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Evaluation of Polysar Below-Elbow Fitting Procedures[1]

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The technique of forming sockets directly on below-elbow stumps using Polysar[2], presented in a January 1968 manual by Gennaro Labate and Thomas Pirrello of the Veterans Administration Prosthetics Center, was used to prepare complete prostheses for three amputees, following a demonstration of the technique by VA personnel. The subjects were male, unilateral below-elbow amputees, with stump lengths in the range of 40-60% of the sound-side measurement. Each amputee had previously worn a conventional prosthesis; one had been using a Munster-type fitting immediately prior to wearing the experimental prosthesis.

The instructions in the manual were considered by our staff prosthetists to be clear and comprehensive; however, the demonstration of the procedure was particularly helpful. No difficulties were encountered in interpretation or application of the fabrication technique. Each prosthesis was fabricated, from measurement to delivery, in approximately one-half day.

At the time of delivery, each synthetic-rubber prosthesis was weighed for comparison with the previously worn conventional product. A staff therapist checked out each prosthesis, and the subject was instructed to wear the arm exclusively during the evaluation period. No special precautionary measures were advised. Initial reactions of the subjects were recorded, with specific reference to weight, cosmesis, the soft foam covering, and comfort.

The experimental arms were considerably heavier than the respective conventional arms worn by the subjects. The weights of the complete prostheses (including harness, cable, and APRL hand and glove) were:

Subject	Conventional	Experimental	Difference	% Increase
A	788.5 g	967.5 g	179.0 g	22.7
B	842.0 g	1133.5 g	291.5 g	34.5
C	777.0 g	921.5g	144.5 g	18.7

Despite these substantial differences, none of the subjects commented adversely about the weight of the synthetic-rubber prosthesis.

Two of the subjects experienced problems related to cosmesis during the initial fitting. The cosmetic cover of Subject B's prosthesis was not sufficiently opaque, and irregularities in the foam underlayer presented an unsatisfactory appearance. This defect was remedied by covering the foam with a layer of Helenca stockinet to improve the color uniformity. Subsequent shifting of this layer caused a wrinkle to develop in the vinyl cover, but this did not disturb the patient.

On initial fitting of Subject C's prosthesis, it was apparent that the foam (a 50-50 combination of Silastic 385 and 386) had collapsed in the area proximal to the wrist unit, producing an unsightly configuration. This difficulty was remedied by the use of a somewhat denser foam mixture, one which retained sufficient flexibility to simulate normal flesh turgor but which was nonetheless strong enough to maintain cosmetic shape when the cover was applied.

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[2] Registered trademark of the Polymer Corporation Limited.

Once those initial problems were solved, all reactions to the soft foam, with a vinyl cover, were highly positive. Initial reactions to the comfort of the experimental sockets were also positive.

The three subjects wore the experimental prostheses for periods ranging from two to four months. Only one (Subject A) subsequently experienced problems, and these required that the prosthesis be replaced. It is worth noting that this patient was the one who had previously worn a Miinster-type prosthesis. After wearing the experimental socket for five weeks, he expressed a preference for his previously worn prosthesis in terms of comfort. His socket produced from Polysar had developed embossed ridges caused by the stockinet, which resulted in considerable discomfort and skin irritation. In addition, the socket had deformed, becoming elliptical in the direction of cable pull, which may have contributed to a dermatitis which occurred after that fitting.

The other two subjects reported at the close of the period of wear that they preferred the synthetic-rubber fitting to their conventional prosthesis. Subject B reported increased comfort and cosmesis, and also reported greater range of motion, which may be due to slightly lower proximal trim lines and some socket flexibility. Subject C felt that he could wear the prosthesis continuously without discomfort; he found no problem with the weight of the prosthesis and felt "more secure" with the experimental prosthesis than with the previously worn arm.

To summarize, the fabrication procedure using Polysar, as demonstrated and as presented in the draft manual, seems to offer advantages in terms of: (a) saving of shop time (the technique requires approximately one-half day, while standard techniques require nearly a full day, not considering curing time), *(b)* elimination of some opportunities for error through the reduction of the number of steps in the fabrication process, and (c) fabrication of a prosthesis with a soft external surface which simulates normal flesh turgor. Difficulties encountered were: (*a*) collapse of the foam cover (tending to dent when the sleeve was applied), which may be ameliorated by the use of a denser foam; *(b)* low opacity of the sleeves, which may be improved by using a dilaminar or a thicker material; (*c*) weight, which seemed excessive although not noted by the subjects; and (*d*) possible deformation or embossing of the socket, as noted in the case of Subject A.