A case report on aneurysm of the atypical right subclavian artery: A rare embryological aberration

Abstract:

Atypical or an aberrant right subclavian artery, is the most prevalent vascular anomaly of the aortic arch but a rare embryological aberration. It is typically discovered by accident during imaging tests or autopsy and is usually asymptomatic. Dysphagia and dyspnea are the most common symptoms, which arise when the abnormal artery compresses the surrounding structures. It could be linked to further cardiac or vascular anomalies.We are presenting an 86-year-old woman who has an aneurysm connected to her atypical right subclavian artery. In order to prevent surgical complications, clinicians who undertake thoracic diagnostic and surgical procedures in thorax should pay special attention to the unusual or aberrant right subclavian artery.

Key Words: Aberrant Subclavian artery, Aneurysm, Dysphagia, Dyspnea.

Introduction:

Subclavian artery is the principal artery of the upper limb, but it also supplies a considerable part of the neck and brain through its branches. On the right side it is a branch of the brachiocephalic artery posterior to the sternoclavicular joint. On the left side it is a branch of the arch of aorta from where it ascends on the mediastinal pleura grooving the left lung, and enters neck posterior to the left sternoclavicular joint. Both arteries pursue a similar course in the neck. Each artery arches laterally from the sternoclavicular join to the outer border of the first rib where it ends by becoming continuous as axillary artery.However in 0.4% to 1.8% of the general population, right subclavian artery can originate directly from the aortic arch, which is located distal to the left subclavian artery. Such a course of the right subclavian artery is conventionally named the ‘lusory artery’. It is also called aberrant right subclavian artery (ARSA) or atypical right subclavian artery.[1-3] This anomaly might be an isolated defect or concurrent with other congenital heart defects. As an isolated defect, it is mostly asymptomatic and thusrecognized incidentally during investigations or autopsy. The lusory artery forms an incomplete vascular ring and therefore, it seldom causes pressure and dislocation of the esophagus or trachea[4-7]. The anomaly may be linked to certain clinical signs as chest discomfort, stridor, dysphagia or both (dysphagia lusoria) and dyspnea [8]. Even in cases when this aberration is

asymptomatic,one should be aware of the clinical implications of this vascular anomaly especially in paticnts with dysphagia, dyspneaand who undergosurgical procedures in thorax, such as esophagectomyor vascular surgery and endovascular procedures involving the aortic arch and its branches.

Arterialusoria is another name for the anomalous right subclavian artery. With an incidence of between 0.5% and 2.5% in the general population, it is one of the most prevalent aortic arch abnormalities.In 80% of instances, the right subclavian artery begins as the terminal branch of the aortic arch and travels down the right arm after passing through the midline of the body, between the oesophagus and vertebral column and, less frequently, (15% of cases), between the trachea and oesophagus [9]. While some people never have any symptoms, others may experience coughing, pyrosis, dysphagia, dyspnea, acute limb ischaemia, retrosternal discomfort, and even Homer's syndrome [10]. The right subclavian artery, which runs posteriorly, and the right common carotid artery, which is positioned anteriorly, compress the oesogagus, resulting in the clinical signs of arterialusoria[11].

Several techniques are proposed for the preoperative diagnosis of this anomaly: Particularly in patients with symptoms, a barium swallow may indicate the abnormality. CT and magnetic resonance imaging are two noninvasive angiography techniques that can be excellent confirming tools. This abnormality can be accurately diagnosed with multislice CT.

Case Report:

We report that an 86-year-old woman with persistent and steadily increasing abdominal pain for two weeks was seen at EWMSC, Mount Hope Hospital. She also reported having three months of continuous, progressively worsening chest pain. She feels as though her chest is heavy, and her dysphagia is getting worse. Her dysphagia began with solid food and progressed to liquids over time. Before the presentation, she was unable to swallow any food or liquids and would frequently regurgitate. The patient has been diagnosed with diabetes for 15 years and is currently taking 500 mg of metformin once daily as part of their normal prescription regimen, no noteworthy personal or family history.
The patient's CT scan revealed an incidental finding of a vascular anomaly, that the right subclavian artery originating from the arch of aorta as the last branch with aneurysmal dilation was confirmed. The aneurism displaced the trachea and the surrounding upper portion of the esophagus anteriorly, compressing them both significantly (Fig 1-3).

Discussion

Normally during embryogenesis, regression of the distal right dorsal aorta occurs leading to the right 4^{th} aortic branch and 7^{th} intersegmental artery becoming the right subclavian artery. On the left side the subclavian artery is derived entirely from the seventh cervical intersegmental artery, which arises from the dorsal aorta opposite the attachment of the fourth arch artery. Aberrant

right subclavian artery is caused by the involution of the right 4th aortic branch and proximal right dorsal aorta with a persistent distal right dorsal aorta and 7th intersegmental artery forming the right subclavian artery. This causes the right subclavian artery to originate left of the midline occasionally causing compression. The retroesophageal course of the right subclavian artery behind the esophagus, although usually asymptomatic, may cause compression and a type of dysphagia known as dysphagia lursoria.

The lusoria artery occasionally emerges from an aortic arch diverticulum at the proximal descending aorta, which Kommerell initially identified as theKommerell diverticulum in 1936 [12-13].Kommerell's diverticulum can be found in anywhere between 15% and 60% of Lusoria artery instances [14]. Aneurysms are almost always found at or near the origin of the artery, and are suspected to result from degeneration of a diverticulum of Kommerell. Because these aneurysms can rupture, thrombose, or embolize even if they are asymptomatic, they should always be treated [15].

The radiographic results of 25 cases of aberrant right subclavian artery that were first shown on CT were assessed by Hara et al. In 95% of the patients with right regtrotrachealsubclavian artery, he found that the retrotracheal course of the aberrant artery could result in a posterior tracheal impression, which manifests as a vascular retrotracheal opacity (8). A case of right regtrotrachealsubclavian artery producing asthma was reported by Parker et al. (9). The trachea's anterior displacement from right regtrotrachealsubclavian artery may be the cause of the asthma. When an angiographer approaches the ascending thoracic aorta via the right axillary, brachial, or radial approaches, right regtrotrachealsubclavian artery is equally crucial from a clinical standpoint (10 &11). When ascending aorta catheterization becomes challenging, the anomalous right subclavian artery may be the cause (12). The brachiocephalic trunk, the first branch of the aortic arch, allows direct access to the ascending aorta, making it simple to reach it by the right radial artery. However, things change and angiography becomes a difficult task when an aberrant right subclavian artery is present (13).

It is well recognized that chromosomal abnormalities, particularly trisomy 21, are linked to aberrant right subclavian artery. According to a recent ultrasonography research, 37.5% of fetuses with Down's syndrome had an aberrant right subclavian artery, when they were between 13 and 26 weeks gestation. Apart from the fact that aberrant right subclavian artery is linked to a higher frequency of intra-cardiac abnormalities, Borenstein et al. report that aberrant right subclavian artery is relatively more common in fetuses with chromosomal disorders, specifically trisomy 21, compared to euploidfetuses. They conclude by saying that right subclavian artery position evaluation is probably going to become a standard ultrasonography diagnostic for chromosomal abnormalities in the second trimester of pregnancy (14 & 15).

Conclusion:

A proper understanding of the anatomic and morphologic variations of the aortic arch is imperative for clinicians performing diagnostic and surgical procedures in the thorax, particularly with regard to the atypical or aberrant right subclavian artery, given the increasing number of imaging studies and catheter-based treatments performed these days.

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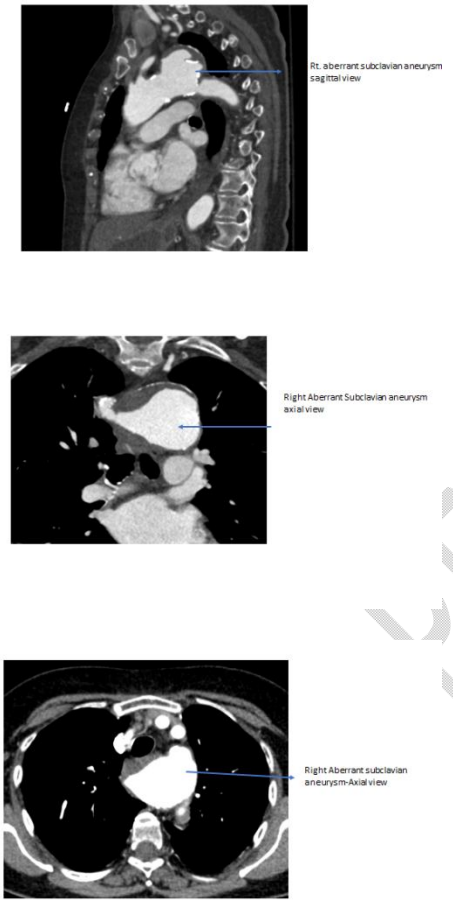
Fig. 1-3.Vascular anomaly of right subclavian artery



Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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