On examining the eyes with the ophthalmoscope, an operation which is generally rendered difficult by the existence of nystagmus, we usually find, under such circumstances, either almost complete integrity of the papilla of the optic nerve, even when amblyopia is far advanced, or a partial lesion; or, finally, in the rare cases where blindness is complete,[1] total atrophy (marked by a pearly white coloration, and extreme tenuity of the vessels) with or without excavation of the papilla.

In the case of Mademoiselle V— we have simply a rather marked amblyopia of both eyes. No well-determined lesion has been discovered on ophthalmoscopic examination. It is worthy of notice that, in this case, flashes of light and sparks preceded the enfeeblement of sight. I have observed the same phenomena in several other cases of amblyopia connected with multilocular sclerosis.

c. Nystagmus is a symptom of sufficiently great importance in diagnosis, since it is to be met with in about half the number of cases. It is not found, so far as I know, in locomotor ataxia, save in very exceptional cases. You may observe that it exists, to a very advanced extent, in Mademoiselle V—. We have there, as you see, a quantity of little jerks or twitches, which cause the eyeballs to oscillate simultaneously from right to left, then from left to right, or inversely. There are cases in which the nystagmus is not present so long as the gaze is fixed on nothing, but shows itself suddenly, in a more or less manifest manner, as soon as the patients are asked to look attentively at any object.

B. There is a symptom more frequently found than nystagmus, one which is almost constant in multilocular cerebro-spinal sclerosis, since it is noted in twenty-two out of the twenty-three cases that we have analyzed, and this is a *peculiar difficulty of enunciation* which you can study in our patient, where it exists in a typical state of perfect development.

The affected person speaks in a slow, drawling manner, and sometimes almost unintelligibly. It seems as if the tongue had become "too thick," and the delivery recalls that of an individual suffering from incipient intoxication. A closer examination shows that the words are as if measured or scanned: there is a pause after every syllable, and the syllables themselves are pronounced slowly. The patient hesitates in the articulation of his words, but there is, properly speaking, nothing like stammering. Certain consonants, *l*, *p*, and *g*, are peculiarly ill-pronounced.

There exists in the case of Mademoiselle V—, as you may observe, a certain slowness in the movements of the tongue, you see that it is even affected by very manifest tremulation when protruded. It must not be supposed, however, that this is a constant phenomenon, for I have several times found that speech might be

[1] Case quoted by M. Magnan.

impeded to a very great extent without the tongue presenting the least trace of tremor. The tongue always, at least according to my experience, preserves its normal volume, and I have never seen it wrinkled on the surface, as may be noticed in certain cases of labio glosso-laryngeal paralysis with atrophy of the lingual muscles.

The difficulty of enunciation, at first scarcely perceptible, becomes gradually aggravated during the course of the disease, until the patient's discourse is rendered nearly incomprehensible. In some instances it becomes suddenly aggravated, as if in paroxysms, and then grows temporarily better.

On the whole, the difficulty of speech which is observed in cerebro-spinal sclerosis approximates, in many respects, to the corresponding symptom of progressive general paralysis. I even think that, in many cases, it would be almost impossible to distinguish between them, if abstraction were made of the assistance given by concomitant phenomena. Add that the approximation may be rendered still closer by the circumstance that, in multilocular sclerosis, as in general paralysis, the utterance of words is sometimes preceded, as you can verify in our patient, by a slight and, as it were, a convulsive contraction of the lips.

However it be, this trouble in the articulation, to which I call your attention, is a very important symptom of multilocular sclerosis. It may potently contribute to settle the diagnosis, principally in those cases, which are indeed exceptional, where tremor of the hand and upper extremities is absent.

To this symptom may successively be added, especially in advanced stages of the disease, certain disorders of deglutition, of circulation, and even of respiration. These are symptoms of *progressive bulbar paralysis*, which ought to give the alarm, because, becoming rapidly aggravated, they have sometimes suddenly and almost unexpectedly determined the fatal termination. On account of the interest attaching to them in prognosis, they shall form the object of a special study.

C. *Vertigo*, in about three-fourths of the cases, is one of the phenomena which mark the invasion of multilocular sclerosis of the nervous centres. As far as I can judge from the descriptions given me by the patient whom I have questioned, the vertigo is generally of the gyratory kind. All objects seem to be whirling round with great rapidity, and the individual himself feels as if revolving on his axis. Threatened with loss of equilibrium, the patient lays hold of whatever is nigh him. In most cases, this giddiness returns in fits of short duration; sometimes, however, it persists almost without interruption for a certain period, superadded to the tremor and paralytic state of the members; it often contributes considerably to render it almost impossible for the patient to stand erect or continue his titubating walk. You must

take care not to confound this titubation with the uncertainty of gait which is connected with diplopia; the latter ceases when the patient keeps one of his eyes closed.

The vertigo in question is all the more interesting because it belongs neither to locomotor ataxia, nor to paralysis agitans, and may consequently help in forming a diagnosis.

D. Most of the patients affected by multilocular sclerosis, whom I have had occasion to observe, have presented at a certain stage of the disease a truly peculiar *facies*. The look is vague and uncertain; the lips are hanging and half-open; the features have a stolid expression, sometimes even an appearance of stupor. This dominant expression of the physiognomy is almost always accompanied by a corresponding mental state, which deserves notice. There is marked enfeeblement of the memory; conceptions are formed slowly; the intellectual and emotional faculties are blunted in their totality. The dominant feeling in the patients appears to be a sort of almost stupid indifference in reference to all things. It is not rare to see them give way to foolish laughter for no cause,[1] and sometimes, on the contrary, melt into tears without reason. Nor is it rare, amid the state of mental depression, to find psychic disorders arise which assume one or other of the classic forms of mental alienation.

One of the patients of Valentiner, usually subject to melancholia, was, from time to time, seized with ambitious mania. A man, whose case has been recently recorded by Dr. Leube[2] looked upon himself as destined to become a king, nay, an emperor; he boasted that he possessed a large number of oxen, horses, and beautiful mansions. He was soon, he said, about to form a matrimonial alliance with "a countess," etc.[3]

Mademoiselle V— was seized, a few weeks ago, with a genuine fit of lypemania. She had hallucinations of sight and hearing. She beheld frightful apparitions, and heard voices threatening her with the guillotine. She was convinced that we wanted to poison

[1] A patient, under M. Charcot's care, of whom we shall have occasion to speak again, Hortense Dr—, is frequently seized with causeless fits of laughter, which she cannot control. Having been subject, before the invasion of the disease, to fits of anger, she has noticed, with regret, that they have increased since that period. (B.) On the other hand, one of two patients, whose cases I had an opportunity of studying, in Professor Behier's wards in the Hôtel Dieu, did not exhibit any marked intellectual disorder, although she had been many years in hospital. The second patient, whose symptoms were more advanced, seemed to wake from a dream, when spoken to, then, trying vainly to fix his gaze on the speaker, he answered intelligently, but the (gradually increasing) difficulty of enunciation made conversation painful. (Sigerson.)

[2] "Ueber multiple inselförmige Sklerose des Gehirns und Rückenmarks' ('Deutsch. Archiv,' 8 Bd., 1 heft, Leipzig, 1870, p. 14).

[3] One of the patients, Aspasie B—, observed by M. Lionville, in M. Vulpian's wards, had hallucinations; Rosine Spitale, whose history we have abridged (Bourneville et Guérard, *loc. cit.*, p. 92 from M. Valentiner, fell into stupor some months before the fatal termination of the disease. (B.)

her. During twenty days she refused all kinds of nourishment, and we were forced, during the whole of that time, to administer food by means of the stomach pump. To-day, these accidents have almost entirely vanished. Nevertheless, the voices are still heard from time to time. You see the patient has been taken, during our examination, with convulsive laughter which she cannot moderate, and which will soon be followed by a shower of tears.

IV.

In order to conclude the descriptive study of the case which I have presented you, gentlemen, as a type of *multilocular sclerosis* of the nervous centres, it only remains for me to direct your attention to the state of the lower extremities. You have seen that Mademoiselle V— cannot rise from her seat, stand erect, or attempt to walk, if she be not strongly supported by two assistants. It is easy to note that the cause of this motor impotence is, principally, a pseudo-tetanic rigidity which has seized on the lower extremities, and which, though very marked when the patient is seated or reclining, becomes exaggerated to the highest degree when she attempts to rise or walk.

This contracture of the lower limbs, at present permanent, only manifested itself quite recently in the case of Mademoiselle V—; it is, in fact, a symptom of the advanced stages of the disease. In the evolution of the morbid process it is always preceded at a considerable distance by a *paretic state*, presenting some peculiar features, with which I will first endeavour to make you acquainted.

In reference to this particular point the clinical history of Mademoiselle V— has been traversed by certain incidents which, without being exactly exceptional, still do not constitute the rule. Consequently I am forced to put it aside for the moment, reserving the right of soon returning to it. In the following description I will draw upon details recorded in a certain number of cases which I have collected, and in which the paretic period was developed in accordance with the normal conditions.

Paresis of the limbs.—We have here a more or less marked decline of the motor power of the limbs, which is frequently manifested at the very outset of the disease, and which is not usually connected with any notable disturbance of sensibility.

Generally one of the lower limbs is first and solely affected. It feels heavy and difficult to move; the foot turns at the least obstacle in walking, or the whole limb suddenly gives way under the weight of the body. The other limb is seized, sooner or later, in its turn; however, as the paresis advances with extreme slowness, the patients are still able, for yet a long while, to walk about with more or less ease and to attend to their occupations, but at

last the day comes when, owing to an aggravation of the motor paralysis, they may be confined to bed. The upper extremities are themselves invaded, either simultaneously or one after the other, usually at a period far removed from the invasion of the disease. Frequently in the commencement there are remissions; thus, it is not rare to see the enfeebled lower limbs resume, for a time, their original energy. Such remissions may even occasionally take place two or three times. I point out this peculiarity to your notice because it certainly is not found, to the same extent, in other chronic diseases of the spinal cord.

I should revert for a moment, in order to lay stress on the fact, already noticed, of the absence of disorders of sensibility. The patients do, indeed, sometimes complain of formications, and of a feeling of numbness occupying the enfeebled limb; but these symptoms are usually transient and but little marked. Besides, it is easy to ascertain that cutaneous sensibility, in the affected members, is almost always preserved, in all its modes. The girdling pains, the fulgurant crises, which play so prominent a part in the early stages of progressive locomotor ataxy, are absent here. It is the same thing with respect to that loss of the sense of position of parts, which also belongs to ataxia. This does not occur in regular multilocular sclerosis, and patients affected by the latter disease can, with closed eyes, determine with exactness the position which has been given to their limbs. Nor has the closure of the eyes any marked influence on the power of the patient to hold himself erect, or on his manner of walking. His gait is uncertain, embarrassed, titubating, on account both of muscular weakness and of the tremor which, sooner or later, is superadded; the feet, held apart in order to enlarge the basis of support, drag awkwardly over the ground, from which it is hard to raise them. When titubation is very much marked the patients threaten to fall at every step, and they do, in fact, frequently come to the ground. The lower extremities are not flung forward, in an abrupt manner and convulsively, as we so commonly see them in sclerosis of the posterior columns. The sphincters are very rarely affected by the weakness which invades the muscles of the limbs, and this contrasts with what occurs in many spinal affections, where you see, at a very early stage, vesicular and rectal troubles superadded to the other symptoms. Finally, to complete the picture, we should lay stress on the habitual absence of trophic disorders of the muscles in the paraplegia connected with multilocular sclerosis. The enfeebled muscles preserve almost to the last their prominence and firmness; tested by faradaic exploration they do not present, at any stage, traces of notable enfeeblement of electric contractility.

Intermixture of unusual symptoms.—I made mention, as we proceeded, of a certain number of symptoms which I took care to

eliminate, because they do not belong to the regular type of the disease. It is necessary to inform you now, by way of corrective, that these symptoms do intermingle, in certain cases, with the ordinary phenomena of multilocular sclerosis, and even become so very prominent that an observer, if not forewarned on the subject, would perhaps be almost necessarily mistaken. Under this aspect, the record of Mademoiselle V— may furnish us with valuable information. I extract, therefore, some details from it, dated March 24, 1867, that is to say, over three years ago. At that period, when, indeed, the paresis and tremor were so far advanced in the lower limbs as to make it impossible for the patient to walk, except by the help of two assistants, the following symptoms were noted: Whilst walking, the feet are slightly thrown forward, "as with ataxic patients." When the eyes are closed there is "exaggeration of the titubation, loss of equilibrium, and the patient would certainly fall if not strongly upheld by two assistants." In the lower limbs "tactual sensibility has diminished in a marked manner. The patient, with closed eyes, cannot tell what position has been given to her limbs. She experiences in them, from time to time, violent paroxysms of fulgurant pains." Finally, the existence of a girdling pain has been noted.

You have recognized, in this enumeration, nearly the whole series of phenomena which serve clinically to characterize progressive locomotor ataxy. Some of them are to be found present today in our patient, but they appear, generally speaking, in a very attenuated form, or relegated to the background. Do we mean to say that, even at the time when they seemed to predominate, they were of a nature seriously to embarrass the diagnosis? No, decidedly not, and I am convinced that, in all cases of the kind, you could avoid deception by bearing in mind the following observations:—

The very fact of paresis of the lower limbs (which does not exist in posterior sclerosis, or which, at all events, only shows itself at an advanced stage) being found mixed up with the *ataxic symptoms*, should put you on the true path. If it have preceded them the case is still clearer. You will also certainly have to chronicle the coexistence of some of the symptoms which belong only to multilocular induration, namely—tremor of the extremities, impeded enunciation, vertigo, nystagmus, etc. It is necessary, besides, to clearly understand the reason why ataxic symptoms are sometimes manifested in the course of multilocular induration, as I announced above. There is here in my opinion, no question of a combination of the elementary forms of two diseases—progressive locomotor ataxia and cerebro-spinal disseminated sclerosis. As for myself, I have never, in a post-mortem examination, met with the coexistence of multilocular gray induration and posterior *fasciculated* sclerosis; and, without denying that such an association

could exist, I believe it to be at least infinitely rare. It is, on the contrary, common enough for the sclerosed patches (which, as a rule, principally occupy the antero-lateral columns) to cross the postero-lateral fissures and encroach on the posterior columns. Occasionally even, I have seen them, when they were confluent, involve a large portion of the substance of these columns throughout the whole extent of one of the regions of the cord, the lumbar region for instance. Now, in all cases of this kind, ataxic symptoms were manifested to different degrees of intensity during life. I have no doubt but that a similar arrangement will one day be found to account for the fulgurant pains, the motor incoördination, and, in a word, for all the phenomena of the same order which are stated in the record of Mademoiselle V—.[1]

Unusual symptoms of another kind may also be superadded to the regular symptoms of multilocular sclerosis. In several cases, which were otherwise well characterized, I have seen an atrophy of certain muscles, or groups of muscles, supervene, which recalled, both by its position and its mode of invasion, progressive muscular atrophy. I have twice had the opportunity of ascertaining the anatomical cause of this new complication; in both cases the irritative process, of which the sclerosed foci are the seat, had, in certain regions of the cord, extended to the nerve-cells of the anterior cornua of the gray matter, and these cells had, in consequence, undergone great alterations. Now, according to the researches which I have detailed to you, it is but little doubtful that progressive

[1] Cases of disseminated sclerosis, in which the posterior columns were involved so as to occasion some of the symptoms of locomotor ataxy, are numerous enough. We may mention, first, the case of Paget, recorded by Cruveilhier in his 'Atlas;' then the three cases which were related at length in our memoir. The first is that of the woman Broisat (disseminated sclerosis, principally occupying the posterior columns), who succumbed in M. Charcot's wards; the two others, which were perhaps more characteristic, inasmuch as the symptoms and lesions of locomotor ataxia were more prominent, were quoted from Friedreich. Finally, we will briefly summarize another case, which we noted during the siege, in M. Marrotte's wards:

Josephine Leg—, aged forty-six years, a silk-winder, has been suffering for two years. She presented the following ataxic symptoms—difficulty of walking with closed eyes; notion of position, with respect to lower limbs, greatly lost; frequent fulgurant pains in the knees and legs: girdle pains. But, along with those symptoms, these were noted, *i. e.*, considerable paralytic enfeeblement of the lower limbs; preservation of the different modes of sensibility in the upper and lower extremities; visual integrity. This woman succumbed to pyelo-cystitis, complicated with sacral eschars. *Autopsy:*—Sclerosed patches on the left external motor oculi and on the optic nerves; sclerosed patches on the pons Varolii, the right superior crus cerebelli, etc.; sclerosed patches on the surface of the lateral ventricles, in the interior of the centrum ovale, on the anterior face of the bulbus rachidicus, and in the fourth ventricle. In the spinal cord we found, 1st, a sclerosed patch, four inches long, occupying the left posterior column; 2d, another of less length and breadth on the right posterior column; 3d, beneath it, another rather circumscribed patch occupying both posterior columns; and 4th, on the antero-lateral surfaces of the cord, many small patches of sclerosis. (B.)

amyotrophy, whether protopathic or consecutive, most frequently arises from an irritative lesion of the great nerve-cells, termed motor cells.[1]

Permanent contracture of the limbs. Spinal epilepsy.—It is time now to revert to the contracture noticeable in the lower extremities of the patient V—, which, at present, constitutes a permanent phenomenon that you may study as a most perfect type. This, gentlemen, is an habitual symptom of the advanced phases of multilocular sclerosis. It does not follow on paresis, suddenly and without transition. At a certain stage of the paretic period there supervene, either spontaneously or under the influence of certain excitations, paroxysmal phenomena, during which the lower extremities are stiffened in extension, whilst, at the same time, they are drawn together, and, as it were, adhere to each other. These fits, which last for some hours, and occasionally for some days, are at first separated by intervals of greater or less length. Later on they become closer, and, at a given moment, permanent contracture is definitely established. When matters have reached this point, the following symptoms are observed—the lower extremities, as happened during the fits, are in extension; the thighs are extended on the pelvis, the legs on the thighs; the feet assume the attitude presented in talipes equinus (varus); the knees, moreover, are so closely drawn together that you cannot separate them without great effort. Both lower limbs are very generally affected simultaneously, and to the same extent; their rigidity is sometimes so marked that, in lifting one of them, whilst the patient is in bed, you, at the same time, lift the lower half of the body, all in one piece, as it were. Only in rare cases, and in the later stages of the diseases, does flexion of the thigh and leg predominate over extension.

Permanent contracture may invade, in exceptional cases however, the upper extremities, which are also generally placed in forced extension and straitly applied to each side of the body. We

[1] Erbstein ('Deutsches Archiv für Klinische Medicin,' t. x, fasc. 6, p. 595) has related the history of a patient who succumbed to disseminated sclerosis (the bulbo-spinal form), in whom, during life, *atrophy* of the anterior portion of the *tongue* had been observed. An histological examination afterwards showed—1st, numerous foci of degeneration, not only interposed between the fasciculi of the hypoglossal nerve at its origin, but also involving them and consequently interrupting their continuity. A section showed that the nucleus of the hypoglossal nerve was replaced by an islet of sclerosed tissue. 2d. The muscular fibres of the anterior portion of the tongue had undergone fatty degeneration; the lesion had invaded some of the muscular fasciculi at the base of the organ.

In a patient named Vincent, who succumbed to disseminated sclerosis, M. Charcot noticed atrophy of the muscles of the thenar eminence. The palm of the hand was hollowed out, and the tendons of the flexor muscles were very plainly defined. (B.)

have here, gentlemen, to deal with a spasm which occupies simultaneously and with almost equal strength the antagonistic muscles, for, when the limbs are flexed, it is almost as difficult to extend them as it is to bend them when they are extended.

When the extremity of one of the feet is grasped by the hand, and somewhat abruptly extended on the leg, there ensues almost immediately throughout the whole extent of the corresponding limb a sort of convulsive trembling, which recalls the tremulation determined by strychnine poisoning. This tremulation, which must not be confounded with the peculiar shake that supervenes on purposed movements, is not always limited to the limb in question; it is sometimes propagated to the other limb, and then the agitation may occasionally become so intense as to shake the whole body, and even the bed on which the patient reclines. It persists in some cases for several minutes, and even much longer, after cessation of the act which set it going. You may cause it to stop at once, as M. Brown-Séquard has shown, and as I have often since observed, by grasping, with the hand, one of the great toes of the patient and flexing it suddenly and forcibly. Immediately after this operation the tetanic rigidity and convulsive trembling cease in both members, which become temporarily "perfectly supple and pliable as after death, before rigor mortis supervenes."[1] The convulsive tremulation may be determined by faradization, by pinching the skin of the leg, or, more rarely, by kneading the limb, by the influence of cold, or by tickling the sole of the foot. It also comes on sometimes spontaneously, or at least apparently so, sometimes because of an effort made by the patient, as in vomiting, defecation, raising himself in bed, or getting out and placing his foot upon the floor. It is also provoked by an attempt to walk, for permanent rigidity does not always absolutely prohibit this act; the patients can sometimes hobble along on their toes, the heel being raised from the floor. Finally, this tremulation may also be temporarily produced, along with rigidity, even during the course of the paretic period, under the influence of one or other of the several modes of excitation which we have just reviewed.

Gentlemen, the phenomenon, whose principal characters I have here sketched, is nothing other than the *spinal epilepsy* described by M. Brown-Séquard. We observe it present in the case of Mademoiselle V— in what I have proposed to call the *tonic* form. This form, which is the type most commonly met with in gray multilocular induration, may be placed in opposition to the *saltatory* form, which predominates, on the contrary, in progressive locomotor ataxia and in some other spinal affections.

Permanent contracture of the limbs and spinal epilepsy must not any longer detain us. These symptoms, in fact, do not exclusively

[1] Brown-Séquard, 'Archives de Physiologie,' t. i, p. 158.

belong to multilocular sclerosis of the nervous centres. Far from it. They shall, therefore, be studied apart, both generally and in their relations with the different affections of the spinal cord in which they show themselves.

LECTURE VIII.

APOPLECTIFORM SEIZURES IN DISSEMINATED SCLEROSIS. PERIODS AND FORMS. PATHOLOGICAL PHYSIOLOGY. ETIOLOGY. TREATMENT.

SUMMARY.—Apoplectiform seizures. Their frequency in disseminated sclerosis. General considerations on apoplectiform attacks in general paralysis, and in cases of circumscribed cerebral lesions of old standing (hemorrhage and ramollissement). Pathogeny of apoplectiform seizures; insufficiency of the congestion theory. Symptoms: state of the pulse; elevation of the central temperature. Apoplectiform seizures in old cases of hemiplegia. Importance of temperature in diagnosis.

Periods in disseminated sclerosis. First, second, and third periods. Symptoms of bulbar paralysis. Forms and duration of disseminated sclerosis.

Pathological physiology: relation between symptoms and lesions.

Etiology. Influence of sex and age. Hereditary predisposition. Previous nervous affections. Occasional causes: prolonged action of moist cold; traumatism; moral causes.

Prognosis. Treatment.

GENTLEMEN: I purpose calling your attention to-day, in the first place, to certain cerebral accidents which may happen to complicate the symptomatology of cerebro-spinal disseminated sclerosis. I refer to *apoplectiform seizures*, which are occasionally encountered several times in the course of the disease, and which sometimes close the fatal scene. These attacks have not hitherto appeared in the case of Mademoiselle V—, whose clinical record is otherwise so complete in most respects; but nothing assures us that they will not some day show themselves. In fact, this is not a rare complication; I find it mentioned in about a fifth of the cases which I have collected, and I have personally observed it in at least three instances.[1]

[1] Case III of the memoir of M. Vulpian, communicated by M. Charcot. Case of the patient Byr (Charcot); case of Nicolas, presented to the Société de Biologie, by M. Joffroy.