

A Case of Variation of the Left Common Carotid Artery

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Aortic arch variation occurs due to disorders of the development of primitive double aortic arch system. During anatomic dissection on adult cadaver we investigated the variability of appearance of brachiocephalic trunk and left carotid artery. Both these arteries originate together such as first branch of the aortic arch. The second one is the left subclavian artery. It arises from the backside of common carotid artery. The special attention was paid also to ductus arteriosus (Botali). It is thick — 2.5/2 cm, and connects pulmonary trunk and aortic arch, below the left subclavian artery. The literature is reviewed and the clinical significance of aortic arch variations is discussed.

Key words: aortic arch, embryonic development, common carotid artery, variation.

Introduction

Variations of human body attract interest not only as a descriptive finding but also because of their particular clinico-anatomical value [1,2,3]. The relatively high incidence with coinciding abnormal topography of the blood vessels attracts the interest of morphologists and clinicians. The experimental and clinical studies show that developmental anomalies differ depending on the period of critical exogenous or endogenous influence [1]. Development anomalies of the aortic arch result from disturbances in the formation of the primary aortic arch in the early embryonic stages. There are a number of publications in literature presenting a variety of variations of the aortic arch and its branches [4,5]. In the present communication is described an anomalous finding of the brachiocephalic trunk and the left common carotid artery concerned with the topography and dimensions of the vessels. The anomaly is considered a result of embryonic dysmorphogenesis of the primary aortic arches.

Material and Methods

During a routine dissection of a cadaver of adult male in the Department of Anatomy, Histology and Embryology, Plovdiv uncommon topography and dimensions of the heart and large arterial and venous blood vessels was recognized after

exposing the elements in the root of the neck and superior mediastinum. Variation of the aortic arch branches was present.

Results

Dissection exposed normal topography of the elements in the superior mediastinum — i.e., lymph nodes, loose connective tissue, venous vessels, remnant of the thymus, and considerably dilated superior vena cava — circumference 8.5 cm and diameter 3.5 cm. The left brachiocephalic vein was with normal dimensions but the thoracic duct was thickened — 2.5cm/2.0cm. The aortic arch was found deeper beginning at the level of the second right sternocostal joint, bending upward and backward from right to left, locating in front of the trachea, and then turning downward and backward to the fourth thoracic vertebra. The convexity of the arch was at higher level and 15 cm in length while the length of the concavity was 6.5 cm. The aortic arch circumference was 12.5 cm and the diameter — 5 cm.

The branches of the aortic arch were two — the brachiocephalic trunk and the left common carotid artery (LCCA) beginning with a common stem and the left subclavian artery. The common stem was 9 cm wide. LCCA branched immediately above the aortic arch, ascended in front of the trachea lodging between the left side of the trachea and the left recurrent laryngeal nerve. LCCA was 3 cm wide, the right common carotid artery 2.8 cm and the right subclavian artery 5.5 cm.



Fig. 1. The brachiocephalic vein lying on the V-shaped structure and dilated thoracic duct



Fig. 2. The common stem of the brachiocephalic trunk and left common carotid artery and the vertical portion of the left subclavian artery parallel to the left border of the trachea

The left subclavian artery was the second branch of the aortic arch beginning from its posterior aspect at 2.5 cm from the LCCA. It passed behind the left brachiocephalic vein, ascended to the level of the left recurrent laryngeal nerve and bent sharply to the left towards the interscalenic space. The artery was 7.0 cm wide and 3.0 cm long up to the bent and its length from the bent to the interscalenic space was 2.5 cm.

The persistent ductus arteriosus with 1.8 cm circumference and 2.0 cm length connected the pulmonary trunk and aortic arch opposite the origin of the left subclavian artery.

Discussion

The anomalies of the aortic arch result from maldevelopment of the primary aortic arches in the early week 4 of gestation. The remnants of the arterial vessels are paired. They leave the heart through the aortic sac, which is the anterior part of the common arterial trunk. From the arterial trunk begin the two ventral aortae, which join the six aortal brachial arches. In further development of the arterial vessels in the cervical region part of the aortic arches reduce and the remaining ones follow an irregular growth [2]. Not all of the aortic arches exist at one and the same time [1]. The first two aortic arches degenerate before the next arches appear. From their roots are formed the two common external carotid arteries [1]. The third and fourth arches form in the beginning of the week 5 of gestation at 5-mm embryo. The carotid arteries develop from the third aortic arch. From the proximal part of the third arch forms the common internal carotid artery and from the distal part the dorsal aorta is formed [1]. The fourth pair aortic arches gives rise to the distal part of the definite aortic arch on the left and the right subclavian artery on the right side. The aortic bag gives origin to the common carotid artery, ascending aorta, the proximal part of the aortic arch and brachiocephalic trunk. Variations are more frequently seen in the initial part of the left common carotid artery than in the right carotid artery [7]. The distance between the initial part of the branches of the aortic arch can increase or decrease with LCCA approaching the brachiocephalic trunk being the most frequent variation [6].

Conclusions

1. The described variation can be due to the common origin of the aortic sac and third aortic arch, which supported by the findings of other authors. Its is possible that an inhibiting noxious factor prevents the cell reaction to induction signal. The anomaly (right shift) of the LCCA could be a compensatory mechanism for the embryo surviving. This suggests more profound studies. Harmful factors of various natures could be a subject of investigation.

2. The right marginal vessels are narrower with approximately 5 mm in their circumference than the left ones, which suggest a tendency to insufficient blood supply of the corresponding regions — the right upper limb and right half of the head and neck.

3. Due to the changed origin of the LCCA the position of the left recurrent laryngeal nerve is changed from lateral to medial with 12 mm. This change in the nerve topology should be taken into consideration in the surgical practice.

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