

Excision and meshed skin grafting for leg ulcers resistant to compression therapy

S. Abisi, J. Tan and K. G. Burnand

Academic Department of Surgery, St Thomas' Hospital, Lambeth Palace Road, London SE1 7EH, UK

Correspondence to: Professor K. G. Burnand (e-mail: kevin.burnand@kcl.ac.uk)

Background: The aim of this study was to determine the success of excision and meshed skin grafting for chronic leg ulcers. The effects of different ulcer aetiology and ulcer size on outcome were also assessed.

Methods: All patients who had excision and mesh grafting for chronic leg ulceration between January 1996 and December 2004 at St Thomas' Hospital were reviewed. Recurrence was classified as any breakdown of the ulcer during follow-up.

Results: Sixty-two patients with 100 chronic leg ulcers underwent operation. Seventy-two of the ulcers were venous and the median ulcer size was 36 (range 1.5–192) cm². Only three patients left the hospital with their ulcers unhealed, but ulcers had recurred in 28 (28 per cent) by 2 months. A further 17 ulcers recurred later, with just over half (55 per cent) remaining healed by 5 years. There was no difference between the recurrence rates of venous ulcers and ulcers of other aetiologies ($P = 0.980$), or large (more than 10 cm²) and small ulcers ($P = 0.686$).

Conclusion: Wide local excision and meshed skin grafting benefitted over half of these patients with refractory leg ulcers. Recurrence was most likely to occur in the first 2 months and, provided that ulcers were healed at this time, there was a low rate of further breakdown.

Paper accepted 14 November 2006

Published online 6 December 2006 in Wiley InterScience (www.bjs.co.uk). DOI: 10.1002/bjs.5619

Introduction

Chronic leg ulceration is a common condition, which may have a prolonged course; some ulcers fail to heal despite the best available conservative management. Venous disorders are responsible for up to 70 per cent of leg ulcers, with arterial ischaemia accounting for around 20 per cent, often coexisting with venous disease (mixed ulcers)^{1,2}. Rheumatoid arthritis and diabetes mellitus can also predispose to leg ulceration; trauma, malignancy and infection are rare causes^{3,4}.

Most chronic leg ulcers respond to standard compression, but 20 per cent are resistant, especially when their cause cannot be determined, and additional treatments are often necessary^{5,6}. Venous surgery does not appear to expedite healing⁷ and skin grafting is often offered as a final option, when all other measures have failed. Various types of skin graft have been employed, including pinch grafts and split-thickness skin grafts⁵. Grafting is often combined with ulcer excision and debridement⁸.

For many years, the authors have carried out tangential excision of the ulcer to provide a well vascularized recipient

base before applying meshed skin grafts^{5,9}. There are, however, few long-term reports of its efficacy and some clinicians have even questioned its value^{8,10}. The aim of this study was to review this treatment for refractory leg ulcers in a single centre over a 9-year interval.

Patients and methods

Consecutive patients who had undergone wide local excision and mesh split-thickness skin grafting for a chronic leg ulcer of the gaiter region between January 1996 and December 2004 were identified from the department database and reviewed. All patients had had an ulcer for a least 6 months, despite compression treatment. This cohort, who failed conservative treatment, represented fewer than 5 per cent of those attending the ulcer clinic during this interval.

The ulcer aetiology was determined from the clinical findings and investigations. All patients underwent venous and arterial colour duplex imaging. Haematological and serological investigations and isotope lymphangiography

were used selectively to assist with the diagnosis. The initial ulcer size was calculated by multiplying the two maximum perpendicular diameters¹¹.

Excision and mesh grafting

A few days before surgery, patients were admitted for bed rest, leg elevation and antiseptic cleansing. Under general anaesthesia, the ulcer was widely excised back to healthy tissue using a Humby knife to provide a well vascularized and healthy base on which split-thickness skin grafts were applied (thickness 0.3 mm). These were harvested from the mid-thigh of the same leg using an air-powered dermatome (Zimmer; Warsaw, Indiana, USA), before being expanded by meshing to one and a half times their original size. Grafts were applied immediately to the ulcer base and secured with surgical staples at the wound edge (*Fig. 1*). The grafted ulcer was dressed with non-adhesive paraffin-impregnated gauze and the whole leg was then bandaged with a layer of orthopaedic wool covered by a retaining crepe bandage. The patient was nursed in bed with the leg elevated for 5 days after surgery, before being mobilized and discharged with a compression bandage consisting of a non-adherent dressing covered by orthopaedic wool, Setopress[®] and Tubigrip[®] bandages (SSL International; KnutsFord, UK). All patients with an ischaemic ulcer had a leg revascularization procedure before grafting and were prescribed low-compression bandages or elastic stockings on discharge. All patients with an ulcer were reviewed in the ulcer clinic at 2 weeks, 6 months and annually thereafter in a special healed ulcer clinic.



a Before



b After

Fig. 1 Bilateral leg ulcers **a** before and **b** after excision and mesh skin grafting

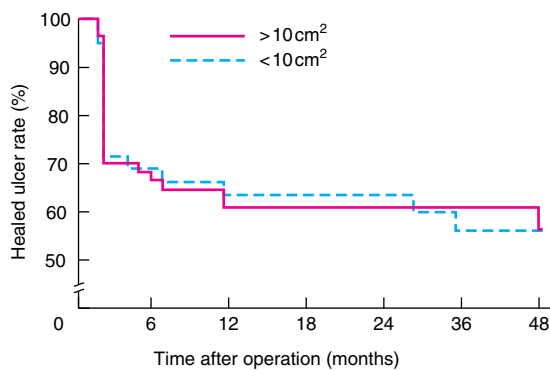
Data analysis

The outcome results were retrieved from outpatient follow-up records, except in four instances in which telephone conversations were required as the patient had moved and no longer attended the clinic. Ulcer recurrence was recorded if there was any breakdown of the skin in the same leg during follow-up. Complete healing was defined as the time when all scabs were removed to reveal intact underlying skin with no exudate.

A Kaplan–Meier life table was constructed for statistical analysis of outcome using Prism[®] software (GraphPad, San Diego, California, USA). Comparisons of recurrence rates between venous ulcers and those of other aetiologies, and between large (more than 10 cm²) and small ulcers, were made using a log rank test.

Results

One hundred procedures were carried out in 62 patients (35 women and 27 men), with a median age of 70 (range 37–90) years. Venous disease was the most common cause of leg ulceration in this series (72 ulcers). Other types of ulcer included rheumatoid ulcers (eight), ischaemic ulcers (six), lymphoedematous ulcers (four), ulcers of mixed arterial/venous aetiology (three) and a diabetic ulcer. No clear aetiology could be ascribed to six ulcers. Twenty-seven of the ulcerated legs had undergone varicose vein surgery previously; none of these limbs had any evidence of deep venous reflux on duplex imaging. Forty-five ulcerated legs had a history of a previous deep venous thrombosis or significant deep vein reflux on duplex imaging. Median



No. at risk	0	6	12	18	24	36	48
>10cm ²	61	60	54	47	42	40	33
<10cm ²	39	38	33	26	26	23	13

Fig. 2 Rate of healed ulcers after excision and mesh skin grafting for ulcers larger or smaller than 10 cm² ($P = 0.686$, log rank test)

ulcer size was 36 (range 1.5 to 192) cm²; 39 were less than 10 cm² and 61 were larger than 10 cm².

The median postoperative hospital stay was 20 (range 12–40) days. Three patients left the hospital with an unhealed ulcer and two had further skin grafting because of poor initial graft take.

Follow-up and recurrence

The median follow-up was 39 (range 2–96) months. After 2 months, 28 ulcers (28 per cent) had broken down, including those in five patients with a history of intravenous drug use who were not compliant with the dressings. Two patients were lost to follow-up and 18 died from other causes. A further 17 ulcers (17 per cent) recurred within 5 years. At this stage, just over half (55 per cent) of the original grafted ulcers remained healed.

The ulcer recurrence rate after 4 years was similar in ulcers defined as venous (42 per cent) and those with other aetiologies (45 per cent) ($P = 0.980$, log rank test). Similarly the size of the ulcer (above or below 10 cm²) did not affect the recurrence rate ($P = 0.686$) (Fig. 2).

Discussion

A consecutive series of patients whose chronic leg ulcers failed to heal with prolonged conservative management were treated by wide excision and meshed split-skin grafting. All but three were healed on discharge and more than half of these ulcers remained healed for up to 5 years. Ulcer recurrence was most likely to occur in the first 2 months after grafting, in keeping with other series^{8,12}. Most ulcers that were healed at 2 months in the study

remained healed at 5 years. There was no control group, in whom conservative management was continued, but all patients in the series had been treated previously with at least 6 months of compression bandaging. The present study also demonstrated that ulcers of various aetiologies can be healed successfully and that the breakdown rate was similar for all types of ulcer. The size of the ulcer did not affect the healing rate, again confirming the findings of others^{12,13}.

Comparison with reported series is difficult as the reported outcome measures vary significantly. In some series, partial healing and complete healing have been combined, giving an overoptimistic impression of the results^{13,14}. In other series, the rate of complete healing was not reported or even described^{12,15–17}. Some studies included other interventions, such as vein stripping¹⁵.

Trier *et al.*¹² reported a 46 per cent cumulative healing rate in a long-term follow-up of 97 ulcers, treated by three different techniques before split-skin grafting: no debridement (34), minimal debridement (11) or total ulcer excision (52). No difference was found in skin graft take achieved by these different techniques of graft bed preparation. Turczynski and Tarpila¹⁴ reported early and late ulcer breakdown in a group of 88 ulcers (51 venous) that had ulcer excision and meshed skin grafting, but the ulcer size was not detailed and a 90 per cent graft take was considered as a success. Kirsner *et al.*¹⁸ reported a 52 per cent success rate at 11 months in 36 ulcers treated by mesh skin grafting, using complete healing as the outcome measure. One small clinical trial (28 participants) compared two groups of patients: one had perforator surgery (Linton's procedure) combined with ulcer excision and mesh split-thickness skin grafting, and the other had perforator surgery and compression dressings. The healing rate (40 per cent) was similar in both groups after 1 year, although the initial ulcer size was much greater in the grafted group¹⁹.

In the present study, early recurrence was common in intravenous drug users and in patients who were non-compliant with compression and dressings after surgery. The long-term results may also be heavily dependent on compliance with elastic stockings, which also provide compression and protection from potential skin trauma that may cause further ulceration²⁰.

References

- 1 Grey JE, Harding KG, Enoch S. Venous and arterial leg ulcers. *BMJ* 2006; **332**: 347–350.
- 2 Patel GK, Grey JE, Harding KG. Uncommon causes of ulceration. *BMJ* 2006; **332**: 594–596.

- 3 Baker SR, Stacey MC, Jopp-McKay AG, Hoskin SE, Thompson PJ. Epidemiology of chronic venous ulcers. *Br J Surg* 1991; **78**: 864–867.
- 4 Callam MJ. Epidemiology of varicose veins. *Br J Surg* 1994; **81**: 167–173.
- 5 Browse NL, Burnand KG, Irvine AT, Wilson NM (eds). Venous ulceration: natural history and treatment. In *Diseases of the Veins* (2nd edn). Arnold: London, 1999; 571–603.
- 6 Jones JE, Nelson EA. Skin grafting for venous leg ulcers. *Cochrane Database Syst Rev* 2005; (1)CD001737.
- 7 Barwell JR, Davies CE, Deacon J, Harvey K, Minor J, Sassano A *et al*. Comparison of surgery and compression with compression alone in chronic venous ulceration (ESCHAR study): randomised controlled trial. *Lancet* 2004; **363**: 1854–1859.
- 8 Kirsner RS, Eaglstein WH, Kerdel FA. Split-thickness skin grafting for lower extremity ulcerations. *Dermatol Surg* 1997; **23**: 85–91.
- 9 Browse NL, Burnand KG, Thomas ML (eds). Venous ulceration: natural history and treatment. In *Diseases of the Veins: Pathology, Diagnosis and Treatment* (1st edn). Arnold: London, 1988; 411–442.
- 10 Monk BE, Sarkany I. Outcome of treatment of venous stasis ulcers. *Clin Exp Dermatol* 1982; **7**: 397–400.
- 11 Stacey MC, Burnand KG, Layer GT, Pattison M, Browse NL. Measurement of the healing of venous ulcers. *Aust N Z J Surg* 1991; **61**: 844–848.
- 12 Trier WC, Peacock EE Jr, Madden JW. Studies on the effectiveness of surgical management of chronic leg ulcers. *Plast Reconstr Surg* 1970; **45**: 20–23.
- 13 Harrison PV. Split-skin grafting of varicose leg ulcers – a survey and the importance of assessment of risk factors in predicting outcome from the procedure. *Clin Exp Dermatol* 1988; **13**: 4–6.
- 14 Turczynski R, Tarpila E. Treatment of leg ulcers with split skin grafts: early and late results. *Scand J Plast Reconstr Surg Hand Surg* 1999; **33**: 301–305.
- 15 Lofgren KA, Lauvstad WA, Bonnemaïson MF. Surgical treatment of large stasis ulcer: review of 129 cases. *Mayo Clin Proc* 1965; **40**: 560–563.
- 16 Kjaer ML, Jorgensen B, Karlsmark T, Holstein P, Simonsen L, Gottrup F. Does the pattern of venous insufficiency influence healing of venous leg ulcers after skin transplantation? *Eur J Vasc Endovasc Surg* 2003; **25**: 562–567.
- 17 Schmeller W, Roszinski S. Shave therapy for surgical treatment of persistent venous ulcer with large superficial dermatoliposclerosis. *Hautarzt* 1996; **47**: 676–681.
- 18 Kirsner RS, Mata SM, Falanga V, Kerdel FA. Split-thickness skin grafting of leg ulcers. The University of Miami Department of Dermatology's experience (1990–1993). *Dermatol Surg* 1995; **21**: 701–703.
- 19 Warburg FE, Danielsen L, Madsen SM, Raaschou HO, Munkvad S, Jensen R *et al*. Vein surgery with or without skin grafting *versus* conservative treatment for leg ulcers. A randomized prospective study. *Acta Derm Venereol* 1994; **74**: 307–309.
- 20 Erickson CA, Lanza DJ, Karp DL, Edwards JW, Seabrook OR, Cambria RA *et al*. Healing of venous ulcers in an ambulatory care program: the roles of chronic venous insufficiency and patient compliance. *J Vasc Surg* 1995; **22**: 629–636.