Addressing Midfoot Charcot Reconstruction Surgical Wound Complication with Fragmented Acellular Fish Skin Graft Augmented with Bone Marrow Aspirate- Case Study

[1]Edgar Sy, DPM, AACFAS, [2]Jonathan Hook, DPM, MHA, FACFAS

1: Fellow, Weil Foot & Ankle Institute, Chicago, Illinois

2. Fellowship Director, Weil Foot & Ankle Institute, Chicago, Illinois

Introduction

Chronic wounds can be both detrimental to the patient and a financial burden on our health system.[1] A cause of chronic wounds is the presence of chronic inflammation and resident cells with reduced ability to produce growth factors.[2] Understanding the severity of this complication warrants research into a solution to heal these wounds rapidly and effectively. Acellular fish skin grafts contain omega-3 polyunsaturated fatty acids, which reduce inflammatory responses and advance cytokines to promote wound healing; a new form of these grafts is divided into tiny fragments (0.15 cm) that can mold into wound beds. Bone marrow aspirate contain hematopoietic stem cells, including mesenchymal stem cells, which have been reported to have the ability to convert into many cell types due to their naive state.[3] In this study, we review the combination of fragmented acellular fish skin grafts and bone marrow aspirate in its effectiveness to achieve wound closure in chronic wounds.

Patient History

65 year old with past medical history of diabetes mellitus, gastroesophageal reflux disease, hepatitis C, hyperlipidemia, and obstructive sleep apnea.

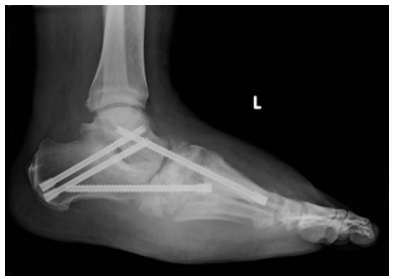

Figure 1. Post-operative radiographs s/p midfoot Charcot beaming and subtalar joint arthrodesis

Methodology & Procedures

A 65 year old male with a chronic non-healing ulcer to the dorsal midfoot who had failed previous wound care treatment was taken to the OR for initial debridement and grafting. Wide sharp excision was performed and all non-viable tissue was removed from the wound bed.

Bone marrow aspirate was obtained from donor site in the distal tibia and the fragmented fish skin graft was then rehydrated in normal saline. These were then mixed and applied to skin depth before the usual dressings were applied.

Graft Application

Single application of fragmented fish skin graft.

Figure 2. Post-operative radiographs s/p removal of orthopedic hardware and application of external fixator

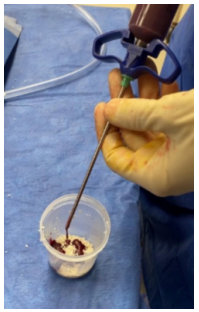

Figure 3. Intra-operative clinical picture of calcaneal bone marrow harvest combined with acellular fish skin

Results

Wound achieved closure at 5 months with no complications

Discussion

Kerecis® Omega3 Wound graft (Kerecis), a new technology incorporating intact fish skin, is rich in omega-3 polyunsaturated fatty acids. Developed in 2009, the graft consists of skin from Icelandic cod. When one applies this modality to wound beds, the graft recruits the body's own cells and is ultimately turned into living tissue. The product itself acts as a bacterial barrier and promotes three-dimensional cellular ingrowth in comparison to human amnion grafts.[4] Bone marrow aspirate in combination with fragmented acellular fish skin grafts are applicable in a wide range of disease processes with consistent, durable results. Due to medical comorbidities as well as these chronic ulcerations, these patients are at an increased risk for amputation. As physicians who provide wound care, we should be striving to provide our patients with the best outcomes possible. Having full wound closure at 5 months is a reasonable time with a complex wound such as this. Further double-blinded, randomized controlled trials are recommended to determine the clinical effectiveness and utility of the Kerecis Omega3 Wound graft for wound healing in the setting of chronic wounds.

Figure 4. Intra-operative clinical images of calcaneal bone marrow harvest combined with fragmented acellular fish skin capped with Kerecis graft

References

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