High innominate artery bifurcation
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Section: Chest imaging
Case Type: Anatomy and Functional Imaging
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Patient: 61 years, female

Clinical History:
A 61-year-old patient with a 45-mm wide ascending aorta measured by cardiac echocardiography underwent a chest computed tomography (CT) examination.

Imaging Findings:
The patient was referred to our centre for assessment of the thoracic aorta after cardiac echocardiography had revealed a mild aortic dilatation (45 mm) at the ascending level. Her clinical history was unremarkable except for hypertension and persistent superficial pulsation anteriorly at the neck base. Chest CT angiography (CTA) showed the presence of a long innominate artery (IA) travelling anteriorly to the trachea for 52 mm from its aortic origin and then crossing rightward and posteriorly with an aberrant high bifurcation located about 1 cm below the right thyroid lobe (fig. 1). In addition, the left vertebral artery arose autonomously from the aortic arch (fig. 2).

Discussion:
A high bifurcation of the IA is an extremely rare occurrence, with as few as five cases of IA bifurcation located up to the thyroid gland level having been reported in the literature so far. The developmental abnormalities underlying this condition are unknown. Embryologically the great supra-aortic vessels evolve from the aortic sac and six pairs of aortic arches corresponding to the six branchial arches, most of which obliterate partially or completely within the eighth week of development. A possible explanation for a high IA bifurcation might be the persistence of a longer portion of the proximal segment of the right fourth arch (from which the IA derives), resulting in elongation of the IA and superior displacement of the origin of the right subclavian artery. A high IA bifurcation can also be associated to variation in the course of the recurrent portion of the right inferior laryngeal nerve, which loops around the right subclavian artery in proximity to its origin. Diagnosis of a high IA bifurcation is imperative before performing neck surgery or other invasive neck interventions (such as tracheostomy) in order to avoid massive hemorrhage or recurrent nerve damage. Other conditions that may cause neck pulsation include a tortuous carotid artery, cervical aortic arch, a cervical origin of the right subclavian artery, as well as tumour masses tightly attached to or arising from neck vessels. Cross-sectional imaging techniques, such as CT and magnetic resonance imaging (MRI), have replaced conventional angiography for the assessment of neck vessel abnormalities, owing to their relative non-invasiveness and their ability to provide additional information about extravascular structures. Doppler ultrasonography can be advantageous in emergency cases, as it allows saving time and can be performed at patient's bedside.

Differential Diagnosis List: High innominate artery bifurcation.
**Final Diagnosis:** High innominate artery bifurcation.

**References:**


Description: Fig. 1a. Coronal CPR showing long IA with high bifurcation. Origin:
**Description:** Fig. 1b. Sagittal MIP image showing anterior course of the IA relative to the trachea.

**Origin:**

**Description:** Fig. 1c. Axial MIP image showing right posterolateral course of the distal IA prior to bifurcation. The left vertebral artery is visible on this thick section MIP image between the common left carotid artery and the left subclavian artery. **Origin:**
Description: Fig. 1d. VR image on the coronal plane depicts the course of the IA and its anatomical relationship with the surrounding structures. Origin:
Description: Fig. 2a. Sagittal CPR image showing aortic origin of the left vertebral artery. Origin:
Description: Fig. 2b. Coronal CPR image showing aortic origin of the left vertebral artery. Origin:

Description: Fig. 2c. VR image showing the course of the left vertebral artery. Origin: