

Cadaveric Study of Anomalous Branching Pattern of Arch of Aorta

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Abstract

Pattern of aortic arch branching may vary due to different embryological reasons. I report a variation from the classical branching of aortic arch in a 60-year old male cadaver during routine dissection. It is observed that the left subclavian artery arises from aortic arch and left common carotid artery and the right brachiocephalic trunk shares a common origin. (i.e., right subclavian artery and left common carotid artery shares a common origin). This study discusses the embryological basis for the anomalous branching and its clinical significance.

Keywords: Arch of Aorta; Brachiocephalic Trunk; Common Carotid Artery.

Introduction

The arch of aorta is present in the superior mediastinum. Normally the arch of aorta gives three branches- left subclavian artery, left common carotid artery and brachiocephalic trunk. The brachiocephalic trunk later bifurcates into right subclavian and right common carotid arteries. So many variations in the aortic arch branching pattern have been noticed. Sharing of common trunk by left common carotid artery and brachiocephalic trunks is already reported [1]. It is also observed that right common carotid artery and right subclavian artery originating separately from the arch of aorta Shiva Kumar GL et al 2010, Ogeng'o JA et al 2010. This study discusses a variant aortic arch branching pattern where the left common carotid artery shares a common trunk with the brachiocephalic trunk.

Materials and Methods

During routine dissection for undergraduate students in the department of anatomy an anomaly was reported. Out of ten cadavers dissected, a vascular anomaly, pattern of aortic arch branching was observed in a male cadaver aged 60. The age of the cadaver could not be assessed as it has been obtained from other medical institute. The thoracic cavity is dissected neatly for further study of the anomaly. The neatly dissected heart and the great vessels have been studied carefully. It is observed that the arch of aorta was giving rise to two branches instead of classical three branches. The branches were left subclavian artery and a common trunk for left common carotid and brachiocephalic trunk. The common trunk was about 2.5 cm long and about 3 cm wide (fig.1). Further course of the branches were normal.

Results

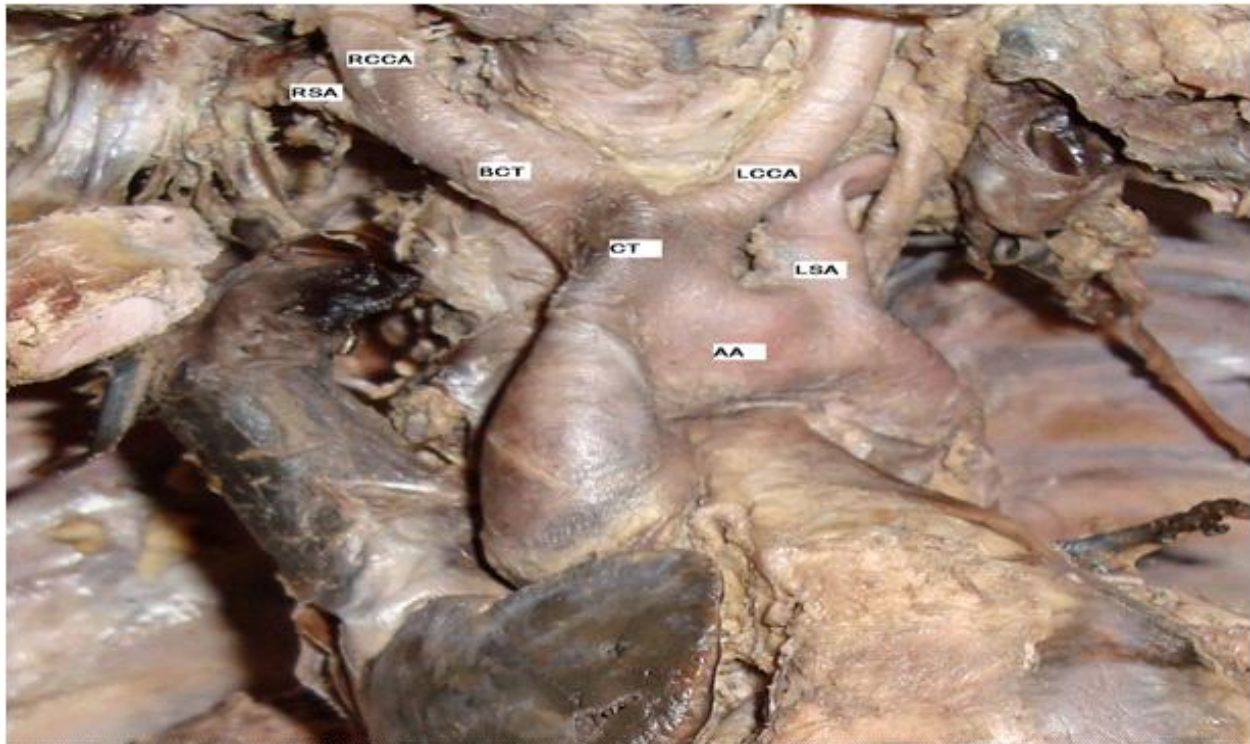
The variations in the branching pattern of arch of aorta have been reported earlier. The variations are due to persistence of parts of aortic arches that normally disappear or due to disappearance of parts that normally persists. Reports of such variations are useful for surgeons and other clinicians for their better performance during clinical practice.

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Fig. 1: Photograph shows the variations in the branching pattern of arch of aorta



A cadaveric image of the heart showing anomalous branching pattern of arch of aorta. Brachiocephalic trunk and left common carotid artery shares a common trunk.

AA: Arch of Aorta; CT: Common Trunk; LSA: Left Subclavian Artery; LCCA: Left Common Carotid Artery; BCT: Brachiocephalic Trunk; RCCA: Right Common Carotid Artery; RSA-Right Subclavian Artery.

Discussion

The arch of aorta, the curved continuation of ascending aorta, begins posterior to the second right sternocostal joint at the level of sterna angle and arches superoposteriorly and to left [2].

Three classical branches spring from convex aspect of the aortic arch: the brachiocephalic trunk, left common carotid artery and left subclavian artery [1]. This is the most common (normal) branching pattern of aortic arch, reported about 65 % of subjects. In analysis of 113 aortic arches in Kenya there was 67.3% of the usual pattern, the remaining 32.7% showed a great variety of patterns, the most common (25.7%) was two branches namely the left subclavian artery and a common stem that gave rise to the brachiocephalic trunk and left common carotid artery [3]. In 27 % of the people, the left common carotid artery originates from the brachiocephalic trunk [4].

The origins of the aortic arch branches have been observed for a long time. (Bergman et al, 2008) shows a picture of a Vesalius (1543) a common trunk between the brachiocephalic trunk and the left common carotid artery. It constitutes the most

common variation in 7 and 27 % of cases [5]. In 1837 Cruveilhier schematized the possible variations.

Paraskevas et al reported the origin of left common carotid artery from the initial portion of brachiocephalic trunk in the cadaver of an 81 year old Caucasian man. The frequency of this occurrence was reported as 0.2% [6]. Nayak et al in 2006 conducted a study on the branching pattern of aortic arch. Out of 62 cadavers dissected about 91.4% of the subject possess normal pattern of branching. In 1.6% of the cases the left vertebral artery arises from arch of aorta. This anomalous branching pattern of aortic arch can be attributed to developmental changes in the fusion process and the absorption of some of the aortic arches into the aortic sac [7].

A brachiocephalic trunk fails to form in approximately 2.5% of people, in these cases each of the four arteries (right and left common carotid and subclavian arteries) originating independently from the arch of aorta. The left vertebral artery originates from the arch of aorta in approximately 5% of people. Both right and left brachiocephalic trunks originate from the arch approximately 1.2% of people [2].

The normal development of aortic arch and great vessels requires the formation and selective regression of six paired vascular arches. These arches connect the ventral aorta to paired dorsal aortas. The aortic arch develops from the persistence of fourth left arch [8]. Anomalous branching pattern could be attributed to alterations in the development of embryonic aortic arch system into adult arterial pattern. Most anomalies arise due to persistence of parts of aortic arches that normally disappear or due to disappearance of parts that normally persists. [6]. Several such uncommon conditions may occur when an arch persists instead of getting obliterated. Proximal part of third aortic arch normally gets extended and absorbed into left horn of aortic sac .if it gets absorbed into right horn of aortic sac, it can lead to anomalies where the left common carotid artery arises from brachiocephalic trunk [4]. The anomalous branching pattern of aortic arch may alter the cerebral hemodynamic which may leads to defective blood supply to the brain.

References

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