

**THE USE OF TRACTION
IN THE TREATMENT OF
CLUB-FOOT**

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The Use of traction in the treatment of club-foot by Newton M. Shaffer

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NEWTON M. SHAFFER

**THE USE OF TRACTION
IN THE TREATMENT OF
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THE USE OF
TRACTION IN THE TREATMENT OF CLUB-FOOT,

*With a Consideration of some of the Mechanical Points involved,
and a Description of the Antero-Posterior and Lateral
Traction Apparatus.**

OVER twelve years ago I felt that there was room for improvement in the then existing forms of apparatus for the mechanical treatment of club-foot, and, in connection with my service at the New York Orthopædic Dispensary and Hospital, commenced a series of experiments bearing upon this subject, and based upon a study of the mechanism of the ankle and tarsus.

The result of these experiments was published in the "Medical Record" for November 23, 1878, under the title "Traction in the Treatment of Club-Foot." In this article, which may be called a provisional report, I called attention to some of the defects in the conventional form of club-foot apparatus, and described one form of traction apparatus, viz., the antero-posterior (see Figs. 7, 8, 9, *et seq.*), which was devised for overcoming the contractions of uncomplicated talipes equinus. The simple lateral shoe or "pusher," with its hinged lever and screw (see Fig. 22), was also de-

* Read before the New York Academy of Medicine, February 8, 1887.

scribed, the latter being used to overcome the so-called lateral deformities of equino-varus prior to the use of the antero-posterior traction apparatus.

Since the publication of this provisional paper I have continued my investigations, and have made many improvements in the apparatus first described. The antero-posterior traction-shoe has been made much more efficient, and perhaps nearly perfect. The simple "lateral pusher" did not meet all of the indications presented in the compound deformity known as equino-varus, and it has been discarded in the treatment of this condition excepting in early infancy, and then it is used as a preliminary splint, the antero-posterior or lateral traction apparatus being used subsequently.

This simple "lateral pusher," however, with its hinged lever and screw, suggested the right line of investigation and introduced, I believe, the important *pushing* principle into the mechanical treatment of talipes.* Following up the clew it gave, I have, from time to time, added other mechanical pushing and traction elements to it until I have practically perfected the lateral-traction apparatus, which meets quite perfectly the indications presented in the compound deformities of club-foot combining the elements of equinus with either varus or valgus.

In the article already referred to I ventured to point out some of the defects in the mechanism of the conventional club-foot apparatus, the principal one being the difficulty of controlling the heel, which, in the conventional form of apparatus, is held in place, more or less insecurely,

* I have searched in vain for a description of an apparatus which fulfills the indications presented by this "lateral pusher." It has a purely lateral action, the hinge being placed at or near the malleolus, and the force is applied to the concave side of the deformity, pushing the entire foot toward the normal position.

by the Scarpa heel-cup, and the retaining strap, which passes from the heel-cup over the neck of the astragalus. All surgeons who have seen and treated many cases of club-foot will at once appreciate this difficulty of controlling the heel with the apparatus ordinarily employed. I did not, when I wrote my provisional essay upon this subject, fully appreciate all the mechanical points involved, though I felt that I had discovered the correct principle of treatment. Further investigation and study enable me to present my theme in a much more tangible shape, and to accompany a description of my apparatus with, so far as I know, a few novel demonstrations of the movements at the ankle and tarsus, which movements we ought to imitate and even exaggerate with the mechanism devised to relieve the deformities of equinus and equino-varus; for it is only these varieties of club-foot that will be considered on this occasion.

I propose to call attention, first, to some points in the mechanism of the normal foot, and to afterward describe the apparatus I have devised to overcome the deformities of talipes.

In Fig. 1 let A B E represent a line drawn from the head of the fibula through the ankle joint to the sole of the foot, B representing the center of antero-posterior motion at the ankle joint. C E D represents the sole of the foot, C the heel, and D the toes. The diagram is supposed to present a side-view of the leg and foot, with the foot at right angles with the leg, as in standing upright; a position, conventionally speaking, midway between flexion and extension of the ankle joint.

In Fig. 2 we have another diagram, similarly lettered, with the ankle in extension. The line A B is the same as in Fig. 1, but at B (the center of antero-posterior motion at the ankle joint) this line becomes deflected posteriorly on its way to E, the line C E D forming an angle of about 45°

with the line A B, the position of full extension of the ankle joint.

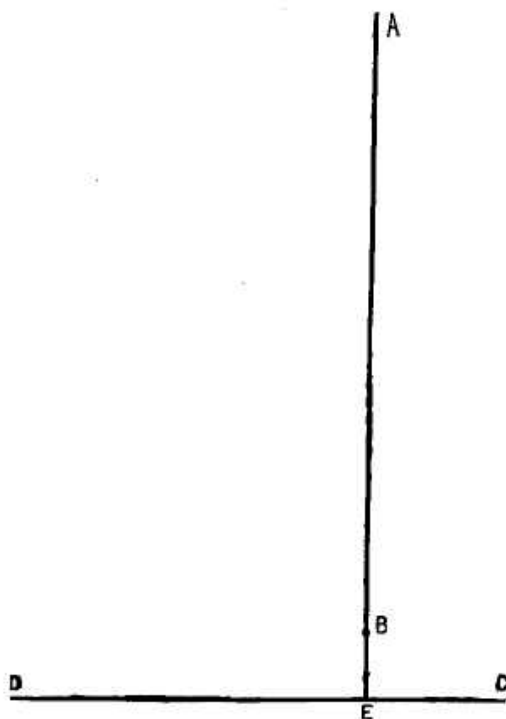


FIG. 1.

In Fig. 3 we have still another diagram, lettered as in Figs. 1 and 2, but with the ankle in full flexion. In this figure, at B, the line A B is deflected anteriorly at B on the

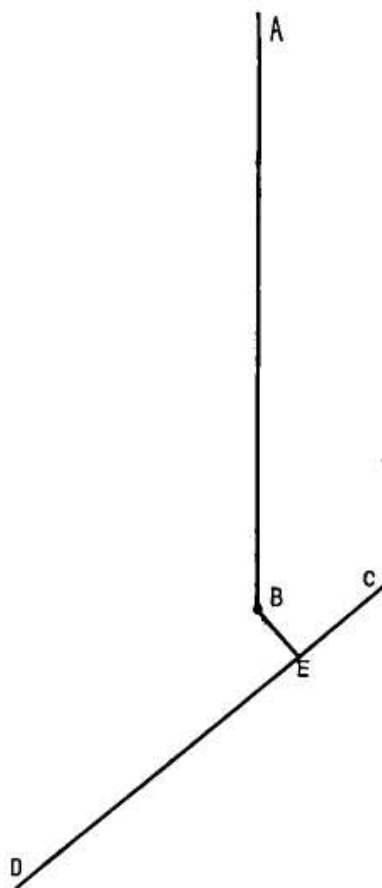


FIG. 2.

course to E, the line C E D forming, in normal flexion of the ankle joint, an angle of about 20° with the line A B.

In these three diagrams, as in the normal foot, there is only one center of antero-posterior rotation, and this is at the point B.* It is not at the ankle joint, but considerably below it, and in all our efforts to change a position of permanent extension, due to muscular or fibrous resistance, to that of flexion, we ought to construct the apparatus devised for this purpose with this definitely located center of motion properly placed. Indeed, it is well to exaggerate the force applied by placing this joint of the mechanism lower down than the normal center of motion at the ankle joint.

This center of antero-posterior rotation at the ankle joint being recognized, we will now combine these three diagrams in one and study the combination.

In Fig. 4 the vertical line A B I corresponds with A B E in Fig. 1; C I D corresponds with C E D, Fig. 1; A B K and E K F in this diagram correspond with A B E and C E D, respectively, of Fig. 2; A B L and G L H of this diagram correspond with A B E and C E D, respectively, of Fig. 3.

In short, A B K and E K F represent extension of the ankle joint. A B I and C I D represent the position when the foot is between extension and flexion, the so-called normal position, or that occupied in standing erect with the foot fairly upon the floor. A B L and G L H represent extreme flexion. All of these three positions have one common center of antero-posterior rotation, viz., B, just

* "The axis of rotation of the curved superior surface of the astragalus passes through the most fixed part of the bone, viz., the tarsal canal, touching the outer malleolus, but passing below the inner, which does not descend so low."—Frank Baker, in Wood's "Handbook of the Medical Sciences," article "Ankle Joint."

as there is only one center of antero-posterior rotation at the ankle joint.

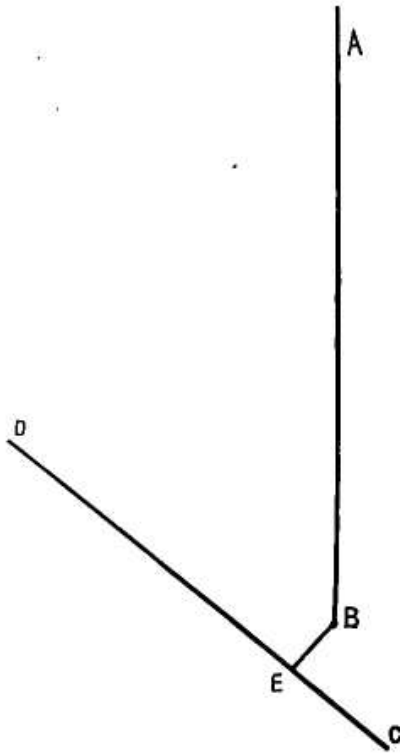


FIG. 3.

We may now apply the principle demonstrated by these diagrams to the deformity of talipes equinus. The ankle