

3-D Echo in the Cath Lab: The Noninvasive Imager's Perspective

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October 13, 2016



Disclosures

There are no disclosures.

3-D Echo: Overview

- **Benefits and Advantages**
- **Challenges and Limitations**
- **Case examples**
- **Future direction**

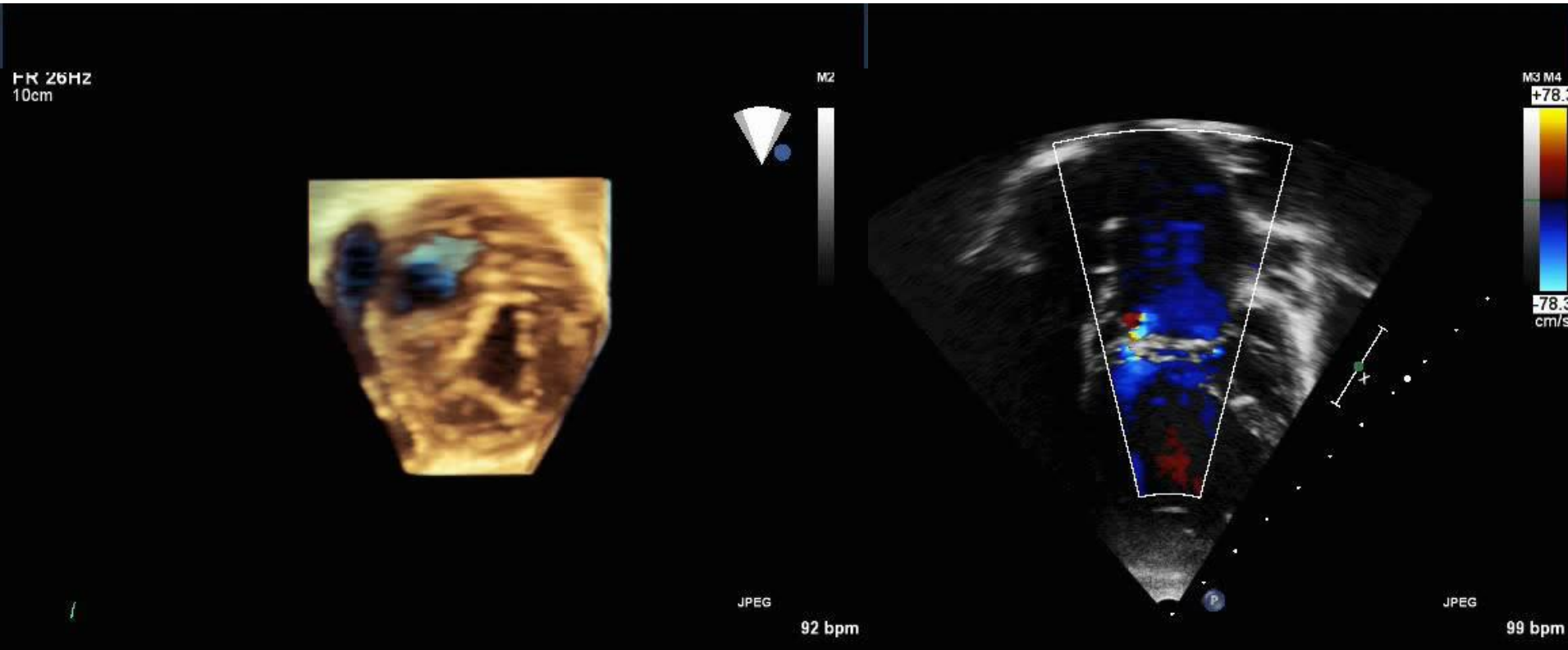


3-D Echo: Advantages

- **Unique imaging planes – 3-D TEE, ICE**
- Views not able to be seen with standard 2-D imaging
- En face views of structures
- Valves - normal and abnormal
- Septal defects - ASD, VSD
- 3-D TEE correlates more closely with surgical findings than standard 2-D TEE, especially for MV pathology



3-D Echo: Advantages - MV



3-D Echo: Advantages

- **Better understanding of anatomy and relationships of structures**
- See this with other forms of 3-D technology
- Cath Lab - can lead to better planning of interventions
 - Selecting the best procedure – pre-procedure planning
 - Guiding the procedure - **Ability to obtain 3-D images in real-time**
 - Assessing post-procedure results



3-D Echo: Advantages

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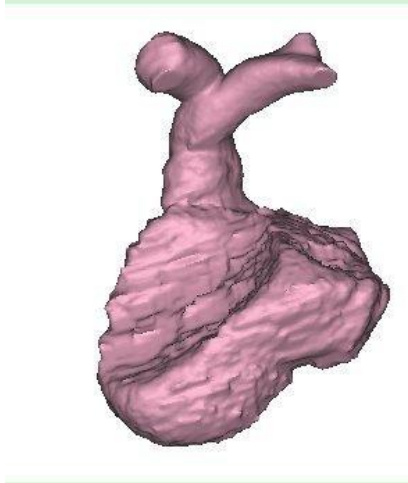
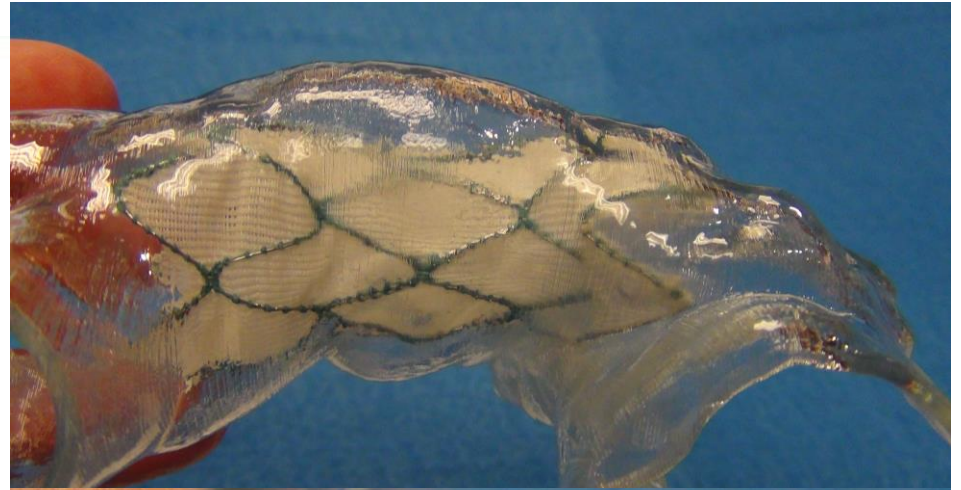
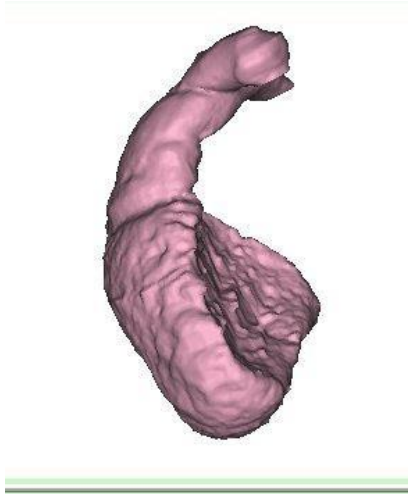


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3-D Echo: Advantages



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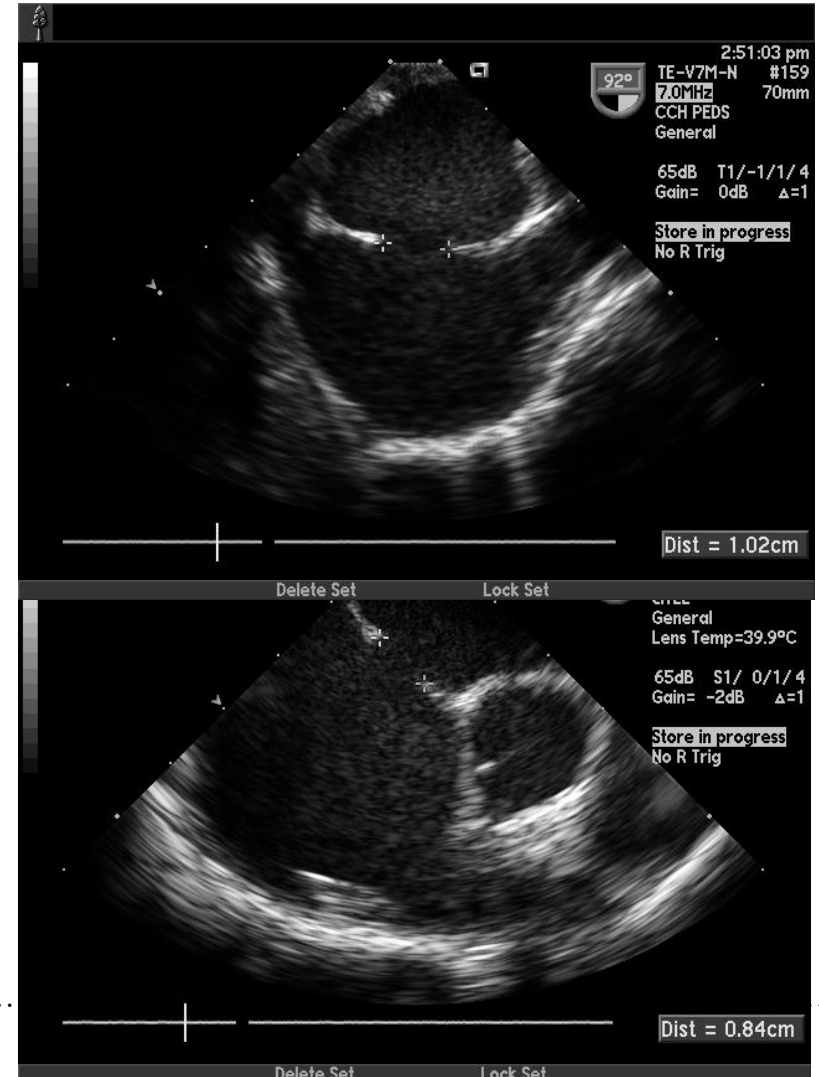
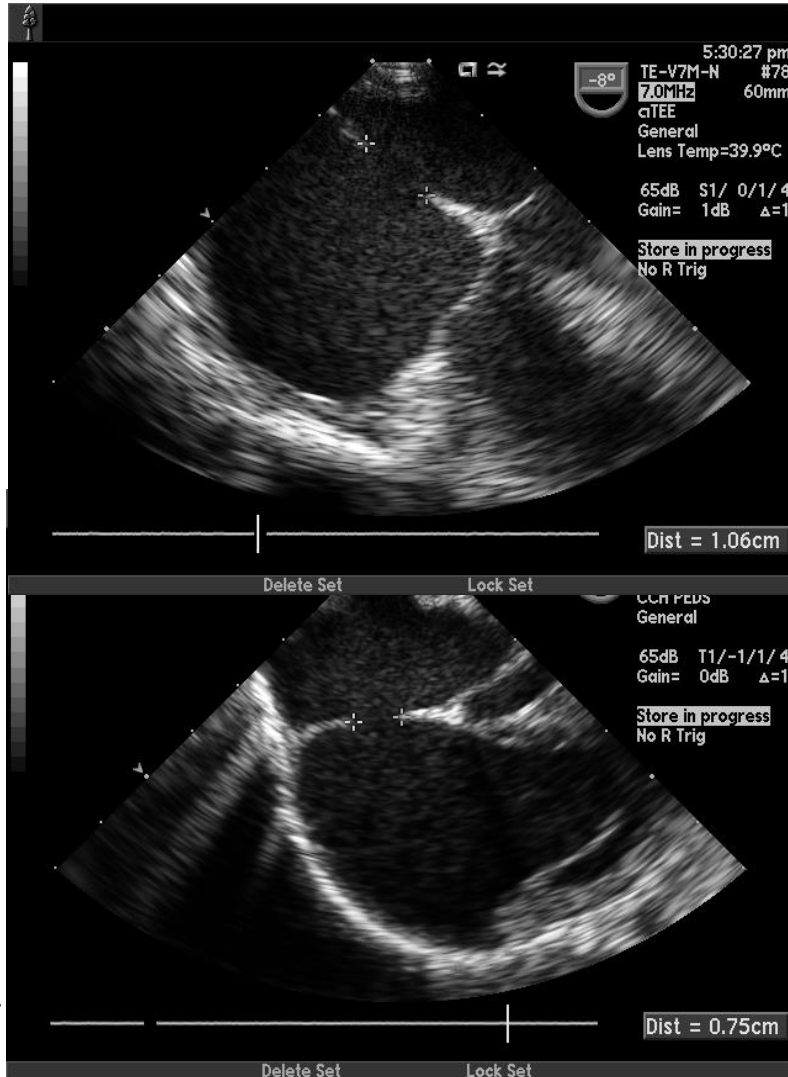
3-D Echo: Advantages - ASD

- 2-D imaging - not able to visualize all of an ASD or the rims from 1 view
- Often oval shaped - not circular
- 3-D TEE allows visualization in 1 view
- ASD size, shape, number of orifices, rims
- Spatial relationship of the defect and hardware to surrounding structures

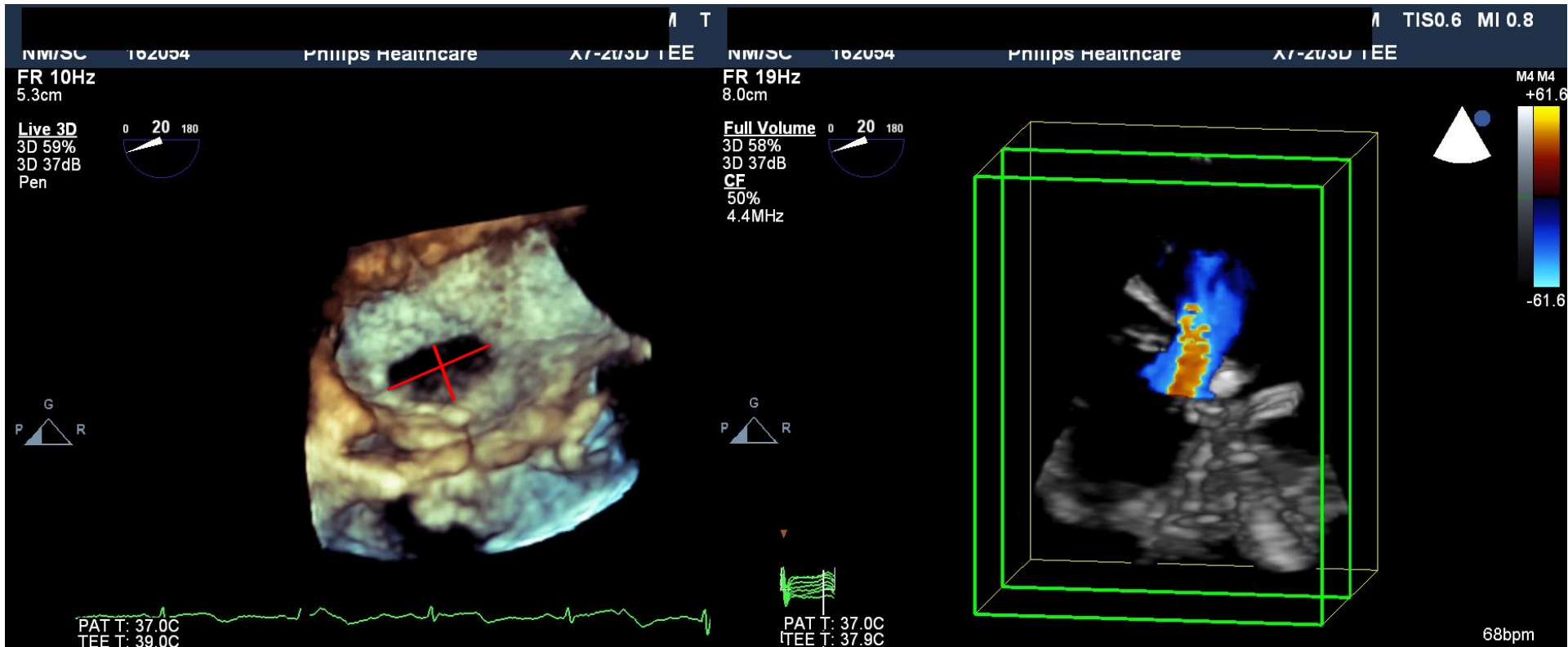


Roberson DA, Curr Cardiol Rep. 2014

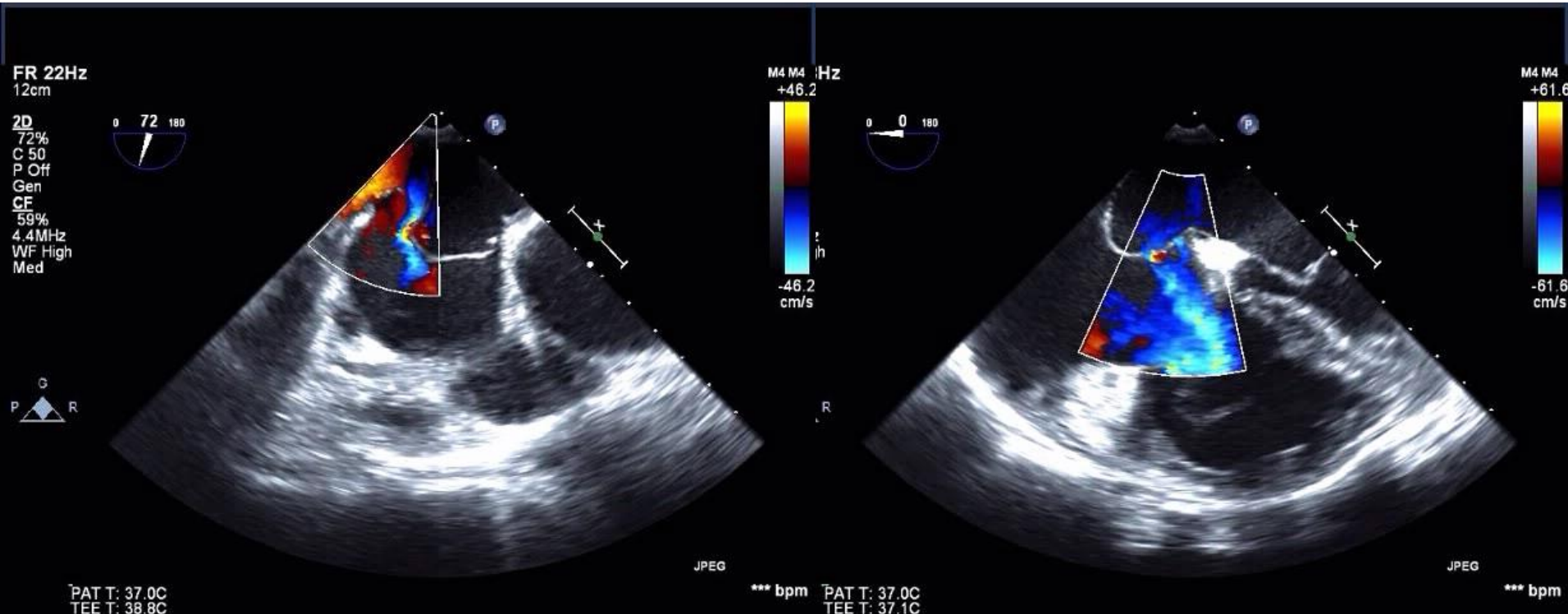
3-D Echo: Advantages - ASD



3-D Echo: Advantages - ASD

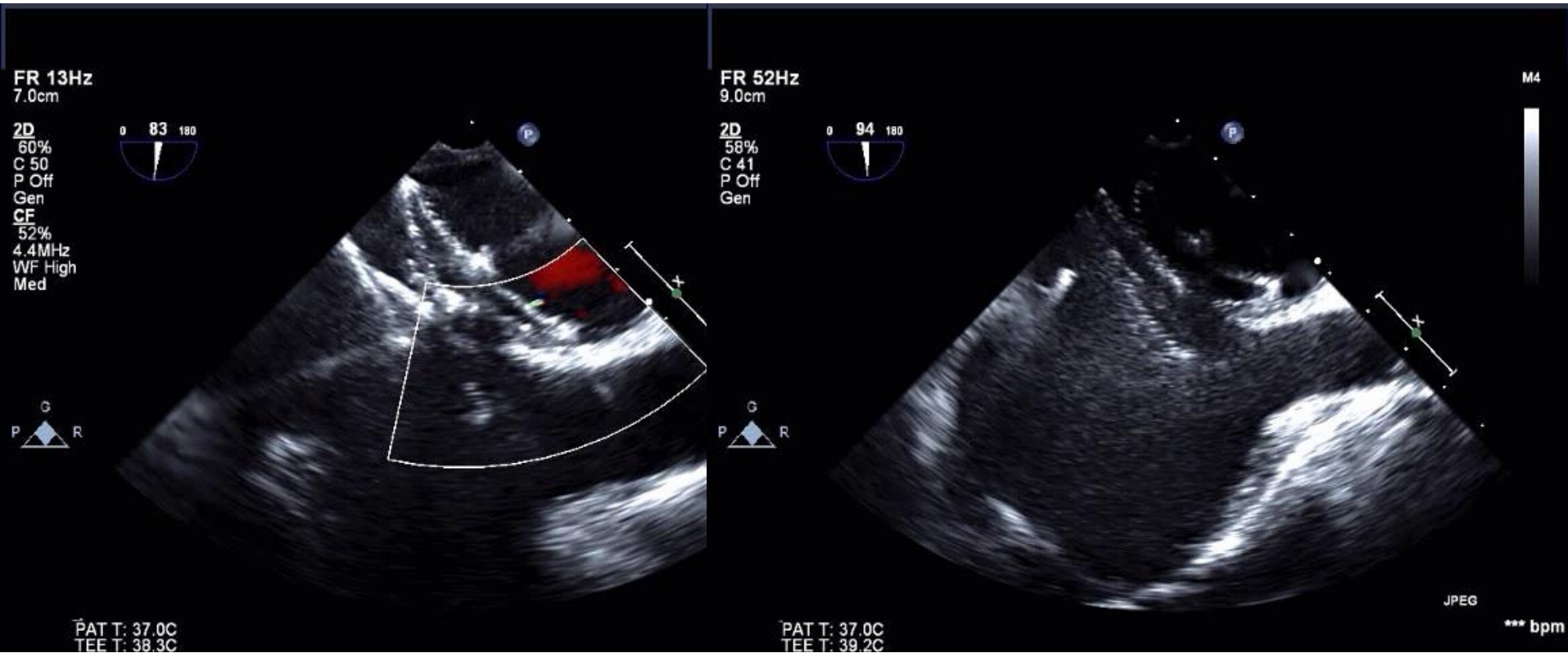


3-D Echo: Advantages - ASD

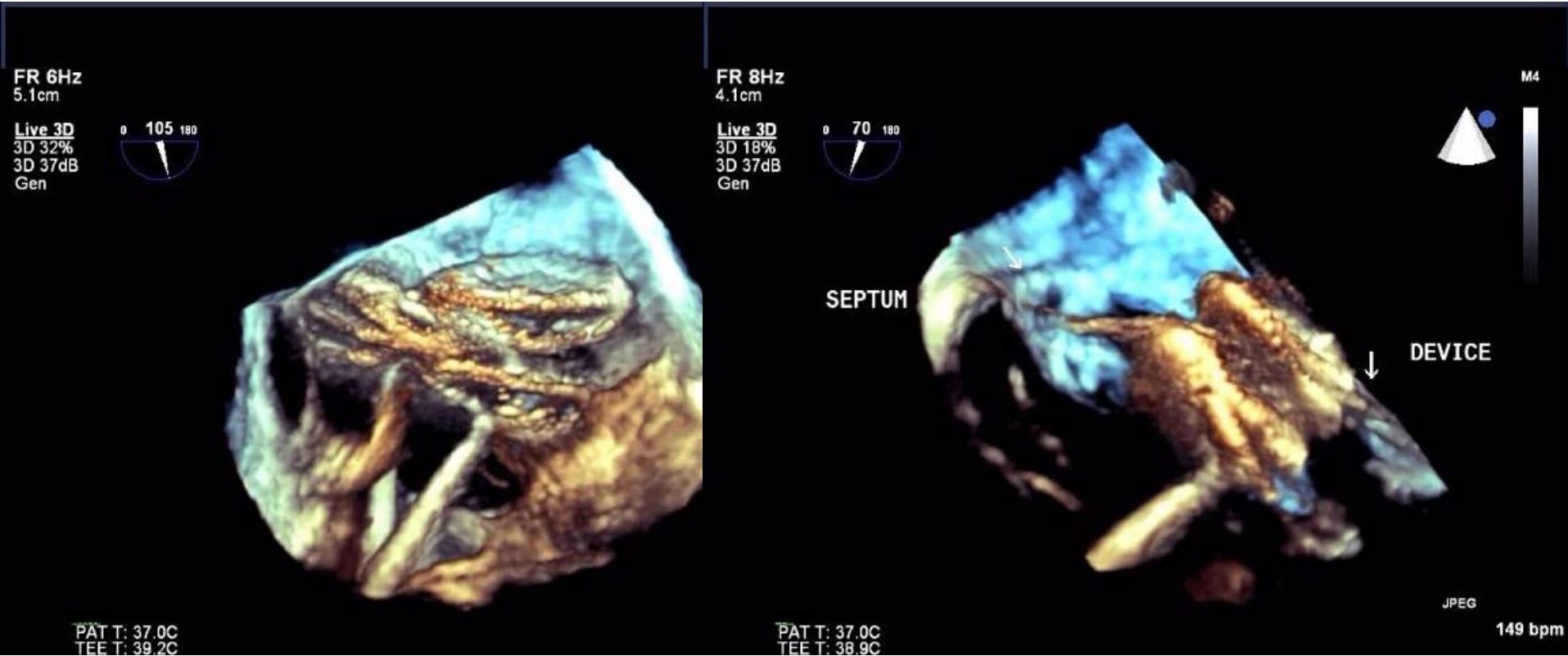


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3-D Echo: Advantages - ASD

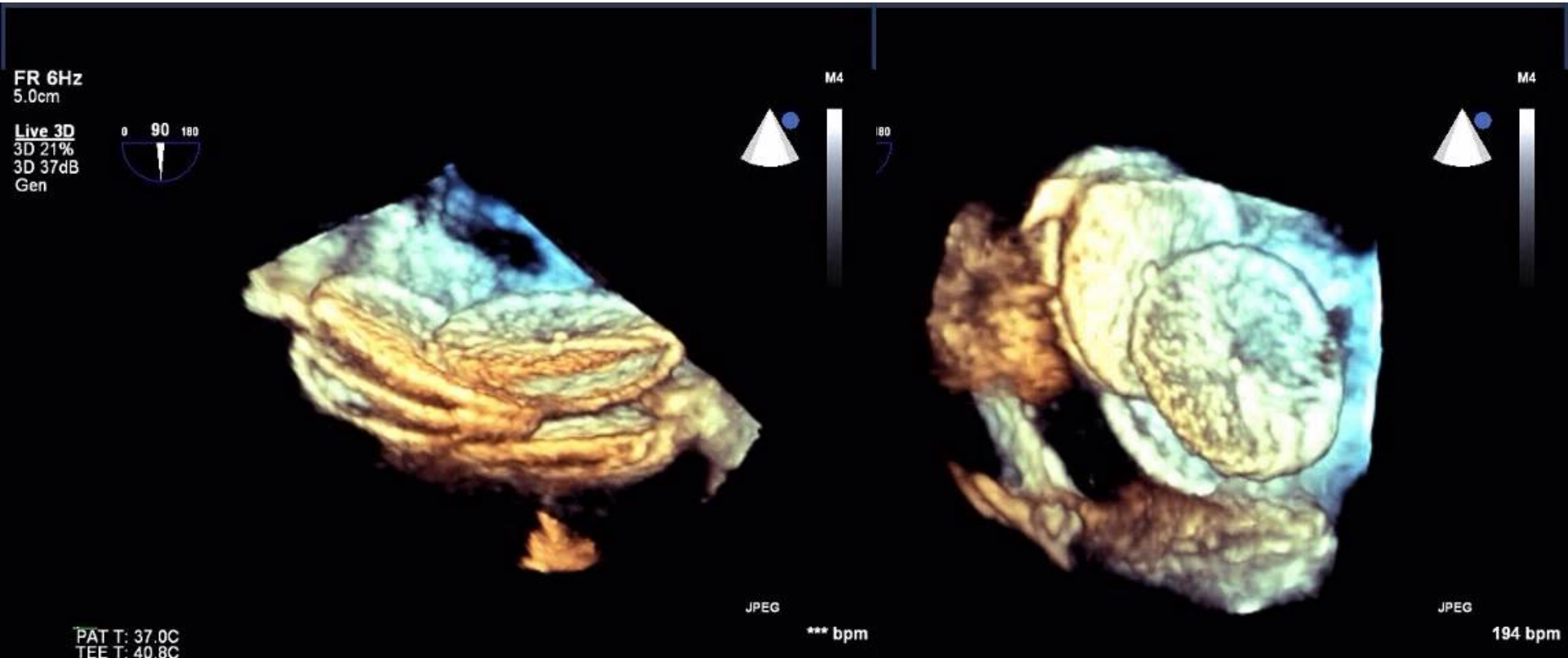


3-D Echo: Advantages - ASD



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3-D Echo: Advantages - ASD



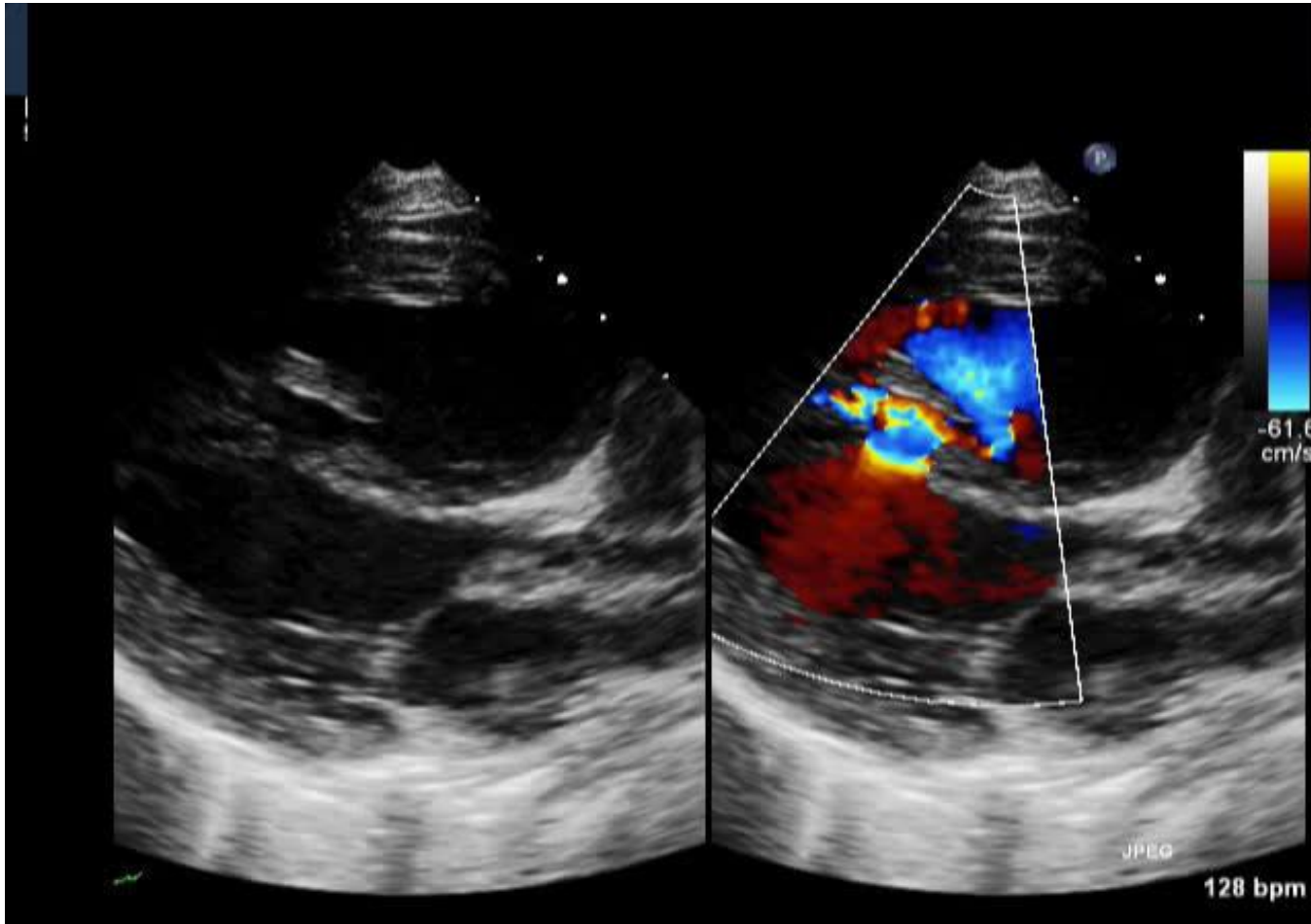
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3-D Echo: Advantages - VSD

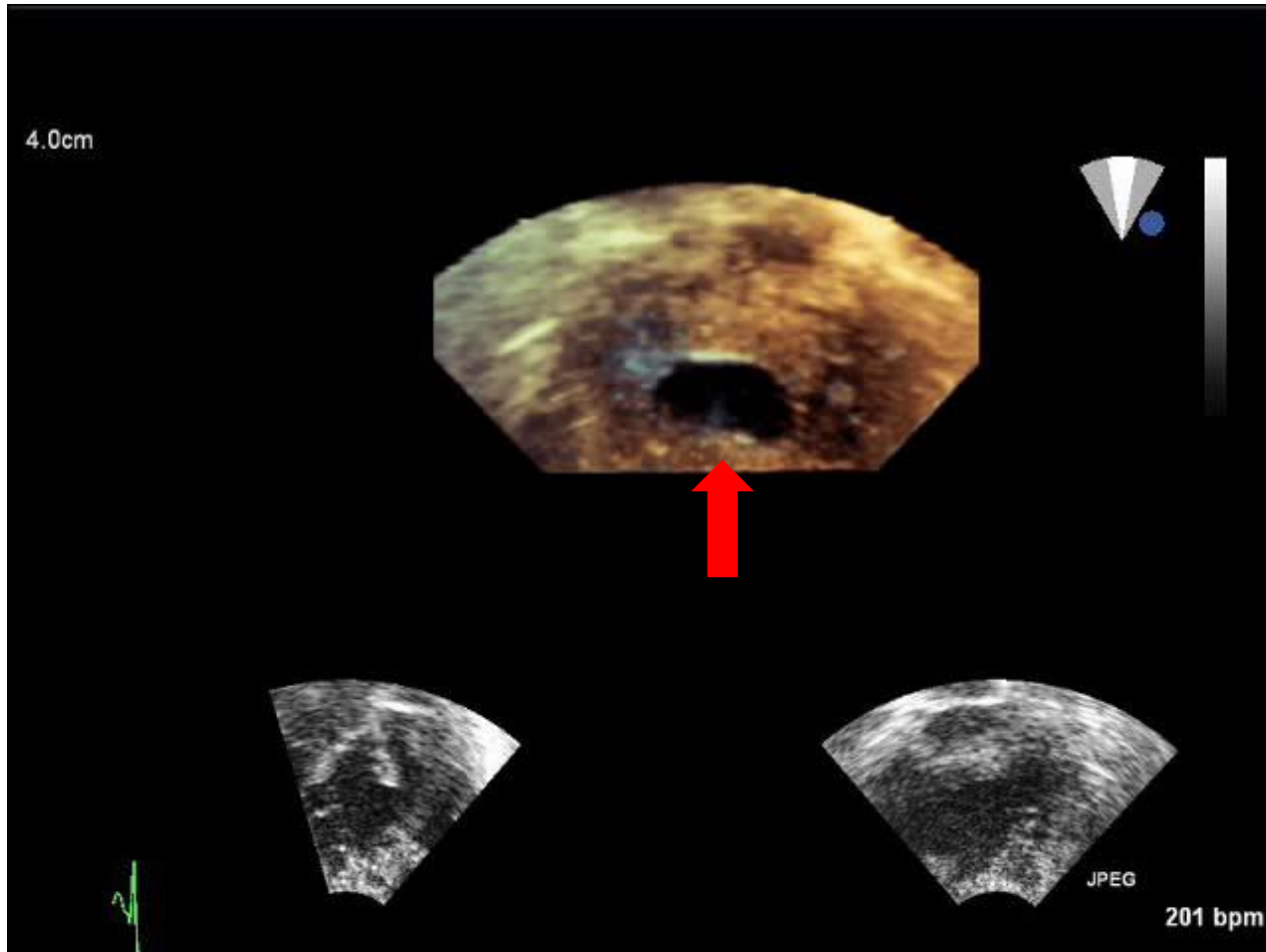
- Several studies shown that 3-D echo is useful for accurate sizing of VSDs
- Similar reasons to 3-D ASD, en face view of the VSD
- 3-D echo correlates better than 2-D with surgical findings of VSD size



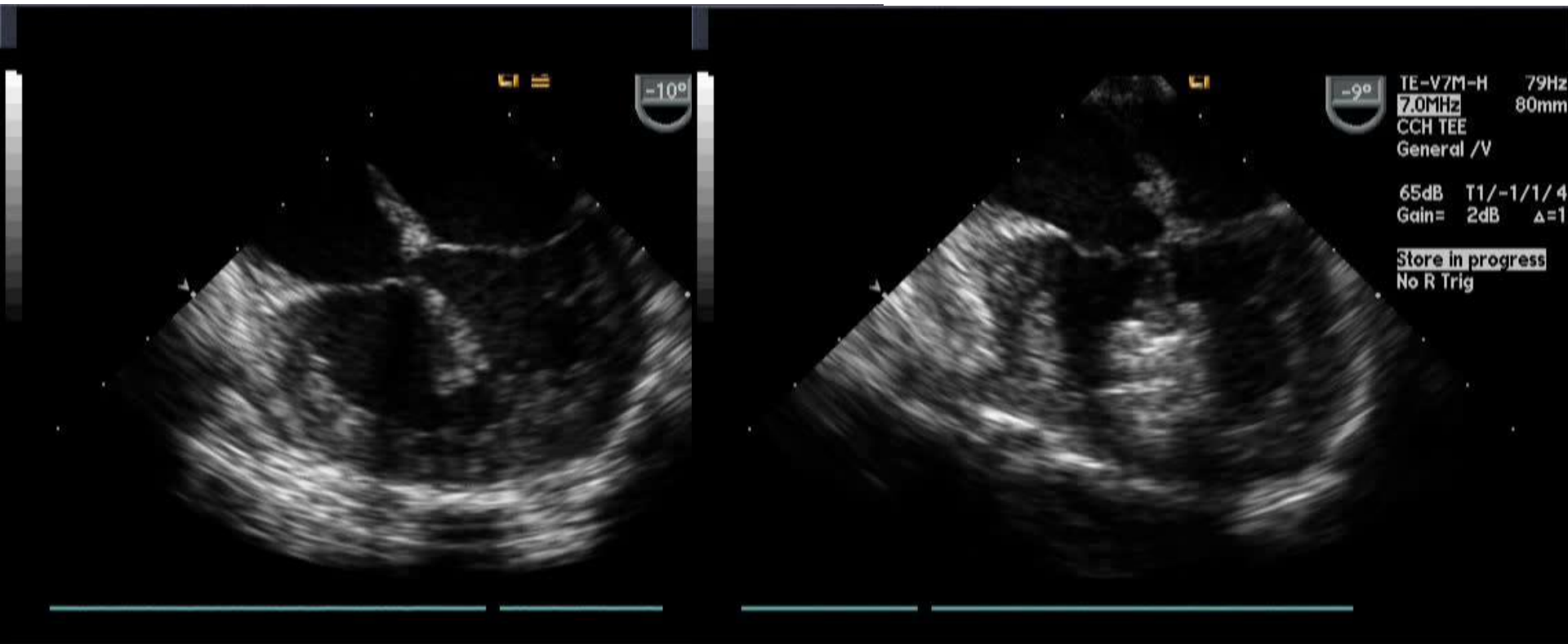
3-D Echo: Advantages - VSD



3-D Echo: Advantages - VSD

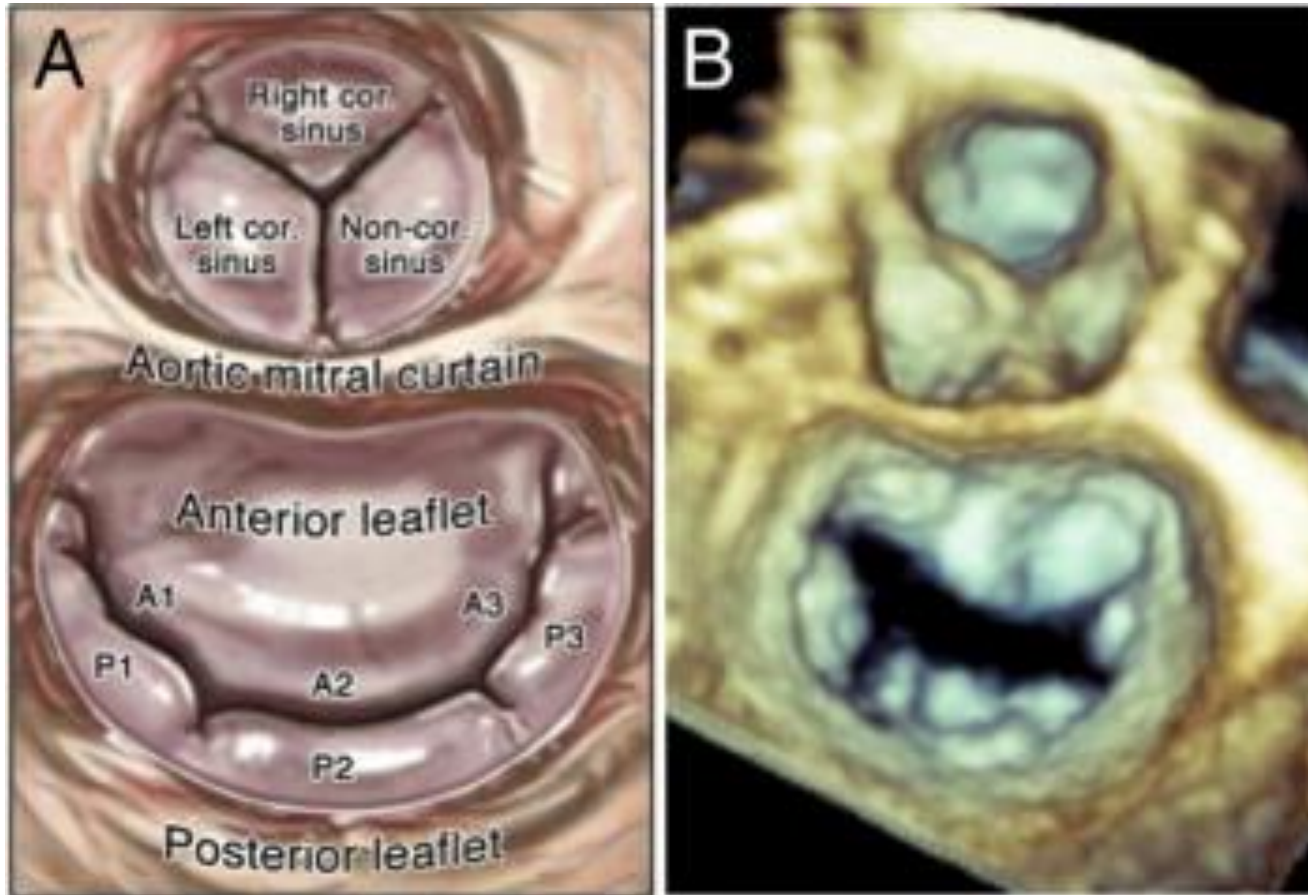


3-D Echo: Advantages - VSD



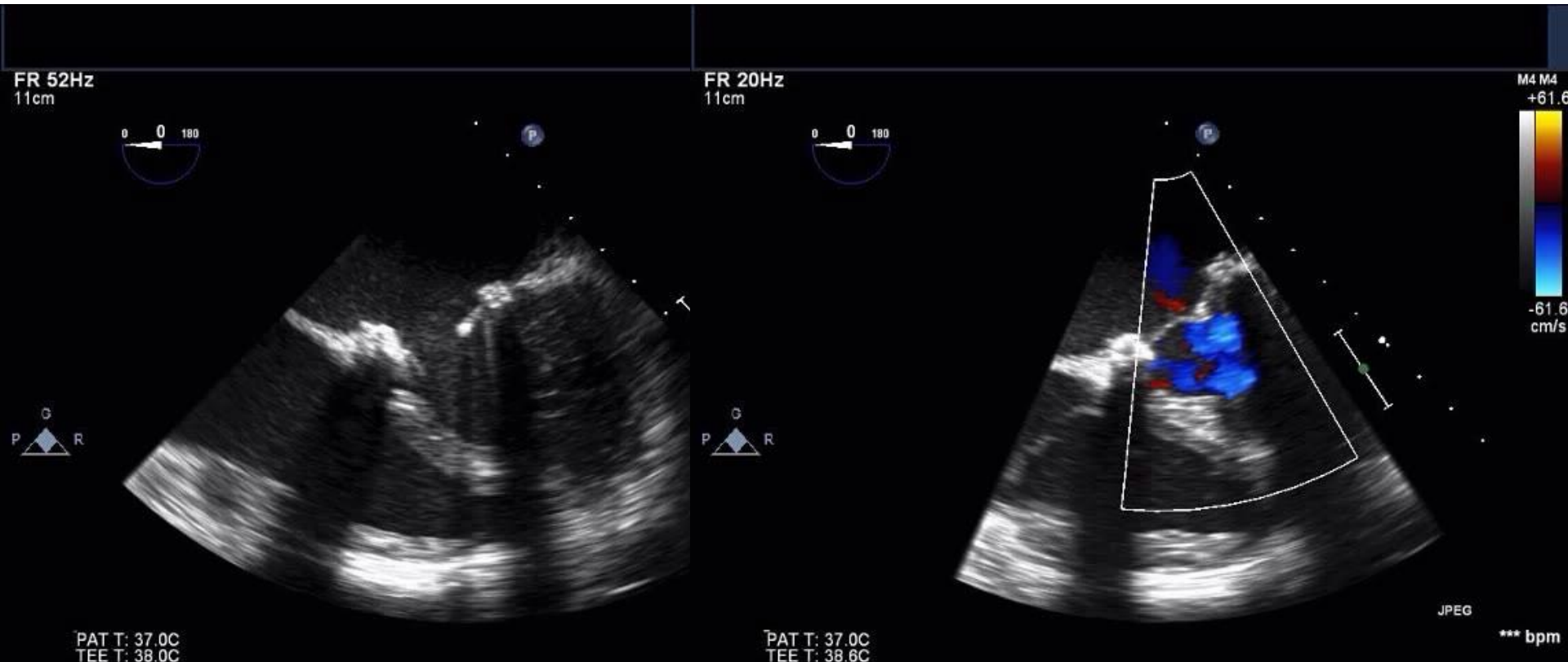
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3-D Echo: Advantages

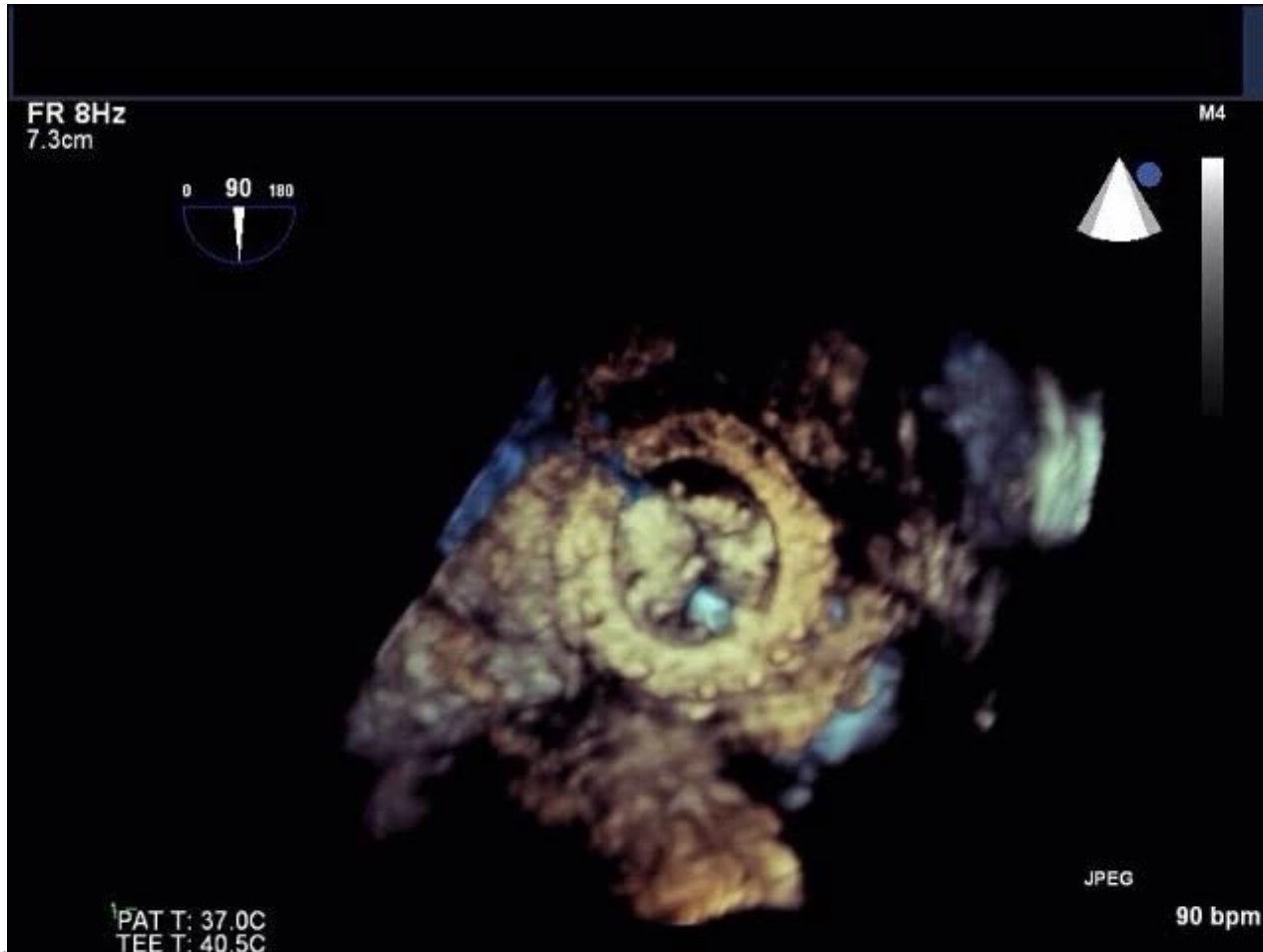


Lang et al. JACC 2011

3-D Echo: Advantages - MV

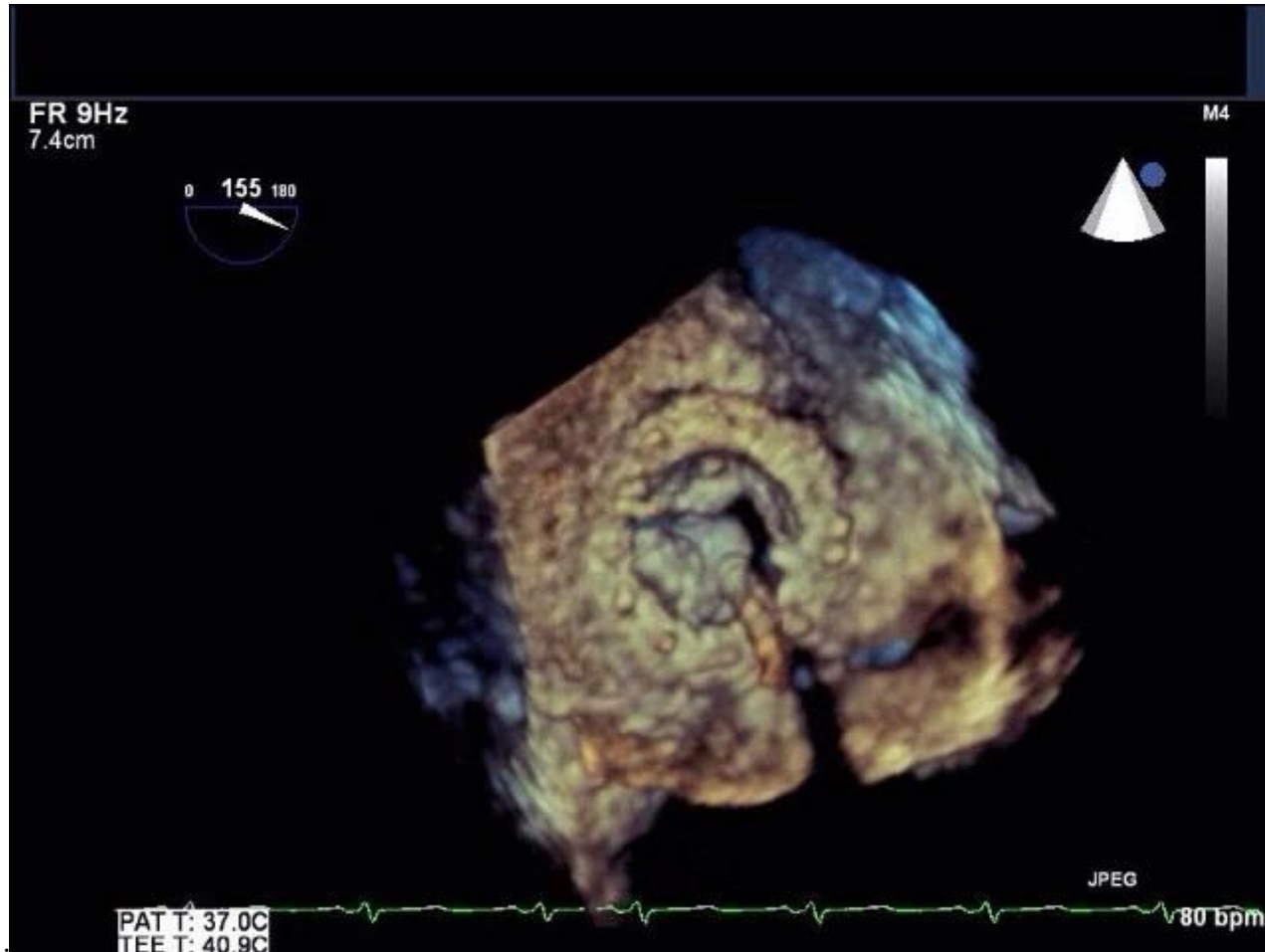


3-D Echo: Advantages - MV



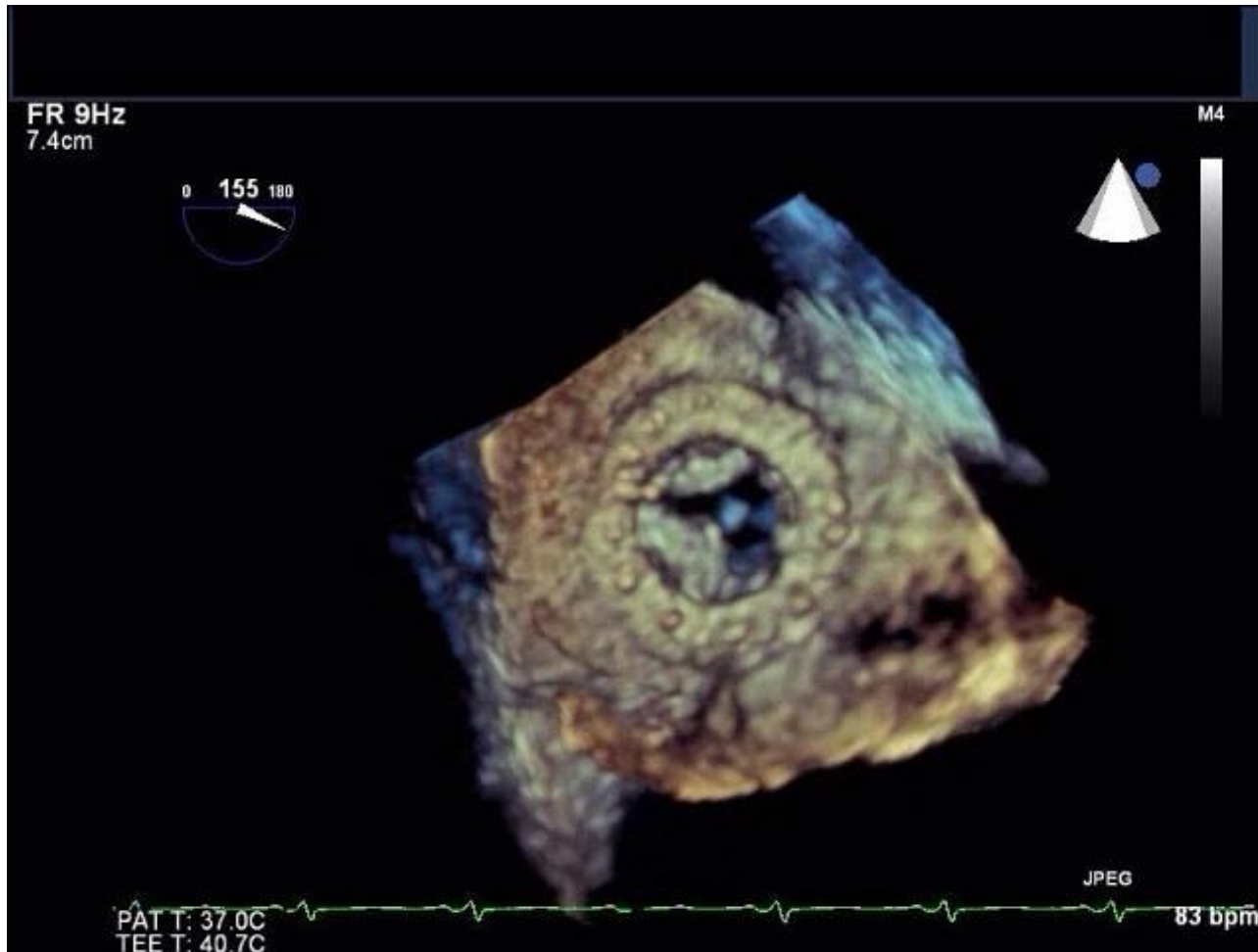
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3-D Echo: Advantages - MV



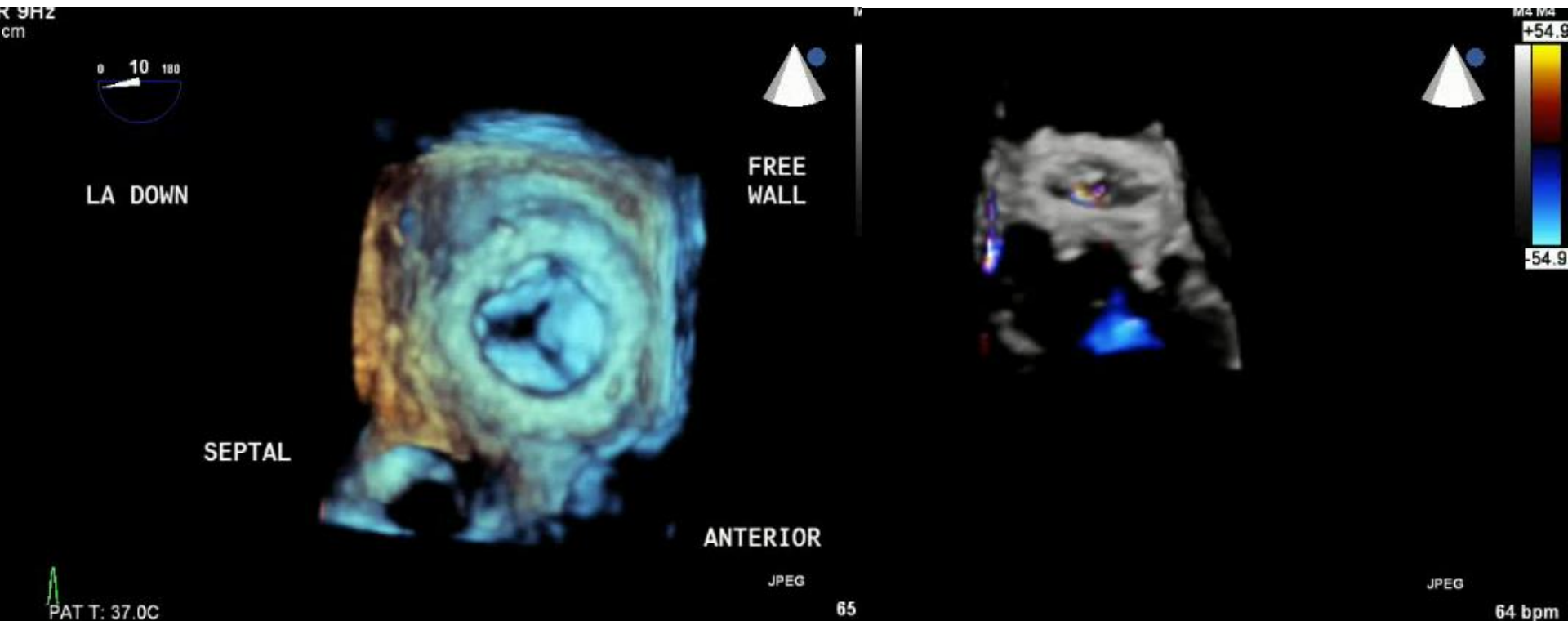
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3-D Echo: Advantages - MV

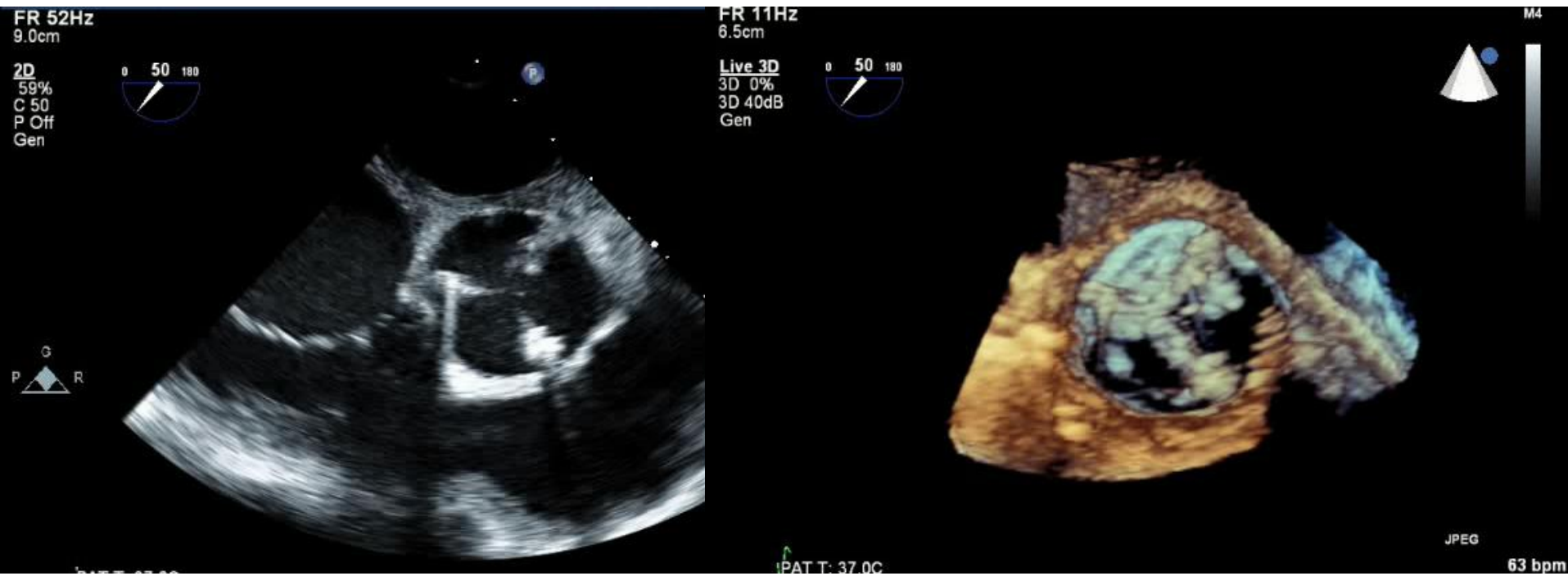


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3-D Echo: Advantages - MV



3-D Echo: Advantages - AoV

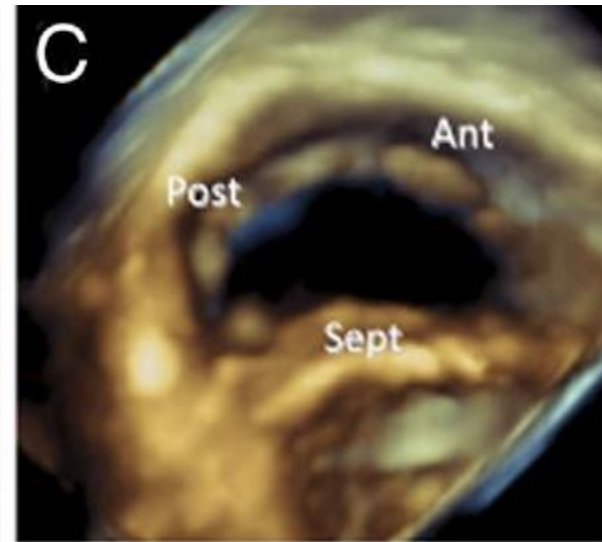
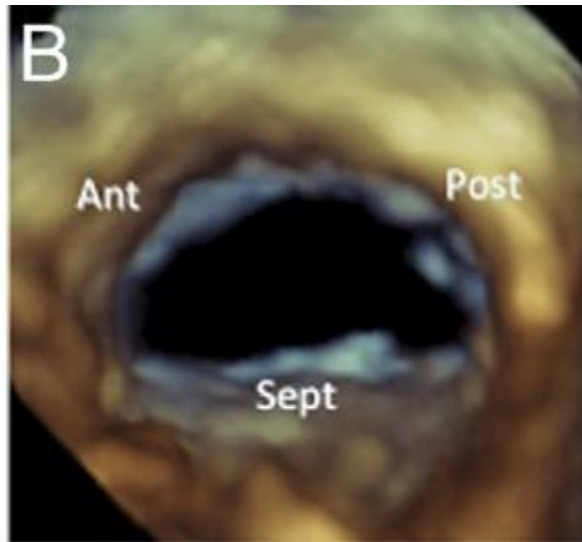
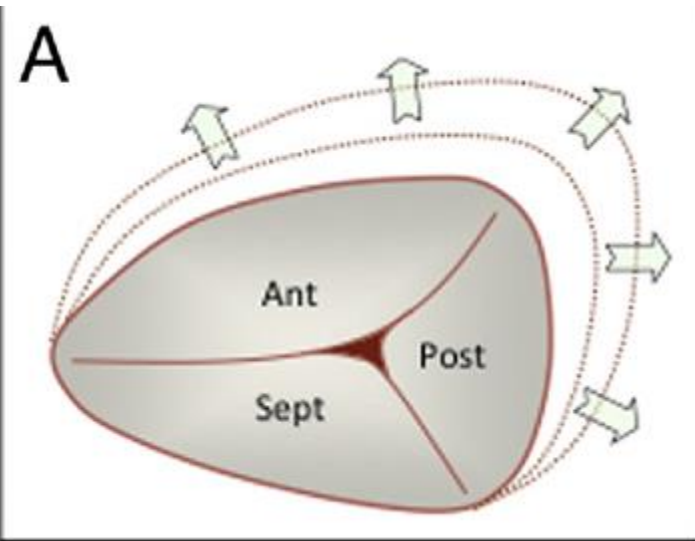


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3-D Echo: Advantages - AoV

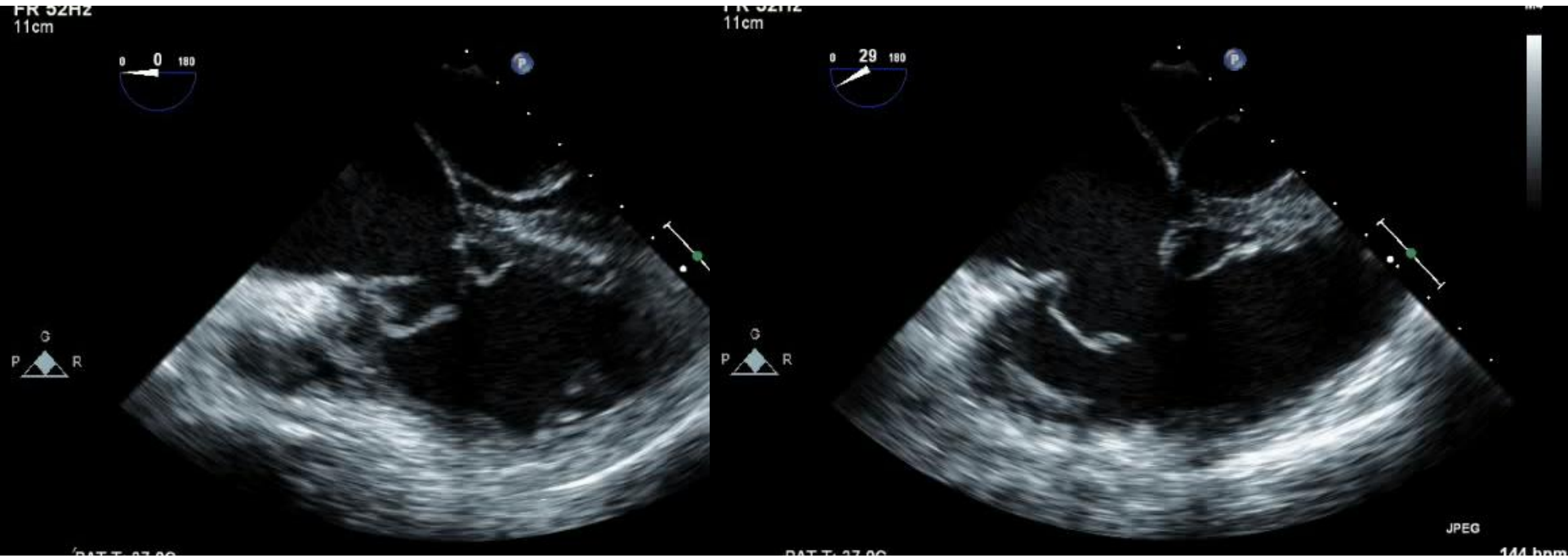


3-D Echo: Advantages - TV

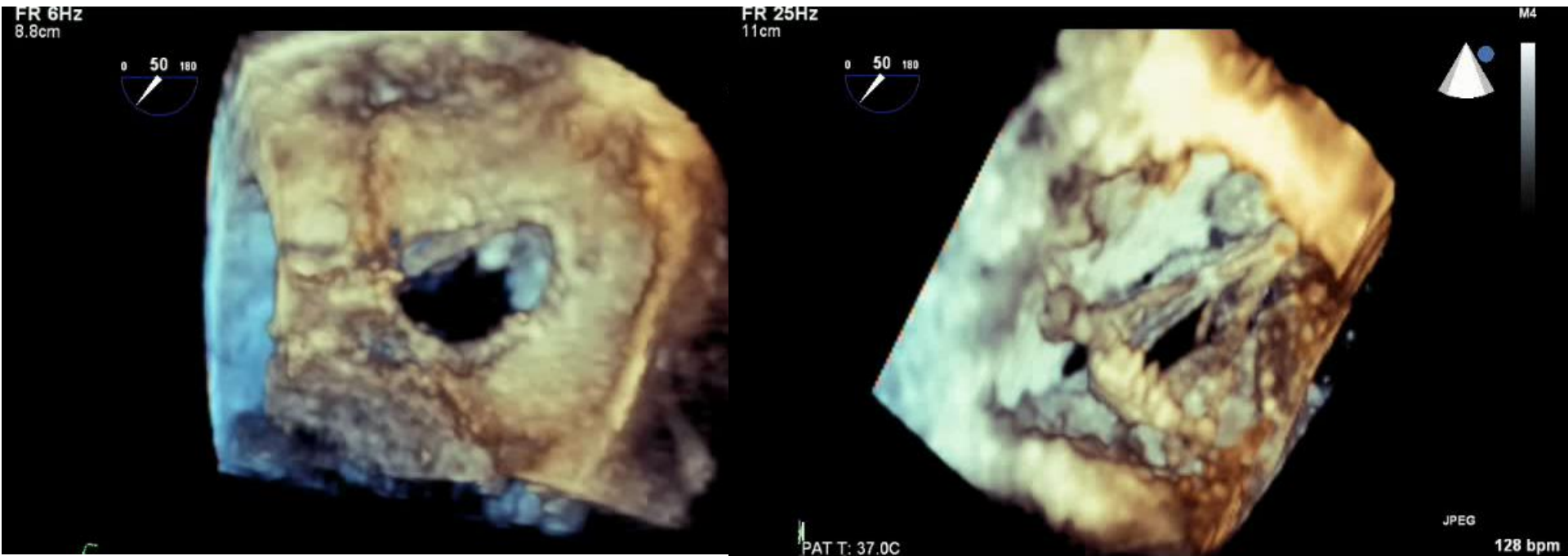


Lang et al. JACC 2011

3-D Echo: Advantages - TV



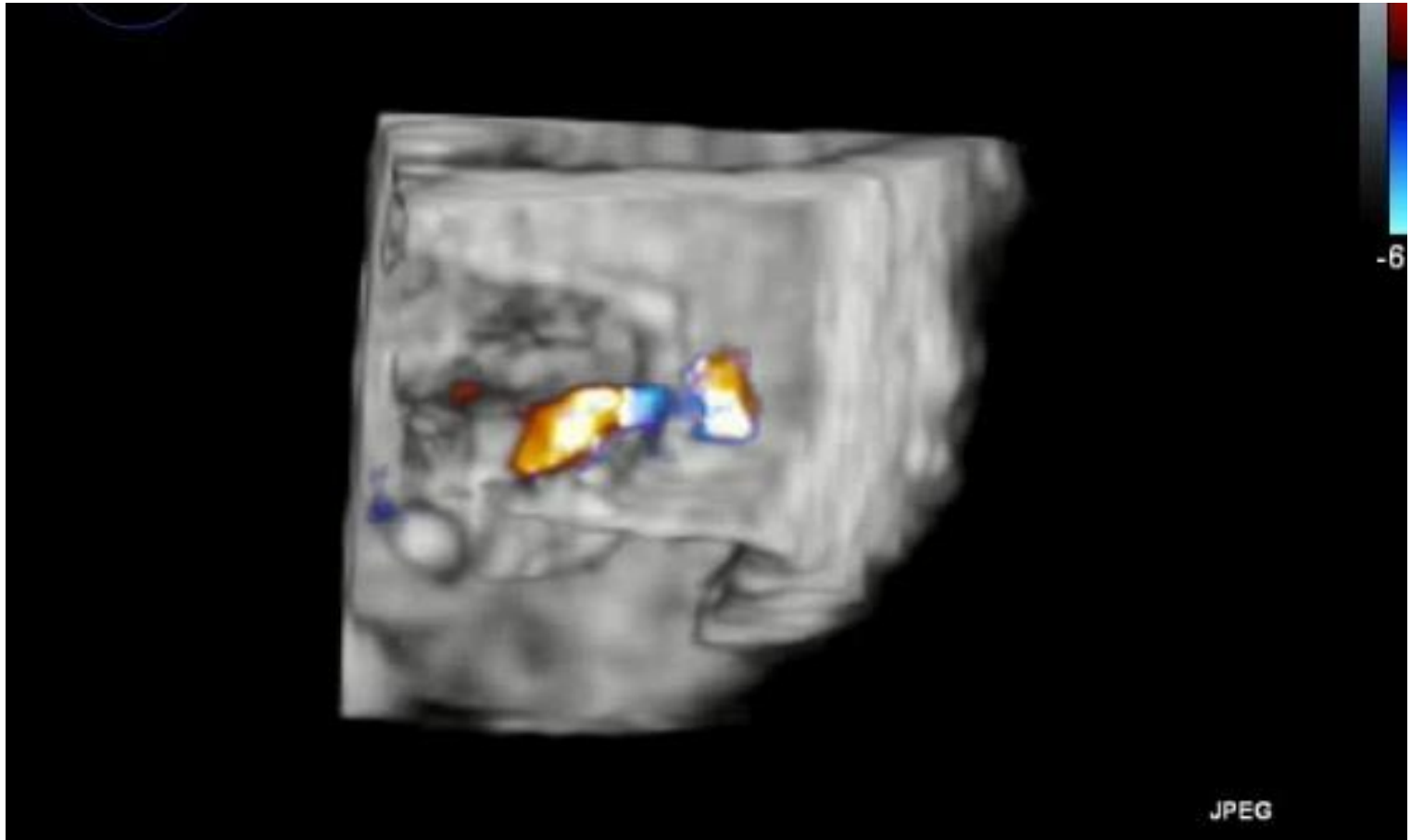
3-D Echo: Advantages - TV



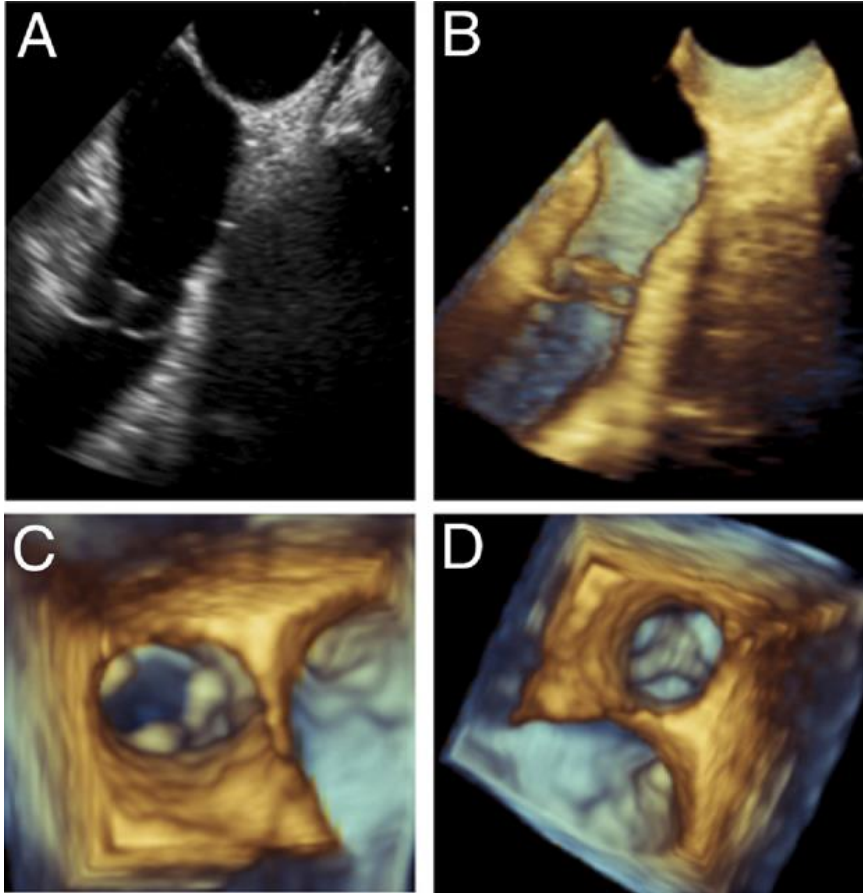
3-D Echo: Advantages - TV



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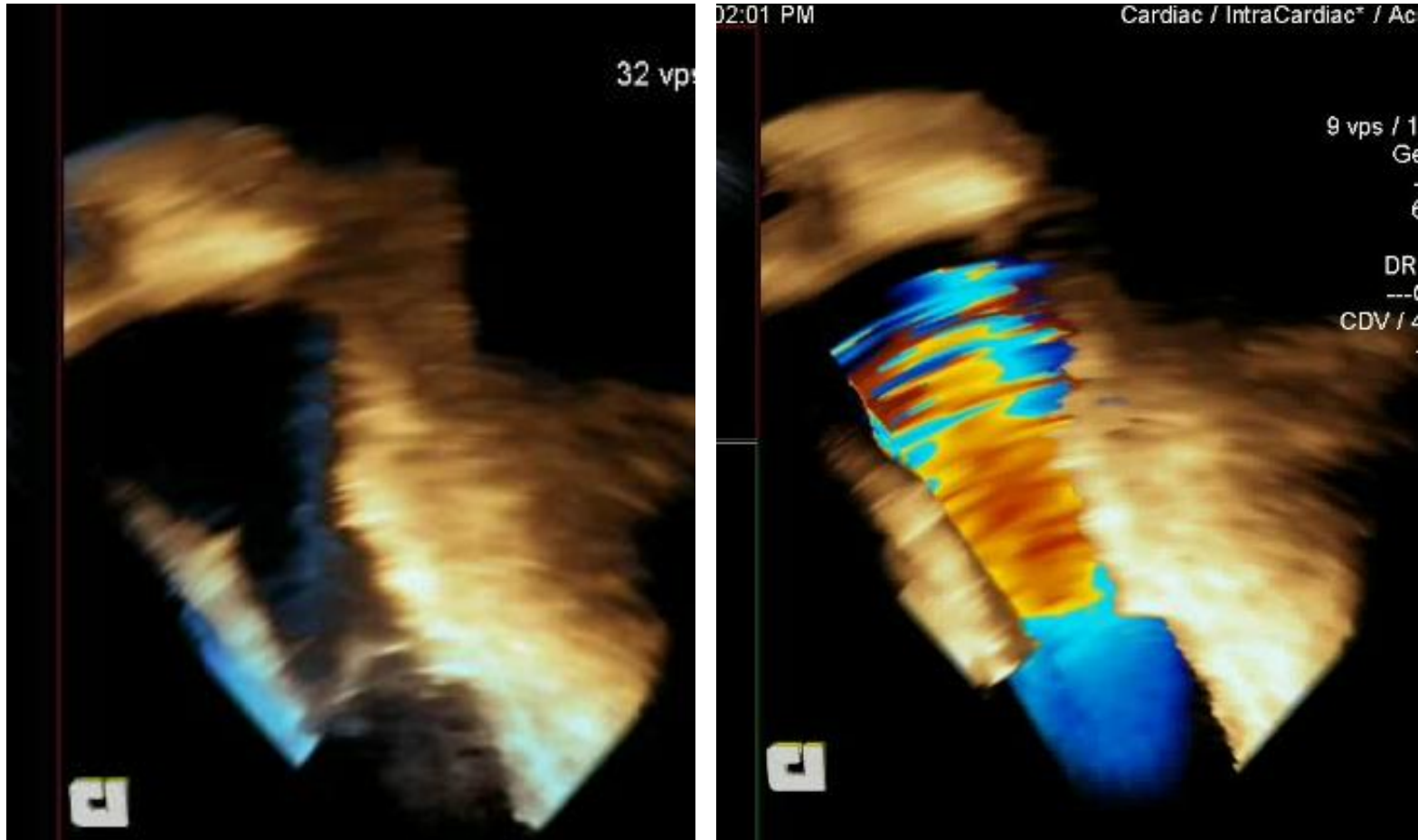
3-D Echo: Advantages - PV



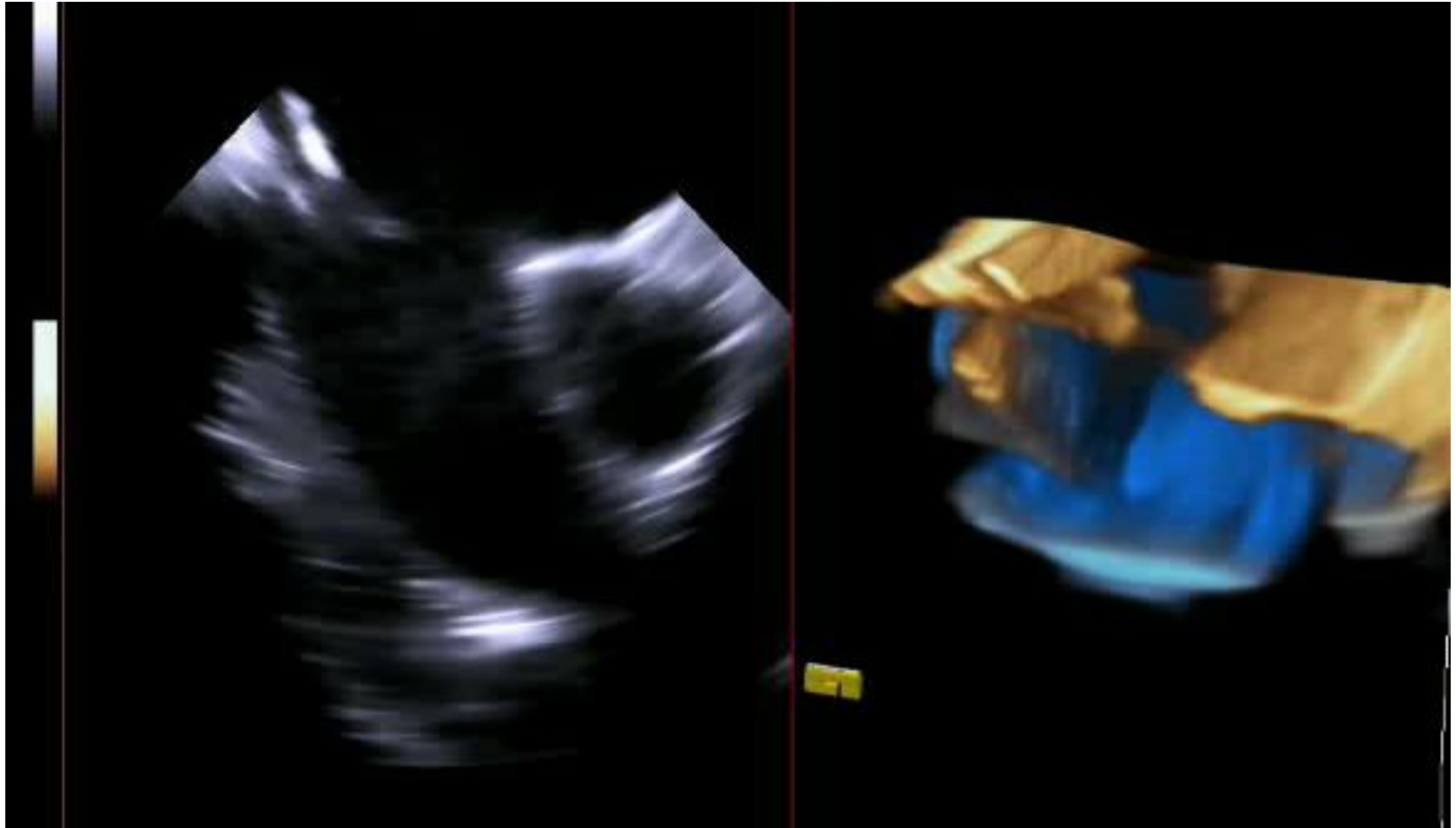
- PV is hard to image with 3-D
- **Limitation of 3-D TEE**
- PV anterior
- PV prior interventions - conduits, valves
- Artifact
- Role for ICE

Lang et al. JACC 2011

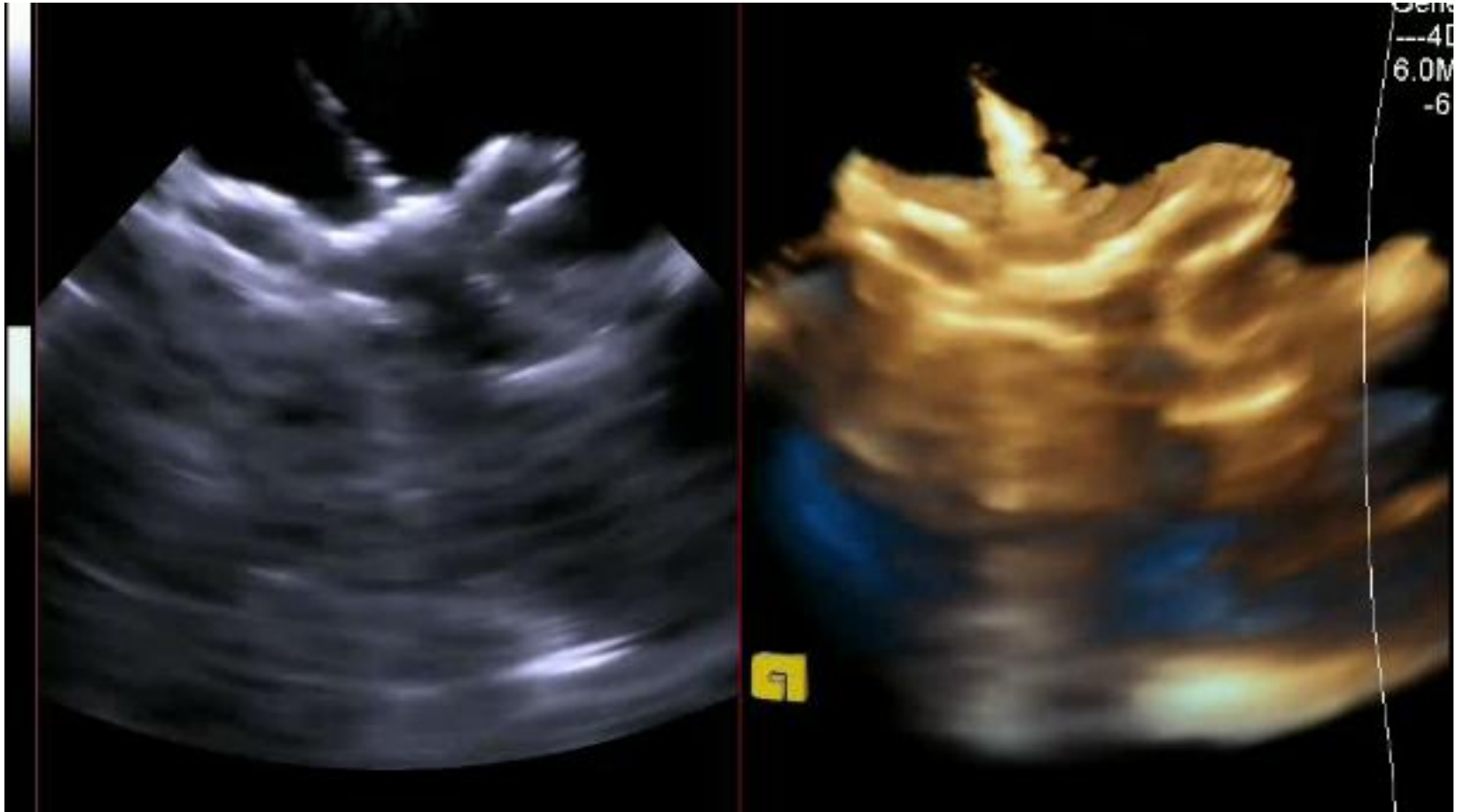
3-D ICE: Advantages - PV



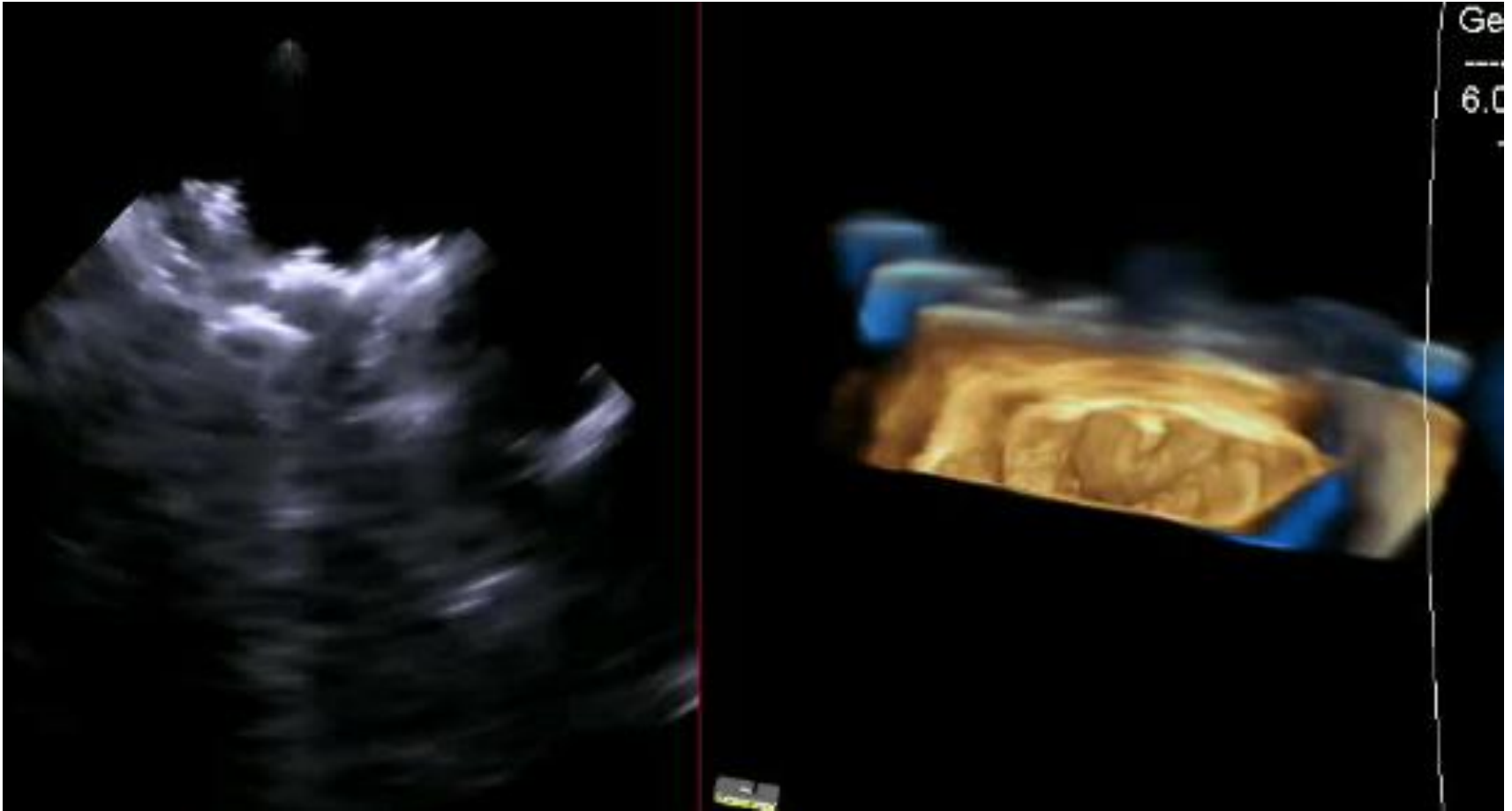
3-D ICE: Advantages - ASD



3-D ICE: Advantages - ASD



3-D ICE: Advantages - ASD



3-D Echo: Limitations

- **3-D TEE probe is large - larger than adult probe**
- >20 kg - size of 5-10 kg difference can change probe
- **No 3-D TEE pediatric probe currently available!**
- Especially important in small patients
- Larger probe may have compression on the LA or interfere with some ASD devices



3-D Echo: Limitations

- **Takes time** – can be slow, time-consuming
- Need real-time imaging in CTA
- Amount of time correlates with amount of information returned
- Communication key - helps
- Make the imaging team aware of the greatest concern, so can focus the study



3-D Echo: Limitations

- **3-D echo lower frame rates, especially color** - less spatial and temporal resolution
- **Cannot make good 3-D images from bad 2-D images**
- Not all pts have good 2-D TEE images
- **3-D prone to artifacts** – respiration/cardiac motion, arrhythmias
- **Difficult to image the PV by 3-D TEE**



3-D ICE: Strength/Weakness

Strength

- Better views of the inferior rim of ASD
- Better views of PV
- No compression of a large TEE probe on LA, airway

Weakness

- Limited sector width
- Continuous wave Doppler is not available for 3-D ICE
- Requires another sheath
- Expensive catheter, not re-usable

3-D Echo: Future

- Faster machines, processing
- Faster reconstruction times
- Higher frame rates, better resolution
- Smaller probes - able to use in smaller patients



3-D Echo: Future

- Still need more evidence that 3-D is helpful
- Does 3-D technology improve outcomes?
- Does 3-D decrease cath related complications?
- Does 3-D decrease procedure time?
- Does 3-D decrease radiation dose?
- Costs?



Acknowledgment

Interventional

- Aimee Armstrong
- Darren Berman
- Brian Boe
- John Cheatham
- Sharon Cheatham

Noninvasive Imaging

- Sanmit Basu
- Lou Bezold
- Cliff Cua
- Steve Cassidy
- Linda Cripe
- Kan Hor
- Kitty Mizelle
- Dan Rowland
- Corey Stiver
- Karen Texter

Thank You

