

#ASEchoJC Twitter Chat

Tuesday, March 29, 2022 – 8 PM ET

- [Beyond the Wires: A Case of Leadless Pacemaker–Mediated Tricuspid Regurgitation \(CASE, July 2021\)](#)
- [A Primer on Three-Dimensional Transthoracic Echocardiographic Imaging of the Tricuspid Valve \(CASE, February 2022\)](#)

Authors

- Filipe Cirne, MD
- Madeline Jankowski, BS, RDCS, ACS, FASE
- Akhil Narang, MD, FASE
- Douglas Wright, MD, FASE

Moderators:

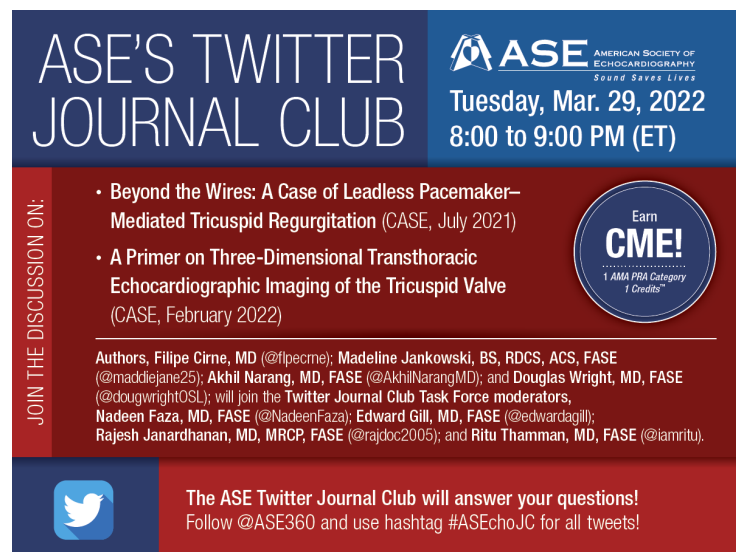
- Nadeen Faza, MD, FASE
- Edward Gill, MD, FASE
- Rajesh Janardhanan, MD, MRCP, FASE
- Ritu Thamman, MD, FASE

Introduction and Welcome: WELCOME to #ASEchoJC focusing on the no longer forgotten tricuspid valve! Register for #CME at <https://bit.ly/3wygQ01>

Articles:

👉 <https://bit.ly/36lBwHO>

👉 <https://bit.ly/3L6rC1u> Follow the hashtag #ASEchoJC!



ASE'S TWITTER JOURNAL CLUB

ASE AMERICAN SOCIETY OF ECHOCARDIOGRAPHY
Sound Saves Lives


Tuesday, Mar. 29, 2022
8:00 to 9:00 PM (ET)

JOIN THE DISCUSSION ON:

- Beyond the Wires: A Case of Leadless Pacemaker–Mediated Tricuspid Regurgitation (CASE, July 2021)
- A Primer on Three-Dimensional Transthoracic Echocardiographic Imaging of the Tricuspid Valve (CASE, February 2022)

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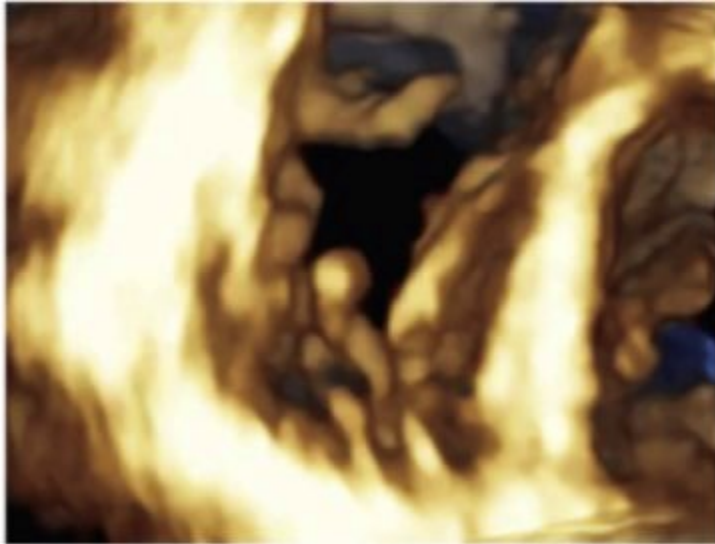
Authors, Filipe Cirne, MD (@fpecme); Madeline Jankowski, BS, RDCS, ACS, FASE (@maddiejane25); Akhil Narang, MD, FASE (@AkhilNarangMD); and Douglas Wright, MD, FASE (@dougwrightOSL); will join the Twitter Journal Club Task Force moderators, Nadeen Faza, MD, FASE (@NadeenFaza); Edward Gill, MD, FASE (@edwardagill); Rajesh Janardhanan, MD, MRCP, FASE (@rajdoc2005); and Ritu Thamman, MD, FASE (@iamritu).

 The ASE Twitter Journal Club will answer your questions!
Follow @ASE360 and use hashtag #ASEchoJC for all tweets!

Q1: What are the different mechanisms of lead-related tricuspid regurgitation?

A1 Notable Responses:

@iamritu: A1. perforation or impingement of 1 or more leaflets, lead entanglement in subvalvular apparatus, RV dyssynchrony, device-related endocarditis w associated direct infectious damage to valvular structure or leaflet flail/avulsion after lead extraction

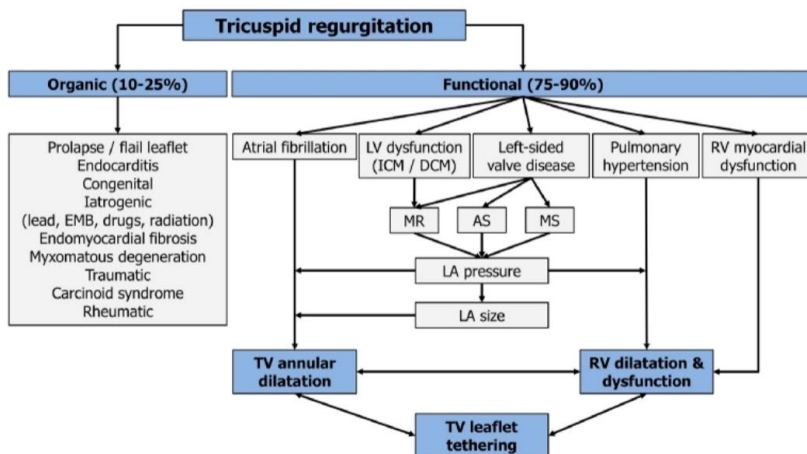


@flpecrne: 1) Leaflet impingement (leaflet restriction/tethering); 2) Lead entanglement into the subvalvular apparatus (leaflet restriction/tethering); 3) Leaflet perforation (eg.: IE, EMB); 4) Leaflet and/or subvalvular apparatus damage after lead extraction (leaflet prolapse, flail or avulsion; chordal and/or papillary muscle partial or complete rupture); 5) Cardiac-device related IE with extension to the TV; 6) RV dyssynchrony.

@NadeenFaza:

- Lead perforation by direct lead damage
- Lead impingement
- Lead entanglement into the subvalvular apparatus
- RV dyssynchrony
- Cardiac device-related endocarditis
- Leaflet and/or subvalvular apparatus damage after lead extraction

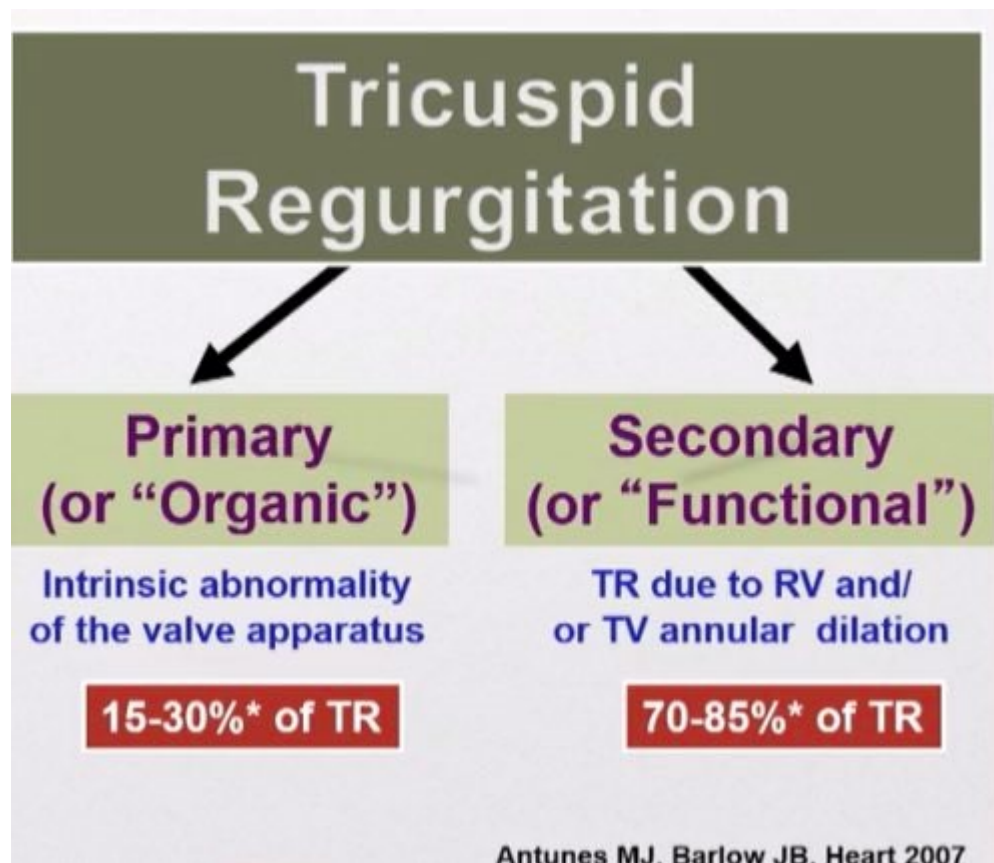
@AkhilNarangMD: Nice slide breaking down mechanism of TR.



@rajdoc2005: Clearly functional TR is way more common.

Wondering if the proportions could change with increasing number of devices these days - with a potential of increasing incidence of iatrogenic TR from PPM!

@iamritu: secondary/functional TR incidence will likely increase with as more devices are implanted



@VLSorrellImages: Important question since without knowing possible mechanisms, you don't know what to look for with echo / imaging.

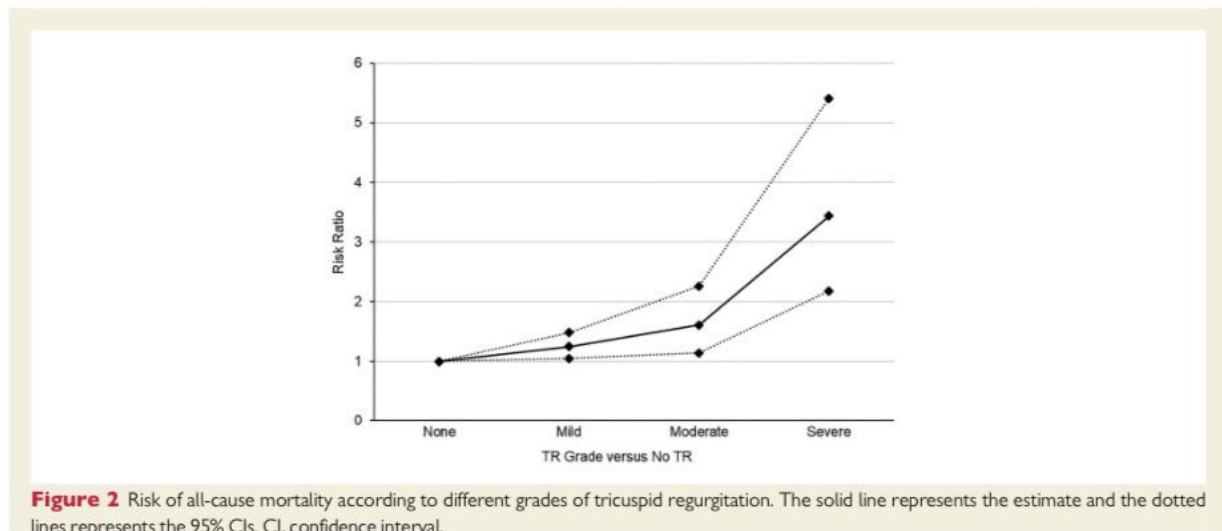
Q2: What are the clinical implications of lead-induced tricuspid regurgitation?

A2 Notable Responses:

@AkhilNarangMD: Severe, massive, or torrential TR can cause terrible symptoms (edema, congestion, cirrhosis, renal failure). Often worsening RV function compounds the problem in addition to RV-PA decoupling.

@flpecrne: Higher mortality rates (Al-Bawardy et al, Hoke et al); higher rates of cardiovascular death and HF hospitalization (Seo et al); RV and RA dilatation (Hoke et al, Arabi et al). Also, limited exercise tolerance, worse quality of life due to HF symptoms and atrial fibrillation are additional negative implications of lead-induced TR, just as for other etiologies of TR.

@iamritu: #Tricuspid regurgitation mortality worse with worse grade of TR



@VLSorrellImages: In addition to what's been listed, some patients may shunt across a PFO and develop hypoxemia (worse with stress). Again, if you don't consider this, you won't ever see this!

Q3: How is the interaction between the intracardiac device and the TV evaluated by echocardiography?

A3 Notable Responses:


@AkhilNarangMD: Need to be adept with both 2D and 3D echo. Master TV inflow view (mid or deep esophagus, sometimes modified bi-caval views) and sweep anterior to posterior with x-plane. Master transgastric views.

@flpecrne: Given that the TV is an anterior structure within the mediastinum, TTE is often better than TEE. And nowadays, with the insights gained from 3D, it is often times hard to accurately assess this interaction with bidimensional echo only.

@flpcerne: On TEE, a TG SAX view or 3D derived SAX view of the valve from esophageal views can reliably identify valve morphology and valve-device interaction.

@iamritu: #echofirst assessment of TR in often focuses on leaflet—lead interaction but not on complex & more difficult to define subvalvular— device relationship which likely leads to underestimation of all cardiac devices as a major cause of significant TR

@AkhilNarangMD: would say both have their value - TTE and TEE. In our transcatheter trials, hard to beat a high quality TEE.

@maddiejane25: Need to  from multiple windows. PSAX at AV level is my favorite for 2D imaging of all leaflets and lead. 3D TTE is favorable for seeing relationships of anatomy and device, must have patience!!

@VLSorrellImages: My favorite TEE view is not the en-face 45 degree TG view (although I like that a lot), it's actually a 135 degree apLAX view - rotated rightward! Often aligns Doppler cursor best & is rarely 'limited'.

@AkhilNarangMD: example of sweeping anterior (top), central (middle), and posterior (bottom) with x-plane.



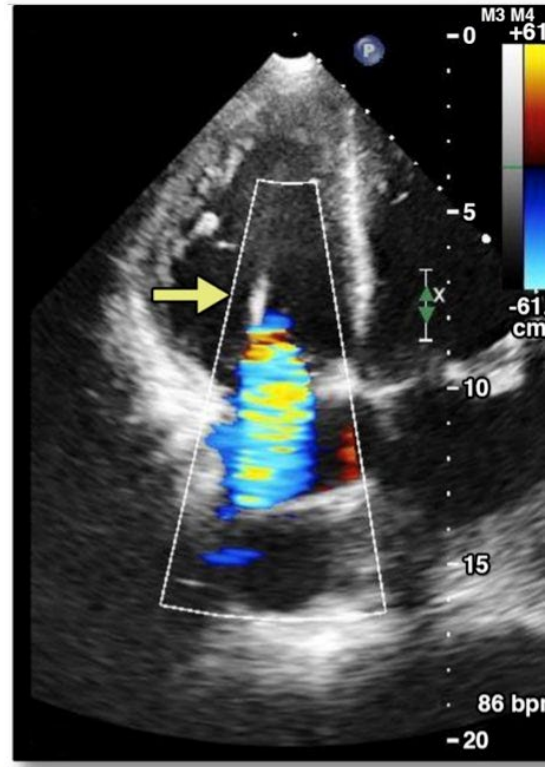
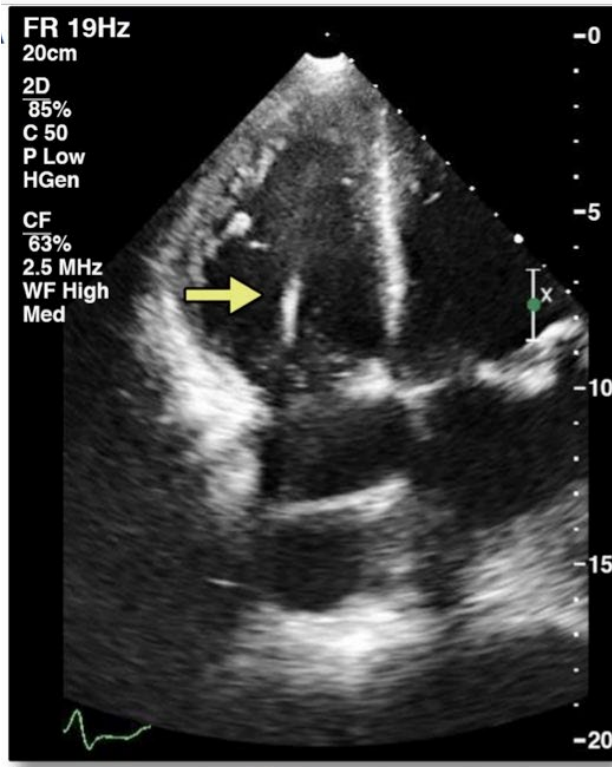
Q4: How is lead impingement confirmed by echocardiography?

A4 Notable Responses:

@flpecrne: With 3D, an en face view and MPR are excellent tools to localize the lead and to assess the mechanism by which it is affecting valve function.

@rajdoc2005: Agree! This is clearly a situation one need to utilize MPR tools on 3D to delineate the lead and the leaflets!

@iamritu: Definitely need 3D echo & remember influence of driving pressure on apparent regurgitant jet area RV driving pressure is much lower than LV pressure, hence TR jet can have a similar jet area to MV regurgitation but be more significant



@DocStrom: Important point. As @JamesDThomasMD1 showed us (<https://bit.ly/3iRCu72>) Jet area best predicted by momentum (flow x velocity) so w/ RV-RA pressure difference lower than LV-LA, a similar sized TR vs MR jet will have more regurg.

@flpecrne: Very good point. Color Doppler can be even more misleading when assessing TR severity. Important to look for other features like hepatic vein systolic flow reversal and even C-V waves on clinical exam.

@LilyLeiZhang: We need to keep in mind systolic flow reversal in hepatic vein has pitfalls in huge compliant RAs eccentric jets. Persistent S-wave reversal can also be seen after TEER even though TR is clearly not severe...likely related to changes in RA compliance

@NadeenFaza: This is key prior to planning transcatheter interventions for the TV to understand the mechanism of TR and the interaction between the device and valve!

@DougWrightOSL: Many potential patients are excluded from TEER based on the lead alone, although could significantly benefit

@NadeenFaza: Absolutely! Leads can be innocent bystanders in some patients with severe TR and their presence should not always preclude #TEER!

@flpecrne: A lead sitting above the leaflet itself (and not in one of the commissures or in the center of the valve) and restricting its motion, are highly suggestive (or even confirmatory) findings for leaflet impingement.

Q5: What are the echocardiographic features of intracardiac device-induced leaflet perforation?

A5 Notable Responses:

@AkhilNarangMD: When looking for flail or torn chordae in these situations often using live 3D imaging can be very helpful to see these small structures. Use a narrow box. You may have to play with gain as well. Sometimes HVR imaging is helpful as well.

@rajdoc2005: We will have to remind our EP colleagues not to perforate that poor TV valve leaflets!! 😬

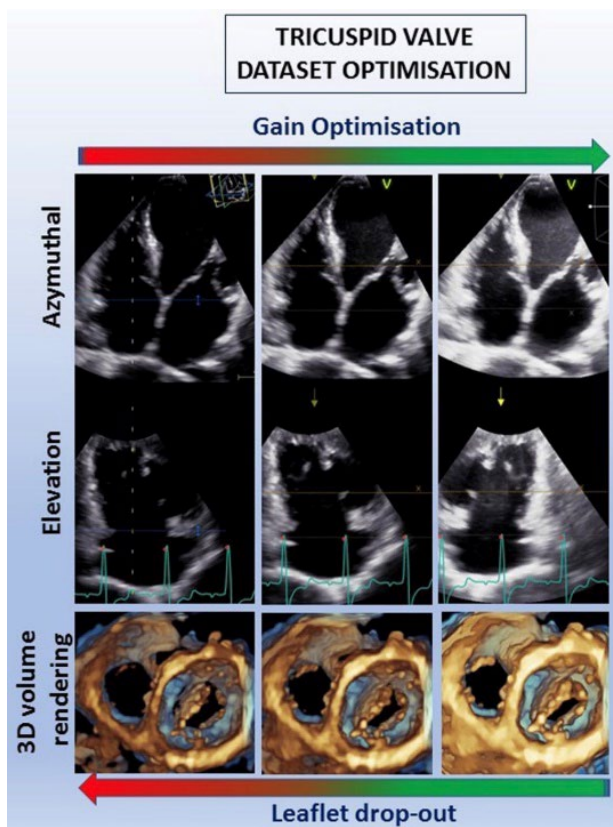
(JK)

@DougWrightOSL: and educate our EP team to look for TR post device insertion. Could save a lot of potential "heart ache" later for the patient. Push for that pre and post device echo!

@flpecrne: Focal leaflet tissue disruption (more easily assessed on an en face view from 3D imaging) with color Doppler flow across the defect. Worth mentioning that regurgitant jet can be central or eccentric.

LilyLeiZhang: <https://twitter.com/i/status/1508969742052339722>

@iamritu: ↑ time gain compensation & overall gain to avoid dropout artifacts of tricuspid leaflets, ask patient to hold their breath during full inspiration to see that all valve components well in both simultaneous orthogonal views (azimuth & elevation)



@rajdoc2005: Great slide! Can't emphasize enough the importance of optimization of 2D settings - before acquiring 3D!!

@DavidWienerMD: 🙏 . Bad 2D images = bad 3D images

@boegel_kelly: Great tip! Patients control their breathing can take your image from average to spectacular in an instant. So important to engage the patient to participate in their echo. Their participation will lead to better image quality → better treatment management. Win/Win

@boegel_kelly: This point cannot be said enough! 2D is the key. You cannot learn to produce good 3D images until you learn how to properly produce a good quality 2D image. 2D optimization is ridiculously important in your 3D image. As my daughter would say "Period"

Q6: What is the mechanism of leadless pacemaker- induced TR?

A6 Notable Responses:

@VLSorrellImages: This: <https://twitter.com/i/status/1508964965167910914>

@flpecrne: More data is needed, but interaction of the device with the subvalvular apparatus causing leaflet restriction seems to be the most likely mechanism.

Q7: What are the management options for lead-induced TR

A7 Notable Response:

@iamritu: leaflet impingement involves posterior & anterior leaflets typically & usual position of pacing lead tip is adjacent to septum; TR more associated w device leads causing valve impingement rather than leads located centrally or in a commissural position

<https://twitter.com/i/status/1508969776953106433>

@flpecrne: Medical management with diuretics is usually the first approach regardless of the mechanism (excluding IE).

@flpecrne: Depending on local expertise and infra-structure, lead repositioning/extraction can be attempted in refractory cases when there is confirmed lead-leaflet interaction.

@rajdoc2005: Note that lead extraction is NOT a benign procedure - esp in cases of chronic leads! Make sure one has local expertise before even attempting!!

@flpecrne: Good point. And the time since the lead was implanted (> or < 1 year) should also be considered, as well as the availability of additional tools like laser-lead extraction.

Q8: How can 2D TTE images be optimized to better assess the interaction between an intracardiac device and the TV?

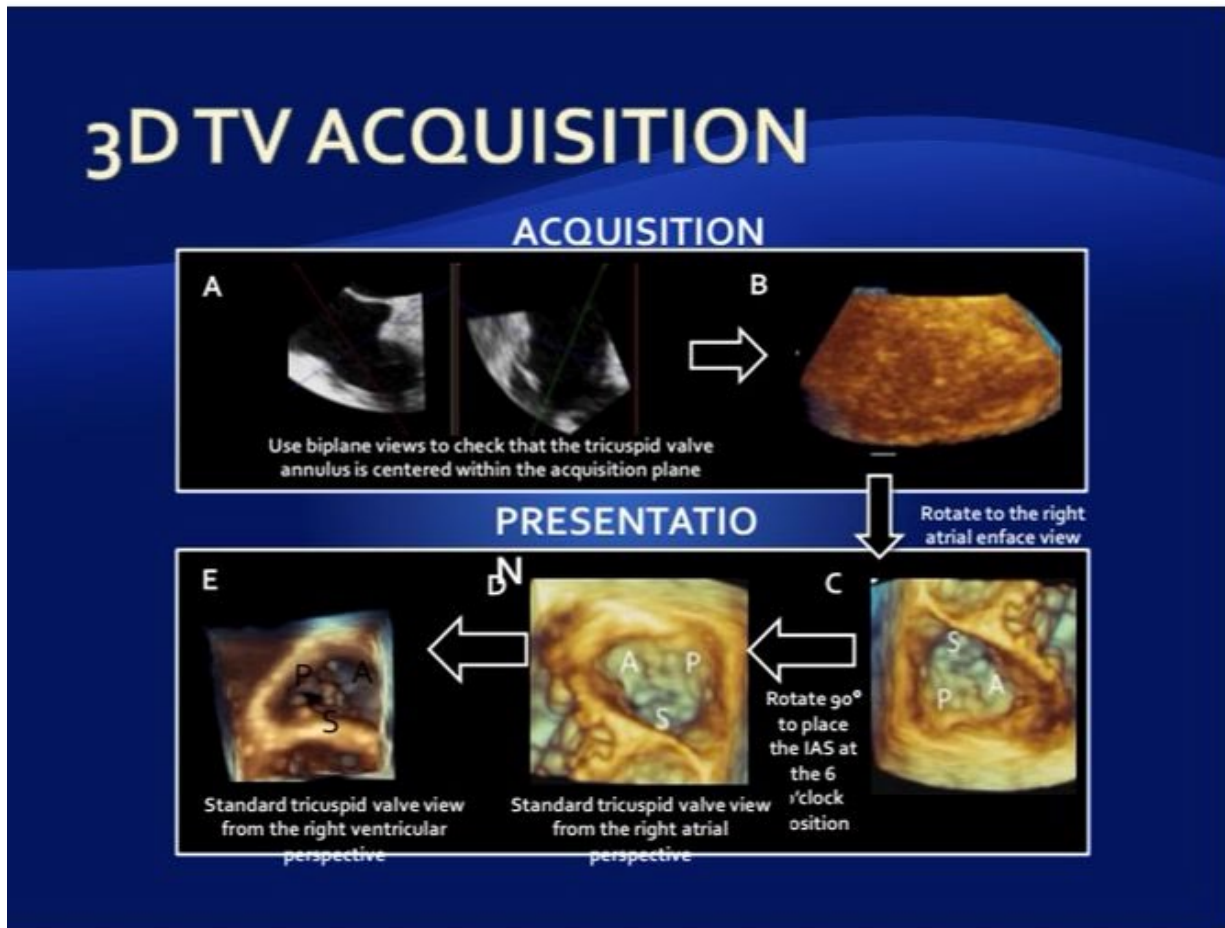
A8 Notable Responses:

@boegel_kelly: Use all windows available and don't be afraid to sweep through the valve. I find an off axis view between apical and parasternal window can be great for viewing tricuspid valve. Don't forget about subcostals. Think outside the box, use your knobology

Q9: How can 3D TTE imaging further aid in the evaluation of the interaction between an intracardiac device and the TV?

A9 Notable Responses:

@iamritu: 3D is 🔑: color maps code position (depth) of voxels & not tissue texture abnormality & 3D usually shows thicker leaflets than they actually are caused by blurring or amplification artifacts; 3D volumetric dataset have higher axial resolution than lateral & elevation



@flpecrne: The main advantage I see with 3D-TTE in this scenario is the possibility to visualize the TV en face (surgical view) as well as MPR. These tools enable us to more accurately assess the mechanism of TR and to localize which is the affect leaflet(s).

@flpecrne: If a percutaneous valvuloplasty device is being considered, especially those targeting the leaflets like Triclip, valve anatomy and the location of the valvular lesions are of utmost importance for procedural planning and execution.

@flpecrne: Of note, the trajectory of the device lead is visualized in only 17% of the times on 2D images (Seo et al).

Q10: How are 3D TTE images of the TV and the intracardiac device obtained?

A10 Notable Responses:

@AkhilNarangMD: Use a small 3D box but often helpful to include portion of AV or septum to help with orientation and identification of TV leaflets.

@boegel_kelly: If patient is able, can have them hold their breath and obtain a multi-beat image to improve your frame rate and in turn your image quality. Also adjust your TGCs prior to storing image - cannot adjust in post processing