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A STUDY OF ABERRANT RIGHT SUBCLAVIAN ARTERY IN CADAVERS

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ABSTRACT

Aortic arches have complex pattern of development making room for variations. The most important abnormality of the aortic arch is the presence of an aberrant right subclavian artery. If this vessel compresses the adjacent structures, several symptoms may be produced. Thirty eight cadavers were dissected and observed for aortic arch branching pattern variations during routine undergraduate dissection over a period of three years in Shamanur Shivashankarappa Institute of Medical Sciences & Research Centre, Davangere. One case of aberrant right subclavian artery was noted. This aberrant artery was taking origin from the aorta distal to left subclavian artery running behind esophagus and trachea. Intrepretation and Understanding and identifying aortic arch arterial abnormalities is significant during evaluation of symptoms due to compression of structures in thorax. Appreciating the associated abnormalities such as nonrecurrent laryngeal nerve, right sided thoracic duct is important in evaluation and treatment of symptomatic patients of aberrant right subclavian artery.

Keywords: Arteria lusoria, Dysphagia lusoria, Right Retroesophageal Subclavian Artery, Kommerell's diverticulum, Nonrecurrent laryngeal nerve.

INTRODUCTION

Development of pharyngeal arches takes place during the 4th and 5th week of embryological development. These arches are supplied by arteries from aortic sac. These aortic arch arteries gives rise to all great vessels of the body. Because of the complex interplay of factors, one can expect great variations in the formation of these vessels in the mediastinum. One of the most common congenital vascular embryologic abnormality of the aortic arch is the aberrant right subclavian artery. This condition is clinically known as arteria lusoria [1]. The first description of this variation was provided in 1735 by Hunauld [2]. Although most cases of this anomaly are asymptomatic, symptoms may appear when a "ring" completely encircles the trachea or the esophagus. Extrinsic compression of the esophagus may lead to dysphagia. This phenomenon, first reported in 1794 by London physician David Bayford, was originally described as "dysphagia by freak of nature" and is commonly referred to as dysphagia lusoria [3].

In 1823, Stedman described the entire anatomical picture associated with aberrant right subclavian artery [4]. The other most common symptoms include cough, stridor, and thoracic pain and infants more often present with respiratory symptoms. Recent researchers have considered this condition as new ultrasonographic marker of down's syndrome [5,6]. The present study evaluates one such aberrant right subclavian artery.

Anomalous variations in the origin and course of arteries have serious implications in angiographic and surgical procedures; hence it is of great importance to be aware of such possibilities of variations.

MATERIALS AND METHODS

The present study was conducted on thirty eight cadavers in the Department of Anatomy, Shamanur Shivashankarappa Institute of Medical Sciences and Research Centre, Davangere over a period of three years during routine dissection for MBBS students.

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During dissection of superior mediastinum, branches arising from the arch of aorta were clearly delineated and followed up for proximal 5 cm course of the arteries were noted. Relation to trachea and esophagus is noted in every case.

Course of recurrent laryngeal nerve was noted on both sides. Specimen of heart for complete examination is taken out with arch of aorta and stumps of branches arising from it are taken out of mediastinum.

RESULTS

Abnormal origin of subclavian artery was identified in a 63 year old female cadaver during routine undergraduate dissection. Right common carotid, left common carotid and left subclavian artery were arising in order from right to left. After 27mm from the origin of left subclavian artery, right subclavian artery has taken origin from the posterior aspect of the aorta. It was running behind division of trachea and esophagus from left side to right mediastinum.

The right recurrent laryngeal nerve did not recur. Instead, anomalous right inferior laryngeal nerves arose from the cervical portion of the vagus nerve at the level of the upper pole of the thyroid lobe, turning transversely by a very short course towards the larynx and running a nearly horizontal course to their point of entrance into the larynx. The left recurrent laryngeal nerve, on the other hand, looped typically around the aortic arch, and the cardiac branches of both vagus nerves entered the cardiac plexus normally.

Figure 1. Showing Aberrant right subclavian artery and recurrent laryngeal nerves on both sides

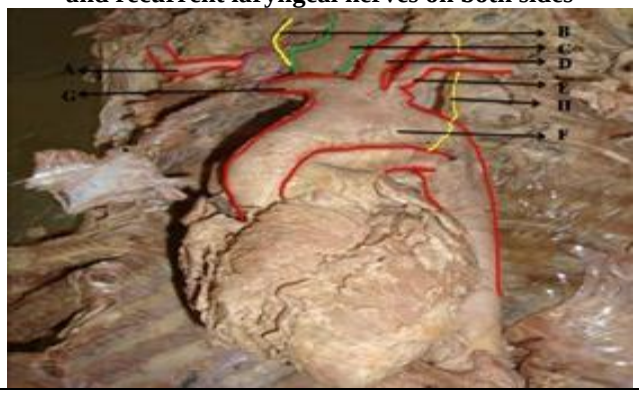
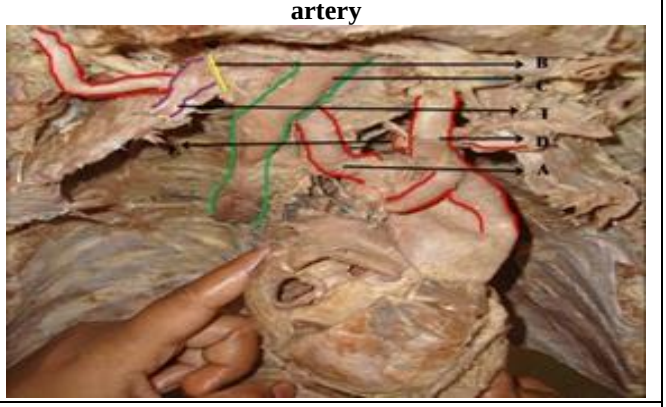


Figure 2. Showing course of Aberrant right subclavian artery



A-Aberrant Right Subclavlan Artery, B-Right Recurrent Laryngeal Nerve, C-Esophagus, D-Left Common Carptid Artery, E-Left Subclavlan Artery, F-Arch of Aorta, G-Right Common Carotid Artery, H-Left Recurrent Laryngeal Nerve, I-Scalenus Anterior Muscle

DISCUSSION

Due to complexity of development of aortic arch arteries variations can be expected. The most common embryologic abnormality of the aortic arch is an aberrant right subclavian artery, which occurs in 0.5% to 1.8% of the population [7,8]. The majority of patients are usually asymptomatic, but can present with significant tracheoesophageal compression [9,10]. The most commonly reported symptoms related to compression of adjacent structures by aberrant right subclavian artery (arteria lusoria) were dysphagia (71.2%), dyspnea (18.7%), retrosternal pain (17.0%), cough (7.6%), and weight loss greater than 10 kg over a 6-month period (5.9%). Among the less common symptoms, stomach-ache, back pain, and numbness of the right upper limb were reported [11]. A familiarity with the anatomy of the most common types of vascular anomalies is necessary for clinicians involved in many medical areas. The most common vascular anomalies coexisting with an aberrant right subclavian artery (arteria lusoria) were truncus bicaroticus, 19.2% (27/141); Kommerell's diverticulum, 14.9% (21/141); aneurysm (just after the origin of arteria lusoria), 12.8% (18/141); and right-sided aortic arch, 9.2% (13/141) [11]. Klinhamer had reviewed extensively and concluded that common carotid origin with retroesophageal subclavian artery accounts for symptoms [12]. Nathan and Gitlinhave described thoracic duct developmental abnormality associated with aberrant right subclavian artery[13]. Elizabeth Pena has postulated that such physical barrier may be a reason for thoracic duct not crossing over to left[14]. We did not find any abnormality with thoracic duct course in thoracic cavity. Injury or sectioning of the right sided thoracic duct during surgical correction of aberrant subclavian artery is a possible complication if one overhooks this co-existent abnormality [15]. Furthermore, many authors have reported that the aberrant right subclavian artery has been found to be present along with patent ductus arteriosus, aortic coarctation and aneurysmal formation [16]. The aberrant right subclavian artery is also clinically important to the angiographer who uses the right axillary,

brachial or radial approach to the ascending thoracic aorta [17]. The presence of an aberrant right subclavian artery is suspected in cases in which catheterisation of the ascending aorta proves difficult. Using the right radial approach, access to the ascending aorta is usually easy, as the brachiocephalic trunk is the first branch of the aortic arch permitting direct access to the ascending aorta. Thus, in the presence of aberrant right subclavian artery, angiography could be very challenging [18]. The aberrant right subclavian artery is more frequent in women and mongoloid children (Down syndrome) and is also associated with chromosome 22q11 deletion (digeorge syndrome)[19].

Embryological Basis of Variations in the Origin of Subclavian Artery:

Normally, the right subclavian artery develops from the distal fusion of a persistent right proximal dorsal aorta with the right seventh intersegmental artery. The aberrant origin of the right subclavian artery is caused by the involution of the right fourth vascular arch and proximal right dorsal aorta and the persistence of the seventh intersegmental artery originating from the proximal descending thoracic aorta, forming the abnormal course of the arteria lusoria [20,21].

CONCLUSION

In order to provide adequate care for patients, knowledge of the exact anatomical and clinical implications of aberrant right subclavian artery is crucial. Correct identification of these vessels is very important for appropriate invasive techniques in order to achieve desired objectives and to avoid major complications during vascular surgery. The awareness of such variations in the origin is of utmost importance during Doppler scanning of blood vessels for clinical diagnosis and surgical management.

Appreciating the associated abnormalities such as nonrecurrent laryngeal nerve, right sided thoracic duct is important in evaluation and treatment of symptomatic patients of retroesophageal subclavian artery. With more and more technical advancement, clinicians dealing with the arch of aorta and the great vessels should be aware of these variations.

Furthermore anatomical variations are needed to be reported constantly so that physicians and anatomists can ensure forward progress scientifically, so also knowledge of the development of the cardiovascular system could be useful for better understanding of the pathophysiology of the variation and that knowledge should be applied to recognize the variations.

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