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Delayed diagnosis of Post Traumatic Deltoid Compartment Syndrome in Rural Uganda: A Case Report

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Case Report

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Abstract

Background

Acute compartment syndrome (ACS) of the deltoid muscle is an exceptionally rare condition, typically associated with fractures or crush injuries. In low-resource settings, the lack of intracompartmental pressure monitoring devices makes diagnosis purely clinical and challenging, often leading to delays in management.

Case Presentation

: A 56-year-old male, Ugandan, who presented with severe, unremitting right shoulder pain and swelling days after a road traffic accident. Despite the absence of a fracture on radiography, physical examination revealed a tense, non-compressible swelling of the deltoid compartment with pain exacerbated by passive stretch. Based on clinical, a diagnosis of right deltoid compartment syndrome was made. An emergency fasciotomy was performed under procedural sedation using a modified V-shaped incision. Intraoperative findings included a large, organized hematoma within the muscle belly. The patient had an uneventful postoperative recovery with preservation of deltoid function.

Conclusion

This case highlights the critical importance of maintaining a high index of suspicion for ACS in patients with shoulder trauma, even without bony injury. It further demonstrates that in resource-constrained environments, successful limb salvage can be achieved through adaptive surgical strategies, such as bedside fasciotomy under sedation and the use of extensile incisions for adequate decompression.

Introduction

Acute compartment syndrome (ACS) is a surgical emergency characterized by elevated pressure within a confined fascial space, resulting in reduced tissue perfusion and potential tissue necrosis [1]. While frequently observed in the leg and forearm, ACS of the deltoid muscle is exceptionally rare, as the compartment is bounded by yielding fascia that typically accommodates swelling [2]. Consequently, the index of suspicion for deltoid ACS is often low, particularly in polytrauma patients where classic signs such as "pain out of proportion to injury" may be masked by altered mental status or distracting injuries [3].

In low-resource settings like Uganda, road traffic accidents (RTAs) impose a significant burden of musculoskeletal trauma [4]. In these environments, the scarcity of intracompartmental pressure monitoring devices necessitates a heavy reliance on serial physical examinations, which can be

subjective and prone to error [5]. Delayed recognition of this condition can lead to devastating sequelae, including rhabdomyolysis, contractures, and permanent functional impairment [3].

We describe a case of delayed diagnosis of post traumatic deltoid compartment syndrome in a rural Ugandan patient, illustrating the diagnostic challenges and management issues in a resource-limited setting.

Case Presentation

A 56-year-old male, Ugandan presented to the Accidents and Emergency Department at Kampala International University Teaching Hospital (KIUTH) with severe pain and swelling in his right shoulder. He was involved in a road traffic accident 36 hours earlier, and had sustained direct trauma to his right arm. Upon admission, he reported intense pain in the right deltoid area that did not improve with initial conservative treatment (use of a sling and Intramuscular (IM) Diclofenac 75mg twice a daily

Physical examination revealed a tender, tensed, non-compressible swelling confined to the right deltoid compartment. The overlying skin was shiny and firm, and passive movement of the shoulder elicited pain out of proportion to the apparent soft tissue injury. Distal pulse was present. A plain radiograph of the right shoulder was obtained to rule out underlying bony pathology. The anteroposterior view demonstrated marked soft tissue swelling surrounding the proximal humerus but revealed no evidence of fracture, dislocation, or bony fragmentation of the humerus, scapula, or clavicle (Fig. 1). Based on a tense compartment, intractable pain, swelling and the history of trauma, a clinical diagnosis of Right Deltoid Compartment Syndrome was made.

Given the urgency of the condition, the patient was taken to the operating theatre for an emergency fasciotomy under procedural sedation rather than general anesthesia. With the patient in the supine position and the right upper limb draped, a V-shaped anterolateral, posterolateral incision was made along the right deltoid area to maximize exposure and release tension. Dissection was carried down through the subcutaneous tissue to the deep fascia.

An exploration of the intramuscular space revealed a significant hematoma. Approximately 150 mL of dark, gelatinous blood clot within the deltoid muscle belly (Fig. 2). The evacuated hematoma appeared organized and dark red-black in color, consistent with a delayed presentation of intramuscular hemorrhage (Fig. 3). Following the evacuation of the clot and release of the fascia, hemostasis was achieved, and the muscle displayed improved perfusion.

The fasciotomy wounds were left open for 72 hours to allow for continued decompression and drainage. An occlusive wound dressing was applied using gauze and crepe bandage. The patient was admitted to the ward and started on a multimodal analgesic and antibiotic regimen, including Intravenous (IV) Paracetamol 1g every 8 hours, Intramuscular (IM) Tramadol 100mg twice daily, and IV Ceftriaxone 2g once daily. Postoperative instructions emphasized strict monitoring of vitals, urine output, and daily wound dressing changes.

By postoperative day 2, inspection of the surgical site revealed two healthy fasciotomy wounds with viable, red muscle tissue exposed at the base (Fig. 4). There were no signs of localized necrosis or purulent discharge, indicating successful decompression of the compartment and preservation of the deltoid muscle function.

Discussion

Diagnostic Challenges in Resource-Limited Settings

The diagnosis of ACS usually relies on clinical signs, particularly the classic "5 Ps": pain, pallor, paresthesia, pulselessness, and paralysis. However, these signs often appear late and signal irreversible ischemia [6]. The most reliable early sign is pain that is out of proportion to the injury and worsens with passive stretching. This can be hard to evaluate in patients with multiple injuries or altered mental states. In high-income areas, measuring compartment pressure with devices like the Stryker needle is the standard practice for unclear cases. A fasciotomy is usually performed when pressures exceed 30 mmHg or delta pressures drop below 30 mmHg [7]. In our experience in rural Uganda, as in many low- and middle-income countries, such monitoring devices are not available. Thus, diagnosis must rely solely on clinical signs, requiring a careful level of suspicion. The delay in diagnosing this patient likely resulted from several factors, including the initial visit to a peripheral center and the uncertainty of deltoid swelling without a visible fracture. This situation emphasizes the need for regular physical examinations in trauma patients in low- and middle-income countries, where clear signs, like a tense compartment, often guide surgical decisions in the absence of pressure measurements [4].

Pathophysiology and Mechanism

While ACS is most commonly associated with fractures (69% of cases), this patient presented with an organized hematoma and no bony injury [6]. The pathophysiology involved blunt trauma causing rupture of intramuscular vessels, leading to a contained hematoma (approx. 30 mL) that gradually increased compartmental pressure. This aligns with findings by McQueen et al., who noted that soft tissue injury alone can precipitate ACS, particularly in patients with coagulopathies or those sustaining direct crushing blows [8]. The dark, organized nature of the evacuated clot in our patient corroborates the timeline of a delayed presentation, yet the muscle remained viable, suggesting the pressure had not exceeded the perfusion threshold for the entire duration of the delay.

Surgical Management and Adaptations

Standard surgical management for deltoid ACS typically involves a longitudinal incision extending from the acromion to the deltoid insertion, ensuring release of the fascia while protecting the axillary nerve [1]. In this case, our team utilized a "V-shaped" incision. While less described in standard texts compared to linear incisions, this approach provided excellent exposure of the underlying hematoma and facilitated

the release of tension along multiple axes of the deltoid fascia. This modification allowed for thorough evacuation of the clot and adequate decompression of the muscle belly.

While general anesthesia is preferred for fasciotomies to ensure muscle relaxation and patient comfort, the scarcity of anesthetists and operating theater slots in rural or district hospitals often creates dangerous delays [9]. Our team performed the procedure under procedural sedation (ketamine-based) and local infiltration. This approach, supported by literature from conflict and low-resource zones, significantly reduced the time-to-intervention once the diagnosis was made [10]. Ebraheim NA et al. have demonstrated that "bedside" or sedation-only fasciotomies are feasible, safe, and limb-saving when access to a main operating theater is restricted [11].

Conclusion

This case highlights that deltoid compartment syndrome, though rare, should be suspected in patients with severe pain and swelling following blunt trauma, even without radiographic evidence of fractures. In low resources settings where diagnostic adjuncts may be unavailable, relying on clinical judgment is crucial. Our successful outcome shows that prompt surgical decompression, adjusted with the available anesthetic methods and surgical techniques, remains the key for limb salvage, even when the presentation or diagnosis is delayed.

Declarations

Availability of Data and Materials

The datasets and images used and/or analyzed during the current study are contained within the article.

Author Contributions

Conceptualization, BMA, KG and KRB; Investigation, BMA and KG; writing original draft preparation, BMA, KRB and BTG; writing review and editing, BMA, KG, BTG and SHB; visualization, BMA, SHB and MVB; supervision, SHB and MVB. All authors have read and agreed to the published version of the manuscript.

Ethics Approval

The requirement of ethical approval for this study was waived by the Research Ethics Committee of the Kampala International University in accordance to the Declaration of Helsinki (2013) and the exemption aligns with institutional and international guidelines for retrospective case reports, which involve anonymized clinical observations without experimental intervention, thereby safeguarding patient confidentiality.

Consent to Participate

Informed consent was obtained from the patient for participation in the study

Consent to Publish

Informed consent was obtained from the patient for publication of this clinical case and all images.

Clinical Trial Number

Clinical Trial Number : Not applicable

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Conflict of Interest

The authors declare no conflict of interest.

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Figures

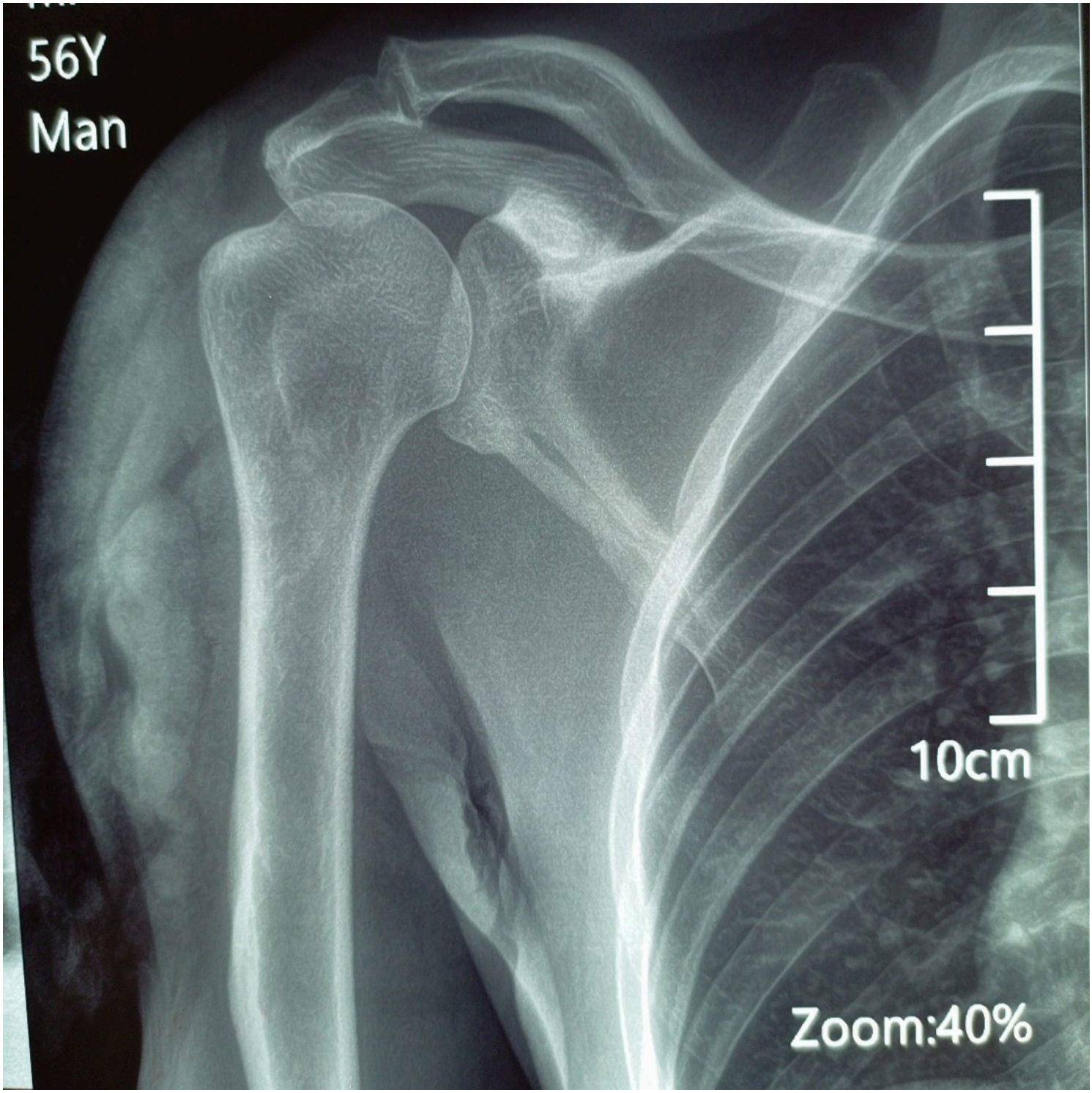


Figure 1

Plain radiograph of the right shoulder

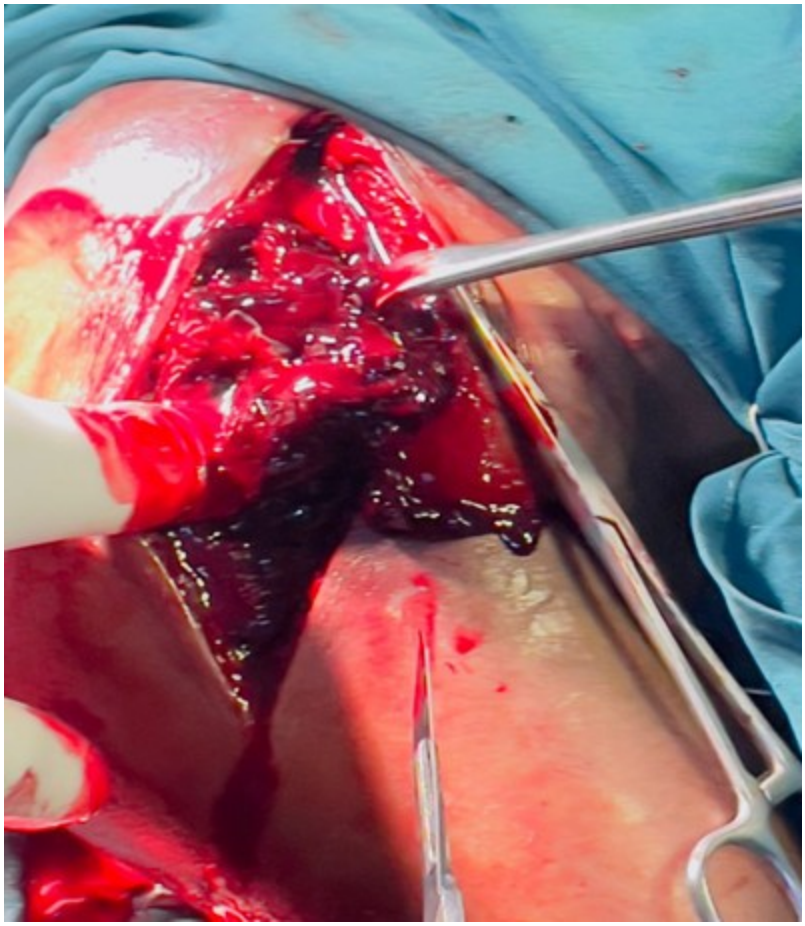


Figure 2

The hematoma evacuation from within the deltoid muscle belly

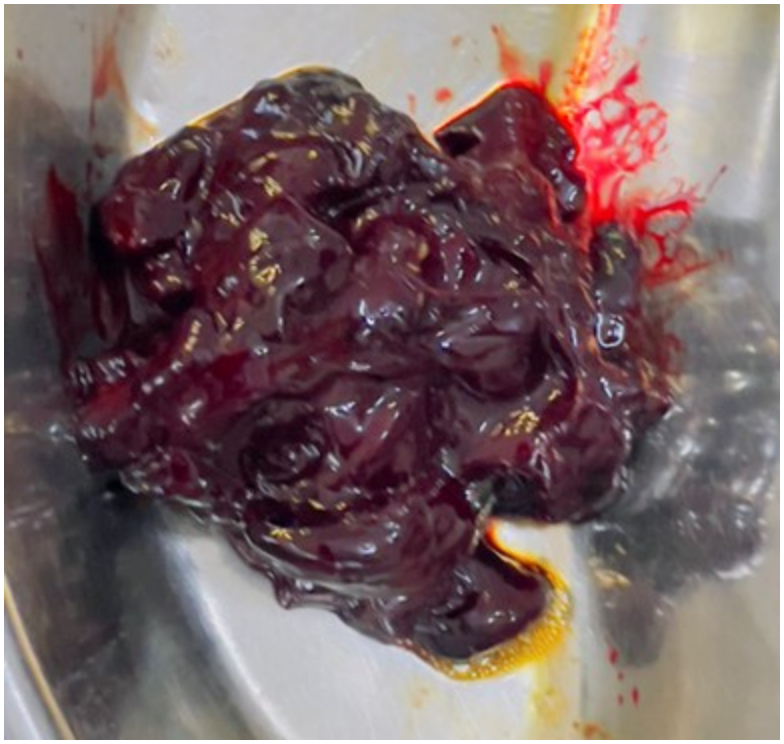


Figure 3

Dark, gelatinous blood clot was evacuated from within the deltoid muscle belly



Figure 4

Two healthy fasciotomy wounds with viable, red muscle tissue exposed at the base