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Case Report

Anatomy Section

An Anomalous Right Subclavian Artery with a Retrotracheal Course: A Case Report

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ABSTRACT

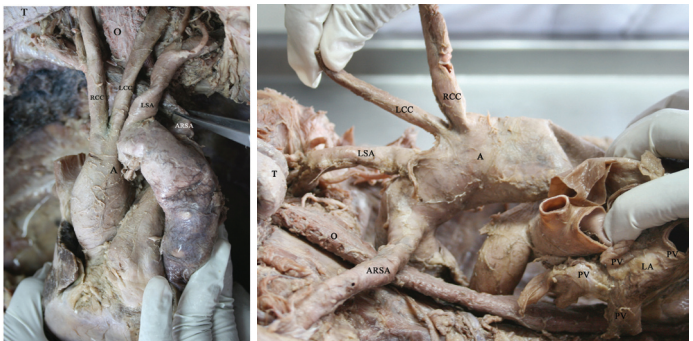
An aberrant right subclavian artery arising as the last vessel of the arch of aorta is an uncommon anatomic anomaly with prevalence reported between 0.2% and 2.0%. In 80% of the cases the aberrant right subclavian artery takes a retro-oesophageal course to the right upper limb. During routine dissection of cadavers for teaching undergraduate medical students an anomalous Retrotracheal right subclavian artery which is a very rare vascular anomaly was encountered in a 35-year-old male cadaver. The artery arose as the last branch of the arch of aorta and coursed to the right between the trachea and oesophagus. The presence of this vascular anomaly could be an unusual cause of dysphagia and breathing difficulty. The clinical significance and embryological aspects of this vascular variant is discussed in this paper.

Keywords: Arch of aorta, Retro- oesophageal course, Vascular anomaly

CASE REPORT

During routine dissection for teaching undergraduate medical students, we came across an arch of aorta with four branches in a male cadaver. From proximal to distal the branches were right common carotid, left common carotid, left subclavian and the anomalous right subclavian artery.

The aberrant right subclavian artery took origin from the dorsal aspect of the arch of aorta as its last branch distal to the usual left subclavian artery, instead of its origin from brachiocephalic trunk. From its origin, the anomalous artery turned right and coursed between trachea and oesophagus inclining upwards and to the right to reach behind the right sternoclavicular joint and continued to supply the upper limb. Because of this variation there was no brachiocephalic trunk. Right subclavian artery appeared to be slightly larger and longer than the left subclavian artery. The trachea and oesophagus were positioned normally. No abnormalities were noted in the heart and other thoracic or abdominal viscera. The recurrent laryngeal nerves on both sides were found to have a normal course. The observations are depicted in [Table/Fig-1-2].



[Table/Fig-1]: Shows the origin and Retrotracheal course of the aberrant right subclavian artery, Trachea has been lifted up and the arch of aorta is slightly twisted forwards for clarity
[Table/Fig-2]: Right lateral view: The arch of aorta has been reflected anteriorly, inferiorly and to the left. Trachea has been reflected anteriorly and superiorly to visualize the anomalous right subclavian artery arising from the arch of aorta to the left of left subclavian artery, crossing the trachea in front of the oesophagus.
A: Arch of aorta; O: Oesophagus; T: Trachea; LA: Left Atrium; PV: Pulmonary Vein
RCC: Right Common Carotid artery; LCC: Left Common Carotid artery
LSA: Left subclavian artery; ARSA: Aberrant right subclavian artery

DISCUSSION

The arch of aorta and its branches are subject to a number of variations by virtue of its development. Though advances in medical imaging technology have greatly improved the detection of vascular anomalies, the clinician should be aware of their existence which could help in adequately managing the variations in emergency approaches to the arch of aorta and great vessels when imaging studies are not available [1]. The aberrant right subclavian artery (ARSA) arises from the arch of aorta or proximal descending aorta, and in 80% of the cases takes a retro-oesophageal course to the right upper limb [2].

Autopsy based studies have revealed that the right subclavian artery can have an anomalous origin as the fourth branch of arch of aorta in 1-2% of the normal population [3]. Though 15% of the ARSA are reported taking a retrotracheal course [2], our literature search revealed only a single case [4] of retrotracheal right subclavian artery, but co-existing with a common trunk from the arch of aorta, which bifurcated into right vertebral artery and left thyroidea ima. In this context, we report a very rare case of RtRTSA (right Retrotracheal subclavian artery) arising distal to the left subclavian artery encountered during routine dissection for undergraduate medical teaching.

Pharyngeal arches form during the fourth and fifth weeks of development and each arch receives its own artery. These arteries arise from the aortic sac and terminate in the right and left dorsal aortae which fuse caudally [5]. Several segments of the aortic arch system degenerate, leading to the normally branching arch of aorta [5]. The right subclavian artery occasionally takes origin from the arch of aorta distal to the origin of left subclavian artery. This condition can be explained as due to the persistence of the distal part of embryonic dorsal aorta and the obliteration of right fourth aortic arch along with the proximal part of right dorsal aorta [6,7]. ARSA is then formed by distal portion of right dorsal aorta and right seventh intersegmental artery and with the shortening of the aorta between left common carotid and left subclavian arteries, the origin of abnormal right subclavian artery settles below that of left subclavian artery [7]. Since its stem is derived from the right dorsal aorta, it has to cross the midline to reach the right arm [7] and hence takes a retro-oesophageal or retrotracheal course, or very rarely passes in front of the trachea [2]. In the present case, it has assumed a retrotracheal course.

According to Loukas et al., there are no reports in literature describing the precise clinical symptomatology of right retrotracheal subclavian artery [4]. They further state that the retrotracheal location of right subclavian artery might result more often in dyspnoeic conditions as opposed to dysphagia which is more common with

right retro-oesophageal subclavian artery. However, RtRTSA like retro-oesophageal right subclavian artery (RtROSA) can compress the oesophagus causing painful swallowing (dysphagia lusoria) [4]. No specific treatment is needed since symptoms are not constant but intermittent and surgery is reserved only for patients with severe and progressive symptoms [4]. In elderly patients, RtRTSA could become tortuous and ectatic resulting in oesophageal or tracheal compression for which surgery is indicated if symptoms are severe [4].

In 1936 Burckhard F Kommerell described in a patient an aberrant right subclavian artery arising from an aortic diverticulum [8]. He assumed that the said diverticulum is a remainder of primitive right dorsal aorta [8]. The retro-oesophageal course of the right subclavian artery by itself might not cause tracheooesophageal compression [9]. Symptoms manifest only if anterior displacement of the trachea is prevented by carotid arteries taking origin from a common trunk or in close proximity with each other [9]. In the present case, the right and left common carotid arteries were seen arising very close to each other, and with RtRTSA coursing behind the trachea, compression of trachea was likely. However, clinical history of the case was not available.

Hara et al., evaluated the radiographic findings of 25 cases of ARSA initially depicted on CT [10]. He observed that the retrotracheal course of the aberrant artery could create a posterior tracheal imprint which appears as a vascular retrotracheal opacity in 95% of the patients with RtRTSA. Parker et al., reported a case of RtRTSA causing asthma [11]. The asthma could possibly be due to anterior displacement of the trachea from RtRTSA. RtRTSA is also clinically important to the angiographer who uses the right axillary, brachial or radial approach to the ascending thoracic aorta [12,13]. Aberrant right subclavian artery could be the culprit in situations where catheterisation of the ascending aorta proves difficult [14]. Ascending aorta can be easily accessed via the right radial artery, as brachiocephalic trunk, the first branch of arch of aorta, permits direct access [4]. But in the presence of an ARSA the situation changes and angiography becomes a challenging task [4].

ARSA is known to be associated with chromosomal defects, especially trisomy 21 [15,16]. A recently conducted ultrasound study on foetuses between 13 and 26 weeks of gestation reported the prevalence of ARSA to be 37.5% in foetuses with Down's Syndrome [15]. However the authors further state that larger prospective studies are needed to examine the potential of ARSA as a marker in Down syndrome screening [15]. But according to Borenstein et al., ARSA is relatively more common in foetuses with chromosomal defects, especially trisomy 21 in comparison to euploid foetuses, aside from the fact that presence of ARSA is associated with increased incidence of intra-cardiac malformations [16]. They conclude by stating that examination of the position of RSA (right subclavian artery) is likely to become a routine ultrasound marker for chromosomal abnormalities in the 2nd trimester of pregnancy [16].

CONCLUSION

The branching pattern of arch of aorta is subject to variations, courtesy its development. Though not always, RtRTSA can compress the oesophagus and trachea causing dysphagia and dyspnea. With more and more imaging studies and catheter-based techniques being performed nowadays, the clinicians dealing with the arch and the great vessels should be aware of their presence in order to avoid the risk of iatrogenic injury.

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