Application of abductor digiti minimi muscle flap and synthetic electrospun fiber matrix* after resection of osteomyelitis of fifth metatarsal

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Introduction

Osteomyelitis is a common complication associated with the diabetic foot.[1] Surgical treatment of osteomyelitis involves debridement/ amputation of the involved tissue and bone.[1] This can leave patients with large wound defects. Diabetic patients often experience poor wound healing related to poor circulation.[2] Following surgical intervention, use of muscle flap may be considered to fill in the wound defect, cover exposed bones, improve local blood flow to the area and encourage healing.[3,4]

A synthetic electrospun fiber matrix (SEFM) could be considered to augment the flap procedures and reduce risk of necrosis or flap failure. The engineered design of the electrospun matrix encourages cellular infiltration and neo-vascularization which could further support wound healing following flap procedures in a high-risk setting.[5]

Methods

A retrospective review of 2 patients aged 62 and 70 with history of renal transplant, peripheral artery disease, and diabetes who received SEFM in conjunction with a muscle flap procedure was conducted. In each case, the patient presented with gangrenous wounds requiring operative debridement or amputation of the 5th metatarsal to address underlying osteomyelitis. Following this, proximally or distally based abductor digiti minimi muscle flap was performed to fill in the wound defect. A full sheet of SEFM was then applied over the muscle flap. Both patients returned bi-weekly for wound monitoring and reapplication of the SEFM as clinically indicated.

Results

One patient received a 2nd SEFM application to both wounds, and the other patient underwent autogenous split-thickness skin grafting (STSG) to the muscle flap. Both wounds achieved complete closure at around 14 weeks.

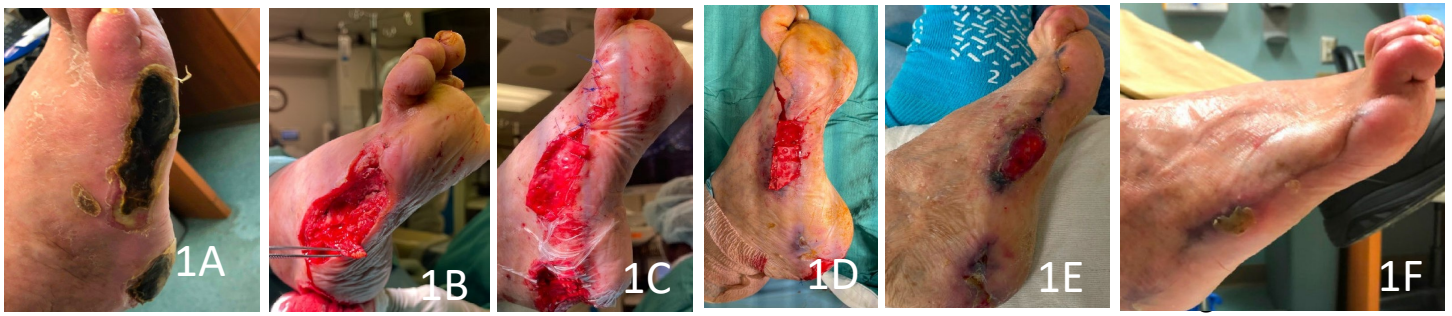

Figure 1: Progressive healing of a gangrenous wound on the lateral foot. 1A: Initial presentation. 1B: Harvest of proximal abductor digit minimi muscle flap after resection of gangrenous tissue and osteomyelitic bone. 1C: application of the SEFM over the muscle flap. 1D: 2nd application of the SEFM applied at week 8. 1E: wound size reduction and granulated wound bed at week 10. 1F: Complete closure at week 14.

Figure 2: Progressive healing of a gangrenous wound on the lateral foot. 2A: initial presentation. 2B: harvest of distal perforator-based abductor digiti minimi muscle. 2C: Distal abductor digiti minimi muscle flap applied to the wound following resection of necrotic tissue and osteomyelitic bone: 2D: The SEFM applied over the muscle flap. 2E: Wound appearance at week 2. 2F: Application of a split-thickness skin graft at week 8. 2G: Complete graft incorporation and closure at week 14.

Discussion

Both patients achieved complete wound closure following SEFM augmentation of muscle flaps on the foot. The SEFM supported granulation tissue formation and healing over the muscle flap in diabetic patients with a history of gangrenous wounds and osteomyelitis. No evidence of necrosis was observed in either patient. Use of the SEFM in this setting could be a novel approach to the management of post-osteomyelitis surgical wounds.

Trademarked Items *Restrata® Acera Surgical, Inc., St. Louis, MO

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