The Classic

Hospital for the Cure of Deformities: Course of Lectures on the Deformities of the Human Frame

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Abstract This Classic Article is a reprint of the original work by W.J. Little, Hospital for the Cure of Deformities: Course of Lectures on the Deformities of the Human Frame. An accompanying biographical sketch of W.J. Little is available at DOI [10.1007/s11999-012-2301-z](https://doi.org/10.1007/s11999-012-2301-z). The Classic Article is ©1843 and is reprinted courtesy of Elsevier from Little WJ. Hospital for the Cure of Deformities: course of lectures on the deformities of the human frame. *Lancet*. 1843;41:350–354.

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LECTURE IX.

Character of spastic rigidity of muscles and deformity in infants, young children, and adults. Treatment. Spastic deformities of ankle. Non-congenital club-foot; their origin, symptoms, and treatment. Spastic contracture of hand and arm. Universal paralytic deformity of upper and lower extremities. Treatment. Value of tenotomy in contracture of elbow and wrist.

THE first contracture which I shall consider is that resulting from universal rigidity of the muscular system, or of the flexor muscles only, in new-born infants, a condition analogous to *trismus nascentium*, a common disease in certain tropical countries.

In some instances the rigidity of the limbs is immediately apparent, in others it escapes observation during several weeks or months, or the spastic rigidity becoming complicated with structural shortening of the tissues on the contracted sides of the articulations, the nurse observes that she is unable to wash and dress the infant with the ordinary facility. The knees cannot be properly separated or depressed. Sometimes the trunk is stiffened, so that the

infant is turned over in the lap “all of a piece,” as the nurse expresses it. Occasionally the head is habitually retracted, and the elbows and wrists participate in the inflexibility. Very frequently the contracture is confined to the lower extremities, but more rarely to a single limb. The infant is observed invariably to sleep with the knees firmly approximated to the abdomen and to each other, and the toes inverted. As the child approaches the period at which the first attempts at standing and progression should be made, it is observed to make no use of the limbs;—a consultation with the medical practitioner ensues, and a paralysis is sometimes pronounced to exist. In cases where the sensorial part of the brain has suffered conjointly with the medulla spinalis, the intellect may even thus early be observed to be less developed than usual. The inability to stand or walk continues until, perhaps, the age of three or four years, when, with assistance, the child contrives to support himself. It is now ascertained that the soles of the feet are not properly applied to the ground, that the knees always incline inwardly, and that they continue bent. The child at length effects locomotion unassisted, but he cannot be said to walk, as his movements are characterised by an inability to stand still and balance himself erect. In the

endeavour to do this he commonly falls, and to avoid this accident requires to continue in an imperfect running until he meets an object against which he can support himself. Being unable to bend the ankles, the toes strike against the smallest irregularities on the surface, occasioning loss of balance and frequent falls. In process of time greater certainty and ease in locomotion may be spontaneously obtained. I have here described to you the course of an ordinary case of this nature; the models before you will illustrate the various grades of the affection; and among the out-patients you may at present witness several cases at different ages. This diagram will show you the common condition in which, at a later age, such patients apply for relief.

The same condition of the central organs of the nervous system, the muscles and articulations, may be produced later in life, during dentition, or during any of the numerous diseases of infancy which excite much general disturbance. I have treated two cases in adults in whom the spastic state of the muscles resulted from direct mechanical injury applied to the spine; and two others, in which the universal contracture of the lower extremities resulted from disease and deformity of the vertebral column.

You will remember that a single member may be thus affected; the case is still less unfortunate when the contracture does not involve the hip-joint, but is confined to the knee and ankle.

Treatment of Universal Spastic Rigidity.—During the earlier months of existence you can resort to few therapeutic measures. I have usually contented myself with directing the nurse several times daily to endeavour to straighten the flexed articulations; and this may generally, after a little perseverance, be accomplished, the object having been to prevent structural shortening of the spastic muscles. But from the observation of the utility, at a later age, of counterirritation to the vertebral column, I am induced to recommend you to try the use of stimulant embrocations to the back. Of course you will not neglect attention to the digestive organs, the proper action of which is of equal importance in health and disease.

From the age of twenty months and upwards, I have employed more active counterirritation to the neck and loins,—lytta, and repeated small issues produced by *argentum nitratum*. Should structural shortening have ensued, you may endeavour, by appropriate mechanical apparatus, such as that requisite in deformities from other causes hitherto considered, to effect elongation of contracted parts; but the primarily spastic nature of the muscular contraction will prepare you for greater resistance, and, perhaps, convince you of the hopelessness of the attempt to effect mechanical elongation. It will, however, in many cases be evident that the primary cause in the nervous system has subsided, and that you have structural

shortening alone against which to contend. Failing manipulations, instruments, and the remedies directed against the cause of the contraction resident in the nervous system, you still have tenotomy as a *dernier resort*, and this, in the majority of instances, will not disappoint your expectations.

The parts requiring section here may be the adductors of the thighs, the ham-strings, gastrocnemii, and adductors of the feet. I can scarcely limit the age at which this operation may not be productive of benefit. There is the drawing (Fig. 14) of an adult, upwards of thirty years of age, who had never walked, but who acquired sufficient power, after tenotomy and straightening of the limbs, to walk with the assistance of a stick only. Several similar cases have been observed in in-patients at the institution. The diagnosis of these spastic contractures from paralytic contractures rests upon the presence of volition in every muscle. You will be careful, also, not to confound them with similar deformity from disease of the articulations.

Thus far I have principally dwelt on spastic contracture of the hips and knees. The corresponding affections of the ankle are more common. As I have already mentioned, they invariably accompany the contractures of the hip and knee, though they often occur independently of them, and

Fig. 14 Spastic Contracture of the Lower Extremities.

constitute the spastic forms of non-congenital talipes, or club foot.

The most simple form is that consisting of abnormal spastic elevation of the heel, causing the individual to walk on the toes only; or the deformity may be combined with some inversion of the toes; or, as in the similar deformity from disease of the joint shown in this model (Fig. ***, p. 176). A complete varus may result from the spastic contraction of the adductors of the foot conjointly with the gastrocnemii (Fig. p. 285).

It is necessary that I should impress upon your attention the mode of origin of these cases of deformity, as errors of diagnosis are, in this respect, not uncommon. In adults the attack can usually be traced to an epileptic, hysterical, or chorea-like seizure; in children the deformity succeeds to an attack of convulsions, but more commonly the origin is unperceived. It is often stated by the parent to have been an injury sustained whilst at play, whereas inquiry elicits the fact that the deformity had not for its cause an origin of that nature, but arose from disturbance of the nervous system. It is evident that in many instances the muscular contraction comes on insidiously, and does not attract attention until some trifling accident at play, as a fall (induced, probably, by the gastrocnemii being already partially affected with spasm, and imperfectly under the child's control), leads to an examination of the limb; from which period the increase of contraction and deformity becomes anxiously watched. In the remarks on spasmodic contractures in general, I mentioned that when the contraction is gradual, the remote cause often consists in chronic derangement of an organ affecting a peripheral part of the nervous system. There exists, in my opinion, no cause more frequently productive of these spastic contractures of the ankle than derangement of the mucous membrane of the alimentary canal, indicated by worms, diarrhoea, or other symptoms of gastric or intestinal morbid sensibility. This disturbance may continue a considerable time unheeded, or without suspicion of its tendency to induce secondary disease being awakened. By means of the chain of filaments on which the reflex functions of the nervous system depend, it may be unobtrusively exciting involuntary contraction, evinced by a scarcely perceptible limp, a tendency to fall, or a certain wayward action in walking. At this period it frequently happens that if the foot be examined when not actually engaged in walking or standing, no abnormal condition can be perceived (unless, perchance, a slight diminution of the bulk of the limb already exists); for Stromeyer has shown, and you will have frequent opportunities of verifying the observation, that it is characteristic of this affection of the gastrocnemii (previously to its acquiring the highest grade, and having existed a considerable period when atrophy commences), to be excited into activity, or much augmented, when the sole of the foot touches the ground, as in

walking. This may remind you of the effects of irritating or touching the web of the frog's foot, or the skin of the sole of the rabbit, when the excitability of the muscles is increased by narcotism or decapitation, or the influence of volition removed. The membrane and skin covering these parts are, like the skin of the human sole under certain circumstances of disease, more particularly susceptible of external impressions, and when irritated, capable of producing reflex muscular contractions. I may refer you for the further study of this interesting subject to the "Treatise on Clubfoot and Analogous Distortions," London, 1838.

You may bear in mind that impaired nutrition of the frame, whether it result from disease in an organ or be the direct consequence of deficiency of food, is one of the most active predisposing causes of these deformities, as of chorea and the whole of the neuroses. Raphania, a disease not unfrequently witnessed on those parts of the Continent where rye-bread is the principal food of the people, is accompanied with spasmodic contracture of the lower extremities, hence it has been denominated the cripple disease. The older authors have attributed raphania to the consumption of secale cornutum, but it admits of doubt whether the symptoms may not in great measure be referrible to imperfect nutrition. In the oriental disease, beribery, in which spastic rigidity of the limbs constitutes so important a symptom, the patient, after subsidence of the acute symptoms, remains affected with spastic contracture. I have recently relieved, by tenotomy, a gentleman who had been totally incapable of locomotion from this disease, contracted during a residence in Ceylon many years since.

The treatment of these spastic contractures of the ankle will, so long as they present a probability of removal by the general and mechanical means, be conducted on the principles already laid down, and when the assistance of tenotomy becomes requisite, the section of those tendons only which offer the greatest resistance should be accomplished, viz., the gastrocnemii, with or without the adductors of the foot (anterior and posterior tibial tendons), according to the peculiar abnormal form of the member. In those cases in which the ligaments do not retain the limb in the old position you will often find that after the operation the antagonist muscles forcibly endeavour to distort the foot in the opposite direction. It is, therefore, important to secure the foot, by means of splints, in the primary deformed position, to prevent too great elongation of the divided tendons. The deformity can be gradually removed by subsequent mechanical means, and the functions of the limb be partially or completely restored by the same after-treatment described in the lecture on deformity from ankylosis.

Spastic Contracture of the Upper Extremity rarely occurs independently of contracture in the lower limbs. The causes are the same. It affects commonly the pronators and

Fig. 15

flexors of the wrists and fingers, sometimes the biceps, pectoralis major, latissimus dorsi, teres major and minor. Either of the models on the table will illustrate this deformity of the hand and arm (Fig. 15). The treatment should be based on the same principles as that necessary in the corresponding affection of the lower limbs. I would not advise you hastily to resort to tenotomy in these cases. I shall defer the consideration of the operation until I have spoken of paralytic contractures.

Universal paralytic contracture of the lower extremities presents, at first view, considerable resemblance to the spastic affection of the same parts. It arises at various periods of infancy, the organic disease of the central organ of the nervous system being preceded or accompanied by disorders of dentition, intestinal derangement, hydrocephalus, fevers of various kinds, and universal debility. A perfect paraplegia or hemiplegia, occurring gradually or suddenly, are frequent precursors of this contracture. In the study of the origin of these contractures it is apparent that in many instances the paralysis affects particular sets of the muscles; the non-paralysed muscles slowly contract and produce deformity. In other instances all the muscles are paralysed *quoad* volition, but the greater mass and power of the flexors and adductors, acting through the involuntary contractility of the fibres, distort the limbs. Such patients, affected with universal contracture, present deformity of hips, knees, and ankles; the principal muscles that appear contracted are the tensor vaginæ femoris, rectus femoris, the ham-string muscles, the gastrocnemii, and adductors, the remaining muscles being wholly paralysed. The models around you will illustrate the appearance of these patients, they are compelled to effect locomotion entirely by the

action of the arms, using for this purpose crutches, or move from place to place on a wheeled carriage, in the manner often displayed by mendicants in the streets of the metropolis. As I have before mentioned, a single limb or joint may be affected with paralytic contracture, and sometimes one limb presents paralytic and the other spastic contracture, the deformity corresponding or not on the two sides. Thus, therefore, nature presents us with two series of deformities nearly identical in external appearance, and your tact as practitioners in diagnosis and prognosis will often be tested. You will at once comprehend that paralytic contractures, on the whole, are the less favourable for treatment. Still, immense advantages are secured to persons thus afflicted, if you can so restore the form of the member that the patient may avail himself of a straight pillar on which to support the trunk. When the muscles on one side of the member only are paralysed, the adaptation of proper mechanical apparatus, with springs in some degree to supply the place of the deficient muscles, will give the sufferer considerable tact and facility in locomotion. Several cases of extremely severe paralytic contracture, the individual never having walked, have, in this institution, been enabled to throw aside crutches and the arm-propelled carriages resorted to in the streets. When a single ankle and knee are affected, the patient may be restored to a considerable extent, and perform the ordinary offices of life with little inconvenience.

Paralytic deformity of the upper extremity is more serious; the member must be condemned to uselessness so long as one set of muscles is unaffected by volition. The movements of progression, performed by the lower extremities, are more simple and considerable; use of these parts is not incompatible with a certain amount of paralysis. A person can effect locomotion with a certain amount of comfort and satisfaction even when the *foot* is completely paralysed, but the functions of the hand are exceedingly complicated; each muscular fibril has its appropriate action and subserviency to volition, and requires to be balanced in its action by its antagonist; when, therefore, the supination of the wrist and extensors of the wrist and fingers are paralysed, the functions of their antagonists are as completely arrested as if all were afflicted with a common calamity. This is, however, the proper place to caution you not too early to abandon a paralysed hand and arm as incurable; it frequently happens that during the continuance of the paralysis, contraction and structural shortening of one set of muscles (as in the leg also) takes place, and on the removal of the cause of paralysis resident in the nervous centre, the limb remains contracted. In these cases you may observe a germ of volition in the apparently paralysed muscles, and by manipulation, frictions, exercise, mechanical support, and more rarely by electricity in its various forms, you may

succeed in partially restoring the limb. I have witnessed cases of paralytic contraction of the arms and hands consequent on fever, wholly restored after considerable lapse of time by this treatment.

I shall conclude this lecture with a few remarks on the utility of sections of numerous muscles of the hand and arm, the substance of which has been elsewhere published. Unfortunately, the universal tenotomists who behold, in a contracted limb, a mere piece of mechanism held in an abnormal form by certain unnaturally tense cords, have, without reflection on the etiology and pathology of these deformities, proceeded with the knife to relax the contracted part, regardless of the numerous conditions requisite for a restoration of the function. In principle subcutaneous tenotomy is equally applicable to the upper and lower extremities, but a wide difference exists in the application of the principle. The movements of the ankle consist, it is true, of flexion, extension, adduction, and abduction, but in the act of walking, flexion and extension are alone absolutely necessary; adduction and abduction being only required under extraordinary circumstances. Operative orthopaedy is capable of restoring a contracted useless leg, and fitting it for the ordinary purposes to which, in the civilised state of society, it is applied, but cannot adapt it to the extraordinary use made of it by the athletes or the professional dancer. But in the case of the hand, every individual, from the day-labourer to the watchmaker, or the workman in the minutest branch of the arts, avails himself constantly, not only of flexion and extension, but of pronation and supination,—those movements which are analogous to the inversion and eversion of the foot. If you, at the same time, bear in mind that, notwithstanding the analogy in these movements of the upper and lower extremities, the acts of pronation and supination are far more delicate and elaborate than the analogous movements of the foot; if you remember that not only are the movements of the hand much more complicated, but that the several fingers possess each their allotted muscles and consequent functions,—you will at once perceive that although in principal orthopaedic operations are equally applicable to the hands, the difficulty of applying the method must be immeasurably greater. The anatomical conformation of the arm and hand, the smaller space in

which is congregated a larger number of nerves, muscles, and tendons, the difficulty of dividing those which may be contracted, without disturbing or exciting unnatural adhesions with those which may be normal in their action,—all combine to retard the progress of orthopaedy in this direction. Operations on the elbow are usually successful; in the hand, also, when merely unnatural flexion or extension exists, paralysis being absent, the functions of the wrist may be restored by tenotomy. Thus, at the Orthopaedic Institution, I have treated cases of contracted elbow and wrist which have yielded perfectly, by section of the biceps, or of the flexors, extensors, and pronators of the wrist, the functions having been more or less completely restored according to the cause of the contraction. I may briefly state the order of success in these cases to have been as follows:—Organic shortening of the muscles from long-continued relaxation, as from accidental injuries and inflammation; congenital contraction; spasmodic contraction; contracture from abscesses with loss of substance, gangrene, &c. The result of my observation leads me to assert, that how discouraging soever at the onset, contractions of the hand are not irremediable; on the contrary, that although few are perfectly curable, the great majority are susceptible of considerable benefit. Although the degree of restoration of function varies, yet in nearly every case that has come under my notice, the deformity (which alone impels individuals of the upper classes of society to seek relief,) has been removed, and I have succeeded in enabling a person to write tolerably. A wide field, however, remains open for future research and experience, and although I would strenuously discountenance all rash and wholesale division of tendons in these cases, I recommend the matter to the attention of those among you who are possessed of an intimate knowledge of the anatomy of the parts, and are endowed with a large share of patience to watch and elaborate results. The loss of a lower extremity is a great privation, but experience shows that the deprivation of the use of the arm and hand is felt as a far greater affliction; so much the greater therefore must be the reward of him who, by adding to the common stock of knowledge on the remedy of this, can so largely contribute to the welfare of his fellow-creatures.