

Variations in the Branching Pattern of the Aortic Arch in Three Trinidadians

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ABSTRACT

In routine anatomical dissections for the purpose of preparation of teaching and museum specimens, it was observed that three cadavers of elderly Trinidadian males (of African descent) showed uncommon origin and variations in the number of branches of the aortic arch.

Variaciones en los Patrones de Ramificación Del arco Aórtico en Tres Tinitenses

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RESUMEN

En disecciones de rutina con el propósito de preparar la enseñanza así como especímenes de museo, se observó que tres cadáveres de hombres mayores trinitenses (de descendencia africana) mostraban un origen poco común y variaciones en el número de ramas del arco aórtico.

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INTRODUCTION

The variations of the branches of the arch of the aorta are usually associated with abnormalities of the heart and persistent fetal conditions. Many variations are due to different modes of transformation of the primary vessels of the brachial arches, especially the fourth. Since the aorta and pulmonary artery develop from a common conus arteriosus, irregular and imperfect development of the septum between them may produce variations (1). The most common pattern, when the three branches arise from the aortic arch, is: the brachiocephalic trunk, left common carotid artery and left subclavian artery (2). The authors report three different cases in which variations were found in the origin and number of the branching pattern of the aortic arch and they are considered as normal variants since the authors did not find any observable signs of anatomical pathology.

During routine dissection, twelve cadavers of adult indigenous Trinidadians: nine males (six Africans and three Indians) and three females (all Africans) were dissected in

the Anatomy Unit during regular dissections with the purpose of preparation of the teaching and museum anatomical specimens. The commonest pattern of branches originating from the arch of the aorta (eg the brachiocephalic trunk, the left common carotid artery and the left subclavian artery) were observed in nine cadavers: six males (three Africans and three Indians) and three African females. Variations from the common pattern of branches of the aortic arch were found in three cadavers of elderly African males. The following two types of variations of the branches originating from the aortic arch were found:

- Common origin of the brachiocephalic trunk and the left common carotid artery

The aortic arch of two cadavers of African males had only two branches: a common trunk originating from the upper convex surface of the proximal end of the aortic arch, which incorporated the brachiocephalic trunk and the left common carotid artery, and the left subclavian artery arising independently from the similar surface of the arch of the aorta distal to the origin of the common trunk. The brachiocephalic trunk showed further bifurcation into the right subclavian and the right common carotid arteries as in the usual branching pattern (Figs. 1 and 2).

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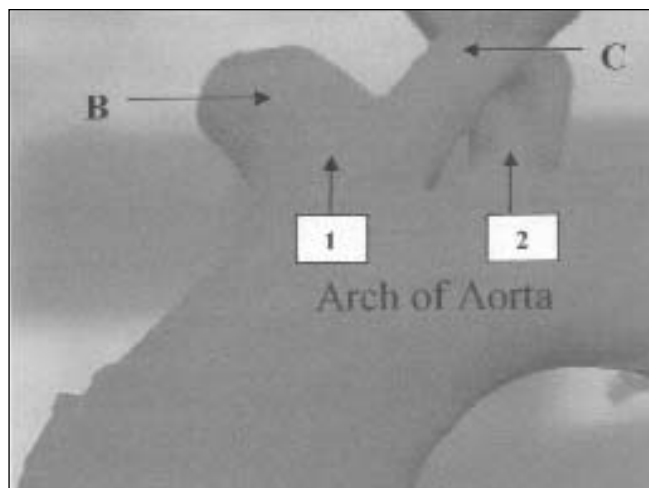


Fig. 1: Common origin of the brachiocephalic trunk and the left common carotid artery (African male).

- 1 – Common trunk for the brachiocephalic artery (B) and the left common carotid artery (C)
- 2 – The left subclavian artery.

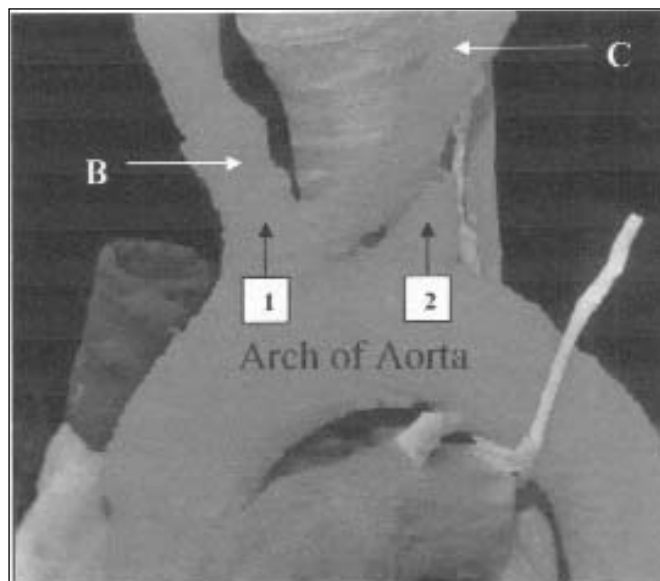


Fig. 2: Common origin of the brachiocephalic trunk and the left common carotid artery (African male).

- 1 – The common trunk for the brachiocephalic artery (B) and the left common carotid artery (C)
- 2 – The left subclavian artery

- Direct origin of the left vertebral artery from the arch of the aorta

In one cadaver of African male, the arch of the aorta had four branches arising from its upper surface. In addition to the three common branches, which were mentioned above, the convex surface of the aortic arch was giving origin to the left vertebral artery (5mm in diameter) which was located between the origins of the left common carotid and the left subclavian arteries. No

other congenital variations were found. There was no noticeable difference in the heart or pulmonary trunk (Fig. 3).

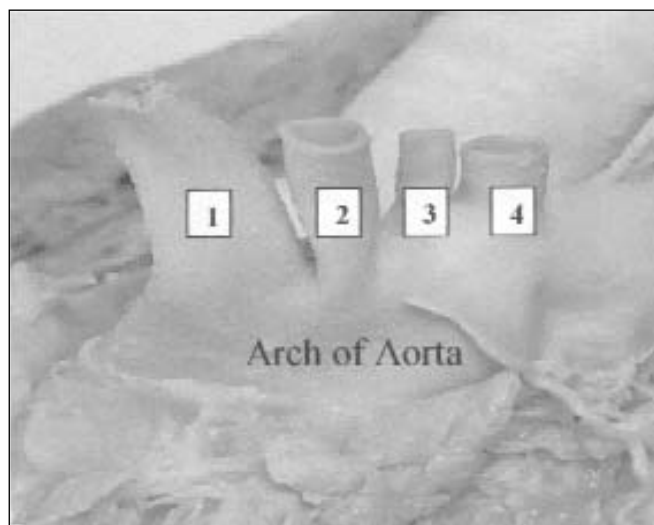


Fig. 3: Separate origin of the left vertebral artery from the aortic arch (African male).

- 1 – The brachiocephalic trunk
- 2 – The left common carotid artery
- 3 – The left vertebral artery
- 4 – The left subclavian artery

DISCUSSION

Recently, a unique aortic arch branching pattern was found in one case, in which four arteries arising from the arch of the aorta were arranged in the following unusual sequence: the right subclavian, the left subclavian, the right common carotid and the left common carotid (3). The mode of development of this type of branching pattern suggests that it might be due to the slowed or retarded growth of the ventral aortic roots between the third and fourth aortic arches and increased absorption of embryonic aortic arch tissue between the origins of those two vessels, allowing fusion between the brachiocephalic and left common carotid branches of the aortic arch.

In the present case, there was a direct origin of the left vertebral artery from the upper surface of the aortic arch and it was located between origins of the left common carotid and left subclavian arteries. Increased absorption of embryonic tissue of the left subclavian artery between the origin of the aortic arch and the vertebral artery may be the reason for such direct origin of the left vertebral artery from the aortic arch. The frequency of such variation in this study corresponds to 8% of all cases. Variations, when there are more than three branches originating from the aortic arch may include the vertebral arteries (1, 3, 4), or the extra branch may be the thyroidea ima artery (2) which ascends in front of the trachea to the thyroid gland.

Even though the branching patterns of the aortic arch are considered to be variants of some deviations from the commonest pattern of development, there were not any noticeable signs of anatomical pathology associated with those variations. These variations have to be taken into consideration by surgeons when they are planning surgical or diagnostic interventions involving the aortic arch and its branches. Surgeons must be aware of possible variations of the major arteries and be able to identify them. Correct identification of these vessels is very important for appropriate invasive techniques in order to achieve desired objectives and to avoid major complications especially during vascular surgery.

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