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A "SLIP" CUFF FOR ANKLE-FOOT ORTHOSES— A PISTON-ACTION ABSORBING POLYPROPYLENE ORTHOTIC CUFF

Relative motion between the cuff and the posterior aspect of the leg is a problem common to all posterior "leaf spring" orthoses, except in the case of the shoe-clasp orthosis[1].

When the patient takes a short stride and ankle action is minimal, this feature is not of clinical significance, particularly when an interposing material, such as a long stocking, is worn between the orthosis and the skin. However, in the case of the patient who takes a long stride, with the associated increased range of ankle motion, the relative motion can be significant.

DESIGN PRINCIPLE

To eliminate relative motion between the AFO and the patient, the authors have adapted the principle demonstrated so well by extensive experience with the Veterans Administration Prosthetics Center shoe-clasp orthosis[2], in developing a cuff which effectively eliminates the problem.

The basic technique requires that a separate polypropylene cuff be fabricated to nest within the cuff of the orthosis in such manner that the inner cuff will remain stationary on the calf and the orthosis itself will glide vertically on the inner cuff during the gait cycle.

FABRICATION TECHNIQUE

The inner cuff is formed over the positive model of the patient's leg. It is 3 in. in height and horizontally it covers about two thirds of the circumference of the calf, going considerably beyond the mediolateral borders of the cuff of the standard polypropylene AFO (Fig. 1).

A vertical slot, 1½ in. x 3/16 in. is cut in the posterior mid-portion of the outer cuff (the calf portion of the conventional polypropylene orthosis), and a ⅛ in. x ½ in. Nyloplex rivet is passed through the slot and fixed to the inner cuff. A separation of ⅛ in. is maintained between the inner cuff and the outer cuff. To reduce friction a ¾ in. strip of Teflon to provide a bearing area is applied around the slot (Fig. 2). The inner cuff is padded, on the calf aspect, with ⅛ in. foam rubber, and a Velcro strap is attached to provide closure.

When the device has been fabricated in this manner the outer shell will move relative to the stationary inner cuff (Fig. 2), thus eliminating detrimental shear forces on the soft tissues of the calf. Figure 3 shows the action of the orthosis just prior to heel-off, and Figure 4 shows its action as the foot has passed from heel strike to foot flat.

Because the stop is riveted to the inner cuff rather than to the upright (in contrast to the

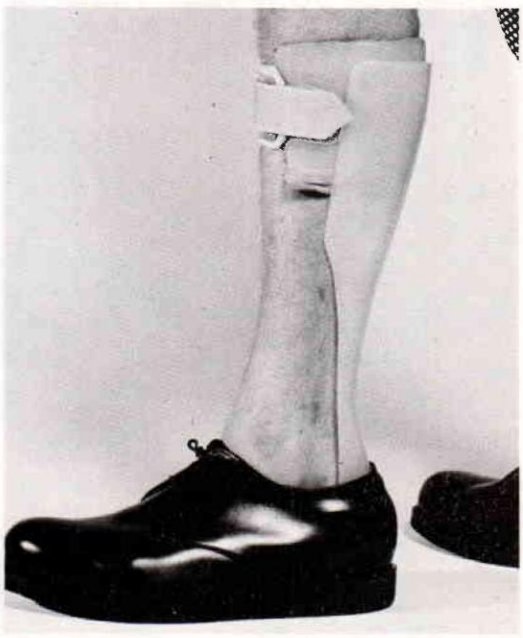

Fig. 1. Lateral view of the inner cuff.

[1] Greenbaum, Werner, Draft Manual, *VAPC Equinus Control Ankle Foot Shoe-Clasp Orthosis*, Veterans Administration Prosthetics Center, New York.

[2] More than 300 shoe-clasp orthoses have been prescribed by the VAPC Clinic Team. When properly used this is one of the simplest and yet most effective ankle-foot orthoses available.

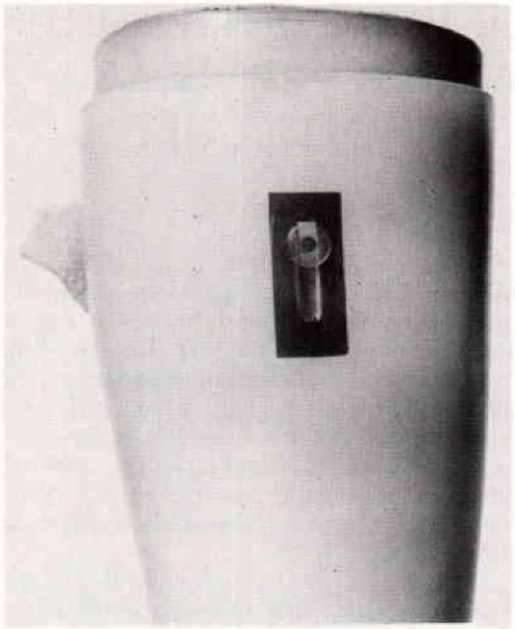

Fig. 2. Rivet and slot arrangement to provide for relative motion between inner and outer cuff.

Fig. 3. Action of orthosis just prior to heel-off.

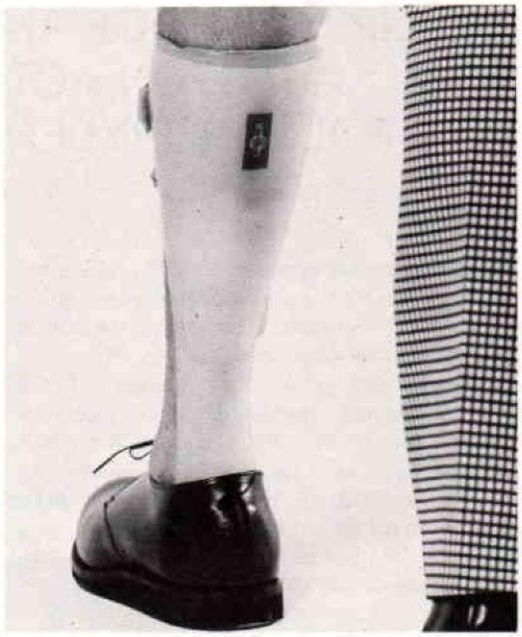

Fig. 4. Action of orthosis at the beginning of the foot-flat part of the stance phase of walking.

method employed in the fabrication of the shoe-clasp orthosis), the inner cuff must be raised before the patient takes his first step, otherwise the stop becomes effective immediately, and compensation for the relative motion will not occur. In the case of the shoe clasp the cuff is lowered initially for the same reason.

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