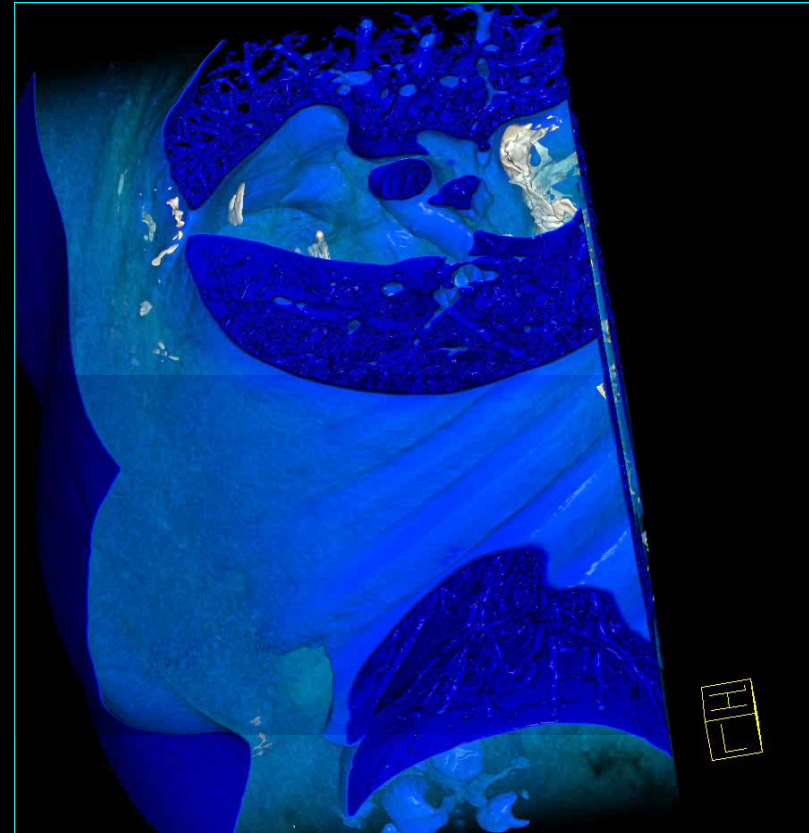


CT for TAVI

*Gudrun Feuchtner, MD
Innsbruck Medical University, Austria*



MEDIZINISCHE UNIVERSITÄT
INNSBRUCK

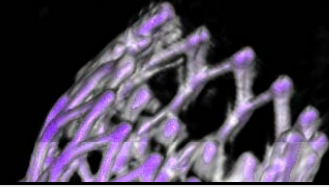


TAVI – Innsbruck Medical University

02/2008 – 04/2012 N=91 pts		Outcome- prodedure	Parav. leaks
94% Sapien	TA 51%	Death 0%	Severe 0% Moderate 16%
6% Core	TF 49%	Conv- open 1%	Mild 67% No 17%

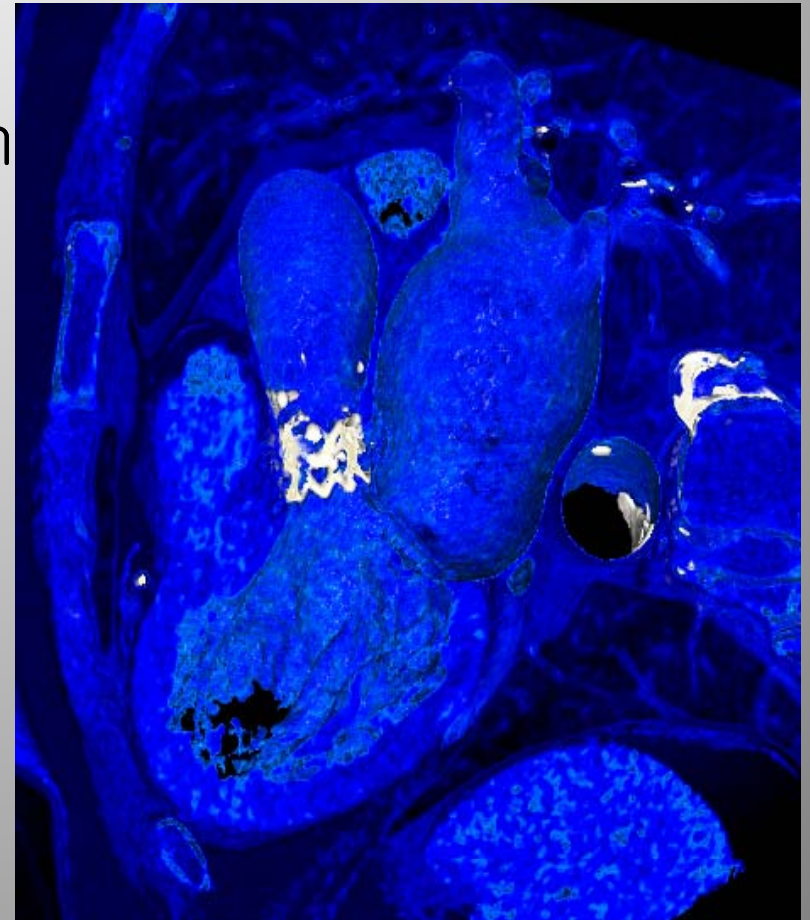


Edwards^T

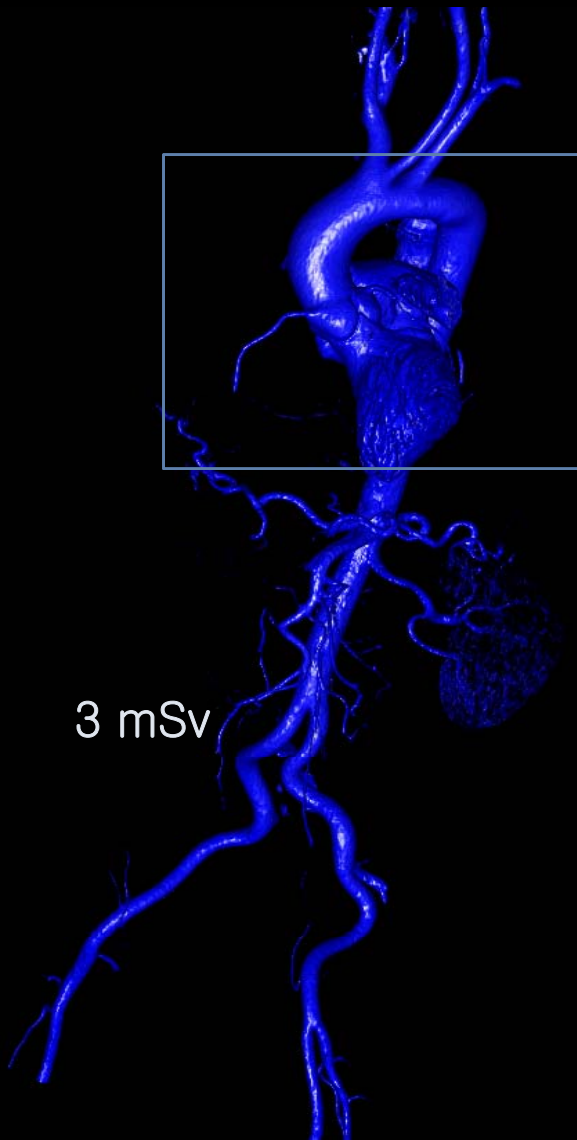


CT for TAVI-planning

- Aortoiliac artery evaluation
- Deployment plane prediction
- Coronary ostia height
- Annulus sizing



Aortoiliac artery evaluation



1.7s



Exclusion of iliac artery stenosis is a „sine-que non“ before transfemoral TAVI

ESC- european society of cardiology scientific statment

▪ **128-high-pitch dual source computed tomography (CTA)**

3D VRT



- Kinking?
- Atherosclerosis severity?

Aortoiliac artery sizing

The image displays a medical software interface for aortoiliac artery sizing, featuring a 3D VRT and Curved MPR views.

3D VRT (Left Panel):

- Univ. Klinik Innsbruck, Ref. SOMATOM Definition AS
- Aorta: 09.08.2011, 10:50:09, SP A292.2
- Manip VRT: 120 kV, 370 mAs, B30f, P +96% avg (FLASH), HR 52 BPM, LAO/RAO 0, CRAN/CAUD 22, M 512x512
- Labels: right iliac art., left iliac art.
- 13.48

Curved MPR (Right Panel):

SIEMENS Ao. Univ.-Prof. Dr. Feuchtnher Gudrun

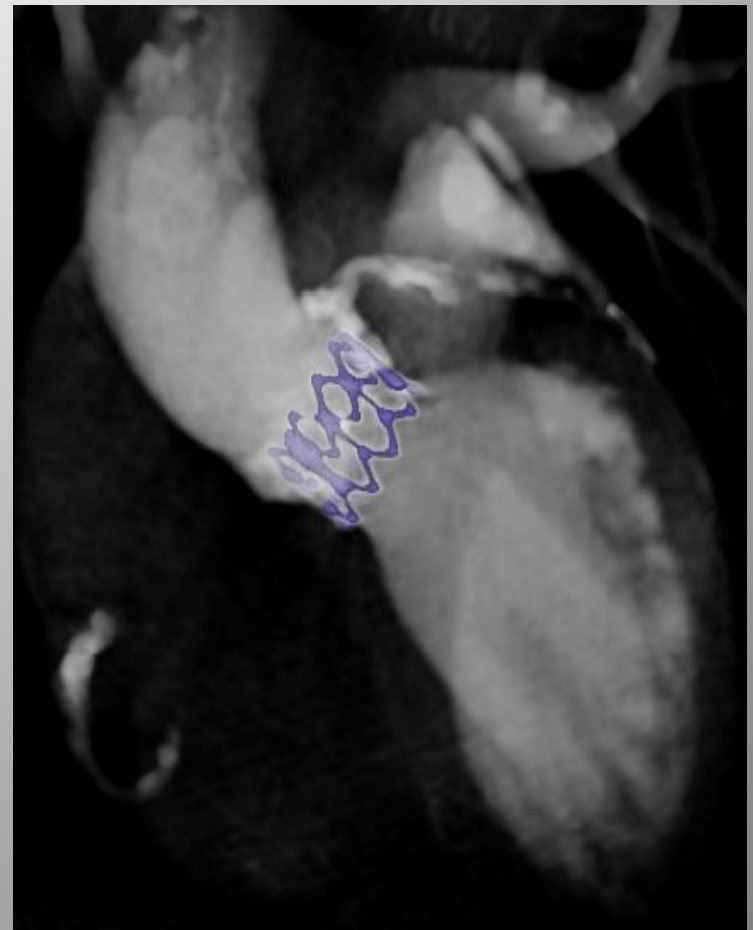
Curved MPR views showing the aorta and iliac arteries. The right iliac artery is highlighted in yellow, and the left iliac artery is highlighted in blue.

Measurement Data:

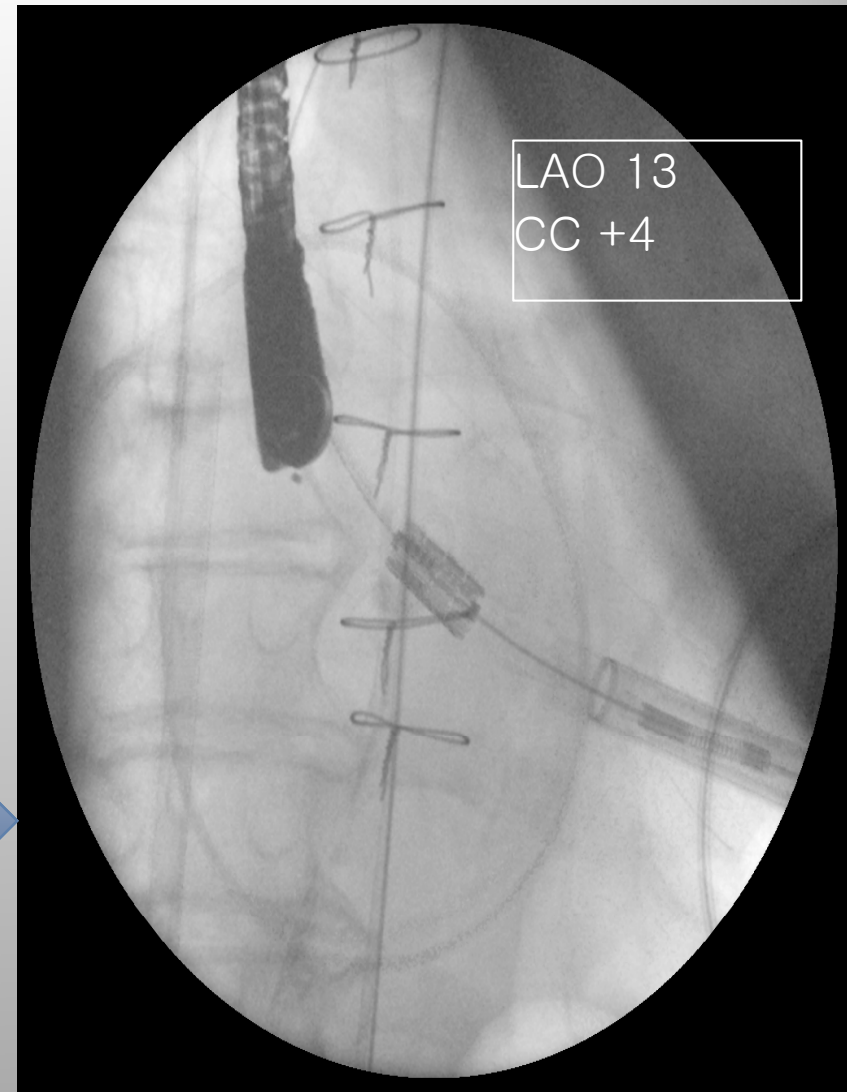
View	Measurement	Value
FRA	A	66.0 mm
FRA	D	8.1/10.0 mm
ALF	ALF	67.9 mm
RFA	AHR	45.2 mm
RFA	AHR	22.6 mm
AHR	AHR	0.0 mm
RFA	AHR	22.6 mm
RFA	AHR	45.9 mm
AHL	AHL	47.9 mm
ALF	ALF	30.5 mm
RFA	AHR	44.9 mm
RFA	AHR	0.25 %
RFA	AHR	0.25 %

CT for TAVI-planning

- Aortoiliac artery evaluation
- Deployment plane prediction
- Coronary ostia height
- Annulus sizing

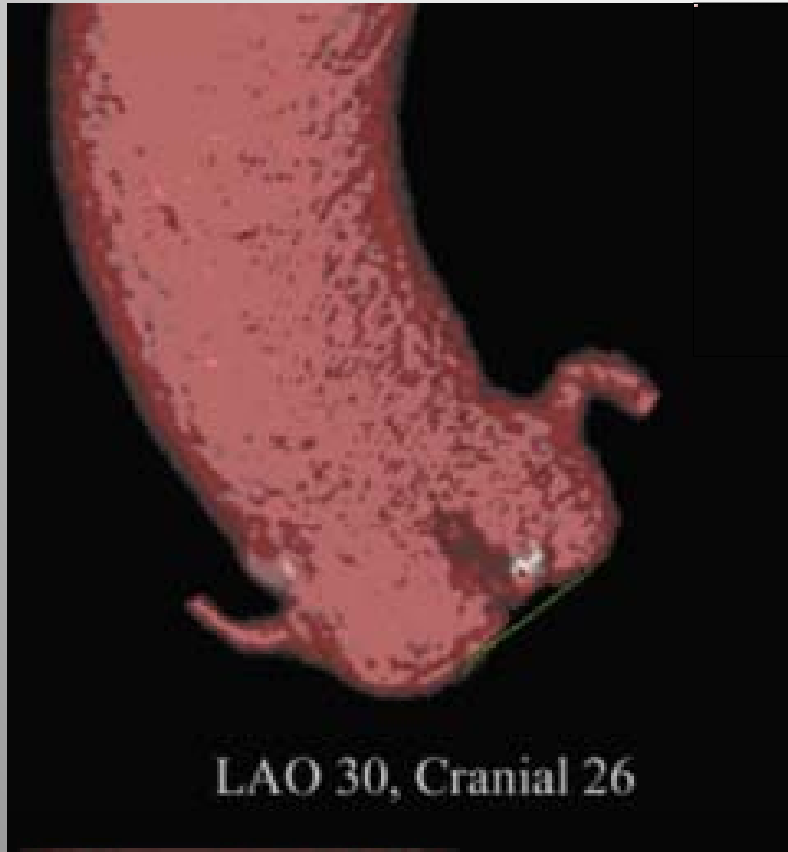


Deployment plane prediction by CT

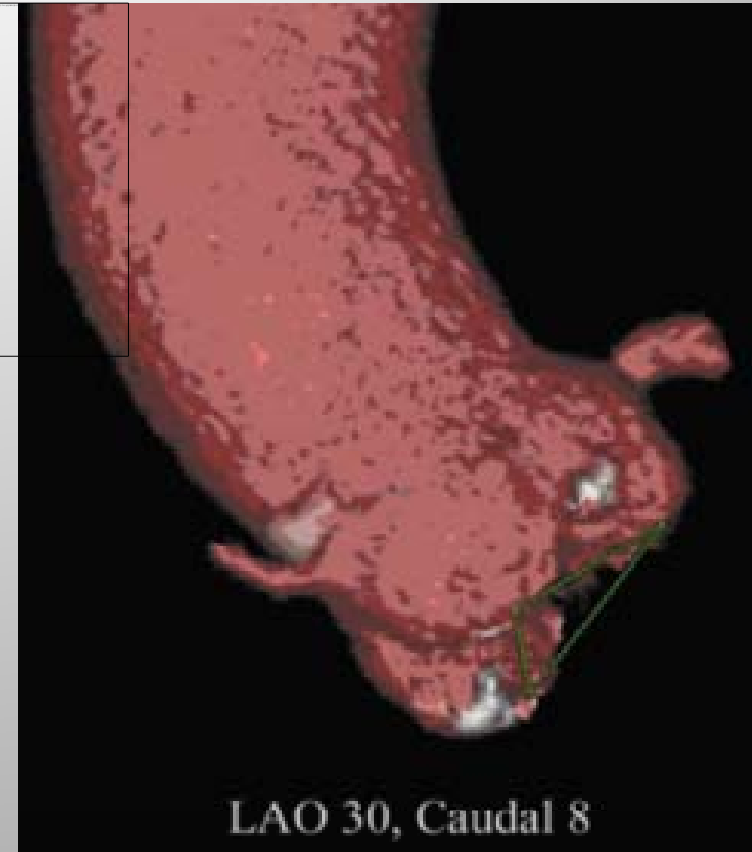


- **3-CSpoints alignment plane**

3-Coronary sinus points “Line of perpendicularity”

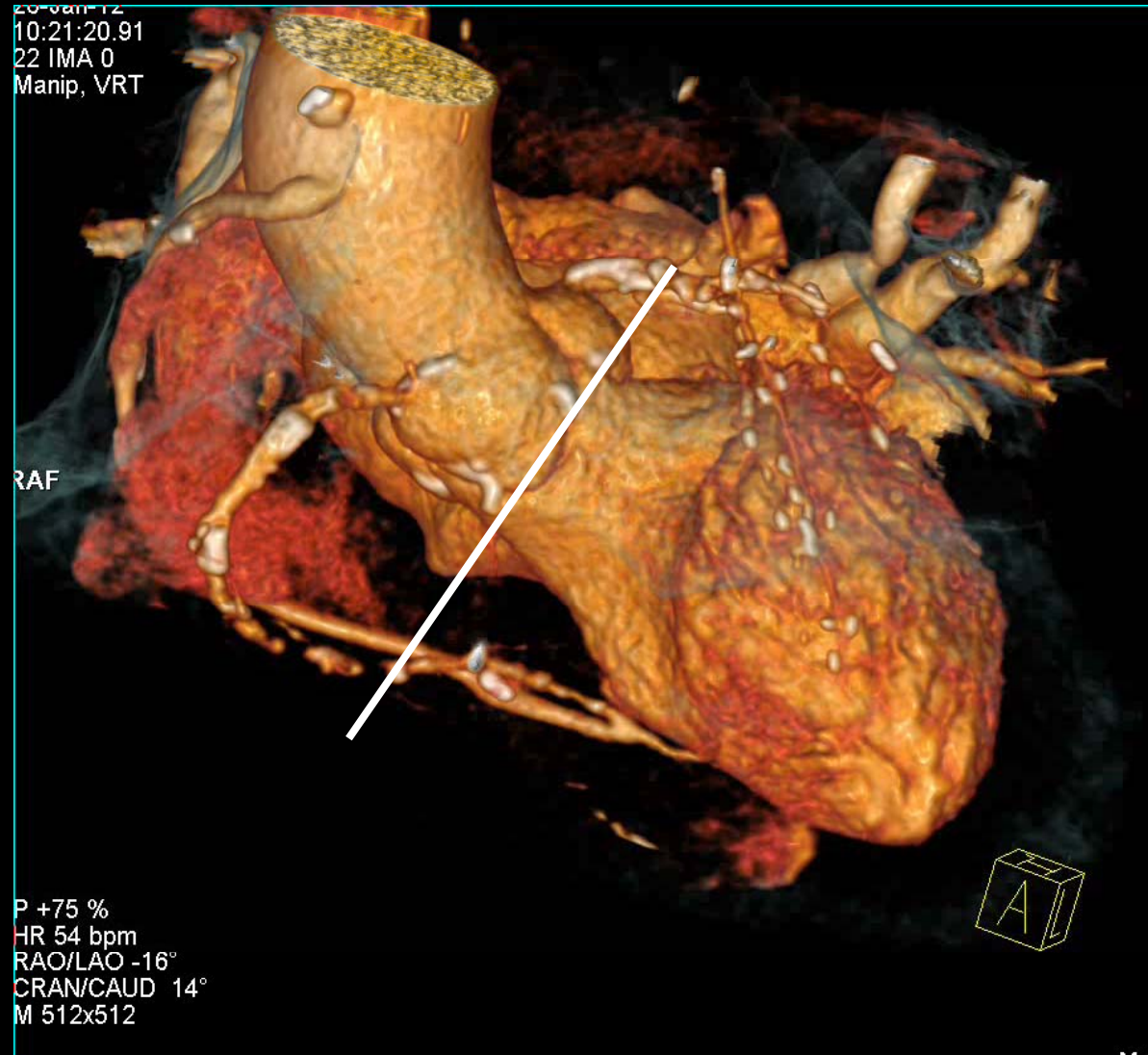


▪optimal

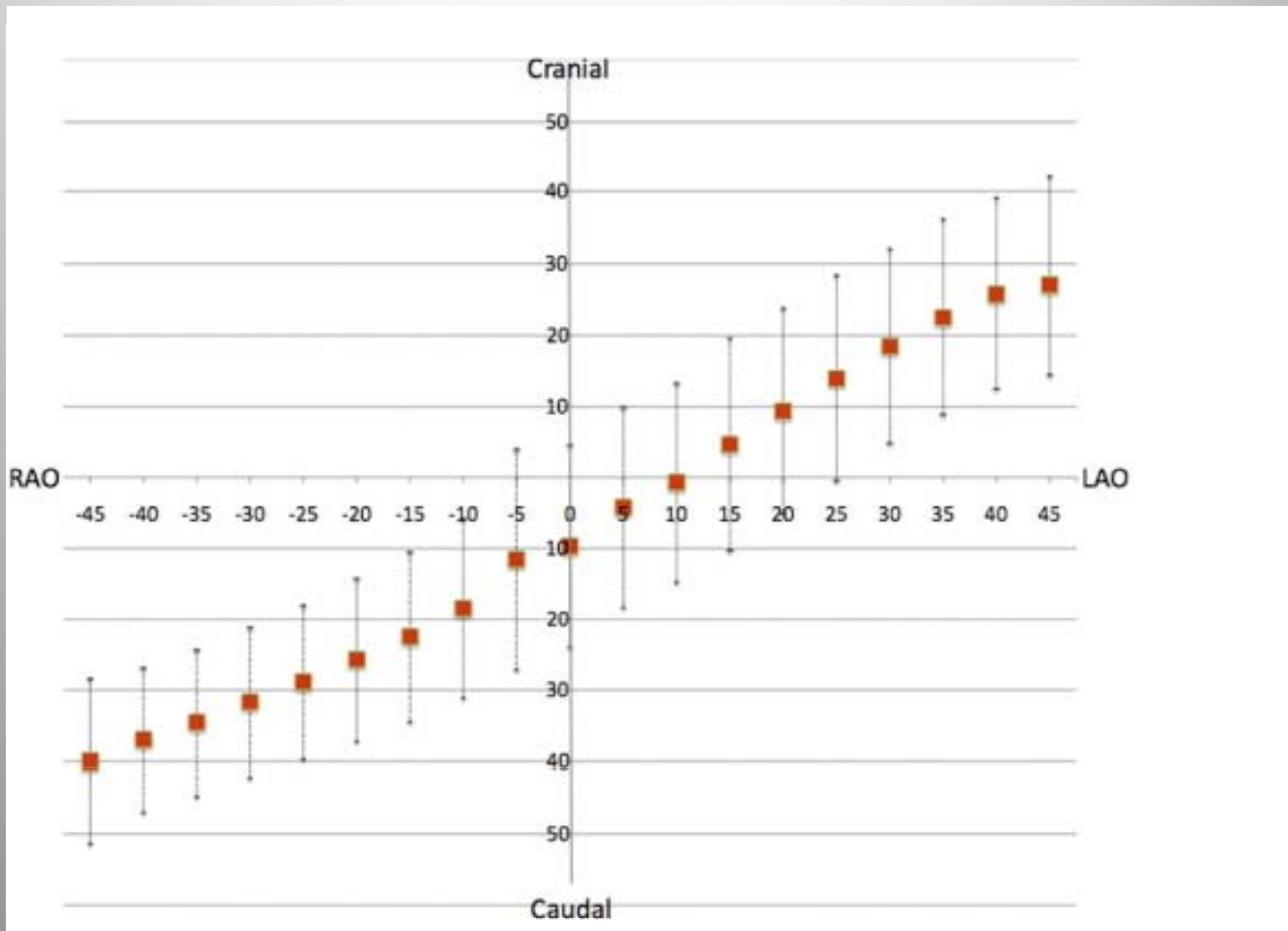


▪Not optimal

3-Coronary sinus alignment (3-CSA) “Line of perpendicularity”



Deployment planes for TAVI



Deployment plane prediction by CT

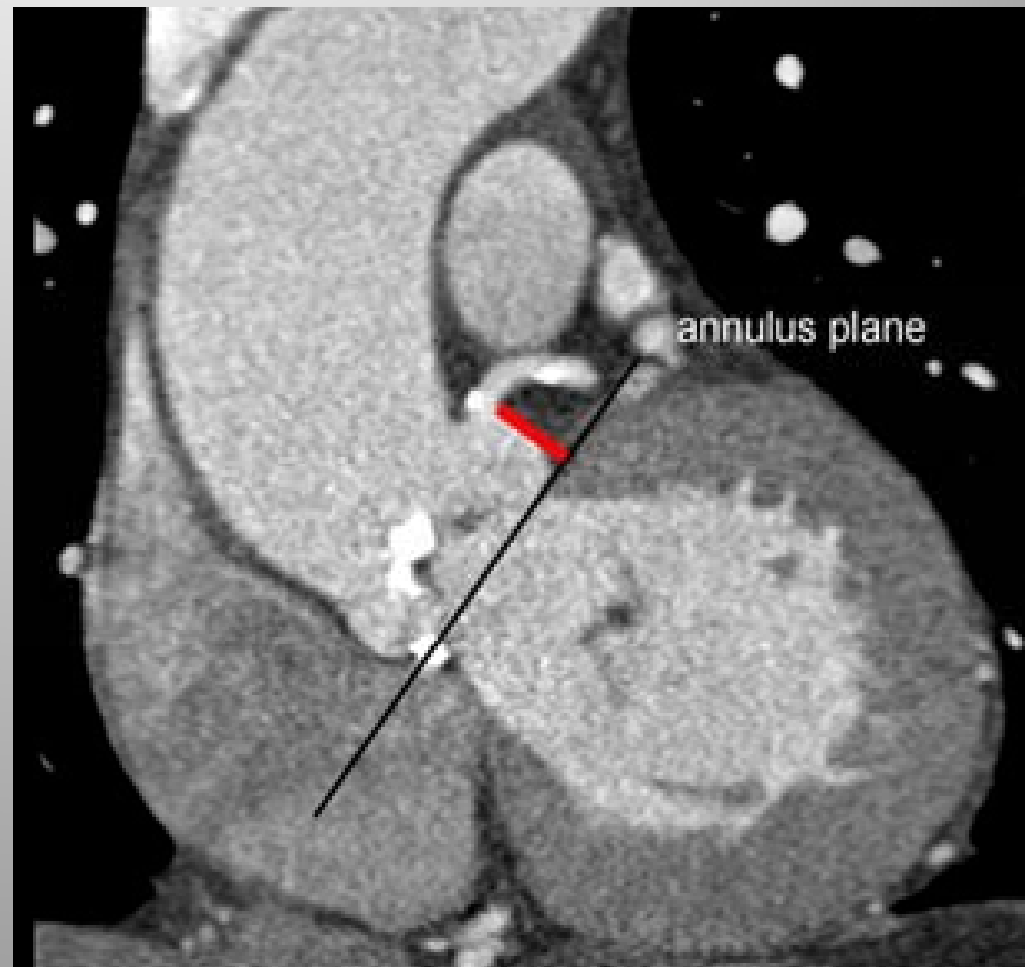
		pts	Correct prediction by CT?	Deviation CT vs CATH
Gurvitch	<i>J Am Coll Card</i> <i>2010</i>	20 CT 20 no CT	18 (90%) 13 (65%)	
Plank*	<i>Eur Heart J Suppl</i> <i>2011</i>	49	47 (96%)	2.1° LAO
Binder**	<i>Circ Cardiovasc Imag</i> <i>2012</i>	40		7.9° CT 5.1° 3D rotational IA

*Contrast volume during TAVI reduced from 81.8 to 59.4cc (p=0.05) using CT

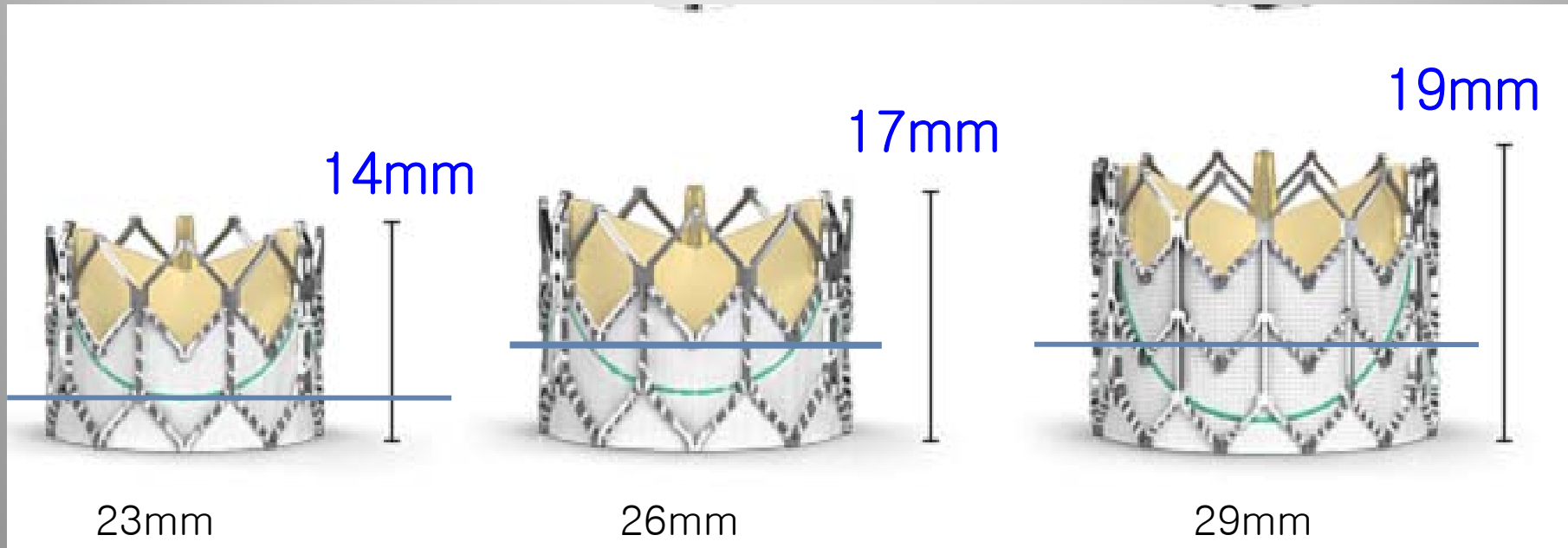
**Contrast volume for rotational IA mean 32mL.

CT for TAVI-planning

- Aortoiliac artery evaluation
- Deployment plane
- Coronary ostia height
- Annulus sizing

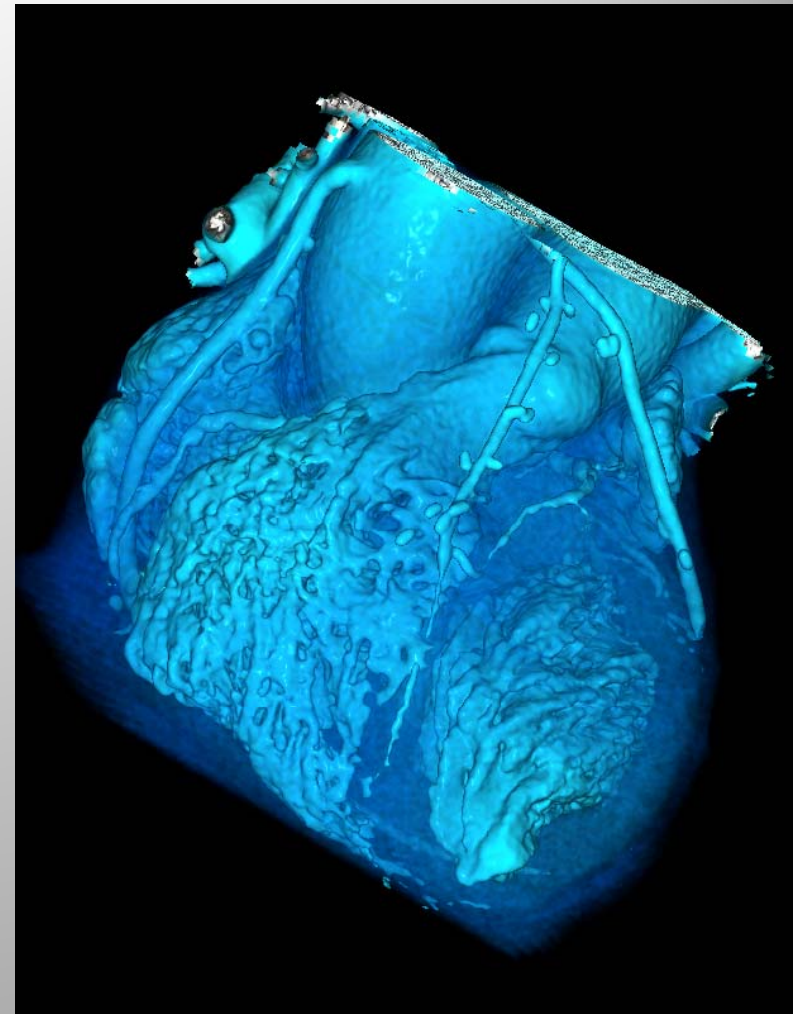
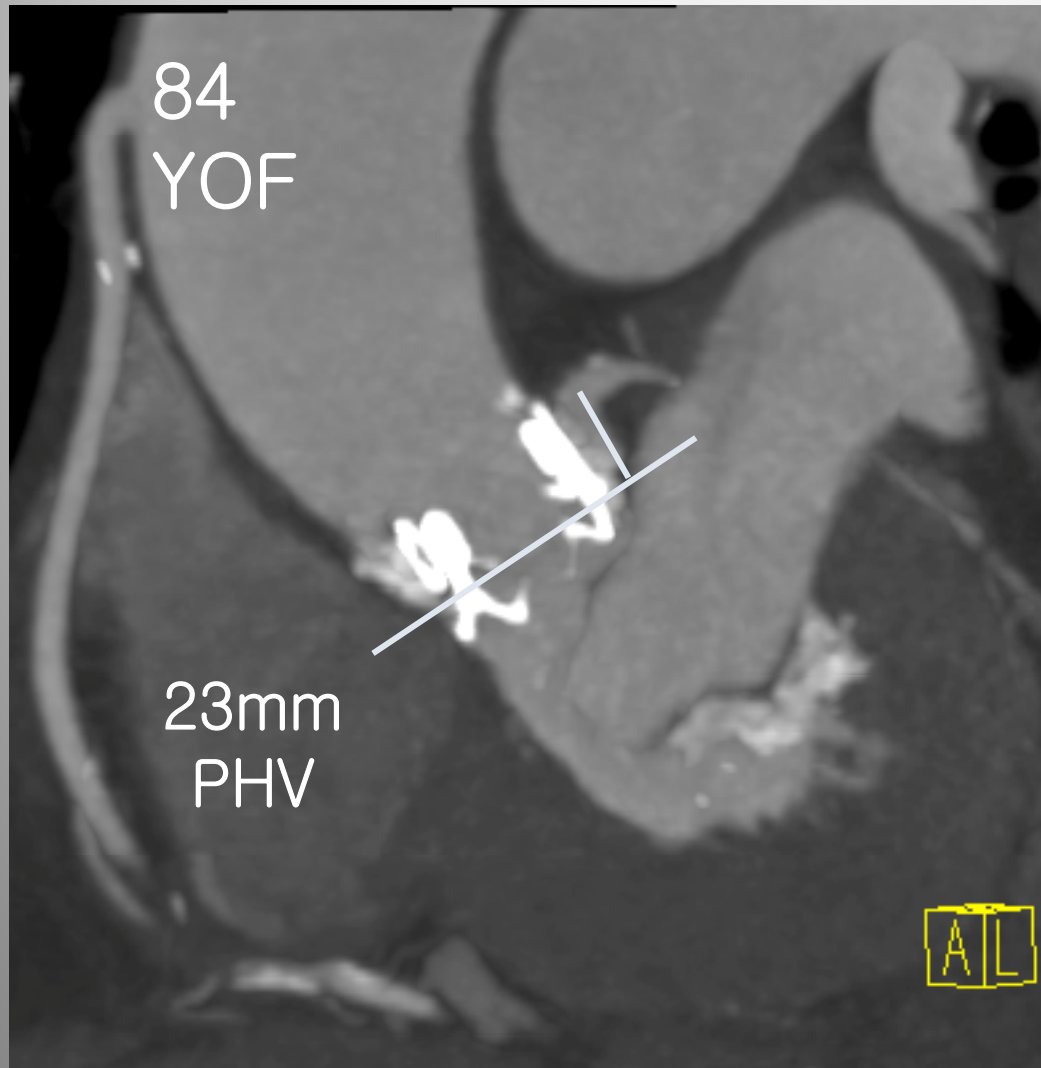


Coronary ostium height— Why to measure...?



▪ **Low ostium <11mm**

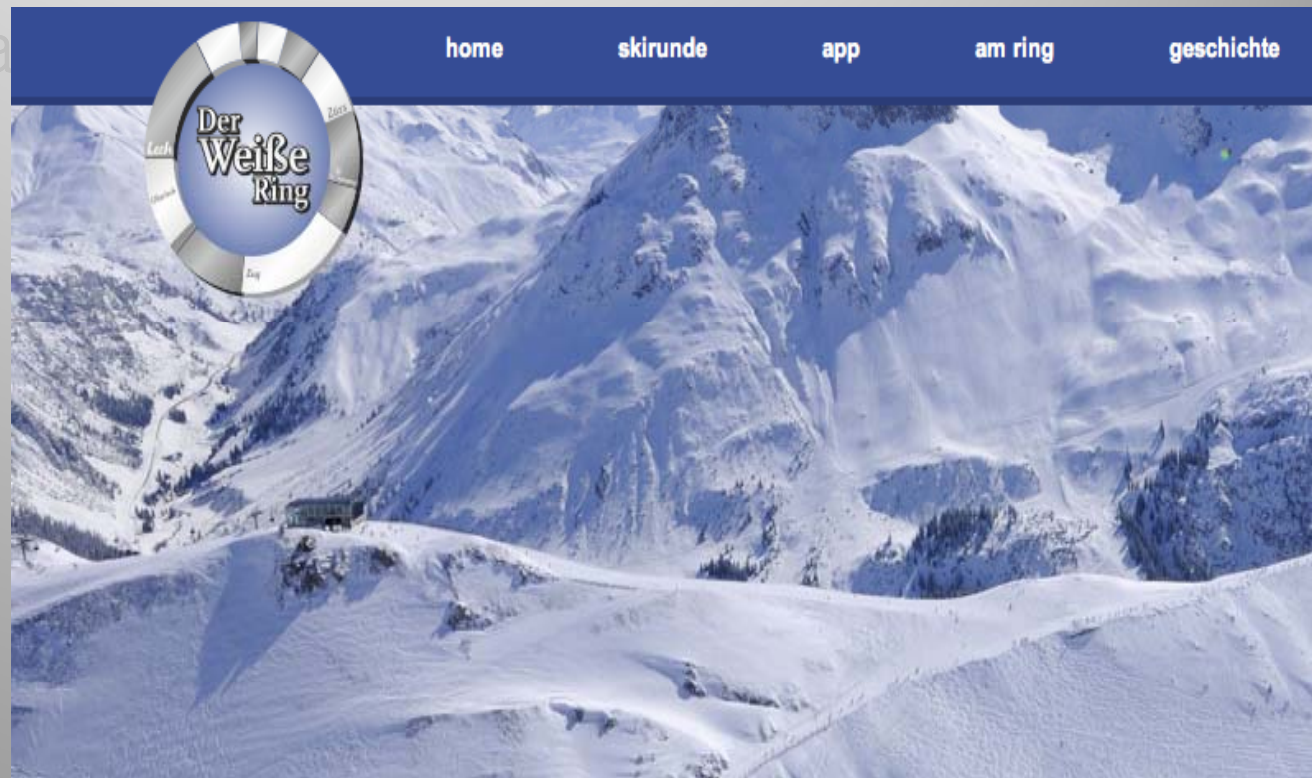
Coronary ostium --> overstenting



▪ 9 mm height

CT for TAVI-planning

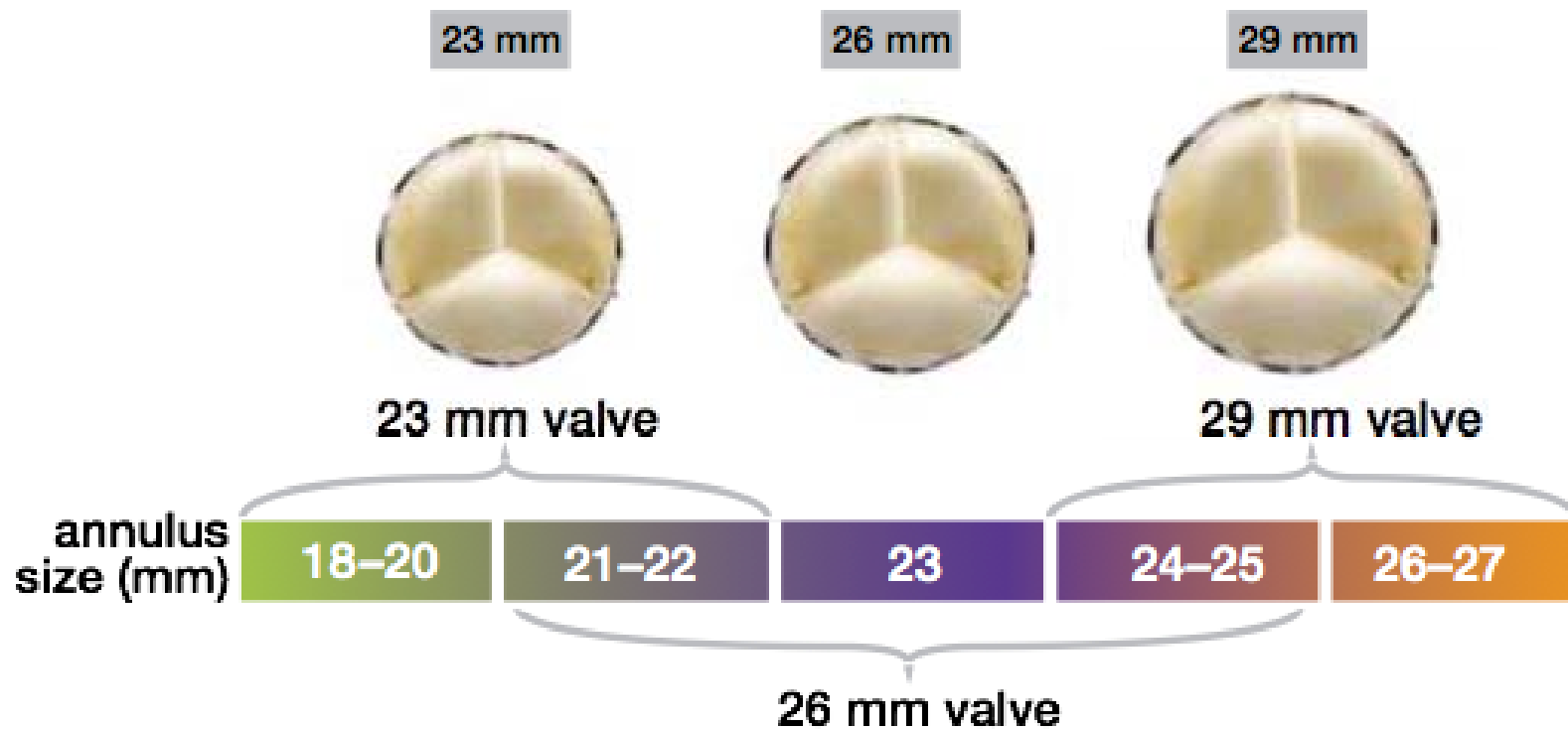
- Aortoiliac artery evaluation
- Deployment plane prediction
- Coronary ostia
- Annulus sizing



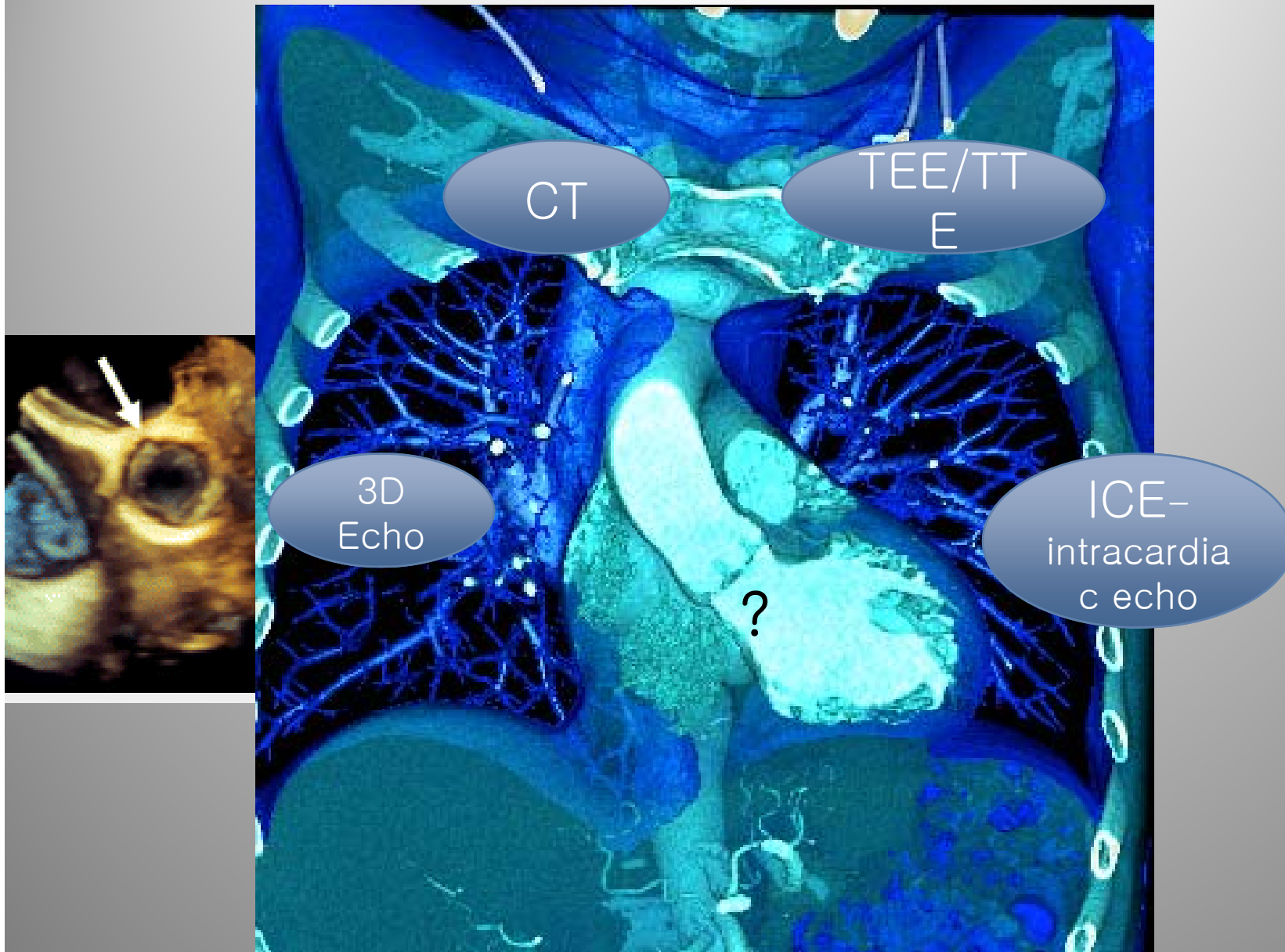
The annulus...



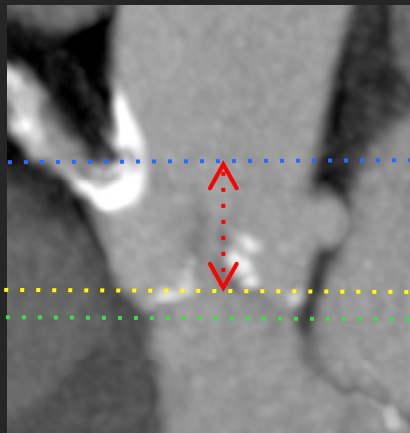
...sizing is crucial



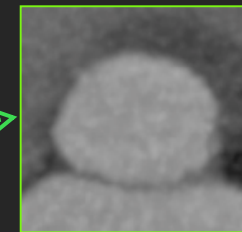
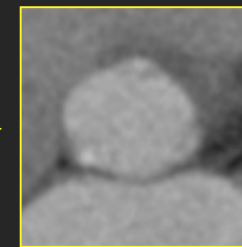
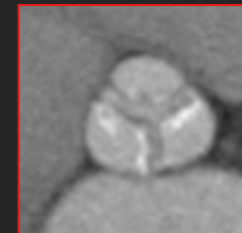
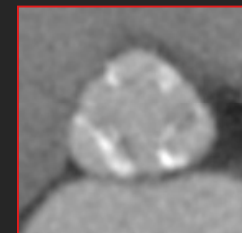
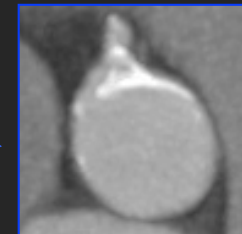
Annulus-sizing: Which modality?



Annulus- how to measure

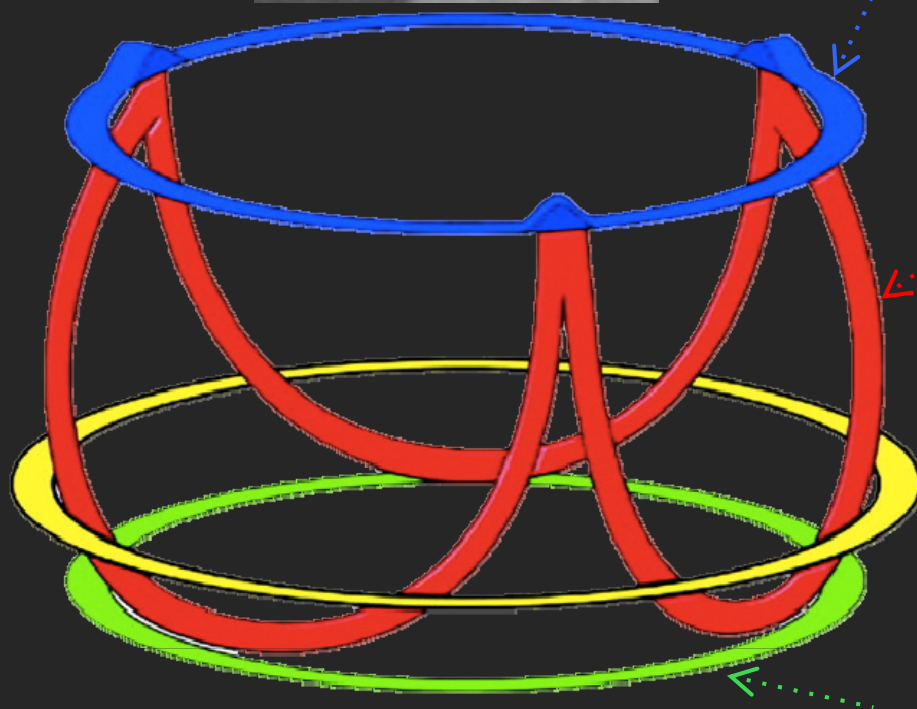


Sino-tubular junction

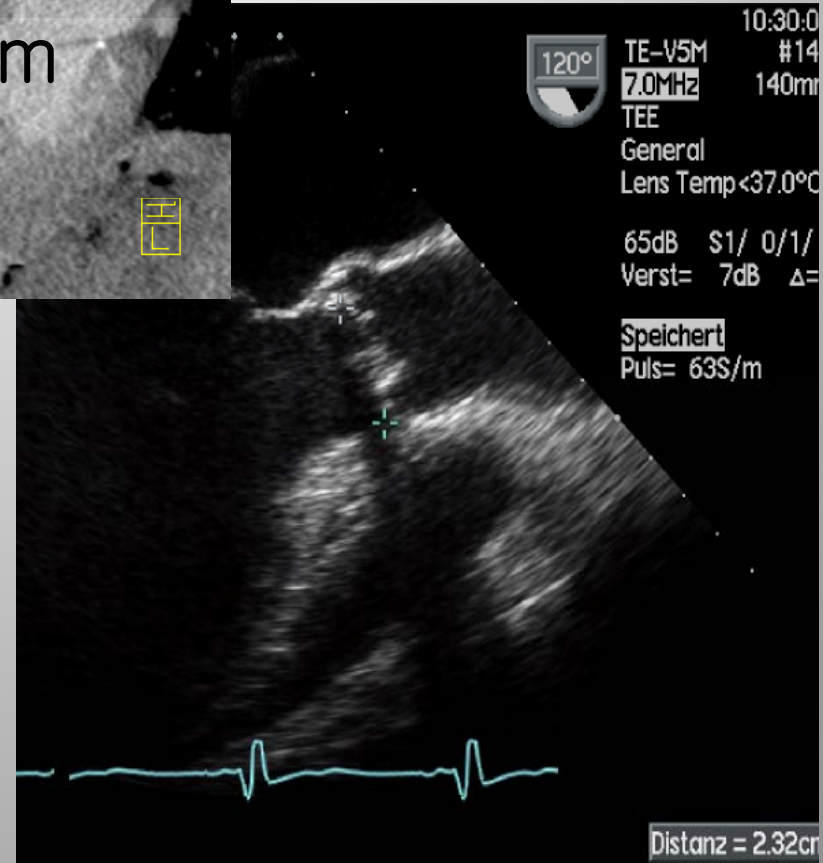
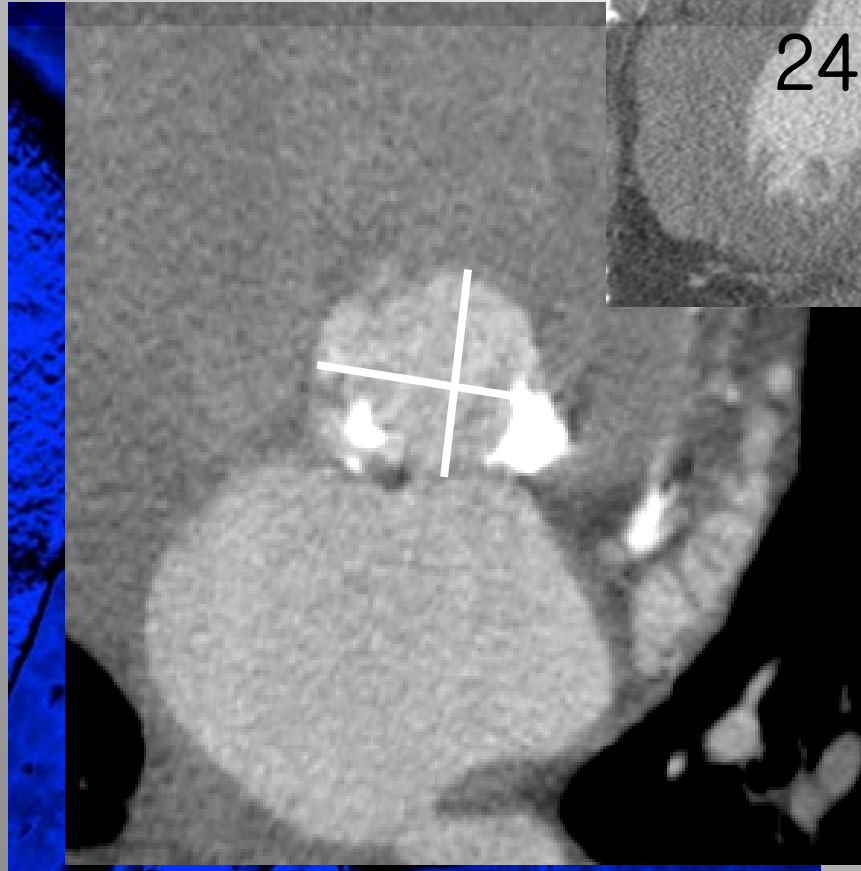
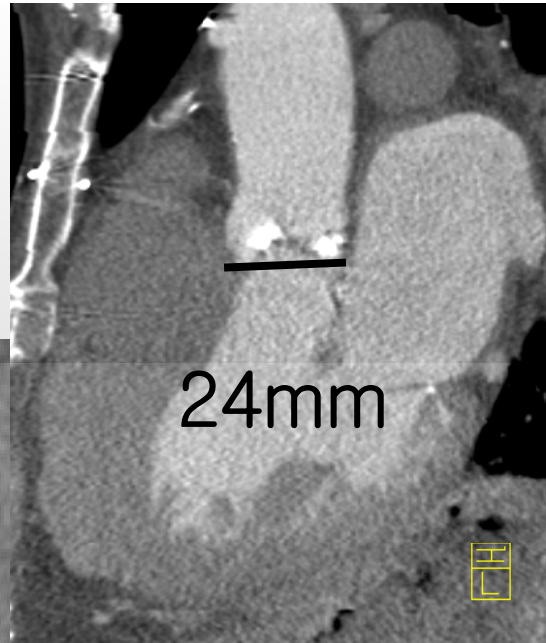


leaflets

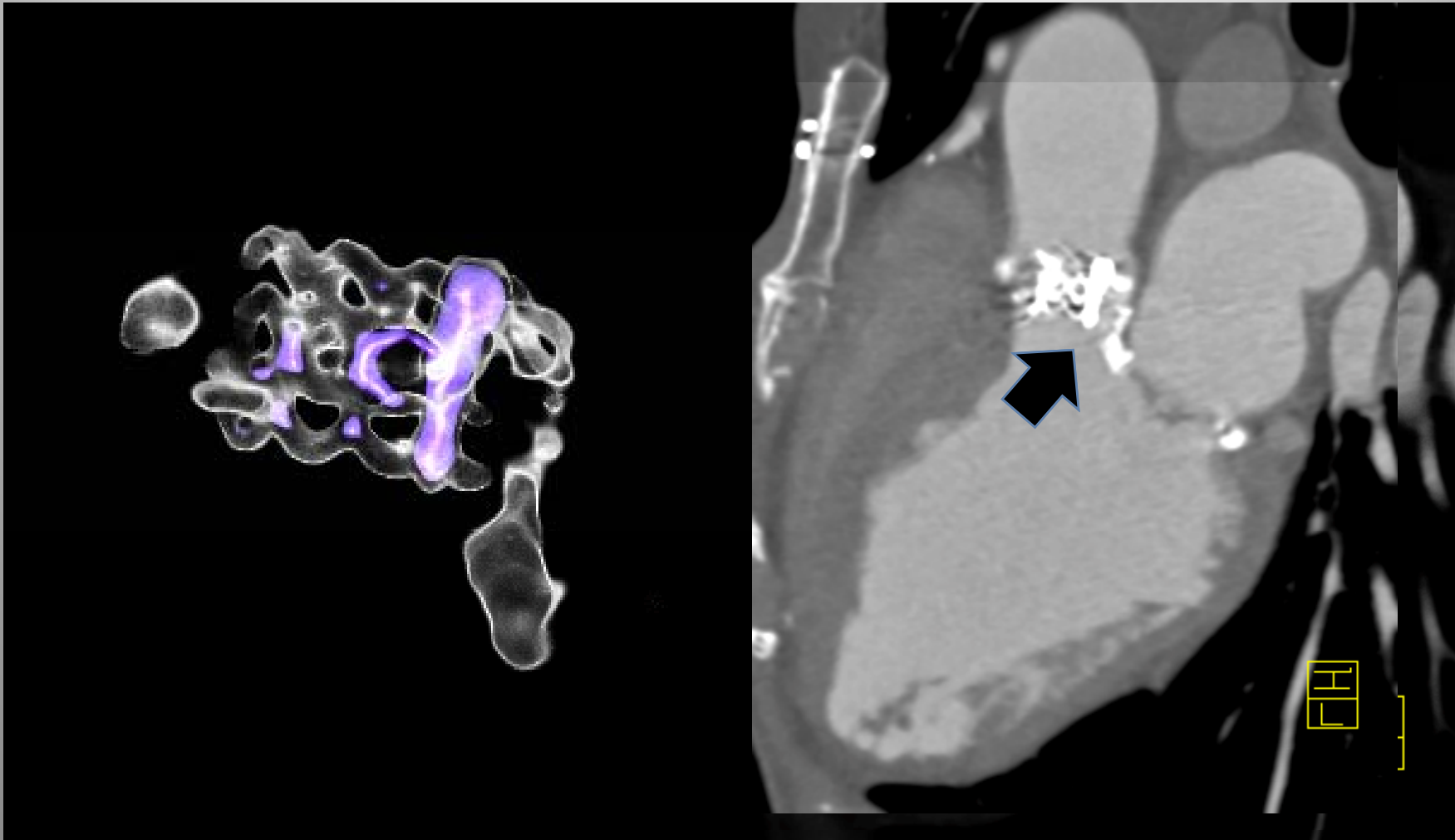
„Annulus“



82 YOM



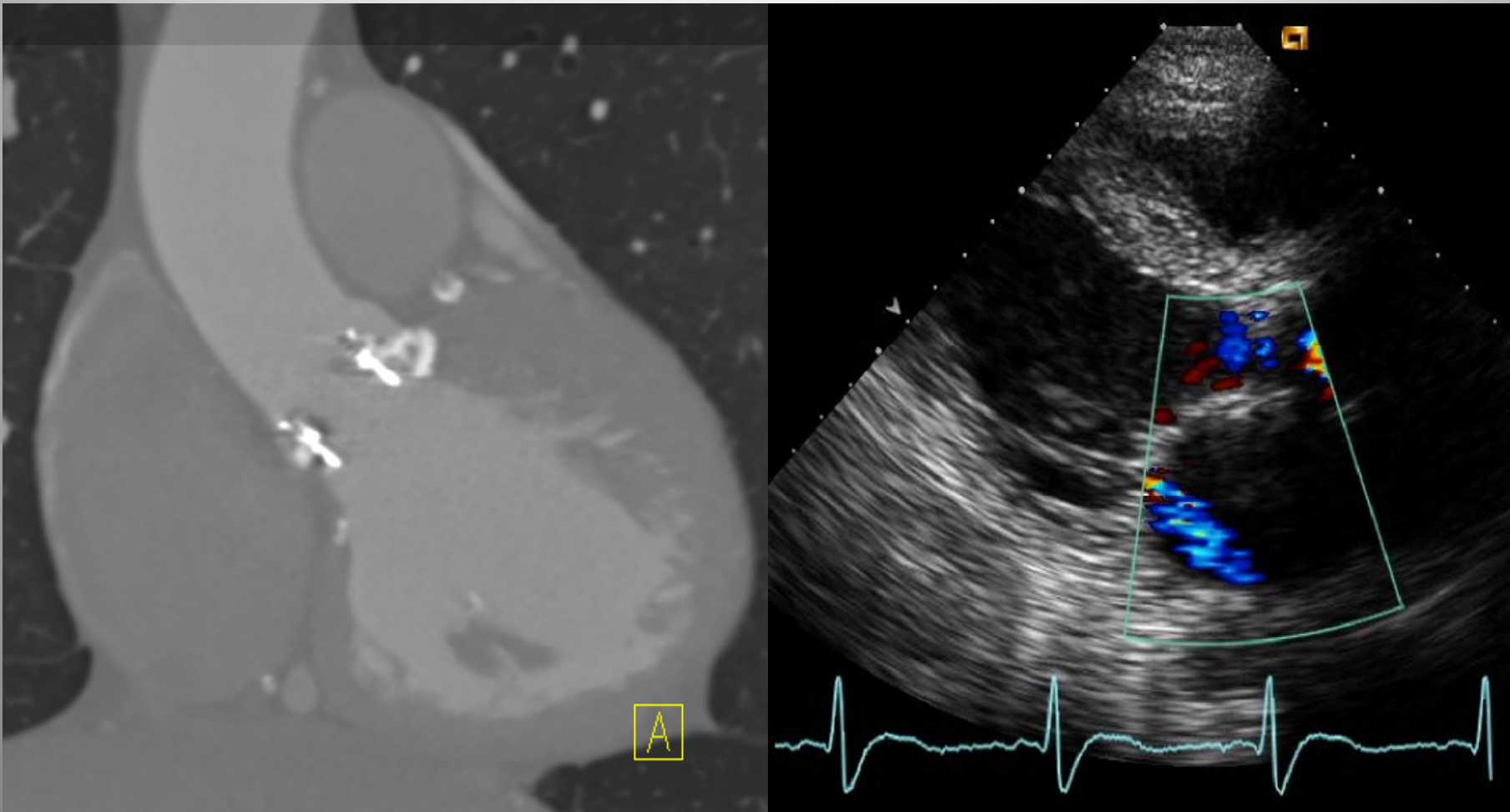
82 YOM



▪ 23 mm Sapien

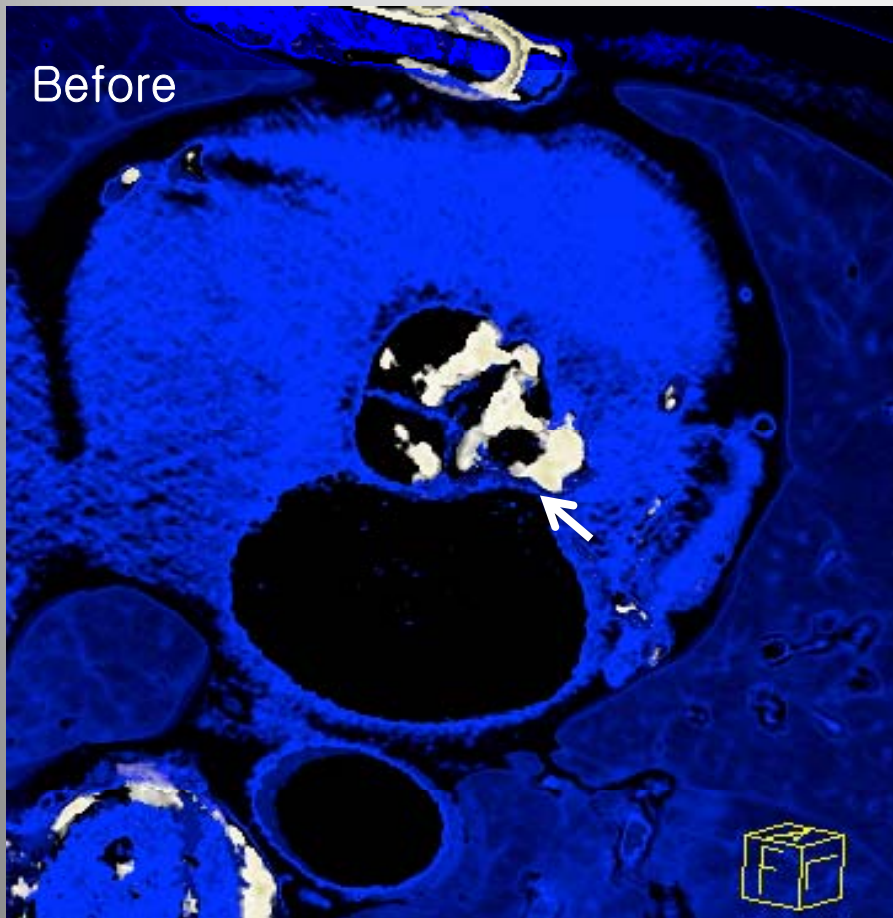
▪ Leak grade II

82 YOM



- PHV Undersizing: 3mm
- moderate paravalv. AR

82 YOM



- Protruding annular calcification

CT sizes annulus larger than TEE

- 50 pts after TAVI (Vancouver BC)
- a different THV size would be selected in 44% and 40% of cases, when a strategy of valve-sizing is undertaken using CT



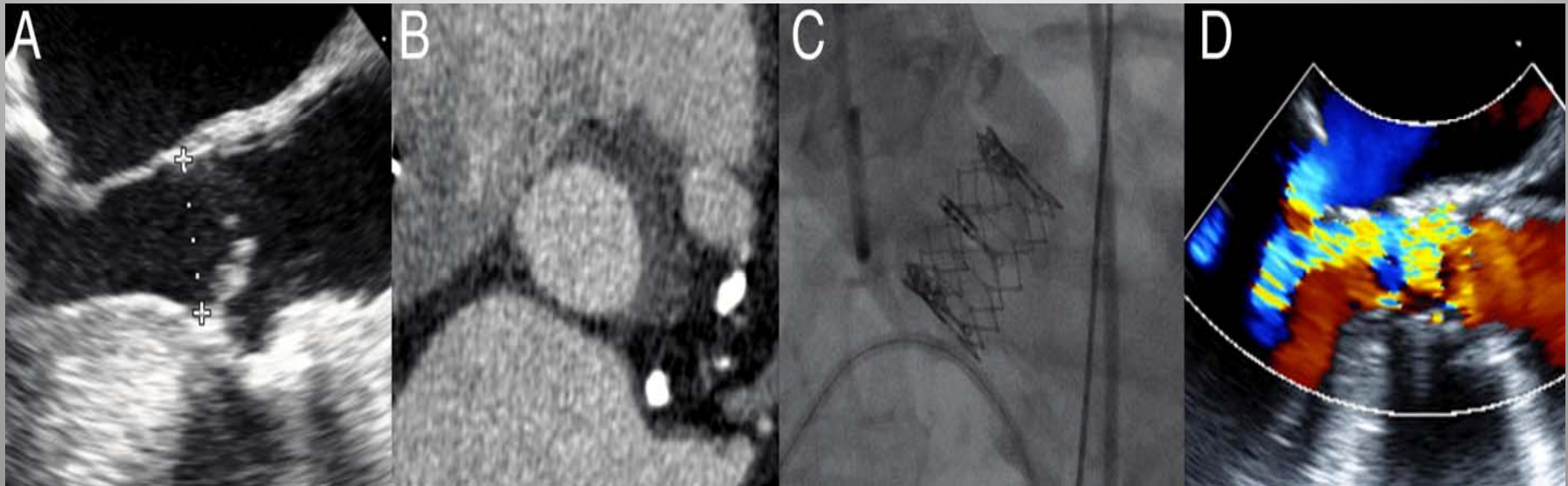
EXPEDITED PUBLICATION

3-Dimensional Aortic Annular Assessment by Multidetector Computed Tomography Predicts Moderate or Severe Paravalvular Regurgitation After Transcatheter Aortic Valve Replacement

A Multicenter Retrospective Analysis

Alexander B. Willson, MBBS, MPH,* John G. Webb, MD,* Troy M. LaBounty, MD,†

- 109 pts
- Moderate or severe paravalv. AR (13/102) was associated with THV „undersizing“ vs. CT ($p < 0.01$)
- „Undersizing“ was predictive of paravalv. AR
 - * Δ diameter AUC = 0.81
 - * Δ area AUC = 0.8
 - * Δ circumference AUC = 0.76



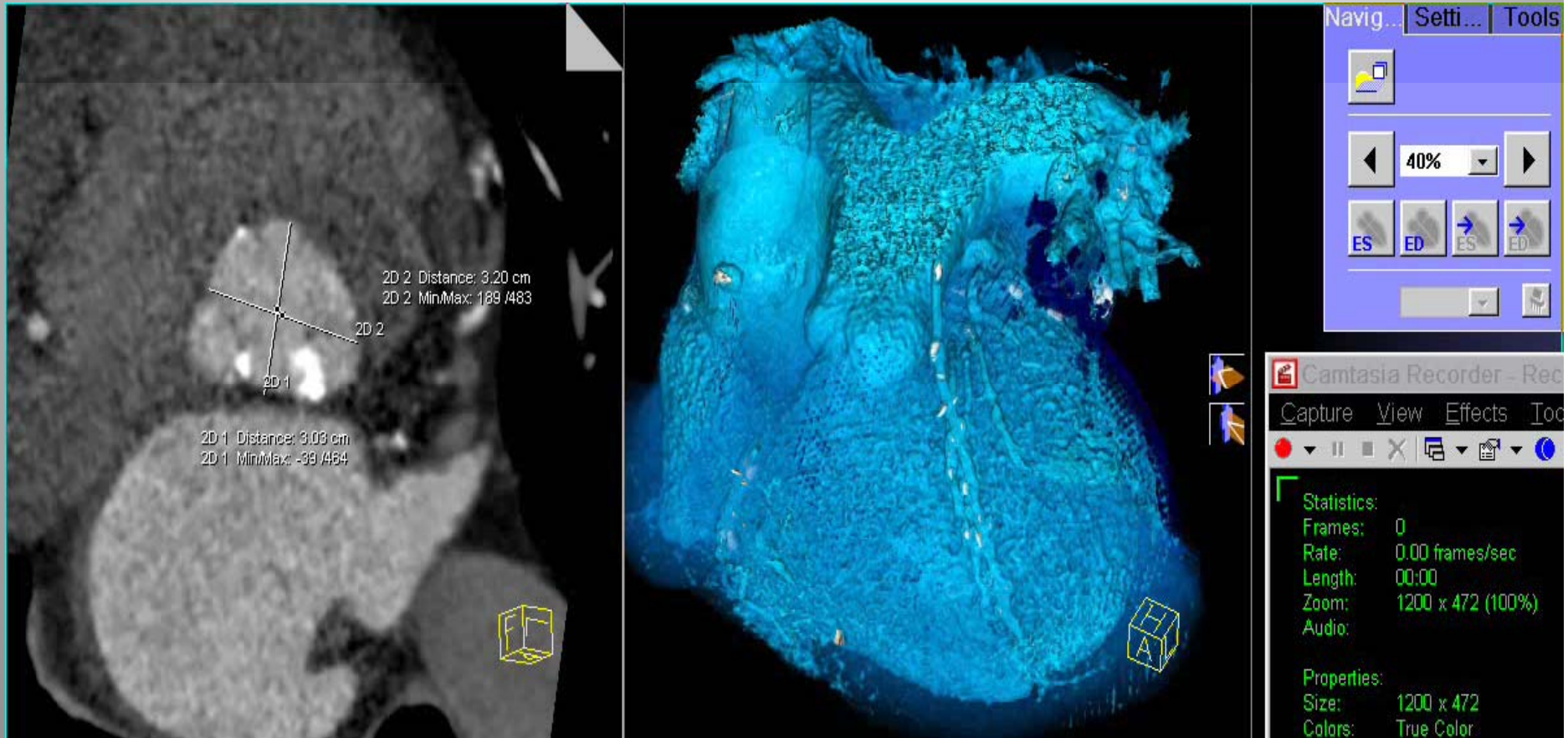
- Undersizing: 2mm

moderate AR II

Does CT allow better annulus sizing than echo?

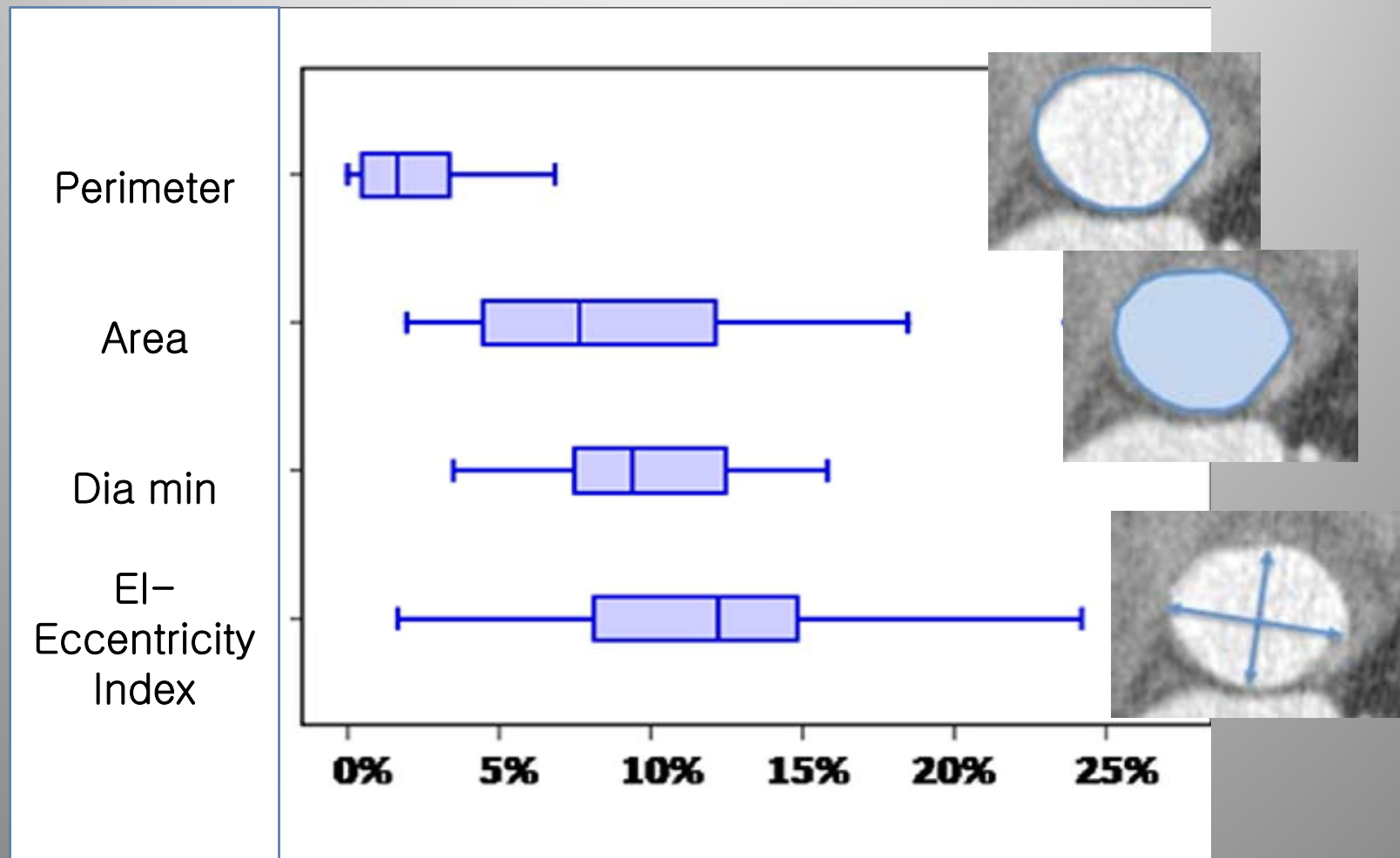


The annulus is dynamic

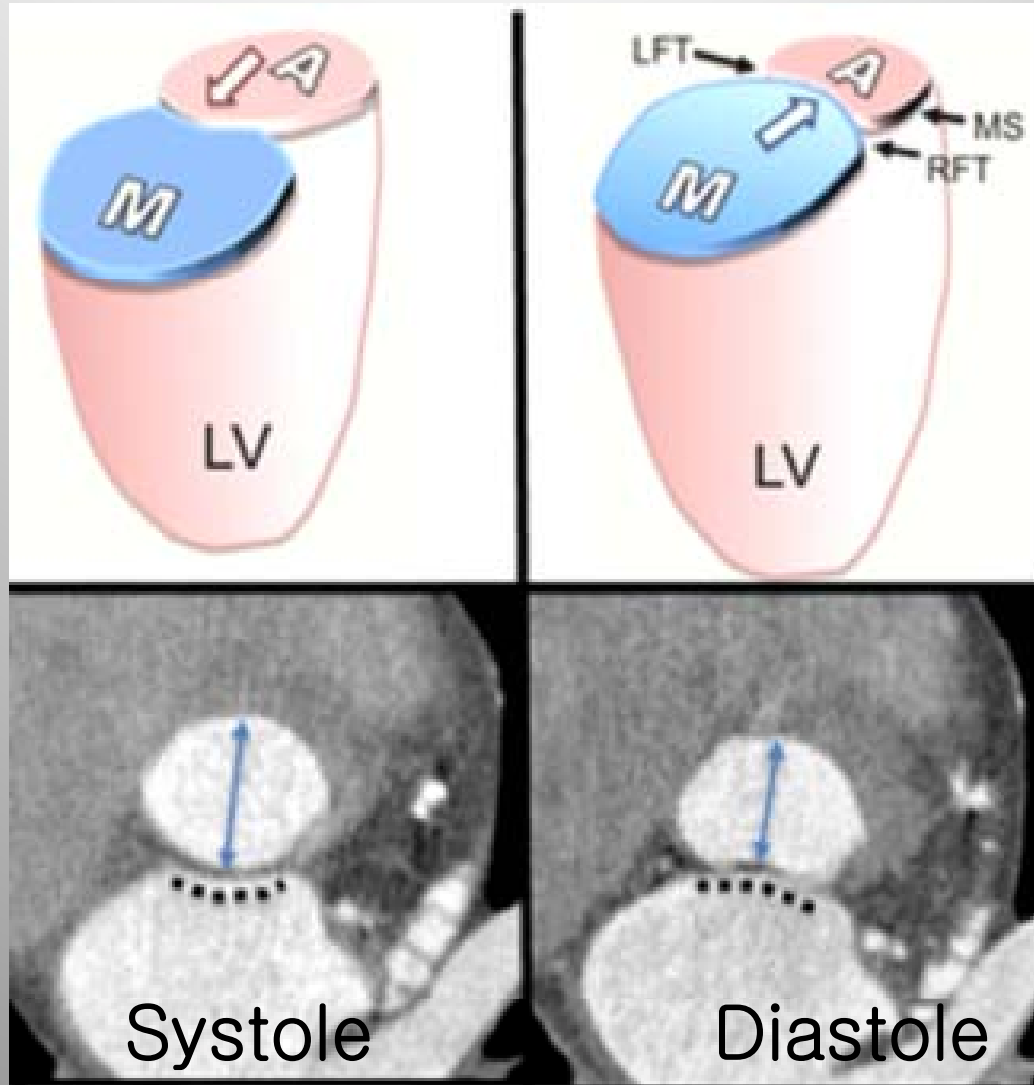


Systole 30 x 32 mm
Diastole 27 x 31mm

4-D % change in annulus dimensions over cardiac cycle



The annulus is elastic & eccentric



Annulus-sizing: How to handle echo vs CT discrepancies?



The Annulus: facts

- CT „overestimates“ vs ECHO → but reflects the true 3D dimensions: Use:

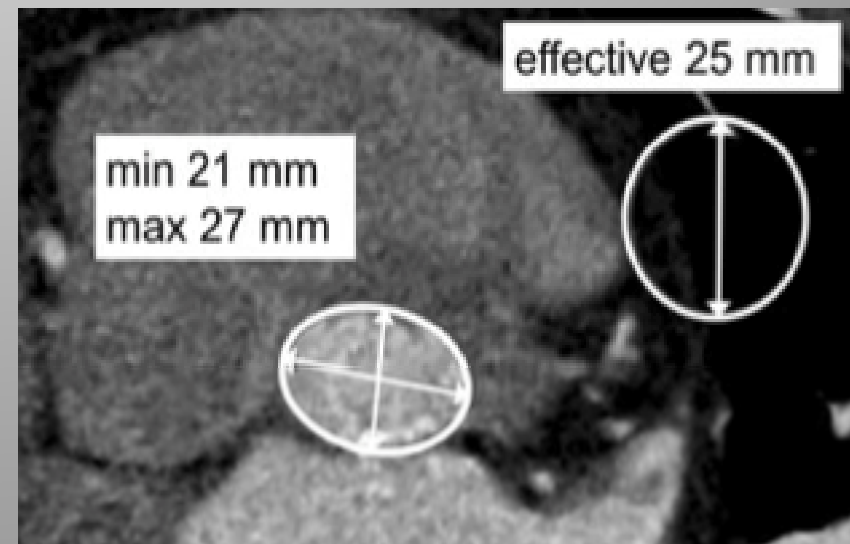
*mean of $D_{\min} + D_{\max}$

* $CT_{EFF} = 2 \times \sqrt{\text{area} / \pi}$

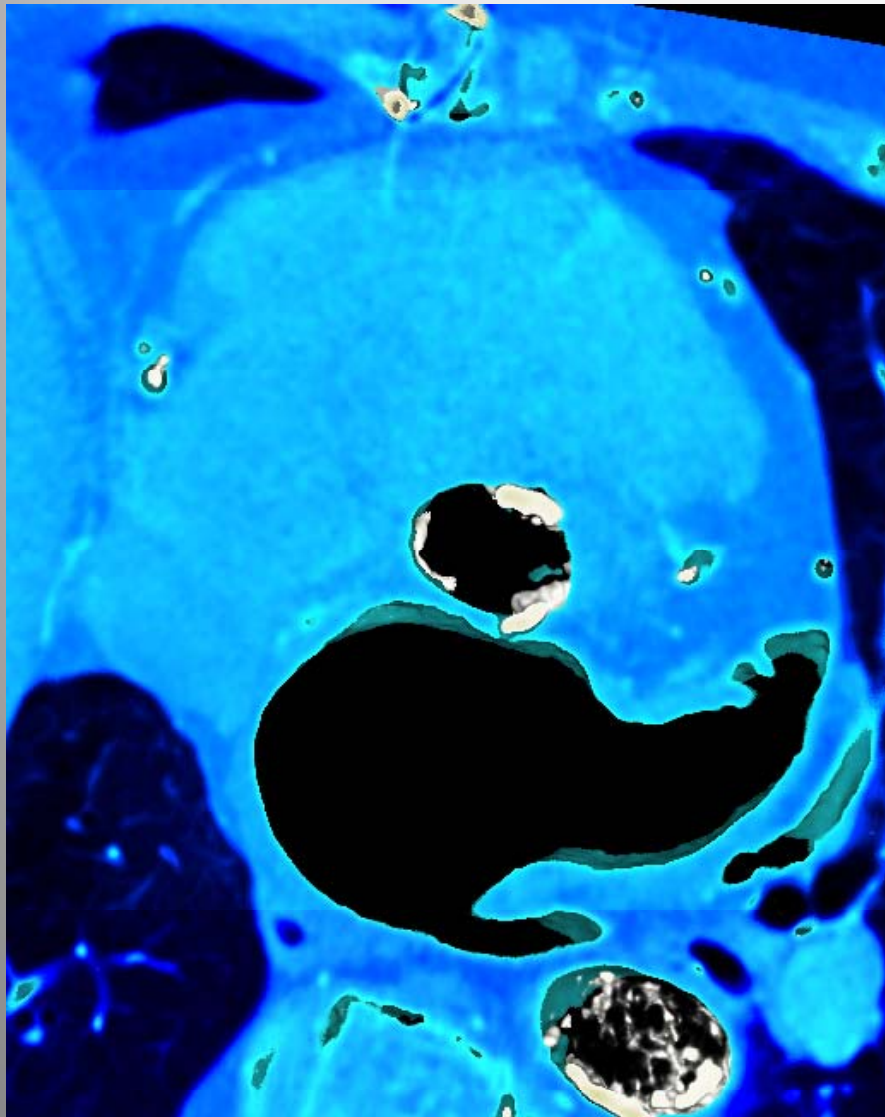
J. Kempfert et al. / European Journal of Cardio-Thoracic Surgery

* D_{\min} can be oversized (mean 4.3mm)

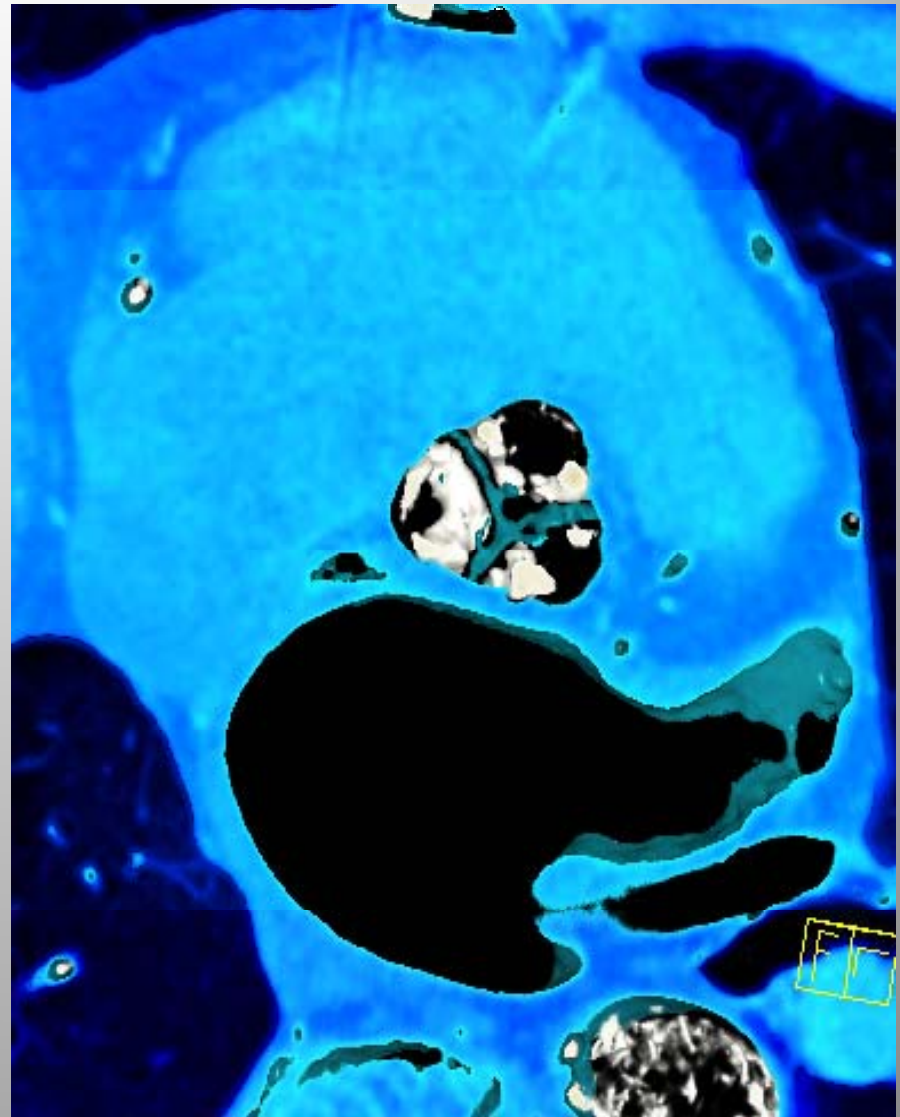
- Systolic > diastolic
- Eccentric
- calcification! → leaks



Calcification → leaks?



Annular



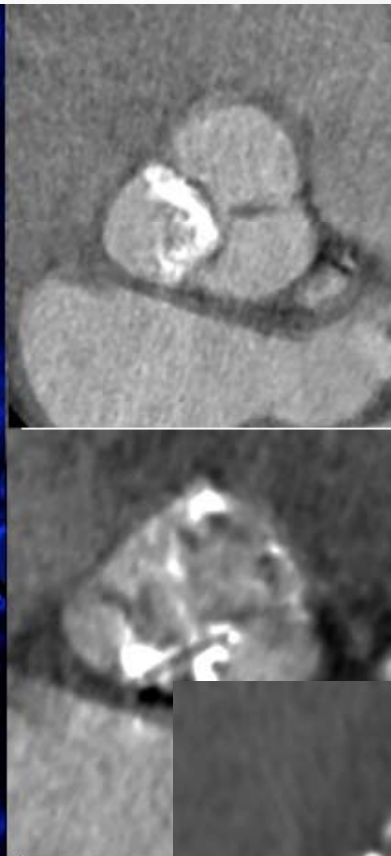
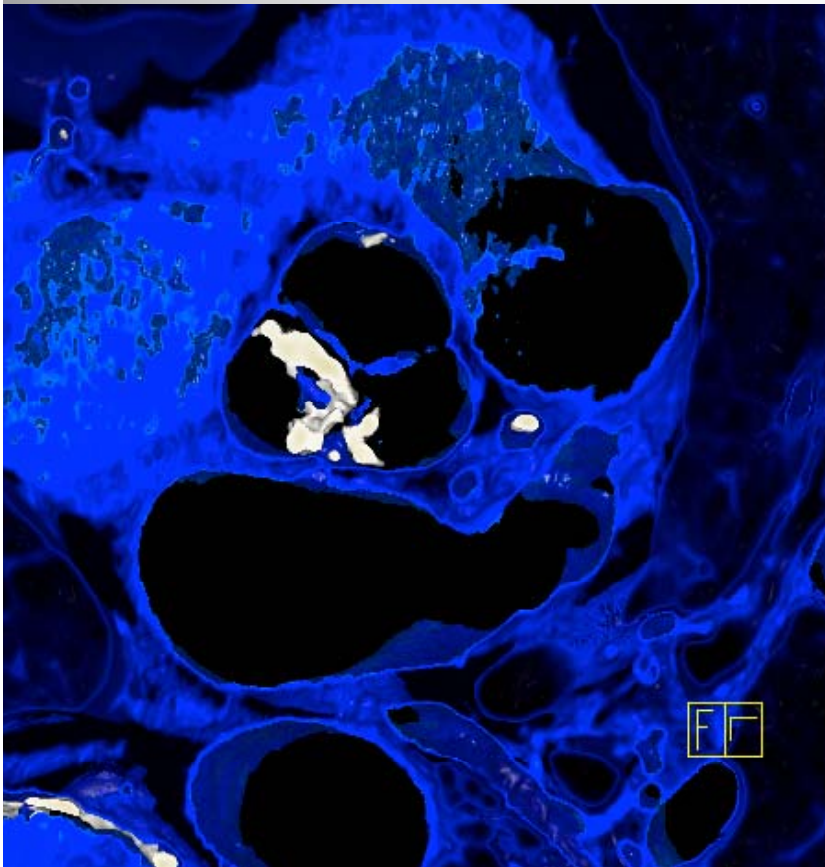
Leaflet

Annular rather than leaflet calcium predicts paravalvular AR after TAVI

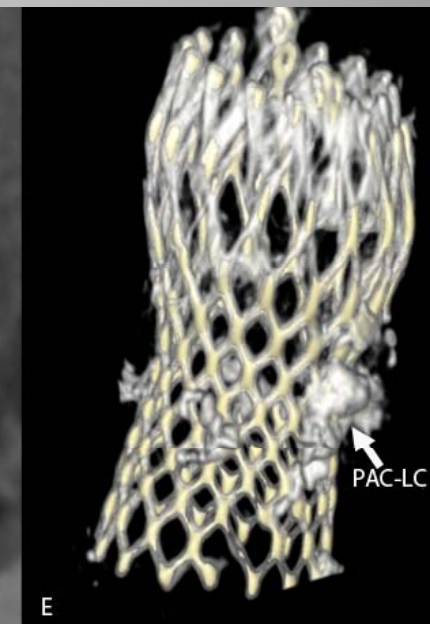
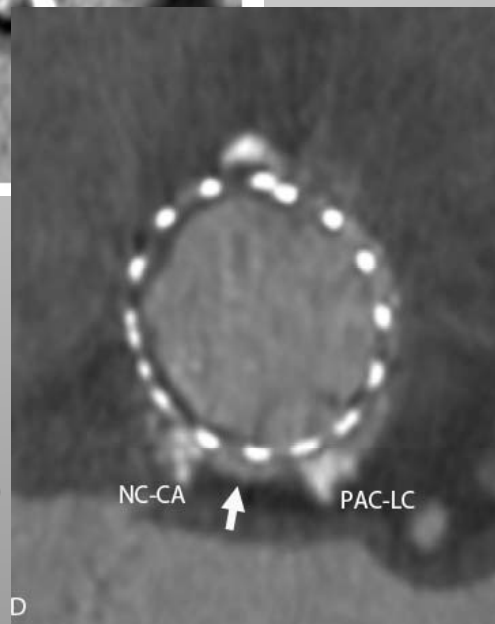
	N			AR	Leaflet	Annular
<i>Ewe Am J Card 2011</i>	79	CTA	Sapien	≥ 1	No AUC 0.58– 0.67	Yes AUC 0.93
<i>John JACC Intervent 2010</i>	100	Ca- Score (Agatston)	Core	≥ 2		DLZ: $r = 0.30$ $p = 0.001$
<i>Feuchtner* (2012 submitted)</i>	56	CTA	Sapien 91%/ Core 9%	≥ 1.5	No P=n.s	Yes P=0.016*

**Protruding annulus calcification >4mm particularly left-sided*,
and total size predict moderate-to-severe paravalvular AR*

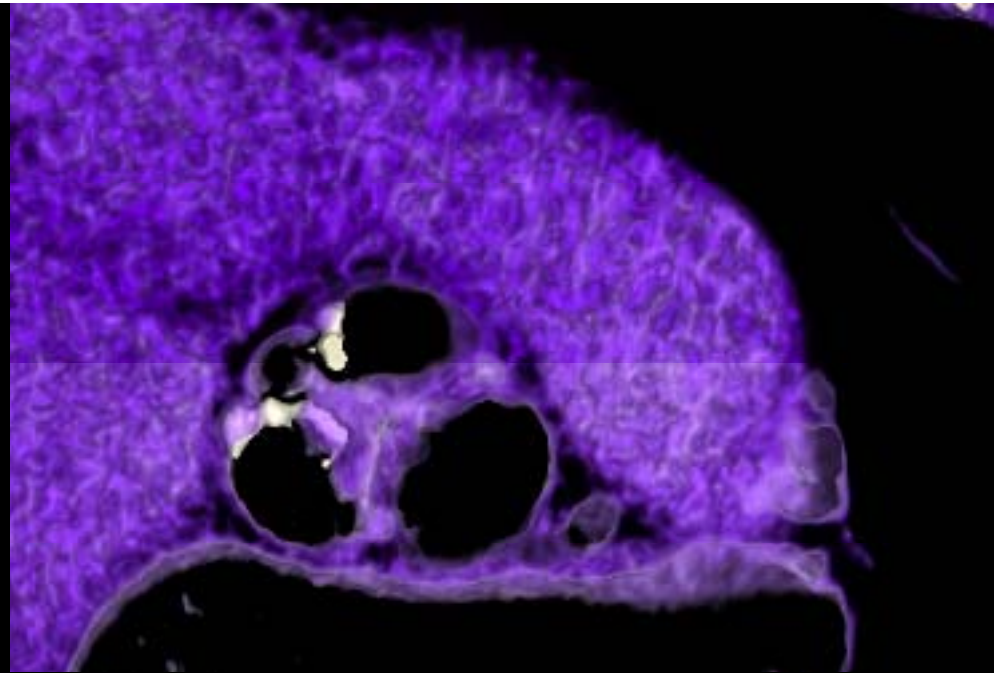
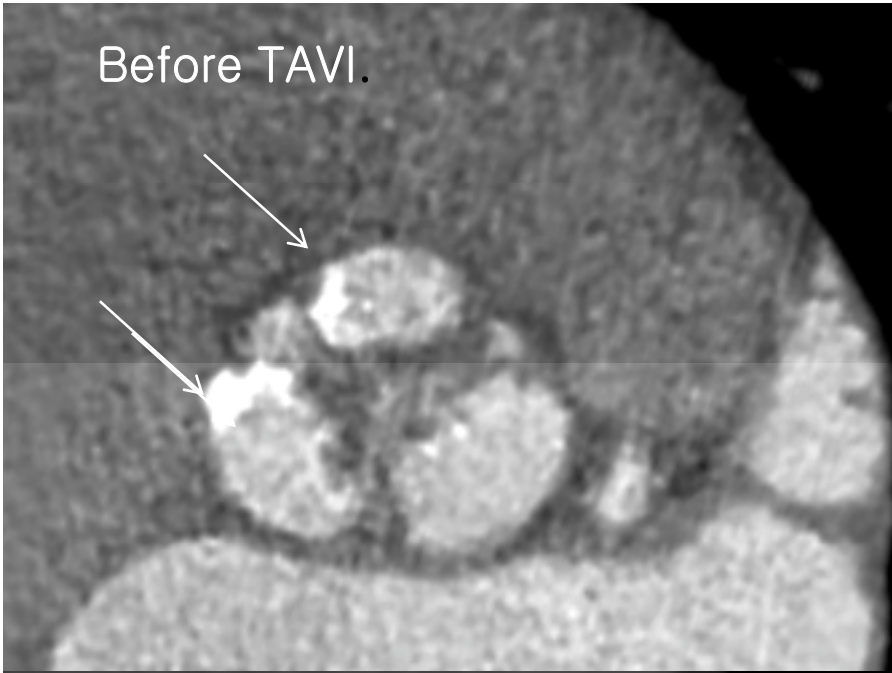
74 YOM



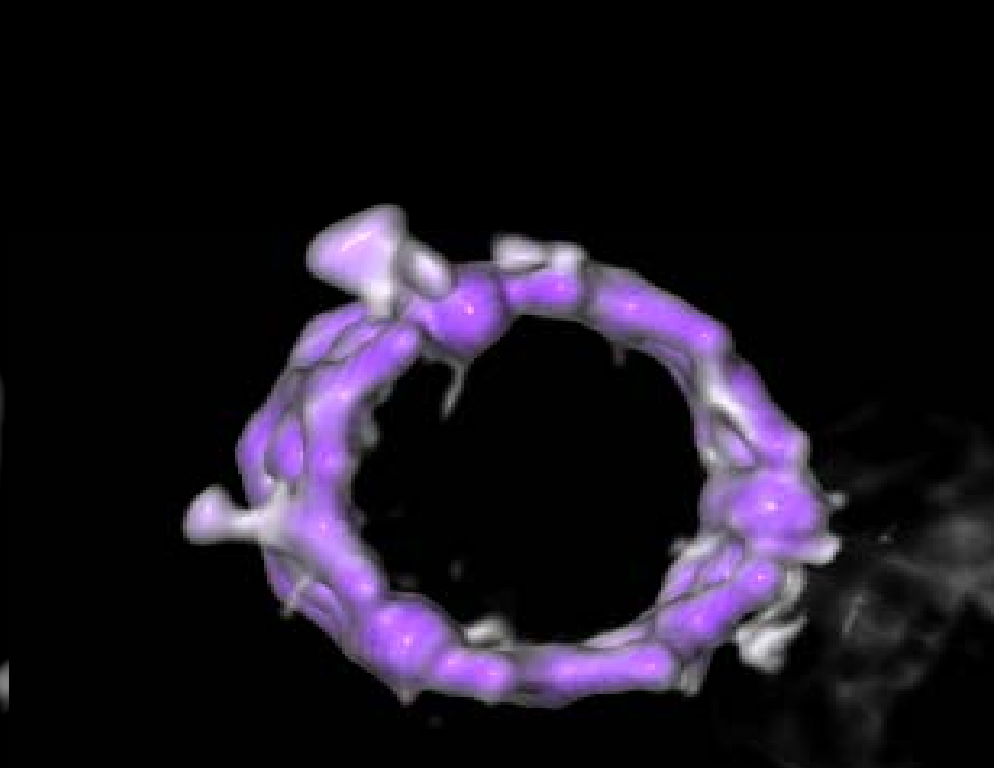
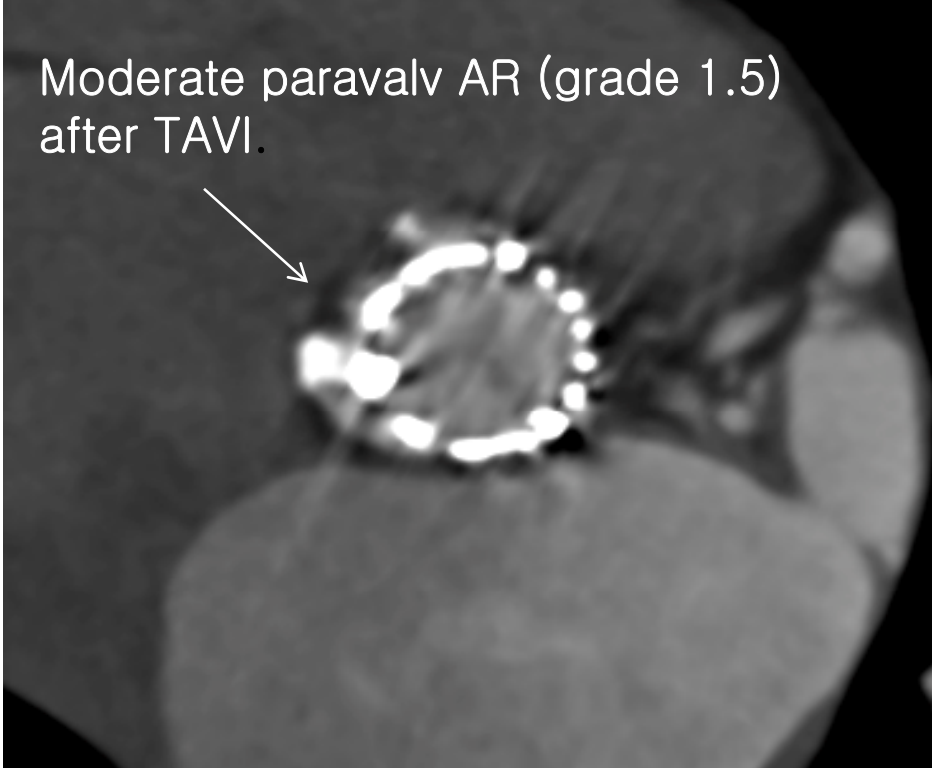
Moderate paravalv AR (grade II)
after TAVI.



Before TAVI.

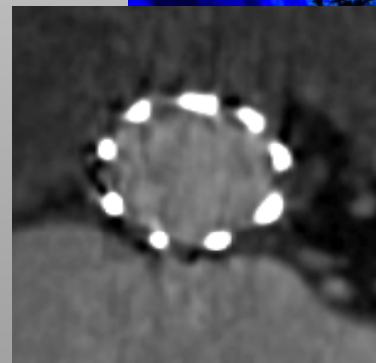
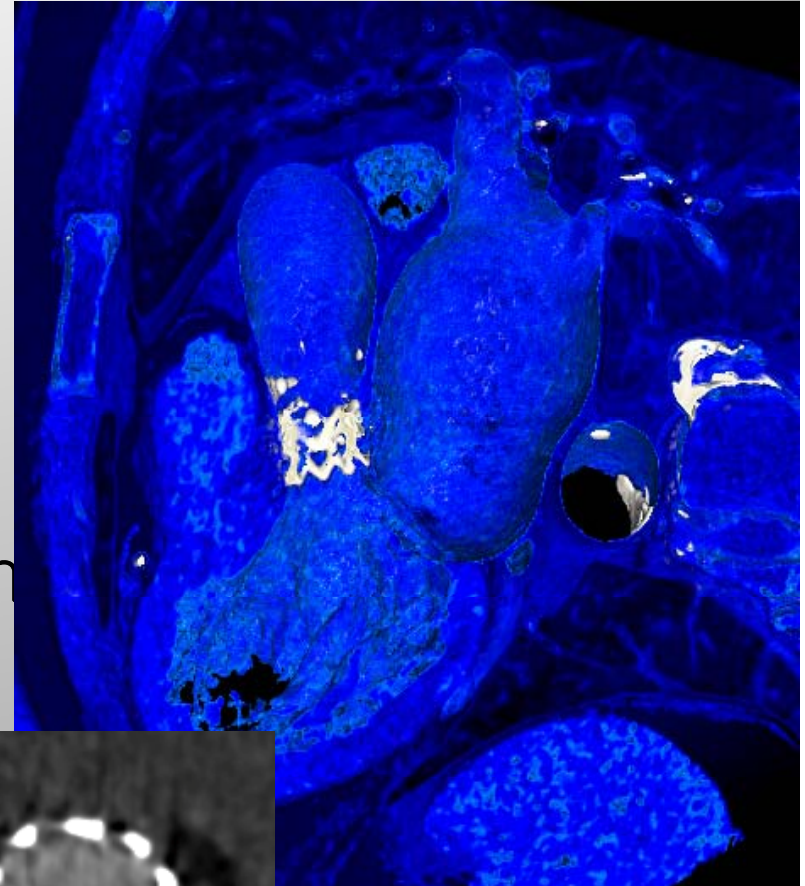


Moderate paravalv AR (grade 1.5) after TAVI.

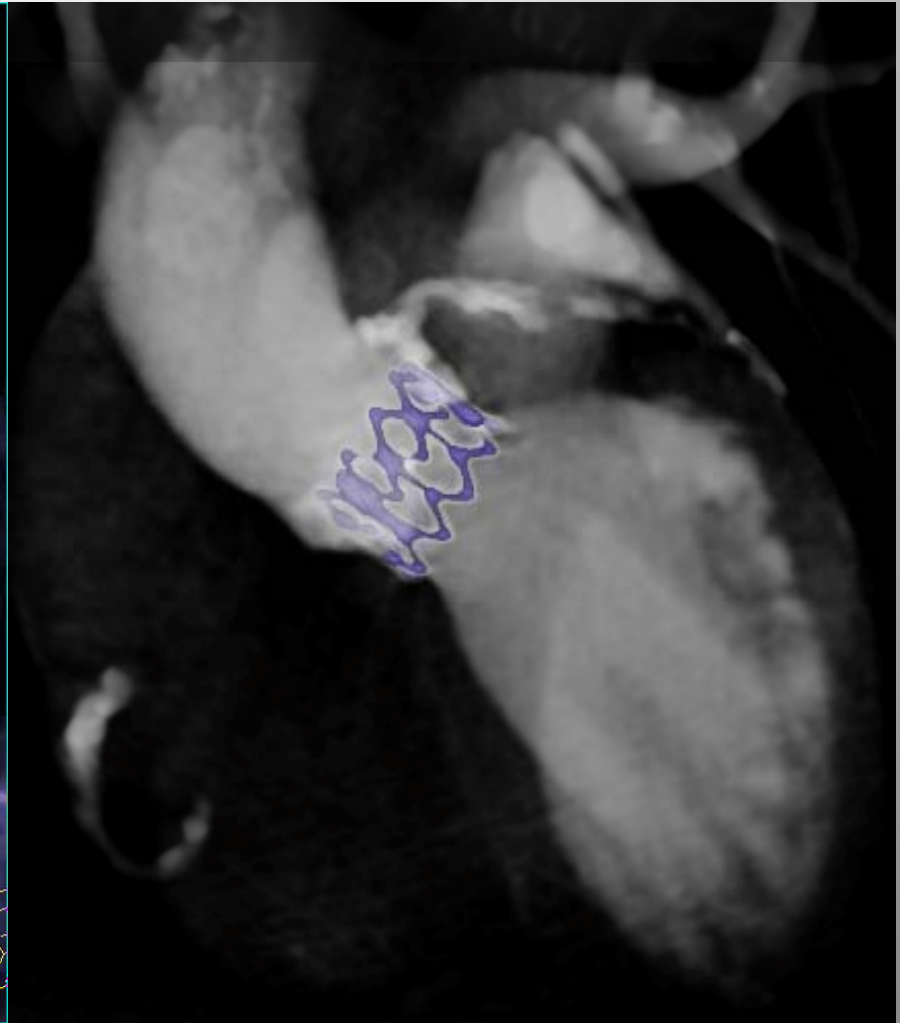
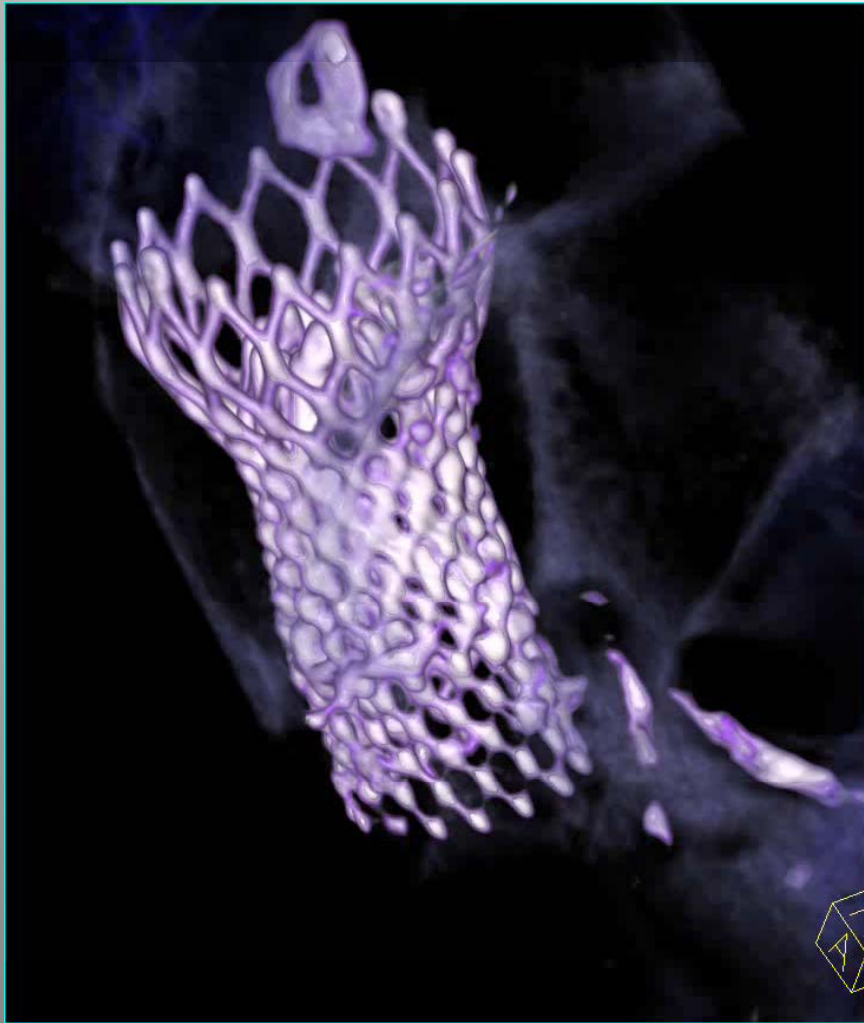


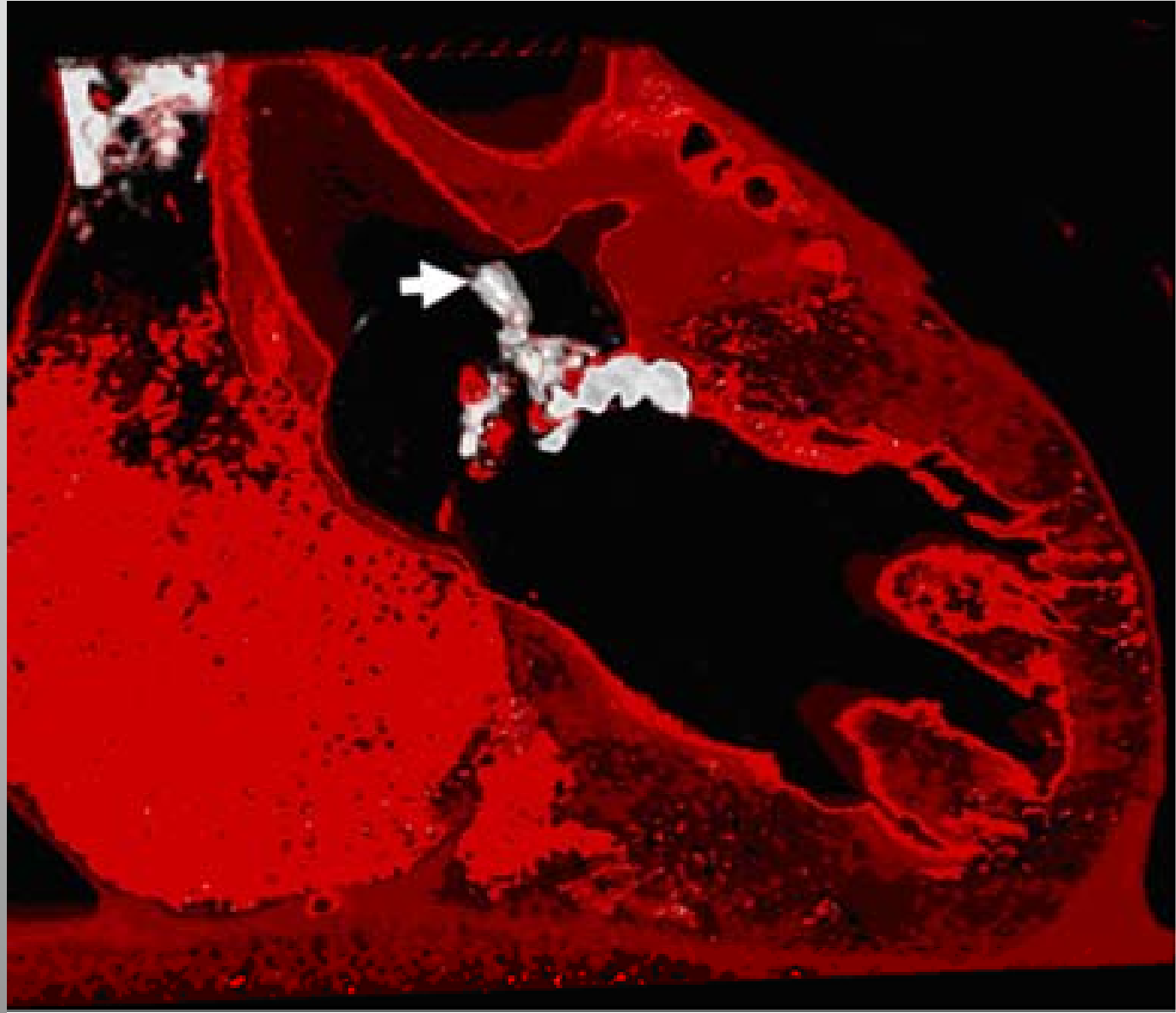
Conclusion– CTA for TAVI

- Aortoiliac artery evaluation
 - *Sizing*
 - *Atherosclerosis*
 - *Kinking*
- Deployment plane prediction
- Annulus sizing!
- Aortic annular calcium



Thank you for attention!





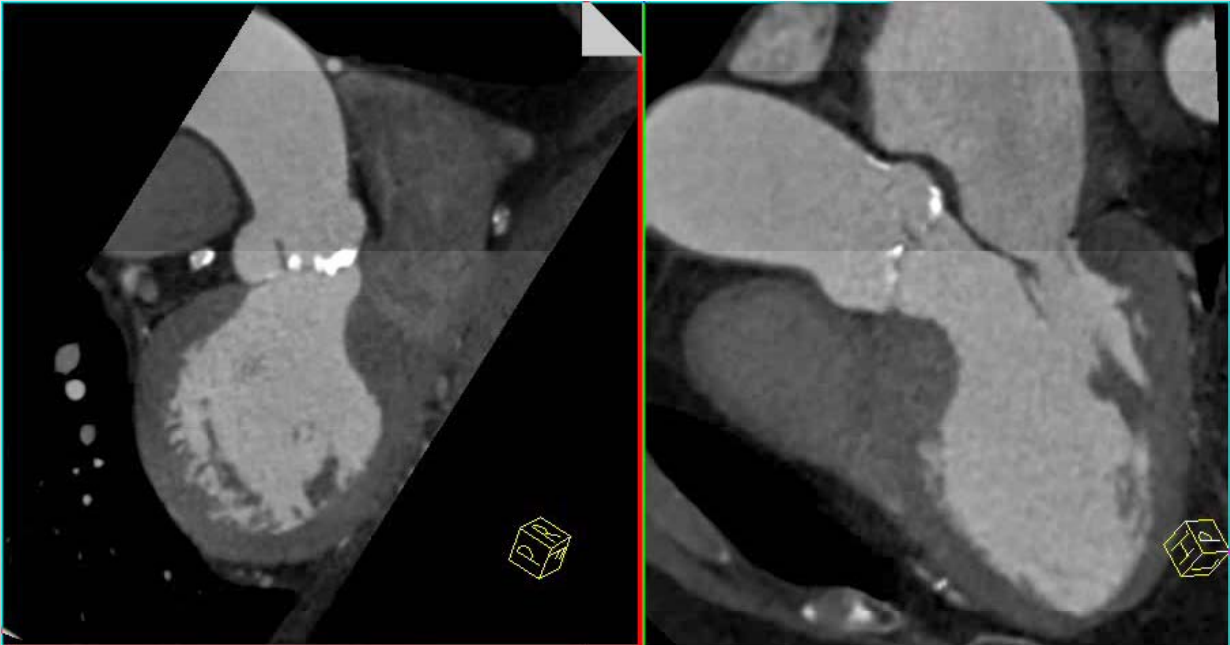
Annular calcium predictspost-deployment dilatation

Schultz Eurointervention2 011	110		COR E	10/110 AUC >0.80 to predict postimplantation -dilatation
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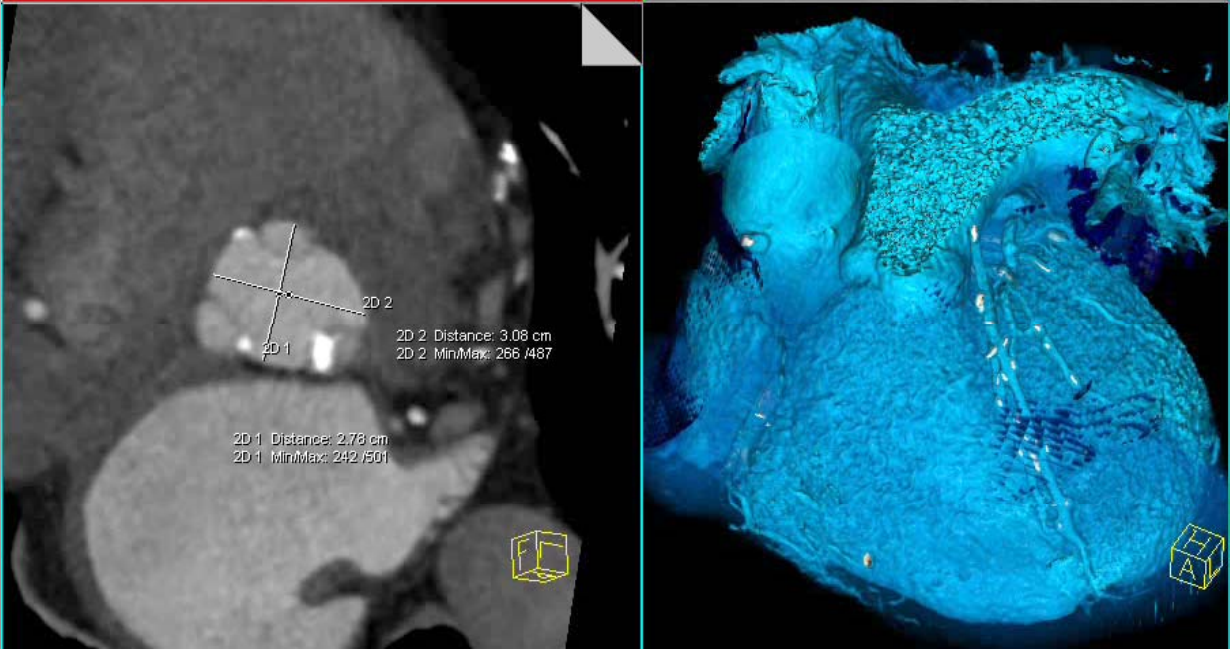
Should we rely on
ECHO?



24mm



27x30mm



Which annulus parameter?

