

Case Report

BILATERAL ABSENCE OF COMMON CAROTID ARTERY WITH VARIANT BRANCHING PATTERN OF AORTIC ARCH

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ABSTRACT

Background: Variation in the branching pattern of aortic arch occurs as a result of developmental changes involved in the transformation of the embryonic pharyngeal arch system of arteries into the adult arterial pattern. **Materials and Method:** During routine dissection for first MBBS in the department of Anatomy BMCRI, Bangalore, it was observed that both the common carotid arteries were absent in a 45 year old male. **Result:** Both external carotid arteries originated from the right brachiocephalic trunk. (Innominate artery). The right internal carotid artery originated from the distal part of right brachiocephalic trunk and left internal carotid artery from the aortic arch along with the left vertebral artery. The study reports the division of brachiocephalic artery into right and left external carotid artery, right internal carotid artery and right subclavian artery. **Discussion:** The variation occurs as a result of increased absorption of third and fourth aortic arches into the aortic sac. **Conclusion:** These kind of variations should be well known by the surgeons before attempting any surgeries or during four vessel angiography.

KEY WORDS: Common Carotid Artery; Innominate Artery; Aortic Arch.

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INTRODUCTION

Common carotid artery, Internal carotid artery and External carotid artery provide the main source of blood to the head and neck. The common carotid artery and internal carotid artery lie within the carotid sheath, accompanied by the internal jugular vein and the Vagus nerve [1]. The two common carotid arteries are of unequal length. The right common carotid artery begins at the bifurcation of the Innominate artery behind the right sternoclavicular joint. The left common carotid artery arises in the superior mediastinum from the arch of aorta, but each terminates at the level of the upper border of thyroid cartilage into external carotid artery and internal carotid artery. Arch of the aorta arches over the root of the left lung,

and connects the ascending aorta with the descending aorta. It is situated in the superior mediastinum behind the manubrium sterni. The arch provides three branches from right to left- brachiocephalic trunk, left common carotid artery and left subclavian artery [2].

CASE REPORT

During routine dissection of Head and neck region for undergraduates in the department of Anatomy, Bangalore Medical College and Research Institute, Karnataka, India, it was observed that both common carotid arteries were absent in a male cadaver. on tracing further into the thorax a variant branching pattern of the aortic arch and the brachiocephalic artery were noticed, which were further dissected, cleaned and photographed.

OBSERVATIONS & RESULTS

1) The Right Brachiocephalic artery (Innominate artery) is the first branch of arch of aorta, in its course it provided four branches.

a) The first branch was the left External carotid artery which branched from the proximal part of the right Innominate artery just behind the right sternoclavicular joint crossed the anterior surface of the trachea and lie along the left side of the trachea in its rest of the course. (fig.1)

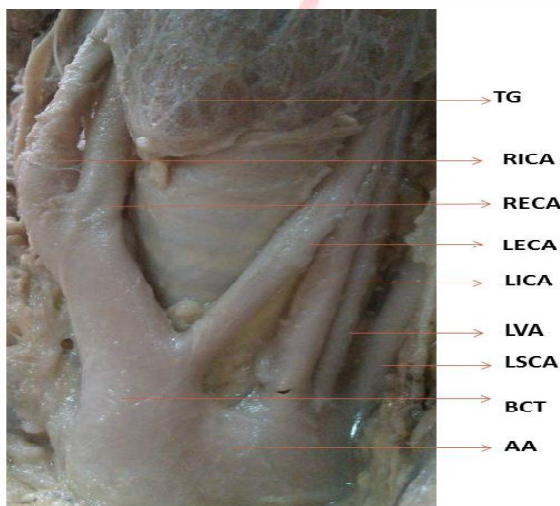


Fig. 1: Origin of left external carotid artery from the brachiocephalic trunk.

2) The right Innominate artery in its further course ascended along the right side of the trachea about 0.5 cms below the base of the right lobe of the thyroid gland it trifurcated into right external carotid artery, right internal carotid artery and the right subclavian artery . (fig.2)

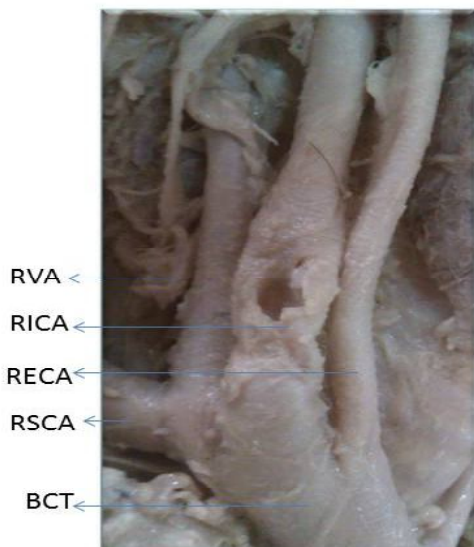


Fig. 2: Brachiocephalic trunk provides three branches on the right side, right external carotid artery, right internal carotid artery and right subclavian artery.

a) Right ECA provided its usual branches in the neck, the superior thyroid artery springing as the first branch of ECA from its anterior surface.

b) Right ICA as usual did not provide any branches in the neck. Presence of the carotid sinus was noted near its origin.

c) The right subclavian artery originated as the last branch of right Innominate artery and soon provided the right vertebral artery from its proximal part, the other branches of the first part of subclavian artery were normal.

2) Branches from the aortic arch (fig.3)

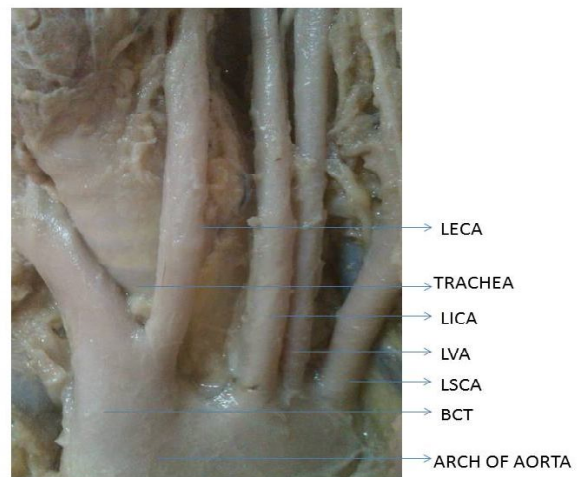


Fig.3: Aortic arch gives three branches on left side, left internal carotid artery, left vertebral artery and left subclavian artery.



Fig.4: Frontal view of all the branches.

a) Second branch from the aortic arch was the left ICA ascending along the left lateral aspect of the left ECA. The carotid sinus was not noted in relation to the left ICA.

b) Third branch from the aortic arch was the left vertebral artery which coursed upwards with out any deviation from the normal anatomy.

c) Fourth branch from the aortic arch was the left subclavian artery which provided the usual branches in the neck except the left vertebral artery.

DISCUSSION

Variation in the branching pattern of the arterial system is not infrequent. Anatomical variations have been reported time and again by different authors from different parts of the world. Review of literature confirms that bilateral absence of common carotid arteries is rare.

Initially the embryo has two dorsal aortae that communicate with an aortic sac through six pairs of branchial arch arteries. All branchial arch arteries do not appear at the same time. They are developed in a cranio caudal sequence, more cranial ones are in the process of disappearing before the caudal ones are completed [1]. During embryological development this primitive pattern is transformed into the adult pattern by involution of particular vascular segments. The right dorsal aorta largely involutes, the first, second and fifth pairs of arch arteries involute. The third pair of arch arteries forms the common and proximal internal carotid arteries. The left fourth arch artery becomes part of the aortic arch while the right fourth arch artery becomes the root of the right subclavian artery. The left subclavian artery is derived from an intersegmental artery arising directly from the dorsal aorta. The brachiocephalic trunk arises from the right limb of the aortic sac.

Unilateral absence of common carotid artery has been described by various authors but bilateral absence of common carotid arteries was described in 1784 which was also associated with double aortic arch. Later in 1978 [3] reported bilateral absence of CCA which occurs as a result of obliteration of the third aortic arch with persistence of ductus caroticus which can lead to separate origins of internal and external carotid artery. In the absence of right common carotid artery the ECA and ICA may arise directly from the arch of aorta or from the termination of innominate artery [4]. Absence of right common carotid artery with origin of the external carotid artery from the innominate artery and origin of the internal carotid artery from the right subclavian artery proximal to the right vertebral artery was reported [5].

Agenesis of the right CCA with separate origin of right ECA and right ICA from the brachiocephalic trunk with right ICA arising proximal to right ECA was reported [6]. Variation in the aortic arch branching pattern has been reported widely [7,8,9] Aortic arch anomalies are associated with chromosomal 22q deletion [9].

Embryological Significance: Most irregularities result from the persistence of parts of aortic arches that usually disappear, or from disappearance of parts that normally persist [10].

Normally the brachiocephalic artery develops from the right horn of the aortic sac, CCA develops from the proximal part of the third aortic arch, ECA develops as a bud from the proximal part of third aortic arch, ICA develops from the third aortic arch distal to the origin of ECA bud and also from the dorsal aorta lying cranial to the third aortic arch. The right SCA develops from the fourth arch, part of the dorsal aorta and right seventh intersegmental artery whereas the left SCA develops from the left seventh intersegmental artery.

In this case probably the right third aortic arch proximal to the external carotid bud has been absorbed into the right horn of the aortic sac with persistence of ductus caroticus resulting in absence of common carotid artery on the right side thus brachiocephalic artery giving origin to both ECA and ICA. The proximal part of right fourth arch has also been absorbed into the right limb of aortic sac resulting in succinctness of SCA and right vertebral artery springing near the origin of right SCA. Absorption of left third aortic

CONCLUSION

Knowledge of the variations in the branching pattern of these great vessels is of great importance in patients who have to undergo four vessel Angiography, Aortic instrumentation or any other surgeries in the neck. It is better to look into the other developmental defects of the heart when such variations are encountered.

Abbreviation:

CCA-Common carotid artery

LECA-Left External carotid artery

RECA-Right External carotid artery

LICA-Left Internal carotid artery

RICA-Right Internal carotid artery

LSCA-Left Subclavian artery

RSCA-Right subclavian artery

LVA-left vertebral artery

RVA-Right Vertebral artery

BCT-Brachiocephalic trunk

AA-Arch of aorta

RSTA-Right superior thyroid artery

TG-Thyroid gland

Conflicts of Interest: None

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