

X-RAYS: A "FITTING TOOL" FOR THE PROSTHETIST¹

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The purpose of this article is to demonstrate the usefulness of x-rays as a "fitting tool" for the prosthetist, i.e., as a means of checking fit of the prosthesis before completion of fabrication. The use of x-rays eliminates some questionable points that may arise at time about prosthesis fit, weight-bearing areas, trimlines, reliefs, etc., where conventional methods may fail or are not wholly satisfactory.

CONVENTIONAL METHODS OF CHECKING CONTACT BETWEEN PROSTHESIS AND PATIENT

To check for *total contact*, the prosthetist generally uses either a ball of clay or powder in the distal end of the socket. This method does show that the patient has *contact* on the distal end of his stump, but does not show that the patient has *total contact* around the periphery of the distal end of the stump.

After static alignment of the prosthesis has been established to the prosthetist's satisfaction, the prosthesis is removed, and visual inspection and palpation of the stump are employed to check for fit of the socket.

Marks made by either the cast or stump sock are reflected on the patient's stump. This method can sometimes be misleading because sock marks over the entire surface of his stump *do not* necessarily mean that *total contact* is present. With the sock stretched tightly over the stump and then placed into the prosthesis, the sock may, sometimes, reflect marks due to the tension in a snug fitting sock.

Weight-bearing areas will also reflect sock marks, but should show increased pressure by

some discoloration (i.e., redness) in these areas. However, in cases of obese patients or patients with redundant stump tissue, these areas have a tendency to move distally once the prosthesis has been removed. A prosthetist must rely on his judgment and experience to know when these areas are in the proper location when the check-out is made by visual inspection.

The mediolateral trimlines of the prosthesis are checked while the patient bears weight on the prosthesis and while sitting with the knee flexed to 90 deg. The mediolateral and anterior trimlines are checked by palpation of the stump around the proximal border of the socket to determine the degree of fit with respect to the femoral condyles, the patellar, and the popliteal areas. With obese patients, it is sometimes difficult to palpate these areas, a condition that limits the reliability of the technique.

The relationship of the patellar-tendon protuberance to the posterior trim is checked after the prosthesis has been removed. Again, this depends on the prosthetist's experience and judgment.

PROCEDURE

The x-rays are taken using the standard knee technique and taken for soft tissue. The same procedure is also used for other levels of amputations. X-rays are taken at the initial fitting after static and dynamic alignment have been completed and the patient is comfortable. At this point, the information provided by the x-rays is most useful to the prosthetist. After examination of the x-rays, adjustments are made to the prosthesis. When problems arise, they are reviewed and discussed with the clinic chief and appropriate remedial measures are taken. Generally, two weight-bearing views of the stump-socket relationship are taken: anteroposterior and lateral (Figs. 1 and 2). If necessary, a third view is taken while the patient is sitting.

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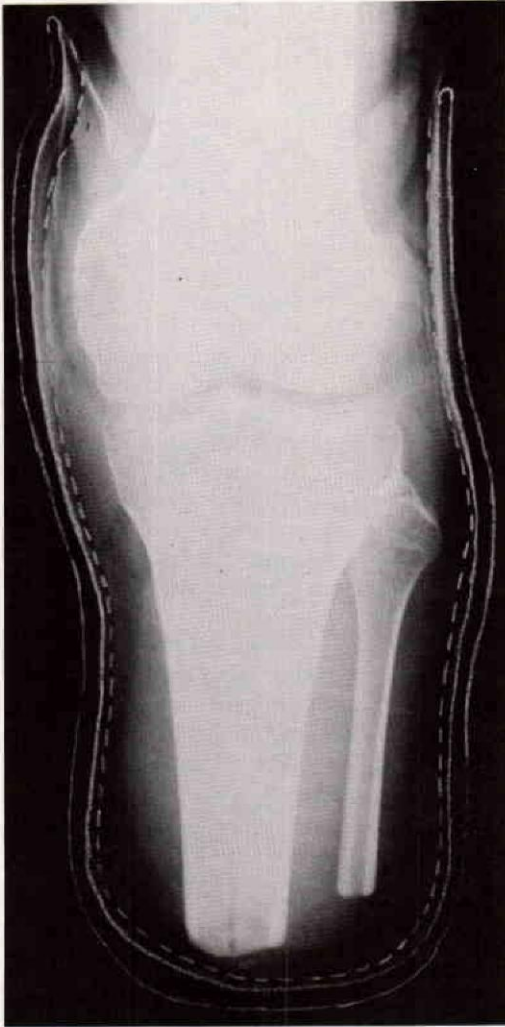


Fig. 1. Anteroposterior view reflects mediolateral relationship of stump to socket, X-ray is outlined for clarity of interfacing and socket shell.

ANTEROPosterior VIEW (Fig. 1)

The proximal mediolateral trimlines are checked for adequate height and fit around the femoral condyles.

The mediotibial flare is checked for adequacy and location of the mediotibial shelf.

The adequacy of relief for the head of the fibula, the distal end of the fibula, and the shaft of the fibula are checked.

The distal end of the stump is checked for *total contact*. (The distal *total contact* is also checked from the lateral view.)

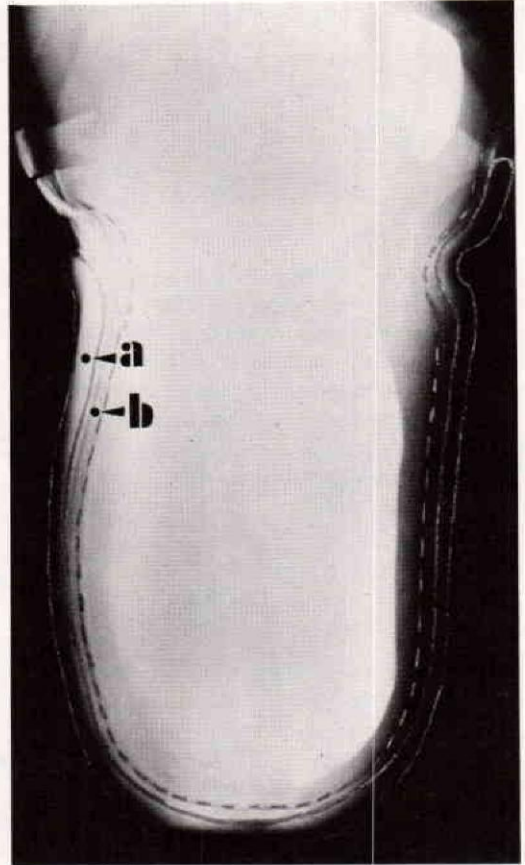


Fig. 2. Lateral view has also been outlined for clarity. (a) Area between the two solid lines represents socket shell. (b) Area between dotted line and solid line represents "Cordo" interfacing.

LATERAL VIEW (Figs. 2, 3, and 4)

The location and adequacy of fit in the area of the patellar-tendon protuberance is determined. At the same time, the posterior brim is checked for height and amount of flare in relationship to the patellar-tendon protuberance.

Relief of tibial tubercle is checked.

The flexion angle of the socket is checked.

The overall fit of the prosthesis for peripheral contact is assessed.

The distal end of the stump is viewed again for *total contact*.

Figure 3 is a lateral view of a condition where the patellar-tendon bar is located too far distally and a lack of total contact in the region of the anterodistal tibia.

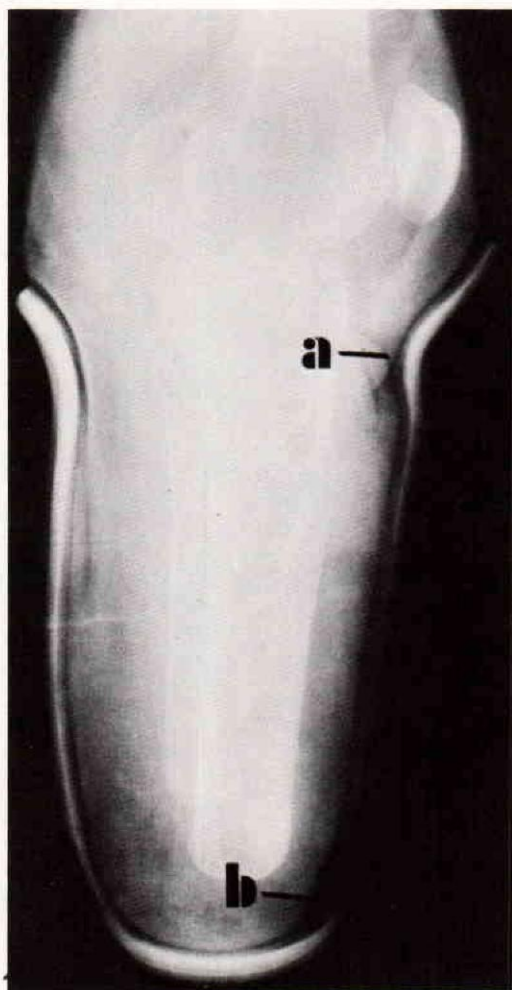


Fig. 3. Lateral view.

- (a) Improper location of patellar-tendon protuberance. It should be located inferior to the patella at the level of the tibial plateau.
 (b) Total contact not maintained at the anterodistal tibia.

Figure 4 is a lateral view of a Syme's prosthesis and stump where total contact has not been achieved.

LATERAL VIEW IN SITTING POSITION (Optional)

Proximal displacement of the stump in the prosthesis is related to the configuration of the posterior brim of the socket; when the brim is not of the proper height, the displacement will be either inadequate or excessive. The fare of the posterior brim should be rounded so as not to cut

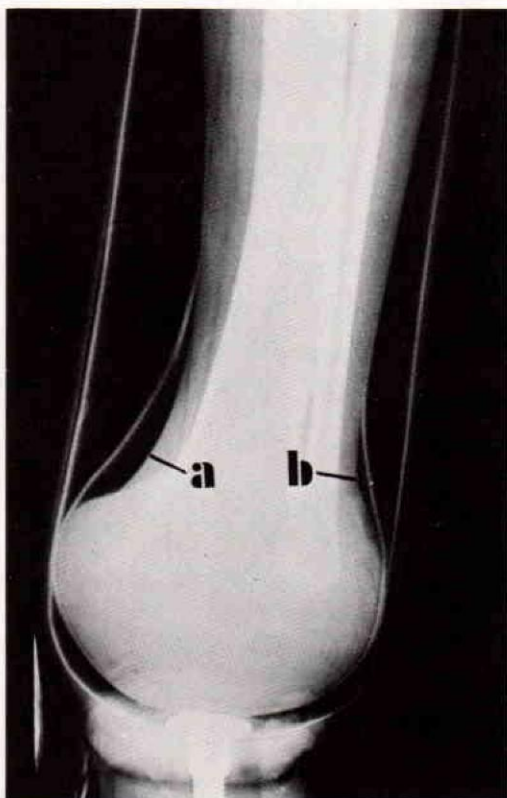


Fig. 4. Closed Syme's prosthesis; a and b illustrate medial and lateral areas that have not maintained total contact under weight-bearing conditions.

into the hamstrings or cause excessive displacement of the stump in the socket.

The location of the patellar-tendon protuberance in relationship to the tibial tubercle is examined to make certain there is adequate relief. This view is used only if doubts about the fitting have been raised by the other x-rays.

The more conventional modes of prosthetics checkout should not be disregarded; but, under proper supervision, x-rays can be a valuable "fitting tool" for the prosthetist assuring him that the patient is given the most effective fit available in prosthetics service.

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