

Gluteal compartment syndrome following joint arthroplasty under epidural anaesthesia: a report of 4 cases

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ABSTRACT

Compartment syndrome is characterised by an increase in the interstitial pressure within a closed osseofascial compartment. This may be due to a decrease in compartment volume, an increase in compartment content or external pressures. We report 4 patients who required surgical decompression for gluteal compartment syndrome that developed after joint arthroplasty. Gluteal compartment syndrome is rare, has high morbidity, and can be life threatening if not detected early. We emphasise the importance of identifying patients at risk, frequent monitoring of patients with continuous epidural infusions, reporting of motor blockade, and regular changing of the patient's position postoperatively.

Key words: arthroplasty; buttocks; compartment syndromes; decompression, surgical; injections, epidural

INTRODUCTION

Compartment syndrome classically occurs in con-

finer spaces surrounded by non-yielding structures, and is caused by an alteration of fluid dynamics within a closed osseofascial compartment, resulting in tissue pressures rising above the arterial perfusion pressure. The aetiology, pathophysiology, and manifestations of gluteal compartment syndrome are similar to those more commonly seen in the leg and forearm. The large gluteal muscle mass is confined in fascia and under conducive conditions can develop severe muscle necrosis leading to acidosis, sepsis, renal failure, and death. It can occur after trauma,^{1,2} vascular surgery,^{3,4} intramuscular drug abuse,⁵ altered consciousness levels due to drug overdose or alcohol intoxication, and prolonged immobilisation.⁶⁻⁸ We describe a series of 4 patients with gluteal compartment syndrome following joint arthroplasty under epidural anaesthesia.

CASE REPORTS

Case 1

In June 2004, a 46-year-old, obese woman, weighing 101 kg, was admitted for a left total knee arthroplasty

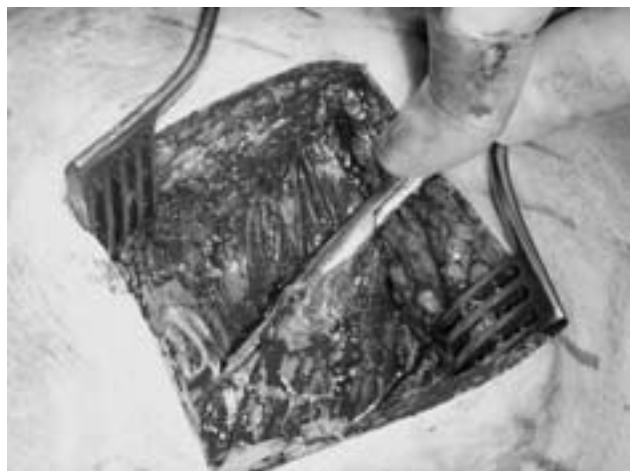


Figure 1 Intra-operative photograph demonstrating muscle oedema.

(TKA). Her body mass index (BMI) was 38 (normal range, 20–25). The patient did not have a history of spontaneous bleeding or a coagulation disorder and was not on any anticoagulant prior to surgery. The operation was carried out in the supine position, under epidural anaesthesia introduced at the L4/5 level. The operating time was 2 hours and the tourniquet was applied for 1 hour and 20 minutes. The patient was nursed in a semi-recumbent position. The epidural infusion was discontinued after 20 hours. The patient started complaining of pain in the left buttock 28 hours after discontinuation of the epidural infusion. There was a tense, tender swelling but no abnormal neurological findings. The patient was thought to have compartment syndrome and underwent decompression 48 hours after the initial operation. Evidence of soft tissue swelling was found but no dead muscle (Fig. 1). The skin was closed primarily and she recovered well.

Case 2

In December 2003, a 71-year-old overweight man (94 kg; BMI, 28) underwent a left total hip arthroplasty in the right lateral position under epidural anaesthesia at the L4/5 level. The patient did not have a history of spontaneous bleeding or a coagulation disorder and was not on any anticoagulant prior to surgery. The anterolateral approach to the hip was used. The operating time was 2 hours and 20 minutes. The epidural infusion was continued for 28 hours after the operation. The patient started complaining of severe right buttock pain 16 hours after discontinu-



Figure 2 Preoperative picture showing circumscribed swelling in the gluteal region.

ation of the epidural infusion. On examination there was a firm, tense, tender swelling with erythema overlying the right buttock (Fig. 2). He had signs of compartment syndrome and underwent decompression 44 hours after the initial operation. The muscles were of a darker appearance than normal, but there were no signs of muscle damage. The patient made a good recovery.

Case 3

In November 2004, a 55-year-old overweight man (86 kg; BMI, 30) underwent a right hip resurfacing arthroplasty in the left lateral position under epidural anaesthesia at the L3/4 level. The patient did not have a history of spontaneous bleeding or a coagulation disorder and was not on any anticoagulant prior to surgery. The lateral approach to the hip was used. The operating time was 3 hours. The epidural was continued for 19 hours after the operation. The patient started complaining of left buttock pain 4 hours after discontinuation of the epidural infusion. On examination, there was an erythematous, tense, and tender area over the left buttock and pain on passive flexion at the hip. He underwent decompression 28 hours after the initial operation. There was tissue oedema but no sign of muscle damage. The patient made a good recovery.

Case 4

In January 2005, a 72-year-old man weighing 81 kg (BMI, 26) underwent a right TKA under epidural

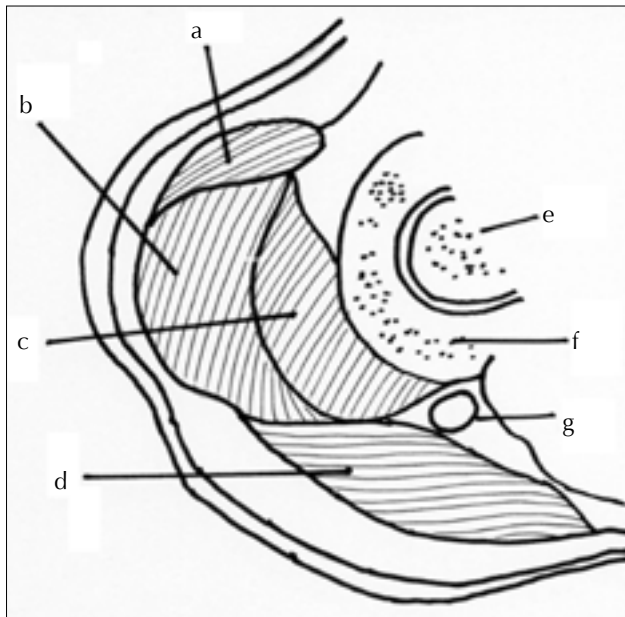


Figure 3 Cross-sectional diagram showing the anatomy of the gluteal compartments: (a) tensor fascia lata, (b) gluteus medius, (c) gluteus minimus, (d) gluteus maximus, (e) femoral head, (f) ilium, (g) sciatic nerve.

anaesthesia at the L1/2 level. He was taking aspirin 75 mg once a day. The operating time was 2 hours and 25 minutes and the thigh tourniquet was applied for 1 hour and 50 minutes. The epidural infusion was continued for 43 hours post surgery. A right foot drop was noticed 4 hours after the epidural infusion was stopped. Examination showed a loss of sensation along the distribution of the sciatic nerve and no active movements at the ankle. There was swelling and tenderness over the right buttock and his serum potassium, urea, and creatinine were raised. A diagnosis of gluteal compartment syndrome was made and surgical decompression carried out. The sciatic nerve was swollen but the muscles appeared viable. The wounds were left open. 48 hours later necrotic muscle was excised from vastus lateralis and the sciatic nerve was less oedematous. The skin was closed primarily. At the 18-month follow-up, the patient had complete recovery of the sciatic nerve, but his hip abductors were weak, with a positive Trendelenburg sign and a residual limp when walking.

DISCUSSION

Although the gluteal region is often treated as a single

compartment, a cadaver infusion study⁸ has shown that it behaves as 3 distinct compartments (Fig. 3): (1) the maximus compartment—this muscle is covered on its superficial and deep surfaces by a fibrous fascia that is contiguous with the fascia lata of the thigh. (2) The minimus compartment—the gluteus medius and minimus are bounded deeply by the wing of the ilium and superficially by the combined layers of the fascia lata. They behave as a single compartment. (3) The tensor compartment—the tensor fascia latae are enclosed by the superficial and deep layers of the fascia lata which creates a rigid compartment. The large sciatic nerve is susceptible, by virtue of its position, to compression and loss of function when gluteal compartment syndrome occurs.⁹

Unrecognised and untreated compartment syndrome causes local tissue ischaemia, acidosis, and muscle necrosis. This causes myoglobinuria and ultimately renal failure, even death. Gluteal compartment syndrome is a rare entity and may occur after posterior cruciate ligament reconstruction,¹⁰ knee arthroplasty,¹¹ or total hip arthroplasty.^{9,12} An association between epidural anaesthesia and gluteal compartment syndrome has been reported.^{8,13,14} Buttock pain at rest with a tense and tender swelling over the buttock and painful movements of the hip, especially on flexion and adduction at the hip, should raise the suspicion of compartment syndrome.^{1,12} The area may be erythematous, but compartment syndrome with normal-appearing skin has been reported.⁷ Our patients presented with buttock pain associated with a tense and tender swelling over the buttock. All had postoperative epidural analgesia and were obese or overweight (Table). There is an increasing tendency among anaesthetists to give patients epidural analgesia. Impaired sensation and motor blockade due to epidural analgesia may prevent the normal, spontaneous changes in posture that redistribute the load on the gluteal area. Obese and overweight patients may be at an increased risk when nursed in the sitting or semi-recumbent posture.^{11,13} The symptoms of gluteal compartment syndrome can also be masked by postoperative sensory blockade. There is also a risk of developing motor blockade that can worsen the pressure on the gluteal compartment. The most important step needed for preventing gluteal compartment syndrome is recognising those patients at risk. Overweight or obese patients with epidural postoperative analgesia who are nursed sitting up are at risk. Vigilant nursing with regular, mandatory changes of posture and checking for motor blockade is necessary. If motor blockade is found, the infusion should be slowed or stopped until the motor function returns.

Table
Details of 4 patients with gluteal compartment syndrome

Patient No.	Age (years)/ Sex	Weight (Kg)	BMI*	Primary operation [†]	Level of epidural infusion	Decompressed side	Duration of symptoms (hours)
1	46/F	101	38	Left TKA	L4/5	Left	48
2	71/M	94	28	Left THA	L4/5	Right	34
3	55/M	86	30	Right hip resurfacing	L3/4	Left	23
4	72/M	81	26	Right TKA	L1/2	Right	47

* BMI denotes body mass index, calculated as weight (kg)/height (m)²

[†] TKA denotes total knee arthroplasty, and THA total hip arthroplasty

The possibility of the symptoms being caused by a subgluteal haematoma was considered. The compartment syndrome developed on the same side as the operation in the 2 patients who underwent TKA, and on the contralateral side in patients who underwent hip operations (Table). This pattern ruled out the possibility of it being just a subgluteal haematoma. In addition, on decompression, the presence of a large haematoma (large enough to cause a swollen and tense gluteal compartment) was not documented, which further supports the diagnosis of compartment syndrome.^{9,11}

Compartment pressure monitoring has been described.^{1,8,15} However, there are varying opinions in the literature with regard to the pressure at which decompression should be carried out. Some claim that a compartment pressure of >30 mm Hg warrants decompression,^{8,16,17} whereas others maintain that it is the arterocompartmental pressure difference that determines the need for surgical intervention.¹⁸ Prompt intervention is vital for tissue and functional salvage. In our series, tests measuring serum creatinine kinase and urine myoglobin were not carried out, as we believed the results would not alter management. Nonetheless, it may be prudent to obtain these results

to corroborate and document this condition for future reference. If the clinical presentation is consistent with compartment syndrome, prompt decompression is advocated, regardless of the pressure measurements. Knowledge of the compartments to be decompressed is essential for adequate exposure and decompression while limiting the morbidity caused by the surgical approach.

CONCLUSION

Gluteal compartment syndrome is an uncommon entity. It carries high morbidity and can be life threatening if not recognised and treated appropriately. The patients at risk are those who are overweight or obese and have postoperative epidural analgesia. Vigilant nursing care is recommended for regular change of posture and for recognition of motor blockade in the presence of epidural analgesia. The surgeon must be aware of this entity and, if it is identified clinically, prompt surgical decompression should be performed. Knowledge of the anatomy of the compartments is vital for effective management of this potentially serious condition.

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