Post-Graduate Lecture

ON THE

SURGICAL TREATMENT OF DEFORMITIES DUE TO PARALYSIS.¹

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GENTLEMEN,—At this hospital, especially devoted to the treatment of patients suffering from epilepsy and paralysis, unusual opportunities are afforded for studying these affections in all their varieties. These cases are generally presented to you in their medical aspect, and the great advances both in diagnosis and treatment made by my distinguished medical colleagues have been well recognised by the profession. But there is also a surgical aspect presented by many of these cases, some of which can be relieved by such operations as trephining the skull and removing any tumour or morbid growth from the substance of the brain which had been diagnosed, and also the operation of trephining the spine, either for the relief from pressure produced by fracture, causing paralysis, or the removal of any morbid growth. These large operations, performed with strict attention to the rules of antiseptic surgery, have been the special study of my colleague, Mr. Victor Horsley, and the results obtained stand out prominently amongst the advances made in modern surgery. But besides these large operations, there yet remain a considerable number of cases of paralysis in which we have to deal surgically with the late effects—more especially with contracted joints and distortion of limbs,—and the treatment of these cases falls more or less under the observation of those who have gained a knowledge of orthopædic surgery. It is this class to which I desire to direct your attention to-day, as the surgical treatment of these cases presents some points of special interest. As a general law, all paralytic affections of the upper and lower extremities, whether infantile or adult, have a tendency to pass into a state of contraction, with some malposition or deformity at the joint or joints involved; whether the hip, knee, ankle, or transverse tarsal joint in the lower extremity, or shoulder, elbow, or wrist in the upper extremity. The muscular affection of the eyes, in cases of paralysis producing strabismus, need hardly be alluded to by me, as they fall especially under the observation of the ophthalmic surgeon attached to the hospital. The contractions met with in the upper and lower extremities naturally arise as the result of the loss of the balance of muscular power, as we know that in many of these affections, especially in the infantile class, either individual muscles or groups of muscles are chiefly affected. We also know that the recovery of muscular power proceeds at very unequal rates in different muscles, or groups of muscles; for example, the deltoid muscle is always very slow to recover, and often fails to do so, leaving a permanent inability to uplift the arm or raise the elbow. The rectus muscle of the thigh is also a very unfavourable one for recovery, leaving a permanent inability to extend the leg upon the thigh and rendering necessary a mechanical support to compensate for this inability. The muscles surrounding the hip-joint generally make a very favourable recovery, and those most useful muscles in progression, the psoas and iliacus, are seldom lost. In the leg, the muscles of the calf—the gastrocnemius and soleus—are always very slow to recover, and frequently fail to do so, thus causing a very troublesome and incurable deformity of the foot—talipes calcaneus. In the leg it sometimes happens that all the muscles make a fair recovery, except the tibialis anticus, which alone remains paralysed, giving rise to an everted condition of the foot—talipes valgus. As a general result, it seems that contraction at some of the joints involved almost invariably occurs; we are therefore obliged to admit that whilst nature is a very good physician and does her best to

aid in the recovery of muscular power, she is unmistakably a bad surgeon, and does her worst in the production of various contractions and deformities. If this law were more generally known many contractions and deformities at the joints might be avoided. Cases are frequently brought to me in which the patients are making an excellent recovery from some paralytic affection, but little attention has been paid to the early stage of contraction which quickly attracts my attention. This most frequently occurs at the ankle-joint from contraction of the Achilles tendon, as we generally describe it, although we know the structural changes really occur in the muscles of the calf. The effect of this contraction is to limit the power of flexing the foot at the ankle-joint, and if allowed to progress, the heel will become elevated and a condition of talipes equinus produced, with all its inconvenience in walking, if one foot only is affected.

If both feet should be affected, then the patient will be unable to stand until after tenotomy has been performed. If the contraction is detected in the early stage, I generally find it can be effectually overcome by a well-regulated course of massage, accompanied with passive movements; these movements, however, require more special attention than is generally given to them. The reason of this contraction being overlooked in the early stage is that there is nothing particular to direct attention to it, and also that the method of testing the flexion power of the foot at the ankle-joint is perhaps hardly studied with sufficient care. This should be done in the following manner. First, the leg must be placed in a fully extended position, and the knee-joint lightly held either by the patient or surgeon to prevent any flexion at this joint, as I need hardly say this would destroy the test by relaxing the heads of the gastrocnemius muscle attached to the condyles of the femur. I prefer the patient to be sitting on a chair, and resting the foot on another chair placed opposite, and of the same height. Then the surgeon, lightly grasping the knee with the left hand so as to keep the leg fully extended, may with his right hand try to flex the foot at the ankle-joint. Instead of using the hand, however, it is a good plan to place a book against the sole of the foot, and by a little pressure try to flex the foot. In slight cases it will be found that the foot can be flexed barely up to a right angle with the leg, and then the Achilles tendon becomes very tense. This is commonly spoken of as a *right-angled contraction of the Achilles tendon*, and gives rise to more inconvenience in walking, and in active exercise, than might be supposed, but it can generally be overcome by massage and passive movement. In a more severe case it will be found that the foot cannot be flexed up to, or nearly so far as, the right angle—probably 10° or more short of the right angle,—the foot forming an obtuse angle with the leg. In such a case I should at once advise tenotomy, as there is no probability of overcoming this degree of contraction by massage and passive movements. The only alternative is the tedious and uncertain process of gradual mechanical extension, carried out by means of a Scarpa's shoe, with rack-and-pinion movement at the ankle-joint, to be worn night and day for many months—at least six,—the patient using crutches, and not allowed to touch the ground with this foot during the whole time. The treatment by tenotomy would average about six weeks, and from its certainty is in every way to be preferred. Naturally the foot should be capable of being flexed upon the leg from the ankle-joint to 18° over the right angle, this degree of flexion being necessary for good walking purposes, and in young people this will, as a rule, be found to exist. In adults also it generally exists, especially in ladies. Less than 15° of flexion beyond the right angle will not suffice for good walking purposes in the adult, and with a limited degree of flexion movement various troubles arise, but these are not connected with our present subject.

For the purpose of measuring accurately the angle of flexion, I use an instrument well known as the "engineer's rule," with a water-level on the lever held horizontally, and the degrees through half a circle marked off in 5° and 10°. For rough use I employ a measure fixed at 18°, which at once shows the patient how much short of the natural angle of flexion the foot may be. The measure should be taken along the outer border of the foot, as this is a tolerably straight line, whilst the arched border on the inner side renders the measure less apparent.

The contractions resulting from paralysis we are called upon to treat surgically most frequently occur in the lower

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extremities, and the great majority result from infantile paralysis, affecting either one or both legs—i.e., in the form of hemiplegia or paraplegia.

In infantile paralysis we have two distinct classes—viz., those characterised by rigidity of the muscles, and those in which the muscles are flaccid. These two classes differ widely in their pathology and clinical history, and equally therefore in their prognosis and treatment. In their medical aspect they have been fully described by my able colleague, Dr. Gowers, in the lectures delivered by him in this hospital. A few surgical points in reference to these, however, I shall here allude to. When one leg only is affected, and the foot contracted, although the awkwardness and inconvenience in walking may be considerable, I have known surgical interference to be strongly opposed on the ground that the contracted foot is a firmer support and more useful, the contraction possibly compensating for some degree of shortening, than it would be after tenotomy, and the use of a raised boot. But I believe it to be better for the patient not to be allowed to walk on the toes with a raised heel, and to have the sole of the foot brought firmly in contact with the ground by tenotomy, even if a boot raised half an inch should be required. When both legs are affected and the feet contracted the patient is totally unable either to stand or walk, and no objection is at the present time ever raised to the combination of surgical and mechanical treatment by which these patients are generally enabled to walk fairly well, although in bygone times I have known the strongest opposition to any surgical treatment raised in these cases, on the ground of the paralytic origin of the affection, and the belief that dividing tendons must still further weaken the limbs. The fact that contracted muscles are strengthened by division of their tendons was never recognised by the older surgeons, and indeed is not universally recognised at the present time; but the explanation will be obvious when I mention that by the increased length of the tendon gained by the insertion of new tendon varying from half an inch to an inch and a half, as it may be required between the divided extremities of the old tendon, movement at the joint involved—say, the ankle-joint—is at once permitted; whilst in the contracted condition of the muscles no movement at the joint could take place. The effect of the joint movement is to increase muscular development, and except in extreme cases of complete degeneration of the muscular fibres, the muscular structure always perceptibly increases in bulk. A good illustration of this fact is seen by comparing the leg of an adult born club-footed and never operated upon with the leg of an adult born club-footed who had been operated upon and well cured in childhood.

I now exhibit to you plaster-of-Paris casts of two such cases, and it will be seen that the calves in the case which had been operated upon and cured, measure two inches more in circumference than the calf of the club-footed adult who had not been operated upon. These cases are given in detail in my work on Club-foot, second edition.

CASE 13.—*Severe case of congenital talipes varus of the right foot in the adult, which had not been operated on, or otherwise treated.*—Mr. B—, aged twenty-six, a tall and very muscular man. The leg on the affected side, below knee, appeared to be very small—a withered limb, as it might be described, and the calf measured only 11½ in. in circumference, and was much higher than natural. I operated upon this gentleman on May 29th, 1854, and the deformity was cured in a little more than a year, but the movement at the ankle-joint remained very limited. The last report published was on May 29th, 1856, when improvement in every respect was maintained, and it is also stated that the calf had increased ¾ in. in circumference.

CASE 14. *Severe case of relapsed congenital varus of both feet after two operations.*—Master H. A—, aged ten years. I operated on this patient on Aug. 12th, 1852, but the measurement of the calves at that time is not stated. On Jan. 15th, 1855, nearly two years and a half after the operation, the calves are stated to have measured 10½ in. in circumference, no doubt a considerable increase since the operation. On June 6th, 1860, I had the opportunity of examining this patient again. He was then over eighteen years of age. The feet remained perfect in form, with free motion at the ankle-joints, and the calves in circumference measured 13½ in.—i.e., 2 in. more than the calf of the gentleman aged twenty-six years, who had not been operated upon. From this illustration, and many more might be given, there can be no doubt that contracted

muscles are strengthened and the muscular development increased by division of their tendons. We are not, therefore, to be deterred from dividing tendons, even in paralytic deformities, and we know that some of the most brilliant results have been obtained in cases of paraplegia, either infantile or adult, in which the patients have been unable to stand or walk for many years. In cases of severe and long-standing paralysis, however, extra care is required to obtain a strong union of the divided tendon, and sufficient without excessive elongation.

All the contractions which occur during the progress of paralytic affections towards recovery are to be treated surgically on the same general principles—viz.: (1) By the subcutaneous division of all the contracted tendons; (2) by gradual mechanical extension, in order to ensure the formation of a sufficient length of new tendon between the divided extremities of the old tendon, and at the same time guard against excessive elongation; and also to stretch the deep ligaments and other structures that cannot be divided; (3) by physiological means to promote the restoration of muscular power—viz., massage and passive movements, together with galvanism to special muscles when required; (4) by mechanical supports adapted to the requirements of the case, so that by compensating for the paralysis, more or less complete of particular muscles, or groups of muscles, the patient may be enabled to walk, a great gain to those who have been allowed to reach adult life without having walked from childhood. In reference to these different principles I have but few remarks to make in their application to the particular class of cases we are now considering.

With regard to tenotomy, in dividing the Achilles tendon we always enter the point of the knife obliquely downwards, near to the margin of the tendon, and divide from within outwards towards the skin; but in one class of paralytic deformities—viz., those with rigid muscles (“spasmodic rigidity” as it is called)—there is a special danger in this operation of a large open wound being made, instead of a subcutaneous puncture. The assistant who has charge of the foot should be aware that in these cases the anterior muscles are sometimes thrown into violent spasmodic contraction as soon as the tendon is divided, and if he does not control this violent flexion of the foot, the tenotomy knife must pass through and completely divide the skin, especially if the Achilles tendon should be prominent and thinly covered, as it generally is in these cases. Before the tendon is completely divided the assistant should begin to relax the tension, and instantaneously, as the division is completed, extend the foot and approximate the divided extremities of the tendon. In this position the foot should then be bandaged and a flexible metal splint applied. This accident happened once in my practice, when dividing the Achilles tendon in a young lady with spastic contraction, although I had especially cautioned the surgeon assisting me as to its liability in this case. Fortunately, however, the case did well. In another case a colleague of mine had the greatest difficulty in preventing it, so strong was the spasmodic action of the anterior muscles. The liability to this accident should be borne in mind. The tendo Achillis is recommended by some surgeons to be divided by passing the knife flatways between the tendon and skin, and then cutting through the tendon from behind forwards. The Edinburgh school generally adopt this method, and it has been recommended by Liston, Syme, and Sir William Fergusson; but in this method of operating the posterior tibial artery may be punctured by the point of the knife dipping too suddenly and too deeply after the tendon has given way, an accident I once saw occur in a boy twelve years of age, but the hæmorrhage was controlled by pressure, and the case did well.

After-treatment.—I need hardly remind you that within the last few months there has been a good deal of discussion as to the rate of extension after tenotomy—i.e., whether it should be immediate, rapid, or gradual. In the particular class of cases we are now speaking of—i.e., paralytic deformities—I would strongly advise you against immediate extension, or what is described as immediate reduction of the deformity. No doubt some successful cases have occurred, but I have seen many unsuccessful—i.e., cases of elongated and very feeble union, practically amounting almost to non-union, and the patients damaged for life, as excessive elongation produces the incurable condition of talipes calcaneus.

The object of gradual extension is not to elongate or stretch the new material, uniting the divided extremities of

the tendon, as is generally supposed; but to regulate the length of new material, or, as it may be called, the new tendon, whilst we have the opportunity of so doing, and the rate at which this is to be accomplished must have reference to the activity of the reparative process, and to the length of new tendon required. In the Achilles tendon this can be easily observed, and I always examine it carefully twice a week. In well-nourished infants the full length required in the divided Achilles tendon should, according to my observation, be obtained in a fortnight, if practicable; in a well-nourished leg in an adult it should be obtained in from three to four weeks; but in atrophied paralytic limbs it should not be obtained in less than from four to six weeks. The extension described as rapid—i.e., gaining the length required at intervals of a week—is more rational, the foot being put up either in a plaster-of-Paris bandage or any immovable splint, but I prefer the gradual extension by means of a Scarpa's shoe with rack-and-pinion movements, which can be regulated as required.

In contractions of the knee- and hip-joints the extension can often be made satisfactorily by means of the ordinary weight extension apparatus. With regard to the third principle of treatment—i.e., by physiological means to promote the restoration of muscular power,—there can be no doubt that the improved system of massage, now so ably taught in some schools of instruction, and by professors who have established this system upon a scientific basis, is of the utmost value; and in many cases this may be still further assisted by a well-regulated course of galvanic treatment. In reference to the fourth principle of treatment—viz., the employment of mechanical supports, so constructed as to compensate for the more or less complete paralysis of certain muscles, which in severe cases often remain as a permanent defect, there can be no doubt as to the necessity of employing such mechanical assistance, and the instruments now in use are constructed upon the most scientific principles, with various ingenious contrivances adapted to the special requirements of each case, and a variety of these appliances I now exhibit to you. There can be no doubt that by a combination of these different principles of treatment the results are now obtained in the class of paralytic deformities which were totally unknown to and not within the reach of our predecessors. Before leaving the subject of tenotomy and its results I would refer to one point which has long attracted my attention—viz., the fact that after tenotomy in cases of paralysis in which the feet are always cold and cannot be warmed by artificial means, a very marked increase of temperature rapidly follows the operation of tenotomy, and the feet remain warm.

The mother of a boy, aged twelve, upon whom I operated six weeks ago at 9 A.M.—dividing the Achilles tendon for paralytic contraction of the foot,—told me that she observed an increase of temperature the same evening; and this has been maintained. Only yesterday I operated upon the other foot, which was also paralysed and contracted, and a very marked difference in the temperature of the two feet was observable, the one about to be operated upon having remained cold. It is of common occurrence at the Orthopædic Hospital for the mother of a child which had been recently operated upon for paralytic contraction to draw attention to the fact that the child's foot became and has remained warm since the operation, whilst she had been unable to keep the foot warm by any extra clothing or other means before the operation. As to the explanation of this increase of temperature after tenotomy, it seemed to me that it might be due to a certain amount of muscular action taking place after the tendons of the contracted muscles had been divided. But Dr. Brown-Séquard, to whom I mentioned the occurrence of this event at the time he was connected with this hospital as one of the physicians, said that he believed it to be due to a direct reflex action of the spinal cord, and that a local increase of temperature probably followed all surgical operations, but it would be most observable in cases of paralysis.

In the surgical treatment of contractions occurring in cases of paralysis it is necessary to bear in mind that these are essentially of muscular origin, and are due either to active muscular contraction, or adapted shortening of an atrophic and passive character. There are no adhesions, either intra-capsular or extra-capsular, in paralytic contractions, although the deep ligaments and bands of fascia are subject to adapted structural shortening. If there is any law firmly established by long experience in the surgical

treatment of contracted joints in deformities due to paralysis it is, *never attempt to overcome muscular contraction by forcible extension.* By subcutaneous tenotomy we can at once remove all, or nearly all, the muscular contraction without the least possible risk, and gradual mechanical extension will overcome the other obstacles. I wish more especially to draw your attention to this law, as I have frequently seen cases in which serious injury has resulted from some failure to recognise the importance of it, such as fracture of the femur, or separation of the lower epiphysis in a case of knee-joint contraction; laceration of the skin when this is in an atrophic condition, as in the so-called *glossy skin* occasionally met with in cases of paralysis; a liability to dislocation of the hip &c.

In addition to the contractions and deformities chiefly affecting the lower extremities in paralytic cases which we have been considering, there are other deformities affecting the spine and the pelvis, as well as also the occasional displacement from ligamentous relaxation, and in some cases the complete dislocation of the head of the femur on the dorsum ilii. These results occur only in one class of cases—viz., the most severe form of infantile paralysis, in which both legs, both arms, and the muscles of the trunk are affected. The natural recovery in these cases is very slow, partial, and incomplete, the permanent defect remaining through life being considerable, and the complications of severe spinal curvature, pelvic tilting, and partial or complete luxation of the hip-joint seriously interfere with any advantage gained by surgical or mechanical treatment.

Clinical Lecture

ON A

CASE OF CYST OF THE PANCREAS.

Delivered at the London Hospital,

By FREDERICK TREVES, F.R.C.S.,

SURGEON TO AND LECTURER ON ANATOMY AT THE HOSPITAL.

GENTLEMEN,—I wish to draw your attention to the case of a man now lying in No. 3 operation ward, who is about to leave the hospital convalescent. The case is of interest both in so far as it illustrates the clinical features of a rare and remarkable disease and in so far as it emphasises the value of an exploratory incision in a certain form of abdominal affection. Briefly, it may be said that the man was the subject of an enormous pancreatic cyst, that the disease was not only not diagnosed, but was not even suspected before the operation, and that the patient has made a good recovery. The rarity of the affection may be illustrated by the fact that, so far as I can discover, a record of no similar case is to be found in the surgical registers of the hospital, and, so far as I know, no other operation upon a cyst of the pancreas has been performed in this country.¹

The patient, a railway foreman, aged forty, was admitted into the hospital on July 11th, 1888.² He had been previously under the care of Dr. John Cotman, and had been seen also by my colleague, Dr. Stephen Mackenzie. He was a well-developed, vigorous, and muscular man, leading a healthy and very active life. He was stout, but not coarse, and had always had exceptionally good health. There was nothing worthy of note in either his family or his personal history. Seven or eight months ago he noticed a throbbing sensation in the region of the umbilicus, which was perceptible only when he lay upon the abdomen, which ceased when he altered his position, and which gave him neither trouble nor anxiety. A little later than this he noticed that he became tired sooner than usual, and had now and then a dragging pain which started from the right testicle and spread into the abdomen. He continued with his work until within five weeks of his admission. He then sought Dr. Cotman's advice on account of vague pains about the abdomen. These pains were never severe, were

¹ This statement is modified in the concluding paragraphs of this lecture.

² The publication of this lecture has been deferred until the final state of the patient could be reported on.