Aberrant Right Subclavian Artery and Common Carotid Trunk with High Arching Azygous Vein: A Case Report

Sandeep Sapkota[1], Binay Thakur[1], Sagar Khatiwada[1], Manoj Tiwari[1], Shachee Bhattarai[1], Ashish Kharel[1], Mahesh Mani Adhikari[1], Ashesh Shrestha[1]

[1]Department of Surgical Oncology, Thoracic oncosurgery Unit, BPKMCH, Bharatpur, Nepal.

Abstract

Aberrant right subclavian artery (ARSA), or *arteria lusoria*, is the most common congenital anomaly of the aortic arch, occurring in 0.5–2% of the population, and may be associated with other rare vascular aberrations. We report a 45-year-old male with progressive grade III dysphagia for 5 months, diagnosed with well-differentiated adenocarcinoma of the distal esophagus. Preoperative contrast-enhanced CT revealed an ARSA arising as the third branch of the aortic arch and coursing posterior to the esophagus, along with a common carotid trunk and high-arching azygos vein. The patient underwent video-assisted thoracoscopic (VATS) three-incision esophagectomy following neoadjuvant chemotherapy, with vascular anomalies noted and preserved intraoperatively. This case highlights the importance of preoperative recognition of vascular variations to avoid catastrophic complications during minimally invasive esophageal surgery.

Keywords: Subclavian Artery, *Common carotid trunk,* Azygos Vein/anatomy, Vascular variation

Introduction

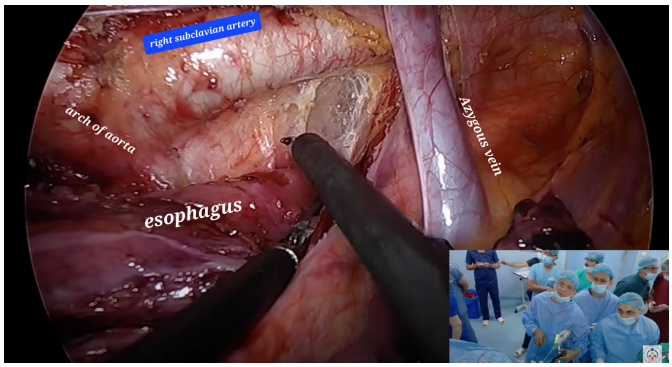
Aberrant right subclavian artery (ARSA), also known as *arteria lusoria*, is most common congenital anomaly of the aortic arch, occurring in approximately 0.5–2% of the population. In this variant, the right subclavian artery arises directly from the distal portion of the aortic arch and typically courses posterior to the esophagus, potentially leading to esophageal compression. The brachiocephalic system is usually absent in these type of cases.[1] David Bayford (1739–1790), a lesser-known contemporary of William and John Hunter, is eponymously remembered for his 1761 discovery of **dysphagia lusoria**—a rare cause of difficult swallowing due to **compression of the oesophagus by an aberrant right subclavian artery -** a finding he reported only in 1787 through the Medical Society of London.[2] Anticipation of these anomalies definitely helps to reduce intraoperative complications like great vessel injury and torrential bleeding which might turn out to be very difficult to manage especially in case of minimal invasive esophagus surgery.[3]

Case summary

A. 45 years male presenting with history of progressive dysphagia for last 5 months, with grade III dysphagia during presentation. **Esophago-Gastro-Duodenoscopy** was done and ulcero-proliferative growth was found from 36 to 39 cm from incisor. Histopathology revealed a well differentiated adenocarcinoma and patient was planned for VATS 3-incision esophagectomy after 4 cycles of fluorouracil, Leucovorin, oxaliplatin and docetaxel (FLOT) neoadjuvant chemotherapy. Post chemotherapy CT-scan showed right subclavian artery was originating as third branch of arch of aorta, which loops posteriorly to thoracic vertebra and goes up to become right subclavian artery and 3D reconstruction showed the common carotid trunk, also the azygous vein was found to drain high up but there was no azygous fissure or azygous lobe. The finding was evident during thoracic dissection of esophagus, fig 1. Right subclavian system is seen to looping esophagus and going up. The patient underwent a three-incision VATS esophagectomy under general anesthesia with 3 ports and capnothorax

Correspondence: Dr. Sandeep Sapkota, Department of surgical oncology (Thoracic oncosurgery unit), BP Koirala Memorial Cancer Hospital, Bharatpur, Nepal, Email: dr.sandeepsapkota@gmail.com, Phone: +977-9851109906

for exposure. The thoracic esophagus was mobilized with mediastinal lymphadenectomy, high insertion of azygous vein and aberrant right subclavian system were noted and injury was avoided, **fig 2.** Gastric mobilization and conduit preparation were performed laparoscopically. The conduit was then delivered through the posterior mediastinum and a cervical esophagogastric anastomosis was fashioned, with feeding jejunostomy and chest drains placed.



Fig; 1 : Thoracic esophagus dissection via VATS showing structures as written, Right subclavian artery is coming off aorta as last branch and has ascended to right side coursing posteriorly

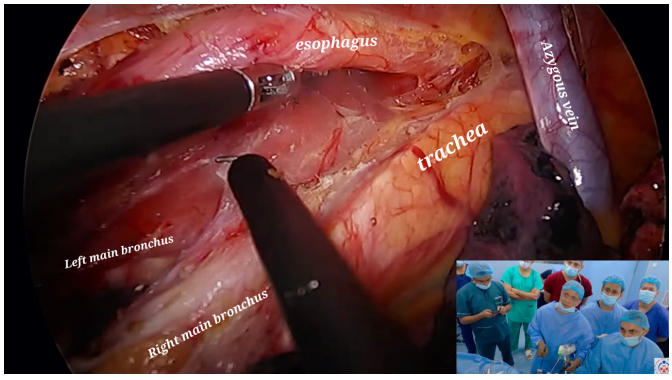


Fig 2: High arching Azygous vein shown which was devoid of any fascial coverage

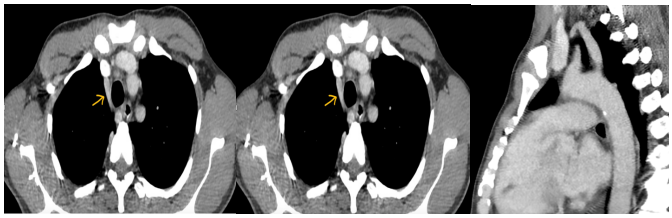


Fig 3: CT images showing axial and sagittal section of mediastinum : First 2 picture shows High insertion of azygous vein without azygous fissure, Last picture shows aberrant origin of right subclavian artery.

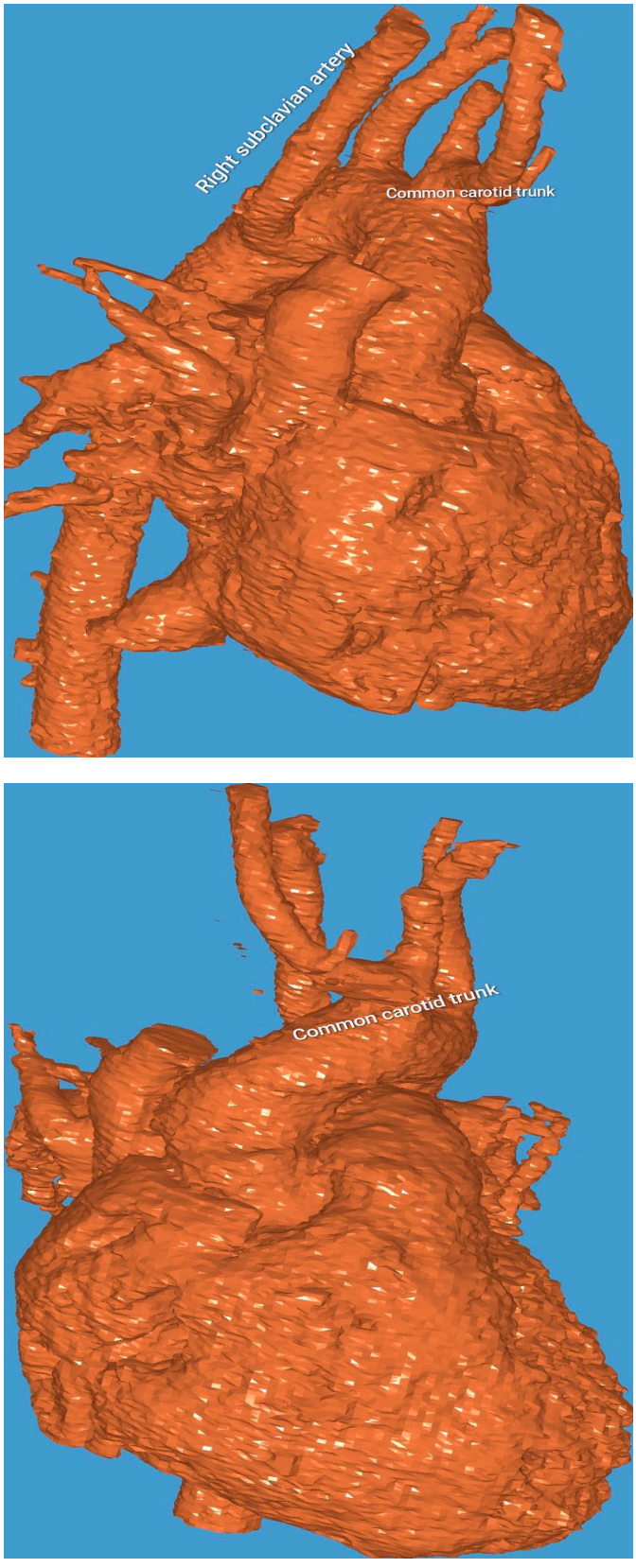


Fig 4: 3D Reconstructed image of CT scan, from left to right showing Anterior to posterior view, common carotid branch, left subclavian, and right subclavian arising respectively from aortic arch.

Discussion

Aberrant right subclavian artery (ARSA), is the most common congenital anomaly of the aortic arch. The common carotid trunk (CCT), also referred to as a **bicarotid trunk**, is a less frequent anomaly in which both common carotid arteries arise from a single stem off the aortic arch.[4] The coexistence of ARSA, CCT and high arching azygous vein represent rare but clinically significant anomaly, resulting from abnormal embryological development.[5] To the best of our knowledge, each variation in isolation has been reported in literature but all three variations to be occurring in a same patient has never been reported before in any literature.

Embryologically, ARSA results from the involution of the right fourth aortic arch and proximal right dorsal aorta, with persistence of the distal right dorsal aorta. This leads to a right subclavian artery originating distal to the left subclavian artery and coursing across the midline.[6] In some cases, ARSA may be associated with **Kommerell's diverticulum**, a remnant of the left dorsal aorta, which can pose a risk for aneurysm formation or rupture.[7]

Common carotid trunk (CCT), also termed **bicarotid trunk**, is another rare aortic arch anomaly, observed in approximately 0.05–0.1% of individuals. It is characterized by a single arterial trunk arising from the aortic arch and subsequently bifurcating into the right and left common carotid arteries.[8] This anomaly represents persistence of the ventral aortic segment between the third and fourth branchial arches. Though usually asymptomatic, the presence of a CCT can complicate endovascular procedures, aortic surgeries, or cannulation strategies, especially in head and neck surgeries. At times, patient may also present with subclavian steal syndrome.[9]

The third anomaly in this triad — **high arching azygous vein** — is even less commonly reported. Normally, the azygous vein arches over the right main bronchus at the T4 vertebral level to drain into the superior vena cava. In some individuals, however, it arches higher than usual, potentially mimicking mediastinal masses or lymphadenopathy on imaging.[10] Recognition of this variant is essential to avoid misdiagnosis or inadvertent injury during thoracic procedures, particularly mediastinoscopy, surgery for mediastinal tumors and esophagectomy. High insertion of azygos vein has been described in cases of azygos lobe as well. The later antomical anomaly has been reported in 1% of population and it has a distinct fissure over right upper lobe which was absent in our case.[11]

The coexistence of these three anomalies has never been reported in an English literature and it has important surgical implications. For example, ARSA may be injured during esophagectomy or neck dissections; CCT may affect cerebral perfusion during arch surgeries; and a high azygous arch may pose a risk during mediastinal interventions.[6] The embryological co-occurrence suggests a disruption in the complex remodeling of the aortic arch system and cardinal venous system during early gestation.

From a clinical perspective, such anomalies are often asymptomatic and incidentally detected on cross-sectional imaging, as in our case. However, their recognition is crucial for surgical planning, preventing intraoperative complications, and accurate radiological interpretation. Preoperative CT angiography or MR angiography is most valuable in delineating vascular anatomy, especially in patients undergoing thoracic, vascular, or head and neck surgery.

References

1. Brauner E, Lapidot M, Kremer R, Best LA, Kluger Y. Aberrant right subclavian artery- suggested mechanism for esophageal foreign body impaction: Case report. World J Emerg Surg WJES. 2011 Apr 9;6(1):12.
2. Asherson N. David Bayford. His syndrome and sign of dysphagia lusoria. Ann R Coll Surg Engl. 1979 Jan;61(1):63–7.
3. Mahmodlou R, Sepehrvand N, Hatami S. Aberrant Right Subclavian Artery: A Life-threatening Anomaly that should be considered during Esophagectomy. J Surg Tech Case Rep. 2014;6(2):61–3.
4. González-Sánchez M, Pardal-Refoyo JL, Martín-Sánchez A. The aberrant right subclavian artery and dysphagia lusoria. Acta Otorrinolaringol Esp. 2013;64(3):244–5.
5. Felson B. The azygos lobe: its variation in health and disease. Semin Roentgenol. 1989 Jan;24(1):56–66.
6. Kellenberger CJ. Aortic arch malformations. Pediatr Radiol. 2010 June;40(6):876–84.
7. Kau T, Sinzig M, Gasser J, Lesnik G, Rabitsch E, Celedin S, et al. Aortic Development and Anomalies. Semin Interv Radiol. 2007 June;24(2):141–52.
8. Ka-Tak W, Lam WWM, Yu SCH. MDCT of an aberrant right subclavian artery and of bilateral vertebral arteries with anomalous origins. AJR Am J Roentgenol. 2007 Mar;188(3):W274-275.
9. Sun YY, Zhang GM, Zhang YB, Du X, Su ML. Bilateral common carotid artery common trunk with aberrant right subclavian artery combined with right subclavian steal syndrome: A case report. World J Clin Cases. 2019 Nov 6;7(21):3639–48.
10. Piciucchi S, Barone D, Sanna S, Dubini A, Goodman LR, Oboldi D, et al. The azygos vein pathway: an overview from anatomical variations to pathological changes. Insights Imaging. 2014 Oct;5(5):619–28.
11. Wall J, Stawicki S. The azygos lobe. Int J Acad Med. 2017;3(3):189.