

## Case Report

# BRACHIOCEPHALIC TRUNK AND LEFT COMMON CAROTID ARTERY ARISING FROM AORTIC ARCH AS A SINGLE TRUNK

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## ABSTRACT

Branches of aortic arch usually are brachiocephalic trunk, left common carotid artery and left subclavian artery from right to left direction. Arch of aorta show more variations in branching patterns. One among which is origin of only two branches in which brachiocephalic trunk and left common carotid artery arise together as a common trunk and other branch is left subclavian artery. The variations occur due to abnormal development of arch of aorta. During routine dissection of superior mediastinum of thoracic region, we have found the left common carotid artery and brachiocephalic trunk was arising from the arch of aorta as a common trunk. These kinds of variations are very rare and knowledge of which is very important for neck surgeons, cardiologists and interventional radiologists while doing surgeries and instrumentation procedures.

**KEYWORDS:** Arch of Aorta, Brachiocephalic trunk, Left common carotid artery.

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## Access this Article online

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**Web site:** International Journal of Anatomy and Research  
ISSN 2321-4287  
[www.ijmhr.org/ijar.htm](http://www.ijmhr.org/ijar.htm)

Received: 22 Aug 2014

Peer Review: 22 Aug 2014 Published (O):30 Sep 2014

Accepted: 09 Sep 2014 Published (P):30 Sep 2014

## INTRODUCTION

The aortic arch continues from ascending aorta and continues as descending thoracic aorta. The brachiocephalic trunk, left common carotid artery and left subclavian artery are the three usual branches arise from the convex aspect of the arch. These branches may branch from the beginning of the arch or the upper part of the ascending aorta with varying distances between them. Primary branches may be reduced to one but more commonly two. The left common carotid artery may arise from the brachiocephalic trunk. More rarely, the left common carotid and subclavian arteries may arise from brachiocephalic trunk, or right common carotid and right subclavian arteries can arise separately.

Left vertebral artery may arise between the left common carotid and the left subclavian arteries. Very rarely both external & internal carotid arteries can arise from aortic arch separately so that common carotids may be absent on one side or both the sides [1].

The anomalies of branches arising from the aortic arches are due to variation in the extent of the fusion process & absorption of some of the aortic arches into the aortic sac. Increase or decrease in the number of branches arising from the arch depends on such process [2].

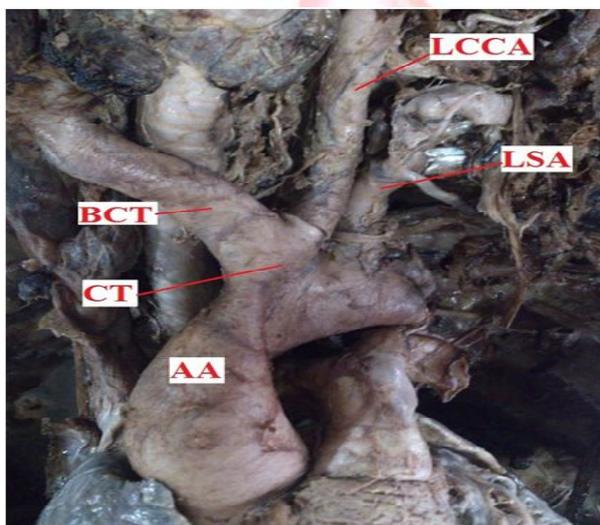
Knowledge of variations in the branching pattern of the aortic arch is of great importance in patients who have to undergo four vessel angiography, aortic instrumentation, or supra

aortic thoracic, head and neck surgery [3].

### CASE REPORT AND OBSERVATIONS

During routine embalmed cadaveric dissection at the department of Anatomy P.E.S. Medical College Kuppam, Andhra Pradesh, India, On Observation, we found variation in the origin of brachiocephalic trunk and left common carotid arteries as a single trunk from the proximal part of the arch of aorta slightly to the right of midline. Brachiocephalic trunk after arising as division of common trunk had a normal course and divided into two terminal branches as usual in to right common carotid artery, right subclavian artery and left common carotid artery crossed to the left in front of the trachea and rest of the course and branching was normal. Whereas other branch of the Arch of aorta, left subclavian artery course and relations are normal.

**Fig. 1:** showing the two branch pattern of aortic arch (AA). Common trunk (CT) is arising from the AA & dividing into brachiocephalic trunk (BCT) and left common carotid artery (LCCA). Left subclavian artery (LSA) is arising next CT.



### DISCUSSION

Adachi has classified the branches of aortic arch into three categories in which the common trunk incorporating the left common carotid artery and brachiocephalic trunk leaving only two branches originating from arch of aorta has been classified as type B and occurred in 11%. The two branches are common trunk and left subclavian artery [4]. Sumit Tulshidas Patil et al have classified the similar branching as aortic arch pattern type II was found in 11 specimens (14.66%).

Accordingly the length of GT type II was further classified into two types. Type II A had long length nearly about 4-6 cm while type II B had very short GT so that left common carotid artery appears to start from the root of brachiocephalic trunk. Out of 11 specimens of type II, four were of type II A and seven were of type II B [5]. The variation in our case fits into adachi's type B and type II B of Sumit Tulshidas Patil et al study. Rekha, P.\* and Senthilkumar, S have classified the similar pattern into type II in their study and found in 2.72% of specimens [6]. Sanjeev Kumar et al have classified similar pattern into type III and have found in 3.33% of specimens [7].

**Table 1:** Showing the Incidence of the two branch pattern of aortic arch was found in other studies.

Sl no	Study	Percentage
1	Moskowitz and Topaz [8]	3.2 (1480 specimens)
2	Natsis et al. [3]	15 (633 specimens)
3	Satyapal et al. [9]	3.4 (320)
4	Nelson and Sparks [10]	1 (193)
5	Nayak [2]	4.8

Common trunk giving origin to Brachiocephalic trunk and left common carotid artery has been previously reported by a number of authors in their case reports [11, 12, 13].

Sumit Tulshidas Patil et al have studied the death history and death certificates of the cadavers used in this study and tried to find a relation of branching pattern of aorta with cerebro-vascular disease. Type I is normal branching pattern of the aorta in which out of 58 cadavers, 7 (12%) were diagnosed with cerebro-vascular disease, while in the case of variant branching pattern, type II, 4 (23.5%) cadavers out of 17 had cerebro-vascular disease. In type II pattern, origin of left common carotid artery is slightly shifted to right side so that it is incorporated with brachiocephalic trunk and comes in a straight line with ascending aorta. This may be the reason to increase blood flow in left common carotid artery. This direct (straight line) flow of blood from aorta to brain or imbalance of flow of blood on left and right side at circle of Willis may be the cause of increased incidence of cerebro-vascular diseases in cadavers having type II pattern of aortic arch [5].

Sometimes such AA anomalies are clinically useful, as catheterization of LCCA originating

from BCT or CT can be achieved without catheter exchange [8].

### EMBRYOLOGICAL BASIS

The six pairs of aortic arches are a series of vessels that connect on each side the aortic sac with the corresponding dorsal aorta. At a later developmental stage, the aortic arches are both reduced in number and extensively transformed, and finally an asymmetric blood supply system is achieved. The first and second aortic arches largely disappear by the time the third to sixth arches develop. The left limb of the aortic sac normally forms the part of the arch of aorta that intervenes between the origins of the brachiocephalic trunk and the left common carotid artery. If the aortic sac fails to bifurcate into right and left limbs, then the variations on the branching pattern of arch of aorta may occur, as observed in present study [2, 14, 15].

### CONCLUSION

A variant of origin and course of a great vessel arising from the aortic arch is of great surgical value, because lack of knowledge of these variations may lead to serious surgical complications during procedures occurring in the superior mediastinum and the root of neck [5]. But most often this kind of variation are clinically silent without harming patient directly by anatomical variation itself but indirectly damages the brain in the form of cerebrovascular accidents like stroke because of more pressure on the variant vessel which may lead to the formation of atherosclerosis.

By the results found in many studies shows that, this kind of variation is very rare and carries more importance in presenting this case by adding to the existing knowledge. In the field of clinical anatomy it continues to remain important to report unusual or rarely seen anatomical variations. By constantly adding to our wealth of knowledge, physicians and anatomists can ensure forward progress and, ultimately, better clinical outcomes for our patients.

### ABBREVIATIONS:

GT: Grand Trunk,

AA: Arch of Aorta

LCCA: Left Common Carotid Artery

BCT: Brachiocephalic Trunk

CT: Common Trunk

### Conflicts of Interests: None

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**How to cite this article:** Gangadhara, Ravi Raj K, N. Shakuntala Rao, H. R. Krishna Rao. BRACHIOCEPHALIC TRUNK AND LEFT COMMON CAROTID ARTERY ARISING FROM AORTIC ARCH AS A SINGLE TRUNK. *Int J Anat Res* 2014; 2(3): 577-579.