# **Diabetic Limb Salvage and Successful Treatment of Necrotizing Fasciitis** Using a Piscine Acellular Dermal Matrix: A Case Report

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### Introduction

Necrotizing foot infections in the diabetic patient are complex clinical situations and have proven difficult to successfully manage. They are typically associated with high failure rates, amputations, increased morbidity, ultimately creating a considerable burden on health-care resources. The incidence of necrotizing fasciitis in diabetic patients is as high as 40% to 60%1, and the mortality rate is 15% to 35%.<sup>2,3</sup>

Management of lower extremity diabetic wounds includes a spectrum of treatment modalities. These range from offloading techniques, debridement, skin substitutes, surgical primary closure, skin grafting, local flaps, and free fasciocutaneous flaps. Each method can be useful, but they are often associated with complications including wound dehiscence, deep infection, graft failure, donor site morbidity, and flap loss causing subsequent amputation.<sup>4,5</sup> Following amputations, the 5-year mortality rate for these diabetic patients are estimated to be just over 60%.<sup>4</sup>

When treating chronic diabetic wounds, the provider often utilizes advanced allogenic or xenogenic skin graft substitutes for soft tissue coverage. Despite the multitude of treatment modalities available for such wounds, there is a paucity of information on the efficacy of skin and dermal substitutes including allografts and xenografts. These dermal substitutes are applied to soft tissue defects to enhance the wound environment, replace dermis, and minimize wound contraction. Piscine acellular dermal matrix (ADM) grafts have gained rapid recognition in wound care for its native dermal structural, porosity and biomechanical properties that favors rapid cell ingrowth and provides a natural bacterial barrier rich in Omega3 fatty acids. Omega3 fatty acids have been shown to assist the wound in leaving the chronic inflammatory state.<sup>6</sup> Fragmented piscine ADM properties allow for direct contact of the graft with traditionally difficult to graft areas such as deep wounds, tunneling, and irregular contour.

We illustrate a case report where a piscine ADM was utilized to reconstruct the soft tissue in a diabetic patient following a right foot infection with necrotizing fasciitis to allow for successful limb salvage.

### **Initial Presentation and Application**

A 70-year-old female with uncontrolled DM2 and ESRD presented to the investigator's private office with a concern for necrotizing infection to the right foot. She was sent to the ED for further workup and treatment. Subcutaneous emphysema surrounding the 4th and 5th rays was noted on x-ray and CT imaging.

She was taken to the OR for emergent amputation of the 4th and 5th rays. A V.A.C VERAFLO was applied to the amputation site and instilled with 0.25% Dakin's solution. Once initial bone biopsies returned and she was medically optimized, she was taken to the OR for repeat debridement 7 days following the initial amputation. A portion of the cuboid was resected, and the wound was noted to track to the plantar medial calcaneus.

A third debridement was performed 2 days later, and at this time an intact piscine ADM was applied to the wound bed. Of note, a portion of the resected cuboid bone was present and covered with the ADM. No V.A.C was used following initial piscine graft application, due to surrounding skin maceration.





Initial presentation



1 month following initial graft



Post debridement

# **Following 2nd Graft Application**



5 days



26 days



40 days

### Second Application

The initial piscine graft completely incorporated within 10 days of application, including complete coverage of the exposed cuboid bone. Local wound care was continued with a silver alginate dressing due to the amount of exudate. Continued tunneling was noted to the plantar calcaneus, therefore, a repeat application of the ADM was deemed necessary.

She was taken to the OR for a 4th debridement with piscine ADM application approximately 1 month following her initial amputation. Debridement was performed, and a fragmented piscine ADM was used to pack the tunneling wound and cover the base of the ulceration. An intact piscine ADM was then used to cover the fragmented ADM and the remaining wound bed. Of note, the 3rd metatarsal head was exposed and covered with the piscine ADM.



Fragmented graft



Sheet covering fragmented graft



### Results

Significant granulation tissue and coverage of depth was noted within the first week of application. Coverage of tendon and bone was noted as well. Skin graft substitute application allowed for complete closure and limb salvage. Complete healing of the large defect was noted 16 weeks after the 2nd graft application.

### Discussion

Necrotizing infections provide unique challenges due to the potential extent of tissue loss present and the rapid progression of the infection. Emergent I&D with amputation often leads large open wounds with exposed tendinous and osseous structures to add to the complexity of the initial infection. Limb salvage is often difficult, and the probability of a more proximal amputation has been noted to range from 15% to 24%.<sup>7</sup>

With our patient, 2 initial debridements were performed prior to piscine graft application. 2 applications of piscine skin graft substitute were then applied and allowed for rapid granulation. Complete healing of the large defect was noted 16 weeks after the 2nd graft application.

The utilization of a piscine skin acellular dermal matrix appears to be a viable option in the treatment of large defects secondary to necrotizing infections. It is our hope that this can provide clinical and surgical guidance to practitioners for similar limb salvage outcomes in necrotizing fasciitis of the lower extremity.

### References

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Conflicts of Interest: Dr. Barron is a paid consultant of Kerecis Limited. No other potential conflicts of interest to report.





54 days



68 days



16 weeks

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