

CASE REPORT

A vascular ring variant: an unusual case of vocal cord palsy due to an anomalous left carotid artery arising from a retrotracheal arch of the aorta

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ABSTRACT. We present the case of an unusual vascular ring in a 23-year-old male patient who presented for CT examination of the chest for diagnostic work up for unilateral vocal cord palsy. Contrast-enhanced CT revealed the left common carotid artery to be arising from the ascending part of a retrotracheal arch of aorta and traversing anterior to the trachea in the retromanubrial space.

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Vascular rings are uncommon congenital anomalies that occur early in the development of the aortic arch and great vessels. The primary symptomatology associated with these anomalies relates to the structures that are encircled by the ring: the trachea and oesophagus. Rarely may it present with the more common problem of vocal cord paralysis, which is itself a sign of disease and not a diagnosis.

Case report

A 23-year-old male patient was referred to our department for contrast-enhanced CT of chest as part of the diagnostic assessment of unilateral vocal cord palsy. He had presented with hoarseness of voice and inability to speak coherently since childhood. Flexible fibre optic laryngoscopy under local anaesthesia revealed reduced left vocal fold closure and decreased sensation in the pharynx. Plain and contrast enhanced multislice CT (Volume Zoom, Siemens, Germany) was performed from the base of skull to mid chest (arch of the aorta). The chest CT (lung windows) was unremarkable. On mediastinal window settings, the arch of the aorta was in an anomalous location, being higher in the thorax in retrotracheal space (Figure 1). The arch passed higher in the left side of the thorax than usual, compressing the trachea. Interestingly, the left common carotid artery (LCCA) was the first branch to arise from the ascending aorta, before running to the left anterior to the trachea and then following a normal course (Figure 2). The anatomic relationship of the rest of the supra-aortic arteries was confirmed to be normal. The innominate

artery originated from the ascending aorta. The left subclavian artery origin was from the left side, *i.e.* descending aorta, with a normal course and calibre. The tracheal contour was altered with flattening of right posterolateral wall due to the anomalous location of the arch.

Discussion

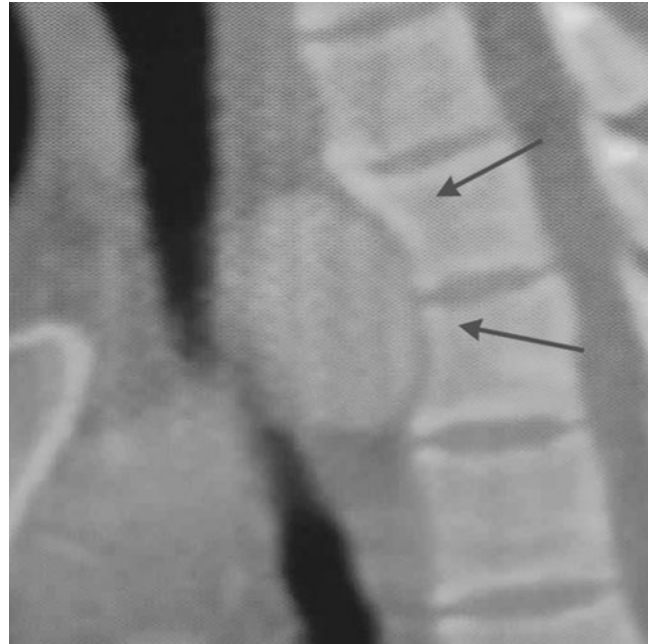
A vascular ring is an unusual congenital condition in which the anomalous configuration of the arch and/or its tributaries surround the trachea and oesophagus, forming a complete ring around them [1]. Several other related vascular anomalies involving arch vessels do not form a complete ring, but are grouped descriptively with vascular rings because they produce similar symptoms related to varying degrees of compression of the trachea and/or oesophagus. Abnormalities of the aortic arch anatomy are well known with a prevalence of 0.5% [2]. Five common different variations of vascular rings are: (1) double aortic arch (most common); (2) right aortic arch with left ligamentum arteriosum; (3) anomalous right subclavian artery; (4) anomalous innominate artery; and (5) anomalous left common carotid artery. This is only the second report of a retrotracheal aorta with aberrant left carotid artery, first case being presented as a poster by Christian Byhahn et al [3]. Vascular rings are the result of abnormal development of the embryonic brachial arches. All aortic arch anomalies are the result either of abnormal regression and/or abnormal persistence of a part of the hypothetical primitive double aortic arch system [4].

In spite of the significant variability in this group of structural anomalies of the aortic arch, they all possess a common feature. Symptoms, when present, are almost

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(a)



(b)

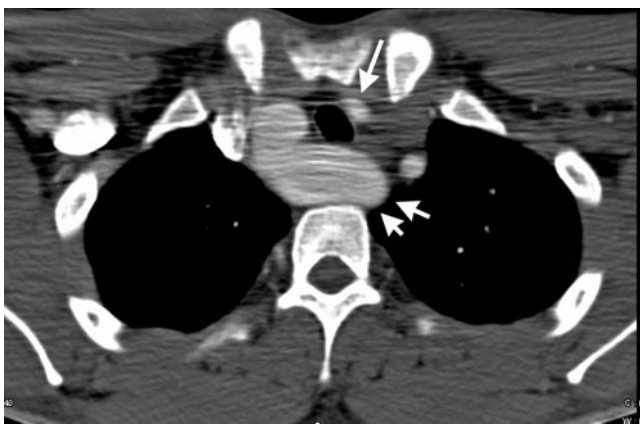
Figure 1. Coronal and sagittal CT reconstructed images show anomalous arch of aorta located higher in the thorax, causing scalloping of vertebral bodies.



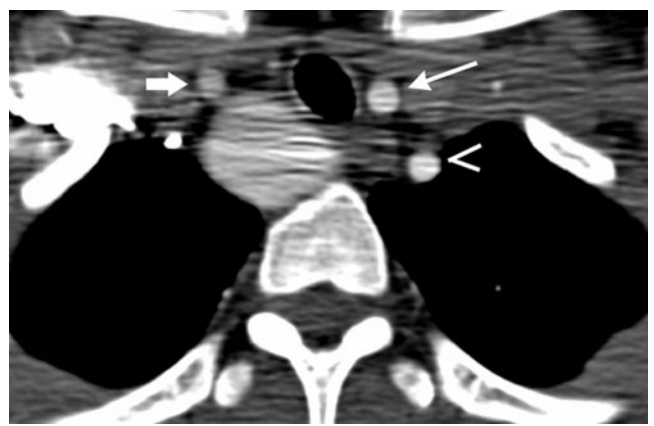
(a)



(b)



(c)



(d)

Figure 2. (a–d) Caudocranial placed axial images showing left common carotid artery (single arrow) to be arising from the ascending aorta and running to the left, anterior to the trachea. The left aortic arch (two arrows) is located higher in the thorax and is retrotracheal in position. The left subclavian artery (arrowhead) is normal in position.

never cardiovascular in nature. They all produce some degree of compression on the major airway structures and/or the oesophagus, the location and severity of compression varying with the configuration of the lesion. Individuals with anomalies producing more severe compression present earlier in life. However, a small number of patients do not manifest symptoms until later in life, and others remain entirely asymptomatic [5, 6].

As the "wandering" vagus nerve descends in the neck and thorax it sends branches to the carotid artery and heart. Unlike the right vagus nerve, the left vagus does not give off its recurrent laryngeal nerve until it is in the thorax, where the left recurrent laryngeal nerve wraps around the aorta just posterior to the ligamentum arteriosum. It then ascends back toward the larynx in the tracheo-oesophageal groove. The patient in our case presented with dysphonia, presumably due to chronic stretch of the left recurrent laryngeal nerve by the anomalous arch.

The true value of detecting vascular ring is in the diagnostic gain because prompt diagnosis will help in treatment, which can be life saving. In addition, prior knowledge of vascular variation will help in preventing complications like fatal haemorrhage or ischaemic stroke due to direct injury to the aberrant arteries

during percutaneous procedures on tracheobronchial tree.

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