

**New
Method**

Symptomatic Aberrant Right Subclavian Artery: Advantages of a Less Invasive Surgical Approach

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We present the case of a 33-year-old woman with a non-aneurysmal, symptomatic aberrant right subclavian artery (ARSA) traveling posterior to the esophagus, as demonstrated on chest computed tomography (CT) scans. She was treated with a less invasive surgical approach: closure of the anomalous vessel close to its origin from the aortic arch, through a left thoracoscopic procedure, followed by right common carotid-subclavian artery transposition via an open right supraclavicular approach. This method avoids the postoperative morbidity associated with open thoracic surgery and allows a clear identification of the anatomic structures minimizing possible procedure-related complications as a long residual arterial stump.

Keywords: arteria lusoria, dysphagia, less invasive surgical approach

Introduction

Aberrant right subclavian artery (ARSA), also known as arteria lusoria, is the most common of the aortic arch anomalies. Its prevalence varies from 0.5 to 2.5% in the general population. This vessel originates as a last branch of the aortic arch beyond the left subclavian artery. It travels to the right arm, crossing the middle line of the body, between the esophagus and

vertebral column in 80% of cases but it can be found between the trachea and esophagus in 15% of cases or even anterior to the trachea in 5% of cases. Although most patients remain symptom-free during their life, an aberrant subclavian artery can produce dysphagia, retrosternal pain, pyrosis, coughing, or dyspnea.¹⁾ In the diagnostic workup, barium-contrast examination of the upper gastrointestinal tract excludes esophageal abnormalities and can demonstrate a compression of the proximal esophagus at the level of the aortic arch but computed tomography (CT) and magnetic resonance imaging (MRI) have become the main tools allowing visualization of an ARSA and surrounding structures with further information regarding any aneurysmal degeneration.²⁾

Case Report

A 33-year-old woman presented with a history of chronic cough, intermittent attacks of stridor, and difficulty in swallowing solid food for about 6 months. Chest X-ray was negative for a pulmonary process. A contrast-enhanced CT was suggested to be performed and

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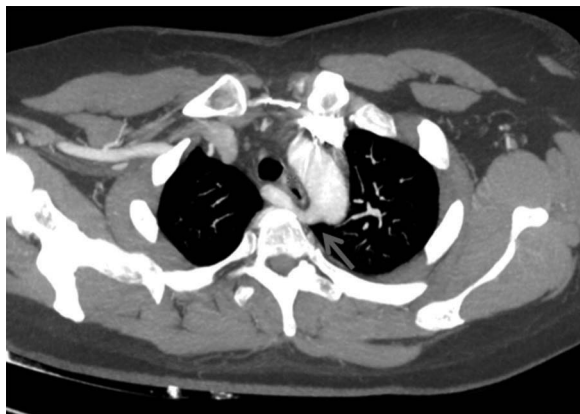


Fig. 1 Preoperative contrast-enhanced CT scan shows a non-aneurysmal arteria lusoria (red arrow) crossing upward and to the right behind a compressed and narrowed esophagus (red asterisk).

revealed an ARSA originating from a left-sided aortic arch and passing posterior to the thoracic esophagus, with no aneurysmal dilatation (**Fig. 1**). Due to the persistence of symptoms, a less invasive surgical approach was performed. Under general anesthesia and double-lumen intubation, the patient was placed in the lateral decubitus position. Through a left triportal thoracoscopic approach, the mediastinal pleura above the distal portion of the aortic arch was opened allowing an adequate exposure of the ARSA: the anomalous vessel, dissected free from the surrounding tissue, was encircled by a vessel loop and divided at its origin at the aortic arch with an endovascular stapling device (**Figs. 2a** and **2b**). Subsequently, the patient was placed in the supine position and, through a right supraclavicular incision, an end-to-side anastomosis was performed between the divided distal ARSA, dissected along its retroesophageal course, and the right common carotid artery with preservation of the right vertebral artery (**Fig. 2c**). At the end of the procedure, good pulses were palpated in the right radial artery. In the postoperative period, the patient presented with normal swallowing but had a transient ptosis. Contrast-enhanced CT performed at 6 months after surgery revealed a widely patent carotid-subclavian artery anastomosis and no aneurysmal degeneration of the residual ARSA stump (**Figs. 3a** and **3b**).

Discussion

Patients with ARSA and symptoms related to esophageal or tracheal compression and those with aneurysmal dilatation need surgical treatment. Median sternotomy,

left thoracotomy, or bilateral carotid-subclavian bypasses followed by thoracic aortic endograft are indicated in the presence of aneurysmal disease. For patients with a non-aneurysmal, symptomatic ARSA, the aim of treatment is the closure of the origin of arteria lusoria and the revascularization of the right subclavian artery.³⁾ Some authors have reported open ligation and transposition of the ARSA to the right common carotid artery via a right supraclavicular incision.⁴⁾ To avoid possible aneurysmal formation, due to a residual long stump of the anomalous vessel at its origin, a mediastinoscopy-assisted ligation of the ARSA, through the right supraclavicular approach, has been recently proposed to aid visualization of the operative field⁵⁾: this procedure, however, can be extremely challenging because the origin of the arteria lusoria is in a narrow and difficult-to-reach anatomic region.⁴⁾ The risk of intraoperative bleeding and the possibility to leave long residual vascular stumps could be avoided through hybrid endovascular approaches as the method proposed by Shennib et al. that performed an end-to-side anastomosis between the divided distal ARSA and the right common carotid artery previous placement of an occlusion device 2 cm beyond the origin of the anomalous vessel.⁶⁾ Management strategies including endovascular interventions are nowadays adopted especially in elderly patients with comorbidities³⁾ and, moreover, in literature there is a lack of data concerning long-term follow-up on the safety of endovascular occlusive devices.⁷⁾ The less invasive surgical approach performed in our case allows, through a left thoracoscopic procedure, a safe closure of the ARSA at its origin at the aortic arch, with no possibility of leaving long residual vascular stump, and, at the same time, avoids excessive displacement of both trachea and esophagus when the ARSA is dissected through the right supraclavicular incision before the carotid-subclavian transposition.

Conclusion

Several procedures have been proposed in the treatment of symptomatic ARSA and actually controversy exists concerning the best surgical technique.⁸⁾ The less invasive surgical approach performed in this case, through a left thoracoscopic procedure and a right supraclavicular incision, has the advantage of minimizing postoperative morbidity associated with thoracotomy and allows an optimal exposure of the neurovascular structures.

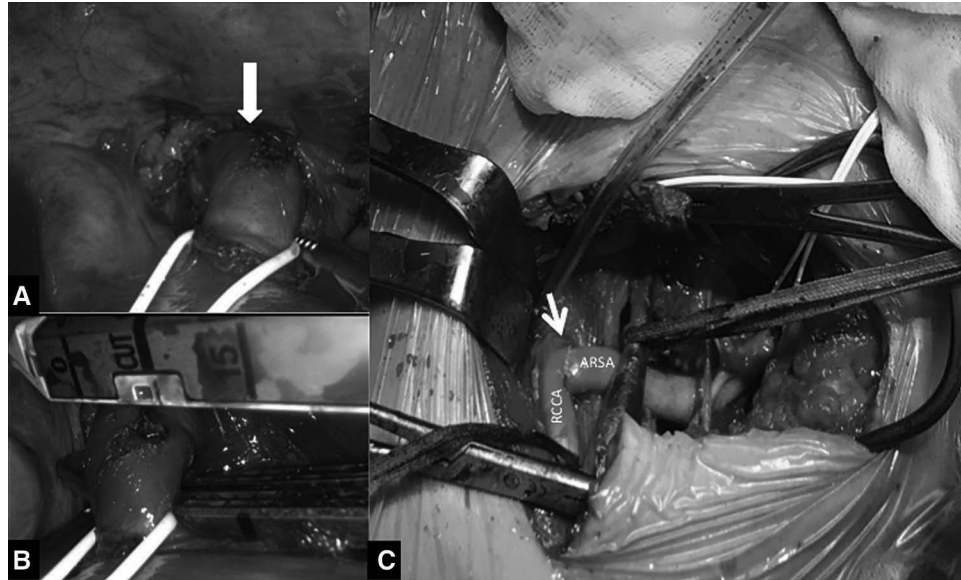


Fig. 2 Intraoperative view of video-assisted thoracoscopic surgery and open vascular surgery. (A) Isolation of the arteria lusoria close to the aortic arch with vessel loop (white arrow). (B) Mechanical stapling device for closure of the arteria lusoria. (C) End-to-side anastomosis (white arrow) between the divided aberrant right subclavian artery and the right common carotid artery. ARSA: aberrant right subclavian artery; RCCA: right common carotid artery

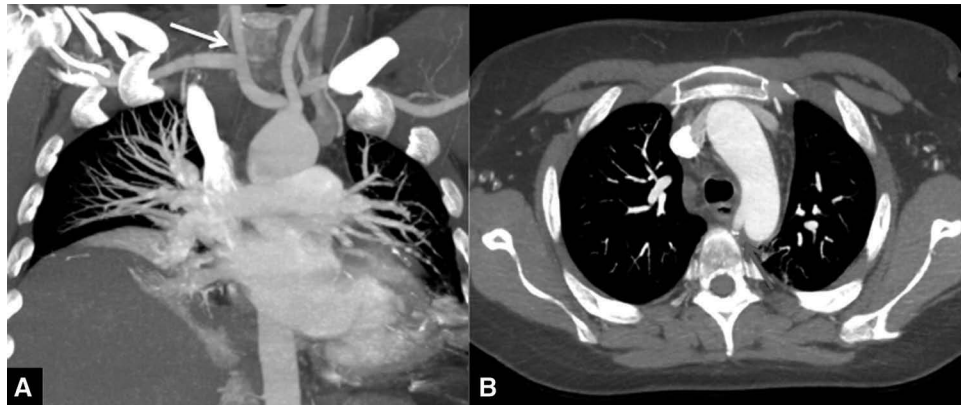


Fig. 3 Follow-up contrast-enhanced CT scan of the chest. (A) A coronal projection shows patent anastomosis of arteria lusoria to right common carotid artery (white arrow). (B) Remaining stump of the origin of arteria lusoria (red arrow).

Authors' Contributions

Dario Amore contributed to research concept, data acquisition and analysis, drafting article, and the approval of the submitted and final versions.

Dino Casazza contributed to drafting article, and the approval of the submitted and final versions.

Alfonso Casalino contributed to acquisition and analysis, research concept, and the approval of the submitted and final versions.

Tullio Valente contributed to acquisition and analysis, research concept, and the approval of the submitted and final versions.

Rosanna Carmela De Rosa contributed to data acquisition and analysis, and the approval of the submitted and final versions.

Paolo Sanguolo contributed to completing the approval of the submitted and final versions.

Carlo Curcio contributed to completing the approval of the submitted and final versions.

Disclosure Statement

No conflict of interest.

References

- 1) Baker AC, Atkins BZ, Clouse WD, et al. Repair of aberrant right subclavian artery entirely via a supraclavicular approach. *Ann Vasc Surg* 2014; **28**: 489.e1-4.
- 2) Stone WM, Ricotta JJ, Fowl RJ, et al. Contemporary management of aberrant right subclavian arteries. *Ann Vasc Surg* 2011; **25**: 508-14.
- 3) Atay Y, Engin C, Posacioglu H, et al. Surgical approaches to the aberrant right subclavian artery. *Tex Heart Inst J* 2006; **33**: 477-81.
- 4) Darwazah AK, Eida M, Khalil RA, et al. Non-aneurysmal aberrant right subclavian artery causing dysphagia in a young girl: challenges encountered using supraclavicular approach. *J Cardiothorac Surg* 2015; **10**: 92.
- 5) Fukuhara S, Patton B, Yun J, et al. A novel method for the treatment of dysphagia lusoria due to aberrant right subclavian artery. *Interact Cardiovasc Thorac Surg* 2013; **16**: 408-10.
- 6) Shennib H, Diethrich EB. Novel approaches for the treatment of the aberrant right subclavian artery and its aneurysms. *J Vasc Surg* 2008; **47**: 1066-70.
- 7) Cobos-González E, Aragón-López JA, García Buen-Abad R, et al. Hybrid treatment of dysphagia lusoria: right carotid to subclavian bypass and endovascular insertion of an Amplatzer II Vascular Plug. *Rev Esp Enferm Dig* 2016; **108**: 0.
- 8) Thompson JL, Burkhart HM. Translocation of an Aberrant Right Subclavian Artery With Resolution of Dysphagia Lusoria. *Ann Thorac Surg* 2016; **102**: e65-7.