The Utility of Abductor Digiti Minimi and Flexor Digiti Minimi Rotational Flaps for 5th Metatarsal Base Chronic Osteomyelitis

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Statement of Purpose

To present a case of successful limb salvage utilizing intrinsic muscular rotational flaps in order to cover exposed bone.

Literature Review

Chronic osteomyelitis is a progressive inflammatory process caused by invasion of microorganisms and results in significant bony destruction and ultimately sequestrum formation. Chronic osteomyelitis presents a unique challenge to the podiatric surgeon, represents a major financial burden for all health systems and significantly affects the quality of life of patients. Aggressive management is key for improving the overall prognosis and outcome of these complex wounds with underlying chronic bone infection (1). The four key principles guiding management include adequate bony debridement of dysvascular bone and surrounding soft tissue, stabilization of remaining bone, targeted antibiotic treatment and coverage of defects with vascularized soft tissue (2). There is significant utility of local muscle flaps for soft tissue coverage of small and medium sized defects in the foot. Local muscle flaps additionally have the added benefit of low morbidity and relative ease of harvest and inset in comparison to more complex soft tissue coverage procedures like free flaps. They have immediate blood supply and dissection is relatively straightforward (3). Attinger et al published a retrospective review of their patients treated with local muscle flaps. They had a healing rate of 84% in diabetic patients and 92% in non-diabetic patients with no significant difference between the two groups (4). The abductor digit minimi flap is well described in literature and noted to be "workhorse" in the reconstruction of defects in the hindfoot and plantar lateral midfoot especially in cases of exposed bone, tendon or joint (5). Vascular supply is based off the lateral plantar artery. When utilizing the muscle proximally based, dissection is carried from distal to proximal ligating several minor perforators. The major pedicle is seen and preserved medially at approximately at the level of the proximal 1/3 of the muscle. Dissection is continued until adequate arc of rotation is achieved (3). It is imperative to perform a doppler examination after inset as to ensure perfusion to the flap. Additionally hemostasis must be strictly controlled as to prevent hematoma formation and ultimately flap necrosis (4). The flexor digiti minimi muscle is located just medial to the abductor digit minimi. Although there is less literature published on the utility of the flexor digit minimi rotational flap, it can be a useful adjunct as in our case for additional defect coverage with little added morbidity.

Case Study

A thirty-six-year-old patient with past medical history significant for paraplegia presents to the emergency department for concern of worsening right foot wound. Was found to have chronic osteomyelitis of the fifth metatarsal. Intrinsic muscle rotational flaps utilizing abductor digiti minimi and flexor digiti minimi muscles were used to provide soft tissue coverage of the metatarsal after debridement of chronic osteomyelitis. Intraoperative cultures were polymicrobial. Patient was discharged with doxycycline and daptomycin. Postoperative course was uneventful. The wound was noted to be healed at final follow up.

Surgical Procedure

The surgical approach for this case was tackled in a two prong fashion. The first goal was bony debridement of the fifth metatarsal to a level of healthy bleeding, viable bone. A chronic ulceration was excised in its entirety and the underlying base of the fifth metatarsal was noted to be grossly necrotic. A TPS burr was utilized to remove necrotic portions of bone, decorticating portion of the exposed bone until bleeding medullary bone was visualized. After we felt like we resected an adequate amount of bone, we irrigated the surgical site with copious amounts of normal sterile saline. The foot was re-prepped. The surgical wound was then extended distally. The abductor digiti minimi muscle was identified and carefully elevated from its distal attachments on the fifth metatarsal and proximal phalanx. We elevated this proximally with care to preserve the proximal pedicle. The muscle was rotated and inset into the soft tissue defect. It was determined that in order to fully cover the exposed bone and have adequate muscle bulk in this area, we needed to harvest the flexor digit minimi as well. We elevated this muscle from distal to proximal in a similar fashion, rotated and inset within the soft tissue defect. Intraoperative doppler confirmed continued perfusion to the muscle with bleeding noted to the distal margins after rotation and inset was complete. The muscle were loosely inset and the incisions were closed with 3-0 Nylon.

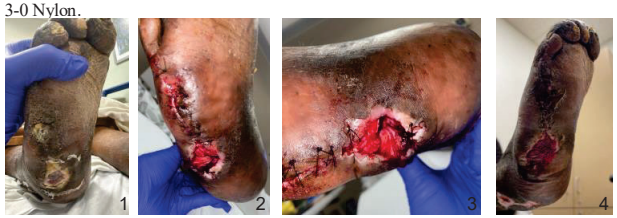

Fig 1-4: Initial presentation to the emergency department (1); Post-operative day 1 with inset of rotational muscle flaps (2-3); One month post-operative appointment with healthy granular tissue over surgical site

Analysis and Discussion

Successful treatment of chronic osteomyelitis in the setting of limb salvage can be cumbersome. The four key principles guiding management include adequate bony debridement of dysvascular bone and surrounding soft tissue, stabilization of remaining bone, targeted antibiotic treatment and coverage of defects with vascularized soft tissue (2). Abductor digiti minimi muscle flaps are well described in literature and can be utilized for a variety of soft tissue defects to the lateral midfoot and heel (5). Although less described, when additional soft tissue coverage is needed, utilization of the flexor digiti minimi can be added without significant additional morbidity. The advantage of local intrinsic muscle flaps is their immediate vascular supply and primary closure of the donor site 4).

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