

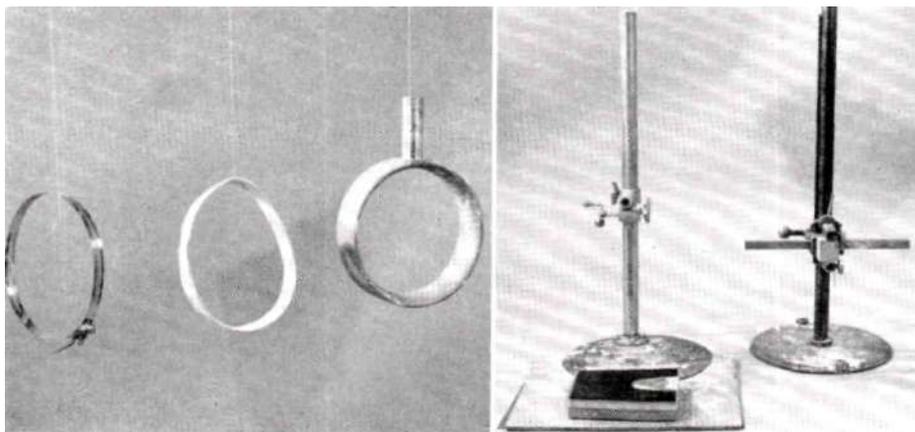
Suspension Casting for Below-Knee, Above-Knee, and Syme's Amputations

Fred Hampton, C.P.¹

The suspension casting technique permits the casting of an amputee's lower-extremity stump while it is being held in an attitude simulating stance-phase weight-bearing in a prosthesis. This is accomplished through application of the principle of the Chinese finger trap; namely, when a cloth cylinder of suitable weave is stretched longitudinally, the circumference of the cylinder is decreased.

SUSPENSION CASTING OF THE BELOW-KNEE STUMP

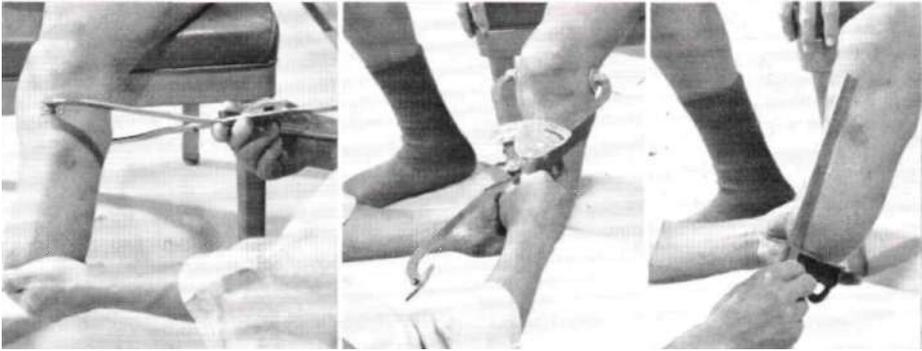
In casting below-knee stumps, a cast sock clamped in a ring is the cloth cylinder. As the amputee bears weight on the suspended sock, the sock stretches longitudinally and constricts circumferentially, thereby firming the tissues of the stump during the application of the plaster wrap. The amputee is properly oriented in an upright position for casting and for producing accurate alignment lines on the cast. The tissues are firmly contained, edema is restricted, and bony prominences are emphasized. Distal redundancy is held firmly in the correct position by the suspension sock. While the stump is suspended, areas requiring relief can be definitively outlined and, if necessary, build-ups of appropriate thickness can be applied to the suspension sock prior to wrapping.



Equipment required includes:

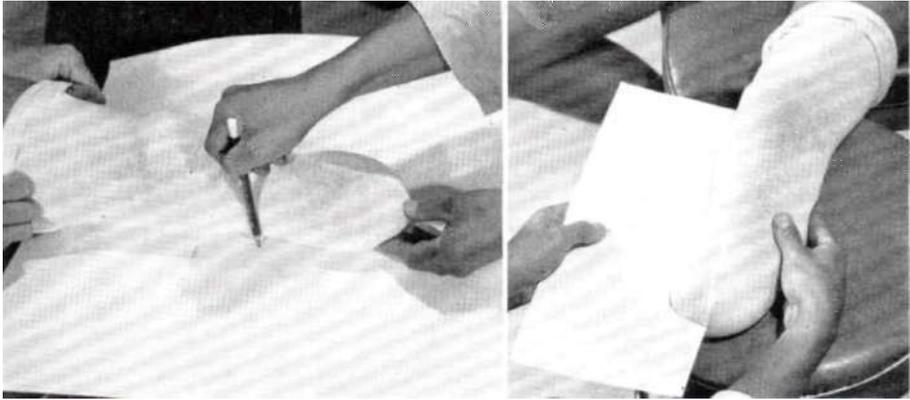
1. A ring, approximately 6 1/2-in. inside diameter.
2. A rubber gasket.
3. A hose clamp.
4. A VA or a Berkeley casting stand with vertical adjustment.
5. Bathroom scale and platform.

¹ Assistant Project Director, Northwestern University Prosthetics Research Center, 401 East Ohio St., Chicago, Ill. 60611. The work of the Center is supported by U. S. Veterans Administration Research Contract V1005M-1079.

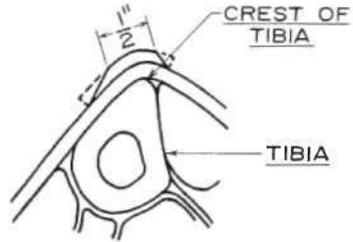


Data to be obtained and recorded are:

1. The length of the normal leg from the medial tibial plateau to the floor, with the shoe off.
2. The shoe size.
3. The anteroposterior dimension of the stump, measured with a VA caliper while the stump is fully relaxed and supported by the prosthetist.
4. The mediolateral dimension of the stump just proximal to the tibial plateau, measured with a VA caliper.
5. The length of the stump, measured from the end of the stump to the level of the midpatellar tendon. A small square is used to obtain this measurement; the blade of the square should contact the crest of the tibia.



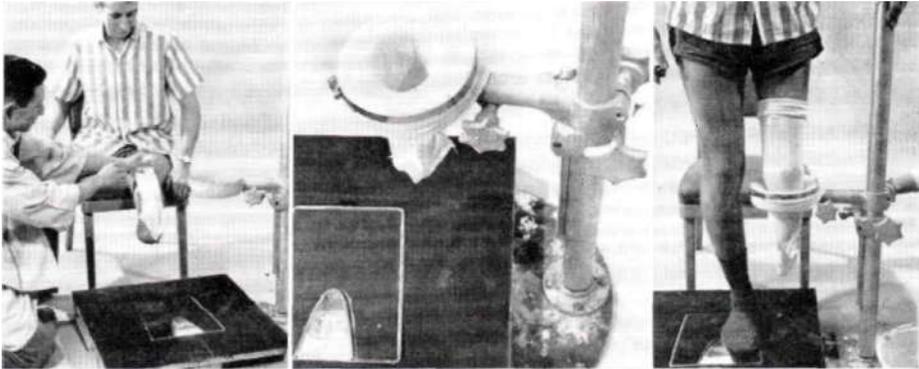
PREPARATION OF MEDIAL TEMPLATE. Because the medial flare of the tibial condyle is a particularly good weight-bearing area, it is desirable to construct a medium-weight cardboard template of the medial aspect of the stump for use as a guide in checking and maintaining the contours of the positive model in this important area. A cast sock is pulled over the stump and held with moderate tension by the amputee. To prevent bulging of the gastrocnemius during the tracing, the weight of the stump is supported by the prosthetist. The pencil is held vertically and slight pressure is exerted against the stump as the outline is drawn. The outline should extend from the proximal border of the femoral condyle to the midline of the distal aspect of the stump. After the medial tibial plateau is marked on the outline as an important landmark, the template is cut out and checked against the stump.



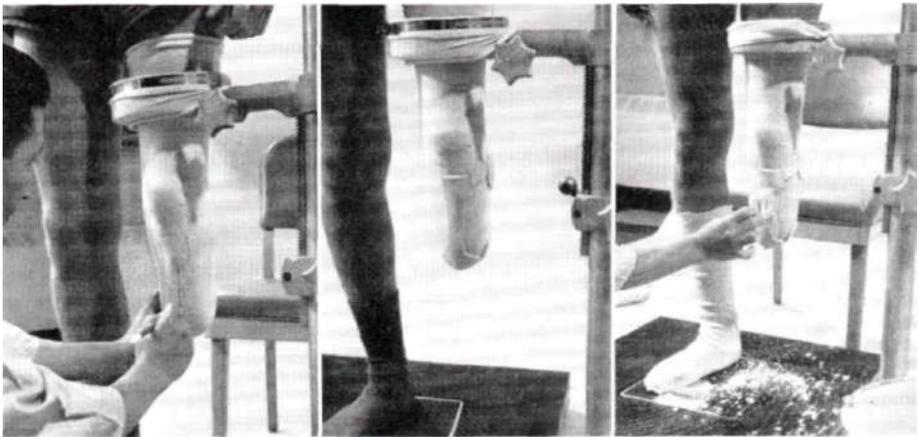
PREPARATION or RELIEF PATCHES. Relief patches should be prepared prior to suspension of the amputee in the ring. Various materials may be used for the patches, such as 1/8-in. Kemblo rubber, 1/8-in. adhesive-backed felt, or any foam material 1/8-in. thick and of sufficient density for dimensional stability. Areas usually requiring relief are the tibial tubercle, the tibial crest, the distal end of the tibia, the leading edge of the lateral tibial condyle, and the head and distal end of the fibula.

The patch for the head of the fibula should extend at least 1/4 in. beyond the bone area. If the head of the fibula is prominent, a double patch is sometimes indicated.

The patch for the tibial crest should be 1-in. wide. This will allow 1/4 in. of plaster on each side for blending the edges of the positive stump model. The actual relief remaining is 1/2-in. wide, sufficient to cover the lateral edge of the tibial crest and blend into the medial tibial surface.



SIZING THE CAST. The dimensions of the negative cast produced are dependent upon the stump, the number and weight of the socks used, and the tension with which the plaster bandages are applied. One heavy cast sock is used to accommodate the fit of a stump wearing a three-ply wool sock in a hard socket. For a mature stump, two heavy cotton cast socks are used to accommodate a five-ply wool-sock fit in a hard socket. For a socket incorporating an insert, one light-weight cotton cast sock is used. Both socks and relief patches are removed from the negative cast before the plaster is poured to form the positive stump model.

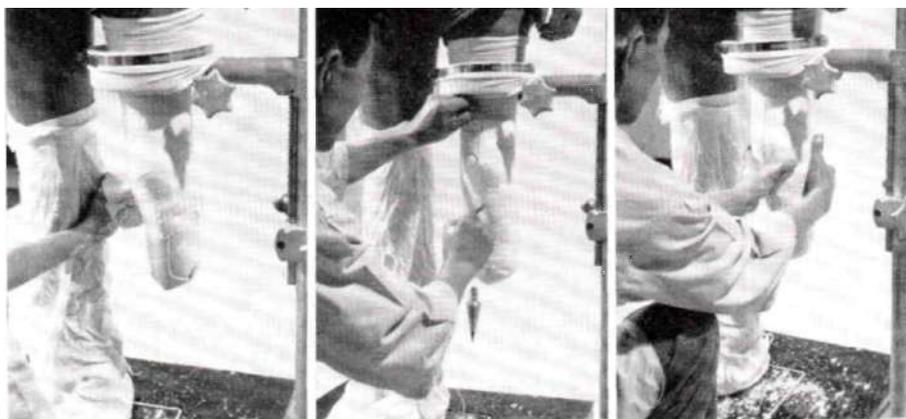


ASSEMBLY OF EQUIPMENT AND SUSPENSION OF AMPUTEE. Preparatory to taking the negative cast of the stump, the distance from the end of the stump to a point 4 in. above the proximal edge of the patella is marked on a heavy cast sock, the ring is mounted horizontally on the vertical stand, and the cast sock is centered in the ring with the mark showing. The gasket is then applied over the sock and secured with the hose clamp.

Next, the ring is lowered on the easting stand to facilitate entry of the stump into the sock. Then the ring is raised until one-half of the body weight is borne by the stump sock, as indicated by the scale. Under these conditions, the suspension sock should contain the thigh to a point 3 in. above the superior border of the patella. The height of the ring should be adjusted until the amputated side is slightly high,

so that further stretching of the suspension sock will be accommodated during the wrapping process.

The amputee should be positioned so as to obtain a correct base of support and so that his thigh is vertically centered in the ring. The knee should be flexed so that the stump is approximately 12 deg. from the vertical, measured along the crest of the tibia. Excessive flexion will result in loss of support or cause bridging of the sock along the posterior aspect of the stump. The stump is palpated, and areas requiring relief are outlined. The relief patches are glued to the appropriate areas, and the flexion angle of the knee is checked.



WRAPPING THE STUMP. Starting from a level just proximal to the top edge of the patella, four wraps of 4-in. plaster bandage are firmly applied. As noted previously, the medial flare of the tibial condyle is a good weight-bearing area. For emphasis, the plaster bandage is applied with firm tension diagonally upward in this area. The plaster bandage is then spiraled downward until the remainder of the stump is completely covered.

Before the plaster begins to set, it is worked by hand to ensure an intimate contact between the wrap and the stump, to emphasize bony areas including the patella, to enhance the texture of the plaster, and to assist in obtaining a smooth inner surface in the cast.

Several techniques and devices may be used when casting a below-knee stump to locate and define the patellar tendon and the support area posteriorly. Later in this article some of the variations will be presented.

When the suspension casting technique was used initially, no attempt was made to deform the cast permanently at the patellar tendon or in the popliteal area. The patellar tendon was defined by a light massaging action on the cast, using the web of the hand between the thumb and index finger, and by applying a light counter-pressure posteriorly with the other hand. The hands were removed after the contouring, and the plaster was allowed to set. This method kept distortion of the tissues to a minimum and preserved the contours of the medial flare of the tibia.

This technique has been modified to the extent that the hands are held in such a manner as to deform the cast permanently, producing a patellar-tendon bar anteriorly and a flattening of the popliteal area posteriorly. Any distortion of the contours of

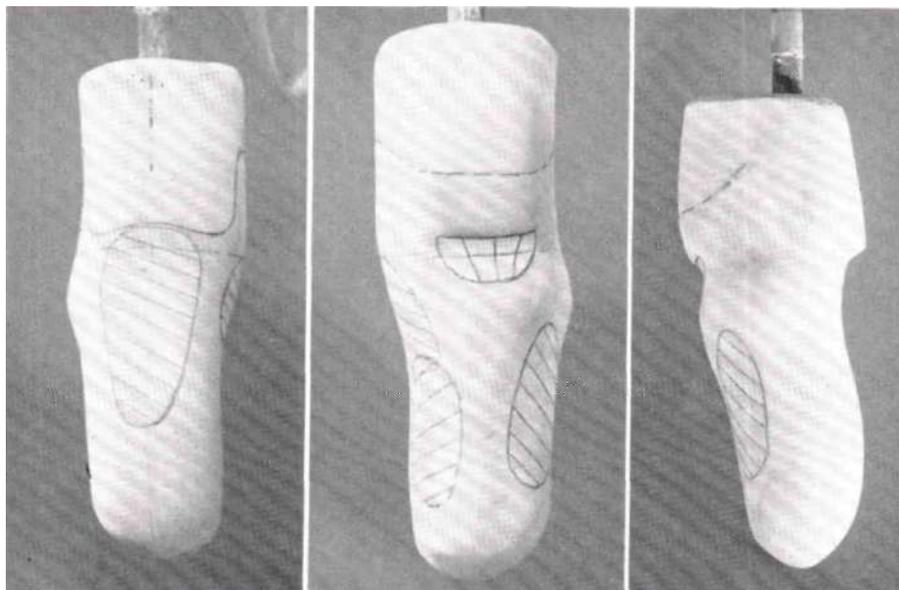
the medial flare of the tibia is corrected later by use of the template (previously discussed) when modifying the positive model of the stump.



ALIGNMENT LINES. After the plaster has set, two vertical alignment lines are scribed on the cast with the use of a plumb bob while the amputee is standing in a position simulating stance phase in a prosthesis. Half of his weight should be borne on the amputated side. The pelvis should be level and at right angles to the line of progression. One line, scribed on the anterior aspect of the cast, will be used as a reference for the correct adduction or abduction angle of the socket during bench alignment. The other line, scribed on the lateral aspect of the cast, will serve as a reference for the flexion angle of the socket.

In order to remove the cast, the hose clamp is released to allow rotation of the ring in the stand. After the ring has been lowered sufficiently to permit the amputee to sit down, the hose clamp, gasket, and ring are removed. Care must be taken to avoid distortion of the cast during its removal.

Before plaster is poured to form the positive model of the stump, the cast socks and relief patches are removed from the negative cast, and the cast is oriented with the reference lines vertical. Orientation can be accomplished by setting the distal end of the cast in plaster and using a square to obtain the correct alignment. A Milmo vertical transfer jig is a useful device for this procedure and also provides a means for holding the pipe vertically in the cast until the plaster hardens.



MODIFICATION OF THE POSITIVE MODEL. Modifications of the plaster model of the stump are made in accordance with the principles developed at the University of California Biomechanics Laboratory, Berkeley and San Francisco (5).

An essential prerequisite to the modification of the plaster model is a complete examination and evaluation of the stump by the prosthetist. Variations in modification will necessarily be based upon this evaluation.

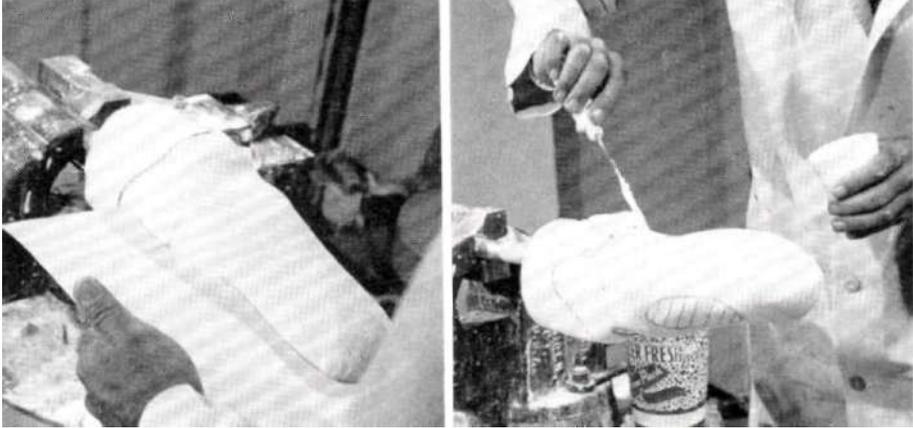
An outline of the socket is drawn on the plaster model of the stump. This outline extends from the midpatellar level anteriorly to 2 1/2 in. to 3 in. above the midpatellar tendon level on the medial and lateral aspects of the model, down to a point 1/2 in. above the midpatellar-tendon level on the posterior aspect of the model.

The anteroposterior dimension of the positive model will be determined by the type of socket to be fabricated. For a socket with a soft insert, the anteroposterior dimension of the model should be modified to that of the stump. For a hard socket, the anteroposterior dimension of the model should be 1/4 in. greater than the measured anteroposterior dimension of the stump; for example, if the anteroposterior dimension of the stump is 3 in., the anteroposterior dimension of the model should be 3 1/4 in.

The following example is offered for guidance in determining the amount of plaster to be removed from the patellar-tendon area of the stump model as opposed to the amount to be removed from the popliteal area. Assuming that the anteroposterior dimension of the stump is 3 in. (to which 1/4 in. must be added for a hard socket) and that the anteroposterior dimension of the slump model is 4 in., it follows that 3/4 in. of plaster should be removed (that is, 4 in. less 3 1/4 in. equals 3/4 in.). Two-thirds of this amount, or 1/2 in., is removed from the patellar-tendon area (that is, 2/3 of 3/4 in. equals 1/2 in.). The remainder, or 1/4 in., is removed from the popliteal area (that is, 3/4 in. less 1/2 in. equals 1/4 in.).

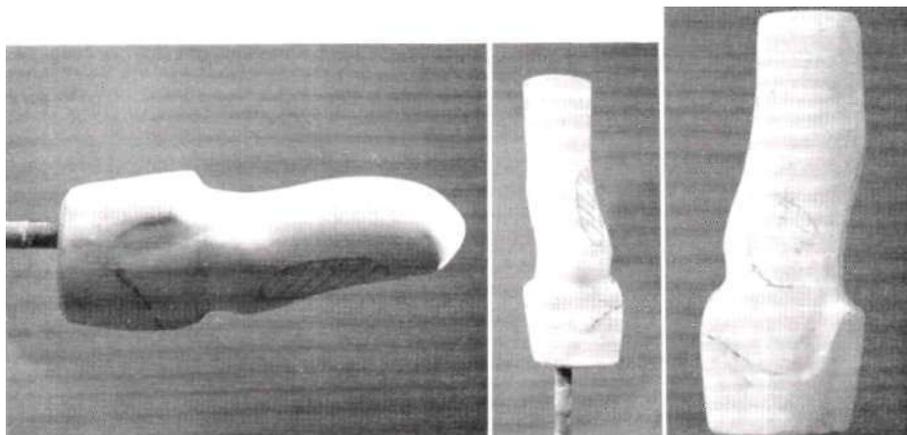
To prevent restriction of circulation in the stump, the plaster is removed posteriorly to produce a flattened surface rather than a bulge. The deepest removal of

plaster is opposite from and just distal to the midpatellar-tendon level—thus creating the start of a radius proximally—and is continued downward to blend in toward the distal aspect of the stump model.



MODIFICATION OF THE POSITIVE MODEL. Starting approximately 1/4 in. from the edge, plaster is removed from the reliefs to blend the edges into the contours of the stump model. Plaster is removed from the area of the medial shaft of the tibia to within 1 in. of the end. The angulation of the shaft must be maintained. The amount of plaster removed is dependent upon the amount of tissue covering the shaft. Approximately 1/8 in. to 1/4 in. of plaster is removed from the anterolateral aspect of the model, starting at the distal border of the relief for the leading edge of the flare of the lateral tibial condyle and continuing to within 1 in. of the end of the tibia. The template made from the stump is used as a guide in modifying the flare of the tibial condyle. The mediolateral dimension of the model should be reduced to within 1/8 in. to 3/16 in. of the measured mediolateral dimension of the stump. Usually, smoothing this area of the model with wire screening is all that is necessary.

If warranted, 1/8 in. of plaster may be added to the relief of the anterodistal aspect of the tibia. The patella is smoothed by a wash of plaster rather than removal of plaster. Along the previously drawn posterior trim line of the socket, a build-up of plaster is applied to a height, of about 3/4 in. The build-up should be given a generous flare, and the distal border of the liare should be blended into the contours of the model, especially in the area of the hamstrings. Plaster should be added to eliminate any groove between the junction of the posterior plaster build-up and the medial or lateral side of the model. A piece of plastic screen or line sandpaper should be used to smooth the entire surface of the model.



BUILD-UP FOR RTV PAD. When a Silastic RTV pad is to be used in the socket of the finished prosthesis, an additional plaster build-up about 3/4 in. high is formed on the distal aspect of the model. A piece of cardboard is applied to the cast to serve as a form for the plaster to be added. The form is sloped away from the distal anterior aspect of the tibia to provide any additional relief required. If the pipe is held vertically when the plaster is poured, a flat distal surface incorporating the correct angular alignment will result. All edges should be feathered into the contours of the model, especially in the tibial area.

VARIATIONS IN SUSPENSION CASTING OF THE BELOW-KNEE STUMP

Since the introduction of the suspension casting concept, many variations have evolved in its use. These variations are mainly in the wrapping, the forming of the patellar-tendon bar, the modification of the wrap cast, and the modification of the positive model of the stump.

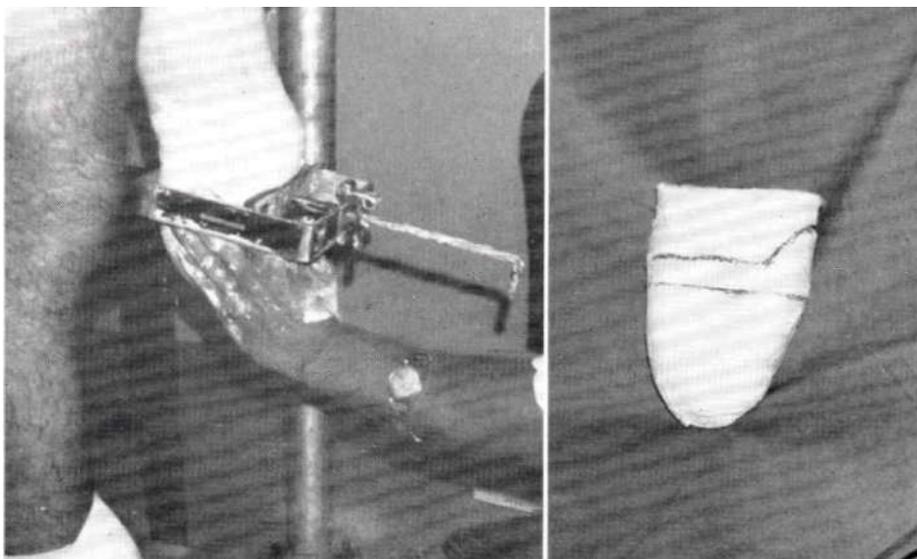


CALDWELL PROCEDURE. In the procedure followed by Mr. Jack L. Caldwell,² gypsona plaster bandage is used in place of standard plaster bandage, a clamp (the Caldwell

² Manager, J. E. Hanger, Inc., of Florida, 938 South Orange Ave., Orlando, Fla. 32806.

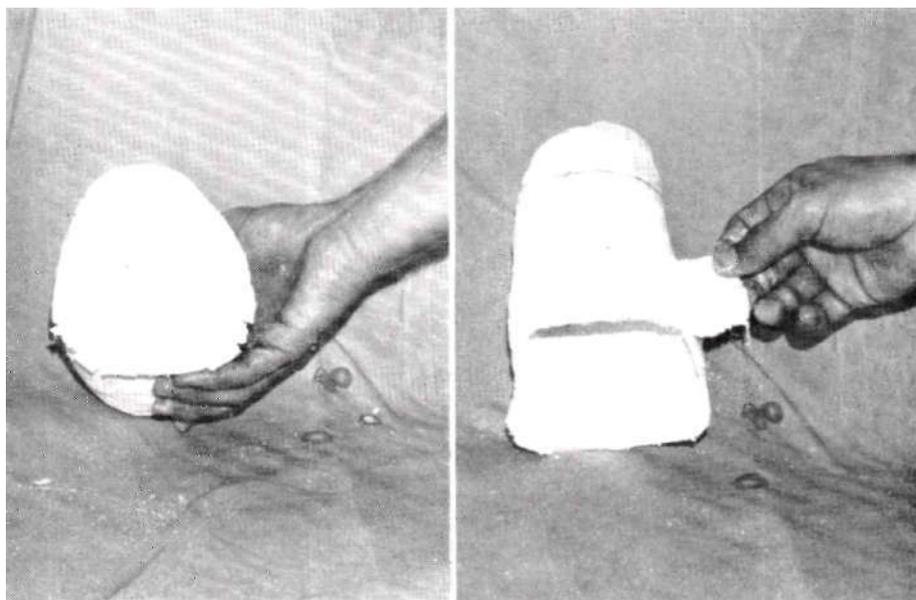
clamp) is used to measure the anteroposterior dimension of the stump and to contour the patellar-tendon bar and the popliteal area into the wrap cast, one heavy-cast sock is used during the wrapping procedure, the flare for the posterior proximal edge of the socket is formed in the wrap cast prior to pouring the plaster to form the positive model of the stump, and the distal portion of the stump is wrapped first for contouring purposes.

In the Caldwell procedure, measurements are taken and recorded on a measurement chart before casting is begun. The patellar-tendon bar of the Caldwell clamp is pressed gently against the amputee's patellar tendon, and the reading made on the clamp scale is recorded. After the stump has been wrapped, the dimension should be approximately 1/8 in. greater than the measurement made on bare skin. Before the contouring clamp is applied to the gypsona-wrapped stump, the popliteal pad and the patellar-tendon bar should be greased with vaseline, since gypsona has an adhesive property not present in the ordinary plaster of Paris or elastic plaster.

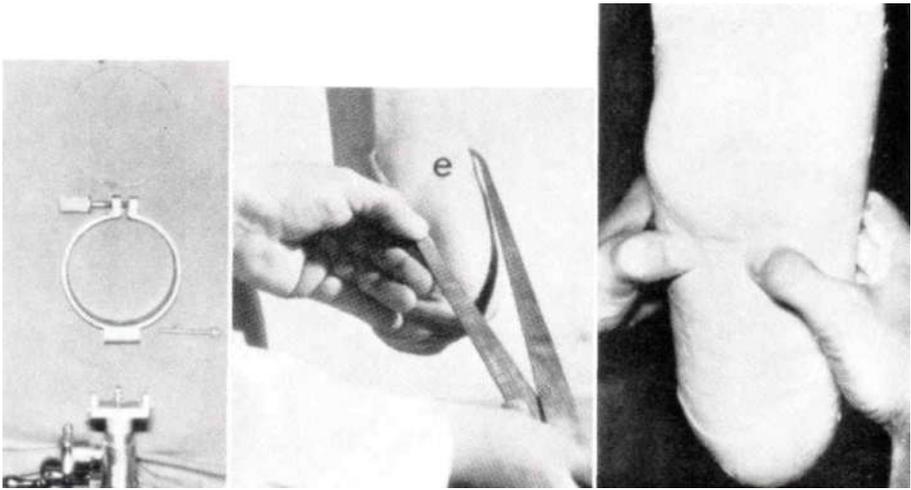


CALDWELL PROCEDURE. As soon as the wrap is completed, the clamp should be slipped onto the amputee's stump and the popliteal pad pressed into the proper area gently and correctly. With the contouring clamp in place, the wet plaster is worked into the medial tibial condylar shelf.

A line is drawn circumscribing the wrap cast at the midpatellar-tendon level, also the socket trim line.



CALDWELL PROCEDURE. After the cast has been trimmed along the proximal trim line, several longitudinal cuts about 1/2 in. in length are made downward from the trim line in the area above the popliteal fossa. The cut area is reinforced with small strips of wet gypsona plaster. The use of warm water will reduce the time required to handle the plaster. The inside of the cast where the cuts were made is smoothed with a paste of warm water and plaster-of-Paris powder.



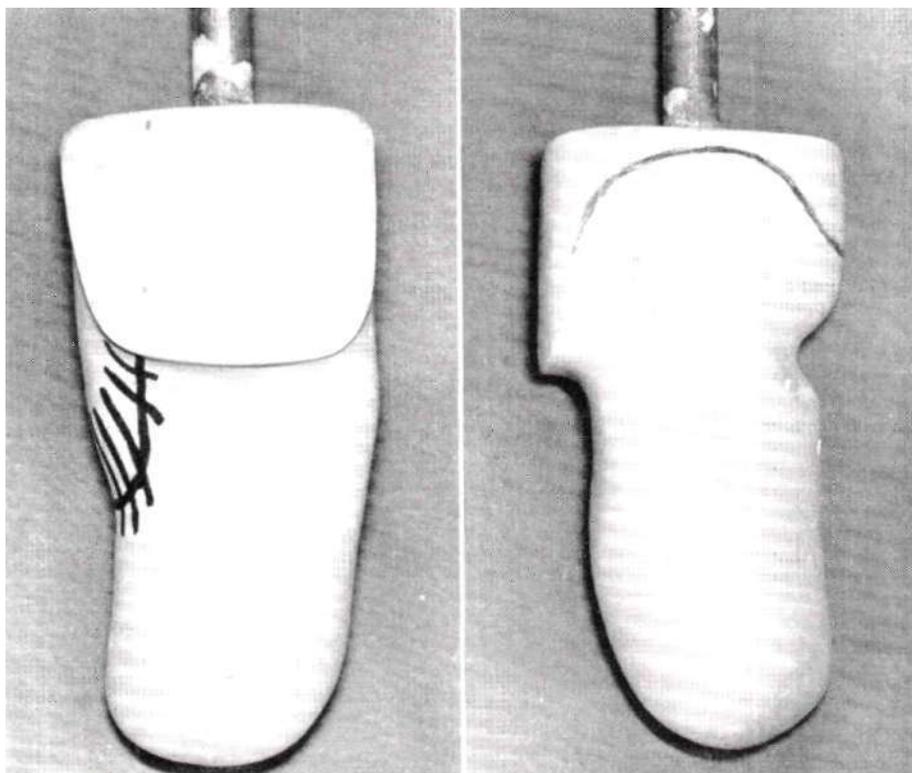
FOORT PROCEDURE. In a procedure developed by Mr. James Foort,³ one heavy cast sock is used routinely, no relief patches are applied to the suspension sock prior to wrapping, plaster is used to provide reliefs during modification of the positive model of the stump, the distance between the hamstrings is measured and used as a control for the posterior outline of the socket, the modification of the positive model under the flare of the medial tibial condyle is extended posteriorly to include the hamstring tendons, and the position of the posterior flare on the plaster model of the stump is located at the midpatellar-tendon level.

A fixed ring holds the casting sock at the top, a clamp ring binds the sock against the fixed ring, a clamping screw is used to force the clamp ring out against the fixed ring, and a pin connects the ring assembly to the UCB stand.

The distance between the outer edges of the tensed hamstring tendons is measured and recorded.

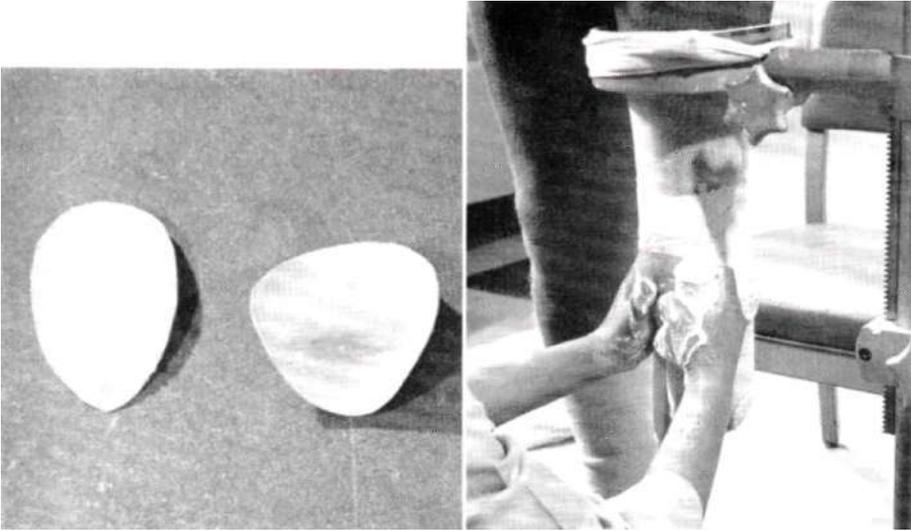
After the plaster wrap has been applied to the stump, the patellar tendon is defined by pressing the thumb tips on either side of it. At the same time, light counterpressure is exerted with the fingers across the back of the stump. This procedure is similar to the technique described in *The Patellar-Tendon-Bearing Prosthesis* (5) and subsequently modified as reported in *Air-Cushion Socket for Patellar-Tendon-Bearing Below-Knee Prosthesis* (4).

³ Technical Director, Prosthetics-Orthotics Research and Development Unit, Manitoba Rehabilitation Hospital, 800 Sherbrook St., Winnipeg 2, Man.



FOORT PROCEDURE. When the plaster stump model has been cast, plaster is removed from the sloping surface of the medial flare with a curved 1 1/2-in. rasp. The purpose here is to prepare the surfaces for supporting weight. Coupled with pressures from lateral surfaces, the medial flare helps to stabilize the stump mediolaterally in the socket. But very little adjustment of this surface is required. A 1/4-in. adjustment at the deepest part of the shelf, tapering off to nothing along the vertical portions, would be the greatest amount removed. If the model is of a seasoned stump, it is sufficient merely to work this area smooth with wire screening. The screening should be swept around the natural contours of the flare, into the posterior area, and over the hamstring tendons.

Plaster is added to the stump model in bony areas to provide relief. In addition, a posterior flare is constructed on the model by means of a plaster build-up. This is done by pouring plaster over the posterior surface above the circumscribed mid-patellar-level line until the addition is 1-in. thick. The plaster is spread with a wet spatula, and the flare is formed with wet fingers and thumb. The back flare is not grooved for the hamstring tendons. Instead, a broad surface is provided against which the tendons can rest when the amputee is seated. The build-up for the posterior flare should be trimmed to about 3/4 in. with a flat rasp (2).



VARIATION USED AT NUPRC. Another slightly different procedure sometimes used at the Northwestern University Prosthetics Research Center incorporates a patellar-tendon pad and a popliteal pad into the wrap during suspension casting. The pads used were developed at the Veterans Administration Prosthetics Center in conjunction with a pneumatic casting system. These pads define the patellar-tendon bar and the popliteal depression, and their use results in a positive stump model with an anteroposterior dimension that is within 1/16 in. of the measured anteroposterior dimension of the stump.



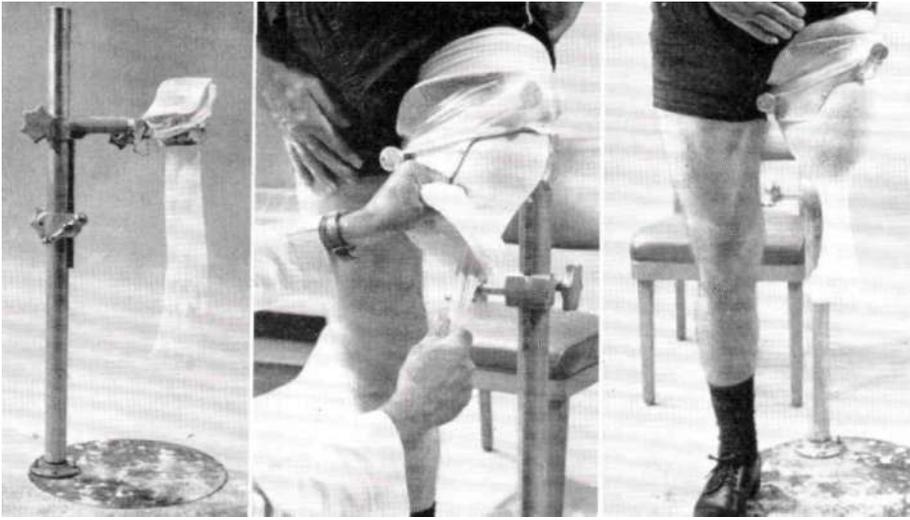
VARIATION USED AT NUPRC. Two wraps of standard plaster bandage are applied to the proximal aspect of the stump, covering the patellar-tendon area. The protuberance of the pad is positioned over the patellar tendon and covered with two additional wraps of bandage applied with firm tension to hold the pad in place.

The popliteal area is then covered with two wraps of plaster bandage, and the pad is placed so that its top edge is approximately 1/2 in. above the top of the proximal border of the head of the fibula. The lateral edge of the pad should be placed 1/2 in. medial to the medial border of the head of the fibula. The pad is covered with two additional wraps of plaster bandage, and firm tension is applied during the wrapping. The wrap is then spiraled down to include the rest of the stump, and the plaster is worked by hand to emphasize bony areas.

If the resulting stump model has a depression in the popliteal area, some plaster is removed from the medial and lateral border of the depression so as to present a flatter posterior surface. A slight screening is usually all that is necessary to finish the patellar-tendon bar. The medial template should be used when modifying the cast to arrive at a true contour of the medial flare of the tibial condyle.

SUSPENSION CASTING OF THE ABOVE-KNEE STUMP

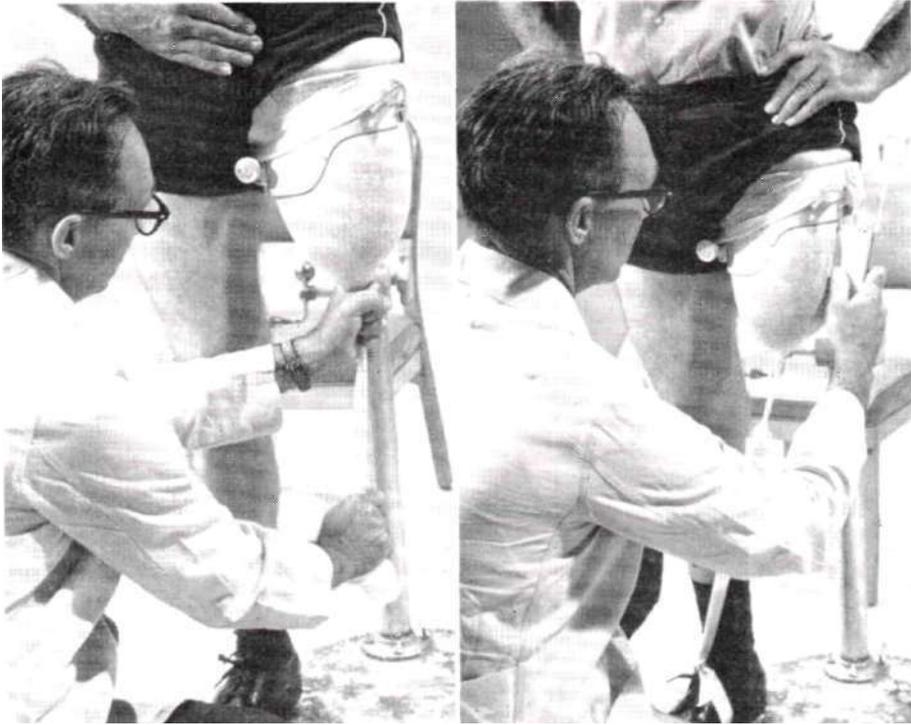
Suspension casting of above-knee stumps may be used in conjunction with a UCB casting stand and brims. The technique permits the firming of stump tissues that are not in contact with the brim. It is also a means of controlling bulges at the distal end of the brim and the adduction angle of the femur. The technique results in a smooth interior to the negative cast of the stump.



CASTING THE ABOVE-KNEE STUMP. The major equipment required is a UCB stand, a set of brims, and a roll of 4-in. tubular gauze.

Initially, the stump is correctly fitted into the brim, in accordance with the instructions contained in *Adjustable-Brim Fitting of the Total-Contact Socket (1)*. The brim is set in the stand horizontally. When all the necessary conditions—such as, the correct anteroposterior and mediolateral dimensions and the circumference of the brim—are satisfied, a piece of tubular gauze approximately 1-yd. long is applied to the brim. The tubular gauze is held to the outside of the brim with adhesive tape and is then draped down through the brim. A stump sock is then applied to the amputee's stump. The distal end of the stump sock is pulled down through the tubular gauze, and the stump sock is removed entirely while pulling the stump into the brim.

Pulling the stump into the brim in this manner results in a bulging of the stump around the distal edge of the brim. To alleviate this situation, the amputee is instructed to flex his trunk over the brim as far as possible, thereby easing the gluteal muscles proximally. As the amputee straightens up in the brim, the tissues should be gently eased proximally in the anterior area of the brim. When the amputee bears weight on the brim, some of the bulging will have been eliminated.



CASTING THE ABOVE-KNEE STUMP. The tubular gauze distal to the brim is grasped and pulled downward, causing the tubular gauze to stretch longitudinally and reduce circumferentially, thereby compressing the stump tissues. With one hand, the prosthetist maintains tension on the distal end of the gauze as he grasps the gauze at the distal end of the stump with his other hand. The amputee is instructed to remove some weight-bearing from the brim, and the gauze is tied with string at the distal end of the stump. Weight-bearing should be reapplied to equal approximately one-half of the amputee's weight. A piece of 1-in. elastic webbing is tied to the distal end of the gauze and passed under the arch of the amputee's foot, usually from the lateral to the medial side. Sufficient force is applied to the elastic to maintain the correct adduction attitude of the femur.

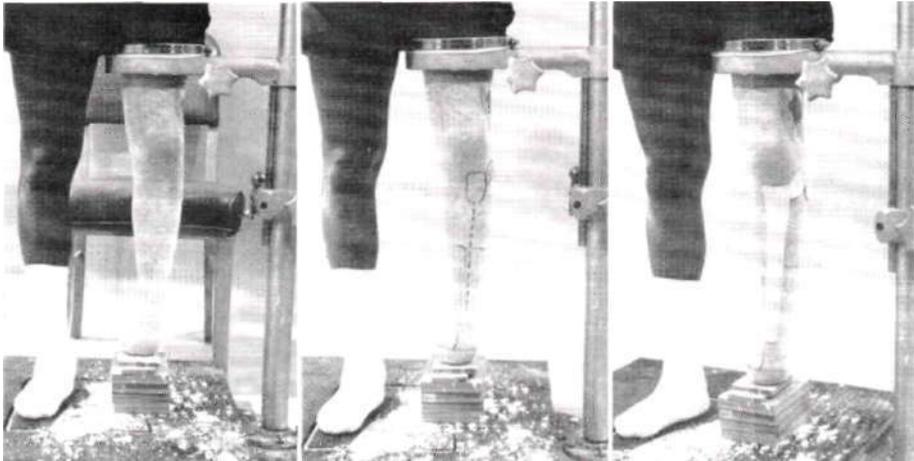


CASTING THE ABOVE-KNEE STUMP. A firm, even wrap of standard plaster bandage is applied, enclosing the stump completely. While the plaster is still wet, the prosthetist palpates the stump to locate the distal end of the femur. He then applies gentle pressure approximately 1 in. above the end of the femur until the plaster sets.

Before the plaster is poured to form the positive model of the stump, the tubular gauze is removed from the brim area down to its contact with the plaster wrap.

SUSPENSION CASTING FOR THE SYME'S AMPUTATION

The suspension casting technique provides a means of wrapping a Syme's stump with plaster bandages under weight-bearing conditions. It is an excellent means of holding an unstable heel flap or supporting redundant tissue in the correct position during the casting procedure. It firms tissues, resulting in a smooth interior to the wrap cast, and it provides a means for checking the size of the medial opening prior to laminating the socket.

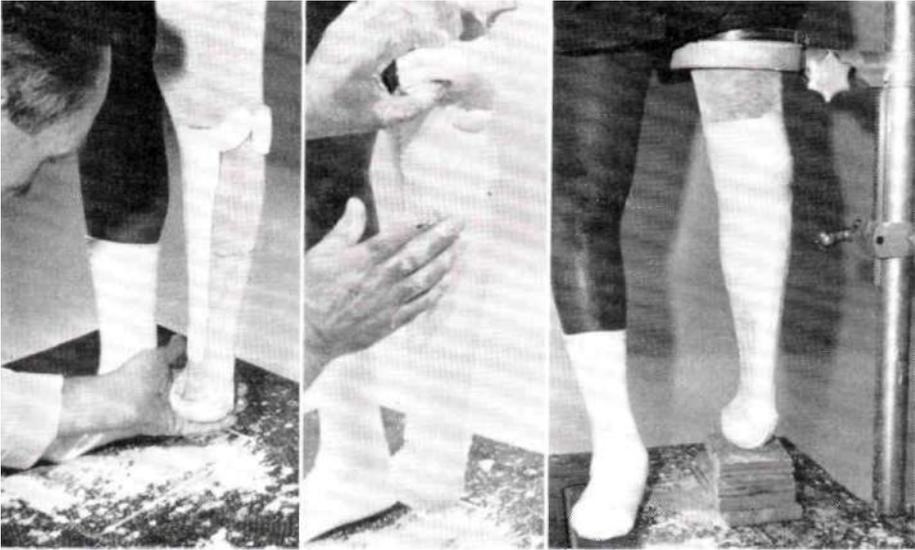


CASTING THE SYME'S STUMP. The equipment used is the same as that used for casting below-knee stumps; namely, an adjustable vertical stand, a ring, a gasket, a hose clamp, a cast sock, and a scale.

A light-weight cast sock is used because it has more stretch than a heavy cast sock and can conform intimately to the contours of the stump. The sock should contact the thigh approximately 3 in. above the patella, with one-half of the amputee's weight borne by the sock.

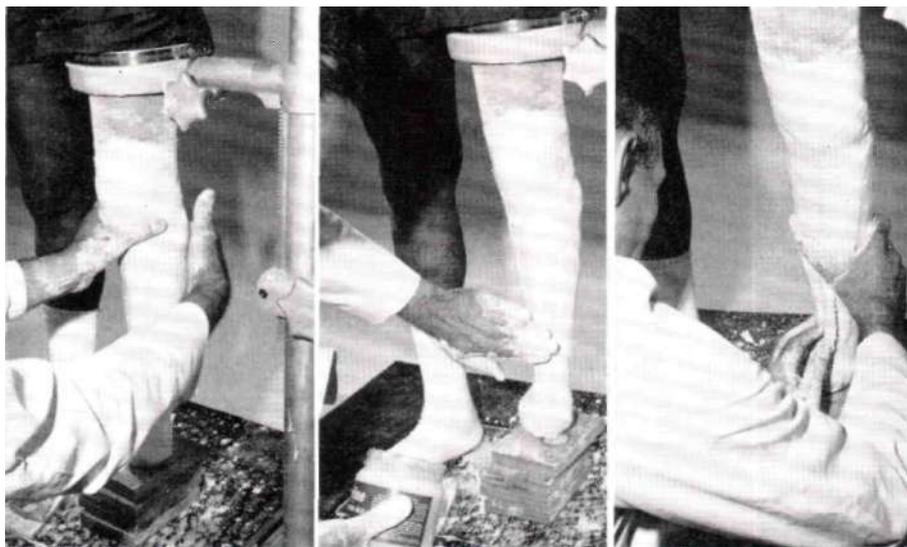
With the amputee supported in a level position, blocks are placed under the stump to contact its distal surface. Areas requiring relief are located by palpation and outlined. An outline of the medial opening is planned and drawn on the suspension sock, as described in *VAPC Technique for Fabricating a Plastic Syme Prosthesis with Medial Opening* (3).

The largest circumference at the bulbous end of the stump is measured, and a horizontal line is drawn just proximal to this. The stump is then measured proximally until the same circumference is obtained, and another horizontal line is drawn at this level. A line is drawn along the crest of the tibia. Just $3/4$ in. medially from the tibial line another line is drawn parallel so as to intersect the two horizontal lines. The width of the cut-out is usually equal to $1/4$ of the circumference measured. This remaining vertical line is drawn following the posterior contour of the stump to complete the medial opening. Relief patches $1/8$ -in. thick are prepared and applied to the areas previously outlined on the suspension sock.



CASTING THE SYME'S STUMP. The blocks are slid from under the stump, and the amputee retains weight-bearing on the sock. Plaster bandages are contoured to the distal end of the stump, and the bulbous end is wrapped up to the distal horizontal line of the medial panel. The plaster bandage is applied vertically to cover the stump to the anteromedial and posteromedial vertical outlines of the panel, and horizontally to include the top edge of the patella down to the top line for the medial opening. After wetting his hands, the prosthetist works the plaster to ensure an intimate contact of the wrap, especially in the area just proximal to the bulbous end. If necessary, one wrap of plaster bandage can be applied in this area to prevent possible bridging.

The wooden blocks are then slid back under the plaster wrap of the distal stump. Slight contact pressure is all that is required to provide a flattened surface to the distal end of the cast. If too much weight is borne on the blocks, the amputee should be raised slightly by vertical adjustment of the casting stand.



CASTING THE SYME'S STUMP. The plaster is worked along the stump and around the proximal aspect of the wrap. The prosthetist locates and defines the patellar tendon and flattens the wrap cast posteriorly just below the midpatellar-tendon level.

After the plaster has set, the remaining area to be covered is evident. Vaseline is applied to the uncovered portion of the sock and 1 in. to 1 1/2 in. along the plaster cast bordering the area. A splint of plaster bandages is made, large enough to cover the opening but not so large as to extend beyond the lubricated areas of the wrap cast. The splint is applied to cover the medial opening and worked well by hand to obtain an intimate mating along all the edges.



CASTING THE SYME'S STUMP. After the panel covering the opening has set, alignment lines are drawn on the cast to be used later for bench alignment. The amputee is oriented so that his pelvis is level, with half of his weight borne on the amputated

side. Using a plumb bob, the prosthetist draws a vertical line on the anterior aspect of the wrap cast to determine the adduction angle of the socket and another vertical line on the lateral aspect of the cast to determine the flexion angle of the socket. Before removing the panel, the prosthetist draws two horizontal lines on the panel extending onto the body of the cast for positioning purposes.

The clamp on the casting stand is loosened to permit the amputee to be seated. The clamp and ring holding the cast sock are removed. The prosthetist slides a knife under the edges of the medial panel and exercises care to avoid distortion during removal. The exposed cast sock is cut, and the stump is withdrawn from the cast.

The cast sock and relief patches are removed from the interior of the wrap cast, and the medial panel is replaced and held in position with additional strips of plaster bandage.

The positive stump model is then poured into the wrap cast, with the wrap cast held so that the alignment lines are vertical. The holding pipe is inserted vertically and should be invested into the plaster to within 1/2 in. of the end of the cast.

LITERATURE CITED

1. Foort, J., *Adjustable-brim fitting of the total-contact above-knee socket*, Biomechanics Laboratory, University of California, Berkeley and San Francisco, 1963.
2. Foort, J., and D. A. Hobson, *A pylon prosthesis system for shank (BK) amputees*, Prosthetics and Orthotics Research and Development Unit, Manitoba Rehabilitation Hospital, Winnipeg, November 1965.
3. Iulucci, Louis, *VAPC technique for fabricating a plastic Syme prosthesis with medial opening*, Veterans Administration Prosthetics Center, New York, September 1959.
4. Lyquist, E., L. A. Wilson, and C. W. Radcliffe, *Air-cushion socket for patellar-tendon-bearing below-knee prosthesis*, Biomechanics Laboratory, University of California, Berkeley and San Francisco, April 1965.
5. Radcliffe, C. W., and J. Foort, *The patellar-tendon-bearing below-knee prosthesis*, Biomechanics Laboratory, University of California, Berkeley and San Francisco, 1961.