

# The combination of photodynamic therapy, photobiomodulation therapy and antimicrobial dressing for the treatment of pressure ulcers: A case series

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**Objective:** A pressure ulcer (PU) is an area of tissue trauma caused by continuous and prolonged pressure, often associated with hospitalised patients immobilised due to neurological problems, negatively affecting their quality of life, and burdening the public budget. Pressure ulcers are more likely in people with reduced mobility and poor skin condition, such as older people or those with vascular disease. In addition, costs are high for service providers, the average cost of treatment per patient per day varies from 1.71 to 470.49 euros in different care settings, and in the United States, costs can exceed US\$ 26.8 billion per year, in cases of ulcers acquired at the hospital. Light therapies include photobiomodulation therapy (PBMT) and photodynamic therapy (PDT). The four major biologic responses evoked by these therapies include alleviation of pain and inflammation, a modulated immune response, and tissue healing and regeneration.

The present study aimed to report a series of clinical cases in which PDT, PBMT and antimicrobial dressing were used to manage pressure ulcers unresponsive to conservative treatment.

**Methods:** Three elderly patients (65-89 years old) with infected pressure ulcer participated in this study. Patients presented unclassifiable pressure injury or deep tissue pressure injury in the greater trochanter of the femur and sacral region.

The lesions were treated with dressings such as PHMB hydrogel (Fig. 1), kerlix (Fig. 2), collagen/alginate (Fig. 3) and silver hydrofiber dressing (Fig. 4), depending on the type and stage of the wound. PDT (Fig. 5) was performed 1-2 times per week with 1% methylene blue and Red Laser ( $\lambda=660$  nm, power=100mW, and energy=12J/point), targeting ulcer area. PBMT (Fig. 6) was performed twice a week with Red and Infrared Laser ( $\lambda=660$  nm + 808 nm, continuous wave, contact mode, power=100mW, and energy=1-2J/point), targeting ulcer area and around the lesion, in healthy areas. All the treated sites were photographed at each visit (Fig. 7).

**Results:** It was noted, in all cases, a marked improvement in tissue repair (Fig. 8-19). The size of the pressure ulcers significantly decreased as combination therapy progressed, and within around 24-36 weeks, the wounds were healed, except in one patient in palliative care who died.



Figure 8 – Case 1: Sacral pressure ulcer. Before the first treatment session.



Figure 9 – After 16 weeks of treatment. Decrease in pain and lesion size.



Figure 10– After 36 weeks of treatment. Complete healing of the sacral pressure ulcer.



Figure 11 – Case 2: Pressure ulcer on the greater trochanter of the femur. Before the first treatment session.



Figure 12 – After debridement of necrotic tissue.



Figure 13 – Improvement in the appearance of the lesion after 7 days of treatment.



Figure 14 –Reduction of pressure ulcer in patient undergoing palliative care, after 32 weeks of treatment.



Figure 15 – Case 3: Pressure ulcer on the left leg. Before the first treatment session.



Figure 16 – After 3 weeks of treatment.



Figure 17 – Improvement in the appearance of the lesion after 11 weeks of treatment.



Figure 18 - Significant reduction in pressure ulcer on the leg after 18 weeks of treatment.



Figure 19 - Pressure ulcer healing after 24 weeks of treatment.



Figure 1 – PHMB hydrogel



Figure 2 – Kerlix dressing



Figure 3 – Collagen/alginate dressing



Figure 4 – Silver hydrofiber dressing (Aquacel Ag).

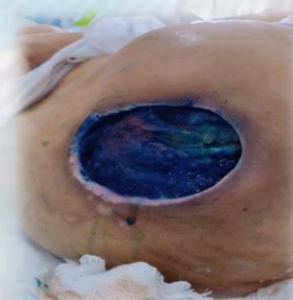


Figure 5 – PDT with methylene blue and red Laser (EC-DMC, Brazil) in pressure ulcer (1-2 x per week).



Figure 6 - PBMT with red and infrared Laser (Elite Duo DMC, Brazil) in pressure ulcer (2 x per week).



Figure 7 – Nurse treating pressure ulcers with light therapies unresponsive to conservative treatment.

**Conclusion:** Light therapies are effective in treating pressure injuries when combined with appropriate dressing for each clinical case. Light devices are noninvasive, no side effects and an attractive tool for wound management.

*I have no conflict of interest.*