Multiple Kinking And Brachiocephalic Origin Of The Left Common Carotid Artery-A Cadaveric Case Report

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ABSTRACT:

The variations in the aortic arch and its branches are of surgical interest. Many anomalies of the aortic arch and great vessels are uncovered as serendipitous findings on imaging studies, in the anatomy laboratory, or at surgery. Knowledge of the branching pattern of the aortic arch is important during supra-aortic angiography, aortic instrumentation, thoracic and neck surgery. An abnormal origin of the left common carotid artery from the initial portion of the brachiocephalic trunk was found in the superior mediastinum in a 60-year-old male cadaver during dissection practice. We report on the exact morphology of that variant that is appearing in an incidence of 0.2% in the literature. We discuss the relative literature and pay attention on the significance of such a variation for clinicians in its recognition and protection.

Key-words: Aortic arch, Brachiocephalic trunk, Angiography, Carotid arteries

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INTRODUCTION:

Many variations occur in the human vascular pattern, not only in the peripheral circulation, but also in large vessels including the aorta. In about 80% of individuals, three branches arise from the aortic arch: the brachiocephalic trunk, left common carotid artery, and left subclavian artery.[1] Adachi first classified this branching pattern as type A. Another 11% of reported cases have a common trunk incorporating the left common carotid artery and the brachiocephalic leaving only two branches originating from the aortic arch, Adachi's type B. The third most common pattern, type C, has the left vertebral artery, a fourth branch of the aortic arch, originating proximal to the left subclavian artery.[2] Numerous other variations of the branching pattern of the aortic arch are found in less than 1% of cases.[1] In all reported cases, however, the most distal branches arising from the arch, or the descending thoracic aorta, was either a subclavian or thyroid ima artery.[3,4]

The possible variation of aortic arch can be seen in (**Figure-1**). The common origin of the carotid arteries (COCA) is a normal aortic arch variant found in approximately 11% of whites[5] with an even higher incidence, up to 25%, reported in the African-American population.[6] In COCA, the right innominate and the left carotid arteries arise from a single origin or the trunk of the aorta (**Figure-2**). Thus, the right and left common carotid arteries both arise from a short "innominate" trunk.[7] Whereas previously it was reported that this defect had no associated anomalies or adverse consequences to the patient, more recent studies have indicated an increased incidence of COCA with certain congenital anomalies, including DiGeorge syndrome, esophageal atresia-tracheoesophageal fistula[8] and anomalous origin of the left coronary artery from the pulmonary artery.[9]

CASE PRESENTATION:

We dissected a 60-year-old, male, formalin fixed cadaver. His weight was 78

Kg and the height 1.78 Meter. He had no past medical history and was on no medication. He did not use to smoke or drink (according to his next of kin). The dissection was carried out as part of the practice for the medical students. We noticed the presence of a left common carotid artery arising from the left surface of the origin site of the brachiocephalic trunk (**Figure-2**). The artery coursed from the right to the left side of the mid-line of the body showing multiple kinking. Remaining course was normal. The brachiocephalic trunk did not show any significant changes. It is short to the site where the abnormal origin of the left common carotid artery was found. In addition to the abnormal issue of the left carotid artery, there was an elongation of the artery itself (**Figure-3**). The left subclavian artery was normal.

DISCUSSION:

There are several reports of blood vessel malformations associated with aortic arches. Non-recognition of a critical aortic arch branch variation of surgery may lead fatal consequences Kinking is distinguished from other elongations of arteries – tortuosity and coiling. Tortuosity is an elongation with curving; coiling is an elongated and redundancy of the artery resulting in an exaggerated S-shaped curvature or in a circular configuration. Stenotic kinking is an elongation causing angulation of less than 90° with Duplex ultrasonography consistent with the artery stenosis of 70% or greater.[10] Tortuosity of the internal carotid artery is observed in 35%, coiling in 6%, and kinking in 5% of patients, according to the literature, with a fourfold higher incidence in women.[11,12] Kinking can sometimes be the reason for cerebral ischemia, resulting in Transient Ischemic Attack (TIA) and/or completed stroke, usually a minor one. Results from recent retrospective clinical trials with the use of MDCTA demonstrate that kinking may be associated with symptoms, whereas coiling does not appear to be associated with symptoms. The degree of severity of the carotid artery stenosis is not related to the presence of the vessel tortuosity.[12] Kinking of the carotid artery needs surgical reconstruction when it causes impairments in haemodynamics, with clinical symptoms and neurological signs–transitory ischaemic attack (TIA)/stroke.[13] In such cases, operative treatment of the kinking must be considered.

Embryological Basis:

The left limb of the aortic sac normally forms the part of the arch that intervenes between the origins of the brachiocephalic trunk and the left common carotid artery. If the aortic sac fails to bifurcate into right and left limbs, then the left common carotid artery will connect to aortic sac directly resulting in a common origin of the carotid arteries. The abnormal brachiocephalic trunk was formed by the fusion of the proximal part of the left third arch artery and left seventh inter-segmental artery into the left fourth artery, which in future may be responsible for formation of carotid and subclavian artery from that common trunk. The branching pattern of the brachiocephalic trunk varies due to the embryological reason that the proximal part of the third aortic arch normally gets extended and absorbed into the left horn of aortic sac. If it gets absorbed into right horn of aortic sac, these variations occur. Thus, these morphological variations are of greater importance in cerebral hemodynamics and in all non-invasive procedures.

CONCLUSION:

The presented case shows that an abnormal origin of the left common carotid artery and multiple kinks. Imaging techniques are valid diagnostic tools for the assessment of carotid anomalies. Additionally, a variant of origin and course of a great vessel arising from the aortic arch is of great clinical value, because the ignorance on behalf the surgeon of such a variation may cause serious surgical complications during procedures occurring in the superior mediastinum and the bare of

neck. If a precise preoperative diagnosis cannot be established, unexpected results may be encountered in surgery or medical approaches. The possibility of their presence should be recognized for surgeons and anatomists.

Sources of support: Nil
Conflict of interest: Nil

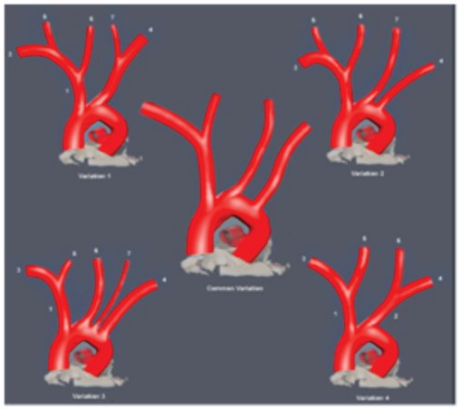

Figure-1:Schematic diagram of variations of aortic arch
1. Rightbrachiocephalic trunk,
2. Left brachiocephalic trunk,
3: Rightsubclavian artery,
4: Left subclavian artery,
5: Right common carotid artery,
6: Left common carotid artery,
7: Left vertebral artery

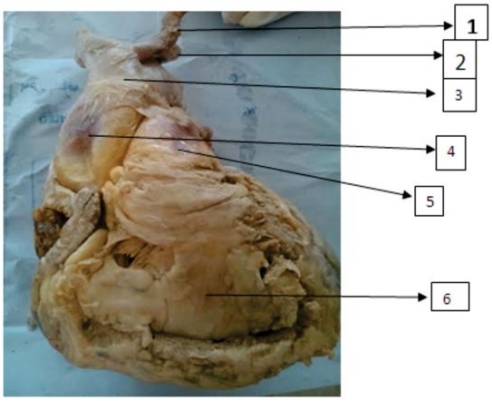

Figure-2: Photograph shows the branching pattern of the aortic arch.
1. Left common carotid artery
2. Left subclavian artery
3. Brachiocephalic trunk
4. Arch of Aorta
5. Pulmonary trunk
6. Right Ventricle

Figure-3: Arrow Shows left common carotid artery arising from initial part of brachiocephalic trunk with multiple kniking.

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