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Case Report

RETROESOPHAGEAL RIGHT SUBCLAVIAN ARTERY: A ROENTGENOLOGICAL PURVIEW AND REVIEW OF LITERATURE

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ABSTRACT

Three major arteries normally originate from the aortic arch. Numerous variations of vessels arising from the aortic arch have been reported. One of the common anatomical variations is the right subclavian artery originating from the distal segment of the aortic arch. We report a case of a retroesophageal right subclavian artery arising from a normally located left aortic arch in an adult male. Radiologists mainly encounter a retroesophageal right subclavian artery incidentally and are usually described as asymptomatic, but several clinical conditions have been associated with this kind of occurrence. It is very important to consider this variation of the right subclavian artery during head and neck surgery. This is an in vivo case report of retroesophageal right subclavian artery during examination of the cervical vessels using computed tomography angiography (CTA).

Keywords: Subclavian artery, Anatomic variation, Aortic arch, computed tomography, retroesophageal right subclavian artery, dysphagia lusoria, aortic arch.

INTRODUCTION

Normally, the aortic arch is divided into three main branches, the brachiocephalic trunk, the left common carotid artery, and the left subclavian artery (1). This is the arrangement of aortic arch branches in 80% of cases (2). In 11% of the cases, the aortic arch branches into two arteries. The first branch includes a common trunk of the left common carotid and brachiocephalic arteries and the second one includes the left subclavian artery. In 8% of cases, the vertebral artery is branched from beside the left subclavian artery as the fourth branch of the aortic arch. Rare variations of the aortic arch branches are observed in the other 1% (3). Our case being reported, is the separation of the retroesophageal right subclavian artery as the last branch of the aortic arch. The subclavian artery is responsible for the blood supply of the upper limb and the part of the thoracic wall, neck and brain. This artery originates from the brachiocephalic trunk on the right side and from the arch of the aorta on the left side; it passes on the anterior surface of the cervical pleura and onto the first rib and travels up laterally passing between anterior and middle scalene muscles (2). Examination of cadaver and clinical studies have revealed abnormalities in aortic arch divisions (1). These studies showed that the right subclavian artery has arisen from the fourth right aortic arch, a small portion of the right dorsal aorta and the right seventh intersegmental artery (3). The first anomaly of the right subclavian artery

was reported in 1735, and various abnormal cases reported subsequently (4,5). In the retroesophageal anomalies, the right subclavian artery forms as the last branch of the aortic arch on the left and passes from the posterior of the oesophagus to the right (6). This type of abnormalities is generally asymptomatic and can be the site of the formation of atherosclerotic plaque, aneurysm or dysphagia lusoria needing surgery and treatment (7,8). An aberrant subclavian artery can also result in airway compression (9).

CASE REPORT

This is a 45-year-old male patient presented to our tertiary care centre because he had difficulties in swallowing solid food followed by progressive vomiting and eventually leading to the reluctance of eating solid food. The family history showed no presence of atopy or feeding problems or malignancy. All the laboratory tests, including liver and renal function tests, complete blood count, erythrocyte sedimentation rate, electrolytes, urinalysis and tuberculosis antibody tests, were all negative. Multislice Computed Tomography (CT) confirmed the diagnosis of an aberrant right subclavian artery (ARSA) (Figure 1).

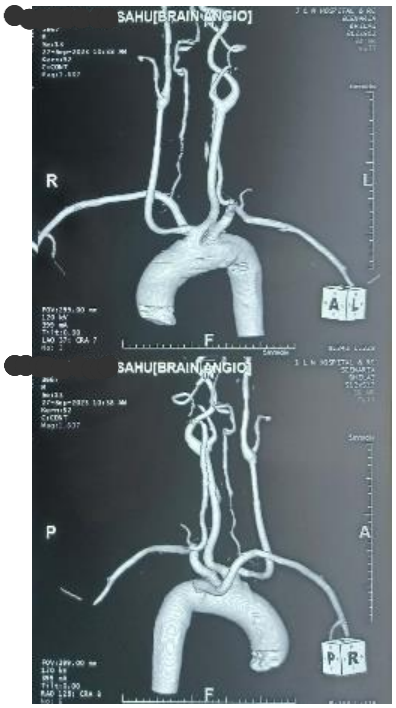

Figure 1 - 3D CT Angiography image exposed an aberrant right subclavian artery

In this patient, CT Angiography showed the variant vessel arising from distal arch of aorta as a separate branch and courses towards right side passing posterior to trachea and oesophagus (between the dorsal vertebra and the oesophagus), to the right axilla allowing it to be more accurately described as a retroesophageal right subclavian artery (Figure 2&3). There was no infundibular dilatation seen.

The right vertebral and internal thoracic arteries normally originate from this vessel. No other aortic arch or vascular variations were noted in this region. The aortic arch appeared of normal length and width, located above the heart. Four branches originated from the aortic arch, namely from right to left; the right common carotid, the left common carotid, the left subclavian and right subclavian arteries, respectively.

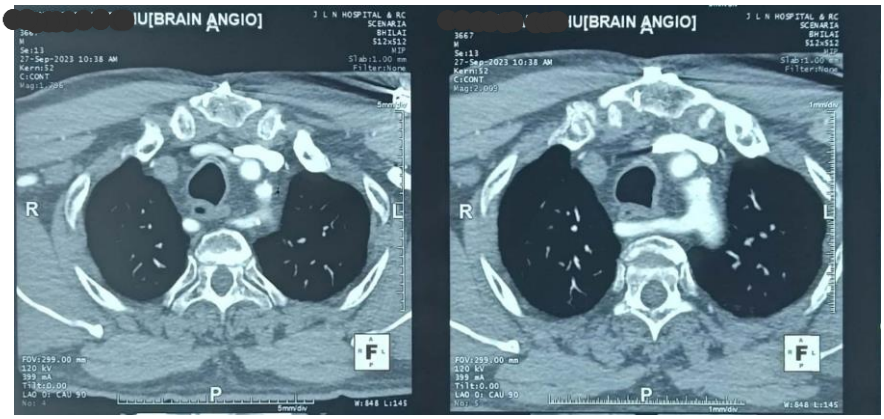

Figure 2 – Axial cut CT Angiography showing aberrant vessel arising from distal arch of aorta as a separate branch and courses between the dorsal vertebra and the oesophagus

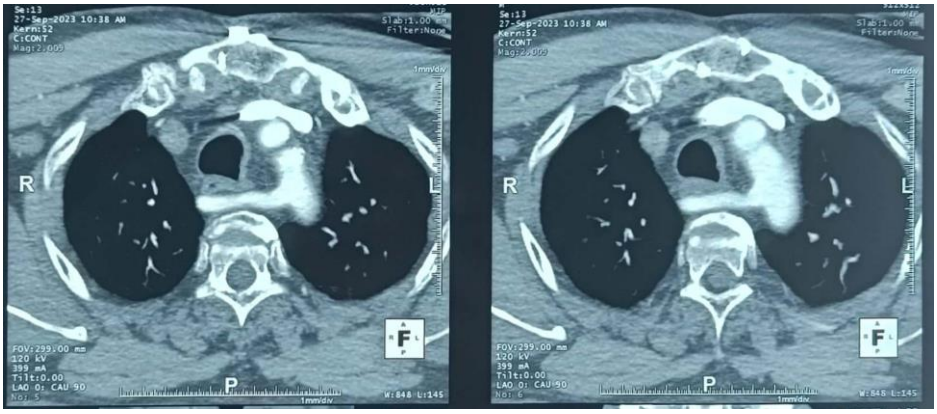

Figure 3 – Axial cut CT Angiography showing aberrant vessel coursing between the dorsal vertebra and the oesophagus

DISCUSSION

The right subclavian artery, which originates from the brachiocephalic artery, develops during the 4-5 week of gestation. During this time period, the aortic arches, associated with pharyngeal arches, are developed and terminated in the right and left dorsal aorta. The right subclavian artery arises from the fourth aortic arch in the normal development, part of the right dorsal aorta, and the seventh intersegmental artery (11). But if these origins change, the aberrant right subclavian artery will create. Adachi-Williams classified anomalous branching pattern of the subclavian artery into four basic morphologic types: 1) type G: the right subclavian artery originates from the aortic arch as the last branch, 2) type CG: the anomalous of the right subclavian artery is type G, and the left vertebral artery originates from the aortic arch, 3) type H: the anomalous of the right subclavian artery is type G, and the two common carotids have a common trunk (carotid trunk), 4) type N: this anomalous is the opposite of the type G so that the left subclavian artery originates from the right aortic arch as the first branch (12). The course of aberrant right subclavian artery varies through the mediastinum; in cadaveric dissection has been revealed that most of them pass behind the oesophagus (80%), and the rest of them pass between oesophagus and trachea (15%) or front of the trachea (5%) (13). Our present case is a type G and hence named retroesophageal right subclavian artery in which its distal part develops from the seventh intersegmental artery, and the proximal part develops from the right dorsal aorta (14).

The retroesophageal right subclavian artery (RSSA) usually is asymptomatic (20). However, several clinical conditions may be associated with this condition. This artery may compress the oesophagus and trachea, and as a result, cause dysphagia, stridor, or dyspnoea, which are more common in children (16). The clinical syndrome of RSSA which was found to be associated with dysphagia was termed “dysphagia lusoria” by Bayford in 1787 [6]. Other symptoms can be asymmetric pulses and blood pressure in the upper limbs, trophic changes in the respective limb, and even acute ischemia of the right upper limb (16, 20). Awareness of such variations has a significant role during Angiography and Doppler scanning of blood vessels (16,21-23). The retroesophageal subclavian artery is incidentally detected in many adult cases when the patients were being evaluated for other reasons. In adults RRSA produces a vascular ring known as Kommerell’s diverticulum. The majority of patients are usually asymptomatic, but can present with significant tracheoesophageal compression [3, 4]. In elderly patients, an RRSA occasionally becomes tortuous and ectatic resulting in oesophageal or tracheal compression, for which surgery is indicated if the symptoms are severe [24]. The exact diagnosis is also crucial for proper planning of surgical and interventional procedures and to avoid damages to vital structures. Appropriate imaging modalities like echocardiography, ultrasonography, CT and MRI are required to detect diverse visceral and vascular abnormalities like the retroesophageal subclavian artery.

CONCLUSION

It is very important to consider the variation of the right subclavian artery during clinical experiments and head and neck surgery. For example, the variation of the artery causes problems in angiography, during which the catheter is directed through the subclavian artery towards the ascending aorta. Furthermore, if variation of artery is associated with the variation of the recurrent laryngeal nerve, neck surgeries can become very problematic. Therefore, it is of great importance to consider these variations during neck surgeries, and non-invasive techniques such as MRA of cervical arteries can be used in order to examine them.

Patient consent statement

The patient's informed consent for the publication of this case was granted. There are no ethical issues for the publication of this case report according to the standard of our institution.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his radiological images and other clinical information to be reported in the journal. The patient understands that his name and initial will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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