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ON PALSY OF THE INTEROSSEI IN TALIPES ARCUATUS OR PES CAVUS,

WITH A NOTE ON A CONGENITAL DEFORMITY OF THE MUSCLES OF THE HAMS.

BY E. MUIRHEAD LITTLE, F.R.C.S. ENG.

IT is generally held by neurologists that the peculiar claw-like deformity of the foot in which the first or proximal phalanges are extended and the second and third flexed is due to paralysis of the interossei and lumbricales, and sometimes of short flexors also.

Thus, Duchenne described the deformity, and attributed it to this cause, and Gowers (*Diseases of the Nervous System*, 3d edition, 1899) says: "If (the interossei and analogous muscles) are paralyzed the first phalanges are over-extended, sometimes even subluxated, and the two other joints are flexed, so that a claw-like form of the foot is the result. Without multiplying instances we may assume that the above represents the opinion of most neurologists. Orthopedists, on the other hand, are not agreed as to the influence and importance of the interossei.

Shaffer, in his paper on "Non-deforming Club-foot," published in the *New York Medical Record*, in 1885, describes the deformity, but does not refer it to palsy of the interossei.

F. R. Fisher, in his papers on "Paralytic Deformity of the Foot" (*Lancet*, 19, 1, 89, etc.), while he describes the claw-like deformity of the toes, does not mention the interossei.

Golding Bird (*Guy's Hospital Reports*, vol. xiii.) denies that paralysis of the interossei is the cause of the deformity.

Walsham and Hughes (*Deformities of the Foot*) write that in some cases of talipes cavus with clawed toes the interossei were reported to react, and in others not to react, to faradism or galvanism.

They figure a case of "Paralytic Talipes Equinus" (p. 263), with marked clawing, in which well-developed interossei were found on dissection.

Tubly suspends judgment until wasting and degeneration of these muscles can be proved by dissection (*Deformities*, 1896).

Bradford and Lovett (*Orthopedic Surgery*, 1890) say: "The origin of the affection (third form of pes cavus) is in a paralysis of the interossei and lumbricoid muscles and of those muscles which are inserted into the sesamoid bones of the great toe."

In the last edition of Hoffa's *Lehrbuch der Orthopädiochen Chirurgie* (1898) I cannot find any reference to palsy of the interossei.

Enough has been said to show that orthopedists are by no means agreed on this subject. Perhaps the reason is that palsy of these muscles has not an immediately obvious result such as follows palsy of the tibialis anticus, and in the adolescent and adult it is not easily detected, because the lateral movements of the toes affected normally by the interossei are lost in the majority of boot-wearing folks from disuse after comparatively few years.

Young children, however, generally possess the power of separating the toes, as babies may often be seen to do on their nurses' laps or sitting on the floor, and it is surprising that few or no observations bearing on this point have been recorded in cases of deformity.

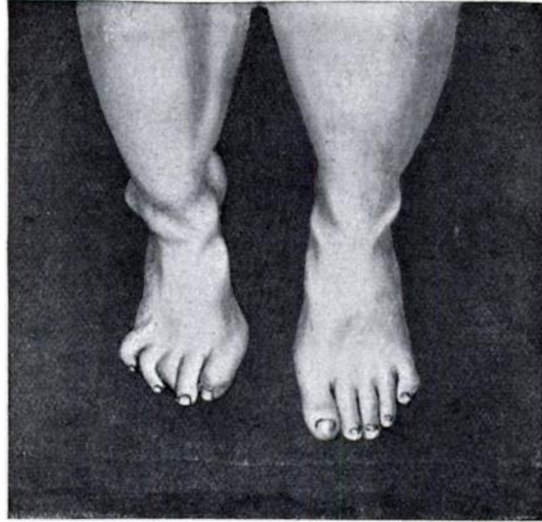
The following brief notes of a case which came under my care in 1897, show, I venture to think, very clearly the existence and the effect of palsy of the interossei in a case of pure talipes arcuatus or cavus:

W. B., male, aged eleven years, was admitted to the National Orthopedic Hospital as a case of hammer toes. Family and previous history were negative.

His right foot presents the following peculiarities. The arch is markedly higher than in the left foot. The toes are clawed—*i. e.*, the first phalanges extended, while the second and third are flexed. The extensor tendons appear to be contracted. When he stands upon the foot the ankles are both inclined to yield inward—ankle valgus or in-ankle. The position of the toes of both feet, when at rest, is shown in the accompanying photograph (Fig. 1). He has perfect

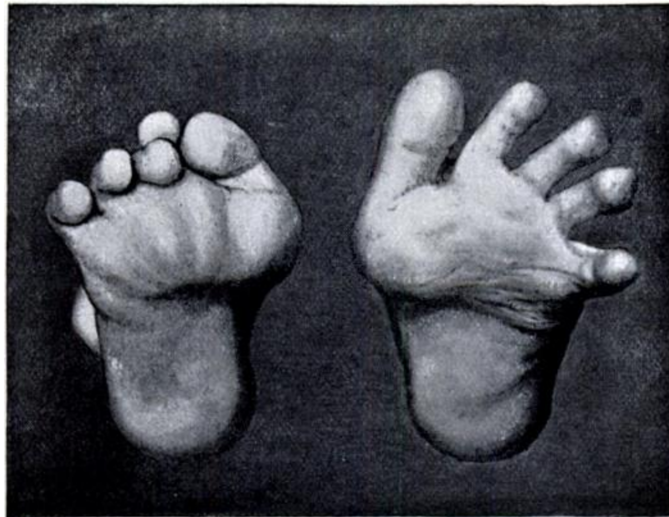
control over the movements of the ankle. The knee-jerk is normal. There is no anæsthesia. When the boy, who is a bright, intelligent

Fig. 1.



Palsy of interossei.

Fig. 2.



Palsy of interossei.

lad, is told to separate his toes he does so as regards the left foot, with great vigor, the four outer toes being strongly abducted. The right toes present a marked contrast. Beyond some increased extension all his efforts to separate them produce no result. Fig. 2, from a photograph taken during a strenuous attempt to separate the toes, shows the contrast between the two feet. It will be noted that all four toes are *ab*ducted, implying contraction of the dorsal interossei and of the abductor minimi digiti. The three plantar and the first dorsal interossei also act briskly and bring the toes back into the position of rest. The boy has apparently already lost the power of lateral movement of the great toe from the use of boots, and, therefore, separation of the toes can only be effected by abduction. The associated action of the dorsal and plantar interossei may be plainly seen in the hand when all the fingers together are abducted or adducted.

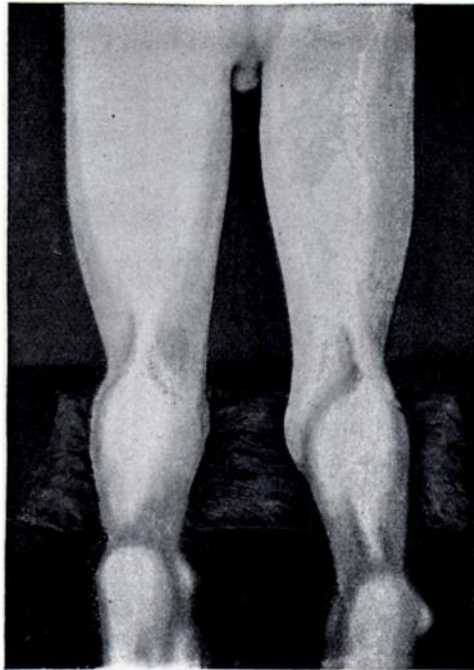
In this case the absence of lateral movement on the deformed side and its presence on the other, together with the absence of palsy of the long muscles, justifies the conclusion that there is palsy of the interossei, very probably accompanied by palsy of some of the other short muscles of the sole of the foot.

Since then I have frequently observed a similar condition in children suffering from paralytic talipes arcuatus of one side. Some children, however, lose the power of lateral movement from disuse early, and, therefore, it is not safe to diagnosticate palsy of interossei, from the fact that the power of separation is absent in one foot, unless it is present in the other.

That all cases of so-called clawed toes are necessarily cases of palsy of interossei cannot be asserted in the face of such cases as the one a dissection of which is represented by Walsham and Hughes (*op. cit.*, p. 263); but there are two forms included by orthopedists, at least, under this term—the true claw, such as in the case of W. B., in which the second and third phalanges are both flexed, as described by Gowers, and the other in which the third phalanx is markedly hyperextended, as in ordinary hammer-toe (in which the flexor tendons are adaptively shortened without paralysis of any muscle). This form of clawed toe occurs in talipes equinus from paralysis of the tibialis anticus, and may well be produced by the attempt of the

elongated and weakened extensors to perform the function of the tibialis in dorsal flexing the ankle and opposing the calf muscles. At the same time they are not able to fully extend the toes, owing to the tonic contraction of the healthy flexors. It is probable also that in some of these cases the interossei also may be palsied, for the effect of the extended (plantar flexed) position of the ankle, in causing extenion of the last phalanx when the patient walks, must not be overlooked.

Fig. 3.



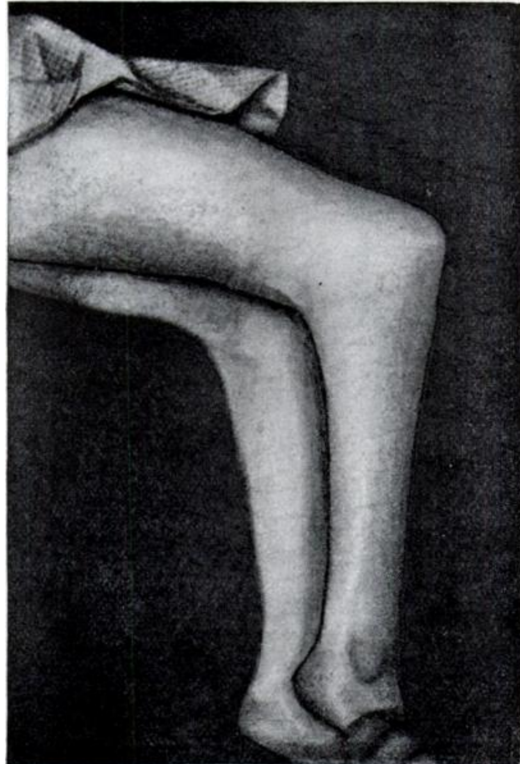
Palsy of interossei and abnormality of ham muscle.

Only those cases, therefore, in which both the second and third joints are flexed can certainly be considered as due to palsy of interossei, unless, as before remarked, the power of separation of the toes is absent on the deformed side only. Clearly this test is inapplicable to cases of palsy on both sides, but the object of this paper is to point out that the lesion can often be detected in vivo without

the aid of electricity by means of volitional contraction of the muscles of the sound as compared with the deformed member.

The patient, W. B., presented also a curious congenital abnormality, which, although unconnected with talipes arcuatus, seems to me rare enough to be worthy of record.

Fig. 4.



Palsy of interossei and abnormality of ham muscles.

On examining the calves and back of the thighs it is found that the usual hollow of the ham is not noticeable, the calf passing into the thigh without any depression to mark the situation of the knee-joint.

On causing the calf muscles to contract nothing peculiar is noticed, but when at the same time the knees are flexed a strong rounded

cord starts into prominence rather to the outer side of the mid-line. This band below seems to be continuous with the outer part of the gastrocnemius; above, its termination is ill-defined, but it can be traced for some distance up the thigh, where it would seem to be attached to the posterior surface of the femur. Both limbs present this abnormality. It is a question whether this band is to be regarded, as has been suggested, as an extra insertion of the biceps into the fascia of the leg or as an origin of the gastrocnemius from the shaft of the femur, as occurs in some of the larger felidæ.

A photograph hardly does justice to the very striking appearance, but two are reproduced in Figs. 3 and 4.