Utilization of Fluorescence Microangiography in Pediatric Acute Compartment Syndrome: A Case Report

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Statement of Purpose
Isolated pedal compartment syndrome in the pediatric population has been seldom reported. Our case study demonstrates the utilization of serial microangiography to monitor progression of acute ischemia associated with acute pediatric compartment syndrome.

Literature Review
Acute compartment syndrome is a critical condition with many reported causes including high energy trauma, fractures, crush injuries, IV infiltration, and congenital hemangioma (1,7). Early recognition and emergent fasciotomy are imperative to prevent permanent functional damage. Diagnosis can often be delayed in the pediatric population due to communication barriers, fear and lack of participation during examination. The average time from injury or hospital admission to surgical fasciotomy has been reported between 12.1 to 32.8 hours in pediatric patients (1,2,6). Studies have, however, shown excellent functional outcome scores in up to 87% of pediatric patients (1). Inclusion of early fasciotomy has been reported between 12.1 to 32.8 hours in pediatric patients (1,2,6).

Case Study Continued
She demonstrated no outward signs of agitation or anxiety and was vitally stable. Left lower extremity examination revealed edema and ecchymosis to the distal forefoot, absent capillary refill and protective sensation to digits 3, 4, and 5, pain with passive dorsiflexion and plantarflexion of digits 1, 2, and 5 as well as diffusely pallor tenderness to the distal forefoot. A superficial fasciotomy performed on the third metatarsal shaft was present. Dorsal pedis and posterior tibial pulses were palpable and all compartments of the foot were soft.

Pain radiographs revealed subtle displaced fractures of the fourth and fifth middle phalanges (Fig. 2). The patient was admitted for antibiotics and serial neurovascular examinations. She began hypertension and serial microangiography studies to monitor progression of ischemia.

Case Study Continued
Fasciotomy was performed in the operating room through a single 6 centimeter dorsal incision overlying the third interspace (Fig. 3). The second, third and fourth interspaces were explored with no evidence of muscle necrosis. A large hematoma was evacuated and an active arterial bleed was identified and cauterized. Immediate visual improvement of digital perfusion was noted (Fig. 4); however, the distal most aspects of digits four and five remained dusky with a guarded prognosis. The incision was left open with anticipated closure via secondary intention.

Analysis and Discussion Continued
The use of fluorescence microangiography has been widely reported in cardiovascular, ophthalmologic, transplant and plastic and reconstructive surgery (8-10); however, it has more recently been recognized as a valuable tool in limb salvage (11-12). Emergent hyperbaric oxygen therapy as well as serial microangiography studies have become an important cornerstone of the treatment algorithm for lower extremity crush injuries at our facility. Serial fluorescence angiography can be used to predict outcomes to patients and their families.

In conclusion, compartment syndrome is a critical, time-sensitive condition that requires a high index of suspicion as well as emergent evaluation and treatment. Standard care including early fasciotomy, local wound care, serial examinations and pressures monitoring is well established. Further adjunctive considerations should include the use of hyperbaric oxygen therapy and monitoring of acute ischemia with serial fluorescent microangiography studies.

Analysis and Discussion
Trauma is the most common cause of acquired distal extremity amputations in the pediatric population (9). Discussing emergent cases of acute compartment syndrome can lead to prompt intervention to reduce morbidity and mortality. ASCS can lead to poor outcomes to patients and their families. This can be a useful tool to help guide these difficult discussions and visualy represent probable outcomes to patients and their families.

References

Analysis and Discussion
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In conclusion, compartment syndrome is a critical, time-sensitive condition that requires a high index of suspicion as well as emergent evaluation and treatment. Standard care including early fasciotomy, local wound care, serial examinations and pressures monitoring is well established. Further adjunctive considerations should include the use of hyperbaric oxygen therapy and monitoring of acute ischemia with serial fluorescent microangiography studies.