Chinese Journal of Traumatology 23 (2020) 32–33

Contents lists available at ScienceDirect

Chinese Journal of Traumatology

journal homepage: http://www.elsevier.com/locate/CJTEE

Case Report

Ascending aorta disruption after thoracic blunt trauma

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ARTICLE INFO

Article history:
Received 5 July 2019
Received in revised form
10 October 2019
Accepted 8 November 2019
Available online 21 November 2019

Keywords:
Ascending aorta
Blunt injury
Aortic dissection

ABSTRACT

Blunt traumatic aortic injury is the second leading cause of death after motor vehicle accidents. The most frequent localisation of aortic lesion is the isthmus, especially in those who survived the accident. Here we report a case of blunt traumatic aortic injury with unusual localisation and modality. A 31 years old man sustained a motorcycle accident, being run over by a car. Computed tomography scan showed an atypical ascending aorta lesion, confirmed by intraoperative finding. The patient underwent emergency ascending aorta replacement with Dacron tubular graft. The patient was discharged uneventfully on 35th postoperative day, after multiple maxillofacial surgeries for concomitant injuries.

Introduction

Blunt traumatic aortic injuries (BTAI) are the second leading cause of death in deceleration trauma, in motor vehicle accidents they represent about the 15% of deaths, with death occurring most of times on the accident scene. Localisation of aortic injuries was analysed in several surgical and radiological series. Aortic disruptions can occur in all segments of the aorta: 92% of aortic injuries occur at the isthmus with 3% occurring in the ascending aorta, 4% in the arch and 1% involving the distal descending aorta.[1] This is in contrast to autopsy series where 65% of injuries occur at the aortic isthmus, 14% in the ascending aorta and arch, 12% in the distal descending aorta and 9% in the abdominal aorta.[2] This means that ascending aortic injuries are not so rare but are quite immediately lethal. The lesion types were classified according to the three layers of the arterial wall involvement, a full thickness involvement was defined as transection or rupture, while the intima/media lesion was defined as tear. Most of transections occur at isthmus level, instead ascending aorta is more frequently the site of tears, and ascending aorta rupture usually fatal.[1] Therefore, here we describe a quite infrequent presentation, with rare location and rare type of the aortic injury.

Case report

A 31 years old man without significant medical history was involved in a motor vehicle accident, being run over by a car while riding his motorbike. He sustained a cranial and facial trauma with complete avulsion of dental arches and, still conscious, was intubated on the scene for airway protection and then transferred to our emergency department. The patient underwent total body computed tomography (CT) scan, which showed a contained rupture of ascending aorta (Fig. 1A, B). Associated lesions included multiple maxillary fractures, left ulna fracture and D4-5 vertebral fracture.

Emergency surgery was indicated. Median sternotomy was performed. Opening the pericardium revealed a transversal full thickness aortic rupture originating above the right coronary artery ostium and extended to the pulmonary artery facing aortic wall about 2 cm distal to the sinotubular junction (Fig. 1C). The circumferential full thickness involvement of the aortic wall was not complete, with the posterior and right lateral ascending aortic wall spared.

Cardiopulmonary bypass was instituted through femoral artery cannulation and central venous cannulation. The aorta was opened just above the sinotubular junction in circulatory arrest and cold hematic cardioplegia was administered through the coronary ostia. The aortic lesion was confined to the proximal portion of ascending aorta, not involving aortic arch and this allowed a safe aortic cross clamp, after a 3 min deep hypothermic circulatory arrest necessary for dividing the aorta from the pulmonary artery. Aortic valve was

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Peer review under responsibility of Chinese Medical Association.

https://doi.org/10.1016/j.cjtee.2019.11.001

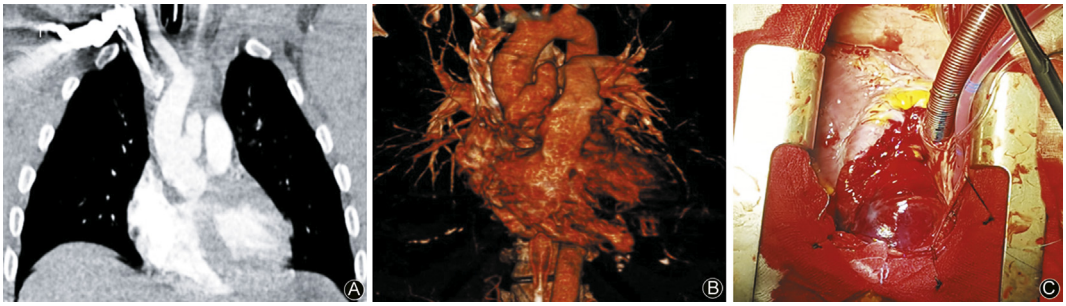

Fig. 1. Preoperative findings: (A) Computed tomography scan, coronal cut; (B) Three-dimensions reconstruction; (C) Intraoperative finding.

tricuspid, morphologically normal and competent. Resection of the injured segment and replacement with 26 mm tubular Dacron graft was performed without complications. The distal and proximal anastomoses were completed during aortic cross clamping without circulatory arrest.

On post-operative day three, the patient underwent maxillofacial surgery for Le Fort type II and III fracture. His postoperative course was complicated by superficial sternal wound dehiscence, resolved by 25th postoperative day. He suffered papilledema and otorrhagia as consequences of head trauma. Due to complex maxillofacial surgeries, the patient needed to be fed by nasogastric feeding tube (NFT) until 29th post-operative day. Postoperative control CT scan was performed (Fig. 2) and patient was discharged home on 35th postoperative day.

Discussion

Traumatic aortic injuries represent one of the leading causes of death after motor vehicle accidents, and it has been widely understood how prompt diagnosis and timely treatment are crucial for the prognosis. About the aortic injury mechanism in thoracic blunt traumas, two main theories have been proposed. First, the displacement of the aorta in a cranial or caudal direction, due to deceleration, can cause tears at the isthmus, because of the traction exercised by surrounding fixed structures: the ligamentum arteriosum, the left main stem bronchus and the paired intercostal arteries. Second, the theory is that hydrostatic pressure rapidly elevates at impact due to deceleration forces, chest compression, occlusion of aortic diaphragmatic hiatus (working as a cross clamp), producing a 'water hammer' effect, which added to the catecholamines release, generates a huge pressure raise and the aorta bursts and tears at its weakest points.[3]

This was the most probable mechanism in our case. Considering that the patient was hit and overrun by a car, deceleration and chest compression both were determined. Direct "extern" lesion of the aorta could be excluded since no other thoracic injuries, sternal or ribs fracture occurred.

Finally, about treatment, a great leap forward dealing with BTAI was made thanks to endovascular strategies, which allows safe exclusion of aortic lesion, avoiding the risks of open surgery and full heparinization in polytrauma patients.[4] Unfortunately, this is true only for isthmus or distal lesions, while, in case of arch or ascending aorta involvement, conventional surgery must be preferred. Even if the direct suture of the transection is described,[5] we preferred the complete replacement of the ascending aorta, due to the haemorrhagic infarction of the aortic wall surrounding the lesion and we advise to always perform complete replacement when feasible, removing all the weakened tissue.

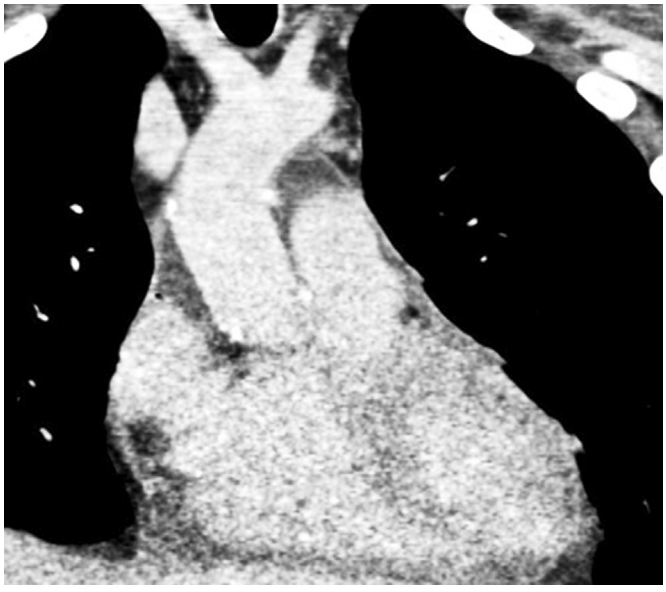

Fig. 2. Postoperative computed tomography scan, coronal cut.

Funding

Nil.

Ethical Statement

The institutional ethical committee have approved this study.

Declaration of Competing Interest

All authors declare that they have no conflicts of interest.

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