SYRINGOMYELIA.

CLINICAL LECTURE DELIVERED AT THE ARAPAHOE COUNTY HOSPITAL, DENVER, COLORADO.

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GENTLEMEN,—The last lecture was devoted to the consideration of hemianæsthesia, and illustrated by cases in the hospital. You remember that at the close of the hour we were studying the case of this patient who is present to-day. An examination into his condition revealed so many remarkable symptoms that I promised to take up his case and study it before you at our next clinic.

George S., male, aged fifty-eight, of New York, a widower for twenty-eight years, and a miner by occupation, has lived in Colorado, at altitudes varying from five thousand to ten thousand feet, about twenty-seven years. His family history seems to be unimportant. His health during childhood was good. He denies more than an occasional indulgence in alcohol, says he has never been guilty of sexual excesses, and has never contracted any venereal disease. During the greater portion of his residence in Colorado he has been exposed to cold and dampness in mining, and has frequently been compelled to sleep at nights insufficiently covered. He has contracted repeated "colds" attended by fever, but none have lasted more than a few days. With the exception of these attacks, he says he always enjoyed good health up to the time his present trouble began.

Present illness: In the early spring of 1888 (nearly four years ago), while engaged for three weeks in putting in a head-gate in Clear Creek (a cold mountain-stream), during which time he was compelled to stand the entire day in the water, he first began to feel a sharp burning pain in his left shoulder. The pain was confined to this shoulder for a day or so, when it extended over the entire left arm and hand. After the pain began it was constant for three weeks, and totally unfitted him for work during this time. Usually the pain was

burning and aching in character, but at times it was sharp and shooting, when it extended from the hand to the shoulder, and distressed him so greatly that he was unable to sleep at night. By the end of the third week he experienced no abnormal sensation in the left arm and shoulder, save a dull, tired feeling, which did not prevent him from using the arm or from sleeping. At this time, however, he observed that if he strained or over-used the left arm it became affected with a slight, irregular, jerky tremor for hours afterwards; but this condition was unattended with pain. The remission of the arm-symptoms lasted about six weeks, and during this time he was able to continue his work at mining, with the exception of a few days, when he quit work and resorted to rubbing liniments over the arm in order to bring back the normal sensation. At the end of two months from the first appearance of his trouble he again experienced pain in the left shoulder and arm. This time it was less severe than during the first attack. It lasted about three months, and was followed by a remission of six weeks. After this a dull, heavy, aching pain settled in the left shoulder, and this has been more or less constant from that time up to the present. During this time there have been periods of several days when a few uncomfortable feelings have been experienced in the shoulder if the arm has been kept comparatively quiet. About six months after the beginning of his ailment a dull pain began in the left hip. Soon after this the left knee and foot became similarly affected. He says every toe of this foot seemed to be stiff and sore. He thinks the parts, especially the knee and foot, were swollen at the time, but this did not give rise to much deformity. At this time (six months after pain began to be felt in the left shoulder and arm) he noticed that his left arm and leg were becoming weak. About eighteen months after the first appearance of pain in the left shoulder he began to experience a numb sensation in the entire left side, including the leg, arm, trunk, and face, although of the face he is not so positive. Occasionally during the last eighteen months, especially after exercise, he has experienced rheumatoid pains in the right shoulder and hip. During the past three years he has not been able to support himself, and has been cared for by the county most of the time. For the last year he has had a poor appetite, refusing meat almost entirely. He has become pale and is poorly nourished. At times he has been troubled with bewildered sensations, and has been unable for an hour or two at a time to realize where he was or what he wanted to do. During the past year his memory has been weakening. We find that he has been troubled with constipation for a year or two, and at present

it is obstinate. The urine is easily expelled, and is normal in color and quantity. It has a specific gravity of 1015, is acid in reaction, and free from albumen and sugar. His sexual power is preserved, although the desire is much lessened. The main symptoms of which he complains at present are: all the joints of his left side are the seat of a constant, dull, aching pain; a disagreeable cold sensation over the entire left side, more marked in the leg, which becomes more pronounced at night, and seems to be unaffected by the amount of covering he can procure; forgetful spells, lasting one or two hours; slight dull pains in the head, more pronounced on the left side; impaired memory, poor appetite, and obstinate constipation; partial paralysis of left arm and leg, and at times drawing sensations in the left side of the chest.

I will now ask you to follow me while I examine into his present condition.

He walks slowly and with some difficulty, the left leg being used like an artificial one; it is not normally bent at the knee, and the heel scrapes the floor in bringing the foot forward. The right leg seems to act normally. With eyes open he walks backward with considerable difficulty, owing, apparently, to the weakened condition of the left leg and the awkward manner in which it is used. The difficulty in walking backward and forward is greatly increased by his closing his eyes, but you notice that there seems to be no tendency to fall, such as we find in posterior spinal sclerosis. In going forward with eyes closed the steps are short, especially those made by the left foot, causing him to turn to the left, so that if the room were large enough he would make a complete circuit in trying to walk in a straight line. This tendency is greatly exaggerated when walking backward with the eyes closed, because it is extremely difficult for him to carry the left foot backward beyond the right. He stands with feet together, on either foot alone, or turns around with eyes closed or open, although the difficulty is greatly increased when he has not the aid of vision, but even then you see no tendency to fall. He seems unsteady and tremulous, but the longer he is allowed to stand in this position the more steady he becomes, contrary to what is found in posterior spinal sclerosis. The movements of the right arm are slightly uncertain when the eyes are closed, while those of the left are markedly so, it being impossible for him with the left hand to touch any desired portion of the body. A fine tremor is perceived in the left arm and leg when he is quiet, either in the sitting or reclining posture. On exercising, the tremor becomes coarse and jerky, affects the legs and arms, the neck and trunk muscles, and is more pronounced on the left

than on the right side. While he is walking with the eyes closed the tremor is most exaggerated, and becomes decidedly coarse and jerky in the legs. The tremor ceases during sleep.

Reflexes: Knee-jerks: right considerably exaggerated; left more exaggerated than the right. Ankle-clonus: absent. Plantar: right present and nearly normal; left slight and only observed on the outer side of the foot. Cremaster: right normal; left scarcely perceptible. Abdominal: absent. Gluteal and inter-scapular: absent. Deep reflexes of the forearms: right normal; left exaggerated. Triceps and biceps: right increased; left greatly exaggerated. Iritic: present, equal and normal. Power of accommodation good. The right pupil is slightly larger than the left. None of the intra- or extra-ocular muscles are affected.

Strength of leg muscles: The right seem fairly strong; the left about one-half the strength of the right. The extensors of the left knee are stronger than the flexors. The muscles of the legs do not seem to obey the will readily, for impressions travel slowly and the impulses from the nerve-centres to the muscles are delayed. When the muscular movements occur they are always slow. The right-arm muscles are fairly strong; the left quite weak. Dynamometer: right, 112; left, 40. The skin presents no trophic changes in any portion of the body. The only trophic changes seem to be in the muscles of the left side, and these do not seem great on inspection, except in the left deltoid, which is considerably wasted. The thenar and hypothenar eminences are well preserved.

Measurements: Calf: right, $12\frac{3}{4}$ inches; left, $12\frac{1}{2}$ inches. Thigh, nine inches above knee: right, $18\frac{1}{4}$ inches; left, $17\frac{3}{4}$ inches. Thigh, eleven inches above knee: right, 19 inches; left, $18\frac{3}{16}$ inches. Forearm (lax): right, $9\frac{7}{8}$ inches; left, $9\frac{1}{16}$ inches. Forearm (contracted): right, $10\frac{3}{8}$ inches; left, $9\frac{7}{8}$ inches. Upper arm (lax): right, 10 inches; left, 9 inches. Upper arm (contracted): right, $10\frac{3}{8}$ inches; left, 10 inches. The left triceps is considerably more wasted than the left biceps. The left mammary gland is the seat of a hard nodular enlargement about one inch in diameter, situated just beneath the nipple.

The electrical reactions to the faradic current are nearly equal on the two sides of the body, and are apparently about normal.

Tactile sense: The sense of touch is lost on the left side up to the median line from the crown of the head to the sole of the foot. On the right side he is unable to recognize the contact of tissue-paper or a feather, but on the face, neck, certain portions of the arm and leg,

and in certain small areas over the trunk he is able to appreciate the contact of the finger or an æsthesiometer when slight pressure is made. He is unable to distinguish two points of the æsthesiometer even when two of his fingers are touched at the same time. On the mucous surfaces of the lips he is unable to distinguish two points of the instrument when they are held half an inch apart. We see, then, that tactile sense is completely abolished on the left side, and greatly lessened on the right; in fact, it seems that it is by the aid of pressure sense that he is able to recognize the presence of a substance on this side. All sensation in the fauces on the left side is abolished; on the right he is able to recognize the presence of substances when pressure is made. No reflex action can be excited in any portion of the fauces.

Temperature sense: Throughout the left side temperature sense is completely abolished. He is unable on this side to distinguish the difference between ice and bottles containing water of 150° Fahrenheit. Ice suddenly applied to the bare trunk on this side gives rise to no reflex contraction of the muscles although his eyes are closed. It seems that it is only by the weight of the ice or bottle that he is able to recognize its presence. If either is but lightly brought in contact with the surface of this side of the body, without his being allowed to feel any of its weight, he cannot recognize its presence by any sensation whatever. On the right side he is unable to distinguish a difference of fifty degrees in temperature. Ice on the abdomen is spoken of as lukewarm, on the chest as slightly cool, on the hand as lukewarm, on the arm as slightly cool, on the foot as lukewarm, at some places on the leg and thigh as lukewarm, and at others as slightly cooler. Bottles containing warm water of 120° are spoken of as something touching him, and when hot bottles of 150° are brought in contact with this side they are indifferently pronounced cool or lukewarm. You see that even on the right side he has no power to distinguish warm from cool substances, but these substances are felt there in certain areas as something in contact with his body, whereas on the left side they make no impression whatever.

Pain sense: On both sides this sense, like temperature sense, is entirely absent. On the left side, the only places at which he experiences any sensation at all when a needle or the sharp points of the æsthesiometer are passed through the skin into the deeper structures, are the testicle and the nodular growth in the mammary gland just beneath the nipple. At these places a smart prick of a sharp instrument gives rise to the sensation of something in contact. Firm pressure on the testicle gives him no unpleasant sensation, although the

pressure is made sufficiently great to cause considerable distress if the parts were in a normal condition. A few days ago I plunged a needle into the surface of the left testicle, but it gave rise to no pain, neither was the experiment followed by any apparent reaction. I would not advise you to resort to this procedure in such a case, unless you had fully satisfied yourselves that all sense of pain was absent. In this case I employed this seemingly harsh measure to make sure that I was not dealing with a case of hysteria. On the right side, while the prick of a sharp-pointed instrument causes the blood to flow, he experiences no pain from the wound inflicted, and says the sensation is like that produced by being touched by the end of a finger. Pressure on the right testicle gives rise to a greater amount of sensation than on the left, but no sense of pain is complained of. The reflex of the left conjunctiva is nearly lost, and no pain is experienced on pricking either conjunctiva, although the reflex is well marked in the right.

Muscular sense is nearly, if not completely, lost on the left side, but on the right it is fairly well preserved.

Pressure sense is nearly abolished on the left side, except in a few areas, and even over these it is greatly lessened. On the right side it is fair, although somewhat below the normal.

Smell: Asafœtida is not perceived on either side. The aromatics give rise to no sensation in the left nostril, and in the right to a sensation of warmth, but their aroma is not distinguished. The compound tincture of gentian I employ in this instance for the aromatic test.

Taste: Chloride of sodium and sulphate of magnesium give rise to no sensation of taste, even when he swallows them in quantities. The latter agent has been used in his case repeatedly as a purgative, but he has not been able to perceive any sense of taste from it for several months. Quinine gives rise to no sensation on the left side, and makes only a faintly bitter impression on the right. He has complained for a number of months of being unable to taste his food.

Hearing: Right ear: watch is heard at six inches; left ear: watch is not heard on contact. The tuning-fork is heard better in the right than in the left ear, showing that the lessened power in the left ear is probably of nerve origin.

Eyes: Central vision: right, $\frac{20}{40}$; left, $\frac{20}{70}$. The fields of each eye are all greatly narrowed, and on roughly testing them there is an apparent approach to left lateral homonymous hemianopsia, but by repeated careful tests made by Dr. Bane at my request with the aid of the perimeter, it will be seen that, while all fields are lessened, the left of each eye showing the greatest contraction, there is not a condition

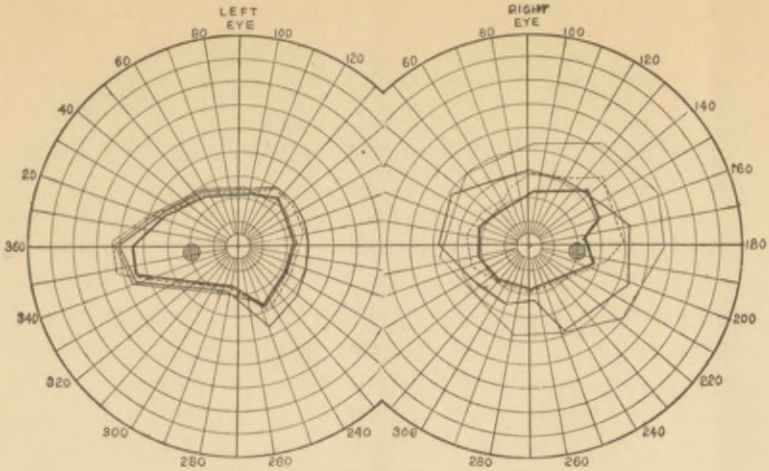

FIG. 1.—Fields of vision for both eyes.

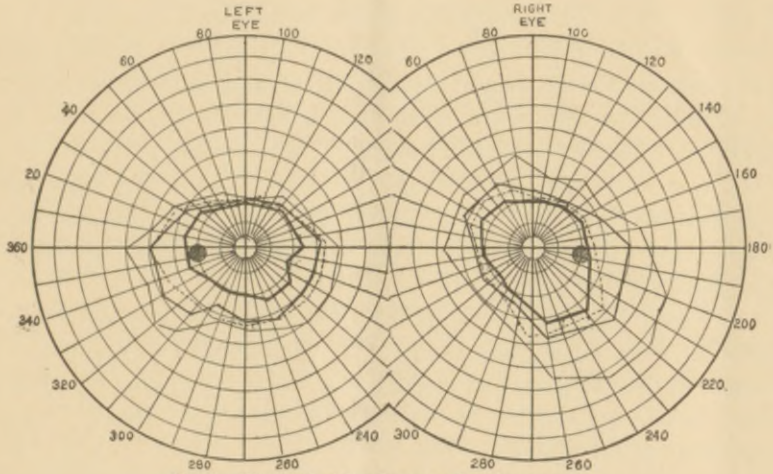

FIG. 2.—Fields of vision for case of syringomyelia.

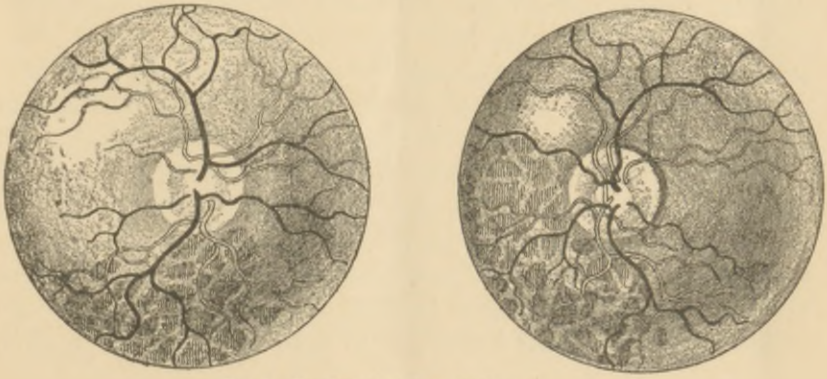

FIG. 3.—Fundus of right and left eye.

of hemianopsia. I show you the diagrams of the fields for colors made on two occasions by Dr. Bane. The first examination was made November 19, 1891; the second, December 28, 1891 (Figs. 1 and 2). Fundus of each eye nearly normal (Fig. 3).

After repeated examinations, I have been unable to detect any evidence of disease in the thoracic or abdominal organs.

I have taken considerable time to make this examination before you, and have gone into many minute details, but I believe you will agree with me that the extremely interesting and rare symptoms presented by the case justify the time consumed in the examination.

Before proceeding to discuss the probable nature of the affection from which this man is suffering, I desire to call your attention to certain changes that have taken place in his condition during the last seven months while he has been in the hospital under my care. On admission the condition of the left side was much the same as we find it to-day, with the exception that the tremor and muscular wasting are now a little more marked; but on the right side tactile pressure and muscular senses seemed nearly normal, and temperature and pain senses, although they might have been below normal, were not sufficiently so to attract attention; so that I was greatly surprised at the clinic one week ago to find complete loss of pain and temperature senses on the right side. The further progress of the disease has also been shown during these months by the patient's increasing enfeebled condition, loss of appetite, etc.

We may inquire, Is this patient the victim of hysteria, or is he suffering from an organic lesion? If the affection is organic, is the trouble in the peripheral or in the central nervous system? If in the latter, is it in the cord or in the brain, or in both? Lastly, What is the nature of the disease?

First, Is it hysteria? One would think that with the presence of muscular atrophy and the profound sensory disturbances found in our patient there should be but little doubt of the organic nature of his disease; but Charcot, the iconoclast of clinical neurology, states that he has found cases of muscular wasting, with loss of temperature and pain senses, apparently due to hysteria. The muscular atrophy and loss of temperature and pain senses are the most prominent symptoms presented by the patient before you. In Charcot's cases traumatism usually preceded, and hysterogenic points often accompanied, the manifested disorder. Besides, the permanent stigmata, as Charcot is wont to call the sensory disturbances in these cases, as a rule, develop more or less suddenly. What I wish you to infer from this statement is,

that while sensory perversions may not manifest themselves for days, weeks, or months after the accident which gives rise to them, when they are apparent they are usually fully developed, and do not begin with a slight disturbance which goes on increasing little by little for months or years until complete loss of certain sensory functions is reached.

In the patient before us, the symptoms of his disease began in one arm nearly four years ago, and have gradually increased until the entire body is now to a greater or less extent affected. During the last seven months I have been able to watch the spread, and the increase in intensity, of the sensory symptoms. The trouble was not preceded by traumatism or fright. There are no hysterogenic points. The left testicle is insensible to the prick of a needle or to firm pressure. If I apply a piece of ice to his bared abdomen while his eyes are closed, there is no reflex action. Further, I have hypnotized him and suggested that he would be able to feel the prick of a pin on his left side, but the suggestion had no effect. I think, then, we may conclude that we have an organic lesion to deal with.

Secondly, Is the lesion in the nerves? The onset and progress of the disease and the character of the present symptoms are totally different from what we find in multiple neuritis.

Thirdly, Will a lesion of the spinal cord account for the symptoms? During the course of these clinics I have been able to show you examples of all the systemic lesions of the cord, and from the character of the symptoms in the man before you we can exclude all of these. Besides, the involvement of all the special senses and the disturbance of sensation found on the face and head show that if the trouble began in the cord it has extended to the medulla or brain.

Fourthly, Would a cerebral lesion give rise to all the symptoms from which our patient is suffering? It is just possible that it might, although it is difficult to realize the location of a cranial lesion so extensive as to give rise to all the sensory disturbances found in this case and yet allow all the cranial motor nerves to escape injury. If an opportunity had been afforded me to study the case in its earliest stages, it is probable that we might have been able to determine the seat of the initial lesion. Were it not for the presence of the well-marked muscular atrophy, I should be inclined to regard the disease as cerebral rather than cerebro-spinal.

We have reached our last query. What is the nature of the disease? Having excluded the peripheral nervous system and all the systemic lesions of the cord, I think, for evident reasons, we can exclude

progressive muscular atrophy and cervical pachymeningitis. We have left for consideration a slow growth or multiple sclerosis.

The prominent symptoms of multiple sclerosis of the brain and cord are, jerky and irregular incoördination of muscular movement on effort, progressive weakness, nystagmus, affections of speech, disturbances in the motor as well as in the sensory cranial nerves, and later irregular patches of anæsthesia. In our patient the tremor is too fine for multiple sclerosis of the ordinary type, and the tremor is present even when the patient is quiet, contrary to what is found in disseminated sclerosis. There is no nystagmus, affection of speech, or involvement of the motor cranial nerves. Finally, the disturbance of sensation is peculiarly unlike that found in multiple sclerosis, and it is much more diffuse and uniform than is found in this disease.

The symptoms presented by the patient before us can be accounted for only by a rather extensive lesion in the gray matter of the medulla and cord. The most probable lesion is one caused by a growth of gliomatous structure in the gray matter of the cord and medulla, a condition to which the name syringomyelia has been given. I have not time now to enter into a discussion of the varying and confusing symptoms of this curious disease, as I have already exceeded the limits of my hour. At our next clinic I wish to study with you two patients, now in the hospital, suffering with supposed growths at the base of the brain, in both of whom sensation is profoundly affected. I hope at that time to be able to revert to the subject of syringomyelia.