

Cameron Rouleau PA-S, Cindy Rossi MHS, PA-C
Quinnipiac University Physician Assistant Program

Introduction

- Compartment syndrome occurs due to increased pressure within a closed fascial space impairing the delivery of blood and nutrients to the area causing tissue damage and eventually necrosis.¹
- The incidence of compartment syndrome is about 1/100,000 females and 7.3/100,000 males. It typically manifests in the lower extremity as a result of tibia fractures; occurrence in the gluteal compartment is much less common.² According to the largest meta-analysis to date, only 139 cases have been described.¹
- Gluteal compartment syndrome is a very rare manifestation that poses permanent and life-threatening risks including sciatic nerve neuropathy and muscle necrosis.³
- Gluteal compartment syndrome most commonly arises from prolonged immobilization due to alcohol or drug intoxication or improper positioning during surgical procedures where the patient has been lying on the hip for hours at a time without moving. The most commonly associated surgical positioning is the left lateral decubitus position.^{1,4}
- Gluteal compartment syndrome rarely occurs secondary to trauma. Documented cases have typically involved minor incidents such as a fall from standing.^{1,5}
- The most common risk factor for gluteal compartment syndrome is obesity.^{1,4} Most recently there was found to be increased risk associated with the use of epidural anesthesia as well.^{4,7}
- Less specific findings like pain, erythema, and swelling are more common in gluteal compartment syndrome. The “6 P’s” that are classically associated with compartment syndrome present much later in gluteal compartment syndrome.¹
- The diagnosis of gluteal compartment syndrome is primarily made clinically. However, the diagnosis is often missed as patients may present with only minor physical manifestations initially.¹ Measuring compartment pressures can be used to confirm the diagnosis. If pressures reach greater than 30mmHg for more than 8 hours, the blood delivery becomes impaired and irreversible damage ensues.^{6,7}
- In the largest meta-analysis to date on gluteal compartment syndrome, bilateral compartment syndrome occurs in 15% of cases and is associated with a 70% chance of survival.¹
- In this same study, only 51% of patients healed without long-term deficits regardless of whether the gluteal compartment syndrome was unilateral or bilateral.¹
- Treatment approaches to gluteal compartment syndrome include fasciotomy or, simply treating the various sequelae, using “medical management.” For instance, rhabdomyolysis can be effectively treated with new technology like continuous renal replacement therapy.¹

Table 1: Most common physical findings of gluteal compartment syndrome¹

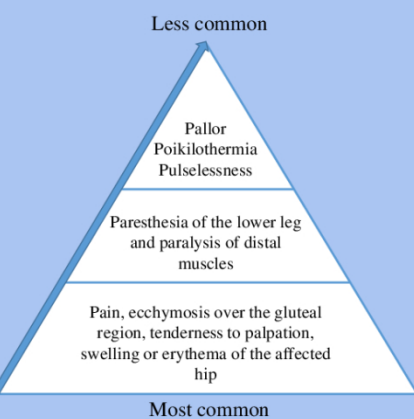


Figure 1: Post-operative fasciotomy site



Case Description

History

- 37yo black male presenting to the ED after waking up experiencing nausea, vomiting, a stiff, tight, and tender left thigh and hip, and difficulty ambulating on the left leg. At that time, he denied lower extremity pain or paresthesia.
- Sustained a fall from standing the night prior and denied any loss of consciousness or head strike.
- At home, he drank a substantial amount of alcohol and took one oxycodone for the pain then fell asleep.
- Denied any past medical history, surgical history, medications or allergies.
- Denied drug or alcohol use/history.
- Denied any fevers, chest pain, shortness of breath, abdominal pain, headaches, or lower extremity weakness.
- After a 5-6 hours in the ED, he began experiencing “excruciating” pain to light touch on his left hip and new onset of left foot numbness.

Initial Physical Exam

- $\frac{139}{94}$ mmHg 81 beats/min 98.2°F
18 breaths/min 100% SpO₂
- General – well appearing, no acute distress, AOX3.
- Heart – normal S1 and S2 without murmurs, gallops or clicks.
- Lungs – all lung fields clear to auscultation bilaterally without wheezes, rhonchi, or rales.
- Musculoskeletal – skin warm, dry, and intact with no lacerations, ecchymosis or soft tissue swelling. Tenderness along greater trochanter and full range of motion passively and actively with significant pain.
- Neurovascular – strength is 5/5 in all extremities, sensation intact. Warm, dry lower extremities 2+ posterior tibialis and dorsalis pedis pulses in bilaterally.

Initial Diagnostic Studies

- WBC 14.6x10⁹/L (H)
- Potassium 5.8 mmol/L (H)
- Creatinine 2.2 mg/dL (H)
 - Increased to 3.4 mg/dL on day 2
- Blood glucose 55 mg/dL (L)
- Estimated GFR 34 mL/min (L)
 - Decreased to 20 mL/min on day 2
- Creatinine Kinase 17,465 U/L (H)
 - Increased to > 40,000 U/L on day 2
- Blood Ethanol – 81 mg/dL (H)
- Toxicology Screen – negative
- EKG – normal sinus rhythm
- X-ray of left hip – no fracture, subluxation, osseous or soft tissue injury and normal joint spaces

Differential Diagnosis

Compartment Syndrome
Deep Vein Thrombosis (DVT)
Fracture/Dislocation of Hip/Femur
Acute Arterial Embolism
Septic Arthritis
Saddle Anesthesia

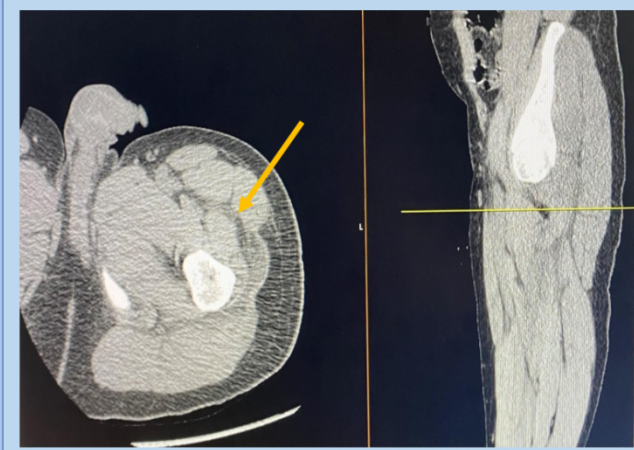
Management

- In the ED, the patient received:
 - 1000mL IV bolus of normal saline
 - 15g of sodium polystyrene sulfonate PO
 - 100mg of thiamine and 400mcg of folic acid PO daily and 2mg of lorazepam IV every 6 hours as needed for withdrawal
 - Single dose of enoxaparin 40mg subcutaneously for DVT prophylaxis
- The patient was admitted due to his acute leg pain, severe traumatic rhabdomyolysis, and acute kidney injury.
 - Pain control with 1000mg acetaminophen PO every 6 hours, 0.5mg of hydromorphone IV every 3 hours, and 5% lidocaine patch daily
 - IV lactated ringers at 200cc/hr with strict I&O monitoring
 - Due to growing concern for compartment syndrome, enoxaparin was held
- On day 2, patient began experiencing severe left hip pain, left foot drop, sensory deficits and decreased motor function of left foot and ankle. Immediate CT scan showed fluid attenuation confirming the diagnosis of gluteal compartment syndrome. Patient was rushed to the OR for emergent left gluteal compartment fasciotomy with neuroplasty and decompression of the left sciatic nerve.
- Patient had immediate return of sensation and motor function post-operatively. Neurologic exams were performed every 4 hours.
- A wound vacuum was placed on the 7th day at negative 50mmHg and remained until the 9th day when he returned to the OR for wound closure and Jackson-Pratt drain placement.

Patient Outcome

- The patient was discharged after 11 days and was scheduled for follow-up with the plastic surgeon.
- Discharge Medications:
 - Acetaminophen 1000mg up to 4x/day as needed for pain
 - Tramadol 25mg up to 4x/day as needed for pain
 - Folic acid 400mcg once daily
 - Thiamine 100mg once daily
 - Polyethylene glycol 17g pack once daily
 - Senna-Docusate 8.5-50mg – 2 tablets twice daily
- At follow up 10 days later, patient stated he was doing well. JP drain was removed and patient was told to slowly increase activity and return in 2 weeks for suture removal.

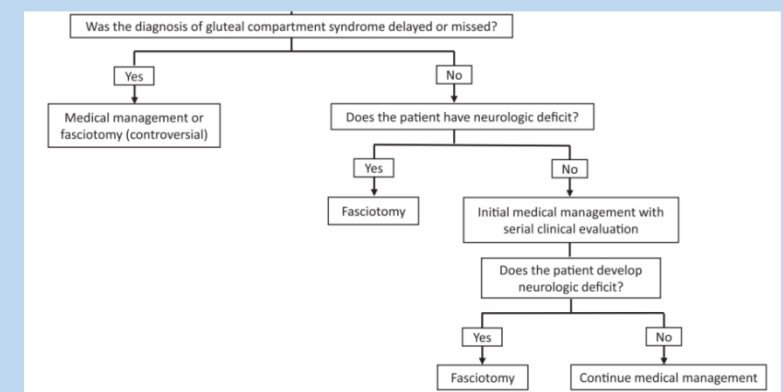
Figure 2: Computed tomography of left gluteal compartment



Discussion

- Gluteal compartment syndrome diagnosis is frequently delayed due the lack of physical manifestations indicating urgency like pulselessness and pallor of the extremity. Therefore, clinicians need to maintain a high index of suspicion and keep it on their differential.¹
- The most common sequelae that occur as a result of gluteal compartment syndrome include rhabdomyolysis, organ failure, sepsis and sciatic nerve neuropathy and if the compartment syndrome is not relieved in a timely manner, permanent neuropathy, motor losses, or even death can occur.¹
- There is some debate about whether or not immediate fasciotomy or medical management of gluteal compartment syndrome is most appropriate. The most recent meta-analysis showed that in patients without neurologic deficits, there was no increased risk for permanent neurovascular damage between patients who received fasciotomy and patients who were managed medically. However, once neurologic deficits appear, fasciotomy should be performed to avoid lifelong deficits. A treatment algorithm is proposed.¹

Table 2: Treatment algorithm for gluteal compartment syndrome¹



Conclusion

- Gluteal compartment syndrome is rare manifestation that is hard to diagnose, but left untreated, can cause permanent neurological deficits and, in the worse cases, death.
- Most patients will present with non-specific and, initially, only minor physical exam findings including pain, erythema, and edema. The classic “6 Ps” are less common with gluteal compartment syndrome.
- Gluteal compartment syndrome usually occurs due to immobilization for a prolonged period of time paired with certain surgical positioning or intoxication, but may also result from trauma.
- Sequelae include rhabdomyolysis, electrolyte abnormalities, acute kidney injury, organ failure, and sciatic neuropathy. Each of these manifestations must be addressed promptly.
- Treatment options include fasciotomy or medical management, but regardless of which option is chosen, treatment must be initiated in a timely manner. It is imperative that providers are diligent not to miss this diagnosis in order to prevent associated morbidity and mortality.

References

1. Adib F, Posner AD, O'Hara NN, O'Toole RV. Gluteal compartment syndrome: a systematic review and meta-analysis. *Injury*. 2022;53(3):1209-1217. doi:10.1016/j.injury.2021.09.019
2. Elkbuli A, Sanchez C, Hai S, McKenney M, Boneva D. Gluteal compartment syndrome following alcohol intoxication: case report and literature review. *Ann Med Surg*. 2019;44:98-101. doi:10.1016/j.amsu.2019.07.010
3. Petrik ME, Stambough JL, Rothman RH. Posttraumatic gluteal compartment syndrome. a case report. *Clin Orthop Relat Res*. 1988;(231):127-129.
4. Iizuka S, Miura N, Fukushima T, Seki T, Sugimoto K, Inokuchi S. Gluteal compartment syndrome due to prolonged immobilization after alcohol intoxication: a case report. *Tokai J Exp Clin Med*. 2011;36(2):25-28.
5. Mustafa NM, Hyun A, Kumar JS, Yekkirala L. Gluteal compartment syndrome: a case report. *Cases J*. 2009;2:190. doi:10.1186/1757-1626-2-190
6. Narayan N, Griffiths M, Patel HD. Gluteal compartment syndrome with severe rhabdomyolysis. *BMJ Case Rep*. 2013. doi:10.1136/bcr-2013-010370
7. Tasch JJ, Misodi EO. Delayed presentation of acute gluteal compartment syndrome. *Am J Case Rep*. 2016;17:503-506. doi:10.12659/ajcr.899249