Using a polylactic acid dermal matrix for achieving wound healing in challenging wounds

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Background

Objective:

- To assess the "real world" effectiveness of **polylactic (PLA) wound closure matrices** to promote healing of challenging chronic wounds.

Background:

- Chronic wounds are characterized by being arrested in the inflammatory phase of healing, which leads to wound beds that have a high content of inflammatory cells and mediators, poor vascularization, and a low healing potential.
- There is mounting evidence that PLA guided closure dermal matrices shift the wound bed from inflammation into proliferation because the **lactate** released by them acts as a paracrine agent (lactormone) with potent signaling effects that include:
  - **Hypoxia mimicking** and triggering of **neo-angiogenesis**
  - **Cell survival and proliferation**
  - **Anti-inflammation**
  - **Wound pH acidification**
- Under under ideal and controlled conditions, PLA matrices have demonstrated these effects. However, it is yet to be demonstrated if the same effects hold under "real world" conditions; particularly in challenging wounds.
- Therefore, here, we show our preliminary experience in using this technology in non-controlled conditions.

Variables	RCTs	RWE
Purpose	Efficacy	Effectiveness
Setting	Experimental setting	Real-world setting
Follow up	Designed	In actual practice
Treatment	Fixed pattern	Variable pattern
Study group	Homogenous	Heterogeneous
Attending physician	Investigator	Many practitioners
Comparator	Placebo/selective alternative interventions	Many alternative interventions
Patient monitoring	Continuous, per protocol	Changeable

Randomized clinical trials (RCTs) controlled conditions vs. uncontrolled real-world evidence (RWE) conditions
Modified from J Korean Med Sci. 2018 Aug 20; 33(34): e213.

Methods

- A series of 15 patients with chronic wounds, including diabetic foot ulcers (n = 6), venous ulcers (n = 4), inflammatory ulcers (n = 3), and trauma injuries (n = 2) received weekly applications of PLA matrices until healing.
- The application protocol consists of **"preparing the wound for healing,"** which includes:
  - Thorough **debridement** of non-viable tissue with tissue preservation wherever possible.
  - Optimization of **comorbidities and nutritional status**.
  - Weekly application of **PLA closure matrices**, ensuring an intimate contact with the full wound surface, its fixation with a non-contact adhesive barrier, and the application of absorbent dressings and compressive bandages as needed.
- Digital planimetry was performed on wound photographs taken at 20 to 30 cm from the wound bed, and 90º in respect to it.
- A qualitative assessment of the images was performed by a trained user blinded to the treatment or time-points.

Results

Case 1: Diabetic Foot Ulcer. PLA matrices were weekly applied to the ulcer of a 69-year old patient with type II diabetes mellitus. The ulcer had been present for 6 months and other treatment modalities had failed to close it. Within 4 weeks the uocer size reduced by 60% and it achieved complete healing in 8 weeks.

Case 3: Pyoderma Gangrenosum. PLA matrices were weekly applied to the ulcer of a 71-year old female with a 2-year old PG ulcer. Note the significant inflammatory halo in the peri-wound area at baseline. After 4 rounds of weekly PLA applications, the ulcer size had reduced by over 80% and the inflammatory halo was greatly reduced. Complete healing was achieved at 8 weeks with minimal scarring and no signs of soft tissue residual inflammation.

Case 2: Diabetic Foot Ulcer. PLA matrices were weekly applied to the heel ulcer of a 72-year old patient with type II diabetes mellitus and poor nutritional status. Despite significant tissue atrophy, the wound healed fast. By 2 weeks a 50% reduction in size ws achieved and by 4 weeks the ulcer was closed with minimal scarring.

Case 4: Trauma. PLA matrices were weekly applied to the skin tear of a 89-year-old frail patient. The patient had a history of frequent skin tears that were difficult to heal. However, the use of PLA matrices led to the complete healing of the defect in only 2 weeks with adequate restoration of the skin integrity.

Case 5: Inflammatory Ulcer. PLA matrices were weekly applied to the ulcer of a 54-year -old patient with a diagnosis of psoriasis and rheumatoid arthritis. Despite no apparent change in the ulcer after the first week of treatment, on the next visit, the patient presented with a fully healed ulcer.

- Following the application of PLA matrices, ulcer healing improved significantly in most patients.
- Within 3 weeks, four ulcers had healed. By 12 weeks, 80% of the patients had healed, and the remaining 2 patients healed within 15 weeks of the application of the material.
- The repair tissue induced after PLA applications was characterized by a large content of granulation tissue and thick epithelial borders in the wound's edge.
- Significant reductions in the erythematous halo of the peri-wound area were observed in inflammatory ulcers. Additionally, minimal scarring was observed in many instances in fully-healed wounds.

Discussion

- PLA releases lactate into the wound bed, which has demonstrated three main effects:
  - Promoting neo-vascularization
  - Promoting cell survival and differentiation
  - Promoting immunoregulation of the wound bed
- When added to a wound bed that has been prepared for repair, its combined effects lead to a shift from inflammation into proliferation.
- The results observed in this patient cohort confirm lactate's powerful effect for healing challenging wounds.
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In summary, here, we confirm the effects of PLA in challenging wounds under non-controlled "real-world" conditions.

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