

Plastic Short Leg Brace Fabrication

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Conventional short leg braces, made of metal and attached to the shoe either by a solid or a split stirrup, are necessarily heavy and quite conspicuous. The weight of a metal brace has the tendency to fatigue weak muscles and to cause rotational gait problems.

In an effort to improve cosmesis and to decrease weight, a plastic short leg brace has been devised that is completely hidden when worn by a male patient and is less conspicuous than the standard brace when worn under nylon hose by female patients (Fig. 1). The plastic brace weighs approximately 250 grams as compared to the 500-1000 grams of a standard double-upright short leg brace.

The brace is a molded plastic shell that is secured to the patient by his shoe and by a velcro closure at the proximal end. The rigid ankle construction provides plantar and dorsiflexion control as well as medial-lateral stability. A lightweight calf-length stocking is worn under the brace (elastic hose may be used). The usual stocking is worn over the brace. To lessen

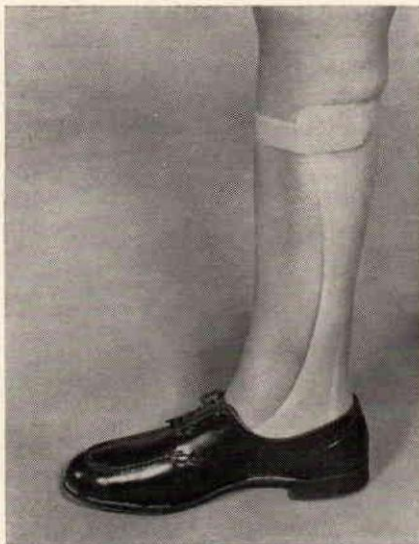


FIGURE 1

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the shock at heel strike, a soft rubber posterior wedge is used in the shoe heel (Fig. 2). A Blucher-type shoe should be used; in some cases it may be necessary to use a shoe one size wider than usual over the brace.

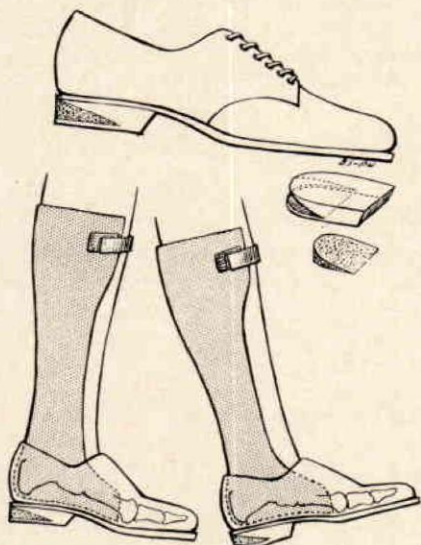


FIGURE 2

FABRICATION TECHNIQUE

To take the plaster impression of the patient's lower leg and foot, place a 1-inch strip of felt or webbing material along the anterior aspect of the tibia and over the dorsum of the foot. Cut a piece of TUBEGAUZ¹ twice the length of the patient's lower leg. Pull the tubegauz up to the knee, twist the distal portion to close the tube at the toes, and pull up the second layer. Secure both layers to an elastic belt around the hips, using YATES CLAMPS.²

Place the patient in a sitting position, wrap the foot and shin with 4-inch plaster of Paris bandage. Wrap from distal to proximal, starting at the heads of the metatarsal bones and ending at the head of the fibula. Wrap the foot rather loosely so as not to impinge on the metatarsals during weight bearing. Place a thin plastic bag³ over the foot and ankle; place the foot into the shoe; lace the shoe; help the patient to a standing position and direct him to bear equal weight on each foot. The heels should be 2 inches apart or normal base width. Hold the knee in slight flexion ($5-10^{\circ}$) and correct any ankle varus or valgus by hand pressure on the appropriate malleolus until the plaster wrap has set.

Assist the patient again to a sitting position, being careful not to deform the plaster wrap. Remove the shoe and plastic bag. Draw a line along the anterior portion of the cast over the felt or webbing strip. Cut the cast on this line with a scalpel or cast cutter. Remove the cast from the leg, and prepare it for filling with plaster of Paris and placing of a mandrel.

The plaster positive mold is sanded smooth and a $\frac{1}{8}$ -inch buildup is made over each malleolus, being particularly careful to include the anterior portion of the lateral malleolus. Slightly flatten the positive mold along

the lateral side to a depth of $\frac{1}{8}$ to $\frac{1}{4}$ inch from 3 inches below the head of the fibula to 2 inches above the lateral malleolus. Coat the positive cast with HI-GLO parting lacquer.⁴ This is necessary to prevent softening of the inner PVA⁵ by moisture in the positive.

Pull a cast sock⁶ tightly over entire plaster positive and tie the mandrel. Sprinkle talc over entire model. Fashion a PVA bag, moisten and pull tightly onto positive. Tie proximal end with PVA strip to mandrel. Pull PVA bag distally and tie off the PVA strip at end of cast. Drive a finishing nail into the distal end of positive through center of tied off PVA, leaving about $\frac{3}{8}$ inch of the nail projecting. This will be used to hook and hold the fiberglass roving⁷ (see Fig. 3).

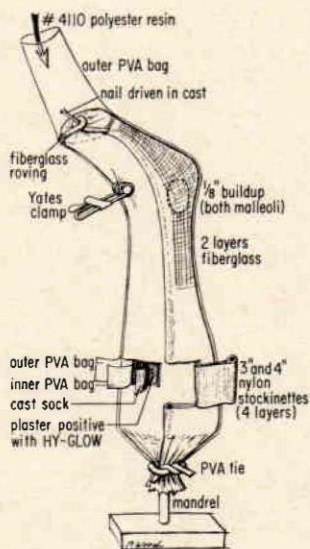


FIGURE 3

Cut 2 lengths of nylon stockinette, one 3-inch width, the other 4-inch width (narrower widths may be necessary for children). Place the 3-inch stockinette inside the 4-inch and a loop of fiberglass roving inside these. Attach fiberglass roving over nail and position stockinette as shown in Figure 1. Place two layers of fiberglass cloth inside the 3-inch stockinette (see Fig. 3). Pull down on roving and stockinette and adjust as shown and tie off at mandrel. The lateral malleolus is completely covered and the medial malleolus is covered to midline only.

Before applying outer PVA bag, drive nail further into cast so as not to snag or tear PVA. Laminate with 4110 polyester resin and color pigment. The PVA may tend to gap at the malleoli. To correct this, pull bag forward and secure with a Yates Clamp.

After resin is cured remove plastic brace from positive and grind the anterior edges back to the stockinette. Do not grind into fibers of the cloth as this will weaken the appliance. The distal trim line should be posterior to the heads of the metatarsals to prevent undue stress on the brace. This is a compromise and tends to slightly decrease the knee stability gained from a long toe lever arm.

The closure on the brace is velcro material. A SACH heel is created in the patient's shoe to absorb shock at heel strike. See details in Figure 2.

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FOOTNOTES

1. TUBEGAUZ S-223, white; not sterilized; size No. 78
The Scholl Mfg. Co., Inc., Chicago 10, Illinois
2. YATES CLAMPS—W2
A. J. Hosmer Corp., Campbell, California
3. Plastic bags: "Baggies"; food wrap size
Colgate-Palmolive Co., New York, New York
4. HI-GLO parting lacquer
A. J. Hosmer Corp., Campbell, California
5. PVA (Polyvinyl Alcohol Film)
A. J. Hosmer Corp., Campbell, California
6. Cast sock: No. 7923, thin, not processed
Knit-Rite Co., Kansas City, Missouri
7. Fiberglas roving—863
Knit-Rite Co., Kansas City, Missouri

REFERENCES

1. Jebsen, R. H. and Simons, B. C.: Experimental Plastic Short Leg Brace. *Arch. Phys. Med.* To be published.

