

Stump Bandaging of the Lower-Extremity Amputee*

By BELLA J. MAY, B.A.

In many rehabilitation centers and hospitals throughout the country, the physical therapist must wait for the amputee to be referred for treatment. Often the surgeon will not refer the elderly patient or the one suffering with a vascular impairment until the sutures are removed and healing is complete.

Early referral of the young, traumatic amputee for proper preprosthetic treatment is well accepted. Such treatment has three main purposes:

1. To prepare the stump for a prosthesis.
2. To maintain general physical condition.
3. To aid the patient's psychological adjustment to his disability.

These aims are achieved through a program of exercise, proper body positioning to prevent contractures, crutch training, and stump bandaging. In the young amputee this training is begun as early as the patient's general physical condition will allow. The amputee is encouraged to assume proper positioning in bed immediately after surgery; walking, exercise, and stump bandaging are usually started a few days after surgery. Early preprosthetic treatment and prosthetic fitting lead to better adjustment and rehabilitation of the amputee. The application of this rationale of treatment toward the geriatric amputee, particularly one suffering from some form of vascular disease, however, leads to much controversy.

Delayed referral may mean a lapse of several weeks or perhaps months before the patient is started on the proper program to prepare him for an artificial limb. Too often this delay results in contractures, muscle weakness, and edematous, flabby stumps that require many extra weeks of prosthetic treatment.

According to many surgeons, early walking and exercise are contraindicated for the geriatric amputee because such exercise may lead to increased edema, sloughing of tissue, and slowing of the healing process as a result of additional stress placed on the already compromised circulation of the stump. Proper bandaging is necessary to control this edema, but, since this requires considerable skill and frequent reapplication, it is impractical.¹ Too often the patient is unable to bandage himself in the early days after surgery and qualified personnel are not available to rebandage the stump as often as necessary. Improper stump bandaging can cause irreversible damage. On the other hand, proper stump bandaging, resulting in shrinking and shaping the stump, is a major key to successful prosthetic fitting.

While working with over 200 geriatric and vascular amputees in the Rehabilitation Department of Jackson Memorial Hospital, the advantages of early preprosthetic treatment became evident.

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THE BELOW-KNEE AMPUTEE

When below-knee amputee patients were started on the usual routine of exercise, walking, and stump bandaging, several patients showed increased drainage, sloughing of tissue, and delayed healing within a few days of the treatment. In all cases the trouble was traced to improper bandaging. Great care always was taken during the treatment period to bandage the stump properly and carefully and to teach the patient the proper techniques. In the interval between treatment sessions, however, the patient often attempted to reapply the bandage, usually replacing it improperly and causing damage to the stump. Occasionally, the patient would leave the bandage untouched for twenty-four hours, causing wrinkles and binding which were equally damaging.

Method

It is necessary for an amputee, or some member of the family, to learn how to bandage the stump as early as possible. Therefore, simple, easy-to-learn techniques were devised that reduce the hazards of early preprosthetic treatment and meet the particular requirements of the patella tendon-bearing prothesis.

Under the old method, the amputee was taught to make two or more recurrent turns and anchor them with one or more circular turns around the proximal portion of the stump before going into the figure-of-eight pattern. Many patients would continue to make circular turns after the recurrences, carrying the bandage from the proximal end of the stump to the distal end, or they would make several tight circular turns around the proximal end of the stump to anchor the recurrences before making a few figure-of-eight turns to catch the corners. These circular turns would choke the stump, cutting off or radically slowing circulation. This obviously led to edema, sloughing, poor shrinkage, and bulbous stumps.

In the new method of bandaging, the patient is taught only angular turns in a figure-of-eight pattern. The only circular turn is an anchor above the knee and the patient is repeatedly advised that this is merely to help keep the bandage on and must not be tight.

The Pattern of Wrapping the Stump.—The bandage is started just above the lateral tibial condyle; it is brought diagonally across the anterior aspect of the stump to the medial distal corner (Fig. 1A). It is then brought back diagonally across the stump posteriorly, swung across the beginning of the bandage and anchored with a circular turn above the patella (Fig. 1B). After a single anchoring turn above the knee, the bandage is brought back down around the medial tibial condyle (Fig. 1C), and across the posterior aspect of the stump to the lateral distal corner as seen in Figure 1D. Figure 1E shows how the figure-of-eight pattern is continued for the rest of the bandage, taking care to cross the crest of the tibia in an angular manner.

If semicircular turns are necessary to bring the bandage in proper position, they must always be on the posterior aspect of the stump in order to compress soft tissue without hampering circulation. As the figure of eights are made, they should partially overlap so that the whole stump is covered, with the greatest amount of pressure on the distal end. In an extremely short stump, it may be necessary to bring the bandage above the knee several times to avoid circular turns below the patella. The figure-of-eight pattern is from the proximal to distal and proximal again, starting at the condyles and covering the stump to include both condyles as well as the patella



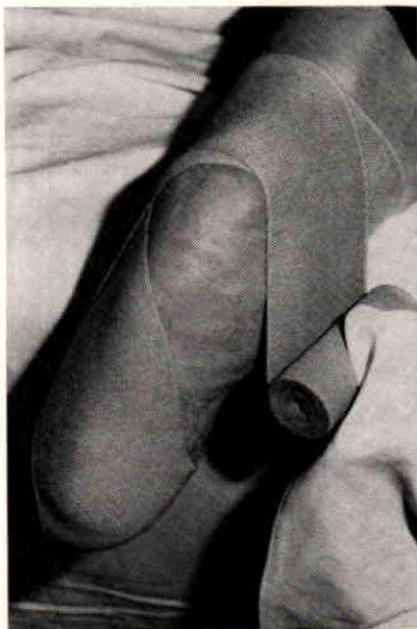
1A

tendon. Only the patella, itself, is left free so as not to interfere with knee motion and allow free circulation in the popliteal area (Fig. 1F).

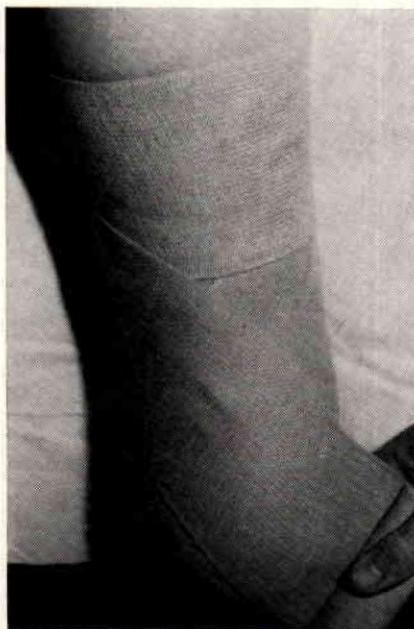
The Second Bandage.—In the average length stump, two 4-inch elastic bandages are necessary to properly shrink and shape the stump. Sometimes in the early postoperative days only one bandage is used if the stump can adequately be covered. In long or especially large stumps, three band-



1B

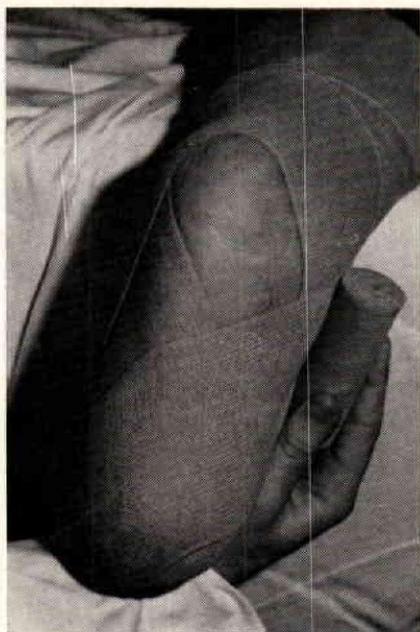


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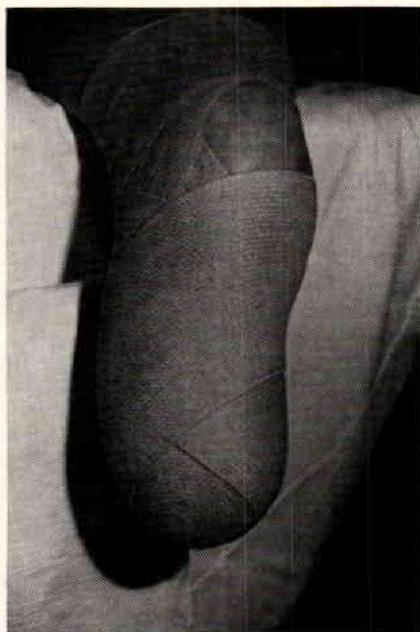


1D

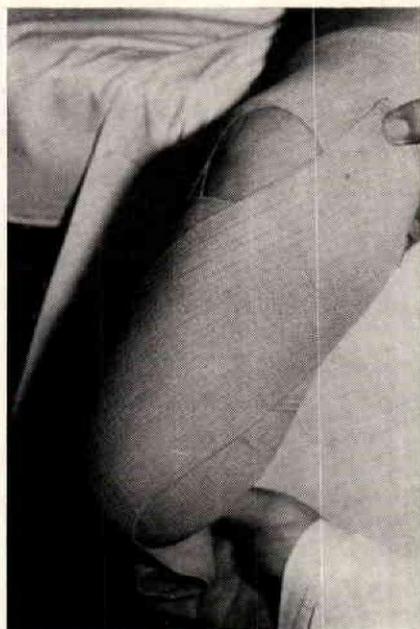
FIGURE 1—Steps in bandaging the below-knee amputee are shown. (A) The first bandage is started immediately above the lateral tibial condyle, brought diagonally across the anterior portion of the stump, swung around, and (B) brought diagonally across the posterior aspect of the stump and anchored above the knee. (C) The bandage then is brought around the medial tibial condyle, (D) across the posterior aspect of the stump, (E) continued across the



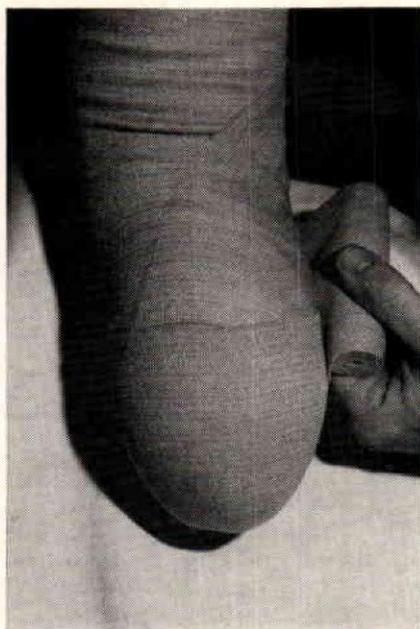
1E



1F



1G



1H

crest of the tibia at an angle, (F) with the patella left uncovered. The second bandage (G) is started in a similar manner, above the medial tibial condyle and brought diagonally across the anterior aspect of the stump to the lateral distal corner. (H) Extra pressure is brought on excess tissue by a semicircular turn posteriorly.

ages are necessary for proper shrinkage. With practice, it has been found that a 4-inch bandage is the best width for all adult below-knee stumps. While it might increase shrinkage to use more than two bandages for the average stump, it has been found that most patients cannot tolerate this.

The second bandage is wrapped like the first with the following exceptions. It is started above the medial tibial condyle and brought across the anterior aspect of the stump to the lateral distal corner (Fig. 1G). It will be noted that with the first bandage, the line of stress is from proximal lateral to distal medial, pulling the medial distal tissue posteriorly and the lateral distal tissue anteriorly. In order to create uniform pressure for proper shaping of the stump, the second bandage is started medially, thus pulling the lateral distal tissue posteriorly and the medial distal tissue anteriorly.

In a long stump, 6 inches or more, it is not necessary to anchor the second bandage above the knee, but it can be anchored with a semicircular turn across the popliteal area. With both bandages an effort is made to bring the angular turns across each other rather than in the same direction in order for the weave of the bandage, itself, to assist in exerting a uniform pressure on the stump.

Bandage Pressure

In the early postoperative days, the bandage is wrapped very loosely with moderate pressure distally and minimal pressure proximally. One or more sterile gauze pads are placed between the incision and the bandage to absorb any drainage. If necessary the elastic bandage can be rewrapped without disturbing this sterile dressing. After drainage has ceased, a single gauze pad is maintained between the sutures and the bandage so as to prevent pulling on the sutures. This pad is discontinued as soon as the sutures are removed unless the stump has not yet healed primarily. Occasionally, primary healing is slowed by the vascular condition of the stump and there may be an open area along the incision after the sutures are removed. In these cases, sterile dry dressings are continued under the bandaging until the incision is completely healed. Contrary to opinion, bandaging even in these cases does not compromise healing if done properly. Actually, bandaging and walking aid healing even with difficult cases, as they are deterrents to dependent edema and venous stasis.

As healing takes place and the sutures are removed, the pressure of the bandage is increased to the tolerance of the patient. Care must be taken to provide the amputee with good elastic bandages and to insure an adequate supply of these bandages throughout the preprosthetic period. The amputee is taught to wash his bandages frequently and replace them as soon as they start to lose their elasticity. As the pressure is increased, the amputee must be warned against pulling the bandage to the fullest extent of its elasticity as this causes wrinkles, undue and uneven pressure on the stump.

Often in the last days of preprosthetic training, the amputee will still have some excess tissue at the distal posterior end of the stump. In these cases extra pressure can be brought to bear in these areas by bringing the bandage from one corner directly to the other over the posterior aspect of the stump before bringing it proximally (Fig. 1H). Several of these posterior semicircular turns can be incorporated in the bandaging but a regular figure-of-eight turn should separate them. When the amputee is taught this change in the method of bandaging, it must be carefully explained that these turns should only be used at the distal end of the stump.

THE ABOVE-KNEE AMPUTEE

In the above-knee amputee, an improperly bandaged stump may create such problems as adductor rolls which result in the need for many prosthetic adjustments as the stump shrinks within its socket. Many geriatric amputees have difficulty adjusting to a prosthesis; these added problems may make successful wearing impossible.

Proper bandaging will reduce the excessive adipose tissue and will lessen the tendency of development of an adductor roll. In addition, bandaging supports the soft tissues in the early healing phase following amputation. It is during this phase that the efficiency of the vascular system is greatly impaired causing an accumulation of fluid in the stump. Ambulation with the stump in a dependent position causes further accumulation of fluid. Therefore, external support is essential to minimize and reduce edema.²

Shrinking the above-knee stump is much more difficult than the below-knee stump. Best shrinkage and shaping of the stump is achieved through the use of pylons. The Hosmer temporary walking leg with a plaster pylon not only shrinks and shapes the stump faster and more efficiently than bandaging, but allows the amputee to begin prosthetic walking much earlier. The friction knee of the temporary walking leg prevents improper gait habits which occur frequently with the peg pylon. It has a lock, if greater stability is needed for the bilateral amputee or the particularly unsteady patient.

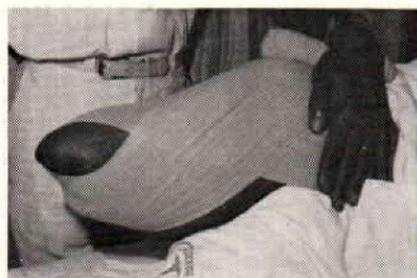
Bandaging should be started in the first postoperative week, but more efficient techniques of above-knee stump bandaging have been needed. Under the old method, bandaging started with several anterior-posterior recurrences which were anchored by several proximal circular turns. Following this several figure-of-eight turns were anchored by a hip spica.

In bandaging the elderly above-knee amputee, two main problems recur fairly constantly. One is inadequate pressure on the medial proximal tissue which causes adductor roll and the other is constant slipping of the bandage. The problem is to bring enough pressure proximally without bandage roll and without cutting off circulation to the distal end of the stump. Most elderly patients, especially women, have an excess amount of soft, flabby, tissue around the proximal area of the stump, and the bandage tends to roll back leaving this area exposed. While the method of bandaging described here does not pretend to solve these problems, it improves upon the old method.

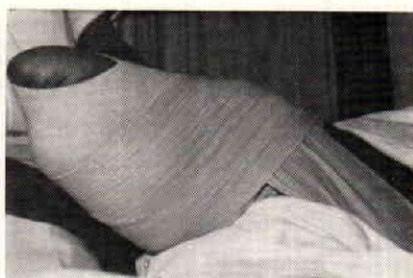
Method

For the average length stump two 6-inch and one 4-inch elastic bandages are used. In a large or obese patient, three 6-inch and one 4-inch bandages are used. With a short stump one 6-inch and two 4-inch bandages are more effective.

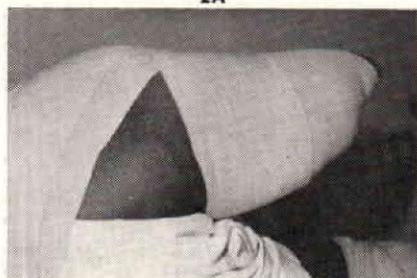
The patient is placed on the unaffected side with the stump in an extended position. Bandaging can be done in a standing position but most elderly patients do not have the necessary balance. The 6-inch bandages are used first; the 4-inch is always the last bandage. The bandage is started in the groin and is brought diagonally over the lateral distal corner of the stump. It is swung around the posterior distal end of the stump, over the medial corner, and brought back diagonally over the anterior stump to the iliac crest (Fig. 2A). It is then brought around the hips in a spica. It is important that the bandage be started from the medial portion of the stump



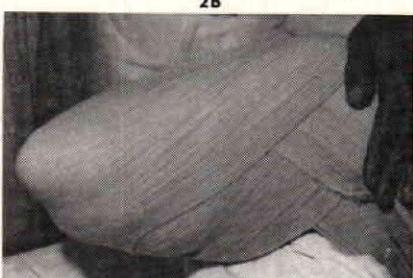
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2B



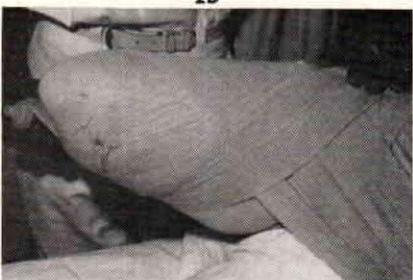
2C



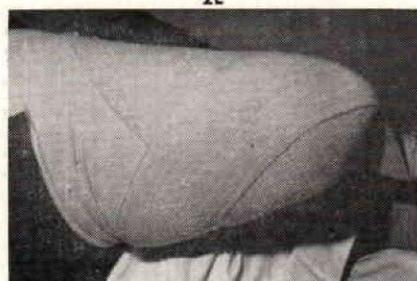
2D



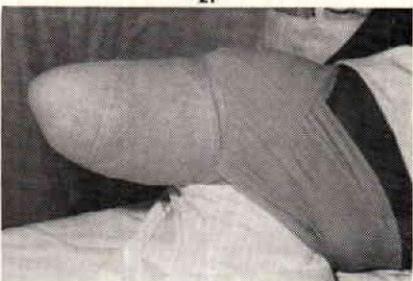
2E



2F



2G



2H

FIGURE 2—Steps in bandaging the above-knee stump are as follows: (A) The first 6-inch bandage is started in the groin and brought diagonally over the lateral distal corner of the stump, swung around the posterior distal end of the stump, over the medial corner, and brought back diagonally over the anterior stump to the iliac crest, (B) swung around the proximal portion of the stump from lateral to medial and around the hips again, (C) covering the stump except for a small part of the lateral distal corner; (D) the second 6-inch bandage is brought around the stump to cover the lateral distal corner in an oblique fashion, (E) across the stump on its second turn as far laterally and distally as possible to help keep the stump in adduction; (F) the 4-inch bandage is started at the lateral proximal portion of the stump, brought over the medial distal corner around the posterior stump to catch the lateral distal corner; (G and H) the figure-of-eight pattern is continued to create the greatest pressure on the distal end.

so the spica will pull the stump into extension. Care must be taken so that the stump is not abducted at the same time.

As the bandage comes back around the hips to the stump, it is swung around the proximal portion of the stump high in the groin area from lateral to medial and around the hips once more (Fig. 2B). At this point, one 6-inch bandage will have been used and all of the stump except for a small part of the lateral distal corner will be covered (Fig. 2C). If the bandages are not sewn together, the second 6-inch bandage is also started in the groin area but slightly more laterally so it can be brought around to cover the lateral distal corner in an oblique fashion (Fig. 2D). This second bandage is brought around in a hip spica, then around the proximal portion of the stump to another spica in a similar manner as the first bandage. As the second bandage is brought around from its second turn around the hips, it should be brought across the stump as far laterally and distally as possible to help keep the stump in adduction (Fig. 2E). In the average stump, both 6-inch bandages will have been used at this point. If the stump cannot be adequately covered with the two 6-inch bandages, a third one should be applied in a similar manner as the first two. While more of the first two bandages are used to cover the proximal aspect of the stump, care should be taken that the bandage does not cut off circulation. It has been found that bringing the bandage directly from the proximal medial area of the stump into the spica helps keep the bandage over that area and prevents rolling to a reasonable degree.

The 4-inch bandage is used to exert the greatest amount of pressure at the distal end of the stump, to prevent "dog ears," and to achieve proper shaping for prosthetic fit. In all but the very short stumps, it is not necessary to wrap this bandage in a spica. Thus it is started at the lateral proximal portion of the stump, brought diagonally across the anterior stump, over the medial distal corner and around the posterior stump to catch the lateral distal corner (Fig. 2F). Starting this bandage laterally brings the weave of the bandage across that of the previous bandage, thus exerting more even pressure on the stump. The bandage is continued in the usual figure-of-eight pattern bringing most of the pressure to the distal end of the stump (Fig. 2G).

The finished bandage should provide for a well-shaped, conical stump with the greatest amount of pressure at the distal end but with the proximal soft tissue well held within the bandage. The repeated hip spicas will assist in keeping the bandage in place for a longer period of time (Fig. 2H). It is better to anchor the bandage with safety pins, as clips tend to loosen too easily. Regardless how well the bandage stays on, the patient must be advised to rebandage four to five times a day to maintain proper pressure and prevent skin problems from wrinkles.

Pressure

In the early postoperative stages, the bandage should be applied fairly loosely so as not to compromise healing. While the sutures are still in, sterile gauze pads should be placed under the bandage for the same reason given earlier. Improper bandaging or bandages which are not changed frequently can create a hazard to healing.

Whenever possible, members of the family should be taught how to bandage the stump as most amputees cannot manage this properly by themselves. In teaching the family, the purposes as well as the methods must be taught and members of the family should be given as many practice sessions

externally rotated, thus placing the volar surface of the hand and forearm in the desired casting position. Polyethylene sheets taped in place were used to cover the surgical dressings and all areas of the palm and forearm that were to be cast.

Plaster of paris splints of a suitable length to cover the volar surface of the hand and forearm were prepared.

These were immersed in water and applied in the normal manner, care being taken to insure that the wrist was held in a neutral position until the plaster had dried. (Fig. 1)

The patient was then turned on his side with the arm abducted, the elbow flexed at 90° and internally rotated, so that the extensor surface of the forearm could be cast. The casting procedure was the same as before.

Indelible pencil was used to establish approximate trim lines and to index the two halves of the cast. The cast was removed from the patient and joined together with plaster of paris bandage. A plaster positive was poured and prepared for lamination.

Lamination Procedure:

The cast was coated heavily with High-Glo parting lacquer and a layup of one layer of 1/2 oz. dacron felt and four layers of nylon stockinette were used. A P.V.A. bag was then pulled over the layup. A blend of 90% rigid and 10% flexible Polyester resin was used. Vacuum was used to insure accurate conformation to the cast, since a rigid laminate was desired. (Fig. 2)

Following trim-out, velcro straps (see Fig. 3) were attached and the orthosis was applied to the patient. Future plans are to line the orthosis with a material such as tricot-backed vinyl foam as the need for surgical dressings diminishes.

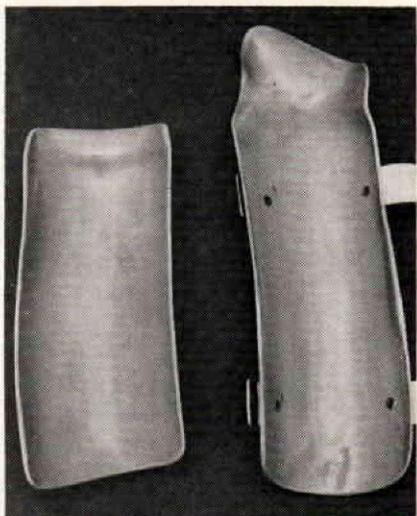


FIGURE 2—Interior view, showing trim lines.

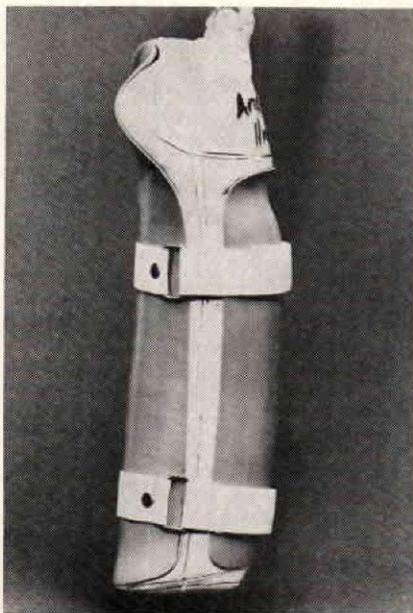


FIGURE 3—Lateral view, showing Velcro closure.