A New Surgical-Prosthetic Approach to the Syme's Amputation, a Preliminary Report

AUGUSTO SARMIENTO, M.D.,[1]
RAYMOND E. GILMER, JR., M.D.,[2]
AND ALAN FINNIESTON, C.P.[3]

The advantage of the end-bearing ankle-disarticulation amputation has been well recognized since Syme published his classic article in 1843 *(2).* Disadvantages and complications of this level of amputation have led some surgeons to favor amputation at a higher level. Failure of adherence of the heel pad to the distal tibia, resulting in a flabby, loose stump, prevents many amputees from ambulating without a prosthesis (Fig. 1) *(1).* Breakdown of the stump is a frequent occurrence. The appearance of the conventional Syme prosthesis is objectionable to many amputees, particularly females, because of its bulbous end. Within recent years, the introduction of the plastic Syme prosthesis in which a portion of the weight of the amputee is borne by the patellar tendon has resulted in greater acceptance of this level of amputation (J). However, the conventional plastic Syme prosthesis still retains a wider distal end and a window for the accommodation of the bulbous stump, significant disadvantages in appearance and structure.

To overcome the objectionable features of the Syme's amputation, there has been developed at Jackson Memorial Hospital, University of Miami School of Medicine, a new surgical-prosthetic approach to this amputation which maintains the end-bearing quality of the stump and improves upon the appearance of the prosthesis.

[1] Associate Professor of Orthopaedic Surgery, School of Medicine, University of Miami, Jackson Memorial Hospital, Miami, Fla. 33136.

[2] Chief Resident, Orthopaedic Surgery, Jackson Memorial Hospital, Miami, Fla. 33136.

'Arthur Finnieston, Inc., 1901 N.W. 17th Ave., Miami, Fla. 33125.

The Syme's amputation has been modified to reduce the circumference of the stump by rongeuring away the metaphyseal flare of the distal tibia and beveling the distal fibula, making the distal bony stump only slightly wider than the diaphyseal portion of the leg (Fig. 2). The eventual stump circumference is reduced by approximately one-third without

Fig. 1. Poor Syme's stump demonstrating a loose and bulbous distal end.

Fig. 2. Roentgenograms of the modified Syme's stump demonstrating the beveled metaphyseal flare.

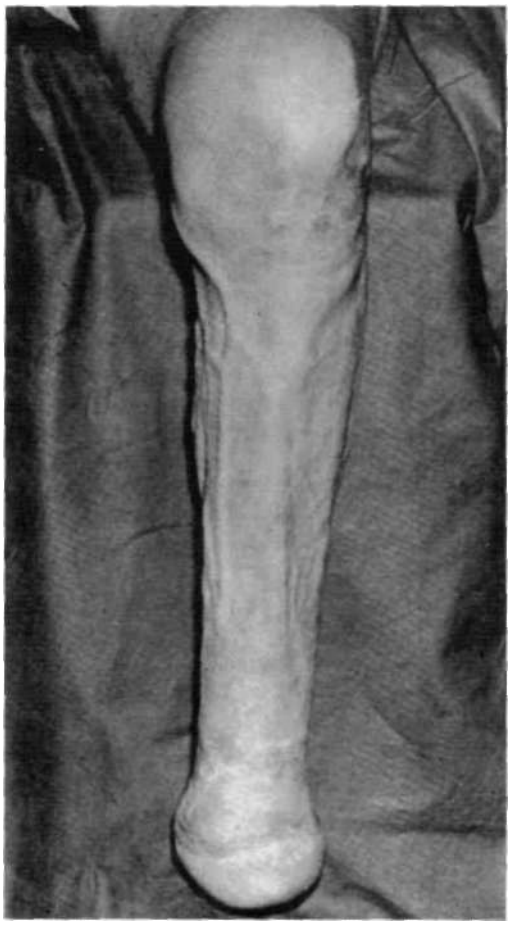

Fig. 3. Modified Syme's stump with its distal end only slightly wider than the thinnest diaphyseal diameter.

interfering with the end-bearing quality of the stump (Fig. 3). There is no alteration of the length of the tibia. A skin incision is used, producing a long posterior flap containing the lied pad a.- the eventual weight-bearing surface. The skin is closed loosely with interrupted wire sutures widely spaced to permit spontaneous drainage, thereby eliminating the need for external drains. A single layer of nonabsorbent surgical dressing is applied to the suture line, and over this one layer of stockinette is applied. A skintight, firmly wrapped plaster cast is applied to the stump and extended proximally so that components of a patellar-tendon-bearing (PTB) prosthesis can be incorporated into the plaster cast (Fig. 4),

POSTOPERATIVE CARE

The stump cast applied at surgery is allowed to remain on until looseness is apparent because of shrinkage of the stump, usually two to three weeks. As soon postoperatively as the patient's condition permits, a SACH foot, is attached to the stump cast, and protected ambulation is allowed and encouraged, usually within the first postoperative week. The degree of weight-bearing on the temporary prosthesis is determined by the patient's ability to ambulate and the absence of discomfort. The cast is changed at frequent intervals until maximum stump shrinkage is obtained.

PROSTHETIC FITTING

The conventional Syme prosthesis is constructed in such a manner that a removable window in the narrow portion of the socket is necessary to allow introduction of the stump into the prosthesis. With the modified operative technique that reduces the bulkiness of the

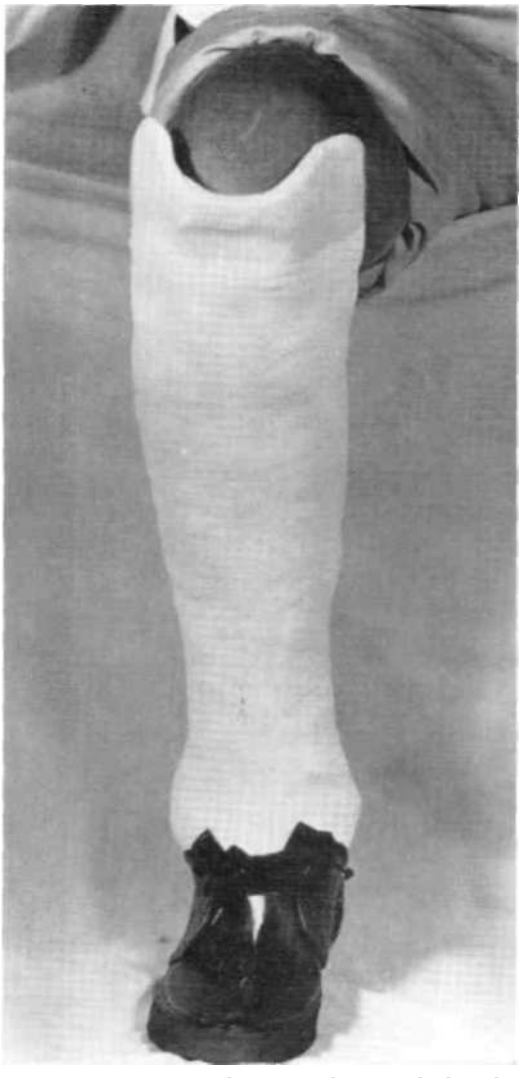

Fig. 4. Temporary plaster prosthesis applied in the operating room immediately after surgery.

distal end of the stump, the requirement for the window has been eliminated (Figs. 5 and 6). A double-walled, windowless prosthesis has been developed. The inner wall is expandable over its narrowest portion at the junction of the middle and distal one-thirds of the shaft. This allows the slightly larger distal end of the stump to glide into the terminal portion of the socket. Upon passage (if the distal end of the slump through the expandable portion of the socket, retraction of the expandable- wall prevents piston action between the stump and

Fig 5. Anterior view of the modified Syme prosthesis. Xote the absence of the conventional window and bulky ankle.

the socket. Thus the need for a supracondylar cuff is eliminated. As in the case of the conventional PTB prosthesis, total contact between the inner wall and the stump is indispensable for the prevention of edema and stump breakdown.

CLINICAL EXPERIENCE

At Jackson Memorial Hospital, University of Miami School of Medicine, the modified Syme's amputation has been performed on seven patients whose ages range from 37 to 72. All the patients were diabetics. Five patients were successfully amputated at the Syme's level; two required amputation at a higher level because of stump gangrene. Three patients have been successfully fitted with expandable-socket prostheses. One patient was lost, to follow-up prior to prosthetic fitting, and the most recent patient at the lime of writing (March 1966) is still ambulatory with a temporary prosthesis.

Fig. 6. Same patient shown in Figure 5. Lateral view of the modified Syme prosthesis. Note the PTB components, the proximal portion of the prosthesis, and the absence of supracondylar cuff.

DISCUSSION

Other factors being equal, the ambulatory ability of the lower-extremity amputee is directly related to the length of the stump. The longer the lever arm below the knee, the greater the proprioceptive and kinesthetic feedback to the central nervous system, resulting in greater voluntary muscular control and coordination, and a better gait. The advantage of the end-bearing quality as provided in the Syme's amputation further enhances the desirable features of the long below-knee stump.

It is believed that, in patients with peripheral vascular disease, the presence or absence of pulses or absence of bleeding from the major vessels should not be the determining factors for the level of amputation. Collateral circulation that gradually develops during the course of the disease is often sufficient to maintain viability of the stump. The presence of skin bleeding should determine the level of amputation.

Obliteration of collateral circulation by edema may be the major cause of breakdown of the stump in cases of precarious circulation. The application of a rigid plaster-of-Paris dressing immediately after surgery probably prevents excessive edema and, therefore, enhances survival of these stumps.

The time-honored belief that long below-knee stumps break down because of poor blood supply in the distal portion ot the leg is open to question. Lack of total contact between the stump and the socket is the most likely factor responsible for distal edema and breakdown of the stump. Experience with 62 cases of immediate postoperative prosthetic fitting of below-knee amputees has further strengthened the opinion that the presence of pulses or circulation, or both, through the major vessels is not essential for the survival of long amputation stumps. Two of the reported cases who demonstrated absence of blood flow in the major vessels below the superficial femoral artery, as shown on preoperative arteriograms, were successfully amputated at the Syme's level. The physiological impact of early ambulation and the decrease or absence of stump and phantom pain may also have played significant roles in the success of this method for management of the Syme's amputation.

SUMMARY

A new surgical-prosthetic approach to the Syme's amputation has been described.

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