



## Acute Traumatic Aortic Disruption and Right Aortic Arch: A Fatal Diagnosis

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### ABSTRACT

Acute traumatic aortic disruption occurs after forceful deceleration and usually due to motor accidents. Only 10 % to 15 % reach a treatment facility alive and a highly suspicious state is needed for timely diagnosis. Most time they suffer multiple associated lethal injuries. Asymptomatic and isolated right aortic arch is a rare anomaly of the aorta with a prevalence of 0.5% [3]. Its diagnosis is by radiologic studies. We present this patient to remember that the incidental right aortic arch and disruption may interpreted as the left side mediastinal rotation in radiography and so inadvertently lead to late diagnosis and a futile outcome. A 24-year old man was brought to emergency room following a motor accident. He had Glasgow Coma Scale Score: 14-15/15 but with stable vital signs. After primary survey chest radiography, emergency abdominal sonography (eFAST) and brain CT scanning were requested. Spiral thoracoabdominal CT was also requested about seven hours after admission and when the patient entered an unstable hemodynamic phase. The primary survey was unremarkable. His chest radiography had left mediastinal rotation, which is opposite to what is seen pathologically in the condition of the traumatic aortic disruption, the right mediastinal rotation. His eFAST and brain CT were normal. The patient remained stable until seven hours after admission when the patient becomes unstable. Massive pleural effusion with aortic disruption and a right aortic arch was seen in thoracoabdominal CT. He transferred to the operation room but arrested during transfer. Massive hemothorax was seen during open cardiac massage. Cardiopulmonary resuscitation was unsuccessful. This may raises that in any blunt trauma patient with highly suspicious history for the great vessel injury, it may be better to consider the spiral chest CT scanning as the primary radiologic test for evaluation of the chest trauma and not waste the time or resources with rely simply on a chest radiography.

**Keywords:** Aortic arch anomaly; Right aortic arch; Dissection; Accident; Aorta; Thoracic

### INTRODUCTION

Acute traumatic aortic disruption is the rupture of the aortic wall due to blunt trauma. It occurs after forceful deceleration and usually due to motor accidents. Most patients die at the trauma scene [1]. Highly suspicious state is needed for diagnosis. Only 10 % to 15 % reach a treatment facility alive. They suffer multiple lethal injuries, which makes diagnosis difficult[2]. Right aortic arch is a rare anomaly of the aorta with a prevalence of 0.5% [3]. Diagnosis is by chest radiography, esophagogram, echocardiography, MRI, and CT. Tracheal right side notching with shifting to the left is seen in the chest radiography. However, both of these are opposite to what is seen in isolated aortic

disruption. We present this case to accentuate that the right aortic arch with disruption may interpreted as the left side mediastinal rotation in radiography and so inadvertently lead to late diagnosis and a futile outcome.

### Case report (Method)

A 24-year-old man was brought to emergency room following a motor accident. He had Glasgow Coma Scale Score: 14-15/15 but with stable vital signs. After primary survey chest radiography, emergency abdominal sonography (eFAST) and brain CT scanning were requested. The patient was remained under observation in the emergency room. Some minimal findings were seen during secondary survey as we explain in the results. Spiral thoracoabdominal CT was also requested about seven hours after admission and when the patient entered an unstable hemodynamic phase.

### RESULTS

The primary survey was unremarkable. Abrasions of the right eyelid and the right anterior chest wall with rhinorrhagia and otorrhagia were noted, however no decreased breathing sound was detected. No obvious chest, abdominal, pelvic, or long bone injuries were noted. In his chest radiography (Fig. 1) widened mediastinum and shifting to the left hemithorax was interpreted as mediastinal rotation, a technical error in the process of the chest radiography taking. This finding masks the right mediastinal rotation, which is seen pathologically in the traumatic aortic disruption. In the light of this report, no immediate appropriate management was taken. Fracture of the left clavicle and left side pubic ramus was also reported.

His eFAST and brain CT were normal. The patient remained stable until seven hours later when the patient become unstable. Thoracoabdominal CT was requested which showed massive pleural effusion with aortic disruption and a right aortic arch (figures. 2-3). He transferred to the operation room but arrested during transfer. Open cardiac massage showed massive left hemothorax. Cardiopulmonary resuscitation was unsuccessful.

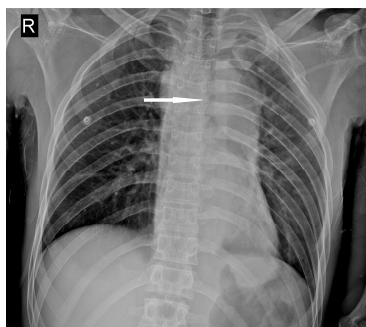


Figure 1. Widened mediastinum, blurred aortic knob, leftside tracheal shifting (arrow)

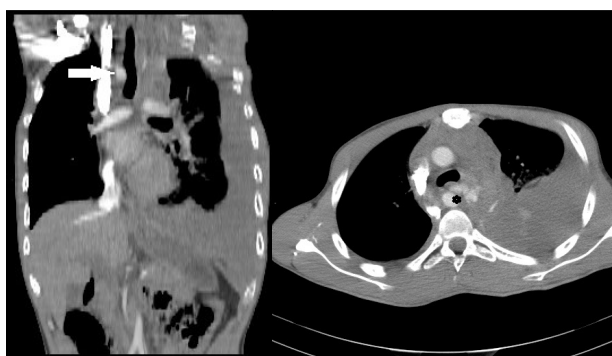


Figure 2. Tracheal indentation due to aorta (arrow) and also Hemothorax with contrast extravasation (asterisk) is seen

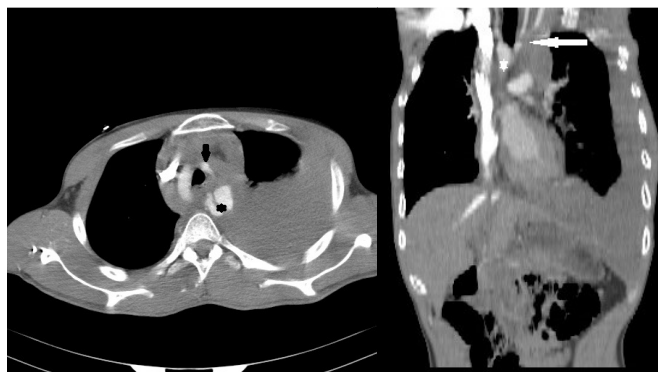


Figure3. The arch is at the right of the trachea (black arrow). Branching left side vessels (white arrow)

### DISCUSSION

In this case misinterpretation of the chest radiography led to a futile management despite enough time for doing better. Clinical findings were as the usual trauma setting. The chest radiography reported as left mediastinal rotation but truly it had left mediastinal shifting and pressure on the right of trachea. The chest CT scanning showed right aortic arch with rupture and massive hemothorax (Figure. 2 and 3). After clear diagnosis by spiral chest CT scanning and during transfer to operation arrested during. Left anterior thoracotomy and open cardiac massage was done which also showed massive left hemothorax. Cardiopulmonary resuscitation was unsuccessful and the patient expired.

Asymptomatic and isolated right aortic arch is a rare condition as we mention in the following paragraphs. It also is important to know that most cases of traumatic aortic disruption have no chance to reaching treatment facility because of either severe associated injuries or exsanguinating hemorrhage. In literature review we found two cases of the right aortic arch and disruption reported by L Ebner *et al* and Taif *et al*, but with different clinical importance [3,4]. In a cohort study of 32 cases of right-sided aortic arch with aneurysm of the aberrant subclavian artery, 12 were associated with aortic dissection, and 2 presented with rupture. However none of them were associated with trauma [5].

Acute traumatic aortic disruption (TAD) is a major cause of death in trauma patients. High-grade suspicion and early radiographic evaluations are fundamentals of prompt diagnosis and treatment. In our case we had no severe associated injuries as the cause of death. As we explained in our case report, exsanguinating hemorrhage was the cause of arrest and death in our patient. One possibility is that if we had a clear diagnosis earlier and not rely only to the patient chest radiography then we could have a better outcome.

Right-sided aortic arch has three types: type I, mirror-image branching of the major arteries; type II, an aberrant subclavian artery; and type III, isolation of the subclavian artery from the pulmonary artery through the ductus arteriosus [6]. Type I is rare with incidence of 0.05-0.1% in the normal population [3]. The type I right-sided arch was the variant in our patient (Figure. 1-3). It may be asymptomatic and diagnosed incidentally in adults [5]. It is important to explain that our case had no history of cardiovascular symptoms in his past medical history and also no history of previous radiologic evaluation.

Early identification is crucial in managing TAD successfully. Chest radiography is routinely the initial imaging performed, followed by a CT chest if any abnormalities are present. Aortography, transesophageal echocardiography and magnetic resonance imaging are other modalities available. In a recent prospective helical CT demonstrated a sensitivity, specificity, negative predictive value, and positive predictive value of 93%, 100%, 99%, and 100%, [7].

### CONCLUSION

Considering the above discussion it may raise that in any blunt trauma patient with highly suspicious history for the great vessel injury, it may be better to consider the spiral chest CT scanning as the primary radiologic test for evaluation of the chest trauma and not waste the time or resources with rely simply on a chest radiography.

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