

Single incision fasciotomy to treat compartment syndrome in the diabetic foot: A case report

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Compartment syndrome of the foot is a rare but well-documented condition caused by increased myofascial compartment pressure. Outcomes following surgical intervention for this condition can be improved by careful pre-operative planning and gentle handling of the soft tissue involved during the procedure. The authors report an unusual case of compartment syndrome in a person with diabetes who presented with foot pain significantly out of proportion to the associated injury. Following diagnosis of acute compartment syndrome, surgical treatment was undertaken.

Mr A, a 61-year-old retiree, presented to the authors' diabetic foot clinic with pain and swelling in his left foot and a fever of 5 days' duration. Mr A reported stepping on a nail while walking barefoot. As the swelling and tenderness in the area worsened over the initial 3 days, Mr A presented to his GP who undertook an incision drainage but the malodorous, purulent discharge and discolouration of the medial aspect of the hind-foot continued (*Figure 1*).

Mr A reported a constant, throbbing pain in the foot and serial 6-hourly examinations revealed a decreasing perception of light touch and pin prick in the forefoot region. Dorsiflexion and movement of the toes were limited. Inflammatory markers were raised and a plain radiograph showed no early signs

of osteomyelitis. Dorsalis pedis and posterior tibial pulses were palpable, although capillary refill of all toes was delayed.

A diagnosis of compartment syndrome of the foot was made and Mr A underwent an incision drainage fasciotomy with a medial Henry approach.

Intervention

Single curvilinear incision made between normal and plantar skin over the medial aspect of the foot from the border of first metatarsal head to the navicular tuberosity level was undertaken (*Figure 2*). The medial compartment was explored first and revealed that the abductor hallucis and flexor hallucis brevis were swollen, but viable. About 10 mL of thick pus was removed.

Article points

1. Compartment syndrome of the diabetic foot is a limb-threatening emergency and a high index of suspicion, clinical awareness and early referral are vital to avoid adverse outcomes.
2. Single curvilinear fasciotomy incision on medial aspect of foot is demonstrated in this case report and provided decompression to all compartments.
3. Complications of surgical interventions in these cases can be avoided with gentle soft tissue handling and careful preoperative planning.

Keywords

- Compartment syndrome
- Preoperative planning
- Soft tissue injury
- Surgical decompression

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Page points

1. Central compartment exploration revealed that the flexor digitorum longus, flexor digitorum brevis and quadrates plantae tendons were viable, but sloughy with associated pus.
2. Following surgery the wound was irrigated with saline and dressed with a gauze dressing impregnated with the antibiotic framycetin sulfate.
3. Mr A reported immediate postoperative pain relief.
4. Mr A was discharged 3 days after the operation with oral antibiotic therapy for a further 2 weeks and weekly follow-up at the authors' diabetic foot clinic and the wound progressed uneventfully to healing.

Central compartment exploration revealed that the flexor digitorum longus, flexor digitorum brevis and quadrates plantae tendons were viable, but sloughy with associated pus. The interosseous compartment was explored and overall muscle bulk was found to be slightly pale, but viable, and a substantial volume of pus was removed. The lateral compartment was released and a small volume of pus removed, all tendons appeared to be viable. Full-thickness skin necrosis over the plantar region (5×6 cm) and partially exposed plantar fascia was removed.

The wound was irrigated with saline and dressed with a gauze dressing impregnated with the antibiotic framycetin sulfate.

Progress to healing

Mr A reported immediate postoperative pain relief. Daily dressing changes with normal saline sufratulle were undertaken. Intraoperative cultures revealed infection with Klebsiella species sensitive to second generation cephalosporin.

Mr A was discharged 3 days after the operation with oral antibiotic therapy for a further 2 weeks and weekly follow-up at the authors' diabetic foot clinic. The wound progressed uneventfully to healing and at 3-month follow-up Mr A was ambulating with a modified shoe. At 1-year follow-up Mr A was completely healed (*Figure 3*).

Discussion

The clinical presentation of compartment syndrome of the foot is well established, but few cases have been reported in the literature (Bonutti and Bell, 1986; Lee et al, 1995).

Mubarak and Hargens (1981) reported that interossei of the foot are located in a compartment – similar to the hand – and may need surgical decompression if there are signs and symptoms of compartment syndrome. The method they describe involves making two parallel dorsal incisions along the length of the second and fourth metatarsals to effectively decompress all four main compartments. However, there is a lack of evidence comparing outcomes of the decompression with the medial Henry approach to treatment of this condition.

In cases of infection of the diabetic foot, presentation commonly includes an increase in pressure in the whole compartment, with spreading into adjacent compartments. Surgical fasciotomy and debridement pose clinical challenges in this patient group, given the high burden of peripheral vasculopathy and common subsequent wound chronicity (Zgonis et al, 2008). Minimal surgical intervention and preservation of blood supply should be the goals of intervention in this group of patients.

During surgical debridement of the foot, sound knowledge of its anatomy is

Figure 1a–b. Mr A's foot wound. Note the extensive lesion and swelling, with an underlying necrotic skin. The inflammation extends beyond the forefoot and midfoot region and tracks up towards the tarsal–tunnel region.



mandatory (Rauwerda, 2000). Mubarak and Hargens (1981) described the anatomy of the foot in four compartments divided by fascia planes. These fascial planes, which have individual neurovascular supplies, require surgical decompression fasciotomy before significant increase in intra-compartmental pressure can be achieved. The medial approach, with a single curvilinear incision made extending from the medial plantar surface of the metatarsophalangeal junction to just proximal of the navicular tuberosity, is preferred. This single incision allows decompression of all four main compartments, first in the medial and central compartments, followed by the other compartments.

The classical signs and symptoms of compartment syndrome of the leg remains the mainstay of diagnosis for compartment of the foot: pain out of proportion to the injury and early sensory loss. Assessing intra-compartmental pressure using a handheld device (e.g. Stryker Intra-Compartmental Pressure Monitor; Kalamazoo MI, USA) is gaining popularity and is a good adjunct technique in diagnosis – with drawbacks being the technical challenges of exact probe placement and the high cost of the unit.

Conclusion

Compartment syndrome caused by underlying infection remains a challenge in diabetic foot care, even for experienced clinicians. The presence of compartment syndrome in the diabetic foot is seldom recognised on initial presentation and clinicians need to increase their wariness of this condition.

The authors believe that the medial Henry approach with a single incision, performed with correct surgical technique, causes less soft tissue damage and is the preferred approach to management of this condition.

In the present case, a single episode of surgical debridement was undertaken to address Mr A's compartment syndrome, and prolonged hospital admission was avoided. ■

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Figure 2. This image illustrates the single medial curvilinear incision of Henry used to decompress all the compartments in Mr A's foot. The central full-thickness wound extension shown was needed to accommodate the complete removal of necrotic skin noted in the middle aspect of the abscess in Figure 1.



Figure 3. Mr A's foot at 1-year follow-up. Note the fasciotomy site scar, the intact medial arch, viable overlying skin and good peripheral perfusion.