

## A QUICK-CHANGE ANKLE DISCONNECT FOR A BELOW-KNEE AMPUTATION

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Fig. 1. The patient.

The subject of this study is a 12-year-old, healthy, female with a long below-knee amputation (Fig. 1). She was first seen by us at nine years of age, with the diagnosis of congenital absence of the fibula. She had had a deformed ankle joint, and a shortening of the tibia, but a foot of normal size.

Until her eighth year, when the foot was amputated, she was fitted about every two years with a molded plastic device that provided end-bearing. PTB supracondylar strap type of suspension was used with a posterior opening. Her foot was gradually drawn into equinus to accommodate the increasing shortage of the extremity. She walked very well with these prostheses, but had the discomfort and inconveniences caused by breakages and adjustments that can be expected of an active growing child with her deformity. However, the cosmesis was not good. After amputation of her foot, which gave her a good conical end-bearing stump, she was fitted with a conventional PTB SACH foot prosthesis. She walked very well, had good cosmetic appearance, and suffered very few discomforts through this growing stage.

When she attained the age of twelve, it again became necessary to replace the prosthesis. When the measurements and the cast-

ing had been performed the mother was asked to bring in a shoe in the style that the girl would like to wear with the stipulation that the heel must not measure more than one inch in height.



Fig. 2. Exploded view of the unit.

A problem became evident when the mother, in a pleading approach and the daughter in a sullen mood, presented me with a pair of tennis shoes, such as all active, athletic girls wear, and a pair of shoes with two-inch high heels, such as every young lady has as her heart's desire. Something had to be done to satisfy the desires of a young lady and a girl and in that way maintain a happy mother-daughter relationship.

Obviously, the solution had to be in pro-

viding interchangeable feet. From having watched her over the years and seeing her, to her mother's displeasure, sacrifice good gait for convenience when making the change from shoes to sneakers, I could not impose the inconvenience and lack of control that would result if the bolt had to be removed from the foot every time she wished to change shoes. Costs also had to be justified.

A quick change coupling at the ankle seemed to be the best approach, and it appeared to present the least problem if a tubular pylon construction could be used. Because there was only 2½ in. available for

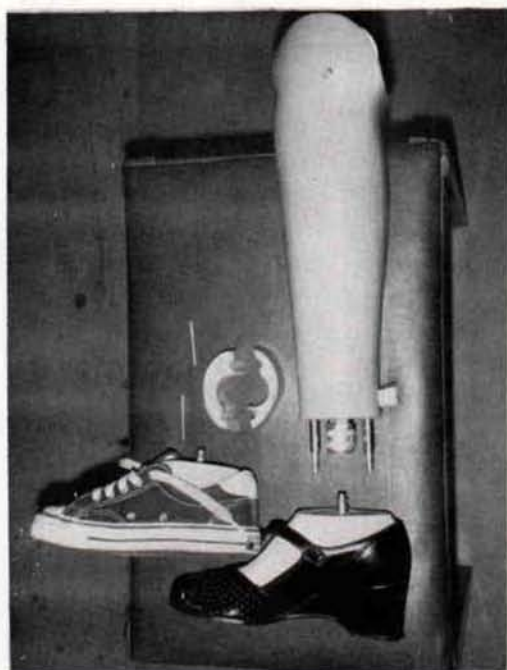


Fig. 3. Partial assembly of the unit.

the coupling, I discussed this with Paul Leimkuehler of Cleveland and had to agree with him that the available quick-change wrist



units would not be strong enough to be used in a below-knee prosthesis for a twelve-year-old girl.

However an air hose coupling (Lincoln Flex-O-Matic automatic air coupling) seemed as though it might be satisfactory. After removing the air seal from the socket

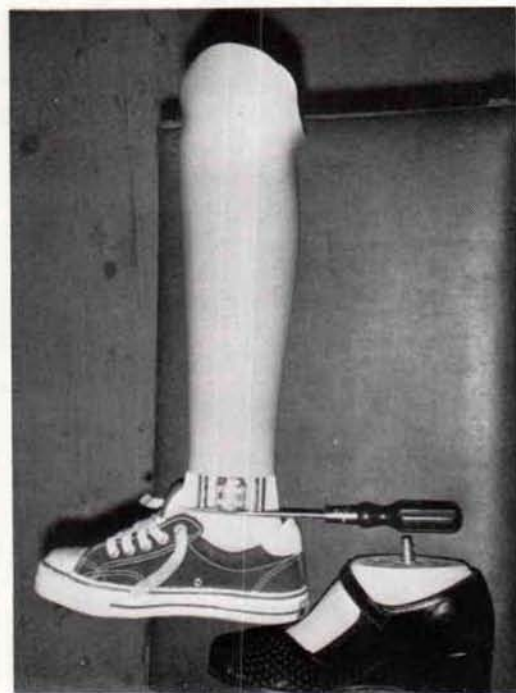


Fig. 4. The unit assembled completely.

part of the coupling, an attachment plate was screwed onto the stud and it was attached to the distal end of the socket block. The nipple stud was then threaded inside to receive the SACH-foot bolt and by attaching a plate to the stem, the nipple unit was inserted and secured in the foot. To control rotation, and to act as locating pins, two  $\frac{3}{4}$ -in. rods were threaded and screwed into the distal end of the socket block, anteriorly and



Fig. 5. Patient in high heels

posteriorly of the coupling. Corresponding holes to receive the pins were then set into the foot. Sleeves are slipped over the pins to prevent any possible motion. A space-filling block is then made that divides into two



Fig. 6. Patient in tennis shoes

parts so that when a foot is locked into position the blocks are removed easily and an easy upward lift of the slip collar releases the connection. All the parts can be disassembled and disconnected to aid in the finish lamination process, to make adjustments, and for servicing.

The patient has now used this prosthesis for more than three months, and has really enjoyed the function provided by the quick-change coupling. She returned to us once to have an adjustment because an attachment plate had made a  $\frac{1}{4}$ -turn off of the bolt. Because the unit is set up on very close tolerances, to function properly all threaded connections must be very secure.

#### Footnote

<sup>1</sup>Flint Limb and Brace Co., 409 West Third Avenue, Flint, Michigan 48503.