Case report

Traumatic pseudo-aneurysm and dissection of the thoracic aorta in the presence of an aberrant right subclavian artery: value of multi-slice helical CT

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Received: 10 December 1999; Revised: 15 March 2000; Accepted: 4 April 2000

Abstract. A case of traumatic pseudo-aneurysm and dissection of the proximal descending thoracic aorta in association with an aberrant right subclavian artery and a common trunk for both common carotid arteries is presented. The diagnosis of this traumatic pseudo-aneurysm and dissection in association with these congenital anomalies by means of a multi-slice helical CT is discussed. To our knowledge, this is the first such case reported in the literature.

Key words: Multi-slice helical CT – Aortic rupture – Aortic trauma – Pseudo-aneurysm – Aortic arch anomalies

Introduction

In cases of trauma, it is important to detect congenital abnormalities, as this is mandatory for presurgical planning and adequate operative preservation of the cerebral blood flow. Surgical clamping proximal to the left subclavian artery in the presence of an aberrant right subclavian artery will halt blood flow not only to the left subclavian artery including the left vertebral artery, but also to the right subclavian artery including the right vertebral artery. Consequently, fossa posterior and posterior cerebral blood flow will be supplied only by the circle of Willis and collaterals of both external carotid arteries [1].

The right subclavian artery originating from the fourth aortic arch branch is the most common congenital vascular anomaly in the area of the aortic arch, with an incidence of 0.5–12.8% [2]. The combination of an aberrant right subclavian artery with a common trunk for both common carotid arteries in association with a traumatic pseudo-aneurysm and dissection of the proximal descending thoracic aorta is, however, very rare.

This rare combination of congenital anomalies with posttraumatic pathology was diagnosed with multi-slice helical CT in our patient (Figs. 1, 2, 3, 4).

Case report

A 49-year-old woman was admitted to the hospital after a car accident. A first CT scan was performed in another hospital. On the CT images there was suspicion of a rupture of the thoracic aorta. She was urgently referred to our hospital. On admission, she complained of chest pain. There were neither immediate hemodynamic nor respiratory problems. Neurological examination revealed signs of “commotio cerebri.” The patient did not have any other relevant extra-thoracic injuries.

On conventional chest radiograph a broadened mediastinum, bilateral zones of parenchymal contusion, a fractured sternum and multiple rib fractures were reported.

Transesophageal ultrasound revealed the presence of some prevertebral blood but could not confirm the presence of a rupture of the thoracic aorta.

A multi-slice helical CT (LightSpeed, General Electric, Milwaukee, Wis.) was performed during contrast injection (100 ml of a non-ionic contrast agent with an injection rate of 3 ml/s). Scan parameters were: scan time 0.8 s; slice thickness: 3.75 mm; table speed: 15 mm/s; reconstruction interval: 2.5 mm.

Cine viewing of the axial CT images allowed the diagnosis of a traumatic pseudo-aneurysm and dissection of the proximal descending thoracic aorta in the presence of an aberrant origin of the right subclavian artery. In addition, a common trunk for both common carotid arteries was revealed. Mediastinal hematoma and lung contusions were also diagnosed.

Postprocessing of the images was done on the CT workstation (Advantage Windows 3.1, General Electric, Milwaukee, Wis.). Reconstructing the images with a volume-rendering 3D mode allowed an anatomical

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**Fig. 1a, b.** Axial multi-slice helical CT image at the level of the thoracic inlet. *a* Note the clear visualization of the left and right common carotid arteries (1) and the left and right subclavian arteries (2). *b* The common carotid arteries are converging to one common trunk (1), and the right subclavian artery has a retro-tracheal and retro-esophageal trajectory (2)

**Fig. 2a-c.** Axial CT images of the thoracic inlet (consecutive images from the top downward. *a* Common trunk for the left and right carotid artery (1) and aberrant right subclavian artery (2). *b* Aortic pseudo-aneurysm (black arrow) and mediastinal hematoma (white arrow). *c* Aortic pseudo-aneurysm and dissection (asterisk)

overview of the aortic pseudo-aneurysm and dissection of both vascular anomalies.

In order to correlate these findings with the gold standard technique, a catheter aortography was performed. The aortography confirmed the pseudo-aneurysm and dissection of the proximal descending thoracic aorta. It also confirmed the aberrant origin of the right subclavian artery and the existence of a common trunk for both common carotid arteries. The aortography did not provide any additional information in comparison with the CT findings.

The patient was surgically treated by a left thoracotomy. Exploration of the pseudo-aneurysm revealed a transection of the aorta. A primary end-to-end repair was done. The post-operative evolution was uncomplicated. The patient was discharged on the tenth post-operative day.

**Discussion**

Conventional chest radiographs are highly sensitive for injuries of the thoracic aorta at a low cost. This makes chest radiographs ideally suited for screening [3, 4].

Catheter angiography is still the gold standard for evaluating aortic injuries in most institutions [3, 5].

Advantages of US include its mobility, which makes it readily available in most emergency departments, the lack of ionizing radiation and the easy access to the technique.

More detailed information can be obtained with transesophageal ultrasound (TUS). Transesophageal ultrasound, however, is a relatively invasive technique and requires specific experience of the operator [3, 6].

Magnetic resonance imaging has the ability to resolve the full extent of the injury within the aorta and the involvement of additional vessels or surrounding structures. Magnetic resonance imaging lacks ionizing radiation, which is an advantage. During surgical exploration and repair, MR images can be used as a road map [3, 7].