Acute compartment syndrome of the foot and ankle is a relatively rare clinical finding. Lower extremity compartment syndrome is customarily due to vascular or orthopedic traumatic limb threatening pathology.

Clinical correlation and measurement of intracompartamental pressure are paramount to efficient diagnosis and treatment. Delayed treatment can lead to local as well as systemically adverse consequences. Frostbite, a comparatively more common pathology of the distal extremities, occurs when tissues are exposed to freezing temperatures.

The authors present a literature review of acute foot compartment syndrome and pedal frostbite withopathogenesis, treatment, and subsequent sequelae. A case report illustrating one example of bilateral foot, traumatic compartment syndrome, is highlighted in this review.

The patient presented with complaints consistent with bilateral foot frostbite trauma, along with gangrenous changes to the distal tip of each foot. Compression pressures were measured in the emergency room, and the patient was treated urgently for bilateral pedal compartment releases. Both pathologies have detrimental outcomes if not treated in a timely and appropriate manner, with increasing amputation rates with time delay.

CASE REPORT

A 27-year-old male who was found down in a wooded area unconscious in approximately 10°F weather overnight, presented via emergency medical service in a wet sweatshirt, underwear and wet socks.

He was altered and completely amnestic to events of the night with a glucose level of 58 mg/dL in the field. His body temperature on the scene was 85.3°F. No signs of head or cervical trauma were found. Radiographs were negative bilaterally for osseous injuries.

The patient was in a state of hypothermia, conscious but disoriented. He was altered and completely amnestic to events of the night with a white blood cell count of 31.6/mL. His ethanol level was 117 mg/dL and positive for methamphetamines.

Complications of each foot presented via emergency medical service in a wet sweatshirt, underwear and wet socks.

Incision for frostbite injuries. Soft tissue swelling can occur in patients with a coagulopathy in the absence of trauma. A muscle tissue dies, ischemia causes infarctus and perifascial edema in muscle fibers.

Revascularization can also result or add to compartment syndrome. In the reperfusion state, there is a complex mechanism that leads to vessel leakage and greater soft tissue edema. Awareness of traumatic or vascular pathology is helpful in making a timely diagnosis of compartment syndrome.

Once the diagnosis is made, prompt intervention is required. Decompression of the fascial compartments is the standard of treatment for patients with compartment syndrome. Common incisonal planning includes two dorsal incisions for access to forefoot compartments and one medial incision for deeper medial compartments. (Table 1)

Maximum width between incisions is suggested to prevent dorsal flap necrosis. Care must be taken to avoid the neurovascular bundles while releasing the compartments.

If compartment syndrome is not addressed, there is a possibility of permanent myoneural tissue damage within the affected compartment due to elevated compartment pressure and decreased blood flow.

DISCUSSION CONTINUED

The exact pressure at which this ischemia happens is debatable and conclusions are mostly from studies of the leg and forearm. What is agreed upon, however, is that acute compartment fasciotomies should be performed if there is any suspicion of compartment syndrome.

Wound healing complications following fasciotomies are reported especially in the setting of traumatic injury with concomitant soft tissue compromise. The assistance of negative pressure therapy has been advocated by some authors to reduce wound complications. Skin grafting and possible free flap reconstruction is often times utilized for facilitating closure and defect. Closer routine post-operative follow-up is recommended for those with diabetes, peripheral vascular disease and neuropathy.

In conclusion, acute thermal injury and frostbite leading to acute compartment syndrome of the foot and ankle is a rare occurrence but it does have long term effects on function and quality of life if not diagnosed and treated promptly and effectively.

Diagnosis can be made with a combination of clinical findings, laboratory values, and pressure monitors. Decompression of the compartments via fasciotomies is the standard treatment method with various approaches described.

Incisional planning may be best done on a case by case basis while accounting for the unique fascial anatomy. The authors present a unique case of frostbite induced compartment syndrome in a post exposure patient with complete resolution of symptoms at 1 year.

References are available upon request.

<table>
<thead>
<tr>
<th>Compartments of the Foot</th>
<th>Muscles</th>
<th>Vessels</th>
<th>Incision for Decompression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial</td>
<td>Abductor Hallucis</td>
<td>Medial plantar artery</td>
<td>Medial</td>
</tr>
<tr>
<td>Central</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Superficial 2. Deep</td>
<td>Flavus Digratus Brevis</td>
<td>Adductor Hallucis</td>
<td>Medial</td>
</tr>
<tr>
<td>Lateral</td>
<td>Abductor Digit Minimi</td>
<td></td>
<td>Medial and dorsolateral</td>
</tr>
<tr>
<td>Interossei Intermetatarsal</td>
<td>4x Interossei Adductor Hallucis</td>
<td>Dorsalmedial and dorsolateral</td>
<td></td>
</tr>
<tr>
<td>Calcaneal</td>
<td>Quadratus Plantae</td>
<td>Posterior Tibial artery and vein</td>
<td>Medial</td>
</tr>
<tr>
<td>Dorsal</td>
<td>Skin</td>
<td>All</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Thermal injury and early gangrenous changes of the left foot with medial foot and ankle edema.

Figure 2: Approximately 3 weeks status post pedal fasciotomies with suture removal.

Figure 3: Resolved gangrene and healed fasciotomy incisions without complication at 1 year post-operatively.