MV and TV Intervention: Preparing for the Next Revolution

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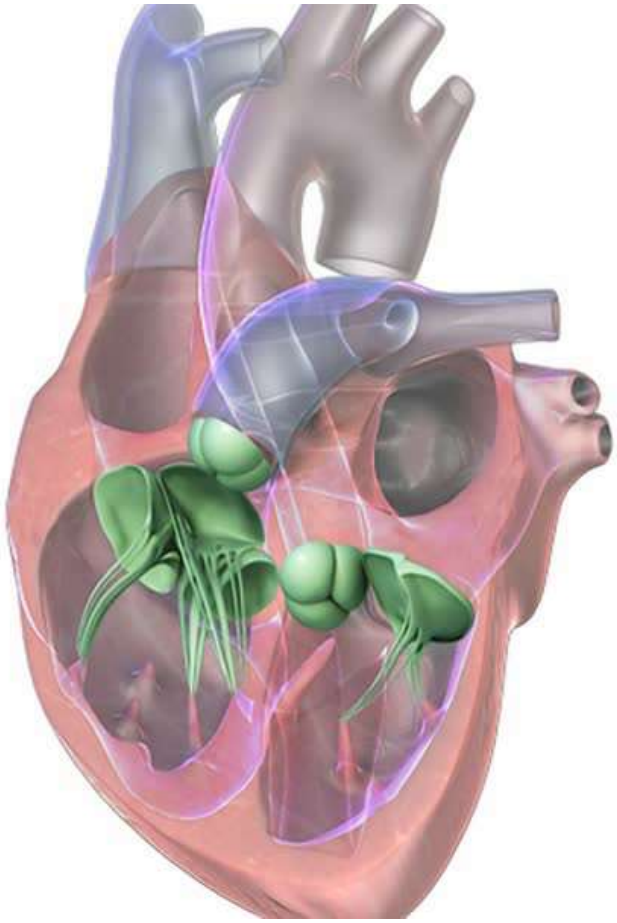
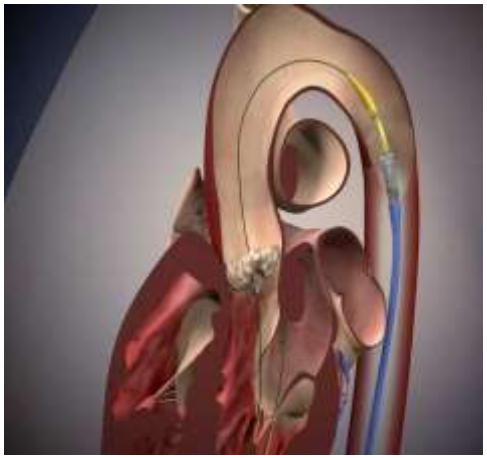
Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
• Grant/Research Support	• Edwards Lifesciences, Abbott
• Scientific Advisory Board	• Medtronic, Abbott
• Executive Physician Council	• Boston Scientific Corp

Challenges beyond the Semilunar Valves





TVT Therapy Alternatives

Anatomy and Management

Aortic	Mitral & Tricuspid
	
Simple	***Complex***

Transcatheter M/TV rR: Device Landscape 2018

Edge-to-edge

- Abbott MitraClip***
- Edwards Pascal*
- MitraFlex

Direct and indirect annuloplasty

- CDI Carillon**
- Mitralign TAMR**
- Edwards Cardioband**
- Ancora Heart Accucinch*
- Millipede IRIS*
- MVRx Arto*
- Mardil VenTouch*
- Mitraspan TASRA*
- Valcare Amend*
- Micardia enCor*
- MitraLoop Cerclage*
- Cardiac Implants RDS*
- QuantumCor (RF)
- Valfix

*In patients *CE mark *FDA approved

MV replacement

- Edwards CardiAQ*
- Edwards Fortis*
- Neovasc Tiara*
- Abbott Tendyne*
- Medtronic Intrepid*
- HighLife*
- Caisson*
- NCSI NaviGate*
- MValve*
- Mitraltech CardioValve*
- Edwards Sapien M3*
- Cephea
- St. Jude
- Micro Interventional
- ValveXchange
- MitrAssist
- Braile Quattuor
- Direct Flow
- Sinomed Accufit
- Valcare Corona

MV replacement (cont)

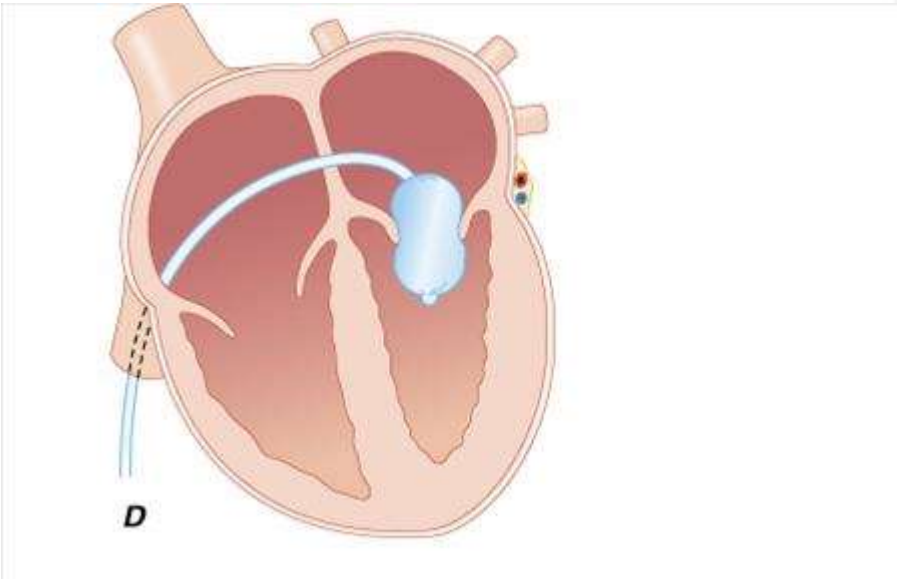
- MitralHeal
- HT Consultant Saturn
- Lutter valve
- Transcatheter Technologies
- Tresillo
- Venus
- Verso
- Transmural Systems
- Saturn (InnovaHeart)
- 4C Medical TMVR

Other approaches

- NeoChord DS 1000**
- Harpoon neochords*
- Babic chords*
- Middle Peak Medical*
- St. Jude leaflet plication*
- Cardiosolutions Mitra-Spacer*
- Mitralix*
- Mitraltech Vchordal
- Coramaze Mitramaze

How should we prepare?

Closed Commissurotomy

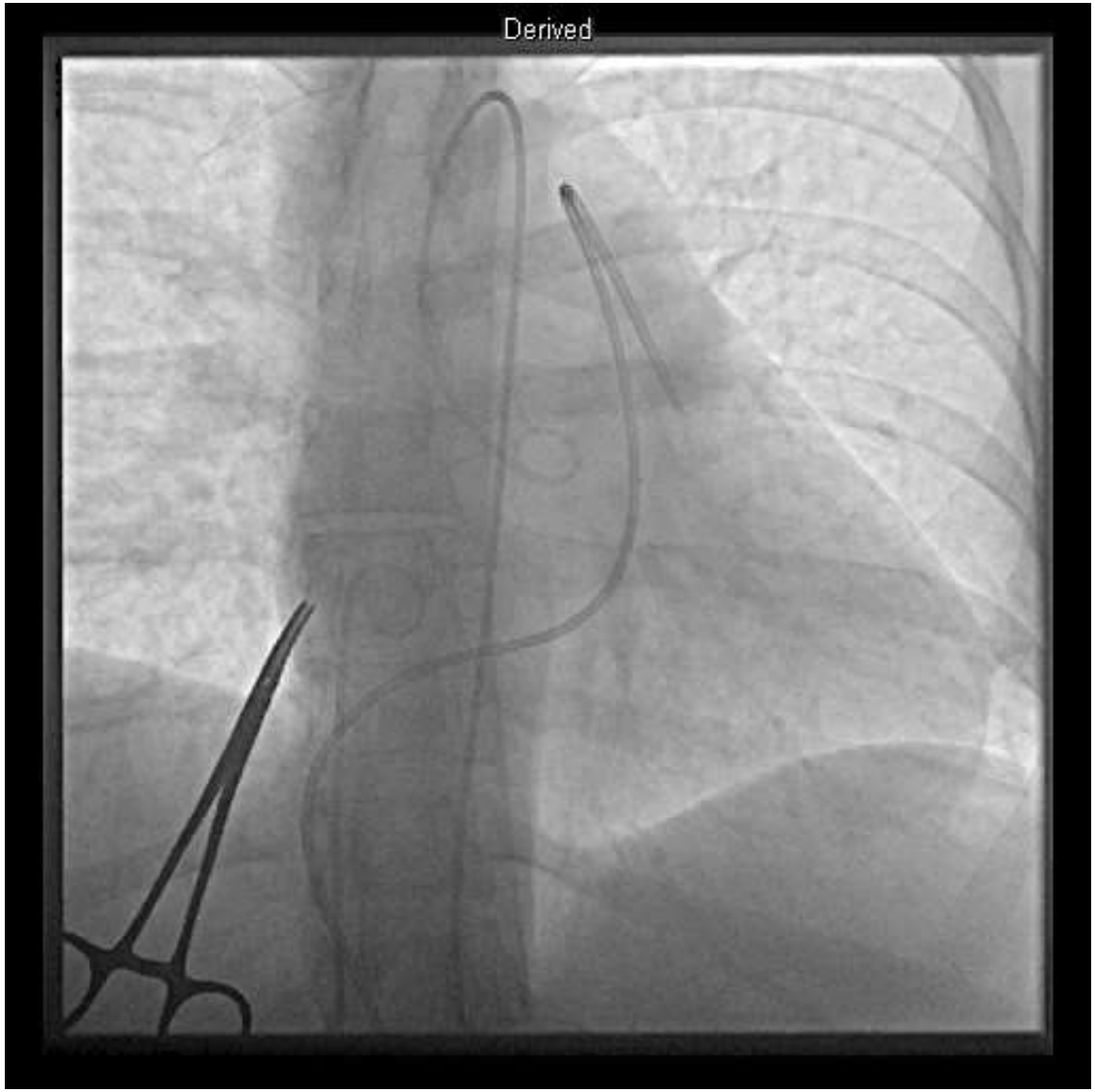


Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Losca
Harrison's Principles of Internal Medicine, 17th Edition: http://www.accessmedicine.com

Mitral Stenosis in Pregnancy

- 32 y/o G2P1 Caucasian Female 26 wks pregnant with severe rheumatic mitral stenosis c/b severe PH and RV dysfunction
- Invasive Hemodynamics

  Pre-valvuloplasty
  - RA 12, RV 79/15, PA 79/41/56, PCWP 29, SBP 90/60
  - LA 30 (post-transeptal puncture), MV mean gradient 25
  - CO/CI 5.9/3.2
  - LVG: Mild to Moderate MR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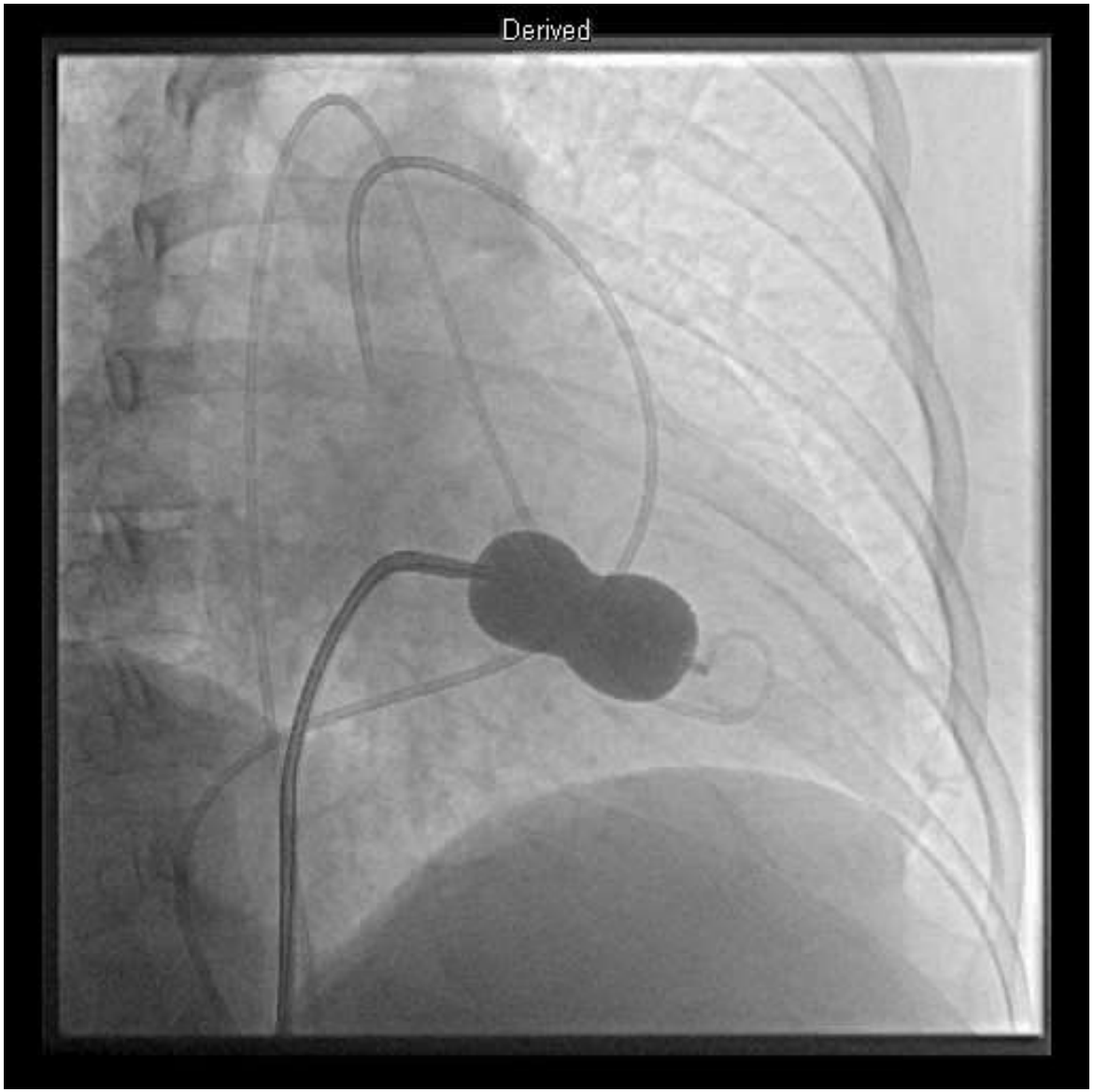
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Mitral Stenosis in Pregnancy (2)

- Invasive Hemodynamics

  Post-valvuloplasty (serial balloon inflations up to 26mm)
  - PA 65/30/41
  - MV mean gradient 6 (25 pre)
  - CO/CI 7.7/4.2
  - LVG Mild to Moderate MR

- Non invasive Hemodynamics
  - MV mean gradient 23 (HR 69) → 12 (HR 76) with stable mild-mod MR
  - Estimated RVSP 99 → 67 + JVP with improved RV function

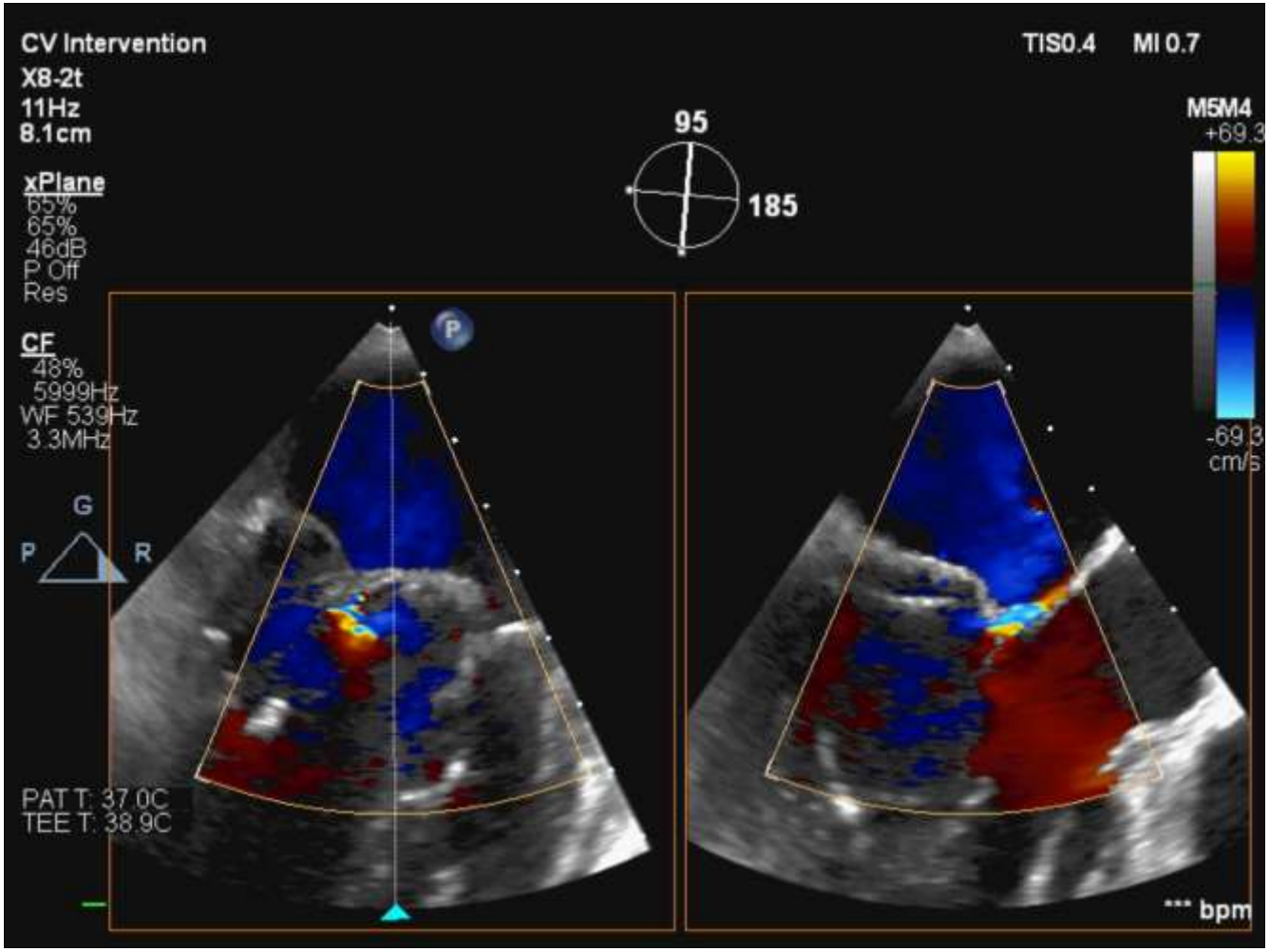
Mitral Regurgitation : Repair

Alfieri Stitch

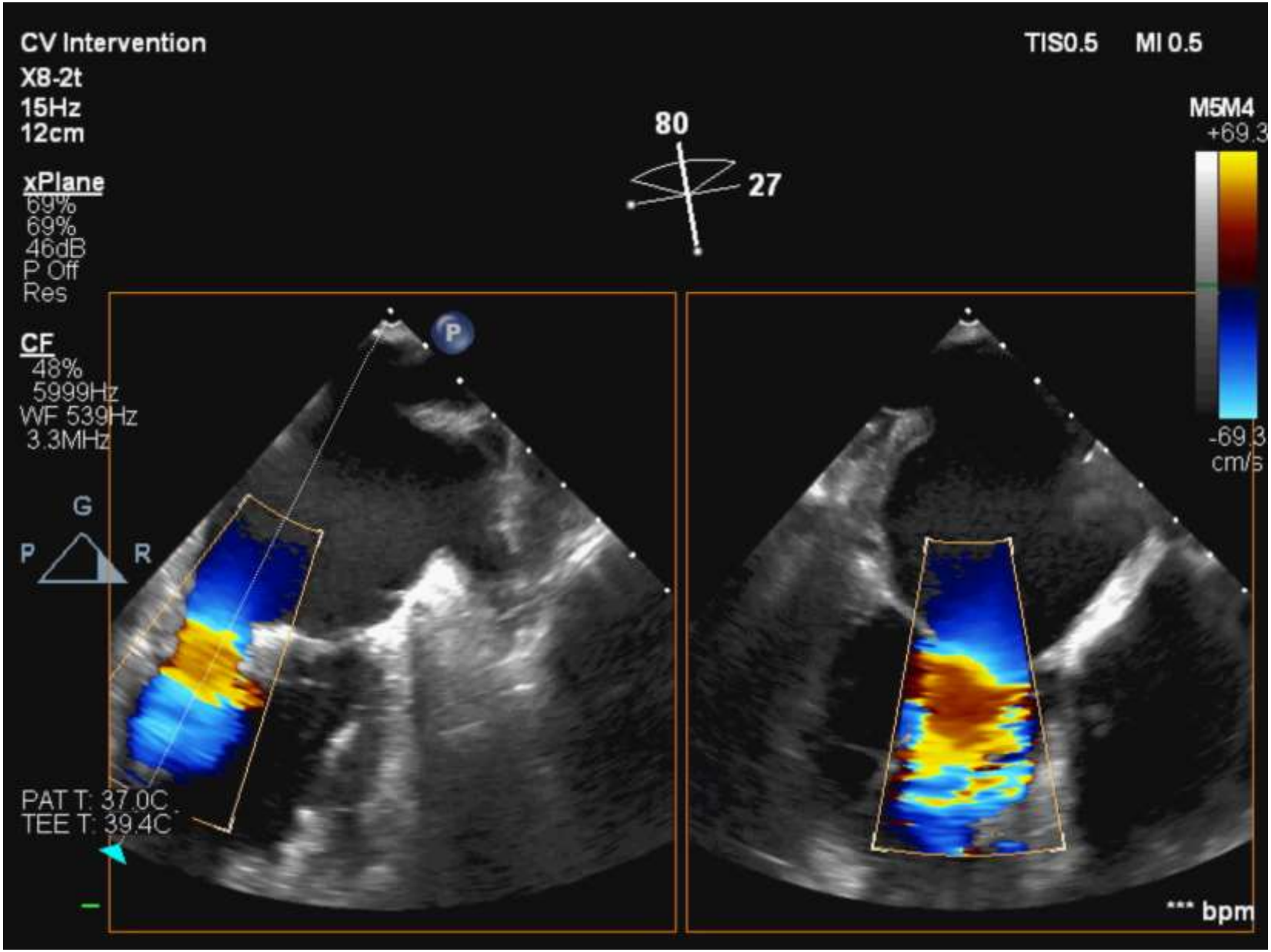
MitraClip

Case : KL

- 98 year old woman active, lives independently
- Slow decline over the past year with SOB
- MV prolapse with chordal rupture with RV pressure of 34.
- MitraClip: LA pressure of 30 v, post 10. 3-4+ MR to trace.

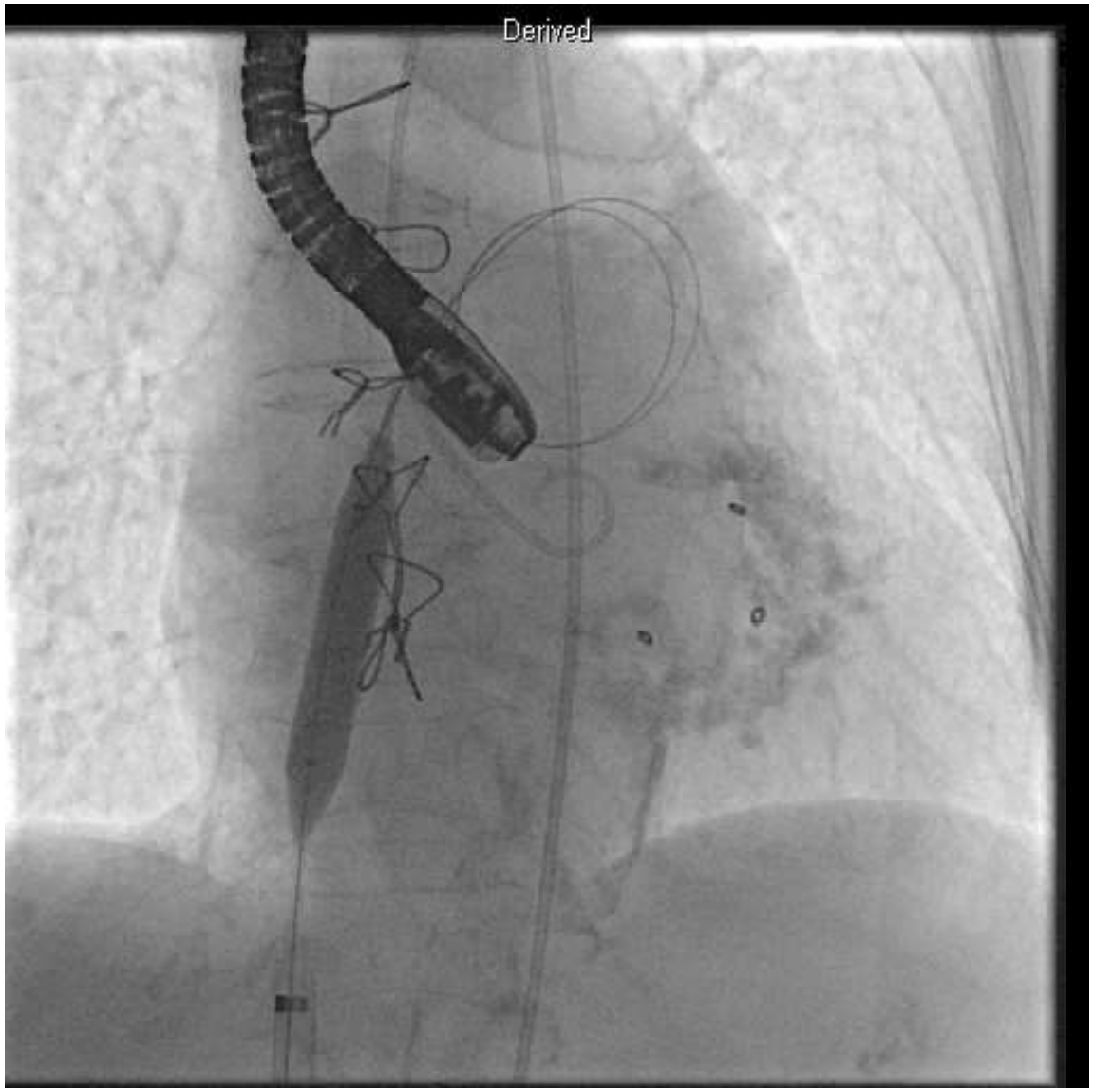

CV Intervention
X8-2t
11Hz
8.1cm
TIS0.4 MI 0.7
95
185
M5M4
+69.3
-69.3
cm/s
xPlane
65%
65%
46dB
P Off
Res
CF
48%
5999Hz
WF 539Hz
3.3MHz
G
P
R
PAT T: 37.0C
TEE T: 38.9C
*** bpm

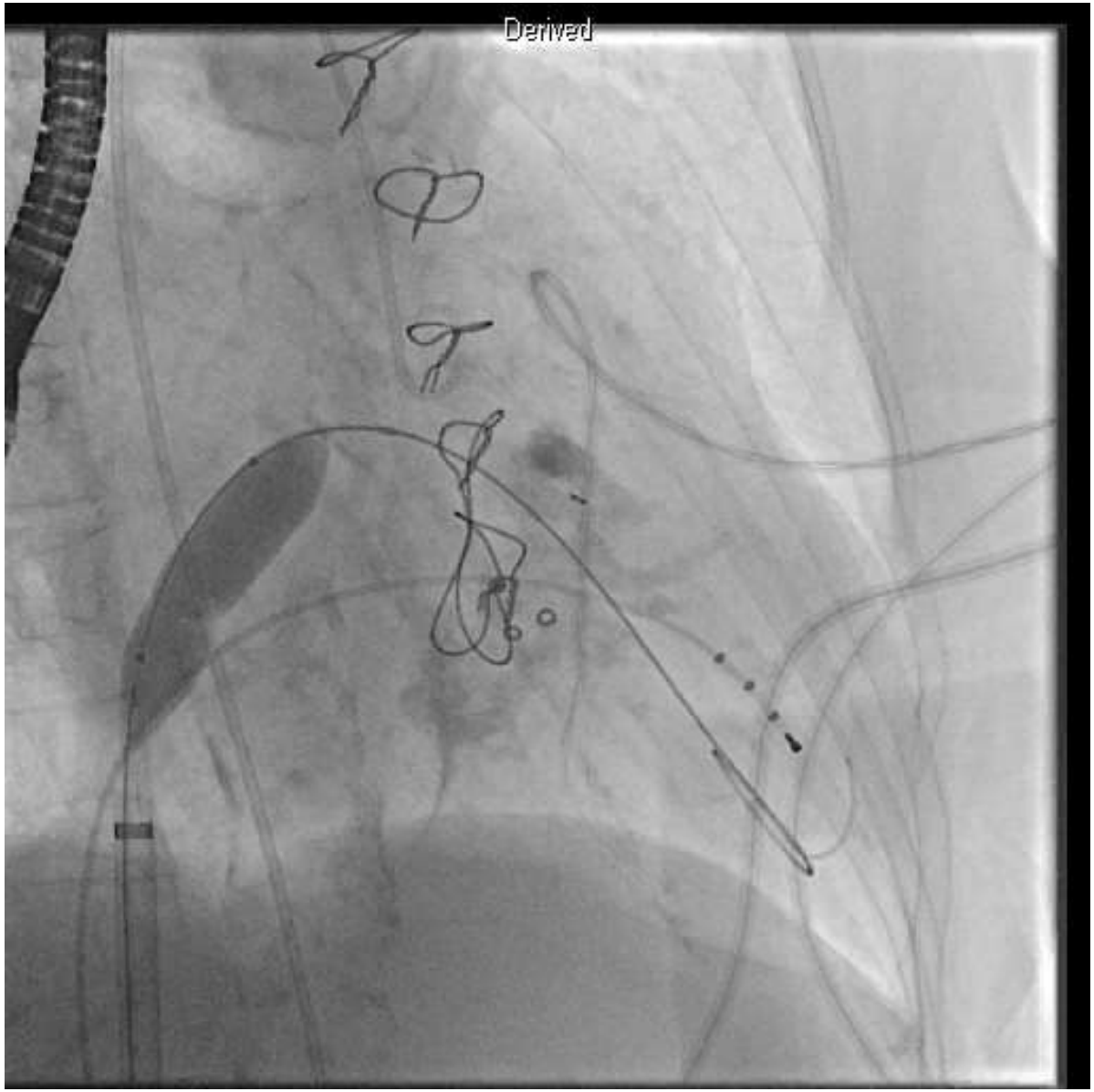

CV Intervention
X8-2t
30Hz
11cm
3D Beats 1
TIS0.2 MI 0.2
M5
0 140 180
3D Zoom
2D / 3D
% 66 / 49
C 46 / 30
Res
PAT T: 37.0C
TEE T: 39.5C
*** bpm


CV Intervention
X8-2t
15Hz
12cm
xPlane
69%
69%
46dB
P Off
Res
CF
48%
5999Hz
WF 539Hz
3.3MHz
TIS0.5
MI 0.5
M5M4
+69.3
-69.3
cm/s
80
27
G
P
R
PAT T: 37.0C
TEE T: 39.4C
*** bpm

Mitral and Tricuspid Valve in Valve Replacement

Mitral ViV Intervention

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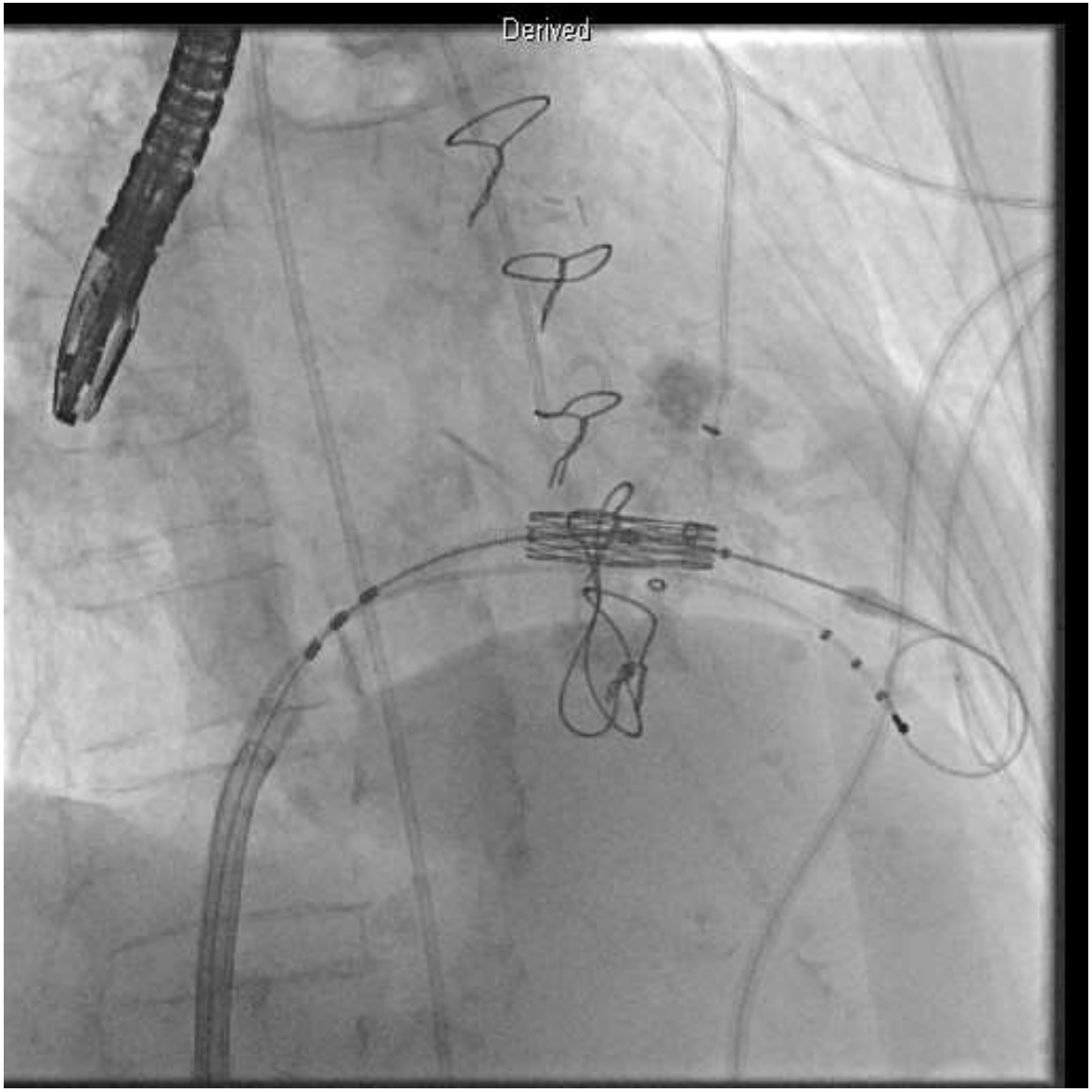
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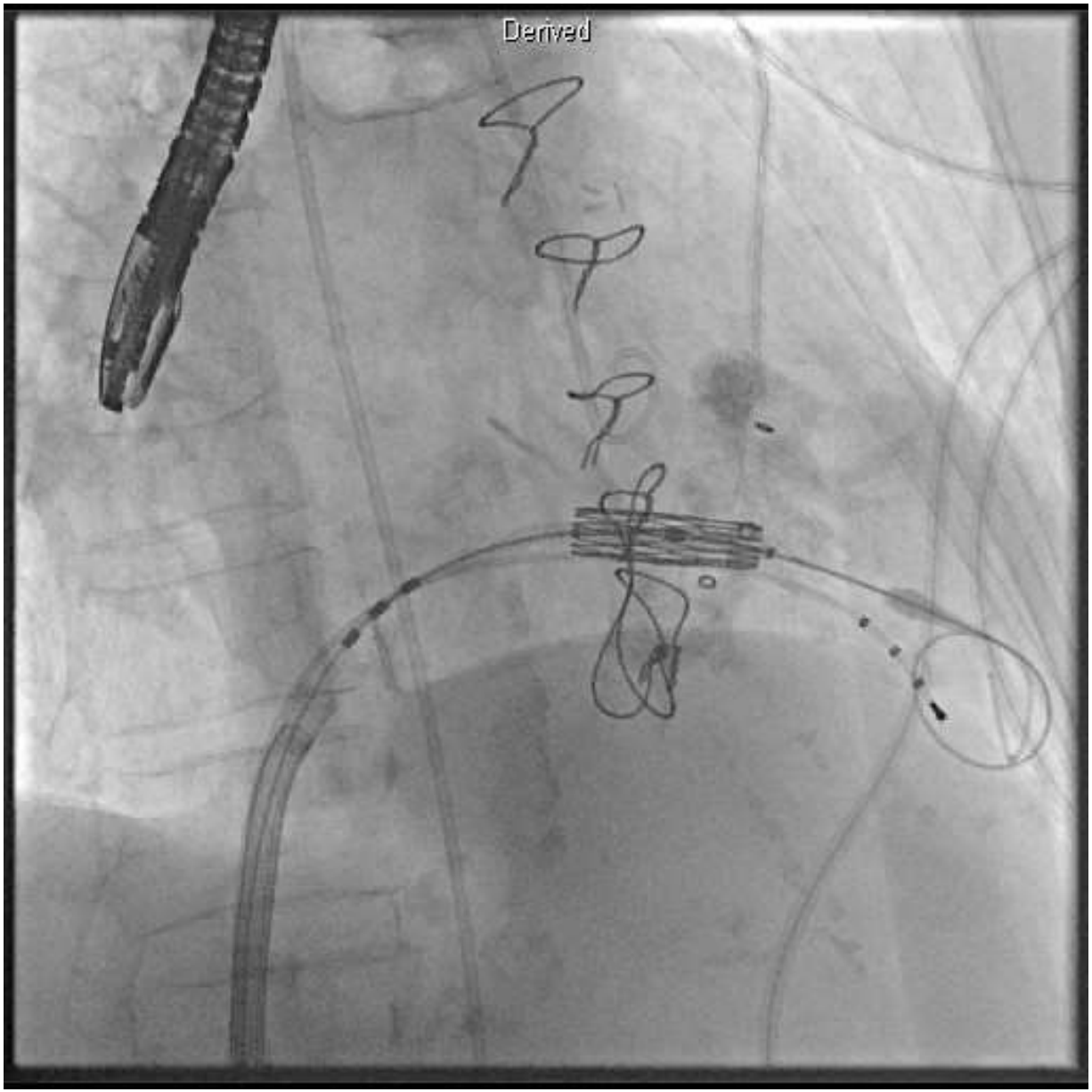
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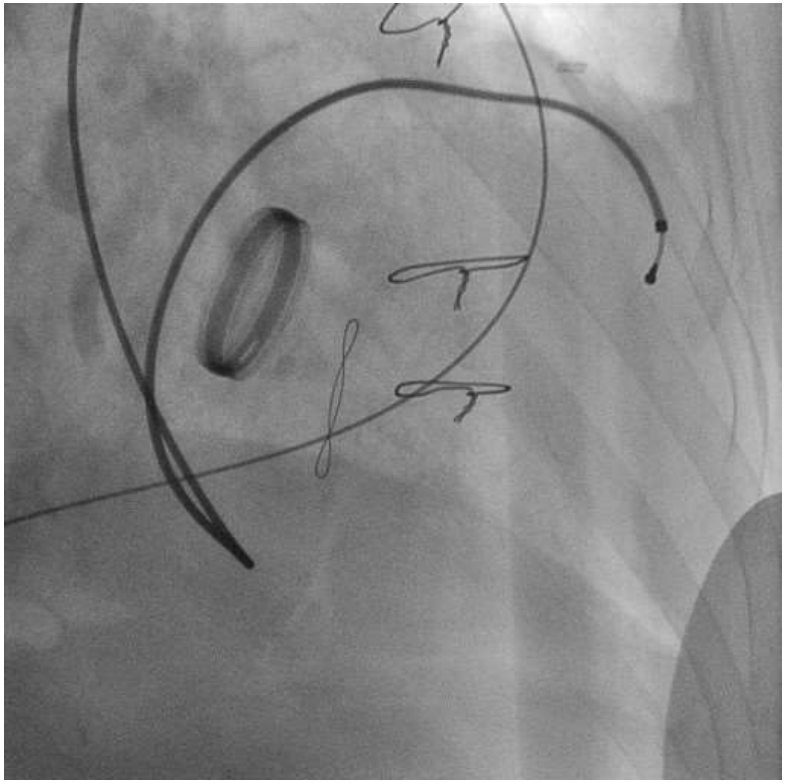
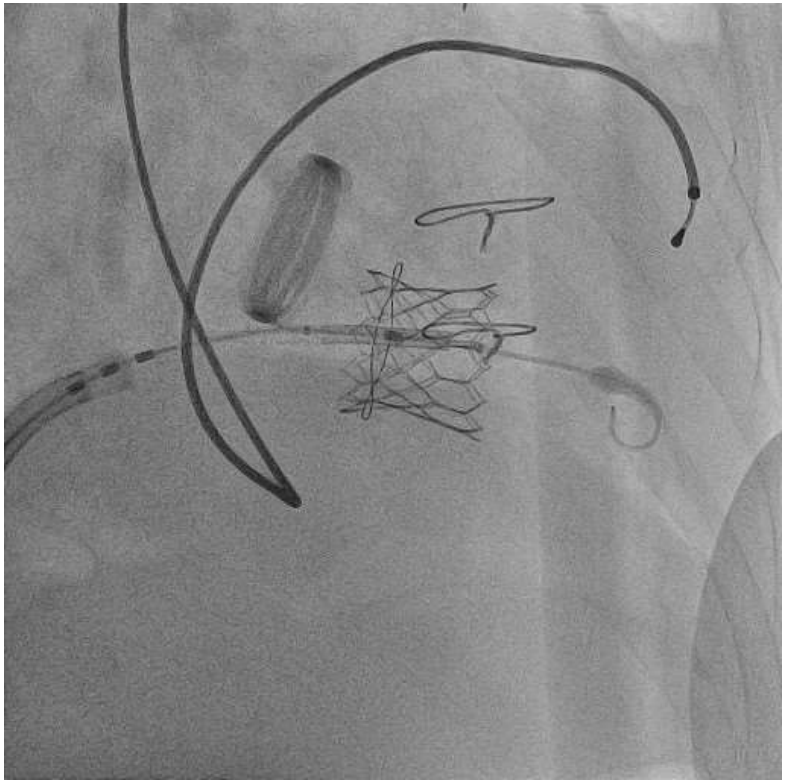
Tricuspid ViV Intervention

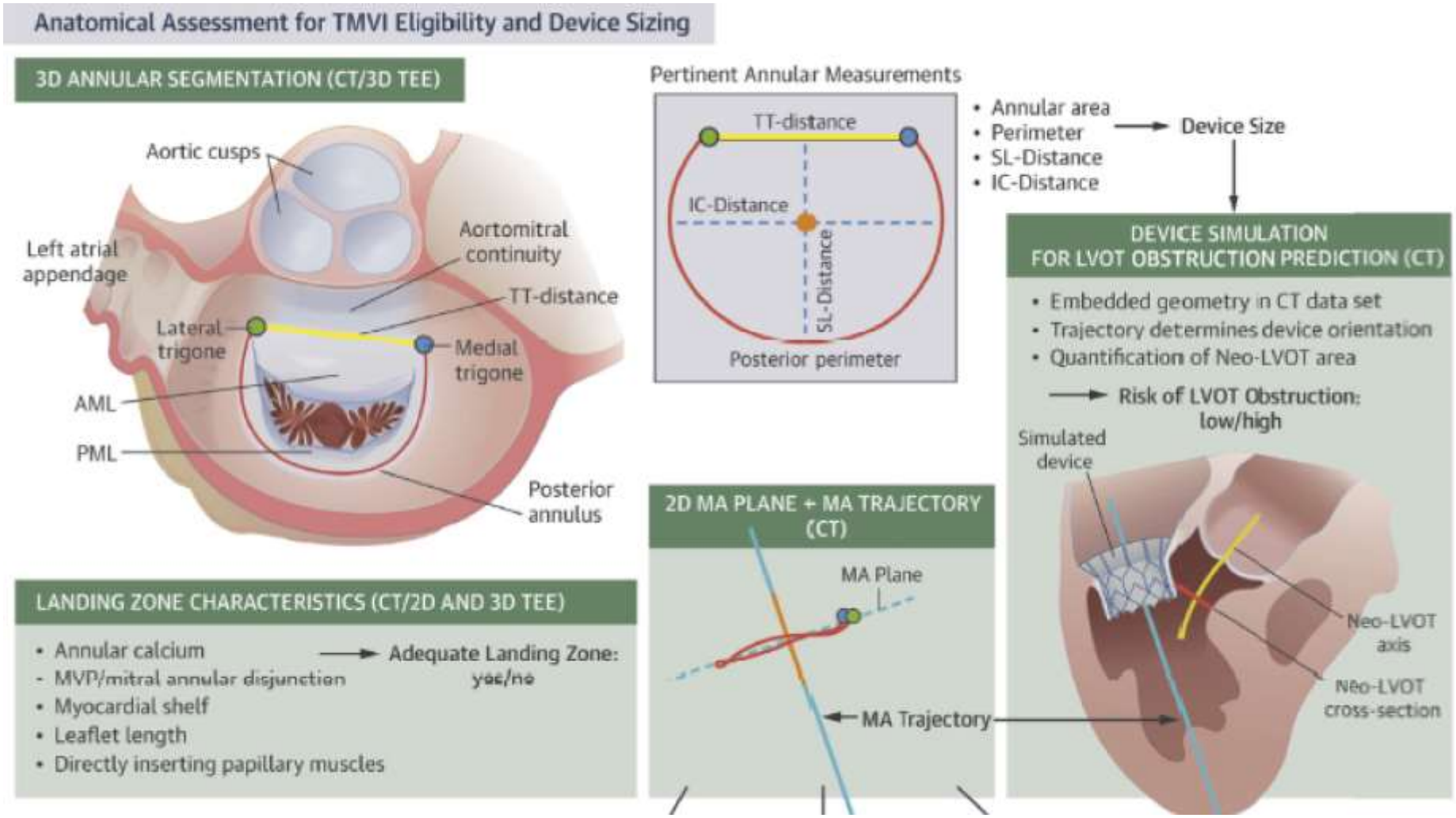




Needs Findings in MV and TV Interventions

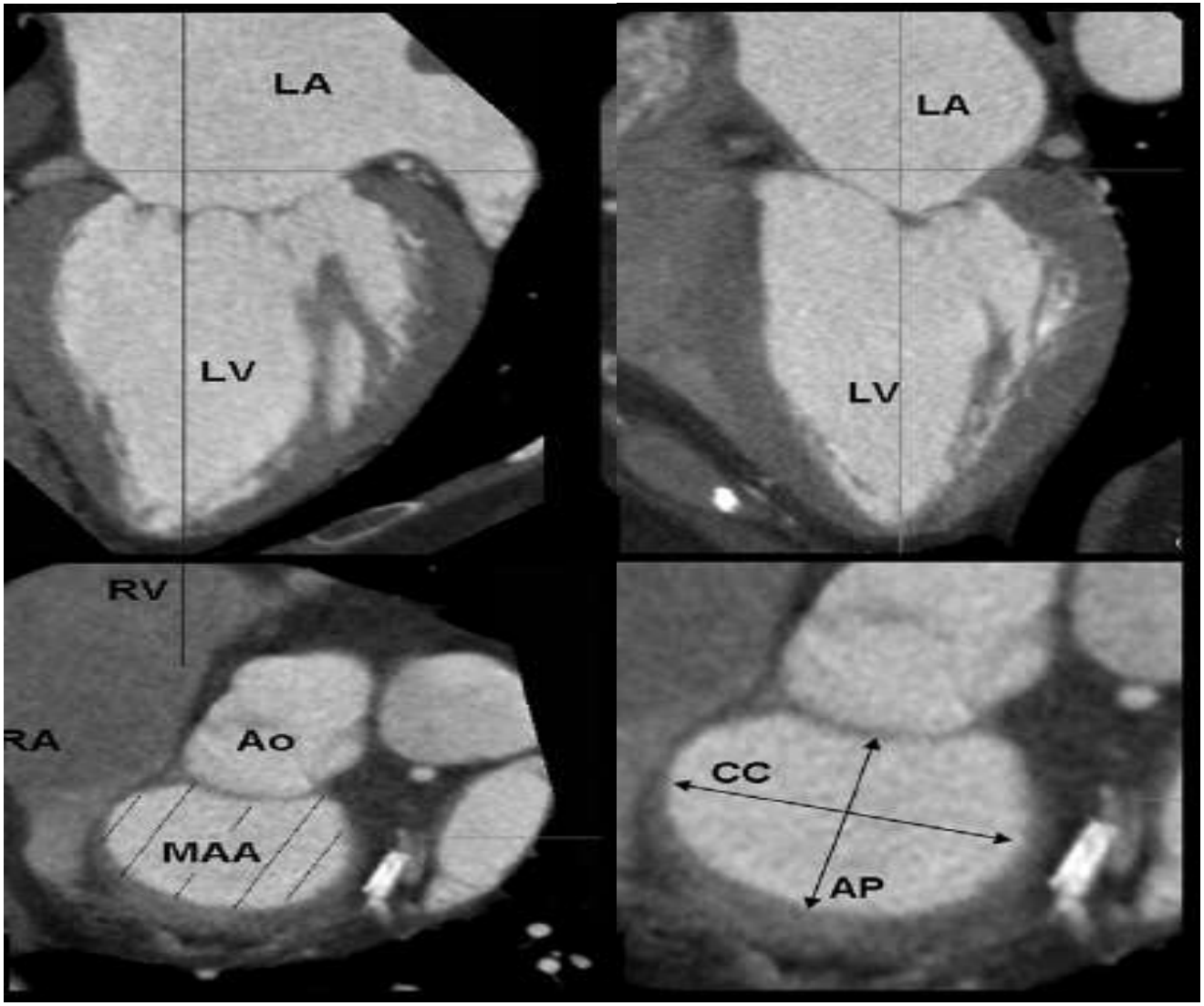
- Mitral Stenosis:
  - Present: Inoue Balloon Valvuloplasty
  - Need: Calcific MS (+/- MAC) Solution: TMVR
- Mitral Regurgitation:
  - Present: Mitraclip
  - Need: Calcific valve tip and immobile valve Solution: TMVR
  - Need: Functional MR Solution: ? Mitraclip
- Tricuspid Stenosis:
  - Extremely rare
- Tricuspid Regurgitation:
  - Enigma: ? TTVR, ?Clip
- V-in-V in Mitral and Tricuspid Positions
  - Doable with current technology
  - Need: predictability

The D-shaped annulus

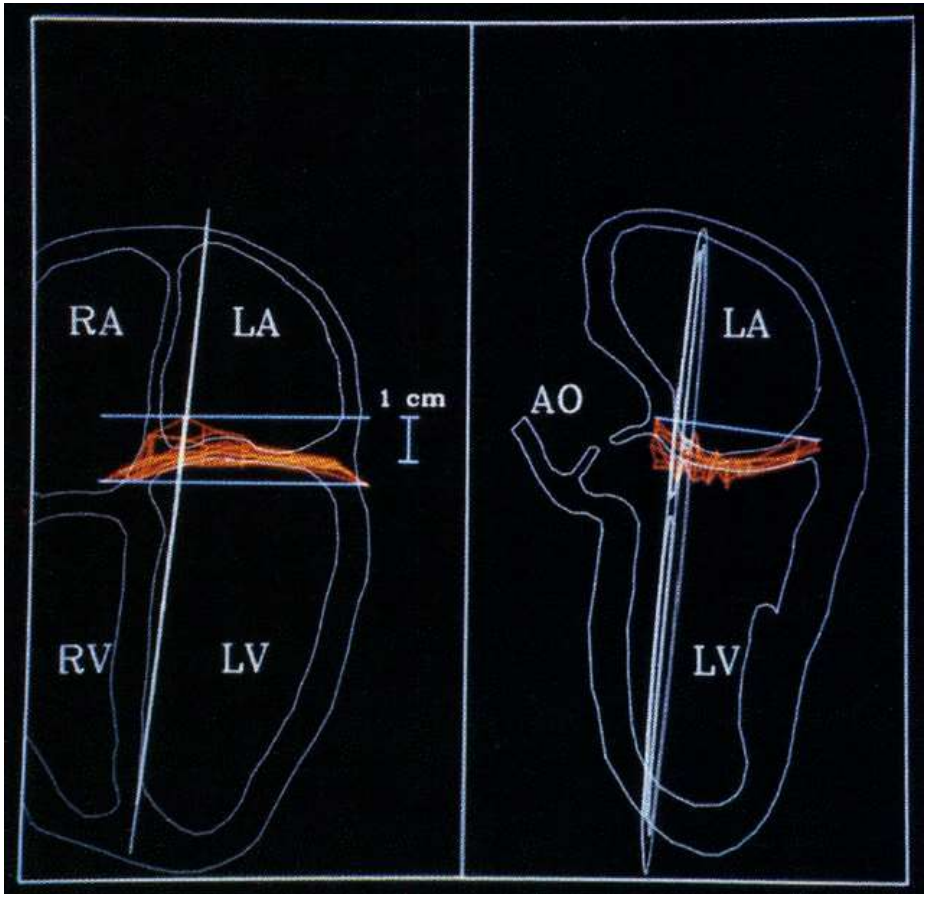


Source: *Blanke et al. JACCI 2015*

MDCT to Guide Transcatheter Mitral Valve Replacement



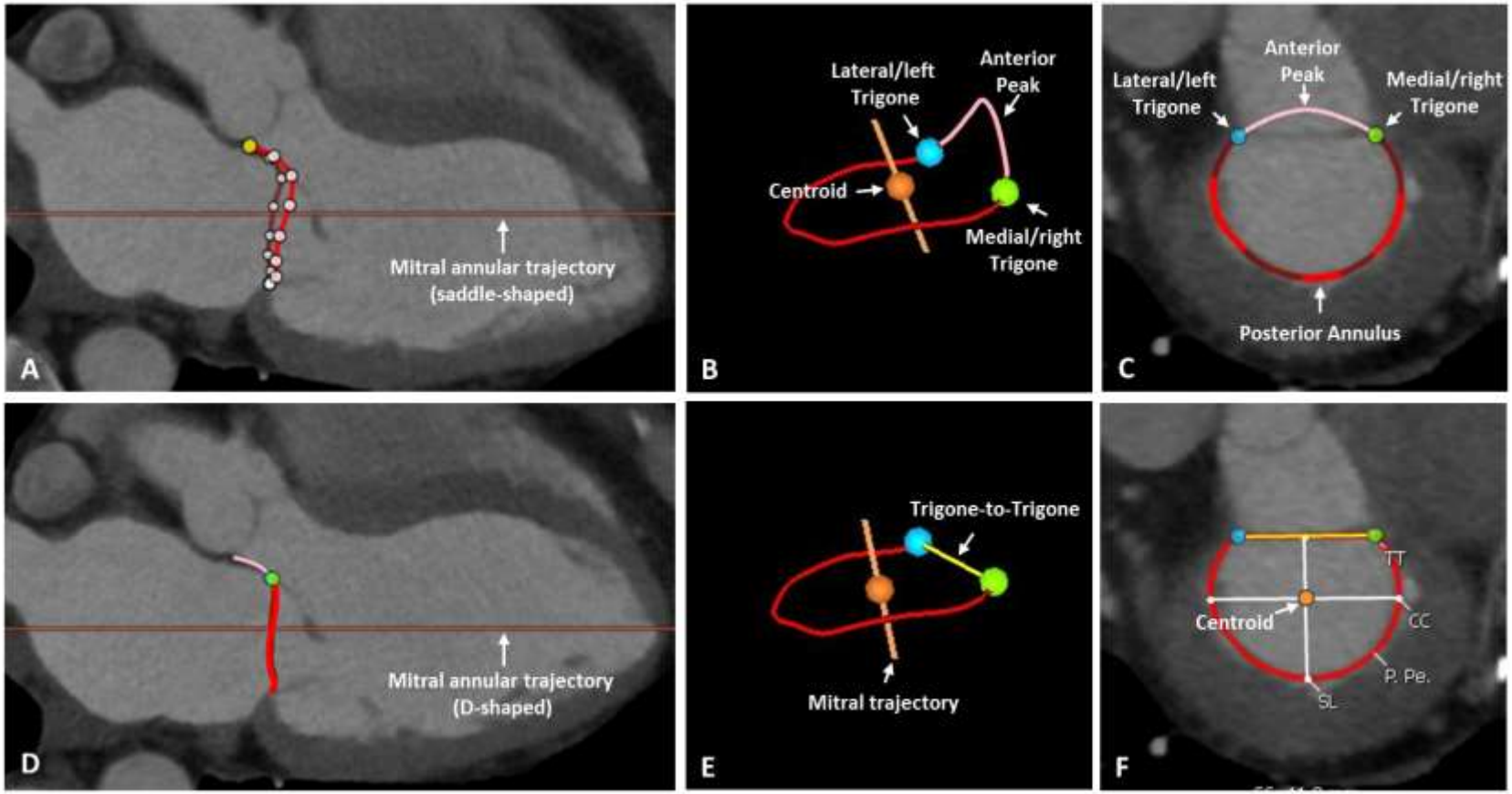
Mitral Annulus is non-planar



Saddle shape with a valley and 2 peaks extending to the aortic root

Source: Levine et al Circulation 1989

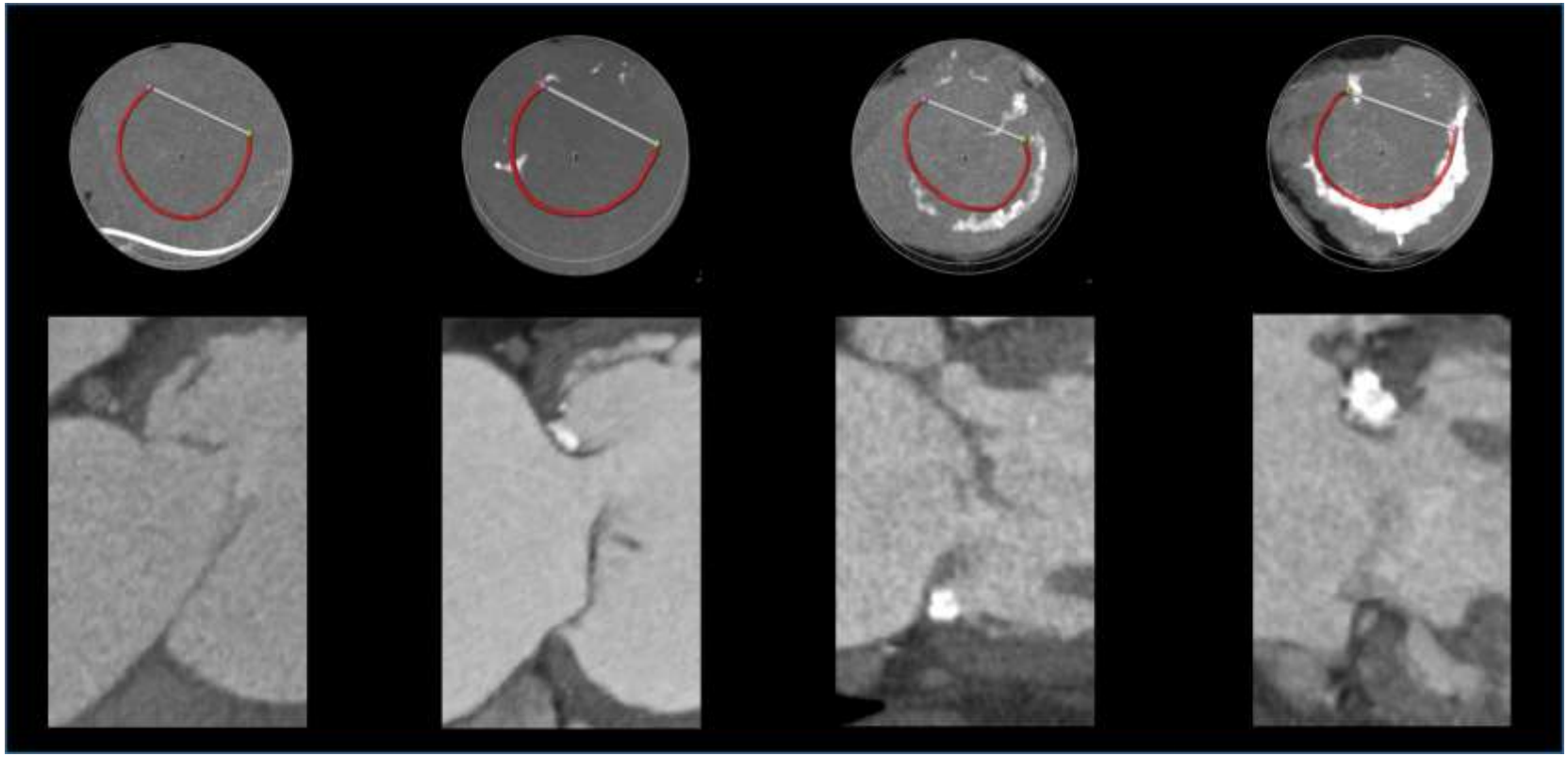
Segmentation of the Saddle and D Shaped Annulus



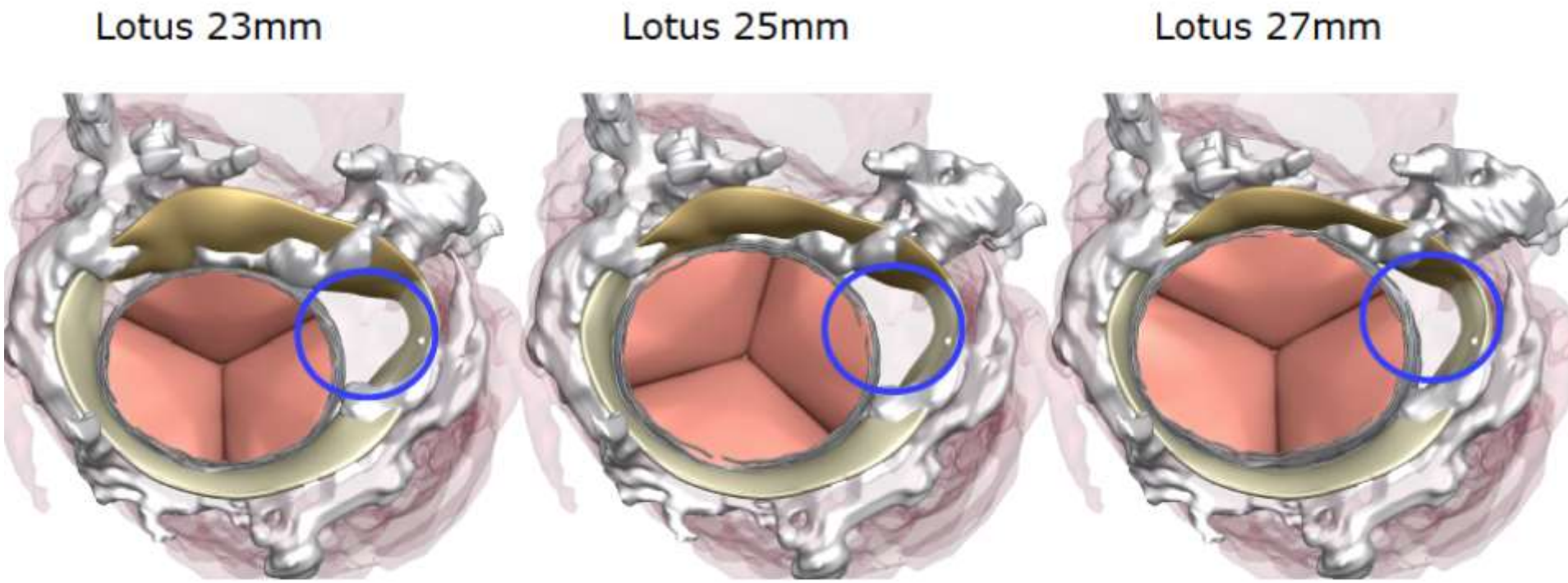
Source: Blanke and Naoum et al JACC Imaging 2015

Landing Zone Characterization

Mitral annular calcium



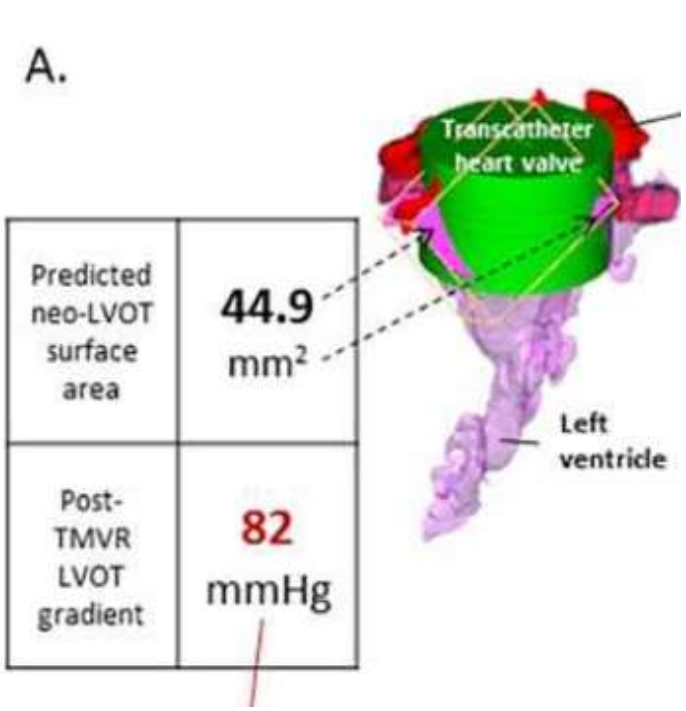
Predicting complications and patient suitability

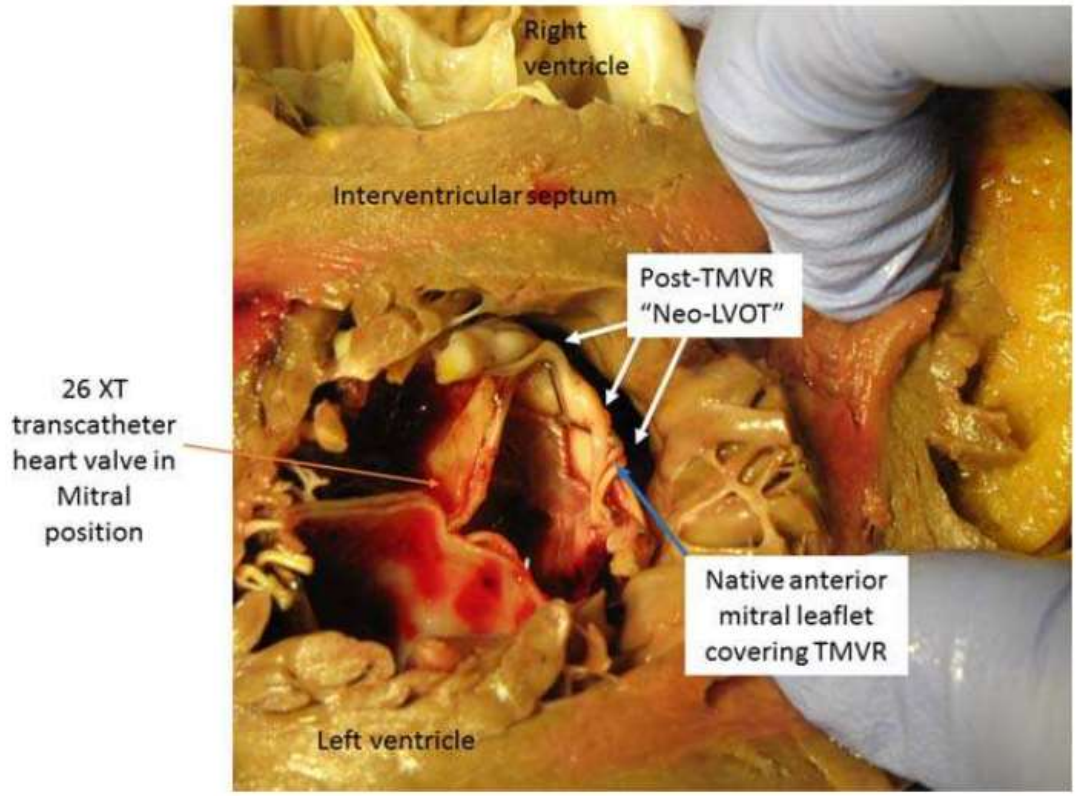


Source: Courtesy R Rajani- St Thomas

Ignore the neo-LVOT at your peril

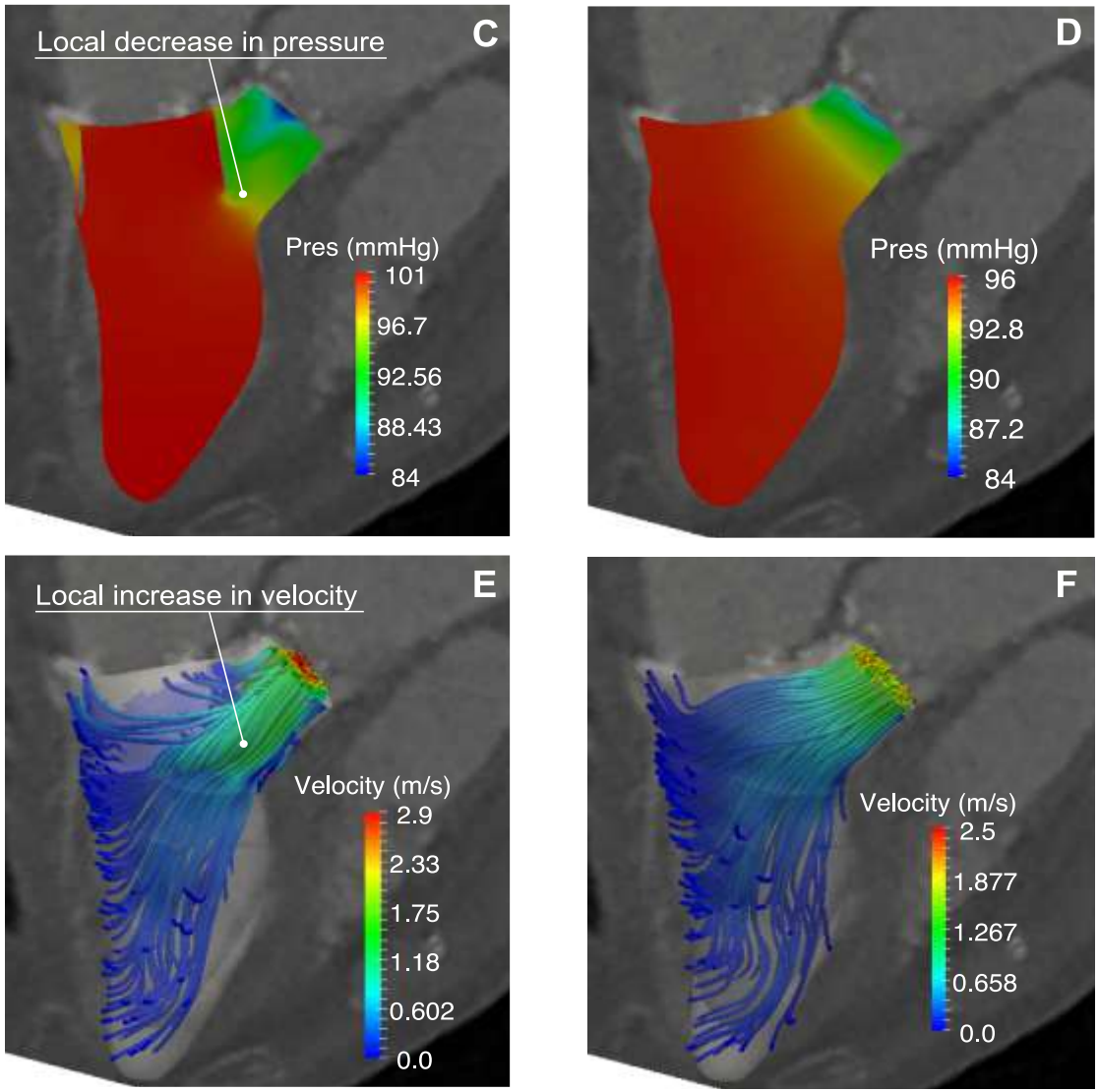
LVOTO





Wang DD et al., Catheterization and cardiovascular interventions 2017, ePub ahead of print

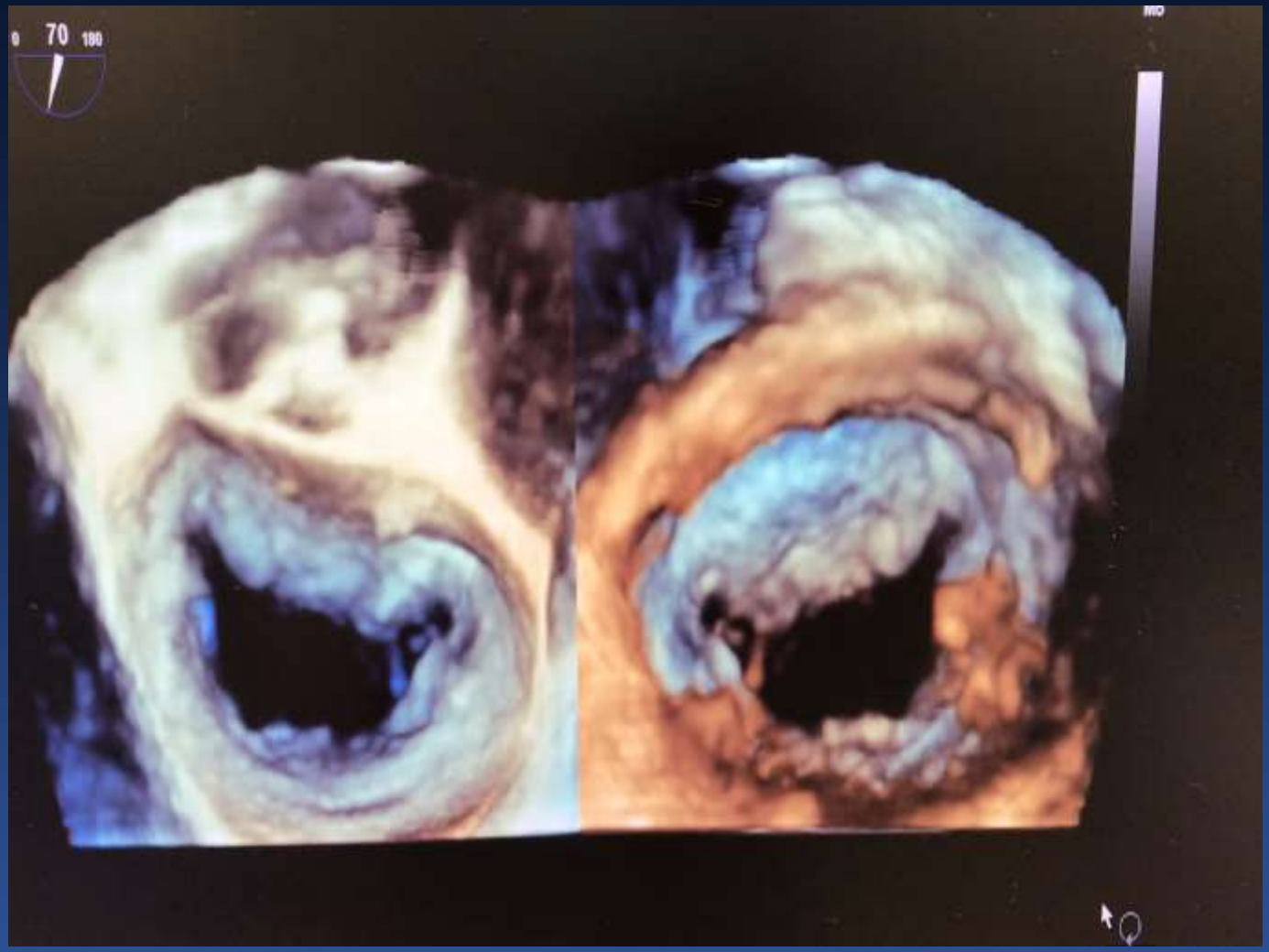
Personalized prediction of blood flow and gradients



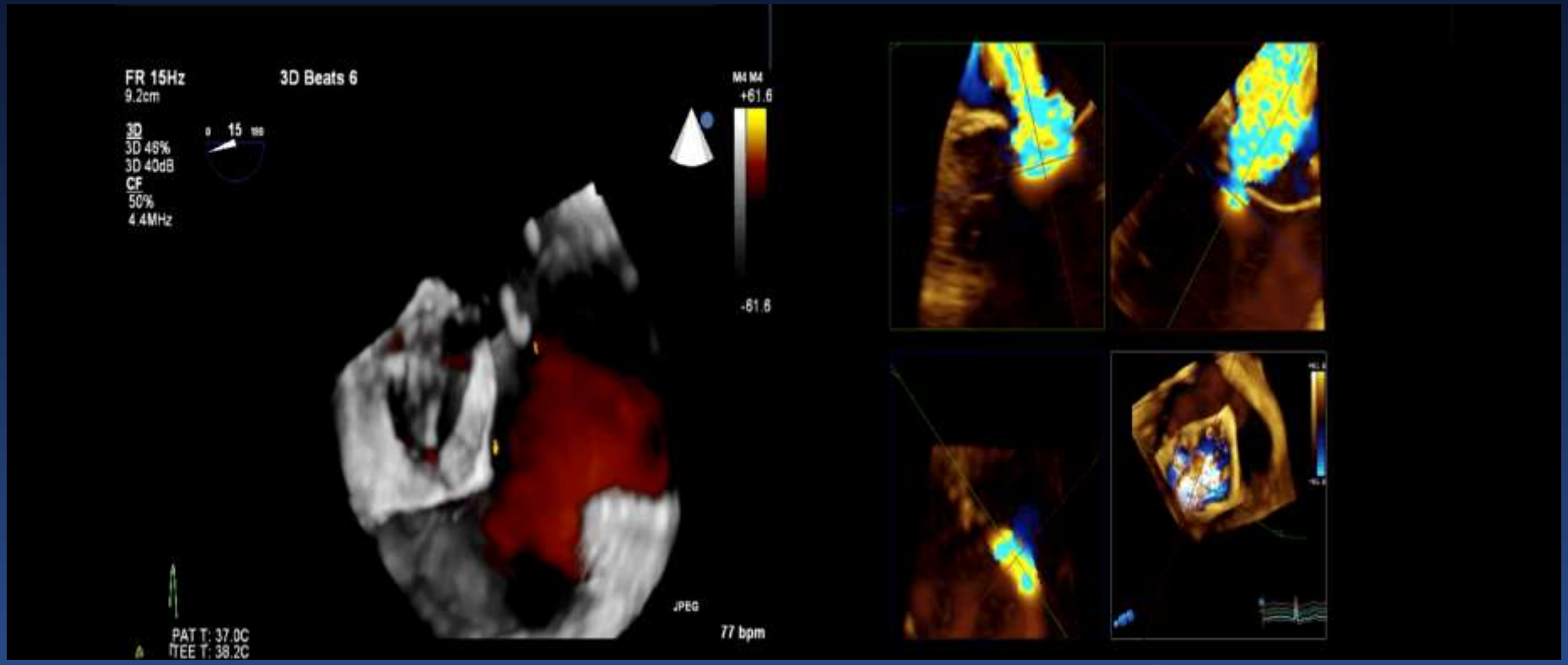
Centre for Heart Valve Innovation
St. Paul's Hospital, Vancouver

Courtesy: Dr Rajani; Guys and St Thomas

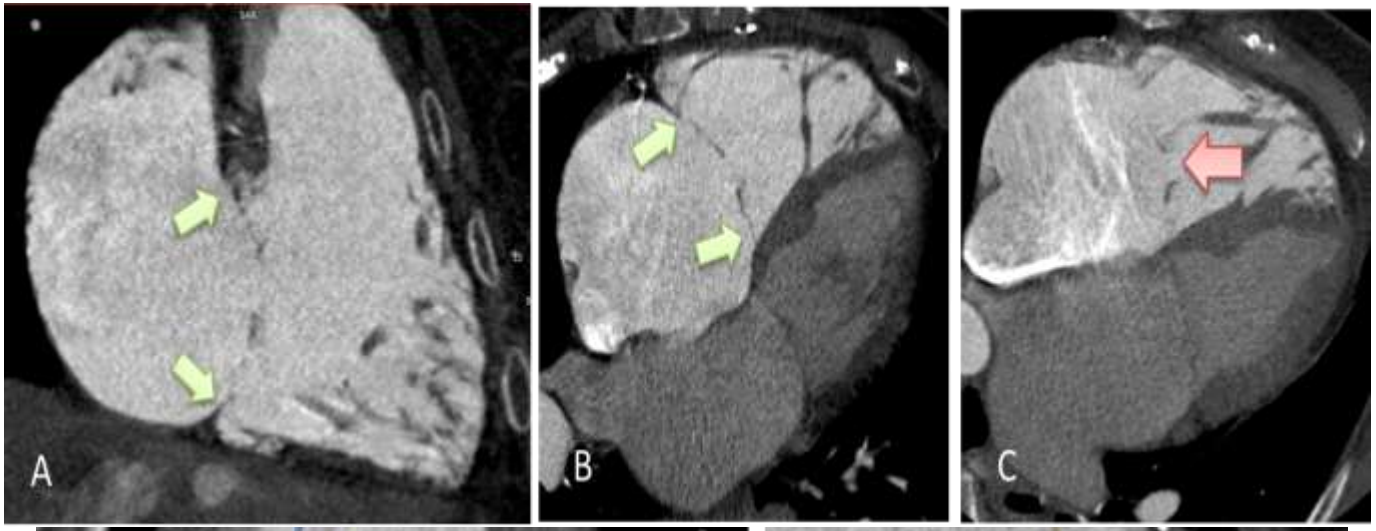
Comprehensive Imaging with 3D TEE for Mitral Procedures

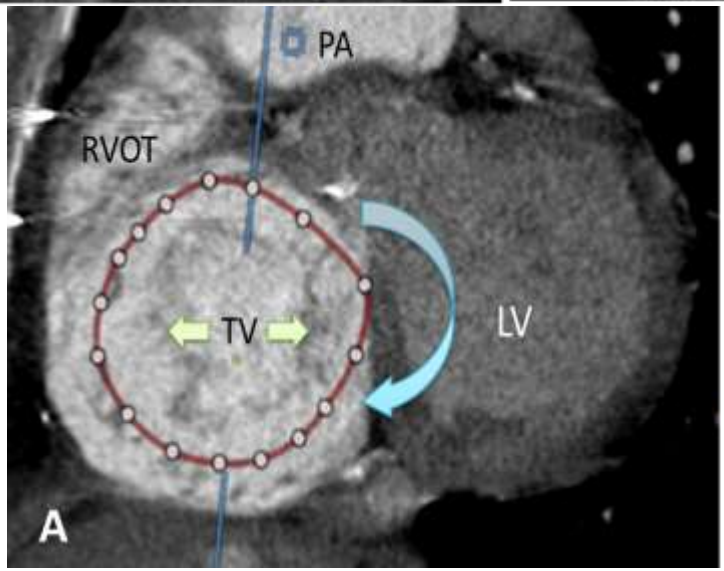


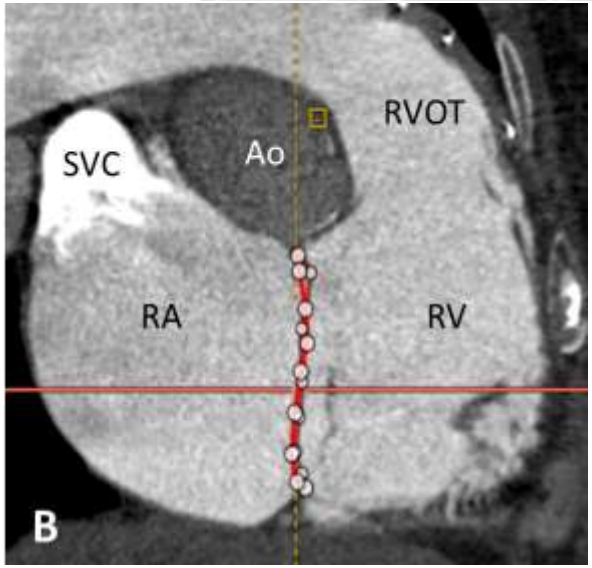
Vena contracta width (VCW) versus area(VCA)



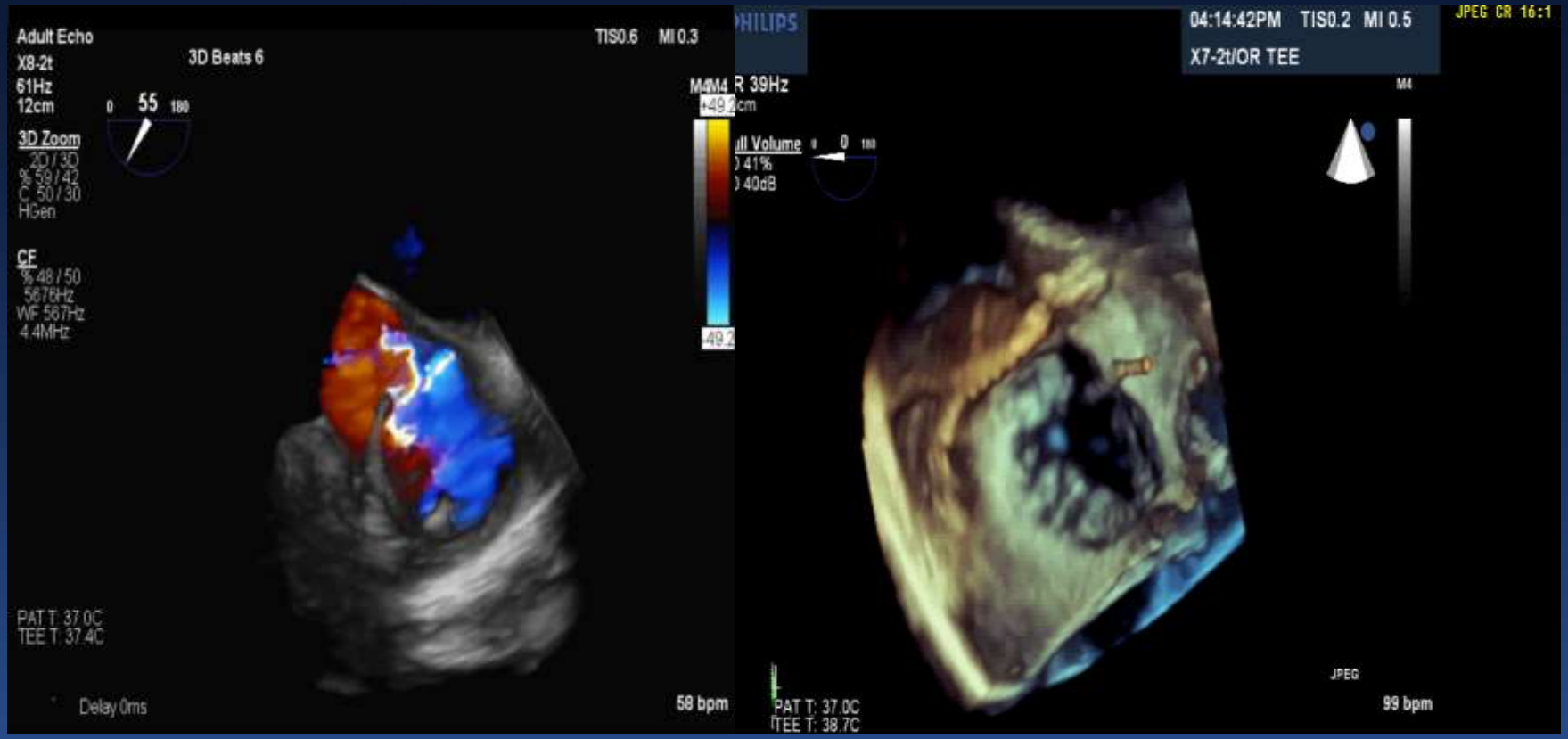
Varied contrast timing allows for Tricuspid Valve/Annular Evaluation



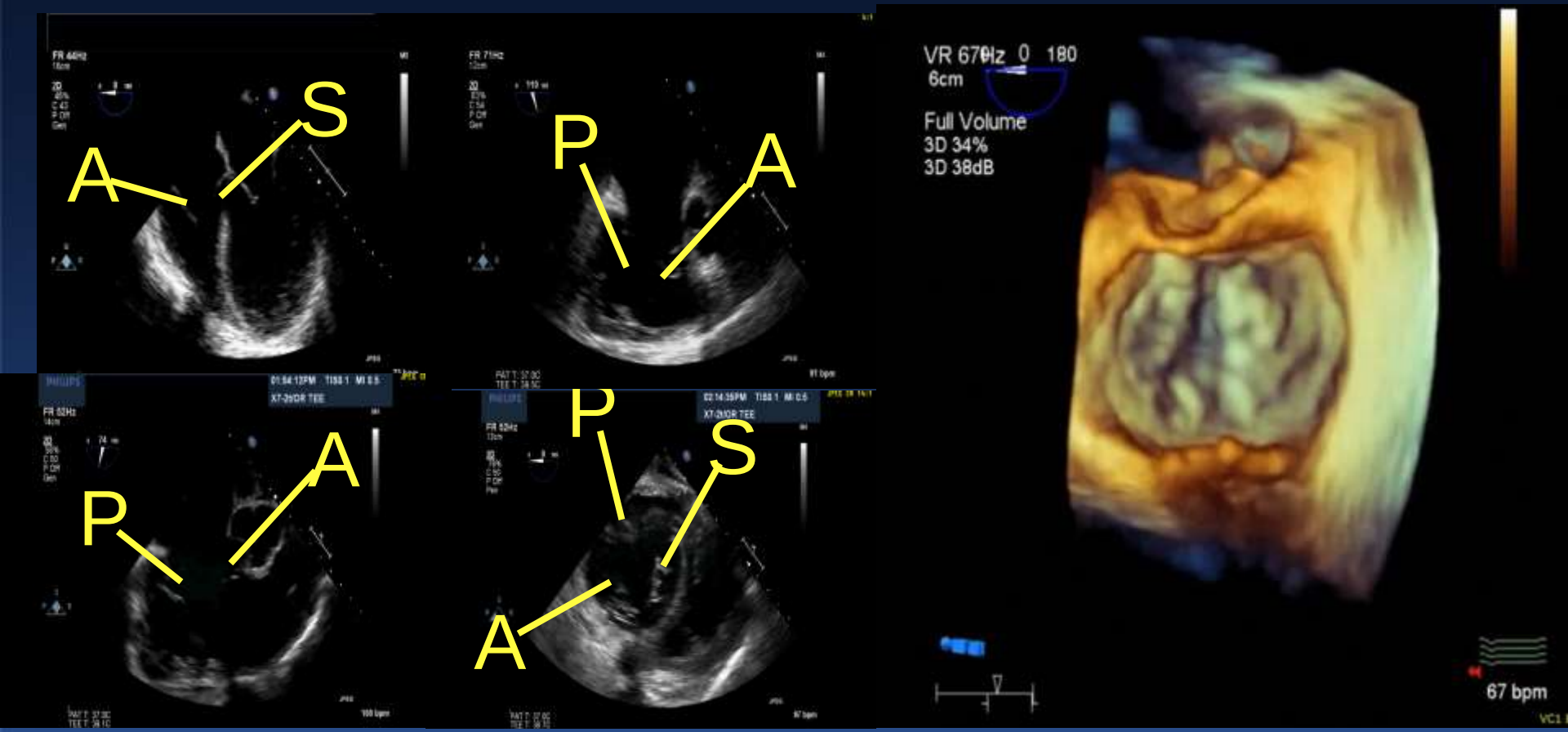




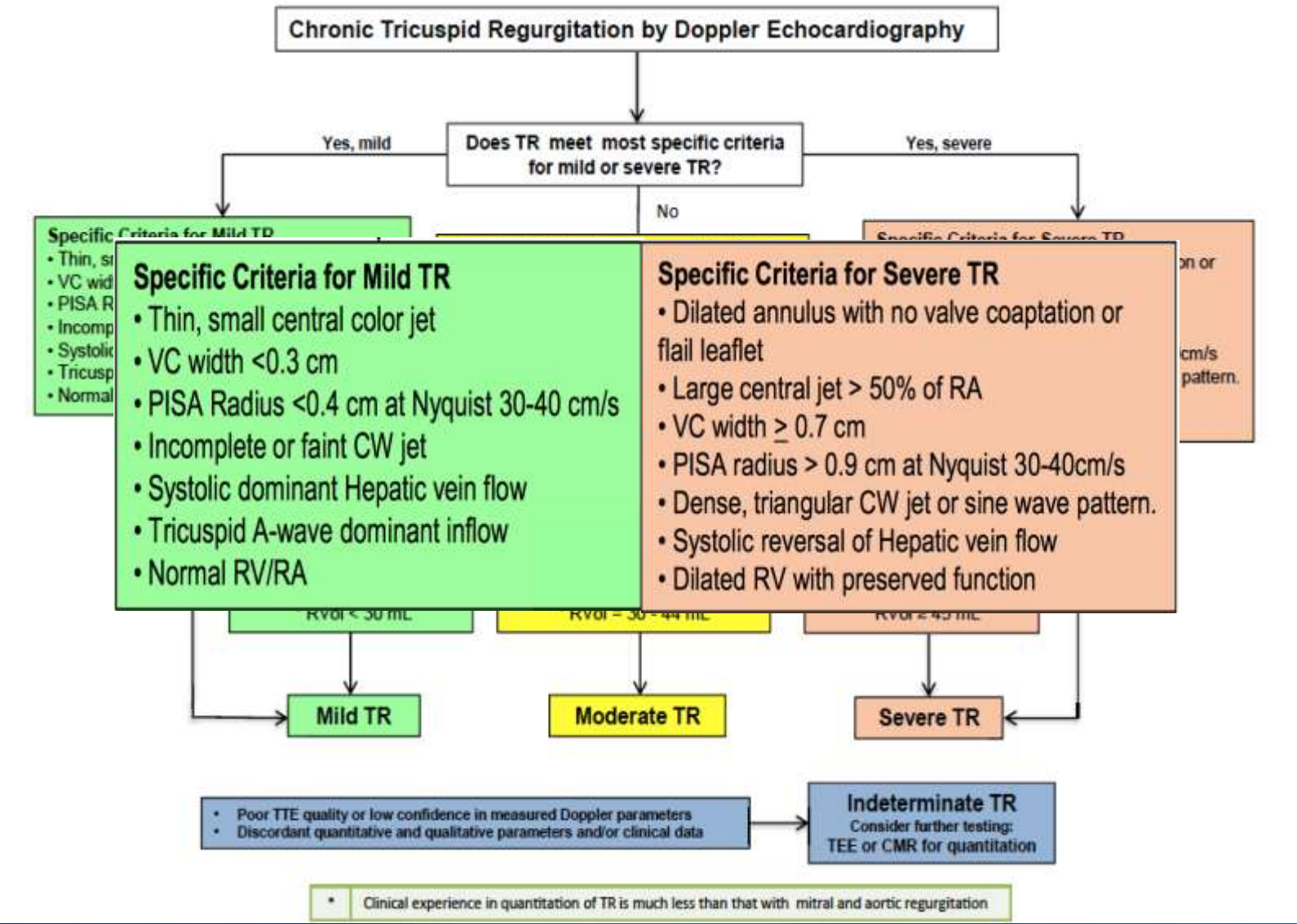
Comprehensive Imaging Assessment of Tricuspid Regurgitation



Comprehensive Imaging Assessment of the Tricuspid Valve



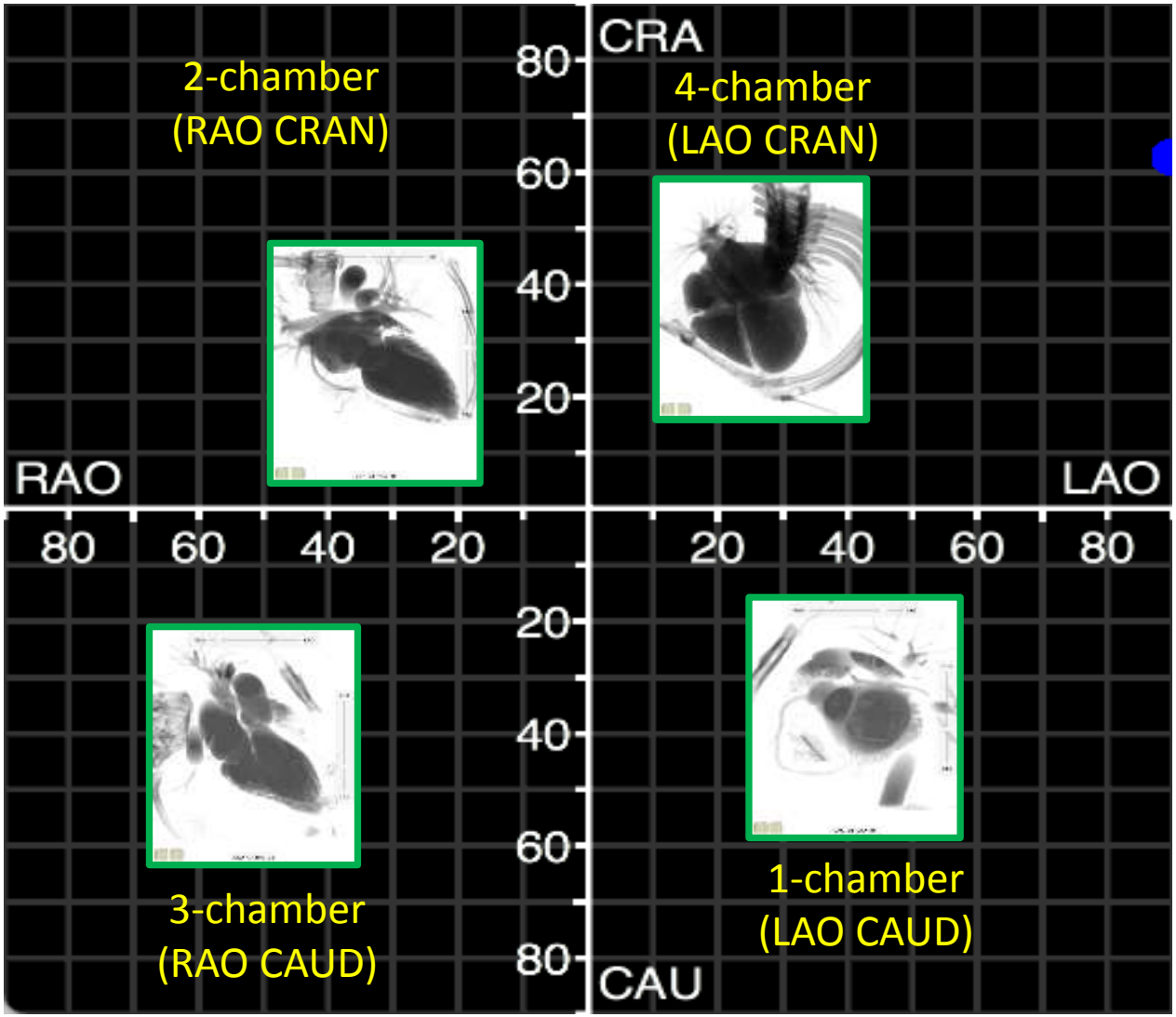
Grading TR is not trivial…



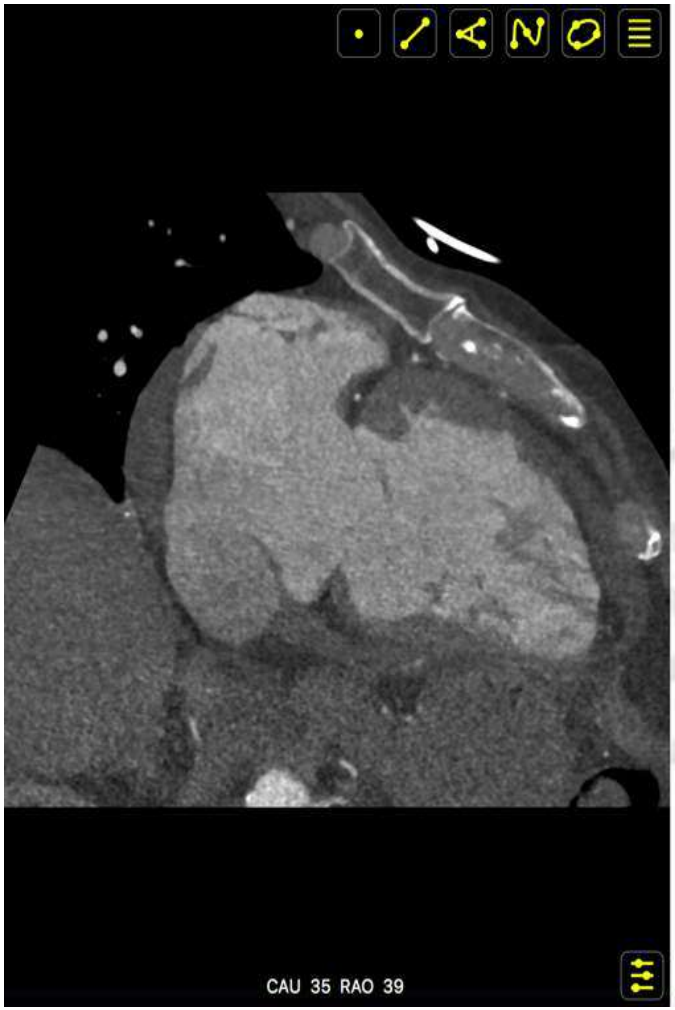
J Am Soc Echocardiogr. 2017 Apr;30(4):303-371

Chamber views of the left heart: from MSCT to fluoroscopy

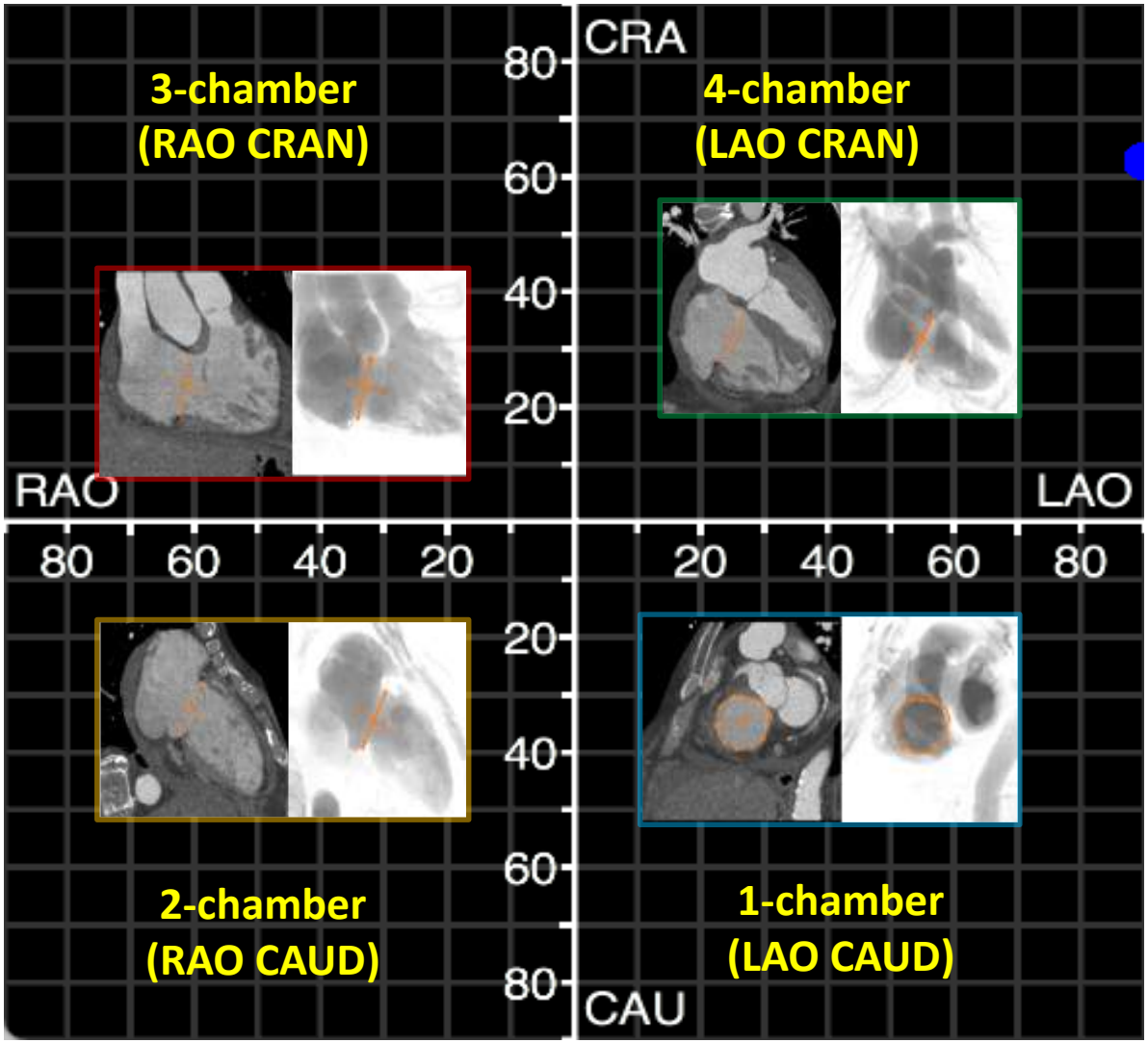
Left heart chamber views



Chamber views of the right heart: from MSCT to fluoroscopy



Right heart chamber views



Preparing for the Future

- Inoue anatomical consideration
- Chamber views on fluoroscopy
- TEE manipulation of catheters (e.g. mitral clips)
- VinV Mitral and Tricuspid procedures
- TEE measurements and quantification
- CTA measurements and quantification
- 3D printing protocol


S
R
L
S
L
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R+L
T