

# Early and Sequential Punch Grafting in the Spectrum of Arteriopathy Ulcers in the Elderly

Elena Conde-Montero, PhD, MD<sup>1</sup>; Laura Pérez Jerónimo, RN; Alicia Peral Vázquez, RN<sup>2</sup>; Lorena Recarte Marín, RN<sup>2</sup>; Pablo Ernesto Sanabria Villarparando, MD<sup>3</sup>; and Pablo de la Cueva Dobao, PhD, MD<sup>1</sup>

## ABSTRACT

**Introduction.** Posttraumatic ulcers secondary to age-related arteriosclerosis may be included in the clinic-histopathological spectrum of the Martorell hypertensive ischemic ulcer. Histologically, they both present occlusive subcutaneous arteriosclerosis. Considering these similarities, they could benefit from the same treatment. **Case Report.** The authors present an 84-year-old white female who had a painful 9-cm x 4-cm ulcer of the central inner aspect of her left leg. The ulcer had developed 2 months prior after mild trauma, with good response to early and sequential punch grafting, combined with single-use negative pressure wound therapy and compression therapy. Pain reduction was obtained from the first punch grafting session. To achieve complete epithelialization 16 weeks after the first punch grafting procedure, 2 more sessions were necessary. **Conclusions.** Early punch grafting is an effective technique for pain control and healing promotion in Martorell ulcers. Punch grafting, which may be performed in an outpatient setting, is well tolerated by patients and may be repeated several times if necessary.

## KEY WORDS

Martorell ulcer, pain, punch grafting, arteriosclerosis, posttraumatic

## INDEX

*Wounds* 2020;32(8):E38–E41.

Secondary to mild trauma, large wounds in the elderly are a frequent reason for consultation. If the elderly hit their legs on household items (eg, furniture or open dishwasher door), they are susceptible to injuries, including wounds. Normally, these wounds have an insignificant clinical aspect at first and progressively acquire a purplish or blackish color and, in a few days, become extensive, deep, and painful wounds. In addition to age, these patients often have comorbidities such as hypertension or diabetes.

This clinical description is similar to Martorell hypertensive ischemic ulcer. In fact, some of these posttraumatic lesions may be considered Martorell ulcers, because they have characteristics traditionally associated with this entity (typical lateral and posterior location on the leg, bilaterality, hypertension, or diabetes mellitus).<sup>1</sup> The

rest of the wounds that do not meet the criteria included in the traditional Martorell definition could be called *posttraumatic ulcers due to age-associated arteriopathy*. Skin biopsy does not assist in differentiating them because, histopathologically, both types of wounds present occlusive subcutaneous arteriosclerosis. The results of a retrospective study comparing leg biopsy findings of patients with and without Martorell ulcers concluded that arteriosclerosis, which is present in both groups, was associated with age.<sup>1</sup> Consequently, biopsy of these ulcers is only needed when other entities are suspected, such as pyoderma gangrenosum or vasculitis.<sup>1</sup>

Punch grafting is a traditional method to obtain thin split-thickness skin grafts containing epidermis and papillary dermis. Grafts are obtained under a local anesthetic with a punch, curette, or sur-

gical 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.<sup>2-6</sup>

Early punch grafting is considered the first-line treatment for Martorell leg ulcers in France, mainly for its benefit in pain reduction and limitation of wound progression.<sup>4</sup> Even if the conditions for grafting are not ideal, the punch graft releases growth factors and cells that promote epithelialization and pain reduction.<sup>2,5,6</sup> In these cases, clinicians have to perform several sessions of punch grafting to obtain complete epithelialization, which has been well-tolerated by the patient.<sup>2,6</sup>

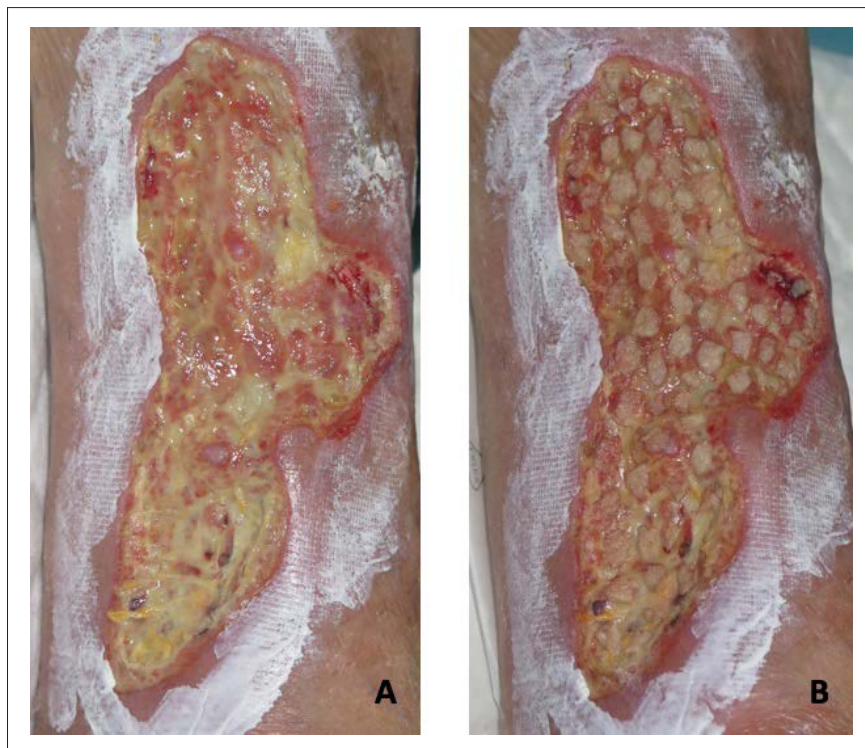
Several studies support the interest of this technique in this wound type.<sup>2,4-6</sup> However, thus far, to the authors' knowledge, no case reports have been published regarding

punch grafting in posttraumatic leg wounds in the elderly. The case of an elderly female with a posttraumatic ulcer that was successfully managed with sequential punch grafting is presented herein.

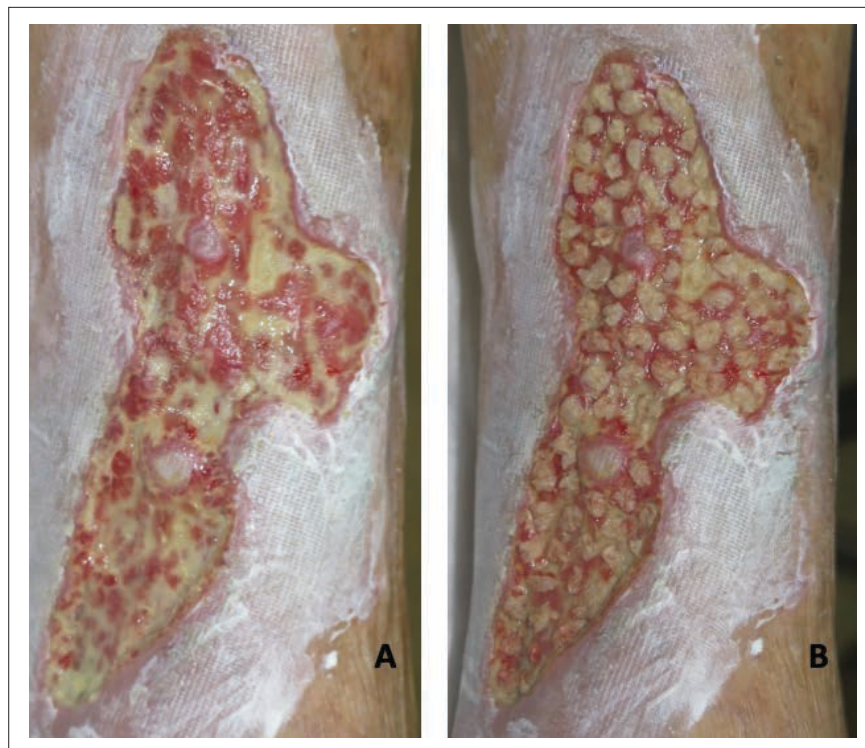
### CASE REPORT

An 84-year-old white female presented with a painful 9-cm x 4-cm ulcer on the central inner aspect of her left leg (**Figure 1**). The ulcer had developed 2 months prior after mild trauma, and despite antibiotic therapy and conventional local wound care, there were continuous progression and pain. The wound edges were well-defined, and red granulation tissue and slough were present in the wound bed. The patient had a history of well-controlled hypertension, chronic cardiac insufficiency, and chronic venous insufficiency. Distal pulses were palpable, and the ankle-brachial index was normal. Hematologic and rheumatologic workup did not show relevant findings. Pain control was poor despite taking prescribed opioids, with a score of 8 out of 10 on the Visual Analog Score (VAS) for pain. Irrigation of sevoflurane was started to control pain and improve the condition of the wound bed. Despite the presence of slough in the wound bed, early punch grafting in an outpatient setting was performed, mainly to control pain and limit wound progression (**Figure 1**).

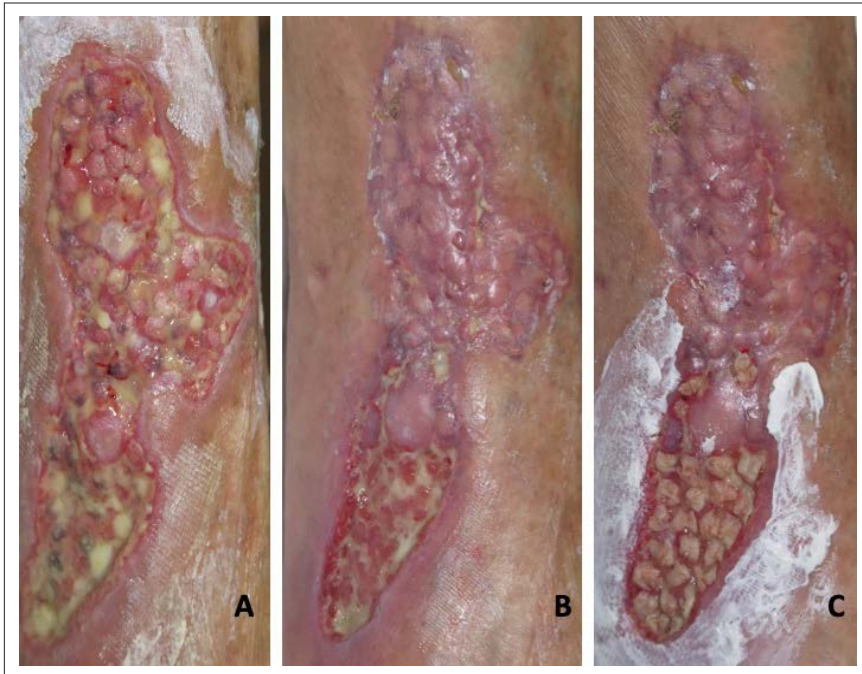
The donor site was the anterolateral aspect of the left thigh. After tumescent lidocaine injection to the donor site, the thin split-thickness skin grafts were obtained with a surgical blade and placed on both wound beds (**Figure 2**). The grafted ulcer was covered with alginate sheets and single-use negative pressure wound therapy (sNPWT; PICO; Smith+Nephew) device, which was used in each dressing change during the first dressing changes to promote graft taking. A multi-component compression bandage system was used. The donor site was covered with an alginate sheet and gauze as a secondary dressing. The first dressing change occurred 5 days after the surgical procedure and frequency of subsequent dressing changes ranged from 3 to 5 days, depending on schedule availability. Graft taking was unsuccessful



**Figure 1.** (A) Ulcer in the inner aspect of the leg, with well-defined edges and sloughy wound bed; and (B) punch grafts on the ulcer bed.



**Figure 2.** (A) Wound at 3-week follow-up after the first punch grafting procedure, with wound contraction and scarce graft taking; and (B) second punch grafting procedure.



**Figure 3.** (A) Wound at 2-week follow-up after the second punch grafting with high percentage of graft taking; (B) at 5-week follow-up after the second punch grafting; and (C) the inferior pole of the wound was covered again with punch grafts.



**Figure 4.** (A) Complete epithelialization was achieved 8 weeks after the third punch grafting procedure (16 weeks post first procedure); and (B) clinical aspect of the donor site after sequential punch grafting.

after the first session; however, pain was reduced (VAS: 3/10) and the wound decreased in depth and width. The frequency of dressing changes was every 3 to 4 days, and the procedure was repeated 3 weeks after the surgical procedure (Figure 2). Graft taking after the second session was more than 60%, and pain control was fully alleviated (VAS: 0/10). Evolution during the next dressing change was satisfactory (Figure 3). At 5 weeks following the second session, punch grafting was again performed to cover the areas without graft taking, mainly in the inferior pole. Complete epithelialization was obtained 16 weeks after the first punch grafting procedure (Figure 4). The technique was well tolerated by the patient. Recommendations after complete healing were daily use of moisturizers and 15 mm Hg to 20 mm Hg compression stockings.

#### DISCUSSION

Available evidence suggests the first described cases of the Martorell ulcer in patients with poorly controlled hypertension corresponded to the extreme with greater clinical (necrosis, pain, and extension) and histological (arteriosclerosis with greater hypertrophy of the wall secondary to poorly controlled hypertension) expressivity on the spectrum of “arteriopathy ulcers in the context of age, hypertension, and/or diabetes.”<sup>7</sup> Consequently, these lesions could benefit from a similar therapeutic approach, which would stop the pathological cycle of necrosis-inflammation in these wounds. This rapid extension of the wound is observed after trauma in elderly patients because initial necrosis by prolonged vasoconstriction, secondary to arteriosclerosis, stimulates the inflammatory phase.<sup>7</sup> Necrosis secondary to this inflammation would maintain the pro-inflammatory mediators with the consequent extension of the wound, creating a vicious cycle.<sup>7</sup>

In order to stop the pathological cycle of necrosis-inflammation, an anti-inflammatory and neo-angiogenic strategy is ideal, so that tissue destruction is stopped and more oxygen may be provided to the wound. The angiogenic effect of early skin grafts counteracts the ischemic and pro-inflammatory environment in these wound beds, which is

an essential promoter of wound healing and a constraining factor for skin necrosis.<sup>6</sup>

Even if the wound bed does not present with perfect conditions for grafting, punch grafts unsuccessful in adhering still release growth factors and cells that promote wound epithelialization and reduce pain, even though the exact mechanism of pain reduction is not well-known.<sup>6</sup> Local pressure and immobilization during the first 3 to 4 days after the procedure are essential for graft taking. The first dressing change should take place 5 to 7 days after the surgical procedure. During subsequent dressing changes, it is essential to avoid excessive cleansing in order to not alter the pro-healing environment in the wound.<sup>6</sup> As in any leg ulcer, if no contraindication exists, compression therapy should be used to reduce inflammation and promote healing.<sup>8</sup>

After cleansing and wound bed debridement, NPWT devices may be used to improve wound bed conditions before punch grafting, but also on the grafts to promote graft taking, as in the present case.<sup>9</sup>

The ideal situation is to graft optimal beds with red granulation tissue. However, the patients who are older and with multiple comorbidities usually have associated pain and anticipatory anxiety for dressing changes.<sup>6,8</sup> Although clinicians try to improve wound bed tissue as much as possible, it is not always easy to achieve optimal conditions for graft coverage, as seen in the present case. Though experience shows that despite devitalized tissue in the bed and the absence of complete graft taking, the wound benefits from this coverage.<sup>6</sup> Moreover, the present authors agree with the literature that invasive surgical debridement in these lesions may worsen the necrosis-inflammation cycle.<sup>5</sup> Punch grafts behave like independent micro-islands—those that do not take should not affect the rest; they also are beneficial because they can release cells and growth factors for healing.<sup>6,8</sup> In addition, the analgesic action of these grafts must be underlined, which, as observed in the authors' clinical practices, is independent of the percentage of graft taking. Repeated punch grafting sessions are well-tolerated by patients, due to its minimally invasive

procedure, with a common rapid reepithelialization of the donor site.<sup>4,5</sup>

In the present case, before every punch grafting session sevoflurane was applied by irrigation to the wound. Sevoflurane is an inhalation anesthetic agent of the group of halogenated ethers for use in induction and maintenance of general anesthesia. In its liquid form, sevoflurane can be used off label as a local anesthetic and applied by irrigation to painful wounds.<sup>9</sup> Although studies published in the literature are mostly isolated cases or short series, the results are promising.<sup>10-12</sup> The benefit of topical sevoflurane does not seem to be limited to its analgesic effect, as it has been proposed to produce accelerated healing due to its vasodilator effect.<sup>10-12</sup> Consequently, topical sevoflurane may help to control pain and improve wound bed conditions before punch grafting without the need for surgical debridement.<sup>12</sup> More studies are needed to explore this hypothesis.

#### LIMITATIONS

Even if this is an isolated case report, which is a limitation of the present results, this experience with this strategy in these arteriopathic ulcers in the authors' clinics shows similar results.

#### CONCLUSIONS

Considering the spectrum of arteriopathic ulcers, which should include Martorell ulcer and posttraumatic wounds in the context of age-associated arteriosclerosis, sequential punch grafting is of high interest for promoting healing, reducing pain, and avoiding lesion progression. **W**

#### ACKNOWLEDGMENTS

Affiliations: <sup>1</sup>Department of Dermatology, Hospital Universitario Infanta Leonor and Hospital Virgen de la Torre, Madrid, Spain; <sup>2</sup>Centro de Especialidades Vicente Soldevilla, Madrid, Spain; and <sup>3</sup>Hospital Italiano, Buenos Aires, Argentina

Correspondence: Elena Conde-Montero, MD, Department of Dermatology, Hospital Universitario Infanta Leonor, Madrid, Spain; elenacondemontero@gmail.com

Disclosure: The authors disclose no financial or other conflicts of interest.

#### REFERENCES

1. Monfort JB, Cury K, Moguelet P, et al. Cutaneous arteriosclerosis is not specific to ischemic hypertensive leg ulcers. *Dermatology*. 2018;234(5-6):194-197. doi:10.1159/000492669
2. Haute Autorité de Santé. Prise en charge de l'ulcère de jambe à prédominance veineuse hors pansement. HAS. November 30, 2006.
3. Nordström A, Hansson C. Punch-grafting to enhance healing and to reduce pain in complicated leg and foot ulcers. *Acta Derm Venereol*. 2008;88(4):389-391. doi:10.2340/00015555-0443
4. Fourgeaud C, Mouloise G, Michon-Pasturel U, et al. Interest of punch skin grafting for the treatment of painful ulcers. *J Mal Vasc*. 2016;41(5):329-334. doi:10.1016/j.jmv.2016.08.002
5. Guisado Muñoz S, Conde Montero E, de la Cueva Dobao P. Punch grafting for the treatment of Martorell hypertensive ischemic leg ulcer. Article in Spanish. *Actas Dermosifiliogr*. 2019;110(8):689-690. doi:10.1016/j.ad.2018.06.016
6. Conde Montero E, Guisado Muñoz S, Pérez Jerónimo L, et al. Martorell hypertensive ischemic ulcer successfully treated with punch skin grafting. *Wounds*. 2018;30(2):E9-E12.
7. Rock KL, Kono H. The inflammatory response to cell death. *Annu Rev Pathol*. 2008;3:99-126. doi:10.1146/annurev.pathmechdis.3.121806.151456
8. Isoherranen K, O'Brien JJ, Barker J, et al. Atypical wounds. Best clinical practice and challenges. *J Wound Care*. 2019;28(Sup6):S1-S92. doi:10.12968/jowc.2019.28.Sup6.S1
9. Vuerstaek JD, Vainas T, Wuite J, Nelemans P, Neumann MH, Veraart JC. State-of-the-art treatment of chronic leg ulcers: a randomized controlled trial comparing vacuum-assisted closure (V.A.C.) with modern wound dressings. *J Vasc Surg*. 2006;44(5):1029-1037. doi:10.1016/j.jvs.2006.07.030
10. Dámaso Fernández-Ginés F, Cortiñas-Sáenz M, Mateo-Carrasco H, et al. Efficacy and safety of topical sevoflurane in the treatment of chronic skin ulcers. *Am J Health Syst Pharm*. 2017;74(9):e176-e182. doi:10.2146/ajhp151008
11. Gerónimo Pardo M, Martínez Serrano M, Martínez Monsalve A, Rueda Martínez JL. Usos alternativos del sevoflurano: efecto analgésico tópico. *Rev Electron Anestesia*. 2012;4(5):181. doi:10.30445/rear.v4i5.373
12. Imbernón A, Blázquez C, Puebla A, et al. Chronic venous ulcer treatment with topical sevoflurane. *Int Wound J*. 2016;13(5):1060-1062. doi:10.1111/iwj.12474