

Atraumatic Biceps Hematoma Leading to Acute Compartment Syndrome in an Elderly Patient: Diagnostic and Management Challenges

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Abstract

Acute compartment syndrome (ACS) is a time-sensitive surgical emergency that can lead to profound consequences which can endanger the limb and life of the patient if it is not rapidly diagnosed and promptly treated. While disproportionate pain and pronounced firm swelling are typically regarded as the defining symptoms and are often precipitated by traumatic injury, atypical presentations that lack significant tense edema and traumatic or compressive causes have been described. We report the case of an 81-year-old male who presented with severe right arm pain and paresthesia; the pain started suddenly while he was holding a dinner plate in his right hand and subsequently developed rapidly progressive compartment syndrome in the right arm and forearm. The diagnosis was inferred from observable findings such as significant tenderness in the right arm, tense swelling, diminished touch sensation, and reduced distal pulses. The decision to proceed with urgent fasciotomy in the operating room was based on examination findings and clinical judgment. This case underscores the necessity of being vigilant for ACS in patients who have not experienced significant trauma, even when there are no pronounced tense or firm compartments upon examination. It advocates prompt intervention to avert irreversible complications.

Keywords

Acute Compartment Syndrome, Biceps Hematoma, Atraumatic Muscle Injury, Elderly Patient, Anticoagulation, Fasciotomy, Emergency Department, Limb Salvage, Diagnostic Challenges, Musculoskeletal Complications

1. Introduction

Acute compartment syndrome (ACS) is a limb-threatening condition character-

ized by elevated intracompartmental pressures leading to tissue ischemia and potential irreversible damage. While ACS most commonly affects the forearm and leg following high-energy trauma, it can also occur in the upper arm, where it is notably rare and often presents diagnostic challenges [1]-[3]. The upper arm's distensible fascia may delay the onset of critical symptoms, increasing the risk of missed or late diagnosis [1] [3].

Spontaneous compartment syndrome, particularly in the absence of major trauma, is an uncommon but recognized entity, with anticoagulation therapy serving as a significant predisposing factor [4]-[6]. Elderly patients are especially vulnerable, as the use of anticoagulants and antiplatelet agents is prevalent in this population, and even minor injuries or muscle strains can precipitate major muscular hematomas and subsequent compartment syndrome [5]-[7]. The clinical consequences of anticoagulant-related bleeding events are substantial, with increased morbidity and mortality observed in frail older adults [5] [7].

Prompt recognition and intervention are critical, as delays in diagnosis and treatment can result in permanent functional impairment or limb loss [1] [8]. However, the clinical presentation may be subtle, and classic findings such as pain out of proportion, paresthesia, and swelling may be absent or delayed, particularly in insensate or elderly patients [6] [8]. This underscores the importance of maintaining a high index of suspicion for ACS in patients presenting with unexplained limb pain and swelling, especially those with a history of anticoagulation [1] [3]-[5].

This case report describes an elderly patient who developed acute compartment syndrome of the upper arm following atraumatic biceps hematoma, highlighting the diagnostic and management challenges in this unique clinical scenario.

2. Case Presentation

An 81-year-old right-hand dominant male presented to the emergency department with acute right upper arm pain and swelling. Symptoms began one week prior after minor exertion, with progressive soreness and edema. The patient was active, had no history of trauma, and was not on chronic anticoagulation or antibiotics. On examination, he had significant edema and ecchymosis over the mid-proximal biceps, focal tenderness, and mild tachycardia. Neurovascular status was initially intact, with preserved distal pulses and sensation.

Imaging revealed severe biceps muscle edema and suspected intramuscular hemorrhage. Orthopedic consultation favored a diagnosis of biceps tendon rupture, but rapid expansion of the hematoma and worsening edema prompted further evaluation. The patient developed new-onset atrial flutter during observation and started on diltiazem for rate control. Given his CHADS₂VASc score of 3, anticoagulation with low molecular weight heparin was initiated after multidisciplinary discussion.

Following discharge, the patient returned with severe pain, paresthesias, and marked ecchymosis extending from the axilla to the forearm. Examination re-

vealed diminished sensation, decreased radial pulse, and limited active range of motion. Concern for acute compartment syndrome led to emergent orthopedic intervention. Fasciotomy and hematoma evacuation were performed, resulting in immediate improvement in symptoms and restoration of neurovascular function.

Postoperatively, the patient experienced urinary retention, urinary tract infection, pseudomonas bacteremia, and coronavirus 2019 bronchitis, all managed appropriately. He declined long-term anticoagulation after risk-benefit discussion and made a full recovery, regaining unrestricted upper extremity function.

3. Discussion

Upper arm compartment syndrome in elderly patients, especially those exposed to anticoagulation or presenting with spontaneous hematoma, presents significant diagnostic challenges and requires a high index of suspicion and prompt intervention to prevent irreversible morbidity [3] [5]-[9]. While compartment syndrome most commonly affects the forearm and leg, it can occur in the upper arm, particularly in patients with bleeding risk factors such as anticoagulation [1] [3] [6] [7] [9]. The relatively distensible fascia of the upper arm may delay symptom onset and diagnosis, increasing the risk of missed or late presentations [6] [9].

Anticoagulated patients are at increased risk for spontaneous hematoma and subsequent compartment syndrome, even after minor or non-traumatic events [7] [10]-[12]. In elderly populations, the prevalence of anticoagulant and antiplatelet use further elevates the risk of major bleeding events, which can be occult or delayed [7] [11]. Advanced age and larger hematoma size are independent predictors of poor outcomes in spontaneous muscle hematomas [10]. Therefore, close monitoring and early recognition are essential in this population.

Early clinical findings—pain out of proportion, pain with passive stretch, and paresthesias—are the most reliable indicators, but may be subtle or absent in elderly patients [1] [2] [5] [8] [11]. Serial physical examinations are essential, as a single normal exam does not exclude compartment syndrome; repeat evaluations every 1 - 2 hours are recommended for high-risk patients [1]. Measurement of intracompartmental pressures can aid diagnosis in equivocal cases, with a threshold of ≥ 30 mmHg or a delta pressure < 30 mmHg indicating the need for fasciotomy [1] [2]. However, clinical assessment remains paramount, as delays in diagnosis and surgical intervention can result in irreversible muscle and nerve damage within 6 hours, and may necessitate amputation [1] [6] [8] [9] [12].

Emergent fasciotomy is the definitive treatment and should not be delayed for confirmatory testing if clinical suspicion is high [1] [5] [6] [8] [9] [12]. Imaging modalities such as CT or MRI may help identify hematoma or edema but should not delay intervention in acute cases [1] [3] [4] [9] [10]. In anticoagulated patients, reversal of anticoagulation and supportive measures may be necessary, but the risk of ongoing bleeding must be balanced against thromboembolic risk [1].

In summary, elderly and anticoagulated patients presenting with atraumatic upper arm pain and swelling require vigilant assessment, serial exams, and rapid

surgical consultation to optimize outcomes and minimize morbidity. Early recognition and intervention are critical to prevent permanent functional impairment or limb loss in this vulnerable population [1] [3] [5]-[10] [12].

4. Conclusion

Upper arm compartment syndrome can occur in elderly patients with atraumatic hematoma, particularly those on anticoagulation. Early recognition, serial examinations, and prompt fasciotomy are essential to prevent irreversible tissue damage and optimize outcomes. Vigilance is critical, as delayed diagnosis may result in permanent morbidity.

Institutional Review and Ethical Compliance

This project was reviewed and determined to meet institutional criteria for publication. All applicable institutional requirements were followed. Institutional Review Board (IRB) review was obtained or deemed exempt in accordance with institutional policies. Written informed consent was obtained from participants when required, and all data were handled in compliance with applicable privacy and confidentiality standards.

Author Contributions

Conceptualization, Mohieldin, S., Sharp, A.; methodology, Beste, R.; validation, Mohieldin, S., Sharp, A.; Beste, R.; formal analysis, Bragg, K.; investigation, Mohieldin, S., Sharp, A.; resources, Mohieldin, S., Sharp, A.; Beste, R.; data curation, Bragg, K.; writing—original draft preparation, Mohieldin, S., Sharp, A.; writing—review and editing, Bragg, K.; project administration, Bragg, K.; funding acquisition, Beste, R. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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