

Right Aortic Arch with Bicarotid Trunk and Aberrant Left Subclavian Artery

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Presence of bicarotid trunk has been previously reported in association with aberrant right subclavian artery (SCA) with no known in human description of bicarotid trunk in association with aberrant left SCA. We, hereby, describe one such rare aortic arch pattern highlighting the association of bicarotid trunk with aberrant left SCA and direct vertebral artery origin from the right aortic arch leading to four arch vessels, which to the best of our knowledge has not been reported so far in literature.

The development of aortic arch is a complex process with various congenital anomalies of aortic arch sidedness and its branching patterns.¹ Most commonly encountered pattern is left-sided aortic arch with three arch branches—brachioce-

phalic artery that further gives rise to right common carotid artery (CCA) and right SCA, left CCA, and the left SCA. This case describes a rare right aortic arch branching pattern with bicarotid trunk, aberrant left SCA, and direct origin of right vertebral artery from the aortic arch.

A 7-month-old male infant patient with failure to thrive, suck-rest-suck cycles, and no cyanosis underwent computed tomography (CT) angiography in view of suspected congenital heart disease (CHD) on clinical grounds and echocardiography showing large ventricular septal defect (VSD) with echo dropout between aorta and pulmonary artery. CT angiography showed type II right sided aortic arch with four arch branches—bicarotid trunk (common trunk giving

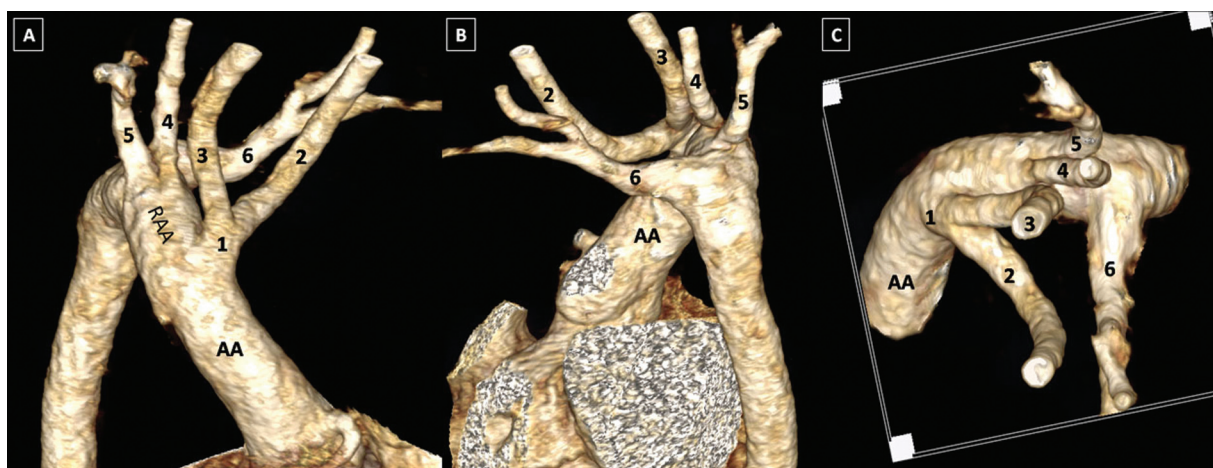


Fig. 1 Volume-rendered reconstructed computed tomography angiography images (A–C) showing type II right aortic arch (RAA) with four-arch branches—bicarotid trunk, right vertebral artery, right subclavian artery (SCA), and aberrant left SCA. AA, ascending aorta; 1, bicarotid trunk; 2, left common carotid artery (CCA); 3, right CCA; 4, right vertebral artery; 5, right SCA; 6, aberrant left SCA.

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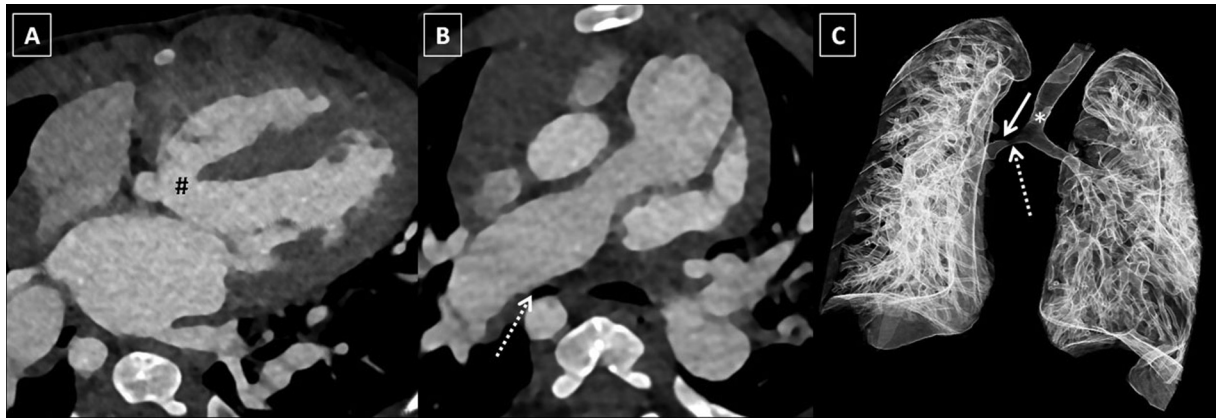


Fig. 2 Four-chambered view of computed tomography angiography (A) showing the perimembranous ventricular septal defect (#) and axial section (B) showing the dilated pulmonary arteries causing narrowing of right main bronchus (dashed arrow). Volume-rendered image of central airways and lungs (C) showing the ostial occlusion of right upper lobe bronchus (arrow) with narrowing of lower trachea (asterisk) and right main bronchus (dashed arrow) caused by dilated right pulmonary artery.

rise to bilateral common carotids), right vertebral artery, right SCA, and aberrant left SCA (→Fig. 1). Additionally, it showed presence of large VSD with confluent dilated pulmonary arteries causing narrowing of lower trachea, right main bronchus with ostial occlusion of right upper lobe bronchus (→Fig. 2). No patent ductus arteriosus or coarctation was seen with normal origin and course of coronary arteries.

Right aortic arch is a rare aortic arch anomaly with aberrant left SCA (type II) being the most common variation in a right-sided aortic arch followed by mirror image branch pattern (type I) and isolated left SCA (type III). Associated CHD is invariably seen with type I and is rarely seen with type II right aortic arch.

Association of bicarotid trunk with aberrant right SCA has been reported previously with origin of three or four arch vessels, including ectopic origin of vertebral arteries.^{2–4} Moreover, associated CHD has been reported in 98.4% of patients with bicarotid trunk with VSD being the most common followed by pulmonary valve stenosis and atrial septal defect in a study including pediatric cardiology patients who underwent cardiac catheterization.⁵

Literature search showed no known in human description of association of bicarotid trunk with aberrant left SCA; however, its occurrence in animals is well documented.⁶ Moreover, the association of bicarotid trunk with aberrant left SCA and direct vertebral artery origin from the right aortic arch, leading to four arch vessels, has not been reported so far. Our case also highlights the importance of CT in delineation of associated cardiovascular and tracheo-bronchial abnormalities. Thorough understanding and description of arch branching pattern, airway anatomy, and cardiovascular associations are extremely crucial while planning any endovascular or surgical procedure and intubation. It may require modification of surgical access or technique

with careful observation during the usage of heart-lung machine or extracorporeal membrane oxygenation (e.g., aortic cannula may obstruct flow to both the carotid arteries in cases of bicarotid trunk).^{5,7}

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Conflict of Interest

None declared.

References

- Priya S, Thomas R, Nagpal P, Sharma A, Steigner M. Congenital anomalies of the aortic arch. *Cardiovasc Diagn Ther* 2018;8 (Suppl 1):S26–S44
- Natsis K, Didagelos M, Manoli SM, Papathanasiou E, Sofidis G, Anastasopoulos N. A bicarotid trunk in association with an aberrant right subclavian artery. Report of two cases, clinical impact, and review of the literature. *Folia Morphol (Warsz)* 2011; 70(02):68–73
- Buffoli B, Verzeletti V, Hirtler L, Rezzani R, Rodella LF. Retroesophageal right subclavian artery associated with a bicarotid trunk and an ectopic origin of vertebral arteries. *Surg Radiol Anat* 2021; 43(09):1491–1495
- Wang K, Zhang M, Sun J, Zhao S. A right-left aortic arch pattern made up by a bicarotid trunk, a left subclavian, a left vertebral and a right retroesophageal subclavian artery. *Surg Radiol Anat* 2011; 33(10):937–940
- Reinshagen L, Vodiskar J, Mühler E, Hövels-Gürich HH, Vazquez-Jimenez JF. Bicarotid trunk: how much is “not uncommon”? *Ann Thorac Surg* 2014;97(03):945–949
- Henjes CR, Nolte I, Wefstaedt P. Multidetector-row computed tomography of thoracic aortic anomalies in dogs and cats: patent ductus arteriosus and vascular rings. *BMC Vet Res* 2011;7:57
- Lamers LJ, Rowland DG, Seguin JH, Rosenberg EM, Reber KM. The effect of common origin of the carotid arteries in neurologic outcome after neonatal ECMO. *J Pediatr Surg* 2004;39(04): 532–536