

# Delayed-onset tension hemothorax following blunt trauma and the rupture of a previously undiagnosed aberrant right subclavian artery

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**Abstract:** An arteria lusoria is a well-known anatomic variant of the right subclavian artery. We describe a patient in whom an arteria lusoria injury was revealed by delayed-onset tension hemothorax following blunt trauma to the thorax.

**Keywords:** Subclavian artery; blunt injuries; hemothorax

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## Case presentation

A 21-year-old male motorcyclist was admitted to the emergency department following blunt trauma to the thorax after being hit by an automobile. A clinical examination evidenced a deformed left forearm but no hemodynamic or respiratory impairments. The patient had a score of 10 out of 15 on the Glasgow coma scale.

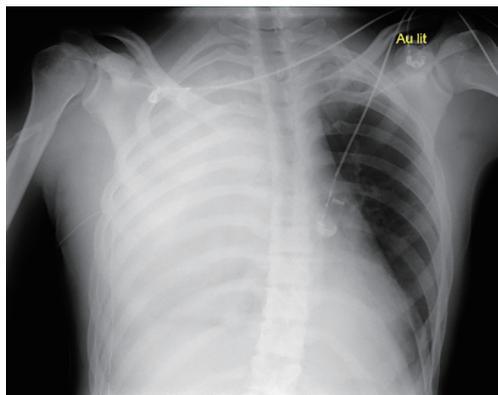
Given the patient's hemodynamic and respiratory stability, we immediately performed a whole-body angiography computed tomography (CT) scan. This evidenced bilateral first rib fracture, bilateral pneumothoraces smaller than one centimeter, right low-level hemothorax, bilateral pulmonary contusions, an upper mediastinal hematoma (in the absence of active extravasation of contrast medium) and fracture of the left ulnar and radial bones, with important deformation of the left forearm, causing dermal and skin suffering.

Upper mediastinal hematoma was related to right first rib fracture and the patient underwent surgical reduction of the left ulnar and radial bones (with osteosynthesis), and was immediately admitted to the intensive care unit. On day 1, a chest X-ray showed the persistence of right moderate hemothorax; 1,400 mL of serosanguinous fluid was fully evacuated after insertion of a right chest tube. On day 2, the patient's condition started to deteriorate progressively, with the appearance of hypoxemia, tachycardia, and right-side miosis, partial ptosis and enophthalmos, constituting a

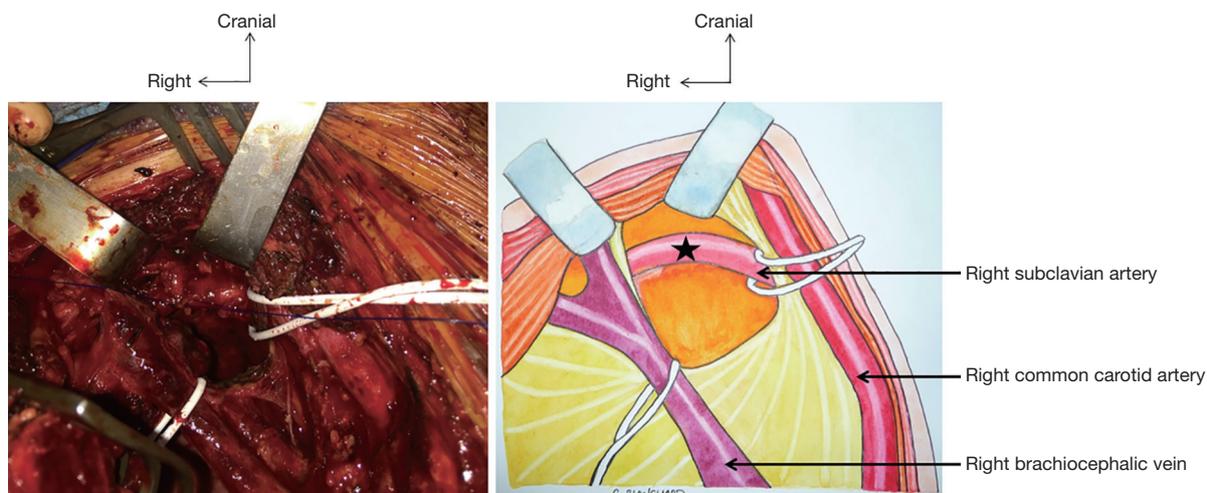
Horner's syndrome. A chest X-ray showed right tension hemothorax (*Figure 1*). The patient was referred to our surgical team. With ineffective drainage, we assumed that the source of the bleeding was extrapleural.

We decided to perform emergency surgery. Right anterior thoracotomy in the fifth intercostal space (with the patient in the supine position) enabled us to evacuate a large quantity of intra- and extra-pleural blood clots. The source of the bleeding appeared to be located in the extrapleural space, and so we suspected damage to the right subclavian artery. The surgical procedure was supplemented with a sternotomy and a subclavian approach. A large hematoma was found in the subclavian area. Although the right common carotid artery was clearly intact, intraoperative inspection revealed an aberrant right subclavian artery (arteria lusoria), with the fourth branch arising from the aortic arch. A semicircular lesion was found 1 centimeter distal to the origin of the vertebral artery, next to a small anterior aneurysm. We were unable to cross-clamp the artery using a direct anterior approach (through sternotomy); leading us to an intra-thoracic approach (through thoracotomy), allowing us a satisfying exposure to cross-clamp the artery, distally to the origin of the vertebral artery. Heparin was not administered. The lesion was sutured directly via an intra-thoracic approach (through thoracotomy), due to a clearly posterior location of the aberrant right subclavian artery. We did not seek to repair the aneurysm, and no grafts were used (*Figure 2*).

The post-operative course was marked by a serofibrinous pleurisy, despite evacuated hematoma, diagnosed using pleural ultrasonography (encysted pleurisy), leading to an ineffective drainage, treated using thoracoscopic decortication and lavage. The chest tubes were removed on day 12, and the outcome was favorable. A post-operative Doppler ultrasound assessment showed a good flow in the right subclavian artery. There was no stenosis, and Horner's syndrome resolved progressively. The patient was discharged on day 20. Follow-up consultations 1 and 2 months after discharge confirmed the full regression of Horner's syndrome, consolidation of the first rib fractures, and (in a Doppler ultrasound assessment) the persistence of good blood flow. The results of CT angiography with 3D



**Figure 1** Chest X-ray showing right tension hemothorax, with ineffective drainage.

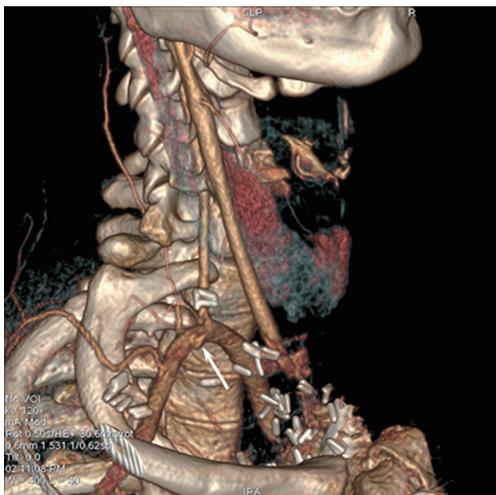


**Figure 2** Intraoperative view of the lesioned aberrant right subclavian artery (anterior approach through sternotomy). The star stands for the location of the lesion on the aberrant subclavian artery.

reconstruction were excellent, and no stenosis was observed (*Figure 3*). The patient was able to return to work 45 days after the accident.

## Discussion

An arteria lusoria is a well-known anatomic variant of the right subclavian artery, with a prevalence of 0.5% in the general population (1). Several researchers have reported on aortic injury following blunt trauma in patients with an aberrant right subclavian artery (2,3). Scaglione *et al.* reported on a case of traumatic avulsion of an aberrant right subclavian artery associated with Kommerell's diverticulum in a patient with a bicarotid trunk, diagnosed by early angiography CT-scan. Treatment consisted in grafting an aortic segment distal to the bicarotid trunk, and the injured aberrant right subclavian artery was re-implanted into the left subclavian artery. The outcome was favorable (4). Alcocer *et al.* described a patient having sustained traumatic rupture at the origin of an aberrant right subclavian artery; the rupture was diagnosed by an arteriogram and treated by grafting the artery to the descending thoracic aorta (5). Our present report is the first to describe an isolated, partial avulsion of an aberrant right subclavian artery distal to the origin of the vertebral artery in a patient having experienced blunt trauma to the thorax. This type of damage had been suggested by the onset of Horner's syndrome, probably caused by the compression of the sympathetic trunk by the upper mediastinal hematoma, but was revealed during an operation to relieve delayed-onset tension



**Figure 3** CT angiogram with 3D reconstruction acquired 2 months after surgery. The angiogram shows the aberrant right subclavian artery with a small anterior aneurysm (white arrow). CT, computed tomography.



**Figure 4** Initial CT angiogram coronal view showing the upper mediastinal hematoma, the absence of active extravasation of contrast medium, and the aberrant right subclavian artery (white arrow). CT, computed tomography.

hemothorax. The initial CT angiogram did not show any active extravasation of contrast medium inside the upper mediastinal hematoma, and little attention was paid to the path of the aberrant right subclavian artery, which is clearly visible using multiplanar reconstructions (*Figure 4*). These reconstructions were not screened at first by Radiology and ICU physicians. The delayed-onset tension hemothorax

may have been related to thoracic drainage; this may have enabled the extrapleural hematoma to drain into the pleural cavity and thus maintained the breach in the aberrant right subclavian artery. Intraoperative management of this arterial lesion is difficult using a direct anterior approach (through sternotomy); leading us to an intra-thoracic approach (through thoracotomy), allowing us a satisfying exposure to cross-clamp the artery. Presence of the aberrant right subclavian arterial lesion and its location to vertebral artery origin was unknown preoperatively, explaining why exclusion followed by bypass or the use of an endovascular approach with endostent did not appear appropriate to us at first. Furthermore, the aneurysm of the aberrant right subclavian artery may have been a weak spot in the arterial wall responsible for the partial avulsion after blunt trauma. This aneurysm differed from Kommerell's diverticulum, which is located at the origin of the vessel concerned.

In conclusion, we observed an isolated, partial avulsion of an aberrant right subclavian artery in a patient having experienced blunt trauma to the thorax. This type of damage had been suggested by the onset of Horner's syndrome but was revealed during an operation to relieve delayed-onset tension hemothorax. The CT angiogram must always be examined carefully, and clinical signs such as Horner's syndrome should prompt the physician to search for damage caused by blunt trauma to the thorax.

### Acknowledgements

We thank Chloé Blanchard, who made the drawing used in *Figure 2*.

### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Informed Consent:* Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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