A CASE SERIES OF PHOTOBIOMODULATION THERAPY IN TREATMENT OF NON-HEALING LOWER LIMB WOUNDS

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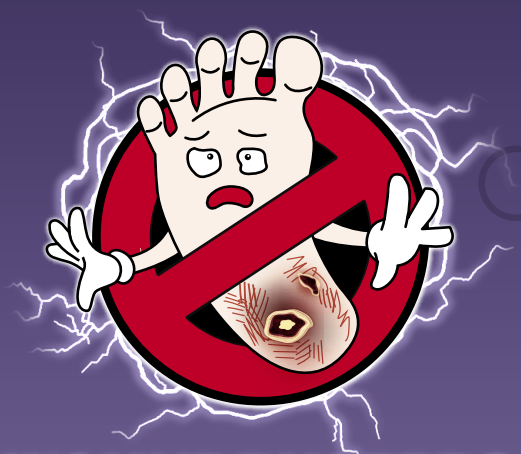

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INTRODUCTION

Non-healing or hard-to-heal wounds are wounds that fail to heal in a timely and orderly manner resulting in significant economic health burden, reduced quality of life and psychosocial disturbances. Photobiomodulation therapy is shown to have therapeutic effects such as immunomodulation, tissue repair and regeneration as well as reduction in pain and inflammation. The objective of this case series is to evaluate the efficacy of photobiomodulation therapy in stagnant lower limb wounds despite standard wound treatment given.

METHODS

Five patients with stagnant wound healing (mean duration of wound = 19.6 months) of various etiology were exposed to weekly photobiomodulation therapy using portable light emitting diodes device, EmoLED Srl (Florence, Italy) for total of 8 weeks period. Prior to blue light treatment, principle of wound bed preparation including wound debridement of devitalized tissues are applied. Patient was then subjected to photobiomodulation therapy with duration of 60 seconds (non-diabetic) or 120 seconds (diabetic) for each area of 50mm^2 wound, in addition to standard wound care. The outcome of treatment is evaluated with Wound Bed Score (WBS) and Visual Analogue Scale (VAS) for pain and wound assessment with TIME framework.

RESULTS

After 8 weeks of treatment with blue light, all patients had improved WBS with an average of 6.2 (pre-treatment) to 13.2 (post completion), particularly in re-epithelization, exudate control and peri-wound scarring. In addition with the serial debridement, tissue fibrosis and callus are less pronounced resulting in a healthier wound bed and epithelial advancement. Higher WBS also corresponded with increased reduction of lesion area. Reduction in wound size ranges between 18.2% to 83.3% with the exception of case no 5 are observed. Despite the non- advancing wound edge in this case, the wound bed is less fibrotic and peri-wound skin inflammation resolved. All patients also had VAS for pain of 0 after completion of 8 sessions of photobiomodulation therapy.

DISCUSSION

Hard-to-heal wounds often involve multifactorial causes which prevent or prolong wound healing. Regardless of the etiology, chronic wounds share common cellular characteristics in which wounds are stalled in prolonged inflammatory state leading to elevated proteases. Excessive proteases degrade extracellular matrix and growth factors needed for tissue repair. Persistent inflammation also contributes to increase of senescent cells with diminished proliferative capacity and cell signaling pathway. Therefore, in most cases, the standard of wound care alone is inadequate to achieve desirable wound outcome.

In photobiomodulation therapy, blue light (spectrum of 410 - 430nm) absorbed by chromophores (cytochrome C) of the skin triggering chain of reaction which modulates inflammatory response, promote cell repair and regeneration. Cytochrome C stimulates mitochondrial function, increasing the production of adenosine triphosphate (ATP), nitric oxide (NO) and reactive oxygen species (ROS). The cellular changes increase cell metabolism, promote angiogenesis and fibroblast proliferation. These photochemical reaction induce tissue regeneration process in wounds arrested in healing.

Good outcome and wound response to blue light treatment observed in all patients in this study. Usage of photobiomodulation as adjunctive therapy help in kick start wound healing in wounds that are resistant to standard of care. However, this prospective observational study is subjected to several limitations. The lack of sample size results in inability for statistical analysis and generalization to broader population.

CONCLUSION

The use of photobiomodulation as an adjunct therapy to standard wound care promotes wound healing in recalcitrant lower limb wounds by improving parameters in WBS and pain with no observable side effect.

CASE 1: 53 years old, female with right Archilles tendinitis. Done debridement and tendon transfer. Duration of wound: 6 months

- WBS: 3, VAS: 4
- Wound size: 1 X 1.5 cm

- WBS: 15, VAS: 0
- Wound size: 0.5 X 0.5cm

CASE 2: 54 years old, male with chronic right venous ulcer, on four-layer compression bandage. Duration of wound: 20 months

- WBS: 3
- Wound size: 6 X 2.5 cm

- WBS: 16
- Wound size: 3 X 1 cm

CASE 3: 37 years old, female with left foot necrotising fasciitis, post wound debridement. Duration of wound: 7 months

- WBS: 6
- Wound size: 5.5 X 6 cm

- WBS: 12
- Wound size: 4.5 X 5.5 cm

CASE 4: 74 years old, male with right lower limb necrotising fasciitis, post extensive debridement. Refused SSG. Duration of wound: 30 months

- WBS: 9
- Wound size: 19.5 X 9 cm

- WBS: 14
- Wound size: 16 X 8.5 cm

CASE 5: 74 years old, female with right lower limb bullous cellulitis, post wound debridement. Duration of wound: 35 months

- WBS: 4
- Woundsize: 2 X 2cm

- WBS: 9
- Wound size: 2.7 X 2 cm

REFERENCES

1. Zhang D, Leong ASW, McMullin G. Blue light therapy in the management of chronic wounds: a narrative review of its physiological basis and clinical evidence. Wounds. 2023;35(5):91-98. doi:10.25270/wnds/22097

2. Fraccalvieri, M., Amadeo, G., Bortolotti, P., Ciliberti, M., Garrubba, A., Mosti, G., Bianco, S., Mangia, A., Massa, M., Hartwig, V., Salvo, P., & Ricci, E. B. (2022). Effectiveness of Blue light photobiomodulation therapy in the treatment of chronic wounds. Results of the Blue Light for Ulcer Reduction (B.L.U.R.) Study. Italian journal of dermatology and venereology, 157(2), 187–194. https://doi.org/10.23736/S2784- 8671.21.07067-5

3. Khoo, V. B., Soon, S., Yap, C. J., Chng, S. P., & Tang, T. Y. (2021). Use of Blue Light in the Management of Chronic Venous Ulcer in Asian Patients: A Case Series. Cureus, 13(9), e17703. https://doi.org/10.7759/cureus.17703

4. Frykberg, R. G., & Banks, J. (2015). Challenges in the Treatment of Chronic Wounds. Advances in wound care, 4(9), 560–582. https://doi.org/10.1089/wound.2015.0635

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