

CASE REPORTS

VARIATION OF THE AORTIC ARCH BRANCHES: TWO MAIN TRUNKS ORIGINATING FROM THE AORTIC ARCH

ARCUS AORTAE DALLARININ VARYASYONLARI: ARCUS AORTAE'DAN ORİJİN ALAN İKİ ANA TRUNKUS

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Gazi Medical Journal 2003; 14: 181-184

SUMMARY: During the dissection of the cervico-thoracic region of a 25-year-old female cadaver, 2 main trunks originating from the convex aspect of the aortic arch with additional variations were encountered. The brachiocephalic trunk and left common carotid artery arose from the first trunk. The other trunk was formed by the left subclavian artery and left vertebral artery. Additionally, the external carotid artery and its branches coursed in front of the hypoglossal nerve on the right side and on the left side, and the left vertebral artery ran through the transverse foramina of the C7 vertebrae.

Key Words: Aortic Arch Branches, Vertebral Artery, Variation.

INTRODUCTION

Three branches spring from the convex aspect of the aortic arch: the brachiocephalic trunk, the left common carotid and the left subclavian artery. The primary branches may be reduced to 1, more commonly 2, the left common carotid arising from the brachiocephalic trunk (1). Its definite frequency may be considered as an anatomical structure with a normal variation but when considered with respect to its role in providing blood to the 3 main vessels of the brain, the common brachiocephalic trunk is of great clinical significance, especially in obstruction (2, 3). According to anatomical text books, the vertebral artery arises from the superior surface of the first part of the subclavian artery and continues through the transverse

ÖZET: 25 yaşında bir bayan kadavramın toraks ve boyun diseksiyonu sırasında arcus aortae'nin konveks üst yüzünden orijin alan iki ana trunkus ve buna ek bazı varyasyonlarla karşılaşıldı. Birinci trunkus, truncus brachiocephalicus ve sol arteria carotis communis'ten, ikinci trunkus sol arteria subclavia ile sol arteria vertebralis tarafından oluşuyordu. Bunlara ek olarak sağ ve sol tarafta arteria carotis externa ile dalları nervus hypoglossus'un önünden geçiyor, sol arteria vertebralis ise yedinci servikal vertebra'nın foramen transversarium'una giriyordu.

Anahtar Kelimeler: Arkus Aorte Dalları, Arteria Vertebralis, Varyasyon.

foramina of the C6 vertebrae (4).

CASE REPORT

Some vascular anomalies were seen in the cervico-thoracic region of a 25-year-old female cadaver. The aortic arch and branches were carefully brought out through dissection. The length and diameter of the branches of the aortic arch were measured with callipers proximal to their origin. Each artery was evaluated in relation to whether or not its branches and courses conform to the normal anatomical structure and this was recorded accordingly.

It was observed that 2 separate trunks instead of 3 branches extended from the aortic arch. The brachiocephalic trunk and left common carotid artery arose from the first trunk. The other trunk

was formed by the left subclavian artery and left vertebral artery. Each trunk later separated into 2 branches (Fig. 1a, 1b). The first had a radius of 13.7 mm and length of 12.4 mm on the right of the aortic arch. To the right, from this trunk extended the brachiocephalic trunk; to the left and upwards extended the common carotid artery. The second trunk, arising upwards from the left of the aortic arch, had a radius of 9.5 mm and length of 43 mm. From this trunk the left subclavian artery was observed to arise to the left and the left vertebral artery upwards to the right. The left subclavian artery showed normal progress and branching. The left vertebral artery was seen to go upwards vertically adjacent to the vagus nerve to the right of the left apex of the lung, and on the left of the prevertebral muscles, and ran through the canal from the vertebral foramen of the C7 vertebrae.

Additionally, the external carotid artery and its branches coursed in front of the hypoglossal nerve on the right side. No other anatomical difference was observed in the cervico-thoracic region or in the left carotid artery or its branches.

DISCUSSION

There are many studies about aortic arch branches with different variations (5-7). Variations of the origin of the left common

carotid artery are significantly higher than those of the right common carotid artery and it is commonly observed arising from the brachiocephalic trunk (8).

Many changes involved in the transformation of the embryonic aortic arch system, such as regression, retention or reappearance, may result in variations in the origin and courses of the vessels. The common carotid and internal carotid arteries are derivatives of the third aortic arch and portions of the ventral aortic roots are retained as the external carotid arteries (9, 10).

A common brachiocephalic trunk is a variant of aortic arch development in which both common carotid arteries and the right subclavian artery originate from a single trunk that arises from the arch. In both autopsy studies and large surgical series of innominate artery disease, a common trunk has been found to occur in up to 10% of the population (11). A diseased common brachiocephalic trunk can have major ischemic implications, given that it supplies both the carotid arteries and the right vertebral and subclavian arteries. The choice of revascularization procedure depends on the particular anatomy, hemodynamic variables, and arterial pathologic features in a given patient (3). As in our case, the arising of the brachiocephalic trunk and left common carotid artery together

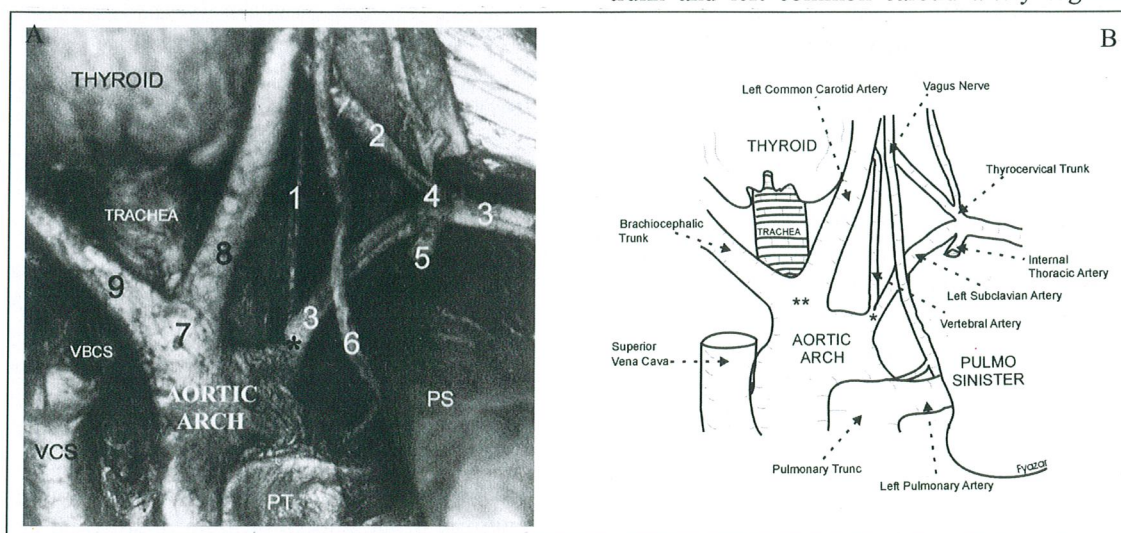


Fig. 1AB: A photograph of the cadaver with vascular anomaly. 1, Left Vertebral Artery; 2, Superior Thyroid Artery; 3, Left Subclavian Artery; 4, Thyrocervical Trunk; 5, Internal Thoracic Artery; 6, Left Vagus Nerve; 7, Common Trunk of Brachiocephalic and Left Common Carotid Arteries; 8, Left Common Carotid Artery; 9, Brachiocephalic Trunk; (*) Common Trunk of Left Subclavian and Left Vertebral Arteries. PS, Pulmo Sinister; PT, Pulmonary Trunk; VCS, Superior Vena Cava; VBCS, Left Brachiocephalic Vein (A). Schematic representation of figure 1a. (*), The left subclavian artery and left vertebral artery arose from the second common trunk; (**), The brachiocephalic trunk and left common carotid artery (B).

from the aortic arch in a common trunk makes the main trunk quite significant in supplying the brain. Legating or pathology of this main trunk will reduce this supply.

The vertebral arteries, which play such a fundamental role in anchoring the developing subclavian vessels during the descent of the aorta, are also subject to anomalies based on variations occurring in the process of their development. Considering their complex embryologic development, it is surprising to learn that the vertebral arteries are the most constant of the subclavian branches. The vertebral artery arises from the superior surface of the first part of the subclavian artery 0.5 to 2 cm medial to the thyrocervical trunk (4, 12). Many authors have published different series or reports about anomalies of vertebral arteries (2, 13, 14). Anomalous origins of the vertebral artery are present in approximately 5% of individuals (15). The majority involve the direct origin of the left vertebral artery from the aortic arch between the left common carotid and subclavian arteries, or the origin from the aortic arch to the left subclavian artery (16). However, the incidence of left vertebral origin from the common trunk of the left vertebral and left subclavian artery has not yet been reported in the literature (13). Knowing the variation in the origin of the vertebral artery and its prevertebral course is of great importance for thoracic and head and neck surgeons (17) and angiography (18).

In cases similar to ours, further studies are needed to examine whether the vertebral arteries originating from the aortic arch or near the beginning of the subclavian artery enter the foremen transversarium more commonly from the lower part (C7) or not. Moreover, we think that a vascular anomaly developing embryonically may affect the development of others vascular structures, causing multiple variations. Many of the complications can be avoided with accurate knowledge of anatomic variations; the presence of these anatomical variations in the same cadaver will take its place in the literature and play a significant role in surgical intervention in the cervico-thoracic region and also in angiographies.

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