

Case Report

Transection of the origin of the innominate artery: A rare sequela of blunt traumatic chest trauma

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ARTICLE INFO

Keywords:

Blunt trauma
Innominate artery
Thoracic trauma
Vascular trauma

ABSTRACT

Blunt traumatic transection of the innominate artery is rare. We describe a case of a 36-year-old male who presented to our Emergency & Trauma Center after being struck by a motor vehicle at high speed. Computerised Tomography (CT) scanning after the patient was stabilised facilitated the prompt diagnosis of the injury. The patient underwent open repair by midline sternotomy, with debranching of the innominate artery, using hypothermic circulatory arrest as a neuro-protective measure. The patient was successfully extubated on post-operative day 3, without neurological deficit. We provide our experience as an option for treating any patient that presents with such an injury.

Introduction

Survivors of blunt transection of the innominate artery are rare, as most with this injury do not survive to hospital [1,2]. A few cases of innominate artery transection following blunt trauma have been described, with the majority involving the origin. Most have associated truncal and craniocerebral injuries [1,2]. We present the case of a patient who presented with blunt traumatic transection of the origin of the innominate artery following a road traffic accident, which was managed by successful open repair and debranching with re-anastomosis of the innominate artery.

Case report

A 36-year-old male was transported to the Emergency & Trauma Center after being struck by a motor vehicle at high speed. On paramedic arrival at scene the patient's Glasgow Coma Scale score was 3. Endotracheal intubation was achieved following rapid sequence induction. There was reduced air entry on the right side of the chest and pleural decompression was performed en-route to hospital. 1000mls of IV normal saline was administered. A pelvic binder was placed.

Significant past medical history was recurrent nasopharyngeal squamous cell carcinoma with a left sided lung metastasis treated with chemotherapy and radiotherapy. There were no regular medications and no known allergies.

On hospital arrival, the patient was tachycardic (130/min), hypotensive (50/30 mmHg) and cold (T 35.1 C). Pupils were 3 mm, equal and reactive to light. Chest X-ray demonstrated a right sided haemopneumothorax, no evidence of tension and a widened

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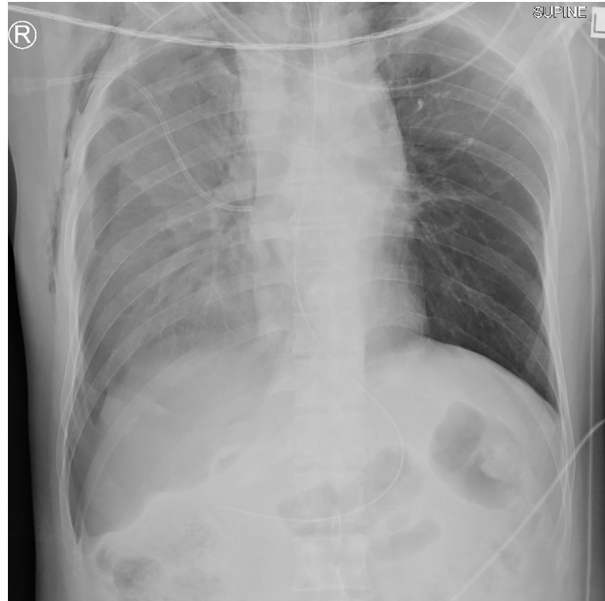


Fig. 1. Chest X-ray on admission. The patient's admission chest X-ray demonstrated a right sided haemopneumothorax with associated deep sulcus sign. There is a widened superior mediastinum.

superior mediastinum (Fig. 1A). Bilateral finger thoracostomies were performed and intercostal catheters inserted. Approximately 1000 ml drained out of the right thorax. A massive transfusion protocol delivered 8 units of red cell concentrate, 4 units of fresh frozen plasma and 1 unit of pooled platelets. The patient's haemodynamic status improved and a noradrenaline infusion was ceased.

Two CT scanners are immediately adjacent to the receiving Trauma Bays. Computerised Tomography (CT) performed 33 min after arrival revealed traumatic transection of the origin of the innominate artery (Fig. 2). On further examination, the right arm was cool, with no palpable radial, brachial or subclavian pulses. Right hand capillary refill time was less than 3 s. Neurological assessment was not possible as the patient was intubated, paralyzed and ventilated.

Other injuries identified included a 3 mm left parieto-occipital subdural haematoma, a type 1 left occipital condyle fracture, a grade 2 left vertebral artery blunt traumatic injury, 1-3rd left sided and 1st right sided rib fractures, a left haemothorax, a left scapular fracture, a left LC2 pelvic fracture and a left femoral condyle fracture.

The patient was transferred to the operating theatre where a midline sternotomy was performed and he was placed on cardiopulmonary bypass. Deep circulatory arrest was achieved by cooling the patient to 20 degrees Celsius. The origin of the innominate artery on the aortic arch was oversewn and the innominate de-branched. The distal end of the innominate was anastomosed to a 10 mm vascular graft, and re-anastomosed to the right side of the ascending aorta using a side-biting clamp (Fig. 3). Total cardiopulmonary bypass time was 156 min, with 8 min of deep circulatory arrest.

CT brain performed immediately post-procedure was unchanged from admission scan with no evidence of ischaemic stroke. Post operatively the right arm was warm and well perfused, with a palpable radial pulse. He was commenced on Aspirin 100 mg daily, with an expected lifelong duration of therapy. Following orthopaedic fixation of his pelvis the patient was successfully extubated on post-operative day 3. There were no neurological deficits. He was well when discharged well to rehabilitation on day 35. A clinical review and chest X-ray were unremarkable 6 weeks after discharge, and the patient is planned for further follow up with a surveillance CT angiogram 6 months post-operatively.

Discussion

Innominate artery injury is the second most common traumatic thoracic great vessel injury after aortic injury [3,4]. A proposed mechanism is compression of the mediastinum between the sternum and the vertebrae, resulting in left sided displacement of the heart. Concomitant left lateral head rotation and neck hyperextension results in tension on the innominate. Innominate artery injury is the second most common traumatic thoracic great vessel injury after aortic injury, with resultant transection of the artery,



Fig. 2. Axial (panel A) and Coronal (panel B) slices of the patient's admission Computerised Tomography (CT) scan, which demonstrated a brachiocephalic trunk transection just distal to its origin, with an adjacent 23 × 28 × 38mm pseudoaneurysm (indicated by black arrow).

generally at its origin [3,5]. High-energy trauma with a widened mediastinum on initial chest X-ray is characteristic. The injury is generally defined on CT angiogram, although formal angiography may aid with intervention planning [5]. Data from penetrating extra-cranial arterial trauma suggests that whilst brachiocephalic injury is associated with a high mortality rate, the prevalence of stroke is comparatively low when compared to distal arterial injury [6]. This patient had no adverse neurological sequelae.

Although endovascular techniques have been described, open surgical repair with oversewing of the aortic arch and re-implantation of the innominate remains the most widely utilised technique [7]. Successful delayed repair in patients with multi-trauma and significant other injuries has been described, with peri-operative beta-blockade maintaining a mean arterial pressure of less than 70 mmHg [8].

In this case, hypothermic circulatory arrest provided neuroprotection. This facilitated repair to the innominate artery whilst there was potential for flow to the left common carotid artery to be disrupted. Although hypothermic circulatory arrest is well described for elective procedures such as ascending aortic surgery, its use in the trauma population has limitations and is less clearly defined [9].

We present this case to draw attention to a rare sequela of blunt chest trauma. The Alfred Trauma Center is a high volume, level 1 adult trauma center admitting more than 10,000 trauma patients annually - with 1600 classified as major trauma patients of whom 95% have suffered blunt injury. Despite this, blunt transection of the innominate artery is rare. We offer our experience using open repair as an option for any patient presenting with this injury.



Fig. 3. A sagittal slice of a CT scan done post-operatively demonstrates the debranched brachiocephalic trunk (indicated by black arrow), which was reimplanted to the right side of the ascending aorta via a 10 mm vascular graft.

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