

Chronic Exertional Compartment Syndrome of the Plantar Foot

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Background:

Chronic exertional compartment syndrome of the lower extremity was first described in literature over a century ago. Exertional compartment syndrome is caused by the rise in pressure of a closed myofascial compartment leading to constriction and strangulation of the neurovascular structures within that compartment.^{1-4,6-8} This may be due to either excessive hypertrophy of the muscle, or insufficient compliance of the surrounding fascia.⁴ This condition commonly presents clinically as recurrent episodes of exercise induced pain and is more frequently identified in athletes who perform repetitive activity or distance sports.⁸ There is usually no history of trauma or injury.⁴ Difficulty in diagnosis of this pathology is often due to the ambiguity of pain symptoms which mimic many common foot and ankle conditions such as plantar fasciitis, peroneal tendonitis, tarsal tunnel, and posterior tibial tendon dysfunction.^{2,4,8} As there are no reliable noninvasive clinical maneuvers to exclusively test for exertional compartment syndrome, measurements of intra-compartmental pressures are recommended, especially when patients history raises concern. Manoli and Weber identified nine compartments in the foot, of which, the medial compartment has been noted to be most susceptible to chronic exertional compartment syndrome.^{2,3,5} If left untreated, chronic exertional compartment syndrome can lead to ischemic pedal changes with irreversible nerve and muscle damage.

We report a case of bilateral chronic exertional compartment syndrome of the foot affecting a 15-year-old male basketball and volleyball player. Relevant anatomy, clinical examination, and treatment are discussed. The goal of this case report to highlight chronic exertional compartment syndrome as a differential diagnosis when treating arch pain in young athletes.

Case Report:

A 15-year-old Caucasian male with no relevant past medical history and no relevant family history presented to the clinic for evaluation of persistent bilateral foot pain. The patient described his pain as recurrent cramping and pain to the arches of both feet which radiates distally to the toes. This patient, who is a competitive basketball and volleyball player at the high school level has noted that these symptom recurrently onset about 15-20 minutes into running and playing sports. The patient was seen by a previous provider and pain has been recalcitrant to all prior conservative treatment methods. Patient reportedly has tried taping, physical therapy, and custom orthotics without improvement in symptoms. On clinical examination, the patient was noted to have a tight plantar aponeurosis with marked hypertrophy of the abductor muscle belly bilaterally. A follow-up clinical visit for pre and post exertional compartment measurements was scheduled.

Investigation:

On follow-up examination, a Stryker intra-compartmental pressure monitor was utilized to measure the pressure of the medial compartment of the foot bilaterally. Pre-exertional testing in this patient revealed abnormal pressures as high as 30 mmhg left foot and 29 mmhg right foot. The patient was sent to run for 15 minutes and returned for post-exertional measurements to be taken. Post-exertional measures were obtained at 1 minute and 5 minutes following his activity and were also abnormal. At 1 minute, compartmental pressures were measured at 42 mmhg left foot and 39 mmhg right foot. After 5 minutes, the patient compartment pressures returned to their elevated baseline. The diagnostic findings consistent with the findings of exertional compartment syndrome in a young athlete.

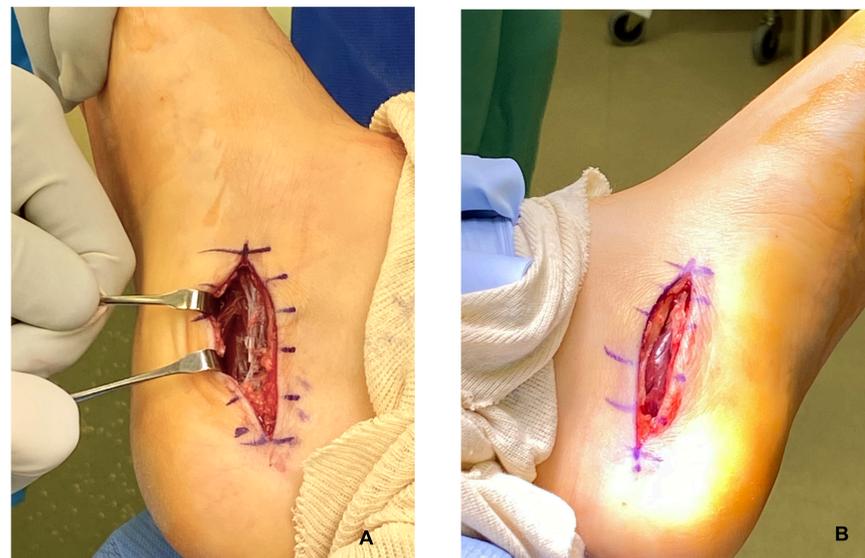


Figure 1. Image A&B: Intraoperative images following medial, deep calcaneal, and superficial compartment fasciotomies

Treatment:

Treatment options were discussed in depth with patient and his parents. Initially, the patient and his mother planned to postpone surgical intervention until completion of his basketball season, although symptoms became so severe that it was impeding his ability to perform daily activities. Therefore, patient and mother elected for surgical intervention sooner.

Patient underwent surgical decompression of the medial, deep calcaneal, and superficial compartments of bilateral feet. A linear longitudinal incision was made at the proximal and medial arch. Superficial fascia was incised and surgical incision was deepened to the level of muscle and deep fascia. Intraoperative hypertrophy of intrinsic pedal musculature was noted, most notably the abductor hallucis muscle belly bilaterally. The deep fascia of the medial, deep calcaneal, and superficial compartments, as described by Manoli & Weber, were then surgically decompressed. Following confirmed release of all compartments, the deep and superficial fascia was left open skin edges were reapproximated. The patient was discharged with limited weightbearing due to the bilateral surgery and a strict elevation protocol of elevation 50 min/hr.

Outcome and Follow Up:

The patients first appointment was one week postoperatively. Due to having underwent bilateral foot surgery, patient admitted some difficulty in compliance to the limited weightbearing status. He subsequently developed mild dehiscence and cellulitis to the left foot surgical site which resolved with a course of oral antibiotics. At one month post-operatively, both plantar foot incisions were completely healed and patient was able to returned to full weightbearing allowing him to resume daily activities. Patient returned to sport at 6 weeks post-operatively with no recurrence of symptoms.

Discussion:

Although exertional compartment syndrome is commonly documented in the lower leg musculature, this syndrome is less commonly identified in the foot. Existing research documenting its occurrence in the foot remains limited to just a handful of case studies^{2-4,6}. It is unclear if this lack of literature is inherently due to the rare occurrence of this pathology, or if exertional compartment syndrome of the foot is a commonly overlooked diagnosis.

We present a case of a young athlete who developed bilateral foot exertional compartment syndrome which was confirmed by intra-compartmental pressure testing. Conservative treatment options were exhausted by a previous treating practitioner and the patient underwent a bilateral medial, deep calcaneal, and superficial compartment fasciotomies by our authors with successful results at 6 weeks postoperatively. There are several features in a patients history which can help to distinguish chronic exertional compartment syndrome from other common pedal pathologies. There is often no injury or trauma and the onset of symptoms will occur/worsen with activity or sport. Patients also commonly describe pain as cramping, burning, or tightness. The goal of this case is to encourage clinicians to have a high suspicion for exertional compartment syndrome in patients who have arch pain and fail to respond to conventional conservative treatments. Additionally, this case reinforces that surgical fasciotomy for treatment of chronic exertional compartment syndrome yields good post surgical outcomes.

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