

# How to prevent TAVI complications with current technology

Antonio Enrique Dager, MD

Angiografia de Occidente S.A., Cali, Colombia

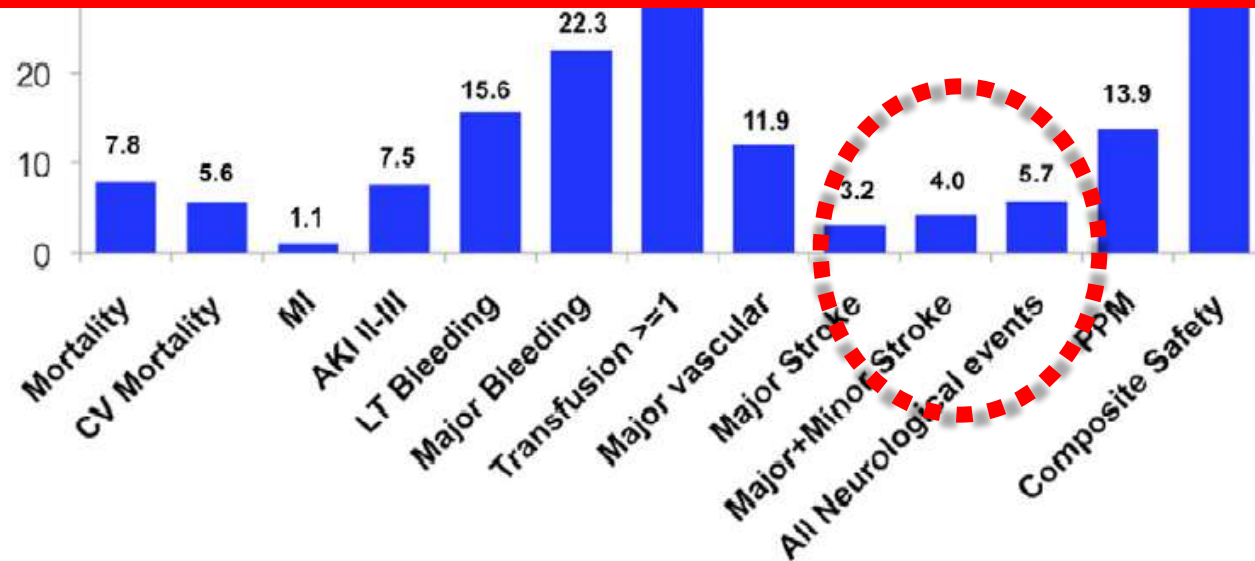
# Potential conflicts of interest

**Speaker's name: Antonio Dager**

**☐ I have the following potential conflicts of interest to report:**

Consultant: MEDTRONIC

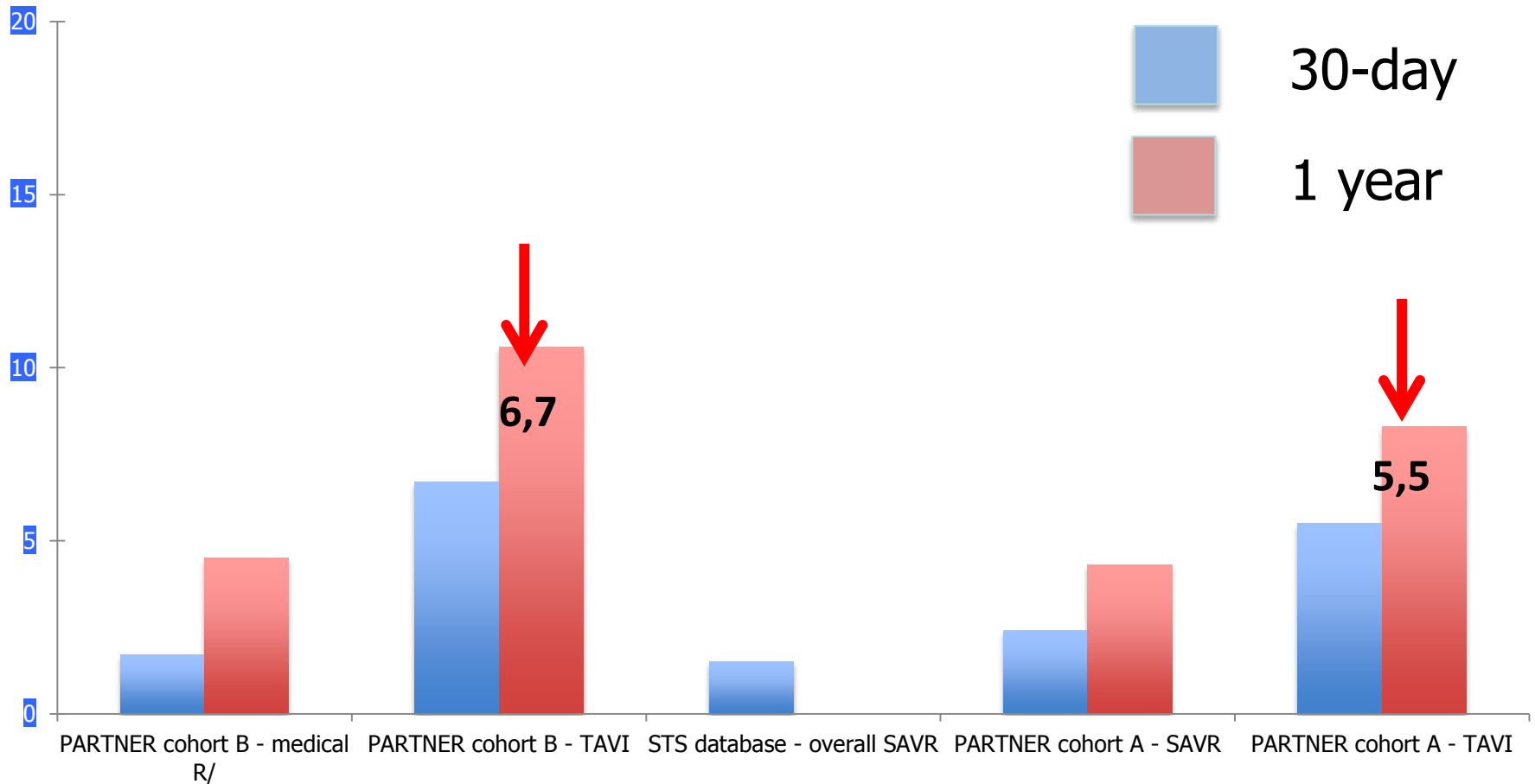
***Stroke concerns a devastating but potentially preventable complication of TAVI***

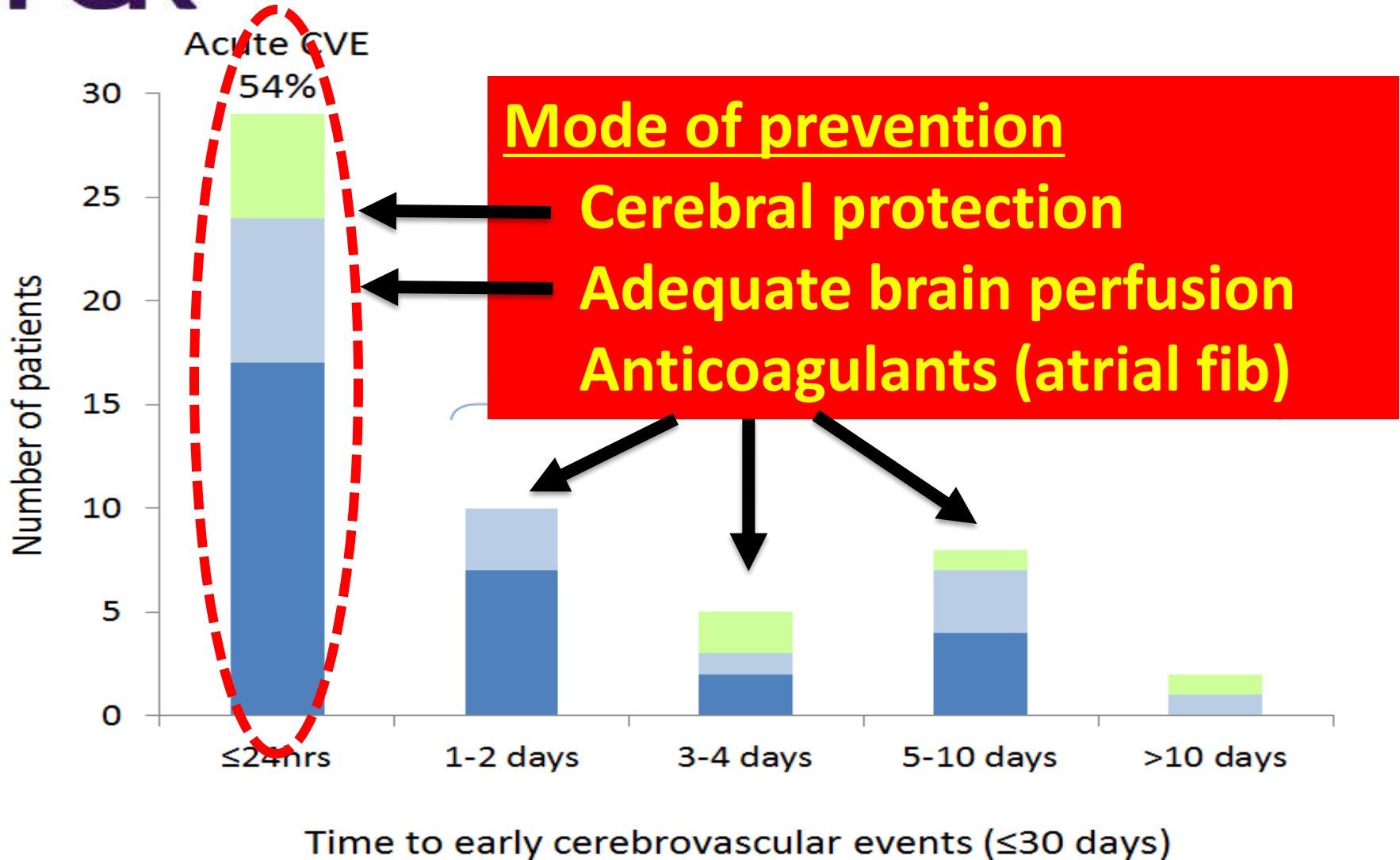


**Figure 2** 30-Day Event Rates of Major VARC-Related Outcomes

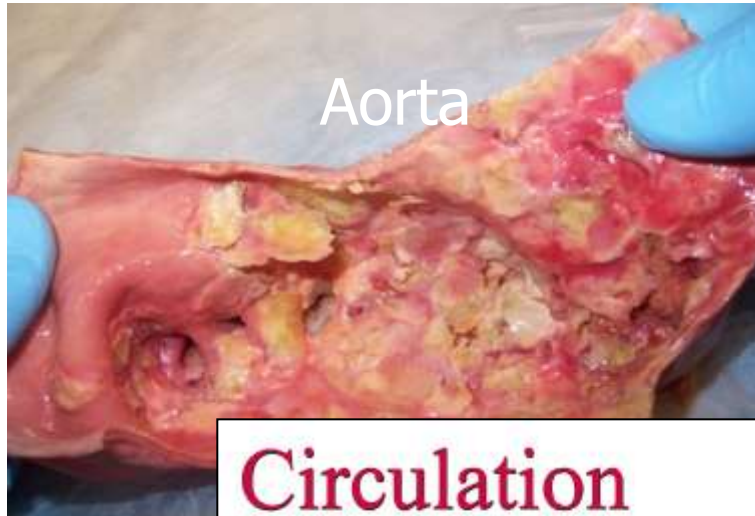
Genereux / Head et al. JACC 2012

# Frequency Stroke





# True capture of cerebral emboli



Aorta



Valve

**Circulation**

JOURNAL OF THE AMERICAN HEART ASSOCIATION



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## Histopathology of Embolic Debris Captured During Transcatheter Aortic Valve Replacement

Nicolas M. Van Mieghem, Marguerite E. I. Schipper, Elena Ladich, Elham Faqiri, Robert van der Boon, Abas Randjgari, Carl Schultz, Adriaan Moelker, Robert-Jan van Geuns, Fumiyuki Otsuka, Patrick W. Serruys, Renu Virmani and Peter P. de Jaegere

*Circulation*, published online May 7, 2013;

*Circulation* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

***“Embolic debris travelling to the brain was captured in 75% of TAVR procedures where a filter-based embolic protection device was used”.***

## SMT deflector

- 9 Fr transradial



## Claret Medical – Dual filter

- 6 Fr transradial

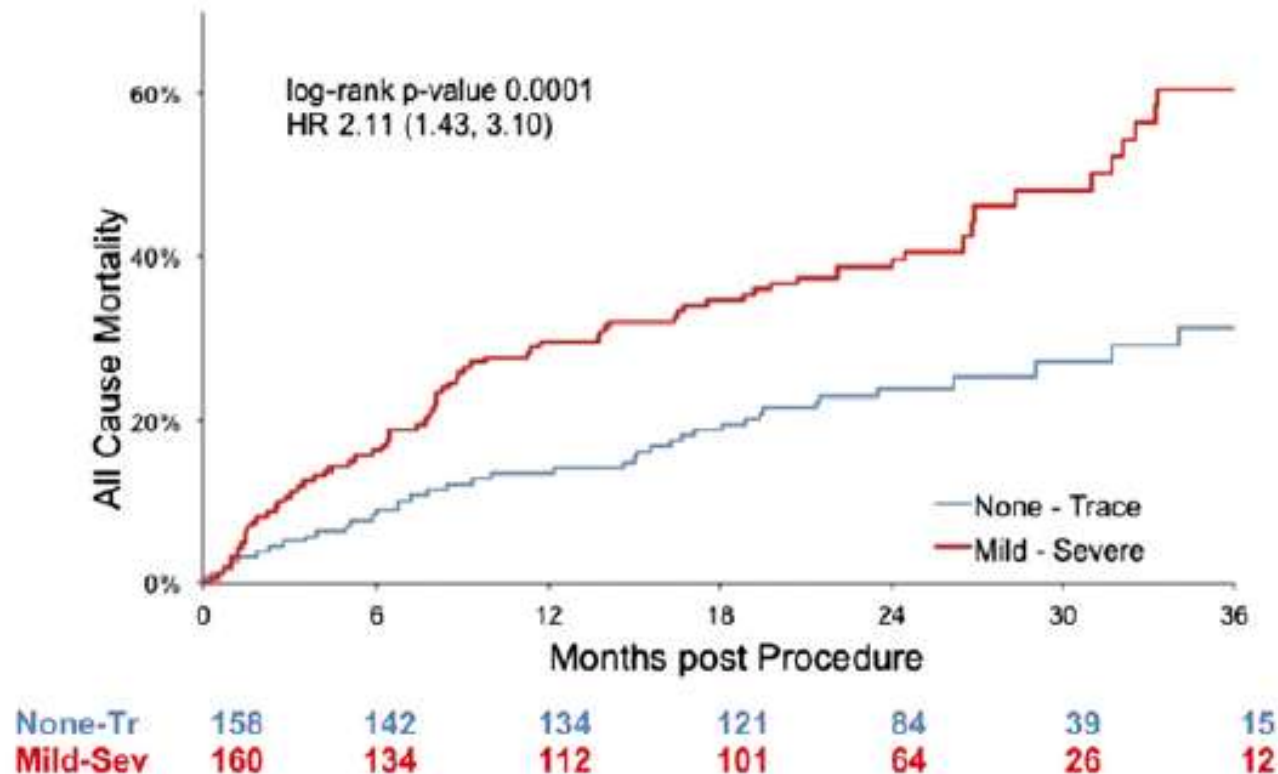


## Edwards/Embrella – deflector

- 6 Fr transradial



# Paravalvular AR (PAR)



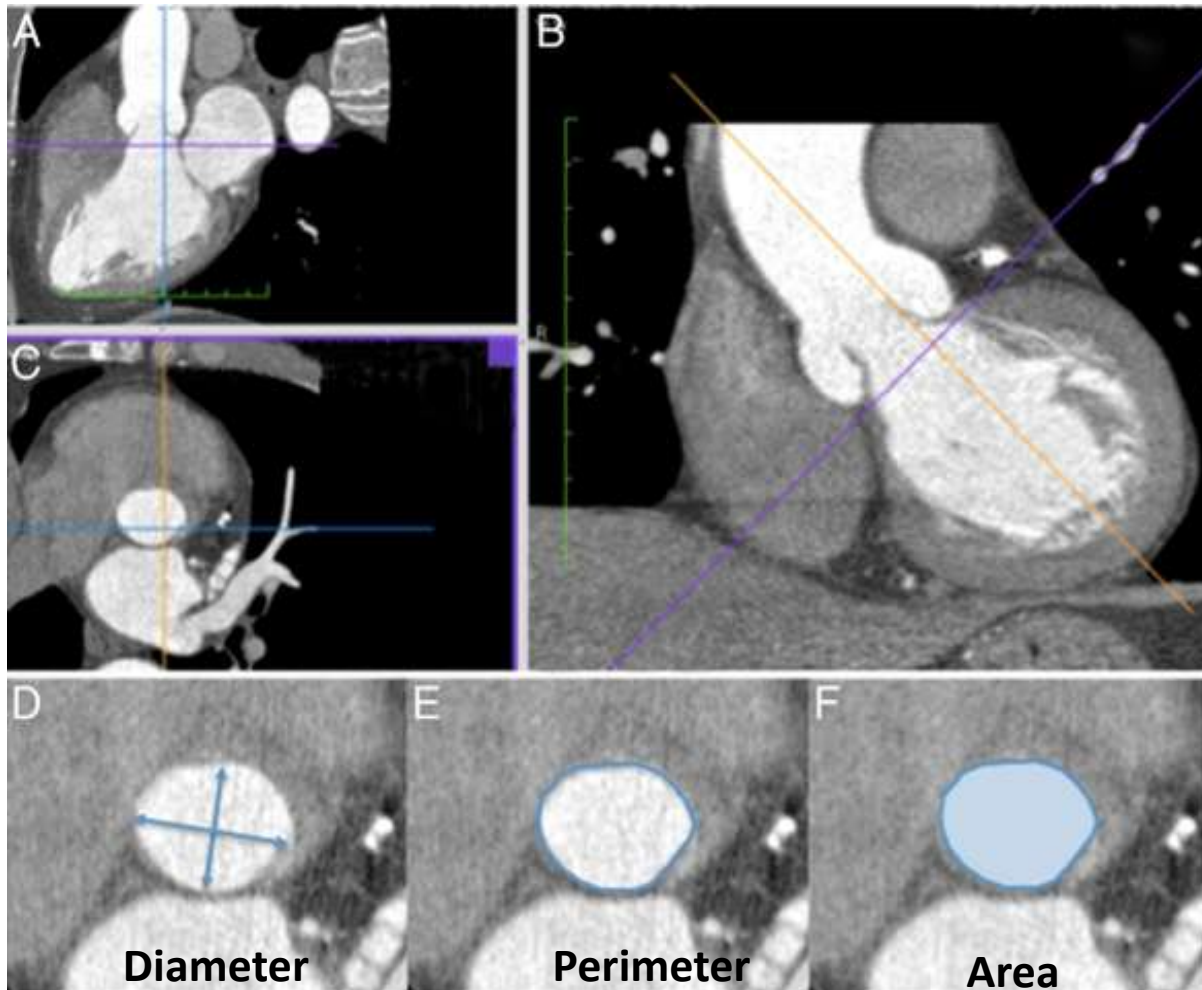
*“Although mild-moderate PAR is currently accepted in high risk pts it will be unacceptable in lower risk groups”*

Kodali et al. NEJM 2012



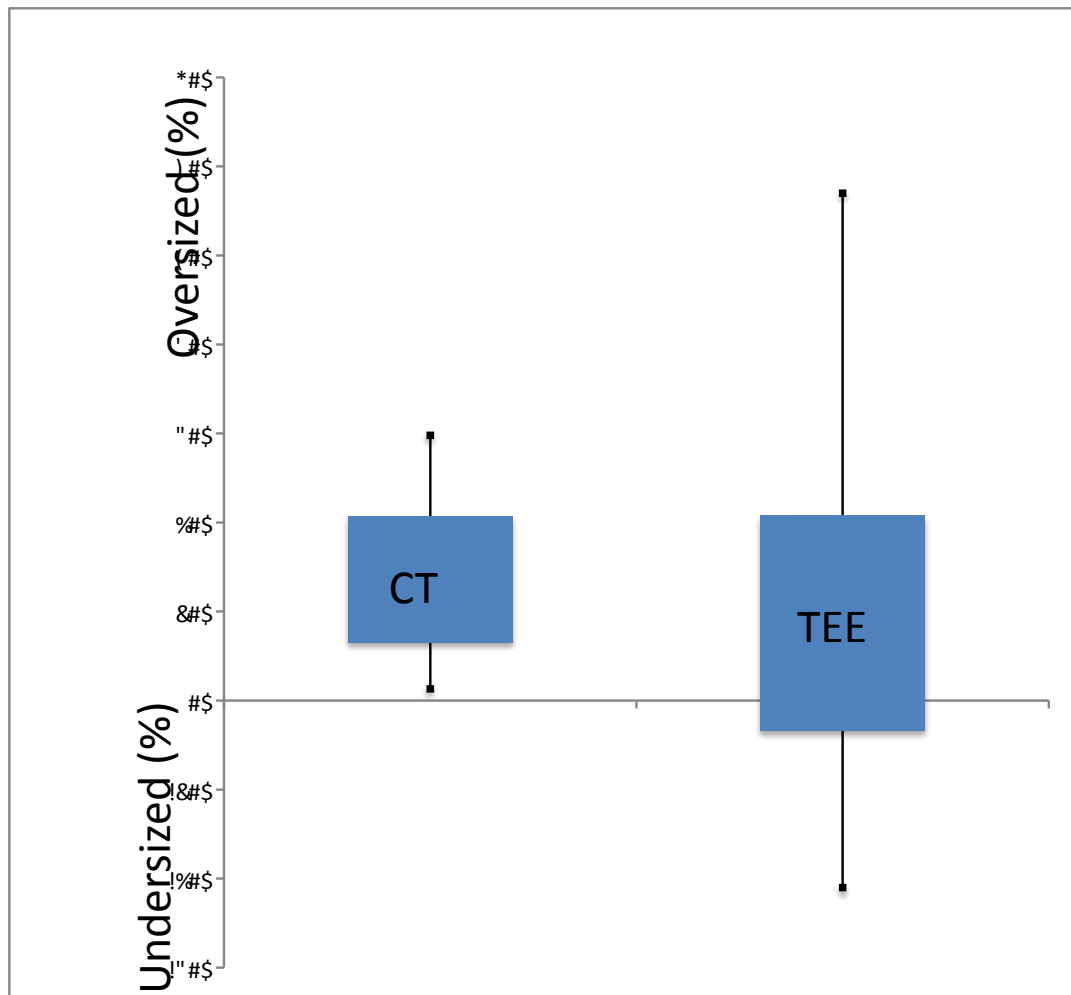
- ◎ Main causes of PAR include
  - ◎ 1) under sizing of the transcatheter heart valve relative to the aortic annular size
  - ◎ 2) Root Calcification
  - ◎ 3) incorrect device positioning (either too high or too low relative to the annular plane)
- ◎ Treatment of severe PAR due to THV under sizing is challenging and typically unsuccessful
- ◎ Procedural Planning crucial

# 3D MSCT measurements



MSCT > 10%!!

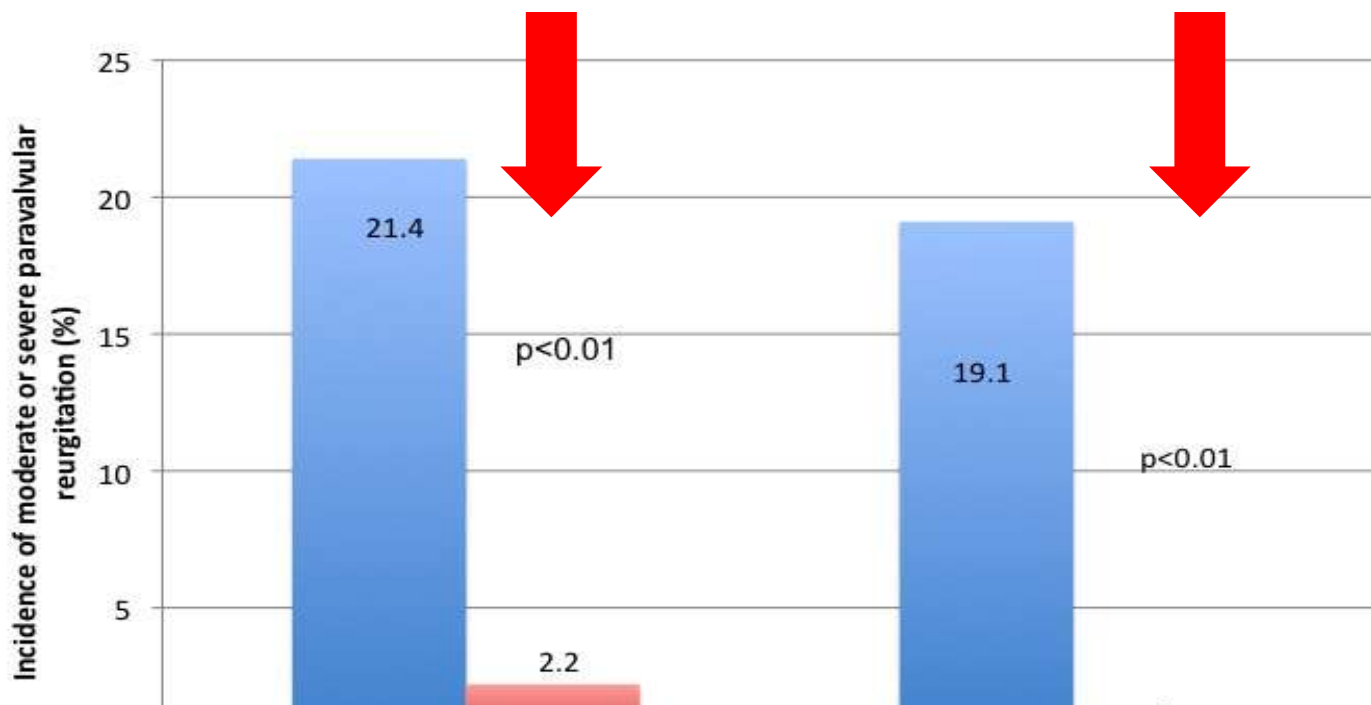
TEE < 10%!!



TEE: 10% THVs were oversized by >30% without annular rupture

33%(40/130) THVs were undersized.

# Impact of oversizing



*“New 3D imaging technology is essential for correct sizing purposes”*

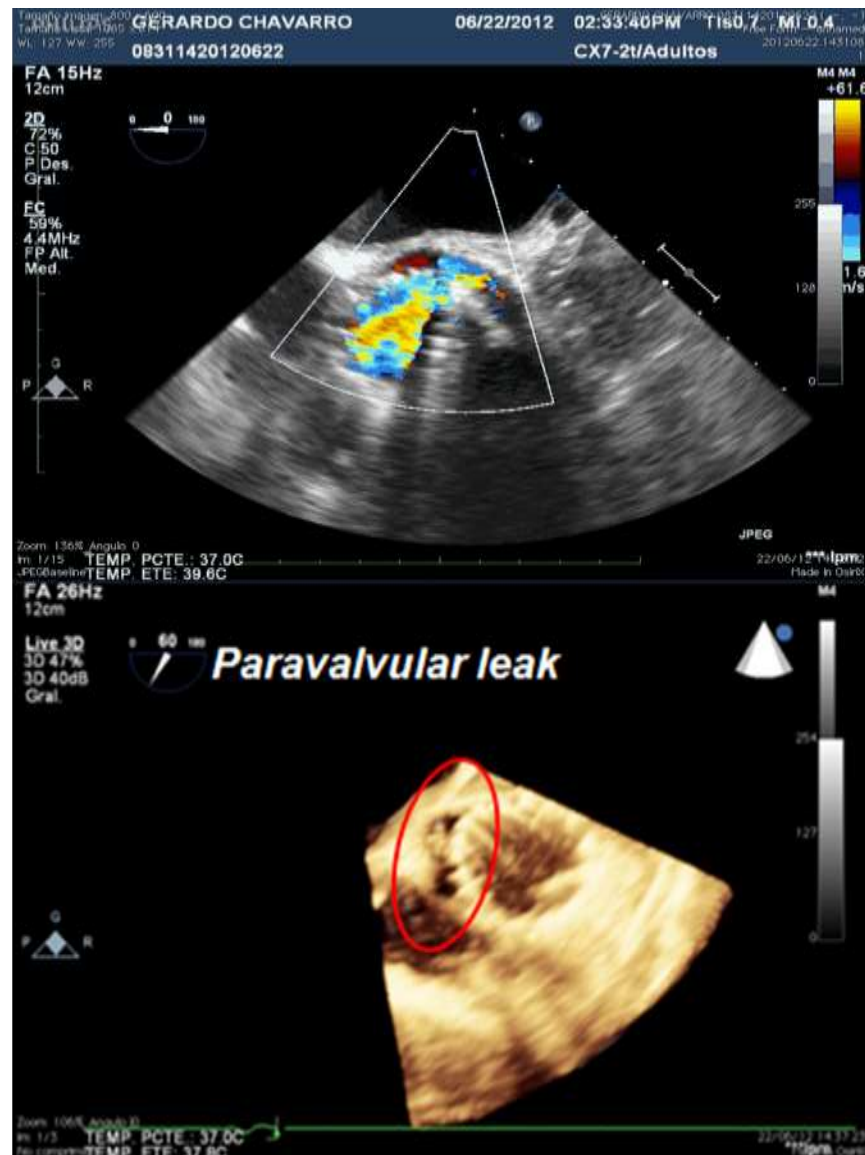
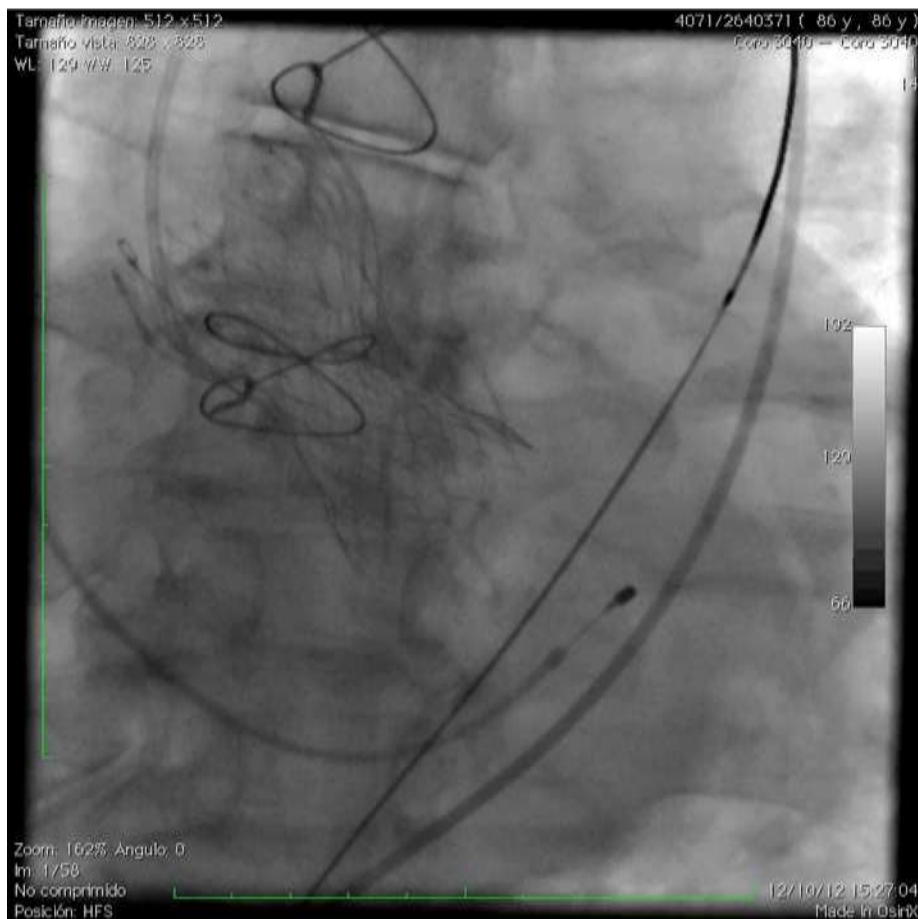
Willson et al. JACC April 3 2012

- Age (years): 86
- Gender: M
- Status post CABG
- NYHA Class III

Body Surface area: 1.70  
Body Mass Index: 25.3  
VA=0.6cm<sup>2</sup>

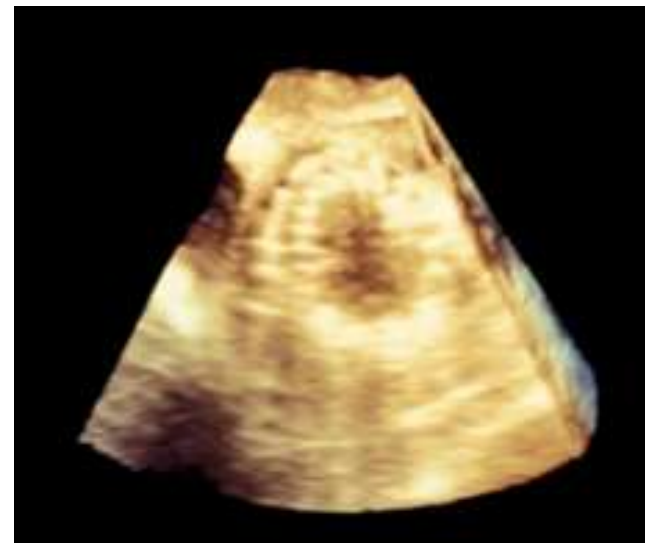


**1st Valve: CoreValve 31 mm**  
**Moderate Paravalvular AR**  
**AR index 30**  
**LVDP 30 mmHg**





# SECOND DEVICE IMPLANT

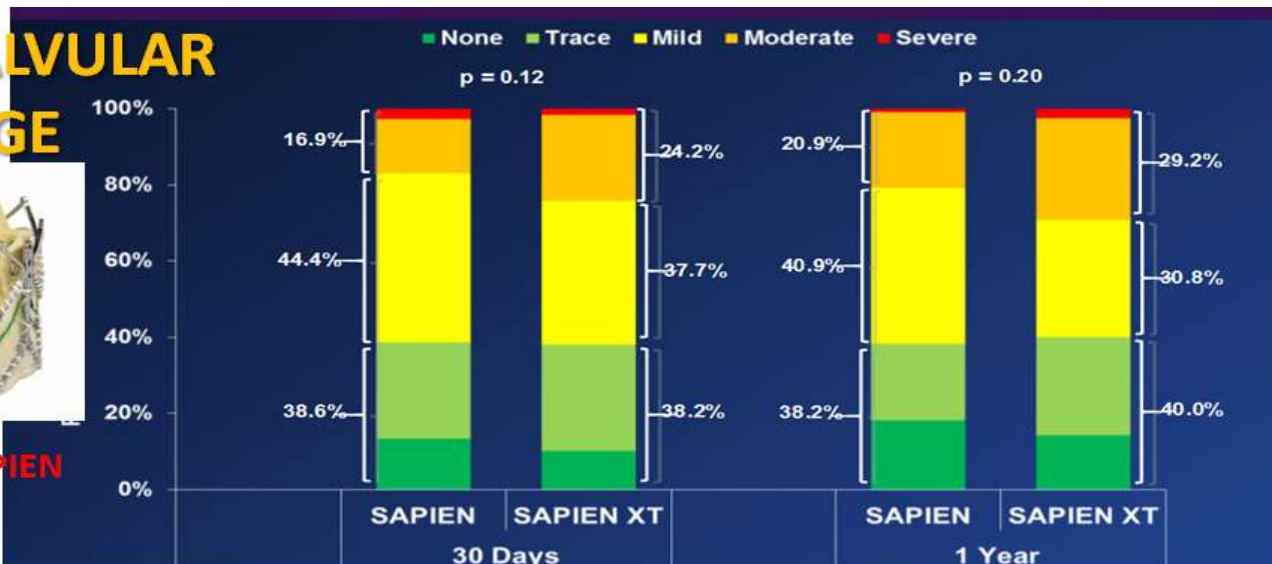


# Valves Hemodynamics

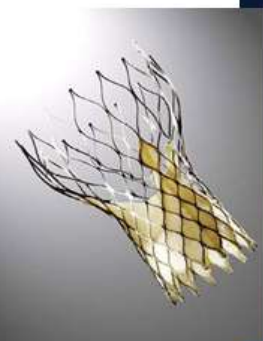
## PARAVALVULAR LEAKAGE



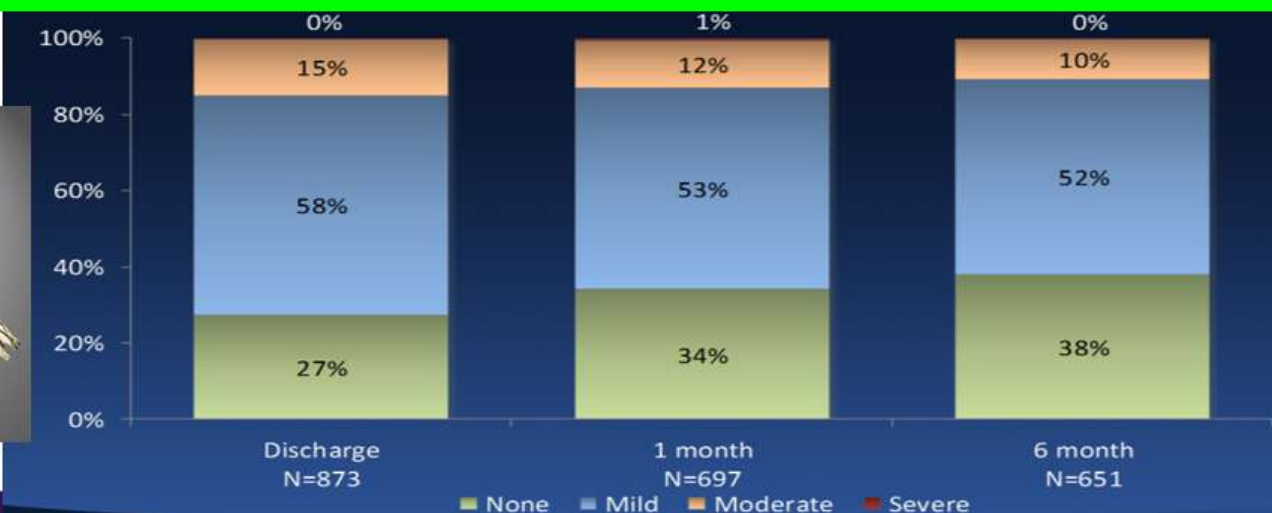
**EDWARDS SAPIEN**



## COREVALVE



**ADVANCE**







## Introduction

- Transcatheter Aortic valve replacement improves survival in inoperable Aortic Stenosis.
- Compared to Surgical Aortic Valve Replacement (SAVR), TAVR is associated with higher paravalvular leak.
- Aortic Insufficiency index (AI index) is associated to severity of prognosis.
- Comparison of AI indices between transcatheter aortic valves are currently limited.
- We present a two-center comparison between Edwards-Sapien Valve and Medtronic Core Valve.

# Conclusions

- Patients who underwent TAVR with the Medtronic Core valve tended to have higher AI index post TAVR vs. those who underwent TAVR with the Edwards-Sapien valve.
- The degree of post implant Aortic Insufficiency by Echocardiography did not differ between the two valves.
- AI index did not correlate well with the degree of Aortic Insufficiency measured by echocardiography in either of the two valves.
- In our study there were major limitations including the lack of randomization, different TAVR procedural protocol and follow up studies done at separate institutions.
- Our data is in conflict with previously published data suggesting the utility of AI index. Despite the limitations our findings will need to be further evaluated and correlated with other clinical outcomes and parameters in larger randomized trials comparing directly different percutaneous valve technologies.

Figure 2: Correlation AI index and AI by ECHO Edwards Valve

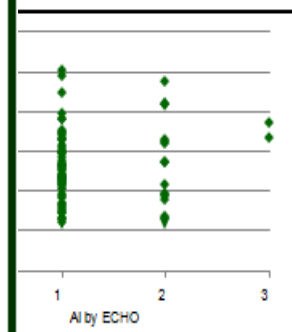


Figure 3: Correlation AI index and AI by ECHO Medtronic Valve



Table 1: Baseline Characteristics

## AR Index Post Implant of Two Different Transcatheter Aortic Valves

Bernardo Lopez-Sanabria<sup>1</sup>, Brian O'Neill<sup>1</sup>, Sergio Andres Perez<sup>2</sup>, Carlos Alfonso<sup>1</sup>, Luis Miguel Benitez<sup>2</sup>, Claudia Martinez<sup>1</sup>, Pedro Martinez-Clark<sup>1</sup>, Mauricio Cohen<sup>1</sup>, Alan Heldman<sup>1</sup>, William O'Neill<sup>1</sup>, Antonio Dager<sup>2</sup>, Eduardo De Marchena<sup>1</sup>.

1. University of Miami, Miami, FL, USA

2. Angiografía de Occidente, Cali, Colombia

**Conclusions:** Patients who underwent TAVR with the Medtronic Core Valve tended to have a higher AR index post-TAVR vs. those who underwent TAVR with the Edwards-Sapien valve; however no difference was seen by echocardiographic assessment of AI post implant. The implications of our findings will need to be further evaluated and correlated with other clinical outcomes and parameters in larger randomized trials directly comparing different percutaneous valve technologies.

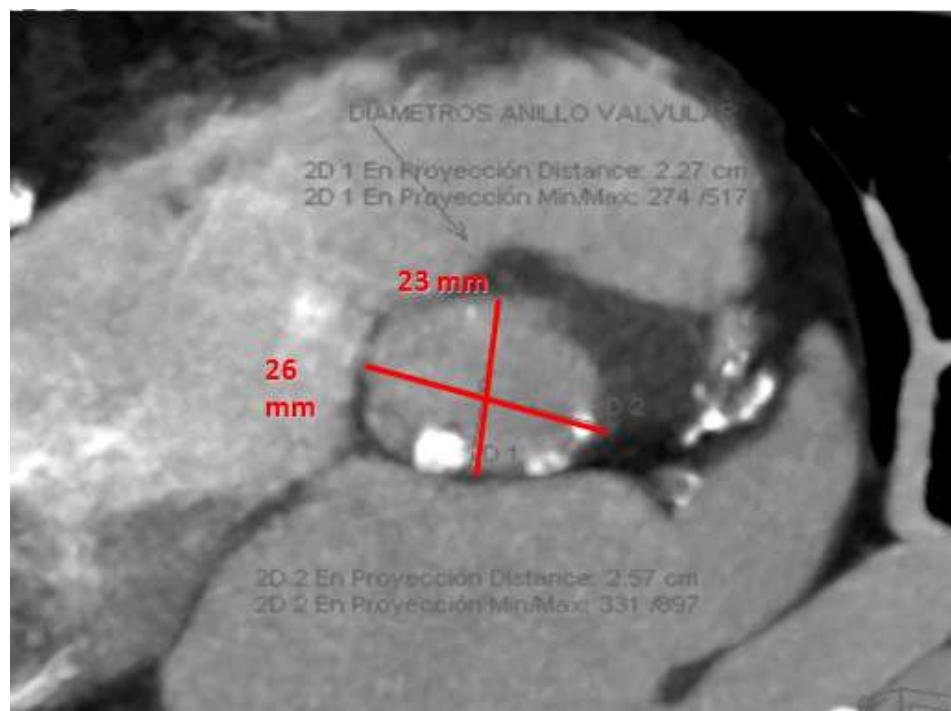
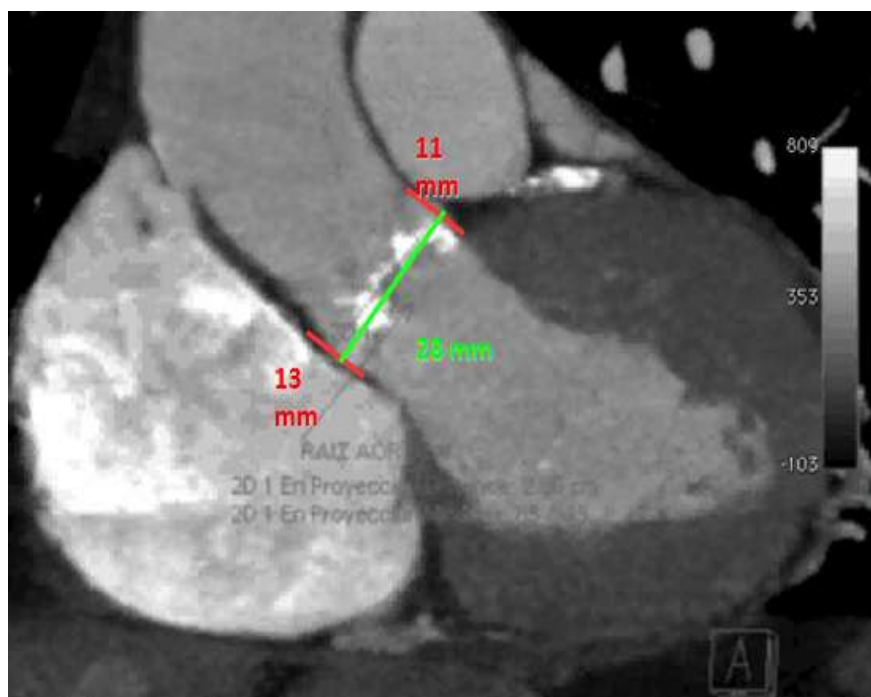
**24 patients with coronary obstruction related to TAVR in  
18 publications, January 2002 to May 2012**

- Obstruction occurred more frequently in women (83.3%), patients with no prior CABG (95.8%), and those who received a balloon-expandable valve (88%)
- Obstruction of the left coronary artery was more frequent than of the right (83.3% vs. 12.5%)
- Most obstructions were treated with PCI (95.8%, which was successfully treated in most cases with PCI)

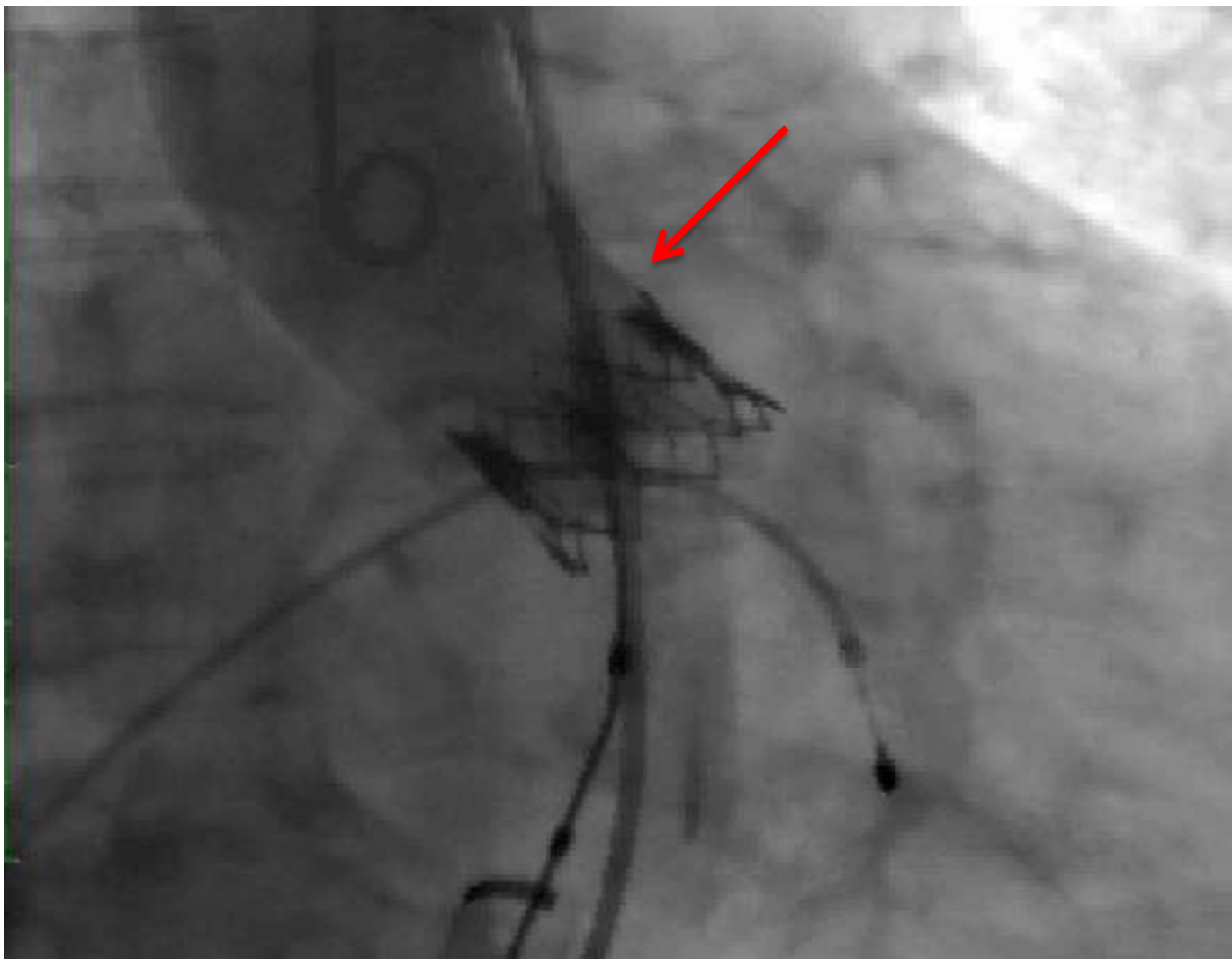
**Implications:** Coronary obstruction after TAVR, while uncommon, can be successfully treated in most cases with PCI.

- 87 years.
- Gender: Female.
- Agatston 5675 U.
- Severe Aortic Stenosis. Trivalve.

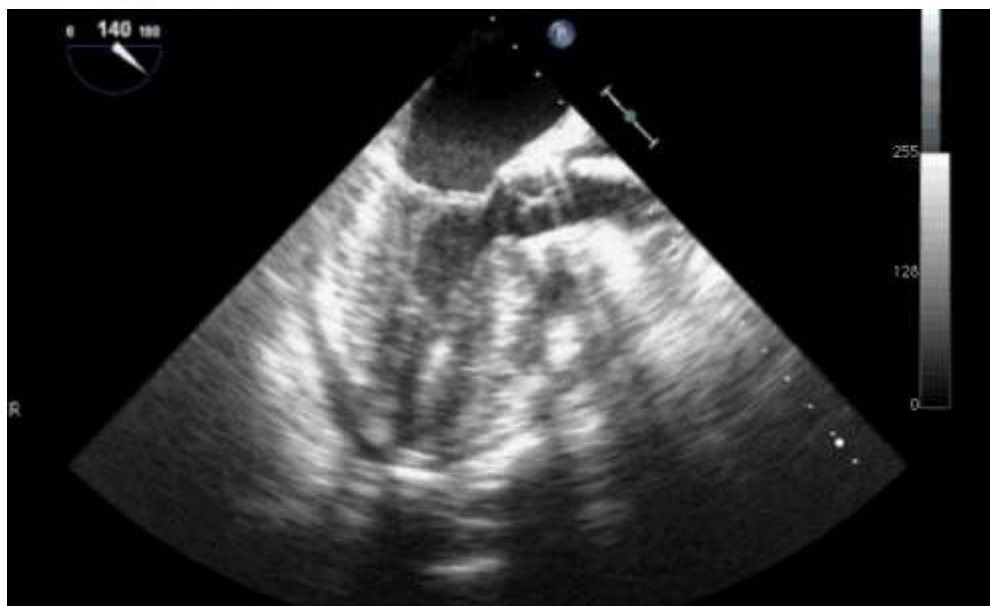
## PREVIOUS MSCT



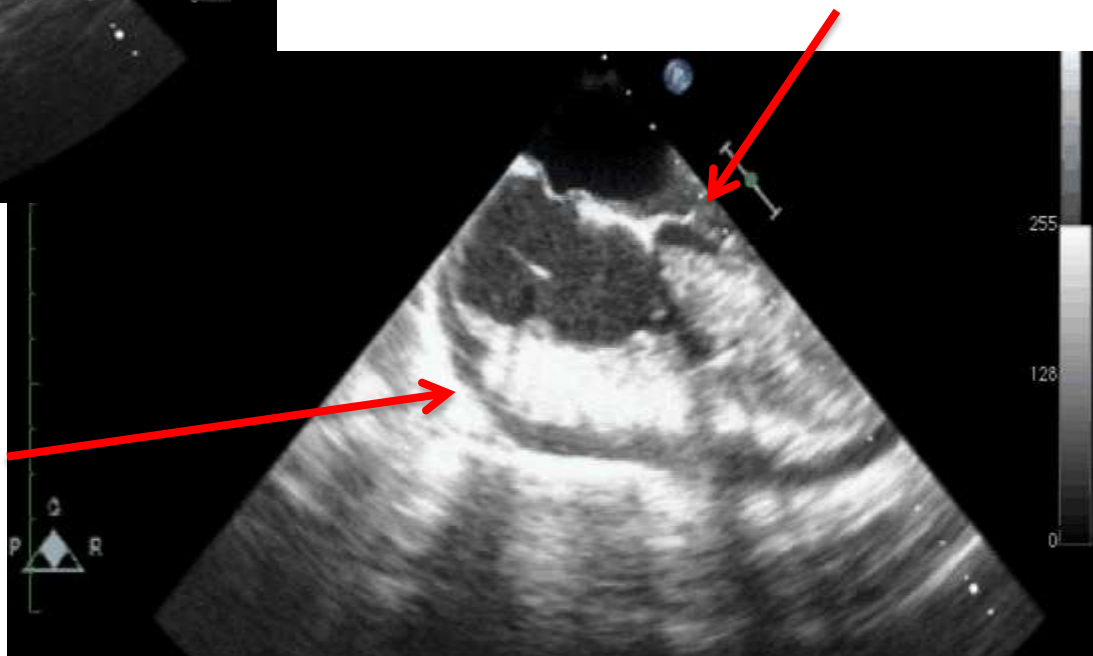
# CORONARY OCLUSION



# AORTIC ROOT DISSECTION

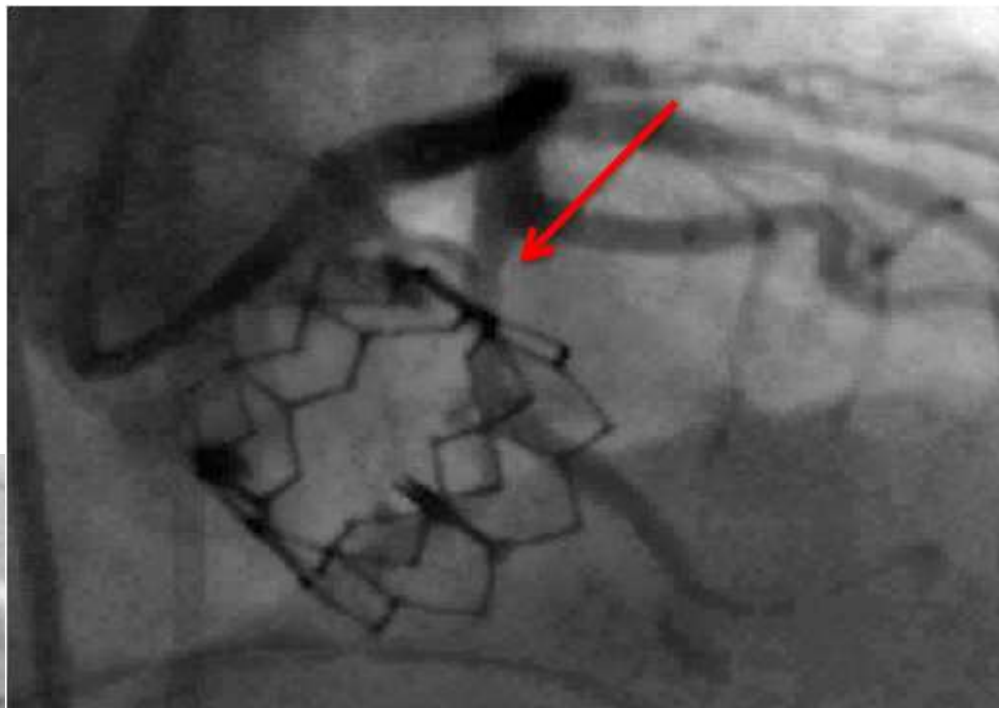
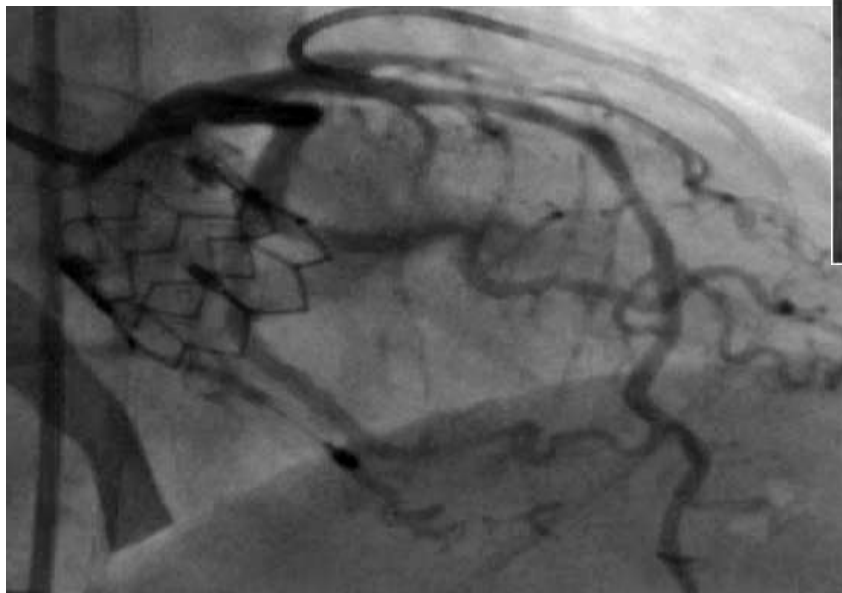


AORTIC ROOT DISSECTION



PERICARDIAL EFFUSION

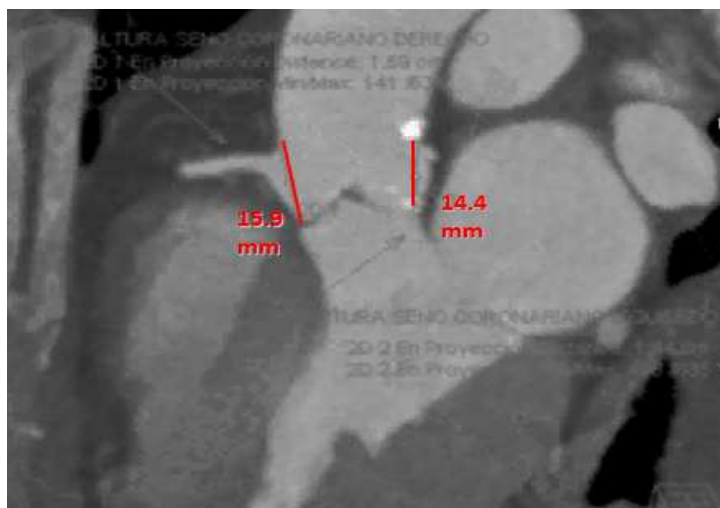
# CORONARY OCCLUSION – AORTIC ROOT DISSECTION





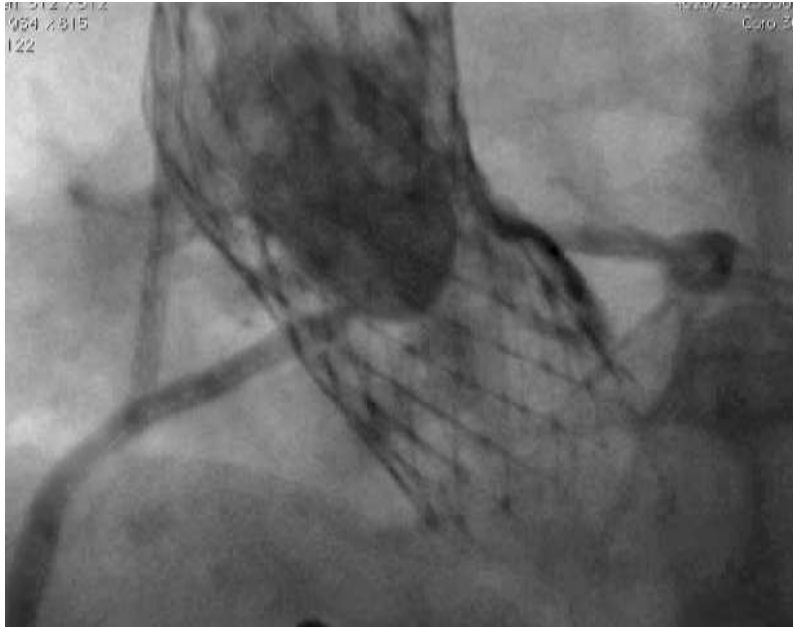
- 75 years.
- Gender: Female.
- Severe Aortic Stenosis. Trivalve.

## PREVIOUS MSCT

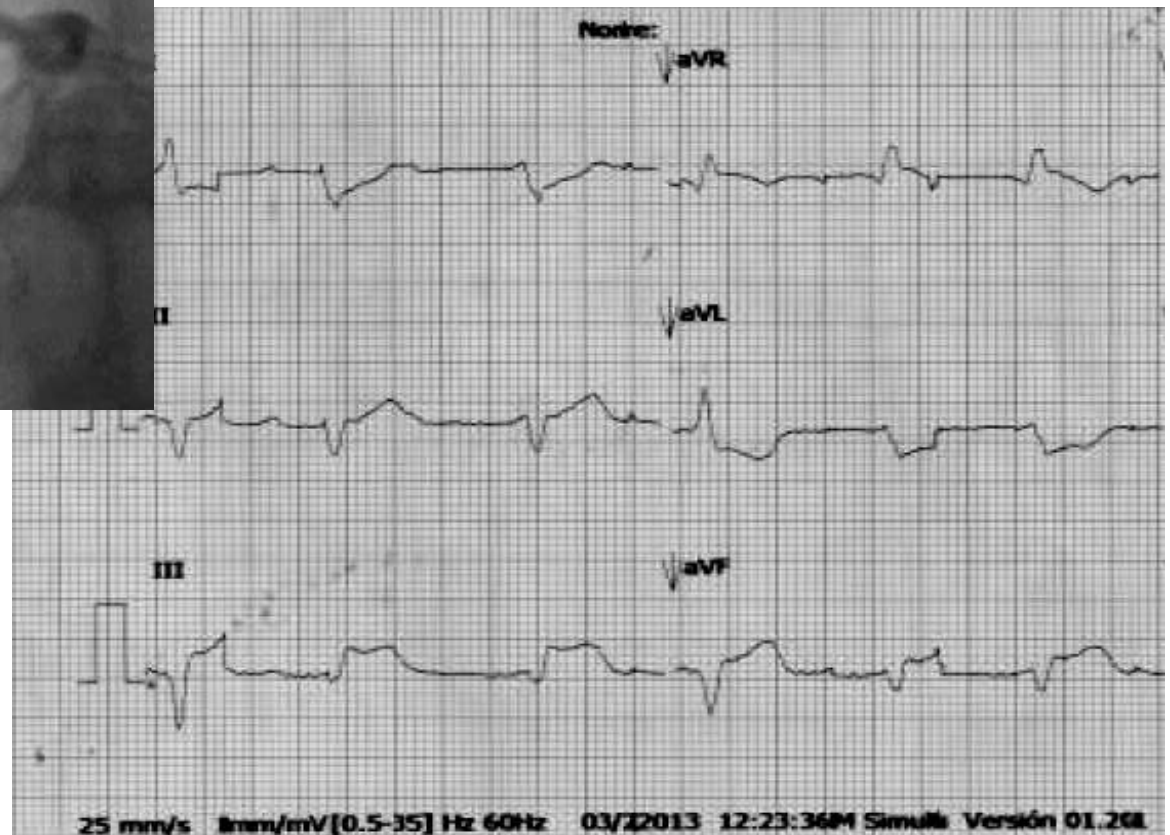


RCO

# RIGHT CORONARY OCCLUSION

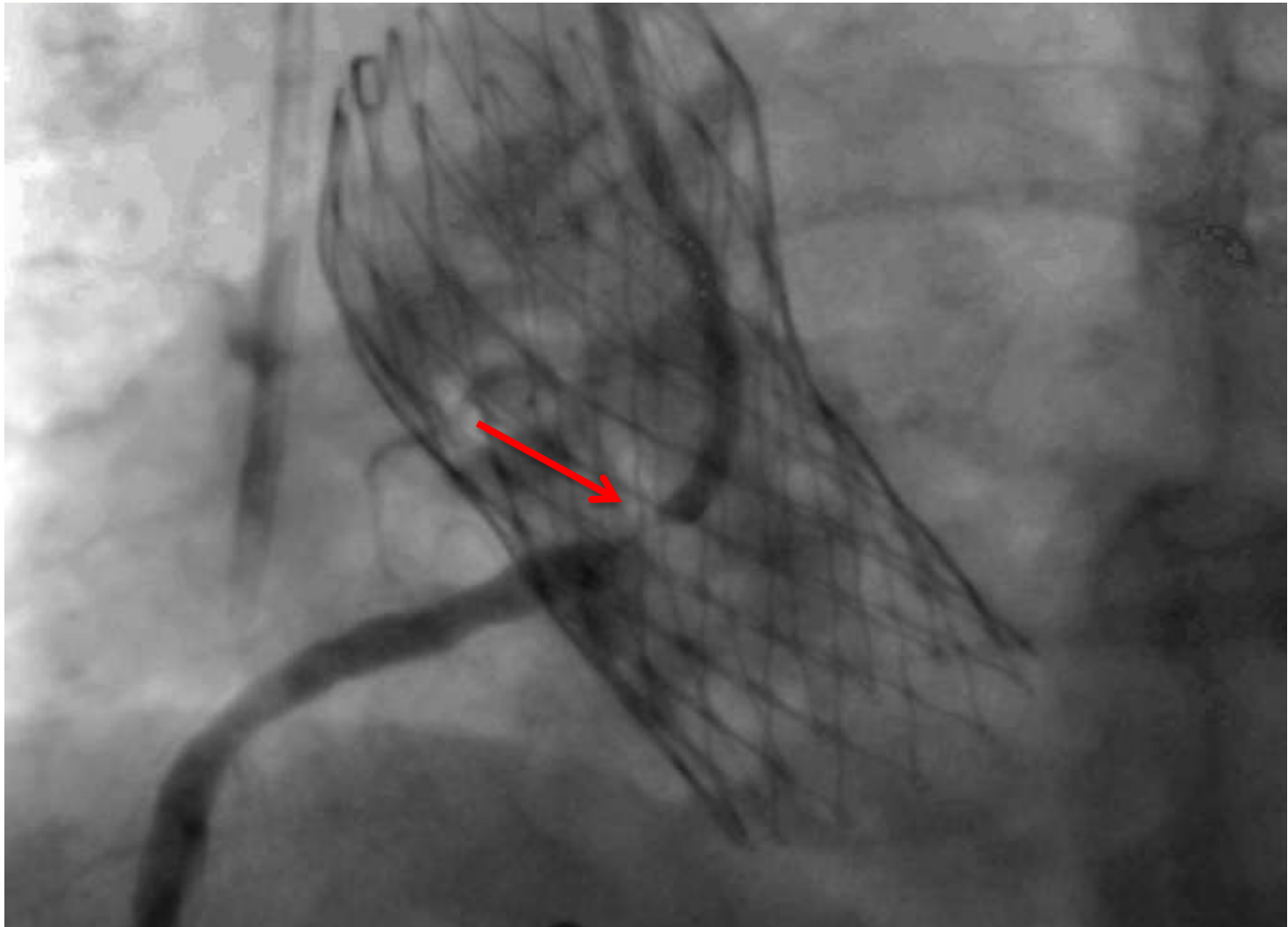


*Acute hypotension and EKG changes shortly after implantation*

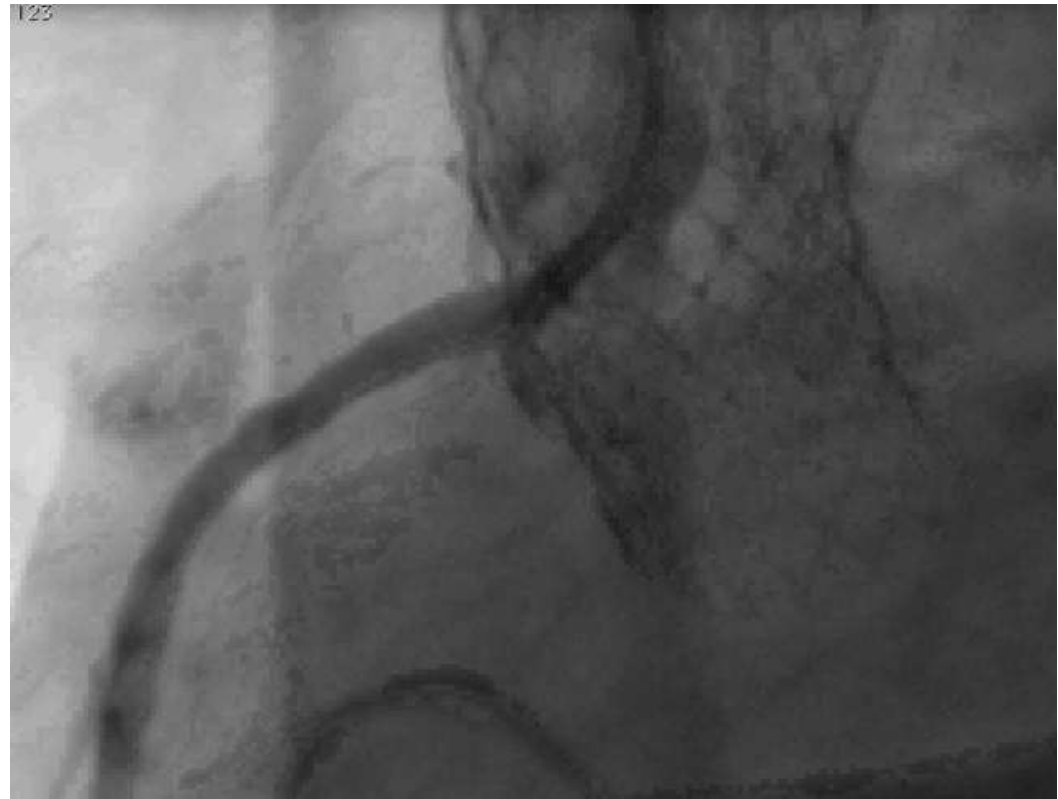
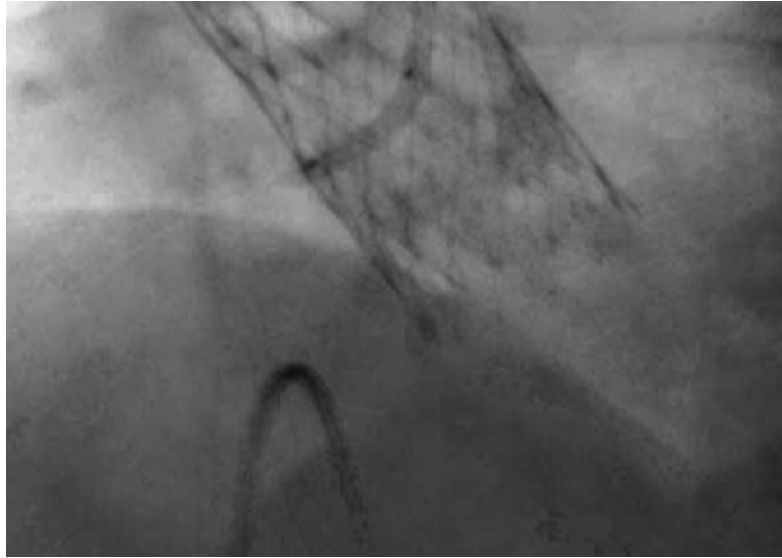




# RIGHT CORONARY OCCLUSION

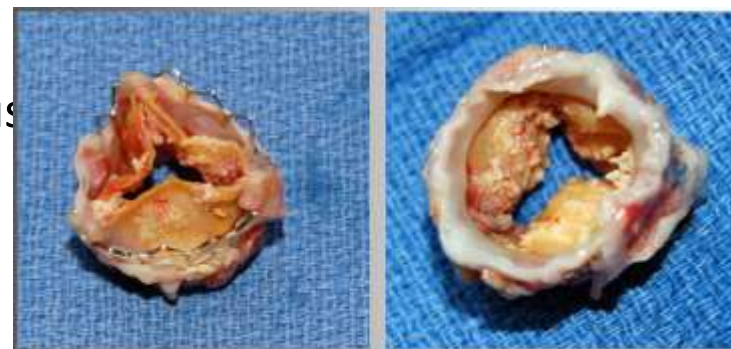
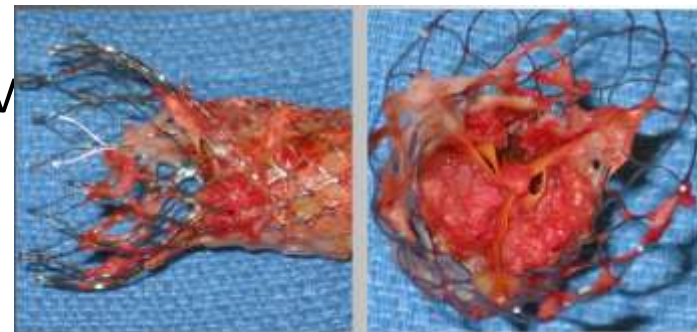


# RIGHT CORONARY OCCLUSION



# Mechanisms of THV Degeneration

- Thrombosis
  - Timing: periprocedural or up to 2-years after TAVI
  - Different presentations
    - Acute with NSTEMI and heart failure
    - Cardiac arrest
    - Symptomatic insidious increase in gradients (dyspnea)
    - Asymptomatic increase in gradient
  - Variable morphology on Echo
    - Thickened leaflets without visible thrombus
    - Thrombotic apposition of leaflets
    - Thrombotic mass on leaflets
  - Reversible with anticoagulation
- Tissue Degeneration (pannus/calcification)
- Asymptomatic bacteremia



# THV Degeneration Registry

- Multi-center international registry
- All cases of THV Degeneration – CoreValve and Edwards
- Defined THV degeneration as any VARC-defined dysfunction that occurs in a THV prosthesis that was normally functioning at discharge (i.e. a mean gradient below 20 mmHg and no/mild aortic regurgitation).
- Prosthetic heart valve dysfunction (aortic valve area 1.2 cm<sup>2</sup> and mean aortic valve gradient 20 mm Hg or peak velocity 3 m/s, OR moderate or severe prosthetic valve AR)
- Aim: To understand the incidence, mechanisms, timing and management of THV degeneration

# New TAVI concepts

Portico – St Jude

BSC – Sadra Lotus

## **Peri-operative stroke:**

- Cerebral embolic protection devices frequently capture embolic debris thereby potentially protecting the brain

## **Paravalvular AR:**

- Correct sizing is paramount to prevent PAR. Improved imaging modalities, such as 3D MSCT, provide essential anatomic information needed for adequate sizing.
- New retrievable valves with better annulus sealing may reduce PAR severity.

## **Coronary Obstruction:**

- Coronary obstruction after TAVR, while uncommon, can be prevented and successfully treated in most cases with PCI.