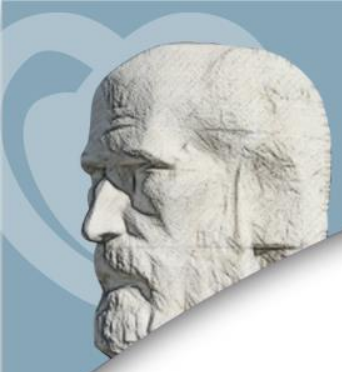
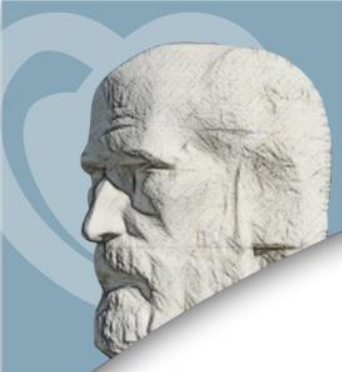


# The main dilema

- **New catheter-based approaches to patients with cardiac disease.**
  1. Aortic valve implantation
  2. Closure of prosthetic paravalvular leaks
  3. Mitral repair

***How can we help ?***
***What to do ?***



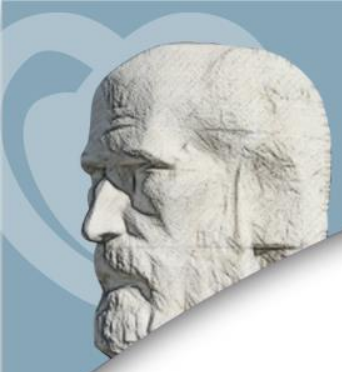
# Fluoroscopy

## Advantages

- Images interventionalists work with
- Good definition
  - Catheters and wires
  - Devices
  - Calcified and metalic structures

## Limitations

- Poor anatomical definition
- Single plane
- Radiation exposure
- Contrast use



# 3D Echo

## Advantages

- Good definition of anatomy
- Visualize the same structure in different planes
- 3D images
- Minimizes radiation exposure
- Increases safety

## Limitations

- Interventionalists are not used to echo perspectives.
- Look back and forth
- Worse definition of intracardiac catheters

# EchoNavigator

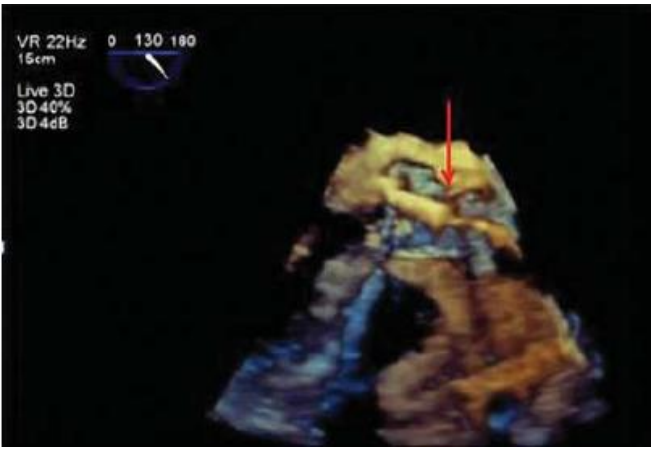
## A New Concept: UNITING IMAGES

- Combines live X-ray and live Echo images for structural heart disease repair.
- EchoNavigator recognizes TEE transducer and will detect and track its position.

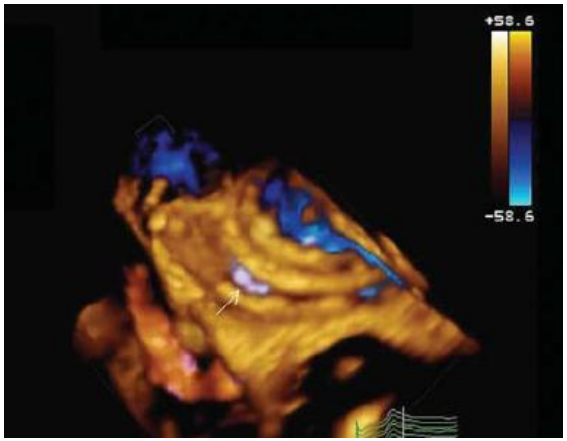
# EAE/ASE recommendations for the use of echocardiography in new transcatheter interventions for valvular heart disease

Jose L. Zamorano[1*†], Luigi P. Badano[2], Charles Bruce[3], Kwan-Leung Chan[4], Alexandra Gonçalves[5], Rebecca T. Hahn[6], Martin G. Keane[7], Giovanni La Canna[8], Mark J. Monaghan[9], Petros Nihoyannopoulos[10], Frank E. Silvestry[7], Jean-Louis Vanoverschelde[11], and Linda D. Gillam[12‡]

**Transcatheter aortic valve implantation**




**Percutaneous transcatheter repair of paravalvular regurgitation**




**Percutaneous mitral valve intervention**

**Eur H J 2011 ; JASE 2011  Eur J echo 2011**

EUROPEAN SOCIETY OF CARDIOLOGY

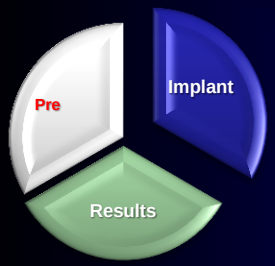
# Selection

## Indications

| | |
|---|---|
| **Severe Aortic Stenosis** | Ao Valve area < 1cm² or 0,6 cm²/m² (Edwards Inc. → AVA <0,8 cm²)<br>Max. Velocity > 4 m/s<br>Mean LV/Ao gradient > 40 mmHg |
| **Symptoms** | III-IV NYHA |
| **High risk** | Logistic EuroScore >20% or STS score >10% |
| **Contraindication to surgery** | |
| **Other possible indications:** | degenerative bioprosthesis |

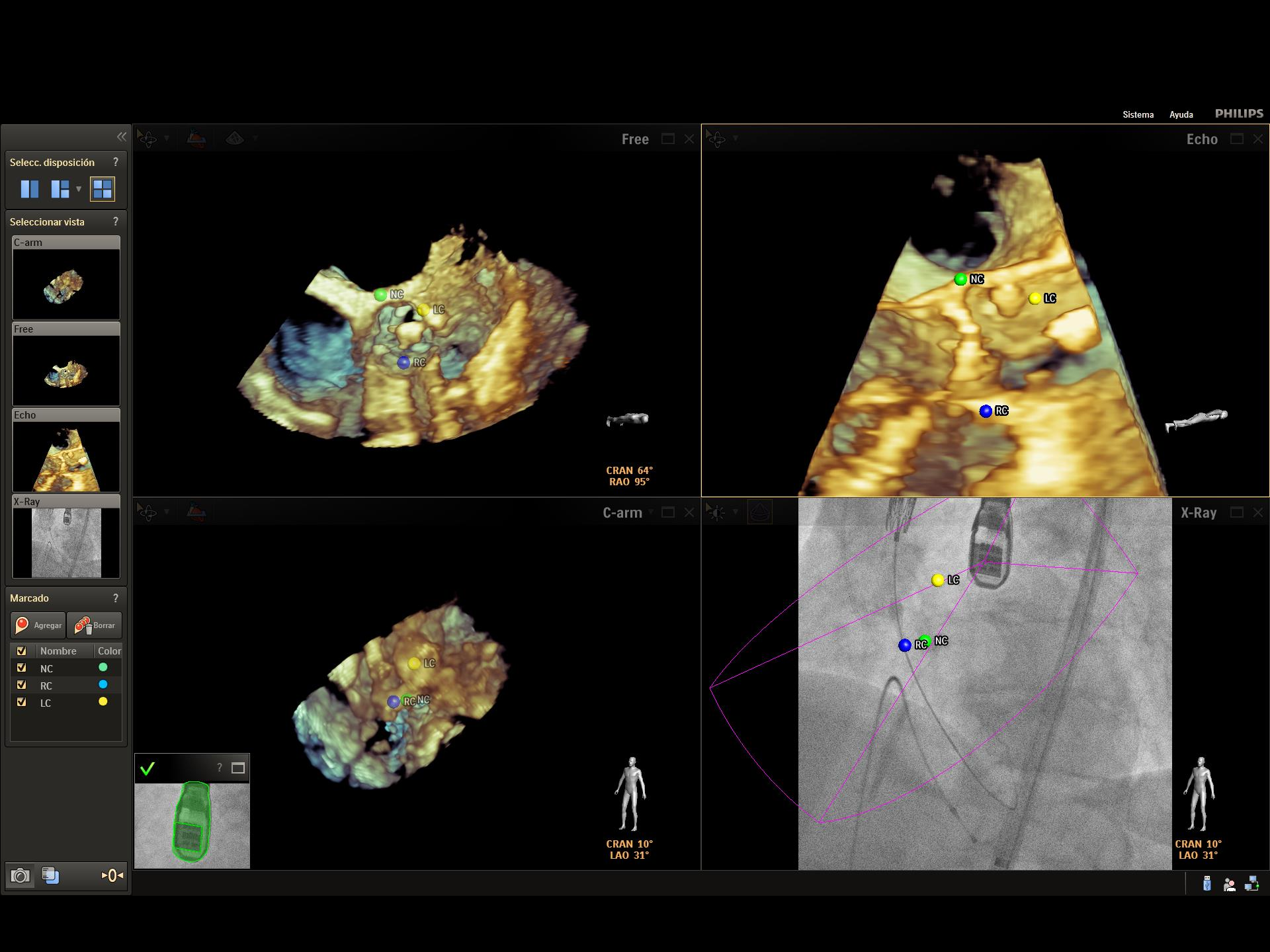
Vahanian A. Et al. Eur Heart J 2008;29:1463–70.

# Implant




- **During procedure**

1) Cross the valve.
2) Valvuloplasty.
3) Position and implantation.
4) Postimplantation


Sistema
Ayuda
PHILIPS
Selecc. disposición
Seleccionar vista
C-arm
Free
Echo
X-Ray
Marcado
Agregar
Borrar
Nombre
Color
NC
RC
LC
Free
NC
LC
RC
CRAN 64°
RAO 95°
Echo
NC
LC
RC
C-arm
LC
RC
NC
CRAN 10°
LAO 31°
X-Ray
LC
RC
NC
CRAN 10°
LAO 31°

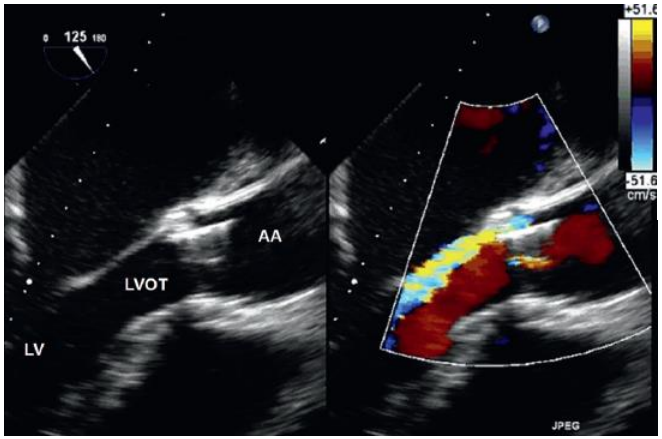
# • Evaluation of success and complications

## Echocardiography: guidance during valve implantation

EuroIntervention

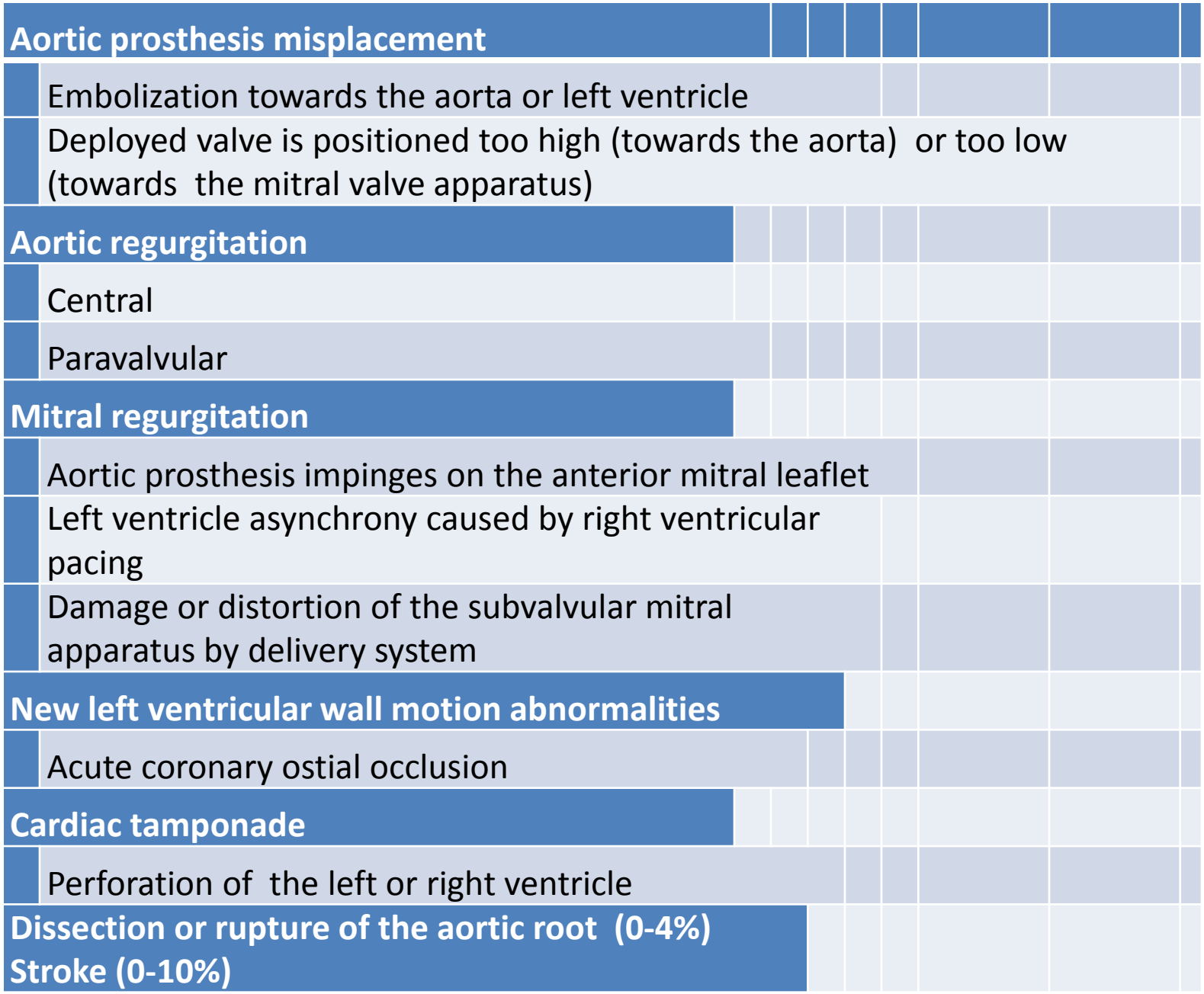
Alexandra Gonçalves, MD; Pedro Marcos-Alberca, MD, PhD; José Luis Zamorano*, MD, PhD, FESC

*Cardiovascular Institute, Hospital Clínico San Carlos, Madrid, Spain*




### Abstract

Transcatheter aortic valve implantation (TAVI) by percutaneous or transapical aproach has emerged as an effective and less-invasive treatment for patients with severe symptomatic aortic valve stenosis and high surgical risk. Echocardiography is a fundamental tool in patients' selection for TAVI, for guiding the intervention as well as evaluating the position, deployment and function of the prosthesis. This review describes the role of echocardiography during the intervention, in procedure guidance and in the assessment of complications.


Aortic prosthesis misplacement
Embolization towards the aorta or left ventricle
Deployed valve is positioned too high (towards the aorta) or too low (towards the mitral valve apparatus)
Aortic regurgitation
Central
Paravalvular
Mitral regurgitation
Aortic prosthesis impinges on the anterior mitral leaflet
Left ventricle asynchrony caused by right ventricular pacing
Damage or distortion of the subvalvular mitral apparatus by delivery system
New left ventricular wall motion abnormalities
Acute coronary ostial occlusion
Cardiac tamponade
Perforation of the left or right ventricle
Dissection or rupture of the aortic root (0-4%)
Stroke (0-10%)

# Paravalvular regurgitation: an integrated approach

## Measurement of paravalvular AR

| For paravalvular jets | |
|---|---|
| Mild | 10% of the sewing ring |
| Moderate | 10–20% of the sewing ring |
| Severe. | 20% of the sewing ring |

However, this assumes continuity of the jet which may not be the case for transcatheter valves.

# Three-Dimensional Echocardiography in Paravalvular Aortic Regurgitation Assessment after Transcatheter Aortic Valve Implantation

Journal of the JASE American Society of Echocardiography

## Aortic Regurgitation

| | None (n=29) | Mild (n=35) | p value* | Moderate (n=8) | p value** |
|---|---|---|---|---|---|
| LV ejection fraction (%) | 63.9 (11.4) | 60.4 (10.6) | 0.227 | 58.6 (13.2) | 0.696 |
| LV mass (g/m$^2$) | 121.9 (39.1) | 125.4 (42.6) | 0.769 | 130.0 (27.7) | 0.784 |
| Ao peak pres grad (mmHg) | 17.6 (10.0) | 14.9 (7.4) | 0.245 | 17.4 (7.8) | 0.437 |
| Mean Ao pres grad (mmHg) | 8.4 (4.5) | 7.5 (3.4) | 0.418 | 9.0 (5.1) | 0.395 |
| LV end diast volume (ml/m$^2$) | 44.0 (16.3) | 48.4 (21.9) | 0.477 | 66.1 (18.6) | 0.044 |
| Aortic valvular area (cm$^2$) | 1.9 (0.6) | 2.0 (0.6) | 0.605 | 1.9 (0.6) | 0.680 |
| AR volume (ml) | ---------- | 22.2 (5.5) | ---------- | 41.3 (6.4) | <0.001 |
| Vena contracta width (mm) | ---------- | 1.9 (0.16) | ---------- | 2.1(0.53) | 0.139 |
| Vena contracta planimetry (cm$^2$) | ---------- | 0.09 (0.06) | ---------- | 0.29 (0.1) | 0.001 |

* p value from none AR vs. mild AR
** p value from mild AR vs. moderate AR

# Three-Dimensional Echocardiography in Paravalvular Aortic Regurgitation Assessment after Transcatheter Aortic Valve Implantation

Alexandra Gonçalves, MD, Carlos Almeria, MD, Pedro Marcos-Alberca, MD, PhD, FESC, Gisela Feltes, MD, Rosana Hernández-Antolín, MD, PhD, Enrique Rodríguez, MD, José C. Silva Cardoso, MD, PhD, Carlos Macaya, MD, PhD, FESC, and José Luis Zamorano, MD, PhD, FESC, *Madrid, Spain; Porto, Portugal*

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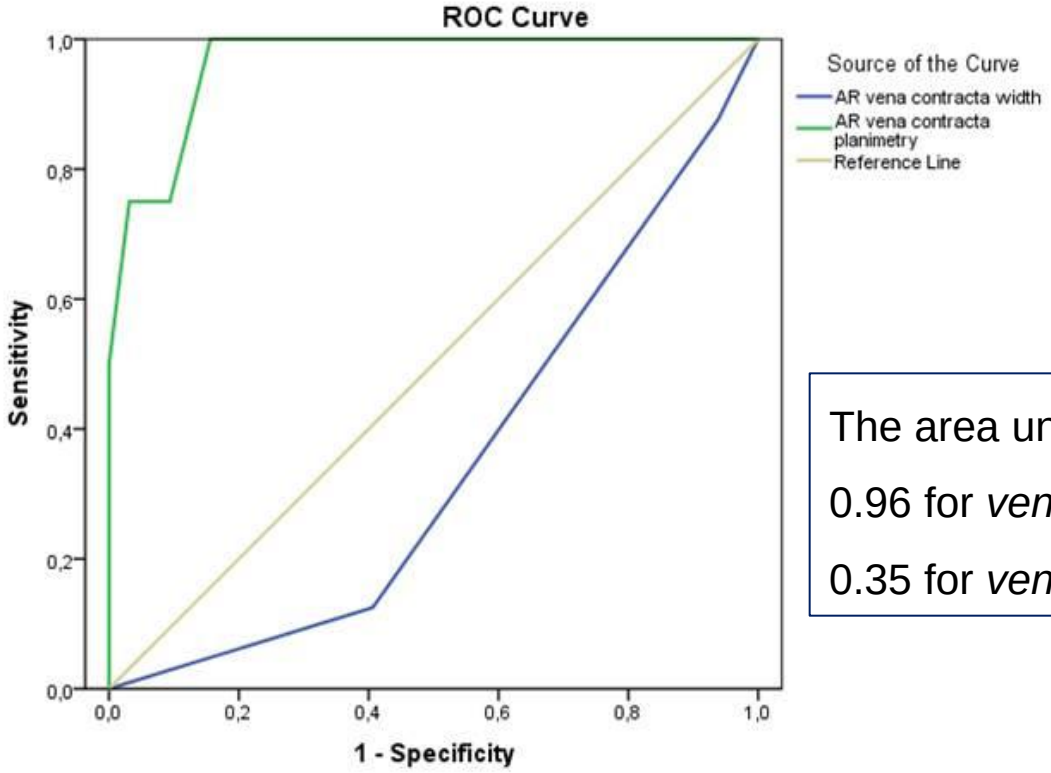



The area under the ROC curve:

0.96 for *vena contracta* planimetry

0.35 for *vena contracta* width

3D TTE *vena contracta* planimetry correlation with AR volume: 0.82, p<0.001

2D TTE *vena contracta* width correlation with AR volume: 0.66, p<0.001

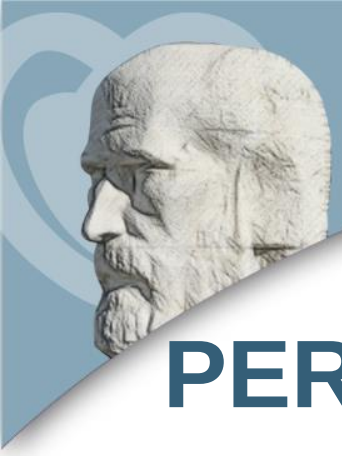
# Leak closure. 3D Echo info

**1.- Diagnosis**

**2.- Monitoring transeptal**

**3.- Guiding intervention**

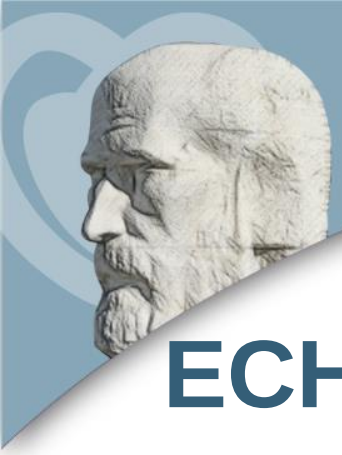
**4.- Assesing results**



# PARAVALVULAR REGURGITATION

## PERI-PROCEDURAL 3D TEE

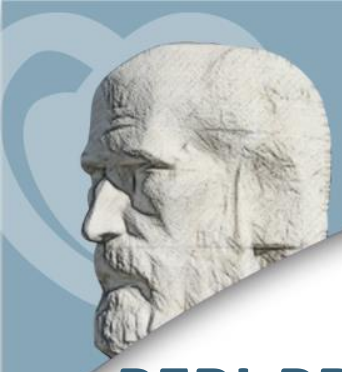
- Confirm location(s) and severity of paravalvular regurgitation.
- Exclude prosthetic and intracardiac thrombi or vegetations.
- Facilitate guidewire and catheter placement (real-time 3D TEE, injection of contrast).



# MITRAL VALVE

## ECHOCARDIOGRAPHY AND PATIENT SELECTION

- Confirms the presence of 3-4+ MR
- Determines anatomic suitability for the device
- TTE is typically used as an initial screen but TEE, ideally with 3D, is necessary to confirm eligibility



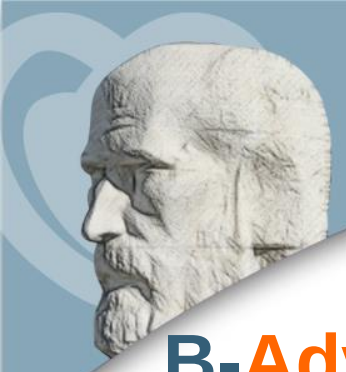
# MITRAL VALVE

## PERI-PROCEDURAL ECHOCARDIOGRAPHY

## A-Transseptal catheterization:

- During the transseptal puncture, TEE is helpful in guiding precise positioning of the transseptal catheter, first in puncturing the atrial septum and second in positioning the MitraClip™ guiding catheter.
- Mid-esophageal short-axis view ($30^0$-$60^0$) and bicaval $90^0$ view at the level of the aortic valve

# MITRAL VALVE



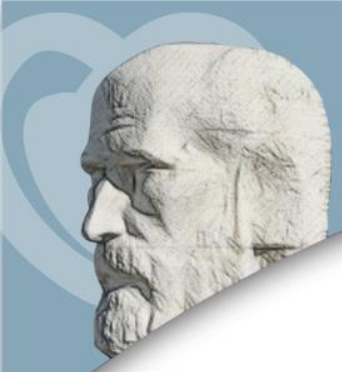
**B-Advancing the clip delivery system towards the mitral leaflets**

- **The mitral clip delivery system is angled down towards the mitral leaflets, aiming for A2P2**
- **Inter-commissural ($55^0$-$75^0$) projection and LV outflow ($100^0$-$160^0$) projection**

# 3D Echo. Integrated Info

## Advantages

- Better understanding of anatomy, placement, and post-release evaluation.
- Facilitates catheter guidance and sizing.
- Useful for difficult locations and multiple holes.
- Minimizes fluoroscopy time.
- Increases safety for patient and interventionalist.
- More efficient procedure.



# Advantages

- **Avoids confusion** of different perspectives of two different imaging modalities. Integrating Echo and X-Ray images
- **Improves communication** between echocardiographer and interventionalist
- **One-screen view** for interventionalist