Aberrant right subclavian artery in a cadaver: a case report of an aortic arch anomaly


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Aberrant right subclavian artery in a cadaver: a case report of an aortic arch anomaly

Aberrant right subclavian artery: an important congenital anomaly of the aortic arch

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This work was conducted at the Anatomy Department of King Khalid University (KKU), Abha, Saudi Arabia.

ABSTRACT

In early embryogenesis, aortic anomalies occur as a consequence of disorders in the development of the primitive aortic arches system. Aberrant right subclavian artery (ARSA), also known as arteria lusoria, is one of the important congenital anomalies of the aortic arch, in which the right subclavian artery arises from the arch of aorta instead of the brachiocephalic trunk. During routine dissection of a female cadaver, we observed retroesophageal aberrant right subclavian artery arising as the fourth branch
from the aortic arch. In this case, the brachiocephalic trunk was absent. Early detection of aortic arch anomalies through diagnostic interventions is helpful to avoid complications during surgical procedures.

**Key words:** anatomical variant, aortic arch, arteria lusoria, retroesophageal

**INTRODUCTION**

Anatomical variations in the human body do exist externally and internally where the latter may be presenting some pathological consequences or a life-threatening factor during surgical procedures. Aberrant right subclavian artery (ARSA) is the commonest congenital aortic arch anomaly with an incidence of 0.5% to 1.8% [1]. ARSA, or arteria lusoria, is a rare anatomical variation in the general population and has a female predominance [2,3]. Right subclavian artery (RSA) normally originates from the brachiocephalic trunk, but when this anomaly is present, the brachiocephalic trunk is absent. Therefore, four large arteries (i.e. right common carotid artery, left common carotid artery, left subclavian artery and right subclavian artery) arises from the aortic arch, in which the right subclavian artery has an aberrant origin arises from the most distal left side [2,4]. This anomaly is frequently asymptomatic, however; in some cases, it may be associated with clinical symptoms such as compression, dysphagia (dysphagia lusoria), cough, and chest pain [1,4-6]. According to Vučurević et al [7] aortic arch branching classification, type 4 pattern was found in this case report. Here, we report a case of a female cadaver with an aberrant right subclavian artery and reviewed the aortic arch branching variations, its embryological development and clinical significances.

**CASE REPORT**

During a routine dissection at the Anatomy Department of King Khalid University (KKU), a female cadaver of unknown age was presented with a retroesophageal aberrant right subclavian artery. The branches were carefully dissected to identify their courses and photographed.
We measured the diameters of the arch of aorta and its branches with a caliper. The diameter of the aortic arch was measured prior to the origin of the right common carotid artery. The descending aorta diameter was performed after 1 cm from the origin of the branching of aberrant right subclavian artery. The diameters of the right common carotid, left common carotid, and left subclavian and aberrant right subclavian were measured after 1 cm of their origins (Table 1).

In the present case, we observed absences of brachiocephalic trunk and presences of four branches namely, right common carotid, left common carotid, left subclavian and aberrant right subclavian arteries from right to left side of the aortic arch (Figure 1).

DISCUSSION

Normally during embryological development, the distal right dorsal aorta degenerates in the double aortic arches system. Right subclavian artery develops from the right 4th aortic arch and 7th cervical intersegmental artery. In the case of aberrant right subclavian artery, the right 4th aortic arch, 7th intersegmental artery, proximal and persistent distal right dorsal aorta involve in the formation of this cardiac malformation [1,5,8]. When aberrant, the right subclavian artery arises from the aortic arch distal to the left subclavian artery and crosses the midline causing compression [1,9].

Despite that the aberrant right subclavian artery is a common aortic developmental anomaly; it is relatively a rare aberration in the general population with a female predominance [10]. The occurrence was more common in female (55.3%) than male cases (44.7%) [2], which is consistent with other reported studies [11,3]. The current case, aberrant right subclavian artery arises from the left side of the aortic arch as the last branch and passes behind the oesophagus.

This anomaly is mostly having a retroesophageal course (dorsal to the oesophagus) in the reported cases (80%), passes between the trachea and the oesophagus (15%), or anterior to the trachea in 5% of the cases [9,12]. Although most of the patients (60-70%) were asymptomatic throughout their lives [6,13], they frequently diagnosed by incidental evaluations obtained for other reasons (i.e. imaging and aortic dissection) [6,14,15]. If symptomatic, in the adult usually produces dysphagia (dysphagia lusoria),
cough, chest pain, shortness of breath and weight loss due to the compressive effect of the nearby structures [2,9]. An aneurysmal aortic dilatation, Kommerell’s diverticulum occurs at the origin of the aberrant right subclavian artery [8, 16]. Increased frequency of pulmonary infections is common in infants than the adult; this is due to the absence of tracheal stiffness, in combination with dysphagia and aspiration of food particles [17].

In our case the aberrant right subclavian artery was 16mm in diameter; same finding had been reported in another study [18]. Caliber of the aortic arch branches depends on the position of their origin. There is an association between the origin of the branches and the diameter of the aortic arch [19].

In right transradial approach for coronary angiography and angioplasty procedures, the presences of the aberrant right subclavian artery increase the number of catheters and prolong angiography time. Before proceeding the techniques, the operator requires a sound knowledge of the anatomical variations thereby decrease the complication rate. [20,21].

Many studies [22-24] reported the correlation between fetal aberrant right subclavian artery, intracardiac malformations and chromosomal abnormalities such as trisomy 21, 22q11 deletion of the long arm of the chromosome and turner syndrome. Prenatal diagnosis of the aberrant right subclavian artery is a useful marker for the ultrasonographic detection of fetal chromosomal abnormalities. In such cases, prenatal cytogenetic analysis is strongly recommended.

Treatment options such as conservative measures and surgical intervention mainly depend on the severity of the patient’s symptoms and the presence of aneurysms [25]. Conservative measures are non-invasive treatments including dietary and lifestyle modifications often used for patients with mild to moderate symptoms [9,25]. This includes reducing or avoiding exacerbating foods, eating small bites of the food at a slower rate with adequate chewing, and having more liquids [25].

Several non-invasive angiography methods such as multislice and multidetector computed tomography, Doppler sonography, transthoracic echocardiography and the magnetic resonance imaging are essential for preoperative diagnosis of the aberrant right subclavian artery. These methods help to avoid unintentional injury of this artery during surgical procedures. [26-28]. Patients with severe symptoms, consideration for
surgery should be taken as a variety of safe and effective surgical approaches have been proposed [2, 25].

CONCLUSIONS

Conclusively, anatomical variations are frequent, and the aberrant right subclavian artery is a well-known anomalous with or without pathological consequences. Prenatal diagnosis of the aberrant right subclavian artery through non-invasive angiography methods help to detect the fetal chromosomal abnormalities. Sound knowledge of the course and relations of the aberrant right subclavian artery is helpful to reduce the risk and complications in surgical procedures.

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References


Table 1. Diameter measurements of the Aortic arch and its branches in millimeters

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AA: Aortic Arch; DA: Descending Aorta; LCCA: Left Common Carotid Artery; RCCA: Right Common Carotid Artery; LSA: Left Subclavian Artery; ARSA: Aberrant Right Subclavian Artery

Figure 1. Right common carotid artery (A), aortic arch (B), retroesophageal aberrant right subclavian artery (C), left common carotid artery (D) and left subclavian artery (E).