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SERIOUS INFECTIOUS COMPLICATIONS RELATED TO EXTREMITY CAST/SPLINT PLACEMENT IN CHILDREN

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□ **Abstract—Background: Extremity injuries necessitating splinting or casting are commonly seen in the emergency department (ED) setting. Subsequently, it is not uncommon for patients to present to the ED with complaints related to an extremity cast or splint. Objective: To present a literature-based approach to the identification and initial management of patients with possible infectious cast/splint complications in the ED setting. Case Reports: We present two cases of serious infectious complications arising from extremity cast/splint placement seen in a single pediatric ED: a case of toxic shock syndrome in an 8-year-old child, and a case of necrotizing fasciitis resulting in upper extremity amputation in a 3-year-old child. Conclusions/Summary: A wide spectrum of potential extremity cast/splint infectious complications may be seen, which include limb- or life-threatening infections such as toxic shock syndrome and necrotizing fasciitis. Simply considering these diagnoses, and removing the cast or splint to carefully inspect the affected extremity, are potential keys to early identification and optimal outcome of cast/splint complications. It is also prudent to maintain particular vigilance when treating a patient with a water-exposed cast, which may lead to moist padding, skin breakdown, and potential infection. In patients with suspected serious infections, aggressive fluid management and antibiotic therapy should be initiated and appropriate surgical consultation obtained without delay.** © **2011 Elsevier Inc.**

□ **Keywords—cast; splint; complication; infection; necrotizing fasciitis; toxic shock syndrome**

INTRODUCTION

Significant casting and splinting complications, although uncommon, can be more severe than many clinicians might anticipate. Even the most astute clinician may easily miss these complications. We present two cases of infectious life- or limb-threatening cast/splint complications presenting to a single pediatric emergency department (ED). We also review the pediatric and adult medical literature regarding such complications, and use these cases to highlight the red flags to look for when a patient presents to the ED with a cast- or splint-related complaint. The approach to these complaints can perhaps be best summarized by a phrase taken from the orthopedic literature: "there are no hypochondriacs in casts" (1).

CASE REPORTS

Case 1: Toxic Shock Syndrome

An 8-year-old girl presented to the ED 2 weeks after sustaining fractures to the distal radius and ulna. A fiberglass splint was placed at an outside ED at the time of initial injury for treatment of distal shaft fractures. She was evaluated by an orthopedic surgeon for follow-up earlier in the day preceding the second ED visit, who noted friction-induced blisters and skin maceration on her right

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middle finger upon removal of the forearm/hand splint in his office. A radiograph confirmed healing fractures and a plaster cast was placed. Later that night, she developed a temperature of 39.4 °C (103°F), myalgias, progressively worsening hand swelling and pain, and a diffuse, erythematous rash, all of which prompted the second ED visit.

Initial ED vital signs were as follows: temperature 38.5 °C (101.3°F), heart rate 162 beats/min, blood pressure 101/49 mm Hg, respiratory rate 24 breaths/min, and room air oxygen saturation of 100%. Removal of the cast revealed purulent blisters on two of her fingers with redness, warmth, and swelling. The extremity had good pulses, capillary refill, and sensation. She was well-appearing, and the remainder of the examination was unremarkable. Significant laboratory findings included mildly elevated liver transaminase levels (less than twice the upper limits of normal), pyuria without bacteruria (> 10 white blood cells [WBC] per high power field), and a systemic leukocytosis: WBC count 21.8 K (normal 4.8−13.0 K/mL^3) with 92% granulocytes. Blood and wound cultures were obtained, and intravenous clindamycin was initiated.

During the first day of hospitalization, she was persistently tachycardic (heart rate around 150 beats/min) with borderline hypotension, which was initially unresponsive to intravenous fluid administration. Ceftriaxone and vancomycin were added empirically, and she was transferred to the pediatric intensive care unit (PICU) for closer monitoring. Her liver function tests worsened (transaminases several-fold greater than the upper limits of normal), and her plasma coagulation parameters were mildly elevated. She steadily improved with more aggressive crystalloid infusion and antibiotic therapy, and was ultimately discharged on oral clindamycin 3 days later. Wound cultures were positive for growth of methicillin-sensitive *Staphylococcus aureus*, whereas blood cultures did not demonstrate bacterial growth.

A presumptive diagnosis of toxic shock syndrome (TSS) was made. This was based on the presence of high fever, relative hypotension, diffuse macular erythroderma, with eventual desquamation. In addition, she exhibited myalgias, pyuria without bacteruria, and hepatic dysfunction. Furthermore, blood, cerebrospinal, and throat cultures were all negative.

Case 2: Necrotizing Fasciitis

A 3-year-old otherwise healthy boy was brought to the ED after falling from playground equipment, resulting in a Gartland type I (non-displaced) supracondylar fracture. He was neurovascularly intact. There were no skin or soft tissue wounds, lesions, or abrasions identified. He was splinted without manipulation in a posterior long arm fiberglass splint, and discharged after arranging orthopedic follow up within the week.

The child returned to the ED 3 days after the initial evaluation, complaining of increased redness and swelling above the splint, particularly over the right shoulder. He appeared comfortable, in no significant distress, with normal vital signs. An area of ecchymosis and swelling was noted over his right shoulder, without any crepitus or bony tenderness to palpation. In addition, a 1-cm superficial abrasion was noted in his right axillary region. Normal capillary refill was noted distally.

The discomfort was presumed to be secondary to a tight splint, causing constriction, edema, and discomfort. The splint was therefore replaced. Due to the new shoulder pain, a radiograph of the right shoulder was obtained to exclude additional injuries that might have been missed on the first evaluation. The radiograph was negative for fracture or visible soft tissue abnormalities. He was discharged home with the diagnosis of shoulder contusion.

The following day the child arrived in the office for orthopedic follow-up, where he was noted to be toxic-appearing. He was taken by ambulance to the nearest ED, where his vital signs were: temperature of 40.8°C (105.5°F) per rectum, heart rate 220 beats/min, respiratory rate 60 breaths/min, an undocumented blood pressure, and a capillary refill time of 10 s. The extremity was dusky, without a radial pulse. He was intubated for respiratory distress, and intraosseous access was obtained. He was aggressively fluid resuscitated. Intravenous ceftriaxone, vancomycin, and metronidazole were administered. He was transferred back to the initial institution for pediatric orthopedic evaluation and PICU admission.

On arrival to the PICU, central venous access was established, gentamicin and ceftazidime were administered, and a norepinephrine infusion was begun. The WBC count was 5800/mL^3 with 52% band forms. A presumptive diagnosis of necrotizing fasciitis was made, and the child was immediately taken to the operating room. A gangrenous right arm was amputated and debridement of the anterior chest wall was necessary due to extensive soft tissue necrosis. After surgery, his vital signs improved and signs of sepsis rapidly resolved. Cultures obtained in the operating room demonstrated heavy growth of *Streptococcus pyogenes*. He required several additional operations for debridement, but was ultimately discharged home without further complications.

DISCUSSION

To place these cases into context and provide an up-to-date discussion, a literature search was performed for English language articles, case reports, reviews, and textbook chapters published in the last three decades. The orthopedic