Flexor Digitorum Brevis Muscle Flap for Coverage of Exposed Calcaneus in Necrotizing Soft Tissue Infection

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Statement of Purpose

Management of soft tissue defects of the plantar foot with exposed avascular structures is challenging to treat. The use of local intrinsic flaps, such as the flexor digitorum brevis muscle flap, can be used to manage deficits with exposed calcaneus while maintaining minimal morbidity in these complex patients.

Literature Review

Necrotizing soft tissue infections are rapidly progressive, limb- and life-threatening, and often leave significant soft tissue deficits. Early recognition and aggressive surgical management are imperative for favorable outcomes. Local intrinsic muscle flaps have demonstrated high success when used for coverage of avascular structures in diabetic patients (1). Diabetes has not been shown to affect the success rate of pedicled muscle flaps and may be a valuable procedure for limb preservation. When compared with historical diabetic controls with regards to amputation, limb salvage appears to prolong survival of diabetic patients. Pedicled muscle flaps have been shown to be as effective as free flaps for coverage of complex foot and ankle defects (1). Local muscle flaps are a simpler, less expensive, and a successful alternative to microsurgical free flaps for defects that have exposed bone with or without osteomyelitis, tendon, or joint at their base (2). Muscle flaps were first introduced by Ger in the 1960s and gained popularity/utility due to their low donor site morbidity and durability to fill dead spaces and defects (3). The distal end of the muscle is often rotated to contour the void of the wound, cover exposed structures, and fill deficits. These muscle flaps may also be used in conjunction with osteotomies or offloading to provide versatile soft tissue coverage along with vascularity to soft tissue and devitalized bone (4, 5). A study by Furukawa et al evaluated the potential long-term complications of reconstruction of the heel using the flexor digitorum brevis muscle flap, with successful outcomes reported.

Case Study

A 49-year-old diabetic male initially presented with severe sepsis, a LRINEC score of 13, and concern for a necrotizing soft tissue infection of the bilateral lower extremities. Imaging showed soft tissue gas throughout the plantar aspect of the right midfoot and forefoot, along with cortical erosions along the plantar aspect of the posterior calcaneus. The left foot was deemed non-salvageable given extensive osseous necrosis of the calcaneus and cuboid and resulted in a below knee amputation. The right foot was successfully salvaged after serial debridements and ultimately a flexor digitorum brevis muscle flap was utilized to cover the exposed calcaneus after control of the infection was achieved. The patient has remained healed and resumed walking with a follow up of 16 months.

Case Study Continued

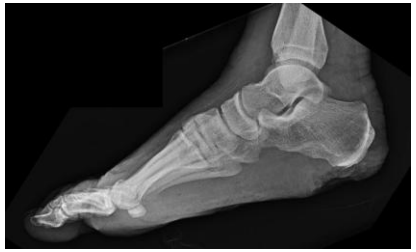

Figure 1: Pre-op radiograph

Figure 2: Pre-op clinical image

Table 1: Lab values

C-reactive protein (mg/L)	**144.7**
White blood cell count (x 1000/µL)	**29.0**
Hemoglobin (g/dL)	**9.5**
Sodium (mmol/L)	**124**
Creatinine (mg/dL)	**4.12**
Glucose (mg/dL)	**506**

Serial debridements were performed to salvage the right foot and obtain control of the infection. The flexor digitorum brevis muscle flap was elevated and rotated in a retrograde fashion. The flap was elevated distally by transecting the tendinous slips and carefully elevated proximally so as to allow for coverage of the calcaneus. Doppler examination was performed to identify perforating vessels as well as visual identification of perforators during the procedure. The flap was inset loosely over the calcaneus with monocryl suture. A wound VAC was later applied and wound healing was achieved through secondary intention.

Case Study Continued

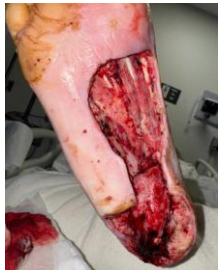

Figure 3: Post-op day 2

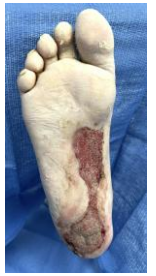

Figure 4: Post-op day 60

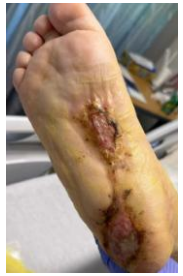

Figure 5: Post-op day 90

Analysis and Discussion

Necrotizing soft tissue infections in the context of diabetic foot infections are rapidly progressive, limb- and life-threatening, and characterized by extensive tissue necrosis. Early recognition and aggressive surgical management are imperative to reduce morbidity and mortality in this high-risk group as amputation has been shown to have a 5-year mortality rate exceeding 70% which is worse than most cancers (6). Minimizing host morbidity while providing coverage of advanced soft tissue deficits with avascular structures is critical for limb preservation in these highly co-morbid individuals. Intrinsic muscle flaps have been shown to be a viable option in the coverage of these deficits. The limb salvage rate with intrinsic muscle flaps in diabetic patients ranges from 91-94%, which compares favorably to amputation outcomes and may prolong survival in this population (2).

References

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