

A neuromuscular electro-stimulation (NMES) device and its contributing healing effect on diabetic foot ulcer

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Background

Diabetes is a significant health concern in South Africa, with approximately one in nine adults affected—totalling around 4.2 million individuals. In the African region, the rate of premature deaths from diabetes is alarming, standing at 58%, surpassing the global average of 48%. Fluctuating blood glucose levels delay wound healing, making proper management crucial, especially in older patients with comorbidities. This case study highlights the wound management of a 91-year-old male patient who developed a stage three pressure ulcer in a hospital setting due to the improper application of compression stockings following a hip replacement six months prior.

In August 2024, the patient underwent a Doppler ultrasound, which revealed a slight hematoma in his veins. This led to the discontinuation of the geko™ device, and as a result, the study could not be completed until the wounds had fully closed. It's important to note that the presence of a blood clot is a contraindication for the use of the geko™ device.

Method

Wound Assessment

A thorough examination of the patient's ulcers revealed:

- **Location:** Two ulcers on the lateral side of the right foot.
- **Characteristics:** Presence of biofilm and necrotic tissue in the wound bed.
- **Clinical Signs:** Mild erythema and oedema surrounding the wounds, indicating inflammation and potential infection.
- **Exudate:** Moderate amount of serious fluid noted.
- **Edge Advancement:** None.

Treatment Plan

Due to clinical signs of arterial insufficiency, compression therapy was discontinued. The wound management protocol included:

1. Cleansing: The wound bed was washed with a Thirids solution (Saline, 3% Hydrogen Peroxide, and Usol) and soaked for several minutes.
2. Debridement: Enzymatic debridement was performed using Melcura Plus.
3. Dressing: The wound was covered with Messorbi absorbent dressing and a crepe bandage, ensuring it was not overly tight.
4. Advanced Therapy: Due to insufficient healing, a neuromuscular electro-stimulation (NMES) device was introduced to augment blood flow to the lower extremities.

Antimicrobial and Debriding Agents Used

- **Antimicrobials:** Iodine and Melcura Silver Gel.
- **Debriding Agents:** Melcura Plus.
- **Biofilm Treatment:** Thirids Solution.

Application

of the geko™ Device

The geko™ device was self-adhesively applied over the head of the fibula on the lateral aspect of the leg, just below the knee. It delivered a charged-balanced electrical (1 Hz) pulse once per second to stimulate the common peroneal nerve, inducing muscle contractions in the calf and foot to enhance venous, arterial, and micro-vascular flow. The patient was educated on the application and removal of the device, which was utilised for 12 hours nightly. His daughter was present to assist if needed.

Results/Discussion

The patient was enthusiastic about integrating the geko™ device into his wound care plan, expressing optimism about its potential to aid his healing, and restore his ability to perform daily activities. His daughter assisted with the device's application and removal.

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

- **Wound Size:** Decrease in size of the ulcers with a total reduction of 1.6cm over 30 days.
- **Tissue Quality:** Healthier granulating tissue with reduced exudate.
- **Pain Management:** Decrease in pain levels led to a reduction in pain medication usage.
- **Sleep Quality:** Longer sleep periods due to decreased pain, and improved mood and mobility, allowing him to walk short distances.

Conclusion

This case underscores the importance of involving patients in their wound care plans, ensuring adherence to treatment and promoting faster healing. Active participation helps patients track their progress and fosters a positive mindset as they work towards recovery goals. The integration of advanced technologies like the geko™ NMES devices can play a critical role in enhancing wound healing, especially in patients with complex medical histories, such as diabetes and neuropathy. This case exemplifies the holistic approach needed in managing chronic wounds effectively in the aging population.

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



Lateral (R) side of the foot 3cm.



Lateral (L) side of the foot 2cm.



Lateral (R) side of the foot 2.2cm.



Lateral (L) side of the foot 1.2cm.

Day 1 of using the geko™ device.

Wound after 30 days of using the geko™ device.

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