Fabrication of Phocomelia Prostheses for Women

By DAVID G. WANNER, C.P.

Institute for the Crippled and Disabled, New York

Fabrication of a prosthetic device for Phocomelias to acquire a better cosmetic appearance, especially for women, may be achieved without cumbersome doors and straps (as in Figs. 1 and 2). But careful planning and accurate measurements and cast are a must. The use of fiberglass and epoxy makes it possible to fabricate a stronger and much slimmer prosthetic device than the conventional wood prosthesis.

The first step in this technique would be the application of a plaster cast. The cast must be taken with the patient standing and the limb fully extended and the foot in a plantarflexed position. In some cases, the foot tends to invert or go into a varus position. The patient should be instructed to hold the foot straight, or if need be, the prosthetist should hold the foot straight while the cast is setting.

For easy removal of the cast from the patient and to eliminate some cast modifications later, *the area of the Achilles tendon may be built up with heavy felt next to the skin under the cast sock.* The build up may be brought around both medial and lateral sides, especially if the ankle is thin. To remove the cast, a cut is made in this area, and the felt is pulled out. When taking the cast, it may be possible to keep high medial and lateral walls and,

FIG. 1

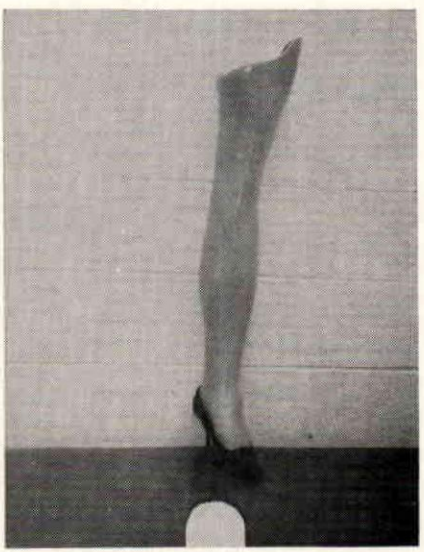

FIG. 2

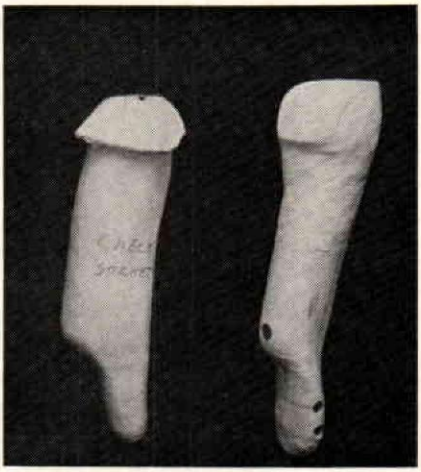

FIG. 3

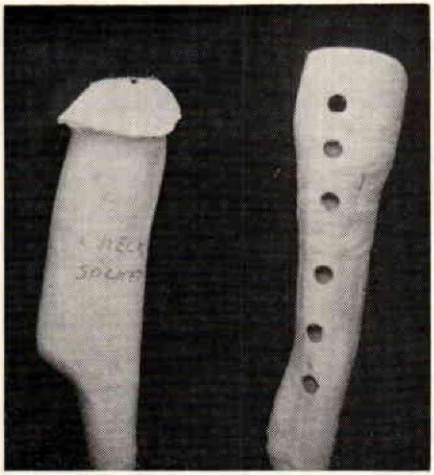

FIG. 4

if possible, to take some weight bearing on the patella tendon as on a regular patella tendon prosthesis. It may be possible on a slim patient to grip the thigh on the condyles with the high medial and lateral walls. In figures 3 and 4, the check socket on the right has high medial and lateral walls. The patient's knee joint was about mid-thigh. On the check socket on the left, the patient had very little femur left. The hip joint was weak, so for more lateral support, the lateral wall was made high as on an AK socket.

Girth measurements should be taken as usual at the proximal end of limb and every 2″ to the distal end. M.L. and A.P. caliper measurements should be taken at critical points, such as the widest point of the heel and foot areas and the width of the malleoli. These measurements are important in the modification of the cast to permit donning of the prosthesis.

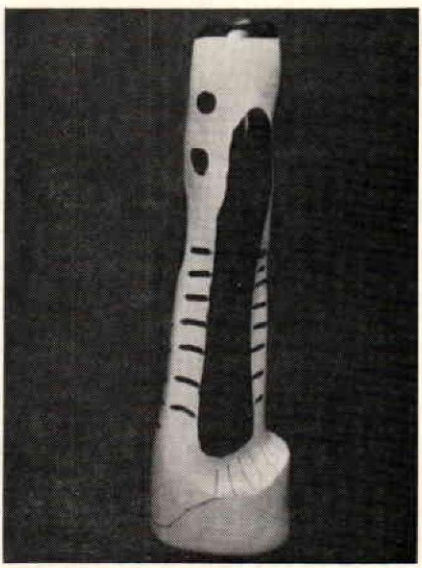

FIG. 5

FIG. 6

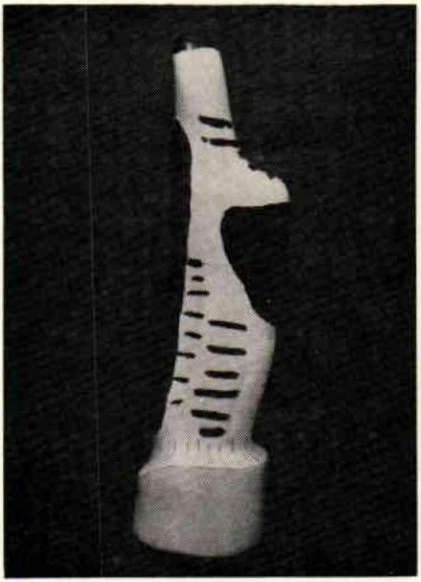

FIG. 7

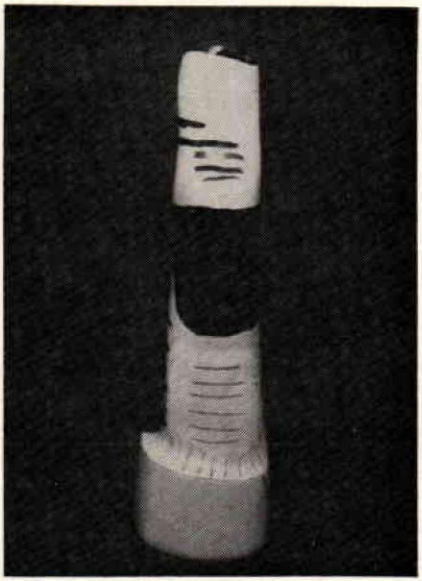

FIG. 8

Cast modification is achieved by proper evaluation of the limb. Also, by distributing weight wherever possible, such as below the medial condyle and under the heel of the foot, keeping in mind that the proximal portion of the socket may not be smaller than the widest part of the foot. It may be necessary to build up the cast on the tibial crest area to permit inserting of the foot in the prosthesis (as in figure 5). The cast should be built up at any bony areas. For example, the malleoli or bony prominences on the anterior of the foot, and ½″ on the distal end of the foot, as in figures 5, 6, 7, 8. Build up areas are solid black and the lines indicate weight bearing areas.

A check socket should be fabricated of plaster of paris bandage (about 6 or 7 layers) and fit before the permanent socket is made (as in figures 3 and 4). The permanent socket will be as thin as possible and still be strong. This will *not* allow any major adjustments in fit later. Any relief or changes to be made should be indicated on the check socket. These changes are then made on the male mold before fabrication of the permanent socket. Changes for a better cosmesis may be made by making holes in the check socket to see if there is too much room for the leg, such as the foot on both medial and lateral sides, also anterior and posterior at heel level (as in figure 3). If there is too much room for the foot or toes, plaster on the male cast may be removed in these areas.

The male cast is prepared to be laminated in the same manner as any cast to be laminated, preferably with vacuum when possible. The vacuum will insure a thinner and stronger socket. The lay up for fabrication should consist of one layer of nylon first, then 5 to 7 layers of fiberglass followed by one final layer of nylon impregnated with epoxy resin. It is not recommended to use dacron felt as this just adds to the weight and makes a thicker socket.

When fabrication of the socket is completed, the distal end is set in a balsa block and set up on an adjustable leg if length permits. The static alignment of the socket to the foot should be set up in such a way as to permit a proper cosmetic shape. Although cosmesis is important, it should not interfere with dynamic alignment.

FIG. 9

FIG. 10

The choice of suspension and proximal shape of the socket may differ with each patient according to his or her anatomy. It is possible to use any one of the many P.T.B. cuff suspensions or to improvise on these techniques. A waist belt may be necessary in some cases or a silesian bandage. The choice of a SACH foot is also recommended as this eliminates mechanical maintenance and makes for a better cosmetic appearance.

When the limb is being finished, it is recommended that the patient be present for cosmetic shape. When filling areas of the limb, such as the calf area, the use of a light material, such as Hosmer plastic foam, is desirable.

The finishing procedure follows the conventional pattern with a lamination of two layers of nylon. The finished prosthesis should be much slimmer and shapelier and thus, more appropriate for women.