SUICIDE VENTRICULE POS-TAVR

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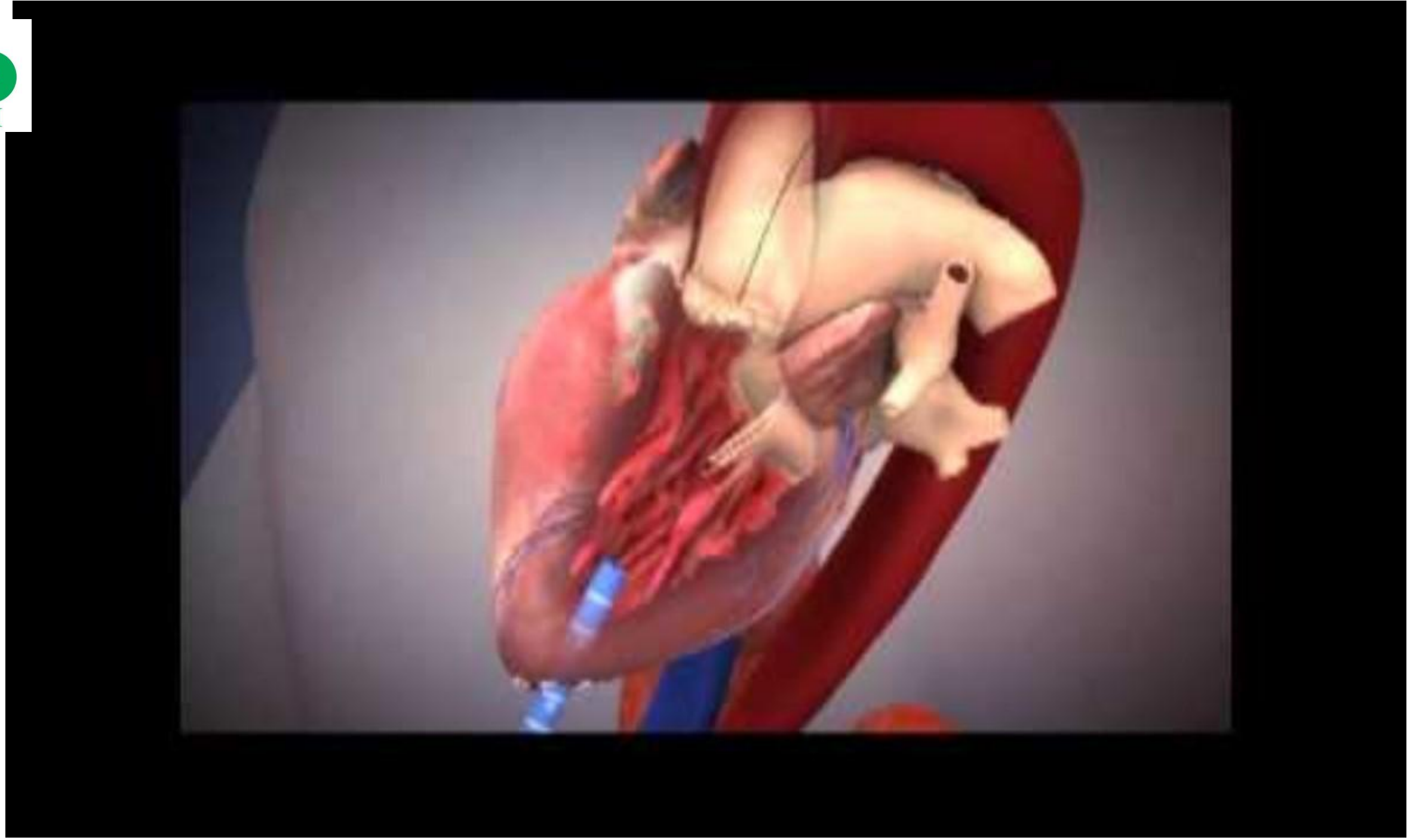
INTRODUÇÃO

- Obstrução dinâmica da LVOT : CMH/ EAo (sobrecarga crônica de pressão);

- VE se adapta ao aumento crônico da pós-carga na EAo --> alívio instantâneo do GTV após a TAVI --> redução abrupta e significativa da pós-carga --> hipercontratilidade do VE e a gradiente intraventricular dinâmico (DIG) --> colapso circulatório resistente --> **"ventrículo esquerdo suicida".**



Suicide Left Ventricule as a Cause of Hemodynamic Collapse Post-TAVR

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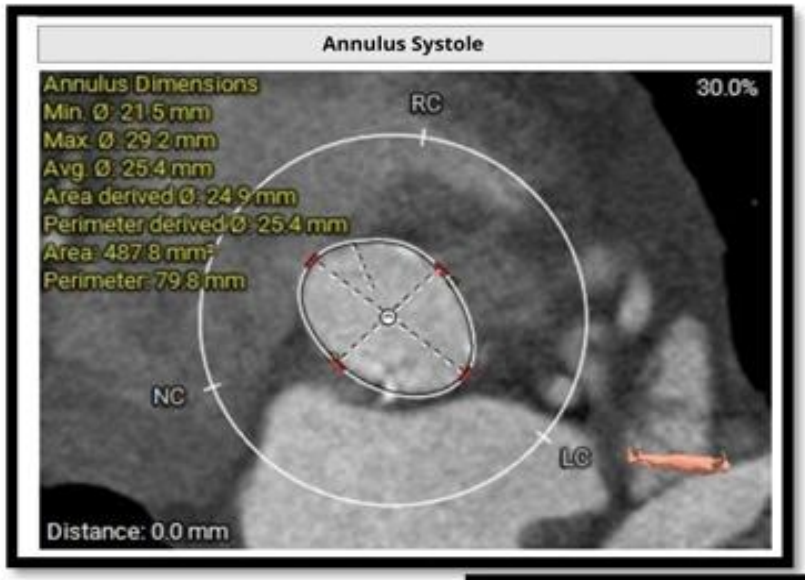
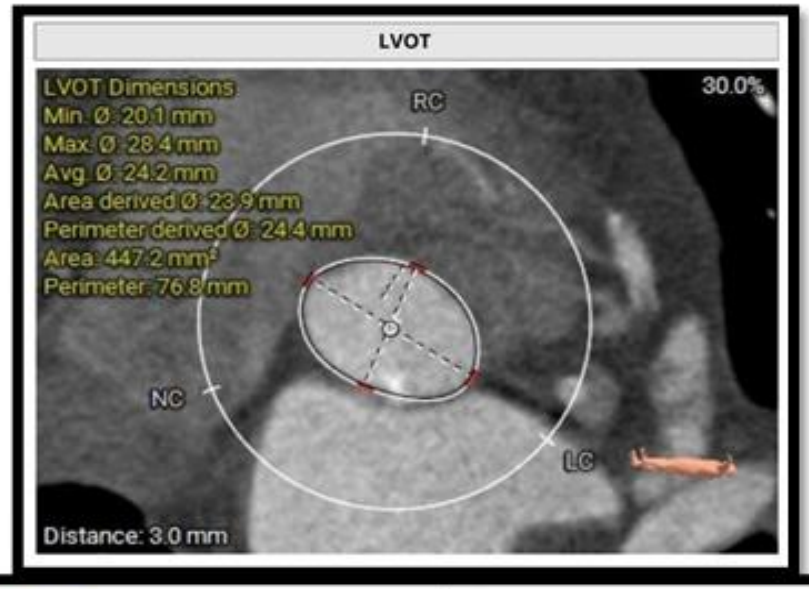
Clinical Case

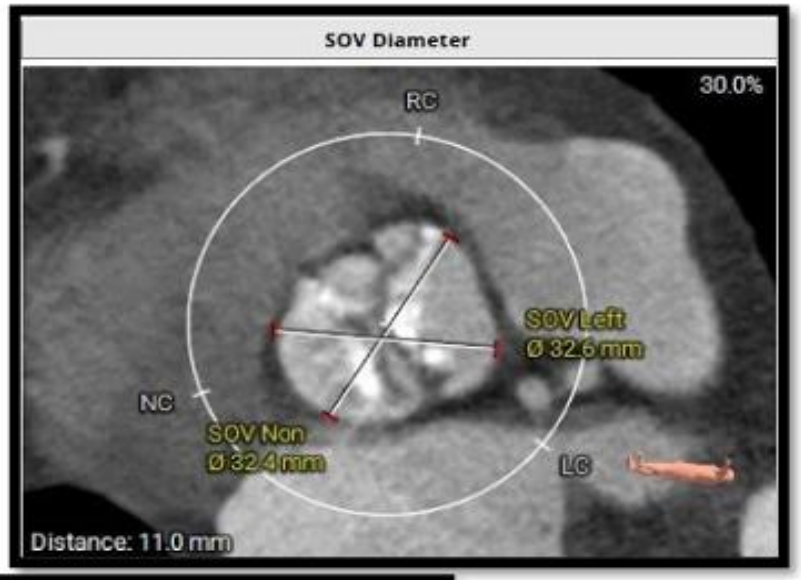
71-year-old female – severe symptomatic AS ACC Stage D1 – DOE/exertional fatigue x 3 months, NYHA III

- PMH: HTN, DMT2, treatment with metoprolol 100mg BID, insulin 30UI
- BMI: 31 BSA 1.89
- Laboratories: hct 33 platelets 230, creat 1.1 PBNP 1450
- EKG: left ventricle hypertrophy, pr segment 160ms, no bundle branch block
- TTE: IVS 17 mm (diastole), LVEDD 30 mm, LVESD 21 mm, LVEF 65%, AV: severe calcification, Vmax 5.2m/s, mean gradient 60mmHg, AVA 0.7 cm^2
- LHC: no coronary lesions, peak-to-peak gradient: 100mmHg
- STS risk score: 2.5 %
- Heart Team: ballon-expandable TAVR candidate

TAVR CT's

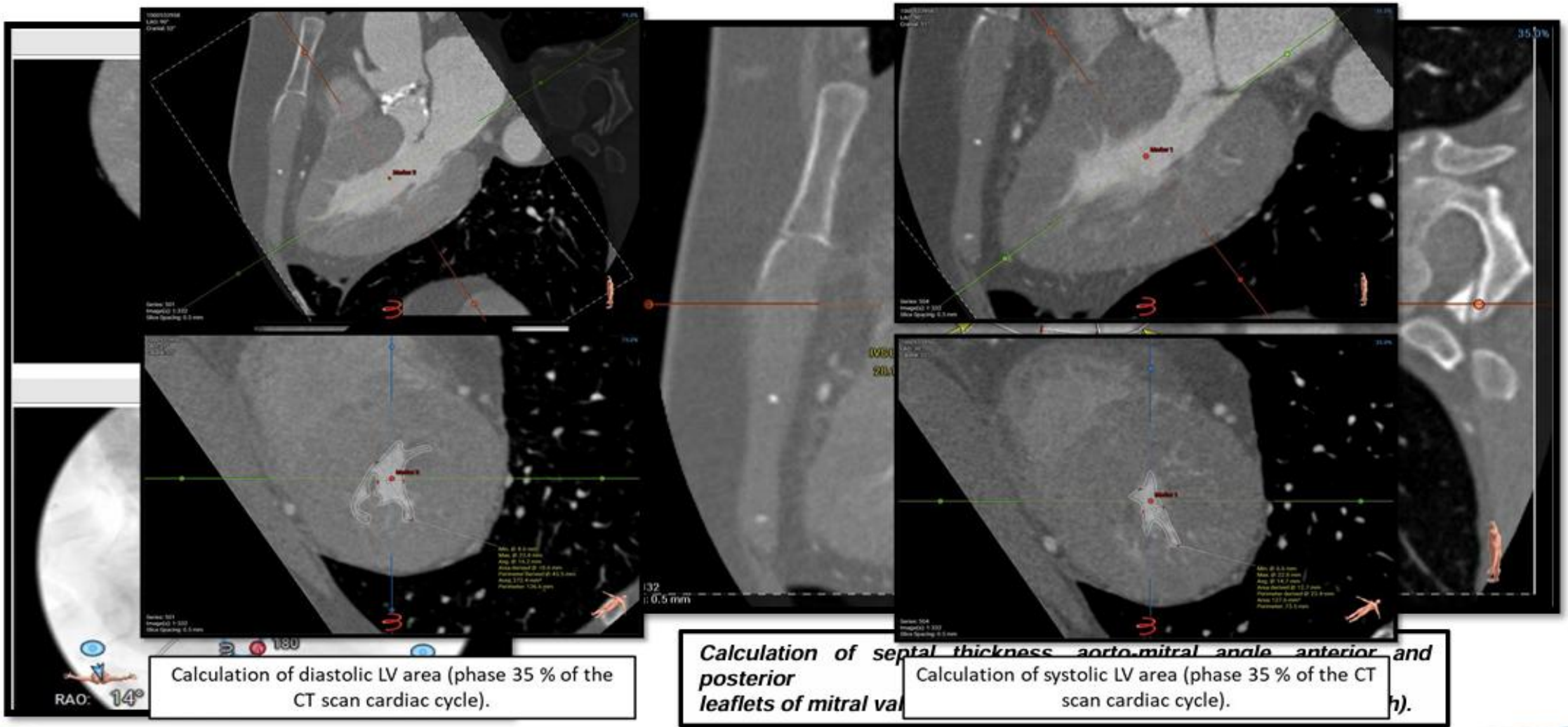

Annulus Systole
Annulus Dimensions
Min. Ø: 21.5 mm
Max. Ø: 29.2 mm
Avg. Ø: 25.4 mm
Area derived Ø: 24.9 mm
Perimeter derived Ø: 25.4 mm
Area: 487.8 mm²
Perimeter: 79.8 mm
30.0%
RC
NC
LC
Distance: 0.0 mm


LVOT
LVOT Dimensions
Min. Ø: 20.1 mm
Max. Ø: 28.4 mm
Avg. Ø: 24.2 mm
Area derived Ø: 23.9 mm
Perimeter derived Ø: 24.4 mm
Area: 447.2 mm²
Perimeter: 76.8 mm
30.0%
RC
NC
LC
Distance: 3.0 mm


SOV Diameter
30.0%
RC
SOV Left
Ø 32.6 mm
NC
SOV Non
Ø 32.4 mm
LC
Distance: 11.0 mm


RCA Height
30.0%
STJ: 24.4 mm
R: 16.4 mm
Basal plane
LCA Height
30.0%
L: 14.6 mm
Basal plane

TAVR CT's



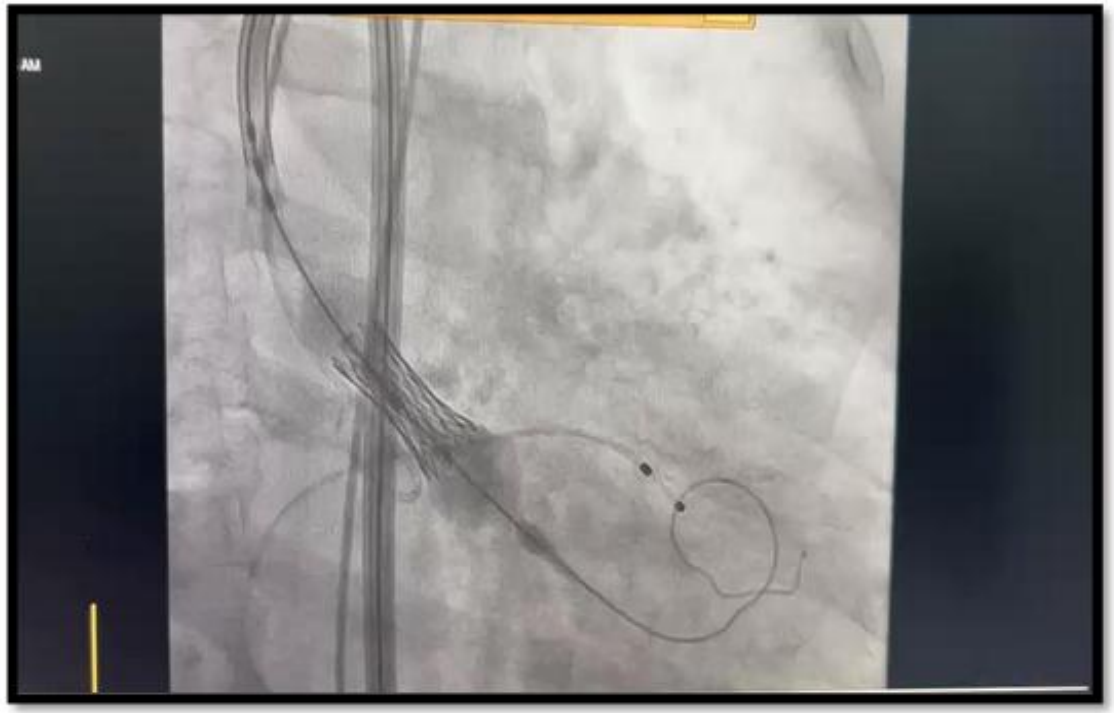
Calculation of diastolic LV area (phase 35 % of the CT scan cardiac cycle).

Calculation of septal thickness, aorto-mitral angle, anterior and posterior leaflets of mitral valve (h).

Calculation of systolic LV area (phase 35 % of the CT scan cardiac cycle).

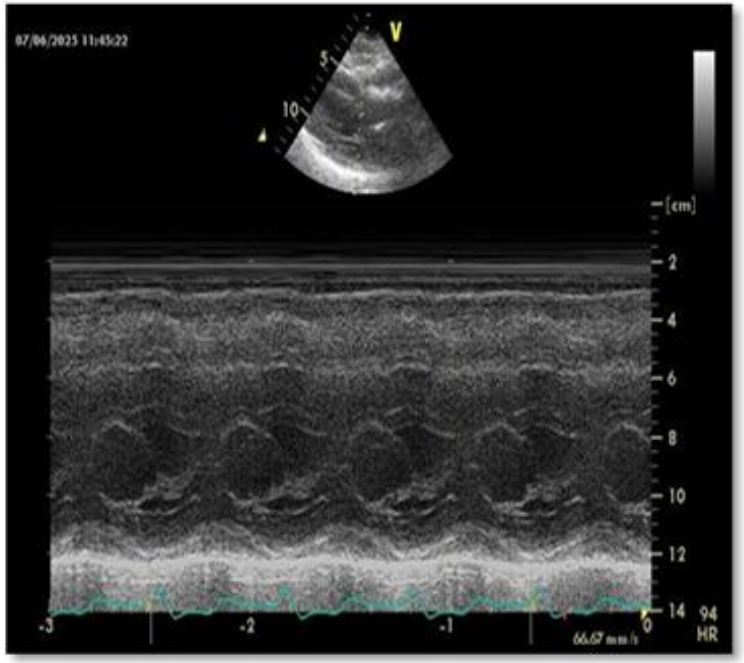
Case Summary

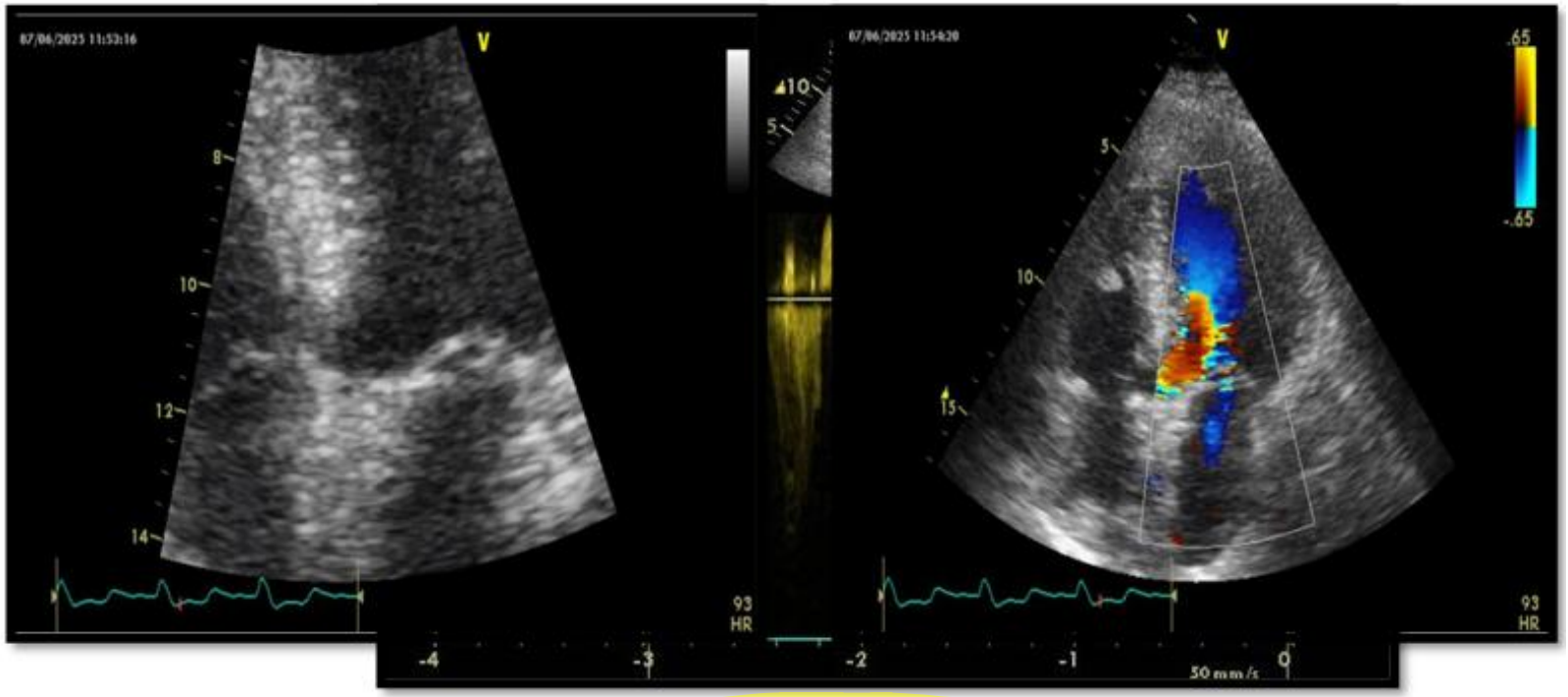
- A 26mm EDWARDS SAPIEN 3 valve was implanted
- Immediately post-procedure, she developed severe hypotension requiring vasopressor support
- The mean LV apex-to-aorta gradient was 23mmHg
- CCU: she developed severe hypotension, escalating vasopressor requirements, sinus tachycardia and oliguria
- TTE revealed an obstructive gradient in the LVOT, and severe mitral regurgitation due to SAM



Case Summary

Post-TAVR TTE





TTE showing SAM and mitral regurgitation | *TE showing LVOTO*

HCI

Case Summary

- IV fluids and beta-blockers were initiated.
- Patient developed cardiogenic shock, acute pulmonary edema, and multiorgan failure.
- Refractory to medical treatment and temporary pacemaker stimulation, leading to death.

Comments

- Acute hemodynamic compromise after TAVR due to dynamic Left Ventricular Outflow Tract Obstruction (LVOTO), also termed ***suicide left ventricle***, is a rare but life-threatening complication.
- Pathophysiology involves a sudden reduction in LV afterload, leading to unopposed hypercontractility, chamber obliteration (LV unloading), and a dynamic intraventricular gradient.
- Certain ***clinical, echocardiographic, and CT*** findings can identify ***predictors of LVOTO***.

Predictors of LVOTO after TAVR

Predictors of LVO after TAVR.

	Univariate analysis			Multivariate analysis		
	OR	C·I	P val	OR	C.I.	P val
Clinical variables						
Sex	2.296	1.26–4.17	*0.006*	–		
Age	1.04	0.99–1.09	*0.078*	–		
Weight	0.977	0.96–0.99	*0.027*	–		
Height	0.966	0.93–1.00	*0.056*	–		
BSA	0.195	0.050–0.76	*0.019*	–		
Previous MI	0.289	0.10–0.83	*0.021*	–		
Previous PTCA	0.407	0.18–0.89	*0.026*	–		
Pulmonary hypertension	0.155	0.021–1.16	*0.069*	–		
Renal failure	0.406	0.21–0.80	*0.009*	–		
PM after TAVI	0.347	0.10–1.16	0.087	–		
Echocardiographic variables						
EDD	0.899	0.85–0.95	*<0.001*	–		
EDV	0.979	0.97–0.99	*<0.001*	–		
EF	1.093	1.05–1.14	*<0.001*	1.075	1.02–1.12	*0.01*
Gmed	1.031	1.01–1.05	*0.007*	–		
CT						
Annulus aortic valve	0.861	0.774–0.957	*0.005*	–		
Area VBR	0.996	0.992–0.999	*0.010*	–		
Perimeter VBR	0.944	0.908–0.981	*0.003*	–		
Aorto-mitral angle	0.950	0.925–0.977	*<0.001*	0.971	0.94–1.0	*0.06*
SLCL	0.870	0.825–0.918	*<0.001*	0.923	0.86–0.99	*0.03*
LV Area (systole)	0.997	0.996–0.998	*<0.001*	0.998	0.98–0.99	*0.001*
LV Area (diastole)	0.999	0.998–0.999	*<0.001*	–		
Minimal LVOT area	0.993	0.990–0.997	*<0.001*	–		

Variables	Cut-off
Ejection Fraction (%)*	≥ 62%
Intraventricular septum to leaflet coaptation length(SLCL)	≤ 22.1mm
LV Area (systole)	≤ 267mm2

**Echocardiographic variable*

Ferri et al. Int J Cardiol. 422 (2025) 132956

Comments

- Acute hemodynamic compromise after TAVR because of dynamic LVOTO manifests mainly as ***significant hypotension progressing to hemodynamic collapse***, an occurs most often ***immediately after deployment.***
- ***Management strategies*** aim to ***augment preload and afterload to support LV filling pressures*** and attenuating hypercontractility.
- ***Interventions*** include IV fluids, β-blockers, phenylephrine, alcohol septal ablation, ventricular pacing, MitraClip, and ECMO.

Suicide Ventricle post TAVR

TCT Plus India 2025
July 26th 2025 Hall 2
10:15-10:23 AM

Ashish Pershad MD MS
Dignity Health, Phoenix AZ

@ashish.pershad

IC Chat with Ashish Pershad

Suicide Ventricle

Definition-

Acute hemodynamic compromise after TAVR because of dynamic LVOT obstruction is termed “suicide” ventricle

Pathophysiology-

TAVR-Sudden decrease in afterload

↓

LV hypercontractility (chamber obliteration)

↓

Dynamic intraventricular gradient

Phenotype at Risk for Dynamic LVOT "Suicide LV"

Phenotype	Percentage likelihood to develop Suicide LV
Female	96%
Age > 80 years	75%
LVEF>70%	50%
Presence of Dynamic IC gradient	48%
LVEDD <3.8 cm	45%
Critical AS	36%
Asymmetric Septal Hypertrophy	38%

Clinical Presentation of Suicide Ventricle

- One of the differential diagnosis for “Hypotension” immediately after valve deployment - exaggerated by a second variable like administration of vasodilators for hypertension/ or inotropes/balloon pump for hypotension or even protamine for heparin reversal
- “Low index of suspicion” for this entity
- “Pulmonary edema” from SAM and worsening MR
- Need real time echo to guide diagnosis and management

Medical Management of Suicide Ventricle

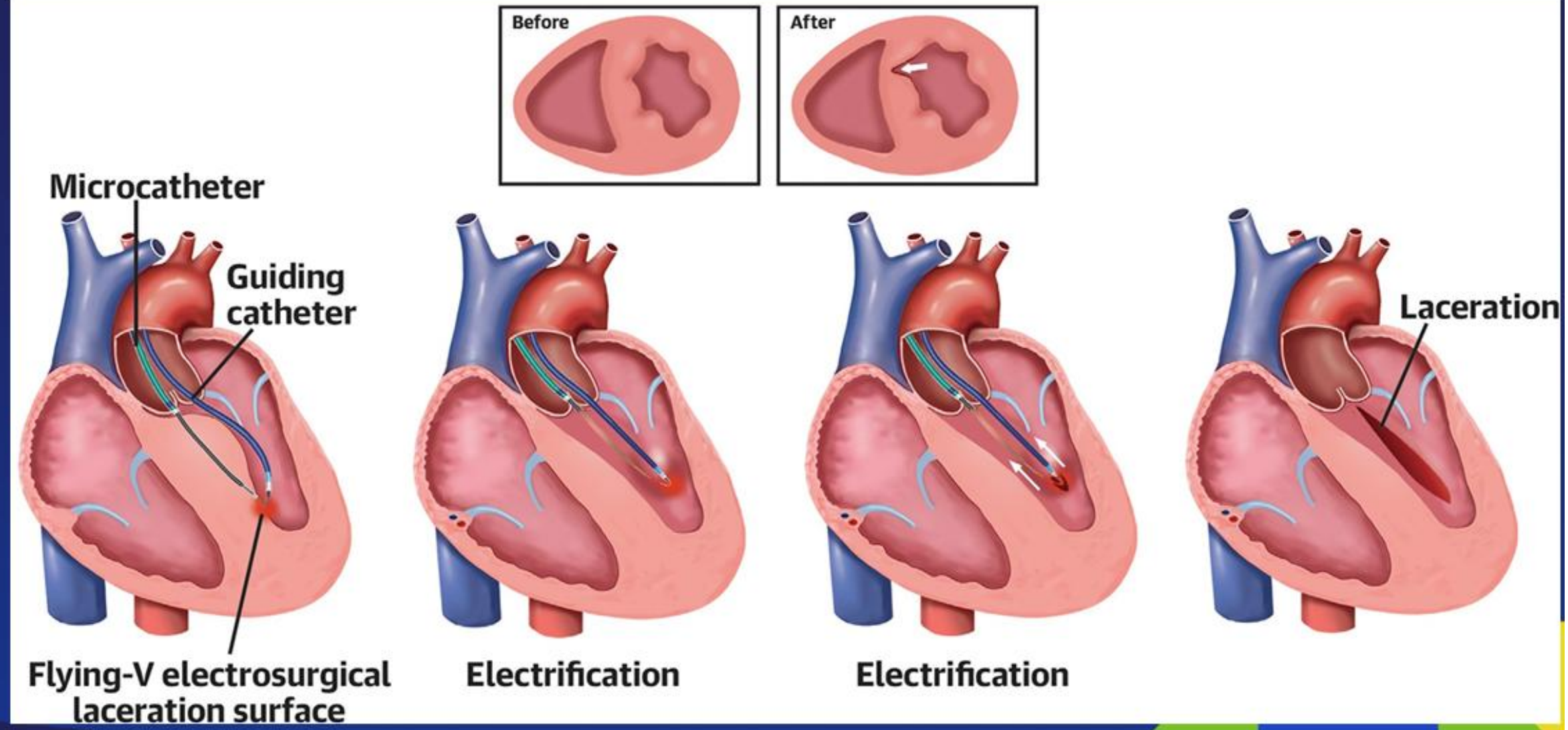
- IVF Aggressive hydration with liters of crystalloid
- Negative inotropy (beta blockers)
- Alpha agonists (phenylephrine)

Effective about a ⅓ of the time

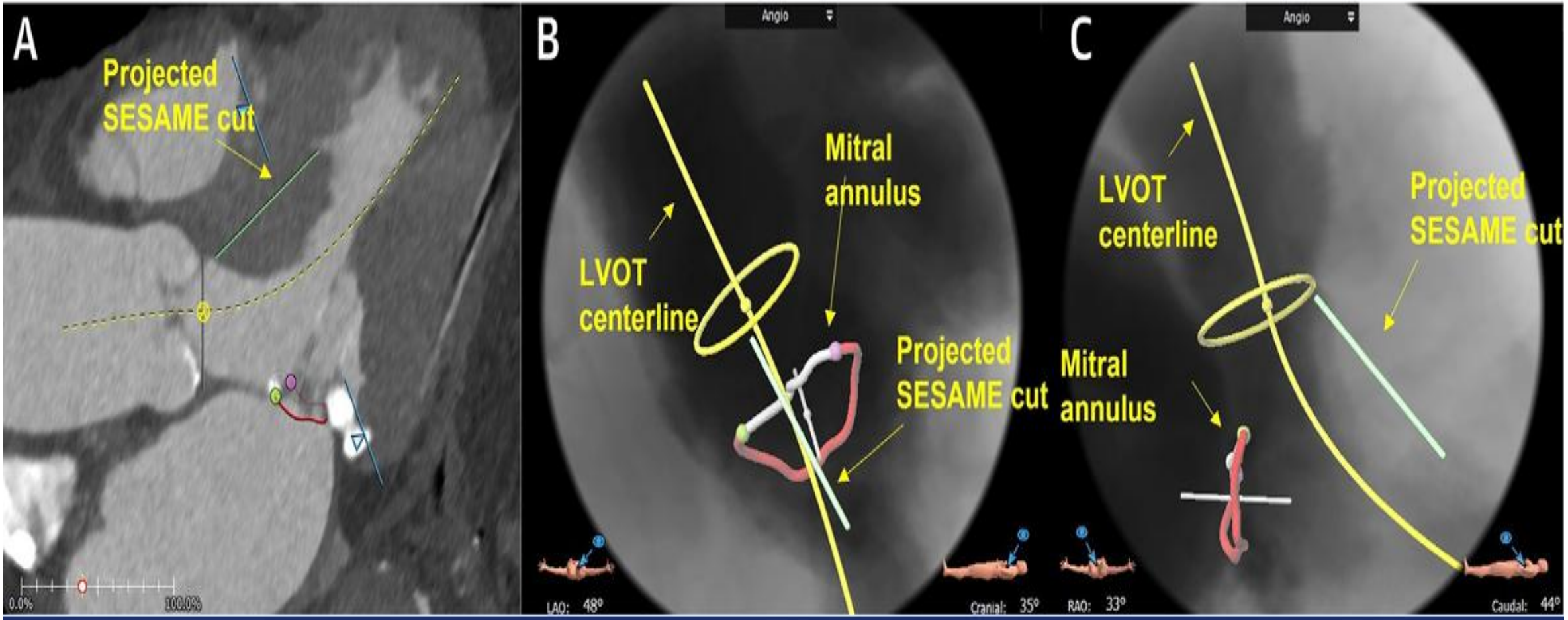
- Alcohol septal ablation (ASA)
- RV pacing inducing LV dyssynchrony
- M-TEER to manage SAM and severe MR

No septal perforator in 15% of cases

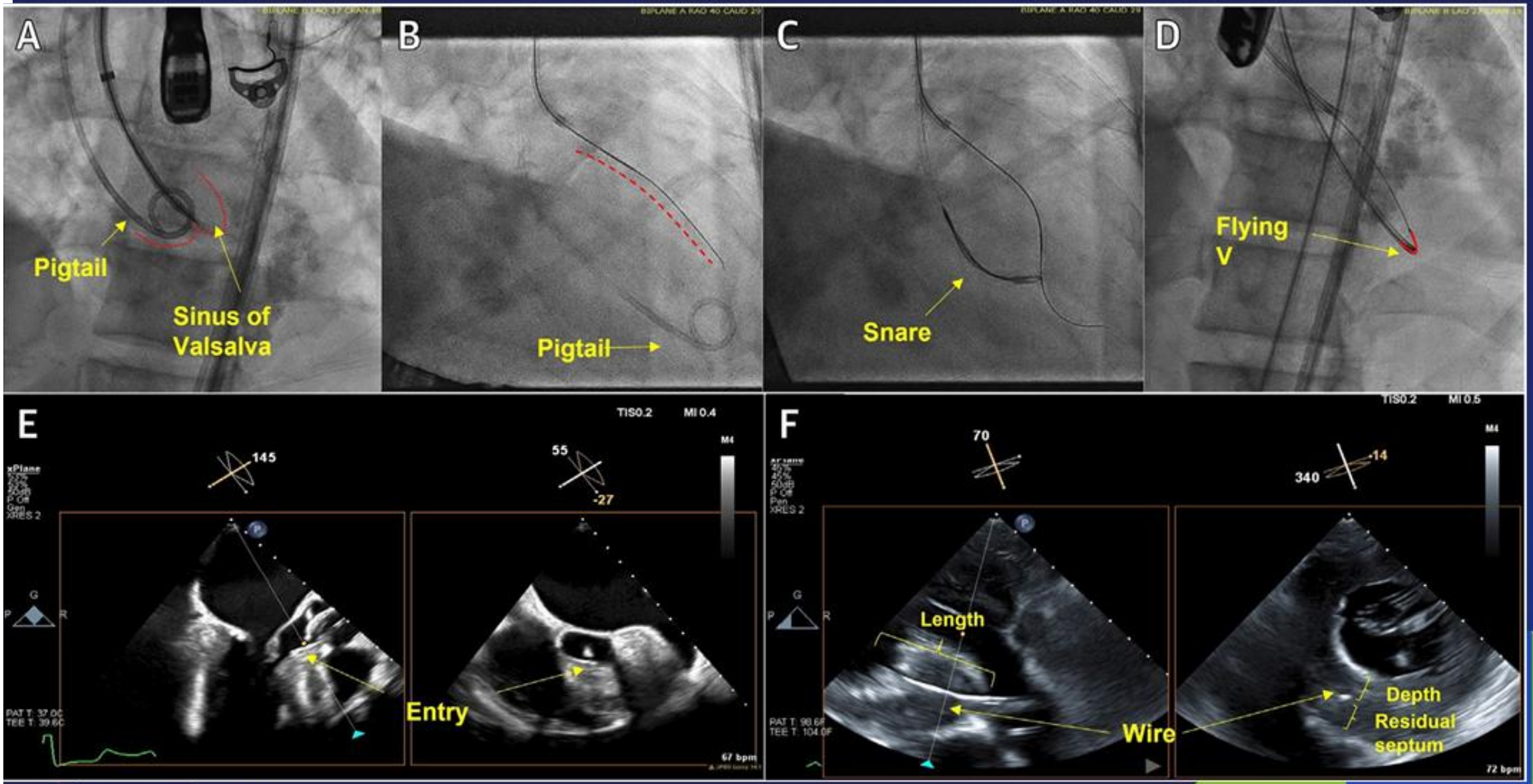
Innovative Techniques for LVOTO-SESAME Schematic



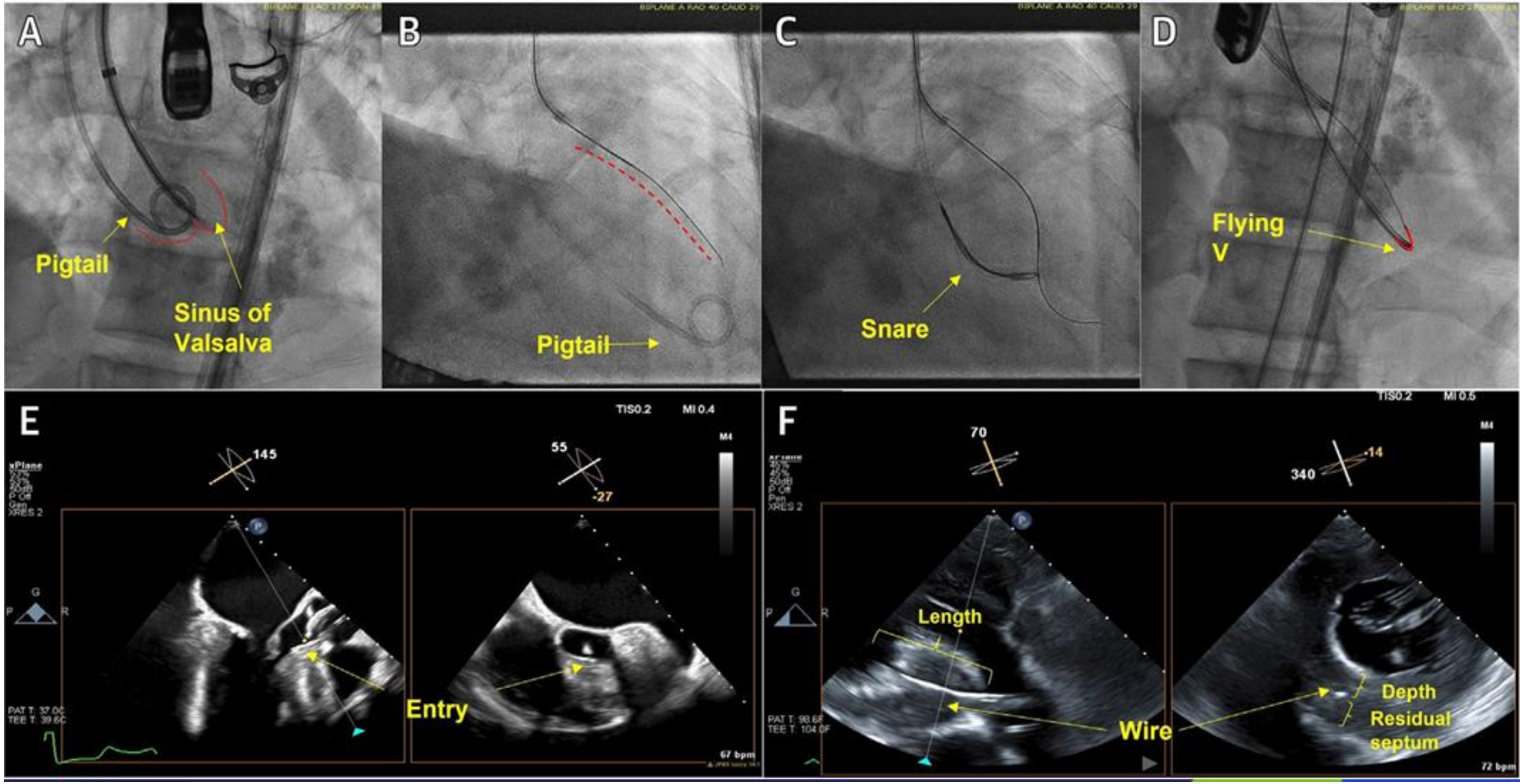
Innovative Techniques for LVOTO- SESAME (septal scoring around midline endocardium)



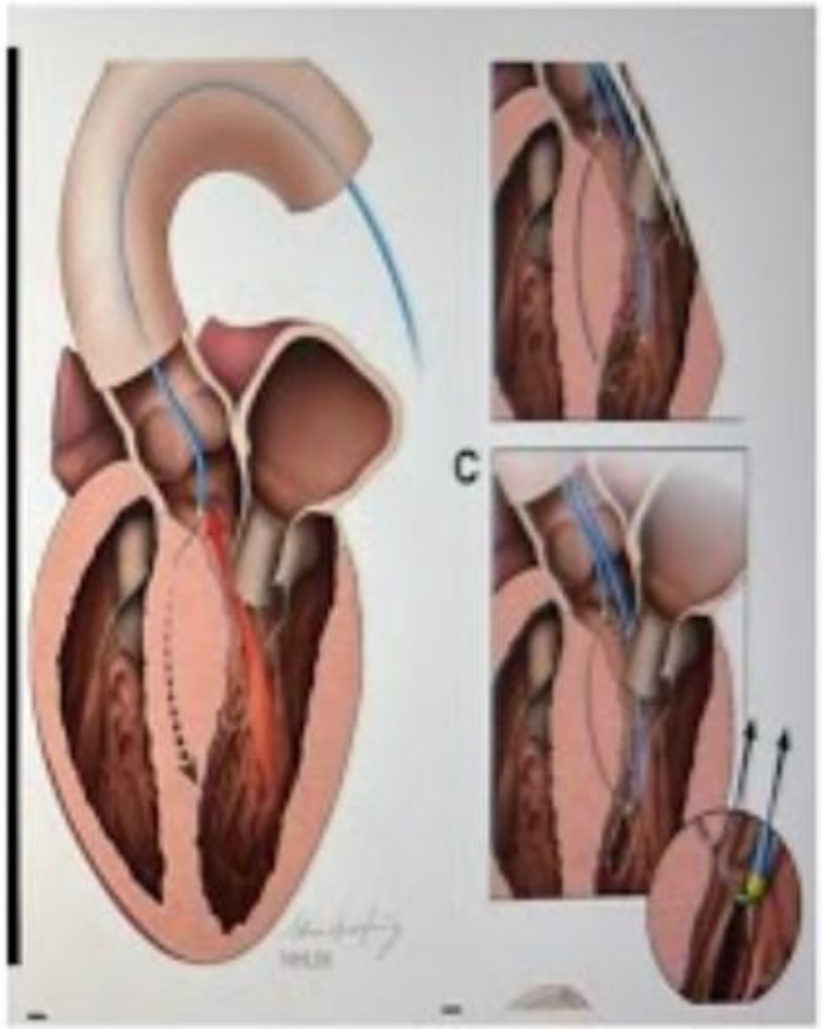
SESAME Procedure



SESAME Procedure



HCI



THE HEART VALVE CENTRE

Interventional Myotomy Using Electrosurgery for Left Ventricular Outflow Tract Obstruction - SESAME

DR. A B GOPALAMURUGAN

JACC: CASE REPORTS VOL. 26, 2023

CASE REPORT

INTERMEDIATE

CLINICAL CASE

Overcoming the Obstacle of Suicide Left Ventricle After Transcatheter Aortic Valve Replacement Phenomenon

Leonidas Koliastasis, MD, MSc,[a,b] Maria Drakopoulou, MD, PhD,[a] George Latsios, MD, PhD,[a] Anastasios Apostolos, MD, MSc,[a] Nikolaos Ktenopoulos, MD,[a] Odysseas Katsaros, MD,[a] Ioannis Kachrimanidis, MD, MSc,[a] Andreas Synetos, MD, PhD,[a] Konstantinos Tsioufis, MD, PhD,[a] Konstantinos Toutouzas, MD, PhD[a]

ABSTRACT

Suicide left ventricle after transcatheter aortic valve replacement is a well described phenomenon associated with increased morbidity and mortality. Prompt actions should be implemented to prevent this situation, and the alarm signs should be recognized. We present a case report of successful recognition, prevention and treatment of this complication. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2023;26:102065) © 2023 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

APRESENTAÇÃO CLÍNICA

- Masculino, 79 anos + EAo grave - classe funcional NYHA III --> 2 hospitalizações nos últimos 6 meses por EAP ;

- O exame físico revelou um sopro sistólico 5/6 no segundo espaço intercostal direito, e não havia sinais ou sintomas de descompensação cardíaca.

- As pontuações de risco o classificavam como de baixo risco (Euroscore II: 2,77%; Pontuação STS: 1,66%), mas a fragilidade (Escala de Fragilidade Clínica: 6) + preferência do paciente e da família --> TAVI ;

- ECG base: BAV 1° grau + BRD;

- AP: DAC estável --> ATC prévia ADA + ACD há 2 anos / Hidrocefalia + DVE com comprometimento cognitivo moderado;

- MUC.: nebivolol 5mg / AAS 100mg / furosemida 40mg / rosuvastatina 20mg.

EXAMES COMPLEMENTARES

ECO:

- Hipertrofia concêntrica do VE com protusão septal

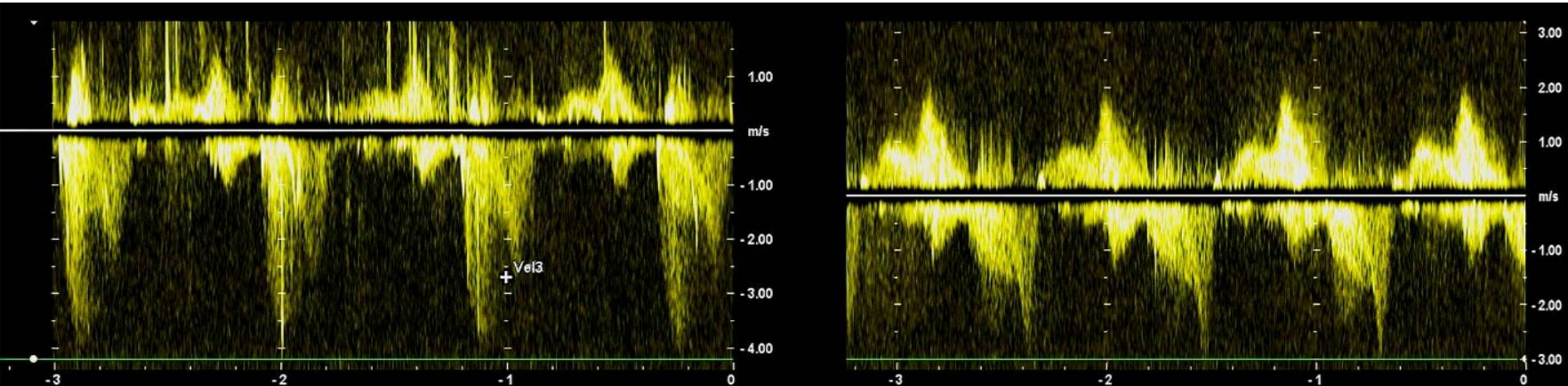
(espessura do septo final diastólico: 16 mm);

- FEVE 60%;
- Não houve movimento sistólico da válvula mitral anterior evidente;
- Gradiente médio: 44 mm Hg; Vmax: 4,2 m/s ;
- Segundo pico Doppler --> obstrução do trato de saída do ventriculo esquerdo --> grad pico de 81mmHg ;
- Cálculo da área valvar aórtica não foi possível devido ao traçado distorcido da LVOT,

- Escore cálcio válvula aórtica (AV) = 2.700A --> Tomografia computadorizada foi usada para planejar o procedimento.

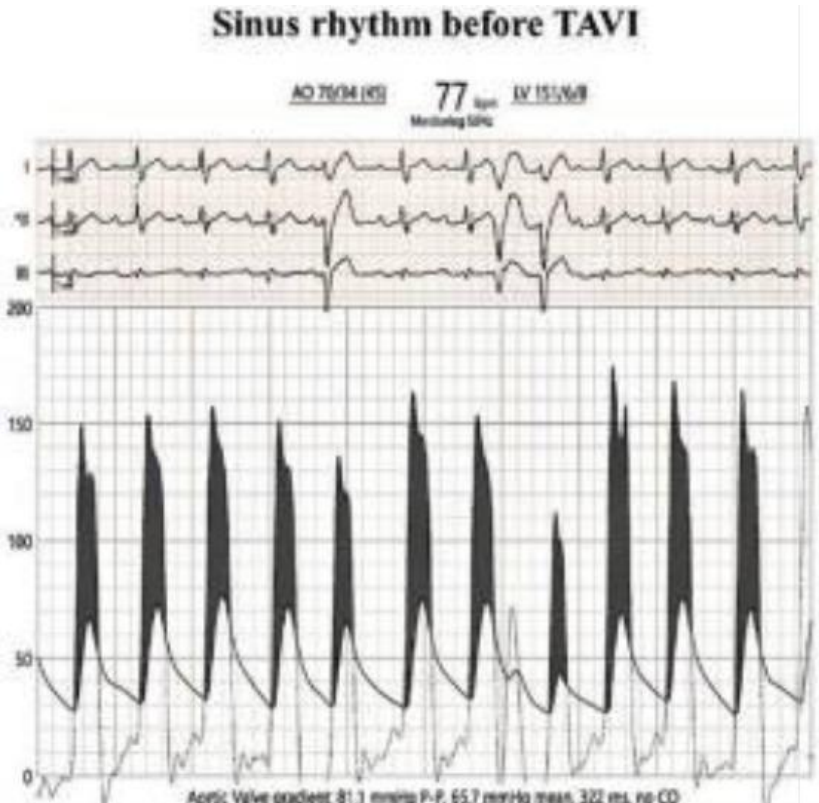
DISCUSSÃO

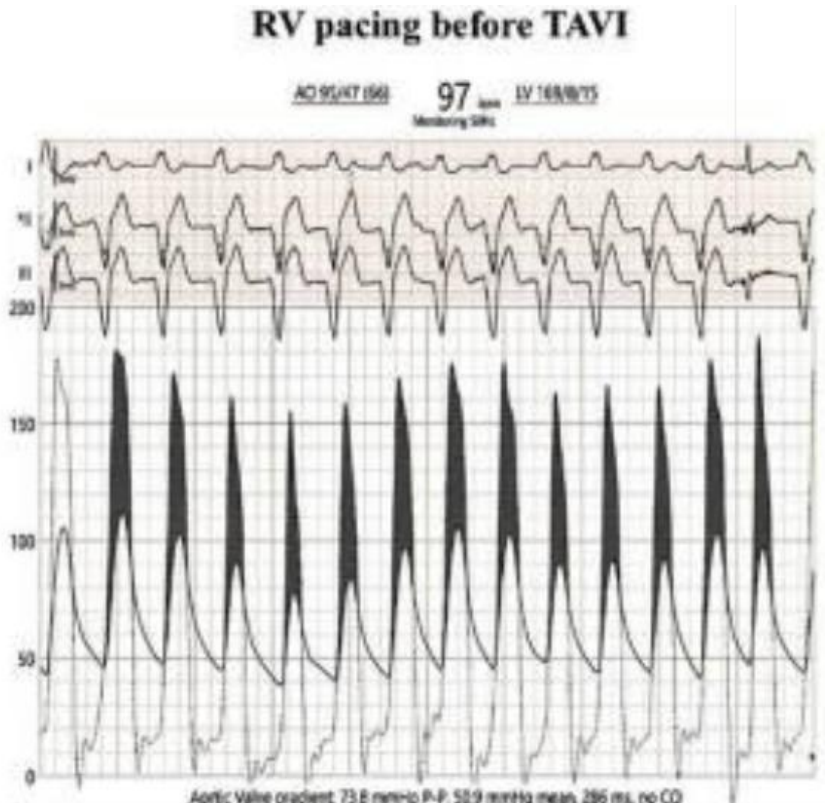
- O gradiente intraventricular dinâmico (DIG) foi descrito como um fator de insuficiência cardíaca aguda após TAVR, com possível evolução imprevisível.
- Objetivo: prevenir a sequela hemodinâmica pós-TAVR do fenômeno do "ventrículo esquerdo do suicida" diminuindo o gradiente de LVOT e planejando os passos terapêuticos após o TAVR caso a prevenção não fosse bem-sucedida;
- Medidas para aumentar a pré-carga de LV (continuação de nebivolol e interrupção de furosemida) --> TAVR 5 dias depois;
- No dia do procedimento TAVR, o paciente apresentou edemas bilaterais leves nas pernas, mas não havia dispneia evidente;
- A ecocardiografia pré-TAVR --> diminuição do gradiente de pico do LVOT para 34 mm Hg.

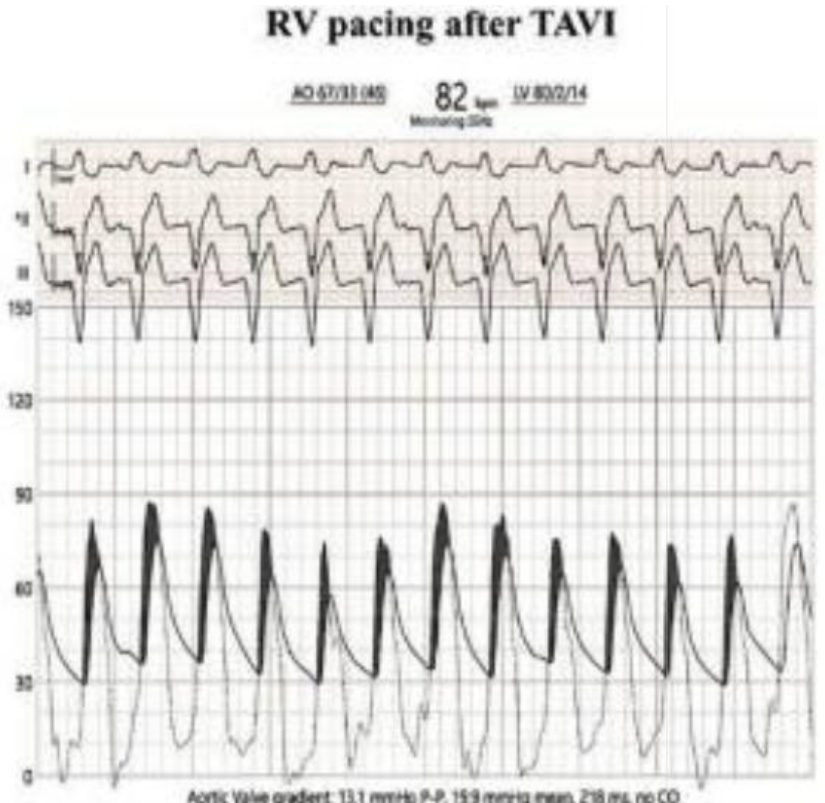


DISCUSSÃO

- Apesar da sobrecarga de volume, o paciente recebeu solução salina intravenosa (IV) a 100 mL/h durante o procedimento.
- Após obter acesso arterial, prosseguimos com as medições hemodinâmicas: gradiente médio LVapex-Aorta= 66 mmHg- após a colocação temporária de um eletrodo de estimulação do ventrículo direito (VD), o gradiente médio foi reduzido para 51 mmHg. Essa foi uma informação valiosa, sugerindo que a dessincronização induzida pelo ritmo do RV foi eficaz para reduzir o DIG
- Uma válvula Evolut Pro de 29 mm (Medtronic) foi entregue e colocada com sucesso, sem predilação por balão. Após a expansão da válvula, foi detectado um bloqueio aurícubentricular de terceiro grau. O gradiente médio LVapex-Aorta sob pacing após TAVR foi de 20 mm Hg,





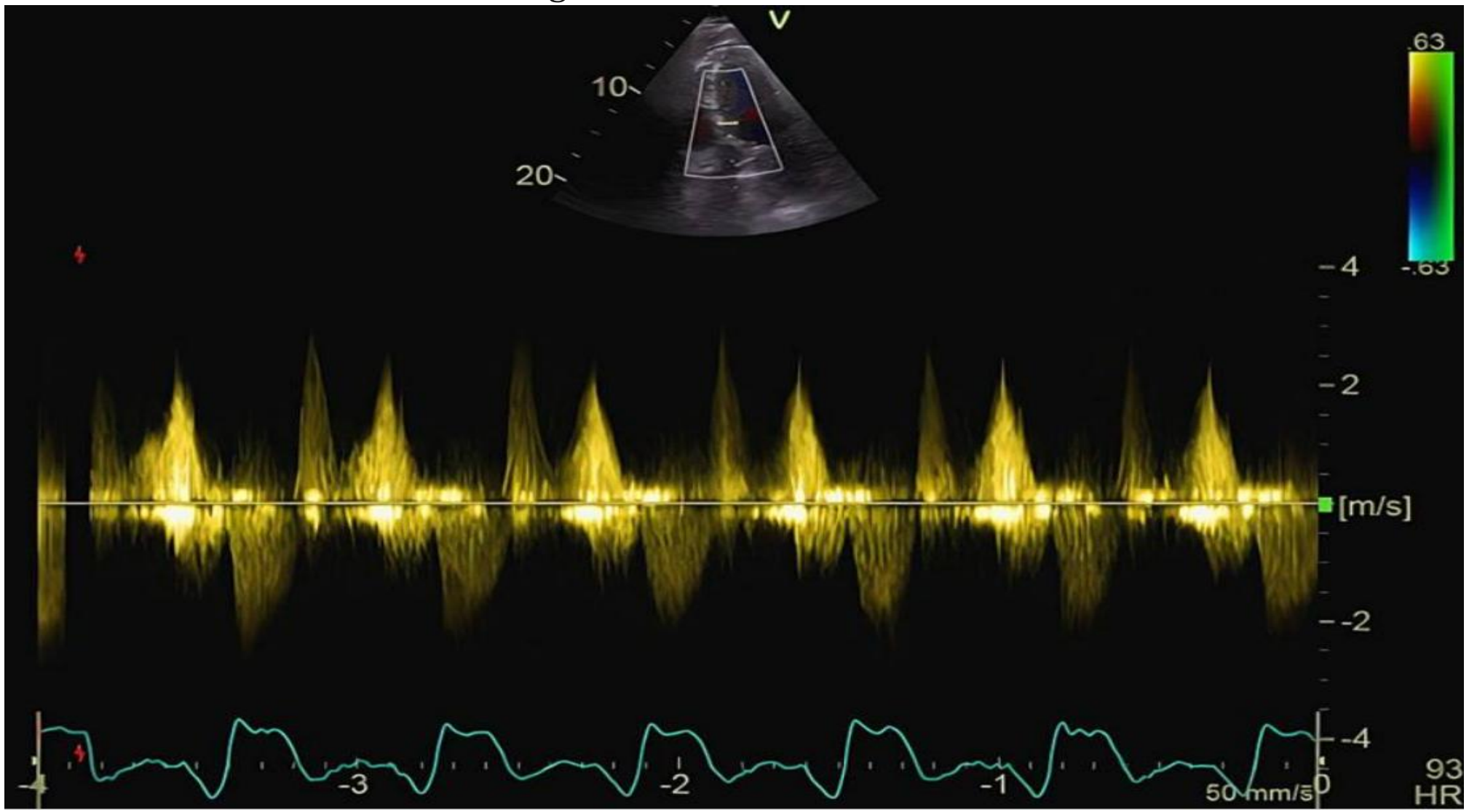


DISCUSSÃO

- Rapidamente após o procedimento, o paciente ficou hipotenso (PA = 75/60 mmHg)
- Nenhuma causa hemorrágica foi detectada e a ecocardiografia rápida ao lado do leito mostrou hipercontratilidade do VE, função normal da válvula protética e ausência de derrame pericárdico.
- Foi iniciada uma rápida carga de soro fisiológico, assim como infusão intravenosa de fenilefrina a 2 µg/kg/min.
- Após receber 6L SF 0.9% em 12h --> PA normal e desmame DVA completo.
- Após normalização da PA --> mais redução do gradiente de pico = 25 mmHg.
- 24h após --> assintomático, hemodinamicamente estável e normovolêmico, sem sinais de congestão, mesmo após a administração dos fluidos.
- BAV 3° grau persistente --> implante MPD bicameral;
- O nebivolol foi mantido durante toda a hospitalização na mesma dose, mesmo quando estava hipotenso. Vale ressaltar que nenhum diurético foi administrado. O paciente permaneceu 2 dias na unidade de cuidados cardíacos agudos e recebeu alta aos 5 dias.

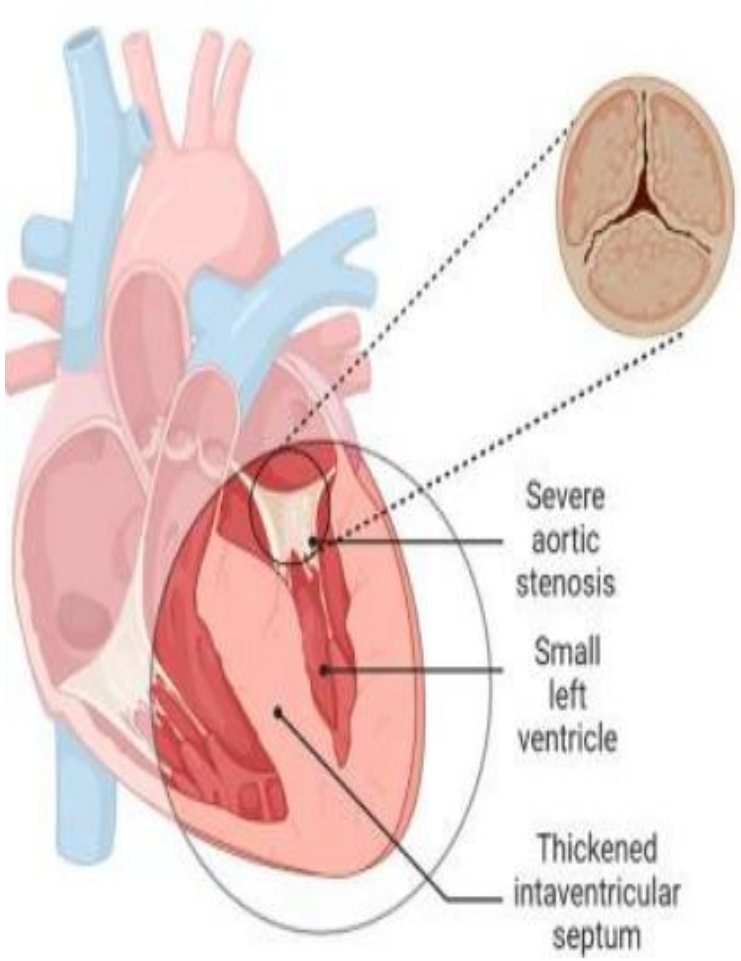
DISCUSSÃO

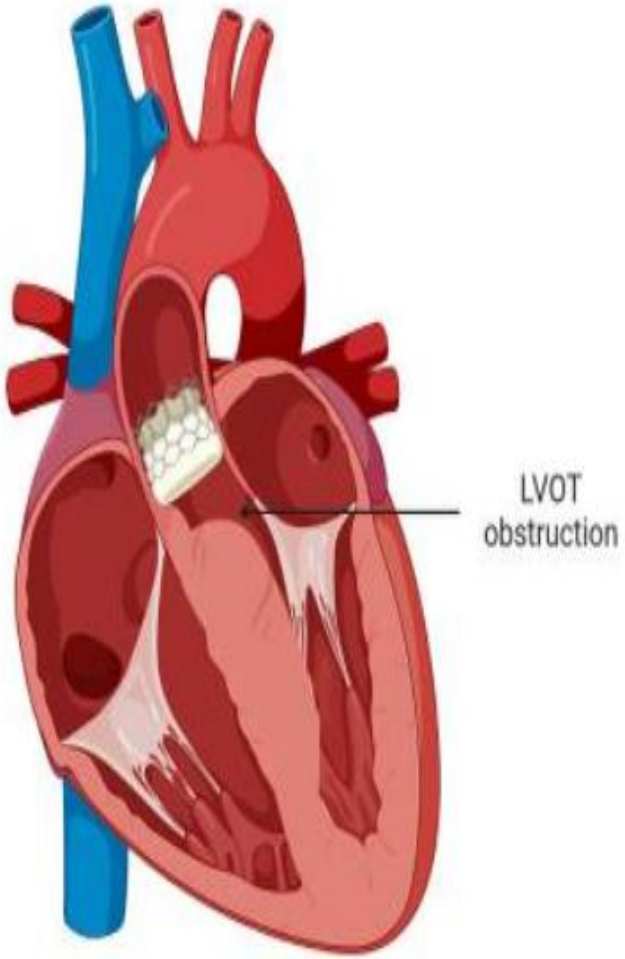
- 1 mês após : válvula protética bem funcional, regressão parcial da espessura do septo (espessura do septo final diastólico: 12 mm), função do VE normal e gradiente de pico do LVOT ainda mais reduzido = 13mmHg



HCI

Severe aortic stenosis with LVOT obstruction ----------→ Suicide LV after TAVR ----------→ Preventive and treatment measures





Preload increase: normovolemia beta-blockers

↓

Afterload increase: pure vasoconstrictors, avoid inotropics, avoid vasodilators, avoid IABP

↓

RV pacing, alcohol septal ablation

↓

ECMO

Rescuing Suicide Left Ventricle Post-TAVR: Emergent Mitral Edge-to-Edge Repair and Valve Post-Dilation Restore Hemodynamic Stability

Teja S. Chakrala, MD

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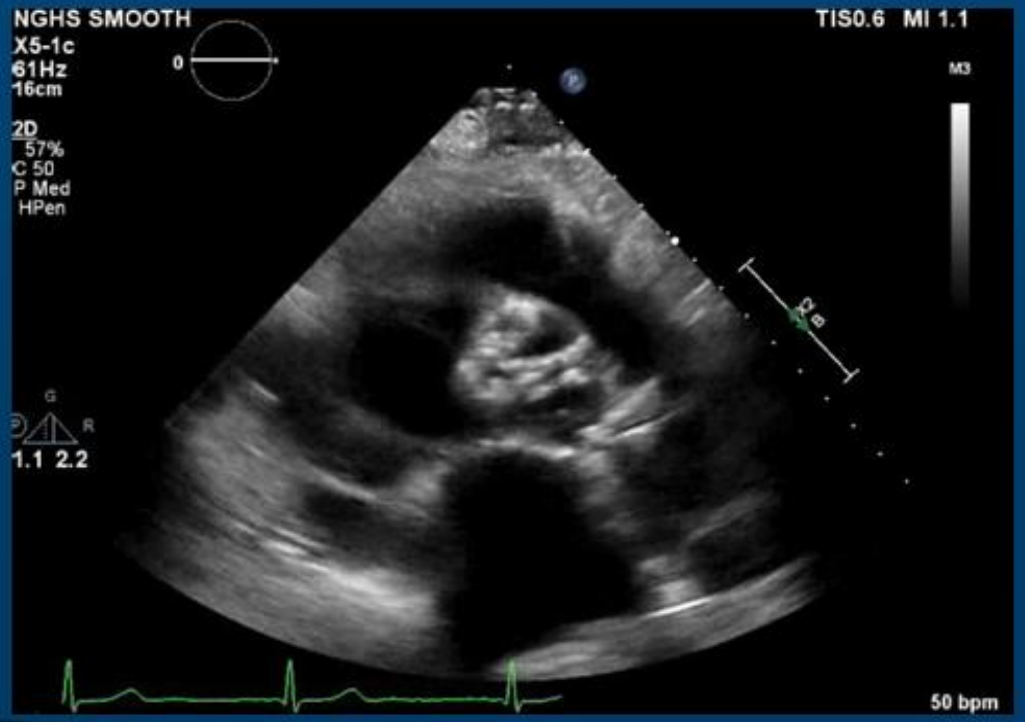
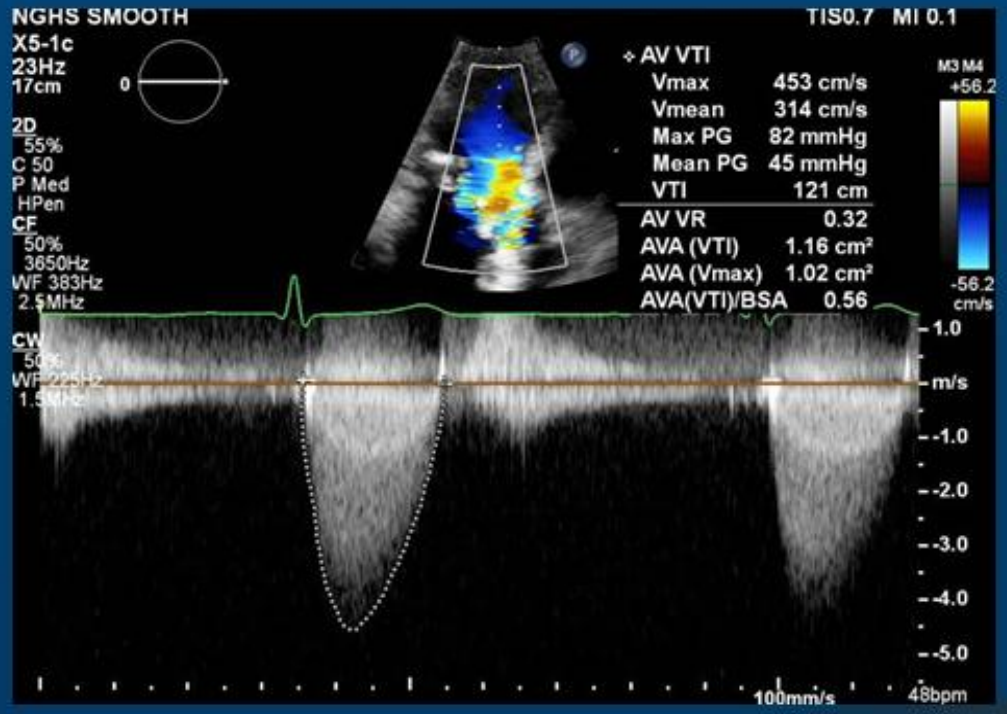
Case Presentation

- An 82-year-old male presented with fatigue and decreased functional capacity that progressively worsened over 6 – 12 months.
- He also reported exertional chest tightness and dyspnea that subsided with rest.
- *Past History:*
- CAD s/p CABG 2019 (LIMA-LAD, SVG-PDA, SVG-OM1), pAF on Eliquis, HTN, known valvular AS, prior CVA
- Vitals were stable. Exam notable for late-peaking SEM in RSB
- EKG: Sinus bradycardia with non-specific ST-T wave changes

Evaluation & Decision Making

- TTE demonstrated preserved biventricular function and a heavily calcified aortic valve (mean gradient 45 mm Hg), fulfilling class I criteria for valve replacement.
- Patent CABG grafts noted on LHC favored transfemoral TAVR with a 26 mm Edwards SAPIEN 3 Ultra.

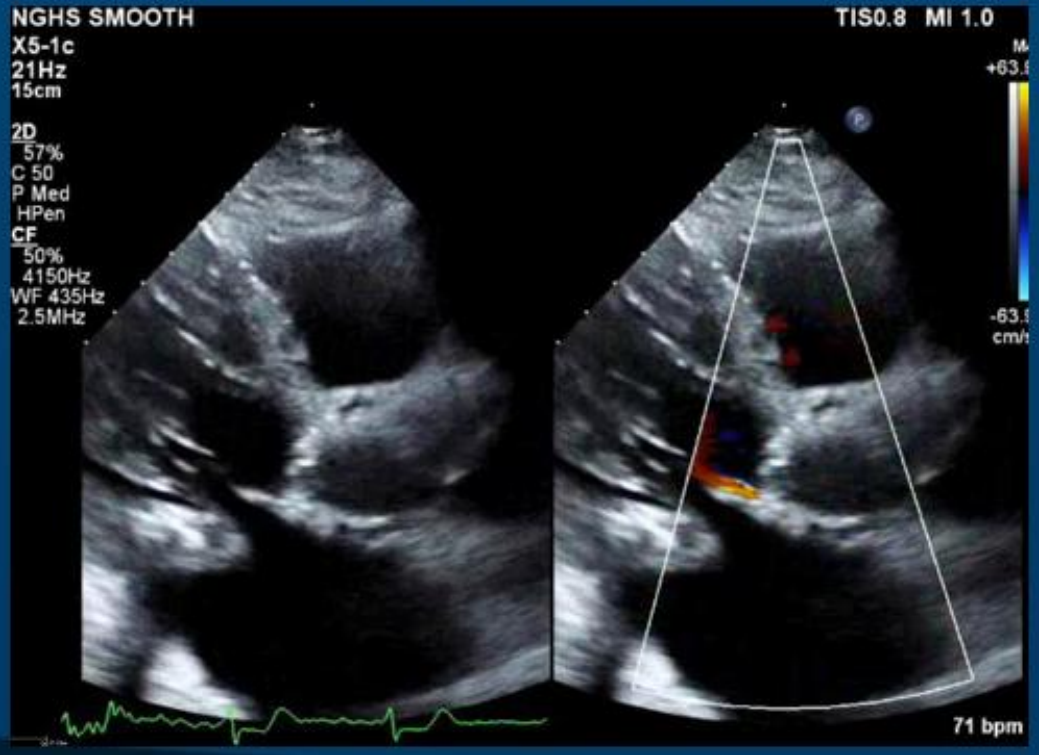


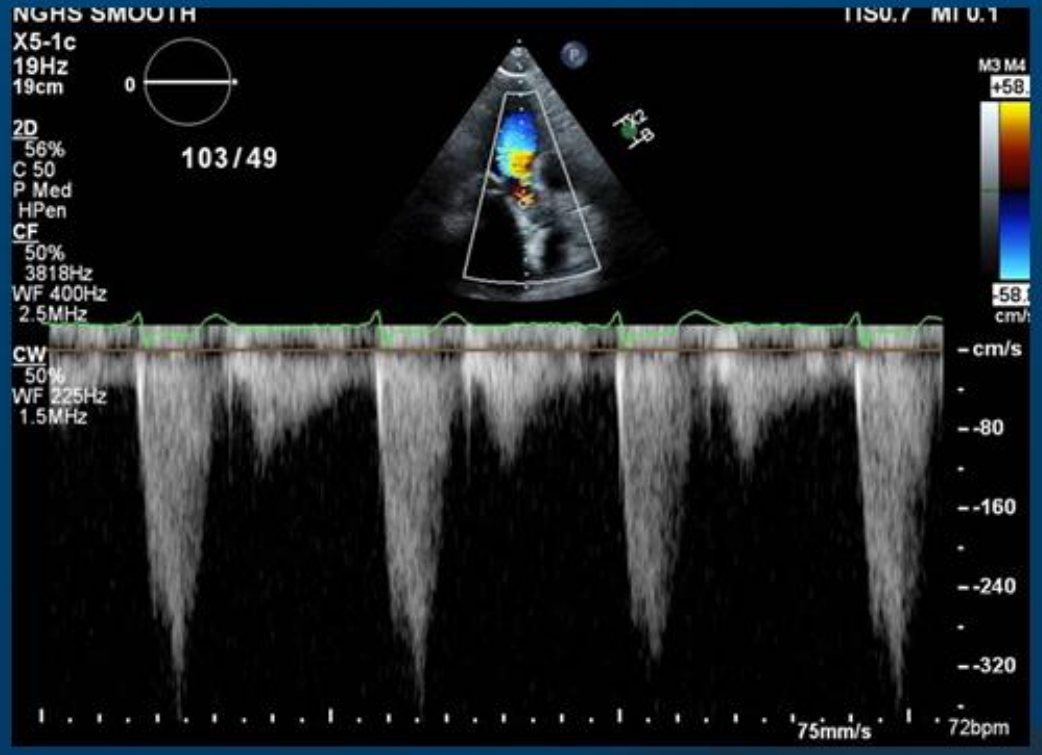


CRF TCT

Post-Procedure Course

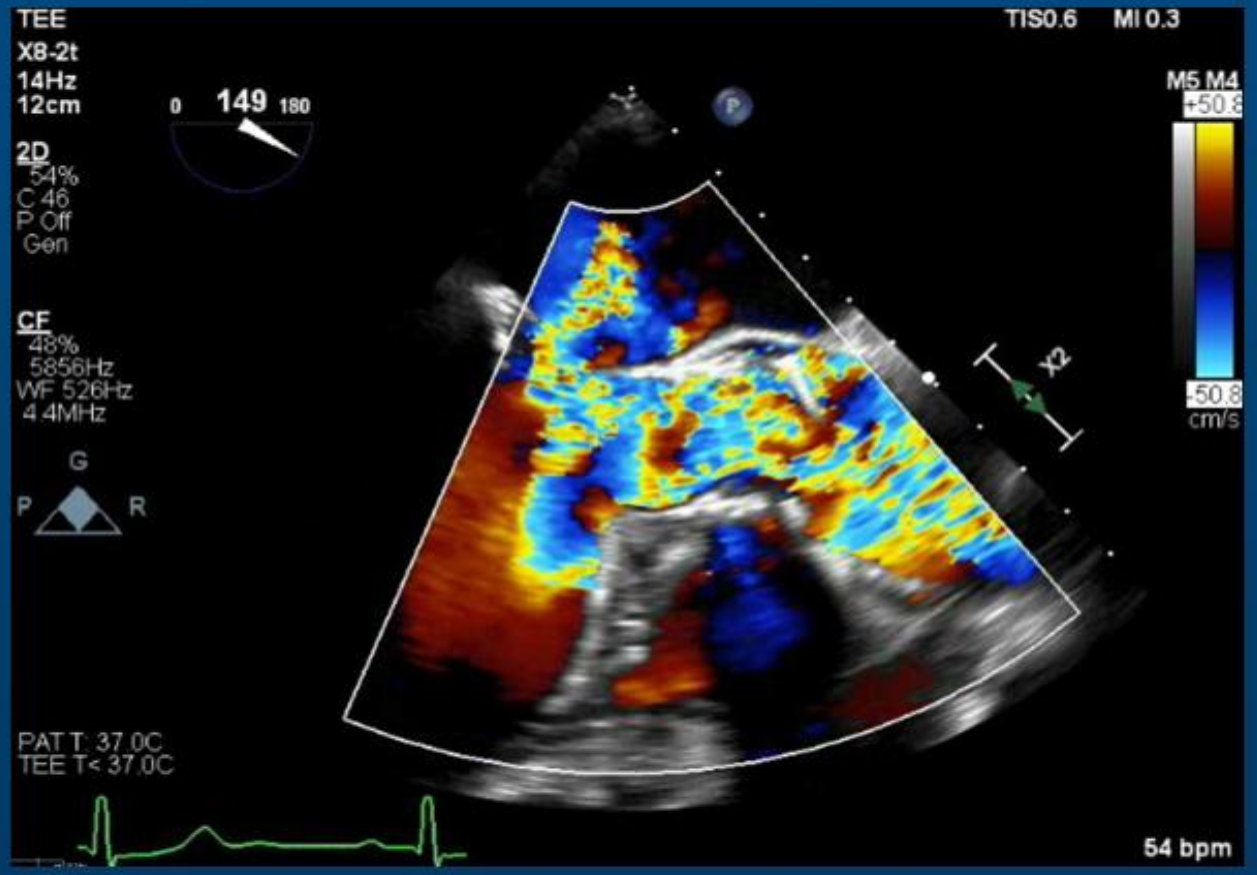
- Valve deployment was uncomplicated. On POD 1, the patient developed severe orthostatic hypotension and symptoms of decompensated heart failure.
- TTE revealed a hyperdynamic, under filled LV, severe SAM of an elongated anterior mitral leaflet, a peak LVOT gradient > 80 mm Hg, and severe MR.





Post-Procedure TEE

- TEE confirmed findings and excluded valve malposition
- Heart team discussion concluded that more traditional treatment options such as alcohol septal ablation were less likely to be effective with possibly increased procedural risk.



Initial Management

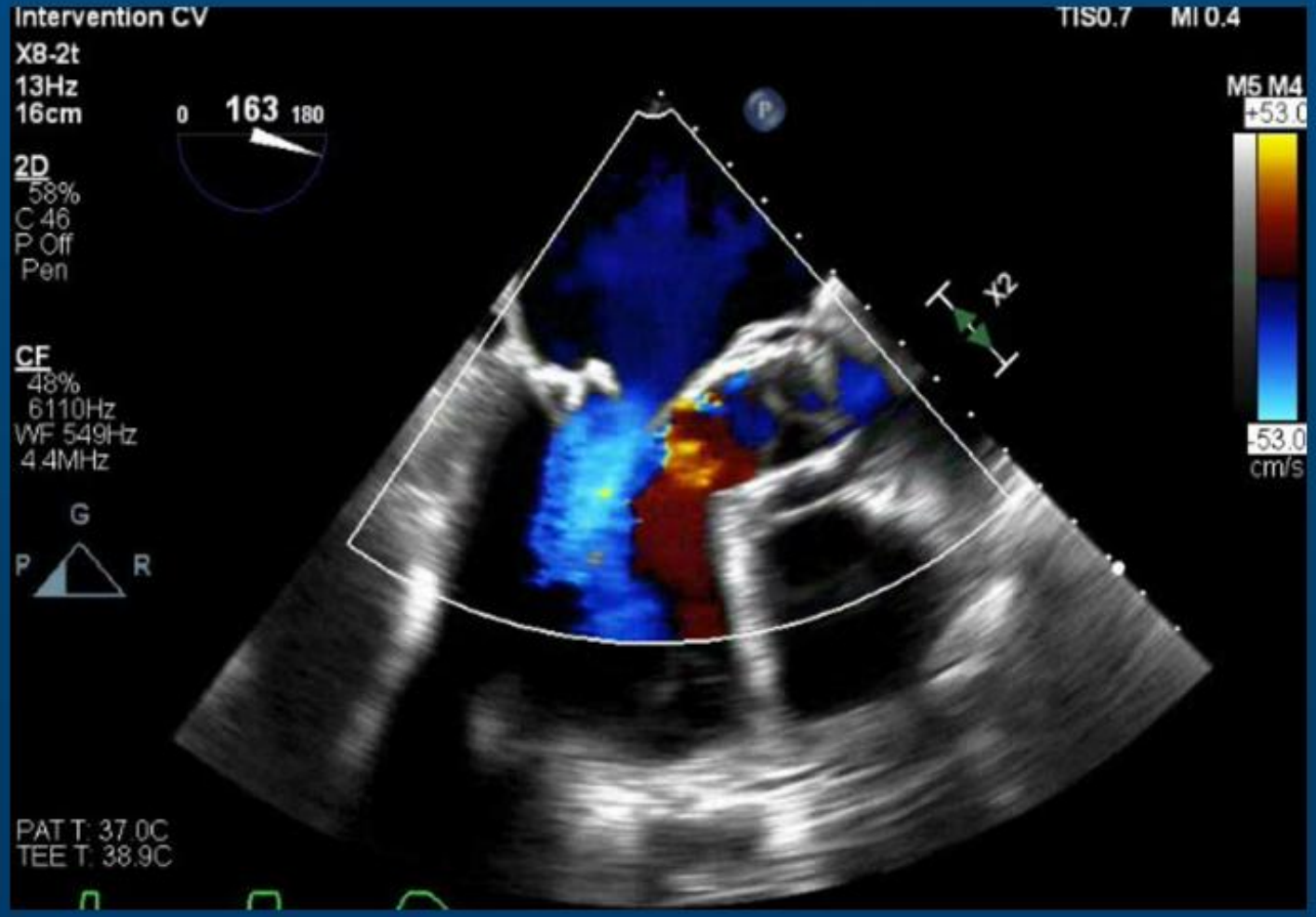
- Medical management with PO beta-blockers and midodrine followed by IV phenylephrine were attempted to improve this "suicide LV physiology"
- Hospital course was further complicated by acute hypoxic respiratory failure secondary to pulmonary edema
- Gentle fluid resuscitation was attempted hoping that IV fluids will actually reduce left atrial pressure and concomitant pulmonary edema

Heart Team Approach

- Patient's hemodynamic status improved and he was able to be weaned off oxygen, however he continued to have significant symptoms with any degree of activity
- This was likely related to ongoing LVOT gradient and systolic anterior motion of the mitral valve noted on repeat TTEs
- He was also noted to have hemolysis on labs – likely attributed to mechanical shear stress
- Multidisciplinary discussion was held and consensus was to attempt M-TEER to reduce mitral SAM and LVOT obstruction along with PVL closure given ongoing hemolysis.

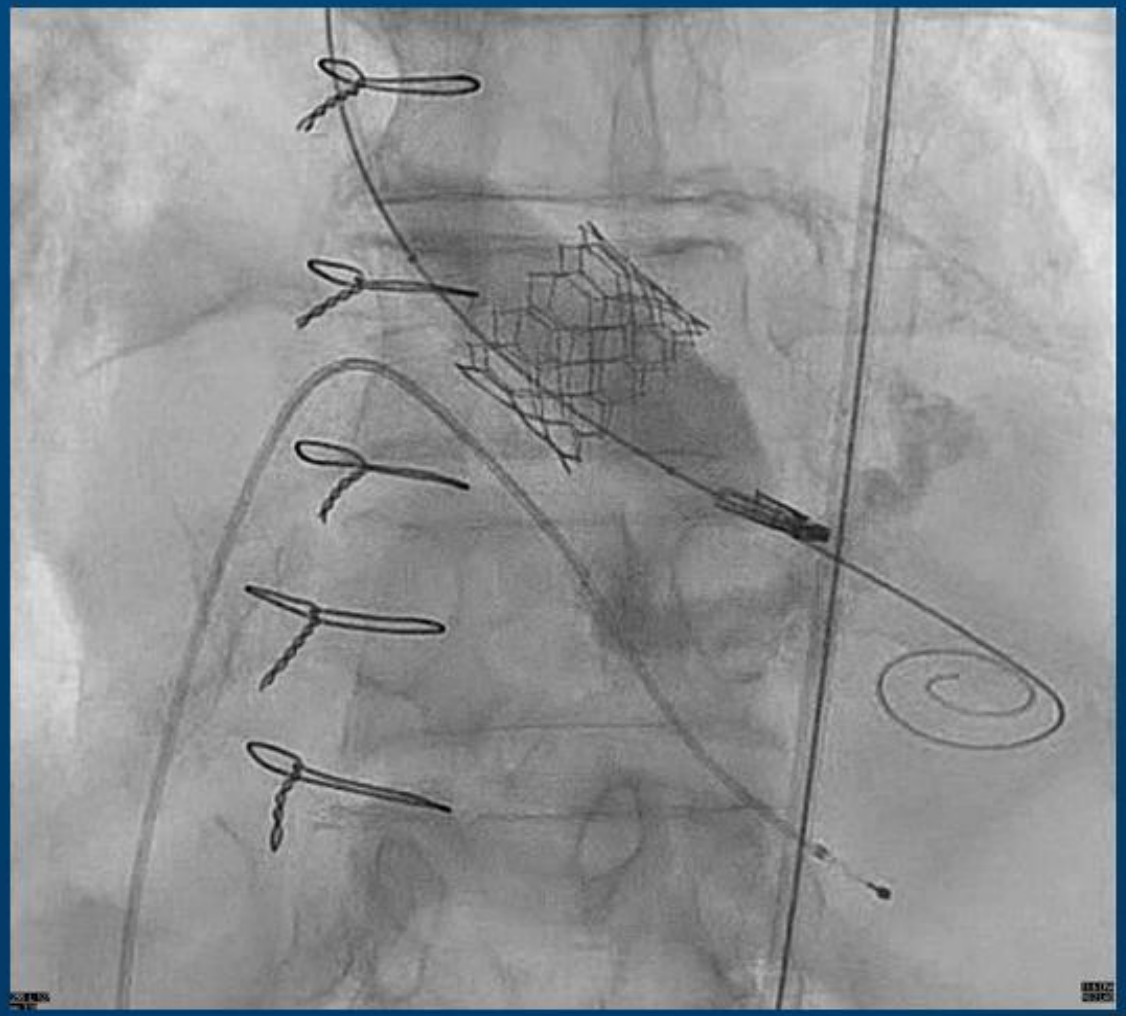
Intervention

- Under fluoroscopic and TEE guidance a single MitraClip XT was placed at the A2–P2 coaptation line
- The MR severity was reduced to mild



Intervention

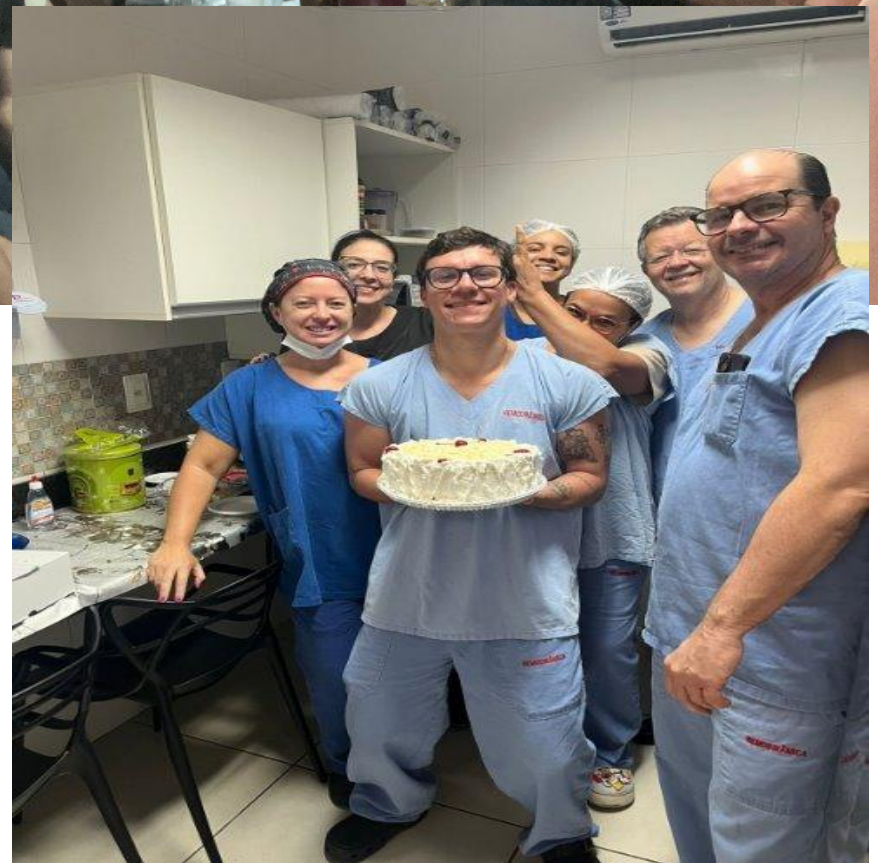
- A 25 mm TRUE balloon then re-expanded the SAPIEN frame
- This reduced the PVL to mild without increasing the aortic gradients
- The procedure was tolerated well, and the patient was able to be discharged home with close follow up



Conclusion

- Dynamic LVOT obstruction after TAVR can precipitate cardiogenic shock.
- When medical therapy is insufficient, *M-TEER can eliminate SAM and severe MR, while balloon optimization of the aortic prosthesis addresses residual PVL*.
- Multimodality imaging and early structural intervention now permit complex post TAVR mechanics to be corrected without surgery.

OBRIGADO!



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