



# Ruptured Abdominal Aortic Aneurysm as a Cause of Trauma

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## Abstract

Abdominal Aortic Aneurysms (AAA) have high rates of mortality when ruptured, with few patients making it to the hospital and even less surviving to discharge despite aggressive measures. While often not in the differential diagnosis among trauma patients, here we present the case of an elderly farmer who presents as a level 1 trauma alert after being found minimally responsive lying next to an overturned tractor. He was intubated in the field for airway protection and initially seen at an outside hospital where he was found to be hypotensive requiring initiation of vasopressors prior to transfer to the regional trauma center for further evaluation. During the trauma evaluation, the patient had a positive Focused Assessment with Sonography in Trauma (FAST) exam, was stabilized temporarily in order to obtain a Computed Tomography (CT)-abdomen/pelvis that demonstrated a large Abdominal Aortic Aneurysm (AAA) with primarily retroperitoneal rupture. This case underscores the need to have a broad differential diagnosis even in trauma activations that includes potential medical catastrophes as an initial cause of traumatic injury. Additionally, the case is a unique presentation in which a large retroperitoneal bleed was detected on FAST exam due to a small amount of intraperitoneal extension.

**Keywords:** Abdominal aortic aneurysm (AAA); Trauma; FAST

## Case Presentation

A 65-year-old male with a history of chronic obstructive pulmonary disorder and gastric esophageal reflux disorder presented to the ED as a level 1 trauma alert. Per report, the patient was working on his farm when he called his wife to tell her that he was not feeling well. The paramedics arrived to find the patient awake on the ground by his tractor, which was lying in a ditch. Due to progressive mental status decline, the patient was intubated in the field using rapid sequence intubation. He was subsequently taken to a nearby community hospital where he was found to be hypotensive with Systolic Blood Pressures (SBPs) in the 50s. He received a single chest x-ray, which was normal, was given a total of three liters of IV crystalloid fluids and was started on a norepinephrine continuous infusion for persistent hypotension despite IV fluid resuscitation prior to transfer. Upon arrival at the regional trauma center, the patient was mechanically ventilated and sedated with bolus doses of Fentanyl and Midazolam. He remained on norepinephrine continuous infusion with SBPs in the 150s. Initial vital signs on arrival were: heart rate of 84, BP of 72/60 (with norepinephrine paused), respiratory rate of 16, pulse oximetry of 98% with fractional inspired oxygen of 60%. Initial physical exam was significant for: an obese male, intubated with symmetric bilateral breath sounds; pupils 2 mm equal and minimally reactive; cervical collar in place; chest wall a traumatic; abdomen soft with slight ecchymosis to the left flank. Given the patient's hemodynamic instability, a bedside FAST exam was performed, which was positive for free fluid (Figure 1A,B,C). While the patient was a level 1 trauma alert, given the overall lack of significant findings on physical exam and repeat portable chest x-ray and portable single view pelvis x-ray, there was concern for possible medical cause of his presentation and persistent hypotension. Electrocardiograph revealed normal sinus rhythm without ST-T changes suggestive of ischemia or other dysrhythmia that could explain the patient's presentation. Thus, the patient was temporarily stabilized and sent for a non-contrast CT-head and CT-chest/abdomen/pelvis with contrast. The CT-head revealed no intracranial hemorrhage; CT-chest was without traumatic injury; CT-abdomen/pelvis revealed a ruptured 6.9 cm diameter infra-renal AAA with small amount of local extravasation of contrast at the site of the aneurysm sac, a small amount of intra-abdominal free fluid, and a large amount of extravasation of contrast into the retroperitoneal space with a large retroperitoneal hematoma inferior to the left kidney (Figure 2). Vascular surgery was consulted for further management. The

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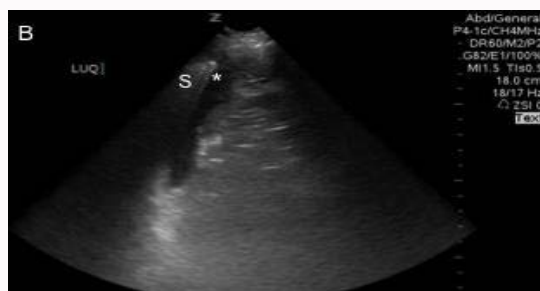
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**Figure 1A:** FAST exam demonstrating free fluid (\*) in the Right Upper Quadrant (RUQ).



**Figure 1B:** Left Upper Quadrant (LUQ).

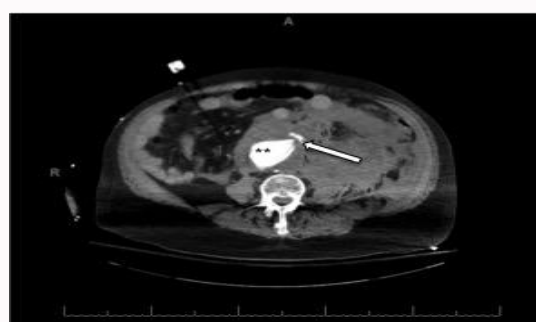


**Figure 1C:** Pelvis. L: Liver; K: Kidney; S: Spleen.

patient was emergently taken to the OR for endovascular aneurysm repair with laparotomy.

## Discussion

In the case presented here, an elderly male presented as a trauma alert, after a presumed tractor accident. He was initially hypotensive, not responsive to initial fluid resuscitation. The FAST exam was suggestive of a possible traumatic intra-abdominal injury that could contribute to the patient's hypotension. Every year in the United States, it is estimated that more than 50 million patients are evaluated for trauma. Approximately 80% of the abdominal injuries seen in EDs are due to blunt injury mechanisms, with less than 20% of these having an intra-abdominal injury [1]. Unfortunately, physicians are faced with difficulty determining which patients will have an intra-abdominal injury, as the physical exam in the altered and/or hemodynamically unstable patient is often unreliable. As such, Advanced Trauma Life Support (ATLS) guidelines recommend the use of the FAST exam as an adjunct to the primary survey in trauma patients with hemodynamic instability, thereby reducing the time to definitive treatment by open laparotomy in patients with intraperitoneal injuries. In Blunt Abdominal Trauma (BAT) patients, the sensitivity of the FAST exam in detecting as little as 500 ml of intraperitoneal free fluid varies



**Figure 2:** CT-abdomen/pelvis with contrast showing a large AAA (\*\*) with intimal flap and extravasations (arrow).

widely, between 43% to 95%, dependent on many factors [2-7]. These same studies also found the FAST exam to be highly specific for detection of hemoperitoneum in BAT (~ 96% to 99% specificity). Despite the wide range of sensitivity, the FAST exam is standard of care in these hypotensive trauma patients. It has been shown to improve numerous patient-centered outcomes including fewer hospitalized days, fewer CT-scans, and shortened time to operative management of injuries [8]. The FAST exam is best at detecting large volumes of intraperitoneal fluid causing hemodynamic instability in a patient. The most frequently identified traumatic intra-abdominal injuries are hepatic and splenic injuries [4,9]. In a study that analyzed the patterns of free fluid accumulation detected by ultrasound after BAT, it was found that only 49% of all extra-peritoneal injuries (of which there were only 12/43 retroperitoneal hematomas) could be identified with intra-abdominal free fluid [10]. Of these, the fluid was only ever seen at the site of injury and not detected in the dependent intraperitoneal spaces viewed with the traditional FAST exam. As such, it is unusual that the patient presented in this case had a positive FAST exam using the conventional views. Furthermore, neither the reported potential mechanism of injury nor the physical exam findings were suggestive of a significant traumatic injury. Thus, as it is often essential in emergency medicine, a broad differential diagnosis including blunt abdominal trauma and other medical and surgical causes were entertained in the diagnostic work-up. In the absence of trauma, an elderly patient presenting with hypotension without signs of sepsis would likely be evaluated for a potential AAA. In the United States, approximately 4% to 9% of individuals over 60-years old have an AAA, which cause approximately 15,000 deaths a year [11,12]. Most AAAs occurs in the infra-renal region of the abdominal aorta, and many remain asymptomatic until they rupture. AAAs are most often detected incidentally on other imaging or through early routine screening programs. While the majority of identified AAAs is asymptomatic, the greatest complication is that of an AAA rupture. Rupture is almost exclusively seen in AAAs measuring > 4 cm, with the risk of rupture increasing with increasing size and an average expansion rate of 0.2 cm - 0.6 cm /year. Additionally, in patients whose AAA does rupture, only about 50% survive to the hospital and, even then, the mortality ranges from 50% to 80% despite aggressive treatment [11,13]. In those that survive to the hospital, they are often hypotensive prior to arrival and approximately two-thirds rupture into the retroperitoneal space [11]. This, thereby, makes diagnosis on a FAST exam problematic for detection of an AAA unless there is communication with the intra-peritoneal space. In the case presented above, focal contrast extravasation around the AAA resulted in only a small amount of free fluid and pushed clinicians to obtain further imaging to determine the source of this intraperitoneal free fluid

on FAST. Vascular surgery subsequently successfully repaired his AAA. However, like the vast majority of cases of ruptured AAA, this patient too was victim to the complications of an AAA contributing their high mortality rates. Throughout the initial stabilization of the patient, there was much discussion between the ED and Trauma teams regarding the nature of the patient's accident. Ultimately the patient's cause of hypotension remained a surgical problem, but keeping a broad differential diagnosis gave the teams a broader perspective and adequate time to pursue further imaging to identify the exact cause of the patient's traumatic accident and engage more appropriate surgical teams.

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