



ANAMOLOUS BRANCHING PATTERN OF ARCH OF AORTA.

KEYWORDS

arch of aorta, brachiocephalic artery, subclavian artery, vertebral artery.

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ABSTRACT

Knowledge of course and branching pattern of major arteries is very important for the vascular surgeons, for various invasive & noninvasive procedures. This study was carried over a span of three years on 30 human cadavers in the department of anatomy. Dissection was done in all the cadavers according to the steps of the cunningham's manual, the branching pattern of the arch of aorta and variations are noted. In our study we observed anomalous branching pattern of arch of aorta in thorax. 29 out of 30 cadavers showed 3 branches arising directly from the Arch of aorta(AA) – normal pattern. In one (1) case, there were 4 branches arising from the arch of aorta. The branches were brachiocephalic trunk, Left common carotid, Left vertebral artery and Left subclavian artery. Left vertebral artery, originated directly from the arch of aorta between the left common carotid and left subclavian arteries.

INTRODUCTION:

The Aortic arch (AA) is located in the superior mediastinum. Its classical branches are the brachiocephalic trunk (BCT), the left common carotid artery (LCCA) and the left subclavian artery (LSA). These branches may originate from the commencement of the arch or from the upper border of the ascending aorta by varying distances between them. The BCT bifurcates into the right common carotid artery (RCCA) and the right subclavian artery (RSA). Occasionally, the LCCA can originate from the BCT (7%), and the LCCA and LSA rarely have a common origin in the form of the left brachiocephalic trunk from the aortic arch. The RCCA and RSA may originate individually from the aortic arch. The left vertebral artery (LVA) may arise between the LCCA and LSA. The right vertebral artery (RVA) and LVA may arise as separate branches from the aortic arch. In 65–95% of the cases three branches arise from aortic arch. Variations in the branching pattern of the AA range from differences in the origins of different branches to the number of branches (H. A. Alsaif, et al. 2010)¹.

METHOD:

This study was carried over a span of three years on 30 human cadavers in the department of anatomy, osmania medical college, Hyderabad, telagana state, India. Dissection instruments were used for dissecting the thorax in all the cadavers according to the steps of the cunningham's manual, The thoracic cavity was opened by cutting costochondral junctions. Sternum and lungs were removed. Pericardium was opened to see ascending aorta. Fibro fatty tissue was removed to study the branching pattern of the arch of aorta and variations are noted.

RESULT:

The present case was observed while dissecting the cadaver of a 50-year-old South Indian man during dissection classes for medical undergraduates in the anatomy department. 29 out of 30 cadavers showed 3 branches arising directly from the Arch of aorta(AA) – normal pattern. In

one (1) case, there were 4 branches arising from the arch of aorta. The branches were 1. brachiocephalic trunk, 2. Left common carotid, 3. Left vertebral artery and 4. Left subclavian artery. Left vertebral artery, originated directly from the arch of aorta between the left common carotid and left subclavian arteries. It was running upwards behind the common carotid artery. Inferior cervical ganglion, ventral rami of 7th & 8th cervical spinal nerves related posterior to it. Finally it entered the foramen transeversarium of C6 vertebra. No other vascular variations were noted during the course of dissection

DISCUSSION AND CONCLUSION:

Literature has shown that normal three-branch pattern has an incidence of 65% to 95% (H. A. Alsaif and W. S. Ramadan, 2010)¹. The abnormal origin of vertebral artery may favour cerebral disorders because of alterations in cerebral hemodynamics (Bernardi and Deton, 1975)². Frequency of origin of the left Vertebral artery from the Aortic Arch is about 2.4% - 8% (Bergman, 2000)³. In the present study our findings are correlating nearly with this author. Incidence of arterial dissection of the vertebral artery of aortic origin is reported to be higher than in the vertebral arteries of left subclavian origin (Kommiyana et al, 2001). In 2002, Paniker et al⁴, has found variation in the origin of left vertebral artery and its topography in 1 out of 20 cadavers. In 2006, Soubhagya R. Nayak et al⁵, studied 62 cadavers and found three branched aortic arch in 56 cadavers with anomalous arch in 6 cadavers. 1.6% had left vertebral artery arising directly from the arch of aorta (AA). In the present study it is nearly 3.2%. Extensive knowledge of the exact position of Vertebral arteries has become more important. In 2007, Satti et al⁶, reviewed 5 aortograms with embryologic variants of the vertebral arteries. They have found variable origin of left vertebral artery in 2 cases. In 2009, Natsis Kl et al⁷, examined 633 digital subtraction angiographies of caucasian Greek patients and classified eight types of the aortic arch. Among these type 1 i.e. aortic arch with 3 branches was found in 83% and type III

i.e. left vertebral artery arising from the arch of aorta was found in 0.79%. In 2011, Muller M. et al⁸, analyzed 2033 contrast CT scans for variations in branching pattern of the arch of aorta. They found left vertebral artery originating directly from the arch of aorta in 4.2% of cases. In 2013, Virendra Budhiraja et al⁹, examined 52 cadavers and have found 33 cadavers (63.5%) showing classical branching pattern of the arch of aorta and remaining with anomalies. Out of those, 8 (15.3%) cadavers had four branches with left vertebral artery as a direct branch of the AA. In 2014, Passaoglu Lale et al¹⁰, retrospectively examined 881 carotid CT angiograms. Among them, 25 (2.8%) cases showed 4 branches coming off the Aortic Arch.

In the present study the classical branching pattern in aortic arch is 96.8% and the Left vertebral Artery arises from 3.2%. This anomalous branching pattern of the AA can be attributed to developmental changes in the fusion process and the absorption of some of the aortic arches into the aortic sac. Usually the first part of vertebral artery develops from proximal part of dorsal branch of seventh cervical intersegmental artery proximal to postcostal anastomosis. When left sixth dorsal intersegmental artery persists, it forms first part of vertebral artery hence left vertebral artery is arising from the arch of aorta. In conclusion incidence of variations in the branching pattern of the arch of aorta are not rare. Knowledge of branching pattern of the arch of aorta is mandatory to all clinicians particularly to Head and neck surgeons, Interventional radiologists and anatomists too.

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CONFLICT OF INTEREST: none declared.

ETHICAL APPROVAL : not required

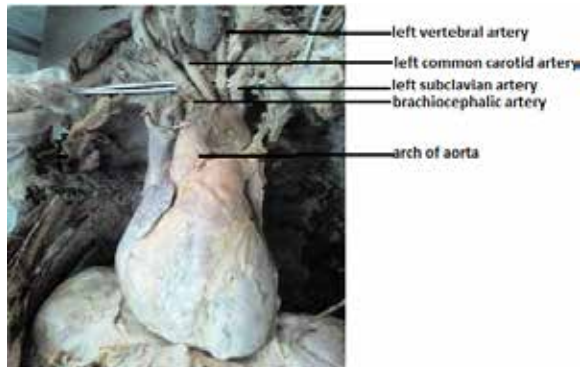


Fig-1: showing anomalous branching pattern of arch of aorta

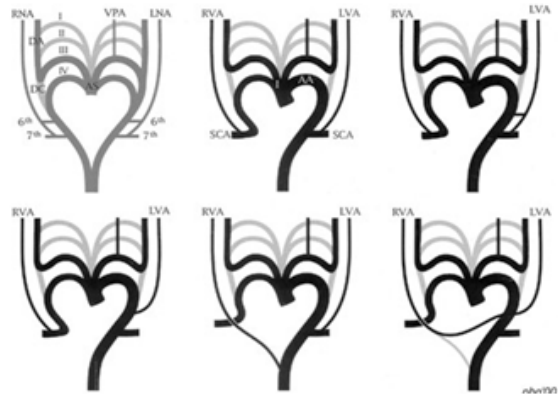


fig-2 : showing different types of anomalous origin of vertebral arteries.

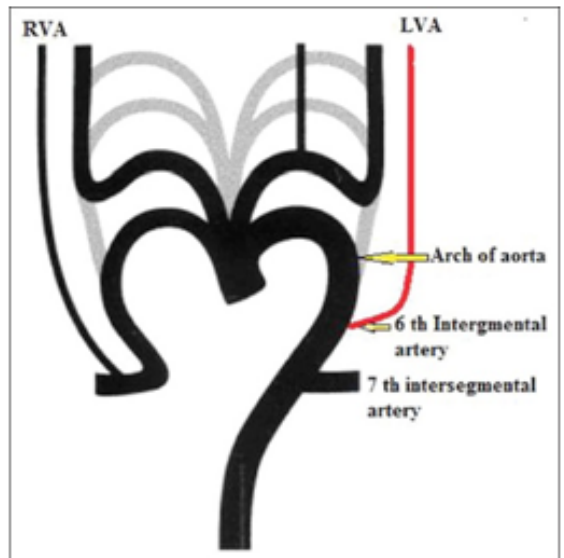


fig-3: embryological possibilities of anomalous development of vertebral arteries

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