

[Extracted from the American Journal of the Medical Sciences for October, 1876.]

ON

F U N C T I O N A L S P A S M S .

LIBRARY

By S. WEIR MITCHELL, M.D.,

MEMBER OF THE NATIONAL ACADEMY OF SCIENCES.

SURGEON GENERAL'S OFFICE

DEC 16 1911

[WITH FOUR ILLUSTRATIONS.]

I SHOULD scarcely have thought it worth while to recall attention to the obscure subject of functional spasms and its near clinical relatives were it not that, in some of the most annoying and seemingly hopeless cases, I have been able to give so much relief as to enable the sufferer to resume his place among the active. Yet, besides this, some of the forms of spasm which I shall describe under this name are not as yet fully recognized, or are seen so rarely in every-day practice, as to be looked upon as mere curiosities, or as utterly beyond therapeutic help.

Duchenne de Boulogne, in the second edition of his great work on Electro-therapeutics, has given the name of functional spasm to "an affection characterized by pathological contractions, painful or not, but manifested only during the exercise of certain voluntary or instinctive movements."

He gives first the classical illustration of the various forms of writers' cramp, and others in which the biceps and deltoid contracted painfully when the hand was used. Then he refers to the spastic disorders of shoemakers, tailors, etc., and to the case of a fencing master, who had contractions of various muscles when employing them in the habitual acts of his business. A large number of such examples might be cited from this author and from others.

Putting aside these well-known instances, I desire to call attention to a class of cases which, although nearly related to those just mentioned, differ from them in several most important particulars. They consist of three distinct classes :—

First, those in which the functional activity of a muscle or set of muscles gives rise at times to an exaggeration of the motions involved naturally, and sometimes also to more or less spasmodic activity in remoter groups.

Second, those in which the functional action of one group results only in sudden and possibly in prolonged spasmodic acts, tonic or clonic, in remote groups of muscles not implicated in the original movement.

Third, those in which standing or walking occasions general and disorderly motions, affecting the limbs, trunk, and face, and giving rise to a general and uncontrollable spasm without loss of consciousness.

The first group is, to my mind, one of the most curious. The pure instances, that is, those in which a normal motion is liable to become excessive, are rare. Some cases of writers' cramp nearly fulfil the conditions; but here pain or sense of fatigue is often, nay usually, superadded, and the overaction is not merely excess, but involves inco-ordination almost inevitably.

I mean, therefore, that there exists a set of rare cases in which the motor act becomes suddenly exaggerated.

The result may be temporary, as in the following history of a man who came under my care some years ago:—

He was engaged in the manufacture of watches, and had in it some work which required him to be constantly picking up and adjusting tiny screws. When I saw him, he had been thirty years at this labour. His general health was faultless; but within two years he had acquired a strange peculiarity which made it impossible to do any steady work. When I began to question him as to this matter, he said, let me show you, and asked leave to pour out some sugar-coated pills which were in a phial on my table. He then began to pick them up, which he did easily. Then he said, these are too large, and at last took a wooden match and broke it into small bits, which he put on the table. As he picked these up he stopped at the third one, and said, there it is locked at last. I found that the forefinger and thumb were, as he truly said, locked on the morsel of wood. I forced them open with great difficulty, and was surprised to find the spasm stronger than his normal power in the same parts. This locking took place ten or twelve times a day, and was apt to last from ten to thirty minutes. He would succeed usually in pulling out the imprisoned screw with a loop of twine, but its release did not end the spasm, and very often the screw cut his fingers. Of late, the trouble began to show itself in turning the pages of a book, when at times the finger and thumb would close with violence, and the page be torn. He made the interesting observation that the spasm came soon if he put himself in his habitual attitude when at work, but that it was long delayed if he stood when at his labour.

This was the best case I recall of pure spasmodic increase of a normal act. It involved no pain, and only at times caused slight tremor, as extreme muscular exertion is apt to do in many persons. The moment the spasm was over he could at once pick up a screw and continue to work.

This man had a varied experience in treatment, to mention which in detail would be to name almost every potent drug at our disposal. I used several means to lessen the sensitiveness of the skin of the affected fingers, thinking it possible that the beginning of mischief lay there. Afterwards, at his earnest desire, I used various electrical treatment, in which in such cases I have little faith. All alike failed, and the record was much like that of writers' cramp. Nothing but rest aided him, and he finally left the city to reside on a farm in the country.

As we all know, many trades are liable to cramp of the over-used muscles, as in the hammer palsy described by Duchenne. The calf cramp of the turner in wood or metal. These are usually brief and painful. But sometimes they are of the nature of what I may call, as it is a truthfully descriptive phrase, *lock spasm*, a permanent or lasting painless spasm, of which this is a good example:—

A sawyer, æt. about 40, temperate and healthy, was seized at the end of a long, hot day's work with a sudden spasm of the biceps. The saw, drawn back to prepare for the downward motion, was arrested. He ceased work and went home. His wife said he had a "cold stroke," his doctor that he had a heat stroke, but at all events the biceps only gave way during the sleep of the night which followed. After the spasm had returned many times he came to me one morning with an attack in full force. After the first they came back at long intervals, but these soon grew less, and when I saw him the spasms took place once a day, rarely twice, nor could their length be predicted. The arm I saw was locked in the extreme of a spasm so violent that no effort I could make relaxed it, although I made efforts which it seemed to me might endanger the bones. On a second visit I walked with the patient to a grocer's near by, and there got the man to bend over so as to bring the forearm horizontal. Then I attached a scale-pan to the wrist by a broad band, while he stood bent with his other hand on a chair seat. Then I weighted the scale-pan until, after it had held eighty pounds for five minutes, the arm began to extend, and at last suddenly gave way. This spasm did not return on removal of the weight, but I got no permanent therapeutic use out of the suggestion this gave me. The enormous amount of force generated to sustain eighty pounds at the end of a lever as disadvantageously situated in regard to its fulcrum and to its active mover as the forearm is in relation to its joint and to the biceps, suggests some interesting reflections. Yet the power here wasted is slight as compared with that evolved to sustain the years of spasm in some cases of hysteria.

In the case I have briefly related, I think that good was done by the use of the induction current; one pole was put on the outside of the biceps below and one on the belly above, and the strongest endurable current was passed through it for two hours once a day, and whenever the spasm took place. After a time I also used hypodermic injections of atropia into the belly of the muscle, a treatment for spasm much employed with my colleagues Drs. Morehouse, Keen, and myself, in 1862, while in charge of the U. S. A. Hospital for Diseases and Injuries of the

Nervous System.¹ The same means are still in frequent use at the Philadelphia Infirmary for Nervous Diseases. These two means were, I think, of value, because the spasms became by degrees less, and after several months ceased; a very unusual result of treatment, if it was a result, in these forms of spasm.

The third case of tonic spasm which I shall place beside those already given must owe what details I can give to my remembrance, as the notes are mislaid.

The sufferer was an officer in rugged health when shot through the forearm and arm at the same moment, and just as he was drawing his sword. He felt a shock, but was more conscious of the fact that he could not release his sword-hilt from his grasp. At last he took hold of the fingers with his left hand, and opened them. This is a not rare incident of arm wounds, and had, I think, no near relation to what followed. The wounds partially divided both the median and musculo-spiral nerves, and he endured many months of torment with causalgia (burning pain) in the palm. At last he got well, and at the close of the war came to me for the trouble I shall now describe. At times when holding anything in the grip of the right hand, he would have a sharp pain where the median divides in the palm, and instantly the flexors would violently close the hand. The spasm would endure for two to ten minutes, and then relax. I have seen his palm cut by the violence with which the nails were driven into it. The initial pain left as the spasm began, and the spasm was not of itself painful. He believed that it was caused by pressure on a tender spot in the palm, but I never could cause it by direct pressure. The median branchings in the palm were certainly tender, and I therefore desired him to use the treatment by repeated blisters, which in the war and since I have found so valuable in many local nerve troubles. He used at least twelve blisters on the palm, with the result of ending, I think, altogether his annoying malady. I heard of him as well a year later.

In this last case there must have been a sensitized nerve region, from which the morbid impulse started. It was really a case of reflex influence, and was sometimes amusing in its consequences, because the victim never knew when the grasp would shut relentlessly on what the hand held.

These cases are, I suspect, excessively rare, as are also those in which a normal muscular act causes remote associated movements. The most familiar case is that of the lifting of a palsied arm during the act of yawning.² Histrionic spasm of the face also offers some odd illustrations, as in the case of Miss Inman, given by Marshall Hall. Here voluntary drawing down of the right angle of the mouth caused at once spastic closure of the right eye. This very curious case began with general tonic spasm of the right side of the face. He quotes from a French journal a

¹ Gunshot Wounds and other Injuries of Nerves, 1864, Mitchell, Morehouse, and Keen, p. 154.

² This act must have curious influence. I saw last year a case of slight strychnic poisoning, in which the act of yawning suspended the spasms.

still more notable case. It is too briefly described as a ball wound of the left side of the face. The wound healed easily, but whenever afterwards the man used the jaws in any way, to speak, to laugh, to chew, instantly the sublabial muscles passed into a state of violent spasm, producing the most hideous grimaces. The normal action of one muscular group evolved the abnormal response of another.

One of my own cases was as interesting. It belonged to the class of hypercineses, in which the spasms lie chiefly in the range of the spinal accessory and first cervical nerves.

R. L., æt. 45, a plumber, previously in good health, was hurt in Jan. 1862, by the fall of a cake of ice, which struck him on the back of the head and knocked him down. He suffered only from stiffness in the muscles at the back of the neck. This never quite left him, and within three months his head was slowly drawn more and more to the left. Then the convulsions appeared, and at brief intervals he had horrible spasms in the trapezius, sterno-cleido-mastoid, tracheloid, and spinatus muscles. Every minute, at least, the head was jerked backwards and twisted to left, the shoulders drawn up, and a storm of rapid but energetic spasms swept over the facial muscles.

He improved very much while taking gelseminum and bromides in full doses, so that at last the abnormal actions above described became really trifling. I believe they came back the year after, but in the interval he had a form of trouble which was painful to see. Whenever he began to chew food the submental muscles would jerk his mouth open, and so hold it until at last he would push it shut with his hand, and chew a little more before the spasm returned. When ready to swallow, his face presented a picture of terror. He would suddenly muster courage and swallow the contents of his mouth at a gulp. Then instantly the jaw flew open, the head was drawn back and down on the left shoulder, the face was convulsed, sweat broke from his forehead, and the attack was at an end. Sometimes, if he could bolt his food very quickly, he escaped the consequences. In this and the last case the muscles involved are really part of the muscle apparatus for chewing, speaking, etc., but have only a subsidiary part; still they belong, as to their activities, to nerves, other than the facial, and are in this sense remote.

I have since seen many cases of this form of spasm, and in nearly all the act of laughing, talking, but, above all, chew-

Fig. 1.



ing, seems to provoke the return of spasms. In one case the convulsive movement drew the head back, and bowed the spine, and passed off by a spasm of the gastrocnemial groups, so as to jerk him into a squatting posture. (See Fig. 1.)

These are hypercineses in which the spasms, usually active with or without apparent cause, are also brought on or increased by the functional activity of other muscle groups, allied or remote.

I have seen also certain spasmodic cases in which all of the abnormal phenomena were related to the physiological act of walking—I might define them as being exaggerations of walking. I have seen this disorder in various forms.

My first case was a chubby, ruddy little boy, aged six, from Tennessee. I could find neither in his own nor his parents' history any cause for his disease, save that it came on slowly after measles. When asked to walk, he exhibited this strange set of symptoms. The left leg was sound and acted well. As he swung the right forward, and lifted the toes to avoid touching the ground, there was first a sudden spasm of the tibial and peroneal muscles, so that the tip of the foot was jerked up too high. Instantly it seemed to relax, and the foot came down, but, as it touched the ground, and the second physiological act of rising on the ball of the foot began, this became extreme and spasmodic. The lad was lifted abruptly, and, the spasm of the gastrocnemii continuing, the leg was jerked up backwards—a true string-halt. I had never seen this before, and was much interested. While at rest on his back he moved the foot at will without annoyance or spasm, nor could I by a blow, or pressure, or tickling of the sole, cause him to repeat the movement.

In July, 1875, I saw at my clinic a case somewhat like the last, but with some important differences.

A delicate looking girl, *æt.* 7, with a good family history, and no cause to which I can trace her troubles of locomotion. She began to crawl at two years, and never walked till the fifth year, yet with this slowness to move there seemed to be no arrest of mental or moral development. The mother thought that she was gaining ground. When we stripped her I found that she had all the foot motions perfectly, save that of flexing the feet, which, when they got to a right angle with the leg, could move no further, the tendo Achillis refusing to yield. The other muscles above the knee were in that curious state which we find in some partial palsies in adults, and which Dr. Seguin has admirably described. It is a condition of rigidity which varies in degree in different cases. In this state, if you flex the leg on the thigh, the extensors, which should be passive slowly, and, as it were, reluctantly, yield and resist the flexion. If you extend the leg, the flexors act to resist in like fashion. Whatever motion be made, the opponent muscles contract, and every willed movement becomes tardy and difficult, or, in bad cases, impossible. When an attempt is made at passive motion, the muscles do not resist in jerks, but smoothly and evenly, so that it seems as if you were bending a stiff hinge or a bar of soft metal. In fact, so striking is this analogy, that at my clinic this state has come to be briefly described as the "lead-pipe leg." In the present case it was not extreme in degree. Voluntary movement

in walking curiously exaggerated the gastrocnemial spasm. Every time the foot came down the gastrocnemius muscles contracted violently, and so as to lift the child with a jerk on to the foot then in use. If the walk was rapid she walked continuously in this position. If she moved slowly the gastrocnemius only acted as she rose on the ball of the foot, the natural physiological act becoming excessive.

Here was then a slight but permanent tonic spasm of the calf muscles, yielding easily under ether, with a temporary functional spasm alternating in each leg as she used it in walking. After some reflection, Dr. T. G. Morton cut the tendons of the calf muscles on both feet, and, as a result, the muscles, in place of continuing to contract, relaxed, as the resistance ceased. The tendons were thus lengthened at least two inches, but ample power remained, and the walk was most satisfactorily improved. Fig. 2 represents this child walking rapidly. The upward jerk of the heel pitches the child forward, so that she hurries to overtake, as it were, her centre of gravity; while, also, to aid in preserving her balance, the belly is thrown out and the shoulders thrust back.

The next case is yet more curious.

R. C., æt. 17, a long, thin, sallow lad, from New Jersey, was brought to me in October, 1874. Healthy up to the age of nine, he had then measles, from which he recovered very slowly, and with marked feebleness of the legs. As time went on the power to use them increased, but by degrees there came upon him a certain stiffness, which extremely embarrassed him in all his movements. At the time I saw him his legs were equally developed, except that just above the left knee the thigh muscles were somewhat wasted. While in bed at rest the legs were quiet. When he stood up the spinal erectors became extremely rigid, and threw the back into a bow, while a strong effort of will was needed to keep the left leg quiet, and sometimes, the effort being insufficient, it was jerked upwards. When seated he kept the leg still by crossing over it the more manageable right leg. When he walked each leg in turn was jerked up by the gastrocnemii, so as to constitute a string-halt, which, as he was swayed to right or left, and bent back by the alternating activity of the spinal erectors, caused him to present a most curious appearance. Fig. 3 represents him just as he came to a stand after rapid walking, when the spine was bent forward, the belly thrust out, the legs bent, and the lad balancing on the ball of the right foot, with the left leg jerked up at a right angle.

At first I felt indisposed to attempt any treatment of this puzzling case. Various electrical treatment was tried and failed, such as induction currents

Fig. 2.



Fig. 3.



to the antagonist muscles, or long-continued induction currents to weary the spasmodically acting muscles and Remak's rapid alternatives.

A long series of atropia injections into the calf muscles met with more success, and the action of these muscles became distinctly less powerful and less troublesome. Next I weakened the back muscles by a series of repeated cross sections at different levels; and finally I put on him an apparatus which limited the extent to which the over-active muscles could move the various parts of the limbs. I did not cure him, but I most certainly did remarkably better his condition, and enabled him to rise, stand, and walk with far less fatigue and effort.

The last two of the cases I have here given involve spasm or increased spasm in groups of muscles accustomed to act together in order to secure equilibrium when standing, or to aid in the movements of progression. The cases first given were also examples of voluntary action bringing on or increasing spasm elsewhere, but, save in the case of yawning, and the consentaneous arm lifting which it causes in some hemiplegias, the muscles which contracted convulsively were not remote from those whose activity seemed to call them into morbid motion. But in the case which I shall now present, the most prominent feature was the fact that every or almost every voluntary motion

caused extraordinary changes of or increase in the amount of the spasm, and this was the case whether the patient was prone or erect.

R. C., æt. 33, watchcase-maker, married, and has healthy children; no syphilis. His family history is bad; a sister, two aunts, and his mother have had palsies in middle life; an uncle had epilepsy, and a cousin dementia. He was always nervous and excitable, used no spirits, smoked moderately, and was always well until the summer of 1865, when he was two days unconscious from sunstroke, and has ever since been made weak by the heat of summer. About two years ago, in the summer of 1874, he

observed that while walking the legs felt weak, and he was obliged to stop, as if to regain power; after which the right leg would drag for a time. At the same time he began to have pain in the back of the neck and lumbar spine. These pains continue. In January, 1875, he noticed a slight but increasing tremor in the left arm, and in two or three months the strange condition which I shall try to describe.

When I first saw Mr. C. he was a healthy-looking man, of unusual intelligence, and marvellously patient under his great suffering. In sleep there was no movement; when he awakened he was conscious of the left hand being rigidly closed. In a few moments it began to twitch, the fingers moving as do those of a violin player. The slightest movement of any other limb, speaking, or eating—even if he be fed—causes the left arm to execute a constant motion of striking the bed or his side, the limb being the while extended. When he arose and walked, this action became more violent, and so much resembled the steady, rapid movement of a pendulum, that I spoke of it at once to my assistants as a case of what might be called, descriptively, *pendulum spasms*. In fact, its rhythmic regularity was astonishing. Dr. Sinkler timed it, on one occasion, as 157; and on several others I found it always exactly 160. It was as accurate as the heart in its motion, but certain things always increased either the power or the number of the motions. Thus if he stood up, having been seated, the number did not alter, but the force of the blow on the thigh increased remarkably.

If, while standing, he elevated and extended the right hand and arm to the shoulder level, instantly the rhythm mounted to 200; and when the right arm ceased to act, the number fell again speedily to 160.

When there was no pendulum spasm he could perform with the left arm any voluntary act not involving the hand, which itself never ceased to twitch; but while the swinging spasms lasted he could execute no volitional act, and the effort to move the limb enormously increased the spasms.

Excitement and emotion, and all forms of electricity, added to the force of the motions, but voluntary movements of other limbs increased the number more than the force. Attempts at passive motion, as the effort to fully extend the partially flexed fingers, cause intense pain in the occiput, just as the effort to overcome rigid gastrocnemii in certain cases gives rise to pain in the dorsal spine. He has power to stop the spasms by certain manœuvres. If he seizes the left hand with the right, and, flexing the left arm, holds it, there is a kind of general spasm; the left hand for a moment seems to struggle with increasing violence; he totters; the face is convulsed; there is horrible pain in the back of the head. Then he gently releases the left arm, which, save for a slight tremor or twitching of the quiet fingers, remains at rest, and may not move in violent spasm for an hour or more, and is sometimes nearly still for twelve hours.

He avoids the use of one hand to stop the other, because of the great pain it causes in the head. When he stops the hand with his leg, he has little head pain, but it is altogether so unpleasant for him to check it that he rarely does so. When standing, if he wishes to stop the pendulum spasm, he throws the left leg back so as to trip the toe; the arm then falls in as it moves, and he brings the leg forward so as to catch the arm against the thigh, where its own spasm holds it. Then there is a general convulsive movement of the entire body, and the limb is at rest.

When the arm is hanging quiet at his side, it begins to move if he

walks a few steps, or if he lifts the right arm, in which at times—especially after sudden arrest of the spasm—I noticed some large tremor.

In all of this strange set of symptoms there is no loss of consciousness, no anæsthesia, no ocular trouble or spasm, no aural defect. When he walks long or fast, the legs have some disposition to become rigid; but this is an inconstant feature.

This patient is now under care of my colleague, Dr. Sinkler, to whom I am in debt for liberty to use his case. So far, nothing has been of any service.

There are several points of great interest about this notable case. No other is so good an illustration of the product of clonic spasm through remote voluntary activity. Also the mode of arrest is curious, and I should have added, in describing it, that a bystander can stop the spasms by securely holding the arm for a few moments, when the usual general contortions occur, and the limb ceases to move. Voluntary motions of remote parts—of any remote parts—set the spasms going. Forceful arrest of the spasmodic swing of the arm seems to cause a discharge of nerve force from numerous nerve centres, and so gives rise to a momentary generalized spasm. This last fact finds analogies in some spinal scleroses, and in some clonic local spasms, the arrest of which occasions remote or morbid activities.

I saw, in the war, a soldier who had a constant *see-saw spasm* of the left foot, caused by a nerve wound of the sciatic. The flexors and extensors acted by turns, so as to keep the foot in constant motion. When I held it firmly, he was seized at once with a general left-lateral convulsion, in which the face moved but slightly, without ocular spasm or loss of consciousness, but with occipital pain. As soon as the foot was released, the other motions ceased. Sensibility was impaired from the peripheral lesion.

In the case of Col. P., described at p. 364 of my book on Nerve Injuries, there was a continual irregular threshing motion of an arm stump, which ceased for a time, when the stump was exercised in voluntary movement, but which extended over a large region of the same side (right) with sense of discomfort in the head if an attempt was made to hold the agitated stump. These peculiarities seem to me worthy of note in cases so obscure, and the history of which has been thus far imperfect, because we are without post-mortem results or interpretations.

There is yet another group of cases, happily most rare, in which, while the patient is at rest prone, or as in one case seated, no spasms exist; but when the upright posture is assumed, at once the patient is seized with general convulsive motions, which may or may not persist. Of such a disorder I have seen three cases.

The first and most singular was that of a journeyman tailor, about 28 years old, a man of lean make, and very anæmic. He had been guilty of no excesses, and had not had syphilis. His secretions were normal, and

his organs, to appearance, healthy. He had, however, worked hard in the cross-legged position which tailors assume, and had been constantly sewing late into the night. This was all that could be learned of his history.

When this man was seated or on his back, he could make every possible movement, slowly or as abruptly as he pleased. If he got up from his bed or a chair slowly and watchfully, and then stood still a moment, he could walk away as well as any one; but if he jumped up suddenly from the prone or the sitting posture, he was seized as by a spell with a convulsive attack, in which his head became giddy, but in which there did not seem to be the least loss of consciousness. The attitude assumed as he made a sudden attempt to get up hastily is difficult to describe, but figure 4 conveys a clearer idea of it than words will give. The right leg bent at the knee, the left was thrown over it, and grasped it in violent flexion.

The body was twisted to the right, and the head also, while the right arm in extension was raised, and the left thrown outwards and backwards in extreme pronation. Then there was a general writhing of the whole frame, the face muscles twitching here and there, and with a groan of relief his attack was over.

Much pains were spent to learn if there was in this case any chance of explanation which would involve a suspicion of simulation. His malady, however, was very constant in its peculiarities. It had come on gradually, beginning with slight contortions; it made him unpopular in the work room, where it was looked upon as some kind of possession; nor had he anything to gain by malingering, while his face had always that look of gloom and melancholy which such a torment as his would be apt to inflict on a person of sensitive temperament.

Dr. C. Handfield Jones¹ briefly calls attention to cases in which spasms occur owing to the weight of the body being brought upon the feet.

He mentions that Bamberger relates the case of a youth æt. 19, convalescent from pneumonia, who had spasms of the legs when he touched the

Fig. 4.



¹ Functional Nervous Disorders, p. 398.

ground with his feet. There was tetanic rigidity, interrupted by violent sudden contractions, which increased in intensity. He says, also, the face was flushed and distorted, but that all movements ceased when the lad lay down. If, while lying, the soles of his feet were pressed, the same phenomena appeared, but with less intensity. He was cured by sedatives and cold affusion.

Bamberger's case is somewhat like the following, which I saw two years ago :—

A lad, *æ*t. 7, of rosy tints and well nourished, had, when a year old, a sudden convulsion, and, soon after, a succession of fits, followed by several days of unconsciousness. His previous health was good; his family record unimpeachable. When three years old he began to creep, but showed no desire to stand or walk. Long and industrious efforts were made to induce him to stand, but he always drew his legs up and sunk down. For a long while this was regarded as due to feebleness. By and by, however, despite the motions just mentioned, he would maintain himself erect, or partly so, and by the aid, for the most part, of his vigorously developed arms.

When I saw him I was struck with the child's intelligence, with his general look of health, and with the perfect use he had of all his members while lying down. Neither when he crawled could I see any failure of power or co-ordinating capacity in the legs.

After I had gone over his case with care, his parents placed him on his feet. I find it impossible to describe the confusion of motions which at once ensued. They seemed to me made up of choreoid movements of the hands, feet, and face, with pretty violent alternate spasms of the flexors and extensors of the legs and arms, with strange rotatory twistings of the spine and neck. His face looked anxious, but twitched very little. When put on his back every motion ceased at once. Pressure on the soles did not cause spasm. When held up by the arms or by the shoulders he had no spasms, but as soon as the feet were on the floor and he tried to stand, the storm of convulsive motions swept over him. The effort of standing seemed to be needed to cause the result. If he tried to walk he was thrown down by the spasms, and therefore did nothing but creep.

Electricity did not cause in him any spasms. The leg muscles responded well to a moderate induction current. There was no disturbance of sensation anywhere. When his soles were tickled he drew them up a little jerkily, but with no spasm.

I regret that this interesting case was seen by me but twice, and that my notes of it are not more ample. His parents, when once they learned that I did not regard the case as hopeful, were indisposed to give much information about it, and seemed to fear that the poor little fellow would be looked upon as a medical curiosity.

I believe I shall have done a good service by directing attention to the fact that voluntary motion may give rise to various forms of spasm. It is familiar enough that morbid sensations may do so, or that in an over-excited state of motor centres, a normal sensation may occasion like results, as in tetanus. As regards the cases to which I have here called attention, two explanations lie open to us. Voluntary acts give rise to spasms in the

muscle willed to move, or in remote groups of muscles. There is at times an unusual discharge of nerve-force in some of these cases, as in the "lock spasms" I have reported, or else the muscle itself has become the means by its over-use of hypersensitizing the sensory centre which takes record of its activities, so that from this centre at times excito-motor impressions are radiated on to near or remote centres, and result thus in spasms. It will be found, in all of these cases, that when an ordinary functional motor act gives rise to spasms elsewhere, these occur in muscles which have physiological and therefore anatomical relations to the muscles which, by their normal use, gave rise to the morbid activities. Thus, the face muscles are physiologically allied, and so volitional movements of one of them may cause spasms in others. The motion of one arm starts spasms in the other; and walking, which involves naturally the swinging of the arms, has a like potency. Why talking or chewing should do the same is less clear, but such morbid relationships have analogues in the cases of neuralgia, where the long irritation of one centre results at last in the like disturbance of remoter sensory centres and in radiated neuralgias which are usually of unilateral relationship.

