

Punch grafting for pain reduction in hard-to-heal ulcers

Objective: Punch-grafting is a traditional technique to enhance wound healing, which has been associated with significant pain reduction. There are few studies measuring pain reduction after punch grafting, our study was designed to measure this outcome.

Method: Patients with hard-to-heal wounds treated with punch grafting were included in a single centre prospective study. Wound pain intensity was measured using a Visual Analogue Scale (VAS) at baseline (before the procedure) and at three time points after the procedure. Punch grafting was performed in an outpatient setting. Patient demographic data, wound aetiology and percentage of graft take were recorded.

Results: A total of 136 patients were included (62 men and 74 women). Mean age was 60±35 years and 51 (38%) had venous leg

ulcers (VLU), 29 (21%) had postoperative wounds, 15 (11%) Martorell ulcers, 15 (11%) traumatic wounds, four (3%) arterial ulcers and 22 (16%) 'other' ulcers. Of the patients, 38 (28%) did not present with painful ulcers and, after punch grafting, all of them remained painless; 29 (21%) patients obtained >70% pain reduction, whereas 73 (54%) patients achieved pain suppression. Pain suppression did not depend on the percentage of graft take.

Conclusion: Punch-grafting is a simple, technique that not only promotes wound healing but also reduces pain. It can also be performed on an outpatient basis. Further studies should be performed to achieve a better understanding of this beneficial finding.

Declaration of interest: The authors have no conflicts of interest to declare.

hard-to-heal ulcer • pain • punch grafting • skin grafting

Pain control in patients with hard-to-heal wounds is a challenge for clinicians. Pain intensity may depend on the wound aetiology and is mainly associated with arterial and Martorell leg ulcers. However, venous leg ulcers (VLU) and other types of wounds can also be painful and have a high impact on a patient's quality of life (QoL).¹

Punch-grafting is a traditional technique to enhance wound healing, and has been associated with significant pain reduction.²⁻⁴ Punch grafting is a method of obtaining thin split-thickness skin grafts (STSG) containing epidermis and papillary dermis. STSG are obtained under a local anaesthetic with a punch, curette or surgical blade and are placed directly on the wound bed. The donor site is normally the thigh, which heals by secondary intention. The procedure can be performed in an outpatient setting.^{2,3}

Even if the wound bed does not present with perfect conditions for grafting, punch grafts that do not successfully adhere still release growth factors and cells that promote wound re-epithelialisation and reduce pain.^{3,4} Local pressure and immobilisation during the first 3-4 days after the punch graft procedure are

essential for graft taking. The first dressing change should take place 5-7 days after the surgical procedure. During subsequent dressing changes it is necessary to avoid excessive cleansing in order not to alter the healing environment.³

Pain reduction after punch-grafting is a phenomenon that we observe daily in our clinical practice. Although this outcome has been rarely analysed in clinical studies, two previous studies^{2,4} have demonstrated this finding. As pain substantially impairs the QoL of patients with hard-to-heal wounds, we have designed a study to measure this outcome.

Methods

Patients with hard-to-heal wounds treated with punch grafting were included in a prospective, non-interventional, single-centre study, from April 2016 to June 2018. Punch grafting was performed in an outpatient setting. Grafted ulcers were covered with an interface and secondary dressing depending on wound exudate. Frequency of dressing changes ranged from 5-7 days. Fig 1 shows the technique used in the clinics, using a Martorell ulcer as an example. Treatment for the underlying cause of the ulcer continued to be applied in all patients, such as compression therapy for VLUs.

Inclusion criteria were patients with one or more ulcers of any aetiology to be grafted using punch grafts. Patients with painless ulcers were also included so to act as a control against which we could compare whether punch-grafting increases pain in the wound. In our clinical practice, we have confirmed that, even if the wound bed does not present with perfect conditions for grafting, punch grafts that do not succeed in adhering

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to the wound bed do release growth factors and cells that promote wound re-epithelialisation and reduce pain.³ This response is especially beneficial in Martorell ulcers and other post-traumatic wounds, particularly in the context of arteriopathy, which are really painful and spread very quickly. The angiogenic effect of skin grafts counteracts the ischaemic and pro-inflammatory environment in these wound beds, which is an essential promoter of wound healing and a constraining factor for skin necrosis.³

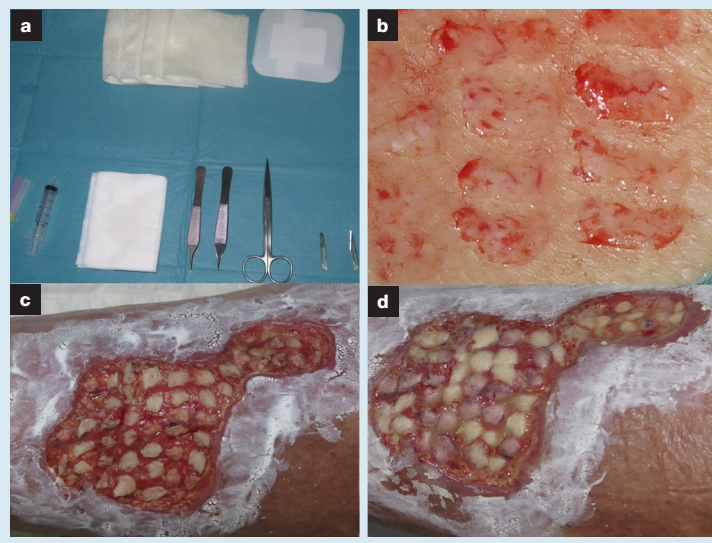
The primary outcome was pain reduction after the punch graft. Wound pain intensity was measured using a Visual Analogue Scale (VAS) at baseline (before the procedure, t0) and at three more time points (weekly follow-ups for three weeks, visits t1, t2, t3). We have used the term 'stagnated patients' to refer to those patients who presented without previous pain and continued without pain during the treatment. Patients who achieved total pain reduction (final pain VAS=0) were included in the 'suppression' group. Those who reported the continued presence of pain (final pain VAS >0) were included in the 'reduction' group. Pain reduction was measured by calculating the difference between initial VAS score and final VAS score.

Patient demographic data and the clinical wound characteristics (aetiology, duration and location) were recorded. The association between the percentage of graft take and pain reduction was also measured.

Statistical analysis

For statistical analysis, the qualitative variables (aetiology and location) are described as a percentage, and the quantitative variables (pain score, reduction in pain) by the mean with standard deviation (SD). Pearson correlation coefficient and Wilcoxon signed-rank test were used. Values of <0.05 were considered statistically significant.

Fig 1. Material used for the procedure (surgical bladder, surgical tweezers, gauze and alginate) (a). Point bleeding at the donor site (b). Punch grafts on the wound (c). Wound aspect at the first follow-up visit (seven days after the procedure) (d)



Ethical approval

The local ethics committee approved this research project. The project followed the guidelines of the Declaration of Helsinki. Written, informed consent including for the use of photographs, was obtained from the patients.

Results

A total of 136 patients were included in the study (62 men and 74 women) with a mean age of 60±35 years. Of these, 91 (67%) were > 65-years-old. Wounds of several aetiologies were included (Fig 2). VLU were the most frequent wounds (n=51; 38%). Patients also presented with postoperative wounds (n=29; 21%),

Table 1. Evaluation of basal pain intensity, depending on ulcer aetiology

Previous pain intensity	Venous, n (%)	Postoperative, n (%)	Martorell, n (%)	Traumatic, n (%)	Arterial, n (%)	Other, n (%)
10	6 (11.8)	1 (3.4)	7 (46.7)	4 (26.7)	3 (75.0)	4 (18.2)
9	1 (2.0)	1 (3.4)	0	0	0	0
8	8 (15.7)	3 (10.3)	3 (20.0)	1 (6.7)	0	2 (9.1)
7	7 (13.7)	0	0	2 (13.3)	0	1 (4.5)
6	4 (7.8)	2 (6.9)	4 (26.7)	0	1 (25.0)	1 (4.5)
5	3 (5.9)	2 (6.9)	1 (6.7)	0	0	2 (9.1)
4	4 (7.8)	3 (10.3)	0	2 (13.3)	0	2 (9.1)
3	6 (11.8)	2 (6.9)	0	1 (6.7)	0	2 (9.1)
2	1 (2.0)	3 (10.3)	0	1 (6.7)	0	2 (9.1)
1	1 (2.0)	0	0	1 (6.7)	0	0
0	10 (19.6)	12 (41.4)	0	3 (20.0)	0	6 (27.3)

Fig 2. Distribution of hard-to-heal wounds according to aetiology and gender

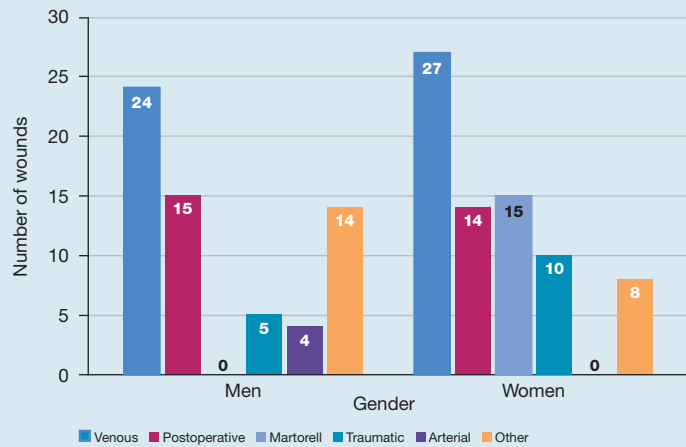


Table 3. Pain suppression after punch graft at follow-up visits

Aetiology (n)	Visit t1	Visit t2	Visit t3	Total (n)
Venous	21	5	8	34
Postoperative	13	3	1	17
Martorell	5	1	4	10
Traumatic	8	1	1	10
Arterial	2	0	0	2
Other	8	2	3	13
Total	57	12	17	86

Table 4. Percentage of pain reduction in those patients (n=22) who did not achieve pain suppression

Aetiology (n)	Percentage pain reduction			Total
	10–39 (n)	40–69 (n)	70–99 (n)	
Venous	1	0	6	7
Postoperative	0	0	0	0
Martorell	0	1	4	5
Traumatic	0	0	2	2
Arterial	0	0	2	2
Other	4	0	2	6

Table 2. Pain stagnation, reduction or suppression, according to ulcer aetiology -

Change in pain intensity	Venous (n)	Postoperative (n)	Martorell (n)	Traumatic (n)	Arterial (n)	Other (n)
Stagnation	10	12	0	3	0	13
Reduction	7	0	5	2	2	6
Suppression	34	17	10	10	2	3

Martorell ulcers (n=15; 11%), traumatic wounds (n=15; 11%), arterial ulcers (n=4; 3%); pressure ulcers, burns and ‘other’ wounds, such as, post-vasculitic ulcers, hydroxyurea ulcers and inactive pyoderma gangrenosum (n=22, 16%).

Patients with ischaemic hypertensive Martorell ulcers and arterial ulcers presented with the most severe pain before the punch graft procedure, VAS pain level of 10 in 47% (n=7) and 75% (n=3), respectively. Just over half of patients with VLUs 51% (n=26) presented with VAS pain score >5 (Table 1).

There was a statistically and clinically significant reduction in pain after punch-grafting (p<0.05). Patients that did not present with painful wounds (VAS=0) maintained this painless situation after the procedure (n=38), Table 2.

For those patients that achieved pain suppression, as Table 3 shows, this was mainly achieved before the first follow-up visit (t1, one week after the procedure).

Except for six patients, the rest of those patients who did not achieve complete pain suppression at the third follow up visit (n=16) obtained >70% of pain reduction. (Table 4). Pain reduction/suppression was maintained over the three follow-up visits, and did not depend on wound characteristics or percentage of graft take (p<0.05) (Fig 3).

Discussion

The results of this prospective study confirm that, in addition to promoting wound re-epithelialisation, punch grafting may control pain in any type of wound.

Punch grafting has been typically used for VLU and Martorell ulcer re-epithelialisation. However, as we have seen in this study, the procedure can be used for wounds of other aetiologies such as arterial, postoperative, traumatic and atypical wounds (post-vasculitis or inactive pyoderma gangrenosum). Martorell hypertensive ischaemic leg ulcer is a well-known painful ulcer with rapidly necrotic progression. Due to the angiogenic effect of skin grafts, early grafting may stop necrosis, alleviate pain and promote re-epithelialisation.^{5,6}

Even if VLUs have not been traditionally considered as painful wounds, in this study half of patients with VLUs reported a VAS pain score of >5 at baseline. At the time of the first follow-up visit, two thirds of VLU patients had achieved complete pain suppression. These findings demonstrate that punch grafting promotes early pain control.

The results of this study are in line with two studies that have also measured pain reduction after punch grafting.^{2,4} In comparison with these previous studies, we present a larger number of included patients and a wider spectrum of aetiologies. We have also included patients with painless wounds to confirm that punch grafting does not increase pain.

Fourgeaud et al. included 41 patients, with a mean age of 73 years, with mainly venous, arterial and Martorell ulcers.⁴ Pain was assessed by a numeric pain rating scale before, the day after and at hospital discharge. This study was carried out in an inpatient setting. In most patients, pain (persistent and pain peaks) showed a significant improvement from day one after the punch grafting procedure (>75%) and pain control increased to >90% on the last day of the patient's hospital stay. As in our case series, these authors found that VLU's can be painful. The authors also reported reduction in the use of strong opioids after the procedure.

We recorded pain intensity at baseline (before the procedure) and at three more time points. The first follow-up visit normally took place 5–7 days after the procedure. Even though pain intensity was registered one week after punch grafting, patients reported that pain reduction had started soon after the procedure, even on the same day.

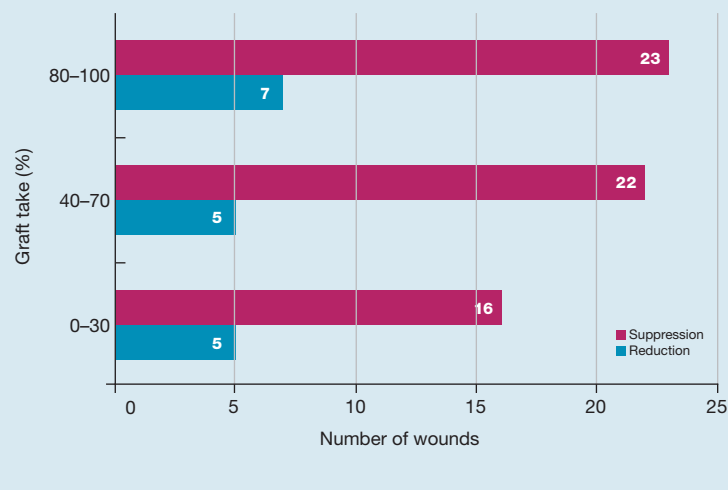
Nordström et al.² presented a series of 22 patients with clean and granulated foot and leg ulcers treated with punch grafts. When analysing the pain with VAS, mean pain intensity was 4.2 before grafting, compared with 0.8 one week later.

In contrast to other studies, some of the wounds included in our study presented with suboptimal wound bed features. As we have previously published,³ even if the wound bed does not present with the perfect tissue for receiving skin grafts (for example, if it is covered with some slough), the wound will benefit from punch grafting.³ Considering that studies with hair follicle-containing punch grafts also show pain reduction, it could be suggested that this effect may be obtained by any intervention that enhances revascularisation and reinnervation in the wound bed.⁷

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Fig 3. Association of pain reduction/suppression and percentage of graft taking



Limitations

Our study has several limitations, such as use of a general VAS measure that does not differentiate peak pain from persistent pain. Moreover, analgesic treatment was not recorded so the dosing reduction of these drugs in association with the punch grafting could not be analysed. Pain VAS in the donor site was not measured. It should also be highlighted that this is not a comparative study, which is an important limitation.

Conclusions

Punch grafting is a simple technique that can be performed on an outpatient basis, which not only promotes wound healing but may also reduce pain. Even if the wound does not present with perfect wound bed characteristics for graft taking, punch grafting may control pain and stimulate re-epithelialisation. Considering the positive results of this series, and those of the two previously published studies,^{2,4} further randomised controlled trials should be conducted to support these findings. **JWC**

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Reflective questions

- What are the barriers that prevents the punch graft technique from spreading among professionals in wound care?
- What is the exact mechanism by which punch grafts, regardless of punch take, reduce pain?