Application of AK Suction Socket Prosthesis By Means of Elastic Bandage

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Mr. Raymond R. Rodriguez, senior physical therapist at the Institute of Physical Medicine and Rehabilitation, New York University Medical Center, recently wrote a very informative article regarding the "Application of Above-Knee Prosthesis" which was published in the Journal of the American Physical Therapy Association.[1] Mr. Rodriguez points out that in a limited number of amputees the application of an above-knee suction socket prosthesis has been facilitated by the use of an Ace bandage.

It is well known that the suction socket suspension offers many advantages over the shoulder harness type or the pelvic belt suspension, but we also are aware of the fact that under certain circumstances it is rather difficult to insert a stump fully by the conventional means of a stockinette. We "old-timers" well remember the blisters we had on our hands when we tried to force a well developed stump into a suction socket which was usually much smaller than was required for the type of muscular stumps which we fitted in the beginning phases of the suction socket program. We have since learned that the application of the suction socket requires a great deal of knowledge about the tissues within the stump and a very close conformity of the socket to those tissues with proper consideration not only for anatomical but also biomechanical requirements of fit and alignment of above-knee prostheses.

Dr. Miles Anderson has developed a tension analysis chart, as published in *Prosthetic Principles—Above Knee Amputations.*[2] This has been of considerable help in the construction of suction sockets. The type of amputees presently being fitted differs widely from the "ideal." It is almost an exception when today such a stump is seen at the prosthetics service of the Institute of Physical Medicine and Rehabilitation. Many of these amputees have a flabby stump as a result of many months of inactivity preceding and also following surgery. Most of the stumps presented by our female amputees consist to a great extent of soft tissue which would atrophy rather rapidly as soon as weight-bearing on a prosthesis is attempted. Quite often our elderly amputees have an impaired sense of balance and the insertion of a stump into a suction socket by means of a stockinette frequently creates problems with which these elder amputees cannot or do not care to cope because it requires a certain amount of effort to be applied in a position where these people would be off balance.

While visiting Europe recently I discussed these problems with Dr. Goetz-Gerd Kuhn and Mr. Hellmut Habermann, who informed me that under similar circumstances they had utilized an elastic bandage instead of the

[1] Journal of the American Physical Therapy Association, Vol. 43, No. 1, January 1963.

[2] *Prosthetic Principles—Above Knee Amputations,* Charles C. Thomas, Publisher.

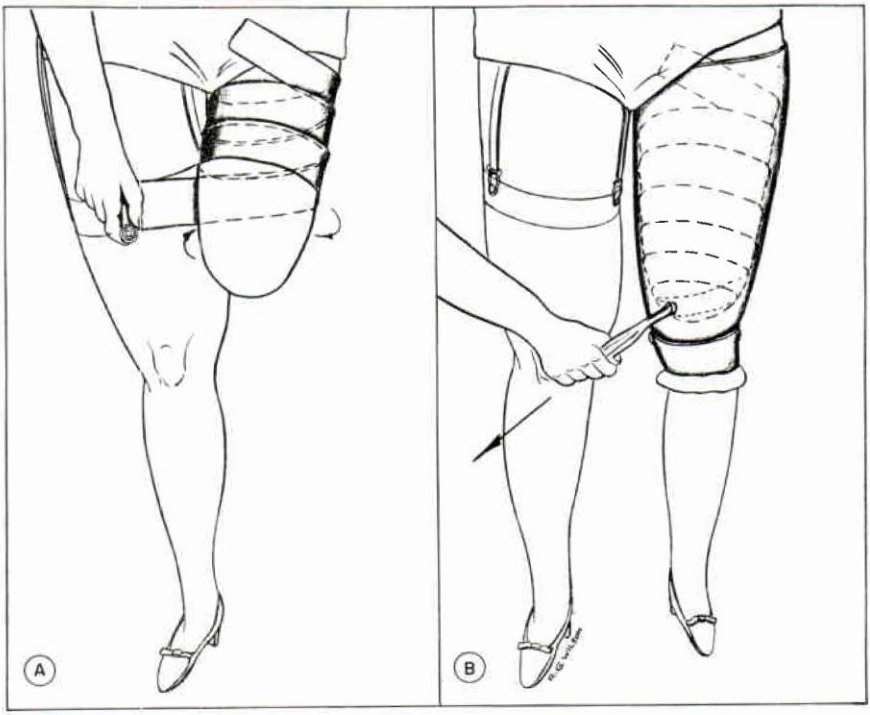

Figure A—Application of bandage to stump.

Figure B—Withdrawal of bandage through valve hole.

standard cotton or nylon stockinette. When I returned to the United States we started to experiment with this method of application and have found it quite helpful in those cases where the standard application created problems.

Mr. Rodriguez has described this method very well in his article. For the benefit of those colleagues who might experiment with this method, may I just repeat the technique which we are presently using and which has been adopted by several prosthetists attending our clinics.

An Ace bandage of 4-inch width or narrower is wrapped around the stump in a spiral fashion, starting in the midline or slightly medial to the midline proximally. We now bandage towards the lateral side, making the first turn around the stump high enough to include all tissues which should normally be inserted into the socket, such as an adductor roll if present. The tension on the bandage is varied depending upon the amount of soft tissue. There should be a certain amount of overlap with every turn.

We have found that only minimal tension needs to be applied to the bandage because the tissue will be further compressed when the bandage is withdrawn through the valve hole. The free end of the Ace bandage is pulled out through the valve hole in the normal manner after the stump is well inserted into the socket. I am not aware of any patient who experienced any difficulties in inserting all of the tissue into the suction socket without need for any pumping motion such as is required if stockinette would be pulled out of the valve hole. The Ace bandage is withdrawn very smoothly and a slight pull is all that is necessary to insert even the flabbiest, most voluminous stump into a tightly fitted socket.

I would state that the method as described by Mr. Rodriguez offers advantages where indicated. It should, however, never be used as a substitute for good and accurate prescription and fitting of a socket. All problems created by a poor fit would still be the same, or even be aggravated, because it is easily possible by means of an elastic bandage to pull a stump into a socket which is much too small for the patient.

In a new stump we have once or twice experienced a problem in removing the limb after the initial period of ambulation. Perspiration probably created a high amount of adhesion between stump and socket. It is also possible that there was a certain amount of swelling in the stump, with the patient unable to relax the tissues as a result of nervous tension, or just an initially tight socket.

We have made it a general practice for the patient to wear a nylon stocking between stump and socket. The stocking should be long enough to extend beyond the proximal end of the socket, should be closed on the bottom, and worn tightly against the stump when the leg is applied. Such a stocking does not cause leakage of air but prevents the tight adhesion of stump to socket which was mentioned previously.

The application of a total contact plastic socket has been greatly simplified by this method of application because such sockets can generally be considerably tighter than ischial bearing sockets. We all know that in a flabby soft stump an ischial bearing socket requires considerable undercuts in order to insert all the soft tissue into the socket and therefore a rather tight proximal socket opening is required. The withdrawal of stockinette in such a socket is often almost impossible. In a total contact socket these problems can quite often be overcome by distributing weight over the total socket with the result of less damaging constrictions. We have found the application of a suction socket utilizing the Ace bandage in these cases of great benefit.

The elastic bandage offers great advantages, also, for the bilateral amputee on account of the ease of application, and in the case of children for whom the parents may have to apply the limb. Where a suction socket is applied by means of stockinette it is quite often difficult to harmonize the pull of the stockinette with the relaxation of the stump. This cooperation is not quite as essential in the application by means of elastic bandage.

I would appreciate discussion of this method by any colleagues who might have utilized the Ace bandage in a similar manner. I realize that the problems of the cotton stockinette must have occurred to others and have probably been worked out by means of other methods, the discussion of which would be of benefit to all.