

THE INFLUENCE OF THE DEEP FEMORAL ARTERY ON WOUND HEALING IN AMPUTEES

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Seventeen patients with arterial occlusive disease, of whom 14 were diabetics, were studied by angiography after amputation of the lower extremity. In one patient the angiography was normal and the stump wound healed well. In two patients the angiographic findings indicated extremely severe impairment of blood supply and wound healing was considerably delayed. Of the remaining 14 patients: in five the superficial femoral artery alone was occluded and wound healing was normal and in nine patients, both the superficial and deep femoral arteries were occluded and wound healing was delayed.

Wound healing of the stump after amputation of the lower extremity due to extensive arterial occlusive disease is decided by the patency of the deep femoral artery.

Key words: amputation; angiography; arterial occlusive disease; deep femoral artery; superficial femoral artery; wound healing

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Level of amputation and quality of wound healing are of crucial importance in the rehabilitation of patients after amputation of the lower extremity for arterial occlusive disease. Angiography is one of the tools used to determine the proper level of amputation (Baddeley & Fulford 1964). A successful amputation is considered one at "the lowest site with considerable chance of healing" (Browse 1973). It is important to determine the correlation between the angiographic findings and wound healing after amputation.

6 weeks) were also investigated for comparison. All patients gave informed consent. The age range was 60-89 years; all but one were men. Fourteen were overt diabetics.

The vessels investigated were:

1. The trunk consisting of the common iliac, external iliac and common femoral arteries.
2. Superficial femoral artery.
3. Deep femoral artery.

Occlusion was graded as: Absent or mild when narrowing was less than 50 per cent; complete or severe when narrowing was more than 50 per cent (Beales et al. 1971). Grading was performed by two of the authors without knowledge of the patients' clinical findings. Angiography was performed by Seldinger's technique (1953).

PATIENTS AND METHODS

Angiographic investigations were carried out on 11 patients with lower extremity amputation for arterial occlusive disease, in whom the wound took more than 6 weeks to heal. Six amputees with a normal rate of wound healing (within

RESULTS

Figure 1 represents a case where the whole arterial trunk of the lower limb is patent. In Figure 2 the superficial femoral artery is com-

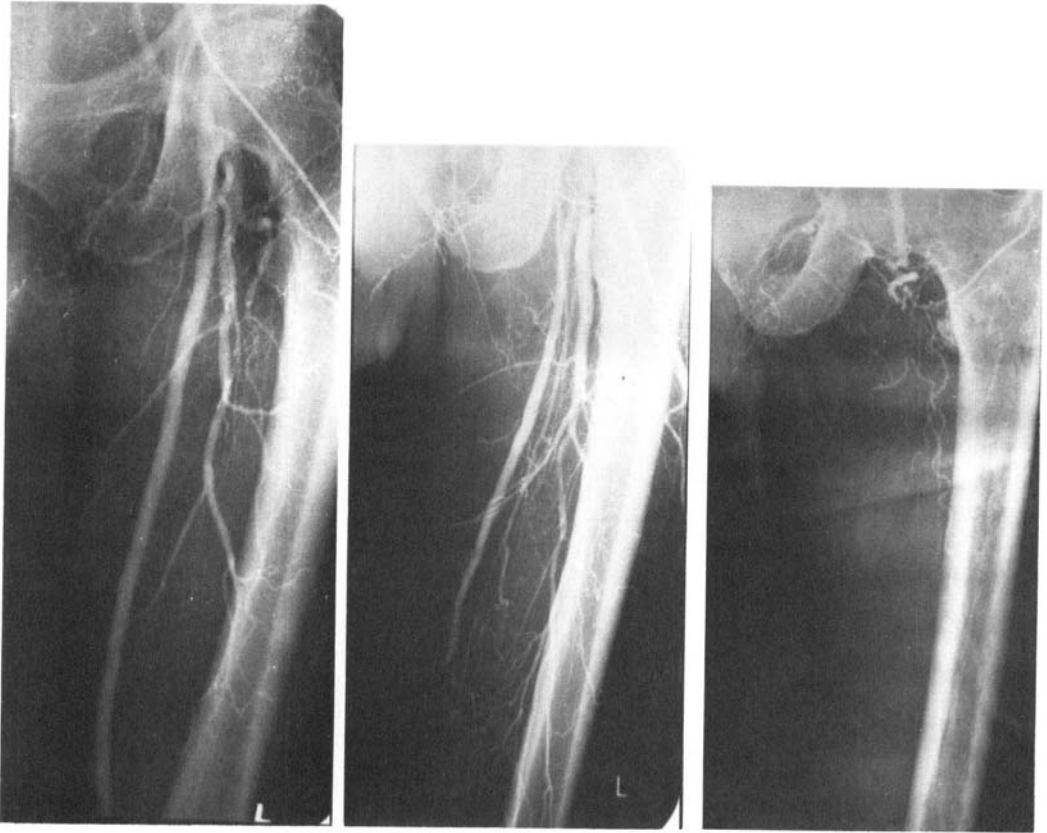


Figure 1. Arteriography showing patent superficial and deep femoral arteries. Figure 2. Arteriography showing occlusion of the superficial femoral artery and patent deep femoral artery. Figure 3. Arteriography showing occlusion of the common femoral artery. There is no filling of the superficial and deep femoral arteries.

pletely occluded. The deep femoral artery is patent and its network of collaterals can be seen. In Figure 3 the main arterial trunk of the lower extremity is completely occluded.

Table 1 presents the relation between rate of wound healing, the level of amputation and the artery occluded. In one case no occlusion was demonstrated. The reason for amputation in this case was occlusion in the arteries of the calf, and a successful below knee amputation was performed.

In two cases none of the arteries of the lower extremity could be demonstrated on angiography. This severe impairment of blood supply caused very prolonged wound healing of the stump (up to a year). In five cases the superficial femoral artery alone was

occluded, and in nine cases both the superficial and the deep femoral arteries were occluded. When only the superficial femoral artery was occluded, wound healing was normal, but when both the superficial and the deep femoral arteries were occluded, wound healing was delayed. There was no difference between the above knee and the below knee amputations.

DISCUSSION

The superficial femoral artery conducts the blood supply for the calf and foot and it is the most frequent site of occlusion in arterial occlusive disease.

Table 1. Site of arterial insufficiency, rate of wound healing and level of amputation

| Site of arterial insufficiency | No. of patients divided according to rate of wound healing and level of amputation | | | | Total |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----|--------|----|-------|
| | Delayed | | Normal | | |
| | AK | BK | AK | BK | |
| None | | | 1 | | 1 |
| Common iliac, external iliac, common femoral, superficial femoral, deep femoral | 2 | | | | 2 |
| Superficial femoral | | | 2 | 3 | 5 |
| Superficial femoral, deep femoral | 6 | 3 | | | 9 |
| Total | 8 | 3 | 2 | 4 | 17 |

The deep femoral artery arises from the lateral aspect of the common femoral artery, supplies the thigh (Martin et al. 1968) and anastomoses with branches of the popliteal and geniculate arteries (Boileau Grant 1958). It was believed that the deep femoral artery was only rarely affected in peripheral vascular disease. Lindbom (1950) found that it was occluded in 4 out of 108 angiograms performed. In later studies, narrowing at the origin of the deep femoral artery was found in up to 39 per cent (Beales et al. 1971) with a higher incidence in diabetics (30.5 per cent) than in non-diabetics (9.5 per cent) (Haimovici 1967, Tingaud et al. 1974). These findings are in agreement with those of our study and previous studies in Israel, all of which included a high proportion of diabetics (Gaspar 1968, Najenson & Levy 1972).

In the above-mentioned reports, as in the present study, occlusion of the deep femoral artery was part of an extensive arterial occlusive pattern and not an isolated lesion. Healing after amputation was delayed when both the superficial and deep femoral arteries were occluded, but it was normal when the deep femoral artery was patent.

It is our conclusion that the postoperative

patency of the deep femoral artery is a major factor in the prognosis of an amputation at any level. In the presence of superficial femoral artery occlusion, the patency of the deep femoral artery decides the outcome of a below knee amputation as it is the source of the collaterals to the calf, and by its action as an artery of supply to the thigh, it also decides the prognosis of an above knee amputation.

The role and importance of the deep femoral artery have been recognized by several surgeons (Martin et al. 1968, Okike & Bernatz 1976) who have used it for revascularization of the lower extremity when other procedures are not possible.

When an amputation wound fails to heal it is worthwhile performing an arteriography. If the superficial femoral artery is found to be occluded, the deep femoral artery should be studied with special care.

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