

Clinical Application of a Synthetic Hybrid-Scale Fiber Matrix* in a Chronic Diabetic Foot Wound

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Background

Non-healing lower extremity wounds can be challenging to treat, and often experience poor healing rates.¹ A synthetic hybrid-scale fiber matrix (SHSFM) could be a novel treatment option in the management of these difficult wounds. The SHSFM is engineered to mimic the structure of native human extracellular matrix in both size and structure, therefore encouraging cellular infiltration and proliferation.² The SHSFM then resorbs via hydrolysis at a controlled rate that matches tissue ingrowth.¹⁻² Prior studies of the SHSFM in lower extremity wounds have demonstrated healing rates of 75%-85% over a period of 12 weeks.^{1,3}

Methods/Patient History

A case study of a patient treated with the SHSFM was conducted. A female with a history of diabetes mellitus and hypertension was referred to the wound clinic after a left hallux amputation that resulted in an open wound. The patient underwent six weeks of antibiotics and vacuum-assisted closure (VAC) therapy to the wound with slow response. After VAC was discontinued, the wound was treated with a SHSFM. The matrix was applied to the wound with adhesive strips and covered with a non-adherent dressing and bolster. The patient returned to the clinic as appropriate for wound assessment and re-application.

Results

One patient with a non-healing diabetic foot wound was treated in this case study. The wound size prior to the first application of the SHSFM was 1.5 x 2.5 x 0.3 cm. The patient received a total of 2 applications of the SHSFM on a bi-weekly basis. Complete wound closure was observed 35 days after initial application of the matrix.

References

1. Abicht BP, Deitrick GA, MacEwan MR. Evaluation of wound healing of diabetic foot ulcers in a prospective clinical trial using a synthetic hybrid-scale fiber matrix. *Foot Ankle Surg (N Y)*. 2022;2(1):100135.
2. MacEwan MR, MacEwan S, Kovacs TR, et al. What makes the optimal wound healing material? A review of current science and introduction of a synthetic nanofabricated wound care scaffold. *Cureus*. 2017; 9(10): e1736.
3. Regulski MJ, MacEwan MR. Implantable nanomedical scaffold facilitates healing of chronic lower extremity wounds. *Wounds*. 2018; 30(8):E77-E80.

Initial Presentation (10/12/22)

- Female, Following 08/2022 left hallux amputation
- 3.2 cm x 1.5 cm x 1.0 cm



Post-Debridement (11/23/22)

- Received six weeks of VAC therapy and antibiotics
- 1.5 cm x 2.5 cm x 0.3 cm



Matrix Application (11/23/22)

- Hybrid-scale fiber matrix was fenestrated and applied to the wound bed



Matrix Application (11/23/22)

- Placed non-adherent dressing on top of hybrid-scale fiber matrix before applying 4 x 4 gauze, foam dressing and then securing with absorbable bandage



After 1 Application (11/28/22)

- Any residual hybrid-scale fiber matrix was reapplied to wound bed and secured with wound closure strips, non-adherent and foam dressings, followed by a bolster dressing
- 2.0 cm x 0.9 cm x 0.2 cm



After 2 Applications (12/06/22)

- Second application after 1 week
- 1.1 cm x 0.9 cm x 0.2 cm
- No inner layer dressings changed for next 2 weeks



After 2 Applications (12/20/22)

- Successful granulation giving way to progressive re-epithelialization
- 0.1 cm x 0.1 cm x 0.1 cm



After 2 Applications (02/07/23)

- Fully healed wound 11 weeks after first application of hybrid-scale fiber matrix



Conclusions

Chronic, non-healing lower extremity wounds can be difficult to manage, especially in the context of patients with multiple co-morbidities. In this case study, the SHSFM was utilized to successfully re-epithelialize a chronic lower extremity wound in a diabetic patient. The successful clinical application of the SHSFM in this case, as well as prior studies documenting successful use in this clinical setting, indicate that the SHSFM should be considered as a viable treatment option for patients with chronic, non-healing wounds.^{1,3}