

Delayed Presentation of Compartment Syndrome in Tibial Diaphysis Fracture**Singh G*, Singh D, Smith C and Sanford C**

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1. Abstract

We present a case report of a 38-year-old male who underwent uneventful intramedullary fixation of a tibial diaphysis fracture with appropriate post-operative monitoring. He presented nearly two weeks after fixation to the clinic with new increasing pain, and was found to have objective and subjective symptoms consistent with compartment syndrome. While he was adequately treated for compartment syndrome, his case demonstrates the need for high suspicion when appropriate symptoms present.

2. Introduction

Compartment syndrome (CS) is a known and severe complication of extremity injury and can result in permanent loss of limb function and vital organ damage [1-4]. CS typically develops within 48 hours of injury, and may be diagnosed clinically or with direct compartment manometry [5-7]. In rare cases, compartment pressures were found to remain subcritical for up to four days before elevation over the surgical threshold [8]. Here we will present a polytrauma patient who developed clinical signs and symptoms consistent with compartment syndrome confirmed by direct intracompartmental pressure manometry 13 days after intramedullary fixation of a tibial diaphysis fracture.

3. Case Presentation

Our patient is a 38-year-old male who presented to our facility as a level 2 trauma activation after being struck by a car while on his bicycle. His chief complaints on presentation were bilateral shoulder pain and left lower extremity pain with associated deformity. Examination and radiographic studies were significant for left mid-shaft tibia fracture with associated fibular shaft fracture and non-displaced posterior malleolus fracture, left scapular body fracture, and right distal third clavicle fracture (Figures 1-3).

Scapular body fracture and clavicle fractures were deemed to be within appropriate parameters for nonoperative management. The Left lower extremity was splinted with strict ice and elevation and compartment checks performed every four hours. He underwent percutaneous fixation of the posterior malleolus and intramedullary fixation of the tibial shaft fracture using a suprapatellar approach on the morning of hospital day one with simple posterior slab splint application post-operatively (Figures 4-7). Postoperatively, compartment checks were continued, and he demonstrated no signs or symptoms concerning for compartment syndrome during his inpatient stay. He was discharged on hospital day 5 after arranging for durable medical equipment and home health to assist with care. He was given instructions to remain non-weight bearing to the left lower extremity due to involvement of the posterior malleolus and to allow soft tissue rest. He presented to clinic on post-operative day 13 with complaints of new onset paresthesia and increasing pain. The splint was removed in clinic and the left leg was noted to be very firm to palpation, expressed increased pain with passive motion of the great toe. These clinical findings were concerning for compartment syndrome. Due to the unusual subacute presentation, direct compartment manometry was then performed using Stryker Intra-Compartmental Pressure Monitor System finding compartment pressure as follows: anterior 49 mm Hg, lateral 41 mm Hg, superficial posterior 31 mm Hg, and deep posterior 30 mm Hg. The patient was diagnosed with compartment syndrome at this time and underwent urgent four-compartment fasciotomy of the left leg with negative pressure wound therapy device application. He ultimately underwent closure 7 days later. The Tibial shaft fracture went on to nonunion with broken interlocking screws which was treated successfully with exchange intramedullary nailing and fibular osteotomy 6 months after the

index operation (Figures 6-9). The patient ultimately made a full recovery with no residual functional or neurological deficits.



Figure 1:



Figure 2:

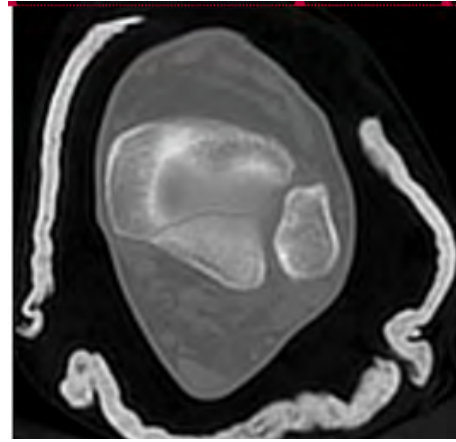


Figure 3:



Figure 4:



Figure 5:



Figure 7:



Figure 6:

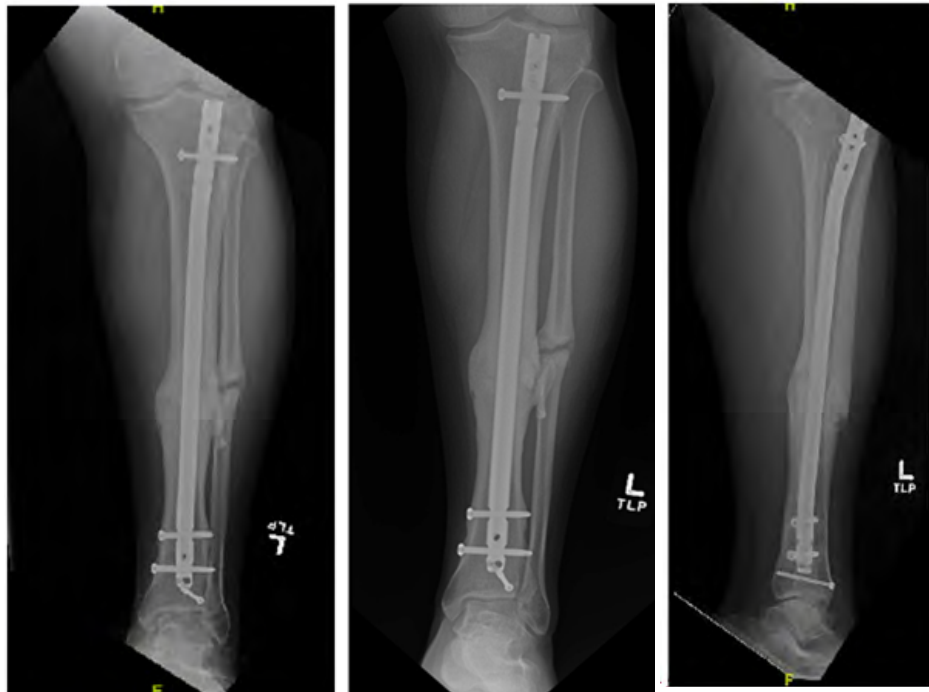


Figure 8:

4. Discussion

Compartment syndrome is a severe complication following fractures, soft tissue injury, or nontraumatic etiology such as post-ischemic revascularization and surgical positioning [3, 4-13]. CS is described as increased pressure within a non-expandable compartment, such as a muscle compartment bound by fascia or in the case of a circumferential skin eschar, leading to residing tissues experiencing loss of perfusion and eventual loss of function [1,2]. Hallmark clinical signs and symptoms of compartment syndrome are pain out of proportion, pain with passive motion, paresthesia, pallor, lack of distal pulses, and paralysis. CS is generally viewed as a clinical diagnosis [7]. However, intra-compartmental direct pressure monitoring is the gold standard for diagnosing compartment syndrome with a sensitivity and specificity above 95% [18,19]. In cases where a patient is unable to report symptoms or in cases where exam is equivocal, manometry may be used to augment clinical diagnosis [7]. Intra-compartmental pressures of over 30mm Hg or within 30mm Hg of the patient's diastolic blood pressure are typically designated thresholds for diagnosing CS [7]. Monitoring is most often completed with a handheld manometer, a simple needle manometer, or a slit catheter system.

Multiple studies monitoring intra-compartmental pressure in tibial fracture patients reported compartment syndrome typically presented within the first 48 hours of treatment [6,16,17]. CS is a surgical emergency; therefore, timely intervention is essential to prevent tissue necrosis, sepsis, renal failure, permanent disability, or death. Fractures are the leading cause of compartment syndrome and account for nearly 75% of CS cases, with fractures of the tibia being the leading cause of limb compartment syndrome at almost 40% [18-20]. Following a tibial fracture, swelling can occur in any of the four compartments of the lower leg but most commonly occurs in the anterior compartment. The mechanism of injury, location, and severity of the tibial fracture play a causative role in the development of CS. Fractures of the tibial diaphysis are more strongly correlated with the occurrence of CS than proximal or distal fractures [21, 22]. Although fractures should be treated within standard treatment practices, care must be taken to prevent the induction of compartment syndrome. Up to 11% of patients with tibial fractures have been shown to develop compartment syndrome [21, 23]. Intra-compartmental pressure may increase during fracture reduction and intramedullary nailing. However, intramedullary nailing is not associated with an increased risk for developing compartment syndrome [24, 25].

Although this patient ultimately went on to a successful outcome, the setback he faced from this fracture and subsequent compartment syndrome, demonstrates the need to have increased suspicion if clinical signs and symptoms are concerning. Due to the unusual chronicity of his symptoms, direct pressure manometry was utilized and was helpful in diagnosing and ensuring timely treatment of his compartment syndrome without residual functional or neurological limitations.

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