

# Traumatic Transection of Aorta

C K Ho, MMed\*, K T Yip, FRCS\*\*, J B Eng, FRCS\*\*\*, L Rajan, MRCP\*\*\*\*, B H Tan, FRCS\*\*\*\*\*,  
\*Department of Imaging, \*\*Department of Surgery, \*\*\*Cardio Thoracic Surgery Unit,  
\*\*\*\*Cardiology Unit, \*\*\*\*\*Department of Orthopaedic, Hospital Lam Wah Ee, Jalan Tan Sri  
Teh Ewe Lim, 11600 Pulau Pinang

### Summary

A 16 year-old man presented with fracture of both his femurs after a road traffic accident. Chest radiograph revealed mediastinal widening. Subsequent CT scan and arch aortogram confirmed the findings of traumatic aortic arch transection at the isthmus. He underwent successful surgical repair. High index of suspicion and prompt actions are important in managing this potentially fatal but treatable condition.

**Key Words:** Trauma, Aorta, Transection, Chest radiograph, Widened mediastinum, CT scan, Aortogram

### Introduction

Traumatic transection of arch of aorta carries a high mortality if not treated promptly. Diagnosis of this potentially fatal condition in a severely traumatised patient after a road traffic accident poses a challenge to the clinicians. We present here our experience in managing a case of traumatic transection of arch of aorta.

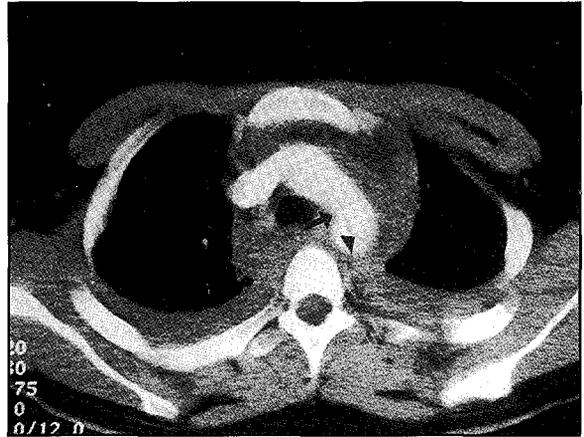
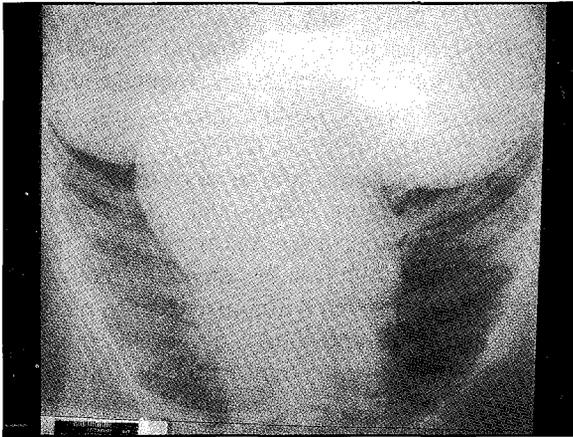
### Case Report

A 16-year-old Chinese man presented to the Accident and Emergency Unit of this hospital at midnight with fracture both his femurs after a road traffic accident. Patient was a motorcycle pillion-rider and involved in an accident with a van. There was no loss of consciousness.

On arrival, the patient was conscious and alert. His blood pressure was 120/70mmHg and radial pulse rate 120/minute. He was however noted to be very pale and restless. There was no external

injury noted on the head, chest or abdomen. On auscultation, normal heart sounds were heard. The lungs were clear with equal breath sounds bilaterally. The abdomen was soft and there was no mass felt. Obvious swelling and deformity of the thighs were noted indicating fracture of both femurs. The patient's right and left femoral pulses were noted to be weak and there was a femoral-radial pulse delay. In view of the clinical findings, intravenous fluid therapy was commenced immediately at the Accident and Emergency Unit.

Further investigation with chest radiography and ultrasound of the abdomen were carried out. Chest radiograph revealed a widened mediastinum. The width of the mediastinum at the level of carina measured approximately 12cm (Figure 1). The outline of the aortic knob was indistinct and there was left pleural apical cap. Veil-like opacities of both lung fields were noted, indicative of haemothorax. The heart size was normal. There was no rib fracture or pneumothorax. The positive findings on ultrasound of the abdomen were small bilateral



**Fig. 1:** Anteroposterior supine chest radiograph revealed a grossly widened mediastinum and indistinct aortic knob, indicating mediastinal haematomas.

**Fig. 2:** Computer Tomography (CT) reveals marked mediastinal haematoma. A kink at the medial aspect of the aortic isthmus (arrow) indicating site of transection. Intimal flap at descending aorta (arrow head) consistent with dissection.

pleural effusion. The solid organs of the abdomen were normal and there was no free fluid seen in the peritoneal cavity.

In view of the chest radiograph findings, an emergency computed tomography (CT) scan of the thorax revealed a marked mediastinal haematoma and bilateral moderate haemothorax. There was a kink at the medial wall of the aortic isthmus with saccular dilatation of the opacified lumen just distal to the aortic isthmus (Figure 2). These features were highly suggestive of transection at aortic isthmus with pseudoaneurysm formation. An intimal flap extending from the isthmus down to mid descending aorta was noted, consistent with Stanford Type B dissection of the aorta.

Subsequently, an emergency conventional transcatheter arch aortogram confirmed the site of transection of the thoracic aorta at the

isthmus with pseudoaneurysm formation. Dissection of thoracic aorta extending from the isthmus down to mid descending aorta was noted.

The patient was operated upon approximately six hours after admission. At surgery, a complete transection of the aorta just distal to the ligamentum arteriosus with periaortic haematoma was noted. Repair of the transection with an interpositional graft was carried out. Postoperative recovery was uneventful. Patient underwent open reduction and internal fixation of fracture both femurs 14 days later and was discharged home after 21 days. Patient was well except for partial left recurrent laryngeal nerve paresis. This recovered fully at 6 months follow up.

## Discussion

Traumatic transection of aorta may lead to a catastrophic outcome if not diagnosed early and urgently. Some 80% to 90% of individuals succumb immediately from complete transection of the aorta. Of those who survive, at least 50% will have rupture of traumatic aortic aneurysm within the next 24 hours<sup>1</sup>. Traumatic transection of aorta most commonly occurs at the aortic isthmus. This is the transition zone between the relatively mobile aortic arch and tethered descending aorta. During major deceleration trauma as in road traffic accident, there is shearing of the aorta especially at the aortic isthmus.

Diagnosis of transection of aorta in a patient with multiple fractures after road traffic accident is not straightforward. Firstly, in approximately 50% of cases, there is no external injury that can be identified on the chest. Secondly, important clinical signs like pallor can be attributed to multiple fractures. A strong clinical suspicion and a thorough physical examination of the patient including palpation of the peripheral pulses are of paramount importance in order to diagnose this potentially fatal but treatable condition.

The principal imaging modality in a patient with suspected blunt trauma to the chest is the supine chest radiograph. In the case of transection of aorta, mediastinal haemorrhage is almost always present. The most important sign indicative of mediastinal haemorrhage in the supine chest radiograph is mediastinal widening. A mediastinal width of 8cm or more at the level above the carina or the mediastinum forms more than 25% of the width of the chest at this level are considered significant<sup>1</sup>. Other signs include blurring of the contour of the aortic arch and left apical pleural cap and left pleural effusion. It is important to note that these radiographic signs are subtle and can be easily overlooked.

Contrast enhanced computed tomography (CT) of the chest could reliably depict mediastinal haemorrhage. Other CT features of aortic transection include a visible false aneurysm that

opacified with contrast material, a linear lucency within the opacified aortic lumen indicative of torn aortic intima and media, marginal irregularity of the opacified aortic lumen and aortic dissection<sup>2</sup>. The role of CT in a patient with suspected aortic transection is to distinguish other unrelated causes of mediastinal widening from mediastinal haemorrhage following aortic injury. It is not a substitute for the more definitive arch aortogram. In a severely traumatised and unstable patient, if clinical and chest radiographic signs are strongly suggestive of transection of aorta, arch aortogram should be performed immediately without going through CT scan first.

At present, arch aortogram is the confirmative investigation in a patient suspected of transection of aorta. Conventional transcatheter arch aortography is the gold standard against which the newer imaging modalities like magnetic resonance (MR) aortography is compared. In a severely traumatised and hemodynamically unstable patient, movement artefacts due to rapid respiration and long scanning protocol are the main drawbacks of MR Imaging. MRI should be reserved for those patients who are stable and for the assessment of associated spinal and diaphragmatic injuries<sup>3</sup>.

In conclusion, early and prompt diagnosis of transection of aorta in a severely traumatised patient is of paramount importance in order to prevent a catastrophic outcome. High index of suspicion and close co-operation between personnel from different disciplines are the corner stone in ensuring successful diagnosis and treatment of patient with traumatic transection of arch of aorta.

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**References**

1. Paul M. Dee. The Radiology of Chest Trauma. In Theodore E. Keats (ed). Radiologic Clinics of North America. Philadelphia: WB Saunders, 1992; 30(2): 291-306.
2. Pierre Schnyder, Gordon Gamsu, Axel Essinger & Bertrand Duvoisin. Trauma. In Albert A. Moss, Gordon Gamsu & Harry K. Genant (eds). Computed Tomography of The Body with Magnetic Resonance Imaging, 2nd Edition. Philadelphia: WB Saunders, 1992.
3. Zinck SE & Primack SL. Radiographic and CT findings in Blunt Chest Trauma. Journal of Thoracic Imaging 2000 April;15(2): 87-96.