

Combined Gluteal and Posterior Thigh Compartment Syndrome Without Associated Fracture: A Case Report

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Abstract

Compartment syndrome usually occurs after trauma, fracture, or compression injuries. To the authors' best knowledge, this is the first reported case in the medical literature of a combined gluteal and posterior thigh compartment syndrome after an accidental fall without an associated fracture. A 65-year-old man attended the emergency department of the general hospital in a remote island complaining of a swollen painful thigh. He reported that 24 h previously he had an accidental slip and fall on his overstretching right leg. Physical examination revealed right posterior thigh edema, tenderness, paraesthesia, and firmness to palpation. Any attempt to flex the knee provoked pain of intensity 10/10. In addition, there was blue discoloration over the lower half of the gluteal region, non-compressible tense swelling, and pain of intensity 10/10 elicited with passive range of motion of the hip. Compartment syndrome was considered and consequently, fasciotomy of the gluteal and posterior thigh compartments was performed under spinal anesthesia. Compartment syndrome is a surgical emergency. In a remote island, it must be considered and treated early because any delayed diagnosis may lead to loss of an extremity, kidney failure, sepsis and even death.

Keywords: Posterior thigh compartment; Gluteal compartment; Compartment syndrome; Fasciotomy

Introduction

Gluteal compartment syndrome usually occurs after vascular

injury, surgical positioning, and prolonged immobilization from alcohol or drug immobilization [1-3]. Early diagnosis and treatment may prevent sciatic nerve palsy and life-threatening hyperkalemia secondary to rhabdomyolysis [4, 5].

Thigh compartment syndrome is relatively rare. So far only 80 cases have been reported in the literature [6]. Due to the large volume of the thigh compartments and the fact that they blend with the compartments of the hip and gluteal regions, a large volume of blood is needed to produce a compartment syndrome [6, 7].

The commonest causes of compartment syndrome of the thigh without associated femoral fracture are anticoagulant medications, hemophilia, human immunodeficiency virus (HIV) infection and hepatitis [8].

This paper presents the first case in the international literature of combined gluteal and posterior thigh compartment syndrome secondary to blunt trauma after accidental fall on overstretching leg without an associated fracture.

Case Report

A 65-year-old man presented to emergency department of the general hospital in a remote island with painful swollen right posterior thigh, with heart rate of 94, respiratory rate of 18, blood pressure of 100/69 mm Hg, hemoglobin (Hb) of 10.6 g/dL, and hematocrit (Ht) of 32%. His past medical history included type II diabetes mellitus, chronic obstructive pulmonary disease (COPD), obstructive sleep apnea, chronic respiratory acidosis, myocardial infarction, and coronary stenting in 2019. He reported that 24 h previously he fell accidentally on his overstretched right leg. Over first day post-injury, he did not have any functional disability of the leg. However, the next day he was not able to walk because his thigh became swollen from the gluteal fold to the end of the popliteal fossa. Inspection of the leg revealed blue discoloration over the gluteal fold, the lower third of the posterior thigh, and the popliteal fossa (Fig. 1). In addition, physical examination revealed edema, pain, paraesthesia, and firmness on palpation. Hip motion and knee flexion provoked pain of intensity 10/10. Femoral and dorsalis pedis arteries were palpable and normal, and the popliteal artery was not palpable due to edema in the popliteal fossa. His laboratory results showed international normalized ratio (INR) of 1.18 (0.9 - 1.2), activated partial thromboplas-

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Figure 1. Bruising over the right gluteal, upper, and lower posterior thigh. Remarkable edema is noted. Physical examination revealed pain, paraesthesia, and firmness on the palpation. Hip motion and knee flexion elicited pain 10/10.

tin time (aPTT) of 25.3 s (22 - 31), prothrombin time of 11.4 s (9 - 12), white blood cells (WBCs) of 6.9, neutrophils of 5.9, glomerular filtration rate (GFR) of 140.79 mL/min, Na of 138 mmol/L, K of 4.2 mmol/L, Cr of 60 μ mol/L, low-density lipoprotein (LDL) of 1.09 mmol/L, high-density lipoprotein (HDL) of 3.71 mmol/L, and hemoglobin A1c (HbA1c) of 52 (20 - 42) mmol/mol. Patient is not a smoker, his body mass index (BMI) is 38 and he was on the following medications: aspirin dispersible 75 mg, atorvastatin 80 mg, bisoprolol fumarate 5 mg, lisinopril 20 mg, metformin hydrochloride 500 mg, and doxazosin mesylate 2 mg. Compartment syndrome was considered. The patient underwent fasciotomy of the gluteal and posterior thigh compartments under spinal anesthesia. The operation was uneventful, and he was transferred to the high dependency unit. The limb was elevated on five pillows to reduce the edema sustained from the compartment syndrome with the aim to review within the first 4 days for possible primary closure. Because of the COPD, obstructive sleep apnea and chronic respiratory acidosis, the patient needed 24-h supplemental oxygen. His vital signs remained stable. On the fourth postoperative day, the surgical wound was assessed, and it was found that the muscles were edematous. Skin pinching was performed and the skin laxity around the wound was found to be unsatisfactory with persistent edema of the muscles of the right posterior thigh. We decided to abandon any

attempt at primary closure and referred the patient to a tertiary referral center for multimodality treatment care.

Discussion

Compartment syndrome is surgical emergency requiring early diagnosis and intervention. The diagnosis is mainly based on detailed history, physical examination, and consequently sound clinical judgement. It has been reported that fractures (69%) and soft tissue injuries (23%) are the most common causes of the compartment syndrome [9]. Gluteal compartment syndrome most commonly occurs secondary to drug/alcohol intoxication or surgical positioning, and traumatic injury represents only 20% of cases [1-3].

The 5 - 6 diagnostic Ps (pain, pressure, pulselessness, paralysis, paraesthesia, and pallor) are described as the characteristic signs and symptoms of the compartment syndrome [10, 11]. However, they may be absent in 50% of the cases [10]. Notably, an analysis of four prospective studies including 132 patients with compartment syndrome reported that the positive predictive value of the pain, paraesthesia, and paresis was only 11-15%, whereas the negative predictive value was 98% [12]. Any use of local anesthetics may mask alarming neurologic symptoms and pain secondary from increasing compartment pressures [13]. It has been reported that epidural analgesia may increase the risk of developing compartment syndrome [14, 15]. Differential pressure between compartments and perfusion pressure less than 30 mm Hg is a reliable indication for fasciotomy [16]. Heckman et al reported that pressure measurements a few centimeters from a fracture site may produce unreliable results [17].

Considering all the above information, we can conclude that diagnosis of compartment syndrome in most cases is a diagnostic dilemma and a troubling situation for any surgeon. The presence of signs of pain and pressure on the extremity should be high suspicious not only in cases of high-energy traumas and crush-injuries but also for unusual conditions and circumstances.

In our patient, we considered the diagnosis of compartment syndrome based only on detailed history, the signs and symptoms elicited in the physical examination and clinical judgement. At the time the patient presented, there was no radiologist in the hospital. We were therefore without the benefit of any imaging evidence or needle intra-compartmental monitoring, and the diagnosis was based purely on clinical judgement.

O'Toole et al demonstrated that the diagnostic rate of compartment syndrome of tibial fractures in a level I trauma center ranged between 2% and 24% [11].

Any misjudgement and delayed intervention may result in the loss of an extremity, renal failure, sepsis, and death [18, 19]. The commonest complications that may lead to high medical costs and medicolegal indemnity cases are infections, muscle necrosis/contractures, fracture non-union, nerve injury, chronic pain, and amputation [20, 21].

In addition to the difficulty with making the diagnosis of the compartment syndrome is the decision whether to close the fasciotomy wound.

There are no predictive algorithms and clinical guidelines

for the best approach for wound closure. A number of techniques have been used for wound closure. The most common approach is the split-thickness skin grafting [22]. Vacuum-assisted closure (VAC) is also widely used but it has been reported that VAC fails to provide adequate skin approximation for final closure; therefore, the patient often needs to undergo an additional intervention [23].

Six innovative techniques based on dermal apposition are listed, namely Ty-Rap (Thomas & Betts, USA) [23], vessel loop shoelace technique [24], subcuticular suture [25], dynamic wound closure (Canica design Inc., Canada) [26], Sure-closure (Life Medical Sciences Inc., USA) [27], STAR (WoundTEK Inc., USA) [27], and silver bullet wound closure device (Boehringer Laboratories, USA) [28]. Bengezi and Vo proposed elevation to alleviate the edema, skin pinching to assess whether the laxity of the skin is satisfactory and consequently wound closure [29].

In our case, after detailed assessment of all the above techniques, we decided to assess the elevation technique because it is less invasive and there is no need for additional materials. The assessment of the wound on fourth postoperative day revealed that it did not fulfil the criteria for safe primary closure. Therefore, for the best interest of the patient, we decided to transfer him in referral center for multimodality treatment care.

Up to authors' best knowledge, this is the first case in the literature that describes a combined gluteal and posterior thigh compartment syndrome not associated to fracture provoked by blunt trauma. Of note, patient's clotting profile at presentation was normal.

Conclusions

Diagnosis and management of compartment syndrome is a troubling situation for any involved clinician. In a remote island, early diagnosis will prevent major complications and save the life of patient. Predictive algorithms and sound clinical guidelines are urgently needed.

Learning points

Signs of pressure and pain in any trauma patients should raise suspicion for compartment syndrome.

Close monitoring and clinical judgement by the same doctor every 2 - 4 h are the best tools to manage suspected compartment syndrome.

Worsening pain aggravated by passive muscle stretch is a cardinal sign for diagnosis.

Continuous pressure monitoring is recommended for all patients at risk for developing acute compartment syndrome.

Fasciotomy is the treatment of choice and must be performed in standardized way to protect key functional structures.

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Conflict of Interest

None to declare.

Informed Consent

Patient consented his case to be published anonymized in the medical literature.

Author Contributions

PG contributed to conceptualization, formal analysis, investigation, methodology, software, validation, writing-original draft, editing, and approval; FRM and DK contributed to formal analysis, investigation, validation, editing, and approval; DB contributed to conceptualization, formal analysis, investigation, methodology, software, validation, writing-original draft, editing, approval, and supervision.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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