Università degli Studi di Palermo
Facoltà di Medicina e Chirurgia
Scuola di Specializzazione in
Malattie dell'Apparato Cardiovascolare
Direttore: Prof. Salvatore Novo

Management delle Valvulopatie

A. Minacapelli
C. Vicari

Tutor: Prof.ssa G. Novo

«Owing to the lack of evidence-based data in the field of VHD, most reccomendations are largely the result of exper ,deviations from the te in certain

Questions
• How severe is VHD?
• What is the aetiology of VHD?
• Does the patient have symptoms?
• Are symptoms related to valvular disease?
• Are any signs present in asymptomatic patients that indicate a worse outcome if the intervention is delayed?
• What are the patient's life expectancy[a] and expected quality of life?
• Do the expected benefits of intervention (versus spontaneous outcome) outweigh its risks?
• What is the optimal treatment modality? Surgical valve replacement (mechanical or biological), surgical valve repair, or catheter intervention?
• Are local resources (local experience and outcome data for a given intervention) optimal for the planned intervention?
• What are the patient's wishes?

STATE-OF-THE-ART PAPER

The Heart Team of Cardiovascular Care

David R. Holmes, Jr, MD,* Jeffrey B. Rich, MD,† William A. Zoghbi, MD,‡ Michael J. Mack, MD,§

Rochester, Minnesota; Norfolk, Virginia; and Houston and Dallas, Texas

The management of complex cardiovascular disease has changed markedly with the development of new strategies of care, an increasing amount of scientific evidence-based data and appropriate use criteria. Applying this plethora of information and synthesizing it for presentation and recommendations to the patient and family have assumed central importance. To facilitate this process of patient centric evidence-based care multidisciplinary Heart Teams have become identified as cornerstones. While specific strategies for implementation of these teams will vary, this broad approach will become the standard of cardiovascular care. (J Am Coll Cardiol 2013;61:903–7)

Table 5 Recommended requirements of a heart valve centre (modified from Chambers *et al.*[32])

Requirements
Multidisciplinary teams with competencies in valve replacement, aortic root surgery, mitral, tricuspid and aortic valve repair, as well as transcatheter aortic and mitral valve techniques including reoperations and reinterventions. The Heart Teams must meet on a regular basis and work with standard operating procedures.
Imaging, including 3D and stress echocardiographic techniques, perioperative TOE, cardiac CT, MRI, and positron emission tomography-CT.
Regular consultation with community, other hospitals, and extracardiac departments, and between non-invasive cardiologists and surgeons and interventional cardiologists.
Back-up services including other cardiologists, cardiac surgeons, intensive care and other medical specialties.
Data review: • Robust internal audit processes including mortality and complications, repair rates, durability of repair, and reoperation rate with a minimum of 1-year follow-up. • Results available for review internally and externally. • Participation in national or European quality databases.

American Heart Association

TABLE 1. The ACC/AHA stages of heart failure[3]

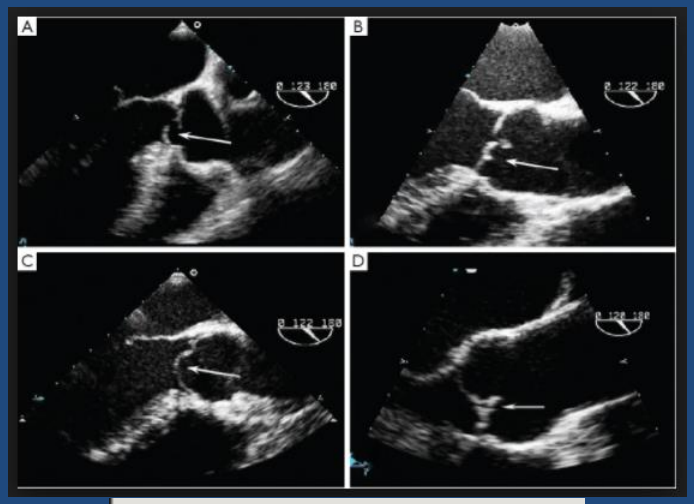
Stage	Description	Examples
A	Patients at high risk for HF because of the presence of conditions that are strongly associated with the development of HF; such patients have no identified structural or functional abnormalities of the pericardium, myocardium, or cardiac valves, and they have never shown signs or symptoms of HF	Patients with systemic hypertension, coronary artery disease, diabetes mellitus, history of cardiotoxic drug therapy or alcohol abuse, personal history of rheumatic fever, or family history of cardiomyopathy
B	Patients with structural heart disease that is strongly associated with the development of HF but who have never shown signs or symptoms of HF	Patients with left ventricular hypertrophy or fibrosis, left ventricular dilatation or hypocontractility, asymptomatic valvular heart disease, or previous myocardial infarction
C	Patients who have current or prior symptoms of HF associated with underlying structural heart disease	Patients with dyspnea or fatigue due to left ventricular systolic dysfunction, asymptomatic patients who are undergoing treatment for prior symptoms of HF
D	Patients who have advanced structural heart disease and marked symptoms of HF at rest despite maximal medical therapy and those who require specialized interventions.	Patients who are frequently hospitalized for HF or cannot be safely discharged from the hospital; in the hospital awaiting heart transplant; at home receiving continuous intravenous support for symptom relief or being supported with a mechanical circulatory assist device; or in a hospice setting for the management of HF

ACC = American College of Cardiology; AHA = American Heart Association; HF = heart failure.

1. Sintomi e segni di scompenso cardiaco

2. Segni ecocardiografici di evoluzione verso HFrEF/dilatazione delle camere cardiache/modifiche emodinamiche sotto sforzo/ruolo emergente dei peptidi

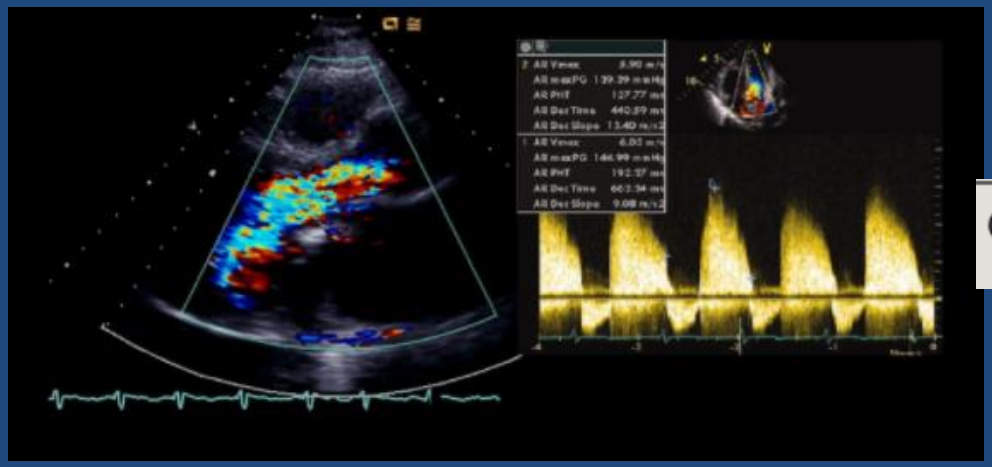
Aortic regurgitation



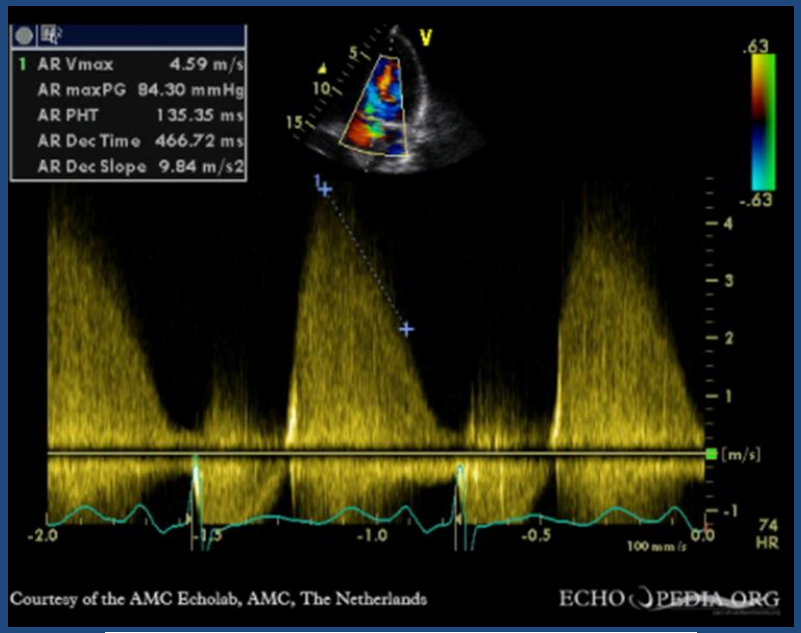
Valve morphology

Colour flow regurgitant jet

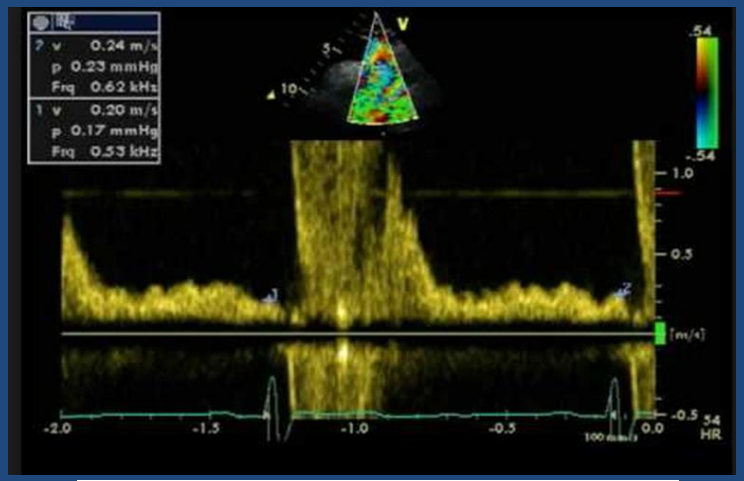
Vena contracta width (mm)



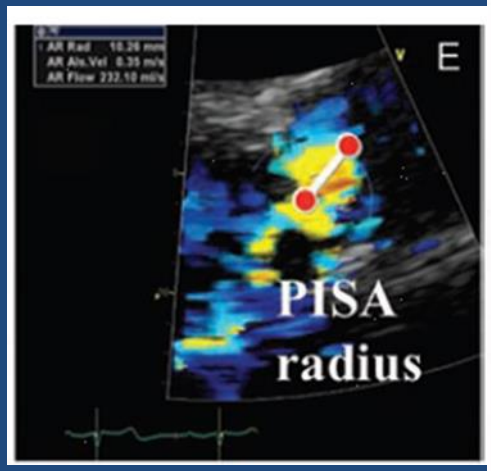
CW signal of regurgitant jet

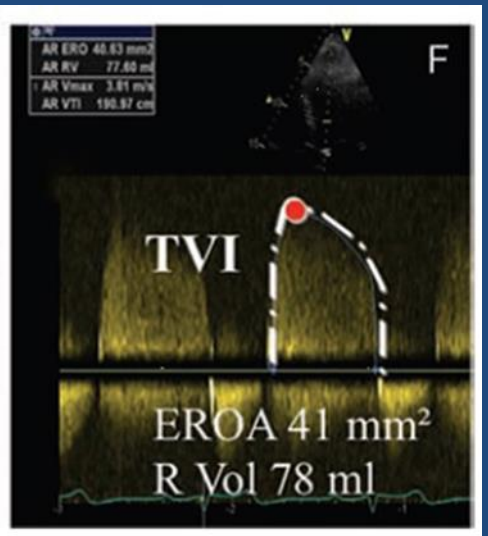


Pressure half-time <200 ms[f]

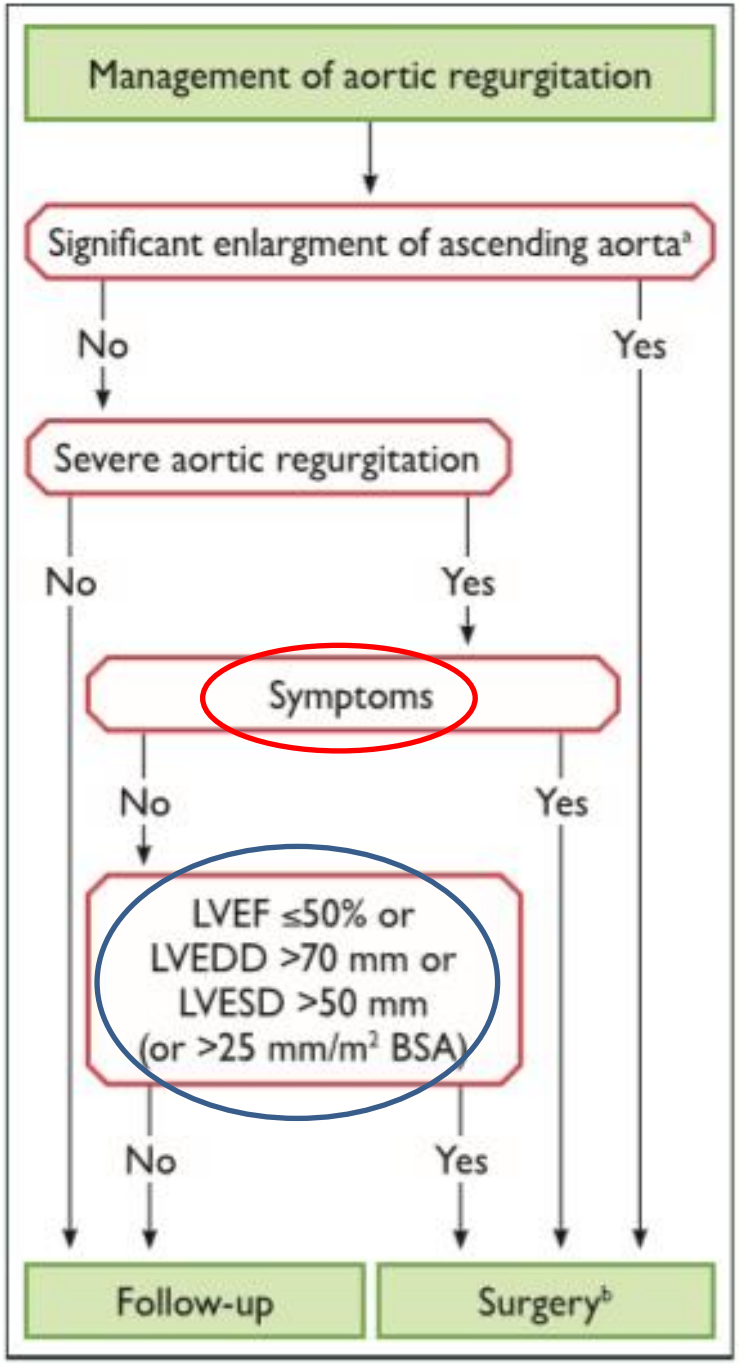


Holodiastolic flow reversal in descending aorta (EDV >20 cm/s)





EROA (mm²)	≥30
Regurgitant volume (mL/beat)	≥60



1. Sintomi e segni di scompenso cardiaco

2. Segni ecocardiografici di evoluzione verso HFrEF/dilatazione delle camere cardiache/modifiche emodinamiche sotto sforzo/ruolo emergente dei peptidi

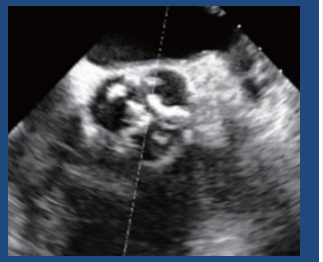
Indications for surgery	Class[a]	Level[b]
A. Severe aortic regurgitation		
Surgery is indicated in symptomatic patients.[57,58,66,67]	I	B
Surgery is indicated in asymptomatic patients with resting LVEF ≤50%.[57,58]	I	B
Surgery is indicated in patients undergoing CABG or surgery of the ascending aorta or of another valve.	I	C
Heart Team discussion is recommended in selected patients[c] in whom aortic valve repair may be a feasible alternative to valve replacement.	I	C
Surgery should be considered in asymptomatic patients with resting ejection fraction >50% with severe LV dilatation: LVEDD >70 mm or LVESD >50 mm (or LVESD >25 mm/m^2 BSA in patients with small body size).[58,66]	IIa	B

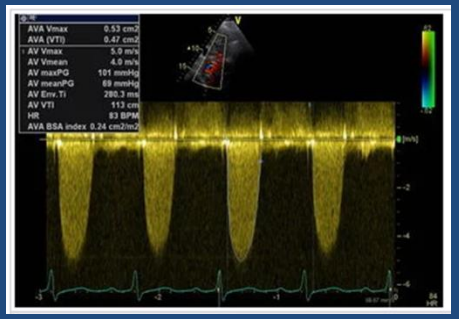
B. Aortic root or tubular ascending aortic aneurysm[d] (irrespective of the severity of aortic regurgitation)		
Aortic valve repair, using the reimplantation or remodelling with aortic annuloplasty technique, is recommended in young patients with aortic root dilation and tricuspid aortic valves, when performed by experienced surgeons.	I	C
Surgery is indicated in patients with Marfan syndrome who have aortic root disease with a maximal ascending aortic diameter ≥50 mm.	I	C
Surgery should be considered in patients who have aortic root disease with maximal ascending aortic diameter:	IIa	C
• ≥45 mm in the presence of Marfan syndrome and additional risk factors[e] or patients with a *TGFBR1* or *TGFBR2* mutation (including Loeys–Dietz syndrome).[f]	IIa	C
• ≥50 mm in the presence of a bicuspid valve with additional risk factors[e] or coarctation.	IIa	C
• ≥55 mm for all other patients.	IIa	C
When surgery is primarily indicated for the aortic valve, replacement of the aortic root or tubular ascending aorta should be considered when ≥45 mm, particularly in the presence of a bicuspid valve.[g]	IIa	C

Aortic stenosis

	Mild	Moderate	Severe
Peak velocity (m/s)	2–2.9	3–4	>4
Mean gradient (mmHg)	<20	20–40	>40
Valve area (cm^2)	>1.5	1–1.5	<1
Indexed valve area (cm^2/m^2)	>0.85	0.60–0.85	<0.60
Velocity ratio	>0.50	0.25–0.5	<0.25

Adapted from Nishimura *et al.*[1]





Valve morphology by echocardiography suspicious of AS

Assess velocity/gradient

LOW-GRADIENT AS
Vmax <4 m/s,
ΔPm <40 mmHg

HIGH-GRADIENT AS
Vmax ≥4 m/s,
ΔPm ≥40 mmHg

Assess AVA

AVA ≤1.0 cm²

AVA >1.0 cm²

Moderate AS

Exclude measurement errors that may cause underestimation of gradient / flow / AVA

Define flow status (SVi)

Low flow (SVi ≤35 mL/m²)

Normal flow (SVi >35 mL/m²)

Severe AS unlikely

Assess LVEF

LVEF <50%

LVEF ≥50%

Dobutamine echo

Integrated approach (Table 6)

Flow reserve present

No flow reserve

Pseudosevere AS[b] or true severe AS

Calcium score by CT (see Table 6)

High flow status excluded

No

Yes

Severe high-gradient AS (normal flow/low flow) (normal EF / low EF)

Define whether high flow status is reversible[a]

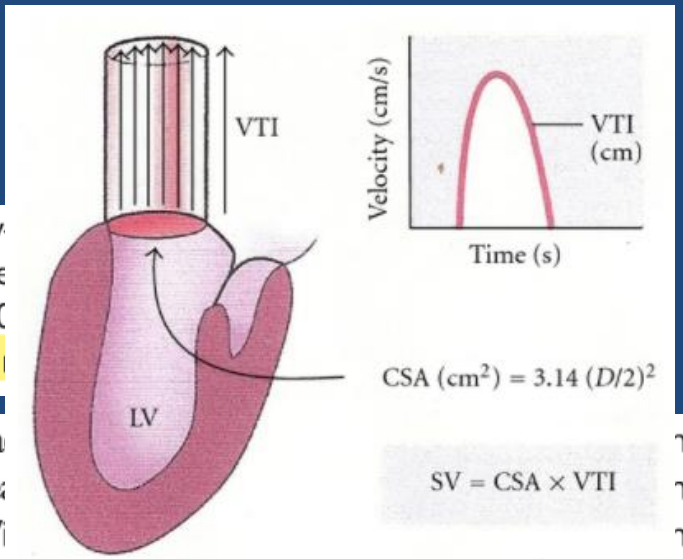
Not reversible

Reversible

Severe AS

Re-assess at restored normal flow

Anemia, febbre, sepsi, ipertiroidismo, fistole A-V etc



Normal-flow, low
tion fraction (valve
tion fraction ≥50
general have only

Low-flow, low-gra
fraction (valve area
fraction ≥50%, SVi
the elderly and is
LV hypertrophy and frequently a history of hypertension.[79,80]

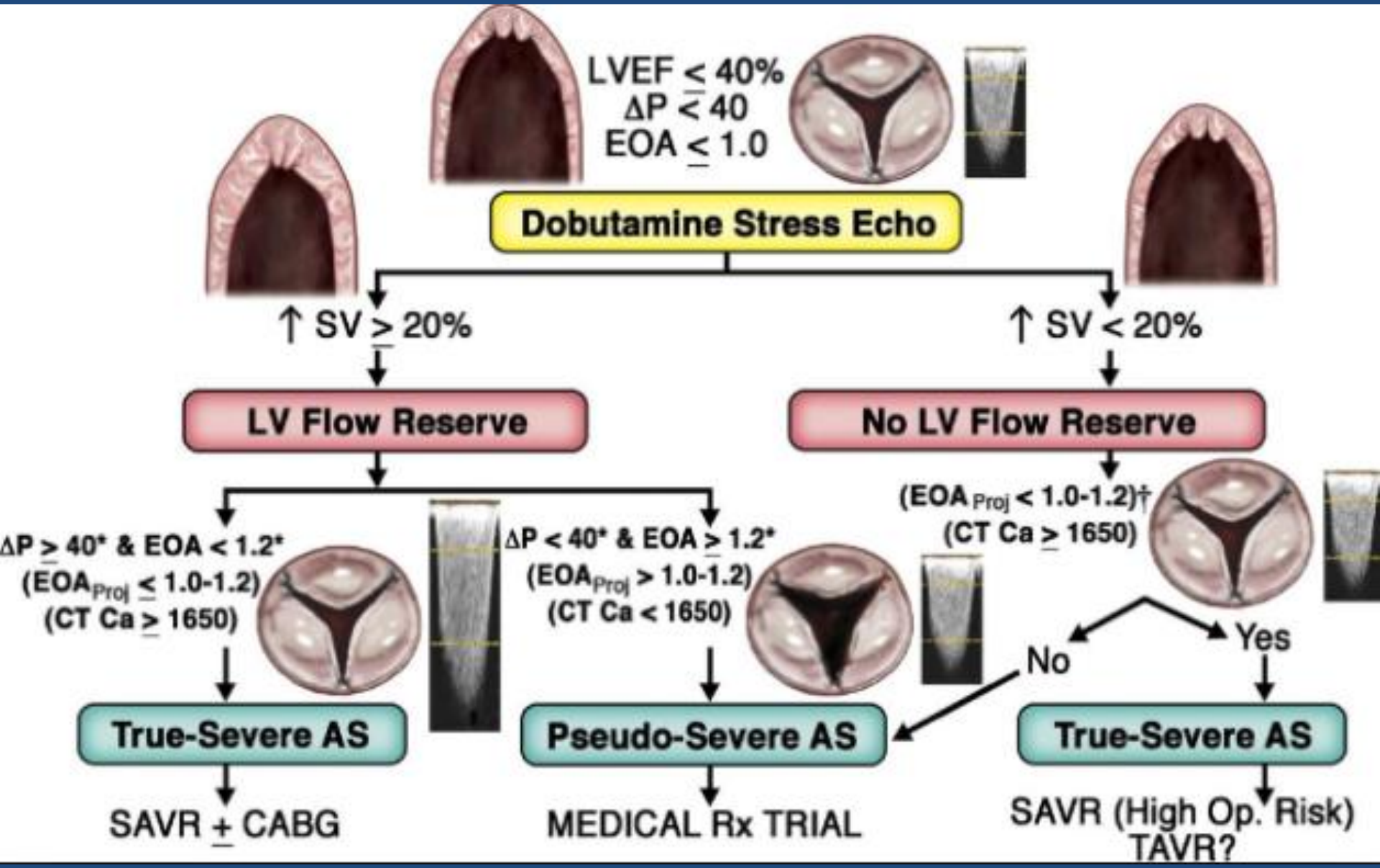
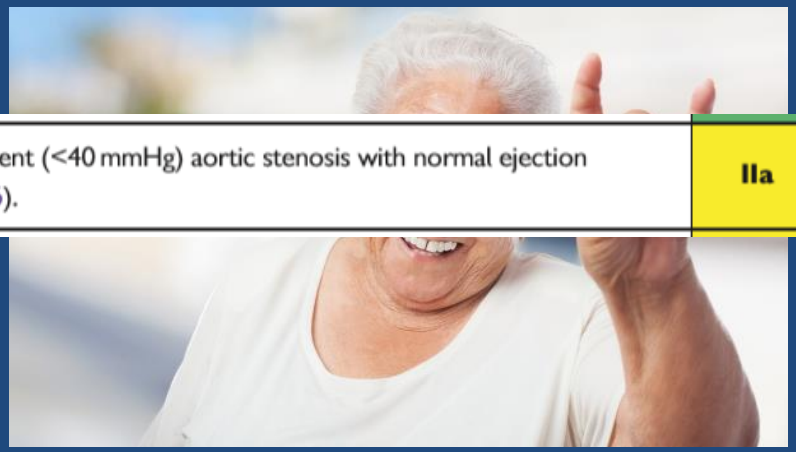

LVEF ≤ 40%
ΔP ≤ 40
EOA ≤ 1.0
Dobutamine Stress Echo
↑ SV ≥ 20%
↑ SV < 20%
LV Flow Reserve
No LV Flow Reserve
ΔP ≥ 40* & EOA < 1.2*
(EOA Proj ≤ 1.0-1.2)
(CT Ca ≥ 1650)
ΔP < 40* & EOA ≥ 1.2*
(EOA Proj > 1.0-1.2)
(CT Ca < 1650)
(EOA Proj < 1.0-1.2)†
(CT Ca ≥ 1650)
No
Yes
True-Severe AS
Pseudo-Severe AS
True-Severe AS
SAVR ± CABG
MEDICAL Rx TRIAL
SAVR (High Op. Risk)
TAVR?

Table 6 Criteria that increase the likelihood of severe aortic stenosis in patients with AVA <1.0 cm^2 and mean gradient <40 mmHg in the presence of preserved ejection fraction (modified from Baumgartner *et al.*[4])

Criteria	
Clinical criteria	• Typical symptoms without other explanation • Elderly patient (>70 years)
Qualitative imaging data	• LV hypertrophy (additional history of hypertension to be considered) • Reduced LV longitudinal function without other explanation
Quantitative imaging data	• Mean gradient 30–40 mmHg[a]
	• AVA ≤0.8 cm^2
	• Low flow (SVi <35 mL/m^2) confirmed by techniques other than standard Doppler technique (LVOT measurement by 3D TOE or MSCT; CMR, invasive data)
	• Calcium score by MSCT[b] Severe aortic stenosis very likely: men ≥3000; women ≥1600 Severe aortic stenosis likely: men ≥2000; women ≥1200 Severe aortic stenosis unlikely: men <1600; women <800



Intervention should be considered in symptomatic patients with low-flow, low-gradient (<40 mmHg) aortic stenosis with normal ejection fraction after careful confirmation of severe aortic stenosis[c] (see *Figure 2* and *Table 6*).	IIa	C

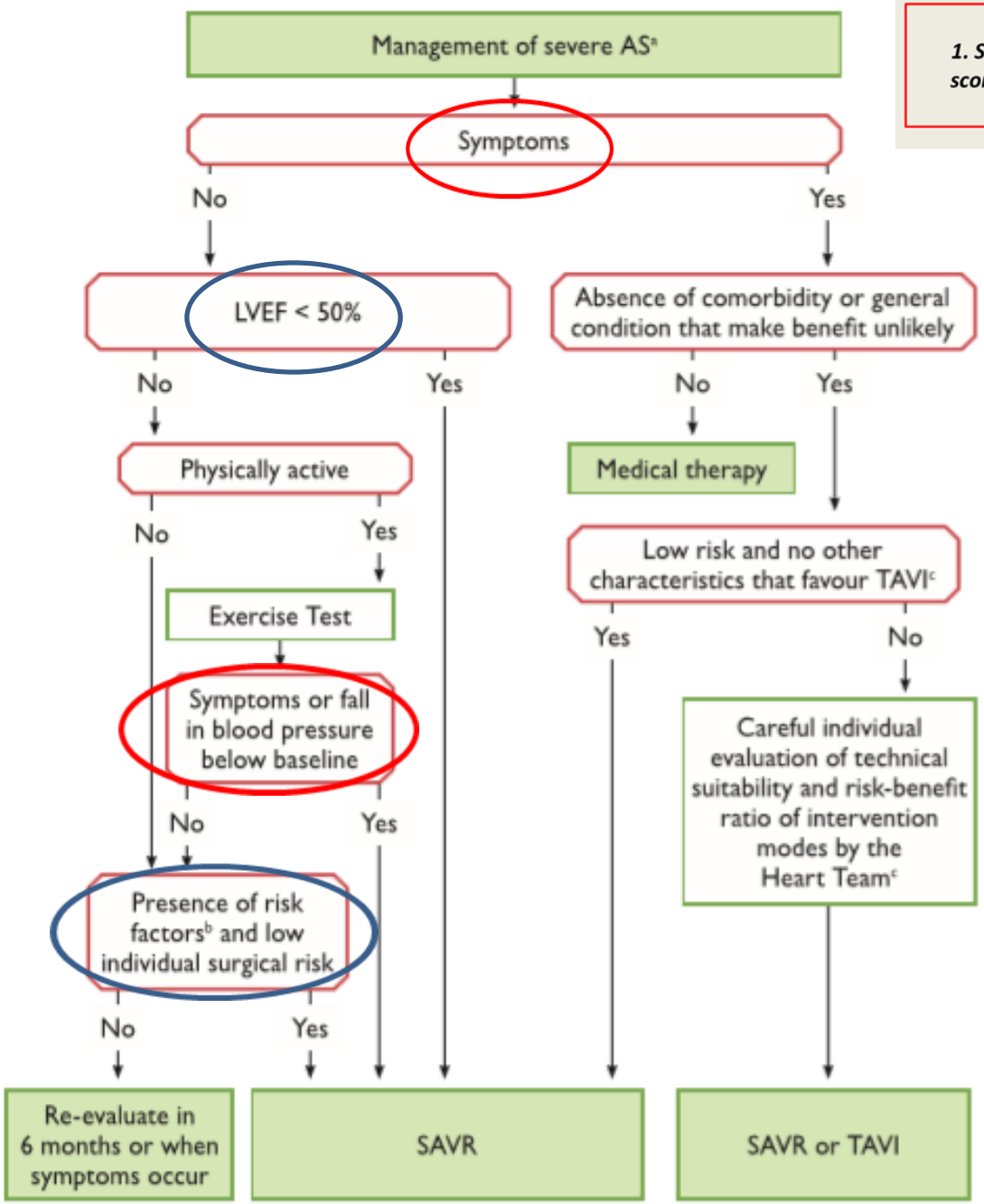
Ricapitolando…..

- SA severa per gradienti e AVA in stato ad elevata gittata (valutare la reversibilità)
- **SA severa per gradienti e AVA in pazienti con normale gittata**
- SA moderata per gradienti ma severa per AVA, con normale ventricolo e normale flusso (SA moderata! Verosimile errore nel calcolo dell'AVA)
- SA moderata per gradienti ma severa per AVA, con ventricolo normale per contrattilità, ma tanto piccolo e ipertrofico da non riuscire a generare un flusso tale che i gradienti raggiungano il cut-off per la severità
- SA moderata per gradienti ma severa per AVA, con ventricolo ipocontrattile non in grado di generare un flusso tale che i gradienti raggiungano il cut-off per la severità

- riserva contrattile presente in valvulopatia realmente severa, con aumento dei gradienti e conferma severità;

- riserva contrattile presente in valvulopatia non realmente severa, nella quale l'incremento del flusso consente maggiore escursione delle cuspidi con riduzione dei gradienti e incremento dell'AVA;

- riserva contrattile assente;



1. Sintomi e segni di scompenso cardiaco

2. Segni ecocardiografici di evoluzione verso HFrEF/dilatazione delle camere cardiache/modifiche emodinamiche sotto sforzo/ruolo emergente dei peptidi

- Vmax > 5,5 m/s.
- Severe calcificazioni + progressione > 0,3 m/s
- PAPs > 60 mmHg
- Elevazione peptidi natriuretici

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B-Type Natriuretic Peptide Clinical Activation in Aortic Stenosis

Impact on Long-Term Survival

Marie-Annick Clavel, DVM, PHD, Joseph Malouf, MD, Hector I. Michelena, MD, Rakesh M. Suri, MD, DPHIL, Allan S. Jaffe, MD, Douglas W. Mahoney, MS, Maurice Enriquez-Sarano, MD

Rochester, Minnesota

Conclusions In this large series of patients with AS, BNP clinical activation was associated with excess long-term mortality incrementally and independently of all baseline characteristics. Higher mortality with higher BNP clinical activation, even in asymptomatic patients, emphasizes the importance of appropriate clinical interpretation of BNP levels in managing patients with AS. (J Am Coll Cardiol 2014;63:2016–25) © 2014 by the American College of Cardiology Foundation

Indications for surgery in asymptomatic aortic stenosis	
IIb C Markedly elevated BNP levels.	**IIa C** Markedly elevated BNP levels (>threefold age- and sex-corrected normal range) confirmed by repeated measurements without other explanations.

Low-Gradient Aortic Stenosis

Operative Risk Stratification and Predictors for Long-Term Outcome: A Multicenter Study Using Dobutamine Stress Hemodynamics

Jean-Luc Monin, MD; Jean-Paul Quéré, MD; Mehran Monchi, MD; Hélène Petit, MD; Serge Baleynaud, MD; Christophe Chauvel, MD; Camélia Pop, MD; Patrick Ohlmann, MD; Claude Lelguen, MD; Patrick Dehant, MD; Christophe Tribouilloy, MD, PhD; Pascal Guéret, MD

Conclusions—In the setting of low-gradient aortic stenosis, surgery seems beneficial for most of the patients with left ventricular contractile reserve. In contrast, the postoperative outcome of patients without reserve is compromised by a high operative mortality. Thus, dobutamine stress Doppler hemodynamics may be factored into the risk-benefit analysis for each patient. (***Circulation*. 2003;108:319-324.**)

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Valvular Heart Disease

Aortic Valve Replacement for Low-Flow/Low-Gradient Aortic Stenosis

Operative Risk Stratification and Long-Term Outcome: A European Multicenter Study

Franck Levy, MD,* Marcel Laurent, MD,† Jean Luc Monin, MD,‡ Jean Michel Maillet, MD,§ Agnès Pasquet, MD,‖ Thierry Le Tourneau, MD,¶ Hélène Petit-Eisenmann, MD,# Mauro Gori, MD,** Yannick Jobic, MD,†† Fabrice Bauer, MD,‡‡ Christophe Chauvel, MD,§§ Alain Leguerrier, MD, PHD,† Christophe Tribouilloy, MD, PHD, FACC*

Amiens, Rennes, Créteil, Saint Denis, Lille, Strasbourg, Brest, Rouen, and Bordeaux, France; Brussels, Belgium; and Bergamo, Italy

In view of the very poor prognosis of unoperated patients, the current operative risk, and the long-term outcome after surgery, AVR is the treatment of choice in the majority of cases of LF/LGAS. (J Am Coll Cardiol 2008;51: 1466–72) © 2008 by the American College of Cardiology Foundation

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FOCUS ISSUE: VALVULAR HEART DISEASE

Outcome After Aortic Valve Replacement for Low-Flow/Low-Gradient Aortic Stenosis Without Contractile Reserve on Dobutamine Stress Echocardiography

Christophe Tribouilloy, MD, PHD,* Franck Lévy, MD,† Dan Rusinaru, MD,† Pascal Guéret, MD,‡ Hélène Petit-Eisenmann, MD,§ Serge Baleynaud, MD,‖ Yannick Jobic, MD,¶ Catherine Adams, MD,# Bernard Lelong, MD,** Agnès Pasquet, MD,†† Christophe Chauvel, MD,‡‡ Damien Metz, MD,§§ Jean-Paul Quéré, MD,* Jean-Luc Monin, MD, PHD‡

Amiens, Créteil, Strasbourg, Lorient, Brest, Argenteuil, Rennes, Bordeaux, and Reims, France; and Brussels, Belgium

In patients with LF/LGAS without CR on DSE, AVR is associated with better outcome compared with medical management. Surgery should not be withheld from this subset of patients solely on the basis of lack of CR on DSE. (J Am Coll Cardiol 2009;53:1865–73) © 2009 by the American College of Cardiology Foundation

treatment for heart failure.[105] Although the outcome of patients without flow reserve is compromised by a higher operative mortality, SAVR (as well as TAVI) has also been shown to improve ejection fraction and clinical status in such patients.[10,78,104] Decision making should take into account the clinical condition (in particular the comorbidities), the degree of valve calcification, the extent of coronary disease and the feasibility of concomitant or staged revascularization. The ability to identify patients with severe aortic stenosis in this subgroup by CT calcium scoring and the availability of TAVI have lowered the threshold to intervene.

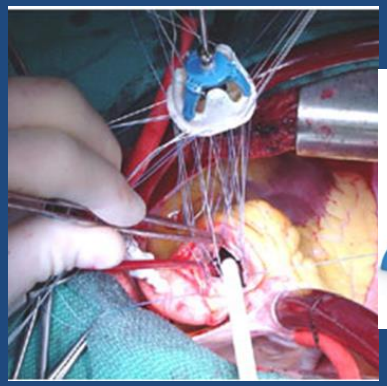
2012	2017
Indications for intervention in symptomatic aortic stenosis	
IIb C Intervention may be considered in symptomatic patients with low-flow, low-gradient aortic stenosis and reduced ejection fraction without flow (contractile) reserve.	**IIa C** Intervention should be considered in symptomatic patients with low-flow, low-gradient aortic stenosis and reduced ejection fraction without flow (contractile) reserve, particularly when CT calcium scoring confirms severe aortic stenosis.

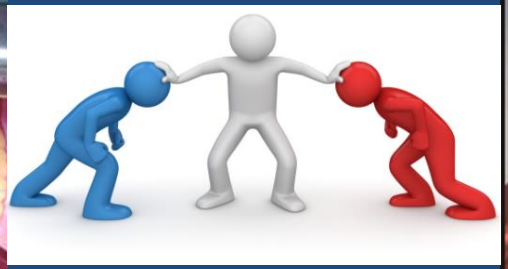
SAVR is recommended in patients at low surgical risk (STS or EuroSCORE II < 4% or logistic EuroSCORE I < 10%[d] and no other risk factors not included in these scores, such as frailty, porcelain aorta, sequelae of chest radiation).[93]	I	B
TAVI is recommended in patients who are not suitable for SAVR as assessed by the Heart Team.[91,94]	I	B
In patients who are at increased surgical risk (STS or EuroSCORE II ≥ 4% or logistic EuroSCORE I ≥ 10%[d] or other risk factors not included in these scores such as frailty, porcelain aorta, sequelae of chest radiation), the decision between SAVR and TAVI should be made by the Heart Team according to the individual patient characteristics (see *Table 7*), with TAVI being favoured in elderly patients suitable for transfemoral access.[91,94–102]	I	B

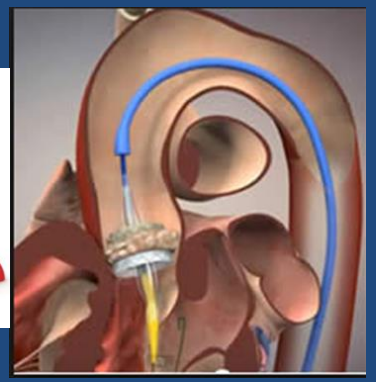
	Favours TAVI	Favours SAVR
Clinical characteristics		
STS/EuroSCORE II <4% (logistic EuroSCORE I <10%)[a]		+
STS/EuroSCORE II ≥4% (logistic EuroSCORE I ≥10%)[a]	+	
Presence of severe comorbidity (not adequately reflected by scores)	+	
Age <75 years		+
Age ≥75 years	+	
Previous cardiac surgery	+	
Frailty[b]	+	
Restricted mobility and conditions that may affect the rehabilitation process after the procedure	+	
Suspicion of endocarditis		+

Anatomical and technical aspects		
Favourable access for transfemoral TAVI	+	
Unfavourable access (any) for TAVI		+
Sequelae of chest radiation	+	
Porcelain aorta	+	
Presence of intact coronary bypass grafts at risk when sternotomy is performed	+	
Expected patient–prosthesis mismatch	+	
Severe chest deformation or scoliosis	+	
Short distance between coronary ostia and aortic valve annulus		+
Size of aortic valve annulus out of range for TAVI		+
Aortic root morphology unfavourable for TAVI		+
Valve morphology (bicuspid, degree of calcification, calcification pattern) unfavourable for TAVI		+
Presence of thrombi in aorta or LV		+

Cardiac conditions in addition to aortic stenosis that require consideration for concomitant intervention		
Severe CAD requiring revascularization by CABG		+
Severe primary mitral valve disease, which could be treated surgically		+
Severe tricuspid valve disease		+
Aneurysm of the ascending aorta		+
Septal hypertrophy requiring myectomy		+







Transcatheter aortic valve replacement versus surgical valve replacement in intermediate-risk patients: a propensity score analysis

Dr Prof Vinod H Thourani, MD, Susheel Kodali, MD, Raj R Makkar, MD, Prof Howard C Herrmann, MD, Mathew Williams, MD, Vasilis Babaliaros, MD, Prof Richard Smalling, MD, Scott Lim, MD, S Chris Malaisrie, MD, Prof Samir Kapadia, MD, Wilson Y Szeto, MD, Kevin L Greason, MD, Prof Dean Kereiakes, MD, Gorav Ailawadi, MD, Brian K Whisenar MD, Chandan Devireddy, MD, Jonathon Leipsic, MD, Rebecca T Hahn, MD, Prof Philippe Pibarot, PhD, Prof Neil J

Interpretation

TAVR with SAPIEN 3 in intermediate-risk patients with severe aortic stenosis is associated with low mortality, strokes, and regurgitation at 1 year. The propensity score analysis indicates a significant superiority for our composite outcome with TAVR compared with surgery, suggesting that TAVR might be the preferred treatment alternative in intermediate-risk patients.

ORIGINAL ARTICLE

Surgical or Transcatheter Aortic-Valve Replacement in Intermediate-Risk Patients

Michael J. Reardon, M.D., Nicolas M. Van Mieghem, M.D., Ph.D., Jeffrey J. Popma, M.D., Neal S. Kleiman, M.D., Lars Søndergaard, M.D., Mubashir Mumtaz, M.D., David H. Adams, M.D., G. Michael Deeb, M.D., Brijeshwar Maini, M.D., Hemal Gada, M.D., Stanley Chetcuti, M.D., Thomas Gleason, M.D., John Heiser, M.D., Rüdiger Lange, M.D., Ph.D., William Merhi, D.O., Jae K. Oh, M.D., Peter S. Olsen, M.D., Nicolo Piazza, M.D., Ph.D., Mathew Williams, M.D., Stephan Windecker, M.D., Ph.D., et al., for the SURTAVI Investigators*

CONCLUSIONS

TAVR was a noninferior alternative to surgery in patients with severe aortic stenosis at intermediate surgical risk, with a different pattern of adverse events associated with each procedure. (Funded by Medtronic; SURTAVI ClinicalTrials.gov number, NCT01586910.)

ORIGINAL ARTICLE

Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients

Martin B. Leon, M.D., Craig R. Smith, M.D., Michael J. Mack, M.D., Raj R. Makkar, M.D., Lars G. Svensson, M.D., Ph.D., Susheel K. Kodali, M.D., Vin Thourani, M.D., E. Murat Tuzcu, M.D., D. Craig Miller, M.D., Howard C. Herrmann, M.D., Darshan Doshi, M.D., David J. Cohen, M.D., Augusto D. Pi M.D., Samir Kapadia, M.D., Todd Dewey, M.D., Vasilis Babaliaros, M.D., Wilson Y. Szeto, M.D., Mathew R. Williams, M.D., Dean Kereiakes, M.D., A Zajarias, M.D., et al., for the PARTNER 2 Investigators*

CONCLUSIONS

In intermediate-risk patients, TAVR was similar to surgical aortic-valve replacement with respect to the primary end point of death or disabling stroke. (Funded by Edwards Lifesciences; PARTNER 2 ClinicalTrials.gov number, NCT01314313.)

STS Operative Risk Calculator

Online STS Risk Calculator

Dataset: 2.61

Definitions

Support

Important: The previous additive [1] and logistic [2] EuroSCORE models are out of date. A new model has been prepared from fresh data and is launched at the 2011 EACTS meeting in Lisbon. The model is called EuroSCORE II [3] - this online calculator has been updated to use this new model. If you need to calculate the older "additive" or "logistic" EuroSCORE please visit the old calculator by clicking here.

Patient related factors			Cardiac related factors		
Age [1] (years)	0	0	NYHA	select	0
Gender	select	0	CCS class 4 angina [8]	no	0
Renal impairment [2] See *calculator below for creatinine clearance*	normal (CC >85ml/min)	0	LV function	select	0
Extracardiac arteriopathy [3]	no	0	Recent MI [9]	no	0
Poor mobility [4]	no	0	Pulmonary hypertension [10]	no	0
Previous cardiac surgery	no	0	**Operation related factors**		
Chronic lung disease [5]	no	0	Urgency [11]	elective	0
Active endocarditis [6]	no	0	Weight of the intervention [12]	isolated CABG	0
Critical preoperative state [7]	no	0	Surgery on thoracic aorta	no	0
Diabetes on insulin	no	0			
EuroSCORE II	0				
EuroSCORE II					
Note: This is the 2011 EuroSCORE II	Calculate	Clear			

interventional procedures, such as mitral edge-to-edge repair. It remains essential not to rely on a single risk score figure when assessing patients or to determine unconditionally the indication and type of intervention. Patient's life expectancy, expected quality of life and patient preference should be considered, as well as local resources.

- Uomo, 82 anni; ipertensione arteriosa, fibrillazione atriale cronica;
- BPCO di grado moderato, OSAS in terapia con CPAP notturna;
- storia di anemia severa con ripetute trasfusioni;
- pregressa tiroidectomia e protesi d'anca.
- IRC III stadio con eGFR 43 ml/min. Classe NYHA II.

STS score 3,92 ed Euroscore II 2,08!

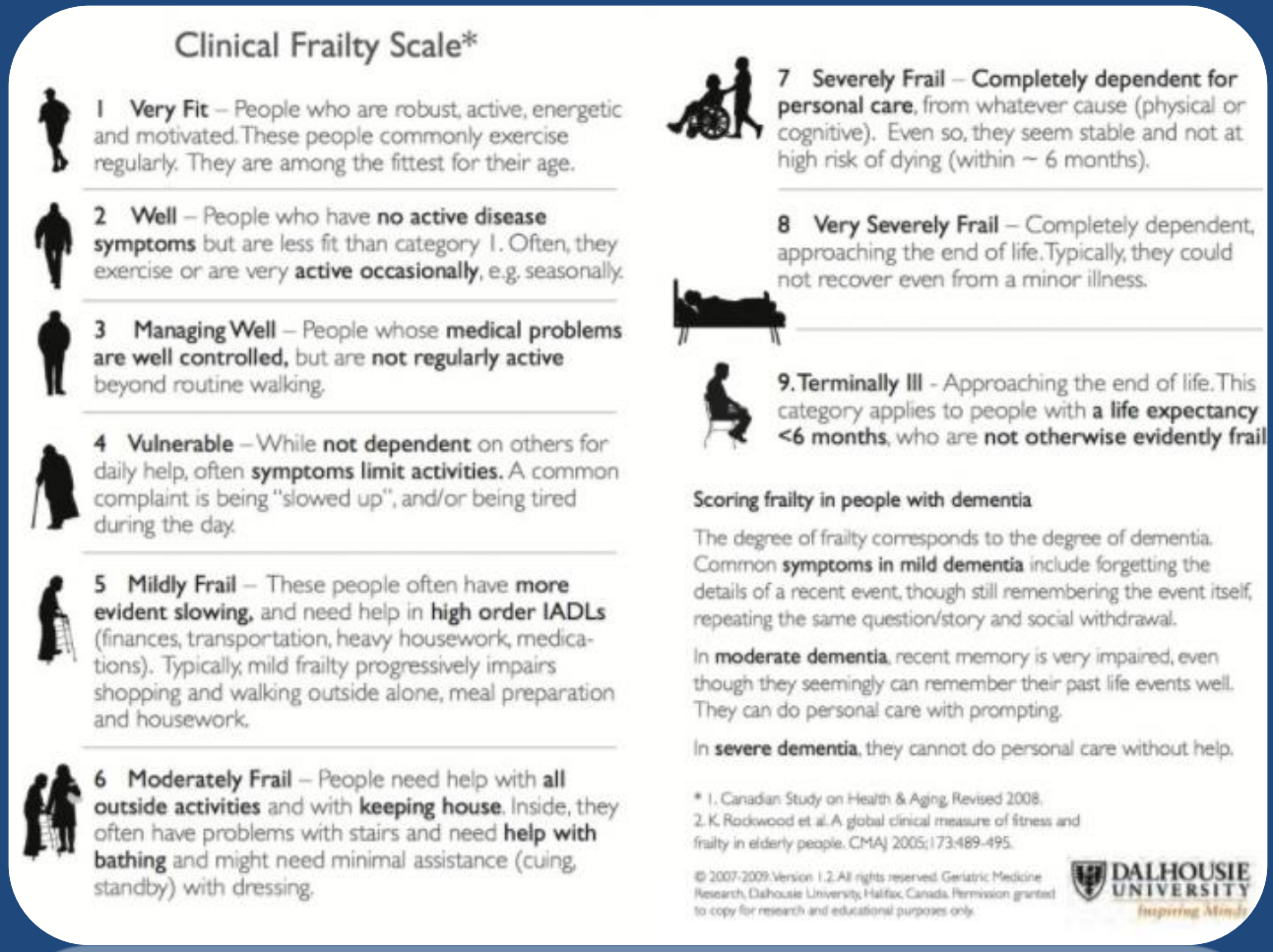
Scores have major limitations for practical use by insufficiently considering disease severity and not including major risk factors such as frailty, porcelain aorta, chest radiation etc. While EuroSCORE I mark-

3.3 Special considerations in elderly patients

Poor mobility, as assessed by the 6-minute walk test, and oxygen dependency are the main factors associated with increased mortality after TAVI and other VHD treatments.[23,24] The combination of severe lung disease, postoperative pain from sternotomy or thoracotomy and prolonged time under anaesthesia in patients undergoing traditional surgical aortic valve replacement (SAVR) may contribute to pulmonary complications. There is a gradual relationship between the impairment of renal function and increased mortality after valvular surgery, TAVI and transcatheter mitral edge-to-edge repair,[25] especially when glomerular filtration rate is < 30 mL/min. Coronary, cerebrovascular and peripheral artery disease have a negative impact on early and late survival after surgery and TAVI.[22]

Besides specific organ comorbidities, there is growing interest in the assessment of frailty, an overall marker of impairment of functional, cognitive and nutritional status. Frailty is associated with increased morbidity and mortality after surgery and TAVI.[26] The assessment of frailty should not rely on a subjective approach, such as the 'eyeball test', but rather on a combination of different objective estimates. Several tools are available for assessing frailty.[23,26,27]

AVOID FUTILITY!



Clinical Frailty Scale*

1 **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 **Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 **Managing Well** – People whose **medical problems are well controlled,** but are **not regularly active** beyond routine walking.

4 **Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities.** A common complaint is being "slowed up", and/or being tired during the day.

5 **Mildly Frail** – These people often have **more evident slowing,** and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 **Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

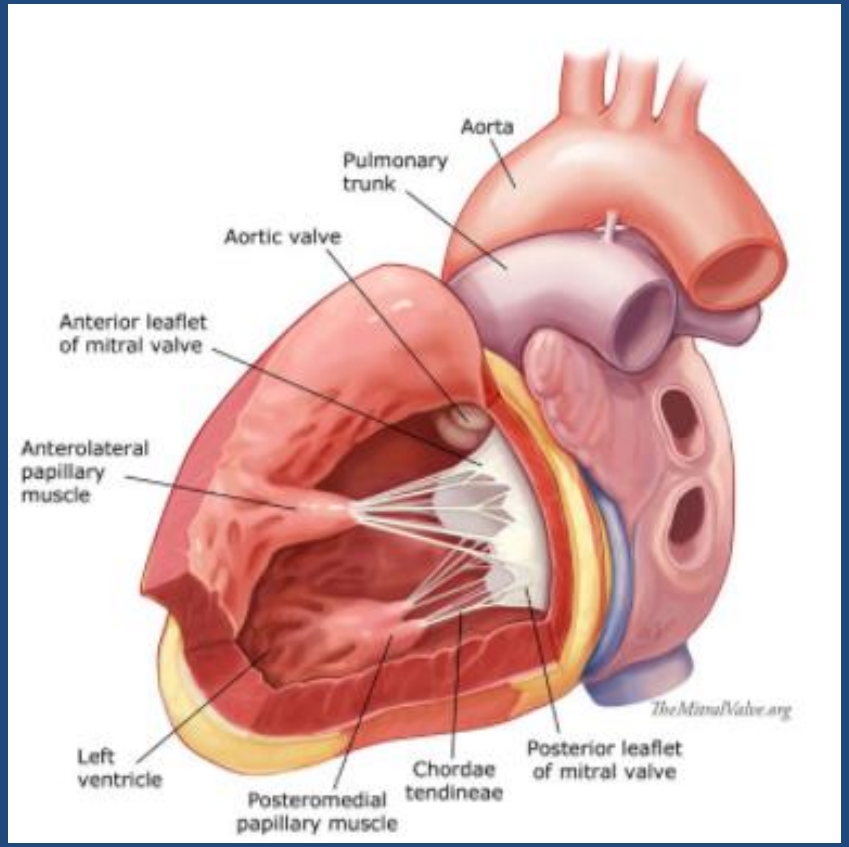
DALHOUSIE UNIVERSITY
Inspiring Minds

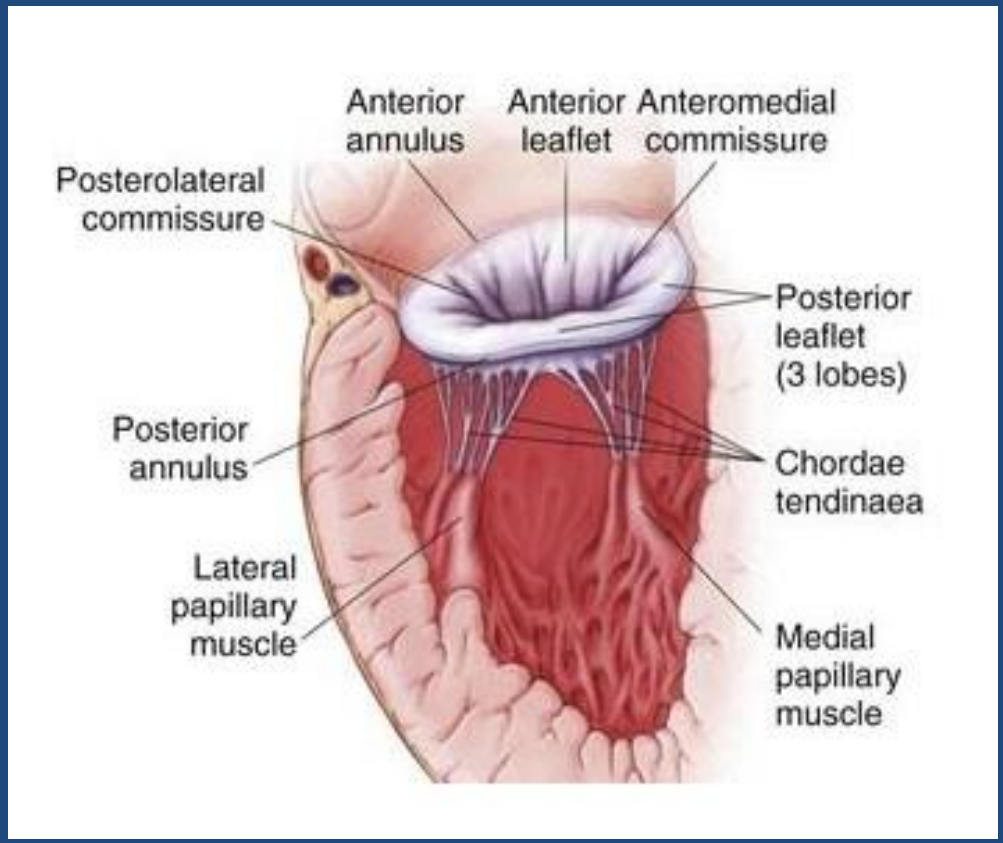
EuroIntervention. 2014 Sep;10(5):609-19. doi: 10.4244/EIJY14M08_03.

Impact of frailty on short- and long-term morbidity and mortality after transcatheter aortic valve implantation: risk assessment by Katz Index of activities of daily living.

Puls M[1], Sobisiak B, Bleckmann A, Jacobshagen C, Danner BC, Hünlich M, Beißbarth T, Schöndube F, Hasenfuß G, Seipelt R, Schillinger W.

Valvola Mitrale



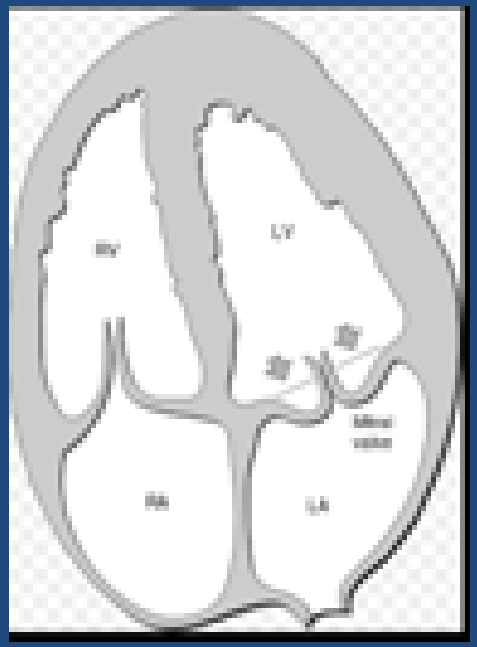


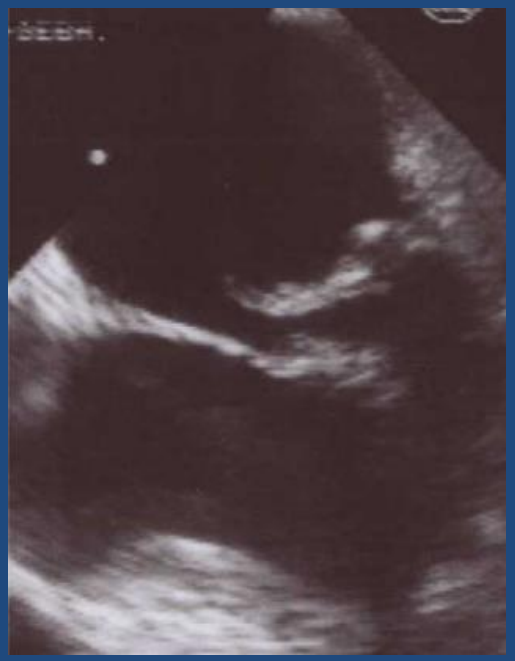
- ***Parete posteriore dell'atrio sn***
- ***Annulus***
- ***Lembi***
- ***Corde tendinee***
- ***Muscoli papillari***
- ***Parete ventricolare***
- ***Continuità mitro-aortica***

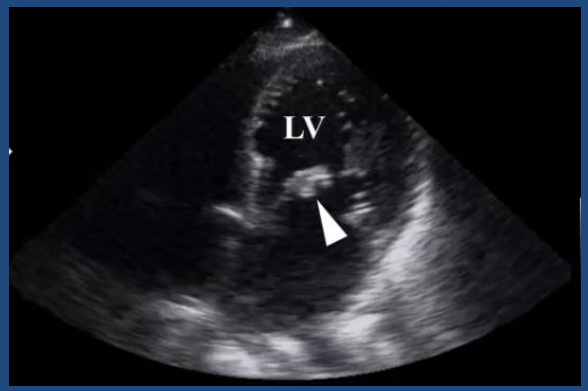
Insufficienza mitralica

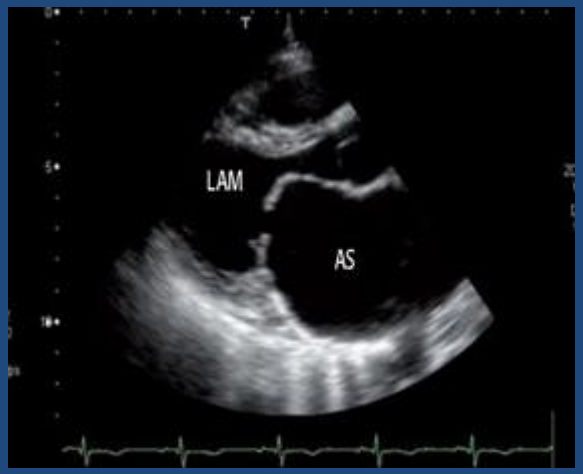
Primitiva

- Degenerativa
- Barlow
- Prolasso
- Reumatica
- Endocardite
- Malattie congen.

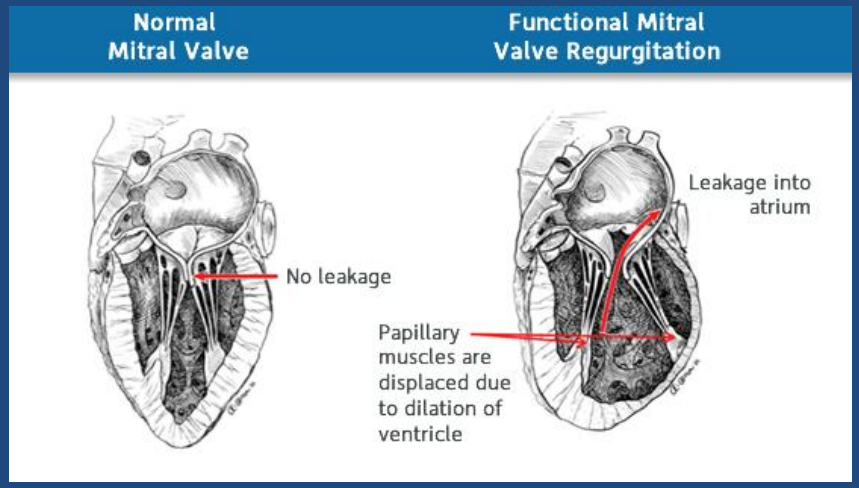






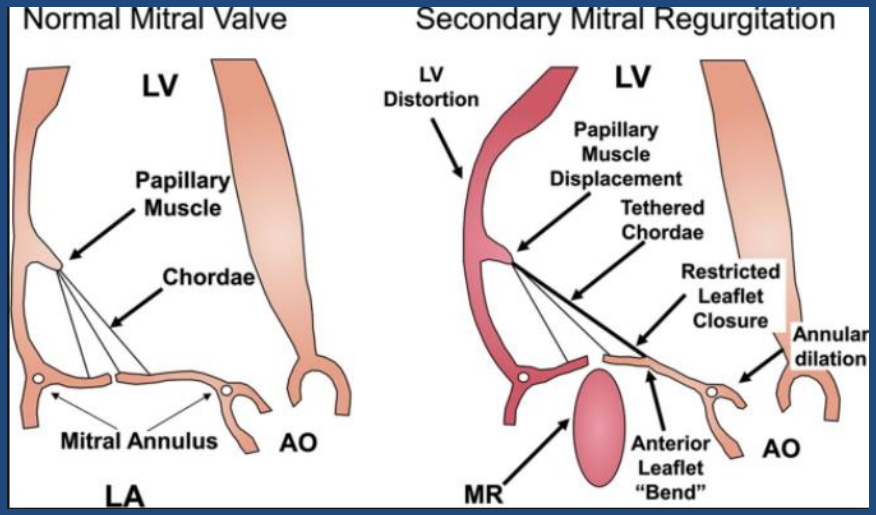


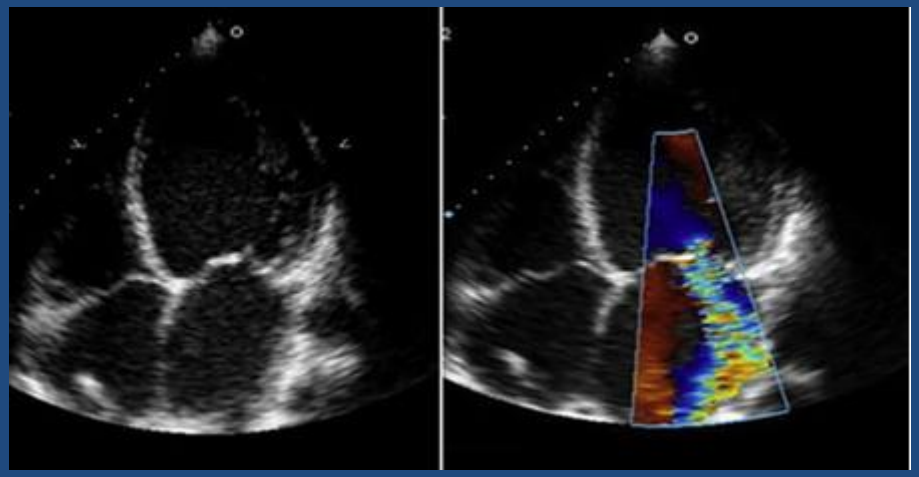
Insufficienza mitralica



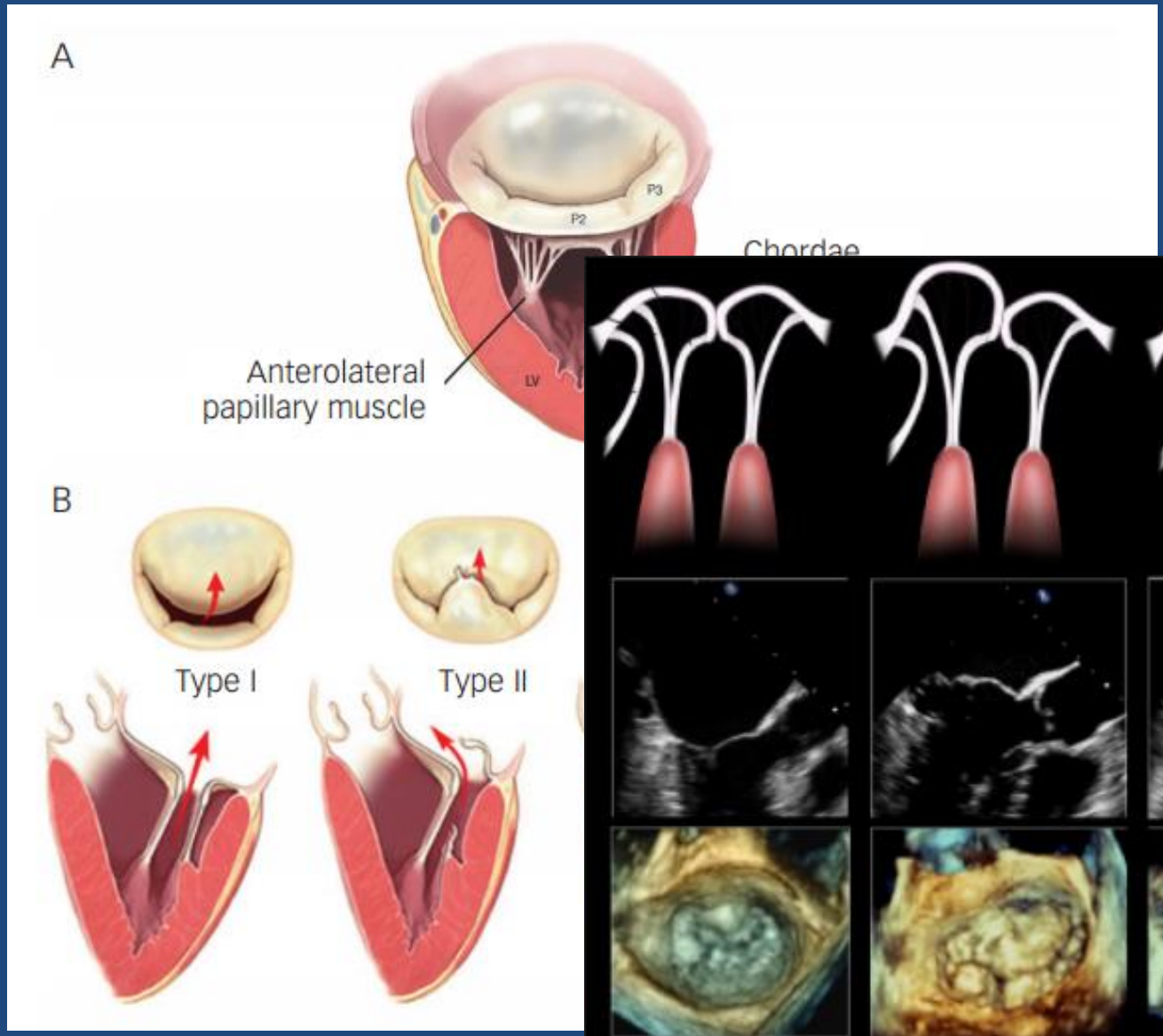
Secondaria

- Ridotto movimento dei lembi (thetering simmetrico e asimmetrico)
- Dilatazione annulus
- Entrambe

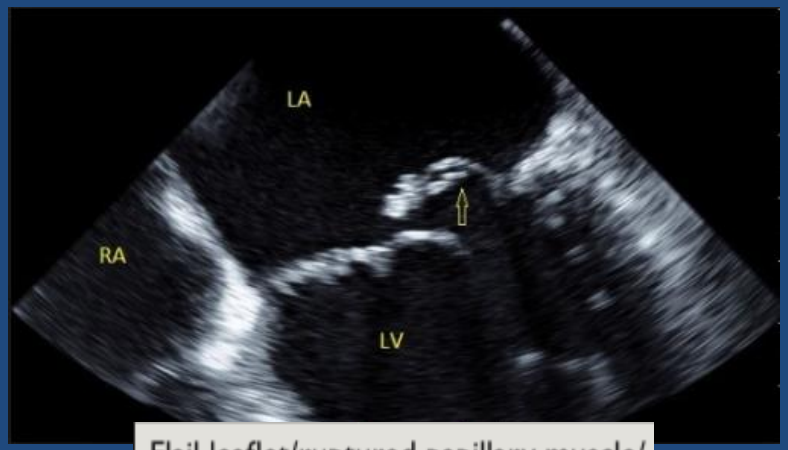




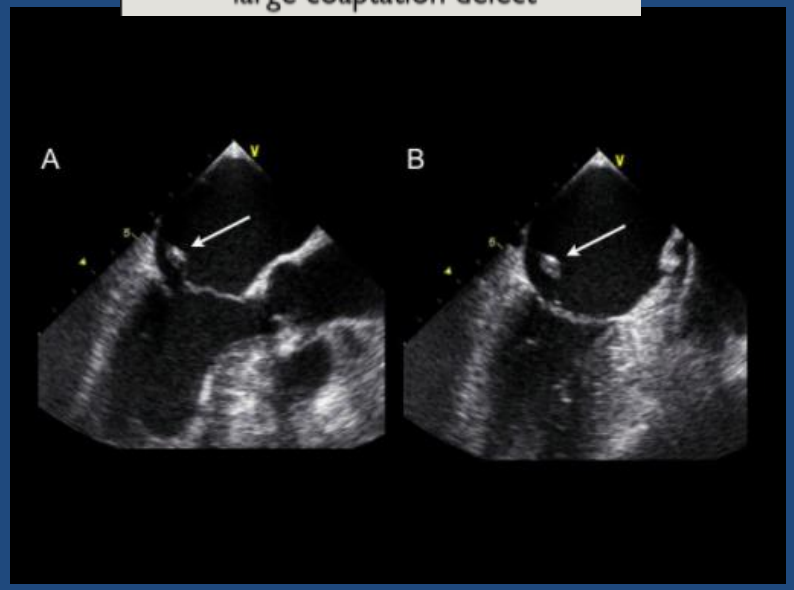
Classificazione di Carpentier



Valutazione Ecocardiografica

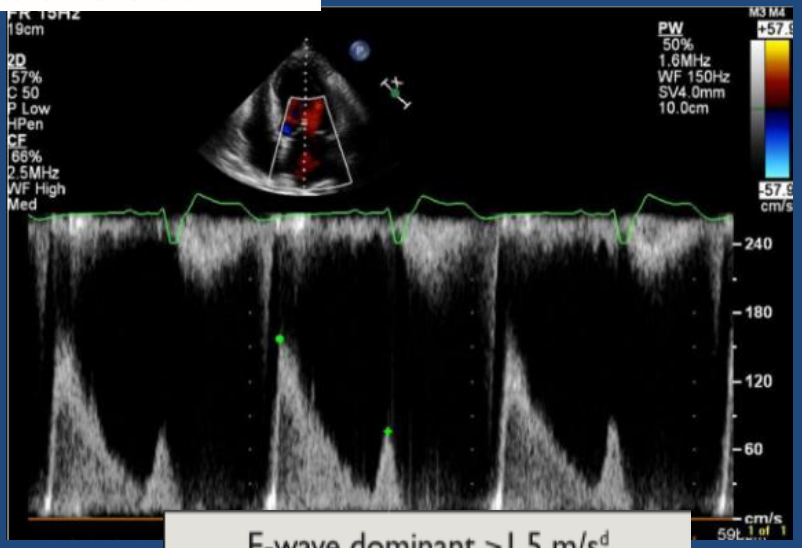


Flail leaflet/ruptured papillary muscle/ large coaptation defect



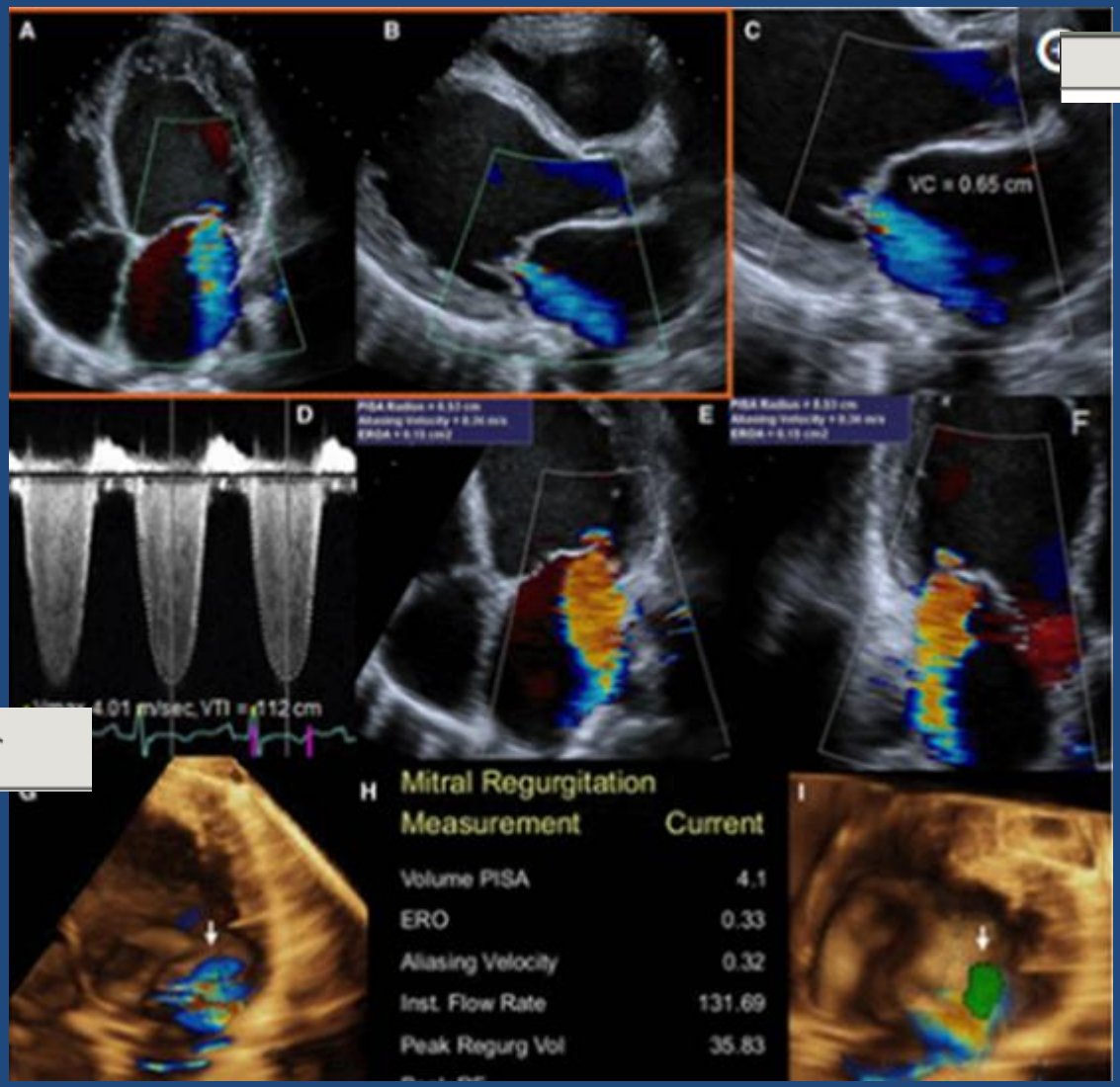
Very large central jet or eccentric jet adhering, swirling, and reaching the posterior wall of the LA

Large flow convergence zone[a]



E-wave dominant ≥1.5 m/s[d]

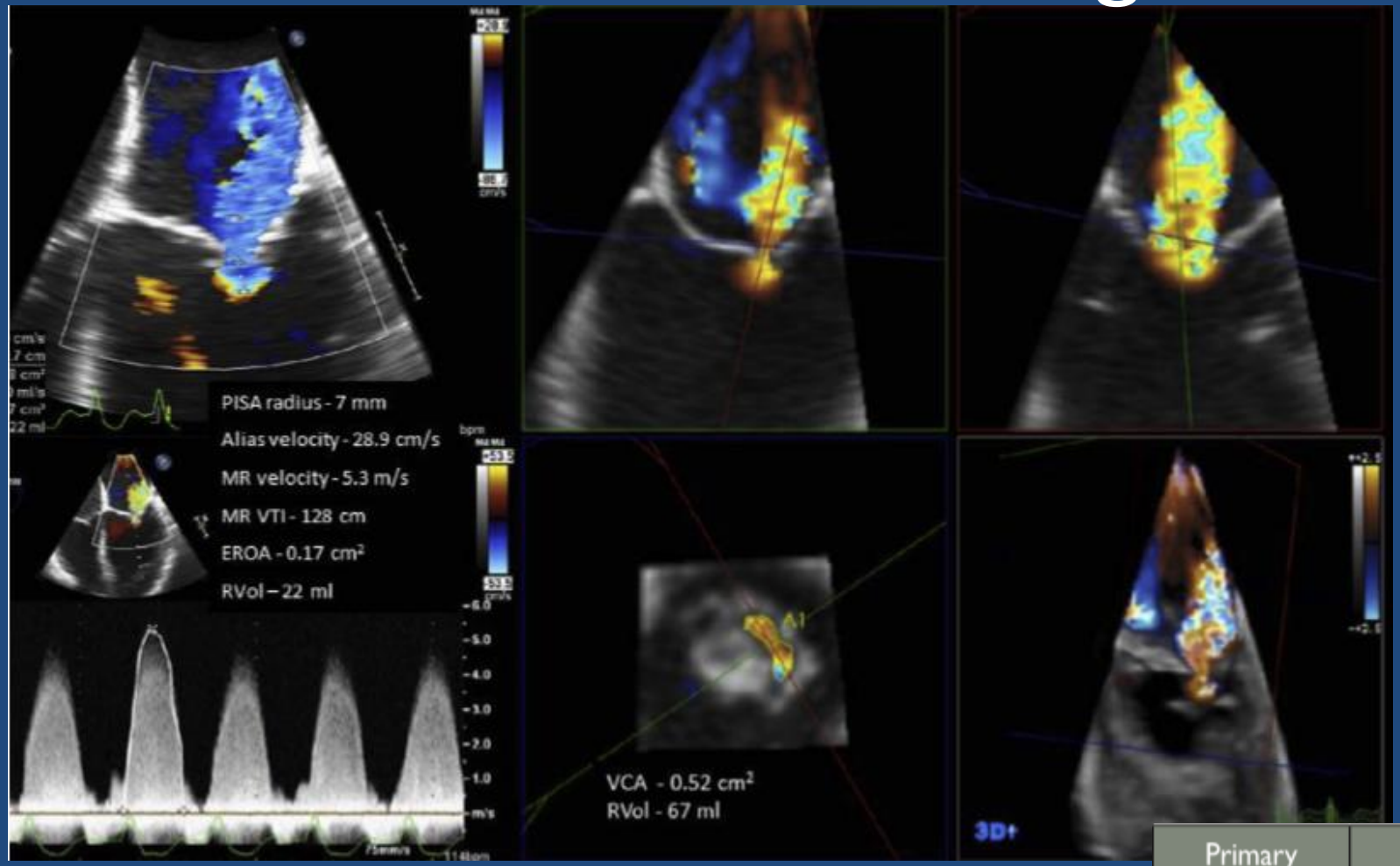
Valutazione Ecocardiografica



≥7 (>8 for biplane)[b]

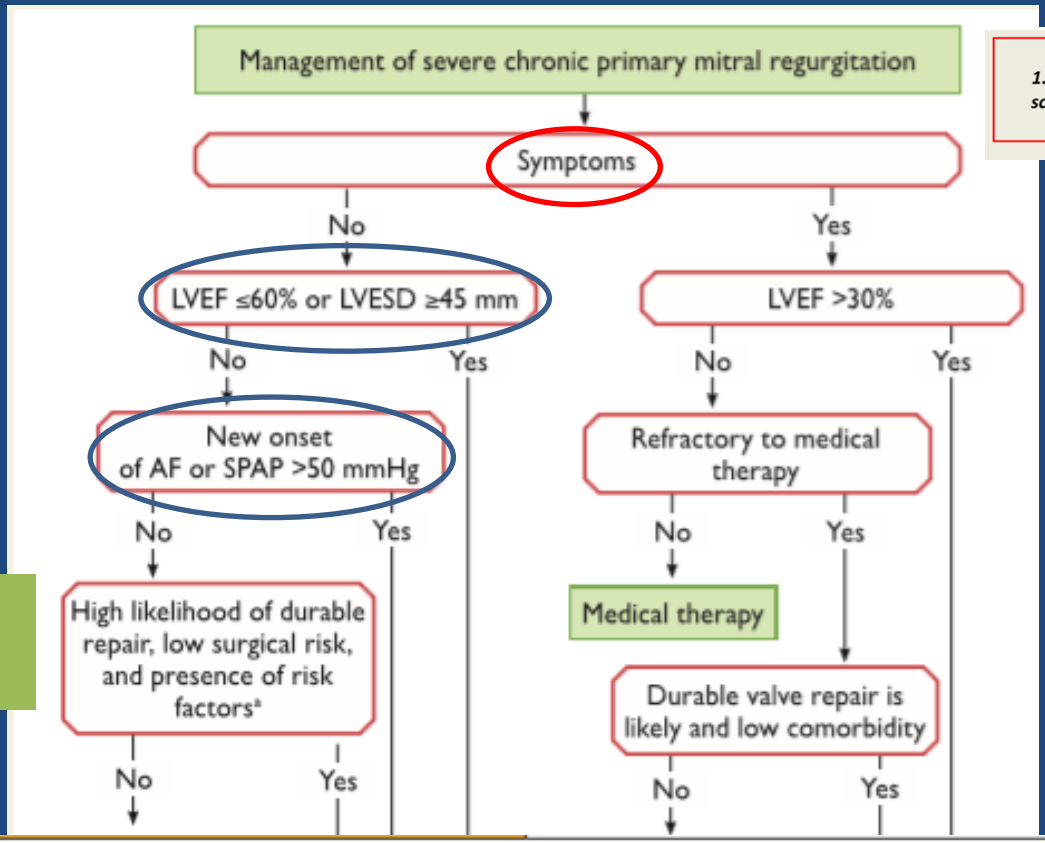
Dense/triangular

Valutazione Ecocardiografica



	Primary	Secondary[h]
EROA (mm^2)	≥40	≥20
Regurgitant volume (mL/beat)	≥60	≥30
+ enlargement of cardiac chambers/vessels	LV, LA	

Trattamento dell'IM primitiva



1. Sintomi e segni di scompenso cardiaco

2. Segni ecocardiografici di evoluzione verso HFrEF/dilatazione delle camere cardiache/modifiche emodinamiche sotto sforzo/ruolo emergente dei peptidi

AS > 60 ml/mq
Flail

Indications for intervention in asymptomatic severe primary mitral regurgitation

IIb C

Surgery may be considered in asymptomatic patients with preserved LV function, high likelihood of durable repair, low surgical risk, and:

- Left atrial dilatation (volume index ≥60 mL/m² BSA) an sinus rhythm

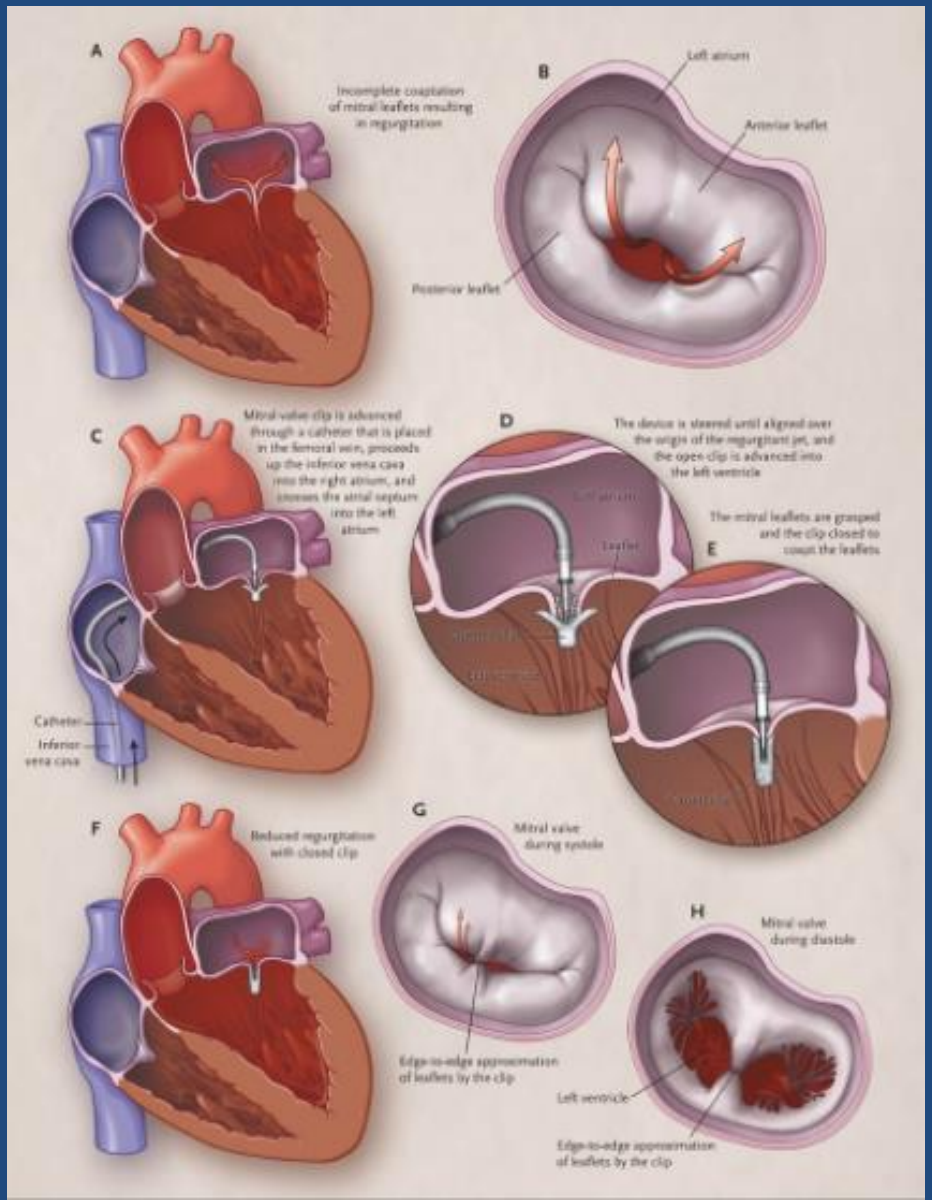
Pulmonary hypertension on exercise (SPAP ≥ 60 mmHg a exercise)

IIa C (modified!)

Surgery should be considered in asymptomatic patients with preserved LVEF (>60%) and LVESD 40–44 mm when a durable repair is likely, surgical risk is low,

Despite the absence of a randomized comparison between the results of valve replacement and repair, it is widely accepted that, when feasible, valve repair is the preferred treatment. Achieving a durable valve repair is essential. Degenerative mitral regurgitation

MitraClip



Transcatheter mitral valve interventions have been developed to correct primary mitral regurgitation either through a transseptal or a transapical approach. Among the transcatheter procedures, currently only the edge-to-edge mitral repair is widely adopted.[129] Experience with transcatheter annuloplasty, transapical chordal implantation or valve replacement is still limited and general recommendations cannot yet be made. Transcatheter mitral valve treatment should be discussed by the Heart Team in symptomatic patients who are at high surgical risk or are inoperable. Percutaneous edge-to-edge repair is generally safe and can improve symptoms and provide reverse LV remodelling. However, the rate of residual mitral regurgitation up to 5 years is higher than with surgical repair.[130]

MitraClip

Percutaneous mitral valve repair using the edge-to-edge technique: six-month results of the EVEREST Phase I Clinical Trial.

Feldman T[1], Wasserman HS, Herrmann HC, Gray W, Block PC, Whitlow P, St Goar F, Rodriguez L, Silvestry F, Schwartz A, Sanborn TA, Condado JA, Foster E.

⊕ **Author information**

Abstract

OBJECTIVES: This study sought to evaluate the clinical results of a percutaneous approach to mitral valve repair for mitral regurgitation (MR).

BACKGROUND: A surgical technique approximating the middle scallops of the mitral leaflets to create a double orifice with improved leaflet coaptation was introduced in the early 1990s. Recently, a percutaneous method to create the same type of repair was developed. A trans-septal approach was used to deliver a clip device that grasps the mitral leaflet edges to create the double orifice.

METHODS: General anesthesia, fluoroscopy, and echocardiographic guidance are used. A 24-F guide is positioned in the left atrium. The clip is centered over the mitral orifice, passed into the left ventricle, and pulled back to grasp the mitral leaflets. After verification that MR is reduced, the clip is released.

RESULTS: Twenty-seven patients had six-month follow-up. Clips were implanted in 24 patients. There were no procedural complications and four 30-day major adverse events: partial clip detachment in three patients, who underwent elective valve surgery, and one patient with post-procedure stroke that resolved at one month. Three additional patients had surgery for unresolved MR, leaving 18 patients free from surgery. In 13 of 14 patients with reduction of MR to < or =2+ after one month, the reduction was maintained at six months.

CONCLUSIONS: Percutaneous edge-to-edge mitral valve repair can be performed safely and a reduction in MR can be achieved in a significant proportion of patients to six months. Patients who required subsequent surgery had elective mitral valve repair or intended replacement.

STUDIO PILOTA -> SICUREZZA E FATTIBILITA’

Mitra Clip

Percutaneous repair or surgery for mitral regurgitation.

Feldman T[1], Foster E, Glower DD, Kar S, Rinaldi MJ, Fail PS, Smalling RW, Siegel R, Rose GA, Engeron E, Loghin C, Trento A, Skipper ER, Fudge T, Letsou GV, Massaro JM, Mauri L; EVEREST II Investigators.

⊕ **Collaborators (282)**

⊕ **Author information**

Erratum in
N Engl J Med. 2011 Jul 14;365(2):189. Glower, Donald G [corrected to Glower, Donald D].

Abstract

BACKGROUND: Mitral-valve repair can be accomplished with an investigational procedure that involves the percutaneous implantation of a clip that grasps and approximates the edges of the mitral leaflets at the origin of the regurgitant jet.

METHODS: We randomly assigned 279 patients with moderately severe or severe (grade 3+ or 4+) mitral regurgitation in a 2:1 ratio to undergo either percutaneous repair or conventional surgery for repair or replacement of the mitral valve. The primary composite end point for efficacy was freedom from death, from surgery for mitral-valve dysfunction, and from grade 3+ or 4+ mitral regurgitation at 12 months. The primary safety end point was a composite of major adverse events within 30 days.

RESULTS: At 12 months, the rates of the primary end point for efficacy were 55% in the percutaneous-repair group and 73% in the surgery group (P=0.007). The respective rates of the components of the primary end point were as follows: death, 6% in each group; surgery for mitral-valve dysfunction, 20% versus 2%; and grade 3+ or 4+ mitral regurgitation, 21% versus 20%. Major adverse events occurred in 15% of patients in the percutaneous-repair group and 48% of patients in the surgery group at 30 days (P<0.001). At 12 months, both groups had improved left ventricular size, New York Heart Association functional class, and quality-of-life measures, as compared with baseline.

CONCLUSIONS: Although percutaneous repair was less effective at reducing mitral regurgitation than conventional surgery, the procedure was associated with superior safety and similar improvements in clinical outcomes. (Funded by Abbott Vascular; EVEREST II ClinicalTrials.gov number, NCT00209274.).

STUDIO DI COMPARAZIONE -> MINORE EFFICACIA E MAGGIORE SICUREZZA

MitraClip

Randomized Comparison of Percutaneous Repair and Surgery for Mitral Regurgitation: 5-Year Results of EVEREST II.

Feldman T[1], Kar S[2], Elmariah S[3], Smart SC[4], Trento A[5], Siegel RJ[2], Apruzzese P[6], Fail P[7], Rinaldi MJ[8], Smalling RW[9], Hermiller JB[10], Heimansohn D[11], Gray WA[12], Grayburn PA[13], Mack MJ[14], Lim DS[15], Ailawadi G[16], Herrmann HC[17], Acker MA[18], Silvestry FE[17], Foster E[19], Wang A[20], Glower DD[21], Mauri L[22]; EVEREST II Investigators.

⊕ **Author information**

Abstract

BACKGROUND: In EVEREST II (Endovascular Valve Edge-to-Edge Repair Study), treatment of mitral regurgitation (MR) with a novel percutaneous device showed superior safety compared with surgery, but less effective reduction in MR at 1 year.

OBJECTIVES: This study sought to evaluate the final 5-year clinical outcomes and durability of percutaneous mitral valve (MV) repair with the MitraClip device compared with conventional MV surgery.

METHODS: Patients with grade 3+ or 4+ MR were randomly assigned to percutaneous repair with the device or conventional MV surgery in a 2:1 ratio (178:80). Patients prospectively consented to 5 years of follow-up.

RESULTS: At 5 years, the rate of the composite endpoint of freedom from death, surgery, or 3+ or 4+ MR in the as-treated population was 44.2% versus 64.3% in the percutaneous repair and surgical groups, respectively ($p = 0.01$). The difference was driven by increased rates of 3+ to 4+ MR (12.3% vs. 1.8%; $p = 0.02$) and surgery (27.9% vs. 8.9%; $p = 0.003$) with percutaneous repair. After percutaneous repair, 78% of surgeries occurred within the first 6 months. Beyond 6 months, rates of surgery and moderate-to-severe MR were comparable between groups. Five-year mortality rates were 20.8% and 26.8% ($p = 0.4$) for percutaneous repair and surgery, respectively. In multivariable analysis, treatment strategy was not associated with survival.

CONCLUSIONS: Patients treated with percutaneous repair more commonly required surgery for residual MR during the first year after treatment, but between 1- and 5-year follow-up, comparably low rates of surgery for MV dysfunction with either percutaneous or surgical therapy endorse the durability of MR reduction with both repair techniques. (EVEREST II Pivotal Study High Risk Registry; NCT00209274).

Ed il reverse remodelling ?

Percutaneous mitral valve repair: The last chance for symptoms improvement in advanced refractory chronic heart failure?

Alessandra Berardini[1], Elena Biagini[1], Francesco Saia[1], Davide Stolfo[1], Mario Previtali[1], Francesco Grigioni[1], Bruno Pinamonti[1], Gabriele Crimi[1], Alessandro Salvi[1], Maurizio Ferrario[1], Antonio De Luca[1], Fabrizio Gazzoli[1], Maria Letizia Bacchi Reggiani[1], Claudia Raineri[1], Gianfranco Sinagra[1], Claudio Rapezzi[1],

Results

Mean age was 67 ± 11 years, logistic EuroSCORE = 23 ± 18%, left ventricle ejection fraction (LVEF) 30 ± 9%. In 6 patients (8%) PMVR was performed as a bridge to heart transplant; many patients were dependent from iv diuretics and/or inotropes. Rate of serious adverse in-hospital events was 1.3% (1 patient who died after conversion to cardiac surgery). Sixty-three patients (84%) were discharged with MR ≤ 2+. At 6-month, 4 patients died (5%), 80% had MR ≤ 2+ and 75% were in New York Heart Association class ≤II. Median pro-BNP decreased from 4395 pg/ml to 2594 pg/ml ($p = 0.04$). There were no significant changes in LV end-diastolic volume (222 ± 75 ml vs. 217 ± 79, $p = 0.19$), end-systolic volume (LVESV, 154 ± 66 ml vs. 156 ± 69, $p = 0.54$) and LVEF (30 ± 9% vs. 30 ± 12%, $p = 0.86$). Significant reverse remodeling (reduction of LVESV ≥ 10%) was observed in 25%, without apparent association with baseline characteristics. The number of hospitalizations for HF in comparison with the 6 months before PMVR were reduced from 1.1 ± 0.8 to 0.3 ± 0.6 ($p < 0.001$).

Conclusions

In extreme risk HF patients with FMR, PMVR improved symptoms and reduced re-hospitalization and pro-BNP levels at 6 months, despite the lack of LV reverse remodeling.

International Journal of CARDIOLOGY

Trattamento dell'IM secondaria

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Cardiac Surgery

Impact of Mitral Valve Annuloplasty Combined With Revascularization in Patients With Functional Ischemic Mitral Regurgitation

Tomislav Mihaljevic, MD,* Buu-Khanh Lam, MD,* Jeevanantham Rajeswaran, MSc,†
Masami Takagaki, MD,* Michael S. Lauer, MD,‡ A. Marc Gillinov, MD,*
Eugene H. Blackstone, MD,*† Bruce W. Lytle, MD*

Cleveland, Ohio

Conclusions Although CABG + MV annuloplasty reduces postoperative MR and improves early symptoms compared with CABG alone, it does not improve long-term functional status or survival in patients with severe functional ischemic MR. The MV annuloplasty in this setting, without addressing fundamental ventricular pathology, is insufficient to improve long-term clinical outcomes. (J Am Coll Cardiol 2007;49:2191–201) © 2007 by the American College of Cardiology Foundation

Trattamento dell'IM secondaria

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Vol. 45, No. 3, 2005
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doi:10.1016/j.jacc.2004.09.073

Recommendations	Class[b]	Level[c]
Surgery is indicated in patients with severe secondary mitral regurgitation undergoing CABG and LVEF >30%.	I	C
Surgery should be considered in symptomatic patients with severe secondary mitral regurgitation, LVEF <30% but with an option for revascularization and evidence of myocardial viability.	IIa	C

ricular Dysfunction

Impact of Mi
Annuloplasty
in Patients W
and Left Ven

Audrey H. Wu, MD,
Francis D. Pagani, MD, PhD, FACC,† Kathy Welch, MS, MPH,† Todd M. Koelling, MD, FACC*
FACC,†
Ann Arbor, Michigan

IIa C
Surgery should be considered in patients with moderate secondary mitral regurgitation undergoing CABG

Taken out

significant MR with severe LV dysfunction. A prospective randomized control trial is warranted for further study of mortality with MVA in this population. (J Am Coll Cardiol 2005;45:381–7) © 2005 by the American College of Cardiology Foundation

Tutte le indicazioni sono in LIVELLO DI RACCOMANDAZIONE C

Trattamento dell'IM secondaria : quali novità?

IIb C

When revascularization is not indicated, surgery may

NESSUNA EVIDENZA A SUPPORTO

who remain symptomatic despite optimal medical management (including CRT if indicated).

IIb C (modified)

When revascularization is not indicated, surgery may be considered in patients with severe secondary mitral regurgitation and LVEF >30%, who remain symptomatic despite optimal medical management (including CRT if indicated) and have a low surgical risk.

When revascularization is not indicated and surgical risk is not low, a percutaneous edge-to-edge procedure may be considered in patients with severe secondary mitral

Percutaneous mitral valve interventions in the real world: early and 1-year results from the ACCESS-EU, a prospective, multicenter, nonrandomized post-approval study of the MitraClip therapy in Europe.

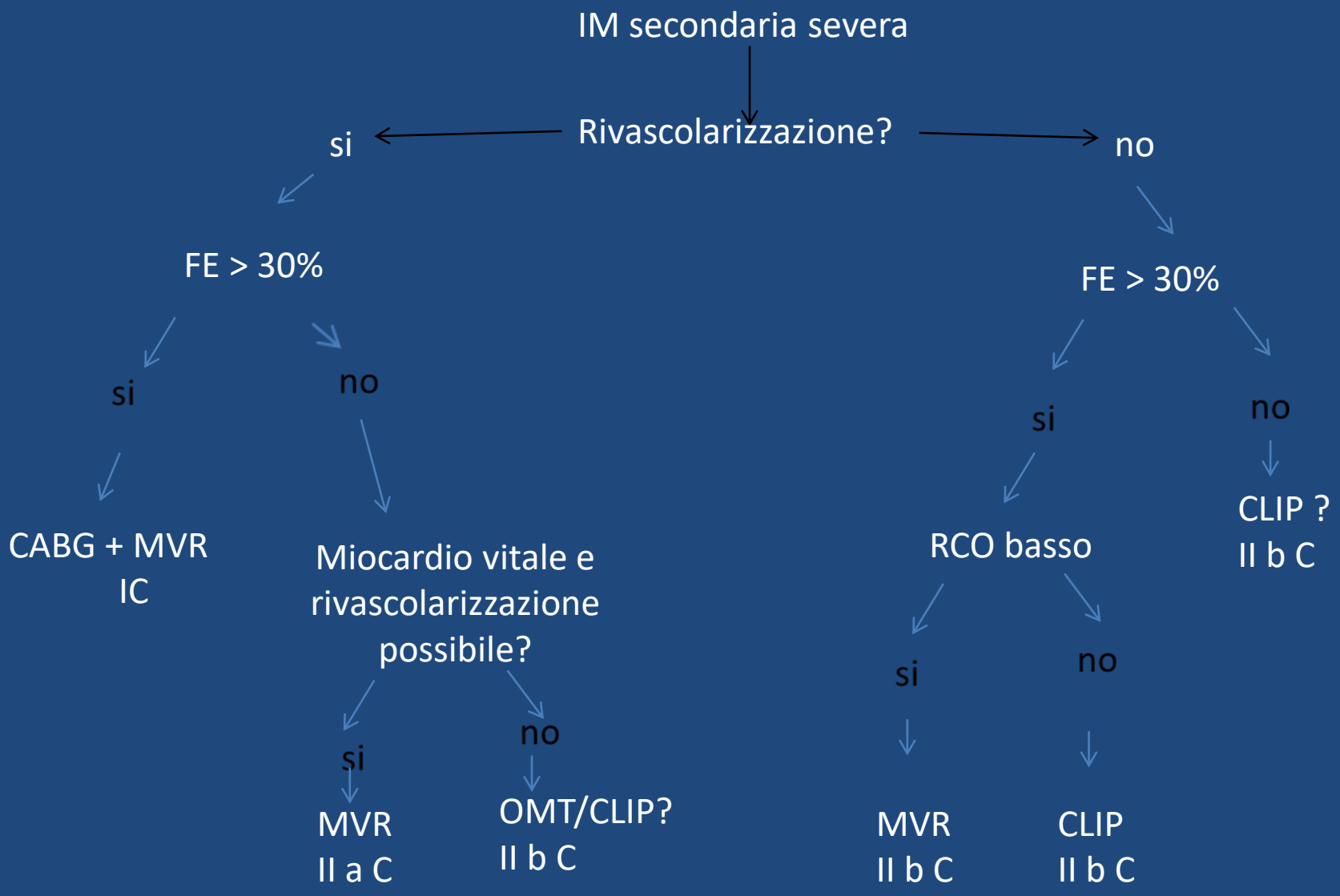
Maisano F[1], Franzen O[2], Baldus S[3], Schäfer U[4], Hausleiter J[5], Butter C[6], Ussia GP[7], Sievert H[8], Richardt G[9], Widder JD[10], Moccetti T[11], Schillinger W[12].

CONCLUSIONS: In the real-world, post-approval experience in Europe, patients undergoing the MitraClip therapy are high-risk, elderly patients, mainly affected by functional MR. In this patient population, the MitraClip procedure is effective with low rates of hospital mortality and adverse events.

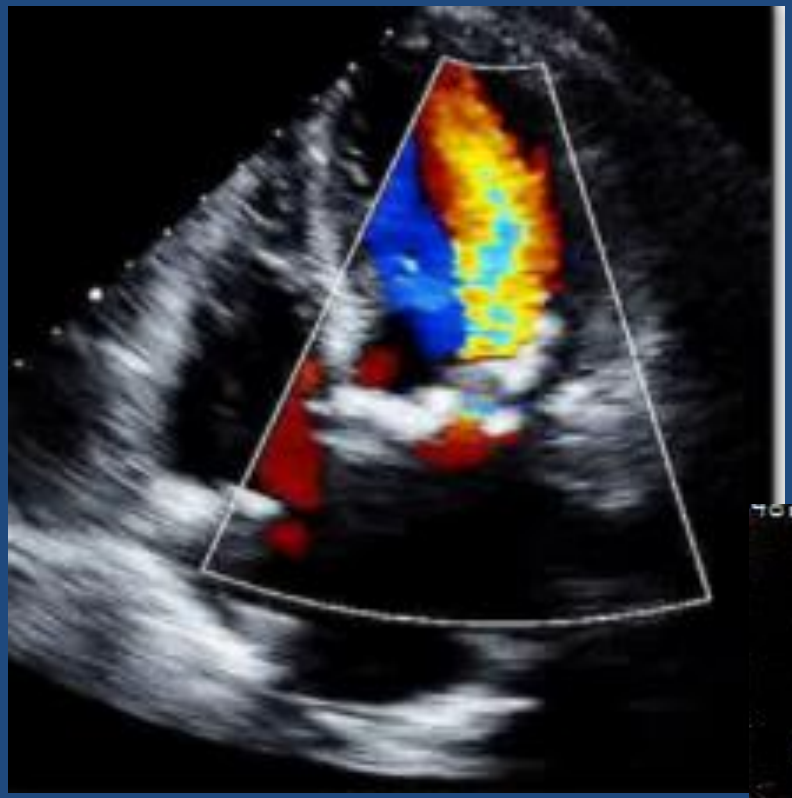
Additional statement:

The lower thresholds defining severe MR compared to primary MR are based on their association with prognosis. However, it is unclear if prognosis is independently affected by MR compared to LV dysfunction. For isolated mitral valve treatment in secondary MR, thresholds of severity of MR for intervention still need to be validated in clinical trials. So far, no survival benefit has been confirmed for reduction of secondary MR.

RIASSUMENDO

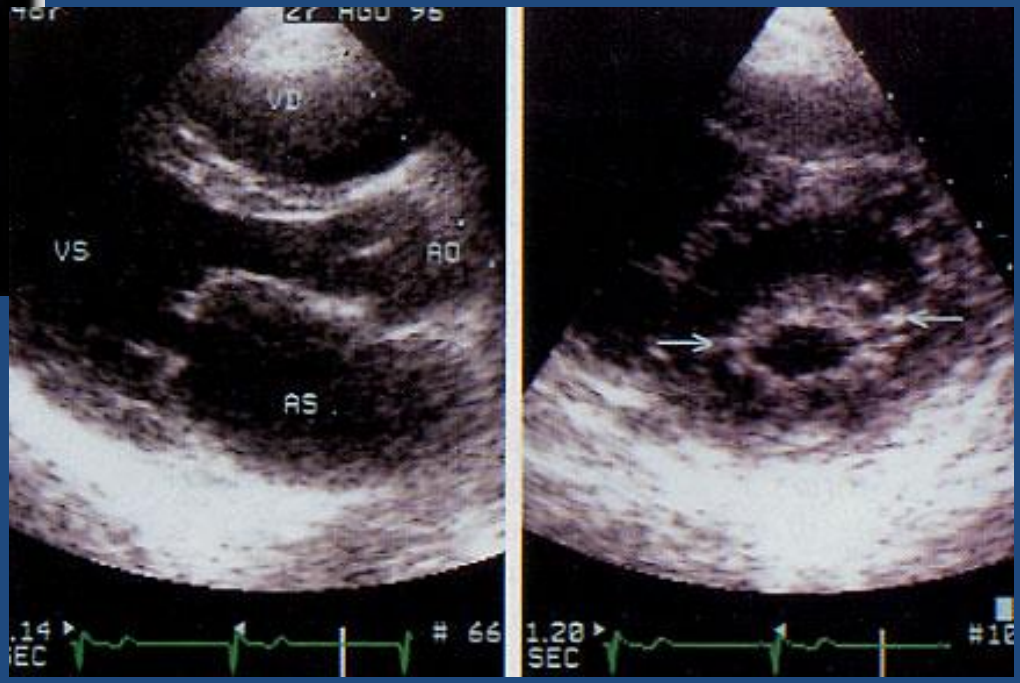


Stenosi mitralica

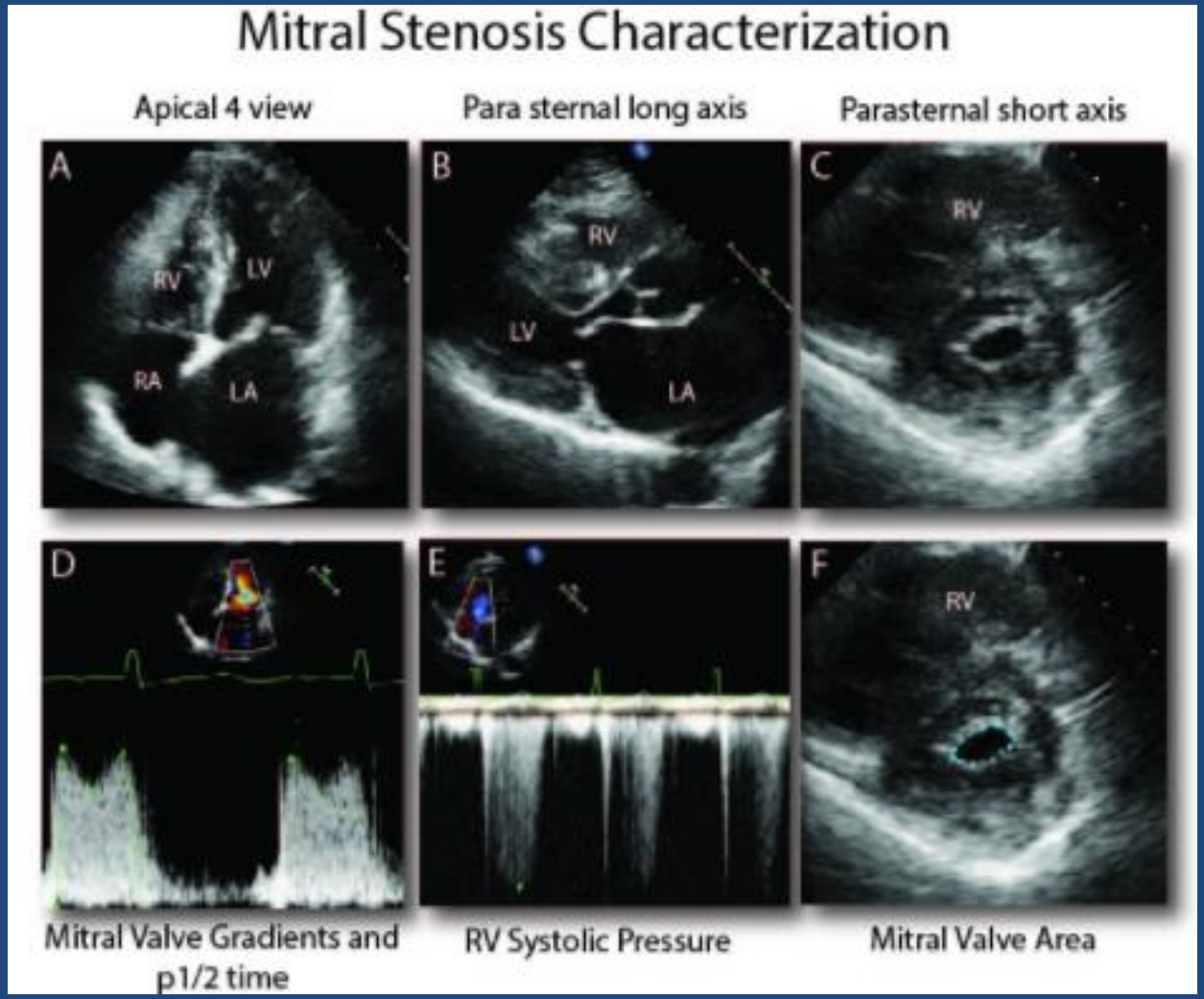


Congenita:
- Ipoplasica
- Paracadute
- Doppio orifizio
- Arcata anomala

Acquisita:
- Reumatica
- Calcificazioni
- LES
- Artrite
- Gotta
- ……



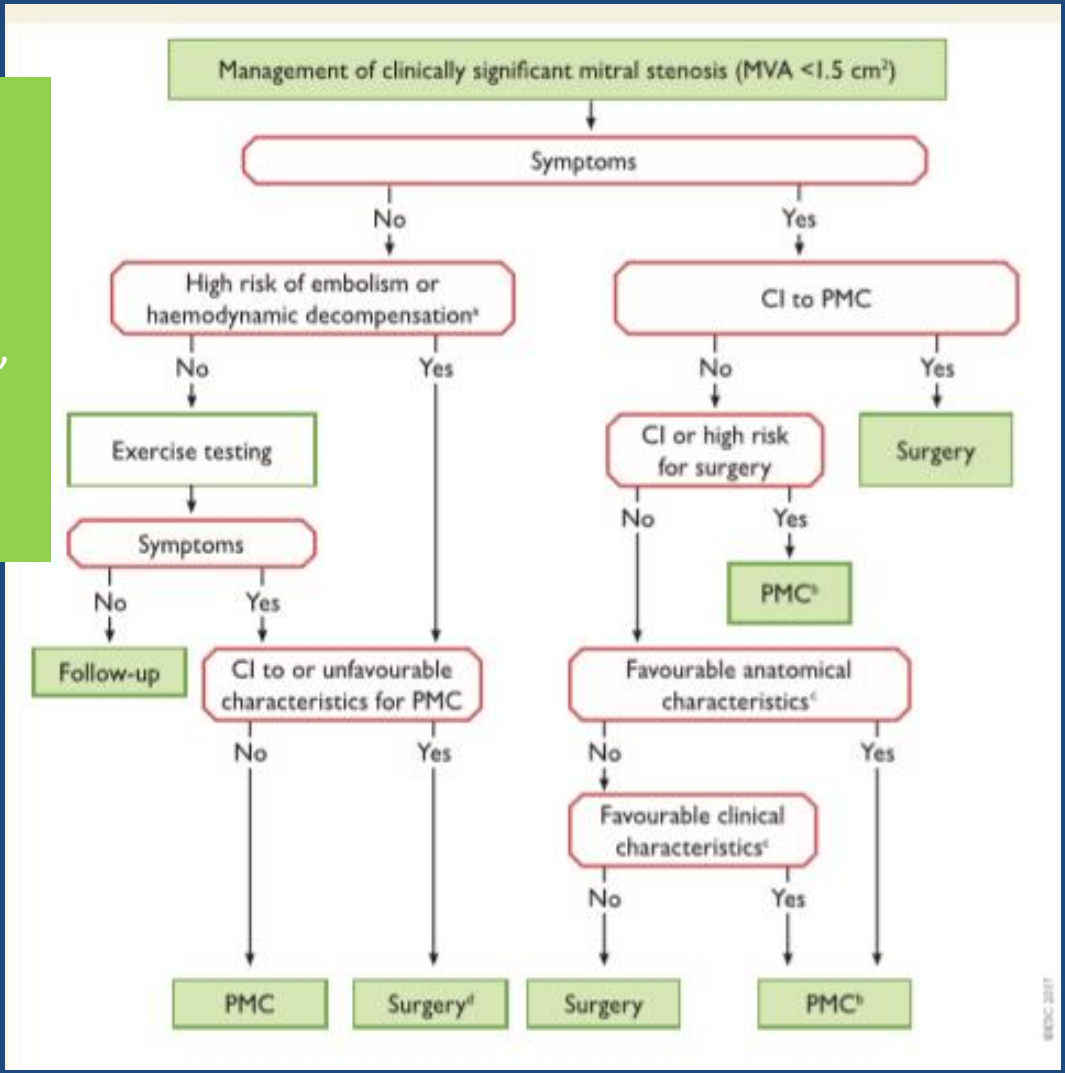
Valutazione ecocardiografica



- Valutazione visiva e color;
- Area planimetrica (< 1 cmq);
- Gradiente medio (>10 mmHg);
- Pendenza onda e ridotta;
- PHT > 200 (ava = 220/pht)
- PISA ed Equazione continuità

Trattamento stenosi mitralica

- Trombo atrio
- storia embolismo
- FA nuova
- pAPS sopra 50,
- intervento ch maggiore
- gravidanza



Trattamento stenosi mitralica

Contra-indications
Mitral valve area >1.5 cm^{2}[a]
Left atrial thrombus
More than mild mitral regurgitation
Severe or bi-commissural calcification
Absence of commissural fusion
Severe concomitant aortic valve disease, or severe combined tricuspid stenosis and regurgitation requiring surgery
Concomitant CAD requiring bypass surgery

Assessment of mitral valve anatomy according to the Wilkins score[145]

Grade	Mobility	Thickening	Calcification	Subvalvular thickening
1	Highly mobile valve with only leaflet tips restricted	Leaflets near normal in thickness (4–5 mm)	A single area of increased echo brightness	Minimal thickening just below the mitral leaflets
2	Leaflet mid and base portions have normal mobility	Mid leaflets normal, considerable thickening of margins (5–8 mm)	Scattered areas of brightness confined to leaflet margins	Thickening of chordal structures extending to one third of the chordal length
3	Valve continues to move forward in diastole, mainly from the base	Thickening extending through the entire leaflet (5–8 mm)	Brightness extending into the mid portions of the leaflets	Thickening extended to distal third of the chords
4	No or minimal forward movement of the leaflets in diastole	Considerable thickening of all leaflet tissue (>8–10 mm)	Extensive brightness throughout much of the leaflet tissue	Extensive thickening and shortening of all chordal structures extending down to the papillary muscles

The total score is the sum of the four items and ranges between 4 and 16.

Trattamento stenosi mitralica

7.5 Special patient populations

When restenosis with symptoms occurs after surgical commissurotomy or PMC, reintervention in most cases requires valve replacement, but PMC can be proposed in selected candidates with favourable characteristics if the predominant mechanism is commissural refusion.[151]

In the elderly populatic
gery is high risk, PMC is a
elderly patients, surgery
patients with degenerati
mitral annulus, surgery is
fusion in these cases, deg
PMC.[143] If degenerative
experience has suggestec
TAVI bioprosthesis in th
elderly patients who are i
In patients with severe
valve disease, surgery is
The management of pati
difficult and requires a c
by the Heart Team.

In cases with severe mi
ease, PMC can be perfor
both valves.

In patients with severe
ered in selected patients
ment and functional tricu
hypertension. In other ca

Valve replacement is
cases of severe mitral st
missural fusion is absent.

Transcatheter Mitral Valve Replacement in Native Mitral Valve Disease With Severe Mitral Annular Calcification: Results From the First Multicenter Global Registry.

Guerrero M[1], Dvir D[2], Himbert D[3], Urena M[3], Eleid M[4], Wang DD[5], Greenbaum A[5], Mahadevan VS[6], Holzhey D[7], O'Hair D[8], Dumonteil N[9], Rodés-Cabau J[10], Piazza N[11], Palma JH[12], DeLago A[13], Ferrari E[14], Witkowski A[15], Wendler O[16], Kornowski R[17], Martinez-Clark P[18], Ciaburri D[19], Shemin R[20], Alnasser S[21], McAllister D[22], Bena M[23], Kerendi F[24], Pavlides G[25], Sobrinho JJ[26], Attizzani GF[27], George I[28], Nickenig G[29], Fassa AA[30], Cribier A[31], Bapat V[32], Feldman T[33], Rihal C[4], Vahanian A[3], Webb J[2], O'Neill W[5].

⊕ **Author information**

Abstract

OBJECTIVES: This study sought to evaluate the outcomes of the early experience of transcatheter mitral valve replacement (TMVR) with balloon-expandable valves in patients with severe mitral annular calcification (MAC) and reports the first large series from a multicenter global registry.

BACKGROUND: The risk of surgical mitral valve replacement in patients with severe MAC is high. There are isolated reports of successful TMVR with balloon-expandable valves in this patient population.

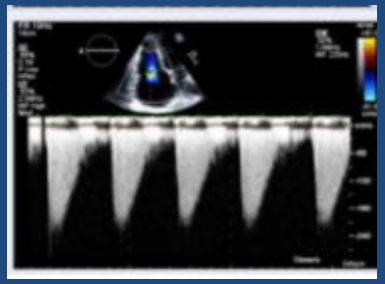
METHODS: We performed a multicenter retrospective review of clinical outcomes of patients with severe MAC undergoing TMVR.

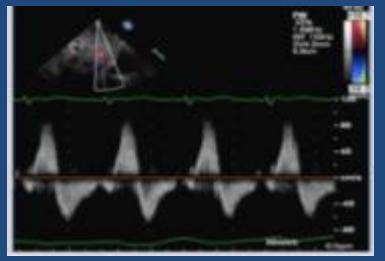
RESULTS: From September 2012 to July of 2015, 64 patients in 32 centers underwent TMVR with compassionate use of balloon-expandable valves. Mean age was 73 ± 13 years, 66% were female, and mean Society of Thoracic Surgeons score was 14.4 ± 9.5%. The mean mitral gradient was 11.45 ± 4.4 mm Hg and the mean mitral area was 1.18 ± 0.5 cm(2). SAPIEN valves (Edwards Lifesciences, Irvine, California) were used in 7.8%, SAPIEN XT in 59.4%, SAPIEN 3 in 28.1%, and Inovare (Braile Biomedica, Brazil) in 4.7%. Access was transatrial in 15.6%, transapical in 43.8%, and transseptal in 40.6%. Technical success according to Mitral Valve Academic Research Consortium criteria was achieved in 46 (72%) patients, primarily limited by the need for a second valve in 11 (17.2%). Six (9.3%) had left ventricular tract obstruction with hemodynamic compromise. Mean mitral gradient post-procedure was 4 ± 2.2 mm Hg, paravalvular regurgitation was mild or absent in all. Thirty-day all-cause mortality was 29.7% (cardiovascular = 12.5% and noncardiac = 17.2%); 84% of the survivors with follow-up data available were in New York Heart Association functional class I or II at 30 days (n = 25).

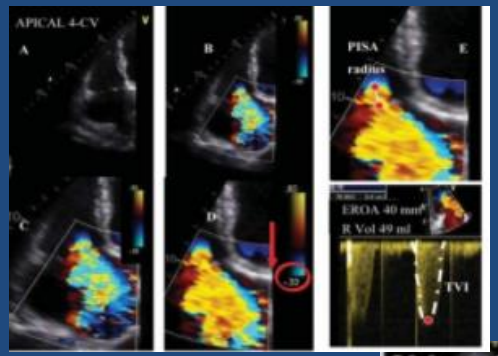
CONCLUSIONS: TMVR with balloon-expandable valves in patients with severe MAC is feasible but may be associated with significant adverse events. This strategy might be an alternative for selected high-risk patients with limited treatment options.

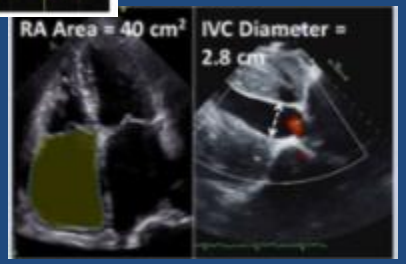
Insufficienza tricuspidalica

Qualitative	
Valve morphology	Abnormal/flail/large coaptation defect
Colour flow regurgitant jet	Very large central jet or eccentric wall impinging jet[a]
CW signal of regurgitant jet	Dense/triangular with early peaking (peak <2 m/s in massive TR)
Other	–
Semiquantitative	
Vena contracta width (mm)	≥7[a]
Upstream vein flow[c]	Systolic hepatic vein flow reversal
Inflow	E-wave dominant ≥1 m/s[e]
Other	PISA radius >9 mm[g]
Quantitative	
EROA (mm²)	≥40
Regurgitant volume (mL/beat)	≥45
+ enlargement of cardiac chambers/vessels	RV, RA, inferior vena cava

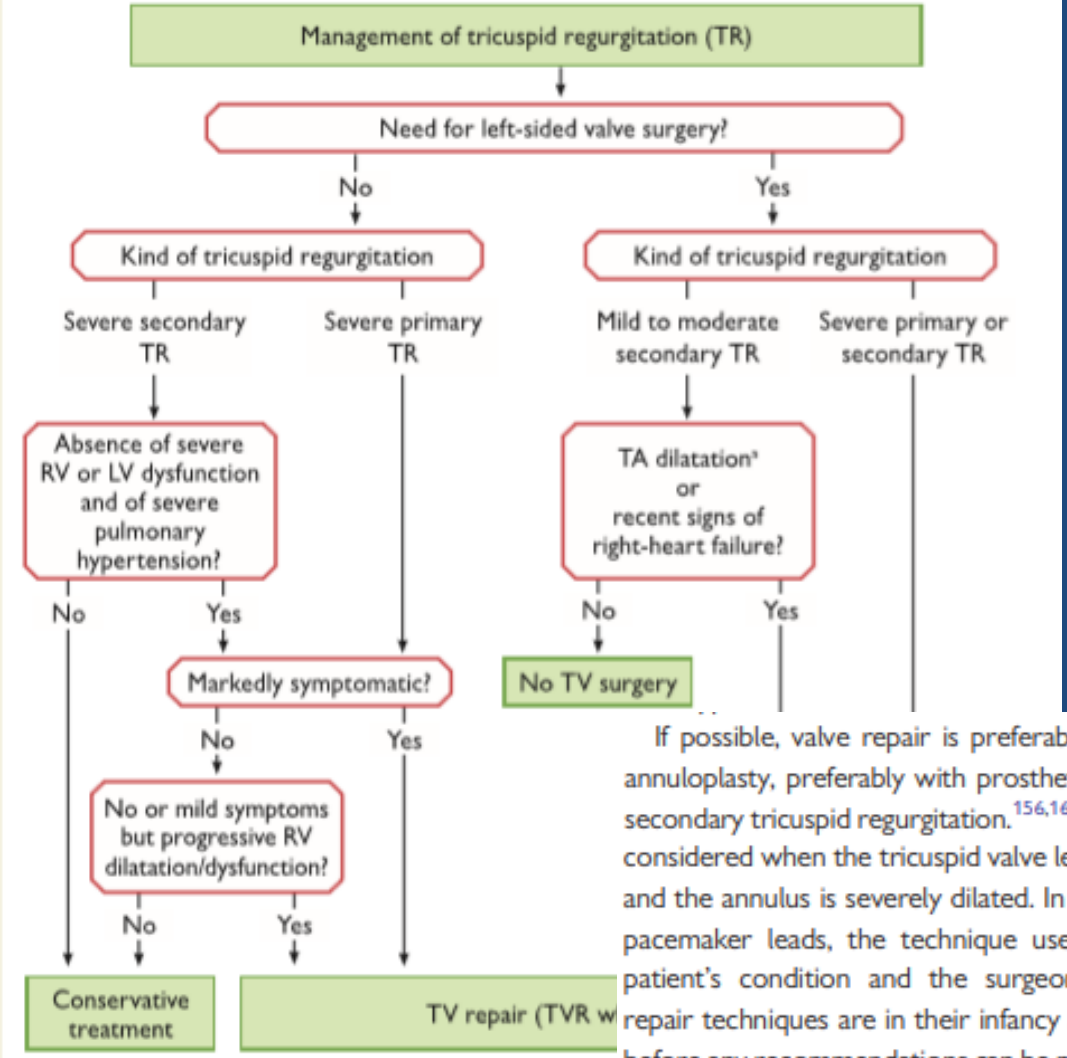








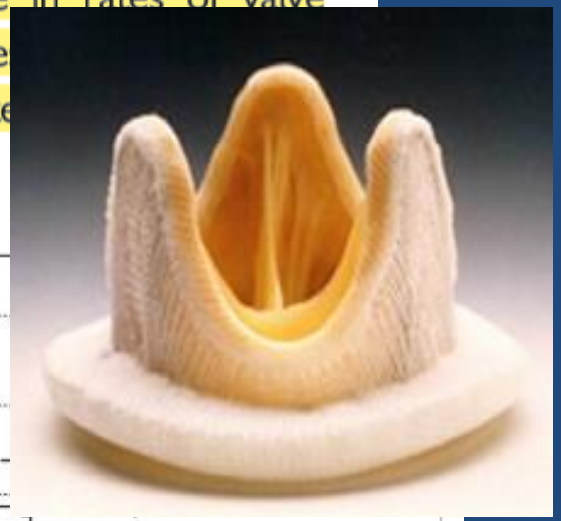
Trattamento insufficienza tricuspidalica



If possible, valve repair is preferable to valve replacement. Ring annuloplasty, preferably with prosthetic rings, is key to surgery for secondary tricuspid regurgitation.[156,161] Valve replacement should be considered when the tricuspid valve leaflets are significantly tethered and the annulus is severely dilated. In the presence of transtricuspid pacemaker leads, the technique used should be adapted to the patient's condition and the surgeon's experience. Percutaneous repair techniques are in their infancy and must be further evaluated before any recommendations can be made.

Valvole protesiche

Every valve prosthesis introduces a new disease process. In practice, the choice is between a mechanical and a biological prosthesis. Randomized trials comparing both prostheses consistently found similar survival, no significant difference in rates of valve
romboembolism, higher rate
eses and higher rates of reinte



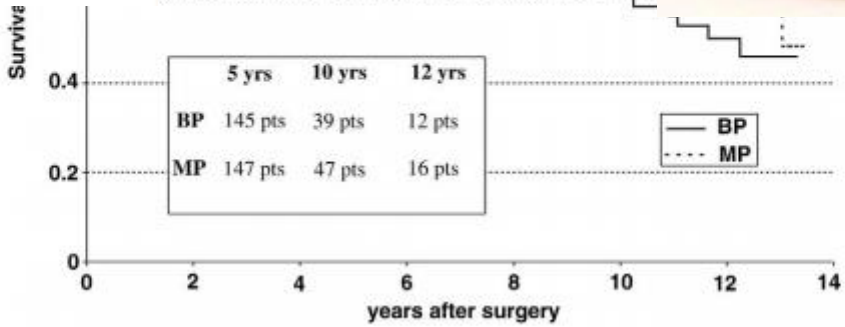


Figure 1 Overall Survival of Patients Who Received Either MP or BP Valves

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November 10, 2009:1862–8

Meccanica o biologica?

Choice of the aortic/mitral prosthesis in favour of a mechanical prosthesis; the decision is based on the integration of several of the following factors

Recommendations	Class[a]	Level[b]
A mechanical prosthesis is recommended according to the desire of the informed patient and if there are no contraindications to long-term anticoagulation.[c]	I	C
A mechanical prosthesis is recommended in patients at risk of accelerated structural valve deterioration.[d]	I	C
A mechanical prosthesis should be considered in patients already on anticoagulation because of a mechanical prosthesis in another valve position.	IIa	C
A mechanical prosthesis should be considered in patients <60 years of age for prostheses in the aortic position and		
A mechanical prost thromboembolism.		

LV = left ventricular.
[a]Class of recommendatic
[b]Level of evidence.
[c]Increased bleeding risk b
[d]Young age (<40 years),
[e]In patients 60–65 years and the choice requires
[f]Life expectancy should b
[g]Risk factors for thrombo

Tutte le indicazioni sono in LIVELLO DI RACCOMANDAZIONE C

Choice of the aortic/mitral prosthesis in favour of a bioprosthesis; the decision is based on the integration of several of the following factors

Recommendations	Class[a]	Level[b]
A bioprosthesis is recommended according to the desire of the informed patient.	I	C
A bioprosthesis is recommended when good-quality anticoagulation is unlikely (compliance problems, not readily available) or contraindicated because of high bleeding risk (previous major bleed, comorbidities, unwillingness, compliance problems, lifestyle, occupation).	I	C
A bioprosthesis is recommended for reoperation for mechanical valve thrombosis despite good long-term anticoagulant control.	I	C
A bioprosthesis should be considered in patients for whom there is a low likelihood and/or a low operative risk of future redo valve surgery.	IIa	C
A bioprosthesis should be considered in young women contemplating pregnancy.	IIa	C
A bioprosthesis should be considered in patients >65 years of age for a prosthesis in the aortic position or > 70 years of age in a mitral position or those with a life expectancy[c] lower than the presumed durability of the bioprosthesis.[d]	IIa	C

[a]Class of recommendation.
[b]Level of evidence.
[c]Life expectancy should be estimated according to age, sex, comorbidities and country-specific life expectancy.
[d]In patients 60–65 years of age who should receive an aortic prosthesis and those between 65 and 70 years of age in the case of mitral prosthesis, both valves are acceptable and the choice requires careful analysis of factors other than age.

Riassumendo

Protesi meccanica

- necessità terapia anticoagulante
- Grande area grigia:
  Tutte le indicazioni sono in LIVELLO DI RACCOMANDAZIONE C
  Limite di età arbitrario
- Possibilità di valve in valve
  La decisione spetta al paziente ed al medico
- iperparatiroidismo, IRC

Protesi biologica

- Più elevata deterioriabilità

Gestione della terapia

Indications for antithrombotic therapy in patients with a prosthetic

Recommendations		
Mechanical prostheses		
Oral anticoagulation using a VKA is recommended lifelong for all patients.[179]		
Bridging using therapeutic doses of UFH or LMWH is recommended when V interrupted.		
The addition of low-dose aspirin (75 - 100 mg/day) to VKA should be conside despite an adequate INR.		
The addition of low-dose aspirin (75 - 100 mg/day) to VKA may be considere atherosclerotic disease.		
INR self-management is recommended provided appropriate training and qu		
In patients treated with coronary stent implantation, triple therapy with aspir (75 mg/day) and VKA should be considered for 1 month, irrespective of the t presentation (i.e. ACS or stable CAD).[182]		
Triple therapy comprising aspirin (75–100 mg/day), clopidogrel (75 mg/day) and VKA for >1 month and up to 6 months should be considered in patients with high ischaemic risk due to ACS or other anatomical/procedural characteristics that outweighs the bleeding risk.[182]	IIa	B
Dual therapy comprising VKA and clopidogrel (75 mg/day) should be considered as an alternative to 1-month triple antithrombotic therapy in patients in whom the bleeding risk outweighs the ischaemic risk.[183,184]	IIa	A
In patients who have undergone PCI, discontinuation of antiplatelet treatment should be considered at 12 months.[185]	IIa	B
In patients requiring aspirin and/or clopidogrel in addition to VKA, the dose intensity of VKA should be carefully regulated with a target INR in the lower part of the recommended target range and a time in the therapeutic range >65 - 70%.[182,184]	IIa	B
The use of NOACs is contraindicated.[45]	III	B

Table 10 Target INR for mechanical prostheses

Prosthesis thrombogenicity	Patient-related risk factors[a]	
	None	≥1 risk factor
Low[b]	2.5	3.0
Medium[c]	3.0	3.5
High[d]	3.5	4.0

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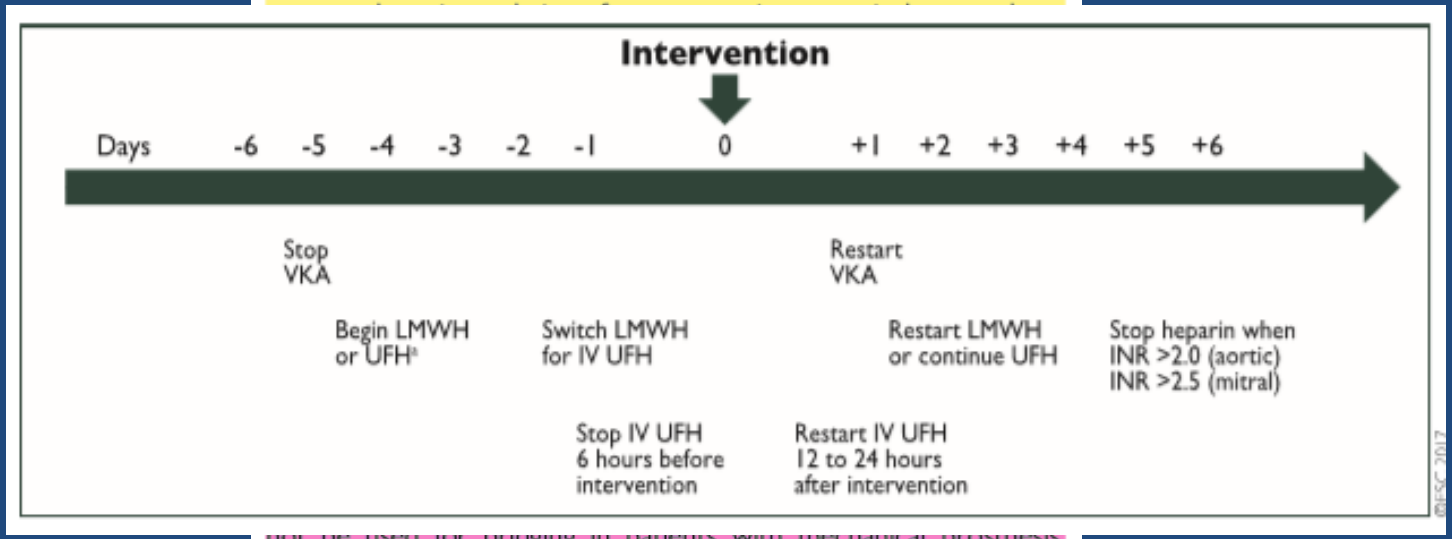
INR = international normalized ratio; LVEF = left ventricular ejection fraction.
[a]Mitral or tricuspid valve replacement; previous thromboembolism; atrial fibrillation; mitral stenosis of any degree; LVEF <35%.
[b]...Pivot, St Jude Medical, On-X, Sorin Bicarbon.
[c]Other bileaflet valves with insufficient data.
[d]Lillehei-Kaster, Omniscience, Starr-Edwards (ball-cage), Bjork-Shiley and other tilting-disc valves.

Gestione della terapia

Bioprostheses		
Oral anticoagulation is recommended lifelong for patients with surgical or transcatheter implanted bioprostheses who have other indications for anticoagulation.[c]	I	C
Oral anticoagulation using a VKA should be considered for the first 3 months after surgical implantation of a mitral or tricuspid bioprosthesis.	IIa	C
Oral anticoagulation using a VKA should be considered for the first 3 months after surgical mitral or tricuspid valve repair.	IIa	C
Low-dose aspirin (75 - 100 mg/day) should be considered for the first 3 months after surgical implantation of an aortic bioprosthesis or valve-sparing aortic surgery.	IIa	C
Dual antiplatelet therapy should be considered for the first 3–6 months after TAVI, followed by lifelong single antiplatelet therapy in patients who do not need oral anticoagulation for other reasons.	IIa	C
Single antiplatelet therapy may be considered after TAVI in the case of high bleeding risk.	IIb	C
Oral anticoagulation may be considered for the first 3 months after surgical implantation of an aortic bioprosthesis.	IIb	C

Interruzione temporanea dell'anticoagulante

Anticoagulation during non-cardiac surgery requires careful management based on risk assessment.[196] It is recommended not to inter-



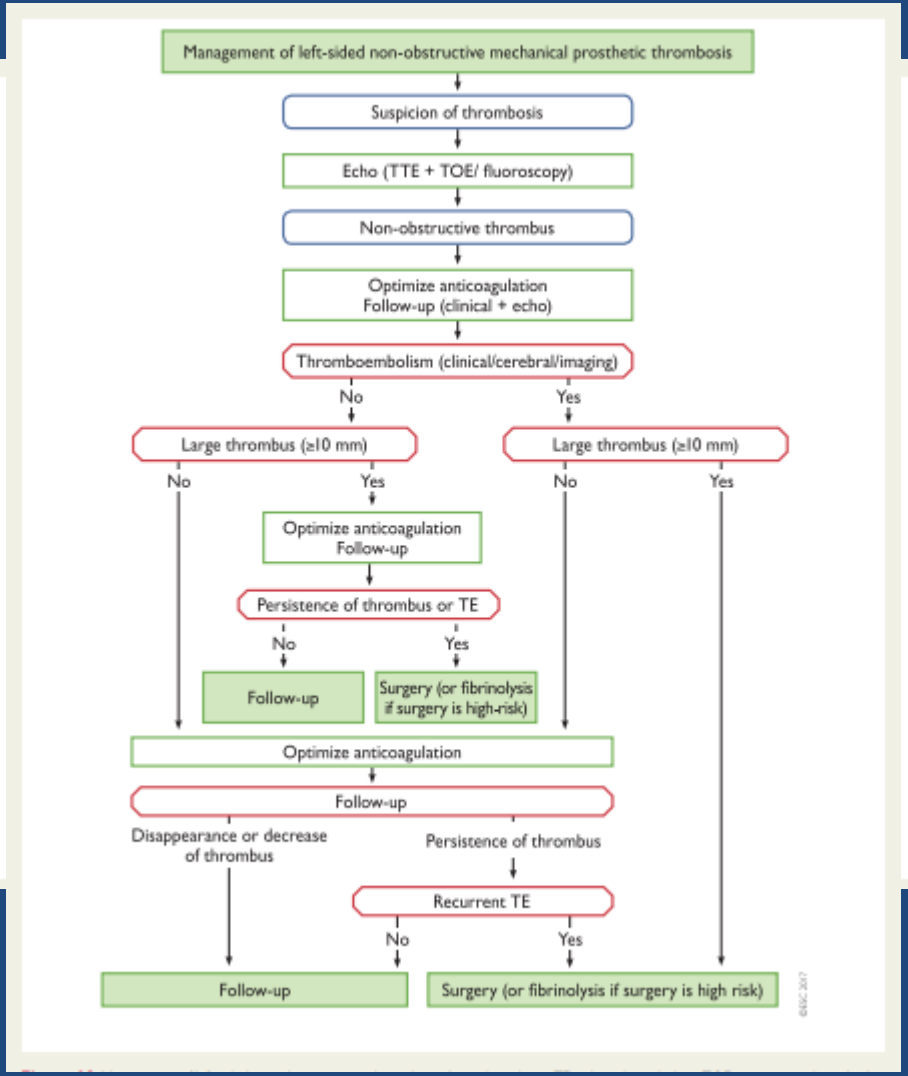
not be used for bridging in patients with mechanical prosthesis. Practical modalities of anticoagulation bridging are detailed in *Figure 8*.

If required, after a careful risk–benefit assessment, combined aspirin therapy should be discontinued 1 week before a non-cardiac procedure.

Oral anticoagulation can be continued at modified doses in the majority of patients who undergo cardiac catheterization, in particular using the radial approach. In patients who require transseptal catheterization for valvular interventions, direct LV puncture or pericardial drainage, oral anticoagulants should be stopped and bridging anticoagulation administered.[171]

Gestione delle disfunzioni

Recommendations	Class[a]	Level[b]
Mechanical prosthetic thrombosis		
Urgent or emergency valve replacement is recommended for obstructive thrombosis in critically ill patients without serious comorbidity.	I	C
Fibrinolysis (using recombinant tissue plasminogen activator 10 mg bolus + 90 mg in 90 min with UFH or streptokinase 1 500 000 U in 60 min without UFH) should be considered when surgery is not available or is very high risk or for thrombosis of right-sided prostheses.	IIa	C
Surgery should be considered for large (>10 mm) non-obstructive prosthetic thrombus complicated by embolism.	IIa	C
Bioprosthetic thrombosis		
Anticoagulation using a VKA and/or UFH is recommended in bioprosthetic valve thrombosis before considering reintervention.	I	C



Grazie per