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Case Reports and Series

Acute Compartment Syndrome of the Foot due to Infection After Local Hydrocortisone Injection: A Case Report

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ABSTRACT

High-energy trauma associated with calcaneal fracture or Lisfranc fracture dislocation and midfoot crushing injuries are known causes of compartment syndrome in the foot. Suppurative infection in the deep osseofascial compartments can also cause compartment syndrome. We describe the case of a 29-year-old female who had developed a suppurative local infection that resulted in acute compartment syndrome after receiving a local hydrocortisone injection for plantar fasciitis. We diagnosed the compartment syndrome, and fasciotomy was promptly undertaken. After more than 2 years of follow-up, she had a satisfactory functional outcome without substantial morbidity. To our knowledge, no other report in the English-language studies has described compartment syndrome due to abscess formation after a local injection of hydrocortisone. The aim of our report was to highlight this rare, but serious, complication of a routine outpatient clinical procedure.

Compartment syndrome is the clinical entity that results from increased pressure within a myofascial compartment. Acute compartment syndrome of the foot has generally been associated with high-energy trauma involving fracture of the calcaneus, Lisfranc joint fracture-dislocation, and mid- and hindfoot crushing injuries. Infection with abscess formation deep to the deep fascia is also a generally known cause of compartment syndrome. When present, the timely diagnosis and a prompt fasciotomy will help to avoid the morbid consequences of untreated acute compartment syndrome.

To adequately treat compartment syndrome of the foot, knowledge of the anatomy of the different myofascial compartments of the plantar vault is important. Kamel and Sakla (1) divided the foot into 4 compartments: medial, lateral, central, and interosseous. They are separated by fascial layers. Manoli and Weber (2) in 1990 further investigated the compartments in a cadaver dye injection study. Their study revealed the presence of 9 compartments in the foot (Table). The medial, lateral, and superficial compartments run along the entire length of the foot. Five compartments are present within the forefoot; they are the adductor and the 4 interosseous muscles. The ninth is the calcaneal compartment, which also communicates with the deep posterior compartment of the leg. The possible presence of a tenth dorsal compartment, containing the extensor digitorum brevis, has also been suggested by some investigators (3).

Untreated compartment syndrome can result in significant morbidity owing to weakness, contracture, deformity, motor paralysis, and sensory neuropathy (1). Timely surgical decompression of the foot using fasciotomy is the most effective method to prevent functional morbidity (4). In 1988, Myerson (5) described the rationale for systematic decompression of pedal fascial compartments in a cadaver study and emphasized the effectiveness of using dorsal and medial fasciotomy incisions.

We report a case of acute compartment syndrome of the foot due to infection secondary to local hydrocortisone (LHC) injection for the treatment of plantar fasciitis. The compartment syndrome was successfully treated by fasciotomy. The purpose of reporting the present case was to demonstrate a rare, but possible, complication of LHC injection and to emphasize the importance of a prompt diagnosis and timely fasciotomy to decrease the morbidity due to compartment syndrome.

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Table
Foot anatomy of different compartments of foot

	Compartment	Muscle Contents	Neurovascular Structures
A	Full length–3		
1	Medial	Flexor hallucis brevis Abductor hallucis	
2	Lateral	Abductor digiti quinti Flexor digiti minimi	
3	Superficial	Flexor digitorum brevis Lumbricals–4 Flexor digitorum longus tendons	With or without medial plantar nerve
B	Forefoot–5		
1	Interosseous–4	Interossei	
2	Adductor	Adductor	
C	Calcaneal	Quadratus plantae	Posterior tibial nerve, artery, vein Lateral plantar nerve, artery, vein With or without medial plantar nerve

Case Report

A 29-year-old female who had been experiencing pain localized to the plantar aspect of her right heel for approximately 3 months had been diagnosed with plantar fasciitis by her family physician. She had undergone an LHC injection in the proximal plantar fascia in August 2011. Radiographs of the heel were not taken by the family physician before injection. She had no history of trauma localized to her symptomatic heel. After the injection, her plantar heel pain had persisted, and she had been administered analgesic medication (aceclofenac, 100 mg twice a day for 5 days, in tablet form) and allowed to continue to walk on the painful heel to her tolerance. The patient's right foot pain progressively worsened, and 12 days after the corticosteroid injection, she presented to our practice with a complaint of severe right foot pain and swelling. Our initial examination showed her entire right foot to be tensely swollen without erythema (Fig. 1). Palpation of the foot revealed a mildly increased skin temperature compared with her contralateral foot and exquisite pain localized to the plantar vault and the dorsal interosseous spaces. However, her maximum tenderness was localized to the inferomedial aspect of the right heel, where she had received the corticosteroid injection. She was unable to actively move her toes, and any passive movements of the toes and ankle, in particular, plantar flexion, caused severe pain. She had a loss of superficial touch sensation and 2-point discrimination over the entire sole of the right foot. The posterior tibial arterial pulse was palpable, although the dorsalis pedis arterial pulse was absent. Systemically, the patient was slightly febrile (oral temperature 38°C), with tachycardia (pulse 102 beats/min). Her left brachial blood pressure was 110/70 mm Hg. On the basis of the clinical findings, in particular, the tense swelling, loss of cutaneous sensation, and severe pain to any stretching of the pedal tissues, we diagnosed acute compartment syndrome affecting her right foot. Moreover, because of the history of the right heel injection, that the pain was localized to the injection site, and her low-grade fever, we thought it likely that she had a deep (deep to deep muscle fascia) abscess in her right foot. Because of these findings, we decided to surgically inspect the tissues and decompress the pedal compartments by immediate surgery. We did not delay the decision to operate to obtain intracompartmental pressure measurements (the equipment for which was not readily available at that point). Preoperative anteroposterior and lateral radiographs of the right foot and ankle were taken, with normal findings, except for the increased soft tissue density and volume. No gas was seen on the radiographs. No evidence was seen of subcutaneous emphysema. The blood laboratory investigations showed only an increased leukocyte count (white blood cell count 12.5×10^3, 80% polymorphonuclear neutrophils). Emergency surgical fasciotomy was undertaken within 4 hours of admission to our hospital.

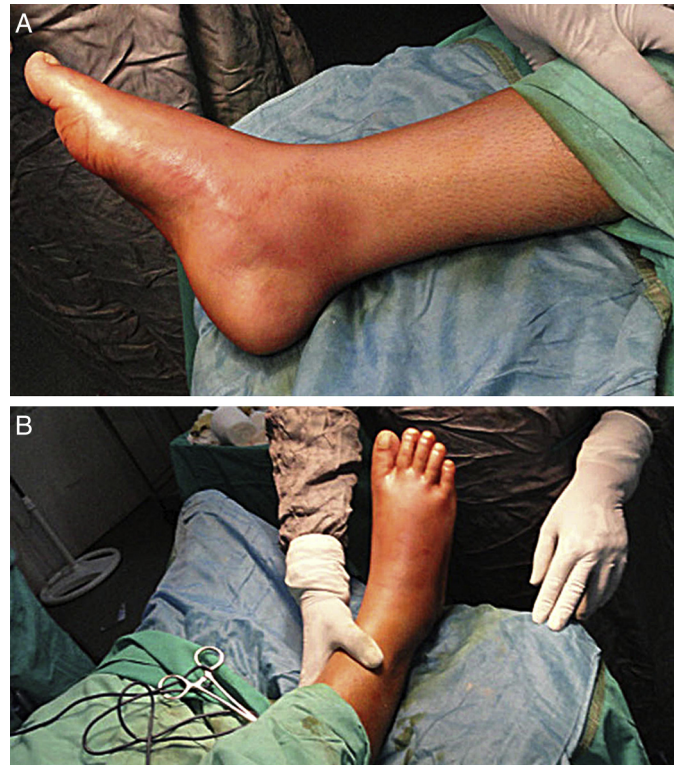

Fig. 1. (*A* and *B*) Clinical photographs of the foot when the patient was taken for fasciotomy. Note the tense swelling of the foot.

Operative Procedure

After establishing spinal anesthesia, with the patient placed supine on the operating table, and without the use of a tourniquet or vasoconstrictor, a 5-cm medial incision was made on the right foot, beginning 2 cm posterior to the medial malleolus and extending to the junction of the medial and plantar surfaces of the hindfoot, distal to the proximal attachment of the plantar fascia to the calcaneus (Fig. 2). The incision was deepened in the anatomic layers, and no purulence was encountered in the subcutaneous fat and superficial fascia. However, when the deep fascia over the abductor hallucis was incised, frank drainage of thick, amber pus was noted (Fig. 2). The dissection included sectioning of the laciniate ligament over the neurovascular bundle in the tarsal tunnel to ensure decompression of the posterior tibial artery and veins and nerve trunks at that level. The abductor hallucis muscle was friable but not necrotic, and a pyogenic collection was present in the muscle belly. Blunt and sharp dissection was used to explore the limits of the abscess as it entered the plantar vault and to debride the grossly infected soft tissue (Fig. 3). The medial band of the plantar fascia was excised. A second longitudinal medial incision, 4 cm long, was then made, extending from 1 cm plantar to the tuberosity of the navicular to the midshaft level of the first metatarsal, along the dorsal margin of the abductor hallucis (Fig. 3). Layer dissection through this incision to the periosteum of the first metatarsal did not reveal any purulent drainage of frank necrosis. Thus, our aim with this incision was additional decompression of the medial compartmental pressure. Thereafter, 2 dorsal longitudinal incisions were made (Fig. 3), such that the first of these was placed over the second metatarsal and the second was placed over the fourth metatarsal. These were then deepened in the anatomic layers to the