An AK Prothesis with Tilt Socket

The patient was a white, 22-year-old male, 6 ft. 4 in. tall who sustained severe injuries in a motorcycle accident which eventually resulted in a high above-knee amputation of the right lower limb. Sight in the right eye was lost, but the left leg was not involved.

The examination revealed a 4½ in. amputation stump, with a femur 3½ in. long. The circumference at the level of the ischium is 25 in., at the 2 in. level, 21 in. Extensive and deeply seated scars covered the anterior and lateral aspects of the stump (Fig. 1, upper).

The stump motion was limited. Max. extension was 26 deg. (Fig. 1, center); Max. flexion 49 deg. (Fig. 1, lower) for a total range of motion of 23 deg.

In consultation with the patient's physician, it was decided to fit him with an above-knee quadrilateral, wood socket, (conventional type, since the extensive scar tissue prohibited the use of a suction socket) in which the anterior and lateral walls were to be 3½ in. above the ischial seat to provide stability. The socket was to be fitted in approximately 5 deg. of abduction in order to gain space at the medial aspect. A Silesian belt was to be provided for suspension. The Coleman "Safety Knee" and the Bock 1H20 foot were prescribed.

Because of the extremely limited range of motion present, additional provisions had to be made to allow the patient to sit. Therefore a joint at the distal aspect of the stump, about 4 in. from the ischial seat, and a locking mechanism to assure stability while standing and walking were incorporated.

The necessary components consisted of two upper joint sections with screws, two lower joints with extension and flexion stops, and the lock mechanism (Fig. 2), and were obtained from Habermann[1]. The fitting was done in conformance with established methods, using the Staros-Gardner coupling (Fig. 3). After static and dynamic alignment were considered to be satisfactory, the assembly was transferred into a definitive prosthesis in the usual fashion.

The swivel points were then established at the midline of the socket, medially and laterally, perpendicular to the line of progression and parallel to the knee axis at the level of the end of the stump. (If more than 50 deg. tilt is desired these points should be moved

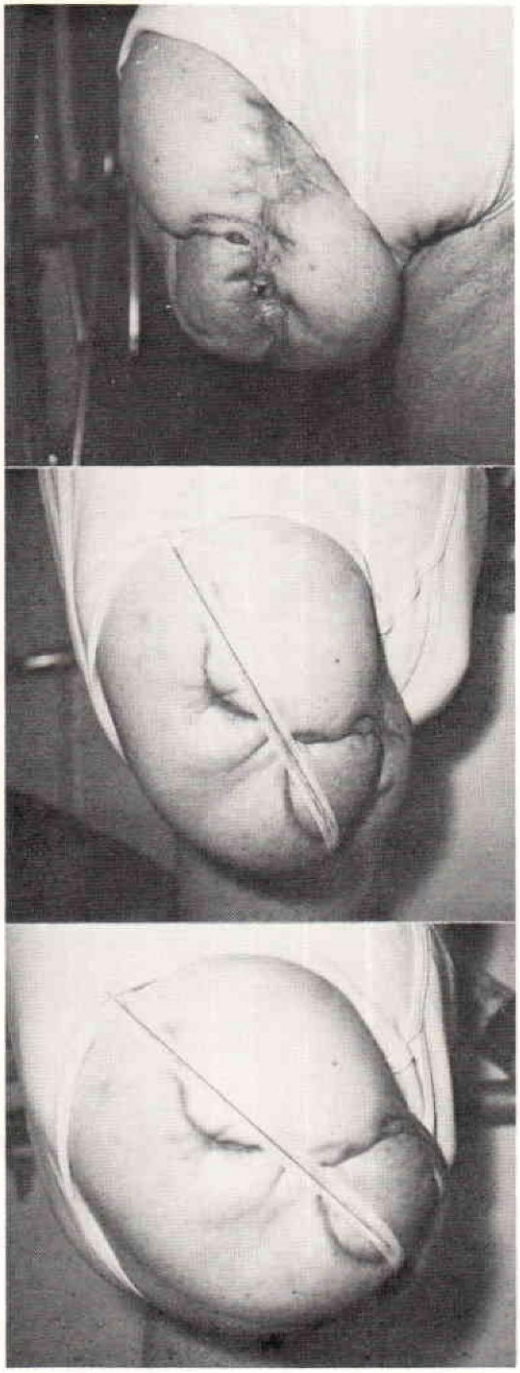

Fig. 1. Three views of the patient fitted with the tilting socket.

[1] Habermann, Hellmut, Orthopaediewerk Habermann GmbH, Chief Orthotist and Prosthetist, Marienburgstrasse 5-7, Frankfurt am Main, Germany.

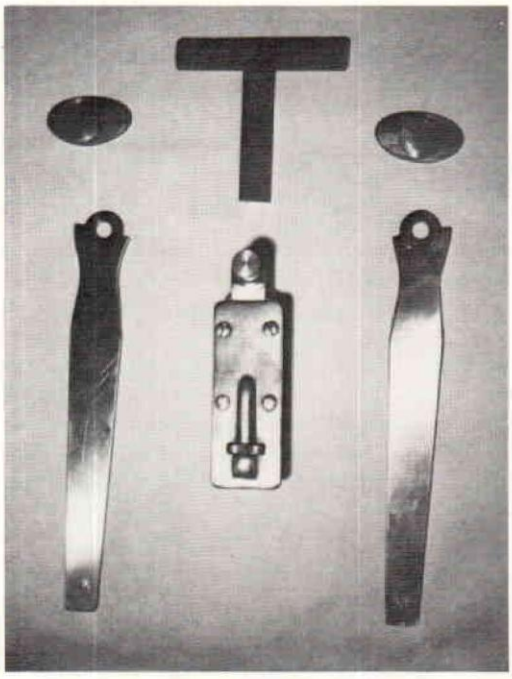

Fig. 2. Components required for the tilting socket. These were obtained from Habermann of Frankfurt, Germany.

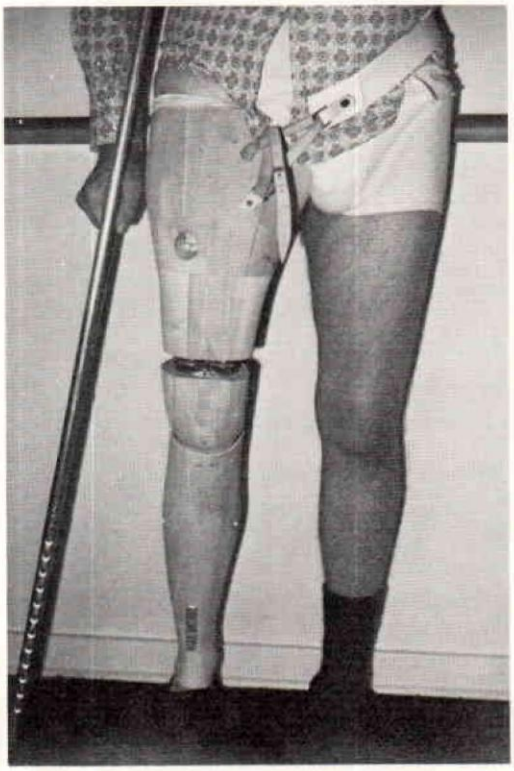

Fig. 3. Leg "in-the-rough" with the "Staros-Gardner" coupling.

slightly anterior of the midline.) After these points were marked they were drilled on the lathe between centers with a 3/8-in. drill, and with a 1¼ in. cylindrical counterbore; two flat surfaces were obtained which were parallel to each other as well as perpendicular to the established axis.

The upper joint sections were then installed, followed by installation of the lower joints. Extreme care must be taken to preserve the alignment already established.

After the joints were fastened with wood screws a cut was made through the thigh portion, approximately 1½ in distal of the joint center. A second cut 1 in. distal of the first one on the anterior half is necessary so that this wood may be removed to provide for clearance (Fig. 4). In addition to this more wood may have to be removed until the

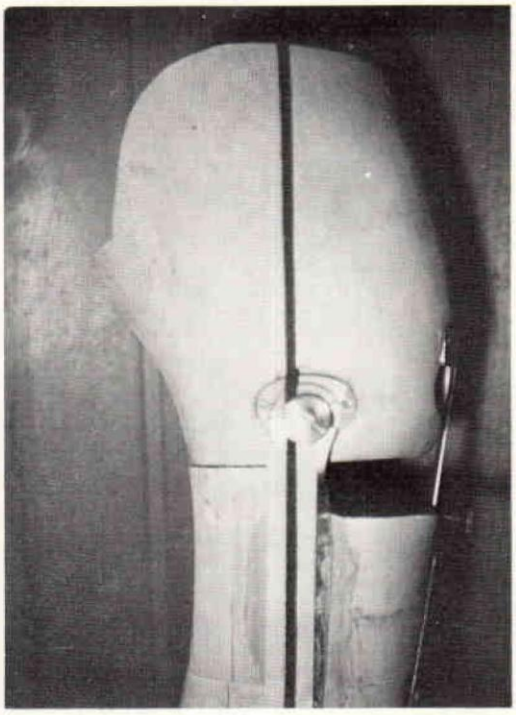

Fig. 4. Lateral view of thigh section showing the saw cuts that are necessary.

desired degree of tilt is obtained. After this the lock is installed, the distal part first, followed by the installation of the proximal "T" section (Fig. 5). To release the lock, the patient merely depresses the knob. Upon extension it locks automatically.

At this time the patient was asked to return for a second fitting, mainly, to assure that the amount of tilt was sufficient. It became

obvious that the Silesian belt was inadequate, and therefore a hip joint and a pelvic belt

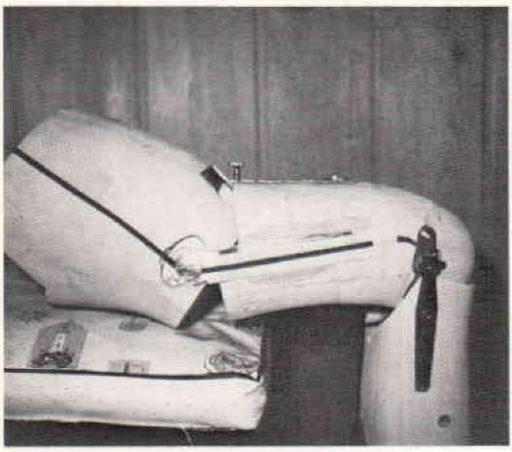

Fig. 5. The complete assembly. Note the locking arrangement.

were added. In addition to this a light webbing strap over the left shoulder was installed to give additional suspension.

The prosthesis was then finished. Upper and lower joints were fastened with N. 10 copper rivets, and the shin and thigh sections were laminated. After lamination the lock was installed. Then the upper "T" section of spring steel was aligned and riveted to the socket. The lower part has a height adjustment to assure a positive lock without any play. The finished prosthesis is shown in Figure 6.

This procedure was obviously time-consuming and, consequently, costly. However, the results were excellent. At this time the patient has worn the prosthesis routinely for 10 months, with only minor adjustments being necessary. I would like to add that this method is used quite often in Germany, not only for patients with a limited range of motion, but also for very short above-knee stumps to be fitted with suction sockets.

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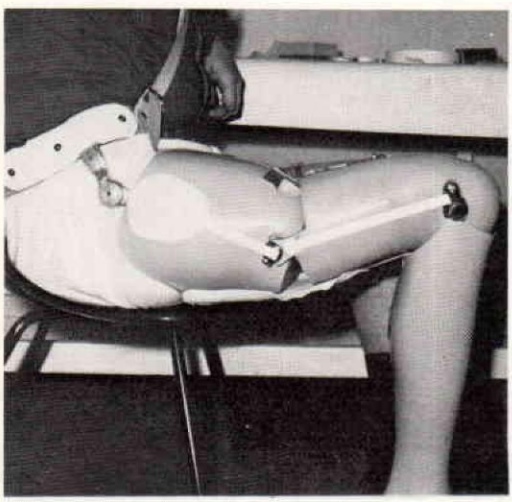

Fig. 6. Three views of patient with the tilting socket.