Orthotics and Prosthetics, Vol. 30, No. 4, pp. 31–34, December 1976

USE OF THERMOPLASTIC COMPONENTS IN TEMPORARY PROSTHESES
A PROGRESS REPORT

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In December of 1974, we reported on our early work with polyvinylchloride (PVC) pylon systems for the below-knee amputee (*1*). Since then, development of this system has continued and been expanded along other lines. The purpose of this article is to report our work and experience with the PVC-pylon system to date.

BASIC BK PYLON

At the end of the previous report, preliminary work on a new pylon system was described. The new system (Fig. 1) has been standardized and is being used routinely in our clinical practice. A female receptacle is fabricated from a slip-type, double-ended coupling that is commercially available. One end of the coupling is shortened and three pieces of galvanized pipe-strapping are attached with pop-rivets for lamination into either a standard plaster-of-Paris rigid dressing or a plastic PTB socket. A PVC pylon and an ankle plug (turned from PVC on a lathe) are attached in the manners previously described (*1*).

With experience, it is possible to attain satisfactory alignment at the time of initial fabrication. Subsequent changes can be made easily, though, with a heat gun when necessary.

These pylons have been used by patients for periods up to and exceeding six months with only two incidences of failure (one of them inexplicably in the case of a very petite young lady). The only problem has been the occasional development of an annoying squeak between the receptacle and the pylon. Work continues on this problem.

COSMETIC COVER

Clinical experience has demonstrated the desirability of extended periods of treatment with temporary prostheses. In this instance, cosmetic appearance of the prosthesis can become an important factor in patient acceptance. The need, therefore, is for an inexpensive, cosmetic covering that can be fabricated quickly for use with the basic pylon. Considerable success has

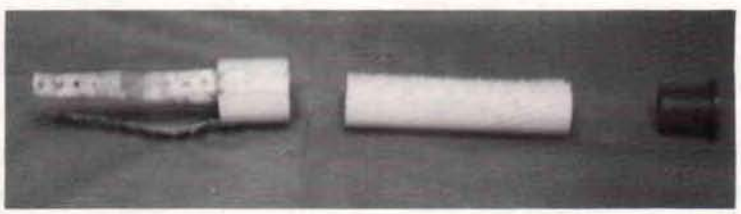

Fig. 1. Components of the new pylon system. From left to right: the female receptacle with galvanized iron straps, the PVC tube, and the PVC ankle plug.

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been attained by foaming a covering in place using a standard polyurethane foam (Otto Bock 617H12). This foam can be given color with standard laminating pigments, and it can be shaped and smoothed in the routine fashion. A separator plate is used between the SACH foot and ankle plug (Fig. 2). A support hose or length of colored stockinette can be applied over the shaped foam covering (Fig. 3). The entire procedure can be carried out in 30–45 minutes making it feasible to be done while the patient waits (Fig. 4). However, for various reasons (basically lack of patient demand) this has not been carried out routinely.

Flexible foam (Otto Bock 617H32) has been used experimentally in one instance to fabricate a cover, but due to the small cross-sectional area between the outer wall and the socket and pylon lying beneath, very little resiliency was achieved and the experiment was abandoned.

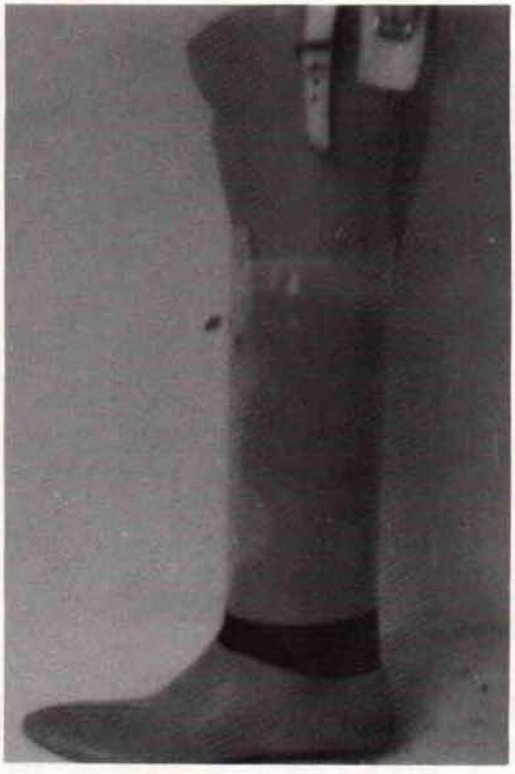

Fig. 2. Lateral view of prosthesis during fabrication, just after foaming cosmetic filler in place.

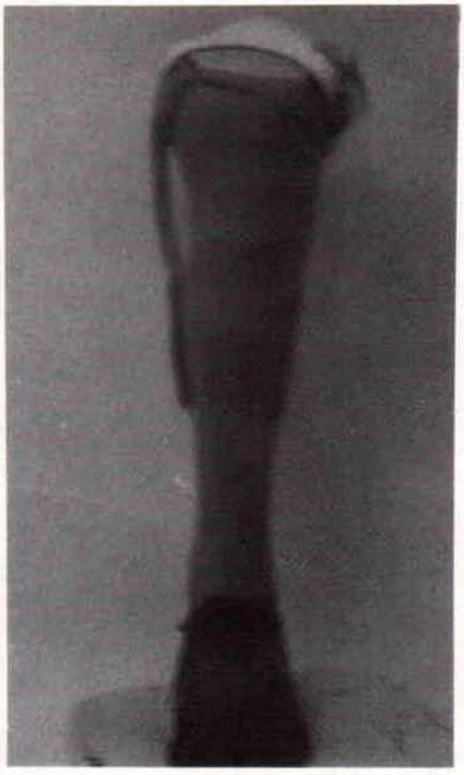

Fig. 3. Finished prosthesis with support hose in place.

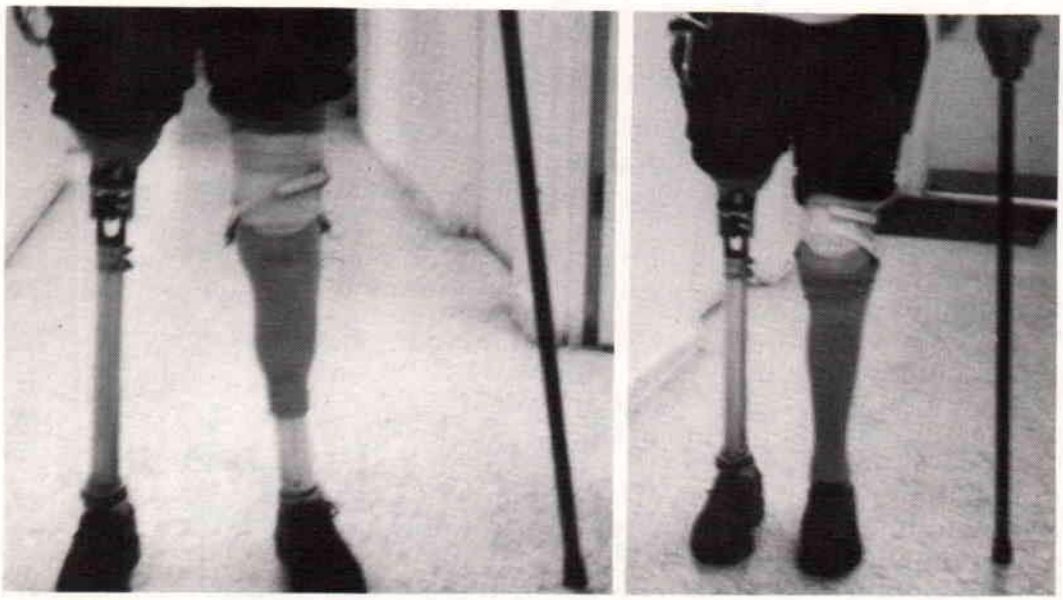

Fig. 4. Two views of the same BK prosthesis. Left, without foamed cosmetic filler; right, with filler and support hose for cosmetic cover.

PYLON SYSTEM FOR THE BELOW-ELBOW CASE

In the past, we have routinely used Polysar® tubing to connect a wrist unit and a polyester socket in the fabrication of temporary below-elbow prostheses. Recently, in the fashion described by Sumida and the group at the Child Amputee Prosthetics Project at UCLA (*2, 3*), we have been experimenting with the substitution of Polysar with a PVC system, using commercially available 3/4-in. I.D. tubing and fittings (Fig. 5). A female receptacle is fabricated in the same manner as the one used with the BK prosthesis and laminated into the socket. Control is achieved at the wrist by splitting the tubing, applying a hose clamp, and using a specially fabricated adaptor applied to the stud of the terminal device (Fig. 6).

Fig. 5. Temporary below-elbow prosthesis using a PVC tube for structure.

Experience with this system has been confined to one case and thus far is inconclusive, but it is hoped it will prove to be a practical alternative to the rather expensive and often unsightly Polysar. Certainly it should be more practical for use with rigid dressings than the techniques used earlier of attaching metal straps to a wrist unit and wrapping the assembly into a rigid dressing with plaster-of-Paris bandage.

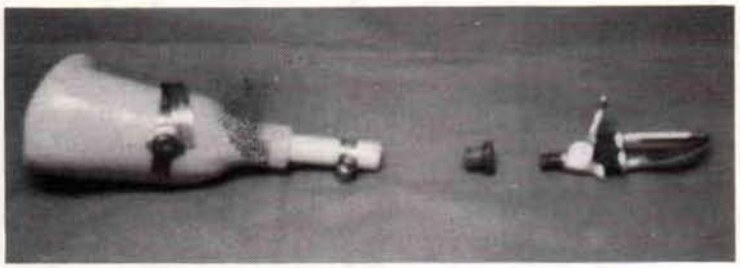

Fig. 6. Components of the temporary below-elbow prosthesis.

CONCLUSIONS

With the emphasis in contemporary prosthetics on the use on temporary or preparatory prostheses in the early periods of stump maturation and with what seems to be a trend (at least in our clinic setting) to even longer periods of use of such systems, the need is for readily fabricated, inexpensive, and durable prostheses. This article describes one such approach and possible elaborations on it. Conceivably, the goals of inexpensive and rapid fabrication would be facilitated if it proved to be practical to use a vacuum formed socket (not necessarily of polycarbonate) with the system and this matter is currently under consideration (Fig. 7).

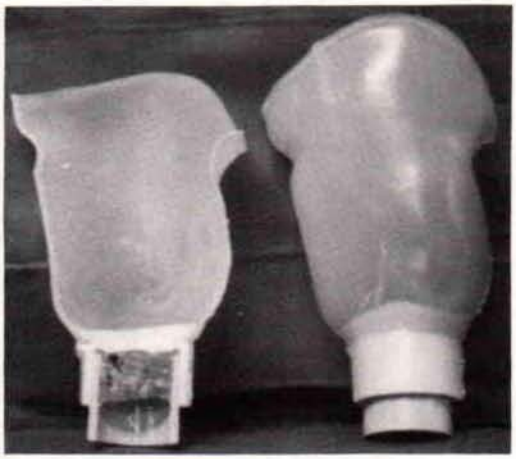

Fig. 7. Cutaway sections of vacuum-formed below-knee socket used in experiments for development of improved, inexpensive attachment methods.

LITERATURE CITED

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