The Healing Power of Nature

Complicated Wounds Following Vascular Surgery: Is it Appropriate to Try and Save the Limb, or are efforts futile, and a Proximal Amputation Indicated

Karl Stark, MD, FACS, FSVS
Midwest Aortic and Vascular Institute, Kansas City, MO

Kerecis®

INTRODUCTION

Wound complications following vascular surgery procedures present unique problems related to medical comorbidities and abnormal tissues at the wound site. These are often related to the indication for the procedure. Clinically, physicians must decide to abandon attempts at limb salvage and do a proximal major amputation. Amputation, in these high risk patients for example at the above knee level have a median survival of six months. At the below knee level this increases to 16 months. Clearly showing the severe mortality associated with either.[1] Therefore, the implications for limb salvage aided by advanced therapies are imperative. 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 wounds[2,3,4].

METHODS

Chart review of a series of patients with an incision-related, and other complication that had not healed, and a decision had to be made between proximal amputation or attempted limb salvage. Each patient represented unique combinations of medical and local wound morbidities. Patients' progress in healing was recorded, along with each modality utilized in the patient's care. The patients had multiple comorbidities, including cardiac issues such as congestive heart failure, diabetes mellitus, chronic renal failure, and protein and calorie malnutrition. Local wound conditions included severe edema, residual ischemia, and infection.

Along with intensive management of the medical problems as possible, multiple wound management modalities were utilized, including appropriate debridement, negative pressure wound device, selective use of some compression wraps, and fish skin xenograft of various configurations. These patients did not undergo hyperbaric oxygen therapy because they did not meet the indicated criteria.

*Kerecis™, Kerecis, Isafjordur, Iceland

CASE 1: 65-YEAR-OLD MALE SEVERE RIGHT LEG ISCHEMIA S/P FASCIOTOMY

Patient History: 65-year-old male with past medical history of diabetes mellitus (DMII), congestive heart failure, coronary artery disease, and chronic renal failure stage III

Wound History: Patient presented to the ER with an acutely ischemic right leg. Initial endovascular intervention was attempted and failed. The Pt underwent a femoral to dorsalis pedis bypass on 9/12/22 with an anterior compartment fasciotomy done along with the revascularization. Initial wound and medical management was used

Fish Skin Graft Applications: Six applications of intact fish skin graft applied in the WCC

Patient Outcomes: After five applications of intact fish skin graft, the wound decreased significantly in size and achieved complete closure including tendon coverage. Progress was interrupted when pt developed acute cardiac symptoms and underwent a below knee amputation (BKA)


Initial presentation with edema of leg and exposed muscle


Edema is controlled and healthy granulation bed ready for grafting


First application of meshed fish skin graft secured with staples


Week 10 Follow up
Epithelium is advancing and decrease in wound size


Week 12
Additional applications of solid intact fish skin graft


Week 14
Follow up
Advanced epithelization


Week 16
Wound size has decreased significantly

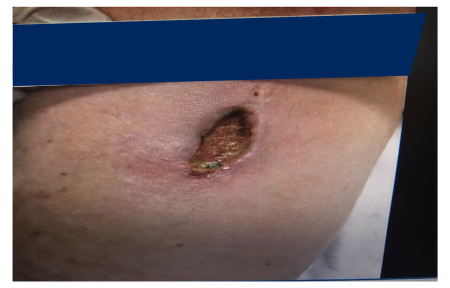
CASE 2: 76-YEAR-OLD MALE LIMB SALVAGE

Patient History: 76-year-old male with past medical history of stage three chronic kidney diseased and was a smoker

Wound History: Patient was seen as a referral for an above knee amputation. He had multiple arterial interventions of his right leg. His last intervention was a re-do femoral tibial bypass. It had failed and pt had complained of pain improved by danging. Pt did not allow compression therapy because of the increased pain. Local anesthesia was injected around the wound and nonviable tissue was debrided.

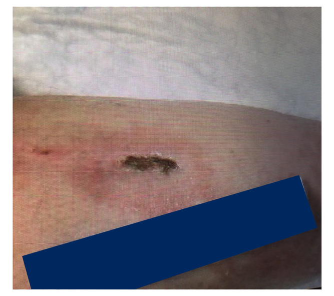
Fish Skin Graft Applications: Weekly applications of intact fish skin graft were done

Patient Outcomes: After application of intact fish skin graft, wound healing progressed with improvement in the peri-wound and significant reduction of wound size. At 9 weeks, wound achieved complete closure and rest pain was resolved.


Initial presentation


Week 2


Week 7 Follow up


Week 9
Final healing outcome
Wound from incisional dehiscence closed

CASE 3: COMPLEX PATIENT WITH SEVERE LEFT LEG ISCHEMIA

Patient History: 54-year-old male with past medical history of diabetes mellitus (DMII) along with arterial disease, peripheral neuropathy, cardiomyopathy and atrial fabulation. He was on chronic hemodialysis. He had revascularization of his left leg for ischemia complicating cholesterol embolism of the left foot and underwent a trans metatarsal amputation (TMA).

Wound History: Patient presented with a right heel ulceration that continued to worsen. He underwent a successful arteriogram with tibial atherectomy and angioplasty, but wound showed poor progression and was found to have associated osteomyelitis of the calcaneus. It was treated with a partial calcanectomy and antibiotics. Also treated with negative pressure wound therapy and several advanced wound treatment products used with no benefit. This led to the use of the fish skin graft product.

Fish Skin Graft Applications: Four applications of intact fish skin graft

Patient Outcomes: After four applications of intact fish skin graft, the wound decreased in size and achieved full closure at 11 weeks. Both limbs remained healed.


Initial presentation


Month 1


Month 2


Week 1 post initial application of intact fish skin graft
Wound size: 5.8x4.7x.3cm


Week 2 Follow up
Wound size: 5.4x.4.0x.1cm


Week 11 Following two subsequent applications of intact fish skin graft, wound achieved complete closure

RESULTS

In this group of patients, wound healing occurred, despite conditions where many vascular surgeons would have recommended amputation. Healing times varied, but once medical problems and local wound issues were controlled, steady progress was seen, and amputation was avoided.

CONCLUSIONS

Severe wound complications in vascular surgery are often associated with multiple comorbidities, making closure doubtful, if not minimally difficult. Managing patients' medical problems concurrent with fundamental wound care can result in limb salvage in many of these patients. This series illustrates a pathway in the management of these complex patients. Specifically, fish skin provides a viable limb salvage option in high-risk patients and may reduce future mortality.

References

1. Adams, B. E., Edlinger, J. P., Ritterman Weintraub, M. L., & Pollard, J. D. (2018). Three-Year Morbidity and Mortality Rates After Nontraumatic Transmetatarsal Amputation. The Journal of foot and ankle surgery : official publication of the American College of Foot and Ankle Surgeons, 57(5), 967–971. https://doi.org/10.1053/j.jfas.2018.03.047
2. Magnusson S, Baldursson BT, Kjartansson H, Rolfsson O, Sigurjonsson GF. Regenerative and Antibacterial Properties of Acellular Fish Skin Grafts and Human Amnion/Chorion Membrane: Implications for Tissue Preservation in Combat Casualty Care. Mil Med. 2017 Mar;182(S1):383-388. doi: 10.7205/MILMED-D-16-00142. PMID: 28291503.
3. Baldursson BT, Kjartansson H, Konrádsdóttir F, Gudnason P, Sigurjonsson GF, Lund SH. Healing rate and autoimmune safety of full-thickness wounds treated with fish skin acellular dermal matrix versus porcine small-intestine submucosa: a noninferiority study. Int J Low Extrem Wounds. 2015 Mar;14(1):37-43. doi: 10.1177/1534734615573661. Epub 2015 Mar 9. PMID: 25759413.