ABSTRACT

Title: ***A Case Report Using Biologically Active Cryopreserved Human Skin Allograft for the Treatment of a Non-Healing Diabetic Foot Ulceration.***

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Introduction:
The multi-disciplinary team approach and continuity of care for diabetic wound care remains the mainstay for treatment of lower extremity wounds and the prevention of limb loss in diabetics. Regularly scheduled sharp wound debridements removing biofilm continues to be the conventional gold standard, however most treatments involve adjunct dressings and therapies.

Objective:
To demonstrate human bioactive cryopreserved split thickness skin allograft (Theraskin®) is a beneficial alternative option in the treatment of chronic non-healing diabetic foot wounds.

This case report involves a 69 year old male with diabetic mellitus with long term sequelae of peripheral neuropathy, multiple comorbidities, and multiple non-healing chronic ulcers localized to bilateral feet. His right foot wound had been present for over 1 year with no signs of healing and a mixed fibrotic-necrotic wound base measuring approximately 4.0cm x 3.0cm x 0.4cm. The patient has failed various conservative treatment modalities. A decision was made to try the all human bioactive cryopreserved split thickness skin allograft.

What is Theraskin® & mechanism of action:
Theraskin® is a biologically active cryopreserved human skin allograft consisting of both epidermal and dermal layers. The allograft biodressing consists of living cells, growth factors, and a native extracellular matrix. The 3 major components of wound healing in Theraskin® consist of localized signaling molecules (growth factors, cytokines), living cells (fibroblasts keratinocytes) and the native extra cellular matrix (ECM) which contributes to structural support, a substrate for cell movement, binding and releasing of growth factors & cytokines, and direct interactions with the recipient cells and cell receptors. The amount of the type I and type III collagen, as well as the ratio of type I to type III collagen in TheraSkin, is equivalent to fresh unprocessed human split-thickness skin. Fresh human skin and TheraSkin had similar quantities of vascular endothelial growth factor, insulin-like growth factor 1, fibroblast growth factor 2, and transforming growth factor β1. *(1)*
Furthermore, Theraskin ® independent research reports the mechanism of action consists of graft (1) imbibition within 24 hours allowing for absorption from the underlying recipient bed. After 48 hours, the (2) inosculation phase demonstrates blood vessels from the graft itself adhere (“inosculate”) to the blood vessels of the recipient bed. Lastly, within 72 hours, (3) revascularization is noted showing recipient bed blood vessels growing into

the graft. This revascularization is noted through near Infrared Spectroscopy. (Theraskin®)

Methods/Procedure:

In our case report, the patient has had a right foot sub- 5th metatarsal wound for over 1 year. Various treatment modalities, such as routine weekly sharp debridements in clinic, with wet-to-dry dressings and later, hydroalginate anti-microbial dressings (Silvercel®) was attempted with no long-lasting resolution nor significant wound healing. The patient was subsequently taken for sharp surgical debridement of the right foot wound in the operating room. Using a 15 blade & forceps followed by a ronguer, sharp surgical debridement was performed until a granular wound base was revealed. Sharp and blunt dissection was continued in preparation for the application of Theraskin skin graft. The surgical site was then copiously irrigated with normal saline. At this time, Theraskin ® was then placed within the margins of the wound in entirety and affixed to the circumferential skin using 5-0 nylon sutures. Adequate wound coverage was noted with no buckling nor sloughing. At this time, the graft sites were then covered with a sterile lightly compressive dressing consisting of 4x4s, ABD pads, kling, and light coband. The patient followed up weekly for continued monitoring and anticipated 2nd graft application 3 weeks postop.

Results:

At first post-op check 1 week out, the graft showed noticeable signs of incorporating with no signs of acute infection or drainage. The sutures were removed. The graft incorporation was noted to be approximately 75% in 1 week with red, beefy granular wound base noted where incorporation had occurred and some graft sloughing noted centrally as the epidermal layer of the graft was rejected, as expected. Full incorporation was noted approximately at day 14. At this point, expected full rejection of the epidermal layer was observed and the dermal layer was fully absorbed into the wound bed. At 3 weeks out, a 2nd surgical application of the graft was applied intra-operatively. The results were similar to the first application with even more granular tissue within the wound base, a significantly smaller wound, in both size and depth. By post-op week 3 of the 2nd application the wound was noted to show substantial signs of epithelization, near closure, and unsurpassed wound healing compared to prior years of standard treatments.



Conclusion:

We conclude that Theraskin® human bioactive cryopreserved split thickness skin allograft is an alternative option in the treatment of chronic non-healing diabetic foot wounds. This is a promising therapeutic alternative for patients with refractory diabetic foot ulcers, who have failed conventional therapies. *In a retrospective cohort study evaluating 188 patients with diabetic foot ulcers or venous leg ulcers, Theraskin had high successful closure rates: Percent of DFUs closed at 12 and 20 weeks were 60.38% and 74.10%, respectively. Percent of VLUs closed at 12 and 20 weeks were 60.77% and 74.60%, respectively *(2)* Further research is needed.

(1) https://onlinelibrary.wiley.com/doi/epdf/10.1111/iwj.13231
(2) https://pdfs.semanticscholar.org/ceaf/b8145da54719baa9a7832ffc6af6a5245b5c.pdf