

AN ADHESIVE STRAPPING FOR SPRAIN OF THE ANKLE *

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Although commonly considered a minor injury, sprain of the ankle looms as a very definite problem which confronts the average physician. The disability engendered by this injury is the source of very considerable economic loss to patients, when the frequency of the injury is considered.

The ankle is an extremely vulnerable joint, partly on account of its anatomical construction and partly because of the additional insecurity imposed upon it by poorly designed footwear. Although properly speaking the ankle joint comprises solely the articulation between the tibiofibular mortise and the talus, from a practical standpoint, it must be considered to include the train of joints which are interposed between the leg and the foot; and, from the standpoint of the average sprain, the joints lying below and anterior to the talus are most involved in the mechanism through which the so-called ankle is wrenched. The ankle joint proper is concerned almost entirely with the motions of dorsiflexion and plantar flexion, which are not commonly involved in the average sprain. The motions of adduction-supination and, less often, of abduction-pronation are involved in the production of this injury. These are primarily motions taking place in the subtalar articulations and, therefore, they involve the calcaneum. It can be roughly stated that as the calcaneum goes, so goes the foot.

The mechanism of the average sprain is rotation of the calcaneum, due to a misstep or to unexpected unevenness of terrain, either in the direction of supination or of pronation to such an extent that the thrust of the body weight falls upon the lateral ligaments of the ankle joint,—that is, either the calcaneofibular ligament in the case of supination of the heel or the calcaneotibial ligament in the case of pronation of the heel. The sprain itself is caused by stretching or tearing these ligaments. It is, therefore, imperative in treating a sprain that the stabilization of the calcaneum in such a position as to relieve ligaments which have been overstrained or torn from any possible stress be considered as the prime indication. The immobilization of the calcaneum against lateral movements is necessarily an important factor in the treatment of sprain. It is not essential that the calcaneum be fixed in complete pronation or in complete supination in the case of inversion sprain or of eversion sprain, respectively. However, if treatment is to be ambulatory and relatively painless, it is essential that the position of the calcaneum be fixed in such a manner as to avoid any stress upon the injured ligamentous structures.

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The boot strapping introduced by Dr. Virgil P. Gibney has long been an almost universally accepted standard dressing for the ambulatory treatment of these injuries, and the strapping herein described was developed as a means of increasing the effectiveness of the Gibney strapping in controlling lateral motions of the calcaneum.

This system of strapping, which has been used over a period of twelve years or more, aims to lock the calcaneum in a fixed position, which can be determined by the operator according to the necessities of the case. In an ankle which has been subjected to an inversion (supination) sprain, the calcaneum can be fixed in any degree of eversion (pronation), or in the rare double sprain, in which the ankle executes excessive motions in both directions, the calcaneum can be locked by this strapping in mid-position. So held, the ligaments which have been injured are spared from active strain, and function of the foot is possible almost immediately.

APPLICATION OF STRAPPING

The hair should be shaved from the foot and from the lower third of the leg. A pad of thin felt or flannel, somewhat wider than the tendo achillis and about four inches long, is cut and glued with some type of skin varnish to the skin posteriorly over the tendo achillis. The skin of the foot and lower third of the leg is painted with tincture of benzoin in order to diminish the possible adhesive dermatitis. Two lengths of one-inch adhesive strapping are then cut. The greater of the two lengths is measured from the outer aspect of the leg about eight inches above the malleolus, around the plantar aspect of the heel, to a point on the leg eight

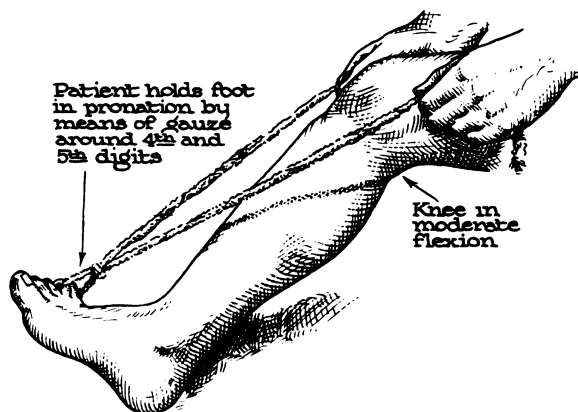


FIG. 1

Sketch illustrating the method of maintaining the desired position of the foot in relation to the leg for applying the strapping. The flexion is essential in order to relax the gastrocnemius group of muscles, thus permitting the foot to come into a right-angle position with the leg. In this illustration the gauze loop is applied in a manner which will produce a moderate degree of pronation. If a position of supination is desired, the loop should be placed around the great and second toes.

inches above the medial malleolus. Approximately eight such lengths are necessary for an average strapping. The shorter straps are measured from the distal third of the fifth metatarsal bone on the outer aspect of the foot, around the heel, and then obliquely under the sole of the foot to the starting point. Approximately fifteen such straps are necessary. The patient sits with the knee flexed to a right angle in order to relax the

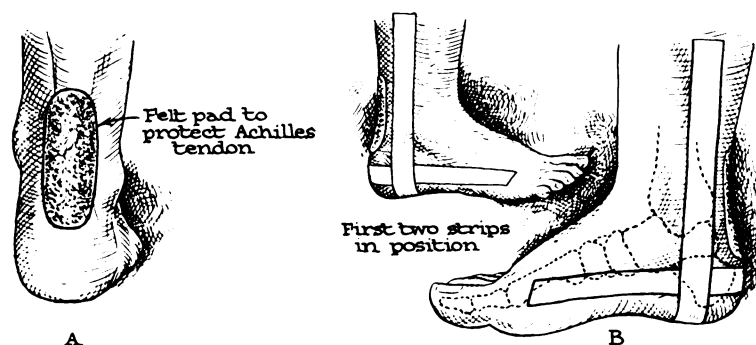


FIG. 2

A: In order to prevent the chafing of the heel by the adhesive strapping, it is desirable to glue a thin strip of felt or of heavy flannel over the tendo achillis. Some type of non-irritating skin varnish or liquid adhesive is used to fasten this strip in position.

B: The relation of the two initial straps to the bones of the foot is illustrated.

tendo achillis, and he holds the foot in the position elected by the operator with the assistance of a gauze bandage looped around the toes in such a manner as to exert traction in the desired direction (Fig. 1).

The two initial straps of the dressing are laid on in precisely the manner used in the Gibney boot,—that is, the first strap (a long strap) extends around the heel from the lower third of the leg parallel to the course of the fibula and sufficiently posterior to pass over or somewhat behind the lateral malleolus. The second strap (a short strap) extends from the distal third of the fifth metatarsal bone to the distal third of the first metatarsal bone, thus crossing the first strap at right angles (Fig. 2, *B*). The straps are put on with the major tension in the direction in which fixation of the calcaneum is desired. The next step is the application of a series of straps, which constitutes the important phase of the dressing. Three sets of three straps each are interlocked, so as to control effectively any lateral motion of the calcaneum. The first of these straps is a long longitudinal one. This strap is laid upon the leg with a forward inclination of 10 degrees from the first longitudinal strap already applied, and overlaps this strap about one-half its width as it rounds the foot. If the successive longitudinal straps are also applied with this inclination from the immediately preceding strap, it will be found that each adhesive strap will pass around the foot and up the opposite side of the leg with the same 10-degree inclination from the preceding strap (Fig. 3, *A*).

Following the placing of the longitudinal strap just described, a pair of the shorter straps is applied in an interlocking fashion, so as to incorporate the heel in a system of straps, which will effectively immobilize it against any lateral or medial motion. The first strap is applied overlapping the preceding transverse strap by one-half of its width. The side of the foot from which this strap is started will depend upon whether the operator wishes to pull the foot into pronation or into supination. The strap is started parallel to the preceding strap, but, when it is brought

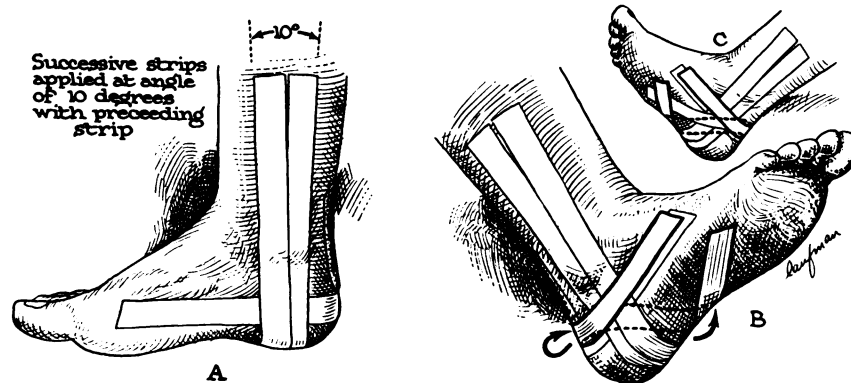


FIG. 3

A: The forward inclination of the successive longitudinal straps is illustrated. This inclination is necessary in order to have the straps conform naturally to the contour of the foot without wrinkling.

B and *C*: The interlocking of the first pair of horizontal straps is illustrated. The dotted lines indicate the location of the strap as it rounds the opposite side of the foot. It is the interlocking of these straps which produces the immobilization of the subastragalar articulations.

around the heel, instead of being continued directly forward toward the toes, it is carried obliquely downward to the plantar aspect of the foot, and terminated on the sole of the foot a short distance from the point at which it was started (Fig. 3, *B*). A second short strap is then applied in a similar manner, beginning, however, on the side opposite to that on which the first strap of this pair was started. This strap will cross the heel directly over the preceding strap, and, if continued obliquely over the sole of the foot, will interlock with the preceding strap. It is this interlocking of the straps which confines the heel in such a manner as to prevent lateral motion.

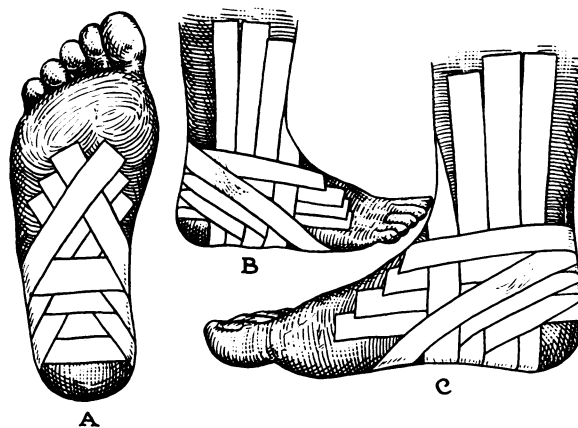


FIG. 4

The strapping as it appears after the application of the three successive pairs of interlocking straps. It will be noted that the straps interlock on all three aspects of the foot, a feature which gives the dressing its stability.

A succession of straps—one longitudinal strap followed by two interlocking transverse straps—are thus applied in rotation, until the heel is completely confined. Usually a series of three such sets of straps are necessary to fix the heel effectively, but occasionally on a large foot a greater number will be required. The appearance at this stage is shown in Figure 4, *A*, *B*, and *C*.

The dressing is completed by applying a series of straps which surround the forefoot and the lower third of the leg. The transverse straps no longer pass obliquely around the heel, but are brought directly around the ankle and the lower third of the leg, as illustrated in Figure 5, A. It will be of some service in applying these straps with uniformity to note that as the bulge of the calf increases, the strap should be placed upon the skin with a downward inclination, this inclination becoming greater with the increase in the bulge of the calf. By doing this, it will be possible to place an encircling strap around the leg, so that its ends are in accurate contact, thus contributing to the smoothness of the dressing. The completed strapping is illustrated in Figure 5, B, C, and D. In order to secure

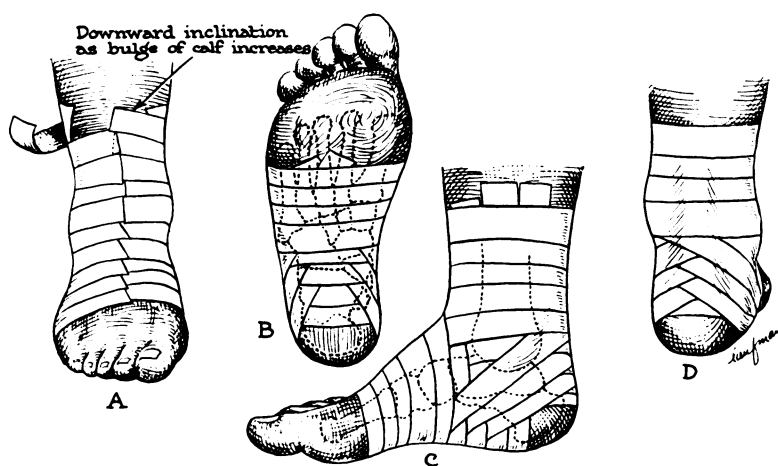


FIG. 5

A: The manner of completing the strapping is illustrated. In order that the circular strappings should begin and terminate at the same level, the downward inclination which is indicated by the arrow must be employed. This inclination should increase as the bulge of the calf increases.

B, C, and D: The finished strapping as seen from the plantar, medial, and posterior aspects of the foot.

a uniform cohesion of the dressing, it is desirable to cover the strapping with a well-applied gauze bandage.

It will be noted that the strapping completely encircles the foot, which will probably give rise to considerable doubt among the readers as to whether this is a safe dressing from the standpoint of circulatory compression. It can be stated, however, on the basis of long experience with this dressing, that, provided the straps are applied with uniform tension and in such a manner as to avoid wrinkling, the dressing is safe even when used upon a freshly sprained ankle.