficial vessels.

Another means of abstracting blood from the cord was brought prominently to my notice by the case of the Grand Street merchant before mentioned. He had in years past suffered much from bleeding piles, which had been operated upon and cured. At about the turning-point of my treatment of the case, the piles reappeared. One night they bled profusely, and the next morning I found the patient very much better. He had had no twitchings in the legs during the night, and had not been compelled to tie them to the foot-posts of the bed—a proceeding which had till then been necessary to prevent their getting drawn up to his chin before morning. The pain in the cord, too, had greatly diminished, and he had gained considerably more power over the bladder. Acting upon this hint, I applied a number of leeches to the verge of the anus, and kept on leeching him thus about once a week, with the greatest possible benefit. I afterward found two cases on record where congestion of the cord had apparently been cured by profuse hæmorrhoidal discharges. I have since very frequently in these cases employed leeching at the margin of the anus, in addition to the dry cups over the spine, and I recommend it as a valuable part of the treatment.

Another excellent revulsive means is the alternate application of heat and cold over the spine. Take a lump of ice and wrap it in a thin towel so as to hold it, and have at hand a basin of hot water and a sponge. First draw the ice three or four times down the spine; then do the same with the sponge of hot water; and so on alternately for five or six minutes. Do this every night or every morning, as most convenient.

By this means the skin becomes very red; the irritability of the cord is much lessened; and there is almost always effected a very marked alleviation of the symptoms.

The only further external means of treatment which I have found useful, is the application of galvanism to the spinal column. I place the positive pole above, the negative pole below, thus passing the current from above downward, and let it flow about five minutes, at the longest. The induced current, also, is of great value, not in curing the spinal affection itself, but in counteracting its effects upon the muscles. In the history of Rose Peyton you find it mentioned that the muscles of the legs are greatly atrophied. This atrophy is very common, depending on disuse of the muscles and insufficient nervous supply to keep up full nutrition. By persistent faradization you may restore these wasted muscles nearly or quite to their normal size and functional power, thus putting them in condition to respond to their proper nervous stimulus, if you should succeed in restoring that.

Of the internal means of treatment there is little to be said. There are only two or three medicines that are really of use. The first of these is ergot, in large doses. I have commonly used either Neergaard's tincture, or Squibb's fluid extract; but of late I have taken to using the drug in substance freshly powdered, and I think it acts, perhaps, better in some cases than either of the preparations I have named. Of the fluid extract I give about one fluidrachm three times a day. This dose is said to be equivalent to about one hundred grains of the powder, but this must be a mistake; for I find practically that I get about as much effect from thirty grains of the powder as from a fluidrachm of Squibb's extract. I give these large doses because the small ones of the text-books have no appreciable effect. You will sometimes be warned by druggists, who know nothing about the matter, and by physicians, who ought to know something about it, that such doses will cause gangrene. Now I suppose there is not a single authentic case on record of gangrene resulting simply from the use of ergot. Gangrene occurs, it is true, in those countries where ergotized rye is used as food; but it is due not to the presence of ergot, but to the absence of fresh meat and almost every

thing else from the dietary of the poorer classes; it is the result of starvation. I have talked with those who have lived in those countries, and they say that the stories of ergot-poisoning are wholly the result of sensationalism or of ignorance, and can never be traced to any trustworthy observation. My friend Dr. Jacobi, formerly resident in such a region, pronounces the accounts all a fabrication. You may, then, safely give of the fluid extract, or the tincture, doses of one or two fluidrachms, the latter being the highest I have ever given. Of the freshly-prepared powder, the highest dose I have given is sixty grains; you may usually give it in twenty- or thirty-grain doses three times a day. There is no other one remedy so useful as ergot in these inflammatory or congestive affections of the cord or its membranes; and, as soon as you have determined that you have such an affection, you should give it at once, without fail and without hesitation.

Another useful drug is the iodide of potassium, which I also give in large doses. If, as is not rarely the case, there be any syphilitic taint, this may be combined with the bichloride of mercury in doses of one-sixteenth of a grain. The iodide I commonly give in commencing doses of seven grains three times a day, increasing each dose by one grain daily until I reach, say, forty-five grains three times a day. The most convenient mode is to make a saturated solution in water, containing a grain to the drop, and then measure the dose by drops. In the case of the gentleman from Ohio with contracted limbs, I got as high as sixty-drop doses before I stopped, and, as the patient had syphilitic infection, I used also the bichloride of mercury.

Belladonna has been strongly recommended for these affections, especially by Brown-Séquard. I have never found it of service, except in those cases where there was paralysis of the sphincter of the bladder; there, however, it is of great value. You may give the tincture in the dose of twenty drops three times a day. By a mistake of mine, a patient with paralysis of the vesical sphincter took in one day three doses of a fluidrachm each. It effectually closed up his bladder, so that he needed something to open it; but I would not advise you to repeat this dose, for it also produced the toxic effects of the drug.

Nitrate of silver is used principally where there is disease of the posterior columns of the cord. It is best given in pill, in doses of one-fourth of a grain three times a day, and must be continued for three or four weeks before you can tell whether it is doing good or not.

These are the chief means of treatment for the congestive and inflammatory affections of the spinal cord. How, now, shall we treat reflex paralysis? As I have before said, upon just the opposite principle. Our main reliance is upon strychnia, which increases the irritability of the cord, especially of its anterior columns, increases its circulation, and improves its nutrition. It is far best given hypodermically, a daily injection of one-thirty-second of a grain, under the skin, will do as much good as at least three times that amount given by the mouth. Of course, if you give strychnia to your congestive and inflammatory paraplegics you will only make them worse. In these it is productive of good only at a certain late stage of the disease, when the cure is pretty much assured, and we wish to improve the nutrition of the cord; and even then it must be given in small doses, say one-sixty-fourth of a grain, and carefully guarded by ergot. I think it is also allowable to employ it as a means of diagnosis when you first take hold of a doubtful case. A hypodermic injection of one-twenty-fifth of a grain will soon settle the question whether you have to deal with a reflex or an inflammatory paralysis. If the former, the patient will be helped by the experiment; if the latter, he will find all his symptoms aggravated, but there is little probability of any serious injury from the single dose, and you have thereafter your course of treatment clear.

LECTURE IV.[1]

LEAD-PARALYSIS—CHOREA.

THE first case which comes before us to-day is one of lead-palsy, and the following is its history, as prepared by Dr. Cross:

Paralysis from Lead-poisoning.—"Michael Coffy, aged thirty-two years, single, born in Ireland, a painter by occupation.

[1] Reported phonographically by Dr. John Winslow.

"When a young man, had soft chancres and buboes, but gives no well-defined, rational symptoms of syphilis. He has been moderately temperate in his habits, and has always enjoyed very good health until 1863, when he was suddenly seized with a very severe attack of colic, which was preceded by great constipation of the bowels and loss of appetite. There soon succeeded nausea and vomiting of bile, accompanied by an acute lancinating pain in the epigastric region, which was so severe that the patient was obliged to lie flat on the floor, and press his abdomen strongly against that surface in order to obtain temporary relief.

"These symptoms continued off and on for a period of about two weeks, gradually diminishing in severity, however, especially after an evacuation from the rectum, which was only obtained with the greatest difficulty. Subsequently the patient had cold, clammy perspirations, and was much debilitated; his right leg at this time became very œdematous. In the course of two months he resumed his usual avocation, that of a painter, but was not aware at this time that his sickness had been caused by the action of lead. During the year 1867 his bowels again became very costive, and his stools, which consisted of only a few lumps of dry, hardened fæces, were attended with much pain and straining. Soon there followed a second attack much more severe than the first, which was characterized by nearly similar symptoms, only there was superadded great tenderness over the kidneys, which were so sensitive that the least pressure caused him the most intense agony. The urine was very scanty and high-colored, and there was a well-marked blue discoloration of the gums.

"In a few months, having somewhat recovered, he went to work again at his former occupation, which he pursued uninterruptedly until the 25th of December, 1869, when, after having passed a very uncomfortable day, his former symptoms returned with increased violence, while the paroxysms of colic came on at much shorter intervals than they had done in the preceding seizures; in fact, instead of intermissions as formerly, there were only remissions of the intestinal spasm. For the first time, he had pain in the feet and the inside of his

thighs. The urine was more scanty and higher-colored, and the bowels more constipated than before.

"In three weeks he again began to work, and had no more trouble except constipation of the bowels, and weakness in both his upper and lower extremities, until July, 1870, when he lost his appetite, and felt very weary and exhausted after any small amount of exertion. He was very restless and could not sleep at night, and this inability to sleep was a sequela of all the other seizures. Now came great tremor of the right hand and arm, which was soon followed by tremor in the left. In August, 1870, he had his fourth and last attack, which was the most severe of all, and lasted about two weeks. This time he vomited blood, had acute pains in the soles of the feet, and cramps in the right hand.

"On recovering from the immediate effects of the colic, he found that he was unable to use his arm or hand at all, and that he had lost power in his legs also. Soon after this he was admitted to the Charity Hospital, where he remained for a fortnight, and during his residence in that institution he became delirious, and continued so for about eighteen hours.

"He came to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, September 12, 1870, when his condition was as follows:

"There was the characteristic dropping of both wrists, which was very extreme in degree. The paralysis of the supinator and extensor muscles of both upper extremities was exceedingly well marked; the flexors were also involved, only to a much more limited extent. The paralysis was more considerable in the right and forearm and hand than in the left. There was much atrophy of all the muscles of these parts, and this was very conspicuous in the abductors and adductors of the thumbs. The patient was so weak in his lower extremities, that he was unable to arise from the sitting posture without assistance, and as he walked he tottered at every step. Yet, he did not drag the toe of either foot, nor swing his legs, as do those suffering from hemiplegia. The blue line was very plainly seen around the edge of the gums of the upper and lower jaw. On testing the amount of muscular power in the right hand by means of the dynamometer, he was

able to turn the indicator only 10°, while with the left he could accomplish somewhat more. The tactile sensibility, sensibility to the electric current, and to pain, were very greatly diminished. The temperature was also diminished; muscular contractility was so much impaired that a powerful induced current had not the slightest effect in causing contractions, and even when the primary galvanic current (sixty cells and very strong) was used the muscles only responded very feebly, if we except perhaps the flexors, so almost completely had their irritability been destroyed. The bowels were regular, the urine was normal, and, although no chemical analysis for lead was made, undoubtedly it would have been found.

"The appearance of the patient was anæmic, cachectic, and depressed; the breath was very offensive; the retinæ were anæmic; the lungs were healthy, and so was the heart, excepting an inorganic murmur at its base."

[Note.—The treatment in this case has consisted of the internal administration of the iodide of potassium, commencing with ten-grain doses three times a day, and the daily application of the primary galvanic current to the paralyzed muscles, with a hypodermic injection of the thirty-second of a grain of the sulphate of strychnia every day.

September 17th.—The iodide was increased to fifteen grains three times a day.

September 24th.—Slight fibrillary contractions in the right arm were produced to-day for the first time, by means of the Faradaic current. *October 1st.*—The iodide of potassium was increased to twenty grains three times a day. *October 5th.*—The induced current had just commenced to cause slight contractions in the left forearm.

November 15th.—Faradization of the left forearm produced good contractions in the extensor corpi radialis and ulnarius muscles. The blue line having disappeared, the iodide of potassium was discontinued, and a tonic substituted.

November 23d.—The muscles of both arms respond feebly to the induced current, yet by means of it the hands can now be extended nearly on a level with the forearms. The right arm has improved the more. Sensibility to touch and to electricity has much improved. His bowels are regular,

he sleeps well, and his appetite is good. The power in both hands has much increased, and he is able to work every day, although he is still under treatment.—T. M. B. C.]

On a former occasion I gave you some idea of the phenomena attending paralysis from lead-poisoning; and in my remarks upon the application of electricity to the treatment of diseases of the nervous system I called your special attention to its efficacy in this disease.

The pathology of the affection is not very clearly understood. One theory is, that the paralysis is due to the lead being brought into actual contact with the muscles, and deposited in their tissue. There might seem to be something to bear out this idea, in the fact that the loss of power is commonly greatest in the right hand and arm, which, in the case of painters and other workers in lead, are probably more exposed than the left to contact with the metal. But to this an opposing argument, which, I think, cannot be overturned, is presented by the fact that some of the worst cases of lead-paralysis are due to the use of saturnine cosmetics; and yet in these cases, just as with the painters, etc., it is the extensors, generally those of the upper extremities, that suffer.

An aggravated instance of this kind I lately saw in consultation with Dr. Sayre, in the case of a lady from Kansas, who had for a long time been accustomed to apply "Laird's bloom of youth" to the face and neck. Now it stands to reason that if the paralysis were due to the contact of the lead with the muscles, it should have affected chiefly those of the face and neck; but of this there was no sign. Take another example. I was consulted regarding a lady in Connecticut, who had paralysis strictly confined to the extensors of the wrists. I found that she, too, had been accustomed to the use of a lead-cosmetic, and also that the drinking-water was conveyed a long distance to the house through a lead pipe.

It cannot be, then, that the paralysis affects by preference the muscles of the hands and arms, simply because the hands are more exposed to contact with lead. Indeed, if that were the case, we should expect the flexors to be paralyzed rather than the extensors, for it is the palms of the hands that do the

handling. All we know of the matter is, that lead, introduced into the system by whatever channel, will produce, in some unexplained manner, a certain train of symptoms, among them lead-colic, which is probably only spasm of the intestinal muscles, and paralysis of the extensors of the arms and hands, and in extreme cases also of those of the lower extremities.

The only form of lead capable of producing these toxic effects would seem to be the carbonate. Metallic lead may appear to do so, but that is probably because it is so readily oxidized, and then converted into the carbonate. I do not think that the acetate is poisonous as such, yet some persons have been poisoned by taking it in large amount—a result probably due to its change into the carbonate in the alimentary canal.

Lead finds various avenues of access to the system, as you have already inferred. It may enter by the skin, the lungs, or the alimentary canal. Its effects are most frequently seen in painters, who handle its oxide and carbonate, and probably also inhale more or less of them. Lead, as you know, is the basis of nearly all our paints, zinc taking its place only for certain in-door decorations not required to stand the weather. Next in frequency among its victims come the workers in metallic lead. I have seen a number among the shot-makers, and the makers of bar-lead; and I have already brought before you two cases of this paralysis in type-setters. Lead-miners are very apt to suffer, and so are lead-smelters, who breathe its fumes.

For water to become poisonous by being brought through leaden pipes, or by standing in leaden reservoirs, it is necessary that it should be quite pure. In that case it will readily become impregnated with lead, and its use for drinking or cooking may be very dangerous. Some years ago I lived in a house where the washing-water was supplied from a lead-lined cistern, filled by rain-water from the roof. I made frequent analyses of this water, and sometimes it contained as much as $4\frac{1}{3\,6}$ grs. of lead to the gallon. On a clear day I could even see the little metallic particles floating about in a precipitating-glass. This, bear in mind, was rain-water, and so, very pure. But with ordinary spring or river water there is comparatively little danger, unless it be allowed to stand a

long time in the pipes. For the generality of such water contains salts, especially sulphates, which form with the lead an insoluble coating for the inside of the tube, protecting it from further action. It is not safe, however, to rely upon this without an analysis of the water; and in any case it is not safe to drink water that has been standing long in the pipes. In the case of the lady just mentioned, the water was brought to the house from a very pure spring, so pure that neither baryta-water nor nitrate of silver gave any precipitate of sulphate or chloride.

In England, a few years ago, the family of the Prince de Joinville were all poisoned by lead, owing, as it was found, entirely to the water used, and which contained not one grain to the gallon. I have met with some similar cases in this city, but always from the use of water that had remained long in the pipes—for the Croton is not so remarkably pure as to become dangerous when it is being constantly drawn. These cases have occurred mostly in persons employed about schools or factories, where the water would be standing unused over Sunday, and in the former over Saturday also. You know that ale and beer, when not drawn directly from the cask, are commonly conducted to the fountain through lead. I had a curious case of lead-poisoning, which for some time puzzled me, in the wife of the proprietor of a beer-saloon. There seemed to be no source of lead except the beer-pipe; yet the family, which was German, all drank beer, and why should this member suffer and the others escape? The mystery was solved on learning that it was her habit, every Monday morning when she came down to open the saloon, to draw off first a couple of glasses for herself. In accordance with the excise law they sold no beer on Sunday, so that she got the full benefit of what lead the beer in the pipe would dissolve from Saturday night to Monday morning. It gave her lead-colic, and afterward lead-palsy.

Look, now, at the patient before you. Although he has improved under treatment, yet you see the characteristic "wrist-drop" very strongly marked. With the hand prone you observe that it hangs down powerless; he cannot extend the hand so as to bring it on a line with the forearm. There is

only a slight tremulous motion when he makes the effort. Even the strong induced current which I am now applying to the extensors on the right forearm, fails to make them contract. The flexors, too, are much enfeebled, although they respond slightly to the current, so that when I place one sponge on the front and the other on the back of the forearm, they flex the thumb and fingers a little; for the extensors, though traversed by the current, cannot oppose them. All the other muscles, even those of the upper arm, have suffered from long disuse. I now pass the current directly through the biceps, and it comes up but partially and with difficulty. Now let us try the electrodes on the back of the left forearm. The extensors are not so badly off as on the right; I can feel and see them rise up a little under the electric stimulus, but not enough to lift the hand.

The loss of power in the flexor muscles of the fingers may be best exhibited by the little instrument I show you here—the dynamometer. It is simply an elliptic spring, of a size to be conveniently grasped by the hand, and having an index to show the amount of compression effected. It measures with the utmost accuracy the degree of grasping force. You see that this patient's greatest pressure suffices only to move the index ten degrees; it would hardly kill a fly! You note also, from the position of the hand, that the flexor carpi ulnaris is more seriously paralyzed than the flexor radialis. This little piece of mechanism I commend to you as exceedingly useful. By no other means can you form so accurate an estimate of your patient's condition, or follow from day to day the almost imperceptible steps of his progress toward improvement or the reverse. To tell the patient to squeeze your hand is a very crude method. You could not judge by it whether he was able to move this index fifteen or twenty-five degrees. Without the graphic attachment, the instrument is very cheap. This attachment—the dynamograph—which I now place in position, is essentially the same that you have been longer familiar with in Marey's sphygmograph. The index of the dynamometer has a pencil affixed to it, its point resting against a card laid upon this rectangular brass plate. By winding up a spring I set in operation a clock-work which moves the plate

and card along past the pencil-point at a perfectly uniform rate. If by an unvarying degree of compression the index and pencil are held stationary, the latter will of course make a straight mark upon the card; but if the pressure varies, its irregularities will be faithfully recorded in corresponding irregularities of the trace. This tests, therefore, the patient's ability to maintain a continuous muscular contraction; it shows, not only the strength of his muscle, but the tone of his nerve. In certain cases of cerebral paralysis, as well as in some forms of spinal disease, its indications are of the utmost importance. Let us try it now upon the man we have been examining. The lever bearing the pencil starts at the height of ten degrees, the point, you remember, to which he raised it before; but it remains there hardly a moment. Now it is falling, falling steadily, and before the card has stopped passing, it has reached the bottom—the man's grasping power is utterly exhausted. Here you see a number of traces made by other patients—for I employ this instrument a great deal. In one set of them, made by a patient with cerebral paralysis, you note a marked difference between the early traces made by the right and by the left hand, and by following out the series you can watch beautifully the successive stages of improvement, until the lines become as straight as you or I could make them.

The prognosis in lead-paralysis is always decidedly favorable if you can get the muscles to respond at all to the induced current; and it is still favorable, though more time must be allowed, if they will respond only to the primary current. But if no response can be evoked by as powerful a galvanic current as it is safe to apply, then you may as well give up the case. As examples of the time required for cure in reasonably favorable cases, let me briefly cite a few from my case-book:

1. X. T.—No contraction from induced current. Primary current caused powerful contractions. Cure in four months.

2. W. C.—Very feeble contraction from induced current. Primary current caused strong contraction. Atrophy of all the extensors of the wrist, and adductors of thumb. Cure in six months.

3. J. B. H.—No action from powerful induced current. Primary current caused strong contractions in all the paralyzed muscles. Cure in two and a half months.

4. W. J.—Lead-paralysis, the result of using cosmetic containing lead. Extensors of wrist affected. No effect from strong induced current. Primary current induced strong contractions. Cure in three months and twenty days.

5. M. P.—Cosmetic. No effect from strong induced current. Strong contractions from primary current.

6. J. D., painter.—No effect from induced current. Strong contractions from primary current. Still under treatment.

7. C. N.—Contractions from induced current. Cure in six weeks.

8. P. C.—No contractions from induced current. Strong contractions from primary current. Cure in two and a half months.

In all these cases contractions were caused either by the induced or by the primary current, and I was therefore able to promise definitely that they would be cured. Where the affected muscles respond unmistakably, though feebly, to the induced current, you may safely say that under proper treatment their functions will be restored in a couple of months. If they will not respond to that at first, but only to the more powerful primary current, then you must date your two months for recovery from the time when Faradism begins to affect them. In the case before us, those muscles which you have seen contract under the Faradaic current will probably in two months longer respond normally to the stimulus of the will; but some of them, like the adductors and abductors of the thumb, are so far atrophied that it will take much longer than that for their nutrition to become fully established and restore them to their old size and strength.

The treatment has been already indicated in the history of this case. It is customary to begin it with the iodide of potassium, in order to eliminate the lead from the system; and I generally keep up this medicine until the blue line completely disappears from the gums, for until that is gone you may be pretty sure there is some lead left. In this man's case you see

it is fast going; the blue line has changed to a pale, whitish gray. The lead combines with the iodide to form a soluble salt, which is chiefly eliminated by the kidneys. You may find lead in the urine of these patients after giving the iodide of potassium. I give no other medicine than this, unless there be marked cachexia, when the patient may require tonics, such as quinine, iron, etc. For the rest you must have recourse to electricity. There is no way of treating these cases successfully except by this, in one or other of its forms. You may have removed all the lead from the system, yet the patient can move his muscles no better than before. To restore them to use they must be exercised; and to exercise them you must find a stimulus to which they will answer. This electricity affords. But you must be sure that you apply it in a form which will provoke their reply. In this man's case the Faradaic current at first caused no contractions; and you might have gone on applying this current daily for month after month and year after year, not only without curing the patient, but without even checking the progressive degeneration and atrophy of the muscles. The galvanic current of a pretty powerful battery was necessary to start the cure, and bring it to the point where the Faradaic could continue it. I have never yet seen a case in which the primary current would not produce contractions, but I suspect that, if this man had gone a year longer without its application, it would then have failed to elicit them, and the case would have been hopeless.

Chorea.—In this little boy we have an example of a disease which you will meet with far more frequently—chorea. He comes from the Out-door Department of the Hospital, where he has been under the care of Dr. Castle, who gives me the following history:

"Michael Prunty, aged ten years, born in the city, of Irish parentage. Applied for treatment at the Out-door Bureau of Bellevue Hospital, on the 4th of October, having had chorea since the 29th of June previous. His mother says that about the 19th of June he went four times during the warmest part of the day to bathe in the Harlem River, and that on his re-

turn home in the evening his face was swollen and the whole surface of his body congested. During the night he was delirious. The next night the fever and delirium were repeated. After this he appeared to be well, until the morning of the 29th, when, on getting up from bed, he had loss of power, and choreic movements of left side, and then told his mother that since the fever of the week before he had felt weak on that side.

"The choreic movements were at first limited to the left side, but had increased in severity, and, about a fortnight before coming to the dispensary, the muscles of the right side had commenced to twitch, and were becoming progressively worse. Could, by an effort of the will, control the movements of the right, and for a few moments those of the left side. Movements not interrupted during sleep. No impairment of sight, or strabismus. Hearing not affected, but for the first month following the attack heard noise of waves on left side. Was always easily angered, and since the attack is more wilful and peevish than before. The choreic movements of tongue prevent his talking much. Is awakened with difficulty when asleep.

"Digestion feeble. Has always been a dainty feeder, and would never eat fat meat or much butter. Has never had rheumatism. No hereditary tendency to disease of nervous system. Some of his ancestors have died of phthisis.

"Stethoscopic examination of chest is difficult on account of the twitching of the muscles, but no rigors were detected of disease, excepting irregular contractions of the heart. Urine passed in the morning neutral."

The symptoms are not at present so well marked as I would be glad to have them for your sake, though for the boy's I cannot well object to his having gone on so far toward recovery. He can hold out his arm and keep it pretty still, but the fingers are spasmodically extended, and now and then there is a sudden movement of flexion or rotation.

Regarding the pathology of chorea, we are in great uncertainty. We cannot even say what is the organ affected; some authors locate the disease in the brain, others in the spinal

cord, others again in the general nervous system. My own opinion is that, under the name "chorea," there are confounded two or three distinct affections, just as locomotor ataxia was lately confounded with several other diseases of the cord, and as almost all shaking palsies were, until two or three years since, called indiscriminately "paralysis agitans." My friend Dr. Ogle, of London, lately wrote a monograph upon "fatal chorea," and reported some fifty autopsies of such cases. The diseased action had almost always been confined to one side of the body, and the lesion was found in the corpus striatum. This was certainly a very different affection from the chorea which you may see almost daily in our dispensaries, and which almost always gets well. I believe that the ordinary chorea of children has its seat in the cord. At the same time it is very common to find it associated with mental symptoms more or less pronounced. The child is less bright than before, or it may even become imbecile; it shows aberration of disposition and will, and in place of its usual gayety it becomes peevish and fretful. This is what you would expect. In disease of the stomach or liver we often find the brain affected secondarily; and it is very rare that there is any serious disease of the cord without its producing this result. In older patients the mental symptoms are sometimes remarkable. I have now under my care a choreic young man who is often put in the most embarrassing positions by the fact that he cannot control his speech. He finds himself irresistibly impelled to say things which he would fain avoid, and this unfortunate tendency debars him entirely from the society of ladies. Whenever he meets them, he is sure to utter something to his own deep mortification. This has been his condition for several months. I knew a similar case in a wealthy gentleman of Harrisburg, who would be making a social visit and conducting himself with the utmost propriety, when suddenly he would jump up, stamp his feet, swear violently, and then, covered with confusion, make his escape from the house.

As to the causes of chorea, the disease has been commonly, and until very recently, supposed to be intimately connected with rheumatism. If I mistake not, I gave you that as my own opinion last year; but, as I have before warned you, I

often find occasion to change my views, and, if you come to these lectures, you must not expect always to hear the same thing. The theory of the rheumatic origin of chorea came into vogue mainly through the influence of Trousseau. He thought he had found it most frequently associated with the rheumatic diathesis, especially where this had produced disease of the heart; and his idea was, that the chorea was, in many instances, due to embolism of the arteries of the brain. Now, further investigation has shown that this is not the case—that none of the symptoms of embolism are present in chorea; and a very extensive study of hundreds of cases has convinced me that there exists no connection whatever between chorea and rheumatism. There are other causes, however, which none deny. Any thing which tends to depress the powers of the system—improper food, bad air, want of cleanliness, etc.—may become a predisposing cause, and then almost any irregularity may determine the outbreak of the disease. Worms may excite it in young children. It may be brought on by fright, or other violent excitement, and this in persons who have appeared in perfect health and under good hygienic conditions. Some of the most interesting cases I have ever seen were caused by fright. Two or three have been due to overstudy at school, which is, as you know, one of the means by which the powers of the system may be very materially depressed.

The prognosis of the disease as it occurs in children is almost invariably good. When I last looked at my table of cases, I had recorded accurate notes of sixty-eight, and of these only two had become confirmed. All the rest either were cured or got well, and even the two persistent ones may recover as the age of puberty comes on. The duration of the disease is generally about two months. That is just about the average of my cases. You can give your prognosis, therefore, with a good degree of definiteness, and so greatly encourage the child's parents or friends.

The disease occurring in adults is a totally different thing. In them you do not often find the choreic movements constant. I have in mind the wife of a prominent man of this city who has been subject to the affection for a long time. She will for

days seem perfectly well. Then, suddenly, she will whirl about on one toe for an hour, until completely exhausted. Again, she will have a spell of getting up and sitting down in her chair, with such force as to bruise the nates. At other times she will jump steadily until her strength gives out.

A few words regarding treatment. I have called attention to the fact that the children who are subjects of chorea nearly always get well. I do not think you can do much to render the recovery more certain, but you may most certainly do much to shorten its period. For the last two or three years my great reliance has been upon strychnia. I commonly begin by given one-sixtieth of a grain three times a day, and gradually increase the dose to one-twentieth. This has proved almost uniformly and quite speedily successful. Some of you will remember the boy brought here last year by my friend Dr. Lusk. He had been treated for months without benefit, but, when put upon strychnia, got well in two weeks. When I spoke of the average duration of the cases as being two months, I meant their duration not left to themselves, but put under judicious treatment.

If you see a case when it first comes on, you may cure it in ten days by the application of ether-spray to the spinal column. Strip the patient to the buttocks, and, with an atomizer, throw the spray all the way up and down the spine for about five minutes. Do this three or four times a week, or, in extreme cases, every day. From six to ten applications will usually effect a cure. I have never seen a case resist longer than two weeks. The method is not my own, although I am not aware that any one else has used it here. I found it lately in a German journal, and have now tried it in some eight or ten cases.

LECTURE V.[1]

APHASIA.

I YESTERDAY brought before you the subjects of cerebral embolism and thrombosis, and one of the consequences of those affections, softening of the brain, or *ramollissement*. To-day I shall take up another very important consequence, *aphasia*, which the cases you see present will very clearly illustrate.

By aphasia we mean loss of the power of speech; but, of course, we restrict the term to express that loss only under certain conditions. Thus, if a man is struck senseless by a blow, or if he has his tongue cut out, we do not call his inability to speak, aphasia. The word is used to signify the loss of the ability to express ideas by language, either from forgetfulness of the words to be employed, or from lack of power so to coördinate the muscles of speech as to articulate them when remembered. Of the distinction between these two kinds of aphasia I will speak further on. But first a few words with regard to the faculty of speech, and the location of its organ in the brain. That such a faculty exists there can be no question, but that it, or any other intellectual faculty, has any special part of the brain appropriated to it, has been a matter of grave and often bitter dispute. Without entering into a discussion of the general question, which would show us overwhelming and, in my opinion, conclusive arguments in the affirmative, let us glance at its history with reference to this special faculty of language.

In the early part of this century, Gall, the father of Phrenology—a man far more scientific than the vagaries of many of his would-be followers have led most of us to believe; a man who has done more to establish the study of the anatomy and physiology of the brain upon its proper basis than any one else that ever lived—located the organ of speech in the lower part of the anterior lobes of the brain, that part resting upon the supraorbital plate of either side. According to him, the full development of this organ would depress the supra-orbital

[1] Phonographic report of Dr. John Winslow.

plate, and push the eyeball forward. Prominence of the eyes, therefore, was, in his system, the sign characteristic of those persons endowed with great powers of language.

Some years later, Bouillaud adopted and supported Gall's view, locating the organ of speech in the anterior lobes. Subsequently to him, Marc Dax published a memoir—for a long time overlooked—locating it exclusively in the *left* hemisphere of the brain; and, a quarter of a century later, in 1863, his son, George Dax, presented a paper to the French Academy, in which he claimed a very limited region as the seat of the organ, namely, the outer and anterior part of the middle lobe of the left side, immediately bordering on the fissure of Sylvius. Two years before this, Broca, who seems to have been ignorant of the observations of the elder Dax, had announced that the organ was situated in the posterior part of the third convolution of the anterior lobe of the left side. Subsequent investigations have pointed to the "island of Reil," at the other extremity of the fissure of Sylvius, in the left side, as its probable seat; and a still later view, that of Hughlings Jackson, includes the last three by broadly stating that it is located in some part of that region of the left hemisphere, in the immediate vicinity of the fissure of Sylvius, which is nourished by the middle cerebral artery.

How do we arrive at such a physiological fact as this, if fact it be? There are four classes of indications by which we may hope to discover the function of an organ—1. Those of anatomy; 2. Those of comparative anatomy; 3. Those of experiment; and, 4. Those of injury or disease.

1. The history of physiology has shown it to be very rare that the scalpel and the microscope alone enable us to determine the function of a part. Even so simple a problem as the mechanical action of some of the muscles remained unsolved until the electric stimulus came to our aid; and we certainly could not expect to differentiate the functions of different parts of the brain by anatomical considerations only. But it has been strongly claimed that the continuity of the several parts of either hemisphere, their similarity of structure, and especially the symmetry of the two hemispheres, preclude us from locating any faculty in one part rather than another,

and particularly from confining it to one side of the brain. To this it might be replied that such *a priori* assumptions have no place in inductive science. But let us look at the facts. When you examine the two anterior lobes of a human brain, your first impression is that they are just alike. Closer inspection, however, shows you that the convolutions are not strictly symmetrical in their arrangement upon the two sides; and that the third convolution of the left side is larger than that of the right. Moreover, the gray cortical substance varies in thickness in different parts of the same side, and unsymmetrically on the two sides. Now, take your microscope, and place under it thin sections from twenty or fifty different parts of the brain. You will find no two exactly alike. There is variation in the size of the cells, in their arrangement with reference to each other, and in their arrangement with reference to the white fibres. But suppose that the microscope showed one part of the brain like every other, and that, even by this means, no difference could be discerned between the two hemispheres, would that be any proof that the different parts, or the two sides, were alike in function? Examine under the microscope a section of the lachrymal gland and a section of the pancreas, and if you can detect the slightest difference between them you have better eyes than mine; yet the difference in function in these two glands, the difference in the properties of their secretions, is not a matter of question. You can easily multiply such examples; but this one is sufficient to show the fallacy of the style of argument we are considering; to show that, with regard to the great gland which secretes the mind (so to speak), we can predicate nothing of the functions of its special parts from their gross or their minute appearances. We have seen, then, that the different parts, and the opposite sides, of the brain are not alike; and, furthermore, that, if they were, it would be no argument to prove their identity of function; and so we dismiss the objections, based on considerations of anatomy, to the localization of the faculty of speech in the region I have indicated.

2. The argument from comparative anatomy we will not stop to consider. Suffice it to say, that it throws much less light upon this question than upon some others in nervous

physiology, as, for example, the determination of the ganglia presiding over certain of the special senses.

3. Neither does experiment help us much here. Bouillaud performed some experiments upon dogs, which, in his own opinion, corroborated his theory, the animals apparently losing the power to bark after injury to the anterior cerebral lobes. But we cannot accept such a result as satisfactory; for we have no right to assume that the bark of a dog bears any analogy to our own articulate speech; we have certainly no evidence that they communicate ideas by this means. It is, of course, unjustifiable for us to experiment upon the human brain; sometimes, however, accident does this for us, and several interesting cases have been recorded in which injuries to the very limited region I have named have been followed by loss or aberration of speech, while other cases in which this part escaped, though the destruction of other parts was far greater, left the speech unimpaired.

4. The best of all experiments are those performed for us by nature in her pathological processes. For nature does the work more neatly than we can ever hope to do it. She can destroy a given part of the brain without the slightest injury to any other, and so gradually as to produce no shock, thus getting rid of the complications that are so apt to vitiate our own results. There are various ways in which a limited part of the brain may be affected pathologically, for example, by cystic or other tumors, or by hæmorrhage of small extent. But, among the most interesting and instructive of them all, are the two we have lately been considering, thrombosis and embolism,[1] which, by more or less completely cutting off the blood-supply of a given region, impair or abolish its functional power. You know that the middle cerebral artery, which is the direct continuation as well as the largest branch of the internal carotid, is lodged in the fissure of Sylvius on either side of the brain. Now, we find that when the left middle cerebral artery is plugged by a thrombus or an embolus, the faculty of speech is commonly impaired; when the right one is plugged, this faculty does not suffer. But it is not in every case of this kind that we have opportunity for an autopsy; how, then, can

[1] See pp. 1–14.

we tell which side is affected? This same artery, which supplies the region designated as that of the organ of speech, supplies also the corpus striatum, the great motor ganglion. If the current of blood is stopped by a plug occupying its main trunk, the corpus striatum loses its power, and we have motor paralysis of the opposite side of the body. The situation of the attendant hemiplegia, then, tells us unequivocally upon which side of the brain is seated the lesion which causes the aphasia. Out of 608 cases of aphasia with hemiplegia which I have collected, I find only two where the paralysis was on the left side. The same preponderance of evidence is found in the situation of the various lesions revealed by autopsy. Nearly all the facts go to show that injury or disease of the posterior and lower part of the left anterior lobe, or perhaps more especially of the island of Reil, is attended with aberration of speech, while lesions of other parts are not so attended.

I have spoken with much positiveness upon this point, to impress upon you the strength of my own conviction. At the same time I am bound to tell you that there are some exceptions—and a single one would be sufficient to overturn the theory that the organ of speech is located *exclusively* in that part of the left hemisphere which has been described. There are rare cases of left hemiplegia attended by aphasia. There are also some cases of aphasia in which post-mortem examination has shown lesion of the right side of the brain alone. How can we explain these seeming anomalies? A simple and ingenious explanation has been proposed by Moxon, of London, which you can accept or not as you please. It is probable that at birth the two sides of the brain are essentially alike in structure and functional capacity, and that both are prepared to take upon themselves the control of the faculty of speech. But the left—which has been shown by Gratiolet to be the earlier developed in the fœtus, and the better supplied with blood—is somewhat the stronger, and gets the preference; and this preference, once instituted, tends to maintain itself by force of habit, and the gain of strength from exercise. As the child grows, therefore, the differences in function and in structure of the two sides become more marked. The case is precisely analogous to that of the right and left hand, the right

for a similar reason gaining the precedence, and then steadily widening the difference between itself and its fellow. These peculiarities are hereditarily transmitted, and probably at least nineteen children out of every twenty, if entirely untaught, would grow up right-handed and left-brained. But the twentieth child would be left-handed; and he may very probably use the right hemisphere in preference, for the faculty of speech. Certain it is that in some of these cases of aphasia the patients have afterward learned to speak. That they have done so by developing the power in the right side of the brain is made eminently probable by the fact that the left has been found after death disorganized and apparently unfit for any function.

The cases before you confirm the views I have expressed. They each exemplify one or more of the several forms of aphasia—*amnesic* aphasia, *ataxic* aphasia, and *agraphia*—terms whose explanation I have reserved until now.

Amnesia means forgetfulness, and amnesic aphasia is that form in which the patient cannot express his ideas because he cannot recall the words which custom has appropriated to them. It is not that he forgets how to articulate a word whose sound he remembers; for in some rare cases of purely amnesic aphasia any word spoken to the patient he can immediately repeat with distinctness, though he could not do so a minute afterward; but it is the word itself, the combination of sounds that stands as the symbol of an idea, which he cannot recall at will.

Ataxia means incoördination, and ataxic aphasia is that form in which the patient, though recollecting the word he wishes to use, cannot articulate it. In the typical case this is not due to any paralysis of the muscles of articulation, for the lips, tongue, and palate, can be made to assume every position necessary for the formation of all the vocal elements. The patient has simply lost the power to bring these muscles into the consentaneous action required for speech; he cannot begin to speak the word, for he has forgotten how to will the necessary movements; he is much in the condition of the infant that has never learned to utter words that it still can understand. In some cases this ataxia extends to all the muscles of

articulation; in others it is confined to a particular group, as those of the lips, for example.

It is very seldom that we find a case in which either of these forms of aphasia is absolute, in which there is inability either to recall or to pronounce any word whatever. Yet the affection is often very profound, so that the patient may be able to say only one or two words from memory, or to repeat only one or two when prompted. The curious phenomena that are sometimes developed from a combination of the two forms in various degrees of intensity, offer a most attractive subject for physiological and psychological speculation; but we must not be tempted to pursue this here, and the phenomena themselves will be better apprehended from a study of cases than from any remarks of mine.

Agraphia means inability to write. This, like aphasia, may be of two kinds. The patient may be unable to write a word because he cannot recall the word, or cannot recollect its written form; or he may be unable to write it because he cannot coördinate the necessary movements of the hand. In the latter case he cannot write from copy; in the former he can probably copy with more or less facility.

Language, in its most general sense, includes every means of communicating ideas. We may do this by writing or by gesture, as well as by articulate speech. In those languages where the written characters stand for things and not for words, the written and the spoken language being thus independent of each other, it is quite conceivable that there may be an amnesia of the written signs of ideas and not of the spoken, and *vice versa*. Even where the written language is phonetic, like our own, the same thing may perhaps be possible, though purely amnesic aphasia, without agraphia, would indicate that the written words had become to the mind the direct symbols of ideas (as they must be to congenitally deaf-mutes). That we may have ataxia of speech and of writing quite independently is well established by numerous cases. What we have said of speech and of writing will apply also to gesture, or pantomime, so far as this is arbitrary and not instinctive.

To enable us to speak, there must be several organs in a

state of integrity—the ear to collect sound, the auditory nerve to convey it to the brain, a ganglion to convert it into sensation, an organ to convert the sensation into an idea, and an organ to convert that into a motor impulse, sent to the muscles of speech. It is clear that the ear must do its work, that we cannot speak unless we have first learned what words are. Deaf-mutes, born deaf, are mute simply because they have never been able to form a conception of what sound is. They have no paralysis or incoördination of the muscles of articulation, and they cannot have forgotten what they never learned; they are not, therefore, properly aphasic. In cases of aphasia the difficulty lies in the ganglia which should convert the sensation into an idea, and send down the motor impulse to the organs of speech.

Let us now look at some cases. Two of the patients before you you have previously seen.

William Wice [1] you will recollect as a case of thrombosis, probably of the left middle cerebral artery, resulting in right hemiplegia and ataxic aphasia, the difficulty of speech being greatest with labials and least with gutturals. Under the treatment by phosphorus and electricity he has greatly improved, so that he can now say "Peter Piper" without hesitating or stammering. He used to say, "P-p-p-p-p-p-peter."

The next man, Richard Murphy,[2] you remember, had five attacks of cerebral embolism, causing hemiplegia, sometimes very transient, sometimes more persistent, always on the right side, and attended by amnesic aphasia. He is considerably better than when we last saw him, and when I ask him to say, "tea, coffee, sugar, crackers," he begins boldly, and goes bravely on through the tea, coffee, and sugar, but breaks down before the crackers.

Now I have to present to you a case similar in some respects to the last, and of remarkable interest as confirmatory of the theory that the organ of speech is located on the left side of the brain. This man is a patient in Bellevue Hospital, and the following notes of his case have been taken down by Dr. Schuyler, assistant house-physician:

[1] Psychological Journal, vol. v., p. 2. [2] Ibid., vol. v., p. 10.

Repeated Hemiplegia from Embolism—the Right Hemiplegia attended by Aphasia, the Left not so attended.—"Dennis C. Minton, Irish, aged forty-four, married, clerk, admitted to Ward 14, Bellevue Hospital, November 19, 1870. Gives a syphilitic history. Has been a hard drinker for twenty-five years. Three years ago last March, while walking in the street, he felt a sensation like that of the prod of a pin in the left elbow, and his arm dropped powerless. Twitchings of the muscles of the arm and side of the face then began; and headache and dizziness, with cloudiness before the eyes, came on. The twitching of the muscles lasted about seven minutes, when he recovered the use of his arm, though it still felt very weak. The dizziness and headache remained. This attack was repeated two days afterward, and again a week after that. He then went to the City Hospital, where he had three more attacks. He remained there about four weeks. After leaving he began to drink hard, and the spasm returned again. He now entered the Long Island Hospital, where he recovered, under the use of electricity and a seton in the back of the neck, and had no more spasms until last summer. Before this trouble began, he had had an attack of gout in his left toe, and this has troubled him at intervals since. With the exception of these attacks of gout, he continued well until last summer, when, in the hot weather, after he had been drinking hard, he felt as if a pin had been thrust into his head, and dropped insensible. He was unconscious for about a minute, and when he awoke complained of headache, dizziness, and a feeling as if sponges were under his feet while he was walking. He was brought to the hospital; and about two weeks afterward he suddenly became dizzy, lost his speech, and lost the use of the tips of the fingers of his right hand. This shock lasted about two minutes. Some two weeks later, he had another shock of the same description, and lost the use of his hand up to the wrist. These attacks were repeated every one or two weeks, [the paralysis] gradually extending up until the right side of the face was affected also. The attacks lasted from one to six minutes. There was never any twitching of the muscles of the right arm, but there is of those of the side of the face. When it reached the side of the face, he had a

roaring noise in the side of the head during the attack. After each attack he felt weak and dizzy. The last attack occurred the day before admission, and, besides following the usual course, extended like a shock down his right side. His speech and sight have been imperfect since this last attack. Nine months ago he had an attack of Bright's disease. His feet have frequently been swollen since. His sight has been more or less imperfect ever since this attack; and, since the shock on the day before admission, he has been unable to read at all. He is subject to attacks of rheumatism. On admission, bowels costive; tongue furred; feet somewhat swollen; water normal in amount and containing no albumen; physical examination of heart and lungs negative; appetite good."

The symptoms in this case are so exactly those of embolism that I cannot attribute them to any other cause. We have a history of rheumatism; and, although at first the auscultation gave but a negative result, yet Dr. Flint now discovers a murmur at the base of the heart, and so do I. This murmur is not such as to indicate positively organic disease; it does not show either roughening or insufficiency of the valves, such as would be likely to result from fibrinous concretions upon them. But it is not improbable that the patient may have had endocarditis, and that such concretions may be scattered about the walls of the heart, among its fleshy columns. Here they would give no certain evidence of their presence, and we should first be led to suspect it by their becoming detached and being sent into the circulation as emboli, to plug up some distant artery. This man has had eleven attacks of vertigo, unconsciousness, and hemiplegia. Whenever the attack has paralyzed him upon the left side, he has had no difficulty of speech; but, whenever he has been paralyzed upon the right side, he has lost the faculty of speech for the time. Of course, in the former cases the emboli were lodged on the right side of the brain, in the latter on the left, and most probably in the middle cerebral artery, since that is the artery most apt to be plugged, and also the one whose plugging is most apt to cause aphasia.

I have had the good fortune to meet with another case very similar to this. A former officer of the army, a private patient of mine, had eight attacks of embolism, following a his-

tory of acute rheumatism and valvular derangement of the heart, detected several years before. When he came under my charge he was suffering from one of these attacks of embolism, attended by paralysis, difficulty of speech, and other symptoms. He had seven attacks subsequent to that one, some paralyzing him on the right, some on the left side; and, as in the case before us, with the left hemiplegia he had never any difficulty of speech, with the right he always had.

Now, I say that two such cases as these are almost absolutely conclusive that the faculty of speech is more intimately connected with the left hemisphere than with the right—mind that I say *more intimately* connected with the left hemisphere, for I do not pretend to believe that it is *exclusively* connected with it.

I have now another case of much interest to bring before you. This lady is a private patient of mine, and she has consented, at great personal inconvenience, to come here to-day and allow me to present her case to you. The following very complete history has been prepared by Dr. Cross:

Amnesic and Ataxic Aphasia, with Agraphia and Right Hemiplegia.—Mrs. W., thirty-two years of age, born in New-York City, married, and the mother of five children, of whom, at the present time, four are living. The youngest child is eleven months old, while the eldest is eleven years. She is a lady of a pale complexion, rather delicate, of a nervous temperament, and of medium height, and endowed originally with much intelligence, culture, and refinement.

There is no venereal taint in her family. She has never had acute articular rheumatism, nor in fact any severe illness prior to the year 1860; but, on the contrary, has enjoyed tolerably good health, such as we might hardly expect from a lady of her delicate organization, if we except a severe attack of intermittent fever, which she had when sixteen years old. Her father, when about forty years of age, was paralyzed on the left side of his body, and at the same time his speech was much affected. He recovered the faculty of speech in time, but was not so fortunate in regard to his paralysis. After the lapse of twenty years, he had a second attack, which again involved the faculty of speech and the left side of his body. In

the due course of time he completely regained the normal use of the faculty of speech, but his hemiplegia persisted until his death, which occurred some years later. Her grandfather, on her father's side, who was one of the assistant ministers of Trinity Church, was suddenly seized in the pulpit, in the midst of his discourse, with the apoplectic form, *par excellence*, of cerebral hæmorrhage, and almost immediately expired. With these exceptions there is no hereditary predisposition to other diseases of the nervous system in the family.

During the month of February, 1860, about three weeks after the birth of her second child, having complained for several days of a severe pain in her right shoulder, which extended down the right arm, symptoms of albuminuria, accompanied with general dropsy, supervened. These were so rapidly developed, that at the end of two weeks the dyspnœa had become so great as seriously to compromise the life of the patient. The anasarca, which was the cause of the impeded respiratory movements, had induced not only ascites but also hydrothorax and œdema of the lungs. Gradually the patient became more or less stupid, and at this stage a slight uræmic convulsion followed. Her urine was now examined, and found to be loaded with albumen. Shortly after this attack of eclampsia, as she was sitting, leaning forward, with her head resting upon a pillow at the side of the bed, the most comfortable position which she could assume in her terrible distress, she was gently aroused from her semi-conscious condition, when it was found that she was completely hemiplegic on the right side of her body, and that she was totally unable to utter a single audible sound. For at least a week after this discovery she was greatly confused in regard to her ideas, and it was fully six weeks before the dropsy had quite disappeared, during which time she was confined to her bed. The period of the convulsion marks the acme or crisis of the albuminuria, as the patient from that period began to recover from the very alarming dyspnœa which had almost suffocated her.

On examination, soon after, motility, tactile sensibility, and the sensation of pain, were discovered to be nearly abolished on the whole right side of the body. The face was

drawn to the left side, and there was a marked deviation of the tongue in the same direction. There were strabismus and partial ptosis of the left eye, with a widely-dilated pupil, which did not respond readily to light. The angle of the mouth was depressed on the diseased side, while the opposite angle was on a higher level than its fellow would be in a normal condition. Now she could utter unintelligible sounds, which could not, however, be interpreted into intelligible words. For about three years and a half a very gradual and progressive improvement took place in her right upper and lower extremities, but even at the end of this period there was still a considerable amount of paresis in these parts. The face was still drawn to the left side, and the integrity of the muscles of the eye had not, even after this lapse of time, fully recovered their accustomed contractility. The tongue did not deviate. The sensibility to touch and to pain was still impaired. She could not sew, not so much from a lack of power to hold her needle as a want of sensibility to guide her in directing its movements; yet, by supplying by means of sight the absence of this special sensibility, she was able to accomplish many things with her right hand which she otherwise would have been totally unable to perform. Her special senses, excepting tactile sensibility, were normal, and her general health had much improved. At this period her urine was again examined, and no albumen or casts of any kind were discovered therein. Until the summer of 1863 she had not, for three years and a half, enunciated an intelligible word, and it was about this period that she one day suddenly exclaimed "No!" the first word clearly spoken in all this time. A month later she was able to say "Yes!" With these few words, assisted by her excellent gestures, she managed to make her wants known and to communicate her ideas to her friends to some extent. Shortly after the births of her last two children there again followed general anarsarca, but not to the same extreme degree as in the preceding attack, there being no shortness of breath or other dangerous symptoms. This condition soon disappeared, however, on the administration of powerful diuretics.

Such is the history of this most interesting case up to the

time when she came under our observation in October, 1870, at which period she was in the following condition:

She appears to enjoy good health, with the exception of frequent headaches, which have only made their appearance lately. These are severe in character. Her face is pale, but this has always been so ever since childhood. She has, however, a remarkably bright, intelligent, and animated appearance, and when spoken to she seems to fully understand every thing that is said. She is fully conversant with the use of all objects with which she was once familiar, although she cannot call them by name, partially from the fact that she does not remember the symbols or words which express the ideas. She attends to all her household duties and knows perfectly well how to supply all the wants of her numerous family. Although seemingly quite intelligent, she at times becomes very much confused in her ideas, as evinced by her imperfect gestures and obtuseness of comprehension. She is only able at the present time to articulate the words "Dado," "Yes," "No," "Yes, no," and "No, yes," which she uses in reply to all questions. "Dado" is a word by which she means to express "yes," and at times she makes use of it almost exclusively. If asked what is the name of an object—as a fan, for instance—she is totally unable to tell the sign or symbol which expresses the idea in language, yet she indicates clearly enough its use by the gesture of fanning herself. She is able to communicate some of her thoughts to her family or her friends quite fluently by the means of an expressive pantomime, and her gestures are so perfect that most any person, after a little practice, could understand very well most of the many ideas which she might wish to impart. She is quite unable to read, as was soon discovered by testing her capacity in this respect, in different ways, and at various times. Webster's large dictionary was given to her, and she was requested to point out the letters contained in the word "yes;" yet even this she could not do until the *y* was first pronounced and pointed out to her, and then, after clearly enunciating the letters *e* and *s*, she with difficulty found them. The *New York Daily Times* was next handed to her, and she was asked to place her pencil on each of the words which com-

pose the heading, as they were slowly pronounced each separately for her; although she was now and then correct, she was not sure, and was very often wrong. She was next tried by means of the alphabet with large distinct letters, and the result was very far from satisfactory. She cannot enunciate a single letter of the alphabet distinctly, not even the letters contained in *Dado*, *Yes*, and *No*, even if they be pronounced first for her, if they be separated apart from the word; yet she can say, *Yes no*, *No yes*, and *Dado*. She is very apt at figures, and does all her own shopping, going to Stewart's, selecting whatever she desires, and, on arriving at home, every thing is found to be correct. She knows exactly how much she ought to pay for the article purchased, and how much is due her in return. All her communication of ideas is expressed by means of gesticulation. Her mind is very clear at times, and, while this history was being taken, she reminded her husband of several mistakes which he had made in regard to time and locality, and he certified, on reflection, that she was right. She can write the monosyllable *No*, but that is the only word which she can write completely, although she was able to write *Jar* for "Jane," *goo* for "good," the words being first slowly spelled for her several times just before she tried to transfer them to paper. Certain objects impress her mind much more than others; as, for example, she remembers the subject of a picture much better than the color, drawings much better than pictures. She now recalls many subjects of art in her husband's gallery, which formerly she could not do. Her right hand, as measured by the dynamometer, is a little weaker than the left, and this is evidently due to muscular paresis, as the patient is right-handed. The extensors of the right foot lack their natural tonicity, so that the toe catches at times; but, on the whole, without very close observation, this defect would not be noticed. The sensibility to touch and the sensation of pain are slightly impaired on the diseased side. There is a very weak mitral systolic murmur heard at the apex of the heart. The lungs are normal, and so are the bladder and rectum. The urine has been microscopically and chemically examined, with a negative result. The special senses, excepting tactile sensibility, are unimpaired. There is no

ptosis, no strabismus, and no defects in vision whatever. The pupils are equal, and respond readily to light. Ophthalmoscopic examination of the eyes reveals a slightly-congested condition of these organs. There is no deviation of the tongue. There is no paralysis or paresis of the muscles of the tongue, which are perfectly mobile, nor are the lips weakened at all in their movements. The mouth is perfectly natural, and is not drawn to either side. There is no emotionable excitability displayed by the patient, as is so often found in those suffering from cerebral hæmorrhage. There are, however, two well-marked conditions in this case, which are found in many aphasic patients, namely, the repetition of the same word and the characteristic expression of great impatiance after an unsuccessful attempt to speak a word. There is no painful tightness in the throat. Her appetite is good, and all her excretory functions are normally performed.

"This was the patient's condition at the time she commenced treatment. This has consisted in the internal administration of phosphorus as follows: ℞. Olei phosphorati ʒss, acaciæ mucilaginis ʒj, olei bergamii gtts. xl. S. Fifteen drops to be taken in a wineglass of water three times a day after meals; together with the application of the primary galvanic current to the head, the positive pole placed on one mastoid process, and the negative placed on the other, for the period of about two minutes, at times reversing the current *pro re nata;* or by applying one of the poles to the forehead, and the other to the nape of the neck. In this latter way she felt the same current much more forcibly than when the poles were applied to the mastoid processes. She has received these applications first passing the current in one direction for a short time, and then in the other, quite regularly three times a week up to the present date, and she has taken her medicine regularly also, only intermitting it for a short time at intervals, as necessity required. During the month of November, 1870, she suddenly one day exclaimed, 'I don't know,' but she could not be made to repeat it, although begged to do so by her friends. One morning about this time she said very distinctly indeed, 'How do you do?' 'What are you doing here?' but she seemed to be perfectly

unconscious that she had given utterance to any such expressions. Shortly after this, one Sunday she called to her husband, 'Papa, dinner is ready,' and then smiled. She is unable to write these phrases, even if they are first pronounced and then slowly spelled for her; and, at this period and even later, she had not repeated them. In regard to numerals, although she can count perfectly by means of her fingers, and make change readily, yet she cannot recognize the printed number when shown to her, much less can she represent its symbol upon paper, and much less still can she enunciate it. Although she can say *no*, after many trials, it was impossible to make her articulate *one* or even *on*, which is merely a transposition of the letters contained in *no*.

"January 31, 1871, on examination, the patient, who had now been under treatment for about three months, was in the following condition:

"She has gradually added to the small stock of words at her command, at one time a single word, at another a complete phrase, and many of the words thus acquired she is able to repeat at times, but she is unable to call them up spontaneously as occasion requires, unless the sentence or word is first repeated to her, excepting a very limited number of them. The phrases which she does speak are not very distinct, and there is a tendency on her part to abbreviate or clip the words. The following are sentences which she uses very frequently: 'How do you do, dear?' 'Dinner is ready.' 'I will see about it.' 'Yes,' with an occasional 'yes no, no yes.' 'I will see.' 'Mary, here.' 'Walter,' 'baby,' 'church,' 'thank you,' etc. Within a few days she has said 'John—black-thread.' And to a friend who was going to the dentist she said, 'Are you going to the (with a motion of her hand to her teeth)?' Last evening she said perfectly distinctly 'A house.' Although she had just said *a house*, she could not repeat the word when requested to do so, yet it was enunciated for her very clearly. Day by day she is recalling words and fragments of sentences, like a child just commencing to talk; with this difference, that a child can enunciate a letter better than a word, being a simple element, whereas this patient cannot articulate the name of a single letter, nor of a single number,

yet she is able to utter occasionally, and at times more frequently, a whole sentence or a part of a sentence. She is able to point out very correctly all the letters of the alphabet, excepting *c* and *p*, which she confounded with each other. She can comprehend the general idea of a paragraph, such as is contained in a letter or a primary reader, if it be sufficiently simple and abound with nouns, the meaning of which she seems to recall with much greater facility than the other parts of speech. She was given a letter which she had never seen before, and she expressed to her husband, so that he understood her perfectly, the meaning of its contents, which related to matters of interest concerning a particular friend. She was again tried, and there was no doubt whatever that she quite readily recognized certain simple numbers and nouns, but in regard to the interpretation of other parts of speech there were grave doubts. A word, as *river*, was shown her, and she was asked its meaning, whereat she arose, walked to a picture, and put her finger on its representation in the painting. This is only one instance of the many words which she has so correctly interpreted. She can write at present *no*, *do*, *Walter*, *Jane*, *good*, and *Sarah*, without any assistance whatever such as spelling the words, pronouncing them slowly or repeatedly for her, and this is done without a copy. Her name was written, and she copied it very well. She also wrote the numerals 10, 20, and 50, quite legibly. More complex numbers than these she cannot even interpret, much less write them without a copy. In regard to copying, she displays much facility. She has improved much in her general health, and latterly her severe headaches have almost entirely disappeared. There is still a slight loss of tactile sensibility in the tips of the fingers of the right hand. Her toe at the present time very rarely catches, except after excessive exercise. Her intellect is undoubtedly much impaired, and, although she is apparently bright and intelligent, this is not actually the case. That the symbols or sign of ideas, when suggested to her, arouse the appropriate stimulus for a brief interval, there is no doubt, although not to the same degree as they would do in health; yet, without this principle of suggestions, her ideas must be very limited, and must partake more of the character of

those impressions which we derive through the means of the senses, being almost in her case devoid of ideation. Although she can write certain words which she is totally unable to speak, on the one hand, yet, on the other, she can speak very many words which she is totally unable to write. Not only is there a loss of the memory of words, and a loss of the harmonious action of the muscles used in the act of speaking, but there is evidently also an inability to appreciate the perceptions of certain acoustic as well as certain optic impressions on the part of the supreme centres, and consequently there is an impairment of the faculty of expressing these ideas in writing.

"T. M. B. C."

This case illustrates, very happily, some of the most characteristic phenomena of aphasia. You see the lady's look of intelligence and animation; and as I talk with her you observe that she seems to understand me perfectly, though she can reply to my questions only by certain expressions of affirmation, of negation, or of doubt. If I ask her my name, or her own, she cannot tell me; but, if I give a wrong name, she instantly answers "No no," and, when I come to the right one, she appears pleased, and promptly says "Yes yes." These expressions she employs correctly, and they mean *no* and *yes* respectively. "Yes no" or "no yes," in her vocabulary, expresses uncertainty, as you perceive when I ask her of matters about which she is in doubt. Her only other word, *dado*, she does not favor us with to-day. By no amount of effort can I get her to repeat any other word than these, however simple, and however clearly it is pronounced for her; and this is not from any defect of hearing or of intelligence, for it is evident that she understands the word and its meaning completely. Her aphasia, then, is ataxic as well as amnesic. Here I show you some of her attempts to write. *Jane* she spells by abbreviating it *Jn*; *no* she writes correctly; but in *good* she cannot get beyond the first three letters. She has agraphia, therefore, which appears to be chiefly, if not wholly, of the amnesic form.

What do you suppose is the cause of the asphasic condition of this patient? Recollect that it came on very suddenly and

was complete from the first, and I think you will agree with me that nothing else explains it so well as embolism. Emboli, you know, are not necessarily formed in the heart; they may originate in other organs, and then become detached; and we know that disease of the kidney, attended by albuminuria, is very apt to lead to embolism. And this lady, you will remember, was suffering from very severe albuminuria at the time of and before the attack.

Embolism, as I have told you, is but one of many causes of aphasia. Another is cerebral hæmorrhage. A gentleman, whom I saw in this city last summer, had an attack of apoplexy while he was bending forward in bed. He did not lose consciousness for more than a moment, and perhaps not at all; but he was paralyzed upon the right side, and he lost completely the power of speech. He made signs for pencil and paper, but when they were brought he made only meaningless scribblings, and could not form a single letter. Yet there was no paralysis of the left side, and he had before been able to write with the left hand, as he can now do. He was very anxious to express himself, and we brought him an alphabet; but he could not point out the letters. He had lost, as completely as did this lady, all memory of words and their elements.

Now, both of these cases would, a few years ago, have been put down under the head of "apoplexy;" for the term was loosely used to cover almost every condition which came on with sudden unconsciousness. It is but lately that we have come to understand this subject of embolism, and you will look in vain for any mention of it in many of your standard text-books. So, if a man fell down in the street with stupor and paralysis from hæmorrhage into the brain, he was said to have apoplexy. If he had the same, or similar symptoms, and the post-mortem examination discovered no clot, the attack was still called apoplectic, and was supposed to have been due to congestion which had disappeared—"congestive apoplexy." They even began to conjecture about "nervous apoplexy." If they had looked in the middle cerebral artery, they would in all probability have found a more satisfactory solution of the mystery. The word apoplexy, then, except in recent writings, must be taken to mean simply a set of symptoms attribu-

table to a variety of causes; just as I told you, some time since, that paraplegia was only a symptom, which might arise from the most opposite conditions.

Before we understood this, and before we knew any thing about aphasia, many cases of this affection, depending upon so-called apoplexy, were recorded, which it becomes interesting to examine under the light of our present knowledge. A few, which I shall now refer to, will incidentally illustrate some of the curious phases that aphasia occasionally exhibits. In Forbes Winslow's "Obscure Diseases of the Brain"—a book as interesting as a novel, but better for summer recreation than for scientific study—he says:

"Loss of speech has been known to occur without any previous symptom of brain or nervous disorder; in other words, there has been no headache, vertigo, noise in the ears, loss of sensibility, depression of spirits, affection of vision, or any other symptom to excite suspicion as to the presence of any abnormal state of the structure of the brain or condition of cerebral circulation."

That is clearly embolism, which, you remember, gives no premonitory symptoms. He continues:

"Dr. Graves cites the following interesting illustrative case: 'A barrister was walking up and down the hall of the Four Courts, waiting for a case to come on, and chatting with one friend and another. As the hall was rather crowded and hot, he went out into the area of the courts for the sake of the air, and had not remained there more than ten minutes when an old friend from the country came up and spoke to him. He was pleased to see his friend, and wished to inquire about his family, when he found to his great surprise that he could not utter a single audible sound; he had completely lost his voice.'"

Now, I venture to say that no possible condition except embolism could have given rise to that. The report goes on: "He recovered the use of his tongue in about three weeks." That is, collateral circulation was becoming established. "But not completely, for some slowness of speech remained. . . . During the day he had several attacks of vertigo, and afterward hemiplegia. For several hours, however, before distor-

tion of the face or any of the usual symptoms of paralysis had commenced, the only existing symptom was loss of speech. This gentleman died of apoplexy in about two months."

Observe how loose is this last statement. That "apoplexy" may have been due to another embolus, to thrombus, or to hæmorrhage; which we do not know.

"A lady, after an attack of paralysis, lost all power of speaking, but was able to communicate, in writing, her wishes. When, however, doing so, she invariably wrote *no* when she meant *yes*, and *vice versa*. When she wrote 'I wish you to do so,' it was construed conversely. This patient, I am informed, is still living, the singular defect alluded to remaining unaltered."

I had, last summer, a patient under my care who was similarly affected. He invariably said just the reverse of what he intended. Ask him, "Do you like soup?" and if he did like it he would answer "No." Thus we see that, instead of abolition of the faculty of speech, we may have a simple aberration of it, a partial aphasia.

Here is another curious case from the same book, reported by Dr. Osborn: A gentleman, twenty-six years of age, proficient in French, Italian, and German, was attacked with apoplexy; became sensible in about a fortnight, but found himself deprived of speech. There was no paralysis whatever of the organs of voice or articulation, and he uttered a variety of syllables with the greatest apparent ease; but what he said was a jargon quite unintelligible. The case was carefully studied by Dr. Osborn, and the following are among the points noted:

"1. He perfectly comprehended every word said to him. This was proved in a variety of ways unnecessary to describe.

"2. He perfectly comprehended written language. He continued to read a newspaper every day, and, when examined, proved that he had a very clear recollection of all that he read. Having procured a copy of 'Andral's Pathology' in French, he read it with great diligence, having lately intended to embrace the medical profession.

"3. He expressed his ideas in writing with considerable fluency; and when he failed it appeared to arise merely from confusion, and not from inability, the words being orthograph-

ically correct, but sometimes not in their proper places. Latin sentences he translated accurately. He also wrote correct answers to historical questions.

"4. His knowledge of arithmetic was unimpaired. He added and subtracted numbers of different denominations with uncommon readiness. He also played well at the game of draughts, which involves calculations relating to numbers and position.

"5. His recollection of musical sounds could not be ascertained, not knowing the extent of his knowledge of music before the apoplectic seizure; but he remembered the tune of 'God save the King,' and, when 'Rule, Britannia' was played, he pointing to the shipping in the river.

6. His power of repeating words after another person was almost confined to certain monosyllables; and, in repeating the letters of the alphabet, he could never pronounce *k*, *q*, *u*, *v*, *w*, *x*, *z*, although he often uttered those sounds in attempting to pronounce the other letters. The letter *i*, also, he was very seldom able to pronounce.

"7. In order to ascertain and place on record the peculiar affection of language which he exhibited, Dr. Osborn selected and laid before the patient the following sentence from the by-laws of the college of physicians, namely: '*It shall be in the power of the College to examine or not examine any Licentiate previous to his admission to a Fellowship, as they shall think fit.*' Having set him to read, he read as follows: *An the be what in the temother of the trothotodoo to majorum or that emidrate ein einkrastrai mestreit to ketra totombreidei to ra fromtreido as that kekritest.*" The same passage was presented to him in a few days afterward, and he then read it as follows: '*Be mather be in the kondreit of the compestret to samstreis amtreit emtreido and temtreido mestreiterso to his eftreido tumbried rederiso of deid daf drit des trest.*' Dr. Osborn observes that there are several syllables in the above of frequent occurrence in the German language, which probably had made a strong impression on the patient's memory. But the most remarkable fact connected with the case was that, although he appeared generally to know when he spoke wrongly, yet he was unable to speak correctly notwithstanding, as is proved by the preceding specimen."

Returning now to Mrs. W., what prospect can we hold out to her? You will say that, when an affection like this has lasted for ten years, and shown so little sign of yielding, we are not warranted in raising what must be delusive hopes by any words of encouragement. But I do not so regard the case. I shall not be surprised if, under treatment, she really recovers the faculty of speech to a very considerable extent. The attempts she has been of late so vigorously making seem to show some gain. Moreover, she appears to be passing through a sort of crisis, as indicated by the headaches she suffers from so terribly, especially at night.

How can we hasten the improvement which nature seems already to have begun? What must be our treatment? A great part of it must consist in diligent, persistent exercise. We must be patient, not expecting brilliant results at once, but content if we can secure a steady gain, however slow at first. You know to what an astonishing degree the memory can be cultivated; how firmly things become impressed upon it by dint of frequent repetition. It is said that there is a compositor in London who has set up the Bible so often that he can repeat it from beginning to end. That is a tough story, and I do not believe it myself, though I find it in this book of Forbes Winslow's. But there is no question that feats almost as marvellous have been accomplished. Think only of the way the Homeric poems were handed down from mouth to mouth of the ancient bards. How shall we go to work to discipline the memory? In the first place it is necessary to get a clear understanding of the thing to be remembered. The fault with most persons who say they have bad memories is, that they are deficient in power of attention; they get no definite conception of an idea, and so, of course, cannot recall it. Then, when if we understand the thing, begin to repeat it—not too often at once, for that is fatiguing, but recurring to it again and again. Lord Bacon said that if you would learn a sentence, you should repeat it ten times, twenty would only weaken the memory. That, in the aphasic condition, great improvement can be effected by this means, I have found in several cases occurring in my own practice, two or three of which are still under treatment. One of the best methods,

after the patients have made some little progress, is to set them to writing, and then they can pursue the exercise by themselves. I have no doubt that, in this lady's case, if the attempt were made every day for a week to teach her to say one particular word, her own name for example; following this by teaching another word in the same way, and then another, it would not be long before she would have quite a number at command. And then her progress would begin to be more manifest, and seem much more rapid. If it takes a stupid child three months to learn the letter A, it will take him less time to learn B, and far less to learn C, and he will have mastered the alphabet within a year. So, when Mrs. W. has recovered a hundred words, the rest will seem to come of themselves.

The use of the muscles of articulation in this persistent exercise is the very best means of overcoming the remaining ataxia. We have also another means at our disposal to aid in dispelling any lingering paralytic element in the ataxia—the application of the induced or faradaic current to the affected parts. This you have seen quite successful in the case of Wice. We want, also, to enlarge the vessels of the brain, increase its blood-supply, and improve its nutrition. This object we shall seek to effect in two ways: first, by the passage of the constant galvanic current through the brain, applying the poles, one over each mastoid process, or one to the mastoid process, and the other to the back of the neck; second, by giving phosphorus, in the form of the phosphorated oil, five drops in emulsion with mucilage three times a day. Under this treatment —as there is no evidence of present organic disease, beyond this headache, which is a little suspicious, and which I shall investigate more closely—I have strong hope that she may get perfectly well.

LECTURE VI.

FACIAL PARALYSIS.[1]

GENTLEMEN: We have before us to-day an example of facial paralysis, an important affection upon which I propose

[1] Phonographic report of Dr. John Winslow.

to speak pretty fully. I introduce to you a captain of the gallant Sixty-ninth Regiment, who has been kind enough to come here to-day, although one of my private patients, and I will read the brief history of this case as drawn up by Dr. Cross:

Facial Paralysis.—"Captain T. D., aged forty-three, born in Ireland. On awakening one morning in July he found something strange about his face, but did not realize at that time what it was. On going out, some of his friends told him that his face was twisted, and, on looking in the glass, he discovered that it was drawn to the left side. He applied for medical treatment, four days afterward, when he presented all the characteristic symptoms of facial paralysis. He was treated with galvanism, both the primary and induced currents. In the course of a week he acquired the power of closing his right eye voluntarily. He took strychnia and phosphoric acid internally. After about twenty applications of galvanism he was dismissed with the power almost entirely restored to all the paralyzed muscles. He is now well, with the exception of slight paresis of the orbicularis oris muscle. At first the induced current did not act, whereas the primary did from the very beginning."

This affection, known frequently as "Bell's paralysis," was for a long period confounded with some others. It is due to lesion of the facial nerve, the portio dura of the seventh pair, —a nerve formerly regarded as sensitive, and often cut for tic-douloureux, but established as strictly motor by the experiments of Bell and Magendie. Remembering the distribution of this nerve to nearly all the superficial muscles of the face, we can readily understand the symptoms which characterize its paralysis.

The most prominent of these symptoms is the inability to close the eye of the affected side, from the fact that the orbicularis has lost its nervous supply, while the levator palpebræ superioris, supplied by the third nerve, retains its power. The eye waters from being kept constantly open; particles of dust get into it, for the patient cannot wink to keep them out,

or to remove them from the surface of the eye-ball where they adhere; the tears, for the same reason, are not distributed over the globe; and they are not conveyed away through the nasal duct, from paralysis of the tensor tarsi, which should hold the funda against the globe to receive them, but flow over the cheek. From all these causes serious inflammation may arise; but, if the patient is sensible, he will avert many of the evil consequences, by frequently closing the lid with the finger, or, if necessary, by keeping it closed with a strip of adhesive plaster.

Again, one-half of the orbicularis oris is paralyzed, and so the patient finds it impossible to whistle or to spit. Indeed, he cannot even retain the saliva upon the affected side, but it is constantly drooling out of the corner of the mouth, constituting one of his greatest annoyances. Captain D. here, though almost completely cured, finds this muscle still so weak that, as you see, he cannot get the right pucker for a whistle.

The buccinator, too, is paralyzed, and this interferes sadly with the comfort of chewing. The proper muscles of mastication are supplied, as you know, by the third division of the fifth pair; the jaws, therefore, continue to do their work well enough. But the buccinator has to assist the tongue in the important office of keeping the food between the teeth; and, when it is paralyzed, this collects between the teeth and the cheek in a manner extremely disagreeable. This patient will tell you that he used to have to remove it with his fingers.

The mouth, the whole face, in fact, is drawn over toward the sound side, for the muscles of that side find nothing to antagonize them. The effect of this is most marked when the patient opens his mouth, and particularly when he laughs or smiles, and brings the zygomatici and the risorius into play. Look on the affected side of the face, and it is utterly devoid of expression—a perfect blank, no matter what or how strong the emotion. There is not even a wrinkle of the brow, for the occipito-frontalis and the corrugator-supercilii have no power to contract. Romberg has humorously said there is no better cosmetic for old women. From the drawing of the face to the

sound side, the tongue, although protruded directly forward, appears to deviate toward the side paralyzed.

The facial nerve takes its origin from the posterior border of the pons Varolii, and the lateral tract of the medulla oblongata, some of the fibres of origin being traced to the floor of the fourth ventricle, and even to the lateral column of the cord. It is in reality, then, a spinal nerve, like some others which make their exit through the cranium. It is important that you should consider its course and its connections, for a knowledge of these often enables us to locate quite definitely the seat of lesion when it is paralyzed, and this has the greatest influence in determining our prognosis. Leaving the cranial cavity by the internal auditory meatus, it enters the aqueductus Fallopii, a canal hollowed for it in the petrous portion of the temporal bone, and finally emerges from the skull at the termination of this canal, the stylo-mastoid foramen.

Of its branches of communication we will consider only three, all of them given off in the aqueductus Fallopii, namely, the two superficial petrosal nerves which arise from the gangliform enlargement of the facial soon after it enters the aqueduct, and the chorda tympani, which is given off from the facial just before it quits the canal: 1. The great superficial petrosal runs to Meckel's ganglion, and through this supplies the levator palati and azygos uvulæ muscles. 2. The small superficial petrosal (which some regard as rather a branch of the glosso-pharyngeal, though communicating with the facial) runs to the otic ganglion, which supplies the tensor tympani muscles, and also, according to Bernard, through the auriculo-temporal, presides over the secretion of the parotid gland. 3. The chorda tympani goes to join the gustatory branch of the fifth, and is in part distributed with this to the tongue; but another portion of its fibres enters into the submaxillary ganglion, which presides over the function of the submaxillary gland.

Thus far we have considered only the symptoms due to lesion of the facial after its exit from the stylo-mastoid foramen. Let us now see what additional ones we shall have when the lesion is situated farther back.

First, let it be above the origin of the chorda tympani, but below that of the petrosals. The patient will complain of a diminution, but not a complete abolition, of the sense of taste upon the side of the tongue corresponding to the paralysis. This fact led to the supposition formerly that the chorda tympani was a sensitive nerve; but the experiments of Bernard and others have clearly shown it to be an efferent nerve, carrying influence from the brain, not to it. It is certain that one of its actions is to increase the flow of submaxillary saliva; it innervates the inferior lingualis muscle; and it is probable that it also erects the papillæ of the tongue, and modifies the circulation in this organ. We can account, then, for the diminution of the sense of taste, when the influence of this nerve is cut off, by the dryness of the mouth preventing the speedy solution of the sapid substance, by the want of erethism of the papillæ, and perhaps also by the changed circulating conditions.

Next place the lesion back of the gangliform enlargement, between this and the meatus internus, we have, of course, all the symptoms thus far described, and, in addition, those due to the petrosal connections. One of these is a falling of the posterior palatine arch upon the affected side; it hangs lower than its fellow, and its edge is nearly straight instead of concave. This comes from paralysis of the levator palati, which we found was supplied by the great petrosal through Meckel's ganglion. One of the two little muscles of the uvula being powerless, the other contracts the uvula into a bow, concave on the sound side, toward which its point is directed. The uvula and velum are also pulled *en masse* toward the sound side, from paralysis of the opposing tensor (circumflexus) palati, which, you will remember, is supplied by the small petrosal through the otic ganglion. These deviations, at least, are what we should expect from our knowledge of the functions of these nerves, and they accord with the statements of most observers. Romberg, however, says that the uvula points to the paralyzed side. We shall not be surprised, from the connection of the small petrosal, through the otic ganglion, with the parotid, to find the secretion of this gland much diminished, and, in some cases of intra-cranial lesion of

the facial, the patient has complained of extraordinary dryness of the affected side of the mouth. It is probable that we may, as stated by good authorities, have a real, and not simply an apparent, deviation of the tongue, some of whose muscles are said to be supplied by Meckel's ganglion. Another occasional symptom, increased acuteness of hearing on the paralyzed side, Landouzy accounts for by paralysis of the tensor tympani, which we found supplied by the otic ganglion; but Brown-Séquard attributes it to hyperæmia of the acoustic nerve from vaso-motor paralysis.

The diagnosis of lesions of the nerve yet more deeply seated—within the cranial cavity—must depend upon the concurrence of the symptoms of facial paralysis, already noted with those of the affection of the nerves; for a central lesion is not likely to be limited to the origin or the tract of a single nerve. Just what symptoms we are to look for as diagnostic of the specific seat of a central lesion will be considered when we come to the subject of cerebral hæmorrhage. Some of them we have recently had occasion to observe in a case of cross-paralysis.[1]

Among the *causes* of facial paralysis I think the most common is cold. The form of paralysis which it induces is that in which the nerve is affected only after its exit from the temporal bone. The case before you is one of that kind, and it most probably originated in this way, though its history is not clear. This cause often passes unrecognized, for the patient may show no other effect of exposure than the paralysis, as in the case of a young lady up-town, whom I was lately called to see. A very common history—one of which I have seen many examples—is, that the patient was sitting in a draught of air, say before the window of a railway-car, felt a little chilliness of the face, but thought nothing of it, sneezed a few times on going to bed, and awoke in the morning to find his face awry.

Cold may produce its effects in two ways. The first is by directly depressing the irritability of the nerve, as when you paralyze the ulnar nerve by holding the elbow in ice-water. The second and far more common mode is, by exciting in-

[1] Psychological Journal, January, 1871, vol. v., p. 14.

flammation and swelling, and consequent pressure upon the trunk of the nerve or its branches. You know that the facial, just after its emergence from the skull, passes for some distance through the parotid gland, so that any inflammatory swelling of this gland would almost certainly compress it. Inflammation is especially apt to follow exposure in persons of a rheumatic diathesis, whence this diathesis should be regarded as a predisposing cause. Rheumatic inflammation affects, as you are aware, the fibrous structures, among which are the sarcolemma of muscles and the neurilemma of nerves. Inflammatory hyperæmia and effusion in the first of these situations would compress the terminal filaments of the nerve; in the second, might compress its fibres in any part of their course.

But we may have pressure from other causes than inflammation. Women are fond of sleeping with the face upon the closed hand, and they sometimes have to pay dearly for it by a loss of half their comeliness. New-born children delivered by forceps are not rarely found paralyzed from pressure of the instrument applied over the ear, especially if the extraction has been tedious. We may, of course, have various traumatic injuries in this region.

Deeper-seated lesion of the nerve may arise from the pressure of tumors of various kinds, from syphilitic periostitis in any part of the aqueductus Fallopii, from scrofulous disease of the middle ear finally destroying the bone, from gunshot or other fractures of the temporal bone, etc.

The *pathology* of the affection has been implied in its etiology, which resolved itself, in most cases, into one or another form of pressure upon the nerve, all producing essentially the same effect. You know that, by pressure on a nerve, its irritability is more or less impaired. If you sit upon the edge of a chair in such a way as to press upon the sciatic, your leg and foot get numb, and you lose power over them. If you were not to change your position, you might thus produce permanent paralysis, for I have shown you more than one case of permanent paralysis of the arm from the patient's going to sleep with the arm thrown over the back of his chair, so as to compress the brachial plexus.

As regards *diagnosis*, this affection is liable to be confounded with one other, and only one, that is, paralysis from cerebral hæmorrhage. In paralysis from hæmorrhage the function of this nerve is hardly ever completely abolished. The patient can always close the eye of the affected side, no matter how severe the hæmorrhage, though, why he should be able to do this when he cannot move the other facial muscles, I am unable to tell you. Then, too, other nerves will be found involved. If the hæmorrhage be above the pons, we shall have paralysis of the extremities on the same side of the body as that of the face, that is, on the side opposite to the extravasation; or, if the hæmorrhage be lower down, we may have cross-paralysis. The fifth nerve will be affected, and with it the muscles of mastication and the sensibility of the paralyzed side of the face. The third will probably be involved, and we shall have divergent squint, ptosis, and dilated pupil; or the sixth, giving us convergent squint. According to the location and extent of the hæmorrhage, we may have any or all of these symptoms combined.

The *prognosis* in facial paralysis due to lesion of the nerve outside the skull is very favorable, if the case is seen early enough. Duchenne says that, when the electro-motor contractility of the muscles is destroyed, it is hopeless to attempt to restore their function. And by this he means susceptibility to the induced current, which is the only one much employed in France, the primary current having been brought into therapeutic use chiefly by the Germans. If Duchenne's statement were correct, then the case before you would have been hopeless, and so would be at least three-fourths of those which come under our observation. For it rarely happens, even when the paralysis has lasted but a few days, that the faradaic current, as strong as you dare to apply it, will induce contraction in the affected muscles. In the captain's case here, only four days after the attack, it would not even cause a tremor. So far as my present experience goes, I should say that, when the muscles fail to respond to every electric stimulus, the prognosis is very bad indeed; but, if you get any reaction, however slight, from a strong interrupted primary current, you have

much reason to hope for success. Next year we may find some more powerful stimulus to muscular contraction, but thus far we have nothing better than the galvanic current.

We have seen how the duration of the affection, before treatment is begun, enters into the prognosis from the rapid diminution of muscular contractility. There is another way in which time becomes an important element. A secondary consequence of the paralysis is permanent contraction of the paralyzed muscles from atrophy, and of the muscles on the sound side from lack of their normal antagonism. After this kind of contraction has once set in, it will sometimes go on in spite of all treatment. It becomes of the utmost consequence, therefore, to institute the treatment before such contraction has commenced, and in this will depend in great measure the encouragement you can give the patient.

When the lesion is deeper seated, the prognosis is, of course, less favorable, but even then it is greatly modified by the location and the cause. You cannot expect to remove an intracranial tumor, or to cure a necrosis of the temporal bone; but, if the pressure on the nerve is due to a syphilitic periostitis in some part of its course through the bone, you may hope to remove it by anti-syphilitic treatment. If, then, by the means already pointed out, you have located the disease in the acqueductus Fallopii, and if, at the same time, you can trace a syphilitic history, you will be warranted in speaking far more favorably than when a lesion so located cannot be referred to this as a probable cause.

The *treatment* has been to some extent implied in what we have already said. Its indications are few and simple: to remove the cause if possible, and put the nerve under the best conditions for regaining its lost power; and to preserve the organic integrity and irritability of the muscles until this can take place.

Where we have reason to suspect a syphilitic, rheumatic, or gouty origin of the trouble—for gout has been said to produce the affection, though I have never seen it—the causal indication may be met by constitutional remedies addressed to the diathesis.

For the restoration of the nerve-function we can do little beyond securing healthy nutrition of the general system by proper hygiene, and by tonics if necessary. You will find by your text-books, however, that a great variety of means have been tried and are even now employed for the purpose of affecting the nerve. One of those most uniformly recommended is a blister along its course. I used to apply it, but I never saw it do any good. So, too, of liniments, they are utterly worthless. Strychnia applied endermically upon a blistered surface, or hypodermically over the paralyzed muscles, I have employed a good deal, but it is of little or no service in the first stage. Strychnia is an excellent tonic, however, and I have found it of value in improving the nutrition of the nerve after any presumably inflammatory action has passed off. It may be administered as above, in doses of one-thirtieth or even one-twenty-fourth of a grain; or may be given by the mouth. This patient, after he had been under treatment about two weeks, got the following mixture, which brought up his appetite and strength: ℞. Strychniæ sul. grs. ij., acidi phosphorici diluti, syrupi zinziberis, āā ʒ ii. M. S. A teaspoonful three times a day.

The third indication must be met by local means. The best way to maintain the nutrition of a muscle is to exercise it; and considerable advantage may be gained from such passive exercise of the facial muscles as the patient may be instructed to make by frequent pinching and kneading. The great means of exercise, however, and the only one we can depend upon, is the electric current, either the induced or the interrupted primary. The constant galvanic current, moreover, may be employed to improve nutrition by dilating the arterioles, and so increasing the blood-supply, apart from the muscular contractions produced by its interruption and renewal. I am accustomed to try first the induced current, and if it excites muscular contraction there may be no necessity for resorting to the other. If there is no response to this, then we must have recourse to the primary. But the application of this latter to the face must be made with great caution. Duchenne destroyed the sight of one of his patients by using too strong a primary current in this situation. I never employ,

unmodified, the current of more than about fifteen of Smee's or Bunsen's cells. But, by passing the current through a column of water some three or four inches in height, I have been able to use as many as sixty cells with safety. Whichever current you employ, you must secure its action upon every one of the paralyzed muscles; and the best way to do this is to place one pole over the point of exit of the facial from the skull, and with the other (a moist sponge) stroke the whole side of the face. Do this three times a week. In the captain's case the primary current was required for about two weeks, or six applications, and then the induced current would act, and was used to continue the cure. As almost always happens, the first muscle to recover its function was the obicularis palpebrarum. In the case of the young lady of whom I spoke, and whom I saw in consultation with Drs. Nott and Castle, the induced current acted from the first, and so I was able to prognosticate a speedy recovery. In about a week she acquired the power of closing the eye, and yesterday I learned that she could already execute many movements on the paralyzed side.

This affection is somewhat liable to recur, and with each recurrence is a little more difficult to manage; but the principles and the mode of treatment are precisely the same as in the first attack.

LECTURE VII.[1]

GLOSSO-LABIO-LARYNGEAL PARALYSIS.

The case before us is an example of a very interesting and very important disease, which, though it has undoubtedly existed for a long time, has never been recognized as a distinct affection until within the last ten or twelve years. Some thirty years ago, Prof. Trousseau was requested to examine a distinguished personage of France, and made a memorandum of the phenomena observed, the chief of which were inability to speak, restraint in moving the lips, and ex-

[1] Phonographic Report of Dr. John Winslow

treme difficulty in swallowing. About twenty years later, Duchenne, knowing nothing of this memorandum, described very definitely the affection which I now bring before you, calling it progressive paralysis of the tongue, lips, and veil of the palate. Trousseau subsequently brought forward other cases, and delivered a very interesting lecture upon the disease, which he named *glosso-laryngeal paralysis*. He gave Duchenne full credit for its discovery, while claiming for himself the prior observation of the single case above referred to, of which, however, his memoranda had been put aside and forgotten. To Duchenne, therefore, belongs the credit of the discovery of the malady, as also of its latest working-up; for he has recently gone over the ground again, changing the name to *glosso-labio-laryngeal paralysis*.

This is quite a rare affection. I have seen altogether, in this city, seven cases of it, before the present one, and this is less pronounced than any of them. Undoubtedly we have here the malady in its incipiency, or at least in a very early stage, so that its physiognomy and symptoms are not well marked. Commonly these are so characteristic that you have no difficulty in pronouncing the diagnosis at once. I remember that in the last case I saw — that of a banker from Kansas City, who had come on to consult Dr. Sayre and myself, but in the doctor's absence had seen me alone—I was able to tell him what was the matter the moment he entered my office, and to describe his symptoms accurately without his help. That patient was unable to speak; but, as in this case there was no impairment of the intellect. In all of my other cases, also, the patients could not speak a word at the time I first saw them; and the paralysis of the lower face had already advanced so far, that it remained as motionless as a mask, while the eyes and the muscles around and above them were full of intelligent expression.

But before describing in detail the symptoms of this disease, or considering its pathology, let me read you the elaborate history of the present case, which has been prepared by Dr. Cross:

Case I. *Glosso-Labio-Laryngeal Paralysis.*—"W. H. S., aged thirty-two, born in New York, married, the father

of two children, both of whom are living; a book-keeper by occupation. He has always been very temperate in his habits. There is no hereditary predisposition in his family to diseases of the nervous system. He has never had acute articular rheumatism, syphilis, nor in fact any disease of importance, until the beginning of the present trouble, which he dates back to the winter of 1867. Up to that time he had always been a tolerably healthy man, and even now he attends to his daily avocations, and does not consider his affection of much moment. His father died of cholera some years ago; his mother and her children are all living at the present time. His grandparents on both his mother's and father's side were very long-lived people, reaching the average age of eighty.

"The first thing that attracted the attention of the patient, in the winter of 1867, was a peculiar sensation at the angle of the mouth, and the inner canthus of the eye on the left side. He says he felt like rubbing those parts continually. This sensation very slowly and gradually extended, and it was not until the winter of 1869, two years subsequently, that he became aware that not only his left cheek, but also his left temple, was very numb. At this period, while meditating over his accounts, he often struck his left cheek with the end of his pencil as one is very apt to do, when he was conscious of a very peculiar feeling which would start from the point struck, and travel rapidly upward, terminating at the left temple. This numbness or anæsthesia remained limited to these parts on the left side for a period of several months, before any other perceptible change took place. There was also a loss of sensibility in the mucous membrane lining the left cheek and the gums on that side, which he had noticed from the very first; he likewise chewed his food mostly on the right side, but attributed this more to the loss of feeling than to any want of power. Since 1867 he was aware that there was something wrong with his face, but he had no idea that there was any paralysis, and supposed the trouble to arise from the non-cutting of a wisdom-tooth on that side. At the time that the numbness had extended to the left temple, he experienced a feeling of constriction around the border of that eye, as though a tight rubber band were encircling it. During the month of

May, 1870, the anæsthesia, which was prior to this period limited entirely to the left side, began to extend, and progressively spread across the forehead, from the left temple to the cutaneous surface which circumscribes the right orbit, and to a small spot situated on the malar bone. Now he had ringing in the left ear, which was subsequently followed by impairment of hearing, to such a degree that he was unable to hear the ticking of a watch, or to understand persons conversing in a low tone of voice.

"During the winter of 1868 he had twitching of the left eyelid, which, after lasting for about a month, disappeared. In the month of September, 1870, the numbness again began to increase, and now attacked the parts about the naso-labial fissure on both sides, where it even now persists. It was at this period that his eyes became very much congested; and this condition, although varying in degree from time to time, lasted for at least a month. The left, however, was much more congested than the right. Soon he experienced some difficulty in reading, and at times he could hardly read at all.

"When the numbness had involved both naso-labial fissures, he noticed a stiffness about his mouth which resembled that peculiar want of natural mobility which is caused by exposure to extreme cold. For the first time he had slight difficulty in swallowing; yet this was not caused by any interference with the act of mastication, for his food was well prepared, but simply the first act of deglutition was not easily performed. For a year past he has been subject at times to vertigo, whenever he suddenly changed his position. When leaning forward, if he quickly raised up his head, he became giddy and had temporary loss of consciousness, only for a few seconds, however; and this occurred often many times in a day. Even on changing his position in bed he became dizzy. About a year ago he became aware that he could not walk very well in the dark, and especially with his eyes closed, yet he did not experience any diminution of motor power in his lower extremities. During the last three months he has had more or less trouble in making water, which did not come as freely as it used to do, and consequently he has been obliged to strain in order to empty his bladder. There is no stricture or other cause of

obstruction in the urethra. Within the last two months he has had pain in the occiput and in the vertex, which would come on two or three times a day and last for about half an hour at a time. This pain was not very severe in character. Two months ago he noticed, while leaning forward in the act of writing, that the saliva fell from his mouth drop by drop. He has very gradually lost his virile power, and he noticed this failure from the onset of the disease. Only within the last month has he become conscious of a slight embarrassment in his speech.

"Such is the history of this patient up to the 9th of January, 1871, when he came under the observation of Dr. Hammond. The following points of interest were ascertained January 12, 1871. Present condition: There is double facial paralysis, which is more marked on the left than on the right side of the face. The lower part of the face is immovable, while the upper is immediately thrown into action whenever the patient laughs or talks. There is at times twitching of the upper lip, and involuntary lifting of both upper eyelids, with a peculiar stare of the eyes, as though they were looking at vacancy. There is at present a feeling of constriction around both eyes. There are oscillatory movements of the eyeballs (nystagmus), which are in a lateral direction, and are almost constant. On this account, ophthalmoscopic exploration was not made. He has double vision at times. When he writes he is very apt to omit or misplace letters in many words, and in conversation he often miscalls or misplaces words. His memory of words is not perfect. He has pain still in the back and top of his head. There is no pharyngeal constriction. The first act of deglutition is imperfectly performed, yet it is not in the least painful; and the patient described it exactly when he said, 'When I want to swallow, it will not work.' The food collects between the cheek and the gums on the left side, but he can remove it with perfect ease by his tongue. He chews his food mostly on the right side, yet he can chew it very well on the left. At present he has very little vertigo. There is no nasal resonance in his pronunciation, and his friends do not notice any change in his voice. His pupils are exactly equal. It is difficult for him to look to the left, but he can turn his

eyes to the right and see objects without any trouble whatever. On account of this he always takes a seat on the right side of a car in travelling. There is no strabismus, no ptosis, and at present only very slight conjunctivitis of the left eye. His nose is drawn to the right side, and the right nostril dilates and obeys the actions of its numerous muscles much more readily than the left. His mouth is dry, and the secretion of saliva is much diminished. In swallowing liquids he experiences no difficulty, but it is a great effort for him to swallow solids unless he takes a quantity of fluid at the same time. In speaking he clips his words; and although he can pronounce every letter in the alphabet, yet he does not evince in his enunciation of the letters that clearness and distinctness of sound which he would undoubtedly have if he had full command over all the muscles concerned in articulation. There is much stiffness about the orbicularis oris. Occasionally, when leaning forward, the saliva falls from his mouth *guttatim*. There is no throbbing, no twitching, no tremulousness, nor deviation of the tongue. His tongue is perfectly mobile, and he can move it freely in any direction. His mouth is drawn to the right side; yet he can open and shut it quite readily, draw it to one side or the other voluntarily, and compress the lips, but when he laughs or talks in an animated manner its defective action immediately strikes the eye. He tires after talking, from the fact that his mouth becomes very dry. There is no feebleness whatever of the voice. The soft palate is relaxed, more especially on the left side, and the natural arch is lost to a greater or less extent, while the uvula is drawn over to the right side.

"Tactile sensibility is diminished in the mucous membrane of the tongue, hard and soft palate, the gums, cheek and lips on the left side; in short, there is anæsthesia of the whole left side of the buccal cavity, which is limited exactly by the mesian line. Tactile sensibility is also diminished in those parts of the face where he felt the numbness, namely, on the left temple, around the left eye, and here to the greatest degree, around the right eye, on the malar bone, and here limited to a circumscribed spot, and lastly in the region of both naso-labial fissures. The sensation of pain is as acutely felt in all these external anæsthetic parts as in the healthy tissue, excepting in the cir-

cumscribed spot on the malar bone. There is impairment, if not actual loss, of taste, on the left side of the tongue. On the left side of the buccal cavity, the tongue included, the sensibility to pain by electricity is diminished. All the muscles of the face respond to the Faradaic current. He can whistle and expectorate, but he does not purse up his lips very strongly. Irritation of the soft palate does not produce normal contractions, although it responds feebly to a stimulus. There is no atrophy of the tongue or of the lips. Tactile sensibility and the sensibility to pain are normal in all other parts of the body. With the exception of the regions already mentioned, there is no numbness nor abnormal sensation to be discovered anywhere. There is no trembling of the limbs. There is some difficulty of locomotion in the dark, and on first arising in the morning. When his eyes are closed he oscillates from side to side, and if not supported would fall. He still has some trouble in passing his urine. In regard to spinal symptoms, with the exception of the want of coördination and the bladder, they are entirely negative. His intellect is perfectly clear, as evinced by his great quickness of comprehension and ready intelligence. His heart and lungs are healthy. He sleeps well. His appetite is good. His bowels are regular. His pulse is 68, slow and full. His respiration is full, deep, and regular. There is no paralysis nor even paresis of the limbs, so far as can be ascertained. He can close quite perfectly both eyes simultaneously, or he can close one at a time. The larynx rises quickly and naturally, and the second act of deglutition is normally performed. The lips, on attentive observation, are seen to have lost their ready play or tonicity, and the angle of the mouth on the right side is thrown into action to a much greater extent than the opposite angle. That innate contractility which resides in the different facial muscles, and on whose normal tension and irritability depends the faculty of expression, is greatly impaired about the mouth and the whole lower part of the face on both sides. The muscles at the right angle of the mouth and on the right side of the face respond to a weaker Faradaic current than on the left. He can blow with sufficient force to put out a candle, but the current of air is imperfectly directed, owing to the lack of the harmonious

action of the muscles of the mouth and lips. His general health is at the present time so good that he thinks, if it were not for the slight difficulty which he experiences in swallowing, and his impairment of coördination, he would be as well as he ever was in his life. The treatment in this case consists in the internal administration of strychnia as follows: ℞. Strychniæ sulphatis gr. j, quinine sulphatis et ferri pyrophosphatis āā ʒ j, acidi phosphorici diluti ʒ ij, syrup. zingiberis ʒ ij. M. S. A teaspoonful in a wine-glass of water three times a day; together with the application of the primary Galvanic current to the base of the brain three times a week, and the application of the induced, or Faradaic, current to all the muscles of the buccal cavity, the lips, and the muscles of expression which are involved in the disease. The patient has now been under treatment about a month, and during that period the disease has made very little, if any, progress in its onward course."

Such, gentlemen, is the history of this very interesting and instructive case. Let us note the order in which the symptoms have made their appearance, and we shall find it differ decidedly from that usually observed in the disease.

The first thing which attracted the patient's notice was anæsthesia of a portion of the left side of the face and buccal cavity, not loss of motility. That shows that there was primarily implication of the trifacial nerve on that side. Now, in every other case which has come under my observation or my reading, the starting-point was in the hypoglossal, as indicated by loss of motility in the tongue. By reference to these diagrams upon the board, you see that the fifth nerve has its superficial origin at the anterior part of the side of the pons Varolii; and the fibres of its sensory root, which at present concern us, have been deeply traced to nuclei in the medulla oblongata, on the floor of the fourth ventricle. I have no doubt that, in this case, the disease originated in these nuclei.

The next nerve involved was the auditory—the eighth of Sömmering; he lost, to a great extent, the sense of hearing on the left side. The auditory nerve, which you see leaving the

pons posterior to the fifth, has, like that, its deep origin in the floor of the fourth ventricle. I think we have clearly the right to conclude that the disease, which commenced in the nuclei of origin of the fifth nerve, gradually extended until it involved those of the eighth.

Still progressing, the disease next invaded the origin of the facial (seventh of Sömmering), the great motor nerve of the muscles of expression. For we find the patient complaining of a feeling of stiffness about the lips, a little want of play in the orbicularis oris—a muscle supplied, as you know, by the facial. This nerve leaves the pons close to the auditory (so that the two were formerly classed together as the seventh nerve), its fibres being traced to the outer wall of the fourth ventricle, and to the restiform and olivary tracts of the medulla. The partial paralysis, first perceived in the lips, extended later to some of the neighboring muscles; the buccinator, for example, began to refuse duty, and allowed the food to get between the gums and the cheek. You see that the gentleman holds his lips slightly open, and when he is leaning forward, intent on his work, the saliva sometimes drops from them. But he tells me that it does not flow from his mouth at night, which is rather surprising; for many persons with no facial paralysis find their pillow wet in the morning. It is especially apt to occur from the general relaxation of the muscles in old age.

About this time, or somewhat earlier, there was some twitching of the left eyelid, and afterward a feeling of constriction about it. Now, twitching of the lid I used to suppose was always caused by spasm of the levator palpebræ superioris, supplied by the third nerve. But having it badly myself at one time (I do now when I smoke too much), I watched the movements carefully before the glass, and was not a little relieved to find they were not such as would proceed from an implication of the third nerve—for this nerve comes from the crus cerebri, an ugly spot to have trouble with. I saw that the movement was not directly upward and downward—the only one possible from the action of the levator—but was rather a twitching downward and inward, and evidently caused by spasm of some fibres of the orbicularis palpebrarum,

pulling the upper lid toward their origin at the tendo oculi. This muscle is supplied by the facial; and it need not surprise us to find, as in the present case, irritation of some of the fibres of this nerve at their origin preceding or accompanying the partial paralysis of other fibres (e. g., those distributed to the orbicularis oris). You will recollect, too, that Dr. Cross speaks of an involuntary raising of the lids. This likewise does not result in the present case from any spasm of the levator palpebræ superioris, but from slight convulsive action of the occipito frontalis, a muscle also supplied by the facial nerve.

The nystagmus and double vision, it is true, might lead us to suspect some difficulty with the third pair, resulting in weakness of the internal rectus and that intermittent, tremulous action which weakened muscles are apt to display. Taking it in connection with the early twitching of the lid, a superficial observer would perhaps diagnosticate at once a partial paralysis of the motor oculi communis. But if that were the case, we should expect also ptosis by this time, and dilatation of the pupil, neither of which is present. There would very likely, also, be some interference with the functions of the superior and the inferior rectus, while in fact the patient can hold his eyes pretty still when he looks straight forward. To what, then, must we ascribe this lateral oscillation of the eyeballs, which is so strongly marked when he tries to look to one side? It can be due only to spasm or paralysis—probably the latter—of one or both of the external recti; and, as he can turn his eyes easily to the right and with difficulty to the left, it is doubtless the left external rectus which is weakened. These muscles are supplied by the sixth pair of nerves, which you see taking origin, close to the pons, from the anterior pyramids of the medulla oblongata, and which may be traced to the floor of the fourth ventricle.

There is in this case no paralysis whatever of the tongue, that is, the hypoglossal is not yet involved, that nerve arising lower down than those we have seen affected. Whence, then, the difficulty of swallowing? It must come simply from want of power over the palatal muscles (levator palati, azygos uvulæ, and tensor palati) supplied by the facial, through the sphenopalatine and otic ganglia. Indeed, these muscles are seen on

inspection to be relaxed on the left side; and the dryness of the mouth indicates that the parotid gland, which also derives its supply from the otic ganglion, has lost something of its functional activity. There seems, then, to be no trouble in the medulla oblongata lower down than the deep origin of the facial. Neither the pneumogastric nor the spinal accessory has suffered, so that there is no interference with regular and complete respiration, or with phonation. The man's voice is as strong as ever, and he can blow his breath with much force, while in no other case I have seen could the patient blow out a candle.

Some of the symptoms, as the attacks of vertigo and of pain, suggest cerebral difficulty; but the man's intelligence is unimpaired, as evinced by his quick and clear answers to my questions, and, if there be any organic disease of the brain, I am unable to make it out. I think we are justified in excluding structural lesion, and attributing these symptoms to some derangement of the cerebral circulation.

The patient, as you see, cannot, with his eyes shut, either stand still or walk steadily across the floor, but keeps swaying from side to side; and he says that he cannot walk in the dark. You have seen this symptom in two cases which came before you at a previous lecture, and we then found it dependent upon a loss of the sense of pressure and of sensibility in the soles of the feet.[1] This loss of sensibility is frequently due to an affection of the posterior columns of the cord, as in locomotor ataxia, but not invariably, for you get the same symptom when the feet are "asleep," for example, from cold, or from pressure on their nervous trunks. In the present instance there are probably independent centres of trouble in the sensory tract of the cord, as evidenced not only by the want of coördination in walking without the aid of sight, but also by some awkwardness the patient finds in buttoning his collar, doubtless from diminished sensibility in the fingers. The difficulty in evacuating the bladder also points to some morbid condition of the cord.

Thus, we have gone over the main points in the history

[1] Psychological Journal, January, 1871, p. 31.

of the case before us, and, in order to show their connection, I have been obliged to anticipate to some extent its pathology. The patient may now be dismissed; while, to complete our picture of the disease, I must rapidly sketch those features which our model does not exhibit.

As I have said, the tongue is commonly first affected. The patient discovers that he cannot clearly articulate the linguo-dental consonants. A little later he is unable to raise the tip of this organ to the roof of the mouth, or to employ it to keep the food between the teeth in mastication. Soon the first act of deglutition becomes difficult—the alimentary mass cannot be readily carried back and pressed against the constrictors of the pharynx; and finally the tongue lies utterly inert on the floor of the mouth. By this time the lips have begun to suffer; they tend to remain apart, and the saliva dribbles from them; the vowels *o* and *u* cannot be distinctly sounded; whistling and spitting become impossible. Then other muscles supplied by the facial partake in the paralysis—the buccinators, the elevators of the palate and of the uvula, and the tensors of the palate; and swallowing becomes harder than ever, the food being often forced from the pharynx back into the mouth, or ejected through the nose. By-and-by the pharyngeal constrictors themselves can no longer be trusted—the pneumogastric and spinal accessory are becoming involved. When these nerves are still further affected, we find the power of phonation lost, and that of respiration seriously impaired, from paralysis both of the glottic muscles and of those fixing and moving the ribs. Every attempt to swallow is now attended with imminent danger of suffocation, from portions of food or drink entering the larynx, and the impossibility of coughing vigorously to throw them out again. A fatal bronchitis or pneumonia may thus be set up; or, if the patient escape these, as well as all the chances of strangulation, he dies at last of inanition.

Thus, in what has heretofore been regarded as the typical form of the disease, we have simply progressive motor paralysis, in muscles innervated by the hypoglossal, the facial, the pneumogastric and the spinal accessory (partly through the pharyngeal plexus), and lastly by some of the spinal nerves—for the phrenic and even the intercostal nerves seem to be some-

times affected. Trousseau tells us that sensibility is wholly intact, and that even the reflex irritability of the paralyzed muscles is retained.

Now, the case we have to-day been examining, and one other which has come under my observation, enable me to say that there is another type of the disease, in which the primary symptom is loss of sensibility, attended sometimes by hyperalgesia, the motor paralysis not appearing until later. I find, also, on a careful review of Trousseau's cases, that one of those is to be placed in the same category.

There is no doubt that this disease was for some time confounded with progressive muscular atrophy, or Cruveilhier's atrophy, as it is often called—a malady characterized by progressive wasting of the affected muscles, and by their weakening in consequence of this wasting, not in consequence of deficient motor innervation. It so happens that in several reported cases the two affections were coincident; that is, there was motor paralysis of the parts we have been considering, with atrophy of some muscles of the trunk and limbs. These two conditions are sufficiently distinct. In the one we have primarily paralysis of motility, and only such subsequent atrophy of the muscle as results from its disuse. In the other we have primarily atrophy of the muscle, and only such loss of power as this necessarily entails. But Trousseau, on the basis of several post-mortem examinations, considered that their association in the cases referred to was something more than accidental. For the chief lesion found in these autopsies was atrophy of the roots of those motor cranial nerves we have enumerated, and of the motor roots of some of the spinal nerves. He suggested, therefore, that glosso-laryngeal paralysis and progressive muscular atrophy were only varieties of a palsy, dependent upon an affection of the cord or of the medulla oblongata, whose chief anatomical expression was this atrophy of motor roots.

It was reserved, however, for the searching eye and the fertile brain of Duchenne, only a few months ago, to proclaim at once the facts and the theory which should exhibit the relation between these affections, and mark a great advance in our nervous pathology. The paper was published in Brown-Sé-

quard's *Archives* for August, 1870. You know that everywhere in the nervous system the gray or cellular matter is considered to be the source of nervous power, while the white matter is held to be only its conductor. Now, Duchenne's theory is, that there are at least three distinct kinds, or sets, of cells, the exclusive function of one set being to preside over sensation (sensory cells); that of another set to preside over motion (motor cells); that of a third set to preside over nutrition (trophic cells). Each set of cells has its own exclusive conducting fibres; but the motor and trophic sets are apt to lie near each other, and their conducting fibres to go together in the same bundle (or "nerve"), while those of the sensory set often take an independent course to their distribution. The anterior roots of the spinal nerves, for example, start probably from both motor and trophic cells, the posterior from sensory cells alone. There are no microscopic distinctions as yet made out between these functionally different sets of cells, though it is not impossible that such distinctions may in future be discovered. The theory of their functional difference is an inference which physiology draws from the data furnished by pathology.

What are these data? In a post-mortem examination of a patient who had suffered profound atrophy of the tongue and facial muscles, and had died from some other cause, Duchenne found that not only were the roots of the hypoglossal, facial, and some other motor nerves much shrunken at their emergence from the brain and cord, but the cells about the deep origin of these nerves had, to a great extent, disappeared, and been replaced by connective tissue. In some places he could even count the cells in connection with the nerve-root, and in one instance there were only nine or ten to be found. Of what kind were the missing cells? Though the microscope could give no answer, yet the fact that the effect of their disappearance was not paralysis, but atrophy of the organ supplied by their nerves, clearly pointed to them as trophic cells alone. Similarly, had the medulla oblongata presented precisely the same appearances, and the history of the case shown not a diminution in the size of the muscle supplied, but simply a lack of nervous motive power, he would have been warranted in

supposing that it was the motor cells which had suffered destruction. And so, if a certain number of cells and the sensibility of a peripheral area having nervous connection with them, had disappeared together, we should justly regard it as presumptive evidence of a genetic relation between them.

Now, if the lesion, resulting in destruction of nervous cells, be of centric origin—for example, if it be a sclerosis due to chronic hyperæmia or inflammation—it is extremely unlikely that it would affect only one of two or more sets of cells lying in close juxtaposition. We should expect, therefore, to find motor paralysis and muscular atrophy in frequent companionship; and this, as I have said, is really the case, the same muscles being both palsied and atrophied. We shall see, however, when I come to speak more particularly of wasting palsy, that it seems frequently to have a peripheric origin, in overexertion of the affected muscles, and consequent exhaustion of their nervous centres; and in such cases we often find no primary motor paralysis. When, as in the case you have just seen, the trouble begins with paralysis of sensation, we should hardly look for attendant atrophy; and in point of fact, in this case, there is no atrophy whatever, as both Dr. Cross's examination and my own have distinctly proved. Still, we have much to learn concerning the etiology of nervous lesions before we can hope for a wholly satisfactory explanation of the apparent anomalies of association which sometimes occur.

You have already divined that not only the forms of paralysis which chiefly concern us to-day, but others as well, are explained by this theory of the disappearance of central nerve-cells having special functions. Thus, locomotor ataxia, which our patient exhibits in some degree, and the characteristic lesion of which is sclerosis of the posterior columns of the cord, falls into the same category. So, too, with "essential," or, as I have termed it, *organic* infantile paralysis, which depends upon destruction of both motor and trophic spinal cells.

With reference to the causes of glosso-labio-laryngeal paralysis very little is known. The course of several diseases, however, shows that there are two radically distinct forms of centric cell-destruction in general, the one acute, the other chronic. In the first, of which organic infantile paralysis may

serve as the type, the invasion is sudden, and the affection may become fully developed in a few hours, after which it progresses very slowly, if at all. In the second, the invasion is very gradual, and the disease is essentially progressive, the cells probably undergoing a slow absorption. To this form belong glosso-laryngeal paralysis, progressive muscular atrophy, progressive locomotor ataxia, and so on. Now, upon the matter of etiology, it has been definitely ascertained that the chronic form may be inherited, but the acute shows no such tendency to hereditary transmission.

Age seems to exert a predisposing influence on the development of the disease in question. The present patient is the youngest, on record, to manifest it, being but thirty-two years of age; and I have seen it positively stated that the disease never appears under the age of forty-five. In this case, indeed, I am unable to discover any probable cause.

One of my patients, a very small man, fifty years old, dated the origin of his malady to some one's coming up behind him and lifting him by his head, "to show him London." I have seen a number of instances where incurable affections were brought on by this same silly trick.

The prognosis is wholly bad. Our patient, comfortable as he now appears, has scarcely a possible chance for recovery; for, of some forty cases of the disease fully reported, every one has gone on steadily, or with only slight remissions, to a fatal termination. Of the seven cases which have come under my own observation before the present, but one is alive—the Kansas City banker—and he only because he has not had time to die. I have sent him home, with the unfavorable prognosis which I always give.

There is no need, then, of my dwelling upon the question of treatment. I tell patients frankly there is no use in it; and for only one of my former cases have I attempted to do any thing with any hope of cure. That was my first one, a gentleman sent me by Dr. Bradley, of this city. I applied galvanism to the muscles of the tongue and throat for three or four weeks, and it certainly did effect something. The man got so that he could swallow quite well, but the improvement was only temporary, and soon the current ceased to elicit any

response. In a few other cases the dysphagia has been mitigated for a time by like means. I am treating Mr. S. here with the galvanic current passed through the brain, and the medulla oblongata, and the Faradaic current to the muscles of the face. He is also taking phosphorus and strychnia. These are the only means that promise to be of any service, and, if a patient insists upon being treated, you may employ them to give him a transient respite or to alleviate his distress.

LECTURE VIII.

CEREBRAL HÆMORRHAGE.

There is no affection, in the whole range of diseases of the nervous system, which it is more important that you should be thoroughly acquainted with, than that which I propose to consider to-day, and which, so far as its symptoms are concerned, has been confounded until very recently with a number of different cerebral affections. By cerebral hæmorrhage is understood that condition which is due to the rupture of a blood-vessel, and the consequent extravasation of blood either into the substance of the brain, or into its ventricles, whereas the term apoplexy is generally applied to sudden causes, however induced, and consequently embraces a large number of diseases in which the prominent symptom is loss of consciousness. Formerly medical writers were in the habit of grouping together, under the term apoplexy, several different affections, but a better knowledge of the subject has taught us to separate and distinguish these from each other, so that embolism, thrombosis, meningeal hæmorrhage, and many other diseases, are readily diagnosticated from cerebral hæmorrhage. There are two forms of this affection, which are called the apoplectic and the paralytic, and which differ from each other in this respect, that, in the former, the mind is suspended in its action, whereas, in the latter, there is no loss of consciousness, although the mind does not generally act with its accustomed vigor after the attack.

Having thus briefly called your attention to the topic upon

which I shall lecture to-day, in these few preliminary remarks, I will now proceed to read the history of the following case:

Case I. *Cerebral Hæmorrhage.*—"Eliza G., forty years of age, single, was born in New York City, and is a washerwoman by occupation. About five years ago she had a very severe attack of typhus fever, after which she found that her eye-sight was more or less impaired, and that her hearing, memory, and intellect, were also somewhat affected. Prior to this, however, she had been a very healthy woman, and had always been remarkably temperate in her habits. She has never had syphilis, gout, nor acute articular rheumatism, but for some time past she has complained of shortness of breath, and great precordial distress on taking violent exercise, such as running up-stairs quickly or otherwise unduly exerting herself. For the last three months she has suffered from violent attacks of asthma, which have troubled her very much. Her mother, when about sixty years of age, was paralyzed on one side of her body, and her speech was much affected. Although she lived for several years after this attack, she never completely recovered from her hemiplegia, nor did she ever regain the normal use of the faculty of speech. A brother, at the age of sixteen, was suddenly seized with loss of consciousness, and died in the course of two hours afterward. During this attack he had no convulsive movements whatever, and he never rallied from his apoplectiform condition. He had, however, organic disease of the heart.

"The first symptom which attracted the attention of this patient occurred about the 3d of October, 1870, at which time she was suddenly seized with a violent pain across the forehead, which returned at intervals for a period of at least two weeks before she was paralyzed. October 17th, as she was engaged in washing, leaning over the edge of a tub in a constrained position, she suddenly felt very dizzy, and her sight grew misty and dim; she left her tub and reeled across the room, but was almost immediately supported and placed in a chair. For a short space of time, her ideas were much confused, but during the attack her consciousness was unimpaired.

"On endeavoring to speak she found that her speech was very much impaired, and it was with very great difficulty that she could make her wishes known to her friends. Mobility on the right side was lessened, while tactile sensibility was also diminished. The muscles of the face were drawn to the left side, while the tongue pointed toward the right. There was internal strabismus of the right eye. The patient came to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, October 24th, just one week after the attack, and walked up the steps with very little assistance. At this time she complained of pain in the back of the head, and constipation of the bowels. She was directed to go home immediately, keep perfectly quiet, and guard against all undue efforts, such as leaning over to tie her shoes, straining in the water-closet, etc. Aloetic pills were prescribed to regulate her bowels, and she did not return to the hospital for treatment until November 10th, when I learned that the pills had had the happy effect of causing the pain in the head to disappear as soon as they had operated. Her condition was now as follows: owing to the paralysis of the tongue, the lips and cheek on the right side, her articulation is rather indistinct, yet by attention you can understand what she says very well. Her face is drawn to the left side, and the angle of the mouth drops on the right, from which the saliva every now and then dribbles. Her tongue deviates very slightly toward the right side. The pupils are both equal, and there is at present no strabismus. Her eyesight, hearing, memory, and intellect, have been more or less impaired ever since she had typhus fever, but she thinks that they are no worse at present than they were before this attack. Motility is much more impaired in the face than in the arm, and it is also more impaired in the arm than in the leg. She staggers occasionally after any considerable amount of exertion. The right cheek is flaccid and puffs out at times, while the food lodges in the cavity thus formed, to the great inconvenience of the patient. The muscles of the tongue are impeded in their normal movements, and consequently she experiences some difficulty in protruding that organ. The motility of the right arm is now very slightly diminished, and she

is able to execute complex movements with it very well indeed. The right leg she raises well from the ground, the toe does not catch; and if it were not for a slight circumduction of the foot in walking, her gait would attract little attention. The tactile sensibility is equal on both sides of the body, while the muscular contractility, and the sensibility to electricity, are slightly diminished on the right side. Slight differences in temperature and the sensation of pain exist between the two sides. There is a suspicious-looking ulcer on the right leg, which has not yet healed. She displays no undue emotional excitability. Her heart was examined, and found to be healthy; the physical exploration of the lungs was made, but unfortunately the result was not recorded. Ophthalmoscopic examination of the eyes at this time revealed nothing abnormal.

"All the diseased muscles respond well to the Faradic or induced current; those of the face, however, requiring a stronger stimulus than those of the arm, and those of the arm a stronger stimulus than those of the leg."

Such, gentlemen, is the history of this very interesting case, which affords us a good example of the paralytic form of the disease now under consideration.

The first symptom which this patient noticed was a violent pain in the forehead, which was present at intervals for two weeks prior to the attack, and which pointed to cerebral difficulty. You know that in cerebral hæmorrhage there are a number of premonitory symptoms which are generally present for a variable period prior to the full development of an attack, and that these phenomena show a disturbance in the cerebral circulation. In some cases we have severe headache, as is well illustrated in the patient before us; in others we find difficulties in speech, which are due either to slight paralysis of the tongue, to paralysis of the cheek and lips, or other muscles concerned in articulation, or else are dependent upon a want of coördination in the muscles of speech, or there may be defects of sight, or numbness limited to one side of the body, which is not an uncommon occurrence, as several cases of this kind have fallen under my observation. Or there may be simply vertigo, with confusion of ideas, and specks before the eyes,

which may precede the attack by only a few seconds, and be the only admonition which the patient has. Even in those instances in which there are premonitory symptoms, the attack takes place suddenly, as it did in the present instance. But, generally, there are present only those symptoms which occur directly before the attack, and which show both mental and physical disturbance.

When an individual is attacked with the paralytic form of cerebral hæmorrhage, he is perfectly aware of his condition, and soon discovers that his arm and face are affected, and that his speech is unintelligible. If, however, he be sitting or lying down, instead of standing, he does not discover that he is paralyzed until he attempts to rise. In a case of a distinguished officer of the army, after a fatiguing day of ceremony, who was returning in his carriage to his hotel, as he passed along Fifth Avenue, he suddenly experienced an indescribable sensation, and then became aware of the fact that he could only see the half of objects. He did not lose consciousness, although when he arrived at the hotel, and attempted to get out of his carriage, he found that he was paralyzed on the right side, and that his speech was so much impaired that he could not make himself understood. In the case of this woman, who is now before us, the attack came on suddenly, and in a very short time involved the whole of the right side of the body. Her speech was so much affected that it was with great difficulty that she could make herself understood. Her face was drawn to the left side, which shows that the muscles of the right side are paralyzed, and that their antagonists still act in a perfectly normal manner. When the face is involved, scarcely any distortion is perceived when the patient does not attempt any facial movements; but if he endeavors to open his mouth, to spit, or to puff out the cheeks, the paralysis is at once evident. In the majority of cases of cerebral hæmorrhage, we find that the facial paralysis soon disappears, together with the difficulties of speech, while the arm and leg still remain paralyzed. The mind becomes more active, and the affected limbs more capable of motion. Usually the leg recovers power much more rapidly than the arm, so that the patient can generally

walk very well long before he can raise his arm from his side, bend his elbow, or extend his fingers. The paralysis in the leg is particularly marked in those muscles which extend the foot, and this gives rise to a peculiar gait, in order that the patient may clear the toes from the ground. This is accomplished by means of the abductor muscles, which are rarely affected. When the patient walks he throws the leg out from the body by means of the muscles of the thigh, so as to prevent dragging his toes on the ground.

Besides these disorders of motility, sensibility is more or less affected. The limbs on the affected side feel heavy as if made of lead, and after a while disordered sensibility is experienced by a feeling as if pins and needles were sticking into it, or as if the limbs were asleep, or as if ants were crawling over the skin, or water trickling over it. In Eliza G.'s case you will observe that the improvement took place first in the leg, then in the arm, then in the tongue, and lastly in the face. We generally find, however, that the difficulty in speech and the loss of power in the muscles of the face disappear before the paralysis of the extremities. You will observe too, that there was external strabismus on the right side, which shows that the third nerve was partly paralyzed, so that the abducens still acting rotated the eye outward. The hæmorrhage, which in this case was on the left side of the brain, must have been small in amount, as the paralysis speedily disappeared, and left behind only the implications of the face and the muscles of the tongue.

You also notice, from the history of the case, that the patient came to the hospital one week after the attack, and that she was advised to go home and to keep perfectly quiet, until all signs of irritation of the brain had disappeared, when it would be proper to commence treatment. I prescribed aloetic pills in order to move her bowels, which were constipated, and advised the patient to delay active measures to restore the power of motion until two or three weeks had elapsed. A clot in the brain is to all intents and purposes a foreign body; as this cannot be removed excepting by certain fixed and definite changes, it is necessary to sustain all the powers of the system in order to promote the absorption as rapidly as possible, and this is accomplished by keeping the patient perfectly quiet,

with the head well elevated, the room cool and thoroughly ventilated, and other indications should be met as they arise. After the lapse of two or three weeks we should commence to take active measures to restore the power of motion, and to prevent those contractions which tend to make restoration much more difficult. This we will try to do by hypodermic injections of strychnia, in doses of a thirty-second of a grain every alternate day, and by the use of the induced current, as this is found to cause contractions of the muscles on the diseased side until they are fully restored.

[Note.—The treatment in this case has consisted solely in the application of the Faradic current to all the muscles which were involved in the disease on every alternate day, and in the course of six weeks improvement had taken place to such a degree that the patient ceased coming to the hospital. At the time of her discharge there was a slight paresis of the muscles of the right leg, which depended upon a weakened condition of the extensor muscles, which had not yet regained their tone. The right arm had almost entirely regained its normal vigor. There was still some slight difficulty of speech, but this depended more upon the paralysis of the facial muscles than upon the impairment of the muscles of the tongue, for the former was even now well marked, while the latter had nearly disappeared.]

Case II. *Cerebral Hæmorrhage with Left Hemiplegia.*—"Joseph E. Pope, sixteen years of age, was born in New York, and is a soap-manufacturer by occupation. When eight years old he had an attack of acute articular rheumatism, which lasted about six weeks. Every autumn since then he has been troubled more or less with severe seizures of subacute rheumatism, which would persist for a variable period, and then readily disappear under the use of the iodide of potassium. Subsequently he had shortness of breath and violent palpitation of the heart whenever he took any violent exercise whatever, and this has been a very great discomfort and source of annoyance to him. He has no hereditary predisposition to diseases of the nervous system. In November, 1869, while

stooping over to tie his shoe, he was suddenly seized with an intense pain in the right frontal region, accompanied with vertigo, dimness of vision, and general confusion of ideas. Loss of consciousness rapidly supervened, the patient falling forward, but before striking the floor he was caught by his brother. He remained completely unconscious for at least an hour, and, after he had revived and regained to some extent his senses, his left side was found to be completely bereft of motility and sensibility. The face was drawn to the right side and the tongue deviated. He was unable voluntarily to close his left eye. His speech was thick and indistinct, owing to paralysis of the muscles of the tongue. He was confined to his bed for the period of a month, after which he became able to move about a very little with assistance. Improvement in speech took place first, and the leg followed next in order. At the end of six weeks he was able to go about without any support whatever. After the lapse of three months the muscles of the face and tongue had entirely regained their normal contractility, but the leg and arm were still very much impaired. He was treated about this time daily by means of a weak induced current, but with very little benefit, so far as he was able to judge. He was admitted to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, September 26, 1870, at which time he was in the following condition:

"Motility is greatly impaired on the left side of the body, yet the muscular power is much more deficient in the arm than in the leg. The left upper extremity hangs by his side quite powerless, and the only motion which he can give to it is a slight lifting of the humerus by means of the muscles of the shoulder. The thumb is drawn into the palm of the hand, and the fingers are rigidly flexed upon it. In fact, motility in the left upper extremity is almost *nil*. The hand cannot grasp the dynamometer, owing to its extreme rigidity. His left foot is adducted to a very great degree, and in walking he swings it in the arc of a circle, and even then he stubs his toe at nearly every step, from the weakness of the extensor muscles. There is much atrophy of the muscles of both the arm and the leg, but more particularly the former. The

tactile sensibility, and sensibility to pain, are normal on the diseased side, while the sensations of heat and cold, and muscular contractility, are more or less diminished. The temperature is also diminished on the diseased side. The bladder and rectum are normal; the urine is healthy and acid in reaction. His memory and intellect are somewhat enfeebled. There is no difficulty whatever at present in closing the right eye voluntarily. He has had only this one attack, and neither before nor subsequently to it has he had any head-symptoms whatever. Physical exploration of the heart shows that this organ is hypertrophied, and that there are both mitral and aortic organic valvular lesions. The lungs are healthy. The pupils are equal and respond readily to light. Ophthalmoscopic examination shows that the optic disks are in a healthy condition, and that the retinal circulation is normal."

This case is particularly interesting from the fact that it is very difficult to decide definitely whether it be one of embolism or cerebral hæmorrhage, although I am inclined to the belief that it is a case of cerebral hæmorrhage; nevertheless, without a *post-mortem* examination, no definite opinion can be given. The attack came on in a young man only seventeen years of age, who had had acute articular rheumatism, which was subsequently followed by disease of the heart, which gave rise to organic lesions both mitral and aortic. The attack was, however, apparently induced by strong muscular exertion while stooping over to tie his shoe. In a case of partial or complete hemiplegia, with or without loss of consciousness which occurs in a patient under forty years of age, with the hemiplegia on the right side, no muscular contractions and organic disease of the left side of the heart, with or without previous attacks of acute articular rheumatism, we may safely predict that the cause of these phenomena is cerebral embolism. The cause of the paroxysms, which we can justly attribute to the constrained position of the patient, the lesion being on the right side of the brain, while the resultant paralysis was on the left side of the body, the marked muscular contractions which have lasted already several months, and the subsequent improvement in the arm and leg,

all favor the view that the patient is suffering from an extravasation of blood into the right hemisphere much more than they point to embolism. In embolism contractions never take place, and if the paralysis does not disappear within three days after the attack, it does not gradually fade away as it so often does in cerebral hæmorrhage. Then, again, there was a short premonition in this case, as was shown by the pain in the head, the vertigo and confusion of ideas, symptoms which indicate hæmorrhage rather than embolism, for in this latter affection there are no premonitory symptoms.

You are aware that advanced age is the most influential circumstance which predisposes to an attack of cerebral hæmorrhage, and this fact has been recognized ever since the days of Hippocrates. It is much more apt to occur in persons over forty years of age than in persons under this age, although the number of the latter is, comparatively speaking, very small. Of two hundred and twenty-nine cases of cerebral hæmorrhage which have fallen under my professional charge within the last five years, two hundred and four occurred in persons over forty years of age, while the remaining twenty-five cases were in persons under that age. Of these, seventeen were attacked between thirty and forty, seven between twenty and thirty, and one, the patient before you, is only seventeen years of age. This is the youngest patient that has fallen under my observation, who was afflicted with cerebral hæmorrhage. There is another point in this case to which I wish to call your particular attention, and that is the difficulty which the patient experiences in closing his left eye voluntarily. You remember that Dr. Cross particularly mentions that fact in the history of Pope. In facial paralysis of cerebral origin the muscles of the face are incapable of expression, and are usually paralyzed on the side opposite the lesion, excepting in some rare instances in which the paralysis of the face is on the opposite side to that of the body, and the orbicularis-palpebrarum muscle remains unaffected, the patient being able to close the eye; whereas, in simple facial paralysis, this muscle is always involved, and consequently the eye remains wide open. It is from this circumstance that we are able to diagnosticate a cerebral from a peripheral paralysis. Although

this patient is quite certain that he could not close the left eye for some time after the attack, yet at present you see that he can do so with the utmost ease. He has not had any irritation of the left eye, as he undoubtedly would have had if there had been much loss of power in the orbicularis muscle, and it had remained thus involved for any considerable length of time. You who have seen many cases of facial paralysis will remember that the patient is unable to close the eye on the affected side, and, in consequence of this condition, the eye is continually exposed to the action of the atmosphere and the many particles of matter which are constantly floating about in it. The patient is also unable to wink, and, as a result, the tears, instead of being distributed over the surface of the eyeball, or carried away by the nasal duct, run over the lower lid upon the cheek, which they keep in a continual state of irritation, while the eye is constantly exposed to the particles of dust which accumulate upon its dry surface, and there remain on account of the loss of power in the constrictor muscle of the eye, whose function is thus impaired. The present case does not, however, invalidate the general law that, in facial paralysis of cerebral origin, the orbicularis-palebrarum muscle is not involved, and the patient can close the eye on the affected side. All writers upon diseases of the nervous system have noted this fact, and have called attention to it as the diagnostic point between facial paralysis of cerebral and peripheral origin; nevertheless, in some rare cases this muscle is partially involved, but never to the same degree as in simple facial paralysis; and it is doubtless owing to this circumstance that the eye does not become inflamed, inasmuch as the muscle is not sufficiently affected to deprive it from partially performing its proper function.

You also observe the marked contractions which exist in the muscles of Pope's left arm. I will now call your attention to the position of the upper extremity in well-marked cases of cerebral hæmorrhage in which there is almost invariably a disposition toward contraction of the pectoralis major and minor muscles, so that the arm is drawn across the front of the chest. At the same time the latissimus dorsi, the trapezius, the rhomboidei, the teres major and minor muscles, are gener-

ally in a state of relaxation, and eventually tend to atrophy. The elbow is slightly flexed, the wrist bent upon the forearm, and the fingers drawn in toward the palm of the hand. In some instances the thumb is drawn in to the palm of the hand, and the fingers are so rigidly flexed upon it that it is impossible to extend them, and the palm of the hand is lacerated by the sharp nails impinging against its surface. It is a curious fact, however, that the muscles of respiration are never affected in cerebral hæmorrhage unless the medulla oblongata be involved. You remember that this patient was completely unconscious for an hour, and then gradually regained his senses; so that you have here an example of the apoplectic form of cerebral hæmorrhage in which the patient falls, is comatose, breathes stertorously, the lips and cheeks puff out with each expiration, the pulse is slow and full, the pupils are dilated, sensibility and the power of motion are abolished on one side of the body. The bladder and rectum are generally not affected. In a short time consciousness commences to return, and you can arouse him from his condition of insensibility. He now attempts to move, though with difficulty, and tries to speak. Articulation is, however, indistinct, for the muscles on one side of the face are paralyzed and the tongue, for a like reason, is restricted in its movements. If the patient be now examined, paralysis will be found to exist in the limbs of the same side, and involve the loss of sensibility, as well as of motion, although rarely to the same degree, as the former is less affected than the latter. In the case of Eliza G., the paralysis of the arm and leg rapidly disappeared, and at the time of her discharge there remained only paralysis of the face on the affected side, and some difficulty of speech.

In the patient before us, although nearly a year has elapsed since the onset of the attack, yet we find no embarrassment of speech, no facial paralysis, no difficulty in closing the right eye; but there still remains great loss of power in the left upper extremity, the fingers of which are so firmly flexed into the palm of the hand that the patient is unable to grasp the dynamometer so as to measure the amount of loss of power upon that side, and the only motion which he can give to his arm is through

the muscles of the shoulder, by means of which he is able to move this member to a slight degree from the side of his body, which fact shows that even the muscles of the shoulder are visibly affected. The lower extremity is not only much impaired, but its nutrition has also suffered as is shown by the atrophy in that part. The temperature on the affected side is also diminished, as is generally the case in these affections, and, although tactile sensibility is now normal, yet the sensations of heat and cold are still impaired.

The mental characteristics of a patient will also be found to have undergone a radical change. He is irritable, unreasonable, and fretful. His sense of the proprieties of life, which in health may have been very delicate, becomes obtuse. His memory is notably impaired, and his reasoning powers greatly diminished. But the greatest change that will be perceived will be found in the emotional faculties. He will laugh when he should cry, and he will shed tears at the veriest trifle—and this characteristic will remain for years. In Pope, the memory and intellect are both found to be impaired, although not to a very marked degree, and his emotions have also undergone a radical change, as you will observe a circumstance in no degree ludicrous whatever will readily excite his mirth. Even in this case in which there are such well-marked contractions, and so great a loss of power upon the affected side, we can hope for marked improvement by a proper course of treatment, although in all cases of cerebral hæmorrhage a patient is neither mentally nor physically the same after an attack as before it, yet in some cases he may regain to a great extent his mental and physical health. I shall advise in the treatment of this patient the use of hypodermic injections of strychnia in the same manner as I have mentioned in the former case, and the employment of the primary galvanic current until the contractility of the muscles is so far restored that we may judiciously make use of the induced current.

[Note.—*February* 16, 1871. The patient at this time was in the following condition: There had been a progressive and gradual improvement in both the upper and lower extremities—the leg, according to the general rule, commencing to

improve first, and in this respect it has excelled the arm in its progress. The foot was only a little adducted, and there was less inclination on the part of the patient to swing it as much as formerly. The muscles responded well to a weak Faradic current, and were very much better nourished than they were when he first came under observation. He could use his leg very well, as evinced by his ability to walk long distances with greater ease; his toes still caught occasionally; the fingers, although weak, were supple, and he was able to give to them a certain degree of motion. He could grasp an object when put into his hand, and could flex his forearm upon his arm, touch his nose or the top of his head with his left hand with facility. At this period he passed from under my observation.]

The treatment has consisted in the application of the primary galvanic current to the diseased muscles until they were susceptible to the induced current, when the latter was substituted for the former. These applications were made three times a week, and at the same time a hypodermic injection of the sulphate of strychnia, varying in amount from the forty-eighth to the thirty-second of a grain, was also given on every alternate day, *pro re nata*. This course of treatment was steadily pursued for over a year with beneficial results. During the month of October the diseased side, which had been anæsthetic, became much more sensitive to electricity than the sound side, and this hyperæsthesia, after lasting about two months, disappeared. T. M. B. C.

LECTURE IX.

CEREBRAL HÆMORRHAGE.—HÆMATOMA OF THE DURA MATER.—CEREBRAL THROMBOSIS WITH CROSS-PARALYSIS.

In the previous clinical lectures I have presented you with three good examples of cerebral hæmorrhage, in one of which there was cross-paralysis with left hemiplegia; in another the whole of the right side of the body was involved, while in the last case the paralysis was limited to the left side of the body.

In all of these patients the face has also been affected, and in the last two we have found more or less embarrassment of speech, with impairment of the muscles of the tongue. I will to-day, gentlemen, continue this interesting subject, and speak to you more fully upon certain points which I was obliged to omit in the last lecture; but before doing this I desire to call your attention to another instructive example of this disease, the history of which has been prepared by Dr. Cross. This patient is the wife of the man who was present at a former clinic when I spoke to you upon the subject of cross-paralysis; and, while she is paralyzed upon the right side, her husband is paralyzed upon the left.

Case III. *Cerebral Hæmorrhage with Right Hemiplegia.* —"Elizabeth Ann Fetter, thirty-eight years of age, was born in New York City; is married, and the mother of fourteen children, of whom five are at present living. Her mother and father both died of consumption. Her husband is hemiplegic on the left side of his body. She has never had syphilis, acute articular rheumatism, nor is she predisposed to diseases of the nervous system through any hereditary tendency. She has always been a remarkably strong, robust woman, enjoying the best of health, with the exception of attacks of dimness of vision, mist before the eyes, and other perversions of sight, together with transient spells of vertigo, which, during the early part of the year 1863, occurred at more frequent intervals than usual, although for a year or two previous to this time she had been subject to them. She has no disease of the kidneys whatever. In March, 1863, she had bilious remittent fever, and while convalescing from this she suddenly lost the power of speech. There was no loss of the memory of words, no defect in the faculty of coördination, but simply a paralysis of certain muscles used in the act of speaking. There was no paralysis of the limbs, nor of any other part of the body, excepting the muscles of the tongue. For two hours she was totally unable to utter a single intelligible word, but with great effort she could give vent to strange and hideous sounds. After having been freely bled she suddenly regained the normal faculty of speech. This attack took place just two weeks

prior to her confinement, which was natural in every respect. For two years subsequent to this she enjoyed her own good health, having occasionally, however, slight cerebral congestive attacks, which were characterized by pain in the head, vertigo, ringing in the ears, disturbances of vision, etc., but not attended by loss of consciousness. In March, 1865, while stooping over in a constrained position washing the floor, she suddenly became dizzy, felt very much confused in regard to her ideas, could not see, and cried out, 'I am paralyzed.' Her husband, who was near at hand, caught hold of and supported her, otherwise she would have fallen. She was placed in bed, and shortly after examined, when it was discovered that the right arm and leg, together with the tongue, were very much paralyzed, and that tactile sensibility was unaffected. There was no paralysis of the muscles of the face, no strabismus, no ptosis, no difference in the size of the pupils, which were normal. After this seizure the patient was confined to her bed, and in the course of a week was delivered of a fine girl. At the end of the third week she could just speak intelligibly enough to make her wants known, and in a short time she was able to move about by means of a chair, by which she supported herself. The leg began to improve very slowly indeed, and after the lapse of two years the arm still remained perfectly useless; her speech was quite indistinct, and her lower extremity was so much impaired that she was able to go about with difficulty. Six weeks prior to her confinement, which occurred in the month of June, 1867, after a violent attack of vomiting, she was again paralyzed. This was evident from a sudden increased difficulty in talking and a greater degree of paralysis in the leg. Although this attack was much less severe than the former, and the head-symptoms were very slight, it was, nevertheless, well marked. In the course of three weeks the lower extremity began to improve, then her speech; and for a considerable time this gradual progress continued, until, arriving at a certain point, it stopped. Her arm has remained about the same, or at least it has not recovered sufficient power to be of the least possible use to her. She gave birth to three children after this last attack, two of whom are alive and well, while the third died, when six months old, of

cholera infantum. None of them had convulsions. The patient was admitted to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, October 5, 1870, when she presented the following points of interest:

"There is right hemiplegia involving the arm, leg, and tongue. The right upper extremity hangs powerless by the side of the patient, and seems perfectly devoid of motor power, yet the fingers are supple, and there is no tendency to rigidity or flexion. She is able to walk, if her hobbling gait can correctly be called walking. There is the extreme swinging of the foot in a circle, and the constant dragging of the toes. Owing to a greater degree of paresis of the peronei and extensor muscles than that of their antagonists, the foot is adducted, and there is produced a variety of talipes very similar to that which is known as equino-varus. There is no paralysis of the muscles of the face, no deviation of the tongue, no ptosis, no strabismus, and no paralysis of the muscles of the lips. The tongue is not very mobile, and, although she can move it in any direction, it is not accomplished with that ready facility which it ought to possess in its normal condition. She does not speak very plainly, and there is a tendency to clip her words, which is quite noticeable. There is no stammering or hesitation in her speech such as is found in the ataxic form of aphasia. There is merely a thickness or indistinctness of articulation which arises from a loss of motor power in the tongue. There is no loss of the memory of words, nor are there any constant disturbances of the intellect. The special senses are unaffected. The cerebral congestive attacks still recur, but are not so frequent as formerly. There is no atrophy of the muscles perceptible on the diseased side, and, as regards their size and fulness, there is no difference between the two sides; although muscular contractility is greatly impaired, it seems as though there is a corresponding lack of nervous energy in the diseased parts. The tactile sensibility is natural on the affected side, as are also the sensations of pain, heat, cold, etc. The bladder, rectum, and urine, are in a normal condition. The heart and lungs are healthy. There appears to be no marked loss of control over the emotions. The intra-ocular

appearances were not noted, the eyes not being examined by the ophthalmoscope."

In this case we have presented to us many interesting phenomena which differ from those which we have found heretofore. You will observe, in the first place, that the face was not affected in the two attacks from which this patient suffered, although the arm, the leg, and the tongue, on the right side, were involved, nor was there any impairment of tactile sensibility upon the diseased side. You know that in cerebral hæmorrhage the paralysis may include the whole of one side of the body, or it may be limited to some particular muscle or sets of muscles. For instance, I have seen several cases in which the loss of power was confined solely to the leg, others in which the arm alone was involved, and still others in which either the tongue or the muscles of the face were paralyzed. Then, again, the disordered cerebral manifestations existed in the present instance for a long period before they culminated in an actual attack, in which there was an effusion of blood in the brain-tissue. The difficulty in speech which this patient experienced was not, in my opinion, due to cerebral hæmorrhage, for, if this had been the case, it would not have disappeared so suddenly; but it is rather to be attributed to a sudden increase of blood to the brain, which was speedily relieved as soon as a sufficient amount of blood had been withdrawn from that organ. You will also observe that there were two well-marked attacks, which were separated from each other by an interval of over two years, and that these were both preceded by indications of increased cerebral circulation, which are very common precursors of cerebral hæmorrhage. In the case now under consideration you will notice that excessive physical exertion was the cause of the attacks, and consequently I consider the prognosis much more favorable than if it had supervened without any obvious exciting cause, for in that case we should have suspected in all probability that the cerebral vessels were seriously affected. In the four cases which I have lectured upon this winter, you will recollect that the attack was caused in all of them by excessive muscular exertion, excepting in the case of Fetter, whose paralysis came on during sleep.

In this connection I will briefly enumerate the most potent causes of cerebral hæmorrhage, to which I have not already called your attention. The disease is much more common among men than among women, although some authors have denied this fact. Then, again, there is supposed to be a special apoplectic constitution, but this has never been proved, as persons of sanguine temperament and plethoric habit are no more liable to cerebral hæmorrhage than persons differently constituted. One of the most common predisposing causes is undoubtedly hereditary predisposition. Of the exciting causes, a long list can easily be mentioned, and chief among these is season, for statistics show that the disease is much more prevalent in winter than at other times. Whatever tends to increase the flow of blood to the head, or to retard its exit, is capable of acting as an exciting cause of cerebral hæmorrhage, and under this head we embrace excessive mental and physical exertion, strong emotional disturbance, the excessive use of alcoholic liquors, straining in the water-closet, tight clothing around the neck or abdomen, childbirth, vomiting, sneezing, and coughing, exposure to great heat, the fact that a patient has had a previous attack, and certain diseases, as syphilis, typhus fever, etc.

In regard to the prognosis, we should take into consideration the extent of the hæmorrhage, and the probability of saving life during the time of the attack and immediately afterward. In the apoplectic form *par excellence* of cerebral hæmorrhage, death almost invariably takes place within a few hours. In the less severe form of cerebral hæmorrhage which is attended with unconsciousness, and of which the case of Pope affords us an example, the prognosis depends upon the strength and age of the patient, and the conditions which produce the attack: thus in his case we should expect a favorable prognosis on account of his age, there being no organic disease of the blood-vessels of the brain, the attack being induced by severe muscular exercise while in the act of tying his shoe. You must also take into consideration the number of attacks, for the second is more apt to prove fatal than the first, and the third than the second. In the mild form of cerebral hæmorrhage with paralysis, which is not accompanied with loss of con-

sciousness, the prognosis is very favorable especially after the lapse of eight days, when all risk of inflammation has passed.

In regard to the prospect of recovery from the paralysis, much depends upon the length of time that the condition has lasted, the opportunities which the patient has had for treatment, and whether strong contractions have taken place. In nearly all cases improvement takes place spontaneously, but after a while it stops, and then it is necessary to employ treatment if we hope to obtain amelioration. The extensor muscles of the upper and lower extremities are as a general rule the last to yield to treatment, and, even after all signs of paralysis have disappeared in the rest of the body, these still remain in a weakened condition. Even in cases where the amount of the hæmorrhage is small, the intellect may suffer to a great extent; in other instances the difficulties of speech may persist for a long time, as is illustrated in the case of Mrs. Fetter, although as a general rule these speedily disappear. Not only may the embarrassment of speech arise from paralysis of the tongue, the lips, or the face, as we have seen in some of the preceding cases, but they may be dependent upon the loss of the memory of words, or an inability to coördinate the muscles concerned in articulation. Again, all signs of paralysis may disappear in all parts of the body excepting the face, as we saw in the case of Eliza Gannon.

Respecting the pathology of this affection I wish to say a few words. In the majority of cases it will be found that the cerebral arteries are impaired by a disease which has been described by Virchow, and which was called by him chronic endoarteritis. This condition is induced by age or other influences which impair the nutrition of the cerebral vessels, although I believe that it is possible for a blood-vessel to rupture without its coats being at all diseased, in consequence of an increased tension of the blood or disease of the perivascular tissue. You are aware that the brain-tissue is less resistant than that of any other organ in the body, and consequently its vessels are not as firmly supported as in other structures. If the perivascular tissue be diseased, the natural support of the vessels is still further lessened and the tendency to hæmorrhage is increased. Then, again, we must take into consideration that certain dis-

cases, such as typhus fever, syphilis, rheumatism, scurvy, chlorosis, and the like, which impair the general nutrition of the body, may also affect the blood, so that the cerebral vessels are not properly nourished. In the four cases which we have studied, you remember that one had suffered from typhus fever, two from bilious remittent fever, and one from rheumatism, and it is perfectly possible that these different diseases so affected the integrity of the cerebral vessels that their tissue was more readily broken down than it otherwise would have been if their nutrition had not thus been impaired, and consequently a less degree of tension was required to cause their rupture.

Note.—[The treatment in this case has consisted in the application of the primary galvanic and Faradic currents to the diseased muscles, and to the trunks of the principal motor nerves every alternate day together with a hypodermic injection of the thirty-second of a grain of the sulphate of strychnia three times a week.

October 22, 1870.—The symptoms of cerebral congestion having commenced to make their appearance to-day, the patient was ordered to take fifteen grains of the bromide of potassium well diluted in water, three times a day, together with the application of the primary galvanic current to the head every alternate day.

October 28*th*.—The induced current having commenced to produce contractions in both the arm and leg, this was alternated with the primary galvanic. The muscles of the arm respond much better to the induced current than those of the leg.

October 31*st*.—The extensor and peronei muscles of the foot on the diseased side have improved to such a degree that they can be stimulated by a weak galvanic current. The muscles are pliable, and the toes can be moved by means of a strong Faradic current.

December 17*th*.—All the muscles are now readily excited by means of Faradism. The patient being unable longer to come to the hospital on account of her domestic duties, purchased a small Kidder's induction-machine, which she now

uses at home. When last seen, in January, 1871, her leg had markedly improved, and she was able to walk very well; her speech was much more distinct, and she could move her tongue with greater ease; her arm had not improved in the same proportion as her leg, nevertheless some amendment had taken place. She could raise it from her side, and partially flex the forearm upon the arm, and she was also able to move her fingers voluntarily, but not to any great degree. The bromide of potassium had had the happy effect of causing the cerebral symptoms to disappear, and, after continuing its use for a period of three weeks, she was directed to stop using it. Subsequently these phenomena again made their appearance, and she was directed to continue the use of the bromide of potassium as long as they persisted. In January she informed me that she had ceased taking the remedy for some time, and that her head-symptoms had entirely disappeared.—T. M. B. C.]

HÆMATOMA OF THE DURA MATER.

This peculiar form of meningeal hæmorrhage is the result ot a chronic inflammation which takes place on the under surface of the dura mater, and is generally situated in the neighborhood of the sagittal suture, so that it involves both hemispheres, and, as a consequence, the paralysis is bilateral. There is first the formation of a single membrane which is of a reticular structure, and owing to its great vascularity, for it is very highly organized, the vessels are easily ruptured; another hæmorrhage takes place, and another membrane is thus formed, and this process gradually goes on until twenty or more of these layers have become organized, and these different lamellæ thus constitute a sac into which blood may be poured, which, pressing upon the brain, and constantly increasing in size from subsequent hæmorrhages, give rise to well-marked head-symptoms, and gradually increasing paralysis. It is impossible to diagnosticate the affection with certainty during life, as it is so generally associated with other cerebral diseases that its symptoms are more or less obscured; nevertheless, by the process of exclusion, we may form a diagnosis which a *post-mortem* examination may subsequently verify.

Case IV. *Hæmatoma of the Dura Mater.*—"Captain C., aged forty-five, married, and father of six children, a native of Massachusetts, has ever since his youth followed the sea for a livelihood. Endowed with a good constitution, and temperate in all his habits, he has been quite free from disease. When twenty-five years of age, however, he had an attack of intermittent fever, from which he speedily recovered, and about twelve years ago he had pleurisy, which was brought on by exposure. He has no hereditary predisposition to diseases of the nervous system, nor has he ever had syphilis, rheumatism, or any other affections excepting such as were the result of traumatic causes. His father lived to the good old age of ninety-seven, and his mother died of puerperal fever when thirty-five years old. One of his children is at present suffering from chorea. Some seventeen years ago, in a severe gale at sea, he went aloft to cut away some spars which were hanging by the rigging, when he was thrown violently into the top, striking on his head. He was immediately taken down in an unconscious condition, in which he remained for some time, and when he regained his senses he found that his ship had been abandoned, and that he was on board of another vessel. On examination it was found that he was not only suffering from concussion of the brain, but that he had also received severe wounds of the scalp, together with a very bad injury of the right leg. After the effects of the concussion of the brain had disappeared, he was unable to walk, on account of the injury to his leg, from which he has never entirely recovered, and even at the present time he is somewhat lame. Subsequently to this accident no head-symptoms were developed, and with the exception of his lameness he was quite himself again. He enjoyed excellent health until

February, 1870.—At this time he was at Darien, Georgia, when one evening while returning to his vessel he was assaulted and severely beaten by some negroes, who left him in an insensible condition. In this state he was found, with severe scalp-wounds on the right side of his head, and more or less contusion on the left. There was also hæmorrhage from the right ear, which continued for several days. He was removed to his vessel, and on the third day became delirious,

and remained so for a week. On the tenth day he became rational, and on the twelfth he was up and about, attending to his duties.

At this period his friends noticed that his speech was more or less affected, and he was aware of a general paresis of his upper and lower extremities. He was more or less deaf in both ears, his memory was impaired, and his ideas were somewhat confused. There was no facial paralysis, and no difficulty of sight. He now gradually improved from day to day, and his symptoms were slowly disappearing, when in August, 1870, he commenced to suffer from vertigo, which went on increasing in severity until it became so severe that he was unable to arise from the recumbent position, or turn over in bed, without augmenting it. He also had a dull, circumscribed headache, was stupid, and had a tendency to go to sleep at any time. The vertigo was more marked in the morning than in the evening. There was no nausea or vomiting. Such was the history of this patient up to the time he was admitted to the New York State Hospital for Diseases of the Nervous System, when his condition was as follows:

"There is a general paresis of both sides of the body, with a marked feeling of weakness in the knees. Tactile sensibility is greatly diminished everywhere, excepting in the integument of the head. There is a want of coördination in the muscles of the tongue, as evinced by the patient's stammering. The tongue does not deviate, nor is it restricted in its movements. There is no paralysis of the face. His hearing is now very good. His pupils are natural and equal on the two sides. His memory is little if any affected, and there is no noticeable confusion of ideas. His eye-sight is unimpaired. He still has severe vertigo, with a tendency to drowsiness, and a constant, dull, circumscribed pain in the head. He is cachectic and anæmic. There is no disease of the heart, and the lungs are perfectly healthy. The tympanum on the right side is not ruptured. The bladder and rectum are normal, and the urine is natural. The ophthalmoscope reveals an anæmic condition of the retina, the choroid is pale, and the retinal vessels are small, straight, and diminished in number."

This case illustrates so well the symptoms that have been

observed in hæmatoma of the dura mater, that, if this man should die, I should not be at all surprised to find, upon *post mortem* examination, the lesions which characterize this affection, the pathology of which I have already briefly described to you. From the history of the case we learn that this man received a fracture of the base of the skull, which was the result of traumatic causes, and that this was accompanied by meningeal hæmorrhage. I think that we can in no other way explain the hæmorrhage which took place from this man's ear for several days, except by attributing it to fracture of the petrous portion of the temporal bone, which you are aware generally suffers in injuries involving the base of the brain. Then you will remember that Captain C. became delirious on the third day after the accident, which shows that he was suffering from inflammation of the brain, which terminated in the course of a week in resolution, for, when inflammation of the brain takes place, it either causes death by its extension from the site of the lesion to other parts of the brain, or it goes on to the formation of an abscess, or it ends as it has done in the present instance. The symptoms after this attack were those which we should expect to find in a person who had had an extravasation of blood at the base of the brain, and, as this was absorbed, these manifestations gradually disappeared. Then he began to suffer from vertigo, a dull, circumscribed pain in the head, and stupor. These phenomena were undoubtedly due to a chronic inflammation which had been taking place in the brain for some time. In hæmatoma of the dura mater we also have the power of motion diminished on both sides of the body, but never to a very great degree, and this was the case with Captain C., as you will observe that he walks very well, although he says he is weak in his lower extremities and particularly in his knees; and, when I ask him to grasp the dynamometer, you notice that he does not turn the index as far as a man who has the normal strength in his hands should do. When he speaks you will observe that there is a hesitation in his articulation, which is not due to paralysis of the tongue, for he is able to move this organ with facility in all possible directions, but is dependent upon a want of coördination in the lingual muscles. There are

also present at this time vertigo, circumscribed pain in the head, and a tendency to drowsiness, which shows that the disease is still active. Jaccoud has called attention to certain phenomena in this disease which he believes are sufficient to indicate its presence. Among the most prominent of these are the absence of fever, the contraction of the pupils, slowness and irregularity of the pulse, the severe and constant headache, and the increasing tendency to stupor, conjoined with the negative facts that there are no facial paralysis, no vomiting, and no general convulsions. These phenomena are all well illustrated in the patient before you, with the exception of the contraction of the pupils, as I find upon examination that they are about natural as regards size, and the slowness and irregularity of the pulse, which do not exist at the present time in Captain C., whose pulse is rather accelerated and weak. From all of which considerations I am inclined to the opinion that this man is suffering from hæmatoma of the dura mater. You know that this disease is found most commonly in children and very old persons, and that it may be induced by injuries of the skull, the excessive use of alcohol, and fevers, and consequently it may occur at any age of life. The prognosis is unfavorable, the patient passing into a state of coma, which soon ends in death.

The treatment merely consists in palliative measures, as nothing can be done to cure this affection.

[Note.—This patient was treated by means of the internal administration of a sixteenth of a grain of the bichloride of mercury, and ten grains of the iodide of potassium, in the compound tincture of cinchona, three times a day, without any amelioration of his symptoms; and, the vertigo and pain in the head, after this remedy had been tried two months, becoming more severe, a seton was passed deeply through the nape of the neck, from which he for a time experienced some relief, and the mercury and potassium were discontinued. But in a short period he felt as bad as ever, and another seton was then inserted into the nape of the neck, and the primary galvanic current was passed through the brain three times a week, one pole being placed on each mastoid process, and then one pole

on the forehead, and the other on the nape of the neck. After the lapse of a month he became discouraged, and was discharged, his disease having undoubtedly increased while under observation.—T. M. B. C.]

You remember that I have already lectured to you upon the subject of cerebral thrombosis, and that I showed you at a former clinic a good example of this disease in the patient whom I have since brought before you several times.

To-day I present to your notice another case, which I am disposed to consider one of cerebral thrombosis, and which is all the more instructive inasmuch as it is accompanied by cross-paralysis, a symptom which I have fully considered in relation with cerebral hæmorrhage. Another point of interest in this connection is the absence of aphasia, either amnesic or ataxic, which we should naturally expect to find when the lesion is situated upon the left side of the brain; and yet, from the very fact of there being no loss of the memory of words and no difficulty in coördinating the muscles concerned in speech, we are able to say that that part of the brain which is supplied by the left middle cerebral artery is not involved. Before proceeding further, I will call your attention to the history of the following case:

Cerebral Thrombosis, with Cross-Paralysis and Right Hemiplegia.—C. B., aged thirty-five, was born in Ireland, is single, and a domestic by occupation. She has never had syphilis, nor is she predisposed to diseases of the nervous system by any hereditary influence, so far as she is aware. Her father died of fever, and her mother succumbed to old age. She is temperate in her habits, and had always been a perfectly healthy woman all her life until two years ago, when she was attacked with acute articular rheumatism, which confined her to her bed for a period of about seven weeks. Her heart was not examined either before or during her sickness. Soon after this she was up and about, attending to her regular duties, and in the course of a few weeks felt as well as ever. At times ever since this attack she has suffered more or less severely from rheumatic pains in different parts of her body, but they would only last a short time, and generally followed

exposure to wet and cold to which her domestic duties necessarily subjected her. She attributed her acute articular rheumatism to this exposure, and no doubt it was the exciting cause. About six months ago she went upon the roof of the house for the purpose of taking down her washing, and while there she ran against a line and severely contused her right upper eyelid, causing eversion of it, besides otherwise injuring the eye itself. There soon followed a small ulcer upon the cornea which is now healed. There has also been a constant discharge of pus from a fistula of that eyelid, the external orifice of which is situated just above the inner margin of the right eye, and this at present is not closed. Her eyesight was always somewhat impaired, but not very materially, and it was in executing movements which required the fine adjustment of the eye or its full power, such as threading a needle and the like, that caused her to notice any defect in vision. The lid has been strapped down, and the eye covered with a bandage.

About a month ago, while at work wringing out clothes and exerting much strength, the right arm and leg became numb, and lost power, but not sufficient to cause her to desist from her labor; nevertheless, it was with great effort that she managed to finish her washing. At the time of the attack she had no head-symptoms whatever, such as vertigo, temporary loss of consciousness, or confusion of ideas. She did not notice any strabismus, or other trouble with her eyes excepting that already mentioned, nor was she aware of any impairment of the muscles of the tongue or of the face, although they undoubtedly were present at this period; nor was she conscious that her face was paralyzed even when admitted. Soon after the attack the numbness and paralysis were at their acme, and instead of increasing they immediately began to improve; at least this is true of the motility of the right side, and up to the present date this has been progressive. Six months ago menstruation ceased, and at the time of what ought to have been her regular monthly period she had, instead of her normal catamenia, a violent headache, which was not confined to one spot, but was generally diffused over the head, and which usually lasted several

hours, and was so severe that she was obliged to lie down and keep perfectly quiet until it passed off.

The patient was admitted to the out-door department of the New York State Hospital for Diseases of the Nervous System, December 16, 1870, when the following points of interest were observed:

"The power in the right upper extremity is diminished, as measured by the dynamometer, 10°, and this was a minimum measurement of the deficient muscular force, as she is naturally right-handed. The tactile sensibility is slightly diminished in the right arm as compared with the left. The lower extremities appear to be normal as regards both motility and tactile sensibility, as there is no difference that can be appreciated between the two sides. The left side of the face is paralyzed, and drawn to the right. The tongue is drawn to the right side to a very great degree, although contrary to the general rule, and this is not apparent on account of the oral orifice being drawn in that direction, but real. The muscles of the face on the left side are flattened, although the naso-labial fissure is well preserved; yet, if the patient be made to laugh or to frown, the immobility of the muscles on the left side, as compared with those of the right, is plainly visible. There is no difficulty in closing the left eye. The tactile sensibility is diminished on the right side of the face, while it is normal on the left. The sensibility to the taste of sapid substances is almost lost, if not completely so, on the right side of the tongue, while it is natural on the left, and the tactile sensibility is also impaired in the right half of that organ. The sensibility to the electric current is diminished on the right side of the face, and the right side of the tongue and the buccal cavity. The angle of the mouth is drawn to the right, and the muscles on this side respond much more readily to a strong induced current than those on the left. The forehead on the left side is quite smooth, while on the right it is much wrinkled. There is no difficulty experienced in chewing on either side, and the food does not lodge in the cavity of the left cheek sufficiently to cause her any inconvenience. There are a thickness of speech, and a change in her voice, which depend upon paralysis of different muscles, namely, those of the

lips, the tongue, and the left cheek. The pupils are equal on the two sides, and about normal in size. There is no ptosis nor strabismus. There is no loss of the memory of words, no difficulty in speech at all, excepting that which is caused by paralysis. There is no trouble with the rectum nor the bladder. The heart and lungs were carefully examined, and were found to be perfectly healthy. On tickling the right hand and foot, or irritating them in any way, the reflex faculty is found to be very much impaired. The paralysis of the face has diminished, since the patient came under observation, but yet it is at present quite well marked, and so is the deviation of the tongue. Even now she cannot whistle, yet she can expectorate, although not very easily. When she blows to extend her cheeks by closing her mouth, the right cheek is the more extended or inflated, and the angle of the mouth on that side is the more firm. She has improved very greatly within the past two weeks, and as a consequence her symptoms are correspondingly modified. Shortly after her attack, her attention was drawn to tingling sensations in the fingers and toes on the affected side; these would come and go, and they have for no great length of time persistently remained. Examination of the fistula of the right upper eyelid shows that it terminates in a bony canal which has been formed in the orbital plate of the frontal bone."

It would appear from the history of this case as though a very short period had elapsed from the commencement of the disease of this patient until it was fully formed; but when we come to consider that her face was greatly paralyzed, and her speech was much affected from the implication of the genio-hyo-glossus muscle on the right side which caused the point of the tongue to be carried in that direction, and that even when admitted she did not know that these organs were involved, it is hardly possible to believe that the attack took place in so short a period of time as the patient has stated.

You remember that there were no head-symptoms whatever excepting a severe headache, which made its appearance some six months prior to the loss of motility and sensibility, and which from its general characteristics was not the headache of cerebral thrombosis, which is rarely diffused over the

whole head, but is rather limited to a situation which is in close relation to the seat of the disease. Then, again, it is rarely very severe, and is noted more for its persistency than its severity. In all of which respects it differs so markedly from that which we now find in this patient, that we are able to attribute it to the disordered menstrual function rather than to cerebral thrombosis.

Although we have in this case the history of acute articular rheumatism with subsequent subacute attacks, yet, when we come to examine the heart, we find no functional or organic disease. Then, again, the attack did not take place instantly, as it always does in embolism; the paralysis is also on the right side of the body, and the lesion is situated upon the left side of the brain; yet there is no loss of the faculty of language, no mental disturbance, and no loss of consciousness—all of which considerations induce me to believe that this is a case of cerebral thrombosis. You are undoubtedly aware of the fact that obliteration of a cerebral artery does not always give rise to notable symptoms. In order that these should be manifested, it is necessary that the morbid process should take place in a vessel which has few and small collateral branches; as, for example, if a thrombus should be so situated as to occlude the basilar artery, so that one or more of its transverse branches were involved, thus cutting off the supply of blood to the pons Varolii, the result would be first an anæmic condition of that region, which might subsequently end in softening. If, however, a thrombus should obstruct the internal carotid, the brain circulation would not be markedly affected, for the blood would be sent through the vertebrals to the basilar, and thence through the circle of Willis, so as to prevent that part of the brain from suffering from a want of proper nutrition. Again, if the basilar artery should be obstructed between a pair of transverse branches, the circulation would still be maintained by means of the collateral branches derived from the carotids and the vertebrals. You are perhaps not aware of the fact that, when an artery in the brain is closed by a thrombus, or an embolus, the collateral branches are never entirely able to compensate for the loss of the primary vessel.

Now, what is the condition in this case, and what part of the brain is involved? You observe that the patient is paralyzed upon the left side of her face, while her body is paralyzed upon the right side, which in my opinion indicates a lesion of the pons Varolii, which has involved the facial nerve below its point of decussation, which always produces paralysis of the face on the corresponding side, and loss of sensation and of motion on the opposite side. Another reason why I regard the pons as the part involved in the patient before us is the loss of the reflex excitability to which I have especially referred in the case of John Fetter, and which you remember is particularly mentioned in the history of that case.

LECTURE X.

POSTERIOR SPINAL SCLEROSIS.

Case. "William Casey, aged sixty years, was born in Ireland, and has been sick ten or twelve years. He was first attacked with pain, he says, 'in the spine of his back.' At the present time he has shooting pains down the legs, which are neuralgic and electric-like in character. These pains sometimes keep him awake at night, and move from one leg to the other. He has now a slight cloud at times over one eye, but there is no dizziness, and no trouble with his speech, nor are there any twitchings of the legs. He has, however, occasional palpitation of the heart; he never has suffered from vomiting, but has experienced a curious feeling in his hands for the last month or so; at the present time he can pick up a pin, but he could do it better a month ago than now, and his fingers are also beginning to get a little numb. He can feel the ground when he stands or walks, and has no burning sensation in the soles of his feet, yet he cannot place his foot where he wishes, and he cannot go easily up stairs or down; if he attempts to walk in the dark, he falls down; and walking on the ice, or on any smooth surface, is attended with great difficulty. When he shuts his eyes he staggers very much; he puts his

foot down with two movements; the heel strikes first, and the sole of the foot follows at an appreciable interval. He cannot walk with his eyes shut, and, when he places his foot upon a chair, it is done with a jerking motion. He passes his water freely, although he suffers from some slight irritability of the bladder, which is not uncommon in men of his age, and is not very important in this connection. There is undoubtedly a little weakness of the bladder, and perhaps a little relaxation of the sphincter, but these conditions are not very well marked. He is inclined to be costive. These are the principal features of the case."

Here is a man who staggers when he walks, moves a little from side to side; or, in other words, has what is called the titubating gait, which is one of the characteristics of the disease now under consideration. He has a double motion in the action of the foot. This is also characteristic. His walk is distinguished by two distinct movements of the foot. He cannot walk with his eyes shut, which indicates that he has lost knowledge of exactly where his feet are, and he is therefore unable to advance. He cannot stand alone with his eyes shut, for the same reason. The sensibility of the soles of his feet is lost, which prevents his knowledge of their exact location, and with this he has lost another sense, viz., the muscular sense. In other words, he has lost the appreciation of the state of contractility these muscles are undergoing at the time he is using them; consequently, in the efforts of standing and movement, which require a certain degree of coördination, the muscular contractility necessary to maintain an erect position or cause motion is not appreciated, and therefore he falls down. If he can see his feet, he is able to walk very well, but even then he does it by spreading his limbs and widening the base upon which he stands. He is also forced to use a cane when he walks and to keep his eyes a few feet in advance of his steps. Sometimes these patients are obliged to stoop a little, that they may look out their footsteps as it were. This patient without doubt has anæthesia. We can say very definitely that he has lost sensitiveness of the soles of his feet. There is some loss of sensibility in the hands, in the ends of the fingers; and he has lost the ability to perform nice move-

ments with them. That precision which is natural, is to a certain extent gone, and he cannot do those delicate things, such as picking up a pin, etc., as well as he could a month ago. In the first place, he had no trouble with his arms at all. There are no head-symptoms of any moment. No gastric disturbance, and very little of the intestinal canal. What is the diagnosis?

SCLEROSIS OF THE POSTERIOR COLUMNS OF THE SPINAL CORD.

We have a pretty clear account of all the symptoms which are peculiar in that condition, especially when it begins in the lower portion of the cord, and has not advanced any further than this case has. It is not one of those instances in which the trouble begins in the head and goes downward, and is characterized by head-symptoms at first, such as vertigo, and disturbances of vision. The disease in this case is not about the medulla oblongata, because he has no gastric symptoms, and no disturbance of the respiratory processes. It simply involves the lower extremities. It is, as usually is the case, extending, and perhaps has been for a long time. It sometimes takes a long time to reach the medulla, but that the roots of the median nerves are now being involved in this case is evident from the fact that the want of coördination begins to show itself in the movements of the upper extremities.

The progress of the disease is slow in this instance, for it has taken ten years to get to this point. Sometimes the disease advances rapidly, but it is usually slow. It is rarely the case that the termination takes place within six or eight years, but occasionally it does. A gentleman from Cleveland, Ohio, consulted me for treatment of his case, which was essentially the same disease we are now considering; he had been treated for dyspepsia, and neuralgia. I may remark, in this connection, that neuralgic pains are very characteristic of this affection, and the existence of these neuralgic pains is the pathognomonic symptom, if any, aside from the lack of coördination. This gentleman had been treated finally for softening of the brain. But his was a case of sclerosis, beginning at the origin of the third pair of nerves at the base of the brain, and *descending*. Such cases are usually rapid, and do not in general extend beyond a couple of years.

This man can scarcely be called paralyzed. He may have lost strength; he probably can perform a pretty fair amount of labor in a short time, but very soon gets tired. He cannot walk very far. If, however, you direct him to push, he can do that tolerably well, perhaps with almost as much force as ever. It is usually the case, in the first stages of the disease, that when a patient presses against a dynamometer, he can exert almost as much strength as ever, but he cannot continue it for any length of time. A continued exertion soon tires him out; he finds himself more easily fatigued this year than last. (At this point the patient had a coughing-spell of a somewhat spasmodic character.) When the patient coughs, he coughs in the manner just seen, and he without doubt has some trouble about his swallowing. It sometimes happens that these symptoms occur. There is a little want of coördination in the muscles of deglutition, and articles of food stick in the throat, and may go down into the trachea and choke the patient. I have seen many cases of this disease in which that symptom was a prominent feature.

There are some other symptoms which usually are present, but which are not absolutely essential. We usually possess a pretty clear knowledge of the situation of any portion of our bodies, as a spot upon the forehead, the centre of an eyelid, the centre of the upper lip, or tip of the nose, and as a rule we have no difficulty, when we close our eyes, in placing our fingers exactly upon the designated spot. When the upper extremities are involved, the patient cannot perform this act with precision. (Trial was made with this man, his eyes being closed, and he invariably struck his lip just beneath his nose, instead of placing his finger upon the tip.) This feature is constantly present when the upper extremities are involved by the disease. These patients are also apt to lose their appreciation of weight.

This is tested by an instrument called the barosthesiometer, and in this case it is found that the appreciation is but little if any lessened, which shows that the upper extremities are not very much affected. In extreme cases the loss of appreciation is so great that the difference between one pound and one hundred pounds cannot be told. I myself have seen cases almost as bad as that.

An examination with the æsthesiometer will show that this man has lost sensibility in the legs; that he is not able to distinguish impressions with as much accuracy as formerly. Sometimes the ability to transmit impressions from the brain through the nerves is very materially interfered with. To illustrate: I had one patient who, when pricked in the leg, could not realize the fact until several minutes had elapsed after receiving the puncture. There was therefore retardation in the rapidity with which impressions are usually conveyed to the brain; the nerve losing, to some extent, its conducting power.

Causes.—This patient does not know what produced his disease, unless it was going down into a damp cellar. He was intemperate at the time he was taken with the disease. He had been, in his earlier days, fond of three things: a dog, a handsome woman, and plenty of good whiskey. This is a very good formula for the provocation of the affection from which he is now suffering. Sometimes it is produced by cold; sometimes by habits of intoxication; sometimes, perhaps, by venereal excess, but this latter is a difficult matter to determine, because it is almost impossible to say what excess is in the matter of sexual intercourse. It probably does, however, occasionally, lead to the production of posterior spinal sclerosis.

Treatment.—Treatment very rarely does any good. What we do we are obliged to do empirically. We know little in regard to the nature or manner in which our remedies act. The treatment is simply the result of experience. I generally begin with the administration of ergot, for the reason that the disease in the first instance is usually congestion, and ergot is therefore indicated. This remedy sometimes produces very decided improvement from the first. I generally give it for about a month, and follow it with the nitrate of silver, and frequently continue this with the lacto-phosphate of lime, which is a tonic to the nervous system.

The nitrate of silver is to be given in half-grain pills, three times a day for twenty-five days in each month; you give this interval of five days in each thirty to prevent the discoloration of the skin. With this interval of five days in each month, it may be continued for a year or more without coloring the skin. Whether this is the cause of the exemption or

not I do not know. The lacto-phosphate of lime in syrup may be given in dessert-spoonful doses after meals and the silver pills before meals.

In general the treatment fails very much more frequently than it succeeds. I have never cured more than five cases out of a hundred. Ten years ago we did not cure any cases of epilepsy, but now we cure twenty out of every hundred. So it is something to be able to cure five out of every hundred suffering from locomotor ataxy.

In connection with these measures I usually employ the primary galvanic current, applied along each side of the spinous processes of the vertebral column, by placing one pole of the battery upon the backbone above, and stroking the back with the other along the line indicated, every alternate day for a period of several months. If you continue it but for a single month, it will do no good. At the same time I use the induced current to the legs simply for the purpose of keeping the muscles in a state of activity. The induction-current keeps them in a healthy condition, and acts upon the muscles locally. This treatment gives the best results of any I have ever adopted. As a rule, the patients will resist all treatment; usually grow worse and die. Occasionally they do not die, but remain as this man is now for years.

I had a patient from Boston who continued in this fixed position, as regards the progress of the disease, for twelve years. He would occasionally come to see if any thing new had been discovered in the line of treatment, and in this way I had his case under observation.

The disease is not very often met with in women. This is a curious circumstance, and I do not know why it is. We saw last year at this clinic only two cases occurring in females. It is almost peculiar to the male sex, but occasionally females become affected.

One great trouble in the treatment of these cases is, that the patients will not continue it long enough. It is only persons who have a marked interest in getting well, that get well. Nothing can be done in the course of a week or month. It requires months and years to produce a cure, if at all. It is characteristic of the disease to exhibit remissions. Some

cases will improve without any treatment; so, while you are employing your remedial measures, and your patients are apparently getting well, you must be upon your guard in respect to your prognosis, for when you least expect it the patient may very rapidly drop back to his former bad condition.

LECTURE XI.

POSTERIOR SPINAL SCLEROSIS.—ABORTED EPILEPSY.—ATHETOSIS.

Case. *Posterior Spinal Sclerosis.*—A. W., forty-two years of age, married, and a tailor by occupation. About two years ago he began to be affected with sharp, electric-like pains in the legs, which went on gradually increasing in severity. He soon began to lose the power of coördinating his legs, but he has never lost his ability to walk in the light, although he cannot walk in the dark, or stand up with his eyes closed. He stands with his feet very far apart, in order to increase his breadth of base, and he places them down with the characteristic double movements.

There are one or two peculiar features in this case. He has no difficulty with his bladder. This is somewhat unusual in a case as far advanced as this. The disease which affects the cord usually exists above the point of origin of the vesical nerves, and there is almost invariably some trouble with the bladder, either of the sphincter or of the viscus itself. It is important to recollect, therefore, that there are cases of this disease in which the bladder is not involved.

The patient has never experienced that very common sensation of tightness about some part of the body, such as would be produced by a cord.

There is no trouble about his head. It is not one of those cases in which the trouble began in the optic nerve, and descending attacked the cord afterward, for he has had no vertigo, nor disturbance of vision until lately, and now he has some trouble in the left eye. He cannot fix it in one position unless that position is straight ahead; and he can hold his eye still then, because all the muscles of the eyeball balance

themselves exactly, and no particular muscle is placed in a state of contraction. In other words, he has slight *nystagmus*, which is indicative of some trouble about the base of the brain.

He has probably two centres of disease; one in the lower portion of the spinal cord, and one at the base of the brain. He has had this disease only two years, which is a very short time to bring him to the state he is now in, as it usually takes very much more time than that. Up to May last he could walk quite well, but has grown rapidly worse since. He can work at his trade now, and has no trouble with his arms as yet; for he experiences no trouble in handling or threading his needle. There is as yet no effect upon coördination, but before very long he will not be able to do these things, unless there is an arrest of the disease at the upper focus, and then there will be slight twitches in picking up things, such as needles, pins, etc.

This man has always been quite regular in his habits, and has probably not used liquor to much excess, and he has never received any injury upon the back.

The first intimation he had, was the turning of the foot under. The pain, however, existed before that for some time.

This is a very rapid case, if it be true that it commenced two years ago with the first sufferings from pain. He has more or less pain now, generally in the legs, but never in one place constantly; sometimes in one leg, sometimes in the other, but mostly in the day, though sometimes in the night-time. These cases usually suffer most pain at night-time. He never gets cramps in the legs, and never feels as though cushions were under his feet when walking. He is obliged, however, to keep his eyes upon the ground a few feet in advance of him, and requires the assistance of the eyesight to get along. He can push probably as strong as ever, as you now see by the resistance he makes. There is no paralysis, therefore, and the defect is mainly one of incoördination, the paralysis not having yet begun. With all this manifest strength in pushing, he can keep it up but for a short time, and the legs can be tired out quite rapidly, yet his strength is really remarkable, considering his inability to walk; you rarely see such a case. This patient probably cannot walk a quarter of

a mile without being exhausted. He never had palpitation of the heart. He is, and has been, troubled with vomiting to a considerable degree. Frequently, these patients are treated for dyspepsia, when the real trouble is locomotor ataxia. These dyspeptic symptoms are generally among the first, and disappear after a while. He will probably have, very soon, vertigo and double vision, which will last for a month or two, perhaps more, and then these symptoms will disappear, and he will lose power in the arms.

If possible, we must arrest that development of symptoms. This man should take the tincture or fluid extract of ergot in large doses. I have seen the initial symptoms rapidly cut short upon the administration of ergot in large doses; give it in teaspoonful doses of the extract, or two teaspoonful doses of the ordinary tincture. Some patients will not tolerate ergot in any doses, but such cases are not very common; after taking it for a month, place him upon the persistent use of nitrate of silver, apply the primary current to the brain and upper part of the spinal cord; there is not much to be done for the legs, yet these measures, applied to the upper part of the cord, will act favorably for them. Sometimes treatment makes these cases worse, sometimes no benefit at all is derived, and sometimes the measures recommended are very beneficial.

This is a very interesting case. It is mainly so because of the immense muscular power which the patient has in comparison to his bad walk. His gait would indicate that he had lost strength and was paralyzed, but it is entirely the result of the inability to coördinate.

Case. *Aborted Epilepsy.*—A colored girl, aged eighteen. The mother says, "She does not act as though she was in her right mind," that she laughs, and at times appears silly. She has never attempted to hurt herself or anybody else. She has fits at the present time, and loses consciousness. These attacks first made their appearance when she was about eight years of age, and, after lasting for a short period, disappeared; and since, she has been quite free from them, excepting on one occasion, for the last ten years. About the 6th of last September they again returned, and she had three the first day, two the

next, and then she had none for a week; then she had another fit, and was again free for another week, and so they have continued down to the present time, taking place about once a week. Her mother observed that the attack was sometimes induced by the contact of her hand against the shoulder when striving to arouse her in the morning. Her courses came on at twelve years of age.

This is a case characterized by tolerably well-marked epileptic paroxysms. She does not bite her tongue, and only about one-third of the cases do, nor does she froth at the mouth. In some text-books you will see it laid down that frothing at the mouth is one of the pathognomonic symptoms of epilepsy; but it is present in only about one-half of the cases, even when they have the *grand-mal*, and with the *petit-mal* of course they have no frothing at the mouth. This girl would probably have been cured of these fits, had she been treated when first attacked, at eight years of age. In such cases there is some hope that, when puberty arrives, the epilepsy will cease of itself. Probably the patient also has epileptic mania, but I like the term aborted attacks better. When these paroxysms are on, she is a little spiteful to her brothers, but nothing violent. There are various kinds of attacks. Some patients are seized suddenly, and will jump up, run about the room, and perhaps talk some gibberish; or get up on a chair, and whirl around, etc., without knowing what they have done. In other cases, we have well-marked signs of mania; sometimes of a very mild form, and sometimes of a very dangerous form.

In this case they are mild in character, but during the attack, however, she knows nothing of her actions. There are cases on record of this kind in which the patient has got up in the middle of the night and either killed all the family, or seized the children and thrown them out of the window, and known nothing of what had transpired. It is well to know that there is something of this kind. The lawyers have got to be aware of the existence of such a disease, and it becomes of importance in a medico-legal point of view. These patients have pain in the head, and usually are dizzy at some part of the day. The fact of her being seized with an epileptic at-

tack when touched by her mother simply shows a great erethism of the nervous system. It is certainly true that epileptiform paroxysms may be brought on by reflex action, but there is no great collection of facts to prove that true epilepsy is produced in that way.

The following will be recommended for this patient, accompanied with the request that she return in about three weeks:

℞. Potassæ bromid., ℥ i.
Aquæ, ℥ iv. M.
Two teaspoonfuls twice a day.

December 21st.—Doses increased to 45 grains, three times per day.

Has had some attacks. If, after taking one teaspoonful and a half twice a day of a saturated solution of the bromide (45 grains), she has an attack, give two teaspoonfuls three times a day (60 grains). These fits have ceased since the patient has taken 240 grains a day.

Case. *Athetosis.*—This woman has been sick for fifteen years. What you see now is a jerking of the left arm and hand; this she can sometimes control by holding them folded under the other arm. The entire side moves in the same way. The face jerks when she gets very much excited. The hand in the morning is cold, and she has occasional pain in the head. The muscles are never in repose, not even when she is sleeping.

The woman supposes that the affection came on from a sudden check of perspiration. She says that she went into a cold bath while in a state of perspiration, and this jerking of the hand and arm commenced immediately afterward.

This is a case of irregular muscular action, which it is difficult to place exactly. But I am inclined to the opinion of Dr. Cross, that it is a case of what I have described as *athetosis.* It consists of involuntary muscular movements, but different from simple flexion and extension. Coördination is gone. The movements are pretty much of the same kind, but are more regular and systematic than those of chorea. They are somewhat paroxysmal, being worse at one time than at another.

This irregular muscular action affects, in this case, mainly,

the fingers, and the foot, and this was characteristic of the three cases which I have seen recorded. The first case I ever saw or heard of was one which I exhibited in the beginning of the session. In that case the irregular muscular action followed upon drinking sixty glasses of gin in one day.

Dr. Hubbard, of Ashtabula, Ohio, sent me the history of a case similar to it, and these cases were sufficiently isolated to warrant me in making them the foundation of a new disease, and they form the basis of the article in my treatise on "Diseases of the Nervous System." Nothing was seen of it before these cases. Dr. Albutt, of Leeds, England, reported another case, which he said was similar to those I have mentioned in my work. The first two cases were in men, but here is another case, which seems to be about the same thing, in a woman. There is not quite the same extent of movement as was exhibited in one of the cases I have already shown you.

What the pathological conditions are, is not known. No *post mortems* have been made, but there is probably some trouble about the corpus striatum; what the nature of the morbid change is, is not known; it is pretty much guesswork.

In the treatment nothing has been permanently beneficial. None of them recover. In the other two cases, in this country, the patients had had epileptic paroxysms at the beginning, but this case did not begin with an epileptic paroxysm. All that the epileptic paroxysm means is, that there was some disturbance of the nervous system in connection with this disease. Probably some functional derangement at first, which has become organic. The use of the primary galvanic current usually has some effect in mitigating the spasms. This woman is receiving this treatment now, and the muscles are very much more quiet than formerly.

LECTURE XII.

PROGRESSIVE MUSCULAR ATROPHY.—PROGRESSIVE MUSCULAR ATROPHY AND POSTERIOR SPINAL SCLEROSIS.

Before proceeding to make any remarks upon the subject of progressive muscular atrophy, permit me first to read to you the history of the following case:

Case. *Progressive Muscular Atrophy.*—"W. E. M., aged twenty-five, single, was born in North Carolina, and has followed the occupation of a planter all his life. He has always been abstemious in his habits, and has never had any disease whatever, excepting an occasional attack of acute bronchitis, when exposed to wet and cold, from which he suffered quite severely at times until he was about fourteen years of age, since which period he has been entirely free from these attacks.

"In regard to his hereditary predisposition to diseases of the nervous system, he gave the following history: His grandmother on his father's side, at the age of sixty-five, first lost power in both lower extremities; after a while the upper limbs became more or less involved as the disease extended upward. She also at this period began to lose flesh quite rapidly, being before this attack quite stout. For five years she was unable to use her legs to such an extent as to be able to walk, but after the lapse of this time she began to improve, and very gradually regained strength in her lower extremities, so that some years prior to her death she was able to go about very well. She lived to the age of eighty-two.

"Two of his mother's brothers died of consumption before they were thirty years old. His father died of erysipelas. Excepting his grandmother, we can obtain no other evidence in his family of any member having had any disease of the nervous system. Up to the age of nineteen he had enjoyed as good health as the average of mankind, and it was at this period (1866) that he went into the army under the command of General Lee. It was here, for the first time in his life, that he was much exposed to the inclemencies of the weather, and endured many hardships, yet his health did not seem to be at

all impaired. During an engagement in May, 1866, he was shot through the left wrist, and both the radius and ulna were fractured. Shortly after, while still under treatment for this gunshot-wound of the wrist, he was riding on horseback, when his horse fell, throwing him violently against a tree, and injuring his left side and head. He was unconscious for a few moments; on regaining his senses, however, he felt dizzy and nauseated, but he soon remounted his horse and rode back to camp, a distance of half a mile. He now discovered that he had quite severely injured his broken wrist, and as a consequence there followed a copious discharge of pus and small spiculæ of bone from the wound.

"In the course of a month he became very much depressed in spirits, and felt as though he were about to be afflicted with some serious disease. It was at this time that he experienced acute electric-like pains darting through the muscles of both legs; these were much more severe at night than during the day. Soon the patient was aware of a slight paresis in the lower extremities, an easy susceptibility to fatigue upon taking his accustomed exercise; then he was seized with a constant dull, aching pain in the small of the back which he aptly described as the 'backache.' He now noticed that his ideas were confused, that his memory was impaired, that he had vertigo, pain in his head, hallucinations of vision, together with hallucinations of hearing. Gradually the head-symptoms grew worse, and the loss of the power of motion and the slight numbness which the patient had experienced at the commencement of the disease in the legs, progressively increased in degree for a period of about three months, at the end of which time he found that both upper extremities were decidedly involved, for he now was conscious not only of sensations of tingling, numbness, and twitchings in the fingers and hands, which had been only slightly marked for the past six weeks, but he also felt a lack of power in an equal degree in both hands as he had in both lower extremities.

"About the first of August, 1866, his head-symptoms began to disappear, and he could walk with very much less effort. He had now been under treatment some three months. A month later the sharp, electric pains had vanished, and his

head-symptoms had notably improved, for there were no hallucinations of sight or hearing, no difficulty in talking, such as he had formerly noticed, no headache, no vertigo, no loss of memory, and no confusion of ideas. He was at this time generally reduced in flesh, but there was no apparent atrophy of the legs present. The backache still persisted, as did also the numbness and loss of power in the legs, but the loss of motility, together with the abnormal sensations in the upper extremities, had entirely disappeared.

"He now went to work every day and did much hard outdoor labor, such as cutting wood, lifting heavy timber, carrying water, etc., which the exigencies of war compelled him to do, although quite unfitted for such laborious exercise, never having completely recovered. As a consequence of this severe exertion in his debilitated condition, in the month of May, 1867, his head-symptoms returned with increased severity, his backache, which had been present up to this time, became much aggravated, the electric pains recurred with renewed violence, the numbness was more marked, and there were superadded cramps, fibrillary contractions in both hands and legs, with twitchings, tinglings, and formications. Now the loss of motility was quite perceptible, and this increased to such a degree that in three weeks the patient was obliged to resort to crutches, and six weeks subsequently he was confined to his bed, where he remained for a period of four months, unable to move any part of his body, excepting his head. About three weeks prior to his confinement to bed, he began to experience a constant desire to urinate, and the demand became so urgent that, if it were not immediately attended to, his water dribbled away involuntarily. Not only was there a weakness of the sphincter of the bladder, but there was a paralysis of the muscular walls of that organ, as evinced by the straining of the patient in order to empty the bladder. These two conditions are very commonly met with in diseases of the spinal cord. The head-symptoms, which we have already mentioned, went on from bad to worse, and continued for nearly the whole time that he kept his bed. He likewise observed that his tactile sensibility was so much impaired that he was unable to appreciate with any certainty the sense of touch in his extremi-

ties. He first noticed the atrophy in his legs in May, 1867, and it appeared to him to extend quite rapidly. His bowels had been constipated ever since the commencement of this attack, but he had never had the feeling of constriction like a tight band around the waist, which is so frequently a symptom of organic disease of the spinal cord.

"During the month of November, 1867, the tactile sensibility began gradually to return, and from this time he commenced to improve in all respects, so that he was soon able to sit up in a chair and give his hands a very little voluntary motion. Two months later the abnormal sensations in the head and fingers had also disappeared. For three years he could not walk at all, although the motility in his hands had completely returned; nevertheless the fibrillary contractions, the cramps, the feelings of cold, the numbness, and the jerkings, still continued in the lower extremities, only they were very slightly marked. The atrophy which had at first progressed quite rapidly, had, during this period, increased very slowly and gradually. In August, 1870, he could walk, with the assistance of a crutch, but he still had a pain in his back, slight numbness, with a sensation of cold, and well-marked atrophy in the legs. For a time, then, he had gradually improved in walking, but at the date of his admission, February 18, 1871, into the New York State Hospital for Diseases of the Nervous System, although he could walk two miles on good even ground with the assistance of a crutch, yet he was conscious of the fact that, as the atrophy increased, and his symptoms of congestion of the spinal cord diminished, he constantly grew worse. On examination at that time his condition was found to be as follows:

"In the legs the extensors, together with the gastrocnemii and solei muscles, were found to have almost entirely disappeared, while the atrophy in the thigh was distinctly visible, and this loss of power had been directly proportional to the extent of the atrophy. The gait of this patient was also highly characteristic of the disease from which he was suffering. In walking, he lifted his feet high from the ground, through the action of the flexors of the thigh upon the pelvis, in order to clear his toes, which dropped to an extreme degree, and his

knees were in this way bent to a greater extent than usual. The legs were very much reduced in size, and the loss of muscular fibre was quite apparent from the greatly-diminished electric contractility in these parts. There was no atrophy to be discovered at that time in any other part of the body excepting the lower extremities, nor did the patient have any head-symptoms whatever, nor had he any loss of motility, or any abnormal sensations in his upper limbs. His bowels were regular, and he had no trouble with his bladder. There was no loss of tactile sensibility, nor were there any sensations of numbness in the legs. His heart and lungs were in a healthy condition. The reflex excitability was diminished in the lower extremities, as was likewise the temperature, and the capillary circulation was very sluggish, as was demonstrated by the decrease of temperature, which was several degrees below the normal standard, and the effect of pressure. There were no fibrillary contractions present, nor had the patient experienced any electric-like pains, cramps, jerkings, or other abnormal sensations, for some time in his legs. The outline of the fibula and tibia, together with the knee-joints, were distinctly discernible, owing to the destruction of the muscles on the anterior surface of the leg, while the posterior aspect of the calf was flattened from a like cause. His backache had completely disappeared, but, although he felt well and suffered no pain, he appreciated the gradual loss of power in his lower extremities. His appetite was good, and his mind was very active. He hoped to be cured, as he thought his age was greatly in his favor. Ophthalmoscopic examination of the eyes disclosed an anæmic condition of the retinal vessels. Chemical and microscopic investigation of the urine showed an increased amount of the phosphates in that excretion, otherwise the result was negative."

The very interesting case before us to-day appears to have begun, as occasionally cases of progressive muscular atrophy do, with congestion of the spinal cord. Certainly the symptoms mentioned as having been present point very strongly to congestion of the nervous centres as the earlier pathological condition, but I do not intend at this time to dwell to any ex-

tent upon the preëxisting disease, but will ask your attention mainly to a condition of progressive muscular atrophy under which the patient now obviously suffers.

Although, doubtless, progressive muscular atrophy is as ancient as any other disease, it is only within comparatively recent times that its peculiar features have been pointed out, and that it has taken its place in the nosological list as a distinct pathological entity. The first account of the disease we have was given by Duchenne (to whom we owe so much for his researches in the pathology and physiology of the nervous system) over twenty years ago.

Cruveilhier, however, had several years previously described it in his lectures, and on that account the affection is frequently known as Cruveilhier's atrophy. It is also sometimes called wasting palsy, and probably the instances of withered arms mentioned in sacred and profane history were cases of this affection.

It very usually happens that the first indication of disease which the patient experiences is an inability to manage his limbs as well as is natural to him, and he ordinarily experiences at the same time an easy susceptibility to fatigue; the muscles ache upon very slight exertion, and sometimes suddenly relax, allowing the patient to fall, if it be the muscles of the thigh or the leg which are thus affected. This feeling of fatigue is especially liable to be experienced in the muscles of the hand and forearm, and is noticeable when the patient attempts to write or perform any other act which requires continuous or repeated muscular contraction; at the same time, or at least very soon afterward, he is subject to neuralgic pains in the affected muscles; these differ, however, from those characteristic of the first stage of locomotor ataxia in the fact that they are not so lancinating in character, being generally fixed in the muscles.

Another early feature of the affection is what has been called fibrillary contraction, and indeed so common is this symptom that it has been regarded as pathognomonic; certainly I have observed it in every case that has come under my observation. It is limited to separate bundles of muscular fibres, and the motion in the superficial muscles can be very distinct-

ly seen through the skin. Frequently the contractions succeed each other with such rapidity as to give the impression of a distinct wave-like movement, and to the patient the sensation is as if there were bundles of moving worms under the skin. If the disease shows a tendency to extend, these contractions are the harbingers of its progress.

Up to this time there has been little or no atrophy, or at least not sufficient to have attracted the attention of the patient; but, as the weakness increases, he finds that it is accompanied by shrinking. Now, I want you to distinctly understand that the loss of power is due directly to the atrophy, and is not a primary feature: as the muscle disappears the patient loses in a corresponding ratio motor power.

It ordinarily happens that the disease begins in the upper extremities, and the situation of all others which it most affects is the ball of the thumb; the thenar and hypothenar eminences disappear, and the outline of the bones of the thumb and the first finger can be very distinctly made out. Even when this is not the initial point, it rarely happens that it does not become involved sooner or later in the course of the disease. Probably the next most common place of origin is the deltoid muscle, and occasionally the affection begins in this part, soon after extending to the other muscles about the shoulder, and eventually to those of the arm and the forearm. Beginning in one upper extremity, the morbid process soon involves the muscles of the other.

When the disease is well pronounced, say, for example, in an upper extremity, the appearance presented by the atrophied member is very striking; the interossei and lumbricales muscles having disappeared, as well as the abductors and adductors seated in the palm and dorsum of the hand, render the outlines of the metacarpal bones distinctly visible; the natural hollow of the palm of the hand is very much increased, and the thumb and fingers, being deprived of motor power, take almost any position in which they are placed; the thumb especially follows the force of gravity and falls about in a very disorderly manner. It can no longer be brought into apposition with the index-finger, as is necessary in the acts of writing or picking up a pin.

In the forearm the disappearance of the muscles gives rise to a peculiar flattening, and in the arm the outline of the humerus can be perceived without difficulty. The shoulder is flattened, the head of the humerus falls out of the glenoid cavity, and the whole contour of the joint can be readily made out.

The skin, not readily adapting itself to the diminished volume, hangs in loose folds over the attenuated muscles. It is not often the case that the muscles of the face become involved, but, when they do, of course the physiognomy of the patient is very greatly altered.

Two interesting cases, in which the upper extremities and the face were both involved, have quite recently come under my notice.

In the case of the patient now before us, the morbid process is entirely confined to the muscles of the lower extremities. In the first place, he observed the pains, the cramps, the fatigue, the awkwardness, and the fibrillary contractions, which so generally precede the atrophy. So great was his weakness that he was obliged to use crutches, and only after the disease had existed some time did he perceive that the muscles of both legs were gradually disappearing. At the present time the extensors of the foot are almost entirely gone, as are the gastrocnemii and solei muscles of both legs. The lower third of the muscles of both thighs is beginning to disappear and the affection is evidently rapidly extending upward.

The atrophy in this patient gives rise to a characteristic phenomenon:

The atrophied extensor muscles of the foot are no longer able to keep the toes elevated; as a consequence they do not clear the ground when the patient attempts to walk, and indeed the corresponding condition of the great muscles on the posterior aspect of the leg prevents the patient from standing without additional support. His ankles give way, and he would fall to the ground if it were not for assistance.

You see how distinctly the shape of the tibiæ and fibulæ of both legs can be distinguished; how entirely the calves of the legs have disappeared, and how, owing to this atrophy of muscles, the ankles and knee-joints appear to be comparatively

larger than they are in a healthy person. Thus far the muscles of the thigh are not affected to any great extent, but even now the patient has a difficulty in extending or flexing the legs.

It sometimes happens in the course of progressive muscular atrophy that, when all the muscles of a limb are not simultaneously involved, contractions take place. This is due to the fact that the normal antagonism existing between the muscles is to a certain extent destroyed. When this is the case in the hand, a very characteristic appearance, resembling the half-flexed claw of a bird, and called by Duchenne the *main en griffe*, is produced.

The temperature of the atrophied muscles is usually several degrees below the normal standard; the cutaneous capillaries appear to be relaxed, and consequently readily become engorged. The electric contractility diminishes correspondingly with the progress of the atrophy, and the reflex excitability is greatly lessened except in the very early stage, when it is usually increased.

Such are the essential features of progressive muscular atrophy; sometimes its progress is slow, but ordinarily it is rapid. I have seen cases that have terminated fatally in the course of three months, and others again in which it has lasted for several years.

As regards the causes, we have no very definite data which are applicable to all cases. There appears to be no doubt, however, that it is produced by injuries to the spine, exposure to cold and wet, and especially by undue muscular exertion. I have seen three cases where the disease made its appearance in the muscles of the leg in ballet-dancers, one of whom, a patient from the New York State Hospital for Diseases of the Nervous System, I brought before you on a former occasion and lectured upon. Another you will recollect, a bricklayer, whose occupation requiring him to bear the whole weight of his body upon one leg, became affected with progressive muscular atrophy in that member; and you doubtless remember the faro-dealer, in whom a like cause was in operation, and in whom the muscles of the hand and arm were first attacked.

Of predisposing causes, sex is influential. Nearly all my

cases, over forty in number, were males, and such has been the experience of other authorities. Age is another predisposing cause, middle age and youth being especially liable. Hereditary influence is sometimes undoubted.

The ballet-dancer to whom I have just alluded has two sisters affected with the same disease. Two cases, brothers, were sent to me not long ago from Washington City. Two brothers, fifteen and seventeen years of age respectively, are now under my care suffering from this disease, and several others have had relatives similarly affected.

As regards the diagnosis, I do not think that you will have much difficulty, as the symptoms are so characteristic and obvious that I do not see how you can mistake it.

Unfortunately, the prognosis is almost uniformly unfavorable; yet still we do occasionally succeed in restoring the atrophied muscles, and still more frequently in arresting the further progress of the disease; nevertheless it must be confessed that instances of either are exceedingly rare.

In accordance with the general idea of these lectures, I shall have very little to say to you relative to the morbid anatomy or the pathology. I must, however, impress upon you the fact that, although the disease is manifested almost entirely in the muscles, the affection is one essentially of the spinal cord; this is its starting-point. The morbid changes are detected here after death, and the atrophy in the muscles is directly the result of the pathological process initiated and going on in the spinal cord. I will simply say to you, in regard to this process, that it appears to consist in the atrophy and disappearance of motor nerve-cells, and the substitution for them of the neuroglia or connective tissue.

I have, as you will remember, already given considerable attention in these lectures to the subject of posterior spinal sclerosis, or locomotor ataxia as it is more commonly called, and I now wish to bring before you a patient who is suffering from a combination of symptoms such as we find in both locomotor ataxia and progressive muscular atrophy.

Case. *Posterior Spinal Sclerosis and Progressive Muscular Atrophy.*—"S. F. S., aged thirty-seven, was born in

Ireland, is married, the father of three children, and a lawyer by profession.

"A man originally of fine constitution and excellent muscular development, from having engaged nearly all his life in outdoor athletic sports, which he has no doubt at times carried to excess. He has always been temperate in his habits, and has never had any severe sickness, but has suffered more or less all his life from obstinate constipation of the bowels, which has been a constant source of annoyance to him. In 1858, an eruption appeared upon his body, which has persisted up to the present time, and which upon examination proved to be pityriasis versicolor; it is confined entirely to the trunk, and consists of irregular brown patches, which are most abundant upon the chest and back. In 1859, he had gonorrhœa, which was followed two months subsequently by a soft chancre, but there is no evidence of constitutional syphilis in the history of this patient, other than the scaly eruption which has already been mentioned. In regard to his family history, we learned that his mother died of puerperal fever when he was quite young, and that his father's death was caused by an attack of pneumonia some years ago. He has a brother who is an imbecile, but otherwise there are no members of his family who are afflicted with any of the diseases of the nervous system.

"In July, 1865, up to which time he had always enjoyed excellent health, he went to Harlem on business, and while there was caught in a shower, during which he was drenched. In this condition he rode to Pine Street, where he remained busy writing at his office for several hours before returning home to change his clothes. Two weeks subsequently he was seized with a severe chill, and feeling very ill he returned home, and was obliged to go to bed. He now became delirious and remained so for about half an hour, when a severe diarrhœa supervened, which lasted about a month. He became so weak and prostrated that he determined to go to the Catskill Mountains in order to recuperate, and here he remained until he thought he had quite recovered, when he returned to New York to resume the practice of law, about the first of September.

"From this period until May, 1866, he seemed to be in

good health, and attended regularly to his professional duties.

"One morning about this time, he started to run to catch a horse-car, when he noticed a stiffness or want of elasticity in his lower extremities, which he compared to the feeling 'as though he had on a pair of wooden legs.'

"His attention having now been thoroughly aroused, he soon experienced numbness and coldness in these parts, and there soon followed incoördination, which was in direct proportion to the gradually increasing numbness, which went on steadily progressing until July, 1869. This want of the guiding power over the legs was especially noticeable when the patient attempted to walk in the dark. There was no feeling of constriction around the waist at this time, although the patient still suffered from constipation of the bowels.

"During the year 1867 he commenced to have incontinence of urine, and for two years this has gradually grown worse.

"In the early part of the year 1869 he first felt, especially at night, sharp, flashing, electric pains in the legs, which remained a variable period, and seemed to be in direct ratio to the amount of physical exercise which he had taken. These have been present at intervals up to the time that the patient entered the hospital for treatment. In July, 1869, he was suddenly seized with strabismus accompanied with double vision, and ptosis of the right eye. The ptosis, however, still persists, although the strabismus and double vision had completely disappeared after the lapse of six months.

"It was not until 1867 that he was aware of any difference in the muscular power of his legs, although for the last year he had noticed that there was a well-pronounced want of coördination in the lower extremities, and that this power of directing the voluntary muscular movements was far from being under his control.

"This disparity, however, became gradually more marked, so that in the course of a year there was a decided diminution in the size of the left leg, which was greatly atrophied, although the right was not at this time perceptibly implicated. Now his venereal appetite began to be impaired, and in June, 1869, he was conscious that the seminal emissions in the act of copu-

lation took place very quickly, although there was no aptitude for repeating the venereal act. He had never had nocturnal emissions; prior to the year 1869 he had never had any sharp electric pains nor any ocular troubles. Since July, 1869, the loss of muscular power has been very slight in his lower extremities; about this time he was seized with a severe pain in the left arm, and there soon followed numbness, which has gone on progressively increasing, and which has been accompanied with a corresponding impairment of motility in that member."

Such was the history of this case up to the time of his admission into the out-door department of the New York State Hospital for Diseases of the Nervous System, November 9th, 1870, when his condition was found to be as follows:

"There was ptosis of the right eyelid, which appeared to vary in degree from time to time. The patient experienced a peculiar feeling in the right eye, as though a foreign body were present, and acting as a source of irritation, yet upon careful examination no conjunctivitis, granular lids, or other extrinsic cause for this abnormal sensation, could be discovered. There was also a slight diminution in the reflex excitability of the conjunctiva of the right eyeball. The pupils, however, were equal and responded readily to light. There were no other aberrations of vision, and all the remaining special senses were normal excepting tactile sensibility, which was very much impaired. His mind was active and his memory was very retentive. The electric pains occurred less frequently than formerly, and were shorter in duration and less severe in character. There was a great degree of incoördination in the left upper and lower extremities, more particularly in the latter, but the characteristic gait of the ataxic patient was not prominently marked, having been more or less modified by the superaddition of progressive muscular atrophy which obscured the ataxy.

"The dynamometer indicated a difference between the muscular power in the two hands, the left being much weaker than the right, which was also more or less involved, as the index plainly demonstrated. Although there was at this time loss of power in his left hand, yet the want of coördination

was exceedingly well marked whenever he attempted to perform any of those complex movements which require the nice management of the fingers, such as buttoning his collar, picking up a pin, and the like, and which depend upon exact coordination of the muscles for their perfect execution. Even these acts he could not accomplish with his left hand unless he was aided by the sense of sight. He could with the tip of the index-finger of the right hand, and when his eyes were closed, touch any spot of his body indicated, as for example the end of the nose, but this he could not do with the left hand, which showed that he did not possess a knowledge of where the different parts of his body were situated when he employed that member. On placing a weight of an ounce in his left hand and then removing it and replacing it by by a weight of four ounces, he was unable to tell which was the heavier of the two when his eyes were closed, although in his right hand he could appreciate quite readily which was the heavier. He could write with his right hand very nicely, and there was no material change to be observed in the formation of his letters, yet he could not continue at that occupation for any length of time without experiencing a sense of great fatigue which compelled him to relinquish what he could formerly accomplish very easily. He had no pain in the back, no feeling of constriction about the abdomen or any other part of his body, no spasms, no fibrillary contractions or quiverings of the muscles. His sexual appetite was now nearly abolished, and the incontinence of urine had increased to such an extent that it continually dribbled away and soiled his clothes. He could not walk in the dark, nor could he stand with his eyes closed, even when his feet were spread widely apart so as to increase his base and give him a firm support. There was marked anæsthesia in the soles of his feet, as there was in all the other parts of his body below the first dorsal vertebra. On measuring the tactile sensibility in the back, the points of the æsthesiometer could barely be distinguished at four inches, in the lower extremities at three and a half inches, in the forearm at three inches, and in a corresponding ratio the tactile sensibility was diminished in all parts of the body below the point mentioned. There was also great impairment of the sensation of pain, or

rather a retardation in the transmission of that sensation to the sensorium which was marked by an interval of over five minutes. For example, on pricking his leg with a needle, he was not aware of that fact until at least five minutes had elapsed, and then he would begin to feel the pain very acutely, and would refer to the exact locality where I had inflicted the injury. When one of the sponges of a galvanic current of sixty cells was applied to the back of this patient, and the other to his leg, it was fully fifteen minutes before he appreciated the normal effect of the galvanism, but immediately he experienced an uncomfortable sensation as though he had been immersed in ice-water. The temperature in the left leg was less than in the right, both being several degrees below the normal standard, and the capillary circulation was very languid, as shown by the coldness and lividity of these parts. The reflex excitability in the hands and feet was nearly abolished. Physical exploration of the heart and lungs revealed a healthy condition of the former, but the latter organs were filled with coarse mucous *râles*, which were equally distributed over both sides of the chest. His bowels were regular, and had been for some time past. About a year ago he commenced to have a suppressed dry cough, but this only lasted a short time. There was a huskiness of the voice which had attracted his attention for about a year, but there was no other evidence of phthisis.

"The atrophy in this case began first in the left foot, and then extended upward, gradually involving the flexors and extensors of the leg and thigh, together with the glutei muscles on that side. It now passed over to the opposite side and invaded the same group of muscles in the same order as it had done in the other limb. It next attacked the muscles of the left hand, forearm, and arm, together with those about the shoulder, but in what order the patient was not aware; and then it invaded the muscles of the right upper extremity, as evinced by the weakness and sense of fatigue which have already been mentioned. On attempting to flex the legs of this patient, it was found that he was able to offer considerable resistance; but, when his legs had once been flexed, they could be extended with the greatest ease, from which fact we learn

that the flexor muscles are much more degenerated than the extensors. In regard to the muscles implicated, it is hardly necessary to state that the atrophy varied in degree not only in the different muscles attacked, but also in various portions of the same muscle, although corresponding parts on the two sides were demonstrated by means of the galvanic current to be impaired. In the left leg, where the atrophy first commenced, the disease was most advanced, and the muscles of that foot were so completely destroyed that its bony outline was perfectly apparent."

After the cases which I have exhibited to you of posterior sclerosis of the spinal cord and progressive muscular atrophy, you will not expect me to make any very extensive remarks in regard to this case. It is interesting, however, as exhibiting to some extent the existence of the two diseases in the same individual.

Apparently the left half of the spinal cord is more involved than the right. The motor fibres are contained in the anterior columns as far up as the anterior pyramids, where they decussate, and that accounts for the paralysis with atrophy of the left leg.

The sensory fibres, which are contained in the posterior columns, decussate soon after their entrance into the spinal cord, and that fact accounts for the loss of sensibility and the other symptoms of locomotor ataxia, which are most conspicuous in the left leg and arm. Doubtless the other half of the spinal cord is likewise implicated, but the more striking facts are as I have mentioned.

You will have observed also that, although the disease in this case has not had an intra-cranial origin, there have been and still are symptoms indicative of intra-cranial disturbance, chiefly those due to a paralysis of the third pair of nerves of the right side.

This is to be accounted for by the intimate anatomical relation which exists between the sympathetic nerve and the spinal cord, a certain part of which, extending from about the third cervical to the third dorsal vertebra, is called the cilio-spinal centre—injury or disease of this portion of the spinal

cord being usually accompanied by disturbances of vision such as those exhibited in the case before us.

The history of the case up to the present time is so full and explicit that it is not necessary for me to dwell further upon its phenomena. Before, however, closing my remarks upon this subject, I wish to call your attention to the treatment of this disease, which I shall now proceed to consider. In the first place, our main reliance is in the use of the primary galvanic current, which should be applied every alternate day to the spinal cord, the negative pole being placed above the diseased portion of the cord and the positive below. The sympathetic nerve should also be thoroughly galvanized, the negative pole resting upon the cervical ganglia in the neck, and the positive upon the cilio-spinal centre. The duration of these applications should vary from five to ten minutes, and should be sufficiently strong to produce a moderate degree of pain. I also employ both the primary galvanic and the faradic currents, applying the sponges either directly to the atrophied muscles or to the nerves which supply them, in order to improve their nutrition and keep up their development as much as possible until the spinal cord has sufficiently recovered its tone, so that they can then readily respond to the stimulus sent out from that nervous centre. You know that I have striven to impress upon your minds that the disease is situated in the spinal cord primarily and not in the muscle, and that is the reason why we direct the galvanism mainly to the spinal cord and sympathetic nerve. In addition to this mode of treatment, I have been in the habit of giving phosphorus in doses of the sixtieth of a grain, three times a day, either in the form of phosphoric acid, oil of phosphorus, or phosphide of zinc. The chloride of barium is another excellent remedy in sclerosis of the brain or spinal cord, and from my experience with this agent I am inclined to regard it very highly. It should be administered in doses of a grain dissolved in a drachm of the tincture of hyoscyamus, which should be given three times a day in water. Cod-liver oil is always advantageous, and in conjunction with the phosphorus is necessary to supply the essential elements to the diseased tissue. Where there is a history of the existence of a syphilitic taint, the

iodide of potassium should be given, in gradually-increasing doses, in combination with corrosive sublimate, as I have already recommended to you in a previous lecture. The patient should be instructed not to tax too severely the atrophied muscles by over-exercising them, as by this means he readily exhausts the already-impaired nervous force of the spinal centre. If the patient be seen in the very first stage of the disease, when the cord is congested, ergot is the proper remedy to be used, and remember to give it in large doses, say a drachm of the fluid extract thrice daily.

Before we can expect any amelioration in the symptoms, it is necessary to continue our treatment for a month or two at least; but, in order to arrive at a cure, the treatment must be extended to months, or even years.

LECTURE XIII.

CONVULSIVE TREMOR.

J. X., the patient before you, is a well-nourished, healthy young man, a farmer by occupation. You have only to look at him to see that he cannot be the subject of any serious organic disease, and yet he is suffering from an affection which, to say the least, is very inconvenient, if not alarming.

At periods varying from a few weeks to several months, he is subject to violent convulsive movements in almost all the muscles of his body, and unattended, except in one instance, by loss of consciousness. The paroxysms last several hours, and during their continuance the patient, owing to the violent jactitations into which his limbs are thrown, is totally unable to execute voluntary movements. He is even unable to stand without support, and cannot guide either his hands or feet. The muscles of speech are likewise affected, and he is consequently unable to articulate distinctly the words he may attempt to utter. While all this is going on, his body is bathed in cold perspiration and the circulation is accelerated; the respiration is increased in frequency and there is well-marked

and persistent pain in the back of the head and nape of the neck.

He is very positive that, except in the one instance to which reference has been made, he is entirely conscious, and just as capable of accurate reasoning as he ever is.

On the occasion of loss of consciousness, the paroxysm had lasted several hours; he was in consequence very much exhausted, and therefore he may have been suffering from simple syncope: still, it is possible that the attack in question may have been epileptiform in character. He has been subjected to various kinds of medical treatment, but nothing has appeared to be of any service. The last attack was about three months ago, and he says it may be three or four months before he will have another attack. He has suffered from the affection since the year 1866, a period now of over six years.

According to his description of the attacks, the muscles are affected very much as those of persons suffering from chorea of a very violent character; and yet it is evident that the disease is not chorea, for the clinical history of that affection does not include such entire remissions as part of its phenomena.

It certainly is not epilepsy, although it must be confessed that it borders upon it; but the essential feature of epilepsy, loss of consciousness, has never been present in any one of its paroxysms unless it was a feature of the occasion already mentioned, and relative to which there is some doubt; for, when we come to question him specifically in regard to loss of consciousness, he is not very decided in his answers.

With the other affections in which tremor and tonic spasm are prominent features, the disease in question has no affinity.

Now, this case is not the first of the kind which has come under my observation. In the New York Medical Journal for June, 1867, in an article entitled "Convulsive Tremor," I gave the clinical histories of three very similar cases, and as the affection is not very common, and the disease may be entirely distinct from any other, it will not be uninteresting if I briefly relate to you not only the main points of my own cases, but likewise what was previously known upon the subject.

In the year 1822 Dr. Pritchard,[1] under the name of convulsive tremor, gave an account of two cases, presenting somewhat similar features to the one before us. His attention was first directed to the subject by noticing that, in some epileptic patients who had come under his observation, fits of tremor occurred in the intervals between the paroxysms and even appeared to take the place of the ordinary seizure. He then noticed several cases in which there were no epileptic attacks, but in which there were violent clonic spasms of the muscles, accompanied with severe pain in the head and profuse perspiration. Dr. Pritchard states that, previous to his observations, the affection had not attracted much attention; but he cites a case from Tulpius of a young unmarried woman, of a pale complexion and phlegmatic temperament, who was afflicted during three years with what was called the shaking palsy, which did not affect her constantly, but came on in periodical fits; each paroxysm lasted nearly two hours, and was accompanied by hoarseness and loss of voice, the consciousness being unimpaired.

He also refers to other cases quoted by Sauvages from Bonetus, in which the symptoms were very similar, consisting of convulsive tremor, attended with headache and vertigo. This disorder was fatal in a few days, and after death a parasite was found in the brain. In this connection it is interesting to recall the fact that the sheep is subject to a somewhat similar train of symptoms, due to the presence of an entozoon in the brain.

In his very excellent treatise on the shaking palsy, Parkinson,[2] in calling attention to the fact that several diseases characterized by tremor have been confounded with paralysis agitans, quotes the following case from Dr. Kirkland:

Mary Ford, of a sanguineous and robust constitution, had an involuntary motion of her right arm, occasioned by a fright, which first brought on convulsion-fits and most excruciating pain in the stomach, which vanished on a sudden, and her right arm was instantaneously flung into an involuntary and

[1] "A Treatise on Diseases of the Nervous System," London, 1822, p. 393.
[2] "Essay on the Shaking Palsy," London, 1817, p. 29.

perpetual motion like the swing of a pendulum, raising the hand at every vibration higher than the head; but, if by any means whatever it was stopped, the pain in her stomach came on again, and convulsion-fits were the certain consequence, which went off when the vibration of her hand returned."

Parkinson also quotes another case from the same source, resulting apparently from worms, and which is thus described:

"A poor boy, about twelve or thirteen years of age, was seized with a shaking palsy. His legs became useless, and together with his head and hands were in continual agitation; after many weeks' trial of various remedies, my assistance was desired. His bowels being cleared, I ordered him a grain of opium a day in the gum-pill; and in three or four days the shaking had nearly left him. By pursuing this plan, the medicine proving a vermifuge, he could soon walk, and was restored to perfect health."

Toulmouche,[1] in a paper which is very suggestive in the light of recent contributions to neurological pathology, cites a case which is likewise similar to the one now before us:

"A woman, whose respiration was convulsive, presented from time to time the following condition: Her nostrils were strongly dilated, the angles of the mouth drawn down, the shoulders and chest spasmodically elevated, the inspiration strong and deep, the sterno-cleido-mastoid muscles were powerfully contracted. During these paroxysms, which lasted several minutes, the patient was deprived of the faculty of speech and threatened with suffocation. Nevertheless, she could, if so directed, move the head, the shoulders, and the muscles of the face, although the spasm continued. . . . In another case the affection was almost entirely confined to the sterno-cleido-mastoid muscle. The patient could turn the head in either direction, but gradually it moved from right to left, without her ability to control its action, so that the right ear almost rested upon the sternum. The other muscles of the shoulder contracted at the same time. He likewise reports another case in which the head was almost continually in motion, the pa-

[1] "Observations de quelques Fonctions involuntaires des Appareils de la Locomotion, et de la Préhension. Mémoires de l'Académie Royale de Médecine." Tome deuxième. Paris, 1833.

tient executing twenty-two rotations in a minute; the movement was due to the alternate contraction of the sterno-cleido-mastoid and splenius muscles of each side; respiration was not obstructed. The movements diminished and finally ceased, after two or three attacks of hæmoptysis."

The concusion which the author draws from his own cases, and those which he cites from other authorities, are mainly interesting in relation to his theory of the pathology. They are—1. That there exist for the movements of our different groups of muscles different central motor forces. 2. That the cerebellum only presides over the coördination of those complex movements which are necessary to the different acts of standing and locomotion, and not at all over those that regulate the more simple movements of the trunk and the members. 3. That this nervous centre is to vertebrate animals the power to maintain themselves in equilibrium and to exercise locomotion. 4. That, if, in the species of neurosis that I have described, the sensation and intellectual faculties experience no change, this fact is due to the circumstance that the lesions of the cerebellum have not yet involved the tubercular quadrigemina. That these last-named organs are in a kind of dependence upon the brain, since in the normal state animals move through the impulsion of various motives of which the brain is the seat. 5. That finally a number of affections, called nervous, consisting in the most erratic derangements of the muscular functions, such as an irresistible tendency to go backward or to advance without rational motive, to leap, to perform other disorderly movements, constitute only a species of insanity, or aberration of the locomotor functions, depending on an affection, either organic or functional, of the cerebellum.

I have quoted these conclusions of Toulmouche in full, more as evidence of the fact that he was disposed to locate the seat of these troubles in the cerebellum than as intending to indorse his collateral hypotheses. It would be easy to quote other instances more or less similar to those we have before us, but I will simply refer to some later cases, and then pass to the consideration of treatment.

Dr. Hughlings Jackson, as appears from a clinical lecture

published in December, 1871, in the London *Medical Times and Gazette*, brought forward a boy, aged fifteen, who was admitted into the London Hospital in January, 1871, the subject of epileptiform convulsions, confined to the right side of the body; he was also aphasic. It is stated that the paroxysms began in June, 1869, in "the more external fingers of the right hand." Dr. Jackson also refers to several other similar cases which he has published from time to time since 1867.

These cases he regards as simply unilateral epileptiform convulsions, and he embraces them all under the title of epilepsy of the corpus striatum. They ordinarily begin in the hand which the patient is the more accustomed to use, and especially the thumb and index-finger. The face and the tongue are sometimes primarily attacked, rarely the foot, and then always the great-toe. These cases have not a great deal of connection with the one before us, they have none at all with the disease which I have described as athetosis, and to which a French writer[1] rather hastily likens them probably because no cases of either disease have come under his observation. A case, however, which has some analogies to the one before us, is now under my charge. It is that of a boy from North Carolina, who has spasmodic muscular contractions confined to the left side, and mainly affecting the muscles of the face, neck, and upper extremity. The duration of a paroxysm never exceeds half a minute, and there is not the least loss of consciousness. These paroxysms may be brought on by simply touching his neck lightly on the left side of the thorax. At intervals of two or three months he has one or more perfectly-marked epileptic convulsions. But even this case I do not regard as identical with the instances of purely convulsive tremor which have come under my observation, though doubtless there is a family resemblance.

In the paper to which reference has been made as published in the New York Medical Journal, I gave it as my opinion that the affection described "depended upon a dis-

[1] "Dictionnaire Annuel des Progrès des Sciences et Institutions Médicales suite et complément de tous les Dictionnaires," par M. P. Garnier. Paris, 1873. Art. Athétose, p. 42.

order of the cerebellum, unattended with any serious organic lesion, and consisting essentially in congestion of some limited portion of its substance." While still disposed to regard its seat as being in the cerebellum, I am not so sure that it is always the result of congestion. Indeed, several similar cases, which subsequently came under my care, were aggravated by the use of the bromide of potassium, which as you know lessens the amount of the intra-cranial blood, and they were cured by means calculated to increase the amount of blood in the brain and spinal cord. Consequently I am induced to think that cerebral anæmia may be one of the pathological conditions capable of giving rise to convulsive tremor. The pathology, however, must remain more or less obscure until we have the opportunity of verifying our diagnosis by *post-mortem* examinations.

In the cases described in the memoir to which reference has been made, the measures which were found efficacious were—1. Counter-irritation by means of a seton in the nape of the neck; 2. Large doses of the bromide of potassium; 3. The primary galvanic current. In two of the cases, as there was a generally anæmic condition, iron and quinine were also administered. In one case the bromide of potassium produced no perceptible effect, and the tincture of hyoscyamus was substituted for it, with good results.

In the case of the young man before us, I am inclined to think from his general aspect, and especially from the fact of the extremely dilated state of his pupils, that there is cerebral anæmia, although his general system gives no indication of debility. He is obliged to leave town immediately, and I cannot, therefore, subject him to an ophthalmoscopic examination. I propose, therefore, to act tentatively upon the theory of cerebral anæmia, and to treat him with strychnia in gradually increasing doses; a plan of treatment which is eminently successful in the analogous affection chorea, and occasionally even in epilepsy. We will, therefore, direct that a solution of the sulphate of strychnia, in the proportion of two grains to the ounce of water, be made, and that of this the patient shall take the first day ten minims three times; this will give him the twenty-fourth of a grain at a dose. The next day he will

take eleven minims at each dose, the next twelve, the next thirteen, and so increasing in like manner till the physiological effect of strychnia be produced. This will consist in slight rigidity of the muscles of the calves of the leg, and perhaps of those of the neck and jaws. When this effect ensues, the dose is to be dropped to the original quantity of ten minims, which is to be gradually increased as before, and so on till the period for the occurrence of the paroxysm is passed. Should this plan of treatment be successful in preventing an attack, it ought to be continued for several months longer. I may state, in conclusion, that there is not the least danger in carrying out this system of treatment. It simply requires ordinary care and prudence.

Note.—Three months after the delivery of the foregoing lecture, the patient reported that he had had no paroxysm; it had generally taken from thirty to thirty-five minims of the solution of the strychnia to produce the physiological effects. He also reported that his general health had never been better, and that he was working assiduously on his farm. The therapeutical promise is therefore good.

LECTURE XIV.

CHRONIC BASILAR MENINGITIS.

The patient whom I have now the opportunity of showing you, first made her appearance at this clinique in the winter of 1871–'72, about a year ago. At that time she was suffering from deep-seated pains in the head, vertigo, and paralysis of the third nerve on the left side, as evidenced by ptosis, dilatation of the pupil, and external strabismus; the latter condition producing diplopia. Conjoined with these symptoms there was slight but decided paralysis of the muscles of the face, arm, and leg of the opposite side, together with cutaneous anæsthesia.

The history of the case was not that of cerebral hæmorrhage, or embolism, for inquiry showed that the symptoms

had been of very gradual development, a fact not consistent with the existence of either of the lesions mentioned. I was disposed to think that the affection was an aneurism of the left posterior communicating, or posterior cerebral artery, both of which, as you know, are in very intimate topographical relation with the crus cerebri, a tumor of some other kind involving the left crus or pressing upon it, or chronic basilar meningitis with effusion, implicating the same part. I regarded the latter as the most probable morbid condition, for the reason mainly that the symptoms were not so intense as regarded paralysis and pain as are those which result from either of the other diseases named.

The explanation of the phenomena observed in this case, some of you will doubtless recollect; but, as the patient illustrates important physiological and pathological facts, and as most of you have not seen her before, it will not be out of place for me briefly to touch upon the relation of the observed symptoms to the supposed pathological condition.

In the first place there were ptosis, external strabismus, and dilated pupil of the left side. These circumstances indicated the involution of the third pair of nerves in the lesion, *probably* of the same side, even if there were no accompanying symptoms, but with these latter, with very considerable certainty.

The third pair of nerves has its apparent origin in the crura cerebri—the right nerve from the right crus, and the left nerve from the left crus. If, however, the fibres be followed out by minute dissection, as has been done by Vulpian, they are seen to be arranged into three groups. Of these the middle and posterior decussate after passing entirely through the crus, while the anterior group passes forward to the optic thalamus, in which ganglion the fibres are lost. None of the fibres of origin originate in the crus, and this latter may be entirely dissected away, and the third nerve be left intact.

Now, if Vulpian be right in his view that a considerable number of the fibres of the third nerve decussate, any disease of the brain affecting these fibres must be manifested by paralysis of the muscles supplied by the nerve of the *opposite* side, and, as the motor and sensory fibres of the spinal

cord decussate below the point at which the third nerves decussate, the disease, if causing paralysis of other parts of the body, would induce this condition also on the opposite side, or, in other words, on the same side with the paralysis of the muscles supplied by the third nerve. But in the case before us the reverse is the fact, the muscles of the eye and those of the face, arm, and leg, being affected on opposite sides. The disease, therefore, whatever its nature, must be confined entirely to the left side of the brain.

The left crus cerebri contains motor and sensory fibres coming from the right side of the body, below the medulla oblongata. It contains the fibres of the left third nerve; disease involving the left crus would, therefore, cause paralysis of the muscles supplied by the left third nerve, and of motion and sensation in the left half of the body. And this is exactly what existed in the patient before us a year ago.

As we have seen, the anterior group of the fibres of origin of the third nerve come from the optic thalamus of the same side, and a lesion affecting this ganglion would give rise to a similar condition so far as the paralysis is concerned. But it is difficult to conceive what morbid process could go on in the optic thalamus, and cause such a group of phenomena, so gradually developed as those which mark this case, and not at the same time produce more extensive disturbance. Taking all the facts into consideration, I thought the theory of basilar meningitis, involving the left crus, the most probable; and when we come to consider the present state of the patient we shall find strong confirmatory evidence of the correctness of this opinion.

At the time to which I am now referring, I prescribed the use of the iodide of potassium in large doses, but gave an unfavorable prognosis. I was therefore somewhat surprised to find her to-day in the anteroom with the other patients, and, to cursory examination, in about the same state as she was this time last year.

But a very slight inspection suffices to convince us that she is differently affected, for we see that the left eye is now rotated inward, showing, therefore, that the sixth pair of nerves has become involved, producing paralysis of the external rec-

tus muscle; the disease, whatever its nature, has shifted its site, and with the change of location there is a corresponding change in the symptoms. It need scarcely be said that such a circumstance is altogether inconsistent with the existence of a tumor of any kind, and is only reconcilable with the theory of meningitis with exudation.

It is not necessary to presuppose any very extensive change in the situation of the disease. To be sure, the origin of the sixth pair at the upper border of the medulla oblongata and below the pons Varolii is quite remote from that of the third pair, but the two nerves are in very intimate topographical relation to each other throughout a great part of their course; they leave the cranium through the same aperture, the sphenoidal fissure, and even within the orbit are in close contiguity. This change in the situation of the lesion is, I think, one of the prominent features of chronic basilar meningitis.

You will also recollect the case of the young man who during the past year has appeared several times before you. He came to me originally with external strabismus, ptosis, and dilatation of the pupil, affecting the left eye, with the most intensely agonizing pain in the head that has ever come under my observation. He had also vertigo, frequent attacks of vomiting, and paresis, if not paralysis of the arm and leg of the same side. A consideration of his condition led me to the diagnosis of a cerebral tumor, and I accordingly gave a very unfavorable prognosis. I was led to this conclusion, not so much from the motorial derangement, as by the atrocious cephalalgia from which the patient suffered. In this case there was some slight suspicion of syphilis, and I treated him with mercury and large doses of the iodide of potassium. In a short time the pain in his head disappeared, and in a few weeks there were no indications of paralysis anywhere—in fact, he was to all appearance perfectly cured; but at the end of two or three months he reappeared, with the corresponding set of symptoms in the right eye and the right half of the body, and with pain in his head fully as severe as that which characterized the previous attack. I again treated him with mercury and the iodide of potassium, and his symptoms again disappeared, and up to the present time there has been no recurrence.

I have now under my care a gentleman, belonging to the legal profession of this city, who has attacks of acute pain in the head, accompanied with all the phenomena of paralysis of the left third nerve. Curiously enough, these attacks alternate with an eczematous affection, involving the trunk, especially the breast. On the disappearance of the skin-disease, under remedial measures, his head-symptoms immediately recur; and when they are relieved, as they are by the action of the iodide of potassium, he is again attacked with the eczema.

In this case I presume there is an actual transference of the disease from the brain to the skin, and *vice versa*.

In a case which I saw a few days ago in consultation with Dr. Hermann Knapp, the eminent ophthalmic surgeon, the patient, a young man of whom there was no history or even suspicion of syphilis, at first became attacked with disease of his brain, characterized by pain and obscureness of vision. Next there was paralysis of the muscles supplied by the third pair of nerves, then the fourth pair became involved, then the fifth, as evidenced by anæsthesia of the face, and paralysis of the masseter and temporal muscles, then the sixth and eventually the seventh and eighth, producing loss of hearing, and paralysis of both sides of the face. In this very remarkable case, there was a gradual advance in the disease, through a period of several weeks, along the base of the brain, from the anterior to the posterior region. With all these symptoms, there was not the slightest mental derangement. Shortly after I saw him, the pneumogastric nerve became implicated in the lesion, and death took place soon afterward. Unfortunately, there was no *post-mortem* examination, but Prof. Knapp and myself agreed that the case was one of inflammation of the membranes covering the basilar surface of the brain.

Now, there is one point to which I especially desire to call your attention, and a careful consideration of which will do much to prevent you from making any serious mistake relative to the part of the brain involved in the morbid process.

The upper or convex surface of the brain is particularly

connected with the evolution of that part of the mind known as the intellect.

In meningitis affecting the membranes covering this upper surface, we should expect *a priori* that the chief manifestations of brain-disorder would be shown in the direction of mental aberration, and in fact we find that such is really the case.

The lower, the basilar, or concave surface of the brain is not so much in relation with intellection as it is with sensation and motion, hence we should expect to find that a meningitis affecting this surface of the brain would more especially produce deviations from the normal standard in sensation, motion, or both. In practice we find that these effects are produced. Take, for instance, the cases before us, and we perceive that the chief manifestations of disease are alterations in sensibility and paralysis of some one or more muscles of the body. You will observe, too, another prominent feature, and that is, that in all of them some of the muscles of the eyeball have been notably affected. Sometimes conjoined with pain in the head there is anæsthesia of distant parts, and sometimes instead of paralysis there is muscular spasm or convulsion.

Thus in thirty-two cases of meningitis of the base of the brain, attended with serous or gelatiniform exudation, collected by Gintrac, there was not one in which convulsion or paralysis was not a prominent feature.

From a very complete summary made by this author, I extract the following remarks relative to symptoms:

"Headache is one of the most common. It occurred in more than two-thirds of the cases; the pain was deep-seated and more or less severe; sometimes it was located in the forehead, sometimes in the occiput, and again in the supra- or infra-orbital regions.

"The patients often expressed their sufferings by sharp and almost characteristic cries.

"There has been sometimes loss of consciousness or stupor, but in the majority of cases the intellect has retained its ordinary activity even to a very advanced period of the disease. Delirium occurred in about one-third of the cases, and was light in character. A disposition to sleep was manifested very often,

even in the early stages, but in two cases there was persistent insomnia. In some of the patients, speech was embarrassed, slow, infrequent, or the articulation difficult. In four cases it was entirely abolished.

"The phenomena offered by the visual apparatus were very varied and worthy of attention; their source is found in the very seat of the disease. The eyes are intolerant of light, the conjunctival vessels injected, and the surface covered with a thick, viscid mucus; they are prominent, and often one is more so than the other. One of the upper eyelids is often paralyzed, generally the left. The eyeballs are usually turned upward, rarely downward; sometimes they roll convulsively. In more than a third of the cases they deviated from their normal axis, and thus strabismus was produced. The pupils are insensible or oscillate; they were dilated thirty times, and contracted four times. Often they are unequal, the one being dilated and the other contracted simultaneously or alternately. Diplopia and amblyopia existed to diverse degrees from the first, or in the course of the disease in every case.

"The other senses have been rarely affected. In one case there was anosmia, with preservation of the tactile sensibility in the pituitary membrane. In two cases deafness; but if sometimes the patients were spoken to in a loud voice, and did not respond, it was perhaps rather due to the state of the intellect, than to the paralysis of the auditory nerve.

"Convulsions were noted in twenty cases; the spasms were general or partial, affecting a limb, or the face, or the eyes, or the organs of deglutition or respiration; if in other cases there were not prominent convulsive movements, there were tremors, subsultus, and carphologia, grinding of the teeth, trismus, with stiffness of the neck; opisthotonos was occasionally observed. In one case the head was spasmodically flexed on the chest, and could not be drawn back without causing great pain. Tonic spasms of the muscles of the arm, forearm, legs, or face, were observed in three cases. Paralysis, exclusive of the muscles of the eyes or upper eyelids, was rare. There were three cases of hemiplegia, one of paraplegia, one of an upper limb, and one of a lower limb.

"Hyperæsthesia was rare, anæsthesia much more frequent.

"Vomiting occurred in fifteen patients. Difficulty of swallowing in seven. Respiration was difficult, irregular, or stertorous, in every case. In a third of the cases there was more or less of intense fever, but generally the pulse was slow; sometimes, after having been slow, it became frequent. The skin was hot and the face flushed."

Now, you must bear in mind that the cases cited by Gintrac were all of great severity, and terminated fatally. You must not, therefore, expect to find, in cases of which the lesion is very limited, all the symptoms noted by him. Then, too, his cases are much more acute in character than the one before us, or the others to which I have referred. Four of his cases, however, present very great analogies with those to which I have called your attention to-day.

It seems to me, after taking a full consideration of the symptoms of this case, and from what we know of others, in which *post-mortem* examinations have been made, that the disease in this woman is really basilar meningitis, and, acting upon that supposition, I will treat her for that affection.

As bearing upon the treatment, inquiry should always be made relative to the causation, for one of the first things to be done in the management of every disease is to remove or counteract the cause. It is astonishing to find how many of these cases are connected either directly or indirectly with a syphilitic taint. As far as my own experience extends, the great majority of my patients affected with the disease in question acknowledged the preëxistence of syphilis; and, even when they failed to do so, in a large proportion of the remaining cases there was evidence upon which to found a reasonable suspicion that syphilis was at the bottom of the cerebral affection.

In the present case I have not, after careful inquiry and examination, any proof that the woman has ever either directly or indirectly been subjected to the action of the syphilitic poison, and yet I cannot help thinking that this disease owes its existence to the influence of that virus. At any rate you will remember that I have frequently inculcated upon you a therapeutical principle applicable to the treatment of all ob-

scure brain-affections, and that is, when in doubt, give iodide of potassium, and give it largely. I have come to the adoption of this idea not from guess-work, but from the results of actual experience, a great deal of which has been brought here before you at these clinics. You will, doubtless, recall several quite recent cases in which the symptoms of severe cerebral lesion were unmistakable, and in which complete recovery ensued upon the administration of large doses of the iodide of potassium. I am inclined to think that most of these were cases of meningitis of circumscribed extent, and involving either the basilar or convex surface of the brain. Whether they were or not, the iodide of potassium cured them, and that, after all, is the principal point.

You know, too, how I prefer to give the iodide of potassium in these cases. A saturated solution of the salt in water contains about a grain to the drop. Starting with say five drops of such solution given three times a day, I give the next day six drops, three times, the next day seven, and so on, increasing a drop for the doses of each day, until the patient takes as much as thirty or fifty drops to the dose. By this method of administration the system is kept fully under the influence of the medicine, and the maximum of the curative effect is produced.

Last year this woman was cured by this plan of treatment, and we have every reason to hope that a like degree of success will follow now.

As regards adjunct treatment, there is nothing which is specially indicated in the case before us. Sometimes iron and the bitter tonics are proper, and the hygiene should always be carefully looked after. Local treatment of any kind is rarely beneficial; and cauterization and blistering are especially to be condemned, as they only add to the distress of the patient, without in the slightest degree arresting the progress of the disease. One point I must not forget, and that is, that excessive mental exertion should always be avoided. Indeed, the less there is of this the better.

The patient has a sore brain, and it is no more sensible to use it than it would be for her to walk from here to the Battery on a sore leg.

LECTURE XV.

CEREBRAL CONGESTION.

Having already considered many of the grave and complicated diseases of the nervous system, I will now invite your attention to an affection which is of vast importance, not only as the initial stage of some of the most serious diseases of the brain, but also as the *avant-courrier* of several of those instances of apparently causeless insanity which so often occur in our midst, and shock the community by their great suddenness, but which nevertheless reveal, on close inspection, well-marked symptoms of cerebral disease. In its medico-legal aspect, therefore, cerebral congestion may well claim our most earnest attention, but to this branch of the subject it is not my intention, at the present time, to refer, as I have on a previous occasion given my views at some length on its causative relation to insanity, in a memoir[1] which I had the honor of reading before the Medico-Legal Society of this city, May 12, 1870.

By cerebral congestion we mean that condition in which the amount of blood in the brain is increased either absolutely or relatively. It is of two kinds, namely, the active and the passive, which are characterized by different modes of origin and different symptoms. In the former there is an increase in the quantity of arterial blood circulating in the vessels of the brain, whereas in the latter there is an augmented amount of venous blood in the cerebral vessels. In some rare instances, however, we find that both these conditions coexist in the same individual.

Now, a state of moderate cerebral congestion may exist for weeks or months without passing into one of the fully-developed forms, yet, upon the addition of a slight exciting cause, it may terminate in—1. An attack resembling apoplexy; 2.

[1] "A Medico-Legal Study of the Case of Daniel McFarland," in the Journal of Psychological Medicine for July, 1870, also published separately by D. Appleton & Co., New York, 1870.

Epileptiform convulsions; 3. Inflammation of the brain or its membranes; 4. Mania. From the character of its initial symptoms we cannot, therefore, safely predict which one of these forms will be developed, although we can, in most cases, by appropriate remedial measures, prevent their occurrence, if the patient be observed at a sufficiently early period.

The most prominent early symptom of cerebral congestion is undoubtedly wakefulness, which is due to an excessive increase of the amount of blood circulating in the cerebral vessels, so that these organs in time become over-distended, and lose their contractility from the relaxation of their muscular fibres. To be sure, all cerebral action is attended with a certain amount of hyperæmia, and is within certain limits perfectly normal; but, if these limits be exceeded, and the muscular coats of the arterioles are so impaired that the quantity of blood in the brain cannot be diminished by their contraction, we have a condition of cerebral congestion which is abnormal, and the result is loss of sleep, for, as I will now tell you, sleep cannot take place without a contraction of the cerebral vessels—an action which is accompanied by a diminution in the quantity of blood in the brain.

There is, however, a condition which is often confounded with sleep, but which nevertheless differs from it in many essential respects. And this is stupor. On comparing together these two states, the points of difference will be very apparent to you:

1. Sleep is a necessity of life, while stupor never occurs in the healthy individual. 2. In healthy sleep a person is easily awakened, while it is almost impossible to arouse him from a condition of stupor. 3. In sleep the mind may be active; in stupor it is, as it were, dead. 4. Pressure upon the brain, intense congestion of its vessels, the circulation of poisoned blood through its substance, cause stupor, but do not produce sleep. In order to induce the latter, it is necessary that the amount of blood in the brain should be diminished in quantity. This fact has been clearly demonstrated by experimentation, by disease or injury, and by means of the ophthalmoscope. If, then, a diminished amount of blood in the brain is the necessity for healthy sleep, it would seem to follow logically that an

increased quantity of this fluid in the cerebral vessels would produce wakefulness, and this fact is as susceptible of proof as that of the opposite condition.

Before, however, making any extended remarks upon this subject, I wish to call your attention to the following history, which very aptly illustrates some of the leading features of cerebral congestion in one of its different phases, and then I will proceed to examine the more obvious symptoms and causes of this affection:

Case I. *Active Cerebral Congestion.*—"J. Y. is thirty years of age, was born in New York, and is a school-master by occupation, and unmarried.

"He says that he has always been very healthy, and has never suffered from any disease excepting intermittent fever, which he had quite severely about two years ago. His father and mother are both living, and are, at the present time, in good health. His sister died of consumption, and his brother has at times suffered severely from neuralgia, which was undoubtedly of malarial origin.

"Some three years ago, he commenced the study of the law, which he pursued too diligently when not occupied with the duties of his school. In the course of time, he perceived that his health began to be impaired, but necessity required him to attend to his school; at the same time he was reluctant to give up his legal studies. He continued to overwork his brain, until he found that he could not sleep more than three or four hours during the night. On arising in the morning, he felt more fatigued than when he had retired to rest the night before. He soon discovered that he could not fix his attention with any degree of fixedness to the subject of which he was reading, for his mind would wander from it to other matters which had no connection with the one before him.

"In fact, as his disease advanced, he was unable to withstand any degree of exertion, either physical or intellectual. His bowels became costive, his tongue coated, and his digestion impaired. He had headache, vertigo, and at times noises in his ears. His memory began to fail, and he

became so fretful and peevish that he was continually finding fault with his scholars, who attributed his ill-nature to the influence of liquor, as they could assign no other cause.

"He continued in this state for some time, the symptoms being either aggravated or lessened, according to the emotions or thoughts of the patient, his habits or occupation. At last he became so wretched that he felt compelled to get medical advice, and came to the New York State Hospital for Diseases of the Nervous System, where he was examined, and his condition was found to be as follows:

"He complained of a dull headache, accompanied with a feeling of fullness or distention in the frontal region. There were vertigo and noises in his ears, which were increased in severity whenever he assumed the recumbent position. There were dark specks floating before his eyes, and his hearing was morbidly acute, so much so that an ordinary sound would cause him much discomfort. To obviate this, he had filled his ears with cotton. His head was hot, his face was flushed, and his eyes were glassy and suffused. The pupils were contracted and intolerant of light. He still experienced numbness and a sensation of tingling in the tips of the fingers of both hands. He was easily fatigued upon the slightest exertion, either mental or physical. He was very irritable and excitable, his whole emotional system being very easily aroused and in a state of continual erethism. His memory was far from being active, and at times his ideas were more or less confused. He was troubled with dreams of an unpleasant character, which would cause him to dread going to bed, but these were not the result of intemperance, for this gentleman was exceedingly temperate in all his habits, especially in the use of alcoholic liquors. He had illusions and hallucinations of both sight and hearing, but he had no delusions. He realized his condition, said he knew he was sick, and was very desirious of being cured. It seemed impossible for him to obtain a reasonable amount of refreshing sleep, for the greater part of the night was passed in pacing his chamber, and if he went to bed he would soon arise, dress himself, and seek the open air. His pulse was about 90 and full, but not very strong. His bowels were costive, but not as much so as they had been.

His urine was examined both chemically and microscopically, and was found to contain an abundance of the urates and alkaline phosphates. His heart and lungs were in a healthy condition. Examination of the retinal vessels, by means of the ophthalmoscope, showed the arterioles not only to be unusually large, numerous, and tortuous, but it also revealed the fact that the optic disk was very much injected, and that the choroid was of a very red hue, while the veins were in a nearly normal condition.

"He was instructed to leave off all mental exertion, to take a hot bath every night before retiring, and to sleep in a chair, so as to avoid the recumbent position. In addition to this he has taken thirty grains of the bromide of calcium four times a day well diluted in water, which had the effect of inducing sleep after he had continued its use for four days. At the end of a week the amount of bromide was diminished to thirty grains three times a day, and he felt so much better that he was told that he could read the papers and light literature so as to occupy his mind. In two weeks he was still more improved, and the bromide was again diminished to sixty grains a day. The constant galvanic current has also been applied to his head regularly every other day, commencing with ten cells, and gradually increasing to fifteen."

This patient is a very good typical illustration of the premonitory or first stage of active cerebral congestion; for you will observe that, although the disease has lasted some time, nevertheless it has not as yet passed to the apoplectic, the epileptic, the inflammatory, or the maniacal variety.

You know, from what has been said, that the symptom above all others that first attracts the attention of the patient in cerebral congestion is wakefulness, and this condition not only indicates a morbid activity of the brain, but it is of itself a positive sign of cerebral hyperæmia, so that, when you meet with a patient who is unable to sleep, you may be quite sure that the amount of blood in the cerebral vessels is increased in quantity. There soon follows a degree of mental and physical irritability which the patient is unable to control. He cannot fix his attention upon any subject which re-

quires much thought, and in some extreme cases his ideas become so confused that he has erroneous conceptions of even simple things. It is impossible for him to so concentrate his mind as to attend to his daily duties, if these are at all complex in character. His nervous system is in such a condition that he cannot sleep, although at times he feels weary, but he is obliged to seek the open air or pace his chamber until, completely exhausted, he can obtain a little rest. His sleep is often disturbed by unpleasant dreams, and when he arises in the morning he feels weary and unrefreshed. In a short time his memory, in regard to recent events, becomes impaired, and this is especially noticeable in regard to the names of persons and places. There is also a proclivity to substitute words having a similar sound when pronounced, or appearance when written. His ideas become confused, his judgment is weak, and he lacks the ability to so direct his will as to follow any definite course of conduct. Illusions and hallucinations soon make their appearance, and they are very commonly present, those of sight and hearing being, in my experience, those most often met with. Delusions may also exist, but they are merely false conceptions, which the patient is able to correct by means of his intellect, and are never fixed.

Besides the changes in conduct and disposition, which become more marked as the disease progresses, we find that the combative proclivities of the patient are easily aroused; that he magnifies the every-day trifles of life, and that his whole emotional system is more or less involved.

Together with these symptoms, there is pain in the head, generally of a dull, aching character, accompanied with a feeling of heat, fullness, or distention; there is vertigo, which is especially increased whenever the patient assumes the recumbent position, or leans forward so as to obstruct the abdominal aorta. The face is flushed, and there is a fullness of the vessels of the head and neck, as may be seen in the abnormal throbbing of the carotid and temporal arteries. There are noises in the ears, such as ringing, whistling, singing, and the like; or these may be of a more disagreeable character. Hallucinations are generally the effect of cerebral disturbance, either as regards the quantity or quality of the

blood circulating through the cerebral vessels, and hence become an important factor in the diagnosis of cerebral disease. There are specks before the eyes, bright flashes of light, and other phenomena of an exalted condition of the visual apparatus. The pupils are always contracted and intolerant of light. The conjunctivæ are suffused, and the vessels of this membrane are distinctly visible in many cases where, in health, none would be discerned. The eyes have a wild, glassy appearance, and frequently motion of the eyeballs is painful. Headache is very commonly present, and is in some cases the prominent symptom. There is also involuntary twitching of the muscles of the face, or of the muscles of other parts of the body. Loud noises are frequently productive of much discomfort to the patient, owing to the over-excitation of the auditory nerve, which is now in a state of morbid activity. In many instances I have observed bleeding from the nose, which of itself points to a hyperæmia of the vessels of the head.

We also notice that there is a slight impairment of speech, which is more apparent at one time than another, and is particularly to be observed in the pronunciation of those words which require the perfect coördination of the muscles of the tongue and of the lips, such as words abounding in labials and linguals.

Nevertheless, there is no paralysis of the face; and the tongue, when protruded, does not deviate to either side, even when there is well-marked paresis in the arm and leg on one side of the body. But this paresis is not always confined to one-half of the body, although this is undoubtedly the general rule. Not only is the power of motion affected, but there also exist perversions of sensation, which are characterized by formication, numbness, a feeling as though the limb were asleep, or pins and needles were sticking in it, or as though water were trickling over it.

These abnormal sensations may be general, but they are usually localized in some particular part of the face or the extremities. The bowels are costive, the urine is scanty, high-colored, and abounding in an excess of the urates and phosphates. The appetite is either lessened or abolished, while

the digestion is imperfect. The pulse is at first full and slow, but, after a while, it is increased in frequency, and there is often present palpitation of the heart upon slight emotional excitement, which indicates a weak and excitable condition of the nervous system. The skin is either dry and harsh, or else it is bathed in perspiration. Examination, by means of the thermometer, shows an increase in the temperature of the head, while the æsthesiometer reveals the existence of an aberration, either of increase or diminution, in the tactile sensibility. The use of the ophthalmoscope will undoubtedly assist us materially in corroborating the fact whether the patient be suffering from cerebral congestion or not; and it is, therefore, of great assistance in arriving at a proper conclusion. If we find that the retinal vessels are increased in number, diameter, and tortuosity, that the optic disk is congested, and that the choroid is unusually red in color, we can safely predict that the patient is suffering from cerebral congestion; but, if there be added the symptoms that I have already described, we can say to a certainty that this disease exists.

In all instances, of course, the symptoms are not as well marked as in the case before us, or as in the description which I have given. Ordinarily, the patient is not confined to his bed, but is up and about, although he is not usually in a fit condition to attend to the more complicated duties of his business with any degree of efficiency.

The next case which I shall bring before you to-day differs in some important particulars from the one which I have just considered, but I will first read to you the history, so that you may then be the better prepared to comprehend the distinction which I wish to draw between it and that of active cerebral congestion.

Case II. *Passive Cerebral Congestion.*—"J. T. is forty-five years of age; is single; was born in Ireland, and is a stone-mason by occupation.

"He has a fine physical constitution, and has always had remarkably good health. There is no hereditary predisposition to diseases of the nervous system in his family, so far as he is aware. He is temperate in his habits, and has been

so all his life. He never remembers to have suffered from any form of disease whatsoever, excepting nocturnal emissions, which for many years past have occurred as often as three or four times a week, and at night during voluptuous dreams, and, as he thinks, are the cause of his present trouble. About Christmas, during the year 1867, he went to bed as usual, and soon fell asleep, but, contrary to his ordinary custom, he awoke in a short time, and was able to obtain little or no rest during the remainder of the night. Having always been accustomed to sleep uninterruptedly for at least seven hours every night, he retired the following evening at his usual hour, and again found no better success than on the previous occasion. From this period up to the time that he first came under our observation this abnormal condition has lasted, which is now about four years, although varying in degree under the influence of treatment; nevertheless he has seldom, during the whole of this long lapse of time, enjoyed a whole night's unbroken slumber. When he does obtain three or four consecutive hours of undisturbed sleep, he considers that he is doing well. One fact, however, is to be borne in mind, and that is, although this patient imagines that he sleeps only two or three hours out of the twenty-four, yet he undoubtedly underrates that amount, as most persons do who are unconscious, and probably obtains more rest than he really imagines. He has had no headache, no vertigo, no pain in the head, no illusions nor hallucinations; in fact, he has suffered from none of the many well-marked symptoms of cerebral congestion, if we except the persistent wakefulness, which in this case seems to be the prominent and prevailing symptom.

"Besides this morbid condition of wakefulness, he experiences at times a tendency to somnolence, although he is unable to sleep; and, when he passes into this condition, he suffers from dreams which are perfectly hideous in character, and which seem to affect him as much as though they were real. Before coming under our observation, he had been in the habit of drinking a pint of beer every night before retiring, and he seems to have realized some benefit from this agent, as it afforded him for some time about three or four

consecutive hours' undisturbed rest, and then he would awake, and he was able to obtain little or no sleep during the remainder of that night, nor even during the next day, although he felt as if he would fall asleep at any moment.

"Such had been his condition prior to his coming under our care, when he was examined, and the following symptoms were noticed:

"The appearance of the patient, although not peculiarly striking on inspection, is quite perceptible in some respects. There is a well-marked redness of the face, which partakes of a livid hue.

"There are a prominence and a fullness of the veins of the head, which are quite conspicuous. The eyes are dull and glassy in appearance, while the pupils are contracted; but the conjunctivæ are not injected. He has no headache at the present time, no vertigo, no flashes of light before the eyes, no ringings in the ears, and no delusions. His mind is clear, and he attends regularly to his business every day; yet he does not appear to grasp subjects presented to him with that readiness of comprehension which characterizes most persons of his degree of intelligence. His memory is very good, and his emotional system is by no means either excitable or depressed. All his bodily functions appear to be performed normally, and he is very well nourished, although he says that he has lost much flesh. His bowels are regular, his tongue is clean, and his appetite is not materially impaired. He is still troubled with unpleasant dreams, and, although he feels sleepy nearly all the time, he is unable to obtain more than three or four hours' undisturbed rest during the night, while it is quite impossible for him to sleep during the day. He also complains of a feeling of lassitude, which is more marked after his day's work is done than in the morning. His heart and lungs are healthy. His urine is deficient in none of its ingredients, but the alkaline phosphates are in excess. Examination of the eyes by means of the ophthalmoscope revealed the fact that the arterioles and veinules were increased in size. There was peripapillary infiltration in both eyes. The retinal veinules were tortuous and immensely dilated, forming large sacs, or pouches, which at first appeared as though clots of blood had

been effused; but this was not the case. He does not at the present time suffer from nocturnal emissions. His eyesight is good. The retinæ are intolerant of light, as is shown by the continued contraction of the pupils.

"He has been subjected to a great variety of remedial agents, as will be seen from the following list of some of the many which he has taken, viz.: bromide of potassium, hydrate of chloral, cyanide of potassium, humulus lupulus, tincture of valerian, tincture of hyoscyamus, phosphide of zinc, oxide of zinc, extract of nux-vomica, and beer. He has also had various remedies applied to his spine.

"From this category he has only experienced benefit from the bromide of potassium, the hydrate of chloral, and the potation of beer. But these in time lost their efficacy, and were soon relinquished to give place to others.

"The treatment recommended in this case was the passage of the primary galvanic current daily through the head, so as to act upon the vessels of the brain, with a pint of ale an hour before going to bed, and thirty grains of the bromide of lithium, thrice daily, well diluted in water. At times whisky has been substituted for the ale.

"After the lapse of two months the patient could sleep five or six consecutive hours, and the dreams which had afforded him so much discomfort were only occasionally present, and then lasted a very short time. He gained strength and flesh very fast, and, although not cured, the vessels of the retinæ had at this period perceptibly diminished in size."

Instead of the well-marked symptoms which existed in the previous case, we find in the patient before us only a few prominent features of cerebral disturbance; but yet these are sufficiently distinct to enable us to diagnosticate it from that of active cerebral congestion. I have already drawn your attention to the distinction between healthy sleep and stupor. Now, in passive cerebral congestion the vessels of the venous system are overladen with blood, owing to some interference in the return-circulation, and, as a consequence, the amount of venous blood in the brain becomes augmented. This condition is manifested by nearly the same phenomena in many

cases like those we have already observed in the other patient; but, instead of the morbid wakefulness, we find in the passive form a tendency to stupor which is never to be found in the active variety, while the character of the dreams in the patient before us is of that description which we find in those who suffer from the passive form of the disease. You may, however, have nearly all the symptoms which I have already described as existing in active cerebral congestion, in passive cerebral congestion, but, so far as my experience goes, they are never of a very prominent character, and, when they do exist, they are generally fewer in number, and only slightly marked. In the present instance, for example, we have a condition of wakefulness with a tendency to stupor, which is the prevailing feature of this patient's disease, and, besides, he suffers from the most frightful dreams. These are indications that the amount of venous blood in the brain is increased in quantity, for, the mere fact of dreaming points to cerebral hyperæmia; and, when we also consider that in the active variety of cerebral congestion there is no tendency to stupor, but, on the contrary, continual wakefulness, we are in a position to prove, even from the few symptoms which this patient presents, that he is suffering from passive cerebral congestion. And assurance is made doubly sure from the light which we derive through the means of the ophthalmoscope, which corroborates by ocular demonstration the result which we have already arrived at.

You will also observe that there are no headache, no vertigo, no illusions, no hallucinations, and no delusions, though all these symptoms are occasionally present. The patient's mind is not active, but he is able to attend to his business without any trouble, while there seems to exist no perceptible disturbance in his emotions, for he is neither irritable, peevish, nor fretful, but, on the contrary, he seems to be in a pleasant frame of mind. Without going into unnecessary details, I will call your attention for a moment to the excess of phosphates, which was found in the urine of both the patients which I have shown you here to-day. You know that the brain, like all the other organs in the body, is constantly undergoing destruction of its tissue, and that increased

action on its part accelerates the metamorphosis of nervous tissue which abounds in phosphorus, and, as a consequence, an increased amount of the alkaline phosphates in the urine is the direct result of an overworked brain.

Then, again, you perceive that the bodily functions of this patient are normally performed. His bowels are regular, his skin is moist and cool, his tongue is clean, his digestion appears to be good, his pulse is about 70, although a little weak, and his aspect has very much improved since I last saw him some weeks ago. He has been under treatment about two months, and he finds that he can now sleep the greater part of the night without being disturbed by those frightful dreams which annoyed him so much when I first saw him. He has also improved in flesh, and he says that he feels much stronger and more inclined to work than he did a short time ago.

But he has not yet recovered, for even now he sleeps only about five hours, whereas he has been in the habit of getting seven or eight. But, if he continues the treatment, he will be cured, and there is now no danger of the affection passing into the apoplectic, the epileptic, or the maniacal form, with due care on his part; for you know that the passive as well as the active variety of cerebral congestion often terminates in this way, although the former is much more liable to pass into one of the fully-developed forms than the latter.

There is another distinction to be observed, which it may also be well for you to bear in mind, and that is that the passive form of cerebral congestion is of more frequent occurrence in old persons than the active, and this is undoubtedly accounted for by the fact that the vital power is less in the aged than in those who are in the prime of life. Without dwelling any longer upon the premonitory form of cerebral congestion, I will pass to the consideration of some of its fully-developed varieties. I will first, however, read you the following history, which is a very good example of the disease in a more advanced stage:

Case III. *Apoplectic Cerebral Congestion of the Active Form.*—"A. C., who is thirty years of age, was born in the United States, is single, and a lawyer by profession.

"He possesses a very excitable and nervous temperament, and is very easily aroused to anger upon the most trivial occurrences, but nevertheless he had attained great reputation at the bar for a person of his age. He has always been very eccentric in his ideas and in his actions, but, notwithstanding this, he has devoted himself assiduously to his profession, having been an excellent student all his life. He has a rather weak constitution, and of late years has still more impaired his health by excesses of all kinds. He has been in the habit of sitting up very late, especially when he became interested in any important case, and, as his mental energies became weakened for want of rest, he would arouse them temporarily into activity by an increase in the quantity of brandy and strong tobacco used. Some years ago he had a severe attack of typhoid fever, which left him in a deplorable condition, and from the effects of which he has never fully recovered. Many members of his family have been and are insane. He has, for some time past, had the most exalted ideas of his own powers of intellect, and of his own importance, but these had not as yet obtained such a mastery over his mind but that he could be reasoned out of them quite readily by well-directed argumentation. Nevertheless, they showed very plainly that his mind was not in a healthy condition. Some three years ago he applied himself more assiduously to his professional duties than usual, still leading a very irregular life, and as a consequence he became very much reduced in health. He lost flesh, grew pale and thin, and could not sleep at night. He was troubled with unpleasant dreams, and when he awoke in the morning he felt so weary and depressed that he used to take three or four drinks of brandy before he could get an appetite for breakfast, and even then he ate very little. After breakfast he would commence to smoke strong cigars, which he indulged in almost uninterruptedly until dinner, and which he would resume as soon as that meal was finished, and continue until he retired at night.

"He soon began to complain of vertigo, a dull, heavy feeling in the forehead, and he had illusions of sight. He was despondent, and unable at this time to attend to his professional

duties in a satisfactory manner, yet he still tried to continue them to the best of his ability.

"About this period he received from home intelligence of a highly-exciting character, but he made no mention of the fact to any one, but went directly from his office to his residence, where he lighted the gas, and in about an hour was found lying on the floor in an unconscious condition.

"At this period he was in the following state:

"He was unconscious to all appearance, but not to such an extreme degree but that he could be partially aroused. His face was flushed, but there was no distortion. A candle held before his eyes caused him to close his eyelids. There was loss of power in the arm and leg on the right side; the temperature of the limb was not, however, diminished in degree, and on tickling the sole of his right foot it was immediately withdrawn. His respiration was slow, about 14 per minute, and a little irregular. His pulse was about 60, full and hard. There was no stertor, nor puffing out of the cheeks, although the respiration was somewhat noisy. When he was asked how he felt, he answered 'Yes,' and whatever questions were put to him he invariably responded to by the same answer. In the course of an hour, the stupor began to pass away, and he was then examined more minutely. He walked to his lounge with assistance, for the right side of his body was still weak. His mind was as yet very much confused, and he did not seem to realize where he was nor what had happened. He, however, in a short time recognized his friends, and, during the ophthalmoscopic examination, he said that 'he could not hold his eye steady because the light pained him.' His pupils were very much contracted and exceedingly sensitive to light. The retinal arterioles were immensely dilated, while the veinules were small. The former were also very tortuous, and their pulsation was quite apparent. The choroids were excessively red in color. Tactile sensibility in the right arm and leg seemed to be increased rather than diminished. The patient could move his arm and leg, which were quite warm and supple, but not with any great degree of facility. The tongue did not deviate when protruded. The pulse and respiration had increased somewhat in frequency.

There had been no relaxation of the sphincters of either the bladder or the rectum during the comatose state. The patient, as soon as he was put in bed, began to cry, but even during this emotional excitement no paresis of the muscles of the face was observed, although it was diligently sought for.

"His head was still hot, and his bowels were costive. His tongue was covered with a thick brown fur, and his breath was fetid. His eyes were bloodshot, and the vessels of the face, neck, and temples, throbbed with abnormal force. His digestion had been for some time impaired, and his appetite poor. The family also informed us that this young gentleman had been in the habit of using opium, but to what extent they were unable to state.

"He was ordered to be confined to his bed, and to be fed regularly with strong beef-tea. Ice was applied to his head by means of India-rubber bags, and thirty grains of the bromide of potassium were ordered to be taken every four hours until sleep was produced. No cathartics were administered, as the bromide was expected to act sufficiently upon the alimentary canal to cause an evacuation of the bowels. After the lapse of twelve hours, the patient fell asleep and slept soundly for about three hours; he then awoke and had an evacuation. The next day his tongue looked much clearer, his head was less hot, and his appetite, although poor, allowed him to take quite an amount of beef-tea. The quantity of bromide was now diminished to one hundred and twenty grains daily, and, as he gradually grew better, and slept longer, more nutritious food and a less amount of bromide were given. At the end of three weeks he was directed to go to the country, and as his sleep had become more regular, and his pulse was rather weak, he was advised to take phosphorus and iron as tonics, still, however, taking sixty grains of the bromide daily, well diluted in water. The paresis of the right arm and leg had, at this time, entirely disappeared, although he felt some weakness in the lower extremities, but this was undoubtedly due to the influence of the bromine. In the course of two months he had improved so much that he resumed the practice of law, but he was admonished to avoid, as much as possible, all those causes which had

been influential in developing the attack, such as intemperate habits and undue mental strain, and was told that, if these were continued, he would suffer a relapse which might be more serious in its consequences."

In the present instance we have a certain set of symptoms preceding the apoplectic stage of cerebral congestion, and this is generally the case, so far as my experience extends. But occasionally the attack comes on suddenly without any very obvious cerebral symptoms, although careful inquiry will generally reveal their existence. In the case of an old gentleman of this city, who was under my charge for cerebral hæmorrhage, there had been three or four attacks of loss of consciousness accompanied with paralysis of the right side. He would, for instance, be walking in the street, when suddenly he would be attacked with a sharp pain in his head; there would be specks floating before his eyes, noises in his ears, and then he would feel dizzy, his eyesight would become dim; he would stagger, lose consciousness, and fall to the ground. In a few moments he would recover his senses, but for some hours afterward there were paresis of the right arm and leg, and confusion of ideas. Now, if at this time proper treatment had been employed, the effusion of a clot of blood would not have taken place in this man's brain. The extreme congestion was merely the first stage toward a more serious lesion of the brain, for, as subsequently happened, owing to the weakening of the cerebral vessels on the left side, blood was effused during one of these attacks, and the patient is now permanently paralyzed on the right side of his body. This gentleman had also organic disease of the heart; but, that these attacks were not due to embolism is very manifest from the fact that there were premonitory symptoms, which, however, were of short duration, and there was no aphasia present, although the left side of the brain was involved.

In the apoplectic variety of this disease, the loss of consciousness is of short duration, and the loss of intelligence is never so complete as in cerebral hæmorrhage. The patient, although in apparently a deep state of coma, can be aroused and made to answer questions in the same manner as a patient

suffering from concussion of the brain. To be sure, the power of the mind is greatly lessened, but the senses still convey to the brain the excitations from without. Thus, a bright light, held before the eyes, will cause the patient to close his eyelids.

The loss of intelligence and of sensibility may exist for a few seconds or for hours, as will be seen from the cases which I have alluded to to-day.

The patient before you, you will remember, was unconscious for nearly two hours, while in the instance of the old gentleman, to whom I have just referred, consciousness was abolished for only a few seconds, or, at the most, a minute or so. The paralysis generally affects all four extremities, although it is occasionally restricted to a single limb or one-half of the body. In the present instance it is limited to the right upper and lower extremities. There is no paralysis of the face, and this is an important point of distinction between this form of disease and cerebral hæmorrhage, although occasionally a slight paresis of the face may exist, yet never to the same degree as that found in cerebral hæmorrhage. It is rarely that we find paralysis of the uvulæ and soft palate in this affection, which, as you know, is so commonly found in conditions of profound coma. The power of motion in the affected limbs is not abolished, but is merely impaired, for the patient can still perform many movements, but not perhaps with his accustomed facility, on account of a lack of the requisite amount of muscular strength. The reflex power is not much involved, for the patient still withdraws the limb upon the application of an ordinary excitation.

While in this semi-comatose condition, he replies to questions with difficulty and often very indistinctly; nevertheless, the mere fact of his responding at all shows that the sensorium is still able to take cognizance of external impressions, although very imperfectly. The respiration is generally slow, loud, and at times irregular, while the pulse is hard and full. The face is usually flushed, but occasionally it is pale. Tactile sensibility, like the power of motion, may be either increased or diminished, but it is never entirely abolished. The temperature of the affected limbs seems to be unaffected, and these,

even when the paralysis is well marked, are warm to the touch, and supple.

The digestive organs likewise may become involved. The tongue is coated, the bowels costive, and the skin is either dry or moist. The head is usually hot, and the urine scanty and high-colored, or pale and abundant. There is no paralysis of the facial muscles, consequently no puffing out of the cheeks and lips at each expiration. When the patient becomes conscious, which in most cases is in a very short time, it will be found that the tongue, when protruded, comes out straight. Where the premonitory symptoms have existed for some time, as in the patient before us, the physical symptoms of disordered cerebral action will be much more prominent than where this affection is initial, as occasionally happens. As soon as the stage of coma has terminated, we find that the patient suffers for a considerable period from both mental and physical exhaustion, which is the result of the excessive hyperæmia to which his brain has been subjected. Perhaps, of all the fully-developed forms of the active variety of cerebral congestion, none is more common than the one before us; consequently, when it occurs, we should be on our guard that active measures be taken to relieve the over-distended cerebral vessels as soon as possible, in order to diminish the risk which all persons run who are afflicted with this form of the disease, of the effusion of serum into the cerebral tissue or its ventricles, which speedily produces death as soon as it occurs.

Having thus called your attention to the principal symptoms in this form of the disease, I now pass to the consideration of another.

Case IV. *Active Epileptic Cerebral Congestion.*—"M. L., aged thirty-five, was born in Massachusetts, is a merchant by occupation, the father of two children, and a resident of this city. He is a short, thick-set man, of a highly-susceptible nervous temperament, and has suffered quite severely of late years from dyspepsia. He is temperate in his habits, and is partially deaf in his left ear, which is the result of a severe attack of scarlet fever which he had in childhood. When about twenty-four years of age, he had small-pox, and ever since his

convalescence from that disease he has suffered more or less at times from dyspepsia accompanied with gastralgia. His father died of cerebral hæmorrhage some years ago, and his mother is now afflicted with Bright's disease of the kidneys. He has also a sister who is at present confined in an asylum for the insane, where she has been for several years. His brother has been subject to violent paroxysms of neuralgia for the last ten years, but they would only last for a short period, and then disappear for a month or so, when they would return with renewed violence upon a very slight exciting cause.

"About a year ago his wife was attacked with typhoid fever, and, as he watched constantly by her bedside day and night, he became completely exhausted both mentally and physically, but still he contrived to administer to all her wants. At the same time he was obliged to superintend a large business, which caused him great anxiety, as he had entered very heavily into certain speculations which demanded his whole attention, and which he knew very well needed his watchful supervision. Finally, however, as his wife became worse, his mental condition was such that he could not concentrate his mind upon any subject, and he was obliged to delegate his business to his partner. He became peevish and irritable in the extreme; he suffered from severe headache, vertigo, and loss of appetite. He could not sleep; there were loud noises in his ears, bright flashes of light before his eyes, and a feeling of exhaustion which prevented him, in a great degree, from attending to the wants of his wife. His bowels were constipated, his urine high-colored and scanty, his cheeks flushed, and his pulse slow but weak. While in this condition, his wife died, and for three nights subsequently he did not sleep at all. He took morphine in small doses, but it had no effect whatever in producing sleep. At this time he learned that his speculations had been unfortunate, and had involved him very heavily in debt, and that, in order to save his good name, it was necessary that he should sacrifice all he had.

"He immediately ordered a carriage, with the intention of going to his place of business, to see if the report were true. On his arrival there he had a short conversation with his part-

ner, during which he became very much excited. Suddenly he turned very pale, said he felt very badly, and then gradually sank to the floor. At first his limbs were extended, perfectly rigid, and the fingers tightly drawn into the palms of the hands. In a short time, however, the color of his face changed to a dusky hue, and he was seized with clonic convulsions, which continued for about ten minutes, and then ceased. After this he passed into a condition of stupor, which lasted about half an hour. As soon as he rallied from this condition he became delirious, and continued so for several hours. From the commencement of the attack until the cessation of the stupor he was perfectly unconscious. He was now seen and examined, and the following points of interest were noticed: He was in a highly-delirious state. His eyes were bloodshot, glassy, and wild. His face was flushed and bathed in perspiration. He was at times incoherent, and he had illusions, hallucinations, and delusions, of various kinds, which were not fixed, but were constantly changing. His pulse was 120, quite weak, and irregular. His tongue was covered with a thick brown fur, and had not been bitten. It was necessary to restrain him, although not much force was required. He was perfectly conscious, and answered questions put to him, although at times rather incoherently. The bromide of calcium was ordered to be administered to him, in thirty-grain doses, well diluted in water, every three hours until he slept. The next day the delirium had passed away, and he appeared quite rational. As his bowels were costive, an aloetic purge was prescribed. At this time he was suffering from the symptoms of well-marked cerebral congestion of the active form, so that the bromide of calcium was continued, in thirty-grain doses, three times a day. As his pulse was very weak and his digestion very much impaired, he was directed to take strong beef-tea and a glass of sherry wine, *pro re natâ*.

"In the course of four or five days his tongue became clean and his appetite improved. He could now sleep soundly for five or six hours. He was at this time put upon a highly-nutritious diet of beefsteak, milk, and eggs. His bromide was not reduced in quantity until the end of two weeks, when

he slept very well, and then his daily allowance was sixty grains. In addition to the bromide, the primary galvanic current was applied regularly every other day to his head and sympathetic nerve, in the manner that has already been described. As he needed change of scene to repair his shattered health, he was advised to go to Europe, in addition to taking a tonic course of treatment, consisting of phosphorus, iron, quinine, and strychnia. At the end of six months he returned to this city and resumed his business, very greatly improved in health. It is now over two years since he first came under our observation; yet, since his return from Europe to the present time, he has had no cerebral symptoms whatever."

Before passing to the consideration of the causes and treatment of cerebral congestion, I wish to make a few brief remarks upon the present case. I have already told you that there are two varieties of the epileptic form of cerebral congestion—the active and the passive—but these do not differ from each other in such essential particulars as is observed in the apoplectic forms, where the symptoms are markedly at variance. The main points of difference between the epileptic forms I will briefly enumerate, in order to assist you in making the distinction. In the passive variety the tongue is more commonly bitten. The attack is more often followed by paralysis, which is of longer duration than in the active form of the disease. There is an increased length of the fit, and the stage of stupor is usually more profound, and generally lasts a longer time, while the repetition of the fits is by no means uncommon. The remaining phenomena, however, in these two varieties, are nearly analogous. But I have found, in the large number of cases which have fallen under my observation, that the epileptic form of passive cerebral congestion is of more frequent occurrence than that of the active. The active form generally occurs in persons who are in the prime of life, but it may occur in those well advanced in years, and then it is generally dependent upon some organic alteration in the brain, of which the epileptiform attack is merely the expression, and in these cases we can usually predict a fatal termination.

In the case which I have just read to you, you see that the attack is ushered in by the premonitory symptoms of cerebral congestion, and I believe this is generally the rule, although the attack, in some instances, takes place with great suddenness. It will be unnecessary for me, therefore, to dwell upon the premonitory symptoms which I have already so fully described, but I will rather call your attention to the attack itself, which is characterized by the absence of certain phenomena which are generally present in true epilepsy.

Suffice it to say that the patient staggers and falls to the ground slowly; that there is never an aura preceding the attack, nor is the onset of the paroxysm accompanied with that peculiar cry which is so commonly met with in instances of true epilepsy; that the tongue is rarely bitten; that the stage of stupor is neither so long nor so profound as it is in true epilepsy; that the stage of most intense congestion is not at the beginning of the attack; and that in epileptiform cerebral congestion the paroxysm is preceded by the well-recognized symptoms of the premonitory stage, which are not present in epilepsy. There may be a number of attacks, but it must be remembered that this form never takes place during sleep, and that the paroxysms are generally few in number, while in other cases there is a repetition of the attacks. In all other respects there is an analogy to epilepsy, which is very obvious. Without, however, going into a minute description of this case, let us examine some of its phenomena, and then we shall be able to contrast them with those found in epilepsy, which I shall consider fully in another lecture.

For some considerable period, you remember, there were, in this patient, manifest symptoms of cerebral disorder, which had at last arrived at such a degree of intensity that it only needed a slight exciting cause to bring on one of the fully-developed forms; and this was not wanting for any length of time, for the sudden news of his loss of fortune, together with the death of his wife, was sufficient in his state of mind to produce that culmination. Prior to his losing consciousness, however, he turned very pale, said he felt badly, and then slowly and gradually sank to the ground. You observe that there is no mention made of an aura, or of the peculiar cry, which were

undoubtedly absent, for I have never met with them in cases of this kind. The tonic convulsion was short, as it usually is in such cases, and then followed clonic spasms, which, in this patient, seem to have been general, although we often find them limited to one side of the body, or to a particular set of muscles. He then passed into a state of stupor, which lasted half an hour, and which, although long for this form of the disease, was neither as profound nor as prolonged as we often find in epilepsy. If the patient had been seen either during the paroxysm or the subsequent stage of stupor, it would have been impossible to have told whether he was suffering from true epilepsy or an epileptiform attack of cerebral congestion, without we had had more copious information upon the subject than those manifestations would themselves furnish. As soon as the stage of stupor had abated, the patient passed into a state of cerebral activity, which was characterized by illusions, hallucinations, and delusions, by increased heat of the head, flushing of the face, acceleration of the pulse, incoherence, an excess of motility, and congestion of the vessels of the brain, as shown by the active character of his delirium, and the loss of sleep. When asked certain questions, he replied quite rationally, although at times he was more or less incoherent; but, nevertheless, he showed by his ready replies that his brain took cognizance of external impressions, and that he was therefore conscious of what was said to him, while the character of the delusions, which were constantly changing, and some of which he was able to describe, could not have existed in a state of complete unconsciousness. From this fact we are enabled to draw the distinction very clearly, and prove that this patient was not laboring under an attack of epileptic mania; for, without loss of consciousness, there is no epileptic mania. On the contrary, instead of his mental faculties being obscured, they were in a state of undue activity; when asked to protrude his tongue, he did so with readiness; but there was no lesion of its tissue discoverable, which is another factor to be taken into consideration in arriving at a proper diagnosis. Although his motility was active, yet he was easily restrained with little or no force, and in this respect we see a wide difference from the blind, impulsive fury of the epileptic,

who unconsciously displays his excess of force in outward destructive action, which neither argument nor persuasion can at all influence. Another point, which it is well to mention in this connection, is the hallucinations of hearing in this patient. You remember that he was deaf in his left ear, but this did not at all affect the character or the intensity of his false perceptions, which were not derived from without, but owed their origin to an increased amount of blood in the auditory organs, and which would have existed if he had been completely deaf in both ears. The state of delirium is occasionally observed in those suffering from the present form of cerebral congestion, but its duration is generally short, lasting only a few hours or so, as in the present instance. After the attack has subsided, the symptoms of cerebral congestion still remain and need appropriate treatment, as has already been described in the history, but which I shall speak of more fully when I come to the subject of treatment. If, however, there be a succession of attacks, the mind and physical constitution of the patient are usually impaired in the same manner as in those who are subject to frequent attacks of epilepsy. The advantages of early treatment are aptly illustrated by the success which has followed in this case, and which has undoubtedly been the means of saving this gentleman from subsequent attacks, and from more serious organic changes which would have been sure to follow if his cerebral vessels had not been relieved of their excessive amount of blood.

The causes of cerebral congestion are numerous, and may properly be divided into two categories, namely, the predisposing and the exciting.

The former are to be found in the individual as an inherent part of his organization, and are, first, sex—for the disease is more common in males than in females. Next, age—the affection being more common in middle life and old persons. Then we have organic diseases of the heart, which may either increase the amount of the blood sent to the head, as in cases of hypertrophy, or impede its return, as we find in valvular disease and dilatation of the right side of that organ. And, lastly, we have shortness of the neck, though this point has not as yet been definitely settled.

Among the exciting causes are those which induce the active form of the disease by increasing the amount of arterial blood in the brain, and those which produce the passive form of the disease by obstructing the return of venous blood to the right side of the heart, so as to induce a sluggishness of the venous circulation.

Of these, the most common are bad hygienic influences, such as the inhalation of a noxious atmosphere, exposure to intense heat, cold, or dampness, a poor quality of food, sudden and excessive physical exercise, the ingestion of a large quantity of food, disease of the heart, a dependent position of the head, blows upon the head, constriction of the vessels of the neck from any cause, constipation of the bowels, rapid eating, the direct rays of the sun, certain general and local diseases, such as disorders of menstruation, erysipelas, the stoppage of a customary flux, fevers, embolism, thrombosis, and the like; alcohol, opium, quinine, strychnia, belladonna, hashish, and other drugs; the pressure of tumors upon the vessels of the neck, masturbation, excessive intellectual exertion, and great emotional disturbances, such as grief, jealousy, disappointed affection, and, above all, excessive mental anxiety.

In the four cases which we have considered, are we able to discover causes which sufficiently account for the production of this affection? In the first there was excessive mental exertion, which is, as you know, one of the most potent factors in causing cerebral congestion, while in the second I am inclined to believe that the patient has been addicted to self-abuse, and that the nocturnal emissions were the result of an erethism of the sexual organs, which had, in its turn, reacted upon the vessels of the brain and induced their distention. In the third, however, we have a number of factors, all combining together and acting as causes; for instance, there is the hereditary predisposition, which has been directly transmitted, as is demonstrated by the patient's eccentric ideas and actions. Then his irregular habits, his excessive mental exertion, the extravagant use of tobacco and brandy, had already brought his brain into such a congested condition that it only needed a great emotional disturbance, such as he received at that time from home, to develop the apoplectic form of the disease. Thus you see that

there may be one or many causes either acting slowly or with great suddenness. Lastly, we find, in the case of M. C., that the constant anxiety which he had undergone, on account of the sickness of his wife and the uncertainty of his business speculations, had already been sufficient to produce prominent cerebral symptoms. Then follow the death of his wife and the loss of fortune, and an epileptiform attack is the result, as might have been naturally expected, for in his condition one of the fully-developed forms of cerebral congestion would be easily induced. Thus we have anxiety, which is the most powerful of all the emotions, for by it the brain is so excited that the mind is kept continually on the stretch, unable to recuperate its exhausted strength, until finally, worn out, it gives rise to actual cerebral disease.

As the treatment has been described with each case, I will briefly detail to you in a few words what course I pursue in these cases, so that you may be prepared to treat them properly, for you will meet with them in practice more frequently than you might anticipate.

In the active form of the disease your aim is to diminish the amount of blood circulating in the cerebral vessels, and, in order to accomplish this successfully, you must lessen the force of the cerebral circulation, and also the quantity of blood in the brain. In the passive form, however, your object is to increase the intensity of the cerebral circulation, while at the same time you diminish the amount of venous blood in the vessels of the brain. I never employ the lancet in these cases of cerebral congestion, and I doubt very much the propriety of so doing, but I frequently apply a couple of leeches inside the nostrils or to the temples, or a few cups to the nape of the neck. I believe, however, that the beneficial result is more speedily effected when the hæmorrhage takes place from the nose, as the cerebral vessels are by this means directly acted upon.

You are always to look out for and discover the cause, and if possible remove it, as that is of the utmost importance, before resorting to other means. We happily possess in the bromides an agent which acts upon the calibre of the cerebral vessels, and diminishes the amount of blood circulating in them.

Of all remedies, none in my experience is so beneficial in depleting the overdistended vessels as some one of the bromides, and I make use of those in severe cases which contain the largest quantity of bromine, for this is the efficacious part of the drug. Greatly-increased experience of this agent has convinced me of the importance of using large doses in order to obtain the physiological effects. I generally employ a saturated solution of the bromide of potassium, which I administer in teaspoonful doses three times a day, well diluted in water, so that the patient will get about thirty grains of the bromide with each dose. The bromide of sodium may be used in a like manner. The bromides of lithium and calcium are to be taken in doses of fifteen or twenty grains three times a day, and in many cases are preferable to the bromide of potassium, which causes much constitutional disturbance in some instances, and they also contain a much larger percentage of bromine. The monobromated camphor is another excellent remedy, where you desire to produce a stimulant effect, and at the same time contract the cerebral vessels. The dose of this is five grains three times a day, or oftener, as circumstances require. It should be made up in pills. The oxide of zinc is also another powerful agent in relieving cerebral congestion, as well as a tonic. It can be given in doses of two grains three times daily, in conjunction with the bromides. As it is not soluble in water, care must be taken that the bottle be well shaken so as to equally distribute the amount. After the lapse of ten days or two weeks it will be found that the cerebral vessels have contracted, and that the patient is suffering from debility and mental depression, the result of the congestion. It is now expedient to make use of tonics, in order to build up the nervous system, and for this purpose I either employ an extemporaneous prescription of strychnia sulph., gr. j; ferri pyrophosphatis, quiniæ sulph., āā ʒi; acidi phosphorici diluti, zingiberis syrupi, āā ʒij; M. ft. mist. Dose, a teaspoonful thrice daily in water, or some one or more of these remedies separately. In other cases I use the phosphide of zinc, which I esteem very highly, in doses of a tenth of a grain three times a day. Fat in some of its various forms is an excellent adjuvant in repairing the debilitated nervous tissue.

Where there is great heat of the head, ice may be applied constantly in India-rubber bags, and it will generally afford great relief to the patient. The bodily functions are to be carefully observed, and regulated, if in an abnormal condition, by appropriate remedies. Thus, constipation is to be relieved by an enema of warm water and oil, and, if the urine be scanty, saline diuretics are indicated. The patient should be instructed to avoid the recumbent position as much as possible, and he should sleep in an easy-chair, so as to gain the advantage of the erect position, in order to facilitate as much as possible the flow of blood from the head. His food should be nutritious and digestible, and he should take plenty of exercise in the open air. The skin should be kept in a healthy condition by means of the Turkish bath, or by frequent bathing and subsequent rubbing with a crash towel. Stimulants are useful in the passive variety of the disease, in order to increase the force of the cerebral circulation, and here we find alcohol in some one of its forms is often very efficacious; while in other instances, the internal administration of the carbonate of ammonia, or the inhalation of sulphuric ether in small quantities several times a day, is attended with excellent results. At the same time the bromide, in some form, must be given in order to fulfill the most important indication, that of contracting the dilated venous vessels.

Lastly, we have a powerful agent in the constant galvanic current in lessening the calibre of the cerebral vessels and improving the nutrition of the brain, and this is not only useful in the active but also in the passive form of cerebral congestion. In regard to the mode of its application, we have already dwelt upon that subject at some length on a previous occasion.

LECTURE XVI.

EPILEPSY.

To-day I have had brought to the clinic some very interesting cases of epilepsy, and shall try to demonstrate to you as clearly as possible the prominent phenomena which are met with in this class of patients. You know that this is one of the most common affections of the nervous system that you will be called upon to treat in practice, and you should therefore be well prepared to recognize it under any of its manifold manifestations.

By epilepsy we mean that condition which is characterized by paroxysms of more or less frequency and severity, during which consciousness is lost, and which may or may not be marked by slight spasm, or partial or general convulsions, or mental aberration, or by all of these factors combined. The prominent and characteristic feature of an epileptic paroxysm, whether it be of the *grand mal* or the *petit mal* variety, is loss of consciousness, for, if this do not exist, there is no epilepsy properly so called.

Occasionally, however, in aborted seizures, there may be a kind of semi-consciousness present, but the patient, when the attack has passed off, has no recollection of its phenomena.

You know that, in my didactic lectures upon this subject, I told you that many authors recognize only two varieties of this affection, the *grand mal*, or severe seizure, and the *petit mal*, or light seizure. I have, however, been in the habit of dividing this disease into four distinct forms, which seems to me to be a more proper and precise classification than that which has been generally adopted.

As I intend to illustrate these different divisions by cases, as far as practicable, it will not be inappropriate for me, at this time, to refreshen your memories by giving you the classification which I make use of:

1. Momentary unconsciousness without marked spasm.
2. Unconsciousness with evident though local spasm.

3. Unconsciousness with general tonic and clonic convulsions.

4. Irregular or aborted attacks.

These four divisions may be met with either separately or combined, or there may be certain complications, such as paralysis or mania, which are not included in this classification. You may have the attack come on very suddenly without any premonitory symptoms, or it may be ushered in by prodromata, which, as a general rule, only precede the paroxysm by a very short lapse of time, while, in other cases, there are well-marked manifestations of an approaching attack for a considerable period.

You will also find that, in some patients, the seizures take place only during the day, in others they occur at night during sleep, while there are cases in which the paroxysms come on both during the day and the night.

In the majority of epileptics, the premonitory symptoms are so immediate as to form a part of the paroxysm; while, in many instances, the first indication we have of an approaching seizure is the attack itself.

The precursory phenomena may manifest themselves in any part of the body, not only differing in situation, but also in character; and they may vary from a simple attack of vertigo to sensations of almost any kind which can well be imagined, and these may be few or many in number.

In some instances we have a well-defined aura, which is a sensation that commences in some distant part of the body and is rapidly propagated toward the head, and which, as it usually is of the same character in subsequent attacks as it was in the first, is a valuable indication of an approaching seizure. As soon, however, as the aura has apparently reached the head, the patient becomes unconscious.

With these few preparatory remarks, I will now proceed to read you the following history:

Case I. *Epilepsy. Petit Mal and Grand Mal.*—"J. F. is thirteen years of age, was born in New York City, and, until two years ago, was a hale, hearty little fellow, always having had the best of health. The first thing that attracted the at-

tention of his mother was, a change in his disposition and conduct, which at times was more marked than at others. Instead of being cheerful and fond of play, he would become sulky and depressed in spirits, and, when asked what was the matter, he would reply 'that he did not feel well, and that his head troubled him.'

"One day, however, his mother noticed that he did not reply when she spoke to him, and, on looking to ascertain the cause, she discovered that he was unconscious, that his eyes had a peculiar appearance, and that his face was distorted, being drawn to one side. In the course of time these attacks began to occur more frequently, and took place not only during the day but also the night, and were accompanied by the dribbling of saliva from his mouth. When an attack came on at night it always awoke him, and with a start he would sit up and catch tightly hold of the side of his bed for a few seconds until it was over. During the paroxysm he was perfectly unconscious, and the only manifestations that were observed were the spasms of the muscles of the face on one side, the fixedness of the eyeballs, and the clutching of the side of his bed, together with dribbling of the saliva.

"At first he had two or more seizures in the course of twenty-four hours, but these gradually increased in frequency, until the lapse of a year, when there were superadded attacks of the *grand mal*, which were characterized by the following phenomena:

"He first felt a peculiar tingling sensation, which commenced in the apex of the tongue, and then quickly mounted to the head, when he became unconscious. Before, however, losing consciousness, he became very pale and felt dizzy. Then followed loss of consciousness and tonic rigidity of the muscles of one side of the body. This lasted for about ten seconds, and then followed the second stage, marked by clonic convulsions, redness and lividity of the face, frothing at the mouth, and irregularity of the respiration, which generally continued for about a minute, and then he passed into the condition of stupor, which lasted for an hour or more, but, if the attack occurred at night, he would not awake until morning.

"As the lesser attacks increased in frequency, they were

accompanied by spasms in the muscles of the throat, which gave rise to a peculiar gurgling sound. For several days the attacks of *petit mal* would be repeated at frequent intervals, and then would follow a *grand-mal* seizure, when for a few days he would be free from paroxysms of either kind. When the lesser attacks occurred in the daytime, he always caught hold of some article of furniture, and remained standing until it had passed; but, when the paroxysms of *grand mal* came on, he not only lost consciousness completely, but fell to the floor suddenly. A year before coming under our observation, his mother was able to calculate very exactly when a seizure would take place, from his ill-temper, extreme nervousness, and discontent, which were the precursors of an approaching paroxysm. He has had two very severe attacks of the *grand mal*, and after one of these his arms were powerless for some time.

"On another occasion he had a continued series of convulsions, lasting for about two hours, which was the cause of his mother again seeking medical advice. Within the last six months she has found that he frequently wets his bed at night. There is no hereditary taint in the family, so far as relates to diseases of the nervous system.

"On admission to the Out-door Department of the New-York State Hospital for Diseases of the Nervous System, J. F. was in the following condition:

"He was very pale and anæmic, and had the characteristic appearance of a person suffering from epilepsy. His pupils were dilated; his facial expression was stupid in the extreme. His memory was impaired; his ideas were very much confused, and his *morale* greatly perverted. He was unable to do even small errands for his mother with any degree of certainty, for he would either lose the money she had given him or forget the errand upon which he had been sent, so that he could not execute it. He complained of a dull feeling of constriction in his head, and was morose and irritable in the extreme. There were on his forehead and chest little spots of extravasated blood, which did not disappear upon pressure, and which betokened a recent attack of the convulsive seizure, which he said he had had upon the preceding day.

"Frequently there were convulsive movements of the face, attended by loss of consciousness, together with glottis spasms, dribbling of saliva, and a loud, gurgling noise in the throat. He at times passes his urine involuntarily during sleep, and in the morning he complains of headache and nausea after a nocturnal attack. Increased irritability, perversion of character, and mental obtuseness, are the precursors of an impending attack of the *grand mal*.

"His appetite is poor, his bowels regular, and his sleep is frequently troubled by disagreeable dreams. His heart and lungs are healthy.

"The retinal circulation is normal. The attacks of *petit mal* occur at present very many times a day, while those of the *grand mal* come on at regular intervals, varying from a few days to two weeks. There seems to be no cause, either predisposing or exciting, which can be ascertained, that is of sufficient importance to account for these epileptic phenomena.

"He was immediately placed upon a saturated solution of the bromide of potassium, of which he took a teaspoonful three times a day, well diluted in water, but without any perceptible effect. The amount of the bromide was gradually increased, until he took one hundred and fifty grains as a daily allowance, which, in the course of a week, produced the well-marked effects of bromism, and the amount was then diminished to one hundred and twenty grains a day, as he had had no fits since being brought fully under its influence. For over three months he was entirely free from an attack, but at this time he omitted to take his bromide, and the fits returned. As he was very much run down in health, he was ordered to take only ninety grains of the medicine, but his attacks still continued. The amount was again increased to one hundred and twenty grains a day, which has been efficacious in completely stopping them for the last eight months, during which period he has not had a single attack. Owing to his impaired appetite, the broken-down condition of his general health, and the trouble which he experienced from the abscesses which had formed in different parts of his body, the medicine was at times reduced to ninety grains a day, but almost immediately there were indications of an approach-

ing attack, so that it was not considered safe to give him less than one hundred and twenty grains, which amount seemed to keep the fits completely under control, which no smaller quantity was able to do."

In this patient you notice that there are two different kinds of attacks, which are sufficiently distinct to enable us to distinguish the one from the other. There are paroxysms of the *petit mal*, or lighter seizure, which are characterized by sudden loss of consciousness, lasting for a very short period, during which the patient remains in a fixed position, catching hold of some object, which he firmly grasps, during its continuance, with his hands; and there are also convulsive movements of the face, which are well marked, and limited to one side of that organ, more particularly around the corners of the mouth, which are accompanied by the dribbling of saliva, which is due to the temporary paralysis of the buccal muscles. As the disease has progressed, we find that the muscles of the pharynx have become involved, giving rise to glottis spasms; and that, when the attacks take place at night, the contents of the bladder are evacuated.

From these phenomena we are able to diagnosticate that variety which I have classified as unconsciousness, with evident though local spasms, and which is characterized by loss of consciousness, attended by convulsions, which are at times very slight in degree, and at other times well marked. Yet they are always limited in extent. As for example in this patient, there were spasms of the muscles of the hands and of the angles of the mouth on one side, together with convulsions of the muscles of the pharynx, which are by no means uncommon occurrences.

In other instances the tongue is pushed forward between the teeth, in which position it is injured by the spasmodic contraction of the muscles of the jaw, or there is a sudden rotation of the head, or a momentary strabismus, or a tugging at the hand, or the grasping of some object, as a chair, which you will remember was the case with this patient. All these acts are performed in a state of unconsciousness. Although they may at times appear to have been accomplished in ac-

cordance with the will, nevertheless they are perfectly automatic; and, after the attack has passed, the patient has no recollection of any thing that has transpired. These attacks were ushered in by prodromata, which were manifested by changes in the conduct and the disposition, and which, in the present instances, preceded the attack by a considerable interval. Then it will be observed that the paroxysms seldom last over a minute, while their average duration is generally much shorter. In many cases there are no subsequent phenomena after an attack of this kind; the patient immediately recovers his consciousness, and feels quite himself again. But this is by no means always the case; for, after a very mild seizure, some patients suffer from headache, vertigo, and confusion of ideas, to the same degree as if they had had a *grand-mal* seizure. The lighter attacks increase in frequency as the disease progresses; and, as a general rule, they occur at much shorter intervals than the fully-developed paroxysms. It is by no means uncommon to find different varieties of epilepsy in the same individual, as we have in the case before us.

Besides the frequent attacks of the *petit mal*, there have been occasional paroxysms of the *grand mal*, which began to make their appearance after the lapse of a year from the inception of the epileptic seizure. These have also increased in frequency, so that at the present time they recur about once a week. They are preceded by well-marked prodromata, which are increased irritability, perversion of character, and mental obtuseness, together with an aura which commences in the apex of the tongue, and then rapidly ascends to the head, when the patient loses consciousness and falls to the ground as if struck with a club.

There is no cry, but merely extreme pallor of the countenance and severe vertigo, which immediately precede the loss of consciousness.

Then follows the stage of tonic rigidity, which is usually of short duration, seldom lasting more than a few seconds, and during which the respiration is greatly impeded, the pupils dilated, the countenance livid, the body drawn to one side, the pulse weak and rapid; there are strabismus, throbbing of the carotids, tonic rigidity of the muscles of the neck, and those of one side of the body, and entire abolition of sensibility.

Then this stage passes away, and convulsions of a clonic character supervene. These are present on only one side of the body, and keep the limbs in constant agitation. The lividity of the face still continues; the respiration is irregular; there is frothing at the mouth, but you will observe the tongue is not bitten, which shows that the roots of the hypoglossal nerve are not involved. The muscles of the neck do not become relaxed during this stage, as is seen from the continuance of the livid hue of the face, which is now at its acme. After the lapse of a minute or more, this stage passes away, and the patient either begins to return to consciousness or passes into a condition of stupor which continues from a few minutes to an hour or more. This case illustrates very well the main features of these two forms of epilepsy; but, as I intend to show you a case of the *grand mal*, which is not complicated with any other form of the disease, I will merely call your attention to a few points before passing to the consideration of the treatment.

You know that the motor power of epileptics is as a general rule weakened, without there being any well-marked paralysis, and, even in such exceptional cases as the one before us, we see that, even where there is decided paralysis, it does not last for any considerable period, but quickly disappears, like that of cerebral embolism. Considerable intellectual impairment is the exception rather than the rule in epileptics. Reynolds has found that the mind was perfectly normal in thirty-eight per cent. of his cases, and, from my own experience, I have seen many cases in which the disease, even when fully pronounced, was unattended by mental change. But, nevertheless, the mind sooner or later becomes involved, and a first attack late in life is often the precursor of subsequent dementia. But this fact is to be particularly borne in mind, that the mild attacks, unattended by convulsions, are much more apt to produce impairment of the intellect than the more severe seizures. Even in the intervals between the paroxysms these patients may exhibit not only disorders of the intellect, but likewise their sensorial and motor functions may be involved. You remember the degree of impairment of the mind of this patient when he first came

to the hospital. His memory was impaired to an extreme degree, his ideas were confused, and his whole intellectual life seemed to be in abeyance. Such was his condition before he ever had an attack of *grand mal*—and such has been the experience of all those who have seen many epileptics, that the attacks of the *petit mal* are more likely to produce this mental change than those of the *grand mal*.

Some of you may remember this boy when he was present at this clinic a year ago. He was then placed upon the bromide of potassium, in large doses, and these doses have been continued, and at times increased, so that now he has not had a fit for eight months. He is at present taking one hundred and twenty grains per day. He has taken as high as one hundred and fifty grains per day. But one hundred and twenty grains is his ordinary daily allowance. As you see, he is broken down in appearance, has large abscesses in his neck, and is altogether in a bad condition. But this is better than to have epilepsy. This attenuated form, these pustules upon the face, and boils or abscesses upon the neck, are all the effect of the large doses of the bromide of potassium which he has taken. But, I think he should continue the medicine for three or four months longer at least. All these effects will disappear very rapidly as soon as the medicine is stopped; but you can help them disappear by the assistance of strong, nutritious food. It would be the height of folly now to stop the medicine on account of the effects it has produced upon his system, for by so doing the fits would undoubtedly immediately return. As you see, his memory is now quite good in comparison to what it was. His ideas are not at all confused, and he reasons and comprehends very well indeed for a boy of his age. He has now no pain in the head; but, as soon as the medicine is cut down to ninety grains a day, all his premonitory symptoms come back immediately. I believe it is better to continue the medicine all his life than for him to have epileptic paroxysms.

An important fact to notice in this connection is, that all the disagreeable effects of the medicine will wear off in about six months, so that in the course of time it will cease to produce boils, abscesses, and the other disagreeable effects of the bromic cachexia, which, I believe, is favorable to the eradica-

tion of epilepsy, and that is the reason why I endeavor to produce bromism, as it appears to so alter the whole organism of the patient that, when it ceases to exist, there is no danger of the disease returning. Perhaps the occurrence of these large abscesses at the back of the neck is beneficial to him. I have seen cases where the addition of a seton to internal remedies has effected a favorable result. A gentleman from Wheeling, West Virginia, came under my care about eighteen months ago for epilepsy, and, with large doses of the bromide of potassium, I could obtain no favorable result. In addition to the bromide, I now passed a seton deeply through the muscles of his neck, and the fits at once stopped. These two things were necessary to be employed in his case, in order to arrest the progress of the disease. He has not had an attack for fifteen months, and he has continued to wear the seton all this time. Ordinarily, when a patient has passed fifteen months without a fit, they do not return, but occasionally they will come back in some unexplained way. I have begun to reduce this gentleman's medicine somewhat by diminishing his daily allowance about thirty grains. I shall continue the remainder for about two months, and then cut off thirty grains more, and so on until the medicine is stopped, a process which will take about six months.

[NOTE.—J. F. continued under our care until July, 1873, a period of about eighteen months, and during fourteen months of this time he had no attacks of either the *grand mal* or the *petit mal*. At the end of twelve months he had so much improved in general health, the boils and pustules on his face having entirely disappeared, that the amount of his medicine was diminished to ninety grains a day, which quantity he continued to take for a period of two months, while his general health, his mind, his memory, his conduct, his temper, all seemed to gradually improve. As fourteen months had now passed without his having a single fit, we told him to still continue taking the ninety grains daily for a few months longer, so as to be sure of eradicating the disease. He then passed from under our observation, but, some time after, his mother informed us that he had had a continued series of fits, which

lasted several hours, and which are commonly called the *status epilepticus*. He had, however, as far as we were able to learn, taken his medicine regularly up to the time when this attack occurred. Since then the patient has passed from under our care.—T. M. B. C.]

Having shown you a patient who was afflicted with two varieties of epilepsy, I will now present you another who is suffering from the *grand mal* only, and whose history is as follows:

Case II. *Epilepsy. Grand-Mal Seizures. Nocturnal Form.*—"C. R. is thirty years of age, was born in Ireland, is single, and a cooper by trade. He is a strong, muscular man, and had been quite free from sickness until 1861, when he had his first epileptic attack. There is no predisposition to epilepsy, or any other disease of the nervous system, in his family, either as regards the direct line or its collateral branches, so far as could be ascertained. He has been in the habit of drinking spirits, but never to excess. Some years prior to the commencement of the fits, he had been addicted to onanism, which he practised very frequently, and which he continued up to the time of their first occurrence. During this period he often suffered from nocturnal emissions, which were accompanied with voluptuous dreams.

"During the year 1861 he went to bed one night feeling quite well, although somewhat fatigued, and soon fell asleep. How long he had continued in this condition he was not aware, but suddenly he was aroused by a feeling of impending danger, as if something dreadful was about to happen. He then called out loudly for assistance, to his mother, who was in an adjoining room, and who came immediately to him. When she arrived, he was unconscious, his face was livid, his mouth was covered with foam, which was tinged with blood, and the left side of his body was every now and then thrown into violent involuntary convulsions, while the right seemed to be unaffected. After the lapse of two or three minutes the patient became more or less conscious, the convulsive movements of the limbs ceased, and he now complained of feeling heavy and

stupid, but almost immediately he passed into a state of stupor from which he did not rally until morning. Then he felt very badly. He had a dull, aching pain in his head, accompanied by nausea. He was dizzy at times, and he loathed the very sight of food. In the course of a day or so these symptoms passed away, and he felt quite himself again. At first these attacks occurred once in every two months, and were very severe in character; but after a while they increased in frequency, so that he would have a fit regularly once a week for a period of two or three months, and then a remission would take place for a month or more, during which time he would have only one attack. These fits usually came on after he had been asleep about half an hour, and consequently were of the nocturnal variety. He was admitted to the Out-door Department of the New York State Hospital for Diseases of the Nervous System, September 19, 1871.

"At that time his condition was as follows: His memory is somewhat affected, especially as regards dates and familiar names. His intellect is far from active, although on some points he is quite clear; but he does not seem to be able to fix his attention upon one subject for any considerable length of time. His aspect is characteristic of the disease from which he suffers. He complains of unpleasant sensations in the epigastrium and in other parts of the body. He is always awakened, before losing consciousness, by a severe spasm, which commences in his left hand and rapidly travels up his arm toward his head, so that he has time enough to call out for help before he becomes unconscious. When, however, his left arm is violently seized at the time that he first feels the aura commencing in the left hand, the attack does not take place, but is cut short by this means. When his fits do not take place shortly after going to sleep, they occur later, but always at night. He does not, therefore, complain of dizziness or headache before the attack, but instead of these phenomena there are twitchings of the muscles in the left lower extremity, together with the aura, which has already been mentioned. His tongue presents the signs of several injuries which it has received during these nocturnal attacks, by being caught between the teeth and badly bitten during the clonic convulsions of the muscles of the jaw.

He has never suffered from incontinence of urine or of fæces. Nor are there any injuries about his head or face, which would show that he had experienced an attack during the day. He is depressed and melancholic, and little inclined to attend to his business.

"When he came to the hospital, he had had only one attack in the last two months. Latterly, however, he has been warned of the approach of a seizure by a clonic spasm in the sterno-cleido-mastoid muscle of the right side, which slowly and gradually draws his head toward the right shoulder for a certain distance, and then relaxes. This occurs consecutively four or five times during the day, and then the aura commences at night, and the fit follows as soon as it has reached the head, which ordinarily is in a very short space of time. These violent twitchings of the muscles of the neck are not accompanied with loss of consciousness. The fits have, as has already been mentioned, increased in frequency; but, as they have increased in this respect, they have become less severe in character. Ophthalmoscopic examination of the retinal circulation shows that the structure at the base of the eye and its vessels are in a perfectly normal condition. There are no petechiæ upon the face or chest. The patient, during the ten years that he has had this disease, has not had any medical advice. His pupils are much dilated at present, and his bowels are constipated.

"He was immediately put upon a saturated solution of the bromide of potassium, of which he took a teaspoonful, well diluted in water, three times a day. At the end of a week he had another attack, which was not as severe as usual. As he complained of much distress in the epigastrium and abdominal region, we discontinued the bromide of potassium, and substituted the bromide of sodium, which he took in thirty-grain doses three times a day. Whenever he felt the aura coming on, his mother was instructed to grasp his arm firmly, so as to prevent the fit; but, as he has had no attack in ten months, she has not had occasion to resort to this procedure."

This case, although not as explicit in many of its symptoms, is, nevertheless, much more full in its details than the

cases you will ordinarily meet with of the nocturnal form. It is often the case that fits take place during sleep, and the patient is unaware of their occurrence. In the morning he awakes feeling stupid, and as though he had not enjoyed his regular night's repose; he may have headache, vertigo, and nausea. His limbs may be sore from the severe convulsions they have experienced during his unconsciousness, and, when he arises, he is unable to account for the pain and soreness from which he suffers, or he may have bitten his tongue, and this may have escaped his notice, except he be questioned in regard to that fact, when he will remember that the pillow was stained with bloody saliva, and that for one or two days he had an unpleasant sensation of pain in his mouth when he masticated his food. He may have passed his water or his fæces involuntarily, and the reason for so doing he may have attributed to some slight indisposition, or he may have injured himself during sleep; and yet, even then, he is ignorant of the the true cause of his wound.

I have met with many of these symptoms in the large number of epileptics which have fallen under my observation, so that, whenever I find a patient suffering from one or more of these phenomena, I inquire carefully into his history, and I generally succeed in discovering that the cause of these abnormal symptoms is due to nocturnal epilepsy. Some time ago I was called to see a patient, in consultation, who was supposed to have had an attack of cerebral hæmorrhage during sleep. On carefully examining the patient, who was a very muscular young man, I discovered that the head of the humerus was in the axilla, and that there was a dislocation which accounted for the loss of motor power in his right arm. He told me that he had retired that night feeling remarkably well, but that, on arising the following morning, he found his shoulder very painful, and that he was unable to move his arm. He also complained of soreness of the muscles on the right side of his body, which he could hardly touch without causing pain. On protruding his tongue, I observed that it was bitten, and there were the marks of former cicatrices, which convinced me of his having had a number of epileptic attacks. He complained of headache, and I noticed some petechiæ upon

his throat and chest. From these phenomena, I knew very well that this young gentleman had had a fit during the night, and, during the violent convulsive stage, his arm had been dislocated.

In another case which came under my care, the patient, a young lady, came to consult me in regard to her head. She mentioned, incidentally, that she was in the habit of passing her water involuntarily, once in about every two weeks, while she was asleep. On questioning her closely, I found her memory weak, her ideas confused, and that she suffered the next morning, after these involuntary losses of urine, with a severe headache. From the impairment of this young lady's mind, which was very well marked, the periodical occurrence of her loss of urine—which was almost invariably followed the next morning by a severe headache and an increased confusion of ideas, and which was present at no other time—impressed me strongly with the belief that she was subject to epilepsy. Nor was I mistaken, for a short time after she had a well-pronounced attack of the *grand mal*.

From these instances you will perceive that there is no invariable law in regard to the occurrence of any particular form of epilepsy, or of symptoms. As a general rule, however, the nocturnal attacks are not accompanied by such well-marked premonitory symptoms as those of the diurnal, for the reason that the patient, being in a condition of sleep, does not take cognizance of existing impressions, or else these phenomena do not exist. Generally, the attack takes place suddenly, and the patient is either awakened from his sleep, and utters an inarticulate cry of a peculiar kind, and which has been compared to the bleating of a young lamb, or else he passes into a state of convulsion, without ever having been aroused. Without going minutely into details of the symptomatology of a *grand-mal* seizure, which I have already described at some length in the preceding case, I will rather call your attention to some of the phenomena which we have not as yet carefully considered, and which differ in some respects from those which we have already observed.

The disorders of motility are very well manifested in the present instance. There are clonic convulsions of the sterno-

cleido-mastoid muscles on the right side, which are present during the day, and which forewarn the patient, almost to a certainty, that he will have a fit the following night. Before this supervenes, however, he experiences twitchings in the left leg and a severe pain in the left hand, which is caused by a violent tonic spasm of the muscles of that member. These derangements of the motor power are present in many cases, and betoken an increased excitability of the reflex power of the spinal cord. We also find that there are impairments of sensibility, which are characterized by vertigo, headache, pain and numbness in different parts of the body, and from which this patient has not been free. You recollect that, during the convulsive seizure, his tongue was severely bitten by being caught between the teeth during the contraction of the muscles of the jaw, and in this way we can account for the froth, tinged with blood, which escaped during the fit, from his mouth. In those instances where the tongue is injured, we have strong reason to believe that the roots of the hypoglossal nerve are in a state of hyperæmia, for it is only in the convulsive form of the disease that this accident happens. I have already spoken to you of an aura which, in the preceding case, commenced in the apex of the tongue, and then so quickly mounted to the head that the patient almost immediately became unconscious. In the patient before us, however, it was ushered in by a feeling of pain in the left hand, which was so severe in character as to awaken him from his sleep. Nevertheless, before it ascended his arm and reached his head, he had plenty of time to cry out and inform those around him that the attack was about to take place. It would have been easy to have stopped the fit at this time if his left arm had been immediately tightly compressed, either by a strap or by the hand of any person who was near by at the time. I have known an attack to be cut short by a person suddenly changing his position; another can arrest the fit by putting salt in his mouth; and in other instances, where the aura commences in some distant part of the body, a ligature, tied tightly around the limb, above the starting-point of the aura, will be sufficient to prevent a seizure.

In all cases where there are sensations of numbness, of

tingling, of cramp, or of pain experienced by individuals in different parts of the body, and which proceed rapidly toward the head, and which are in reality auras, properly so called, it is always expedient to strive to arrest the fit by means of the ligature, especially if the aura commences in some one of the extremities, as a hand or foot.

Like the attacks of the *petit mal*, the *grand-mal* seizures increase in frequency as the disease progresses; but, usually, the latter become milder as they are more frequent. I have been in the habit for several years of examining, with the ophthalmoscope, the fundus of the eye of all epileptics who have come under my observation, and in a large number of these, in which there existed either cerebral congestion or cerebral anæmia, I have obtained valuable information, which has aided me very materially in effecting a cure. Nevertheless, there are some cases in which there can be discovered no changes in the cerebral circulation; and to this category belong the two cases which we have considered to-day. This patient has now been under treatment one year, and, during this time, he has taken thirty grains of the bromide of sodium, well diluted with water, three times a day. After passing ten months without having a fit, he inadvertently omitted taking his medicine, and the fits returned. But, since then, I have increased the amount of the bromide to a hundred grains daily; and even now, as you see, he exhibits no symptoms of bromism, and he has had no fit for over six weeks. When I touch the base of his tongue or fauces with the handle of this pencil, you perceive that he is nauseated, and the muscles of his throat are at once susceptible to the touch, which shows that he is not yet taking a sufficient amount of the medicine; for, as soon as he is under its influence, the reflex faculty of the pharynx will be lessened. In cases which have lasted as long as this, we can rarely hope for a favorable termination; but, considering the happy effect which the bromide has exercised upon this patient during an interval of ten months, we can well anticipate a cure in this case, if the patient will only persevere in taking the remedy regularly for a period of eighteen months or more. It is not always easy to explain how the bromide acts in so favorable a manner in some of

these nocturnal cases of epilepsy, but such, nevertheless, is the fact, that in some few instances of this form of the disease it is efficacious in arresting the paroxysms. Generally, however, in the nocturnal form of epilepsy, strychnia will be found to be more beneficial than the bromide, and in the non-convulsive seizures rather than the convulsive.

[Note.—C. R. continued under our observation two months after the amount of his bromide was increased to a hundred grains daily, and during that time he had no return of the fits. We then lost sight of him, and he has not since returned under our care.—T. M. B. C.]

Case III. *Gastric Epilepsy. Grand Mal. Nocturnal Form.*—"A. C., aged twenty-eight; was born in the United States; is single, and a house-keeper by occupation. Had been the subject of epilepsy for four years when she first came under our care. She was a woman of industrious and steady habits, and had never been sick until the commencement of these epileptic seizures. Her grandmother on her father's side had been afflicted with epilepsy for many years, so that we obtain a direct hereditary predisposition to that disease in her case. In the winter of 1866 she had her first attack, which occurred at night, and was not very severe in character. At this time she was observed, by a friend who was sleeping with her, and who was awakened by her convulsions, which lasted a minute or so, to be perfectly unconscious; her eyes were fixed; froth, tinged with blood, issued from her mouth; her hands were clinched, the fingers being drawn strongly into the palms of the hands; her face was livid, and the convulsions appeared to be equal on both sides of the body. In a short time these disorderly movements ceased, and she passed into a condition of stupor, without regaining consciousness, from which she did not arouse until morning. Then followed violent headache and nausea, and she complained of soreness of her tongue, especially in the act of eating, or in taking hot or cold drinks. It was also discovered that she had passed her water involuntarily during the night. She was questioned closely the next morning in regard to the remembrance

of the events of the preceding night, but she was unaware of what had taken place.

"These paroxysms at first occurred about once in three months, but have continued to increase within the last four years, not only in frequency but also in severity, so that when the patient first came under our observation she was having a fit about once a fortnight. The only cause that we were able to discover, besides the hereditary predisposition, was, that, on the day preceding her first attack, she had eaten very heartily, before retiring, of corned-beef and cabbage, and this was undoubtedly the exciting cause of the epileptic seizure. You will observe that there were no premonitory symptoms whatever, such as headache, vertigo, an aura, glottic spasms, or crying out for help, for she did not awaken, but, from a condition of unconsciousness, she passed directly into epileptic convulsions. Her seizures have always been of that variety which we call the *grand mal*. They have always occurred at night, and have never been over two minutes in duration, both sides of the body being about equally convulsed.

"When the patient first came under our care, her condition was as follows: Her skull was well formed and symmetrical; her memory was good, and her mind appeared to be active, although at times she complained of a slight confusion of her ideas. There was no defect in her speech, and her special senses were unimpaired. There was no weakness of her motor power, and the circulation seemed to be active. Her heart and lungs were healthy; her pulse was 76, and, although not exceedingly strong, it was regular, and far from feeble. Her bowels were constipated, and her digestive functions somewhat irregular. She complained of a feeling of heat and weight in the epigastrium, accompanied with eructations and distention. Her menstruation was natural and her urine healthy. Examination of her eyes, by means of the ophthalmoscope, revealed a congested condition of the retinal vessels. On examining the tongue, there were numerous scars, which showed that this member must have suffered frequently during these nocturnal attacks. She said that she almost invariably passed her water during the seizure. There

were no injuries of the head, such as are so often met with in those who suffer from the diurnal form of the *grand-mal* seizures, that could be discerned. After each of these attacks she suffers severely, for at least twenty-four hours, with violent headache and nausea; and, as the attacks became severer in character, there were well-marked petechiæ to be found upon the forearm and wrists, but they were not observed either upon the face, neck, or chest. She had lost much flesh, for she was very thin and pale. Her appetite was capricious, and her tongue was thickly furred. She had had an attack two days before we saw her, and at that time the petechiæ on her forearms and wrists were very noticeable.

"She was ordered to take six grains of the extract of aloes and three grains of ox-gall at night before retiring. The next day, as her constipation had been relieved, we prescribed thirty grains of the bromide of potassium, three times a day, well diluted in water, together with the thirty-second of a grain of strychnia. At the same time the primary galvanic current was applied to her brain and sympathetic nerve, three times a week, for about ten minutes: at each sitting one pole being placed on the forehead and the other on the nape of the neck for a third of the time; for another third, one pole placed on each mastoid process; and, for the remaining third, one pole rested upon the sympathetic nerve in the neck, and the other on the first dorsal vertebra. The current was derived from ten cells of Stöhrer's battery. The patient was put upon a highly-nutritious diet, and was instructed to avoid all food that would cause gastric irritation. A little over a month after the commencement of the treatment she left off taking her medicine for a day or so, and the result of this indiscretion was a violent fit. After this she continued to take her medicine regularly for two years, without having had any epileptic seizure. At the end of this time she had increased in weight, and had greatly improved in general appearance. She had now no headache, no nausea, and no involuntary discharge of urine. Six months ago we saw her, and there had been no return of the fits, although she had ceased taking her medicine for several months. The application of the galvanism to her brain and sympathetic nerve was continued regularly for about eight months."

This case illustrates very well the prominent features of a *grand-mal* attack of the nocturnal form; but, without dwelling longer upon this branch of the subject, I will pass to the consideration of another variety of this disease, to which I now wish to call your attention.

Case IV. *Epilepsy. Momentary Unconsciousness, without evident Spasms.*—"Miss J. F., aged seventeen, a young lady of refinement and culture, had been subject to sudden attacks of unconsciousness for a period of two or three years. At first, however, they were so slight in degree that her parents paid little attention to these absences, as they called them, and thought they were of no particular consequence, as they did not seem to affect her general health. In time, however, they found that her mind and memory were becoming considerably involved, and they then sought medical advice.

"It seems that this young lady had enjoyed excellent health until she was about fourteen years old, when she had a severe attack of scarlet fever, which had impaired her hearing, to a considerable degree, in her left ear. Shortly after her convalescence she began to have these fits of absence, as they were called, which her mother very accurately described. When engaged in conversation, for instance, she would suddenly stop in the middle of a sentence, her face would be deadly pale, her eyeballs would become fixed, and, when her mother spoke to her, she did not reply, but in a few seconds she would resume her conversation, as if nothing had happened. She had no recollection of her mother speaking to her. At other times she will drop whatever she may be carrying in her hand; and, when she regains consciousness, which is always in a very few seconds, she is surprised at what has happened, and exclaims, 'How strange I did not hear it fall! how stupid I must have been!' She has an aunt who is epileptic, and a brother who is insane, and is now confined in an asylum. These paroxysms have increased in frequency, so that she has a number every day; but her mother thinks they are now no more severe than they were three years ago.

"In the spring of 1870 she came under our care, and at that time her condition was as follows:

"Her head is symmetrical and well formed. Her memory is very weak, and her ideas even on simple subjects are greatly confused, so much so that she appears to be in a state of imbecility. Her emotional system is very easily aroused, by even trifling matters. She has at the present time as many as six or eight of these seizures daily. They occur at no regular intervals, but come on at different times during the day. There is simply a loss of consciousness for a few seconds, extreme pallor of the face, fixedness of the eyeballs, and at times she drops whatever she may have in her hand; but there is no evidence of any convulsions in any part of her body, not even in the muscles of the eyeballs. Her pupils are dilated, and the vessels of the retina, as seen by the ophthalmoscope, are small and straight, and the choroid very pale. Her heart and lungs are healthy. Her urine is very copious, and she is inclined to be constipated. Her cutaneous circulation is languid, and her pulse is weak and frequent, beating at the rate of about ninety pulsations to the minute. Her skin is cool and moist. She has no premonitory symptoms of any kind; the attack comes on suddenly, and disappears in the same way. After the paroxysms, she has lately complained of vertigo and an increased confusion of ideas; but these phenomena have only been present during the last six months. Before this, however, she felt quite herself again as soon as she regained consciousness, and had no evidences of nervous derangement after her attacks. Her catamenia have been very irregular ever since they were established, which was about two years ago. Her hearing is greatly impaired on the left side, which may account somewhat for her lack of ready comprehension when addressed. Her tongue is furred, but her appetite is good, and she sleeps well at night.

"She was directed to take ten drops of a solution of the sulphate of strychnia, which contained two grains of the drug to the ounce of water, or about the twenty-fourth of a grain at a dose, three times a day, and half an hour before meals, and to increase the amount by one drop each day until she commenced to obtain the physiological effects of the drug, when she was to return to the original dose, and again increase the medicine as before. In this manner she proceeded,

and took daily over half a grain before the physiological effects of the drug manifested themselves. Together with the strychnia-treatment, the galvanic current was applied to her brain and sympathetic nerve every other day, as has already been described."

Instances like the one before us are frequently met with in practice, but they usually fail to impress upon the mind of the patient or those around him the grave character of the disease from which he suffers. In many cases the attack is so slight and so instantaneous, that it may not even attract attention, for the reason that the loss of consciousness is of so short duration that the continuity of the acts and the ideas of the patient is apparently scarcely interrupted; yet during a few seconds he is perfectly unconscious, and there is during this interval as complete abolition of sensibility as though he were afflicted with the *grand-mal* seizure. He can be burned, pricked with a pin, or otherwise injured, without the slightest sensation of pain, and, at the same time, hearing and sight are totally abolished. You will, however, generally observe a marked pallor of the face, then a fixedness of the eyeballs, which is accompanied with a vacant stare. The conversation of the patient is suddenly cut short, perhaps, in the middle of a sentence, and in a second or so he may resume his discourse as if nothing had happened, so that those around him are not aware that he has had a fit. In other cases the attacks are more severe, and the loss of consciousness of longer duration; hence we find present other phenomena besides the momentary blank in the mental processes. For example, it is not uncommon to find that the patient suddenly drops whatever he may have in his hand, of which we have a good illustration in the case before us, or, if walking, he may stagger, and, if it were not for the speedy return of consciousness, he would fall to the ground. You will notice, also, that the pupils are dilated; but you will fail to discover any spasmodic contractions of the muscles of the face or of any other part of the body. In this form of the disease the motor tract does not seem to be involved to any appreciable extent, the hemispheres appearing to be the organs chiefly affected. It is in these ab-

sences, or faints, as they are familiarly called, that the mind is in time so gravely affected, and hence they are to be regarded as a more unfavorable type of the disease than the *grand-mal* seizures. Perhaps the reason of this may be explained from the fact that the lighter paroxysms are more frequent, and attack the hemispheres with a greater intensity than those of the *grand mal.*

However this may be, experience has taught us that in these attacks the mind sooner or later suffers to a considerable degree. As a rule, we do not find, after a paroxysm of this kind, any symptoms of nervous derangement; but occasionally they exist, as you will recollect they did in this patient, who had vertigo and an increased confusion of ideas. Occasionally you will meet with cases in which the symptoms following an attack of this kind are as severe in character as those after a *grand-mal* seizure. This young lady's mind has now become affected to such a degree, that I do not expect to restore it to its original capacity; for, as you are aware, mental decay has already taken place, and cannot be entirely removed. Nevertheless, the treatment in her case has been successful, and, although she has been under our care sixteen months, she has had no fit in the last year; and, from the time that she commenced to take her medicine, her attacks have gradually diminished in frequency and severity, until at the end of four months they had entirely disappeared, and have not since returned. The use of the ophthalmoscope in this instance pointed out the therapeutic agent to be employed, and the extreme anæmia of the retinal vessels, which existed, has been overcome by the use of strychnia, which has the power of increasing the amount of blood in the brain and spinal cord. She has also had the assistance of galvanism, which, when properly applied, produces an analogous effect. It will not do, however, to diminish the amount of the medicine for at least six months. But I shall prescribe for this patient phosphorus and cod-liver oil, in addition to the strychnia, in order to supply to the brain as much material as it is able to take up, and see if in this manner we may not be able to improve her mental faculties.

In the diurnal form of epilepsy I have found the bromide

to act favorably, while in the nocturnal the strychnia had been productive of much more success in my hands than the bromide; however, I place more reliance on the condition of the cerebral circulation, as seen by the ophthalmoscope in regard to treatment, than I do on other indications, and this case shows you very well the results of such investigation.

[NOTE.—After Miss J. F. had continued the use of galvanism for a year from the occurrence of her last fit, we stopped employing it, but she still took the sulphate of strychnia, which she used for about six months longer, and she then ceased taking that remedy. The phosphorus and cod-liver oil she continued for about a year, and her mind seemed to improve somewhat during that time. When last seen in June, 1873, she had had no return of the fits for nearly three years.

Her mind had improved very much, in comparison to what it was when she first came under our care; nevertheless, it was not what we should expect of a person of her degree of education and in her social position. In fact, there was marked mental decay. Her general health was good, and her emotions were more easily controlled. Her conduct and moral character were changed from what they formerly were, but not to an extreme degree. Her catamenia were now regular, and she had no vertigo.—T. M. B. C.]

The next variety of this affection which I shall bring before you here to-day will be that which is called the irregular or aborted attacks.

In these the loss of consciousness is not always complete, there being occasionally a kind of semi-consciousness present, but in nearly all these patients you will find that they retain no recollection whatever of what has taken place during the paroxysm; and, even in those instances where they apparently recall what has transpired during the attack, it is not at all improbable that they have acquired that information from others rather than from any distinct remembrance on their part.

Before reading you the histories of some patients which I

will presently show you, afflicted with this form of epilepsy, I wish to point out to you the difference that exists between these irregular or aborted paroxysms and a real attack of epileptic mania, as the former have been, by some authors, confounded with the latter.

In epileptic mania, properly so called, the paroxysms of mental aberration come on subsequently to a true epileptic fit, and rarely last but a few moments. In the aborted attacks, however, there is no true epileptic seizure which is followed by mental aberration, but the irregular paroxysms appear rather to take the place of the attacks of true epilepsy.

Case V. *Epilepsy. Irregular or Aborted Paroxysms.*—"T. L., aged thirteen years, of Jewish descent, was born in New York City. He has been suffering for four or five years from a very peculiar nervous affection which had come on suddenly after a severe fright when he was about eight years old. Until this period he had been a very healthy child, and was remarkably well nourished. He had an uncle who died of softening of the brain, and his grandfather was afflicted with paralysis agitans. These paroxysms at first occurred about once a month, but they gradually increased until he had one every two or three days. His father described them as follows: 'My son will be sitting in a chair, when his face will become deadly pale; he will jump up and rush around in the most frantic manner, crying and shouting strange words which I cannot understand. He does not appear to know what he is about. When I speak to him, he takes no notice of what I say, although I have always found him to be a most obedient boy. He is moody and depressed at times. Sometimes he has a strange feeling in his head before the attacks come on, as though he was turning round with great speed.'

"He came under our care during the summer of 1871, when he was found to be in the following condition:

"He was thin, and his countenance was very pale. His mind was active, and not at all impaired, and his memory was very retentive. In fact, I have seldom seen a more brilliant boy of his age than this young lad. He had no disease of the heart or lungs. His pulse was 92, regular, but feeble;

his bowels were constipated, and his skin cool. His tongue was coated, and his appetite poor. He frequently had palpitation of the heart. At his second visit he had an attack while I was conversing with him. He was sitting in a chair, when he said, 'I feel it coming, oh! oh!' He immediately turned deadly pale, jumped from his chair, and commenced to rush around the room, throwing his arms in the air, and uttering the most agonizing cries; he then returned to the place from which he had started, turned around two or three times on one leg, and then sat down and began to cry. His eyes were fixed, and the pupils dilated, but there were no convulsive movements present. I pricked him with a pin, but he did not move; I shouted in his ears, but he did not hear; I held a candle before his eyes, but the pupils did not contract, for sensibility was entirely abolished. After the paroxysm had lasted for about ten minutes, he began to regain his senses, but his ideas were quite confused for some little time. He did not feel at all stupid after this attack. He said that the reason that he cried out was owing to a strange feeling in his head, which was very likely vertigo. I now carefully examined his retinal circulation with the ophthalmoscope, and I found the vessels anæmic. He has never had any true epileptic paroxysms. As the attacks had come on during the day, he was directed to take a teaspoonful of a saturated solution of the bromide of potassium thrice daily, well diluted in water, and this amount was gradually increased until bromism was produced, which required one hundred and forty grains as a daily allowance. As he constantly grew worse, the bromide was stopped, and the sulphate of strychnia and galvanism were substituted. As soon as the physiological effects of the strychnia began to manifest themselves, the paroxysms decreased in frequency, and, after he had been under treatment three months, he had an attack about once in three weeks. He then left New York, and I have not heard from him since."

Case VI. *Epilepsy. Irregular or Aborted Paroxysms.* —"G. N., aged fifty-three years, was born in Ireland, is married, and the father of eight children, all of whom are at the present time living. He had for several years been employed

as a traveling agent, but lately he has followed the avocation of a private watchman. He has always been temperate in all his habits, and enjoyed excellent health until 1861, when an accident befell him, from the effects of which he has never entirely recovered. He has always been considered a good business-man.

"He has a strong hereditary predisposition to diseases of the nervous system, as will be seen from his family record. His wife has been insane for a number of years. Her father and his are cousins-german. A first cousin on his father's side, who had been addicted to excessive indulgence in drink, died insane, and a second cousin on the same side is at present confined in a lunatic asylum. He was, for a number of years, prior to his interdiction, in the habit of eating opium. He also has a brother who has disease of the brain.

"Nevertheless, G. N. had never exhibited any symptoms of mental aberration prior to the year 1861. At this time, as he was one day walking up Ninth Avenue, a cornice, which was in the course of erection, fell and buried him in its ruins. He was taken out of the *débris* in an insensible condition, and carried home. On examination there was found to be a fracture of the skull, with depression of the left parietal bone, and other injuries. He remained in a semi-conscious condition for over three weeks, and then he gradually regained his mental faculties. He now experienced an intense pain in the nape of the neck, which was swollen and extremely sensitive to the touch. He was unable to speak for nearly a year, not because his tongue was paralyzed, for such was not the case, as he could move it in all directions with facility, not on account of the loss of the memory of words, for he could remember perfectly; his defect of articulation was due to a want of coördination in the muscles of the tongue and the lips, so that he could not bring them into harmonious action, and consequently when he commenced to speak, after the lapse of a year, his speech was characterized by hesitation and stammering, which were at first very conspicuous, but are at present hardly noticeable.

"For nine months he had a peculiar painful sensation in his head, which felt as though the brain rubbed against the

depressed piece of bone at every pulsation, but at the end of this time it disappeared.

"As soon as he had fully regained consciousness, he was again examined, with the following result:

"There was a general paresis of the body, which was equal on the two sides. There was no paralysis of the muscles of the face, no deviation of the tongue to either side, and no strabismus. Tactile sensibility was normal in all parts of his body but his neck. His special senses, with the exception of hearing, were unimpaired. He had no difficulty in swallowing, no palpitation of the heart, and his respiration was perfectly normal. He was confined to his bed for a year, and during all this time his neck was so sensitive that he could not bear the least pressure upon it. He had his head and shoulders so supported, however, that nothing could come in contact with his neck, and this relieved him from much pain. As soon as he was able to sit up, he was sent to St. Luke's Hospital, where he was again examined. It was there discovered that the cervical vertebræ had been dislocated, and were partially rotated upon their axes, and this accounted for the severe pain from which G. N. had so long suffered. He gradually gained sufficient power to enable him to stand by supporting his head firmly between his hands, and his speech, which had returned, was marked by great hesitation and stammering, but this after a while began to improve also. The wound from the fracture of the skull had at this time completely healed. He remained at this institution for about nine months, and at the end of that period he was thought to be in a fit condition to be discharged.

"Two months after the reception of his injuries, while still confined to his bed, G. N. commenced to have fits of absence, during which he was perfectly unconscious, but there were no convulsive movements observed. These spells came on quite frequently, but he did not attach much importance to them, as they were of only short duration.

"In the course of time, however, his disposition, his temper, and his conduct, became more or less affected in consequence of these epileptic attacks, and he had a strong desire to leave home, which was acceded to by his friends, and he

was consequently sent to St. Luke's Hospital. While at this institution these attacks continued, and he began to notice that his memory was very bad, as he was unable to commit to memory the hymns which he had been instructed to learn. His ideas were every now and then greatly confused, and he did not seem to possess the power of concentrating his attention. Mental exercise of all kinds seemed to be irksome to him, with the exception of writing poetry, in which he seemed to take a great interest, although he had never before indulged in that kind of occupation. His poetry was of a religious character, and some of it was published in one of the daily papers of this city.

"After his discharge from the hospital, he returned to his regular avocation, but he was unable to walk much, on account of the pain which he had in the neck. Some six months subsequent to this time, he went to a small town in this State for the purpose of collecting some money. On arising the following morning, he called upon the gentleman and presented to him the bill, but he was quietly informed that he had settled with him on the preceding day, and on examining his pockets he found the money. He then made inquiries in order to find out where he had been and what he had done. He was informed that he had acted, while at the hotel, in a very strange and ungentlemanly manner, shrieking, smashing furniture, crockery-ware, and every thing that came in his way, for which the landlord subsequently charged him well, thinking that he was drunk. He had after this left the hotel for an hour or more, when he returned to his room and slept till morning. He had no recollection whatever of these acts, but during the time that he was absent from the hotel he must have settled the bill. It has already been stated that G. N. never drank stimulants.

"Since this attack he has had several of these seizures, the last one of which occurred shortly before he came under our care. He had been very much depressed for some time on account of pecuniary losses, when suddenly one day his face assumed a deadly hue, his eyes had a peculiar appearance, he became wild and maniacal, and disappeared from his family. When he returned to consciousness, he found himself sixty

miles from home, in a strange place, and he was perfectly unconscious how he ever got there. On arriving home he discovered that he had behaved in a most disorderly manner, and had broken every thing in the room that was within his reach, and had then left the house. He must have, during this attack, been unconscious several hours.

"He was admitted to the New York State Hospital for Diseases of the Nervous System, October 31, 1871, when he presented the following points of interest:

"There exists a well-marked depression of the outer table of the skull, situated at the anterior third of the left parietal bone. The wound has healed, and there now remains only a small cicatrix. The nape of the neck is still very sensitive to the touch, and strong pressure causes intense pain. The patient holds his head in a fixed position, a little to one side, and when walking he steadies it by means of his hands. On introducing the fingers into the pharynx, the projection forward of the cervical vertebræ can be distinctly felt. They are also rotated on their axes, as the prominence, which is most markedly felt on the left side, would tend to show. He complains of a sensation in his head as though a tight band were encircling it. He has vertigo and attacks of unconsciousness which are unaccompanied by convulsive movements; then these momentary paroxysms cease, and the aborted or irregular attacks take their place.

"At the present time these epileptic seizures occur about once a week. When the lighter attacks come on, he feels dizzy, and would fall if it were not for the quick return of consciousness. His speech is very little affected, although he occasionally stammers, especially when he becomes excited in conversation. He is very irritable, and his whole emotional system is easily aroused. Trifling circumstances seem to cause him great annoyance. His memory is very poor, and his intellect is feeble. His pupils are contracted, and his eyes have a peculiar vacant expression. The ophthalmoscope shows that the retinal vessels are in a congested condition. His special senses are normal, if we except the impairment of hearing and the hyperæsthesia which exists at the nape of the neck. His bowels are regular, and his urine natu-

ral. There still exist a certain amount of paresis on both sides of the body, and a giving way at the knees when walking, which is quite noticeable. He has functional disease of the heart, and on arising in the morning he suffers from precordial distress. His lungs are healthy. His tongue is perfectly mobile, and does not deviate to either side. There is no loss of the memory of words, but simply slight ataxic aphasia. His appetite is poor and his tongue furred. He has had illusions and hallucinations, but no fixed insane delusions. He had an aborted seizure two days before coming to the hospital. He was immediately placed under treatment, which has consisted in the administration of large doses of the bromide of potassium, of which he took a teaspoonful of the saturated solution four times a day. As soon as he was fully under the influence of the medicine, the amount was reduced to ninety grains as a daily allowance. For a period of five months he continued to take his medicine regularly, having occasionally a slight attack of the lesser seizures, but no aborted paroxysms. As he was considerably run down in health at this time, he was ordered to take cod-liver oil and the twenty-fourth of a grain of strychnia as a tonic, and his bromide was increased to one hundred and twenty grains daily. A month later the fits ceased, and he had no return of them for seven months. He then quit coming to the hospital. At this period his general health had improved, and he was able to attend regularly to his business, but his mind and memory were still impaired to a considerable extent. He seemed, however, to have a greater control over his emotions than formerly."

Case VII. *Traumatic Epilepsy. Aborted Paroxysms.*— "M. C., aged eleven years, was born in New York City, and was a very robust child until she was five years old, at which time, as she was one day leaning out of a window, which was about eighteen feet from the ground, she lost her balance and fell head-foremost, striking violently on the pavement in the back-yard. When she was picked up she was found to be in an unconscious condition; she was carried into the house, and in the course of about ten minutes she began to vomit a large quantity of blood. After this she gradually regained

consciousness. The same night she was attacked with severe epileptic convulsions, characterized by complete loss of consciousness and violent involuntary muscular contractions, limited to the right side of her body. These occurred almost continuously from six o'clock in the evening until ten o'clock the next morning. After the paroxysms had ceased, she was found to be completely paralyzed on the right side, including the leg and arm. The face was not affected. There was no strabismus, but speech was entirely abolished. For two years she was confined to her bed before she began to regain sufficient power to enable her to support the weight of her body, and all this time she had an attack of epilepsy regularly once a month, which generally took place during the day, although occasionally she had an attack at night.

"These seizures were usually of the aborted variety, and were characterized by the following phenomena: The patient would become suddenly pale, her eyes had a peculiar expression, and she would run violently around the room, laughing in a very strange manner. At the end of two or three minutes, with a full inspiration, the fit ceased, and she became conscious. During the paroxysm the pupils were dilated, and she was perfectly insensible to pain. Occasionally, however, she has a *grand-mal* seizure, in which the convulsions are limited to the paralyzed limbs. At the end of two years speech began to return very gradually, and this was the first sign of improvement which was manifested in her condition. Six months after this she was able to walk, although the muscles of the leg were very weak. The arm had gained very little power during this time.

"In the summer of 1870 she was admitted into the New York State Hospital for Diseases of the Nervous System, when her condition was found to be as follows: Her mind was weak, and her memory much impaired. She was unable to read, and her actions were those of a child four or five years of age. Her right arm was atrophied, extremely distorted, and possessed of a very small amount of muscular power. The right leg was much shorter than the left; and, when she walked, the toes were inverted. Her pupils were dilated. At this time she had a fit about once in two or

three months, which was similar in character to the one that has already been described. Her general health was good, and there was no defect in her articulation. The treatment consisted of twenty-grains of the bromide of potassium, three times a day, well diluted in water, and the application of galvanism, three times a week, to the paralyzed limbs. She remained under our care for over a year, without having any fits. Her leg improved, so that she could walk much better than formerly, but the arm resisted all treatment."

It is apparent, from the preceding cases, that there is a form of epilepsy in which the patient is unconscious or semi-conscious for an interval varying from a few minutes to several hours, during which he performs strange involuntary acts, which, as a rule, are not accompanied by clonic convulsions, although, in some instances, these movements may be present in a limited part of the body. The attack is never preceded or followed by a true epileptic paroxysm, but comes on by itself, and appears to take the place of a regular attack. Maniacal manifestations may exist for hours or days, and then be followed by a fit. There are examples, however, of true mania with epileptiform convulsions. I have already mentioned that the mental aberration in epileptic mania always follows the epileptic paroxysm.

I now come to the consideration of the causes, which I have purposely omitted until the present time, so as to group them all under one head. These are commonly divided into the predisposing and exciting. Under the former we include sex, age, and hereditary tendency. In regard to sex, I have found about an equal proportion of males and females afflicted with this disease. The period of life most common for the occurrence of epilepsy is between the ages of ten and twenty. Hereditary predisposition in this, as in all other diseases of the nervous system, is an important element, and I have found it to exist in about one-fourth of all my cases. Of these, the direct epileptic tendency could be traced in about one-eighth of these patients, although this percentage is much larger than that of other authors.

The exciting causes, as described by Reynolds, who has

made the best division I know of, are divided into the psychical, the eccentric, general organic changes, and physical influences.

Under the first head we include fright, worry, grief, overwork, and the like; under the second, venereal excesses, onanism, dentition, indigestion, etc.; under the third, scarlet fever, rheumatism, diphtheria, pneumonia, etc.; under the fourth, blows, falls, cuts, and sunstroke. In the seven cases which I have enumerated, it will be found that two of these patients have a direct epileptic predisposition; two are descended from ancestors who were either insane or had some organic disease of the nervous system; while in three there existed no hereditary predisposition whatever. It will, likewise, be found that the exciting cause of the paroxysms was as follows: In one it was from fright; in two from injuries to the head; in one from scarlet fever; in one from masturbation; in one from intestinal irritation, caused by eating corned-beef and cabbage; and in one there was no apparent cause. Among the exciting causes, I have found, undue mental exertion, venereal excesses, dentition, indigestion, and menstrual derangement, most frequent.

Four of these seven cases were between the ages of ten and thirty; two between twenty and thirty, and one over fifty, an age at which true epilepsy rarely begins.

A few words before closing, in regard to the prognosis, will conclude what I shall have to say upon this subject at present. Hereditary influence, the existence of long intervals between the attacks, the disease commencing late in life, and marked impairment of the mental faculties, are all to be taken into account in giving an opinion, as they are unfavorable indications.

LECTURE XVII.

FACIAL NEURALGIA.

I PROPOSE to devote the next two or three lectures to the consideration of several neuralgic or neuralgoid affections, which both from their frequency and obstinacy are worthy of careful study. According to the general plan of these lectures, I shall not dwell upon the pathology of the diseases. Not because I have no definite views upon the subject, but for the reason that its discussion would lead us away from more practical points, and would be necessarily more or less speculative in character.

NEURALGIA OF THE FIFTH PAIR OF NERVES.

There are before you three patients affected with neuralgia of the face, a form of the affection which is located, or at least is manifested, in the sensitive branches of the fifth pair of nerves.

The histories of these cases, prepared by Dr. Cross, give you the salient features of three well-marked varieties of facial neuralgia—one produced by depressing physical causes, one by malarious influence, and the other by syphilitic infection:

CASE I. *Neuralgia of the Fifth Pair of Nerves, due to Anæmia.*—"J. H., female, aged thirty-one, entered the New York State Hospital for Diseases of the Nervous System in the autumn of 1870. She was the mother of five children, the births taking place during a period of seven years. So far as she knew, her ancestors had been healthy, but she herself was delicate, and had never been robust like others of her near relations. She was married at the age of twenty.

"Being poor, she has been obliged to work at hard manual labor in order to maintain herself and children, her husband not contributing much to the support of his family. Even with all her efforts she has not been able to obtain sufficient good and wholesome food to keep her system in a well-nour-

ished state. She was therefore anæmic, and this was shown by her general appearance, and the character of her pulse.

"At the time of admission she was suffering from intense pain on the right side of her face, which was so excruciating that she had been unable to sleep for three nights. It came on in paroxysms continuing for about an hour, and then a remission would take place for two or three hours, when it would again increase in severity. At night the pain was generally worse than in the daytime. There were no indications of her ever having had either syphilis, rheumatism, malarious diseases, or gout. It appears, however, that a few days prior to the attack she had been engaged in washing in a very warm room, and in a state of perspiration had exposed herself to a cold northeast wind while hanging out the clothes. A short time after this she experienced sharp twinges of pain shooting along the course of the ophthalmic branch of the fifth pair of nerves, which in the course of a few hours extended and involved the superior and inferior maxillary branches. After the lapse of three days the paroxysms were so severe that she came to the hospital for relief.

"Her condition was now as follows: Her face was flushed on the affected side, and was so sensitive that the slightest touch caused her great agony. Her right eye was bloodshot, the pupil contracted, the eyelids partially closed, and the tears ran down her cheeks. The pain at this time was exceedingly sharp and lancinating, and during its continuance there were spasms of the muscles of the face, with a tendency to close the eyelids. Pressure on the two upper cervical vertebræ caused intense pain, and over the supra-orbital notch, and the infra-orbital and mental foramina, the least touch was unbearable. The left side of her face was pale, and the pupil dilated. Her pulse was weak and very frequent, her bowels constipated, her urine abundant and pale. Previous to this attack she had had vertigo and headache, the latter being confined to a small spot on the top of the head. There were also noises in the ears, and a tendency to drowsiness. She had been troubled with violent palpitations of the heart, and had felt very much debilitated. She had also had numbness in the tips of her fingers, with a sensation as though pins and needles were

sticking into them. In fact, her condition was that of well-marked cerebral anæmia.

"The primary galvanic current from a battery of twenty cells was applied to her face—the positive electrode containing a wire brush being placed on the most sensitive spots of the fifth pair while the negative was applied to the two upper cervical vertebræ. This application was continued for about twenty-five minutes at each *séance*. In addition she was ordered to take cod-liver oil and a tonic compound of strychnine, iron, quinine, and phosphoric acid. Her diet was to consist of beef-steak, milk and eggs, together with a liberal allowance of brandy. The next day when she came to the hospital her face was greatly swollen, and she stated that the galvanism had relieved her considerably. These applications were continued daily for a period of three weeks, at the end of which time the neuralgia had disappeared. In consequence of her anæmic condition, she was advised to continue the tonic remedies and the highly-nutritious diet which had been prescribed, in order to put her system in the best possible condition to avoid future attacks. Within the last three years she has been three times under our care for similar seizures, which were undoubtedly due to an anæmic condition induced by poor quality of food and too rapid parturition. The treatment in these three attacks was substantially the same as has already been enumerated, and a cure was speedily effected as soon as the tone of the system had been improved."

Case II. *Neuralgia of the Fifth Pair of Nerves, of Malarial Origin.*—"C. W., aged twenty-five, entered the hospital in the summer of 1871, suffering from excruciating pain in the course of the ophthalmic division of the fifth pair of nerves. He stated that these attacks came on regularly every other day at a certain hour, and, after lasting a variable period, ceased. When he began to have them, they occurred at about four o'clock in the afternoon, but within the last three months they have gradually been taking place earlier, so that at the present time they commence at about ten o'clock in the morning, and last for an hour or more. After the paroxysm he is perfectly free from pain for two days, and then it returns with

renewed violence. This fact is to be observed, that he never has had an attack at night. He has now been subject to these seizures for the last six months, and they have gradually been getting worse until they have become perfectly unendurable. He is consequently much run down in health, and has a well-marked cachectic condition. He has been living in the West for several years, where malaria is very prevalent, and, although he has not had a well-developed attack of intermittent fever for eighteen months, he had not been in good health for some time prior to the supervention of the neuralgia. He had felt weak, his bowels had been constipated, and he had had periodic attacks of violent headaches, which, however, were of short duration. His tongue was also furred, his appetite capricious, and his head and hands were at times excessively hot.

"These symptoms, after continuing for about a year, and which showed that the malarial poison was still active, were succeeded by violent paroxysms of neuralgia, of which the hæmicrania from which he had suffered at intervals, for nearly a year, was merely a lighter manifestation. For the last four months he has been taking the sulphate of quinine in doses of a grain thrice daily, together with fifteen grains of the iodide of potassium. Latterly, however, the doses of these remedies have been increased, but there has been no amelioration in the intensity of the paroxysms. When he came under our care the following points of interest were noted: There were no indications that he had ever had either rheumatism, syphilis, or gout, but the history of the case, the periodicity of the attacks, and the neuralgic pains being limited to the ophthalmic branch of the fifth pair, pointed very distinctly to a malarial origin.

"One morning, while we were conversing together, he suddenly pressed his hand against his forehead and commenced to walk rapidly up and down the room. He constantly exclaimed: 'It has come again; can't you give me something to stop it, for God's sake?' His eye was partially closed, and when he removed his hand from his forehead the eyelids trembled. There were at first red streaks observable along the course of the branches of the affected nerves, and in a

short time the forehead, the conjunctiva, and the side of the nose, became greatly congested, and he complained of acute, darting pain in the eyeball on the right side. The pain was especially severe and lancinating at the supra-orbital foramen and at the parietal eminence. A moderate degree of pressure, however, seemed to afford him marked relief. In the course of three-quarters of an hour the paroxysm was over. He now complained of noises in his ears, specks before his eyes, and vertigo. Examination at this time, by means of the ophthalmoscope, showed the vessels of the retina on the affected side to be increased in number, size, and tortuosity. The pupil was likewise contracted, and the conjunctiva more or less injected. On the left side, however, the pupil was natural, and retinal circulation normal. The patient had no cough, his heart and lungs were healthy, his bowels were constipated, his urine was scanty and high-colored, his pulse was 90, but not strong. He had a peculiar yellow hue of the skin and conjunctivæ, which showed a want of activity on the part of the liver. On percussing the spleen, it was found to be much enlarged.

"The galvanic current was applied to the ophthalmic division of the fifth pair every day for twenty minutes, in the manner that has already been described, in order to relieve the pain, and in conjunction, constitutional remedies were given to effect a cure. The sulphate of quinine in solution was administered, in seven-grain doses, thrice daily. At the end of five days the physiological effects of the medicine were apparent, for the patient was at this period completely cinchonized; nevertheless the paroxysms did not cease. The sulphate of quinine was now continued in large doses for a week, while the galvanism was omitted, and the patient during all this time grew worse. The pain had become so sharp and lancinating that we were obliged to administer hypodermic injections of the sulphate of morphia *pro re nata* during the paroxysms. The galvanism was again continued, and in place of the quinine four drops of Fowler's solution of arsenic were given thrice daily, and this amount was gradually increased to twenty drops as a daily allowance, before the neuralgia began to yield. After the lapse of a month the patient was free from pain,

but he still continued to take four drops of Fowler's solution, together with iron, phosphorus, and a highly-nutritious diet, for several weeks. A year after he returned home he informed us that he had had no relapse, although he is living in a very malarious section of the West. He, however, takes his arsenic in small doses as a prophylactic, and it no doubt counteracts the influence of the miasmatic poison."

Case III. *Neuralgia of the Fifth Pair of Nerves, of Syphilitic Origin.*—"L. N., twenty-eight years of age; is single, was born in Virginia, and is a merchant by occupation. From his childhood he has always been remarkably strong and healthy until some seven years ago, when he contracted an indurated chancre, which was accompanied by enlargement of the inguinal glands on both sides. Subsequently he had well-defined secondary symptoms, such as fever, sore throat alopecia, a coppery eruption, especially prominent upon the shoulders, back, and chest. From these coppery spots the skin was constantly being desquamated in thin, flat scales. In the course of a year from the appearance of the chancre, which had healed kindly in three weeks, his throat became again very sore; his nose was swollen, and intensely red. These phenomena did not yield to ordinary treatment, and he consequently consulted an eminent surgeon, who on examination discovered large mucous patches on the walls of the pharynx, at the base of the tongue, on the tonsils, and on the mucous membrane of the tip of the nose. He had previously been treated for six months with mercury and iodide of potassium in moderate doses.

"At this period he was placed upon the chloride of gold and dilute muriatic acid, while an ointment of the iodide of lead was used freely upon the mucous patches in the nose which had already commenced to attack the cartilage. This treatment was continued for three months, at the end of which time the mucous patches had healed, and he was now advised to take a tonic of iron and quinine, as his general health was much impaired. For a year he was free from any of the manifestations of syphilis, but his throat was still very sensitive to the effects of cold. Soon, however, mucous patches again ap-

peared in the throat, which resisted treatment with great pertinacity. Nodes began to form upon the right tibia, and there was enlargement of the right epitrochlear gland. He was ordered to take the sixteenth of a grain of the bichloride of mercury in a wine-glass of cinchona-bark three times a day, and the mucous patches were painted every morning with a strong solution of chromic acid. It was four months before the ulcers healed, nevertheless he continued to take the bichloride of mercury for some three months longer.

"He now formed the habit of drinking whiskey to excess. After he had indulged in this habit for several months, he received a blow on the right frontal bone, to which he paid little or no attention, as the skin was not abraded, and there was no sign of contusion. Soon after this he was confined to his bed for three weeks from a severe attack of hepatitis, and while convalescing from this disease he was seized one night with the most excruciating pain in the right frontal region. His physician, thinking that the paroxysm was due to his debilitated condition, prescribed morphine in moderate doses, together with tonics. Every night when he was warmly ensconced in bed the attack came on with renewed violence, and lasted at intervals through the whole night. During the day, however, there was a remission of the pain and sometimes complete intermission, while the paroxysm lasted.

"The patient was totally unable to sleep, and was at periods in a highly-maniacal condition. He would roll on the floor in agony, uttering loud groans. His face was flushed, his pupils contracted, his eyes bloodshot, his skin bathed in perspiration, his pulse frequent and small, and his appetite greatly impaired. The pain, which at first had been confined to the right frontal region, extended so as to involve all the branches of the fifth pair on both sides of the face, and also the cervico-occipital nerves on the right side. Through all these branches sharp, shooting, lancinating pains of the most agonizing character flashed during a paroxysm, and, although he took from a grain to two grains of morphine through the night, it did not afford him great relief.

"After he had made an ineffectual attempt to commit suicide, his physician found on examination a large gummy tumor

on the right frontal eminence, which was excessively sensitive to pressure. Suspecting its nature, he forthwith administered thirty grains of the iodide of potassium well diluted in water three times a day, and in the course of a few days the neuralgia ceased as if by magic.

"Some few weeks subsequent to this attack, the patient came to New York, and was again seized with acute neuralgic pains as before. On examination, we found a large tumor situated on the right frontal eminence, which was excessively sensitive to the touch, but pressure exerted along the course of the affected nerves, or on the frontal bone at a short distance from the swelling, excited little or no pain. There were acute lancinating pains darting along the branches of the fifth pair of nerves on both sides of the face, and likewise along the branches of both occipito-cervical nerves. The patient walked rapidly up and down the room, holding his head firmly in his hands, in the greatest distress. His face was flushed, his pupils contracted, his eyelids partially closed, his hearing morbidly acute, his pulse frequent, and flashes of light before his eyes. The tumor was about the size of a small pigeon's-egg, and indicated very distinctly the cause of his malady. Forty grains of the iodide of potassium well diluted in water were administered three times a day, and this was rapidly increased to sixty grains before the pain entirely disappeared, although he experienced much relief after the second day. The tumor still remained, however, after the cessation of the neuralgia.

"In order to eradicate the syphilitic taint which existed in this gentleman, and also to remove the tumor, he was directed to take mercurial baths three times a week, consisting of a drachm of the black oxide of mercury, and also to apply citrine-ointment to the site of the tumor. After he had taken twenty-four baths, the tumor completely disappeared. Tonics and the bichloride of mercury were then substituted for the mercurial baths, which he took regularly for over a year, since which time he has had no paroxysms of neuralgia, although he has been troubled exceedingly with boils of a very obstinate character, which only yielded to the internal administration of bichloride of mercury, and the external application of citrine-ointment."

These cases very clearly show how, in order to treat a disease effectually, we must ascertain the cause, and bring our therapeutic measures to bear upon it. The first case was successfully managed by tonics, and those general hygienic measures which are calculated to improve the tone of the system; very often these will suffice, but it is not to be doubted that we can, in many cases, shorten the duration of the treatment by direct medication. I have often cut short a severe neuralgic paroxysm with a couple of ounces of brandy or whiskey.

It is in such cases as this first that strong tea or coffee will frequently arrest a paroxysm. Guarana, or paullinia, as it is sometimes called, acts even more effectually, probably only because it is more concentrated, for, when we go back to first principles, we find that the active principle of these substances is one and the same thing. In such cases there appears to be a deficient tone in the coats of the cerebral blood-vessels; a state of passive congestion is thus induced, and this repletion of the intra-cranial vessels is an immediate central cause of the neuralgia. I have used paullinia in neuralgic headaches for the past ten years, and, though I cannot promise you that it will do much toward preventing a proclivity to the seizures, it is certainly almost always efficacious in cutting short a paroxysm due to an anæmic state of the system, and a resultant deficient tonicity in the blood-vessels of the brain.

A few days ago I was visited by a gentleman who at the time was suffering from an attack of supra-orbital neuralgia, which he described as atrocious; so intense was the pain that he was at times slightly delirious, and his wife came with him, fearful that he was not altogether capable of taking care of himself: the general aspect of the patient, the state of his pulse, and the ophthalmoscopic examination, all indicated anæmia. I told him that I was not in the habit of promising much to patients, but that I was disposed to assure him that his pain would be gone in half an hour after his taking a dose of medicine I was going to prescribe for him. As his attacks generally lasted two or three days, and he had then only suffered for a few hours, he was thankful for the measure of relief I promised. He took the fifteen grains of paullinia I prescribed, and within the half-hour was entirely free from pain.

Then, as I have just told you, it not unfrequently happens that in similar cases immediate relief is obtained from alcohol, preferably in the form of one of the spirituous liquors, brandy, whiskey, or rum. One dose of an ounce or two in persons not accustomed to the use, will frequently cut short an attack.

It is probable that morphia acts in a similar way, in addition to its anodyne influence; and, when it is hypodermically injected in the dose of from one-sixth to one-fourth of a grain, an attack of facial neuralgia is often aborted.

The beneficial effects of electricity are sometimes very decided, but it must be confessed that frequently, no matter what form of this agent we employ, failure results. Occasionally, I have found that the application of a very mild primary (galvanic) current to the skin and the affected nerve-branches gives immediate relief. I have obtained this effect in my own case several times, but have just as often failed; but then my neuralgia is decidedly malarial in character, and electricity is not so beneficial in this type as in some others.

Of other applications to the affected nerve or its vicinity I have not much favorable experience. Liniments are dirty and useless; steam sometimes gives relief, especially when the pain is confined to a limited spot. I had recently a severe case of neuralgia, occurring in a lady exhausted by purpura hæmorrhagica, and which was entirely confined to one eye. The application of steam, as it escaped from the spout of a tea-kettle, always gave her relief in a few minutes.

Occasionally I have found relief follow the application of veratria, especially when the pain is supra-orbital and the result of cold. I use it according to the following formula: ℞. Veratrine, grs. x; etheris sulph., ʒj; alcoholi, ʒvij; M. ft. sol. A few drops to be rubbed over the painful parts every three or four hours. Redness and a pricking sensation are produced at once, and sometimes the pain disappears after three or four applications.

The bisulphide of carbon, applied in the form of vapor, has been recommended; but, in several trials which I have made of it, I have seen no perceptible effect over the pain. Lotions of solution of atropia, and of tincture of aconite, cautiously used, are sometimes beneficial.

But, in the facial neuralgia of anæmia, local measures are only at best palliative. The affection must be combated by general measures, and of these good food, fresh air and mental tranquillity stand first. Their good influence may, however, certainly be promoted by judicious medical treatment, and this ought to consist in the administration of tonics, such as iron, quinia, and others of this kind, and stimulants. The special measures I need not again bring to your notice.

LECTURE XVIII.

CERVICO-OCCIPITAL AND INTERCOSTAL NEURALGIA.

The first case which I have to present to you to-day is one of cervico-occipital neuralgia, so called from its occupying the cervico-occipital region, and being chiefly situated in the four superior cervical nerves. Of these the great occipital branch is the one mainly affected. The history of this case is as follows:

Case I. *Cervico-Occipital Neuralgia, rheumatic in Origin.*—"K. M., a married lady, forty-five years of age, came under our care during the fall of 1871, for a severe pain in the back of the neck, which had troubled her very much for several weeks. It appears that this lady had inherited a rheumatic diathesis, as she had been afflicted for the last twenty years with rheumatic pains shifting from joint to joint and from muscle to muscle, although she had never had an attack of acute articular rheumatism. Her father died of general paralysis, and her mother has organic disease of the heart.

"With the exception of these vague rheumatic pains, she has always enjoyed very good health. Two days prior to the commencement of the present attack, she was exposed to a draught of wind while riding in a railroad-car, which blew directly upon the nape of her neck. The next day she experienced sharp shooting pains in the back of the neck, corresponding to the occipital and posterior parietal regions. In a

few days the pain became so severe that she was unable to sleep at night, and for which morphine was prescribed in large doses. While under its influence she felt very much relieved, but, as soon as the effects of the medicine had passed away, the pain returned with increased severity, and was not only present in the occipital and posterior parietal regions, but had also extended to the inferior maxillary nerve.

"On examination, her condition was as follows: There were sharp, shooting pains along the nerves distributed to the occipital and posterior parietal regions as well as to the neck, and along the course of the inferior maxillary nerve. These paroxysms occurred at various times during the day and night, without any regular periodicity. There was marked cutaneous anæsthesia in the parts to which these nerves were distributed, and this condition was especially manifest wherever these nerves became superficial. She could not move her head without exciting paroxysms of pain, and even gentle pressure was sufficient to cause her much suffering. She was unable to sleep in the recumbent position without the aid of morphine. She had headache, her tongue was coated, her face flushed, her bowels constipated, her skin moist, and her pulse full and strong. These latter phenomena were due evidently to the morphine, which she had taken in large doses.

"The treatment consisted in the application of galvanism to the affected nerves for half an hour every day—a wire brush being attached to the positive electrode, which was passed along the course of these nerves, while the negative electrode was applied to the nape of the neck. The constitutional remedies employed were a mixture of one ounce of the saturated solution of the iodide of potassium and half an ounce of the wine of colchicum-root. Of this she was ordered to take fifteen drops three times a day, increasing the dose each day by one drop. In the course of two weeks the neuralgia had disappeared, but the patient still continued to take fifteen drops of the mixture for about a month. At this time her bowels were regular, her tongue clean, her appetite good, and her headache had entirely ceased. Within the past two years she has had no relapse, although she has had rheumatic pains at intervals during this time, which speedily disappeared under the influence of the iodide of potassium and the wine of colchicum."

This case affords a fair illustration of an ordinary attack of cervico-occipital neuralgia, and the cause is that which in my experience is among the most common. Often the pains are not so sharp as in the present instance, but are dull, aching, wearisome in character. Indeed, I think it scarcely if ever happens that the pain, in the form of neuralgia now under notice, equals that of neuralgia of the fifth pair.

The disease often shows a tendency to extend; sometimes it goes to the fifth pair; again, to the lower cervical and dorsal nerves; and, again, to those of the axillary plexus and its branches. Or the cervico-occipital region may be involved by the extension of the neuralgic disease from other parts, as for instance the arm, a case of which is now before you, and the history of which I proceed to read:

Case II. *Occipito-Cervico-Brachial Neuralgia, of Rheumatic Origin.*—"Mrs. R., aged sixty-five years, was born in Germany; is married, and the mother of several children. Her health has usually been good until within the last twelve months. For many years, however, she has been subject to attacks of subacute rheumatism in different parts of her body, which generally lasted a short time, although they caused her much annoyance. About a year ago she was seized with a dull, aching pain in the right arm, which at first was not very severe, but which soon increased in degree, and interfered, to a considerable extent, with her sleeping at night. The pain, which was at first confined to the right arm, soon extended to the occipital and posterior parietal regions, and was so acute that she could not move her head or contract the muscles of the arm without increasing the severity of the paroxysm. She complained of a particularly painful spot on the outer aspect of the right arm.

"In the course of two months she found that there were numbness and loss of mobility in the affected limb, and, as she had been admonished not to use it, in time the loss of power became more and more perceptible, while the pain had not at all diminished in intensity. After the affection had continued about five months she came under our observation, and her condition was then as follows:

"There was no history of any injury, or of her ever having been subjected to the influence of malaria, gout, or syphilis, although the evidence of her having had attacks of subacute rheumatism was very positive. Her right arm hung helplessly by her side, and she was able to raise it only to a very slight degree. She could flex her forearm on the arm and move the fingers of the right hand quite well, but the arm itself was very greatly restricted in its movements. There were the sensation of pins and needles in the fingers, numbness and actual diminution of tactile sensibility in the arm, forearm, and fingers, of the right upper extremity. The muscles of the arm, the shoulder, and especially the deltoid, were flabby, atrophied, and only contracted feebly to a very strong Faradic current. There were paroxysms of pain coming on several times during the day and night, which were excessively acute and lancinating in character, and were confined to the median and the branches of the musculo-spiral nerves in the arm, and the branches of the great occipital in the neck. There was one spot on the outer aspect of the arm, where the musculo-spiral nerve becomes superficial, which was exceedingly sensitive to the touch, while several places in the occipital and posterior parietal regions gave acute pain on pressure.

"On moving the upper extremity, there was discovered very marked crepitus in the shoulder-joint on the affected side, and, when it was forcibly abducted or adducted, there was acute pain along the course of the median, musculo-spiral, and occipital nerves. The pain was generally more severe at night, and came on in paroxysms, which would last for an hour or more, and then a complete intermission would take place. The muscles were so small and attenuated, that the humerus could be distinctly felt throughout its whole course. There were no nodes or tumors discoverable on its surface. She complained of pain in her head, vertigo, and a tendency to somnolency.

"On examining the retinal circulation by the means of the ophthalmoscope, the vessels were found to be small and straight, and the choroid rather pale. She was cachectic, and her bowels were torpid. At this time she could move her head without exciting much pain, which had now assumed a dull, aching char-

acter. When the paroxysms of pain came on at night, she was totally unable to sleep during their continuance; and it was owing to these frequent attacks that her anæmic condition was induced, as she had not had any cerebral symptoms until some three months subsequent to the onset of the neuralgia. Her appetite was capricious, and her tongue furred. Her heart and lungs were healthy. The paroxysms of pain observed no regular periodicity, coming on at irregular periods either during the day or night, sometimes being acute and lancinating, at other times dull and aching, but always sufficiently severe to awaken her during sleep.

"Suspecting the rheumatic origin of the neuralgia from the deposit which existed in the right shoulder-joint, the rheumatic diathesis afforded us by the history of the case, the numbness and great loss of power, together with excessive pain, which had existed for some time prior to the manifestation of the cerebral symptoms, we gave her a favorable prognosis, and immediately put the patient under treatment, which consisted in the internal administration of a mixture containing a saturated solution of the iodide of potassium one ounce, and the wine of colchicum-root half an ounce: of this she was to take fifteen drops three times daily, well diluted in water—the same to be increased one drop for the doses of each day until the physiological effects of the medicine had manifested themselves. At the same time a strong Faradic current was applied to the affected muscles three times a week, and along the course of the affected nerves. Under that treatment at the end of two months the pain had entirely disappeared. She was now placed upon tonics, and, as there were some adhesions in the shoulder-joint caused by the deposit, the humerus was gently rotated in its socket, and the patient was instructed to exercise the arm daily by swinging a small dumb-bell. The electricity was still continued. Six months after coming under our care she was able to put her hand on the top of her head, and to raise her arm to a level with her shoulder. The affected muscles had increased in size, and their contractility had so much improved that they responded readily to a weak Faradic current. Her general health was now excellent, her appetite was good, her bowels were regular, she had

no headache and no vertigo. There had been no return of the neuralgia. Such was her condition when she passed from under our care some three months ago, and since then we have not heard from her."

This case is certainly a very interesting and instructive one, and is a good example of many that you are likely to meet with. Indeed, I may remark that brachialgia, under which term neuralgic affections of the arm are included, is almost always due to rheumatism; a circumstance which does not add to their curability.

Now, in the treatment of cervico-occipital neuralgia the iodide of potassium is a remedy entitled to prominence, even when there is no syphilitic taint present. It is certainly true that the disease is sometimes a manifestation of syphilis, and then, of course, iodide of potassium is the medicine to be employed; but it is almost equally efficacious in the rheumatic form of the disease, and its beneficial influence may be increased by the addition of colchicum. In the cases before us, the iodide was given in the form of the saturated solution—each drop of which contains about a grain of the salt, and with this the fluid extract of colchicum was combined in the proportion of one-third. Fifteen drops of the mixture, therefore, contained ten grains of the iodide, and five of the fluid extract of colchicum. In both cases the remedy was successful, for, although electricity was also employed, and probably was of service, I am not disposed to regard it as the chief agent, or as being any thing more than an adjunct.

I may also speak favorably of the efficacy of the bromides in the form of neuralgia under consideration. Among the causes of the disease is anxiety of mind, or excessive mental application. I meet with many such cases in my practice, and they are generally successfully treated with the bromide of potassium, sodium, or calcium, in fifteen or twenty grain doses three times a day. My preference is for the latter-named salt, as it seems to act more rapidly, more efficiently, and with less constitutional disturbance, than the others.

When the affection is of malarious origin, quinine or arsenic will usually effect a cure. I had, a few days ago, a patient

from the interior of this State, who for several months past had been suffering from severe pain in the nape of the neck and back of the head, which had been regarded as intra-cranial. Now, it is very difficult in many cases for patients to tell by the sensation whether a pain in the head is situated within the skull or in the scalp. They appear usually to be disposed to consider it within the cranium, and I often have some trouble to convince them to the contrary. Physicians are very apt to be deceived also in this respect, and hence it was not surprising that the patient I refer to was supposed to be suffering from severe brain-disease. The suspicion was heightened, both in his own mind and in that of his medical attendant, by the fact that even moderate mental exertion increased the pain. Well, there is one circumstance which, of itself, is almost sufficient to make the diagnosis clear, and that is the tenderness on pressure, which always exists in cervico-occipital neuralgia when the nerves are pressed upon where they are most superficial, and indeed, at almost any point of their course both in their roots and branches. When to this we add the fact that, in cervico-occipital neuralgia, there are none of those significant symptoms—ocular paralysis, aberrations of speech, disturbances of motion and sensibility in various parts of the body, convulsions, etc.—which indicate basilar cerebral disease, no one who has seen cases of each, or even heard them properly described, is likely to be mistaken in their diagnosis. There is a pain in the back of the head, not in the neck, which results from cerebral hyperæmia, but the history of the case, the location of the morbid sensation, and the absence of tenderness on pressure, will suffice for its discrimination from cervico-occipital neuralgia.

But to return to my patient: the pain in the back of the neck was severe, and it radiated to the temporo-parietal regions on each side. The least touch about the posterior border of the insertion of the sterno-cleido-mastoid muscle was agonizing, and even a breath of air caused great suffering. As is usual in the disease, no matter what its cause may be, the pain was aggravated by exposure to cold and damp.

Now, I noticed in this patient that every alternate night, at about eight o'clock, there was a slight febrile exacerbation.

This was not the case throughout the whole course of the disease, but only for three or four nights, as he informed me, in a month. I therefore gave him arsenic—he had previously taken quinine without effect—in the form of the granules of arsenious acid (one-fiftieth of a grain each) one three times a day, and had the satisfaction, in which the patient largely participated, of seeing him gradually but effectually cured in about two weeks.

Now, these cases, and the remarks I have made upon them, go to show how important it is for you to seek for and ascertain the cause, for, without a knowledge of that, your efforts at treatment will be so many gropings in the dark. Occasionally you may strike the right course at once, but more frequently you will blunder on till your patient gets tired of you, and tries some other physician, with a more logical mind.

There is one other case here which, as it also is similar to many others you will meet with, I will notice now, although the hour is about expired.

Case III. *Intercostal Neuralgia.*—"Mary S., aged twenty-seven years, is married, and the mother of three children. For several months before coming under our care she had been very much run down in health. She had had headache, vertigo, specks before her eyes, and her appetite had been capricious. She had also been greatly troubled with constipation and felt much debilitated.

"While in this state she was one night seized with a severe pain in the right side, which prevented her from taking a full inspiration. This continued for about two weeks, when she came under our observation, at which time she was in the following condition:

"She complained of dull, aching pain in the right side, which was greatly increased in severity whenever she took a deep inspiration. On examination, her heart and lungs were found to be healthy. There were several spots in the course of the fourth and fifth ribs which were acutely sensitive to pressure, especially over the spinous processes and in the neighborhood of the sternum. The pain was constantly present, and did not cause her very much distress so long as she kept perfectly quiet;

but, whenever she moved, or made a full respiratory movement, she suffered exceedingly. She had violent palpitations of the heart, which were always increased by exercise or mental excitement. Her face was pale, her pupils were dilated, her pulse was frequent and small, her bowels were constipated, her skin was cool and moist, her tongue was furred, and her appetite impaired. She generally slept on the affected side so as to arrest the movement of the right ribs as much as possible. She still complained of headache and vertigo. She had no fever, and as a rule slept well at night.

"An aloetic purge was prescribed to relieve her constipation, and galvanism was applied daily—the positive pole being placed on the fourth and fifth spinous processes, and the negative, containing a fine wire brush, drawn along the course of the affected nerves for ten or fifteen minutes at each *séance*. The tincture of the chloride of iron and cod-liver oil were given internally, in conjunction with a full, nutritious diet and plenty of brandy. In the course of two weeks the pain ceased, but the internal remedies were continued for six weeks, so as to repair the tone of her system, and she was then discharged, cured."

In regard to this form of neuralgia or pleurodynia, as it is sometimes called, I have only time to remark that you will find your patients to be rendered much more comfortable by the ribs being prevented moving in respiration through the application of a broad flannel bandage tightly wound around the chest. In this way the overstrained muscles are allowed rest, the diaphragm being sufficient to carry on the respiratory movements for a few days.

As an internal remedy I know of nothing better than the chloride of ammonium in drachm-doses, dissolved in water, and administered three times a day.

LECTURE XIX.

SCIATICA.

We have to consider, to-day, a disease which is unfortunately very common, and which, from the inconvenience, discomfort and intense pain which it produces, is not surpassed by many which it is our province to treat. I have just come from a consultation in the case of a gentleman, who, two or three days ago, was suddenly seized, while reaching for a book on a high shelf in his library, with a severe, sharp, lancinating pain in the posterior part of the hip and thigh, which instantly incapacitated him from moving. He is now stretched out on his bed, unable to stir the affected limb by a hair's-breadth without suffering the most acute agony.

This morning, a very honest and intelligent colored man, formerly a servant of the Sanitary Commission, and now a porter in the custom-house of this city, a strong and well-built man, came hobbling into my consulting-room on a crutch, scarcely daring to bear the least weight on his left leg, his countenance showing how much he suffered at every action of the muscles of the affected limb, and all on account of this very disease, sciatica, with which he had been suddenly seized the day before, two interesting cases of which are now before us, and to the histories of which I ask your attention.

Case I.—"L. R., aged seventeen, was admitted into the New York State Hospital for Diseases of the Nervous System, in September, 1870. She gave the following history: From childhood she had been a very healthy girl until within the last three years, since which period she has suffered from a painful affection of the left lower extremity, which has caused her to lose much flesh. When fifteen years old, she began to grow very rapidly, which she has continued to do for the past two years. Her father died of a fever some years ago, but her mother and brothers are still living, and are in excellent health. About three years since, without any known cause,

she was seized at night with a dull, aching pain in the back of the thigh. This gradually became worse, and for some time was limited to the upper part of that member. After a while, however, the pain extended along the nerves on the posterior aspect of the leg to the foot, and was of a peculiar darting character, and during the paroxysm, which usually lasted several hours, she was totally unable to sleep. For three years she was subject to these paroxysms, which had greatly impaired her health, and oftentimes confined her to her bed, and which had resisted the most rigorous treatment.

"At the time of her admission into the hospital, she was examined, and the following points of interest were elicited. The left leg was smaller by a third than the right. The muscles were atrophied, and their muscular contractility considerably impaired. There was marked anæsthesia along the whole posterior aspect of the left leg. The limb was contracted, the thigh being partially flexed on the pelvis, and the leg on the thigh. The leg could be straightened, but the contraction of the muscles connecting the thigh with the pelvis could not be overcome. She complained of a dull, aching pain extending down the back of the leg, which was accompanied by severe darting pains whenever she attempted to use that extremity. She was obliged to use crutches, for, whenever she bore the weight of her body upon the affected limb, it caused her intense suffering. At the sacral foramina and at the head of the fibula there were small, circumscribed spots which were markedly hyperæsthetic. She was subject every now and then to paroxysms of very acute pain, extending through the whole of the posterior portion of the leg, which usually lasted for two or three days, and then a remission would take place.

"During these attacks she was confined to her bed, and relief was only afforded by large doses of morphine administered internally. Changes of temperature seemed to affect the paroxysms of pain to a considerable degree.

"Although well developed, she had lost much flesh, and was exceedingly pale; her pupils were dilated, her lips bloodless, and her aspect that of a person who had endured much physical suffering. Her appetite was poor, her bowels were constipated, and she had a short, dry cough which was due to

bronchitis. There was no history of any hereditary taint in her family, and, as far as syphilis and rheumatism were concerned, if either of these diseases existed, they had not yielded to either the iodide of potassium or the wine of colchicum, which had been administered in large doses. We commenced the treatment with tonics consisting of iron, quinine, strychnia and phosphorus, so as to improve the tone of her system, at the same time the primary galvanic current was applied to the painful nerves regularly three times a week, and, during the paroxysms when the pain was so severe as to deprive her of sleep, morphine was administered hypodermically *pro re nata*.

"After the lapse of three months, her general condition had improved, and her cough had disappeared. But she was soon seized with a paroxysm of pain which confined her to her bed for two weeks, during which she was treated with large fly-blisters applied to the painful spots, and morphia internally. Iodide of potassium was after this attack given in gradually-increasing doses until she took one hundred and twenty-five grains daily. From this remedy she experienced no relief. She then took sulphur-baths every other day for a month, without any beneficial result. She soon had another attack of acute pain, which lasted three days, and from which she recovered under the same treatment as before.

"As no diminution in the frequency of the paroxysms had yet taken place, we began the use of deep injections of morphine, directing the point of the hypodermic syringe so as to penetrate the sheath of the sciatic nerve, and injecting therein the third of a grain of sulphate of morphia. These injections were repeated daily, and by this means we not only obtained the effects of the morphia, but also that of acupuncture. The quantity of morphine was gradually increased by a minim a day until the amount reached three-quarters of a grain daily, when she began to experience relief.

"Besides these injections she was given a full, nutritious diet, plenty of brandy, and galvanism was regularly applied to the affected muscles and nerves. For four months, three-quarters of a grain of morphia was daily injected under the sheath of the sciatic nerve, and gradually the neuralgia dimin-

ished in intensity until it finally disappeared. Whenever these injections were omitted, as they occasionally were, she was subject to paroxysms of pain; after this the quantity of morphine was gradually diminished by one minim a day, until the amount was reduced to five minims, when the remedy was discontinued. Her general health, since the pain had ceased, had rapidly improved, her appetite was good, her sleep regular, and she could walk without the aid of crutches, perfectly free from pain. The muscles and the diseased side had increased so that the circumference of the affected leg was nearly as great as that of the other.

"There, however, remained a contraction of the thigh on the pelvis which could not be overcome, although the contraction of the leg on the thigh had yielded to the use of galvanism. In order to remedy the former, we advised a surgical operation, to which she would not submit, and on that account one leg was apparently shorter than the other, so that in walking she had the gait of a person suffering from infantile paralysis. After the injections were discontinued, she remained at the hospital for three months, during which galvanism was applied to her leg regularly every other day. She was then discharged cured, and a year afterward she stated that she had had no return of pain."

Case II.—"J. I. R., forty years of age, was born in the United States; is married, and a stage-driver by occupation. He has always been temperate in his habits, and has never suffered from any disease since he was ten years old, until the beginning of his present trouble. From the character of his occupation, he has been continually exposed to all kinds of weather, and his being confined to a narrow, hard box on the top of the stage, and constantly riding over the rough pavement, has no doubt been influential in producing the severe neuralgia from which he now suffered along the course of the right sciatic nerve.

"This pain began about two years and a half ago in the region of the sacral foramen, and seemed confined to a small area in this situation, which was acutely sensitive to pressure. Being obliged, however, to continue his occupation, he

found that he could not rest the weight of his body upon the right side of his nates, without exciting severe suffering. He still attended to his duties for two weeks longer, and then he was obliged to desist on account of this pain, which had now extended into the calf of the leg, which was swollen, and so painful, that he could not move the limb, as the least muscular exertion served to increase his suffering.

"For five months he had endured these paroxysms, which occurred at irregular intervals almost daily, without obtaining any relief; at the end of this time he applied for admission to the New York State Hospital for Diseases of the Nervous System, when he was in the following condition: He was able to walk by means of a cane, but not without much physical suffering, which was excited whenever he attempted to bend the leg on the thigh or the thigh on the pelvis; consequently he kept his leg straight, dragging the foot along on the ground when walking, so as to avoid bending the knee. The right leg was smaller than the left, but there was only little atrophy and the muscles responded readily to a moderately strong Faradic current; not, however, without exciting pain. The whole posterior aspect of the leg was in a state of hyperæsthesia, which was particularly marked over the sacral foramen, and above Poupart's ligament there was a very sensitive spot. He frequently complained of sharp electric pains in the cutaneous branches of the sciatic nerve, which were of frequent occurrence, and took place generally during the day, although occasionally they were present at night, and then he was unable to sleep. He was thin, his appetite was impaired, his tongue was coated, he felt much debilitated, and was sometimes troubled with diarrhœa.

"The treatment consisted in a deep injection of the one-sixth of a grain of the sulphate of morphia into the sheath of the affected nerve, and this amount was gradually increased by a minim a day until the quantity was augmented to half a grain. Tonics were administered internally, and galvanism was applied to the nerves and muscles on the diseased side.

"After the lapse of three months, under this treatment, the pain had ceased, and then the amount of morphine was gradually diminished. Six months from the time of coming

under our care he was discharged, but he has subsequently returned twice to the hospital within the last two years for similar attacks, which yielded to the deep injections of large doses of sulphate of morphia.

"At the present time he is perfectly free from pain, and is able to use his right leg very well without the assistance of a cane. Nevertheless, it is not as strong as it formerly was. Whenever he takes moderate exercise he finds that the muscles of the right lower extremity soon become fatigued, and, after he has been walking an unusual amount, his leg is weak and stiff for several days. His general health is, however, good, his appetite is excellent, he sleeps well, he has gained in weight twenty pounds, and has not had a paroxysm of pain for over six months."

You will observe that, in both these cases, the disease was not of such sudden onslaught as in those to which I have alluded, and I think it is usual for it to begin in this somewhat gradual way; still its progress is always rapid enough, the full height being generally reached in a few hours.

A patient who has once had an attack becomes thereby more liable to others. The nerve, after the full force of the disease is spent, remains in a more or less irritable state, during which it is particularly liable to a fresh outbreak, and, even when this does not occur, it is quite common for the patient to be reminded, on any little extra exertion or exposure to cold, that he has a master ready on the least sign of rebellion to put the screws to his refractory subject. Sometimes, even when the patient remains perfectly still, there are sharp, shooting, electric-like pains in the affected limb, and which follow the course of the sciatic nerve and its branches. Occasionally there are involuntary muscular twitchings, which may be so extensive as to involve the whole limb.

You will infer, from these histories and remarks, that sciatica is a neuralgic affection of the sciatic nerve and its branches. I am inclined to think such an inference would be correct, and yet I am not quite sure that sciatica is a true neuralgia. It certainly is neuralgoid, but the sudden way in which it sometimes makes its appearance, as well as the gen-

eral course of the disease, gives some warrant for the opinion that sciatica is not exactly neuralgia. But, as we have no precise idea as to what neuralgia is, the discussion of the questions of the relations of sciatica to it is perhaps rather premature. What we do know is, that sciatica is a painful affection of the sciatic nerve, analogous in its main characteristics to neuralgia, and that must suffice us for the present.

Careful observation of the disease shows—and indeed, if you pay even moderate attention to the complaints of your patients, you will find—that there are some points where the pain is more acutely felt than at others. These, as in cases of pure neuralgia, correspond to the points where the nerves are most superficial, or where they are in contact with a hard resisting medium such as bone. Thus, in sciatica, we find the painful points on the skin to be those which correspond to the sacral foramina where the large and small sciatic nerves emerge from the pelvis, a series corresponding to the emergence of cutaneous branches through the fascia, a fibular point at the head of the fibula, an external malleolar, and an internal malleolar.

As far as the causes of sciatica are concerned, you have had some of them already indicated to you in the remarks I have made, and in the histories of the cases before you. In addition, it may be induced by an enlarged prostate gland pressing on the nerve, tumors of the abdominal organs, hardened fæces in the colon, the fœtal head in childbirth, and by pressure on the nerve at any part of its course, as it passes down the back of the thigh.

The diagnosis is not likely to prove a serious matter with you, and scarcely calls for special consideration at this time; and the prognosis is not serious ordinarily unless the cause is of such a character as to be difficult or impossible of removal. In the treatment of sciatica almost every agent capable of directly relieving pain, and many others, which have been suggested from theoretical considerations of the nature of the disease, have been employed, with varying success. I have no intention of wearying you with them, but will briefly give you the ideas which no small amount of experience has caused me to form on the subject:

One point, however, about which there is no difference of

opinion, is, that, if there is any agent exerting a mechanical effect on the nerve, such as a tumor, for instance, of any kind, it must be removed before you can expect any permanently beneficial result. You may relieve the pain temporarily without removing such a cause, but you will not cure the disease.

My experience has convinced me that no direct effect is to be produced in cases of sciatica by constitutional means of treatment, except in those cases which have a constitutional origin. These are the malarial, the rheumatic, and the syphilitic cases. In the first, quinine, but I think preferably arsenic, will be of great service; in the next colchicum is generally advantageous; while, in the syphilitic cases, iodide of potassium must be given with or without mercury, according to the length of time which has elapsed since infection. When, as sometimes happens, sciatica occurs soon after the origination of a chancre, mercury may be administered with advantage, but, if several years have elapsed, I prefer to give the iodide alone.

As to local means of treatment—and they should be employed even when there is a constitutional cause—there are two agents which are preëminently useful, and these are morphia hypodermically administered, and the galvanic current. The first should be given in gradually-increasing doses, and I prefer for this purpose the solution recently recommended by Dr. Lawson, in his little work on Sciatica, of morphiæ muriat., or (as we generally use in this country) sulphatis grs. x, aquæ destil. ʒ ij, M. solv. This solution is partially solid at ordinary temperatures, and must be warmed before administration, so as to cause complete solution of the separated crystals. Every six minims of this contain one-half of a grain of morphia. Two minims, equivalent to one-sixth of a grain, are sufficient for a first injection, and this may be gradually increased, if necessary, to half a grain. One injection a day is generally sufficient; two, however, may be necessary in extreme cases. Dr. Lawson carries the point of the syringe to the depth of an inch or an inch and a half, without regard to the nerve, further than that he recommends that the injection be given in its neighborhood. I prefer to strike the nerve with the point of the syringe, and then to inject. To do this

is no difficult matter. Select a point on the posterior aspect of the thigh about four inches below the trochanter major of the femur, and an inch exterior to the median line; push the point of the syringe perpendicularly, and with no great haste, and, at a depth varying from one to two inches, you will strike the nerve. You will know this by a slight thrilling sensation, passing down the patient's limb. All you have to do now is to inject and withdraw the syringe. If you do not strike the nerve, it is better nevertheless to administer the dose rather than to try again, or to move the point of the syringe about in the attempt to find the nerve. Even if you miss it at first, a little experience will soon enable you to hit the nerve every time. To save pain and apprehension on the part of the patient, it is better to render the skin anæsthetic by the ether-spray. The effects of this treatment are generally very decided at once. I have had patients, who walked with the utmost difficulty, leave my consulting-room with an elastic step and free from pain a few minutes after using such an injection as I have described; and others, who could not even turn in bed or move the affected limb, get up and walk about the room after a like period. The pain, however, returns, and the injection must be repeated, and in slightly larger doses.

But the treatment is not only palliative, it is often positively curative. Dr. Lawson himself was permanently cured by it, and many cases within my own experience have been equally successfully treated. Several of them, those of you who attend the clinics of the New York State Hospital for Diseases of the Nervous System have seen for yourselves.

I do not wish you to understand that Dr. Lawson devised this treatment. It was practised long before he wrote on the subject, and I have used it for several years. Both the cases before you were treated by it two years before Dr. Lawson's observations were published. But to him is to be ascribed the credit of recommending a strong solution, and thus diminishing the quantity of fluid injected, and of insisting upon the great value of the method more strenuously perhaps than had any one before him.

The next method of treatment which is to be regarded as decidedly beneficial in sciatica is electricity. My experience

has convinced me that the Faradic current does no good. On the contrary, by stimulating the muscles to contract, it increases the pain in the nerve and its branches; having, therefore, the same effect as voluntary movements of the limb. But such is not the case with the primary or galvanic current when applied, as it ought to be, so as to pass equally and constantly through the nerve. One sponge may be placed on the back at the junction of the sacrum with the os innominatum or lower, over the point of exit of the sciatic nerve from the pelvis, and the other in the popliteal space, or higher upon the posterior face of the thigh. As strong a current as the patient can bear should be used.

I prefer, however, to pass the current directly through the nerve by means of needles introduced down to its sheath. These needles should be insulated except at their points, and then, being attached to handles which can be brought into communication with the battery, are rapidly passed with a rotary motion down to the nerve. I generally select a point at the upper part of the posterior aspect of the thigh for one needle and a point two or three inches below for the other. Two or three of Hill's cells will furnish a current of sufficient intensity. I have several times succeeded in breaking up a paroxysm of intense sciatica, and effectually curing the patient by a single application, but usually several are required. I have never witnessed the least untoward result from the use of galvanism in this way.

Another useful means of treatment consists in the employment of repeated blisters. These should be made long enough to reach the whole length of the thigh, and should be three or four inches wide. One will often give great relief, and two or three will sometimes effect a cure. But they are not to be compared in efficacy to the measures I have mentioned.

As to ergot and other internal remedies which have been suggested under the idea that sciatica is a disease of the cord, I have not much to say. Certainly pains along the course of the sciatic nerve are often relieved by ergot, but then every pain in the sciatic nerve is not sciatica, and those pains in it which result from special diseases are very different in character, and have a very different clinical history, from that affection of the nerve which we call sciatica.

LECTURE XX.

ORGANIC INFANTILE PARALYSIS.

This affection, as its name implies, is essentially a disease of childhood, and it particularly claims your earnest attention, not only on account of the frequency with which you will meet with cases in practice, but also owing to the great difficulty which you will experience in effecting a cure, if you do not appreciate the gravity of the affection, and begin early an appropriate treatment. There is a prevalent idea that nothing can be done to arrest the course of this disease, and hence it is that cases, which would be at an early period amenable to treatment before the beginning of muscular atrophy, are neglected, and consequently, when brought under observation, exhibit evidences of having existed for a length of time, such as the decrease in the size of the limbs, the great loss of electric contractility, and the marked changes of fatty degeneration which the muscles are seen to have undergone when we come to examine their fibres under the microscope. Not only, in severe cases, do we discover these phenomena, but we also find a considerable decrease in the temperature of the affected limbs, which become cold and bluish, owing to a want of proper circulation. Then in time follow distortions of various kinds, according to the degree of the paralysis of the different muscles, for it must be remembered that, however extensive the paralysis may have been in the beginning, in the lapse of a few weeks or months the general paralytic effects begin to subside, and after a while there remains only a local paralysis which is confined to either one or more extremities, a group of muscles or a single muscle, as the case may be.

We find very early in the course of the disease that the electric contractility of the affected muscles is considerably impaired, and in some cases abolished, to the stimulus of the Faradic current, even before we can discover any signs of atrophy. When, however, atrophy has once begun, the elec-

tric contractility disappears in proportion to its progress; so that in a few months it is entirely lost, and then we discover that the patient is unable to exert his power of will over these muscles, and that the galvanic current is powerless to excite contractions. We also perceive that certain muscles in the same patient have their electric muscular contractility impaired in different degrees: for example, when the affection is recent, you will notice that certain muscles respond to a weak Faradic current, while others are only called into activity by a powerful galvanic battery. From this circumstance we infer that the former muscles will regain their normal condition in a short space of time, whereas the latter will require months and perhaps years to restore them to their normal integrity.

One point I wish to impress particularly upon your minds, and that is, that this disease primarily is a paralysis and not an atrophy. The atrophy is a secondary result, which takes place on account of deficient nutrition, in consequence of the impaired function of the spinal cord, so that a smaller amount of blood is sent to the affected muscles than to their corresponding healthy members. Owing to these changes in nutrition, the muscular fibres are absorbed or else replaced by fat. When this process of fatty degeneration has progressed to such an extent that we are unable to produce contractions by means of a powerful galvanic battery, there is nothing to be expected in the way of treatment, as the case is absolutely hopeless. Before making any further remarks, I desire to read to you the following histories, which will aptly illustrate many of the symptoms of this disease:

Case I. *Organic Infantile Paralysis.*—"Lizzie W., a pretty, robust-looking little girl, of about six years of age, came to the New York State Hospital for Diseases of the Nervous System, in the month of August, 1870, to be treated for a paralysis of the right lower extremity, which had existed for over a year. The affection had developed itself very suddenly in her case. She had complained of pain in her back, and had had some febrile symptoms during the day, but no particular importance was attached to these phenomena. The next morning the nurse found that the little girl did not

arise at her accustomed hour, and, on going to ascertain the cause, she perceived that she was paralyzed in all four of her extremities to such an extent that she was unable to move. For two weeks she was perfectly helpless, and then her left lower and both her upper extremities began to improve, and they continued to do so gradually during six months, when they were apparently restored. The right leg had regained sufficient power, at the end of a month, to enable her to walk, but soon after this it began to diminish in size, and was very cold to the touch. Friction had been resorted to, to restore the impaired mobility, but with little or no success.

"When admitted to the hospital, L. W. was in good general health. Her bowels were regular, her tongue was clean, her skin was cool, her pulse was natural, her appetite was excellent, and her sleep was sound. Her heart and lungs were healthy.

"There was no paralysis of the upper extremities, nor of the left leg. These members were warm, well nourished, and apparently strong, although they may have been weaker than they formerly were. The right leg and thigh were small, on account of the atrophy of the muscles, and very cool to the touch. The skin was livid, and its circulation impeded. The toes hung down to an extreme degree, whenever the patient raised her foot from the ground. The power of the will over the diseased muscles was diminished, but not abolished, as she could still bring them into action by a strong effort of volition. The tactile sensibility was normal, although the reflex excitability was entirely destroyed. The temperature of the right leg was several degrees below that of the left, as was ascertained by means of a delicate thermometer. The right leg was about half an inch shorter than that of the left, and this, combined with the paralysis, and the impairment of the voluntary power over that extremity, gave to the patient a very characteristic gait, which is better appreciated when seen than when described.

"On applying a strong Faradic current to the affected muscles, no contractions of their fibres were observable in any part of the leg, although at the upper portion of the thigh the muscles responded feebly. A primary galvanic current of forty cells produced slight contractions in all the diseased muscles

excepting the tibialis anticus, which required the full force of a fifty-cell battery to cause it to act, and even then the fibres contracted very slightly. Specimens of the different diseased muscles were obtained by means of Duchenne's trocar, and carefully examined microscopically. Oil-globules were discovered in all, and the transverse striæ were very faintly visible in the fibres of the tibialis anticus, while they were more or less indistinct in all those muscles whose electric contractility was greatly impaired. In the thigh, however, at the upper third, the muscles appeared to be in a perfectly normal condition.

"This patient's treatment consisted in the daily application of the primary galvanic current, one pole being placed upon the back above the seat of the disease, and the other applied to the fibres of each muscle, so as to bring them all into action. After all the diseased muscles had been thus thoroughly galvanized, the mother was instructed to knead them daily, even to the extent of exciting pain. An hypodermic injection of the one-fortieth of a grain of the sulphate of strychnia was given every other day. At the end of a year all the muscles of the right leg excepting the tibialis anticus responded better to a strong Faradic current than to the galvanic, and consequently the former was substituted for the latter. After the lapse of eighteen months, during which the treatment was strictly followed, the patient could walk well. The two legs were nearly equal in size, but there remained paresis of the tibialis anticus accompanied with dropping of the foot, and a quarter of an inch of shortening in the right leg. As far as could be learned there was no hereditary predisposition to diseases of the nervous system in the family, and no apparent exciting causes could be assigned for the attack."

Case II. *Organic Infantile Paralysis.*—"A bright boy, four years of age, came under our care at the latter part of the year 1870, for paralysis of the lower extremities and the right arm. It seems that some two years ago his mother discovered that he did not use his legs and arm with his customary vigor; but, as he had never learned to walk, and had been intrusted almost entirely to the charge of a nurse, she could not state

how long the affection had lasted before it was noticed. The nurse informed us, however, that the child had been restless and very fretful for a few days prior to the discovery of the paralysis, and she was quite sure that the disease had come on very rapidly. This boy had nursed until he was eighteen months old, when he was weaned. For some time after this he was troubled with diarrhœa, and lost flesh considerably during several weeks.

"Prior to this attack, however, he had been remarkably well. After he was paralyzed, he could move both his legs and arm to a slight degree, and for three or four months he appeared to improve somewhat, but his limbs began to waste in the course of time, and became cold to the touch. He had never learned to walk, nor even to support the weight of his body upon his legs.

"When we first saw him his condition had by no means improved. His right arm hung by his side, and, although he was able to give it some voluntary motion, it was in reality nearly useless. It was almost an inch shorter than the left, its muscles were greatly atrophied, and its strength so much impaired that the child could not raise it from his side or grasp an object with his hand, and retain it. He could move the fingers to a slight degree, through a strong effort of the will. There was a tendency for the fingers to contract into the palm of the hand, which showed that the extensor muscles were the most affected. The deltoid appeared to be equally involved with the other muscles of the right arm. The legs, like the arm, were greatly atrophied, and were some five degrees below the temperature of the left arm. The child could not stand without support; in fact, he could not use his legs with any better success than he could his affected arm. He had to be carried about, wherever he went.

"The tactile sensibility and the sensibility to pain were unimpaired. The reflex excitability was somewhat diminished, although not entirely destroyed. A strong Faradic current was incapable of exciting the diseased muscles into activity, although forty cells of a very powerful galvanic battery produced feeble contractions. The peronei and the tibialis anticus muscles in both legs were greatly weakened, and caused

a certain degree of distortion, which might be appropriately called talipes equino-varus. There was no trouble with his bladder, his bowels were regular, his appetite was good, and his general health was excellent for one in his helpless state.

"As soon as we found that the diseased muscles responded to galvanism, we pronounced the case favorable, and immediately began the treatment by making an application of galvanism sufficiently strong, to the diseased muscle every other day, to cause contractions without regard to the degree of pain. Of course, the pain which the patient suffered was necessarily great, as the sensibility was intact. An hypodermic injection of the one-sixtieth of a grain of the sulphate of strychnia was employed every alternate day, and gradually increased *pro re nata*. Small doses of phosphorus were also administered internally.

"After remaining under treatment a year, the patient could walk, but the deformity of the feet still remained. The peronei and tibialis anticus muscles were still very weak. His legs had, however, increased considerably in size, and he could manage to progress with a rather hobbling gait. His arm had likewise improved very gradually, he could raise it from his side, and use the hand for movements which were not very complex in character, but not with facility, and it had likewise gained in length, from the persistent application of galvanism, over half an inch. As all the muscles now contracted under the influence of a Faradic current, his mother determined to proceed with the treatment herself, and he accordingly passed from under our observation relieved, but not cured. The result of this case has not yet been ascertained."

As in the examples which I have just read, the symptoms of organic infantile paralysis are generally pretty quickly developed, and as a rule careful investigation will usually reveal their existence in the great majority of cases, although sometimes no phenomena whatever are observed, they being so slight as to pass unnoticed, until suddenly the nurse or the mother discovers some time afterward that the child does not use its limbs in creeping, or in making other move-

ments. This failure to distinguish the disease is most apt to occur in the cases of very young children where the paralysis is confined to the lower extremities; because these members are not used, comparatively speaking, to the same extent as the arms, before the child has learned to walk; and consequently, when the legs are paralyzed, they do not attract the attention of the nurse or parents.

The disease is usually, however, ushered in by well-marked phenomena of febrile excitement, which consist in increased temperature of the skin, acceleration of the pulse, inability to sleep, restlessness, and a general peevishness of disposition which cannot be controlled. The tongue is coated, and, if the child be sufficiently old to express his feelings, he may complain of a dull, aching pain in the back, which marks the limit of the disease in the spinal cord. After these symptoms have lasted a few days, the paralysis is usually fully developed; sometimes, however, the affection begins suddenly with convulsions.

There soon appears a marked diminution in the temperature of the affected limbs, which is easily ascertained from the first by means of a very delicate thermometer, and which as time elapses becomes very apparent to the touch. This deviation of temperature is always present, and is at times so extreme that the thermometer will indicate a difference of as many as ten degrees between the diseased limbs and the corresponding healthy ones, although you will ordinarily find that the decrease in temperature is not over four or five degrees. The tactile sensibility and the sensibility to pain are generally normal, although in some few cases you will discover a slight impairment, but this is the exception rather than the rule. The reflex excitability, however, is more commonly affected; sometimes it is abolished even from the very commencement of the disease, and at other times it is diminished, so that when you tickle the sole of the foot, for instance, the patient will make an attempt to withdraw it, but by no means with that degree of vigor that he would manifest if his spinal cord were in a perfectly healthy condition.

Before long, evidences of impaired nutrition show themselves in the affected extremities, such as you see in this little

girl, whose right leg is small, and badly supplied with blood. You will observe the livid hue of the skin, and you will notice, when I press it strongly with my finger, that it is some time before the color returns to the compressed surface. All this points to a sluggish condition of the venous circulation.

In time atrophy supervenes in the paralyzed limbs, and this degeneration after it has once begun usually pursues a very rapid course, and, *pari passu* with the atrophy, the electric contractility of the muscles is still further diminished; and hence it is that, when the muscles have become greatly degenerated, we are able to produce either slight contractions, or none at all, by means of the induced or galvanic currents. For you must remember that the electric contractility is generally impaired before the supervention of the atrophy, in the same manner that it is in other kinds of paralysis. When speaking of diseases of the spinal cord accompanied with paralysis, I believe I told you that the electric contractility was almost always more diminished in them than in those of cerebral origin. After the atrophy has commenced and the transverse striæ have begun to disappear, there of course must come a time when the muscular tissue is converted into oil-globules and fat-vesicles. If we remove a small piece of the affected muscles from a patient at this stage of the disease, by means of the little trocar invented by Duchenne, and examine it carefully under the microscope, we shall find that the transverse striæ are either very indistinct, or are entirely absent, that the fibrillæ are irregular and loose, and that oil-globules and fat-vesicles are seen in abundance. But in every patient you will not discover structural changes in the muscles, even though the disease has lasted some time; for in two instances, which I can now distinctly recall, and in which the disease had existed for several years, the most careful microscopic examination failed to reveal the slightest change in their structure.

You observe that both these patients are able to move their affected extremities to a certain extent, although the amount of atrophy is considerable in each, and that there are certain muscles which are more implicated than others. In this little girl the tibialis anticus appears to be very weak,

and allows the toes to drop whenever she raises her foot from the ground; and the same muscle is likewise involved, together with the peronei, in this little boy, to such a degree that the opposing group of muscles, although diseased, are still powerful enough to distort the limb, and produce that kind of club-foot which we designate talipes equino-varus. You see also that the hand has a tendency to close, so that the fingers are drawn into the palm, but he can extend them through a strong effort of volition.

The power of the will is diminished, but not abolished, even in those muscles that are the most affected; but after a while, as the disease progresses, the influence of volition will be destroyed, and the distortions that exist will become permanent, if the treatment be not continued. The extensor muscles in this, as in some other forms of paralysis, generally lose their electric contractility to a greater degree than the others, and consequently we find that they resist treatment longer. You must, however, bear in mind that the mere fact of the electric contractility being lost to a Faradic current, howsoever strong it may be, is no certainty that the muscular tissue has undergone degeneration, for we find that this current is unable to produce contractions in cases when a weak galvanic battery will readily cause them to take place; consequently, in arriving at an accurate prognosis, it is necessary in the first place to examine carefully portions of the fibres of the affected muscles to see to what extent their tissue is involved. If the transverse striæ still exist, and fatty degeneration has not taken place to an extreme degree, and there still remain enough muscular fibres to contract to a strong galvanic current, the prognosis is favorable, and the only two elements that will be required to effect a favorable result are perseverance and time.

Another point of importance is, that there is no tendency in this disease for the paralysis to extend beyond the limits of the muscles first involved. But there is, on the contrary, a strong disposition toward the repair of the spinal lesion which results generally in a partial restoration of motility before the commencement of atrophy.

In organic infantile paralysis the bladder is not involved, as it so often is in other forms of spinal disease; neither is con-

stipation nor diarrhœa a constant symptom, although either of these conditions may be occasionally present.

The tendency in this affection to muscular atrophy, and the permanent character of the paralysis, suffice to distinguish it from those cases of anæmia of the anterior columns of the spinal cord which have been confounded with this disease.

In the large number of cases of organic infantile paralysis which have come under my care within the last eight years, I have been unable in the majority of them to find an adequate cause for the onset of the disease. It may, however, supervene after any of the diseases of infancy, or after undue exposure to cold. In the two cases before us we find that one followed an attack of diarrhœa, and for the other we are unable to assign any cause.

The first sign of improvement in the muscles is an increase in the temperature of the affected parts. For ascertaining this, I generally employ Becquerel's disks, which will determine with absolute certainty a variation of the one-hundredth of a degree. By means of this apparatus we can accurately note slight changes in the rise of temperature which take place from time to time, and which indicate an improvement in the circulation and nutrition of the parts.

I will now pass to the consideration of the treatment, which I generally divide into general and local. Of these, however, the latter is of the most importance. During the acute stage, I require that the patient should be confined to his bed, and kept absolutely quiet, no medication being of any benefit during this condition, so far as I know. After the acute symptoms have passed, and the disease has become chronic, our attention is to be particularly directed toward the trouble of the muscles. As a tonic to the muscles and a general stimulant to the nervous system, I know of no remedy that will fulfill these conditions better than strychnia. It may be given in doses of a thirty-second of a grain three times a day, either alone or in conjunction with iron, quinine, and phosphorus. I generally, however, prefer an hypodermic injection of the thirty-second of a grain of strychnia every other day, which is to be increased or diminished, according

to the age of the patient. By local treatment we aim to promote nutrition of the muscles, and increase their contractile power. The first result is accomplished by increasing the amount of blood, and causing it to flow more quickly through the diseased muscles; and, for this purpose, heat, friction, and kneading, are the methods to be employed, while, in order to increase the contractile power of the muscles, electricity, together with active and passive motion, are the chief means of accomplishing that end.

In applying heat the limb should be immersed in hot water varying in temperature from 110° to 130°, according to the susceptibility of the patient, and it should be allowed to remain there for at least twenty minutes or longer, as the case may require. Frictions are also useful adjuvants, but, in order to be of any utility, they should be employed many times a day, and with sufficient force to redden the skin. But, of all these means, I consider kneading of the muscles the most efficacious. In order to produce the desired effect, the diseased muscles should be strongly pinched to the extent of exciting pain, and in this manner the affected parts should be gone over thoroughly once or twice a day. After this process has been carefully performed, the redness of the surface will readily indicate the increase of the amount of blood in the parts.

Our main reliance, however, depends upon electricity in some one of its forms. If contractions can be produced by the induced current, we should steadily employ it. But if this agent fails us as it so often does, especially when the disease has only lasted a short time, we should have to make use, as a last resort, of the primary galvanic current. If we are unable to elicit from a powerful battery of this kind, after a few trials, any contractions, the case is hopeless; and, if we examine microscopically fibres of the muscles in such instances, we shall find that the muscular striæ have disappeared. But, if even the feeblest contractions exist in response to a strong galvanic current, no matter howsoever slight they may be, we should persevere, and in time success will crown our efforts. In addition to electricity in those cases where the power of will has been more or less impaired, the joints

should be freely moved daily, and the child taught to bring the diseased muscles into activity through a strong effort of the will. Before closing this subject, I have one other case to bring before you, which is interesting from the fact that, although it resembles organic infantile paralysis in its effects, nevertheless, on careful examination of the history of the case, you will perceive that it differs from that affection in several important particulars.

Case III. *Paralysis with Distortion, probably the Result of Spinal Meningitis.*—"A boy, aged ten years, was brought to the clinic, suffering from paralysis of the forearm, and paralysis with distortion of the right leg. It appears that he was a healthy child until he reached his second year, when he had a violent attack of vomiting and purging, which was followed by convulsions, accompanied with opisthotonos, which occurred at intervals for several weeks.

Such was the brief history of this case prior to his admission to the clinic, at which time his condition was as follows: He seemed to be in good general health, but there existed paralysis of the right forearm and leg. The foot was distorted through a paralysis of the peronei and tibialis anticus muscles, while the heel was drawn up, producing a deformity which might be called talipes equino-varus. Often you would notice movements, similar to chorea, take place in the left shoulder, and these shrugging or jerking motions were at times very evident. When he was excited, he was able to move the right arm quite freely, but, as soon as the excitement abated, he was unable to give it much motion. When he moved the forearm, he always moved the whole arm at the same time, and then he was able to perform movements very satisfactorily. In all the movements of the diseased members there was the association of coördinated movements in other parts of the body; when he wished to raise the whole arm, there was associated therewith a movement of the shoulder. If he moved the leg, he was obliged to throw his body backward. In fact, all his movements on the diseased side were associated with movements in some other part of the body. He was unable to raise his toes through an effort of the will, although he could elevate his knee."

This boy appears to be suffering from infantile paralysis, but such, I think, is not the case. You observe that there is an extreme degree of paralysis in the peronei and tibialis anticus muscles, and as a consequence the foot is drawn inward, while the gastrocnemius and soleus contract tonically and shorten the muscles at the back of the leg to such an extent as to elevate the heel to a considerable degree. You see, however, that it requires some force to overcome the resistance and bring the heel into its proper position. It is through the paralysis and contractions of the different healthy muscles of the legs that the various forms of club-foot are produced, for in this way their natural antagonism is destroyed, and deformities are the result. Some of these instances take place before the birth of the child, and they are therefore born with distortions of the extremities.

You remember that the trouble commenced with this boy when two years old, with vomiting and purging, and this was succeeded by spasms accompanied with opisthotonos, occurring at intervals during several weeks. In all probability he had either an attack of congestion of the cord or inflammation of the meninges, and I should be rather inclined to think the latter of those affections, for violent contractions are one of the main symptoms indicative of the disease of the meninges of the cord. It is not usual to have spasms in congestion of the cord itself unless the meninges are involved. I have seen cases in which the spasms affected both sides of the body, and yet there remained, as a result, paralysis upon one side only.

Such appears to have been the sequence in this case. This is not exactly such an example as I have already brought before you to illustrate organic infantile paralysis. It rather resembles the remains of a spinal meningitis which has been followed by paralysis of the right forearm, and paralysis with distortion of the right leg. You observe that now, while he is excited, he moves his right arm very readily, whereas while he was quiet he was unable to do so. This shows conclusively that he has at times a certain amount of voluntary power over the right arm. Besides, if you watch him closely, you will see, every now and then, a shrugging or jerking of the left shoulder which very closely resembles chorea. His move-

ments are, as you see, not such as a child would make if full voluntary power were present. He cannot move the forearm without moving the whole arm, and sometimes he can perform these movements better than at others.

In this case the influence of coördinated movements is well illustrated. Some people, you know, who stammer, can speak freely if they do something else at the same time; and, not unfrequently, persons can be broken of stammering by directing them to associate some other movements of the body with their efforts of speaking. Sometimes nothing more is required than merely tapping the thigh lightly with the finger, or some equally simple motion. The result is, that the associated movement corrects the stammering, and the person speaks without hesitation. A like circumstance takes place in this boy's arm. He cannot make a simple motion of the forearm without throwing back the arm. When he wishes to raise the whole arm from his side, he brings into play the shoulder or some other part of the body simultaneously. From this fact you see that there is no actual paralysis of the deltoid, because, when the movement of the shoulder is associated, the arm is raised.

But the main point of inquiry in this case is, What will benefit the boy? In the first place, I should advise the division of the tendo-Achilles, and then to draw down the foot, and retain it in its natural position by some simple apparatus. Then I should proceed to act systematically upon the muscles with the electric current, and, if these muscles possess any contractility, I should expect, with time and perseverance, to improve his condition materially. When I come to compare the length of the right leg with that of the left, I find an appreciable amount of shortening, which betokens an arrest of development often occurring in these cases. To overcome this deficiency, he will be obliged to wear some apparatus to make up for the shortening, for he will not, in all probability, regain the loss of length, which he might do if younger. In one case of infantile paralysis of the arm which I had under my observation, and which was shortened fully three-quarters of an inch, the arm grew out equal to the other under the influence of the primary galvanic current. One

electrode was placed upon the head of the radius, and the other applied to the various muscles. In the course of time the limb increased in length and size, and, when the child passed from under my care, he was fully cured. In addition to galvanism, I should make use of an hypodermic injection of strychnia, from the one-fortieth to the one-thirtieth of a grain, according to circumstances, every other day, and increase it, if I thought it necessary.

THE END.

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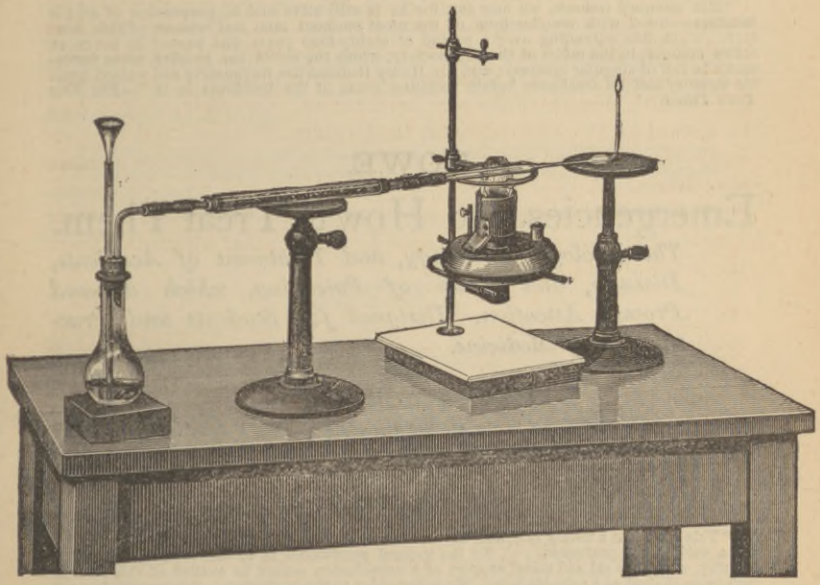

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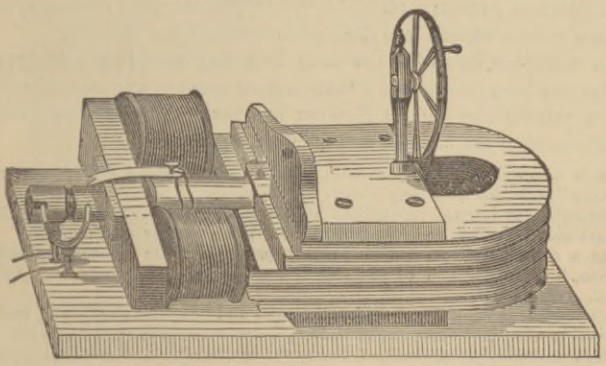

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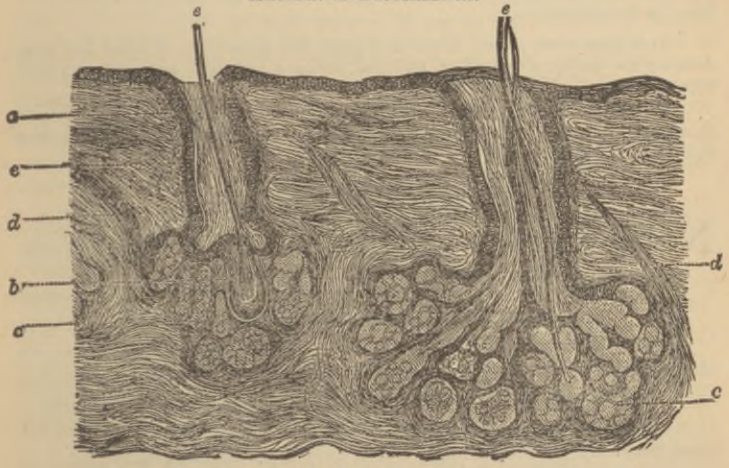

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