A Clinical Lecture

ON A

CASE OF PERNICIOUS ANAEMIA HAVING CHANGES IN THE SPINAL CORD.

DELIVERED AT GUY'S HOSPITAL.

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GENTLEMEN,—Most of you will remember the woman about whom I want to talk to-day. She was in Mary Ward in September. She was 31 years of age, and a nurse. She was said to have always been delicate; the history given was that she had been out of health for two years, during which she had been getting weaker, losing weight, had had much anorexia, totally disliked her food, and had become paler. There were no definite symptoms indicating disease of any particular organ. Her illness might be summed up by saying that she had become thinner, paler, and weaker, and had suffered from considerable dyspnoea. She was sent in with the diagnosis of anorexia nervosa. So the first thing we did at the bedside was to try to make it clear to those who were round with us what was meant by anorexia nervosa. It is a condition which was described by Sir William Gull about fifty years ago. Most of the patients are women; they have a great dislike for food; are always of a nervous, neurotic disposition; take less and less food; waste more and more, although they have no organic disease; and ultimately they are reduced to an extraordinarily light weight. I have known one patient weigh less than 5 st. If such a patient undergoes what is called a complete Weir Mitchell course—that is to say, if she is put to bed, rested completely, isolated absolutely from her friends, has massage applied every day, is systematically fed every two hours, so that at the end of a few days she is taking a great excess of food; I have seen a woman only 5ft. 4 in. high taking over 5,000 calories a day, which gave a heat value for her food per kilogram of body weight of 115 kilo-calories—she generally quickly recovers, loses her distaste for food; even if she was sick before the treatment began, she keeps her food down, and ultimately, though a few such patients are never quite cured, most are cured or immensely improved. You do not see this treatment in the hospital, partly because it is expensive and partly because it is difficult to carry out, as these patients have to be isolated in a room by themselves and must have a special nurse and masseuse. The most essential feature of the cure is the absolute isolation of the patient from her friends, which isolation even extends to not allowing the receipt or sending of letters. The metabolism of these patients is of great interest. One, whom Dr. E. I. Spriggs and I examined,¹ utilized 96.5 per cent. of the fat in her food even when 2,692 kilo-calories of fat were taken daily. The total amount of nitrogen in her food for fifty-five days was 2,142.54 grams; of this, 1,481.5 grams were recovered from the urine and faeces, leaving 661.04 grams stored in the body or got rid of in some other way. Her increase of weight in fifty-five days was 13,256 grams; and if the gain in weight had been entirely protoid, it would have accounted for 442 grams of nitrogen, so that even on this assumption there was a deficit of 219 grams of nitrogen. Allowing for menstruation and sweat, this might at the lowest be reduced to 120 grams. The explanation of this deficit is difficult, but it might be due to the tissues containing simpler nitrogenous substances and to the water in the tissues having been reduced during observation.

The patient about whom we are talking was, as I have told you, sent in as a case of anorexia nervosa. The first thing you have to remember when the suggestion of anorexia nervosa is made is that it is a grave mistake to say that a person is suffering from anorexia nervosa when she is not. Indeed, you should never make a diagnosis of anorexia nervosa at one examination only, because the organic diseases which cause people to waste and become weaker and paler are such serious diseases, that to put a person suffering from one of them into a nursing home

and isolate her from her friends is as bad a thing as you could do. Moreover, you tell the friends of the patient who suffers from anorexia nervosa that she will get well, but people suffering from most of the diseases which may be confused with it will not get well. An obvious one is phthisis. A person with phthisis becomes weaker, loses appetite and flesh, and becomes pale. In every case in which you suspect anorexia nervosa, carefully examine the patient to see if she has phthisis. We concluded that the woman who forms the subject of this lecture had not phthisis. The next thing to remember is that cancer will make you lose flesh, it will make you weaker, it will make you paler, and make you lose appetite; therefore, whenever you suspect anorexia nervosa, look everywhere to find whether the patient has malignant disease. This woman had none. Some cases of granular kidney have the group of symptoms which I have just mentioned. We examined this patient's urine, and it was healthy; we took her blood pressure, and it was below normal; there was no evidence that she had granular kidneys. People suffering from a gastric or duodenal ulcer may lose their appetite, get weaker, thinner, and paler. We examined this patient carefully, but we could find no evidence that she had a gastric or duodenal ulcer. We could not make out that she had diabetes, which would have made her weaker and paler and thinner, although of course she probably would have had a large appetite. We could not find anything wrong in her heart, lungs, abdomen, or kidneys. Up to this stage it looked as if the doctor who suggested that she had anorexia nervosa was right.

But we went on with our examination and came to the nervous symptoms, and those of you who were round the bedside with me the other day will remember that, beginning with the feet, we, so to speak, "struck oil" at once, for we discovered she had an extensor reflex in her great toes. That seems to those of you who are beginning medicine a very trivial matter, but it is of fundamental importance. Most textbooks tell you that an adult who has extensor reflex of the great toe must necessarily have organic disease of the nervous system. I think I have once in my life seen a case in which there was no organic disease, and in which that sign occurred, but that is so rare that for all practical purposes the statement in the books is correct, namely, that if there is an extensor reflex of the great toe, the possessor of that reflex, if an adult, has organic disease of the nervous system. You will remember that to obtain it the sole of the foot should be warm, and that you should stroke the sole lightly with some sharp object from behind forwards, and generally steady the foot so as not to mistake a flexion of the ankle for a flexion of the toe. If you do this to a healthy person the toe is generally flexed towards the sole of the foot. If it is extended, there is disease of the central nervous system. In children up to the age of about 3 it is always extended, whether they are healthy or diseased, so that the reaction is of no use in children. Further, the disease of the nervous system indicated by an extensor reflex of the great toe is always some alteration in the upper motor neuron. So that the moment we found that this woman had an extensor reflex in her great toe we were compelled to assume that she had organic disease of the nervous system, although she made no complaint of anything to point to organic disease of that system, nor could we find anything else, on examining her further, to indicate any organic disease of her nervous system. Having settled definitely that she had organic disease of the nervous system, somebody then handed to us the temperature chart, and it was seen that during the two days that she had been in the hospital her temperature was about 101°.

The problem before us was this: here is a woman who is wasted, weak, has anorexia, is pale, has almost certainly chronic degeneration of her upper motor neuron, and has a raised temperature. What can be the matter with her? You will remember that she came in because of her general weakness, and pallor and anaemia. Therefore the suggestion was now made that this woman really had pernicious anaemia, and that the changes in the spinal cord which gave the extensor jerk in the great toes were secondary to pernicious anaemia. And further, it was alleged by those who took this view that it would explain the rise of temperature; consequently the diagnosis suggested was that the patient had pernicious anaemia.

Inasmuch as when we mentioned anorexia nervosa I sought to explain what it was, so now I must stop to explain what is meant by pernicious anaemia. You may say that any anaemia which is profound enough to kill is pernicious. That, in a sense, is true. The term "pernicious anaemia" is bad, and yet it is used so constantly for one particular disease only that we know what we mean when we employ it. This trouble was first described by Addison, and if you read his work on the suprarenal capsules you will find that while discovering Addison's disease he stumbled across people who were anaemic and weak, and in whom no obvious cause for anaemia could be found. These patients were frequently of a lemon tint, they were sometimes, but not by any means always, a little wasted, and he stated that the disease which these people were suffering from was uniformly fatal in the end, and that when a *post-mortem* examination was made nothing could be found wrong. Addison's description has passed into the classics of medicine and has needed no alteration, and this apparently causeless anaemia first described by him is called pernicious anaemia. It would be very much better if it were called Addison's anaemia. We have made little or no advance in the clinical symptoms since Addison described them. We have learnt something owing to examination of the blood and to more thorough *post-mortem* examinations than were possible in his day, and the chief change in the blood is this: there is a great reduction in the number of red cells, and there is a great reduction in the haemoglobin—in other words, there is a profound anaemia, but the reduction in the haemoglobin is usually not as great as the reduction in the number of red cells; therefore each cell carries an excess of haemoglobin. In other words, the colour index is above unity. Other changes in the blood are that many of the red cells are misshapen, there is much poikilocytosis, there are many megaloblasts, and very often several nucleated reds, and generally there is considerable deficiency of white cells. You will remember that although the woman I am describing to you was anaemic and weak she had not a yellow colour, which Addison described as usually characteristic of his cases. So we could not say, from merely looking at her, that she had pernicious anaemia. But I need hardly say we examined her blood immediately the suggestion of pernicious anaemia was made. There were two examinations; she did not live long enough for more. The first gave the colour index as 1.7, the reds being reduced to 1,750,000, the haemoglobin 45 per cent. Later examination showed almost the same, the colour index being then 1.9, and the white cells were greatly reduced. Thus you see there was a great reduction of red cells, a great reduction of white, and a raised colour index, and therefore the diagnosis of pernicious anaemia was made. She had some poikilocytosis, she had some megaloblasts and one or two nucleated reds, and so the diagnosis was confirmed, and we knew that she had pernicious anaemia and not anorexia nervosa, although she had anorexia. Still she certainly did look like a case of anorexia nervosa; she was the usual sex, the usual age, she had anorexia, and was wasted. Further, most cases of pernicious anaemia are not wasted, and most are primrose yellow in colour. Occasionally in addition to the lemon-yellow colour of the skin you see scattered over it little dark brown patches of pigment. Whenever you see them, inquire whether the patient has been taking arsenic, as is likely, because arsenic, as I shall tell you presently, is the best drug you can give a patient with pernicious anaemia, and arsenic causes brown pigmentation of the skin; but brown pigmentation due to pernicious anaemia, it is definitely settled now, may occur inside the mouth, like the pigmentation of Addison's disease,² so that it becomes a considerable clinical difficulty at times without a blood examination to know whether you are dealing with a patient who has pernicious anaemia, with one who has been taking arsenic, or with one who has Addison's disease. An examination of the blood will put that right for you. I cannot now give you a lecture on pernicious anaemia, it would take too much time; but I may remind you that sufferers from it have most of the signs usually associated with profound anaemia—that is to say, they are giddy, they have a feeble beat of the heart, they have haemic murmurs, the heart may be dilated, they are short of breath, and in women you find amenorrhoea. This woman had most of

these symptoms. Let me remind you that occasionally you see haemorrhages in the retina sometimes associated with retinitis and optic neuritis; so severe were these features in an anaemic patient in the hospital two years ago, that from the ophthalmic appearances we successfully suggested pernicious anaemia. Our patient had no changes in the fundus of her eyes; if she had we should have known that she was not suffering from anorexia nervosa. She went from bad to worse, and at the end of two days she died.

I am often saying to you in the wards that if we put aside a few functional diseases—such, for instance, as genuine neuralgia—you can never be said to make a diagnosis unless you have a definite picture of what will be found at a *post-mortem* examination. Whenever you see a patient in the ward or anywhere else, by the time you have left the bedside you ought to be able to describe what you would expect to see if the patient were at that moment shot and you made a *post-mortem* examination. You must picture to yourself the naked-eye and histological appearance of the liver, the heart, the lungs, and the other viscera; and, further, you must have in your mind, as far as present knowledge will allow, a rational explanation of the patient's symptoms. Unless you have that, you have not made a diagnosis. We must now try to form such a picture and explanation for our patient who lay in No. 5 bed in Mary Ward. We diagnosed that she had pernicious anaemia, and that she also had chronic degeneration of her upper motor neuron. In pernicious anaemia we picture to ourselves an excessive destruction of blood, great haemolysis, and we believe that to be the essential feature of the disease. The reason why we believe this is that if you make a *post-mortem* examination on a case of pernicious anaemia and take a piece of the liver, and let it lie in a 5 per cent. solution of potassium ferrocyanide for five minutes, and then transfer it into a 1 per cent. solution of hydrochloric acid, it turns blue, as this piece of liver, from a patient with pernicious anaemia, which I show you has done. On applying this test to the liver of our patient it also turned bright blue. The explanation is that in pernicious anaemia there is a great deposit of free iron in the liver, and the potassium ferrocyanide and hydrochloric acid and free iron give you Prussian blue, and consequently from the bright blue colour we infer the presence of a good deal of free iron in the liver, and we know that this is characteristic of pernicious anaemia; therefore, as we said during life that the patient had pernicious anaemia, we pictured to ourselves that the morbid anatomist would be able to demonstrate this blue colour. He did, and thereby clinched the diagnosis. The appearance of free iron in the liver means that there had been a great destruction of blood, and the resulting free iron has been deposited in the liver, and you might demonstrate it there in any condition in which there is considerable haemolysis, but the appearance of this free iron in the liver is much more constant and much more abundant in pernicious anaemia than in any other disease, although you sometimes see a less degree of it in other diseases accompanied by severe destruction of the blood. I have seen it in severe pyaemia. When there is a considerable amount of free iron in the liver a little is deposited in the kidney and a little in the spleen. At the *post-mortem* examination on this woman it was possible to demonstrate free iron in the liver, kidneys, and spleen. Much of the work concerning free iron in the viscera has been done at Guy's Hospital. Dr. F. G. Hopkins,³ working at some cases under my care, published a very important paper on the subject. The normal liver should contain 0.09 per cent. of free iron, but he found in four sufferers from pernicious anaemia the amount of free iron was 1.038, 0.204, 0.400, and 0.190 per cent. The spleen in health ought to contain 0.18 per cent. of free iron, but he found the amount in 2 cases of pernicious anaemia to be 0.301 and 0.325 per cent. Mr. J. H. Ryffel⁴ has recently published the results of 7 cases. The amounts of free iron in the liver were 0.34, 0.24, 1.01, 0.14, 0.57, 0.60, and 0.086 per cent., showing an excess in 6 out of 7 cases, and the increase in the spleen and kidneys was equally striking. So that analyses show that in pernicious anaemia there is a great deposition of free iron in the liver, kidneys, spleen, and especially in the liver. It is found almost entirely in the periphery of the lobules of the liver, and in the convoluted tubules of the kidney.

The intensity of the Prussian blue reaction is by no means necessarily proportionate to the amount of free iron, but this is proportionate to rapid haemolysis and a high colour index. As so much free iron is found in the liver, I suggest that the destruction of red cells and haemoglobin takes place somewhere in the portal area, and the free iron is consequently deposited chiefly in the liver. This patient only had 45 per cent. haemoglobin, and her red cells were reduced to a little over a million. Therefore, each red cell had more haemoglobin than it should. In other words the colour index was high, and this high colour index, which is such a constant feature of pernicious anaemia, may be regarded as an attempt at cure, each red cell carrying more haemoglobin than it should to compensate for the paucity of red cells.

You will remember we took out the femur of this woman, and the marrow was red like fetal marrow, and evidently it was in a state of great activity. The suggestion is that this indicates an attempt at repair, that the marrow of the bones becomes unduly active and red, like fetal marrow, because it is called upon to make an excess of red cells to compensate for their abnormal destruction, and that in its hurry to cure the disease, it is constantly pouring into the blood immature forms of red cells, such as megaloblasts, poikilocytes, nucleated reds, and red cells staining badly, which give blood films so characteristic of pernicious anaemia. When the marrow is in this condition, the bones are sometimes tender during life; they were so in our patient.

I have already told you that our patient had a moderate degree of pyrexia. It is strange that the temperature should be raised, as it usually is in pernicious anaemia, because the sufferers from it are generally not wasted, and, the red cells being greatly reduced in number, the oxygen-carrying power of the blood is diminished, and, generally speaking, a raised temperature means more active oxidation. We may suppose that, as a result of the breaking down of the blood, there is some substance formed which, acting like belladonna, sends the temperature up by its action on the nervous system.

I have left till last the chief interest of our patient—namely, the state of the spinal cord.

You will remember that she had an extensor reflex in both great toes, and from this we diagnosed there was degeneration of the lateral columns of the cord. Degeneration of the spinal cord occurs in various forms of severe anaemia—more often in pernicious anaemia than others—but not in many cases of pernicious anaemia; it is probably due to some toxin; it may be that which produces the haemolysis, or it may be one of the results of the haemolysis. Poisons will produce degenerations of the spinal cord, for we meet with them as a result of poisoning with ergot of rye. I hand round some beautiful sections of the cord from our patient. They have been stained by the Weigert-Pal method. The healthy parts are stained very dark; the degenerated parts are unstained, and hence appear light (see Figs. 1, 2, and 3). You will notice that the degeneration is much more extensive in the dorsal than in the cervical region, and that

it is the posterior columns and crossed pyramidal or lateral tracts that are most degenerate; indeed, in one of our sections there are hardly any healthy fibres left in these regions. The degeneration in the lateral tracts was the cause of the extensor jerk in both great toes. We found during life no other evidence—for example, exaggerated knee-jerks—of degeneration of the lateral columns, and none of degeneration of the posterior columns. Our patient was moribund when we examined her, and this, no doubt, explains to some extent the absence of many symptoms of degeneration of the cord; nevertheless, the degeneration of the cord—if it exists—in a case of pernicious anaemia is usually much more extensive than the symptoms observed during life would lead you to expect.

If you look carefully, you will notice some areas of degeneration outside and near to the lateral tracts and some on the edge of the cord in the cervical region. You will also see in the section of the dorsal region that the white matter adjacent to the posterior horns (posterior root zone) is not degenerate. Lissauer's tract, too, has escaped. Further, a low power of the microscope will show you small diffuse areas of degeneration and several minute haemorrhages. I doubt whether you will ever see better examples of severe changes in the spinal

cord in pernicious anaemia than are shown in the slides before you. In all respects they show the usual changes found in an extreme case, but lesser degrees of degeneration are more common, and these are generally seen only in the posterior columns. The grey matter is not affected. All these changes in the cord are rare in the higher cervical and the lower dorsal and lumbar regions, and once again let me remind you that any changes in the spinal cord are uncommon in pernicious anaemia—hence this lecture.

If I may sum up the chief points of interest in this case: in the first place, it teaches us that you should be very careful about the diagnosis of anorexia nervosa. If we

had not discovered that extensor reflex in the toes we might never, in the two days that that woman was in the hospital, have examined the blood and found that she had pernicious anaemia, and we should have had the mortification of

a case of supposed anorexia nervosa going down to the post-mortem room and found to be pernicious anaemia. We should not have forgiven ourselves for that. And in the next place, it does most admirably illustrate the advantage of taking special notice of small points. It would seem incredible—mere hocus-pocus—to any of the laity to believe that, because this woman instead of bending her toe downwards bent it upwards, we should be able to infer she had pernicious anaemia and sclerosis of the upper motor neuron, and would certainly die.

All I have to tell you about treatment is that sufferers from pernicious anaemia often improve if they take arsenic. But the improvement is never permanent. The usual thing is that the patient comes into the hospital, is given arsenic, the blood improves, and the patient feels better, and then, after some weeks' treatment, goes out of hospital, but is admitted again in a few months, and again improves on

Fig. 1.

Fig. 2.

Fig. 3.

arsenic. That happens three or four times, and then the disease proves fatal.

REFERENCES.

- ¹ *Journal of Physiology*, vol. xxvi, p. 151. ² *Quarterly Journal of Medicine*, vol. i, p. 108, and *Guy's Hospital Reports*, vol. lxiii, p. 103. ³ *Guy's Hospital Reports*, vol. i, p. 349. ⁴ *Journal of Pathology and Bacteriology*, vol. xiv, No. 3, p. 411.

REMARKS ON A CASE OF SUBACUTE COMBINED DEGENERATION OF THE SPINAL CORD, SIMULATING DISSEMINATED SCLEROSIS, WITH THE RAPID DEVELOPMENT OF PERNICIOUS ANAEMIA SHORTLY BEFORE DEATH.

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It is well known that the nervous symptoms due to subacute combined degeneration of the spinal cord may be developed a considerable time before the anaemia or cachexia which usually precedes or accompanies the symptoms due to the degenerative changes in the spinal cord. In cases of this kind the diagnosis is sometimes very difficult, more especially in the early stages of the case; disseminated sclerosis in particular may be very closely simulated. In the following case, in which the nervous symptoms were developed three years before the anaemia became sufficiently marked to attract attention, this difficulty in diagnosis was more striking than in any of the recorded cases of subacute combined degeneration with which I am acquainted. This was partly due to the early age (31) at which the cord symptoms developed, but chiefly to the facts: (1) That, in addition to ataxic-spastic paraplegia, nystagmus and derangements of the bladder and rectum, optic atrophy, exactly resembling that characteristic of disseminated sclerosis, was present; and (2) that remarkable periods of improvement and relapse, so characteristic of disseminated sclerosis, occurred. The case is also important and exceptional inasmuch as the profound anaemia which developed a fortnight before death was typical pernicious anaemia, megalocytes were present in the blood during life, and the free iron reaction was very marked in the liver and kidneys after death. The notes of the case are as follows:

A man, aged 33, married, a hairdresser by trade, was admitted to the Edinburgh Royal Infirmary on September 18th, 1906, complaining of difficulty in walking and a tight feeling across the stomach.

History.

The patient, who denied any venereal disease, stated that he enjoyed good health until October, 1904, when he had an attack of influenza. After this he noticed that his legs were weak, and that his sight was becoming impaired; he however continued to work without much complaint until January of the present year (1906); he then had another attack of influenza. After this his legs were for a time much weaker, and he complained of a feeling of numbness, tingling, and pins and needles in the legs, buttocks, and lower part of the back. Since this second attack of influenza his sight has become much worse. He continued to follow his occupation until three weeks ago, when his walking became very unsteady, and he noticed that in walking he dragged his legs. Two months ago he felt giddy when getting up in the morning or when he turned quickly. For the past five or six weeks he has felt a tight feeling across the upper part of the abdomen, and his water has at times dribbled away. Since January he has been obstinately constipated. He has had no pain in the back and no lightning pains. There has been no affection of speech. During the past year he has become much "shorter in the temper." His social condition was quite satisfactory, and he had been a very steady man.

Family History.

Father, aged 53, is alive and well; mother died a year ago, at the age of 52, cause unknown. There were twelve children in the family: all died in childhood (causes of deaths not known) except one brother, who is abroad, and, as far as the patient knows, healthy. The patient has had six children; two died, at the ages of 14 months and 2½ years respectively, from inflammation of the brain (? meningitis); the four surviving children are alive and well. There have been no miscarriages.

Condition on Admission.

The patient was a spare, thin man. The body was fairly well clothed with fat; muscularity was poor. His height was 5 ft. 3½ in., and his weight 7 st. 1½ lb.; when in perfect health he used to weigh 8 st. 8 lb. in his clothes. The temperature was 97.6°, the pulse 74, and the respirations 20 per minute.

The mucous membranes were slightly anaemic. (I have no record of any blood examination at this date.) The appetite was poor; the tongue was rather red and raw; the bowels were obstinately constipated.

The patient walked with great difficulty and only with support. The gait was very ataxic and also spastic, the toes being dragged along the ground. There was marked Rombergism. The muscularity was poor, but there was no localized muscular wasting, and no definite paralysis of any muscle or group of muscles; the calves though small in size were firm. The knee-jerks and Achilles jerks were greatly exaggerated. There was no sustained ankle clonus, but a few clonic contractions were obtained in the right leg. The plantar reflex showed a double extensor response, more marked on the right side. The abdominal reflex was active on both sides. The deep reflexes in the upper extremities were normal. He complained of a feeling of numbness and tingling and coldness in the lower extremities, buttocks and lower part of the back, but no objective derangements of touch, pain, or heat and cold were detected. The sense of movement (muscular sense) in the lower extremities was distinctly impaired. The bowels were obstinately constipated; the functions of the bladder were distinctly affected (precipitant urination and some dribbling, but no loss of expulsive power). There was no lateral nystagmus, but distinct nystagmus on looking up, and especially on looking upwards and to the left. The pupils were equal, 4 mm. in diameter; they contracted actively to light and on convergence. The acuity of vision was much impaired— $\frac{1}{2}$ in each eye. There was distinct pallor of both optic discs, chiefly marked on the temporal sides, and greater in the right than in the left eye. There was no volitional tremor; no speech affection; and (at this stage) no pain in the back.

A soft systolic murmur was present in the aortic area, the aortic second sound was somewhat accentuated, but the heart, kidneys and other viscera appeared to be normal.

Diagnosis.

The condition was one of ataxic-spastic paraplegia. It was obvious that the patient was not suffering from tabes. The age at which the disease had developed, the absence of other cases in the family, the absence of foot deformity, and the presence of optic atrophy were against Friedreich's ataxia. The ataxic-spastic paraplegia, the nystagmus, the giddiness, the optic atrophy, the affection of the bladder and rectum, were indicative of disseminated sclerosis. The fact that the illness had commenced at the age of 31 in a perfectly healthy man who had not had syphilis, after an attack of influenza, seemed to support this diagnosis. The subsequent progress of the case—the marked improvement which resulted under treatment on two occasions (see *infra*)—was strongly in favour of this diagnosis. Granting, as was thought, that the patient was suffering from disseminated sclerosis, the peculiar character of the nystagmus (it was only present on looking up) was exceptional and interesting.

Treatment and Subsequent Course.

The patient was treated with rest in bed, massage and arsenic (5 minims of Fowler's solution three times daily). Rapid improvement took place; the patient's walking quickly improved; the bladder derangement disappeared. He was discharged from hospital on November 3rd, 1906, walking well and stating that he felt quite fit for work. The exaggeration of the deep reflexes, the double Babinski, the optic atrophy and the nystagmus were still present. For two months after his discharge from hospital the patient felt very well and was able to walk about and to do his work, which involved a lot of standing; weakness in the legs and difficulty in walking then again developed.

He was readmitted to the infirmary on February 20th, 1907. The ataxic-spastic paraplegia was very marked and he could only walk with support. The urinary difficulties had returned, and he now had to "force" in order to get the water away. He complained of an aching pain on the left side of the back, of numbness, pricking, and coldness in the legs, and of a sensation as if he were walking on rubber. The knee-jerks and Achilles jerks were markedly exaggerated; ankle clonus was now present in both legs; there was a marked double extensor response; the abdominal reflexes were still very active on both sides. The vertical nystagmus and the pallor of the optic discs were more marked. Dr. Sym kindly examined the eyes and reported as follows:

"The acuity of vision in right eye is $\frac{1}{2}$, and in left eye $\frac{1}{4}$. The optic discs are distinctly paler than normal, especially on their outer sides. The retinal vessels are slightly reduced in size."

The patient was again treated with arsenic and again improved. On May 8th he was discharged, able to walk well with the help of one stick and saying that he was fit for work.

For three months after his discharge he continued well and was able to follow his occupation. Then the weakness in the legs and difficulty in walking again occurred, and he began to suffer from pain in the back.

On October 15th, 1907, he was admitted to the infirmary for the third time, unable to walk without support; the gait was still very ataxic and spastic; Rombergism was marked. The patient complained of severe pain in the lower part of the back and in the legs, numbness and tingling in the feet, and a cold feeling in the knees and elbows.

The knee-jerks and Achilles jerks were still markedly exaggerated; ankle clonus and an extensor response were present on both sides. There was considerable difficulty in