

Right-sided Aortic Arch with Aberrant Left Subclavian Artery Arising from a Kommerell Diverticulum: A Case Report

ANKIT GANDHI¹, SHASHANK M HIREMATH², ADITYA HADOLE³, ASIF TAMBOLI⁴, AMOL BHOITE⁵

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ABSTRACT

Right-sided aortic arch with an Aberrant Left Subclavian Artery (ALSA) arising from a Kommerell diverticulum is a rare congenital anomaly of the aortic arch system. A 58-year-old male presented with progressive exertional breathlessness and intermittent dysphagia. Contrast-enhanced CT aortography with multiplanar and three-dimensional reconstructions demonstrated a right-sided aortic arch with sequential branching of the left common carotid artery, right common carotid artery, right subclavian artery, and an ALSA arising from a Kommerell diverticulum. The aberrant vessel followed a retro-oesophageal course, causing indentation of the oesophagus, explaining the patient's dysphagia. Mild fusiform dilatation of the aortic arch was also observed without evidence of dissection or rupture. This case highlights the importance of multidetector CT angiography in the diagnosis and anatomical characterisation of rare aortic arch anomalies. Early recognition of Kommerell diverticulum is important for appropriate clinical management, surveillance, and prevention of potential vascular complications.

Keywords: Aortic arch anomaly, Congenital vascular anomaly, Dysphagia, Multidetector computed tomography, Oesophageal compression, Vascular ring

CASE REPORT

A 58-year-old male presented to the outpatient department with complaints of progressively increasing exertional breathlessness and intermittent chest discomfort for six months. The patient also reported occasional difficulty in swallowing solid foods during the past two weeks. There was no history of syncope, palpitations, haemoptysis, or significant weight loss. There was no history suggestive of chronic pulmonary disease or previous vascular interventions.

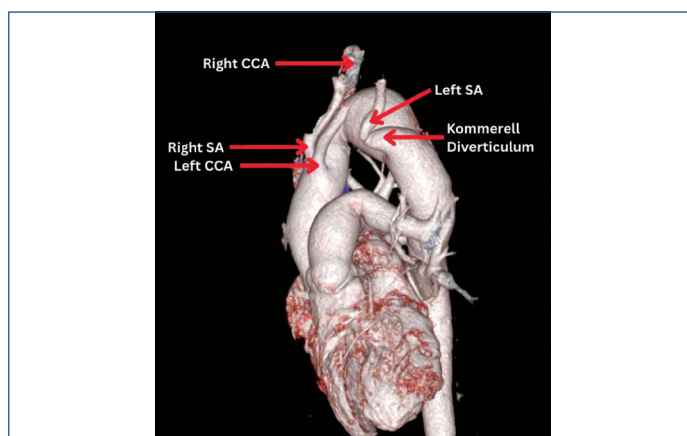
The patient's medical history revealed long-standing hypertension that was under irregular medical treatment. The patient had no significant family history of congenital cardiovascular anomalies.

On general physical examination, the patient was conscious, oriented, and haemodynamically stable. Vital parameters were within normal limits. Cardiovascular examination revealed normal heart sounds without any audible murmurs. Respiratory system examination showed normal bilateral air entry with no added sounds. No signs of heart failure or peripheral oedema were observed.

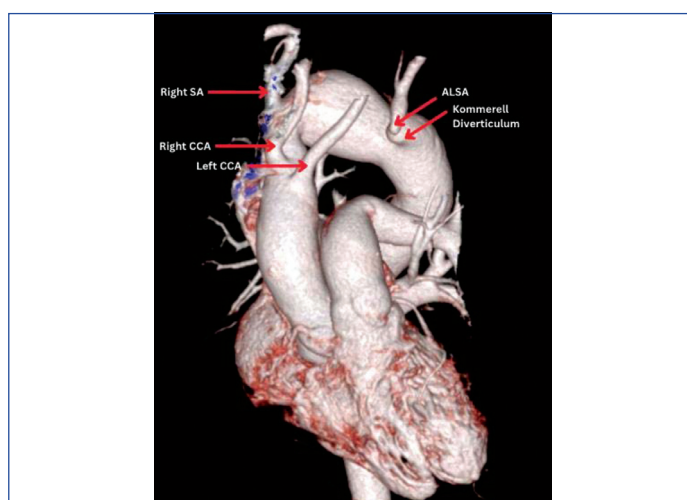
Routine laboratory investigations, including complete blood count, renal function tests, and liver function tests, were within normal limits.

CT angiography revealed a right-sided aortic arch, in which the aortic arch coursed to the right side of the trachea instead of its usual left-sided position. The descending thoracic aorta also continued along the right side of the mediastinum before gradually crossing toward the midline.

Three-dimensional volume-rendered CT angiographic images clearly demonstrated the right-sided aortic arch configuration and its relationship with the supra-aortic branches. It demonstrates the right-sided aortic arch with an ALSA arising from a focal Kommerell diverticulum [Table/Fig-1,2]. The ALSA coursed posterior to the oesophagus toward the left upper limb. [Table/Fig-3] shows the right-sided aortic arch with the ALSA arising from the Kommerell diverticulum and coursing posterior to the oesophagus. [Table/Fig-4] demonstrates indentation of the posterior wall of the oesophagus by the Kommerell diverticulum and retro-oesophageal ALSA. The arch of the aorta showed mild fusiform dilatation, with a maximum diameter measuring approximately 3.8 cm.

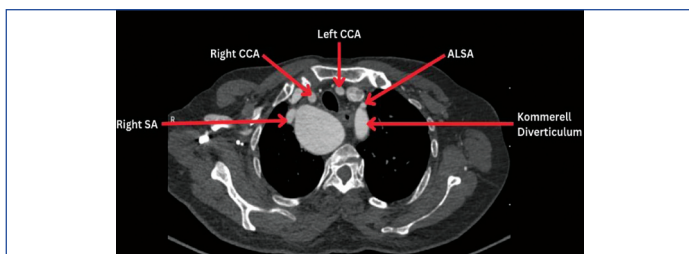


[Table/Fig-1]: A 3D CT angiography showing a right-sided aortic arch with Aberrant Left Subclavian Artery (ALSA) arising from a Kommerell diverticulum.

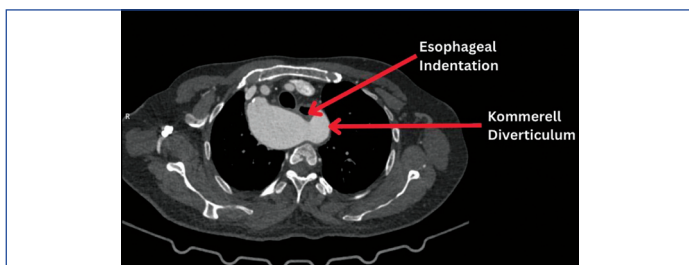


[Table/Fig-2]: A 3D CT angiography demonstrating right-sided aortic arch with Aberrant Left Subclavian Artery (ALSA) arising from a Kommerell diverticulum.

The ascending aorta appeared normal in calibre with a diameter of approximately 32 mm, while the descending thoracic aorta measured approximately 30 mm. The thoracic and abdominal segments of the



[Table/Fig-3]: Axial contrast-enhanced CT image showing right-sided aortic arch with Aberrant Left Subclavian Artery (ALSA) arising from a Kommerell diverticulum.



[Table/Fig-4]: Axial CT image showing Kommerell diverticulum causing oesophageal indentation.

aorta were otherwise within normal limits. Importantly, there was no evidence of aortic dissection, intraluminal thrombus, or rupture.

Based on the CT angiographic findings, the diagnosis of right-sided aortic arch with ALSA arising from a Kommerell diverticulum was established. After the imaging diagnosis, the patient was referred to cardiology and cardiothoracic surgery for further evaluation and management planning.

The patient was counselled regarding the presence of this rare congenital vascular anomaly and the potential risk of future complications related to Kommerell diverticulum, including aneurysmal enlargement, dissection, or rupture. Long-term follow-up and periodic imaging surveillance were advised to monitor the diverticulum and the aortic arch dimensions.

DISCUSSION

Right-sided aortic arch is a rare congenital vascular anomaly caused by abnormal regression and persistence of embryonic aortic arch segments during fetal development [1]. Normally, the aortic arch develops from a complex transformation of the pharyngeal arch arteries, resulting in a left-sided aortic arch that course over the left main bronchus. When the left fourth arch regresses and the right fourth arch persists, a right-sided aortic arch forms [2]. This anomaly is uncommon in the general population, with a reported prevalence of approximately 0.05-0.1% [3].

According to the Stewart-Kincaid-Edwards classification [4], right aortic arch anomalies constitute Group-III. The present configuration, characterised by an aberrant left subclavian artery arising from a Kommerell diverticulum, corresponds to Type II right aortic arch.

Fekadu D et al., reported a middle-aged patient with a right-sided aortic arch and an ALSA arising from a Kommerell diverticulum diagnosed on CT angiography. The patient also presented with compressive aerodigestive symptoms, emphasising the pivotal role of CT angiography in establishing the diagnosis and guiding management [5].

Jlind B et al., (2020) described a patient presenting primarily with dyspnea associated with a right-sided aortic arch and an ALSA. Similar to the present case, CT angiography established the diagnosis by demonstrating the anomalous aortic arch anatomy and the aberrant course of the left subclavian artery [6].

Mubarak MY et al., reported a case of a right-sided aortic arch with an ALSA arising from a Kommerell diverticulum in which multidetector CT angiography accurately delineated the anomalous aortic arch configuration, branching pattern, and retro-oesophageal course of the aberrant vessel. However, unlike the relatively incidental presentation described by Mubarak MY et al., our patient presented with both exertional dyspnea and intermittent dysphagia [7].

The ALSA typically follows a retro-oesophageal course as it travels toward the left upper limb [8]. This anatomical relationship may lead to compression of the oesophagus or trachea, producing symptoms such as dysphagia, dyspnea, cough, or chest discomfort.

CONCLUSION(S)

Right-sided aortic arch with ALSA arising from a Kommerell diverticulum is a rare congenital vascular anomaly that may remain asymptomatic or present with compressive symptoms in adulthood. Multidetector CT angiography plays a crucial role in the accurate diagnosis and anatomical characterisation of such vascular anomalies.

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PARTICULARS OF CONTRIBUTORS:

- Third-Year Junior Resident, Department of Radio-Diagnosis, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India.
- Third-Year Junior Resident, Department of Radio-Diagnosis, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India.
- Second-Year Junior Resident, Department of Radio-Diagnosis, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India.
- Professor and Head, Department of Radio-Diagnosis, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India.
- Associate Professor, Department of Radio-Diagnosis, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Ankit Gandhi,
Krishna Vishwa Vidyapeeth (Deemed to be University), Karad-415110,
Maharashtra, India.
E-mail: radiology844@gmail.com

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