BOVINE ARCH: Definitions and Implications

Frank J Criado, MD
MedStar Union Memorial Hospital
Baltimore, MD USA

DISCLOSURE: Medtronic: consulting, sales training

The aortic arches or pharyngeal arch arteries are a series of six paired embryological vascular structures that give rise to the great arteries of the neck and head. They emerge symmetrically on both sides of the embryo, but then undergo significant remodeling to form the final asymmetrical structures of the great arteries.

1. Aberrant Right subclavian artery
   - Most common arch anomaly.
   - Not a true ring.
   - Usually asymptomatic.
   - Sometimes dysphagia lusoria when dilated subclavian artery compresses esophagus posteriorly.

2. Innominate artery compression syndrome
   - In children the brachiocephalic (innominate) artery is located more to the left and may compress the trachea anteriorly.

3. Right Arch Mirror Image
   - Mirror-image variety of the left arch.
   - Asymptomatic.
   - Associated congenital heart disease in 98%, mostly tetralogy of Fallot.

4. Right Arch with Aberrant left subclavian
   - Left subclavian artery is the last branch.
   - Obstructing anomaly.

5. Double Aortic Arch
   - Complete ring encircles esophagus and trachea.
   - Four vessel sign.

6. Double Arch with Atretic Segment
   - Left arch is very small and has atretic posterior segment.
   - Still a four vessel sign.

Arch Branches = Supra-Aortic Trunks (SATs)
Bovine Arch refers to a group of anatomical configurations of the aortic arch caused by the aberrant or variant origin of the left common carotid artery. Bovine is a misnomer as it is NOT present in cattle.

TRUE BOVINE ANATOMY: frequently present in cattle

Common origin LCCA-IA: 13% GP (25% Blacks, 8% Whites)

Origin LCCA from IA: 9% GP (10% Blacks, 5% Whites)
2-2 TEVAR = 40% of all TEVAR procedures

Patient Population
- Aneurysm Group: 175 patients with known TAA and thoracic CT or MRI scan on record, randomly selected from Yale Center for Thoracic Aortic Disease database
- Control Group: 240 patients without TAA, randomly selected from all patients who underwent thoracic CT scan at Yale-New Haven Hospital between May 2006 and May 2008

Results: Bovine Arch and TAA

Bovine Arch – A Marker for Thoracic Aortic Aneurysm

Ramez Mozaffar, MD, Matthew Horvick, BA, Harold Majdikian, MD, Esther S. Lee, BA, Maryann Tranquilli, RN, John A. Ricco, PhD, and John A. Fesmire, MD
Proceedings of the 15th World Congress on Endovascular Therapy Vancouver, BC Canada 2018

Section of Cardiovascular and Thoracic Surgery, Yale University School of Medicine, New Haven, CT. Department of Thoracic Medicine and Surgery, New Haven, CT.
4D Flow MRI

SUMMARY
- Bovine Arch Anatomy is significantly more common in patients with TAA
- Aneurysms tend to grow faster
- Bovine Arch Anatomy patients prone to AD
- Poor outcomes reported after AD treatment
- Radiologists often overlook Bovine Anatomy in their reports
SUMMARY

- Bovine Arch Anatomy should NOT be described as a normal variant