Tips and Tricks for Assessing Adult Congenital Heart Disease

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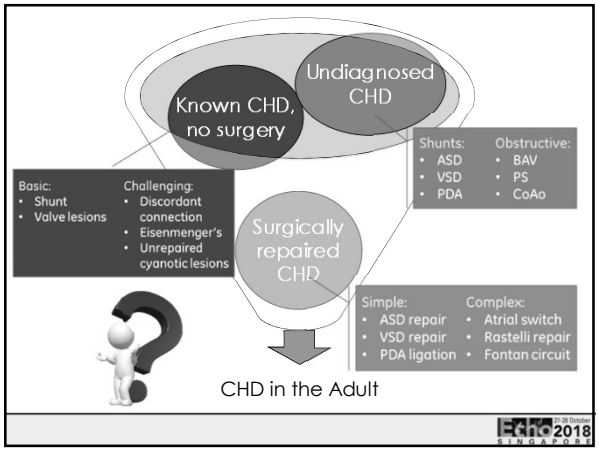
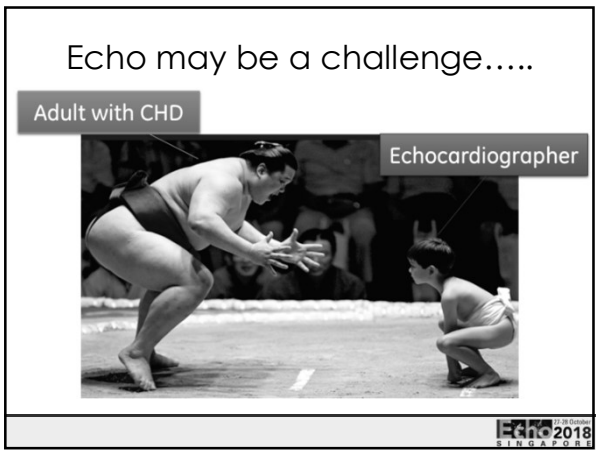
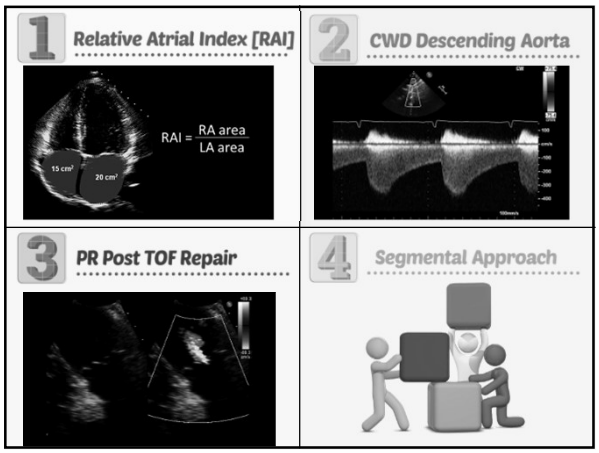
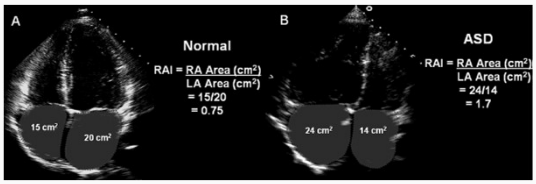


Echo may be a challenge…..





1 Relative Atrial Index [RAI]



Cutoff value **> 0.92** predicted patients with ASDs vs. matched controls with 99.1% sensitivity & 90.5% specificity

Kelly NF, …….. Scalia GM. J Am Soc Echocardiogr. 2010 Mar;23(3):275-81

Types of ASDs

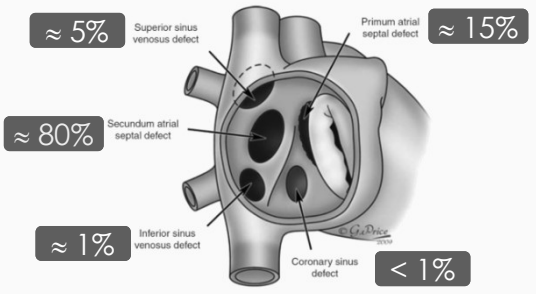


Image from Sridharan S., Price G., Tann O. et al. Cardiovascular MRI in Congenital Heart Disease: An Imaging Atlas. 2010

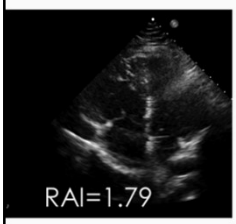
L-R Shunting across an ASD

Right heart volume overload
⇓
RA & RV dilatation
⇓
Pulmonary hypertension
⇓
RV failure

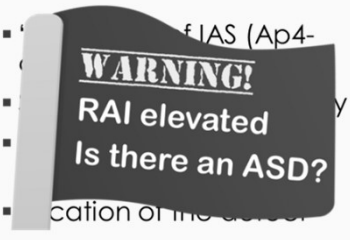
Limitations for Detecting an ASD

- "Drop-out" of IAS (Ap4-ch)
- Suboptimal image quality
- Use of limited standard imaging planes
- Location of the defect

Limitations for Detecting an ASD



- f IAS (Ap4-
- y
- cation of the defect



54 y.o. female, dilated right heart on outside echo

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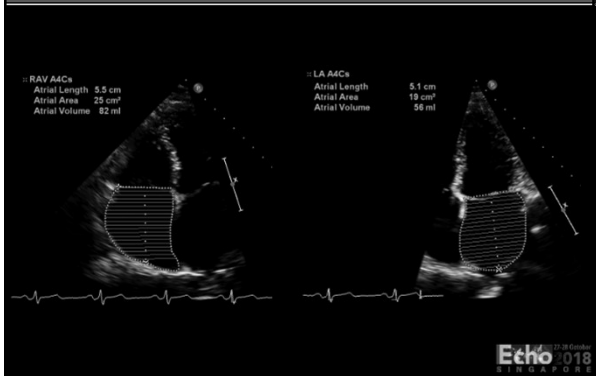

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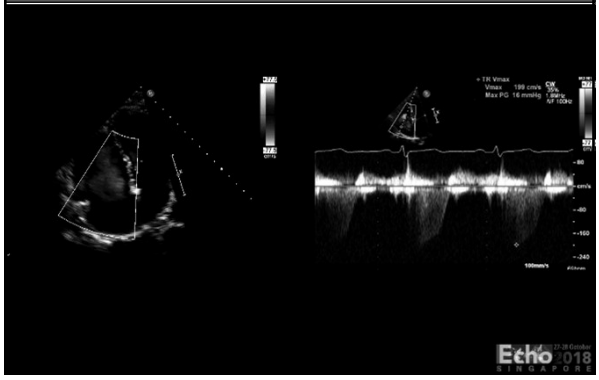
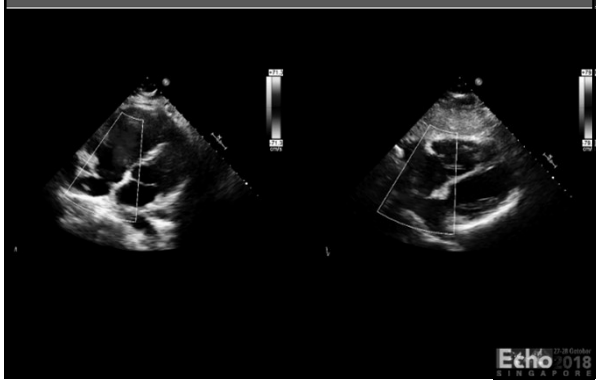
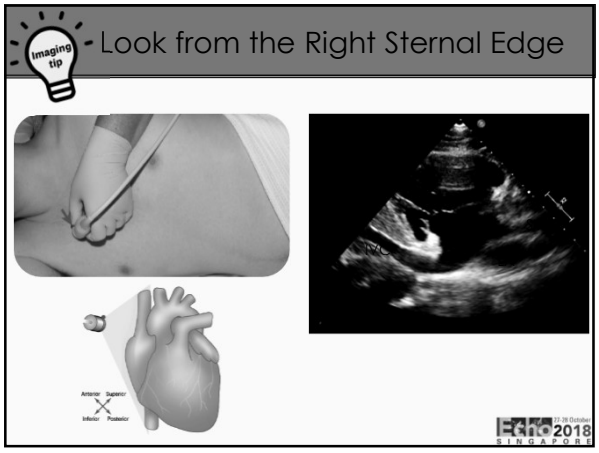


54 y.o. female, dilated right heart on outside echo



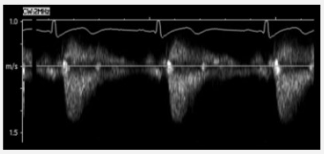
54 y.o. female, dilated right heart on outside echo

Look from the Right Sternal Edge

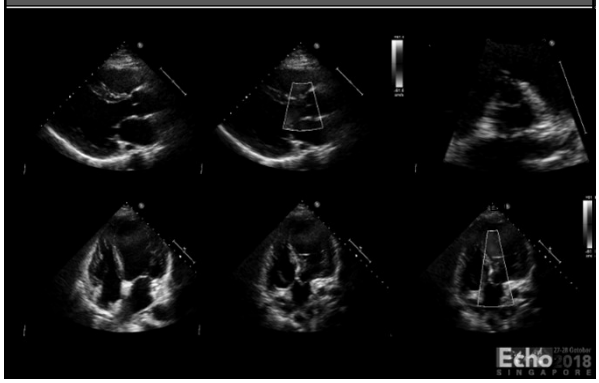


2 CW Doppler Descending Aorta

Normal



23 y.o. female, routine echo prior to RFA



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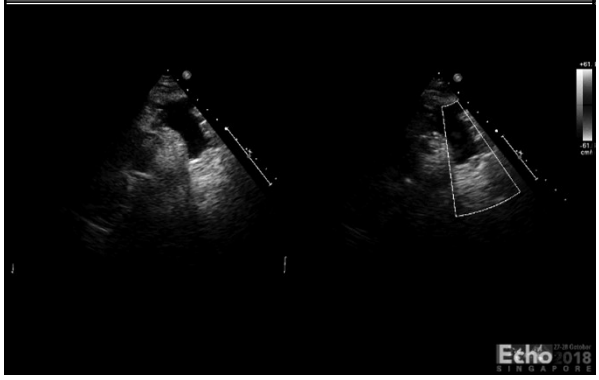

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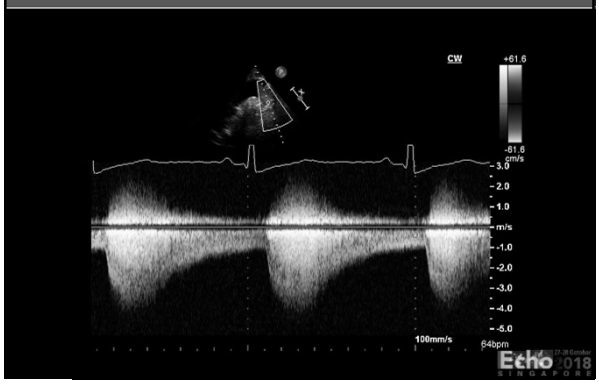

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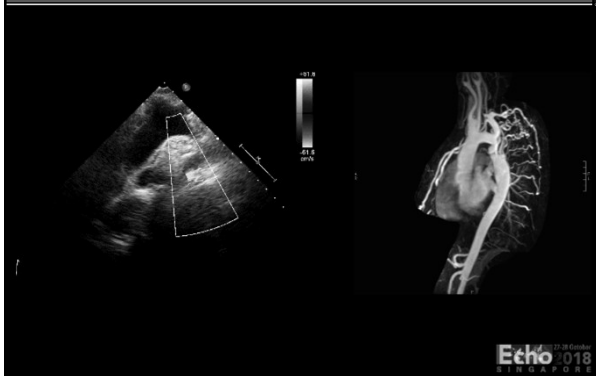
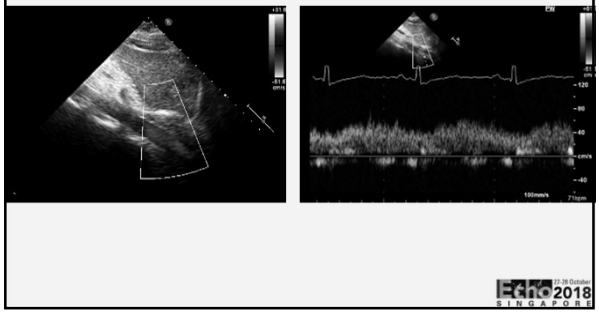
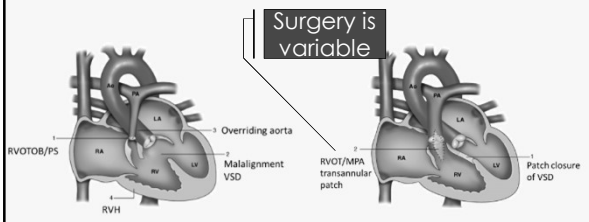


Don't forget the Abdominal Aorta



3 PR Severity post ToF Repair



Images from Mullins CE, Mayer DC: Congenital Heart Disease: A Diagrammatic Atlas. New York, Wiley-Liss, 1988

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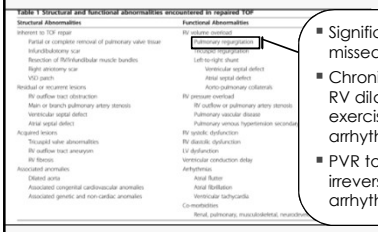
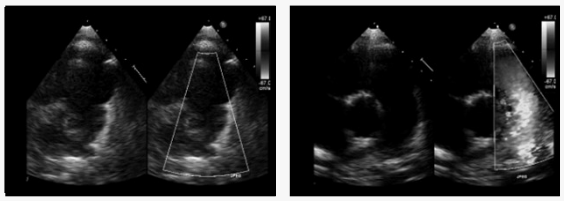


- Significant PR frequently missed on Echo
- Chronic severe PR leads to RV dilatation & dysfunction, exercise intolerance, ↑ risk arrhythmias & SCD
- PVR too late: RV dysfunction irreversible, pts. vulnerable to arrhythmias & SCD

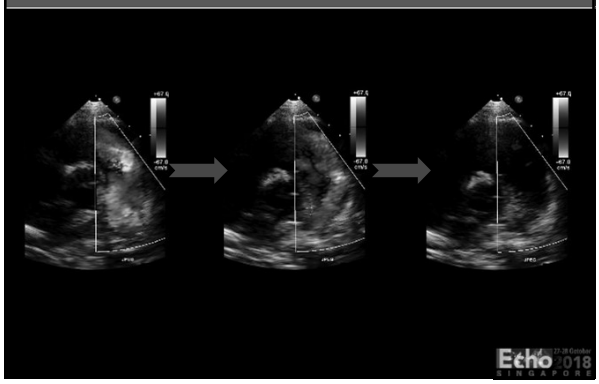
Geva T. J Cardiovasc Magn Reson. 2011 Jan 20;13:9.

"Free"/"Wide Open" PR

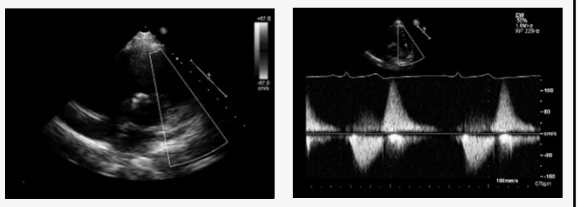
Low velocity, laminar flow of short duration



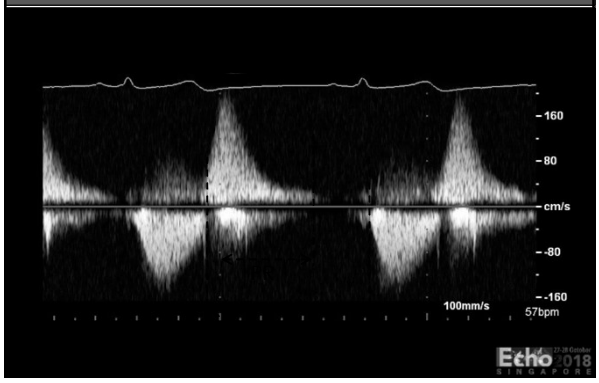
PR Duration may be Brief!



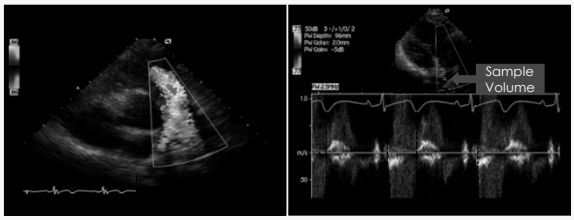
Always do CWD across PV



Early Termination



Look at PA Branches for Diastolic Flow Reversal (DFR)



DFR in PA Branches Best Predictor of Severe PR

CONGENITAL HEART DISEASE

Two-Dimensional and Doppler Echocardiography Reliably Predict Severe Pulmonary Regurgitation as Quantified by Cardiac Magnetic Resonance

Table 3 Analysis of 5 2D and Doppler echocardiographic measurements for detecting severe pulmonary regurgitation (n = 36)

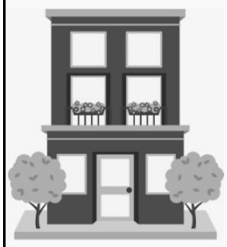
Parameter	Sensitivity	Specificity	PPV	NPV
MPA diastolic flow reversal	100%	39%	59%	100%
BPA diastolic flow reversal	87%	87%	87%	87%
PR jet/pulmonary annular diameter ratio ≥ 50%	94%	74%	76%	93%
PHT < 100 ms	90%	64%	78%	82%
PRI < 0.77	73%	47%	58%	64%

BPA, Branch pulmonary arteries; *MPA*, main pulmonary artery.

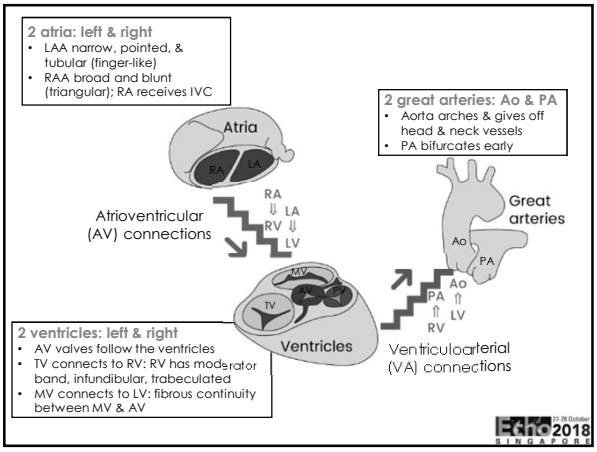
Renella P. J Am Soc Echocardiogr 2010;23:880-6.

Segmental Approach

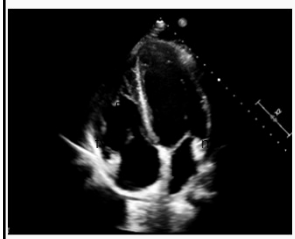
3 storied house



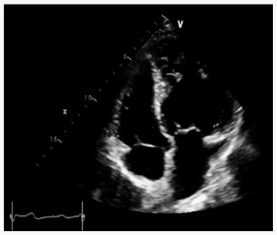
- 3 floors:
  - Atria
  - Ventricles
  - Great arteries
- 2 Staircases:
  - Atrioventricular connections
  - Ventriculoarterial connections
- 2 Entrances:
  - Systemic veins
  - Pulmonary veins



Normal:
AV concordance

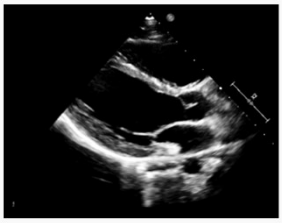


Abnormal:
AV discordance

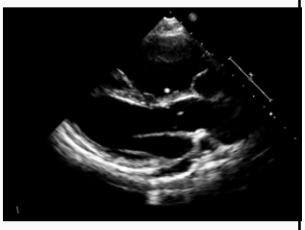


AV, atrioventricular

Normally related GA:
PLAX =>Only one seen



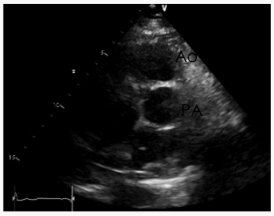
Abnormally related GA:
PLAX => Side-by-side



GA, great arteries

Normally related GA:
"sausage-circle"

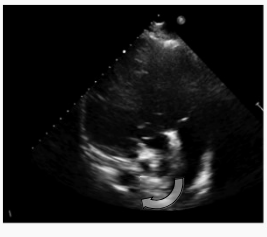
Abnormally related GA:
both valves seen in SAX



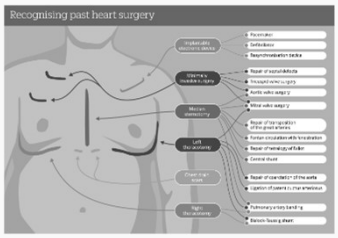
GA, great arteries

PA Bifurcates Early

Aorta Arches



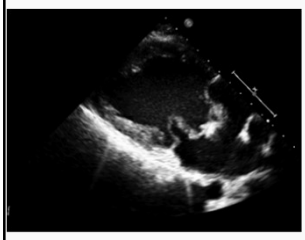
Where's the Scar?

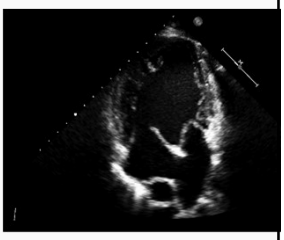


http://www.bmj.com/content/bmj/suppl/2016/07/28/bmj.i3905.DC1/wolf033625.ww1_default.pdf

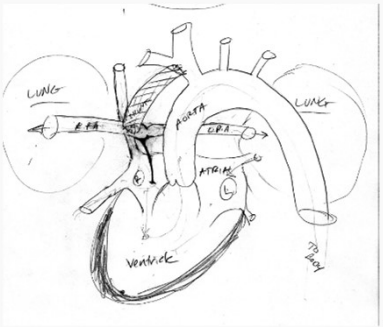
https://tricuspid.wordpress.com/tag/scars/

Start at the Apical Window

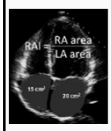




Draw it out

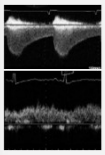


1 Relative Atrial Index [RAI]



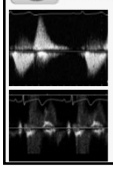
- RAI > 0.92: ? ASD
- Off-axis imaging & panning with colour Doppler crucial

2 CWD Descending Aorta



- Sawtooth profile (diastolic tail) = severe coarctation
- Check abdominal aorta for damped or continuous flow

3 PR Post TOF Repair



- Presume severe PR until proven otherwise
- CWD of PR jet & PWD in PA branches essential

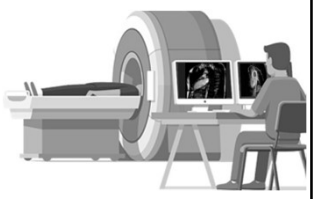
4 Segmental Approach

- Identify chambers & arteries
- Identify AV & VA connections
- Start at the apical window

Know the limitations & refer Onwards…..

Specialist Centre

Alternative Imaging



References & Further Reading

General

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References & Further Reading

Coarctation of Aorta:

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- Li W, et al. **Doppler-echocardiographic assessment of pulmonary regurgitation in adults with repaired tetralogy of Fallot: comparison with cardiovascular magnetic resonance imaging.** Am Heart J. 2004 Jan;147(1):165-72.
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