# *Diagnosis of Chronic Abscess of the Brain.*

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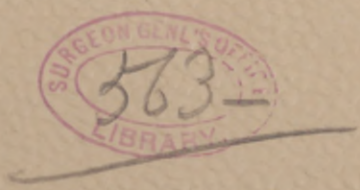


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# DIAGNOSIS OF CHRONIC ABSCESS OF THE BRAIN.

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Chronic abscess of the brain may, for the sake of convenience of description, be divided into two varieties. The one is the result of acute or subacute focal intracranial suppuration in which the symptoms have become more or less latent; while the other begins with symptoms so ill-defined and unobtrusive as scarcely to attract attention, if, indeed, they do not escape observation entirely during the early stage of the morbid process. It would aid in preventing confusion in the study of abscess of the brain if all those cases that begin with more or less pronounced cerebral symptoms, and continue with unmistakable and progressive signs of brain-disorder, were regarded as acute or subacute, no matter what may be the duration of their course. It may be argued that it would be more definite to call those abscesses of the brain that begin with acute or subacute symptoms, and are followed by a latent period, as latent, leaving the term chronic to apply only to those whose early period is insidious. It does not matter much which course is followed so that it is distinctly understood what is meant to be conveyed by the word chronic as employed to designate certain varieties of abscess of the brain. A chronic abscess is essentially latent from its commencement to the beginning of its terminal period, and the so-called latent abscess is usually one whose duration is more or less prolonged. An abscess of the brain whose early symptoms have been so unobtrusive as to place it in the category of the chronic variety may run a much shorter course than the one ushered in by pronounced symptoms and followed by a latent period.

Wide differences of opinion are held to-day by physicians and surgeons of recognized ability regarding the difficulties encountered in the diagnosis of chronic abscess of the brain. Much of this discrepancy is due, it seems to me, to many accepting all intracranial suppuration as the result of an acute process. At the Surgical Congress held in Berlin April 17, 1895, the distinguished surgeon, Professor von Bergmann, in a paper entitled "Progressive Cerebral Surgery," stated: "Cerebral abscess must always be operated on. Its diagnosis is easy if the etiology is considered. The principal cause of cerebral abscess is inflammation of the middle ear; it is usually situated in the temporal lobe." Leube,

than whom few have attained to greater distinction as careful and painstaking diagnosticians, says: "The diagnosis of subacute and chronic abscess of the brain is, on the whole, easy." According to Professor Murri: "He (Leube) gives the most important indications of cerebral abscess, intermittent fever associated with rigors, and attributes great value to the absence of optic neuritis and etiological considerations." (*Lancet*, January 12, 1895.)

Gowers, in his work on *Diseases of the Nervous System*, begins the paragraph on diagnosis of cerebral abscess with "The extreme variability and frequent latency of the course of cerebral abscess often render its diagnosis difficult and even impossible."

Spitzka, in Pepper's *System of Medicine*, after making the statement that "there is little difficulty in recognizing the existence of cerebral abscess in which well-marked focal and constitutional symptoms coincide, or where a distinct abscess-producing cause, such as an ear-trouble, a head-injury, or a putrid bronchiectasis, coexists, adds, "but there are a number of cases, varying from the latent form to forms with obscure general symptoms, whose recognition is impossible or at best a matter of conjecture." (Vol. v. p. 799.)

Professor Murri states that Martius has made a study of seventeen cases of cerebral abscess occurring in the German hospitals during the past few years, and not one of them was recognized during life (*Lancet*, January 5, 1895, p. 12). I might continue at great length to quote from various writers concerning the difficulties of recognizing, during life, chronic cerebral abscess, and I might add mistake after mistake in diagnosis, not a few of which would be my own, but I have no need to extend my remarks in this direction, as you are aware, I have no doubt, from personal experience, of the uncertainties attendant upon the diagnosis of intracranial suppuration, especially of the chronic variety. I do not wish to underestimate the difficulties that are sometimes encountered in diagnosticating acute cerebral suppuration. These not infrequently prove insurmountable, but they are, on the whole, less than are met with in diagnosis of chronic abscess. Many of our text-books are content with a description of abscess of the brain, as though it always originated in acute cerebral suppuration.

The importance of recognizing the essential difference between acute abscess and chronic abscess of the brain will justify a rather lengthy quotation from Professor Murri's admirable "Address on Experimental Craniotomy and Diagnosis of Cerebral Abscess" (*Lancet*, January 12, 1895, p. 79):

"Abscess of the brain, which, when clinically considered, seems to be an essentially unique morbid process, resolves itself into two varieties which differ utterly in diagnosis, viz.: acute abscess and chronic abscess. Writers aiming at the unity of the process lose sight of the clinical side, and do not bring into sufficient relief the practical differences which exist between the

two varieties. What they say of abscess applies chiefly to the acute form. Bacterial analysis might throw more light on the causes of the differences which are developed in the process of suppurative inflammation of the brain. At present what we chiefly know is the intensity of the exciting causes; the duration of the process depends much on these. If a considerable cerebral artery is closed by an embolus; if a wound on the head causes disturbance, contusion, or hemorrhage in a zone of the brain; if a suppurative otitis media violently affects the bony substance and gives rise to a thrombus in the cranial sinuses, or excites inflammation in the adjacent meninges, the nutritive process of the cerebral tissues near cannot avoid deterioration, the pyogenic agents find a field well prepared, and their devastations are in consequence very rapid. But here, besides the rapidity of the disease, there arises another clinical distinction. These occurrences, being more intense, cannot easily happen without being perceived by both the patient and his medical attendant. Moreover, the succession of phenomena aroused by them is not so disconnected as to lose the evidence of their reciprocal relation and the unity of the process they reveal. Finally, even the reaction of the brain provoked by rapid and great intracranial changes is more evident and appreciable to the practitioner. If to all this we add that the rapid diffusion of suppuration causes fever, and even a special fever, as a phenomenon revealing the nature of the morbid process, then it is easy to comprehend how the clinical idea assumes a form so distinct that the diagnosis of acute abscess naturally follows.

"When we come to the chronic forms of cerebral abscess, the description and opinions of pathologists inspired by the observation of such facts no longer correspond to the facts themselves. In these the exciting causes are less intense or less apparent. It is one thing, for example, if an embolus from a pulmonary vein closes the artery of Sylvius, and another if pus penetrate unperceived into the brain by one of those narrow ways which lead there from without. The slightness of the latter is not only marked by the absence of disorders perceptible to the patient, but it also causes a slower succession of changes around itself; the surrounding tissues, not previously affected and violently attacked, have time to organize themselves for the defence, and in time circumscribe with a solid barrier (pseudo-membrane) the hostile element (pus) which tends to destroy it. This mysterious faculty which the brain possesses of adapting itself to the most serious lesions as long as they are gradual has full opportunity to act completely. Thus it follows that, from ignoring or forgetting the primary cause, it seems as though no external cause exists; and here we have the idiopathic abscess, which is almost always chronic. Even where the primary cause is known, if it be not violent, the process which succeeds follows with less rapidity, and hence the slight changes of the brain may not arouse perceptible functional disorders. Here we have the latent abscess or the latent period of the chronic abscess. The slowness with which brain-alterations proceed proves that a length of time is required for their development, and here we see the abscess become chronic. The perception of these internal processes is often defective, as is frequently seen in the doctrinal works of the pathologists and in the reasoning of clinical physicians who write and think of cerebral abscess as though it existed only in the acute form. But the abscess exists also in the chronic, idiopathic, latent, or semi-latent form, and this, though less frequent than the acute, is by no means as rare as statistics would make us believe."

A small number of cases of chronic cerebral abscess, from their inception to the beginning of the terminal period, and a few others in their most latent stage, may not present pronounced symptoms of organic brain disease until there are manifestations of the terminal period, but a careful study of cases of obscure brain diseases will reduce this number to a minimum. The symptoms of abscess of the brain are common

to several forms of organic brain disease, and a correct interpretation of them will depend upon the experience, diagnostic skill, and thoroughness of the medical attendant. Professor Murri's precaution to bear in mind the possibility of the presence of chronic cerebral abscess in investigating cases of obscure brain disease might be advantageously observed by all. The frequency of this form of cerebral abscess is not great, but the presence of chronic cerebral suppuration is too often overlooked for the credit of medical science or the welfare of the unfortunate sufferer.

Conclusions reached by an analysis of the most accurate history may, in some cases, lead from the truth; but in the vast majority of instances information thus obtained, together with a thorough examination of the mental and physical condition of the patient, when all the modifying circumstances of the case are carefully considered, will greatly aid in arriving at an accurate diagnosis. Not infrequently the history of some condition that is known to be favorable to abscess-formation in the brain will be obtained from the patient. Months, and in rare cases years, may have elapsed since the cause was apparently active, and at the time of the examination it may have been forgotten both by the patient and his friends, and memory of it is only revived by a careful and intelligent line of questioning. It may have been a blow on the head; a fall from a height and lighting on the feet or buttocks without striking the head; a painful condition of one or both ears, either with or without otorrhœa; suppuration in some portion of the body; or some exhausting disease, possibly influenza, diphtheria, rheumatism, or typhoid fever, from which recovery has never seemed complete. In typical cases the history will develop the fact that headache, intermittent or constant, has been a prominent feature for a greater or less part of the time that has occurred since the time of the illness that left the patient's health impaired. In some cases irregular febrile phenomena, dimness of vision, vertigo, failing nutrition and strength, and sometimes mono-spasm, mono-paresis, hemiplegia, or general convulsions have been experienced. In the majority of instances, on examination of persons suffering from chronic cerebral abscess, we shall find evidence of organic brain disease; but occasionally the patient may present a vigorous appearance, and death may occur without warning, as was the case in Professor Murri's experience (*Lancet*, January 12, 1895, p. 80). The most careful and exhaustive examination of the motor apparatus and of the general sensory phenomena may yield negative results. The reflexes may be normal or slightly exaggerated. If the motor cortical areas or the motor tracts of the brain are affected, either directly or indirectly by the abscess, symptoms of paresis, paralysis, or muscular rigidity will be present, corresponding to the extent and situation of the abscess and the softening resulting from its presence. Nutrition and muscular strength

usually fail in the course of the disease, but in some cases these are unimpaired. Mental failure, especially slow action of the mental faculties, and difficulty in maintaining mental concentration for a length of time, and lessened power of memory, together with irritability of temper, are not infrequent results of chronic cerebral abscess. Recurring convulsions, sometimes mistaken for those of idiopathic epilepsy, are occasionally found in cases whose other symptoms of cerebral disease are most obscure.

Individual Symptoms. Among the special symptoms of chronic abscess of the brain headache is the most important. Its significance is that its beginning dates from exposure to certain conditions that are known to be capable of giving rise to abscess of the brain. It is rarely constant, but there are very few cases of this disease in which headache has not been more or less pronounced during some portion of their course. At times the headache is severe, and at others it amounts simply to a dull or uncomfortable cephalic sensation. In some instances the headache, if present at all, has been so slight as to escape attention entirely. When the terminal period, caused by softening, œdema, or extension of the abscess, is reached, headache, even if absent before, often becomes a very prominent symptom, and its severity marks the beginning of the end. The seat of the pain does not always correspond to that of the abscess. If the terminal period is short and the symptoms tumultuous, the obscured consciousness often prevents any voluntary complaint of head-pain being made, although, even in such rapid cases, if the patient can be aroused and his attention engaged for a few moments, the fact that headache exists can, not infrequently, be obtained from the patient in answer to a direct question. The typical temperature of chronic abscess of the brain, if the morbid process is sufficiently large to exert much depression, is normal or slightly subnormal. At times there may be slight intermittent febrile processes which are frequently attended by cool and clammy perspiration. Optic neuritis, when present, is a symptom of great importance. Some observers seem inclined to think that it is of infrequent occurrence, while others have observed it in a sufficiently large proportion of cases to regard it as a valuable aid in the diagnosis. In the cases that I have observed it has been present more frequently than absent, but the extreme degree of swelling so commonly seen in association with tumor of the brain I have not observed as a symptom of abscess.

*Terminal period.* This period may extend over several weeks or a few days, and, possibly in some cases, may last only a few hours. Its duration depends upon the manner in which the abscess causes death. The latent period may end suddenly by the abscess bursting into the lateral ventricles and giving rise to all the symptoms of intra-ventricular hemorrhage. The rupture may occur on the surface of the brain

and cause local, or, more commonly, general lepto-meningitis, which proves rapidly fatal. When the pus finds its way to the surface of the brain in the posterior fossa, both by the meningitis and the direct irritation of the pons and medulla, the cardiac and respiratory centres are interfered with. In the latter case, if the patient survives the shock, the symptoms will be those of cerebro-spinal meningitis, prominent among which will be retraction of the head, rigidity of the muscles of the back of the neck, and sometimes of the spine, with manifest opisthotonus and shock-like convulsive rigidity of the muscles of the limbs, especially of the arms. Œdema and softening of the brain-substance are the causes of death in about one-half the cases of abscess of the brain. In many of these in which the motor and sensory areas of the brain are not especially affected, either directly or indirectly, by the abscess, the softening may take place so gradually that no symptoms of it may be detected until sudden collapse or death results from the apparent arrest of cerebral function. It is probable, however, that if these cases that end suddenly from softening and œdema were carefully watched, symptoms of failing brain-power and general vigor, together with increased headache, irritability of temper, and a tendency to depression, might be detected weeks before the fatal end. In all the cases of chronic abscess of the brain except one which have come under my observation during the terminal period the symptoms of this stage have developed in a subacute manner. The prominent symptoms have been headache, usually dull and heavy in character, but at times attended with severe paroxysms of pain, failure of nutrition, energy, and strength; mental dulness and slowness, and irritability of temper; vomiting only when associated with severe paroxysms of pain in the head; optic neuritis in a number of instances; slow or normal pulse when the patient is quiet, but sometimes easily accelerated by exercise; subnormal temperature in nearly every case; convulsions occasionally at the beginning or ending of the terminal period; paralysis, usually hemiplegic in character, or paresis, with rigidity of the affected muscles from pressure on the motor fibres of the brain, in more than one-half the cases, and in a number hemianæsthesia with hemianopsia. As the terminal period progresses the symptoms increase in gravtiy; the sensory functions become more and more blunted, the patient's apathetic condition increases, and finally stupor, followed by coma, sets in, and the patient dies after remaining unconscious several hours to several days. It is rare after symptoms of the terminal stage become prominent for the patient to show more than temporary improvement.

Localizing Symptoms. Percussion has afforded me little or no aid in diagnosticating a chronic abscess. The localizing symptoms of abscess of the brain may vary from those of tumor because pressure-symptoms are sometimes less marked in the former than in the latter, and on

ccount of the more complete destruction of tissue and greater œdemaa and softening found associated with abscess. We must remember, however, that a tumor may exert no more pressure than abscess, and that it may as effectively destroy brain-substance as the latter. Definite focal symptoms are less frequent from abscess than from a morbid growth, because the most common seats of the former are in those portions of the brain, the cerebellum, frontal and temporo-sphenoidal lobes, whose functions are not definitely known. It is probable that distinct localizing symptoms are as frequently absent as present from abscess of the brain.

*Frontal lobe.* A large abscess may exist unsuspected in the anterior portion of the frontal lobe, and a small one may be situated just anterior to the motor region without giving rise to symptoms indicative of its location. It is only when softening or œdema extends backward to the motor area of the cortex or the white substance beneath it, or pressure is exerted on this portion of the brain, that localizing symptoms develop, except in a few cases in which pupillary symptoms are found when the abscess is in the posterior and lower portion of the frontal lobe. If, with general symptoms of abscess of the brain following a blow on the front of the head, a septic embolus from the lungs or associated with an infective process in the frontal sinus, a gradual increasing paresis or paralysis of the face or arm on one side should occur, preceded, or not, by convulsive movements of the affected muscles, pupillary symptoms would indicate one frontal lobe as the seat of the abscess. If the pupil on the side opposite to the one on which the muscles are involved should become sluggish or inactive, while its fellow responded normally to light and accommodation, it would aid in locating the abscess in the posterior portion of the frontal lobe. It must be borne in mind, however, that the same pupillary phenomena may be present when the anterior portion of the temporo-sphenoidal lobe is the seat of the abscess, as occurs from a similar lesion in the posterior portion of the frontal, but suppuration in the former situation usually results from middle-ear disease. Macewen's observations in relation to the pupillary phenomena may be quoted in full: "When the abscess is situated in the temporo-sphenoidal lobe or the frontal lobe, the pupil on the same side as the abscess may either become myotic or mydriatic, accompanied by a degree of stability. When the abscess is small and produces cerebral irritation the pupil on the affected side may be more or less contracted and sluggish. When the abscess is large and exercises considerable pressure the pupil on the affected side is prone to stabile mydriasis. An abscess which is small and produces a stabile myosis to begin with, may, as it augments in bulk, produce a stabile mydriasis in the same eye. Occasionally, the only difference detectable is sluggishness of one pupil to both light and accommodation, while its neighbor acts freely.

In a case of cerebral abscess a sluggish pupil with either mydriasis or myosis on the same side as an infective injury to the skull, or a unilateral otitis media, affords further evidence of the abscess being on the corresponding side of the brain." (*Pyogenic Infective Diseases of the Brain and Spinal Cord*, p. 145.) In five cases of abscess of the frontal lobe observed by me the pupillary phenomena described by Macewen were present in only one, but this was the only one of the five in which the abscess was located in the posterior portion of this lobe.

*Temporo-sphenoidal lobe.* A small abscess, and even one of considerable size, may be situated in the temporo-sphenoidal lobe without giving rise to any distinct localizing symptoms. In the case of chronic abscess of this lobe the history, most likely otitis media on the same side as the abscess, might afford the only clue to localization. A large abscess, on the other hand, would probably develop localizing symptoms from the effects of pressure on the surrounding structures, and if extensive softening and œdema should occur, regions of the brain whose functions are fairly well known would become involved. If the abscess were on the left side in the posterior portion of the temporal region, so as to affect the first and second temporo-sphenoidal convolutions, sensory aphasia would be present. On either side of the brain a large abscess in the anterior portion of this lobe might cause paresis or paralysis, first in the face, and secondly in the arm of the opposite side, with pupillary symptoms, such as sometimes occur in abscess situated in the posterior portion of the frontal lobe. Macewen has observed in cases of abscess in the anterior portion of the temporo-sphenoidal lobe paralysis of the third cranial nerve of the same side, thus producing crossed paralysis, the third cranial nerve on the same side as the abscess being affected and paralysis of the face and arm of the opposite side resulting. A careful study of the direction in which the paralysis extends after the first group of muscles is involved will often afford valuable information upon which to base a localizing diagnosis. Not infrequently the middle-ear disease which leads to acute abscess of the brain paralyzes the facial nerve as it passes through the Fallopian canal, but this rarely occurs in chronic abscess.

*Occipital lobe.* In three cases[1] of chronic abscess of the occipital lobe observed by me paresis and muscular rigidity, nearly complete hemianæsthesia, and hemianopsia of the opposite side existed. In each case the abscess was large and situated in the white substance, so as to exert pressure on the fibres of the posterior half of the internal capsule. It is probable that the fibres coming from the cortical centre of sight in the cuneus were rendered functionless, either by pressure or softening, as the cortical substance of this region did not seem to be directly involved.

[1] The Medical News, July 27, 1895.

A small encapsulated abscess, in all probability, might remain in the white substance of the occipital lobe for a long time without giving rise to any localizing symptoms. It should be borne in mind that chronic abscess of the so-called idiopathic variety (probably due to suppuration in distant portions of the body) is most commonly situated in the occipital lobe.

*Cerebellum.* An encapsulated abscess of considerable size situated in the posterior portion of one lateral lobe of the cerebellum might cause no definite symptoms so long as it remained more or less latent. An abscess in the anterior portion of either lateral lobe or one in the middle lobe would likely give rise to pressure-symptoms on the pons and medulla, in which case cerebellar ataxia would be manifest. The cardiac and respiratory phenomena, together with yawning, observed in acute abscess of the cerebellum, would probably not occur in the chronic abscess until the terminal stage develops.

Differential Diagnosis. Other organic lesions than abscess of the brain are attended by symptoms common to intracranial suppuration, so that one of the most difficult problems encountered by the clinical physician in the diagnosis of chronic cerebral abscess is differentiating it from other diseases that so nearly resemble it, both in their clinical history and apparent etiology.

The following case illustrates the similarity of the symptoms of cerebral softening following thrombotic occlusion of an artery to those of cerebral abscess:

A man, aged twenty-two years, an Austrian by birth, a miner by occupation, living in Colorado four years, was admitted into the Arapahoe County Hospital, March 25, 1895, completely paralyzed in the left leg and arm and lower side of the face of the same side, the upper portion of the latter being paretic. His family history was negative, and he had always enjoyed good health up to the beginning of his present illness. He denied indulgence in alcohol further than an occasional glass of beer, and said that he had never exposed himself to venereal poison. About two months before coming under my care he suffered for two or three weeks from pain in the left side of the head and the left ear. Bleeding by the application of leeches over the left mastoid process seemed to relieve the pain, both in the head and ear. About four weeks ago he felt weak in the left arm for a day or two. The arm seemed all right on the third day, but on the fourth it became quite weak, and he began to suffer from pain in the left side of the head in the parietal region, and occasionally in the anterior temporal. Two days later the left leg was weak and awkward, and the day following the left side of the face was observed to be smooth and the mouth drawn to the right. Seventeen days ago, when he first came to Denver, from Idaho Springs, he could ascend and descend stairs, but the whole of the left side was weak, yet he could still use the left arm some, although not so well as the left leg. Two days later, or on the 10th of March, the left arm and leg and the lower portion of the left side of the face became completely paralyzed, and remained in this condition until he entered the hospital on the 25th day of March. Consciousness had never been affected.

*Examination on admission.* There was complete flaccid paralysis of the left arm, left leg at ankle and knee, and lower half of the left side of the face. The upper portion of the face and the hip were paretic. He could not close the left eye as tightly as he could the right. The tongue was protruded slightly to the left, and when the face was at rest the mouth was drawn a little to the right. The left side of the face seemed equally weak both for voluntary and emotional movements of the affected muscles. The deep reflexes were slightly increased on the left side, but the superficial were absent. It was impossible to make a satisfactory examination of the sensory phenomena in the absence of an interpreter. The fundi and disks of the eyes were normal. Both pupils were dilated, the left being larger than the right, and both acted feebly to light and accommodation. The axillary temperature was 98.6° F.; pulse 72; respiration 20. His mind seemed clear, and he appeared to appreciate what occurred around him. Three days later, or on the 28th, I began having the temperature registered in each axilla thrice daily, at 6 A.M., 12 M., and at 6 P.M.; and this was continued until April 12th, the time of the operation. At noon of the 28th the temperature was R. 99.8° F., L. 99.6°. It remained about the same until the next day at noon, when it was found one degree below normal, and the same in each axilla. On the 30th the temperature was found to be 100° F. in each axilla and the next two days it was normal. The pulse varied from 70 to 72, and respiration from 18 to 24.

On April 1, 1895, assisted by an interpreter, I made a more careful examination. At that time he could raise his left leg from the bed and hold it straight at the knee, but there was absolute paralysis of the muscles below the knee. The arm and face remained about the same as on the former examination. The left trunk-muscles were weaker than the right, but still retained considerable power. Dyn.: R., 120; L., 0. Knee-jerks: R., absent; L., increased. Ankle-clonus: R., absent; L., present and continuous. Tendo Achillis: R., absent; L., increased and attended by clonus. Plantar reflexes: R., present; L., absent. Cremaster and abdominal reflexes: R., present; L., absent. The deep reflexes of the right forearm were slightly increased; the left were exaggerated. All the sensory phenomena were lessened on the left side, the temperature-sense being the most impaired; on the right, sensation normal. Taste and smell present on each side and about equal. Hearing with watch: R., 10/12; L., 8/12; with tuning-fork hearing better in left ear. Eyes: R., V. = 20/30(?); fields—temporal normal, nasal absent up to median line; and fundus and disk presented nothing abnormal. L., V. = 20/30(?); fields—nasal preserved, temporal absent up to median line. Some obscuring of the nasal side of the disk by congestion and recent exudate. Beginning neuro-retinitis was apparent. The next three or four days the axillary temperature was about normal or slightly subnormal. On one occasion it was nearly two degrees below normal. On April 4th the left fundus and disk remained about the same as on the 1st, and the right were still normal. Power seemed to be returning in the left leg, but no change could be detected in the arm and face. Bilateral left homonymous hemianopsia was still absolute. Sensory function was greatly lessened throughout the left side, but it was most impaired in the arm. During the entire time he had been in the hospital he had complained of considerable pain in the right side of the head, extending from the anterior temporal region back to the posterior parietal. Just how long he had had pain in the right

side of the head I could not ascertain. It will be remembered that at the beginning of his illness the pain was in the left side of the head. The head-temperature had been persistently slightly elevated, and the rise was sufficient to lead me to diagnosticate an irritative lesion in the brain. From the 4th to the 12th of April the patient remained in nearly the same condition that he had been in from March 25th to April 4th, except that headache became more troublesome, and was limited to the right parietal region. The axillary temperature remained practically normal, was about equal in each axilla, but occasionally it was 0.1° to 0.2° higher in the left than in the right. As time wore on the tendency was for the temperature to be slightly continuously higher on the paralyzed side, but the difference was never more than a few tenths of a degree.

On April 10th he made a slight correction in the history of his illness. In the original history he had stated, or the interpreter had made him state, that he had pain in the left ear, and this, together with the head-pain, had been relieved by leeches applied over the mastoid region; but in his revision he said it was four months ago when he had pain in the left parietal and frontal regions of the head, and there was no pain in the ear. He reaffirmed the former statement that the pain in the left side of the head ceased on the application of leeches to the left mastoid region. About this time (or April 3d) it was observed that anæsthesia of the left side, including the face and scalp, was becoming more pronounced, and the special senses, taste and smell, were less acute than on the right side. Repeated registration of the surface-temperature of the head showed the head-temperature to be about two degrees above normal. This indicated an irritative lesion of the brain. The urine had been examined a number of times and found free from albumin and sugar, and no cardiac murmur had been detected. The young man's age was against the idea of hemorrhage; there was no cause, so far as I could detect, for embolism, and his repeated and positive assertion that he had never exposed himself so as to contract syphilis made me inclined to disregard the vascular lesions, although, in a clinical lecture on this case delivered the day before the patient was subjected to an operation, I stated that thrombotic occlusion of arteries of syphilitic origin would best explain the symptom-group. The localizing symptoms indicated two separate and distinct lesions, one in the Rolandic region on the right side, involving primarily the arm-centre, and the other in the centrum ovale of the temporo occipital region of the same side. I argued that a single lesion in the centrum ovale so situated as to cause anæsthesia of the opposite side would affect the leg as much or more than the arm, and the face would be involved to a less extent than the leg or arm; but in this case, the face and arm being more affected than the leg, indicated that we should find two lesions. Excluding a vascular lesion, the probabilities were in favor of a tumor or an abscess. Multiple tumors in the centrum ovale are uncommon, and the absence of choked disks was decidedly against the diagnosis of tumor. In favor of abscess we had the gradual onset of the paralysis involving one group of muscles after another, and the seat of one of the lesions in the centrum ovale of the occipital lobe was the common location of abscess of pyæmic origin. No distinct cause could be found for abscess, but I consented to recommend an operation for the relief of the patient in hopes that we should be fortunate enough to find and evacuate one or more abscesses.

On the 12th of April Dr. Edmund J. A. Rogers removed a button of

bone from the skull over the arm-centre on the right side and found the brain-substance, including the cortex immediately beneath the trephine-opening, soft and diffluent, looking very much like pus. On exploring the centrum ovale in the occipital region another area of softening was found. Dr. Leonard Freeman, pathologist to the hospital, examined the material as it was taken from the brain, and his report is as follows:

"The soft, white material removed from the brain by Dr. Rogers closely resembled pus to the naked eye, but under the microscope no pus-corpuscles could be seen. A few red corpuscles were detected, but they probably came from the blood that mixed with the material during the operation. The corpuscles of Gluge were quite numerous, and some small fat-globules were observed here and there. The mass of the substance was composed of disintegrated nerve-fibres, which were rather short, and could be distinctly seen and accurately studied as they floated in the current of the fluid across the field. There were no gliomatous or other tumor-cells, and no crystals of any kind. There was no reticulated structure."

The operation was carried no further than to remove the most diffluent of the broken-down brain-substance. The wound was carefully dressed and the patient regained consciousness, and said his head felt better. About twelve hours after the operation he began to exhibit evidences of failing, and the temperature rose to 100° F. After this he lost rapidly, and died fifty hours after the operation, the temperature reaching 106° F. just before death.

*Autopsy*, six hours after death, performed by Dr. Leonard Freeman: On removing the iodoform gauze from the wound softened brain-substance and yellowish-whitish particles resembling disintegrated brain-substance ran out. The middle meningeal vessels on either side arose from the ophthalmic vessels. Great œdema existed at the base of the brain, especially around the cerebellum, pons, and medulla. The arteries at the base of the brain presented no evidence of disease, except on the right side, where the middle cerebral was thickened and its calibre was occluded by a thrombus at the point where the nutrient vessels to the basal ganglia are given off. The cortex of the middle and lower Rolandic region and temporo-sphenoidal lobe was softened. The cortex of the left hemisphere was negative. On cutting into the right cerebral hemisphere a large area of softening, about three inches by two in size, occupied the cortex of the middle and lower Rolandic region and the white substance beneath. The occipital lobe was the seat of a large area of softening which occupied nearly the entire white substance of this lobe. The softening in the occipital lobe reached the cortex postero-laterally. The entire corpus striatum and thalamus were softened but not diffluent. The interior of the left hemisphere presented no pathological appearances. Cerebellum and ventricles negative. The microscope showed the change in the arterial walls to be syphilitic.

In the light of the autopsy the clinical history is clear, and had not syphilis been so strenuously denied, no other diagnosis than that of arterial occlusion would have been seriously considered. It is useless to speculate whether the man knew he had syphilis; whether he had contracted it without sexual intercourse and did not know it; or whether the condition of his cerebral bloodvessels was due to hereditary syphilis. The latter is very improbable.

The following case,[1] coming on after an attack of influenza, a possible cause of cerebral abscess, and presenting symptoms of meningitis, was due to an unsuspected vascular lesion which proved fatal:

J. N., aged thirty years, white, a boiler-maker by occupation, whose family and personal history was not obtainable, suffered from la grippe about four weeks before. He was greatly reduced by the attack, but no localized lesion was found. He had gradually recovered, so that he anticipated returning to work in a day or two, but he was still weak and languid. On the morning of the 17th of April, 1895, about thirty-six hours before I saw him, he awoke and was talking with his wife, when suddenly he put his hand to his head and cried, "Oh, my head!" Soon after this he lost consciousness, but he rallied in the course of a few hours and talked some during the day, but seemed dull and stupid and complained of pain in his head. The next morning he was nearly unconscious, but in the afternoon he was able to talk with his wife, and seemed rather bright. The temperature, Dr. Richmond reported, had appeared normal, although he had not registered it. When I entered the room, at 5 P.M., he observed and spoke to me, and said that his head was paining him. He looked depressed and appeared to be suffering. Pupils were small, but responded to light. The posterior cervical muscles were rigid and the head slightly retracted. After I had been in the room examining him for two or three minutes he became unconscious, and I found it impossible to arouse him The temperature was 98.3° F. in each axilla; pulse 72; respiration 16. The knee-jerks were slightly increased. The ophthalmoscope showed no ocular change, and there was no evidence of paresis or paralysis of any muscles. The history of la grippe, the prolonged convalescence following it, and the sudden development of head-pains with normal temperature made me apprehensive of cerebral abscess, although no discharge was observed from either ear, and his wife stated that he had had no ear-trouble. On removing him to the County Hospital two hours later, his temperature was found to be 100.4° F. in the right axilla, 100.2° F. in the left, and 100.4° F. in the rectum. The rise in temperature was thought to be due to the disturbance caused by removing him to the hospital. He did not seem to be totally unconscious; his eyes would follow me or the lamp around the room; when asked his name he endeavored to give it, and succeeded in doing so in an indistinct manner. I asked Dr. Rogers, the attending surgeon at the hospital, to see him with me at 9 P.M. The temperature then registered 99° F. in the right axilla and 99.2° F. in the left; pulse 60; respiration 16; retraction of the head was well marked, and on my attempting to bring the head forward, it seemed to give some pain. The diagnosis at this time seemed to rest between meningitis and cerebral abscess. The retracted condition of the head indicated irritation of the meninges in the posterior cerebral fossa, but the normal temperature at the time of my first visit, and its again descending after he had been resting a few hours in the hospital, seemed to militate against the presence of meningitis. That night his temperature was registered in each axilla every two hours, and the average temperature for the night was 98.4° F., being about the same in each axilla. At 9 o'clock

[1] Irrigation of the Posterior Cerebral Fossa for the Relief of Basilar Meningitis. Journal of Nervous and Mental Disease, Nov. 1895.

the next morning the temperature in each axilla was 99° F.; pulse 64; respiration 18. He was becoming more stupid, pulse was occasionally irregular and respiration at times intermittent. At noon, when Dr. Rogers again saw him with me, his condition remained about the same as it had been during the morning, but we could find no indications for operative procedure. During the afternoon his temperature varied from 98.6° to 99.4° F.; pulse 63; respiration 18. It was quite evident that there was pressure in the posterior fossa, especially around the pons and medulla. The low temperature contraindicated meningitis, although normal or subnormal temperature is sometimes observed in this disease. Abscess of the brain did not seem likely, as the temperature had been found constantly a little above normal most of the time for the twenty-four hours he had remained in the hospital. During the afternoon he seemed to be sinking into a deep comatose condition, and it was evident that life could not be prolonged many hours unless relief of pressure on the pons and medulla was effected by surgical means. I could be positive of but one thing, and that was pressure at the base of the brain in the posterior fossa. A button of bone was removed from the posterior cerebral fossa of this patient, and the parts irrigated for the relief of cerebral pressure, the patient subsequently dying.

*Autopsy* eleven hours after death by Dr. Leonard Freeman, pathologist to the hospital: The wound had healed without the formation of any pus, and no abnormal adhesions between the dura and the bone were detected. The external surface of the dura presented a healthy and glistening appearance. The pia over the convex surface exhibited no marked changes except engorgement of the veins. No clots were found in the venous sinuses. The arteries at the base of the brain presented evidences of disease in their walls, and in the main branch of the left middle cerebral artery, just before the cortical vessels are given off, a clot was found which blocked up the entire calibre of the vessel. In the centrum ovale of the left frontal lobe a considerable quantity of semi-fluid blood was found, which, after ploughing up and destroying a considerable portion of this part of the brain, ruptured into the lateral ventricle and filled the lateral, third and fourth ventricles. The corpora striata were softened A slight hemorrhagic extravasation was found in the right frontal lobe. The remainder of the brain presented a normal appearance. There was no evidence of any meningitis, nor of abscess. The pathological condition was one of hemorrhage into both frontal lobes, the greater in the left, the blood finding its way into the lateral ventricles, and filling these, together with the third and fourth ventricles.

The case just reported presented symptoms before death that were difficult to interpret. At the time of my first visit the normal temperature, dazed appearance, and retraction of the head, following a prolonged convalescence from an attack of la grippe, suggested the possibility of cerebral abscess complicated with cerebro-spinal meningitis. It may be thought that the sudden onset of the cerebral symptoms should have suggested cerebral hemorrhage; but we know how common it is for a cerebral abscess to be unsuspected until it ruptures into the ventricles, when the symptoms simulate those of hemorrhage into the cavities of the brain. A large hemorrhage into the ventricles is so commonly attended

with a subnormal temperature at first, and a few hours later by a considerable rise of the temperature, that the case did not appear like one of cerebral hemorrhage. Further, the man's age was against the probability of hemorrhage. The subsequent history of the case after the patient was admitted into the nervous wards of the hospital soon made me give up all thoughts of a cerebral abscess and led me to regard it as a case of cerebro-spinal meningitis. The sudden loss of consciousness, followed an hour or two later by a return to a conscious condition, and after this consciousness and unconsciousness alternating one or more times, were difficult to explain before death.

The normal temperature at the time of my first visit may probably be explained by the irritating influence of the blood in the lateral ventricles counteracting the depressing effect of the hemorrhage into the anterior lobes of the brain. The condition of alternating consciousness, in the light of the post-mortem results, is probably explicable from the fact that hemorrhage first took place in the substance of the left anterior lobe, which probably gave rise to loss of consciousness. After reaction from this consciousness probably returned, and subsequently when the blood burst into the lateral ventricles, consciousness was again lost. As this process of filling the ventricles was evidently a gradual one, from the fact that depression was no greater, consciousness returned while this was going on, and it was not till the lateral ventricles became completely distended and the blood had found its way into the fourth ventricle that consciousness was finally lost.

Hemorrhage into the frontal lobes of the brain is of extremely rare occurrence, and hemorrhage in a man so young as the patient whose case has just been reported is extremely infrequent. A hemorrhage into the centrum ovale external to the great ganglion, and then bursting into the lateral ventricles, would have found its way so readily into the cavities of the brain as to overwhelm the vital forces of the patient and cause a profound shock, such as is commonly witnessed in ordinary intraventricular hemorrhage. The retraction of the head was due to blood in the fourth ventricle, and the serum of the blood which had found its way around the pons and medulla into the posterior fossa came from the blood in the fourth ventricle.

The case throughout its clinical history was a most puzzling one, and a positive diagnosis was not attempted. It was quite evident that there was irritation in the posterior fossa, and that in this portion of the brain pressure was increased; but beyond this I would not be positive, though the most likely thing that would account for it seemed to me at the time to be a basilar meningitis with exudation around the pons and medulla.

We meet with cases whose symptoms are apparently best explained by a vascular lesion, but at the autopsy an unsuspected cerebral abscess may be found, as occurred in a man whose history is as follows:

J. S., aged seventy-five years, white; widower for a number of years; born in Ireland; by occupation a laborer; of large physique; in Colorado since 1870, was admitted to the Arapahoe County Hospital, January 22, 1895. Family history, so far as I was able to learn, was unimportant. His health in childhood was good, and he had no serious illness until his seventieth year. He had indulged rather freely in alcohol, but during the last five years he had rarely drank. He denied syphilis, but suffered from gonorrhœa twenty years before. He received a bullet-wound in the left shoulder while in the army, in 1861. With the exception of the time during which he was disabled on account of the wound, he said that he was never sick a day in his life until twelve years ago, when he was kicked on the left shin. The injury to the left leg was followed by great pain, and later a large ulcer developed, which nearly healed at times, but for a number of years he had had a large open sore on this leg. One month before coming to the hospital, however, the ulcer completely healed, leaving a large dark-colored, rough cicatrix which was very tender to pressure. For some years he had suffered from vague rheumatoid pains in the legs, especially in the knees and ankles, and in the entire left leg he had had a feeling of numbness for about five years. This leg seemed to him awkward, but he was able to walk with the use of a cane. For a number of months there had been a partial inability to control the bladder; frequently he would soil the bedding and his clothes, and had to evacuate the bladder several times during the night. The patient said that he was struck over the lower portion of the back and nates by a cable-car early in January of the present year. He was able to rise and walk immediately after, and he did not think he had sustained much injury, although pressure over the lower portion of the back gave him considerable pain. Since the accident he had lost all control over the bladder, and the left leg had been very weak. The left arm, he had noticed, was weaker than the right. He had been obstinately constipated for a number of months. The condition of the right pupil, which was widely dilated and immobile, was the result of an injury which he had received eleven years ago to this eye.

*Examination, January* 22, 1895. He is unable to stand on account of the weakness of the left leg, and the examination has to be made while the patient is lying in bed. An old scar is observed on the anterior surface of both legs below the knees. They are evidently the result of old ulcerations. The arteries of the extremities are hard and unyielding. The left leg is very weak, but he can move this leg at all the joints, although the power is feeble and the movements are ataxic. The ankle-muscles of the left leg are weaker than those of the knee, and the latter are weaker than those of the hip. Muscular power seems to be fairly good in the right leg; the left arm is weaker than the right: Dyn. R., 100; L., 40. There is slight rigidity in the left arm, with tendency to hold the arm close to the side of the chest, and flexed at right-angles at the elbow. His mental condition seems feeble, concentration of his mind is very difficult, and it is almost impossible to keep his attention on one subject more than a few minutes at a time. There is considerable loss of sensation throughout the left side, apparently more pronounced in the arm and leg than in the face. The knee-jerks are present; the left slightly increased, while the right is less than normal. Plantar reflexes and tendo Achillis are present; ankle-clonus absent; cremaster and abdominal reflexes are absent. The external ocular muscles seem to act

normally. The right eye is cataractous, the pupil being widely dilated and does not respond to light or accommodation. The left pupil is very small and does not respond to an active mydriatic, so that an examination of the fundus of either eye is impossible. There is apparent hemianopsia of the left eye; the fields could not be tested in the right eye on account of the presence of a cataract. The mental hebetude was too great to permit of an accurate examination of the special senses. The temperature is 98.2° F.; pulse 60; respiration 24. During the first week of his stay in the hospital his temperature varied from 98° to 99.2° F., usually being about 98.4° F. in the morning, and 98.8° to 99° F. in the evening; the pulse ranged from 54 to 90, only falling to 54 on one occasion, to 60 on three, and to 66 on two, the usual variation being from 72 to 88; respiration varied less than the pulse, ranging, except on two evenings, from 18 to 20. A record of the temperature, pulse, and respiration was made twice daily. During this week he gradually failed, both mentally and physically. He soon lost all continuity of thought, and his mind was a complete blank for any event of recent occurrence. He ate but little; he emaciated rapidly, and passed the discharges from the bladder and bowels into the bed. The second week, from January 29th to February 4th, there was a gradual failure. The temperature ranged between 98° and 99.4° F.; pulse between 60 and 80; respiration between 18 and 20. During the third week prostration increased rapidly, and his mind became a total blank. The temperature was a little lower than during the preceding week, rising above 98.4° F. only once, when it reached 100° F. one evening, but most frequently it registered 98° F. The pulse varied from 70 to 96, averaging about 80, and was weak and compressible; respiration ranged from 20 to 36. The rigidity of the left arm- and leg-muscles became more pronounced. On February 12th he passed into a deep comatose condition, and the muscular rigidity began to relax, and at 5 P.M. the temperature was 99° F.; pulse 100; respiration 24. The next morning at 7 o'clock the temperature had reached 101.4° F.; pulse 120; respiration 40; and at 5 P.M. the temperature was 105° F.; pulse 130; respiration 36. He died during the night.

*Autopsy.* The post-mortem examination was made about twenty hours after death by Dr. Leonard Freeman, pathologist to the hospital. The dead-room was cold and the body thoroughly frozen. Unfortunately, only the contents of the cranial cavity were examined. The adhesion of the dura to the bone was not abnormal. The membranes and cortical surface of the brain, neither on the convex nor on the basilar surface, showed any evidence of disease. The vessels were atheromatous, but not to a pronounced degree for one seventy-five years old. On sectioning the left cerebral hemisphere, no gross pathological changes were found, but in the right hemisphere an encapsulated cavity about two inches in diameter, containing a foreign substance presenting almost the identical appearance of orange water-ice, was found in the centrum ovale of the parieto-occipital region. The greater portion of the pathologic process had taken place in the occipital lobe. The lateral ventricle had not been broken into, but only a very thin partition of brain-substance intervened between the cavity and the posterior horn of this ventricle. None of the cortical substance of the brain had been directly involved by the foreign substance, which occupied a position so as to exert pressure on the right internal capsule. No evidence of gross disease was found in any other portion of the brain. In the frozen state it was impossible to determine

whether the lesion was a cyst or an old abscess. On melting the icy contents of the cavity they presented the appearance of a watery straw-colored liquid, and seemed to be the result of a cyst; but the microscope showed numerous granular and broken-down pus-cells, proving the lesion to be a chronic abscess. There was no odor. After warming the brain the right hemisphere was found to be much softer than the left; but the extent of the ante-mortem softening could not be determined, as brain-substance softens so rapidly on warming it after it has been frozen.

Although I had an opportunity to study the above case for a period of three weeks, the presence of an abscess of the brain had not been suspected before death, and finding one at the autopsy was a great surprise to me. The age of the patient, the atheromatous condition of the radial arteries, and the comparatively sudden onset of the symptoms of cerebral softening, led me to suspect and to diagnosticate arterial thrombosis. The temperature was normal or nearly so, as is common to abscess or slow necrotic softening taking place after occlusion of a cerebral artery. I regret that I did not make a careful comparison of the temperature in each axilla. It is probable that the temperature would have been found higher on the paralyzed than on the unaffected side. In hemiplegia from necrotic softening it is likely that this difference of temperature in the two axillæ does not exist to a marked degree, and when present is not persistent, except possibly when the lesion causing the softening is an irritative one, as sometimes happens in acute softening from obstruction of large vessels. The history of a fall did not militate against thrombosis, as the head did not appear to have been injured at the time, and it is not infrequent for occlusion of a cerebral artery in the aged to be preceded by increased physical exertion, which may or may not be a determining factor in the final closure of a narrowed vessel. As it was impossible to obtain a view of the ocular fundi, the condition of the disks could not be ascertained. The absence of headache was in favor of a vascular lesion, and against abscess or tumor. In a man seventy-five years of age the sudden occurrence of a hemiplegic lesion, without headache preceding or following it, in the absence of a growth, or the history of one, in other portions of the body, the presence of tumor of the brain is not suspected. While no age is probably exempt from abscess of the brain, the infrequency with which it occurs in extreme old age made it improbable that I should meet with it in a man seventy-five years old. Of 223 cases of abscess of the brain tabulated by Gowers in his work on the *Diseases of the Nervous System* only one was found at the seventieth year or over. There was no discoverable cause for cerebral suppuration. There was no discharge from the ears, or history of any; the nose appeared to be free from infective material; and no evidence of purulent substance in the thoracic or abdominal cavity was detected during life. In reviewing the history of the case, after the autopsy revealed an abscess of the brain, it has occurred to me that the large open

sore on the leg might have furnished infective material with which the brain-substance became infected. The ulcer had troubled him for a period of twelve years, but it had entirely healed, he said, a month before he came to the hospital. The appearance of the cicatrix indicated that the sore had been healed several months. As his memory for recent events was greatly impaired on his entering the hospital, it is probable that events that occurred months or years before appeared to his mind of a later date. This loss of time-sense is common in dementia, especially of the senile variety. We must remember that the left leg had appeared numb, weak, and awkward for a period of five years, and for a number of months he had lost partial control of the bladder. The capsule and its contents indicated that several months, at least, had elapsed since cerebral suppuration took place. What part the blow to the lower portion of the spine had to do with causing the abscess, it was impossible to say. No tenderness of this portion of the spine was detected at the time of my examination. If the blow occurred only two weeks before he entered the hospital, as he stated, it is quite evident that it played no part in the causation of the cerebral suppuration; but, as before stated, his time-sense for recent events was impaired, and no reliance could be placed upon his statements relating to time, especially for things of comparatively recent date. Had the diagnosis of cerebral abscess been made on the patient's admission to the nervous wards of the hospital I should have recommended and urged a surgical operation, as no hope could be entertained without the evacuation of the abscess, although the extreme age and prostration of the patient would have lessened the probability of recovery.

Not infrequently the history obtained from the patient is sufficiently inaccurate to be misleading. In such cases the corroborative testimony of the friends may aid in arriving at a correct diagnosis.

A man, aged about thirty years, came under my care a few months ago, and reported that he had been suffering from headache for two or three months. His habits had been dissipated; he had indulged in alcohol and venery to excess, and had contracted syphilis some years before. He gave no history of a fall, a blow to the head, otorrhœa, or injury of any kind. He had been treated for typhoid fever for a number of weeks previously to my seeing him, and had emaciated considerably. On examination I found the left arm and leg were weak, and that his mind was clouded. There was lessening of all sensory phenomena on the left side, and a complete left bilateral homonymous hemianopsia. The Wernicke pupil was absent. A few hours later he became stuporous, soon passed into a comatose condition, the left leg and arm became rigid, and the flexor muscles contracted. The left side of the face soon appeared paretic, and the tongue was protruded slightly to the left of the median line. He lived about three days and died in a comatose condition. The first two days his temperature was normal or subnormal; the pulse and respiration were exceedingly slow. The day of his death the temperature was quite

high, reaching 104° to 105° F., and the pulse and respiration were frequent. With this history it seemed to me that the most probable condition was one of syphilitic growth in the brain, especially when taken in connection with the choked disk which was present in each eye, but the swelling was not extreme. Thrombosis of a cerebral artery was excluded on account of the presence of the optic neuritis, and nothing but the subnormal temperature and the peculiar rigidity suggested an abscess of the brain. The lesion was located in the centrum ovale, involving the occipito-sphenoidal region. After the patient's death, and before the autopsy was held, it was learned through his brother that some time preceding his fatal illness he had had a fall and struck upon the head; after this he was dizzy and suffered from headache for a time, and even after returning to work his head felt uncomfortable. With this additional history an abscess was made probable, and at the autopsy a large encapsulated abscess was found in the centrum ovale on the right side, involving the occipital and temporo-sphenoidal lobes. The whole of the right side of the brain was œdematous.

It is well known that trauma of the brain may excite into activity latent syphilis of the brain, and the diagnosis between abscess and syphilis of the brain may become a most difficult problem to solve in syphilitic ubjects who suffer from an injury to the head. In this case the paresis of the left leg and arm when I first saw the patient, followed by the rigidity of the muscles, indicated an abscess rather than a tumor, as the rigidity denoted extensive softening, which is more common to the former than to the latter.

Some cases of brain-lesion may improve under antisyphilitic treatment for a number of months, and then relapse after the treatment is suspended, and again improve from the same treatment, and yet at the autopsy an abscess and not a tumor will be found.

A case of this kind came under my care more than a year ago. The patient was a man, a tailor by occupation, whose habits had been bad. He was a free drinker; had suffered several times from gonorrhœa, and had contracted a hard chancre about ten years before. He had never been the subject of traumatism. About eighteen months before I saw him he suffered from a severe cold, which was followed by purulent bronchial expectoration. Soon after this he began to complain of headache; his general health failed, he lost flesh and strength, and his mental power was lessened. On consulting a physician, because of his syphilitic history and head-pains, he was placed upon potassium iodide for a number of months; his headache decreased, but did not entirely disappear; he continued rather weak; appetite poor and vacillating; bowels constipated; and he was unequal to his work, both mentally and physically. He continued in this condition of impaired health for more than a year, when his headache again increased, mental confusion became greater, and he felt a sense of physical prostration almost continually. He slept poorly, became very much emaciated, and his headache at times was agonizing. He was again treated for syphilis of the brain, and again temporarily, but only slightly, improved in health. His condition became miserable, but he did not especially attract the attention of the remainder of the lodgers in the house where he was staying. After passing a restless

night, he arose in the morning to dress himself, but before his toilet was completed he fell to the floor, and when found a few hours later he was mentally confused and unable to rise to his feet, the entire left side being almost completely paralyzed. When I saw him, a few hours later respiration was slightly stertorous; his temperature was about 1° F. subnormal in the right vxilla, and one-half degree subnormal in the left; pulse 60, full and strong; respiration 12 per minute. On arousing him he seemed for a moment to appreciate what was said to him, but if left alone he almost immediately relapsed into an unconscious state. The left arm and leg were almost completely paralyzed, the paralysis being deeper in the leg than in the arm; the face did not seem to be affected. The tongue was protruded in the median line. No satisfactory test could be made of the general sensory phenomena on account of his blunted mental condition, but, so far as I was able to determine, sensation was less acute on the left side than on the right. The knee-jerks were increased, the left to a greater extent than the right; plantar reflexes were absent; ankle-clonus was slight on the right and well marked on the left side; cremaster and abdominal reflexes were barely perceptible on the right side and absent on the left; pupils were equal in size, rather widely dilated, and reacted to light feebly; there was no paralysis or paresis of the external ocular muscles; both optic nerves were slightly atrophied, with some swelling of the disks; the choking of the disk was greater on the right side than on the left; there was apparent left bilateral homonymous hemianopsia, but it was difficult to test the visual fields accurately; the urine was free from albumin and sugar; the heart presented no evidence of disease; and mucous râles were heard in the lungs. No headache was complained of spontaneously, but on arousing him and asking him if he had any pain, he said "Yes," and pointed to his head. Stupor gradually deepened into coma, and he died a few hours later. At the autopsy an encapsulated, chronic abscess in the centrum ovale of the right side was found, involving the occipital and temporo-sphenoidal lobes. The pus was thick, greenish and offensive, and the entire right side of the brain presented an œdematous appearance. No pathological changes beside these were found in the brain. Permission was not obtained to examine any portion beside the head.

It is impossible to discuss the probabilities of arriving at a diagnosis soon after the formation of the abscess, which possibly dated back some fifteen or eighteen months before the patient's death, and about the time of the beginning of the head-symptoms, following a purulent discharge from the lungs. When I first saw the man, a few hours previous to his death, the diagnosis lay between a vascular lesion, tumor, and abscess. The eye-symptoms were sufficient to exclude a vascular lesion. The syphilitic history and the marked amelioration of symptoms from the use of potassium iodide pointed to a tumor of syphilitic nature; but the choked disks presented less swelling than is commonly observed in cases of progressive tumor of the brain. In the *Medical News* for March 10, 1894, I reported a case whose history was somewhat similar to that of this. In it the swelling of the optic disk was well marked and a tumor was diagnosticated, and the accuracy of the diagnosis was verified

by the autopsy. In the present instance, notwithstanding the strong probabilities of a syphilitic growth, the history of a purulent bronchial discharge immediately preceding the development of cerebral symptoms, and the slight swelling of the optic disk, determined me to venture the diagnosis of a chronic abscess.

Quite recently I put on record the case[1] of a little girl who was referred to me by Dr. McNaught. She was eleven years of age; had suffered for a length of time from otorrhœa, suppuration in the groin, probably a psoas-abscess, and had sustained a severe injury to the head from a fall, all causes of cerebral abscess. She became the subject of epileptic seizures during which she did not lose consciousness; the convulsive attacks were attended with retraction of the head, at times with opisthotonos, tetanic rigidity of the arms, and frequently with shock-like movements of the arms. There was complete atrophy of the optic nerves, and no evidence of an exudate was apparent in the eyes when I saw her, which was several years after the head-symptoms first became manifest, and some time after blindness, almost complete, had developed. At the autopsy a large cyst, connected with a small tumor of the left lateral lobe of the cerebellum, was found. A more definite diagnosis than that of organic disease affecting portions of the brain in the posterior fossa was not ventured during life. The history of the seizures without loss of consciousness, talking and throwing the arms wildly around throughout the attack, with distinct clonic convulsive movements and opisthotonos, at first suggested hysteria; but this was easily excluded by the optic nerve atrophy and certain vascular changes in the fundi. If these had not been sufficient to enable me to diagnosticate an organic lesion, the attacks that I witnessed would have been ample evidence of such changes. The posterior neck-muscles were rigid as cords; the head was retracted, the spine arched backward, and the masseters, at times, were firmly contracted, so that when she attempted to speak her teeth, which she was unable to separate, were simply uncovered by the lips, and the arms, rigidly extended, were thrown wildly around, with shock-like convulsive movements. Three morbid processes were considered in the diagnosis, namely, abscess, tumor, and the results of an old basilar meningitis. The history of a bilateral otorrhœa with a very offensive discharge from the ears, occurring about the time of the commencement of her first symptoms, which were attended by a convulsion; the suppuration in the right groin, the origin of which could not, when I saw her, be determined, as there had never been any further evidence of caries of the spine; and the blow to the head received just previously to the convulsive seizures becoming frequent, from an etiological standpoint, were about as strong evidence in favor of cerebral suppuration as one expects to find. The subnormal temperature during the first few days of my observation of the case was in favor of chronic cerebral abscess. The otorrhœa had ceased for a period of nearly ten years, and during this time the child had never complained of pain in the ears. It seemed to me, then, that, if the little patient was suffering from abscess of the brain, the probabilities were against the ears having been the source of the septic poison, as even chronic abscess due to ear-infection rarely runs a very prolonged

[1] Tumor and Large Cyst of the Cerebellum, with Symptoms Extending over Several Years. Medical Record, August 17, 1895.

course. Headache is common to all the pathological processes under discussion. The optic nerve atrophy, without any swelling of the disks, was in favor of chronic meningitis and against the presence of a growth or abscess. I felt inclined to exclude intracranial suppuration, but I confessed to the physician with whom I saw the patient in consultation, that I had not sufficient reason to be positive in my opinion. Between meningitis and tumor I was unable to decide. One of these morbid processes would have accounted for some of the symptoms, while the second was necessary to explain the others. Almost total loss of sight, with optic nerve atrophy and seizures attended with opisthotonos, rigidity of the muscles, tonic extensive spasm of the extensors of the limbs, especially of the superior ones, and the shock-like movements of the arms, are found in meningitis of the posterior fossa when the surface of the pons is irritated. So far the symptoms and theory of meningitis harmonized, but I was at a loss to account for other cranial nerves than the optic escaping. That the child at times should feel quite well, and be entirely free from headache or any apparent discomfort, and that there should be no rigidity of the posterior neck-muscles, except during the paroxysms, seemed to me inconsistent with the theory of an old meningeal exudate in the posterior fossa. A tumor in the cerebellum so situated as to produce remittent pressure on the pons, with distinct paroxysms of increased pressure, is common to the experience of every one who has studied and observed persons suffering from cerebellar growths; but for the pressure-symptoms to be apparently completely intermittent, and to recur with as much regularity as epileptic seizures, without loss of consciousness or mental dulness, was new to me in my experience of cerebellar growths.

In the light of the autopsy, which revealed the presence of a large cyst and a small tumor in the posterior three-fourths of the left cerebellar hemisphere, are the symptoms explicable? It is possible, owing to the watery contents of the cyst, that the pressure exerted by the cyst after it became chronic, on the adjacent structures, was not so great as results from a more solid and unyielding tumor, so that, while there might have been a papillitis during the early stages of the growth, the lessened pressure after the formation of the cyst and the breaking down of the growth allowed this to subside with the resulting atrophy of the optic nerves, and time had permitted all intraocular exudate to be absorbed. We know that a growth in the cerebellum, from its effects upon the circulation of the veins of Galen and adjacent veins and sinuses, disturbs the function of the pons and medulla, usually to a slight extent, continuously, and, when it has reached sufficient size to exert pressure on the respiratory and neighboring centres, by paroxysms, threatening life by increased pressure, which probably results from temporary œdema of the parts. In the case of a cyst, with yielding contents which may vary in quantity from time to time, the pressure-symptoms probably may become intermittent. The peculiar tetanic spasms were most likely due to temporary irritation of the pons and medulla.

With the information gained from the clinical and pathological obser-

vations of this case, could error be prevented in the diagnosis of a somewhat similar one? If a large cyst of the cerebellum is attended with more varying pressure-symptoms than a tumor, a problematic diagnosis might be ventured, and it might, or might not, be correct. The only unilateral symptom in the case was the tendency of the right arm and leg to become a little more rigid than the left, with, at times, a turning of the head and eyes to the right; but this was inconstant and of little localizing value in determining which hemisphere of the cerebellum was affected. Had it been possible to localize accurately the lesions, the tumor, in all probability, could have been removed, the contents of the cyst evacuated, and the life of the patient saved. A careful study of the case just reported demonstrates how meagre and unsatisfactory are the symptoms, even of an extensive lesion in one lateral hemisphere of the cerebellum, and that ataxia from lesions of this portion of the brain probably only occurs when they are situated so as to exert pressure on the pons, usually through the medium of the middle lobe of the cerebellum.

It will be seen by a careful study of the cases that I have reported in this paper that, in the diagnosis of chronic cerebral abscess, while one must be careful to study every symptom, together with the apparent etiology, too much stress must not be laid upon either. Chronic otorrhœa, a blow to the head, and suppuration in a distant portion of the body, were found in one of my cases, yet the patient died from cyst and tumor of the brain. In another the symptoms were distinctly indicative of arterial thrombosis, yet the patient died of intracranial suppuration. Hitz observed a case in a man twenty-nine years of age who had suffered for sixteen years from otorrhœa, and had, besides, received a blow on the head, both being distinct causes of abscess, yet death occurred from tumor of the brain (*Lancet*, January 12, 1895, p. 82, Murri). One of Professor Murri's cases of abscess of the brain occurred in a man who had never received a blow or any apparent injury to the head, nor had been the subject of suppuration in distant portions of the body, nor had he suffered from any disease that is likely to cause cerebral abscess, yet death occurred, and the autopsy revealed intracranial suppuration. In another one of his cases there had been suppuration in the tissues which surround the bones of the cranium, suggesting that the organic brain disease was due to suppuration, yet the patient died from sarcoma and encephalic tuberculosis. And again, in another one, the symptoms and apparent etiology pointed to tubercular meningitis, but the patient succumbed to intracranial suppuration.

In the diagnosis of chronic abscess of the brain the morbid processes from which the suppuration must be differentiated are tubercular meningitis, softening, hemorrhage, and tumor.

Tubercular Meningitis.—Theoretically it does not seem that there should be much danger of mistaking a cerebral abscess for meningitis;

but theory fails, and preconceived opinions of the value of symptoms weaken in the stern reality of clinical facts and post-mortem results, not always because the theory is wrong or the opinions have been based on false premises. There is no portion of the human organism the destruction or irritation of whose tissues gives rise to so clear, invariable, and definite symptoms as that of certain portions of the brain when the lesion is limited and uncomplicated. Irritation of a given portion of the brain will be attended by the same symptoms, no matter how often the irritant is applied, provided the conditions and modifying circumstances are always the same; but the extent of pathological lesions varies, and the degree of irritation or the amount of loss of function from a similar lesion depends upon so many inscrutable causes, that no two cases will be attended by precisely the same symptoms. Besides, the results of irritation of a portion of the brain, whether it be due to meningitis, softening, hemorrhage, or tumor, may give rise to the same general character of symptoms that occur from the presence of an abscess. The majority of cases of tubercular meningitis, even in the adult, run their course in a few weeks, are attended by a febrile process, and present symptoms of cranial-nerve involvement. While these are the usual symptoms that serve to distinguish tubercular meningitis from chronic abscess of the brain, unfortunately for the diagnostician they often vary greatly. The duration of some cases of tubercular meningitis is longer than that of some cases of chronic cerebral abscess. I reported a case of tubercular meningitis, with continuous symptoms, in a child, to the College of Physicians of Philadelphia, in 1883, in which the disease extended over a period of more than eight months. In the same paper are collected numerous cases, in some of which the duration of the symptoms was a year or more from the time of the first evidence of tubercular disease of the brain to the death of patient (see *Transactions* for 1883). Professor Murri, in the *Lancet* of January 26, 1895, p. 206, reports a case in a man thirty-three years of age, who had suffered horribly from headache for a period of five months immediately preceding his death from tubercular meningitis. In this connection he says: "Kratmer refers to a case which lasted four months, and speaks of those of Leitz of forty-two and fifty-four days' duration; Gatti of Milan, observed one lasting seventy-nine days; and Dickinson noted one of eight months' duration." Rise of temperature is not always found in fatal tuberculosis of the cerebral membranes. It seems to me that we must make a distinction between tubercular meningitis and tuberculosis of the membranes unattended by inflammation. Two years ago I saw and studied with Dr. McLauthlin a case of tuberculosis of the meninges in a man about thirty years of age. He had been suffering from tuberculosis of the lungs for a number of years, and for several weeks before I saw him he had been depressed in spirits and experienced severe headache, but he had not been attended by any physician. During the

week immediately preceding his death, covering the time during which he was seen by Dr. McLauthlin and myself, the temperature was slightly subnormal until a day or two before his death, when it registered from 97° to 100° F. At the autopsy the pia at the base of the brain, especially in the Sylvian fissures and over the optic chiasm, was studded with masses of tubercles, but the microscope showed no evidence of recent inflammation. In Murri's case, above referred to, and those of others in which inflammatory products were quite abundant, although probably not of recent date, the temperature was normal or subnormal for a period preceding death. Cranial-nerve symptoms are not invariable in basilar meningitis, and some cases of abscess of the brain are attended by irritation of the cranial nerves.

A condensed report of one of Professor Murri's cases (*Lancet*, January 26, 1895, p. 207) will illustrate this point:

A male, aged thirty-five years, was admitted to the clinic, August 16, 1890. He was in a state of delirium and some stupor. His wife stated that up to his present illness he had never suffered from illness. About two weeks before this, or in the beginning of August, he began to complain of headache, which became so intense that he could not leave his bed after August 7th. His strength gradually failed; his mental condition from the beginning was abnormally irritable, and soon became dull. On the night of the 15th, a few hours before admission to the clinic, delirium and stupor first appeared. The patient seemed well nourished. Occasionally there would be muscular twitching, when he would give vent to cries of pain in his head. There was slight rise of temperature. Examination on admission to the clinic: Pupils were equal in size; reacted slowly; tongue deviated toward the left; sensory phenomena everywhere dull; spasms and contractions occurred in all the limbs; pulse was 86; respiration 20; temperature does not seem to have been registered; stupor was variable and spasms continued during sleep. Six days later the left pupil was dilated. On the next day, or the 23d of August, the muscles of the back of the neck were rigid and the head retracted; there were ptosis of the right eye and deviation of the eyes and head to the right; reflexes were normal everywhere; general sensory phenomena continued obtuse; smell was absent. On the 25th there was convergent strabismus of the left eye from weakness of the external rectus muscle, and the ball of this eye was painful; the muscles of the left side of the face were weak, and he was unable to protrude the tongue. On the 27th the left leg and arm showed evidence of weakness, but muscular and posture senses were everywhere good; the pulse was regular; there was nystagmus of the left eye, and tonic spasm of the right arm with flexion of the forearm upon the arm and of the hand upon the forearm; reflexes of cornea and pupil of the left eye weak and slow; the right eye presented normal reflexes; deglutition occurred with difficulty, owing to lessened reflex action of the pharynx; the headache continued intense; stupor deepened each day, and by September 12th the patient was absolutely comatose. The pulse at that time varied from 120 to 130, and breathing increased from 24 to 28, and the temperature reached and went above 100.2° F. on several occasions. He was almost always feverish, with the

exception of two periods, from August 25th to 29th, and from September 3d to 11th, during which times the temperature remained at 96.6° F. Death occurred on the 14th of September. At the autopsy all the meninges presented a normal appearance. There were three abscesses; one pinhead in size, on the anterior right side of the pons in the vicinity of the nucleus of the sixth nerve; another, small, in the anterior part of the left temporo-sphenoidal lobe; a third and largest, occupied part of the right optic thalamus, internal capsule, and lenticular nucleus; the lateral ventricle was not broken into. The abscess was rather large and completely encapsulated, and contained inodorous, greenish pus. The parts around the large abscess, including the cranial nerves, were greatly compressed.

This case presented the typical cranial-nerve symptoms so commonly witnessed in tubercular meningitis, and as no cause could be found that would have made one suspect intracranial suppuration, the diagnosis must have been difficult, if not impossible.

It will be seen that the ease with which tubercular meningitis and chronic abscess of the brain may be mistaken for each other is much greater than what at first sight would appear. It is less difficult to point out the dangers of mistakes in diagnosis than to lay down rules by which they may be avoided, but the more we are on our guard the less likely will we be to commit unpardonable blunders.

Cerebral Softening and Focal Encephalitis. I am not aware that any one, either in journal articles or text-books, has pointed out the danger of mistaking cerebral softening from thrombosis of a cerebral artery for chronic abscess of the brain. Professor Murri reports a case, in the person of a girl, seventeen years of age, of grave chlorosis with chlorotic thrombosis of the lateral sinus and of the cerebral veins. This distinguished observer had made the diagnosis of "Chronic abscess of the left temporal lobe," and from a careful study of the clinical symptoms it is difficult to see how this mistake could be prevented in a similar case. It was not until recently, when I encountered a case of focal encephalitis, due to thrombosis of an artery, in a young man who presented symptoms which simulated those of abscess, that my attention was called to it. This case is reported at some length in this paper.

About twelve years ago, while practising in Philadelphia, I was engaged in an elaborate series of observations of the temperature of each side of the body in cerebral lesions, and on the surface-temperature of the head and body in health and disease; but the development of pulmonary tuberculosis in my own person compelled me to abandon the work for a number of years. During the past two years I have resumed the study of the comparative temperature on each side of the body in cerebral lesions, and within the past six months, with the kind and intelligent assistance of trained nurses, both in the St. Luke's and Arapahoe County Hospitals, I have made numerous and interesting observations

along this line. It is premature as yet to undertake to arrive at definite conclusions, but the following provisional statements may be made: In paralysis from brain-lesions the temperature on the paralyzed side is equal to or greater than on the unaffected side, when the lesion in the brain is an irritative one; but less on the paralyzed side when the brain-lesion is a destructive, non-irritating one. In cases of hemiplegia from cerebral hemorrhage the temperature on the paralyzed side is lower than on the opposite side during the stage of depression immediately following the hemorrhage; but as soon as reaction has become well established the temperature rises on the paralyzed side to a point about half a degree to a degree Fahrenheit higher than it does on the unaffected side, and remains so for a few weeks, or until, from atrophic changes, the paralyzed parts become cooler than the normal side. In case of hemiplegia of thrombotic origin the difference in temperature of the two sides of the body at first is less than occurs from hemorrhage; but if encephalitis results from the arterial occlusion, the temperature on the paralyzed side will equal or exceed that of the normal side for weeks, months, or even years, and probably as long as the irritation in the brain remains. In one case under my observation at present, the patient having been paralyzed without loss of consciousness two years ago, although great trophic disturbances have become manifest in the paralyzed limbs, yet the temperature on the affected side remains constantly above that of its fellow. In hemiplegia from tumor or abscess of the brain the temperature may be elevated on the paralyzed side from 0.5° to 2° or 3° F. beyond that of the other, the amount of the heightened temperature on the affected side depending upon the degree of irritation in the brain. Theoretically we should expect to find the difference in the temperature of the two sides of the body greater when the paralysis is due to tumor than when it results from abscess, but I have as yet been unable to determine this point. Slight differences in temperature always in favor of the same side of the body, extending over a considerable period, are significant; but greater differences may occur for a short time and denote nothing of importance.

Thrombosis of the cerebral vessels may take place in persons who have been subjected to causes that are known to be capable of giving rise to cerebral abscess. If this occurs in young subjects, and is followed by encephalitis, headache, paralysis of one group of muscles after another, and a temperature on the paralyzed side equal to or greater than on the unaffected side, the lesion may be mistaken for abscess, especially if the patient denies syphilis and presents no positive evidence of it. Under such circumstances it is probable, although I do not wish to make this point too prominent until further observation enables me to speak more positively, that a temperature on the paralyzed side equal to that of the normal side, or elevated only a few tenths of a degree Fahrenheit above it, would be in favor of thrombosis, while a persist-

ent increase of heat on the paralyzed side of one-half to one or more degrees Fahrenheit would be in favor of abscess. Further, the temperature in cases of thrombosis of a cerebral artery is, as a rule, less variable, and is more commonly normal than that of chronic abscess. The mental condition in cases of focal softening from thrombosis, while it is blunted, is more nearly normal when the patient is aroused than in the cases of chronic abscess that have come under my care. There was one observation made in the case of thrombosis reported in this paper that seemed to point strongly against abscess, and I called attention to it in a clinical lecture the day before the operation. When the patient's leg was first paralyzed the paralysis was complete in all the muscles of the leg and hip, but during the next few weeks paralysis began to lessen in the hip-muscles, and before the patient was subjected to an operation he was able to lift the leg from the bed and hold it straight at the knee. From what we know of the effects of abscess on the surrounding structure of the brain, from œdema and softening, which have a tendency to increase rather than to diminish, it seems very improbable that the degree of paralysis caused by an abscess will lessen before the pus is evacuated. If optic neuritis, with swelling of the disks, were to occur, a thrombotic lesion might be excluded, although hyperæmia of the papilla, with some slight neuro-retinitis, was evident in the eye opposite to the side of the brain-softening in the case reported in this paper. No choking of the disk was observed.

Cerebral Hemorrhage. It seems useless to discuss the differential diagnosis between abscess and hemorrhage of the brain The condition presented by the case observed by me of hemorrhage into both anterior lobes of the brain, with gradual filling of the ventricles without paralysis, convulsions, or change of temperature to any extent from the normal, must be exceedingly rare. The case was the more confusing because the hemorrhage followed an illness (la grippe) which has given rise to abscess of the brain.

Tumor. The diagnosis between chronic abscess of the brain and tumor is sometimes very difficult or even impossible. Professor von Bergmann and many others lay great stress upon etiological considerations and the presence of fever in favor of abscess; but, as we have already seen, the history of middle-ear disease, which Bergmann considers the principal cause of abscess, does not preclude the possibility of tumor.

Hitz, as already mentioned, saw a man who for sixteen years had suffered from otorrhœa, and besides had received a blow on the head, yet he died of tumor of the brain. The case of the little girl, eleven years of age, reported in this paper, illustrates the fallacy of laying too great stress upon etiology. She had suffered from otorrhœa, had had an abscess in the right groin, and had received a severe blow to the head, all possible causes of abscess, yet she died from tumor and cyst of the cerebellum.

Instead of the presence of fever being a symptom of chronic abscess, a subnormal temperature extending over a considerable period is more commonly the rule. There may be periods of febrile processes in abscess, but we find also the same condition in tumor. Neither tumor nor chronic abscess free from complication, such as meningitis and distention of the lateral ventricles, is, as a rule, attended by fever. If the temperature-record is any aid in the differential diagnosis between these two morbid processes, it is that a prolonged subnormal temperature, in a case of organic brain-disease, associated with evidences of great prostration, such as loss of flesh, strength, appetite, and, at times, a yellowish-pale hue of the skin, is in favor of abscess rather than tumor. We must remember that while a traumatism to the head is a frequent cause of abscess of the brain, it is also capable of giving rise to tumor. In cases of old injuries to the head, dating back more than a year, in which no evidence of inflammation of the brain immediately followed the trauma, the development of organic disease of the brain, supposing the diagnosis to lie between abscess and tumor, the probabilities, other things being equal, will be in favor of the latter. Well-pronounced swelling of the optic disks, amounting to $\frac{1}{30}$ to $\frac{1}{20}$ of an inch (requiring +3 D to 4 D to see the centre of the disk) is always against abscess and in favor of tumor. It is conceivable that an extreme degree of choked disk might occur from abscess, but I have never observed it, and I am not aware that it has been met with by others. Complete blindness is not an infrequent result of tumor, and well-advanced amaurosis is very common. In abscess I have never met with marked amaurosis, and my personal experience in this direction is but confirming the observations of Gowers, Murri, and others. Optic neuritis, limited to the same side of the brain as the abscess, is said to have occurred. It must be exceedingly rare, and as the same eye-phenomenon has been observed in tumor, it has no practical diagnostic value. In a case of distention of the right lateral ventricle from accumulation of a straw-colored watery fluid, observed by me some years ago, well-pronounced optic neuritis was found on the right side, while on the left the eye was normal. Hirt calls attention to the diagnostic value of paralysis of groups of muscles consecutively involved in abscess. This undoubtedly is of frequent occurrence in this disease, but, as paralytic symptoms are found in only about one-half the cases of abscess of the brain, and as the muscular involvement from tumor of the brain sometimes takes place by groups, the phenomenon loses much of its supposed significance in a differential diagnosis. A steady but gradual increase of symptoms of organic disease of the brain, with the development of one nerve-root symptom after another, is in favor of tumor, so are prolonged periods during which the symptoms make but little progress.

The only conclusion at which one can arrive after a study of all the

symptoms of chronic abscess of the brain, is that the diagnosis is often a most difficult one, and sometimes is an object of impossible attainment. The nearest approach to accuracy in diagnosis in obscure cases is to arrive at a conclusion which amounts to a problematic diagnosis between two or more morbid processes. To recommend an operation for the relief of chronic abscess of the brain only in those cases in which the diagnosis is certain, is to sacrifice many lives that might otherwise be saved by judicious boldness. The physician who has not the courage to recommend an exploratory operation in a strongly probable case of abscess of the brain, lest he may be wrong in his diagnosis, is more solicitous for his own reputation than for the welfare of his patient.

In conclusion, if we are ever to reach positiveness and certainty in the diagnosis of obscure brain-diseases, it will be attained only by a careful study of minute symptoms and what often seems unnecessary and tedious detail.