

## Traumatic Aortic Rupture

Adem Melekoğlu <sup>1</sup>, Ertuğrul Altınbilek <sup>1</sup>, Derya Öztürk <sup>1</sup>, Büşra Demirci Samedova <sup>1</sup>, İrem Pınarbaş <sup>1</sup>, Mehmed Necmeddin Sutaşır <sup>1</sup>, Burak Demirci <sup>2</sup>, Abuzer Coskun <sup>2\*</sup>

<sup>1</sup> Emergency Medicine, Health Sciences University, Şişli Hamidiye Etfal Training and Research Hospital, 34418, Istanbul Turkey.

<sup>2</sup> Emergency Medicine, Health Sciences University, Istanbul Bağcılar Training and Research Hospital, 34200, Istanbul Turkey.

**\*Corresponding Author:** Abuzer Coskun, SBU, Istanbul Bağcılar Training and Research Hospital, Emergency Medicine Clinic, Burak Demirci, Dr. Sadik Ahmet Street, 34200, Istanbul, Turkey.

**Received date: September 11, 2023; Accepted date: September 17, 2023; Published date: September 22, 2023**

**Citation:** Abuzer Coskun, Ertuğrul Altınbilek, Derya Öztürk, Büşra D. Samedova, İrem Pınarbaş, et al (2023), Traumatic Aortic Rupture, *Journal of Thoracic Disease and Cardiothoracic Surgery*, 4(4); DOI:10.31579/2693-2156/065

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### Abstract

Traumatic thoracic aortic rupture is a serious and life-threatening clinical condition. Traumatic aortic rupture, which is rarely encountered in the emergency department but has a high mortality, is a clinical condition that should not be overlooked in patients presenting to the emergency department with blunt thoracic trauma. In this presentation, a case who applied to the emergency department with a motorcycle accident and developed traumatic aortic rupture with stable vitals was discussed.

**Keywords:** Emergency medicine, trauma, aortic rupture, mortality

### Introduction

Traumatic Aortic Rupture (TAR) is typically a transverse rupture of the aortic wall after blunt trauma. The extent of damage varies considerably between cases. In mild trauma, the injury may only be a partial circumferential tear in the intima, which may extend to the medial layer of the aortic wall (Grade 1-2) [1,2]. More serious traumas may cause aneurysm in the vessel wall (Grade 3). Rupture may occur after full-thickness incision of the adventitial layer (Grade 4). Blood from the rupture flows into the mediastinum and pleural space, initiating gold minutes for survival [2].

There are some mechanisms suggested in the pathogenesis of TAR. The first mechanism put forward for the development of rupture is the rupture of the aortic wall due to the severity of the 'stretching' [3]. Some researchers have attributed the occurrence of TAR to a 'sudden pressure increase' in blood pressure [4]. Another researcher suggested that it was the result of the 'water hammer' effect of TAR. A water hammer effect occurs when the flow of an incompressible fluid is significantly obstructed, causing high-pressure waves to be reflected along the vessel wall [5]. Aortic rupture is another mechanism suggested to result from 'bone compression'; It has been explained as the rupture of the aorta as a result of compression between the anterior thoracic bone structures (manubrium, first rib, medial clavicles, and sternum) and the vertebral column [6].

Causes of TAR due to blunt trauma include traffic accidents, accidents with air transport vehicles, rail system vehicle accidents, falls from height,

and pedestrian accidents [7]. In this case report, a case of TAR developing after a motorcycle accident will be discussed.

### Case Presentation

A 56-year-old male patient was brought to the emergency room because he had an accident with his motorcycle at a speed of about 50 km without protective equipment. While he was in motion, he made a sudden maneuver because another vehicle jammed his road, as a result of which he rolled over the side of the road into the stockade, meanwhile, he crashed his ribcage into a tree and fell to the ground. The general condition of the patient, who was brought to the emergency room by the healthcare team in a lying position on the backboard with a cervical collar, was good and conscious. The victim had no known disease history. Vital signs in the emergency room were: Blood Pressure: 130/85 mmHg, Pulse: 98/minute, O2 saturation 95%, Glasgow Coma Score: 15 points.

In the physical examination performed on the patient's stretcher; There was a dermal abrasion of 3 cm in diameter in the left parieto-frontal region of his head and a well-defined full-thickness incision of 1 cm in width. No pathology was observed in the facial and neck examination. A dermal abrasion of the thorax starting from the left breast level and extending to the upper left part of the abdomen was detected. The patient described severe pain in the same area. Breath sounds were normal in the right hemi thorax and there were rales in the left basals. Abdominal and pelvic examination was normal. There were dermal abrasions of different

diameters on the extremities of the patient. In addition to the patient's hematological parameters, thoracic CT imaging with IV contrast was performed to elucidate the thoracic injury.

In the CT images, hemorrhage consistent with the hemothorax was detected in the left hemithorax of the patient (Figure 1,2). The lung

parenchyma was found to be normal in the tomography image, and an image compatible with rupture was detected in the aortic arch (Figure 2). The patient, who was diagnosed with TAR shortly after he arrived in the emergency room, was transferred to the intensive care unit after endovascular aortic repair by cardiovascular surgery (Figure 3).

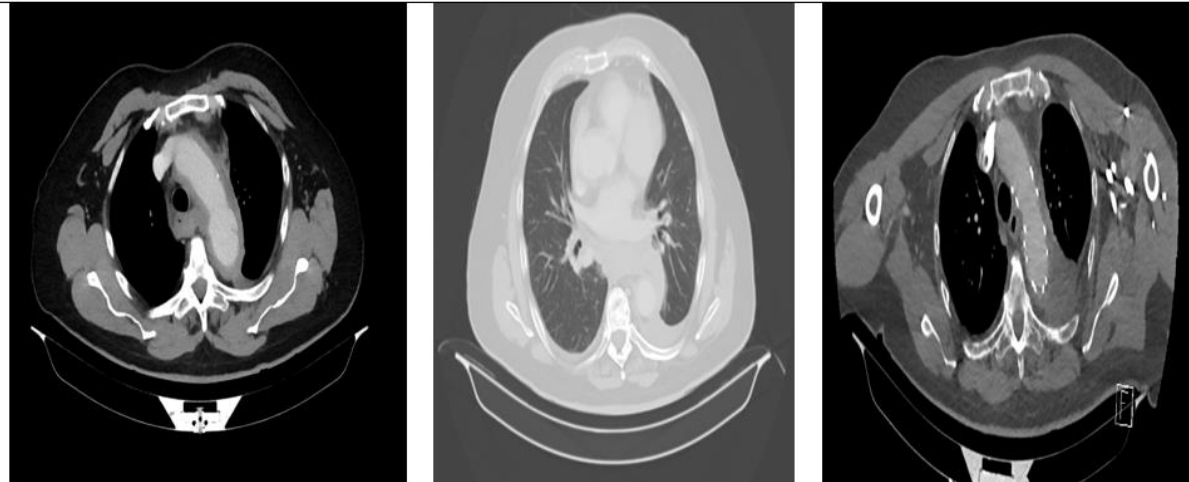


Figure 1: Traumatic aortic rupture

Figure 2: Left hemothorax

Figure 3: Endovascular repair

## Discussion

Thoracic injuries in the first few hours after trauma are called golden hours, and have an important place in terms of mortality in trauma patients. Large vessel injury after high-energy trauma is among the differential diagnoses in secondary examination, and trauma patients should be managed according to advanced trauma life support (ATLS). In the case we shared, the patient's vitals were stable, but there was chest trauma. To detect thoracic injuries, we detected incidental aortic injury on diagnostic imaging.

The main cause of traumatic aortic ruptures is traffic accidents, often with other serious injuries. The prehospital mortality rate is high [2]. In autopsy studies, aortic injury was found to be 20% of those who died due to traffic accidents [8]. It has been reported that 7000-8000 people die due to TAR each year in the USA and Canada due to traffic accidents [9]. It has been stated that the most common cause of death after brain injuries in traffic accidents is aortic injury that develops after blunt thoracic trauma [10].

Motorcyclists exhibit a higher risk of motor vehicle accidents compared to other drivers and fatal crashes most often occur as a result of severe head and/or chest trauma with multiple visceral injuries. Traumatic aortic rupture (TAR) is a common cause of rapid death, as are brain injuries due to head trauma, brain stem, and upper cervical spinal cord trauma. The incidence and injury mechanisms of TAR due to traffic accidents have been fully investigated in-car driver deaths but have been less studied on motorcyclists. They reported that the majority of aortic lacerations occurring in victims of motor vehicle drivers were car passengers (53.3%), followed by pedestrians (19.0%) and motorcyclists (16.9%) in the third place. In the case we describe, our patient was a motorcycle driver and developed TAR due to chest trauma after an accident while driving at moderate speed. The fact that our patient did not use protective equipment was noted as an important reason for aortic injury [10].

The mortality of TAR due to trauma is high, and patients usually die at the scene of the accident. It is stated that the survival rate at the crime scene in patients with TAR is 20%. Autopsy reports of 275 TAR cases were reviewed, and it was reported that only 38 reached the emergency department alive, with a survival rate of only 13.8%. In addition, it was documented that only 2 of the TAR patients who reached the emergency department survived, while the other cases died within 15 days of the

accident [11]. In the case we presented, our patient was brought to the emergency room by the national health team in a short time, and he was diagnosed with TAR with rapid diagnostic imaging because he had thoracic trauma. Although he was operated without delay, the patient died during the 3-week intensive care unit.

## Conclusion

Traumatic aortic rupture is rarely seen in the emergency department due to its high mortality. It should be evaluated in secondary examination in trauma patients. High suspicion is required for the diagnosis because the findings are indistinct. TAR should be kept in mind in trauma patients with sudden clinical deterioration, especially in patients with left hemothorax and mediastinal hematoma due to thoracic trauma. Aggressive diagnosis and treatment continue to be the most important factor in increasing survival in trauma patients.

**Acknowledgements:** None declared.

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