Vascular rings and slings: Why I do it

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Objectives

Anatomy of the vascular ring/sling

Effect on tracheobronchial tree
MRI Protocol

2D imaging

• Black blood imaging:
  • Axial & Coronal orientation

3D imaging

• Gad enhanced MRA
• 3D SSFP
Rings and Slings

Vascular Ring
- Abnormal encircling of the trachea and esophagus by aortic branches or remnants

Pulmonary Sling
- Anomalous origin of left pulmonary artery (PA) from right PA

Other things
- Tracheal compression by innominate artery
- Criss cross PAs
Rings

- Only patent vessels are visualized by MRI
- Remnants cannot be directly seen
3 Ds to help diagnose a ring (when ring is completed by remnants)

- Dimple (Ductus) opposite the side of arch
- Diverticulum
- Descending aorta opposite the side of the arch

ARCH SIDEDNESS: determined by the bronchus over which the aorta passes
## Vascular rings

<table>
<thead>
<tr>
<th><strong>Double aortic arch</strong></th>
<th><strong>Right arch</strong></th>
<th><strong>Left arch</strong></th>
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<tbody>
<tr>
<td>• Right dominant</td>
<td>• With aberrant left subclavian A and Lt ductus</td>
<td>• Circumflex</td>
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Double aortic arch

- Persistence of both the right and left embryonic 4th aortic arches

- May be *patent* or have *atretic* (fibrous) segment

- Usually symptomatic and detected in infancy

- Right arch is usually dominant (75-80%)
Double aortic arch with both arches patent
Pearl

- Side of the non dominant arch determines the site of thoracotomy
- If similar appearing caliber, phase contrast imaging
Double aortic arch with atretic left arch

- The atretic arch segment cannot be visualized by any imaging modality.
- Can be mistaken for Rt arch with mirror image branching.
Imaging features: Double aortic arch with atretic left arch

- Diverticulum from descending aorta
Imaging features

- 4 artery sign
**Vascular rings**

- **Double aortic arch**
  - Right dominant
  - Left dominant
  - Codominant

- **Right arch**
  - With aberrant left subclavian A and Lt ductus
  - Mirror image with retroesophageal left ductus
  - Circumflex

- **Left arch**
  - Circumflex
Right arch with aberrant left subclavian artery and left ductus

- 2\textsuperscript{nd} most common vascular ring
  - usually *isolated* anomaly
- Most commonly asymptomatic due to “loose” ring
- Due to interruption of “Edwards’ hypothetical left arch” between left common carotid and left subclavian arteries
- Left subclavian artery is last great vessel to arise from aorta
Right arch with aberrant left subclavian artery and left ductus

Divertericulum of Kommerell
Vascular Rings – *Rare*

- **Right Aortic Arch with Mirror-Image Branching and Intact Retroesophageal Left Ligamentum Arteriosum**
  - Presence of a Dimple (Ductus)

- **Circumflex aortic arch**
  - (Proximal) Descending aorta opposite to the side of arch
Conclusions

- Understand the goals of imaging
- Learn how to infer the position of an atertic segment/ligamentum
- Learn what constitutes a ring
Thank you