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Case Report

Post-traumatic 'transection' of the aorta

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Introduction

Incomplete Aortic Injury (IAI) may result as a disastrous outcome of Road Traffic Accidents.[1] 85% patients with IAI die at the scene of the incident. Of the rest, only 2% would be alive at 4 months.[2] Studies have shown that 96% of injuries occur at the aortic isthmus, the post subclavian constriction representing the obliterated ductus arteriosus. This forms the fulcrum for a torsional rotation of the aorta.[3,6]

We describe the uncommon case of a 38 year old male patient who was diagnosed with an 'aortic transection' two months after a Road Traffic Accident on imaging studies, and the successful surgical management of the case.

Case report

A 38 year old male patient sustained decelerating injury due to steering wheel impact to the chest, abdomen and hip. He was taken to a roadside hospital where he was diagnosed to have multiple rib fractures and acetabular fracture, for which he underwent hip surgery. However, a large left haemothorax was missed. CT Angiogram at the subsequent civil referral hospital a month later revealed a significant sternal fracture, and a complete post subclavian 'cutoff' of the aorta (Fig. 1). Patient was then referred to our tertiary centre as a case of "Aortic Transection".

Clinical examination revealed a haemodynamically stabilized patient with shallow breathing, hoarseness of voice, dullness on percussion over the left hemithorax and bilaterally weak femoral pulses. He had no hard signs to suggest splanchnic hypoperfusion. Repeat imaging studies done at the next centre revealed a "pseudocoarctation" in the aortic isthmus, i.e. a localized dissection with significant loss of luminal continuity. He also had a sternomanubrial dissociation and renal contusion.

The challenge in this patient was to address the circulatory imbalance to the lower body. The problems were legion. Inaccessibility of the descending aorta and an unbalanced sternum precluded routine sternotomy. Absence of a significant post subclavian "landing zone" and a complex aortic pseudocoarctation ruled out endovascular stent placement. Delayed presentation meant adhesions around the aorta and lung. A thoracotomy approach would be difficult, especially if

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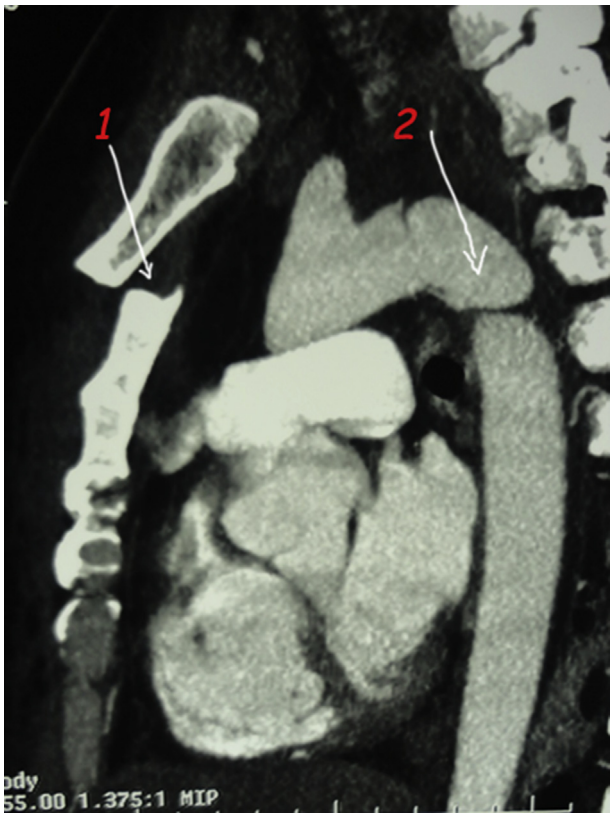

Fig. 1 – CECT Thorax showing (1) sternomanubrial dissociation and (2) cutoff of post subclavian aorta.

the heart fibrillated prior to instituting cardiopulmonary bypass. Furthermore, the arch vessels are relatively difficult to access via a thoracotomy, especially for aortic cross clamping to enable surgery on the descending aorta. Finally, the biggest concern was neurological protection of the spinal cord and the brain during aortic clamping.

It was decided to address the issue by operating on the pseudocoarctation between clamps, with partial femoro-femoral cardiopulmonary bypass. Core cooling was done after thoracotomy to a modest 32 °C with monitoring of oesophageal and rectal temperatures.

Adjunctive use of spinal protective measures was carried out. Lumbar drain in L3–L4 space was used to drain out CSF at the rate of 10 ml/h, extracting a total of 50 ml intra-operatively over 5 h. CSF pressure monitoring was carried out post-operatively as well. IV Methylprednisolone was given at 3 mg/kg BW. Systemic pressures were monitored via the right radial artery keeping a mean of 70 mmHg for ensuring cerebral perfusion and Left femoral artery line (mean 45 mmHg) for spinal cord perfusion (Fig. 2). Neurological monitoring was done by Bilateral Bispectral Index (BIS).

Venous cannulation in the right atrium was performed under transeosophageal echocardiogram (TEE) guidance. Surgical approach was via a left thoracotomy, after which difficult lung adhesions were separated and the post subclavian aorta dissected free (Fig. 3). There was a visible damage in the aorta 1 cm distal to the isthmus. This area needed to be replaced. Fortunately, one clamp could be placed proximal to the left subclavian origin and distal clamp downstream after the pseudocoarctation. The left subclavian origin was temporarily occluded. Lower body perfusion was maintained by femoral perfusion, whereas upper body perfusion was monitored by right radial pressures. This way, the affected aortic segment could be safely resected and replaced (Fig. 4). Postoperatively patient regained full distal aortic pressures and was effortlessly discharged on the fourth day.

Discussion

The present case highlights the difficulties in the management of an uncommon entity. It needs proper preoperative evaluation and well-planned execution of surgery as a multidisciplinary teamwork.

Post-traumatic IAIs are rarely seen in cardiothoracic practice. They involve considerable morbidity and mortality. CT scans form the mainstay of diagnosis and evaluation unlike Chest Radiographs.[4] Though technically less morbid, management by endovascular stents is not ideally suited for most thoracic aortic injuries.[5] Surgery remains the mainstay of any possible salvage, but perfusion, metabolism, and oxygen delivery to the spinal cord during the vulnerable period of aortic occlusion is crucial.[7]

In this instance, the patient was lucky to survive the immediate period after the accident and the enormous risk of surgery. The real issue was to perform the surgery without permanent vascular and neurological sequelae.

In the present case, it was obvious that the intact circle of Willis would ensure cerebral antegrade perfusion with a beating heart even if the proximal clamp inadvertently included the origin of the Lt common carotid, and the issue was only to perfuse the lower limbs and cord, for which we had electively decided to use femoral arterial cannulation. Simple adjuvant measures like proper planning of monitoring lines, controlled CPB circuit and close communication between surgical, perfusion and anaesthetic teams proved to be invaluable in spinal cord protection.

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