

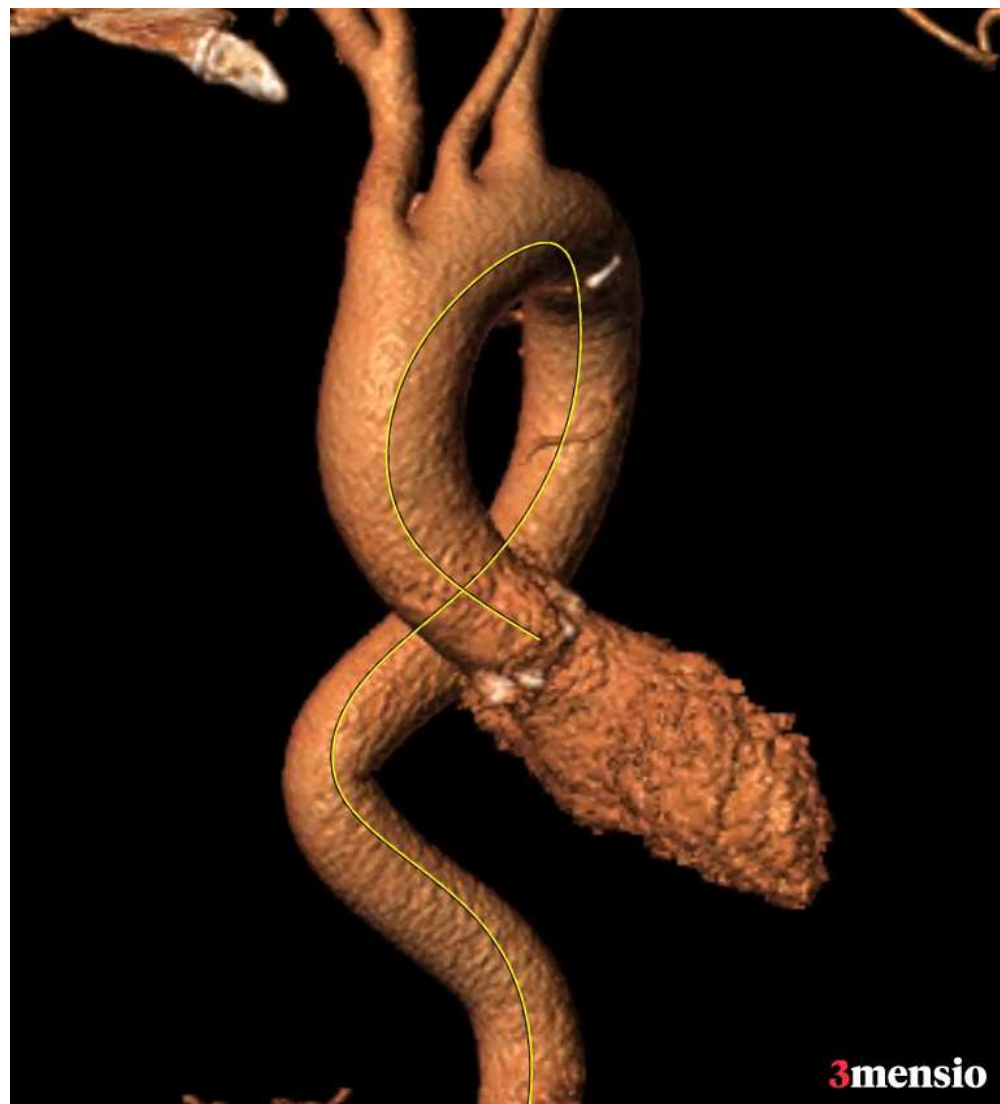
# **TAVR using cusp overlap view for self-expanding THV**

**Cheol Woong Yu, MD, PhD**

**Cardiovascular Center, Anam Hospital, Korea University  
Medical College.**



Elongation of aortic root



RAO

Shortening of aortic root



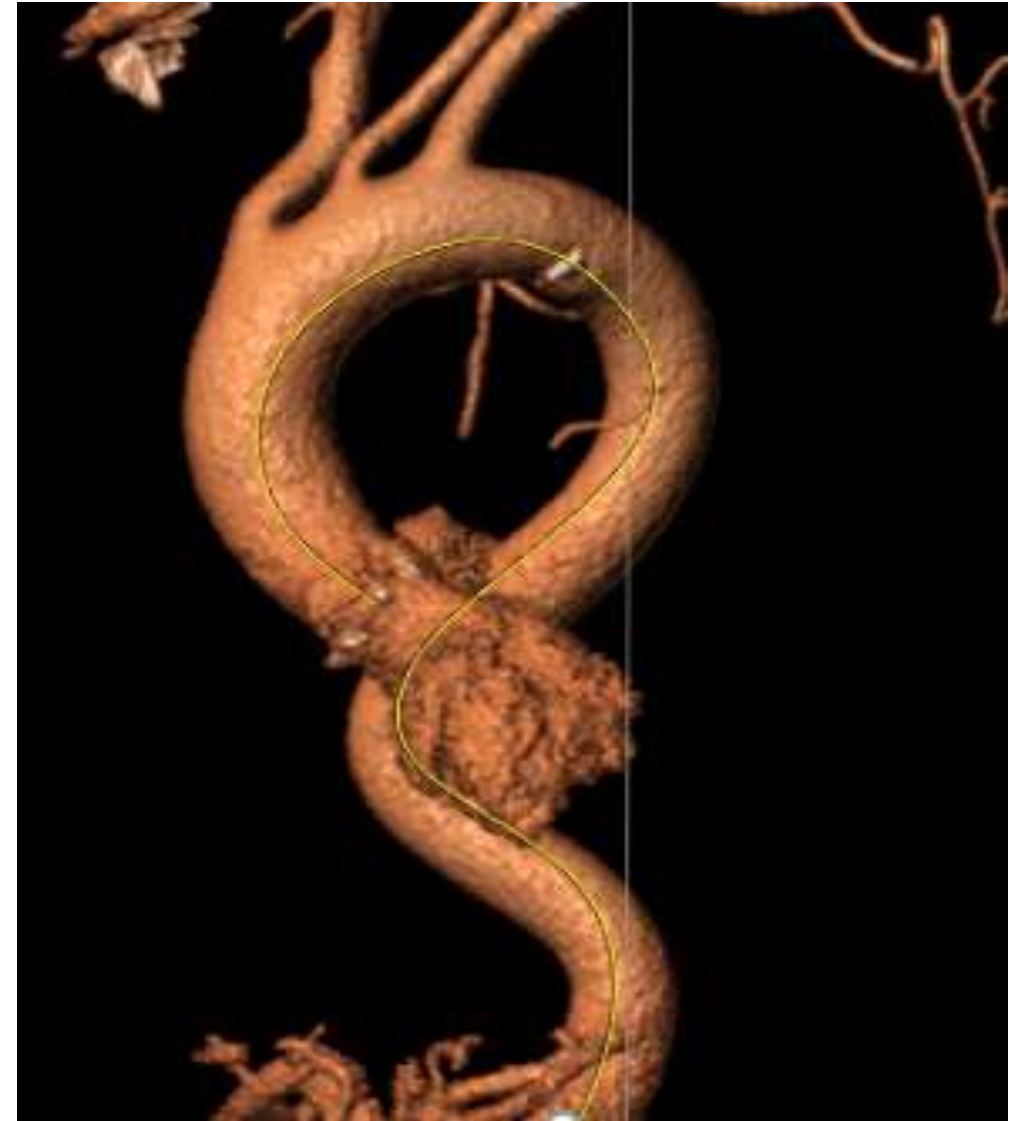
LAO



NCC is located at the more posterior and lower portion than RCC & LCC



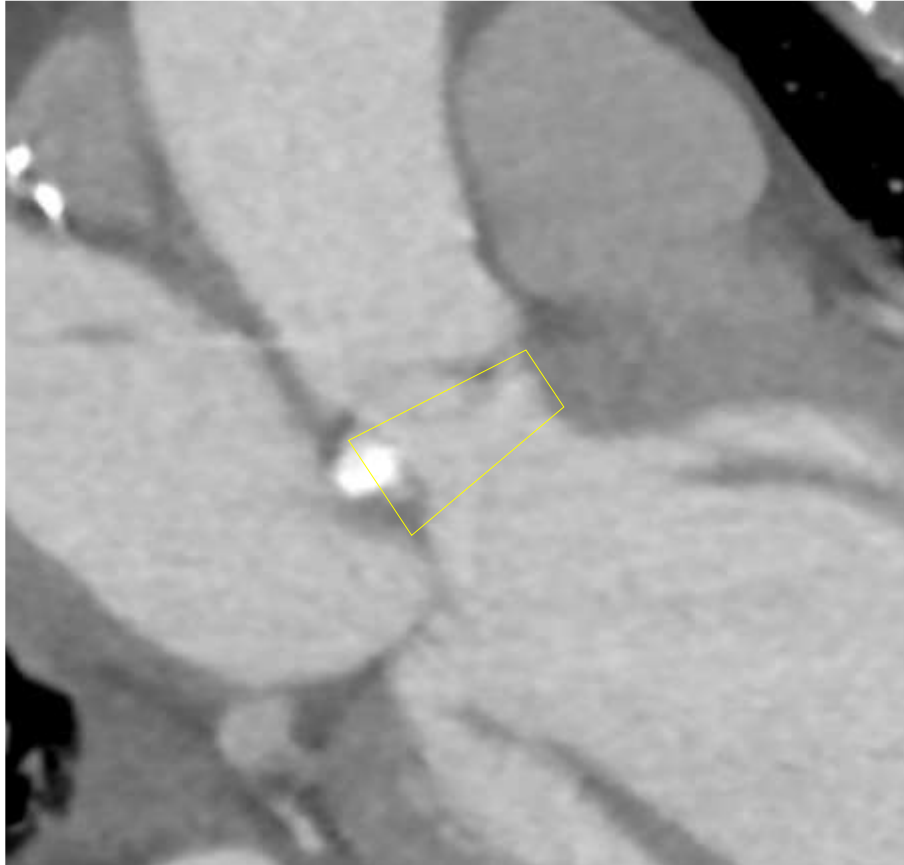
RAO CAU



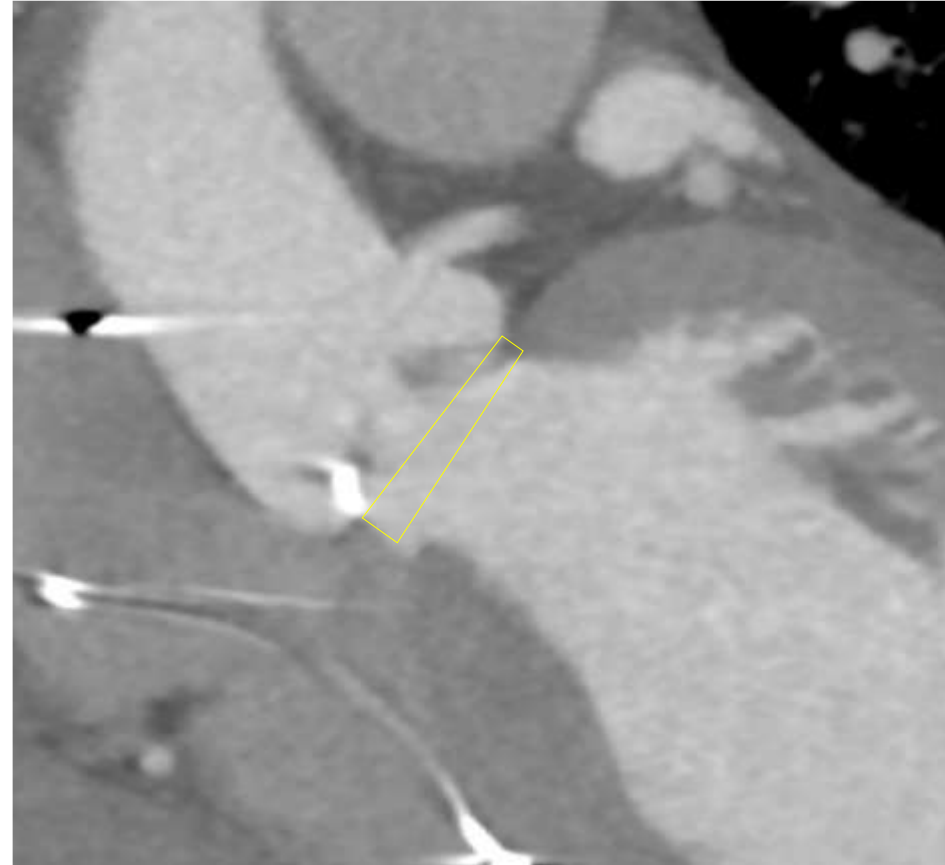
LAO Caudal



# LVOT Parallax



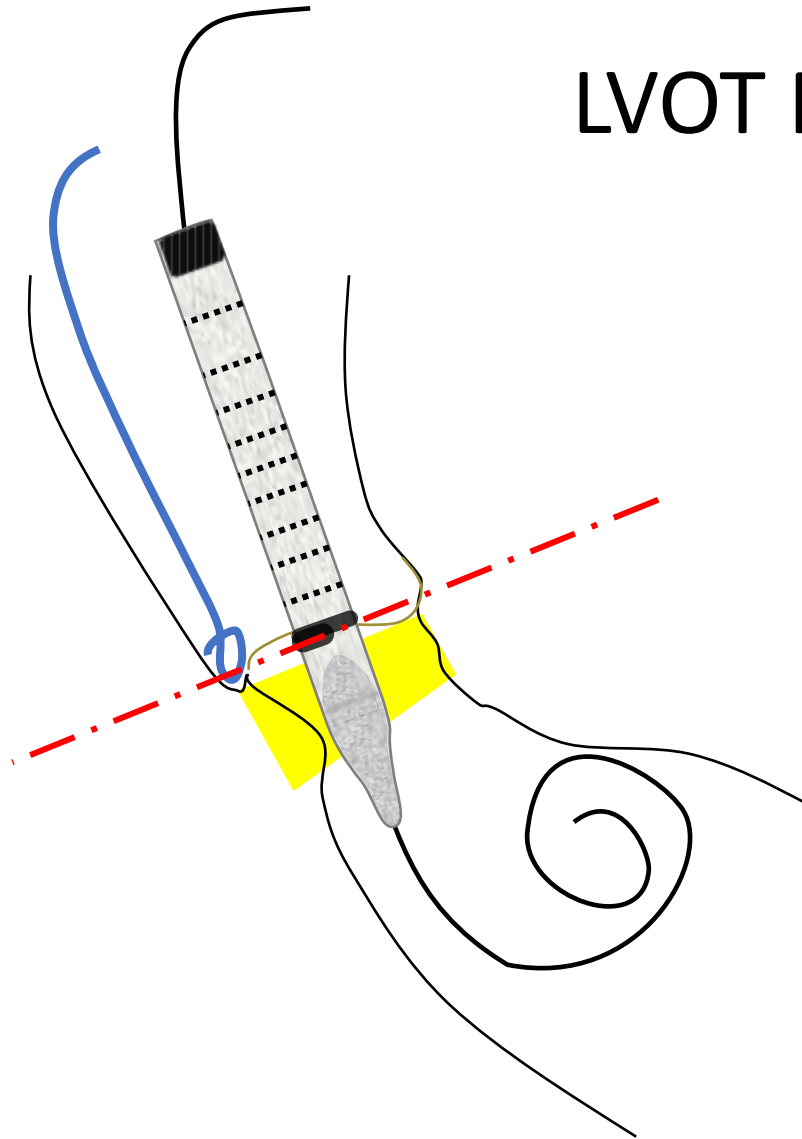
RAO 30 Caud 20



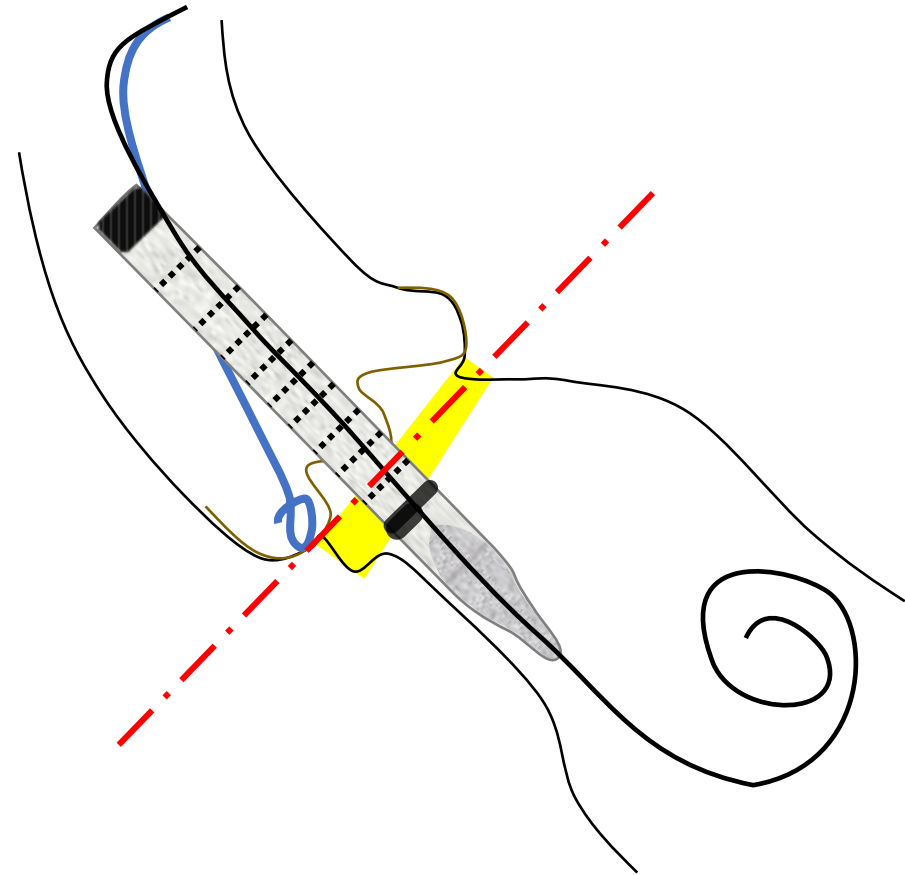
LAO 20 Cran 12



# LVOT Parallax



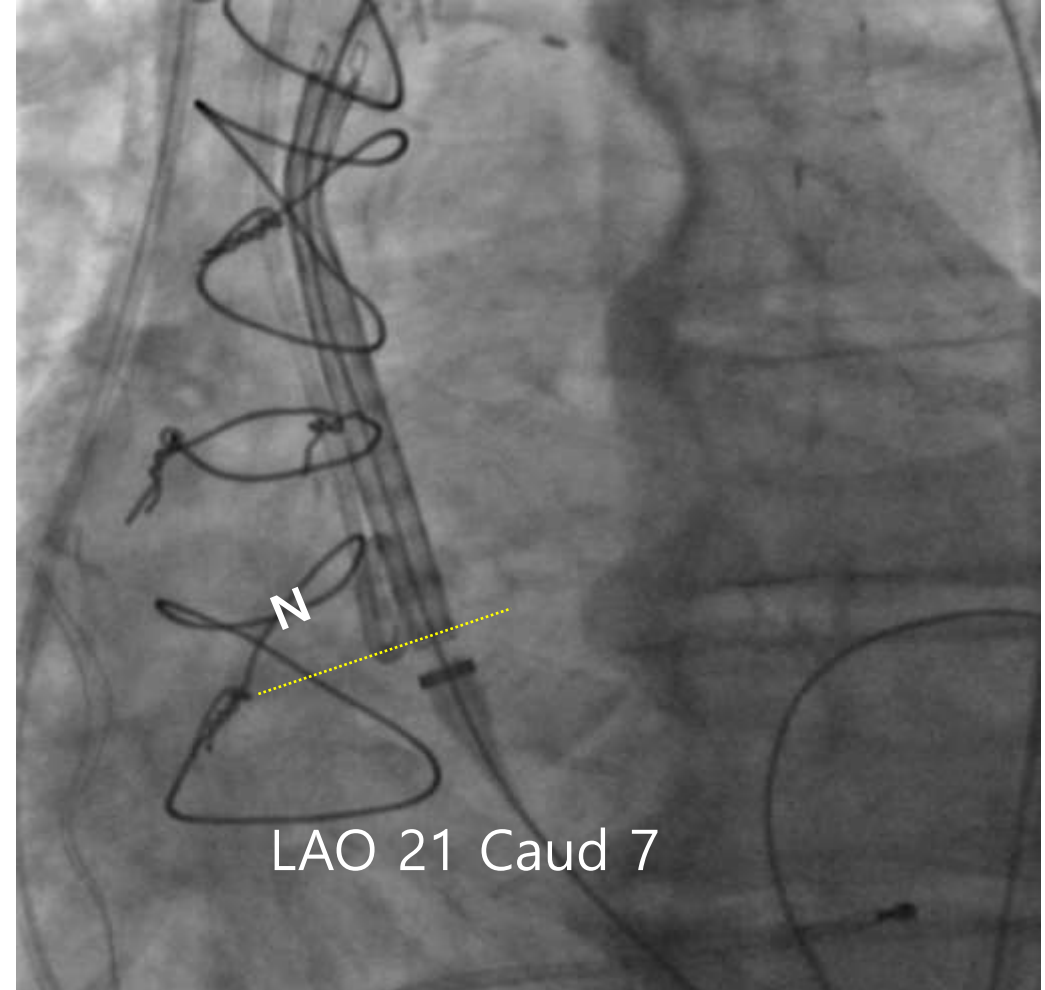
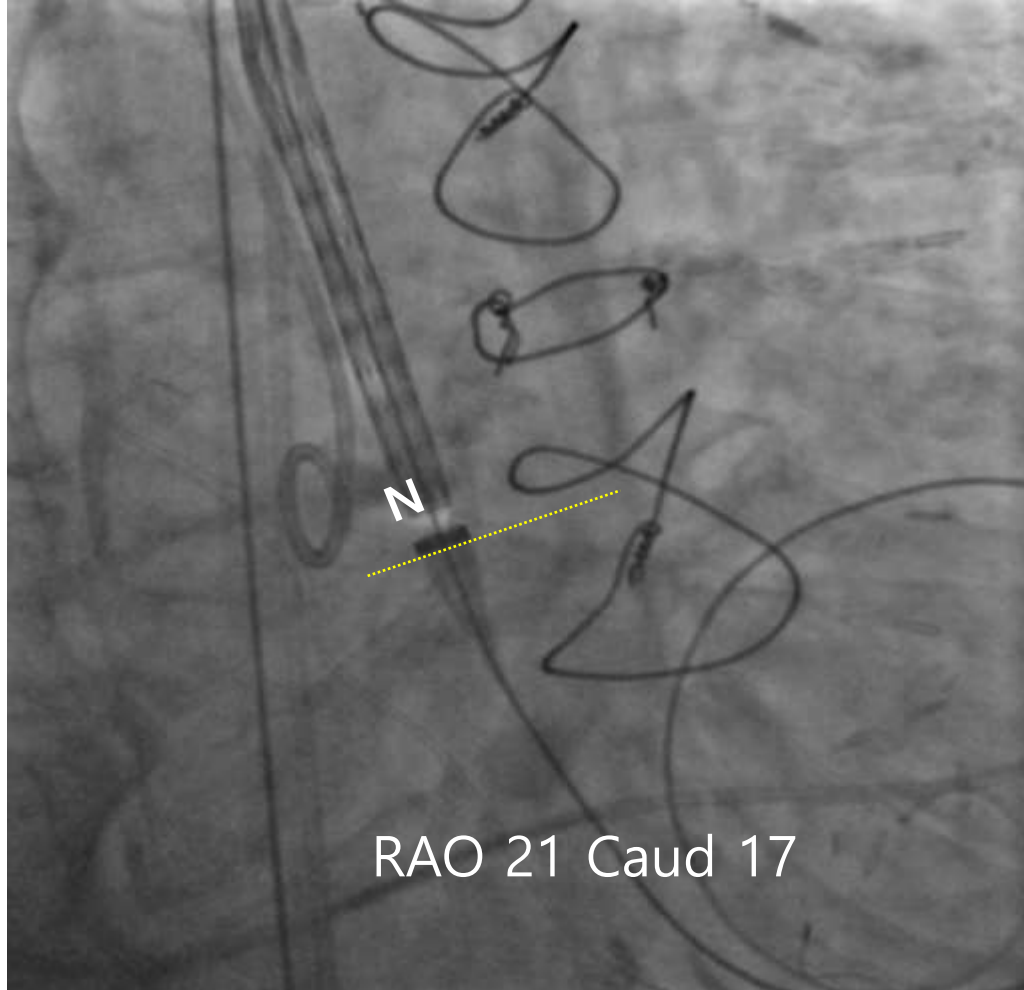
RAO 30 Caud 20



LAO 20 Cran 12



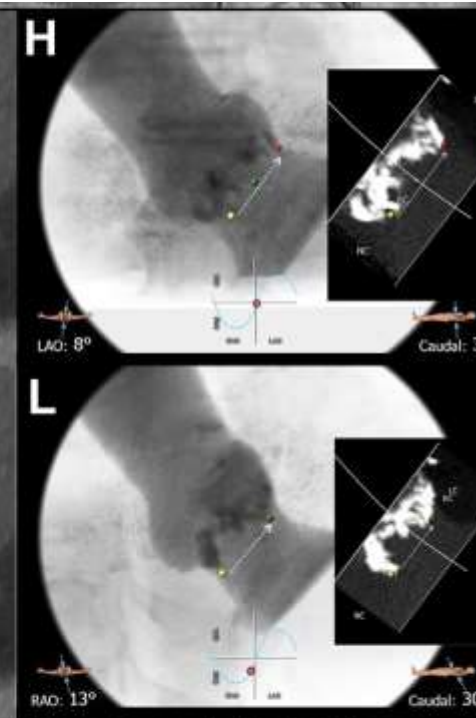
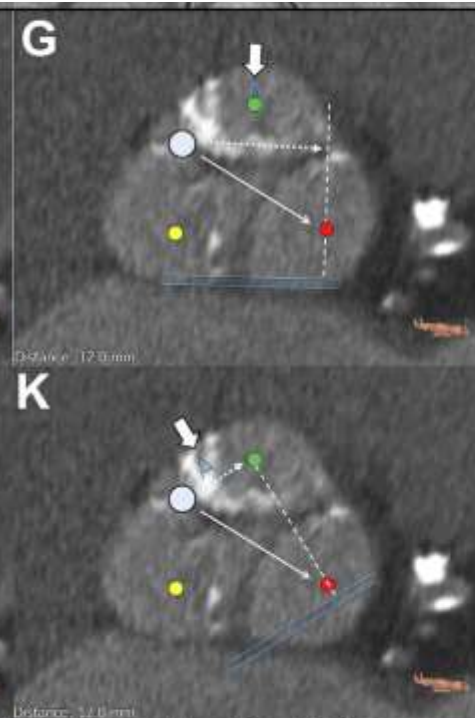
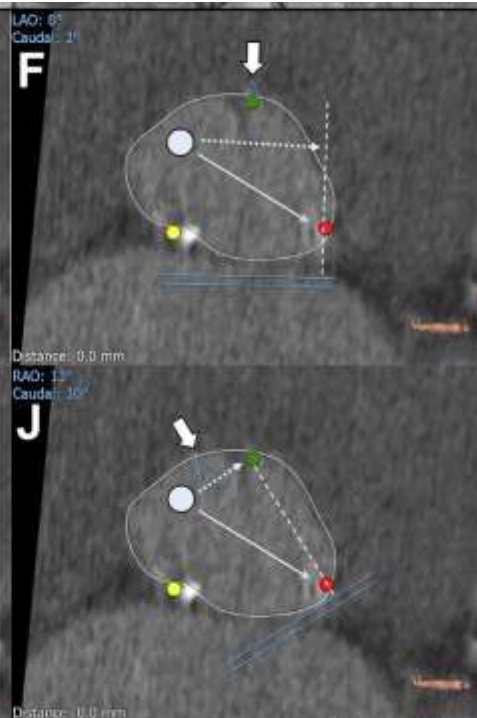
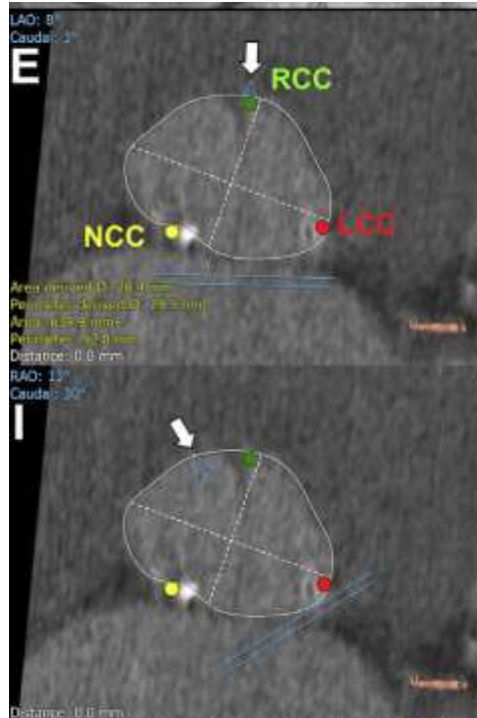
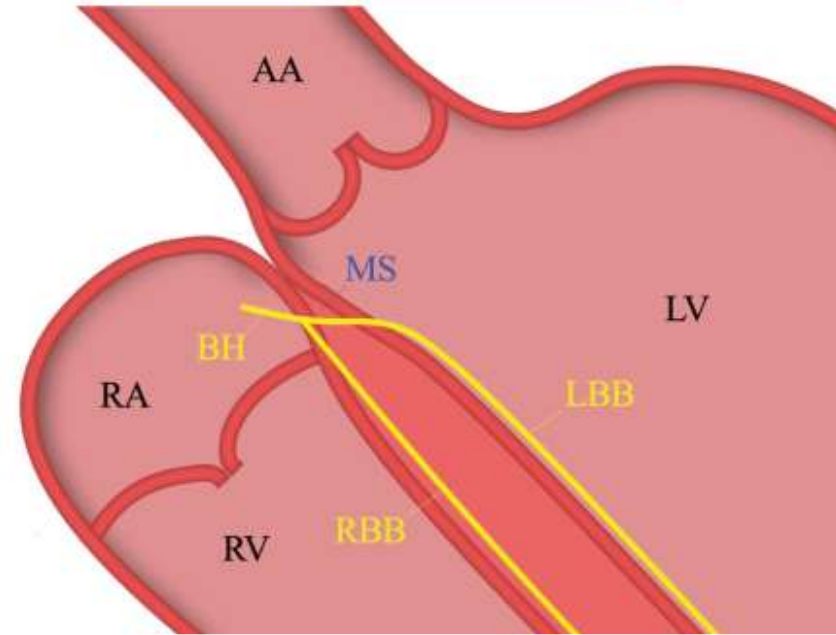
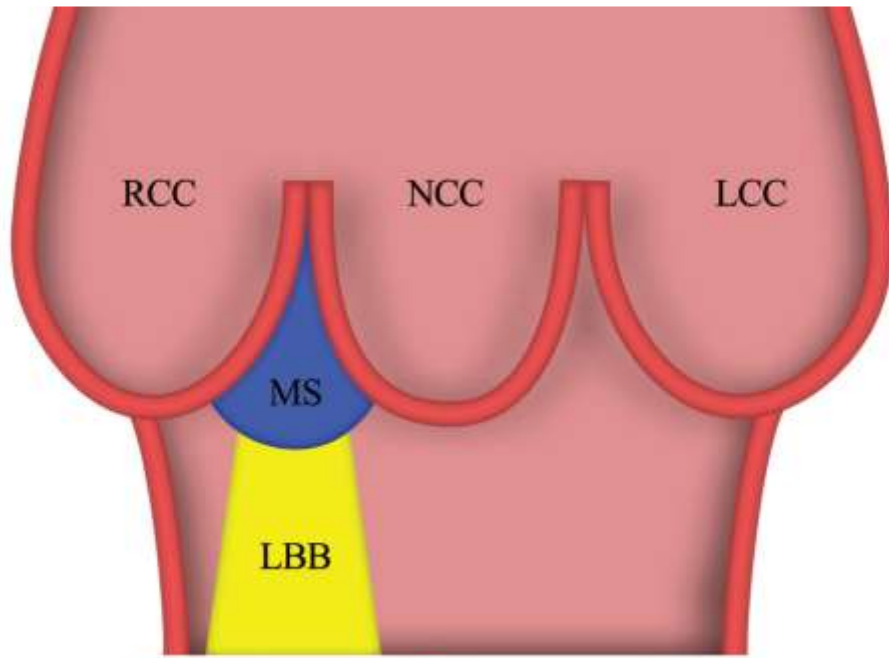
Did the pigtail change position?



THV parallax

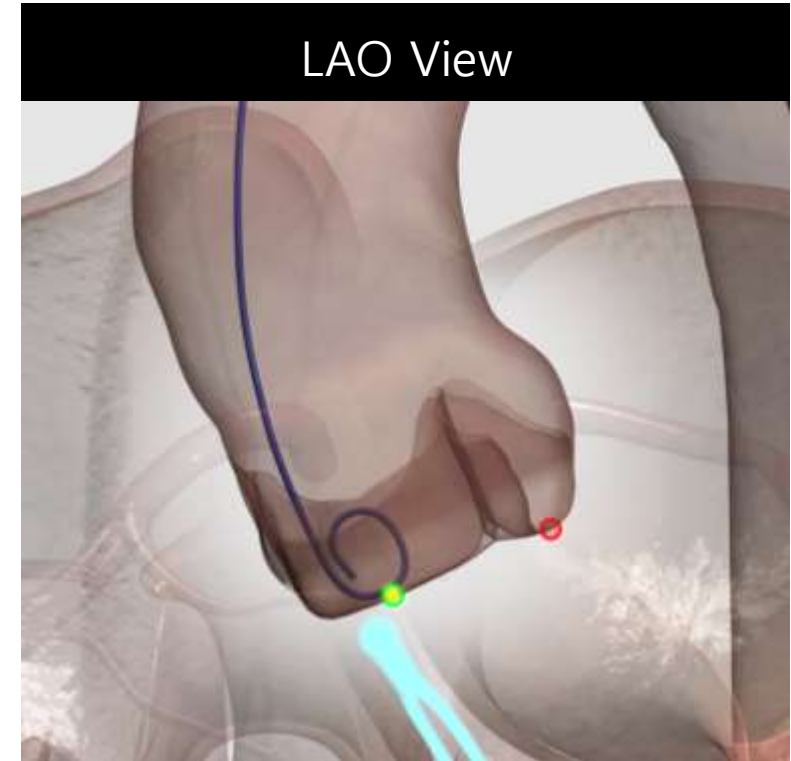
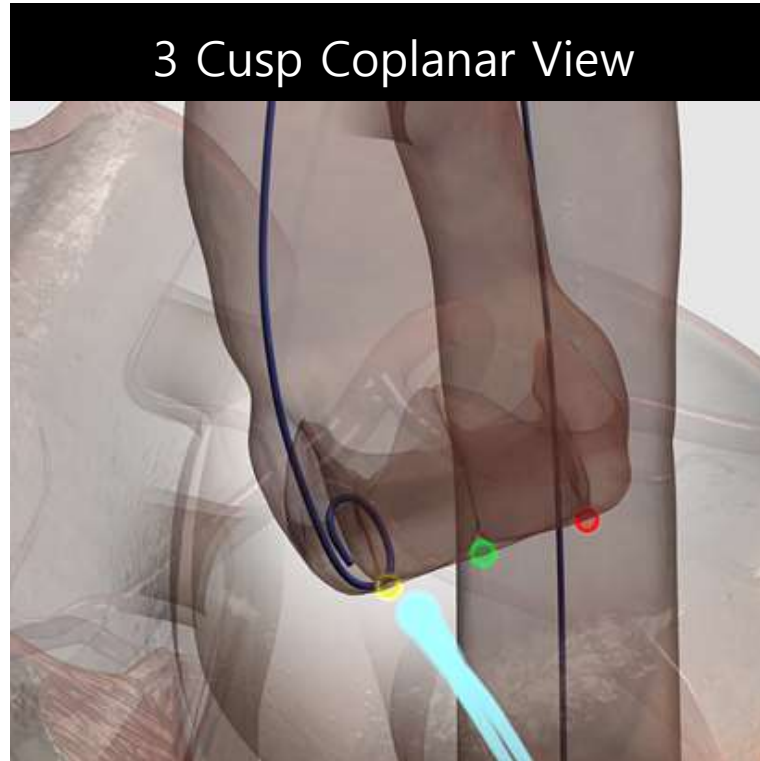






# Elongation of the LVOT

## ANATOMICAL MODELING OF VIEWS WITH CUSP ALIGNMENT



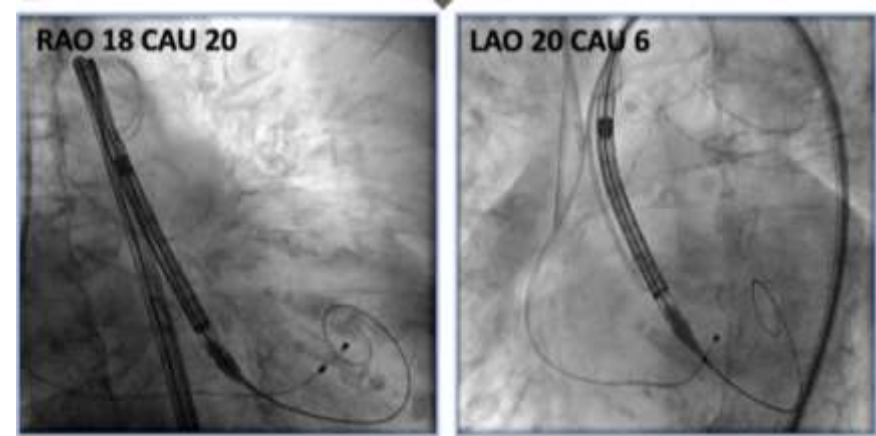
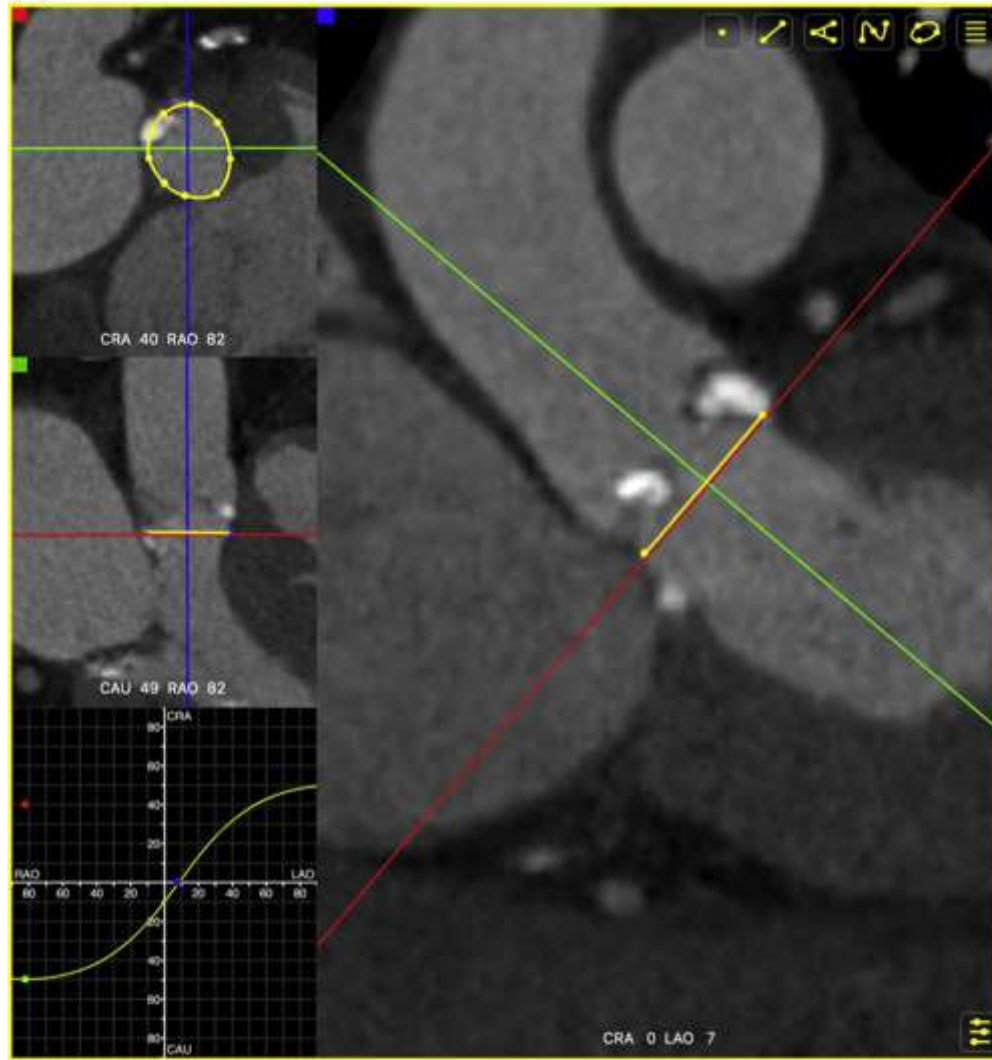
The cusp overlap view shows greater visual separation between the basal annular plane and the conduction system.



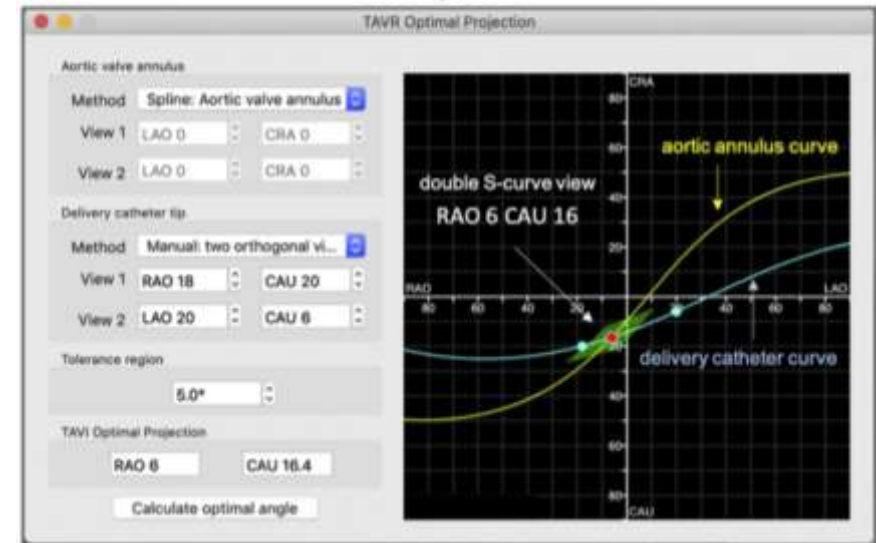


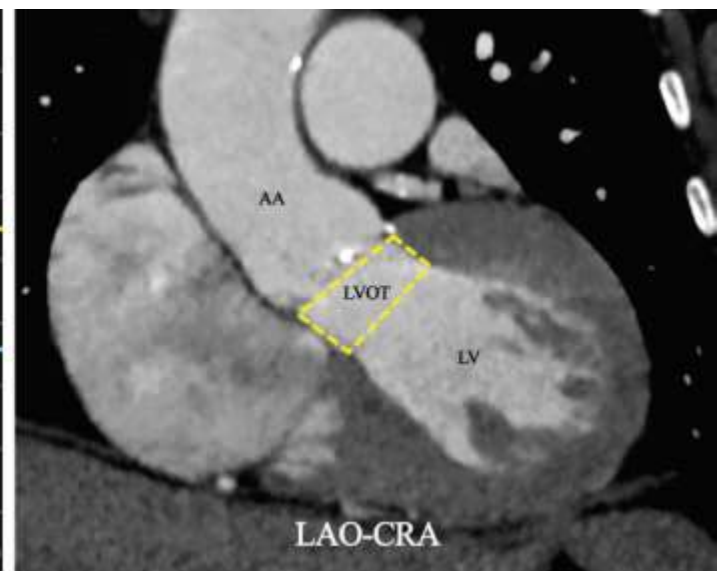
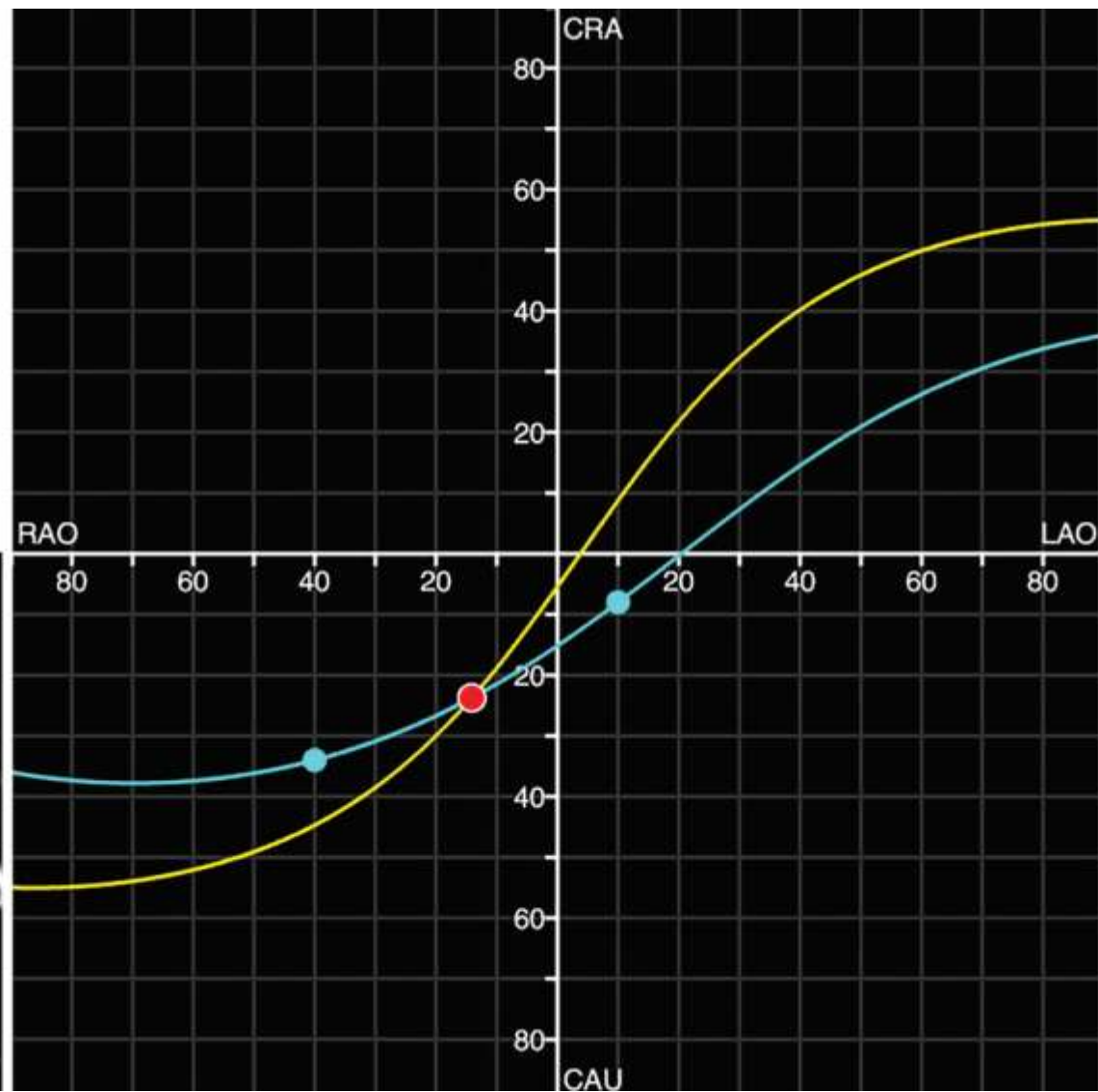
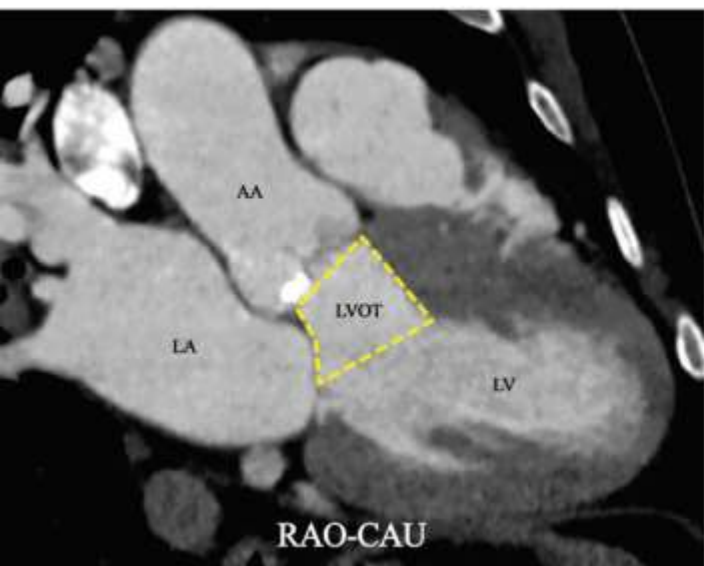
# Double S curve

- Aortic annulus S curve and delivery catheter S curve usually do not match.

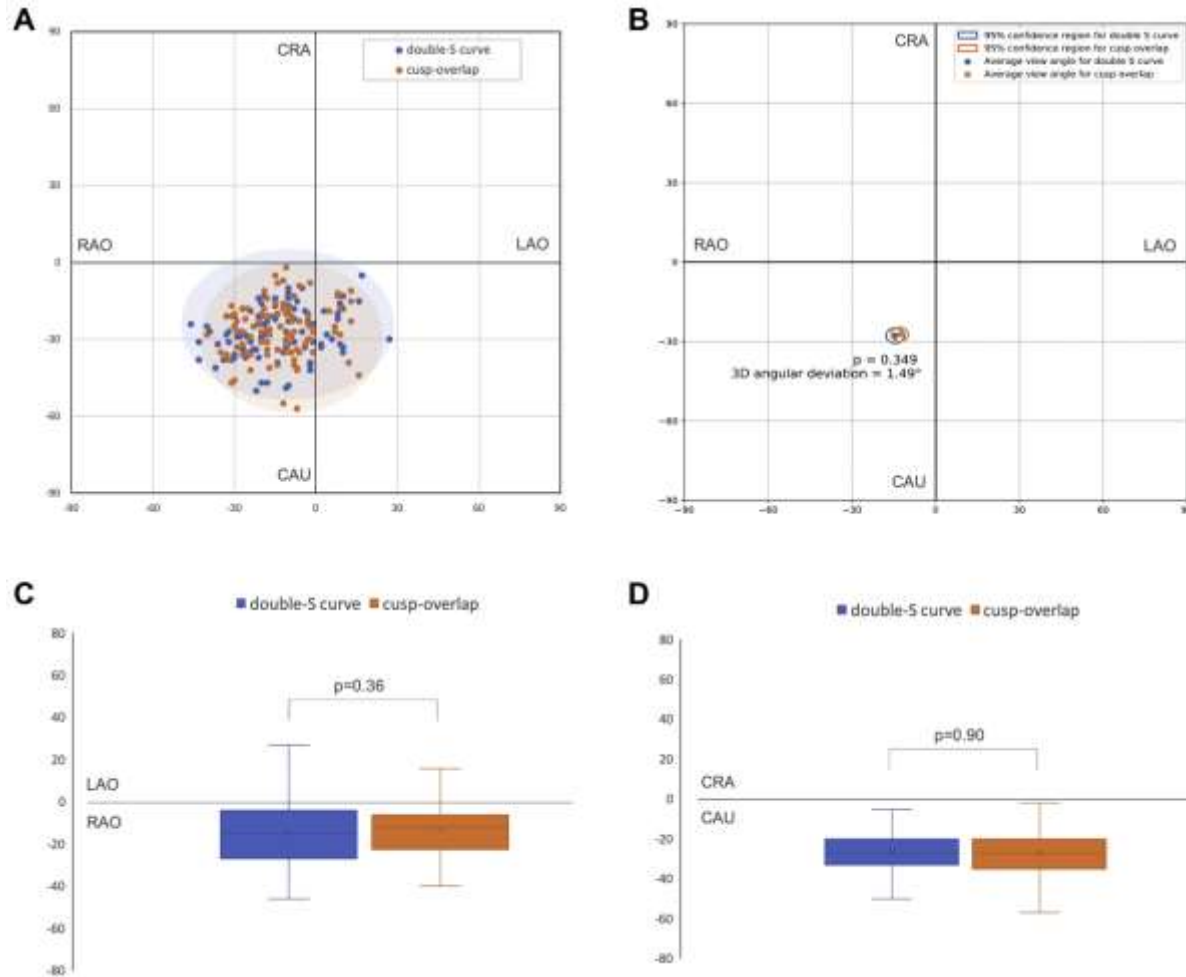


C

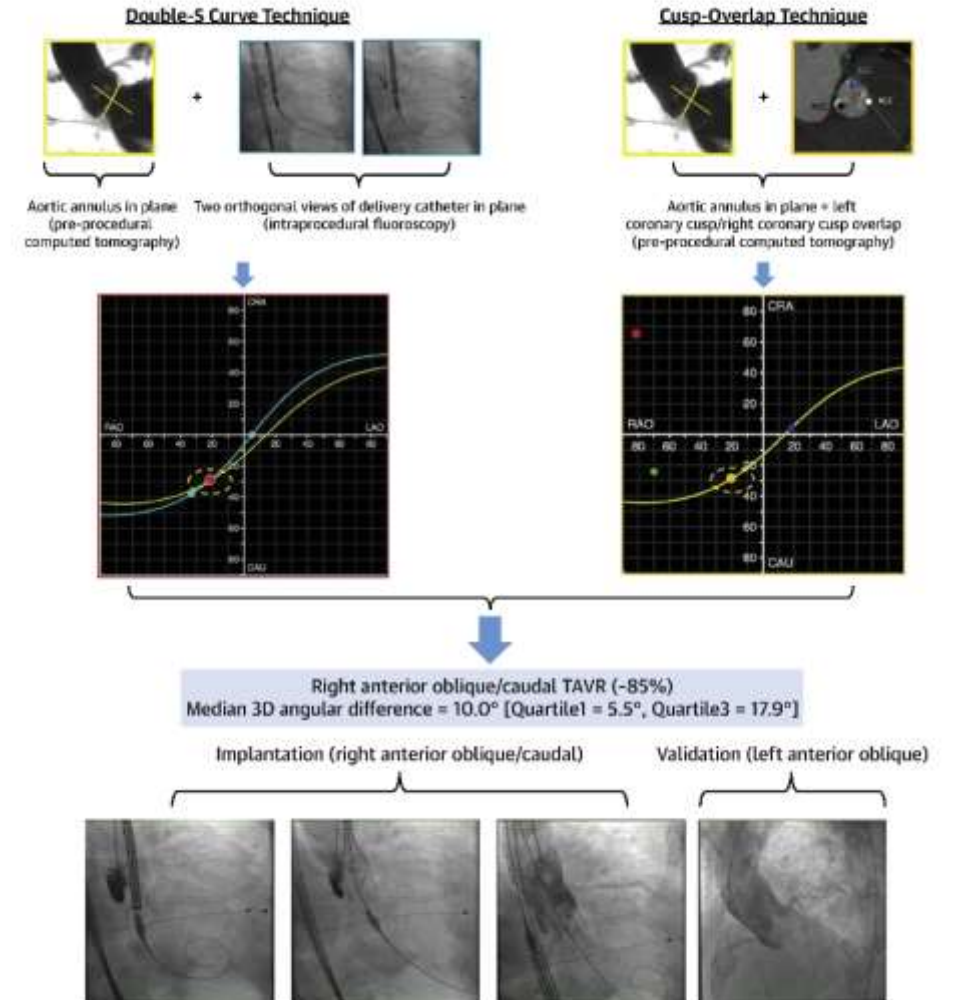


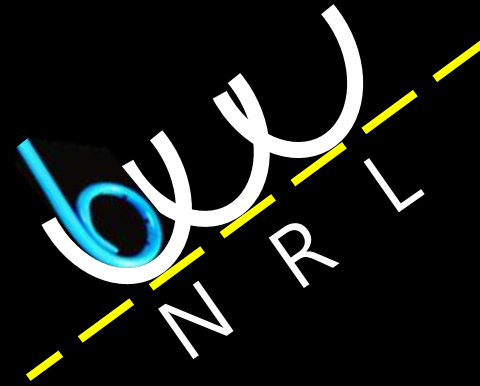
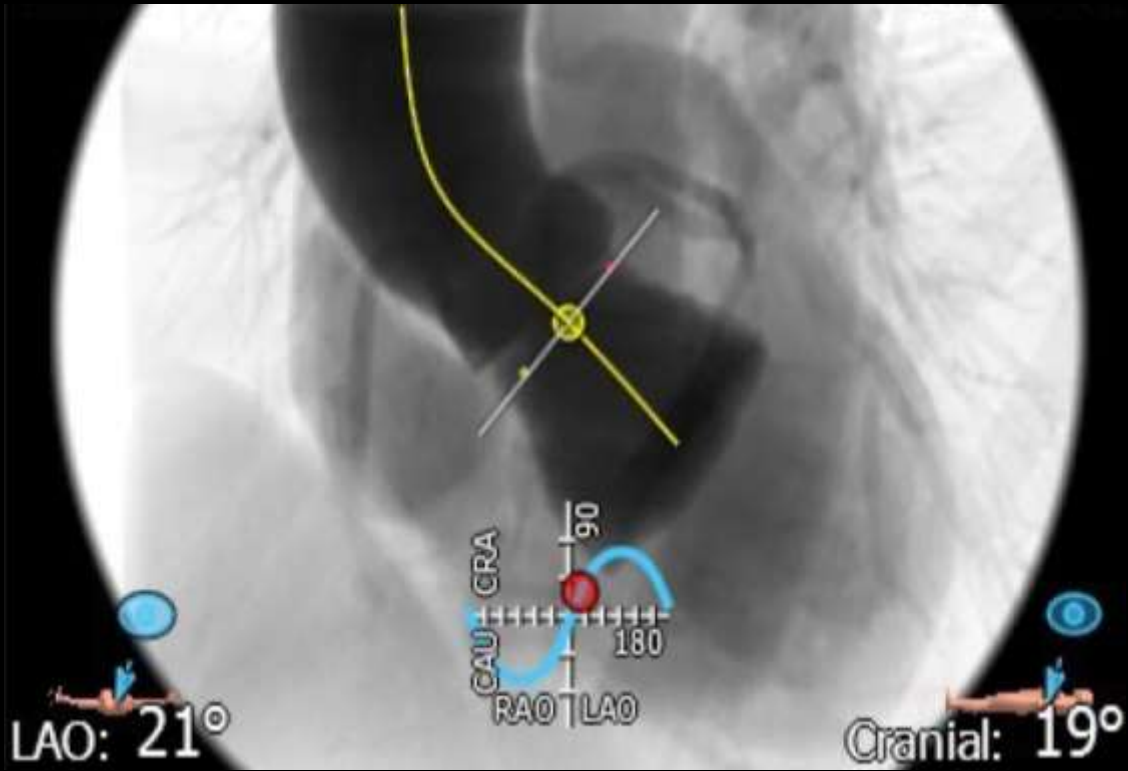


# Double S-curve = COT



## CENTRAL ILLUSTRATION: TAVR According to the Double S-Curve and Cusp-Overlap Techniques





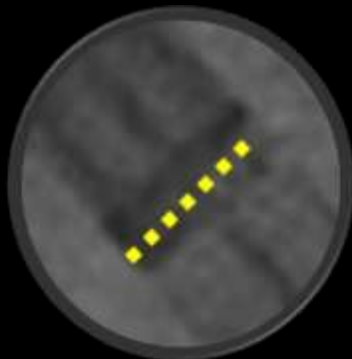
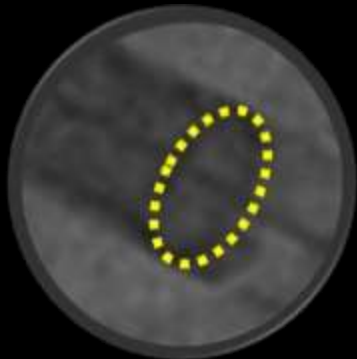
**Optimal angle**

**LAO 21 °**

**Cranial 19°**

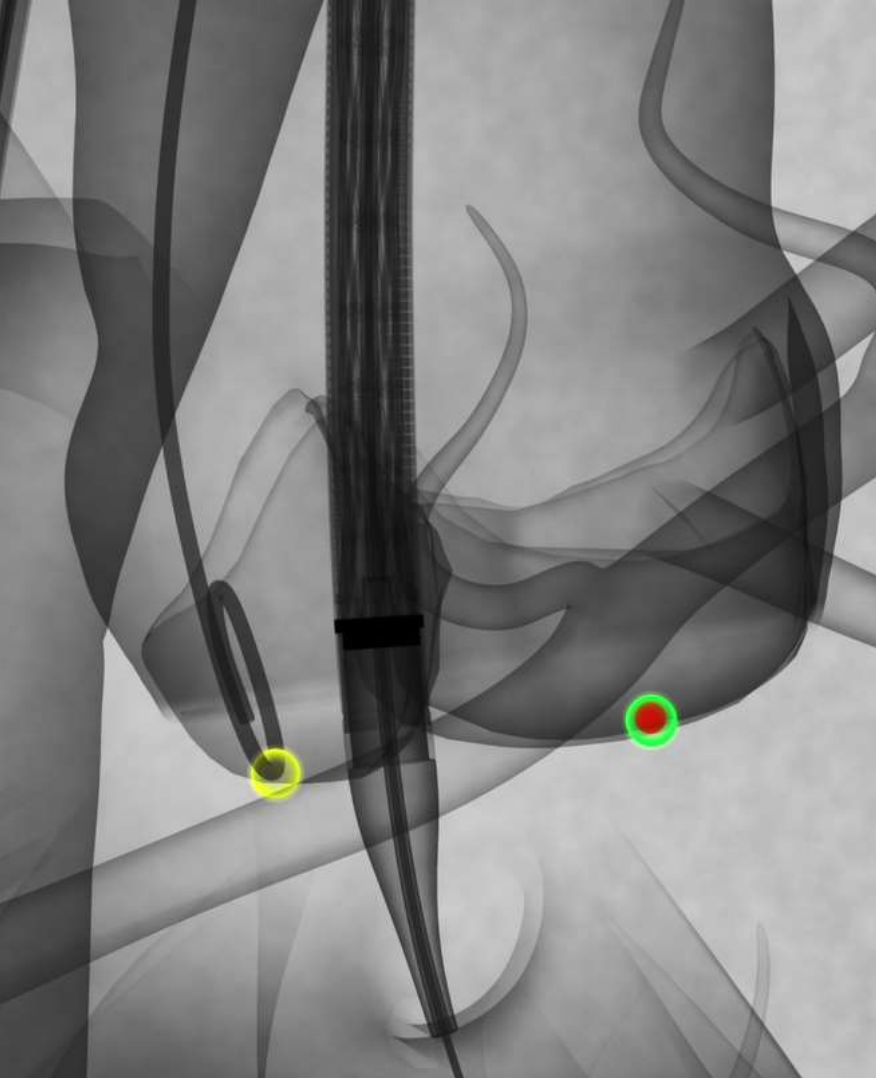
**LAO ?**

**Caudal ?**





# Cusp Overlap Technique



## PRECISION



RELIABLE VIEW to accurately assess and achieve target implant depth by isolating the NCC.

## CONTROL



PROCEDURAL TECHNIQUE allows valve to descend to target position to minimize the risk of interaction with the conduction system.





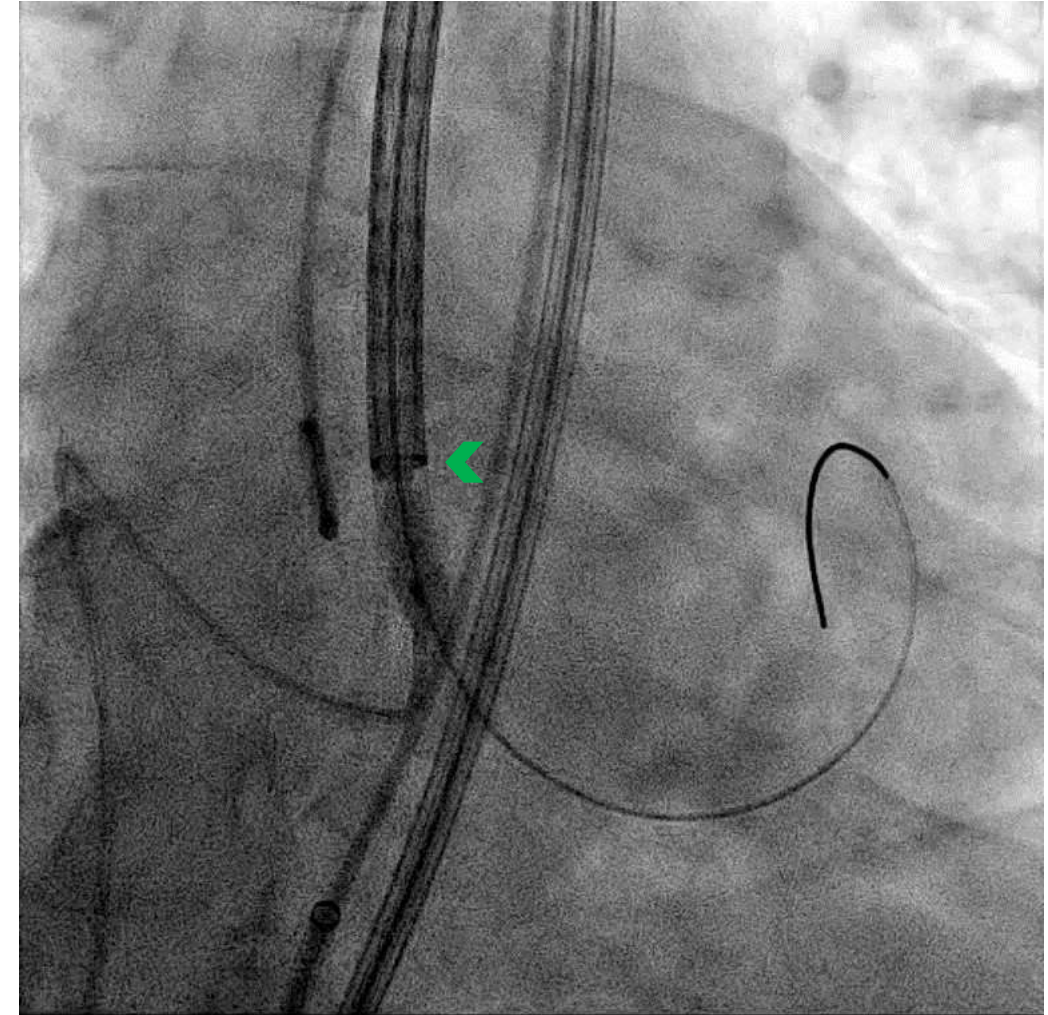
# Initial Deployment

**Slowly deploy the valve until the marker band reaches the third node of frame.**

- Use small movements ( $\frac{1}{4}$  turns) to facilitate slow deployment.
- Approach target depth (3 mm) from a supra-annular starting position to allow valve to descend to target depth.\*
- This method is intended to minimize interaction with structures of the conduction system.



3 mm Target Implant Depth



Begin Deployment with Radiopaque Marker Band at Mid-Pigtail

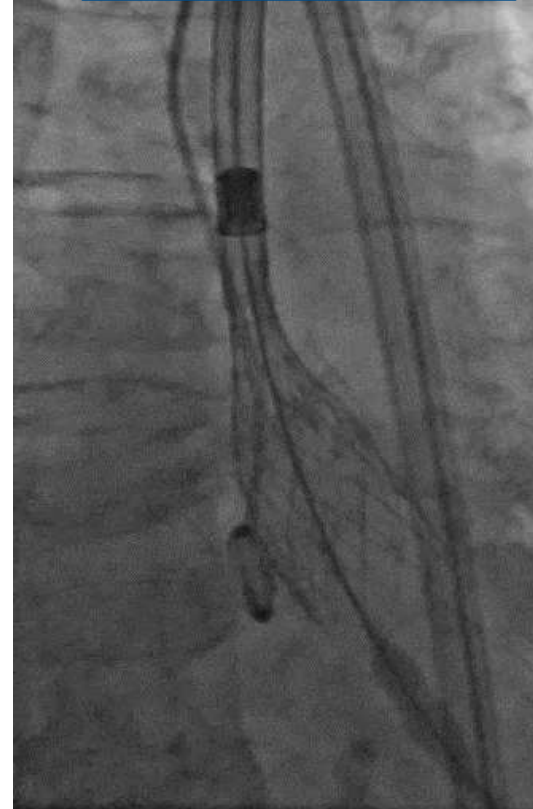


# Move to LAO View

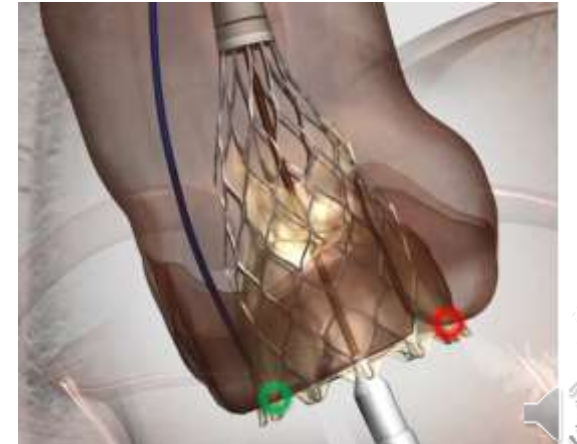
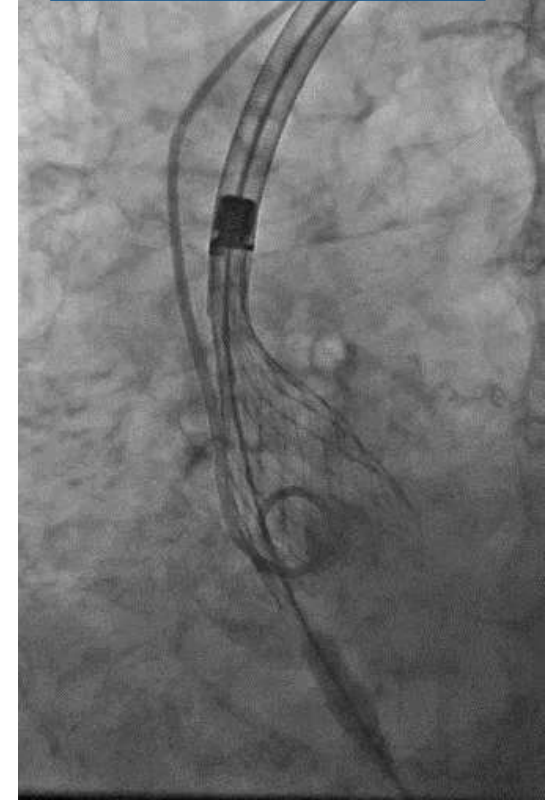
CONFIRM DEPTH AND PERFORMANCE

- **Move to a 3 cusp coplanar view and then roll LAO (no greater than 25°) until aortic arch is open and parallax at the inflow is minimized.**
  - Remove any remaining parallax at inflow by moving caudal.
- Assess depth at LCC.
- Confirm valve performance:
  - Assess hemodynamics and prosthetic regurgitation.
  - Confirm coronary perfusion.
  - Determine whether to deploy or recapture.

Cusp Overlap View



LAO View



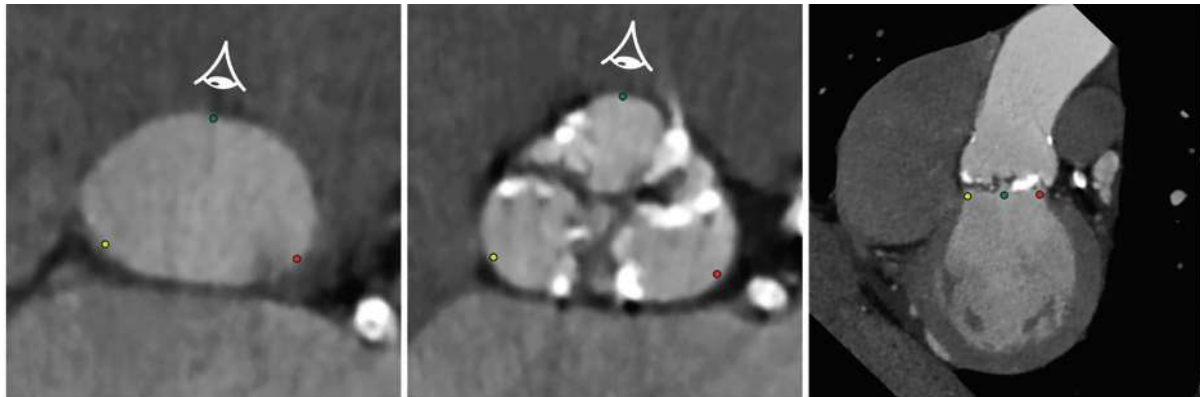
# Deployment

- After confirming valve position and performance, release tension, apply forward pressure to centralize delivery system in aorta, and pull guidewire back from apex.
- Remove pigtail from NCC.
- Very slowly deploy as outflow region leaves capsule and paddles release.
  - Use  $\frac{1}{4}$  turns and pauses to minimize any potential movement upon release.
  - This final phase of deployment should generally be completed over 30 seconds.

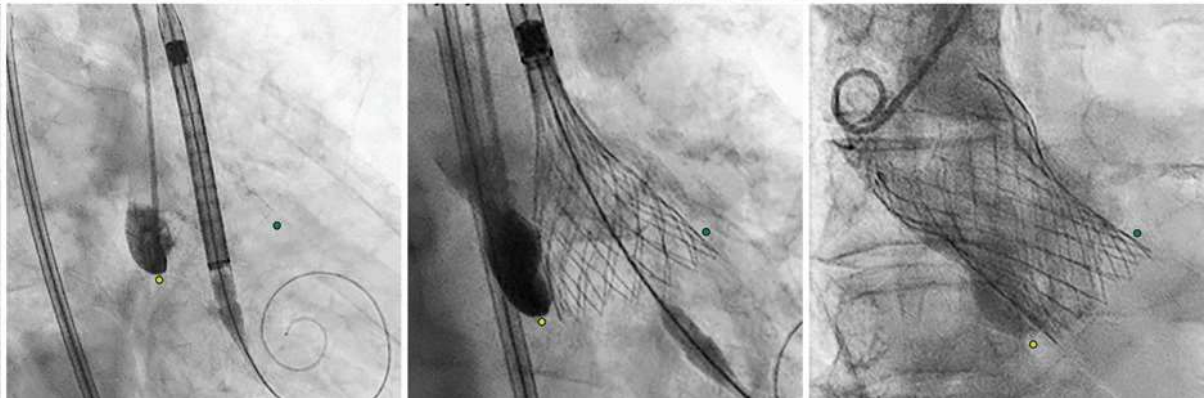
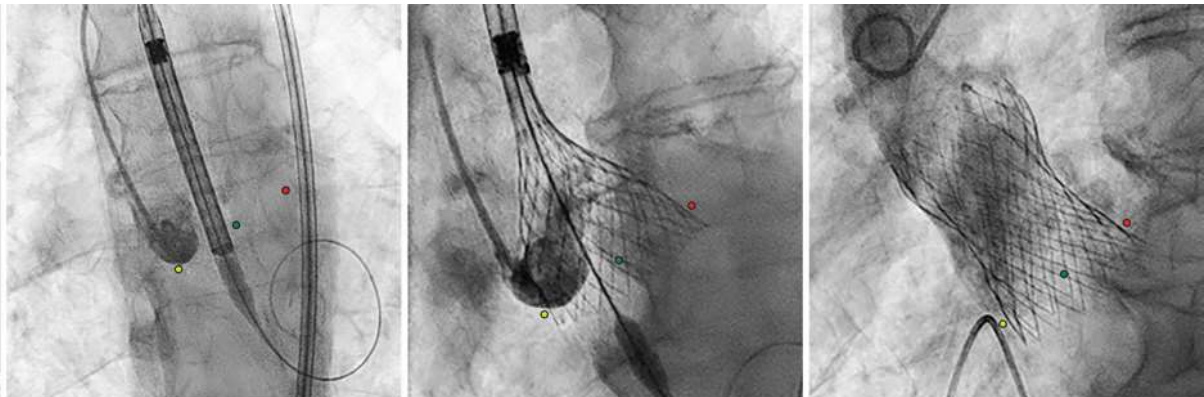
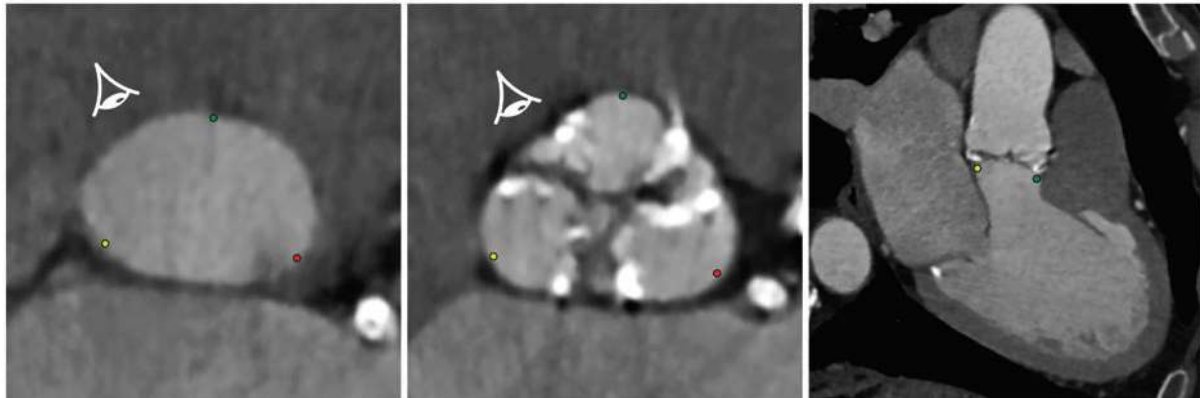




**3 Cusp View  
LAO - CRA**



**2 Cusp View  
RAO - CAU**



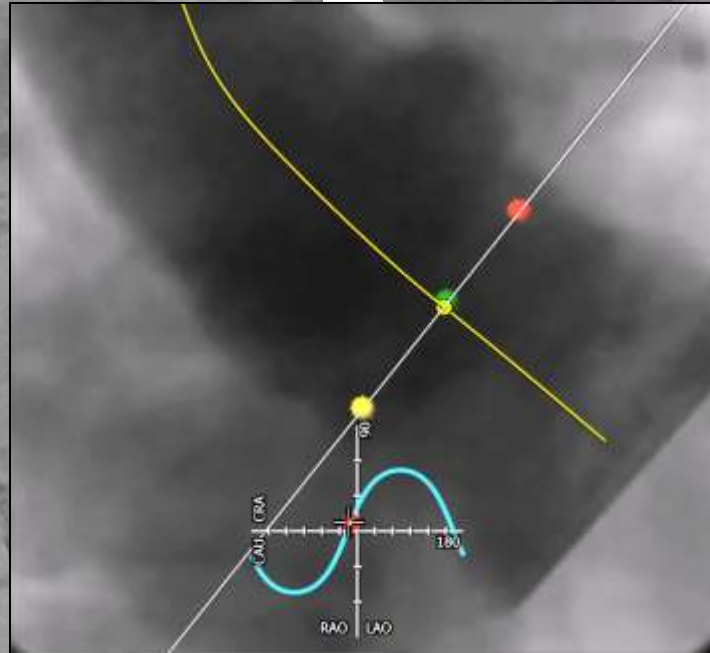
# CASE 1

3 Cusp Coplanar View

Cusp Overlap View

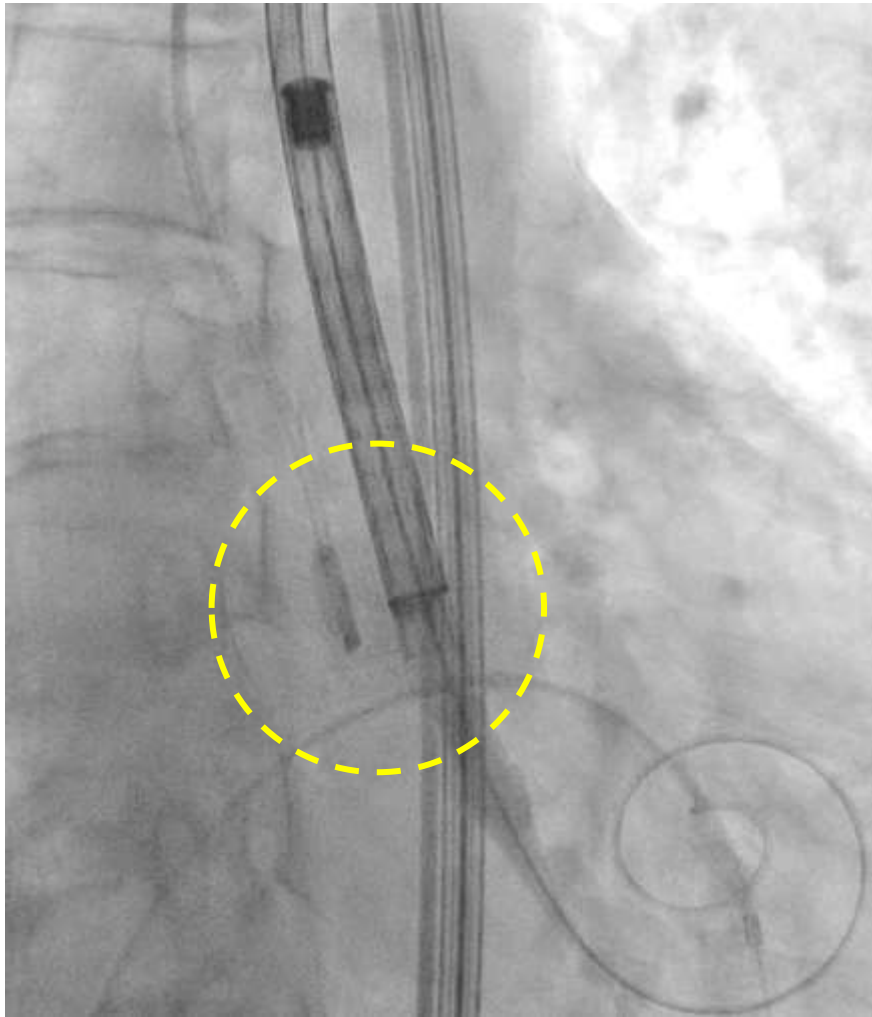
LAO 17  
Caud 2

RAO 13  
Caud 22

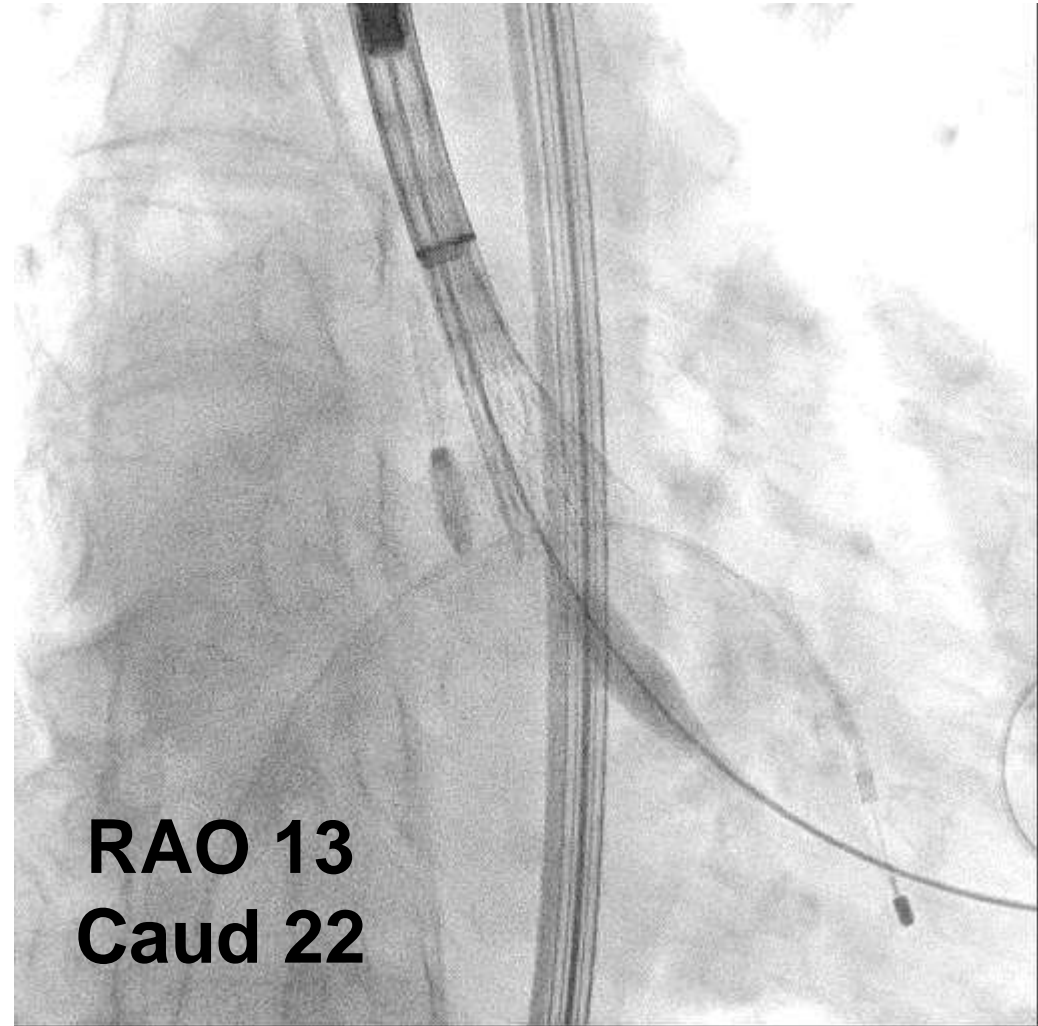




# Cusp Overlap View



Begin Deployment at Mid-Pigtail  
Evolut Pro 26mm



RAO 13  
Caud 22



# Cusp Overlap View

RAO 13  
Caud 22

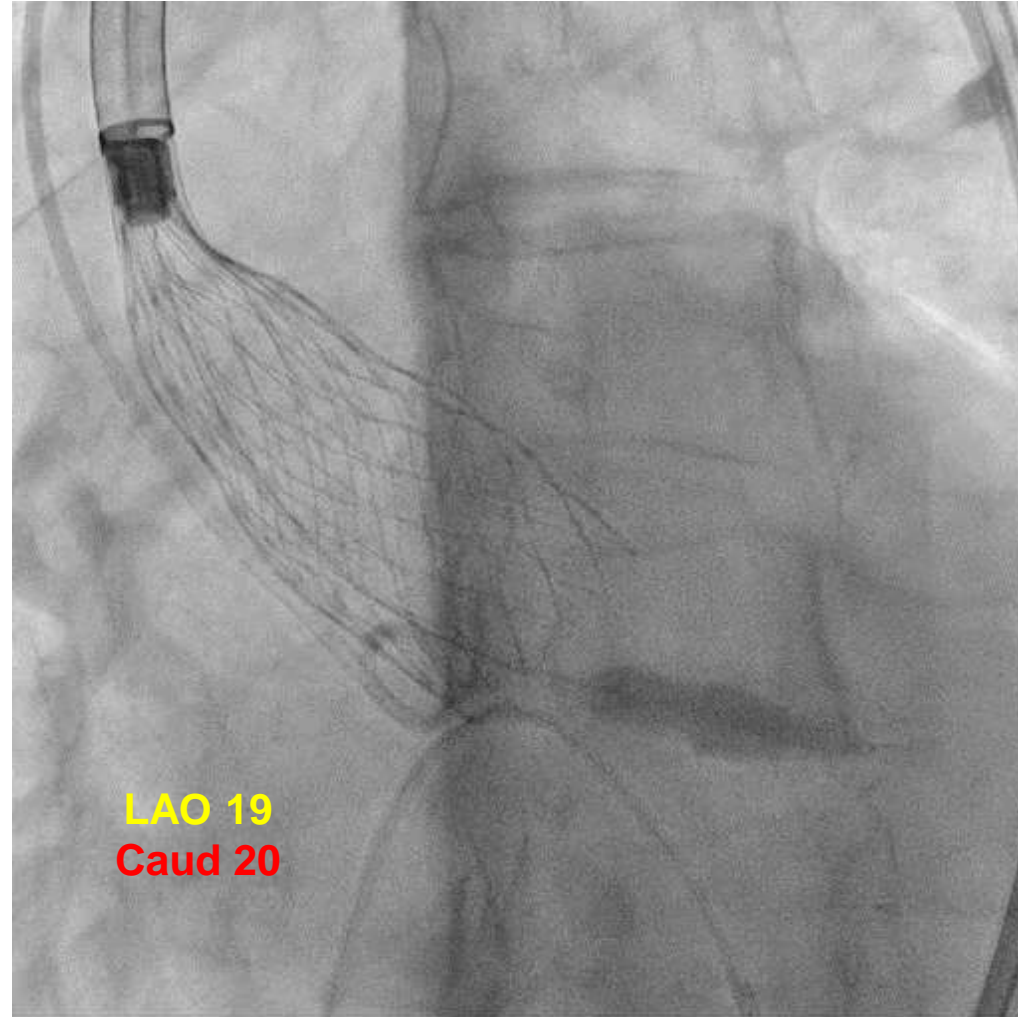
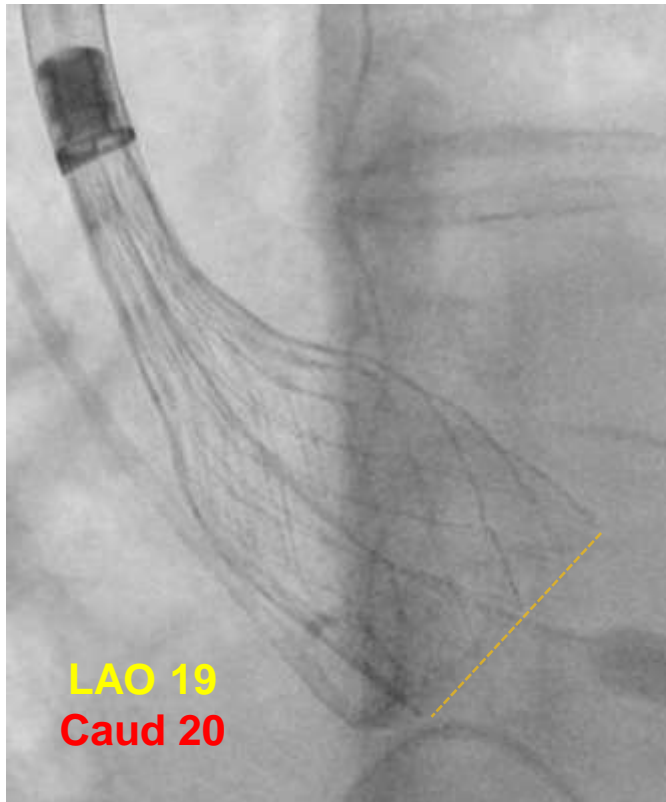
3 cusp coplanar + more caudal  
for THV alignment

LAO 19  
Caud 20

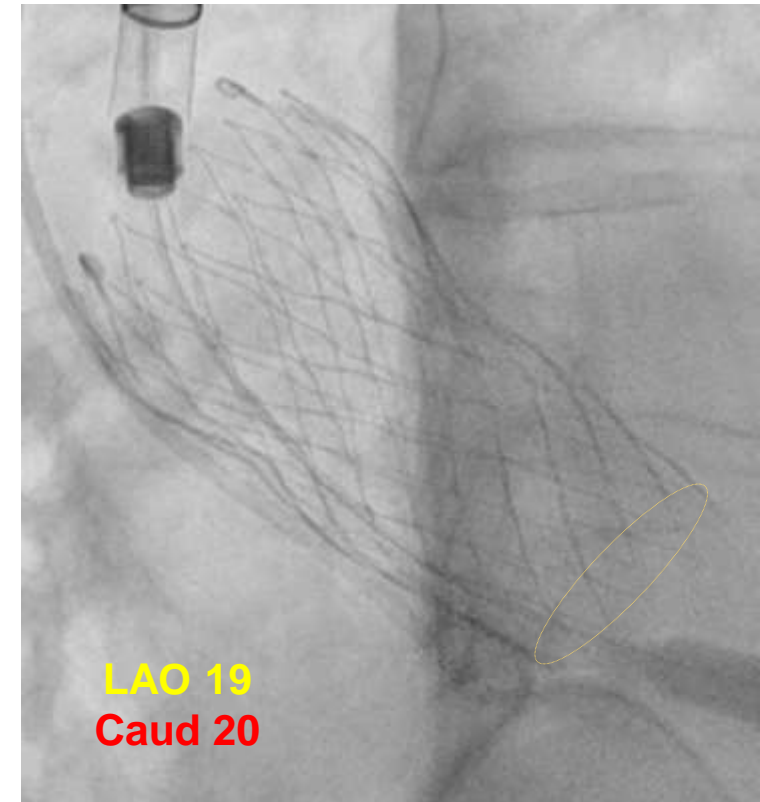


# Self-centralization of self-expanding THV

Before final release



After final release

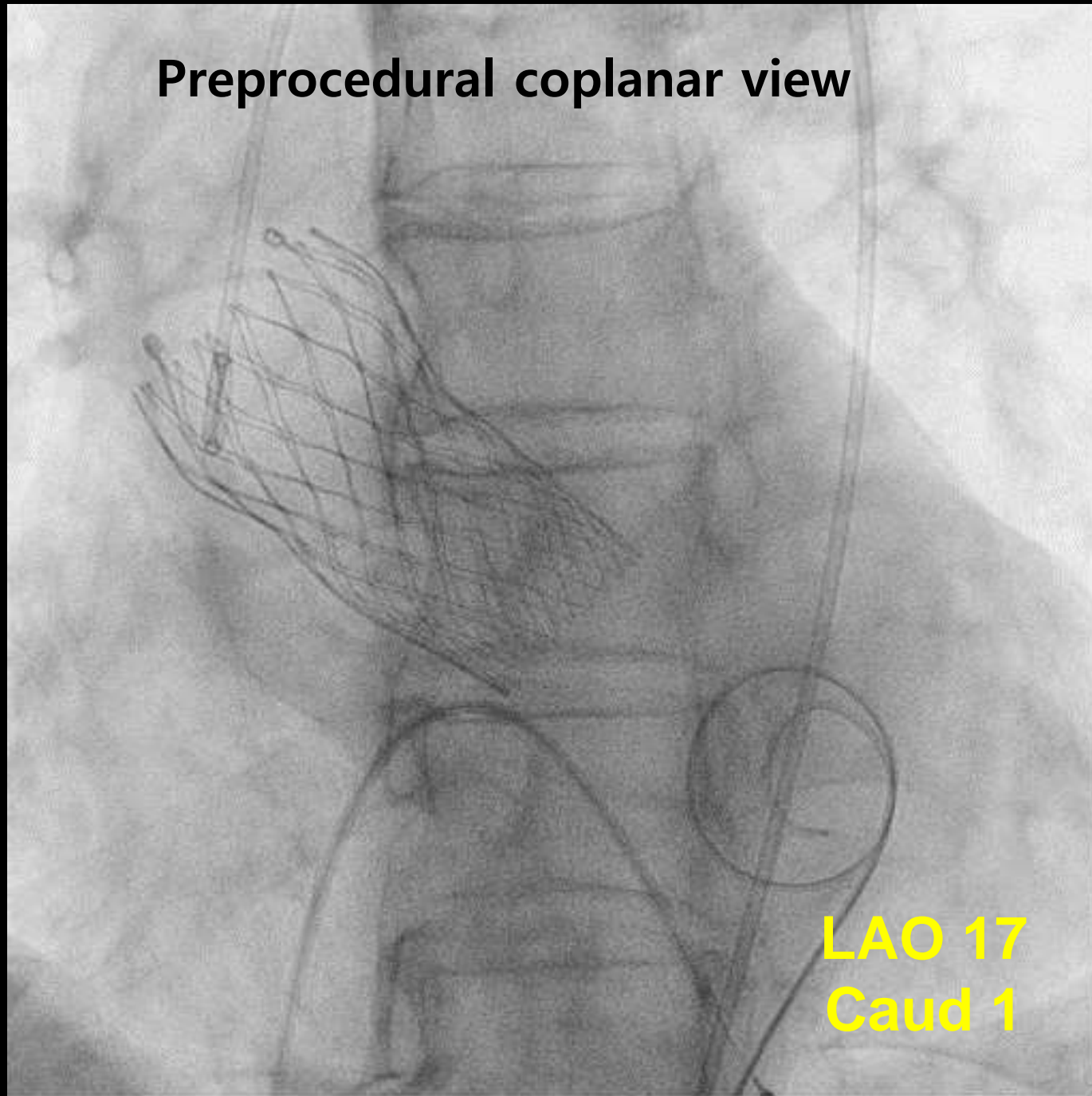


THV alignment View





# Preprocedural coplanar view

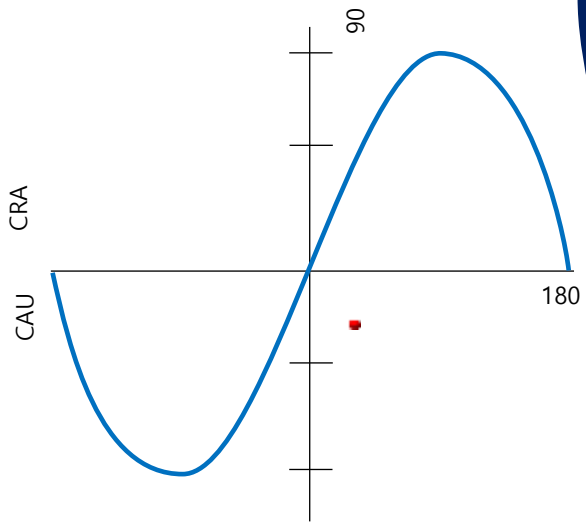


LAO 17  
Caud 1



Inflow alignment view

Self-centralization during final release



LAO 29 CAU 14  
S Curve

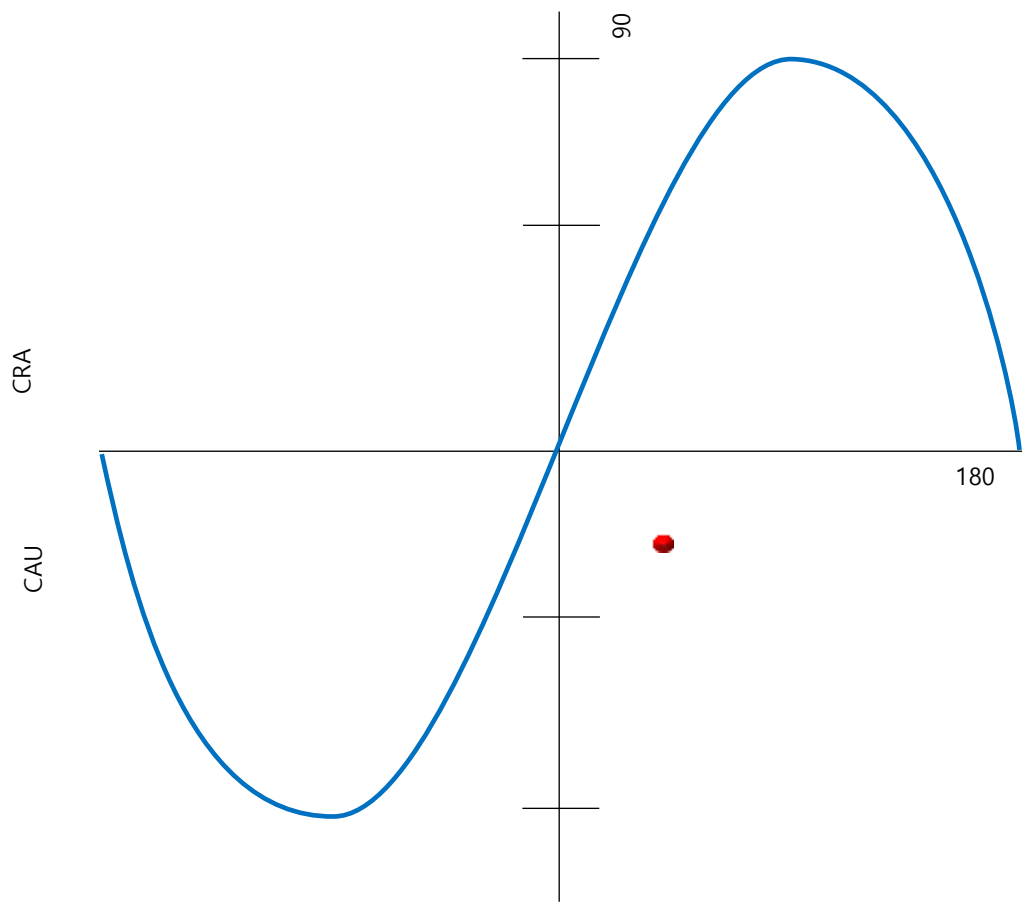
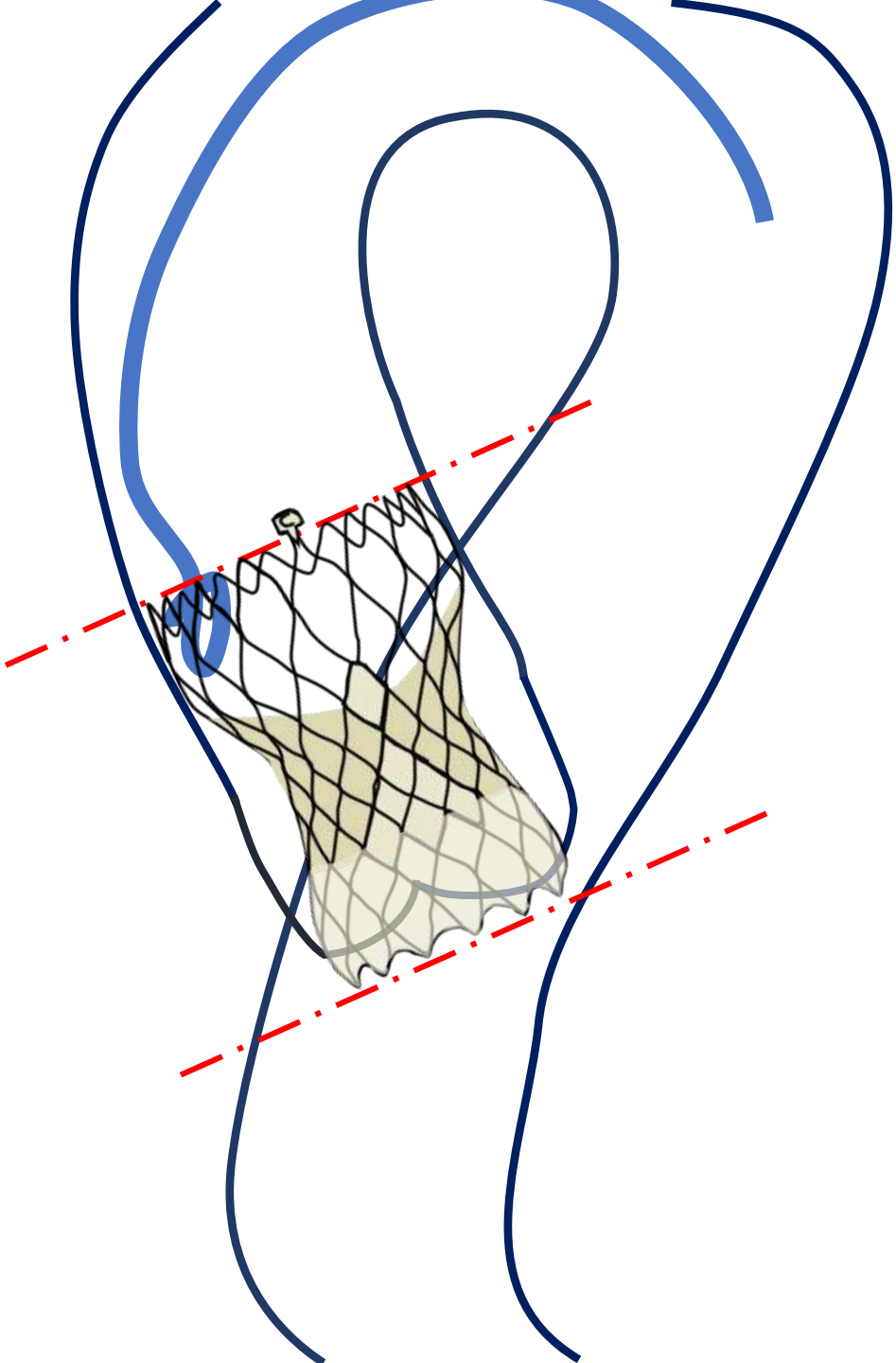
LAO 29 CAU  
14

LAO 29 CAU  
14





# Effect of self-centralization of valve during final release



LAO 19 CRA 8  
preprocedural S Curve

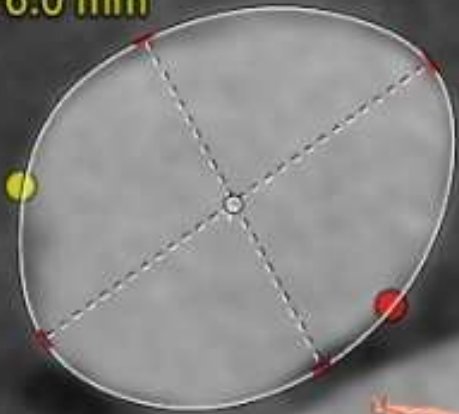


# How about Bicuspid AS?

Evolute Pro 29mm, Preballoon 18mm, 3times capture

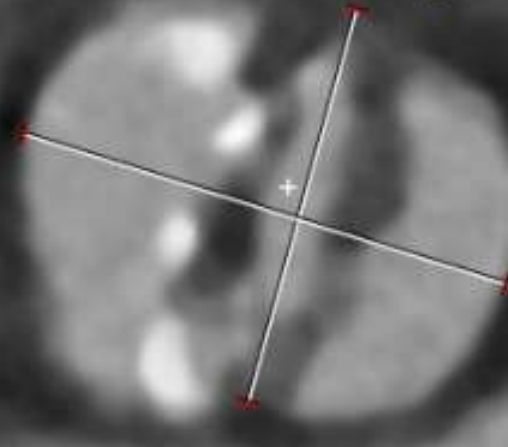
ANNULUS

Min. Ø: 21.4 mm  
Max. Ø: 27.2 mm  
Perimeter derived Ø: 24.2 mm  
Area: 448.3 mm<sup>2</sup>  
Perimeter: 76.0 mm

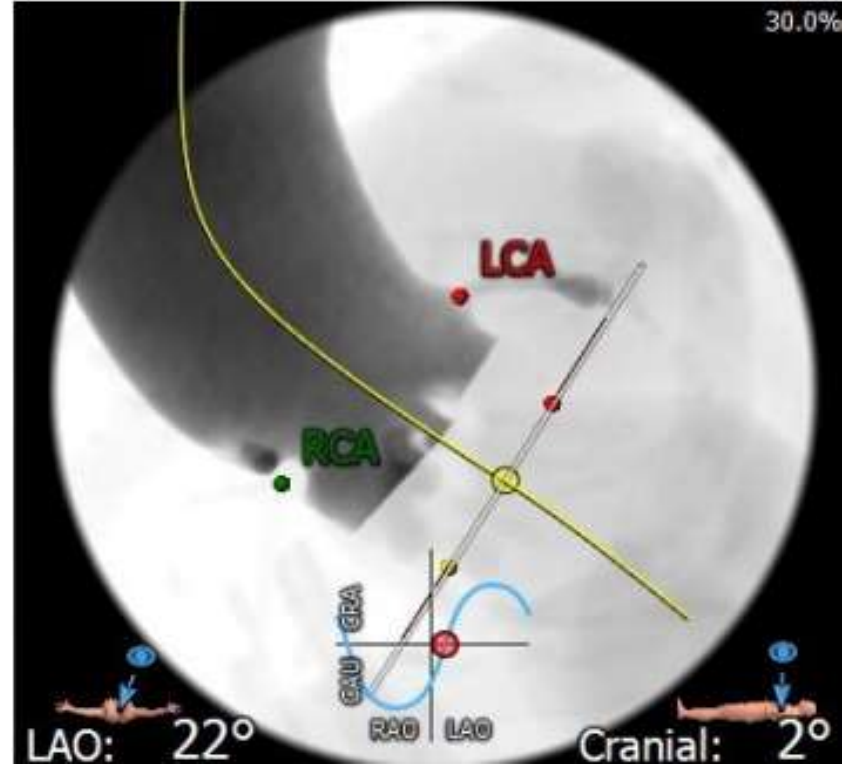


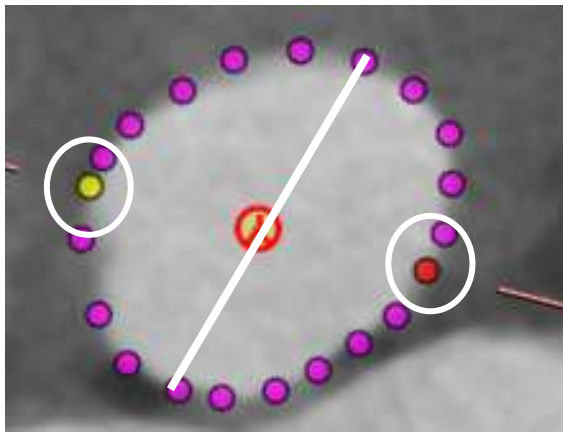
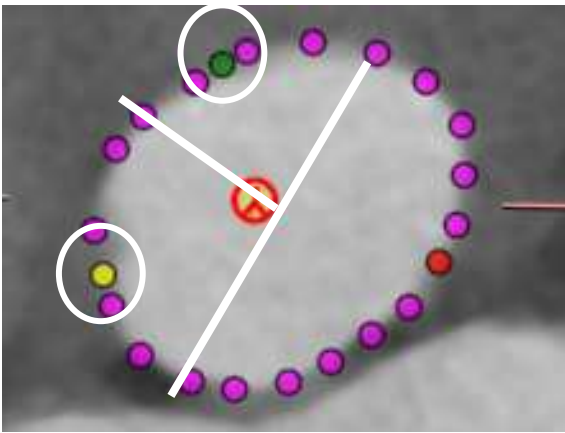
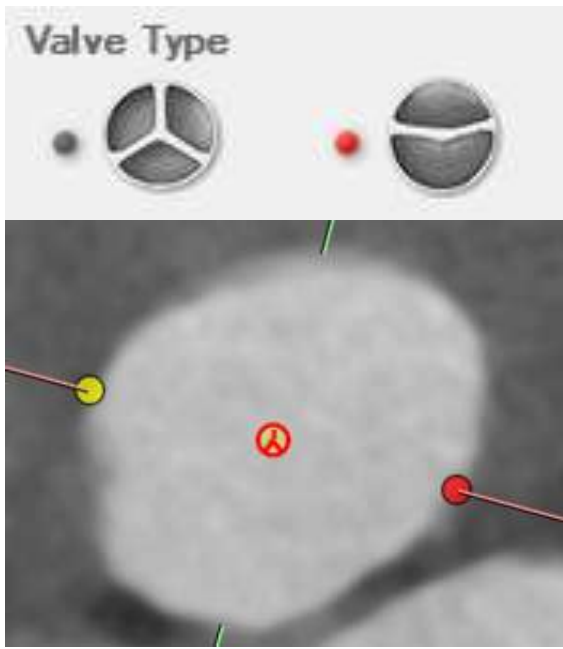
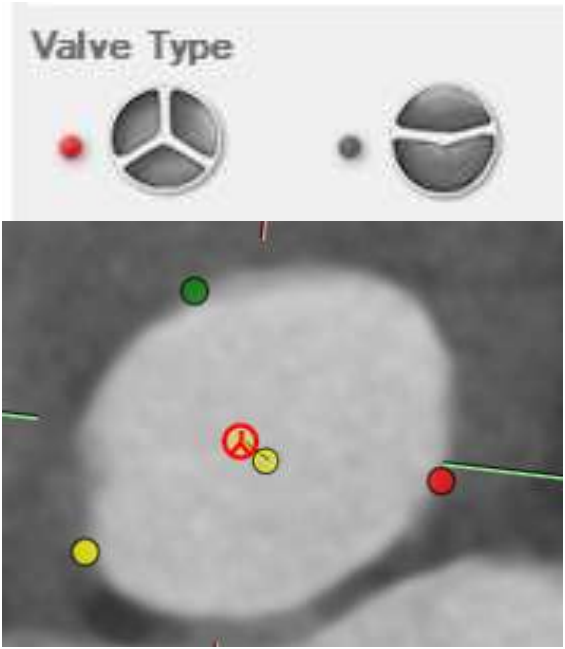
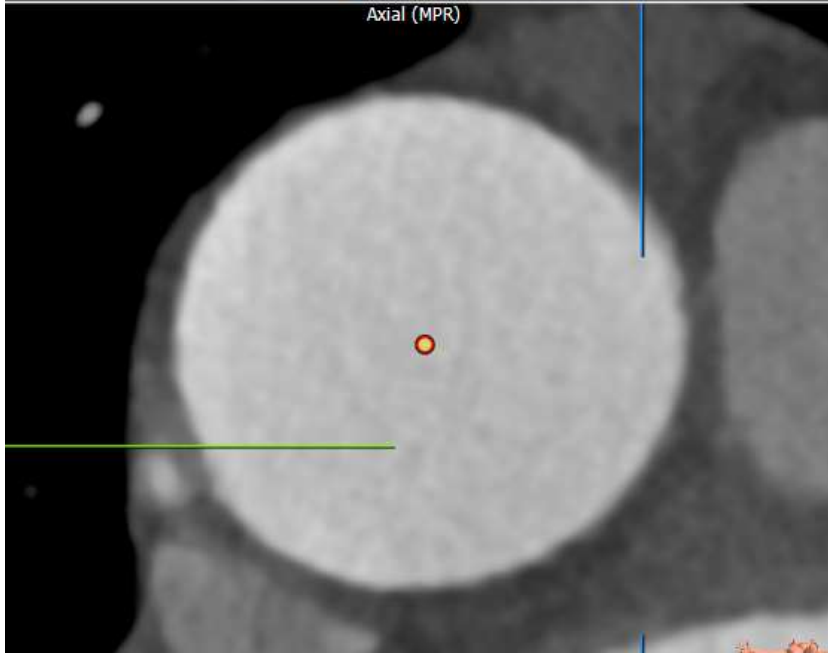
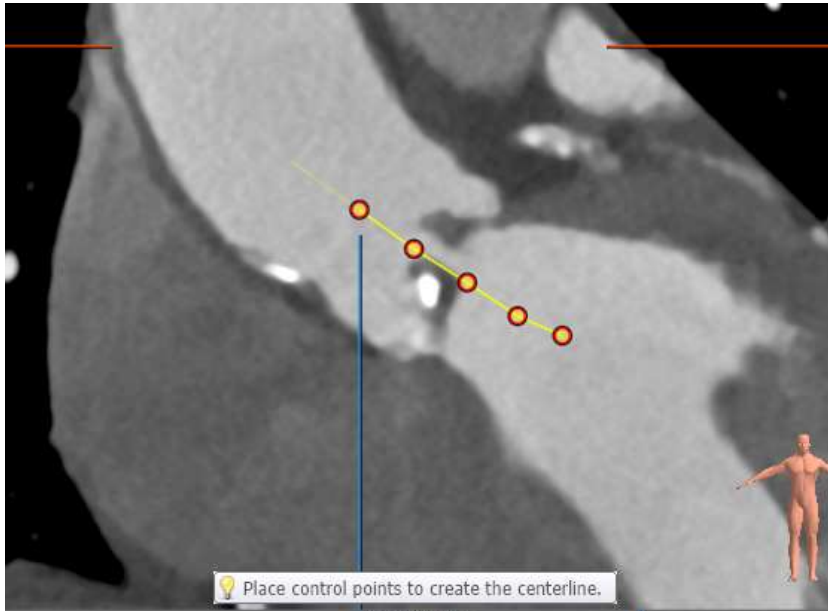
SOV DIAMETER

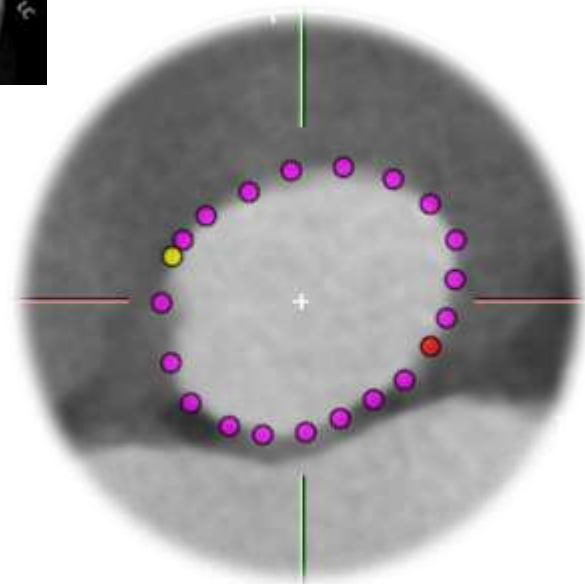
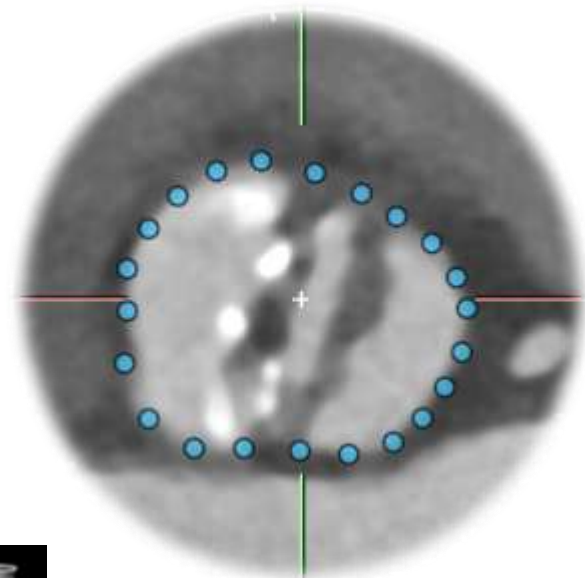
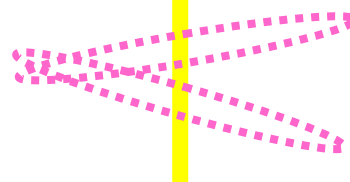
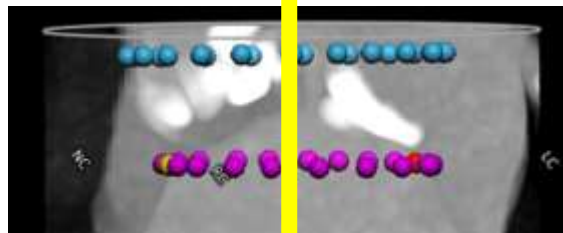
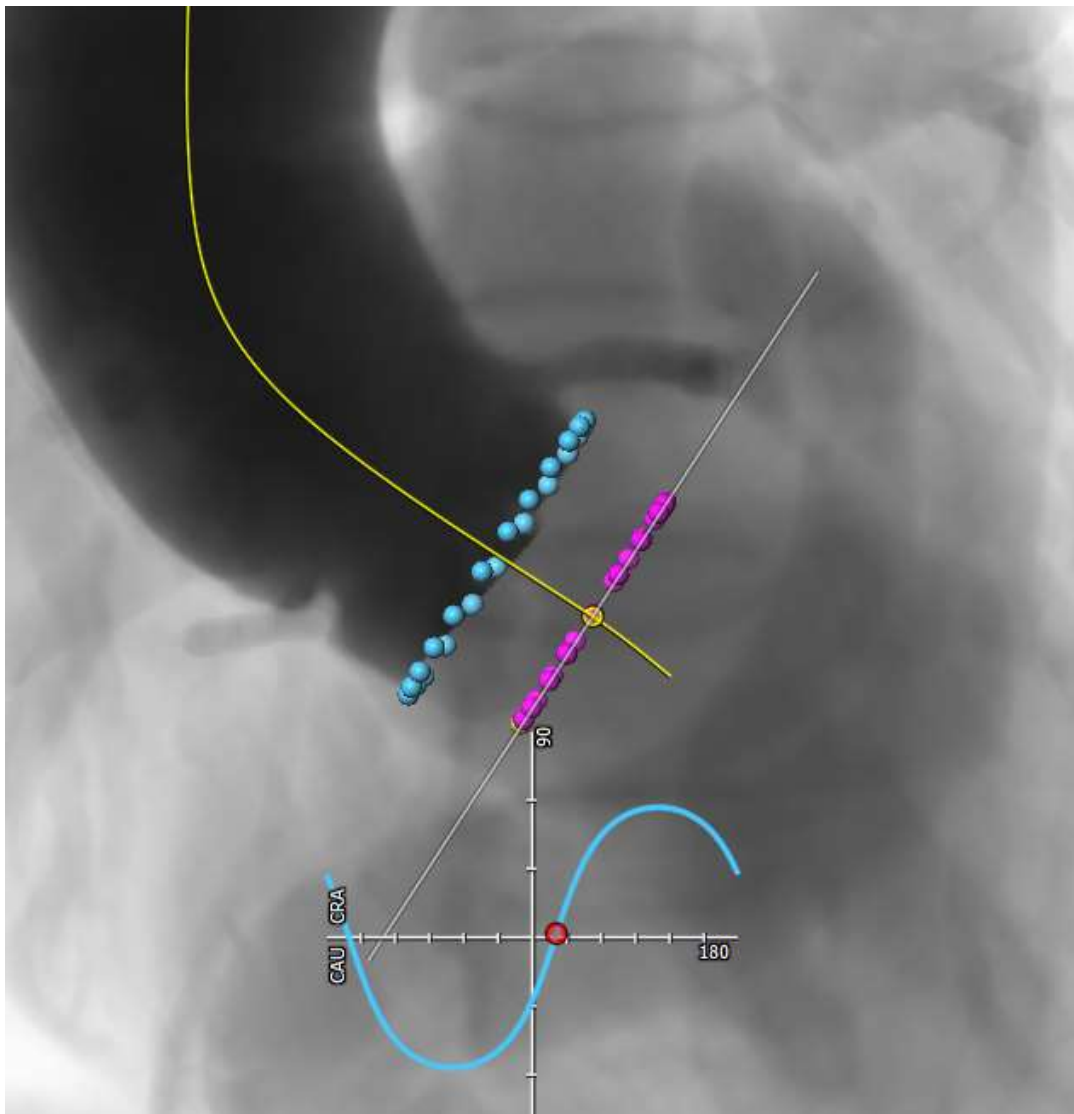
Min. Ø: 23.4 mm  
Max. Ø: 29.0 mm  
Avg. Ø: 26.2 mm



IMPLANTER'S VIEW

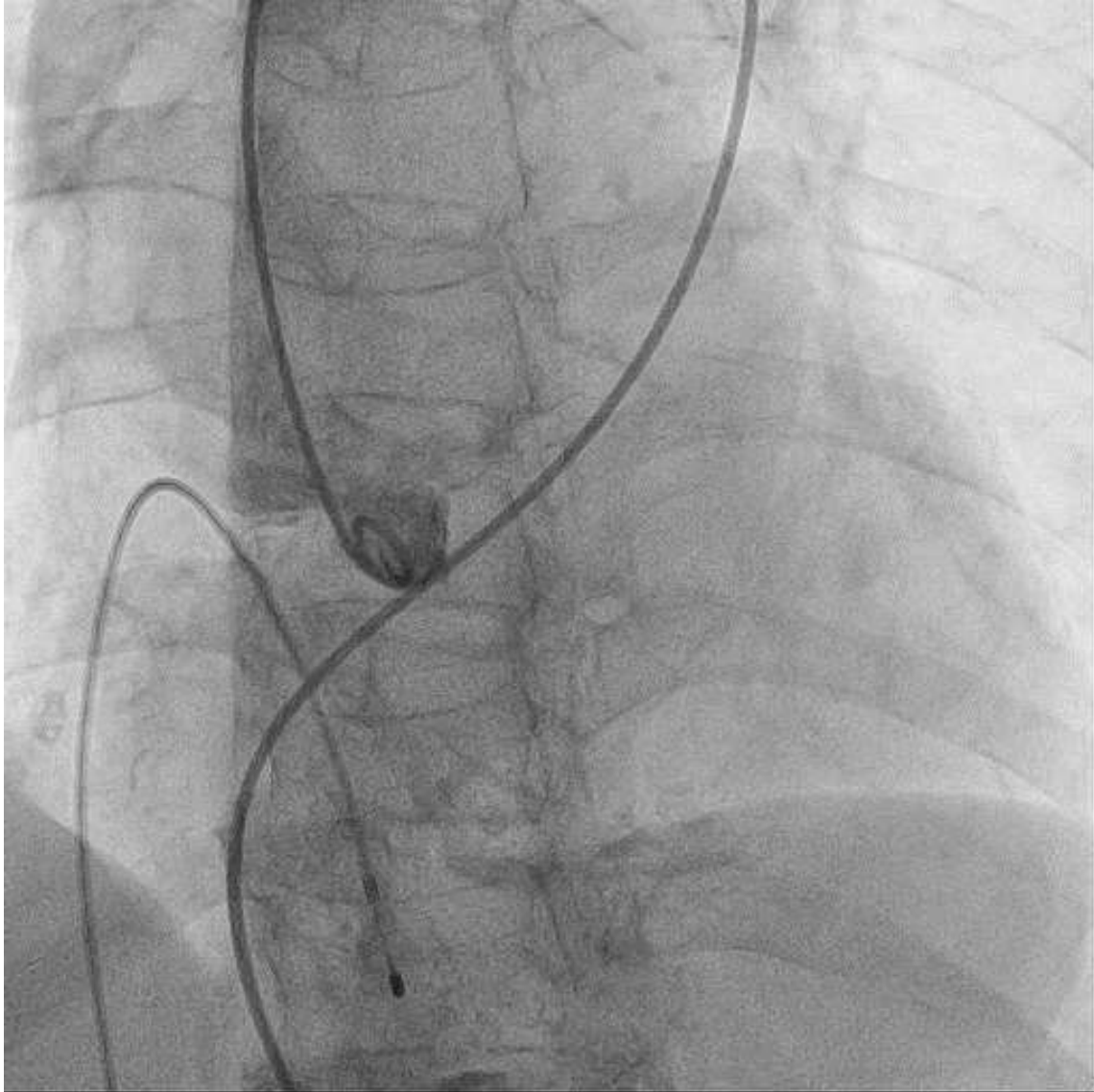




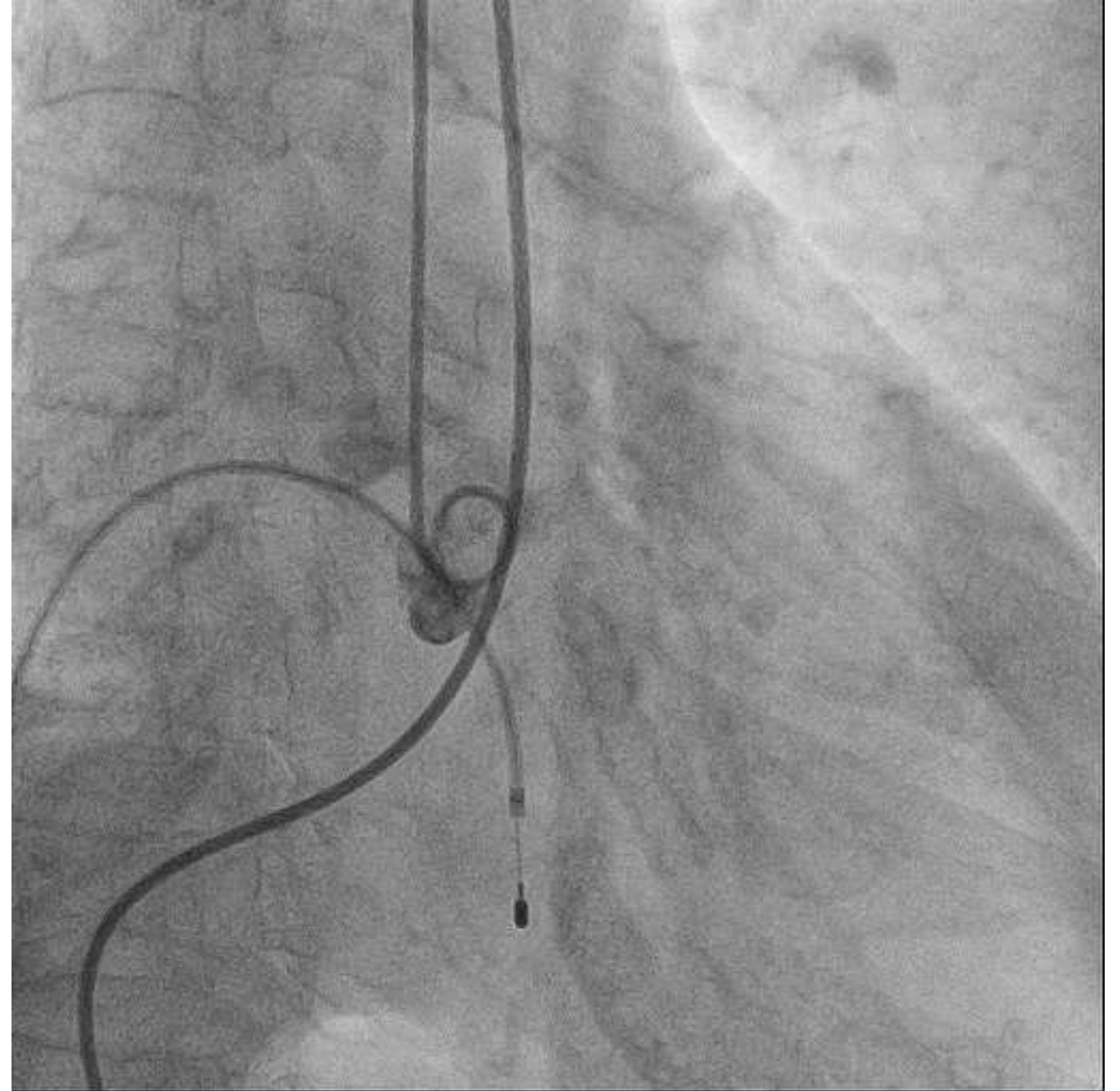




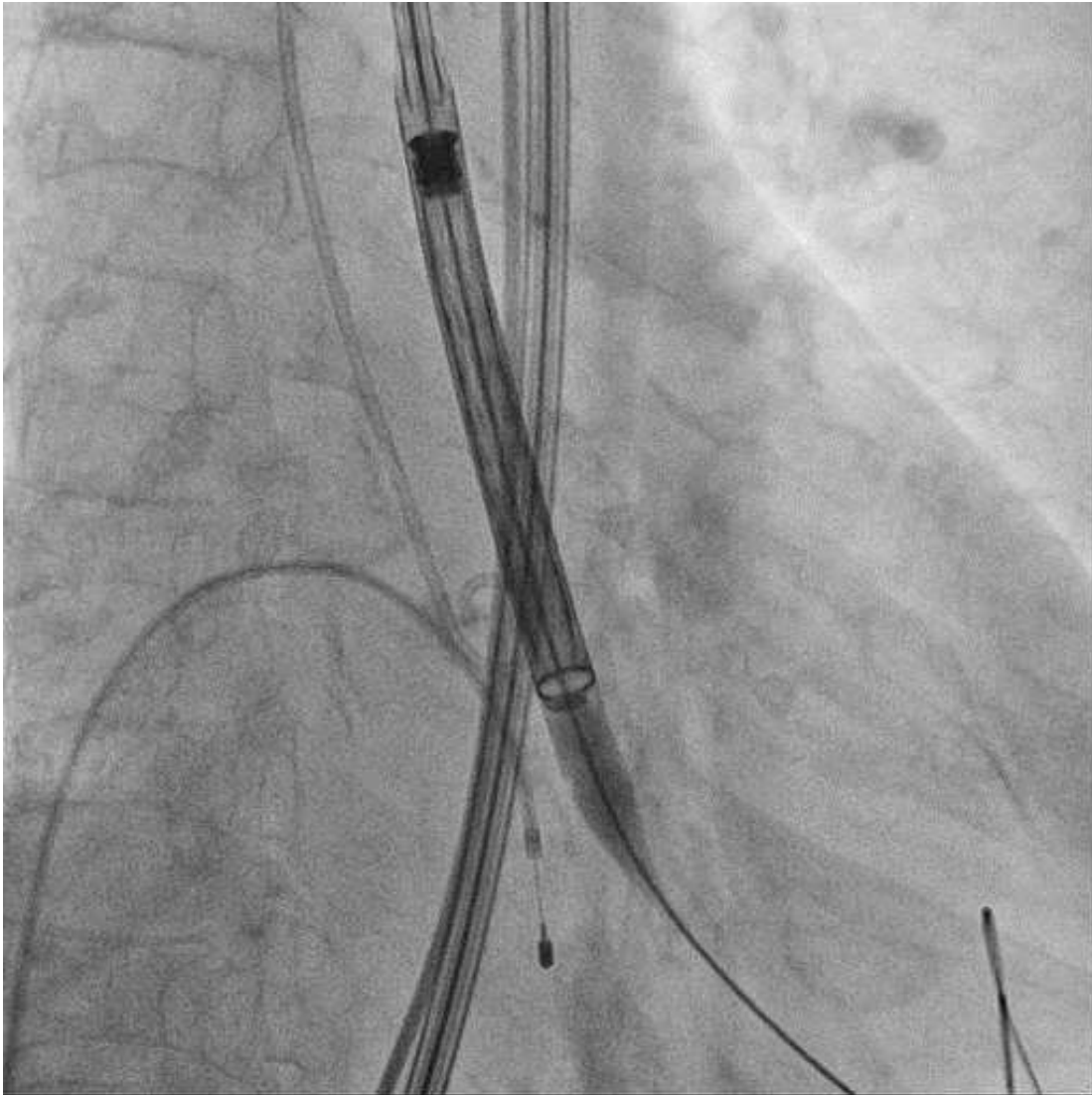
**Coplanar View  
LAO17 – Cranial 4**



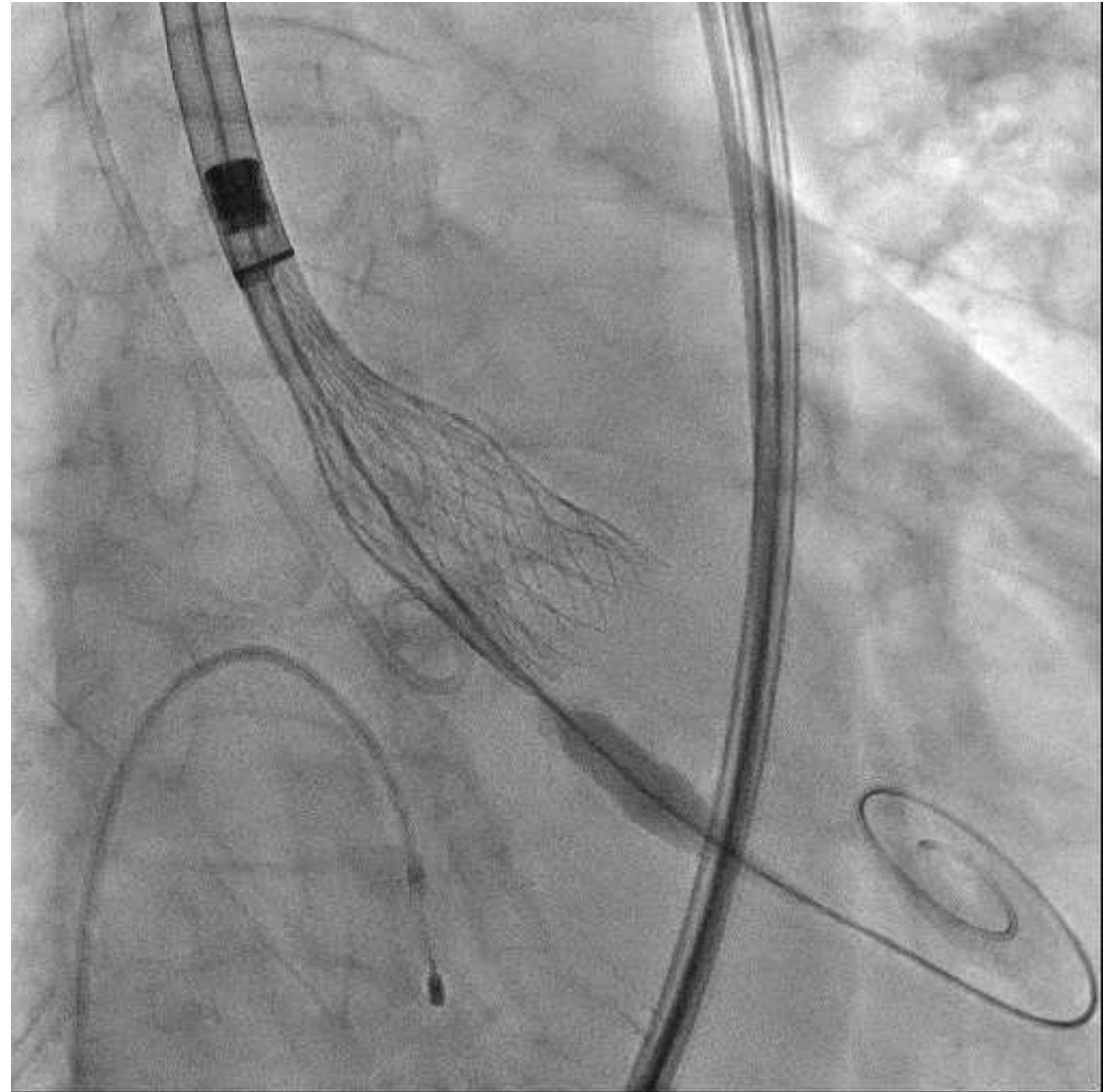
**RAO 11- Caud 34**



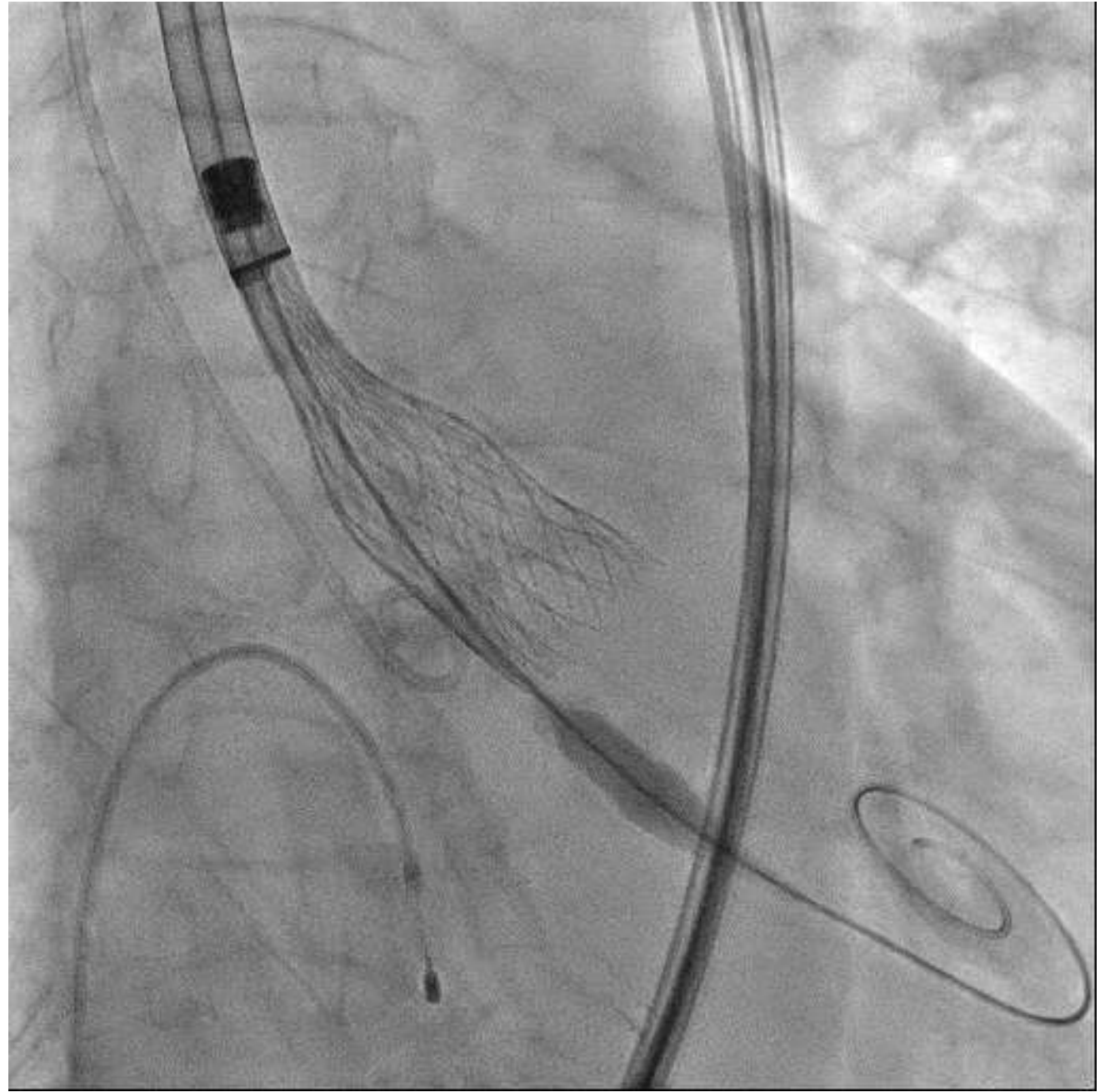
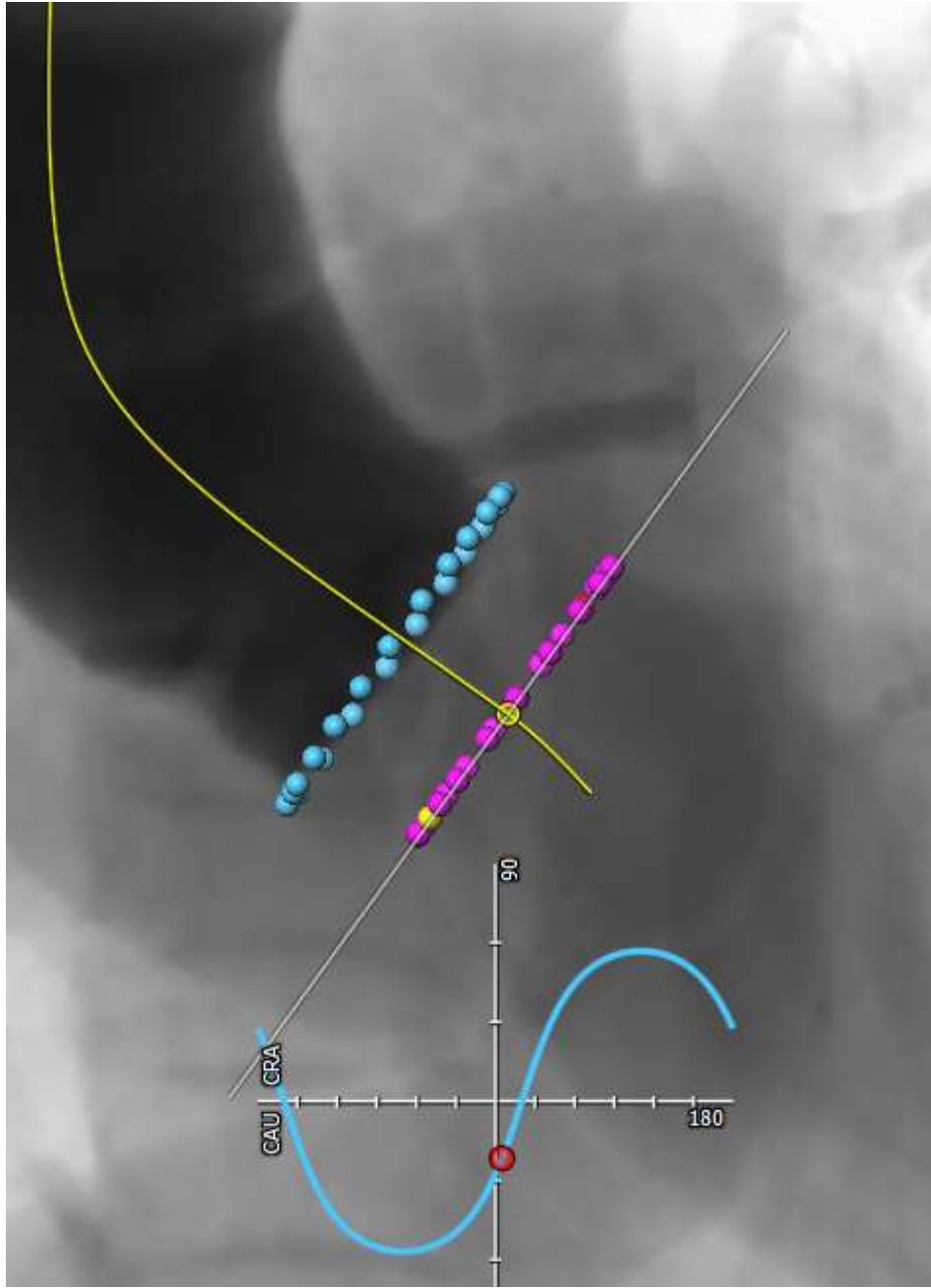
**RAO 11°, Caud 34°**



**LAO 10°, Caud 36°**



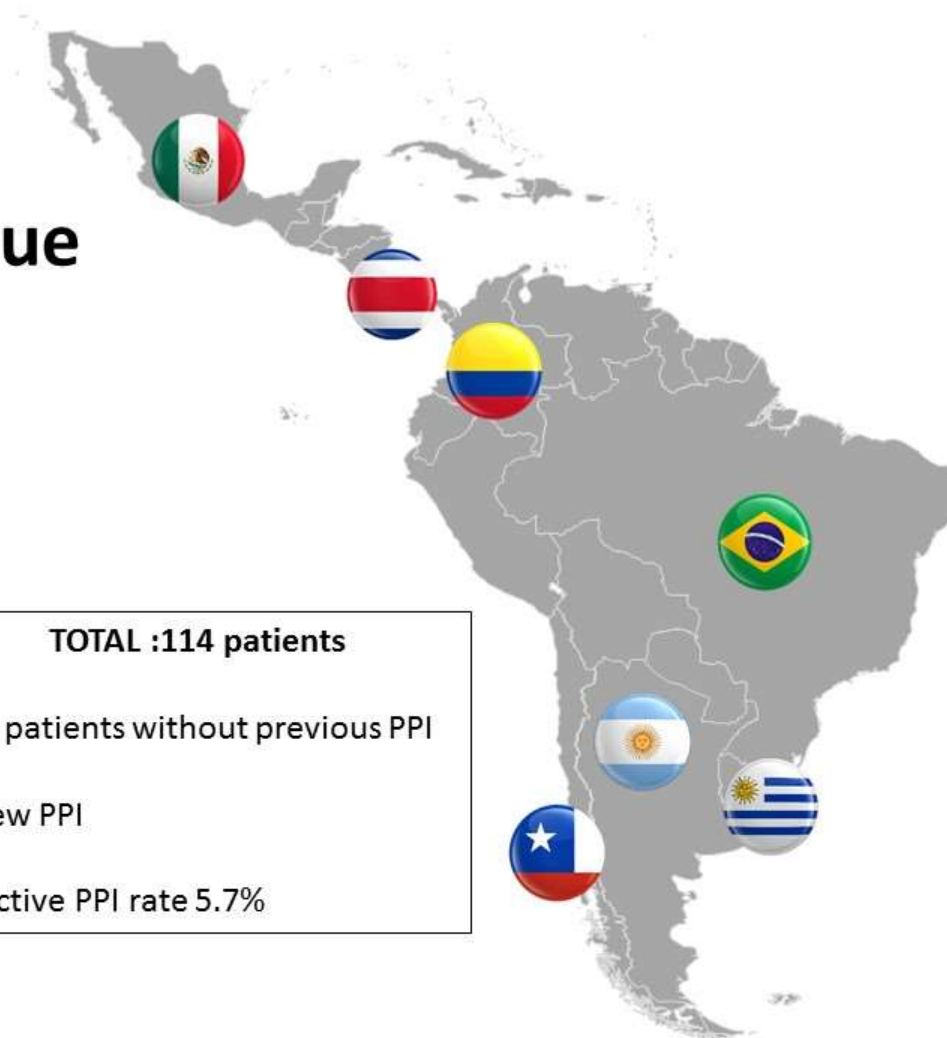




# Latin American Early Adoption of Cusp Overlap Technique

| Country    | Patients | New PPI |
|------------|----------|---------|
| Argentina  | 36       | 2       |
| Brazil     | 13       | 1       |
| Chile      | 6        | 0       |
| Colombia   | 10       | 0       |
| Costa Rica | 31       | 2       |
| Mexico     | 15       | 1       |
| Uruguay    | 3        | 0       |
| TOTAL      | 114      | 6       |

**TOTAL :114 patients**  
105 patients without previous PPI  
6 new PPI  
Effective PPI rate 5.7%



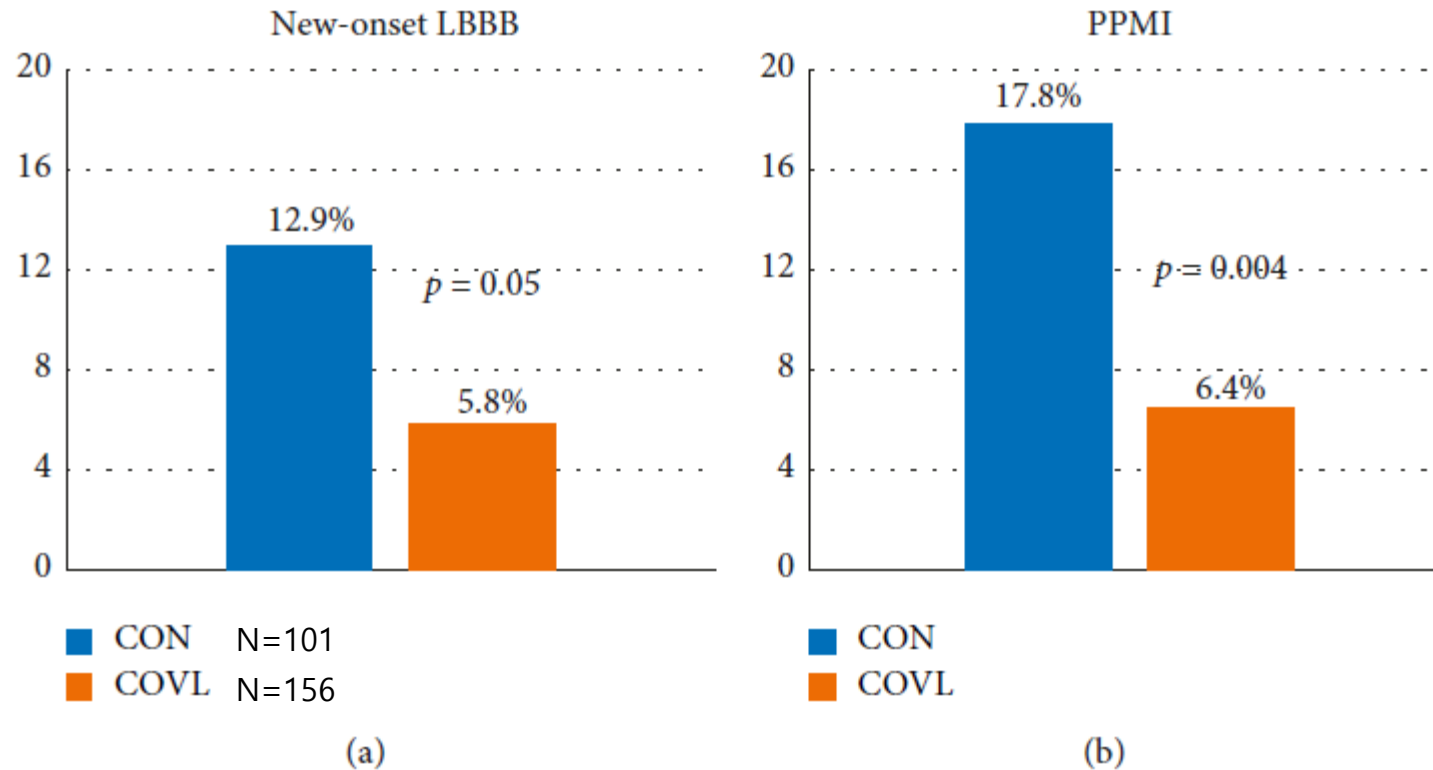


# Cusp Overlap Technique

Research Article

## Impact of Cusp-Overlap View for TAVR with Self-Expandable Valves on 30-Day Conduction Disturbances

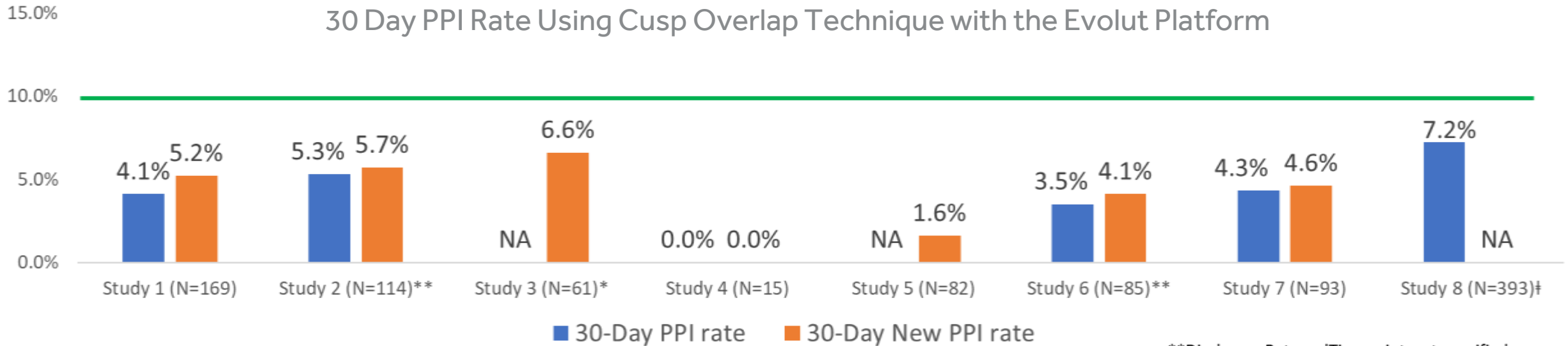
Oscar A. Mendiz<sup>1</sup>, Marko Noč<sup>2</sup>, Carlos M. Fava<sup>1</sup>, Luis Abel Gutiérrez Jaikel<sup>3</sup>,  
Matias Szejffman<sup>4</sup>, Aleš Pleskovič<sup>2</sup>, Paul Gamboa<sup>1</sup>, León R. Valdivieso<sup>1</sup>, Hemal Gada<sup>5</sup>,  
and Gilbert H. L. Tang<sup>6</sup>



# Cusp overlap data

## SUMMARY

Cusp overlap technique has been associated with single-digit pacemaker rates in several single center and multicenter clinical studies. Large, prospective studies are being performed to confirm the risks and benefits of this new implant strategy.

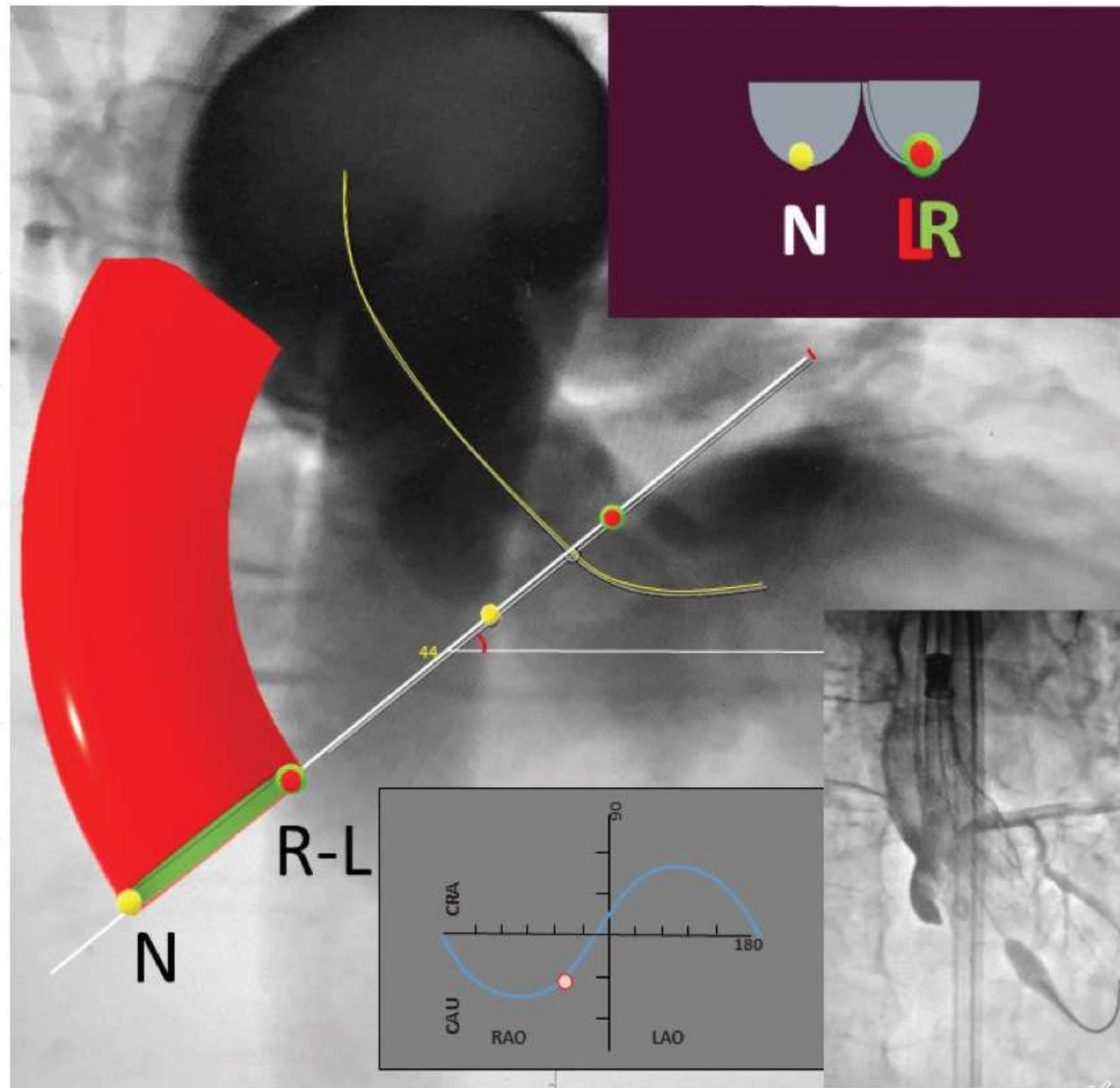
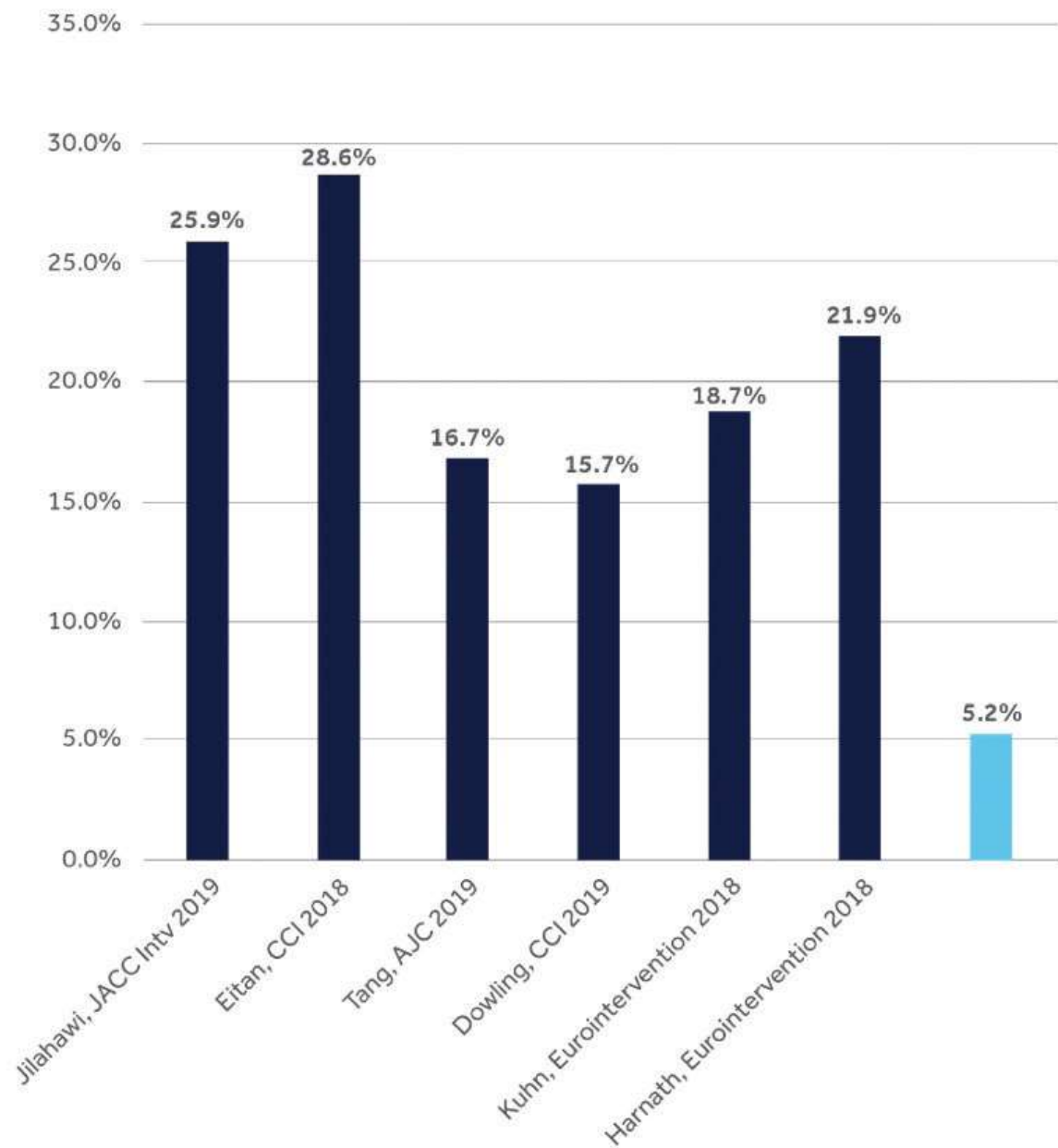


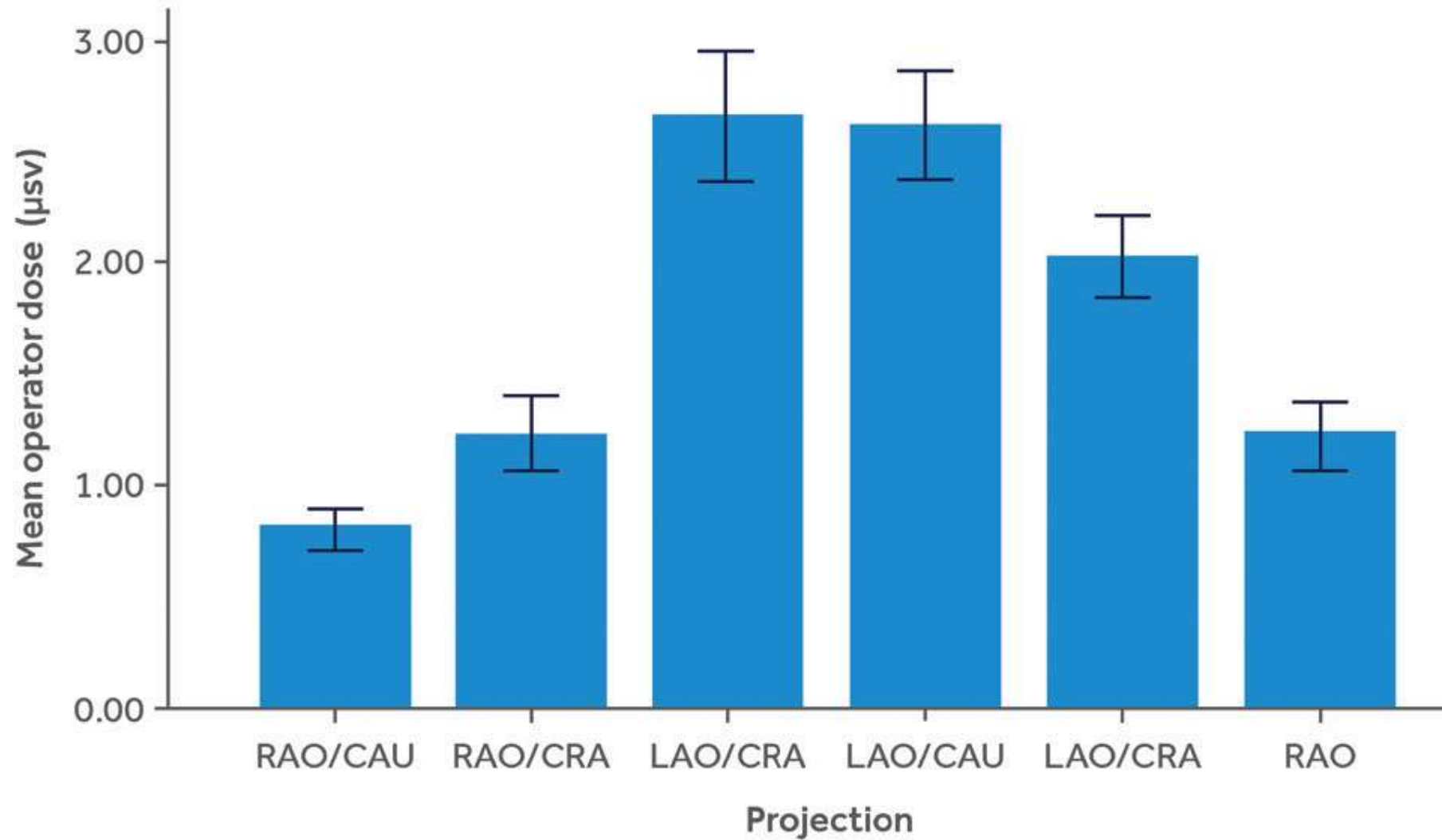
\*53 Evolut, 3 Neo, 5 Portico

\*\*Discharge Rates †Timepoint not specified

<sup>1</sup>Gada et al., presented at TCT 2020. *Reduction of rates of permanent pacemaker implantation with 34 mm Evolut R using cusp overlap technique*; <sup>2</sup>Gada et al., presented at TCT 2020. *Reproducibility of cusp overlap technique to reduce permanent pacemaker implantation with Evolut – the Latin American Experience*; <sup>3</sup>Mendiz et al., Presented at TCT 2020. *Cusp Overlapping Technique for TAVR Procedures with Self-Expandable Valves*; <sup>4</sup>Giuliani et al., presented at TCT 2020. *Impact of Cusp-Overlap technique on pacemaker requirement among transcatheter aortic valve replacement*; <sup>5</sup>Gada et al., presented at TCT 2019. *Site-level variation and predictors of post-TAVR permanent pacemaker implantation in the Evolut low Risk Trial*; <sup>6</sup>Fraser et al., London Valves 2019. *Achieving single digit pacemaker rates in contemporary practice – retrospective analysis Sapien 3 vs Evolut R*; <sup>7</sup>Pisaneillo et al., ACC 2020. *Implantation of self-expanding transcatheter heart valves in the annular plane is associated with low implant depths and pacemaker rates*; <sup>8</sup>Aljabbary et al., presented at CCC 2020. *Cusp Overlap Method for Self-Expanding Transcatheter Aortic Valve Replacement*









# Take Home Message

- Most of aortic root is angulated to anterior, horizontal, and left sided direction in old human being.
- Cusp overlap view provides the longest course of aortic root and LVOT, and remove THV parallax.
- We can control only depth of self-expanding THV through aortic annulus.
- If you use cusp overlap view, you can deploy the self-expanding THV as shallow as possible, and minimize the interaction between device and conduction system, which is translated into better clinical outcomes such as lower PPI rate.
- Self-centralization of self-expanding THV is a function of fitting the excessively inclined THV to the axis of the aortic root, but it is difficult to accurately predict the result.
- After self-centralization, the NCC side of THV sometimes becomes deeper and the RCC & LCC side becomes shallower.

