ABSTRACT
Pressure ulcers are a common problem in intensive care unit (ICU). Recently, topical sevoflurane has been used especially for treatment of venous ulcers and infected skin ulcers. We present a case of topical sevoflurane treatment of a pressure ulcer. Treatment was applied for one month without any antibiotic supplementation. After one month, the ulcer size was decreased, necrotic tissues were cleared, and wound cultures were negative. There are three beneficial effects of local sevoflurane treatment: good analgesic action, antibiotic effects, and acceleration of wound healing. These beneficial effects may make sevoflurane an alternative treatment for pressure ulcers in an ICU.

Key Words: Ulcer, Wound care, Topical antioxidants.

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CASE REPORT
A 76-year female was admitted to ICU after cardio-pulmonary arrest with a primary diagnosis of chronic obstructive respiratory disease. The patient was followed with a Glasgow Coma Score (GCS) of 4. Mechanical ventilation support was maintained for two months. After one month, a pressure ulcer had developed at the upper sacral region. Two months later, the ulcer was grade 3, measured 5 x 7 cm (35 cm²), and necrotic fields were observed (Figure 1). At this time, wound culture revealed Pseudomonas aeruginosa that was susceptible to colistin. The C-reactive protein (CRP) was 65 mg/L and the white blood cell (WBC) count was 18,000 /mm³. However, there were no infectious symptoms like redness, swelling or purulent appearance. After written consent from the patient’s relatives, topical sevoflurane irrigation was initiated every two days for a period of one month at a dose of 1 ml/cm².

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Irrigation was done carefully at the wound site, and contact of the sevoflurane with the healthy skin tissue was avoided. After 30 days, another sample was taken from the wound for culture evaluation and it was negative. At that time, CRP was 50 mg/L and WBC count was 15,000 /mm³. The wound size measured 4 x 5 cm (20 cm²), and epithelialisation with granulation tissue could be clearly observed at the edges of the wound. Moreover, a decrease in necrotic fields was clearly observed (Figure 2). Further treatment of the pressure ulcer with sevoflurane was planned.

DISCUSSION

Topical sevoflurane administration has been studied previously for chronic venous ulcer treatment and for infected surgical wounds. The analgesic effects of sevoflurane in leg ulcers, surgical wounds, malignant leg ulcers, and epidural abscesses with cutaneous fistulation have been reported. Moya et al. found that sevoflurane had long-lasting analgesic effects in patients with painful chronic venous ulcers. Gines et al. demonstrated that topical sevoflurane decreased opioid consumption in patients with chronic vascular skin ulcers. The mechanism of its analgesic effects is not fully understood. It has been suggested that topical sevoflurane has a peripheral analgesic effect by partial pressure on the peripheral nociceptors that block pain transmission. The use of topical sevoflurane for wound care provides analgesic effects that ensure comfort for patients suffering from pressure ulcers. However, we were not able to observe the analgesic effects of topical sevoflurane, because our patient received sedative and analgesic treatment in the intensive care unit.

The antibiotic effects of sevoflurane have been demonstrated especially on pathogens resistant to conventional antibiotics. The antibacterial effects of sevoflurane on S.aureus, P.aeruginosa, and E.coli have been reported previously. Serrano and colleagues showed the antibacterial effects of both isoflurane and sevoflurane on pathogens resistant to conventional antibiotics.

Martinez et al. reported a case of a 43-year patient with a surgical site wound superinfected with P.aeruginosa and S.aureus, treated with topical sevoflurane. Moya et al. treated an infected chronic venous ulcer with topical sevoflurane for one month without systemic antibiotic treatment, and Methicillin-resistant staphylococcus aureus (MRSA) infection showed progressive improvement. These studies propose that sevoflurane primarily affects the cell wall of the bacteria and it also may have a synergistic effect with conventional antibiotics. However, Rahman et al. found that clinical relevant doses of sevoflurane had no effect on growth of P.aeruginosa and S.aureus. Karabiýik et al. assessed the antibacterial effects of sevoflurane and nitrous oxide and concluded that the antibacterial effects of inhalation anaesthetics depend on the duration of anesthesia and type of micro-organism. In our case, the infection symptoms such as, local signs and systemic fever were missing and only laboratory findings showed positive wound culture. Nevertheless, P.aeruginosa growth in wound culture turned into negative after topical sevoflurane treatment without any systemic antibiotic treatment. However, this outcome is not sufficient to validate the antibiotic effects of topical sevoflurane.

Topical sevoflurane administration has been shown to improve healing in venous ulcers. Sevoflurane action on wound healing is unknown, but it has been suggested that its vasodilatory effects increase the microcirculation. It may have a directly inhibitory effect on vascular smooth muscle that results in vasodilatation. However, Lee and colleagues suggested that sevoflurane exposure can alter the inflammatory phase of the healing process. Gines et al. found a 51.1% reduction in ulcer size with 90 days of treatment of topical sevoflurane. We observed an approximately 42% decrease in ulcer size with one month of treatment with topical sevoflurane.

Topical sevoflurane can cause irritant effects on healthy skin, so avoiding contact to the healthy skin is important. Otherwise, it is safe and well tolerated. The use of topical sevoflurane in pressure ulcer treatment is not very common. It can be a good alternative for traditional pressure ulcer treatment and should be recognised.

Pressure ulcers continue to be a persistent and complicated problem in the ICU. Topical sevoflurane can be a good and a safe therapeutic alternative, for pressure ulcers.

PATIENT'S CONSENT:
Informed consent was obtained by the patient’s first degree relatives.

CONFLICT OF INTEREST:
Author declared no conflict of interest.

AUTHOR’S CONTRIBUTION:
IG: Planned, applied and written this case report.
REFERENCES


