

Prostheses for the Lower-Extremity Amputee with Unusual Complications

By JOSEPH P. GIACINTO, C.P.*

The principles taught in modern prosthetics education programs within the United States have resulted in high standards of fitting for the management of amputees commonly seen by the prosthetist. The following report describes the application of these principles in the treatment of three unusual problems.

In the first instance, a 12-year-old boy riding a bicycle was struck by a car with such force as to remove the left half of his pelvis. Small portions of the right pubic rami were surgically removed (Figure 1). A right-sided colostomy and a tender amputation scar made prosthetic fitting difficult. As shown in Figure 2, the prosthesis used was a modification of the Canadian Hip Disarticulation prosthesis. The socket was designed for distribution of some of the weight-bearing surfaces on the lower ribs, and this also provided increased stability. It was necessary to add shoulder straps to reduce excessive piston action. The prosthesis has proved to be comfortable and functional, enabling the boy to walk with a gait that is cosmetically acceptable. A cane is rarely necessary.

The second problem concerned a 42-year-old woman born with a proximal focal femoral deficiency or an underdeveloped proximal femur, and wore Perthe's type braces for about forty years. She refused a disarticu-



FIGURE 1

* Prosthetic Limb Shop, University of Michigan Medical Center, Ann Arbor, Mich.

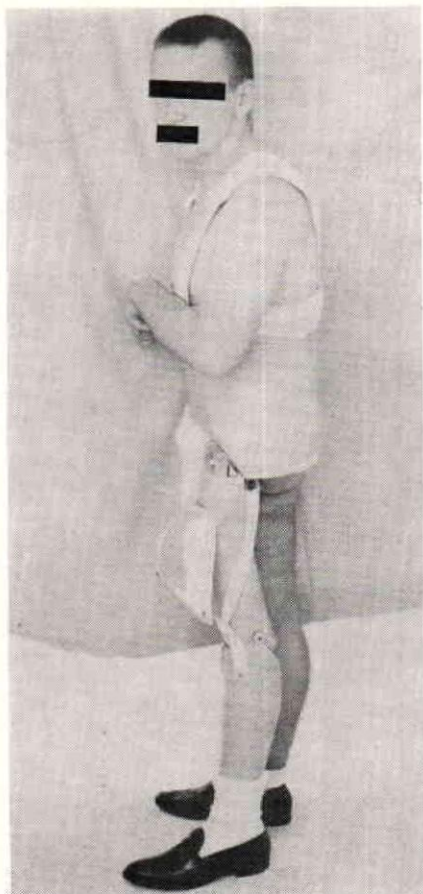


FIGURE 2

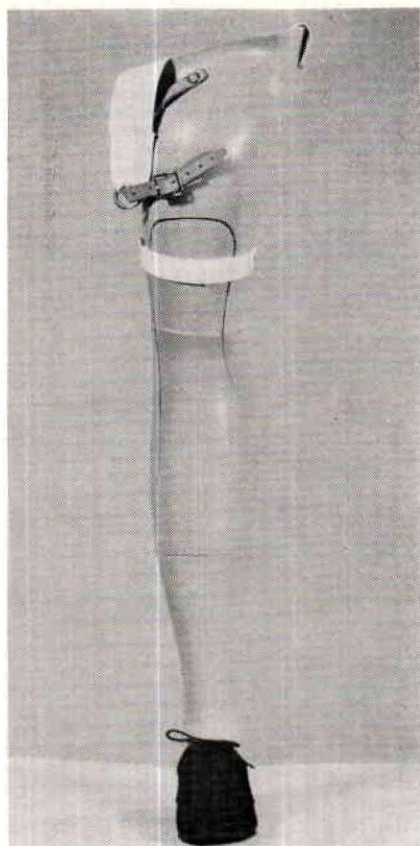


FIGURE 3

lation of her ankle and therefore an ischial weight-bearing prosthesis was fabricated that incorporated her equinus foot into a socket. Outside knee joints at the level of her ankle joint permitted her to sit, stand, and walk in a manner comparable to an above-knee amputee. Unfortunately, this extremely active lady could not develop confidence in walking with an unlocked prosthetic knee joint. As a compromise, another prosthesis was constructed as shown in Figures 3, 4, and 5. It was ischial weight-bearing and without a knee joint. The shin was contoured to conform to the shape of her foot that was held in an equinus attitude. A portion of the shin was cut out anteriorly to make it easier to apply the prosthesis. The cover was retained as a keyed insert, and a Velcro strap retained the superior portion of the cover. A trochanteric joint and pelvic band were unnecessary because the rudimentary femoral head was united to the distal femoral shaft. For this reason a modified Silesian bandage provided adequate suspension and controlled the tendency for internal rotation that is commonly seen in patients with this malformation. Other patients with a proximal focal femoral deficiency have generally preferred a prosthetic knee joint. This lady was given a cosmetic prosthesis simulating a Pylon and has expressed complete satisfaction with it.

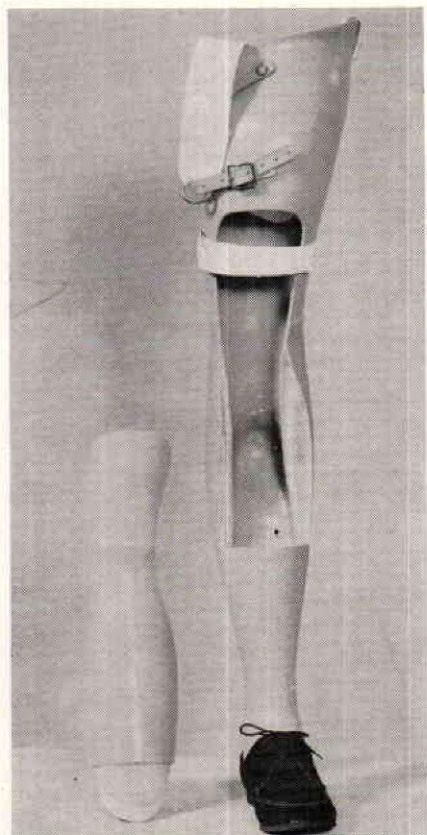


FIGURE 4

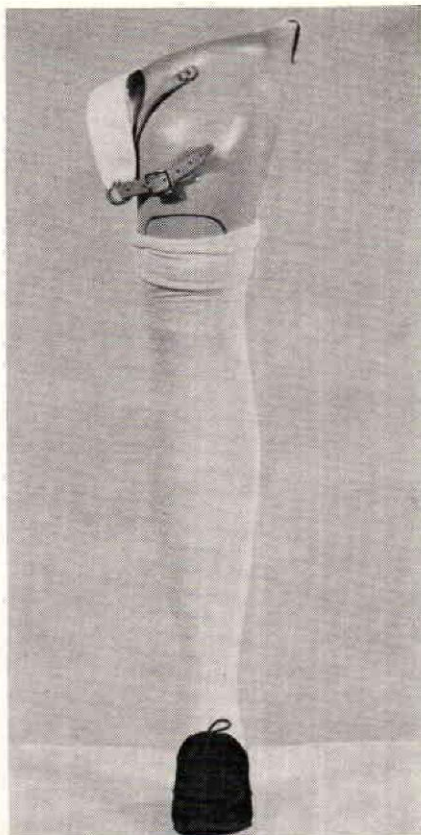


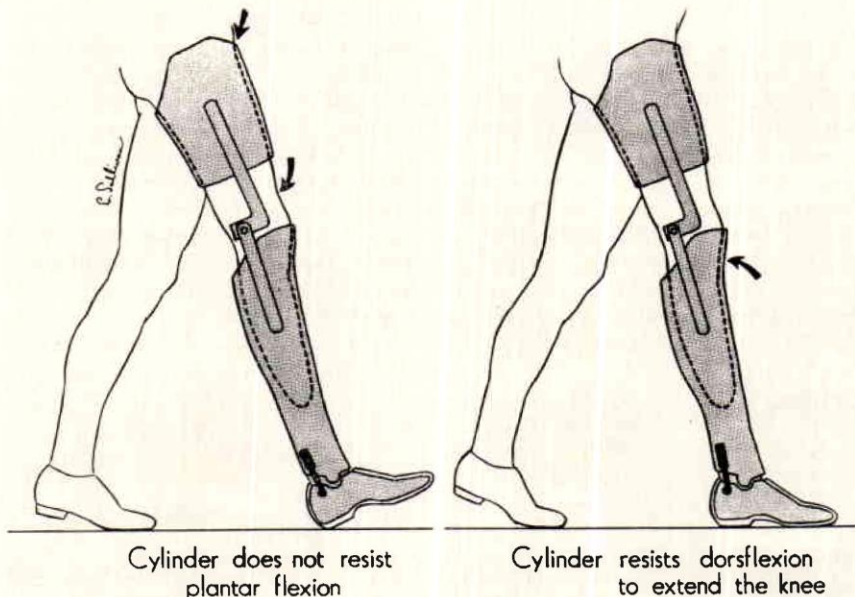
FIGURE 5

In the third case the patient was a girl with congenitally dislocated hips. She acquired poliomyelitis during the convalescent period following the reduction of her left hip at 17 months of age. The entire left leg and hip remained flail. The dislocated right hip was surgically reduced at the age of 5 but was fractured. A Syme amputation of the left flail foot was performed at the age of 12; because the left leg was very short it would not tolerate weight-bearing. When the patient was 15, her conventional below-knee prosthesis with drop locks at the knee was replaced with a total contact socket (Fig. 6). The prosthesis is a modification of the "UCLA functional long leg brace" utilizing the standard single-axis wooden foot, but the knee joints, side bars, and hydraulic damper were produced by the U.S. Manufacturing Co. The plastic thigh shell is similar to the upper portion of a quadrilateral socket, and the below-knee plastic socket has total contact but is aligned in a neutral position. The hydraulic damper is inserted into the distal portion of the shin, and the piston rod of the hydraulic cylinder is attached to the pin in the posterior portion of a single-axis wooden foot. Figure 7 shows the position of the hydraulic cylinder in the prosthesis at heel strike; the arrow indicates the force exerted by the anterior brim of the quadrilateral socket on the patient's abdomen. The force is anterior to the uprights, which results in extension of the knee. Shortly after heel strike, the hydraulic cylinder permits the foot to flex slowly to approximately 20° . Ankle dorsi-

flexion is strongly resisted by the hydraulic damper, and, this promotes extension of the knee in mid-stance and the heel-off phases of walking. Despite the flail leg, this below-knee prosthesis provides a more normal gait than one with a lock at the knee. The freely-swinging knee also affords ease in sitting and standing.

The prosthetic management of patients described above shows that even in difficult cases, simple modifications of standard techniques of alignment and fitting may be sufficient to produce a prosthesis that is functionally and cosmetically acceptable.

Pressure of pelvis on anterior brim of thigh shell extends the knee



FIGURES 6 & 7