

CHAPTER 5

The Hip-Disarticulation Amputation

I. PREOPERATIVE INSTRUCTIONS TO THE PROSTHETIST

1. When notified by the surgeon, obtain from him all necessary information required and available at this time.

a. Side of amputation.

b. Proposed level of amputation if this information is available.

c. Any additional physical defects of the patient which might restrict or limit movement and/or weight-bearing and ambulation activities.

2. Talk to the patient, explain your role, what you intend to do, and what is expected of him. He may be apprehensive and anxious; don't make him more so. Explain the advantages to be derived from an immediate postsurgical prosthesis and from well-fitting prostheses, generally.

3. Consider any physical defect noted by the surgeon which would influence casting and/or alignment of the prosthetic unit.

4. Note approximate size of the 1/2 in. reticulated polyurethane, 20 ppi, sheeting required. This interface material must be sterilized before application.

5. Note approximate size Orlon Lycra stump sock required. This sock must be gas sterilized before application at surgery (see Table 2, Chapter 2, Section I.6).

II. PREOPERATIVE PREPARATIONS BY THE PROSTHETIST OF MATERIALS AND COMPONENTS

1. Fashion elongated horeshoe-shaped iliac crest felt relief pads, right and left, of 1/2-in.-thick medium-hard felt.

2. Select and assemble an appropriate adjustable prosthetic unit and pylon.

3. Obtain a shoe from the patient at least one day prior to surgery and fit a SACH foot to it. If the patient is unable to furnish a shoe or if the shoe should be unsatisfactory for proper fitting and alignment, a Kingsley Immediate Postsurgical SACH foot is selected. A neoprene rubber heel can be glued to a conventional SACH foot to level it in order to achieve proper static and dynamic alignment of the prosthesis when the patient stands.

4. Assemble components and materials required for the hip-disarticulation rigid dressing application at the time of surgery (Fig. 242) (see Appendix B for List of Suppliers):

a. Small towel

b. Sterile Orlon Lycra stump sock

c. 2 rolls bias-cut cotton stockinet, 5 in.

d. Sterile 1/2 in. reticulated polyurethane sheeting

e. Iliac crest felt relief pads, right and left

f. Dow Corning Medical Adhesive, Type B

g. 4 rolls of 5 in. elastic plaster bandage

h. 12 plaster splints, 4 in. x 15 in., extra fast setting

i. 3 rolls of 5 in. conventional plaster bandage, extra fast setting

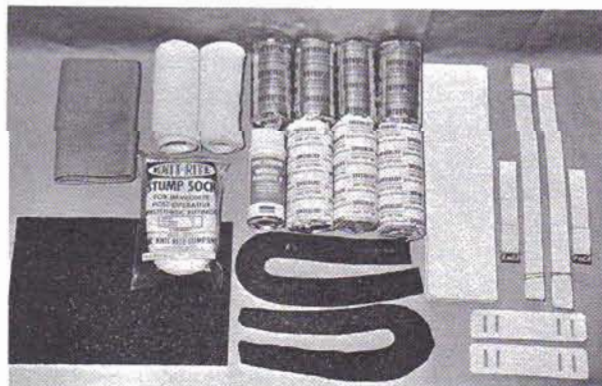


FIGURE 242

- j. 2 (1 in. wide) cotton webbing shoulder suspension straps with safety buckles
- 5. Assemble kit of tools required for hip-disarticulation rigid dressing application at the time of surgery:
 - a. Bandage scissors
 - b. Skiving knife

III. THE HIP-DISARTICULATION AMPUTATION SURGERY

The Boyd anterior flap approach is used whenever possible and the standard hip-disarticulation procedure is carried out. Muscle stabilization and the filling of dead space are simultaneously obtained by suturing the adductors and extensors to the gluteal muscles with interrupted absorbable suture. Care must be taken to develop a myofascial flap in the adductor group which is sufficiently long for closure.

Adequate postoperative drainage is essential. Suction drainage for the acetabulum and a distal Penrose drain for soft tissue are strongly recommended. The drains are removed 48 to 72 hours after surgery. Then weight bearing is carefully started.

Initially the wound is dressed with nonadherent silk or nylon over which is placed a small amount of well-fluffed gauze.

A sterile Orlon Lycra stump sock holds the dressing in place. For application it must be unrolled completely and cut along its lateral aspect distally to the border of the box toe. Locate the uncut portion of the stump sock over the fluffed gauze dressings and firmly support the stump sock in a proximal diagonal direction.

It should be noted that for any given patient, variations in surgical technique will be necessary. Problems in our series of hip disarticulations have developed when the degree of radiation damage to the skin and myofascial flaps was not recognized and postoperative skin necrosis ensued.

Variations in surgical technique should not, however, preclude the use of the immediate postsurgical rigid dressing. It provides valuable soft tissue immobilization and allows the patient to sit and stand early in the postoperative period (Fig. 243, 244, 245, and 246).



FIGURE 243.—Hip-disarticulation anterior (Boyd) technique prior to closure.

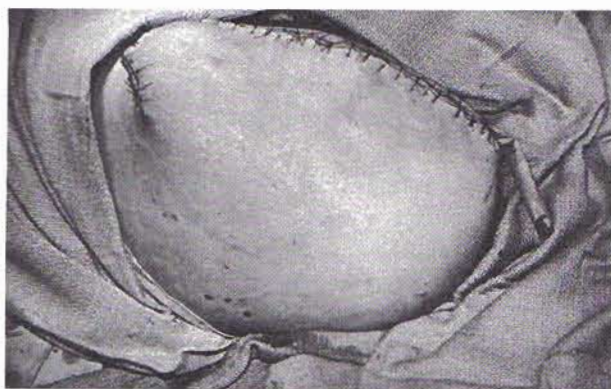


FIGURE 244.—Appearance of hip disarticulation, at time of closure, with drains.

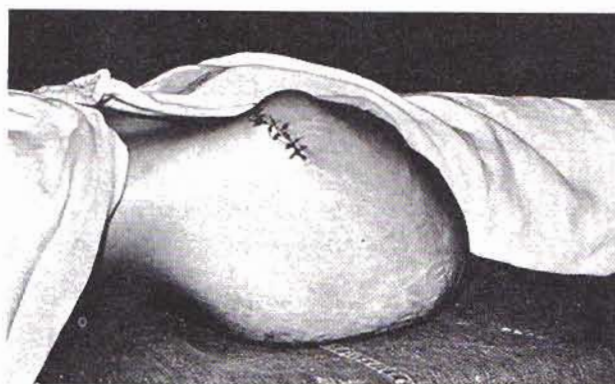


FIGURE 245.—Same patient as in Figures 243 and 244, 24th postoperative day, at time of cast change and suture removal.

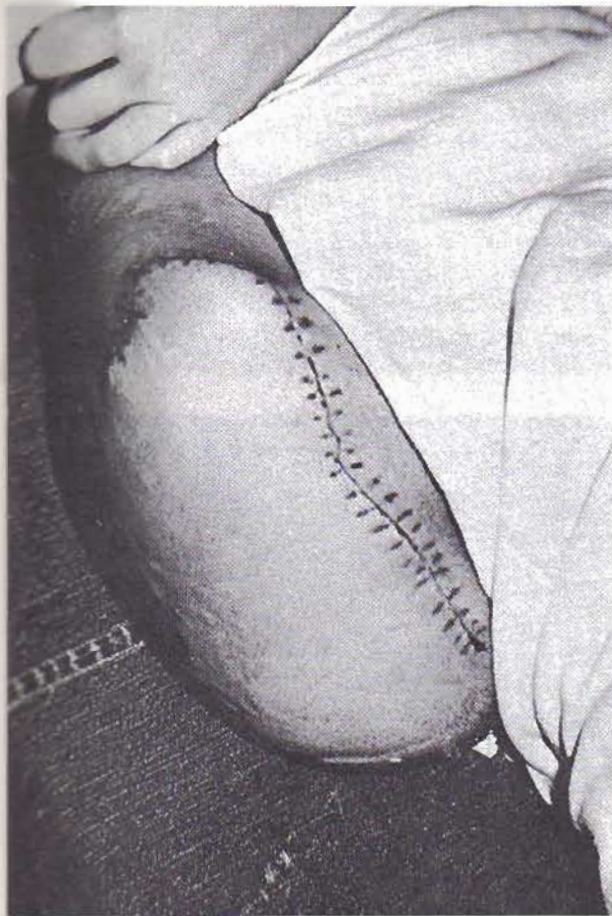


FIGURE 246.—Same as Figure 245.

IV. THE HIP-DISARTICULATION IMMEDIATE POSTSURGICAL PROSTHESIS

A. PREPARATORY REQUIREMENTS BEFORE APPLICATION OF THE RIGID DRESSING

1. The use of a fracture table for application of the rigid dressing is recommended. Fold back 4 in. of the proximal and cut borders of the Orlon Lycra stump sock. **DO NOT EXPOSE THE WOUND.**

With Dow Corning Medical Adhesive, Type B, spray the entire exposed inner portion of the stump sock including the anterior and posterior borders where the sock has previously been split. Spray the corresponding areas of the skin and allow 5 seconds for the adhesive to become tacky (Fig. 247). Reapply the stump sock firmly in a proximal-diagonal direction



FIGURE 247

towards the sound side and instruct an assistant to maintain it suspended. Avoid leaving wrinkles in the stump sock.

The adjustable shoulder suspension harness, which is interchangeable for left and right, can be substituted to achieve the same result.

2. Place a small folded towel in the area of the stomach to allow for expansion due to food intake later (Fig. 248).

3. Depending on the patient's size, apply one to two rolls of 5-in.-wide bias-cut stockinet. Begin the wrap on the lateral distal portion of the amputated side wrapping diagonally across the abdomen towards the iliac crest and waist. Place alternating wraps over the pelvis and lower waist including the stump. Apply firm tension to the stockinet whenever wrapping over the area of the buttock and anterior distal stump margin. All portions of the pelvis and lower waist to be included in the following plaster wrap should be



FIGURE 248



FIGURE 249



FIGURE 250

protected by approximately two layers of stockinet (Fig. 249 and 250).

4. Prepare an appropriate size of $\frac{1}{2}$ in. reticulated polyurethane sheeting and trim it to the required shape to cover the total area where the two skin flaps meet.

5. When indicated, add additional pieces of reticulated polyurethane sheeting to areas which appear concave, to insure even overall stump compression and to prevent hematoma.

6. Bevel the polyurethane sheeting, including any additional pieces that may be required, around the entire periphery with a pair of scissors so they will blend smoothly into the plaster wrap.

7. Spray the back of the polyurethane sheeting, including the areas of the stump sock on which it will be located, with Dow Corning Medical Adhesive, Type B. Allow 5 seconds for the adhesive to become tacky, then reapply. Repeat the procedure if additional sheeting is required to fill concave areas. Locate smaller pieces beneath larger ones (Fig. 251 and 252).

8. Prominent iliac crests are relieved with elongated horseshoe-shaped $\frac{1}{2}$ -in.-thick medium-hard felt relief pads. Both right and left pads are sized, trimmed, skived, and beveled in the appropriate areas for individual requirements.

Locate each pad close to the borders of the iliac crest so the posterior pad extensions are not more than $\frac{1}{2}$ in. apart. By so doing, the plaster wrap will span these areas without actually contacting the underlying skin. Terminate the relief pads in a feathered edge *slightly past the level of the posterior iliac crest.*



FIGURE 251



FIGURE 252

9. Maintaining continuous tension on the stump sock, spray the backs of the felt relief pads including the areas of their location on the bias-cut stockinet with Dow Corning Medical Adhesive, Type B. Allow 5 seconds for the adhesive to become tacky.

Reapply the felt relief pads exactly as outlined before (Fig. 253).

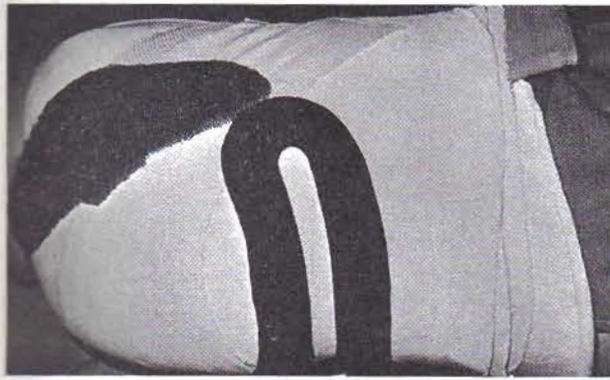


FIGURE 253

Note: The $\frac{1}{2}$ in. separation between the posterior extensions of the felt relief pads also takes into consideration the slight migration of the two posterior extensions towards one another as the elastic plaster bandage is being applied. If the separation exceeds $\frac{1}{2}$ in., the relief pads lose their function as supports to bridge the plaster wrap across the iliac crest and hence relieve it from pressure. Skin damage over the iliac crest may result. No relief pads are required for an obese patient.

B. APPLICATION OF THE RIGID DRESSING

1. For the initial wraps, elastic plaster bandage is used rather than conventional plaster. When using an elastic plaster bandage, the elasticity provides safe and beneficial compression of the stump while conforming well to its contours, providing a smooth rigid dressing. *Continuous tension must be maintained on the stump sock until the plaster has hardened.*



FIGURE 254

Begin the plaster wrap on the distal-lateral stump portion and continue diagonally across the abdomen to the iliac crest and lower waist (Fig. 254). Repeat this procedure twice and alternate the third wrap by placing it circumferentially, covering the pelvis and lower waist region (Fig. 255). Continue in this manner until the cast is completed (Fig. 256). Extend the wrap proximally to include the two lower ribs. The cast socket brim must flare outward for maximum comfort. Keep the plaster bandage from rolling back on itself by relaxing the tension at this portion of the cast socket.



FIGURE 255

By using all available stretch from the elastic plaster bandage, apply firm tension to the buttock and distal anterior stump margin and in effect, maintain the tissue support by anchoring the wrap to the pelvis and waist of the sound side. The circumferential wraps provide cast suspension. Use sufficient elastic plaster bandage to form a three- to four-layer thickness.



FIGURE 256

2. Because of the inherent structural weakness of elastic plaster bandage, the initial wrap must be reinforced with conventional plaster bandages and splints.

Approximately four to six double layers of 4 in. x 15 in. plaster splints are applied over the distal portion of the cast socket anteroposterior, partially overlapping each previous layer (Fig. 257, 258, and 259).



FIGURE 257



FIGURE 258



FIGURE 259



FIGURE 260



FIGURE 261

3. A roll of 5 in. conventional plaster bandage is applied over the plaster splints in a diagonal and circumferential manner with even, overlapping wraps (Fig. 260 and 261).

Variation: For an obese patient, with the plaster of paris still wet, flatten the cast socket slightly with both hands in the anteroposterior dimension. Also mold the plaster into the soft tissue just proximal to the ilium bilaterally. This procedure will improve cast socket suspension and avoid rotational instability (Fig. 262).

4. (a) At the anteroproximal level of the rigid dressing, two 1 in. safety buckles sewn to 1 in. x 8 in. cotton webbing straps, are located about 4 in. apart (Fig. 263).

(b) At the posterproximal level of the rigid dressing, two 1 in. cotton webbing shoulder suspension straps are located about 4 in. apart and in a direction so they will cross when placed over both shoulders.

5. Incorporate the safety buckles and suspension straps to the cast socket by placing two turns of a 4-in.



FIGURE 262

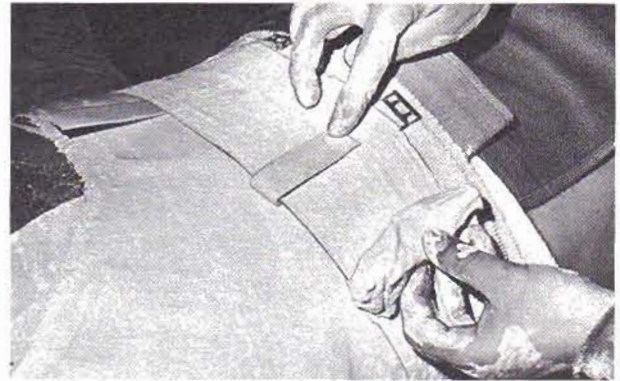


FIGURE 265

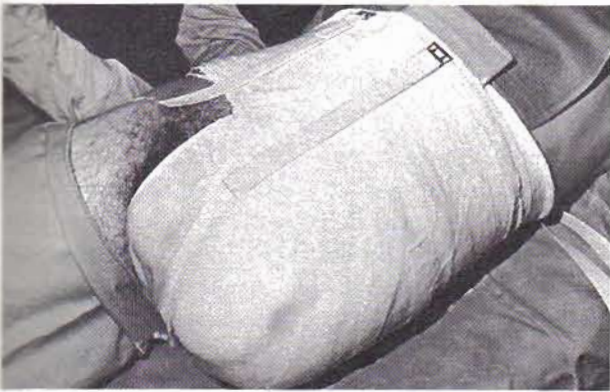


FIGURE 263

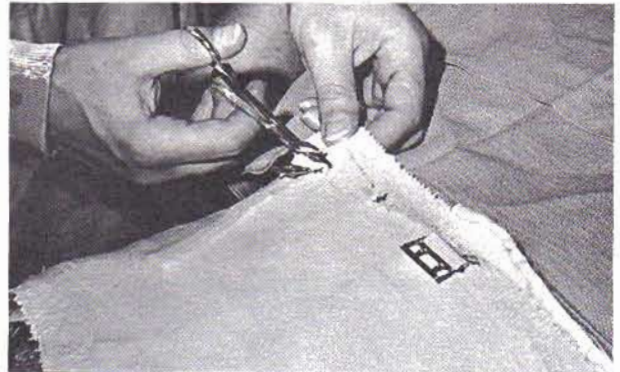


FIGURE 266



FIGURE 264

roll of conventional plaster bandage over the webbing retainers and suspension straps (Fig. 264).

The remaining distal portions of the webbing are folded back and wrapped in place with the remaining plaster bandage to anchor them firmly in place (Fig. 265).

6. After the plaster has hardened sufficiently, the proximal tension on the stump sock is released and the towel removed from over the stomach area.

7. With a pair of scissors, cut a slot in the stump sock and the bias-cut stockinet at the level of, and corresponding to, the size of the safety buckles. The sock and stockinet are pulled down over the proximal cast brim and the buckles are passed through the slots (Fig. 266).

8. Secure the folded back portion of the stump sock and stockinet to the cast with two plaster splints (Fig. 267).

9. Place both shoulder suspension straps over each shoulder after crossing them in back for men, and in front for women. Attach them to the anterior attachment buckles. Thread the excess webbing through the lower attachment loop of the safety buckle and fold the remaining material back underneath the suspension strap (Fig. 268).

The patient is now ready to be moved to the recovery room (Fig. 269).

Drain removal is difficult, if not impossible, with the prosthetic unit attached to the rigid dressing. For this reason, attachment of the prosthetic unit is delayed until the drain (or drains) have been removed (48 to 72 hours postsurgically).

THE WHOLE PROCEDURE OF CAST APPLICATION SHOULD NOT TAKE MORE THAN 20 MINUTES WITH PRACTICE.



FIGURE 267

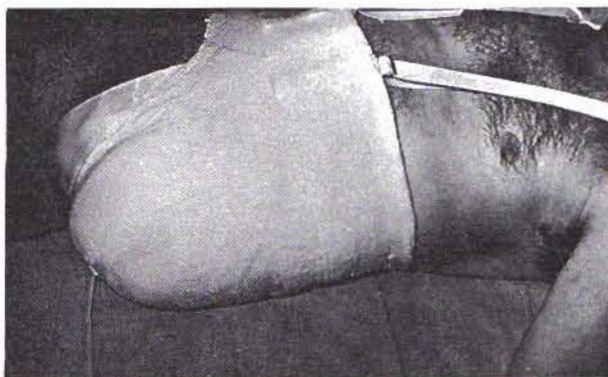


FIGURE 268

HIP-DISARTICULATION CASTING TECHNIQUE

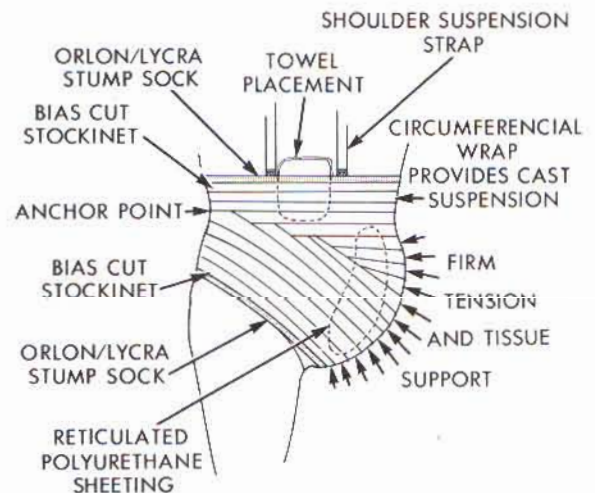


FIGURE 269

C. APPLICATION OF THE PROSTHETIC UNIT

After the drains have been removed 48 to 72 hours after surgery, the patient is taken to the cast room for application of the prosthetic unit, pylon, and foot.

LIST OF SUPPLIES REQUIRED:

- a. Prosthetic unit, aluminum tubing, and hose clamp
- b. Immediate Postsurgical SACH foot with bolt and base plug
- c. Approximately eight plaster splints, 4 in. x 15 in., extra fast setting.

Note: Prior to application, two slots should be cut with a hacksaw in the distal (or foot end) of the pylon tubing.

LIST OF TOOLS REQUIRED (Fig. 270):

- a. Metal shears
- b. Indelible pencil
- c. Screwdriver
- d. $\frac{5}{16}$ in. Allen wrench for foot
- e. $\frac{3}{16}$ in. Allen wrench for prosthetic unit base plug
- f. $\frac{3}{8}$ in. Allen wrench for unit alignment adjustment
- g. Tube cutter
- h. Bandage scissors

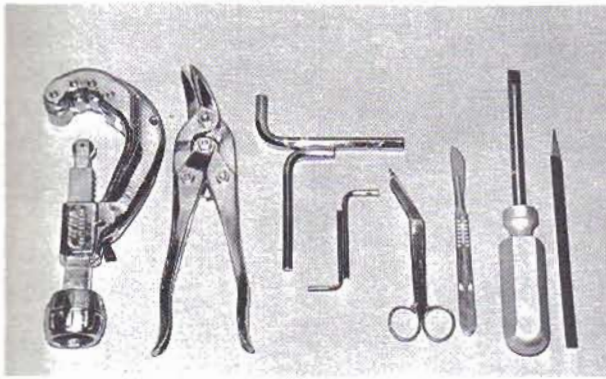


FIGURE 270

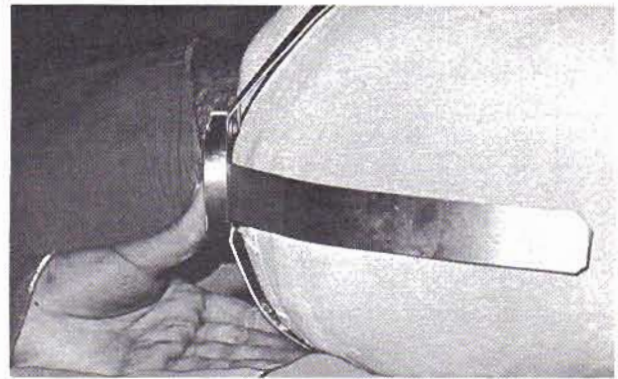


FIGURE 272

1. (a) Position the patient supine so that the pelvis is parallel to the foot edge of the table and place the sound leg in neutral position.

(b) Detach the socket attachment plate from the prosthetic unit by loosening the quick disconnect screw. Fasten three socket attachment straps to the anterior, lateral, and posterior portions of the socket attachment plate with the $\frac{8}{32}$ in. machine screws provided. Hold the assembly next to the cast socket to determine strap length.

(c) Cut the straps 1 in. below the level of the ilium with metal shears.

2. Bend and shape the socket attachment straps so they closely conform to the exterior contours of the plaster socket (Fig. 271). The socket attachment plate should be:

- a. parallel to the foot edge of the table,
- b. located in the center of the cast socket when viewed laterally (Fig. 272),
- c. 90 deg. to the table top, and
- d. outset so an imaginary verticle line from the

ischial tuberosity will bisect the medial border of the socket attachment plate.

3. Recheck the position of the socket attachment plate to assure that placement is correct and with an indelible pencil mark the location of the socket attachment straps on the cast socket (Fig. 273). With reasonable care, this alignment procedure will result in satisfactory bench alignment requiring few, if any, adjustments when the patient stands.

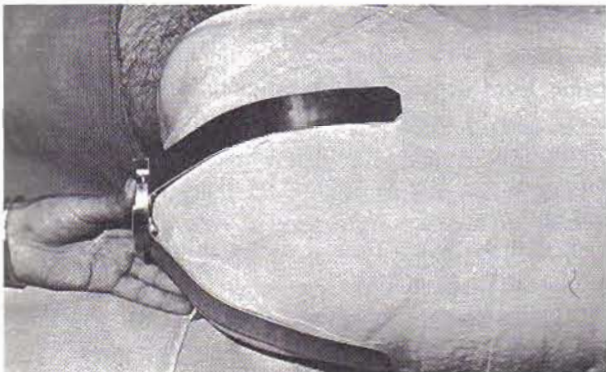


FIGURE 271



FIGURE 273

4. Fold a double layer of 4 in. x 15 in. plaster splints three times and place it between the back of the socket attachment plate and the distal end of the cast socket. Relocate the straps using the reference marks established previously (Fig. 274).

Note: Loose and broken socket attachment straps result if step 4 is omitted. Also, secure attachment of the straps to the socket will be impaired.

5. Laminate the socket attachment straps to the cast socket with approximately four to six 4 in. x 15 in. plaster splints and complete the application with one roll of 5 in. conventional plaster bandage. Cover the straps entirely including the portion of the straps just proximal to the socket attachment plate (Fig. 275, 276, and 277).

6. Assemble the adjustable prosthetic unit with all adjustments in neutral position. Attach the assembly to the socket attachment plate by loosening the quick disconnect screw.

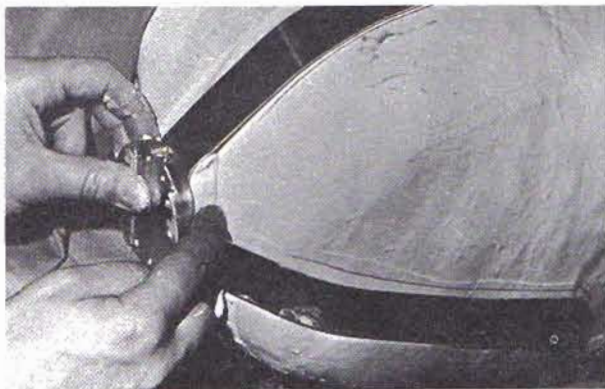


FIGURE 274

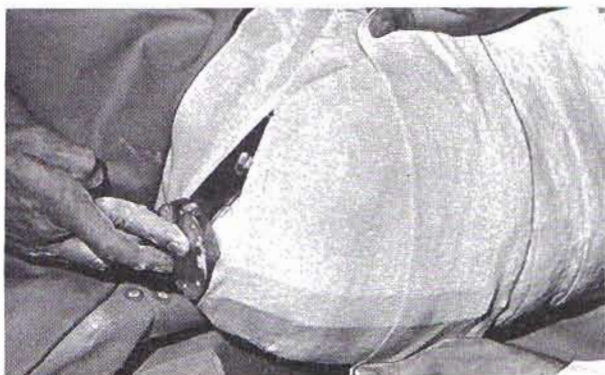


FIGURE 275



FIGURE 276



FIGURE 277

7. Attach the ankle plug to the foot. Connect the previously slotted portion of the pylon tube to the ankle plug and fasten it securely by means of the hose clamp.

8. Reposition the patient with his pelvis parallel to the foot edge of the table and place the sound leg in neutral position.

With the ankle of the sound foot held in neutral position, compress the heel pad with a straightedge which is projected parallel with the bottom edge of the table across to the heel of the SACH foot. The pylon tube which extends proximally past the prosthetic unit is marked $\frac{5}{8}$ in. above the proximal level of the base clamp, resulting in a pylon $\frac{3}{8}$ to $\frac{1}{2}$ in. short when a shoe is applied on the sound side (Fig. 278 and 279).

9. Cut the pylon tube at the established mark with a tube cutter (Fig. 280).

10. Remove the prosthetic unit from the socket attachment plate by loosening the quick disconnect screw. Insert the pylon in the base clamp of the prosthetic unit.



FIGURE 278

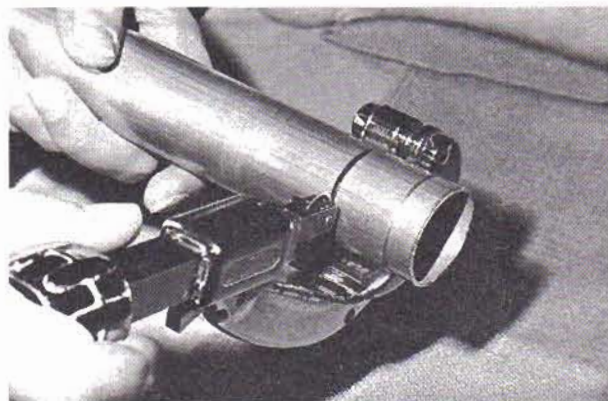


FIGURE 280



FIGURE 279



FIGURE 281

11. Reattach the complete assembly to the socket attachment plate and establish approximate toe-out.

Tighten the base clamp of the prosthetic unit with a $\frac{1}{8}$ in. Allen wrench, securing it to the pylon tube (Fig. 281).

12. Detach the completed assembly from the socket attachment plate by loosening the quick disconnect screw before the patient is taken from the cast room.

D. HIP-DISARTICULATION PROSTHETIC CONSIDERATIONS

Simplicity of design, application, and alignment combined with acceptable weight characteristics of the immediate postsurgical hip-disarticulation prosthesis has so far discouraged further improvements to this unit. Simplicity is accomplished at the expense of function. Initially in the static situation, demands on the prosthesis are relatively few but these increase and become progressively more critical as the patient ambulates. While an acceptable prosthetic unit with articulation is possible, alignment and ambulation stresses

present difficulties in retaining the unit securely to the rigid dressing because of the structural weakness of plaster.

While it is difficult to describe in detail all possibilities of error in the application of the hip-disarticulation immediate postsurgical prosthesis, following are key considerations:

1. Avoid suspending the stump sock in such a manner that the most proximal portion is pulling away from the lower waist, resulting in a loose cast in this area. At the same time, avoid proximal constriction by cutting of the socket brim into soft tissue.

2. While it is recommended that full use be made of the stretch characteristics of the elastic plaster bandage, avoid overstretching either border of the bandage. Failure to do so will produce ridges in the underlying plaster bandage and/or stump sock and stockinet.

3. Never turn or twist a plaster bandage so that it will bunch or have a rope effect. Use the full width of the bandage partially overlapping each previous turn.

4. Avoid an overly thick cast.

5. Perhaps the most critical aspect of the initial

plaster wrap is the firm support of the soft tissues on the posterior, distal, and anterior stump margins including the inferior lateral stump portion. Insufficient compression and support of these areas can allow hematoma formation, or in extreme cases, wound separation.

6. There may be some difficulty securing the socket attachment plate and straps to the plaster socket because of the relatively flat attachment surface. Careful

contouring of the socket attachment straps to the rigid dressing affects ultimately the secure attachment of the prosthetic unit to the rigid dressing and the amount of plaster splints required to fill all voids between the socket attachment plate and straps.

7. After the initial cast has been removed, each subsequent cast is applied with the patient in a supported, standing position.