The Use of X-Rays and Xerograms in Prosthetics

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INTRODUCTION

The amputation of a limb causes a patient to suffer both a physical and an emotional loss. This loss is magnified by the socioeconomic effects of an amputation. As certified prosthetists, we are charged with the responsibility of replacing the lost limb in a manner accepted both by the medical prescription and the patient, and then with the prosthetic management of the patient for years to come. X-rays or xerograms (Fig. 1) of the residual limb are a valuable evaluation tool which will assist in the design of the prosthesis and future successful management of the patient.

An x-ray provides much valuable information about the residual limbs' bony structure and any calcification of blood vessels. The xerogram, a relatively new procedure, reveals not only the skeletal structure and vessel calcification, but also soft tissue, blood vessels and muscular structures.

The replacement of a human limb with an artificial one requires that the prosthetist evaluate the needs of the patient—socially, emotionally, and physically—in order to assist in the proper design. This many include x-rays of the residual limb prior to casting and also during the preparatory prosthetic stage. X-rays can be used in two ways: a) to visualize conditions beneath the skin which may alter prosthetic design and prescription and b) to maintain the relationship between the skeletal structure and the prosthesis during fitting.

CASE STUDIES

Case 1

Mr. C was a 47 year old traumatic above knee amputee, successfully fit three years ago with a total contact suction socket, who returned for the fitting of a new prosthesis, necessitated by weight gain.

Following normal casting and measuring procedures, the patient was fit with a new total contact ischial weight bearing test socket on an adjustable pylon. During

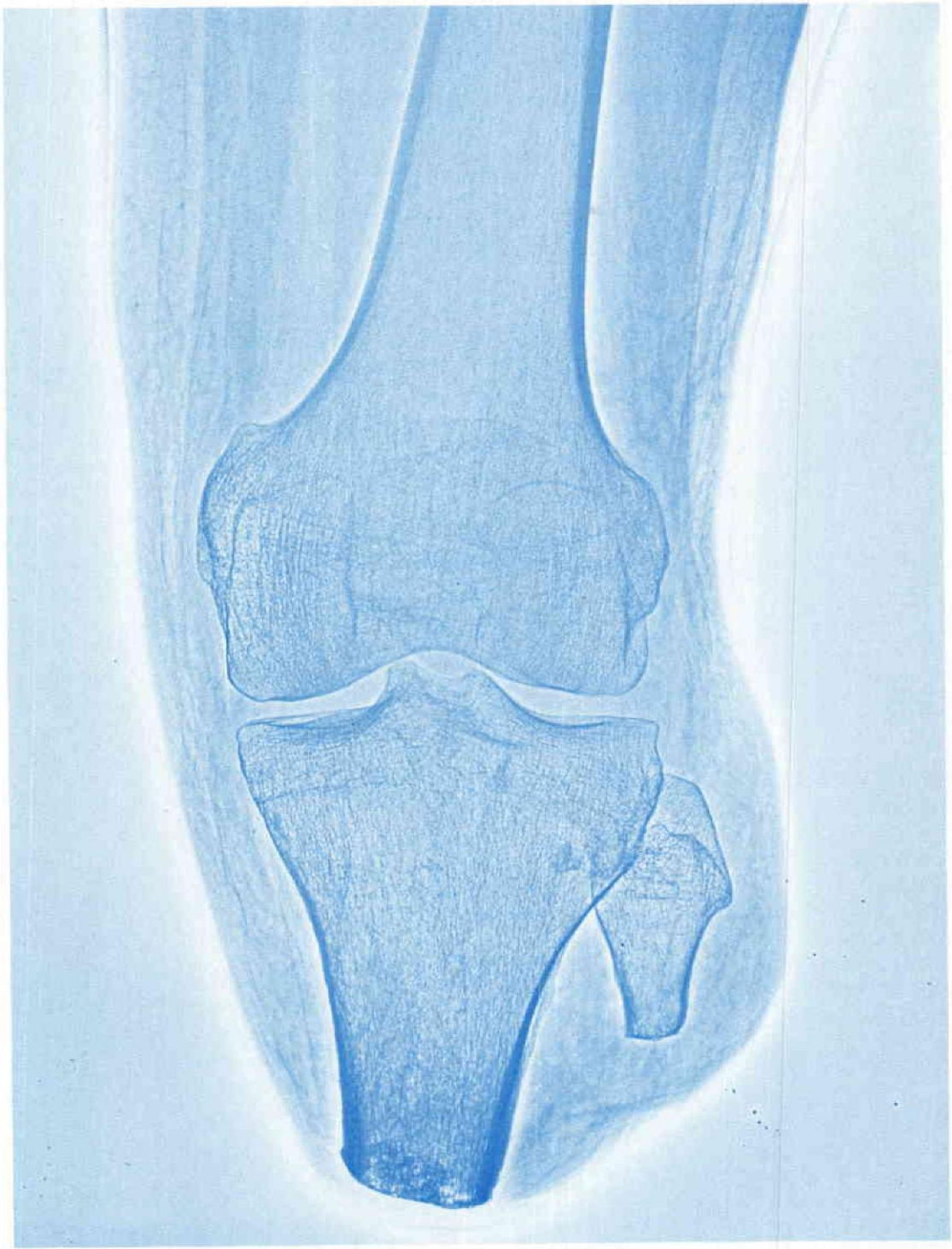

Fig. 1. Xeroradiograph of a below knee residual limb. The xeroradiograph is printed on paper and shows excellent definition of bone structure and density.

ambulation the patient complained of severe cramping and pain on the distal ⅓ of his residual limb. Upon examination of his residual limb, a firm area of tissue was palpated on the medial distal and posterior distal aspects of his limb. X-rays (Fig. 2) were then taken of his limb which revealed a massive calcium formation on his medial and posterior distal femur. This growth was probably secondary to multiple foreign bodies (buckshot) remaining in the soft tissues.

Fig. 2. Conventional x-ray of the distal femur of Mr. C showing calcium formation of buckshot.

A clinical decision was made to continue the attempt to fit Mr. C with a total contact suction socket because he had successfully worn one in the past. Mr. C was fit with multiple test sockets with x-rays taken during the fittings, and is now a successful wearer, and has returned to his job as a policeman.

Case 2

Mr. J was referred to our facility with a prescription for a below knee prosthesis. Visual inspection (Fig. 3A) noted a well healed, non-edematous below knee amputation with a longitudinal scar along the lateral aspect of his leg. Even though there were no complaints of pain or tenderness, an x-ray (Fig. 3B) revealed two metal plates, one along the lateral aspect of the femur and one along the lateral aspect of the tibia. Several of the plate screws extended into the soft tissues in some weight bearing areas. Also, a butterfly shaped bone fragment was found to be dislodged in the medial tibial condyle area. Mr. J was initially fit with a preparatory prosthesis with gel insert and M.A.A.I.A. [multiple axis audio indicating ankle] (Fig. 4); a double layer of gel was used on the medial aspect of the socket and an M.A.A.I.A. was used to initially limit weight bearing and then

Fig. 3-A. Mr. J presents a normal-appearing below knee amputation.

Fig. 3-B. An x-ray revealed femoral and tibial plates with screws extending into weight bearing areas.

Fig. 4. Patient Mr. J was fit with a gel insert, PTB socket, multiple axis audio indicating ankle, and waist belt. The tibial plate loosened in response to weight bearing and was surgically removed.

slowly progress the patient to a full weight bearing status. This was accomplished in two weeks and, as anticipated, four weeks post fitting, the tibial plate began to loosen and was surgically removed.

The patient is now doing well using a patella tendon bearing prosthesis, gel insert, A.F.P. [adaptive fixation prosthetic] construction and SACH foot. If x-rays were not used to determine this patient's problem, a great amount of time and effort could have been wasted attempting to reduce the pain by different prosthetic modifications.

SUMMARY

An x-ray of the patients' residual limb should not be a luxury, but a necessity. Not only can fractures and plates be seen on an x-ray but also calcification of blood vessels, bony spurs, arthritic changes, osteoporosis and other potential problems. Without x-rays and other vital patient information, both physical and psychological, the prosthetist is also handicapped during the rehabilitation process of the patient.

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