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TECHNICAL NOTE

ALLOWING NORMAL ADDUCTION OF FEMUR IN ABOVE-KNEE AMPUTATIONS

Virtually every article written in modern times on above-knee socket construction stresses the importance of support of the femur by the lateral wall of the socket. X-ray studies carried out at Fitzsimons Army Hospital since March 1974 show that very few above-knee prostheses built in the United States today achieve proper adduction of the femoral stump.

I have been amazed by the number of prostheses that are aligned so that the amputee is prevented from moving the femur into normal or equal adduction, because the prosthetic foot touches the sound foot while the femur is still in abduction. In *every* case, I found that, by simply realigning the knee and foot with respect to the socket, the amputee could bring the femur into a normal position.

After looking at X-ray pictures, it became evident to me that the head of the femur should be used as a starting point when aligning the AK prosthesis. I found the head of the femur to be located very near the center of the socket in the M/L dimension, and I now use that M/L center as a starting point in bench alignment.

A straight line from the center of the socket (viewed from the posterior) to the center of foot indicates the line of support. If the foot is located so that the support line intersects the distal end of the femur, a very close approximation of adduction equal to the contralateral side will occur. (I am sure every prosthetist knows that the distal end of the amputated femur is extremely close to the lateral wall of the AK socket.)

The only obstacle preventing adduction now is the prosthetic knee joint, which must be moved laterally to prevent it from touching the sound knee. I routinely place the center of the M/L axis of the knee on the support line during bench alignment. X-ray pictures confirm this position to be quite in accordance with the normal.

Aligning the distal femur over the center of the knee gives a definite advantage to wearers of hydraulic knees. A definite decrease in rotation is noticed when the distal femur is directly over the hydraulic cylinder.

A typical bench alignment of a long stump is shown in Figure 1. Photographs of a typical prosthesis aligned in the manner suggested here are shown in Figure 2. The socket brim is shown in Figure 3.

Adduction is difficult to maintain when the M/L dimension of the socket is excessive, because support of the femur is lost when weight is applied and the top of the socket moves laterally. When the M/L dimension is too large it is possible to have a socket with the lateral wall appearing to have 20 deg. adduction built in and yet the femur will be in abduction. This is not at all unusual; in fact, most United States AK limbs have this fault.

It would seem to me a serious study should be

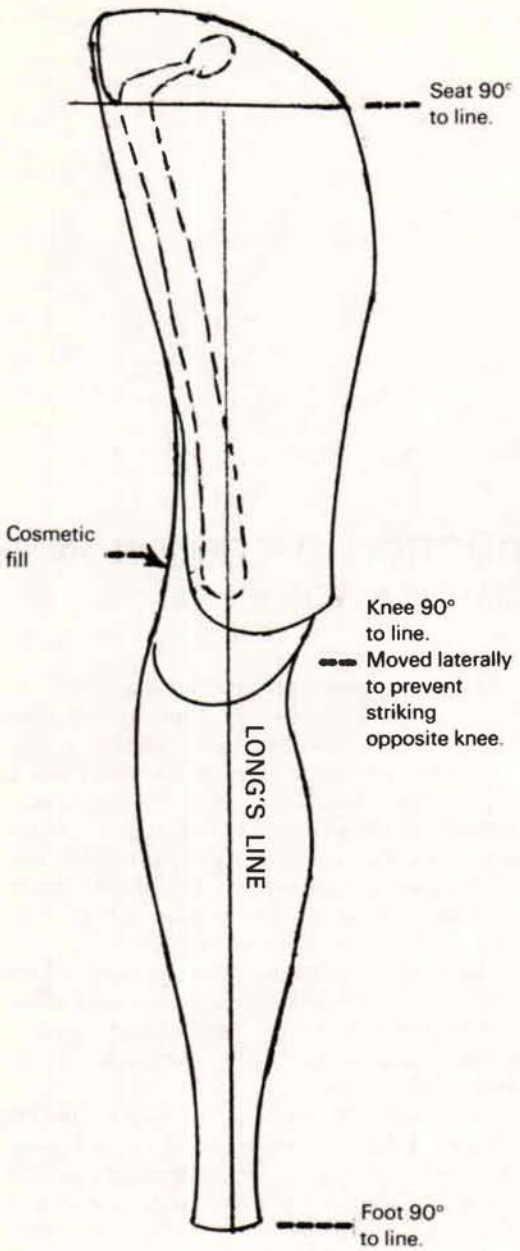

Fig. 1.

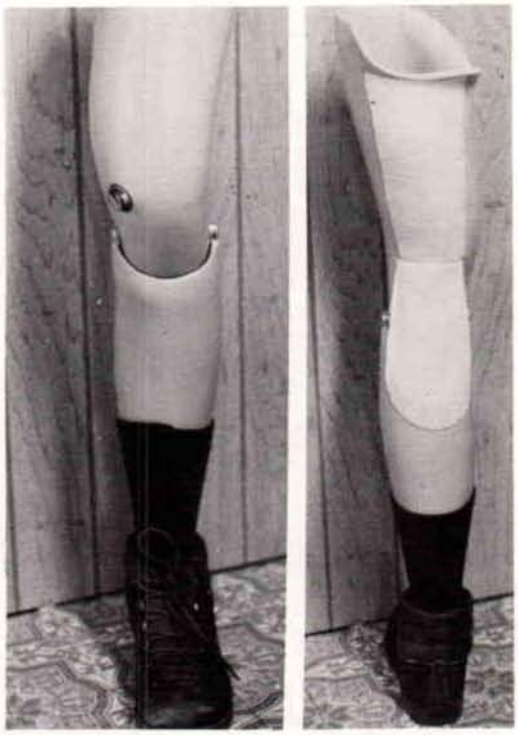

Fig. 2.

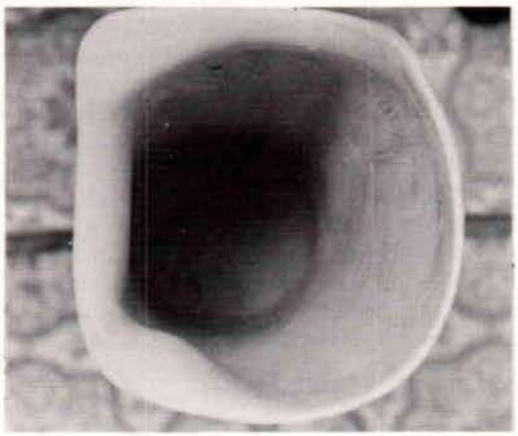

Fig. 3.

devoted to developing a method of measuring the stumps to give a more realistic shape to the top of the socket.

(Most IPOP casts achieve better adduction than regular sockets.)

This alignment permits the AK amputee to walk freely, securely, and without back pain, and side motion of trunk is greatly stabilized. Most amputees can balance on the prosthesis without shifting shin over heel. This is impossible with the stump in abduction.

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