

## CLINICAL REPORT

# Pinch Grafting of Chronic Leg Ulcers in Primary Care: Fourteen Years' Experience

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**Pinch grafting for treatment of chronic leg ulcers has been evaluated mainly in hospitalized and immobilized patients. This study describes the results of 199 pinch graft operations of 126 chronic leg and foot ulcers in 85 patients in primary care between 1987 and 2001. The aetiology of the ulcers was venous insufficiency in 43% and multi-factorial in 25% (77% with venous insufficiency as the main determinant). The mean ulcer size was 13.5 cm<sup>2</sup> and the mean ulcer duration was 15.9 months. The overall healing rate within 3 months was 33%, ranging from 19% for multi-factorial or combined venous and arterial ulcers to 48% for venous ulcers. Within 12 months the overall healing rate was 60%, with 67% healed venous ulcers. The results from our study suggest that pinch grafting is suitable for treating chronic leg ulcers, especially venous ulcers, in primary care. *Key words: skin transplantation; leg and foot ulcers; primary health care; healing rate.***

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Pinch grafting offers an alternative approach to conventional management of chronic leg and foot ulcers but the method, first described by Reverdin (1) and further developed by Davis (2), has been evaluated mainly in hospitalized and immobilized patients (3). However, pinch grafting is easy to perform and does not require strict immobilization, therefore is well suited for treating patients in primary care (4, 5). Pinch grafting has also been found to cost 3.3 to 5.9 times less when undertaken in primary care in comparison with hospital care (6).

Since 1987 we have treated leg ulcer patients in primary care with pinch grafting. The results from the first 84 operations have been presented earlier (5).

The aim of this study was to recount our experience of 14 years' pinch grafting in primary care. The results from 199 pinch graft operations of 126 ulcers in 85 patients treated at one health centre were specifically studied in order to evaluate healing rate within 3 and

12 months after surgery for ulcers of different aetiologies, sizes and duration.

## MATERIAL AND METHODS

### Patients

In the present study, we enrolled 85 consecutive patients treated at the health centre in Lyckeby between 1987 and 2001. The subjects included 59 females (69%) and 26 males (31%), with a mean age of 74 years (range 35–94), giving a total of 126 leg ulcers (Table I). In all, 199 operations were performed; 189 were done at the health centre, 4 at the district nurse's office, 4 in the patient's home and 2 in nursing homes. The approval of the Ethics Committee of the University of Lund was obtained.

Forty-six ulcers in 39 patients, 26 females (67%) and 13 males (33%), with a mean age of 72 years (range 45–87) were grafted 2 or more times, maximum 6 times. Twenty-three patients, 17 females and 6 males were treated on more than one occasion for a new or recurrent ulcer. The indications for re-grafting were a non-healing or painful ulcer.

Complete healing was the end point of the study. The patients were followed until the grafted ulcer healed, or for at least 12 months.

### Documentation of ulcer

Ulcers with a distinct ulcer area or an area with widespread but connected ulcer outlines were registered as one ulcer. Ulcers with different locations but on the same ulcerated limb and bilateral ulcers were registered as 2 cases. In the case of re-operation, healing time was observed from the first pinch graft operation. Every ulcer was registered as one case despite re-operations.

The ulcers were documented by photographs and traced on a sheet of plastic film placed on the wound. The wound tracings were then used for calculating the area of the ulcer in square centimetres by multiplying the 2 maximal perpendicular diameters.

Leg ulcer location was documented as medial or lateral, and foot ulcer location as medial, lateral or dorsal, on the sole or on the heel.

### Assessment of ulcer aetiology

The ulcer diagnosis was established taking into account the clinical findings, the results from measuring the arterial circulation and from skin biopsies. The ulcer was classified as arteriosclerotic in patients where the ankle-brachial pressure index (ABPI), measured by a hand-held ultrasound Doppler, was <0.9 (7) and where no clinical signs of oedema or history of venous insufficiency were present.

The diagnosis of venous ulcers was founded on a history of

previous deep vein thrombosis (DVT), typical clinical picture and a long history of recurrent ulcers, oedema of the leg and no signs of impaired arterial circulation. In 11 patients with insulin-dependent diabetes mellitus, the ulcers were classified as diabetic or multi-factorial with a diabetic component. For 5 patients on oral antidiabetic treatment, the ulcers were classified as venous in 4 patients, due to recurrent venous ulceration and pronounced oedema. In one patient the ulcer was classified as arterial with arterial surgery performed on both legs. Assessment of diabetic ulcers followed the routines for primary care patients during the study period, therefore no laboratory tests were performed. Vasculitis was assessed by skin biopsy, taken from the edge of the ulcer (8).

### Operation technique

One technique of skin transplantation was described by Reverdin (1) and further clarified and illustrated by Davis (2). This method, "the pinch graft technique", was recapitulated in a recent study (5). Preoperatively, dressings were changed usually once a day for one week, the condition of the ulcer being the main determinant for the frequency of dressing changes. After applying superficial anaesthetic to the donor site, usually the front of the thigh, small full-thickness grafts were transplanted on to the ulcer. The grafts were placed a few millimetres apart and covered with a silicone net and slightly saline-moistened gauze. Apart from the first week, postoperatively, with daily dressing changes, the wound was treated according to normal dressing principles, thus avoiding dryness. For patients with venous insufficiency a short stretch bandage was applied as well. The patients were not immobilized postoperatively.

### Statistics

Differences between groups (healing rate within 3 and 12 months for ulcers of sizes <median and ≥median and for ulcers of duration <median and ≥median) were calculated using the  $\chi^2$  test (two-tailed).

## RESULTS

The main features of 126 chronic leg and foot ulcers in 85 patients treated with pinch grafting in primary care during the years 1987 to 2001 are summarized in Table I. The aetiology was venous insufficiency in 43% ( $n = 54$ ) of the ulcers. Ulcers with a combined venous and arterial aetiology constituted 17% ( $n = 21$ ) and for ulcers with a multi-factorial aetiology, 25% ( $n = 31$ ), venous insufficiency was the main cause in the majority of ulcers, 77% ( $n = 24$ ). In 34% of the cases ( $n = 43$ ) the ulcer was provoked by a trauma.

Almost one-quarter of the ulcers were bilateral (24%,  $n = 30$ ). Ulcer location showed that 87% ( $n = 109$ ) of the ulcers were located on the leg, and 13% ( $n = 17$ ) on the foot. Approximately half of the ulcers were located medially; 50% for leg ulcers ( $n = 54$ ) and 47% for foot ulcers ( $n = 8$ ).

Diabetic ulcers ( $n = 9$ ) and multi-factorial ulcers with a diabetic component ( $n = 14$ ) were found in 43% of foot ulcers, of which 60% ( $n = 6$ ) were located medially on the foot.

The mean duration of the pinch-grafted ulcer was

Table I. Ulcer aetiology and healing within 3 months and 12 months after pinch grafting of 126 leg ulcers in primary care

| Ulcer aetiology | Ulcers healed within 3 months |                   |                          |                                         | Ulcers healed within 12 months                |                          |                                                      |                                                            |                                                    |
|-----------------|-------------------------------|-------------------|--------------------------|-----------------------------------------|-----------------------------------------------|--------------------------|------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------|
|                 | No. (%) of patients           | No. (%) of ulcers | No. (%) of healed ulcers | Mean duration (range) of ulcer (months) | Mean size (range) of ulcer (cm <sup>2</sup> ) | No. (%) of healed ulcers | Mean duration (range) of ulcer (months) <sup>a</sup> | Mean size (range) of ulcer (cm <sup>2</sup> ) <sup>a</sup> | Mean healing time (range) of healed ulcers (weeks) |
| Venous          | 38 (45)                       | 54 (43)           | 26 (48)                  | 8.4 (1–48)                              | 7.3 (0.4–35.0)                                | 36 (67)                  | 9.3 (1–48)                                           | 6.8 (0.4–35.0)                                             | 15.7 (3–46)                                        |
| Venous-arterial | 16 (19)                       | 21 (17)           | 4 (19)                   | 14.3 (4–36)                             | 10.9 (0.1–41.3)                               | 7 (33)                   | 12.4 (4–36)                                          | 16.1 (0.1–53.3)                                            | 19.3 (6–41)                                        |
| Multifactorial  | 19 (22)                       | 31 (25)           | 6 (19)                   | 6.2 (3–12)                              | 30.2 (0.1–165.6)                              | 21 (68)                  | 8.7 (3–36)                                           | 13.2 (0.1–165.6)                                           | 24.2 (3–48)                                        |
| Arterial        | 5 (6)                         | 6 (5)             | 2 (33)                   | 3.5 (3.5–3.5)                           | 0.85 (0.8–0.9)                                | 4 (67)                   | 23.3 (2–84)                                          | 24.4 (0.8–93.6)                                            | 21.0 (13–34)                                       |
| Diabetic        | 3 (4)                         | 9 (7)             | 2 (22)                   | 2 (2–2)                                 | 4.6 (4.6–4.6)                                 | 5 (56)                   | 9.0 (2–20)                                           | 4.3 (0.5–7.6)                                              | 13.6 (5–25)                                        |
| Traumatic       | 2 (2)                         | 2 (1)             | 1 (50)                   | 1.0                                     | 5.1                                           | 2 (100)                  | 1.5 (1–2)                                            | 8.7 (5.1–12.3)                                             | 15.5 (8–23)                                        |
| Vasculitic      | 1 (1)                         | 2 (1)             | 1 (50)                   | 42                                      | 1.2                                           | 1 (50)                   | 42                                                   | 1.2                                                        | 13                                                 |
| Pressure sore   | 1 (1)                         | 1 (1)             | 0                        |                                         |                                               | 0                        |                                                      |                                                            |                                                    |
| Total           | 85 (100)                      | 126 (100)         | 42 (33%)                 | 8.7 (1–48)                              | 10.3 (0.1–165.6)                              | 76 (60%)                 | 10.4 (1–84)                                          | 10.2 (0.1–165.6)                                           | 18.5 (3–48)                                        |

<sup>a</sup> Information on ulcer duration for and size 2 ulcers not available ( $n = 124$ ).

15.9 months (median 7.0 months) and the mean size was  $13.5 \text{ cm}^2$  (median  $4.6 \text{ cm}^2$ ). The number of grafts applied ranged from 1 to 80, with a mean of 16 grafts.

Of the 39 re-grafted patients, 24 patients (61%) underwent one re-operation for an ulcer mainly located on the leg (20/24) and predominantly with a venous (9/24) or multi-factorial (9/24) aetiology. An additional 10 patients were re-grafted twice for an ulcer also mainly located on the leg (7/10), where venous-arterial aetiology constituted the single largest group ( $n=3$ ).

A small proportion, 13%, of the re-grafted patients (5/39), had 3 or more re-operations. The characteristics for these 5 patients were underlying serious disease such as severe arteriosclerosis, diabetes or long-standing rheumatoid arthritis (RA). For three patients the ulcer was located on the foot.

Complete healing within 3 months was found in 42 ulcers (33%) with a mean healing time of 9.8 weeks (median 11.0 weeks) (Table I). For patients with venous ulcers, healing rate was 48% ( $n=26$ ) compared with 19% for ulcers with a combined venous and arterial aetiology ( $n=4$ ) and 19% for ulcers with a multi-factorial aetiology ( $n=6$ ). The mean age of patients whose ulcers healed within 3 months was 73 years (median 76 years), the mean duration of the pinch-grafted ulcer was 8.7 months (median 4.0 months) and the mean size of the ulcer was  $10.3 \text{ cm}^2$  (median  $2.6 \text{ cm}^2$ ).

The overall healing within 12 months was 60% ( $n=76$ ), with a mean healing time of 18.5 weeks (range 3–48 weeks). For patients with multi-factorial ulcers, healing rate was 68% ( $n=21$ ) and 67% for venous ulcers ( $n=36$ ). For ulcers with a combined venous and arterial aetiology, healing rate was 33% ( $n=7$ ). The mean age of patients with ulcers that healed within 12 months was 73 years (median 73 years), the mean duration of the pinch-grafted ulcer was 10.4 months (median 5.0 months) and the mean size of the ulcer was  $10.2 \text{ cm}^2$  (median  $3.5 \text{ cm}^2$ ).

One patient with an ulcer that healed within 12 months had venous surgery postoperatively and one patient had arterial surgery. Postoperatively, 67% of the patients ( $n=57$ ) were treated with compression therapy and 25% ( $n=21$ ) with long-term antibiotics, perorally.

Healing rate and ulcer size are documented in Table II for 118 ulcers with a median size of  $4.6 \text{ cm}^2$ . There was a higher healing rate for smaller ulcers within both 3 and 12 months ( $p=0.039$  and  $p=0.032$ , respectively).

Healing rate and ulcer duration in 121 ulcers with a median duration of 7.0 months is reported in Table II. There was a higher healing rate for ulcers with shorter ulcer duration within both 3 and 12 months ( $p=0.001$  and  $p=0.003$ , respectively).

## DISCUSSION

Using pinch grafting in the treatment of chronic leg ulcers in primary care, we found an overall healing rate

of 33% within 3 months and 60% within 12 months. These figures tally with those from hospital care; 36% within 3 months (9) and 38% within 6 months (10).

For venous ulcers (54 ulcers, 43% of all ulcers), we found a healing rate of 48% within 3 months and 67% within 12 months, compared with 22% within 3 months (9) and 38% within 6 months in hospital care (10). Our higher healing rate could be explained by the shorter ulcer duration in primary care (median 5.0 months) compared with that in hospital care (median 17.0 months) (9). Another explanation could be the different definitions of arteriosclerosis (ABPI  $<0.9$  in primary care and ABPI  $<0.7$  in hospital care) (10), which means that we assigned more ulcers to the group with combined venous and arterial aetiology.

Healing of venous leg ulcers using compression therapy has been thoroughly investigated, with healing rates within 3 months from 20 to 30% when treated by district nurses (11) to 69% in community leg ulcer clinics (12). Before pinch grafting, our venous ulcers were all treated with adequate compression, mostly for a period much longer than 3 months.

We found that 25% of the ulcers had a multi-factorial aetiology, the majority with evidence of venous insufficiency, findings that agree with an earlier study, where a multi-factorial aetiology was noted in 33% of cases (13). After 3 months, 19% of the 31 ulcers in this group were healed, and after 12 months, the healing rate was 68%.

It is generally known that foot ulcers as well as leg ulcers in patients with RA or diabetes are difficult to treat (14). We found a high frequency of re-grafting of mainly foot ulcers in 5 patients with severe generalized disease such as diabetes, RA or pronounced arteriosclerosis. Consequently, attention should be paid to treatment of the simultaneously underlying disease whether venous or arterial insufficiency, chronic inflammatory disease or diabetes.

Size is known to be a predictor of ulcer healing (15). We found that ulcers smaller than  $4.6 \text{ cm}^2$  healed better than larger ulcers, within both 3 and 12 months. Good ulcer healing after pinch grafting has been noted in ulcers smaller than  $10 \text{ cm}^2$  (16), but the opposite has also been noted, with the best results for the largest ( $>5 \text{ cm}^2$ ) ulcers (17). Previously, we have found pinch grafting of leg ulcers in patients with RA to be successful only for ulcers smaller than  $15 \text{ cm}^2$  (18).

Another predictor of ulcer healing is duration, with poor healing being found for older ulcers (15). We found that ulcers of less than 7.0 months' duration healed better than older ulcers, within both 3 and 12 months.

Neither cost effectiveness of pinch grafting, nor pain reduction postoperatively was considered in the present study. In an earlier comparison between primary and hospital care of pinch grafting of venous leg ulcers, with

Table II. Ulcer size in 118 ulcers and ulcer duration in 121 ulcers healed within 3 months and 12 months after pinch grafting in primary care\*

|                          | No. of healed ulcers (median size 4.6 cm <sup>2</sup> ) |                    |          |          | No. of healed ulcers (mean duration 7 months) |                        |          |          |
|--------------------------|---------------------------------------------------------|--------------------|----------|----------|-----------------------------------------------|------------------------|----------|----------|
|                          | With size < median                                      | With size ≥ median | $\chi^2$ | <i>p</i> | With duration < median                        | With duration ≥ median | $\chi^2$ | <i>p</i> |
| Healing within 3 months  | 26/58                                                   | 16/60              | 4.24     | 0.039    | 29/59                                         | 13/62                  | 10.60    | 0.001    |
| Healing within 12 months | 42/58                                                   | 32/60              | 4.59     | 0.032    | 44/59                                         | 30/62                  | 8.73     | 0.003    |

\*Information on ulcer size for 8 ulcers and ulcer duration for 5 ulcers not available.

the same healing outcome, we have shown that treatment costs for patients in primary care are 3.3 to 5.9 times less than those for patients in hospital care (6). We have also demonstrated a significant pain reduction after pinch grafting of chronic leg ulcers in patients with RA (18).

It has also been clearly shown that healing of a chronic ulcer has a positive emotional impact on the patient's quality of life, with a reduction of pain, fear and anger (12), and that older patients prefer treatment on an outpatient basis (19).

The strength of our study is that it is population based, including all patients treated with pinch grafting at one health centre during a 14-year period. The operations were carried out by the same general practitioner in everyday clinical practice, and the patients were followed until the grafted ulcer had healed, or at least for 12 months. The main weakness is that the study is open, and lacks a control group treated with compression only. Although the study covered a period of 14 years, there were few ulcers in most aetiological groups. However, healing rates showed that almost half of the ulcers of venous aetiology were healed after 3 months, and two-thirds after 12 months, thus comparable with those from hospital care.

In conclusion, we found pinch grafting of chronic leg ulcers, particularly venous ulcers, to be a technique that is well suited for primary care.

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