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Contributors

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SECTION OF THE TARSAL LIGAMENTS

IN

CONGENITAL CLUB-FOOT.

By ROBERT WILLIAM PARKER,

Surgeon to the East London Hospital for Children, and to the Grosvenor Hospital for Women and Children.

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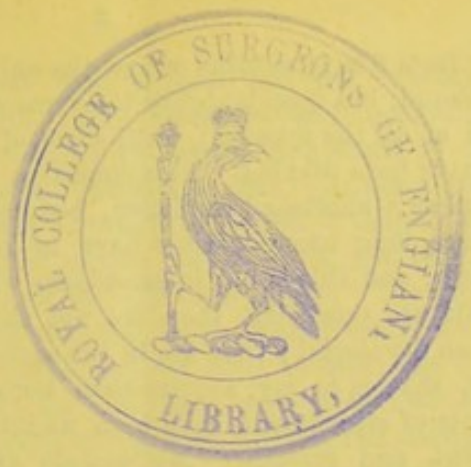


CONGENITAL CLUB-FOOT.

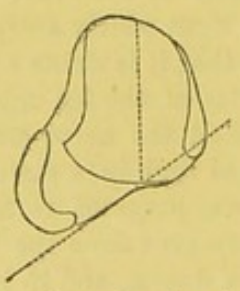
The part played by the Tarsal Ligaments in maintaining the Deformity; and the value of their Subcutaneous Section in its Cure.

For some years past, I have been much occupied in the study of the anatomical conditions existing in congenital club-foot, and, in conjunction with my friend Mr. Shattock, I contributed to the Pathological Society a paper on the subject, which appeared in the *Transactions* of that Society for the year 1884. I may very briefly say of that paper, that it was commenced without reference to the conclusions at which Mr. Shattock and I both arrived, long before we had finished it. When we commenced the study of club-foot, we were both dominated by what, I believe, is the most widely accepted doctrine as to its mode of causation; namely, that it is either a paralysis or a spasmodic contraction of certain muscles of the leg acting upon the foot. Neither of us was prepared to find the nerve-centres, the nerve-trunks, and the muscles of the afflicted limb in a state of absolute histological integrity; neither of us was prepared to find that, after all the soft parts had been entirely removed from the limb, the deformity would persist in just as marked a degree, and in just as intractable a form, as previously to the dissection. Yet such was the case. My object in this paper is not to merely repeat the substance of what I said at the Pathological Society, but rather to advocate the practical lessons which, I venture to think, this anatomical condition imposes on all who are concerned with the treatment of club-foot.

Brief Abstract of the Anatomy of Congenital Club-Foot.—In a not inconsiderable number of cases of club-foot, which I have had the opportunity of dissecting during the past four or five years, mostly still-born children at term, but including also three cases in children

ranging from 6 to 18 months of age, the only constant condition, which I have found, has been inability to overcome the deformity (even after removal of all the muscles), until some of the ankle and tarsal ligaments have been divided. This condition of ligaments can hardly be described as a shortened condition, because such a term would imply that, once long enough, they have in some way or other become shortened; and this is not in accordance with the actual facts. These ligaments are short, but they are not shortened; they are as they have been developed; they are in the same condition as certain of the muscles, that is to say, shorter than normal, owing to the fact that the points of attachment have been unduly approximated during development and growth. Microscopic examination of the muscles shows them to be histologically normal in all respects in early infancy; the nerve-trunks also, and the spinal cord, show a healthy structure; the full supply of normal ganglionic cells was particularly striking in the lumbar enlargement of the spinal cord in the cases examined, and shown at the Pathological Society.

As regards the bones of the tarsus, I may say that, although an exaggerated inclination inwards and forwards of the neck of the astragalus was found in the great majority of cases, yet this condition was not constant; that in one well marked case the inclination inwards was much below the average amount found in the infantile normal astragalus, a fact which demonstrates that this conformation of the astragalus is not only not the essential element of the deformity, but also that it is not even a necessary part of it. The average amount of this obliquity in club-foot is 49°, while the maximum has reached as high as 64° in my own cases. Some authors have even described the neck of the astragalus as pointing directly inwards. The average normal obliquity amounts to 38°. In one case of talipes, it amounted to only 31°. A comparison between the human talipedic astragalus, and that of the ourang-outang, shows how nearly the former approximates the latter.



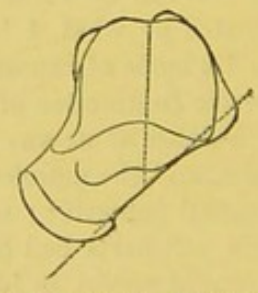


Fig. 1.—Talipedic astragalus from child, aged 18 months. Natural size. Obliquity of neck, = 53°.

Fig. 2.—Astragalus from ourang-outang. Reduced one-third. Obliquity of neck, = 45°.

This peculiar conformation of the astragalus appears to be associated with the great power of inversion which the fœtal and infantile foot enjoy; a movement which, in the anthropoid apes, is one of the characteristics of the *pes* throughout life; it is as little pathognomonic of the condition of talipes in the one as in the other. The calcaneum likewise presents a slight incurvation; that is to say, the outer margin

of the bone is more convex than normal, and the cuboid surface, instead of looking forwards, looks forwards and inwards. This incurvation is probably produced by the traction made on the bone through the external calcaneo-cuboid ligament. In congenital club-foot, all the constituent bones are slightly altered in shape; they present, when seen in horizontal section, as in Fig. 3, a slight incurvation; in severe cases, this may be very accentuated. The importance of taking cases of congenital club-foot in hand very early, before ossification of the bones has occurred or had time to complete itself, becomes abundantly manifest; for the bones, once fairly ossified in this incurved condition, will oppose themselves, with all the strength of an arch, to rectification, which will then become exceedingly difficult, not to say impossible.

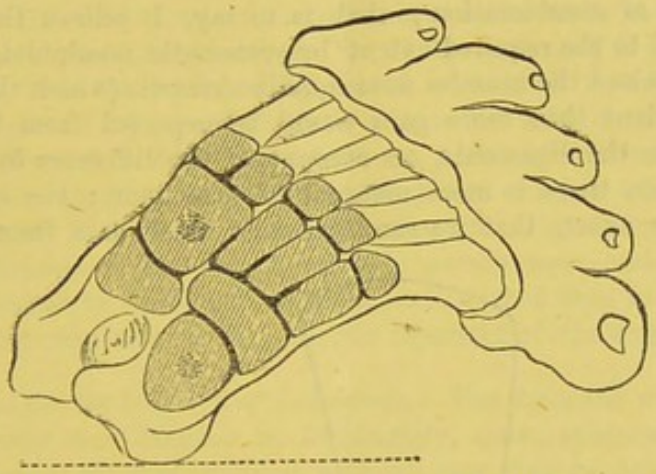


Fig. 3.—Horizontal section through talipedic foot. Reduced one-third.

As regards the ligaments structurally, I have not found any changes at all. The condition, which is abnormal in them, is again purely anatomical, and consists in an altered and abnormal mode of attachment. Talipes, in the great majority of cases, is a deformity only because it is a fixed position; it is a physiological position at one or other period of fœtal life; it has become pathological, owing to the fact that the assumption by the foot of the other (physiological) positions, which are necessary for the due development of all the parts concerned in the production of these movements, has been interfered with.

These anatomical details will strike other surgeons than myself, and their bearing on treatment will hardly need emphasising at my hands.

Subcutaneous Division of Ligaments as a means of Treatment.—I am not going to enter into the details of the treatment usually applied to talipes; as is well known, this treatment is partly operative and partly mechanical, the latter monopolising the greater share. I wish rather to advert to what I consider the insufficiency of this treatment, and to propose the adoption of such further measures as the knowledge of the foregoing anatomical considerations naturally suggests. The ligaments chiefly at fault are those placed on the inner border of the

deformed foot, namely, the anterior portion of the internal lateral ligament of the ankle, the astragalo-scaphoid, and the calcaneo-scaphoid ligaments, all three being blended into one indistinguishable capsule of great strength (spoken of in this paper as the "astragalo-scaphoid capsule"); in a less degree, the capsular ligaments between the scaphoid and the internal cuneiform bone, and between the latter and the first metatarsal bone, are at fault. In the severest cases—those which have relapsed, and have been walked upon—in which the patient walks upon the dorsum pedis, and in whom the outer edge of the foot is greatly inverted, the long and short (calcaneo-cuboid) plantar ligaments will be found short. Hence it follows that tenotomy leaves the major part of the anatomical conditions unaltered. With the exception of the calf-muscles, represented by the tendo Achillis, I believe, in the majority of cases, that the muscles of the leg may be left out of consideration; that is to say, I believe they may be elongated to the required extent by systematic manipulation. If the ligaments and the muscles were equally extensile (which they are not), it is evident that more gain would be expected from the muscles than from the ligaments, on account of the difference in length; in the former, there is more material to gain upon; the latter are so extremely short, that we cannot expect much gain from stretching

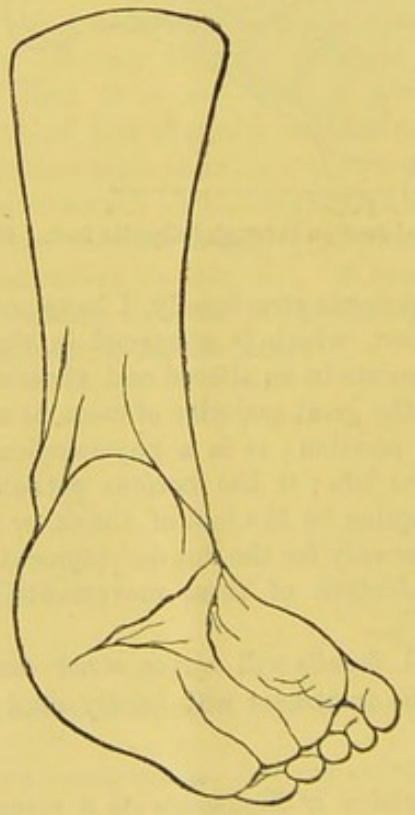


Fig. 4.—The sole of a talipedic foot. The transverse line in front of the heel corresponds to the chief ligamentous attachments.

them; moreover, an unyielding nature is one of the characteristics of ligamentous structures. For these reasons, therefore, I would urge subcutaneous division of the tarsal ligaments, whenever the short condition of these structures prevents the unfolding and rectification of

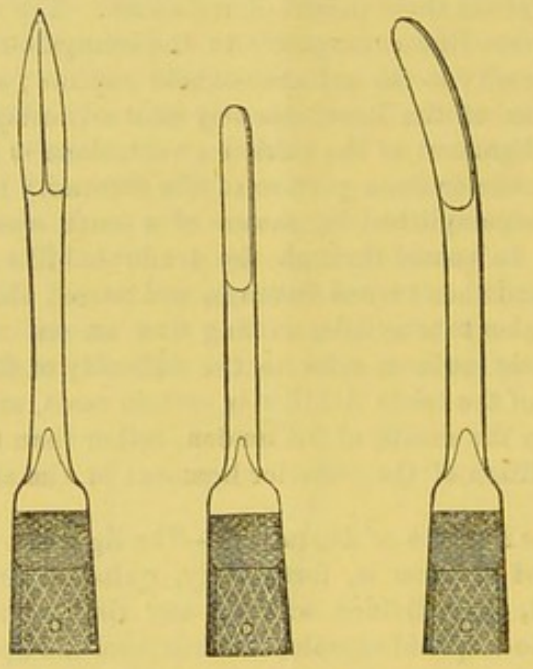
club-foot. I have practised the method a good many times during the past three or four years, and with uniformly satisfactory results. The time necessary to the rectification of a severe case of talipes is materially shortened, the chances of relapse are lessened, and the treatment of this congenital deformity is placed on a sound anatomical basis.

The adjoining woodcut (Fig. 4.) is taken from a plaster cast of a foot, on which I operated as just described, about twelve months ago. The transverse line in front of the heel indicates very well the position occupied by the ligaments above alluded to, or rather the points at which they exercise their power of resistance. The inner extremity of the transverse line corresponds to the astragalo-scaphoid capsule, the outer extremity to the calcaneo-cuboid capsule; and it is in this line that section of the ligaments may most advantageously be made The posterior ligament of the ankle may occasionally require dividing in cases where the equinus portion of the deformity is much marked. This is best accomplished by means of a small spear-headed knife, which should be passed through the tendo Achillis in the direction of its fibres, and then turned flatways, and passed through the posterior ligament about its middle, cutting first on one side and then on the other. Most authors refer to the difficulty of flexing the ankle after division of the tendo Achillis in certain cases, and attribute this to adhesions in the sheath of the tendon, rather than to its true cause, the short condition of the posterior ligament of the ankle.

Rules for the Division of Ligaments.—The ligament which will most frequently need division is, fortunately, quite subcutaneous, can be easily reached, and divided without any risk to other structures. The "astragalo-scaphoid capsule" extends from the tip and sides of the internal malleolus across the astragalo-scaphoid articulation, on to the internal cuneiform bone, and loses itself in a fibrous expansion, blending with other ligaments on the fore part of the inner border of the foot. The extent and direction of the fibres which chiefly oppose rectification of the foot can be felt with the finger-tip, when traction is made on the inverted foot. A curved tenotome should be entered immediately in front of the anterior border of the internal malleolus, the blade as far as possible being kept between the ligaments to be divided and the superjacent skin. In the next stage of the operation, the blade is to be turned against the surface of the ligament, and, by means of a gentle sawing motion, is made to divide it. As the superficial fibres are divided, deeper ones come into play, and must in their turn be divided until bone is reached. By keeping the knife close to the bones, and directing its point towards the plantar aspect, the calcaneo-scaphoid ligament, which forms an important part of the capsule in these cases, can be easily divided. In this operation, the tendon of the posterior tibial muscle will almost certainly be divided, and not improbably that also of the anterior tibial muscle. The long and short plantar (calcaneo-cuboid) ligaments can most effectually be reached just where they pass between the two bones. A straight tenotome must be entered as nearly as possible over the calcaneo-cuboid articulation on the outer edge of the foot. If there be much inversion,

this point will appear to be on the sole of the foot. The blade must be kept close to the bone, and be made to follow the direction which this articulation takes. In this manner, the two ligaments, mostly blended together at this point, will be divided simultaneously.

I append the forms of tenotome which I have found most useful in children. They differ from those in ordinary use, chiefly in the fact that the stem is longer and the cutting blade shorter. They were made for me by Mayer and Meltzer; the drawings have accidentally been made quite one-third larger than the knives themselves.



Figs. 5, 6, and 7.—Tenotomes; these sizes must be considerably reduced for infants.

The success of all such operations depends on the smallness of the external incision; that is, on their being subcutaneous. I therefore prefer a short cutting blade, as I think the danger of enlarging the external wound is lessened thereby. If it be intended to divide several structures at the same sitting, I should recommend an anæsthetic to be given, and that an Esmarch's bandage be applied. In this manner, all undue hæmorrhage is prevented. I would just add that general rigidity of the foot is a means of gauging the extent to which the ligaments, being affected, need division. This rigidity depends partly on their unyielding nature, and partly on their shortness. Even in contracted muscles, there is always more or less elasticity, dependent, among other things, on their length. The subsequent treatment of these cases is simple enough. My practice is to rectify the foot as much as possible, and to apply a plaster-of-Paris bandage. I leave this first dressing undisturbed for a week or a fortnight, in order that healing of the cutaneous wound may complete itself. After this period, manipulations, etc., may be commenced. I shall not enter into these well known details; each case must, of course, be treated in relation to its special requirements.

It must not be supposed that syndesmotomy (section of the ligaments) is necessary in all cases; or that this operation alone will cure club-foot, any more than tenotomy cures it. Moreover, there will always be a residuum of cases for which neither the one nor the other operation will suffice, and in which tarsectomy, in some form, may have to be entertained. But the subcutaneous, or even the open, division (for the skin itself is often no mean factor in resisting rectification of the foot), in suitable cases, of the strong unyielding ligamentous structures which I have shown by dissection to be constantly implicated in this deformity, will, I venture to think, not only secure a better result, but lessen the tendency to relapse, and reduce the length of time necessary to effect a cure.

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