Management of traumatic aortic transection
Clinical Guideline

Scope

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<th>Site</th>
<th>Department, Service or Operational Area</th>
<th>Applicable to:</th>
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<tr>
<td>RPH</td>
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There is no Cardiothoracic Service at Royal Perth Hospital.
If required 24/7 surgical coverage will be provided by Fiona Stanley Cardiothoracic Surgery, by the rostered on-call Cardiothoracic Surgeon.

Definition

**Traumatic blunt aortic injury**
Complete transection, or small or partial thickness tears of the aorta with pseudoaneurysm formation, as a result of blunt trauma mechanism

Rationale

Blunt trauma to the thoracic aorta is rare but has been implicated as the second most common cause of death after intracranial haemorrhage. Blunt trauma to the thoracic aorta accounts for <1% of adult admissions to a level 1 trauma unit and often occurs due to high impact or a high velocity motor vehicle crash, falls from heights, or compression between the sternum and the spine. A combination of sudden deceleration and shearing at the relatively immobile aortic isthmus is the most common reason for these injuries, although any portion of the aorta is at risk.

Most of these patients die at the scene from complete aortic transection. Patients who survive to hospital usually have small or partial thickness tears of the aorta, with pseudoaneurysm formation. Out of these greater than 50% die within 24 hours. It is imperative that these injuries are recognised early on and strategies, procedures and protocols are put in place for holistic and multidisciplinary management of these critically ill patients.
Management

Diagnosis

Suspicion and concerns about aortic transection should be highlighted in the Emergency Department (ED) Resuscitation Bay based on:

- Mechanism of injury
- Clinical examination which may not reveal any obvious findings, but difference in blood pressures in both arms (pseudocoarctation) should be assessed and documented.
- Chest X-ray (low sensitivity, but a 98% negative predictive value if normal):
  - Widened or abnormal mediastinum (a mediastinal width >8cm at the level of the arch is considered abnormal; a clear aortic knob outline has a 72% sensitivity, 47% specificity and 87% negative predictive value). An erect chest X-ray should be performed as soon as clinically appropriate and once the spine has been cleared
  - Tracheal deviation to the right
  - Oesophageal or NG tube deviation to the right
  - Left apical or pleural cap
  - Disruption of the calcium ring in the aortic knob (broken-halosign)
  - Left main-stem bronchus depression
  - Paravertebral stripe
  - Left haemothorax (arterial)

Initial management

All patients presenting with possible traumatic aortic transection should be managed in accordance with Advanced Trauma Life Support (ATLS) principles.

If suspicion of aortic injury is high, then management of these patients should begin in the Emergency Department resuscitation bay. Senior help (ED consultant / Trauma consultant) should be notified and be involved in the management thereon.

If the aorta is injured, but is not the source of active haemorrhage, it should be low on the list of management priorities, after haemorrhage control and neurologic stabilisation

Initial management is based on:

- Rapid identification and control of ongoing haemorrhage from other potential injury sites, avoiding over-resuscitation
- Controlling blood pressure (BP) and maintaining a systolic BP of 100mmHg. Beware of head injury as lowering the BP may be hazardous for Cerebral Perfusion Pressure (in consultation with Neurosurgery). This can be extremely hazardous if the patient doesn't have an aortic injury (e.g. haemorrhagic shock, or a major head injury), and should only be instituted after definitive demonstration of the injury.
- Maintaining pulse rate between 60-80 BPM
• Use of IV beta blockers (Metoprolol in small doses – titrated to the target systolic BP)
• Pain Relief
• Correction of Coagulation abnormalities
• Insertion of Arterial line in the right radial artery (NOT in left arm or femorals)
• Other sources of blood loss should be ruled out as pulse may not be a good indicator after beta blocking

Investigations
• An erect CXR is a useful ‘rule out’ test, but will not detect thoracic spine injuries which are a common accompaniment, and can be a source of significant delay because these patients cannot be sat up until the spine is cleared. Clinical suspicion based on mechanism, or signs, should lead to a low threshold for performing a CT. Every hour delay in diagnosis equates to an increase in mortality of 1-2%. As CT technology has developed it has established itself as the best screening modality for aortic injury. The sensitivity of modern CT scanners is reported at 97-100%, with a negative predictive value of 100% and specificity of 83-99%
• Computed Tomography (CT) scan of mediastinum (non-contrast run followed by contrast run), and Abdominal/Pelvic scan to look for other injuries, as well as the calibre of femoral arteries for further intervention.
• Angiography may be used where the CT is equivocal or does not allow adequate visualisation of branch vessels or other surrounding vessels.

Monitoring and observation
• Ideally, confirmation of aortic transection (or otherwise) should be made by a senior radiologist before the patient’s final disposition from Radiology
• If this is not immediately possible, then the patient should be haemodynamically monitored according to pre-set parameters, until formal confirmation
• Patient’s disposition should be either ED resuscitation, State Major Trauma Unit (SMTU) High Acuity or Intensive Care Unit (ICU)
• All other surgical procedures should be delayed until diagnosis of aortic transection has been ruled out
• Patient should always be accompanied by senior doctors of the Trauma/ Emergency team
• If aortic transection is confirmed, Vascular, Cardio-thoracic, Anaesthesia and ICU teams should be consulted
• Patient should be transferred to ICU if the BP and pulse are difficult to manage, or if there is a delay to definitive management of their injury (interventional, surgical or conservative)
Definitive management

- Endovascular stenting by vascular team (with Cardiothoracic standby); or
- Open thoracotomy and aortic grafting (in patients with haemodynamic instability; large volume haemorrhage from chest tubes; contrast extravasation on CT or rapidly expanding mediastinal haematoma; penetrating aortic injury)
- Anti-platelet therapy (check with Vascular Team) to be considered in the context of other injuries
- Patients should remain on beta-blockers for a minimum of six months and should have outpatient follow up by Vascular Surgery

Authors / Acknowledgements

We acknowledge the following previous site endorsed work and/or contributors used to compile this document.

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References


Document version control

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