THE RADICAL TREATMENT
OF
SEVERE TALIPES EQUINO-VARUS IN
CHILDREN.

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HOWEVER keenly some of the views set forth in the following paper may be traversed, this statement, I think, will be allowed to pass unchallenged, that the old-fashioned or orthodox treatment of severe club-foot by subcutaneous tenotomy and the subsequent use of Scarpa's shoe, left much to be desired. For my own part I am prepared to admit that I found it entirely unsatisfactory in dealing with congenital talipes in hospital out-patient departments, and tedious, and oftentimes disappointing, in practice in the wards.

An important feature in the orthodox treatment of club-foot consisted in the subcutaneous division of the tendon of Achilles last of all. Thus, in the most recent edition of Erichsen's 'Surgery'—to which book the surgeon naturally refers when in search of authority—we read as follows :—"After these [the tendons of tibialis anticus

and posticus] have been cut across, the tendo Achillis should be divided ; but it is better in all cases to delay this for some weeks, as it steadies the foot and thus facilitates the correction of the lateral displacement." But even after the Achilles tendon had eventually been divided, so much force had to be brought to bear upon the foot that the child was apt to suffer severely, and if the surgeon, or the dresser or nurse, persisted in its energetic employment, it was at the risk of producing an excoriation or even a slough upon the instep. Thus, treatment was apt to become intermittent, and progress slow and painful. Moreover, operative interference under chloroform was likely to be required time after time, and the surgeon rarely knew when the case was perfectly cured and safe from relapse.

One element in the production of this unsatisfactory state of affairs is the unreasonable prejudice which so widely existed against getting to work at the earliest possible moment upon a congenital club-foot. So the child was allowed to drift on ; the tarsal bones becoming more misshapen, the fibrous structures more resisting, and the deformity more intractable.

Professor Sayre has done more than any one else to check this *laissez aller* practice, by insisting, in his own peculiar manner, that the treatment of the deformity should be delayed for no longer a period than is needed for the aforementioned attendant to wash his hands and the monthly nurse the child.

I do not think that my experience in connection with the old-fashioned treatment of congenital club-foot has been in any way peculiar, but I must honestly admit that, after operating on a child and giving him much attention in the wards, and after supplying the parents with careful instruction as to subsequent procedures, I was very apt to find that child, some months later, an unwelcome applicant for further treatment. Indeed, I am sure that my experience cannot have been peculiar, for many children who have been under the care of other surgeons,

and who have been submitted to the orthodox operative measures, have, under the guidance of blind chance, found their way to me for supplemental help. I have little doubt, moreover, that failures of my own under the old treatment have sought orthopædic salvation in other hands.

I think it far less likely, however, but still not impossible, that many children on whose congenital club-feet I have operated after Phelps's open and radical method have gone elsewhere for advice. For, after the operation has been once effectually performed, the occurrence of inversion is improbable, even though some further drawing up of the heel may take place, for the operation has less control over the position of the heel than of the anterior segment of the foot—less beneficial influence over the equinus than over the varus. (The vertical scar upon the inner border of the foot shows that the open operation has been resorted to.)

That which I have called the orthodox treatment of club-foot (as opposed to the radical method) was based upon the theory that it was inexpedient, if not dangerous, to divide a shortened tendon or band of fascia, except by means of a slender blade introduced through the smallest possible opening in the skin. But in these days of surgical cleanliness the operator prefers to know exactly what he is dividing: to have his eye or his finger always in advance of his knife. He has less dread of incising the skin than the surgeon of the past generation had of even pricking it.

However vigorously the knife may have been used in the anatomical darkness of a subcutaneous operation, the complete effacement of the deformity is effectually hindered by the skin, which is not only thick and resisting, but is closely connected with the subjacent plantar fascia. An essential feature in Phelps's operation is that the skin is freely incised, so that on the completion of the operation nothing whatever is left to oppose the complete effacement of the deformity.

Preparation.—It is hardly necessary to insist that at the time of the operation the patient should be in the best possible health; and for this purpose he may be kept under observation for a few days before operating. The day before the operation the foot is well soaked and washed. And on the morning of operation it is again washed in soap and water, and then with a 1 in 2000 solution of perchloride of mercury. After this, and till the surgeon is ready, the foot is kept enclosed in wet antiseptic cloths.

No Esmarch's band or other form of tourniquet is used. Each bleeding point is seized by the catch-forceps as it attracts attention, but, as a matter of fact, the amount of bleeding is far less than might have been expected. Perhaps one or two small vessels may require temporary pinching with the self-holding forceps, but it is quite exceptional for more than one of them to need a ligature.

The *instruments* required are a tenotomy knife for the tendon of Achilles, a medium-sized scalpel, a pair of dissecting forceps, a few pairs of catch-forceps, a pair of scissors, and a steel director. No specially designed knife is needed.

The operation.—An anæsthetic having been administered, the foot is uncovered, and the amount of resistance and deformity is estimated by forcible manipulation. The tendon of Achilles is then divided subcutaneously, the foot being flexed to the utmost and brought into the best possible position.

For many years, and quite independently of Phelps's innovation, I have been in the habit of beginning all operations for equino-varus by the division of the heel-tendon. The influence of this tendon is by no means confined to the elevation of the heel; having contracted, as it were, to the utmost in drawing up the heel, the tendon obtains a still further shortening by rotating the os calcis inwards on its antero-posterior axis. Thus, its division reduces, and in some slight cases actually effaces

each element of the congenital deformity. Such cases, however, do not enter into the class of those for which I am advocating the adoption of Phelps's operation, as they may be efficiently dealt with by the far simpler procedure. But I would like to insist on this, that in all cases of equino-varus, whether the surgeon contemplates the adoption of the subcutaneous or the open operation, he begin by dividing the Achilles tendon. After this tenotomy, the foot should be flexed with great force to a right angle, when, if a considerable amount of deformity still persist, the radical operation may be proceeded with, unless, indeed, a milder course of treatment appears to offer an equally favorable result.

The next step in the operation consists in making a free vertical incision from dorsum to sole of foot, between the tip of the internal malleolus and the tuberosity of the scaphoid. This passes across the head of the astragalus, and the top of the incision brings into view the internal saphenous vein and the tendon of the tibialis anticus. The vein is generally sacrificed, and, the foot being straightened out, the section of the tibialis anticus tendon affords considerable mechanical relief. Attention being then given to the lower part of the incision, the plantar fascia—comparatively thin as it covers the abductor hallucis—is divided, and probably a good deal of that muscle. The strong piece of the fascia over the flexor brevis digitorum is cut, and, in an extreme case, some of the short flexor itself. The tendon of the tibialis posticus is next sought in the depths of the wound, and, on its division—the foot being still further straightened out—the tendon of the flexor longus digitorum, which lies close to its outer side, may invite section. At about this period of the operation the anterior part of the internal lateral ligament may be dealt with. It is an element of the highest importance in keeping up the cramped position of the inner border of the foot, running, as it does, from the front of the internal malleolus—over the head of the astragalus—to the scaphoid bone. The old-

fashioned, subcutaneous operation entirely failed to cope with this difficulty.

After the front of the deltoid ligament has been freely traversed by the scalpel, and, by the help of more forcible manipulation, the foot has been further straightened out, the scaphoid must needs be pulled forwards from the astragalus, the astragalo-scaphoid joint being left wide open. Placing the end of the finger into this joint, the surgeon may distinctly feel the fibres of the inferior calcaneo-scaphoid ligament maintaining some deformity. When these have been divided, some of the inner fibres of the calcaneo-cuboid ligaments may be found to want a touch of the scalpel. In short, every structure must be cut, which prevents the full and unobstructed straightening of the foot.

When the bleeding has been controlled—and it is usually quite insignificant—the wound and the foot are washed over with a warm mercuric solution (1 in 4000), the yawning incision is gently stuffed, and the foot is enveloped with mercuric gauze, and the foot and ankle and the lower part of the leg are enclosed in a flannel bandage. Two lateral splints of common house-flannel are then soaked in creamy plaster of Paris, and are firmly and evenly applied under a gauze bandage. During their application and hardening the foot is held in the over-corrected position, good heed being given that the plaster casing is not dented in by any uneven pressure of thumb or fingers. The toes are left uncovered for inspection, so that early information of obstructed circulation may be obtained.

I confess that in some of my earliest operations I was apprehensive lest the anterior segment of the foot might show signs of threatening gangrene, not only because of its being rigidly confined in the gypsum casing, but because of the depth of the wound which traversed the tissues from dorsum to sole. Practice, however, has shown such fears to be groundless. The casing, though rigid, is not actually tight, and although the internal

plantar artery may perhaps be cut in the operation, the dorsalis pedis and the external plantar artery, which are of far greater anatomical importance, run no chance of being injured. But small though the internal plantar artery is, it may often be recognised in the progress of the operation and avoided. The child suffers but little distress after the operation, and on one occasion only did a house surgeon deem it advisable to remove the dressings to examine the foot. In that particular instance the toes had become blue and cold ; but a fresh casing was at once applied, and everything went well. As a rule, the first dressing is done at the end of ten days or a fortnight. The casing is opened out, the bandages are cut up, and the mercuric gauze, already loosened by a little aseptic discharge, is lifted out of the wound, the surface and depths of which are thickly covered with healthy granulations. The foot is then washed and lightly dressed as before, and again secured in plaster of Paris. In six or seven weeks, or a little more, the wound is completely healed, and the treatment by manipulation and massage is entered upon.

We all know how carelessly or imperfectly instructions as regards manipulation and massage are carried out by parents when a child is under their unsupervised control ; it is a severe and crucial test for the value of this radical operation that when the child is brought for inspection at the end of some weeks, or even months, the foot is found in a very excellent position. If it still shows more inversion than is desirable, it is at once seen that this defect can be corrected with the least possible application of force. Time after time I have asked the sister or nurse of a ward if the child seemed to suffer from the position in which the foot is left ; and the answers which I have received have left me well assured that the change of position causes little or no distress, for the simple reason that it is kept up without any force or strain. There is no strain because every resisting band has been severed.

The deep wound which the operation leaves upon the inner aspect and in the sole of the foot at the mid-tarsal joint soon fills up with granulation tissue, which in due course becomes converted into firm scar tissue. The subsequent contraction of this new material is rarely strong enough to reproduce or to perpetuate the inversion of the foot. It does prove sufficient, however, firmly to weld the anterior with the posterior segment of the foot, and to render the corrected foot serviceable for flat standing and for progression. The sooner that the patient can be got to stand upon the flattened foot—the wound, of course, being healed—the less is the risk of even a slight amount of inversion recurring. In the progress of cicatrisation a firm fibrous splice is inserted in each one of the divided tendons and ligaments; and I apprehend that the widened space between the astragalus and scaphoid is filled in with the same material. Probably it is the interposition of this thick medium between the two segments of the foot which renders the parts so strong and trustworthy when all is healed.

In one very severe case of equino-varus, when almost every structure which one expects to encounter in the radical operation had been divided, and the foot still resisted easy adjustment in the correct form, I found that the impediment came from the tendon of the peroneus longus. Having exposed this in the depths of the sole, and having divided it, the foot at once came easily into position.

I confess that if a candidate at examination told me that the tendon of the peroneus longus was one of the structures needing division in the operation for the cure of talipes equino-varus, I should be inclined to think that his statement was based either upon a misapprehension or upon ignorance. But, as a matter of fact, this tendon may have a great deal to do with the perpetuation of the congenital deformity:—when a foot has long been cramped with an inverted sole, an elevated heel, and a contracted internal border, this tendon may

very likely be found at fault. And the greater the previous elevation of the heel the greater may be the need, after dividing the tendon of Achilles and flexing the foot, of severing the tendon of the peroneus longus. The peroneus longus is an important extensor of the foot, and when, after Achilles-tenotomy, the deformed foot is forcibly flexed, the peroneal tendon is tightened up, and is holding the base of the first metatarsal bone as closely as it can towards the heel. In other words, it is dragging the scaphoid against the head of the astragalus. And as it is the surgeon's object in performing the open operation to insert a thick wedge of space between the astragalus and the scaphoid, and to be able to maintain that space without the exertion of any considerable force, the tendon of the peroneus longus may need to be sacrificed.

I have not directed attention to this anatomical detail with the idea of suggesting that in the performance of the open operation the surgeon must expect to be called upon to divide this particular tendon, but rather with the view of emphasising two statements: first, that a surgeon cannot expect to deal effectually by a subcutaneous operation with every resisting structure in the depths of the sole; and, secondly, that he must be prepared to sever, in his open wound, every structure which he finds offering obstruction to the perfect and easy correction of the deformity.

An important element in the open method, and one to which Phelps strongly refers, is the need of "over-correcting" the deformity, if I may once more be allowed that expression. In the old operation the surgeon was content to lay down his tenotomy knife when, by the employment of a fair amount of force, he could bring the foot into a good position. He was content to leave a certain portion of the deformity to be effaced by the subsequent employment of Scarpa's shoe, or of some other retentive apparatus. But now, after operating according to Phelps's method, he fixes the foot in a gypsum casing, a good deal in the position of valgus, if not of calcaneo-valgus. As

a sailor might say, he gets "well to wind'ard" of the original defect.

In the paper which he read before the Berlin meeting of the International Congress, Phelps wrote that he had never found it necessary to resort to the open incision in children under one year of age. Had he postulated that the operation is not suited for infants, I would, in that one particular only, have joined issue with him. In suggesting the field of usefulness of an operation the age of a patient is without value as a definite landmark. Age is a purely relative term, and I fail to see why an operation which is good for a boy of eight years is unsuitable for one of eight months. Indeed, I have operated on an infant of eight months after this radical method, and with the most satisfactory results. This particular child was born with talipes equino-varus, in the private practice of a former house surgeon at the Children's Hospital, Dr. Bays, who had corrected much of the deformity by Achilles-tenotomy. He was familiar with the open method of treatment, and he called me in simply that the remaining deformity of this sturdy infant might be effectually dealt with once and for all.

Granting that the principle of the operation is good, I fail to see how the tender age of a child with congenital club-foot can of itself be a barrier against its adoption. What the surgeon desires is to correct the deformity at the earliest possible moment, with the least possible distress to the child, and with the greatest possible chance of shutting out the risk of relapse. For my own part, I have no "age limit," but I trust that it is superfluous for me to insist that I would not advise the open operation in a case which gave a fair prospect of yielding readily to simple subcutaneous tenotomy, with adjustments and massage; especially (as more frequently happens in private practice) when the child can be kept under the prolonged supervision of the operating surgeon, and under the well-directed manipulations of intelligent nurses or parents.

In one very severe case of relapsed equino-varus, after dividing all those fibrous structures which chiefly opposed the desired position of the foot, I deemed it expedient to complete the treatment by the open method by removing the astragalus. But the necessity of resorting to a tarsectomy in conjunction with the open operation, at any rate in the case of children, must be very rare. In a certain number of his cases Phelps has completed the open operation by dividing the neck of the astragalus, and in a smaller proportion he has gone a step farther, and has removed a wedge from the outer side of the os calcis. Of these modifications I have at present no personal experience, but I do not think that section of the neck of the astragalus can give much advantage over the insertion of a thick wedge of space into the astragaloscaphoid joint. And if one is too ready to excise a piece of the os calcis there will be a risk of obtaining an improved position of the foot by the shortening of its outer border, rather than by the lengthening of the inner border. Still, I would not for a moment suggest that the open operation is never to be supplemented by a tarsectomy. Indeed, I think otherwise. But in the case of children, to which class of patients these practical observations are confined, the simple but thoroughly free incision on the inner side of the foot will usually be found to be sufficient. And if the results of treatment by lengthening the inner border of the foot can eventually be shown to be equal to those following the removal of a wedge of bone from the outer border, preference may be claimed for the simpler method.

Kirrmisson records a case in the '*Journal de Médecine*' (January, 1890), which he successfully treated by Phelps's operation, in which relapse had occurred after the performance of Lund's operation of removal of the astragalus. This I can well understand, for even after the removal of this bone the inversion of the foot in an extreme case is by no means effectually dealt with, unless at the same time the front of the deltoid ligament and the adjacent

tendons are also severed. And I am entirely in agreement with Kirrnisson when he says that the thorough and open method of Phelps will probably render the removal of the astragalus, and tarsectomies in general, very exceptional procedures in the treatment of club-foot. Indeed, Phelps himself at the Berlin Congress insisted that osteotomy should never be resorted to as a primary operation. On the same occasion he also remarked that in none of the cases in which he had operated had a sensitive scar, a flat foot, or a local paralysis detracted from the usefulness of his treatment. And in a private note Dr. Phelps recently informed me that he had then performed the operation 200 times without a death.

So far as my own experience with the radical or open treatment goes (and I have practised it in a considerable number of severe cases of equino-varus during the last few years), I have every reason to speak well of it; and it is with the hope of bringing it into more general notice, as well as of learning the views which other surgeons hold concerning it, that I have ventured to bring the subject before this Society.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. v, p. 26.)