An 84-Year-Old Man with Acute Atraumatic Compartment Syndrome of the Upper Extremity Due to \textit{Streptococcus pyogenes} Cellulitis

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Patient: Male, 84-year-old
Final Diagnosis: Compartment syndrome
Symptoms: Arm pain • arm swelling
Medication: —
Clinical Procedure: Fasciotomy
Specialty: Surgery

Objective: Unusual clinical course
Background: Acute compartment syndrome represents a surgical emergency to restore blood supply by fasciotomy and decompression. Compartment syndrome is most commonly associated with crush-related injuries and fractures; however, other non-traumatic etiologies can occur. This report illustrates a rare case of acute atraumatic compartment syndrome of the upper extremity due to \textit{Streptococcus pyogenes} cellulitis in an 84-year-old man, presenting a challenging clinical scenario.

Case Report: An 84-year-old man presented to the Emergency Department with 24 h of significant right-arm pain and swelling. Due to the amount of increased swelling and significant pain, compartment pressure was obtained. He underwent emergency fasciotomy of his right forearm, hand, and carpal tunnel release. Both blood and intra-operative wound cultures grew \textit{Streptococcus pyogenes} (Group A Streptococcus). The patient suffered a prolonged hospital course requiring multiple subsequent surgeries and eventual skin grafting. Despite his complicated hospital course, he made a remarkable recovery and was discharged home in excellent condition.

Conclusions: This report illustrates that compartment syndrome should be considered as a complication of cellulitis in patients with severe pain, even without a history of trauma. Early diagnosis, antibiotic therapy, and emergency fasciotomy are required to preserve the affected limb.

Keywords: Cellulitis • Compartment Syndromes • \textit{Streptococcus pyogenes} • Case Reports

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**Background**

Acute compartment syndrome is an emergent surgical condition in which a compartment, an anatomical area bounded by fascia and bone, develops increased pressure and diminished vascular supply [1]. It is primarily associated with traumatic extremity fractures, but can also occur with burns, infections, and prolonged limb compression [1,2]. Failure to diagnose acute compartment syndrome can result in serious limb-threatening complications such as deformity, paralysis, and amputation [3].

Cellulitis is a bacterial skin infection that is caused by pathogens entering through breaks in the skin [4]. One pathogen responsible for many cases of cellulitis is *Streptococcus pyogenes* (Group A Streptococcus), a gram-positive coccus that is noted to be among the most common human pathogens [2,4]. Streptococcal infection has been noted to be a rare but possible cause of acute compartment syndrome, and management in these cases includes prompt surgical intervention and intravenous antibiotic treatment [2,3,5,6].

Given the frequent association between compartment syndrome and traumatic injuries, atraumatic compartment syndrome caused by bacterial infection presents a challenging clinical scenario. This report illustrates a case of acute atraumatic compartment syndrome of the upper extremity due to *Streptococcus pyogenes* cellulitis in an 84-year-old man.

**Case Report**

An 84-year-old man with past medical history including coronary artery disease, hypertension, and chronic kidney disease presented to the Emergency Department (ED) with atraumatic right-arm pain and swelling that had been present for approximately 24 h. The physical exam showed a temperature of 36.7°C, pulse of 96 beats per min, blood pressure of 131/81 mmHg, and respiratory rate of 22 breaths per min. He appeared to be in moderate distress due to pain. The patient had severe right-arm swelling, tenderness, and pain with passive finger extension. Additionally, he had antecubital space ecchymosis that expanded while in the ED (Figures 1, 2). Lab results included hemoglobin 14.1 g/dL, white blood cell count 6.4×10⁹/L, and glucose 128 mg/dL. A bedside ultrasound of the right arm revealed diffuse interstitial edema (Figure 3). Hand Surgery was consulted due to concern for compartment syndrome. Using a Stryker Needle™ (Stryker Intra-Compartmental Pressure Monitor, Stryker Corporation, USA) inserted in the dorsal compartment of the right forearm, his compartment pressure was 43 mmHg.

Due to the patient's concerning clinical picture and elevated dorsal compartment pressure, he was taken to the operating room.
room for right-forearm fasciotomy, right-hand fasciotomy, and right-hand carpal tunnel release. Incisions were made on the volar and dorsal aspects of the forearm. Additionally, incisions were made on the right hand overlying the proximal palm in line with the fourth metacarpal, over the thenar eminence at the junction between the glabrous and non-glabrous skin, and over the second and fourth metacarpals. Intraoperative findings revealed fluid within the subcutaneous tissues, but the muscles and fascia showed no signs of a necrotizing process. Right-forearm tissue culture had isolated growth of *Streptococcus pyogenes*, prompting treatment with intravenous penicillin G and clindamycin. Blood cultures taken from the ED when he arrived were also positive for the same organism.

The patient underwent a protracted clinical course, including several weeks in the Intensive Care Unit. He returned to the operating room for 11 total procedures, including washouts and debridements, throughout his admission. He was later discharged in stable condition with a successful skin graft and, notably, normal right-arm range of motion and sensation. Upon follow-up evaluation several months later, the patient was noted to have healed well, aside from having a small draining wound on the medial right forearm, which was excised at that time.

### Discussion

This case highlights the importance of considering compartment syndrome as a complication of cellulitis in patients with concerning clinical features, as compartment syndrome is primarily diagnosed based on clinical assessment. Patients with acute compartment syndrome typically present with pain that appears to be out of proportion to their injury [7]. Additionally, other common clinical features of compartment syndrome include pallor, paresthesia, pulselessness, and pain upon passive range of motion [2,5].

Our patient’s symptoms of severe right-arm swelling, tenderness, and pain with passive finger extension were clinically concerning. However, due to the subjective nature of these symptoms, a compartment pressure measurement was obtained to provide additional evidence for this diagnosis. Debate exists regarding the pressure threshold for diagnosis of compartment syndrome; however, absolute compartment pressures of 30 mmHg and 45 mmHg have been referenced as thresholds by prior studies [1,7]. A differential pressure, or diastolic blood pressure minus absolute compartment pressure, of 30 mmHg or less has also been used as a criterion for diagnosing compartment syndrome [1,7]. An absolute compartment pressure threshold of 30 mmHg was used in our patient’s case.

As compartment syndrome is commonly associated with instances of trauma, atraumatic cases can be easily missed. Given the severe complications that may result from a missed diagnosis, this case has shown that having a high clinical suspicion for atraumatic compartment syndrome is crucial.

Prior studies detailing atraumatic compartment syndrome caused by Group A and Group C Streptococcus demonstrated similar hospital trajectories requiring emergency fasciotomies, intravenous antibiotic treatment, and prolonged admissions [2,3]. One study of 13 cases revealed that a majority of patients had no significant history of immunosuppression and the mortality rate was 15% [6]. These referenced case reports, along with our patient’s case, stress the importance of early recognition and prompt surgical and medical intervention to reduce serious complications [2,3,5,6].

### Conclusions

Although rare, Streptococcal cellulitis is a known etiology of atraumatic compartment syndrome. This report illustrates that compartment syndrome should be considered as a complication of cellulitis in patients with severe pain, even without a history of trauma. Early diagnosis, antibiotic therapy, and emergency fasciotomy are required to preserve the affected limb.

### Conflicts of Interest

None.
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