



BACKGROUND

- High-energy crush injuries → rapid compartment syndrome of the foot and leg
- Emergent fasciotomy prevents irreversible neuromuscular damage
- Post-fasciotomy wounds create reconstructive challenges:
 - Soft-tissue loss
 - Persistent edema
 - High wound tension
 - Limited foot soft tissue
 - Proximity to critical neurovascular structures
- Traditional closure may require:
 - Delayed primary closure
 - Skin grafting
 - Flap reconstruction
- Multimodal strategies may optimize limb salvage and reduce reconstructive morbidity

METHODS

Patient Profile

- 36-year-old male with high-energy crush injury (industrial wall collapse)
- Bilateral lower extremities trapped under debris for several hours
- Rescued using mechanical crane removal of debris
- Presented with compartment syndrome of the right foot and leg

Initial Surgical Management

- Emergent bilateral 4-compartment leg fasciotomies
- Right foot four-compartment fasciotomies

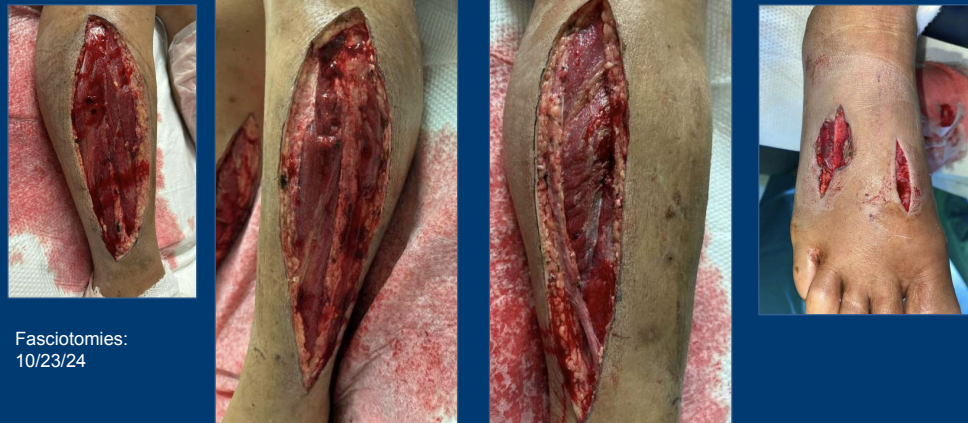
Adjunctive Wound Management

- Negative Pressure Wound Therapy (NPWT) to enhance perfusion and granulation
- Vessel loop external tissue expansion ("Jacob's ladder") for gradual wound edge approximation and tension reduction
- Serial assessment of muscle contractility, tissue viability, and soft-tissue compliance

Reconstructive Phase

- Right dorsal foot curettage debridement and wound bed preparation (21.05 cm²)
- Placement of biosynthetic dermal matrix
- Final layered closure: bilateral leg incisions (18–22 cm) with tension-free primary closure

Case Study



Fasciotomies:
10/23/24

Closure (delayed)
10/28/24



Healing:
3/18/25



References:

RESULTS

- All compartments demonstrated: Robust perfusion, healthy red muscle and positive contractile response to cautery
- NPWT successfully reduced edema and improved tissue pliability
- External tissue expansion allowed gradual tension reduction
- Biosynthetic dermal matrix: Stable adherence, no infection nor graft failure, successful dermis formation
- All fasciotomy sites achieved tension-free layered closure
- Postoperative course:
 - No complications
 - Durable soft-tissue coverage
 - Limb preserved

DISCUSSION

- Extensive fasciotomy wounds require staged, multidisciplinary coordination
- NPWT + external expansion:
 - Improve wound bed quality
 - Reduce closure tension
 - Decrease need for graft/flap
- Biosynthetic dermal matrix provides:
 - Scaffold for neoderms formation
 - Alternative to complex flap reconstruction
 - Protection near critical neurovascular structures
- Sequential strategy allowed:
 - Limb salvage
 - Functional closure
 - Avoidance of higher morbidity reconstructive procedures
- Multimodal closure may represent a viable limb-preserving strategy in severe crush injuries.