



# Il ruolo dell'immagine ecocardiografica della Protesi Perceval nel pre, intra e post operatorio

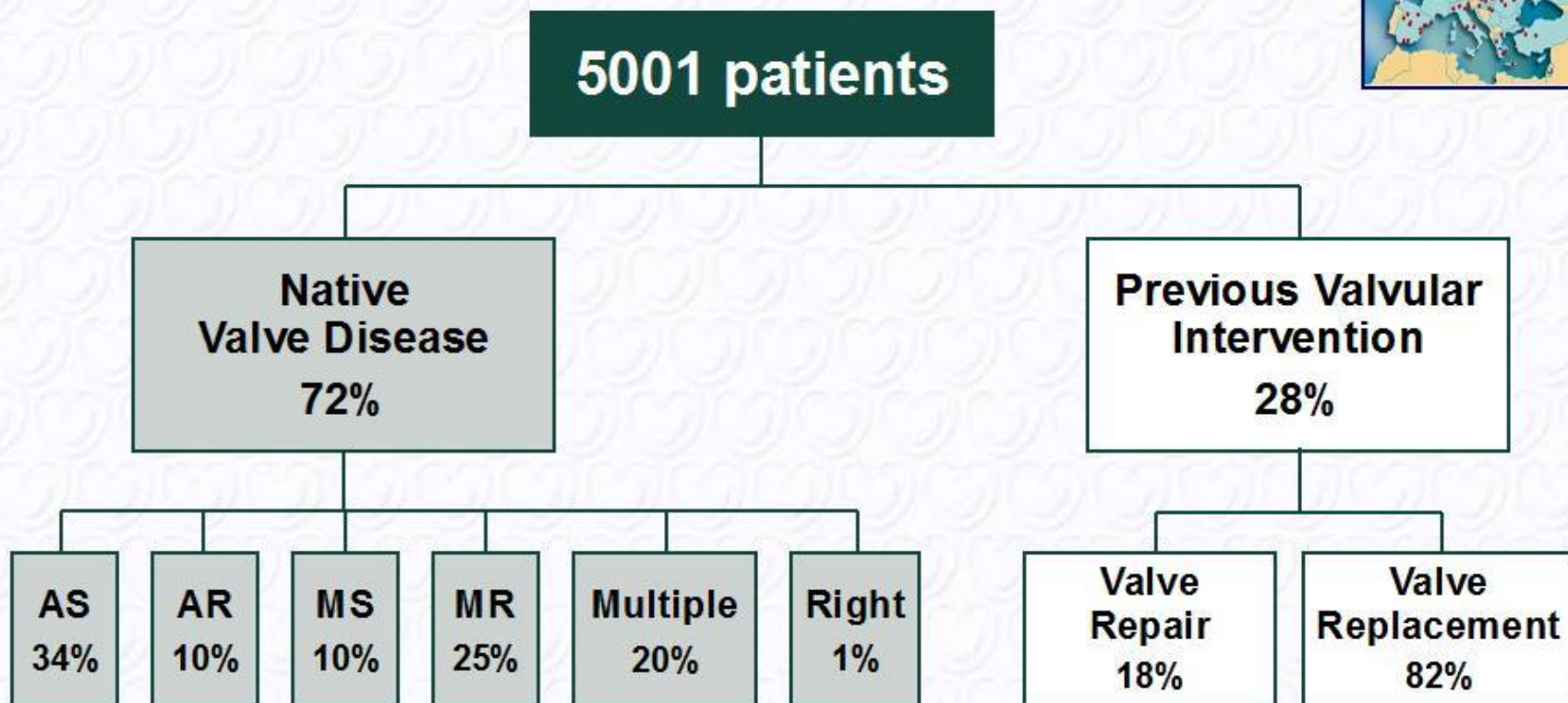
**Wanda Deste**

*Dipartimento Cardiovascolare*

*A.O.U. "Policlinico-Vittorio Emanuele"*

*P.O. Ferrarotto – Catania - Italy*

# Distribution of Valvular Heart Diseases in the Euro Heart Survey



lung et al. *Eur Heart J* 2003;24:1244-53

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



# Patient Characteristics in the Euro Heart Survey



	Age (years)	≥ 70 years (%)	≥ 1 comorbidity (%)
<b>AS</b>	69±12	56	36
<b>AR</b>	58±16	25	26
<b>MS</b>	58±13	18	22
<b>MR</b>	65±14	44	42

lung et al. *Eur Heart J* 2003;24:1244-53

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







**31.8% did not undergo Intervention, despite NYHA Class III/IV symptoms**



**Do patients with valvular heart disease receive interventions according to established guidelines?**

**92 hospitals from 25 countries  
5001 patients from April-July 2001**

European Heart Journal (2003) 24, 1231–1243

**A prospective survey of patients with valvular heart disease in Europe: The Euro Heart Survey on Valvular Heart Disease**

Bernard Jung<sup>a\*</sup>, Gabriel Baron<sup>b</sup>, Eric G. Butchart<sup>c</sup>, François Delahaye<sup>d</sup>, Christa Gohlke-Bärwolf<sup>e</sup>, Olaf W. Levang<sup>f</sup>, Pilar Tornos<sup>g</sup>, Jean-Louis Vanoverschelde<sup>h</sup>, Frank Vermeer<sup>i</sup>, Eric Boersma<sup>j</sup>, Philippe Ravaud<sup>b</sup>, Alec Vahanian<sup>a</sup>

<sup>a</sup>Cardiology Department, Bichat Hospital, AP-HP, Paris, France  
<sup>b</sup>Epidemiology, Biostatistic, and Clinical Research Department, Bichat Hospital, AP-HP, Paris, France  
<sup>c</sup>Cardiac Surgery Department, University Hospital, Wales, Cardiff, UK  
<sup>d</sup>Cardiology Department, Hôpital Cardiologique, Lyon, France

Valvular heart disease;  
Echocardiography;  
Cardiac surgery

Outcomes of contemporary patients with valvular heart disease (VHD) in Europe, and to examine adherence to guidelines. **Methods and results** The Euro Heart Survey on VHD was conducted from April to July 2001 in 92 centres from 25 countries; it included prospectively 5001 adults with moderate to severe native VHD, infective endocarditis, or previous valve intervention. VHD was native in 71.9% of patients and 28.1% had had a previous intervention. Mean age was 64±14 years. Degenerative aetiologies were the most frequent in aortic VHD and mitral regurgitation while most cases of mitral stenosis were of rheumatic origin. Coronary angiography was used in 85.2% of patients before intervention. Of the 1269 patients who underwent intervention, prosthetic replacement was performed in 99.0% of aortic VHD, percutaneous dilatation in 33.9% of mitral stenosis, and valve repair in 46.5% of mitral regurgitation; 31.7% of patients had ≥1 associated procedure. Of 1269 patients with VHD, 31.8% did not undergo intervention, 68.2% did. In asymptomatic patients, adherence with guidelines was 70.0% and 78.5%. Operative mortality was <5% for single VHD. The survey provides unique contemporary data on characteristics and outcomes of patients with VHD. Adherence to guidelines is globally satisfying as assessed by the survey. *Journal of Cardiology*. Published by Elsevier Ltd. All rights reserved.

Bichat Hospital, 46 rue Henri Huchard, 75018 Paris, France.

E-mail address: bernard.jung@bch.ap-hop-paris.fr (B. Jung).

0195-668X/03/5 - see front matter © 2003 The European Society of Cardiology. Published by Elsevier Ltd. All rights reserved.  
doi:10.1016/S0195-668X(03)00201-X

# Why do we need new guidelines on the management of valvular disease?

- **New evidence has been accumulated on:**
  - risk stratification,
  - diagnostic methods,
  - therapeutic options.
- **The importance of the collaborative approach between cardiologists and cardiac surgeons, working as a « heart team », has emerged.**

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



## PERCEVAL S<sup>tars</sup> Club

The only Self-Anchoring, Self-Expanding, Sutureless, Surgical solution for AVR



- *Prior implantation*
- *During Implantation*
- *Post Implantation*

## *the implant is not recommended for:*

- *Bicuspid valve replacement with asymmetrical sinus of Valsalva*
- *A ratio between the diameter of the JST and the diameter annulus  $< 1.3$  (a ratio  $> 1.3$  can prevent a correct fixation of the valve-stent on the aorta).*
- *Aortic aneurism ( $> 4$  cm) or a dissection of the aorta requiring intervention*
- *Any vegetation and complex valvular anatomy*
- *Mitral regurgitation  $> 2$  grade*
- *Ventricle function  $< 20\%$*

# *Echo in Perceval*

## Evaluation *PRE*

### *Transthoracic and transesophageal*

- *Aortic valve stenosis*
- *Morphology*
- *Parameters aortic root*
- *Evaluation ventric sn*
- *Valvulopathy associated*



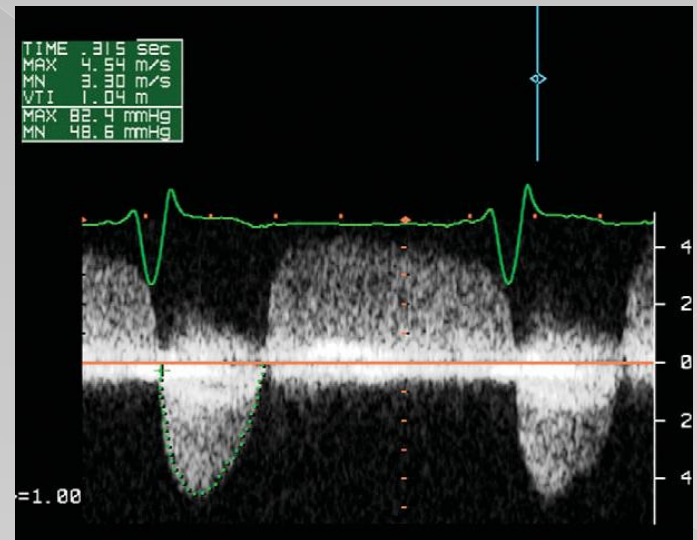
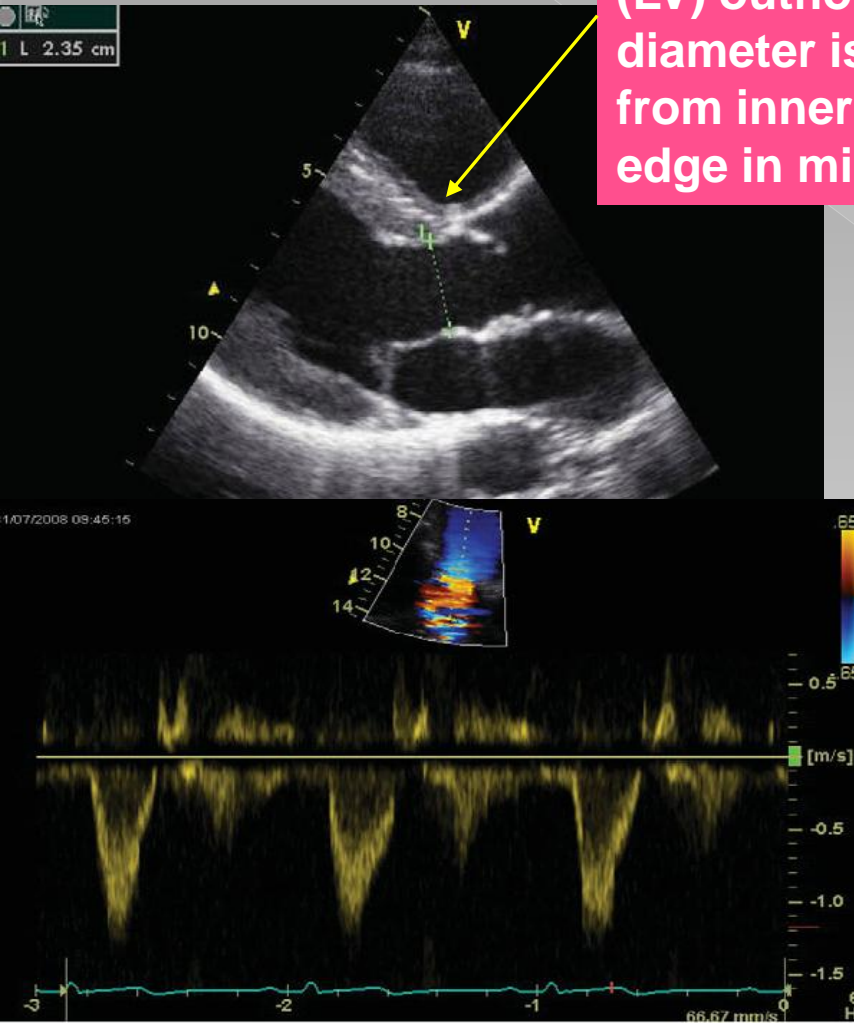
# Calculation of the continuity equation



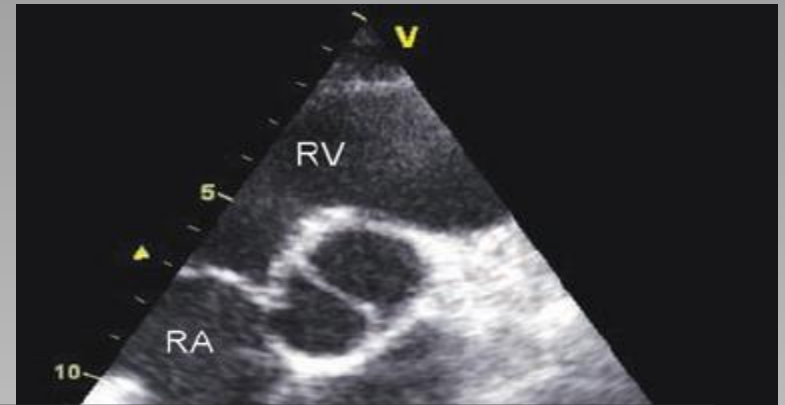
$$A_2 = A_1 \times V_1 / V_2$$

The left ventricular (LV) outflow tract diameter is measured from inner to inner edge in mid-systole

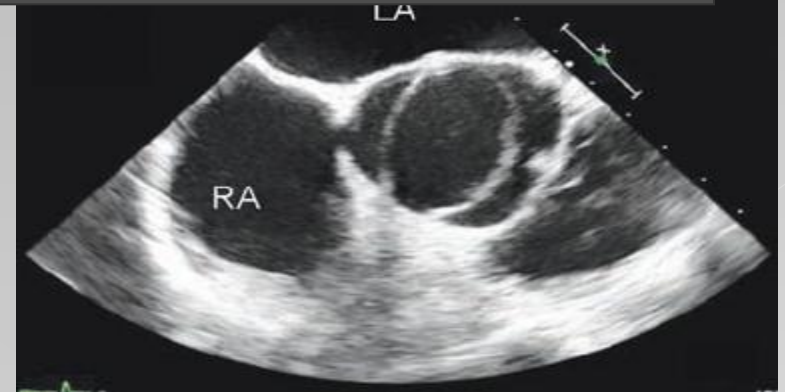
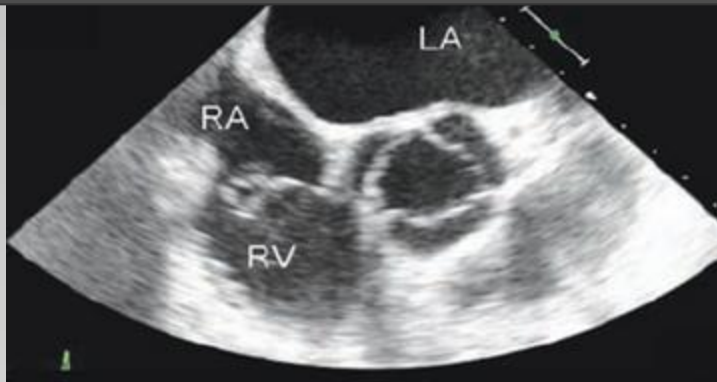
- ◆  $Q = v \times A$  (v = velocità; A = Area)
- ◆  $Q_1 = Q_2$
- ◆  $v_1 \times A_1 = v_2 \times A_2$
- ◆  $A_2 = v_1 \times A_1 / v_2$



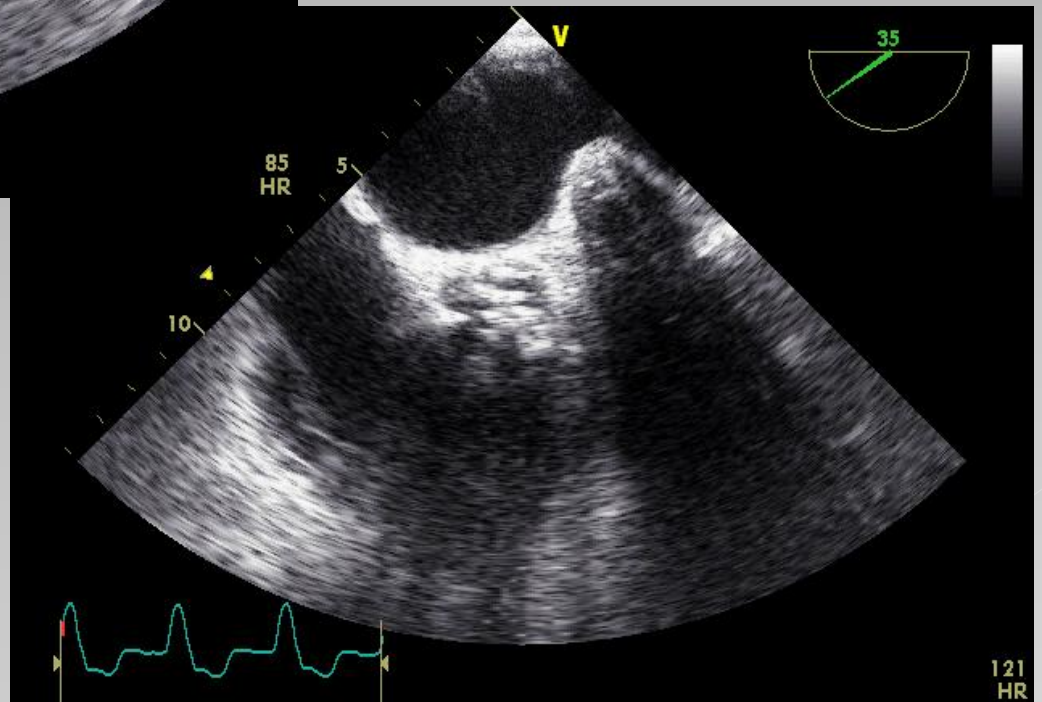
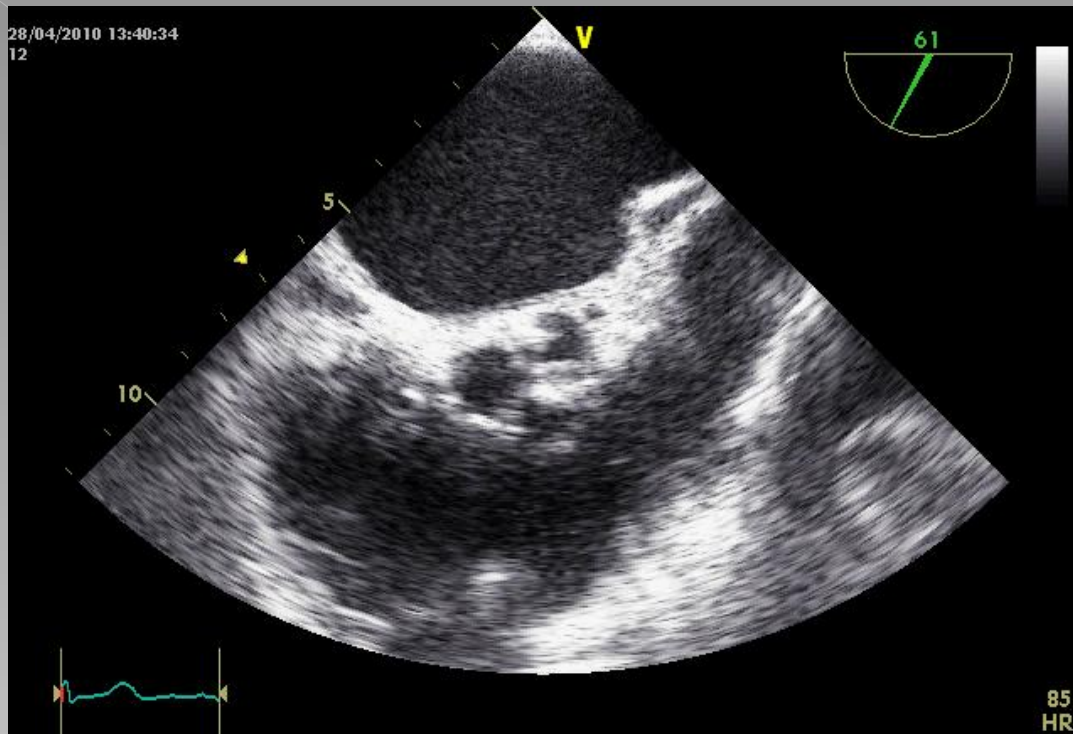
# Aortic Valve Morphology



*The presence of a bicuspid valve has been proposed as contraindication*



28/04/2010 13:40:34  
12



PHILIPS

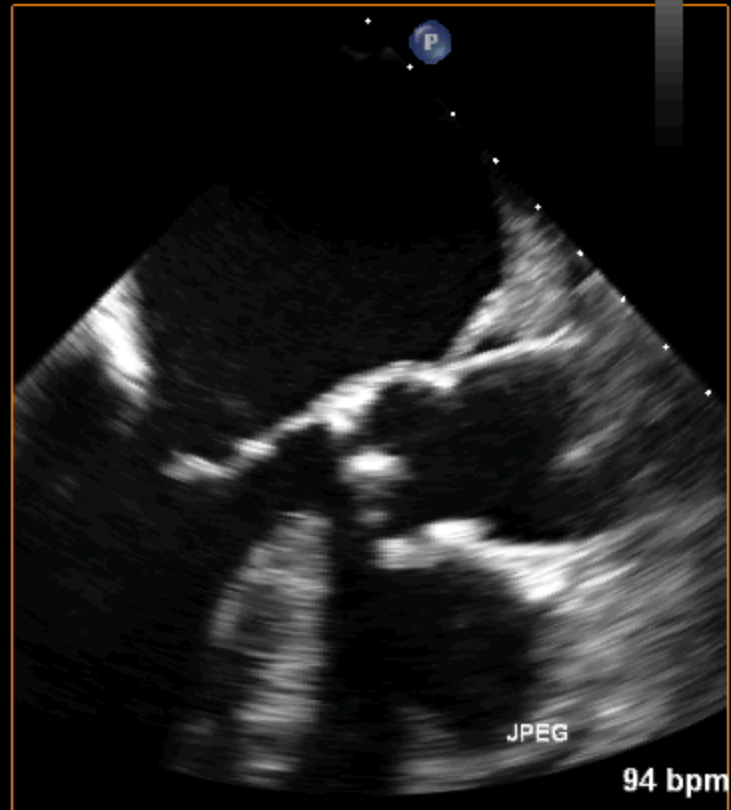
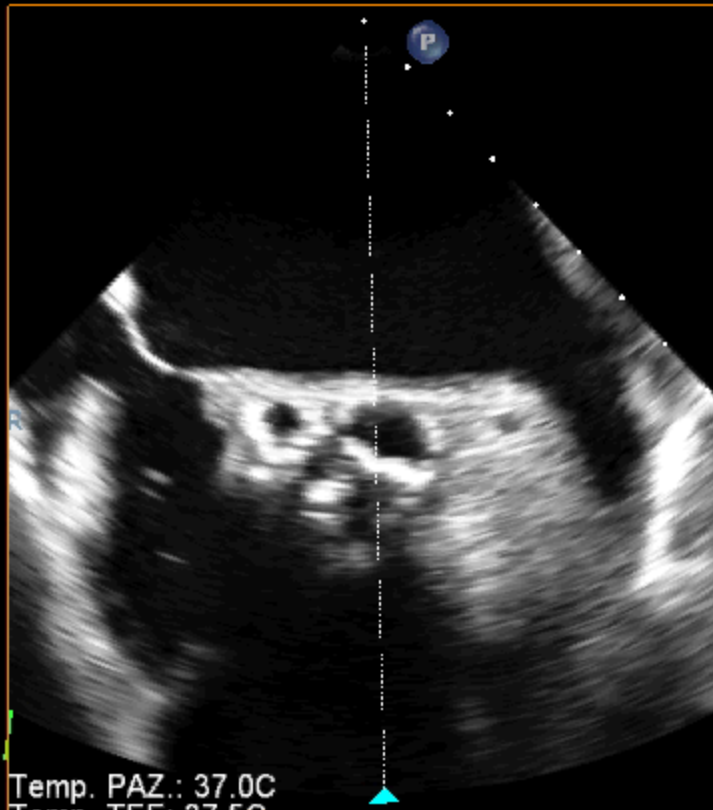
TIS0.1 MI 0.5

CX7-2t/TEE3D

M3

FR 29Hz  
12cm

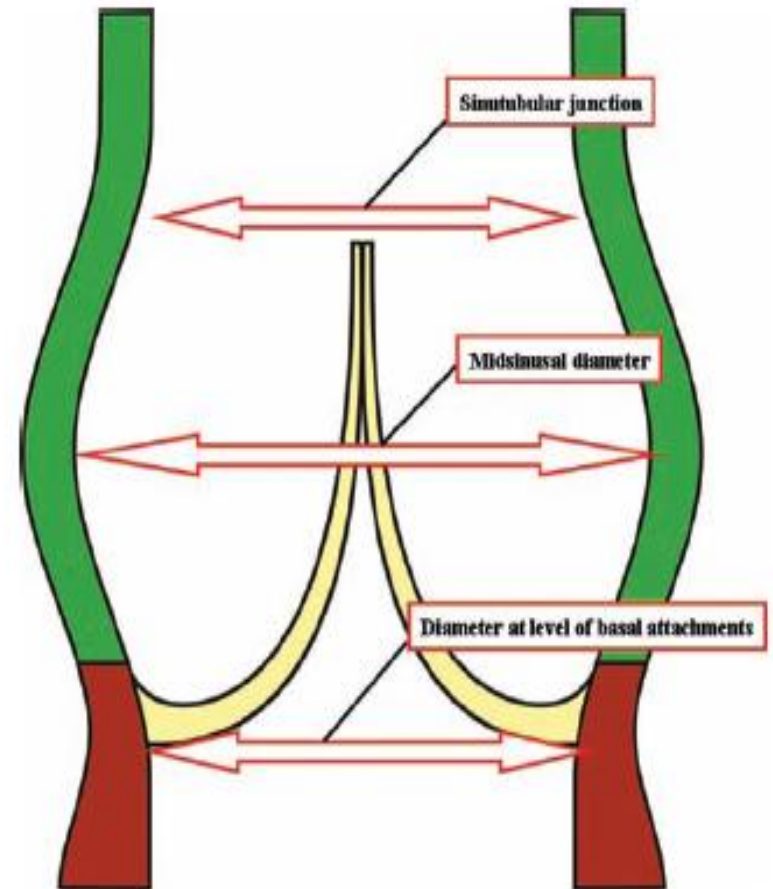
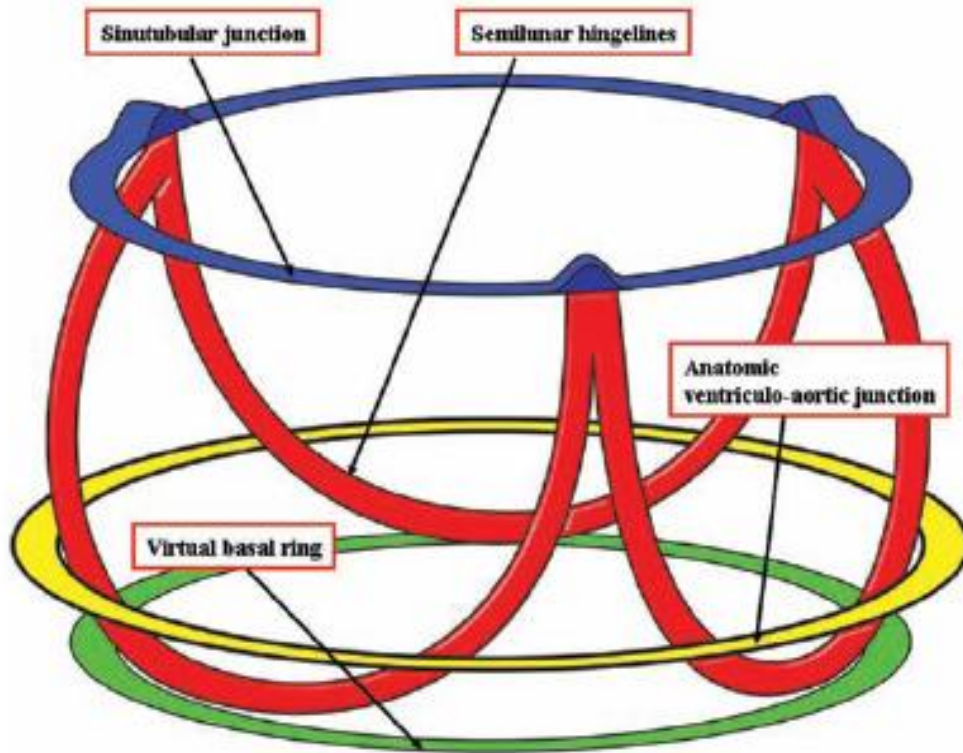
3D Zoom  
61%  
61%  
60dB  
P Bassa  
Gen.



Temp. PAZ.: 37.0C  
Temp. TEE: 37.5C

94 bpm

# Aortic Valve Assessment

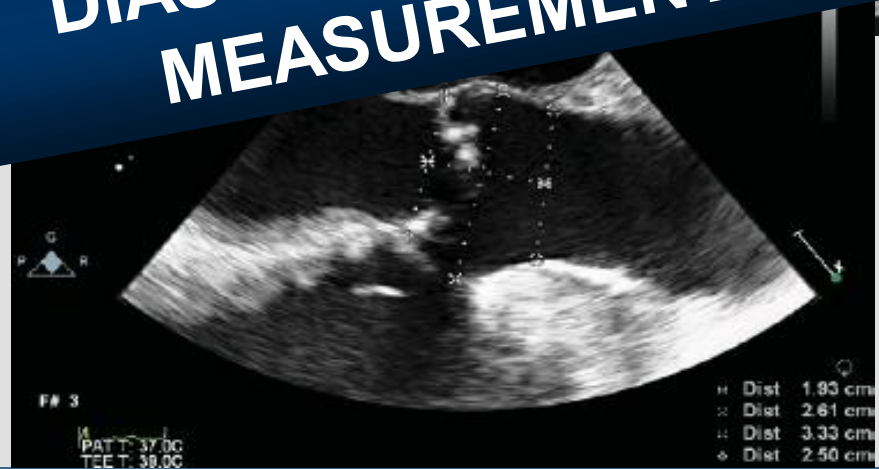


# Aortic Valve Annulus Size



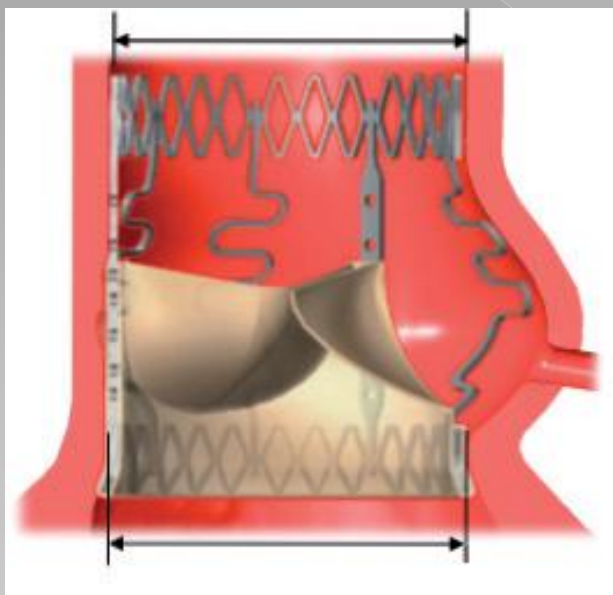
**END  
DIASTOLE OR SISTOLE  
MEASUREMENT ?**

- ANULUS
- SOV
- ST J



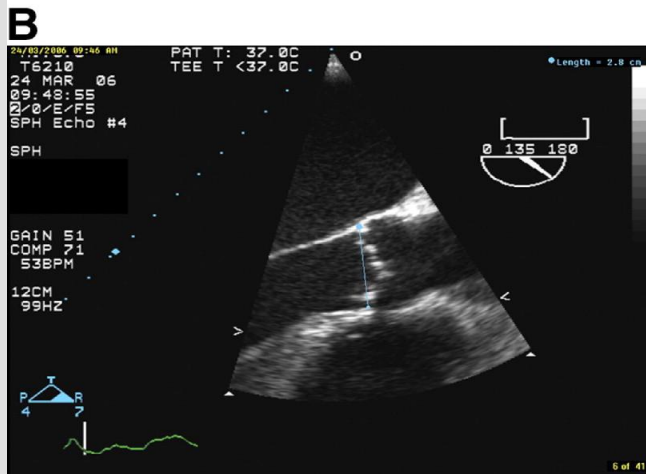
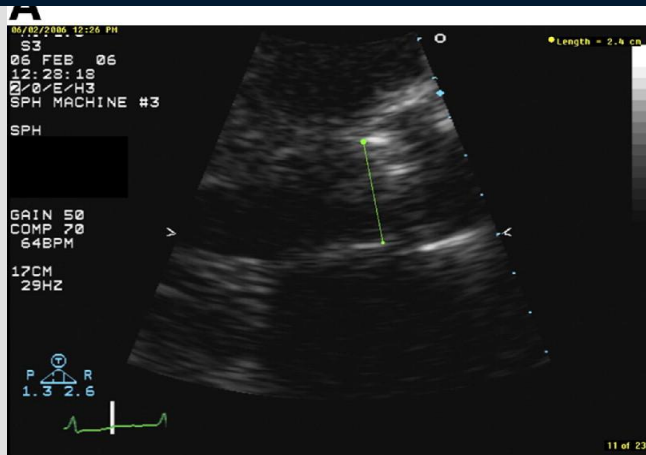
**The patient is Suitable if**

$$\frac{\text{Ø STJ}}{\text{Ø Annulus}} \leq 1.3$$



# Aortic Valve Annulus Size

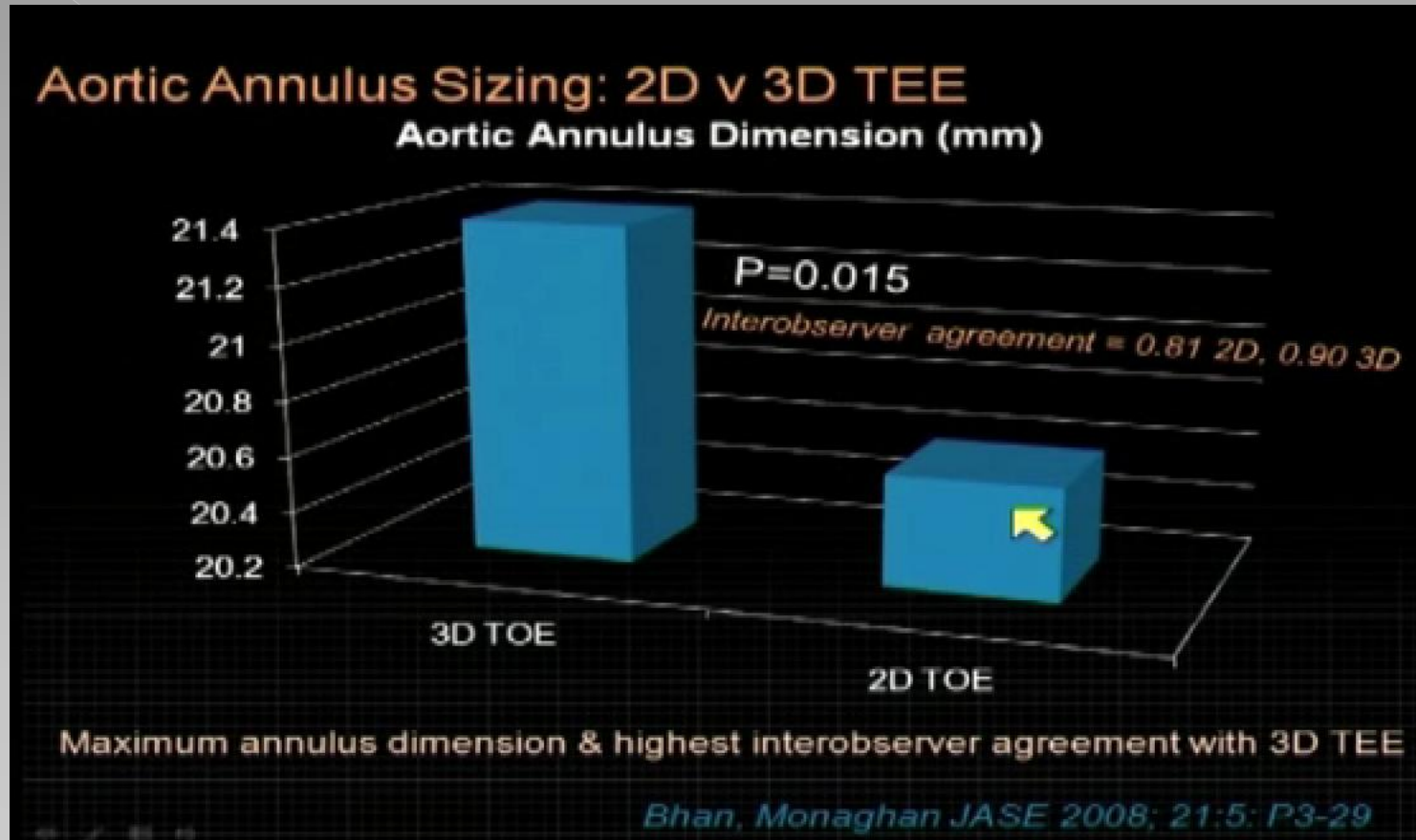
## Aortic Annulus Dimension Assessed by Both TTE and TEE



The mean difference (TTE-TEE)  
is -1.36 mm



# Aortic Valve Annulus Size





“Doing an aortic valve area was never so simple!”

Jose Luis Zamorano, MD - Madrid  
President Elect European Association of  
Echocardiography of ESC

European Heart Journal Advance Access published November 6, 2007



EUROPEAN  
SOCIETY OF  
CARDIOLOGY®

European Heart Journal  
doi:10.1093/eurheartj/ehm467

Clinical research

## Real-time three-dimensional echocardiography in aortic stenosis: a novel, simple, and reliable method to improve accuracy in area calculation

Juan Luis Gutiérrez-Chico<sup>1\*</sup>, José Luis Zamorano<sup>2</sup>, Elsa Prieto-Moriche<sup>2</sup>, Rosa Ana Hernández-Antolín<sup>2</sup>, Marisol Bravo-Amaro<sup>1</sup>, Leopoldo Pérez de Isla<sup>2</sup>, Marcelo Sanmartín-Fernández<sup>1</sup>, José Antonio Baz-Alonso<sup>1</sup>, and Andrés Íñiguez-Romo<sup>1</sup>

<sup>1</sup>Unidad de Cardiología Intervencionista, Hospital de Meixoeiro, Instituto Galego de Medicina Técnica, Crtra. de Meixoeiro s/n, 36204 Vigo (Pontevedra), Spain; and <sup>2</sup>Hospital Clínico San Carlos, Madrid, Spain

Received 21 April 2007; revised 10 September 2007; accepted 24 September 2007

PHILIPS

TIS0.2 MI 0.5

CX7-2t/TEE3D

FR 16Hz  
12cm

Battiti 3D 1

M4

3D  
3D 47%  
3D 29dB



Temp. PAZ.: 37.0C  
Temp. TEE: 38.4C

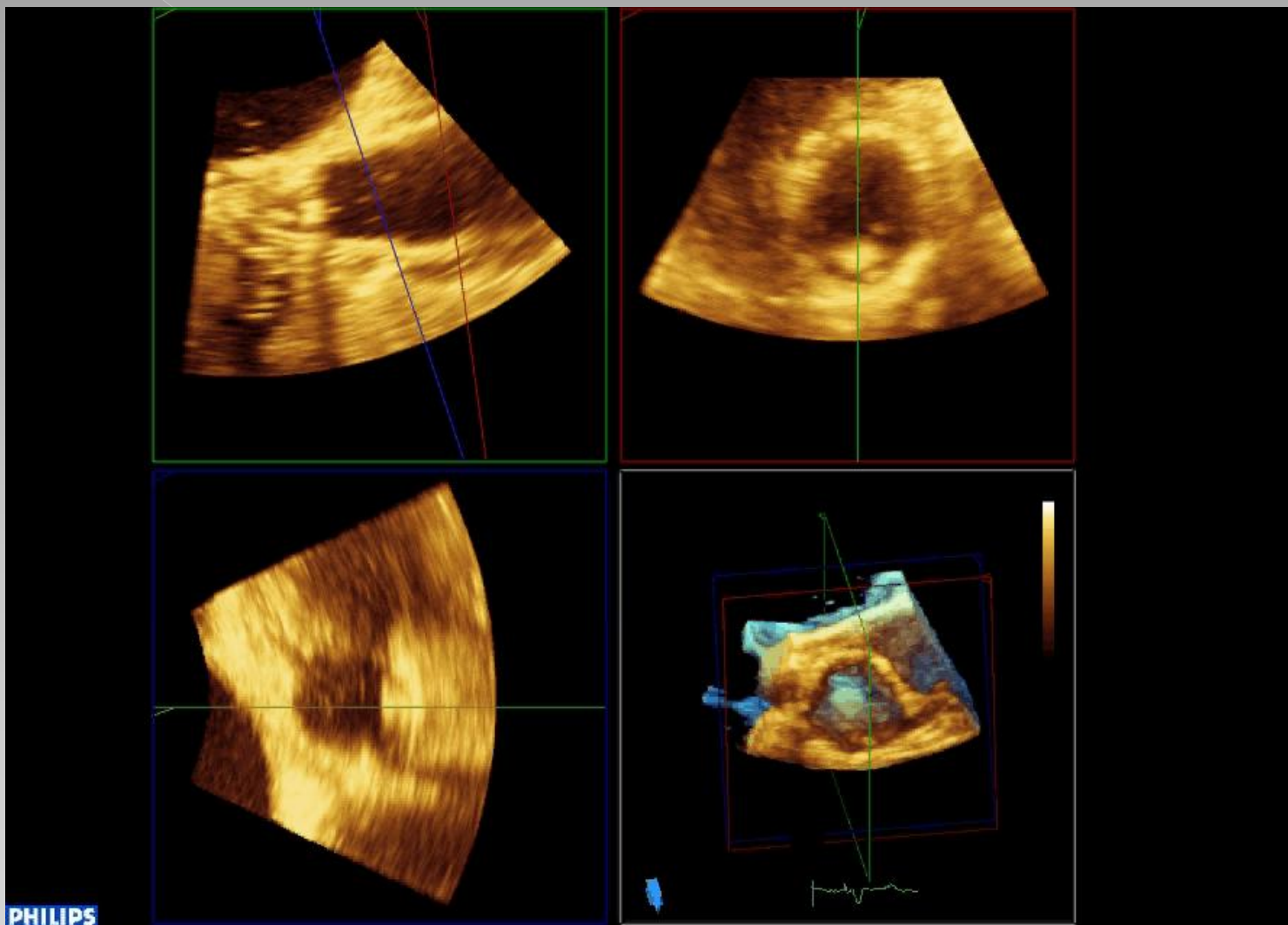
JPEG

102 bpm

# Potential Role of three dimensional Echocardiography



# ECO 3D

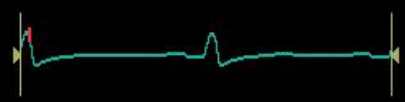
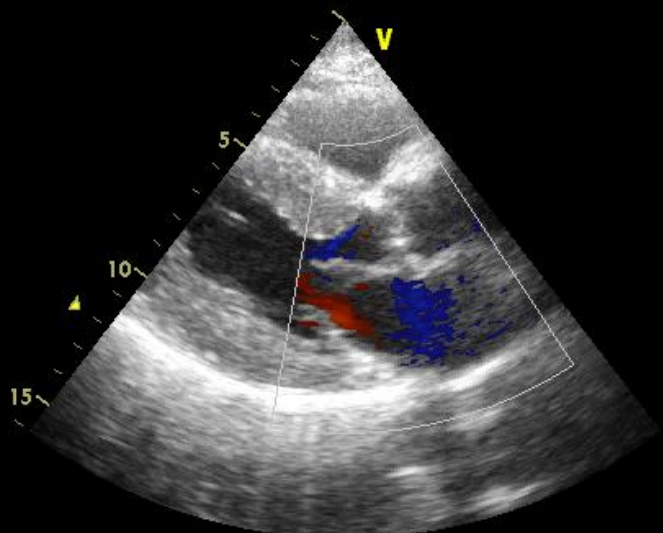


# ***Ventricolo sinistro***

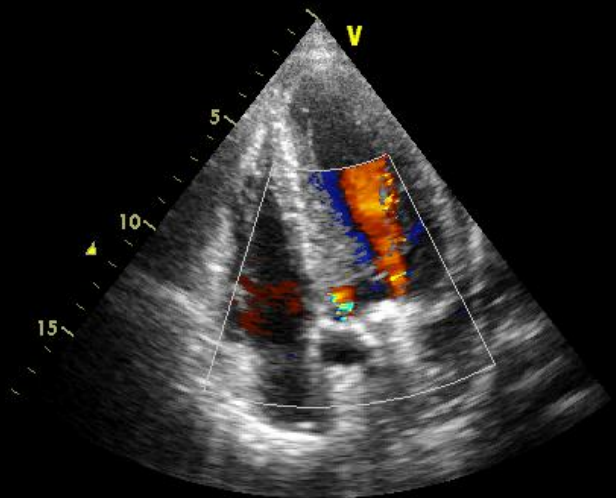
- 1. Funzione sistolica***
- 2. Funzione diastolica***
- 3. Funzione longitudinale***
- 4. Severa ipertrofia***

# SEVERA IPERTROFIA

24/03/2010 11:38:38



24/03/2010 12:02:47



67  
HR

# *Prognostic value of myocardial fibrosis in patients with severe aortic valve stenosis.*

**99 pt, follow-up  $6.2 \pm 3.0$  ye**

**To evaluate whether myocardial fibrosis influences left ventricular performance in severe aortic stenosis and to assess its effect on long-term survival after aortic valve replacement.**

***Patients with a higher grade of myocardial fibrosis had a significantly lower freedom from cardiac death at 10 years ( $42\% \pm 19\%$  vs  $89\% \pm 6\%$ ,  $P = .002$ ), with congestive heart failure the most common cause of death***

## **CONCLUSIONS:**

***The amount of myocardial fibrosis appears to have significant effect on clinical status and long-term survival after aortic valve replacement. We believe that new strategies for the earlier detection of myocardial fibrosis are needed to achieve a better prognostic outcome.***



○ **Myocardial remodeling with aortic stenosis and after aortic valve replacement: mechanisms and future prognostic implications.**

[Yarbrough WM](#), [Mukherjee R](#), [Ikonomidis JS](#), [Zile MR](#), [Spinale FG](#)

- **A** pathologic process that elicits myocyte hypertrophy and alterations in extracellular matrix composition, both of which contribute to increases in left ventricular stiffness.
- A pathologic increased myocardial extracellular matrix fibrillar collagen content occurs later in the time course of left ventricular pressure overload at a time coincident with severe abnormalities in diastolic function followed by the development of symptomatic heart failure.
- Aortic valve replacement remains the most effective treatment for elimination of chronic pressure overload secondary to aortic stenosis but has traditionally been recommended only after the onset of clinical symptoms.
- Long-term follow-up of patients with symptomatic aortic stenosis after aortic valve replacement suggests that valve replacement may not result in complete reversal of the maladaptive changes that occur within the myocardial extracellular matrix secondary to the pressure overload state.
- These are likely responsible for persistent abnormalities in diastolic function and increased morbidity and mortality after aortic valve replacement.

# Background

Severe Aortic Stenosis

Left ventricular (LVH)  
hypertrophy

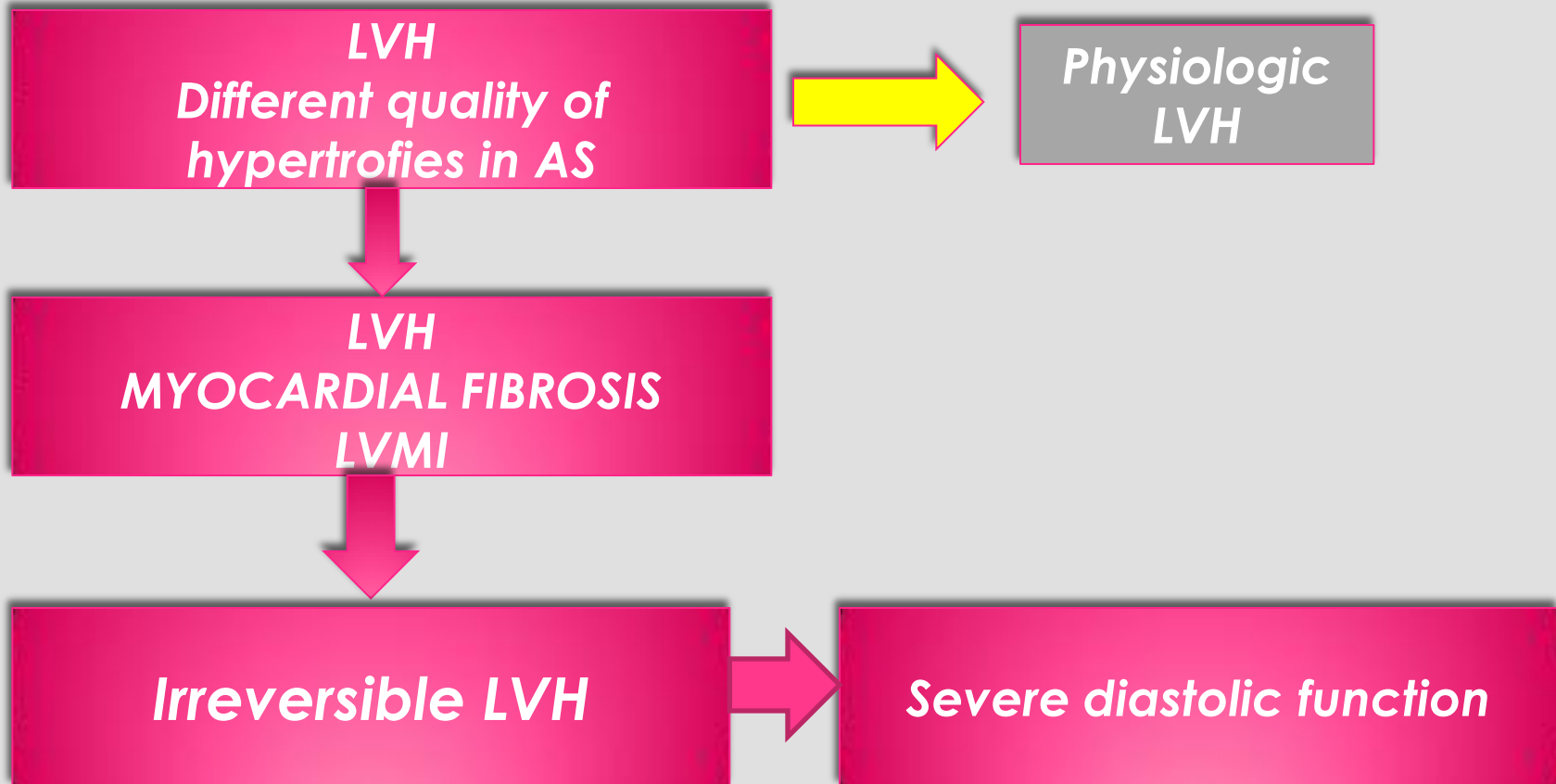
Left ventricular mass  
(LVM)

Independent risk factor for  
cardiovascular mortality and  
morbidity.

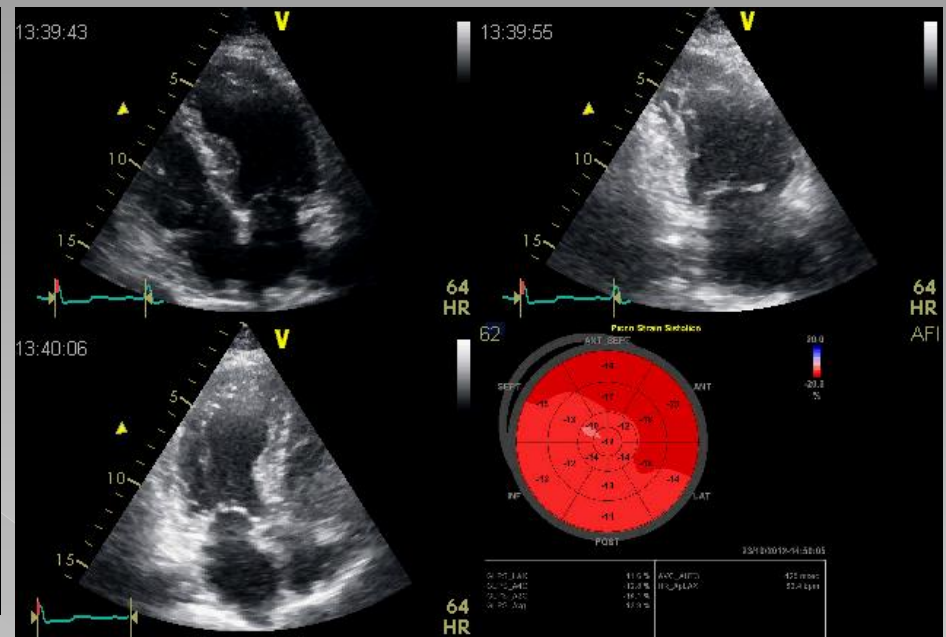
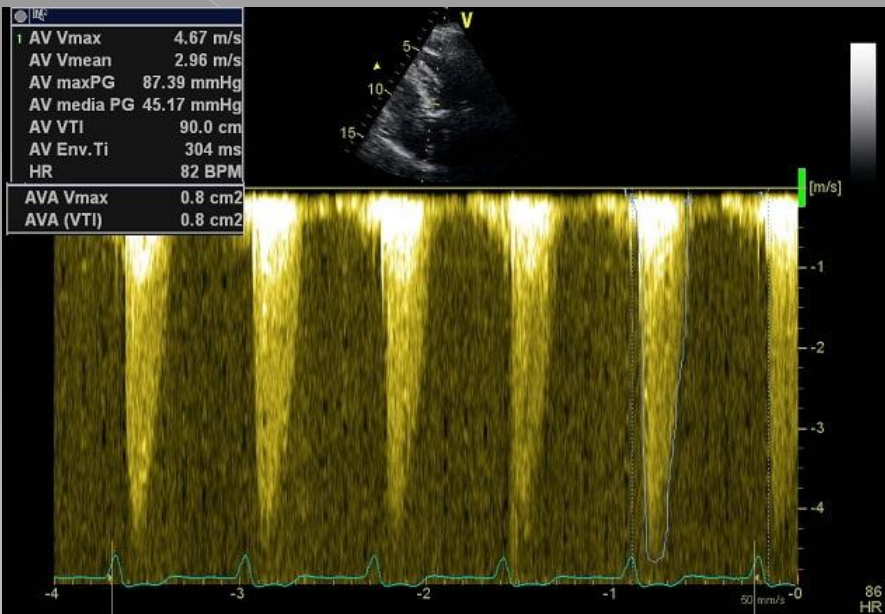
*Division of Cardiology Ferrarotto Hospital  
University of Catania*



# MYOCARDIAL FIBROSIS



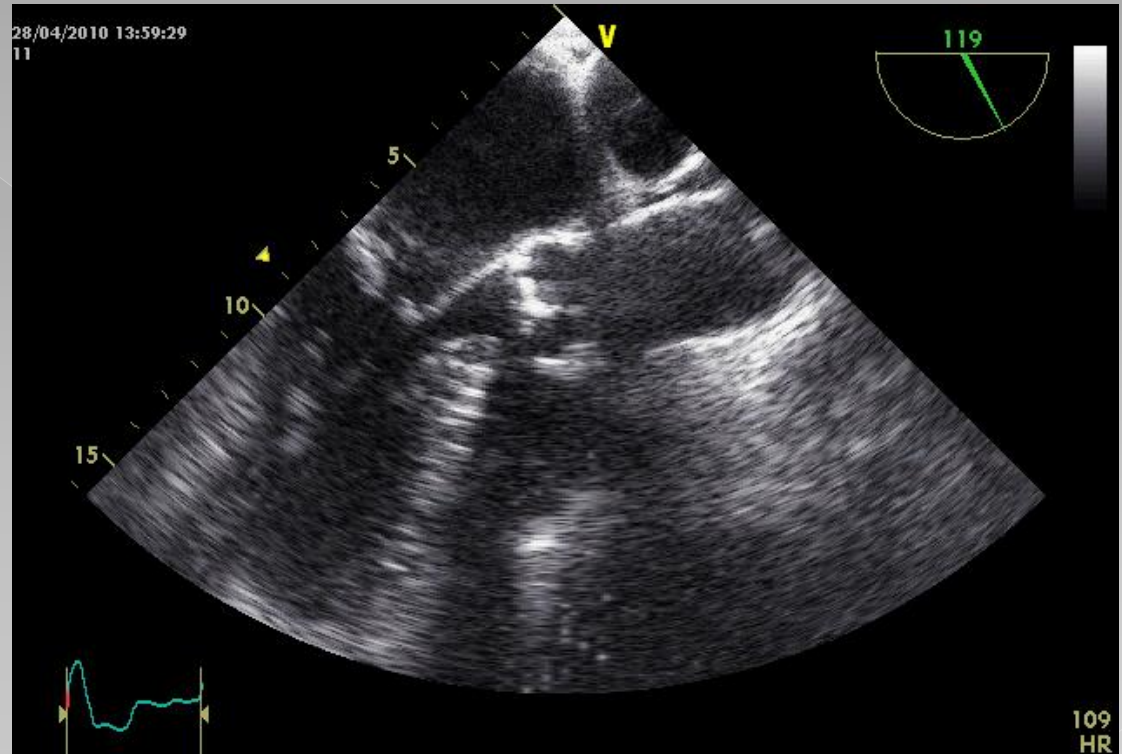
# Transthoracic Echocardiogram



- **LVEF: 55% GLS: -13.8%**
- **mGrad: 45 mmHg**
- **iAVA: 0.4 cm<sup>2</sup>/m<sup>2</sup> (invariant)**
- **Jet velocity AS: 4.67 m/s**
- **SVi: 32 ml/m<sup>2</sup> (invariant)**

# Left Ventricular

Left ventricular  
function  
Left ventricular  
hypertrophy  
Sigmoid  
septum





- *Prior implantation*
- *During Implantation*
- *Post Implantation*

# *Evaluation post*

*Transesophageal echo intraoperatively  
to verify correct valve positioning  
Mitral valve  
to assess for paravalvular leak*

PHILIPS

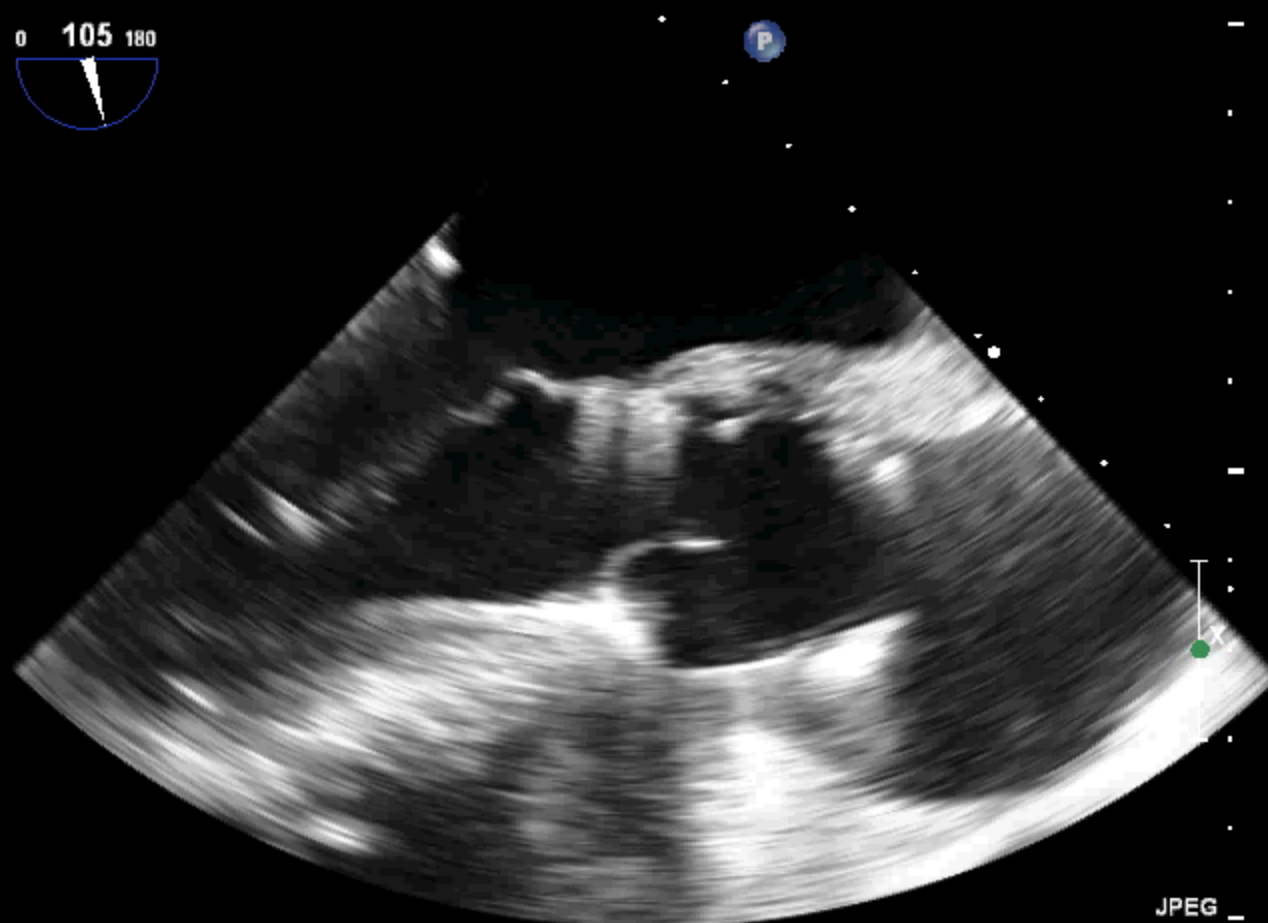
TISO.1 MI 0.5

CX7-2t/Adulti

M4

FR 50Hz  
10cm

2D  
61%  
C 50  
P Off  
Gen.



JPEG \_ 10  
71 bpm

Temp. PAZ.: 37.0C  
Temp. TEE: 39.5C



PHILIPS

TIS0.2 MI 0.5

CX7-2t/Adulti

FR 34Hz  
10cm

Battiti 3D 2

M4

3D  
3D 52%  
3D 40dB



JPEG

Temp. PAZ.: 37.0C  
Temp. TEE: 39.5C

73 bpm

PHILIPS

TISO.2 MI 0.5

CX7-2t/3DTEE

FR 10Hz  
9.6cm

Battiti 3D 1

M4

3D  
3D 23%  
3D 31dB



PROT.

LAM



JPEG

Temp. PAZ.: 37.9C  
Temp. TEE: 39.8C

38 bpm

PHILIPS

TIS0.1 MI 0.5

CX7-2t/AdultI

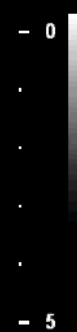
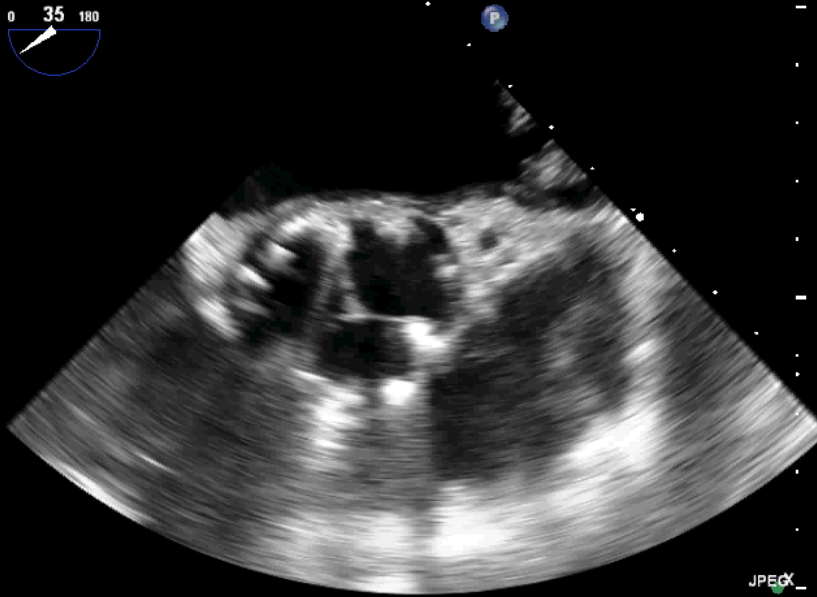
FR 50Hz  
10cm

M4

2D  
62%  
C 50  
P Off  
Gen.



G  
P R



Temp. PAZ.: 37.0C  
Temp. TEE: 38.6C

JPEG

PHILIPS

TIS0.2 MI 0.5

OSPEDALE FERRAROTTO CX7-2t/AdultI

FR 34Hz  
10cm

Battiti 3D 2

M4

3D  
3D 52%  
3D 40dB



Temp. PAZ.: 37.0C  
Temp. TEE: 37.4C



82bpm

PHILIPS

TIS0.2 MI 0.5

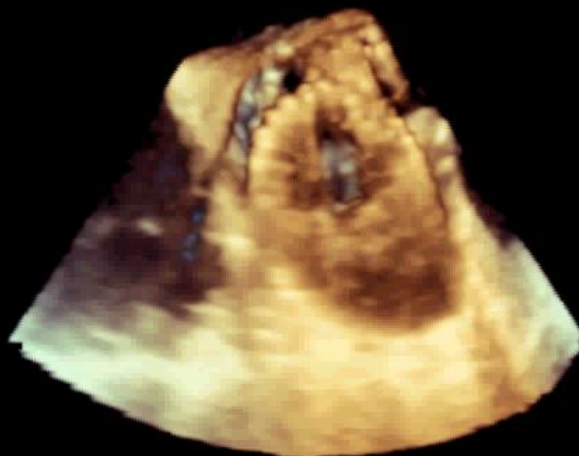
CX7-2t/Adulti

FR 34Hz  
10cm

Battiti 3D 2

M4

3D  
3D 52%  
3D 40dB



Temp. PAZ.: 37.0C  
Temp. TEE: 39.3C

PHILIPS

TIS0.2 MI 0.5

CX7-2t/Adulti

FR 34Hz  
10cm

Battiti 3D 2

M4

3D  
3D 52%  
3D 40dB



Temp. PAZ.: 37.0C  
Temp. TEE: 39.4C

JPEG

88 bpm

PHILIPS

TIS0.6 MI 0.4

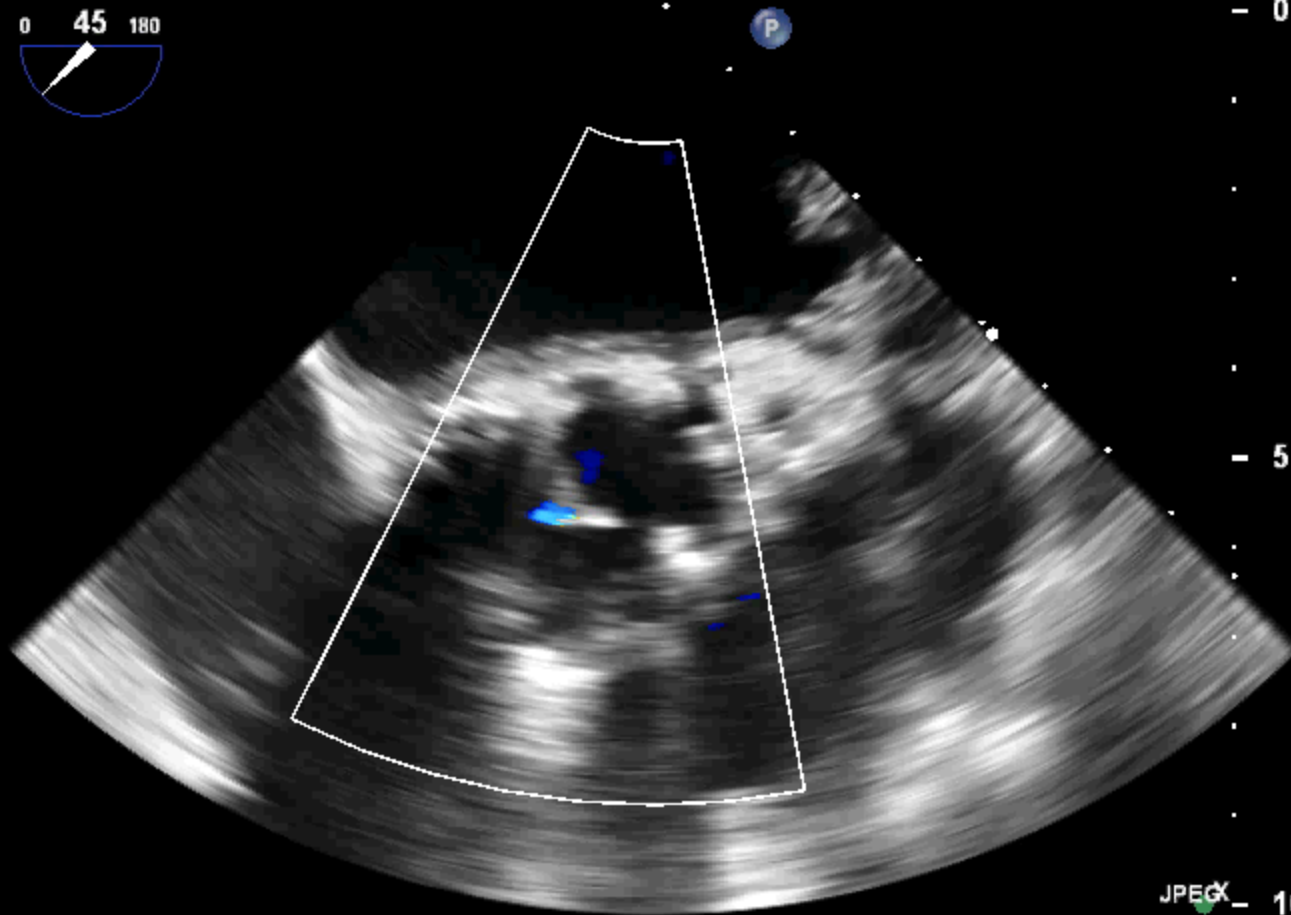
CX7-2t/Adulti

FR 20Hz  
10cm

2D  
63%  
C 50  
P Off  
Gen.



CF  
59%  
4.4MHz  
WF Alto  
Med.



Temp. PAZ.: 37.0C  
Temp. TEE: 39.2C

JPEG\_ 10  
127 bpm

PHILIPS

TISO.9 MI 0.4

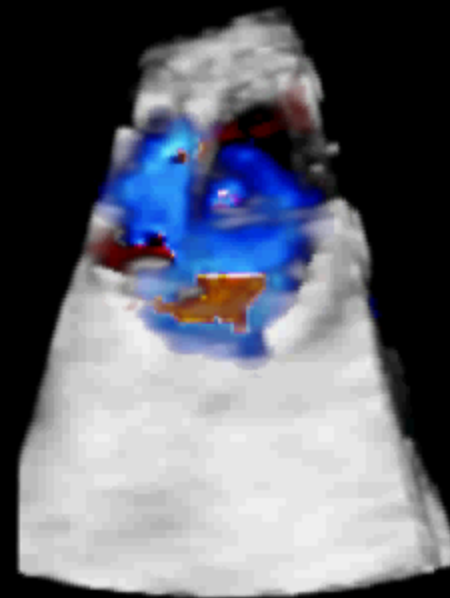
CX7-2t/Adulti

FR 20Hz  
10cm

Battiti 3D 4

M4 M4  
+57.8

3D  
3D 52%  
3D 40dB  
CF  
50%  
4.4MHz



JPEG

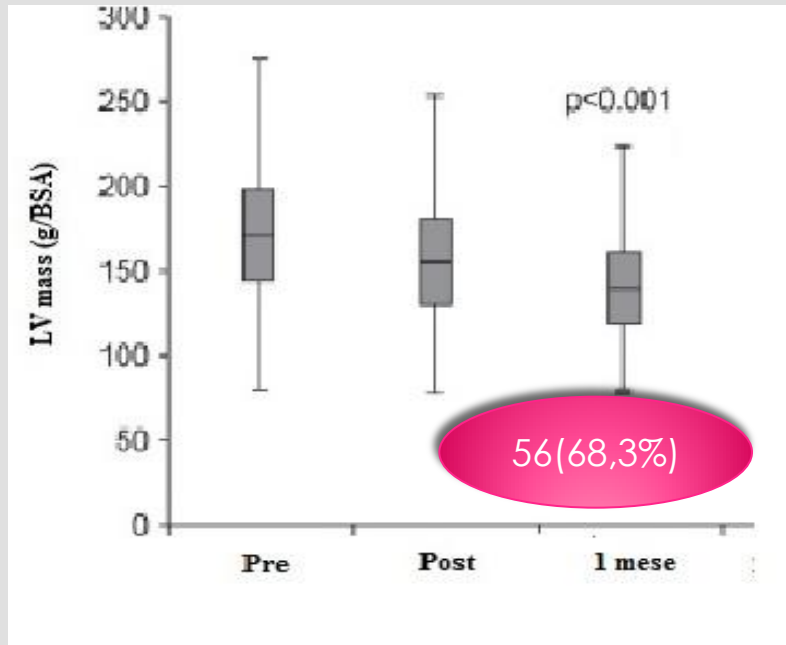
Temp. PAZ.: 37.0C  
Temp. TEE: 39.5C

77 bpm

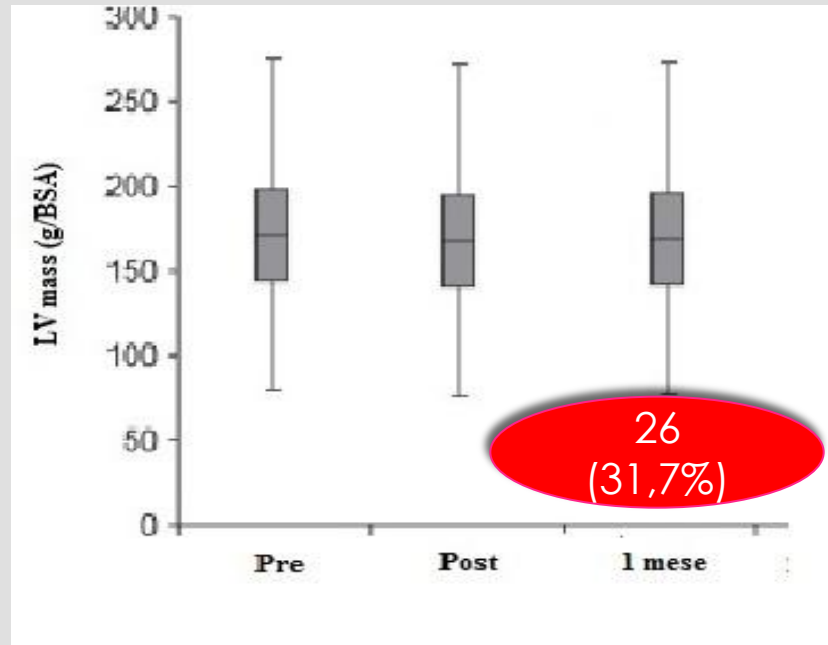


- *Prior implantation*
- *During Implantation*
- *Post Implantation*

# Regression of Left Ventricular Mass



Regression LVM

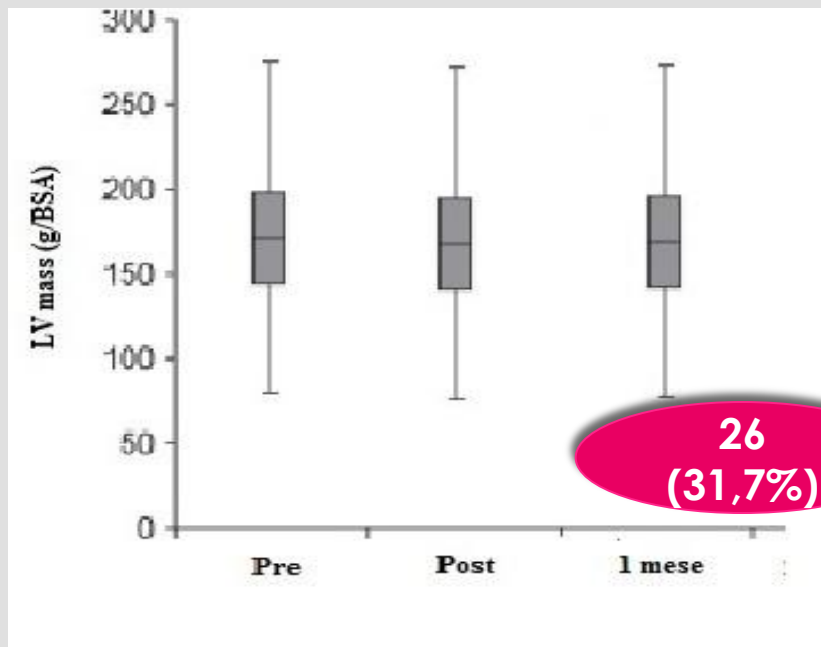


No Regression LVM



# Regression of Left Ventricular Mass

No Regression LVM



Hypertension, Diabetes  
Reduced systemic arterial  
compliance

LVH  
MYOCARDIAL FIBROSIS

## Acute improvement in myocardial function assessed by myocardial strain and strain rate after aortic valve replacement for aortic stenosis.

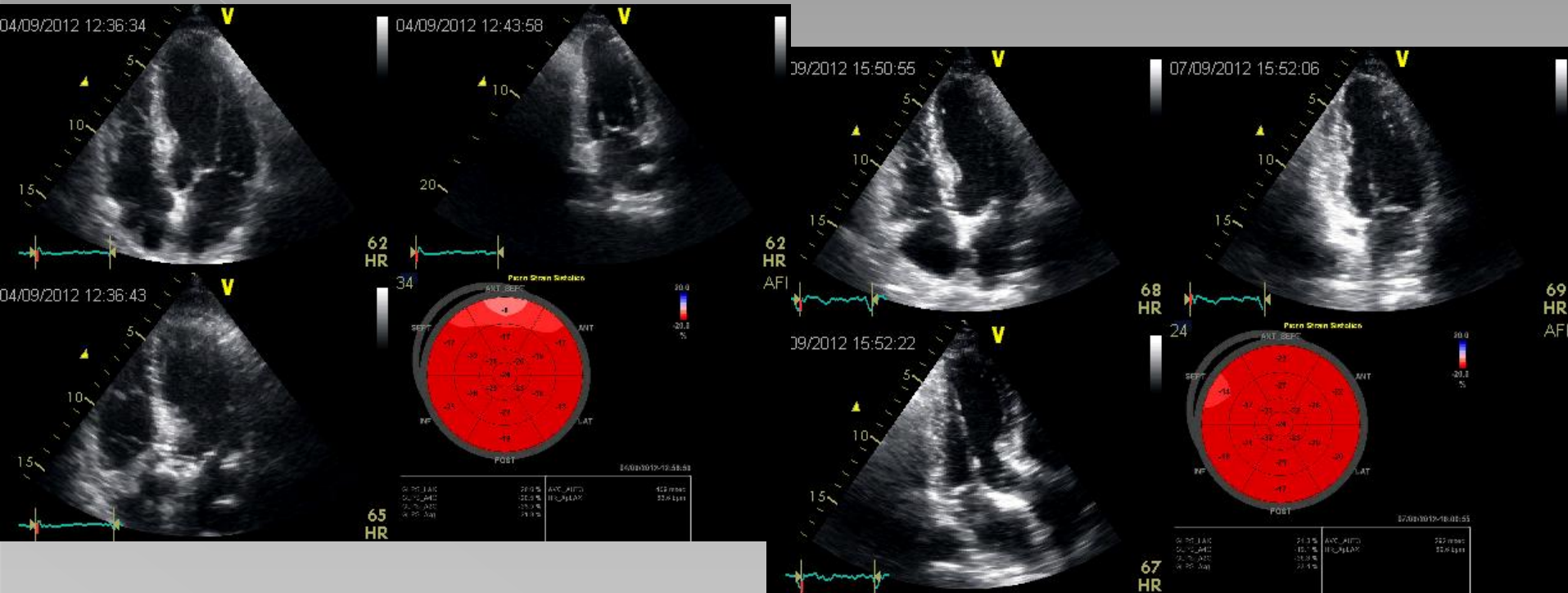
Iwahashi N, Nakatani S, Kanzaki H, Hasegawa T, Abe H, Kitakaze M.

Department of Cardiology, National Cardiovascular Centre, Suita, Osaka, Japan.

*At the early stage of disease, when EF is still preserved, subclinical myocardial dysfunction can be detected in the form of myocytes hypertrophy and **reactive interstitial fibrosis***

*Conventional echocardiography is an appropriate instrument to detect global LV dysfunction while tissue Doppler imaging, in particular **strain and strain rate imaging**, can better detect subtle systolic myocardial function damage before global LV dysfunction occurrence*

# Global Strain



**Perceval s**  
**A 30 giorni riduce**  
**significativamente LVMI**

**LVMI**  
**Gr.**

**Perceval**

**128,45±26,7**

**TAVI**

**134,73±28,7**

# Aortic cross-clamp time, new prostheses, and outcome in aortic valve replacement.

A number of sutureless bioprosthetic aortic valves have been recently introduced in clinical practice, their main advantage being a reduction in the aortic cross-clamp time (AXCT).

## METHODS:

- A retrospective analysis was conducted of 979 patients with aortic valve stenosis
- The AXCT was analyzed as an independent predictor of severe cardiovascular morbidity, defined as the presence of a low cardiac output, stroke, acute kidney injury, or operative mortality.
- Subgroups of patients who benefited more from a reduction in AXCT were investigated.

## RESULTS:

- The AXCT was an independent predictor of severe cardiovascular morbidity, with an increased risk of 1.4% per 1 min increase.
- Patients with a left ventricular ejection fraction  $< \text{ or } = 40\%$ , and also diabetic patients, showed the most relevant clinical benefits induced by a reduction in AXCT.

## CONCLUSION:

- In selected patient populations at high risk of systolic dysfunction, the use of sutureless aortic valve bioprostheses may be considered.

# PARTNER - Leak

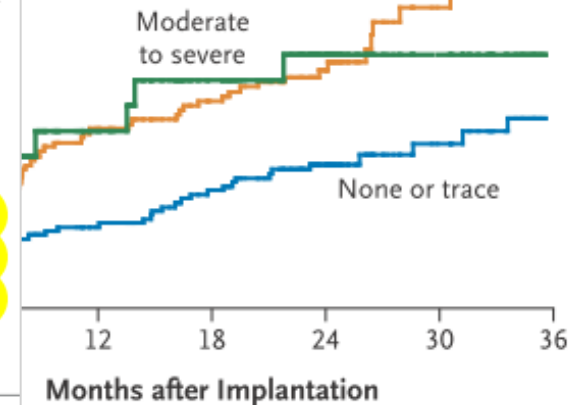
## Two-Year Outcomes after Transcatheter or Surgical Aortic-Valve Replacement

that subsequent device generations and increased operator experience with TAVR may improve outcomes.<sup>18,38-40</sup>

In conclusion, this 2-year follow-up of patients in the PARTNER trial supports the use of TAVR as an alternative to surgery in selected high-risk patients with aortic stenosis. The two treatments were similar with respect to mortality, reduction in cardiac symptoms, and improved valve hemodynamics. The early increase in the risk of stroke with TAVR was attenuated over time. **A new, important observation was the association of paravalvular regurgitation after TAVR with late mortality.** Work now should be directed toward

Severity of Paravalvular Leak: None or Trace, Mild, or Moderate

log-rank test



Months after Implantation	12	18	24	30	36
None or trace	134	121	84	39	15
Mild to severe	160	134	86	51	21
Mild	160	134	15	13	5

### REFERENCES

1. Bonow RO, Carabello BA, Chatterjee K, et al. 2008 Focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with aortic stenosis of the bicuspid aortic valve: a guideline of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2006 Guidelines for the Management of Patients With Aortic Stenosis). *Circulation*. 2008;118:1029-1062.
2. Bach DS, Siao D, C, McCallister BD Jr, et al. 2008 Focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with aortic stenosis of the bicuspid aortic valve: a guideline of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2006 Guidelines for the Management of Patients With Aortic Stenosis). *Circulation*. 2008;118:1029-1062.

Moderate to severe 24 19

# OBSERVANT

International Journal of Cardiology xxx (2012) xxx–xxx



Contents lists available at [SciVerse ScienceDirect](#)

International Journal of Cardiology

journal homepage: [www.elsevier.com/locate/ijcard](http://www.elsevier.com/locate/ijcard)



## Transcatheter aortic valve implantation versus surgical aortic valve replacement for severe aortic stenosis: Results from an intermediate risk propensity-matched population of the Italian OBSERVANT study

Paola D'Errigo <sup>a</sup>, Marco Barbanti <sup>b,c,\*</sup>, Marco Ranucci <sup>d</sup>, Francesco Onorati <sup>e</sup>, Remo Daniel Covello <sup>f</sup>, Stefano Rosato <sup>a</sup>, Corrado Tamburino <sup>b,c</sup>, Francesco Santini <sup>e</sup>, Gennaro Santoro <sup>g</sup>, Fulvia Seccareccia <sup>a</sup> and on behalf of the OBSERVANT Research Group

<sup>a</sup> National Centre for Epidemiology, Surveillance and Health Promotion, Istituto Superiore di Sanità, Rome, Italy

<sup>b</sup> Division of Cardiology, Ferrarotto Hospital, University of Catania, Italy

<sup>c</sup> ETNA Foundation, Catania, Italy

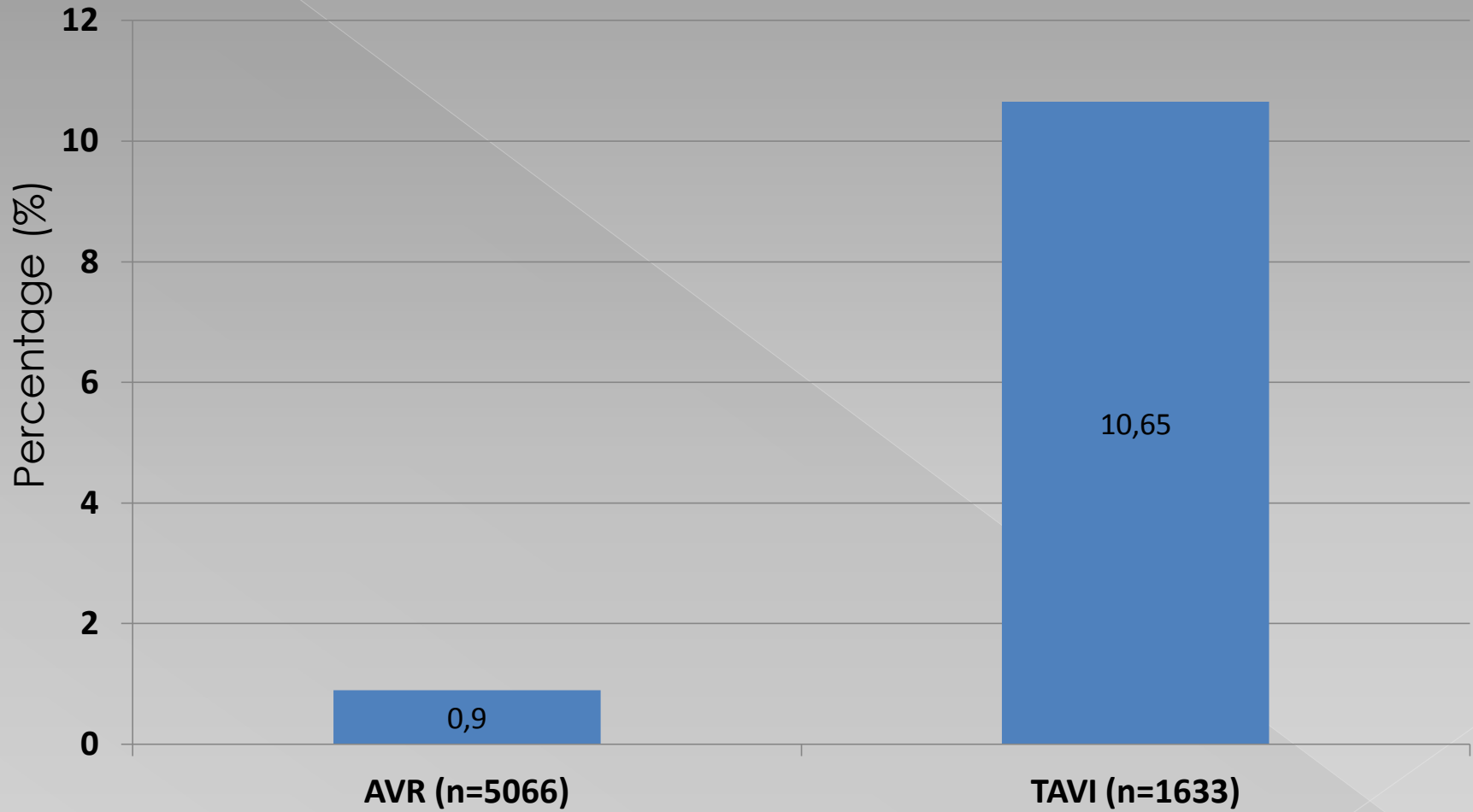
<sup>d</sup> Department of Cardiothoracic and Vascular Anesthesia and ICU, IRCCS Policlinico San Donato, San Donato Milanese, Milan, Italy

<sup>e</sup> Division of Cardiac Surgery, University of Verona Medical School, Verona, Italy

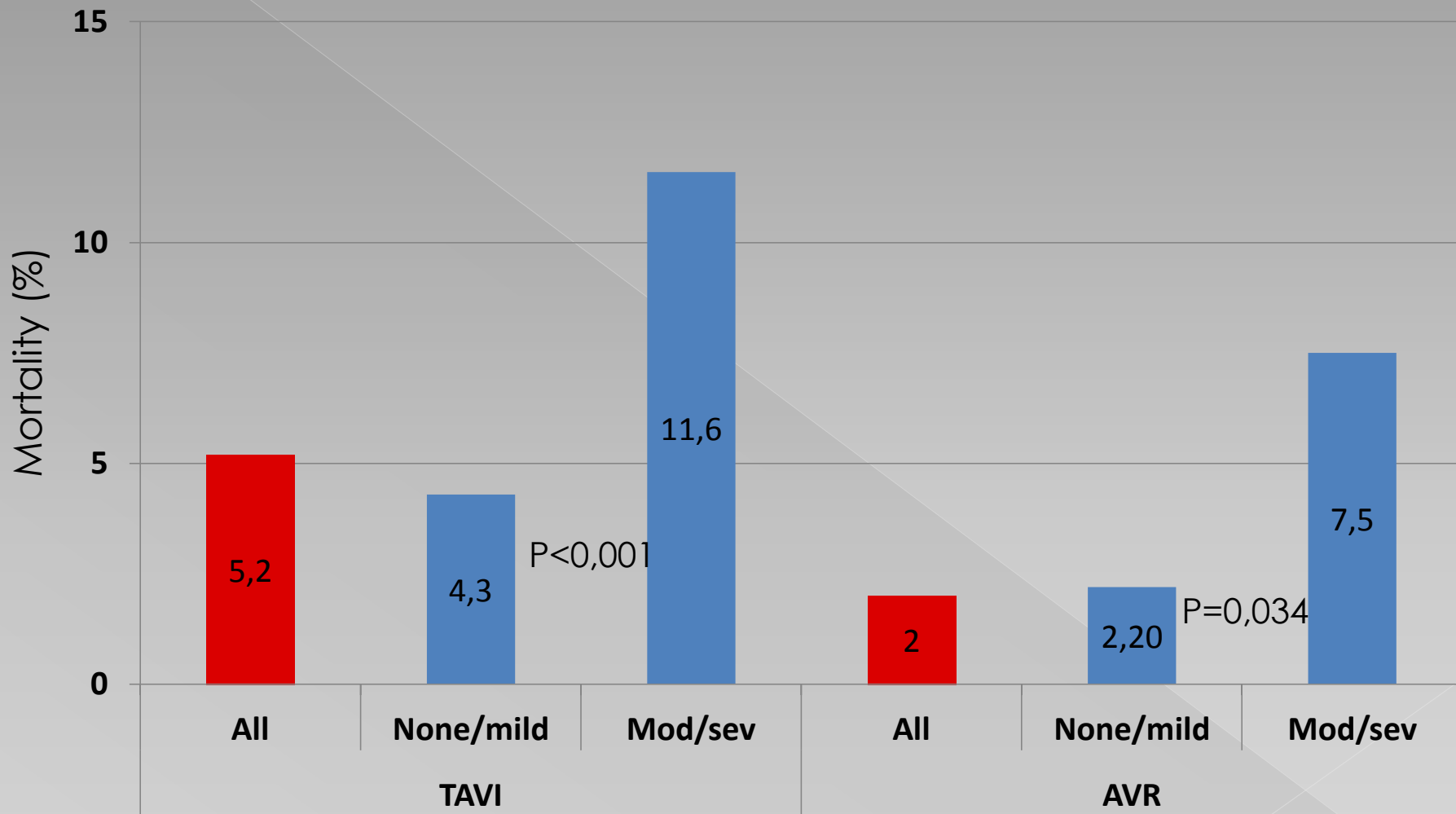
<sup>f</sup> IRCCS San Raffaele, Milan, Italy

<sup>g</sup> Division of Cardiology, Careggi Hospital, Florence, Italy

# OBSERVANT - Leak



# OBSERVANT - Leak





# Impact of PVR AVR

	All	Mod/sev PVR	None/mild PVR	P value
Death, n (%)	116 (2,0)	4 (7,5)	112 (2,2)	0,034
Myocardial infarction, n (%)	28 (0,5)	1 (1,9)	27 (0,5)	0,345
Stroke, n (%)	74 (1,4)	2 (3,8)	72 (1,0)	0,319
Major vascular complications, n (%)	11 (0,2)	0 (0,0)	11 (0,2)	0,574

# TAVI

	All	Mod/sev PVR	None/mild PVR	P value
Death, n (%)	95 (5,2)	24 (11,6)	71 (4,3)	<0,001
Myocardial infarction, n (%)	14 (0,8)	2 (0,9)	12 (0,7)	0,932
Stroke, n (%)	23 (1,2)	5 (2,4)	18 (1,1)	0,188
Major vascular complications, n (%)	118 (6,4)	15 (7,3)	103 (6,3)	0,634

# *Dobutamine Doppler echocardiography*

## **BACKGROUND:**

Small-sized mechanical aortic prostheses are commonly associated with generation of high transvalvular gradients, particularly in patients with large body surface area, and can result in patient-prosthesis mismatch.

## **METHODS:**

Fourteen patients. A dobutamine infusion was started at a rate of 5 microg x kg(-1) x min(-1) and increased to 30 microg x kg(-1) x min(-1) at 15-minute intervals..

## **RESULTS:**

Dobutamine stress increased heart rate and cardiac output by 83% and 81%, respectively (both  $p < 0.0001$ ), and mean transvalvular gradient increased from 15.6 $\pm$ 5.5 mm Hg at rest to 35.4 $\pm$ 11.9 mm Hg at maximum stress ( $p < 0.0001$ ). Although the indexed effective orifice area was significantly lower in patients with a larger body surface area, this was not associated with any significant pressure gradient. Regression analyses demonstrated that the mean transvalvular gradient at maximum stress was independent of all variables except resting gradient ( $p = 0.05$ ). Body surface area had no association with the changes in cardiac output, transvalvular gradient at maximum stress, and effective orifice area.

## **CONCLUSIONS:**

These data show that the 21-mm Sorin Bicarbon bileaflet mechanical prosthesis offers an excellent hemodynamic performance. The lack of significant transvalvular gradient in patients with a larger body surface area suggests that patient-prosthesis mismatch is highly unlikely when this prosthesis is used.

# FUTURO

# GRAZIE

