

A neuromuscular electro-stimulation (NMES) device and its contributing healing effect on venous ulcerations

AUTHOR: Liraz Naude, RN, RM, MSc(UPI), Cert. WC (UFS, Herfordshire), AWC, IIWCC (SUN/Toronto)

Director & Founder Eloquent Health & Wellness
Director & founder Eloquent Learning Health

Background

In this case, a 78-year-old male patient with a complex clinical history was discharged from hospital with a terminal prognosis following heart failure. The patient presented with bilateral oedema, multiple below-knee venous ulcers with full-thickness skin loss, significant undermining, purulent exudate (3+), and severe pain rated at 8/10. Standard treatment options were deemed ineffective, and the patient was sent home under palliative care expectations.

Inspired by the adaptive traits of the geko, such as adhesive toe pads for secure attachment, silent movement, a small form factor, and regenerative capabilities, the geko™ device embodies these biomimetic features to deliver a compact, comfortable, and effective therapeutic solution. It functions quietly, requires no additional power sources, and is suitable across a range of clinical scenarios, including patients with limited mobility or muscle paralysis.

Method

Wound Assessment

A thorough examination of the patient's ulcers revealed the following:

- **Location:** Multiple below-knee venous ulcerations
- **Characteristics:** Full-thickness skin loss with significant undermining
- **Clinical Signs:** Bilateral oedema, swelling, and recent hospital discharge following heart failure
- **Exudate:** Grade 3+ purulent discharge
- **Pain Level:** Severe (rated 8/10)

Treatment Plan

The patient received an integrated wound care approach focused on managing pain, reducing oedema, and promoting tissue regeneration and healing. The treatment plan included the following interventions:

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- **Cleansing:** Regular and thorough cleansing of the affected areas to reduce bioburden and prepare the wound bed for healing.
- **Debridement:** Removal of necrotic tissue and slough to expose viable tissue and promote granulation, supported by targeted irrigation to flush out debris and contaminants.
- **Light Therapy:** Application of therapeutic light to stimulate cellular activity, reduce inflammation, and accelerate tissue repair.
- **ABS Compression:** Controlled compression therapy to manage oedema and improve venous return, supporting wound healing and reducing fluid buildup.
- **Use of the geko™ Device:** Continuous neuromuscular stimulation of the common peroneal nerve to enhance lower limb circulation, reduce oedema, and promote tissue perfusion and wound healing.

Application

of the geko™ Device

Worn at the knee, the device delivered painless electrical stimulation to the common peroneal nerve, activating the muscle pump of the lower leg. This stimulation facilitated enhanced venous return, helping to reduce oedema, improve circulation, alleviate pain, and promote tissue oxygenation.

Results/Discussion

The geko™ device was especially beneficial for this patient with limited mobility and heart failure, as it requires no active muscle use, produces no heat or noise, and functions without external power—making it ideal for continuous, low-maintenance use in a home care setting.

After a short period of using the geko™ device, several notable improvements were observed:

- **Reduction in Oedema:** A visible decrease in swelling, indicating improved fluid drainage and venous return.
- **Wound Bed Improvement:** The wound base appeared more viable, with reduced exudate and enhanced tissue perfusion.
- **Pain Management:** Pain levels decreased, likely due to improved oxygenation and the removal of necrotic tissue.
- **Skin Integrity & Colouration:** Noticeable improvement in skin texture and normalization of colour, suggesting restored microcirculation and reduced ischemia in previously poorly perfused areas.
- **Enhanced Tolerance to Treatment:** The patient reported greater comfort during dressing changes and showed increased engagement with the clinical team—an essential factor in managing end-stage chronic wounds.

Conclusion

The geko™ device played a crucial role in transforming the trajectory of this complex case. It significantly reduced oedema and pain, supported faster wound healing, and improved overall circulation. Most importantly, it contributed to a noticeable improvement in the patient's quality of life—offering hope and dignity in a situation where none had initially been expected. This case highlights the potential of the geko as a powerful adjunct in the management of chronic, non-healing wounds in vulnerable patients.

Ulcerations healing progression with the application of the geko™ device:



Medial Posterior.



Anterior Lateral.



Medial Posterior



Anterior Lateral



Medial Posterior.



Anterior Lateral.

Day 1 of using the geko™ device.

Wound after 21 days of using the geko™ device.

Wound after 42 days of using the geko™ device.

