


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

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In early embryogenesis, aortic anomalies occur as a consequence of disorders in the development of the primitive aortic arches system. Aberrant right subclavian artery, 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 retro-oesophageal 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. (Folia Morphol 2021; 80, 3: 726–729)

Key words: anatomical variant, aortic arch, retro-oesophageal, arteria lusoria

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% [25]. ARSA, or arteria lusoria, is a rare anatomical variation in the general population and has a female predominance [13, 23]. 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 RSA) arises from the aortic arch, in which the RSA has an aberrant origin arises from the most distal left side [16, 23]. 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 [3, 16, 24, 25]. According to Vučurević et al. [27] aortic arch branching classification, type 4 pattern was found in this case report. Here, we report a case of a female cadaver with an ARSA and reviewed the aortic arch branching variations, its embryological development and clinical significances.

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

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CASE REPORT

During a routine dissection at the Anatomy Department of King Khalid University, a female cadaver of unknown age was presented with a retro-oesophageal ARSA. 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 calliper. The diameter of the aortic arch was measured prior to the origin of the right common carotid artery. The descending aorta diameter was performed at a distance of 1 cm from the origin of the branching of ARSA. The diameters of the right common carotid, left common carotid, and left subclavian and aberrant right subclavian were measured at 1 cm from 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 artery and ARSA from right to left side of the aortic arch (Fig. 1).

DISCUSSION

Normally during embryological development, the distal right dorsal aorta degenerates in the double aortic arches system. RSA develops from the right 4th aortic arch and 7th cervical intersegmental artery. In the case of ARSA, the right 4th aortic arch, 7th intersegmental artery, proximal and persistent distal right dorsal aorta involve in the formation of this cardiac malformation [3, 25, 26]. When aberrant, the RSA arises from the aortic arch distal to the left subclavian artery and crosses the midline causing compression [19, 25].

Despite the fact that the ARSA is a common aortic developmental anomaly, it is relatively a rare aberration in the general population with a female predominance [20]. The occurrence was more common in females (55.3%) than males (44.7%) [23], which is consistent with other reported studies [13, 18]. In the current case, ARSA arises from the left side of the aortic arch as the last branch and passes behind the oesophagus.

This anomaly is mostly having a retro-oesophageal 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 [10, 19]. Although most of the patients (60–70%) are asymptomatic throughout their lives [14, 24], they are frequently diagnosed by incidental evaluations obtained for other reasons (i.e. imaging

Table 1. Measured diameters of the aortic arch and its branches in millimetres

Aortic arch	28
Descending aorta	22
Left common carotid artery	8
Right common carotid artery	8
Left subclavian artery	9
Aberrant right subclavian artery	16

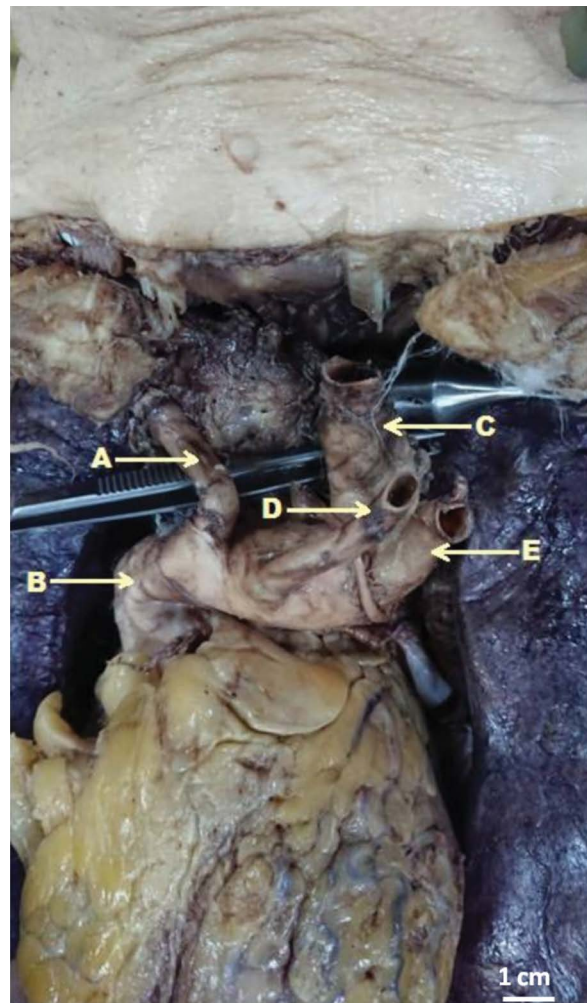


Figure 1. Right common carotid artery (A), aortic arch (B), retro-oesophageal aberrant right subclavian artery (C), left common carotid artery (D) and left subclavian artery (E).

and aortic dissection) [5, 11, 24]. If symptomatic, in adult patients ARSA usually produces dysphagia (dysphagia lusoria), cough, chest pain, shortness of breath and weight loss due to the compressive effect of the nearby structures [19, 23]. An aneurysmal aortic dilatation, Kommerell's diverticulum occurs at

the origin of the ARSA [9, 26]. Increased frequency of pulmonary infections is more common in infants than adult patients; this is due to the absence of tracheal stiffness, in combination with dysphagia and aspiration of food particles [4].

In our case, the ARSA was 16 mm in diameter; same finding had been reported in another study [21]. The calibre 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 [17].

In right transradial approach for coronary angiography and angioplasty procedures, the presences of the ARSA increase the number of catheters and prolong angiography time. Before proceeding the techniques, the operator must gain a sound knowledge of the anatomical variations to decrease the complication rate [1, 2].

Many studies [6, 7, 15] reported the correlation between foetal ARSA, 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 ARSA is a useful marker for the ultrasonographic detection of foetal 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 [22]. Conservative measures are non-invasive treatments including dietary and lifestyle modifications often used for patients with mild to moderate symptoms [19, 22]. This includes reducing or avoiding exacerbating foods, eating small bites of the food at a slower rate with adequate chewing, and having more liquids [22].

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 ARSA. These methods help to avoid unintentional injury of this artery during surgical procedures [8, 12, 28]. Patients with severe symptoms, consideration for surgery should be taken as a variety of safe and effective surgical approaches have been proposed [22, 23].

CONCLUSIONS

Conclusively, anatomical variations are frequent, and the ARSA is a well-known anomalous with or

without pathological consequences. Prenatal diagnosis of the ARSA through non-invasive angiography methods helps to detect the foetal chromosomal abnormalities. Sound knowledge of the course and relations of the ARSA is helpful to reduce the risk and complications in surgical procedures.

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