Coronary Artery Imaging

K. Scott Kirby, CVT, RDCS (AE PE), FASE

September 7, 2024

Children's Hospital Colorado
Here, it's different.™

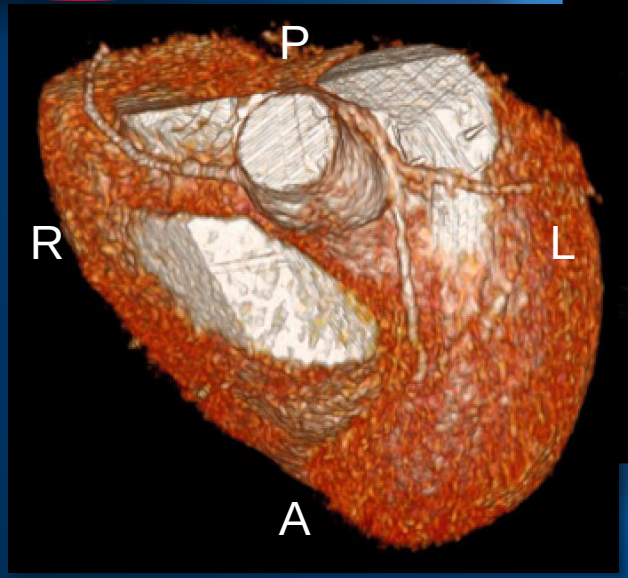
I have no financial disclosures

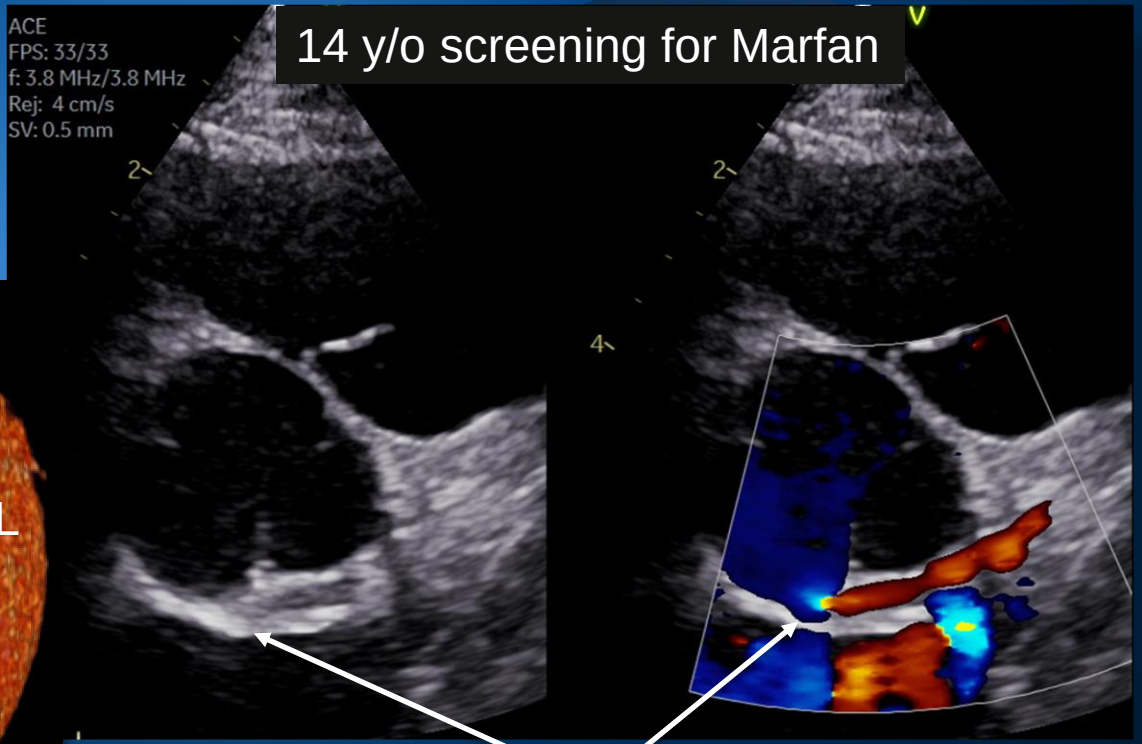
Topic Roadmap

Why image coronaries in the young?

Risk of cardiac arrest and/or sudden death with anomalous origins or course

- Chest pain w/ exertion
- Syncope
- ~~Abnormal ECG~~
- Incidental finding





Why image coronaries in the young?

Risk of cardiac arrest and/or sudden death with anomalous origins or course

- Chest pain w/ exertion
- Syncope
- ~Abnormal ECG
- Incidental finding

Acquired CA disease in the young

- Kawasaki
- MIS-C

CHD repair that involves manipulation of the CA's

- D-TGA
- TOF
- DORV
- Ross/Konno
- Valve-sparing aortic root replacement

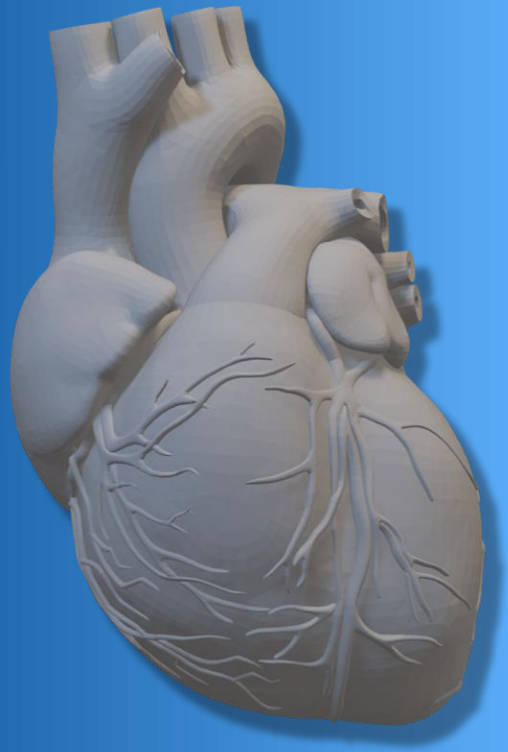
System settings are crucial to clear definition of CA origin and proximal course

Understanding the normal anatomy is key

Standard views do not provide adequate visualization of CA origin and course

CA's are superficial, bouncing with the surface of the heart. Cineloop is your friend!

Still images are not sufficient. They can be used in addition to, but not in place of, cineloop clips*



* I *will* be showing a lot of still frames in this presentation

A New Skill Set

Clear 2D imaging of the coronary artery origins and their proximal course takes a great deal of finesse

nope.

Equipment optimization ***before*** attempting to display the coronary arteries is one key to success

Use a coronary artery-specific preset (or make manual changes)

Displaying the 2D image of the arteries is crucial ***prior*** to color Doppler attempts

Equipment Settings

2D Settings

Resolution
Axial - High frequency

Lateral – High scan line density

Compression (~40)
Clear vessel boundaries

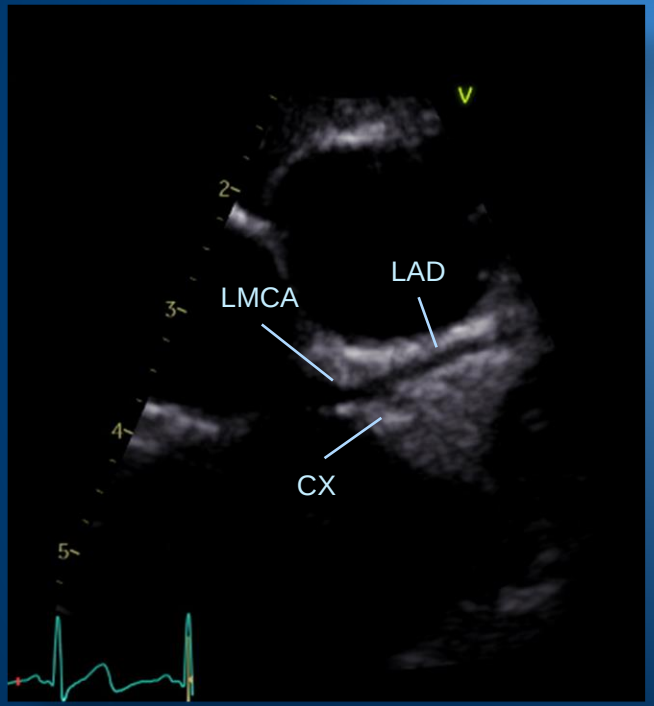
Frame rate
Decrease depth
Narrow sector width

Gain
Clear up the lumen

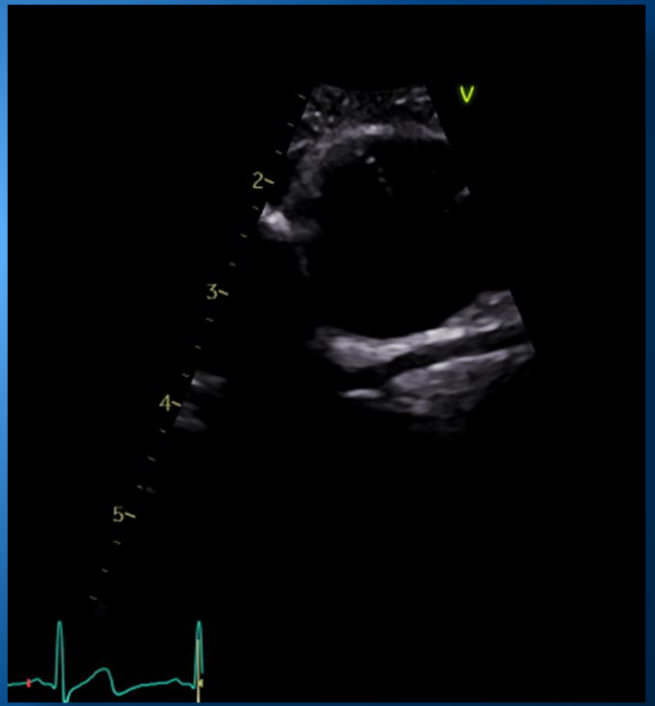
Axial Resolution - Imaging Frequency

LCA, 2 y/o

6 MHz transducer



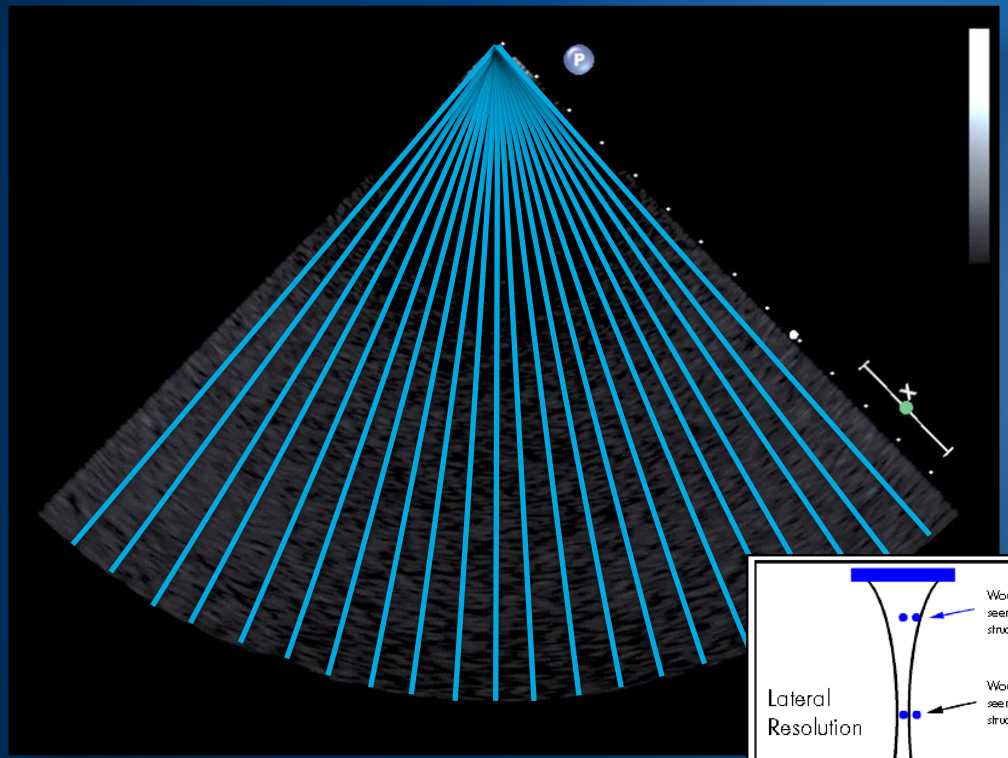
12 MHz transducer

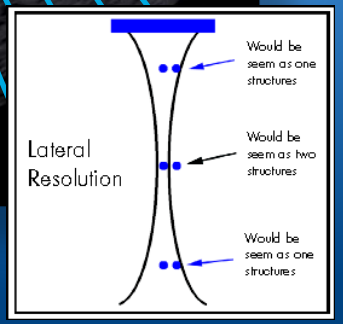


Don’t drop dynamic range *too much* when evaluating for KD

Kawasaki disease with giant aneurysms and LCA thrombus

Lateral Resolution





These controls are a balance, (or trade-off), between lateral resolution vs. temporal resolution

Instead,

- Decrease depth
- Narrow sector
- Use re-write zoom

Color Doppler Settings

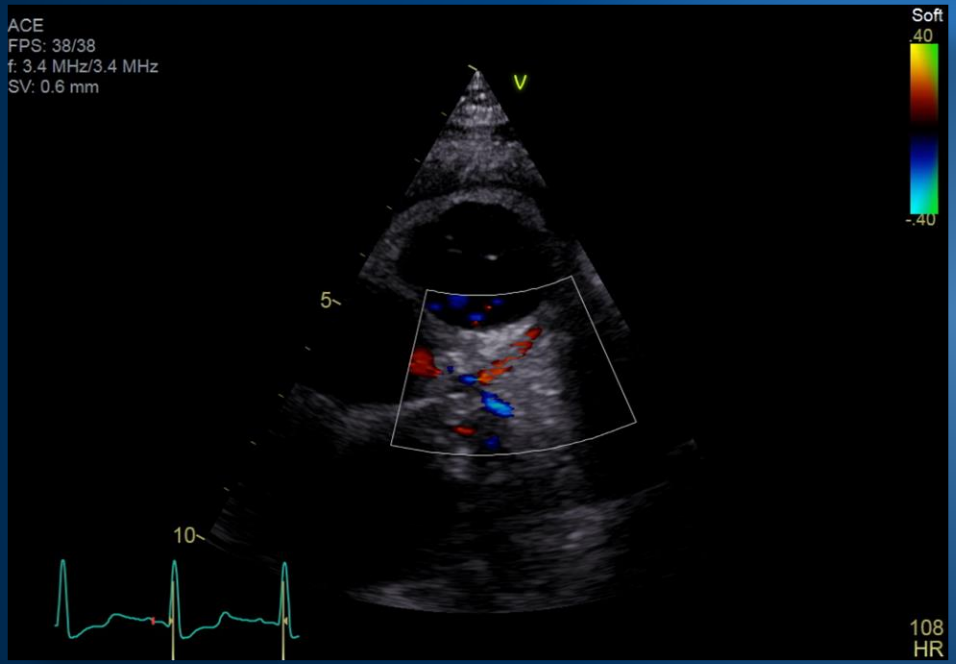
Resolution
Increase frequency - Axial
Increase scan lines - Lateral

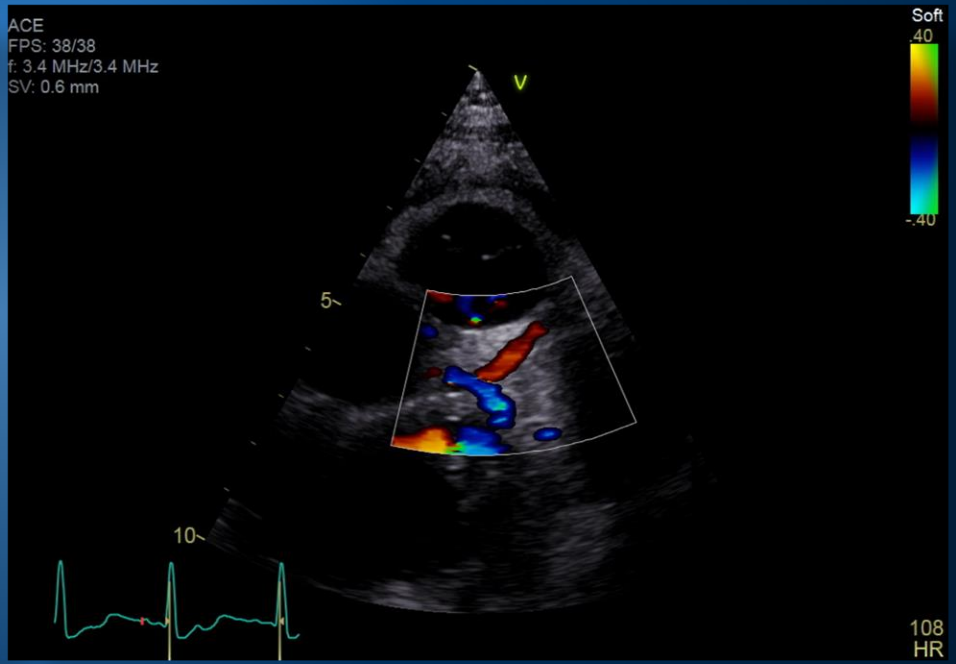
Write Priority
or
Tissue Priority

Frame rate
Decrease Depth
ROI size

Nyquist limit
Normal coronary artery
flow is very low velocity

Tissue vs. Color Priority





Okay, so ***how*** do you do it?

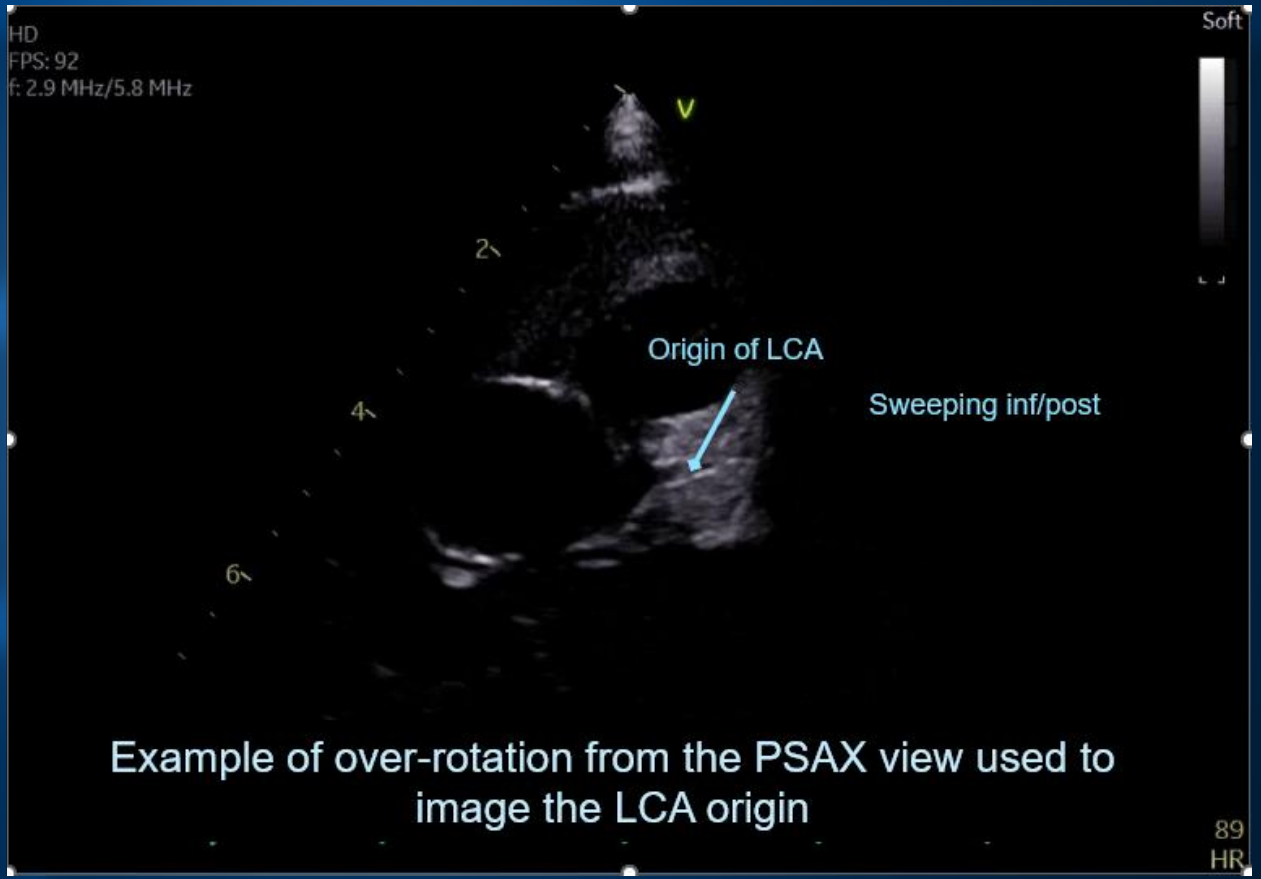

Windows
&
Views

PSAX - Left Coronary Artery Origin

Best seen with over-rotation of the PSAX view (from the PLAX)

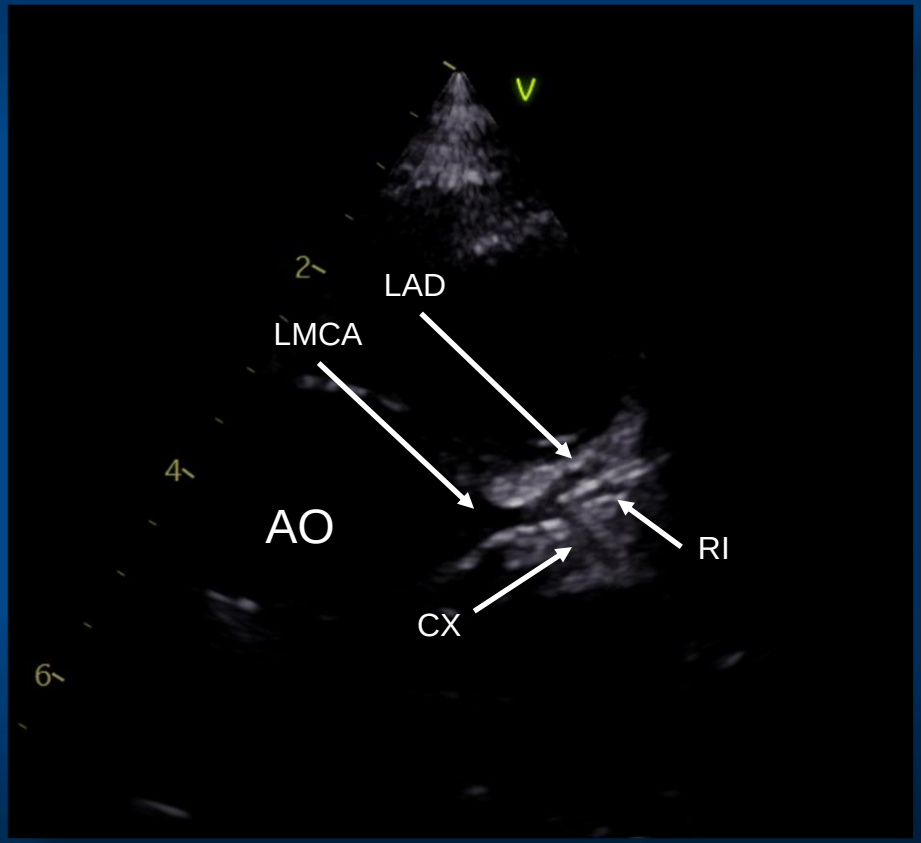
2D sweep to demonstrate the degree of over-rotation sometimes required

Nearly a reversed PLAX plane



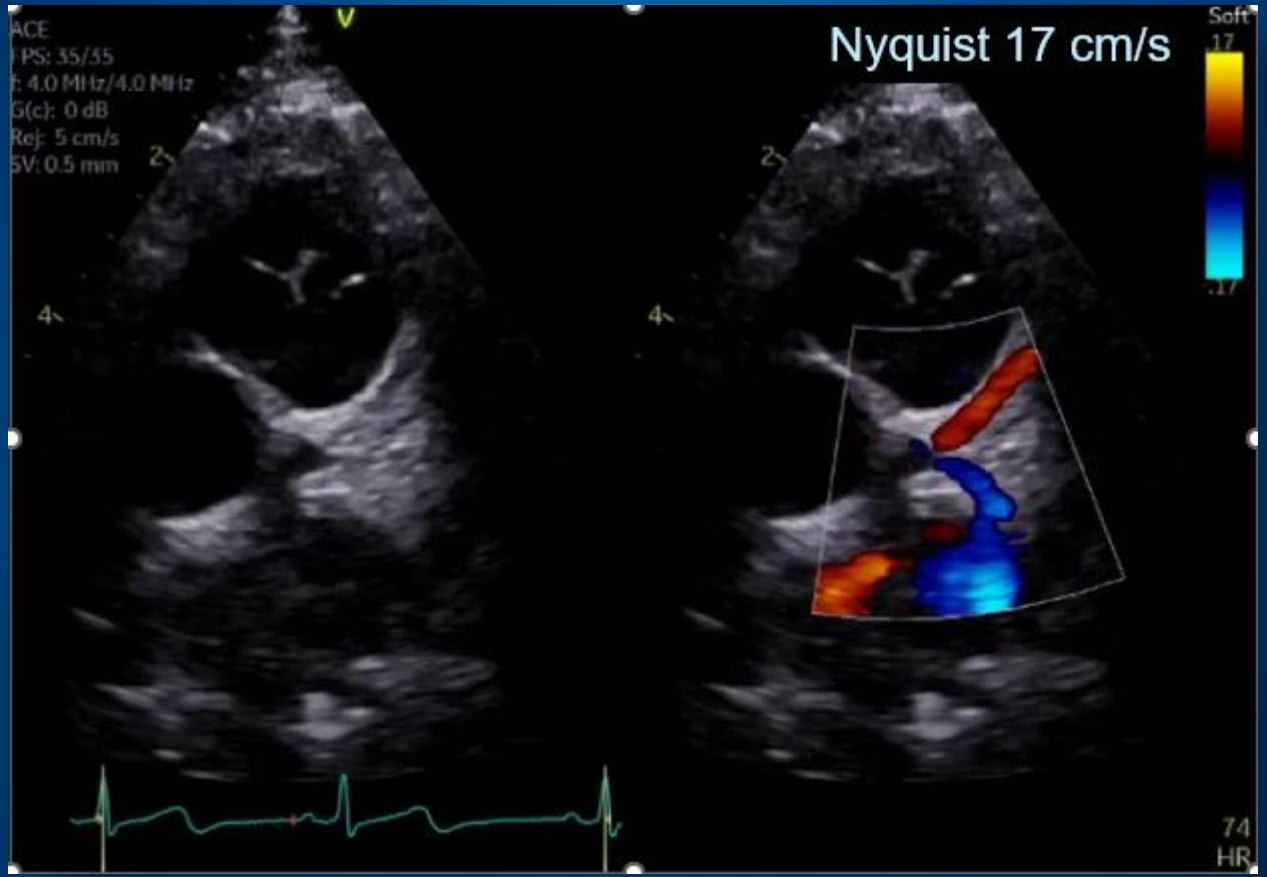
Example of over-rotation from the PSAX view used to image the LCA origin

Left Coronary Artery Origin

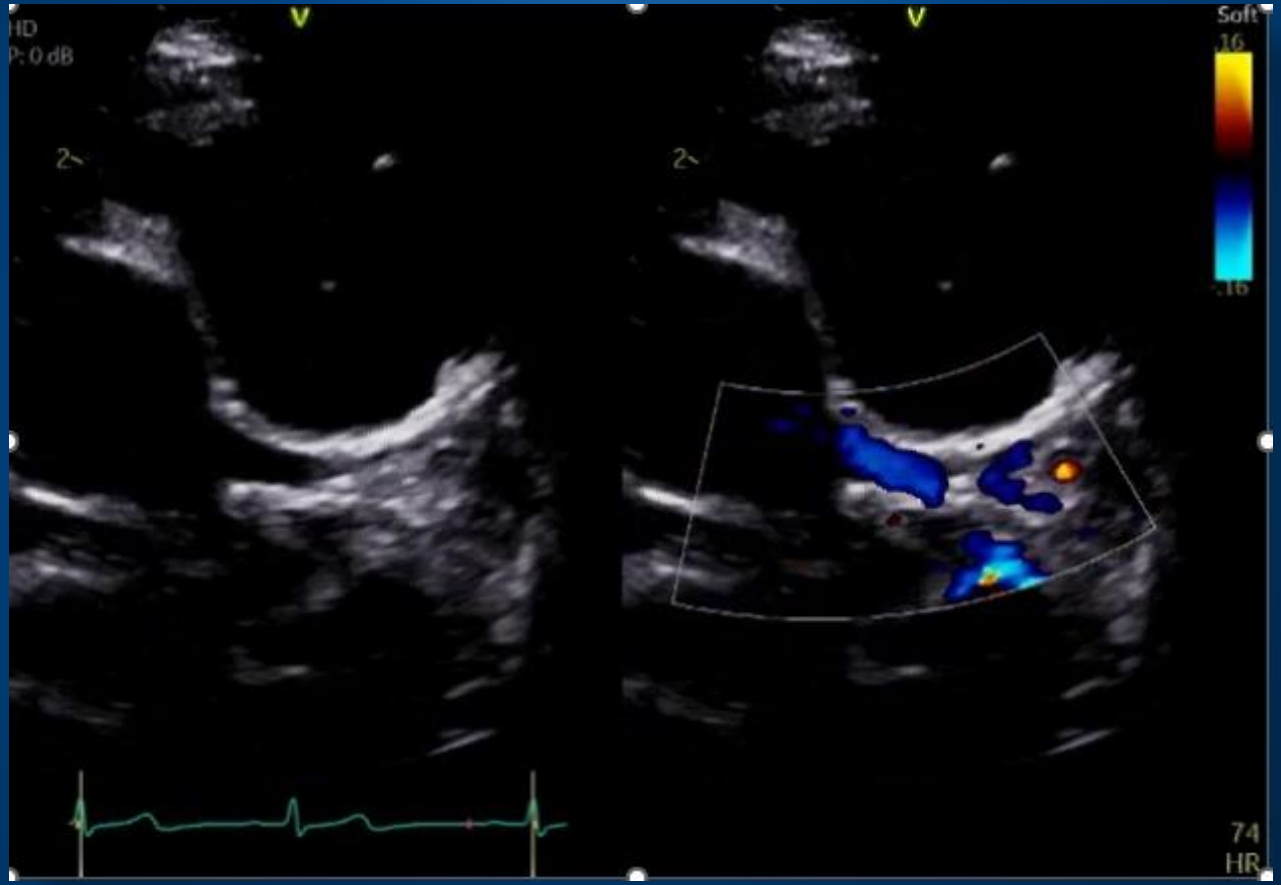


Left Coronary Artery - *Distal*

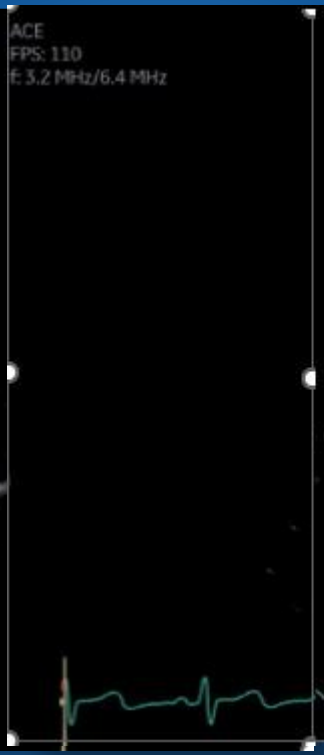
Left Coronary Artery Color Doppler



Left Coronary Artery Color Doppler



PLAX, RVOT – LCA bifurcation to LAD & CX

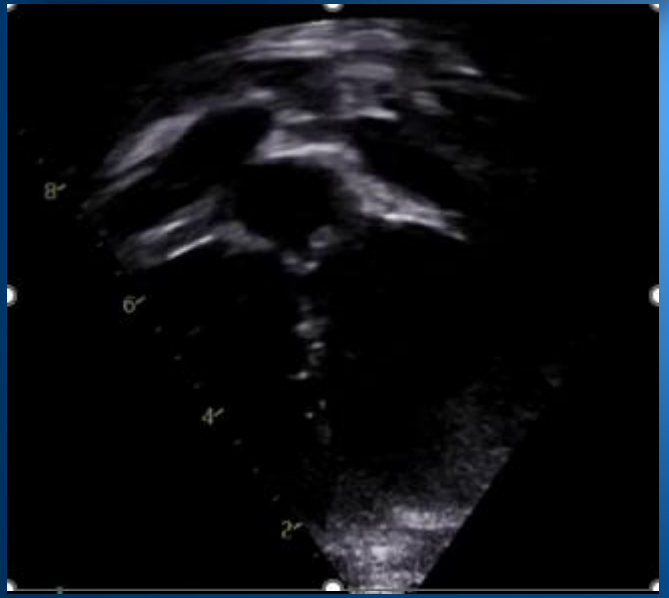


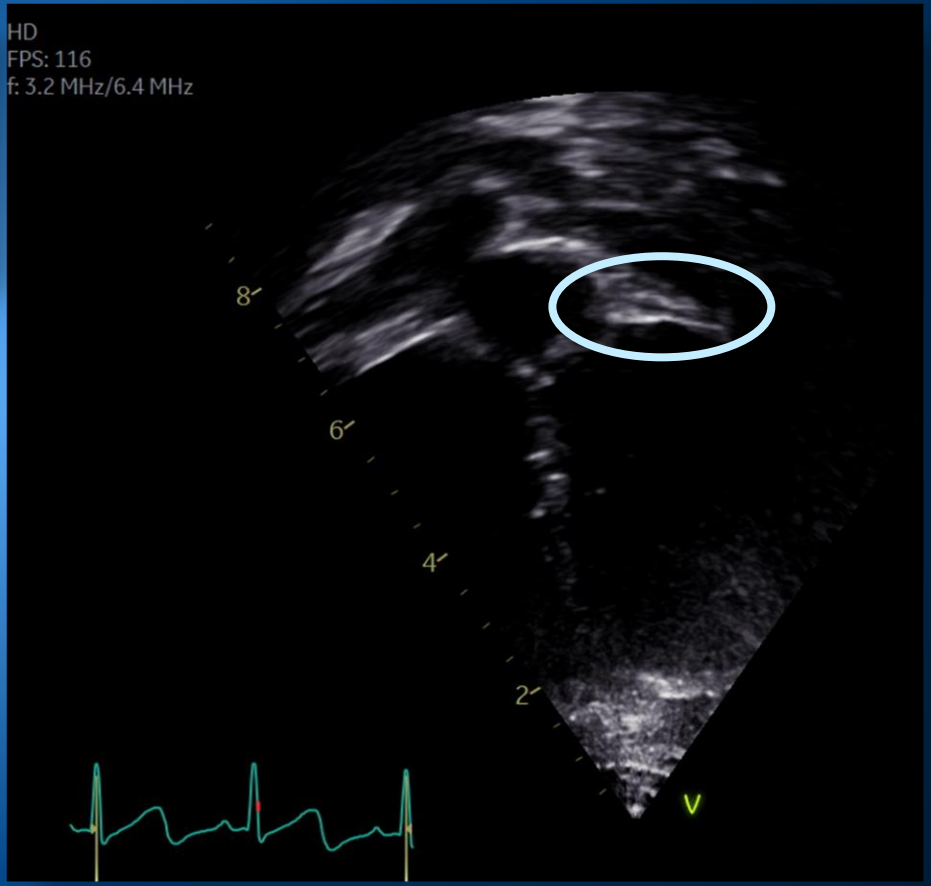
1.3 kg premie

4 y/o

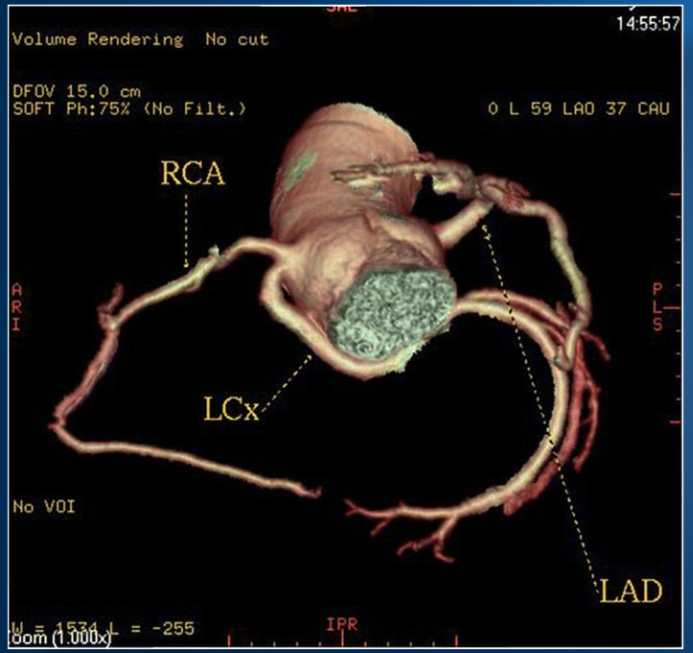
Circumflex Artery, Apical “5-Chamber” View

Circumflex artery in the anterior left AV groove from the apical “5 chamber” view





Circumflex artery arising from the RCA – normal variant

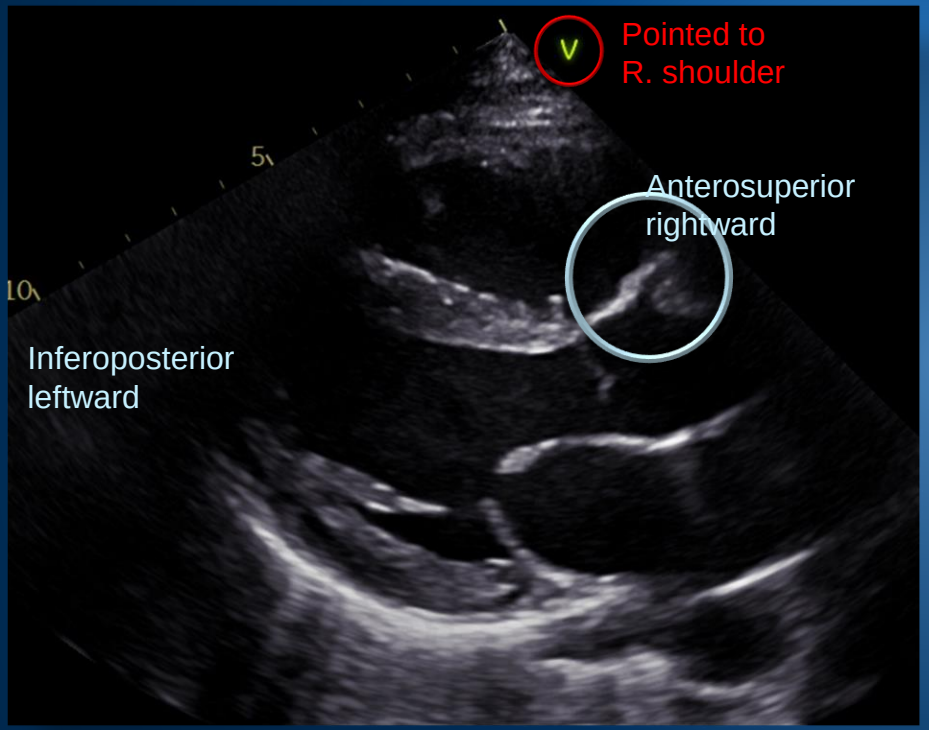


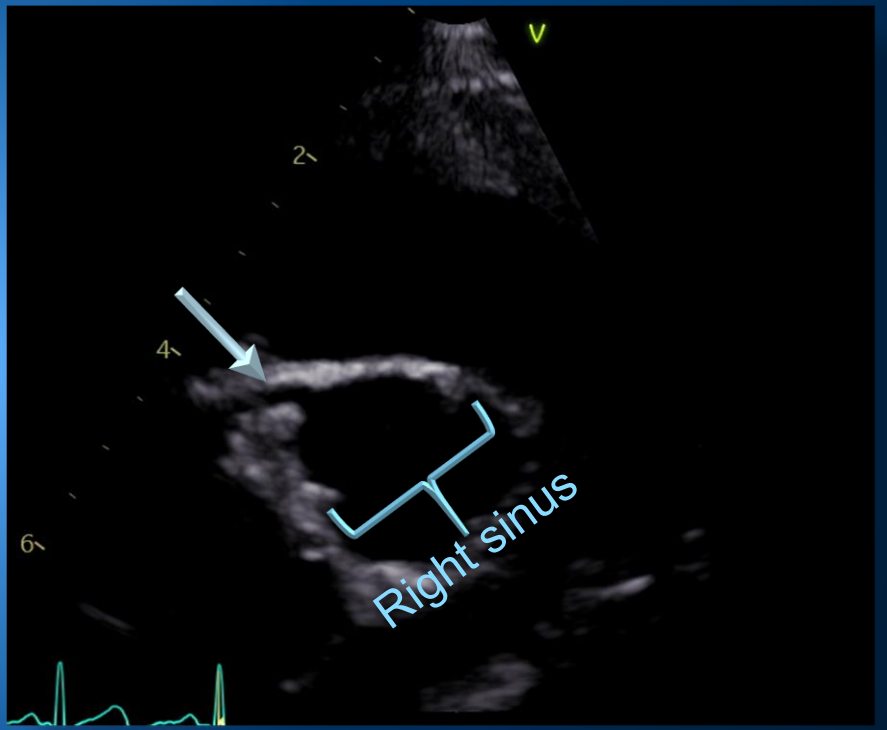
BMC Cardiovascular Disorders

Apical 4-chamber view, just posterior to the aortic root

https://heart.bmj.com/content/108/5/344

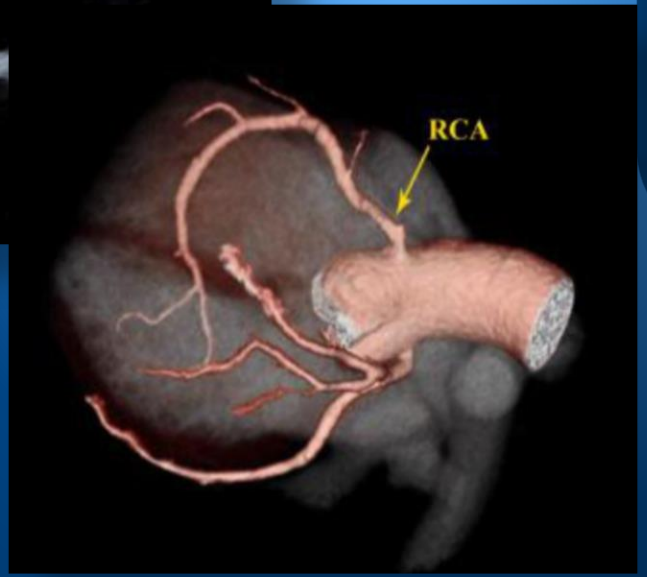
Right Coronary Artery Origin





High Take-off of the RCA – normal variant

https://www.onlinejase.com

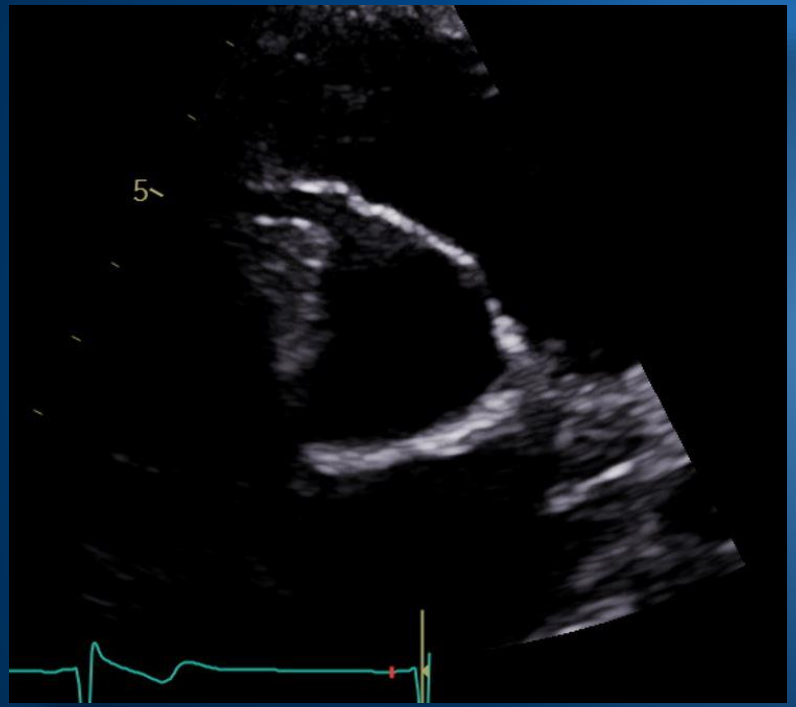


PLAX view, right coronary origin.

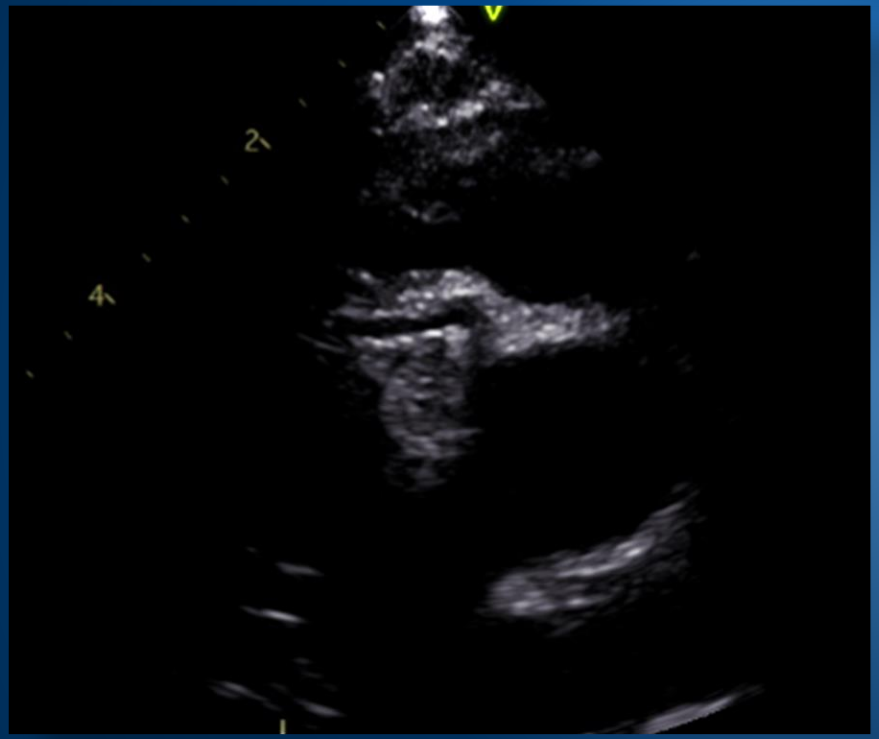
This view is helpful to define a superior origin of the RCA from the ascending aorta.

But will not accurately diagnose other abnormal origins, due to a lack of a right and left reference.

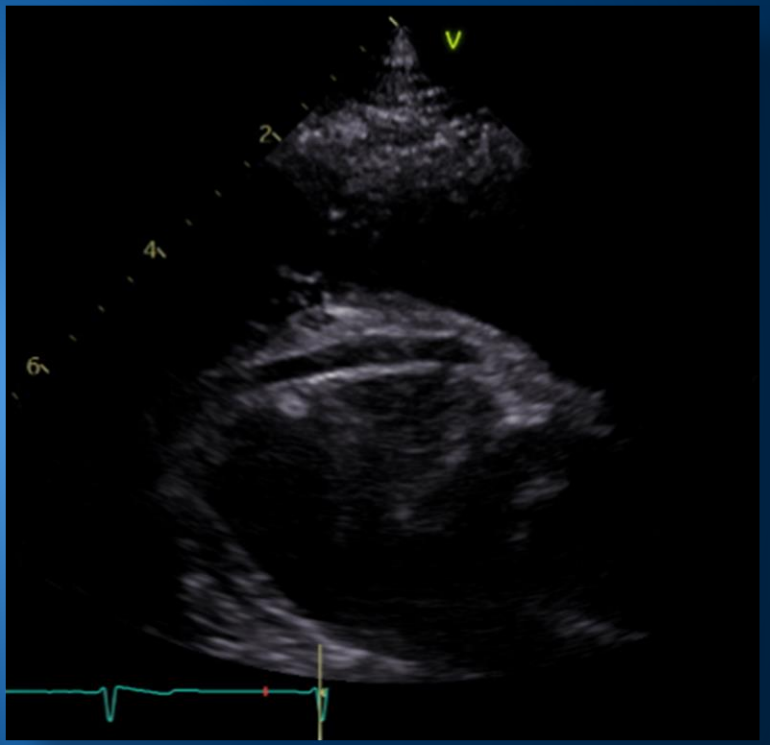
RCA Origin



RCA - Distal Anterior

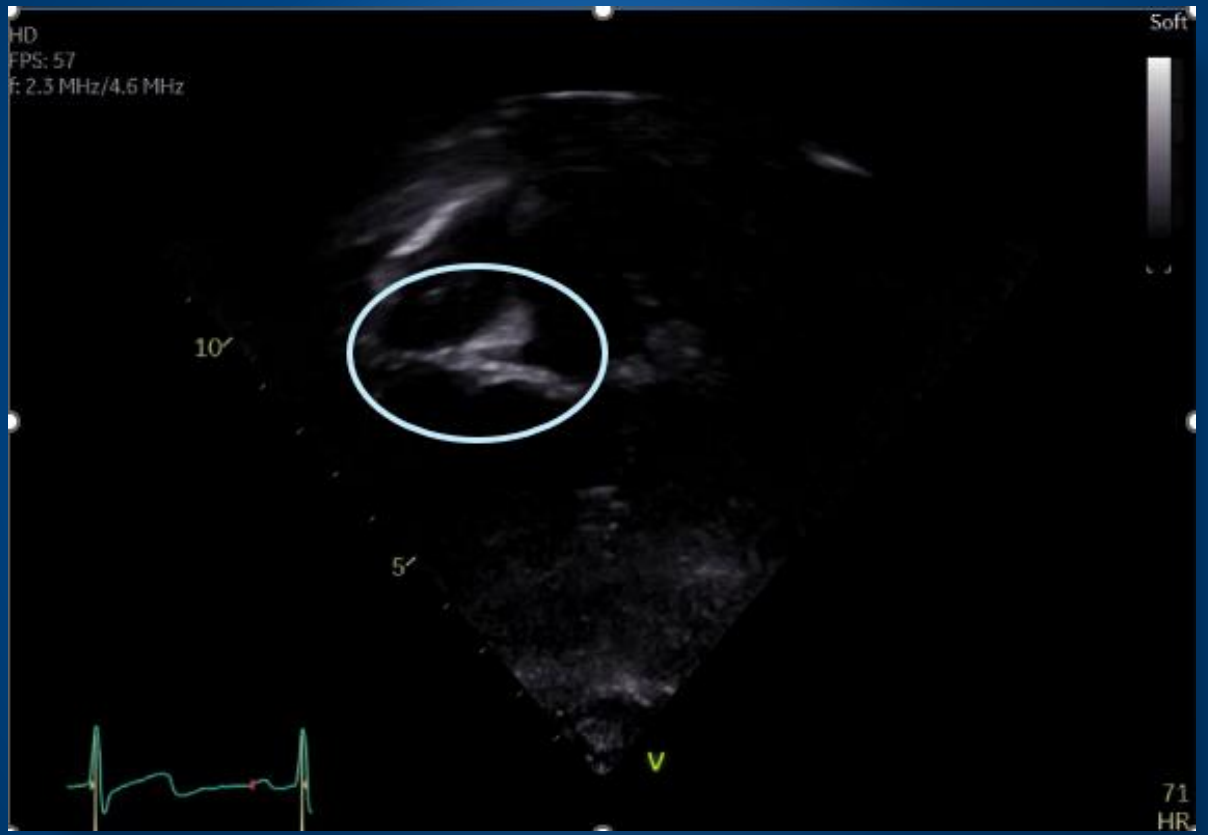


7 y/o



14 y/o

RCA - Distal Anterior, Apical Window

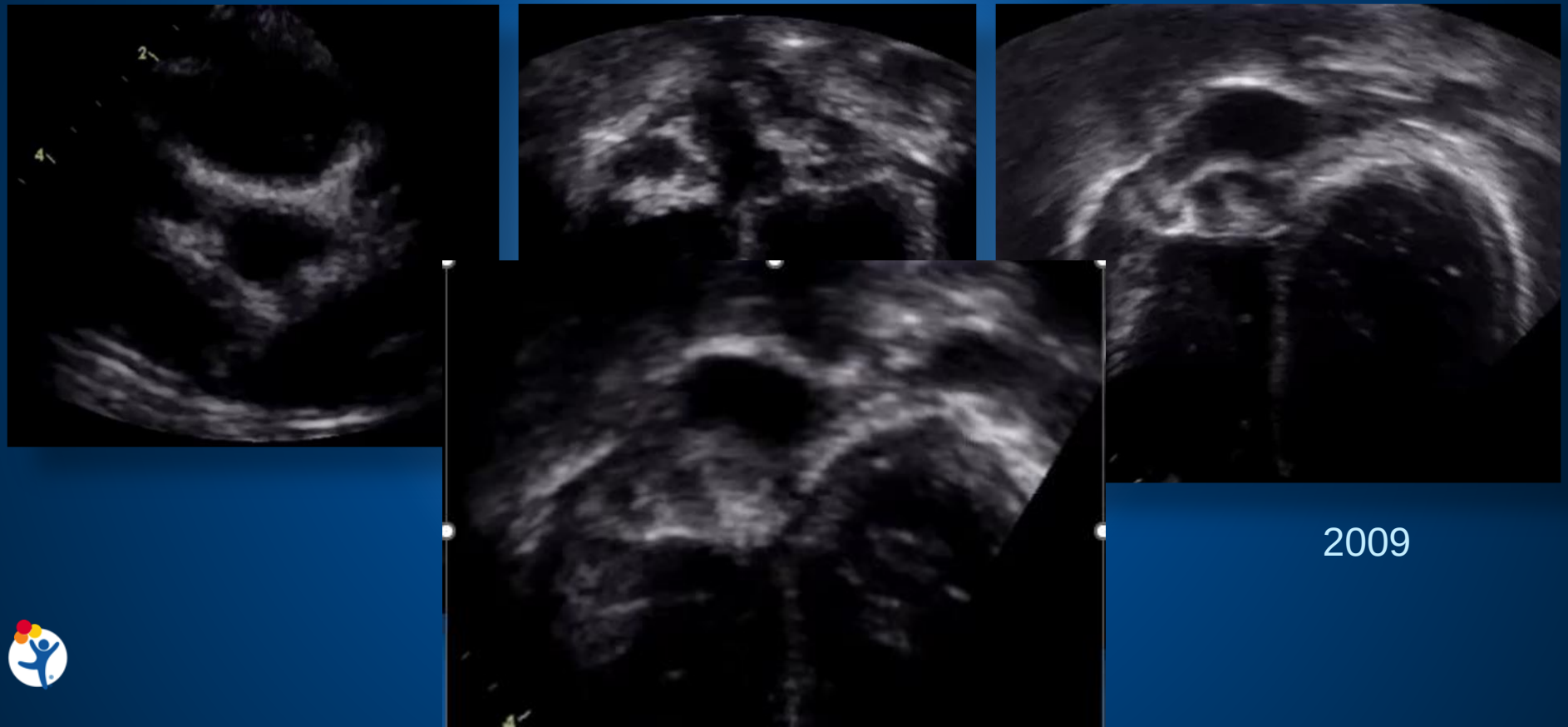


RCA in the *anterior* right AV groove

RCA - Distal *Posterior,* Apical Window

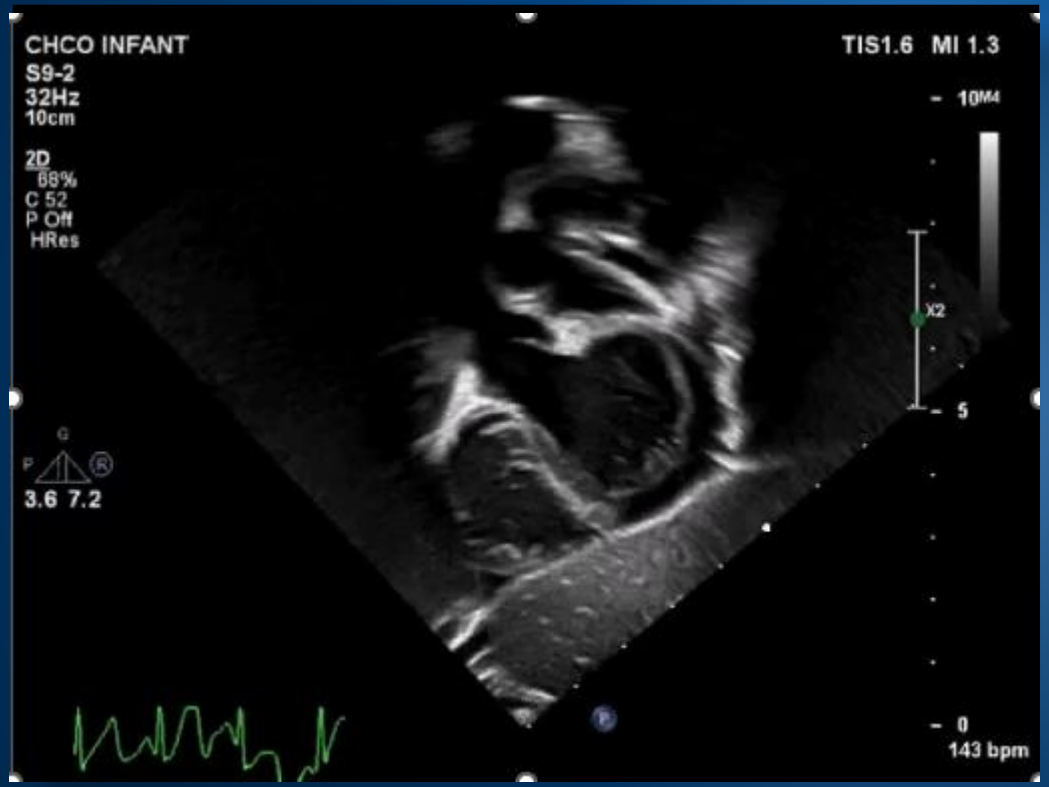
RCA in the *posterior* right AV groove

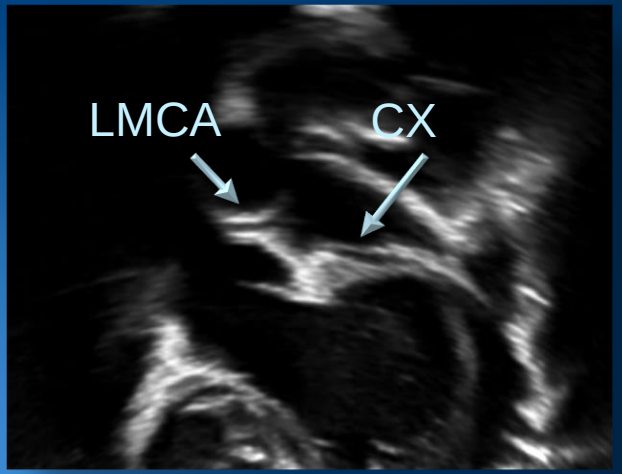
Kawasaki with giant aneurysms and *distal/posterior* RCA thrombus

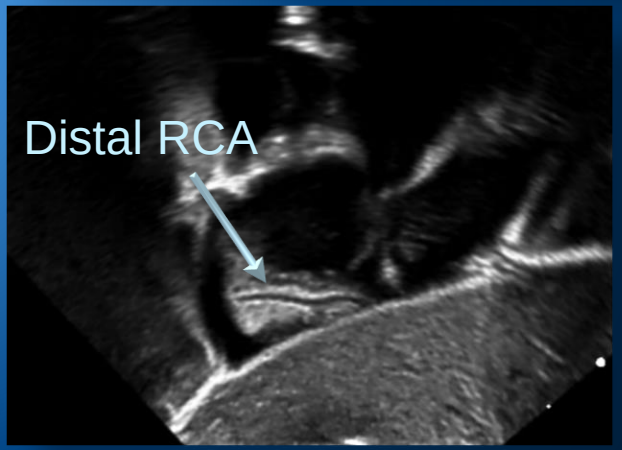


2009

Subcostal Sweep







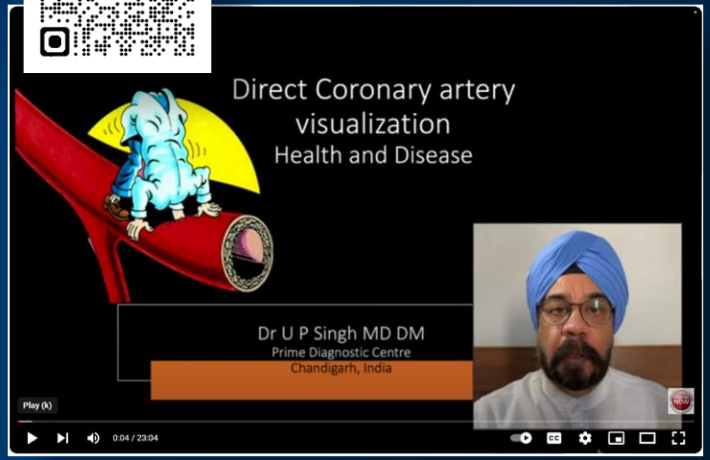
Recommended Additional Resources

GUIDELINES AND STANDARDS

Recommendations for Multimodality Assessment of Congenital Coronary Anomalies: A Guide from the American Society of Echocardiography

Developed in Collaboration with the Society for Cardiovascular Angiography and Interventions, Japanese Society of Echocardiography, and Society for Cardiovascular Magnetic Resonance

Peter Frommelt, MD, FASE, Leo Lopez, MD, FASE, V. Vivian Dimas, MD, FSCAI, Benjamin Eidem, MD, FASE, B. Kelly Han, MD, FASE, H. Helen Ko, BS, ACS, RDMS, RDCS, RCCS, FASE, Richard Lorber, MD, FASE, Masaki Nii, MD, PhD, Beth Printz, MD, PhD, FASE, Shubhika Srivastava, MBBS, FASE, Anne Marie Valente, MD, FASE, FSCMR, and Meryl S. Cohen, MD, FASE, *Milwaukee, Wisconsin; Palo Alto and San Diego, California; Dallas and San Antonio, Texas; Rochester and Minneapolis, Minnesota; New York, New York; Shizuoka, Shizuoka, Japan; Boston, Massachusetts; Philadelphia, Pennsylvania*



STATE-OF-THE-ART REVIEW ARTICLE

A Practical Guide to Pediatric Coronary Artery Imaging with Echocardiography

Lynne M. Brown, BA, RDCS (AE) (PE), FASE, C. Elise Duffy, MBBS, FRACP, Carol Mitchell, PhD, RDMS, RDCS, RVT, RT(R), FASE, FSDMS, and Luciana Young, MD, FACC, FASE, *Chicago, Illinois; and Madison, Wisconsin*

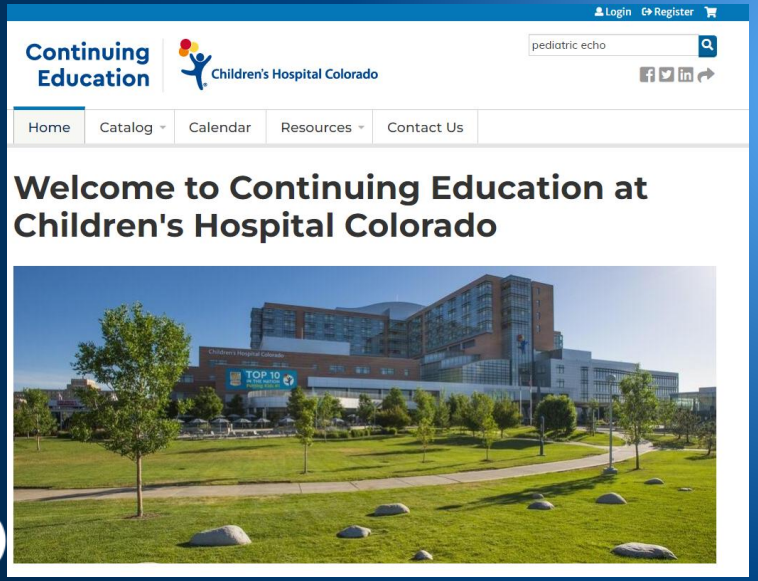
Pediatric Echo Scanning Tutorial Resource

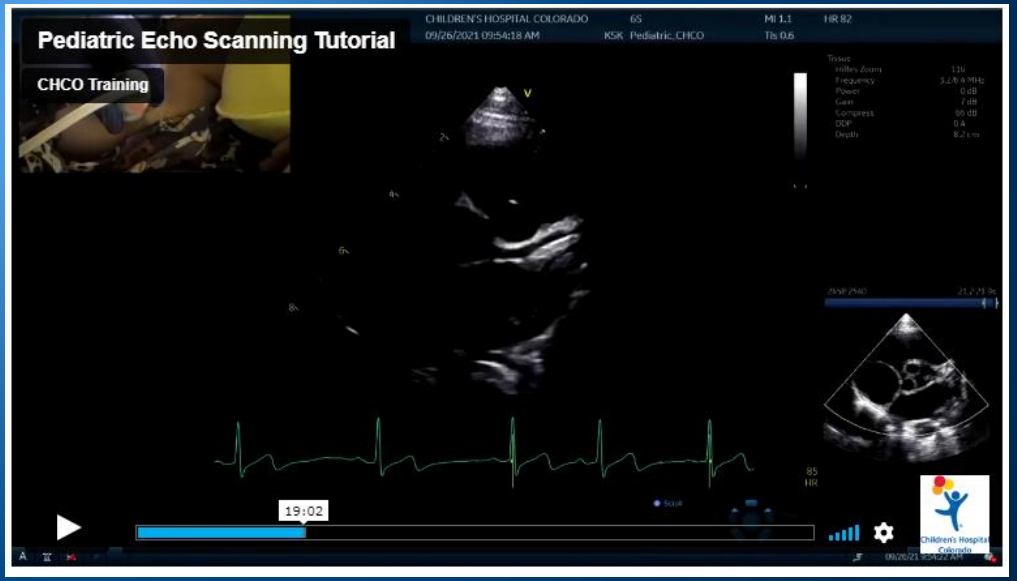
Posted on our education platform.

https://ce.childrenscolorado.org/ Search for: “Pediatric echo”

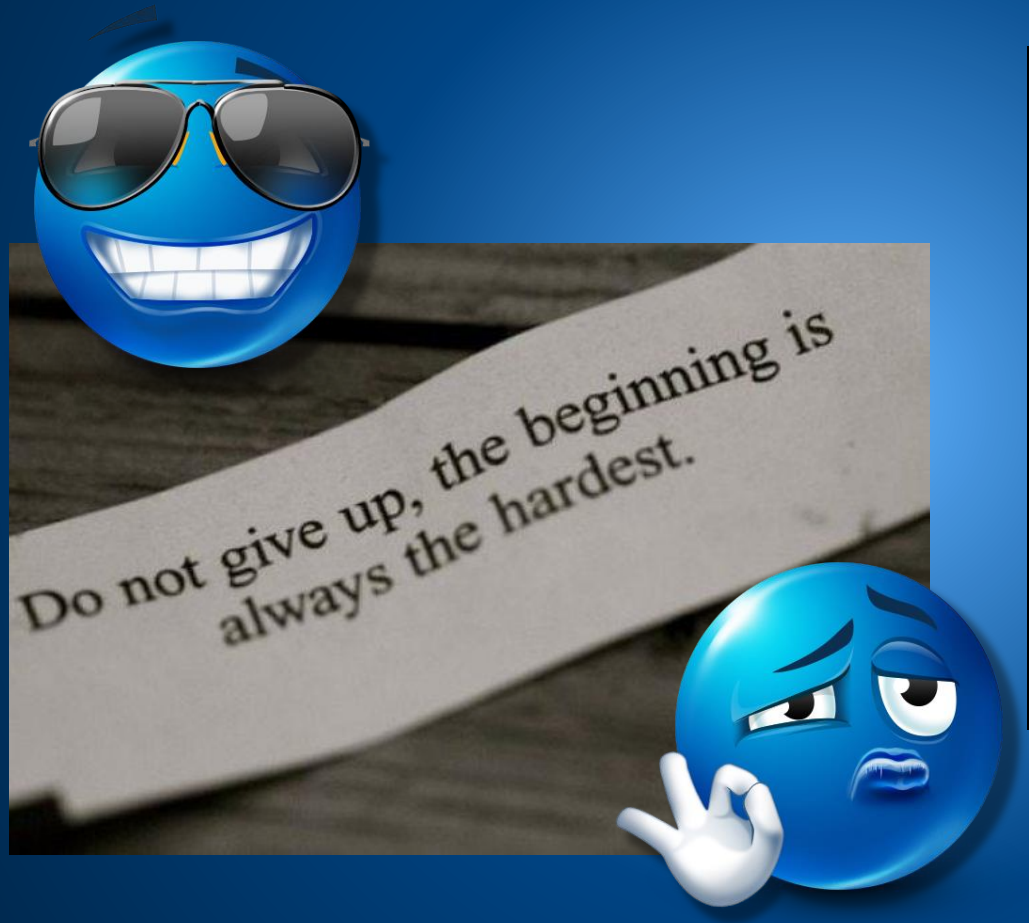
Currently available through 3/31/2026. No cost. No CEU’s.

scott.kirby@childrenscolorado.org





This isn’t easy at first!



IT DOESN'T GET EASIER

YOU JUST GET BETTER

References

BMC Cardiovascular Disorders https://bmccardiovascdisord.biomedcentral.com/articles/10.1186/s12872-015-0098-x

https://heart.bmj.com/content/108/5/344

https://www.onlinejase.com/article/S0894-7317(15)00009-7/fulltext#secsectitle0065

Recommendations for Multimodality Assessment of Congenital Coronary Anomalies: A Guide from the American Society of Echocardiography (asecho.org)

A Practical Guide to Pediatric Coronary Artery Imaging with Echocardiography (onlinejase.com)

https://bluemoji.io/

https://www.bing.com/images/create

Cleanpng.com

Tips and tricks: Direct Coronary Visualization with Transthoracic Echo – YouTube https://youtu.be/9BpIzuBJcaI?si=OHnGNq2NirbHN_EI


FINISH