A.K. Air-Cushion Sockets

by J. E. Dillard, C.P.

Distal pressure, edema and discoloration have for years been problems for a number of above-knee amputees. Many efforts have been made to solve these problems, the most successful being the application of total-contact pressure. The above-knee air-cushion socket is another method of overcoming these problems.

Shortly after this writer completed the course entitled "Advanced Below-Knee Prosthetics" at Northwestern University Medical School, several above-knee patients with badly discolored distal ends were seen. Since various methods had been tried to eliminate this problem but had not been completely successful, it was thought that if air-cushion sockets for the below-knee amputee were successful, why would they not be equally successful with the above-knee amputee?

Several volunteers with discolored distal ends were contacted and above-knee air-cushion sockets were made for them.

The first sensation indicated by the amputees was feeling in the distal end but no discomfort. Second, a gripping or tightening effect was felt in the lower third of the stump; this feeling dissipated after use of about one week. Color changes became apparent almost immediately and after approximately three weeks of use, normal skir color returned with the exception of some permanent pigment change.

One amputee who had a problem of discomfort from muscle bunching and spasms stated that

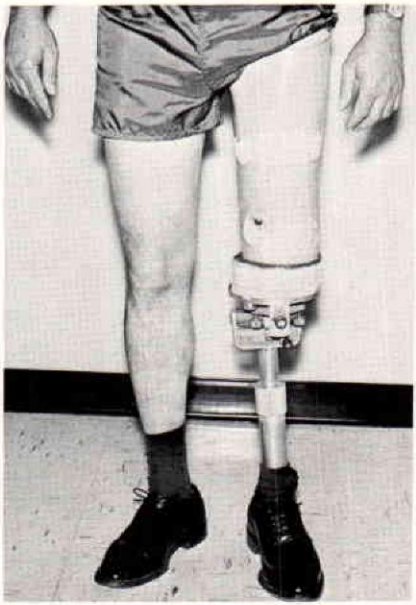

Figure 1

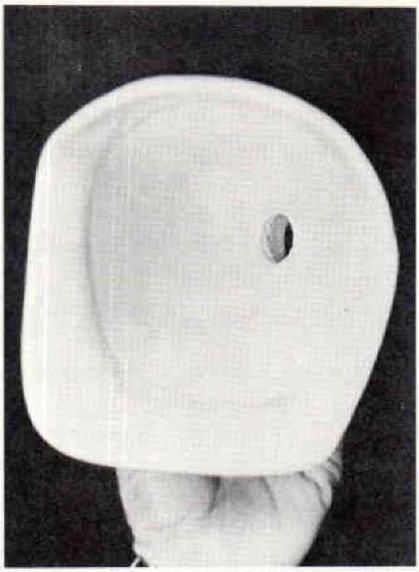

Figure 2

the air-cushion socket completely eliminated his problem.

A veteran patient, under the direction of *H. J. Buegel, M.D. was fitted on an experimental basis and discoloration was almost completely eliminated. (Fig. 1) In a letter to Dr. Buegel the patient stated that he was using the leg approximately 15 to 16 hours per day, being on his feet most of this time as a machinist. He had been unable to wear a prosthesis for about three months prior to this fitting.

The above-mentioned veteran and two other patients were fitted with suction air-cushion sockets. No lamination problems were experienced. There was some concern, however, as to whether or not a seal at the valve could be maintained without loss of air or separation (Fig. 2). To date this has not been a problem; they are functioning properly.

This method has two apparent advantages: first, the socket can be fitted somewhat looser proximally eliminating possible constriction; secondly, foam impregnated stockinette acts as a seal with a gripping action developed as a result of weight bearing.

Methods of casting and cast modifications are basically the same as for the conventional total-contact suction socket with the exception of the proximal tension analysis which should be reduced approximately one-half inch. Care should be used here in evaluating the stump as a loose proximal fit will cause undesirable noise. The proximal third of the socket is of rigid plastic with the distal two-thirds made of three layers of nylon stockinette impregnated with #384 Silastic Elastomer. A distal air chamber is formed with about three-eights to one-half inch space (Fig. 3).

Stump length measurement is critical; reducing the stump length about three-eights inch is suggested. Any additional shorting results in

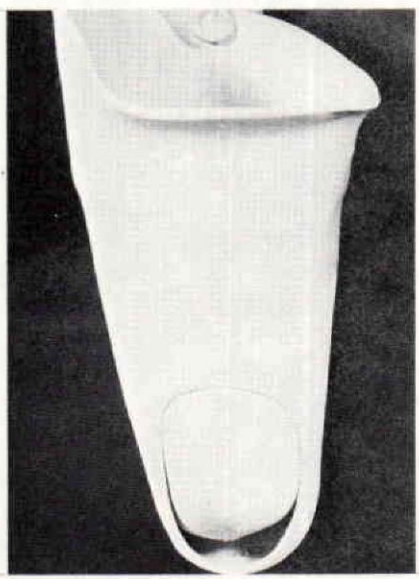

Figure 3

burning and skin irritation at the ischial seat.

Modification of the socket in the proximal third is possible and can be built up in the event of shrinkage. If extensive shrinkage occurs in the distal two-thirds, a new socket must be made. In the case of recent amputations this could mean a new socket in a very short time.

In conclusion, it is believed that this method of fitting has merit particularly for patients with hard to control edema, discoloration, and pain. It is also useful for stumps with bone spurs and little tissue, as well as an aid to stimulate circulation. Air-cushion sockets with hip-control suspension offered no problems. Atrophy can be accommodated by addition of stump socks. No problem of excessive perspiration has occured. Suction sockets can be used with close attention to the proximal fitting, but may need early replacement.

This is not a cure-all method, but one way to solve a major problem for the comfort of the amputee patient.

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