ACUTE COMPARTMENT SYNDROME OF THE PEDIATRIC FOOT: A CASE REPORT

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BACKGROUND
Acute compartment syndrome of the foot and lower leg is a surgical emergency that can lead to serious limb threatening complications after traumatic injuries. Compartment syndrome in the foot is rare, however, it is more widely documented in the adult literature compared to the pediatric population. High clinical suspicion of compartment syndrome is warranted in pediatric patients with traumatic injuries, as there are a wide range of clinical symptoms. Many pediatric patients may not exhibit the classic clinical findings, which may lead to difficulty in diagnosis. Early diagnosis and decompression in these pediatric patients are key to preserve function and prevent permanent limb complications.

PURPOSE
The purpose of this case is to present our findings of a pediatric patient who developed acute compartment syndrome after a traumatic accident. We discuss clinical findings, treatment and outcomes from initial injury to 8 months follow up. Acute compartment syndrome in the foot is rare in the pediatric population, and there are very few well documented cases. This case is significant to showcase positive outcomes after experiencing acute compartment syndrome.

CASE DESCRIPTION
The patient is a 15 year old female with no significant medical history who presented to Advocate Christ Medical Center ED immediately following Bike vs. Auto injury. She was alert, oriented, and cooperative. Her pediatric exam revealed an extremely edematous and tense right foot. There was diffuse ecchymosis and superficial skin necrosis at the dorsal midfoot. Posterior tibia pulse +2/+4, however, dorsalis pedis pulse was diminished +1/+4 and capillary fill time prolonged. There was pallor noted from the digits to the midfoot. Patient’s sensation was intact to the digits. She had diminished motor function of the right foot. There was significant pain to palpation to right foot, and compartments of the foot were tense. On X-ray, patient had digital fractures in addition to Lisfranc injury. A CT was performed, which revealed fractures of metatarsal bases 1-5 with 5mm separation of metatarsal 1 and 2 in addition to separation of 2nd and 3rd metatarsals.

INTerventions & TIMelines
Acute compartment syndrome was suspected in the ED. Consent was obtained from patient’s legal guardian to confirm diagnosis by measuring intra-compartmental pressures. Compartment pressures of the medial and central compartment were measured at 70mmHg and 71mmHg, respectively. The patient was taken to the OR directly from the ED for emergent fasciotomies.

General sedation was performed by anesthesia and a local anesthetic ankle block was administered to the right foot. ICP were measured and had increased to 95mmHg and 105mmHg.

The fasciotomy incisional approach consisted of 3 total incisions: 1 dorsomedial incision between metatarsals one and two to decompress the first and second interosseous dorsal and plantar compartments; 1 dorsolateral incision between the fourth and fifth metatarsals to decompress the 4th and 5th dorsal and lateral compartments; and 1 medial incision between the first metatarsal base and abductor hallucis muscle belly to decompress the medial compartment. The incisions were left open and adaptive and dry sterile dressing was applied to the surgical site.

INTERVENTIONS & TIMELINES

| Day 1 | ED | • Clinical suspicion of ACS | • Compartment pressures measured |
| Day 1 | OR | • Re-measure compartment pressure | • Emergent Fasciotomies |
| Day 16 | ORIF Lisfranc injury | • Gift application |

The patient had regained motor function of the right foot immediately post operatively. DP and PT pulses strongly palpable and triphasic on doppler.

The patient’s hospital course was uncomplicated, and she was discharged from the hospital after two days. She presented to clinic five days post op. Patient was twice a week for follow up.

At 16 days postop, the patient returned to the operating room. The patient underwent ORIF of Lisfranc injury right foot. The Wright medical Charlotte Lisfranc Reconstruction system was utilized, and a screw was inserted from the medial cuneiform to the 2nd metatarsal base. During the same procedure, the fasciotomy sites were debrided and irrigated. Integra bilayer grafts were then applied to the fasciotomy sites.

OUTCOMES
Immediately after the emergent fasciotomies, the patient regained pulses and motor function. In the first 24 hours, patient did not have any residual motor or sensory deficit.

Following the ORIF of Lisfranc injury and graft application, she was seen weekly for the next four weeks. Patient was non-weightbearing in a CAM boot. At each visit, patient did not have any sensory or motor deficit.

At 3 weeks postop graft application, the silicone bilayer was removed. The medial wound was completely healed. The dorsal wounds demonstrated granular tissue with excellent incorporation of the grafts. Fasciotomy sites fully healed at 7 weeks.

Patient transitioned to CAM boot weight bearing as tolerated at 7 weeks postop Lisfranc injury. She was fully weight bearing in regular shoe at 15 weeks. At 8 months follow up from initial injury, patient is doing well without complication. She has no residual sensory, motor or functional deficits.

REFERENCES

DISCUSSION & CONCLUSION
Acute compartment syndrome of the foot is not widely discussed in the pediatric literature. The most common injuries causing acute pedal compartment syndrome are direct trauma or crush injuries. These injuries many times result in multiple foot fractures of the forefoot and midfoot: digital fractures/dislocation, metatarsal fractures, and Lisfranc injury/dislocation. Surgical decompression remains the standard of care for early diagnosed acute compartment syndrome. A late or miss diagnosed acute compartment syndrome can be limb threatening, especially in the pediatric population. This can lead to loss of foot function, pedal deformities and chronic pain. As the typical clinical symptoms are not always reliable, intra-compartmental pressure measurements are recommended confirm diagnosis. A high clinical suspicion and diagnosis in combination with an early intervention is important in order to preserve limb function and prevent long term complications.

Fig 2a. XR highlighting Lisfranc injury (left), clinical picture in the ED (right), Fig 2b. Emergent Fasciotomies in the OR; Fig 2c. Integra graft (left), ORIF Lisfranc (right)

Fig 4. Six weeks postop; dry eschars on fasciotomy sites

Fig 3. Three weeks post op; Integra bilayer removed