

CASE REPORT

Discovery of a Clandestine Ticking Bomb - Blunt Traumatic Aortic Injury

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ABSTRACT

Blunt traumatic aortic injury (BTAI) is a crucial diagnosis to be made early in the management of trauma patients with aims to improve survival outcome. The objective of this case report is to highlight and explore the role of imaging especially Computed Tomography Angiography (CTA) thorax to diagnose a focal traumatic aortic isthmus pseudoaneurysm in a young gentleman sustaining high impact thoracic trauma.

Keywords: Aorta, Pseudoaneurysm, Vascular injury, Trauma, Thoracic arteries

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INTRODUCTION

In major traumatic injuries, the statistics have shown that the second most common cause of fatalities is a traumatic aortic injury (1). Patient with blunt traumatic aortic injury (BTAI) usually succumbs immediately. The minority of patients that survived may have a contained rupture, or pseudoaneurysm, in which early recognition and prompt diagnosis is crucial in saving lives.

CASE REPORT

A 30-year-old man was thrown off his motorbike following a collision with a car. The motorcycle's speed upon collision was estimated to be more than 60km/hr. Upon arrival at the emergency department, he was alert and orientated to time, place and person. He complained of central chest pain that worsened with inspiration.

On examination, there was unequal chest rise. He was tachypnoeic, hypoxic, tachycardic and hypotensive. There was tenderness on the right side of his chest wall with reduced air entry. High flow oxygen was administered. Fluid resuscitation was initiated and the patient only responded transiently. His vital signs only

stabilized after blood products were transfused. Pelvic spring was negative and log-roll manoeuvre and back examination was unremarkable. An extended Focused Abdominal Sonography in Trauma (e-FAST) was performed at the bedside and revealed minimal free fluid within the Morrison's pouch. The lung ultrasound showed evidence of sliding sign bilaterally thus, excluding the diagnosis of pneumothorax.

Initial portable chest radiographs showed opacities at the right mid to lower zones. The mediastinum was widened and the aortic knuckle was not well delineated. There was a slight displacement of the trachea to the right (Figure 1). No pneumothorax and no pleural effusion was seen. The heart size was not enlarged. After discussion with the radiologist on call, Computed tomography angiography (CTA) thorax was decided as the next intended investigation. The result of the CTA examination showed a small saccular outpouching from the medial aspect of the proximal descending thoracic aorta, measuring 0.5cm (Figure 2). No active contrast extravasation was observed. There was also extensive mediastinal hematoma causing tracheal deviation to the right. The hematoma extends from the upper thorax to the right dome of the diaphragm. Contusional lung changes were seen within the right middle lobe and the posterior segment of the right lower lobe (Figure 3). At this point, an aortic injury with grade III pseudoaneurysm of descending aorta was diagnosed based on the size and its location on CTA.

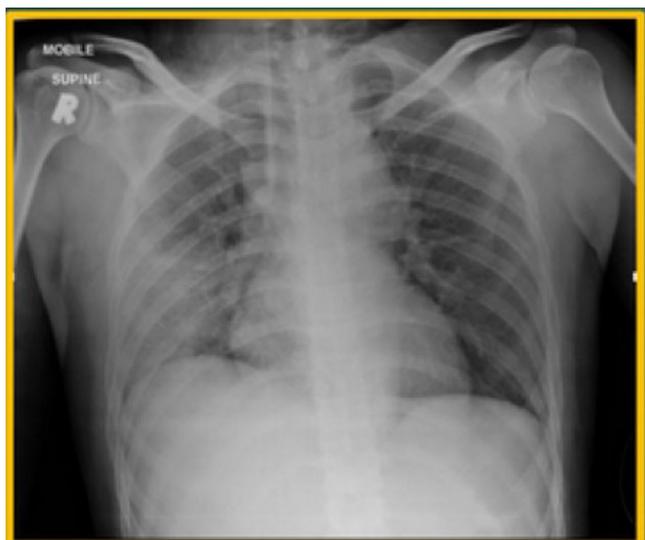


Figure 1: Chest radiograph showed widening of the mediastinum, with tracheal shift to the right. Mid to lower zone right lung contusion. No obvious pneumothorax



Figure 2: Out pouching of the contrast (arrow) at the medial aspect of proximal descending thoracic aorta

This patient was treated with conservative medical management. He was discharged after a few days of hospitalization. His clinic visits were uneventful. No repeat CT scan was performed.

DISCUSSION

Blunt traumatic aortic injury (BTAI) is a challenge to diagnose clinically, as the signs and symptoms are non-specific. In high impact blunt trauma cases presenting with haemodynamic instability, the suspicion of BTAI



Figure 3: Extensive mediastinum hematoma (arrow) causing tracheal deviation to the right, seen from upper thorax extending until right dome of diaphragm. Extensive contusional changes seen at right mid to lower zone

is often delayed; more so in cases with concurrent intrabdominal, pelvic or long bone fractures.

On chest radiograph, the abnormalities that are usually observed in BTAI are widened indistinct aortic knuckle, widened mediastinum, apical cap, left pleural effusion, tracheal deviation, upper rib fractures and left bronchus depression. The above-mentioned signs are usually subtle. These are the reasons that the plain chest radiographs are usually described as normal in many BTAI cases. Many centres have considered that CT thorax is mandatory in cases with high impact chest trauma. Cross-sectional imaging is important as to delineate accurate anatomy as there are a few mimickers or normal variant that should be considered such as ductal remnants (or a diverticulum). It is a normal embryologic remnant of ductus arteriosus and commonly found in the inferior aspect of the aortic arch near the isthmus as it can be confused with an aortic pseudoaneurysm. Meanwhile, another normal variant is infundibula which are found at the origin of the intercostal or bronchial artery at the proximal descending aorta.

The most appropriate diagnostic tool to diagnose BTAI is Computed tomography angiogram (CTA) (2). With the appropriate CTA protocol, the diagnosis of BTAI is rarely missed. However, CTA may be equivocal especially in Grade I-II BTAI. This is due to the lack of abnormality in the aortic wall contour that can be difficult to detect

on CTA imaging. Grade III aortic injury may also be missed, especially if it is focal, and small saccular form like the one reported in this case. ECG gated computed tomography angiogram and reconstruction of thin slices CT images can improve detection of intramural hematoma and intimal flap (Grade I-II). Trans-oesophageal echocardiography (TEE) serves as an alternative imaging modality in an unstable patient. Another imaging technique which has been described is the intravascular ultrasound (IVUS). This examination, however, is invasive compared to the other conventional radiological examinations.

The aortic isthmus is a common site for aortic injury due to its fixed structure. A shearing force, direct or indirect, may cause injury to this site. A sudden increase in the blood (fluid) pressure within the aorta has also been reported to be a contributing factor for BTAI at the isthmus and aortic root, also known as the water-hammer effect (2). A blunt thoracic injury can rarely lead to brachiocephalic artery pseudoaneurysm (3). There is up to 37% of deaths happen in the first 4 hours of admission (4). Hence it is crucial for early detection of BTAI so that appropriate treatment can be initiated. A focal pseudoaneurysm can be the subtle sign of BTAI, hence aortic wall contour and aortic calibre should be meticulously evaluated. Early recognition is crucial to saving lives. Clinicians and radiologists should be aware that a pseudoaneurysm in BTAI is even harder to diagnose in the presence of mimickers of normal variant (ductal remnant and infundibula). A new aortic injury score has been developed based on the CT angiography and patient's physiology. It is used to predict the stability of the injured aorta, the study suggested posterior mediastinal hematoma more than 1 cm and the ratio of lesion/ normal aortic diameter more than 1.4 are associated with aortic rupture (5). Treatment options are still controversial, the treatment includes an endovascular stent, open surgery and in selected cases conservative management. Conservative non-operative medical treatment followed by serial clinic follow up have been shown to be successful in a selected patient of BTAI as seen in this case.

CONCLUSION

CTA thoracic is the best modality to diagnose a clinical suspicion of BTAI in blunt thoracic trauma patients and should be made mandatory for high impact trauma. With the advancement of ECG gated and reconstruction of thin slice CT, evaluation of Grade I and II injury is better explored thus reducing missed diagnosis. In cases with grade III traumatic pseudoaneurysm of the aorta, an early diagnosis by radiological imaging provides a clearer clinical pathway of management.

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