



Review

Advances in the treatment of blunt thoracic aortic injuries

Dimitrios Challoumas^{a,*}, Georgios Dimitrakakis^b^a Cardiff University School of Medicine, Heath Park Campus, University Hospital of Wales, Cardiff CF14 4XW, UK^b Department of Cardiothoracic Surgery, University Hospital of Wales, Heath Park Campus, Cardiff CF14 4XW, UK

ARTICLE INFO

Article history:

Accepted 29 October 2014

Keywords:

Blunt thoracic aortic injury

Trauma

Endovascular repair

Open repair

Delayed repair

Cardiovascular surgery

ABSTRACT

Blunt thoracic aortic injuries, even though rare in incidence, carry significant mortality rates and their management still remains challenging. There have been major shifts in diagnosing and treating these injuries in the last 5 decades, which proved to be beneficial in terms of mortality and complications. Endovascular repair has been increasingly used for definitive treatment and its outcomes appear to be at least equally safe and effective as those of open repair. We present a balanced review of the relevant literature regarding the most appropriate approach and definitive treatment of these pathological entities. Based on the studies analyzed, endovascular repair is increasingly being established as the choice of treatment, however, the conventional open surgical approach still remains a safe method for severe injuries; the mortality, complication rates and proven longterm results of the latter are continuously improving. Additionally, delayed repair, where appropriate, seems to be a safe option with very low mortality rates. Despite the encouraging short and midterm outcomes reported, endovascular treatment needs to be assessed in the longterm for more accurate conclusions to be drawn about its durability and safety.

© 2014 Elsevier Ltd. All rights reserved.

Contents

Background	1432
Definitive treatment	1432
Open repair	1432
Endovascular repair	1432
Complications	1432
Statistics of advancements in management	1433
Study selection	1433
Evidence	1433
Cohort studies	1435
Retrospective studies	1435
Prospective studies	1436
Meta-analyses	1436
Non-systematic reviews	1437
Guidelines	1437
TEVAR short and midterm outcomes	1438
Conclusion	1438
Conflict of interest	1438
References	1438

* Corresponding author. Tel.: +44 029 2068 8113.

E-mail address: dchalloumas@hotmail.co.uk (D. Challoumas).

Background

Blunt thoracic aortic injuries (BTAIs) are the second leading cause of death from blunt trauma, after head injury, and even though they are quite rare, accounting for less than 1% of trauma admissions, their morbidity and mortality rates are significantly high. Importantly, pre-hospital mortality is about 85% and even of those reaching medical attention, a third will die before operative intervention [1,2].

Analysis of the National Trauma Databank (USA) by Arthurs and colleagues, in 2009, revealed that in a 5 year period, 3114 patients suffered a BTAI, representing 0.3% of all trauma admissions ($n = 1.1$ million) [3].

By far the most important cause of significant blunt chest trauma is motor vehicle accidents (MVs; 18% of all MVAs), usually as a consequence of rapid deceleration and the exertion of shearing forces, and the majority of aortic injuries (55–67%) occur at the isthmus of the descending thoracic aorta [1,4].

Associated injuries, which are usually present in patients with BTAIs, depend on the nature and force of impact and they may include closed head injuries, rib fractures (flail chest), pulmonary contusions, pelvic injuries, intracranial haemorrhages, liver injuries, upper limb fractures, maxillofacial injuries, diaphragmatic ruptures and cardiac contusions in descending order of frequency, as revealed by a prospective study conducted by the American Association for the Surgery of Trauma (AAST) [2]. The extent of polytrauma and the expected mortality is defined by the injury severity score (ISS), which derives from the abbreviated injury scale (AIS) values, and is a very useful tool when comparing treatment methods. Major trauma is commonly defined as ISS over 15 [3,5,6].

The clinical features may range from no symptoms to these of severe hypovolaemic shock, therefore investigation of these patients should be staged appropriately even in asymptomatic patients after significant thoracic impact to exclude a potentially fatal BTAI [7].

CT scan has now replaced angiography, which used to be the method of choice for confirming and evaluating BTAIs in the past. This shift is one of the major advancements in the management of these patients and CT scan is now the preferred screening tool and gold standard for diagnostic confirmation and evaluation [4,7,8]. Features of a CT suggesting a BTAI include mediastinal haematoma and hemopericardium, false aneurysm, irregularity of the aortic contour, aortic dissection and haemothorax [4,7,9].

According to clinical judgement on an individual basis, treatment may be interventional (immediate or delayed, surgical or endovascular repair) or conservative. The timing of repair largely depends on the extent of injury on the thoracic aorta and the presence or absence of other injuries [7].

In general, minimal aortic injuries (intimal tear of less than 1 cm with no or minimal peri-aortic haematoma) receive conservative management [10]. Other groups of patients that may benefit from initial conservative management and/or delayed repair include those with severe head and pulmonary injuries, coagulopathies, hypothermia and acidosis, haemodynamically unstable patients (systolic blood pressure <90 mm Hg or drop in systolic blood pressure >40 mm Hg), patients who have undergone damage control procedures and those with severe medical comorbidities, burns or severe sepsis [4,11,12].

Permissive hypotension in BTAI patients is essential for the following reasons: (1) to minimize the risk of rupture prior to urgent repair and for those managed conservatively, and (2) to stabilize patients with other serious associated injuries (e.g. brain and pulmonary injuries or cardiac instability) if a delayed repair of the BTAI is planned. The idea of establishment of this permissive hypotension derived from its successful use in the management of

dissecting aortic aneurysms as it reduces shear forces. β -blockers are often used, with or without nitroprusside, to ensure that the mean arterial pressure, ventricular ejection force and hence aortic shear force drop and remain low [4,13].

Although Fabian et al. (1997) and Von Oppel et al. (1994) have reported 11.6% and 10.3% mortality from rupture prior to surgical repair respectively, the aggressive antihypertensive management employed in a study in 1998 resulted in no deaths from rupture in 71 patients [2,13,14]. The authors of the latter study recommended maintenance of systolic blood pressure at 100 mm/Hg and pulse rate under 100 beats/min with the use of intravenous labetalol or esmolol combined with sodium nitroprusside if needed [14]. Vasodilators should only be used in conjunction with β -blockers, only if the latter do not yield adequately low systolic blood pressure, as they can produce tachycardia which is associated with increased shear forces [13].

Other groups aimed at and advocate systolic blood pressures of as low as 80 mmHg, however, maintaining the pulse rate under 100 seems to be universally accepted [15–17].

Definitive treatment

BTAIs can be either repaired surgically [open repair (OR)] or with an endovascular approach [thoracic endovascular aortic repair (TEVAR)], which is increasingly gaining popularity and is now the treatment of choice [4,7,9].

Open repair

This can be performed through emergency median sternotomy or thoracotomy depending on the desired operative site [4].

The clamp and sew technique that was used in the past is now preferred very rarely due to the high incidence of paraplegia [7].

Cardiopulmonary bypass is used as a safe method of proper support, which has the advantages of decompression of the heart, circulatory support, distal perfusion and reduction in paraplegia rates, as well as dealing with unexpected life-threatening bleeding during the operation with the use of an integral pump sucker. Finally, hypothermia and drainage of cerebrospinal fluid are other strategies used for cord protection [7,18].

Various operative techniques may be used in an OR such as direct suture, resection and direct anastomosis, and insertion of an inter-position graft, and these depend on the nature and extent of the injury [4,14].

Endovascular repair

A femoral artery cutdown is usually performed for the placement of endovascular stent grafts, which are inserted usually into the femoral, iliac or abdominal arteries depending on their size. With the aid of fluoroscopy, a guide wire is placed across the injury and subsequently the stent graft is deployed upon angiographic confirmation of the location of the injury. The metal stents of the stent graft function by exerting a radial outward force with covered graft material that excludes flow from the injury [4]. Compared to OR, TEVAR is minimally invasive and can be performed soon after the establishment of diagnosis prior to management of other concomitant severe injuries [4].

Complications

Apart from the common peri-operative complications, spinal cord injury and stent endoleaks are widely accepted to be specific complications of BTAIs repair.

Download English Version:

<https://daneshyari.com/en/article/3238878>

Download Persian Version:

<https://daneshyari.com/article/3238878>

[Daneshyari.com](https://daneshyari.com)