Use of Human Reticular Dermis Graft* to Heal Ischemic Wounds

Nikul Panchal, DPM, FACFAS

mtfbiologics
Science Driven. Patient Focused.

INTRODUCTION

Ischemic wounds pose significant challenges in the healing process. The lack of oxygen and nutrients due to impaired circulation hinders normal cellular activities necessary for wound repair[1]. Ischemia also leads to the accumulation of metabolic waste products, further impairing the wound healing cascade[2]. Additionally, ischemic wounds often exhibit compromised immune response and increased susceptibility to infection[3]. Moreover, the presence of underlying conditions like peripheral artery disease or diabetes exacerbates the difficulty in healing ischemic wounds[2].

Human Reticular Dermal Graft (HRDG)* derived from donated human dermal tissue, provides a natural scaffold for cellular infiltration and tissue regeneration. Meshed HRDG contains a dense network of collagen fibers, growth factors, and extracellular matrix components that promote angiogenesis and neovascularization in ischemic wounds. It supports the formation of granulation tissue, facilitating wound closure and re-epithelialization[4]. The goal of this study is to provide evidence of the ability of the meshed HRDG to support an ischemic limb with documented pulselessness beyond the knees.

METHODS

Patient with non-dopplerable pulses distal to the poplitieal arteries B/L developed dry gangrene of the entire hallux. Due to poor peripheral blood flow, vascular surgery recommended a below the knee amputation. Patient already had previous angioplasties and arterial bypass surgeries, after which only the arteries in the thigh remained patent. Patient refused and wanted to pursue all possible options to save the limb. A partial first ray resection was performed, after which the subsequent amputation stump became necrotic. Site was debrided and HRDG was applied along with negative pressure wound therapy. Only one application of HRDG was performed.

RESULTS

The ischemic wound healed without incident and the patient avoided a below the knee amputation. At one year follow-up, the patient did not have any recurrence of the original wounds, no new wounds, and an intact limb.

CONCLUSIONS

The unique properties of HRDG make it a valuable option for supporting healing in ischemic wounds, and more importantly, helped prevent more proximal amputations. Anatomically, the reticular dermis has an open, uniform structure with preserved matrix proteins, that support angiogenesis and neovascularization in these wounds that have a desperate need for it. Remarkably, only one application was required which proves its efficiency and overall cost effectiveness. Further application of this product in this manner is warranted to solidify it as a standard of care for treating ischemic ulcerations.

CASE REPORT

Patient Information: 80 year old female

Symptoms: Severe ischemic pain to the hallux not responsive to narcotic, increased dysvascular changes

Wound Information: Dry gangrene of the hallux

Duration: 8 months, worsened significantly over the past few weeks

Medical history: DM2, CHF, HTN, CAD, Gout

Surgical history: Coronary angioplasty with stenting, Tonsillectomy, Lower extremity angiography, Lower extremity fem-pop bypass

Allergies: Vancomycin, Vitamin B + C Complex [Allbee-c], Vitamin B12, Zosyn [Piperacillin Sod-tazobactam So], Penicillin

Initial Examination/Wound History:

- Patient with non-dopplerable pulses distal to the poplitieal arteries B/L developed dry gangrene of the entire hallux.
- Due to poor peripheral blood flow, Vascular Surgery recommended a below the knee amputation.
- Patient already had previous angioplasties and arterial bypass surgeries, after which only the arteries in the thigh remained patent.
- Patient refused and wanted to pursue all possible options to save the limb.

Treatment:

- A partial first ray resection was performed, after which the subsequent amputation stump became necrotic.
- Site was debrided and HRDG was applied along with negative pressure wound therapy.
- Only one application of HRDG was performed.

Outcome:

- The ischemic wound healed without incident and the patient avoided a below the knee amputation.
- At 1-year follow-up, there was no recurrence of the original wound, no new wounds, and an intact limb.

Week 0: Pain with dysvascular changes

Week 8: Necrosis of the hallux with increased pain

Week 9: s/p partial first ray resection

Week 10: s/p partial first ray resection, incision was necrotic

Week 12: s/p revisional partial first ray resection, site was packed open with antibiotic beads

Week 13: s/p debridement of wound/ application of HRDG (POD#0)

Week 13: s/p debridement of wound/ application of HRDG (POD#2)

Week 14: s/p debridement of wound/application of HRDG (POW#1)

Week 15: s/p debridement of wound/ application of HRDG (POW#2)

Week 19: s/p debridement of wound/ application of HRDG (POW#6)

Week 20: s/p debridement of wound/application of HRDG (POW#7)

Week 21: s/p debridement of wound/application of HRDG (POW#8)

Week 22: s/p debridement of wound/application of HRDG (POW#9), NPWT was discontinued at this time and the patient went back to her home overseas. One year follow up was performed via phone call, at which time the patient confirmed there was no wound recurrence after healing nor any further amputation.

REFERENCES

1. Younan G, Guleserian K, Zahka KG, Backer CL. 2016. Ischemic heart disease. In Moss and Adams' Heart Disease in Infants, Children, and Adolescents (9th ed., pp. 772-798). Lippincott Williams & Wilkins.

2. Akita S, Akino K, Yakabe A. 2016. Ischemic wound healing: A new model of impaired wound healing in the aged. *Wound Repair and Regeneration*, 24(2):287-293.

3. Rao D, Goldstein LJ, Corbett DR, Kavounis KM, Voellinger CR, Raghu AV, Granick MS. 2018. Ischemic wounds: definition, types, and etiology. *Wounds*, 30(7):204-209.

4. Carty MJ, Pribaz JJ, Antaya RJ, DeSanti L, Huang C, Mooney D, Orgill DP. 2017. Design, characterization, and clinical application of a completely autologous bioengineered skin-substitute graft. *Journal of Burn Care & Research*, 38(3):155-162.

***SomaGen® (MTF Biologics, Edison, NJ)**