



Oxford University Hospitals NHS Foundation Trust

How to assess the mitral valve using 3D echo

Monday 19th June
Jim Newton
Oxford

Your experience with 3D echo

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6. What's a 2D echo?

3D echo for mitral the mitral valve

Rule 1	• Know your mitral valve anatomy
Rule 2	• Recognise the pitfalls
Rule 3	• Be fast but thorough
Rule 4	• Maximise use of 3D




Know your anatomy

Can you draw a mitral valve?

How to draw a mitral valve



How to draw a mitral valve



Relate anatomy to imaging planes



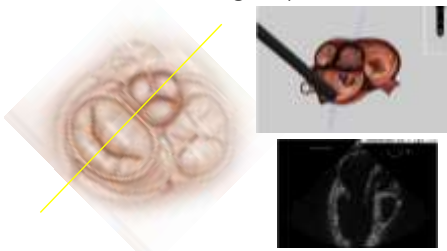
Zero degree plane



60 degree plane



140 degree plane

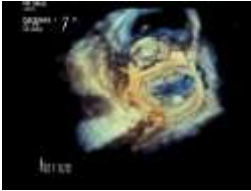


How would you describe this lesion?



1. A2 prolapse
2. P2 prolapse
3. P2 and P3 prolapse
4. P1 prolapse
5. A2 and P2 prolapse

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- 5. A2 and P2 prolapse



Recognise the pitfalls

What type of TOE?



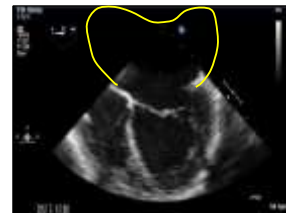
Don't get distracted....



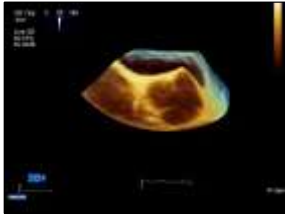
2D or 3D TOE is not perfect



TOE is not perfect



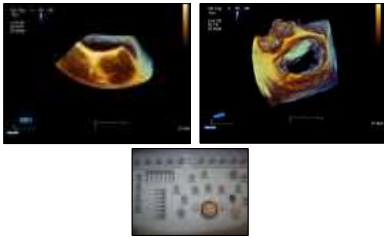
3D pitfalls and challenges



3D pitfalls and challenges

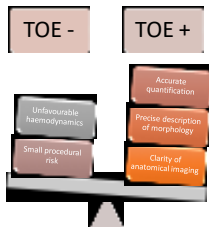


3D pitfalls and challenges

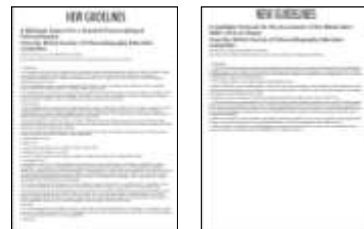


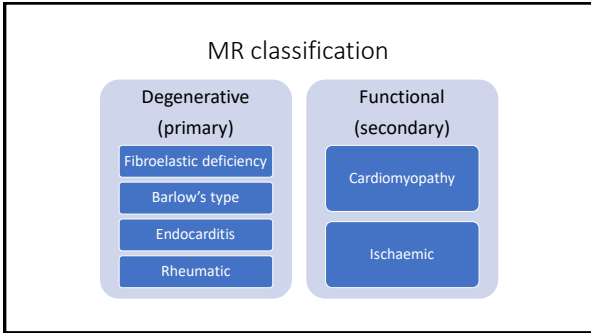
Be fast but thorough

Utilise the strengths of TOE





Have a routine







Spectrum of degenerative MR

- Fibroelastic deficiency
 - Thin transparent leaflets
 - Ruptured thin chord
 - Discrete prolapse zone



Spectrum of degenerative MR

- Secondary myxomatous changes in prolapsed segment
- Thickened and expansion of prolapse zone



Spectrum of degenerative MR

- Excess tissue and myxomatous changes

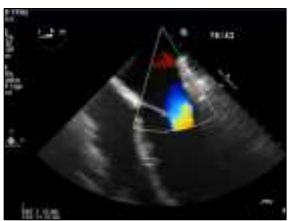



Spectrum of degenerative MR

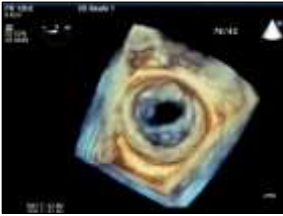
- Barlow's valve
 - Large valve size, thickened and elongated chordae
 - Diffuse myxomatous changes, excess leaflet tissue

Changes can be subtle



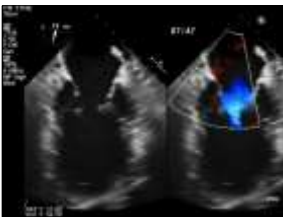
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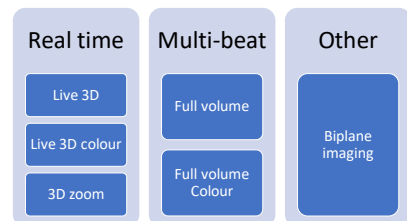


Maximise the use of 3D

Advantages of 3D echo for the mitral valve

- Higher spatial resolution
- Less probe manipulation
- View valve from left atrial and left ventricular aspect
- More accurate for orifice area assessment – MS and EROA

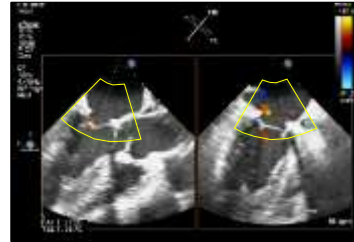
3D echo modes



Live 3D echo



3D zoom mode



3D zoom mode



Full volume (multi-beat)



Full volume



Full volume artefacts

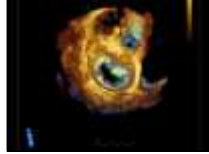


Use 3D to show others the problem



Use 3D to...

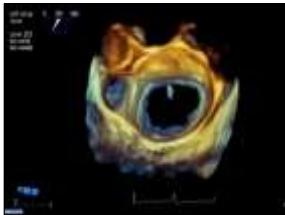
Teach mitral imaging



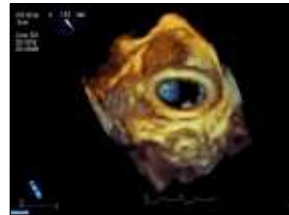
Display findings



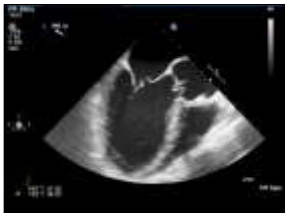
Surgical planning



Surgical planning



3D in complex anatomy



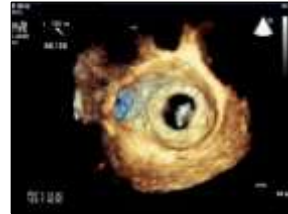
3D in complex anatomy



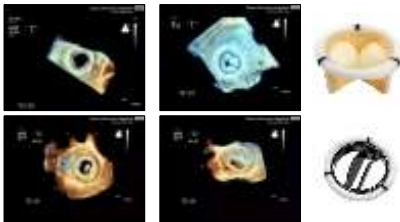
3D in complex anatomy



Prosthetic valve evaluation



Prosthetic valves



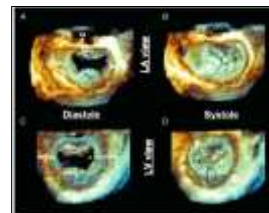
Guideline now released



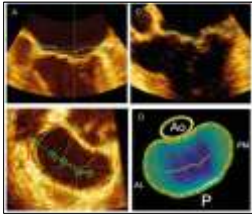
Common issues with 3D

Problem	Image	Recommendation Suggestions for Correction
Over Gain		<ul style="list-style-type: none"> Reduce gain or zoom range - no greater than 50% Reduce contrast/brightness, range or mid-range Optimize gain setting with TIC or slightly over gain Background depth should be reset
Under Gain		<ul style="list-style-type: none"> Increase overall gain with TIC or slightly over gain Optimize brightness, range or mid-range Increase overall gain or mid-range - between 50 and 60 Background depth should be reset
Black Artifact		<ul style="list-style-type: none"> Reduce Artifact - set for semi-contrast rate Adjust Artifact - have patient hold or hold breath Use optimal image quality and lower the patient's tidal Use reference image only for missing and analyze to adjusts contrast appearance or use full time
Flow Resolution		<ul style="list-style-type: none"> Compromise between volume rate and spatial resolution Increase one velocity and flow volume rate Increase size of phase or orthogonal plane after flow variables Optimize frequency, compression, focus and range

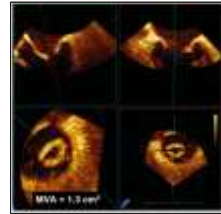
Standardised imaging displays



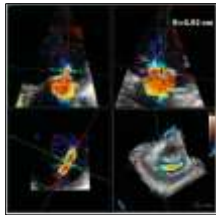
Quantification of anatomy



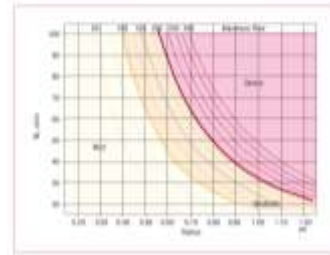
True planar assessment of orifice area



3D measurement of vena contract and PISA



Easy PISA

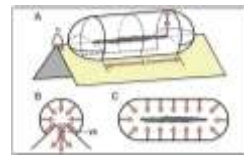


Leaning PISA



$$EROA = \frac{2\pi^2 \times \text{Nyquist Limit}}{V_{max}(2\theta)} \times \frac{\pi}{180}$$

Taking the PISA



Equation 3: $R_{\text{PISA}} = \sqrt{\frac{(\pi L^2 / 180) - 5\pi \text{EROA}^2}{\pi \times (V_{max} / V_{max}(\theta)) - 4.72}}$

Not just TOE though...



View structures 'en-face'



Conclusion

- Know your anatomy – and how to image it
- Do the TOE for the right reasons
- Be fast but thorough
- Watch the blood pressure....