

Delayed onset acute compartment syndrome in a patient on blood thinning medications: Surgical management utilizing regenerative collagen technologies and modular external fixation following a traumatic foot and ankle injury

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CASE STUDY

PURPOSE

Acute compartment syndrome (ACS) is a surgical emergency. Although ACS is most commonly associated with traumatic bone fractures in young men, identifying ACS in the absence of fracture can be challenging, as this typically occurs in older patients with more medical comorbidities.¹

We report the case of a middle-aged male with a past medical history of pain to his right ankle following a fall. He presented with complaint of worsening pain and swelling. Physical examination revealed firm dorsal and lateral compartments of the right foot with significant pain and edema. Emergent fasciotomies of the right foot and sharp debridement of necrotic and non-viable tissue were performed. A collagen nerve wrap was placed to isolate and protect the mangled nerve. A bilayered skin substitute was placed to facilitate dermal regeneration in preparation for staged rotational flap and split thickness skin grafting (STSG). Full wound closure and foot function were achieved at 7 months using regenerative collagen technologies for nerve and wound repair, in conjunction with a modular external fixation device to achieve an optimal outcome, in this case.

SUMMARY

We report the case of a young man diagnosed with ACS in the absence of fracture. Astute soft tissue injury management with advanced regenerative tissue technologies and effective immobilization resulted in an outcome of healing and restoration for this patient.

In this particular case, the onset of acute compartment syndrome was delayed due to internal bleeding into the compartments, which caused an increase of interstitial and compartmental pressures within the foot, ultimately leading to bulla formation, edema, pain and tenderness to the area of concern. Patients on blood thinners that experience any foot and/or ankle trauma must be closely followed, to ensure an injury that initially appears stable does not become an emergent, limb-threatening event.

REFERENCES

1. Hope MJ, Bosse McQueen MM. Acute Compartment Syndrome in the Absence of Fracture. J Orthop Trauma 2004 Apr;18(4):220-4



Figure 1. Presentation on Day 2 After Injury

PRESENTATION

Patient (JS) was a 56 year-old male who engaged in frequent travel. Medical history included epilepsy and a cerebral vascular accident. He had residual left-sided weakness, and was being treated with anticoagulation and anticonvulsant therapies. JS had fallen in his hotel shower. On the day of injury, he was seen at an outside medical facility where he had X-rays and a brain CT done. All imaging came back negative and the patient was released from care with instructions to seek further care if the injury worsened.

The right ankle/foot progressively worsened and the patient presented to the AHMC Emergency Department 2 days later. At admission, the patient reported progressive tenderness and swelling associated with decreased sensation. JS denied symptoms of nausea, vomiting, chest pain, focal weakness, and fever. The Podiatric Medicine and Surgery service was contacted for further workup and evaluation.

Upon physical examination, it was noted that the patient's right foot was erythemic, edematous, and ecchymotic, firm with 2+ pitting edema and decreased range of motion, no calf tenderness. The skin was dry and intact with fluid-filled vesicles distributed throughout the dorsal and lateral aspect of the right foot (Figure 1). The patient had significant pain and edema in excess of expectations for the reported injury. The injured limb showed decreased active and passive range of motion in the ankle and subtalar joint. Doppler examination revealed detectable Dorsalis Pedis and Posterior Tibial pulses. A lateral compartment pressure measurement of 43mmHg was noted.



Figure 2. Fasciotomy on Day 2 After Injury

SURGERY 1 - FASCIOTOMY

The on-call podiatric surgeon performed emergent fasciotomies of the dorsal and lateral compartments of the right foot (Figure 2).



Figure 3. Application of collagen nerve conduit and dermal regeneration template (week 1 post-op)

SURGERY 2 - NERVE WRAP AND DERMAL REGENERATION TEMPLATE

On post-op day 7 (Figure 3), a sharp debridement of necrotic and non-viable tissues was required to mitigate further soft tissue damage to the affected limb. Appreciable damage to the lateral dorsal cutaneous nerve was noted during the debridement procedure. A type 1 bovine collagen nerve wrap was placed around the nerve to isolate and protect it during the healing process. In addition, to address the amount of tissue removed during debridement, a bilayered collagen/silicone dermal regeneration template (DRT) was placed on the surgical wound to facilitate dermal regeneration and prepare the limb for final reconstruction with rotational flap and STSGs.

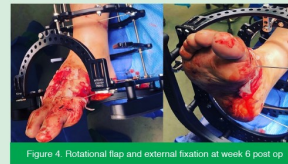


Figure 4. Rotational flap and external fixation at week 6 post op

SURGERY 3 - EXTERNAL FIXATION AND DORSAL ROTATIONAL SKIN FLAP

At 4 weeks, following the removal of the silicone layer and observation of healthy neodermis formation, the patient underwent a dorsal rotational skin flap procedure where application of a modular external fixator device required a joint plastics and podiatric surgery approach (Figure 4).



Figure 5. STSG applied at 16 weeks, shown here healing at 24 weeks/6 months

SURGERY 4 - REMOVAL OF FIXATION AND PLACEMENT OF SKIN GRAFT

The modular external fixation device was removed at 4 months and split thickness skin grafts (STSG) were applied to the wounds for definitive closure (Figure 5).



Figure 6. Completely closed STSG covered wounds at 7 months

FINAL OUTCOME

The patient's soft tissue wounds completely healed at 7 months (Figures 6). Full function of the patient's foot/ankle was restored and the patient successfully returned to normal living activities.