

# A Step Forward: The Use of Decellularized Dermal Matrices for Delayed Diabetic Foot Ulcers

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## INTRODUCTION

- Hard-to-heal wounds (HHWs), including diabetic foot ulcers (DFU), represent a considerable source of morbidity due to the population aging and the increasing of comorbidities: hence, the management of HHWs generate considerable health costs.<sup>1</sup>
- It is claimed that as much as half of chronic wounds fail to heal with current treatments.<sup>2</sup>
- HHWs fail to progress through the orderly phases of healing but remain in a self-perpetuating inflammatory stage, despite adequate wound management.<sup>3</sup>
- Extracellular matrix (ECM)-based scaffolds are decellularized tissues that can stimulate natural tissue regeneration capacity by providing native tissue-specific ECM signals, directing anti-inflammatory macrophages and activating constructive remodeling.<sup>4</sup>
- This novel ECM-based human tissue regenerative matrix\* is devoid of cellular materials and comprised of intact collagen, elastin, proteoglycans, cytokines and growth factors.

## CASE HISTORY

We present 3 case studies of DFUs. Participants were required to have a DFU, consent to having the matrix applied, and be willing to totally pressure offload after application.

- Participant #1 is a 55-year-old male with a history of Type 2 Diabetes, Diabetic Neuropathy, Stroke, Hypertension and Smoking
- Participant #2 is a 56-year-old male with a history of Type 2 Diabetes, Hypertension, Dyslipidemia, Bicuspid Aortic Valve Replacement, Osteomyelitis of the L5 Metatarsal Head in 2017 which resulted in reconstruction and skin grafting
- Participant #3 is a 67-year-old male with a history of Type 2 Diabetes, Diabetic Neuropathy, Osteomyelitis and recommended below knee amputation by an Orthopedic Surgeon

## CLINICAL SITUATION

- Participant #1 wound measured 0.8x0.4cm to the plantar aspect of the 5<sup>th</sup> metatarsal head that was first documented in August 2023. Our team had trialed serial wound debridement, total contact casting, collagen matrix, silver impregnated foam and iodine-based dressings with no success in wound closure.
- Participant #2 wound measured 2.5x0.7x0.3cm to the lateral side of the left foot that was first documented in February 2020. Our team had trialed serial debridement, silver contact layer, collagen matrix, hydrofiber, total contact casting, and topical oxygen therapy with no success in wound closure.

- Participant #3 wound to his heel measured 1.7x1.6x0.2cm and another wound to the lateral side of his 5<sup>th</sup> metatarsal head measured 1x0.5cm. Wounds were first documented in October 2023. Our team trialed iodine-based dressings, silver foam, serial debridement and total contact casting with no success in wound closure.

## ACTIONS TAKEN

- All participants had the decellularized dermal matrix applied on April 3<sup>rd</sup>, 2024. All wounds were prepped with conservative sharp wound debridement using a curette, creating a 100% friable wound bed with attached wound edges. Clients were seen weekly for cover dressing changes. No cleaning or debridement was done for 3 weeks with weekly cover dressing changes. After three weeks debridement was started on the lifting matrix edges and periwound callous.
- Participant #1 wound dressed with non-adherent silver contact layer, secured with steri-strips, covered with a foam dressing and secured with cloth tape. Pressure was offloaded with total contact casting and client committed to smoking cessation. After 2 weeks, the cast was discontinued due to client reported pain. The dressing was changed to a simple foam dressing and cloth tape. Offloading was continued with custom orthotics, decreased ambulation and decreased smoking from a pack a day to 3-4 cigarettes per week. The wound closed on May 21<sup>st</sup>, 2024.
- Participant #2 wound dressed with a foam dressing, a small amount of cloth tape, and gauze roll. Pressure was offloaded with a knee scooter, custom orthotics with insoles and decreased ambulation. No changes were made to the wound care or offloading until the graft released on May 29<sup>th</sup>, 2024 and topical oxygen therapy was restarted to improve his periwound skin.
- Participant #3 wound dressed with a foam dressing and cloth tape. Pressure was offloaded with total contact casting and decreased ambulation. The heel wound continued to have drainage and the matrix appeared macerated. The matrix was repositioned multiple times and steri-strips used to try to hold it in place. Total contact casting was stopped after 3 weeks and offloading switched to Darco shoe. Client was not complaint with decreased ambulation. Client showered, against instructions, and suffered some mental health and family challenges post application. The matrix lifted on the heel wound on May 14<sup>th</sup>, 2024 and the wound remains open. The wound to the 5<sup>th</sup> metatarsal head closed on May 14<sup>th</sup> and has remained closed.

## RESULTS

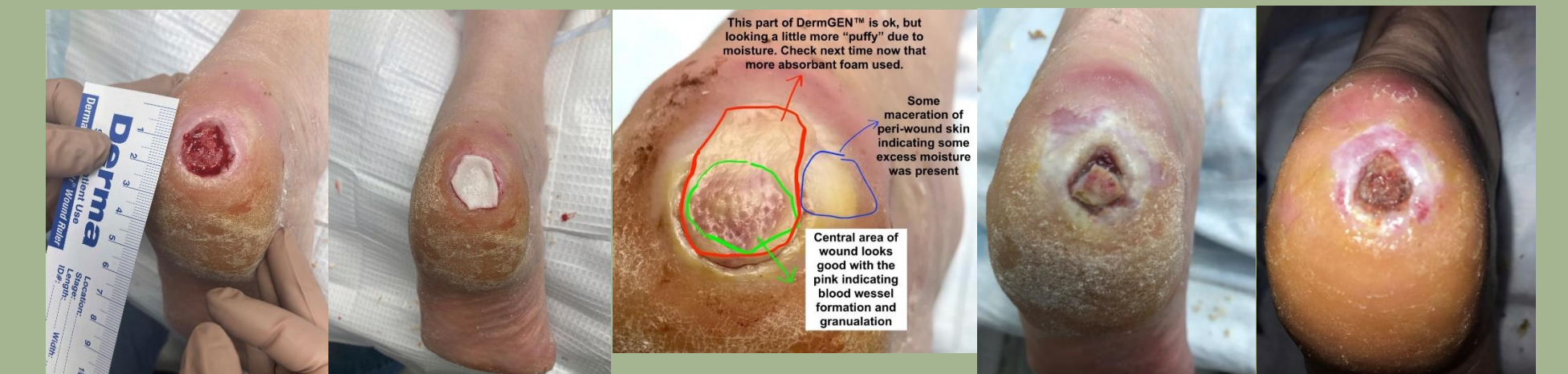
Participant #1- April 3<sup>rd</sup> post debridement, April 3<sup>rd</sup> post application, April 10<sup>th</sup>, May 21<sup>st</sup>



Participant #2- April 3<sup>rd</sup> post debridement, April 3<sup>rd</sup> post application, April 17<sup>th</sup>, May 29<sup>th</sup>



Participant #3 Heel Wound- April 3<sup>rd</sup> post debridement, April 3<sup>rd</sup> post application, April 10<sup>th</sup>, May 7<sup>th</sup>, May 14<sup>th</sup>



Participant #3 5<sup>th</sup> Metatarsal- April 3<sup>rd</sup> post debridement, April 3<sup>rd</sup> post application, April 10<sup>th</sup>, May 14<sup>th</sup>



## IMPLICATIONS FOR PRACTICE

- A new tissue regenerative scaffold\* used here provided reduced inflammation, new ECM matrix stabilization and stimulation of the participant's cells to facilitate effective healing.
- This product may help to provide a more effective treatment for HHWs by providing key features missing in current treatments.
- Effective offloading is a key ingredient to successful therapy

## REFERENCES

- (1) Tognetti, L. et al. Dermatologic Therapy. 2021;34:e14987; <https://doi.org/10.1111/dth.14987>
- (2) Hu, M.S., et al. 2018. Stem Cells Int. 2018, 6901983; <https://doi.org/10.1155/2018/6901983>
- (3) Zhao, R. et al., Int. J. Mol. Sci. 2016, 17, 2085; <https://doi.org/10.3390/ijms17122085>
- (4) Rasouli, M. et al., Acta Histochem. 123 (2021) 151785; <https://doi.org/10.1016/j.acthis.2021.151785>

## ACKNOWLEDGEMENTS

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