#ASEchoJC Twitter Chat
Tuesday, May 25, 2021 – 8 PM ET

- **Intimal Sarcoma: An Extremely Rare Case of a Left Atrial Tumor with Partial Obstruction of the Mitral Orifice** (CASE, April 2021)
- **Complicated Double-Orifice Mitral Regurgitation: Combined Hemodynamic Assessment Using Echocardiography and Four-Dimensional Flow Magnetic Resonance Imaging** (CASE, September 2020)

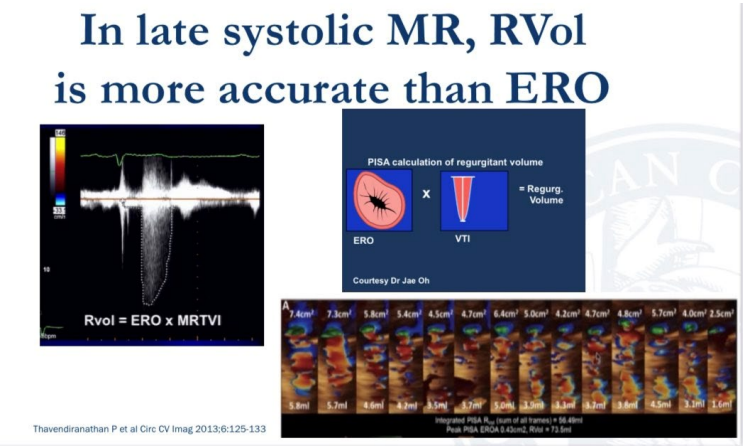
Moderators: Ritu Thamman, MD, FASE (@iamritu), Edward Gill, MD, FASE @(edwardagill), Ashish Aneja, MBBS, MD, FASE (@ash71us), Enrique Garcia-Sayan, MD, FASE (@EGarciaSayan), with James Thomas, MD, FASE (JamesDThomasMD1)

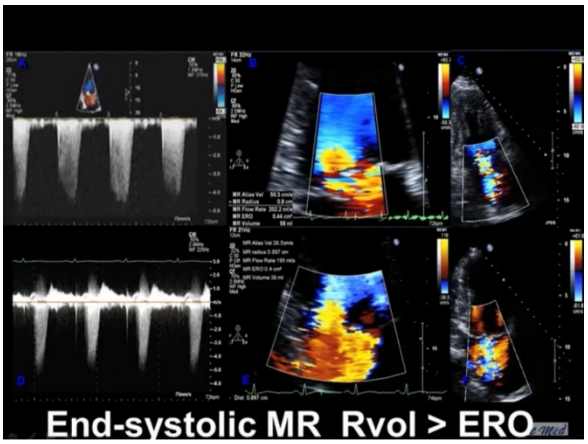
Introduction and Welcome: Welcome to tonight's #ASEchoJC with moderators @ash71us @EGarciaSayan @edwardagill & me with guest author & past @ASE360 president @JamesDThomasMD1 from @CASEfromASE https://bit.ly/2QRs90N "The Not-So-Simple Mitral Valve" case of Complicated Double-Orifice mitral

Q1: What method may be the most accurate for echocardiographic quantification of mitral regurgitation in non-holosystolic, eccentric jets?

A1 Notable Responses:

@iamritu: If end/late systolic MR use Rvol because single frame EROA will overestimate MR severity





@rajdoc2005: This is a really important point. Dont get tricked by the color flow and over-estimate MR severity!!

@LilyLeiZhang1: I always like to look at LV, LA sizes , and mitral E peak velocity. When color Doppler looks concerning yet LA is not enlarged, and E-wave is only 80's, it's essentially impossible to have chronic severe MR

@EGarciaSayan: good points @LilyLeiZhang1. Multiparametric approach and integration are Key. E<A as you point out usually corresponds to mild and PVein reversal to severe. But many patients won't have definite criteria for mild or severe.

@ash71us: I wonder whether people use the volumetric method frequently with Echo for MR quantification...has it been validated with USA since 3D isn't always available?

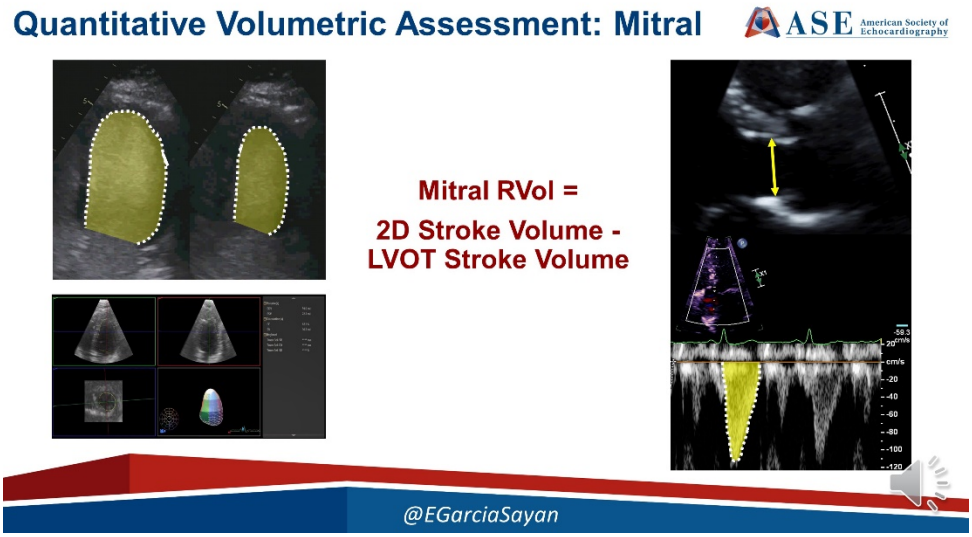
@iamritu: In #Coapt volumetric calculations were thrown out because the LV volumes were significantly underestimated https://nejm.org/doi/full/10.1056/NEJMoa1806640

Table 1. Left Ventricular Stroke and Regurgitant Volumes in the COAPT Trial.*

Characteristic	Device Group	Control Group
LVEDV — ml	194.4±69.2	191.0±72.9
LVESV — ml	135.5±56.1	134.3±60.3
Effective regurgitant orifice area — cm^2	0.41±0.15	0.40±0.15
Total stroke volume (LVEDV minus LVESV) — ml	59.4	56.7
Mitral regurgitant volume — ml†	>45–60	>45–60
Forward stroke volume (total stroke volume minus mitral regurgitant volume) — ml	0–15	0–15

* Plus–minus values are means ±SD. LVEDV denotes left ventricular end diastolic volume, and LVESV left ventricular end systolic volume.
† The estimated mitral-regurgitant volume is based on an effective regurgitant orifice area of 0.40 cm^2.

@EGarciaSayan: In this #ASEChoJC @CASEfromASE paper by @JamesDThomasMD1 et al, volumetric method correlated well with CMR, Mitral inflow overestimated RVol and PISA unreliable with more than one, eccentric jet. See example of RVol calculation here.



@RezaEmaminia: In your experience, how well do 2D biplane LV volumes (with or without UEA) and 3D volumes correlate? Which one do you use in MR quantification?

@EGarciaSayan: Volumetric method not easy and requires to be very methodical. Need accurate, unforeshortened LV volumes (otherwise underestimate RVol). Use UEAs when needed. And 3D may help. Same goes for accuracy in LVOT measurements.

@ash71us: when do use the PISA angle correction?

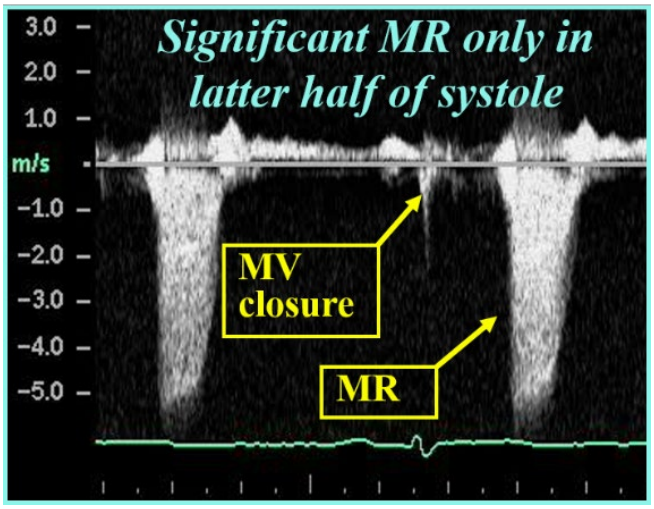
@RezaEmaminia: Is PISA validated to be used for more than a single jet?

@EGarciaSayan: I don't think adding PISA RVols in multiple jets is necessarily valid. Especially if eccentric or commissural. Same reason we can't use for post #TEER assessment. Is angle correction enough to solve this problem?

@edwardagill: We could start that discussion by naming the multiple methods for MR quantification: PISA, multiple orifice vena contracts by 3D, volumetric with flow across the mitral and LVOT, and stroke volume using LV SYSTOLIC AND DIASTOLIC VOLUMES

@GregRic95512046: And color doppler

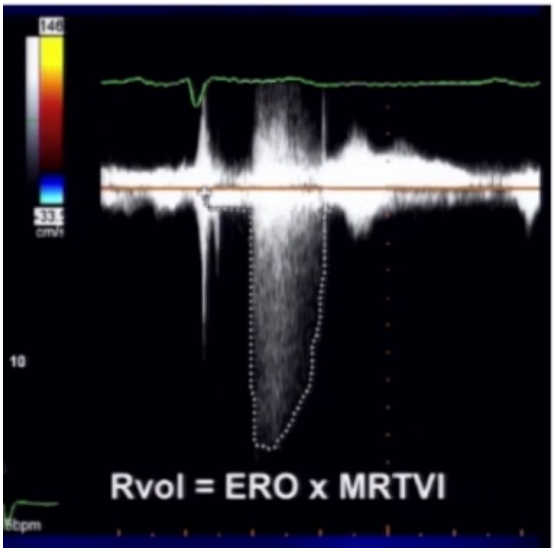
@JamesDThomasMD1: PISA is still useable but to calculate Rvol, you must use CW Doppler VTI only when the jet is largest. See fig



@iamritu: And important where you trace the CW - Trace ONLY the dense CWD don't overtrace it

@edwardagill: So that would result in an MR VTI roughly half the VTI you would measure with a trace of the full "envelope" true or false?

@iamritu: Exactly- that's why RV is a better parameter to use for late systolic MR

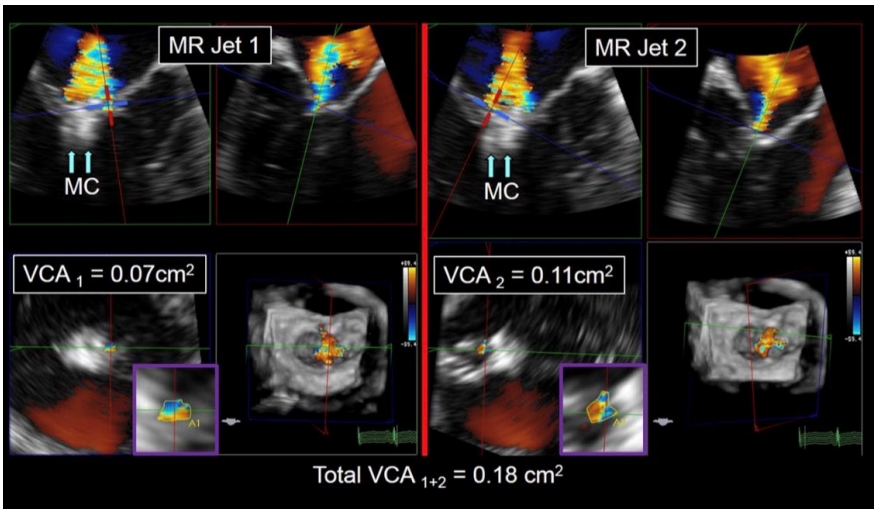


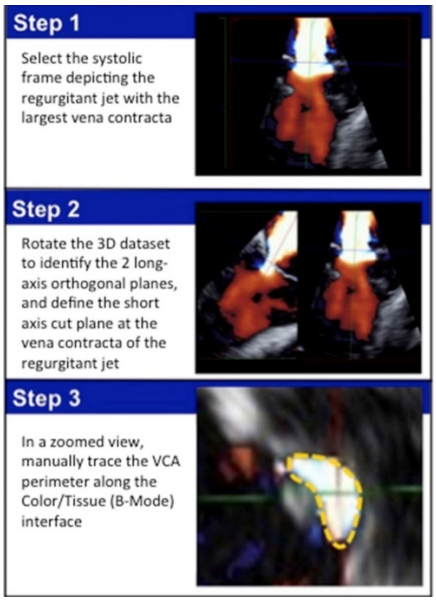
Q2: Which echocardiographic methods are preferred for quantification of mitral regurgitation when multiple jets are present?

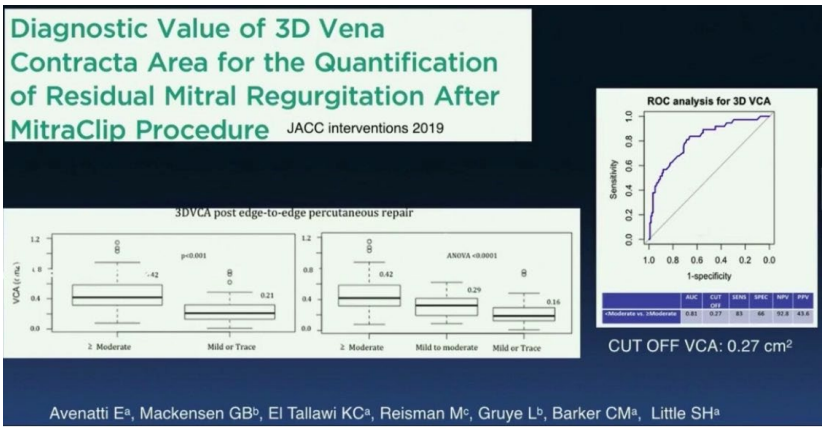
A2 Notable Responses:

@iamritu: 3D VCA by PISA
Single jet with VCA<.2 mm2 Mild
.2-.39 mm2 Moderate

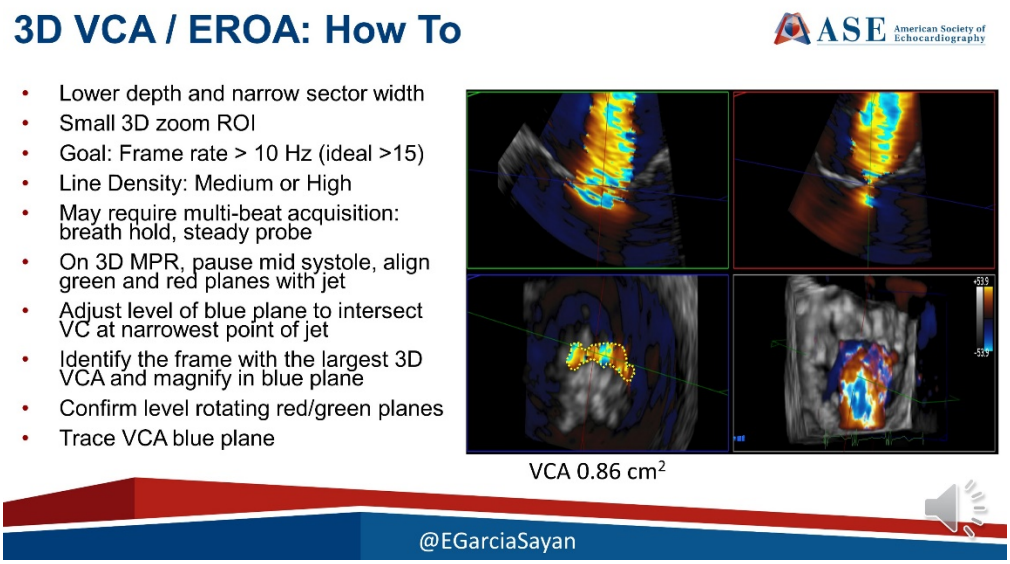
>= .4 mm2 or 2 or more >= moderate jets
Post Mitraclip validated for >.27 cm2 as severe







@EGarciaSayan: couldn't agree more. I love 3D VCA, but good 3D image acquisition is key (excellent line density + temporal resolution - good equipment and small ROI). See my how-to slide from last year @ASE360 scientific sessions.

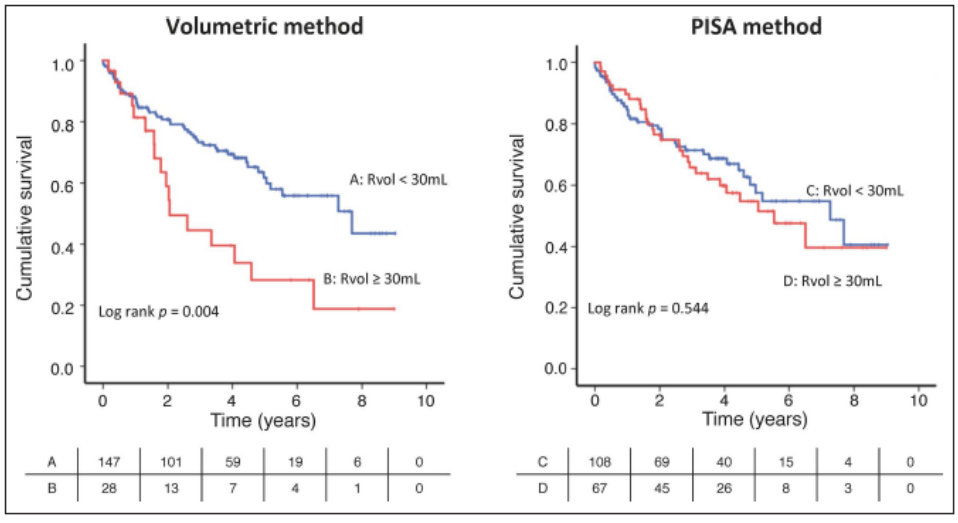


@rajdoc2005: 3DVCA works great when ALL the aforementioned criteria is met!!! Now that's the problem too in practice!!

@JamesDThomasMD1: It sounds so good, but spatial resolution just isn't there. Lots of lateral spread...

@RezaEmaminia: Can be often tricky post-TEER with jets originating in between clips.

@EGarciaSayan: volumetric method seems superior based on this paper. Also recent paper by Anthony N. DeMaria et al in 2ary MR also suggests benefit of volumetric method over PISA. EOA ≥0.2 cm2 or Rvol ≥30 mL had prognostic value only with this method.
https://ahajournals.org/doi/10.1161/JAHA.120.018553

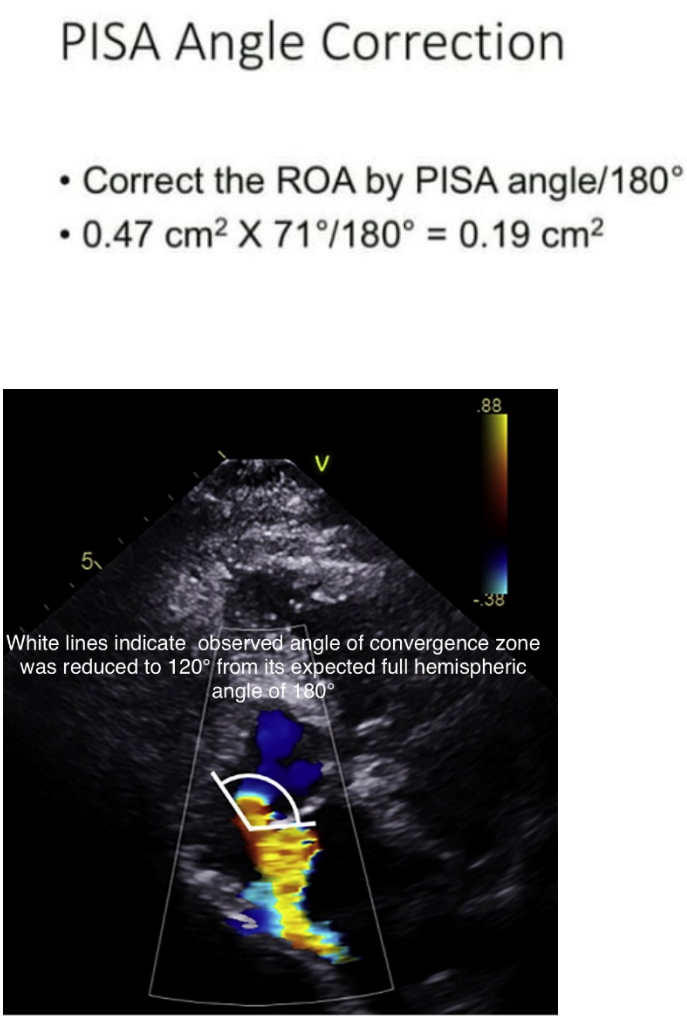


@JamesDThomasMD1: Secondary MR is very prone to PISA overestimation as ROA often decreases in mid systole. VTI only from the dense CW.

Q3: How do we apply angle correction on a near commissural MR jet PISA?

A3 Notable Responses:

@iamritu: Because proximal convergence is constrained, angle correction required for calculation of EROA by PISA 2 jet near commissures, w adjacent LV walls limiting flow convergence zone to a spreading angle of 120° not full hemisphere EROA down to 0.24 cm2 (by 1/3 ie 60/180)



@JamesDThomasMD1: You can correct most of the overestimation by eyeballing the angle and taking that % of a hemisphere away. Also, raising aliasing v will reduce constraint.

@LilyLeiZhang1: https://ncbi.nlm.nih.gov/pmc/articles/PMC5881082/ found a small study that tried to validate against MRI... if angle correction also is validated by 3D VC EROA, I'm bringing an angle caliper to the lab

Q4: What are the technical limitations of four-dimensional flow MRI?

A4 Notable Responses:

@iamritu: -long scan time (~10 min) sensitive to arrhythmias/ movement
-time consuming to process large 3D data sets need correction/ segmentation
-Need dedicated data analysis software not widely available
-limited to voxel size 2 - 3 mm prone to partial vol effects

@JamesDThomasMD1: 4D flow is technically challenging and takes a long time for fine resolution. No AF, have to track the MV annulus. Kids, don't try this at home! https://doi.org/10.1148/rg.2019180091

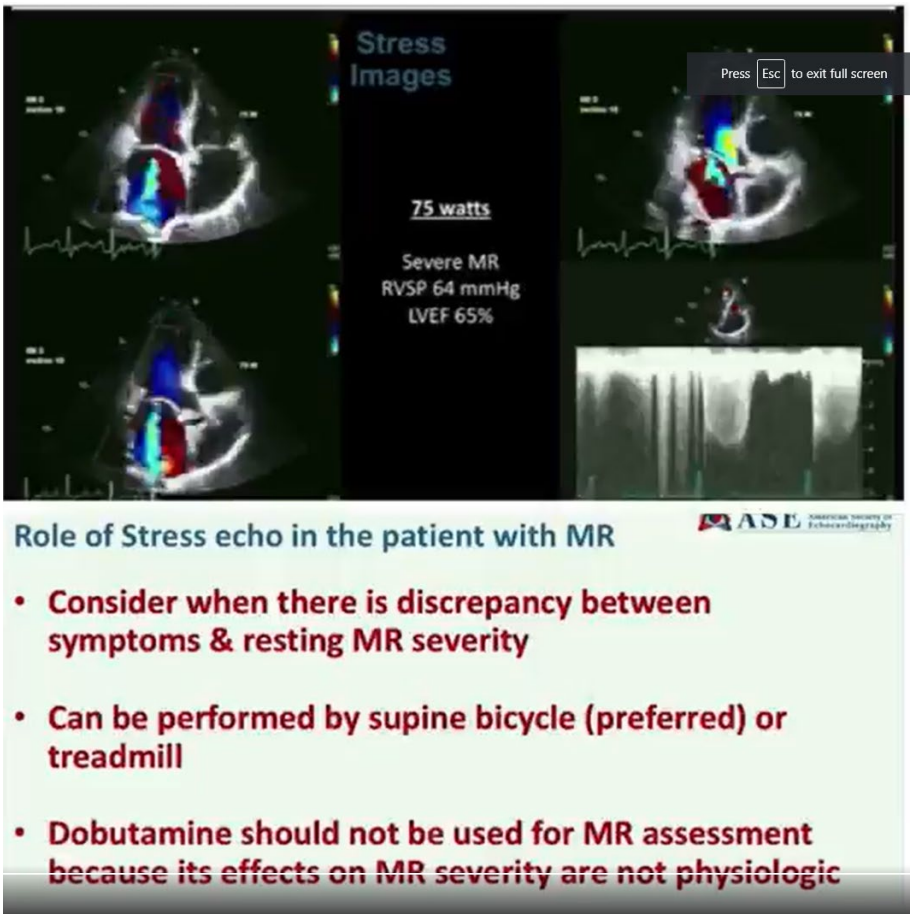
Parameter	Recommendations	Reasons	Comments
ECG gating	Retrospective	Avoid sequence interruption Cover entire R-R cycle	Crucial for all anatomic areas
VENC	Maximum velocity expected (10% higher when possible)	Avoid velocity aliasing	The higher the VENC, the lower the VNR Use multiple VENCs if available
Temporal resolution	Optimal <40 msec Avoid >60 msec About 20–50 cardiac frames	Accuracy	Arterial/cardiac studies ≥20 cardiac frames Venous studies ≥14 cardiac frames
Spatial resolution	Maximum, isotropic voxels, 2.0–2.5 mm^3 for aorta and pulmonary artery	Accuracy	About five voxels in vessel of interest
Field of view	Maximum	Better SNR and coverage	Cover region of interest
Flip angle	A bit higher than Ernst angle	Better CNR	Higher if use of contrast agent
Contrast agent	Macromolecular	Larger coverage Better SNR	Bolus followed by very slow perfusion
Offset errors correction	Eddy current correction, phase unwrapping…	Accuracy Correction of offsets	Check eddy current correction before flow measurement

@ash71us: it's improving but requires contrast...plus 4D may not be accurate when applied at valve level...

Q5: How does stress Echo for Mitral Regurgitation help clinically?

A5 Notable Responses:

@iamritu: When symptoms don't = MR grade
Use supine bike or treadmill
Dont use Dobutamine because it's effects on MR severity color flow Doppler(Pisa/VC) aren't physiologic
If no improvement in MR grade w exer stress echo worse prognosis suggests not contractile reserve
LVEF Up-pointing triangle< 5%



@JamesDThomasMD1: 1) Functional capacity
2) Does non-holo -> holo
3) What happens to RVSP
4) Any VT???

@edwardagill: VT interesting in this case. Wonder if related to the mitral annulus disjunction?

@iamritu: Possibly although LGE was negative & MAD was not super long & Picklehaube sign barely >16cm/sec

@ash71us: wonder where in the myocardium was the VT mapped?

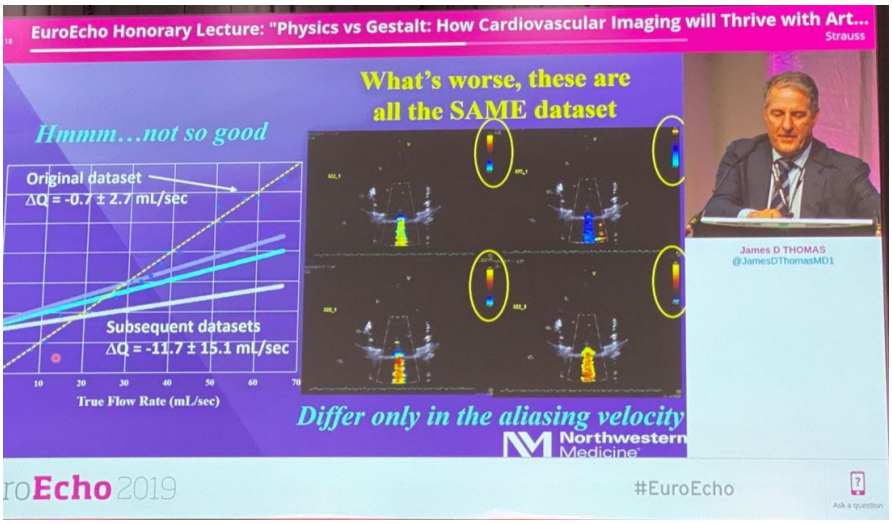
@iamritu: Most MAD & EP studies have the VT mapped to the pap muscles or LVOT areas close to the disjunction- 3 places Mayo,Canadian & Argentina Ep trials small numbers

Q6: What echo parameters does one have to be careful of when quantitating MR using artificial intelligence?

A6 Notable Responses:

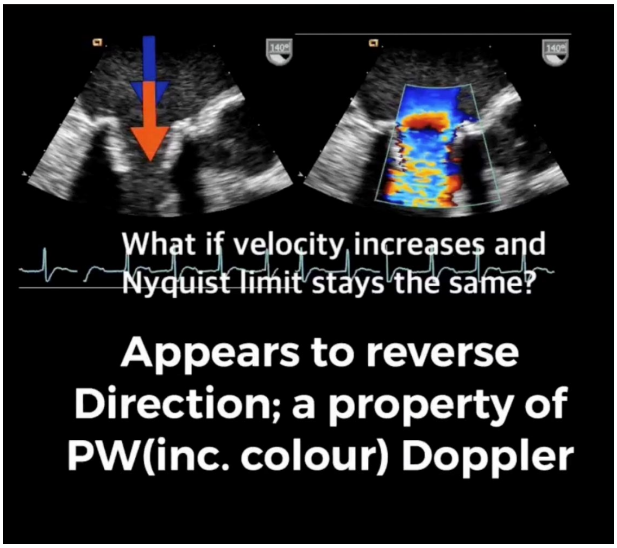
@edwardagill: All of them!

@iamritu: Here's something from #Euroecho19! @JamesDThomasMD1 honorary talk keep the aliasing velocity inside the data sets!



@JamesDThomasMD1: Yep, rule #1, you can't get rid of the color bar! (Something that was news to my engineering friends...) MR is a lot harder than EF to do with AI.

@iamritu: Keep the color bar!



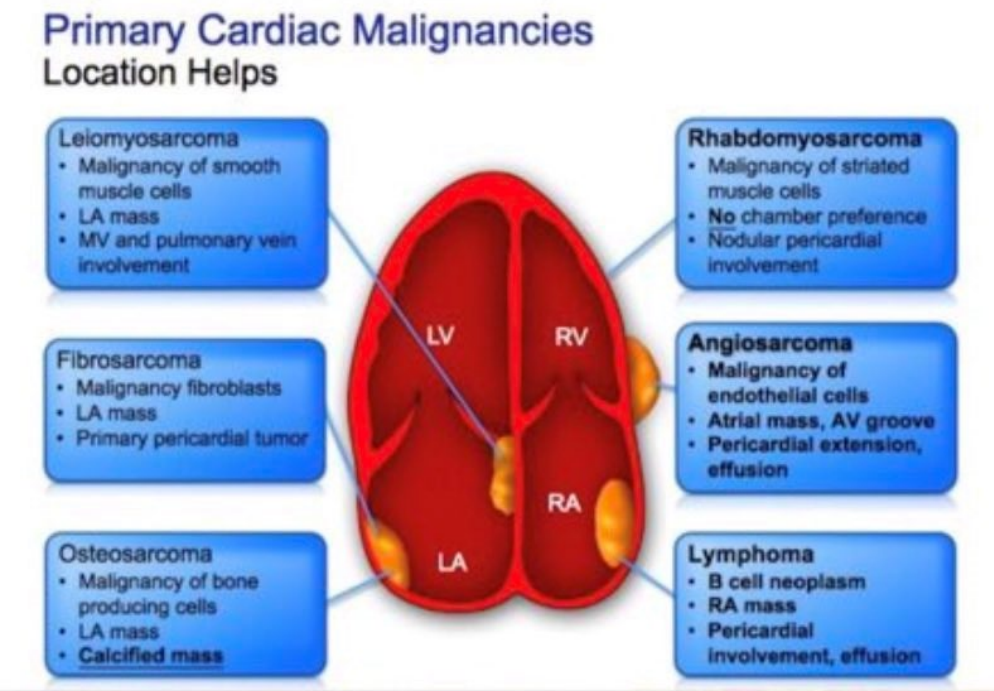
Q7: What are the most common primary malignancies of the heart?

A7 Notable Response:

@iamritu: Primary malignancies rare(by autopsy series) location helps

The distribution of primary malignant cardiac tumors: site and pathologic diagnosis

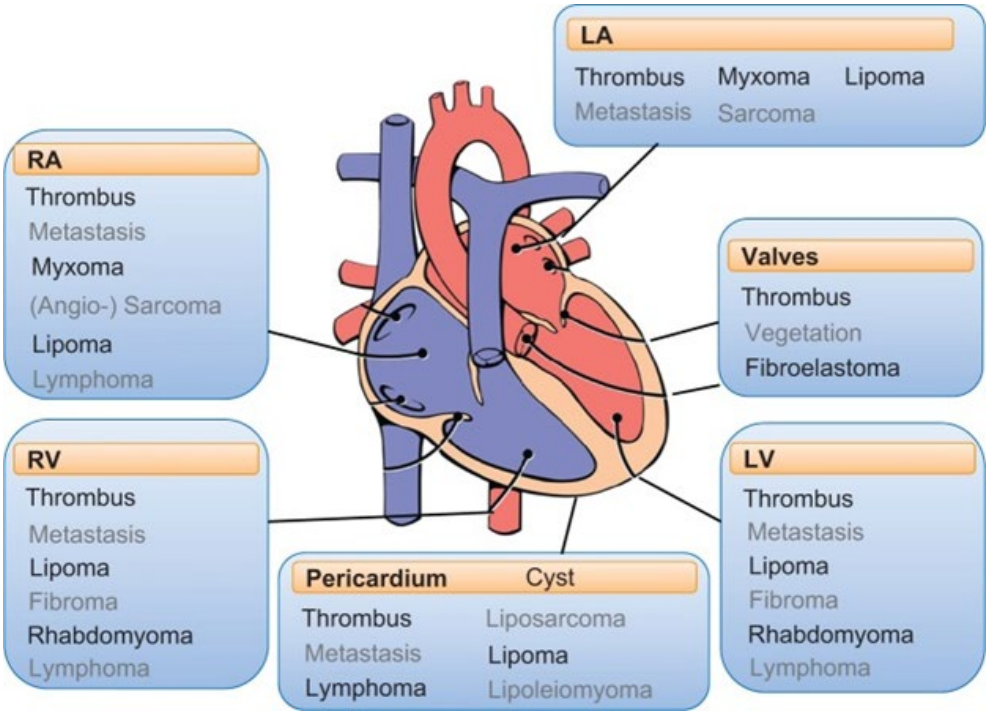
	Site					
	Left atrium	**Left ventricle**	**Right atrium**	**Right ventricle**	**Pericardium**	**Blood vessels**
Pathologic diagnosis	Undifferentiated sarcoma	Lymphoma	Undifferentiated sarcoma	Angiosarcoma	Liposarcoma	Undifferentiated sarcoma
	Leiomyosarcoma		Angiosarcoma	Liposarcoma	Lymphoma	Intimal sarcoma
	Osteosarcoma		Leiomyosarcoma	Lymphoma		Leiomyosarcoma
	Rhabdomyosarcoma		Synovial sarcoma			
	Fibrosarcoma		Liposarcoma			
	Fibrous histiocytoma		Lymphoma			
	Lymphoma					



@EGarciaSayan:

- Cardiac Sarcomas are the most common primary cardiac malignancy.
- Angiosarcoma>>rhabdomyosarcoma>>fibrosarcoma>>leiomyosarcoma
- Look for predilection for right atrium
- Usually board-based lobular masses

- Can manifest w obstruction, arrhythmias, or embolization



@purviparwani: Some #Echofirst #whyCMR features for malignant tumors

❤️ >5cm

❤️ Right Heart

❤️ Multiple mass

❤️ Irregular margin

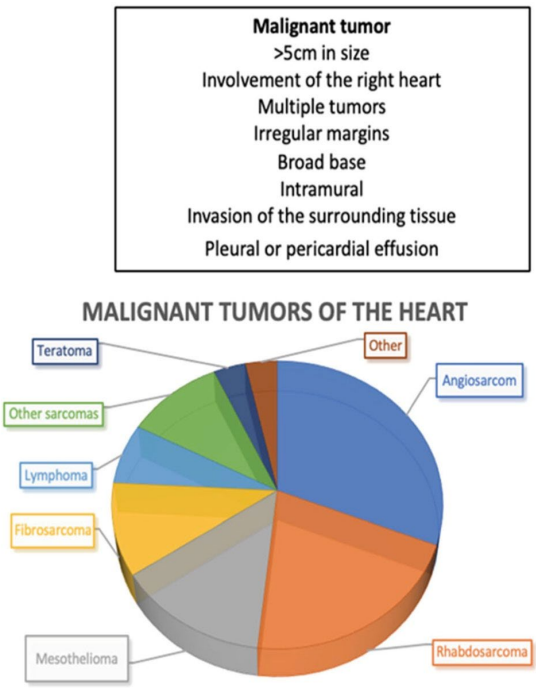
❤️ Broad base

❤️ Intramural

❤️ Invasion of surroundings

❤️ Effusions

Our notes: ink.springer.com/content/pdf/10.1007/s12410-019-9522-4.pdf



and most common types of tumors ([2, 7–10])

@onco_cardiology: Cardiac Mass evaluation with #whyCMR by @purviparwani et al. https://link.springer.com/article/10.1007/s12410-019-9522-4

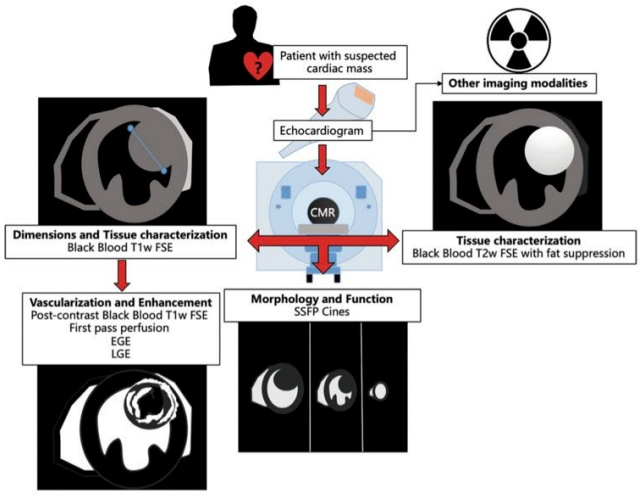


Fig. 4 Schematic presentation of author-suggested imaging protocol. FSE fast spin echo, SSFP steady state free precession, EGE early gadolinium enhancement, LGE late gadolinium enhancement

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@onco_cardiology: Although we love #echofirst, #whyCMR often needed to assess better morphology, and evidence or extent of myocardial invasion. Cardiac mass evaluation incomplete without CMR

Q8: How can we distinguish between a left atrial myxoma and malignancy by #echofirst?

A8 Notable Responses:

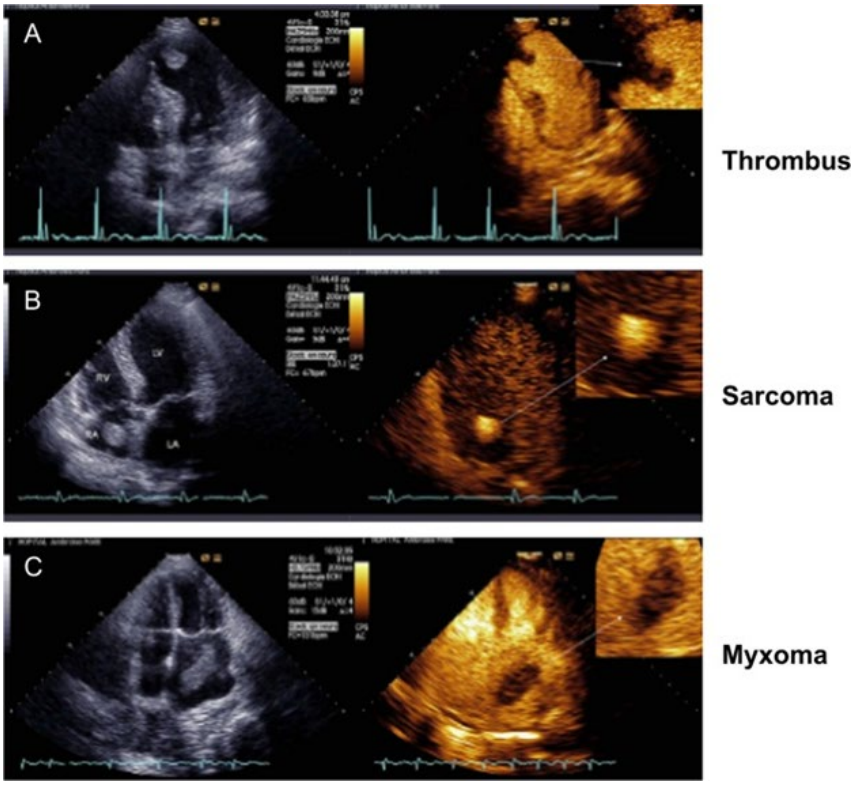
@iamritu: Myxomas usually pedunculated, mobile with a broad-based endocardial attachment near fossa ovalis.

Malignancy more apt to have rough surface/multi lobed w heterogeneous echo texture & location varies

@EGarciaSayan:

- Myxomas usually lobular masses on LA attached by a pedicle to interatrial septum / fossa ovalis
- Age 30-60, more common in women
- ~75-80% LA, 15-20% RA myxomas are less common

Image below from review by @RMankadMD https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5292983/



@iamritu: If you have a mass in only in the RV ~50% chance it's malignant #ASEchoJC Thankfully rare!

6. Mankad R. • Herrmann J.
Cardiac tumors: echo assessment.
Echo Res Pract. 2016; **3**: R65-R77

@EGarciaSayan: and of course the use of #UEAs with VLMI and perfusion!

@ash71us: vascularity is one option!

Q9: How can ultrasound enhancing agents (UEA)to help diagnose malignancy versus nonmalignant mass?

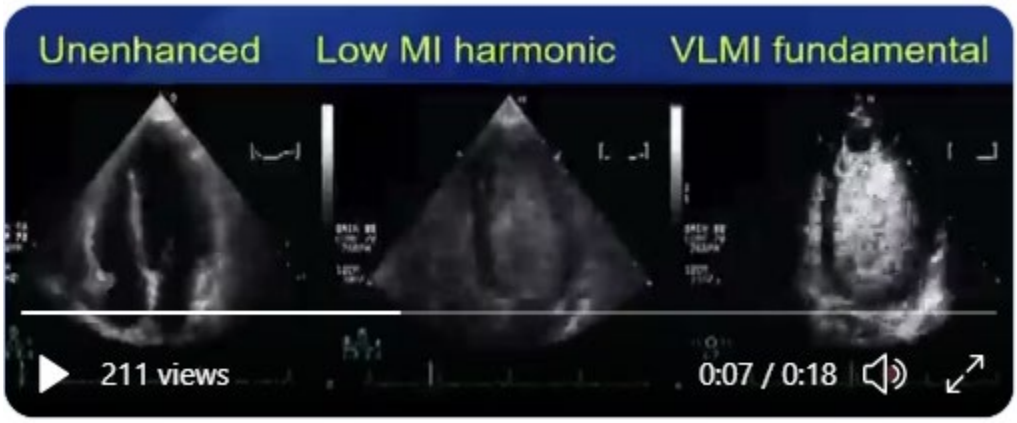
A9 Notable Responses:

@EGarciaSayan: Perfusion #EchoFirst can differentiate a malignant highly vascularized tumor, from thrombus or benign tumor.

- Use VLMI + intermittent high MI "flash"
- Stromal tumors, such as myxomas, have a poor blood supply and appear partially enhanced
- CMR remains gold standard

@iamritu: Yes! #ASEchoJC use VLMI #UEA

https://twitter.com/i/status/1397356396606279680



@ash71us: VLMI is probably as good as #WhyCMR if no foreshortening.... we use it for all patients with reduced LV function...very very useful...

@EGarciaSayan: See clip from @ASE360 guidelines for #UEAs, and excellent @JASE paper by J. Kirkpatrick @robertomlang et al.https://sciencedirect.com/science/article/pii/S0735109704001202

https://twitter.com/i/status/1397356129856917505

@ash71us: I find flash perfusion to be a good screening tool but we almost always get a #WhyCMR

@EGarciaSayan: Absolutely. #EchoFirst VLMI + intermittent high MI “flash” can be very helpful in extremes (highly vascularized malignancy vs thrombus), but when in doubt #WhyCMR is always best for tissue characterization.