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POST-PARALYTIC CHOREA.

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I have long had in mind to call attention to the mode in which various forms of neural disturbance may succeed one another, seeming to grow out of degrees, or, at least, out of variations of one common parent cause. A well-known sequence is the passing of chorea into hemiplegia, or, more rarely, into a curious double hemiplegia.

It is not so well known, perhaps, because it is so rare, that a curious but noticeable one-sided awkwardness of movement is in some cases the precursor in children of a hemi-spasm.

In such a case, well known to me, the child was considered for some days to have incipient chorea on the left side, and had indeed all of the peculiar awkward ways of that disease. It increased during a week, and then ended in convulsions, beginning and closing with pure left hemi-spasm.

In a case, lately brought to my clinic in a state of protracted hemi-spasm, there was said to have been the same previous condition, and the doctor who saw it considered it to be chorea.[1] I have in like manner seen the hand of a clerk, incapacitated for using the pen, at one period by cramp, at another by choreal disturbances, and lastly, by intense pain, that is, at different times these three symptoms were observed as a result of excessive use of the pen.

The sequence of loss of power following chorea has been amply seen

[1] The spasm in this case I at once relieved by nitrite of amyl, and the child went into a quiet slumber. Nitrite of amyl has passed long since into familiar use at this hospital, and, indeed, is looked upon by many physicians in America as the best of all the immediate anti-convulsivants. It was first used with success in convulsions by me in 1871, and my results were published in April, 1872, in the *Philadelphia Medical Times*. A very important case, in which it proved of singular value, was soon after reported in Brown-Séquard's *Archives*, by Dr. Wharton Sinkler, and it was, at my suggestion, next used with success, by Dr. Jenks, in eclampsia. I am glad to see from recent reports that it is beginning to attract attention in England.

and fully described, but, if I am not mistaken, the fact that organic palsies, especially hemiplegia, are occasionally followed by hemi-chorea, or a still more limited local development of that disorder, is, I think, less well known. In briefer language, as there is a post-choreal paralysis, so, also, is there a post-paralytic chorea. The propositions which I desire or hope to prove are these :—

That on adults who have had hemiplegia and have entirely recovered power, there is often to be found a choreal disorder, sometimes of the leg and the arm, usually of the hand alone. That it may exist in all degrees, with partial loss of power, and with full normal strength. That it may consist in mere awkwardness, or exist to the degree of causing *involuntary* choreoid motions of the part.

I hope also to show that the younger the person when paralyzed, the more probable is the occurrence of choreal developments, so that in many cases of infantile deformity the choreal troubles remain as the chief difficulty long after there has been a restoration to full muscular power.

I have reason to believe that some of the general and prolonged choreoid disturbances which we see now and then from birth, are due to, or, rather, are in some fashion related to, intra-uterine palsies which have either wholly or in part passed away.

If these propositions are corrrect, or even the first two, they will prove that choreoid affections may be owing to gross organic lesions, and that under certain favouring circumstances, the same lesion which occasions a palsy may in itself, or in the disturbances it causes, also bring about chorea. It is quite plain that the post-paralytic chorea is rare, but less so than I used to think. It is not found well marked in cases of palsy which remain much enfeebled. One may see cases of nearly absolute extinction of movement, whose actions are quite free from any lack of guidance, devoid of all uncertainty, save that which comes of loss of power. Nor is this acquired awkwardness which is left by some of the better recoveries from palsy altogether sudden; on the contrary, where I have been able to study it, it has seemed to grow slowly, increasing as the paralytic state faded out. It appears in such cases to be owing to some tardy and chronic change about the seat of the clot or embolus; but as to this I hesitate to speculate further, believing that, having thus called attention to these facts, they will in future be more often found and more fully studied.

Case I.—The following case I attended in the first attack of hemiplegia, and saw many times afterwards. Since it is the only case which ended in death, I give it the first place. The following notes are Dr. Sinkler's report of the case to the Philadelphia Pathological Society :—

The patient was a man 47 years of age, single, who for some years had been employed in the post-office as letter-carrier and clerk. For twelve years he had served in the British army in India, and during the late war he was in the United States Army. He had always enjoyed good health, and was temperate

in the use of tobacco and liquor. He had never suffered from any constitutional malady.

There was no cardiac disease, nor were there any atheromatous changes in the radials.

December, 1871, he had an attack of left hemiplegia. The paralysis was not absolutely complete, he being able to move slightly the hand and foot, and in about six months was able to return to light work. He could walk fairly well at the end of this time, could use the arm to some extent, and there was no contraction of the flexors on the paralyzed side.

For several months he continued to improve. Once, however, he had an attack of vertigo, which was followed by an increase of weakness for a few days.

Rather more than a year after the first attack he had a second. He did not become unconscious, but he was extremely difficult to rouse. The face was flushed, the breathing stertorous, and the speech thick. He complained of intense pain in the head. The loss of power was on the right side, but it was not so complete as it had been on the left side in the previous attack. There was no facial palsy. It was two or three months before the patient was able to walk even a few steps. The muscular power of the limbs seemed to have returned, but the difficulty was in co-ordination. The power of locomotion in time returned to some extent, but he was never able to walk any distance, even with assistance. His gait was uncertain, and if his attention was called to anything while he was walking he was liable to fall. In fact, there was a sort of choreic condition of the limbs which was induced when voluntary effort was made, and unless he carefully observed his movements he tottered or fell.

During the next few months he had several attacks of vertigo, followed by severe pain in the head, loss of appetite, and obstinate constipation. After these attacks there was always increased difficulty in walking. For several months before death the expulsive power of the bladder became weakened, and urination was often delayed many hours.

On May 7, 1874, while sitting on the commode and endeavouring to urinate, he suddenly fell forward unconscious. He was caught, however, before striking the floor. There were no convulsive movements, but the body became rigid and the eyes were rolled up. Consciousness returned in a few minutes, but on recovering he felt as if he were choking. He could not swallow, and respiration was laboured. Speech was thick and almost inarticulate. For a few days before this he had been unusually heavy and inclined to sleep most of the time. In a few hours he was able to take into the stomach some liquids; but the next day the inability to swallow returned, and the respirations became more frequent and difficult. The bladder was emptied by the catheter, and the urine examined and found to be free from albumen.

His condition from this time grew steadily worse. The surface became congested from insufficient aeration of the blood, everything that was attempted to be swallowed was regurgitated through the nose and mouth, and the patient died on May 12.

There was no increase of paralysis in the extremities, and consciousness remained almost to the last.

Post-mortem forty-eight hours after death. The body was in a good state of preservation, having been kept in ice. The veins of the scalp were full. The skull was brittle, a corner breaking off when the calvarium accidentally dropped on the floor. Dura mater not unusually congested. In the superior longitudinal sinus was a firm white clot extending almost its entire length. The arachnoid was opaque over its convexity, but was more especially so at the base. A white clot occupied the right internal carotid. The vessels of the circle of Willis were enlarged and extensively atheromatous. The right middle cerebral artery was almost double the normal size, and stiffened with atheromatous changes; the left was in very much the same condition, and in the under surface of the middle lobe, where the vessel rested, was a spot of softening the size of a pigeon's egg. On section of the brain, the puncta vasculosa were prominent and some serum exuded. There was a moderate amount of fluid in the ventricles. In the left corpus striatum was a patch of softening as large as a filbert. No change in the right. In the right crus cerebri was a small spot

of softening, which presented a dark color with many almost black points. A fragment of this was kindly examined by Dr. Tyson, who found only pigmented cells and no hæmatoidin crystals. There were adhesions and recent lymph in the right pleura, and the base of the right lung was somewhat congested. The liver and kidneys were gorged with blood, but otherwise healthy.

This case is in many ways valuable here. In the first hemiplegia, which was on the left, he was delirious or insensible for two days, and very slowly but very completely recovered power. In fact, he became so well that there was but slight difference in the force of the left or the right grasp, or in that of the separate fingers. I think that he had at this time in the left hand a remarkable awkwardness, but as to this I am not absolutely sure, for I was not then so attentive to this point as I have since become. His attack was on Dec. 24. Jan. 20 I stained his finger nails on both sides. No growth took place on the left side for two weeks, and up to April the left growth was one-half that of the right. About March 10 he had one of those strange attacks of arthritis which Charcot and myself and some others have described. In this case it was sudden and acute, and involved every joint of the left (palsied) arm, there being elsewhere no pain or swelling. I have never seen a more remarkable case of post-paralytic arthritis. It grew well very slowly, but became more completely well than is usual in such cases.

Then came the second hemiplegia (right side), not so profound an attack. In neither was there loss of sensation. Again he recovered full power. The amount of it restored was indeed notable, but as the reporter states, despite his strength, which seemed to be amply sufficient to enable him to walk, he had a disorder of movement which Dr. Sinkler, whose attention I had often called to such cases, looked upon as deserving the name of choreic. It was so extreme that all the man's attention was needed to enable him to walk, but it was not eyesight that was thus needed, but concentration of will to regulate motion. He walked as well in the dark as in the light.

This patient had no involuntary or spontaneous movements, no motor disturbance until voluntary acts were attempted, when they at once became irregular; those of the hand were, as I recall them, so striking, that they possessed every clinical peculiarity of the chorea of childhood.

The lesion mentioned in the report as a small spot of softening in the right crus cerebri was, I suspect, the site of a former clot. The general and most extreme changes in the intra-cranial vessels, with almost utter absence of atheroma outside of the head, strike me as clinically curious. The great amount of lesion in this interesting case makes any further pathogenetic analysis of symptoms unprofitable; but it may come to be read more clearly in the light cast by the future cases which I shall here relate.

Case II. *Hemiplegia; repeated attacks; post-paralytic chorea, with automatic choreal movements.*—M. H. S., æt. 38; no children; married

sixteen years; has had no syphilis or rheumatism. She presented herself at my clinic January 28th, 1874, and gave me the following account: In June, 1872, she was taken in the street with partial loss of power on the left side. It involved the left face. The following night she was delirious—screaming and laughing—being in great measure conscious, but unable to control herself. The leg proved to be but slightly affected, the hand not severely; but for four days she was unable to say what she wanted, but was able to make signs and to write. For a week the face was drawn to the right.

In July, 1872, she had a second attack on rising in the morning. This time she lost all power to speak for twelve days. There was no wrong use of words on recovery, but simple and complete loss of speech, and ever since a certain thickness of utterance. No loss of consciousness, but entire loss of motion on the whole left side. Again recovery was rapid, and in seven weeks she could walk, and use the arm well. On the 11th of January she had partial loss of power in the right leg, and later in the day of the right arm; also there was some twitching of the leg, and an increase of the facial (left) palsy, which had never improved as much as the limbs. In a few days she became much better, and within a fortnight ceased to drag the foot.

The face is still decidedly drawn to the right; the heart-sounds normal; urine healthy; menstruation regular; the eye-grounds are absolutely normal; no headache or vertigo.

The movements of the right side are strong; the grip equal by dynamometer, but there is a curious and indescribable awkwardness of leg-action on the right, and the right hand movements are simply choreic. The effort to pick up, or take any small object, results in contractions and slow extensions of the fingers, which also separate from one another, and the effort results in failure, either from falling short of or from passing by the object aimed at; with this, there are, at each effort, twitches of the right face, and excitement seems to increase all her motor difficulties. When not willing an action, her fingers, like those of a bad case of chorea, are constantly in movement, shutting, opening, separating, but these motions cease during sleep.

The treatment used proved of little value.

The choreal character of this case was complete, and it could have been cited or shown to a class as a type case of unilateral chorea.

Case III.—My next case, W. H. E., æt. 65, is taken from the rich note books of my clinic, at the Infirmary for Nervous Diseases. It is not so precise a case as the last, but is interesting for its differences and peculiarities.

This man, well up to March, 1869, was first seized with numbness in the ulnar nerve tracks (right). Then he felt a sense of lack of power to direct the legs, and within an hour, having no loss of consciousness, he was attacked with entire loss of motion and sensation on the right side. For several days he could not speak at all. Motion returned slowly, so that he can walk fairly well, and use both hands.

I saw him in February, 1872, and then found the following remarkable symptoms: He had loss of sense of touch, pain, and temperature, on the whole right side, including the tongue and mouth. He had a constant stinging and burning pain at places, which shifted anywhere or everywhere in the side affected. Movement, active or passive, either brought this on or increased it. A rough contact also awakened it, but a touch would not.

Once started, the pain spread outwards from the spot first influenced, and soon was felt irregularly here and there throughout the side, but within half an hour, even if severe, it faded away. Sensibility was not extinct in the arm or the leg, and in these members every touch was pain. In the face and neck, and at parts of the trunk, the anæsthesia was complete, but deep rubbing or a blow would cause the same pain, and then the same radiation of it would occur. At the same time there were more or less constantly a feeling of formication, and of horrible burning, and a sense as of worms crawling under the skin. As in other cases of unilateral burning, with or without anæsthesia, there was a great increase from effort, as in the strain of defecation. In this man, as in a case which I now see frequently, there was also a sense of constriction around the waist, and in various parts about the limbs, like the common girdled feeling of myelitis and ataxia.

He walked pretty well with a cane, but put the foot down clumsily, and did not like to use the hand, owing to the pain it caused. He could open and shut the hand at will, and the force of the grip differed little on the right and left; but the effort to seize any minute object with the right hand resulted in curious awkward movements, ending at last in repeated and annoying failures.

When the hand was not in voluntary activity, the fingers were in constant motion. They opened and shut, and came together or spread apart laterally, and this if the eyes were opened or not. I regret that I did not ask if this motion ceased in sleep. A voluntary act substituted for these movements the strangely awkward efforts I have spoken of, which would without doubt, I think, be called choreal. Excitement greatly increased their peculiarities.

There was in this case another point of interest. If he willed a movement, as of the fingers, he could tell where the motion placed them, but if I bent the wrist and crossed the fingers he was absolutely unable to say where the parts were, or in what relation, but he walked or moved his hands as well with his eyes *closed* as with them open. This man had no heart trouble, and no syphilis. He worked as a teamster, or rather owned a number of drays. He had normal urine, and no disorder of the eyes; indeed, as far as I could learn, had no double vision at any date.

The numbness improved, but in July, 1872, he died suddenly, with a large clot in the right cerebrum, and was said by the surgeon, who made the examination, to have had evidence of a large old cavity, which occupied much of the left corpus striatum, and this was all I could learn of this most interesting case.

Case IV.—R. W., æt. 19. This girl previously suffered from loss of appetite, but although living in a damp, undrained house, was as to all her organs and functions in good health. In March, 1869, after an attack of sick stomach and headache, she went to bed at 6 P. M., and awaking at 9 P. M. was seized with hemiplegia of the left side and left face. For twenty-one days she could not move, and then the leg got better, and was well, though very easily tired when I first saw her. The arm also improved, but although it had every motion, she could raise Duchenne's dynamometer to 70° with the right, and only to 25° with the left grasp.

Sensation was lessened in the left hand, nine lines being at the index-finger tip the confusion limit. The left hand was cold and easily chilled. Under induction currents to the muscles, dry faradization to hand, hypodermic injections of strychnia, with tonics, the hand grew warm, the feeling improved, and the grasp-power rose to 50 (left) by June 9th.

During the time she was under my care, the arm and hand exhibited, during voluntary movement only, all the usual difficulties and irregularities seen in a case of well marked chorea. She dropped things, failed to direct her motions, and was plainly choreic, but only in the hand and arm, nor did these improve as her general strength grew better.

These cases may suffice as examples of post-paralytic chorea in adults. I have seen many others and some even more remarkable, but of which I have not notes. It is to be observed as regards all of them, that the chorea occurred in either right or left half-palsies, that it was worse in the region of complicated motions, the hand, and that in no case was it seen in connection with rigidity of the part, while its presence and long continuance seemed to be consistent with various degrees of regained power, from the least up to the most complete.

I might also have added to my cases a number of those singular forms of post-paralytic spasms in which the arm or the hand incessantly repeats certain regular and purposeless motions, which in some cases are unrestrainable, in others are seen to disappear during volitional acts which, in this case, may or may not show by their irregularities any trace of the spasms alluded to. I had one patient who, after a right hemiplegia, incessantly rubbed the right leg with the right hand, so as even to wear out the pantaloons. I know of another whose arm is alternately pronated and supinated, and one whose limb swings across the body only as he walks, at each step the fingers being firmly flexed. All of the post-paralytic cases are not quite so hopeless as those given above, but as a rule the chorea is likely long to outlast the return of normal power; yet as to this question of full power, I think it right to add that the return to a healthful standard of endurance is very rare, and that invariably prolonged exertion increases the choreal troubles for a time, as any lowering agency affecting the general health will do for a longer period.

The cases of complete recovery were always in very slight palsies.

Case V.—In January, 1874, I saw a man, T. G., æt. 52, who, in April, 1873, with no premonition had left hemiplegia, and was insensible for an hour. He had a sense of numbness, but when I saw him the power and the feeling were normal. The inco-ordination of the hand was most striking, and so also, as is not rare in these cases, was the absence of tremor. He could not handle or pick up minute objects at all. There was no movement when the part was not volitionally exerted. Six months treatment by strychnia and induction currents, left him with scarce a trace of the old trouble.

I have remarked at the beginning of this paper upon the rule which I thought demonstrable, in accordance with which post-paralytic chorea is more surely found, the younger the subject of the paralysis. I think I can go further, and state that very few cases of hemiplegia in young children fail to leave them with more or less of the form of inco-ordination

we call choreal. I suspect, also, that it is not to be seen in the slight brachial palsies, resulting from the true spinal palsy called infantile, but slight brachial remnants of infantile palsy are rare. I may possibly be wrong as to this point, but I have been used to diagnose at sight from the choreal movement during volition, the presence in a child of a cerebral palsy. This, at least, I am sure of, that very complete infantile palsy may occur, and pass away, leaving no choreal heritage, while as profound a loss of power from cerebral disease almost surely sets this future mark upon the muscular motions of the limb.

The post-paralytic chorea of man is troublesome enough, but that of childhood is more grave, because it makes it so hard to relieve deformities, and to treat with success the relics of the palsy, while, also, it interferes with education in very many ways.

If I had any hesitation as to naming the post-paralytic inco-ordination as choreal in the adult, I should not have a trace of doubt as to my clinical right so to call it in the child, and I suspect that when attention is fully given to this class of facts, almost every physician will be able to recall to mind cases of this interesting malady.

As might be expected, children born palsied are sure victims of choreoid disturbances. I have the belief that some of the forms of general and congenital chorea, with partial limb-weaknesses, or sometimes with general lack of power, are merely examples of the remoter consequences of intra-uterine cerebral palsies. If I had studied with more care the cases of these congenital choreas which have passed under my eye, I could, I suspect, have often obtained evidence of the former palsy, but while to look at a case with a special object has its logical dangers, it has also, for well balanced searchers, its plain advantages; and at the time when I saw the best of these cases I had not begun to know how much of interest lay in their study. They seemed then to me, as to all of us, hopeless, irremediable curiosities, utterly inexplicable, from which no man could learn anything of value.

I quote the following case from the note-books of my clinic at the Infirmary for Nervous Diseases as illustrative of my meaning. It is, of course, open to infer that there may have been intra-uterine defects of neural nutrition, rather than a true palsy, and such may, indeed, have been the case.

Case VI.—R. G., female, æt. 4, of light hair and complexion, and healthy appearance; is intelligent, but speaks with difficulty; no trace of facial palsy; is now always well, and has never been ill. From birth she has been excessively feeble in the trunk, and cannot sustain her head erect without aid. The right leg is very weak, the left better, and she can stand by a chair, but only with large aid from her arms and hands. The right arm is the more feeble, but both upper limbs are much more powerful than the lower, whilst among the muscle-groups in either arm some are much stronger than others. The hands are kept in slight flexion, but

can be extended. There are no notable atrophies, and no lack of sensation. The notes of the electrical condition have unhappily been left out. While, with more or less effort this child could move every muscle, some of them could be but merely stirred, and were incompetent to effect a motion of the part. The whole body was more or less disturbed by choreal movements, which were mild though incessant during inactivity, but hopelessly wild and disqualifying during voluntary action: those of the hands being most remarkable.

I have spoken with caution of the origin of this case, and have quoted it chiefly to call attention to this class of possible causes of general chorea.

The following case is an excellent instance of chorea from paralysis at birth:—

Case VII.—C. W., female, æt. 11, was delivered by forceps, and when born was in general convulsions. She bears to this day the mark of the forceps upon her left temple. The convulsions disappeared within a few hours, and left her with total palsy of the left side, and inability to take the breast. From this time her history is that of an early hemiplegia. In later years this palsy involves no atrophy, but in early life every paralysis, cerebral or spinal, may cause atrophic change, and even the most distinct cerebral palsy may bring about defects of nutrition and absolute shortening of limbs. In the present case the loss of power lessened by degrees, and when I saw her first she was then nine years old; the right leg and arm were a good deal shrunken, or, rather, were undeveloped, the right leg a half inch shorter than the left, and owing to relatively greater palsy of the extensors of the foot, the gastrocnemial mass was shortened from lack of opposition, and the heel drawn up. The power of the right (paralyzed) foot and hand was greater than that of the left members, and was unusual for a child of her age. Her leg was so awkward in its motions that falls were common. The hand and arm had all the peculiarities of the most perfectly typical case of chorea. The fingers were rarely still, and the arm was given to sudden and irregular activity. I cannot better describe the hand in action than to ask the reader to take as an example of its movements the last well-marked case of chorea which he may have seen. Although slow in intellectual development, the child was clever and quick, but inclined to write, sew, or make signs by preference with the left hand.

The treatment, which was unusually happy, extended over years, but as yet it has but partially restored to the hand its needed dexterity, nor can I hope that this limb will ever be as nimble as its fellow.

I have seen a somewhat similar case, now æt. 17, in which there was a forceps delivery, convulsions, and *general* loss of power, with rapid restoration, good as to the left arm, but slow and incomplete as to the right arm and both legs. To this day the motions of the right arm, now as vigorous as need be, are distinctly choreal. The left arm is natural; both legs contracted; some of their muscles contracted, some were totally palsied, and, at the age of 15, she crept on her hands and knees. Dr. T. G. Morton, who saw this case with Dr. Wm. Hunt and myself, after consultation divided a number of tendons in the legs and feet, and, aided by apparatus,

and after long treatment by massage and electricity, this very interesting patient walks erect, her moral and intellectual development keeping pace with the physical gain. The constant obstacle is the awkward choreal movements of the legs and the right arm, which at present constitute the real and most serious obstacle in the way of entire cure. I was struck in this case as in the last with the fact that for many years there was, with right hemiplegia, a more or less notable difficulty of speech, a difficulty not only in articulation, but in choice of words or in finding the needed word. It is now in both cases rather a trouble of articulation or of readiness in speech, than of memory of words.

Case VIII. was a male, æt. 4; had convulsions from unknown cause which ended in left hemiplegia, slowly passing away in a few years, and left him, as far as power and endurance are concerned, absolutely well. Curiously enough, at the age of 16 years the right grip is less strong than the left, although he is right handed. The loss of capacity to execute with the left hand, any movement except the grossest, is most remarkable. He drops a cup or a tumbler, and fails again and again to pick up a pencil or a coin. The lack of power to direct motions is the most conspicuous I have ever seen, and is so increased by excitement or by failure that the hand then moves irregularly and spontaneously, which it never does under ordinary circumstances.

Very recently a lad was brought to me from near Pottsville, who it seems had convulsions and right hemiplegia at the age of six years. He recovered in a remarkable degree the power and endurance of both leg and arm. The leg, however, lost an inch in length, showing, as I have again and again remarked, the power of cerebral palsy in the child to affect growth. In this case there was always some difficulty as to language, bu it was a trouble of articulation rather than aphasic; nor indeed have I ever seen a case of aphasia in the many well-marked right hemiplegias of children which I have met with. The age at which aphasial troubles are first to be seen would be worth knowing. He had with no losses of sensation a choreal disorder of leg and arm which baffled all efforts to overcome, so that, despite orthopædic instruments which were multiplied endlessly, he was constantly falling, while his hand was almost useless. I had him subjected to a long and elaborate gymnastic training, and as he was fond of music he was taught the piano and violin. In some years of such teaching he came at last to have a far larger and more accurate command of the uncertain limb. He had been drugged a good deal before I saw him—and here I may as well say once for all, that in these cases, unless there is a failure of general health, the usual anti-choreal drugs, arsenic, zinc, etc., are worse than useless.

It were quite needless to multiply cases of this kind, as I might readily do. Enough has been said to illustrate the propositions with which I started. I might well have added a number of interesting cases of post-

paralytic motorial disorders, but they would not have come under the heading of choreal, and I have for this reason refrained. I hope, however, before long to present in fuller form a clinical study of all the consequences, nutritive, sensory, and motor, of the hemi-paralyses, both of the adult and the child.