

Gluteal acute compartment syndrome in a patient undergoing neuraxial anesthesia: a case report

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Abstract

Acute compartment syndrome (ACS) is defined as increased pressure within a muscle fascial compartment. The incidence of ACS is higher in individuals with multiple risks. The current diagnosis of ACS is based on clinical findings and intramuscular pressure (IMP).

The patient in our case report is a man with a complex medical history undergoing lower limb orthopedic surgery. A combined spinal-epidural anesthetic was administered without complications. Postoperative pain management was carried out with continuous epidural infusion. Three boluses of 10 mL 0.2% ropivacaine *via* the epidural catheter were required due to postoperative pain

(VAS 9/10), partially reducing the localized pain in the gluteal region (VAS 7/10). Clinical monitoring revealed swelling and redness in the gluteal region. Fasciotomy was avoided due to spontaneous symptom resolution.

Diagnosing ACS is rarely straightforward and requires a high index of suspicion and clinical awareness. Our study demonstrates that epidural anesthesia has contributed to accelerating the diagnostic process.

Introduction

Acute compartment syndrome (ACS) results from elevated pressure within a closed myofascial compartment,¹⁻³ leading to reduced capillary perfusion and subsequent ischemia, hypoxia, and tissue necrosis if not promptly treated.⁴ The syndrome is a potentially limb- and life-threatening complication. While most often associated with trauma, ACS can also occur in the postoperative setting, especially when predisposing factors like obesity, reduced mobility, intraoperative hypotension, and lengthy surgeries are present.⁵ The gluteal region, although rarely affected, comprises multiple compartments susceptible to ACS under certain conditions.⁶ The diagnostic process is primarily clinical and supported by intracompartmental pressure measurement and imaging when necessary.^{1,2} One commonly debated topic is whether regional anesthesia, such as spinal or epidural techniques, masks the typical signs of ACS, thereby delaying diagnosis.⁴ Our case contradicts this concern and shows that epidural anesthesia, when carefully assessed, may actually prompt early suspicion of ACS.

Case Report

A 69-year-old male (85 kg, 165 cm, body mass index [BMI] 31.25) with a history of well-controlled hypertension, obesity, senile dementia, chronic hepatitis B, psoriatic arthritis, poliomyelitis, and advanced right knee osteoarthritis presented for elective right total knee arthroplasty (TKA). Due to chronic knee pain and lower-limb weakness, the patient had been largely immobile and wheelchair-bound for the preceding six months. Combined spinal-epidural anesthesia (CSE) was selected. The epidural catheter was placed at the L2-L3 level using an 18-gauge Tuohy needle and loss-of-resistance technique. Spinal anesthesia was then administered at L3-L4 with a 25-gauge Whitacre needle, injecting 12 mg of 0.5% hyperbaric bupivacaine, 5 mcg of sufentanil, and 15 mcg of clonidine. The procedure was uneventful. A T8 sensory block (Holman scale 4) and complete motor block (Bromage scale 1) were achieved. Surgery lasted 3 hours and 45

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minutes, with the patient maintained in the supine position. Intraoperatively, two episodes of hypotension (MAP 45 mmHg) lasting about 7 minutes were treated with crystalloid infusions. Full motor recovery was observed within the first postoperative hour. Analgesia was maintained with a continuous epidural infusion of 0.2% ropivacaine at 8 mL/h. After 24 hours, the patient reported severe pain (VAS 9/10) in the right gluteal region, partially responsive to three consecutive boluses of 10 mL 0.2% ropivacaine, which reduced the VAS score to 7/10. Physical examination revealed swelling, redness, and numbness in the gluteal area, raising suspicion of gluteal compartment syndrome (Figure 1). Laboratory findings demonstrated elevated creatine phosphokinase (CPK 12,018 U/L, CR 1.5 mg/dL), suggestive of muscle damage. Intracompartmental pressure was 28 mmHg. Ultrasound revealed subcutaneous edema, while MRI confirmed edema of the gluteus maximus and medius muscles and excluded a blood hematoma. Given the absence of neurologic deficits and spontaneous clinical improvement, surgical decompression was not pursued. The patient was monitored closely, and laboratory values gradually normalized over the following days.

Discussion

ACS has an overall incidence of 3.1 per 100,000 annually, with a marked male predominance (7.3/100,000 in men *versus* 0.7/100,000 in women). Although most cases arise from limb trauma, ACS in elective surgical settings remains under-recognized, particularly in immobile or obese patients undergoing prolonged procedures in fixed positions.⁵ In our case, several risk factors for ACS were present: male sex, obesity, prolonged immobilization from prior poliomyelitis, intraoperative hypotension, and a surgery lasting nearly four hours.^{7,8} Importantly, the surgical position (supine), while seemingly benign, may still compromise gluteal perfusion in the presence of obesity and

immobility.⁶ The gluteal region contains three muscle compartments: the gluteus maximus, the gluteus medius and minimus, and the tensor fascia lata. Pressure elevation in any of these compartments – typically due to an inflammatory cascade and increased capillary permeability – can disrupt local perfusion, leading to ischemia. One critical insight from this case is the role of epidural anesthesia in the diagnostic process. Traditionally, regional anesthesia is thought to obscure ACS symptoms.^{9,10} However, our case demonstrated that the failure of pain relief in a neuraxially anesthetized area – in this instance, the right gluteal region – prompted early suspicion of a pathological process. Epidural block assessment, therefore, served as a functional test for pain localization and treatment efficacy. This challenges the prevailing narrative in the literature and underscores the need for dynamic pain assessment during epidural analgesia. The diagnostic approach was further supported by elevated CPK levels, physical findings, and imaging, all of which confirmed the suspicion of ACS. However, the pressure threshold (28 mmHg) did not mandate surgical intervention.^{11,12}

Conclusions

This case illustrates that gluteal compartment syndrome, although rare, can occur in the context of non-traumatic orthopedic surgery, particularly in patients with multiple predisposing conditions. The case also reinforces the need for proactive monitoring of postoperative pain, even in patients receiving regional anesthesia. Contrary to concerns about masked diagnosis, epidural anesthesia in this case facilitated early identification of ACS due to poor response to analgesic boluses. This observation offers a paradigm shift: when used judiciously, neuraxial anesthesia may not hinder, but rather assist, in the recognition of compartment syndromes. Early diagnosis and conservative management resulted in full recovery without the need for fasciotomy. Awareness of atypical presentations of ACS in the gluteal region is essential, and when properly evaluated, epidural analgesia can be a valuable ally in timely diagnosis.

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Figure 1. Swelling, redness, and numbness in the gluteal area.

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