CASE REPORT

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A RARE AORTIC-ARCH VARIANT – ARTERIA LUSORIA: CASE REPORT WITH REVIEW OF LITERATURE AND CLINICAL IMPLICATIONS

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Abstract. *The aberrant right subclavian artery (arteria lusoria, AL) is the most common aortic-arch branching variant, occurring in approximately 0.5–2.5% of the population. Although usually asymptomatic, AL's retroesophageal course can produce dysphagia lusoria or respiratory symptoms and is associated with Kommerell's diverticulum and a non-recurrent right laryngeal nerve – findings with important diagnostic and procedural implications. During routine dissection at the Medical University – Sofia, we identified an AL in an 81-year-old female cadaver. The right subclavian artery arose ≈0.5 cm distal to the left subclavian artery from the transition of the aortic arch into the thoracic aorta. The aberrant vessel followed a retroesophageal course, and the brachiocephalic trunk was absent; the right and left common carotid arteries and the left subclavian artery originated separately and without other anomalies. This cadaveric case highlights a rare but clinically relevant aortic-arch variant that may complicate right transradial coronary access, endovascular and open surgical approaches to the aortic arch and neck, and neck surgery due to likely association with a non-recurrent laryngeal nerve. Further investigation combining regional cadaveric series, imaging databases, and clinical registries is warranted to clarify local prevalence and optimize diagnostic and therapeutic pathways.*

Key words: *right aberrant subclavian artery, arteria lusoria, clinical significance, diagnostics*

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INTRODUCTION

The aortic arch (AA) typically gives rise to three major branches: the brachiocephalic trunk (BCT), the left common carotid artery (LCCA), and the left subclavian artery (LSA) [1]. The BCT then divides into the right subclavian artery (RSA) and the right common carotid artery (RCCA) [1]. Although this arrangement is the most common, anatomical variations of the AA occur [2]. The aberrant right subclavian artery (aRSA), also known as arteria lusoria (AL), represents the most frequent of these variants: the RSA arises directly from the AA as the last branch. AL occurs in 0.5–2.5% of individuals and is reported more commonly in females than in males [3-6].

Historically, AL was first reported by Hunauld [2]. Bayford later described the clinical entity "dysphagia lusoria" during the autopsy of a woman with long-standing dysphagia [7]. This presentation is also referred to as Bayford–Autenrieth dysphagia [6]. According to Polguj, symptomatic compression from the retroesophageal course of AL is relatively uncommon, occurring in only 7–10% of patients [6]. Nonetheless, when present, such compression can produce clinically relevant morbidity [6].

The association of AL with a Kommerell's diverticulum warrants particular attention because of the elevated risk of serious complications, including dissection and rupture [8]. Epstein and DeBord reported that approximately 60% of aRSA cases coexist with a Kommerell's diverticulum [8]. In addition to these compressive and aneurysmal risks, AL may have procedural implications: the variant anatomy can impede right transradial access to the ascending aorta during coronary angiography, thus complicating endovascular procedures [9].

CASE PRESENTATION

During a routine anatomical dissection, a rare vascular anomaly of AL was observed in an 81-year-old female cadaver. The dissection, performed for educational purposes in the Department of Anatomy, Histology, and Embryology at the Medical University – Sofia, was approved by the Medico-Legal Office and the local Ethics Committee. The AL originated anomalously, arising approximately 0.5 cm distal to the LSA from the transition of the AA into the thoracic aorta. This vessel displayed a retroesophageal course, traveling posterior to the esophagus before assuming its typical trajectory within the interscalene space (Figure 1). Notably, the BCT was absent. The first branch of the AA was the RCCA, which followed its normal anatomical path. The second branch of the AA was the LCCA, which similarly had no diversion from its typical path. The LSA exhibited no abnormalities, maintaining its expected course from the AA (Figure 2). A thorough examination of the cadaver revealed no additional vascular anomalies. The cadaver presented no visible surgical scars or evidence of prior medical interventions that could have influenced the vascular anatomy. Medical records associated with the cadaver did not indicate a history of prior surgeries or symptoms potentially attributable to such subclavian deviation.

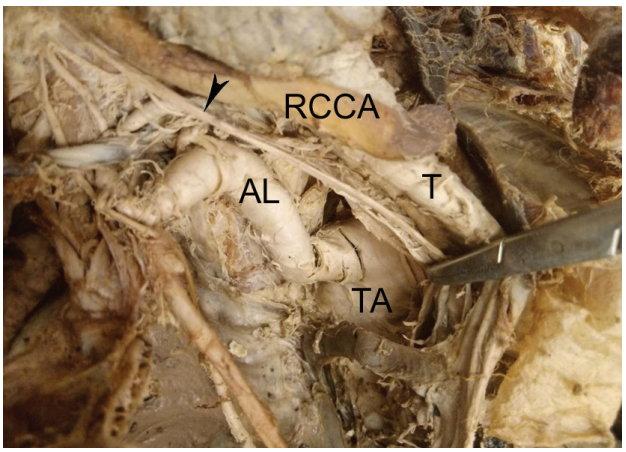

Fig. 1. Photograph of cadaveric dissection of the mediastinum demonstrating an aberrant right subclavian artery (arteria lusoria, AL) arising from the thoracic aorta (TA) and coursing retroesophageally toward the right interscalene space; the right common carotid artery (RCCA) is seen superiorly and the trachea (T) lies medially. The vagus nerve is indicated by the black arrowhead.

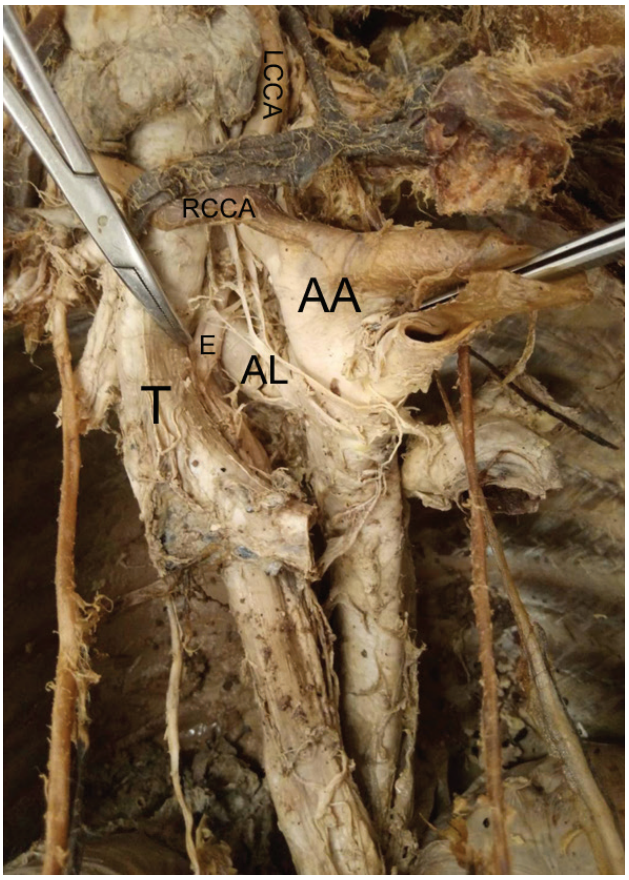

Fig. 2. Cadaveric dissection of the mediastinum showing the aortic arch (AA) with separate origins of the right common carotid artery (RCCA) and left common carotid artery (LCCA). The aberrant right subclavian artery (arteria lusoria, AL) arises ≈0.5 cm distal to the left subclavian artery and courses posterior to the esophagus (E) toward the right neck, passing medial to the trachea (T).

DISCUSSION

The present case features a rare case of AL with retroesophageal course, originating from the initial part

of the thoracic aorta distal from the LSA and AA. The embryological development of the vascular anomaly is central to understanding its anatomy and clinical consequences. The RSA develops from the distal fusion of a persistent right proximal dorsal aorta with the right seventh intersegmental artery [6]. AL results from an unusual embryological event: the regression of the proximal right fourth AA, leaving the RSA attached to the descending aorta via the persistent right dorsal aorta. This compels the vessel to adopt its characteristic retroesophageal course, which may lead to esophageal compression and resultant dysphagia lusoria [6, 10]. Furthermore, this specific developmental failure is strongly correlated with the presence of a non-recurrent right laryngeal nerve, a critical consideration for any subsequent neck surgery [11].

Although the anomaly is anatomically significant, its clinical expression is highly variable. Usually, most patients with AL are asymptomatic and rarely need treatment [10]. When symptomatic, it typically leads to gastrointestinal complaints, such as dysphagia [12], or respiratory symptoms, including dyspnea [13] and persistent non-productive cough [14]. Myers et al. [10] presented three factors predisposing AL to be symptomatic: 1) when the esophagus and trachea are compressed between the AL and truncus bicaroticus; 2) aneurysm; 3) with aging and following atherosclerotic changes or fibromuscular dysplasia. The possibility of this anomaly should also be considered in elderly patients who have dyspnea, when more common causes have been excluded [13]. Massaro et al. [13] emphasized this by describing an 83-year-old woman presenting with concurrent dyspnea and dysphagia for solids, where high-resolution CT confirmed the retroesophageal AL course.

Recognition and diagnosis commonly follow from non-specific investigations that prompt targeted imaging. The diagnostic process often begins with less specific findings, as illustrated by Jakobsen et al. [12], who describe a 40-year-old female whose worsening childhood dysphagia was initially evaluated by a barium swallow test and gastroscopy before being confirmed as AL via thoracic and abdominal CT [12]. Abdelsalam et al. detailed the case of a 54-year-old woman with chronic dysphagia and persistent cough whose condition was only fully elucidated after upper endoscopy and bronchoscopy revealed extrinsic compressions on the esophagus and trachea, respectively [14]. Subsequent CT angiography then demonstrated an AL with aneurysmal dilatation arising from diverticulum of Kommerell, exerting simultaneous pressure on both the trachea and esophagus [14]. This case report highlights the clinical importance of the AL, emphasizing the need for comprehensive imaging, such as CT angiography, to confirm the diagnosis, define the degree of compression, and assess for critical associated features like aneurysmal change.

AL usually remains undetected throughout an individual's life and is therefore often discovered incidentally [6]. The incidental discovery of AL during procedures such as coronary angiography – particularly when difficulty arises in navigating through the AA via a trans-radial approach [15, 16] or through imaging studies like CT angiography [17]. In particular, AL may pose serious challenges during coronary angiography via the right transradial approach because of altered vascular anatomy, and should therefore be taken into careful consideration [15]. Moreover, the presence of AL can complicate the management of aortic dissection, hinder endovascular treatment, and increase the risk of surgical complications [18].

Though uncommon, aneurysmal change of the AL can produce severe and potentially life-threatening symptoms and thus requires specific consideration. Other symptoms, although rare, could be provoked due to aneurysm of the AL [10, 14]. Given the severity of aneurysmal compression and the risk of rupture, affected patients – such as the case described by Abdelsalam et al. – may require hybrid endovascular-surgical intervention [14].

Limitations of the present report are that it is single-case, its cadaveric nature and the absence of corresponding clinical history. Nevertheless, documenting such anatomical variants remains valuable for educating clinicians and anatomists, improving procedural planning, and informing regional prevalence studies. Future work should combine cadaveric series, imaging databases, and clinical registries to better define local incidence, clinical presentation, and optimal management strategies for patients with present aberrant AL.

CONCLUSION

The present case report features a rare finding of an aberrant AL with a retroesophageal course and absent brachiocephalic trunk in an 81-year-old female cadaver. Although often asymptomatic, this configuration may cause dysphagia or respiratory symptoms when compressive or aneurysmal change is present, and it has clear procedural implications – notably potential difficulty with right transradial coronary access, increased complexity in endovascular or surgical repair of aortic pathology, and a high likelihood of an associated non-recurrent right laryngeal nerve that surgeons should anticipate. Given the cadaveric

nature and lack of clinical history, we recommend that clinicians maintain suspicion for this variant in unexplained dysphagia/dyspnea or when encountering unexpected difficulty during right-sided vascular procedures, confirm anatomy with preoperative CT angiography when suspected, and individualize management (observation for asymptomatic cases, intervention for symptomatic or aneurysmal disease). Future work should combine regional cadaveric surveys, imaging databases, and clinical registries to better define local prevalence, symptomatology, and optimal management pathways.

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Ethical statement: *This study has been performed in accordance with the ethical standards as laid down in the Declaration of Helsinki. The dissection, performed for educational purposes in the Department of Anatomy, Histology, and Embryology at the Medical University – Sofia, was approved by the Medico-Legal Office and the local Ethics Committee.*

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