

Survivable Traumatic Thoracic Aortic Transection After Pedestrian–Vehicle Collision: A Case Report

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Abstract: Traumatic thoracic aortic transection is a rare but highly lethal consequence of high-energy blunt trauma, and early diagnosis is essential for survival. A 56-year-old male was brought to the emergency department after a high-energy pedestrian–vehicle collision. He was conscious and hemodynamically stable on arrival but had chest pain, dyspnea, thoracic tenderness, decreased breath sounds over both hemithoraces, and left upper quadrant abdominal tenderness. Initial portable chest radiography showed mediastinal widening and heterogeneous opacity in the left lower lung zone. Because of the trauma mechanism and suspicion of multisystem injury, contrast-enhanced thoracoabdominal computed tomography angiography was performed. Imaging demonstrated focal disruption of the aortic wall at the distal aortic arch–proximal descending thoracic aorta junction, with a 30 × 20 × 28 mm pseudoaneurysm and para-aortic mediastinal hematoma causing rightward displacement of the trachea. Additional injuries included suspected pulmonary contusion/laceration, small bilateral high-attenuation pleural effusions, fractures, and suspected splenic laceration. The patient underwent urgent definitive aortic repair and was discharged in good clinical condition on the seventh hospital day. This case emphasizes the value of early computed tomography angiography in survivable blunt multitrauma with suspected major vascular injury.

Keywords: Aortic Rupture; Computed Tomography Angiography; Multiple Trauma; Pseudoaneurysm; Blunt Trauma.

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1. Introduction

Traumatic thoracic aortic injury is an uncommon but life-threatening consequence of high-energy blunt trauma. It is associated with high prehospital mortality, and patients who reach the emergency department alive often have concomitant thoracic, abdominal, or skeletal injuries. Because clinical findings may be nonspecific and may be masked by associated trauma, early diagnosis remains challenging [1,2]. Computed tomography angiography is the principal imaging modality for evaluating suspected blunt thoracic aortic injury. It enables rapid identification of direct and indirect signs, including aortic wall disruption, pseudoaneurysm, contour abnormality, active extravasation, and mediastinal or para-aortic hematoma [2,3].

Prompt imaging-based diagnosis and multidisciplinary management are essential to guide definitive treatment and improve survival [1,4]. We report a survivable case of traumatic thoracic aortic transection in a 56-year-old patient with multiple blunt injuries after a pedestrian–vehicle collision. This case emphasizes the diagnostic value of early computed tomography angiography in detecting life-threatening aortic injury in the setting of multitrauma and demonstrates a favorable outcome after urgent definitive repair.

2. Case Report

A 56-year-old male patient was brought to the emergency department by ambulance after a high-energy pedestrian–vehicle collision. The patient was reportedly struck by a motor vehicle as a pedestrian, resulting in suspected blunt thoracic and abdominal trauma. The time from trauma to emergency department admission was approximately 30 minutes. On arrival, the patient was conscious and oriented, with a Glasgow Coma Scale score of 15. Initial vital signs were as follows: blood pressure 122/89 mmHg, heart rate 122 beats/min, respiratory rate 17 breaths/min, peripheral oxygen saturation 98% with 2 L/min oxygen support, and body temperature 36.8°C.

His main complaints were chest pain, shortness of breath, and generalized body pain. Physical examination revealed tenderness over the thoracic wall, decreased breath sounds over both hemithoraces, abdominal tenderness in the left upper quadrant, and multiple soft tissue injuries and abrasions over various parts of the body. No obvious neurological deficit was detected on initial examination.

Initial laboratory tests showed hemoglobin 12.8 g/dL, white blood cell count $15.14 \times 10^3/\mu\text{L}$, platelet count $243 \times 10^3/\mu\text{L}$, serum creatinine 1.28 mg/dL, lactate 2.6 mmol/L, and troponin 6.8 ng/L. Arterial blood gas analysis revealed pH 7.357, pCO_2 40.1 mmHg, pO_2 85 mmHg, bicarbonate 21.9 mmol/L, and base excess -2.8 mmol/L. Coagulation parameters were as follows: international normalized ratio 1.13 and activated partial thromboplastin time 17.2 seconds.

Initial portable anteroposterior chest radiography demonstrated mediastinal widening and heterogeneous opacity in the left lower lung zone, suggestive of post-traumatic thoracic injury (Figure 1). However, plain radiography did not allow definitive evaluation of major vascular injury. Given the high-energy trauma mechanism, persistent thoracic symptoms, and suspicion of multisystem trauma, contrast-enhanced thoracoabdominal computed tomography angiography was performed. Computed tomography angiography revealed traumatic thoracic aortic injury consistent with aortic transection/contained rupture at the junction of the distal aortic arch and proximal descending thoracic aorta, corresponding to the aortic isthmus (Figures 2 and 3).

A $30 \times 20 \times 28$ mm pseudoaneurysm was identified posterior to the descending thoracic aorta, with associated para-aortic and mediastinal hematoma causing rightward displacement of the trachea. Additional traumatic findings included possible bilateral pulmonary contusion, suspected traumatic pulmonary laceration in the left lower lobe, small bilateral high-attenuation pleural effusions, a right fifth costovertebral junction fracture, a displaced medial scapular fracture, and suspected splenic laceration without free intraperitoneal fluid. The dynamic computed tomography angiography cine images further demonstrated the aortic isthmus injury, pseudoaneurysm formation, and associated mediastinal hematoma (Supplementary Videos 1 to 3).

Following the diagnosis of traumatic thoracic aortic transection, the patient was urgently evaluated by the cardiovascular surgery team in the emergency department. After multidisciplinary assessment, he was immediately transferred for definitive treatment, and successful aortic repair was performed. No major perioperative complication was reported. After the procedure, the patient was admitted to the intensive care unit for postoperative monitoring.

During follow-up, he remained hemodynamically stable, and no neurological deficit, recurrent bleeding, or major procedure-related complication was observed. The associated traumatic injuries, including suspected pulmonary contusion/laceration and suspected splenic injury, were managed conservatively with close clinical and radiological follow-up. The patient was discharged in good clinical condition on the seventh hospital day.

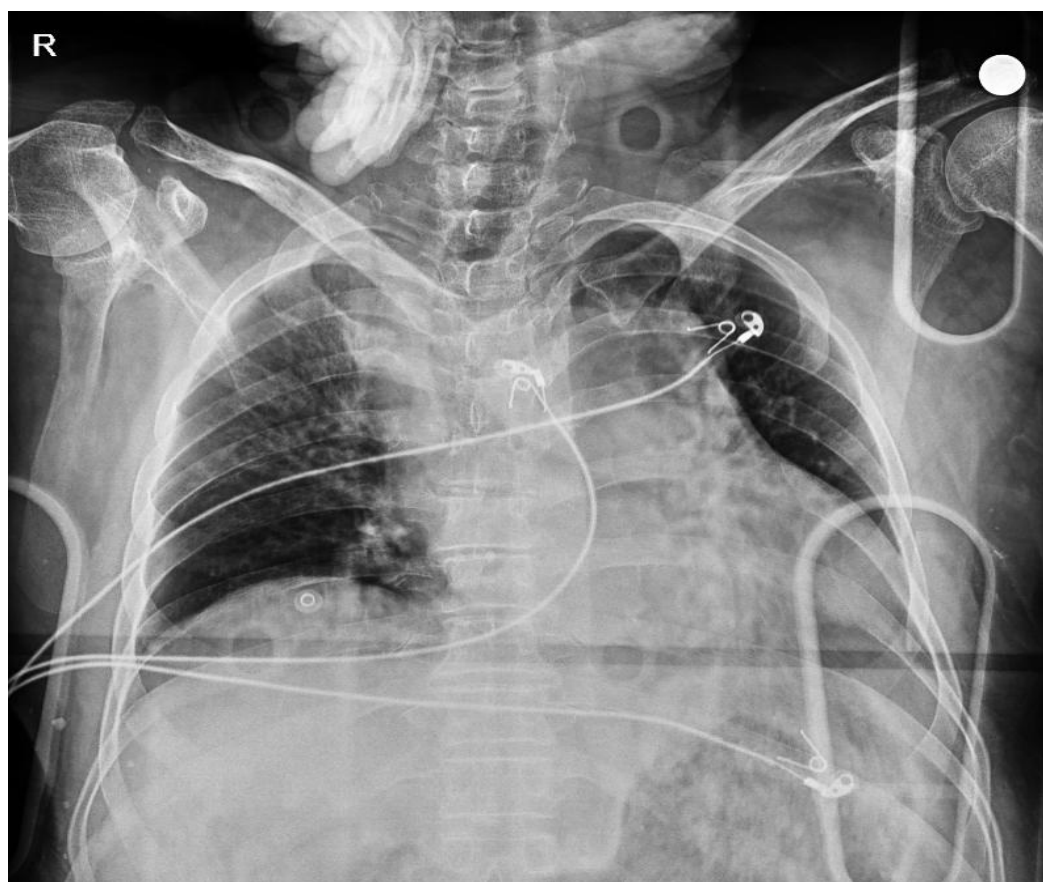


Figure 1. Initial portable anteroposterior chest radiograph demonstrating mediastinal widening and heterogeneous opacity in the left lower lung zone.

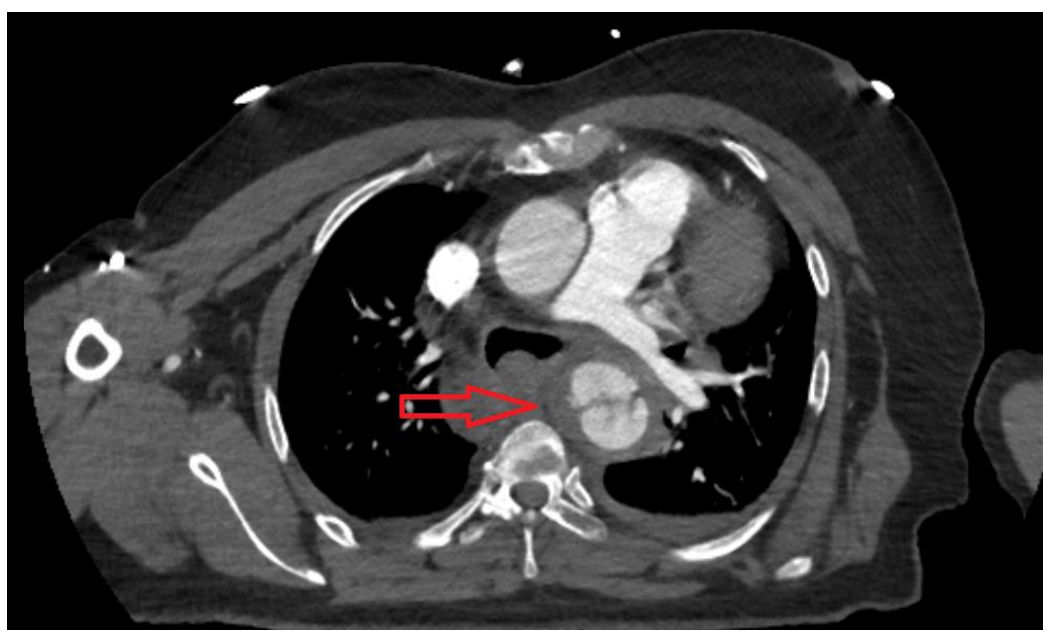


Figure 2. Axial contrast-enhanced computed tomography angiography image demonstrating traumatic thoracic aortic transection/contained rupture at the distal aortic arch–proximal descending thoracic aorta junction. The red arrow indicates the pseudoaneurysm and disrupted aortic contour, with surrounding para-aortic and mediastinal hematoma.



Figure 3. Sagittal contrast-enhanced computed tomography angiography image demonstrating traumatic thoracic aortic transection/contained rupture at the distal aortic arch–proximal descending thoracic aorta junction. The red arrow indicates focal aortic contour disruption and pseudoaneurysm formation at the aortic isthmus.

3. Discussion and Conclusion

Traumatic thoracic aortic injury is among the most lethal forms of blunt trauma. The aortic isthmus is a typical site of injury in rapid deceleration mechanisms because it represents a transition zone between the relatively mobile aortic arch and the more fixed descending thoracic aorta [2,3]. In the present case, the injury was located at the distal aortic arch–proximal descending thoracic aorta junction, consistent with this typical anatomical distribution. Diagnosis can be difficult in multitrauma patients because initial clinical findings may be nonspecific and associated injuries may distract from major vascular trauma. Chest radiography may show indirect signs such as mediastinal widening, but it cannot reliably exclude blunt thoracic aortic injury. Therefore, contrast-enhanced computed tomography angiography is essential when the trauma mechanism and clinical findings raise suspicion for major vascular injury [1,3].

The key imaging findings in this case were focal aortic wall disruption, irregular aortic contour, pseudoaneurysm formation, and surrounding para-aortic and mediastinal hematoma. These findings are characteristic of clinically significant blunt thoracic aortic injury and generally indicate the need for urgent definitive management rather than observation alone [3,5]. Computed tomography angiography also allowed simultaneous evaluation of associated thoracic and abdominal injuries, including suspected pulmonary contusion/laceration, pleural effusions with possible hemorrhagic content, fractures, and suspected splenic laceration.

Management of blunt thoracic aortic injury depends on injury severity, hemodynamic status, anatomical suitability, institutional resources, and associated injuries. Contemporary recommendations support prompt multidisciplinary evaluation and definitive repair when indicated [1,6]. In this patient, early imaging diagnosis during the initial

emergency department evaluation was followed by urgent cardiovascular surgical management. The favorable outcome and discharge on the seventh hospital day are notable considering the life-threatening vascular injury and associated multitrauma.

In conclusion, traumatic thoracic aortic transection should be considered in patients with high-energy blunt trauma, even when the initial presentation is not immediately catastrophic. Early contrast-enhanced computed tomography angiography is critical for detecting direct signs of aortic injury and associated traumatic lesions. Timely imaging diagnosis, multidisciplinary evaluation, and definitive repair may result in favorable outcomes in survivable blunt multitrauma.

Supplementary Materials: Video S1: Contrast-enhanced thoracic computed tomography angiography cine image demonstrating traumatic thoracic aortic transection at the aortic isthmus, with pseudoaneurysm formation and surrounding mediastinal hematoma. Video S2: Contrast-enhanced thoracic computed tomography angiography cine image demonstrating mediastinal hematoma adjacent to the proximal descending thoracic aorta, with associated pleural effusion and suspected pulmonary contusion/laceration. Video S3: Contrast-enhanced thoracoabdominal computed tomography cine image demonstrating associated abdominal trauma assessment, including a small hypodense lesion in the posterior upper pole of the spleen suspicious for splenic laceration.

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Conflicts of Interest: All other authors declare no conflicts of interest.

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