The Otto Bock All Plastic Above Knee Prosthesis for the Geriatric Amputee

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Since the end of World War I, and especially following World War II, great efforts have been devoted to the improvement and development of new and better fitting techniques as well as more functional prosthetic components for the amputee. Inasmuch as most of the amputees involved have been comparatively young, it is only logical that not too much thought has been given to the needs of the geriatric amputee.

Today, however, as a result of advances made in the prevention, care, and management of disease, we can expect ever increasing numbers of older amputees. These older amputees require specialized attention.

Recognizing this situation, a conference on the Geriatric Amputee, sponsored by the Committee on Prosthetics Research and Development of the Division of Engineering and Industrial Research, was held at the National Academy of Sciences in Washington, D. C. Results of this conference are contained in Publication 919 entitled "The Geriatric Amputee."

In this publication, both Medical and Prosthetic Management Panels agree that the following specifics were desirable in prostheses for geriatric patients:

1. Minimum weight.
2. Articulated knee joint capable of providing knee stability.
3. Comfortable fit.
4. Secure suspension system easily donned.

With these recommendations in mind, Otto Bock Orthopedic Industry has developed a new, plastic knee/shin set-up with a manually operated knee lock and double frictions. It is designed for use in the fabrication of a lightweight all plastic above-knee prosthesis for the geriatric amputee. The knee lock mechanism is installed so as to provide sufficient space for the accommodation of long stumps. It is cable controlled and manually operated by a lever located near the lateral-proximal brim of the socket. However, if desired, it can be positioned anywhere on the socket for the needs of the amputee.

The set-up **(Fig. 1),** consists of a foam plastic shin and upper knee section together with a rigid plastic articulated knee mechanism. The knee lock and friction are installed in this knee section as supplied.

For the fabrication of the actual prosthesis, Degaplast acrylic resin is used; the resin is compounded according to specifications for application in the prosthetic and orthotic field. This resin is supplied in both rigid and flexible with a mixture of 80% rigid and 20% flexible being most desirable. For a soft inner socket, 100% flexible is used. A paste-type hardener and coloring pigment are the only other components required.

Although polyester resin may be used in the technique, we prefer acrylic resin for the following reasons:

1. It is non-toxic for the prosthetist as well as the amputee.
2. Being a thermo-plastic it lends itself to reheating and reshaping.
3. No post curing is required.
4. Thin wall lamination when our perlon and fiberglas tubing is used.
5. Easy to trim because lamination is thin.

The complete manual on the fabrication process includes 82 illustrations. Quite obviously, it is impossible, in this short article to do anything but touch lightly upon some of the highlights of the process. We offer it as one possibility for the geriatric A-K amputee.

Fabrication begins with a plaster impression of the stump. This is converted into a test socket having a reinforced proximal brim of sufficient strength to accept weight bearing **(Fig. 2).** The stump is fitted in the socket, modifications are made as necessary, and the amputee applies weight bearing while fit and size are checked by the prosthetist.

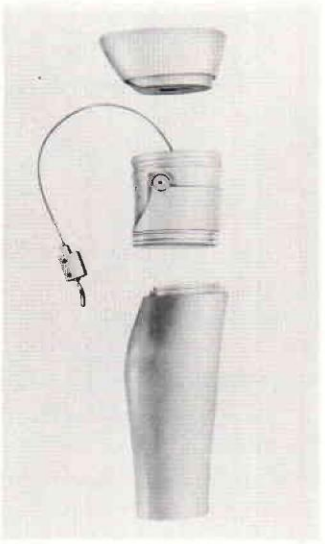

FIGURE 1

FIGURE 2

The test socket is filled with wet plaster and a two-way suction pipe is inserted **(Fig. 3).**

The positive cast is then prepared for lamination of the plastic inner socket. The lay-up consists of two layers of Perlon stockinette, two of fiberglass tubing, and two more of Perlon. If more strength is required for heavy amputees, additional layers may be added. This provides a thin, lightweight, yet rigid inner socket **(Fig. 4).**

Next, a layer of Perlon is pulled over the cured inner socket. This serves as a spacer. A PVC bag is pulled over this lay-up **(Fig. 5),** vacuum is applied, and a polyethylene sheet is wrapped around to contain the Pedilen #200 foam that is poured to give the bulk necessary for shaping the outer socket **(Fig. 6).**

The socket is then placed in a balancing jig **(Fig. 7),** which is used to determine optimum positioning of the socket. Reference lines are marked on the socket.

FIGURE 4

FIGURE 5

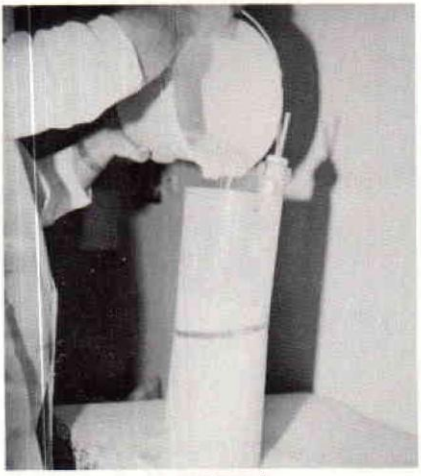

FIGURE 3

FIGURE 6

FIGURE 7

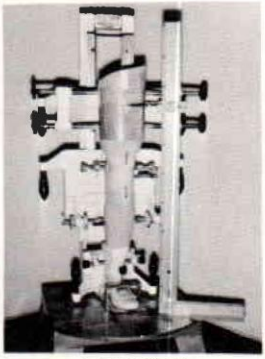

FIGURE 8

FIGURE 9

The foot and knee/shin set-up are then oriented into the alignment jig with the socket being brought into place in the same position previously determined by the amputee in the balancing jig. These components are aligned in relation to each other, cut to the desired length, and bonded together for test walking **(Fig. 8).**

After fitting has been completed, the shin and thigh are shaped down to the required measurements in preparation for lamination. A lay-up consisting of two layers of Perlon, two of fiberglass, and three more of Perlon stockinette is then applied **(Fig. 9).**

Upon completion of curing, the foam is removed completely **(Fig. 10).**

During the last National A.O.P.A. Convention at Miami Beach, this lightweight, all plastic A.K. prosthesis attracted considerable interest **(Fig. 11).** With this in mind, we are pleased to be able to describe some portions of the fabrication procedure and will be happy to supply additional details to anyone interested in the process.

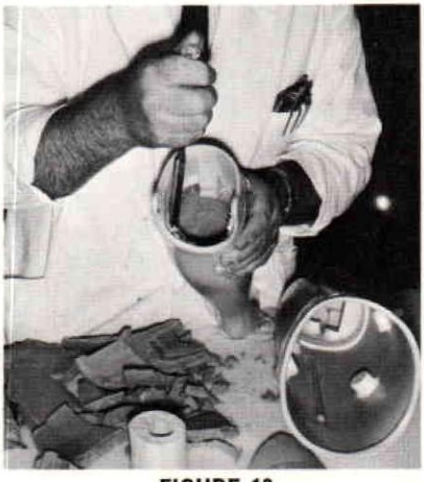

FIGURE 10

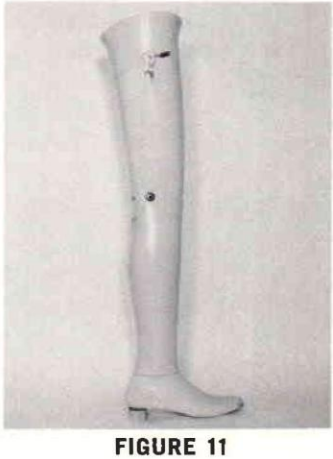

FIGURE 11