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Case Study

From Bathroom Fall to Life-Threatening Shock: A Case of an occult Adrenal Gland Injury

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Abstract

Adrenal gland trauma, although rare, can be a life-threatening condition that is often overlooked in the acute emergency setting, particularly in intoxicated patients. This case study presents a 48-year-old male who sustained a left adrenal gland injury after falling while under the influence of alcohol. Despite initial presentation with nonspecific symptoms, the injury went undiagnosed for several hours. This case emphasizes the critical importance of maintaining a high index of suspicion in patients with undifferentiated shock, especially those with a history of alcohol consumption. The patient's delayed diagnosis underscores the challenges clinicians face when managing trauma in patients with alcohol-related coagulopathy, which can complicate both the clinical presentation and the response to injury. Whole-body computed tomography (WBCT) played a pivotal role in identifying the adrenal injury, highlighting the limitations of bedside ultrasound in such complex cases. The study also discusses the significant diagnostic value of WBCT when there are constraints on other imaging modalities. This case serves as a reminder of the need for heightened awareness of adrenal gland injuries in trauma patients, particularly those who present with subtle signs and symptoms after a fall or blunt trauma.

Keywords: *Adrenal Gland Trauma; Alcohol-Related Coagulopathy; Blunt Trauma; Undifferentiated Shock; Whole-Body Computed Tomography (WBCT)*

Introduction

Trauma remains to be one of the leading causes of mortality and morbidity worldwide, with abdominal injuries often being the diagnostic challenges due to its concealing nature. Less than 0.15% of all trauma cases involve adrenal gland trauma, making it an uncommon and unrecognized condition. The adrenal glands' deep retroperitoneal location and small size make them naturally protected from major damage unless high energy mechanism such as motor vehicle accidents and falls from height. However, when adrenal injuries do occur, they are frequently accompanied by damage to nearby organs such as kidneys, lovers or spleen which can overshadow their presence and delay the diagnosis.

In emergency departments, recognition of adrenal gland injury is particularly challenging as rapid prioritization of airway, breathing and circulation dominates the early management. Subtle retroperitoneal haemorrhage may progress silently, leading to overt haemorrhage, undifferentiated hypotension that resists standard fluid resuscitation. This challenge is exacerbated in patients who are intoxicated with alcohol as it blunts the physiological reactions and impairs the clinical signs that make injury severity difficult to assess (Messina et al., 2023).

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Early implementation of thorough diagnostic techniques becomes crucial in complex presentation. Extended focused assessment with sonography in trauma (EFAST) is a useful first line imaging modality. However, there are limitations in assessing retroperitoneal structures. Patients who have significant injury mechanisms or unexplained hypotension have a low threshold in proceeding with whole body computed tomography (WBCT) (Al-Kandari et al., 2025).

Adrenal trauma carries the risk of both acute and delayed complications. Hemorrhagic shock, adrenal pseudocyst development and post traumatic adrenal insufficiency can all contribute to morbidity if not promptly identified and managed. The value of early endocrine evaluation in trauma care, especially in cases of refractory shock considers cortisol administration.

This case reports emphasizes the necessity for continuation of monitoring, thorough assessment and individualized management in the emergency setting of adrenal gland trauma. Early recognition is crucial in improving outcomes for patients with such occult and life-threatening injuries.

Case Presentation

A 48-year-old man with a history of diabetes and hypertension presented to the emergency department (ED) in a peri-cardiac arrest state. He had collapsed while being transferred to bed, prompting immediate cardiopulmonary resuscitation (CPR). Return of spontaneous circulation (ROSC) was achieved after five cycles. Upon further questioning, it was revealed that the patient had fallen in the bathroom the previous day while under the influence of alcohol and had developed persistent left-sided chest pain afterward.

Initially, the patient sought care at a private clinic, where a chest X-ray was performed. He was informed that the results were normal and was discharged with analgesics. However, his condition worsened over the next 24 hours, leading to collapse and transport to the ED.

In the ED, the patient was hypotensive and in class IV hemorrhagic shock. An extended Focused Assessment with Sonography in Trauma (eFAST) revealed free fluid in Morrison's pouch and the splenorenal recess. The massive transfusion protocol (MTP) was activated. A whole-body computed tomography (WBCT) scan identified a large mixed-density hematoma in the left upper abdomen, although the exact source of the bleeding remained unclear.

The patient was urgently taken to the operating room, where intraoperative findings included a left adrenal gland injury in association with a ruptured adrenal adenoma, along with a splenic laceration. Hemostasis was successfully achieved, and the patient ultimately made a full recovery. He was discharged after a two-month hospital stay.

Discussion

1. Rare Incidence and Clinical Significance

Adrenal gland trauma accounts for only 2–5% of all blunt abdominal trauma cases, and less than 0.15% of all trauma admissions. The prevalence is slightly higher in post mortem studies, suggesting a number of cases go undetected during the acute phase. Most adrenal injuries are identified incidentally during imaging for other trauma. It often leads to underdiagnosis, especially when overshadowed by more apparent injuries.

Bilateral adrenal gland injuries are exceedingly rare but pose a significant risk for adrenal insufficiency and refractory shock. Unilateral injuries, such as in this case, are more common and often do not present with overtly symptoms initially. This contributes to the diagnostic delay and potential for poor outcomes if unrecognized.

2. Anatomical Protection and Susceptibility

The adrenal glands are retroperitoneal endocrine organs situated on the superior poles of the kidneys. Their deep-seated anatomical location behind major organs and bony structures like the ribs gives them natural protection. The left adrenal gland lies posterior to the stomach and spleen, making it less susceptible to trauma than the right, which is adjacent to the liver and inferior vena cava.

Despite their protected position, adrenal glands are highly vascularized, receiving blood from the superior, middle, and inferior adrenal arteries. They have a single central vein for drainage, which can predispose them to hemorrhage when injured. This can manifest as retroperitoneal hematomas that are difficult to detect without advanced imaging.

3. Diagnostic Utility of eFAST and Limitations

The extended Focused Assessment with Sonography in Trauma (eFAST) is widely used in the emergency department to rapidly evaluate trauma patients for internal bleeding. While it is excellent for identifying free intraperitoneal fluid and thoracic injuries, its sensitivity is limited for detecting retroperitoneal organ injuries, including the adrenal glands.

In this case, although eFAST showed free fluid in Morrison's pouch and splenorenal recess, it failed to localize the bleeding source, demonstrating its limitations in retroperitoneal trauma. This supports the need for clinicians to escalate to WBCT imaging when eFAST findings are inconclusive and clinical suspicion remains high (Figure 1 & Figure 2).

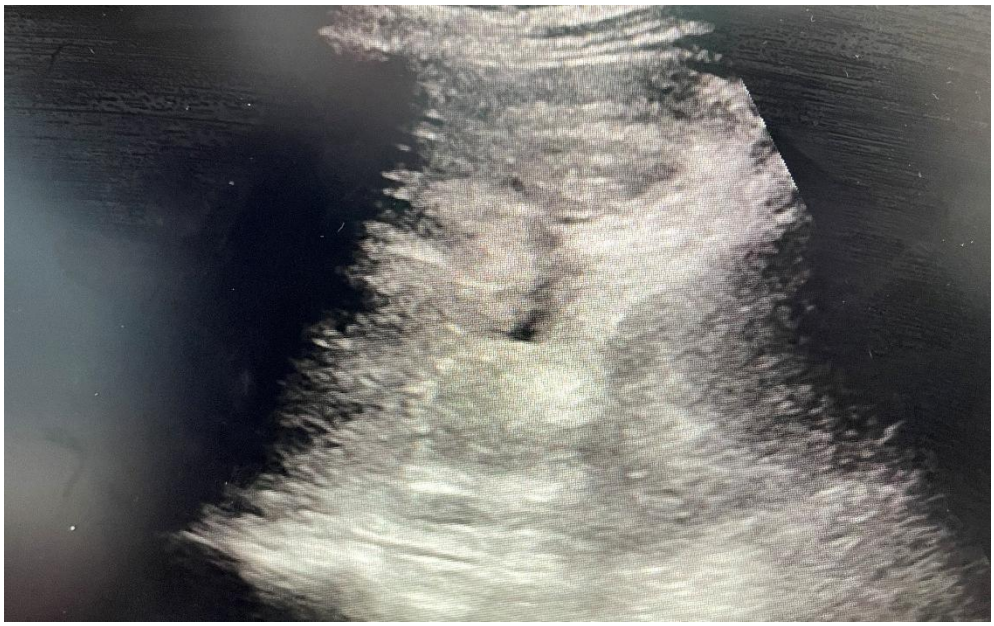

Figure 1: Mass Showing in Mixed Echogenicity

Figure 2: Free Fluid Over Splenorenal Recess

4. Whole-Body CT: A Lifesaving Tool

WBCT is increasingly used in trauma settings due to its ability to provide a comprehensive and thorough evaluation of the entire body in a short time frame. It is especially valuable in cases of undifferentiated or cryptogenic shock where initial assessments fail to localize the source of bleeding.

In adrenal trauma, WBCT can detect subtle signs such as adrenal enlargement, hematoma, periadrenal fat stranding, or contrast extravasation. Studies have shown that WBCT improves survival in trauma patients by facilitating early diagnosis and intervention. However, WBCT is often limited by resource constraints, radiation exposure concerns, and clinicians focus on more obvious injuries.

In this case, WBCT was needed in raising suspicion for retroperitoneal bleeding, prompting timely surgical exploration and intervention (Figure 3 and Figure 4).

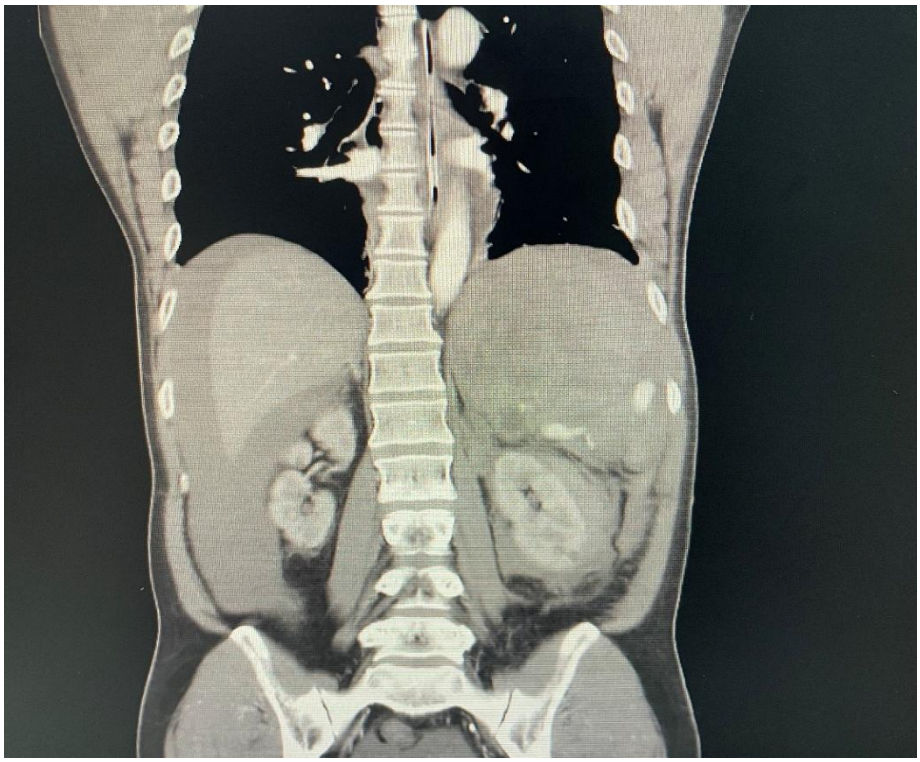

Figure 3: WBCT Shows Periadrenal Streakiness Appearance

Figure 4: WBCT Shows Contrast Extravasation

5. Understanding Shock Parameters

Shock recognition in trauma relies on both macro and microcirculatory indicators. Macros hock parameters include blood pressure, heart rate, and urine output, while micro shock markers include lactate levels and base excess. Persistent hypotension despite resuscitation should prompt consideration of less obvious factors such as adrenal insufficiency.

In cases of adrenal haemorrhage, especially bilateral, cortisol deficiency may interfere with vascular tone maintenance, resulting in refractory shock. Early recognition and administration of corticosteroids can be lifesaving. However, routine administration of steroids in all trauma patient is not supported by current evidence. Benefits of exogenous steroid administration remain unclear. Therefore, decision to initiate steroids should be based on case-to-case basis and guided by clinical judgement.

6. Role of Steroid Therapy

The adrenal glands secrete cortisol, which is essential for stress adaptation and maintaining vascular tone. Adrenal hemorrhage can cause acute adrenal insufficiency, especially in bilateral injuries or in patients with underlying adrenal disease (Elhassan et al., 2023). In this case, an adrenal adenoma was discovered incidentally in the operation theatre while patient underwent damage control surgery.

While steroids are indicated in clinically suspected adrenal insufficiency, there is no consensus on prophylactic administration in all trauma cases. Hydrocortisone is the drug of choice when adrenal crisis is suspected. However, there is a lack of evidence supporting steroid use in all traumatic hemorrhagic shock, underlining the need for further prospective studies.

7. Alcohol-Related Risks and Diagnostic Delay

Chronic alcohol use markedly increases the risk of high-impact trauma due to impaired motor coordination and judgment (Chikritzhs & Livingston, 2021). Moreover, it contributes to coagulopathy through liver dysfunction and platelet abnormalities, causing more severe haemorrhage.

Alcohol also blunts the physiological stress response and can mask symptoms of shock, leading to delayed presentation and diagnosis. In this case, the patient underreported his fall and presented it only after his condition deteriorated. Alcohol-related delays are common in emergency medicine and pose a diagnostic challenge that calls for a low threshold for advanced imaging in intoxicated patients.

8. Missed Diagnoses in the Emergency Department

The fast-paced environment of the ED often requires us to focus on life-threatening conditions. Often times, clinicians were to focus on airway breathing and circulation while adrenal gland injuries would be silently evolving and may be overshadowed by more obvious pathology (Rayzah, 2025). Clinical suspicion for adrenal injuries should be heightened in cases of unexplained hypotension, especially when accompanied by flank bruising, lower rib fractures, or negative findings on initial eFAST (Figure 5).

Timely recognition requires awareness and a high index of suspicion together with judicious use of imaging. Establishing protocols that incorporate endocrine injury into trauma assessments may improve diagnostic accuracy and patient outcomes.

Figure 5: Incidental Findings of Adrenal Gland Adenoma and Splenectomy Done

Conclusion

Even though adrenal gland injuries are rare, they carry significant risks if not promptly diagnosed and treated. This case emphasizes the complexities of identifying such injuries in the emergency department, especially in patients with delayed presentations due to alcohol intoxication. It is crucial to have high index of suspicion, along with timely use of WBCT and awareness of adrenal insufficiency. Emergency physicians must take into account of occult injuries in cases of undifferentiated shock and use all available diagnostic tools to guide appropriate management. A proactive, thorough, and holistic trauma approach can make the difference between life and death in these challenging scenarios.

Conflict of Interest

The authors affirm that they have no conflicting interests.

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