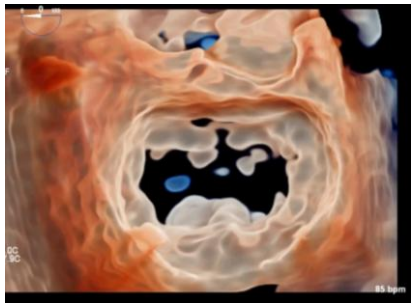
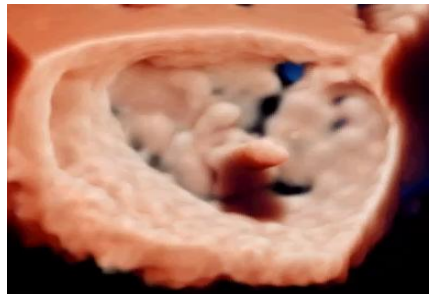
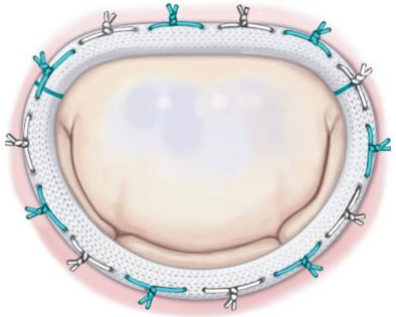


Association des Alumni et Amis de l'AP-HP



Traitement percutané de l'insuffisance mitrale



A.Berrebi

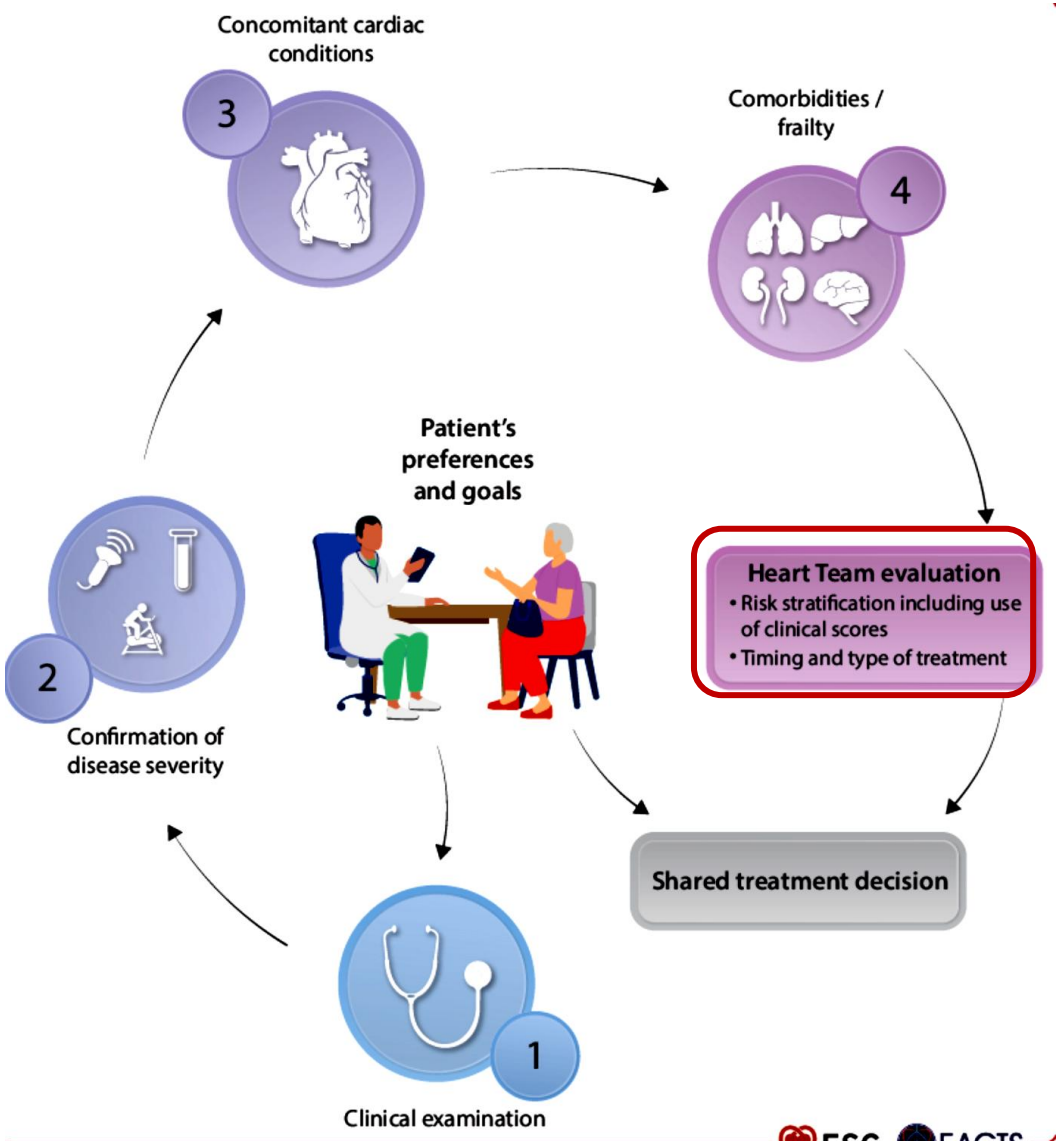
HÔPITAUX UNIVERSITAIRES PARIS OUEST

Hôpital européen Georges-Pompidou

HEGP (AP-HP) – Université Paris Cité

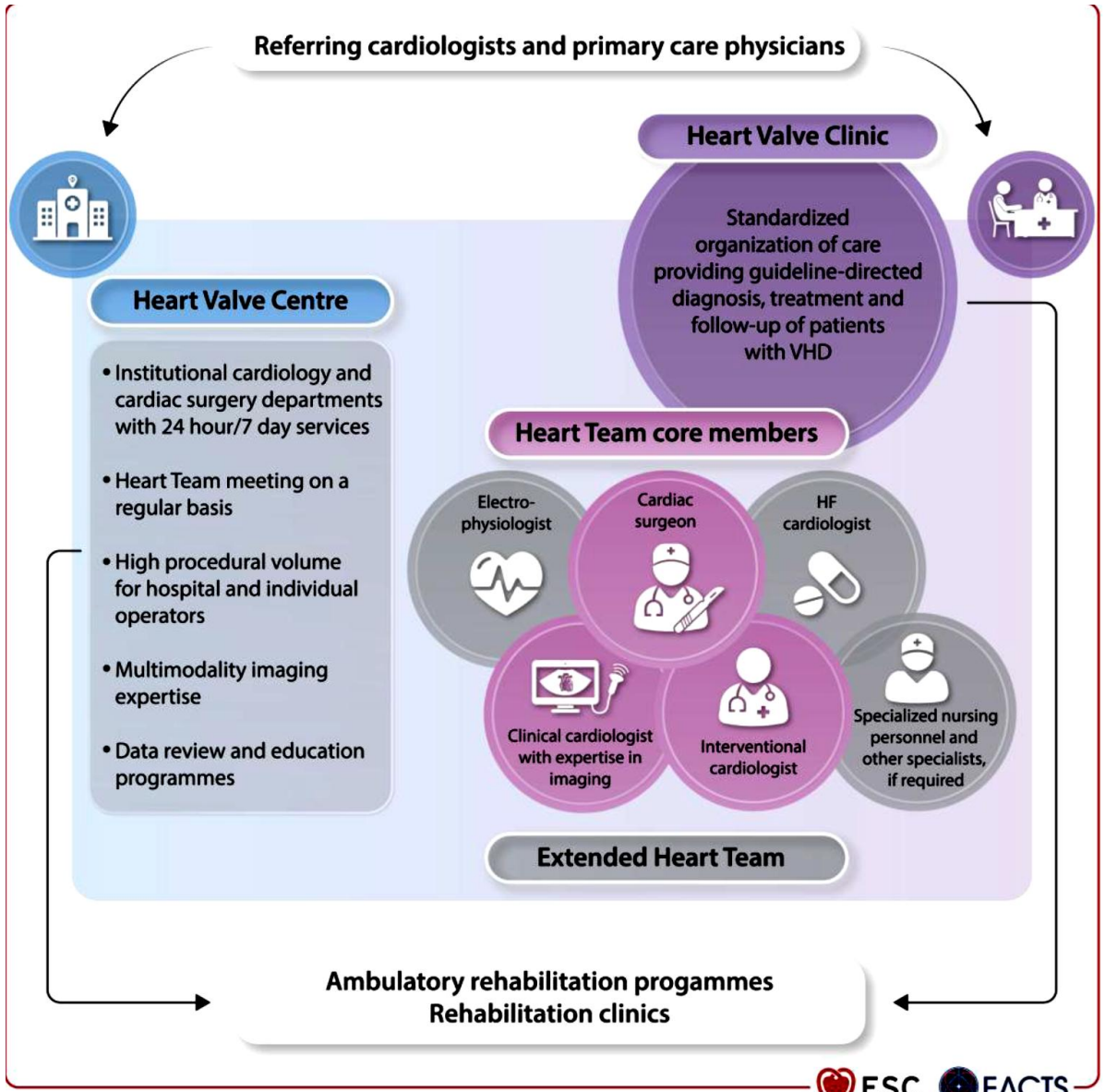
Pas de conflit d’intérêt

Importance de la « Heart Team » (ESC 2025)



ESC Guidelines for the management of valvular heart disease (European Heart Journal; 2025 – doi: 10.1093/eurheartj/ehaf194)

ESC EACTS



ESC EACTS

Cardiologue et Echographiste en Chirurgie

Keynote Lecture Series

Lessons learned during my 25 years as Dr. Carpentier's echocardiographer

Alain Berrebi

Cardiac Surgery Department, European Georges Pompidou Hospital, AP-HP Université Paris Cité and Institut Medico-chirurgical Montsouris, Paris, France

Correspondence to: Alain Berrebi, MD. Cardiac Surgery Department, European Georges Pompidou Hospital, AP-HP Université Paris Cité, 20 rue Leblanc 75015 Paris, France. Email: alainberrebi@hotmail.com.

My collaboration with Professor Carpentier began in the early 1990s and was to continue for more than 25 years. Ours was a unique relationship based on mutual respect and unwavering trust: he liked to introduce me as "the justice of the peace", a symbol of the power of partnership. The lessons I learned during my 25 years with Professor Carpentier could be summarized in four key messages: understanding the surgeon's needs based upon the pathophysiological triad and functional approach, establishing a dedicated two-dimensional (2D)/three-dimensional (3D) intra-operative echo protocol in a common language, participating in evolution and evaluation of mitral valve reconstruction and transmitting knowledge to younger generations by education: "give to be given". I owe my entire professional career to him. Beyond that, we have forged an unbreakable bond, a relationship that is not only scientific but also deeply human. This filial bond will last forever.

Ann Cardiothorac Surg. 2026 Jan 31;15(1):2. doi: 10.21037/acs-2025-dmv-08

Traitement percutané de l'insuffisance mitrale

- **Epidémiologie: une population de plus en plus âgée et fragile**
- **Dans l' IM, l'étiologie compte (primaire vs secondaire)**
- **Place du traitement percutané dans la prise en charge de l' IM**
- **Rôle de l'imagerie multi-modalité : l'œil et le GPS de l'interventionnel**

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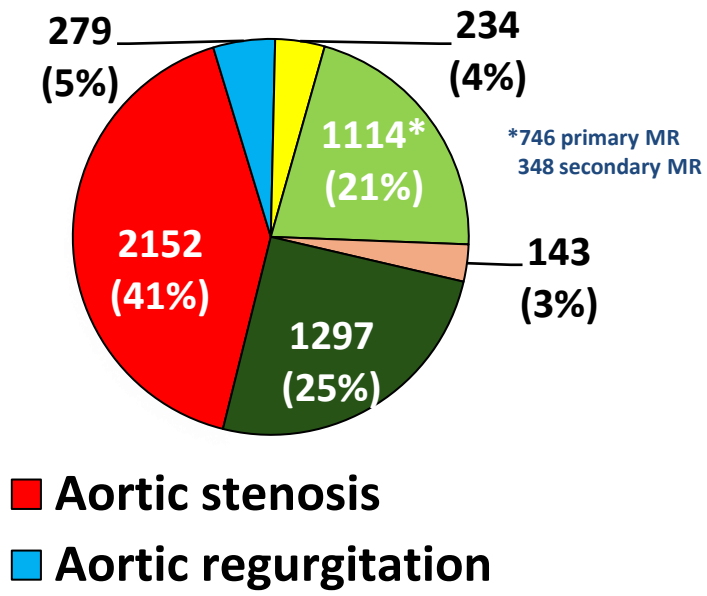
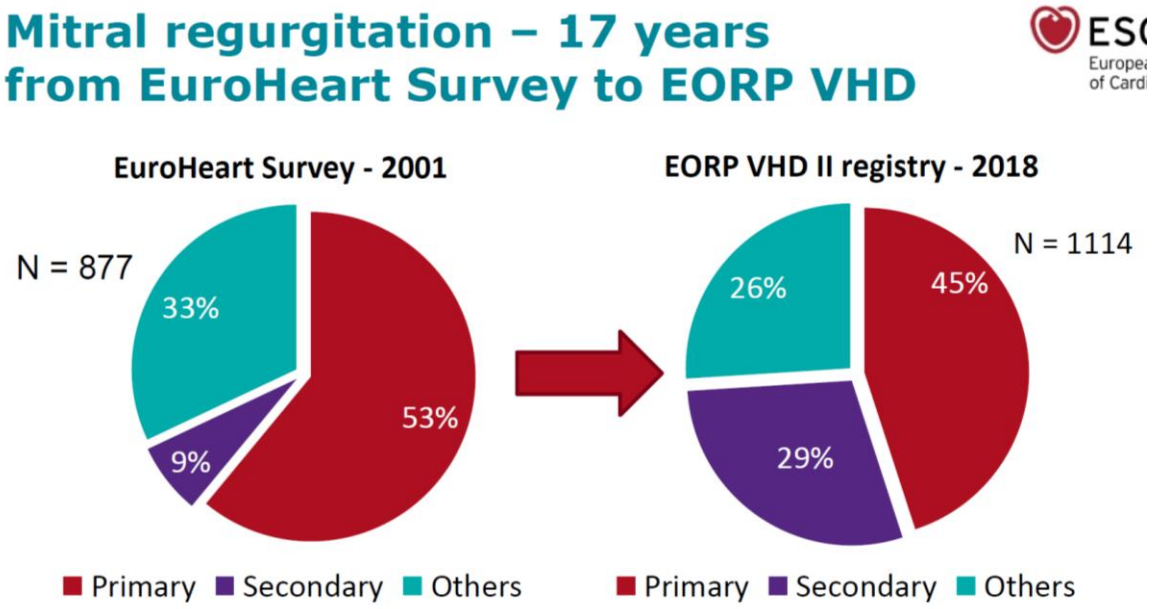
EORP VHD II registry

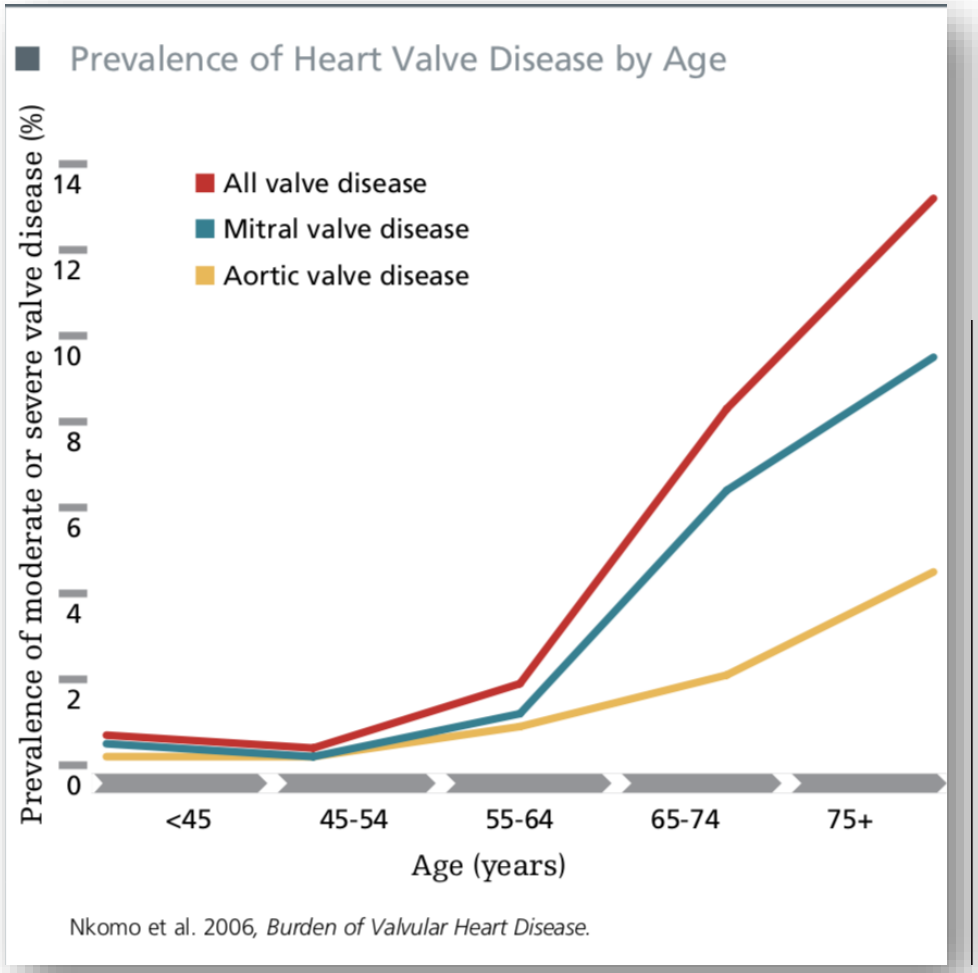
Distribution of Valvular Disease





Iung B et al. Circulation.2019;140:1156-69

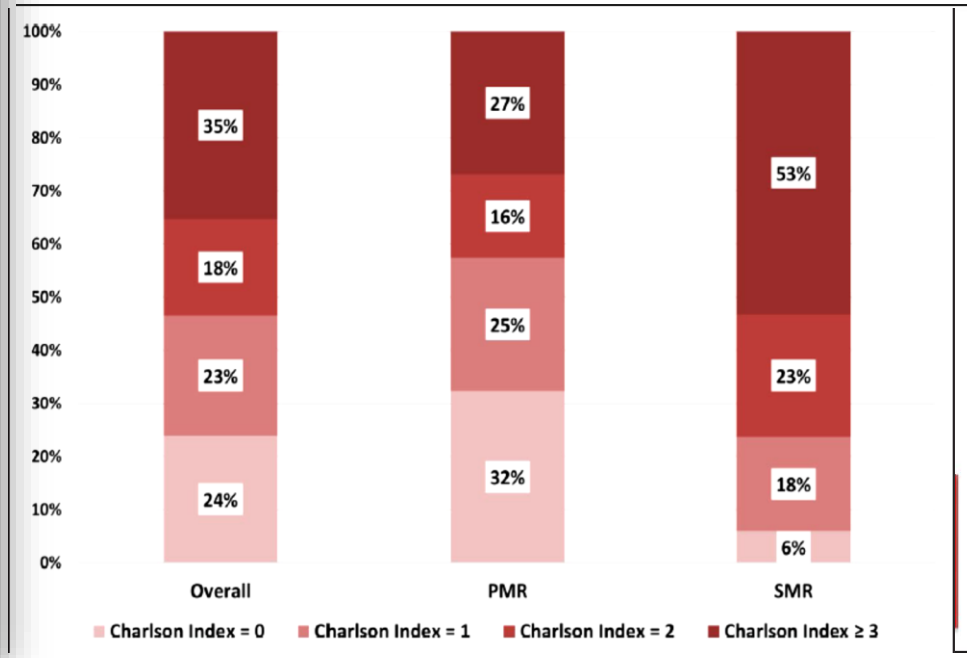
Une population plus âgée et fragile



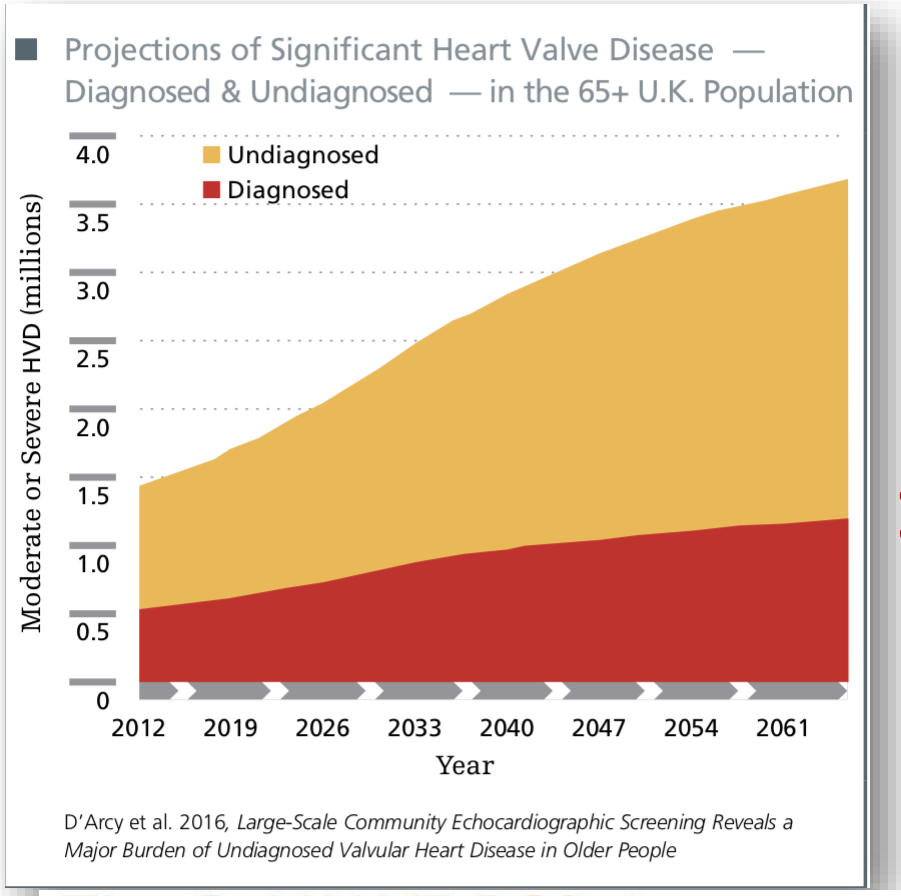
Nkomo et al. 2006, *Burden of Valvular Heart Disease.*

Dismal Outcomes and High Societal Burden of Mitral Valve Regurgitation in France in the Recent Era: A Nationwide Perspective *J Am Heart Assoc. 2020 Aug 4;9(15):e016086*

David Messika-Zeitoun, MD, PhD; Pascal Candolfi, PhD; Alec Vahanian, MD; Vincent Chan, MD, MPH; Ian G. Burwash, MD; Jean-François Philippon, MD; Jean-Manuel Toussaint; Patrick Verta, MS, MD; Ted E. Feldman, MD; Bernard Iung, MD; David Glineur, MD, PhD; Thierry Mesana, MD; Maurice Enriquez-Sarano, MD



MR is common and often undiagnosed… OxVALVE cohort



D'Arcy et al. 2016, *Large-Scale Community Echocardiographic Screening Reveals a Major Burden of Undiagnosed Valvular Heart Disease in Older People*

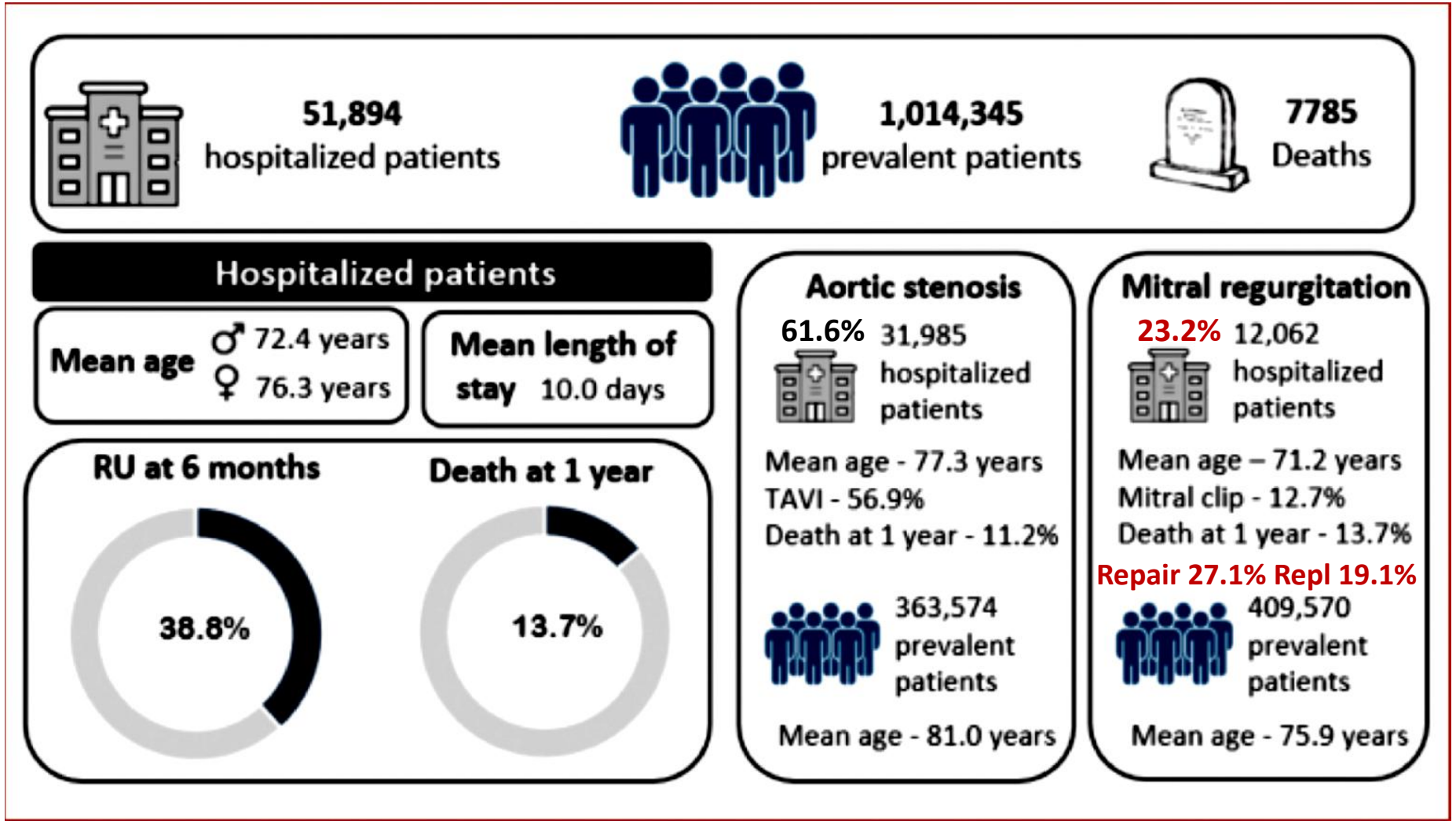
Prevalence of Primary MR

65-74 yrs	≥ 75 yrs
1.3 (0.9-1.8)	4.8 (3.9-5.8)

The OxVALVE-PCS data suggest that the number of individuals in the UK aged 65 years or older with moderate or severe VHD will increase from 1.5 million in 2015 to 3.3 million in 2056 (122% increase), with a doubling in prevalence by 2046.

Epidemiology of valvular heart disease in France

Clémence Grave[a,*], Amélie Gabet[a], Christophe Tribouilloy[b], Ariel Cohen[c], Grégory Lailler[a], Alain Weill[d], Philippe Tuppin[e], Bernard Iung[f], Jacques Blacher[g], Valérie Olié[a]

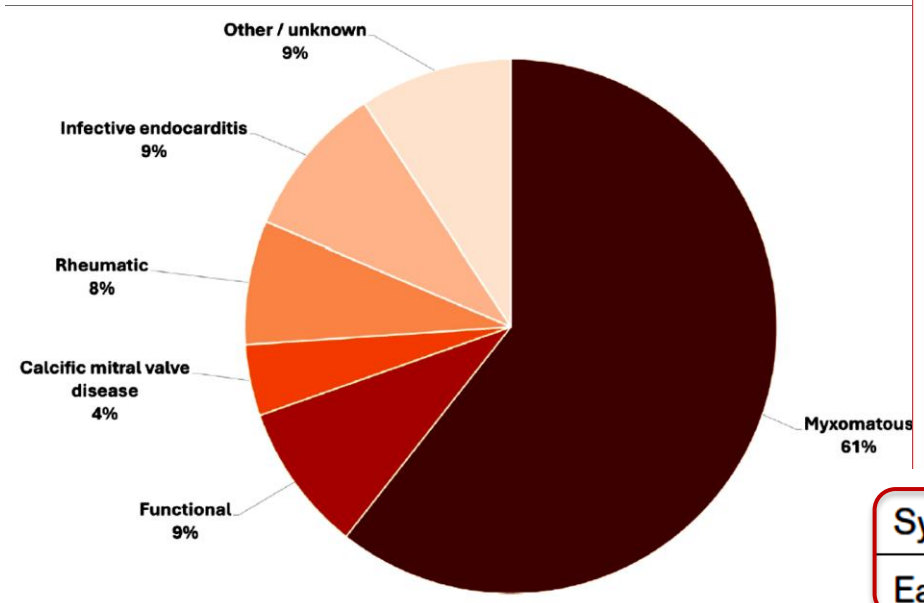


Archives of Cardiovascular Disease 117 (2024) 669–681

Clinical Presentation and Outcomes After Surgery for Mitral Regurgitation: Real-World Insights From the MITRACURE International Registry

Messika-Zeitoun et al *Circulation.* 2025;152:927–938.

Advanced clinical presentation was common: 43% were in New York Heart Association class III/IV, 30% exhibited congestive heart failure, 47% were on diuretics, 22% had atrial fibrillation/flutter, 35% presented with reduced ejection fraction, and 22% had pulmonary hypertension (≥50 mm Hg). Most patients were symptomatic or presented with class I/IIa indication for intervention, and an early intervention was performed only in 3% of patients. The repair rate was 62% overall and 80% in myxomatous disease. In-hospital mortality was 4.5% overall but 2.3% in patients with myxomatous MR (1.8% isolated, 3.1% combined).



What Is New?

- Despite growing evidence supporting benefits of early intervention, this real-world study of an unselected population demonstrated that most patients were still referred late in the course of their disease, with advanced symptoms, left ventricular systolic dysfunction, elevated right ventricular systolic pressure, or atrial fibrillation, and early intervention was seldom performed, even in patients with myxomatous disease.

Symptomatic	2966 (85%)
Early intervention	106 (3%)

Traitement percutané de l'insuffisance mitrale

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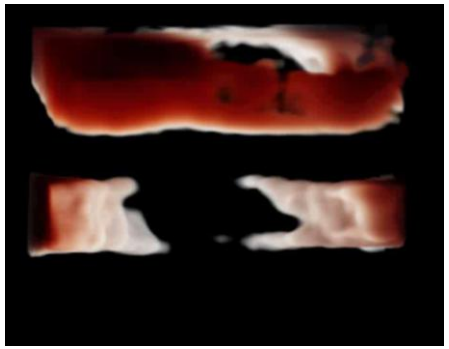
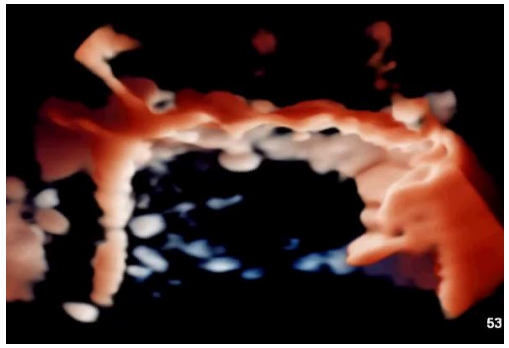
L’étiologie compte !

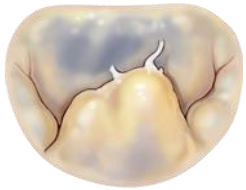
Degenerative (primary)





FED

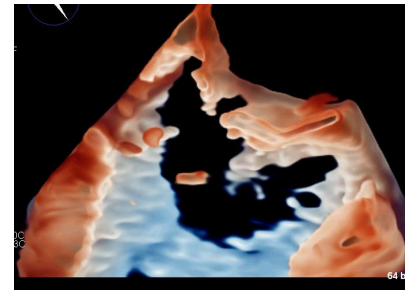
FED+



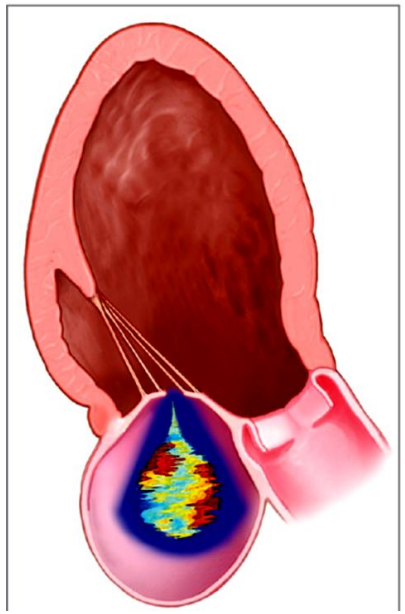
Form Fruste

Barlow’s

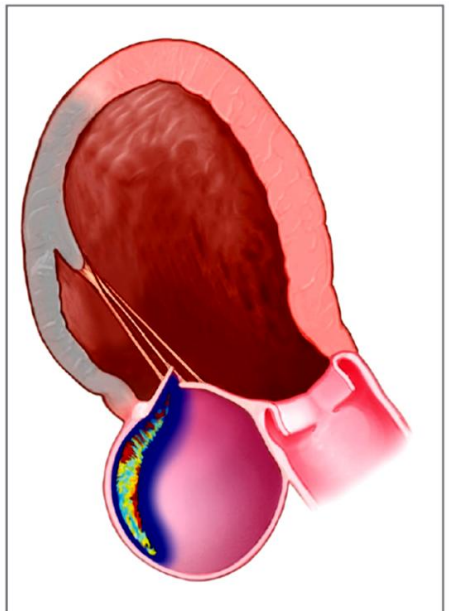
Functional (secondary)



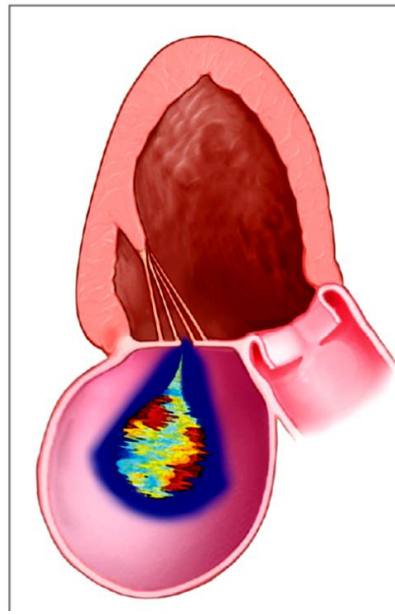
A Ventricular functional MR



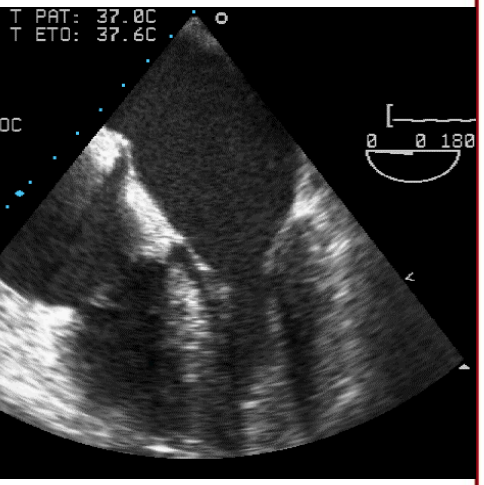
B Ischemic MR



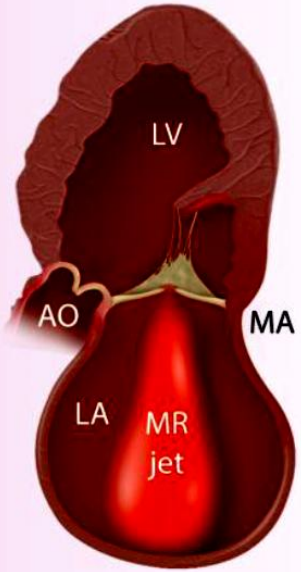
C Atrial functional MR

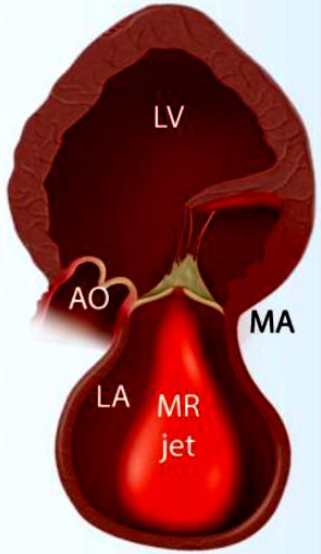


Type I



Key criteria	Atrial SMR	Ventricular SMR
	LVEF ≥50% without regional wall motion abnormalities	LVEF <50% with or without regional wall abnormalities
	No or mildly dilated LV cavity[a] without leaflet tethering	Restrictive leaflet motion with tethering
	Mitral annulus dilatation (AP >35 mm)	Normal leaflet morphology
	Enlarged LA (LAVI >34 mL/m^2)	Central or eccentric jet
Additional echocardiographic criteria[b]		
	Normal leaflet motion	Dilated LV
	Normal leaflet morphology	Dilated LA
	Usually central jet	Dilated MV annulus
Additional clinical criteria		
	Atrial fibrillation	Ischaemic heart disease
	HFpEF	Dilated cardiomyopathy





ESC EACTS

Type IIIb

A LV end-diastolic dimension of <56 mm in females and <63 mm in males; indexed LV end-diastolic volume <71 mL/m2 (in women) or <79 mL/m2 (in men).
B Additional echocardiographic criteria for atrial SMR may no longer be fulfilled in advanced stages.

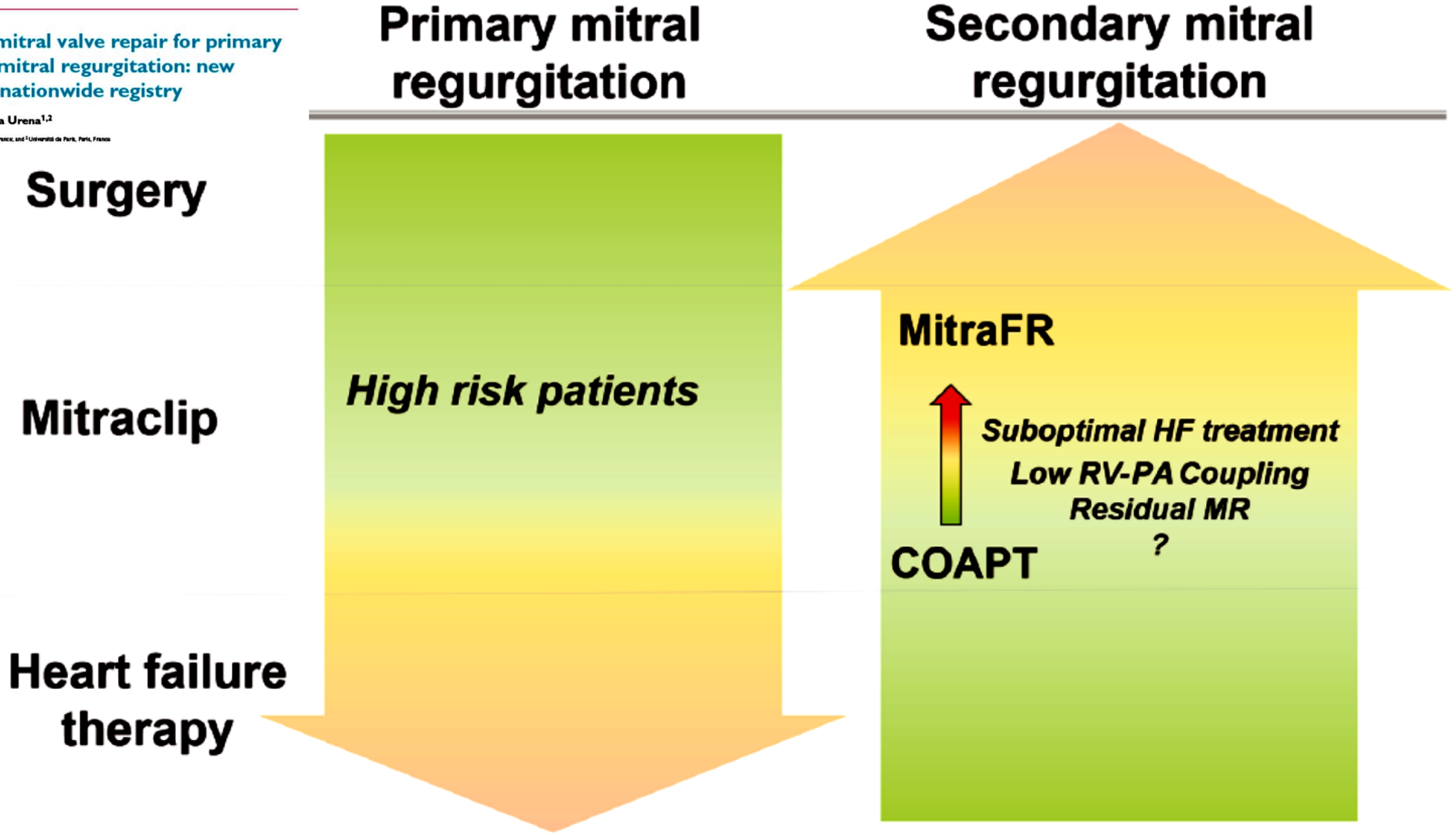
ESC European Society of Cardiology
European Journal of Heart Failure (2021) 23, 1377–1379
doi:10.1002/ejhf.2203

EDITORIAL COMMENT

Transcatheter mitral valve repair for primary and secondary mitral regurgitation: new insights from a nationwide registry

Bernard Iung[1,2*] and Marina Urena[1,2]

[1]Cardiology Department, Bichat Hospital, AP-HP, Paris, France; and [2]Université de Paris, Paris, France

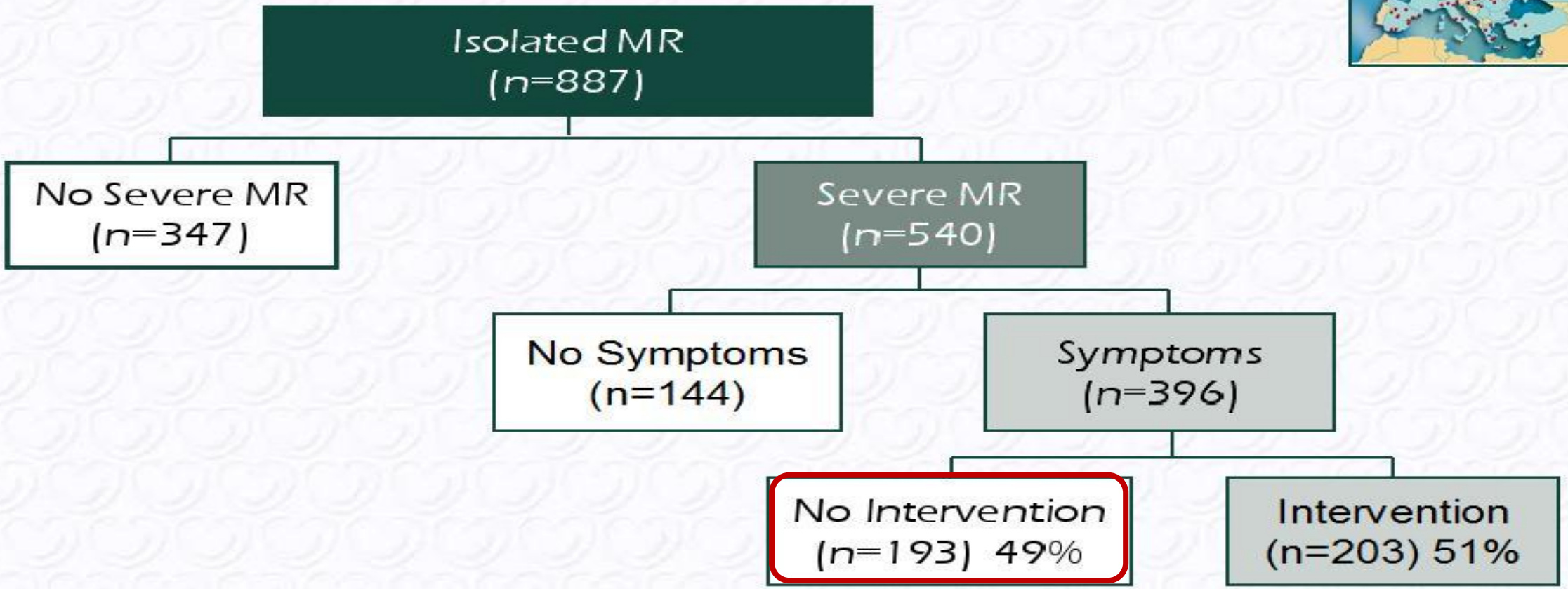


Iung B and Urena M. European Journal of Heart Failure (2021) **23**, 1377–1379

Traitement percutané de l’insuffisance mitrale

- Epidémiologie: une population de plus en plus âgée et fragile
- Dans l’ IM, l’étiologie compte (primaire vs secondaire)
- **Place du traitement percutané dans la prise en charge de l’ IM**
- Rôle de l’imagerie multi-modalité : l’œil et le GPS de l’interventionnel

Current Management of Severe MR

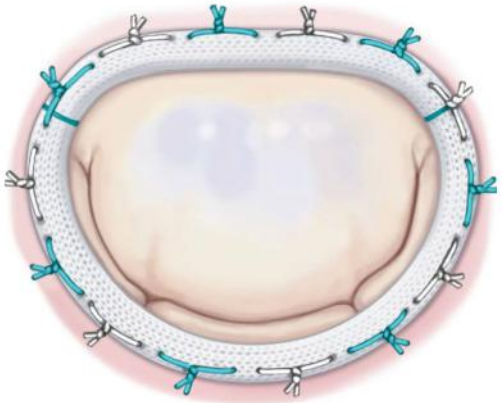


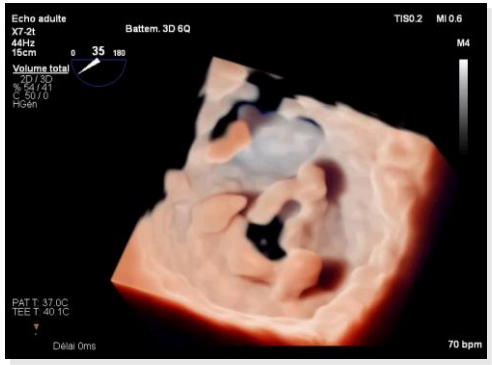
Mirabel et al. *Eur Heart J* 2007;28:1358-1365

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

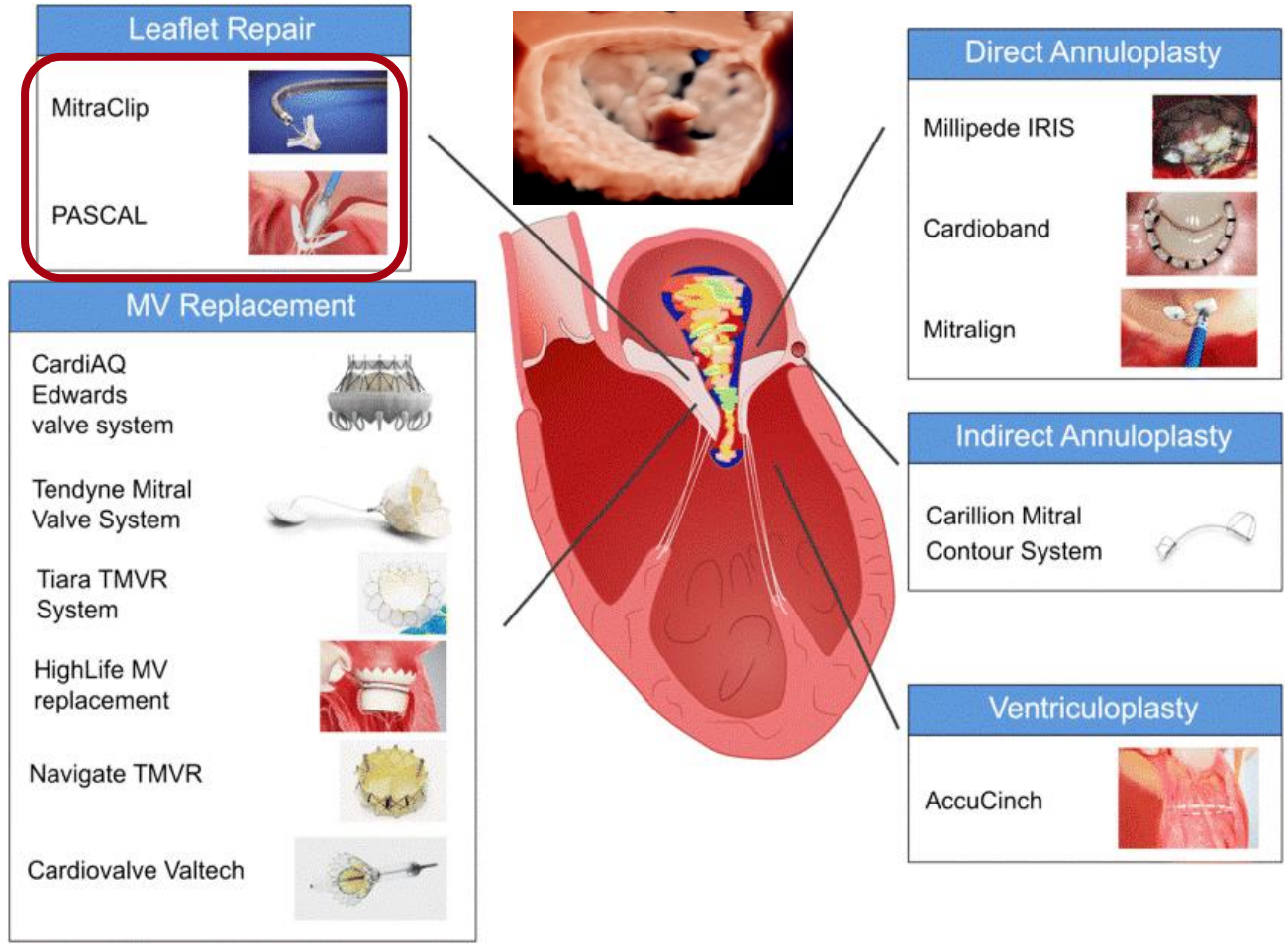
Mitral Interventions in 2026

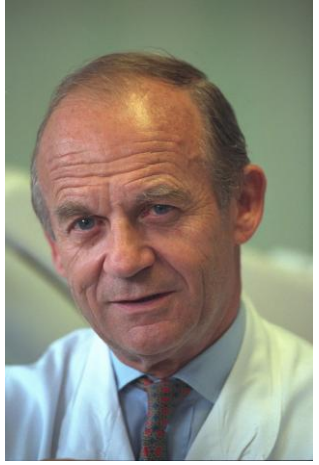
Mitral Valve Surgery





Transcatheter Mitral Valve Procedures



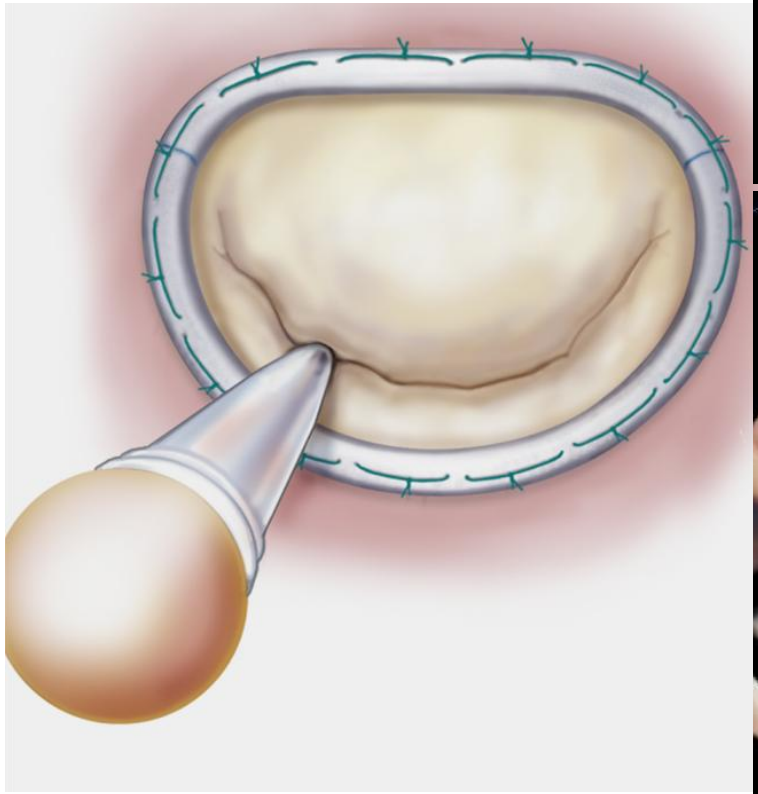


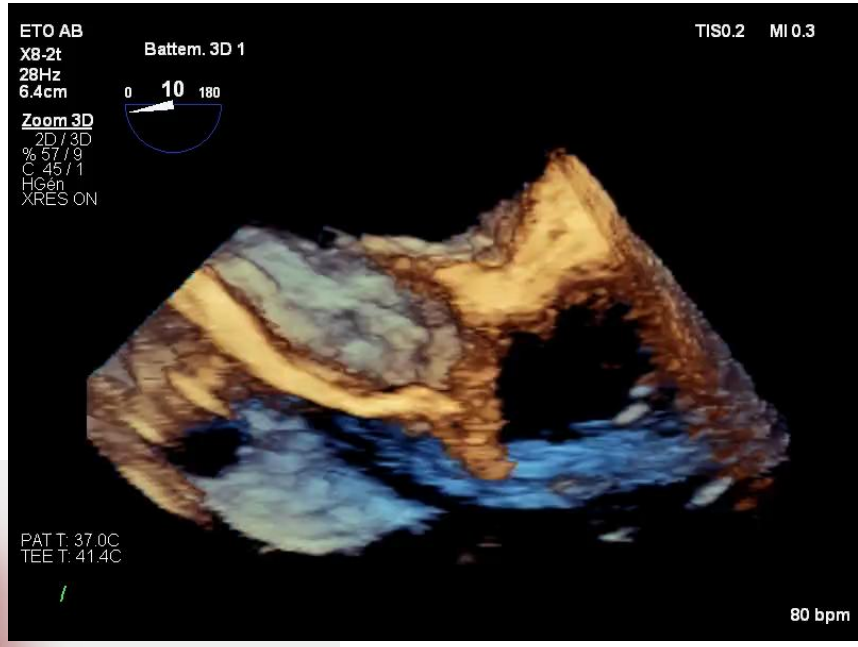
MV reconstruction
The 3 « Golden » rules

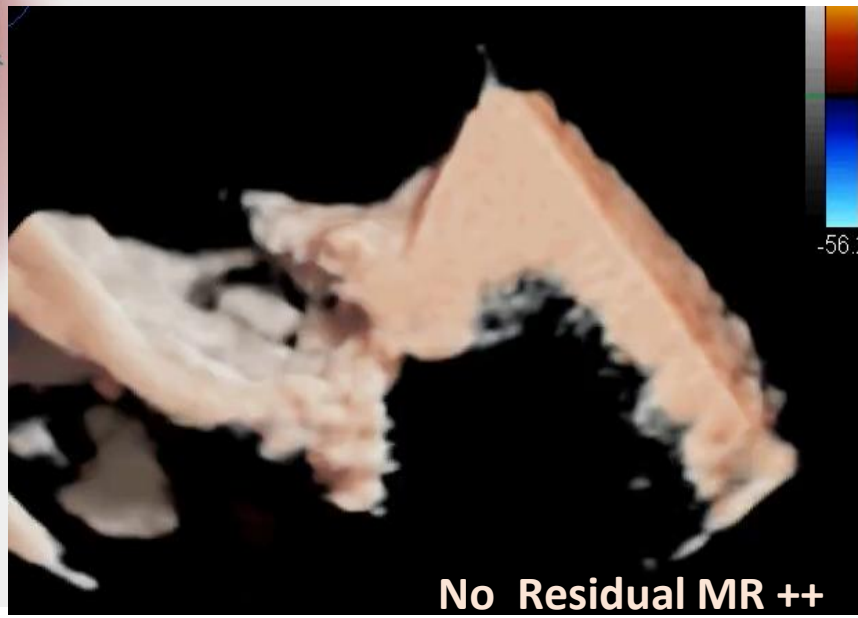
Restore a large surface of coaptation (≥ 8 mm)

Preserve or restore full leaflet motion

Remodel and stabilize the annulus ++

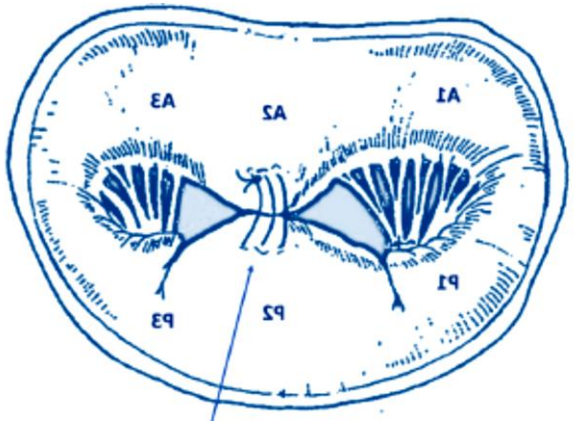


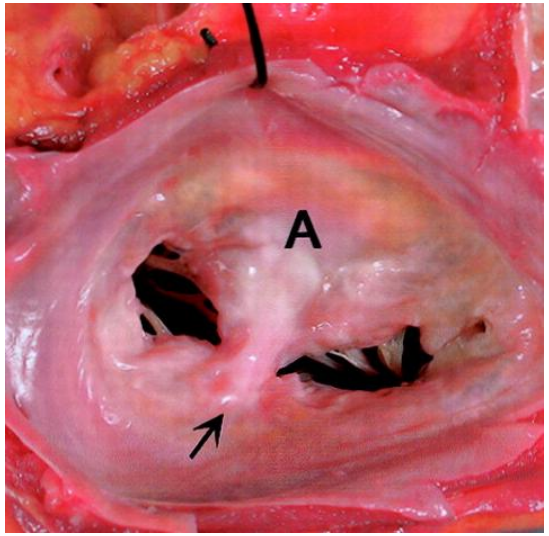


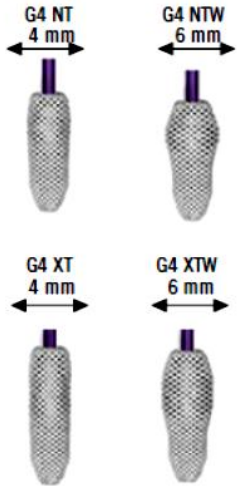
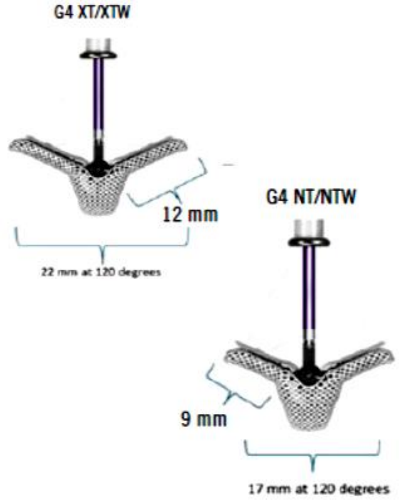
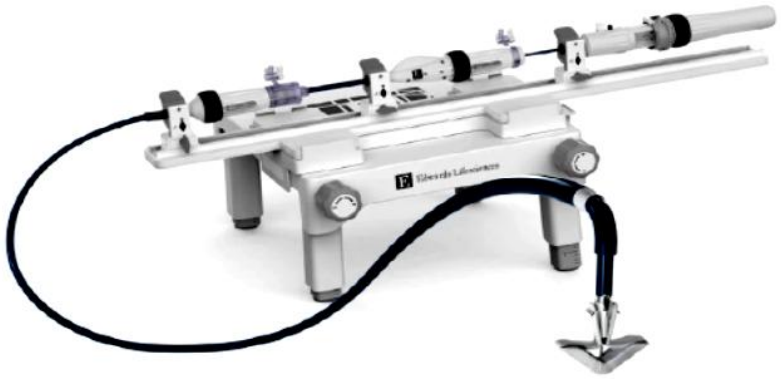
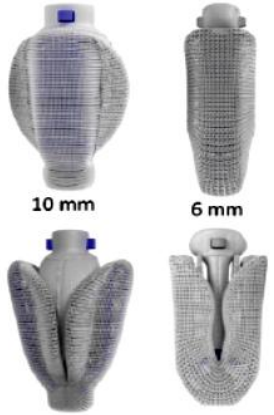
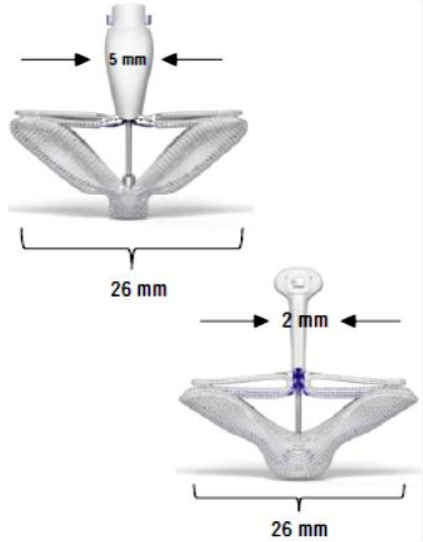


A. Carpentier: JTCS 1983;86(3):323-37

From Alfieri's stitch to Edge to Edge repair





TEER system	Implant types	Implant size	Device features
 MitraClip – 4th generation			• Rigid arm • Cobalt-chromium alloy • 2 working catheters • Longitudinal orientation of hooks • 24 Fr
 PASCAL Precision – 2nd generation			• Flexible arm • Nitinol • 3 working catheters • Horizontal orientation of hooks • Central spacer • 22 Fr

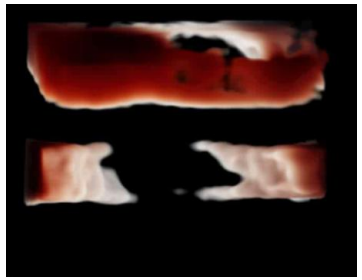
Things to fix: MR interventions in 2025 ESC Guidelines

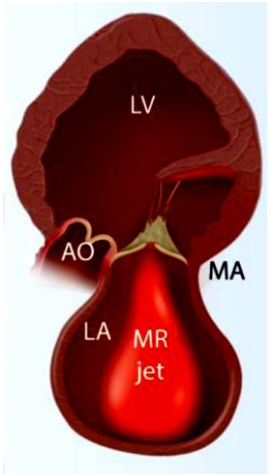
ESC European Society of Cardiology
European Heart Journal (2025) **00**, 1–102
https://doi.org/10.1093/eurheartj/ehaf194

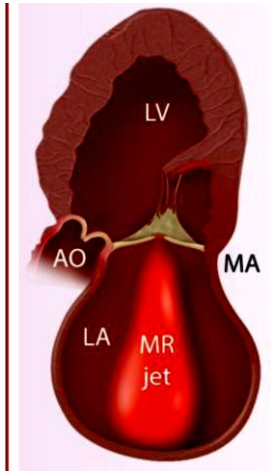
ESC GUIDELINES

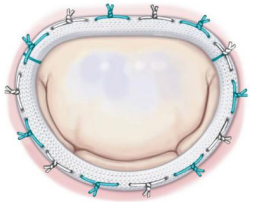
2025 ESC/EACTS Guidelines for the management of valvular heart disease

Developed by 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)







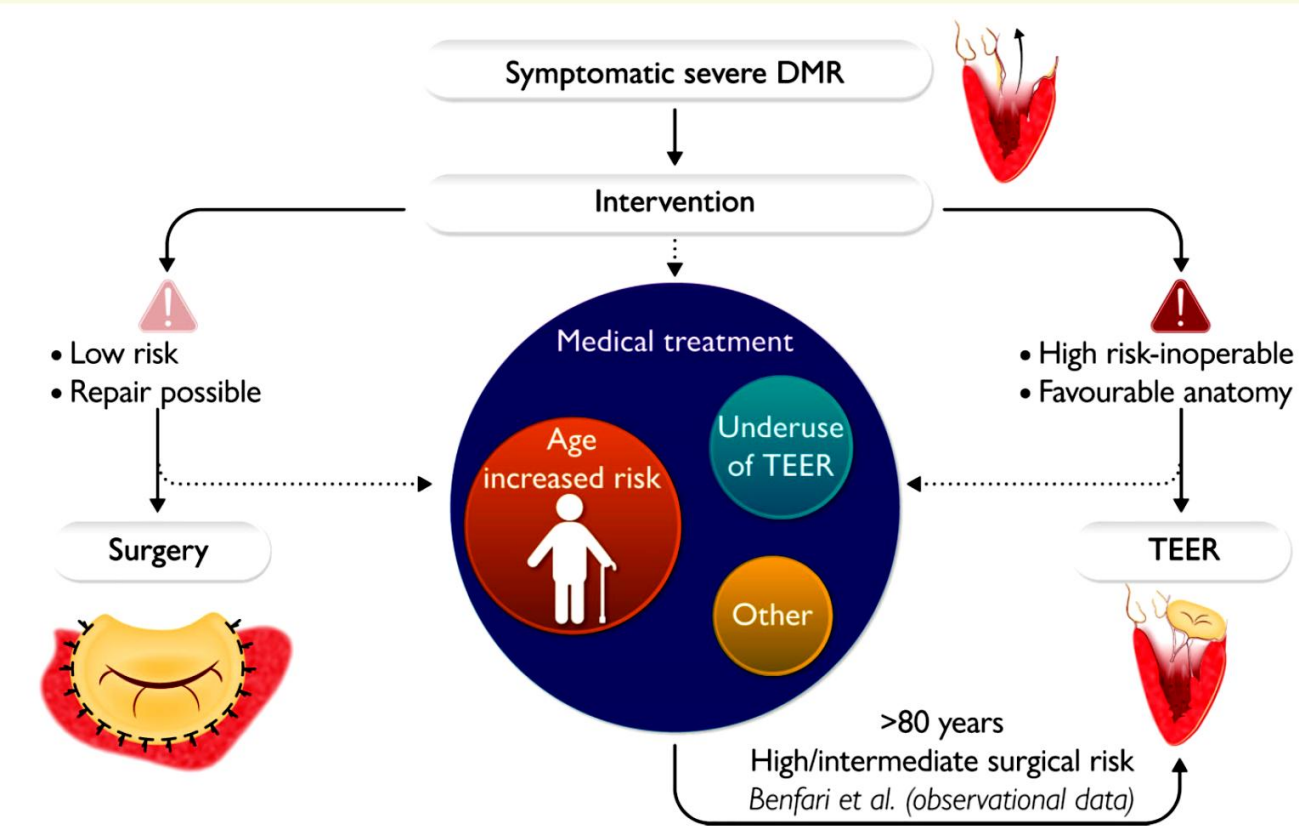
	Primary MR	Ventricular Secondary MR	Atrial Secondary MR
 Surgical Repair	Class I	Class IIb (not suitable for TEER)	Class IIa
 Surgical Replacement	Class IIa	Class IIb (not suitable for TEER)	Class IIa
 TEER	Class IIa	Class I	Class IIb

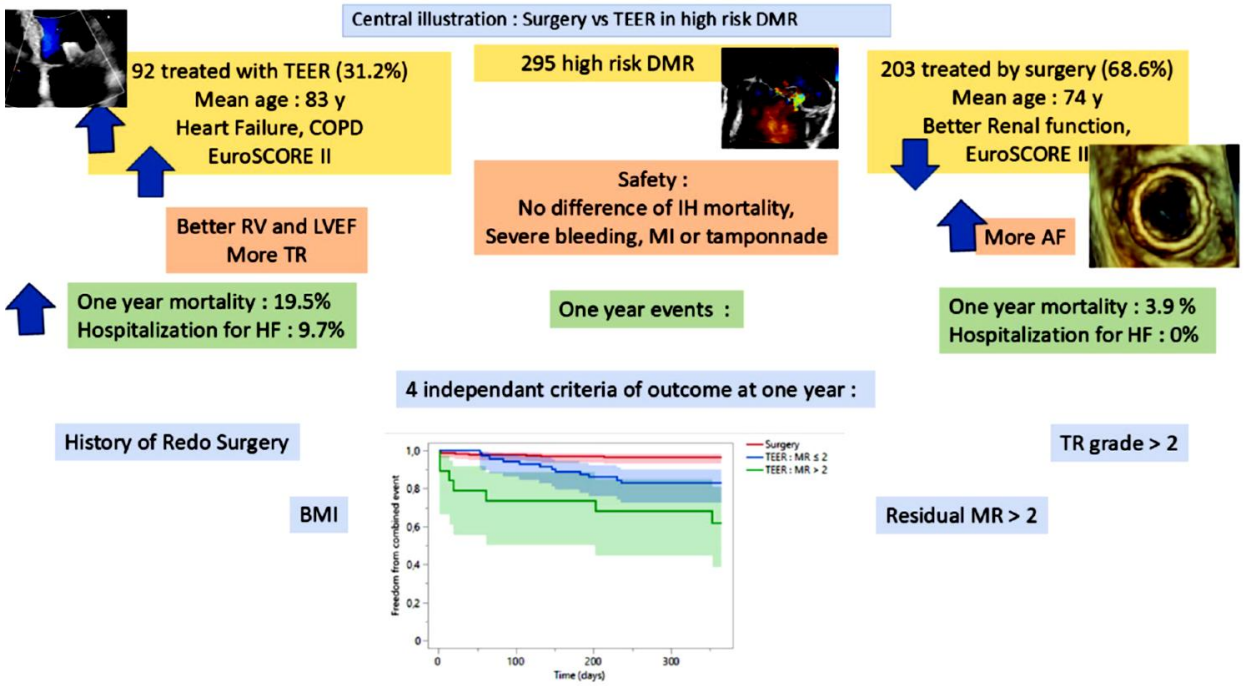
New insights into transcatheter edge-to-edge repair: filling a gap for undertreatment of primary mitral regurgitation in the elderly?

Bernard Iung [1,2]* **and Marina Urena** [1,2]

Transcatheter edge to edge compared with surgery in older patients with degenerative mitral valve regurgitation

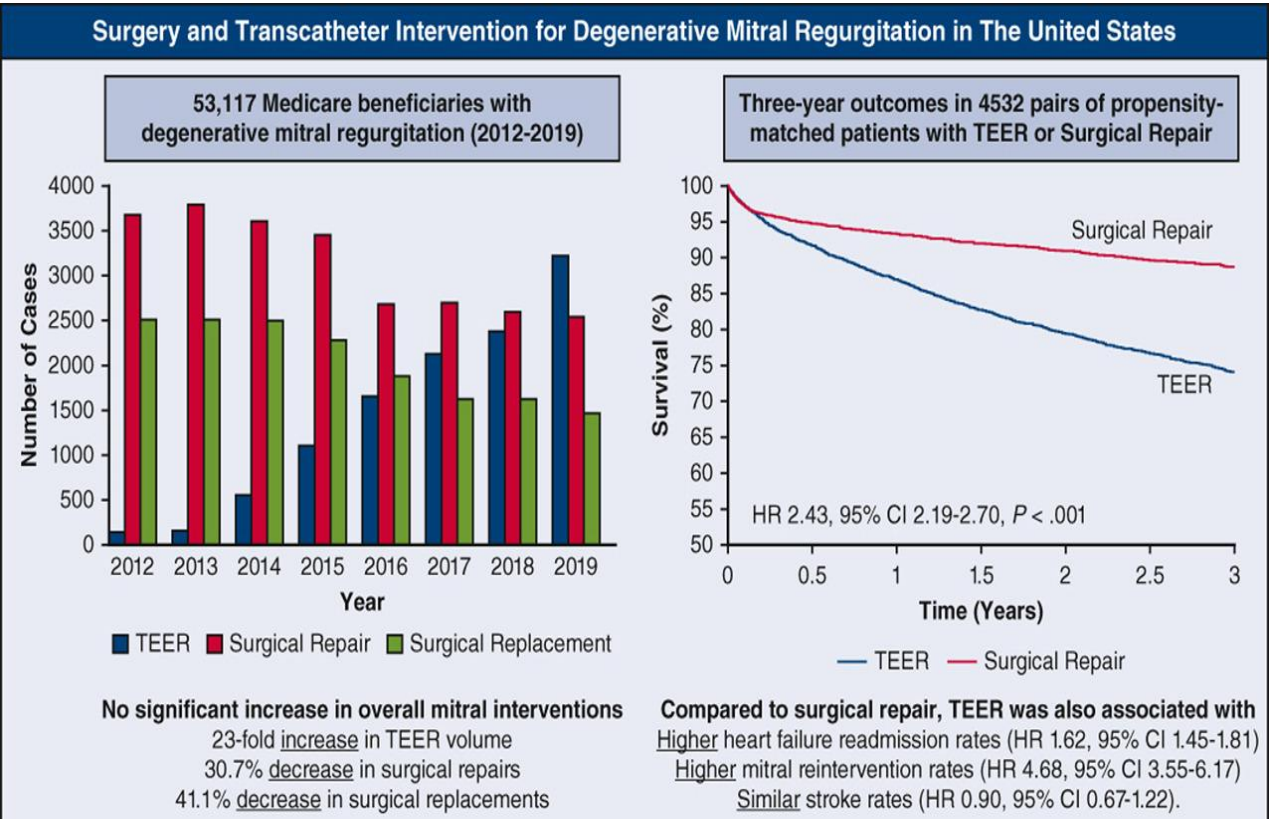
Suc *et al. Journal of Cardiothoracic Surgery* (2025) 20:65





Don't leave Moderate to Severe >2 + Residual MR ++

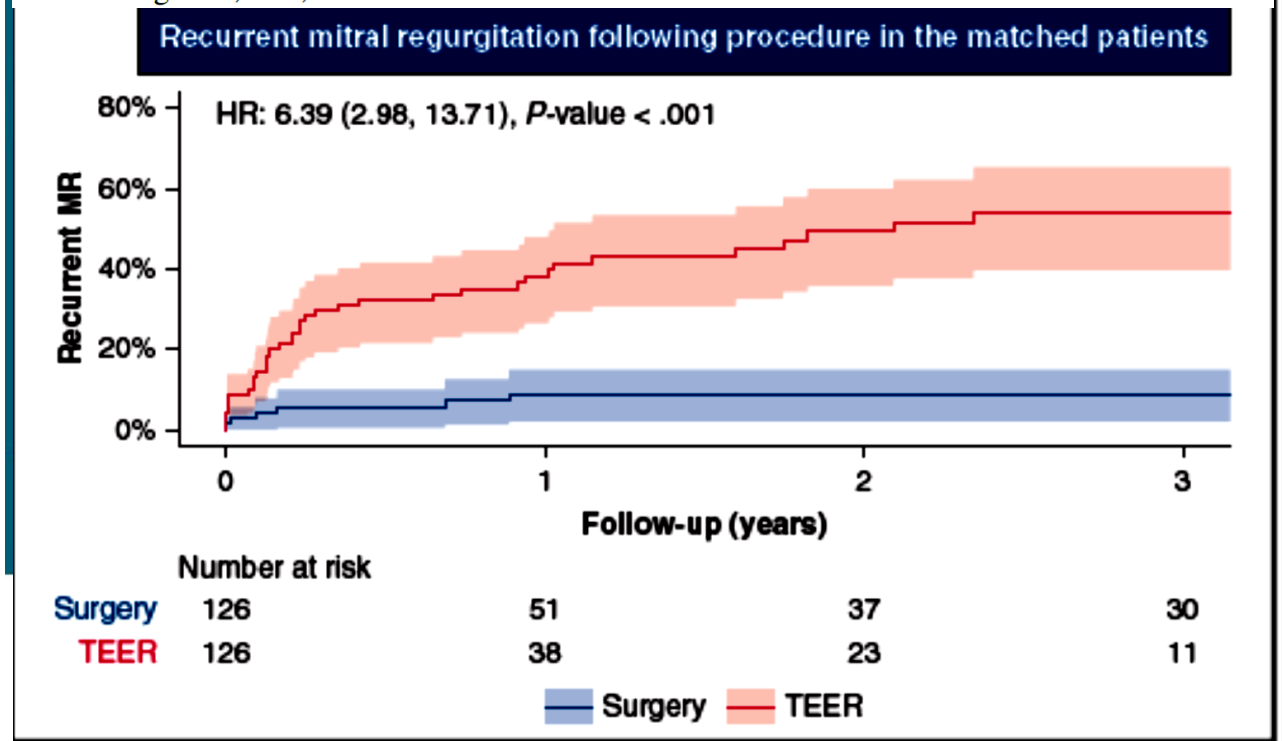
Surgical repair vs TEER in Degenerative MR at 3 yrs: a word of caution



Chikwe J et al. J Thorac Cardiovasc Surg. 2025;169(1):80-88

Transcatheter edge-to-edge repair versus mitral valve surgery in octogenarians: Comparative analysis of safety, durability, and survival

Sina Danesh, MD,[a] Hartzell V. Schaff, MD,[a] Kimberly A. Holst, MD,[a] Paul C. Tang, MD, PhD,[a] Tedy Sawma, MD,[a] Joseph A. Dearani, MD,[a] Austin Todd, MS,[b] Agata Sularz, MB, BChir,[c] Kevin L. Greason, MD,[a] Juan A. Crestanello, MD,[a] Mohamad Alkhouli, MD,[c] and Arman Arghami, MD, MPH[a]



> Multimed Man Cardiothorac Surg. 2017 Oct 6:2017. doi: 10.1510/mmcts.2017.016.

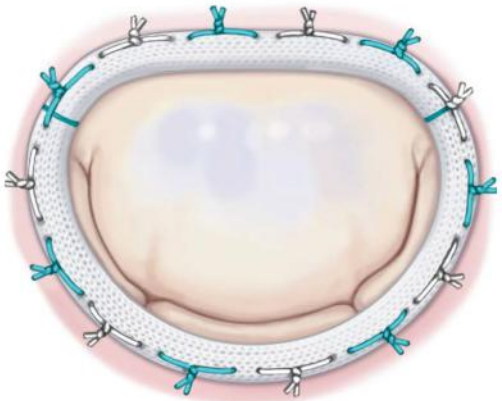
Mitral valve annuloplasty

Benedetto Del Forno [1], Alessandro Castiglioni [2], Alessandra Sala [2], Alberto Geretto [2], Andrea Giacomini, Paolo Denti, Michele De Bonis [2], Ottavio Alfieri

Affiliations + expand

PMID: 29300071 DOI: 10.1510/mmcts.2017.016

Free article

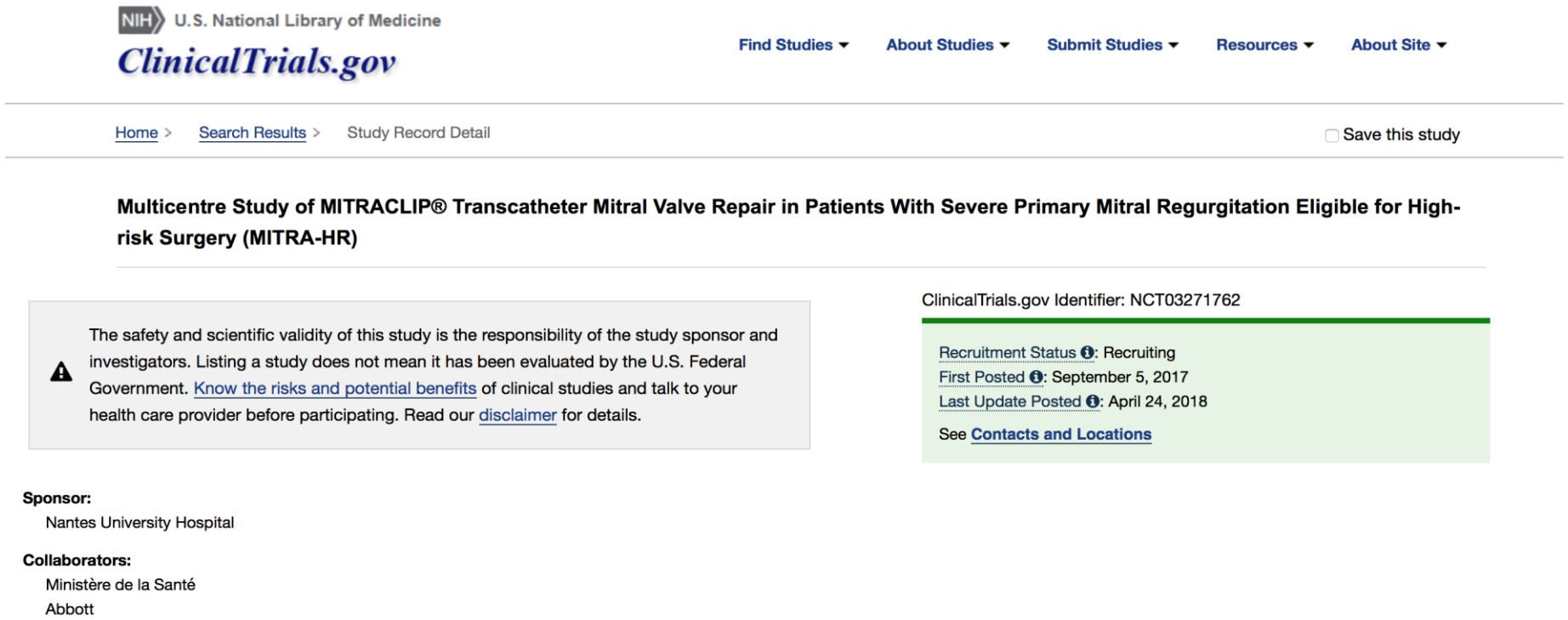


Abstract

Mitral valve prosthetic ring annuloplasty represents a key milestone in the history of mitral valve repair, delivering restoration of annular shape and size. Increased leaflet coaptation, together with significant reduction in stress on sutures, has ensured predictability and immediate stability for valve repair, both of which were lacking with previous techniques. Long-term durability of repair seems to be positively affected by placement of an annuloplasty ring, and by following the well-established, standardized approach described in our tutorial, this procedure can be performed with a very low surgical risk.

series.[303–306] The efficacy of more recent TEER system iterations[307] will be investigated in high-risk (MITRA-HR study NCT03271762)[308] and intermediate-risk patients (REPAIR-MR study NCT04198870).

- **IM sévère primaire symptomatique chez des patients à risque opératoire élevé ou présentant des facteurs de fragilité**



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Multicentre Study of MITRACLIP® Transcatheter Mitral Valve Repair in Patients With Severe Primary Mitral Regurgitation Eligible for High-risk Surgery (MITRA-HR)

The safety and scientific validity of this study is the responsibility of the study sponsor and investigators. Listing a study does not mean it has been evaluated by the U.S. Federal Government. Know the risks and potential benefits of clinical studies and talk to your health care provider before participating. Read our disclaimer for details.

ClinicalTrials.gov Identifier: NCT03271762

Recruitment Status: Recruiting
First Posted: September 5, 2017
Last Update Posted: April 24, 2018

See Contacts and Locations

Sponsor:
Nantes University Hospital

Collaborators:
Ministère de la Santé
Abbott

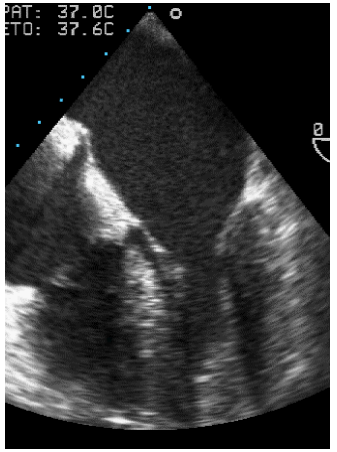
Things to fix: MR interventions in 2025 ESC Guidelines

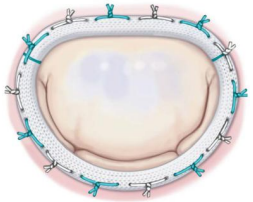
ESC European Society of Cardiology
European Heart Journal (2025) **00**, 1–102
https://doi.org/10.1093/eurheartj/ehaf194

ESC GUIDELINES

2025 ESC/EACTS Guidelines for the management of valvular heart disease

Developed by 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)



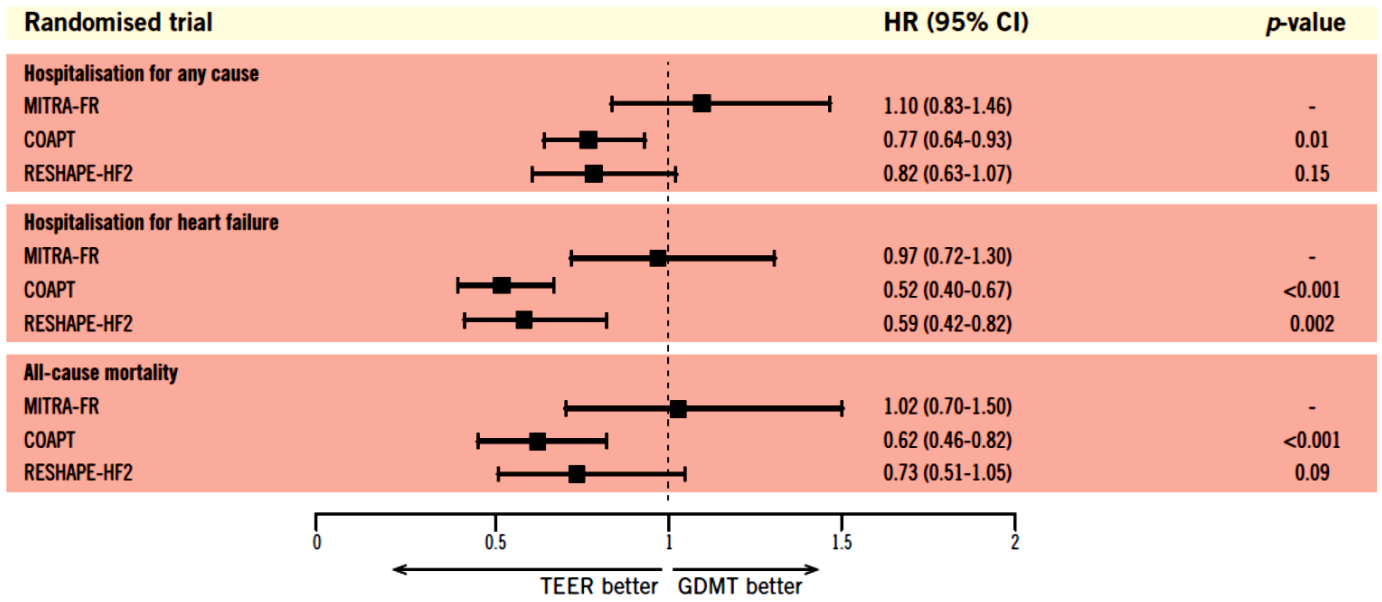
	Primary MR	Ventricular Secondary MR	Atrial Secondary MR
 Surgical Repair	Class I	Class IIb (not suitable for TEER)	Class IIa
 Surgical Replacement	Class IIa	Class IIb (not suitable for TEER)	Class IIa
 TEER	Class IIa	Class I	Class IIb

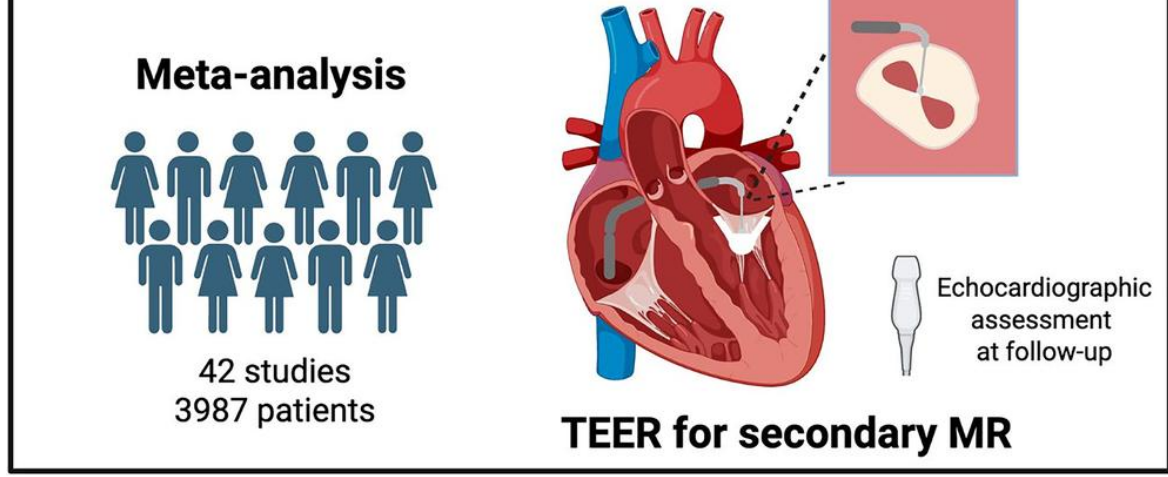
EuroIntervention
2025;21:e1458-e1478
published online e-edition December 2025
DOI: 10.4244/EIJ-D-25-00116

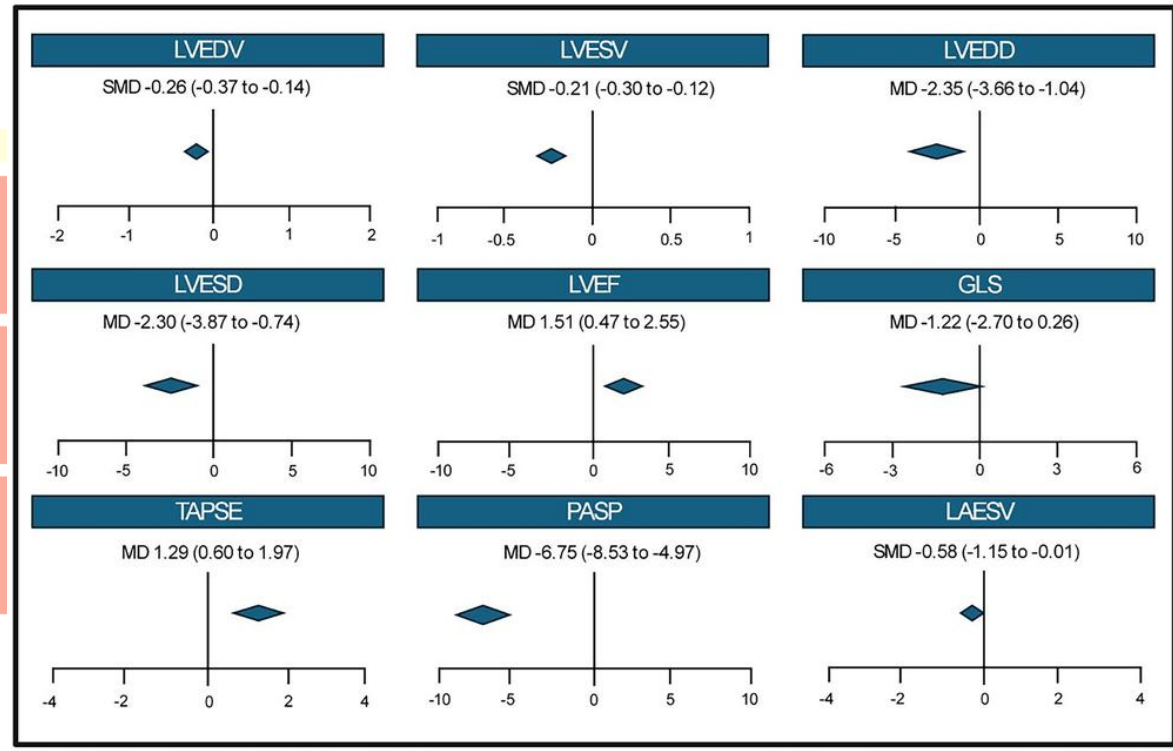
State-of-the-Art
by EuroIntervention

Transcatheter edge-to-edge repair in secondary mitral regurgitation

Josep Rodés-Cabau[1,2]*, MD, PhD; Siddhartha Mengi[1], MD; Erwan Salaun[1], MD; Jean-Michel Paradis[1], MD; William T. Abraham[3], MD







TEER yielded significant LV reverse remodeling (reduced LV volumes and diameters), improved LVEF and TAPSE, and decreased PASP.

Lombardi et al *J Am Heart Assoc.* 2026;15:e045616.

ESC European Society of Cardiology
European Heart Journal (2026) **47**, 1294–1303
https://doi.org/10.1093/eurheartj/ehaf480

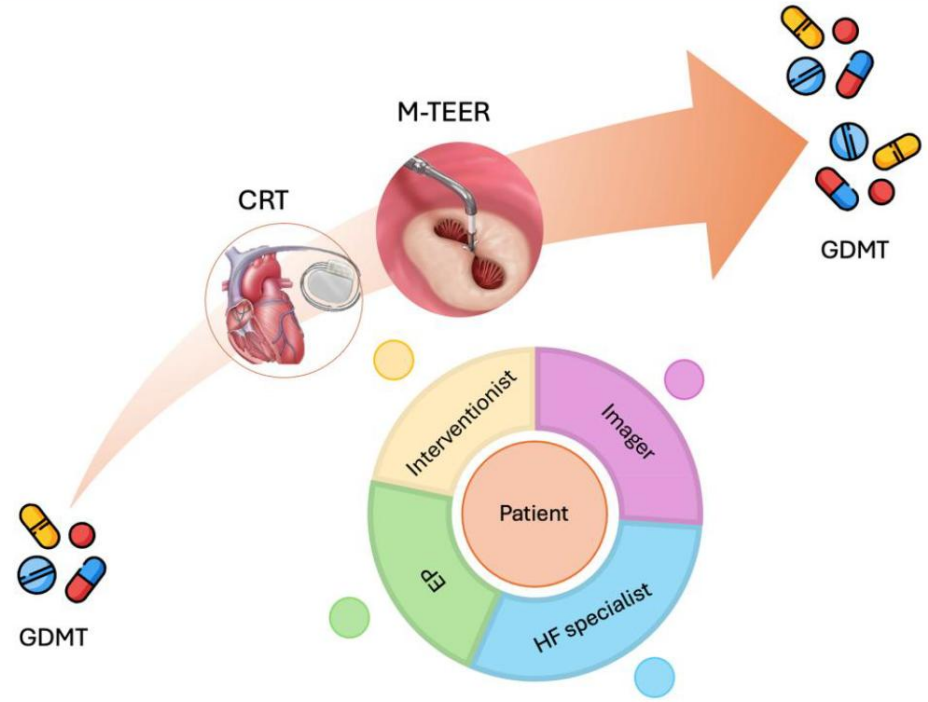
STATE OF THE ART REVIEW
Valvular heart disease

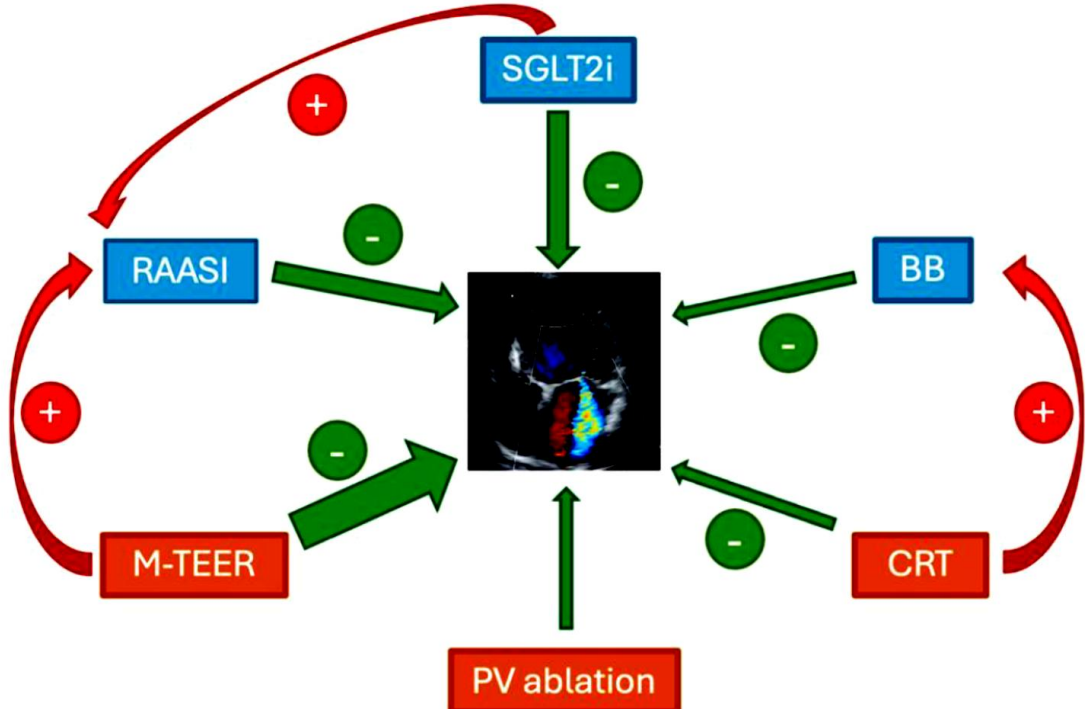
Heart failure with reduced ejection fraction and ventricular secondary mitral regurgitation: a holistic approach

Marianna Adamo [1,*], Matteo Pagnesi [1], Nina Ajmone Marsan[2], Johann Bauersachs [3], Jörg Hausleiter [4,5], Shelley Zieroth[6], and Marco Metra[1]

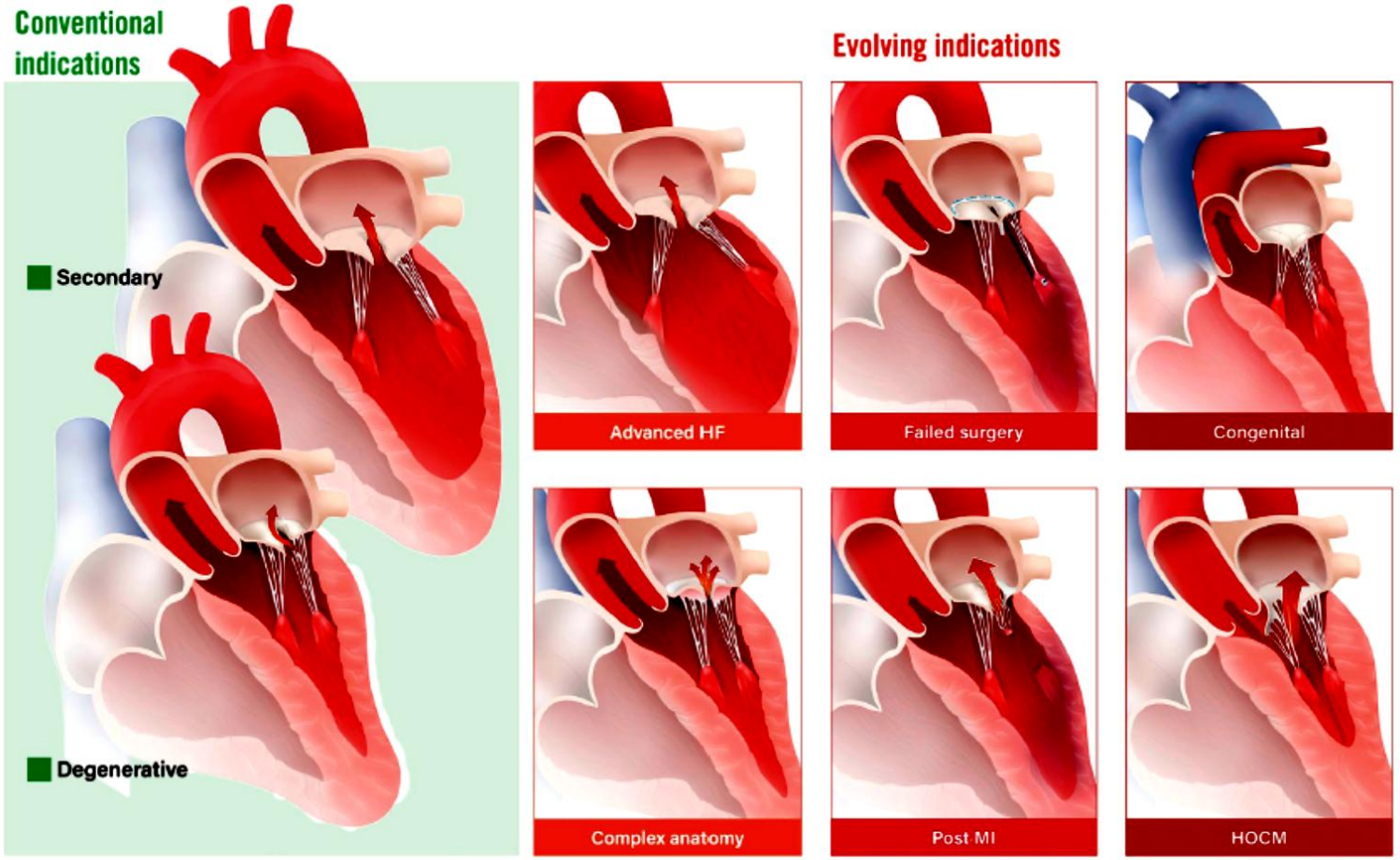
Management of patients with heart failure with reduced ejection fraction and ventricular secondary mitral regurgitation

Diagnosis	Treatment: drugs and interventions	Follow-up
Assessment of patient characteristics (anatomy, HF stage, comorbidities) + Accurate multiparametric quantification of ventricular SMR (echocardiography, CMR if needed) and its mechanisms	M-TEER in selected patients with specific clinical and echocardiographic criteria; Coronary revascularization in case of relevant obstructive CAD; Initiation and optimization of GDMT according to patient profile (renal function, potassium level, blood pressure, heart rate, comorbidities); CRT if wide QRS and LVEF ≤35%, especially if there is dyssynchrony and no scar; Pulmonary vein catheter ablation if AF is the cause of SMR and HF	Careful periodic reassessment with possible further optimization of medical therapy and maintenance of a euvolemic status to prevent HF events





TEER: Expanding indications



Mony Shuvy *et al.* • *EuroIntervention* 2024;20:e230-e238 • DOI: 10.4244/EIJ-D-23-00700

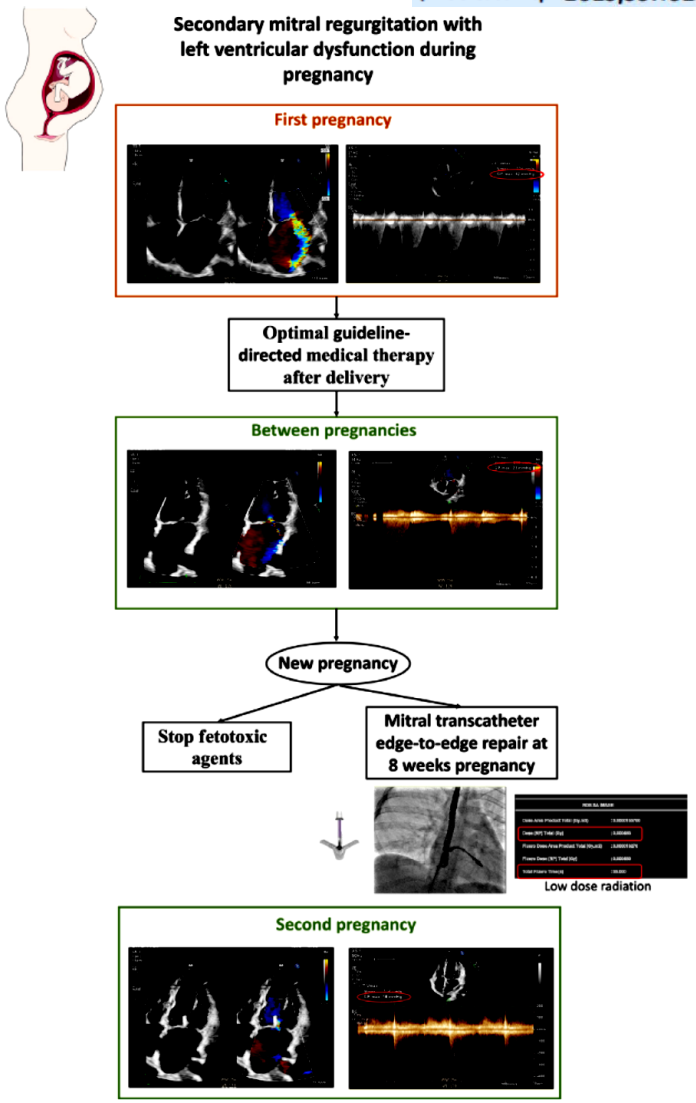
Mitral Transcatheter Edge-to-Edge Repair in a Pregnant Woman

Procedure and Pregnancy Outcomes

Clémence Delhomme, MD,[a] Gaspard Suc, MD, PhD,[a,c,d] Claire Thuillier, MD, MSc,[b,d] Grégory Ducrocq, MD, PhD,[a,c,d] Tiphaine Barral, MD,[b] Eric Brochet, MD,[a] Dominique Himbert, MD,[a] Agnès Bourgeois-Moine, MD,[b] Bernard Iung, MD,[a,c,d] Marina Urena, MD, PhD[a,c,d]

VISUAL SUMMARY Management of Secondary Mitral Regurgitation With Left Ventricular Dysfunction During the 2 Pregnancies and Between Pregnancies

(JACC Case Rep. 2025;30:102995)



Urgent Transcatheter Edge to Edge Repair (TEER) of Mitral Regurgitation in Cardiogenic Shock: A Systematic Review and Meta-Analysis

Dimitriadis et al *J Am Heart Assoc.* 2025;13:e034932. DOI: 10.1161/JAHA.124.034932

Objective

Evaluation of urgent transcatheter edge to edge repair (TEER) in patients with severe mitral regurgitation (MR) and cardiogenic shock (CS)

Population

24 studies, 5,428 patients

Severe MR and CS

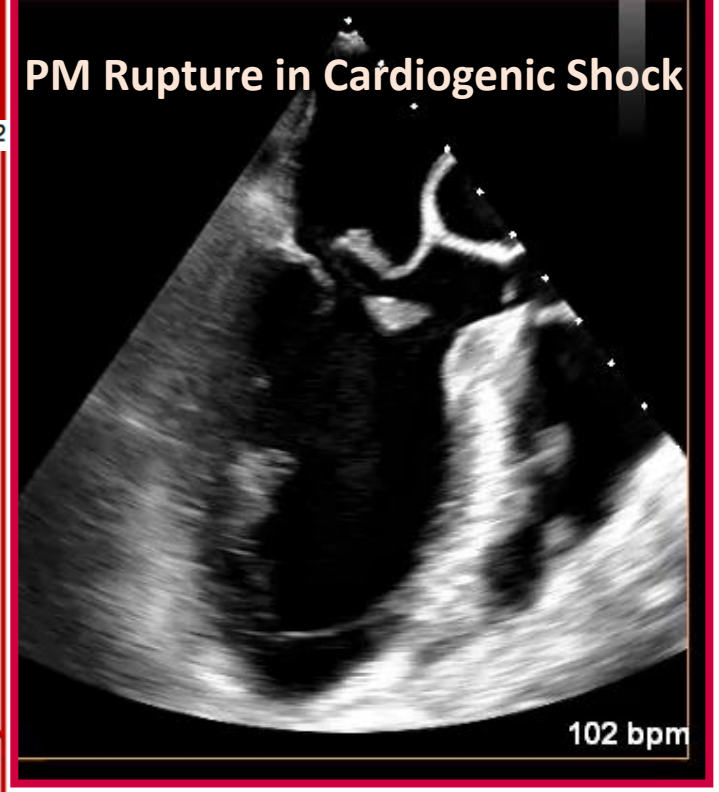
Urgent TEER

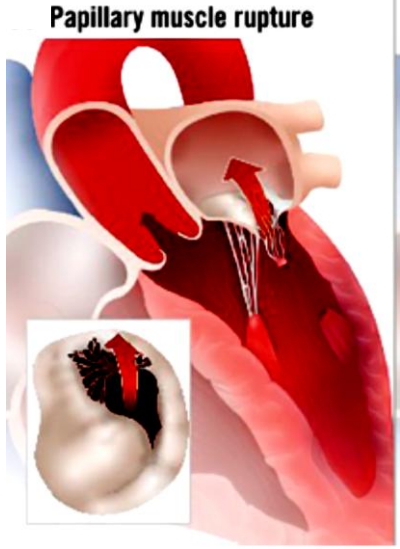
Results

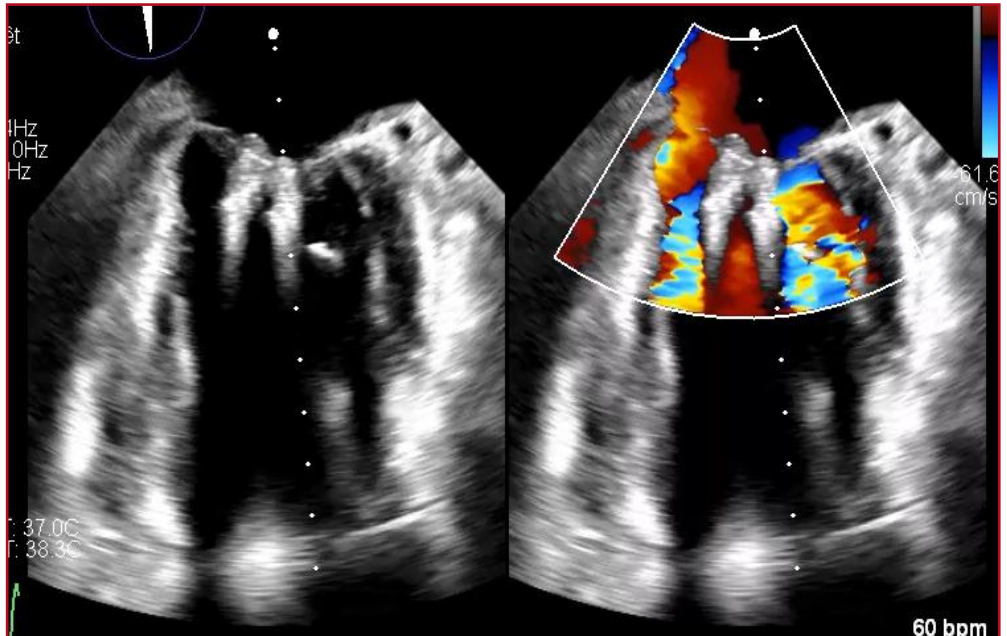
30d Device Success	30d All-Cause Mortality	30d MR<2+	30d Stroke
86%	14%	89%	2%

30d Myocardial Infarction	Mean FU All-Cause Mortality	Mean FU HF Hospitalizations
15%	34%	9%

Conclusion In patients with MR and CS, TEER is associated with favorable 30-day and intermediate-term outcomes.







Traitement percutané de l'insuffisance mitrale

- Epidémiologie: une population de plus en plus âgée et fragile
- Dans l' IM, l'étiologie compte (primaire vs secondaire)
- Place du traitement percutané dans la prise en charge de l' IM
- **Rôle de l'imagerie multi-modalité : l'œil et le GPS de l'interventionnel**

The essential role of multimodality imaging

Multimodality imaging

Associated diseases and conditions

Evaluation of VHD dynamics and variability

Assessment of extravalvular cardiac consequences from VHD

Planning and guiding of interventions, assessment of complications

Evaluation of eligibility for intervention and risk stratification

TTE

- Diagnosis and quantification of valve dysfunction
- Cardiac chamber anatomy and function
- Cardiac damage and remodelling
- Follow-up

TOE

- Higher resolution to assess valve anatomy
- Mechanism(s) of VHD
- 3D visualization of valves
- Guiding of interventions

CCT

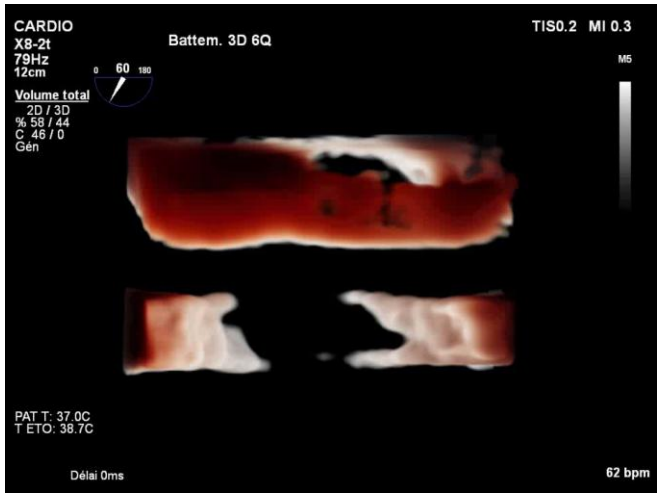
- Cardiac anatomy and access
- Assessment of calcifications
- Exclusion of CAD

CMR

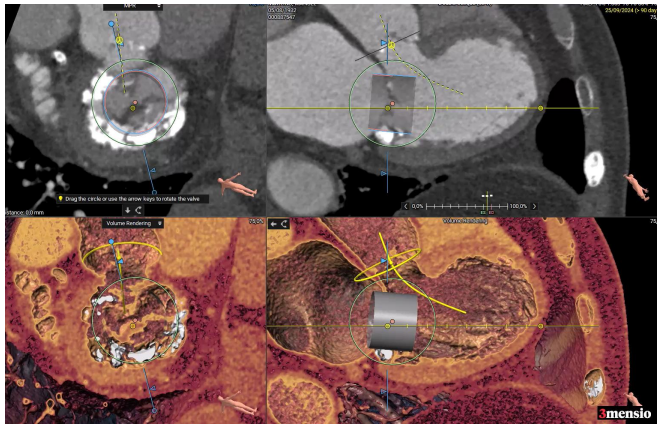
- Chamber volumes and function
- Regurgitant fraction
- Myocardial fibrosis

ESC EACTS

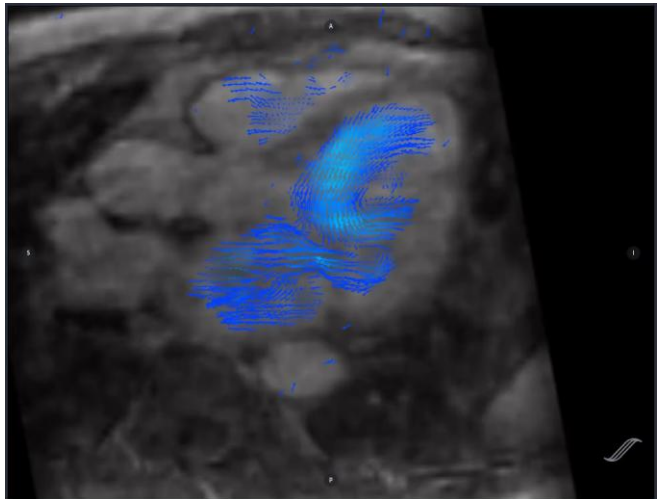
3D TEE

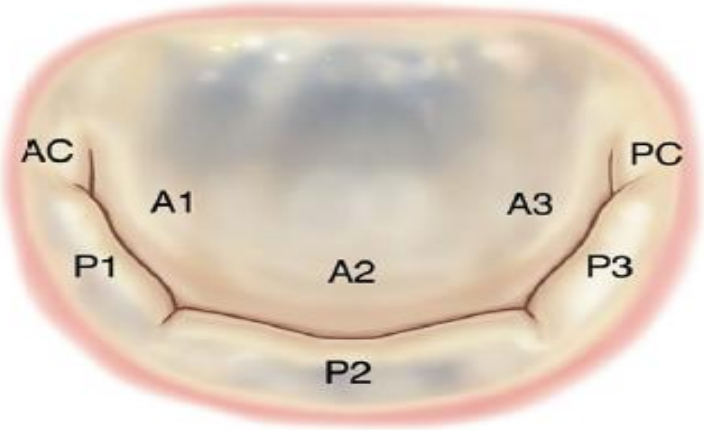


CCT



CMR

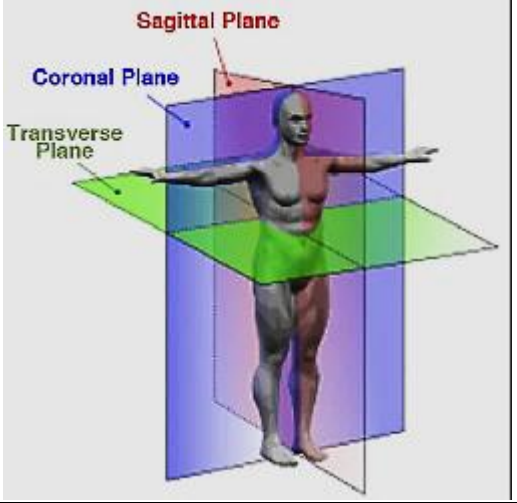


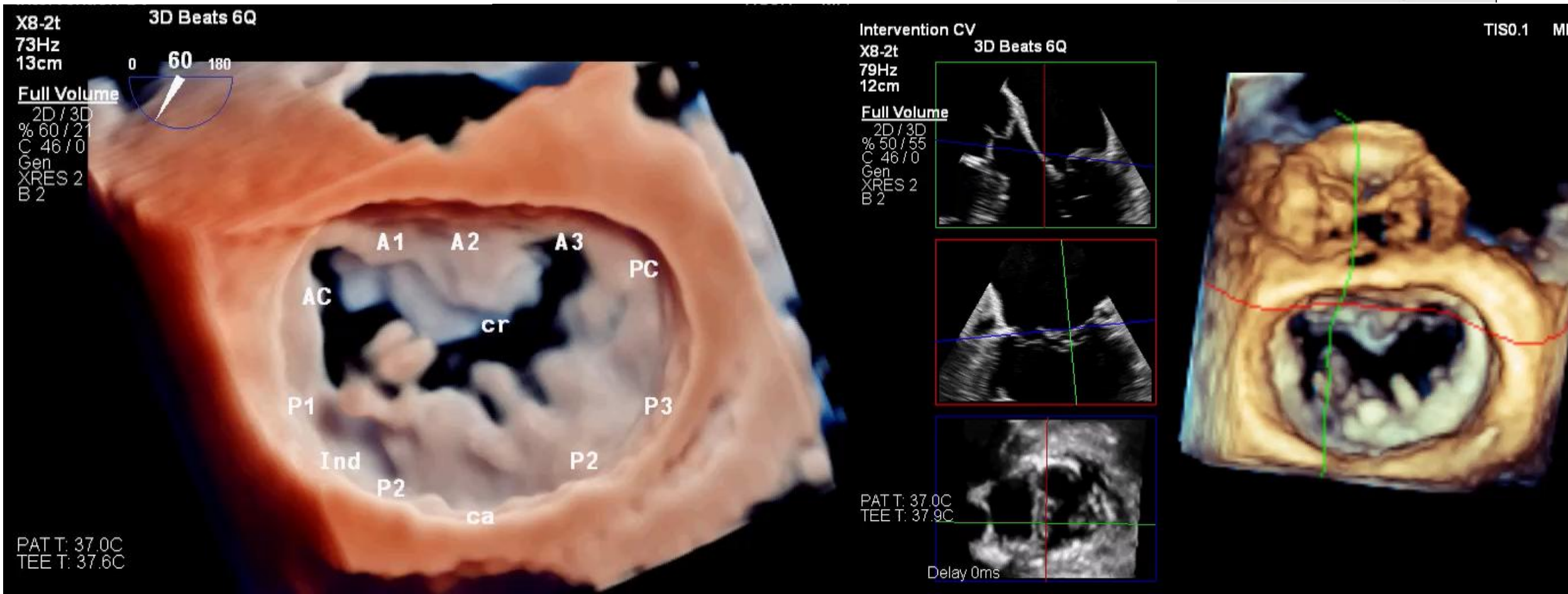


ESC European Society of Cardiology
European Heart Journal - Cardiovascular Imaging (2023) 00, 1–79
https://doi.org/10.1093/ehjci/jead090
EACVI DOCUMENT

Three-dimensional transoesophageal echocardiography: how to use and when to use—a clinical consensus statement from the European Association of Cardiovascular Imaging of the European Society of Cardiology

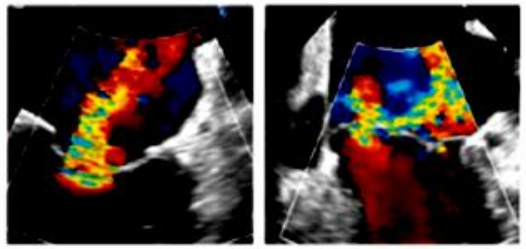
Francesco F. Faletra*, Eustachio Agricola, Frank A. Flachskampf, Rebecca Hahn, Mauro Pepi, Nina Ajmone Marsan, Nina Wunderlich, Leyla Elif Sade, Erwan Donal, Jose-Luis Zamorano, Bernard Cosyns, Mani Vannan, Thor Edvardsen, Alain Berrebi, Bogdan A. Popescu, Patrizio Lancellotti, and Roberto Lang



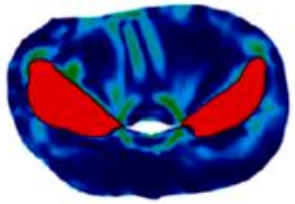


TEER and Imaging Screening

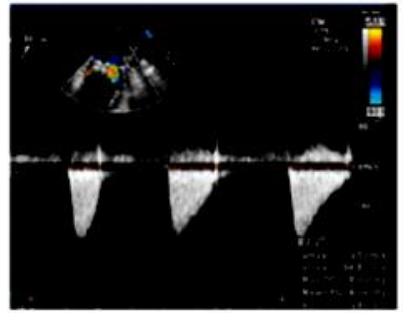
Jet number, width, and location



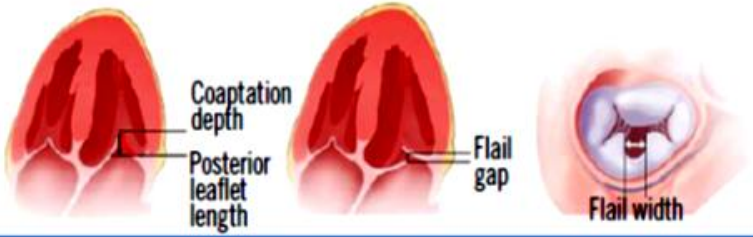
Leaflet tension



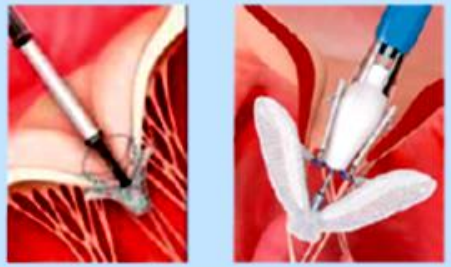
Baseline transmitral gradient



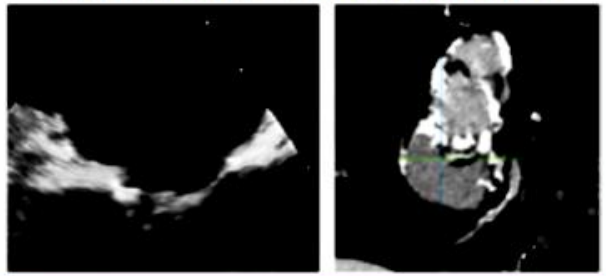
Anatomical complexity



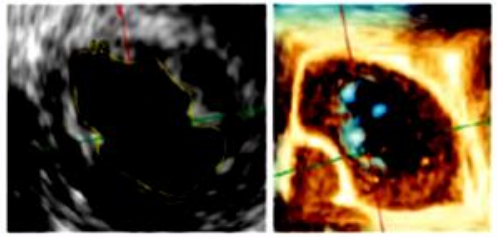
Device selection



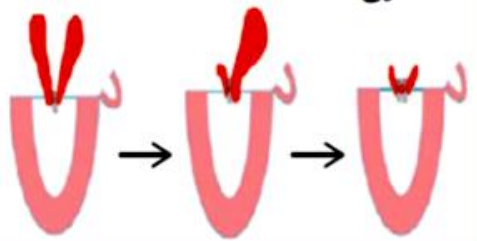
Annular and leaflet calcification



Baseline mitral valve area



Procedural strategy



Hausleiter J and al.

EuroIntervention 2023;18:957-976

Faisabilité Réparation Edge to Edge Mitrale

Repair!

Anatomical suitability for M-TEER

Centre experience

Replacement?

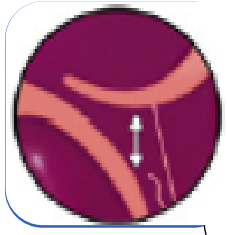
Non-complex Ideal for M-TEER	Complex Suitable for M-TEER	Very complex Challenging for M-TEER	Criteria favouring replacement M-TEER hard or impossible
- Central pathology - No calcification - MVA >4.0 cm^2 - Posterior leaflet >10 mm - Tenting height <10 mm - Flail gap <10 mm - Flail width <15 mm	- Isolated commissural lesion (A1/P1 or A3/P3) - Annular calcification without leaflet involvement - MVA 3.5-4.0 cm^2 - Posterior leaflet length 7-10 mm - Tenting height >10 mm - Asymmetric tethering[26] - Coaptation reserve <3 mm[24] - Leaflet-to-anulus index <1.2[25] - Flail width >15 mm - Flail gap >10 mm - Two jets from leaflet indentations	- Commissural lesion with multiple jets - Annular calcification with leaflet involvement - Fibrotic leaflets - Wide jet involving the whole coaptation - MVA 3.0-3.5 cm^2 - Posterior leaflet length 5-7 mm - Barlow's disease - Cleft - Failed surgical annuloplasty	- Concentric MAC with stenosis - MVA <3.0 cm^2 - Relevant mitral valve stenosis (mean gradient >5 mmHg) - Posterior leaflet <5 mm - Calcification in the grasping zone - Deep regurgitant cleft - Leaflet perforation - Multiple/wide jets - Rheumatic mitral stenosis

Hausleiter et al. EuroIntervention 2023;18:957-976

Morphologie Favorable

- **Central pathology in Segment 2** ***or segment 1 or 3***
- **MVOA > 4 cm²** ***or 3 cm² with good residual leaflet mobility***
- **<u>Mobile length</u> of posterior mitral leaflet > 10 mm** ***or between 7 and 10***
- **No leaflet calcification** ***or calcifications excluding the grasp zone***

IM primaire

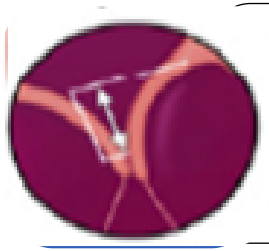


Flail gap < 10 mm

Flail Width < 15 mm

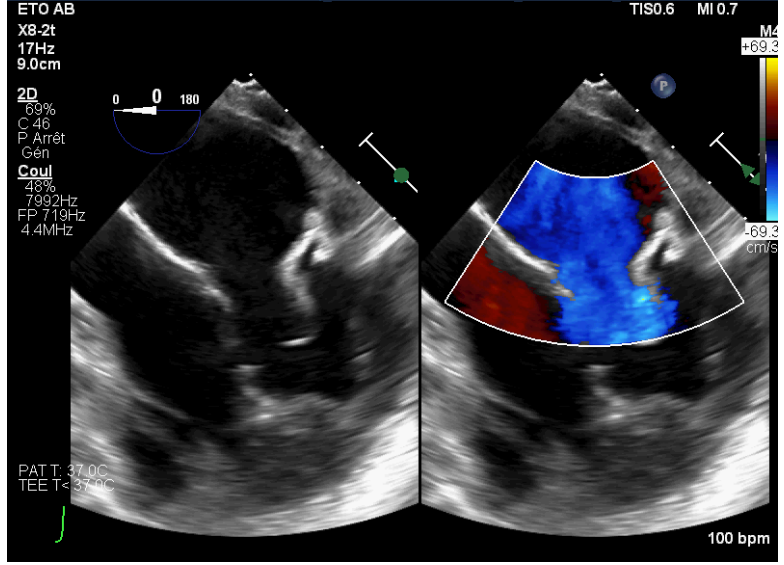
IM secondaire

Coaptation length ≥ 2mm



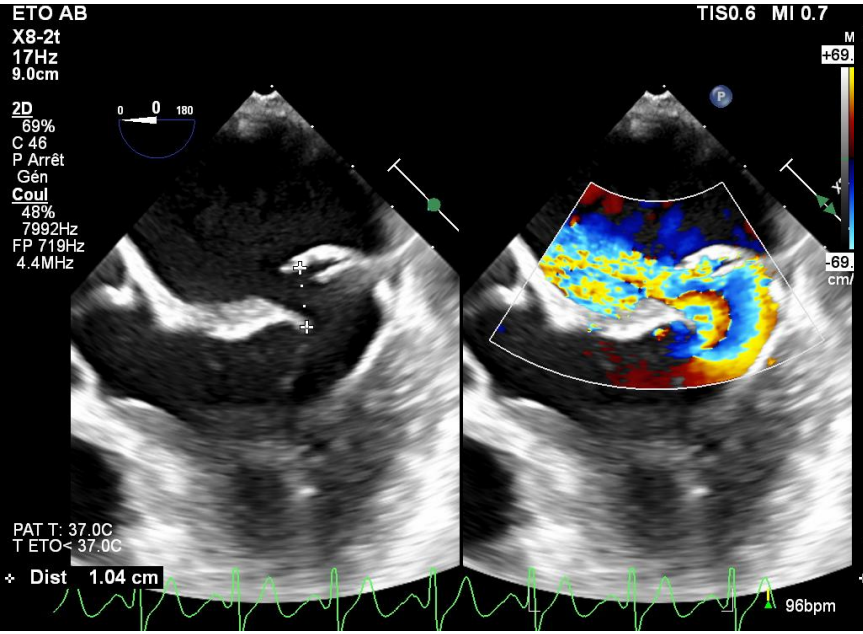
Coaptation Depth <11mm

Degenerative MR
FED

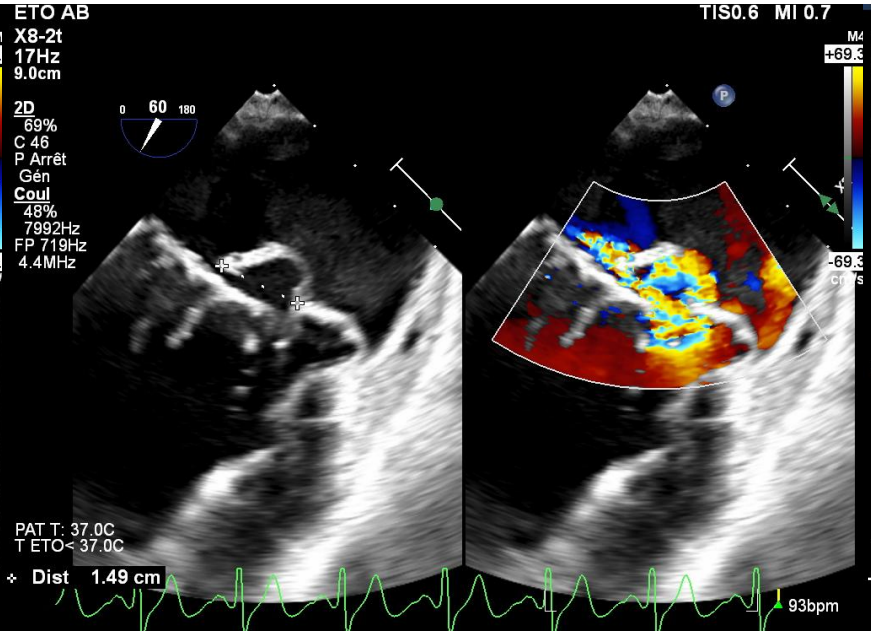


« Flail » P2
Type II due to CR

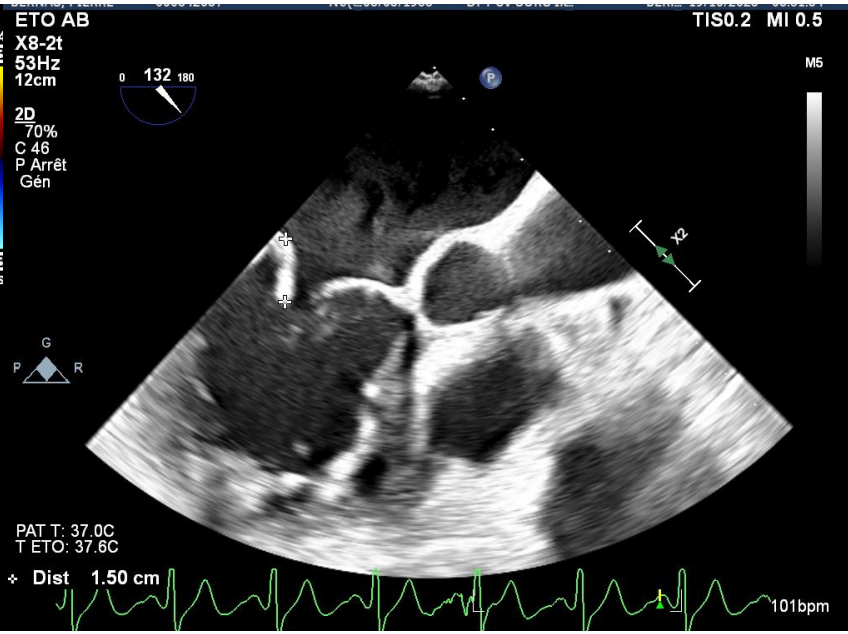
Gap



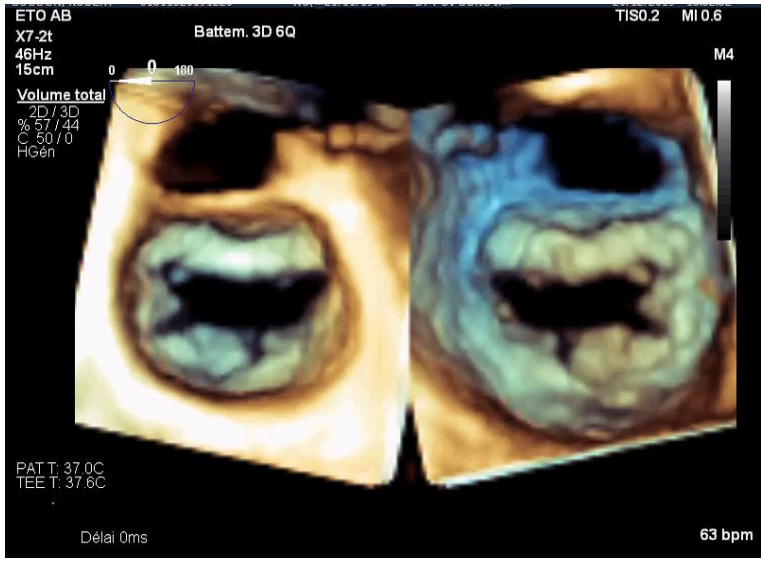
Width

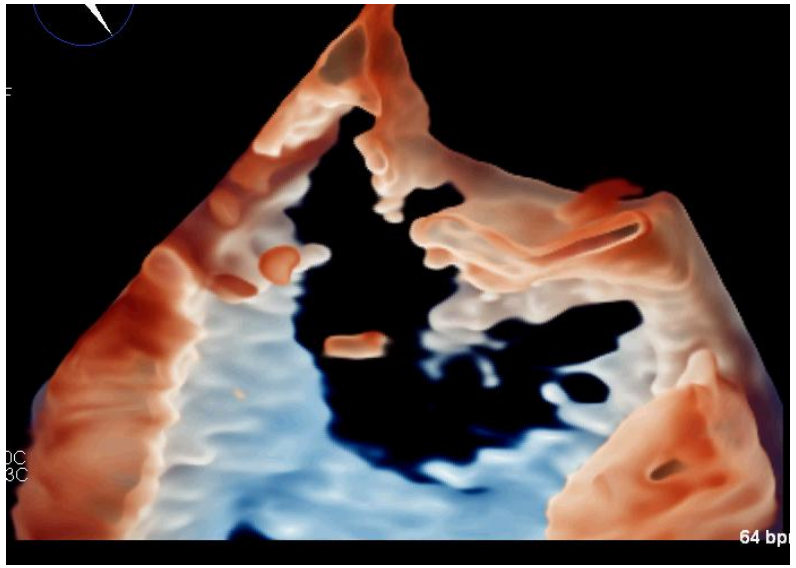


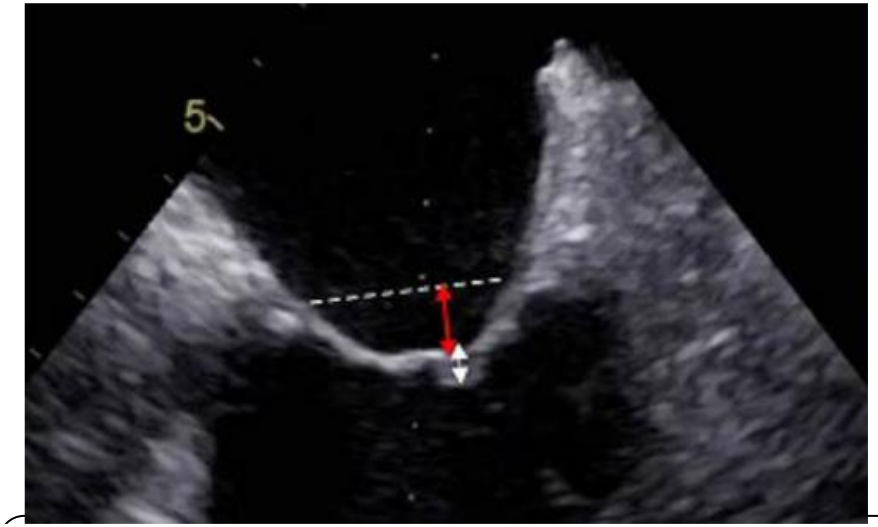
Post Length

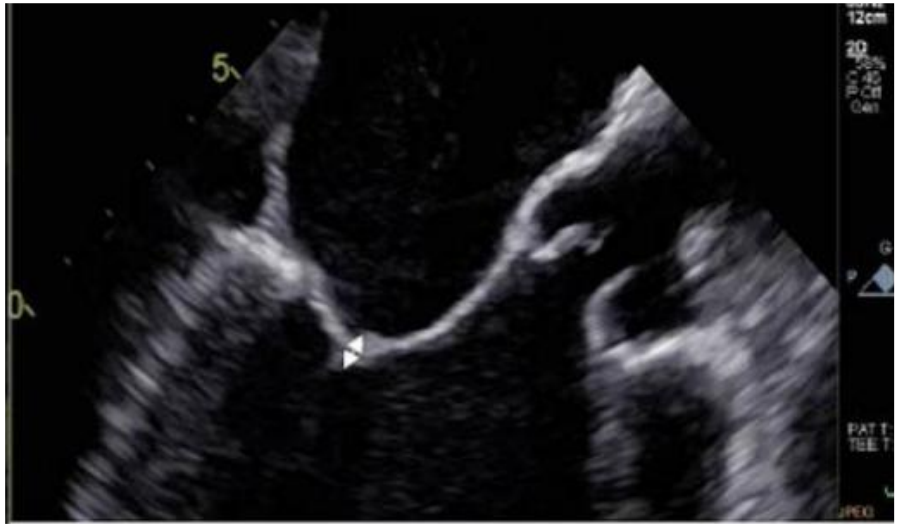


Functional



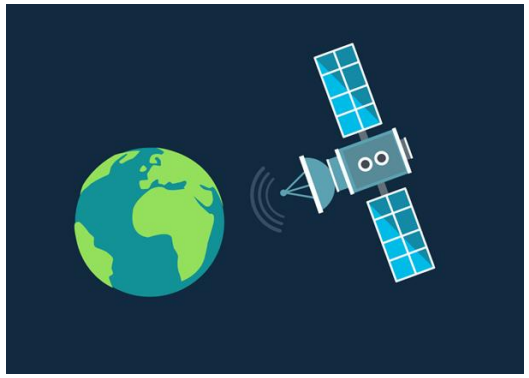


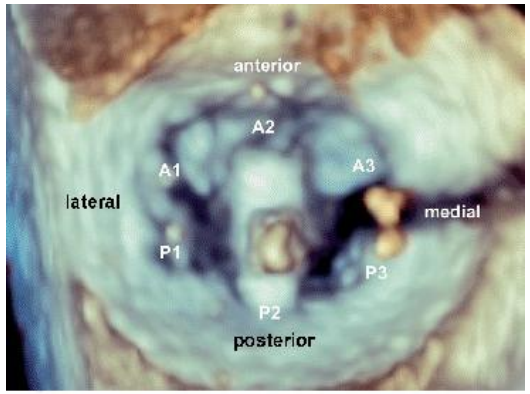


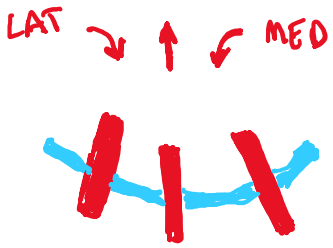


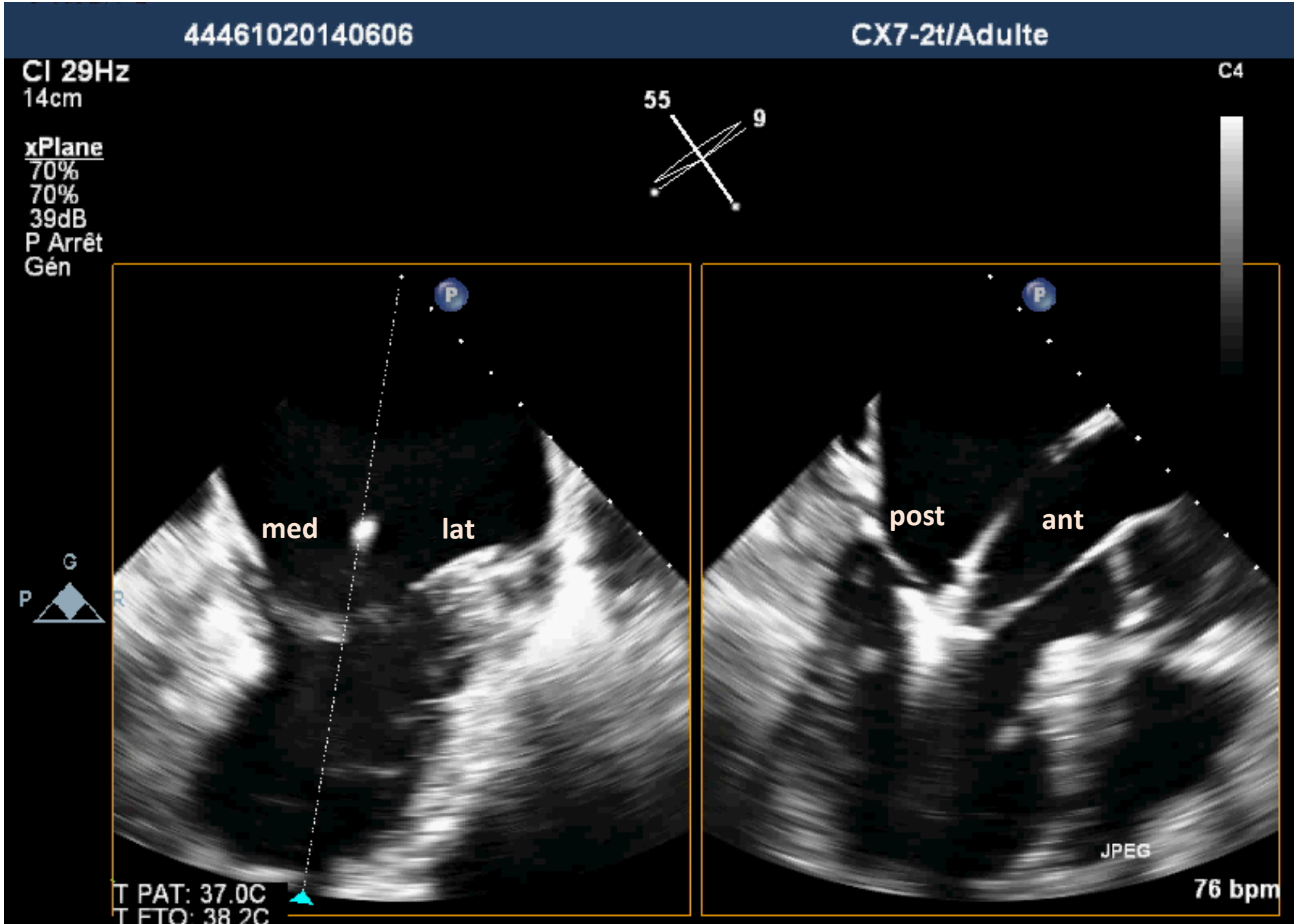
Coaptation Depth <11mm

Coaptation length ≥ 2mm



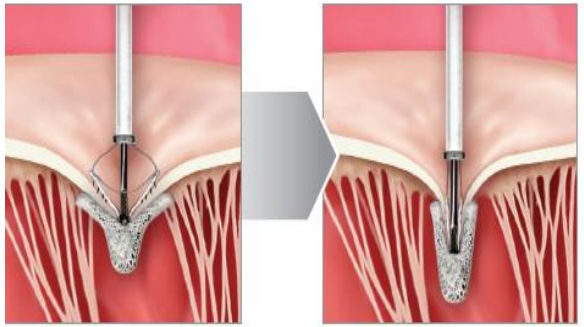

anterior
A2
A1
A3
lateral
medial
P1
P3
P2
posterior


LAT
MED


44461020140606
CX7-2t/Adulte
CI 29Hz
14cm
xPlane
70%
70%
39dB
P Arrêt
Gén
55
9
C4
med
lat
post
ant
G
P
JPEG
T PAT: 37.0C
76 bpm

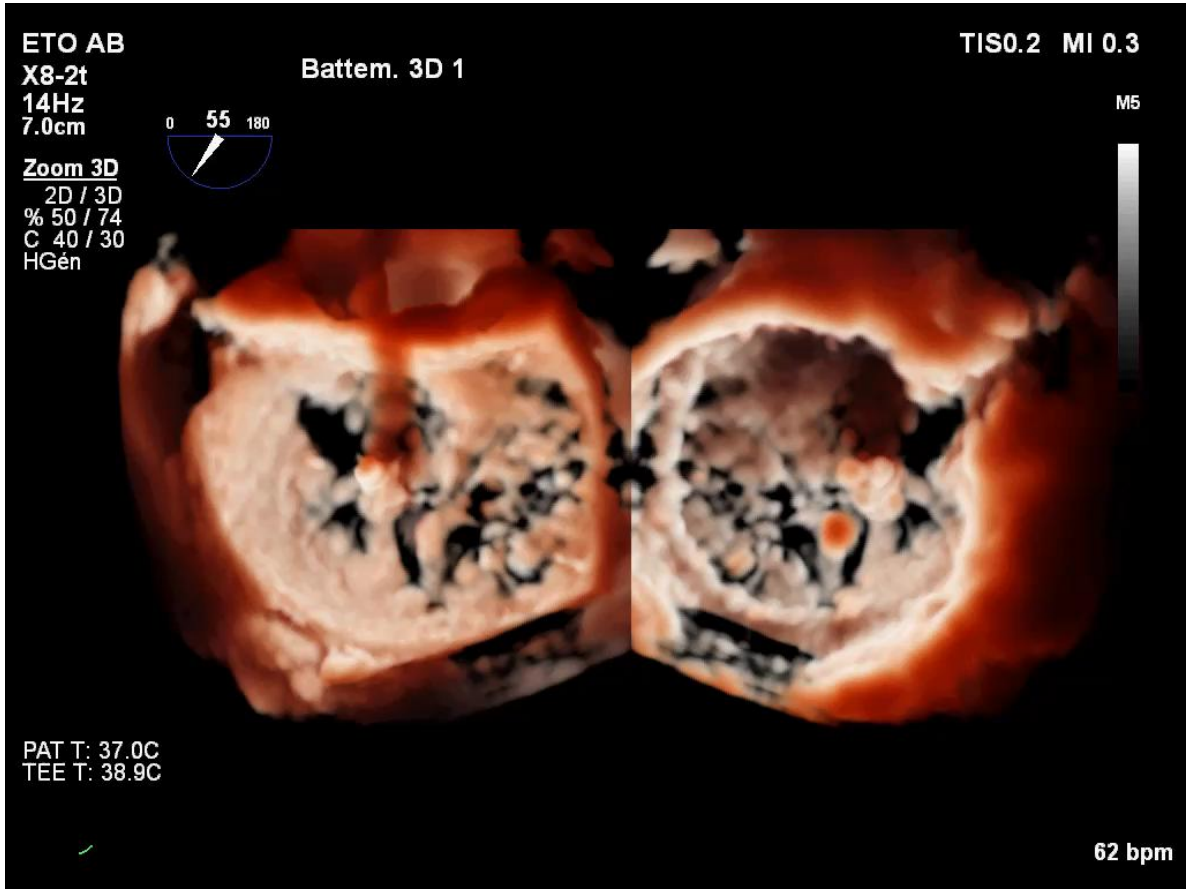
Clip positioning and orientation

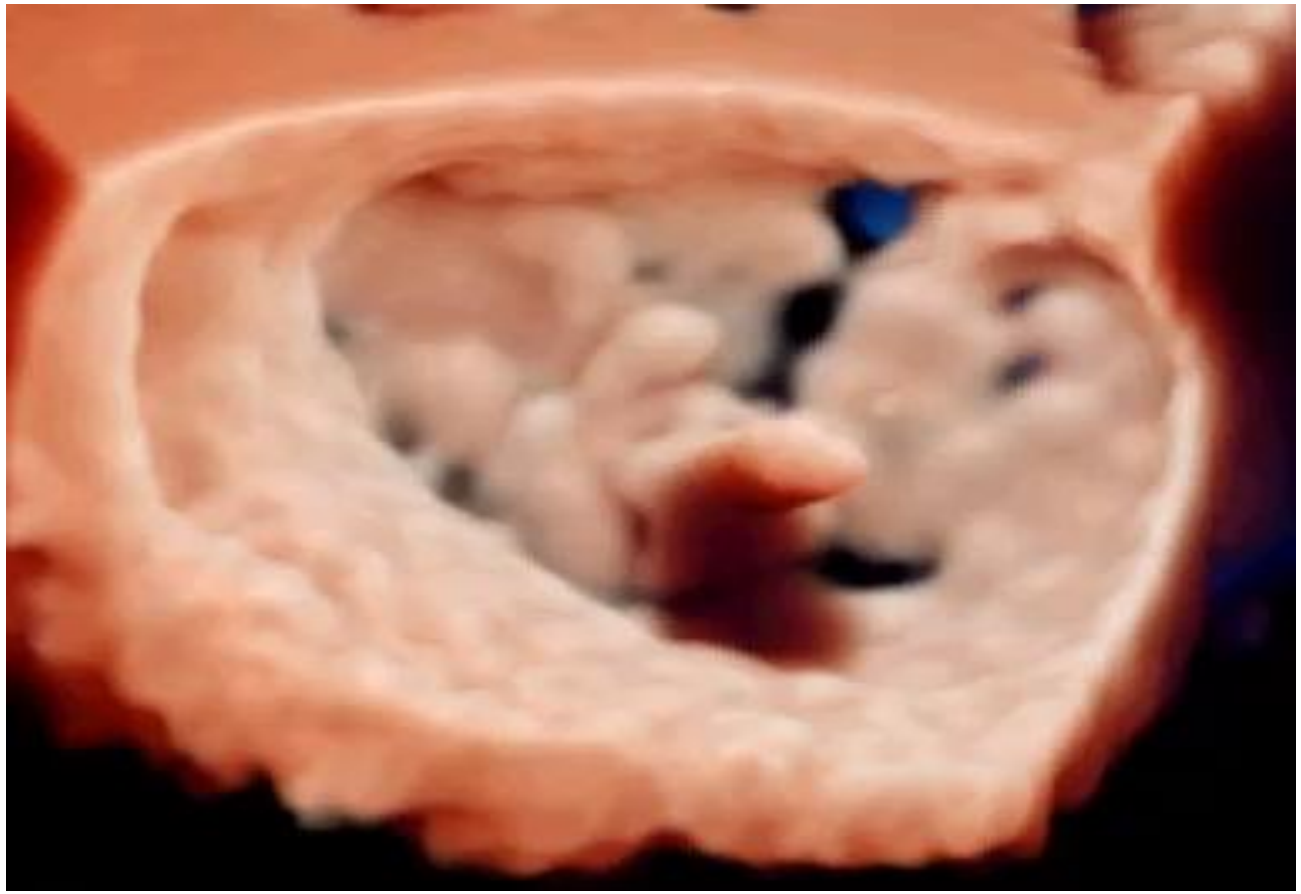
GRASPING DES FEUILLETS



EVALUATION:
IM RESIDUELLE - GRADIENT

Larguage du Clip





Repair!

Anatomical suitability for M-TEER

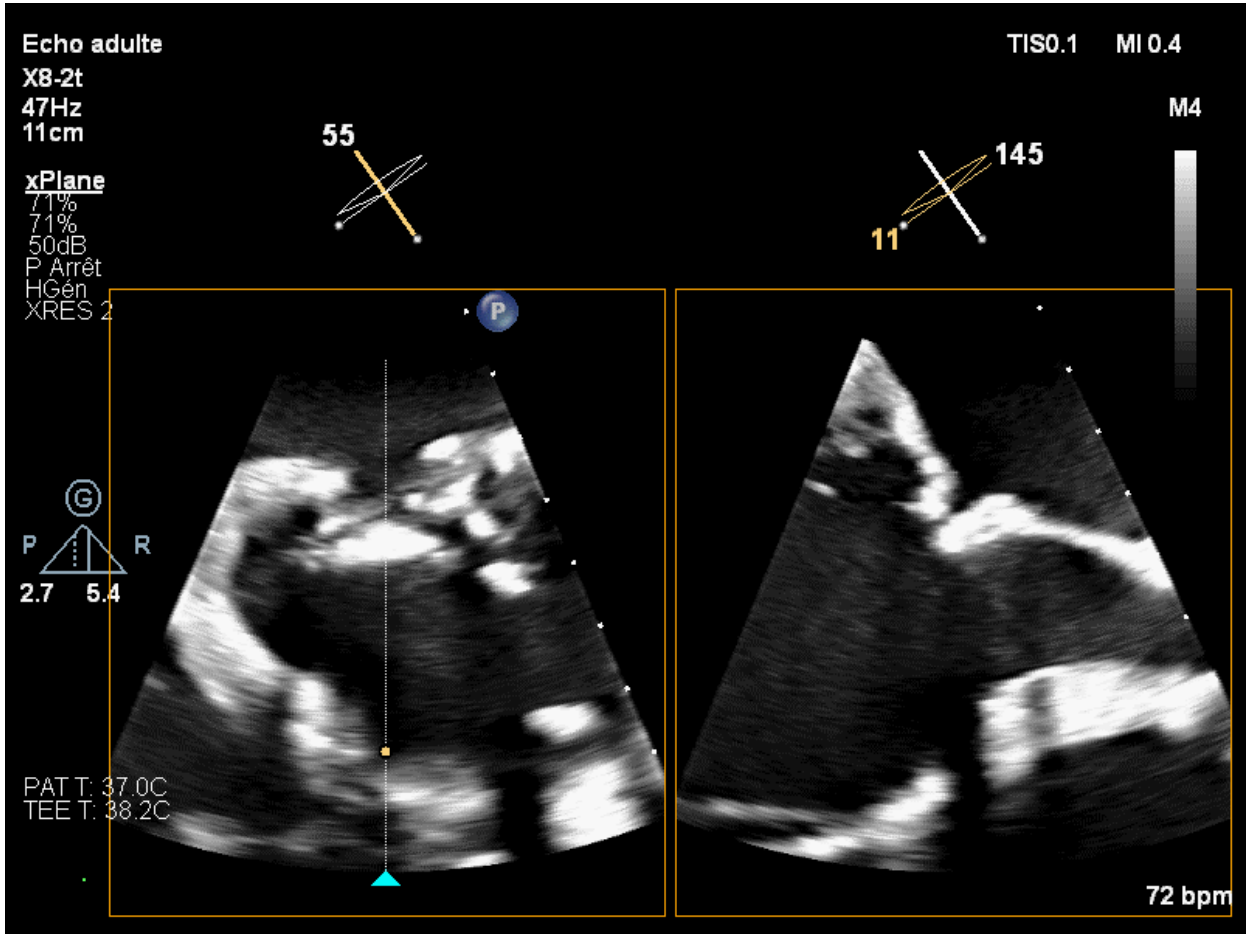
Centre experience

Replacement?

Non-complex Ideal for M-TEER	Complex Suitable for M-TEER	Very complex Challenging for M-TEER	Criteria favouring replacement M-TEER hard or impossible
- Central pathology - No calcification - MVA >4.0 cm^2 - Posterior leaflet >10 mm - Tenting height <10 mm - Flail gap <10 mm - Flail width <15 mm	- Isolated commissural lesion (A1/P1 or A3/P3) - Annular calcification without leaflet involvement - MVA 3.5-4.0 cm^2 - Posterior leaflet length 7-10 mm - Tenting height >10 mm - Asymmetric tethering[26] - Coaptation reserve <3 mm[24] - Leaflet-to-anulus index <1.2[25] - Flail width >15 mm - Flail gap >10 mm - Two jets from leaflet indentations	- Commissural lesion with multiple jets - Annular calcification with leaflet involvement - Fibrotic leaflets - Wide jet involving the whole coaptation - MVA 3.0-3.5 cm^2 - Posterior leaflet length 5-7 mm - Barlow's disease - Cleft - Failed surgical annuloplasty	- Concentric MAC with stenosis - MVA <3.0 cm^2 - Relevant mitral valve stenosis (mean gradient >5 mmHg) - Posterior leaflet <5 mm - Calcification in the grasping zone - Deep regurgitant cleft - Leaflet perforation - Multiple/wide jets - Rheumatic mitral stenosis

Hausleiter J and al. EuroIntervention 2023;18:957-976

Type IIIa + Calcifications bord libre



Long-Term Clinical and Hemodynamic Outcomes of Transcatheter Mitral Valve Replacement

Nicolas Groshenry, MD,[a,b] Gaspard Suc, MD, PhD,[a,b,c] Jules Mesnier, MD,[a,b,c] Clemence Delhomme, MD,[a,b,c] Audrey Cailliau, MD,[a,b,c] Eric Brochet, MD,[a,b,c] Gregory Ducrocq, MD, PhD,[a,b,c] Reza Farnoud, PhD,[a] Linda Bleuze, RN,[a] Dominique Himbert, MD,[a,b,c] Skerdi Haviari, MD,[b,d,e] Bernard Iung, MD, PhD,[a,b,c] Marina Urena, MD, PhD[a,b,c]

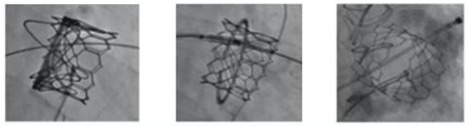
CENTRAL ILLUSTRATION: Long-Term Clinical and Hemodynamic Outcomes After TMVR

Transcatheter Mitral Valve Replacement (TMVR) Using Balloon-Expandable Aortic Prostheses, N = 200

Patient Population

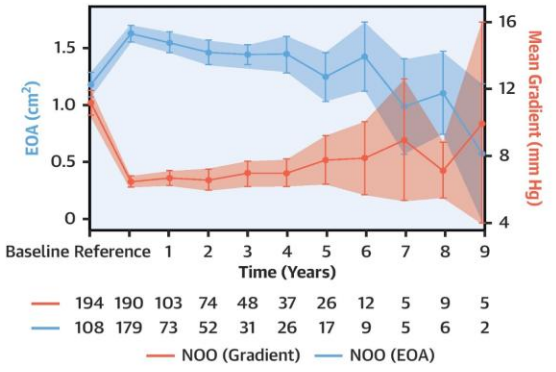
200 patients treated with TMVR using SAPIEN device

121 ViV | 45 ViR | 34 ViMAC

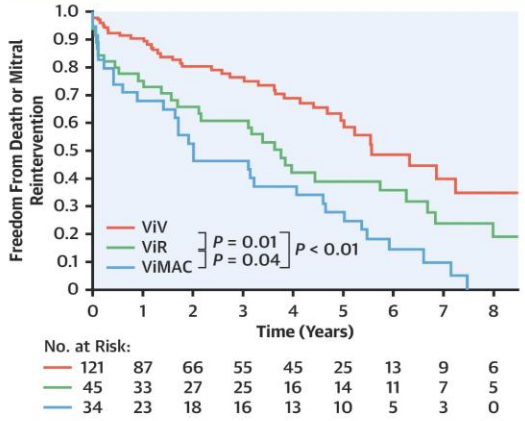


Median age: 70 years
Women: 67%
Median EuroScore II: 7.4%
Median follow up: 3.2 years

Hemodynamic Outcomes



Primary Outcome: All-Cause Mortality or Mitral Reintervention



- Freedom from death or mitral reintervention at 1, 5, and 8 year was 82%, 48%, and 20%, respectively.
- The occurrence of death or mitral reintervention was higher in the ViR and ViMAC groups compared to the ViV group ($P < 0.01$).
- A slight increase in mean gradient (+0.25 mm Hg/year, $P < 0.01$) and a modest but significant reduction in EOA (−0.04 cm²/year, $P < 0.01$) were observed during follow-up.
- TMVR using aortic prostheses results in favorable long-term clinical outcomes and demonstrates acceptable durability with low frequency of severe SVD (7%) and valve failure (10%) over extended follow-up.

Groshenry N, et al. JACC Cardiovasc Interv. 2026;19(2):239-251.

TMVR : 2 scenarios

TMVR and New ESC 2025 Guidelines

Recommendations in 2021 version	Class	Level	Recommendations in 2025 version	Class	Level
Management of biological heart valve failure (Continued)					
Transcatheter valve-in-valve implantation in the mitral and tricuspid position may be considered in selected patients at high risk for surgical reintervention.	IIb	B	Transcatheter transvenous mitral or tricuspid valve-in-valve implantation should be considered in patients with significant valve dysfunction at intermediate or high surgical risk, if anatomy is suitable.	IIa	B

Recommendations	Class	Level
Indications for mitral valve surgery and transcatheter intervention in clinically severe rheumatic and degenerative mitral stenosis		
TMVI may be considered in symptomatic patients with extensive MAC and severe MV dysfunction at experienced Heart Valve Centres with expertise in complex MV surgery and transcatheter interventions.	IIb	C

CCT Scan and TMVR

CENTRAL ILLUSTRATION: Key Elements of Computed Tomography Acquisition and Evaluation for Neo-LVOT Obstruction Risk During Transcatheter Mitral Valve Replacement

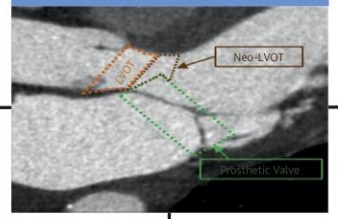
- Small ventricle
- Asymmetrical septal hypertrophy
- Perpendicular aorto-mitral angulation
- Elongated anterior leaflet
- Device related

Anatomic High-risk Consideration

- LVOT peak gradient >10 mm Hg from baseline echocardiography
- Peak gradient >30 mm Hg. Hemodynamically significant >50 mm Hg
- LVOT Area <1.7-1.9 cm^2

Hemodynamic Definition of LVOT Obstruction

Anatomic definition of Neo-LVOT



Anatomic Segmentation of Neo-LVOT

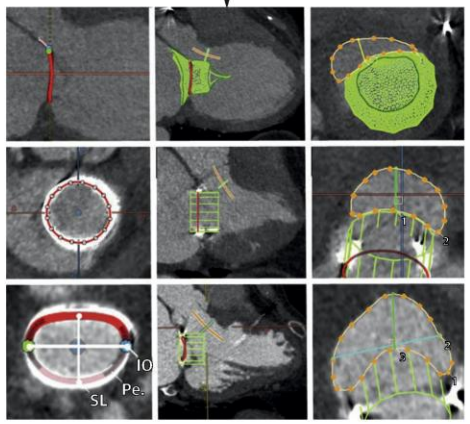
CT Acquisition

- Full Cardiac Cycle
- Data Set Reconstruction of 5%-10% Interval
- Mid to End Systole Phase Reconstruction

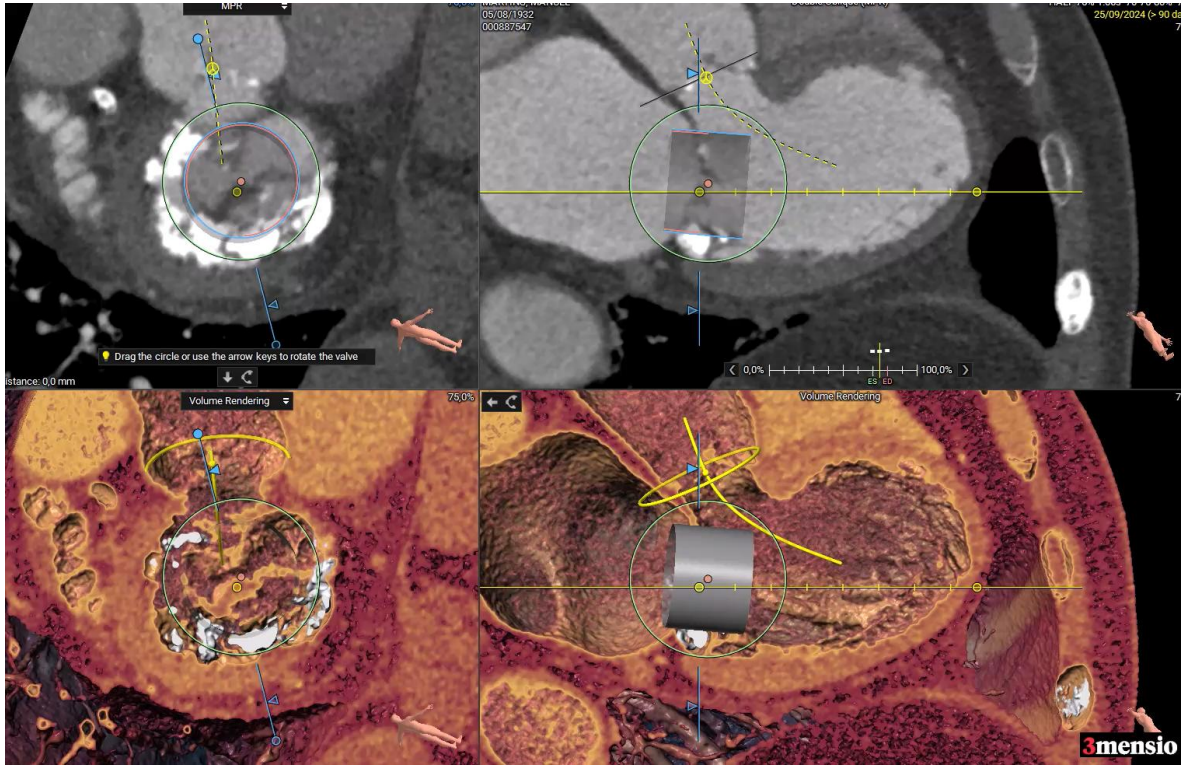
Native

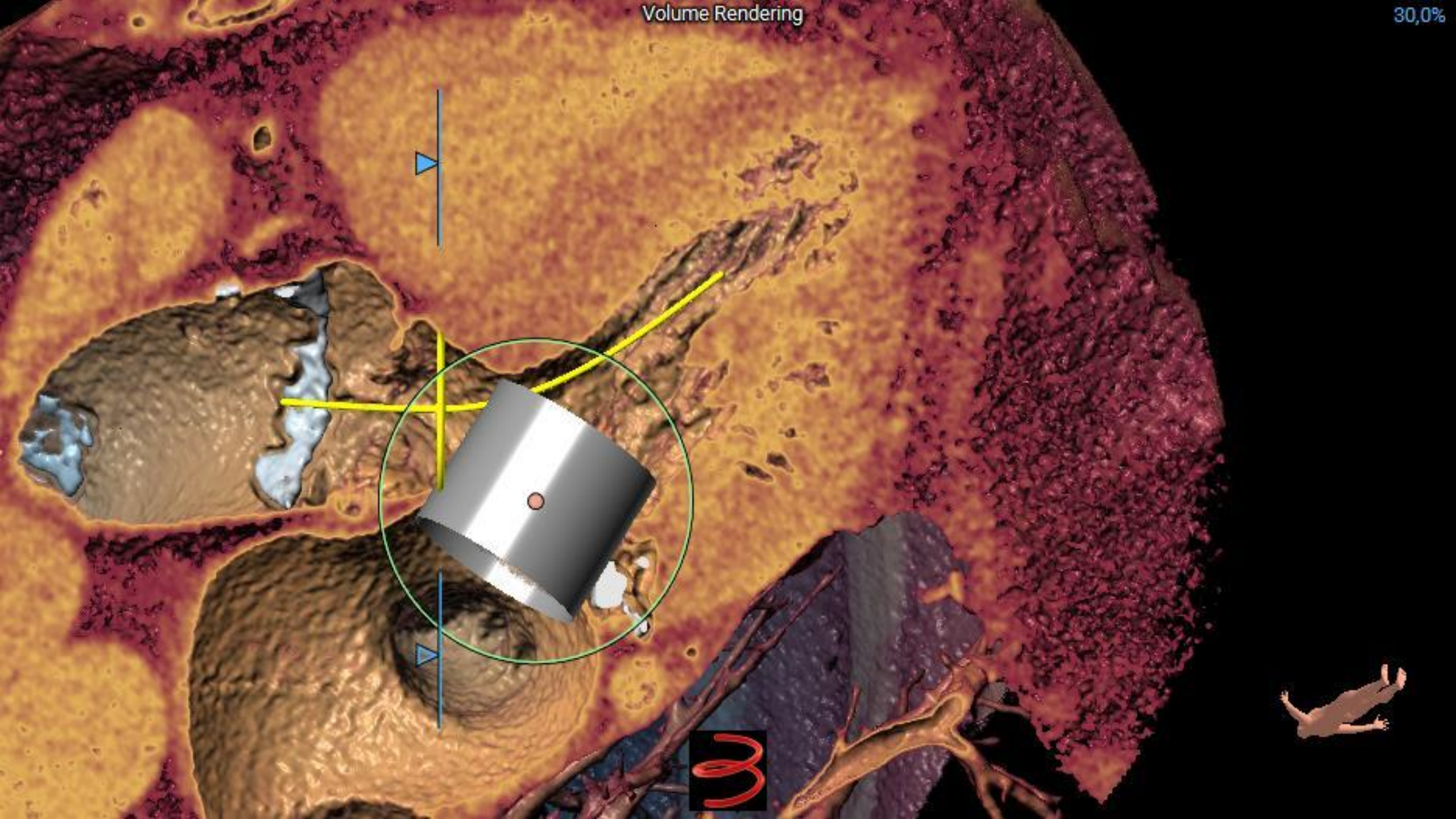
Bioprosthetic

Ring



Reid, A. et al. J Am Coll Cardiol Img. 2021;14(4):854-66.




Volume Rendering
30,0%

Case presentation

- **Demographics**
  - Woman
  - 63 years old

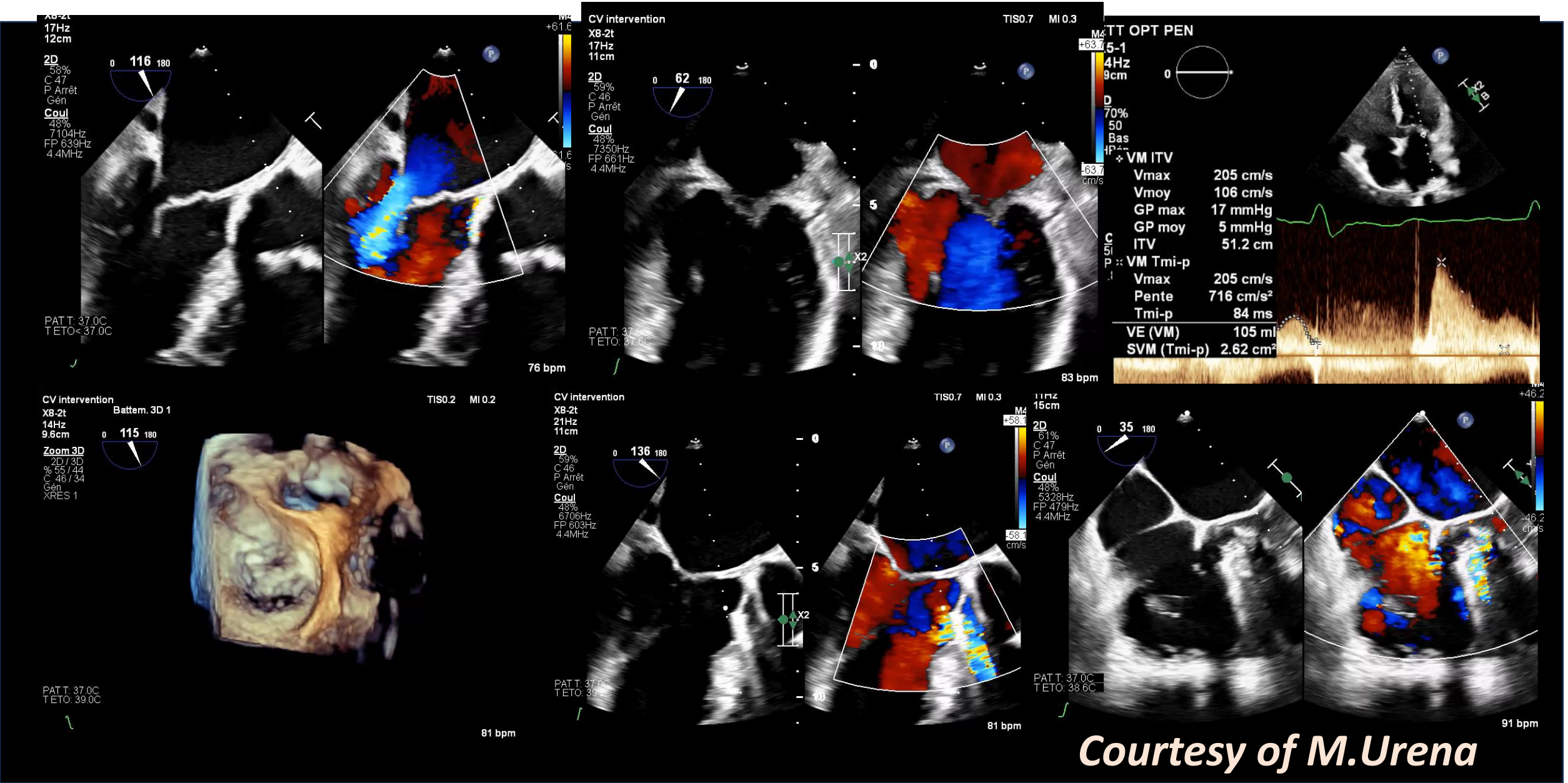
- **Clinical history**
  - Rheumatic valve disease requiring surgery in 1979, 1989 et 2000 (mechanical aortic valve replacement)
  - Major bleeding requiring transfusion
  - Paroxysmal atrial fibrillation
  - Severe tricuspid regurgitation

- **Clinical presentation**
  - Severe congestive heart failure (NYHA III)

EUROSCORE II: 25%

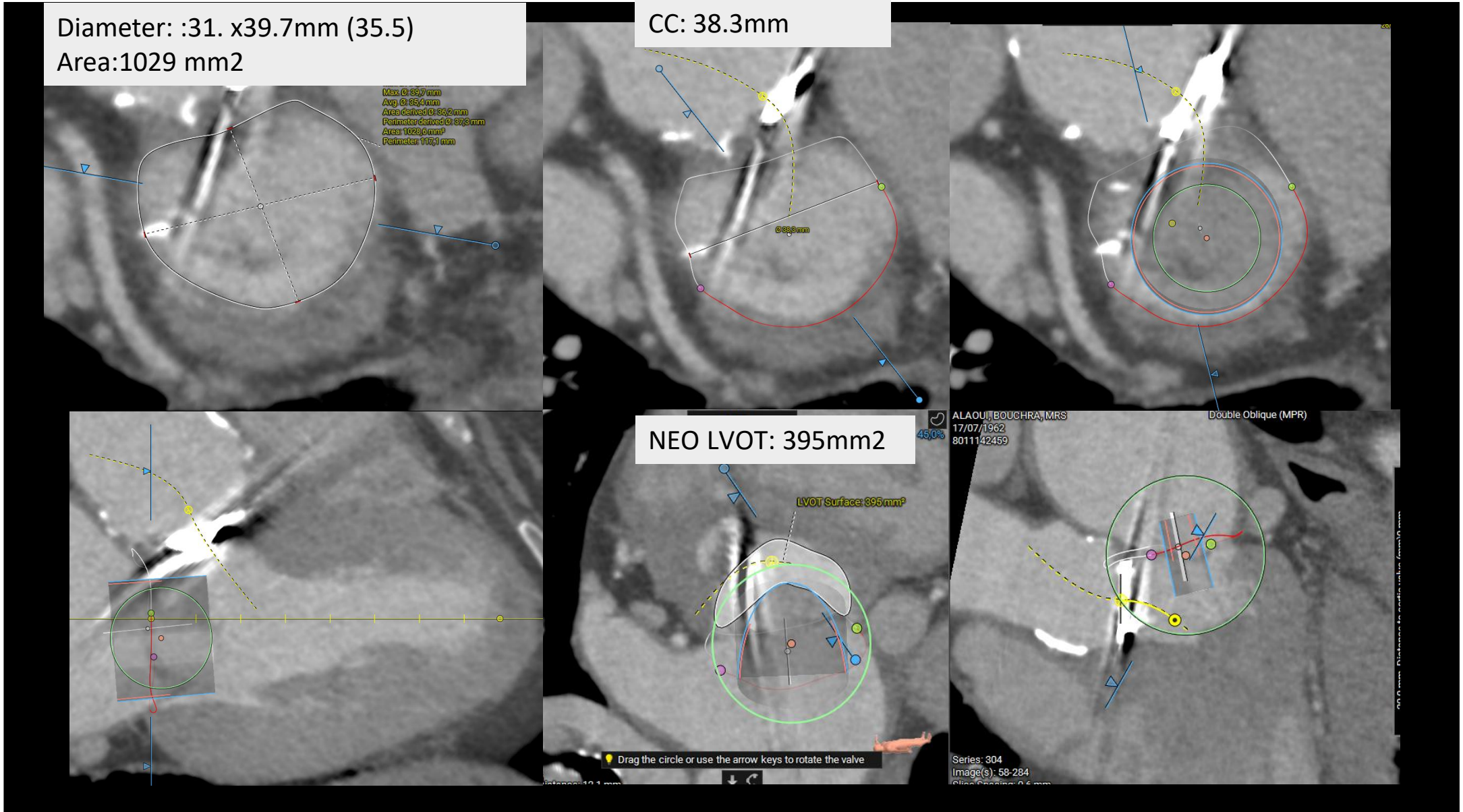
Courtesy of M.Urena

Echo assessment



Courtesy of M.Urena

CT analysis- *Mitral valve*



HEART TEAM DISCUSSION

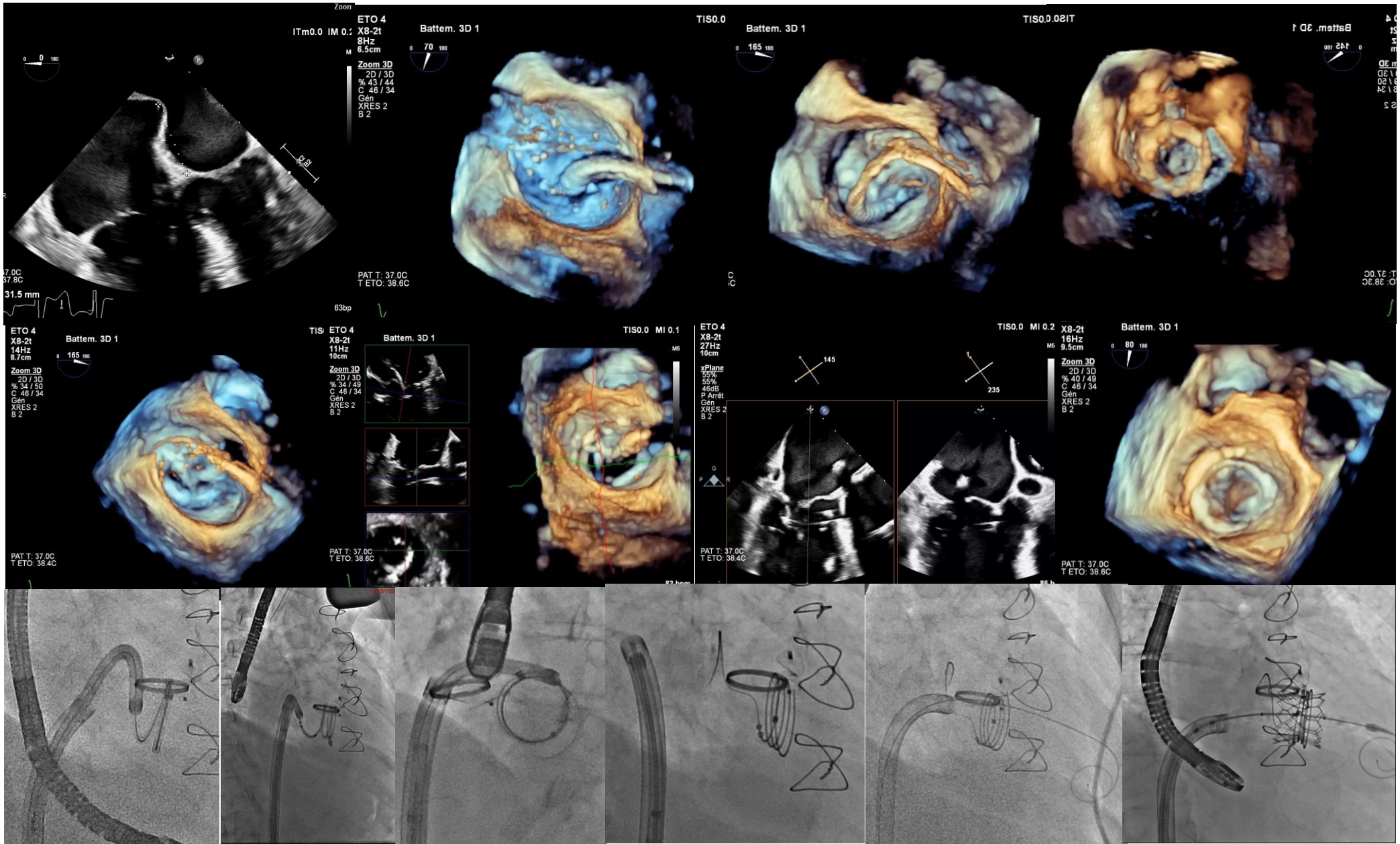
Woman of 63 years with multiple valve disease (severe MR, severe TR, aortic paravalvular leak)

- **Very high surgical risk**
- **Patient refused surgery**

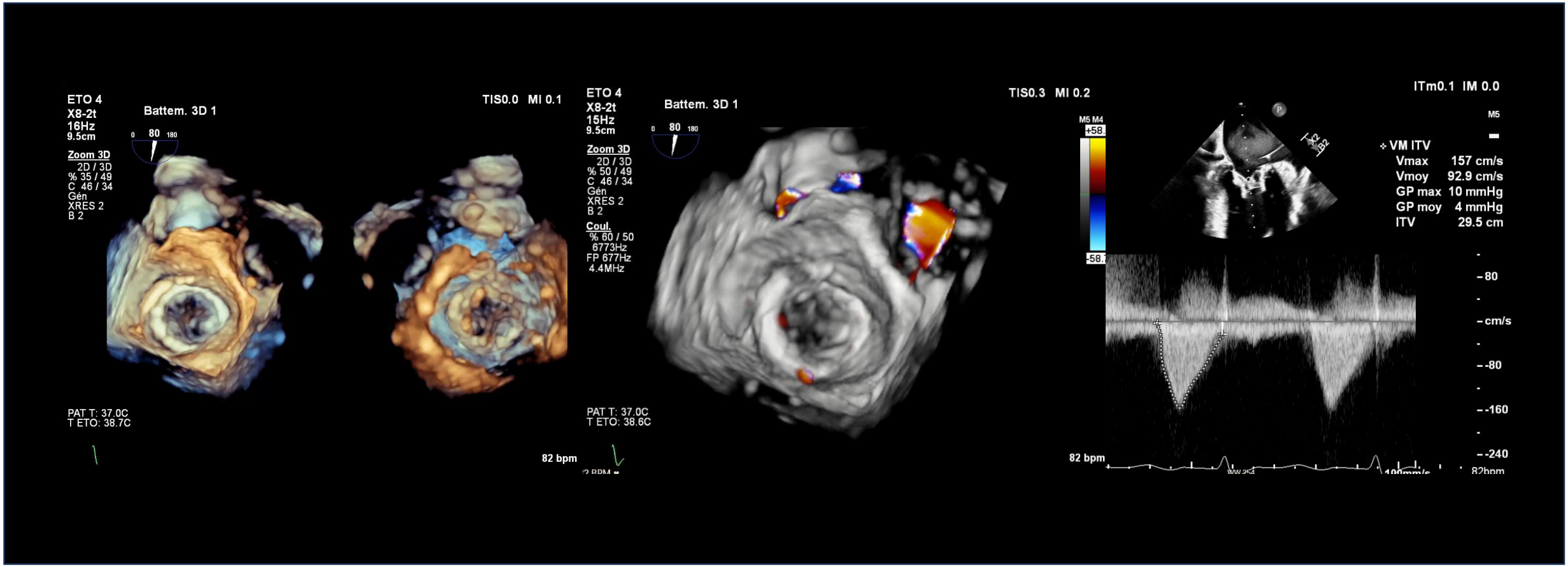
- **Fully percutaneous therapy**
  - **Paravalvular leak closure**
  - **SAPIEN M3 valve**
  - **Tricuspid valve repair**

Courtesy of M.Urena

SAPIEN 3 SYSTEM



SAPIEN M3 valve- *Result*



Courtesy of M.Urena

Evolution

- Uneventful hospitalisation period
- Discharge at day 3 (antivitamin k)

At 1 month

- **NYHA class 2**
- **No complications**

- Mean gradient: 7 mmHg
- Non paravalvular leak
- Absence of LVOT obstruction
- Mild to Moderate tricuspid regurgitation
- Non paravalvular leak

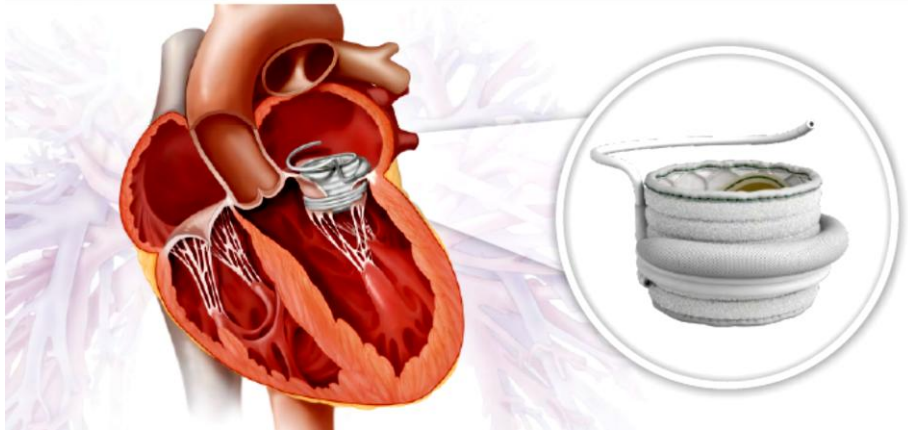
Courtesy of M.Urena

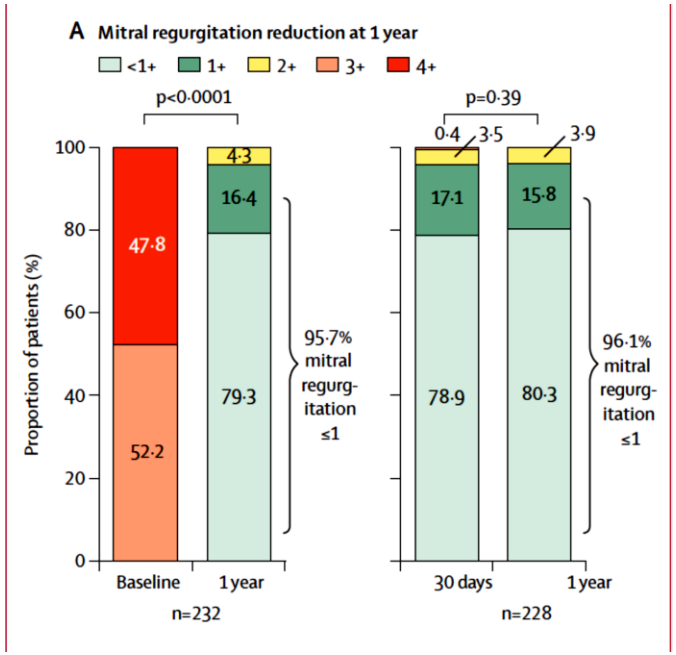
A team effort

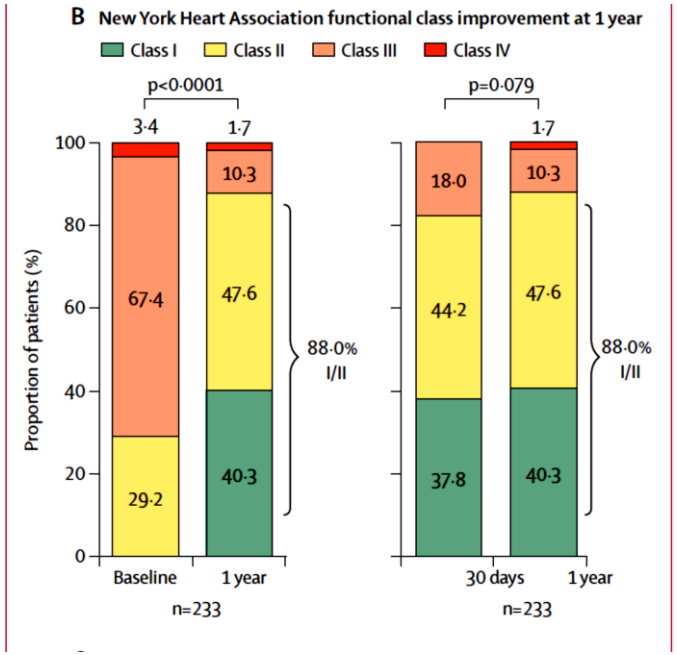
Courtesy of M.Urena

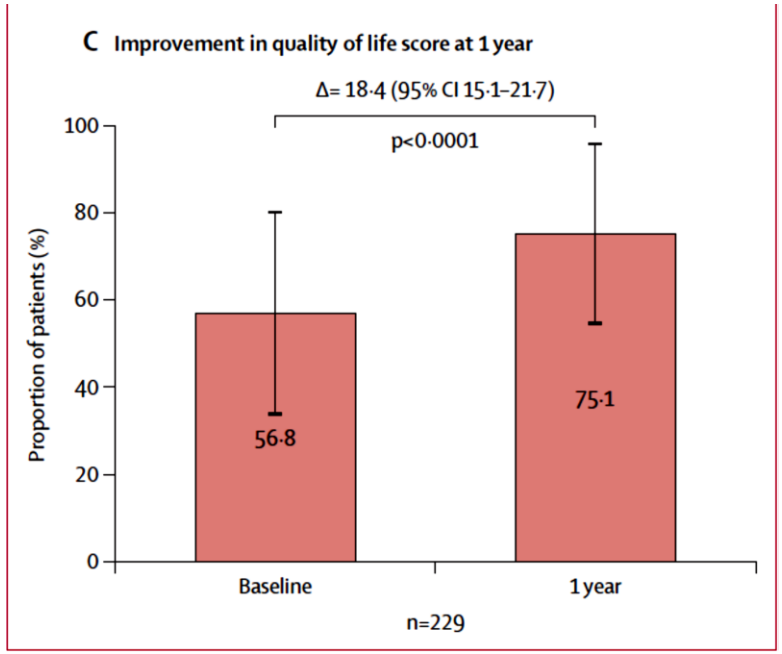
Percutaneous transcatheter valve replacement in individuals with mitral regurgitation unsuitable for surgery or transcatheter edge-to-edge repair: a prospective, multicountry, single-arm trial

Mayra E Guerrero, David V Daniels*, Raj R Makkar, Vinod H Thourani, Federico M Asch, Michael Pham, Kamran I Muhammad, Adam B Greenbaum, Alejandro Vasquez, J Bradley Oldemeyer, Thom G Dahle, Charanjit Rihal, M Andrew Morse, Evelio Rodriguez, Brian P O'Neill, Mark Russo, Brian Whisenant, Pradeep Yadav, Xiao Yu, Dee Dee Wang, Moody Makar, David A Baran, Paul Mahoney, Gautam Reddy, Philipp Blanke, John Webb, on behalf of the ENCIRCLE Trial Executive Committee and Study Investigators†*





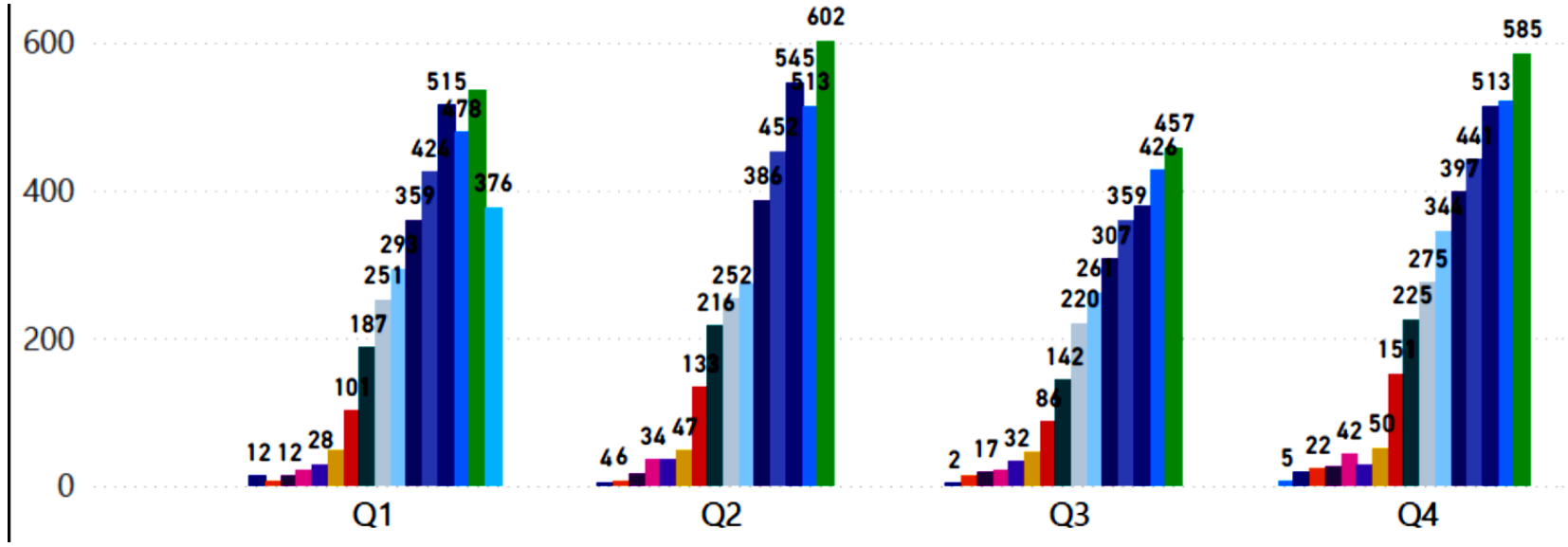




Lancet 2025;406(10519):2541-2550. doi: 10.1016/S0140-6736(25)02073-2

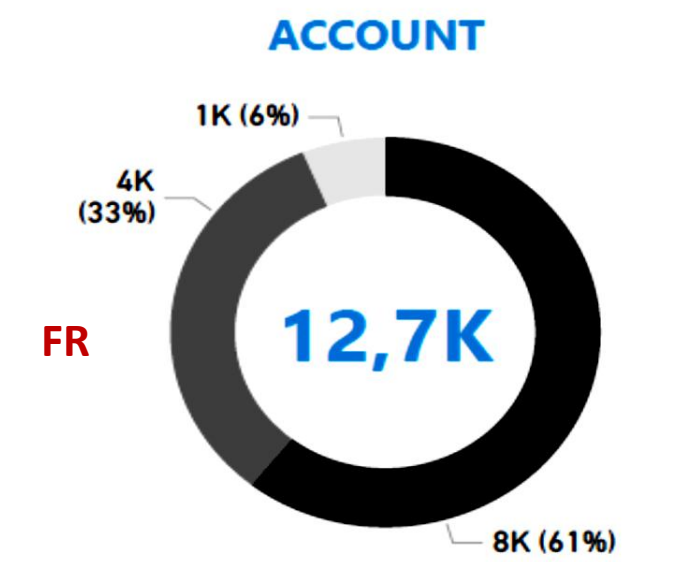
Mitra-Clip à l'APHP

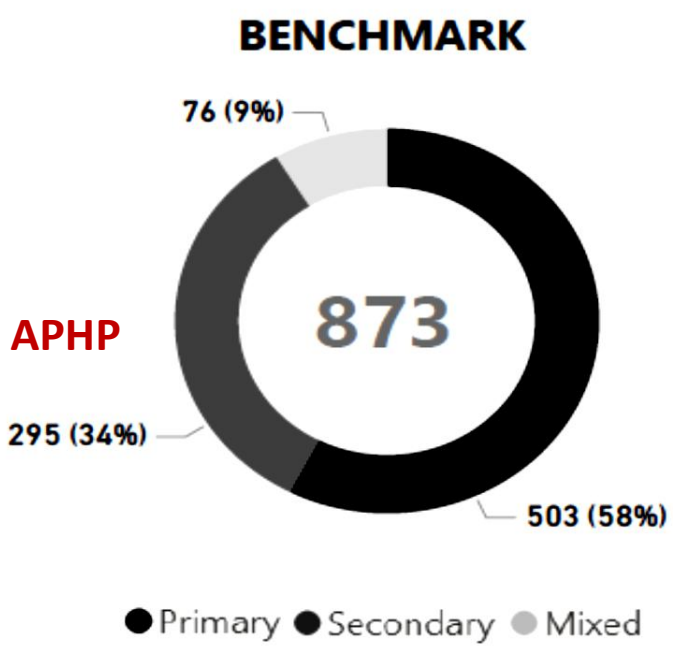
Bichat
HEGP
Henri-Mondor
Pitié-Salpétrière

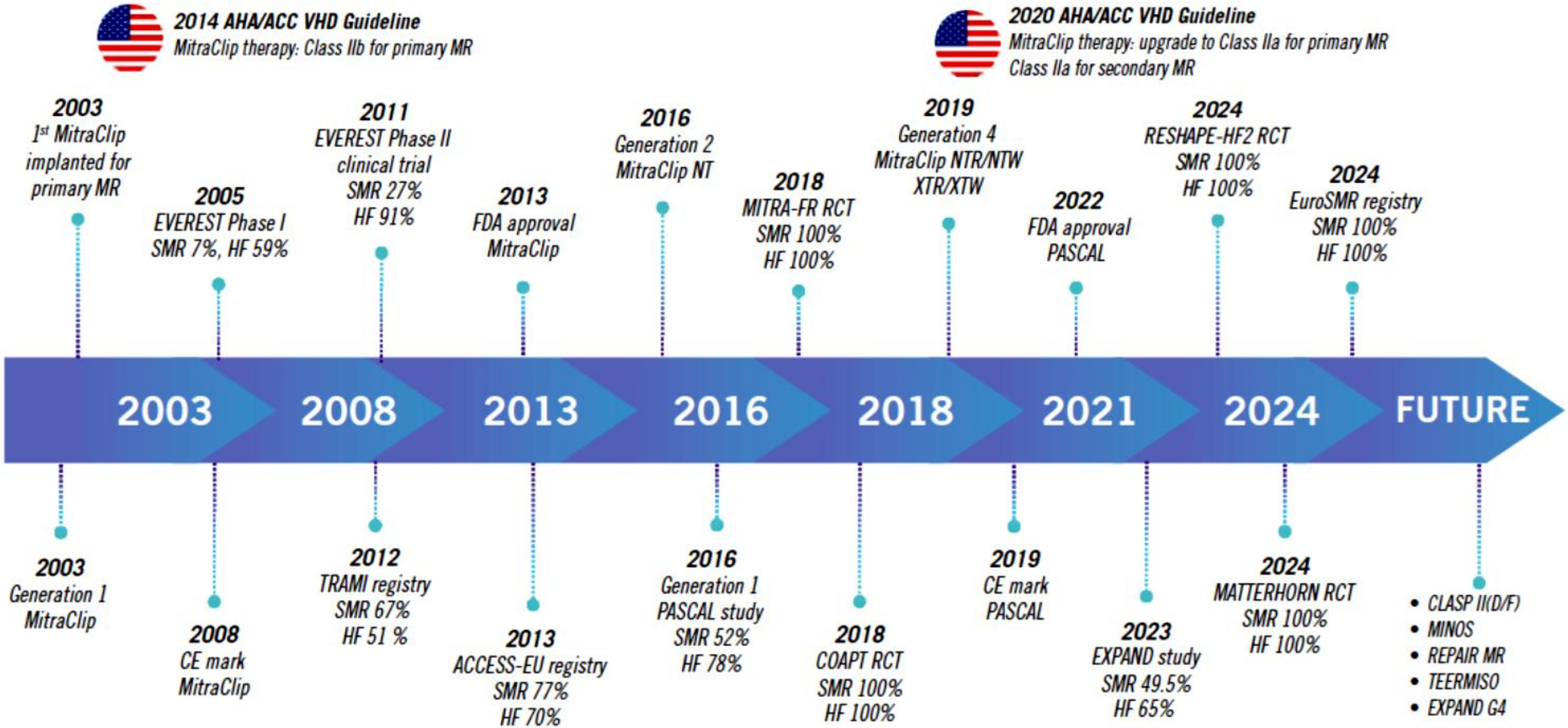


01/01/2008 - 28/02/2026

Procedures by Etiology*



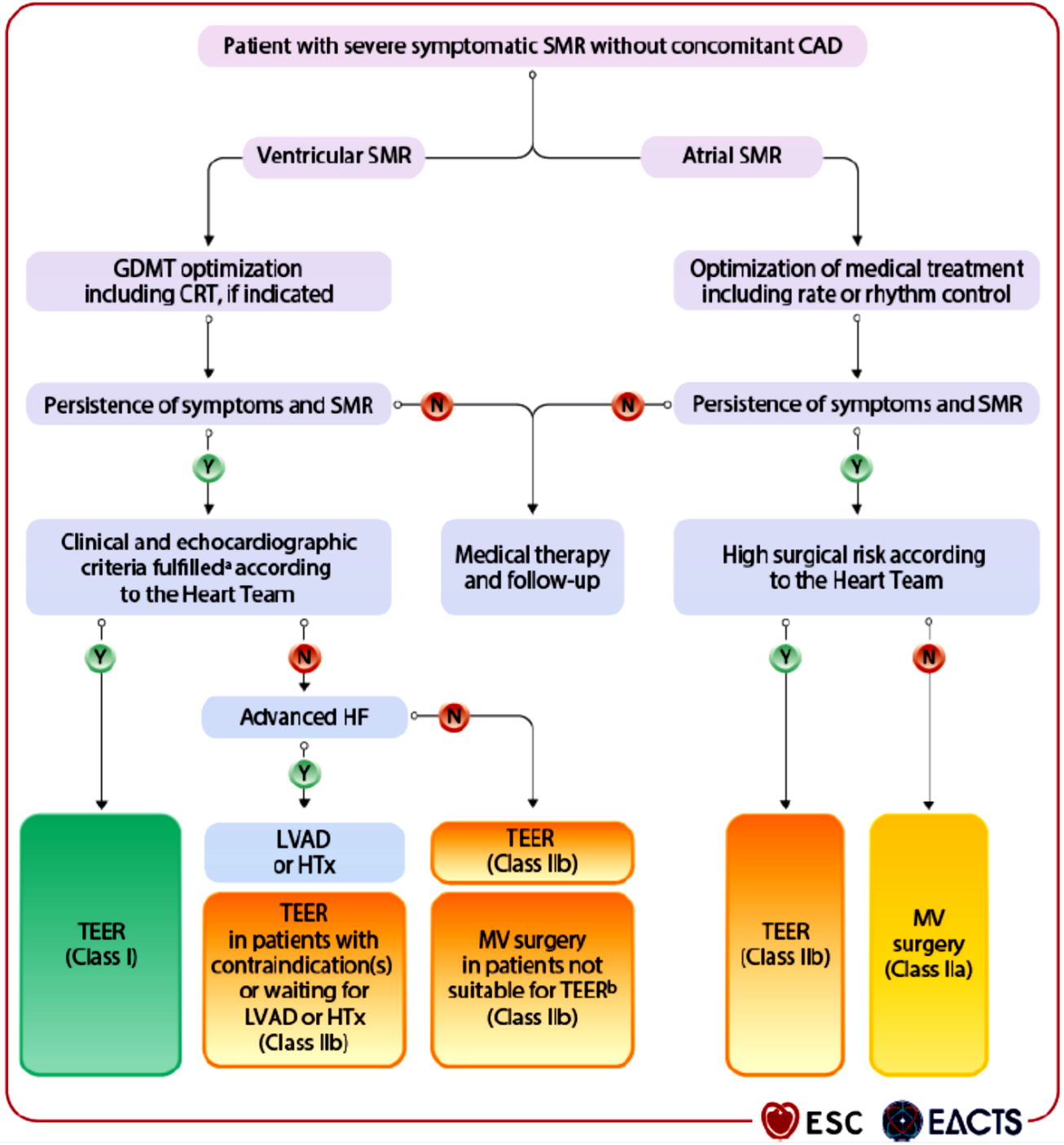



2014 AHA/ACC VHD Guideline
MitraClip therapy: Class IIb for primary MR
2020 AHA/ACC VHD Guideline
MitraClip therapy: upgrade to Class IIa for primary MR
Class IIa for secondary MR
2003
1st MitraClip implanted for primary MR
2005
EVEREST Phase I
SMR 7%, HF 59%
2011
EVEREST Phase II clinical trial
SMR 27%
HF 91%
2013
FDA approval
MitraClip
2016
Generation 2
MitraClip NT
2018
MITRA-FR RCT
SMR 100%
HF 100%
2019
Generation 4
MitraClip NTR/NTW
XTR/XTW
2022
FDA approval
PASCAL
2024
RESHAPE-HF2 RCT
SMR 100%
HF 100%
2024
EuroSMR registry
SMR 100%
HF 100%
2003
2008
2013
2016
2018
2021
2024
FUTURE
2003
Generation 1
MitraClip
2008
CE mark
MitraClip
2012
TRAMI registry
SMR 67%
HF 51 %
2013
ACCESS-EU registry
SMR 77%
HF 70%
2016
Generation 1
PASCAL study
SMR 52%
HF 78%
2018
COAPT RCT
SMR 100%
HF 100%
2019
CE mark
PASCAL
2023
EXPAND study
SMR 49.5%
HF 65%
2024
MATTERHORN RCT
SMR 100%
HF 100%
CLASP II(D/F)
MINOS
REPAIR MR
TEERMISO
EXPAND G4
2012 ESC VHD Guidelines
MitraClip therapy: Class IIb for primary MR
2021 ESC VHD Guidelines
MitraClip therapy: Class IIb for primary MR
Class IIa and IIb for select secondary MR
2025 ESC VHD Guidelines
MitraClip therapy – upgrade
Class IIa for primary MR
Class I for secondary MR

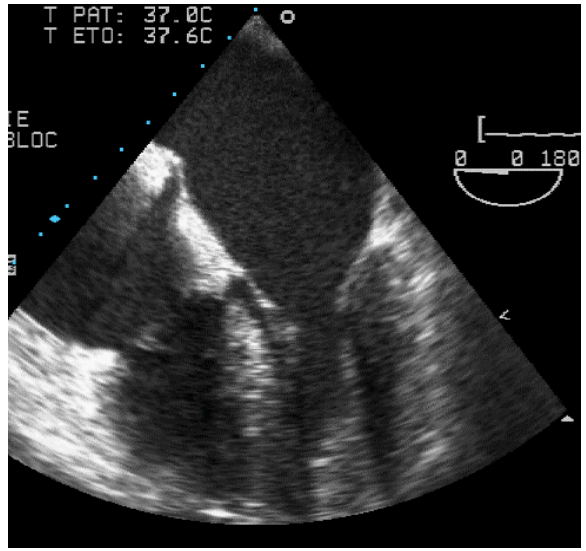
Interventional Echographist Education and Transmission to the Young Generation

Secondary MR

Ventricular



Atrial



Recommendations on indications for intervention in severe *ventricular* secondary mitral regurgitation (SMR) without coronary artery disease

Recommendations	Class	Level
TEER is recommended to reduce HF hospitalizations and improve quality of life in haemodynamically stable, symptomatic patients with impaired LVEF (<50%) and persistent severe ventricular SMR, despite optimized GDMT and CRT (if indicated), fulfilling specific clinical and echocardiographic criteria. REV.	I	A

Recommendations on indications for intervention in severe *atrial* secondary mitral regurgitation (SMR)

Recommendations	Class	Level
MV surgery, surgical AF ablation, if indicated, and LAAO should be considered in symptomatic patients with severe atrial SMR under optimal medical therapy. NEW	IIa	B
TEER may be considered in symptomatic patients with severe atrial SMR not eligible for surgery after optimization of medical therapy including rhythm control, when appropriate. NEW	IIb	B

Quelles Interventions en 2025 ?

HAS
HAUTE AUTORITÉ DE SANTÉ

COMMISSION NATIONALE D'EVALUATION DES DISPOSITIFS MEDICAUX ET DES TECHNOLOGIES DE SANTE

AVIS DE LA CNEDiMTS
19 novembre 2019

Faisant suite à l'examen du 08/10/2019, la CNEDiMTS a adopté un projet d'avis le 22/10/2019.
Ce projet d'avis a fait l'objet d'une phase contradictoire le 19 novembre 2019. La CNEDiMTS a adopté l'avis le 19 novembre 2019.

Indications retenues :

Patients avec une insuffisance mitrale secondaire de grade 3+/4+ symptomatique malgré une prise en charge médicale optimale et remplissant les critères suivants :

- non éligibles à la chirurgie de réparation ou de remplacement valvulaire,
- ayant eu une hospitalisation pour insuffisance cardiaque dans les 12 mois précédant l'intervention,
- ayant une fraction d'éjection ventriculaire gauche comprise entre 20 et 50%,
- et une surface de l'orifice régurgitant > 0,3 cm² et un volume télédiastolique indexé du ventricule gauche ≤ 96 mL/m².

Les patients ayant un ventricule gauche fortement dilaté (défini par un volume télédiastolique indexé du ventricule gauche > 96 mL/m²) et une insuffisance mitrale modérée ou moindre, démontré par un orifice régurgitant de la valve mitrale ≤ 0,3 cm², ne sont pas éligibles à la technique (non indication).

Les critères cliniques et échocardiographiques doivent être validés par une équipe multidisciplinaire *ad hoc*.

Les patients ayant une espérance de vie inférieure à 1 an compte tenu de comorbidités extracardiaques ne sont pas éligibles à la technique (non indication).