Addressing Complex Wounds with Aseptically Processed Pre-meshed Human Reticular Dermal Allografts*

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ABSTRACT

Complex wounds can require surgical reconstruction with grafts, flaps, and negative pressure wound therapy (NPWT)[1]. Aseptically processed human reticular acellular dermal matrices (HR-ADMs) provide the architecture for cell infiltration[2], and have supported natural wound closure[3]. Pre-meshed HR-ADMs can be expanded to cover large defects, facilitate drainage of exudate from the wound surface and save OR time from meshing. This study examined how pre-meshed HR-ADMs aid in the natural rebuilding of complex wounds.

Case 1 is a 46-year old, diabetic male, with gas gangrene on his right foot. Surgical intervention included primary amputation of the 4th, 5th toes with their respective metatarsal heads and debridement of non-viable tissue. Infection was decompressed along the plantar foot extending toward the plantar medial rear-foot. The plantar fascia was removed, debrided to healthy bleeding muscle and packed with 0.25% sodium hypochlorite solution for 3 days. Subsequently, in the OR, pre-meshed HR-ADM was applied, secured with staples/nylon suture, dressed with oil emulsion dressing, treated with NPWT and off-loaded with a knee walker. Weekly vacuum changes were performed until graft incorporation (3 weeks) with complete granulation observed at 10 weeks.

Case 2 is a 56 year old, diabetic male with bilateral forefoot dry gangrene. A guillotine transmetatarsal amputation was performed due to compromised tissue perfusion and extensive soft-tissue necrosis after failing 1st and 2nd ray resections. Post-amputation, pre-meshed HR-ADM was secured over the exposed metatarsal heads (to help expedite granulation), dressed with oil emulsion and NPWT. 80% graft take was observed at first post-op visit. Wound vacuum was changed weekly with debridement of necrotic tissue culminating in substantial rebuild of the wound bed.

These cases demonstrate the potential role of pre-meshed HR-ADMs for treating complicated wounds. By providing the natural inherent structure to support granulation activities, pre-meshed HR-ADMs with NPWT aid tissue reconstruction in complex wounds.

MATERIALS AND METHODS

Human dermis was recovered from donors with research consent, and the tissue was aseptically processed at the Musculoskeletal Transplant Foundation (Edison, NJ) according to Good Tissue Practices (Figure 1).

Two patients (46 and 56 year olds) with diabetes were diagnosed with complex wounds on their feet. In addition to tissue grafts, negative pressure wound therapy (NPWT) was used.

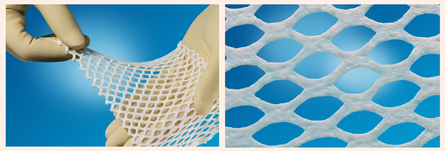

Figure 1: Representative images of meshed HR-ADM with a 3:1 meshing ratio.

CONCLUSION

These two cases demonstrate that pre-meshed HR-ADMs can be used for treating complex wounds.

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CASE 1

Patient Information: 46 year old male with Type II Diabetes, HbA1c of 9.6.

Wound History: Patient was febrile to 101.3F with soft tissue emphysema and grossly infected wound right foot 4th metatarsal head. The wound was there for several weeks and the fever started 4 days prior to the hospital admission.

Wound Size: 2cmx1cmx1cm

Initial Examination:
- Primary amputation of the 4th and 5th toes with their respective metatarsal heads.
- Lateral foot was debrided extensively to remove all non viable tissue.
- Infection was decompressed along the plantar foot extending toward the plantar medial rearfoot.
- Plantar fascia was removed and debridement was carried down to level of healthy bleeding muscle.
- Wound was packed with 0.25% Sodium Hypochlorite (Dakin's solution).

Treatment:
- 3 days after initial treatment, repeat debridement was performed. Pre-meshed HR-ADM was secured with staples and nylon suture and dressed with oil of emulsion and NPWT at 125 mmHg.
- Weekly VAC changes were performed until complete graft incorporation was achieved 3 weeks after application of graft.
- Strict non weight bearing for three weeks followed by heel weight bearing in surgical shoe.

Outcomes:
- Complete wound closure achieved at 10 weeks.

Initial Wound (t=0)

Post incision and drainage

After 3 days of Dakin's solution

Placement of pre-meshed HR-ADM

Placement of dressing over HR-ADM

Day 6

Day 18

Day 75

CASE 2

Patient Information: 56 year old male with type II diabetes and history of myocardial infarct, peripheral vascular disease, hyperlipidemia, hypertension, and coronary artery disease.

Wound History: Patient developed a bilateral forefoot dry gangrene and failed 1st and 2nd ray resection.

Wound Size: 4cmx6.5cm with exposed bone of 1st and 2nd metatarsal heads

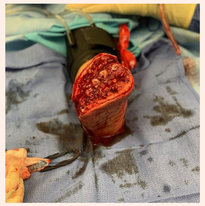
Initial Examination:
- A guillotine TMA was performed as a result of severely compromised tissue perfusion and extensive soft tissue necrosis.

Treatment:
- After amputation, necrotic tissue was removed.
- The pre-meshed HR-ADM was secured over the metatarsal heads to help expedite granulation over the exposed metatarsals.
- Graft was secured with skin staples and 3-0 nylon sutures and dressed with oil of emlusion and negative pressure wound vac therapy.

Outcomes:
- 80% graft take was observed with the first post-op visit.

Day 0 - Initial wound

Post amputation



Placement of pre-meshed HR-ADM

Placement of dressing over pre-meshed HR-ADM

Day 14

Day 21