

ASE Guidelines on Aortic Regurgitation

What Do I Measure?

Case Studies

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ASE GUIDELINES AND STANDARDS

**Recommendations for Noninvasive Evaluation of
 Native Valvular Regurgitation**
 A Report from the American Society of Echocardiography
 Developed in Collaboration with the Society for Cardiovascular
 Magnetic Resonance

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 Toronto, Ontario, Canada; and Washington, DC* **JASE 30: 303, 2017**

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 The same day
 in March 2017!**

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

**A Report of the American College of Cardiology/American Heart Association
 Task Force on Clinical Practice Guidelines**

*Developed in Collaboration With the American Association for Thoracic Surgery, American Society of
 Echocardiography, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular
 Anesthesiologists, and Society of Thoracic Surgeons*

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New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

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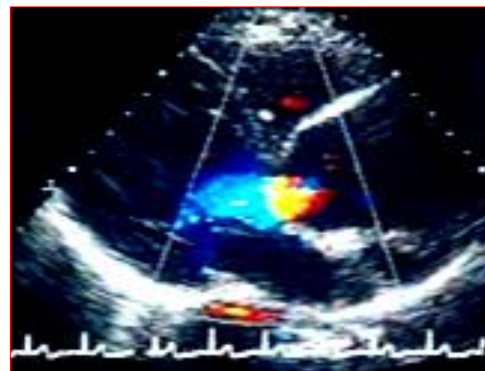
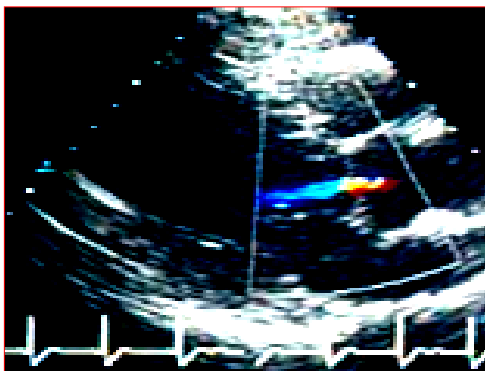
What is New?

- Emphasis on identification of Etiology/Mechanism of regurgitation
- 2D/3D TTE--an integrative approach & algorithms to assess severity
- When is TEE needed
- Important role of CMR & CMR methodology
- The challenge of co-existing valvular lesions
- A clinical perspective...
- Library of case studies on the web: www.asecho.org/vrcases

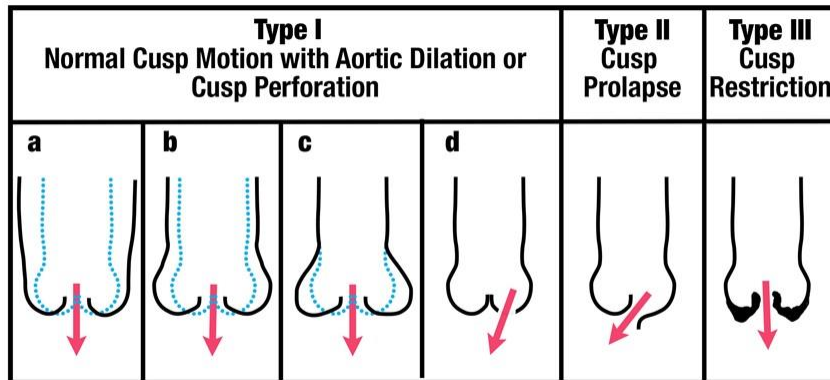
Zoghbi W et al. JASE 30: 303, 2017

Aortic Regurgitation

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Aortic Regurgitation

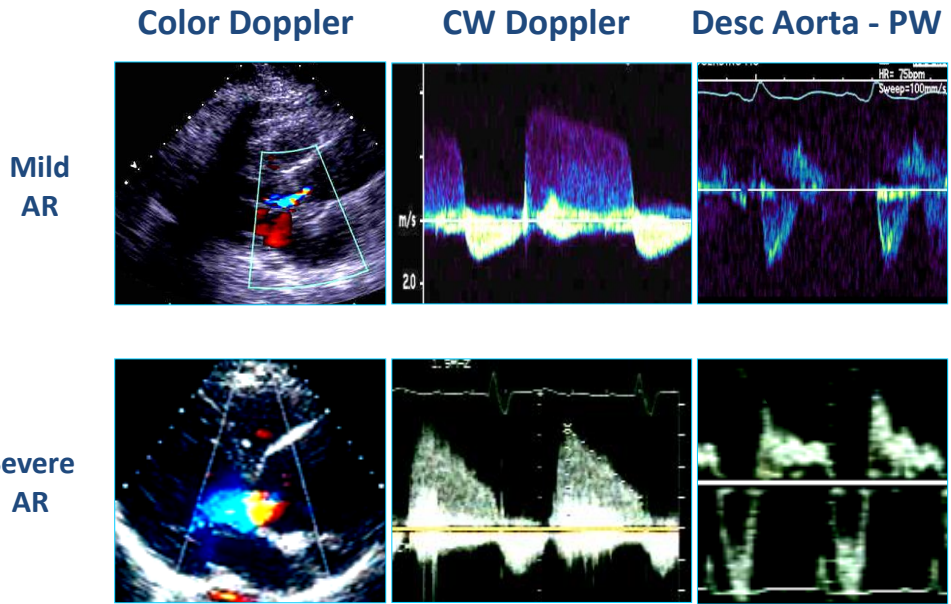


Zoghbi W et al. JASE 30: 303, 2017

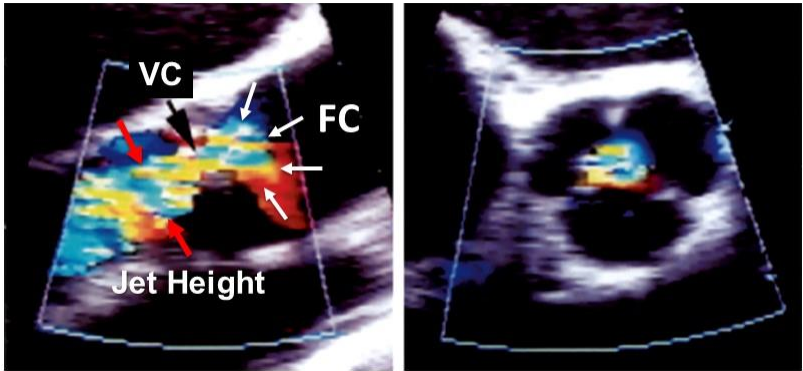
Assessment of AR Severity

Echo/Doppler Indicators of Severity

- Aortic Valve/ Root/Mechanism
- LV enlargement
- Color Doppler: jet width; vena Contracta
- Pressure half-time
- Regurgitant Volume/Fraction
- Diastolic retrograde flow in aorta



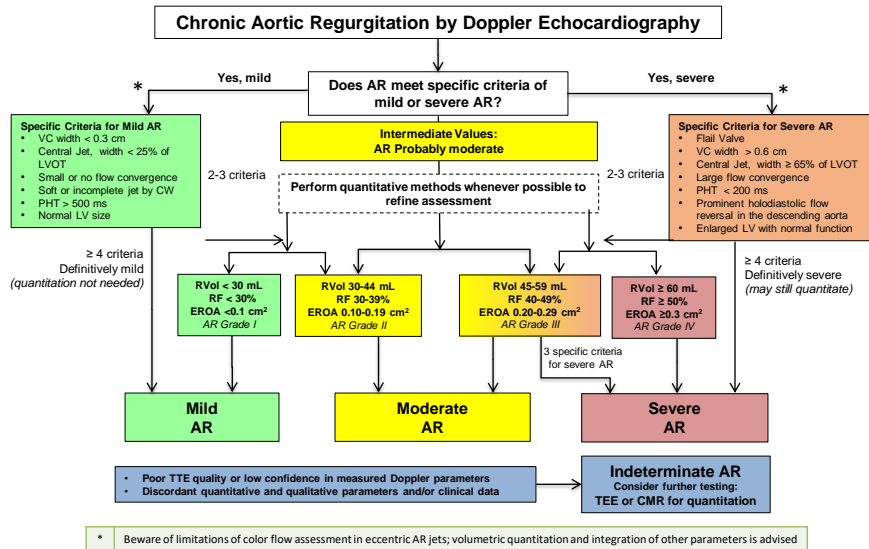
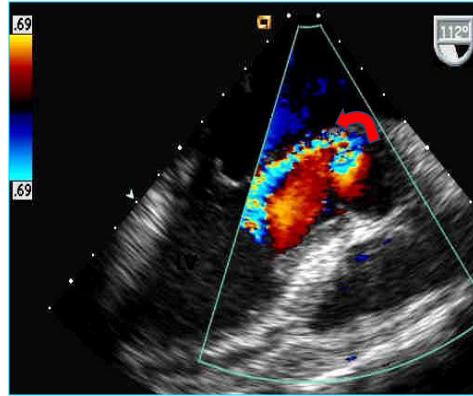
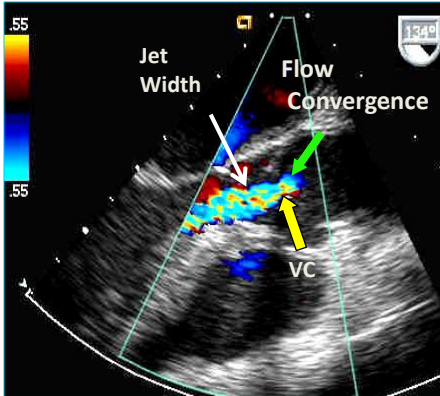
Aortic Regurgitation- Color Doppler



AR Severity- Color Doppler

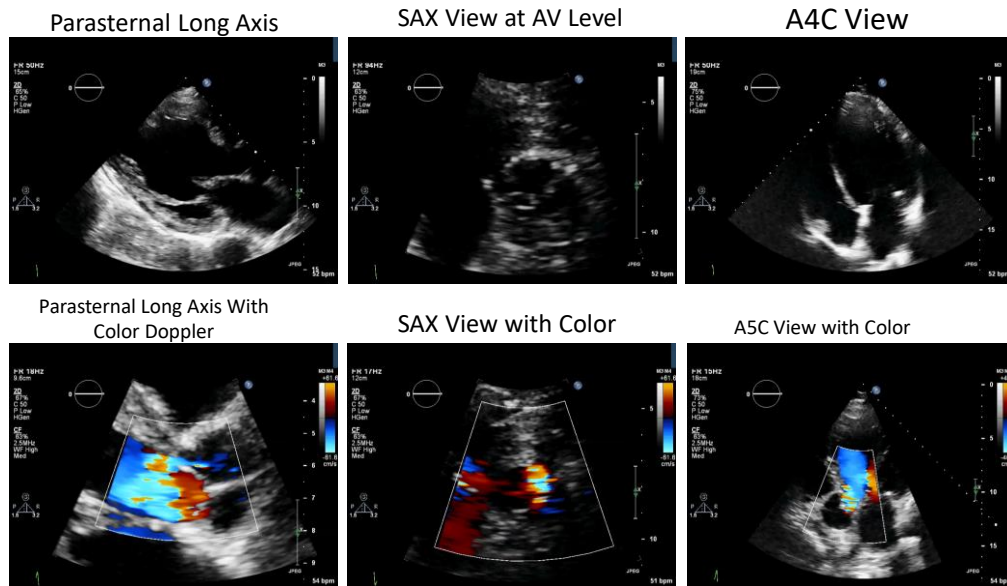
Central AR Jet

Eccentric AR Jet



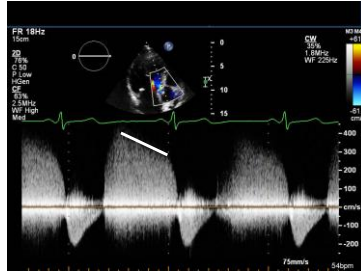
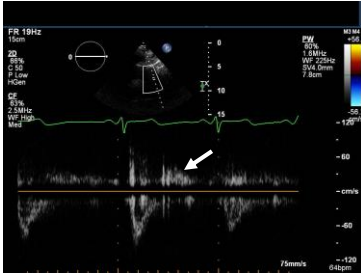
Case

- 59-year-old male with a PMH significant for IV drug abuse
- He presented to the ED with a recent history of chest pain, SOB, fever & chills
- BP 158/66, HR 56, RR 16, SpO2 97% RA
- Loud 3/6 diastolic murmur heard at LLSB
- Bibasilar rales on lung auscultation

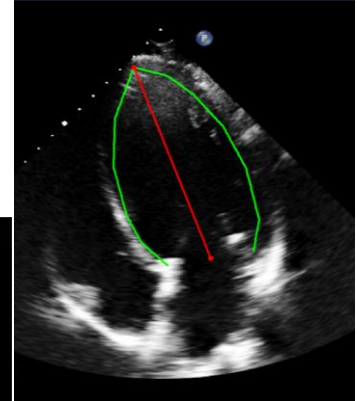


Faint Doppler reversal signal in the descending aortic arch

PHT 412 ms

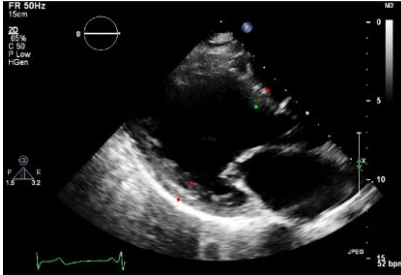
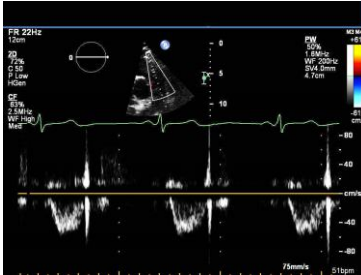


EDV 254 mL (143 ml/m²) = Severely enlarged

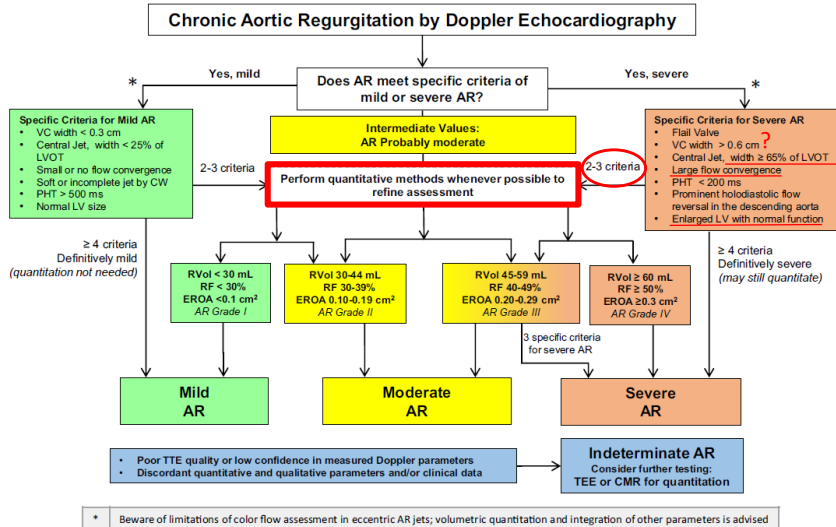


Diminished RVOT flow

EDD 6.4 cm

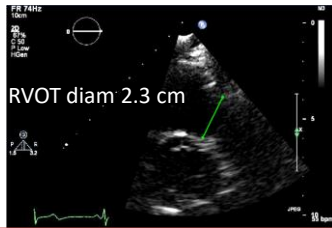
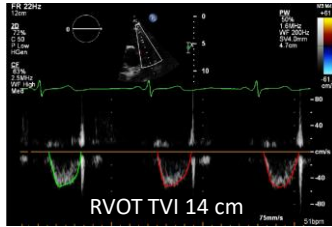


LVEF 62%



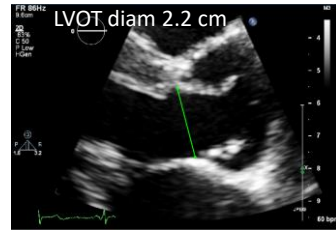
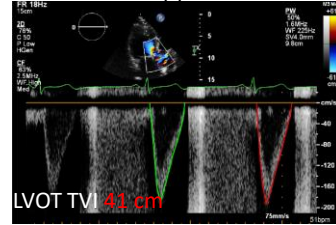
SV METHOD (LVOT SV – RVOT SV)

Pulsed Doppler RVOT



$$RVOT\ SV = 0.785 * 2.3^2 * 14 = 58\ mL$$

Pulsed Doppler LVOT



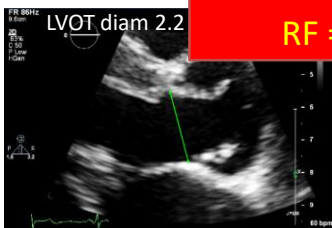
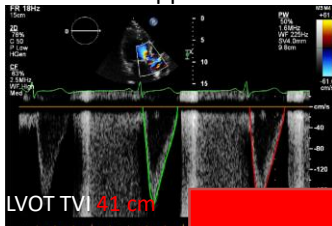
$$LVOT\ SV = 0.785 * 2.2^2 * 41 = 156\ mL$$

$$Rvol = 156 - 58 = 98\ mL$$

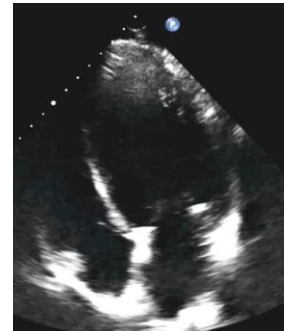
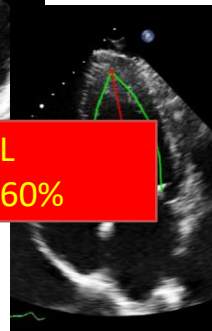
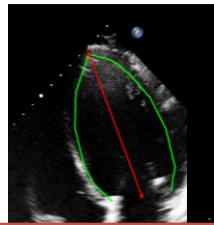
$$R\ F = 98/156 = 63\%$$

Internal Check of Volumes

Pulsed Doppler LVOT



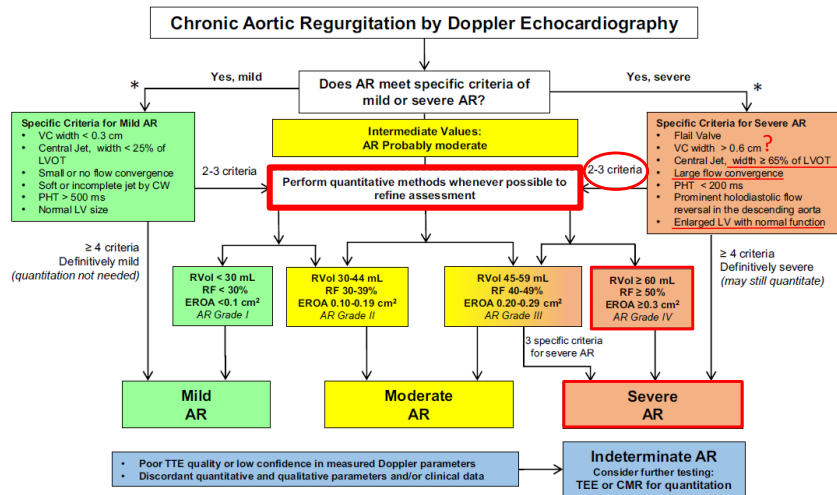
$$LVOT\ SV = 0.785 * 2.2^2 * 41 = 156\ mL$$



$$RVol = \sim 90-95\ mL$$

$$R\ F = RVol / SV_{LVOT} = \sim 60\%$$

$$LV\ SV = EDV - ESV = 254 - 95 = 159\ mL$$



Case

- 72-year-old male with 3V CAD admitted for CABG.
- An echo was performed.
- Aortic insufficiency (AI) was noted on color Doppler.
- The importance of AI grading here lies in the possibility of changing the management (ie, AVR) should significant regurgitation be present.

Parasternal Long Axis



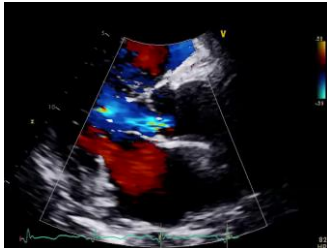
SAX View at AV Level



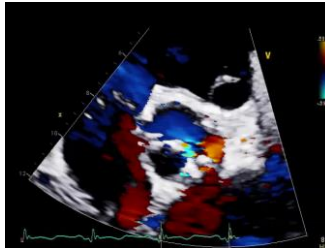
A4C View



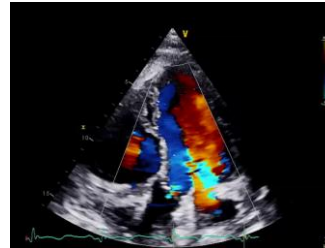
Parasternal Long Axis With Color Doppler



SAX View with Color



A5C View with Color

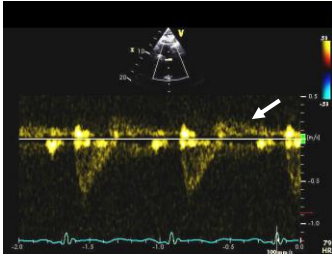


WHAT IS YOUR ASSESSMENT OF THE AORTIC REGURGITATION?

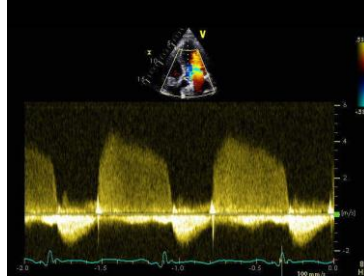
Based on these views only...

Is AR mild, moderate, severe or Indeterminate?

Faint Doppler reversal signal in the descending arch



Dense AI jet signal

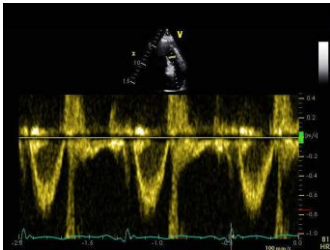


EDV 139 mL (79 ml/m²) = upper limit of normal size



LVEF 63%

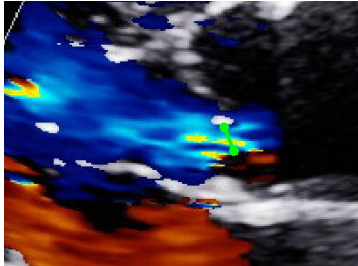
Prominent RVOT VTI



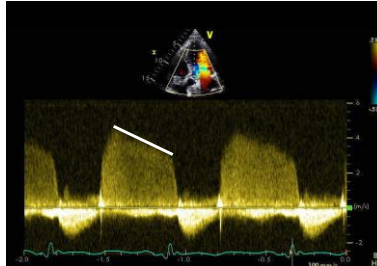
EDD 4.5 cm



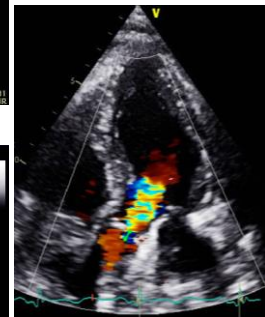
Vena Contracta width 0.4 cm



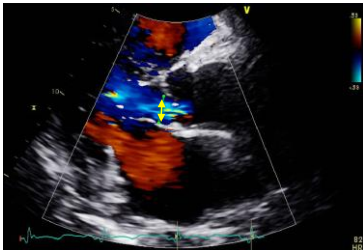
PHT 311 ms



PISA radius 0.5 cm



Jet/LVOT 0.4



EDD 4.5 cm



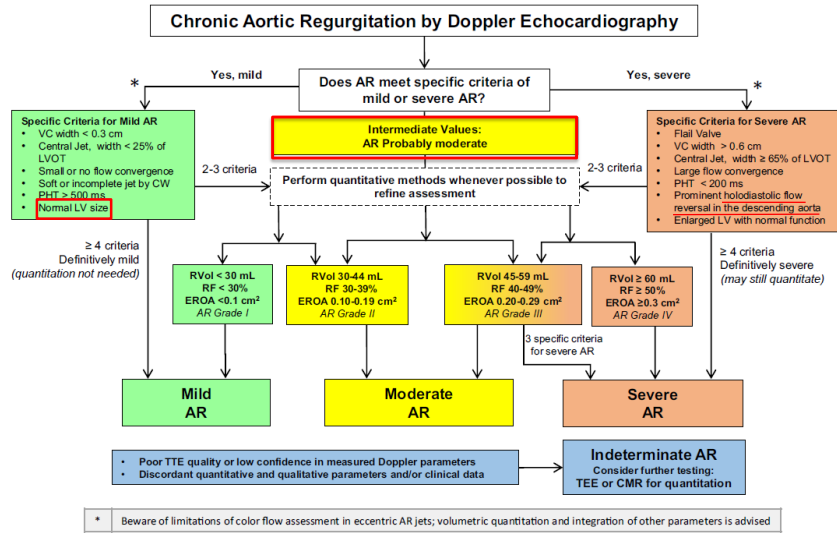
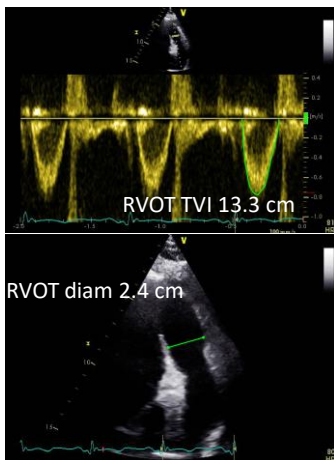


Figure 25 Algorithm for the integration of multiple parameters of AR severity. Good-quality echocardiographic imaging and complete data acquisition are assumed. If imaging is technically difficult, consider TEE or CMR. AR severity may be indeterminate due to poor image quality, technical issues with data, internal inconsistency among echo findings, or discordance with clinical findings. *PHT*, Pressure half-time.



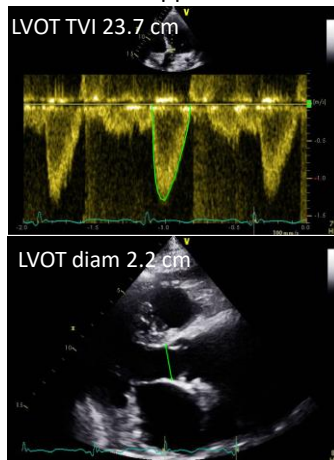
SV METHOD

Pulsed Doppler RVOT



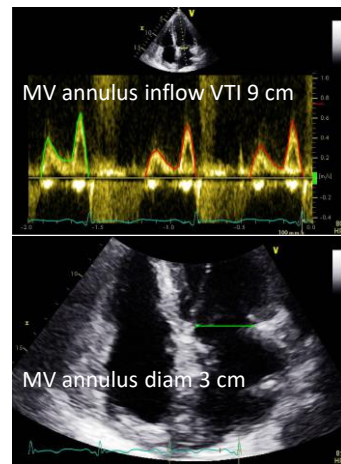
$$\text{RVOT SV} = 0.785 * 2.4 * 13.3 = 60 \text{ mL}$$

Pulsed Doppler LVOT



$$\text{LVOT SV} = 0.785 * 2.2 * 23.7 = 90 \text{ mL}$$

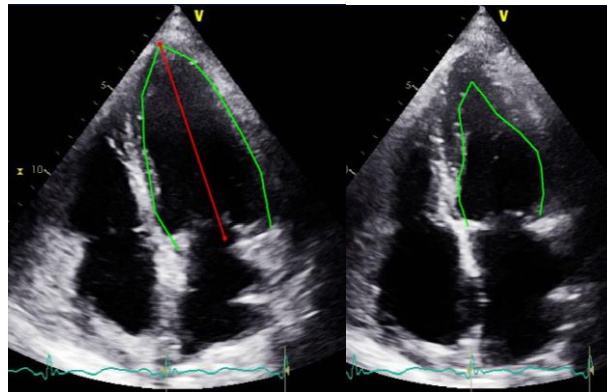
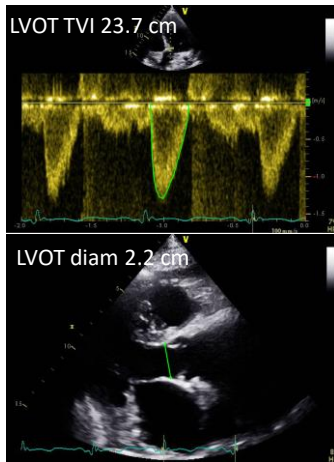
Mitral Annulus



$$\text{MV SV} = 0.785 * 3 * 9 = 63 \text{ mL}$$

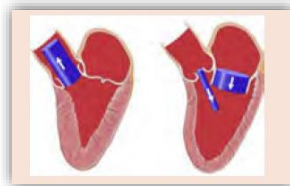
Internal Check of Volumes

Pulsed Doppler LVOT



$$\text{LV SV} = \text{EDV} - \text{ESV} = 139 - 51 = 88 \text{ mL}$$

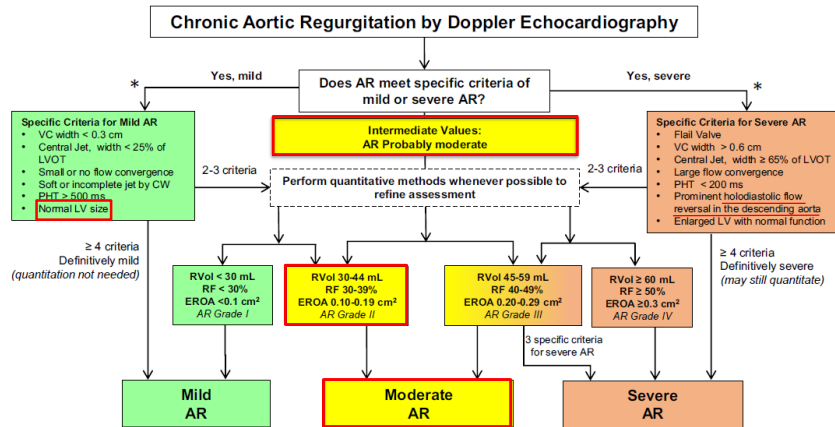
SV METHOD



$$\text{RVol} = \text{SV}_{\text{LVOT}} - \text{SV}_{\text{MV}} = 90 - 63 = 26 \text{ mL}$$

$$\text{RVol} = \text{SV}_{\text{LVOT}} - \text{SV}_{\text{RVOT}} = 90 - 60 = 30 \text{ mL}$$

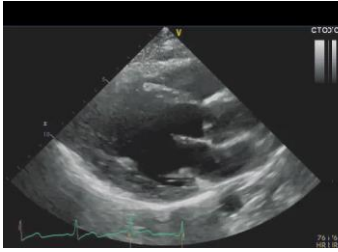
$$\text{RF} = \text{RVol} / \text{SV}_{\text{LVOT}} = 30 / 90 = 33\%$$



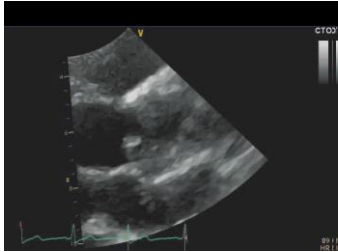
Case

- 24 year old female
- History of urticarial rash.
- Adequate functional capacity with no limiting SOB
- P/E: ?murmur, clear lung fields
- ANA panel on 2/16/2016 was positive

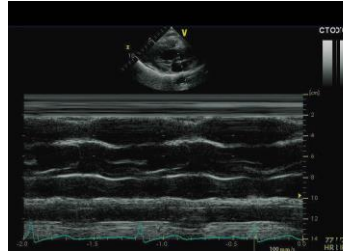
PLAX



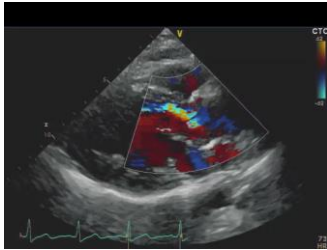
PLAX zoom in aortic valve



PLAX Mmode AV



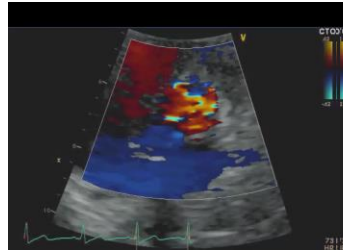
PLAX color Doppler



SAX

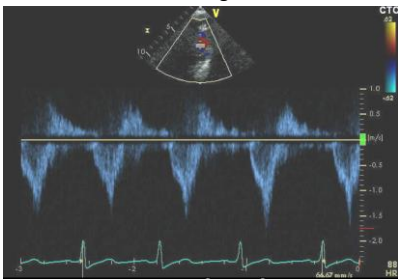


SAX color Doppler

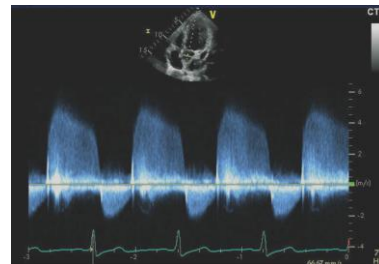


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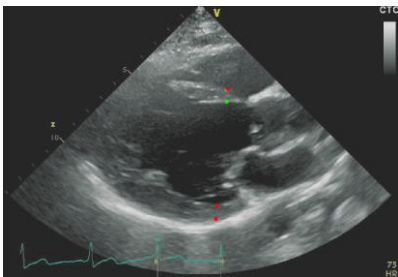
Faint Doppler reversal signal in the descending arch



Dense AI jet signal

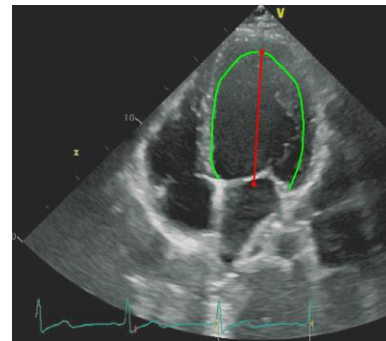


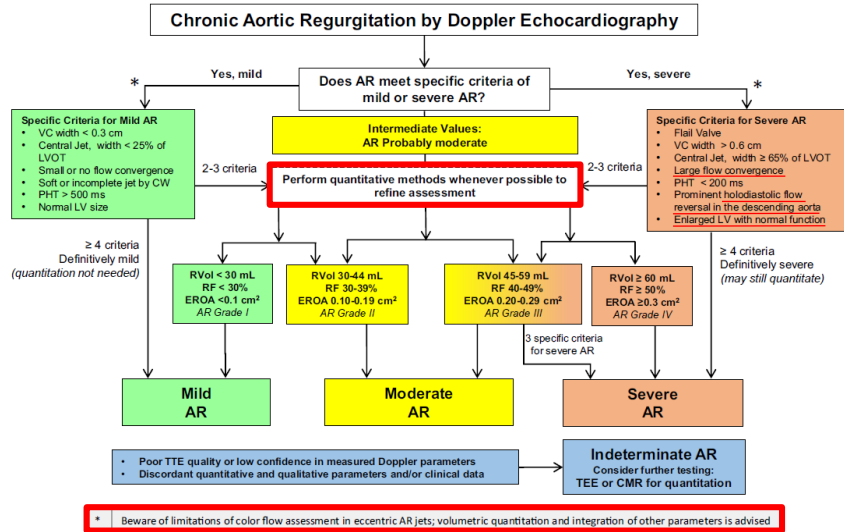
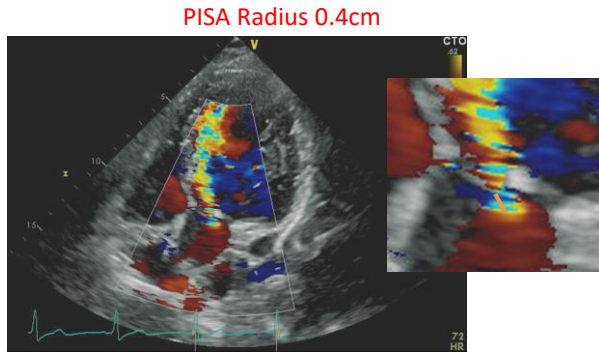
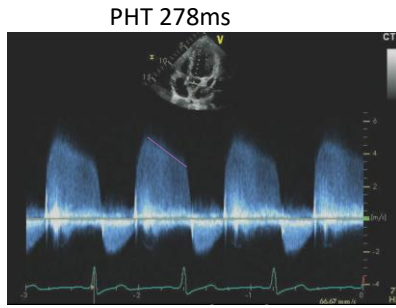
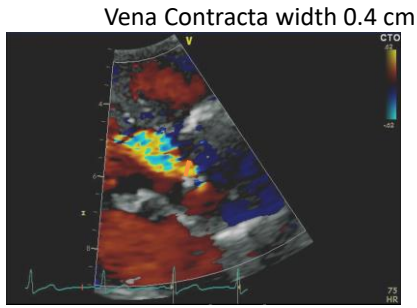
EDD 5.4 cm



EDV 141 mL
(80 ml/m²) =
Dilated

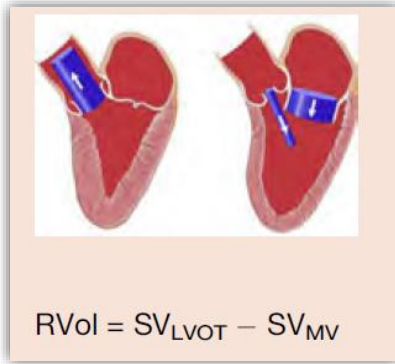
LVEF 63%



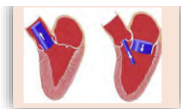
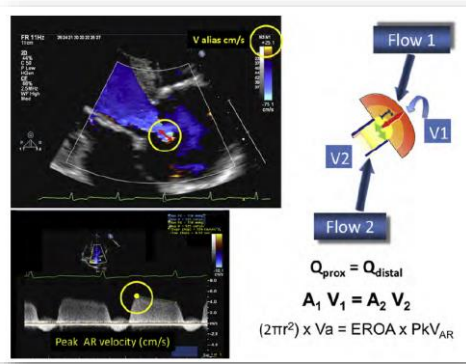


TIME FOR SOME QUANTIFICATION

SV method

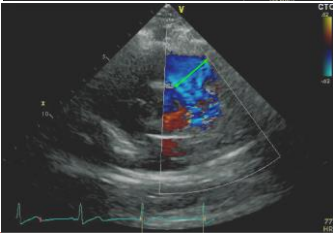
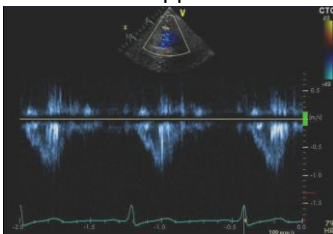


PISA method



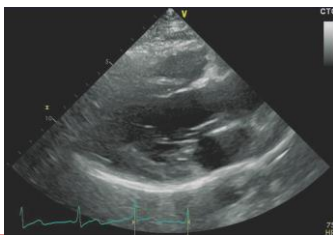
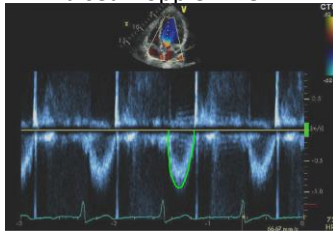
SV METHOD

Pulsed Doppler RVOT



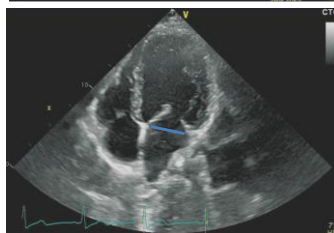
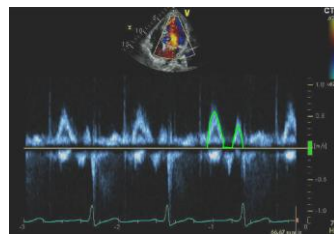
$RVOT SV = 0.785 * 2.3^2 * 14.3 = 59 \text{ mL}$

Pulsed Doppler LVOT



$LVOT SV = 0.785 * 2.4^2 * 19.3 = 87 \text{ mL}$

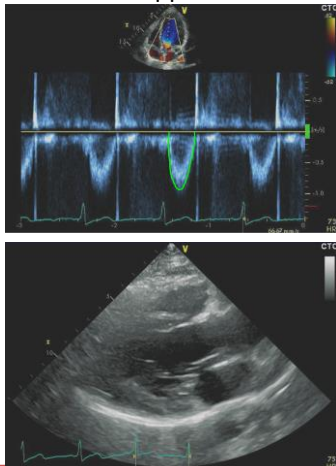
Mitral Annulus



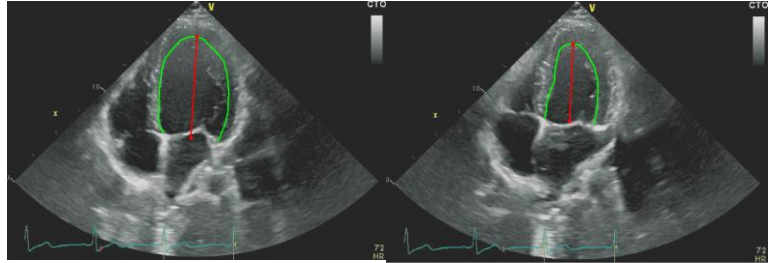
$MV SV = 0.785 * 3^2 * 8.1 = 57 \text{ mL}$

Internal Check of Volumes

Pulsed Doppler LVOT

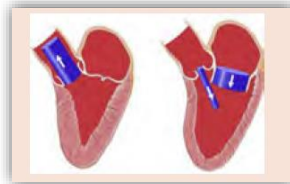


$$\text{LVOT SV} = 0.785 * 2.4^2 * 19.3 = 87 \text{ mL}$$



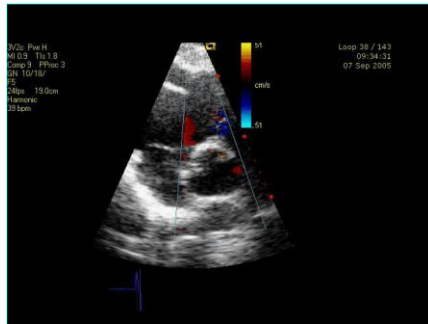
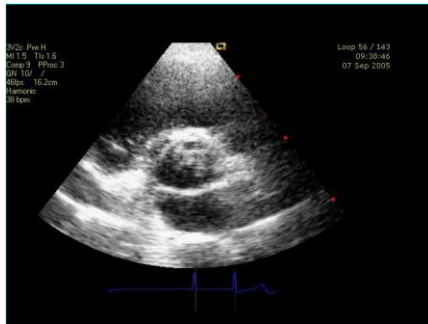
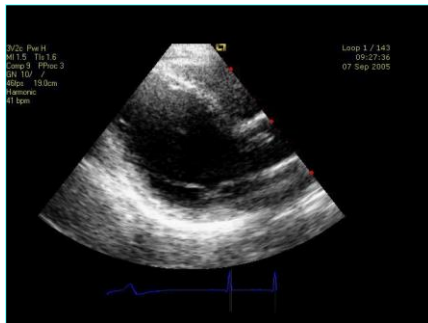
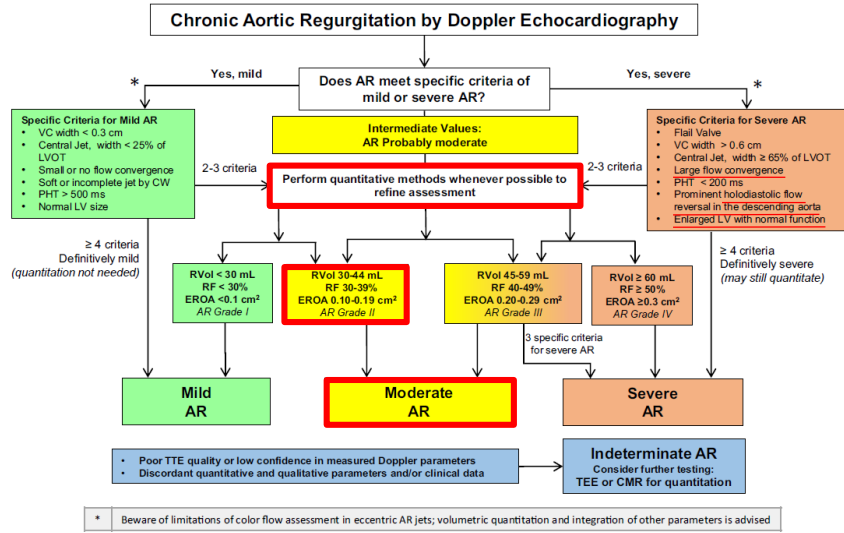
$$\text{LV SV} = \text{EDV} - \text{ESV} = 141 - 51 = 90 \text{ mL}$$

SV METHOD



$$\text{RVol} = 28 \text{ mL}$$

$$\text{RF} = \text{RVol} / \text{SV}_{\text{LVOT}} = 28 / 90 = 33\%$$



What is your best initial assessment of Severity of Aortic regurgitation?

- A. Mild
- B. Mild to moderate
- C. Moderate
- D. Moderate to severe
- E. Severe



Eccentric AI jets



Reliable indicators of severity

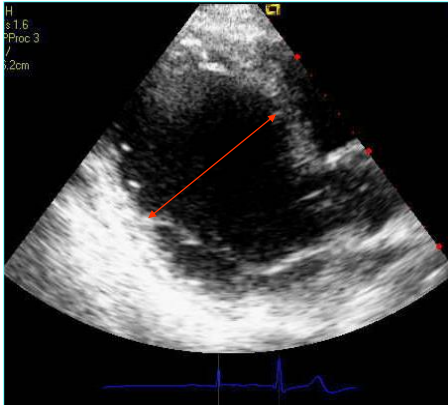
- Vena Contracta- if clearly defined
- Regurgitant flow and regurgitant fraction
- Flow reversal in aorta
- LV size –always look at the scale!

Less reliable indicators of severity:

- Jet width/LVOT diameter
- Area of jet in Short axis
- Adequate CW jet recording may be difficult- “bidirectional”

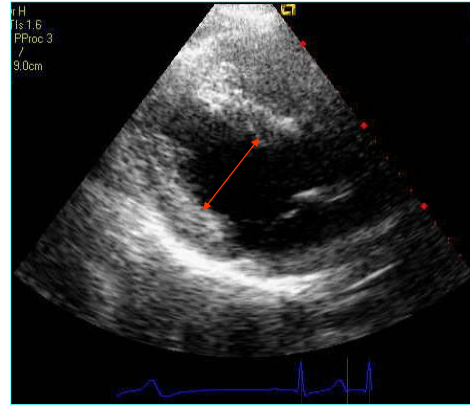
LV Dimensions- 2D

End- Diastole



D ed = 7 cm

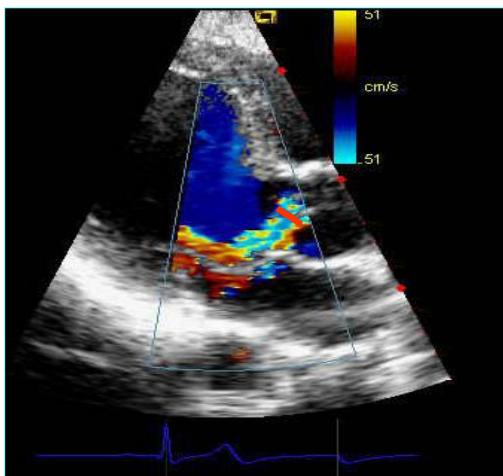
End- Systole



D es = 4.3 cm

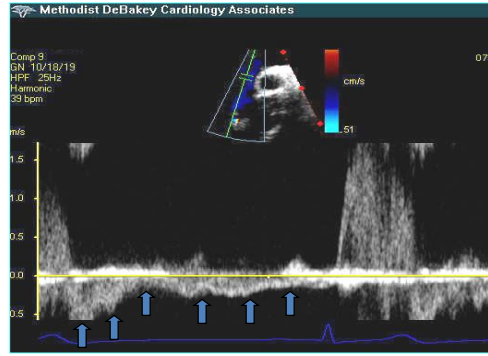
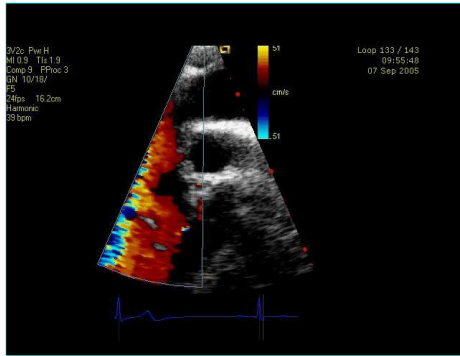
HOUSTON
Methodist
LEADING MEDICINE

Vena Contracta

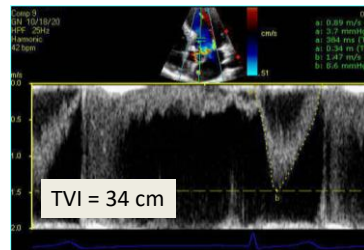
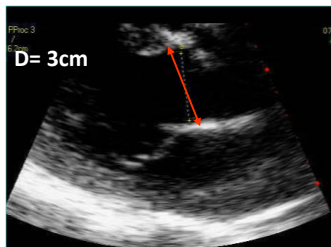


VC = 1 cm !

Aortic diastolic Flow Reversal

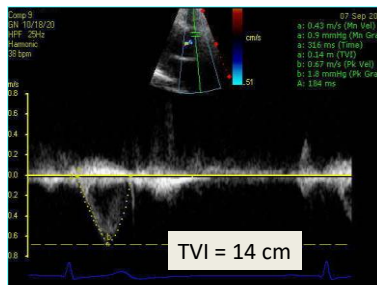
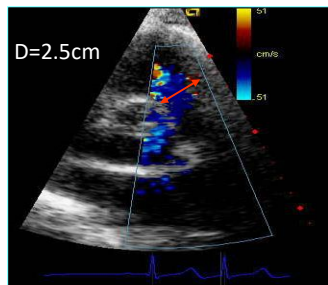


LVOT Flow



$SV_{LVOT} = 240 \text{ ml}$

RVOT Flow



$SV_{RVOT} = 69 \text{ ml}$

Reg V = 240-69
=171mL
RF = 171/240
= 71%

New ASE Valvular Regurgitation Guidelines- *Endorsed by SCMR*

What is New?

- Emphasis on identification of Etiology/Mechanism of regurgitation
- 2D/3D TTE--an integrative approach & algorithms to assess severity
- When is TEE needed
- Important role of CMR & CMR methodology
- The challenge of co-existing valvular lesions
- A clinical perspective...
- Library of case studies on the web: www.asecho.org/vrcases