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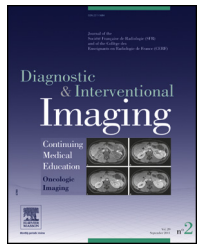

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Traumatic injuries of the thoracic aorta: The role of imaging in diagnosis and treatment

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Stent graft

Abstract Traumatic injury of the thoracic aorta remains the leading cause of death in multiple trauma patients and it requires urgent management. Computed tomography has a key diagnostic role and allows the clinician to choose an appropriate treatment strategy. The development of new classifications, based on a better understanding of the mechanisms of these injuries, has clarified the indications for treatment. Advances in techniques, especially in endovascular management, have contributed to improving prognosis for patients. Interventional radiology, which usually consists of endovascular placement of a covered stent, now constitutes the gold standard treatment in these injuries. Due to the potentially grave prognosis of these patients, it is crucial to know how to detect these injuries and to describe the imaging signs of serious damage.

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Road traffic accidents are the main cause of aortic trauma. Traumatic injury of the large vessels is being seen with increasing incidence in tertiary trauma units. While during the 20th century this rise could be attributed to an increase in numbers of road traffic accidents, today it is the improved initial management on the part of emergency care networks, at the head of which are emergency ambulance services, that is responsible for a fall in early deaths, and this explains why there is a growing number of patients who manage to survive until they are admitted to a hospital unit [1,2].

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These traumatic injuries have a significant mortality rate. The Princeps study by Parmley et al. reported a death rate of 80%, a survival rate of 20% and a development of chronic disease rate of 5% [1]. The improvement shown by these figures is largely due to effective emergency management and the expansion of treatment with stent grafts.

Indeed, although only 38% of patients survive following aortic trauma, better management at the scene of the accident and quicker transportation to hospitals has led to improvements in overall survival. Specifically, only 4% of patients die on the way to the hospital. Nonetheless, mortality around the time of the injury remains high, estimated at 20% in the 24 hours following the hospital admission [1—4].

This serious pathology therefore needs quick, effective and consensual management.

Sites of predilection, mechanism and pathophysiology

The pathophysiology of thoracic aorta trauma injury is complex. The greater frequency of aortic isthmus damage is in part related to its anatomical position, which is relatively fixed within the rib cage [5]. In a high-velocity trauma, such as a road traffic accident, the thoracic aorta is subjected to rapid deceleration together with compression of the chest wall. Associated with this are complex torsion or stretching injuries to the aortic wall, especially at the points of fixation, which explains the increased frequency of injury to the aortic isthmus [5,6] (Fig. 1).

By contrast, injuries to the ascending thoracic aorta are probably just as common but they are seen less often because they are so serious that they are frequently the cause of immediate death [5,7].

The circumstances in which these injuries arise are, in decreasing order of frequency: road traffic accidents, crushing accidents, falls from a height and other deceleration accidents that occur during sports such as skiing [2—6].

Which examinations should be performed? A crucial role for CT angiography

The management of a patient with thoracic aorta trauma varies depending on their condition on arrival at hospital, as well as whether there are any associated injuries. A careful evaluation by the intensive care team allows the initial assessment to be made, and as part of this the factors that could worsen the prognosis must be clearly set out.

Although transoesophageal echocardiography used to be considered to be the first line technique for exploring a suspected traumatic aortic injury, recent data from the literature has confirmed that CT angiography should take the main role in the decision process when managing these

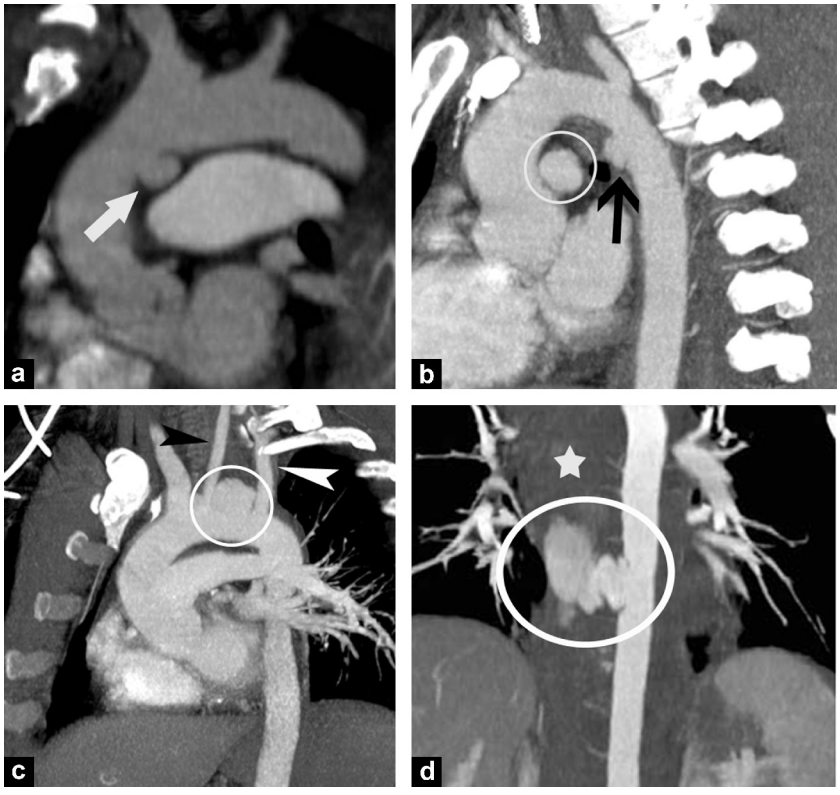

Figure 1. Multiplanar CT angiography reconstructions of the thoracic aorta. Illustration of the preferential topographical distribution of traumatic injuries: a: accumulation of contrast material in a crevice in the ascending thoracic aorta wall, located at the aortic valve cusps (white arrow); b: presence of two trauma injuries: an injury to the aortic root, located immediately above the sinus of Valsalva (white circle); another injury to the descending thoracic aorta at its junction with the isthmus (black arrow); c: traumatic pseudoaneurysm (white circle) of the aortic arch, originating between the left carotid artery (black arrow head) and left subclavian artery (white arrow head); d: traumatic rupture of the descending thoracic aorta with significant extravasation of contrast material in the arterial phase (white circle), explaining the abundant mediastinal haematoma (white star).

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