

AORTIC ARCH-STUDY OF DIFFERENT BRANCHING PATTERNS

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ABSTRACT

INTRODUCTION

The arch of aorta is the continuation of ascending aorta which arises from the left ventricle inside the fibrous pericardium. The arch is convex upwards, behind and somewhat towards the left sided if it has to be described in 3 dimensionally. The study was conducted in the Department of Anatomy at KMCT, Kozhikode from 2014-2015.

Fifty formalin fixed heart specimens of both sexes with age ranging between 50 to 70 years were used. Mainly three types were noted.

KEYWORDS

Aorta, Arch, Branching, Variation.

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INTRODUCTION: The arch of aorta is the continuation of ascending aorta, which arises from the left ventricle inside the fibrous pericardium. The arch is convex upwards, behind and somewhat towards the left sided if it has to be described in 3 dimensionally.

The arch of aorta is embryologically significant and provides origin from left to right:

1. Brachio-cephalic trunk,
2. The left common carotid and
3. The left subclavian artery.^{1,2}

The arch is not formed from a single entity. Different parts of the arch are contributed by different sources. The arch develops mostly from the fourth aortic arch (left common carotid to the left subclavian arteries). During development, the arch is derived from the ventral part of aortic sac, the left horn and the left fourth arch artery. Variations in the branching pattern of aortic arch are not very uncommon.

Some congenital heart diseases can be linked to these malformations. In fact these variations of branching patterns can be broadly classified into.

1. Those showing only branching variations.
2. And those which are a part of the inevitable underlying heart conditions.

These branching variations of aortic arch are due to the changes in the extent of the fusion between the various arches and absorption of some of the parts of aortic arch into aortic sac.³

AIMS AND OBJECTIVES:

1. To find the different variations in branching patterns of arch of aorta.
2. To establish the underlying embryological cause.

3. To differentiate whether it had any underlying congenital cardiac anomalies.

MATERIALS AND METHODS: The study was conducted in the Department of Anatomy at KMCT, Kozhikode from 2014-2015.

Fifty formalin fixed heart specimens of both sexes with age ranging between 50 to 70 years were used.

The thorax was opened, the heart along with the arch of aorta were dissected and was studied.

The branching pattern was noted. The associated heart disease if found was noted.

RESULTS:



Image 1: Showing the four branched pattern

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Image 2: Showing the three branched pattern



Image 3: Showing the two branched pattern

Variation	Four branch	Three branch	Two branch
Number	1	48	1

Table 1: Showing the branching pattern of the arch of aorta

Variation	Four branch	Three branch	Two branch
Associated heart malformation	Nil	Nil	Cardiomegaly

Table 2: Showing the associated heart disease

DISCUSSION: The Arch of Aorta in its primitive form and its branches connect aortic sac to the corresponding dorsal aorta. Majority of the first, second and fifth arches disappears and the remaining contributes to form the aortic arch.

The spiral septum which is formed in the truncus arteriosus extends into the aortic sac, dividing it into pulmonary trunk and ascending aorta. The arch of aorta is derived from the ventral part of the aortic sac, its left horn and the left fourth arch artery.

Normally, the three branching pattern exists. Normally, the proximal part of the left third aortic arch absorbs into the left horn of the aortic sac forming left common carotid artery. If it gets absorbed into the right horn, then it leads to common trunk bearing brachiocephalic trunk and left common carotid artery.³ This explains the two dividing branch of the aorta.

The left subclavian artery normally develops from the seventh cervical intersegmental artery and first part of the vertebral artery develops from the dorsal division of the seventh cervical intersegmental artery. Direct origin of the left vertebral artery from the arch of aorta between the origin of left common carotid artery and left subclavian artery can be explained as persistent sixth cervical intersegmental artery.^{3,4} and increased absorption of seventh cervical intersegmental artery up to the dorsal and ventral division. This explains the four branching pattern of the arch of aorta.

CONCLUSION: Usually, the three branching pattern dominates. Occasionally, the two branching pattern or the four branching pattern surfaces. Although, it is impossible to tell the associated cardiac problems which are embryologically significant. But there is definitely hemodynamic instability in the lesser branching patterns which may cause pressure on the cardiac muscles and eventually results in congestive cardiac failure.

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