[62.7%]; 90 mg [72.2%]), and 84% maintained a response that
was equal to or greater than PASI 50.

Although it seems that there was no major decrease in
response over time in the study population as a whole, it
is important to identify this subgroup and prepare rescue
strategies, such as reduction in the administration interval
(e.g., 12 to 8 weeks) or combination with other topical
or systemic agents or phototherapy.

Several clinical studies have found that combination
with narrowband UV-B phototherapy improves the efficacy
of some tumor necrosis alfa (TNF-α) factor inhibitors such as
etanercept1,5 and adalimumab.6,7 A recent study based on
a small clinical series revealed similar findings in patients
with moderate-to-severe psoriasis: results from the PHOENIX I

W, et al. Treatment with 311-nm ultraviolet B accelerates and
improves the clearance of psoriatic lesions in patients treated

Belinchón I, Ballesier I. Terapia combinada con etanercept y fár-
macos sistémicos o fototerapia. Actas Dermosifiliogr. 2010;101

Lucas A, Belinchón I, Pérez-Crespó M, Mataix J, Betlloch I.
Successful response to narrow-band UVB in a patient under-
going concomitant treatment with adalimumab for psoriasis.

A, Legat FJ. 311 nm UVB accelerated response of psoriatic
lesions in adalimumab-treated patients. Photodermatol Pho-

Wolf P, Weger W, Legat FJ, Posch-Fabian T, Wackernagel
A, Inzinger M, et al. 311-nm ultraviolet B-enhanced response
of psoriatic lesions in ustekinumab-treated patients: A randomized

Effective treatment of psoriasis with narrow-band UVB pho-
totherapy is linked to suppression of the IFN-α and Th17 pathways.

Gambichler T, Tiggens C, Dith A, Stryggman M, Scola N, Altmeyer P,
et al. Impact of etanercept treatment on ultraviolet B-induced
inflammation, cell cycle regulation and DNA damage. Br J Der-

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References

1. Puig L, Carrascosa JM, Daudén E, Sánchez-Carazo JL, Ferrán-
en la evidencia para el tratamiento de la psoriasis moderada
gra en agentes biológicos. Actas Dermosifiliogr. 2009;100:
386–413.

2. Lucka TC, Pathirana D, Sammain A, Bachmann F, Rosumeck
moderate-to-severe psoriasis: A systematic review and meta-
2012;26:1331–44.

3. Kimball AB, Gordon KB, Fakharzadeh S, Yeilding N, Szapary
PO, Schenkel B, et al. Long-term efficacy of ustekinumab in patients
with moderate-to-severe psoriasis: results from the PHOENIX I

W, et al. Treatment with 311-nm ultraviolet B accelerates and

5. Belinchón I, Ballesier I. Terapia combinada con etanercept y fár-
macos sistémicos o fototerapia. Actas Dermosifiliogr. 2010;101

Successful response to narrow-band UVB in a patient under-
going concomitant treatment with adalimumab for psoriasis.

A, Legat FJ. 311 nm UVB accelerated response of psoriatic
lesions in adalimumab-treated patients. Photodermatol Pho-

A, Inzinger M, et al. 311-nm ultraviolet B-enhanced response
of psoriatic lesions in ustekinumab-treated patients: A randomized

Effective treatment of psoriasis with narrow-band UVB pho-
totherapy is linked to suppression of the IFN-α and Th17 pathways.

10. Gambichler T, Tiggens C, Dith A, Stryggman M, Scola N, Altmeyer P,
et al. Impact of etanercept treatment on ultraviolet B-induced
inflammation, cell cycle regulation and DNA damage. Br J Der-

Sevoflurane: A Valid Alternative for the
Treatment of Vascular Ulcers?2

Sevoflurano, ¿una alternativa en el
tratamiento de las úlceras vasculares?

To the Editor:

Vascular ulcers are a major health problem because of their
frequency, chronic nature, and high recurrence rate. The
standard treatment, which consists of cleansing, debride-
ment, and application of dressings, achieves cure rates of
65% to 85%.1

The approaches used to accelerate scarring of these
ulcers include dressings (biologic, synthetic, or biosyn-
thetic), human amniotic membrane transplantation,1 and
autologous platelet-rich plasma.2

Options for analgesia to control the pain associated
with vascular ulcers include topical anesthetics such as
the creams Emla (lidocaine and prilocaine) and Lambdalina
(lidocaine), oral analgesics, and even opiates. These prod-
ucts aid in the healing process and in pain control, although
they can produce undesirable effects.

Sevoflurane is an inhaled general anesthetic from the
halogenated ether family that is indicated for induction
and maintenance of general anesthesia during hospital or out-
patient surgery.3 Its analgesic effect is both central4 and
peripheral,5 although it has traditionally been thought that
halogenated anesthetics lack a peripheral analgesic effect.6

Topical sevoflurane has been reported to be effective in
the treatment of long-standing venous ulcers3 and ischemic
ulcers7 that are refractory to standard treatment; when irri-

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1 Please cite this article as: Lafuente-Urruz RF, Gilberate Y.
Sevoflurano, ¿una alternativa en el tratamiento de las úlceras vas-
gated topicaly over the painful ulcer bed, it produces a rapid, intense, and lasting analgesic effect, with a suitable safety profile that is well accepted by patients. In addition, it significantly reduces the size of the ulcer and the time necessary for epithelialization. Its effect can be so intense that it is even possible to perform surgical debridement without the need for further analgesia.

Similarly, it has been suggested that direct application of sevoflurane has an antimicrobial effect on ulcers that are superinfected by multiresistant *Pseudomonas aeruginosa*, and a bactericidal effect has been reported in vitro against *Staphylococcus aureus*, *P. aeruginosa*, and *Escherichia coli*.

Sevoflurane (Sevorane) is marketed as a colorless volatile liquid with no additives or preservatives in a 250-ML amber-colored polyethylene naphthalate bottle with a safety cap and a filling adapter. Each milliliter of liquid contains 1 ML of sevoflurane (INN). It should be kept at room temperature and protected from sunlight.

Once the ulcer has been cleansed with saline solution, sevoflurane is applied directly on the ulcer bed, ensuring that the liquid is distributed throughout the tissue and taking care that it does not come into contact with the surrounding healthy skin. It is necessary to wait 2 minutes before applying standard wound care and placing the dressing. A compression bandage should also be applied when necessary.

To date, 12 patients have been treated with topical sevoflurane, and 2 of these cases have been published.

The case of an immunodepressed patient with a postsurgical wound superinfected by multiresistant *P. aeruginosa* who was cured after several applications of sevoflurane is pending publication. At the 17th Annual Meeting of the European Society of Regional Anesthesia in Barcelona in October 2011, a series of 9 patients was presented (6 women and 3 men with diabetes). The patients had painful venous ulcers on the lower limbs that were refractory to regular analgesics and were treated with sevoflurane on an outpatient basis to control the pain. In all cases, the reduction in pain at rest was rapid (less than 2 minutes), intense (7.4 [0.5] to 2.1 [0.6] points with the first application and 7.2 [1.3] to 1.1 [0.6] points with all of the remaining 67 applications), and lasting (from 7 to 16 hours). The ulcers were cured in 4 cases.

The risk-benefit ratio of sevoflurane has proven very favorable to date. The only undesirable effects of topical application are pruritus at the borders of the wound and irritation of the surrounding skin with repeated applications. Sevoflurane has not been reported to have sensitizing potential. Similarly, local irrigation with sevoflurane was well tolerated in patients with heart disease.

Systemic absorption of sevoflurane applied to an ulcer involving circulatory compromise is thought to be slow and incomplete, although blood levels have not been measured in patients treated with this procedure.

The mechanism underlying the analgesic, epithelializing, and antimicrobial effects of sevoflurane remains unknown. Inhaled sevoflurane has no peripheral analgesic effect; however, topical or subcutaneous administration does produce a peripheral effect. When a halogenated agent is inhaled, the partial pressure reached in the peripheral nociceptors may not be sufficient to block transmission of a painful stimulus; however, with direct application, the nociceptors are exposed to sufficient partial pressure to block transmission of painful stimuli.

In conclusion, topical sevoflurane could prove to be a promising strategy for analgesia and epithelialization in the treatment of vascular ulcers.

References