

**Recollections
of the
Radiographic Control
of the
Position of the Femur
in
Prosthetic Fitting of the AK Amputee
Fitzsimons Army Medical Center
1974 to 1983**

Between 1974 and 1983 and for a longer period of time before 1974 Fitzsimons Army Medical center was the treating facility for casualties from Vietnam and usually treated between 100 and 120 amputees in its amputee clinics. Although I do not have records to know the proportion of AK amputees in that group my recollection is that 50% were AK amputees at various levels. The remaining patients were BK and upper extremity amputees.

During the management of these patients and the fitting with prosthetics by various socket techniques (suction vs non suction and waist belt stabilization vs no outside hinge and belt accessory) the control of the abductor gait with the fitted prosthesis became a problem that in the past had been controlled by the use of a cane in the hand of the patient on the opposite side from the amputation. This pattern seemed logically acceptable in the elderly amputee who had often had a prolonged period of inactivity and therefore muscle weakness but in the young patient who had been physically active the idea of muscle weakness seemed less likely.

Although I may be in error, I believe it was Col Anthony Ballard MD Medical Corps USA, and the Chief of the Orthopedic Service immediately before my tenure that suggested that the origin of the abductor gait might be the abducted femur which would unbalance the abductor muscles at the hip and by shortening their resting position weaken them in function, producing an abductor gait while walking. This would occur even though our fitting was intended to be to adduct the femur to an anatomic position of adduction.

By misjudging the fitting position of the femur we might have not succeeded to adduct sufficiently and therefore we began to use a standing AP radiograph to evaluate the position of the femur. To adequately evaluate the position we often had to use a long X-ray cassette, I think 36 inches, to really get the picture that we desired. That length allowed us to be sure that the lower spine was straight, the pelvis was level and the position of the proximal amputated femur similar to that of the opposite side allowing for the expected norm for that level of amputation. The long film was occasionally supplemented with a standing 14 by 17 placed horizontally and taken in the AP position of the pelvis and proximal femur. This supplemental film gave us a more direct picture of the ischial seat and comparable position of the femurs, including an estimate of the rotation of the femur as well, since we desired to position the femur in its normal position of rotation as well as adduction. These films also gave us several valuable controls of the fitting position, such as the position of the ischial seat and the contact of the seat in the standing position, the accuracy of the fit of a suction socket and the leveling of the knee unit.

As we developed more experience with the technique additional principles became important to us. In the long AK fitting the amount of adduction could be anatomical as

compared with the expected position and the opposite side. However as the amputated femur shortened the degree of adduction to 'balance' the abductor muscles at the hip seemed to increase so that with the short AK the degree of adduction of the proximal femur was often much greater than the expected 'normal' adduction. This produced some unusual appearing prosthetics and some 'cosmetic' shaping of the finished socket was necessary so the prosthesis did not appear unusually shaped (Z shaped) because of the appearance of an excessively adducted socket for the short femur. Changes of the adduction of the femur almost always were accompanied, as would be expected, with a change of the 'leveling' of the knee unit. There were instances when with the gait training, that was routine, that abductor strengthening exercises for the hip abductors were used and beneficial.

As we worked with the technique the flexion position also came into some focus and we began for a time to use a lateral film to evaluate the degree of flexion or flexion contracture of the proximal femur. The lateral radiograph was helpful in some short AK to be sure that a flexion contracture was not a problem for the fitting but in most other cases the clinical evaluation of a flexion contracture was sufficient to treat and fit the amputee.

This technique did not seem to change the necessity of a pelvic band with the short AK amputee fitting with or without a suction socket but it did improve the gait of these patients and allowed them to function most of the time without the need of a cane to walk. If a short AK particularly and a longer AK as he walked had a tendency to lean forward then a flexion contracture would be considered. In some patients the ischial seat needed modification to be sure it was level and not irritating the patient by being too large for the patient and prosthesis. With adduction some of the ischial seats became quit small but seemed to support adequately as long as the X-ray control was used to confirm support.

This technique was tried on the older amputees as well and the results though not as dramatic as the younger patient were gratifying particularly in the longer AK amputee.

Not every patient was able to discard the accessory cane entirely and some used the accessory cane only occasionally, but the vast majority of fittings were much more satisfactory and the gait patterns more normal than had been our experience in the past.

I cannot be more emphatic that the treatment of the AK amputee still required an experienced team of the surgeon, physical therapist, prosthetist and now an experienced X-ray technician who was familiar with the needs of the team treating the patient.



William W. Eversmann, Jr. MD
Colonel, Retired Medical Corps United States Army
Formerly Chief of the Orthopedic Service
Fitzsimons Army Medical Center
Denver Colorado