the patient at absolute rest. I have been forced to keep patients in bed for sixty days. The diet should be carefully regulated. You do not want the patient to have too much blood, and you want no flabby tissue to oppose resistance to the action of the heart. Counter-irritation over the aorta by blisters or the light cautery should be employed. The patient should be put on long courses of iodide of potassium with small doses of mercuric bichloride, or of iodide of potassium with sodium salicylate. Under the hygienic treatment, which, after all, is as efficacious and as important as the medicinal treatment, and with counter-irritation, we may hope to see such patients recover. We would not begin the use of nitrite of amyl, nitro-glycerin, and such agents. It is not a neurosis, as angina pectoris sometimes is. This is dependent upon a definite physical change; it is a definite mechanical condition; and we do not want to accustom the patient to these drugs, to which he would quickly become addicted, but we want to get rid of the local condition that is present. This patient should be urged to take gentle exercise, but never sufficient to bring on the pain. He should try to tone down in regard to his flesh, take proper food and chew it thoroughly. Such cases as this are numerous, and you will usually find that if you treat the patient properly you will be able to give him a great deal of relief, if not entirely cure him.

OBSTETRICAL PARALYSIS; MULTIPLE NEURITIS AND ITS RELATION TO DISEASES OF THE SPINAL CORD.

CLINICAL LECTURE DELIVERED AT THE HARVARD MEDICAL SCHOOL.

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GENTLEMEN,—In a previous lecture[1] I spoke of the so-called obstetrical paralysis of infants, due to injury of the nerves of the brachial plexus, especially the fifth and sixth, and I referred to the important suggestion made by my colleague, Dr. C. F. Carter, that this form of paralysis is not due to pressure, as has been heretofore supposed, but to the stretching of the cervical nerve-roots on account of the position of the head during labor, and especially under traction. I refer to the subject again now merely to introduce the photographs of a striking case which has recently come under my care in the Massachusetts General Hospital.

It will be remembered that the muscles usually affected are those which rotate the arm outward, abduct the arm at the shoulder, and flex the forearm, frequently also the extensors of the forearm, and sometimes the extensors of the hand and fingers. Usually the child's arm hangs close to the side, extended, and rotated more or less strongly inward.

In the case illustrated by these photographs the arm is drawn up, as you will see, by a strong contraction of the upper portion of the pectoralis major and probably the anterior part of the deltoid, though it is difficult to determine this by the finger. The contraction is so strong that some effort is required to overcome it. The arm can be drawn down into its normal position, but quickly returns to that represented in Figs. 1 and 2, evidently because the antagonistic muscles are para-

[1] Published in the second volume of the first series.

lyzed. This contraction is likely to be an important element in the case, because if it is allowed to persist adaptive shortening will undoubtedly take place. The pectoralis major receives its nerves from the sixth cervical root, together with most of the other paralyzed muscles, and it must happen very rarely that a few fibres should escape in this way while the rest are injured.

MULTIPLE NEURITIS, AND ITS RELATIONS TO DISEASES OF THE SPINAL CORD.

I do not propose to give in this lecture anything like a complete account of multiple neuritis, but rather to call attention to some of the more important developments of the last few years. The whole subject of multiple neuritis is one of immense importance, partly from its intrinsic interest and partly because the neuritis may be associated with serious diseases of the spinal cord and brain, while, on the other hand, these diseases may be simulated without really existing.

The peripheral nervous system in the aggregate represents, diffused over the whole cutaneous and muscular area of the body, the functions which in the central nervous system are concentrated into a small space. It seemed easy enough to understand how a limited lesion of this small space, occupied, for example, by the spinal cord, should give rise to symptoms affecting a large peripheral area of the body, but it was harder to believe, and until less than twenty years ago it was not believed, that the peripheral nerves representing this large area or large segment of the muscular system could become primarily and simultaneously affected so as to give rise to symptoms closely simulating those which the lesions of the central nervous system would have produced. Yet this turns out to be the fact, and inasmuch as the prognosis in a case of peripheral neuritis is usually far better than it is in disease of the central nervous system, and as the treatment is to a considerable extent different, it becomes our duty to learn to distinguish, so far as this is possible, the cases in which the peripheral nerves alone are affected, and, furthermore, to recognize under what circumstances the central and peripheral nervous systems are liable to be affected together.

The position of the nerve-fibre, as compared with the rest of the nervous system, is a little peculiar, and it is evident that we have still a good deal to learn about it. The natural way of regarding it is as an appendage of a nerve-cell, a prolongation of a nerve-cell process. Cut off from the nerve-cell it degenerates, but while in connection with the nerve-cell it may be called into activity by faradization for pro-

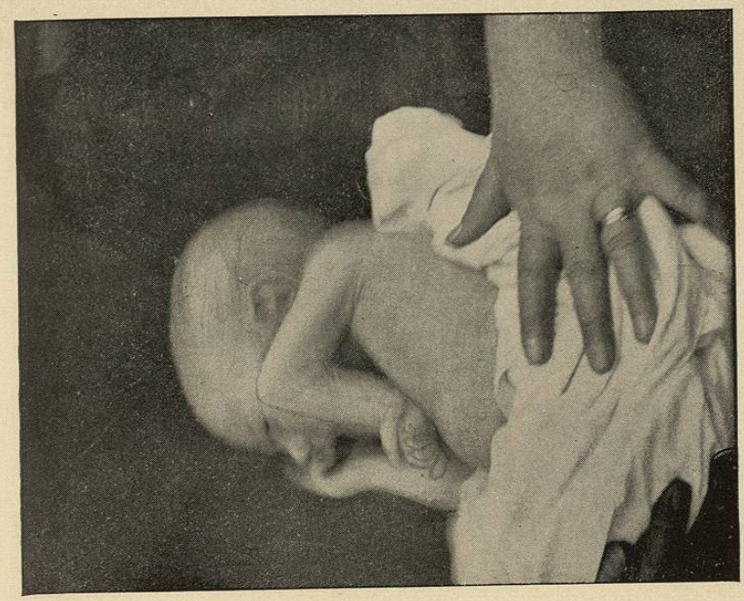

FIG. 2.—Lateral view of the same infant. The arm is drawn up by the action of the pectoralis major.

FIG. 1.—Paralysis of left arm, due to injury of the brachial plexus.

longed periods without showing material signs of fatigue,[1] while at the same time its independent nutritive changes appear to be but slight. In view of these facts it was hard to believe that a nerve-fibre possessed the delicate chemical affinities which seemed necessary in order that it should fall prey to any considerable variety of diseases. The brilliant investigations of the last twenty years have, however, brought to light an immense number of important facts, of which the following are perhaps the chief. The nerve-trunk contains a number of fibres which, for convenience' sake, we will speak of as having different functions, centripetal, or motor, or vaso-motor, the conduction of different sorts of cutaneous sensibility and of muscular and arterial sensibility, possibly special trophic fibres, and the like. It now appears that under the selective influence of disease any one of these systems of fibres may become affected almost alone, though usually several are affected at once. It should be said, however, that in view of the fact that nerve-fibres seem to be conductors merely, and, so far as we know, are capable of conducting equally well in either direction, and even of conducting impulses of varying kinds (though it may be thought on this point our generalizations run ahead of our knowledge), some pathologists cling to the view that when a nerve becomes diseased otherwise than from injury we should not lose sight of the possibility that this disease may be secondary to changes, slight and as yet indiscoverable, in its trophic centres. The number of agents which may thus attack the peripheral nervous system is large, comprising the mineral poisons, arsenic, phosphorus, copper, lead, mercury, ptomaines generated by specific organisms, as those of typhoid, tuberculosis, syphilis, variola, and so on, the poisons generated by gout, rheumatism, Bright's disease, severe forms of anæmia, and many other conditions, besides atmospheric states of which we know little.

The most familiar type of multiple neuritis is the acute, with which every one is now familiar, such as is developed most often by alcoholic excess and arsenical poisoning, but occurs also after typhoid fever and the grippe, and sometimes under conditions pointing to infection, as in beriberi, and among fishermen on our northern shores, as has been shown by Dr. F. C. Shattuck and others and by myself. In this acute form all the functions of the nerve are generally involved, so that the patients suffer from progressive paralysis, beginning usually in the hands and feet, but sometimes beginning in other muscular groups, such as the deltoid; from paræsthesia, hyperæsthesia, anæs-

[1] See first lecture.

thesia, degeneration of the muscular masses, and sometimes of the nerve-trunks.

Besides the acute type of multiple neuritis, in which all the fibres of the nerve are usually more or less involved, there are a number of other types which are equally important. In the first place, the disease may be excessively chronic and the symptoms so indefinite that the diagnosis is difficult or impossible. Then, even in moderately acute cases one set of nerve-fibres are sometimes involved more than the rest; thus we may have well-marked incoördination of all four extremities attended with comparatively little paralysis or pain, and this has even led to the erroneous diagnosis of locomotor ataxia. These ataxic cases have been most frequently observed after poisoning with arsenic, but they are met with also after other cases. I have this winter seen two typical cases of this sort, in one of which the attack followed immediately after a severe cold, and so, very likely, may have been a symptom of grippe-poisoning. In the other case both lead and arsenic were found in the urine. It is not certain, however, that in this latter case the ataxia and neuritis were purely plumbic or arsenical in origin, for it is not uncommon to find lead and arsenic in the urine. On the other hand, it is highly probable that the presence of the arsenic in particular added to the patient's susceptibility, if indeed it was not the whole cause of the attack. In both these cases the diagnosis of neuritis was made certain by the presence of other characteristic signs, especially impaired electrical reactions in one case, and muscular atrophy in the other. In both cases the ocular muscles were affected, and this has been true of other cases of ataxia from neuritis which I have seen. One of these cases had been actually diagnosticated as an acute form of locomotor ataxia, greatly to the alarm of the patient. In the other the persistence of the symptoms indicates that the spinal cord may actually be involved. Another type of multiple neuritis is that which occurs in the ordinary form of lead-poisoning. Here, as a rule, the muscular system alone is affected, although anæsthesias are sometimes met with. In the majority of cases, as is well known, instead of having a paralysis of all four extremities, as happens in most cases of acute and even chronic neuritis, the disease is confined to the arms. On the other hand, a study which I have made of lead-paralysis as seen in children would seem to indicate that in them the legs are as likely to be involved as the arms, though the number of reported cases is but small. Sometimes also, even with adults, forms of neuritis are seen in cases of lead-poisoning which resemble in all essential respects the generalized varieties hitherto considered.

The type of polyneuritis met with after diphtheritic poisoning has its own characteristics, which are too well known to need special mention here.

Is it always an easy matter when we meet with a case of well-marked multiple neuritis to satisfy ourselves as to its origin? To my mind this is far from being true. It sometimes happens that we are able to rule out lead, arsenic, diphtheria, and alcohol, and then are obliged to fall back on the assumption of poison carried in the atmosphere, the nature of which we are as yet unacquainted with. I have already alluded to the fact that occasionally multiple neuritis occurs in an epidemic form among fishermen, not only in the tropics where they are exposed to beriberi, but even in northern latitudes and on our own shores. Again, I have seen an acute fatal case of neuritis where no cause except exposure to wet could be discovered, and I have seen other cases of great interest where even this cause was not present. Thus, an elderly gentleman of exemplary habits and excellent previous health, not gouty or rheumatic, who had been travelling in Europe for pleasure, began to suffer, just before he took the steamer for home, with prickling of the feet. The typical symptoms developed rapidly, and in the course of a few weeks he became so severely affected that he could not walk alone. I feared that he was suffering from a diffuse form of myelitis; yet after a time the symptoms began to mend, and in the end he made a perfect recovery.

The difficulty as regards etiological diagnosis is especially marked in the more chronic cases, which are, after all, the most numerous. In the acute cases we have for those of plumbic origin, as a rule, the characteristic distribution of the paralysis; for the arsenical cases, the occurrence of severe pain, often gastro-intestinal disturbances, and brown or yellow discoloration of the skin; for the diphtheritic cases, the typical course of the disease; for the alcoholic cases, the greater persistency of the delirium and usually a well-marked history. But in the subacute and chronic cases these guides often fail us.

I wish now to turn to the relations between multiple neuritis and diseases of the spinal cord. I have already spoken of the important fact that we are now often able to assure patients, who would formerly have been considered victims of an incurable poliomyelitis or locomotor ataxia, that their disease is one from which they will recover. Yet we should not forget the fact that, even if we have before us a case of polyneuritis, this should not blind us to the possibility that we may have to deal with a myelitis as well. In the first place, in cases of polyneuritis the spinal cord is liable to be secondarily involved. Thus,

in the acute fatal case of my own, where the patient died at the end of a week, enlarged axis cylinders were found in the lateral columns and in the nerve-roots, and collections of leucocytes were found about the vessels in the medulla oblongata. Then, poliomyelitis, especially the adult form, is liable to be complicated from the outset with polyneuritis. I have had an opportunity of making a post-mortem examination in a severe case of this kind, where the gray matter was found threaded with a line of destructive inflammation through the entire length of the spinal cord on both sides. The peripheral nerves were not examined, but the intense pain which the patient suffered, besides the extreme tenderness of the limbs and pain on handling, rendered it certain that an extensive neuritis would have been found. In the next place, the same cause which gives rise to polyneuritis is liable also to cause a poliomyelitis, and perhaps degeneration of the long spinal tracts. Thus, lead-poisoning is liable to give rise to these forms of myelitis as well as to polyneuritis, and the same may probably be said of arsenic and alcohol and syphilis. There is, furthermore, a form of chronic or subacute spinal degeneration, which has been described by Dana and myself in this country, and by Lichtheim, Bennett, and others abroad, which is especially prone to occur in connection with anæmia and other constitutional diseases, and seems pre-eminently to attack feeble persons and women, generally of advanced life.

Now, in some of the cases of this kind which I have observed, well-marked signs of neuritis of the chronic type have seemed to be present, though it must be admitted that in the presence of a chronic myelitis the diagnosis of chronic neuritis is not always to be made with certainty. In one case, however, some filaments taken from the perineal nerve showed evidences of degeneration, and this is not surprising in view of the fact that the anterior gray matter was more or less involved as well as the anterior and posterior roots. It is difficult to say whether in this case the neuritis formed an original part of the process or whether it was secondary to the myelitis, but the studies in the pathology of locomotor ataxia have made it certain that neuritis of the cutaneous nerves may occur at a very early stage.

I have already alluded to the fact that cerebral symptoms are also found in connection with those of polyneuritis. In one case of this sort, observed by myself, but of unknown origin, several foci of encephalitis were found along the walls of the third ventricle. At the time this observation was made but little was known of polyneuritis, and unfortunately the peripheral nerves were not examined, but the spinal cord was free from any marked disease, and the symptoms of

acute polyneuritis were absolutely unmistakable. Besides the cerebral and spinal relations of neuritis, it is also to be noted that cases are occasionally met with where the symptoms to which we should be tempted to give the name of polyneuritis seem to begin in the muscular system. This has been specially referred to by Professor Senator, of Berlin. Again, a few cases have been observed where a progressive form of muscular atrophy, resembling in some respects the typical progressive muscular atrophy of spinal origin, seems to have been due to progressive degeneration of the peripheral nerves.

As regards the treatment of polyneuritis I have but little that is of especial importance to say, but can warmly commend the opinions offered by Professor C. K. Mills, of Philadelphia, in a recent number of the *University Magazine*, of Philadelphia, and I cannot do better than to give you a brief summary of them. After speaking of the extreme care with which acute cases should be mechanically handled, he says that where alcohol has been the cause it should usually be withdrawn at once, but if this causes absolutely dangerous symptoms a little milk-punch may be allowed. Dr. Mills thinks that there are sthenic congestive cases, where inflammation of the brain and spinal cord threaten, which may be treated to advantage by venesection. To relieve the pain and tenderness he recommends hot fomentations or poultices or repeated alternating applications of hot and cold water. Besides stimulants and cardiac tonics he believes in the use of the salicylates or gaultheria in the early stages. In the subchronic or subacute stages more energetic local measures may be used, as local and general baths, with precautions against exposure; stroking, kneading, percussion, massage, and galvanism. As a matter of fact, each acute case is a study by itself, and offers a large field for perseverance and ingenuity, and the physician will have to turn to all the authorities for detailed instruction. In chronic cases the essential thing is to improve the general and local nutrition by every means in our power.