

SAPIEN 3 Platform Handles Complex TAVR Cases

With Preprocedural CT Analysis

Tae-Hyun Yang, MD

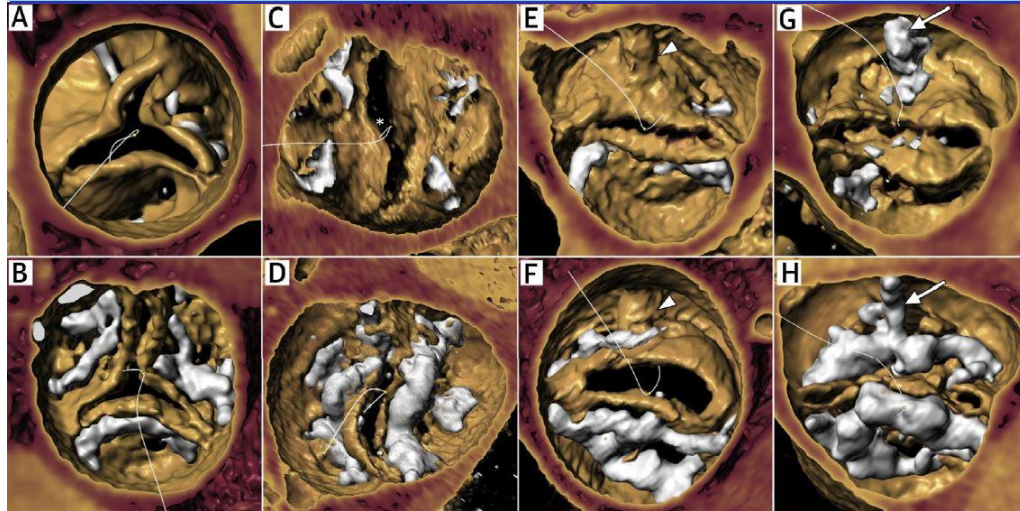
Inje University Busan Paik Hospital, Rep. of Korea

Disclosure

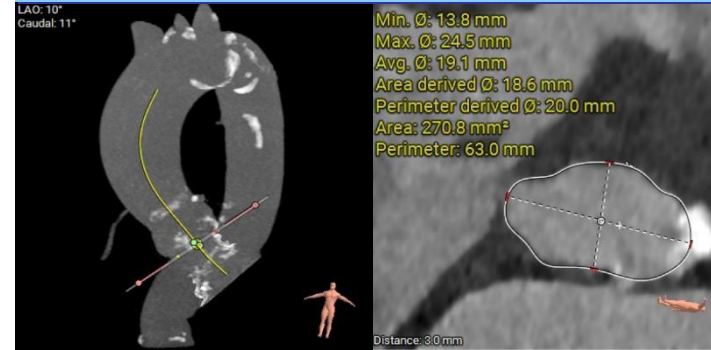
- I have nothing to disclose potential conflicts of interest

Anatomical Risk Stratification of Native AV Morphology

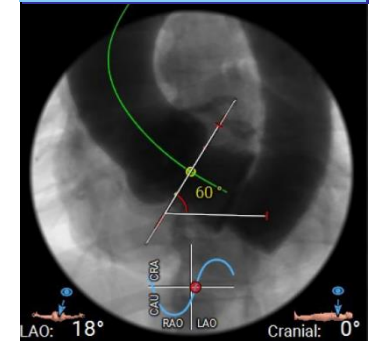
Bicuspid AV and Calcification



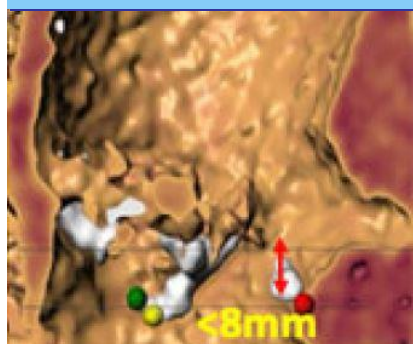
LVOT calcification



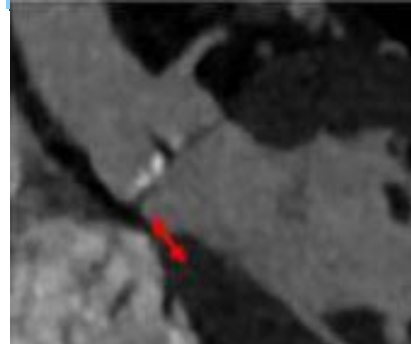
Horizontal aorta



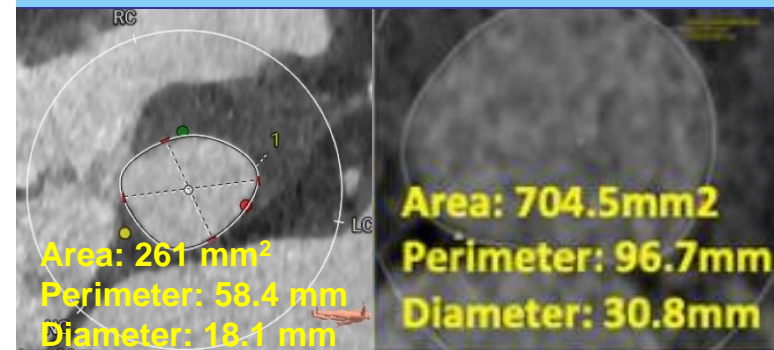
Low coronary height Narrow SOV



Short membranous septum



Too small or large annulus



Noncalcified AV

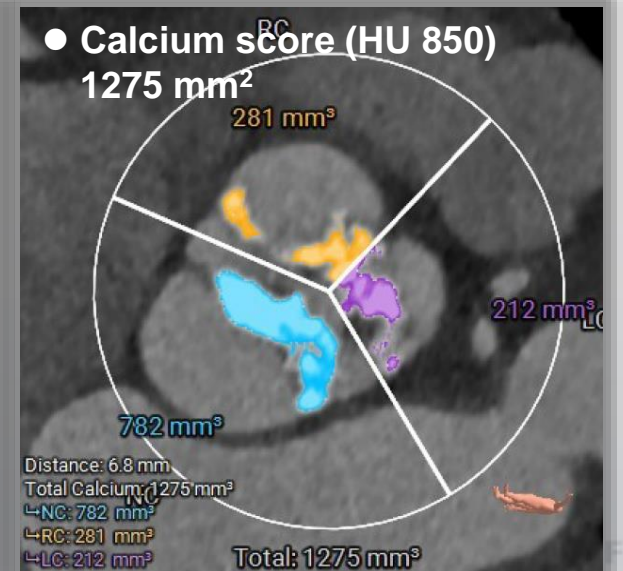
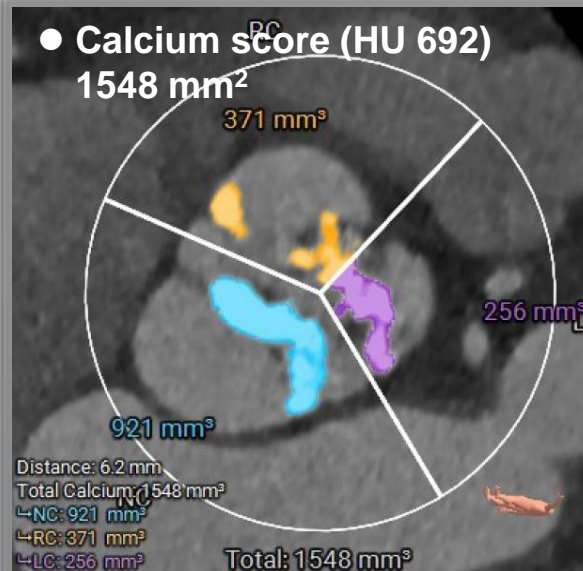
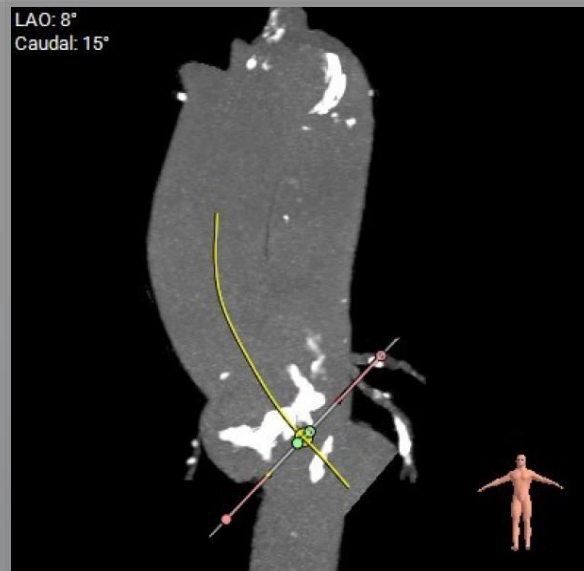
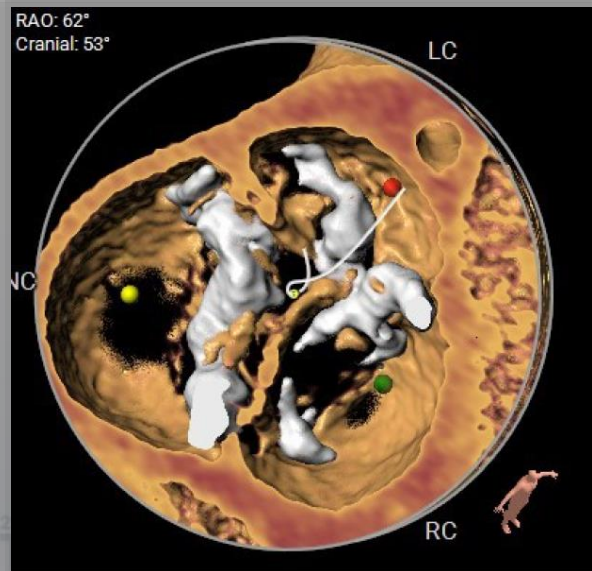
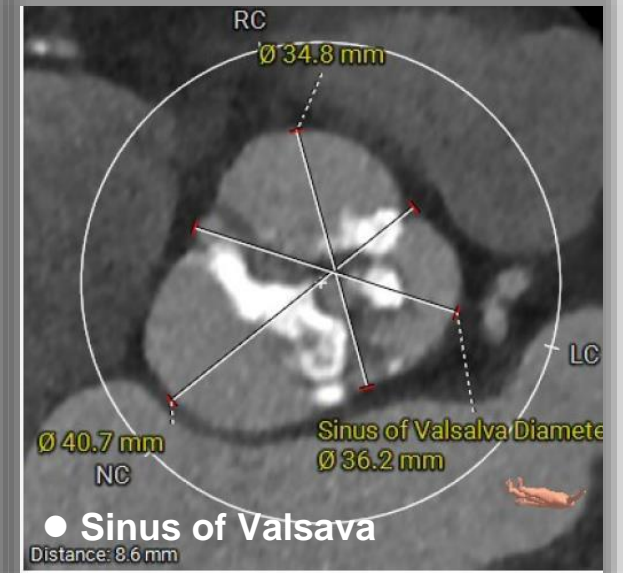
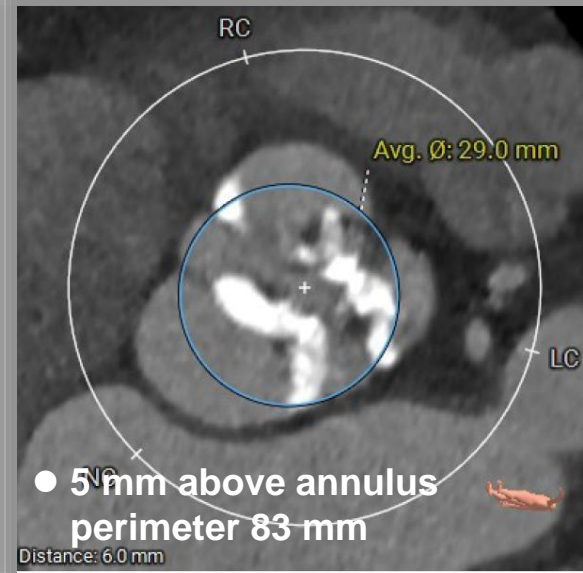
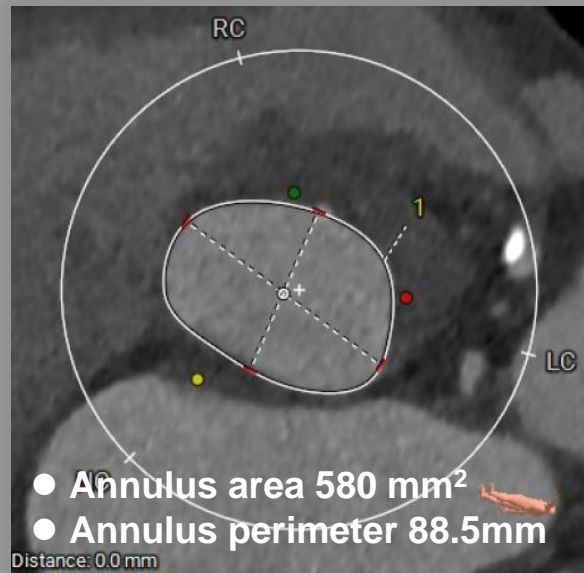
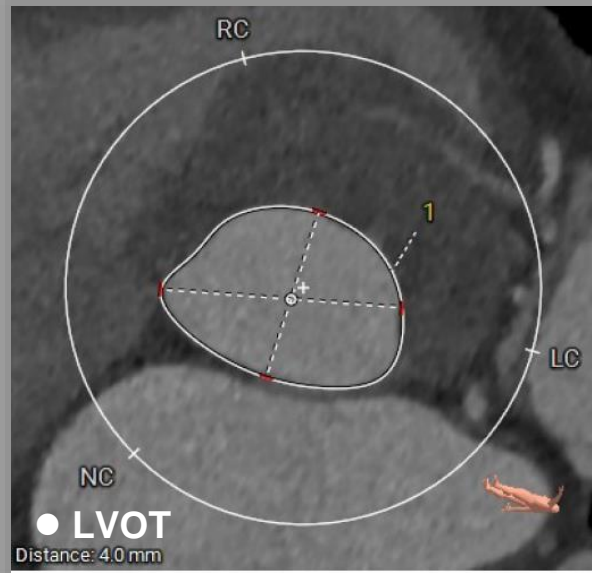


Case IA: BAV Type 1 (L-R) with Heavy Calcification

- 80 year old man
- DOE (NYHA Class II) for 6 months, syncope 10 days ago
- Severe degenerative AS (**high flow, high gradient**)
- Paroxysmal atrial fibrillation
- HFpEF
- Non-sustained VT on Holter
- STS score: 4.302%
- TTE

AVA (2D/Doppler)	Trans AV PG	Trans AV Vmax	AR	MR/TR	Pulmonary HTN	LVEF
??/0.57 cm ²	139/90 mmHg	5.72 m/s	Mild (I-II)	trivial	(-)	56%

Case IA: BAV Type 1 (L-R) with Heavy Calcification

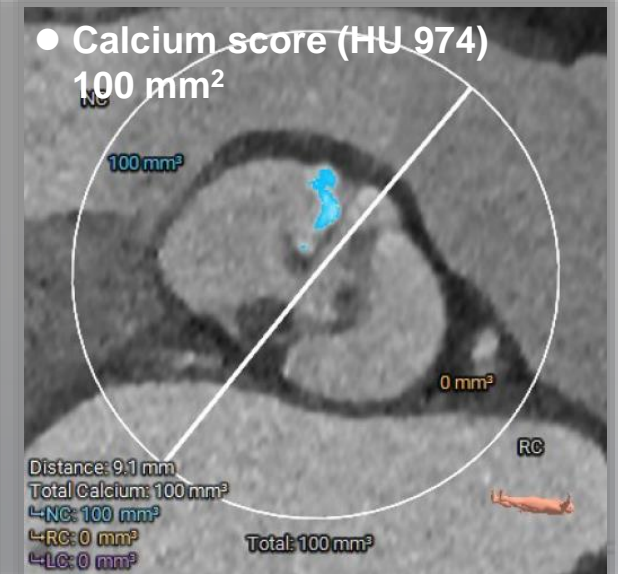
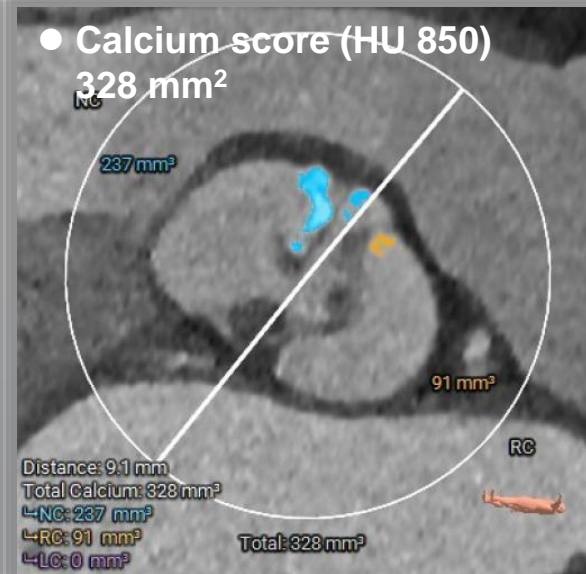
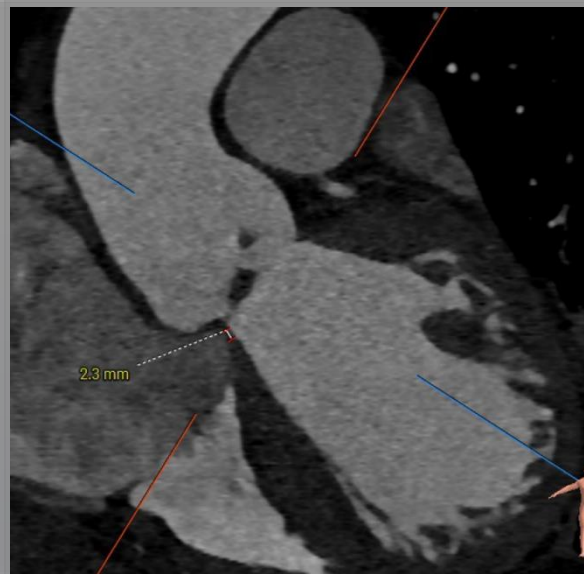
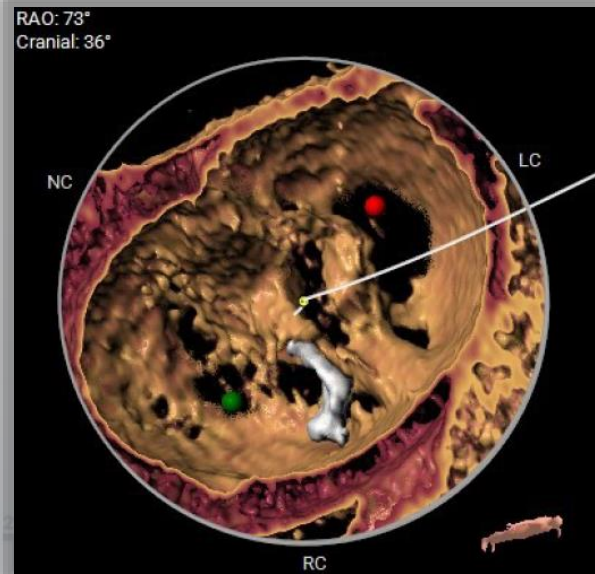
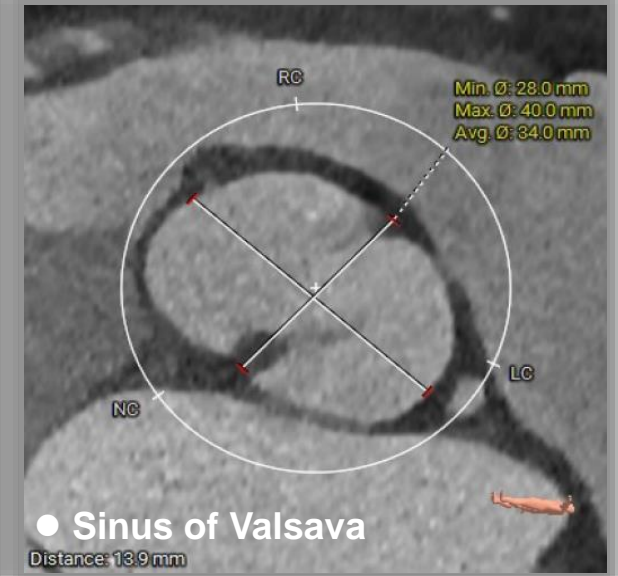
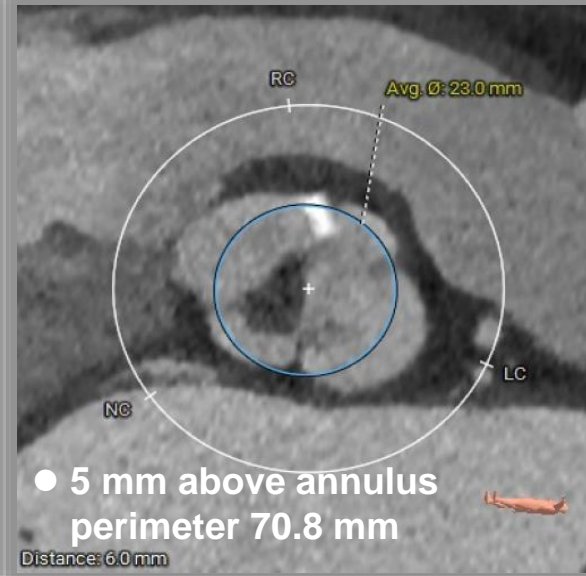
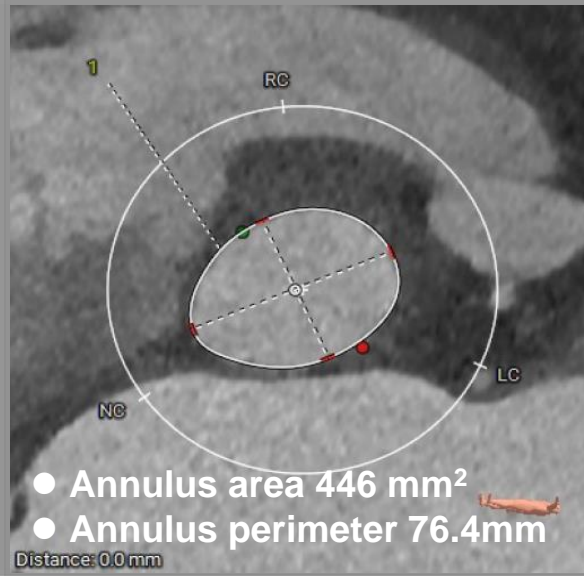
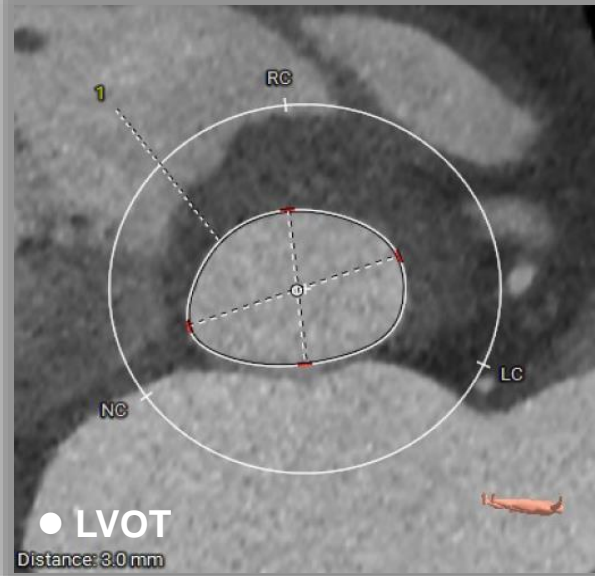


Case IB: BAV Type 0 with Mild Calcification

- 89 year old woman
- Worsening DOE (NYHA Class III-IV) since 2 months ago
- Severe degenerative AS (**classic low flow, low gradient**)
- HFrEF (LVEF 22%)
- Hypertension
- Diabetes on OHA
- STS score: 13.4%
- TTE

AVA (2D/Doppler)	Trans AV PG	Trans AV Vmax	AR	MR/TR	Pulmonary HTN	LVEF
0.84/0.60 cm ²	43/25 mmHg	3.3 m/s	Trivial	I-II/I	Moderate	22%

Case IB: BAV Type 0 with Mild Calcification

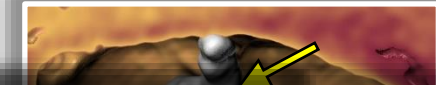


CT Morphological Features and Outcomes in BAV

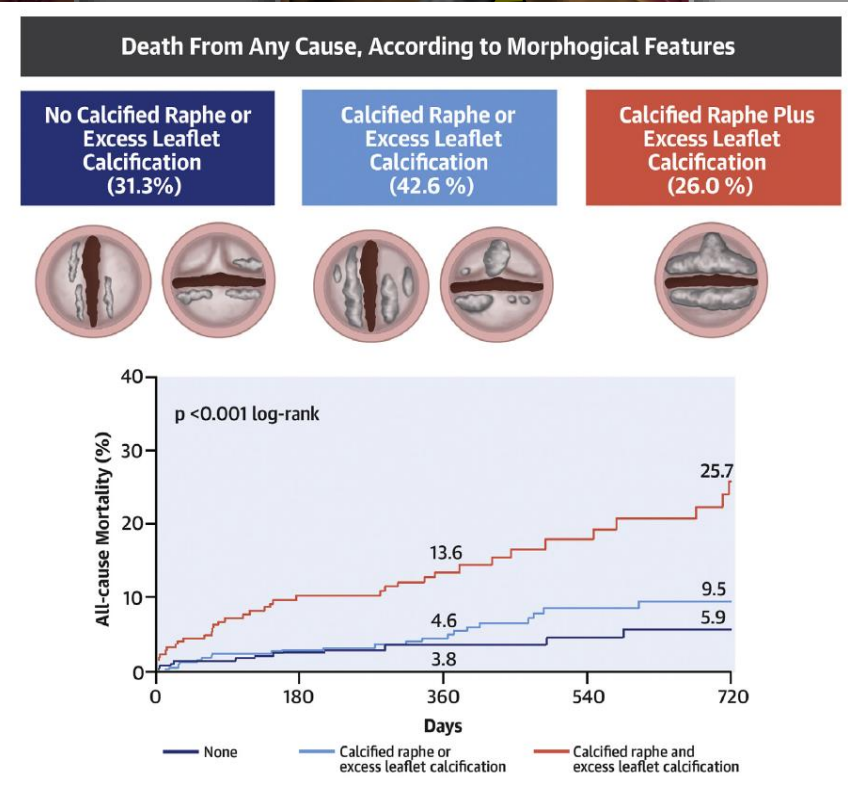
Low TAVR risk
Mild leaflet calcium
Raphe non-calcified

Intermediate TAVR risk
Excess leaflet calcium OR
Severely calcified raphe

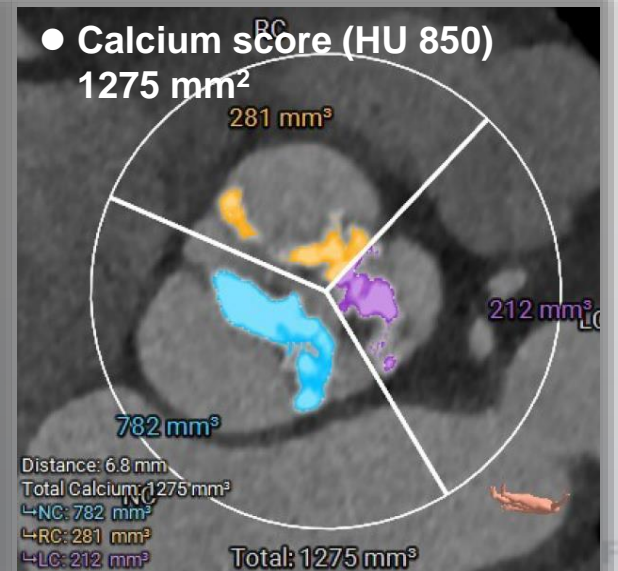
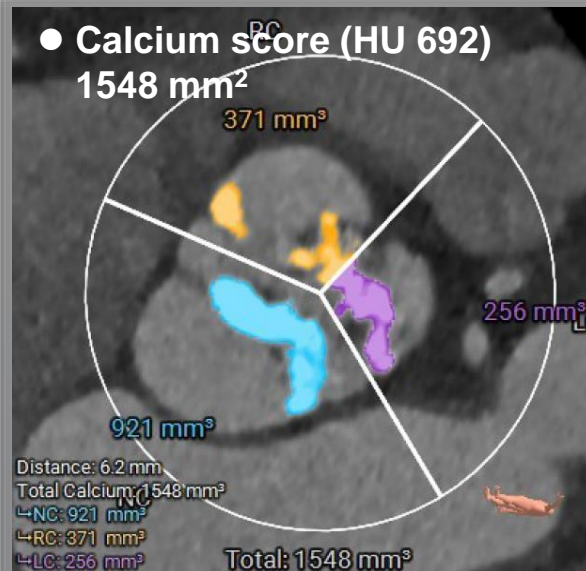
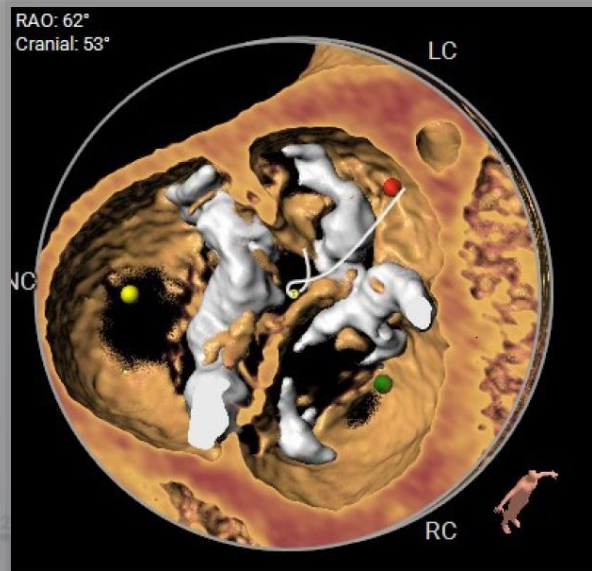
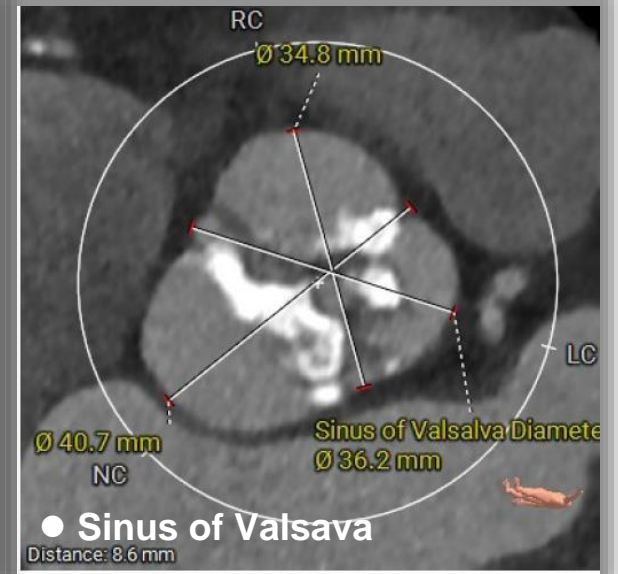
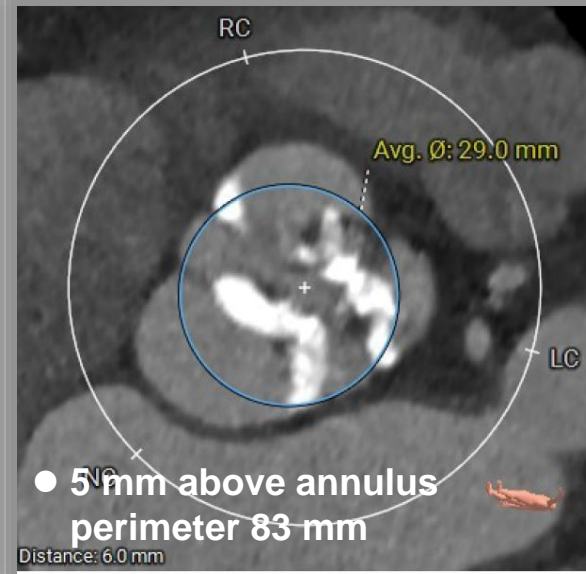
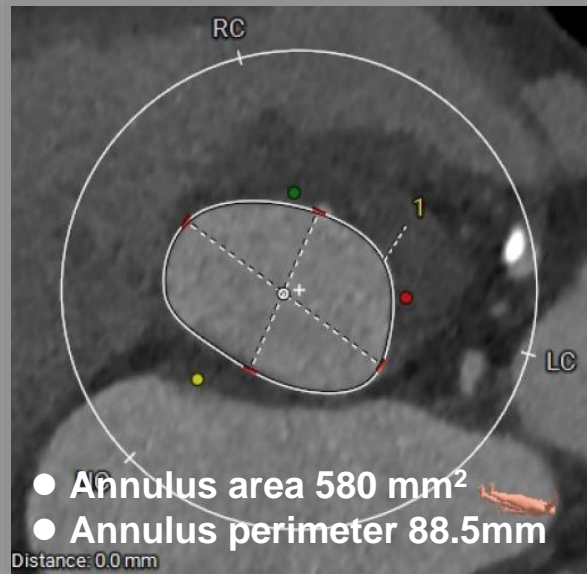
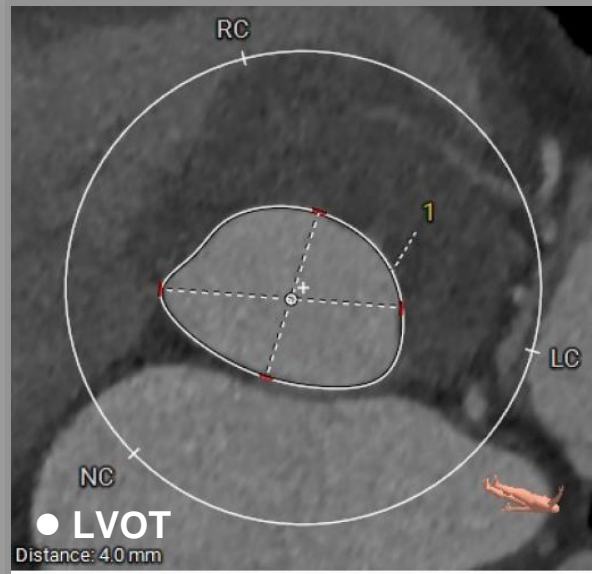
High TAVR risk
Excess leaflet calcium AND
Severely calcified raphe



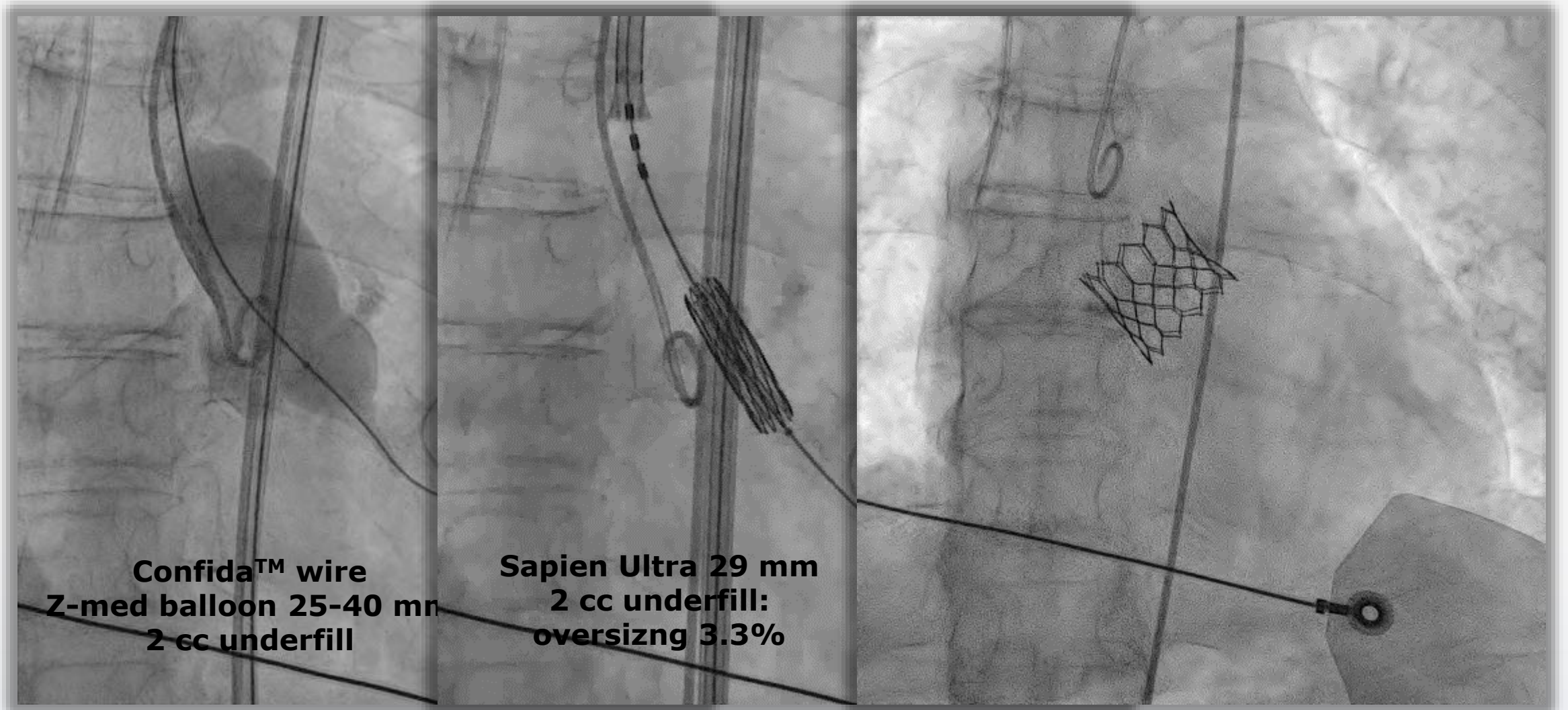
	Overall (N = 1,034)	None (n = 324)	Calcified Raphe or Excess Leaflet Calc (n = 441)
Procedural outcomes			
Conversion to surgery	9 (0.9)	1 (0.3)	2 (0.5)
Coronary obstruction	0 (0.0)	0 (0.0)	0 (0.0)
Aortic root injury	18 (1.7)	3 (0.9)	3 (0.7)
Implantation of second valve	14 (1.4)	4 (1.2)	3 (0.7)
Echocardiographic findings			
Aortic valve gradient, mm Hg	10.6 ± 5.0	10.8 ± 5.4	10.4 ± 4.3
Effective orifice area, cm ²	1.7 ± 0.5	1.7 ± 0.4	1.7 ± 0.5
LVEF, %	56.3 ± 14.0	59.0 ± 13.3	55.3 ± 14.1
Paravalvular regurgitation ≥mild*	291 (28.6)	63 (19.8)	130 (29.7)
Paravalvular regurgitation ≥moderate*	33 (3.2)	5 (1.6)	11 (2.5)



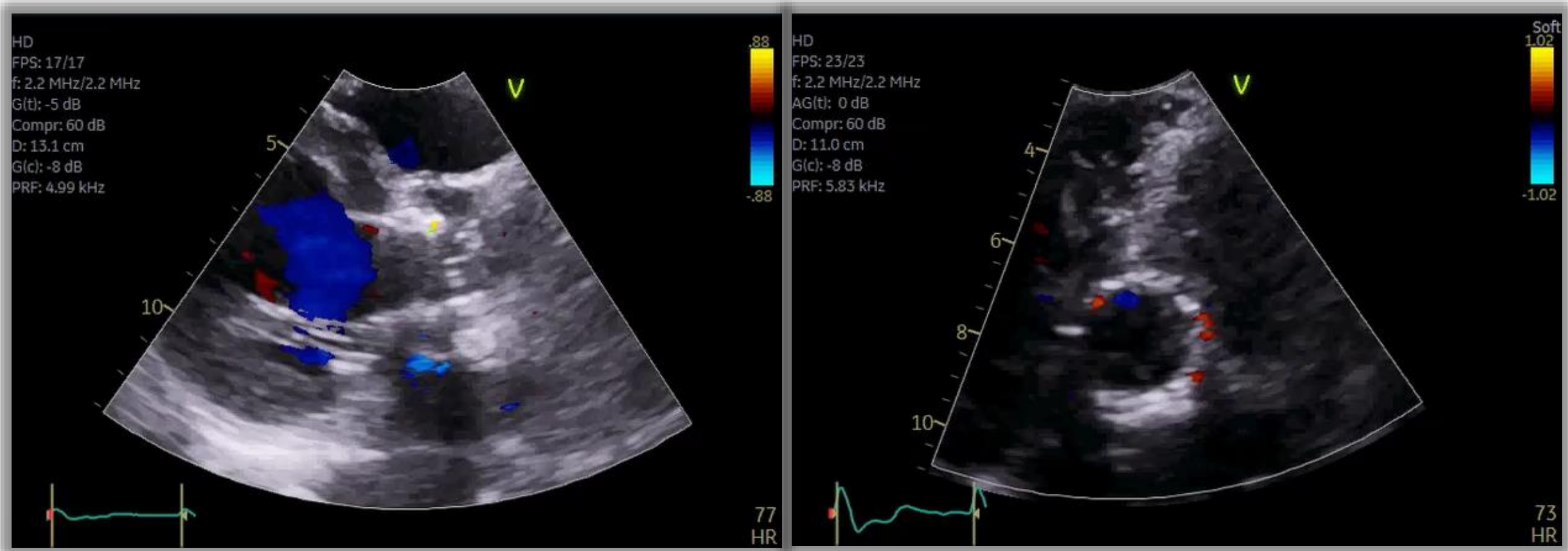
Case IA: BAV Type 1 (L-R) with Heavy Calcification



Case IA: Successful TF-TAVR with S3 Ultra 29 mm



Case IA: Successful TF-TAVR with S3 Ultra 29 mm



AVA (2D/Doppler)	Trans THV PG	Trans THV Vmax	PAR	MR/TR	Pulmonary HTN	LVEF
-/2.33 cm ²	20.7/11.7 mmHg	2.3 m/s	Mild (I-II)	I/Trivial	(-)	59%

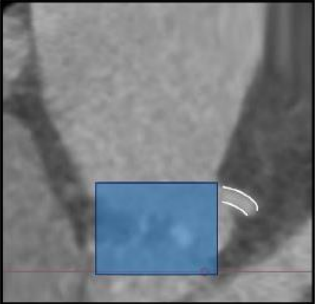
Case II: Low Coronary Height, Narrow SOV, Longer Leaflet

- 81 year old man
- Worsening DOE (NYHA Class III) since 2 months ago, presyncope 20 days ago
- Severe degenerative AS (**high flow, high gradient**)
- HFpEF
- Hypertension
- Diabetes on insulin
- STS score: 3.099%
- TTE

AVA (2D/Doppler)	Trans AV PG	Trans AV Vmax	AR	MR/TR	Pulmonary HTN	LVEF
0.72/0.58 cm ²	154/103 mmHg	6.20 m/s	Mild (I)	trivial	Borderline	61%

Coronary Obstruction with TAVR in Native AS

Direct Obstruction



Stretched vessel view

Displaced leaflet **obstructing** coronary ostium

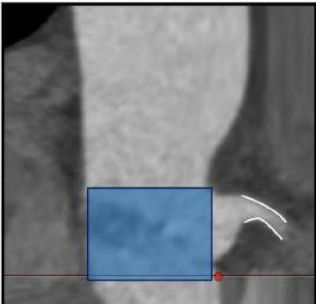
Level of coronary ostium

Displaced leaflet **not** obstructing coronary ostium

Level of STJ

Displaced leaflet **not** sequestering sinotubular junction

Indirect Obstruction



Displaced leaflet **not** obstructing coronary ostium

Level of STJ

Displaced leaflet **sequestering** sinotubular junction

Low LCA height (<12 mm) 3

Shallow SOV (< 30 mm) 4

VTC (< 3 mm)

Low and narrow ST junction

○ **THV**

○ **Native aortic root**

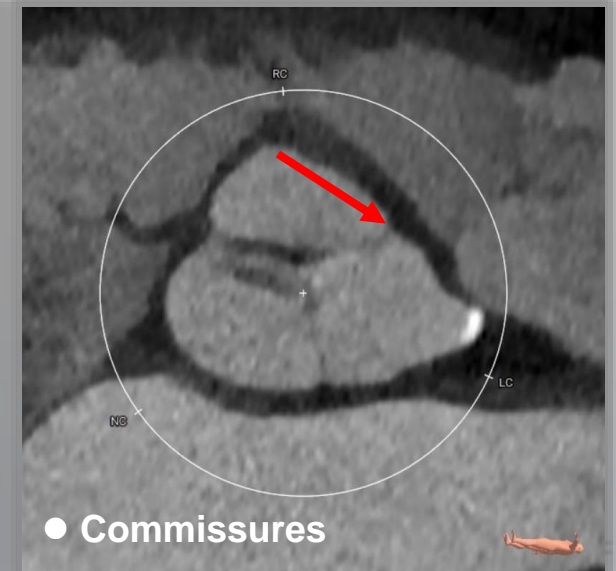
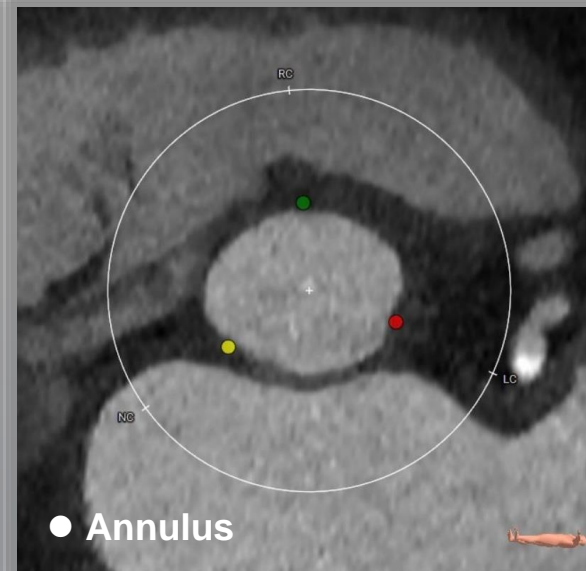
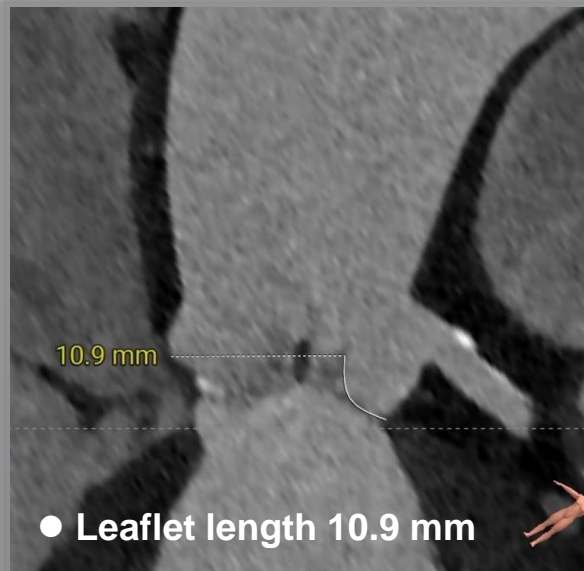
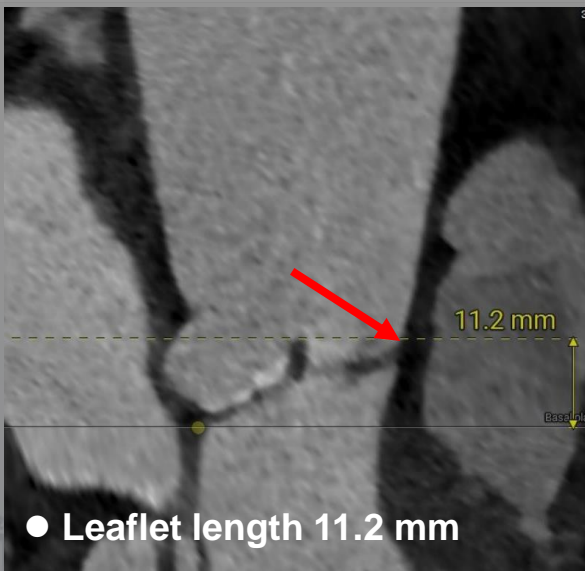
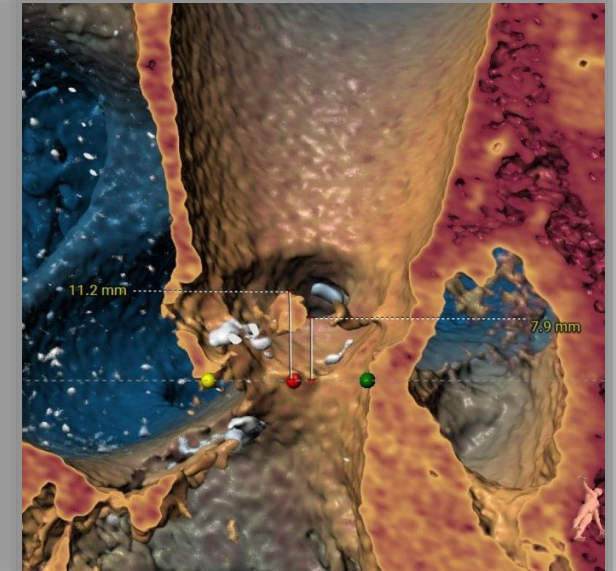
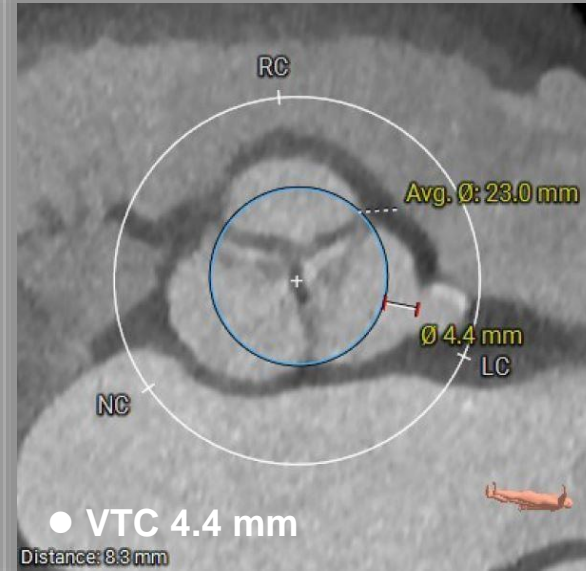
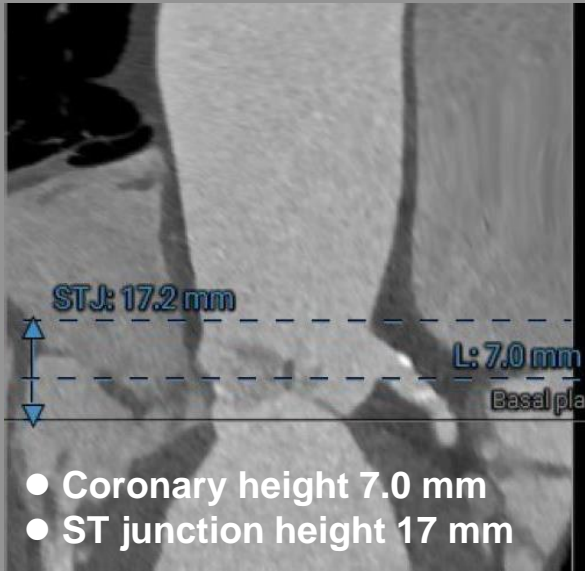
New multivariate prediction model for direct obstruction

Optimal Thresholds - Poor Sensitivity and Specificity							
Left	Thresh	Sens	Spec	Right	Thresh	Sens	Spec
Height	11 mm	0.58	0.79	Height	15 mm	1.00	0.51
SoV	31 mm	0.80	0.61	SoV	29mm	0.92	0.71
Residual SoV	5 mm	0.70	0.64	Residual SoV	5 mm	0.85	0.60

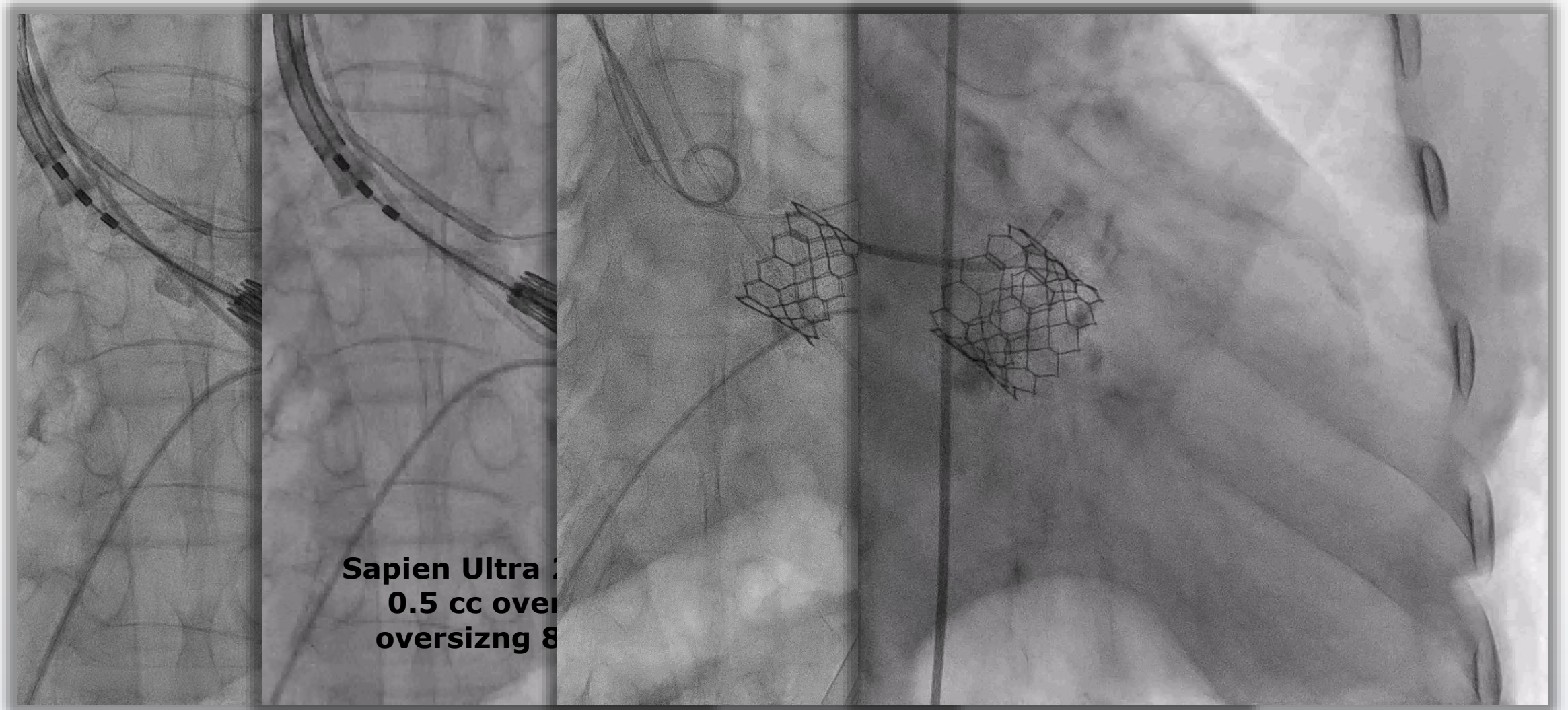
Novel Prediction Model Developed

Propensity matching	Obstruction	No obstruction
Age, sex, and annulus area	n = 60	n = 60
Optimal thresholds established	Cusp height > coronary height and VTC ≤ 4mm or Culprit leaflet calcium volume > 600mm ³	
Model: Obstruction IF		
Model validation and performance	Left AUC 0.93 (Sens 0.93; Spec 0.84)	Right AUC 0.94 (Sens 0.92; Spec 0.96)

Case II: Low Coronary Height, Narrow SOV, Longer Leaflet



Case II: Successful TF-TAVR with S3 Ultra 23 mm



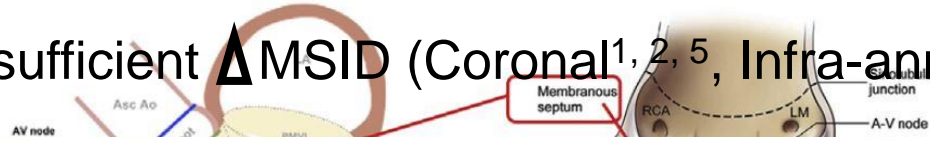
Case III: Short Membranous Septum

- 75 year old woman
- Worsening DOE (NYHA Class III) since 1 month ago, generalized edema
- Severe degenerative AS (**classic low flow, low gradient**)
- HFrEF (LVEF 32%)
- s/p Coronary stenting at RCA
- Diabetes on OHA, Hypertension, CKD on hemodialysis, Liver cirrhosis (Child-Pugh B)
- STS score (AVR): 15.03%
- TTE

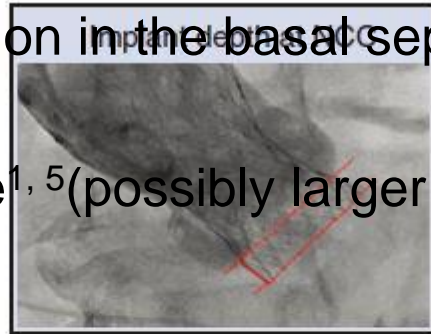
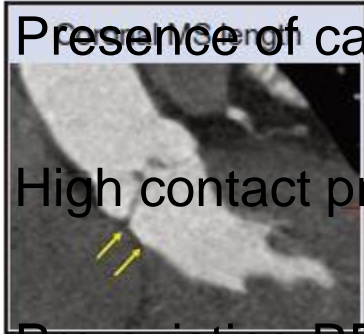
AVA (2D/Doppler)	Trans AV PG	Trans AV Vmax	AR	MR/TR	Pulmonary HTN	LVEF
0.70/0.76 cm ²	43/25 mmHg	3.29 m/s	Mild (I)	Mod/Mild	Severe	32%

Risk of Conduction Disturbance

- Short MS length (Coronal^{1, 2}, Infra-annular³)
- Insufficient Δ MSID (Coronal^{1, 2, 5}, Infra-annular^{3, 5})

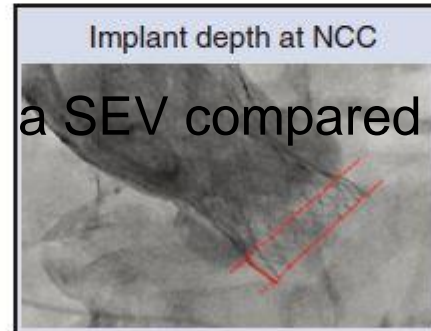
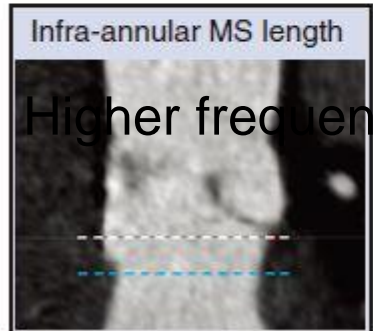


- Presence of calcification in the basal septum¹ and NCC-DLZ²



- High contact pressure^{1, 5} (possibly larger THV, higher oversizing, post balloon)

- Pre-existing RBBB^{2, 3}

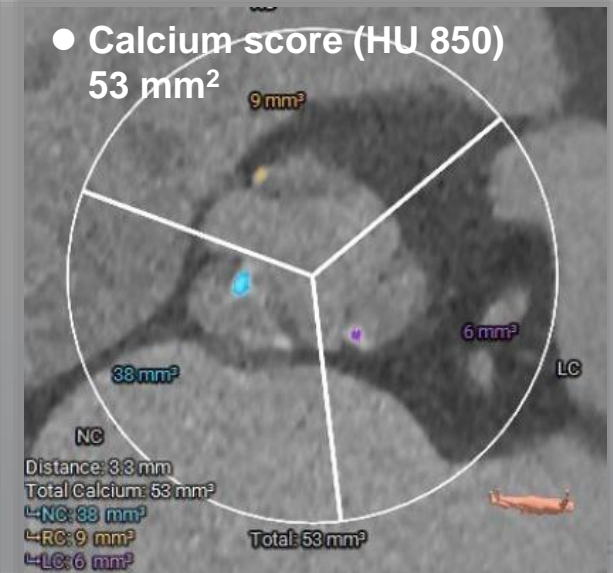
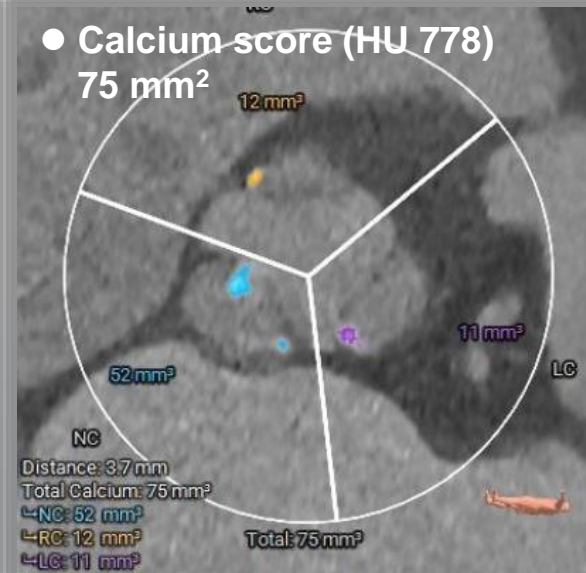
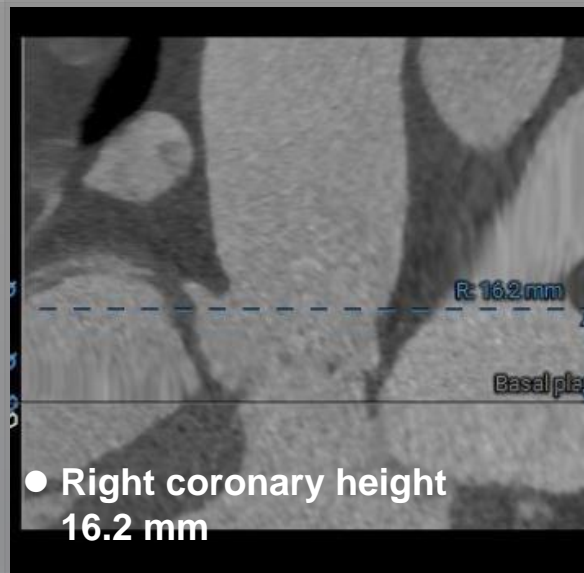
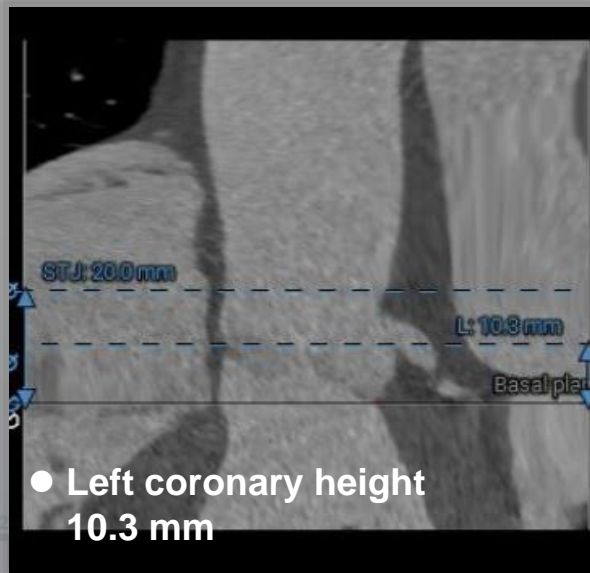
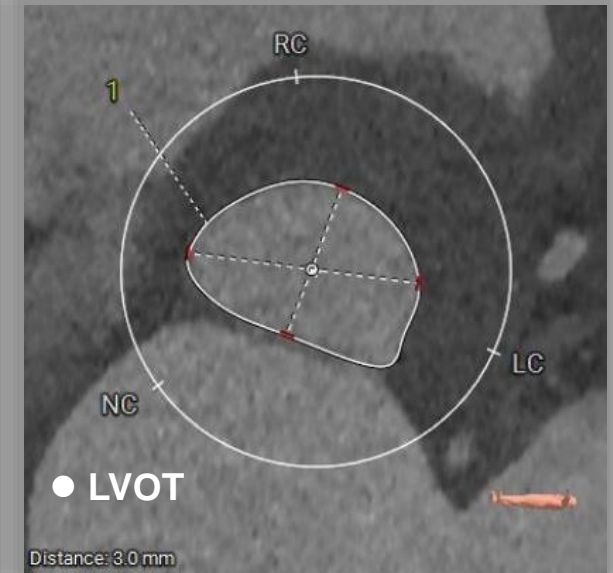
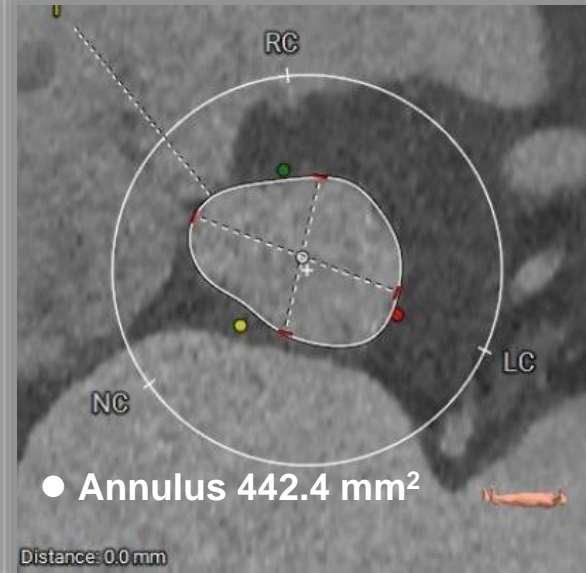
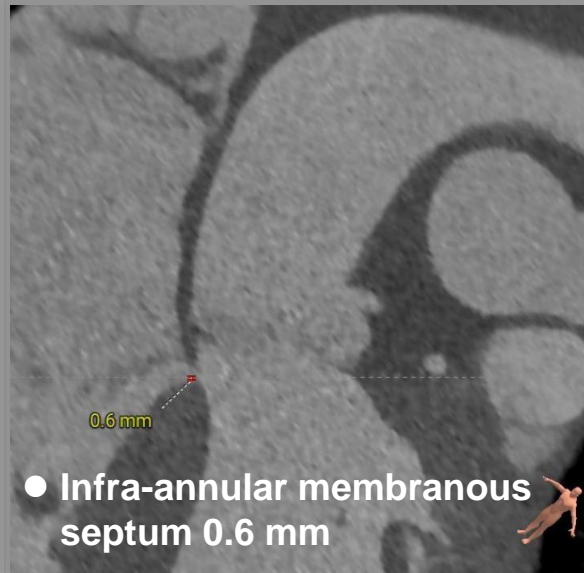
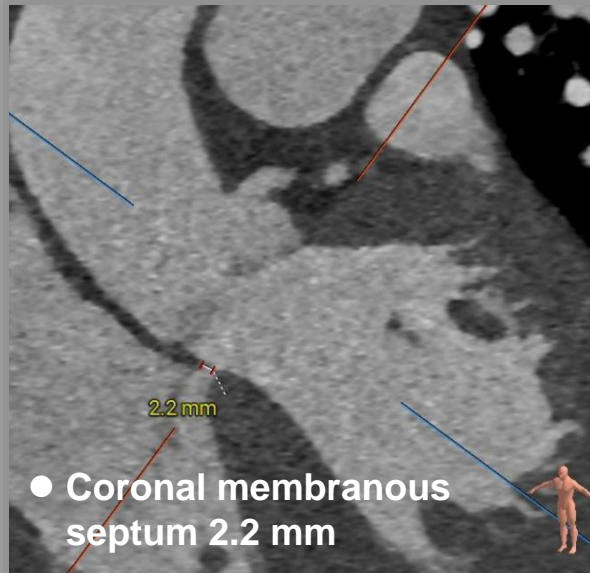


- Higher frequency with a SEV compared to the BEV

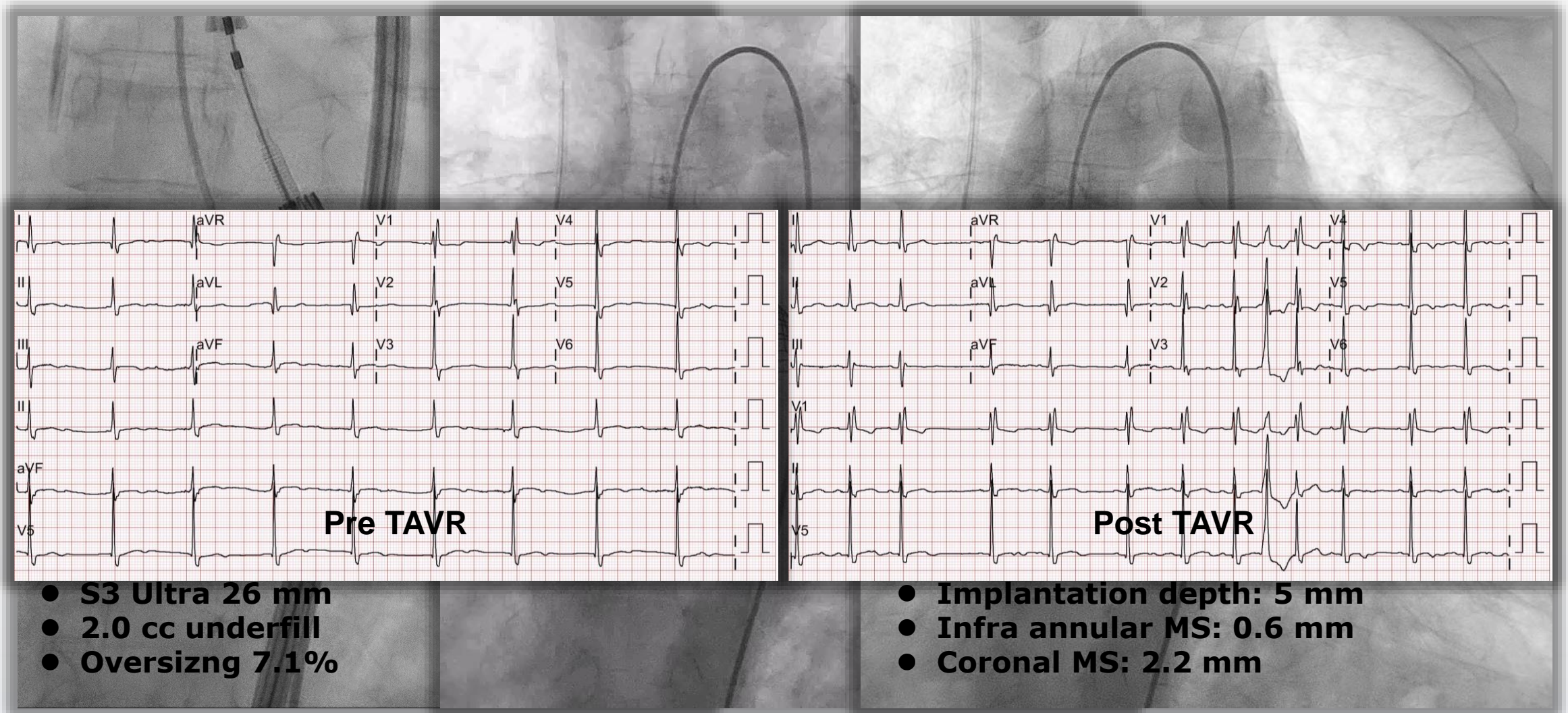
minus = Δ Infra-annular MSID

- # MS: Membranous septum
- # Δ MSID: Difference between MS length and implantation depth
- # NCC: Non coronary cusp
- # DLZ: Device landing zone
- # THV: Transcatheter heart valve
- # RBBB: Right bundle branch block
- # SEV: Self expandable valve
- # BEV: Balloon expandable valve

Case III: Short Membranous Septum

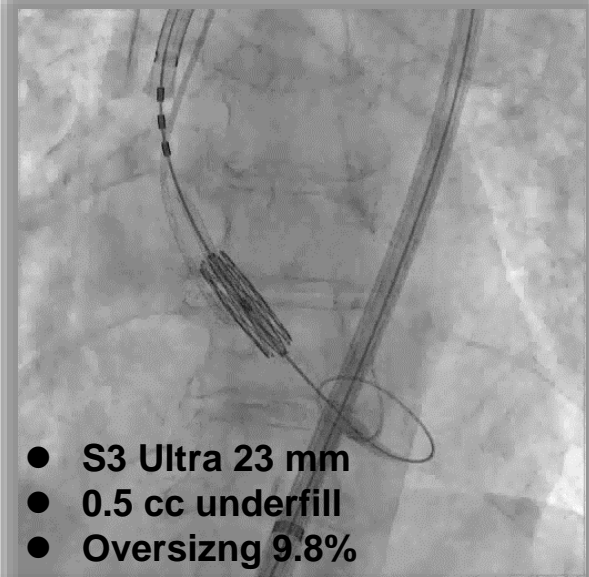
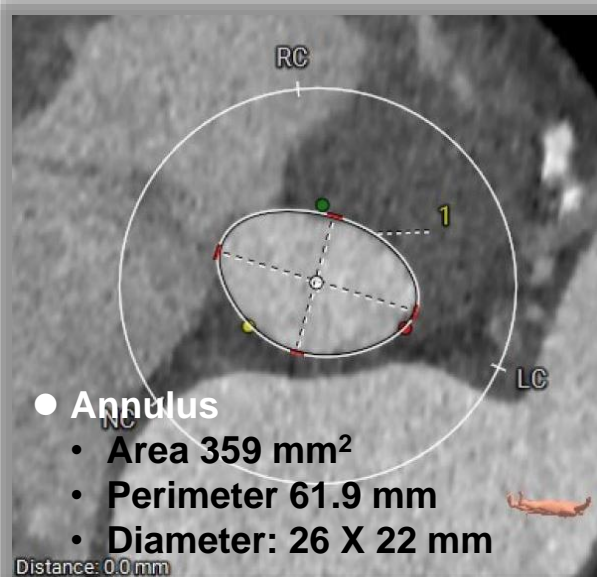


Case II: Successful TF-TAVR with S3 Ultra 26 mm

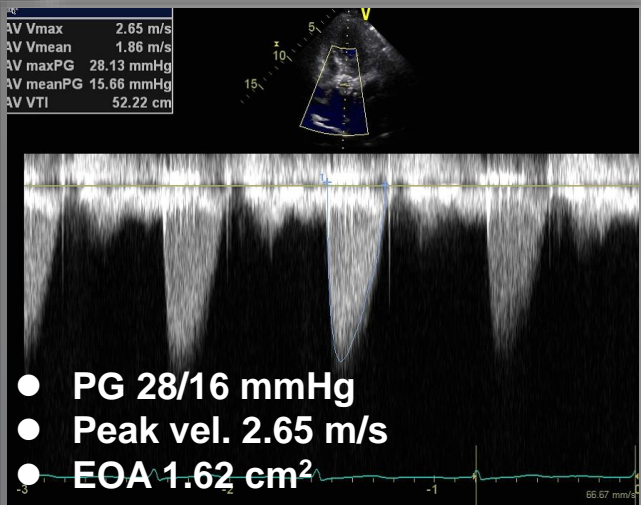
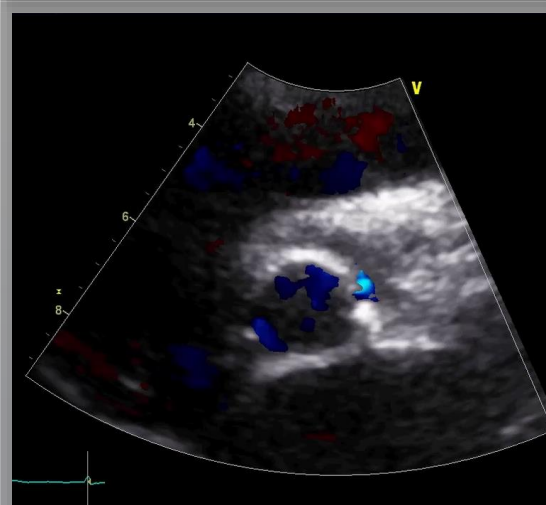
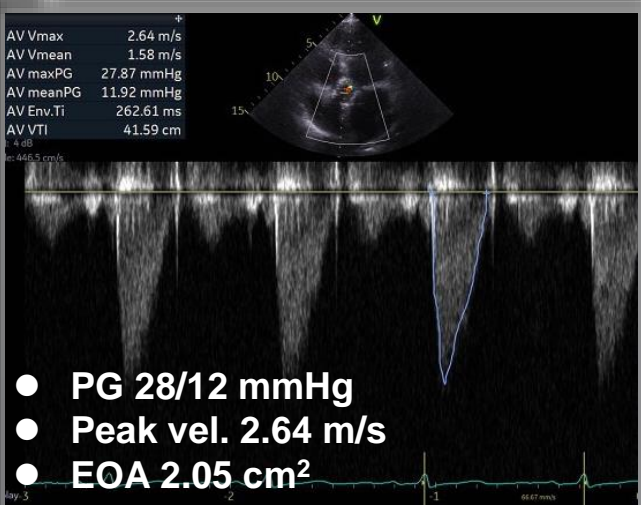
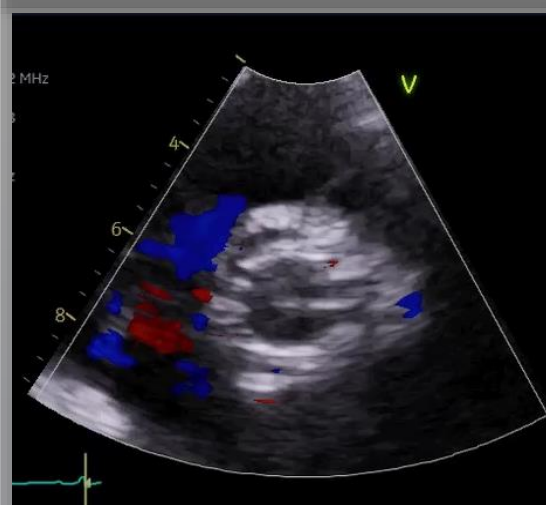
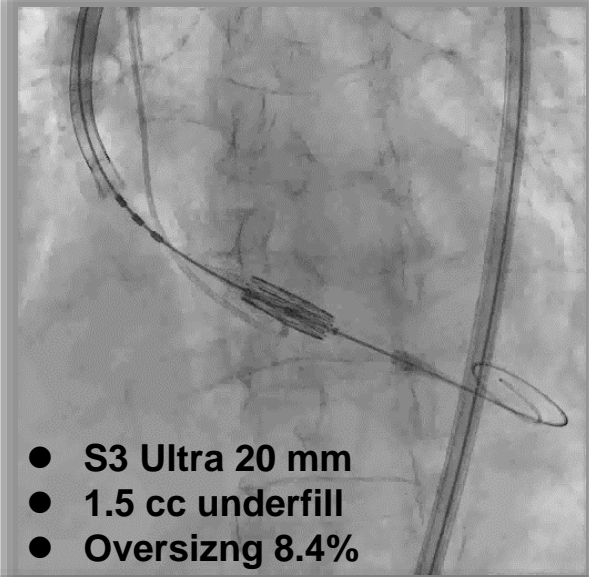
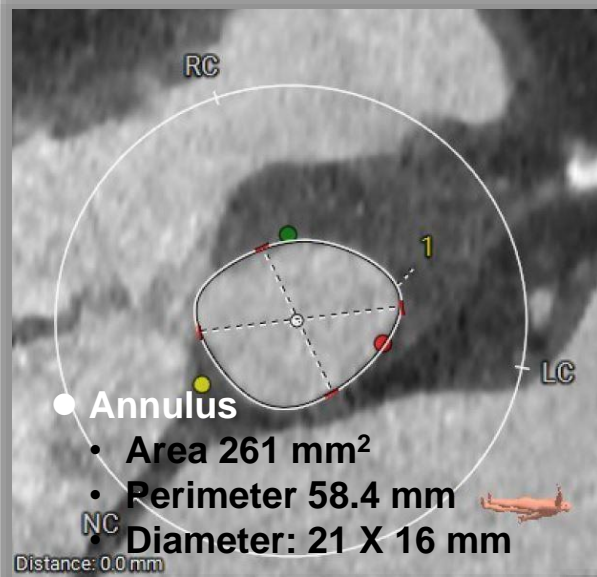


Case IV: Small Annuli

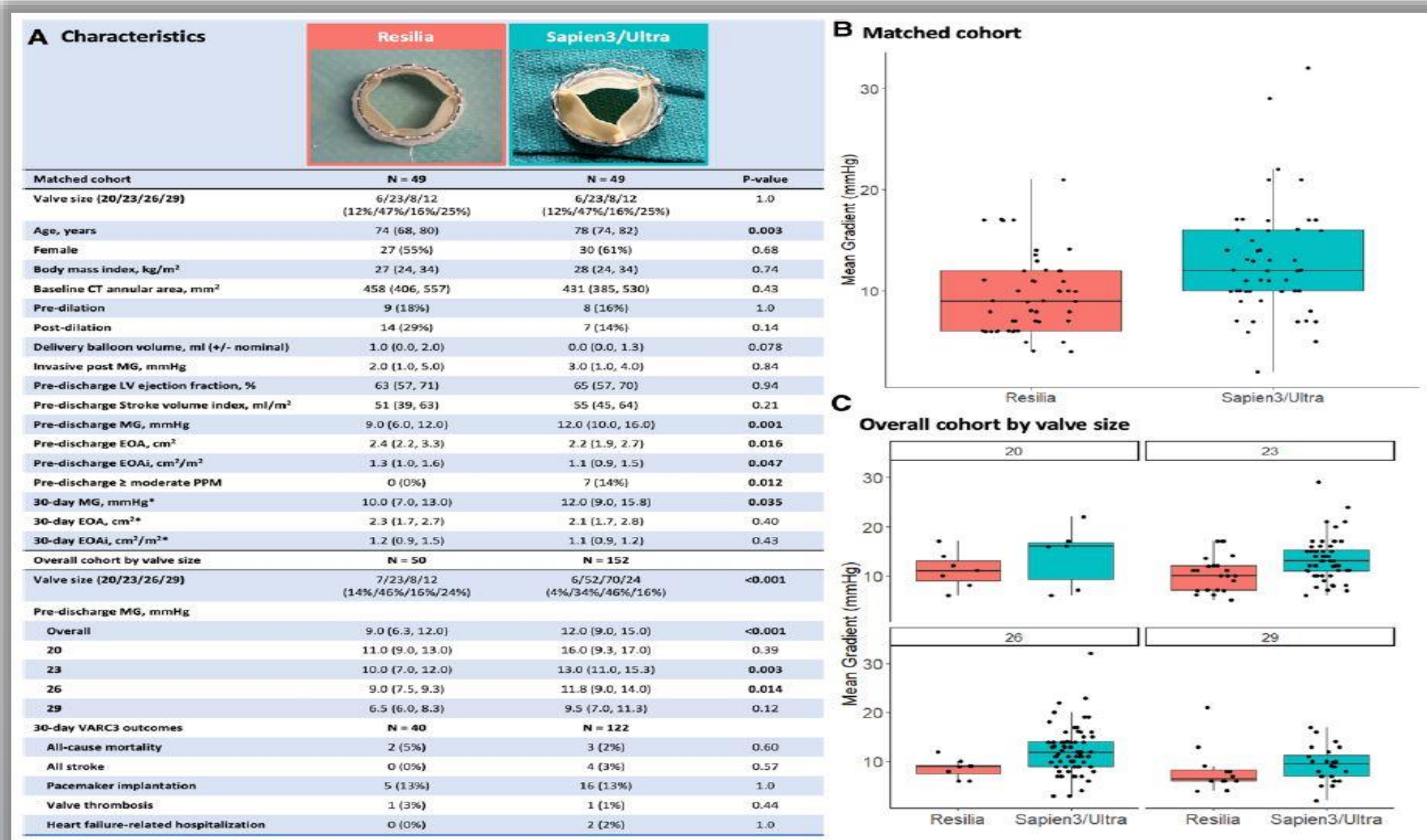
- 82/F, Ht. 148 cm, Wt. 45 kg, **BSA 1.36 m²**)



- 88/F, Ht. 145 cm, Wt. 45 kg, **BSA 1.35 m²**)



Hemodynamic Comparison of Resilia and Sapien 3/Ultra THV



Conclusions

- Preprocedural CT can reveal anatomical high-risk features that predict multiple (avoidable) complications
 - Aortic root injuries with high TAVR risk BAV
 - Coronary compromise
 - Conduction disturbances
 - Small or large annuli
 - Aortic/leaflet complex injury etc.
- Sapien 3 platform (incl. Resilia) with help of CT can handle complex TAVR cases minimizing periprocedural complications.