

Mitral regurgitation

Stephen Glen

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Assessing mitral regurgitation

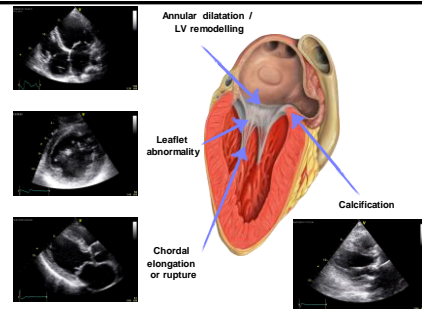
- Mechanism
- Severity
- Associated abnormalities

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Which is true?

1. The MR jet velocity is an indicator of severity of regurgitation
2. Dominant A wave pattern on mitral inflow is consistent with severe mitral regurgitation
3. A normal left atrium volume excludes severe mitral regurgitation
4. A vena contracta width of 8 mm is consistent with severe mitral regurgitation
5. Regurgitant orifice area is more reliable than regurgitant volume in predicting prognosis

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John Barlow



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Severe mitral regurgitation

Acute mitral regurgitation

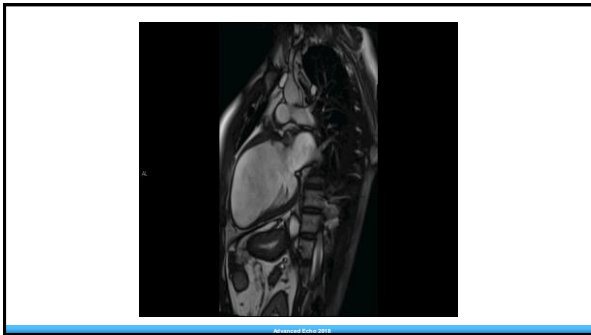
- Uncommon
- Post MI / rupture papillary muscle or chordae, endocarditis, acute cardiomyopathy (rare)
- Easy to underestimate severity by colour or Doppler
- Pulmonary vein systolic flow reversal usually present
- LA may not be dilated
- Identify the mechanism using TOE if required

Primary mitral regurgitation

- Flail leaflet, ruptured papillary muscle, severe leaflet retraction or large perforation = severe regurgitation
- VCW > 0.7 cm or systolic flow reversal in more than one pulmonary vein = severe regurgitation
- Absence of flow convergence or dominant A wave filling pattern = not severe regurgitation

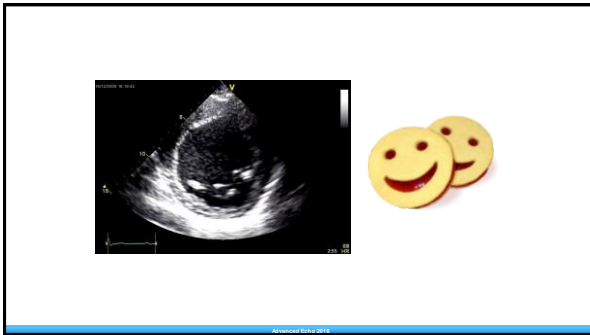
Secondary MR

- Much more difficult to assess
- LV stroke volume may be reduced, so regurgitant volume will also be smaller
- Orifice often elliptical
- Pulmonary venous flow abnormal because of high LA pressure
- No evidence that surgical correction improves clinical outcome
- Mitraclip treatment of severe MR does improve functional class even if moderate residual MR
- But the main problem is the ventricle...



Tenting

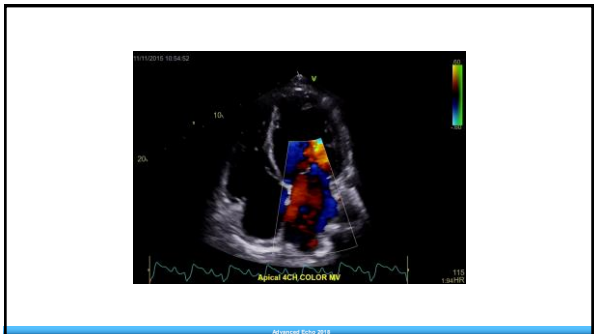
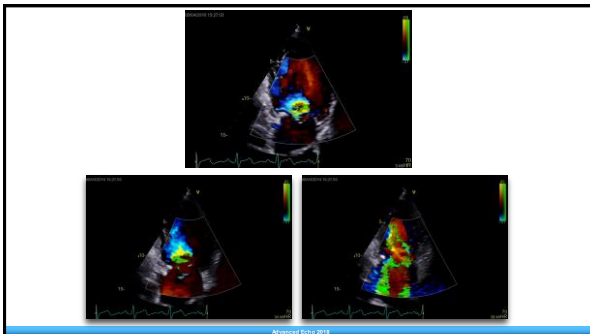
Tenting causes an elliptical orifice - not hemispheric
PISA in the smaller dimension will underestimate regurgitation



Mid systolic versus holosystolic regurgitation

- Leaflet prolapse may cause regurgitation in late systole only
- EROA calculation will overestimate regurgitation severity
- Quantification should be by regurgitant volume
- This predicts cardiac death, CCF and AF more reliably

An echocardiogram image showing aortic regurgitation, likely illustrating the concept of mid-systolic regurgitation.



Bundle branch block

- Can cause early systolic regurgitation
- Orifice area is unreliable
- Regurgitant volume (taking into account the duration of regurgitation) should be measured

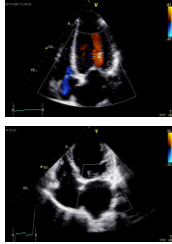
An echocardiogram image showing aortic regurgitation, likely illustrating the concept of bundle branch block.

Severity

An echocardiogram image showing aortic regurgitation with various flow disturbances labeled. The labels include: PISA, Vena contracta, Flow disturbance, Jet size, and Pulmonary vein flow reversal.

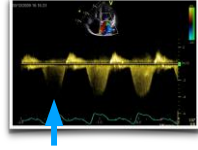
PISA

- More accurate for central than eccentric jets
- More accurate for circular than elliptical or ovoid areas
- Errors up to 25% in expert readers are common
- Simplified approach assumes a 5 m/sec MR jet, baseline shift to V_a of around 40 cm/sec, $EROA = r^2/2$
- For primary MR, $EROA \geq 0.4\text{cm}^2$ is severe, $< 0.2\text{cm}^2$ is mild



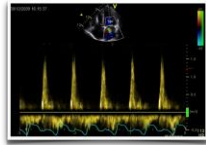
CW jet

- The MR jet velocity does not indicate severity of regurgitation
- Low jet velocity could suggest haemodynamic compromise
- Truncated / triangular jet could suggest high LA pressure
- Density is qualitative indicator (but is angle dependent)



Pulse wave

- Severe MR = dominant early ventricular filling (high E wave, usually $> 1.2\text{ m/sec}$)
- Low E wave and high A wave virtually excludes severe MR
- Most reliable in primary MR although will be affected by calcification or stenosis



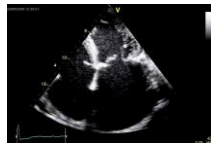
Pulmonary vein flow

- Watch for single vein flow reversal (eccentric MR entering pulmonary vein)
- Care to make sure MR jet is not contaminating pulmonary flow signal
- Tricky by transthoracic echo to image all pulmonary veins



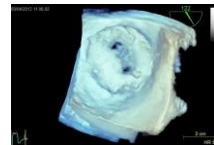
Atrial volume

- Normal LA size virtually excludes severe chronic MR
- LA volume is better than diameter
- Should be indexed
- LA can dilate with AF / hypertension



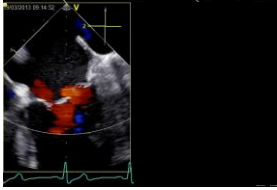
Is 3D TOE necessary?

- 3D TTE less sensitive & accurate for identifying flail segments
- 2D & 3D TOE comparable in describing mechanism
- 3D TOE best for localising the disease



Zakry S et al. JASE 2011;24:1079-85

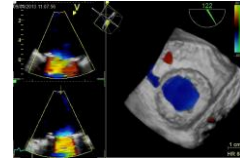
Realtime biplane imaging



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3D colour

- To improve alignment for PISA
- Detection of and localisation of multiple jets



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EAE/ASE Recommendations for Image Acquisition and Display Using Three-Dimensional Echocardiography

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(J Am Soc Echocardiography 2012;25:3-46)

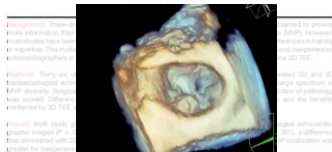
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Experts and Beginners Benefit from Three-Dimensional Echocardiography: A Multicenter Study on the Assessment of Mitral Valve Prolapse

Martina D'Amico, MD, Marco G. Gargiulo, MD, PhD, Hironori Kouchi, MD, Alexander Weymann, MD, Raffi Bekeredjian, Prof, MD and Christian Basso, MD, Heidelberg, Germany; Ben, September



Conclusions: The reported diagnostic advantage of 3D TEE over 2D TEE in MVP assessment for expert echocardiographers can be transferred to inexperienced echocardiographers. Inexperienced echocardiographers benefit from the technology to a greater extent than their expert colleagues. (J Am Soc Echocardiography 2015)

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Exercise echo

- Useful in "asymptomatic" patients
- Development of PA pressure > 60 mm-Hg [class IIa recommendation]
- Inability to increase EF (<4% change)
- Inability to reduce end-systolic volume
- Inability to increase global longitudinal strain (<1.9% change)



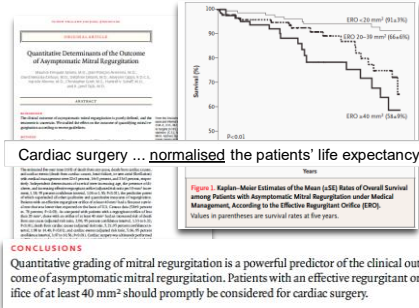
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Case

- 54 yrs, female
- Asymptomatic
- Incidental murmur
- No comorbidity



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Robot-Assisted Minimally Invasive Mitral Valve Repair



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Mitral valve repair

- Multiple large studies confirming good outcomes
- < 1% perioperative mortality
- Minimally invasive approach preferred
- 15 year survival around 80%
- 87% free of mitral regurgitation at 5 years
- 68% at 10 years



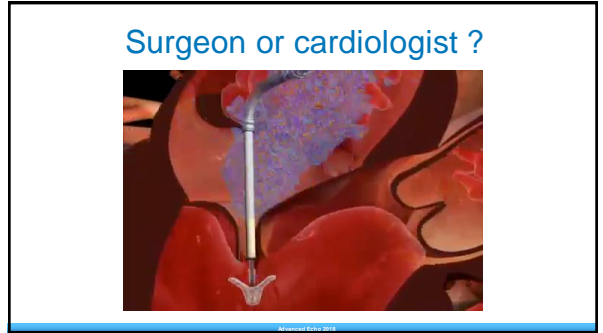
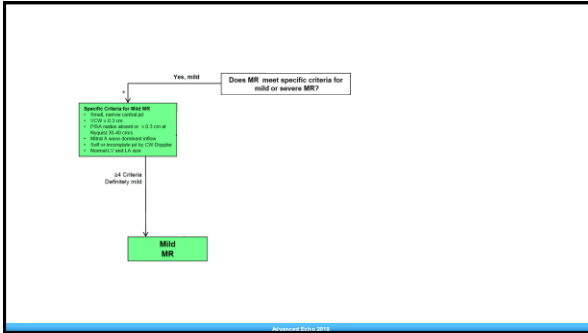
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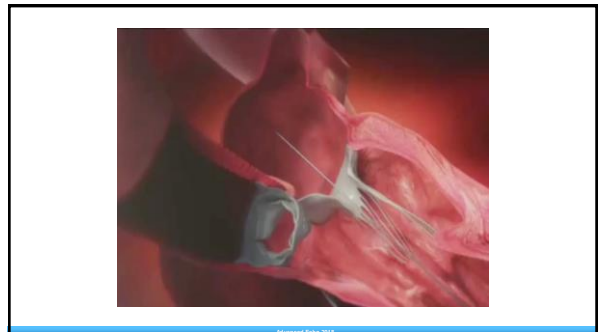
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- Structure
- MV morphology
- LV and LA size^a
- Quantitative Doppler
- Color flow jet area^b
- Flow convergence^c
- CDO jet
- Semi-quantitative
- VQW (cm)
- Pulmonary vein flow^d
- Mitral inflow^e
- Quantitative^{f, g}
- EROA, 2D PISA (cm²)
- RVOI (mL)
- RF (%)

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27% MAE, 6 reoperation for failed repair, 1 death



- ### Key points
- Mechanism should be specified
 - LA volume should be measured and indexed
 - Late systolic MR is rarely severe
 - Quantitate if other parameters do not clarify severity
 - Measure blood pressure
 - Consider TOE or CMR if echo images unclear



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