

Noves aportacions i limitacions de les tècniques d'imatge cardíaca en l'estudi de les valvulopaties



Miquel Gómez

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Universitat Autònoma de Barcelona

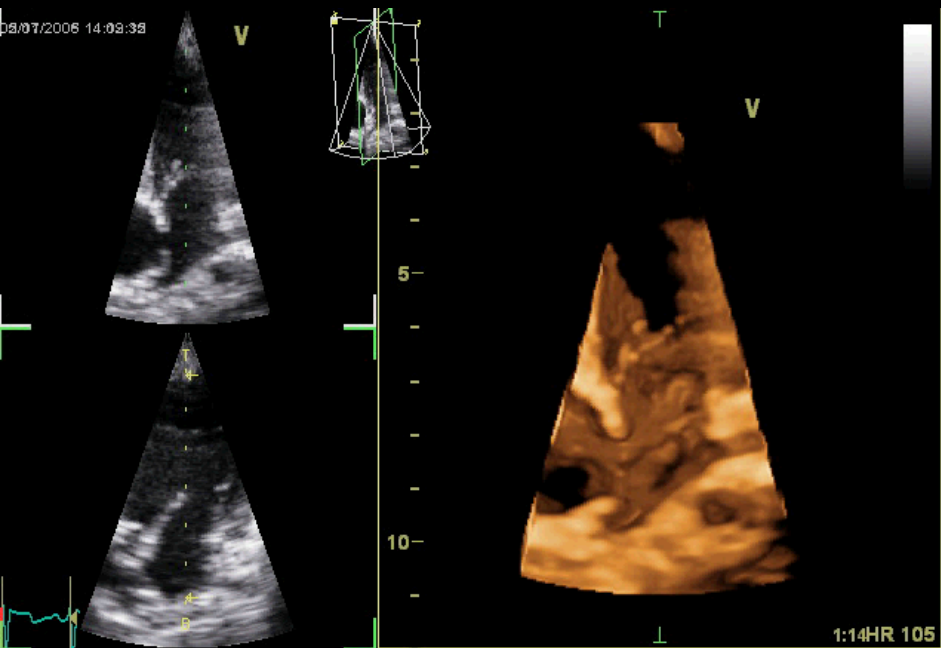
Noves aportacions i limitacions de les tècniques d'imatge cardíaca en les valvulopaties

- **Ecocardiografia 3D a la pràctica clínica**
- **Aportacions de la RM cardíaca**
- **Estratificació pronòstica a l'estenosi aòrtica**
- **Una nova visió de la valvulopatia aòrtica**

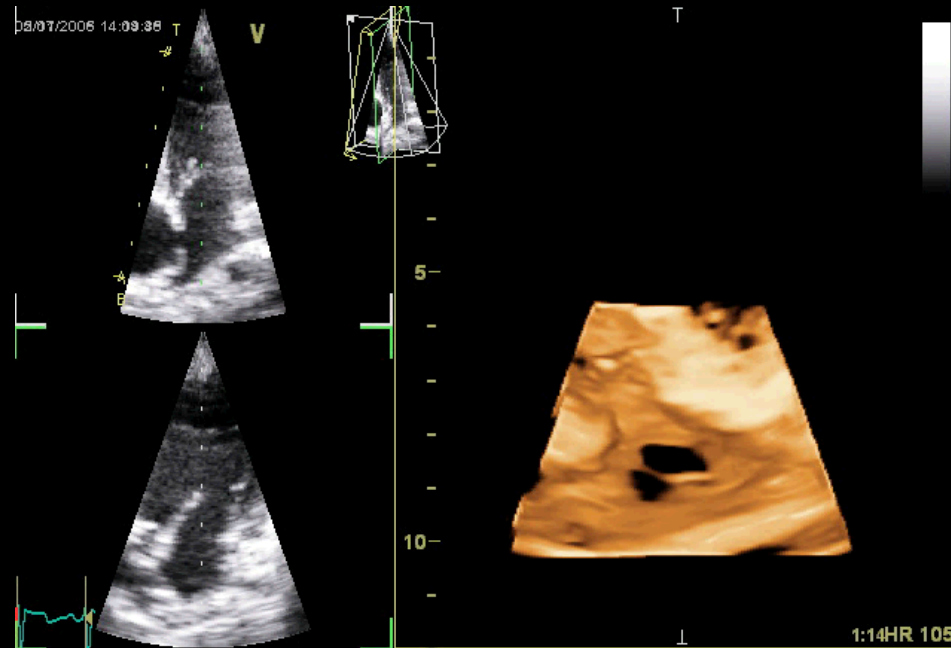
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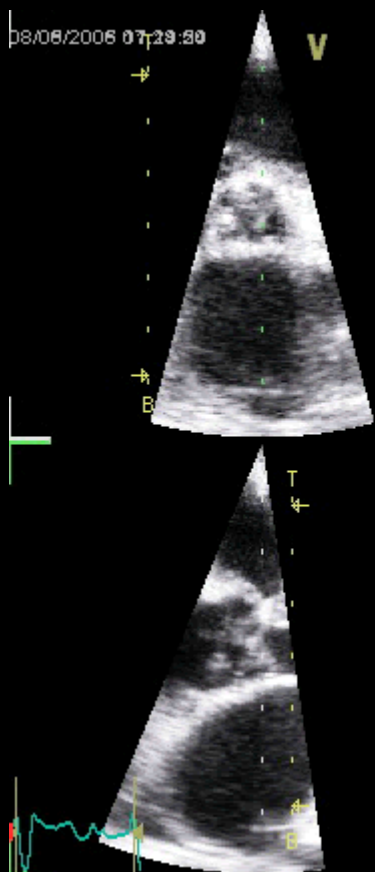
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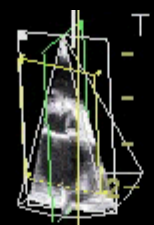
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V

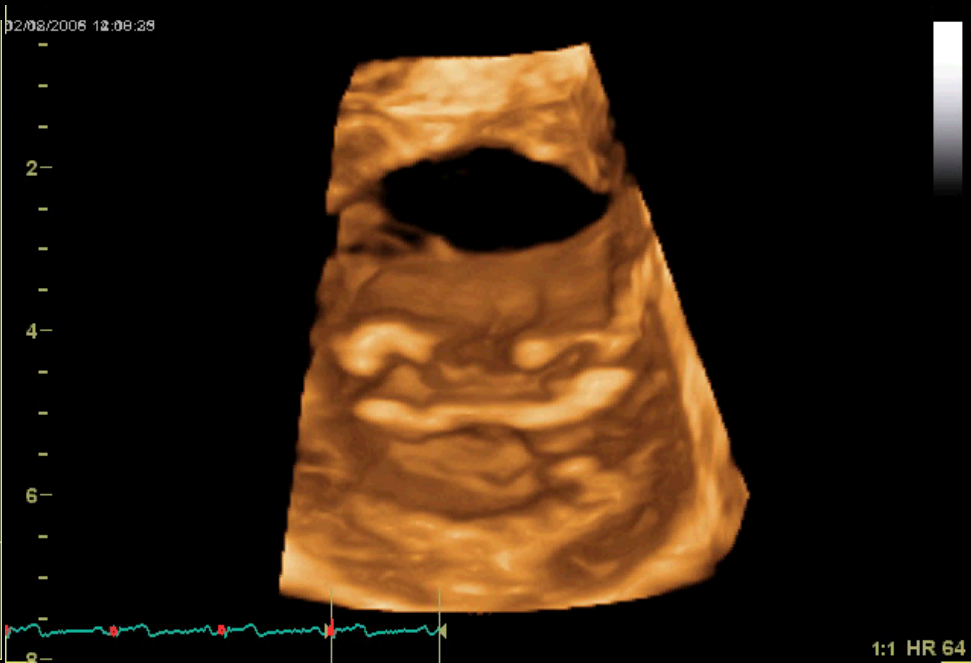
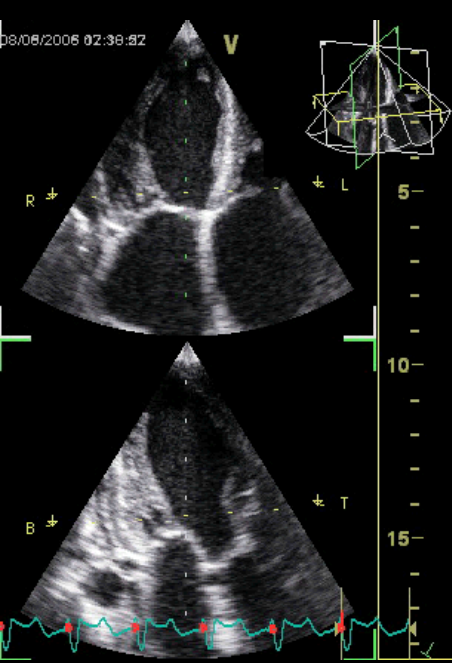


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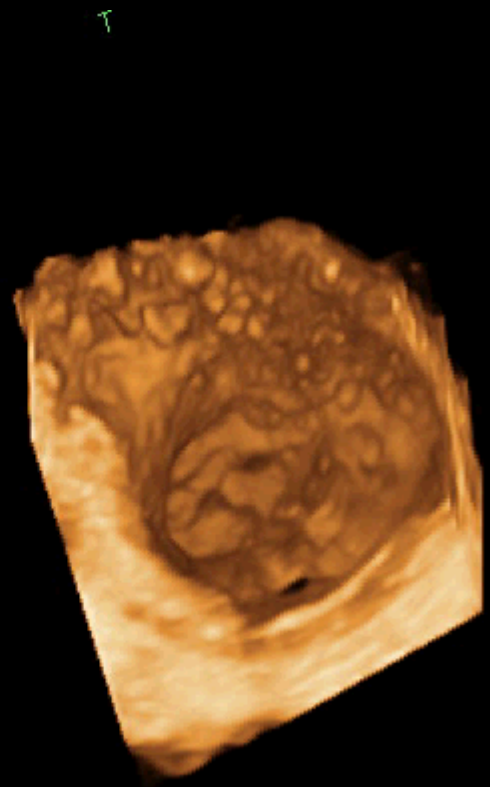
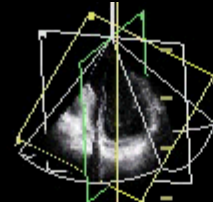
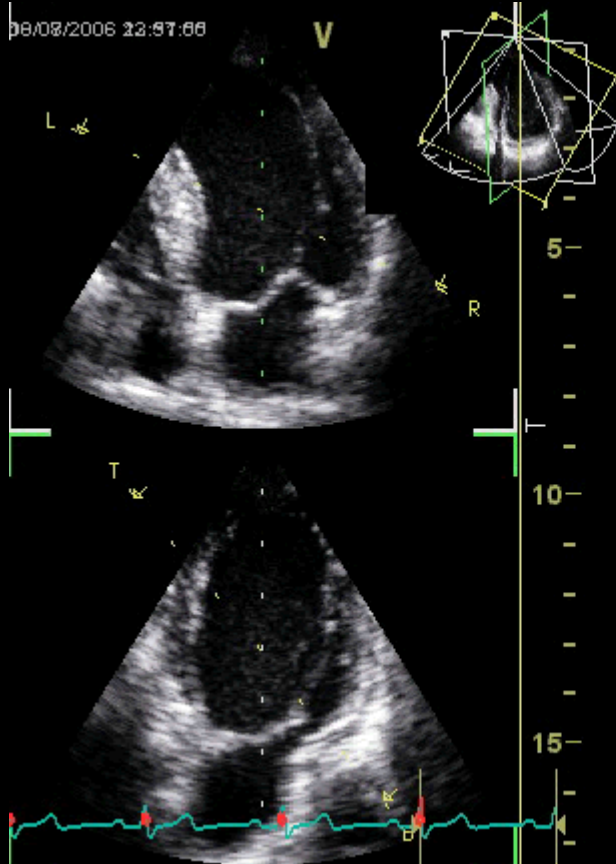


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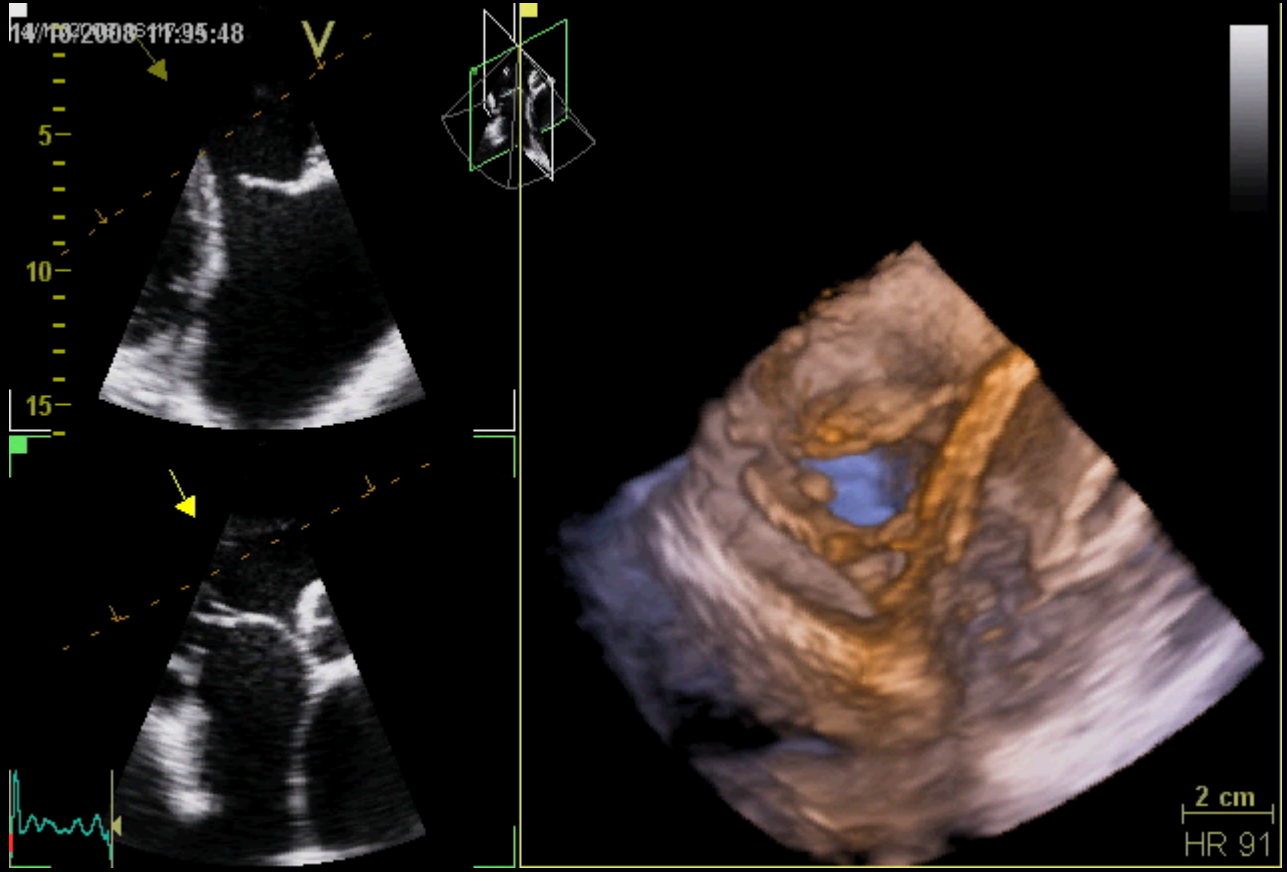
1:17 HR 78



08/08/2006 22:57:66



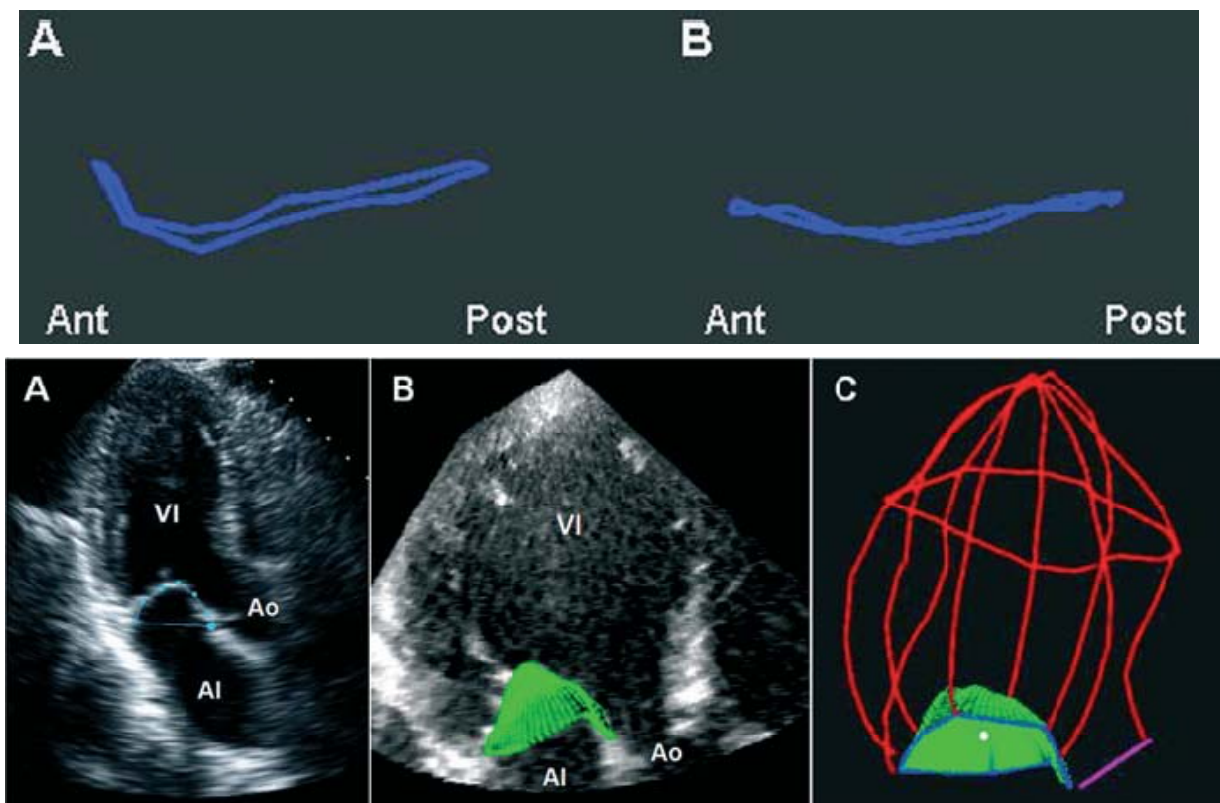
1:1 HR 68



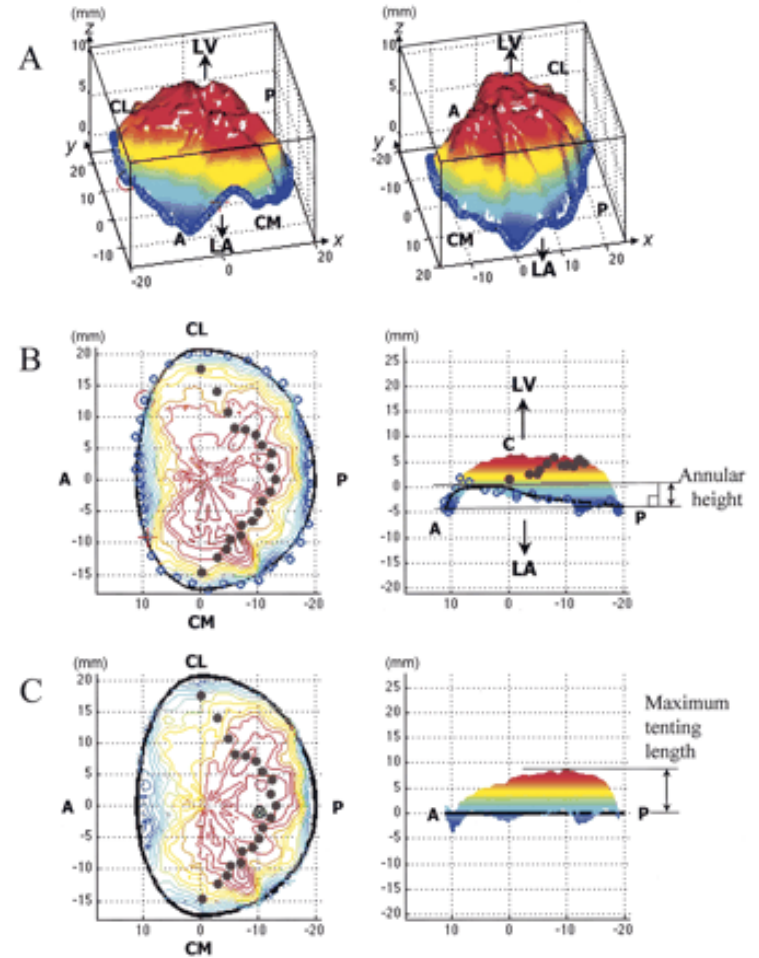
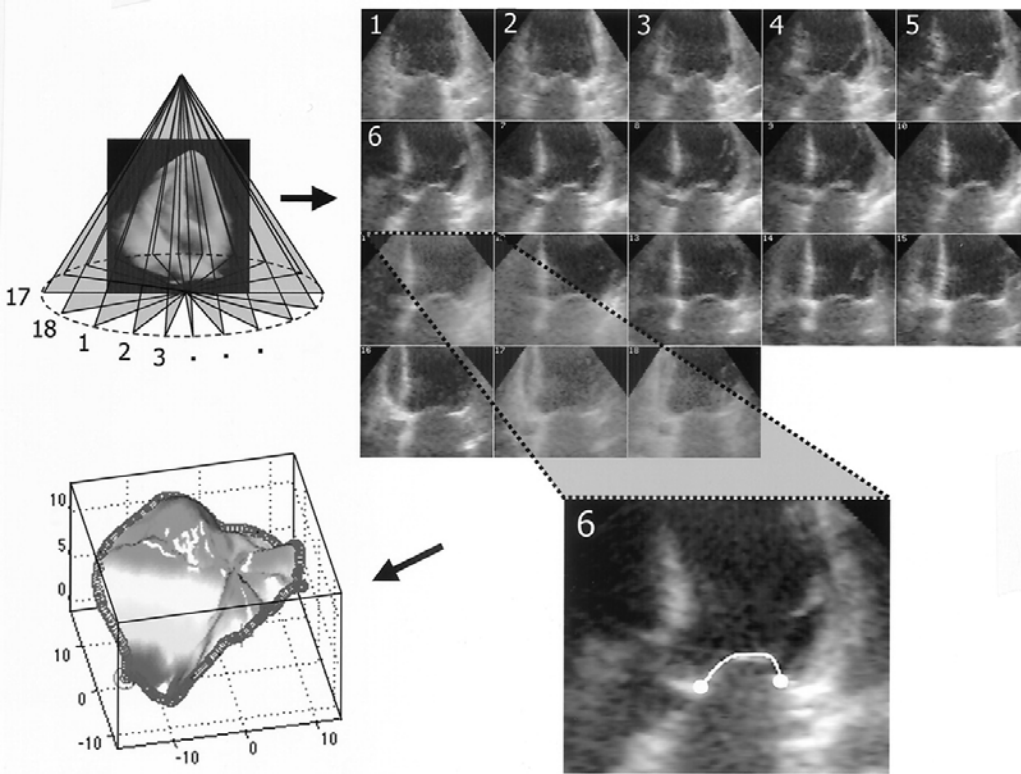
Clinical Applications of Realtime 3D Echocardiography and Its Advantages Over Conventional 2D Echocardiography

- Evaluation of valve function and diseases
- Unlimited image plane orientation for better understanding of the complex geometry of valves and subvalvular apparatus:
 - MV and AV stenosis – ‘en face’ view with more accurate valve area measurement
 - MV prolapse – accurate identification of the scallop involved
 - MV and AV regurgitation – identification of the precise mechanism of regurgitation and assessment of the exact size of vena contracta area with colour Doppler
 - Guide for surgical or percutaneous procedures
-

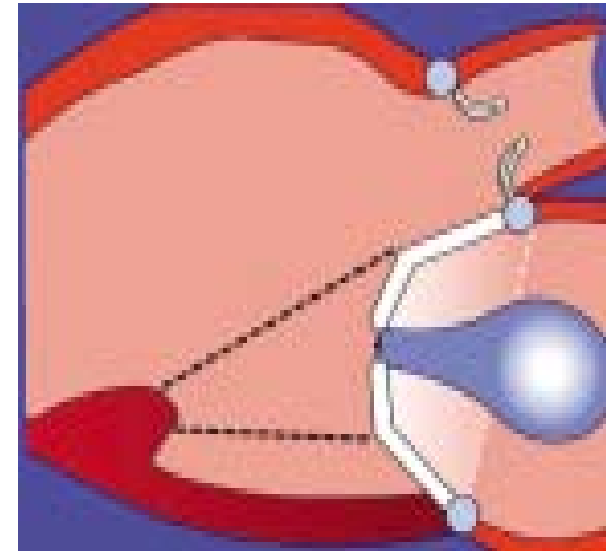
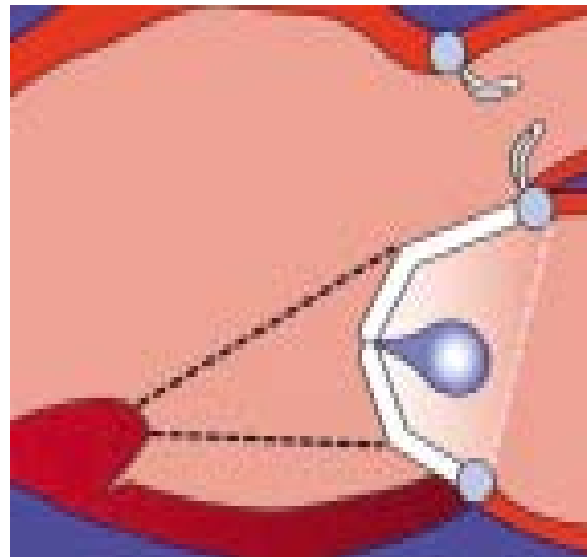
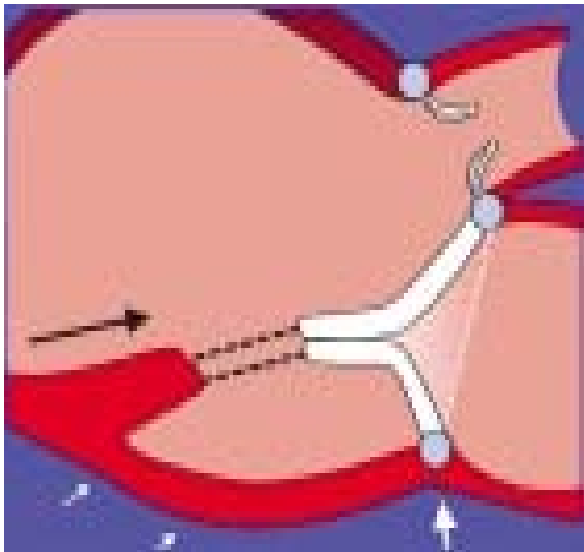
Caracterització anatòmica de la vàlvula mitral



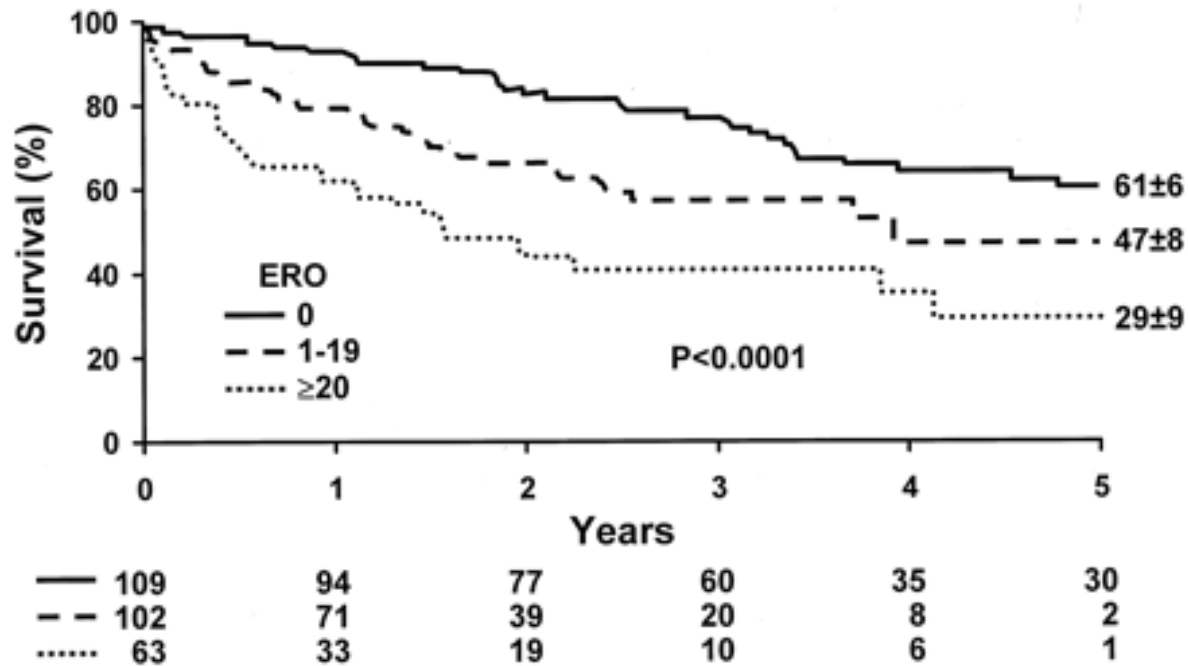
3D Echo for the assesment of tenting in ischemic MR



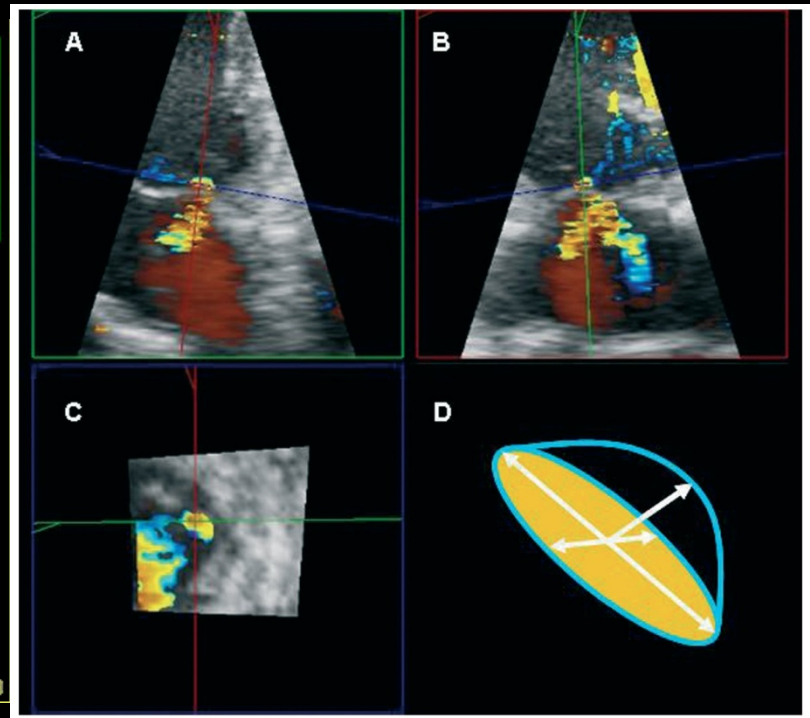
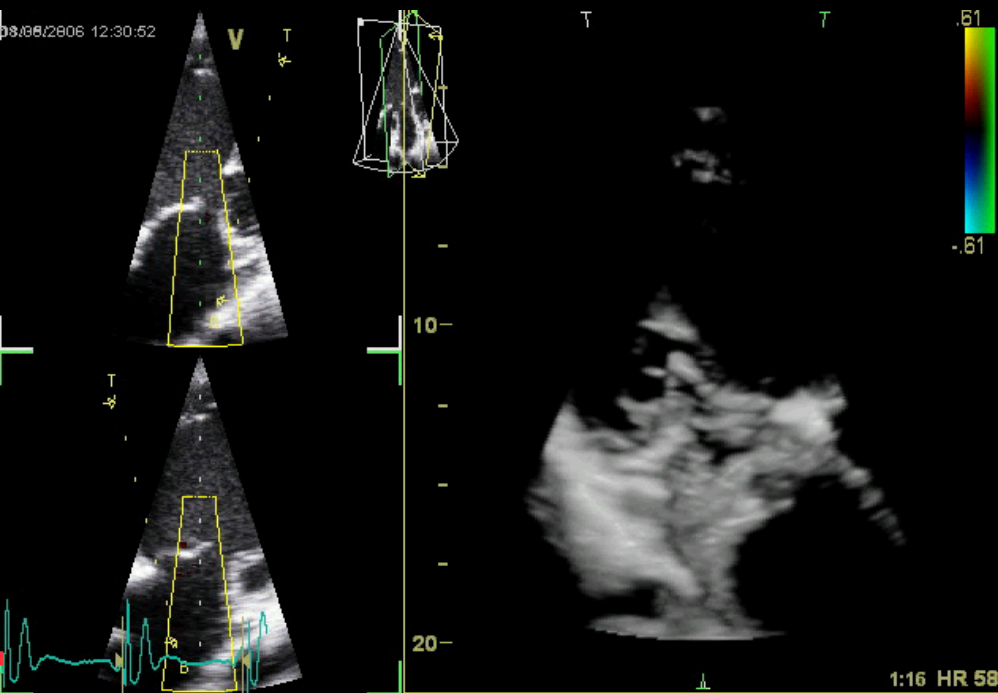
Mecanisme de la IM isquèmica



Pronòstic de la IM isquèmica

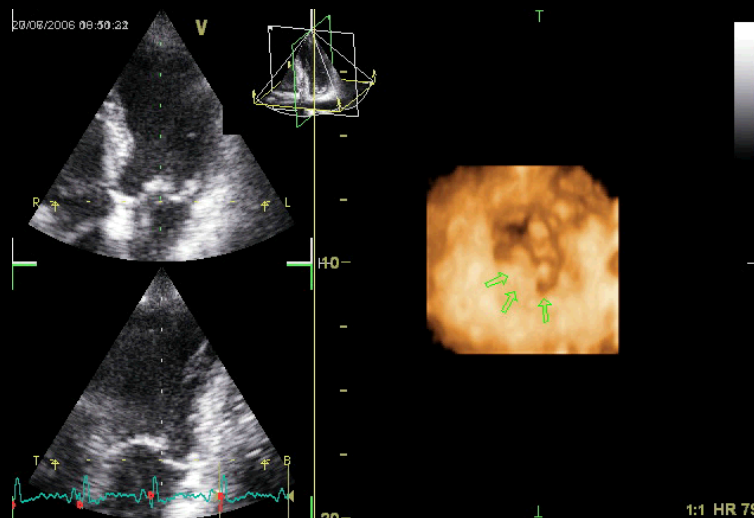
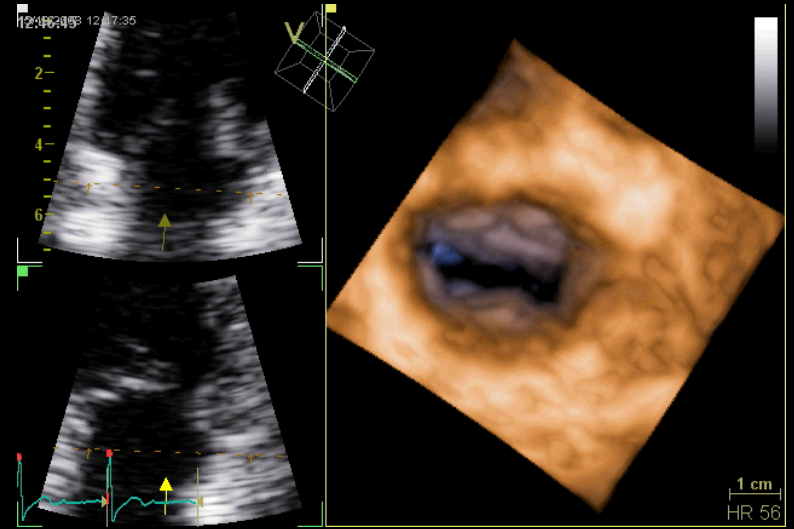
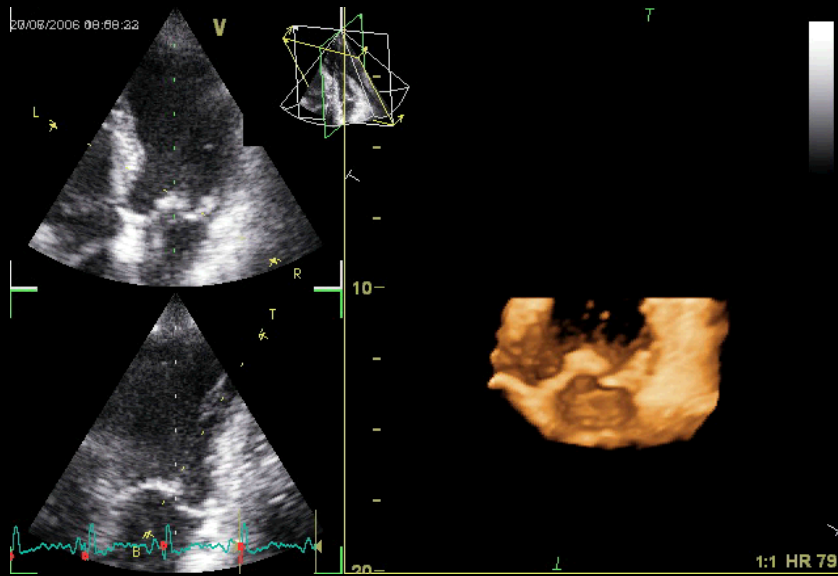


Eco-3D: Càlcul automàtic i precís de PISA



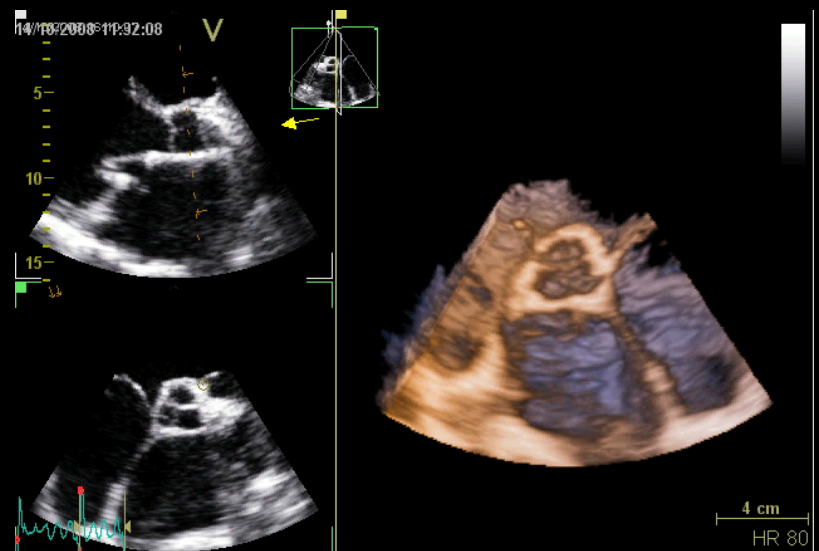
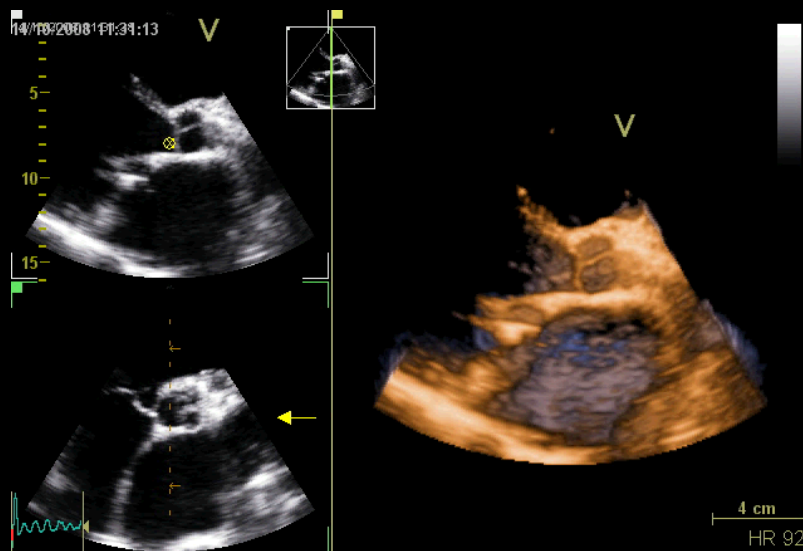
Eco-3D

Definició del prolapse mitral



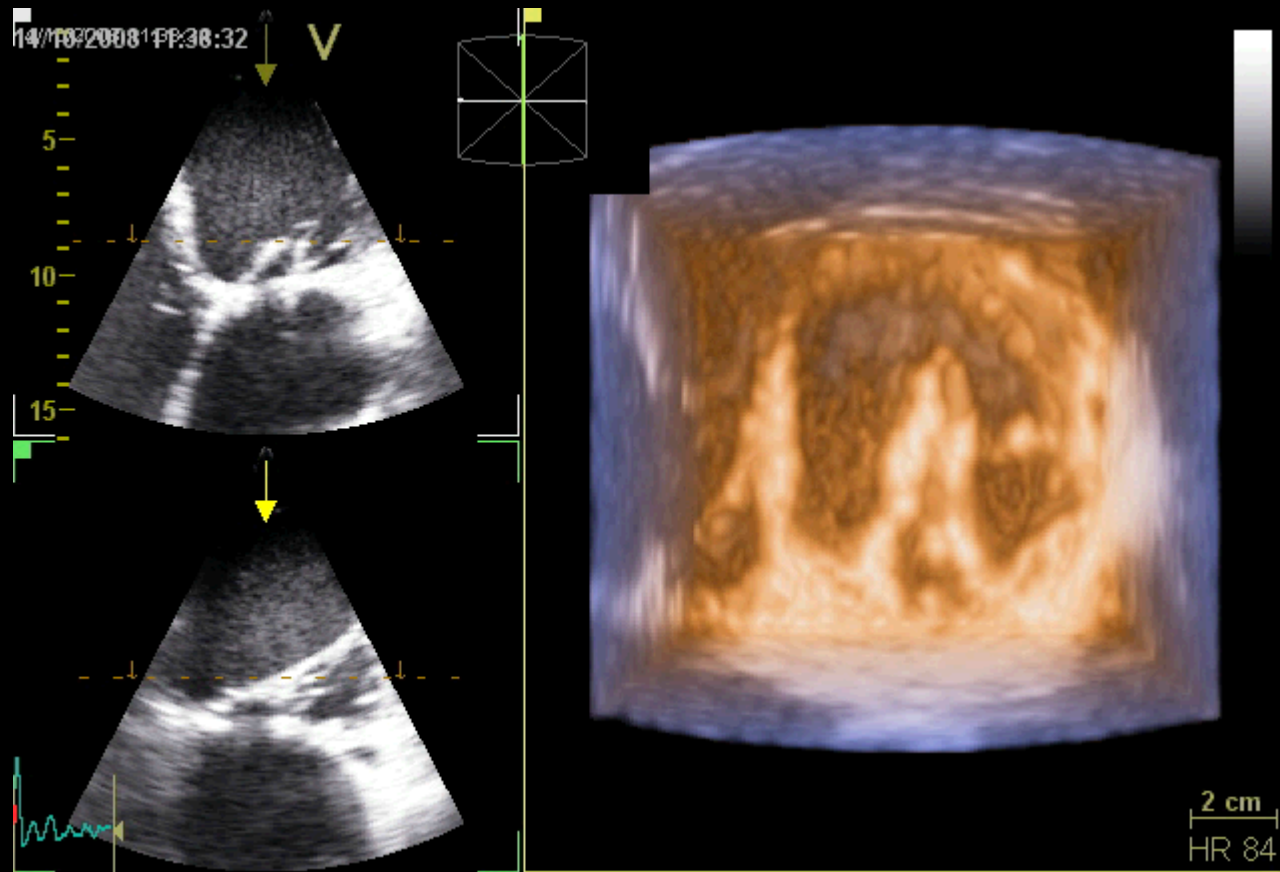
Eco-3D

Patologia polivalvular



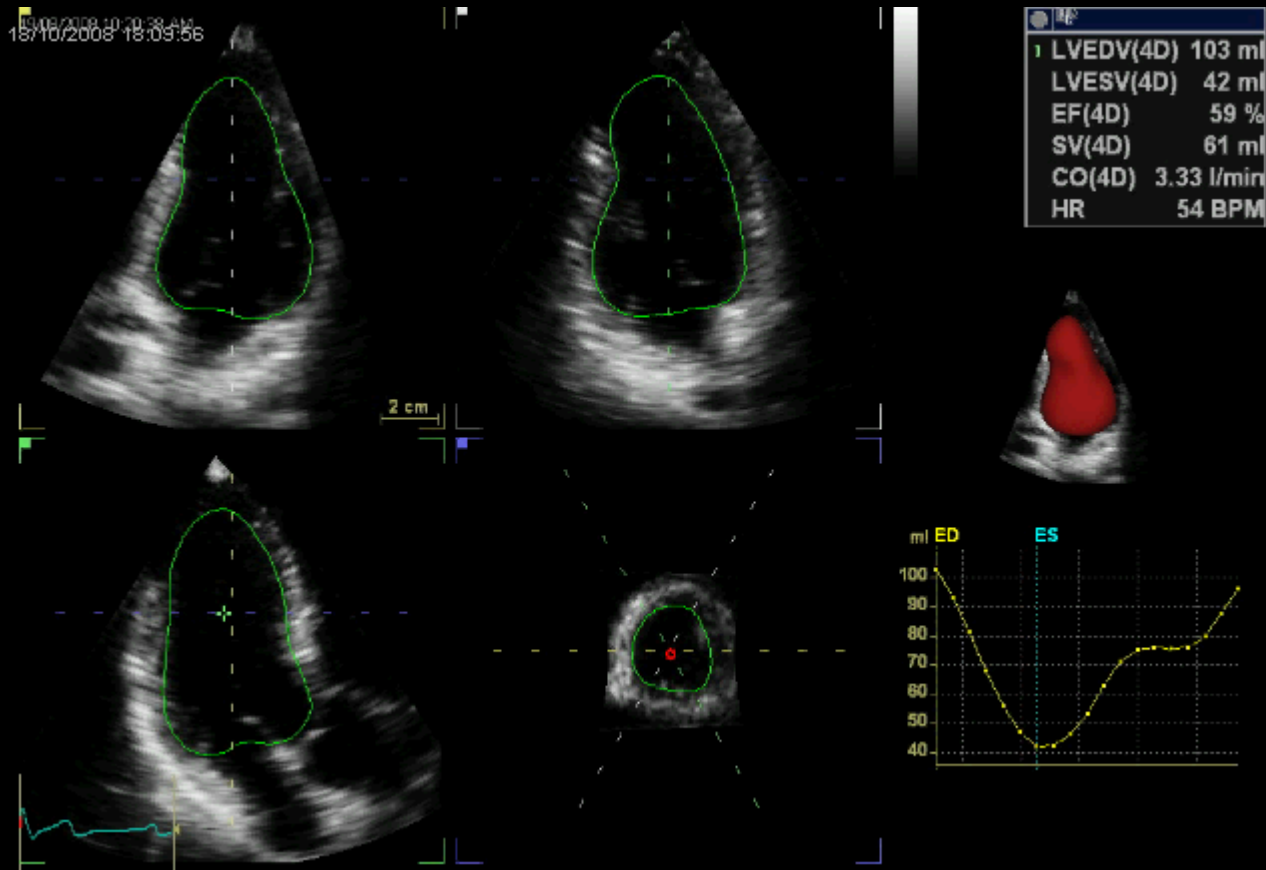
Eco-3D

Valoració de l'Score de Wilkins a l'estenosi mitral



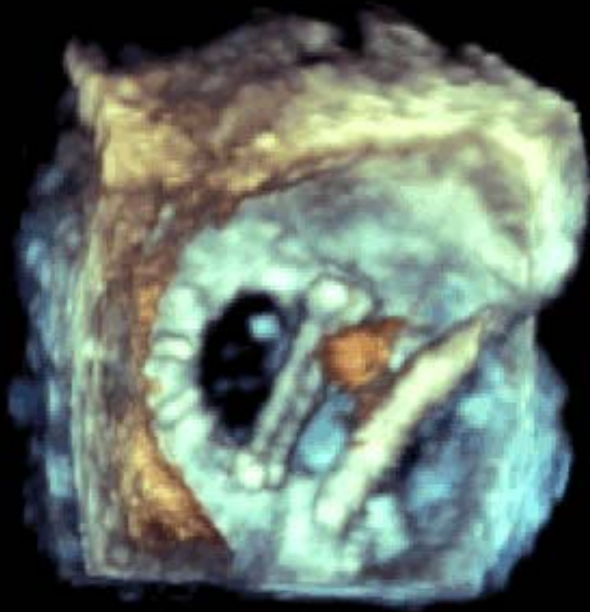
Eco-3D

Funció ventricular



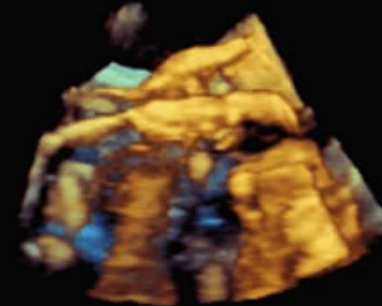
Eco-3D

Tècniques percutànies



R 30Hz0 150 180
3cm

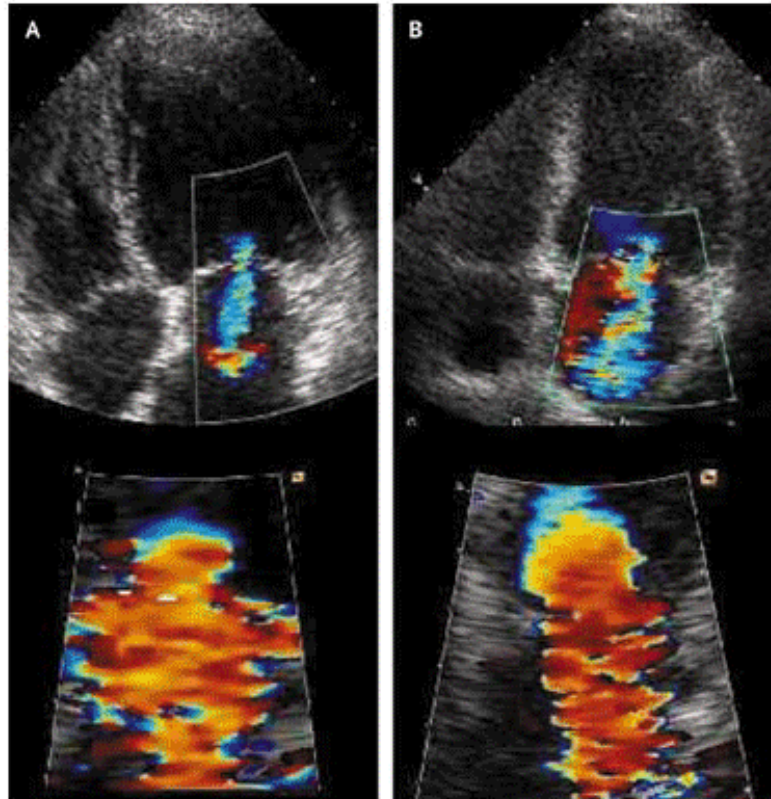
ive 3D
D 28%
D 40dB



3D†



Ecocardiografia d'esforç a l'insuficiència mitral



Noves aportacions i limitacions de les tècniques d'imatge cardíaca en les valvulopaties

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- Una nova visió de la valvulopatia aòrtica

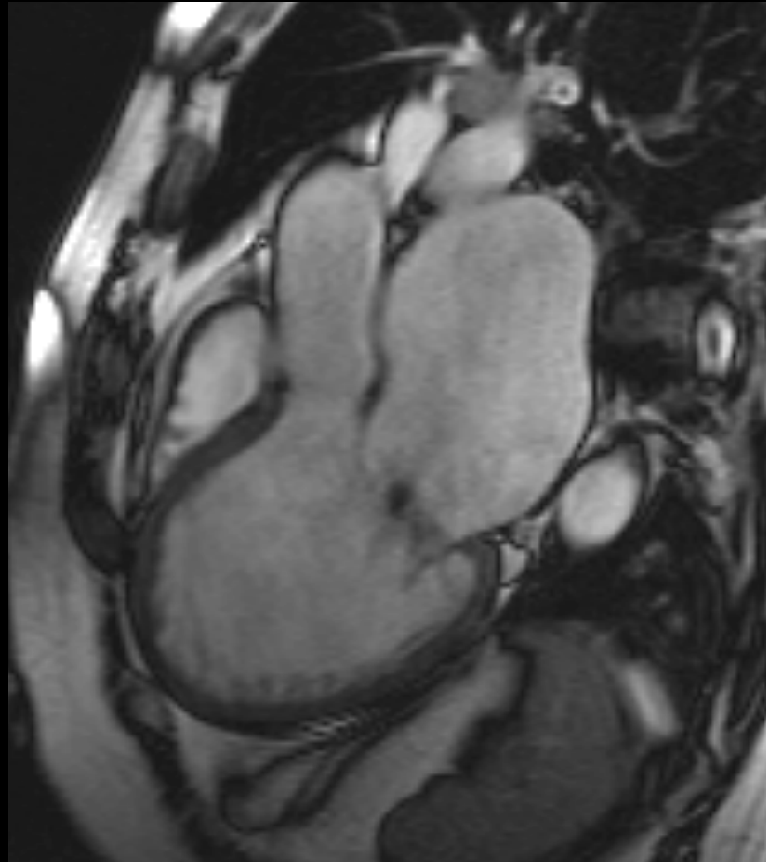
Clinical indications for cardiovascular magnetic resonance (CMR): Consensus Panel report[☆]

Dudley J. Pennell*, Udo P. Sechtem, Charles B. Higgins, Warren J. Manning, Gerald M. Pohost, Frank E. Rademakers, Albert C. van Rossum, Leslee J. Shaw, E. Kent Yucel

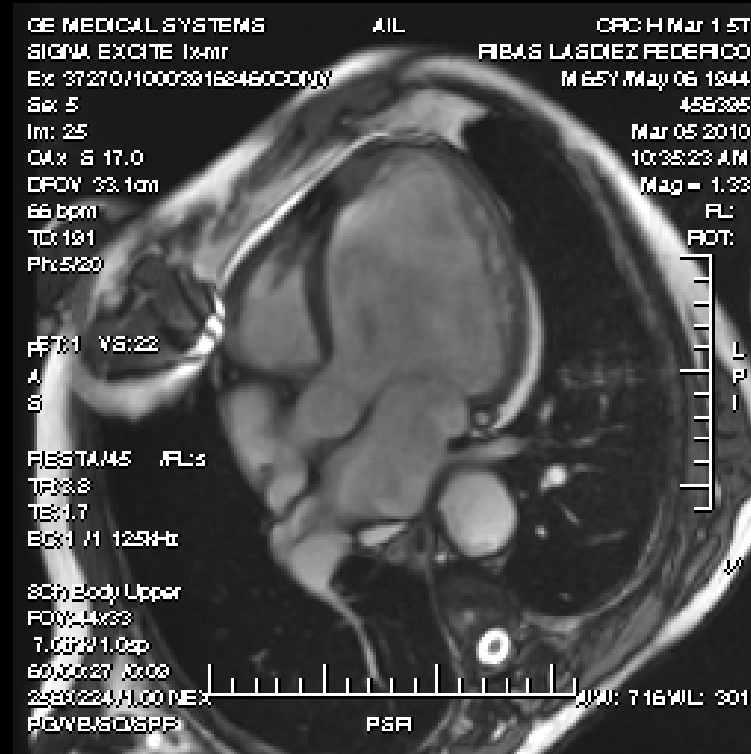
Table 5 Indications for CMR in patients with valvular heart disease

Indication	Class
1. Valve morphology	
Bicuspid aortic valve	II
Other valves	III
Vegetations	Inv
2. Cardiac chamber anatomy and function	I
3. Quantification of regurgitation	I
4. Quantification of stenosis	III
5. Detection of paravalvular abscess	Inv
6. Assessment of prosthetic valves	Inv

RM cardíaca: Insuficiència mitral

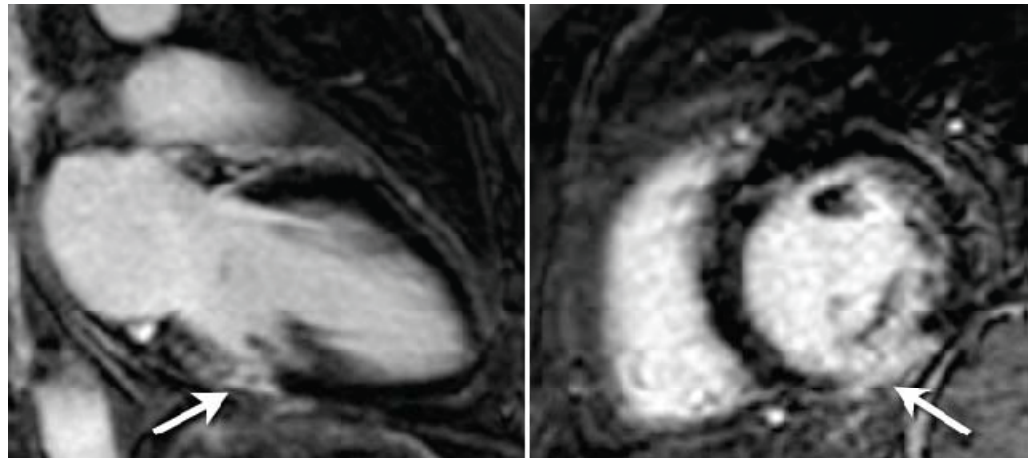
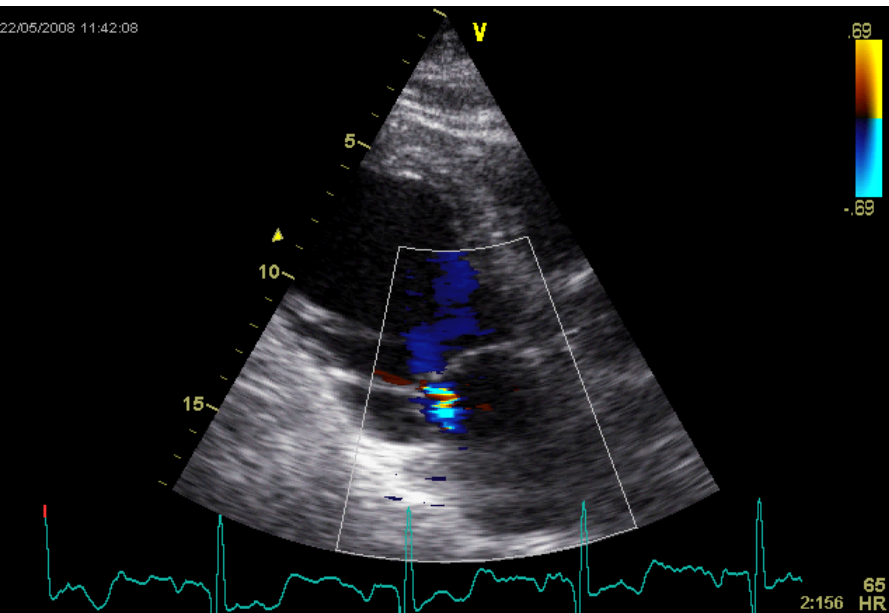


RM cardiaca: Insuficiència mitral funcional



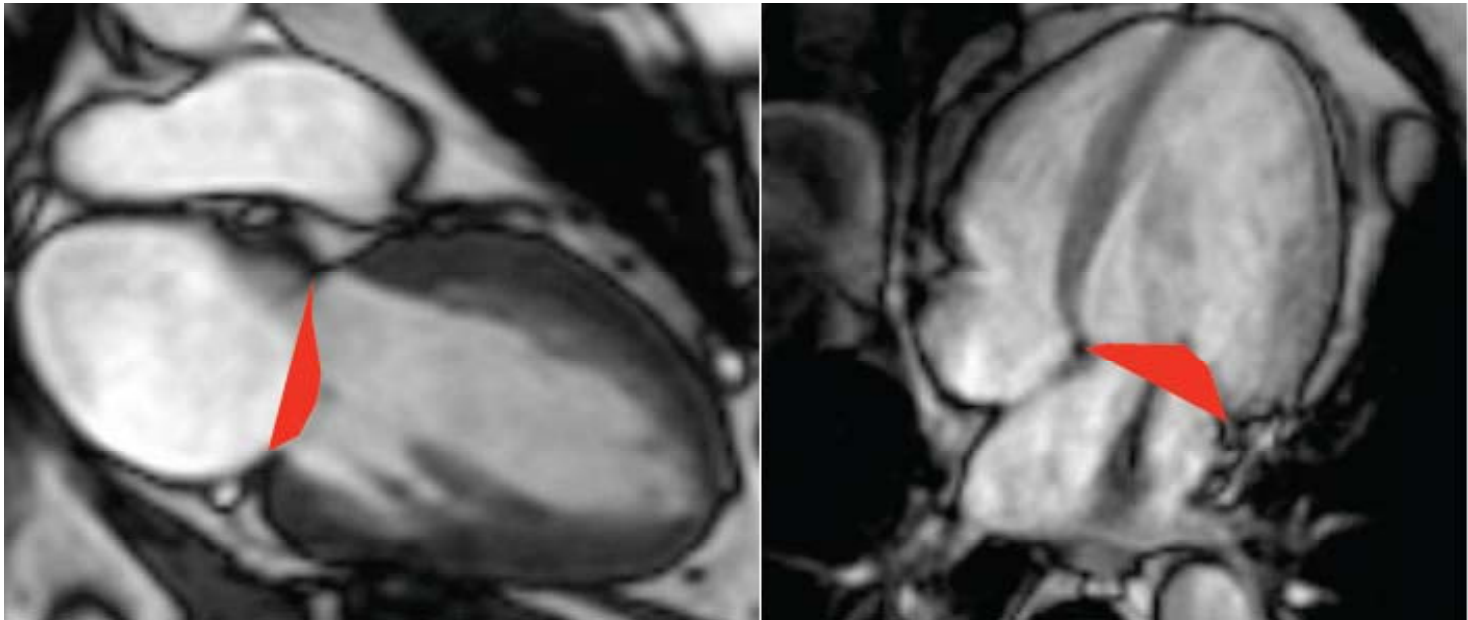
RM cardíaca a la Insuficiència mitral

Mecanisme isquèmia-necrosi



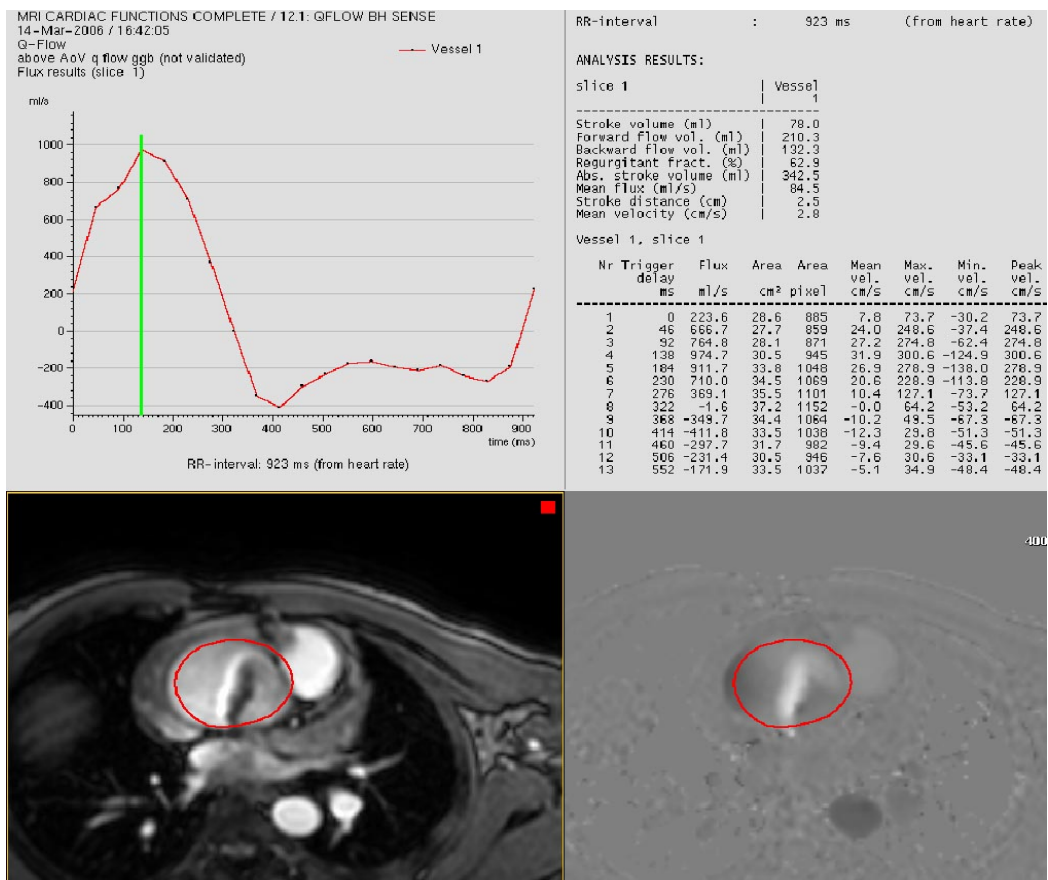
RM cardíaca a la Insuficiència mitral

Tenting mitral



RM cardíaca a la Insuficiència aòrtica

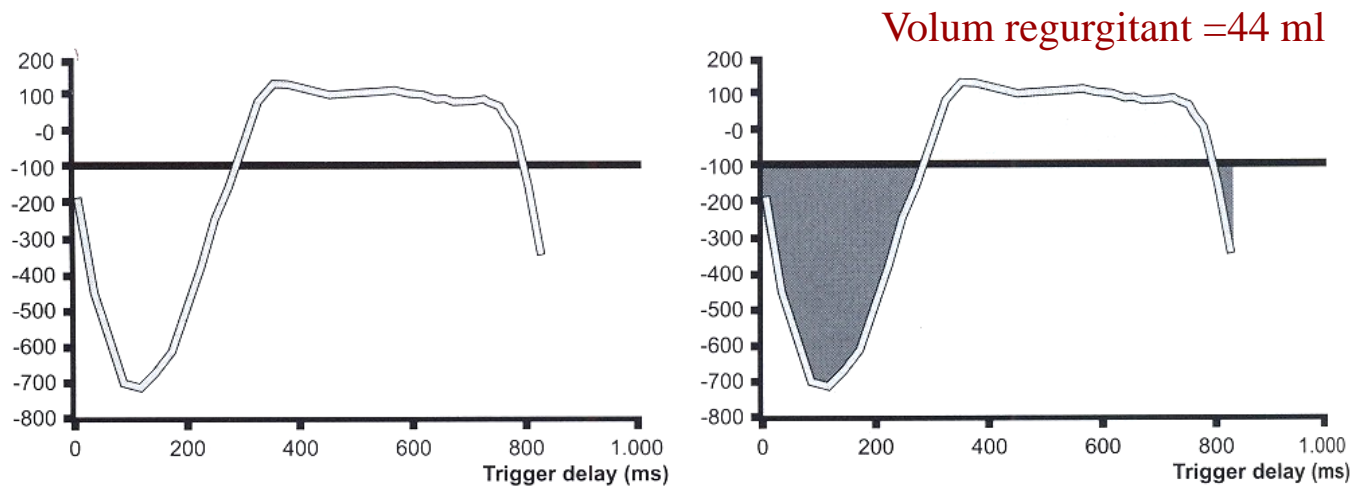
Quantificació



Seqüències de contrast de fase

RM cardíaca a la Insuficiència aòrtica

Quantificació



Volum batec=140 ml

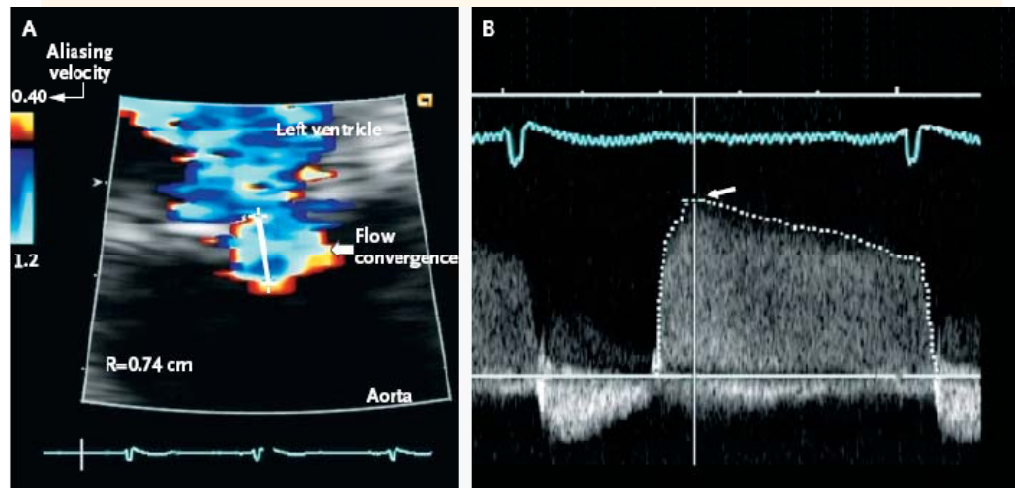
Fracció de regurgitació= $(VL/VR)=31\%$

RM cardíaca a la Insuficiència aòrtica

Quantificació

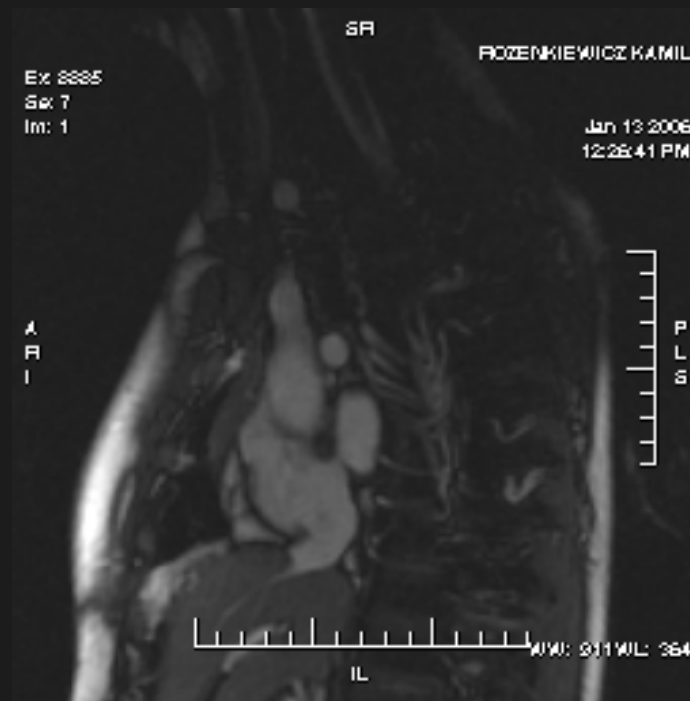
Table 1. Classification of the Severity of Aortic Regurgitation.*

Variable	Aortic Regurgitation		
	Mild	Moderate†	Severe
Width of vena contracta (mm)‡	<3.0	3.0–5.9	≥6.0
Ratio of width of aortic regurgitant jet to left ventricular outflow (%)	<25	25–44	45–64
Regurgitant volume (ml per beat)	<30	30–44	45–59
Regurgitant fraction (%)	<30	30–39	40–49
Effective regurgitant orifice (mm ²)	<10	10–19	20–29



RM cardíaca

Coartació aòrtica associada a aorta bicúspide



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Risk Score for Predicting Outcome in Patients With asymptomatic Aortic Stenosis

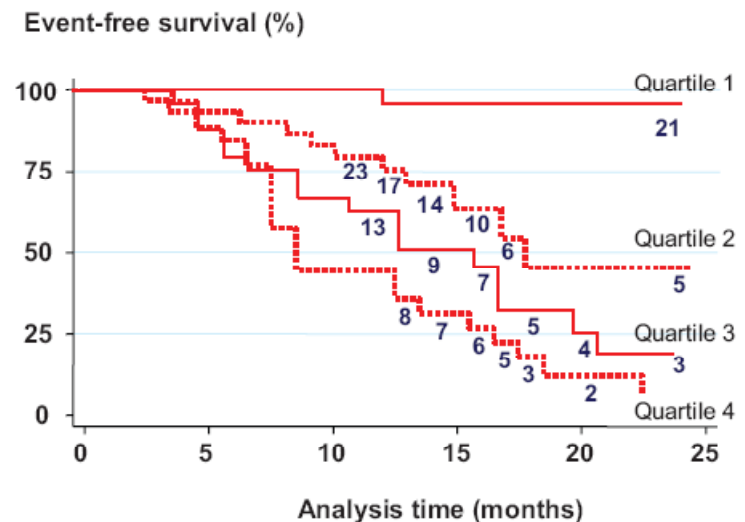
Valvular Heart Disease

Risk Score for Predicting Outcome in Patients With Asymptomatic Aortic Stenosis

Jean-Luc Monin, MD, PhD; Patrizio Lancellotti, MD, PhD; Mehran Monchi, MD; Pascal Lim, MD; Emmanuel Weiss, MD; Luc Piérard, MD, PhD; Pascal Guéret, MD

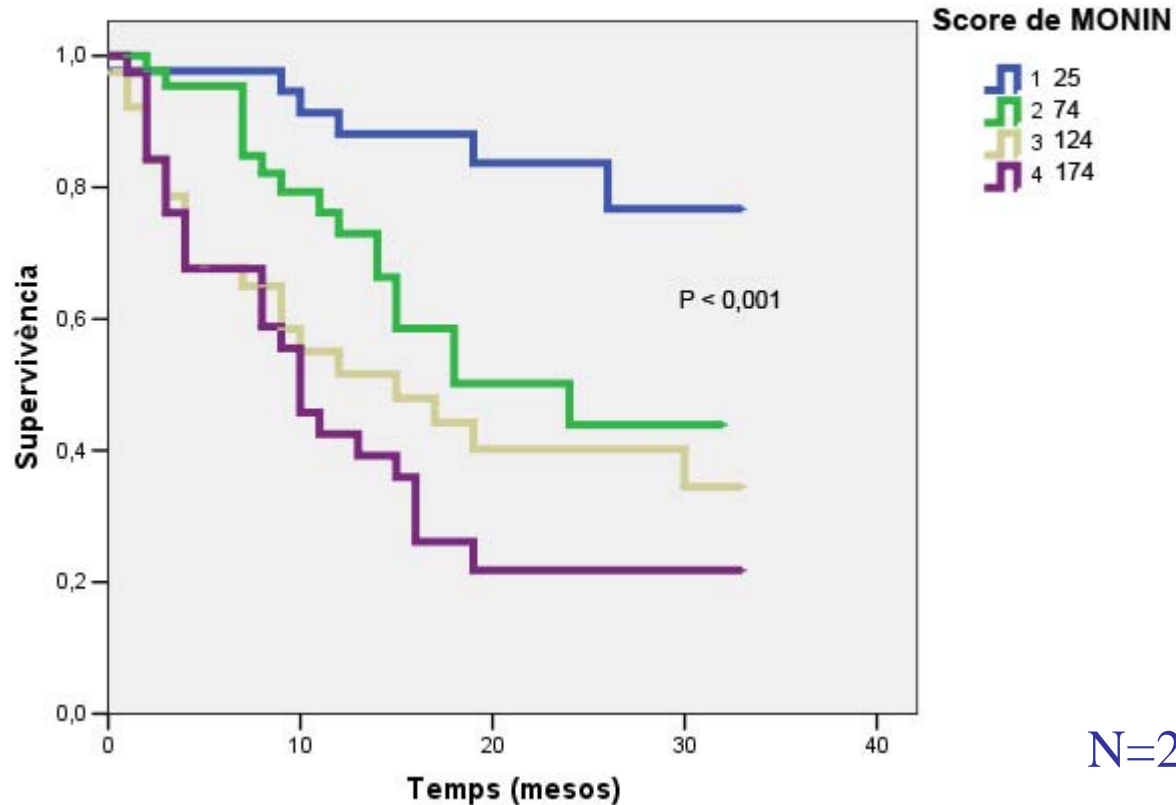
Background—The management of patients with asymptomatic severe aortic stenosis remains controversial. We sought to develop a continuous risk score for predicting the midterm development of symptoms or adverse events in this setting. **Methods and Results**—We prospectively followed 107 patients with asymptomatic aortic stenosis (aged 72 years [63 to 77]; 35 women; aortic-jet velocity, 4.1 m/s [3.5 to 4.4]) at a single center in France. Predefined end points for assessing outcome were the occurrence within 24 months of death or aortic valve replacement necessitated by symptoms or by a positive exercise test. Variables independently associated with outcome were used to build a score that was validated in an independent cohort of 107 patients from Belgium. Independent predictors of outcome were female sex, peak aortic-jet velocity, and B-type natriuretic peptide at baseline. Accordingly, the score could be calculated as follows: $\text{Score} = [\text{peak velocity (m/s)} \times 2] + (\text{natural logarithm of B-type natriuretic peptide} \times 1.5) + 1.5$ (if female sex). Event-free survival after 20 months was 80% for patients within the first score quartile compared with only 7% for the fourth quartile. Areas under the receiver operating characteristic curve for the score were 0.90 and 0.89 in the development and validation cohorts, respectively.

Conclusions—If further validation is achieved, this score may be useful to predict outcome in individual patients with asymptomatic aortic stenosis to select those who might benefit from early surgery. (*Circulation*. 2009;120:69-75.)



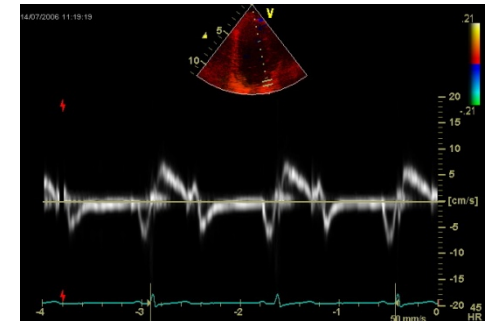
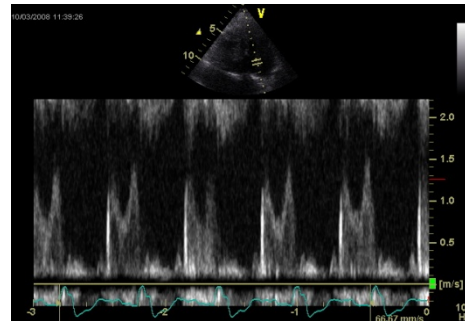
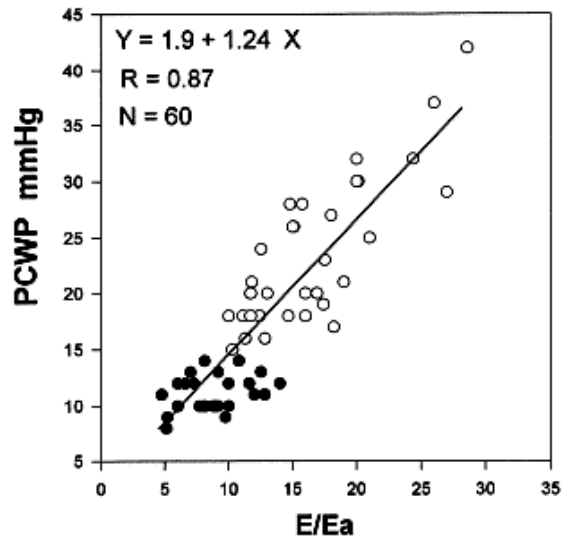
$$\text{Score} = [V_{\text{max}} \text{ (m/s)} \times 2] + (\text{Ln}(\text{BNP}) \times 1.5) + 1.5 \text{ (if female sex)}$$

Risk Score for Predicting Outcome in Patients With asymptomatic Aortic Stenosis



Doppler Tissue Imaging: A Noninvasive Technique for Evaluation of Left Ventricular Relaxation and Estimation of Filling Pressures

SHERIF F. NAGUEH, MD, KATHERINE J. MIDDLETON, RCT, HELEN A. KOPELEN, RDMS,
WILLIAM A. ZOGHBI, MD, FACC, MIGUEL A. QUIÑONES, MD, FACC

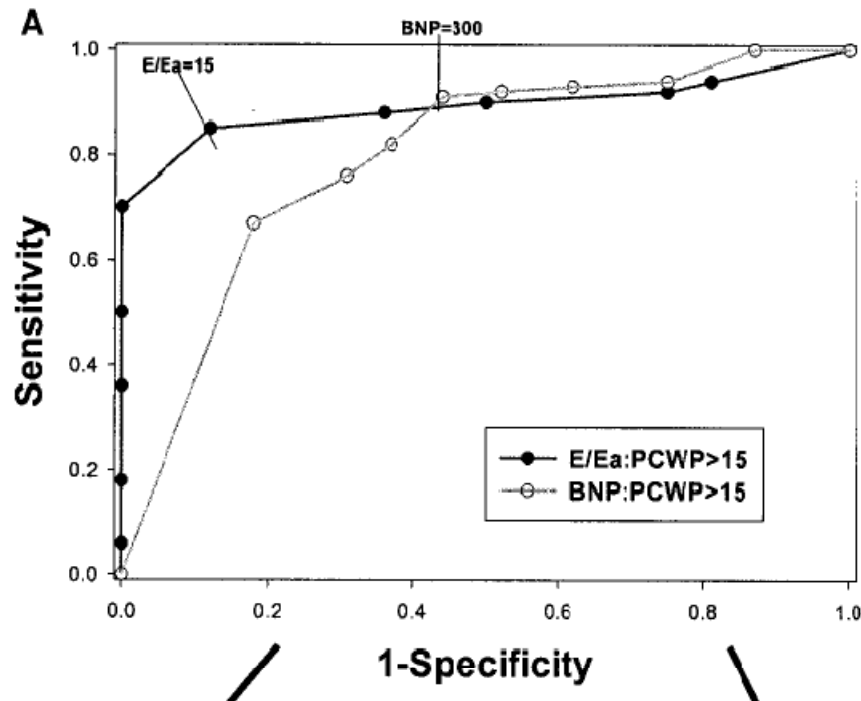


$$PCP = 1,24 [(E/Ea) + 1,9]$$

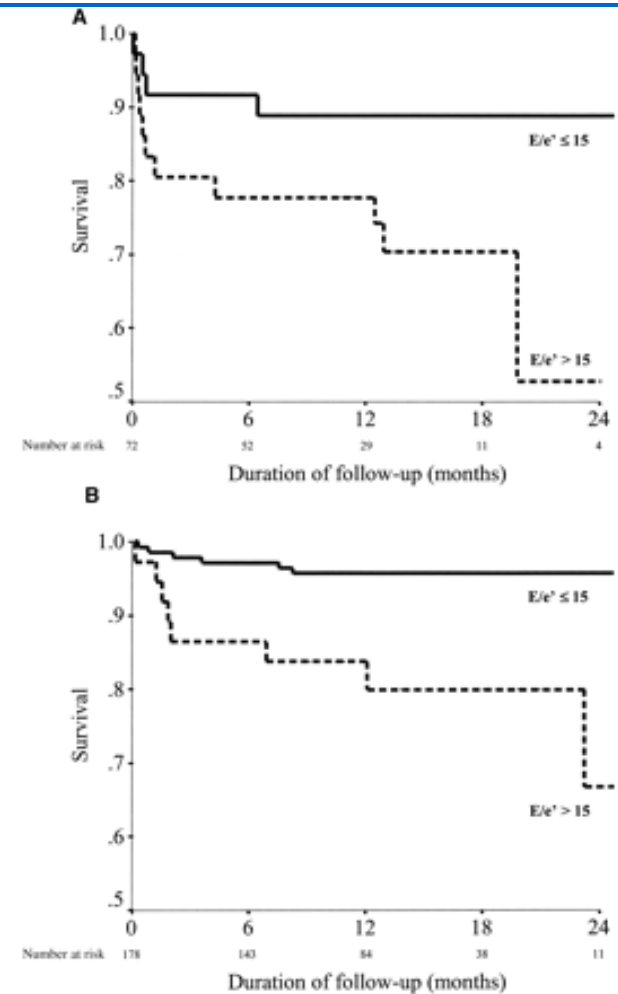
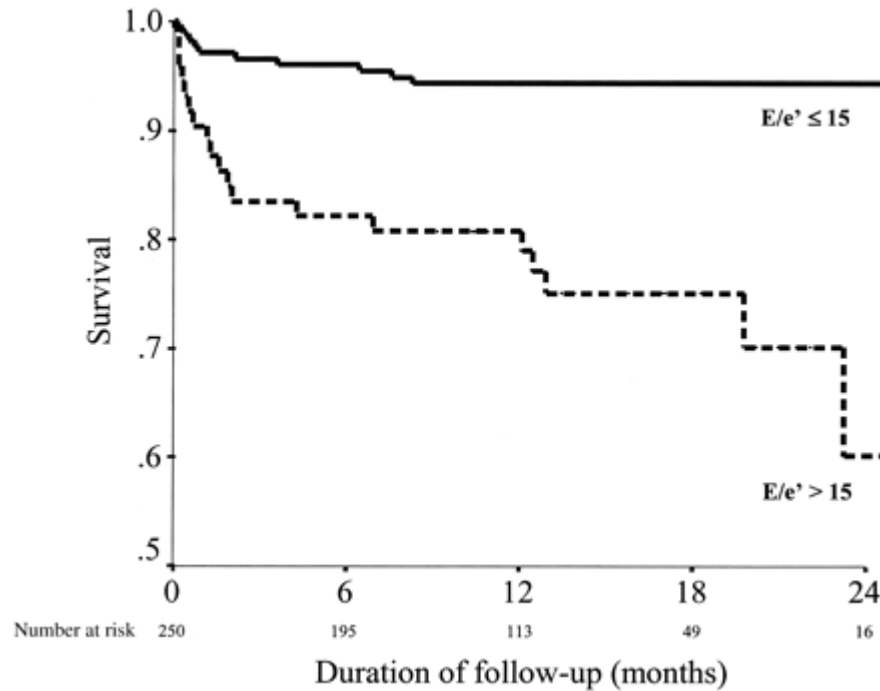
Optimal Noninvasive Assessment of Left Ventricular Filling Pressures

A Comparison of Tissue Doppler Echocardiography and B-Type Natriuretic Peptide in Patients With Pulmonary Artery Catheters

Hisham Dokainish, MD, FRCPC; William A. Zoghbi, MD; Nasser M. Lakkis, MD; Faiz Al-Bakshy, MD; Meeney Dhir, MD; Miguel A. Quinones, MD; Sherif F. Nagueh, MD



Noninvasive estimation of left ventricular filling pressure by e/e' is a powerful predictor of survival after acute myocardial infarction



Survival of patients with an E/e' ratio of 15 or >15 , stratified according to left ventricular ejection fraction: **(A)** patients with ejection fraction 40%; **(B)** patients with ejection fraction $>40\%$.

DTI i estenosi aòrtica



J Am Soc Echocardiography 2008 (Epub)

E/Ea is the Major Determinant of Pulmonary Artery Pressure in Moderate to Severe Aortic Stenosis

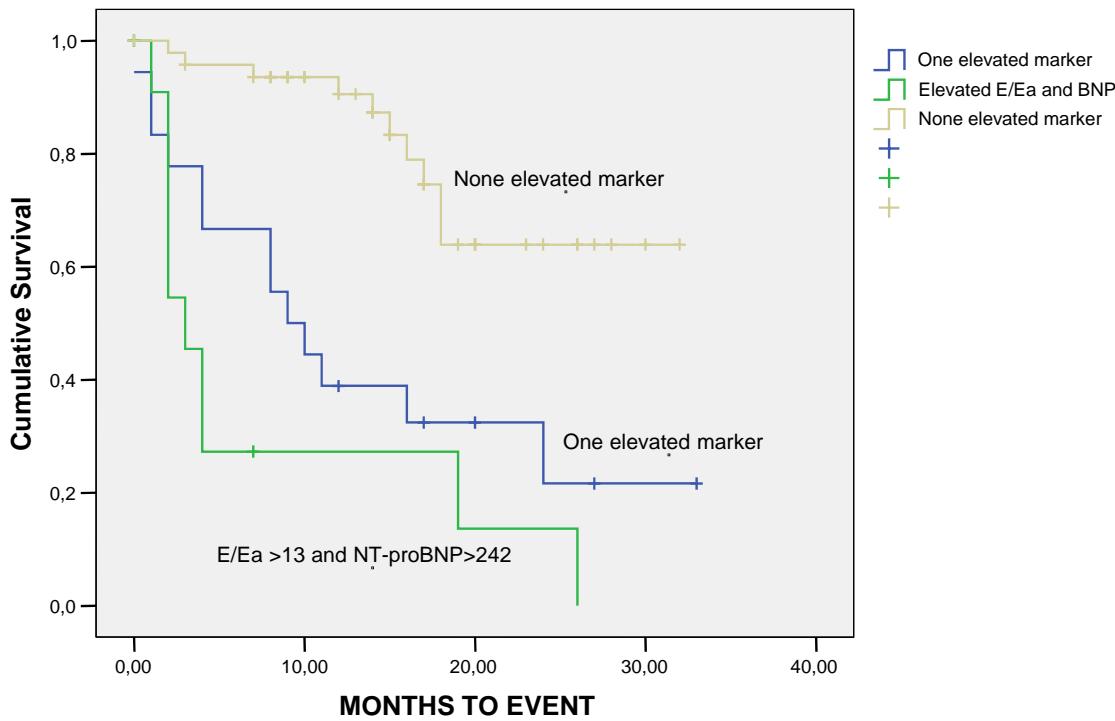
Grace Casacang-Verzosa MD^a, Vuyisile T. Nkomo MD^a, Maurice E. Sarano MD^a,
Joseph F. Malouf MD^a, Fletcher A. Miller Jr MD^a and JaeK. Oh MD^a

^aDivision of Cardiovascular Diseases, Mayo Clinic, Rochester, Minnesota

Correlació Swan-Ganz-ecocardiografia

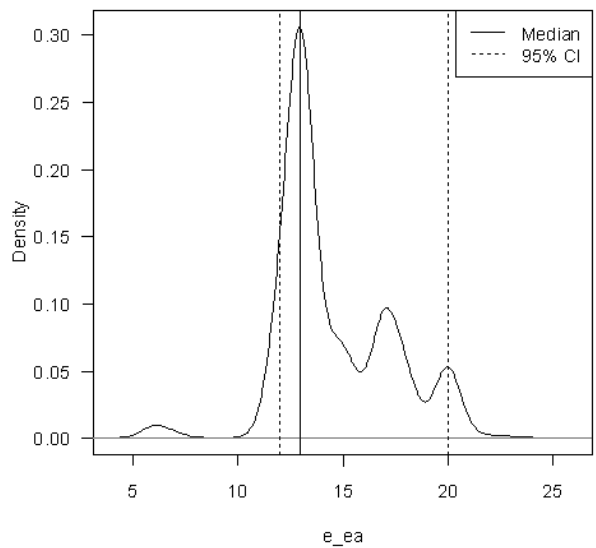
Prognostic value of combined use of E/Ea ratio and NT-proBNP in aortic stenosis

N=203 Survival Functions



Bootstrap density plot of E/Ea

Best E/Ea's cut point: 13 (95%CI: 12; 20)



Review

Open Access

Current clinical applications of spectral tissue Doppler echocardiography (E/E' ratio) as a noninvasive surrogate for left ventricular diastolic pressures in the diagnosis of heart failure with preserved left ventricular systolic function

Stephane Arques*¹, Emmanuel Roux¹ and Roger Luccioni²

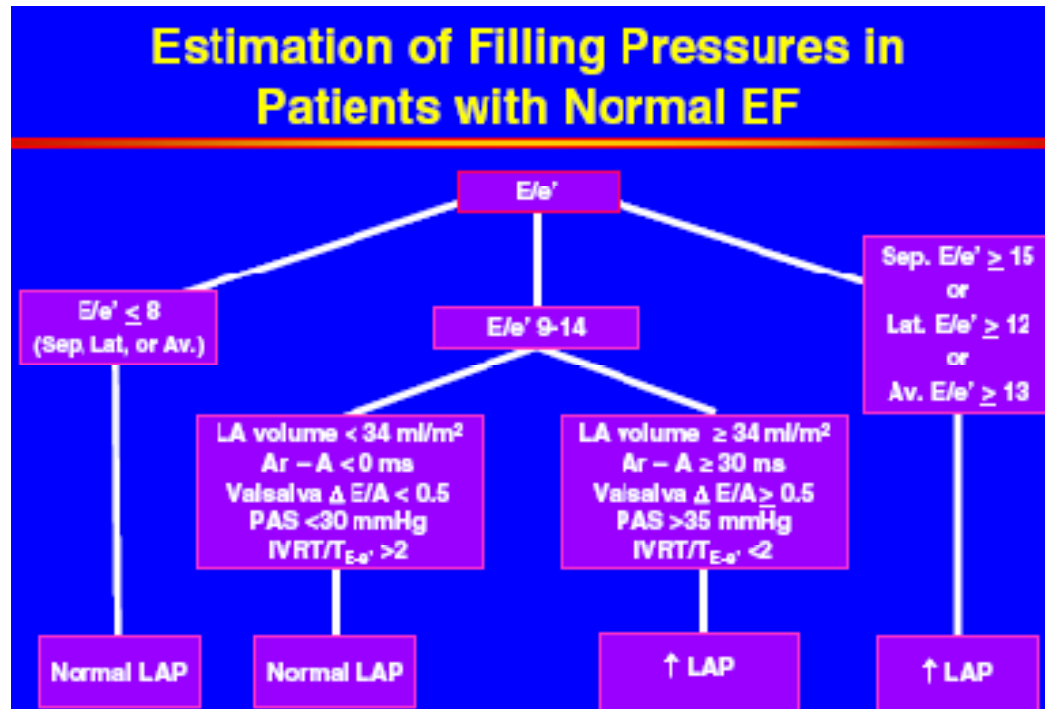
Table 4: Clinical studies that investigated the accuracy of the spectral tissue Doppler E/E' for the diagnosis of acute congestive heart failure on admission before tailored therapy.

Reference	Population study	Number of patients	Sensitivity-Specificity	Threshold value for E/E'
Dokainish ⁹⁷	NYHA II to IV LVEF < 50%	76	92% – 72%	Average E/E' > 15
Dokainish ⁹⁷	NYHA II to IV LVEF > 50%	46	79% – 93%	Average E/E' > 15
Arques ⁹⁸	Acute dyspnea at rest LVEF > 45%	70	80% – 94.3% 76.7% – 91.4%	Average E/E' > 11.5 Septal E/E' > 13
Arques ⁹⁹	Acute dyspnea at rest LVEF > 50%, BNP 100–400 pg/ml	34	88.2% – 76.5% 76.5% – 88.2%	Average E/E' > 10.1 Septal E/E' > 13
Arques ¹⁰⁰	Acute dyspnea at rest, elderly LVEF > 50%, atrial fibrillation	41	81.8% – 89.5%	Septal E/E' > 13
Arques ¹⁰⁴	Acute dyspnea LVEF > 50%, hypertension	40	77.8% – 100%	Lateral E/E' > 11
Huang ¹⁰⁵	Acute dyspnea LVEF < 50%	–*	70.8% – 100%	Average E/E' > 16
Huang ¹⁰⁵	Acute dyspnea LVEF > 50%	–*	88.9% – 82.9%	Average E/E' > 11

BNP: B-type natriuretic peptide; LVEF: left ventricular ejection fraction;*: overall population of 92 patients.

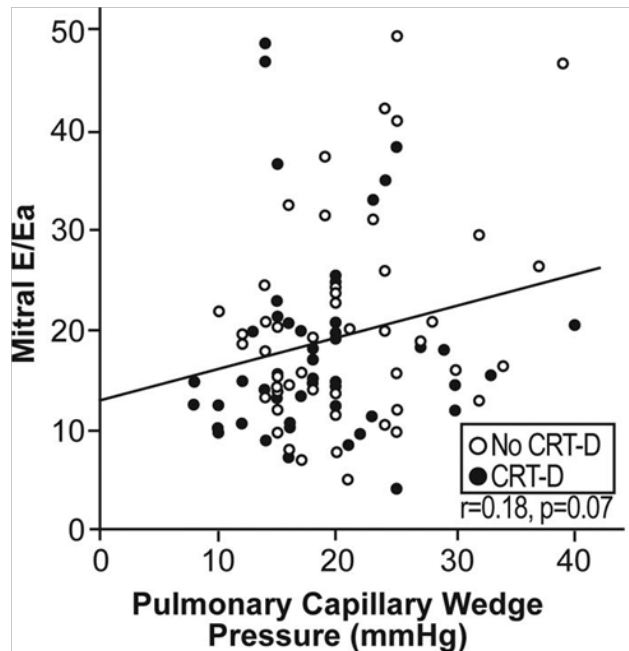
Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography

Sherif F. Nagueh, MD, Chair,[†] Christopher P. Appleton, MD,[†] Thierry C. Gillebert, MD,*
 Paolo N. Marino, MD,* Jae K. Oh, MD,[†] Otto A. Smiseth, MD, PhD,*
 Alan D. Waggoner, MHS,[†] Frank A. Flachskampf, MD, Co-Chair,*
 Patricia A. Pellikka, MD,[†] and Arturo Evangelista, MD,* *Houston, Texas; Phoenix, Arizona;
 Ghent, Belgium; Novara, Italy; Rochester, Minnesota; Oslo, Norway; St. Louis, Missouri; Erlangen, Germany;
 Barcelona, Spain*



Tissue Doppler Imaging in the Estimation of Intracardiac Filling Pressure in Decompensated Patients With Advanced Systolic Heart Failure

Wilfried Mullens, MD; Allen G. Borowski, RDCS; Ronan J. Curtin, MD;
James D. Thomas, MD; W.H. Tang, MD



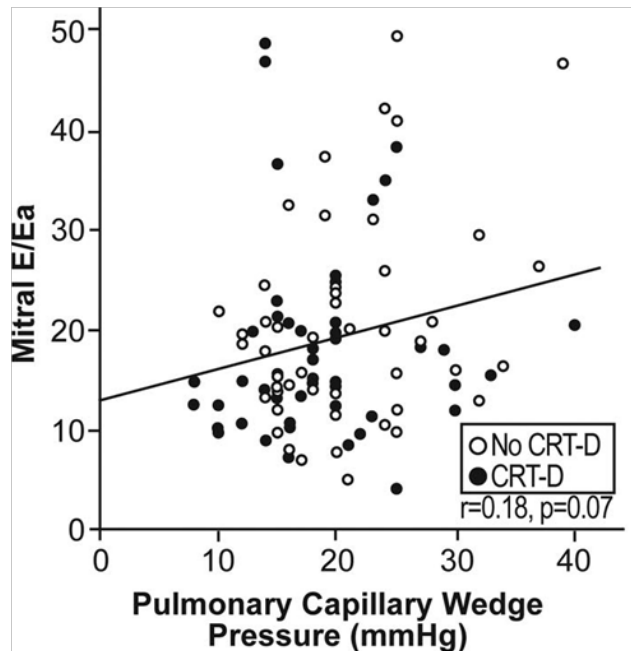
N=109

Miocardiotapia dilatada FE<30%

22% IM significativa

Tissue Doppler Imaging in the Estimation of Intracardiac Filling Pressure in Decompensated Patients With Advanced Systolic Heart Failure

Wilfried Mullens, MD; Allen G. Borowski, RDCS; Ronan J. Curtin, MD;
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N=109

Miocardipatia dilatada FE<30%

22% IM significativa

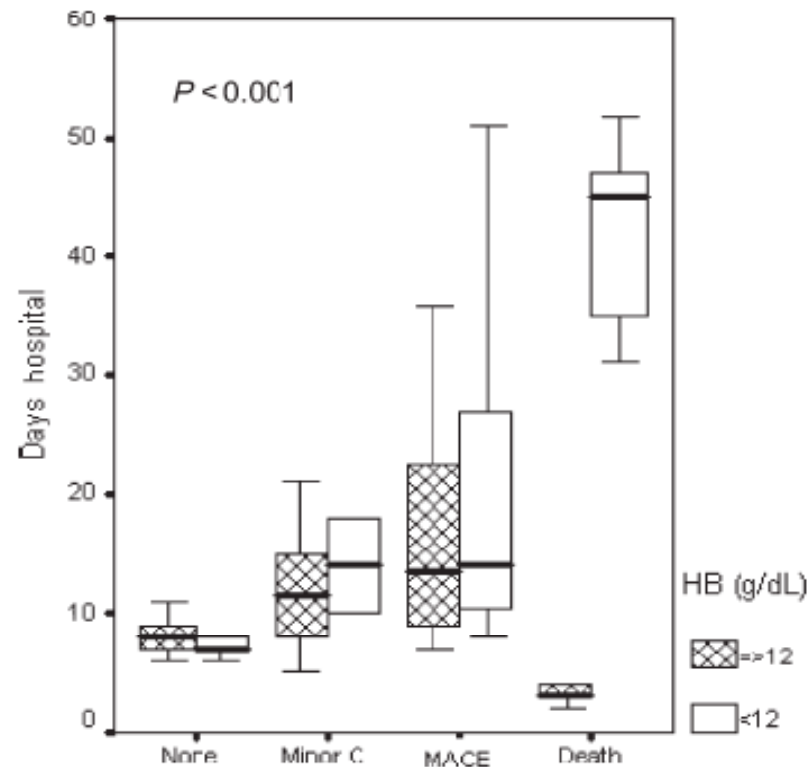
LIMITACIONS CONEGUDES:

- Depressió de la FE
- Patologia valvular mitral
- Pròtesis valvulars
- Fibril.lació auricular

Is pre-operative anaemia a risk marker for in-hospital mortality and morbidity after valve replacement?

Mercè Cladellas^{1*}, Jordi Bruguera¹, Josep Comin¹, Joan Vila², Elisabeth de Jaime³, Julio Martí¹, and Miquel Gomez¹

¹Department of Cardiology, Hospital del Mar (IMAS-UAB), Passeig Marítim 25-29, E-08003 Barcelona, Spain; ²Institut Municipal d'Investigació Mèdica (IMIM); and ³Department of Geriatrics, Institut Municipal d'Investigació Mèdica (IMIM), Barcelona, Spain



Estenosi aòrtica

Identificació de progressors ràpids

Oxidized LDL: a marker of rapid progression in aortic stenosis

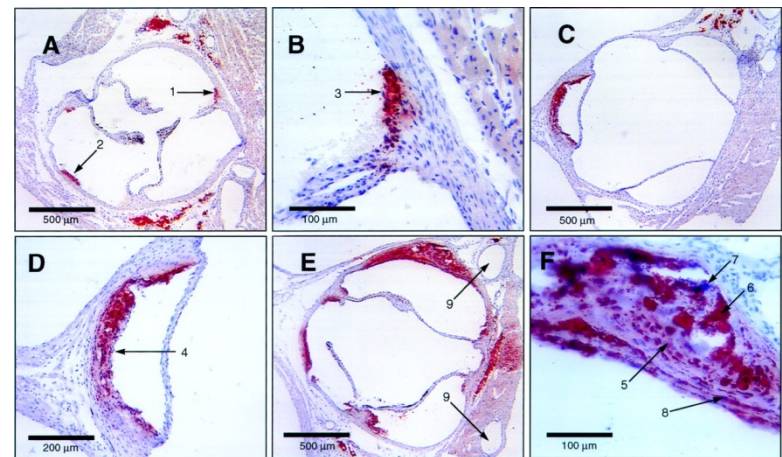
	SLOW PROGRESSORS	RAPID PROGRESSORS	P
PCR (mg/dl)	3.9	4.2	ns
LDLox (mg/dl)	42	74	0.01
Calcitonyne (pg/ml)	4.1	4.4	ns
CaxP	21	22	ns
Creatinine (mg/dl)	1.01	1.19	ns
PTH (U/l)	68	73	ns

n=107

68.5%

n=48

31.5%



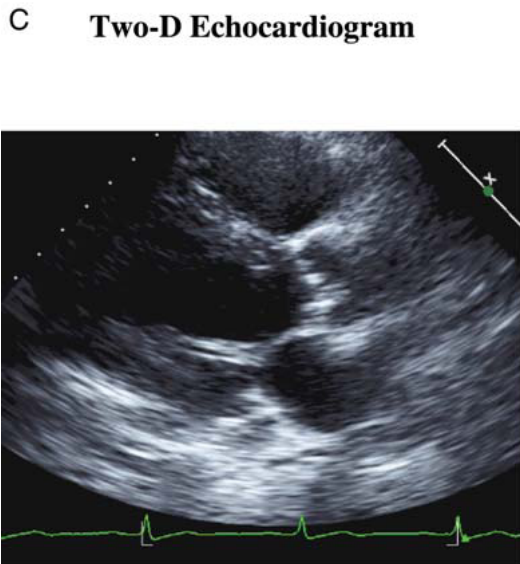
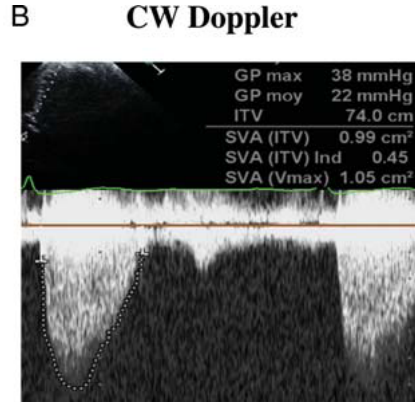
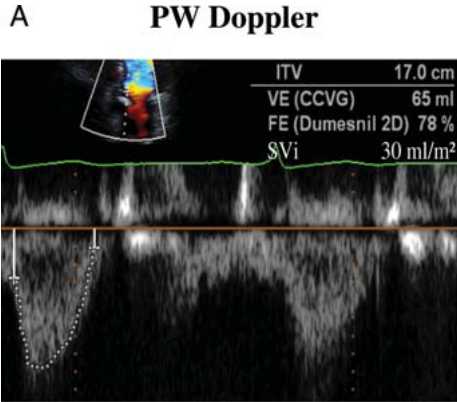
Association between circulating oxidized low-density lipoprotein and fibro-calcific remodeling of the aortic valve in aortic stenosis

Noves aportacions i limitacions de les tècniques d'imatge cardíaca en les valvulopaties

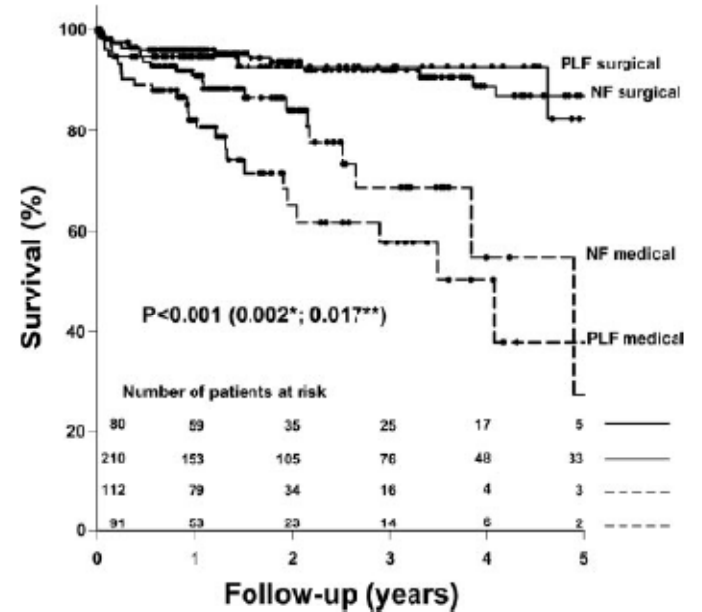
- Ecocardiografia 3D a la pràctica clínica
- Aportacions de la RM cardíaca
- Estratificació pronòstica a l'estenosi aòrtica
- **Una nova visió de la valvulopatia aòrtica**

Paradoxical Low-Flow, Low-Gradient Severe Aortic Stenosis Despite Preserved Ejection Fraction Is Associated With Higher Afterload and Reduced Survival

Zeineb Hachicha, MD; Jean G. Dumesnil, MD; Peter Bogaty, MD; Philippe Pibarot, DVM, PhD



Circulation American Heart Association
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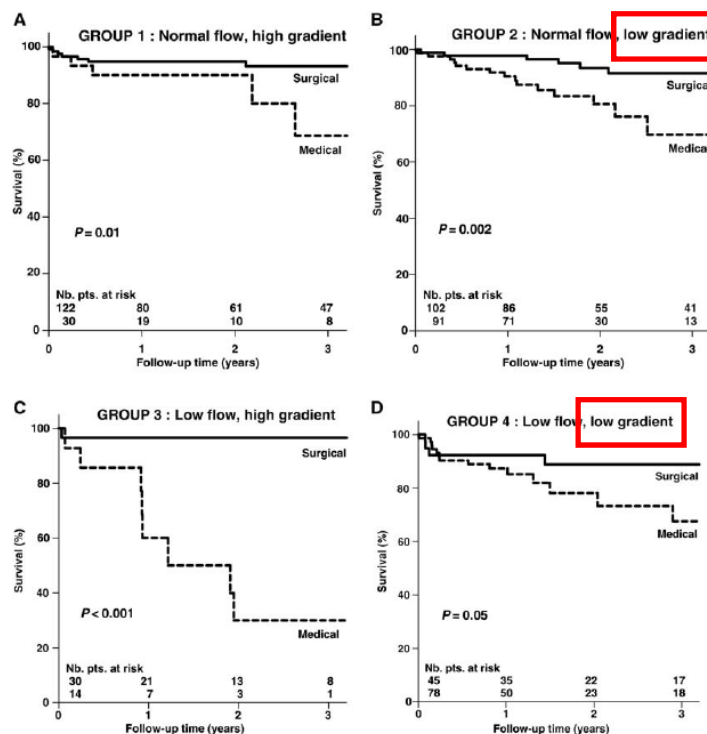
CLINICAL PERSPECTIVE

In the present study, we report that a significant proportion (35%) of patients with severe aortic stenosis on the basis of echocardiographically determined aortic valve area may have a pattern characterized by paradoxically low-flow and low transvalvular gradients despite a normal left ventricular ejection fraction. The pattern is associated with higher global left ventricular afterload, more pronounced concentric remodelling, evidence of intrinsic myocardial dysfunction, and lower survival, which suggests that these patients are at a more advanced stage of their disease than their counterparts with the more classical normal flow pattern of aortic stenosis. Surgical treatment was also associated with a much better prognosis than medical treatment. Nonetheless, in this series only 47% of patients with paradoxically low-flow pattern were treated surgically as compared with 65% of patients with normal flow pattern. Hence this condition may often be misdiagnosed,

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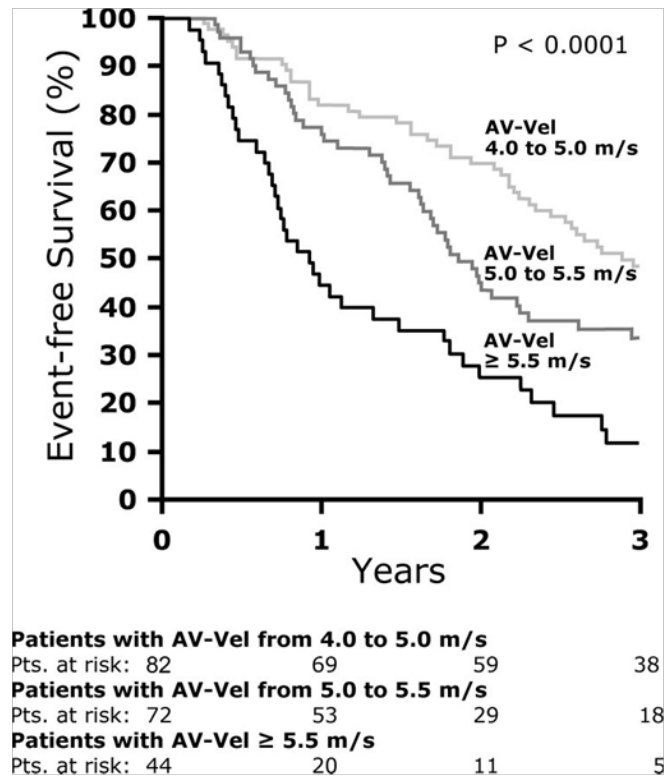
Paradoxical low flow and/or low gradient severe aortic stenosis despite preserved left ventricular ejection fraction: implications for diagnosis and treatment

Jean G. Dumesnil^{1*}, Philippe Pibarot^{1*}, and Blase Carabello²

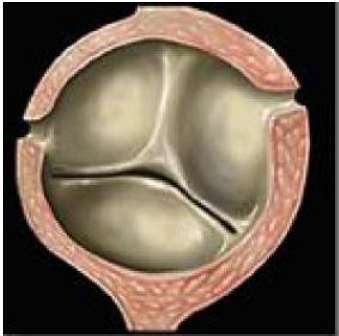


Natural History of Very Severe Aortic Stenosis

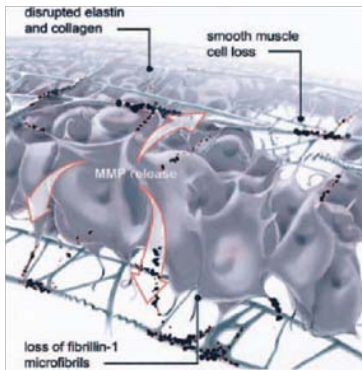
Raphael Rosenhek, MD; Robert Zilberszac; Michael Schemper, PhD; Martin Czerny, MD;
 Gerald Mundigler, MD; Senta Graf, MD; Jutta Bergler-Klein, MD; Michael Grimm, MD;
 Harald Gabriel, MD; Gerald Maurer, MD



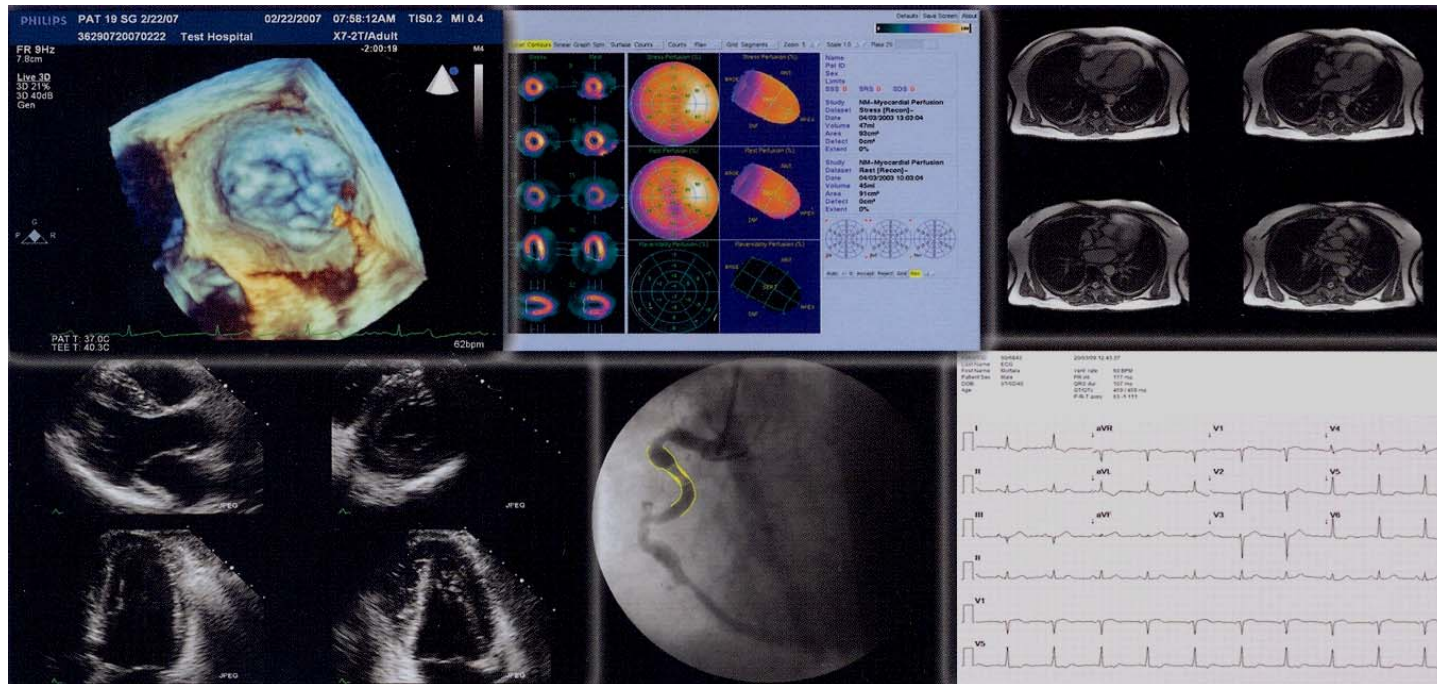
Aorta bicúspide: identificació de fenotips



- **Fenotip AP o tipus 1 (coronàric esquerre-dret): (2/3)**
 - Més insuficiència aòrtica severa
 - Més dilatació aòrtica (afecten a arrel aòrtica)
- **Fenotip L o tipus 2 (coronàric dret-no coronàric): (1/3)**
 - Més estenosi aòrtica severa
 - Menys dilatació aòrtica (afecten a segment ascendent i crossa aòrtica)



Imatge cardíaca: multimodalitat



Conclusions

1. L'Eco 3D ens aporta:

- coneixement anatòmic i funcional, especialment de la vàlvula mitral
- serà una guia pels procediments percutanis i quirúrgics futurs

2. La RM cardíaca és útil a:

- La quantificació de les regurgitacions valvulars
- La detecció de mecanismes que condicionen el pronòstic

3. Existeixen eines a les tècniques d'imatge cardíaca que, tot i les seves limitacions, ens permeten estratificar millor el pronòstic de les valvulopaties

4. L'estenosi aòrtica a baix fluxe i baix gradient amb FE preservada, així com diferents fenotips d'aorta bicúspide, ens aporten una nova visió de la valvulopatia aòrtica

Gràcies



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