

Punch-grafting to Enhance Healing and to Reduce Pain in Complicated Leg and Foot Ulcers

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Sir,

Chronic, difficult-to-heal leg and foot ulcers cause suffering for patients and generate increased costs for patients and society, which can be counteracted by speeding the ulcer healing with grafting. Split-skin grafts performed in the operating theatre are often applied to large ulcers (1). Punch grafting of leg ulcers has not been studied previously, although several studies have been performed with pinch grafting (2–7). These procedures can be performed as an outpatient treatment. Accessibility for grafting can be further enhanced and waiting time decreased if nurses in the wound healing team perform the grafting themselves.

The aim of this study was to investigate the healing rates and the effect on pain in ulcers after punch grafting. We also wanted to study whether punch grafting can be performed by a nurse in the ambulatory setting using topical anaesthesia of the donor site.

MATERIALS AND METHODS

Twenty-two consecutive patients (10 men and 12 women, age range 44–90 years) with chronic (older than 6 weeks) clean, granulated leg and foot ulcers took part in the study. The mean age was 71 years (men 66 years, women 75 years). A complete medical history was taken. All the patients were examined in order to establish the ulcer diagnosis. Fourteen patients had venous ulcers, 5 had combined arterial-venous ulcers, one had a hydrostatic ulcer, one a rheumatic vasculitic ulcer and one a diabetic foot ulcer. The cleanest ulcer was chosen as the study ulcer in the 6 patients with more than one ulcer. The duration of the ulcer before grafting was between 11 weeks and 6 months for 7 patients, between 6 months and 2 years for 6 patients and more than 2 years for 9 patients (mean 1816 days). The patients themselves could choose if they wanted to be grafted as inpatients or outpatients, they were not randomized. Thirteen patients were grafted as outpatients and 9 as inpatients. Of the latter, 7 had venous ulcers. Digital images and drawings on plastic foil were made of the ulcers at the time of grafting. The ulcer area was calculated in cm² using the Visitrak instrument (Smith & Nephew, UK) and varied between 0.7 and 67.0 cm² (mean 18.0 cm²). The mean area for the 13 outpatients was smaller (10.6 cm²) compared with the 9 inpatients (30.0 cm²).

All donor sites were planned to be anaesthetized for 2 h with EMLA (Astra Zeneca AB, Södertälje, Sweden). However, 6 patients had not applied it and received local anaesthetic infiltration (lidocaine 10 mg/ml + adrenaline 5 mg/ml). Ten patients received the EMLA patch measuring 6 × 6 cm, and 5 EMLA cream and plastic foil. There was no randomization between the alternatives: the smaller donor sites were anaesthetized with the EMLA patch and the larger with EMLA cream and plastic foil. One patient was not anaesthetized as he had neuropathy. If the EMLA did not give satisfactory anaesthesia after 2 h it was supplemented by infiltration anaesthesia.

All the punch grafting was performed by one of the authors (AN) who is a registered nurse and who also performed in-

filtration anaesthesia when required (on delegation from the responsible physician). From the donor sites, skin was harvested with a 4-mm biopsy punch. The grafts were removed with scissors and tweezers and placed on sterile, saline-moistened cotton dressings. A strong light and a magnifying glass were used to put the grafts in the ulcer bed with the dermal side downwards. There was at least 4 mm of space between the grafts. Between 3 and 104 grafts were placed in each ulcer; a total of 755 grafts were taken from the 22 patients (mean 34 grafts). All grafted ulcers were dressed with paraffin gauze compresses to ensure that the grafts came into direct contact with the ulcer bed. Eight of the grafted ulcers were almost dry and, on top of the paraffin gauze, a secondary dressing of polyester-film and cotton was used to keep it moist. Fourteen ulcers were exuding heavily and were dressed with hydrofibre dressing on top of the paraffin gauze. The change of dressing varied, depending on how much the ulcers exuded. Twenty patients had compression-therapy bandages: 11 had long-stretch; 7 had short-stretch; 2 had 4-layer bandages. Two did not have any compression therapy. At the donor sites, 12 patients were dressed with polyurethane foam dressings, 9 with paraffin gauze and a secondary dressing and one patient had both alternatives. The patients were advised to remain still, with their leg in a supine position as much as possible during the first week after grafting.

Follow-ups were performed regularly for 6 months, except in 3 patients; one developed an ulcer infection after one month and 2 were grafted again after 3 months. The first control was made after one week, the other controls after one, 3 and 6 months. At these visits the ulcer area was measured and the ulcer pain was assessed with the visual analogue scale (VAS) 0–10 (no pain at zero and the worst possible pain at 10). The patients were asked about the pain in the ulcer before the grafting took place, using the VAS and to describe the pain in their own words. Over a period of one week, the patients filled in a daily pain questionnaire. At the follow-up visits the patients were asked about the pain according to VAS.

The ethics committee of the University of Göteborg approved this research project. Informed consent was obtained from the patients.

For statistics, non-parametric, unpaired Mann-Whitney *U* tests were used.

RESULTS

Six patients had infiltration anaesthesia and 15 EMLA (patch or cream and plastic foil). Ten percent (1/10) of the patients receiving the EMLA patch had to be supplemented with infiltration anaesthetics, compared with 60% (3/5) of the patients receiving EMLA cream (not significant (ns)).

All the donor sites healed in 14 days, irrespective of the dressing that was used.

Of all the 755 harvested grafts in the 22 patients, 374 had vascularized in one week (49.5%). Half of the ulcers (11/22) had healed completely in a mean of 76 days (range 30–136 days). The mean initial size of all

ulcers was 18 cm². For the 11 patients where the ulcers healed, the mean initial ulcer size was 14.8 cm² (median 12.5) and for the others, the mean initial ulcer size was larger 20.9 cm² (median 12.9).

The mean ulcer duration before grafting was 702 days (median 365 days) for the 11 patients with ulcers that healed, compared with 2929 days (median 720 days) for the 11 that did not heal (ns).

Three patients did not attend the 6-month follow-up (one because of an ulcer infection after one month, 2 patients after 3 months as they wanted re-grafts). Of the 8 remaining non-healers, 3 ulcers had almost healed (99% smaller), 3 had ulcers 0.3–53.5% smaller and 2 had ulcers 20–37.7% larger.

There was no significant difference in healing if the grafting was performed in the out- or inpatient setting; 6/13 (46%) vs. 5/9 (56%) (ns).

When analysing the pain with VAS, 4 patients had impaired sensation in the ulcer area, while another patient did not understand the VAS. Among the remaining 17 patients, mean ulcer pain was 4.2 before grafting, compared with 0.8 one week later (ns). The mean VAS value for the 10 outpatients was 3.8 before grafting and 1.1 after one week. For the 7 inpatients, the mean VAS value was 5.5 before grafting and 0.7 after one week. After one month the mean VAS was 0.7 for the 17 patients, after 3 months 0.9 (11 patients) and after 6 months 0.5 (5 patients) in the remaining non-healed ulcers.

DISCUSSION

We chose the punch-graft method (2–7), which has been used in our department for many years with good results, although no previous reports of its use in leg or foot ulcers have been reported. Punch grafting has, however, been studied in other diseases, such as in the treatment of vitiligo (8), chondrodermatitis nodularis helices (9) and acne scars (10).

Today, grafting is, as far as we know, performed by physicians. In this study, we have shown that punch-grafting can be performed by a nurse in outpatients, as well as inpatients. An advantage of outpatient care is that the grafting can be performed without delay when the ulcer is most likely to be in a suitable condition for grafting, and with decreased cost compared with inpatient grafting. The advantage of inpatient care is that it is easier to help patients rest with their legs in a supine position. Profuse ulcer exudation otherwise reduces the ability of the grafts to take. In this study, the ulcers that were grafted on inpatients were larger and more painful compared with the outpatients.

In our patients, the pain decreased after punch-grafting, which has also been shown in other studies for pinch-grafting (6). EMLA generally has a very good pain-relieving effect even on intact skin; the depth of the anaesthesia depends on how long it is allowed to



Fig. 1. Example of a venous ulcer (23 cm²) one week after transplantation. Twelve 4-mm punch grafts were harvested and placed on the ulcer bed several millimetres apart. A pink to purple colour-change in at least half of the grafts indicate vascularization (arrows). A few of the grafts have moved from their original positions, leaving an empty space in the middle of the ulcer.

work (11). We chose 2 h for practical reasons. EMLA patches are easier to apply, especially for the patients themselves, than the cream, which needs an occlusive plastic film on top. The patches come in only one size, 6 × 6 cm. EMLA cream was therefore used when anaesthetizing larger donor sites. In this study, several patients needed supplementary infiltration anaesthesia more frequently after the EMLA cream than after the patches. In spite of time-consuming instructions the EMLA was often applied incorrectly and did not give a good enough anaesthesia.

One way of following the healing is with photographs until the ulcer is completely healed. A first sign of graft healing is vascularisation, when the capillaries grow into the grafts and change the colour of the graft from white to pink and purple (Fig. 1), which may start as early as during the first 24 h.

This first study of punch grafting leg ulcers shows that half of the ulcers were healed in a mean of 2.5 months (76 days). The healing results are at least as good as the results of studies with pinch grafting, in which Ahnslide et al. (2) showed 36% healing in 3 months in 145 leg ulcers, Christiansen et al. (3) found 38% healing in 32 months in 46 patients with 412 ulcers, Tarstedt et al. (4) found 54% healing after 6 months in 143 patients with 288 ulcers, Öien et al. (6) reported that 8 of 20 patients (40%) healed in a median in 3 months, and Öien et al. (7) found that 33% healed in 3 months in 85 patients with 126 ulcers.

REFERENCES

1. 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.
2. Ahnslide I, Bjellerup M. Efficacy of pinch grafting in leg ulcers of different aetiologies. *Acta Derm Venereol* 1997; 77: 144–145.

3. Christiansen J, Ek L, Tegner E. Pinch grafting of leg ulcers. A retrospective study of 412 treated ulcers in 146 patients. *Acta Derm Venereol* 1997; 77: 471–473.
4. Tarstedt M, Falk L, Molin L. Pinch grafting in slow-healing leg ulcer. An old method becomes popular again. *Läkartidningen* 1997; 94: 2473–2476.
5. Öien RF, Hansen BU, Håkansson A. Pinch grafting of leg ulcers in primary care. *Acta Derm Venereol* 1998; 78: 438–439.
6. Öien RF, Håkansson A, Hansen BU. Leg ulcers in patients with rheumatoid arthritis – a prospective study of aetiology, wound healing and pain reduction after pinch grafting. *Rheumatology* 2001; 40: 816–820.
7. Öien RF, Håkansson A, Hansen BU, Bjellerup M. Pinch grafting of chronic leg ulcers in primary care: fourteen years' experience. *Acta Derm Venereol* 2002; 82: 275–278.
8. Lahiri K, Malakar S, Sarma N, Banerjee U. Repigmentation of vitiligo with punch grafting and narrow-band UV-B (311nm) – a prospective study. *Int J Dermatol* 2006; 45: 649–655.
9. Rajan N, Langtry JA. The punch and graft technique: a novel method of surgical treatment for chondrodermatitis nodularis helioides. *Br J Dermatol* 2007; 157: 744–747.
10. Hafner J, Salomon D. The role of surgery in the treatment of acne scars. *Rev Med Suisse* 2006; 2: 1100–1103.
11. Wahlgren CF, Quiding H. Depth of cutaneous analgesia after application of a eutectic mixture of the local anesthetics lidocaine and prilocaine (EMLA creme). *J Am Acad Dermatol* 2000; 42: 584–588.