NORTH FLORIDA CARDIOVASCULAR EDUCATION FOUNDATION

Role of Echo for Mitral & Tricuspid Valves in 2024

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Disclosures

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None

Structural Interventions

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ASD Closure

PVL Repair

LAA Occluder

TAVR

TEER

TMVR

Tricuspid Repair

LV “enhancement”

An Essential Subspecialty

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JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 73, NO. 20, 2019

EXPERT CONSENSUS SYSTEMS OF CARE DOCUMENT

2019 AATS/ACC/ASE/SCAI/STS Expert Consensus Systems of Care Document: A Proposal to Optimize Care for Patients With Valvular Heart Disease

A Joint Report of the American Association for Thoracic Surgery, American College of Cardiology, American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

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*American College of Cardiology representative. †Society of Thoracic Surgeons representative. ‡Society for Cardiovascular Angiography and Interventions representative. §American Society of Echocardiography representative. ||American Association for Thoracic Surgery representative.

Imaging Personnel	
Echocardiographer with expertise in valve disease and transcatheter and surgical interventions	Echocardiographer with expertise in valve disease and transcatheter and surgical interventions
Expertise in CT with application to valve assessment and procedural planning	Expertise in CT with application to valve assessment and procedural planning
Interventional echocardiographer to provide imaging guidance for transcatheter and intraoperative procedures (52)	
Expertise in cardiac MRI with application to assessment of VHD	
Criteria for Imaging Personnel	
A formalized role/position for a "valve echocardiographer" who performs both the pre- and postprocedural assessment of valve disease	A formalized role/position for a "valve echocardiographer" who performs both the pre- and postprocedural assessment of valve disease
A formalized role/position for the expert in CT who oversees the preprocedural assessment of patients with valve disease	A formalized role/position for the expert in CT who oversees the preprocedural assessment of patients with valve disease
A formalized role/position for an interventional echocardiographer	

As treatment options rapidly expand for VHD, a new specialty of interventional echocardiography is emerging (52). Interventional echocardiographers blend a sophisticated knowledge of echocardiography with clinical expertise and can help guide management decisions at the point of intervention. They have become integral to the high performance of any MDT, especially at Comprehensive (Level I) Centers. The interventional echocardiographer is a critical participant in select valve cases (e.g., transcatheter mitral valve repair and repair of paravalvular leaks). Effectiveness in this role requires an individual who has regular involvement in these procedures and thus is familiar with the devices and procedural steps, is competent to provide interventionalists with imaging guidance for transcatheter procedures, understands how echocardiography can help avoid or identify procedural complications, recognizes the unique echocardiographic characteristics of transcatheter devices and delivery systems, is proficient with 3D imaging, and understands the treatment goals of transcatheter valve procedures.

Nishimura RA, O'Gara PT, Bavaria JE, et al. J Am Coll Cardiol. 2019 May 28;73(20):2609-2635.

Interventional Echo

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1. Selection

- ✓ Patient
- ✓ Device type/size

2. Guidance

- ✓ Standard
- ✓ Unique steps

3. Evaluation

- ✓ Device performance
- ✓ Cardiac performance

4. Outcome

- ✓ Critique 1-3
- ✓ Get better (self/team)

Transcatheter Edge-to-Edge Repair (TEER)
(aka MitraClip®)

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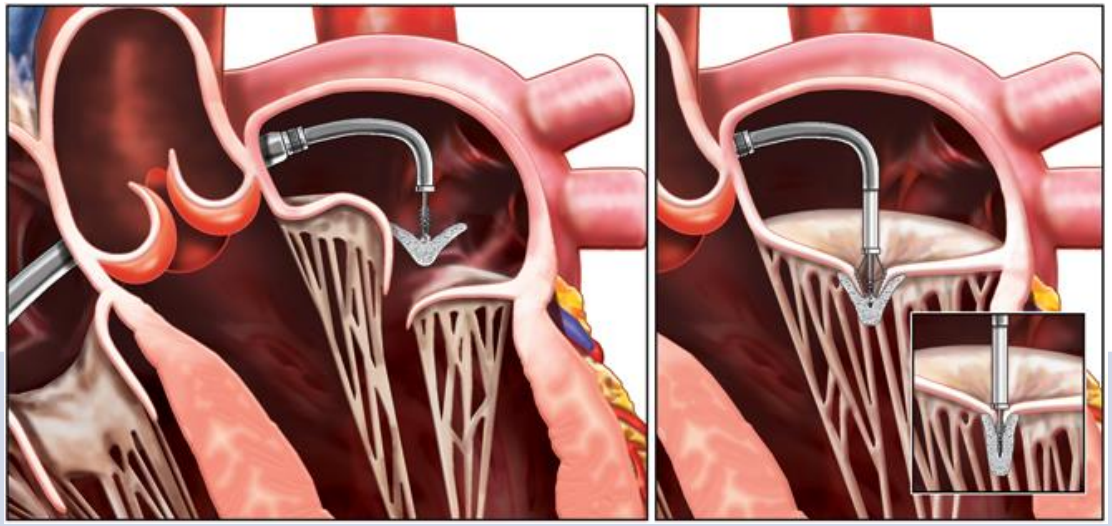

2003
First Case

2008
CE Mark

2011
EVEREST II trial

2013
EVEREST II HRR
FDA approval for 1^{ary} MR
(prohibitive surgical risk STS ≥ 6%)

2018
Updated version (NTR & XTR)
COAPT trial

2019
FDA approval for secondary MR

J Am Coll Cardiol. 2014 May 27;63(20):2057-2068.

Mitral Valve: Complex Anatomy

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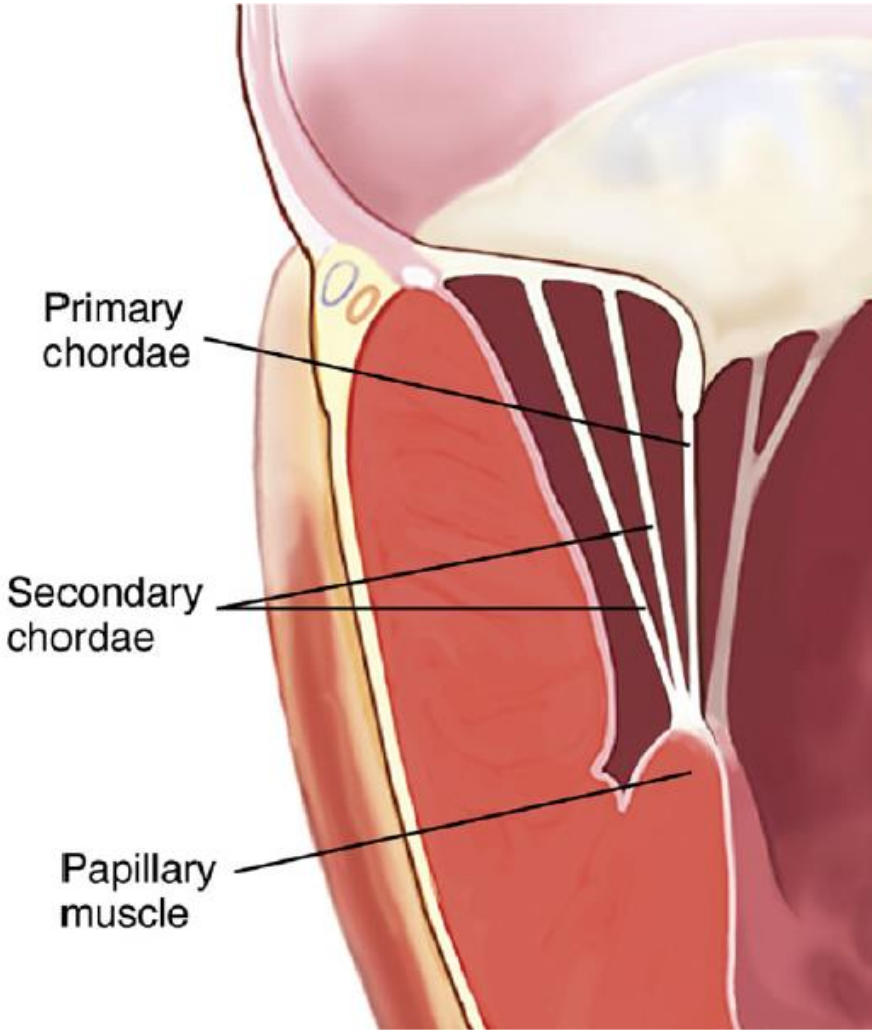

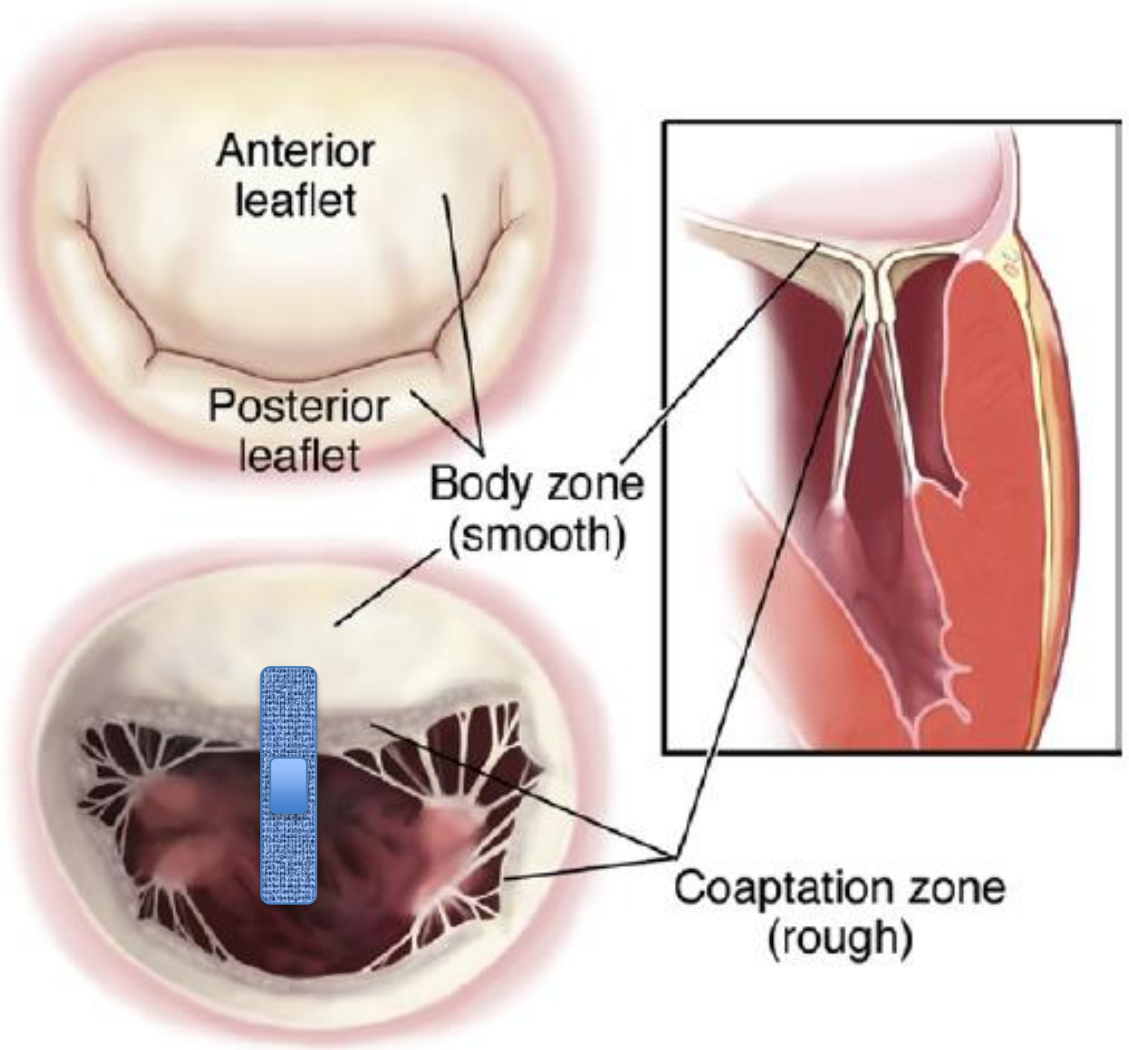

J Cardiothorac Vasc Anesth. 2009 Aug;23(4):531-43.

Courtesy of Enrique Garcia-Sayan, MD, FACC, FASE

Everest Trial Anatomic Eligibility

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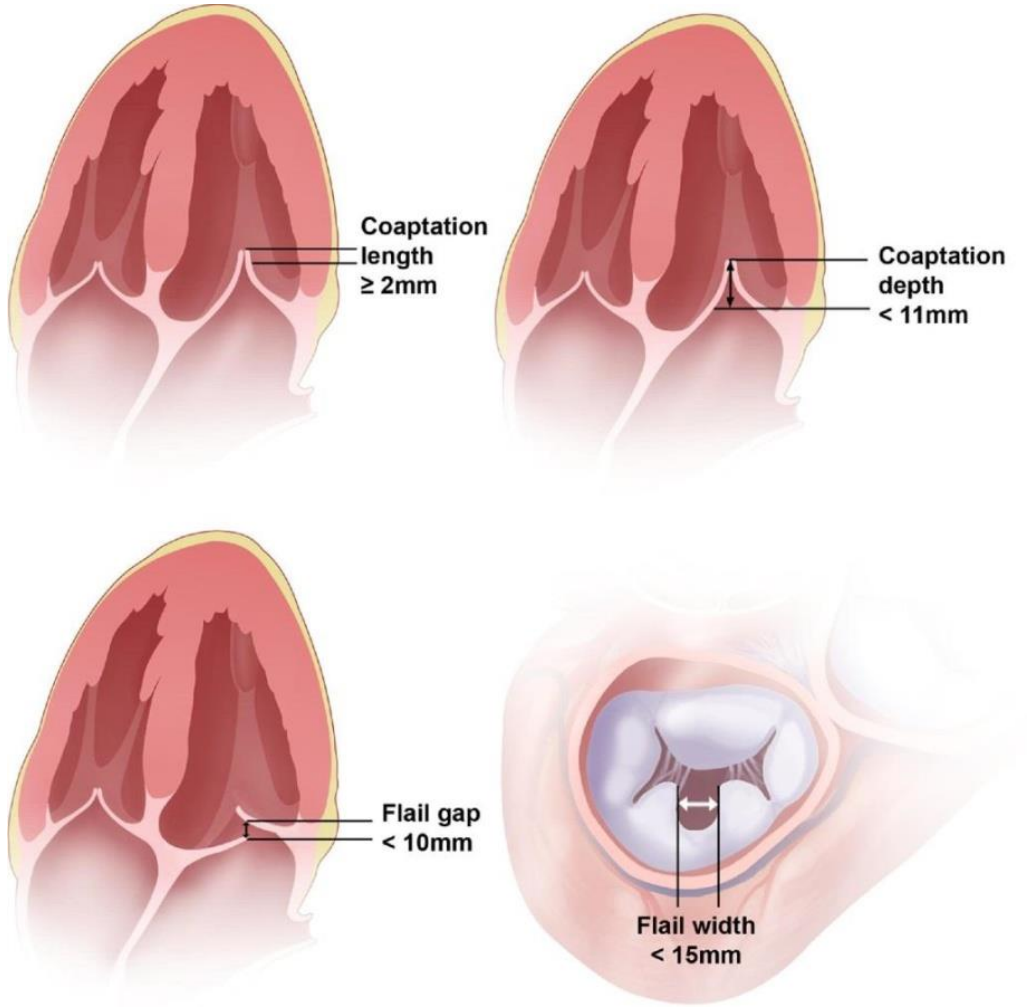
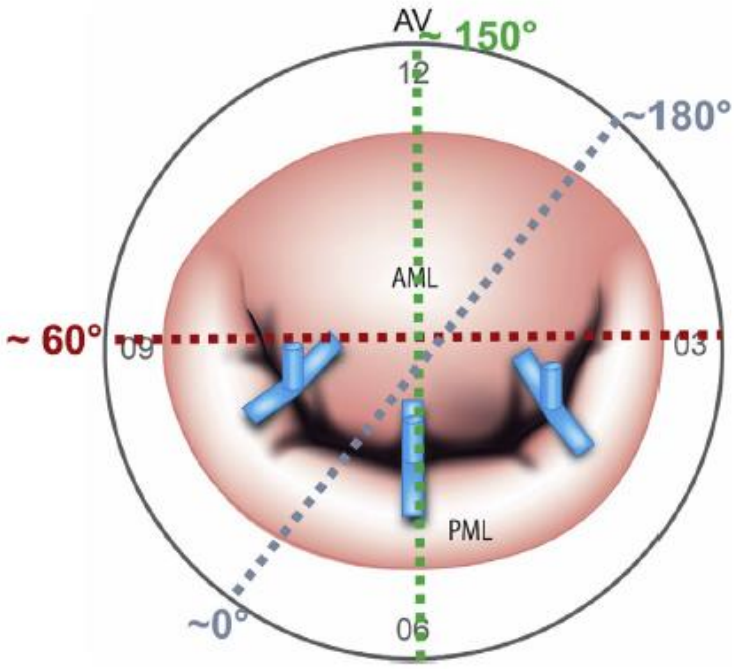
- Origin of MR is from the central 2/3 of the valve
- Sufficient leaflet tissue for mechanical coaptation
- Protocol anatomic exclusions
  - Flail gap >10mm
  - Flail width >15mm
  - Coaptation depth >11mm
  - Coaptation length < 2mm
  - LVIDs > 55mm
  - MV Area < 4.0 cm2



Feldman T and Cilingiroglu M. JACC 2011; 57:529-537



State of the Art: Transcatheter Edge-to-Edge Repair for Complex Mitral Regurgitation

Nir Flint, MD, Matthew J. Price, MD, Stephen H. Little, MD, G. Burkhard Mackensen, MD, PhD, Nina C. Wunderlich, MD, Moody Makar, MD, and Robert J. Siegel, MD, *Los Angeles and La Jolla, California; Tel Aviv, Israel; Houston, Texas; Seattle, Washington; Darmstadt, Germany*

Transcatheter edge-to-edge mitral valve repair has revolutionized the treatment of primary and secondary mitral regurgitation. The landmark EVEREST (Endovascular Valve Edge-to-Edge Repair Study) and COAPT (Clinical Outcomes Assessment of the MitraClip Percutaneous Therapy for High Surgical Risk Patients) trials included only clinically stable patients with favorable mitral valve anatomy for edge-to-edge repair. However, since its initial commercial approval in the United States, growing operator experience, device iterations, and improvements in intraprocedural imaging have led to an expansion in the use of transcatheter edge-to-edge repair to more complex mitral valve pathologies and clinical scenarios, many of which were previously considered contraindications for the procedure. Because patients with prohibitive surgical risk are often older and present with complex mitral valve disease, knowledge of the potential effectiveness, versatility, and technical approach to a broad range of anatomy is clinically relevant. In this review the authors examine the current experience with mitral valve transcatheter edge-to-edge repair in various pathologies and scenarios that go well beyond the EVEREST II trial inclusion criteria. (J Am Soc Echocardiogr 2021;■:■-■.)

Keywords: MitraClip, PASCAL, Mitral regurgitation, Mitral valve repair, EVEREST trial, Percutaneous mitral edge-to-edge repair

N. Flint, R. Siegel et al. JASE 2021

Transcatheter Edge-to-Edge (TEER) Devices

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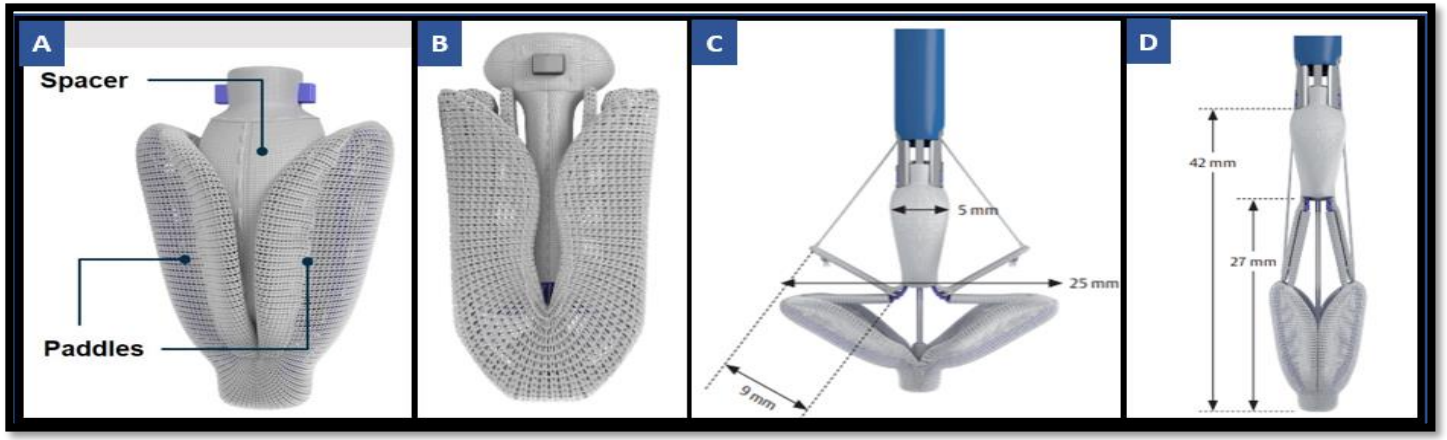
MitraClip System (Abbott)

Now have size choices:
Consider grasping length, width and mechanism

Pascal System (Edwards)



N. Flint, R. Siegel et al. JASE 2021

P2 prolapse, plus…

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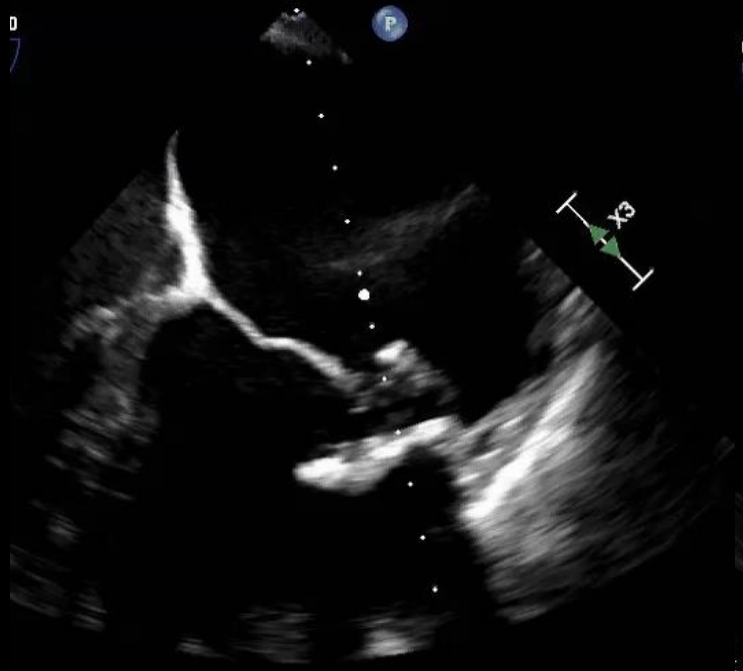

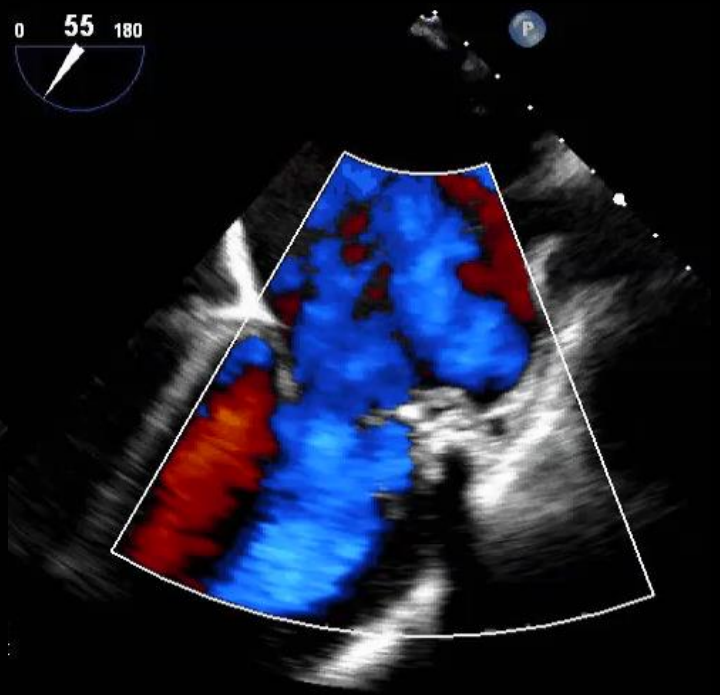

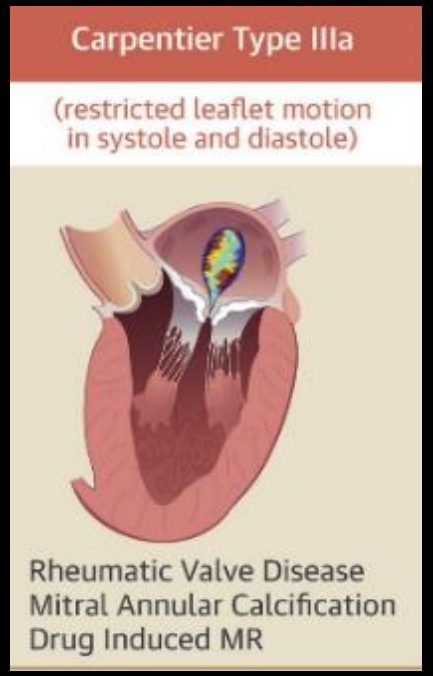

71 yr male; retired physician; Dyspnea

Clip deployment…

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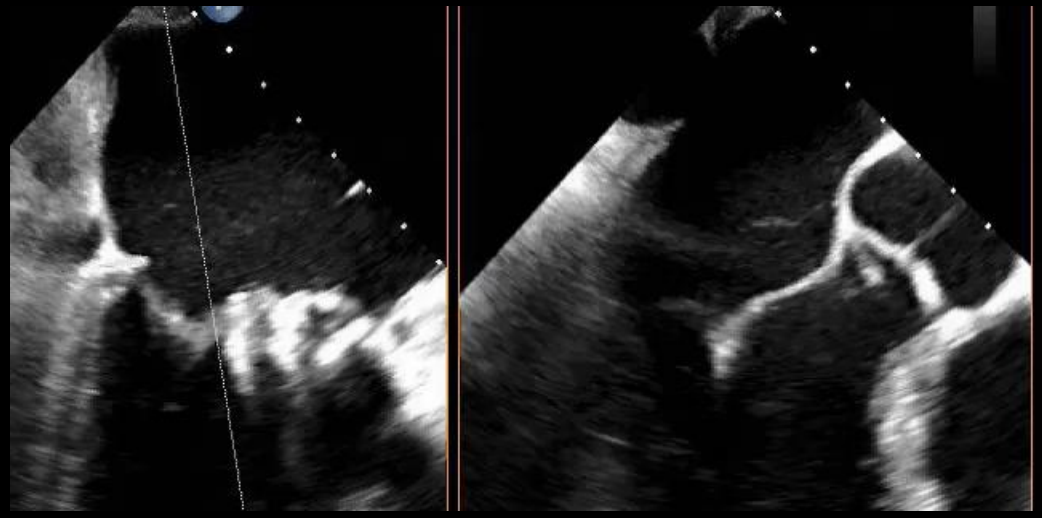

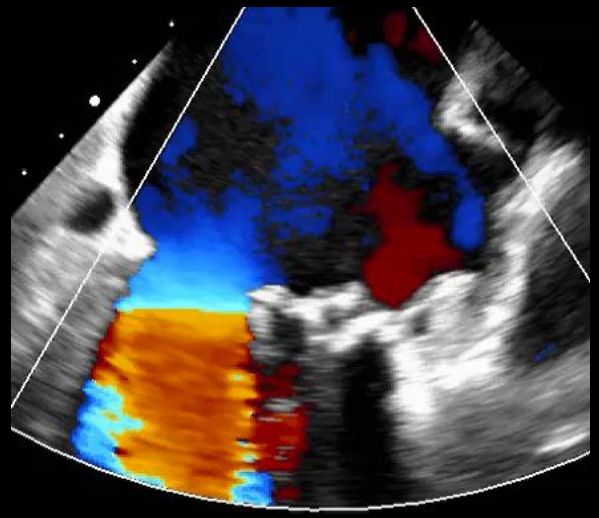

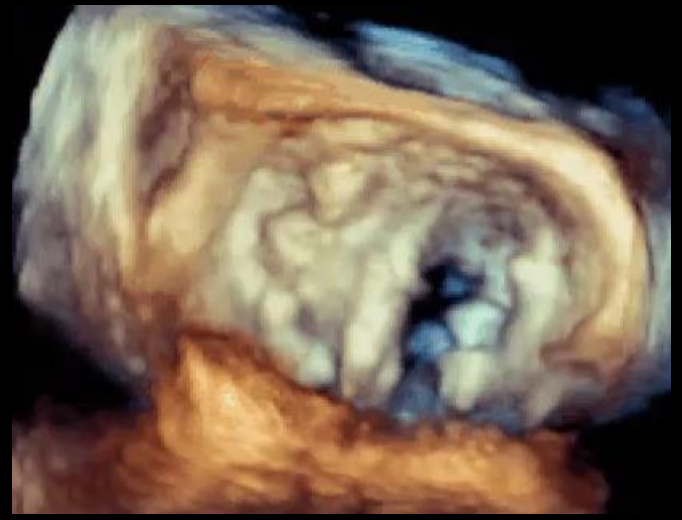

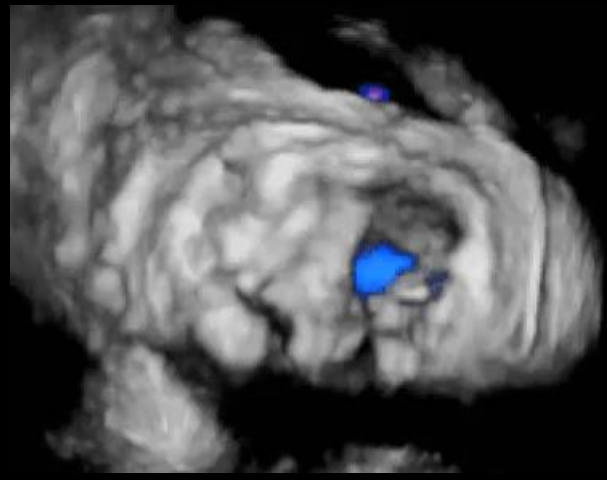

Final Result (Clip x 2)

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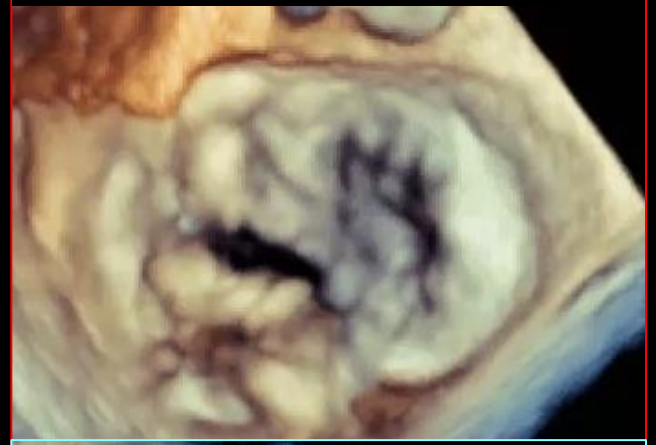
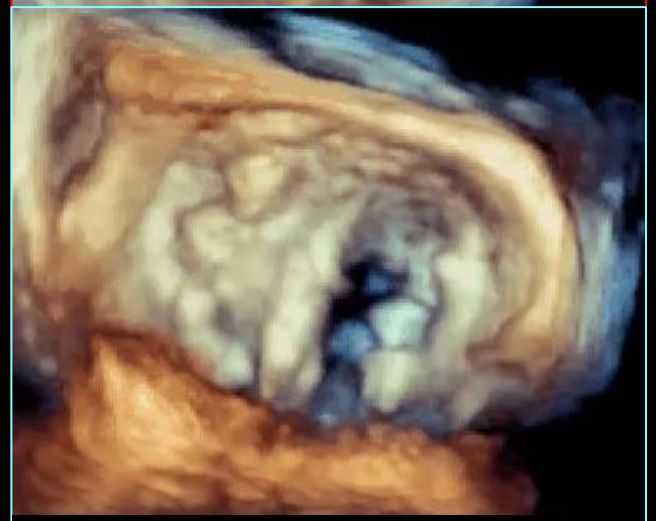
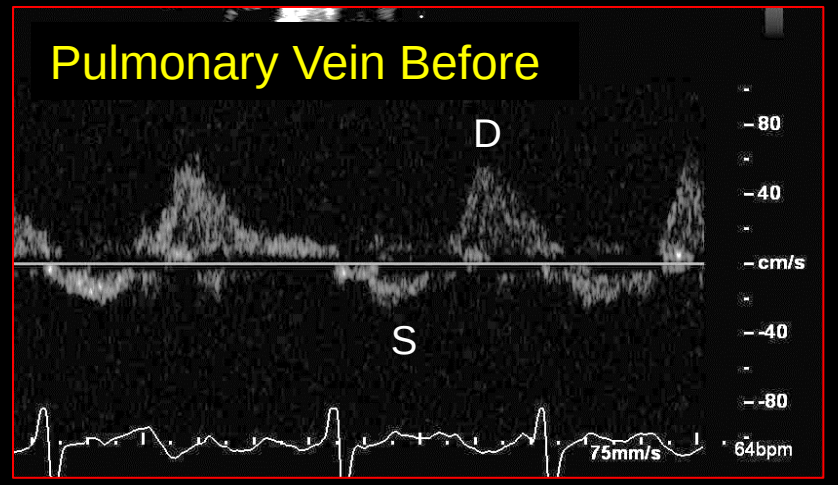
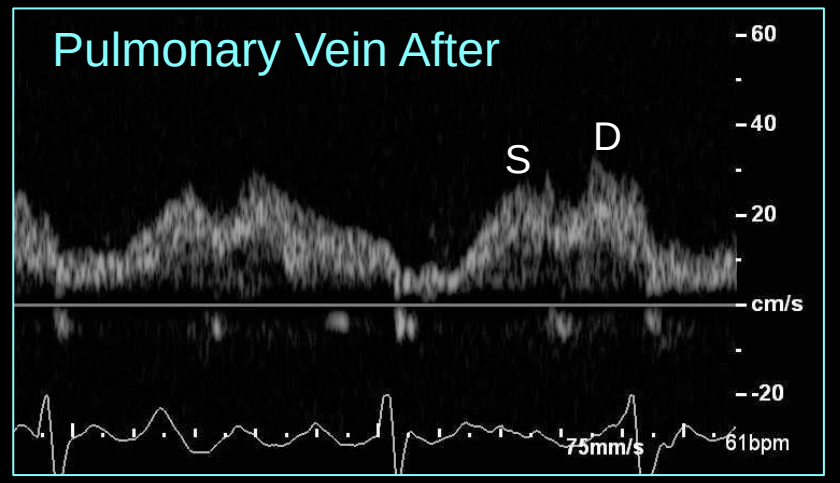
Baseline





After MitraClip





Patient selection for TEER

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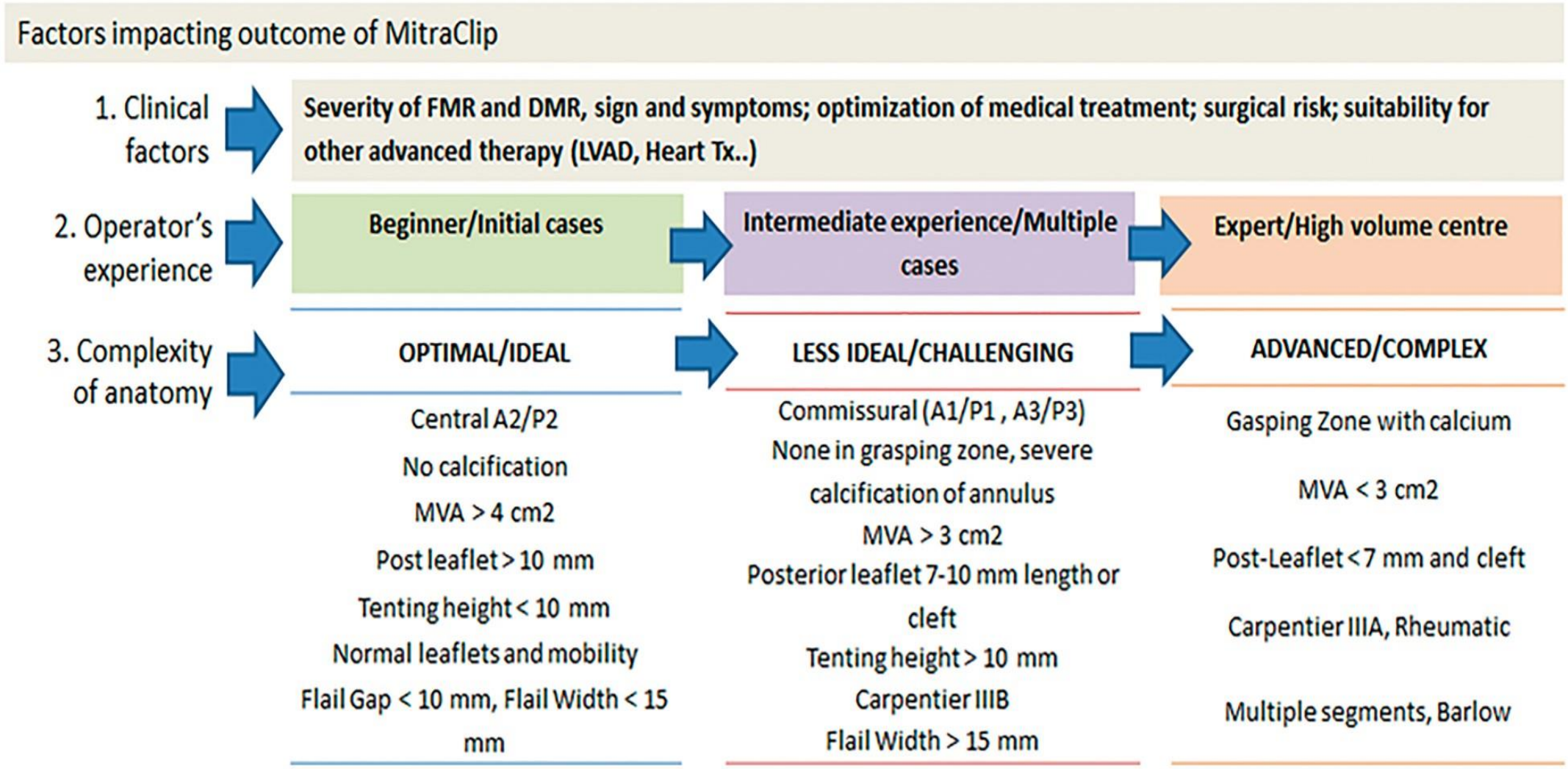

Eur Heart J Cardiovasc Imaging, Volume 21, Issue 10, October 2020, Pages 1059–1067, https://doi.org/10.1093/ehjci/jeaa062

Recent surgical mitral repair; POD 3

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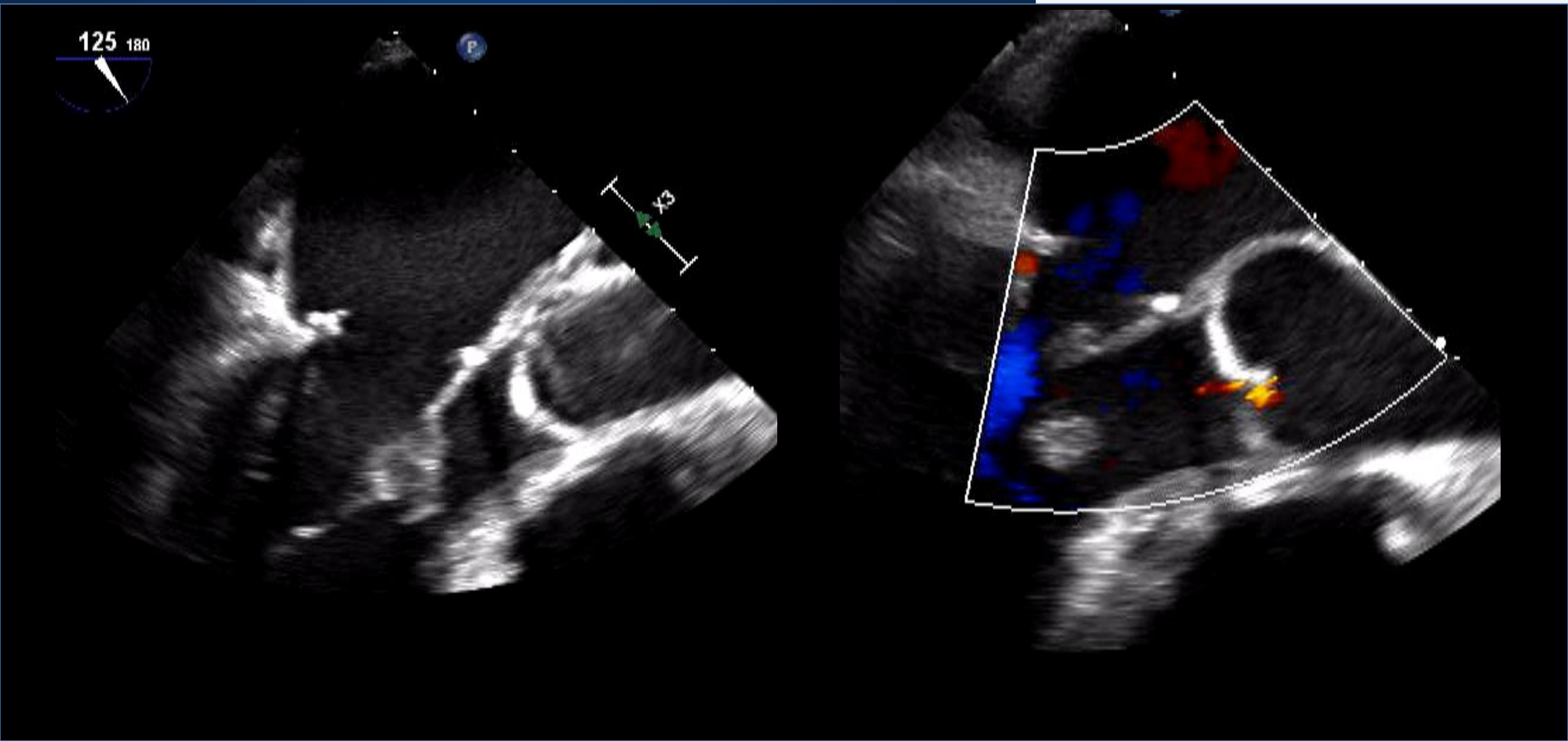

LVOT Obstruction

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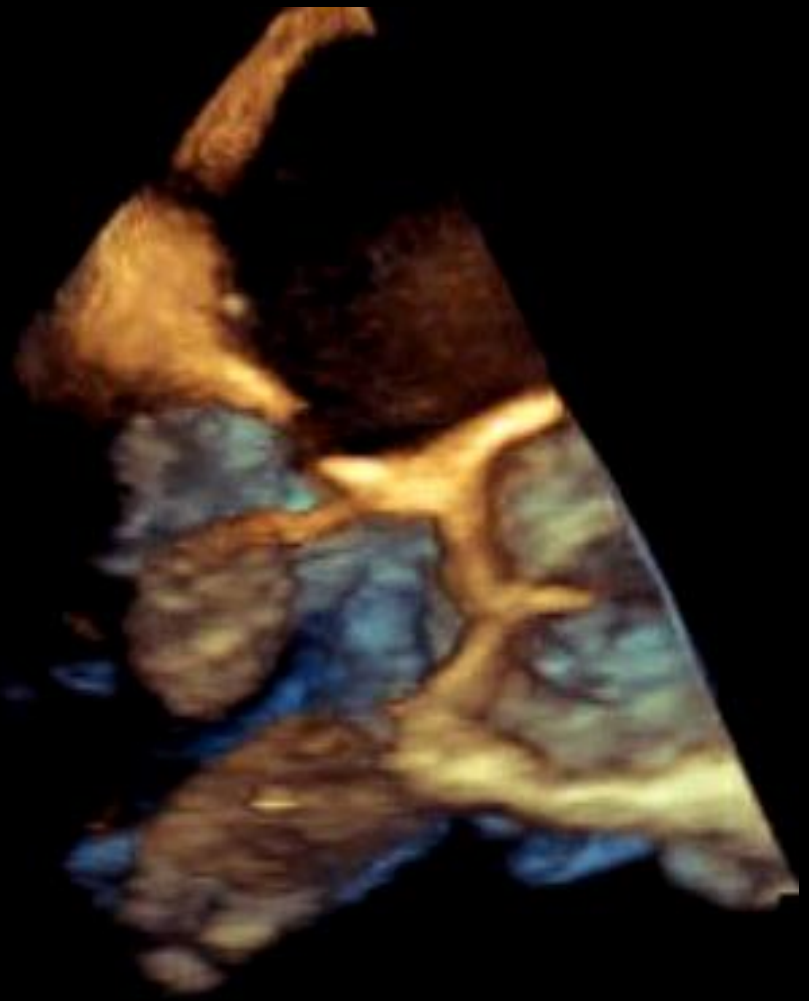

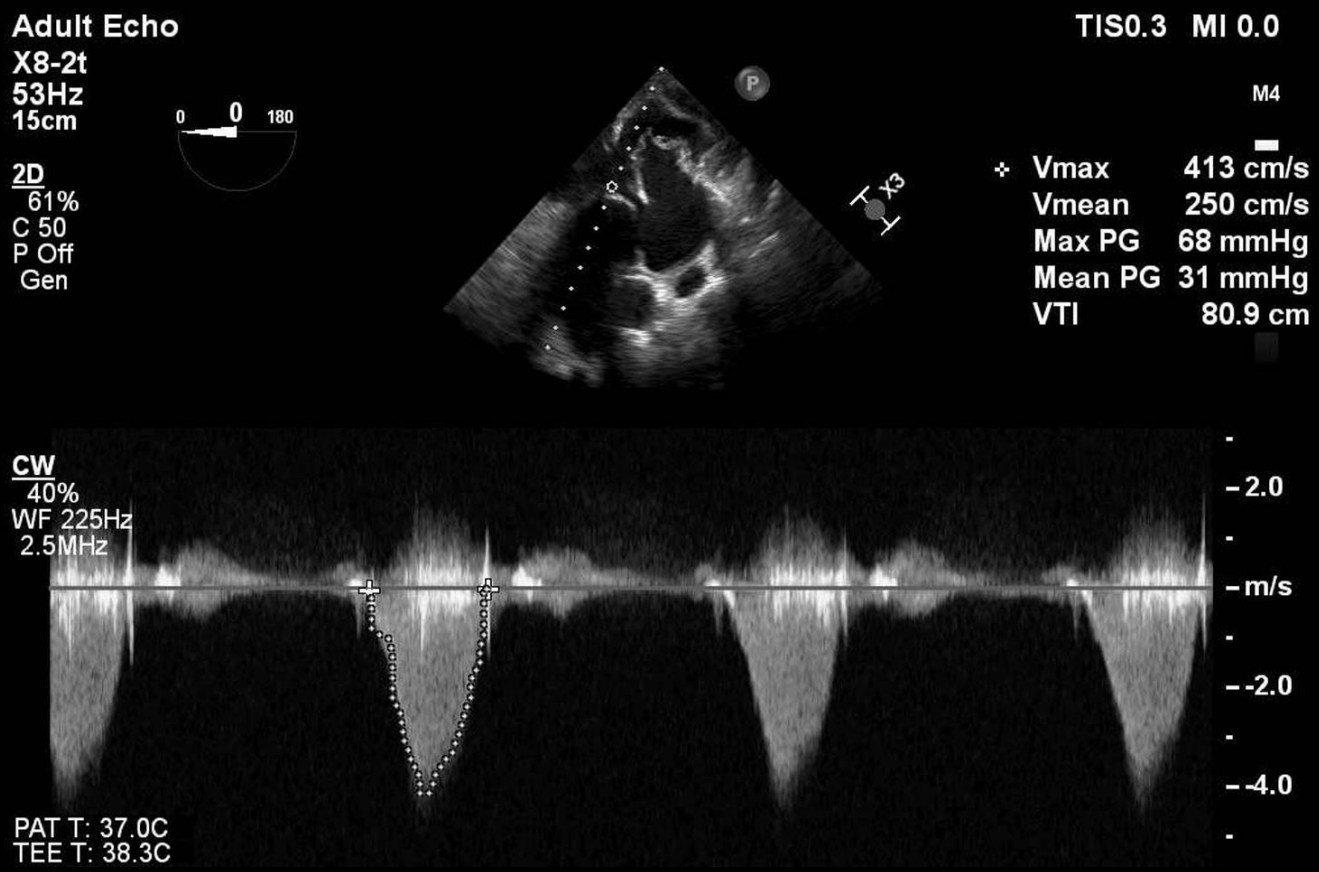

Trans-gastric view:
gradient across the LVOT

Minimal Residual MR

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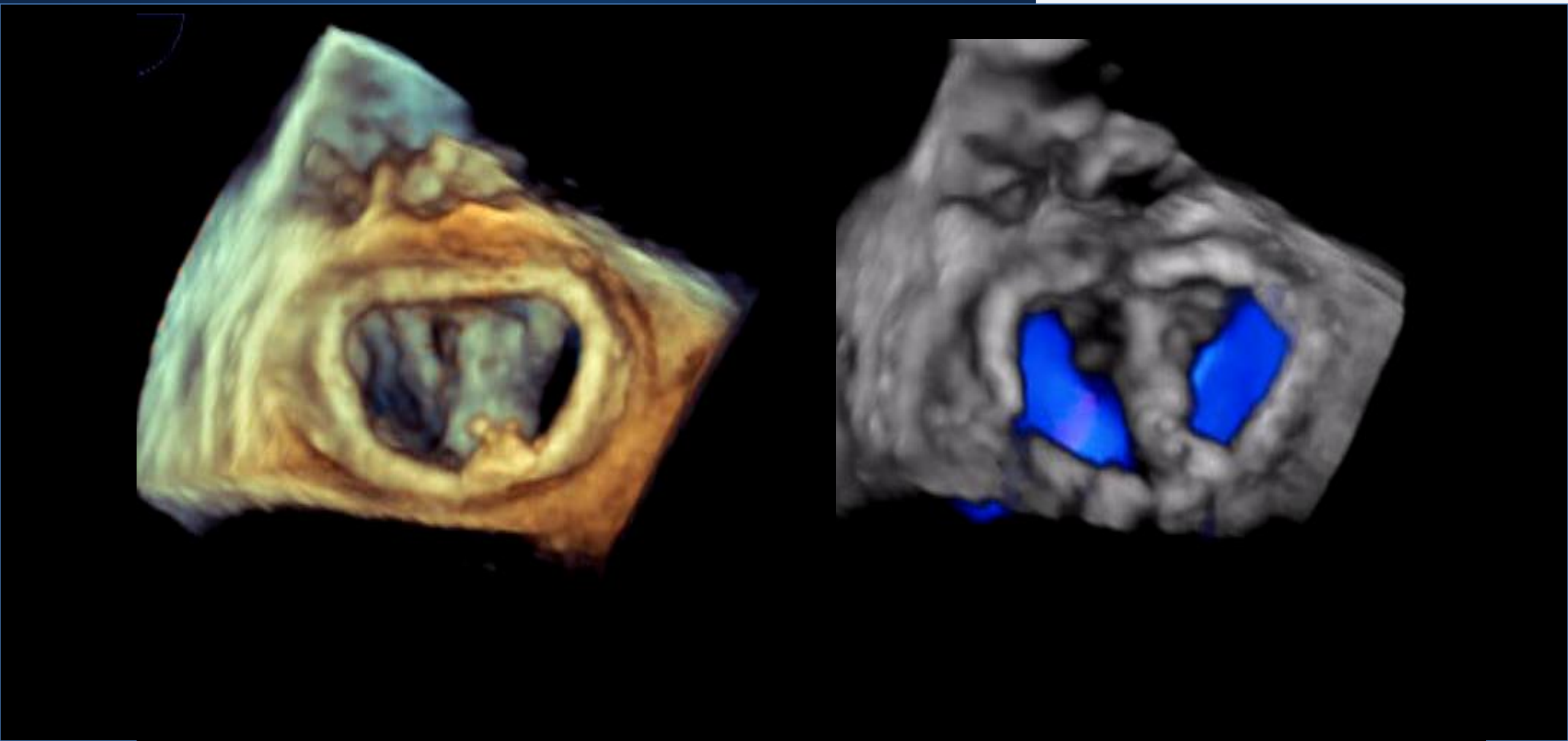

Resolution of SAM & LVOT Obstruction

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Baseline

After MitraClip

MV TEER following failed surgical repair

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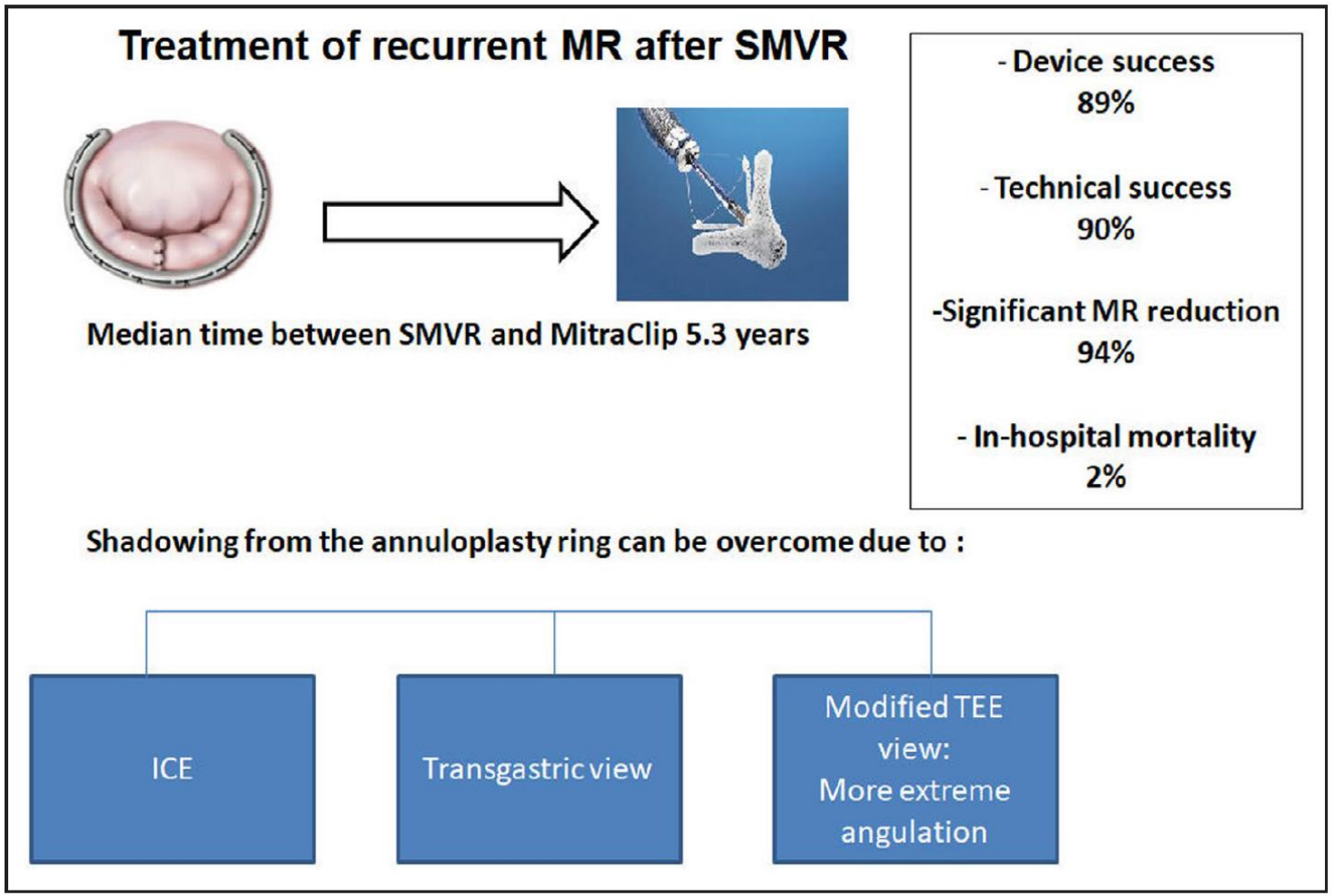
ORIGINAL RESEARCH

MitraClip After Failed Surgical Mitral Valve Repair—An International Multicenter Study

Zouhair Rahhab, MD; David Scott Lim, MD; Stephen H. Little, MD; Maurizio Taramasso, MD; Shingo Kuwata, MD; Matteo Saccocci, MD; Corrado Tamburino, MD; Carmelo Grasso, MD; Christian Frerker, MD; Theresa Wißt, MD; Ross Garberich, MD; Jörg Hausleiter, MD; Daniel Braun, MD; Eleonora Avenatti, MD; Victoria Delgado, MD; Gian Paolo Ussia, MD; Fausto Castriota, MD; Roberto Nerla, MD; Hüseyin Ince, MD; Alper Öner, MD; Rodrigo Estevez-Loureiro, MD; Azeem Latib, MD; Damiano Regazzoli, MD; Nicolo Piazza, MD; Hind Alosaimi, MD; Peter P. T. de Jaegere, MD; Jeroen Bax, MD; Danny Dvir, MD; Francesco Maisano, MD; Paul Sorajja, MD; Michael J. Reardon, MD; Nicolas M. Van Mieghem, MD, PhD

- International multicenter observational retrospective study
- 104 consecutive patients
- Median 5.3 yrs after surgical MV repair



J Am Heart Assoc. 2021;10:e019236. DOI: 10.1161/JAHA.120.019236

COAPT

Stone GW, Lindenfeld J, Abraham WT, Kar S, Lim DS, Mishell JM, Whisenant B, Grayburn PA, Rinaldi M, Kapadia SR, Rajagopal V, Sarembock IJ, Brieke A, Marx SO, Cohen DJ, Weissman NJ, Mack MJ; COAPT Investigators. Transcatheter Mitral-Valve Repair in Patients with Heart Failure.,
N Engl J Med. 2018 Dec 13;379(24): 2307-2318

Spectrum of LV Dysfunction: Is it the Valve or the Ventricle?

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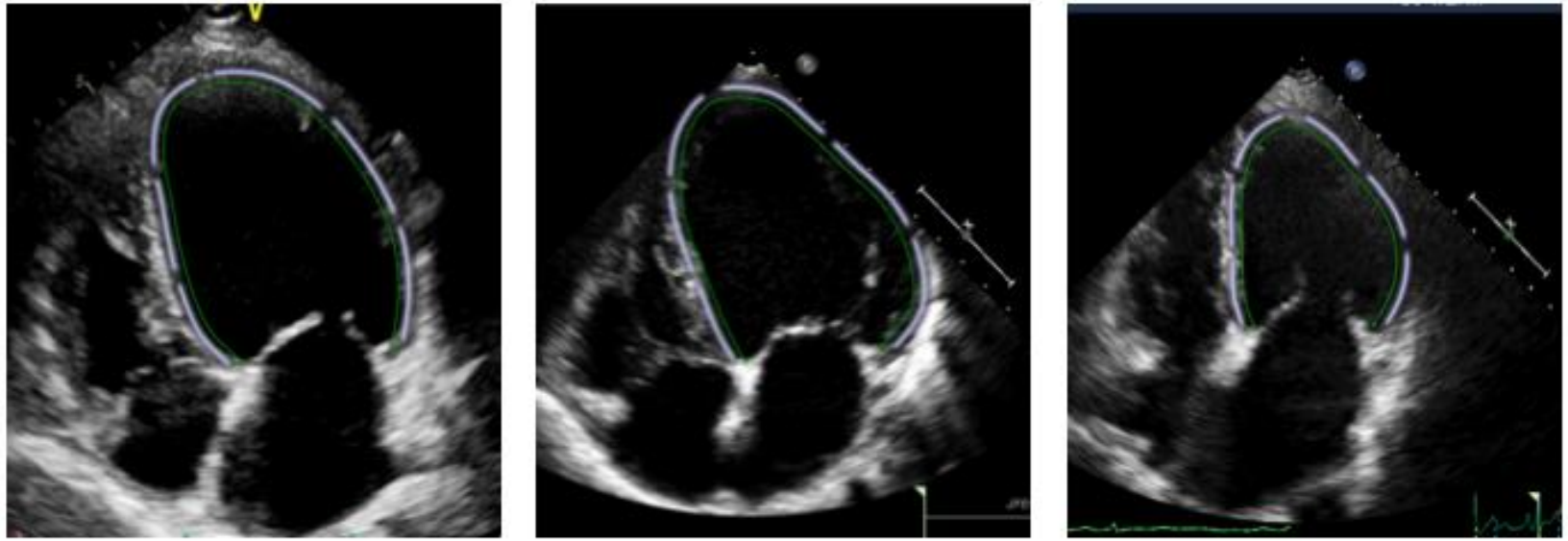

LVEF 22%
LVEDV 310 mL
GLS -6.8%

LVEF 36%
LVEDV 197 mL
GLS -8.4%

LVEF 60%
LVEDV 140 mL
GLS -20.3%

Futile *Helpful*

Transplant, LVAD, Hospice

Spectrum of LV dysfunction

MR correction may be beneficial

LVEF, LV size, LV geometry
Severely abnormal

LVEF, LV size, LV geometry
Mild-to-moderately abnormal

LVEF, LV size, LV geometry
Normal

Courtesy of Dr. Paul Grayburn

MV Transcatheter Edge-to-Edge Repair (TEER)

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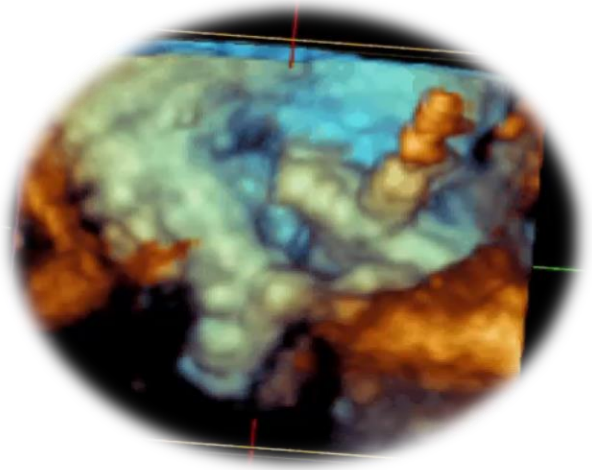
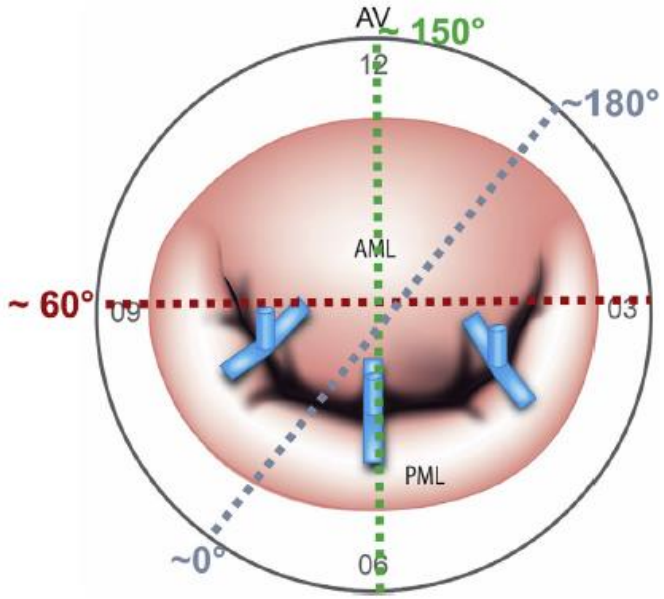
- **TEER success requires**;
  - Thoughtful patient selection
  - An imaging and procedural protocol
  - A rational approach to problem solving

- **Simple to Complex primary MR can be treated**;
  - An array of device sizes now available
  - Experience of the treatment team remains important
  - Diastolic valve area is a key anatomic limitation

- **Secondary MR should be treated;**
  - Technical success is easier than clinical success
  - Ventricular function will define futility





Set up the shot

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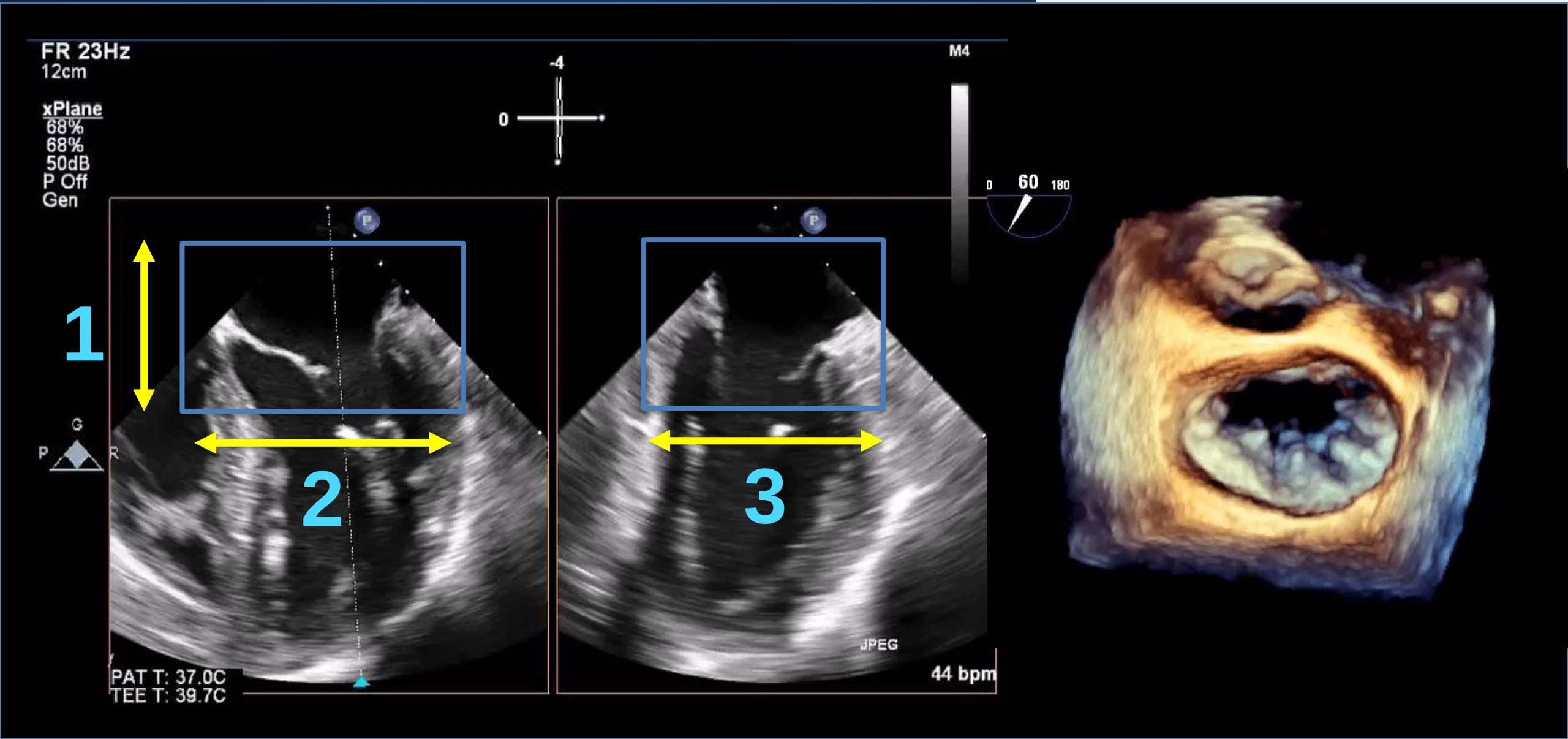

Ongoing improvements in 3D Imaging

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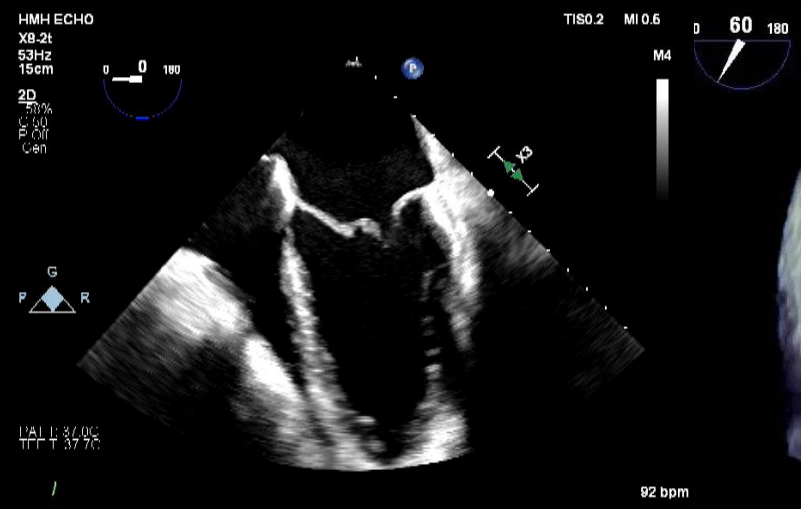
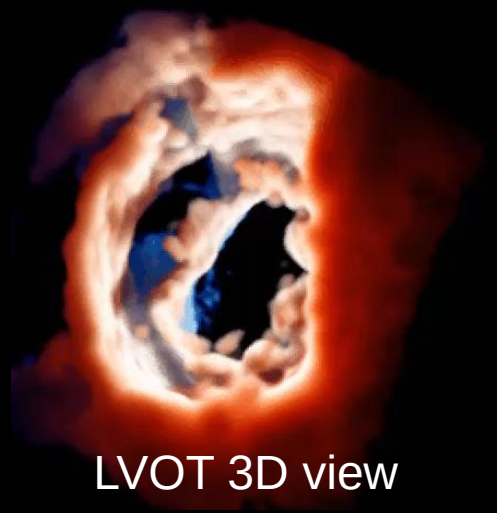


"Classic" 3D view

Adjustable light source

LV view of MV



LVOT 3D view

Interventional Echo

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1. Selection

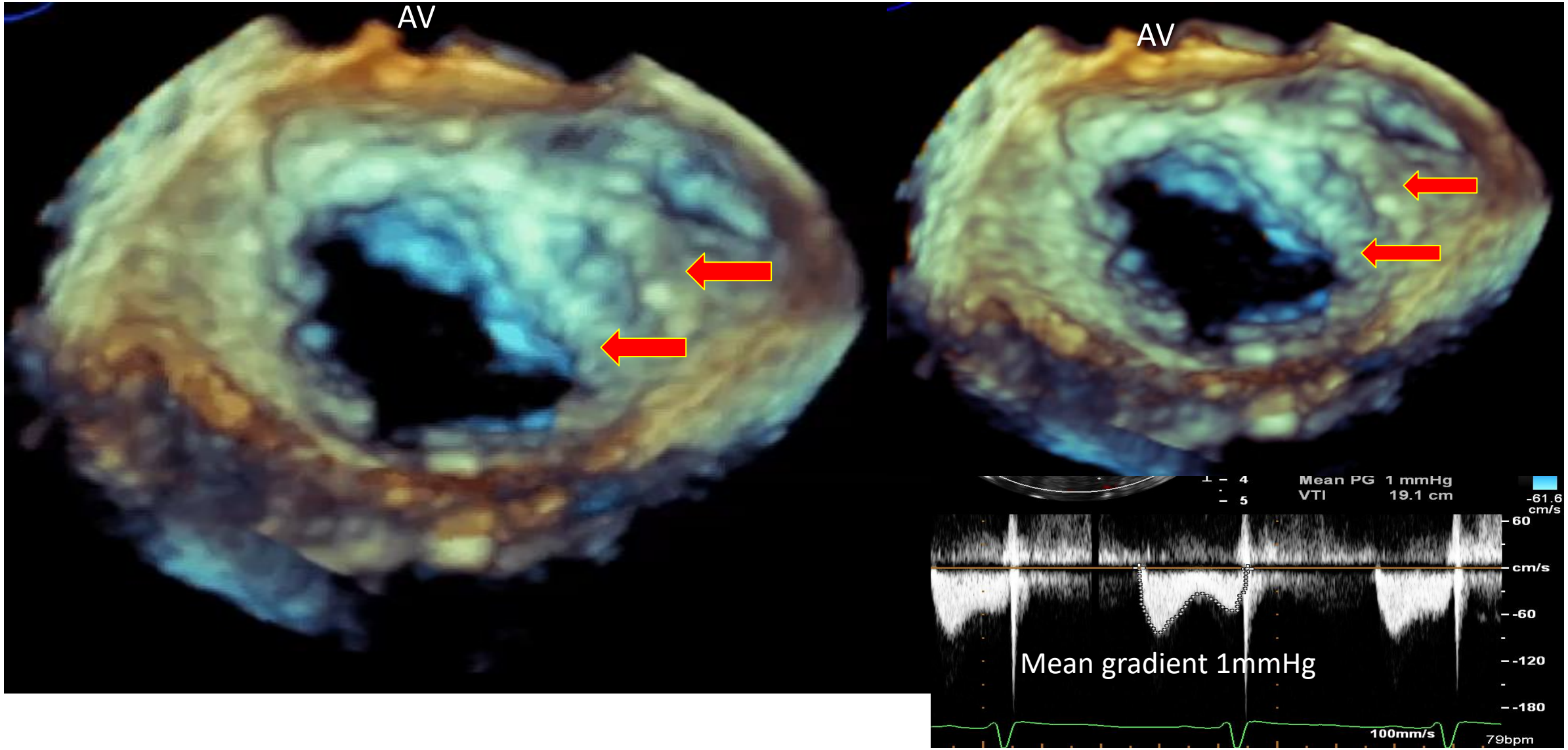
- ✓ Patient
- ✓ Device type/size

2. Guidance

- ✓ Standard
- ✓ Unique steps

3. Evaluation

- ✓ Device performance
- ✓ Cardiac performance


AV
AV
Mean PG 1 mmHg
VTI 19.1 cm
-61.6 cm/s
60
cm/s
-60
-120
-180
Mean gradient 1mmHg
100mm/s
79bpm

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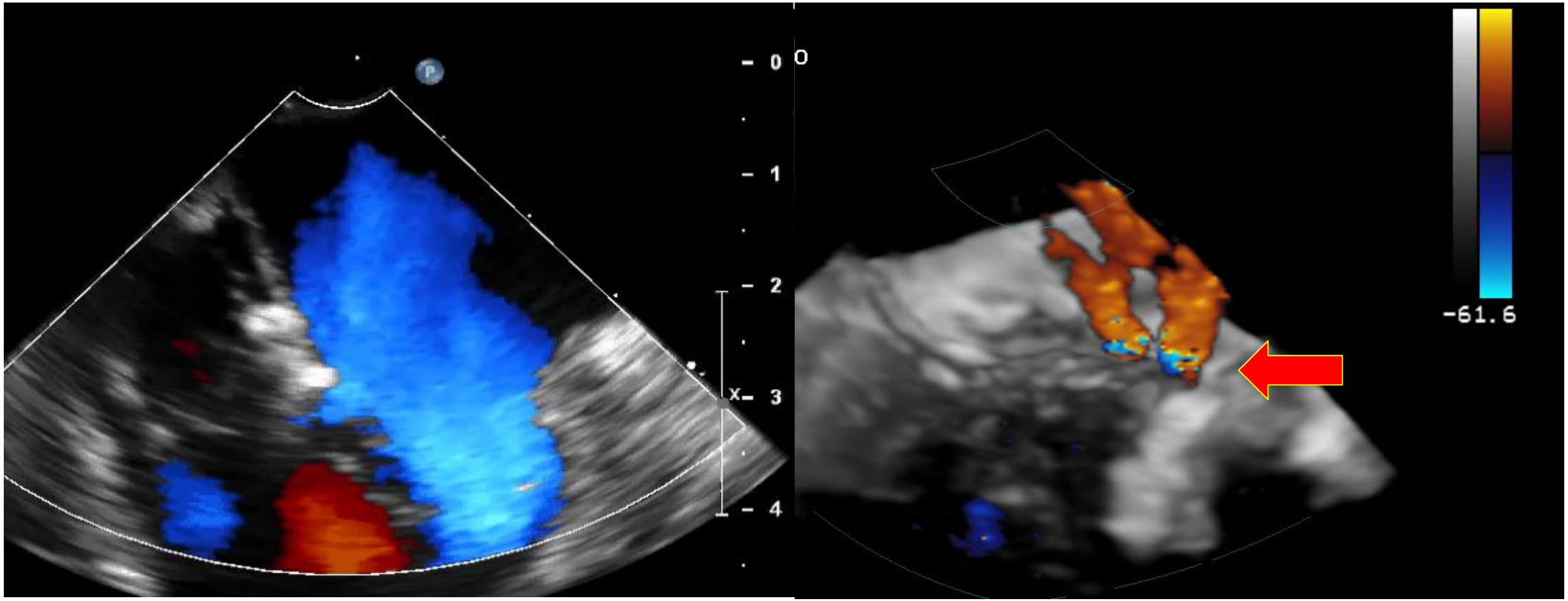

After implantation of 2 MitraClips the residual MR is mild.

Quantifying MR after MitraClip
Not so easy…

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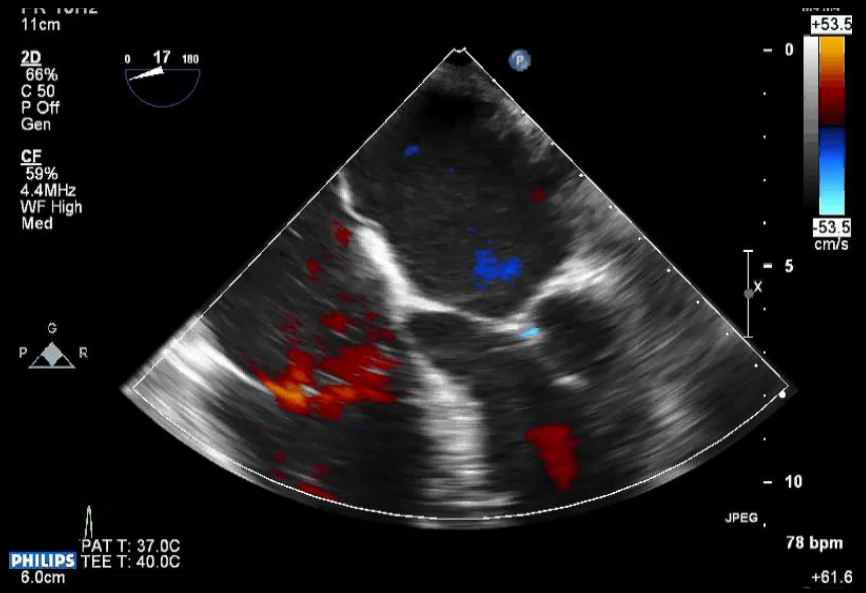
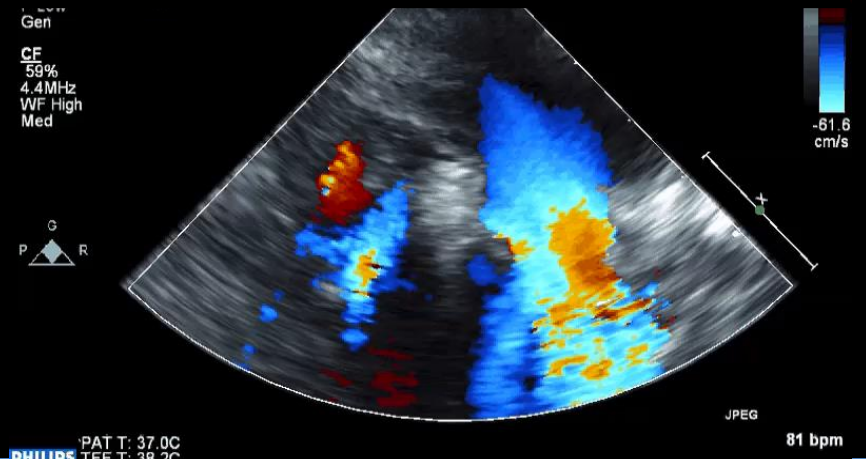
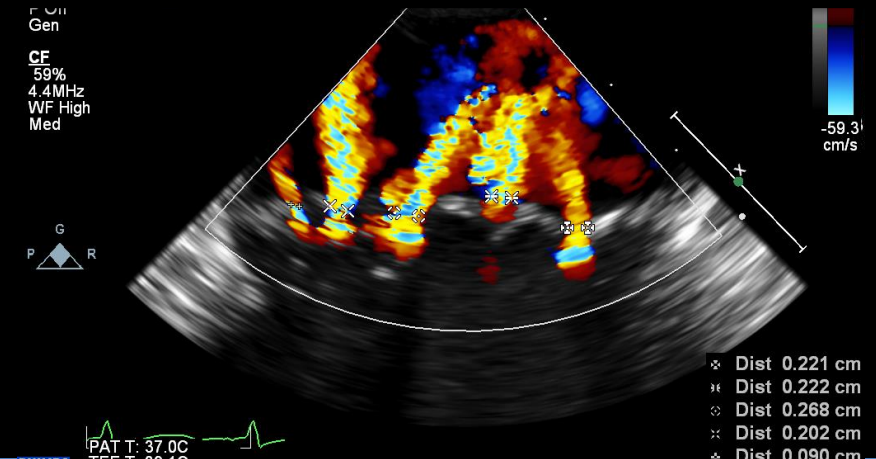
2 MitraClips- One Jet



One MitraClip- Two Criss-Cross Jets



One MitraClip- 5 Jets!



Acute Hemodynamic Response

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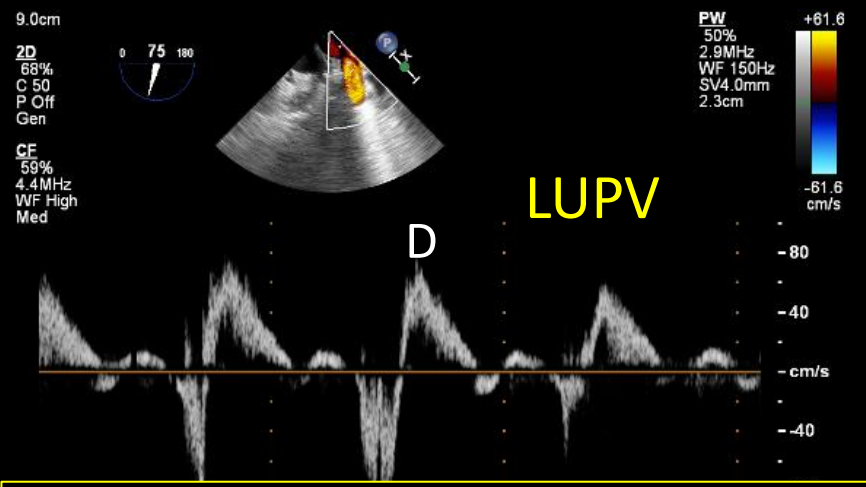
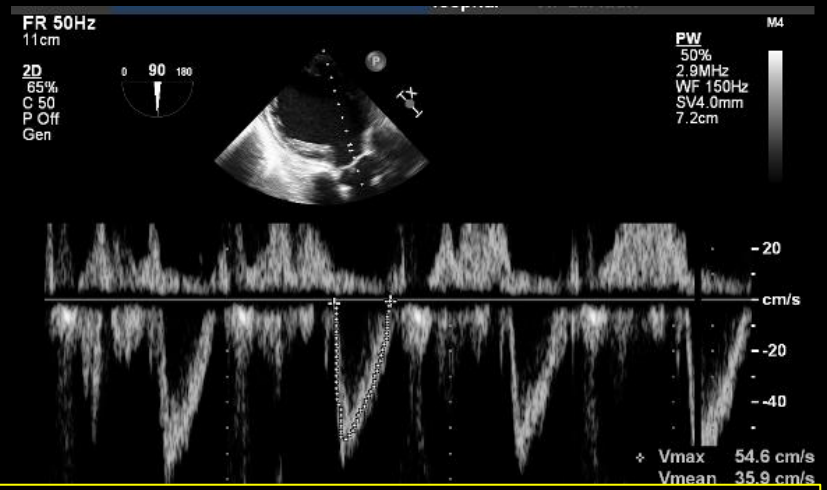
Baseline



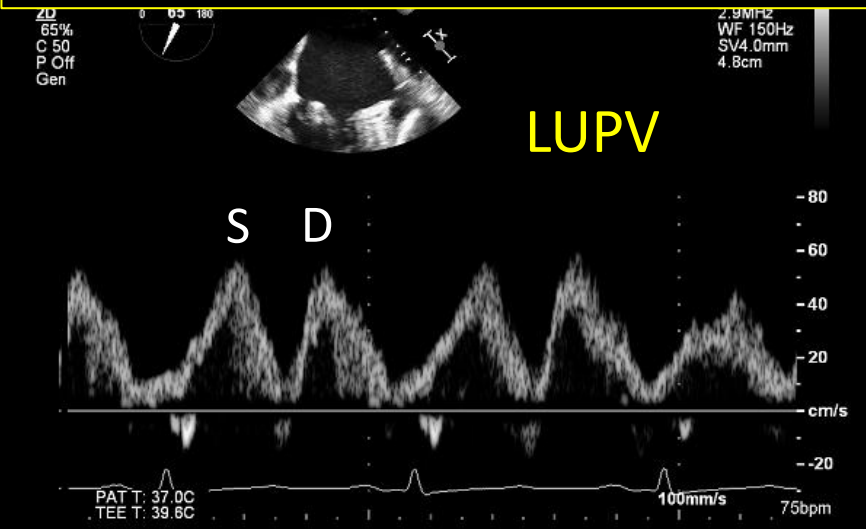


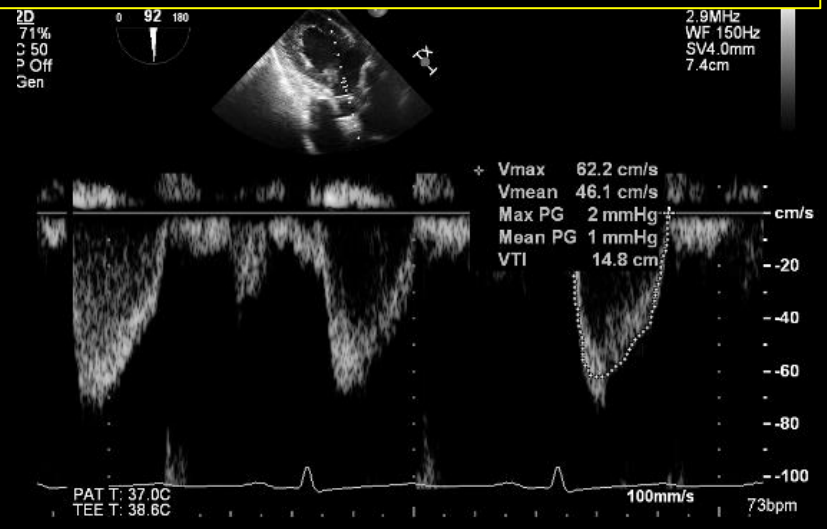
LVOT VTI: 9.12 cm

LVOT SV: 35ml

60 % increase of forward stroke volume

Post- MitraClip





LVOT VTI: 14.8 cm

LVOT SV: 56 ml

Ratio of S/D Velocity Time Integral

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FIGURE 2 Examples of Pulmonary Venous Flow in Patients With Low and High Ratios of Systolic to Diastolic Velocity-Time Integral

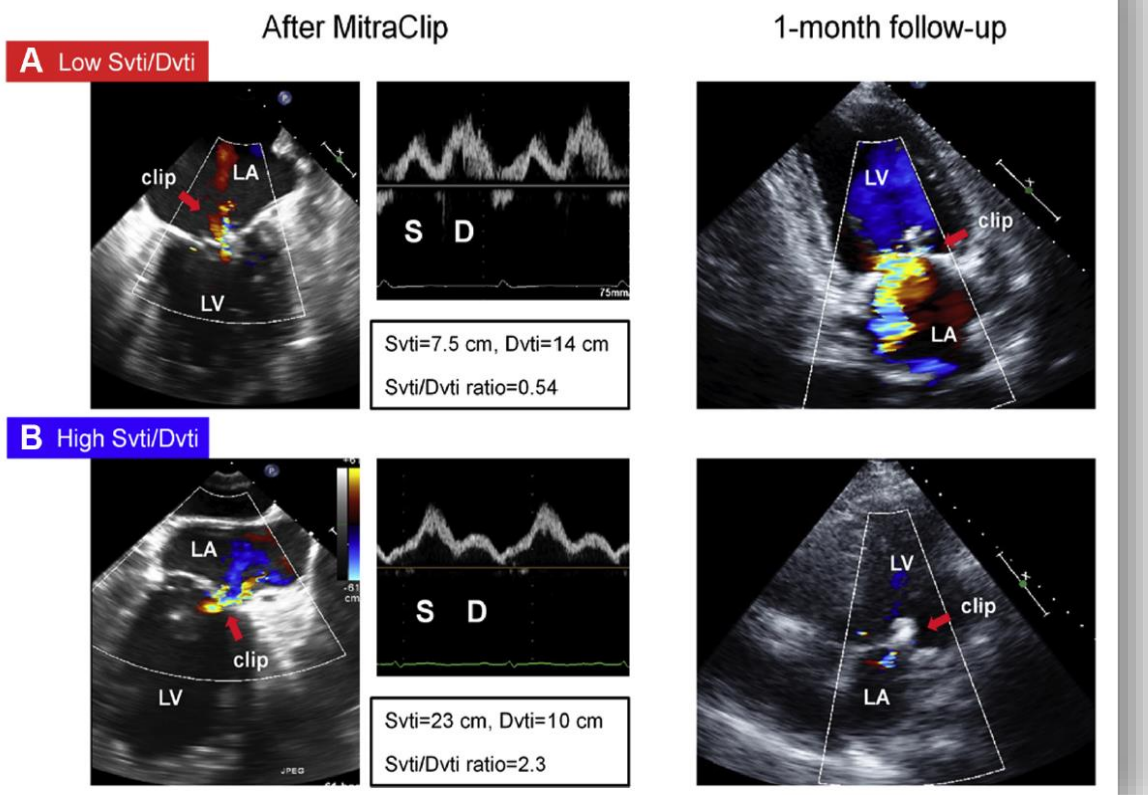
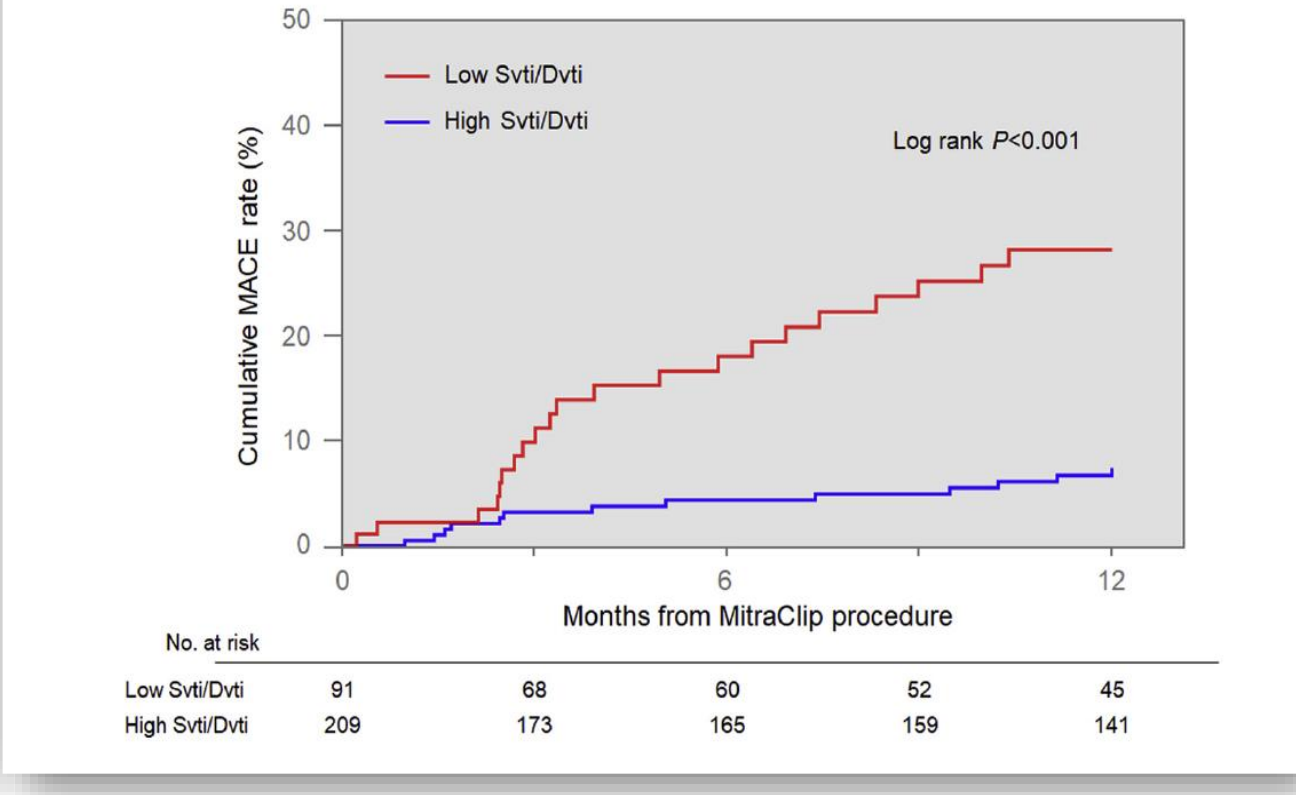


FIGURE 5 Kaplan-Meier Curves of Major Adverse Cardiovascular Events During 12-Month Follow-Up



Hiroki Ikenaga et al. J Am Coll Cardiol Intv 2019;12:140–50

TEER outcome by Hemodynamic Profile

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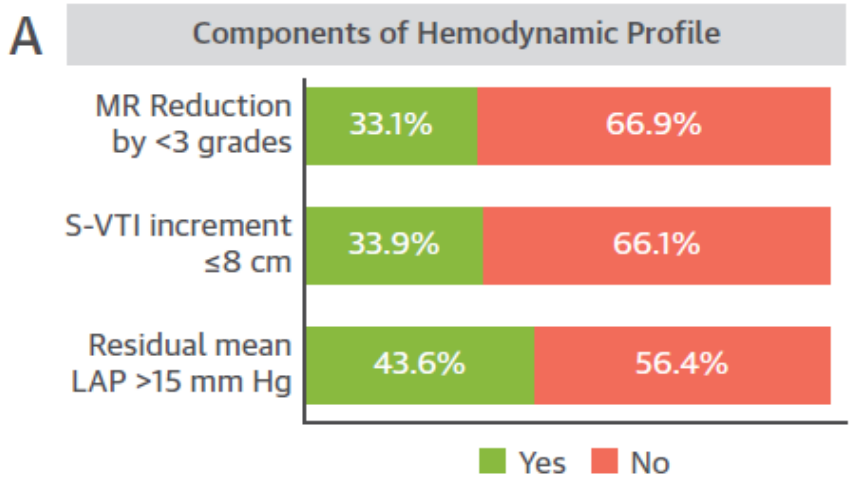
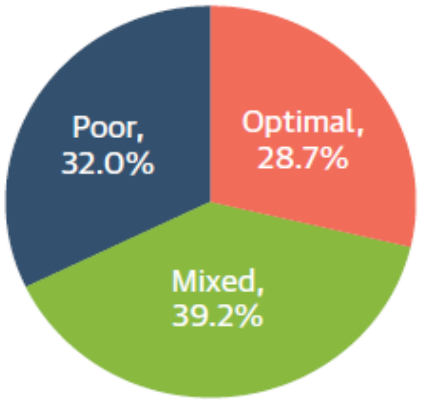
FIGURE 1 TEER Outcomes According to Intraprocedural Hemodynamic Profile (N = 181)

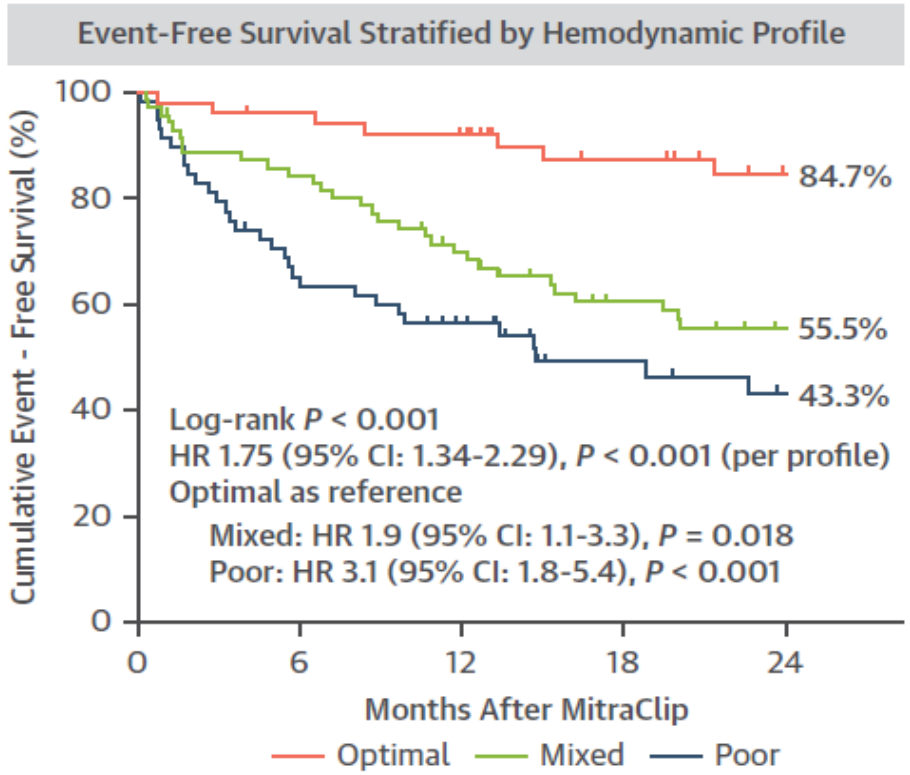


B

Hemodynamic Profiles

Risk Profile	Number of Components
Optimal	0
Mixed	1
Poor	≥2





Zaid, Little, Goel et al. JACC Img (in press)

Hemodynamic response to TEER

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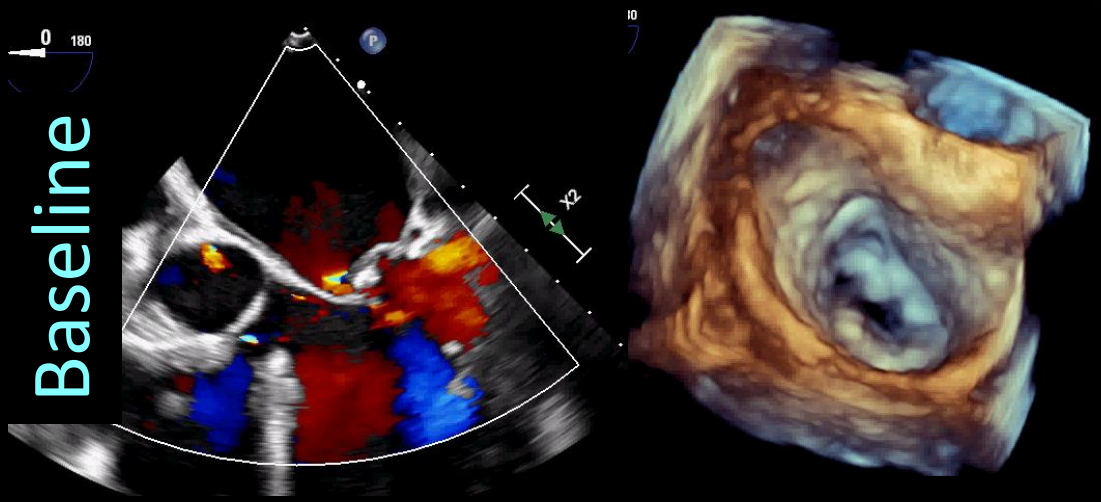
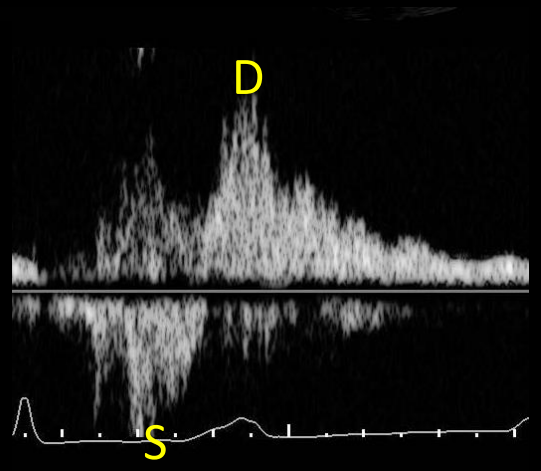
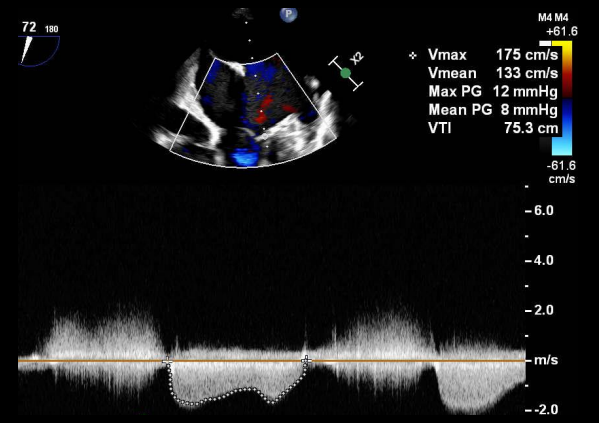
Baseline

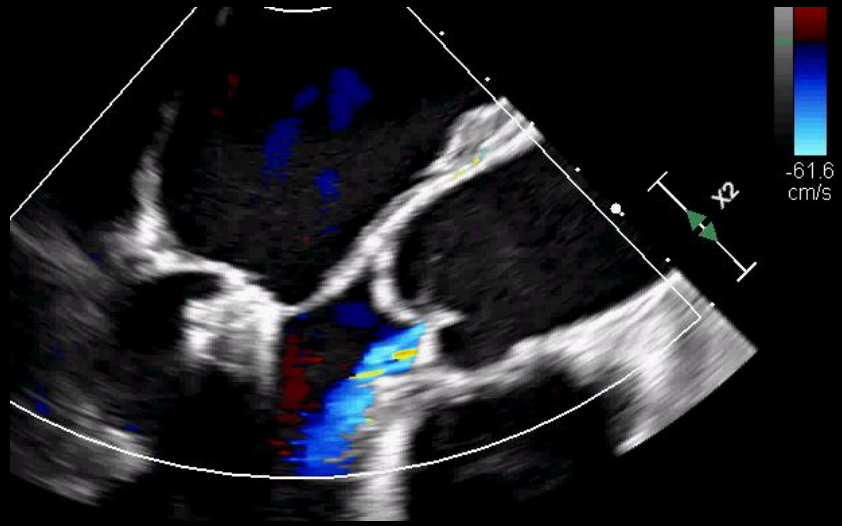


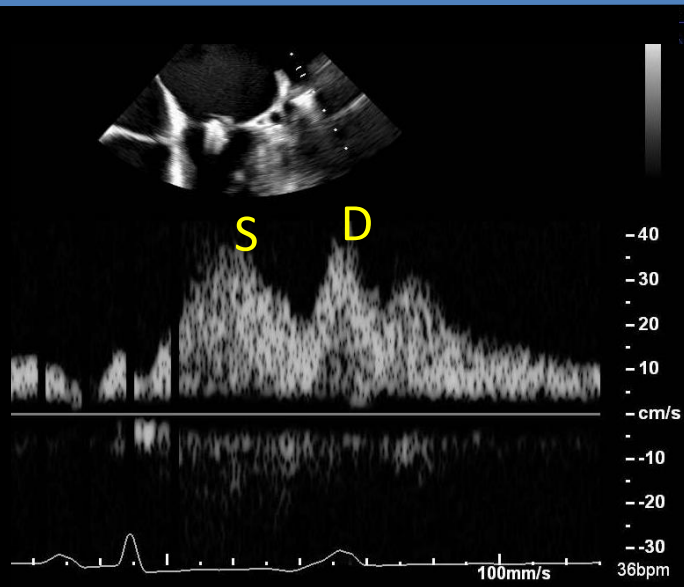


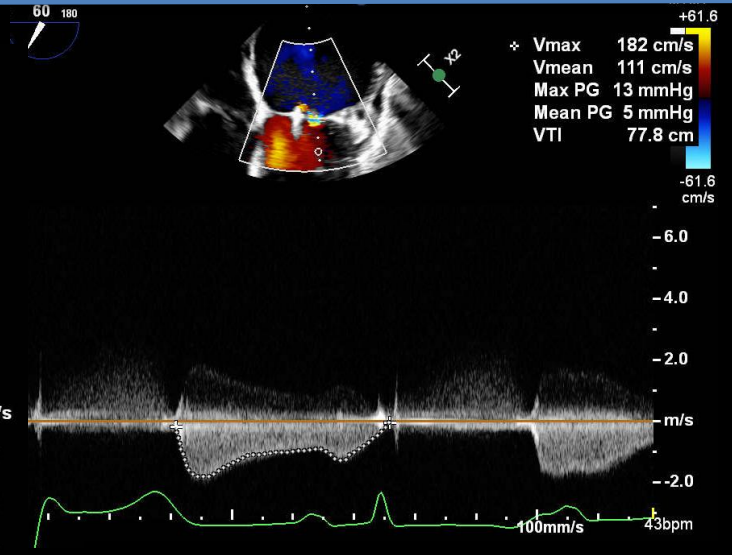


Mean Gradient 8mmHg

Post MV-TEER







Mean Gradient 5mmHg

Mean Diastolic Pressure gradient

A function of total diastolic area & flow volume

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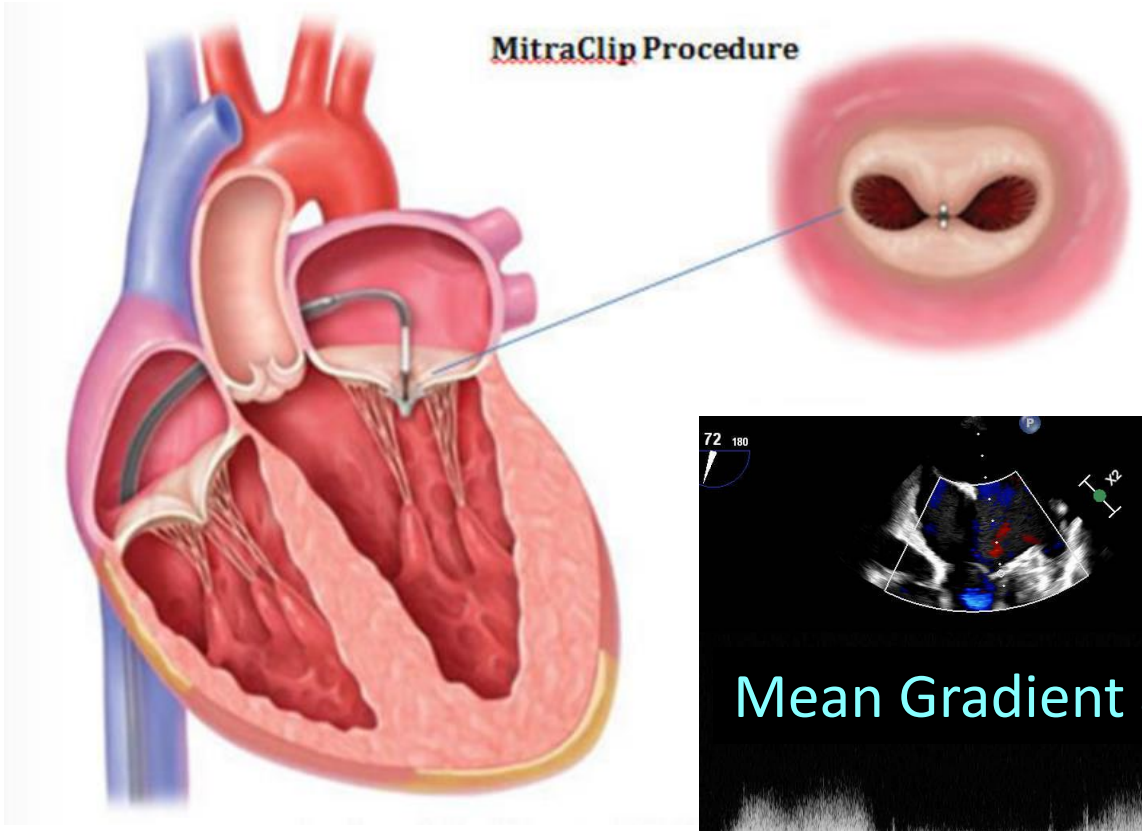
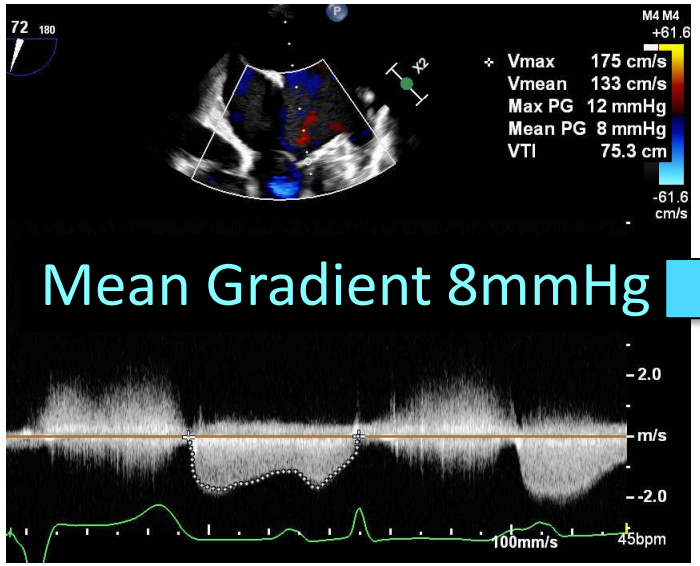
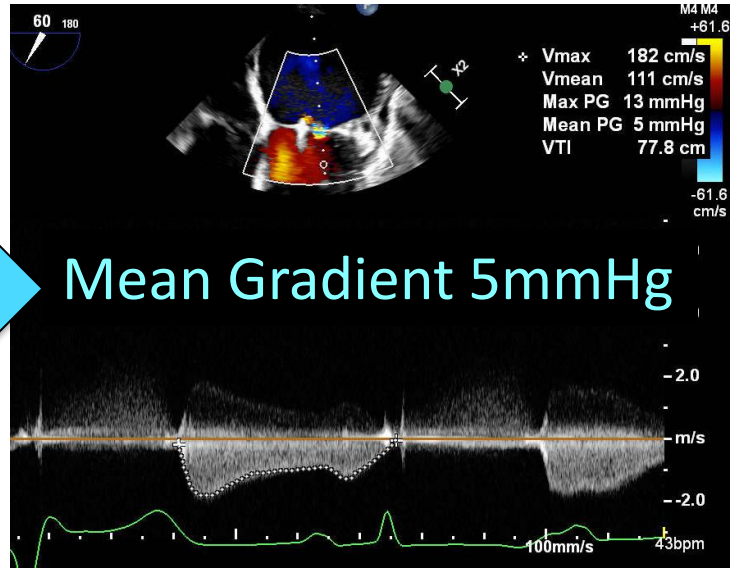


Flow ∝ √Pressure

Increase the flow 2X;
pressure increases by 4X





Effect of Mitral Valve Gradient After MitraClip on Outcomes in Secondary Mitral Regurgitation

Results From the COAPT Trial

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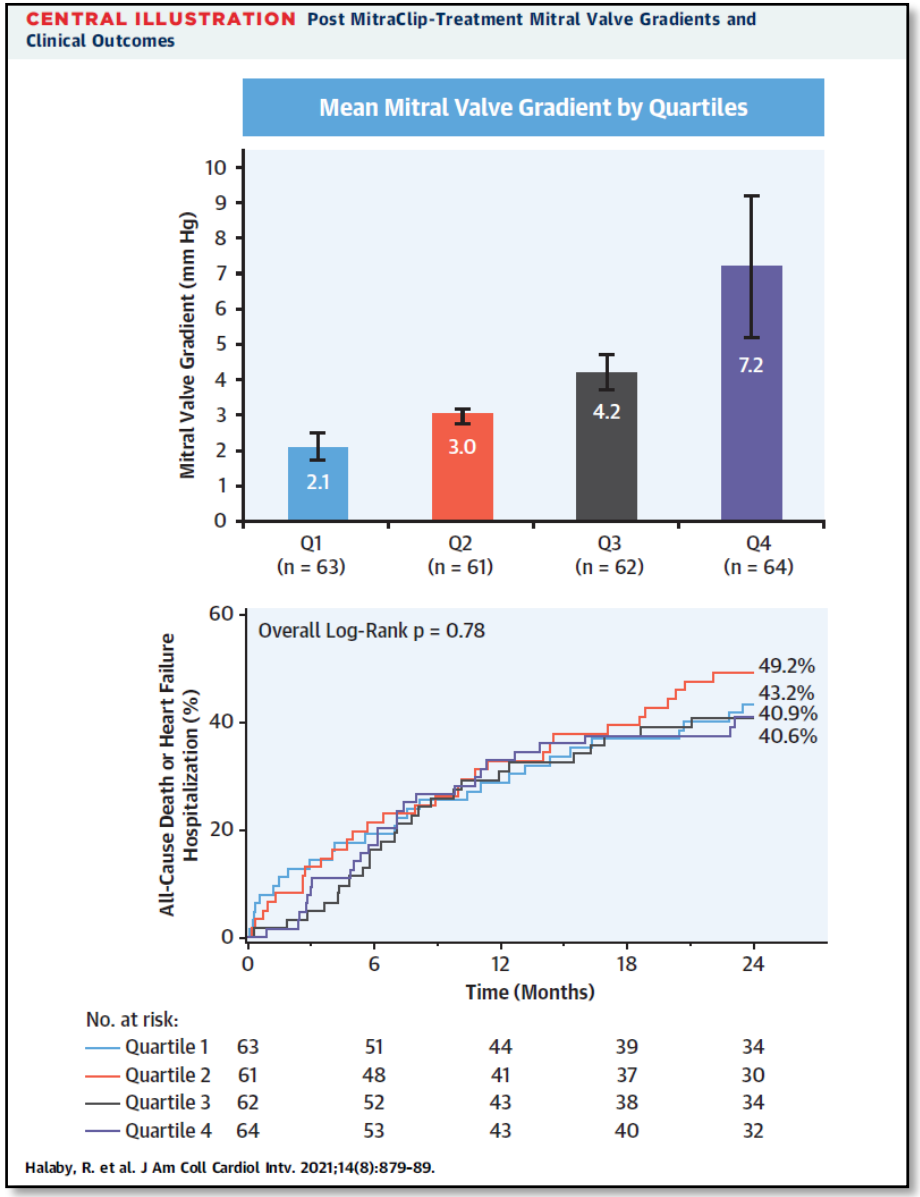
- Among HF patients with severe SMR, higher MVGs on discharge did not adversely affect clinical outcomes following MitraClip.
- In select patients with HF and SMR, the benefits of MR reduction may outweigh the effects of mild-to-moderate mitral stenosis after MV-TEER.



The Integral Role of the IE in Heart Interventions

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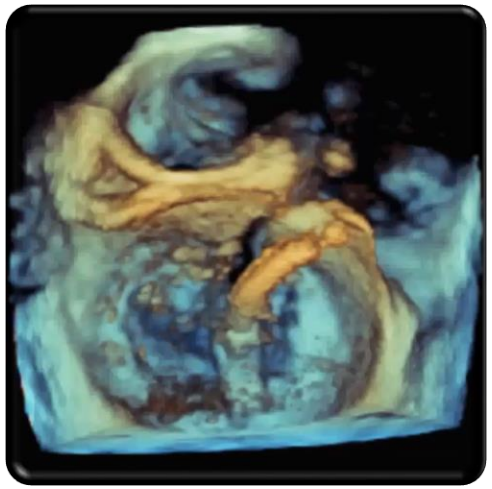
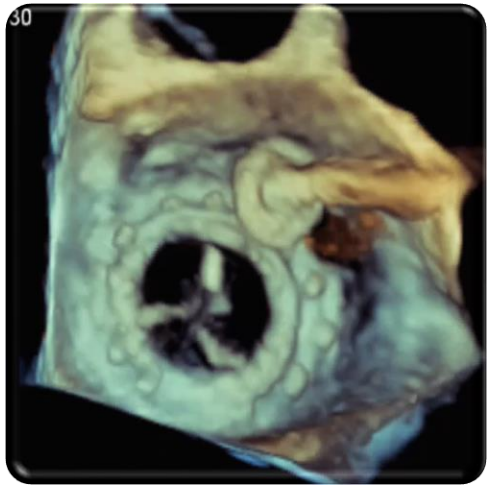




Aortic
TAVR
ViV
PVL

Mitral
TEER
TMVR, ViV,
ViR, ViMAC
PVL

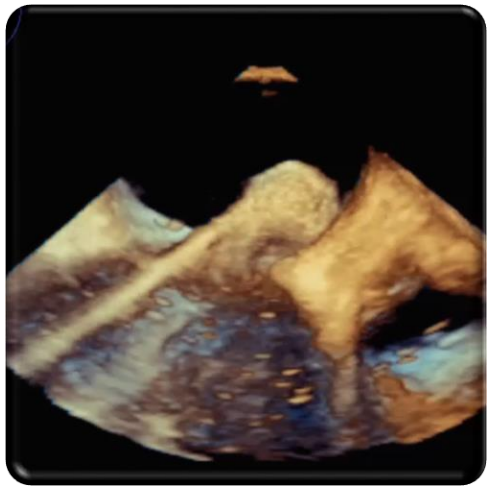
Congenital
ASD, PFO,
VSD, Septal
Ablation

IE

Tricuspid
TEER
TTVR, ViV,
ViR

EP
LAAO
Ablations

Pulmonic
TTVR
ViV
ViR

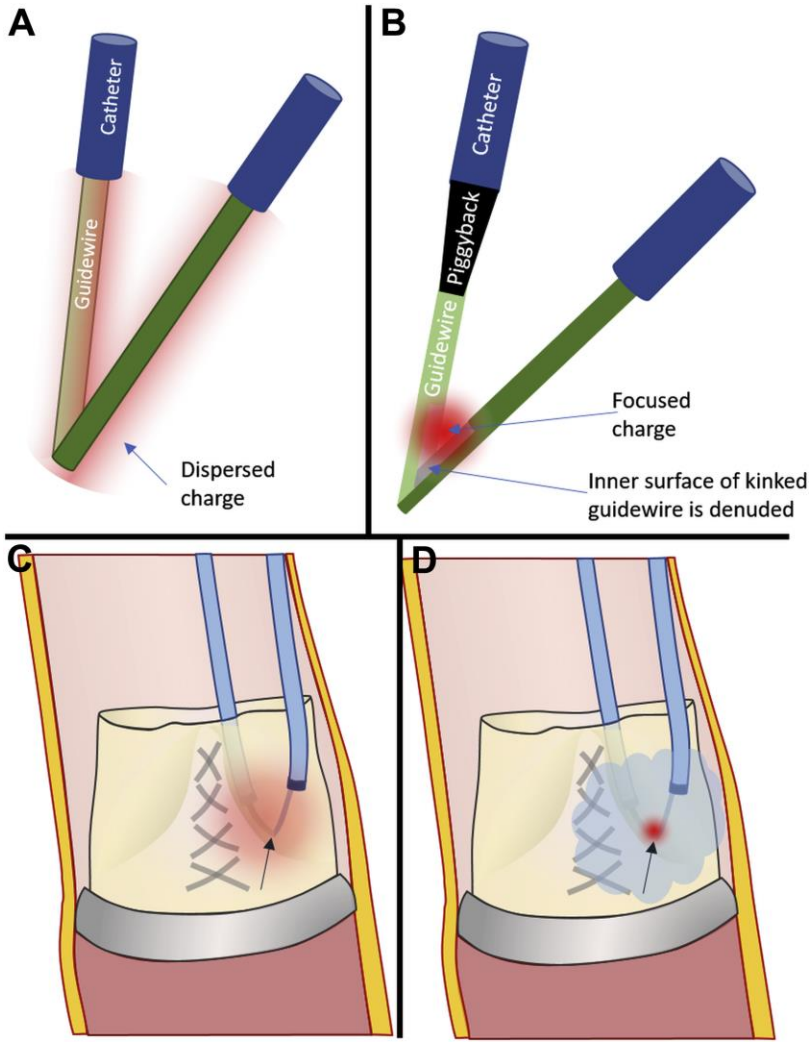


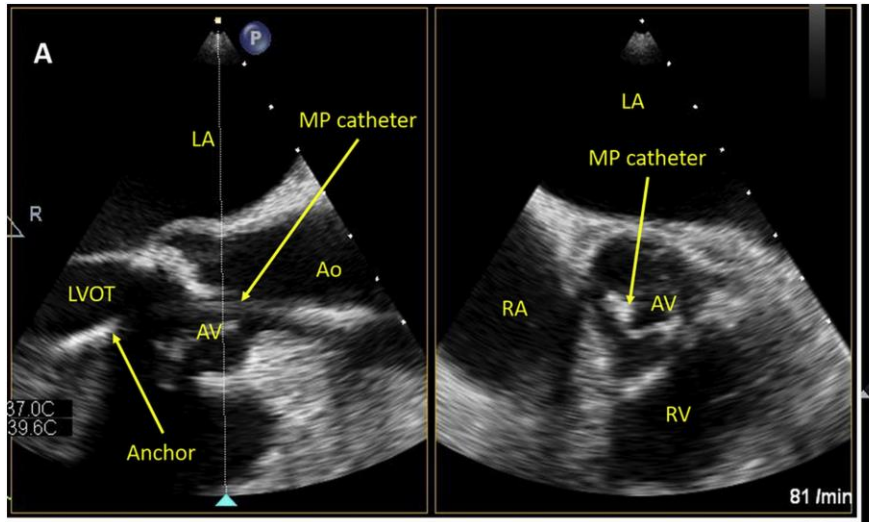
Courtesy of Dr. Enrique Garcia-Sayan

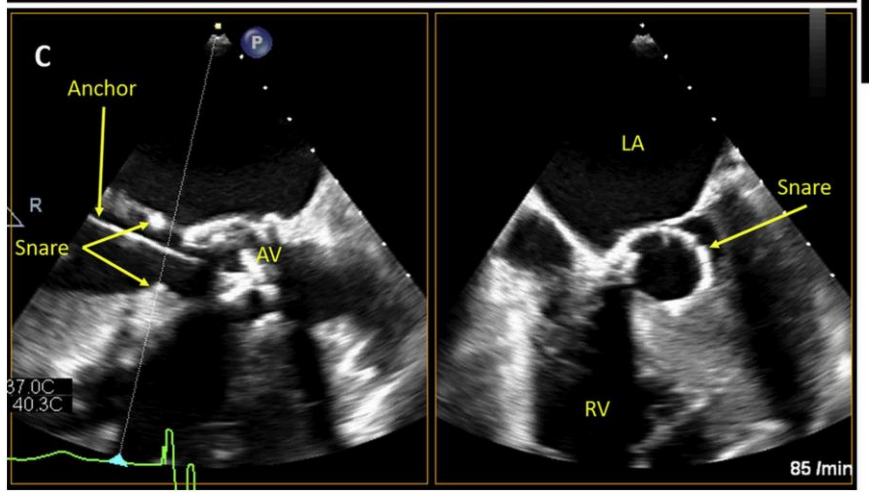

Welcome to the era of percutaneous, image-guided, electrosurgery for structural heart disorders!

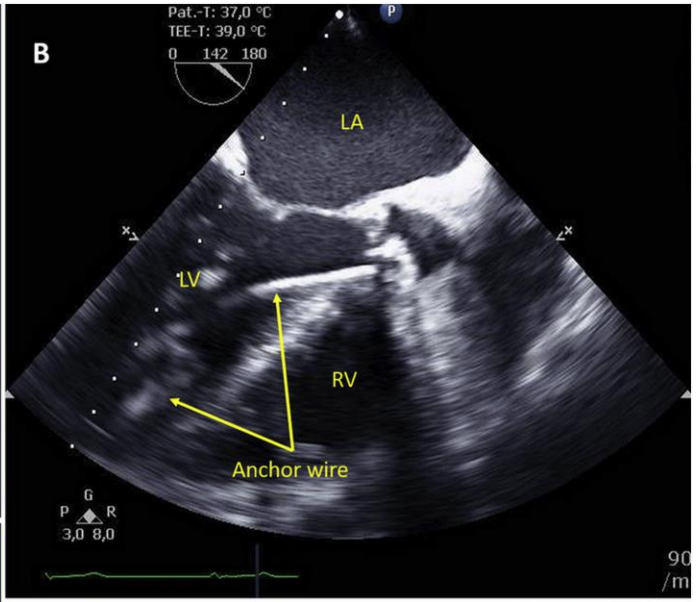

BASILICA
LAMPOON
SESAME

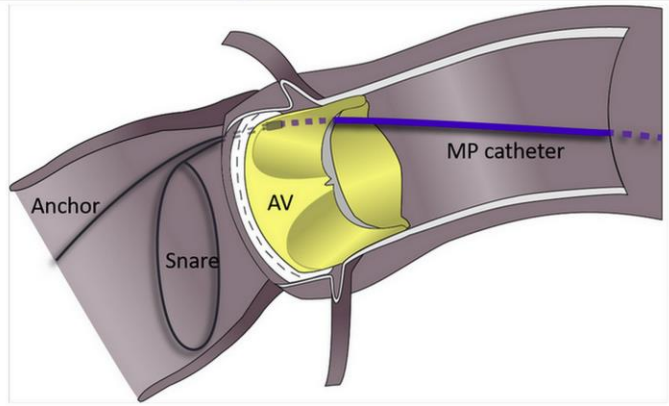
BASILICA Procedure (pre-TAVI)











Protsyk et al. JASE 2021

Guiding BASILICA

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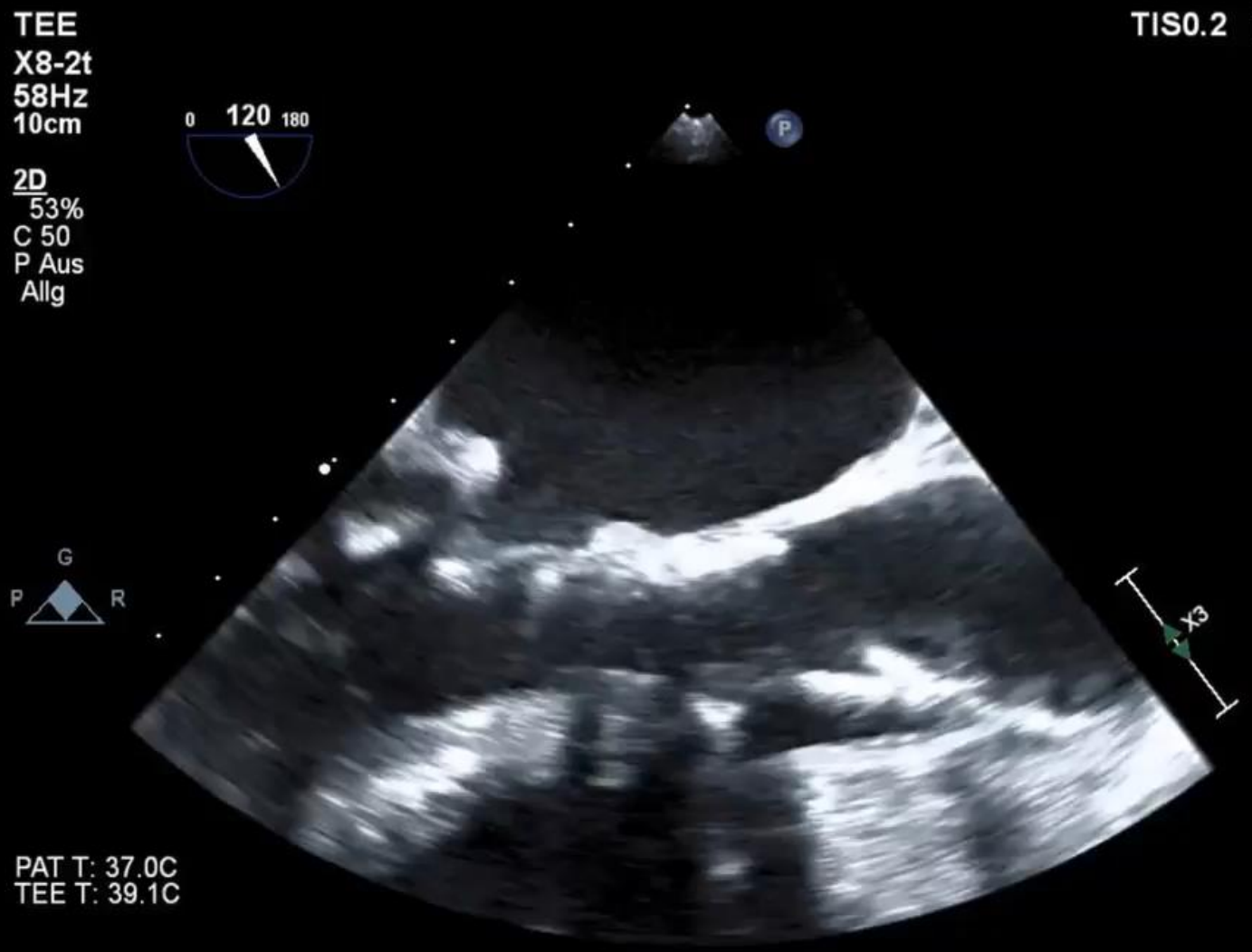
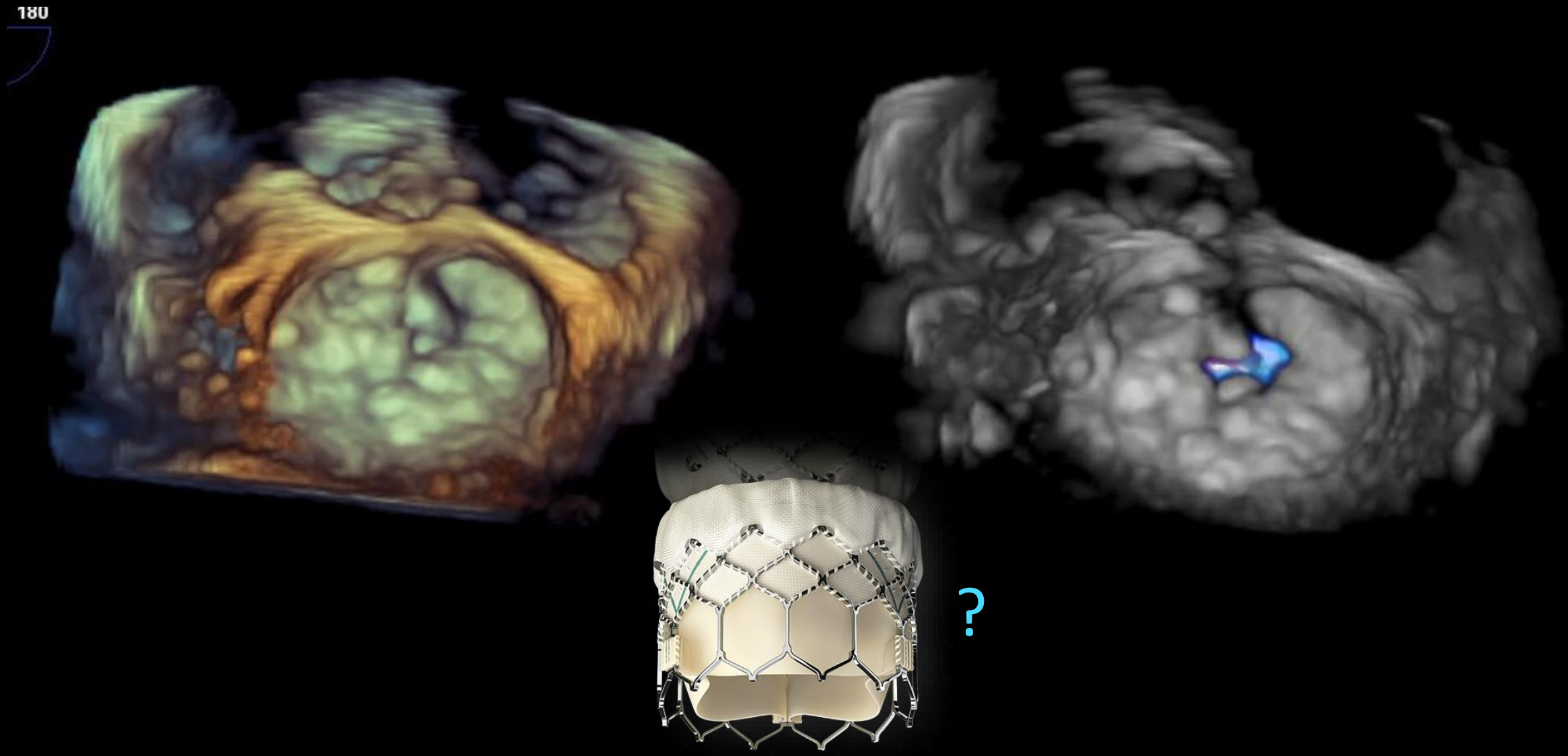


Protsyk et al. JASE 2021


LAMPOON

73-year-old woman with severe MAC

HOUSTON Methodist
DEBAKEY HEART & VASCULAR CENTER



Digital Deformation Modeling

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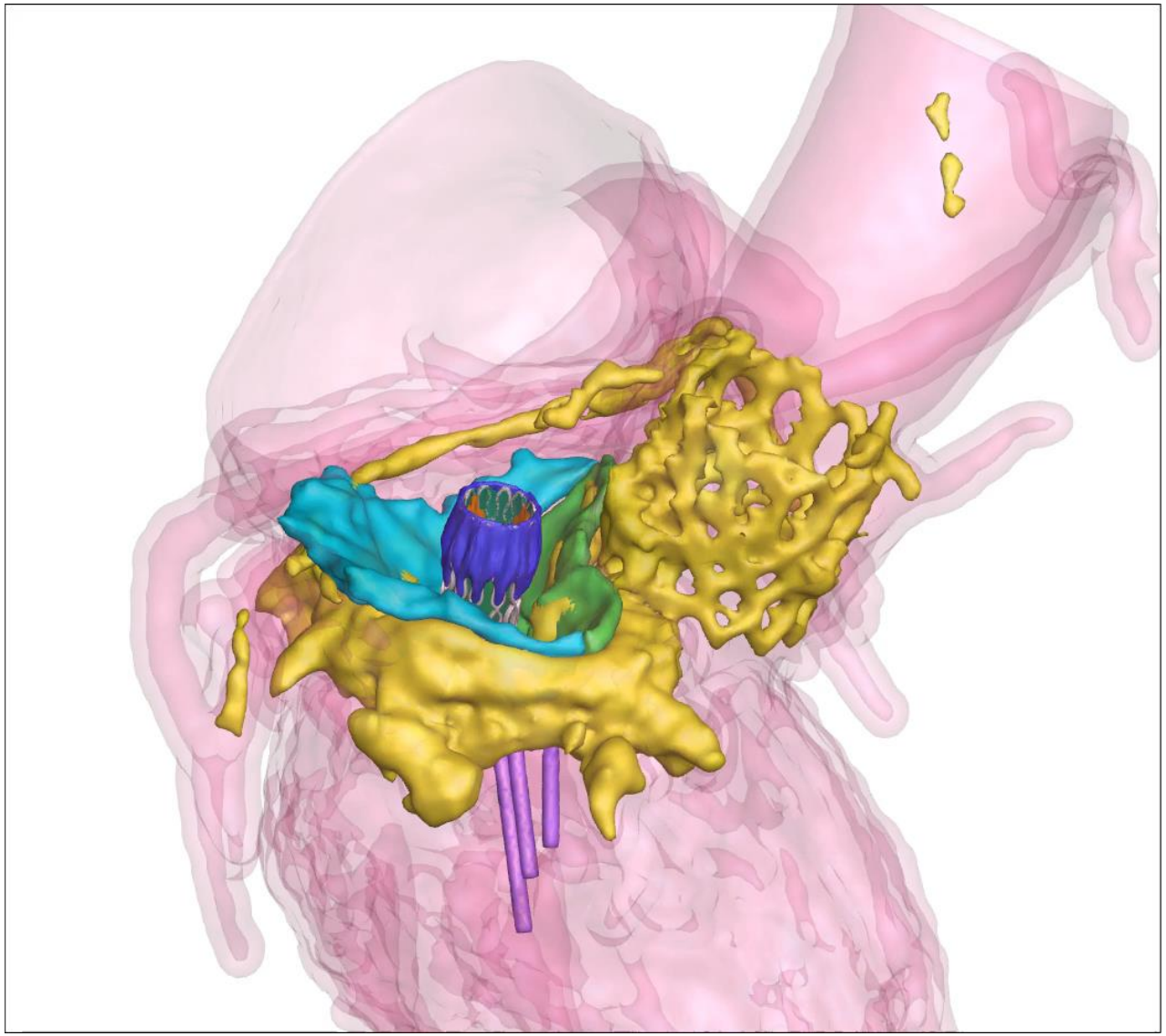
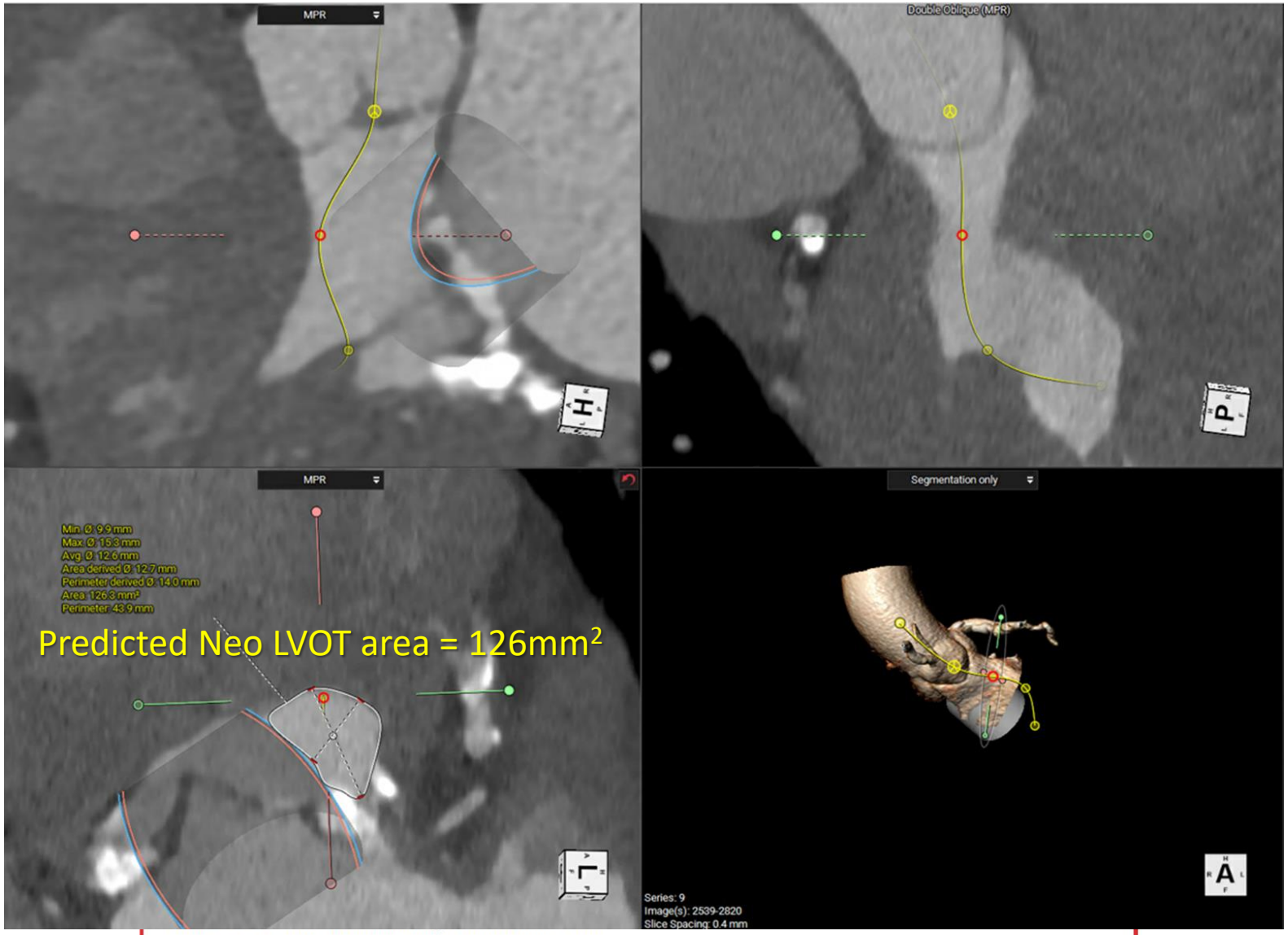
DASI Simulations



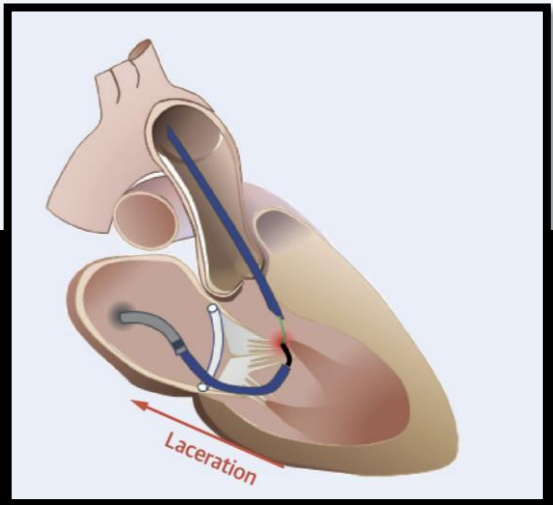
Assessing the risk of LVOT obstruction

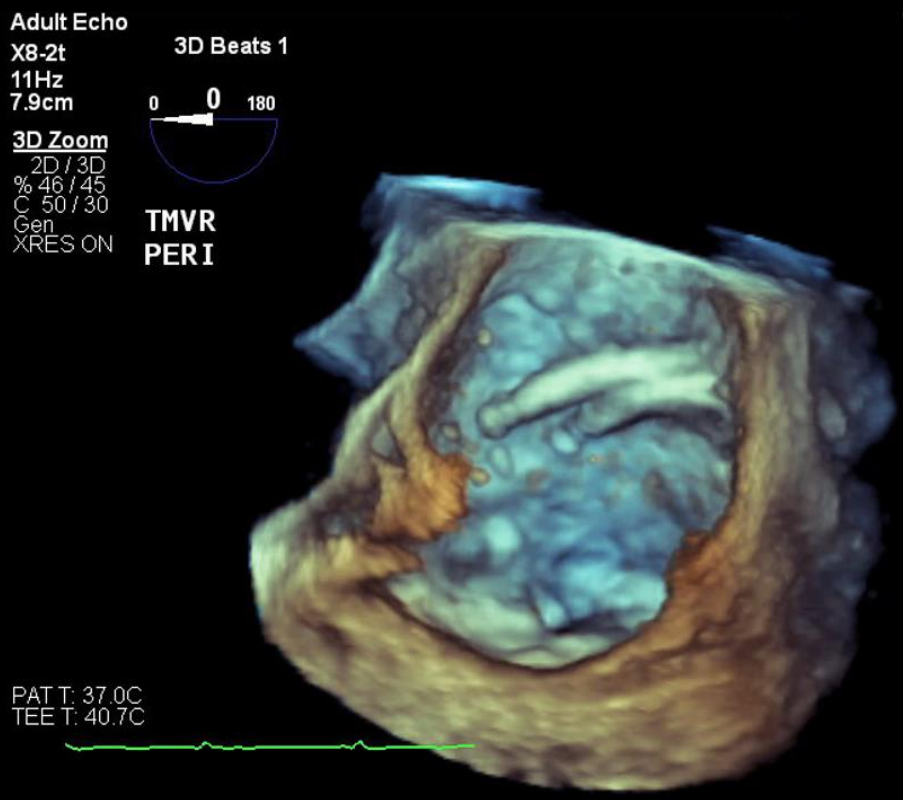


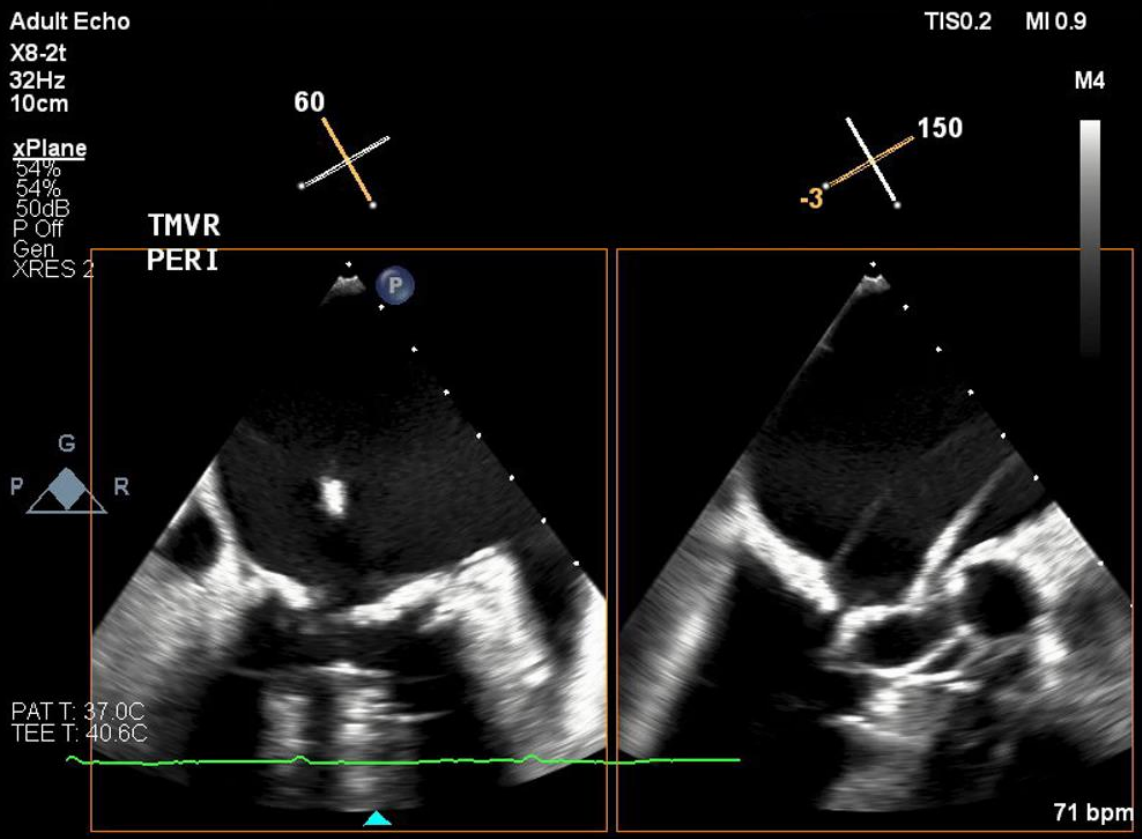
Neo LVOT area <170-190 mm^2 = increased risk for LVOTO

References:
1.Yoon S.H., Bleiziffer S., Latib A., et al. "Predictors of left ventricular outflow tract obstruction after transcatheter mitral valve replacement". J Am Coll Cardiol Intv 2019;12:182-193.
2. Wang DD, Eng MH, Greenbaum AB, et al. Validating a prediction modeling tool for left ventricular outflow tract (LVOT) obstruction after transcatheter mitral valve replacement (TMVR). *Catheter Cardiovasc Interv* 2018;92:379–87

Base to tip Lampoon







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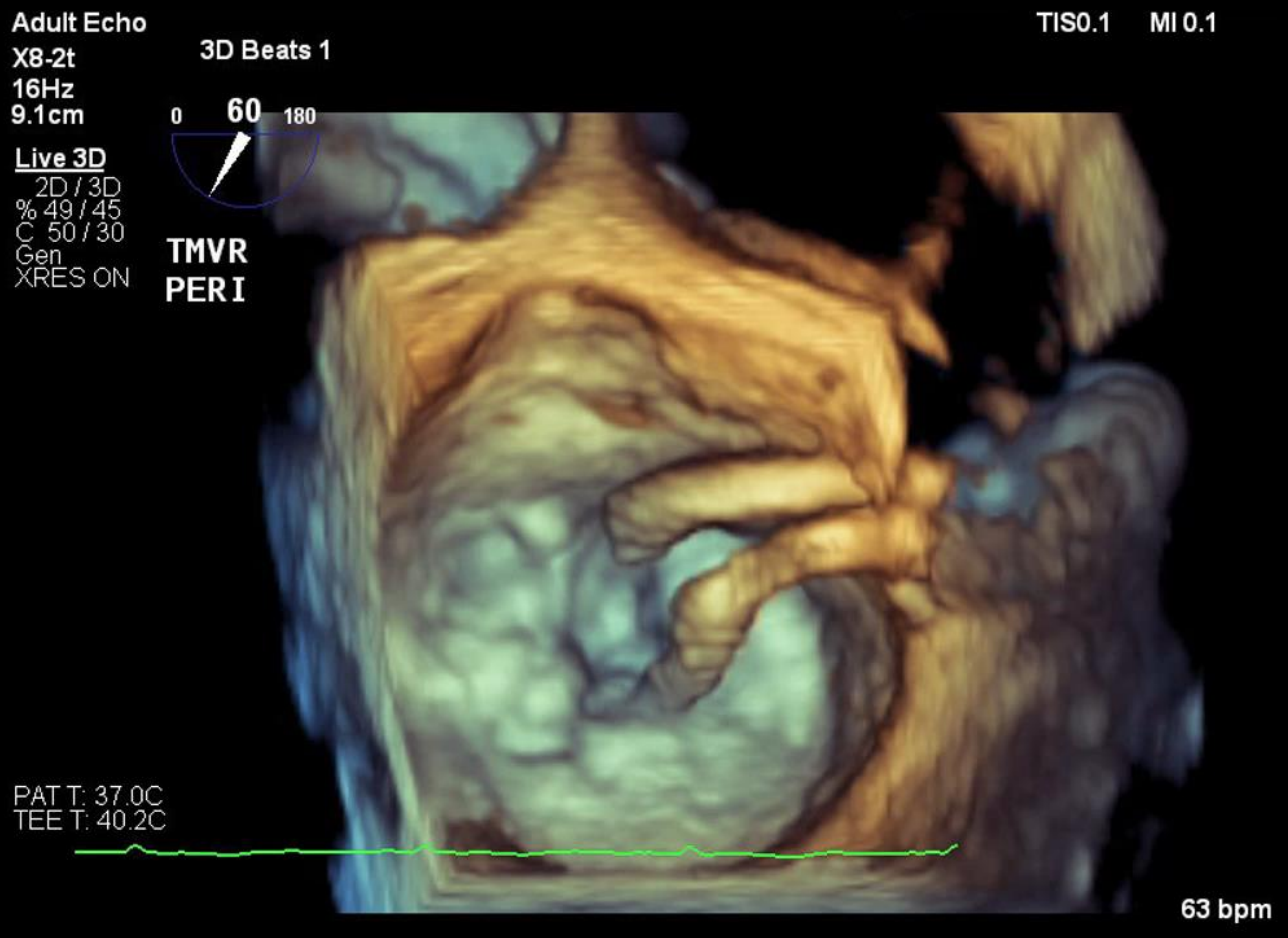

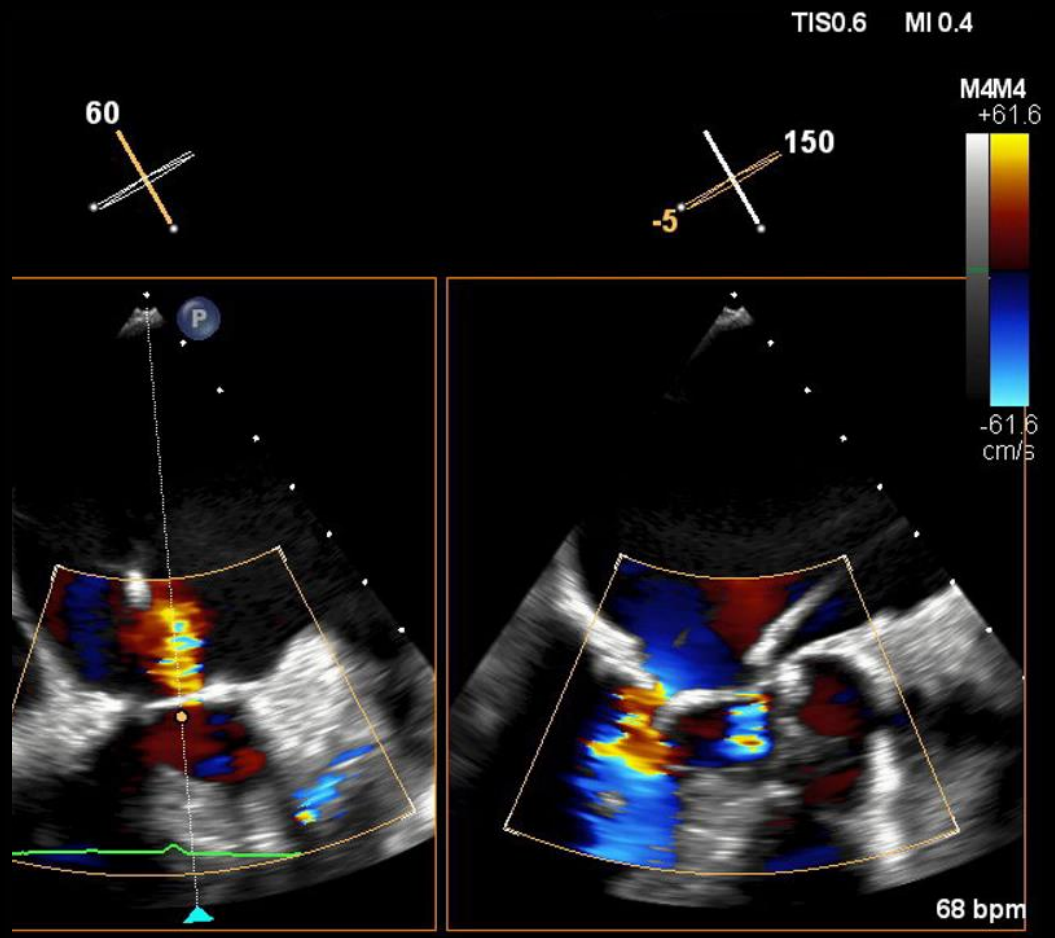

The flying ‘V’ – anterior leaflet slice

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THV deployed in MAC

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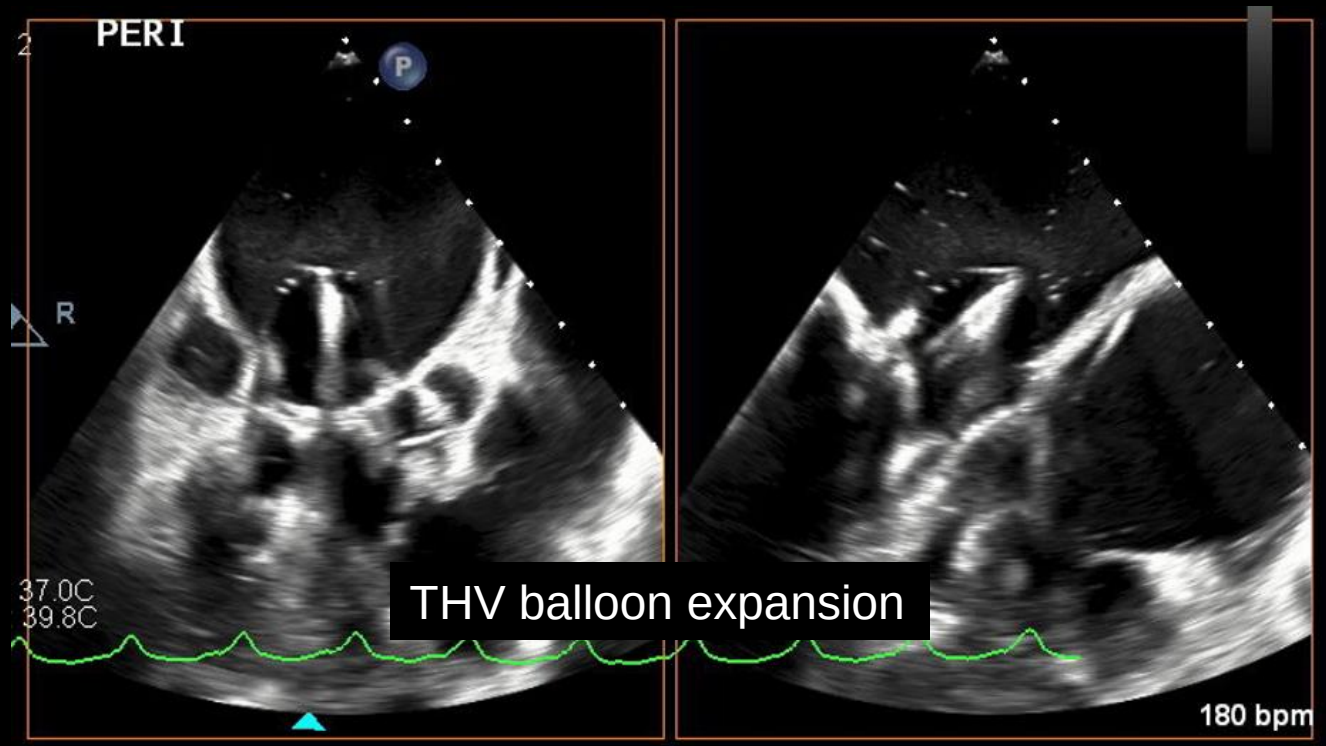
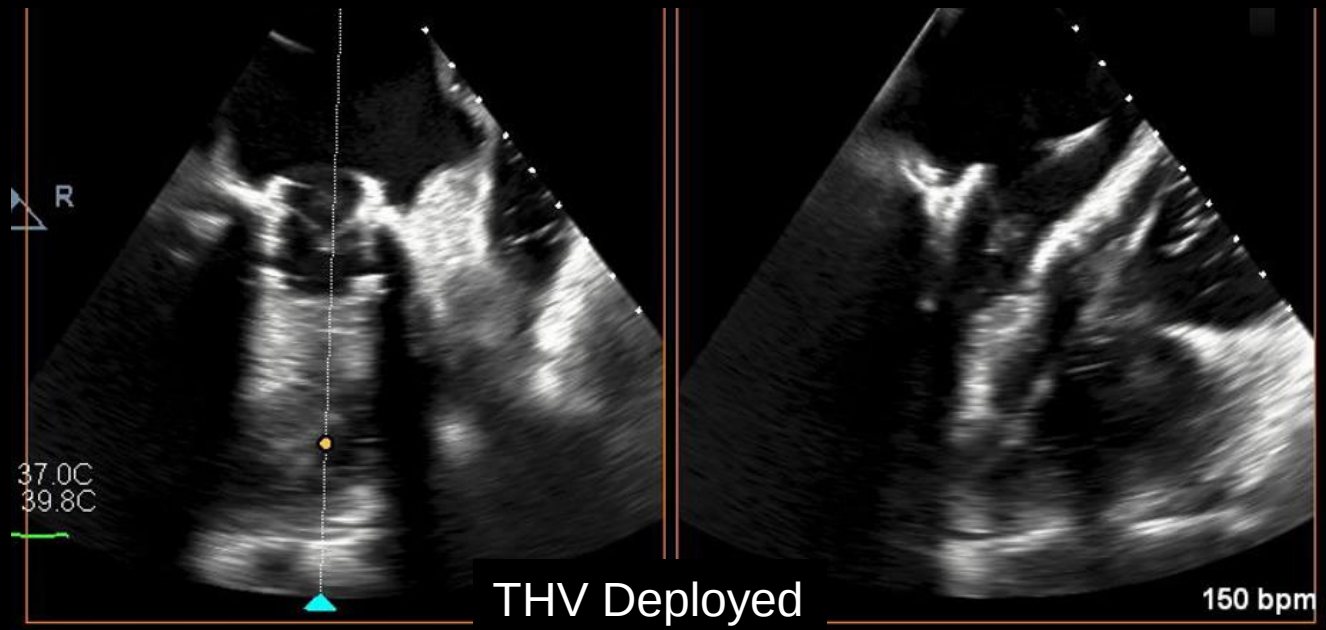
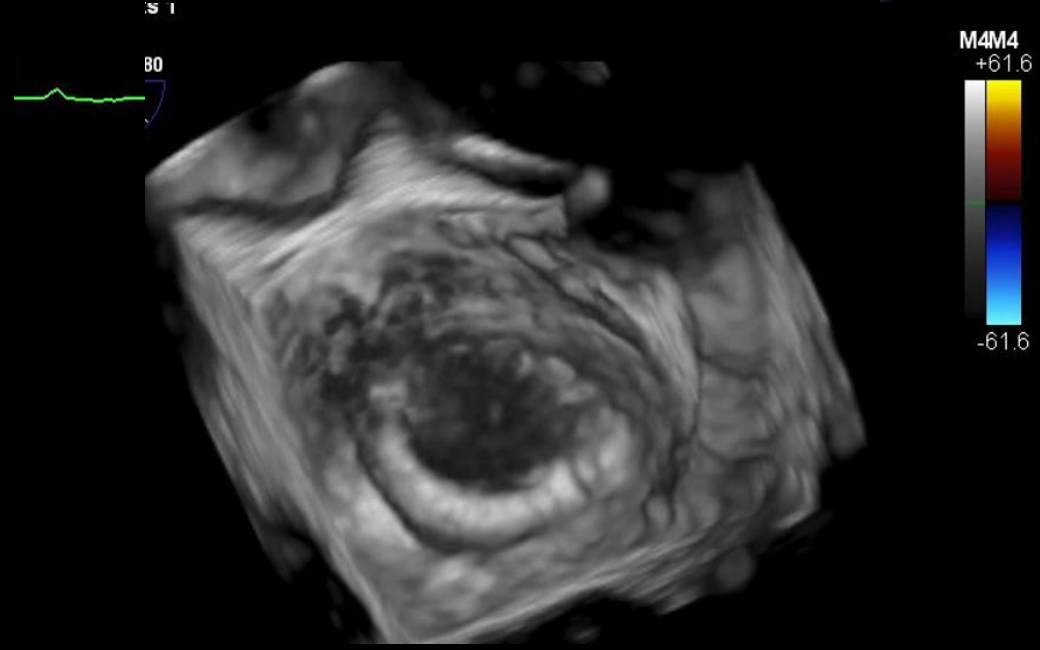


THV balloon expansion



THV Deployed

Mean diastolic gradient 1 mmHg



Posterior PVL – mild?

Catheter-based SHD Intervention in 2024

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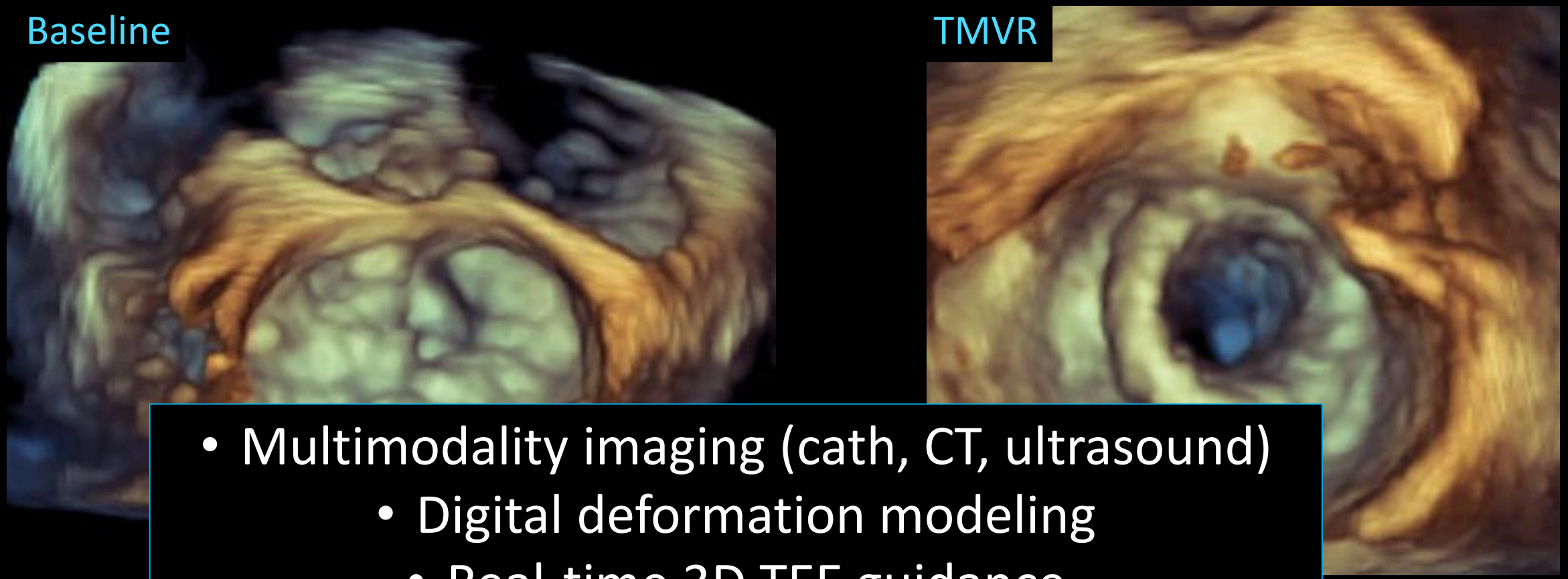

- Multimodality imaging (cath, CT, ultrasound)
- Digital deformation modeling
- Real-time 3D TEE guidance
- Catheter-based electrosurgery
- Beating heart valve implantation

A little PVL - Risk for hemolysis?

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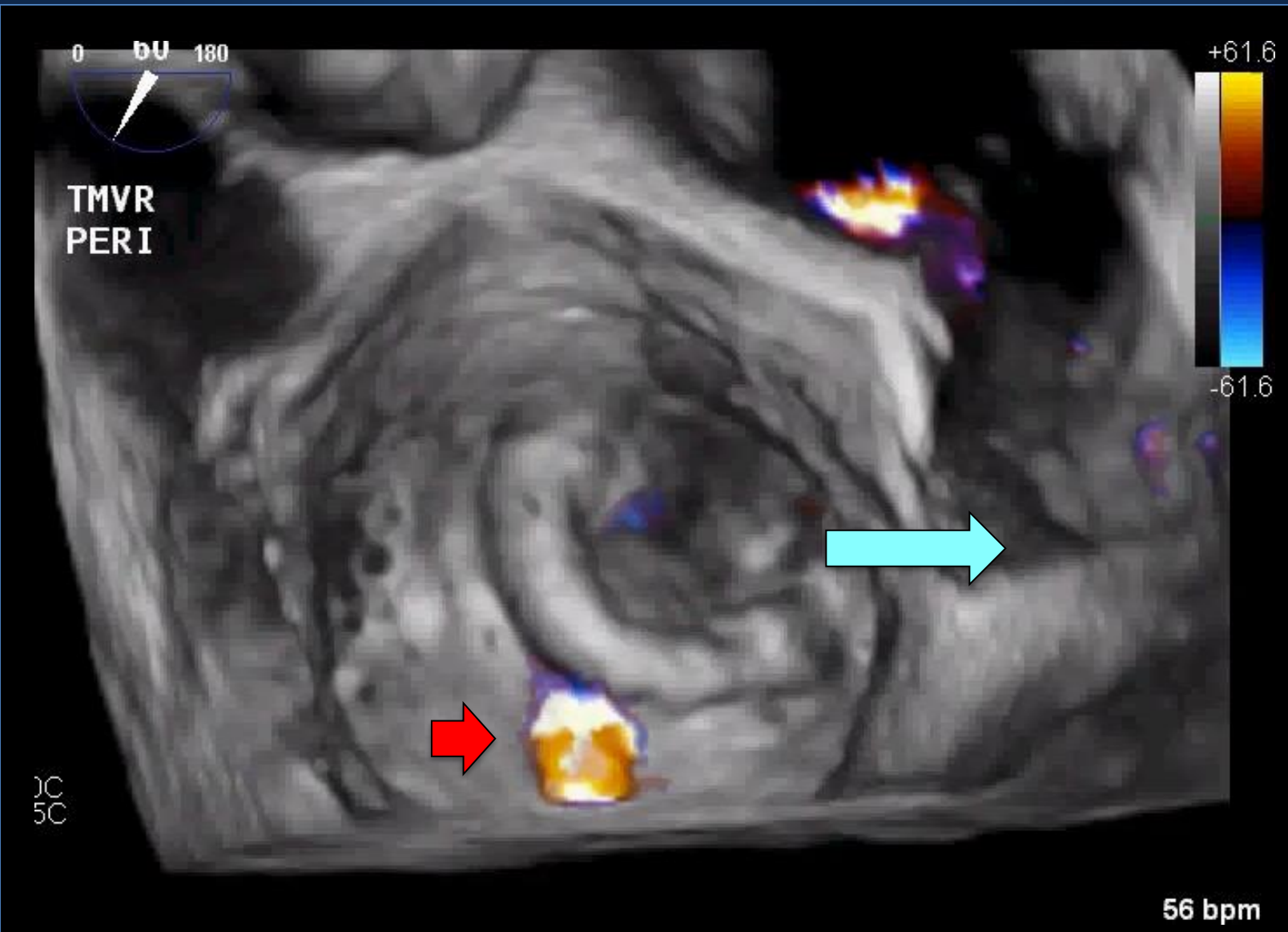

1. Mild PVL
2. Left to Right Shunt

Disney Finish

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Stephen King Finish

HOUSTON Methodist
DEBAKEY HEART & VASCULAR CENTER

2 months later – increasing dyspnea

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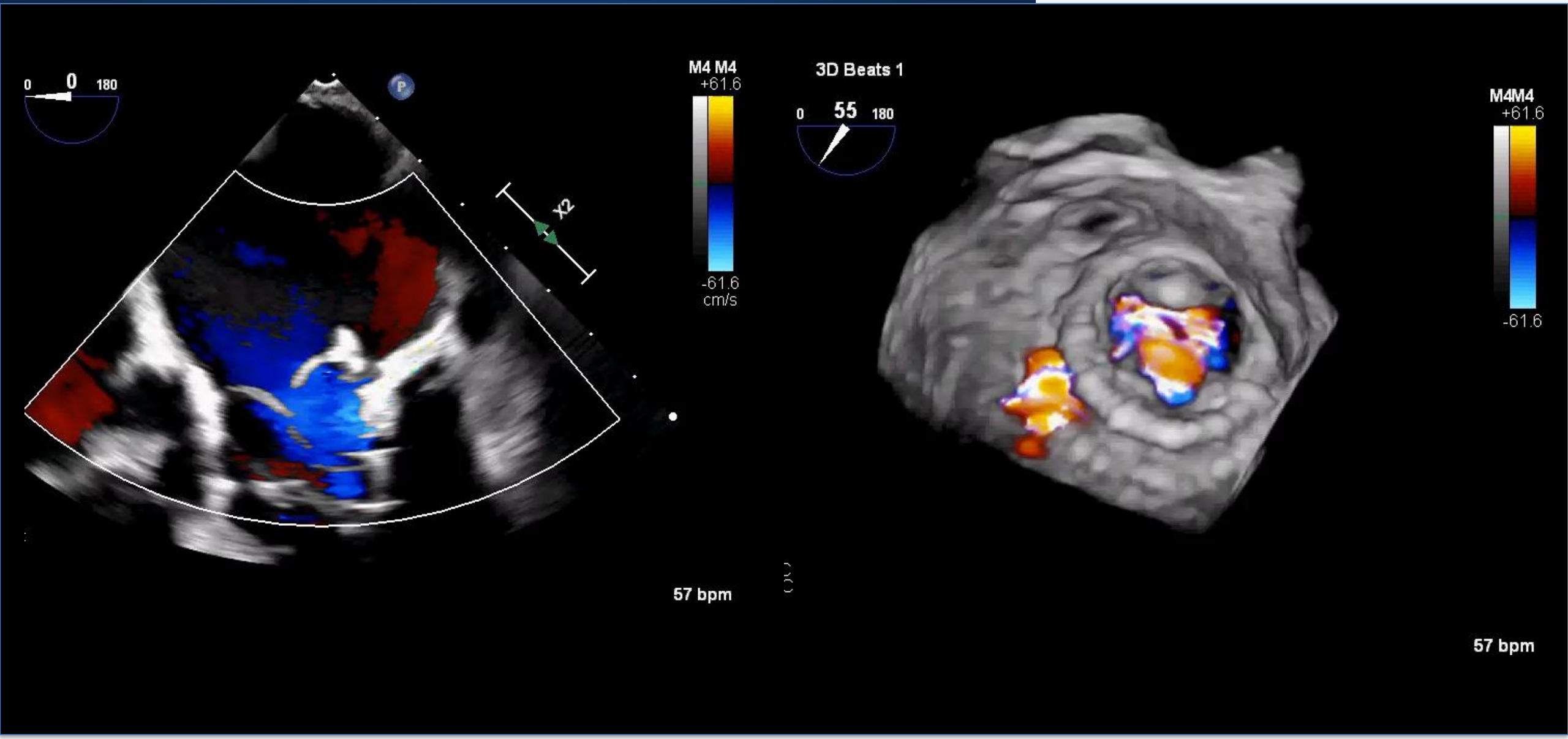

PVL repair → AVP II deployed

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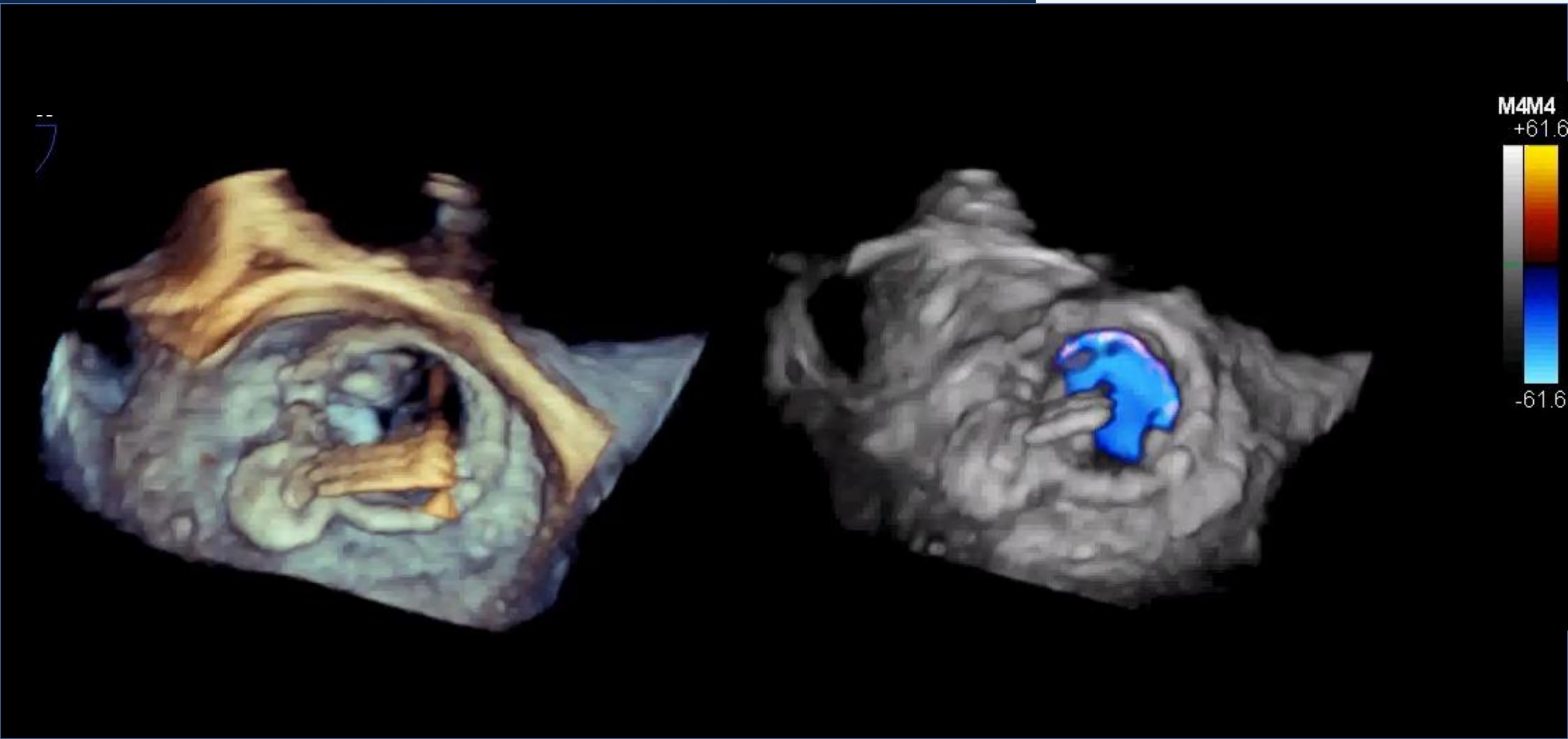

Plug deployed through THV frame

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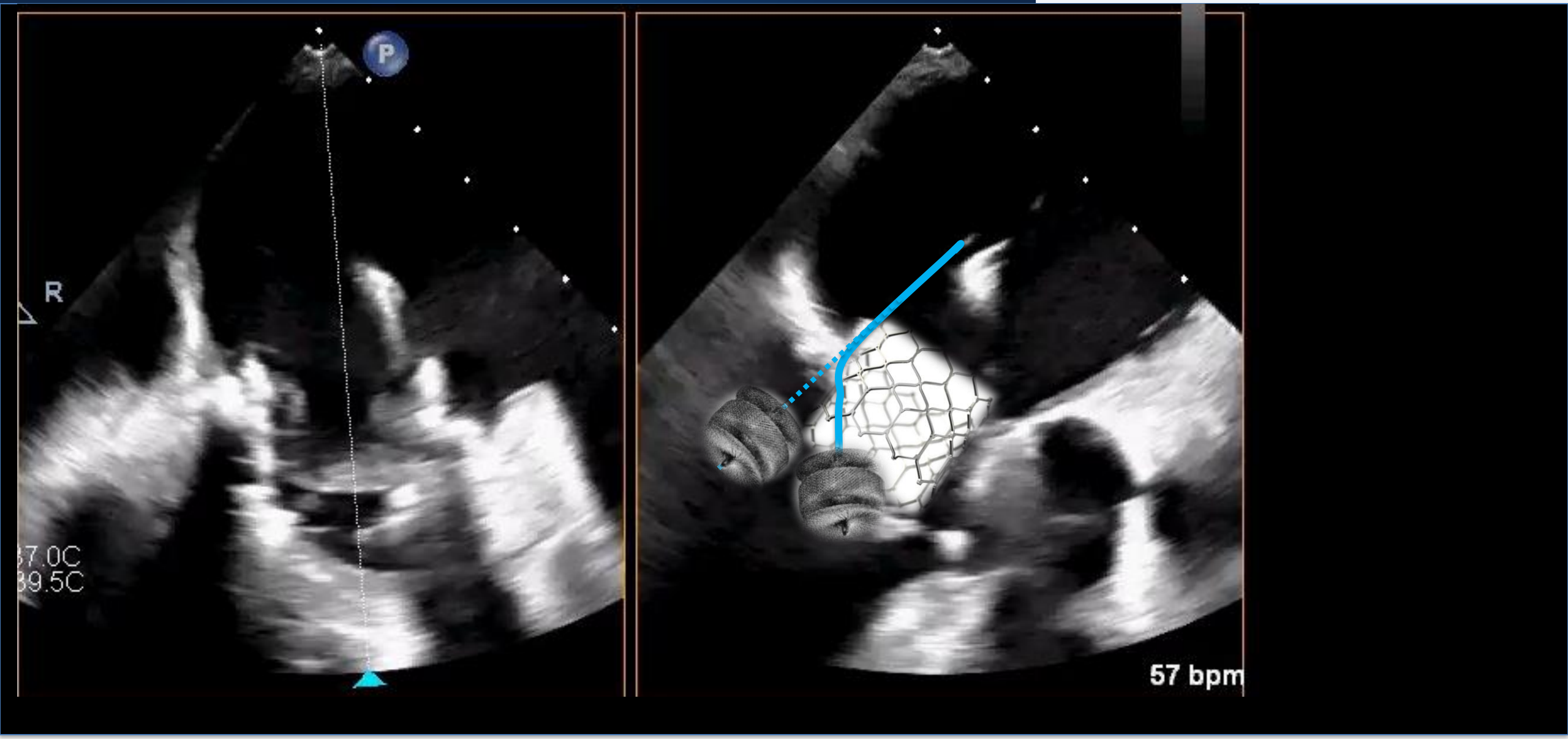

Large ASD: New Right →Left Shunt

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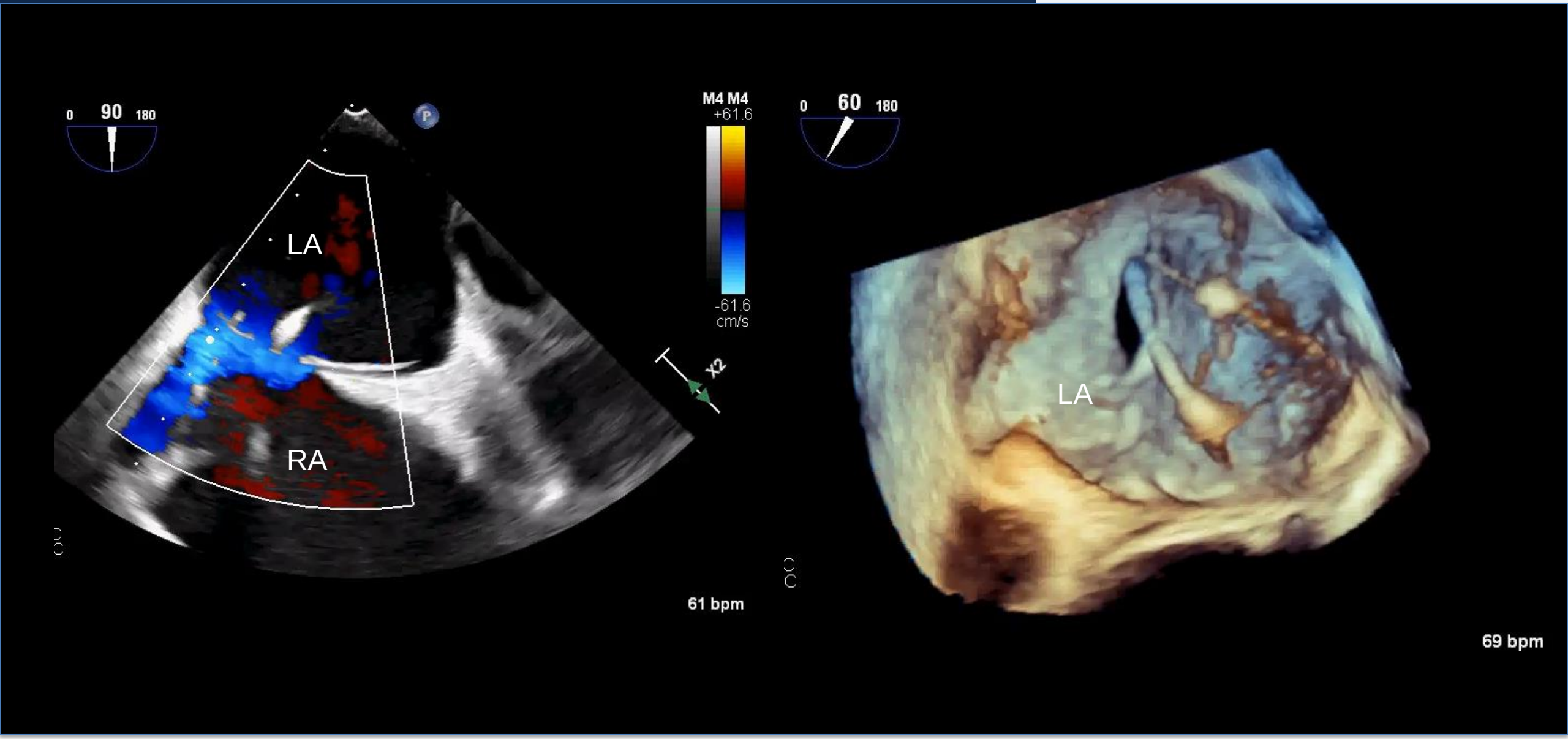

Worsening Hemodynamic Status

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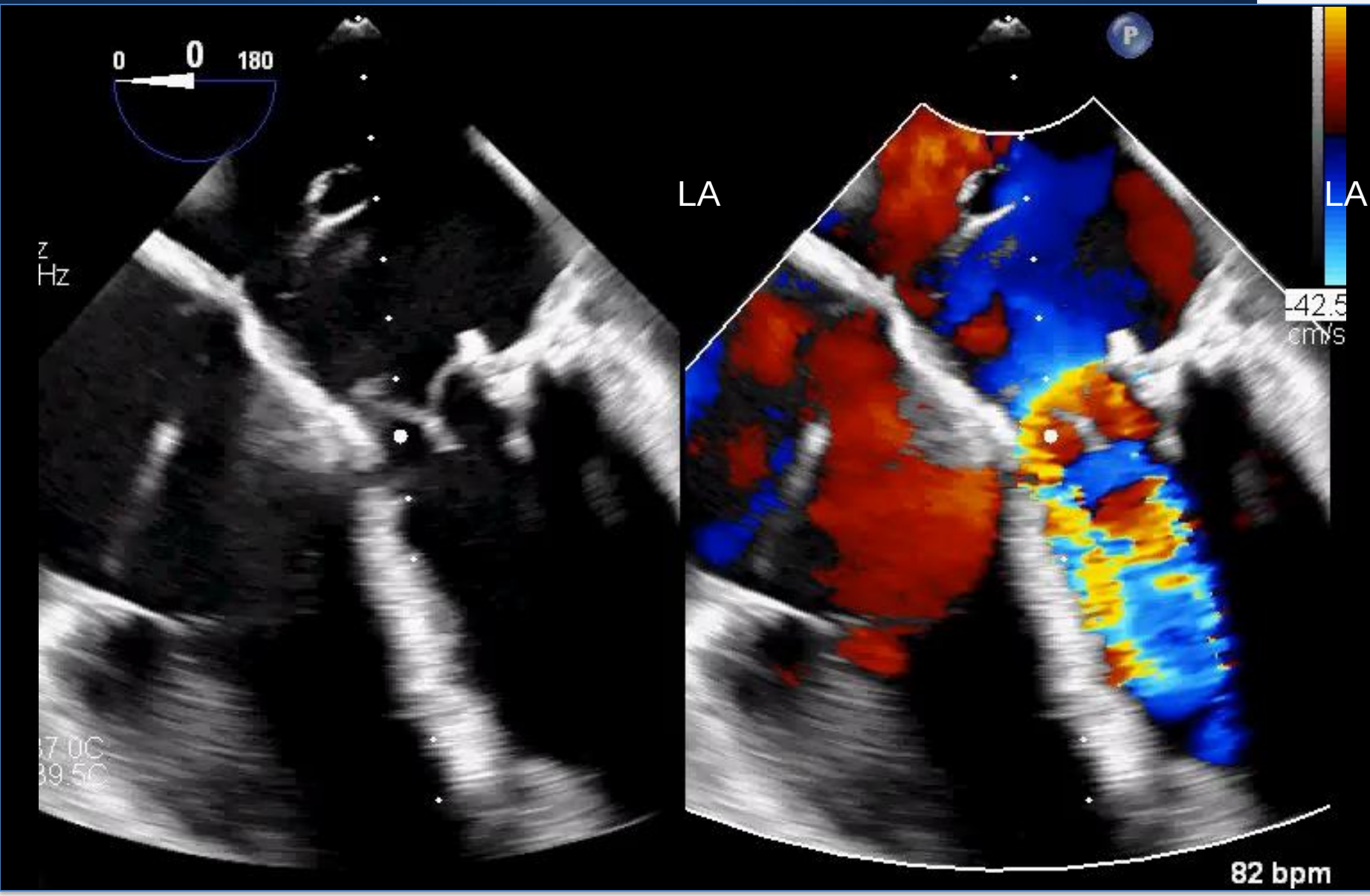

1. PVL still bad
2. TR much worse
3. RV more dilated with terrible systolic function

Helical ASD Occluder Deployed

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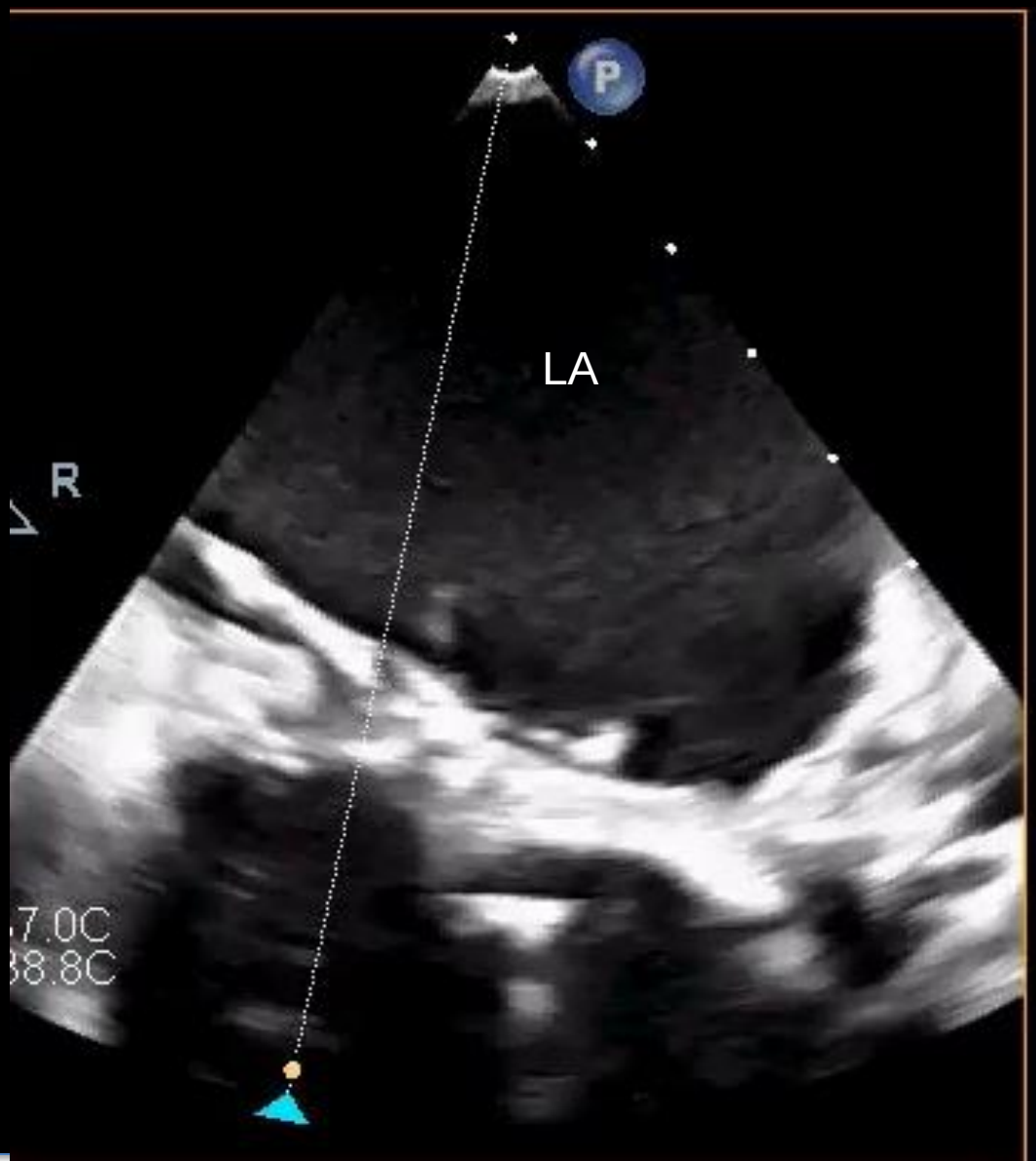
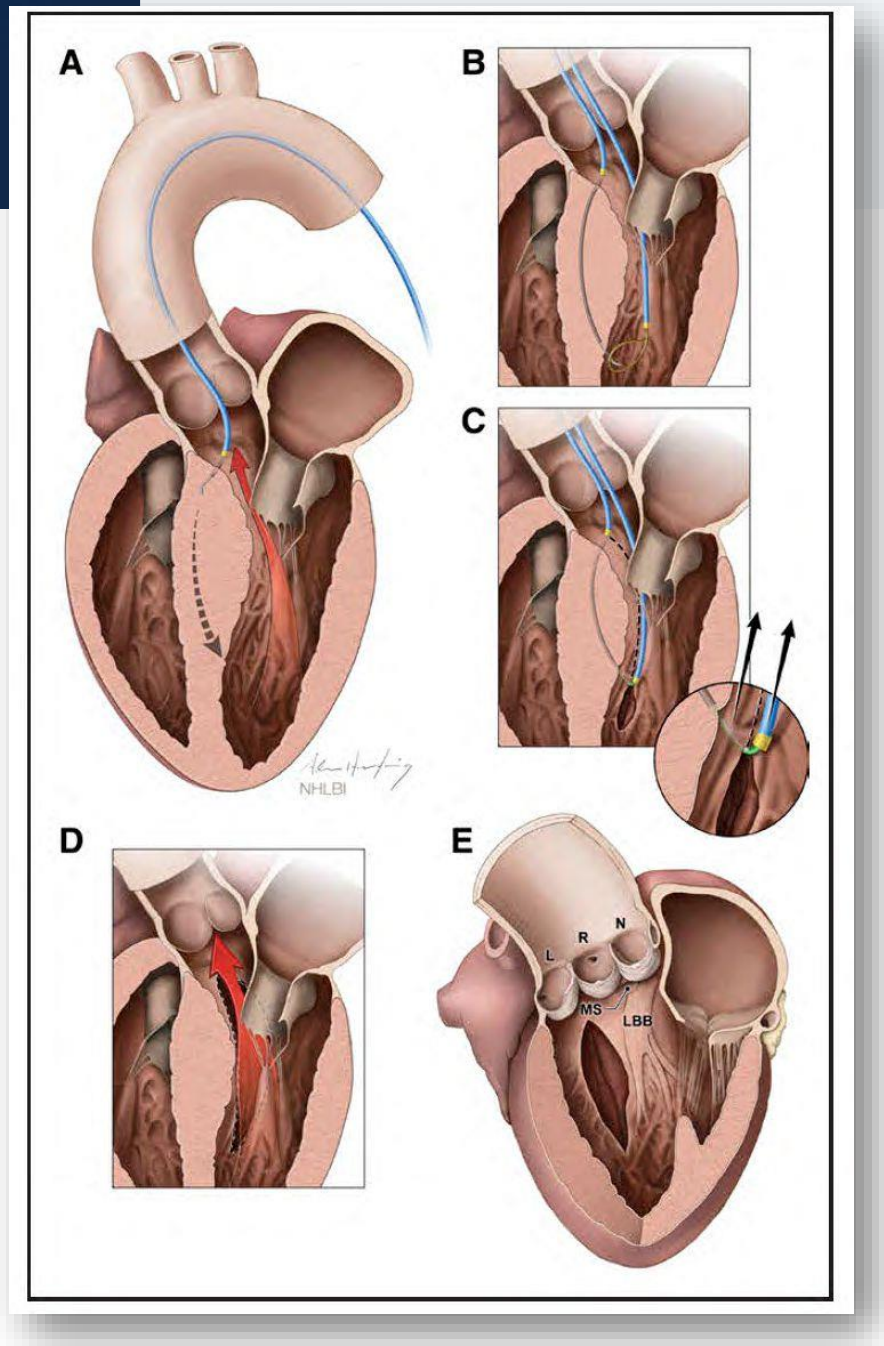



SESAME

Open SESAME

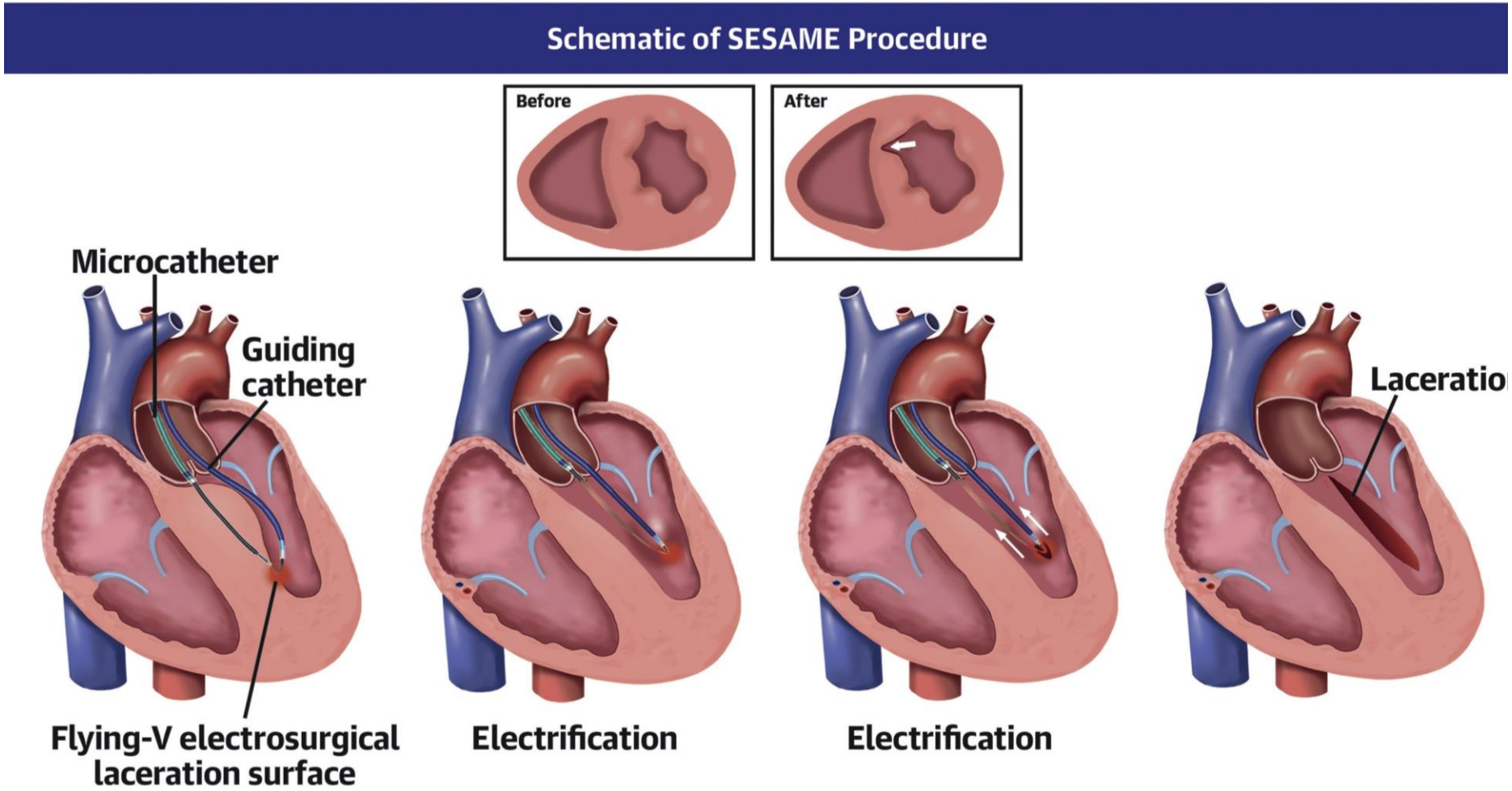
SESAME procedure involves advancing catheters retrograde across the aortic valve and applying radiofrequency energy to lacerate the myocardium and create a myotomy trough.



Septal Scoring Along Mid-line Endocardium = SESAME

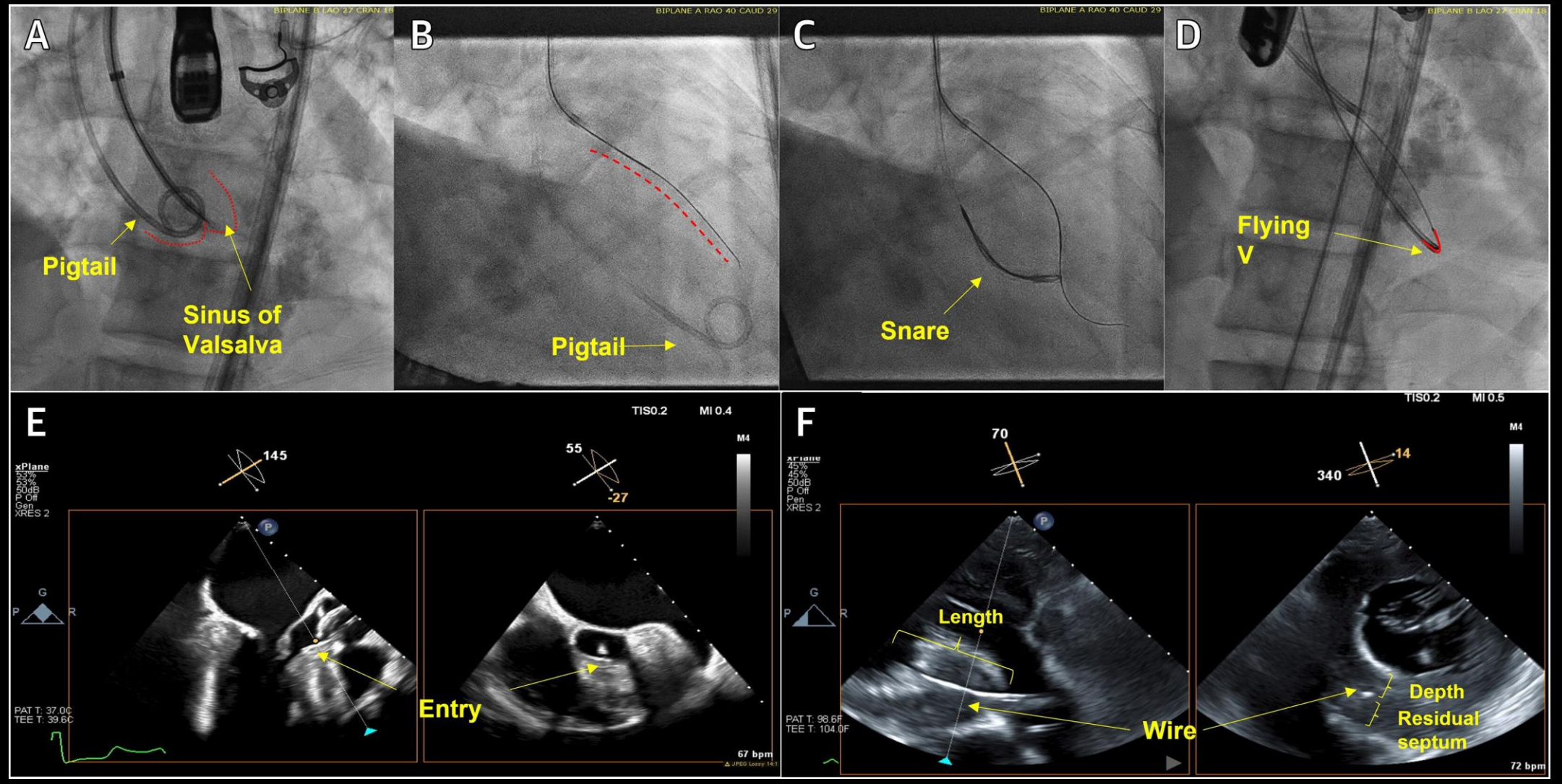
SESAME PROCEDURE

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER



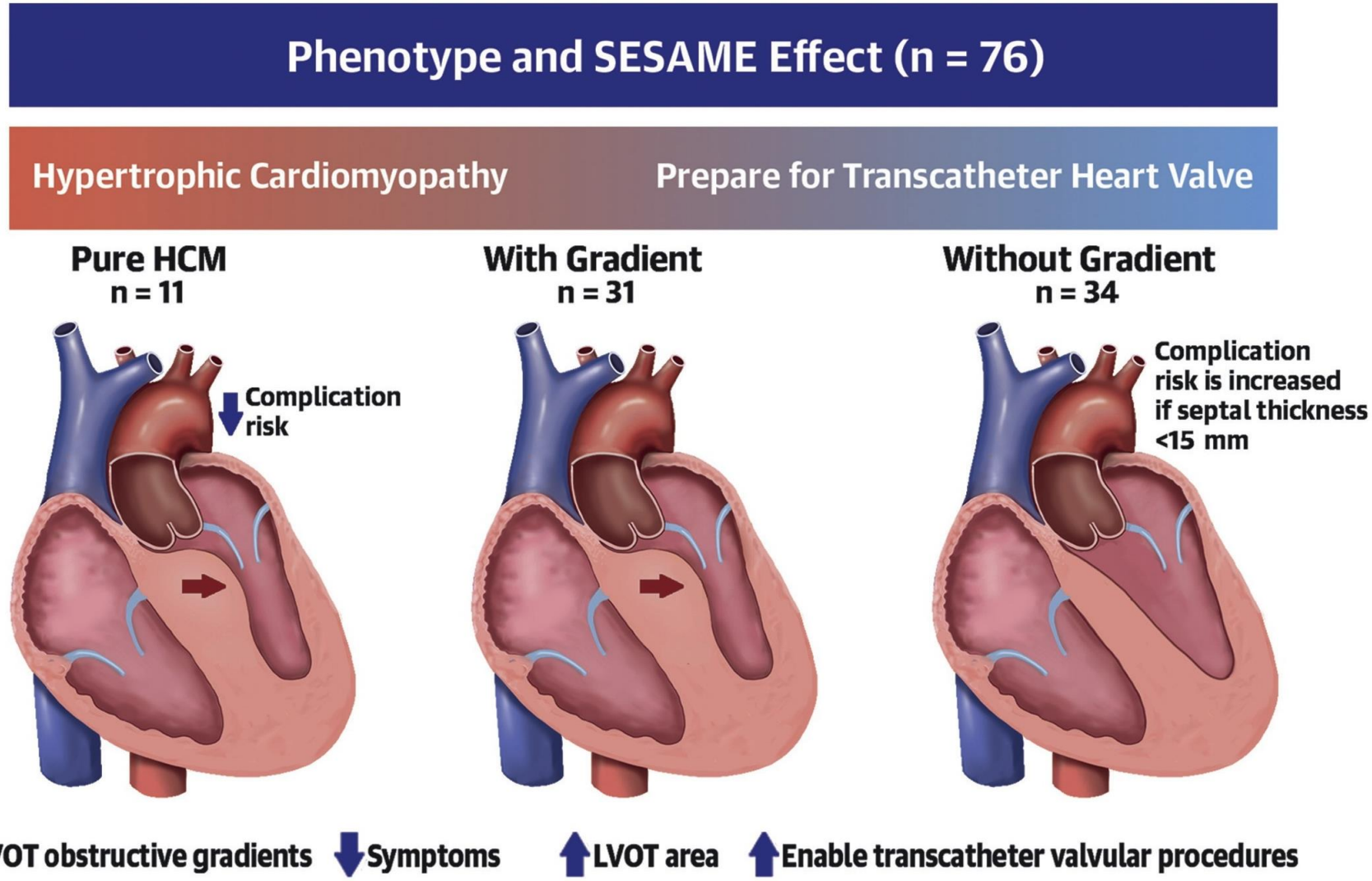
Greenbaum AB, et al. J Am Coll Cardiol. 2024;83(14):1257-1272.

Guiding SESAME



Greenbaum et al. JACC. 2024

Open SESAME



2.6 % mortality
30% major complication

Greenbaum AB, et al. J Am Coll Cardiol. 2024;83(14):1257-1272.

The era of percutaneous, image-guided, electrosurgery for structural heart disorders!

The Heart Valve Team Imager

What does the team need from you?

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

Job description

– Before; during; after intervention

Characteristics

– Cautious, flexible, detailed, selective leader

Knowledge

– Know the patient; know the procedure;

– know the alternatives

Commitment

– Establish a funding model

– Follow the patient outcome; know the team outcomes

The Concept of Level III-SHD

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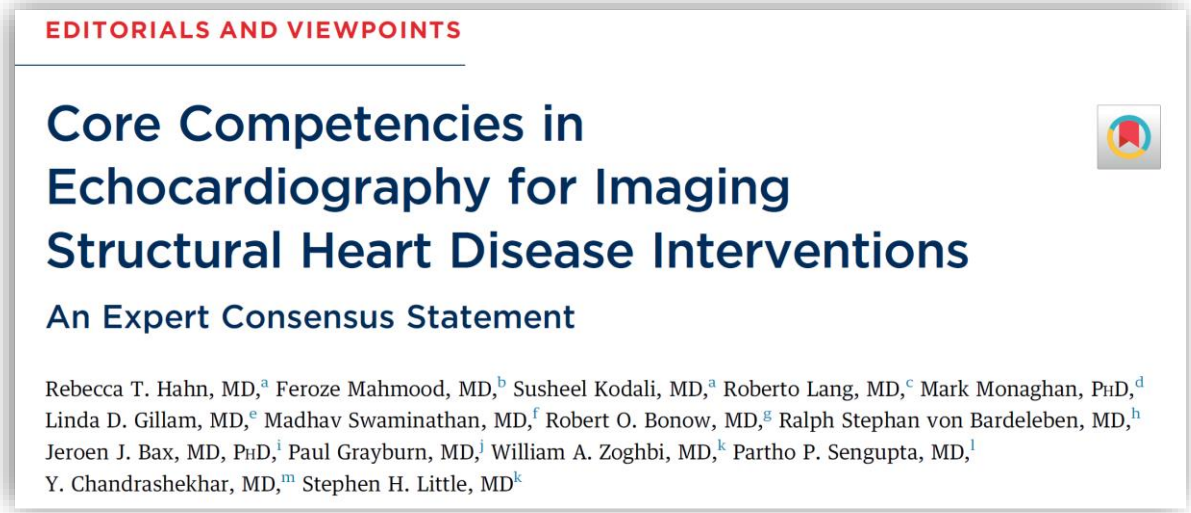
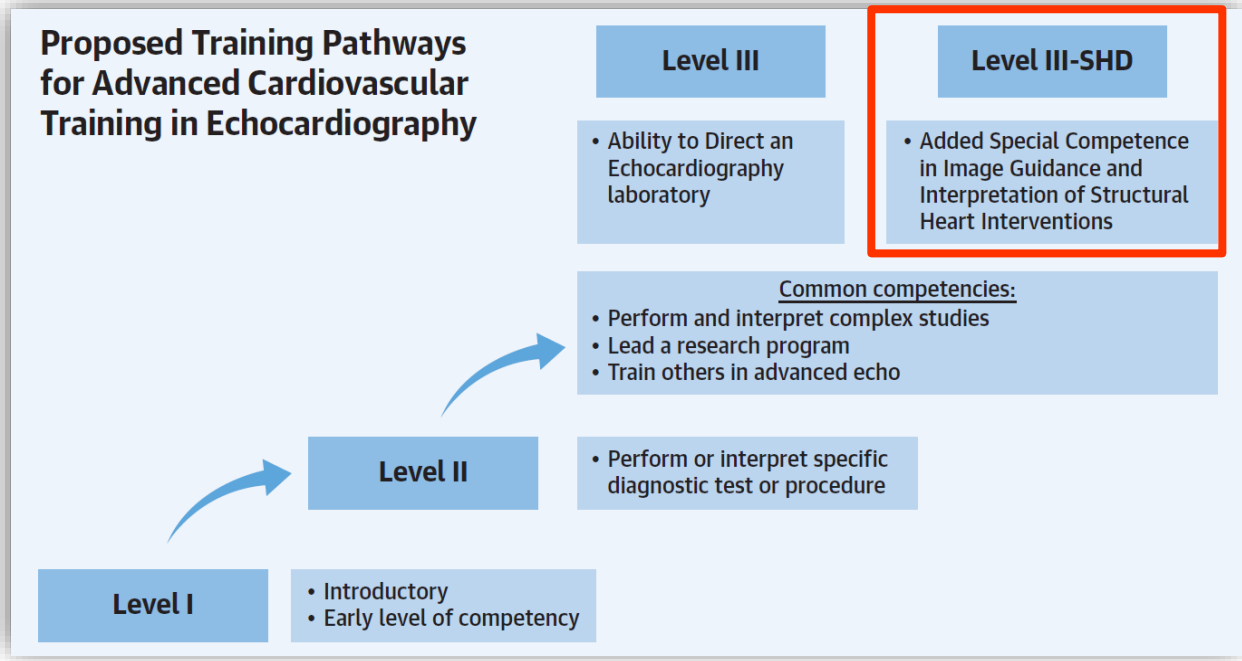


EDITORIALS AND VIEWPOINTS

Core Competencies in Echocardiography for Imaging Structural Heart Disease Interventions

An Expert Consensus Statement

Rebecca T. Hahn, MD,[a] Feroze Mahmood, MD,[b] Susheel Kodali, MD,[a] Roberto Lang, MD,[c] Mark Monaghan, PhD,[d] Linda D. Gillam, MD,[e] Madhav Swaminathan, MD,[f] Robert O. Bonow, MD,[g] Ralph Stephan von Bardeleben, MD,[h] Jeroen J. Bax, MD, PhD,[i] Paul Grayburn, MD,[j] William A. Zoghbi, MD,[k] Partho P. Sengupta, MD,[l] Y. Chandrashekhar, MD,[m] Stephen H. Little, MD[k]



- Distinguish level III-SHD from advanced echocardiography training
- Differences in knowledge and skills required
- Clinical practice may diverge from that of the more traditional echo lab director

Hahn RT, Mahmood F, Kodali S, et al. JACC Cardiovasc Imaging. 2019 Dec;12(12):2560-2570.

GUIDELINES AND STANDARDS

Recommended Standards for the Performance of Transesophageal Echocardiographic Screening for Structural Heart Intervention: From the American Society of Echocardiography

Rebecca T. Hahn, MD, FASE (Chair), Muhamed Saric, MD, PhD, FASE (Co-Chair), Francesco Fulvio Faletra, MD, Ruchira Garg, MD, FASE, Linda D. Gillam, MD, MPH, FASE, Kenneth Horton, ACS, RCS, FASE, Omar K. Khalique, MD, FASE, Stephen H. Little, MD, FASE, G. Burkhard Mackensen, MD, PhD, FASE, Jae Oh, MD, FASE, Nishath Quader, MD, FASE, Lucy Safi, DO, FASE, Gregory M. Scalia, MBBS, FASE, and Roberto M. Lang, MD, FASE, *New York, New York; Lugano, Switzerland; Los Angeles, California; Morristown, New Jersey; Murray, Utah; Houston, Texas; Seattle Washington; Rochester, Minnesota; St. Louis, Missouri; Hackensack, New Jersey; Brisbane, Australia; and Chicago, Illinois*

https://doi.org/10.1016/j.echo.2021.07.006

JASE: VOLUME 35, ISSUE 1, P1-76, JANUARY 01, 2022

TEE Probe Manipulation & levels for imaging

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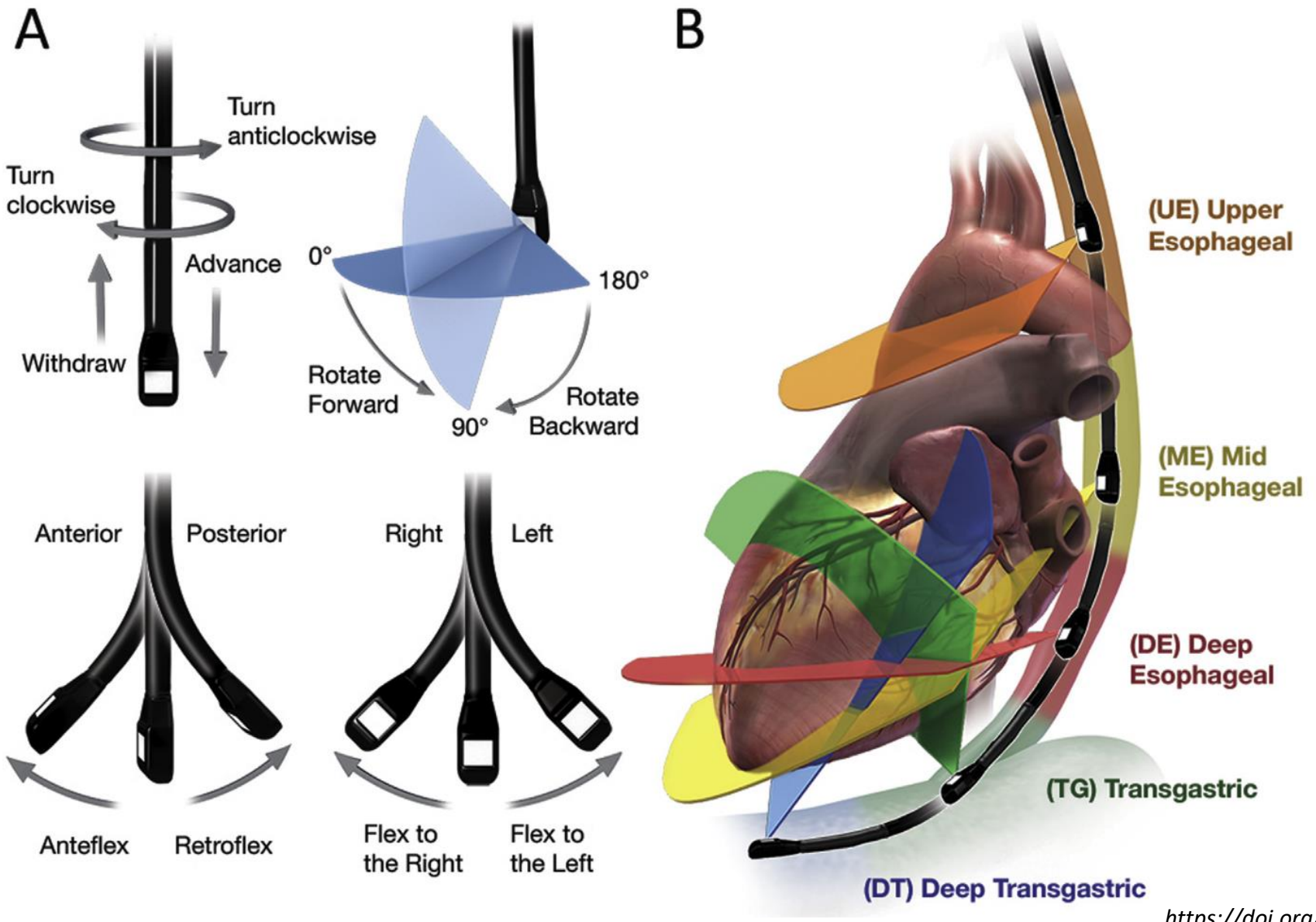


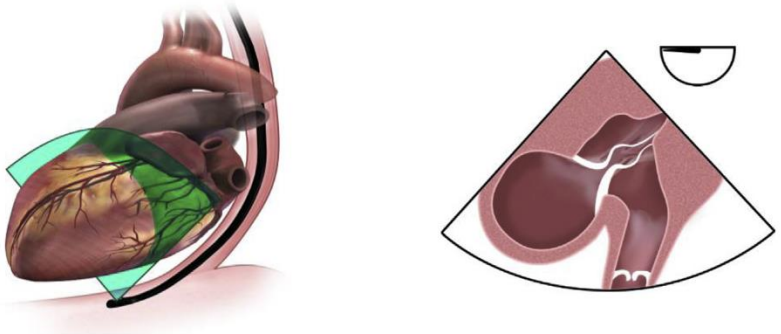
https://doi.org/10.1016/j.echo.2021.07.006

Table 6 (*Continued*)

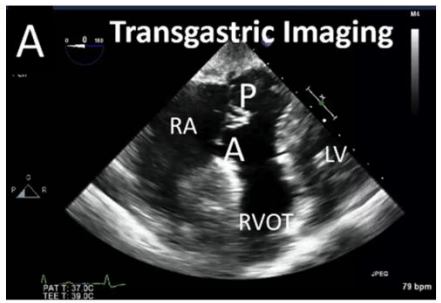
Imaging level: TG

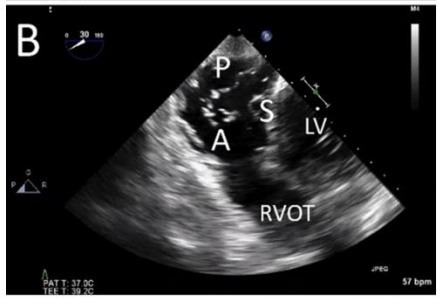
Acquisition protocol:

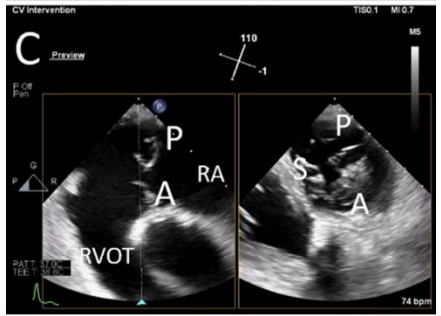
- With both right and anteflexion and rotating the probe clockwise to center the TV in the imaging plane, a two-chamber inflow-outflow view of the right heart is obtained.

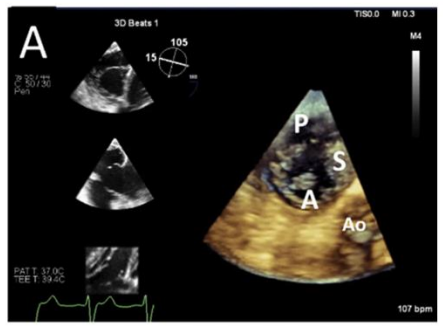


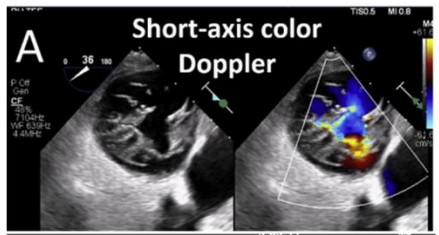
Planar imaging	Volumetric imaging	Functional imaging

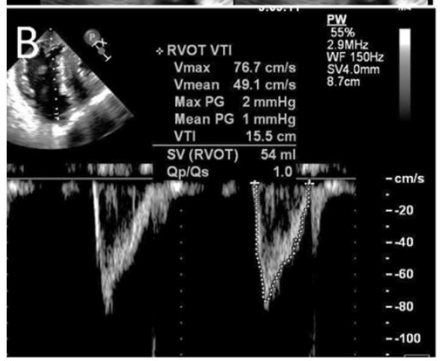


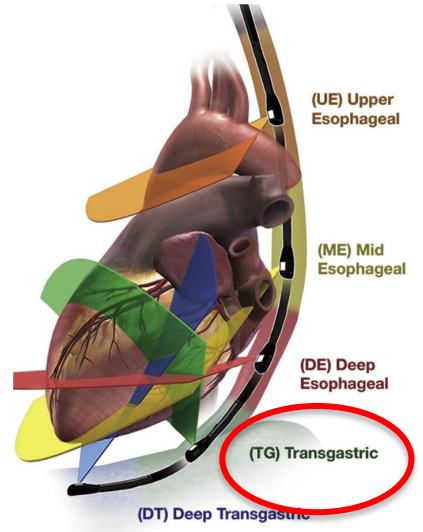












Trans-Gastric Imaging

- Rotation
- x-plane evaluation

TEE screening for TEER

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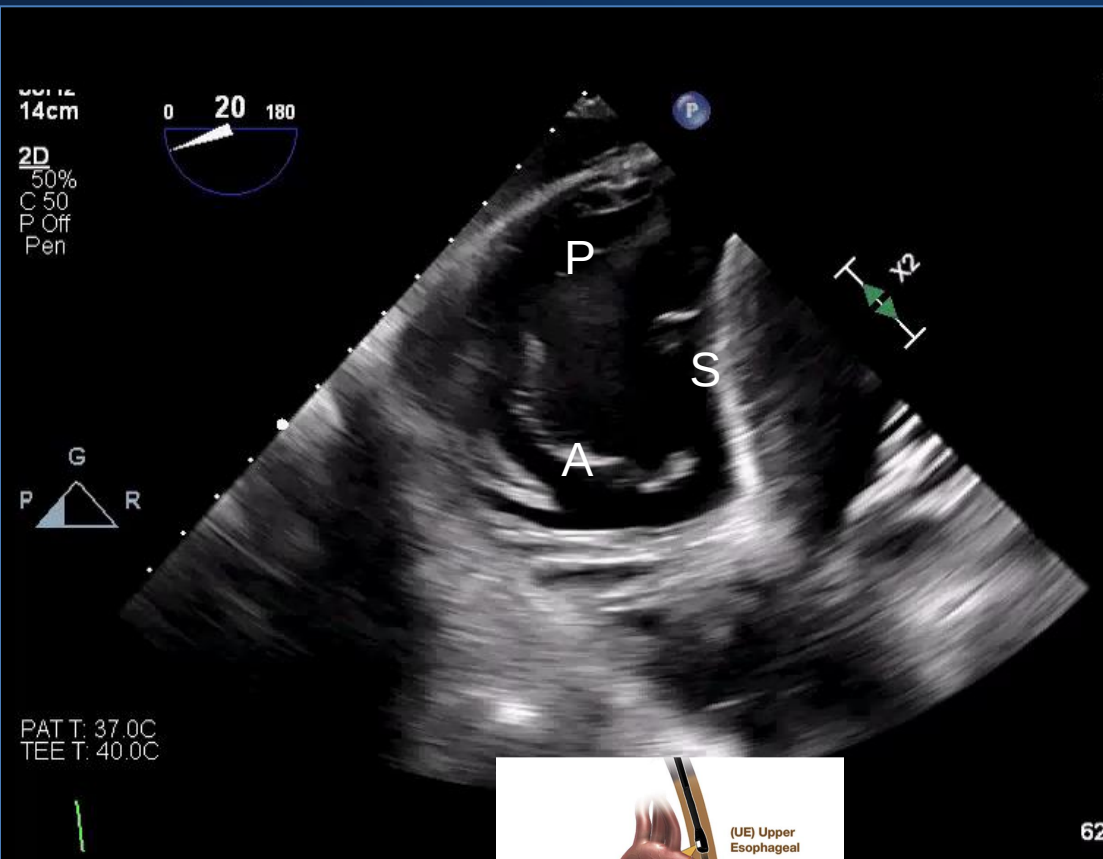

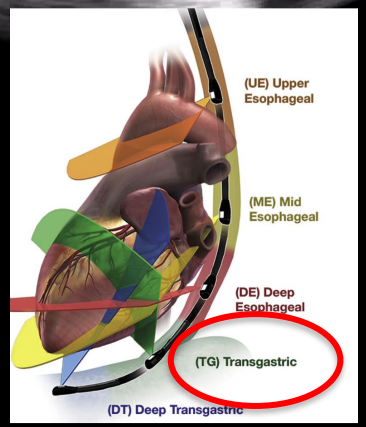

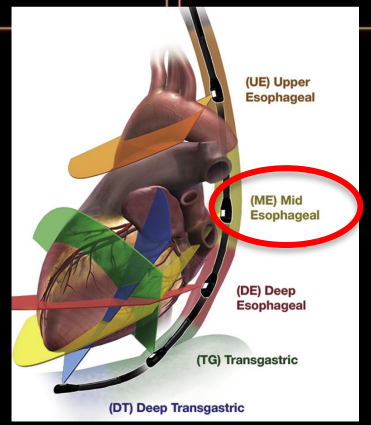

Patient Selection & Device Selection

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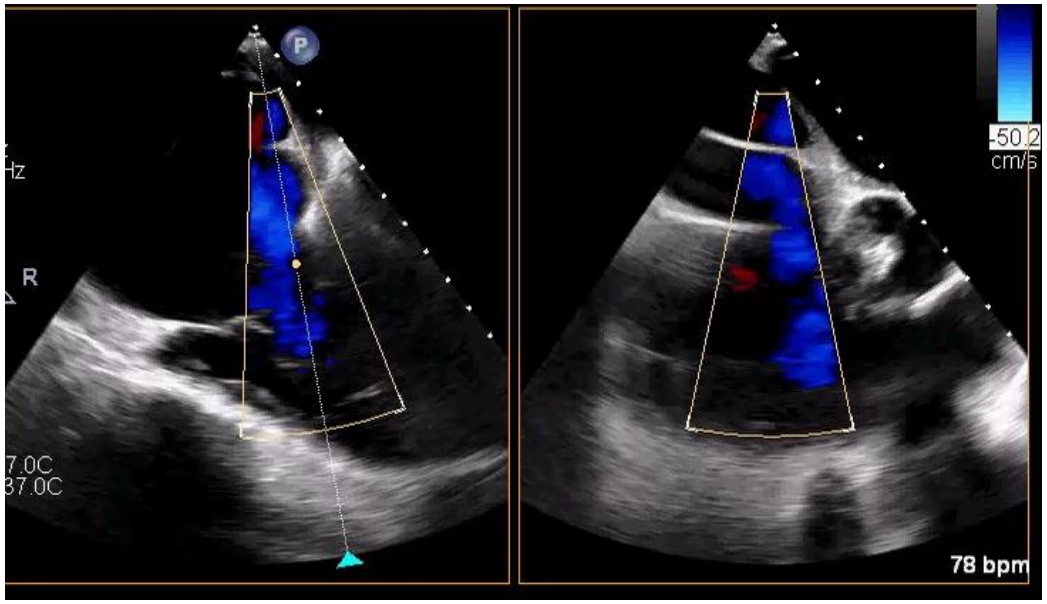
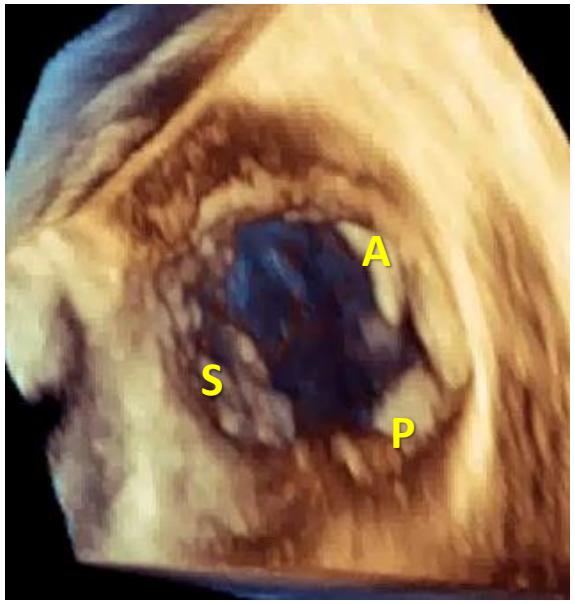
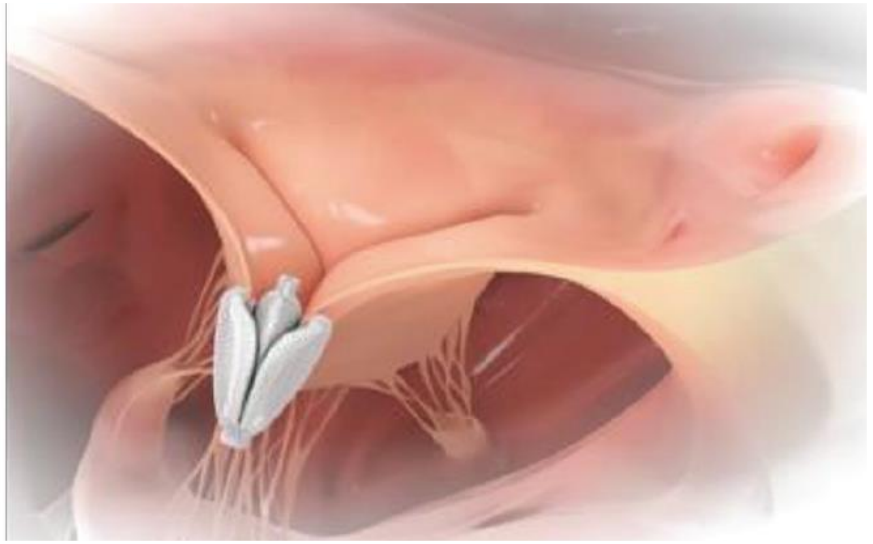




TTVR

TV - TEER



OR

Romero, J. et al. Heart International. 2022;16(1):49–58

New Guidance from ASE

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Recommendations for Special Competency in Echocardiographic Guidance of Structural Heart Disease Interventions: From the American Society of Echocardiography

Stephen H. Little, MD (Co-Chair), Vera H. Rigolin, MD (Co-Chair), Enrique Garcia-Sayan, MD, Rebecca T. Hahn, MD, Judy Hung, MD, G. Burkhard Mackensen, MD, PhD, Sunil Mankad, MD, Nishath Quader, MD, and Muhamed Saric, MD, PhD, *Houston, Texas; Chicago, Illinois; New York, New York; Boston, Massachusetts; Seattle, Washington; Rochester, Minnesota; and St. Louis, Missouri*

Transcatheter therapies for structural heart disease continue to grow at a rapid pace, and echocardiography is the primary imaging modality used to support such procedures. Transesophageal echocardiographic guidance of structural heart disease procedures must be performed by highly skilled echocardiographers who can provide rapid, accurate, and high-quality image acquisition and interpretation in real time. Training standards are needed to ensure that interventional echocardiographers have the necessary expertise to perform this complex task. This document provides guidance on all critical aspects of training for cardiology and anesthesiology trainees and postgraduate echocardiographers who plan to specialize in interventional echocardiography. Core competencies common to all transcatheter therapies are reviewed in addition to competencies for each specific transcatheter procedure. A core principle is that the length of interventional echocardiography training or achieved procedure volumes are less important than the demonstration of procedure-specific competencies within the milestone domains of knowledge, skill, and communication.

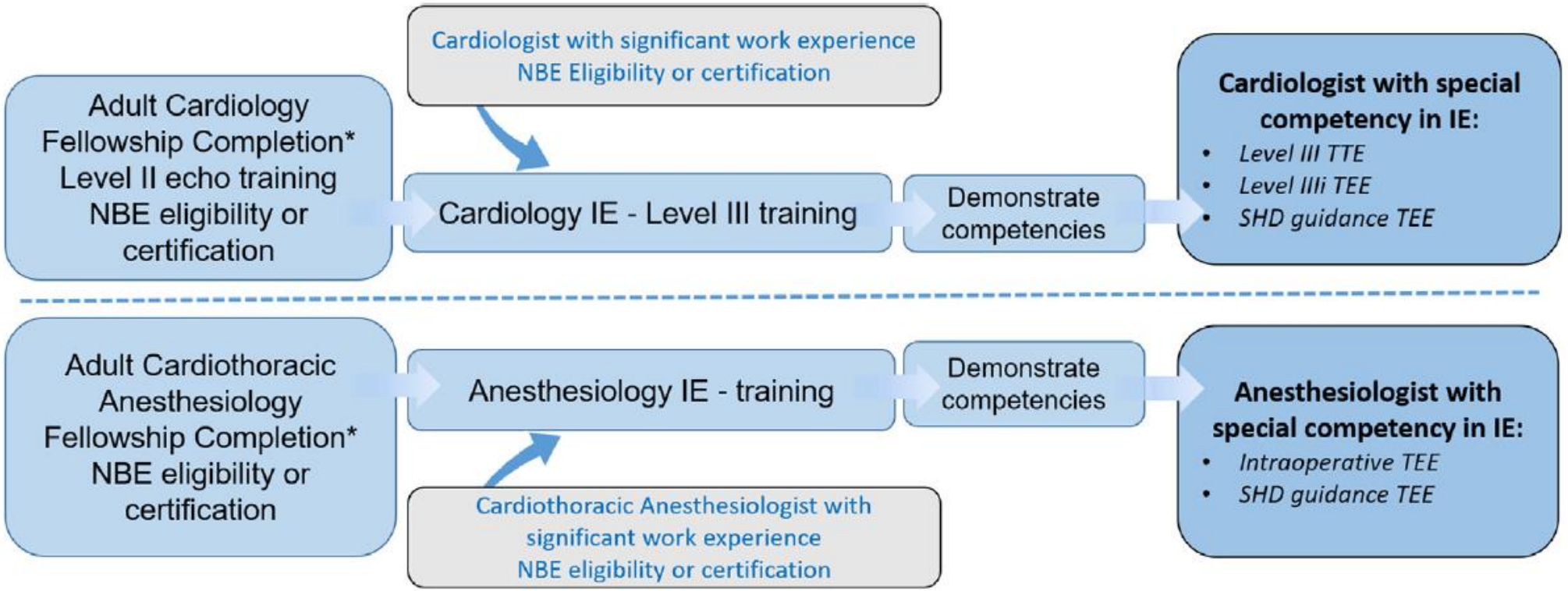
Keywords: Interventional echocardiography, Structural heart disease, Echocardiography training

Interventional Echo Training

- Institution requirements
- Defined training pathways (cardiology and CV anesthesiology)
- Competencies defined
  - Knowledge based
  - Performance based
- Training duration
- Procedure volumes

Little SH, Rigolin VH, Garcia-Sayan E, et al. J Am Soc Echocardiogr. 2023.

IE training pathways



*ACGME or international equivalent

Figure 4 Training pathways to achieve level III IE competency.

Little SH, Rigolin VH, Garcia-Sayan E, et al. J Am Soc Echocardiogr. 2023.

IE training requirements

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Table 6 Prerequisite general competencies of the IE trainee

- Know the basic principles of echocardiography, physics, artifacts, and best practices for image optimization for both 2D and 3D echocardiography
- Know the use of 2D and 3D and Doppler echocardiography to evaluate native and prosthetic valve disease, basic adult congenital heart disease (including atrial and ventricular septal defects), and imaging of LAA
- Know the standard views included in a comprehensive TEE for SHD assessment[11]
- Skill to independently perform comprehensive diagnostic or perioperative 2D, 3D, and Doppler TEE[12,13]
- Skill to independently perform 3D transesophageal echocardiographic image acquisition, cropping, and postprocessing[14]
- Skill to identify the potential complications of and how to manage them[12]
- Skill to effectively communicate detailed information on cardiac anatomy periprocedurally and intraprocedurally in addition to collaborating in interdisciplinary cardiovascular care teams

Table 8 Minimum procedural volume typically necessary for the development and demonstration of level III IE[3]

Procedure/technical skill	Number*
Echocardiographic guidance of interventional procedures,† which include	75
Structural valvular interventions‡	30
Transseptal catheterization guidance	10
Percutaneous closure of septal defects and perivalvular leaks	15
Alcohol septal ablation	10
Placement of devices to exclude the LAA	10
Intraoperative TEE, which includes	75
Surgical valve repair or replacement	50
Ventricular assist device placement and assessment	20
ICE	10

*Numbers are based on consensus; are intended as general guidance, on the basis of the educational needs and progress of typical level III echocardiography trainees; and represent the cumulative

Little SH, Rigolin VH, Garcia-Sayan E, et al. J Am Soc Echocardiogr. 2023.

Guidelines coming soon...

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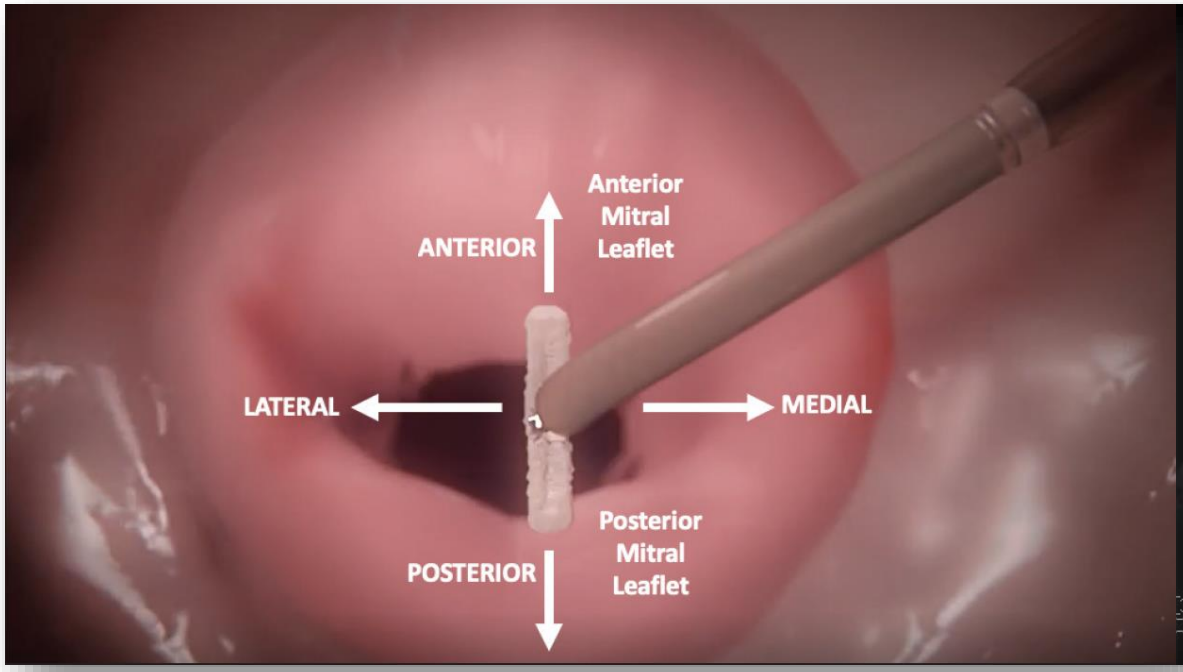
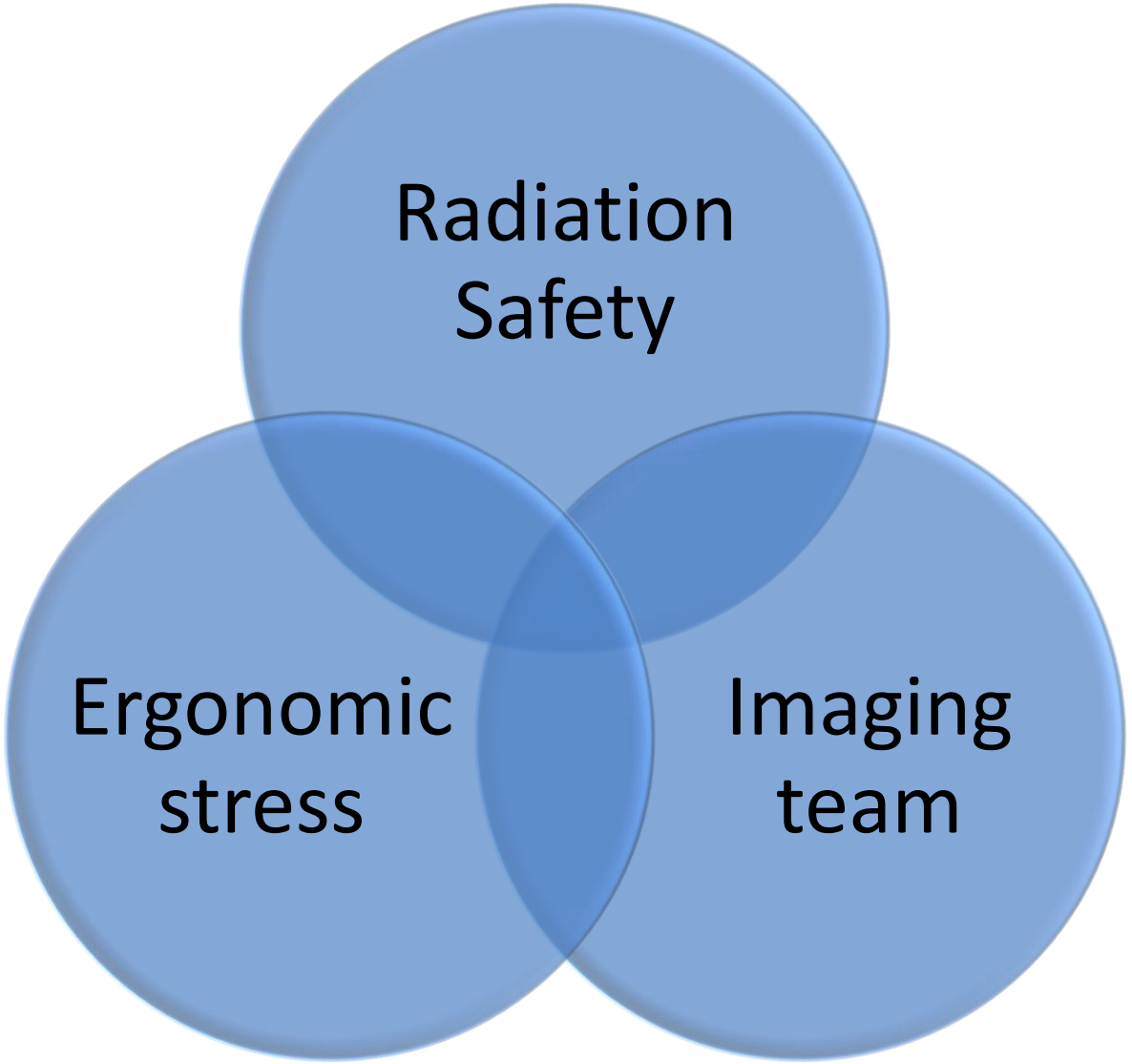
ASE recommendations for the performance of Mitral Valve Transcatheter Edge-to-Edge Repair (MV-TEER)



Cath lab considerations



Photon Scatter: Simulation

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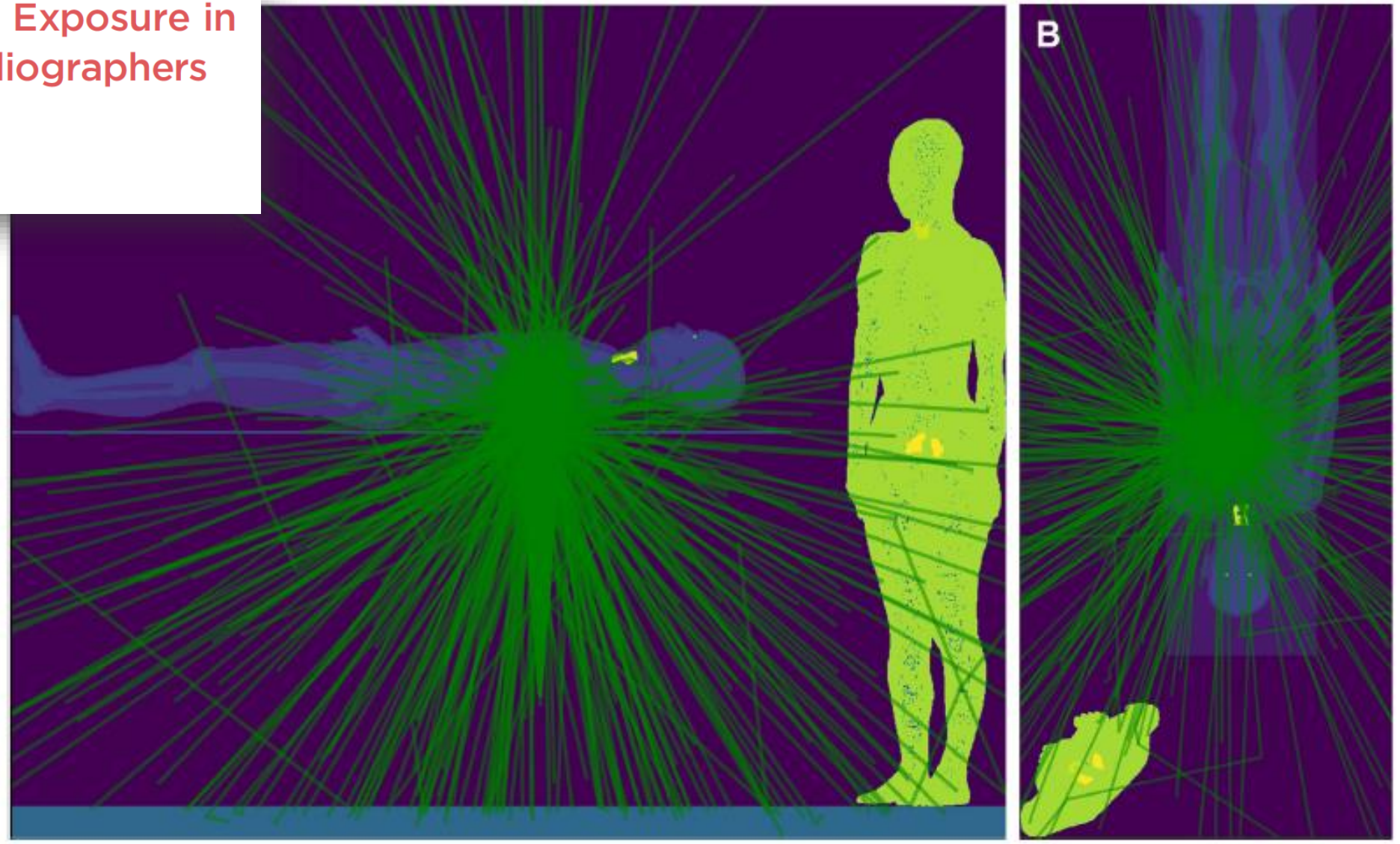
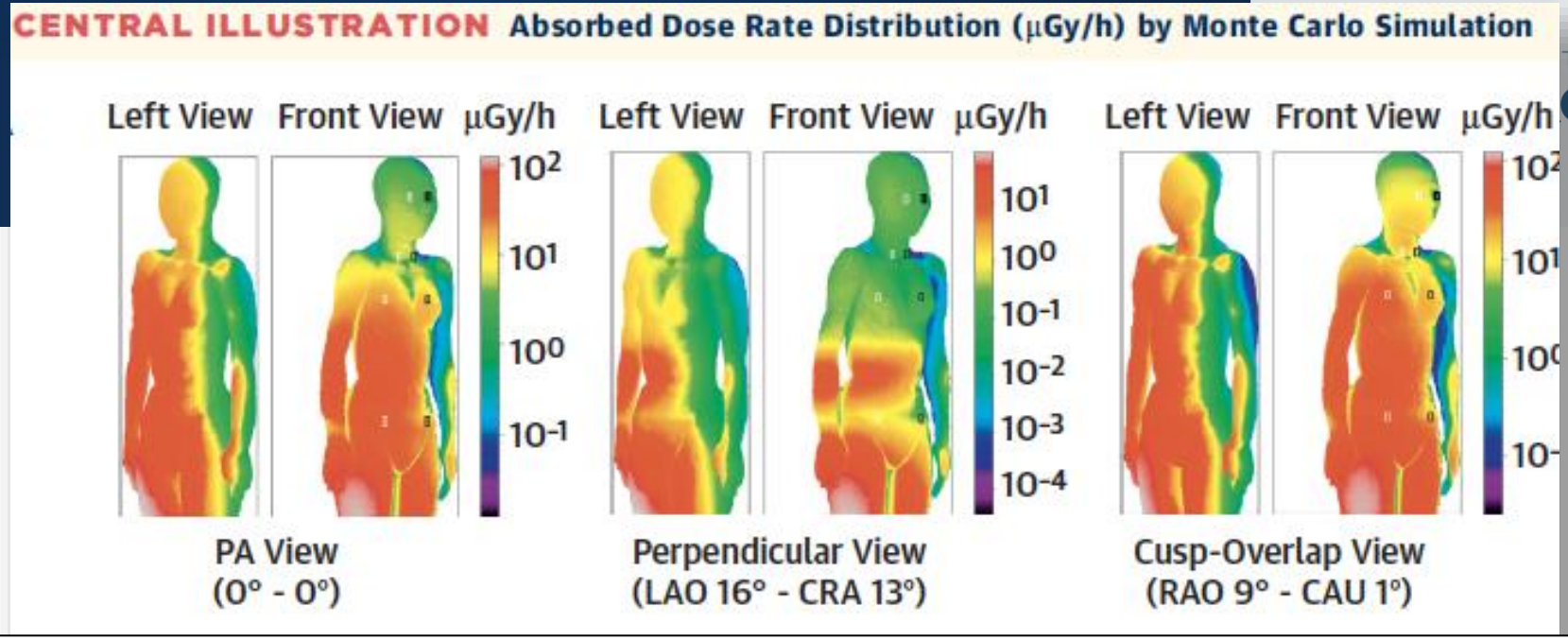
Body Surface Radiation Exposure in Interventional Echocardiographers During Structural Heart Disease Procedures



Kataoka et al. JACC: Asia 2023



1. During SHD procedures, the right waist and lower body of interventional echocardiographers were exposed to high radiation does.
2. Interventional echocardiographers, especially young women, should be educated regarding radiation exposure.
3. Advancement in radiation shield protection is needed.

JACC: Asia 2023

Radiation Exposure to IE and Sonographers: A call to action

HOUSTON Methodist DEBAKEY HEART & VASCULAR CENTER

Enrique Garcia-Sayan, MD, Nishath Quader, MD, et al. JASE (in press) 2024

Interventional Echo is a CV subspeciality

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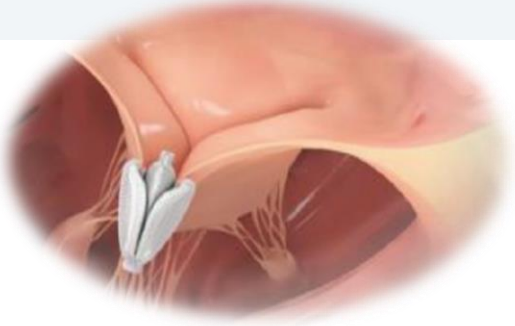

- Recognize the mechanism and severity of valve dysfunction
- MV-TEER patient selection is key; TMVR- is challenging
- TV-TEER and TTVR is *now* being done commercially
- Evaluation of TR has improved, and imaging expectation have increased! *(ASE Guidelines – 2021 & 2023)*
- Percutaneous electrosurgery for SHD is a seismic advance
- New training guidelines define competency for IE

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