

# Prosthetic Rehabilitation of a Patient With Bilateral Hip-Flexion Contractures: Report of a Case\*

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Prosthetic rehabilitation of the patient with hip-flexion contractures in excess of 30 degrees is difficult. Some of the problems which are frequently encountered are those of prosthetic fitting, of increased expenditure of energy in walking, and of cosmetic results. A case is reported in which these problems could be managed.

## CASE REPORT

A 59-year-old man who had had ulcerative colitis for five years underwent herniorrhaphy in January, 1962. Subsequently, bilateral occlusion of the iliac arteries developed. In February, 1962, aortoiliac endarterectomy was performed and was followed by a *Staphylococcus aureus* septicemia. The infection responded to antibiotic therapy. Eight months later, a plan to bypass a rethrombosed aortoiliac segment was abandoned because of an infection involving the right retroperitoneal area. In March 1963, a dacron graft extending from the aorta to both common iliac arteries was implanted. Gangrene developed in both lower extremities in spite of the procedure. On May 1, 1963, a right above-knee amputation was performed, followed by a left below-knee amputation on May 6, 1963.

On June 6, 1963, the patient was transferred to Bronx Municipal Hospital Center. Physical examination on admission disclosed bilateral inguinal draining sinuses, a right above- and left below knee stump which were in the process of healing. Roentgenographic examination accompanied by injection of contrast medium into both inguinal draining sinuses, performed on October 15, 1963, revealed a communication between the sinuses and the small bowel. The infected dacron graft was removed through the right inguinal sinus without difficulty. Subsequently, both fistulae closed. During this period the patient's wife died and his ulcerative colitis flared up.

By the time of his transfer to the Department of Physical Medicine and Rehabilitation, bilateral 60-degree hip-flexion contractures as well as a 90-degree knee-flexion contracture on the left had developed (fig. 1). Attempts to decrease the contractures by manual stretching and by use of pulleys were unsuccessful. Surgical release of the contractures was believed to be contraindicated because of the patient's impaired local circulation. The marginal circulation in the stumps, the severe contractures and the decreased mobility of the lumbar spine seemed to make the prescription of prostheses inad-

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visible. An additional point was that the patient could not sit for more than an hour without developing numbness in the gluteal regions. The patient, however, insisted that he be given an opportunity to attempt ambulation.

It was, therefore, decided to try out the following plan: A bent-knee pylon was to be constructed for the left leg to allow the patient to stand between parallel bars. If he could tolerate weight-bearing pressure, a pylon for the right side was to be made. Because of the limited mobility of the lumbar spine, it was anticipated that both pylons would have to be aligned in sufficient initial hip flexion to compensate for the limited motion in the hips and in the spine.

*Method*—A plaster-of-Paris mold for the left below-knee stump was constructed. It enclosed the entire stump from the hip to the end of the stump. Padding material was incorporated into the mold. Reliefs for the rectus femoris muscle and for the adductor longus tendon were provided. The mold was allowed to dry on the patient for 24 hours and then a three-inch wide section of the anterior wall of the mold was cut out. The removed section extended from the proximal end of the mold to a point corresponding to the condyles of the femur, and it was re-attached on one side to the mold by means of moleskin. This arrangement allowed the stump to be placed into the mold from the front and it held the stump in place. A hollow, square, wooden pylon was constructed to serve as a shin piece. By resorting to this type of shin piece, we were able to increase the area of floor contact and at the same time keep the pylon light. The mold was attached to the shin piece by means of a medial and a lateral metal band. The alignment allowed for the hip-flexion contracture (fig. 2). As a result of this alignment, the weight was borne primarily on the knee and the posterior thigh. The patient was able to stand with this device without discomfort.

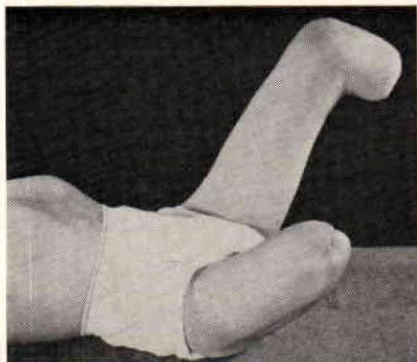


FIG. 1—Position of fixed contractures.

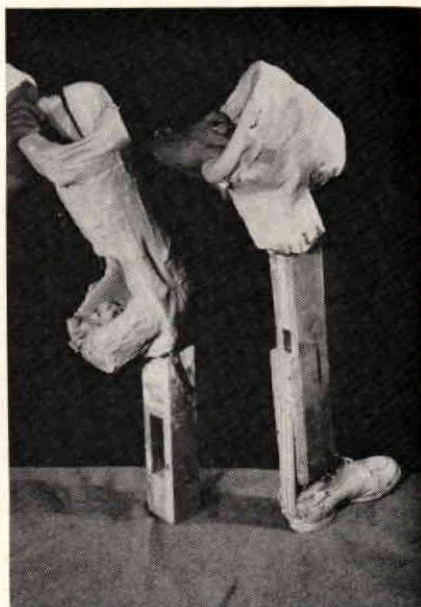


FIG. 2—Right above-knee pylon and left below-knee pylon with accommodation for contractures.

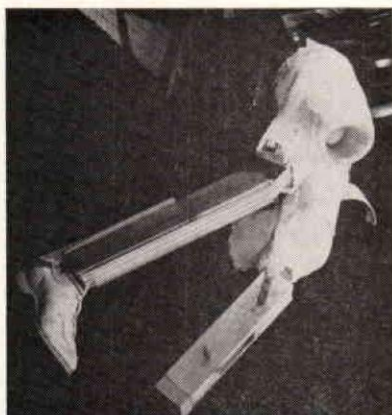


FIG. 3—Above-knee pylon with hinge knee and extension aid.



FIG. 5—Prostheses in extended position, above-knee showing modified Swiss lock and alignment for maximum function allowing for fixed contractures.

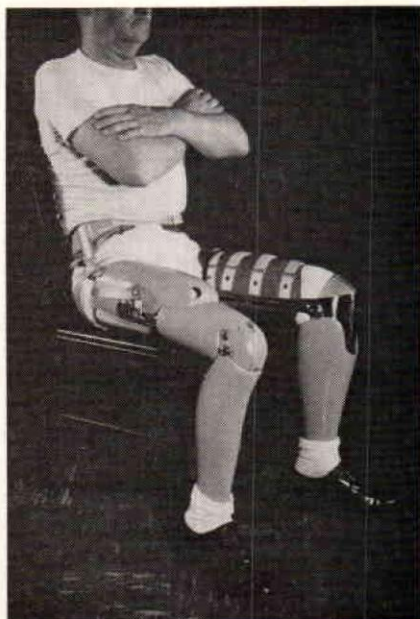


FIG. 4—Prostheses in the flexed position, above-knee alignment for cosmesis.

The right above-knee stump was then prepared as follows: A plaster-of-Paris socket was constructed with the patient in the standing position. Reliefs for the rectus femoris muscle and the adductor longus tendon were incorporated into the socket. Hollow shin and thigh pieces were made of wood and were joined by means of a strong metal hinge to allow for knee motion. The center of rotation of this joint was at the posterior border of the shin and thigh pieces (fig. 3). A strong elastic web strap bridged the knee joint anteriorly and served as an extension aid. A prosthetic

foot with single axis ankle and anterior and posterior bumpers was attached to the shin piece. The plaster socket was attached to the proximal end of the wooden thigh piece at a 60-degree angle by means of a medial and lateral metal band embedded in plaster. The pylon was aligned so that the ankle joint fell under the greater trochanter and the knee joint axis was placed posteriorly to the trochanter-knee-ankle (TKA) line. A non-elastic web strap belt, attached to the lateral side of the socket, provided auxiliary suspension. Weight bearing occurred on the entire posterior aspect of the thigh.

The patient was able to ambulate between parallel bars and to progress to ambulation with a walker. It was therefore decided to prescribe permanent artificial limbs. The appliances followed the basic design of the pylons with a few exceptions. The below-knee prosthesis consisted of a molded leather socket with an anterior opening (fig. 4). The stump was held in the socket by means of Velcro straps. The prosthesis included outside knee joints with drop-ring locks, a single axis ankle, and a conventional foot with anterior and posterior bumpers. In the above-knee prosthesis, the thigh piece consisted of two separate parts: a wooden socket and a distal portion. The two were joined by means of hinges placed medially and laterally and could be locked with a modified Swiss lock in 60-degree flexion to enable the patient to stand upright (fig. 5). When the patient sat down, the lock could be opened to allow the socket and the distal portion of the thigh piece to be realigned into a straight line relative to each other, thus giving a more cosmetic appearance (fig. 4). A Bock knee with friction lock, pelvic band, single axis ankle joint, conventional foot with anterior and posterior bumpers completed the prosthesis.

*Results*—The patient was able to ambulate on his prostheses at first with a walker and subsequently with Lofstrand forearm crutches. Within a few days he was able to negotiate stairs, curbs and ramps. He was discharged from the hospital on May 29, 1964.

The patient has learned to drive a hand-controlled car since his discharge and he is independent in every way.

#### SUMMARY

The feasibility of prosthetic rehabilitation of a patient with a right above-knee and a left below-knee amputation in the presence of bilateral hip-flexion contractures of 60 degrees and left knee-flexion contractures of 90 degrees has been demonstrated.

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