



Advanced Cardiac CT Imaging: Utility in Critical Decision Making

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Disclosures

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Why CTA for Evaluation of Congenital Heart Disease?

Fast

- Critically ill
- Claustrophobic
- Children

High Spatial Resolution

- Coronary artery
- Calcifications within vessels and conduits
- 3D Modeling

Compatibility

- Metallic artifact
- VAD/ECMO catheter

Extracardiac Structures

- Lung
- Airway
- Bones

Disadvantages- ionizing radiation, no flow data, tissue characterization

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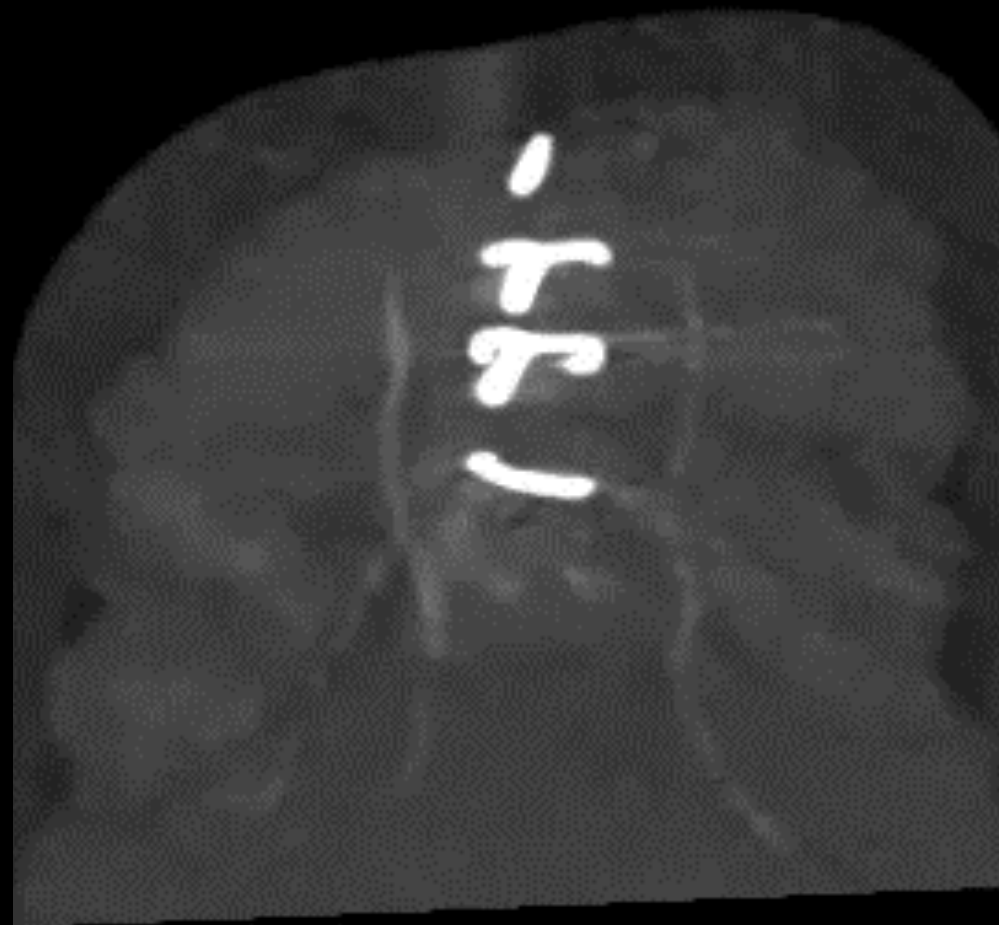
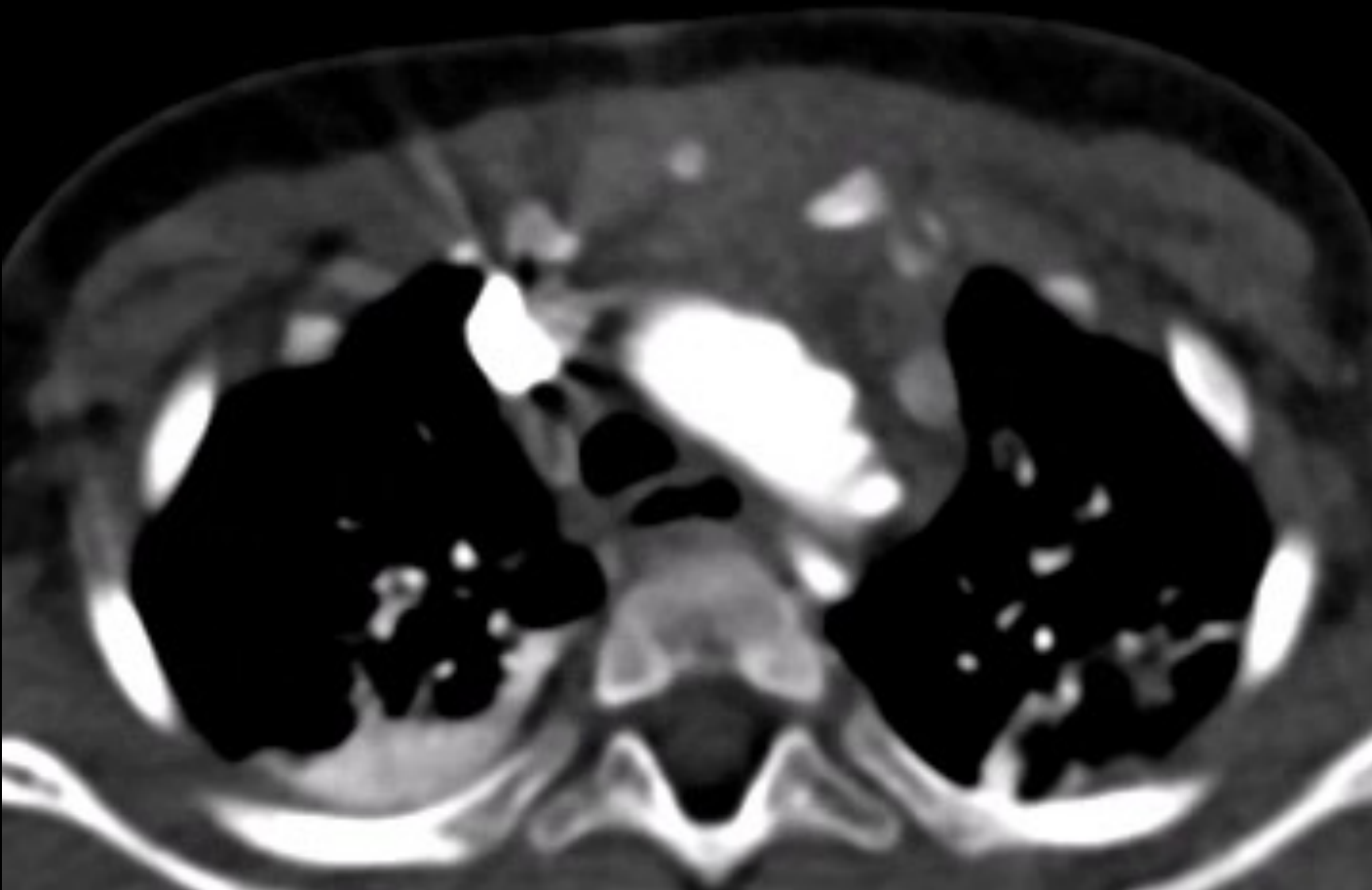
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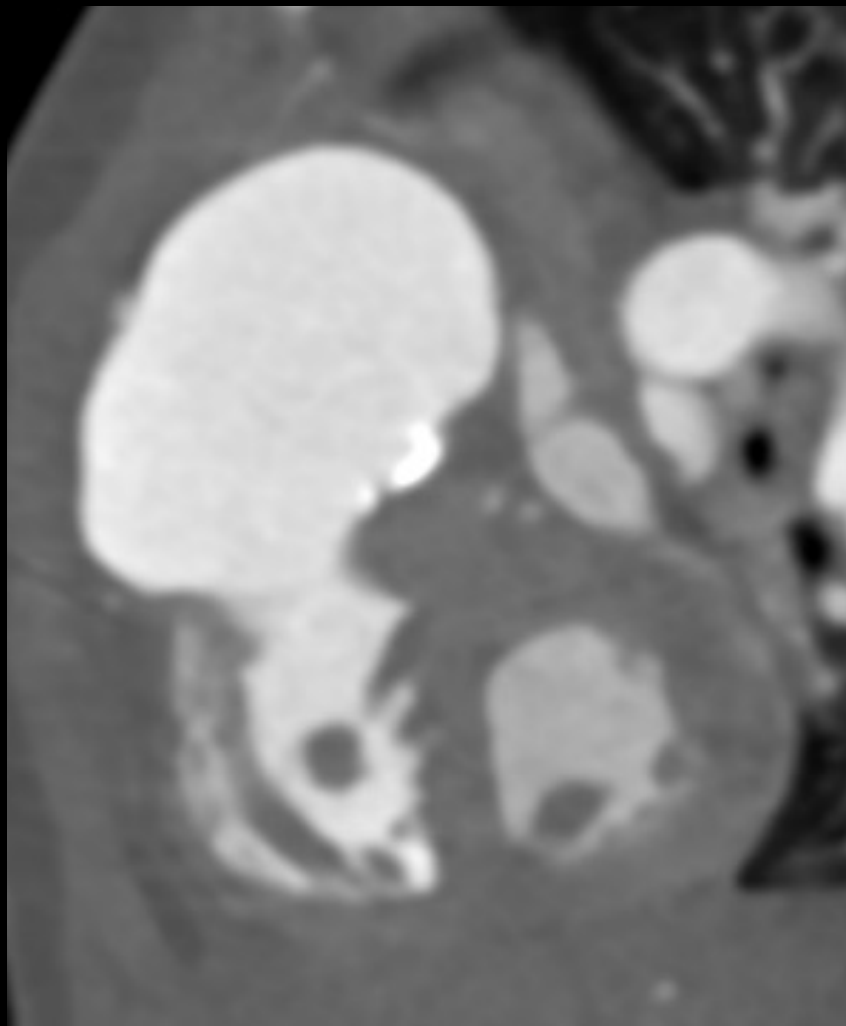
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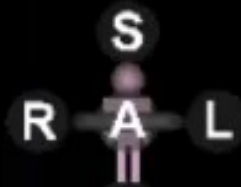
15 month old with TOF





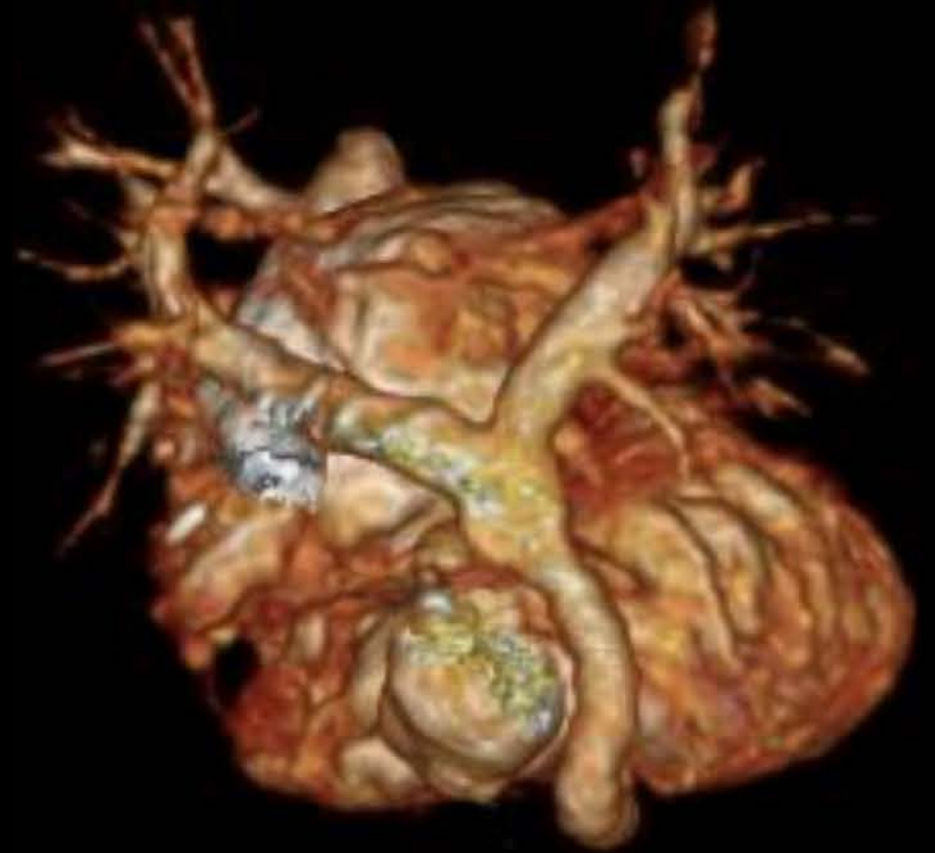
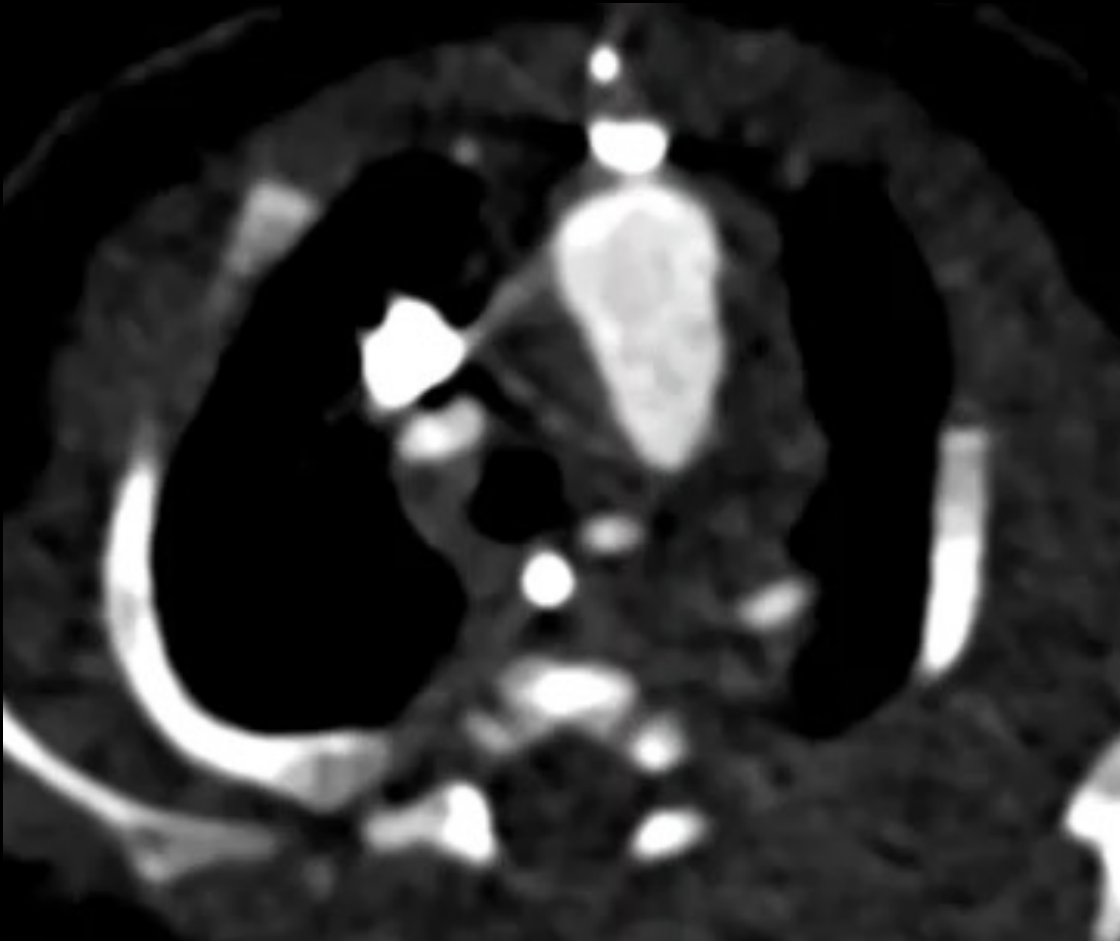


4/7/1 (40%)
HR 0
LAO 0
CRA 0

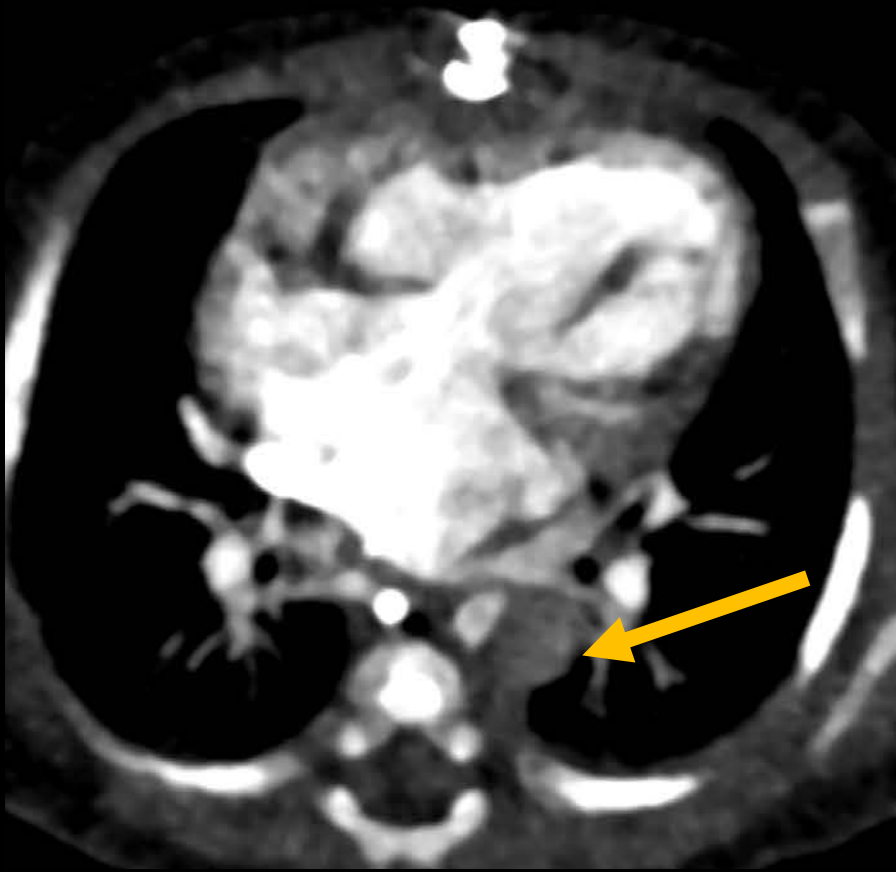


Free breathing with no sedation

6 week old HLHS s/p Sano with desaturations



Courtesy of Lorna Browne, MD
Children's Hospital Colorado



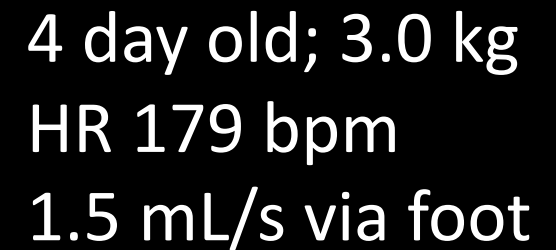
Type B Aortic Dissection post Sano
No sedation for CT

A hand-drawn anatomical diagram of a vascular system, likely representing a fetal or neonatal circulation. The diagram shows a network of vessels with various color-coded segments and labels. Key features include:

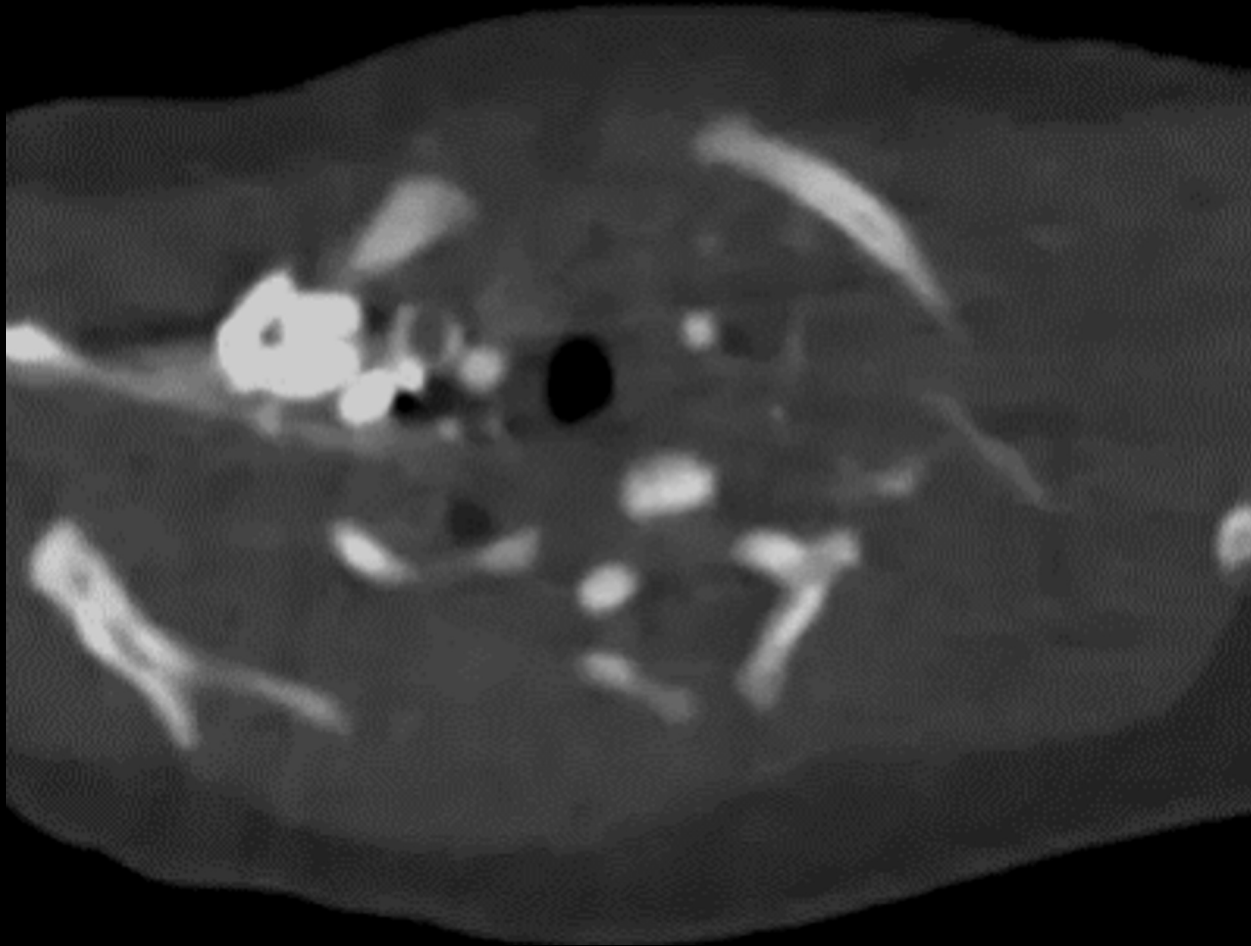
- Subclavian artery:** A large vessel at the top, labeled "Subclavian artery" with a circled "1" next to it.
- Anterior Agonist:** A vessel branching off the Subclavian artery, labeled "Anterior Agonist".
- MAPCA Purple:** A vessel segment labeled "MAPCA Purple".
- PDA Yellow:** A vessel segment labeled "PDA Yellow".
- RPA Blue:** A vessel segment labeled "RPA Blue".
- Blue LPA:** A vessel segment labeled "Blue LPA".
- Orange:** A vessel segment labeled "Orange".
- Right Middle:** A label on the left side, "Right Middle".
- RLL:** Multiple labels for "RLL" (Right Lung Lobes) are scattered throughout the diagram, indicating the branching pattern to the lungs.
- LL:** Labels for "LL" (Left Lung Lobes) are also present on the right side.
- AP, H, L, B:** A vertical list of letters on the far left: "AP", "H", "L", "B".

The drawing is a schematic representation of the complex vascular anatomy, showing the connections between the heart, lungs, and other organs.

Drawing courtesy of
Ammie White, MD



8 day old w/ TAPVR to coronary sinus, pulmonary stenosis & TA



8 day old; 2.7 kg
HR 162 bpm
0.8 mL/s via right hand

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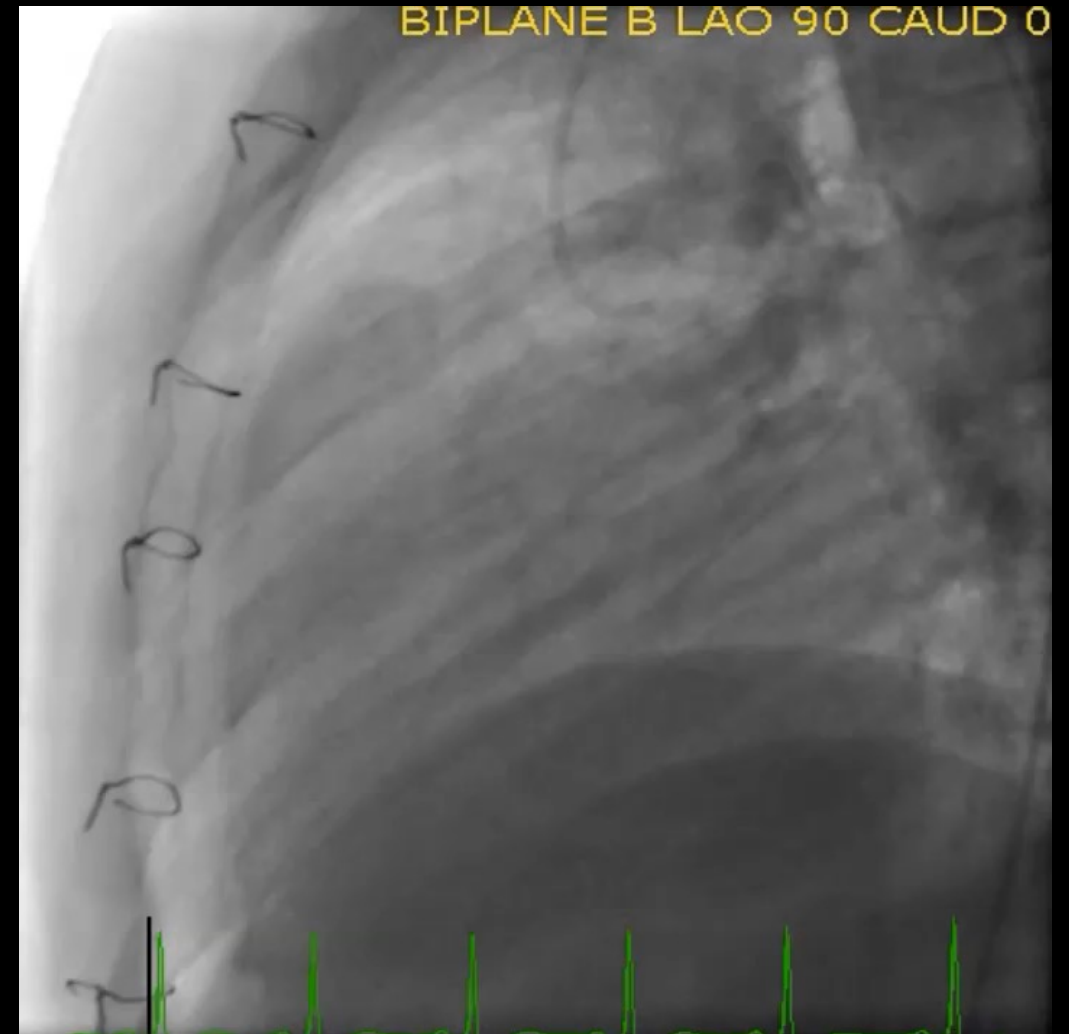
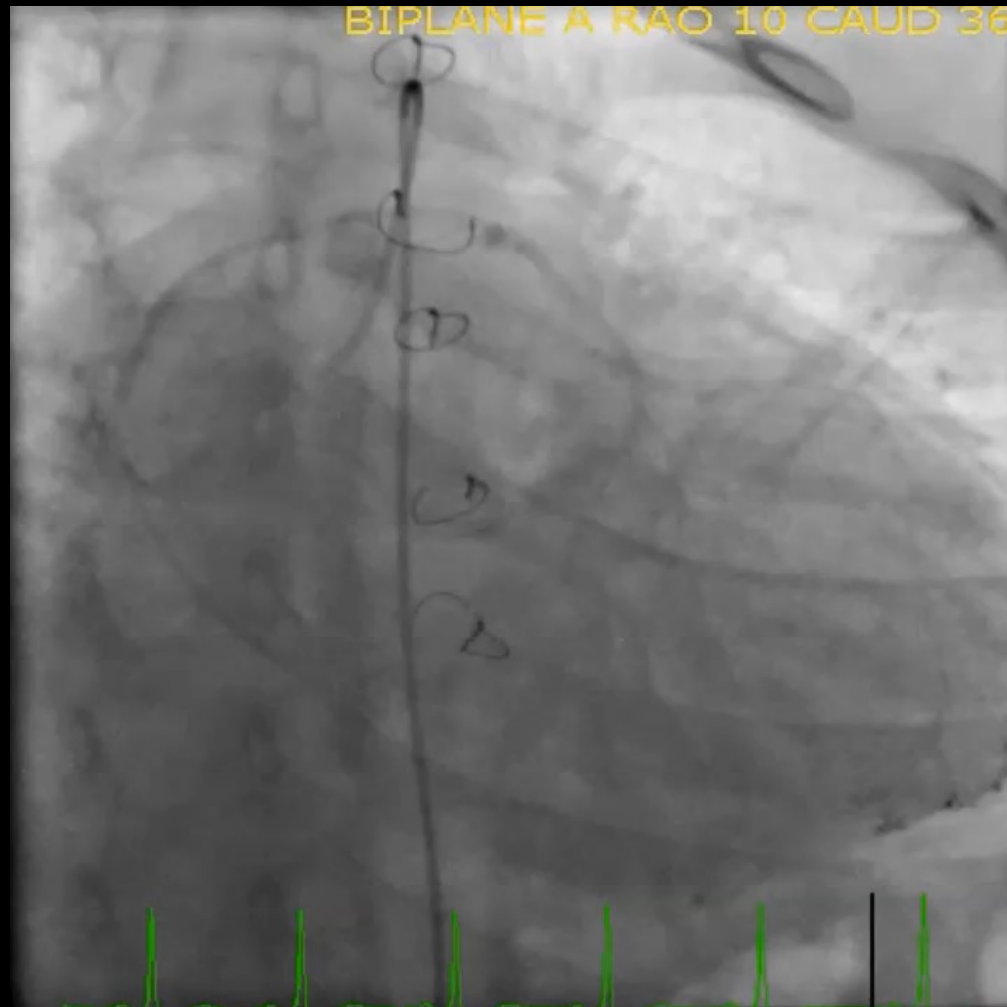
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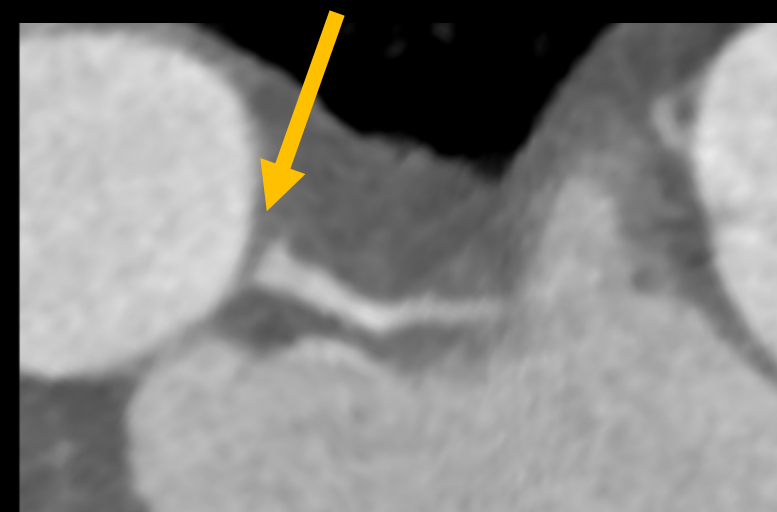
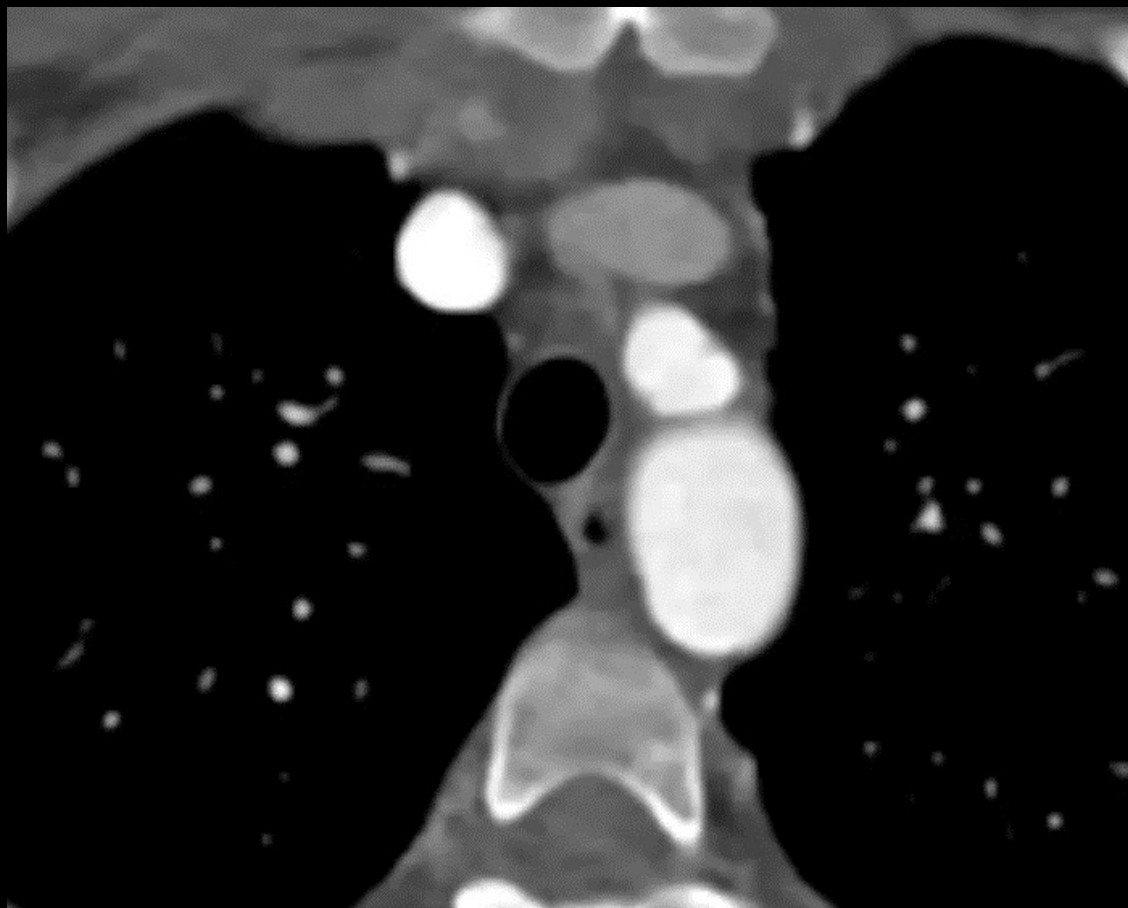
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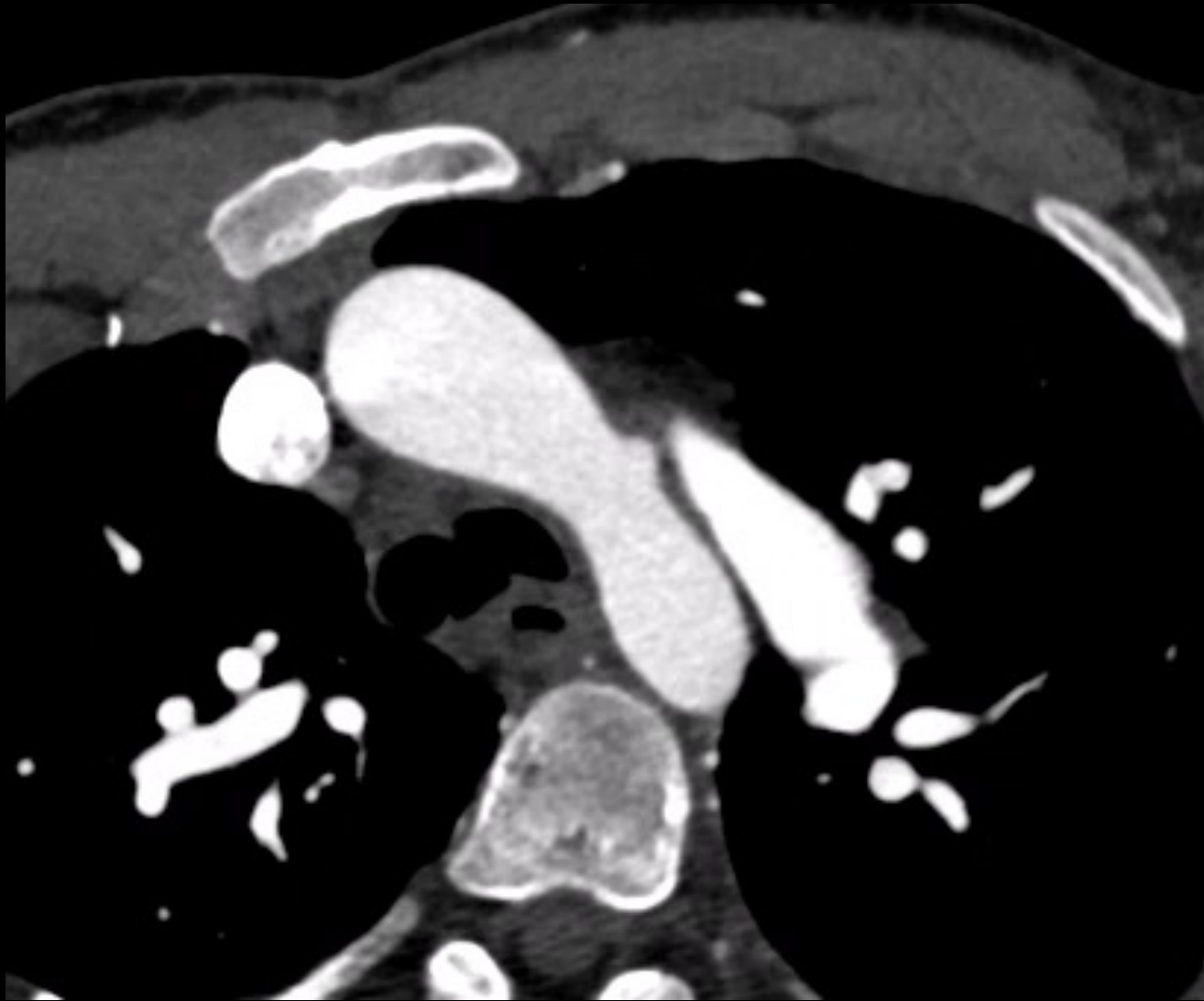
13 yo h/o ASO now with perfusion defect





Coronary Imaging with High Spatial Resolution

16 year old TOF post repair, pre-evaluation valve





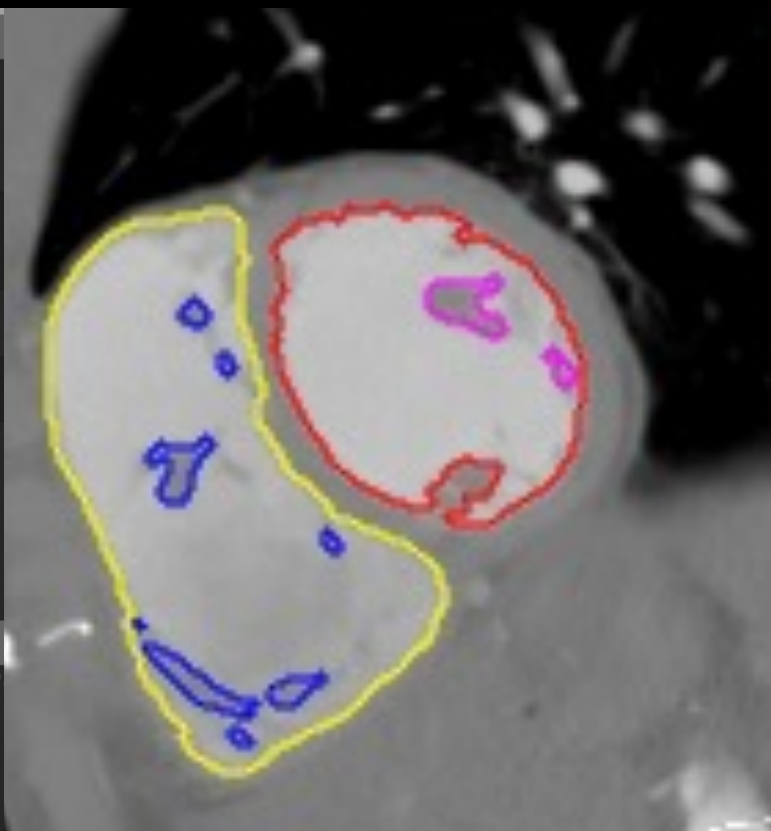
SAX3D Stack LV Function

EDV:	100.50 ml
ESV:	38.50 ml
SV:	62.00 ml
EF:	61.69 %
CO:	4.46 l/min
CI:	3.23 l/min/m ²
HR:	72.0/min
Pap Mass (Diast):	3.08 g
Pap Mass (Syst):	0.79 g
Phase Diastole:	20
Phase Systole:	8
EDV/H:	62.39 ml/m
EDV/BSA:	72.79 ml/m ²
ESV/H:	23.90 ml/m
ESV/BSA:	27.89 ml/m ²
SV/H:	38.49 ml/m
SV/BSA:	44.91 ml/m ²

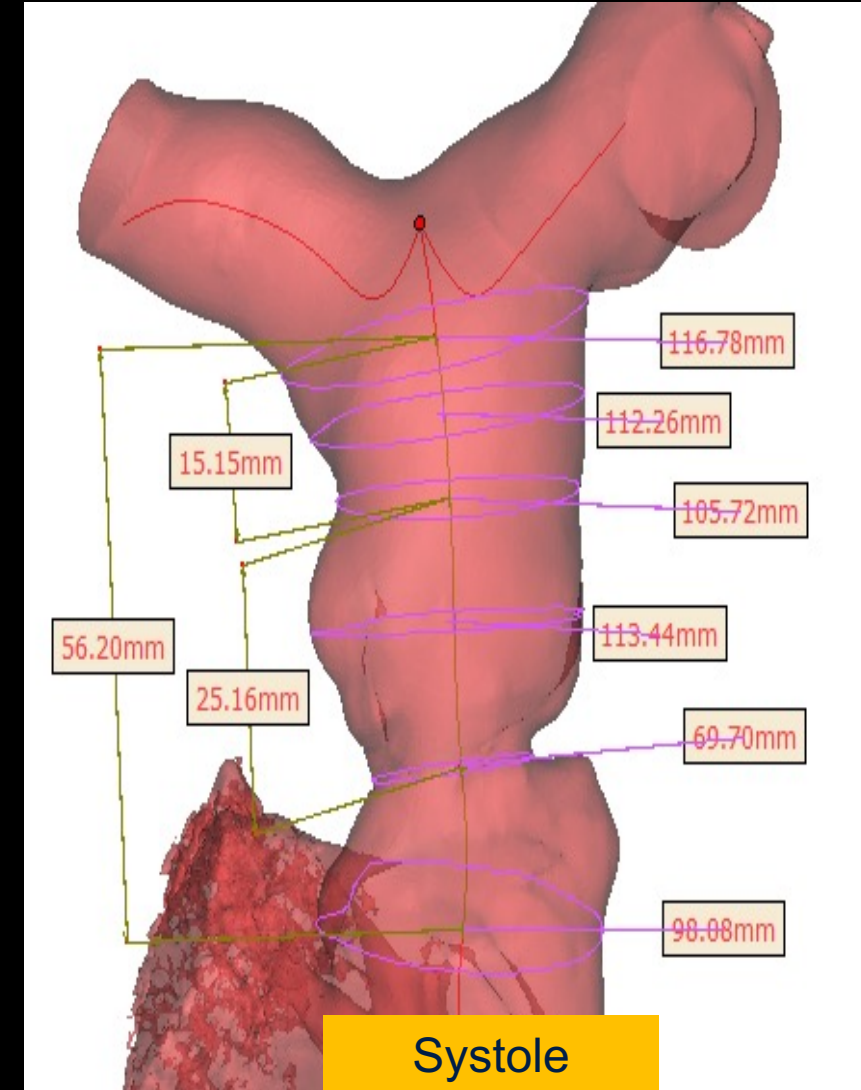
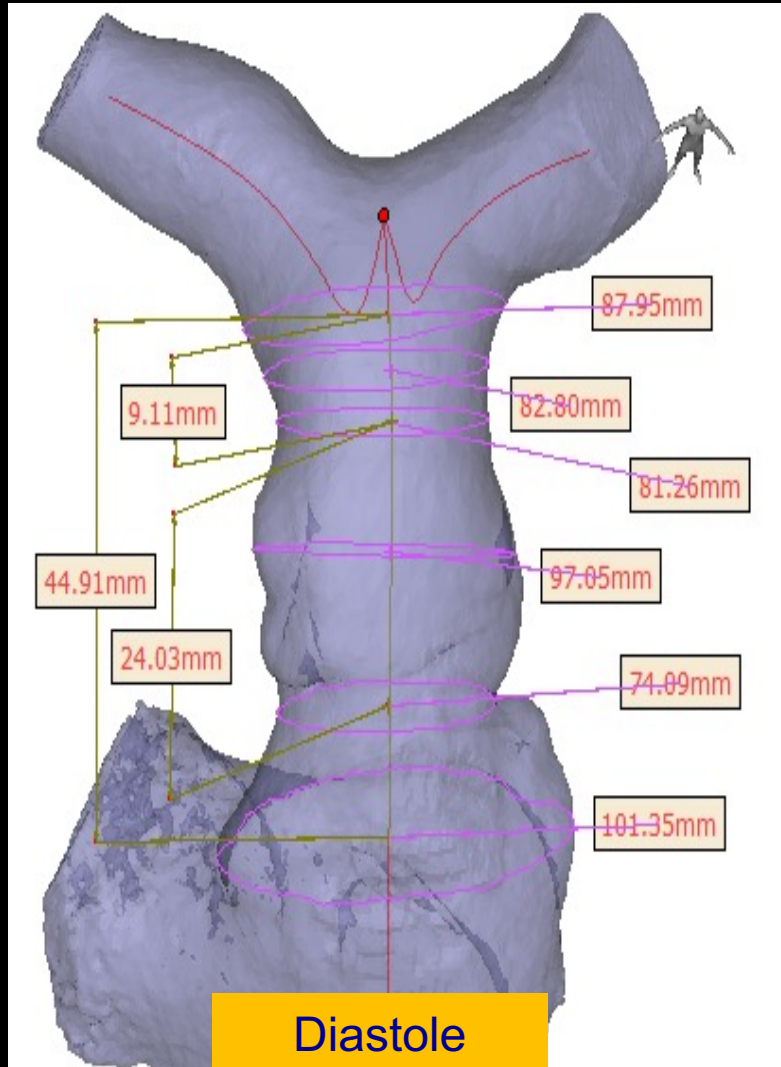
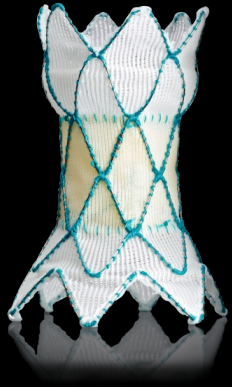
SAX3D Stack RV Function

number of slices used to calculate syst. (phase 8: 1

RVEDV:	241.84 ml
RVESV:	115.35 ml
RVSV:	126.49 ml
RVEF:	52.30 %
RVCO:	9.11 l/min
RVCI:	6.60 l/min/m ²
HR:	72.0/min
RV Pap Mass (Diast):	11.02 g
RV Pap Mass (Syst):	4.90 g
Phase Diastole:	20
Phase Systole:	8
RVEDV/H:	150.12 ml/m
RVEDV/BSA:	175.16 ml/m ²
RVESV/H:	71.60 ml/m
RVESV/BSA:	83.55 ml/m ²
RVSV/H:	78.51 ml/m
RVSV/BSA:	91.61 ml/m ²

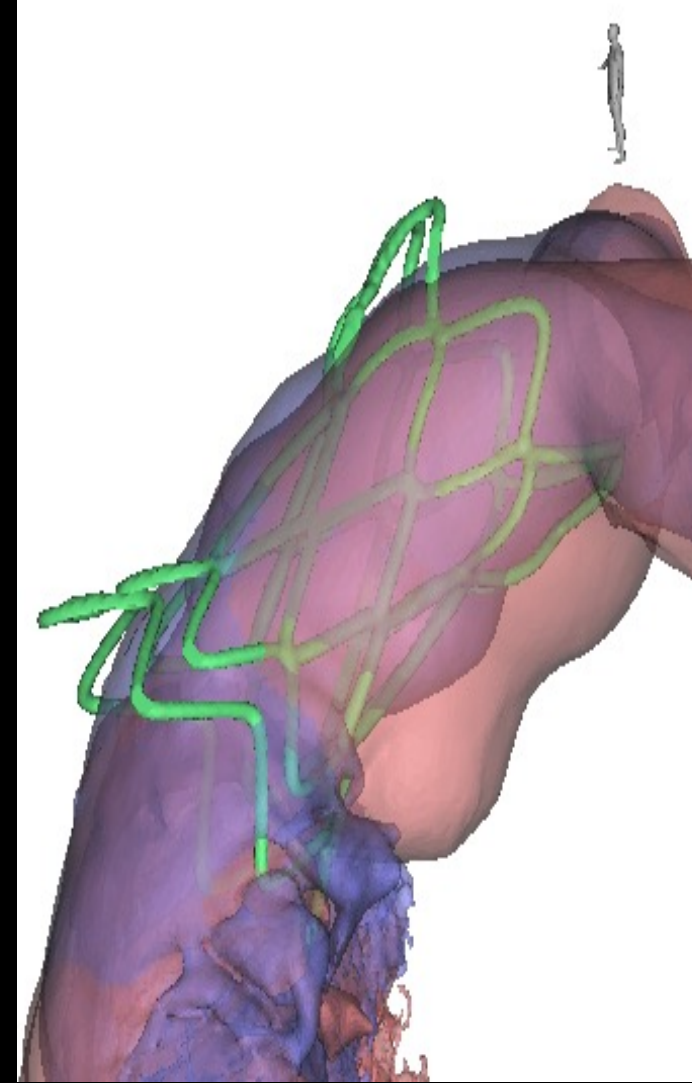
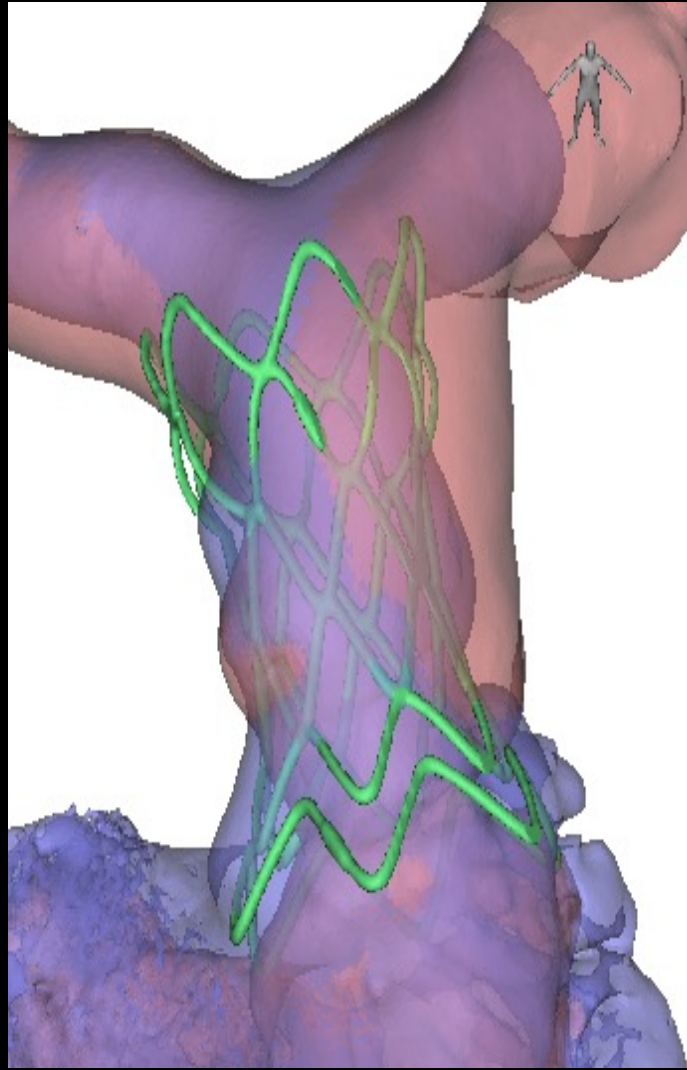
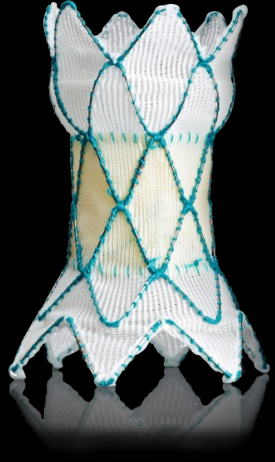


Virtual Models Based on CT scans



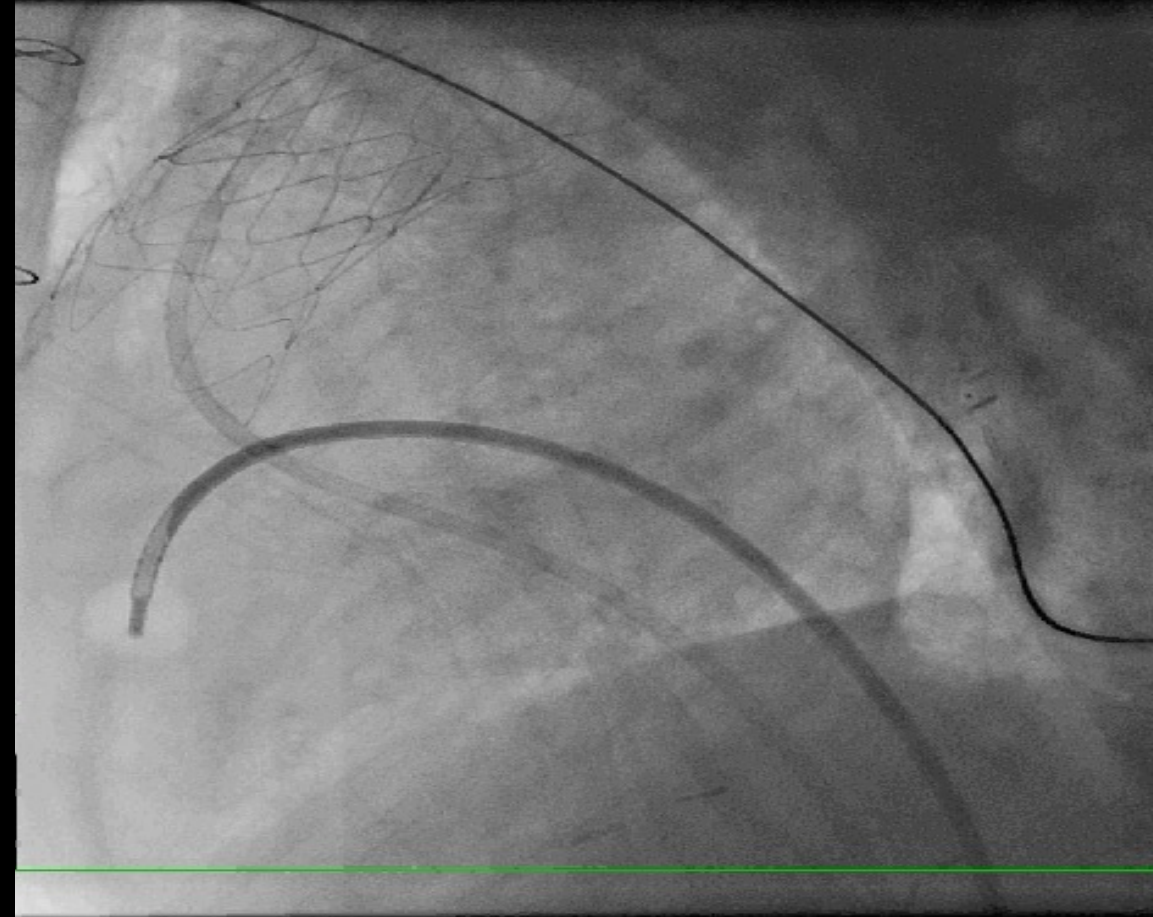
Courtesy of Matthew Gillespie, MD; Children's Hospital of Philadelphia

Anatomy with device overlay



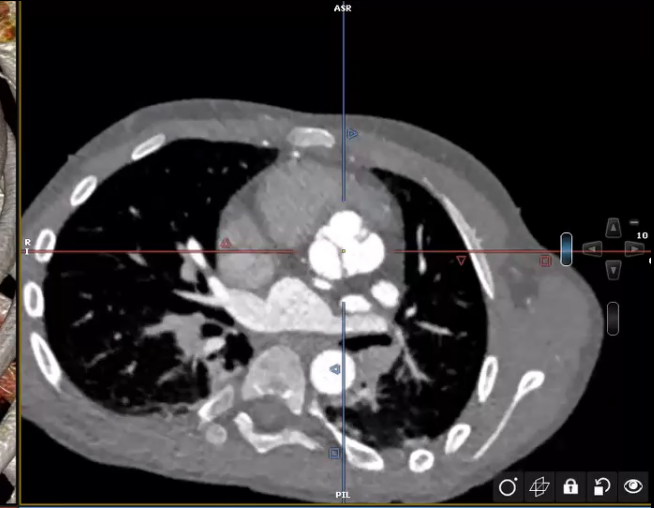
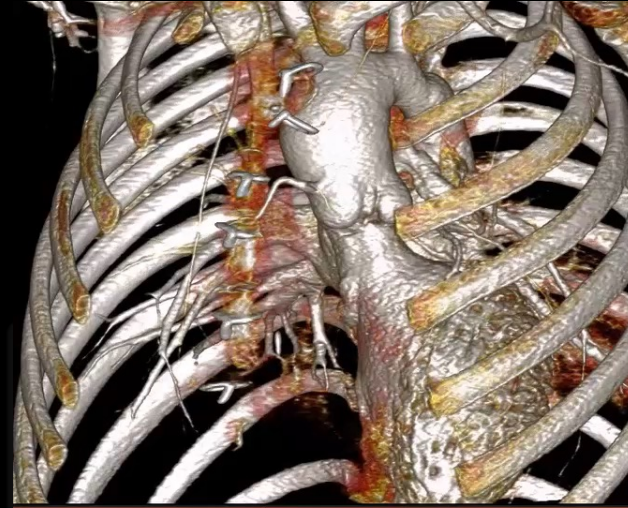
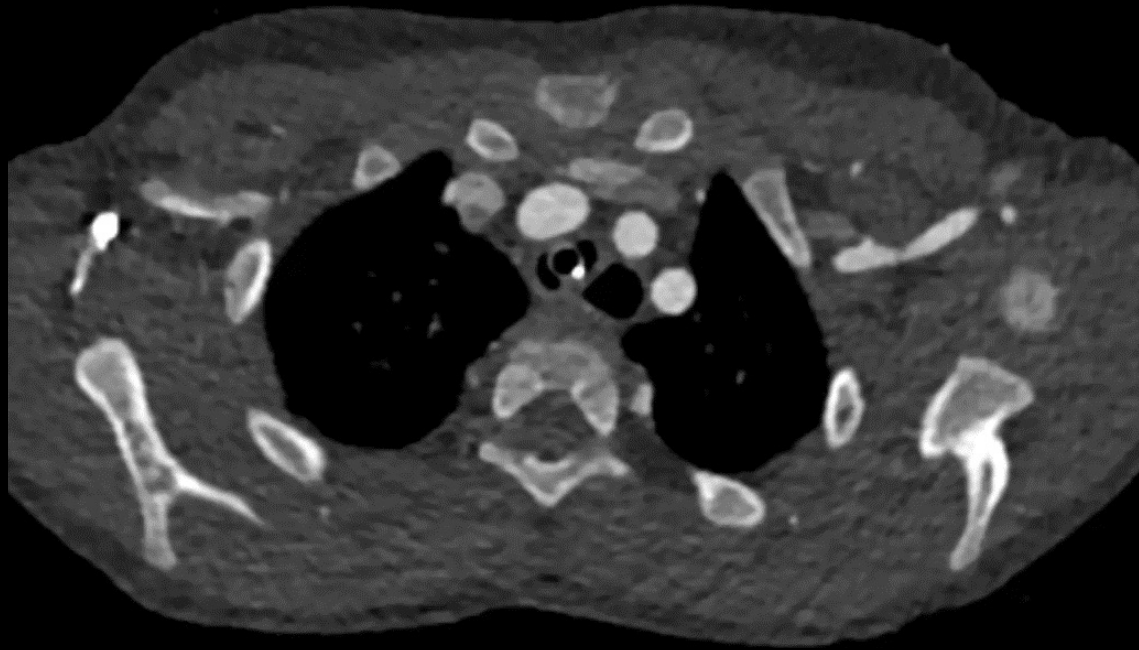
Courtesy of Matthew Gillespie, MD; Children's Hospital of Philadelphia

RV gram post device placement



Courtesy of Matthew Gillespie, MD
Children's Hospital of Philadelphia

6 yo with a h/o DORV s/p ASO w/ neo-aortic regurgitation

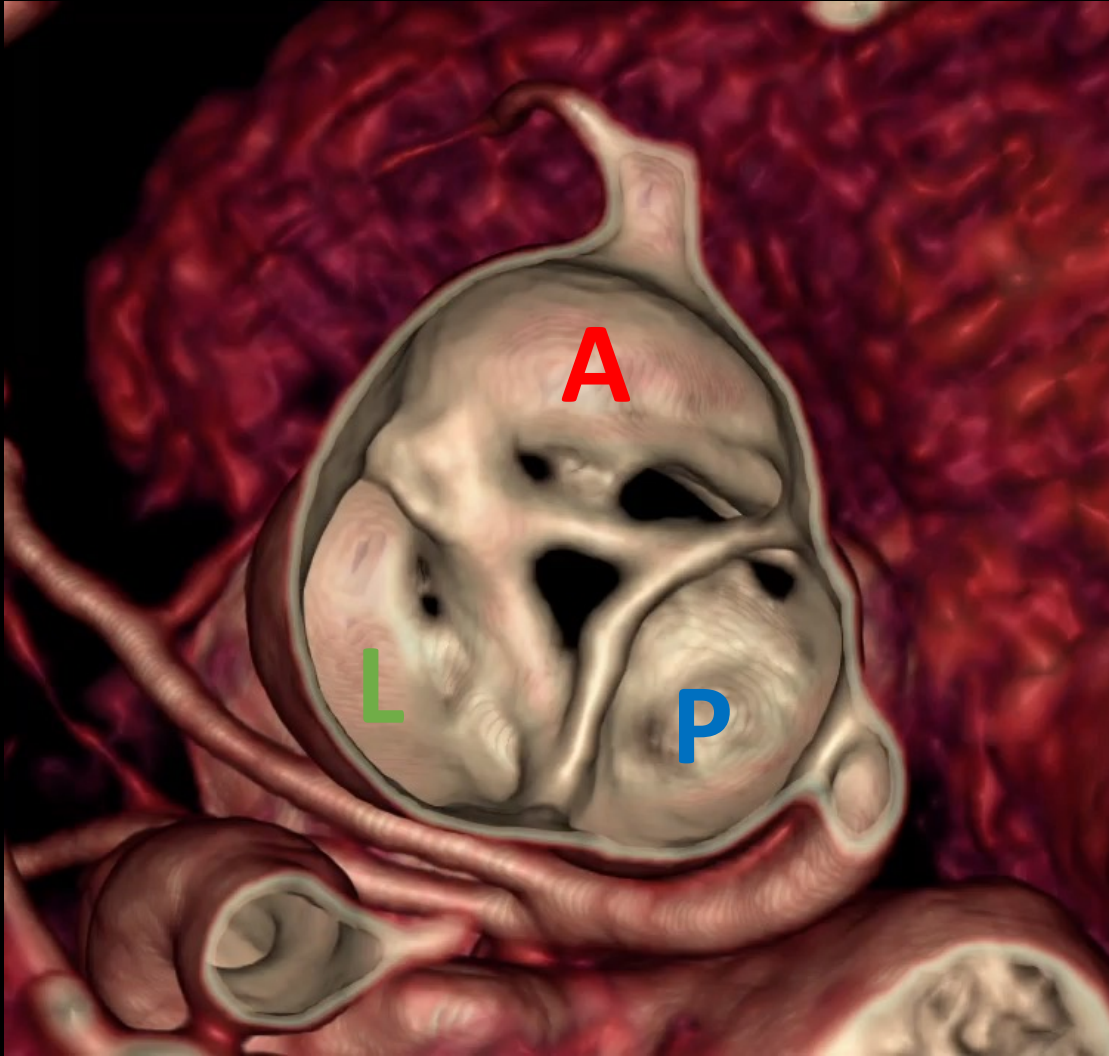


CTA Volume Rendering

Volume rendering courtesy of
Matt Jolley, MD
Children's Hospital of Philadelphia
@JolleyLab



Leaflet Morphology



Anterior-Facing
Leftmost (Noncoronary)
Posterior-Facing

Volume rendering courtesy of
Matt Jolley, MD
Children's Hospital of Philadelphia
@JolleyLab

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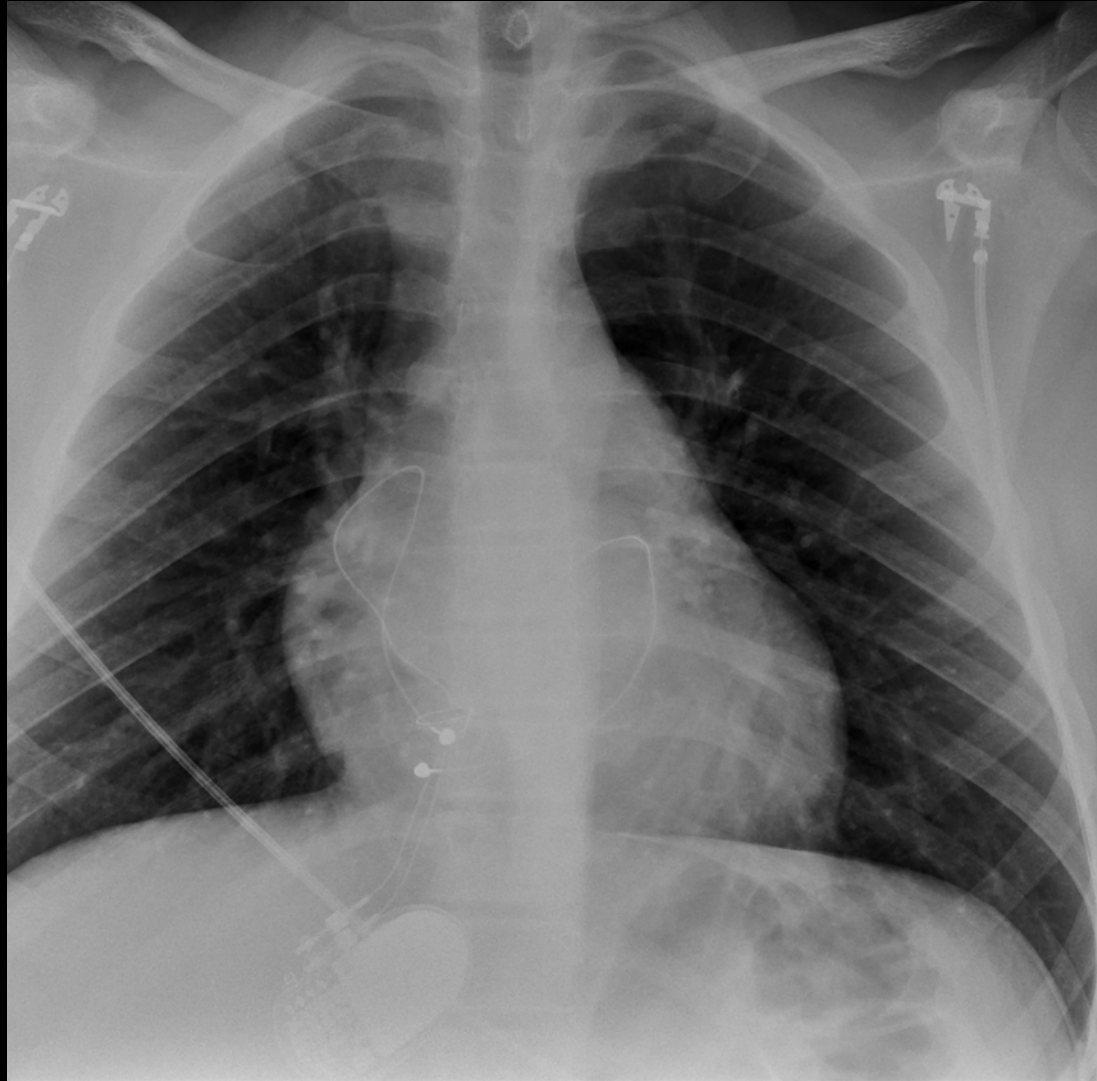
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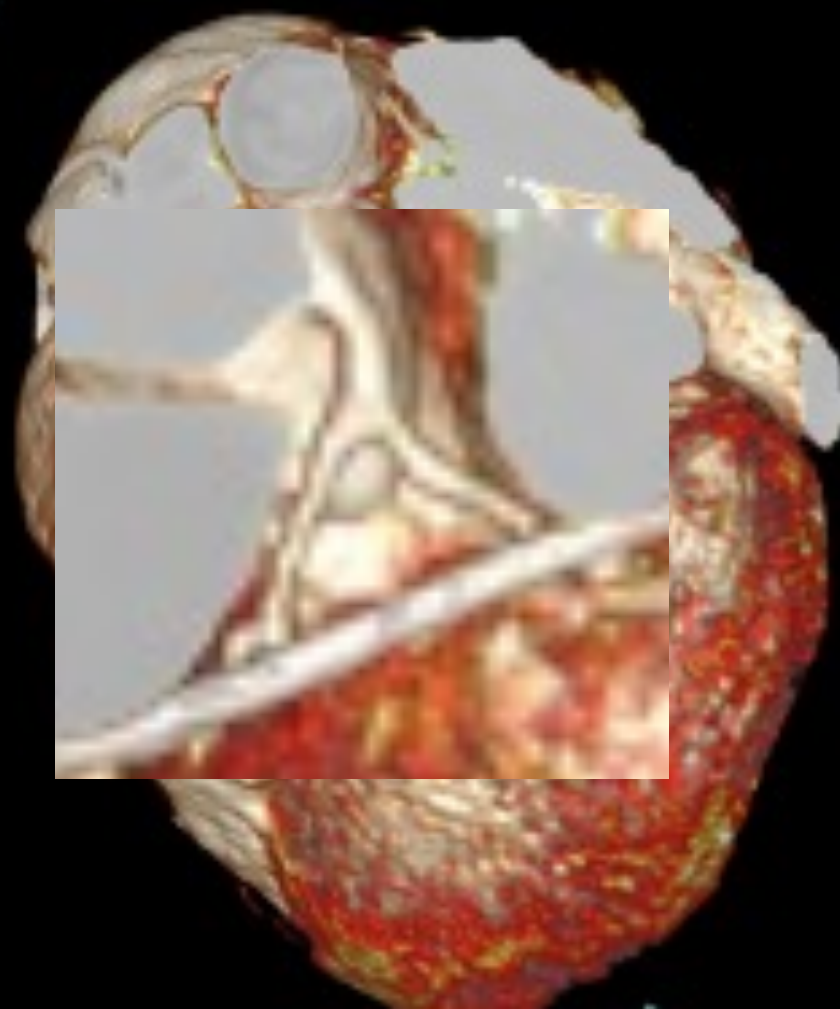
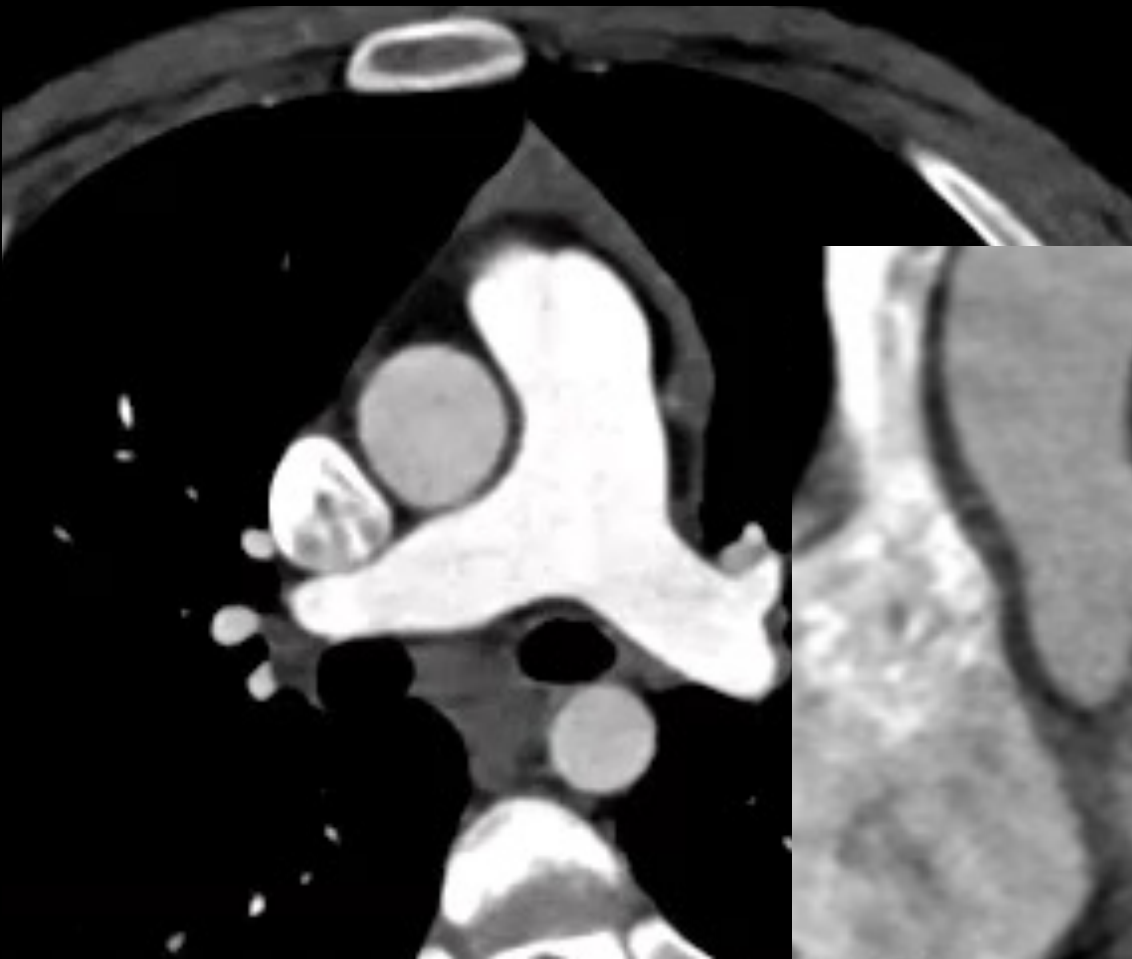
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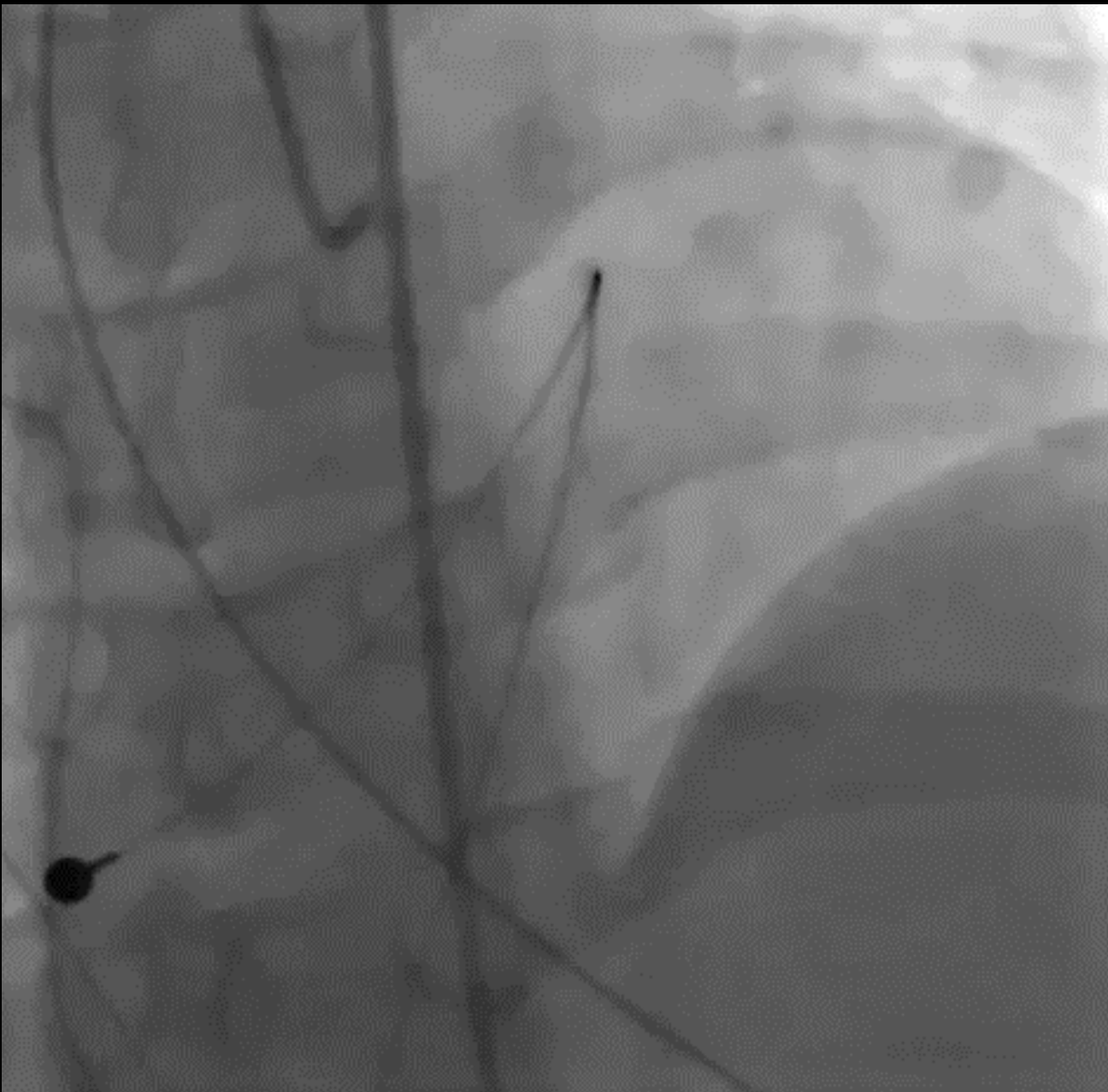
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13 year old with epicardial pacer for heart block





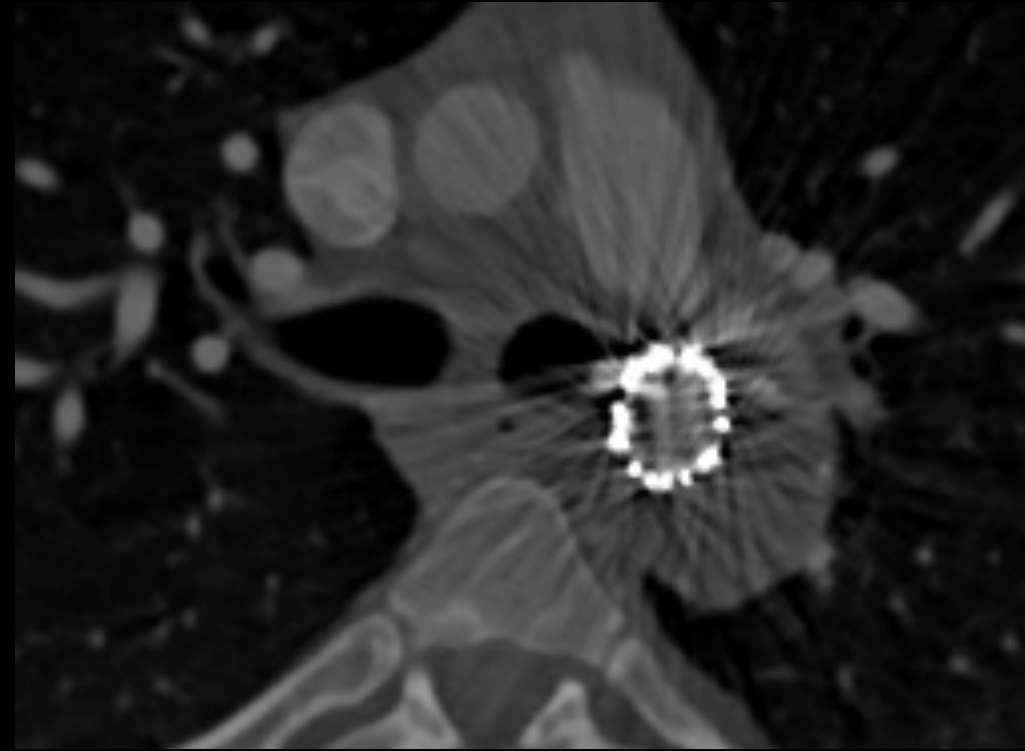
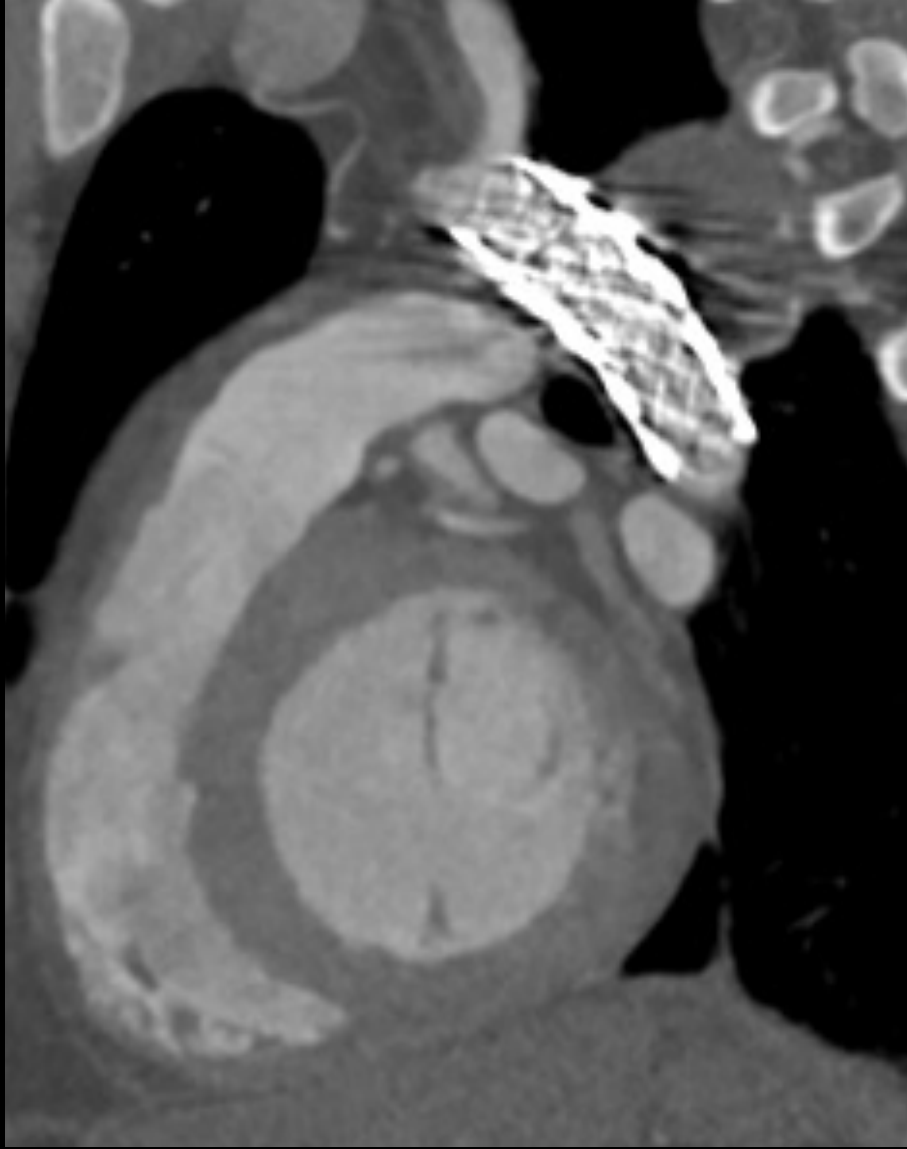


Coronary
assessment in
presence of lead

Surgical removal of
pacemaker lead

20 year old with Williams syndrome h/o coarctation repair

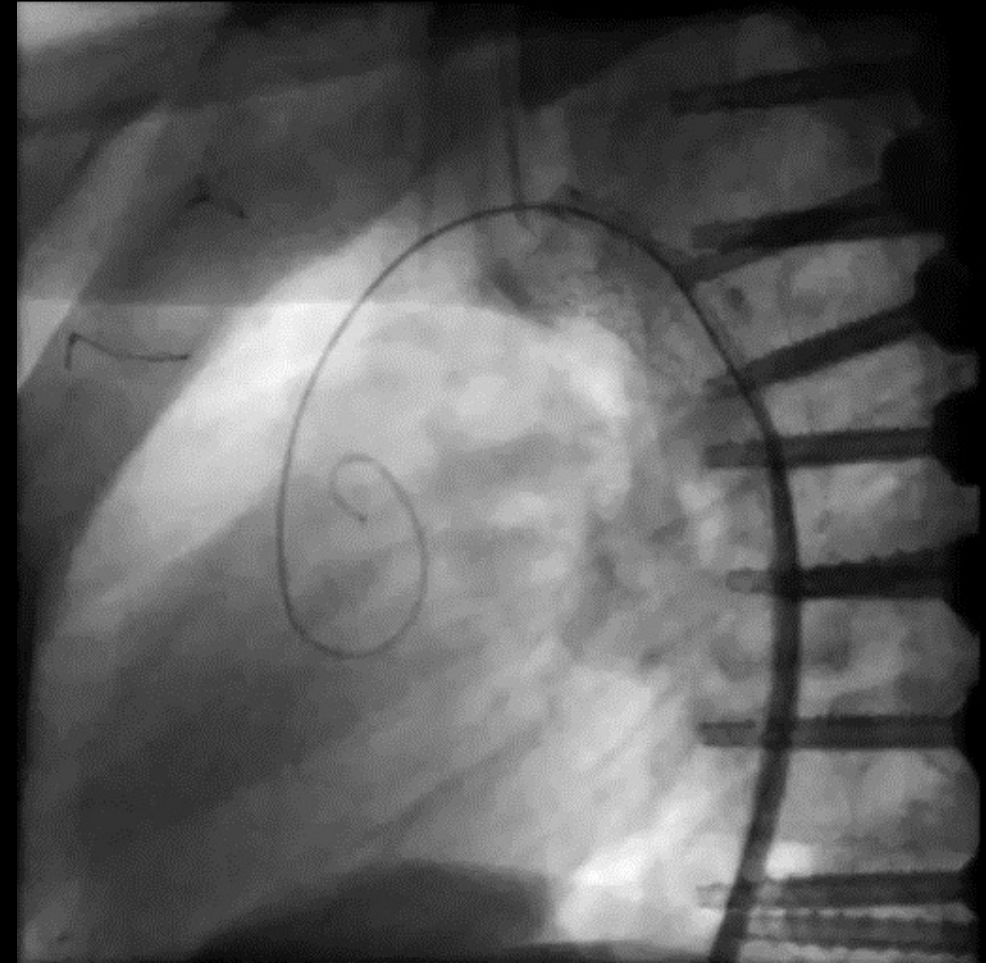
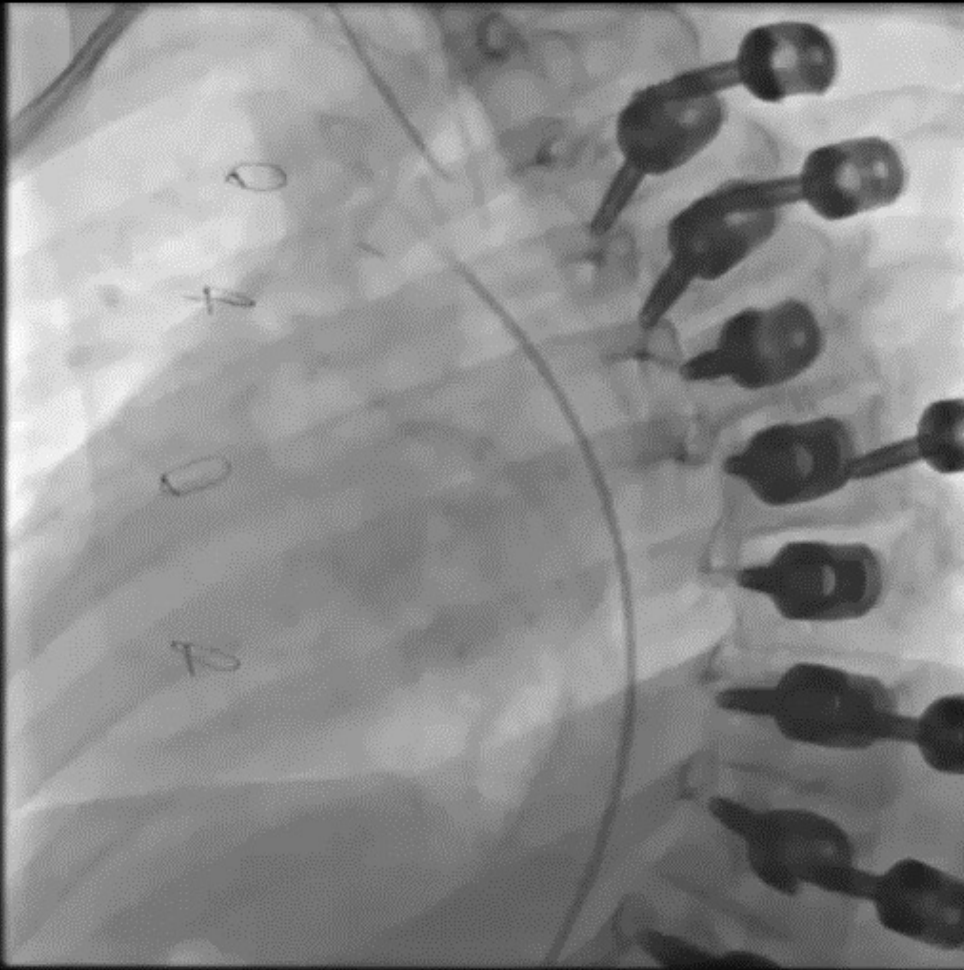




Evaluation of aneurysm
post stent

14 year old h/o coarctation and spinal rods





CT evaluation in presence of spinal hardware

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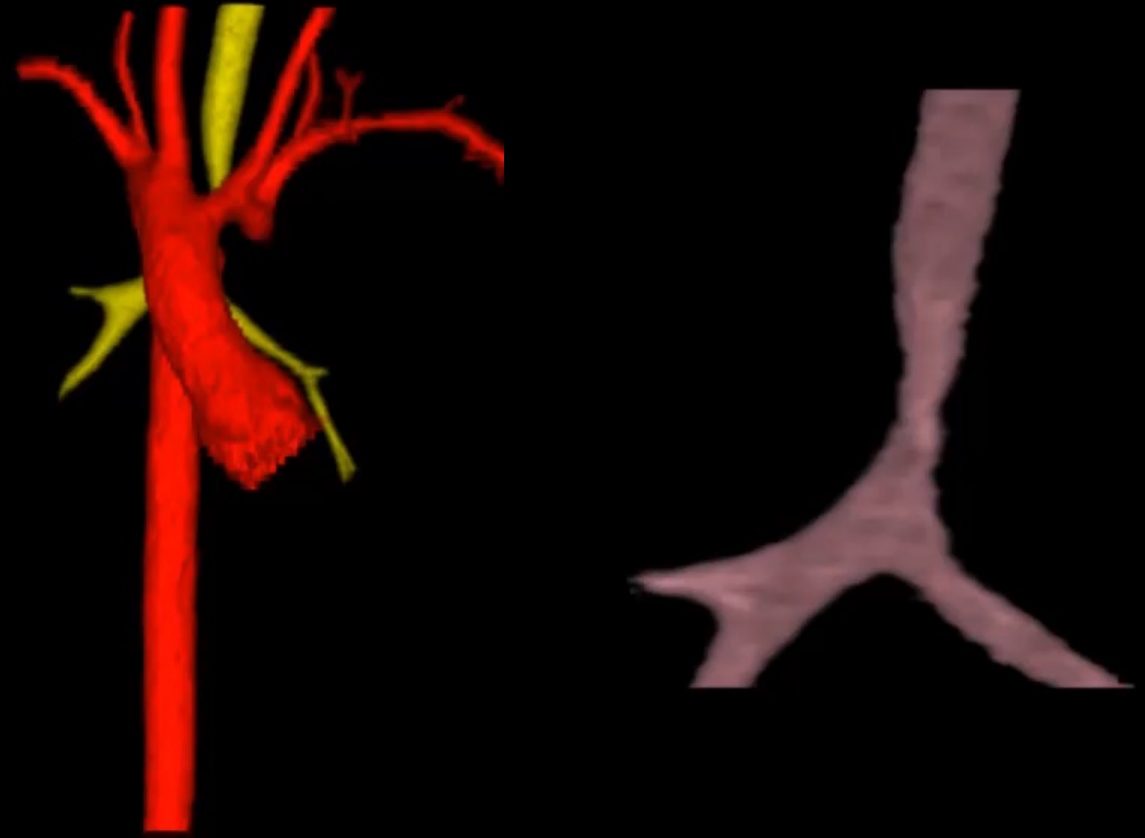
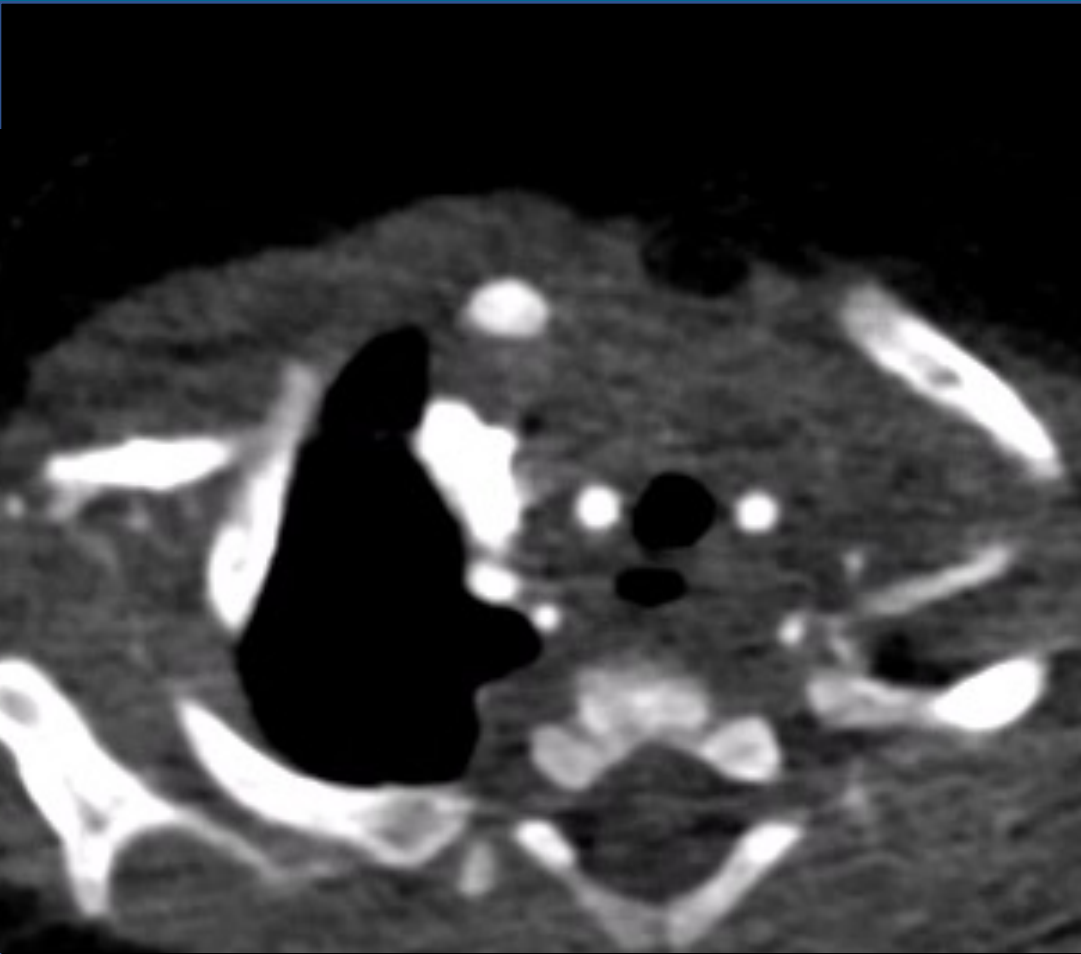
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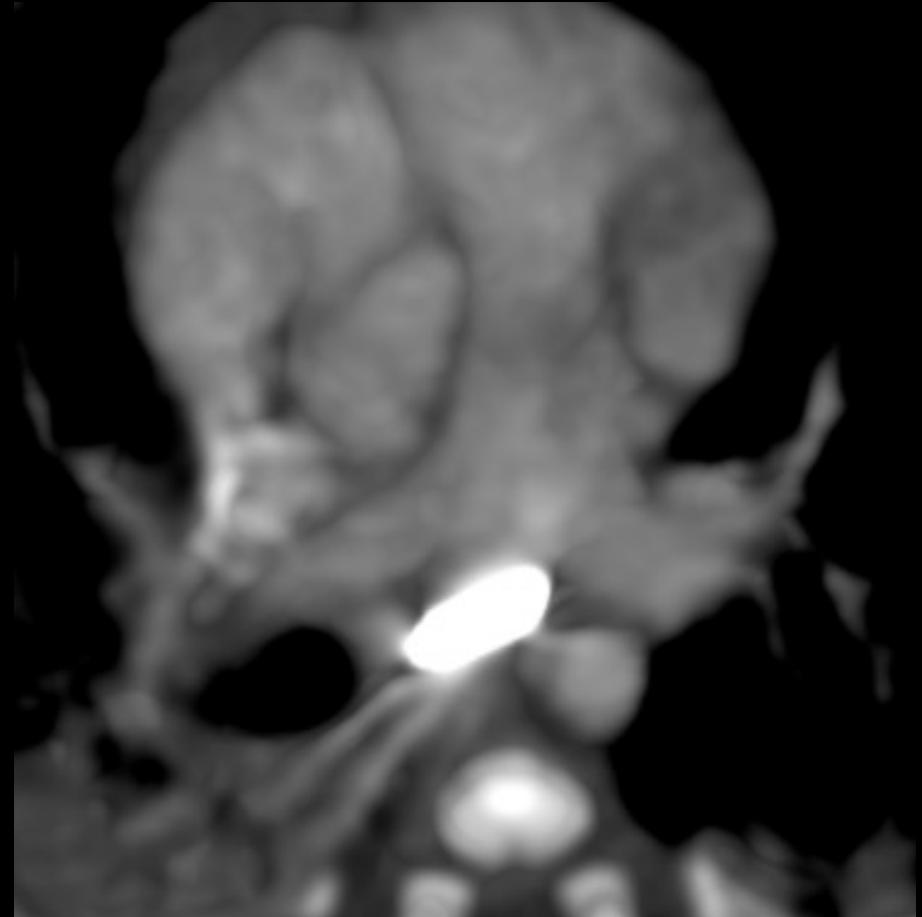
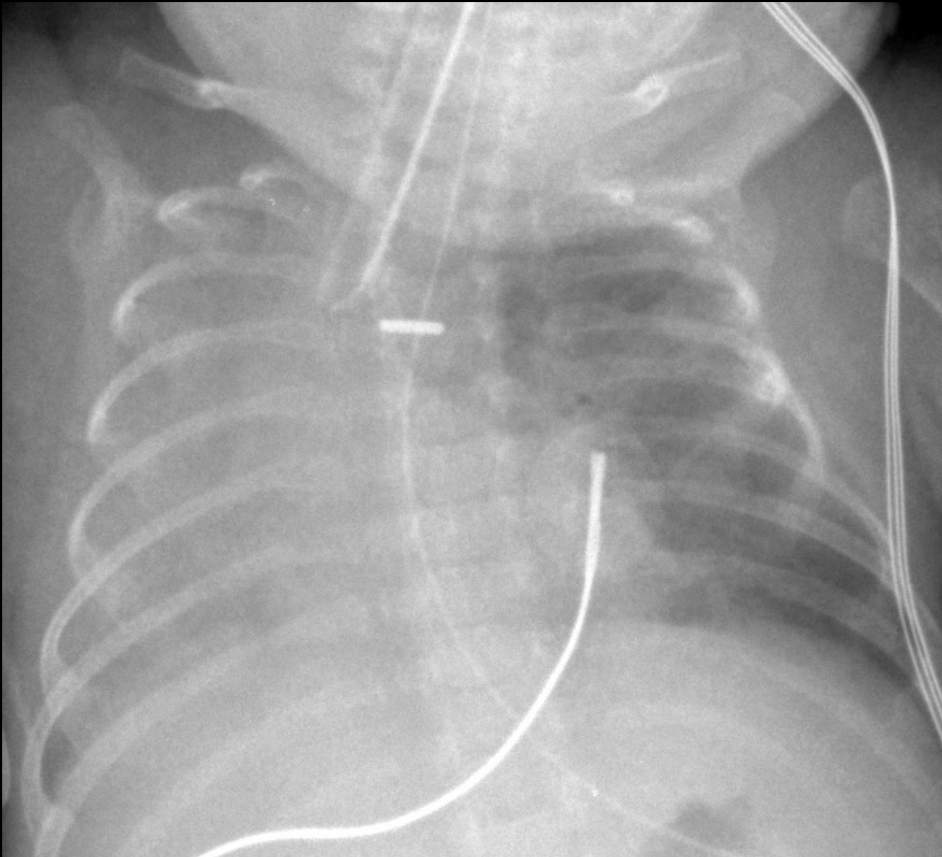
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2 mo old with double aortic arch and stridor



27 week old with respiratory distress

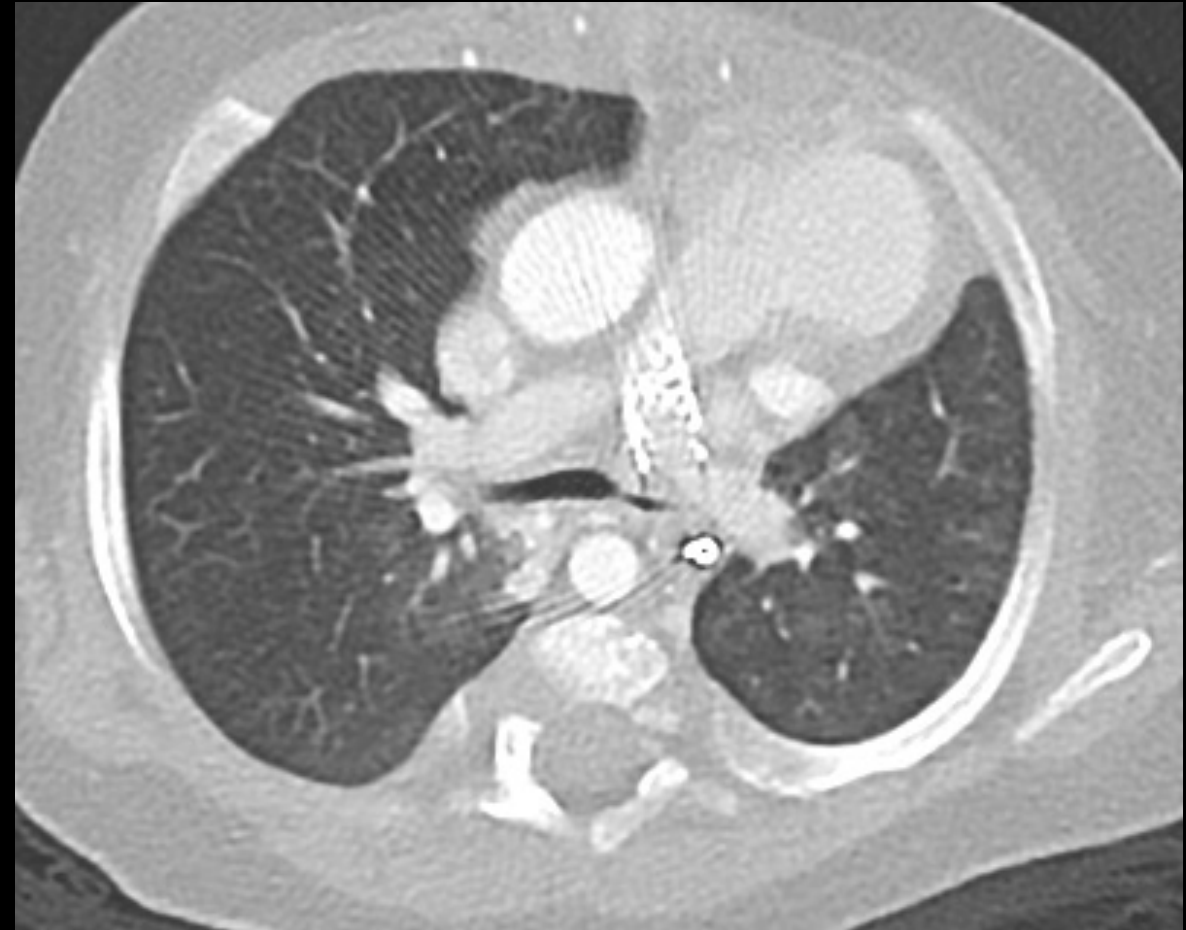
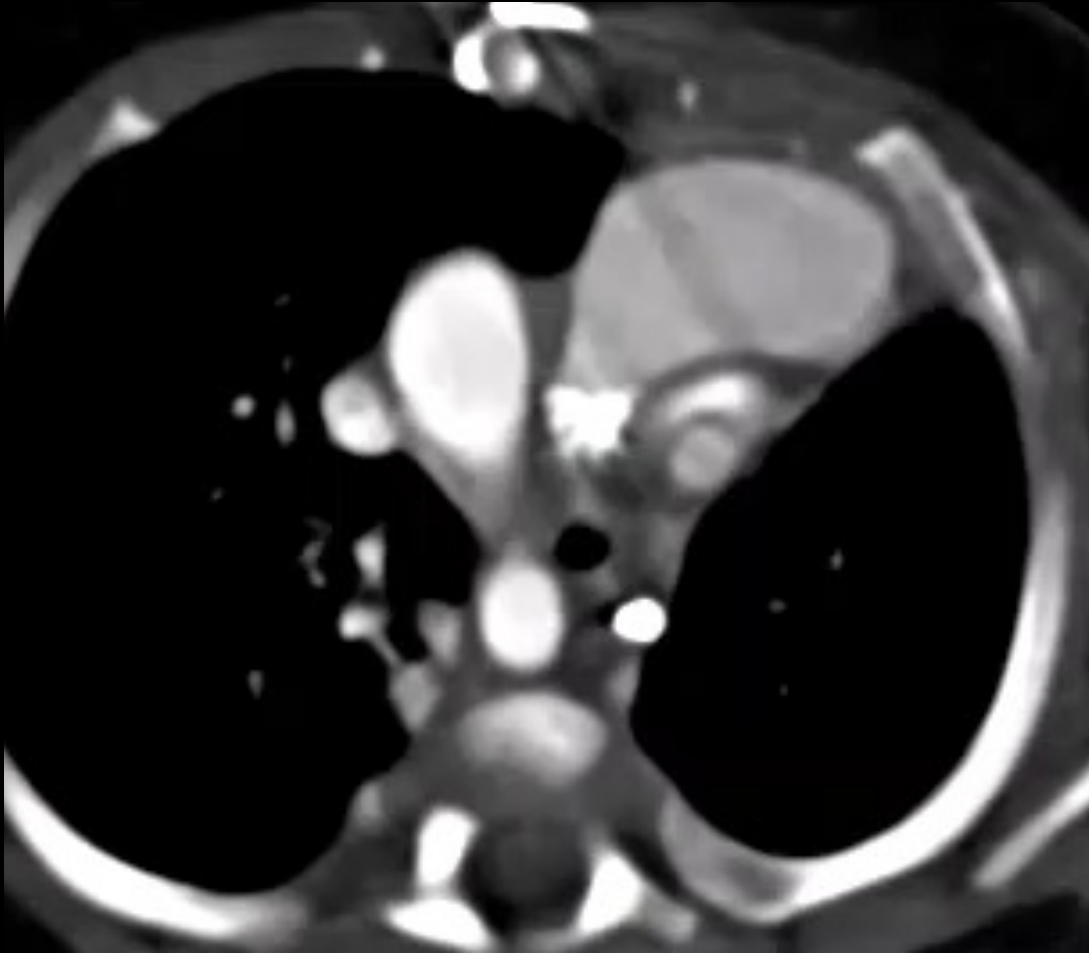


Courtesy of Lorna Browne, MD
Children's Hospital Colorado



PDA ligation of Left Main Bronchus
Airway evaluation with an adjacent clip

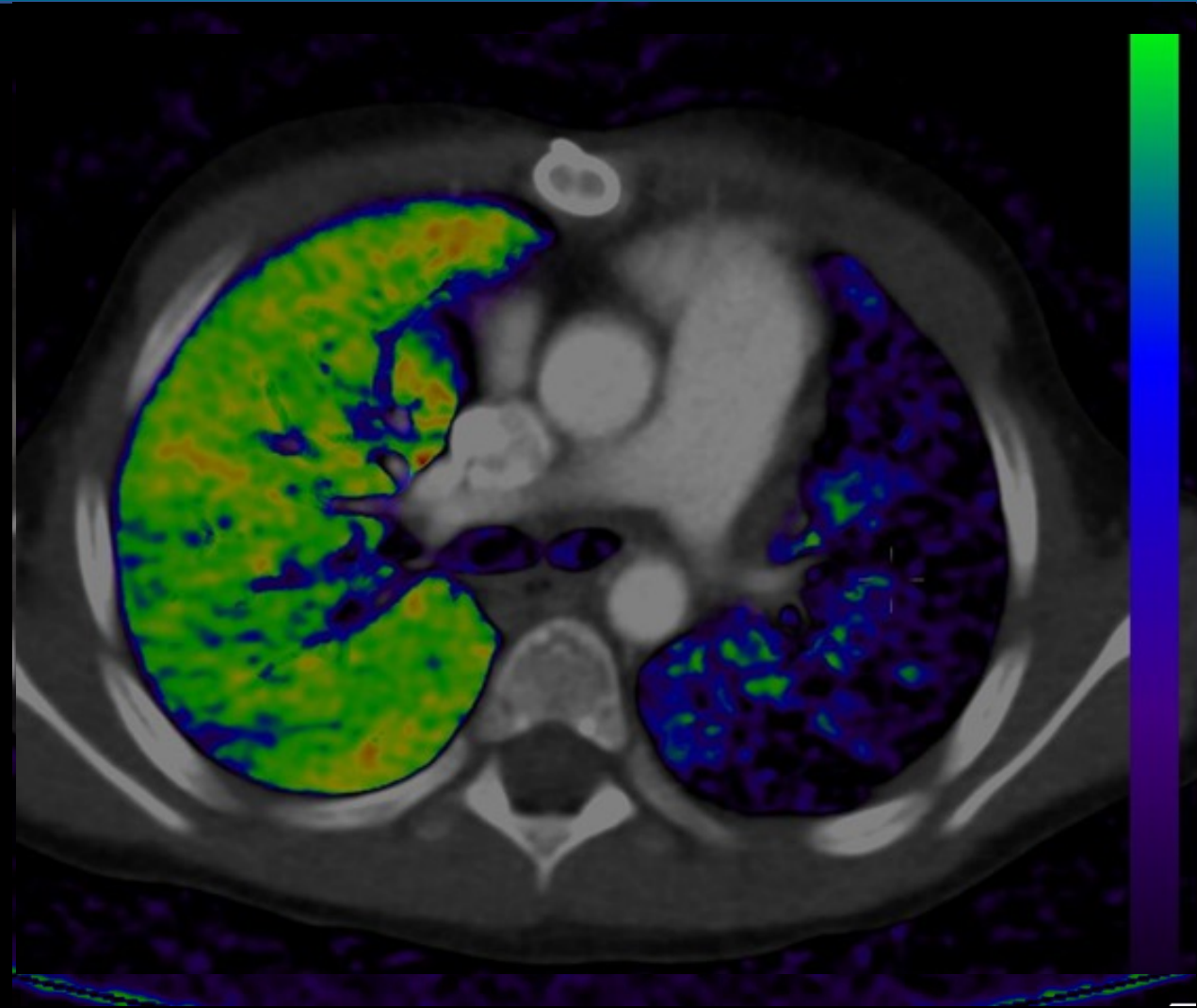
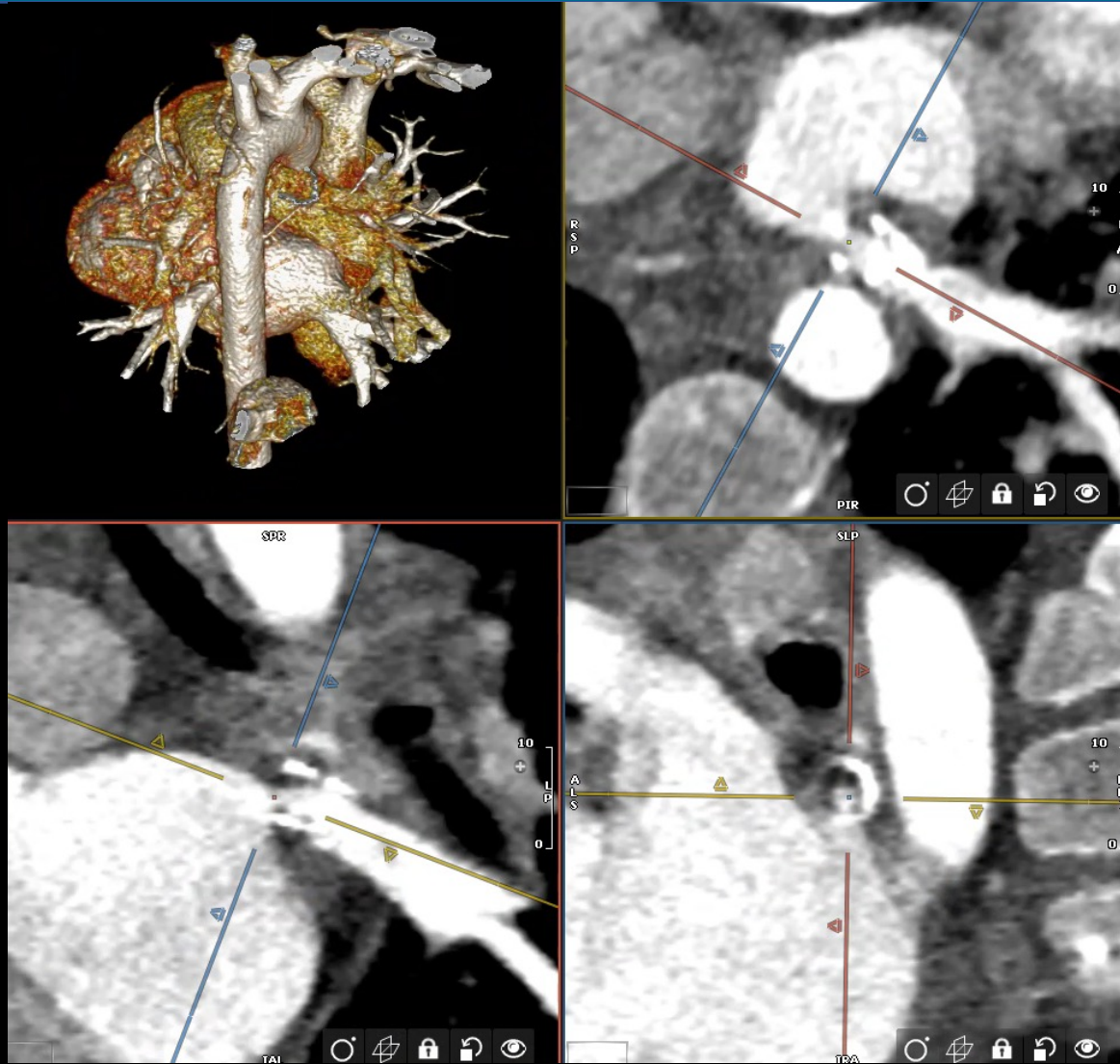
4 mo old w/ TOF s/p stent. Concern for airway compression





Dynamic airway evaluation in the
presence of a stent

5 yo w/ LUPV atresia and LLPV stenosis.



Conclusion

- Cardiac CT has an important role in the evaluation of CHD
 - Fast, less need for sedation with high spatial resolution
 - Better with artifacts, stents
 - Important for evaluation of extra-cardiac structures

Cardiac CTA is an essential tool that aids presurgical and postsurgical evaluation of cardiac disease

Acknowledgements – Cardiac Imaging Team

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Thank you!

Questions?
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