## The Healina Powerof Nature

# Application of fish skin graft\* to salvage a complex foot wound with loss of the majority of the dorsum and heel of the foot resulting from necrotizing fasciitis

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#### INTRODUCTION

One of the primary goals for contemporary wound care is the ability to treat and salvage wounds that otherwise could not be treated. Salvage of a functional limb is the difference in many patients of having the ability to have a meaningful life versus the loss of independence and a marked decreased quality of life. Successful treatment of complex wounds encourages practitioners to push further and attempted salvage of limbs that in the past would have been considered not possible to save. This case represents a dramatic success in closing wounds on a foot that would have been judge by most practitioners to not be salvageable.

With all the other facets of care being utilized including appropriate IV antibiotics, diabetes control, confirmation of adequate arterial flow, nutritional support, and offloading with stability of the ankle and still a downward trend in the wounds with no evidence of healing. The addition of meshed fish skin graft to the wounds caused a dramatic reversal and progressive improvement to complete healing. Fish skin is a novel biologic that mimics the architecture of the human dermis and augments cellular proliferation and migration, leading to expedited healing in acute and chronic wounds2,3,4.

#### RESULTS

The patient's wound had improved dramatically at just one week and wound size had decreased from the dorsal wound measuring 8.4 cm x 5.5cm the heel measuring 5.2cm x 6cm to 1.5cm x 1.7cm and the dorsal wound had reduced in size to 0.2 x 0.2 x 0.1 over a period of 5 months. At this point he presented with an area of induration and erythema along his posterior mid- calf area which I had drained under local anesthesia and debrided The wounds on the heel and dorsum of the foot subsequently wend on to close completely. After eight total applications of fish skin graft, the patient's wounds have remained closed, and the patient has retained full function of his foot and ankle area.

#### METHODS

The patient is a 67-years old male with type 2 diabetes mellitus and is a non-smoker. He had presented with a serious foot infection and initially had debridement of both dorsal and plantar aspect of his foot along with the heel. Because of the extensive loss of tissue, I was asked to see him for a below-knee amputation. Following debridement of nonviable tissue, a negative pressure wound device was applied along with using a cam walker to stabilize his ankle. The patient has been discharged to a skilled nursing unit on IV antibiotics. Despite these appropriate care measures, he presented 2 weeks after being discharged with his wound dramatically deteriorating.

Meshed fish skin graft was applied over his wounds and bolstered with staples, a nonadherent layer and a negative pressure wound device was reapplied. After one week, his wound had dramatically improved. The patient subsequently underwent three additional applications of meshed fish skin grafts over the next several weeks. Prior to each application, the outer layers of the tendon were. After four applications of the meshed fish skin graft and the patient's continued progress, I switched him to a solid fish skin graft. The solid fish skin graft was applied to the wound four additional times.

### CONCLUSIONS

This case illustrates that even the worst foot wounds that many people would abandon as non-salvageable can be is saved now utilizing all the components of advanced wound care. The fish skin product has expanded treatment of these wounds to treat in this case a wound that was failing with all appropriate measures being done and resulted and salvage of the foot that has full function. and would otherwise have been amputated..

#### CASE: 67-YEAR-OLD MALE NECROTIZING FASCIITIS LIMB SALVAGE

Patient History: 67-year-old male with past medical history of diabetes mellitus (DMII) and non-smoker

Wound History: Patient presented with necrotizing fasciitis involving most of the dorsum of the calcaneus and Achilles tendon. After initial evaluation, pt was taken to the OR for extensive debridement of all necrotic material. A wound VAC was placed following debridement of the wound. Amputation was considered after the pt had undergone two previous debridements of the wounds.

Fish Skin Graft Applications: Four applications of meshed fish skin graft and four applications of the solid fish skin graft were applied in the WCC

Patient Outcomes: After eight total applications of fish skin graft, the wound decreased significantly in size and achieved complete closure including bone and tendon coverage. The patient regained sensitivity of the large defect following the use of fish skin grafts.





Fourth application of meshed fish skin graft, dorsal tendon area is covered with progressive coverage of the calcaneus and Achilles tendon





Following additional applications of solid and fenestrated fish skin graft

- L. Arhuidese I. Neiim R. Ako E. Cammer J.. Malas M: Survival after major lower extremity amputation in patient with end –stage renal disease. Journal of Vascular Surgery 2018, Volume 70, Issue 4, P1291-1298, October 2019
- Baldursson BT, Kjartansson H, Rolfsson O, Sigurjonsson GF. Regenerative and Antibacterial Properties
- 10.1177/1534734615573661. Epub 2015 Mar 9. PMID: 25759413. 4. Lullove, E. J., Liden, B., Winters, C., McEneaney, P., Raphael, A., & JC, L. I. (2021). A Multicenter, Blinded, Randomized
- Controlled Clinical Trial Evaluating the Effect of Omega-3-Rich Fish Skin in the Treatment of Chronic, Nonresponsive Diabetic Foot Ulcers. Wounds: a Compendium of Clinical Research and Practice.