

The management of healing problems in the dysvascular amputee

G. HORNE and J. ABRAMOWICZ*

Amputee Unit, West Park Hospital, Toronto

**George Brown-West Park Prosthetics and Orthotics School, Toronto*

Abstract

This paper outlines the management of the dysvascular amputee. The surgical techniques and postoperative care that would prevent wound healing problems are described. The treatment of patients with established wound healing problems is discussed.

Introduction

With the introduction of new techniques and the use of more distal bypass procedures, advances in vascular surgery in the last few years have resulted in the preservation of limbs which would otherwise have been amputated because of rest pain or gangrene. However, this progress has meant that the patient with peripheral vascular disease faces amputation later in the evolution of his vascular disease than he would have done prior to these developments. Amputation at the below-knee level is still the most frequent level of primary amputation (Finch et al, 1980; Boontje, 1980) but at this level wound healing is frequently a problem (Boontje, 1980). At our Unit, we admit 150 new lower extremity amputees per year. Approximately 50% of the below-knee amputees have failure of primary wound healing, which we define as healing of the surgical incision by the fourteenth post-operative day. Wounds which break down after that are defined as having secondary wound breakdown. This paper describes our technique of management in patients with wound healing problems.

Prevention is better than cure

A number of steps can be taken to facilitate primary healing of the surgical incision. Skin flaps must be carefully marked so that when

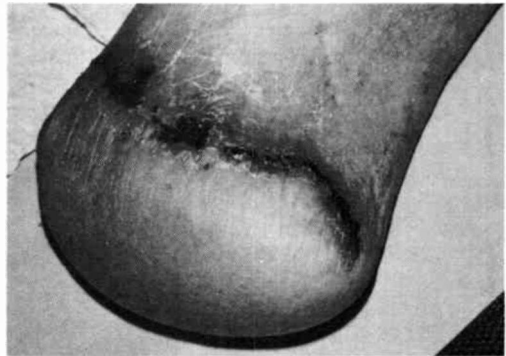


Fig. 1. Skin necrosis over the distal tibia.

wound closure is performed dog-ears are avoided and there is no undue tension on the suture line. In the case of the below-knee amputation the anterior transverse skin incision should be performed 1.5 cm proximal to the level of tibial transection to prevent the suture line lying over the exposed bone which may cause wound breakdown (Fig. 1). Subcutaneous sutures should be avoided for these only serve to devitalize the subcutaneous tissue and compromise the already tenuous circulation in the dermis. (Carpenter et al, 1977). Penrose



Fig. 2. Sinus resulting from use of Penrose drain.

All correspondence to be addressed to Dr. J. G. Horne, Department of Surgery, Wellington Clinical School of Medicine, Wellington, New Zealand.

drains should be avoided as following their removal there remains an open area in the wound which often takes several weeks to epithelialise (Fig. 2). We therefore advocate the use of a suction type drain. For skin suture, we prefer the use of the Donati (OA Manual) suture, as this minimizes trauma to the margin of the anterior flap and also permits accurate skin margin apposition.

Great care must be taken in the application of the rigid dressing. Adequate padding must be used to protect the skin flaps and at risk areas (Fig. 3 top); two amputation pads followed by an elasticized bandage are used as this can be applied with more even tension than an elasticized plaster bandage. After the application of a non-elasticized plaster bandage the posterior flap is moulded anteriorly around the distal end of the stump to minimize the tension along the wound margin.



Fig. 3. Top, pressure necrosis over fibular head. Bottom, oedema of stump end secondary to incorrect bandaging.

Positioning of the stump in the post-operative period is important as there is evidence to suggest that elevation of the stump, while reducing oedema, also reduces skin blood flow and thus potentiates healing problems. Measurement of transcutaneous oxygen levels along the margins of the anterior flap of a standard below-knee amputation, has shown that elevation of the stump above the horizontal

reduces the transcutaneous oxygen level to zero in dysvascular patients (Ewald, 1981; Carpenter, 1977). Ambulation of the patient is delayed until the first cast change at ten days has confirmed that the wound is beginning to heal satisfactorily. If the wound is found to be healthy at ten days, gentle ambulation may be commenced using a temporary prosthesis of the prosthetist's choice. However, great care is necessary in fitting a temporary prosthesis because the wound is by no means stable at this time and the slightest malalignment will cause undue pressure on the stump and subsequent breakdown. Every effort should be made to control ambulation as patients who progress too rapidly have a higher incidence of secondary wound problems.

The established problem

Despite the amputee team's best efforts many dysvascular patients still have wound healing problems. General measures that should be employed in their management include complete bed rest, adequate diabetic control and good nutrition, all of which will enhance the healing process. The wound itself may need to be debrided. This can be achieved either mechanically when there is a large area of dead tissue involved, or chemically if the area is smaller and not so deep. The aim of debridement is to remove the eschar and any underlying necrotic debris. It is important to prevent further injury to the stump and thus further embarrass skin circulation. Stump oedema must be controlled by the proper application of a stump bandage. Improper application of the stump bandage may cause distal oedema and thus compromise wound healing (Fig. 3, bottom). A posterior splint should be applied to prevent further mechanical trauma and migration of the suture line distally over the cut surface of the tibia. If this distal migration occurs then adhesions develop between the suture line and the distal tibia and when the patient is mobilized in a prosthesis further wound breakdown is likely at the site of the adhesion. The posterior splint also prevents the development of a knee flexion deformity which is likely to compromise successive prosthetic fitting.

Routine wound cultures almost always indicate the presence of bacteria. However, this only means that the wound is contaminated and there may not be frank infection (Robson and

Heggars, 1969). If the patient exhibits any sign of infection, fever, cellulitis or the drainage of pus, then, and only then, are antibiotics indicated.

Progress in wound healing can be ascertained if the wound shows a clear, pink, granulating base and has contracting margins. However, if the wound appears to be enlarging; has a persistent necrotic base or continuing drainage, then, consideration should be given to revising the stump. We generally persevere with conservative management of the wound for at least six weeks before considering revision. If revision is indicated, we have used fluorescence angiography to determine whether a local revision will be successful or whether it will be necessary to amputate at a higher level (Horne and Tanzer, in press). If the area of necrosis has a fluorescent margin indicating marginal hyperemia, then local revision is likely to be successful. However if there is no marginal hyperemia it is necessary to go to a higher level.

Conclusions

The incidence of wound healing problems in dysvascular amputees is likely to increase as vascular surgery becomes more sophisticated. The management of patients with delayed healing is time-consuming and painstaking.

However, with careful attention to detail, it is possible to obtain delayed primary healing in many of these patients.

REFERENCES

- BOONTJE, A. H. (1980). Major amputations of the lower extremity for vascular disease. *Pros. Orth. Int.*, **4**, 87-88.
- CARPENTER, N. H., GATES, D. J., WILLIAMS, H. T. (1977). Normal processes and restraints in wound healing. *Can. J. Surg.*, **20**, 314-323.
- EWALD, U., TUWEMO, T., ROTH, G. (1981). Early reduction of vascular reactivity in diabetic children detected by transcutaneous oxygen electrode. *Lancet*, **1**, 1287-1288.
- FINCH, D. R., MACDOUGAL, M., TIBBS, D. J., MORRIS, P. J. (1980). Amputation for vascular disease: the experience of a peripheral vascular unit. *Br. J. Surg.*, **67**, 233-237.
- HORNE, J. G. and TANZER, T. Fluorescence angiography in the assessment of skin viability. *J. Bone Jt. Surg. (A)* in press.
- MULLER, M. E., ALLGOWER, M., SCHNEIDER, R., WILLENEGGER, H. (1979). *Manual of internal fixation*. Techniques recommended by the AO group, 2nd. ed. Springer Verlag, Berlin, New York.
- ROBSON, M. C. and HEGGERS, J. P. (1969). Bacteria quantification of open wounds. *Milit. Med.*, **134**, 19-24.