



XXIX CONGRESO NACIONAL

**CACI2019**

*Pilar*

**Instituto de Cardiología y Cirugía Cardiovascular**  
**HOSPITAL UNIVERSITARIO FUNDACION FAVALORO**  
Buenos Aires- Argentina

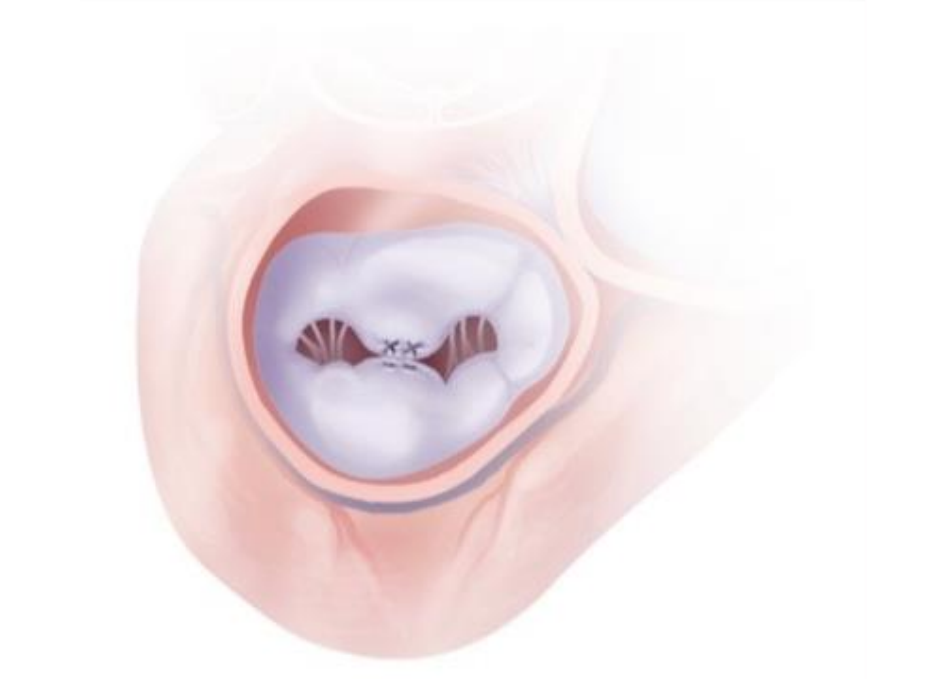
**“Evaluación Imagenológica en otras  
Intervenciones Estructurales”  
Válvulas Mitral y Tricúspide**

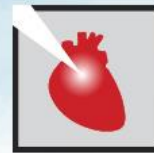
Fabián Salmo <sup>MTSAC, FAC</sup>

Coordinador Laboratorio Ecocardiografía HUFF

Curso de Posgrado Ecocardiografía UF







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<http://dx.doi.org/10.1016/j.jacc.2017.01.017>

**CLINICAL PRACTICE GUIDELINE: FOCUSED UPDATE**

**2017 AHA/ACC Focused Update of the  
2014 AHA/ACC Guideline for the  
Management of Patients With  
Valvular Heart Disease**

A Report of the American College of Cardiology/American Heart Association  
Task Force on Clinical Practice Guidelines

Developed in Collaboration With the American Association for Thoracic Surgery,  
American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions,  
Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

**IM Primaria**  
Sintomáticos (NYHA CF III-IV)  
Anatomía Favorable  
Alto Riesgo quirúrgico

Clase IIb(B)

EVEREST II

**IM Secundaria**  
Aprobado por la FDA  
Marzo 2019

COAPT   
MITRA-FR

ESC  
European Society  
of Cardiology

European Heart Journal (2017) 00, 1–53  
doi:10.1093/eurheart/ehx391

ESC/EACTS GUIDELINES

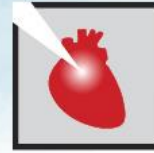
**2017 ESC/EACTS Guidelines for the  
management of valvular heart disease**

**The Task Force for the Management of Valvular Heart Disease of  
the European Society of Cardiology (ESC) and the European  
Association for Cardio-Thoracic Surgery (EACTS)**

**IM Primaria**  
Sintomáticos (NYHA CF III-IV)  
Anatomía Favorable  
Alto Riesgo quirúrgico

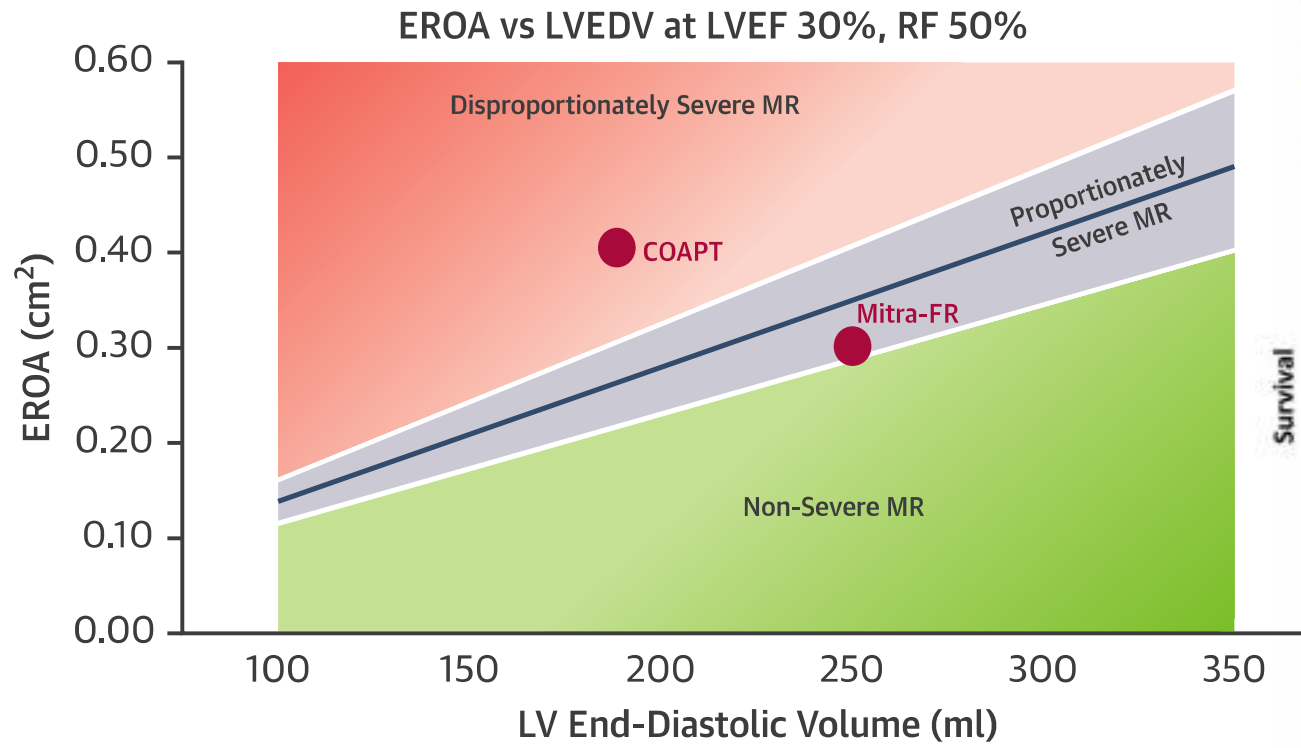
Clase IIb(C)

**IM Secundaria**  
Sintomáticos  
FEVI < 30%  
Tratamiento Médico completo  
(incluido TRC si está indicado)  
No Revascularizable

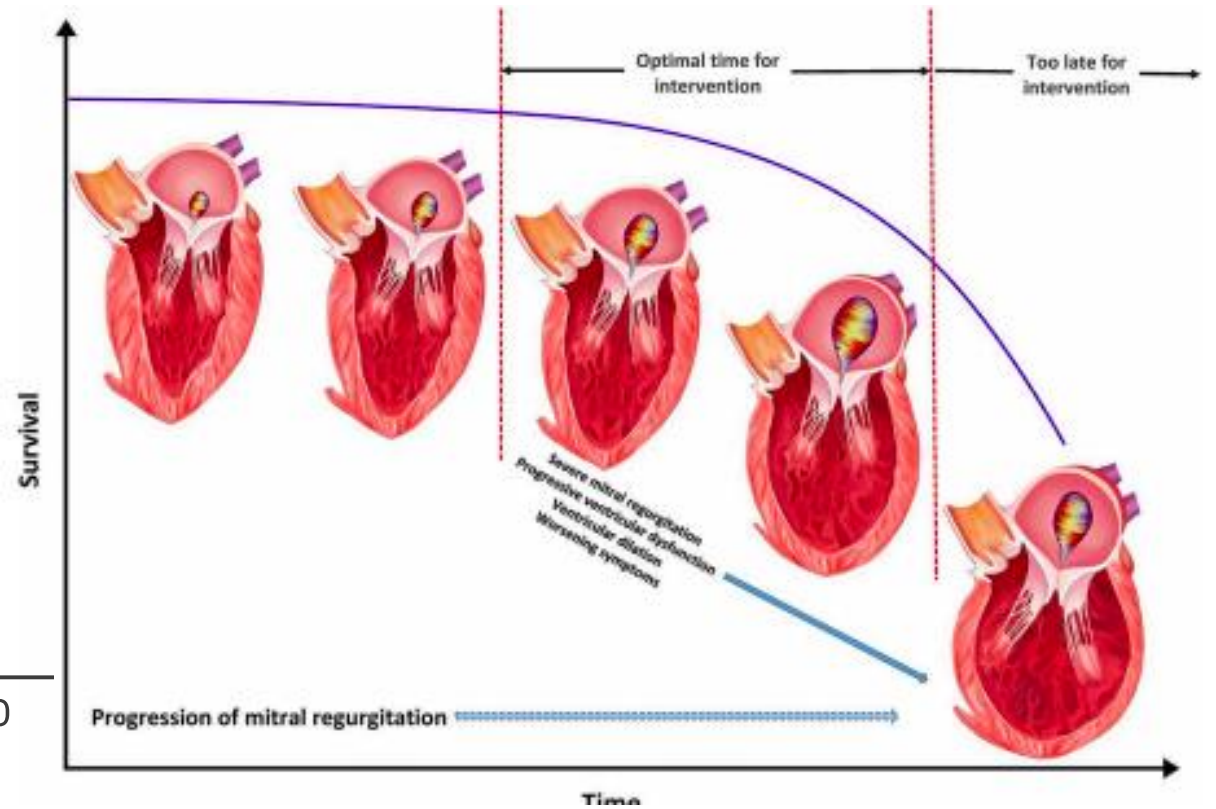


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JACC Cardiovasc Imaging. 2019 Feb;12(2):353-362



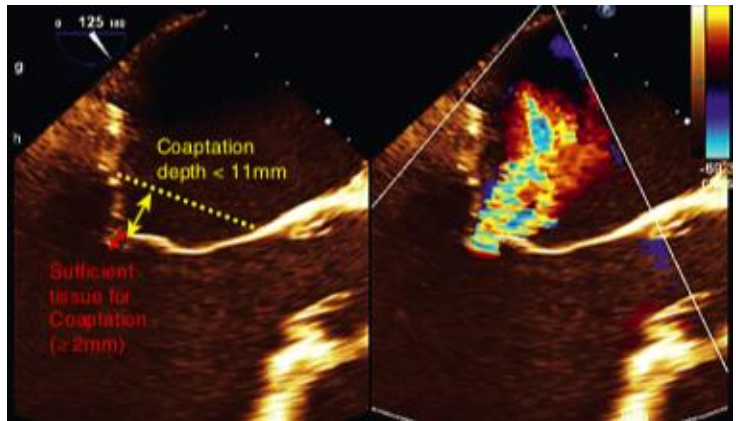
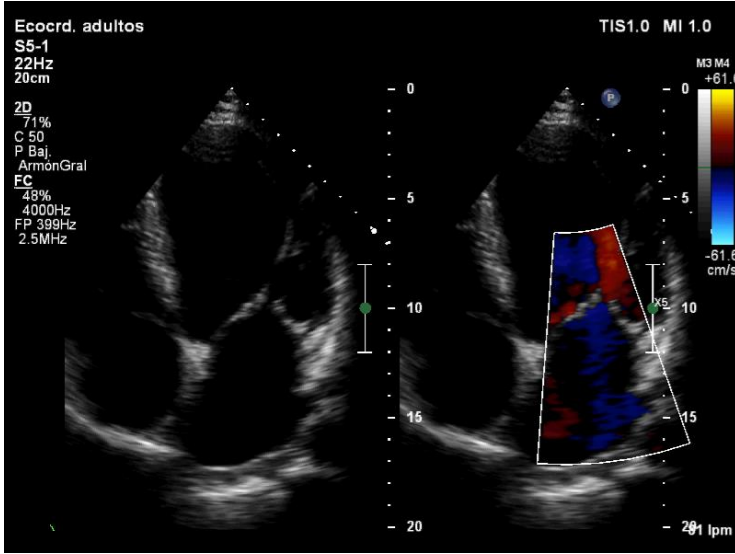
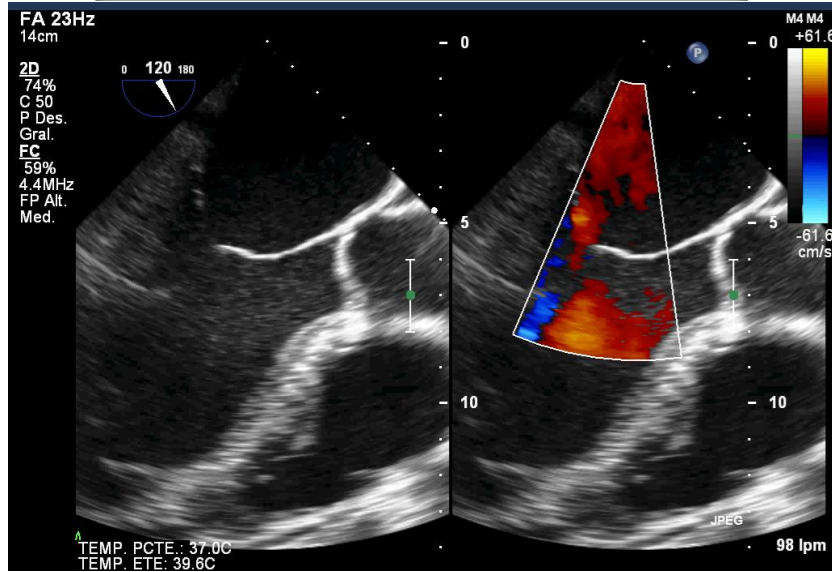
Front. Cardiovasc. Med. 2019; 6: 88

# Morfología Favorable

Central MR ( A2-P2 )  
Degenerative or Functional

Non severe calcification  
("grasping area")

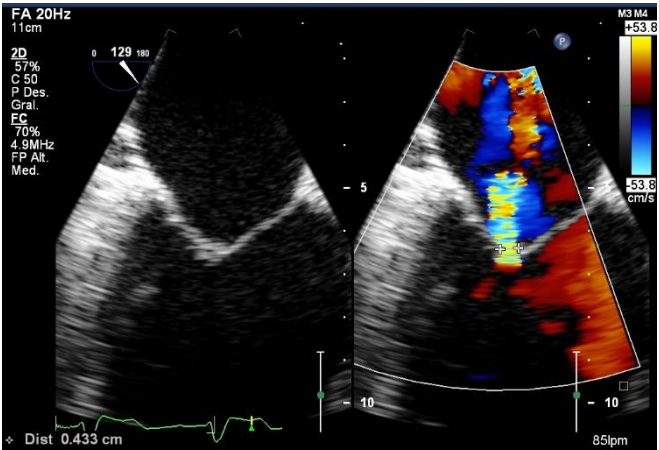
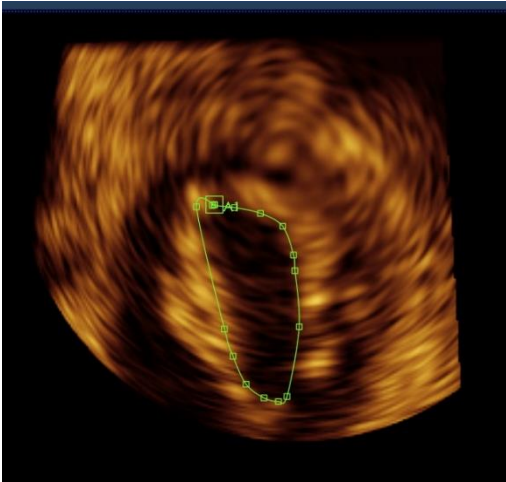
Coaptation Depth  $\geq 2$  mm  
Coaptation Height  $\leq 11$  mm



Flail Gap < 10 mm  
Flail Width < 15 mm

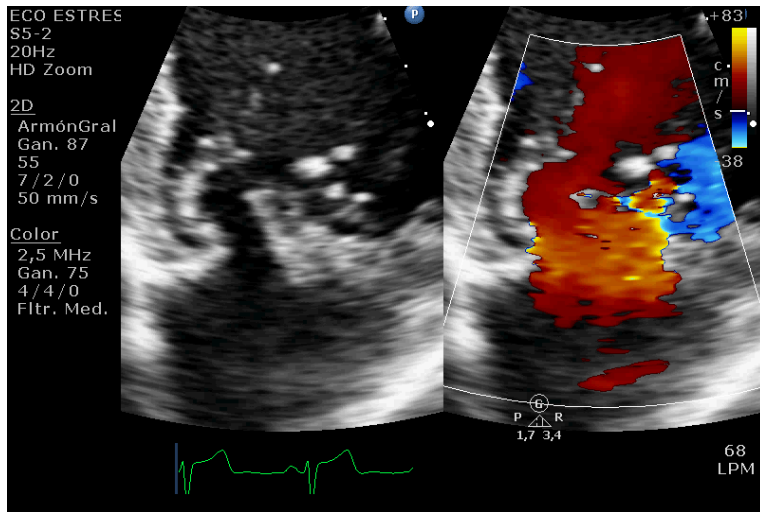
MVA > 4 cm<sup>2</sup>

Posterior leaflet length >10 mm



# Morfología no Favorable

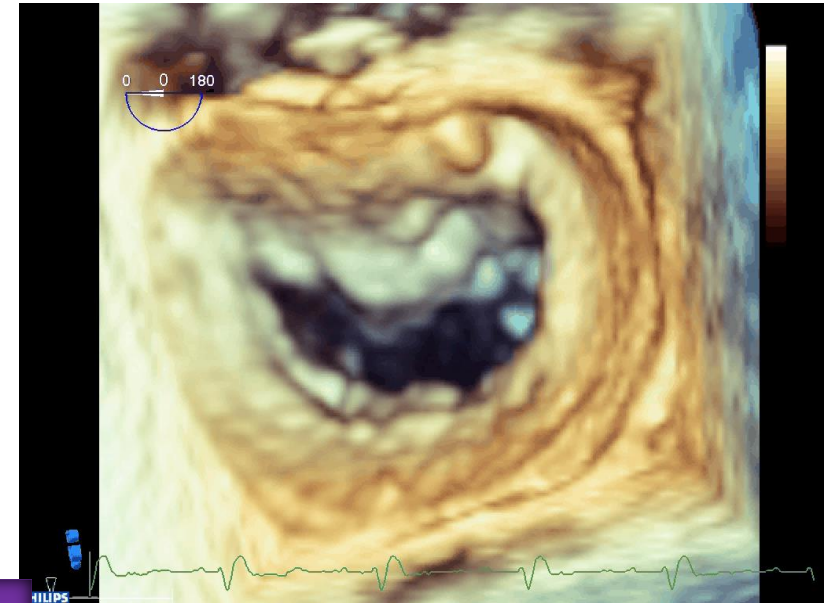
Barlow's Syndrome  
with multisegmentary  
"flails"



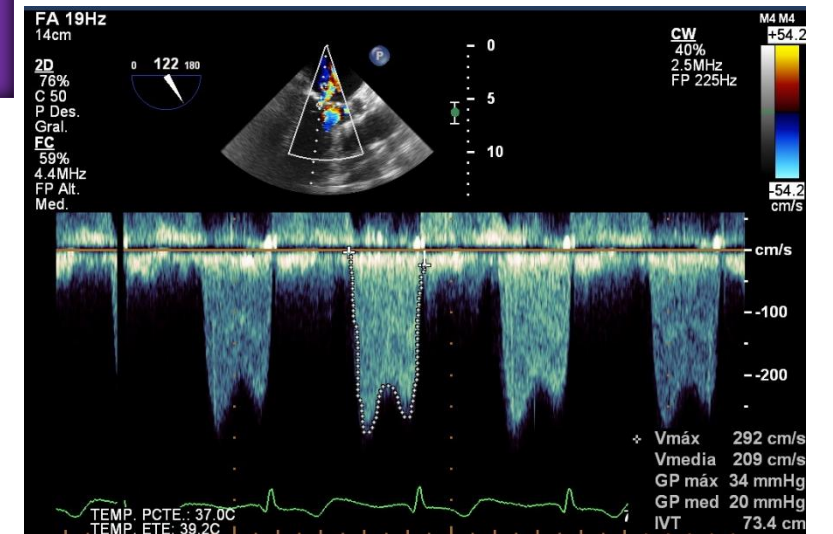
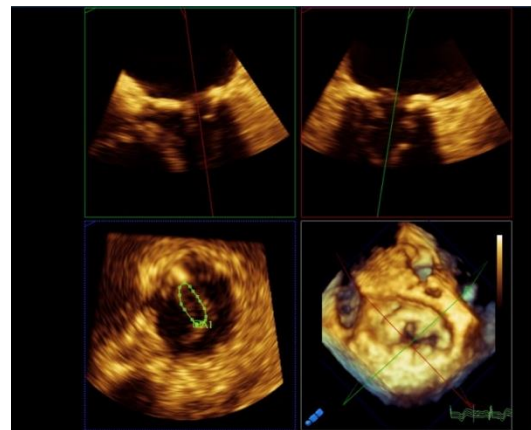
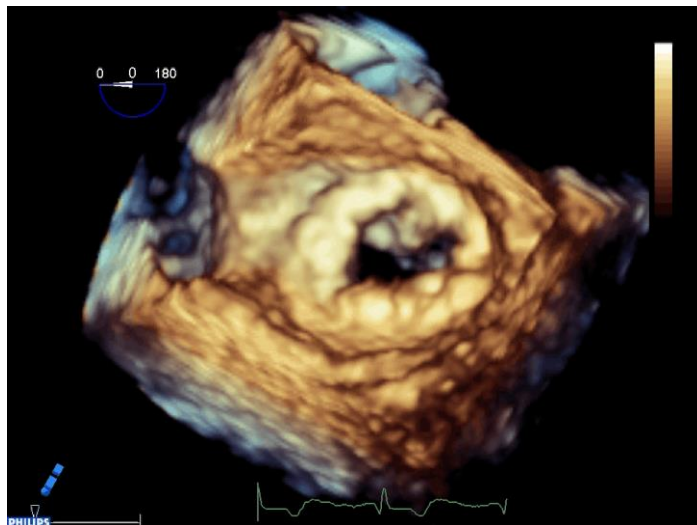
Severe Calcification( MAC)



Valve Perforation



Mitral Stenosis :MVA < 3 cm<sup>2</sup>  
MG >5 mmHg



Morfología óptima	Morfología Probable	Morfología no favorable
Jet de origen central (A2-P2)	Patología en los segmentos (A1-P1/A3-P3)	Válvula mitral perforada o cleft
Ausencia de calcificación valvar	Leve Calcificación por fuera del área de grasping. Calcificación del anillo. Anuloplastia con anillo	Severa calcificación de la zona del grasping
Área Valvular Mitral > 4 cm <sup>2</sup>	Área valvular > 3 cm <sup>2</sup> con buena movilidad de las valvas	Estenosis mitral significativa hemodinámicamente (AVM < 3 cm <sup>2</sup> , GM > 5 mmHg)
Longitud de la valva posterior >10 mm	Longitud de la valva posterior 7-10 mm	Longitud de la valva posterior > 7 mm
Altura de la Coaptación < 11 mm	Altura de la Coaptación > 11 mm	
Grosor y movilidad normal del las valvas	Restricción sistólica (Carpentier IIIB)	Restricción sistodiastólica de origen reumático (Carpentier IIIA)
Flail width: < 15 mm Flail gap < 10 mm	Flail > 15 mm solo con una anillo grande y opción a múltiples clips.	Síndrome de Barlow con "flail" multi segmentario
Centros que se inician	Centros Intermedios	Centros de Alto Volumen

Beyond  
EVEREST

TMVR?  
New devices

# MitraClip Timeline

1º Generación

2003

Primer Caso



EVEREST

2º Generación

2016



3º Generación

2018



MITRA FR  
COAPT

4º Generación

2019



5º Generación

202...

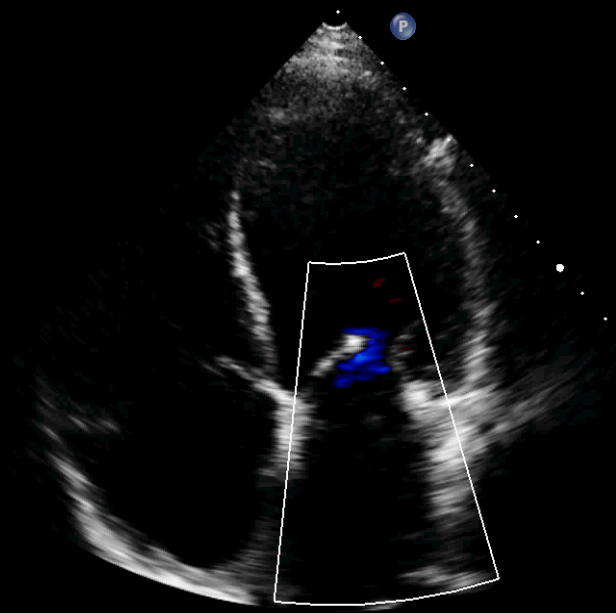




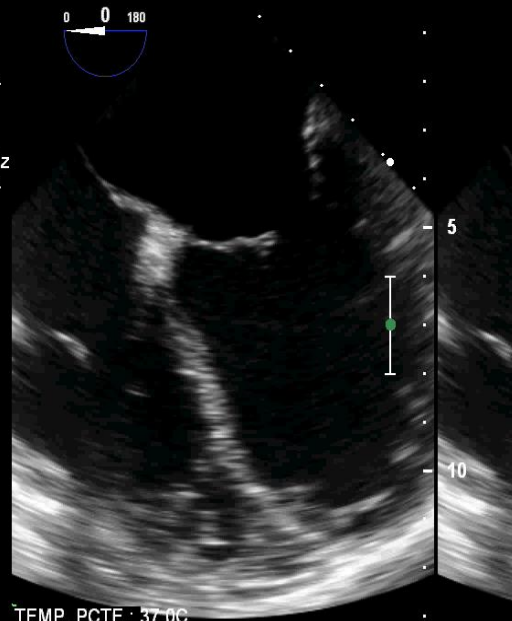
FA 21Hz  
17cm

2D  
66%  
C 50  
P Baj.  
ArmónGral

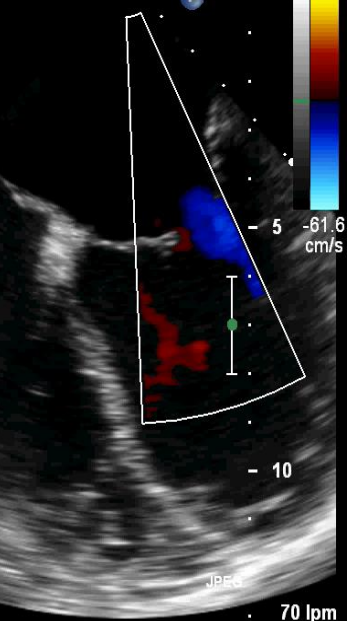
FC  
66%  
2.5MHz  
FP Alt.  
Med.



M3 M4  
+61.6  
13cm  
FA 26Hz  
62%  
C 50  
P Des.  
Gral.  
FC  
59%  
4.4MHz  
FP Alt.  
Med.



M4 M4  
+61.6  
-0  
-61.6  
cm/s



JPEG  
85 lpm

TEMP. PCTE.: 37.0C  
TEMP. ETE: 38.6C

Latidos 3D 1

70 lpm

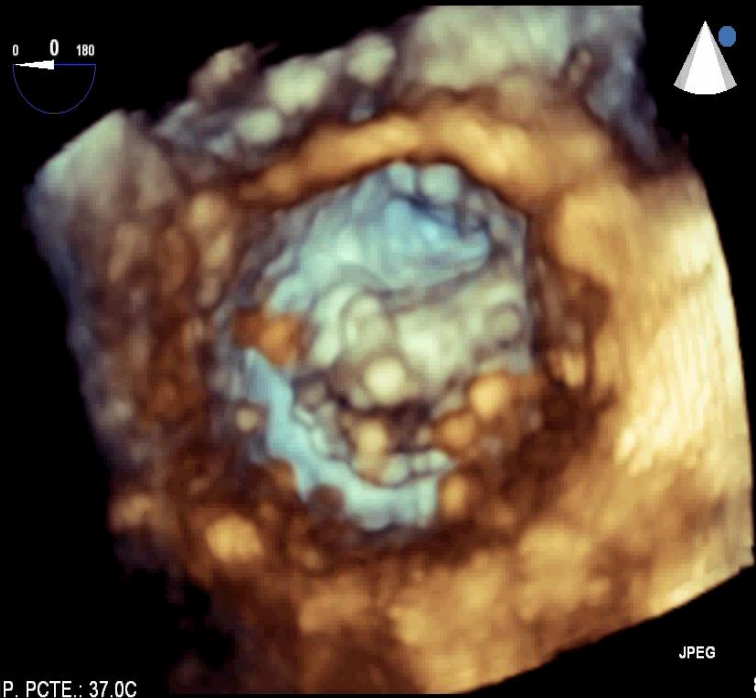
9.4cm

3D  
3D 47%  
3D 40dB



FA 8Hz  
9.4cm  
3D  
3D 47%  
3D 40dB  
JPEG  
86 lpm

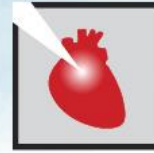
TEMP. PCTE.: 37.0C  
TEMP. ETE: 40.2C



FA 8Hz  
9.4cm  
3D  
3D 47%  
3D 40dB

TEMP. PCTE.: 37.0C  
TEMP. ETE: 40.6C

M4  
JPEG  
83 lpm



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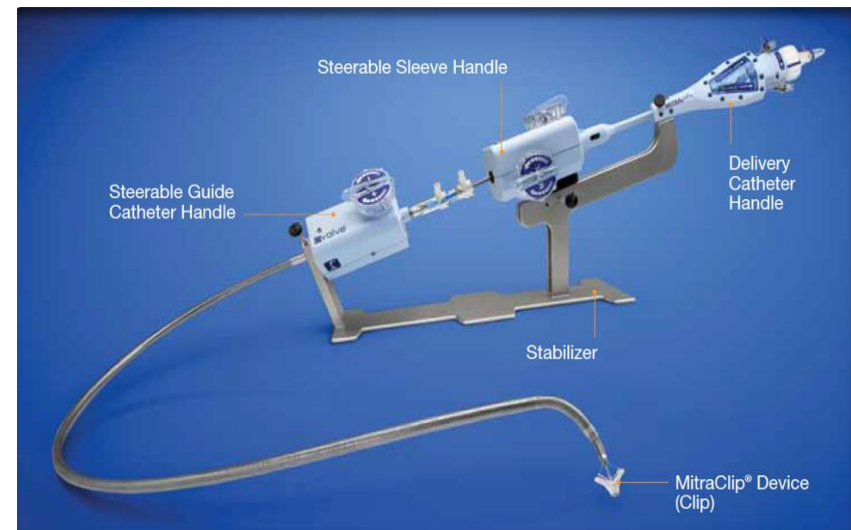
## Steerable Guide Catheter (SGC)

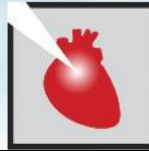


## Clip Delivery System (CDS)



## MitraClip

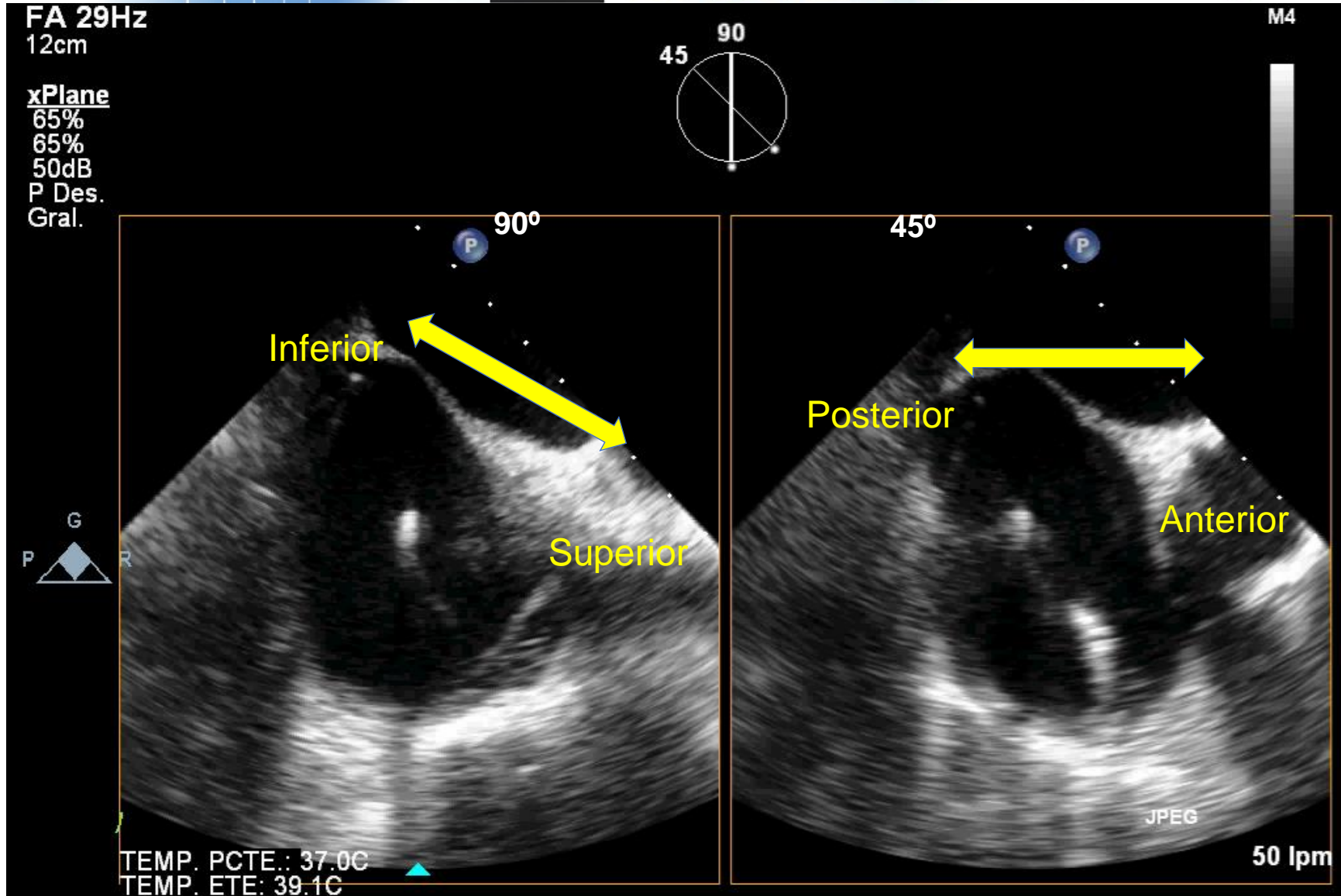




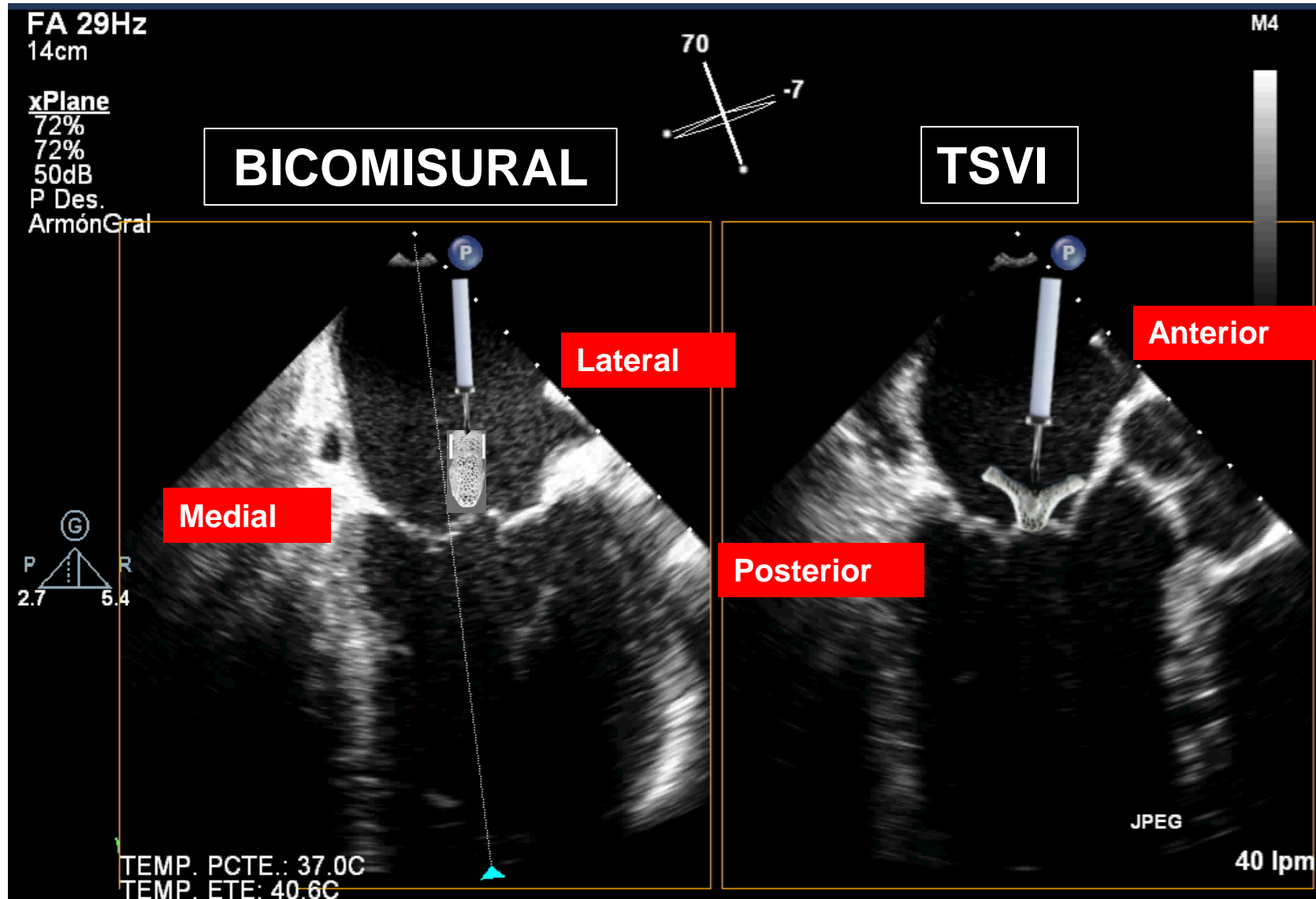
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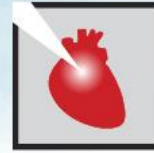
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# Posicionar el MitraClip por encima de la VM



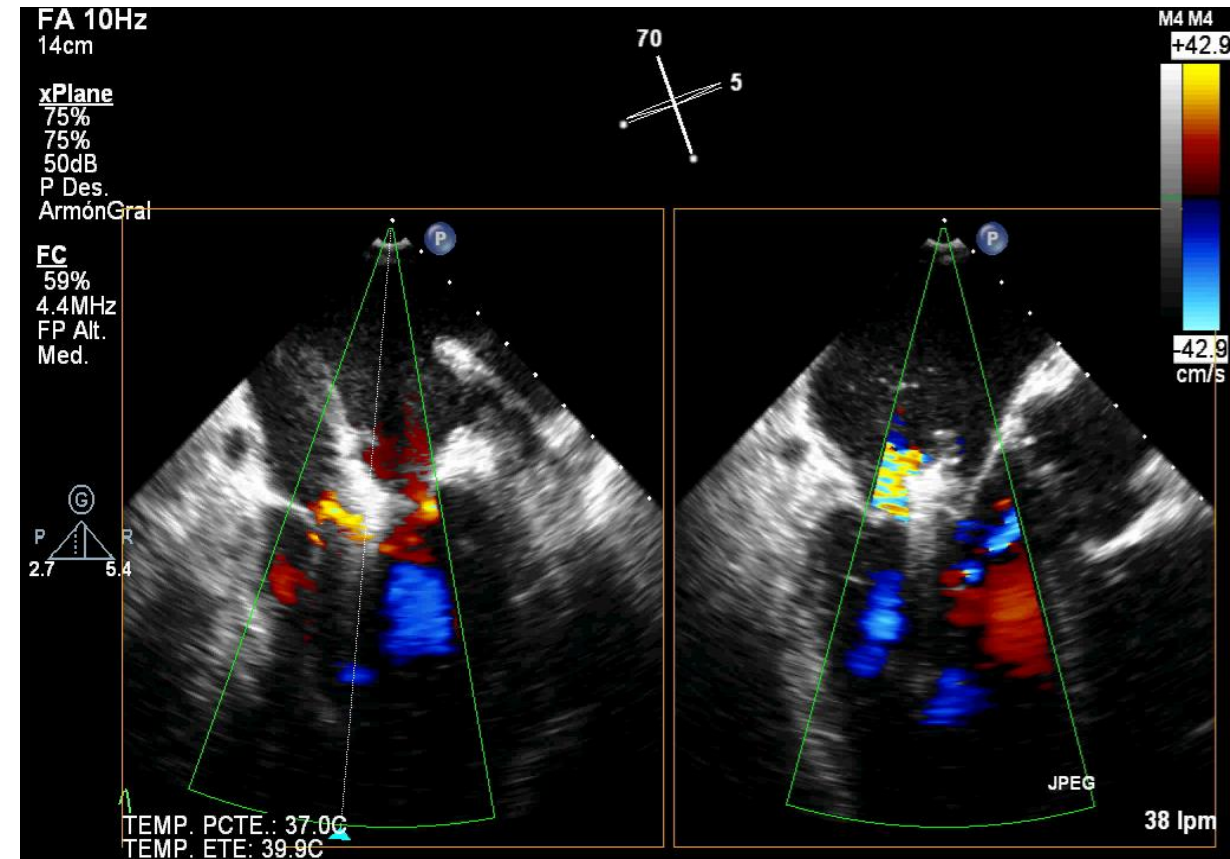
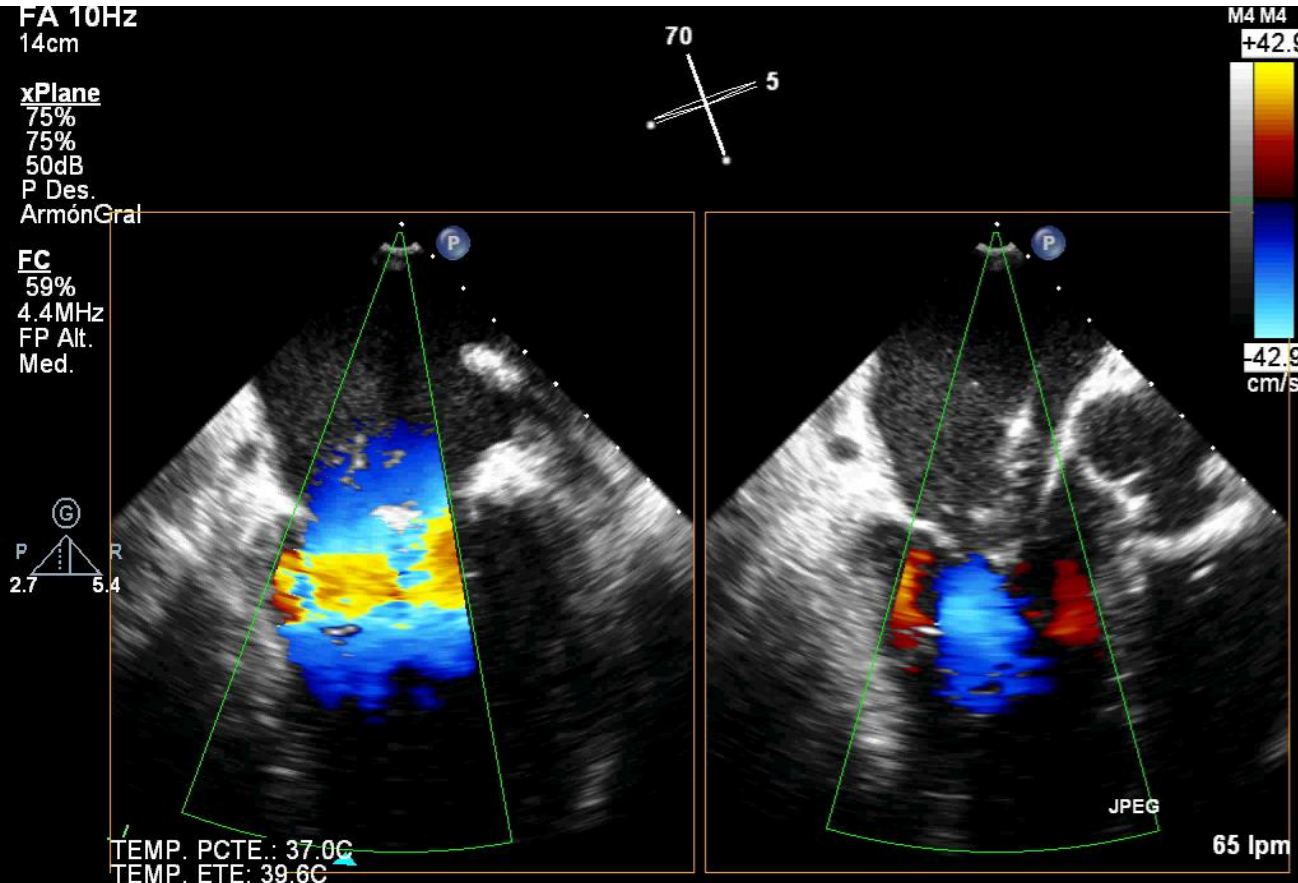


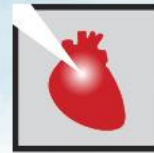
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# Avance del Mitra Clip en el VI “Split the MR jet”

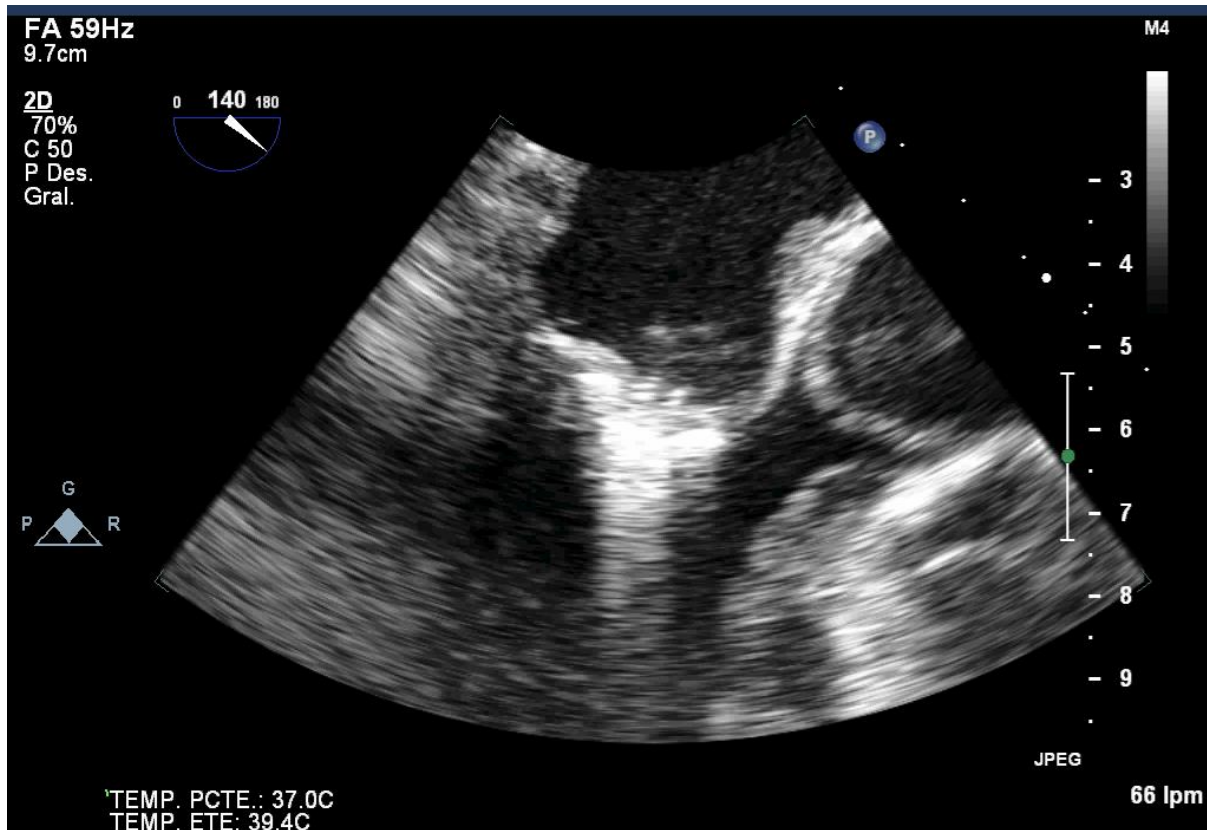




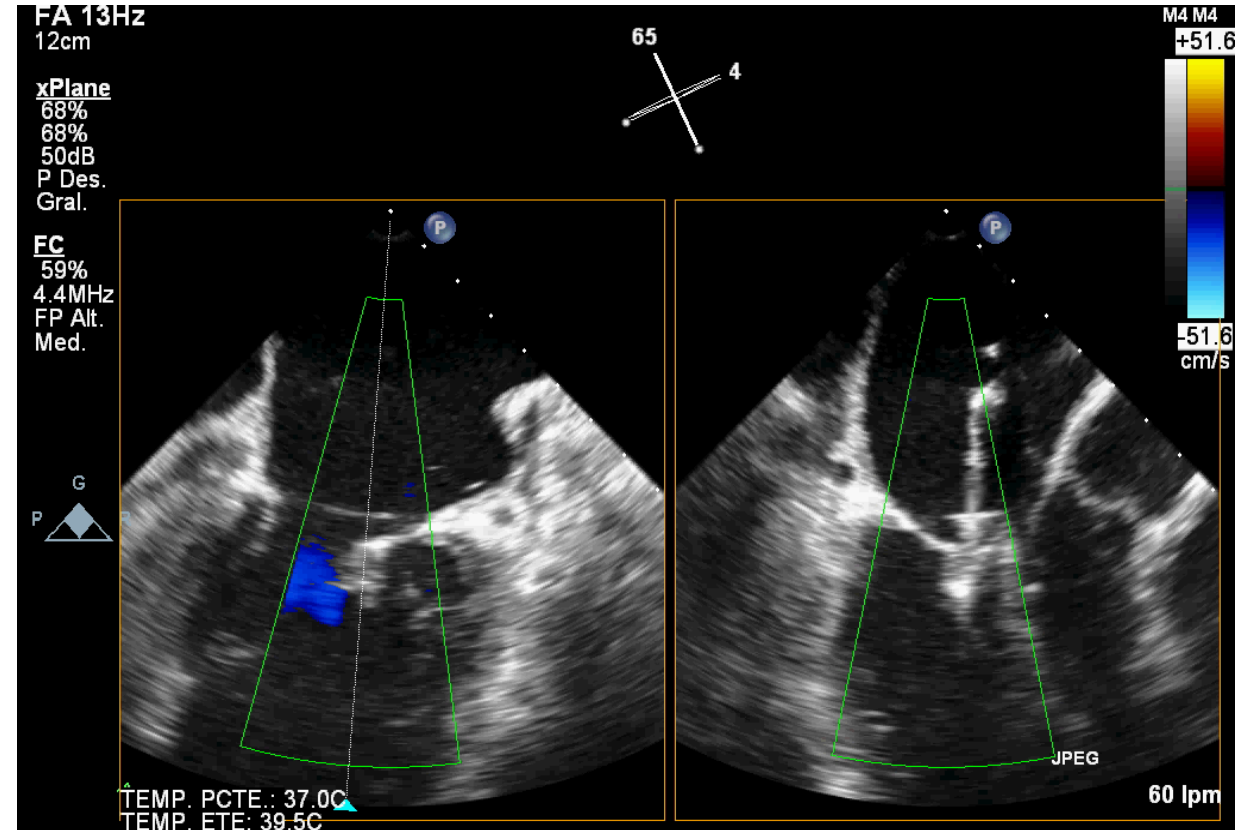
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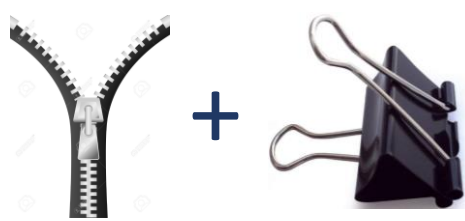
# “Graspping”



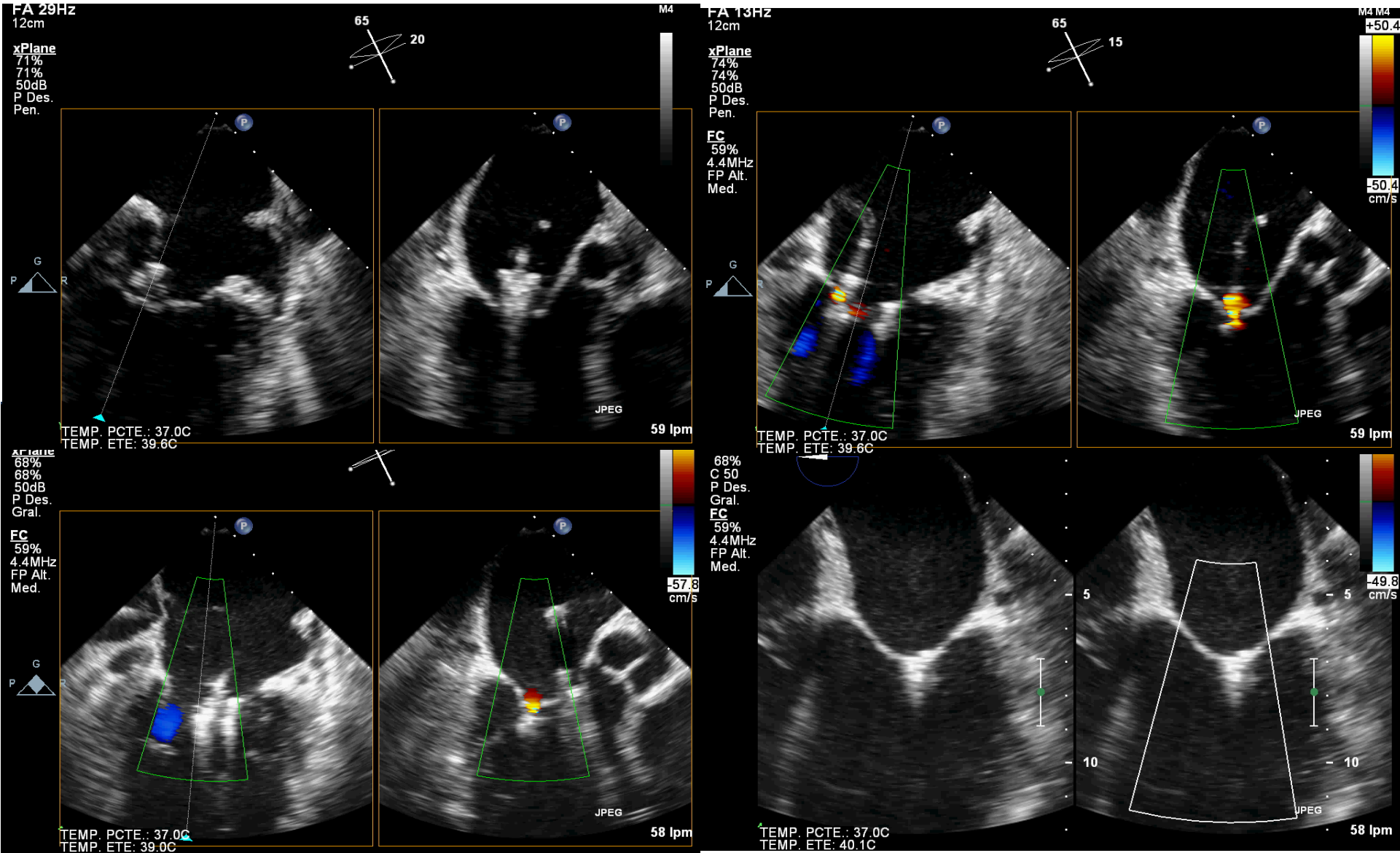
“ Graspping View”



IM Residual Moderada (+3)



# Implante de 2º Clip



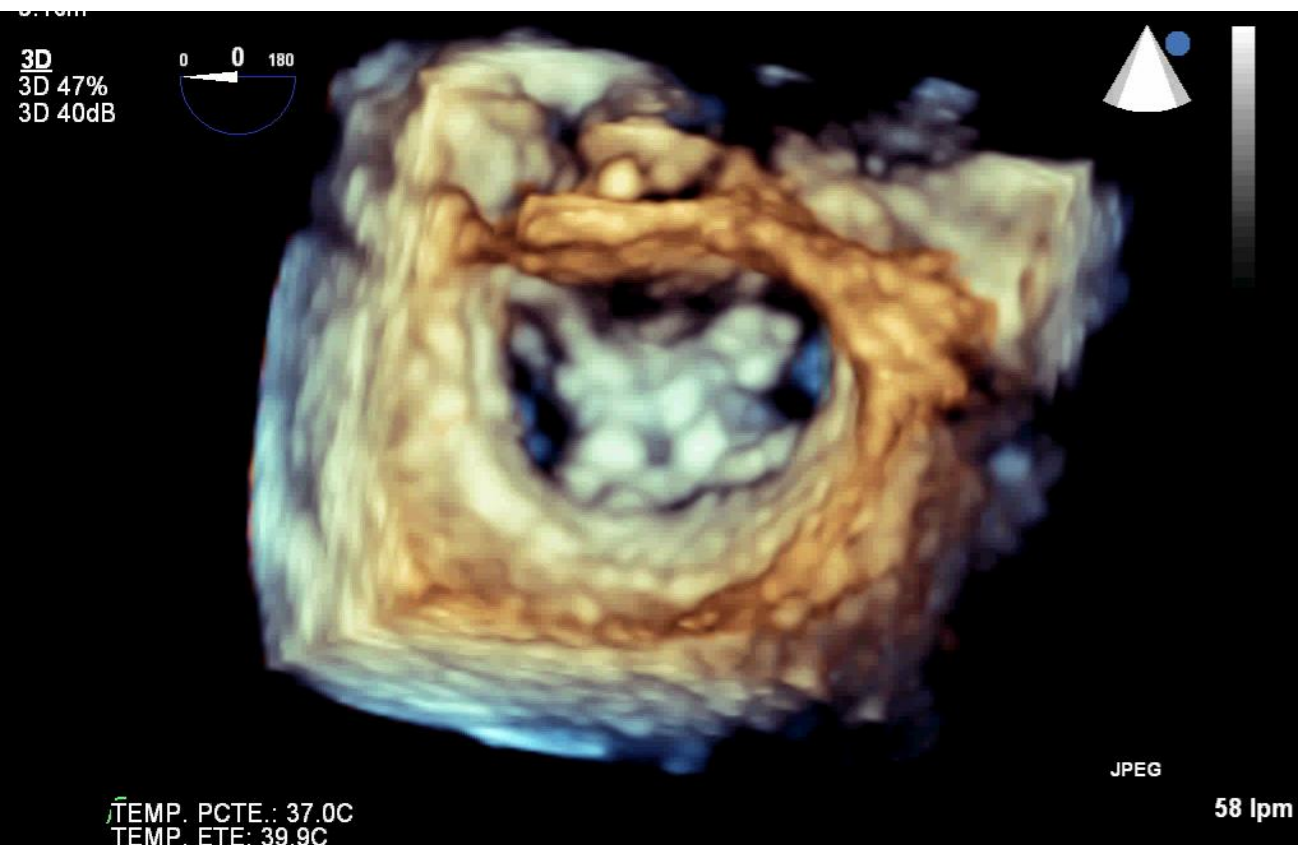


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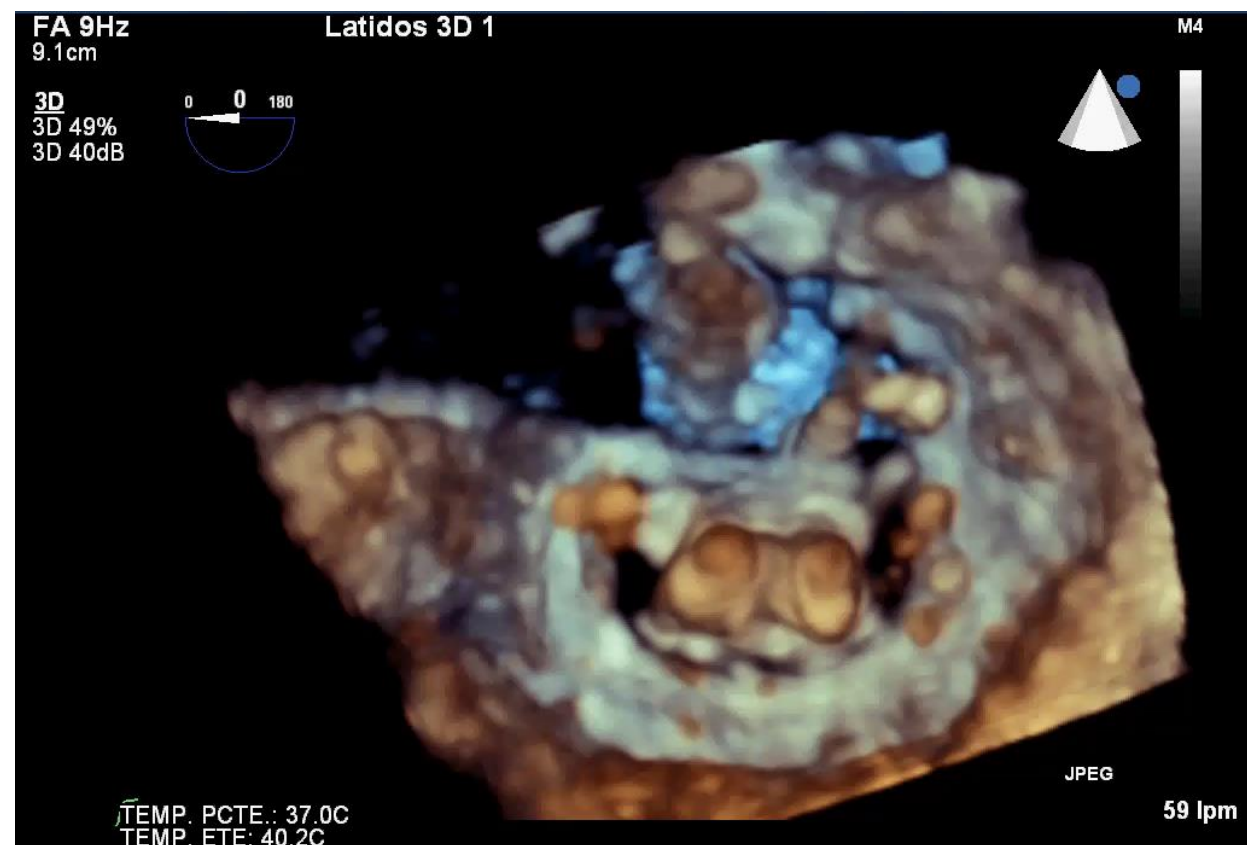
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## Implante de 2º Clip



**VISTA AI**



**VISTA VI**





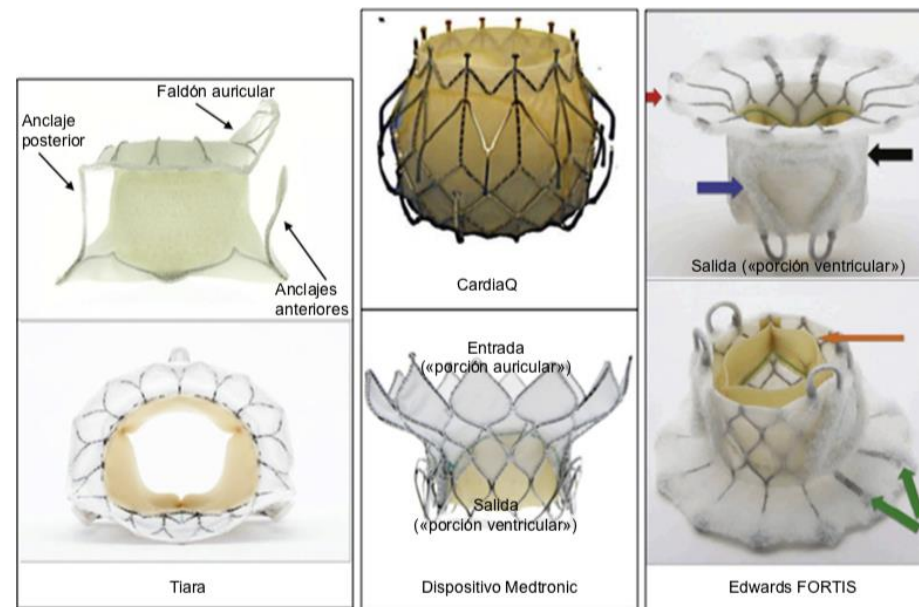
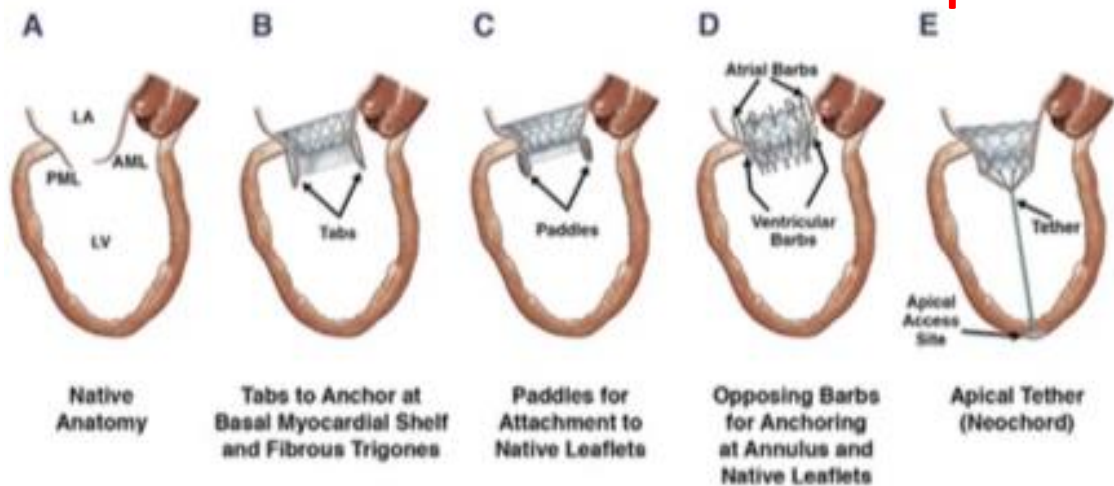
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# Reemplazo Mitral Transcatéter

## Tipos de Válvula

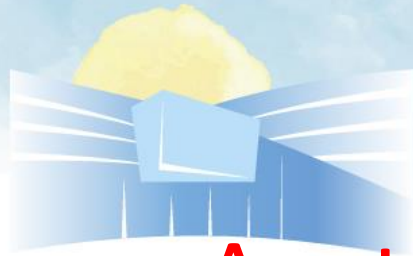


Company	Abbott	Edwards	Edwards	Medtronic	Neovasc
Name	Tendyne	CardiaQ	Fortis	Twelve	Tiara
Patients treated	31	12	23	15	15
First implant	October 2014	June 2012	February 2014	September 2014	January 2014
Functional aetiology	86%	64%	100%	73%	54%
Successful deployment	21/23 (91%)	9/11 (82%)	10/13 (77%)	14/15 (93%)	9/11 (82%)
30-day mortality	1/23 (4%)	5/11 (45%)	5/13 (38%)	2/15 (13%)	3/11 (27%)
MR grade 0 at follow-up	19/19 (100%)	na	8/9 (89%)	13/14 (93%)	na

Rev Esp Cardiol. 2015;68(12):1165–1173

JACC Cardiovasc Imaging 2015;8(10):1191-1208

EuroIntervention 2016;12(Y):Y97-Y101

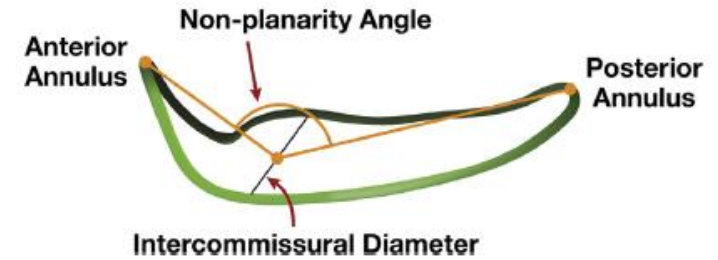
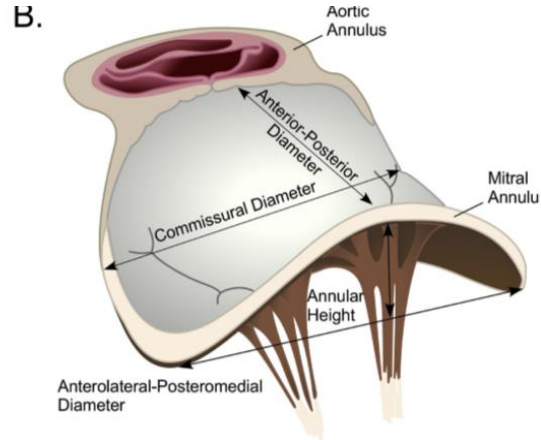
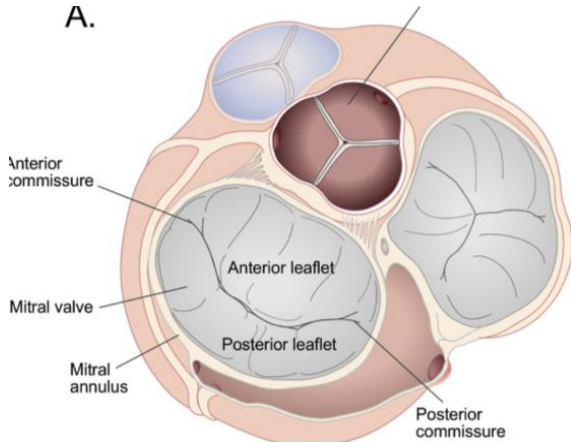


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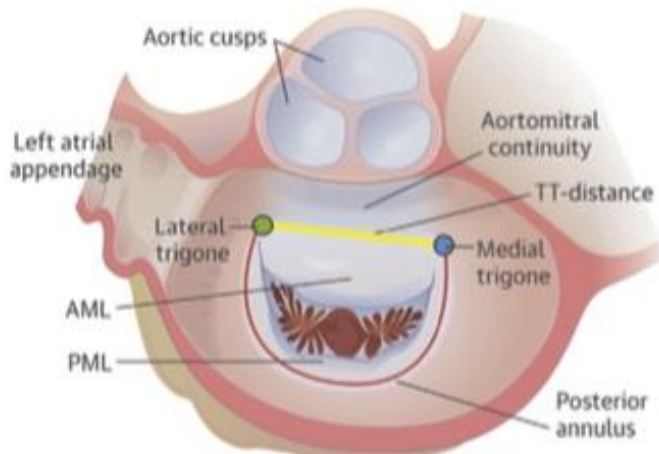
*Pilar*

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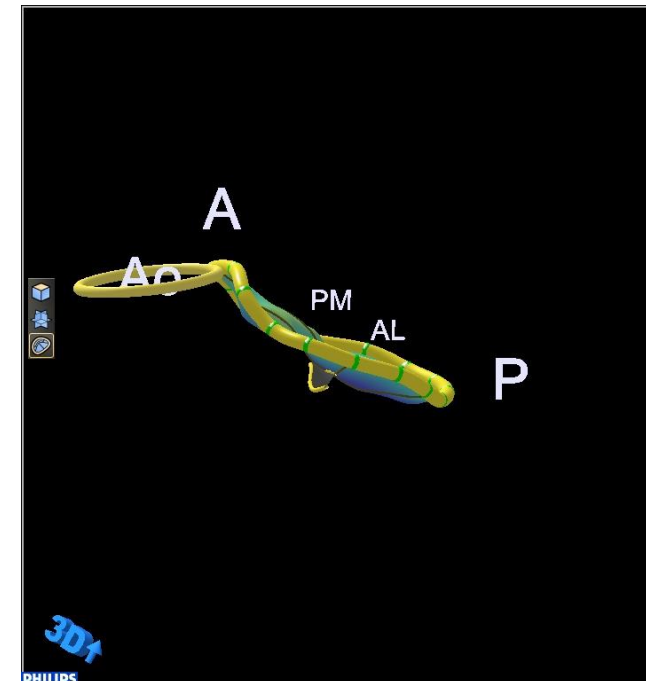
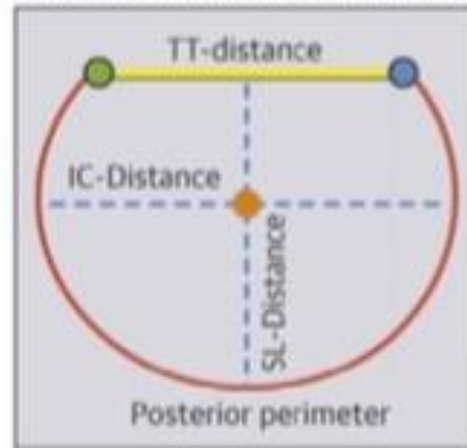
# Anatomía del anillo mitral



J Am Soc Echocardiogr 2017; 30:461-71



Pertinent Annular Measurements



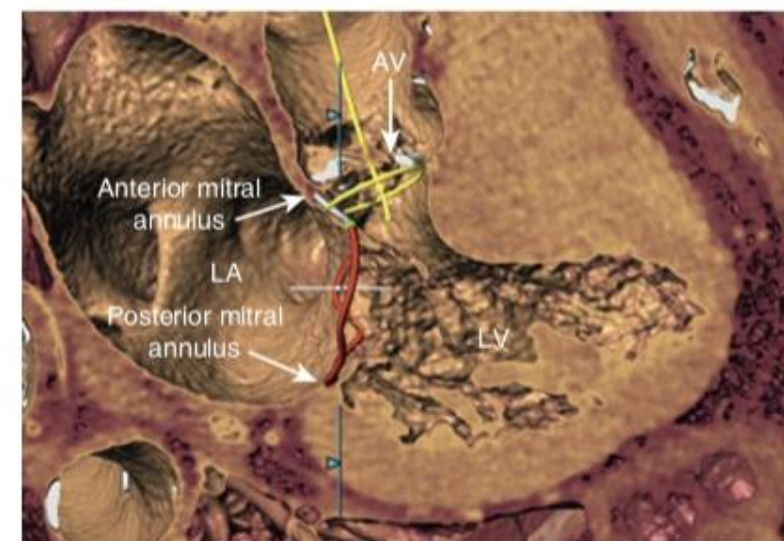
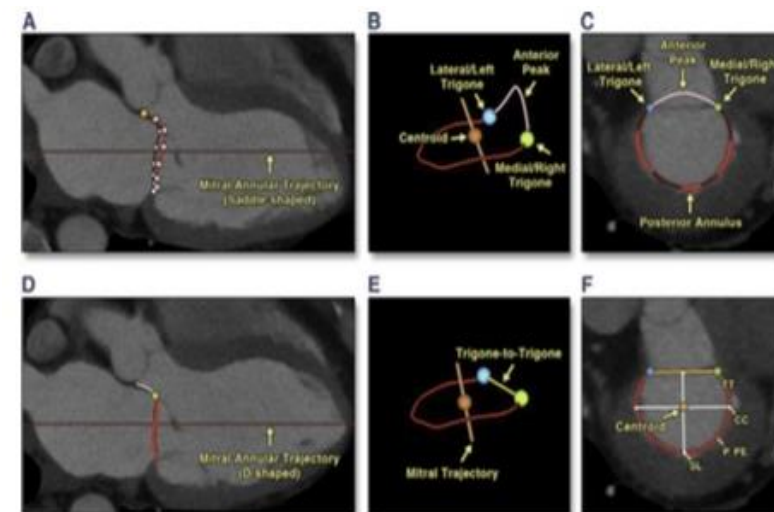
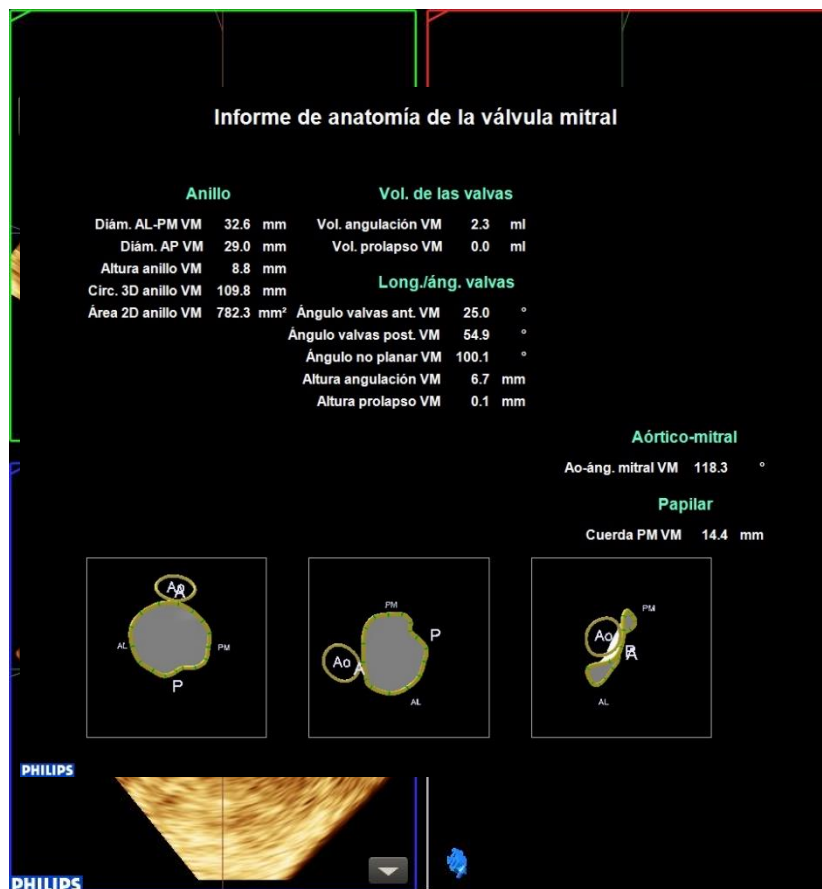
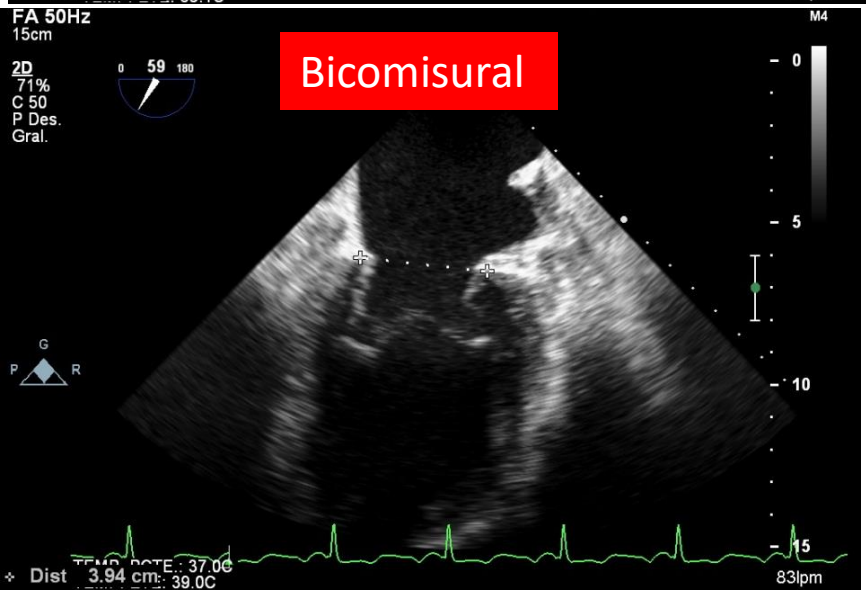
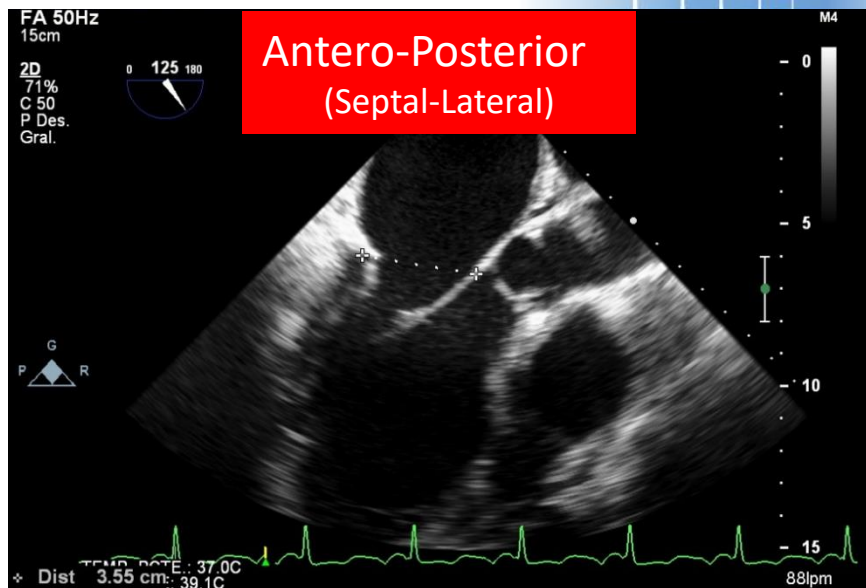
JACC Cardiovasc Imaging 2015;8:1191-1208



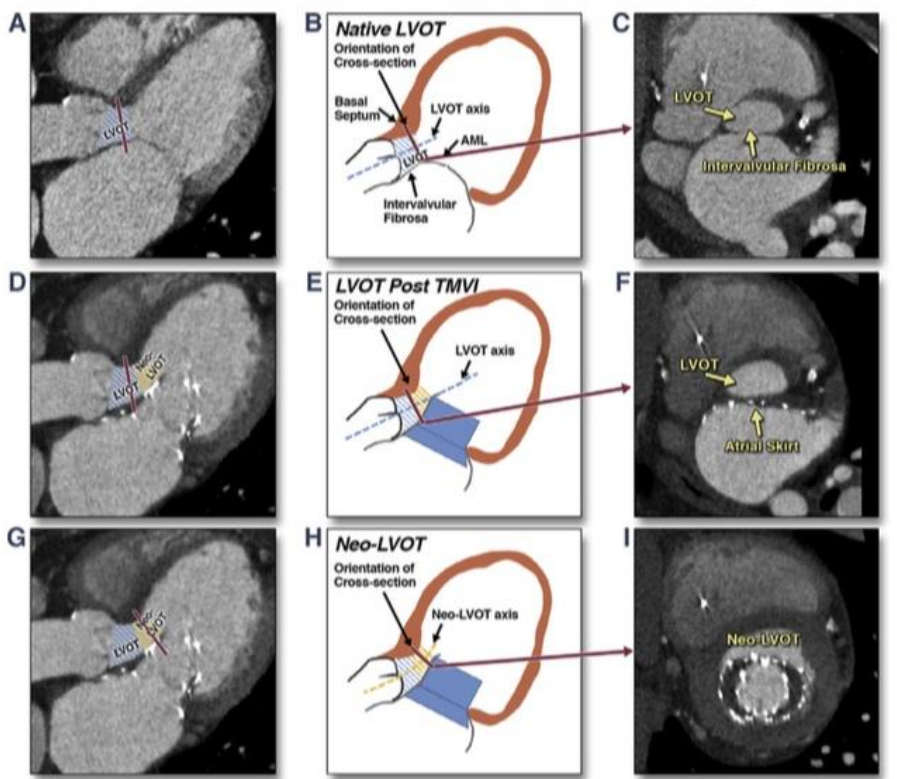
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# Anillo Mitral



La mayoría de los Prótesis Percutáneas protuyen hacia la cavidad del Ventrículo Izquierdo durante la liberación desplazando la valva anterior mitral hacia el septum interventricular lo que es llamado como Neo-TSVI.



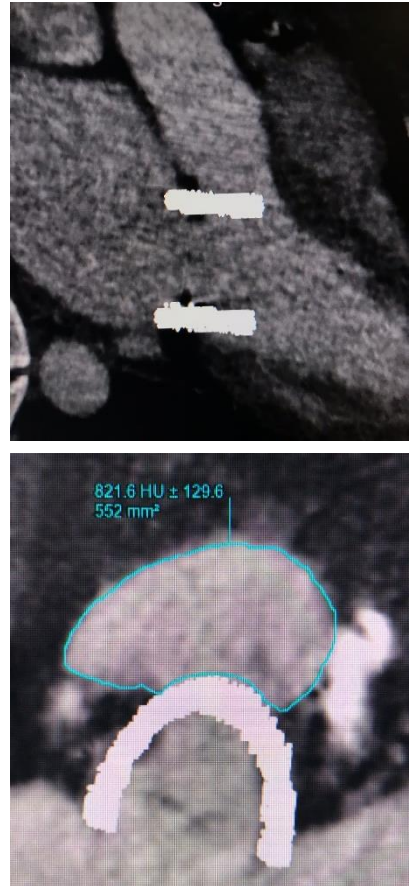
### Predicting LVOT Obstruction in Transcatheter Mitral Valve Implantation Concept of the Neo-LVOT

Philipp Blanke, MD,<sup>a</sup> Christopher Naoum, MBBS,<sup>a</sup> Danny Dvir, MD,<sup>a</sup> Vinayak Bapat, MD,<sup>b</sup> Kevin Ong, MD,<sup>a</sup> David Muller, MBBS,<sup>c</sup> Anson Cheung, MD,<sup>a</sup> Jian Ye, MD,<sup>a</sup> James K. Min, MD,<sup>d</sup> Nicolò Piazza, MD,<sup>e</sup> Pascal Theriault-Lauzier, BSc,<sup>e</sup> John Webb, MD,<sup>a</sup> Jonathon Leipsic, MD<sup>a</sup>

**NEO-TSVI**

- Segmento Ventricular de la prótesis
- Valva anterior mitral
- Septum interventricular

**Neo-TSVI >2,5 cm<sup>2</sup>**



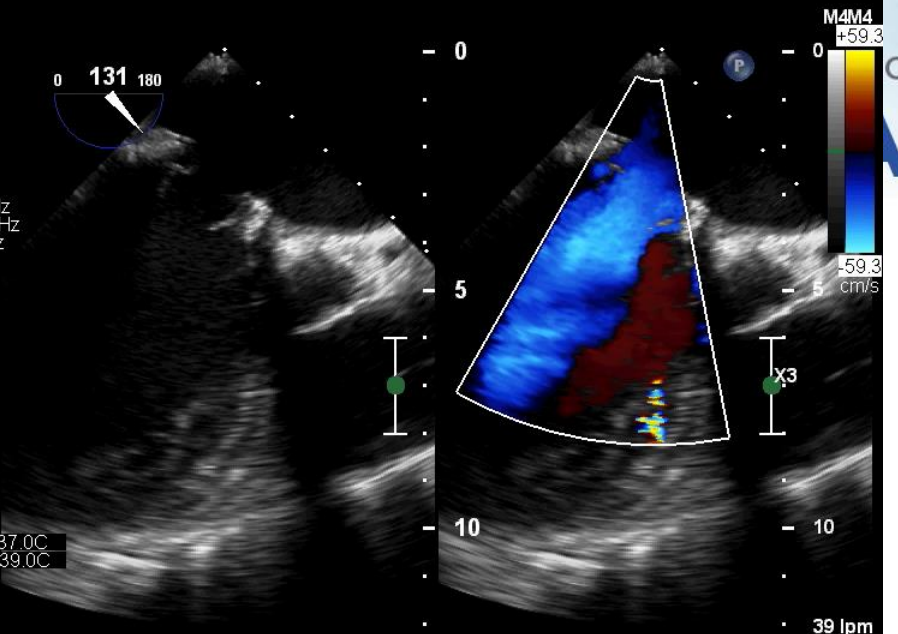
Ecocrd. adultos

X7-2t  
21Hz  
12cm

2D  
61%  
C 50  
P Des.  
Gral.  
EC  
48%  
6838Hz  
FP 615Hz  
4.4MHz

PAT T: 37.0C  
TEE T: 39.0C

J



TIS0.7 MI 0.4

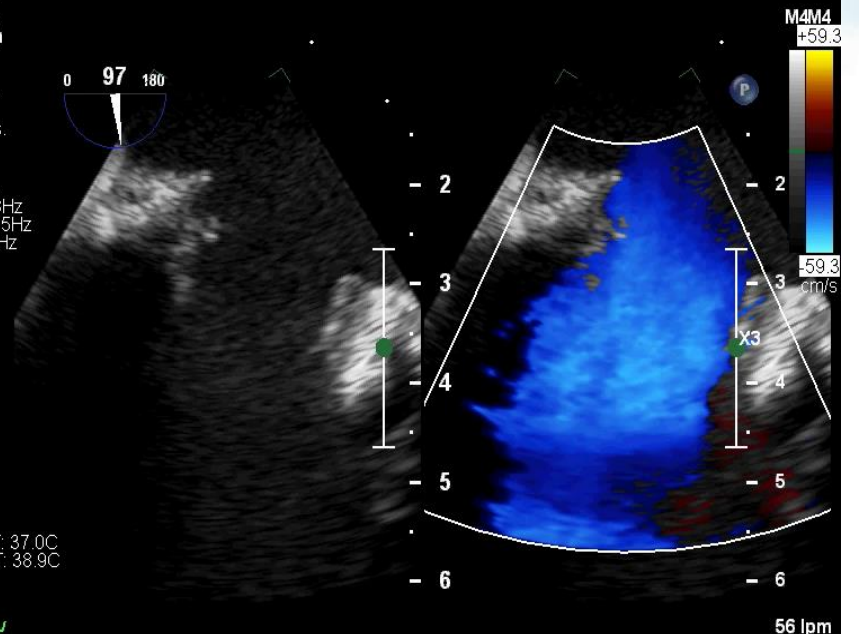
Ecocrd. adultos

X7-2t  
20Hz  
6.2cm

2D  
61%  
C 50  
P Des.  
Gral.  
EC  
48%  
6838Hz  
FP 615Hz  
4.4MHz

PAT T: 37.0C  
TEE T: 38.9C

J



TIS0.5 MI 0.8

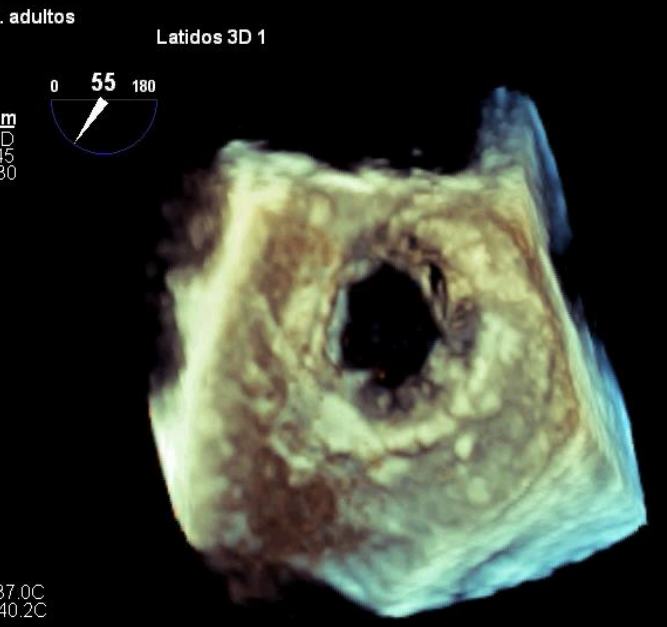
Ecocrd. adultos

X7-2t  
8Hz  
5.3cm

3D Zoom  
2D / 3D  
% 56 / 45  
C 50 / 30  
Gen

PAT T: 37.0C  
TEE T: 40.2C

L



TIS0.1 MI 0.3

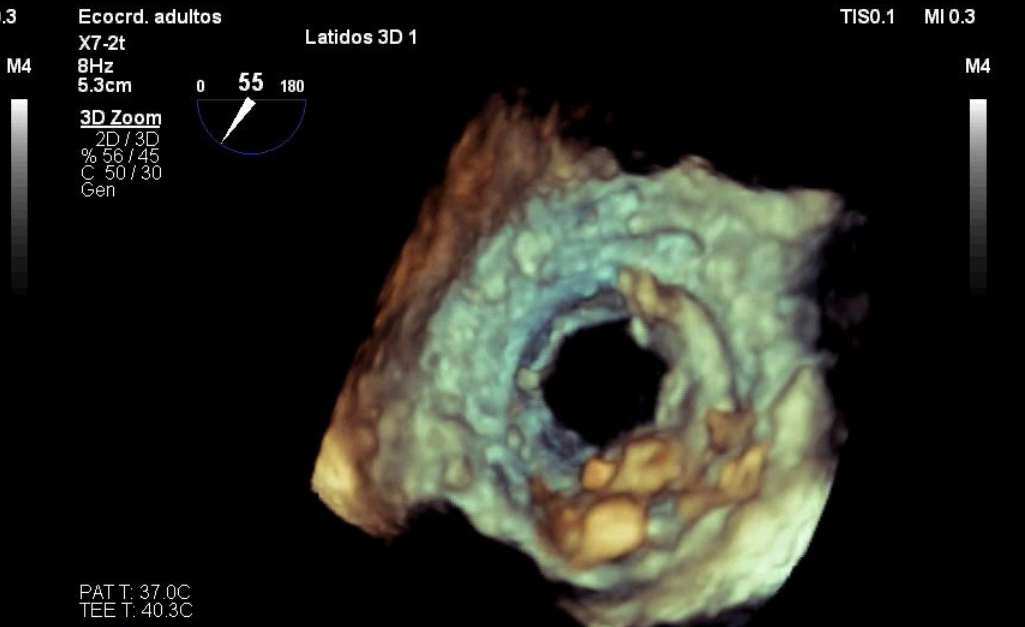
Ecocrd. adultos

X7-2t  
8Hz  
5.3cm

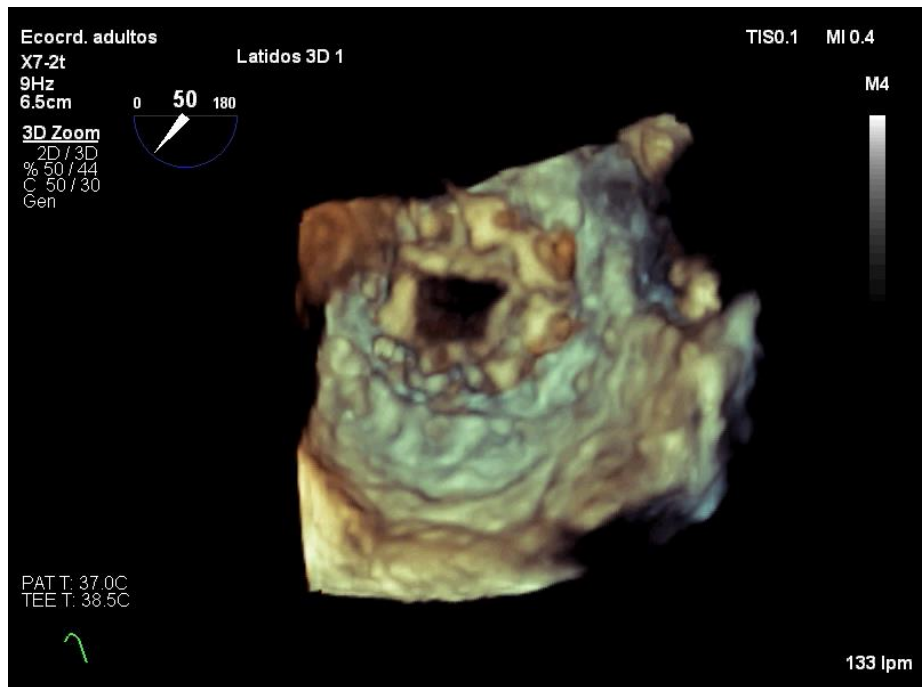
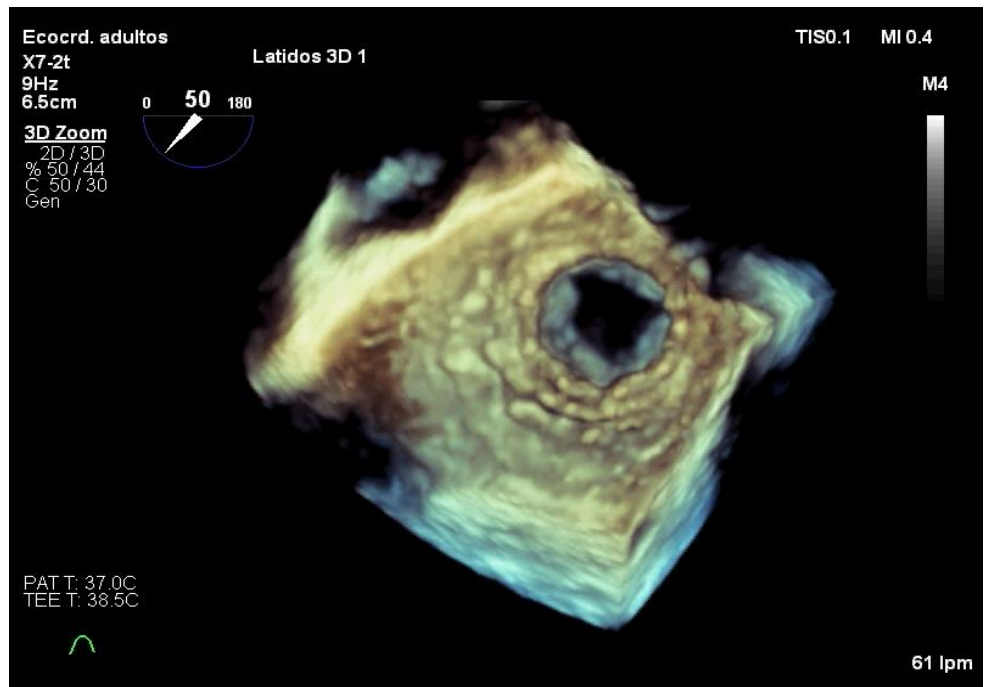
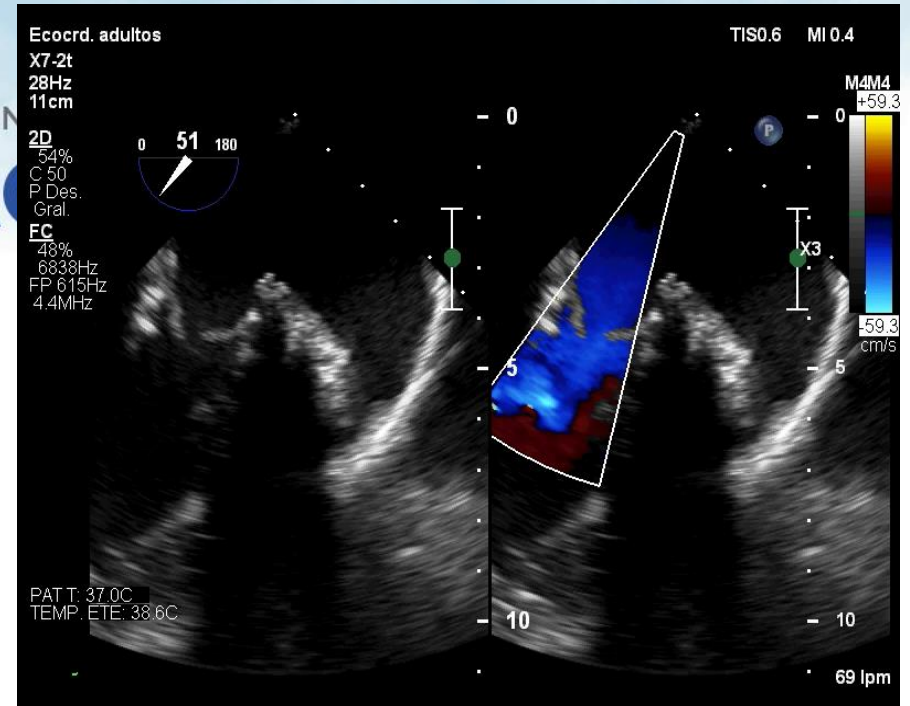
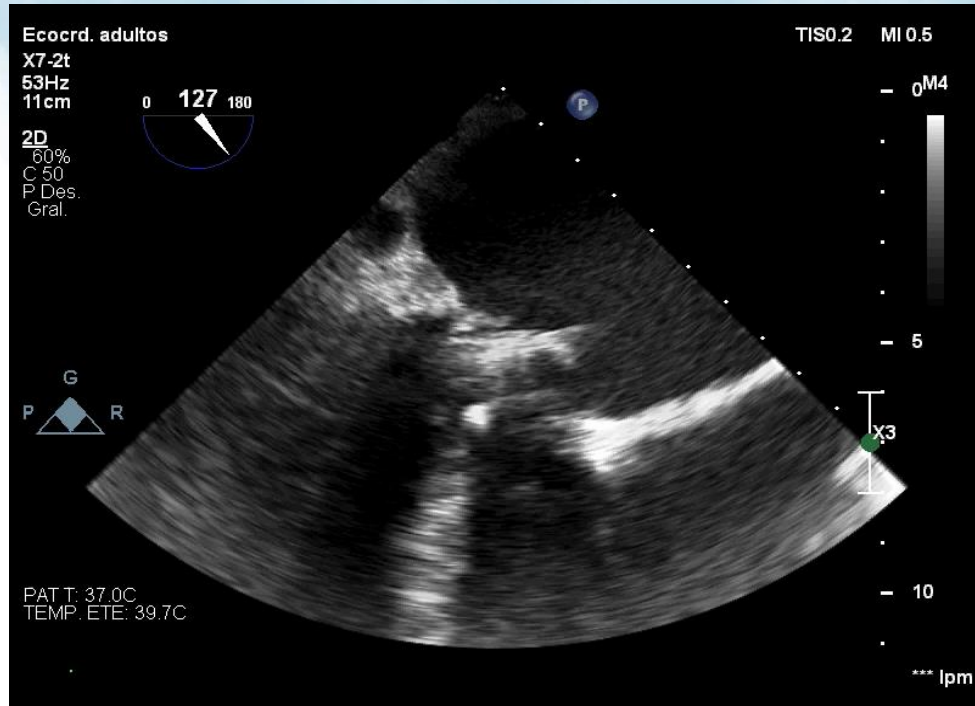
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2D / 3D  
% 56 / 45  
C 50 / 30  
Gen

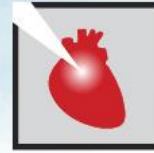
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TEE T: 40.3C

L



TIS0.1 MI 0.3

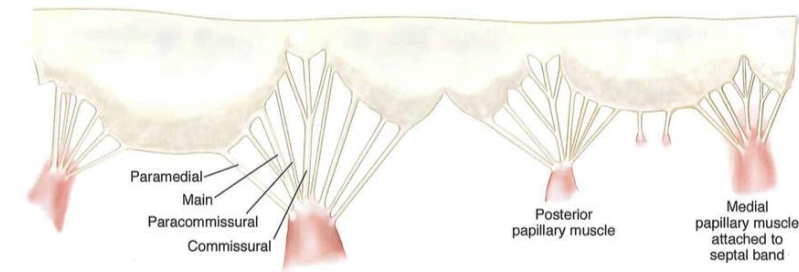
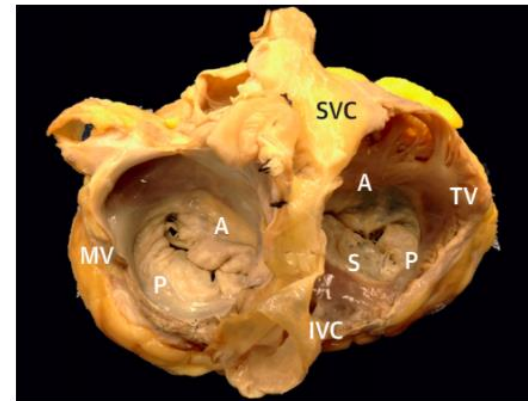
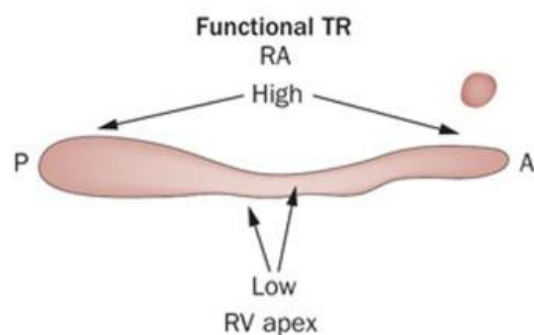
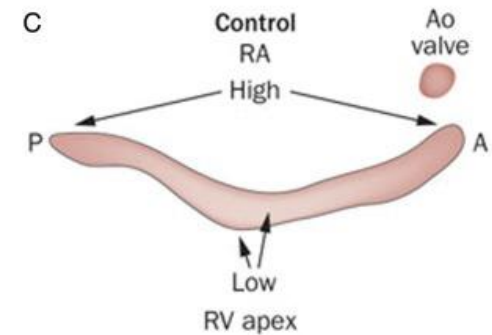
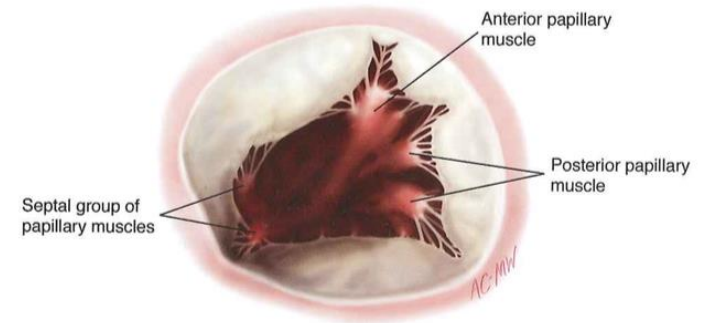
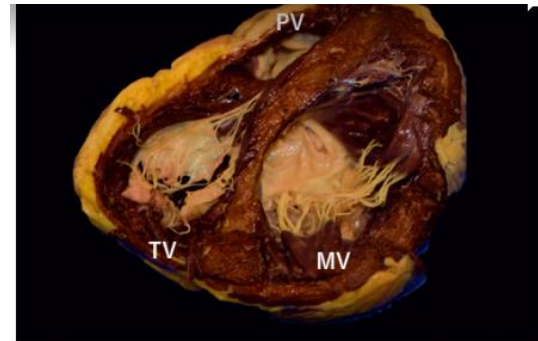
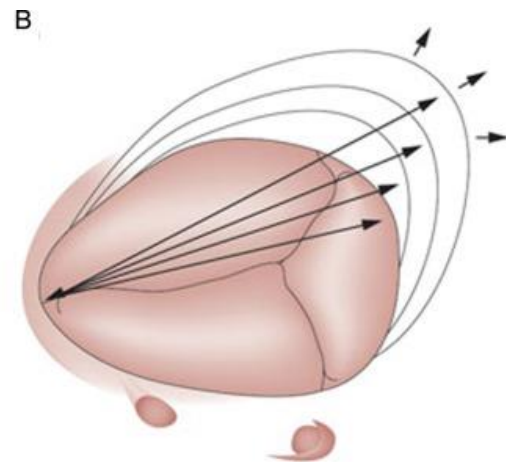
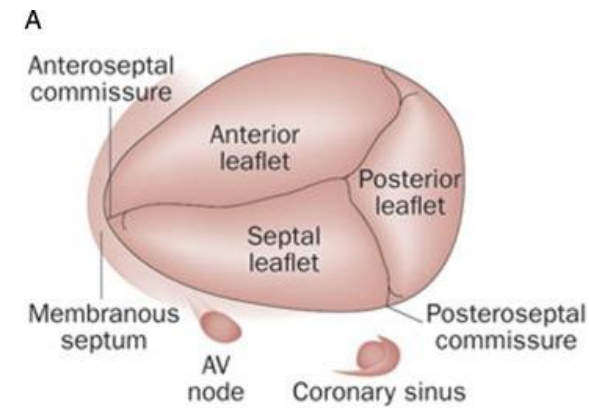


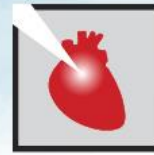


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# Anatomía





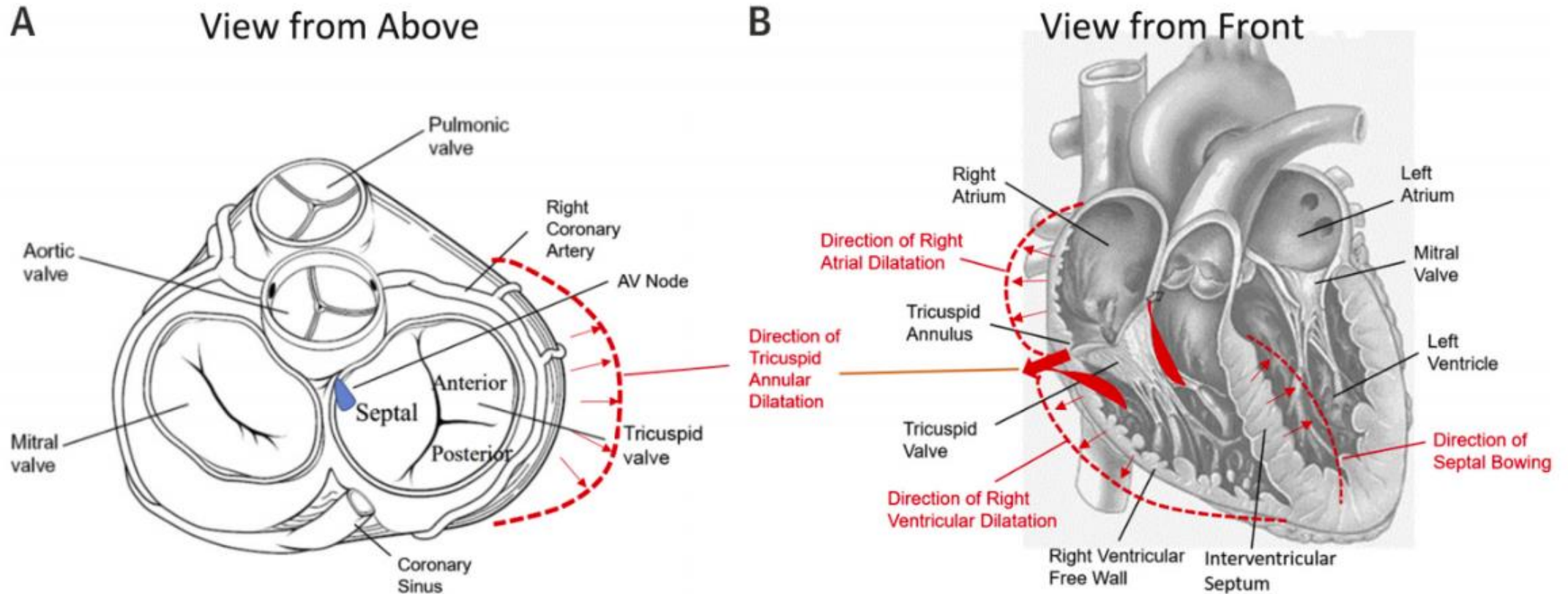
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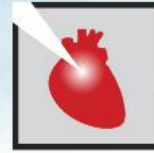
Pilar

# Anatomía

## Relación con estructuras vecinas







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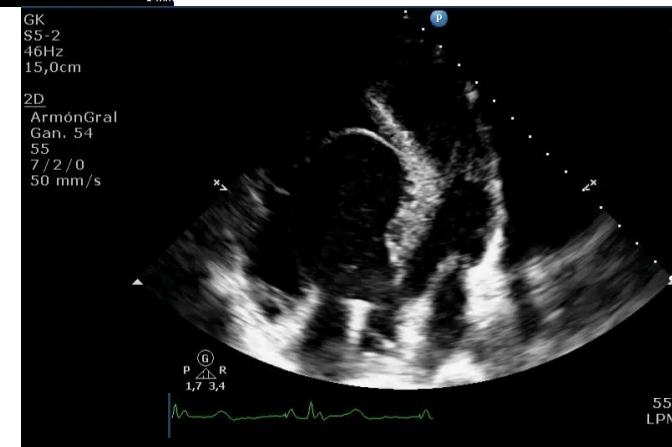
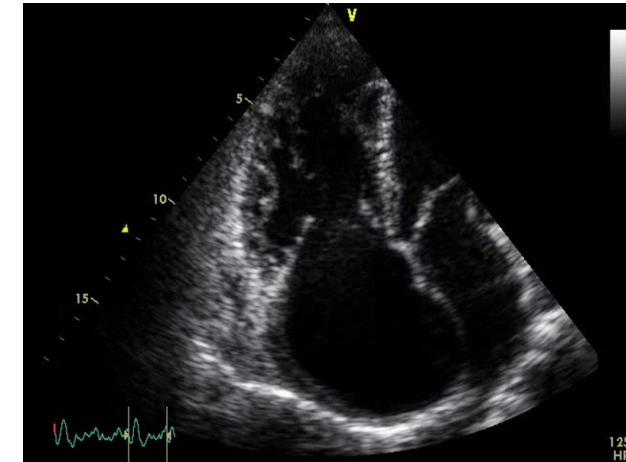
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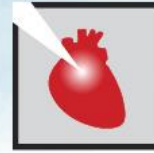
*Pilar*

**20-25%**

- Anomalía de Ebstein
- Carcinoide
- Degenerativa ( mixomatosa)
- Endocarditis
- Fibrosis Endomiocárdica
- Iatrogénica ( MCP, BEM)
- Reumática
- Toxinas
- Trauma
- Ruptura de Músculo Papilar

## Etiologías IT Primarias





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75-80%

## Etiologías

### IT Secundarias (Funcionales)

Patología del VI



Disfunción del Ventrículo Izquierdo  
Valvulopatías izquierdas (Mitral-Aórtica)

Disfunción del VD



Cardiomiopatías ( DARV)  
Isquemia del VD  
Sobrecarga de Volumen

Hipertensión Pulmonar

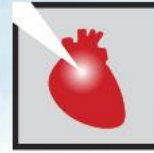


Primaria  
Secundaria

Dilatación anular  
Idiopática



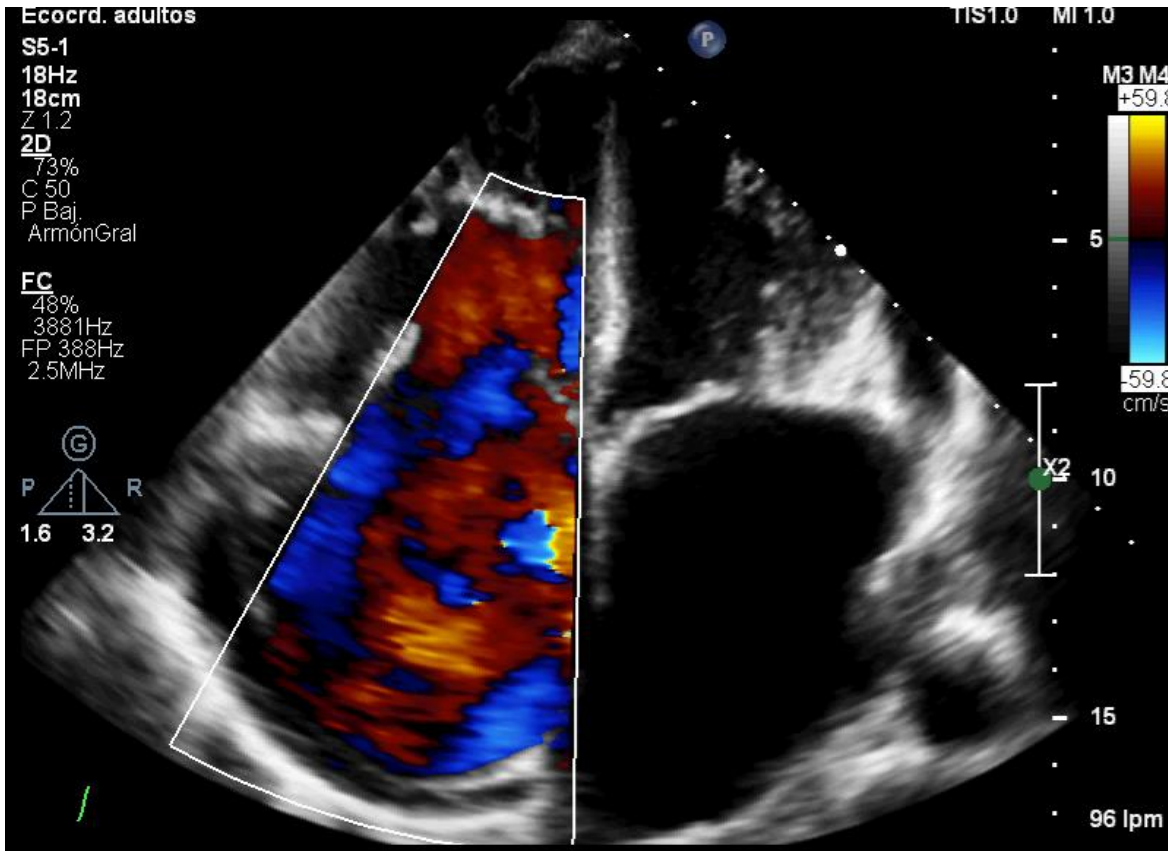
Fibrilación Auricular



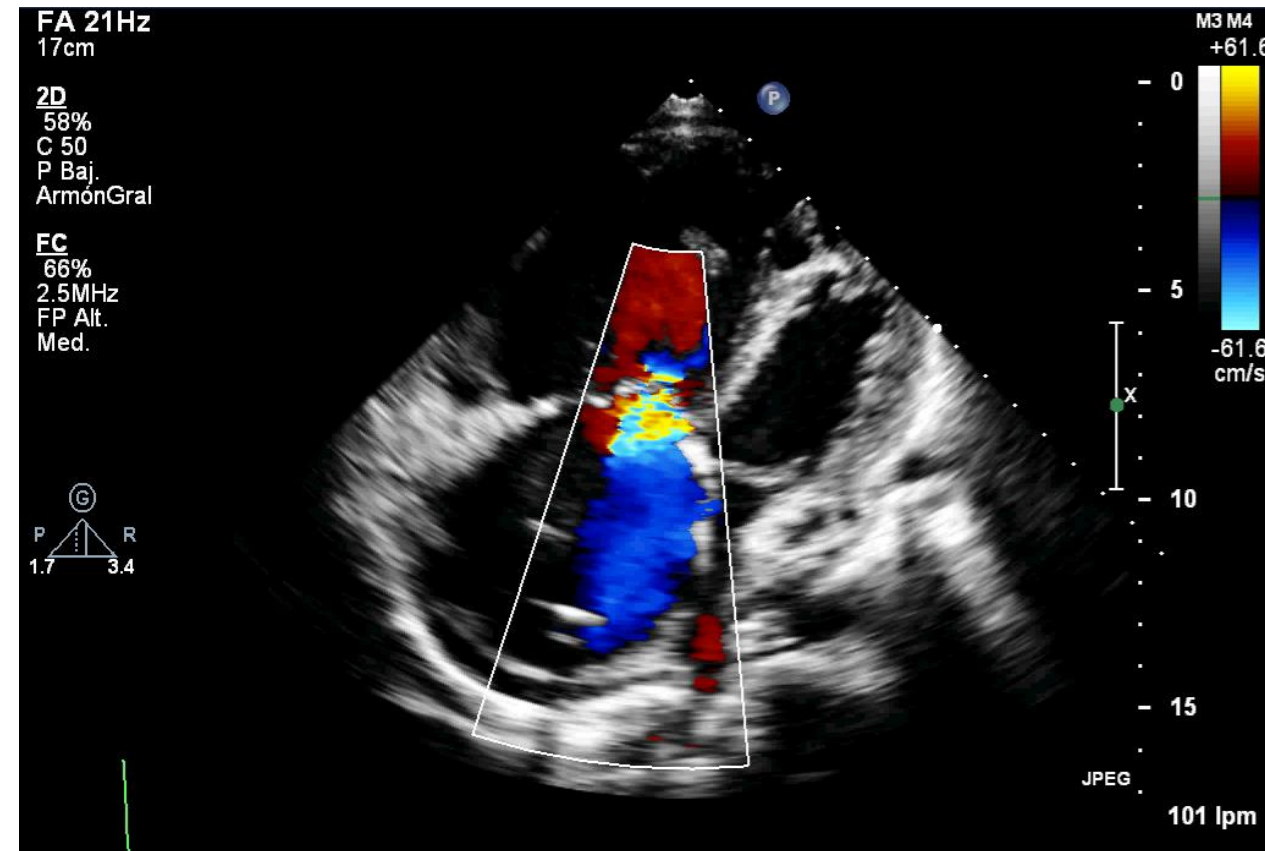
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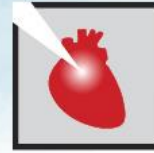
## IT severa ( funcional)



Valvulopatía Izquierda, IM severa



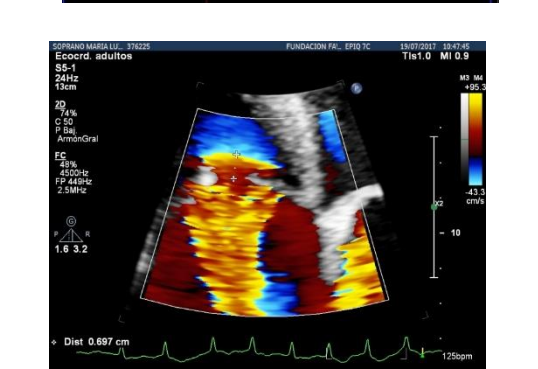
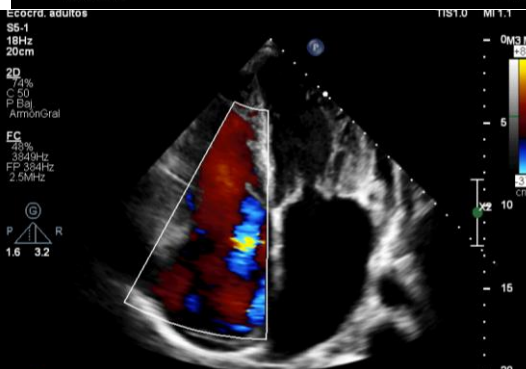
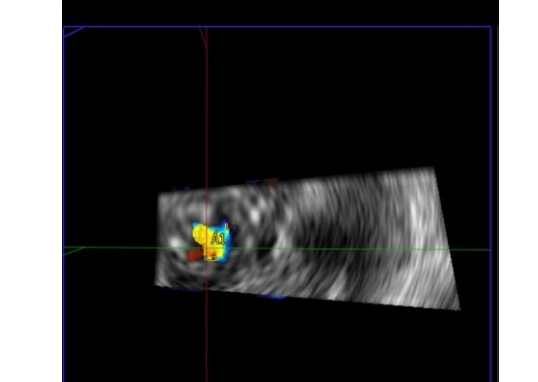
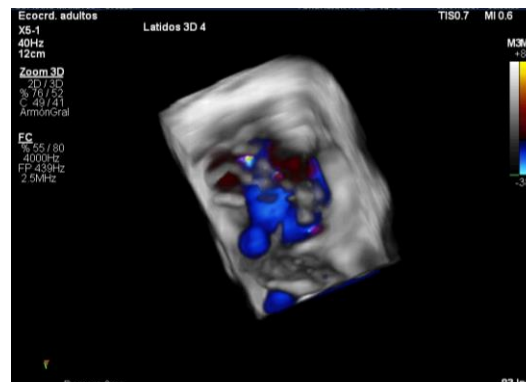
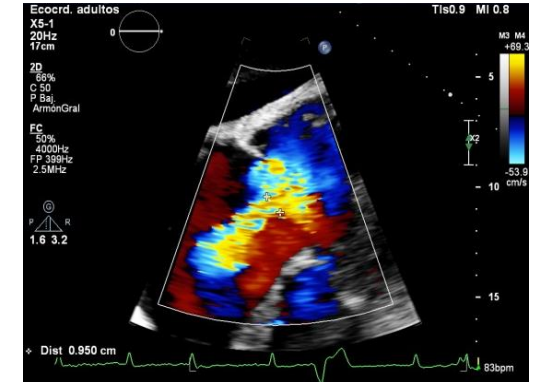
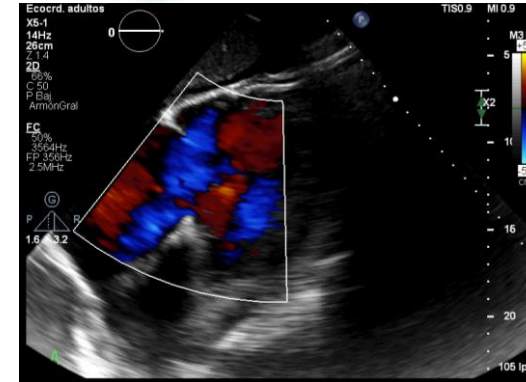
Hipertensión Pulmonar



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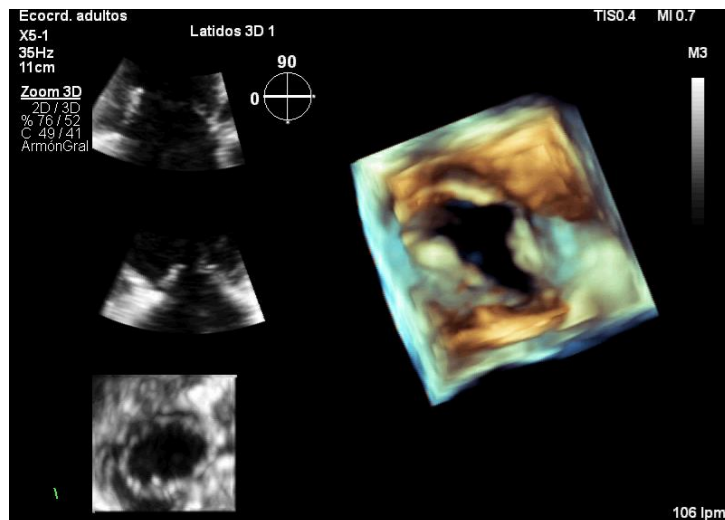
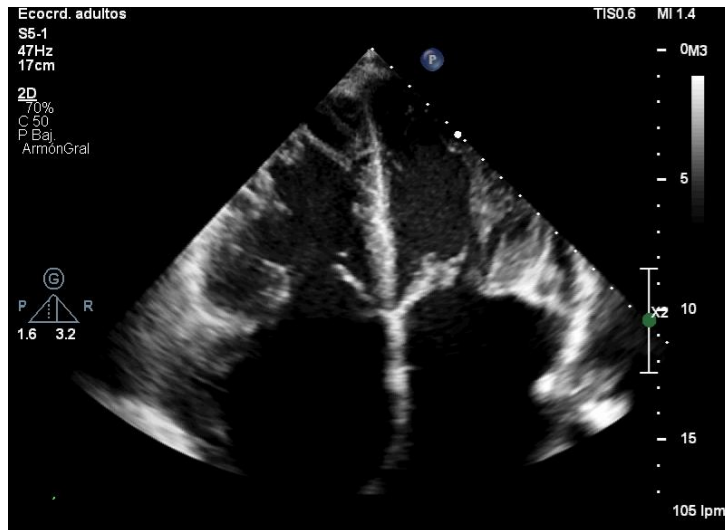
*Pilar*

Parameters	Mild	Moderate	Severe
<b>Qualitative</b>			
TV morphology	Mildly abnormal leaflets (e.g. mild rheumatic thickening, limited prolapse)	Moderately abnormal leaflets (e.g. moderate thickening or prolapse)	<b>Severe valve lesions (e.g. Flail leaflet, ruptured papillary muscle, severe retraction, large perforation or vegetation)</b>
Interventricular septal motion	Normal	Typically normal	Paradoxical/ volume overload pattern
Color flow TR jet [Note: not recommended for sole grading of severity]	<b>Small RA penetration or not holosystolic</b>	Moderate RA penetration or large penetration and late systolic	Deep RA penetration and holosystolic jet
Flow convergence zone	<b>Not visible, transient or small</b>	Intermediate in size and duration	<b>Large throughout systole</b>
CW signal TR jet	Faint/parabolic or partial contour	Dense, variable contour	Dense, triangular with early peaking contour (peak <2 m/s in very severe TR)
IVC diameter	Normal	2.1 -2.5 cm	>2.5 cm
<b>Semi-quantitative</b>			
Color flow jet area (cm <sup>2</sup> ) [Central Jet] <sup>a</sup>	<5	5-10	> 10
Color jet area:RA area (%)	10-20	10-33	>33
Vena contracta (cm)	<0.3	<0.6	≥ 0.7
PISA Radius (cm) <sup>b</sup>	≤0.5	0.6-0.9	> 0.9
Hepatic vein flow	Systolic dominance	Systolic blunting <sup>c</sup>	<b>Systolic flow reversal</b>
Tricuspid inflow	E-wave < 1 m/sec or A-wave dominant	Variable	E-wave ≥1.0 m/sec
<b>Quantitative</b>			
EROA (mm <sup>2</sup> ) [by PISA]	<20	20-39 <sup>d</sup>	≥40
EROA (mm <sup>2</sup> ) [by 3D]	Unknown	Unknown	>75
Regurgitant volume(mL) [by PISA]	<30	30-45 <sup>d</sup>	≥45
RV and RA size	Usually normal	Usually normal or mild dilatation	Usually dilated*

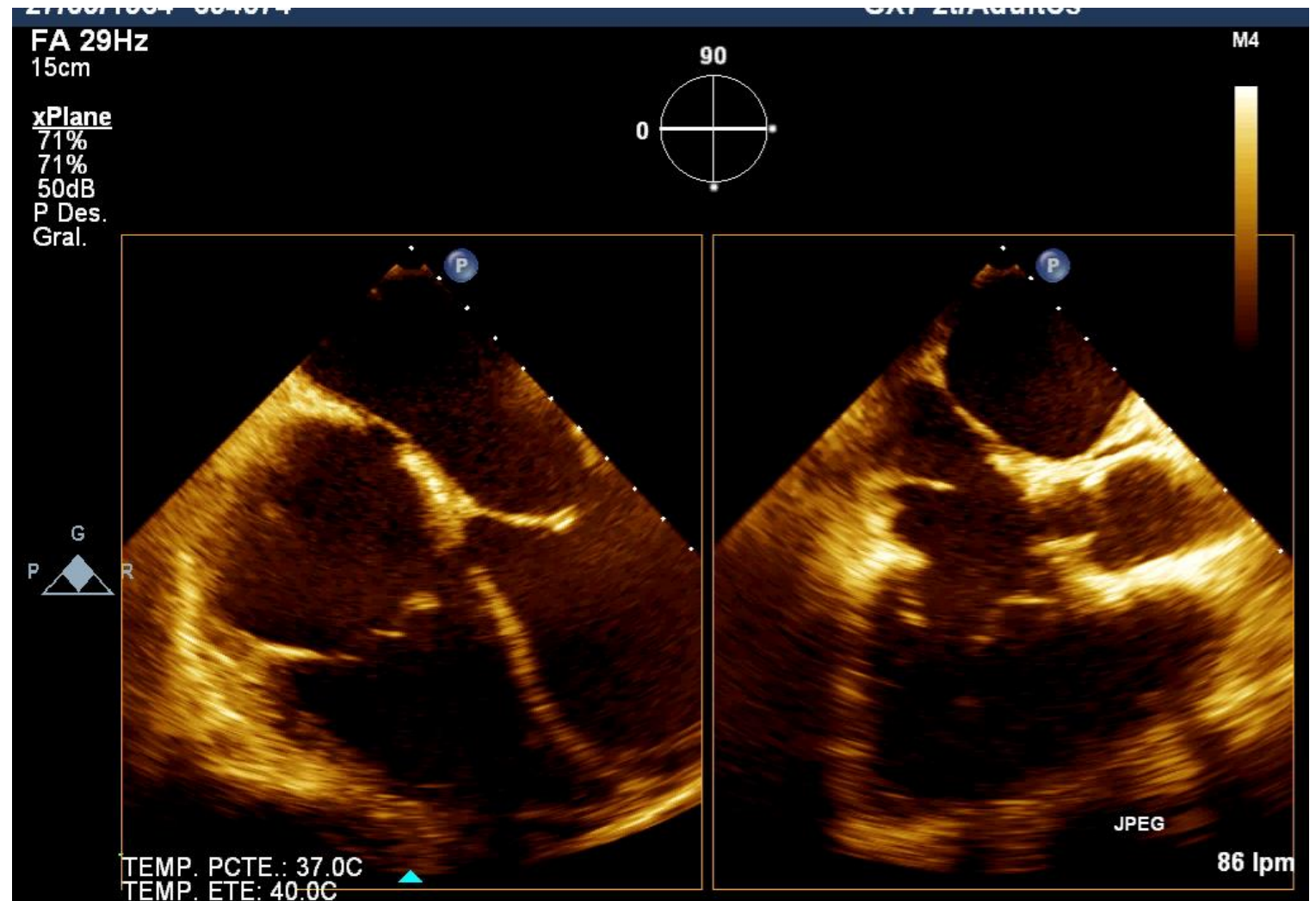
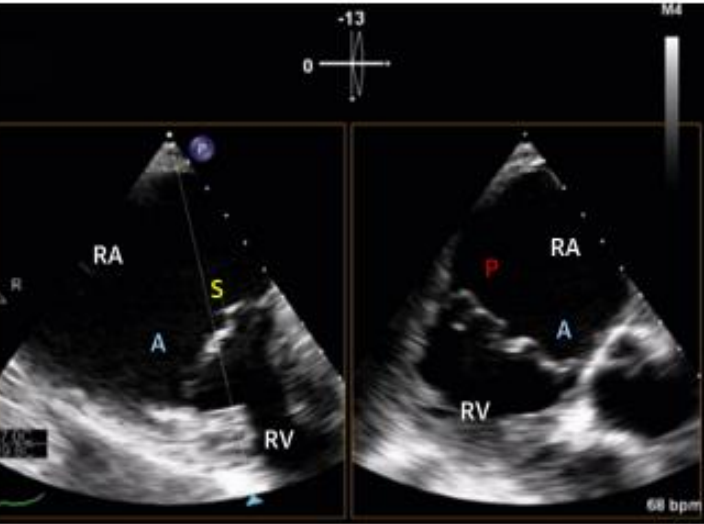


# Ecocardiografía

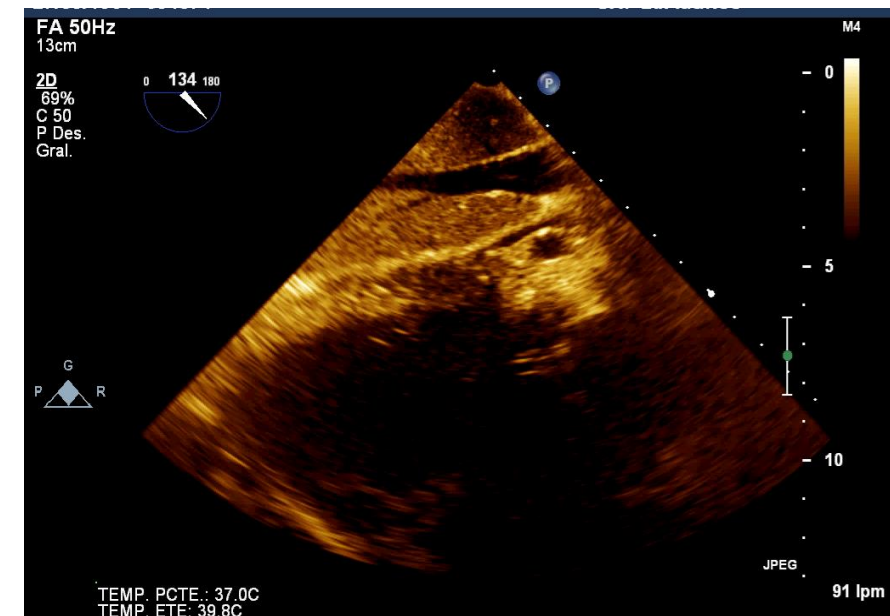
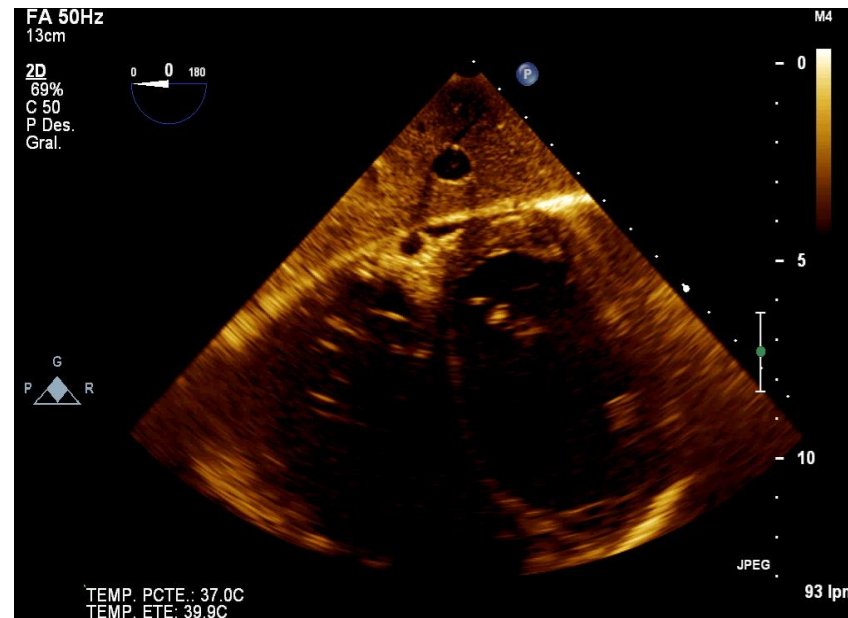
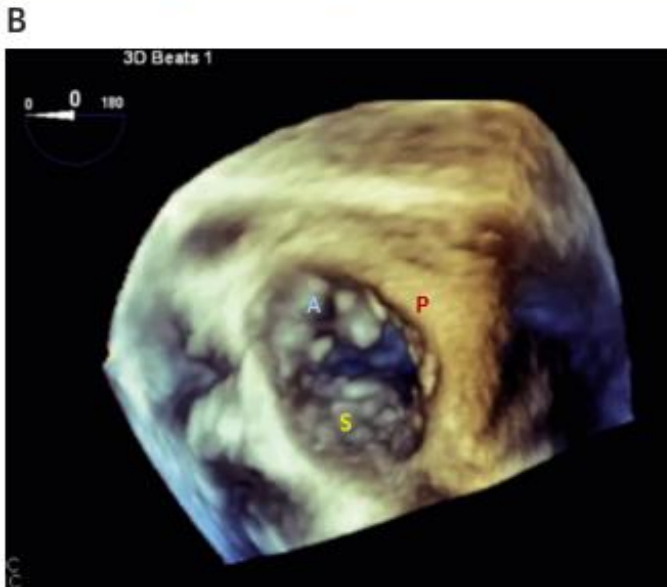
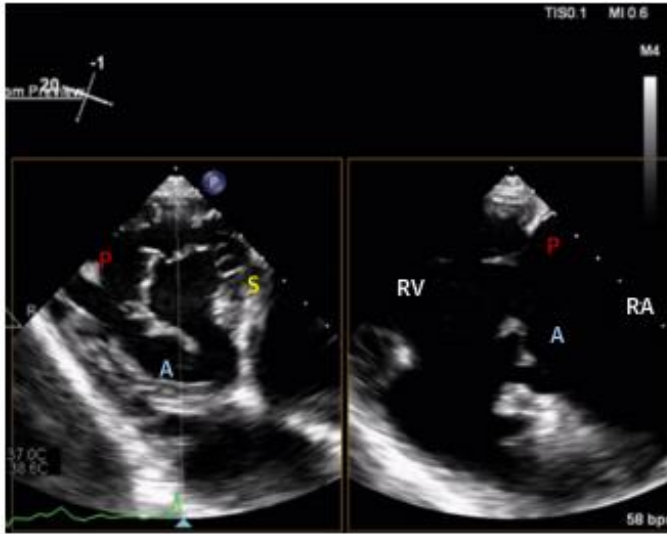
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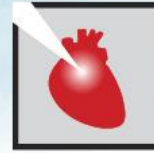


# Evaluación Anatómica ETE 2D/3D



# Evaluación Anatómica ETE 2D/3D





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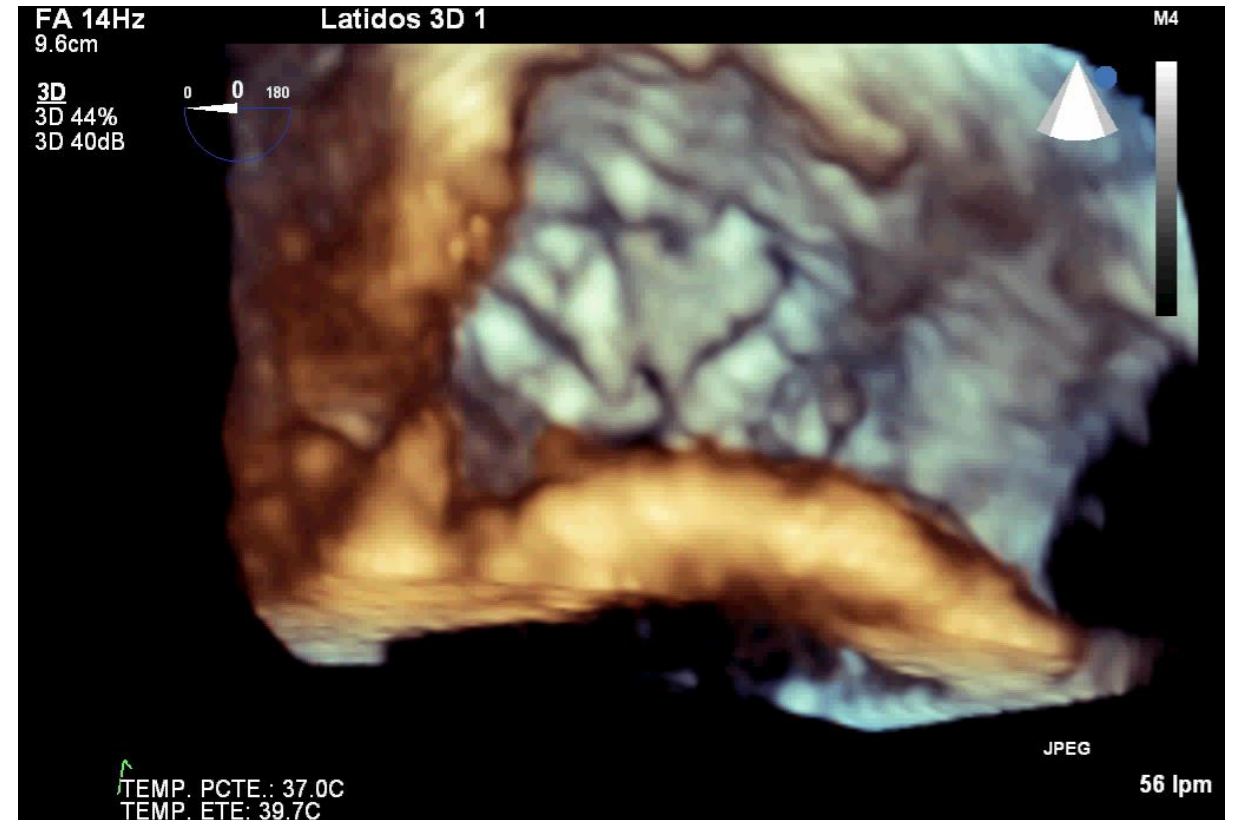
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*Pilar*

## ETE 3D



Vista Auricular



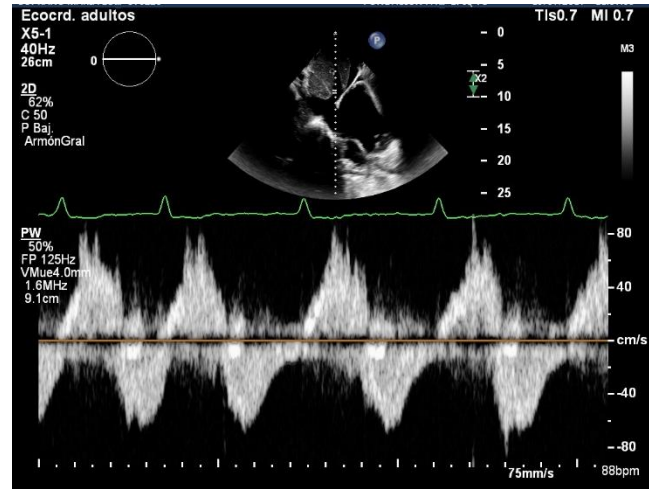
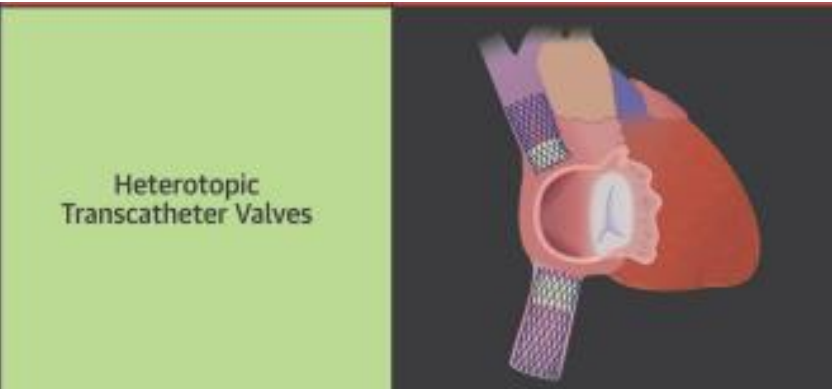
Vista Ventricular





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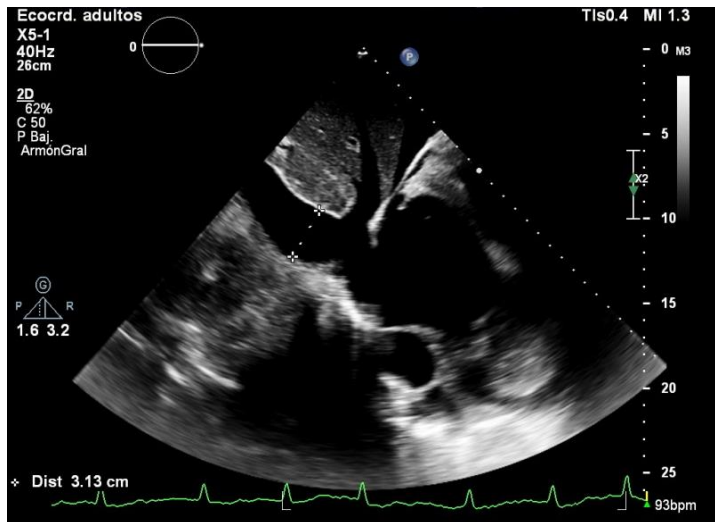
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A



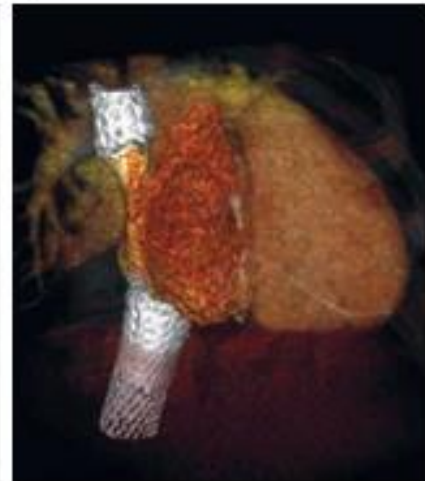
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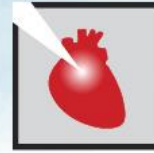


C



D

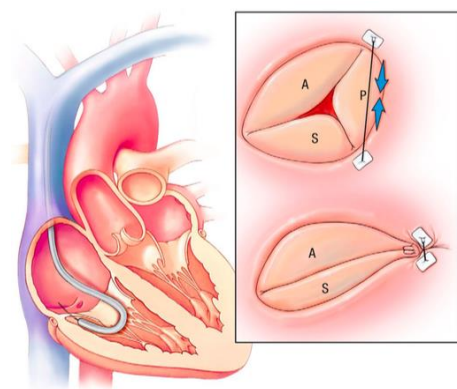
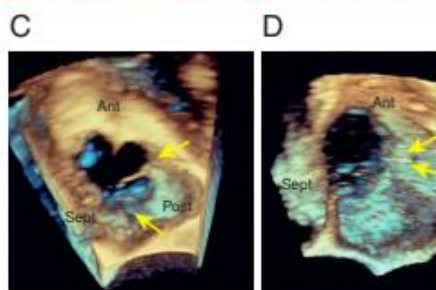




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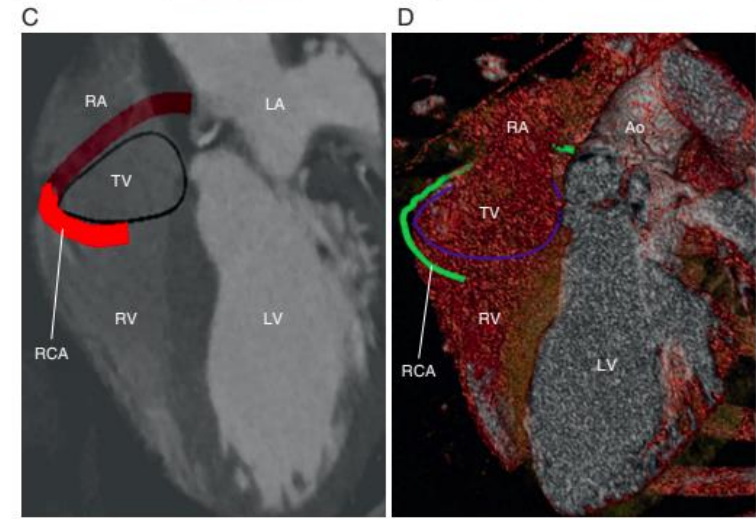
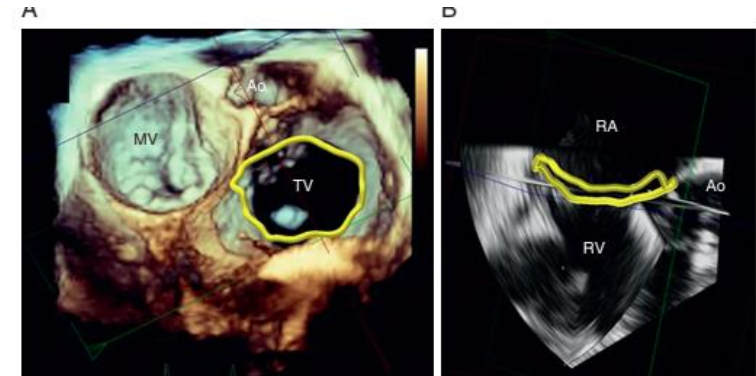
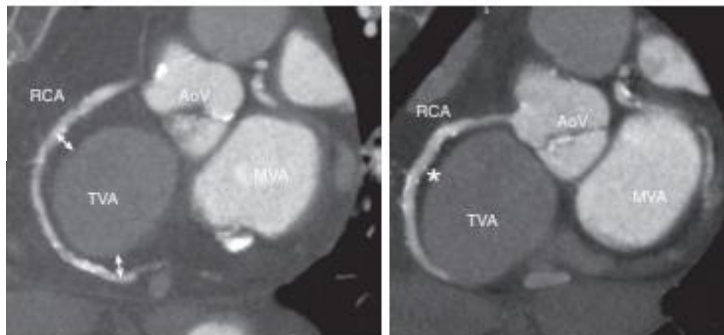
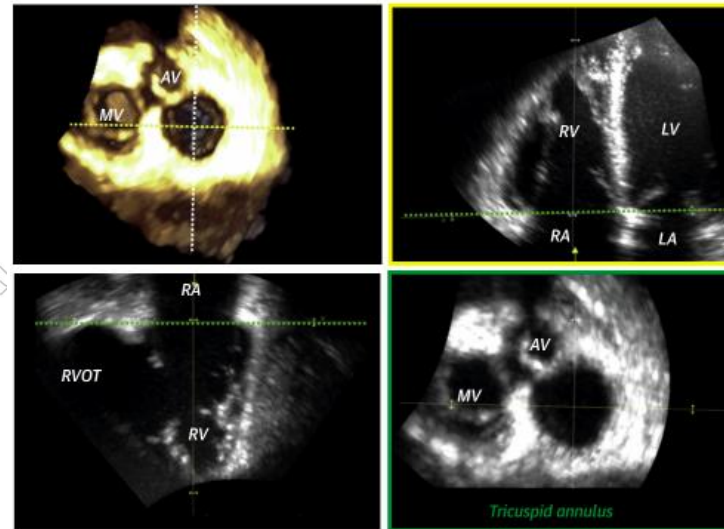
*Pilar*

Tricuspid Valve Annuloplasty



MitraAlign

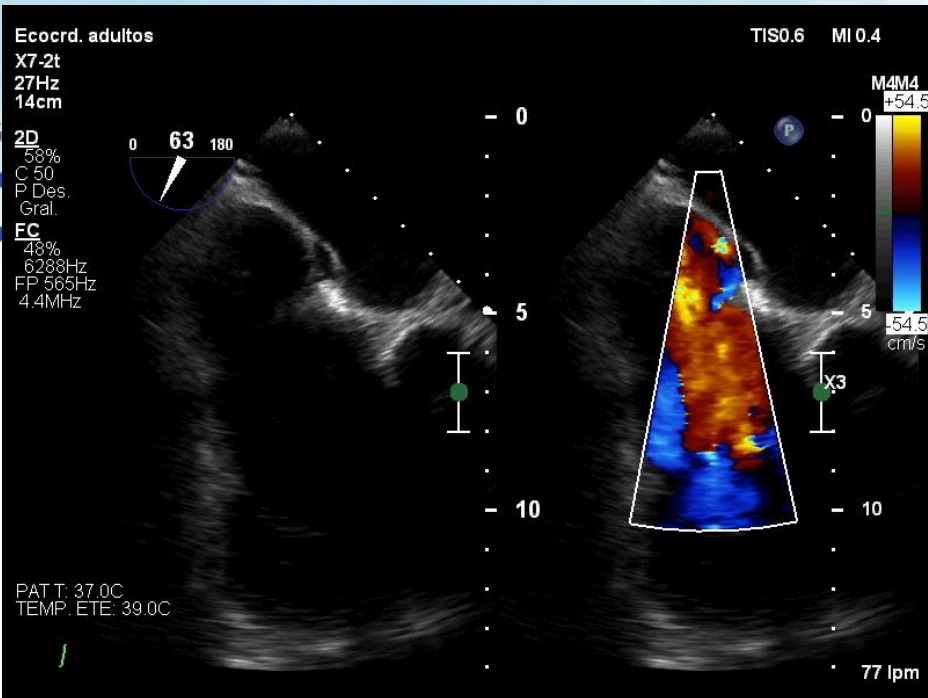
**TRIALING  
TRICINCH  
CARDIOBAND**



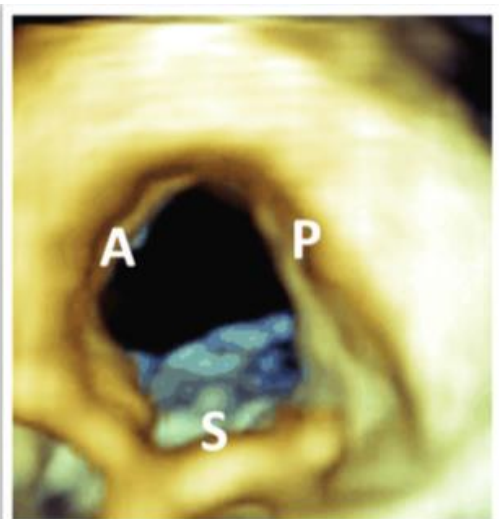
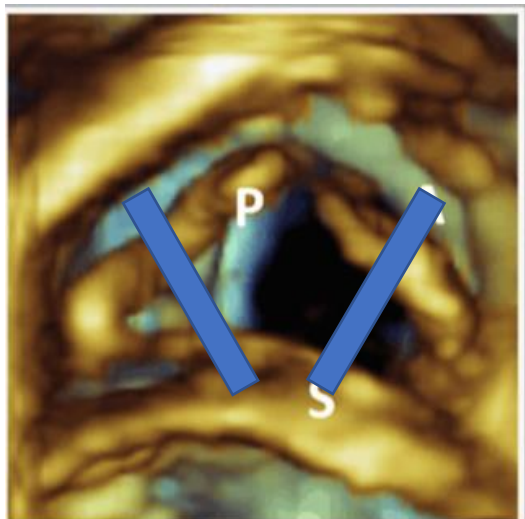


XXIX CONG  
**CAO**

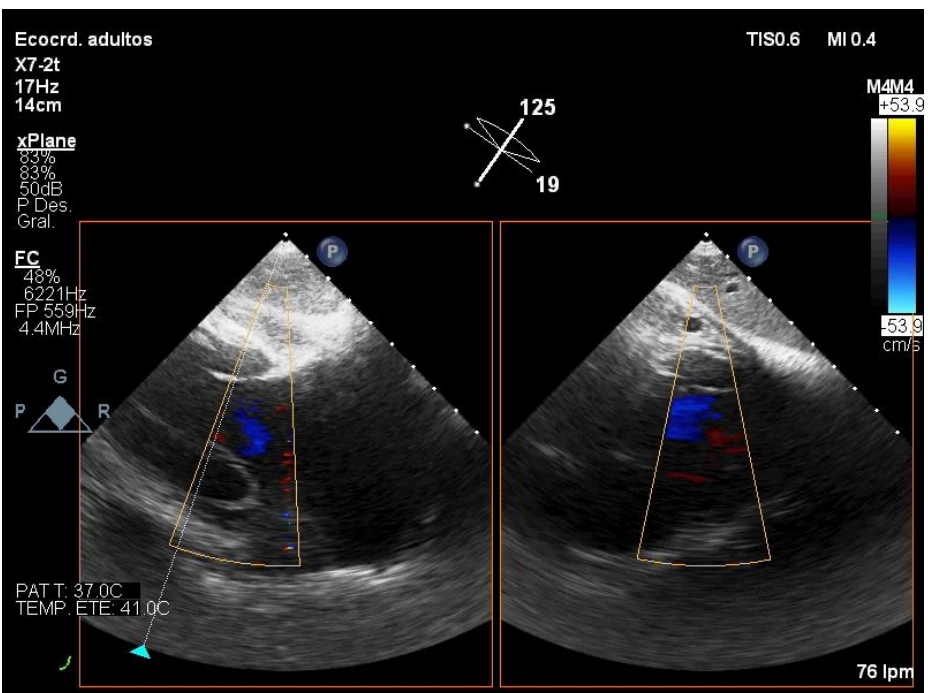
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X7-2t  
27Hz  
14cm  
2D  
58%  
C 50  
P Des.  
Grat.  
FC  
48%  
6288Hz  
FP 565Hz  
4.4MHz



Edge-to-edge  
Plasty

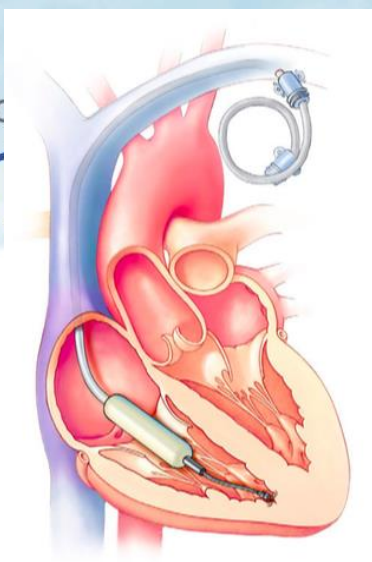


Ecocrd. adultos  
X7-2t  
17Hz  
14cm  
xPlane  
83%  
83%  
50dB  
P Des.  
Grat.  
FC  
48%  
6221Hz  
FP 559Hz  
4.4MHz





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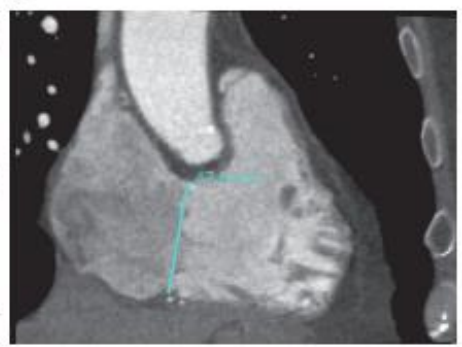
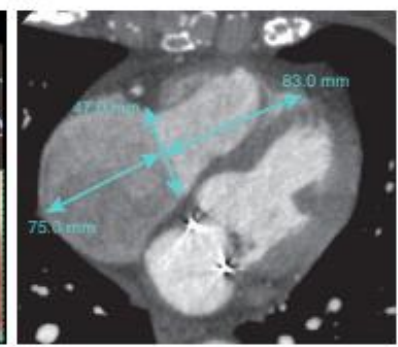
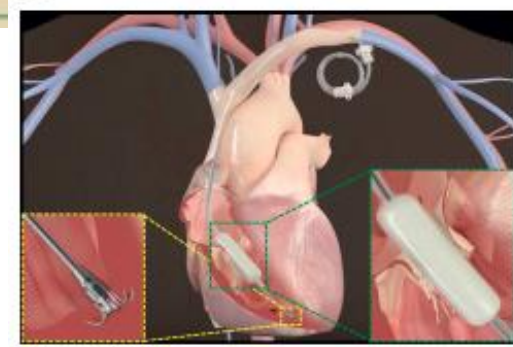
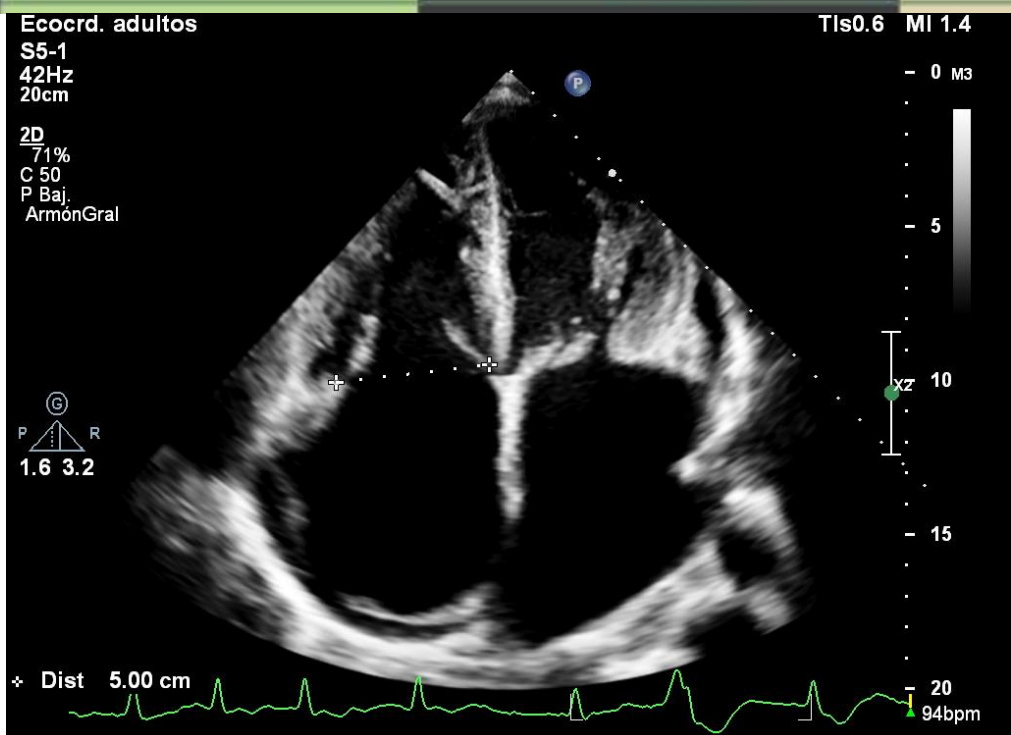


FORMA

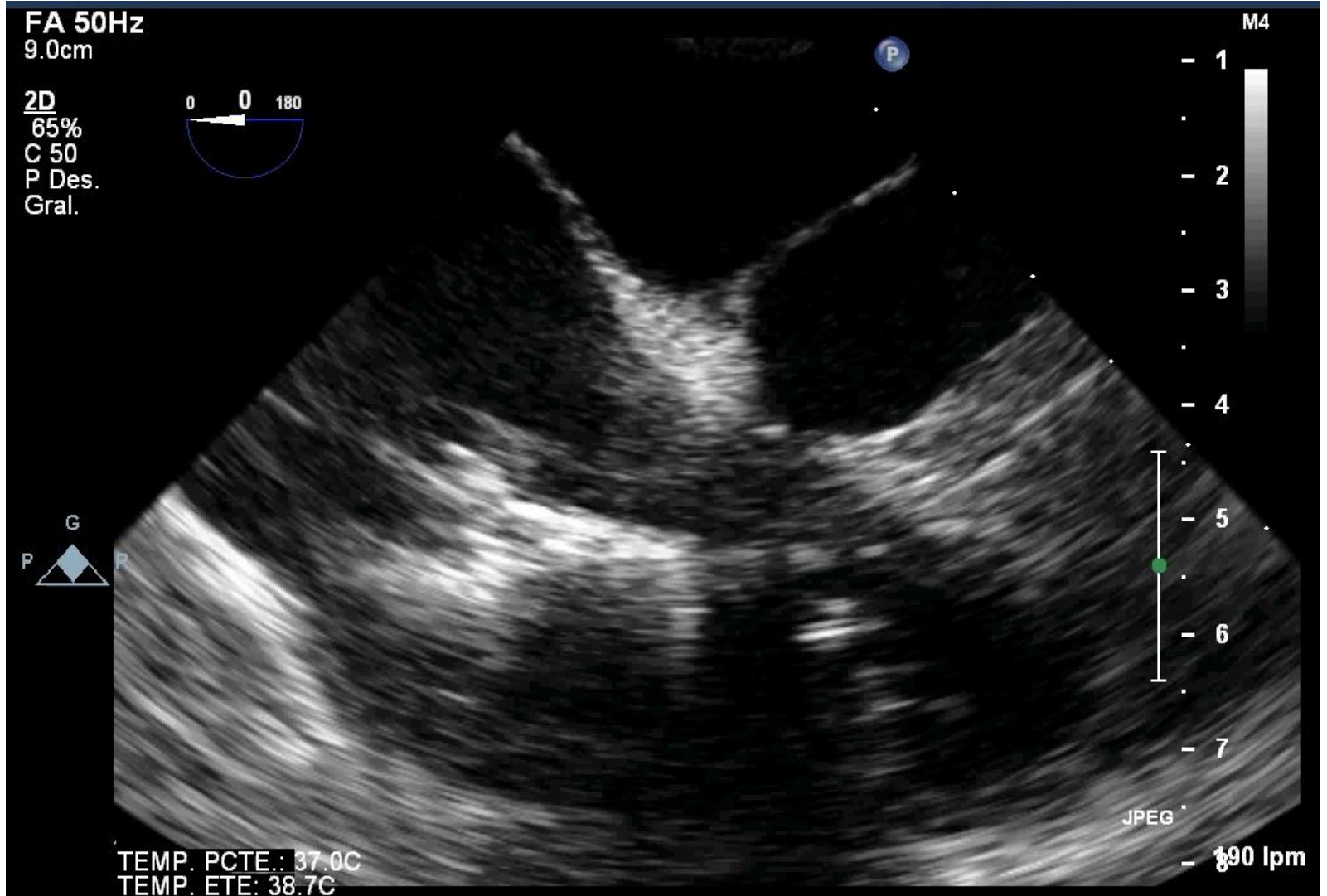
### Spacer System

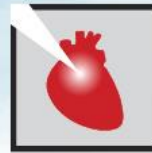


- Location of the largest vena contracta
- Dimensions of the tricuspid annulus
- RV dimensions
- Distance from the tricuspid annulus plane to the RV apex
- Location of the RV anchoring target
- Dimensions of the left subclavian and axillary veins



Valve in valve/ring





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**TABLE 2 Challenges of Transcatheter TV Treatment**

Large tricuspid annulus size

Nonplanar and elliptical annulus shape

Fragility of tricuspid annular tissue and narrower annular shelf in comparison to mitral annulus

Noncalcified annulus in secondary tricuspid regurgitation

Angulation in relation to superior and inferior vena cava

Trabeculated right ventricle, muscular bands and chordae tendinae

Thin right ventricular free wall

Proximity of AV node and right His bundle branch

Proximity of the right coronary artery to annulus and risk of coronary injury

Risk of occlusion of coronary sinus, vena cava or outflow tract

Slow-flow in right ventricle

Patients with pacemaker or defibrillator leads

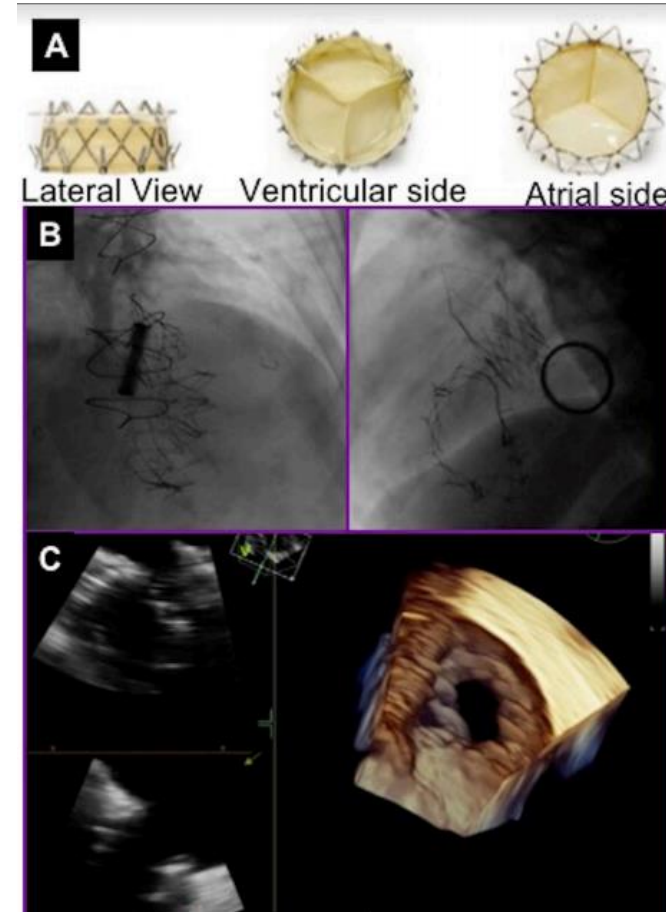


FIGURE 5 | Trisol valve. Elastic nitinol frame and an inner valve apparatus.



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**Muchas Gracias**