29th TCTAP2024

TAV-in-TAV: Planning and Optimizing the Procedure

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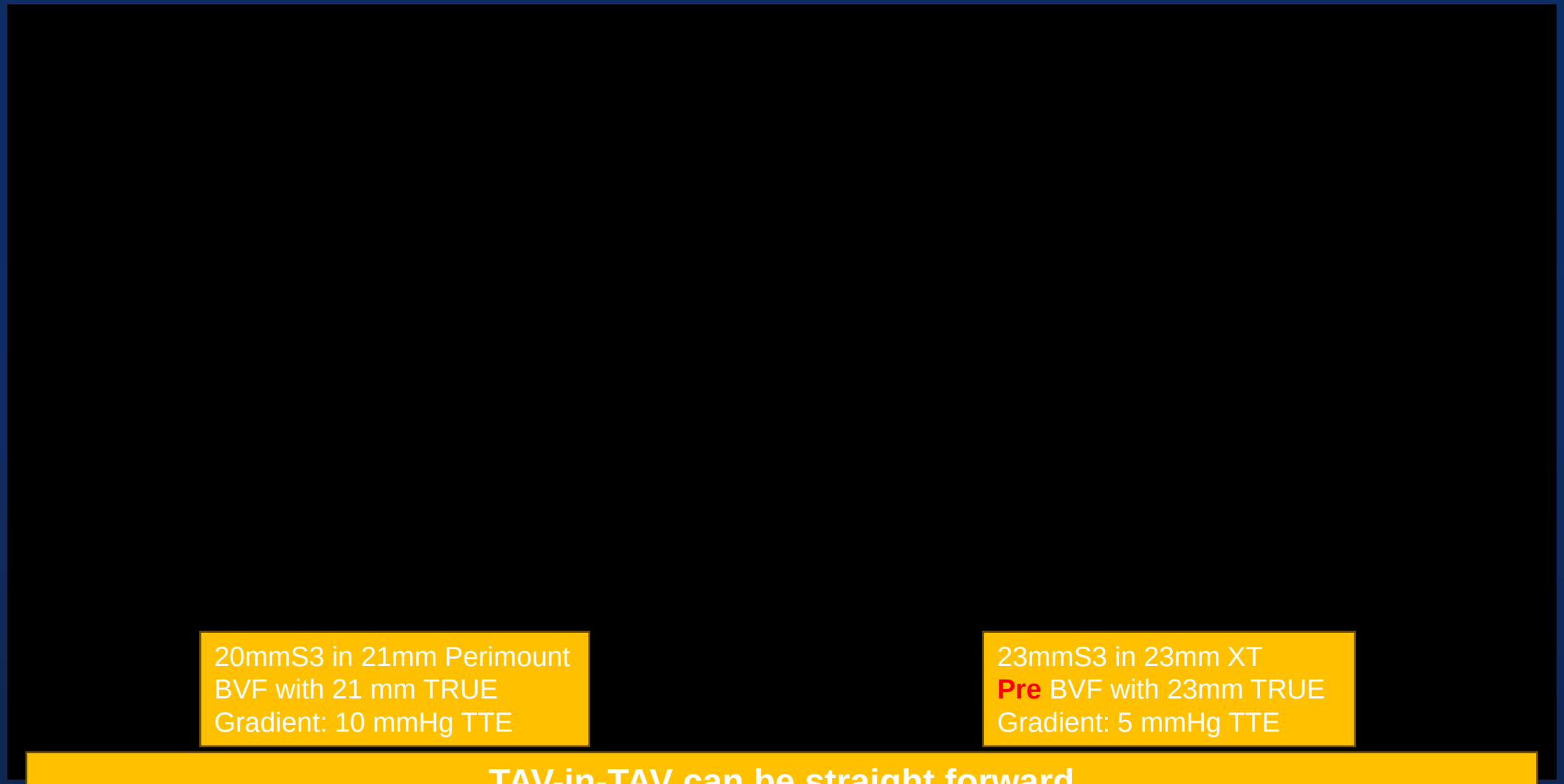
CVRF

Disclosure

- In the past 12 months, I and/or my spouse, have received the following:

• Relevant conflict to this presentation	Company
• Consulting fee/Proctoring fee	Edwards LifeSciences, Abbott, Anteris

TAV-in-TAV vs. TAV-in-SAV: so what's so different?



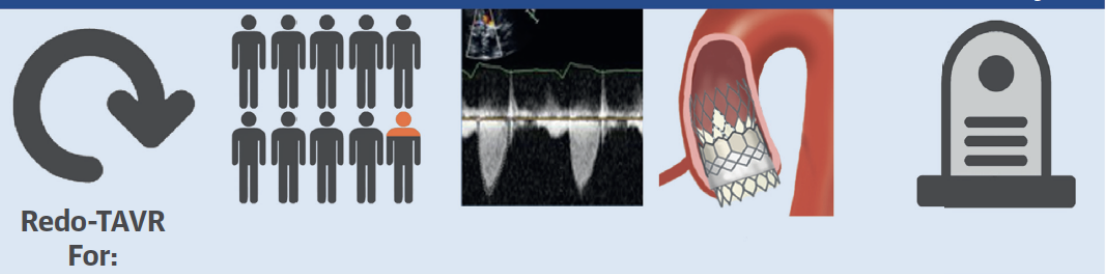
20mmS3 in 21mm Perimount
BVF with 21 mm TRUE
Gradient: 10 mmHg TTE

23mmS3 in 23mm XT
Pre BVF with 23mm TRUE
Gradient: 5 mmHg TTE

TAV-in-TAV can be straight forward

Registry data of feasibility and safety in CAREFULLY selected patients

CENTRAL ILLUSTRATION Repeated Transcatheter Aortic Valve Replacement for Transcatheter Heart Valve Dysfunction



	Incidence	Residual Gradient	Coronary Flow Obstruction	Mortality at 30 days
Redo-TAVR For:				
Failed TAVR Valve	0.22%	13 mm Hg	0.7%	1.4%
Failed TAVR Procedure	0.11%	11.5 mm Hg	1.3%	5.4%

Landes, U. et al. J Am Coll Cardiol. 2020;75(16):1882-93.

Outcomes stratified for patients presented with probable TAVR failure and those with probable THV failure. TAVR = transcatheter aortic valve replacement; THV = transcatheter heart valve.

Circulation: Cardiovascular Interventions

ORIGINAL ARTICLE

Transcatheter Aortic Valve Replacement for Degenerated Transcatheter Aortic Valves

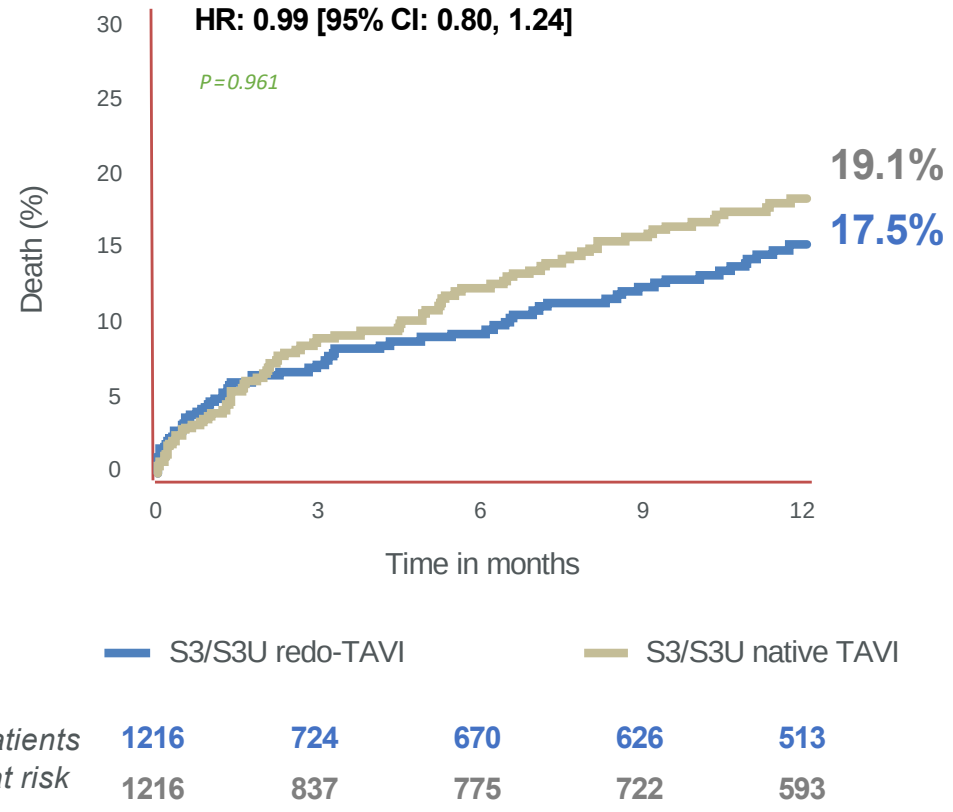
The TRANSIT International Project

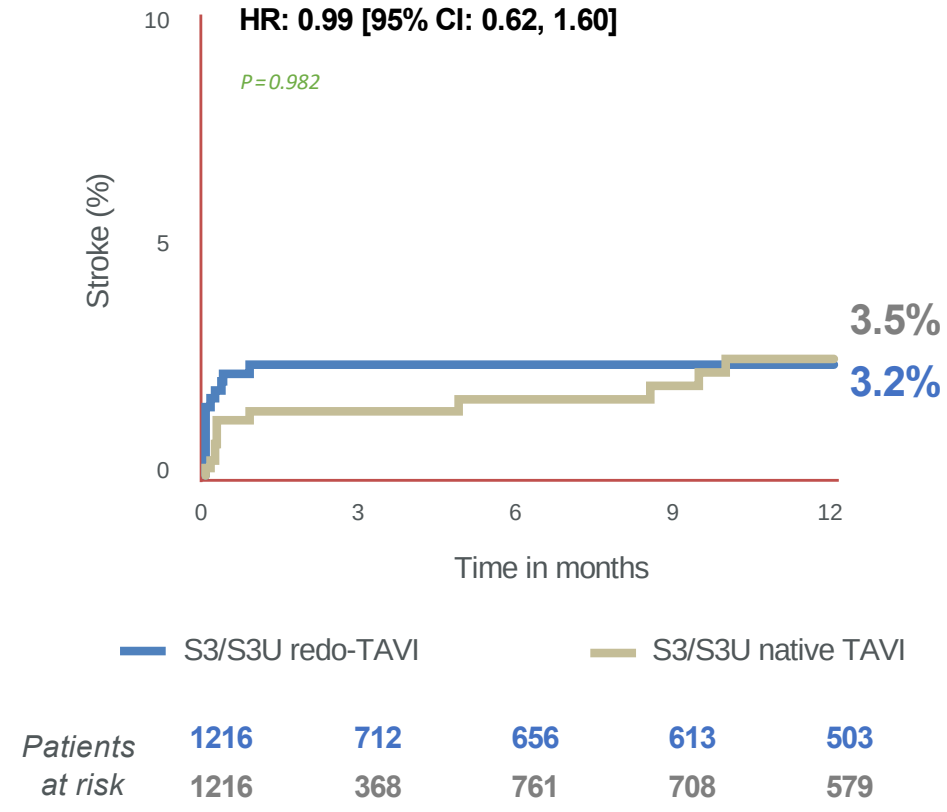
Luca Testa, MD, PhD; Mauro Agnifili, MD; Nicolas M. Van Mieghem, MD, PhD; Didier Tchétché, MD;

- TRANSIT
  - N=172 TAVI in TAVI
  - No coronary obstruction (!!)
- Caution:
  - Selection bias – how many cases rejected?
  - Case series only

TVT registry on TAV-in-TAV with S3U in TAVI

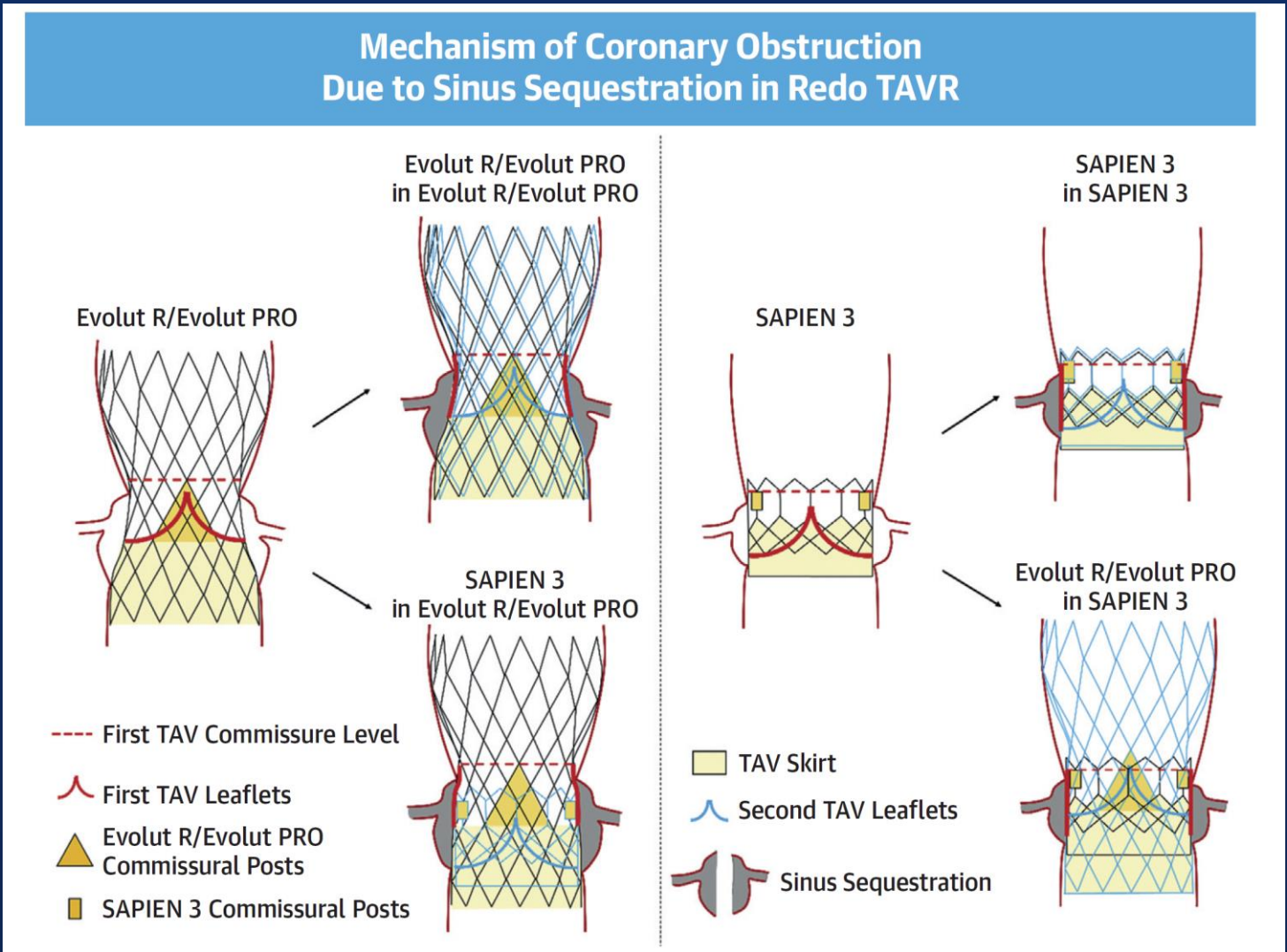
Primary endpoints of death and stroke for SAPIEN 3 platform[1]





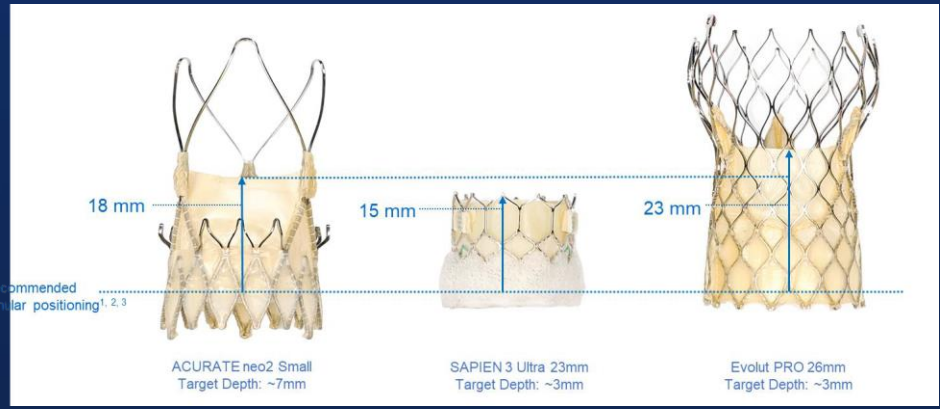
Makkar, R et al. Lancet 2023

TAV-in-TAV: coronary obstruction risk!



- Placement of a THV within a THV will render the 1st THV a **stent graft**, pinning down the original leaflets

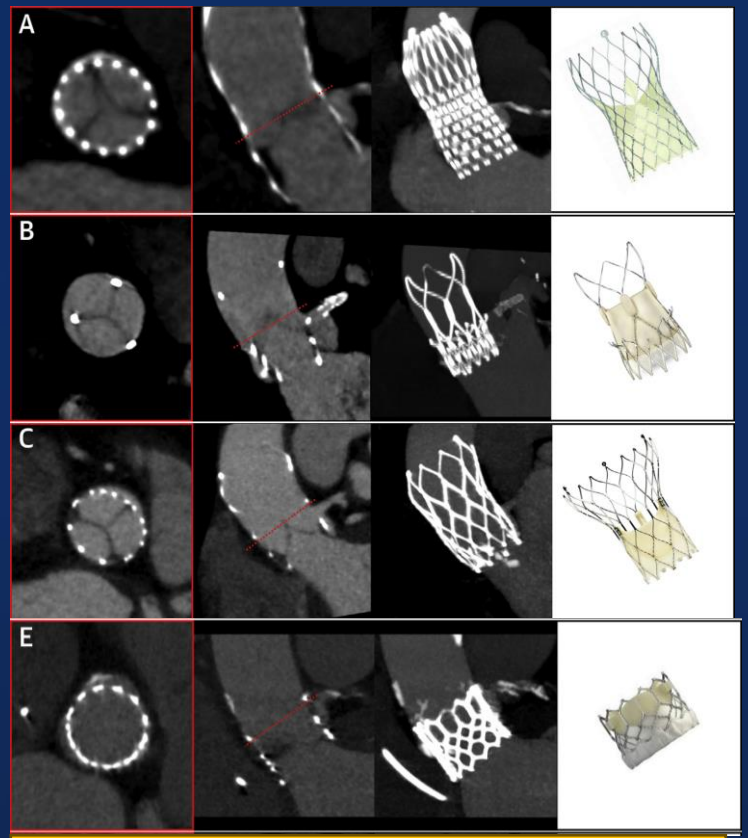
- **Neoskirt concept**



Ochiai T et al. Risk of Coronary Obstruction Due to Sinus Sequestration in Redo Transcatheter Aortic Valve Replacement JACC Intv 2020;13:2617-27

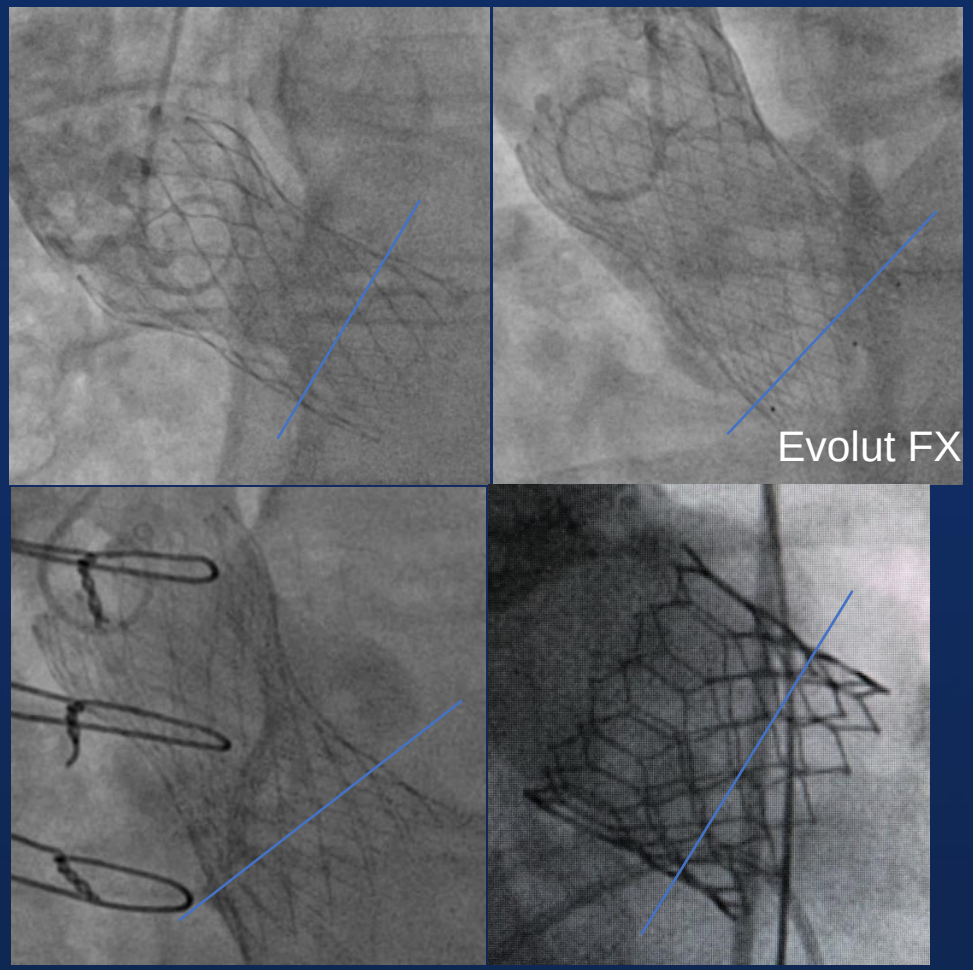
TAV-in-TAV: unique challenge – heterogeneity

Heterogeneity in design



Leaflet height
Commissural alignment

Variable implant depth



Variable expansion

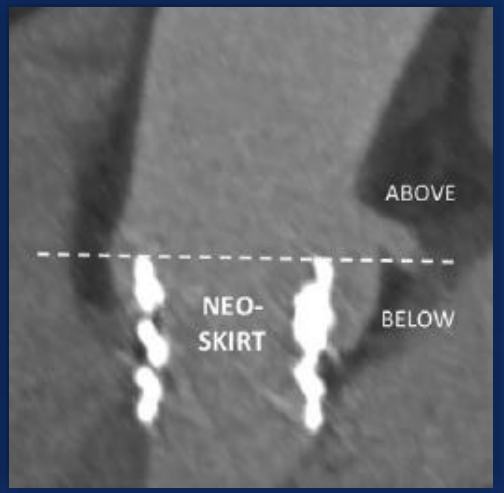
True ID 18.5 to 22mm

True ID 21 to 25mm

Buzzatti, N, Latib A. JACC Imaging 2020
Aortic valve in valve app – Prof Bapat

Index TAVI – Edwards Sapien platform

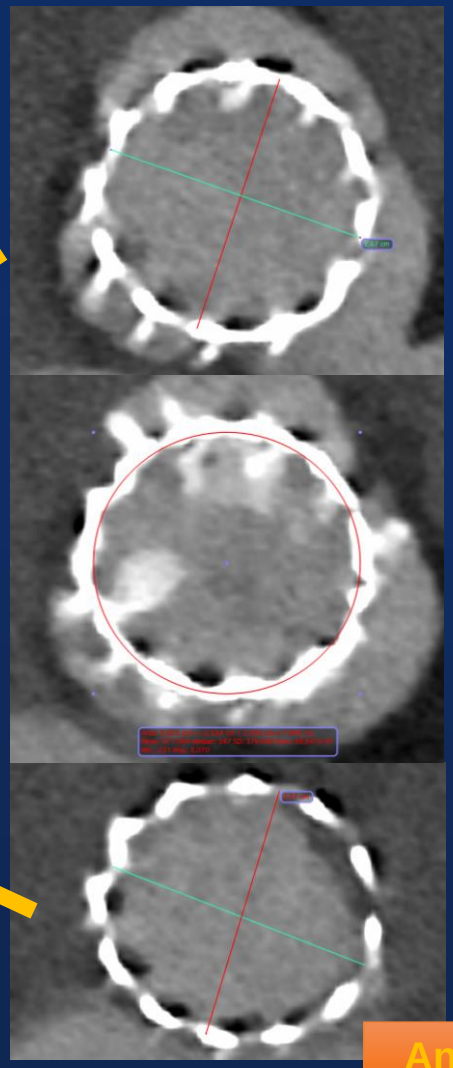
- Short frame, intra-annular
- Leaflets/neoskirt at the commissure tabs
- Due to its design, leaflets or neoskirt plane MAY not extend above STJ/coronary ostia
- Fundamentally lower risk of coronary obstruction ”by design”



A case example – 5 year old underfilled 29mmS3

An under-expanded THV

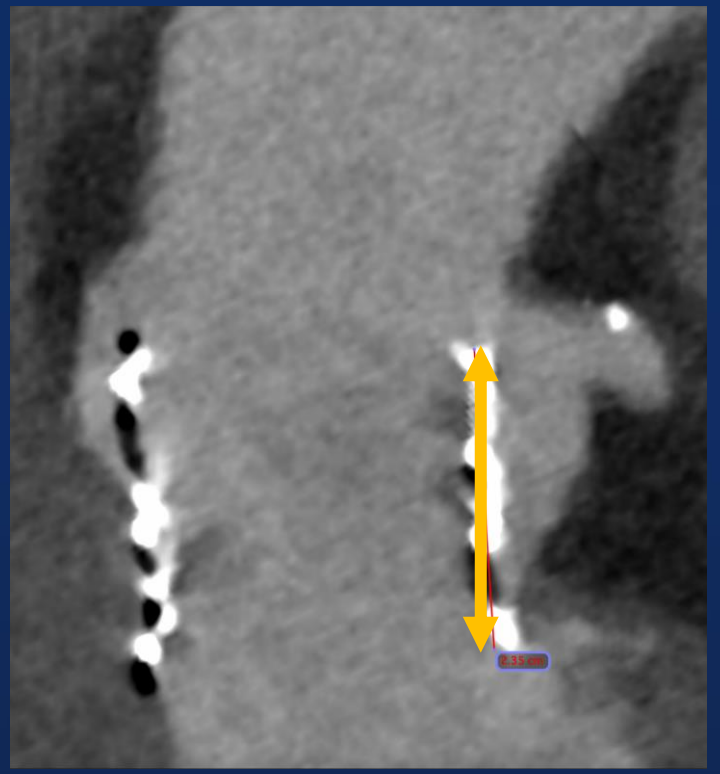
Height
23.9mm



Diameter
26.5mm

Diameter
25.5mm

Diameter
26mm



Height
23.5mm

An underxpanded 29mm S3 with a taller frame and smaller EOA

TAV-in-TAV procedure plan

Plan and Rationale

- **Right** transfemoral TAV-in-TAVI with **left** transfemoral “BVF”
- Sentinel cerebral embolic protection
- TRUE balloon 26mm **PRE** dilatation
- **26mm S3U** + 2cc
- TRUE Balloon **post** dilatation

➢ **Contralateral access to BVF so ipsilateral THV ready to deploy if AR**

➢ **Concern re embolic risk due to multiple inflation planned**

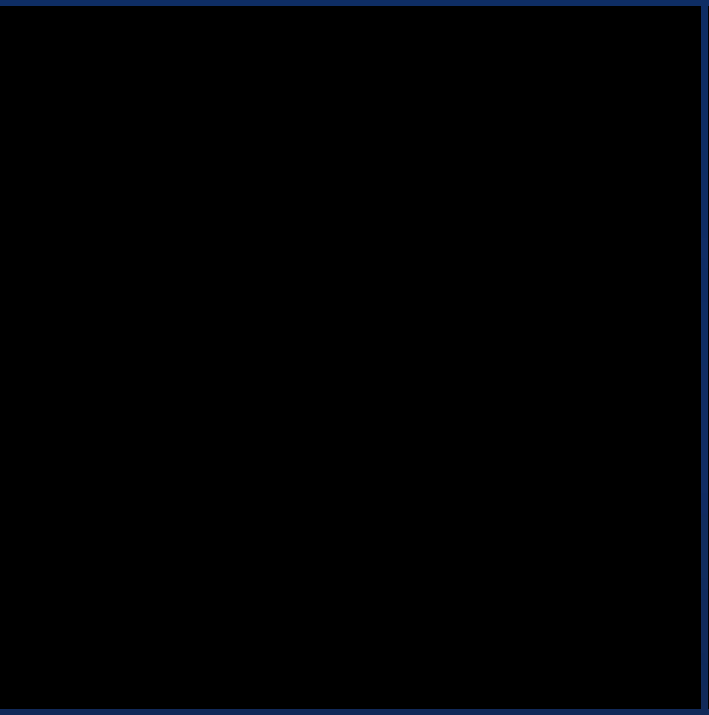
➢ **Address under-expansion prior to new THV**

➢ **Achieve high pressure expansion**

➢ **Prevent underexpansion of TWO stent frames**

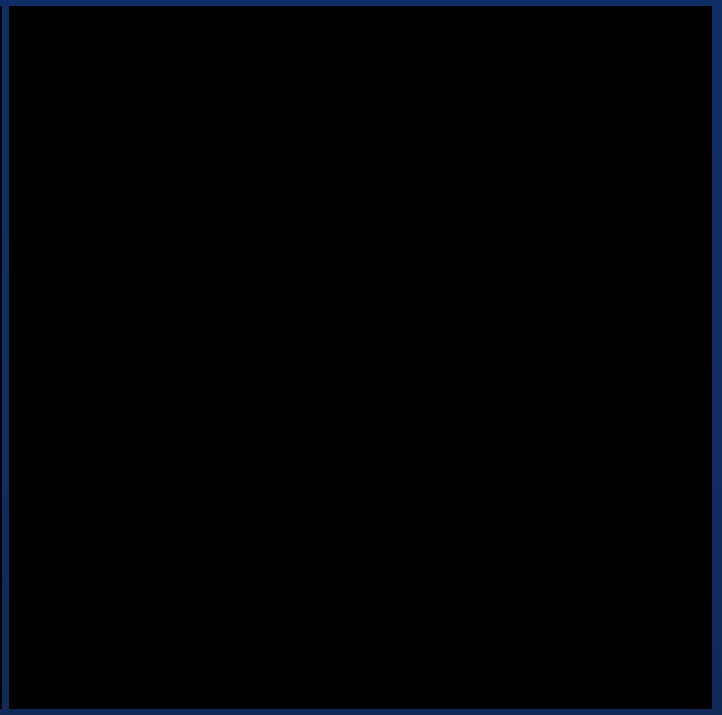
TAV-in-TAV

Procedural outcome



S3U 26mm +2cc inflation @ 9ATM

Top of new THV as per previous



TRUE 26mm balloon inflation

Coaptation length on TEE from 9mm to 4mm

Procedure outcome

- Large (6mm) debris in CEP basket
- No CVA/PPM/vascular complications
- Discharged day 2
- Discharged on **warfarin**

Echocardiographic outcome Day 1

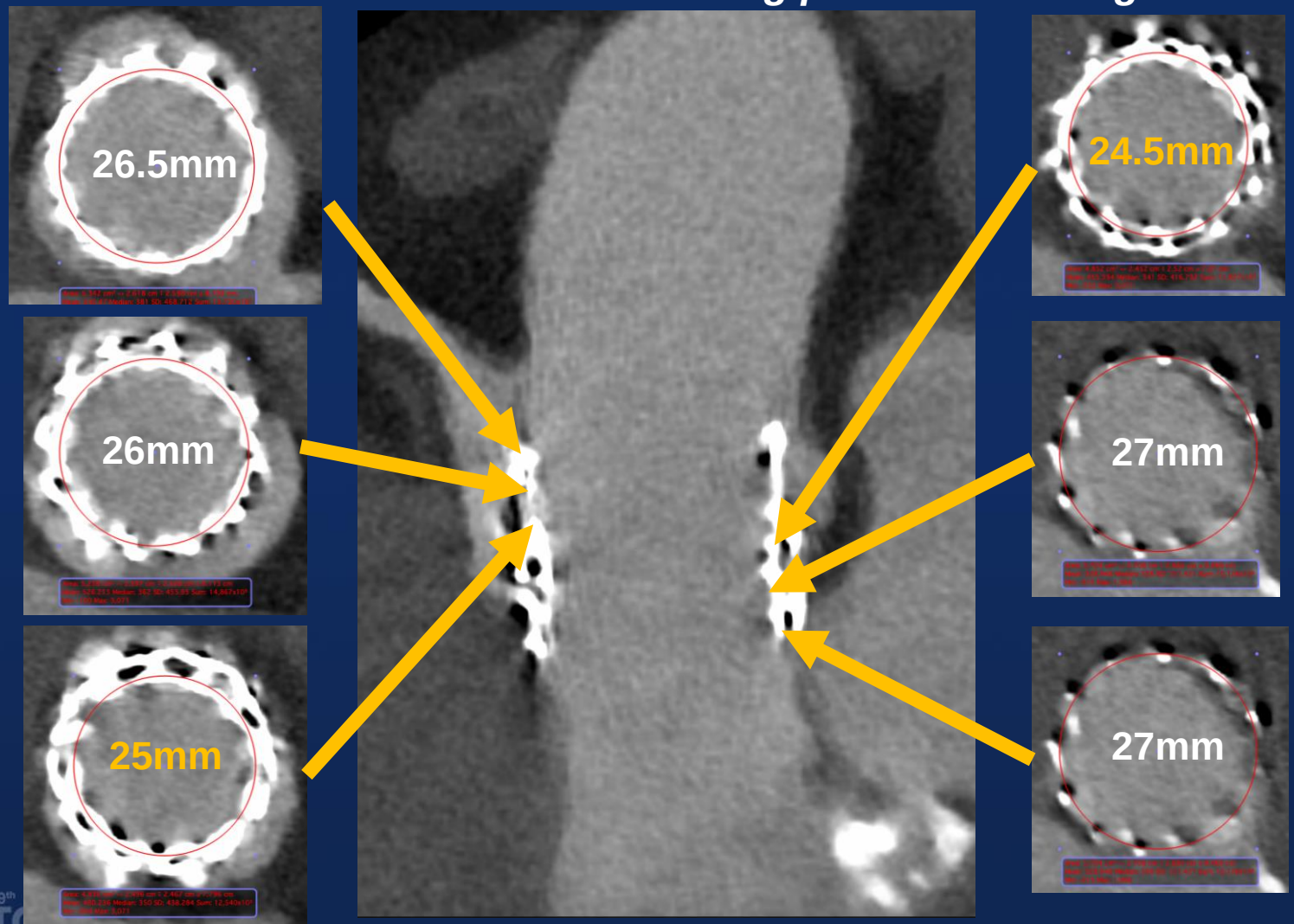
- Mean gradient:12mmHg
- Peak: 21mmHg
- EOA: 2.6cm2

Echocardiographic outcome Day 60

- Mean gradient:12mmHg
- Peak: 27mmHg
- EOA: 2.6cm2

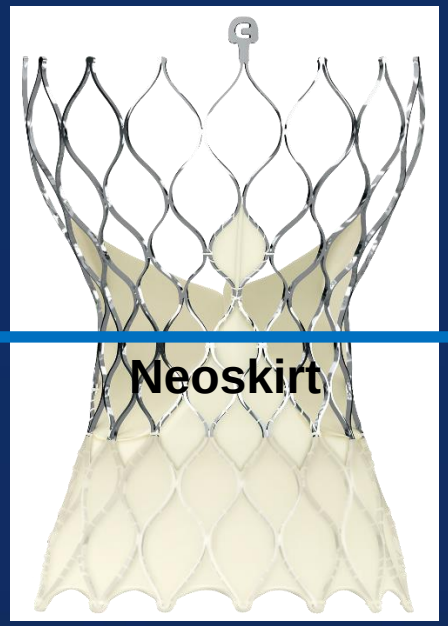
TAV-in-TAVI postscript – CT TAVI

Learning points – challenges for TAV-in-TAV

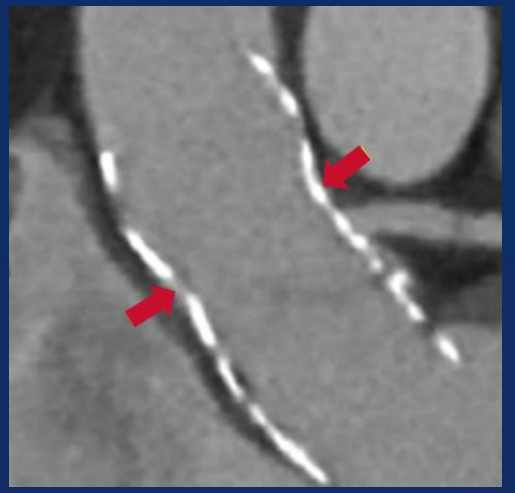


- **Overall improved expansion of THV particularly the first THV, particularly inflow/outflow**
- **Despite predilatation significant “sandwiched” tissue from 1st THV**
- **Despite postdilatation mid body remains waisted**

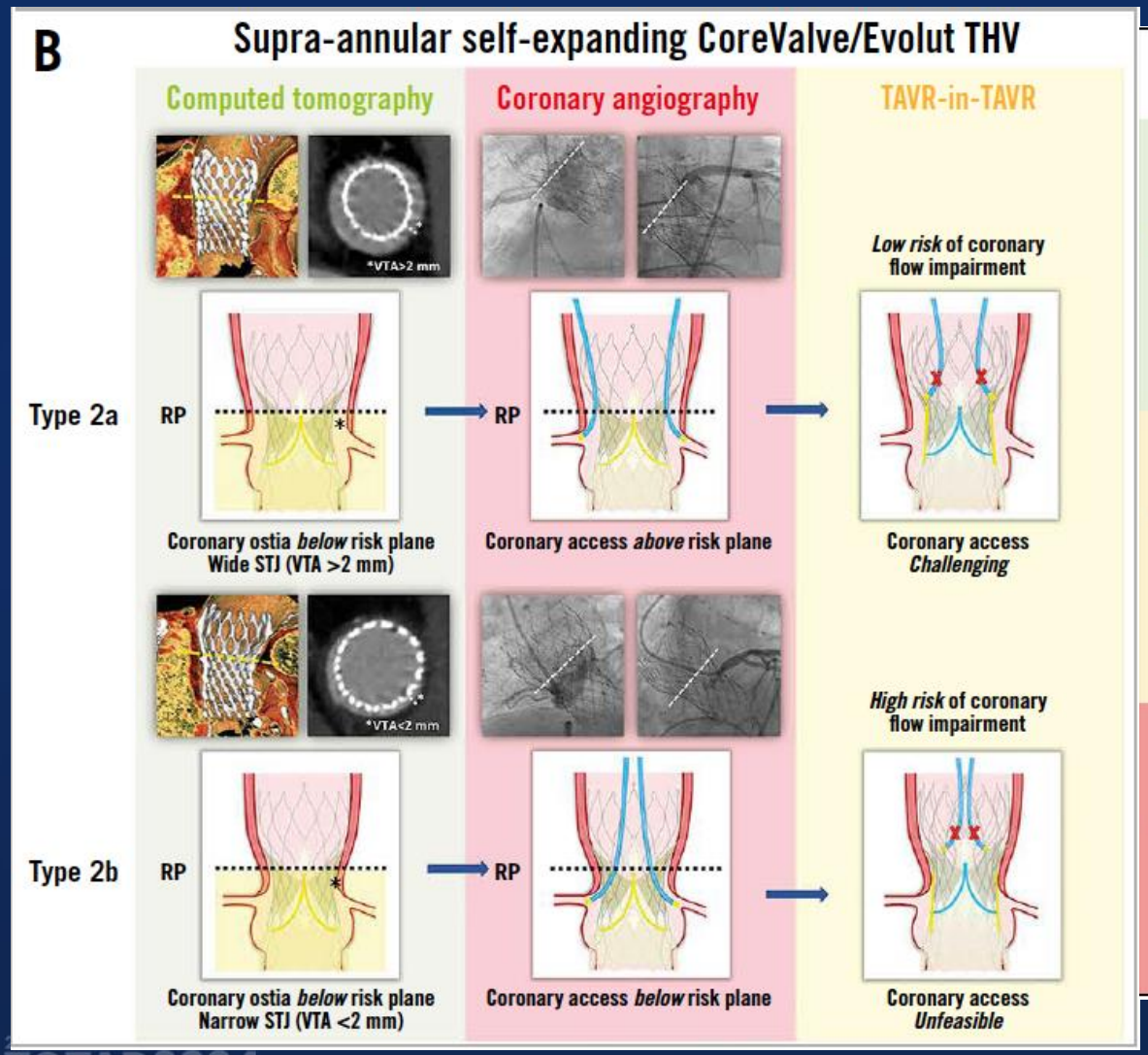
Index TAVI – Medtronic CV/Evolut R/FX

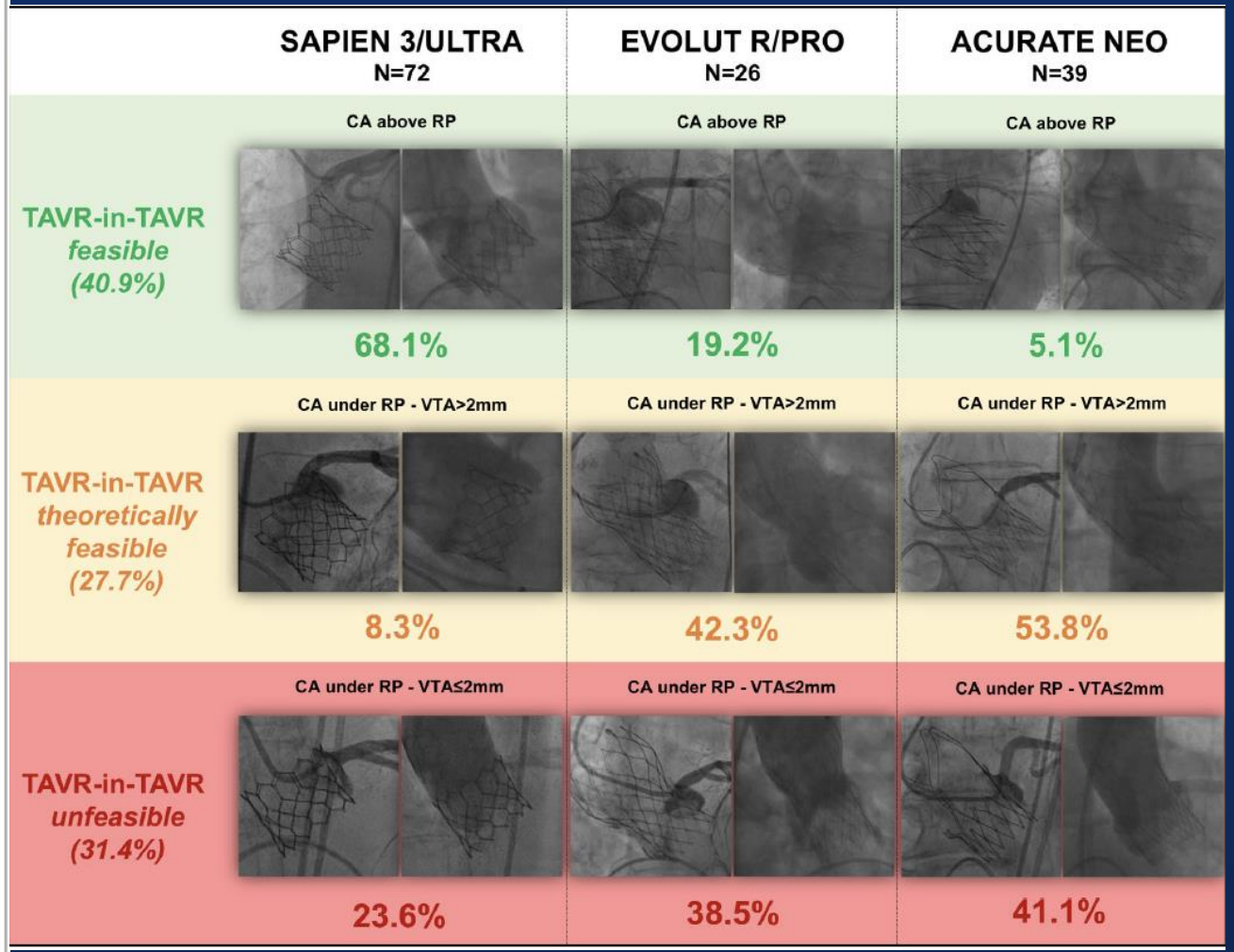


- Tall frame, supra-annular
- Leaflets/neoskirt ***variable*** **– particularly S3U**
- Due to its design, leaflets or neoskirt plane almost always extend above STJ/coronary ostia
- Fundamentally **very high risk** of coronary obstruction ”by design”



Medtronic SEV – coronary obstruction risk



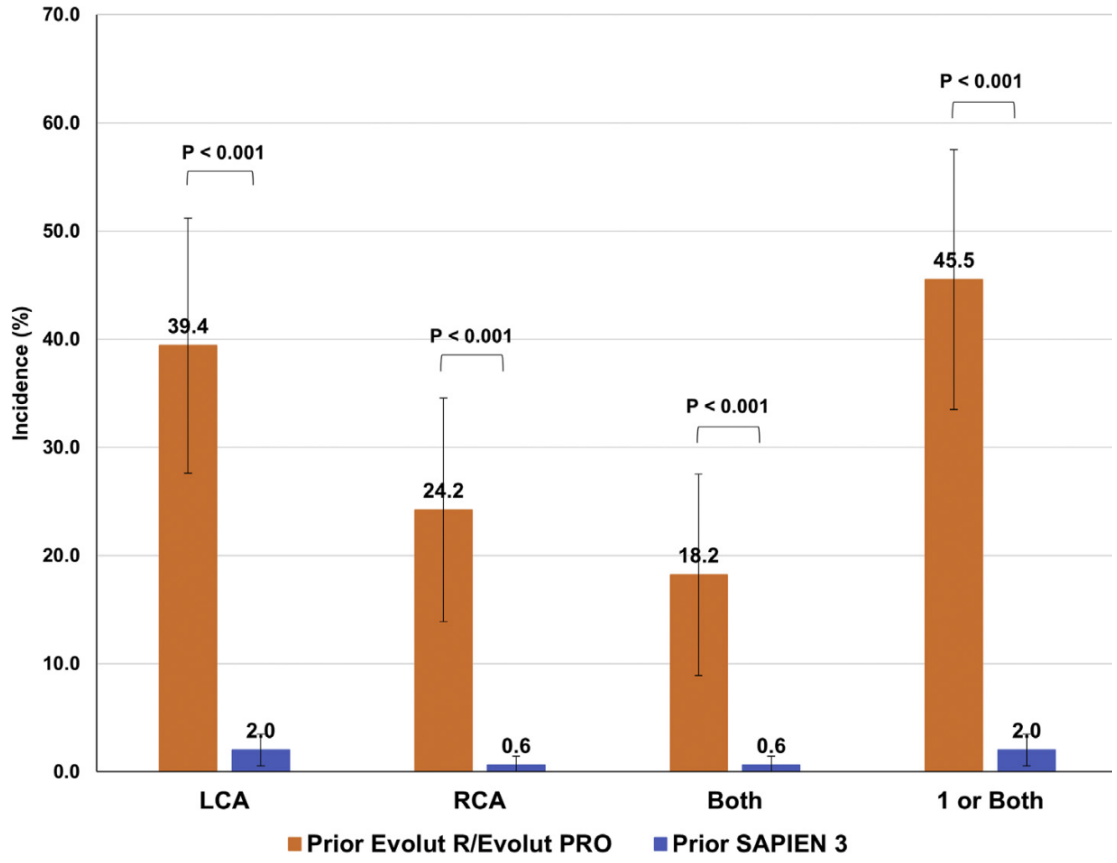


Tarantini, G. Eurointervention 2020

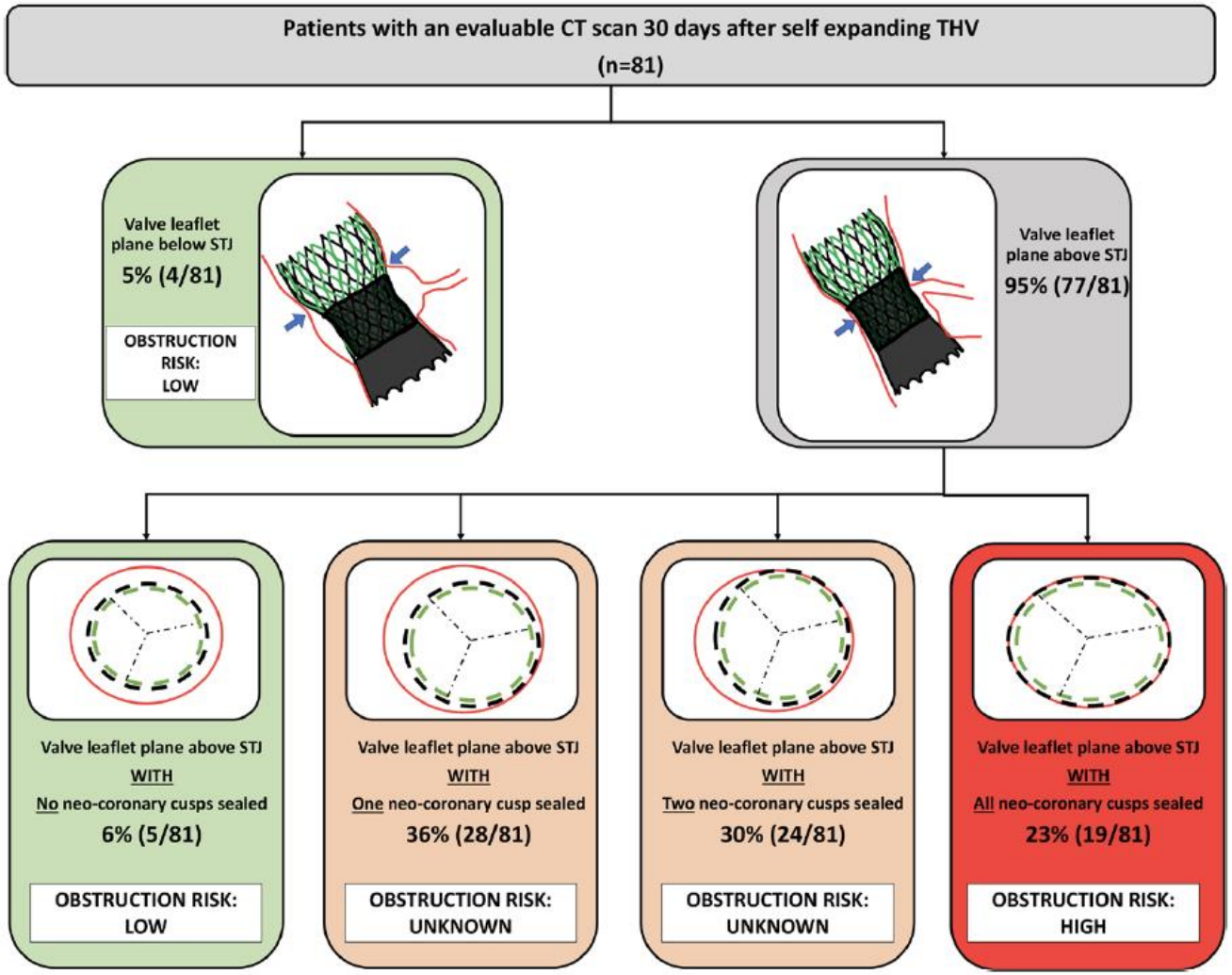
Fovino, LN, Tarantini G. Coronary Angiography After Transcatheter Aortic Valve Replacement (TAVR) to Evaluate the Risk of Coronary Access Impairment After TAVR-in-TAVR, JAHA 2020

Medtronic SEV – challenging TAV-in-TAV

FIGURE 3 CT-Identified Risk of Sinus Sequestration in Redo TAVR in Evolut R/Evolut PRO and SAPIEN 3

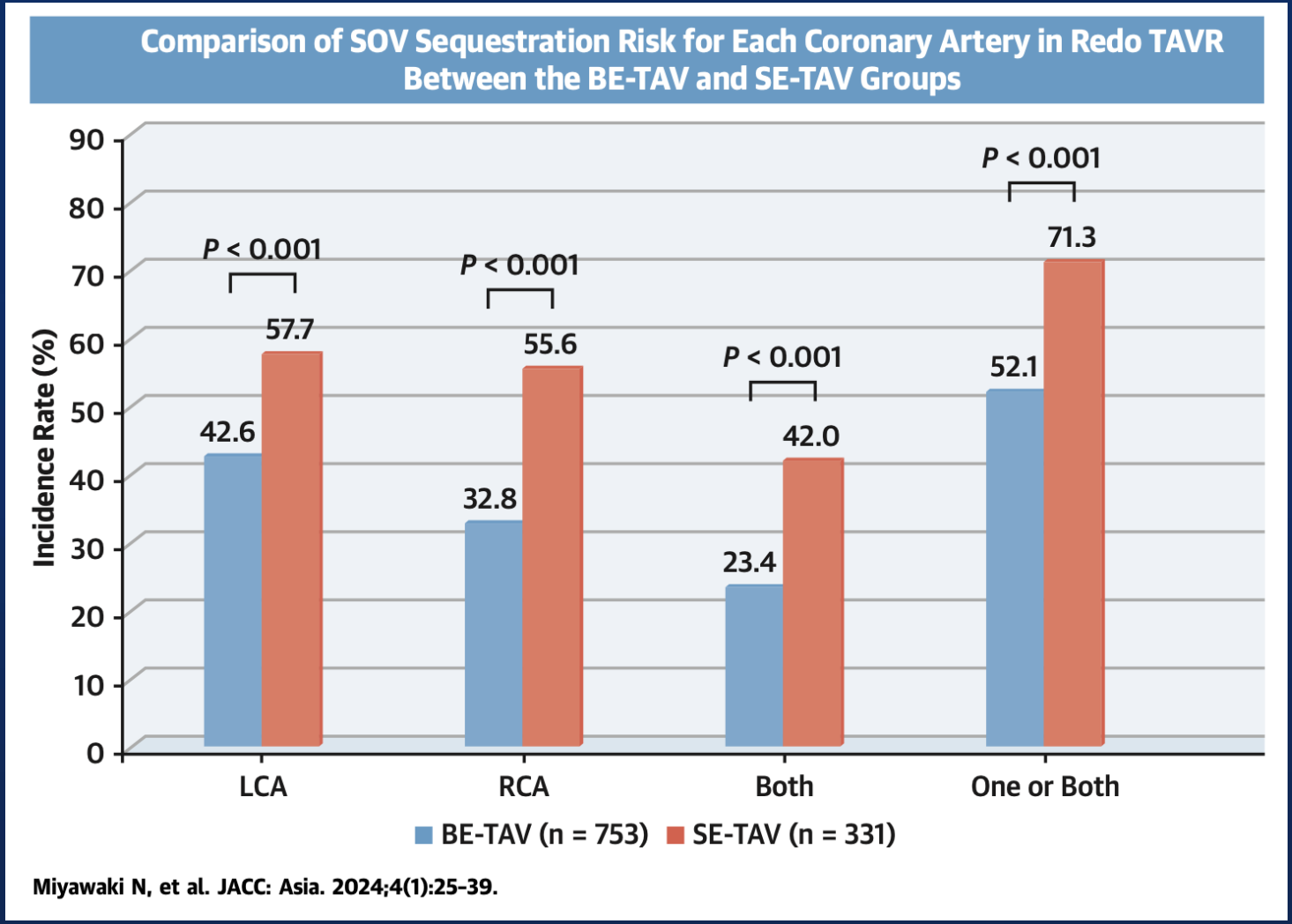


CT-identified risk of sinus sequestration in redo TAVR in prior Evolut R/Evolut PRO and prior SAPIEN 3 are shown. Abbreviations as in



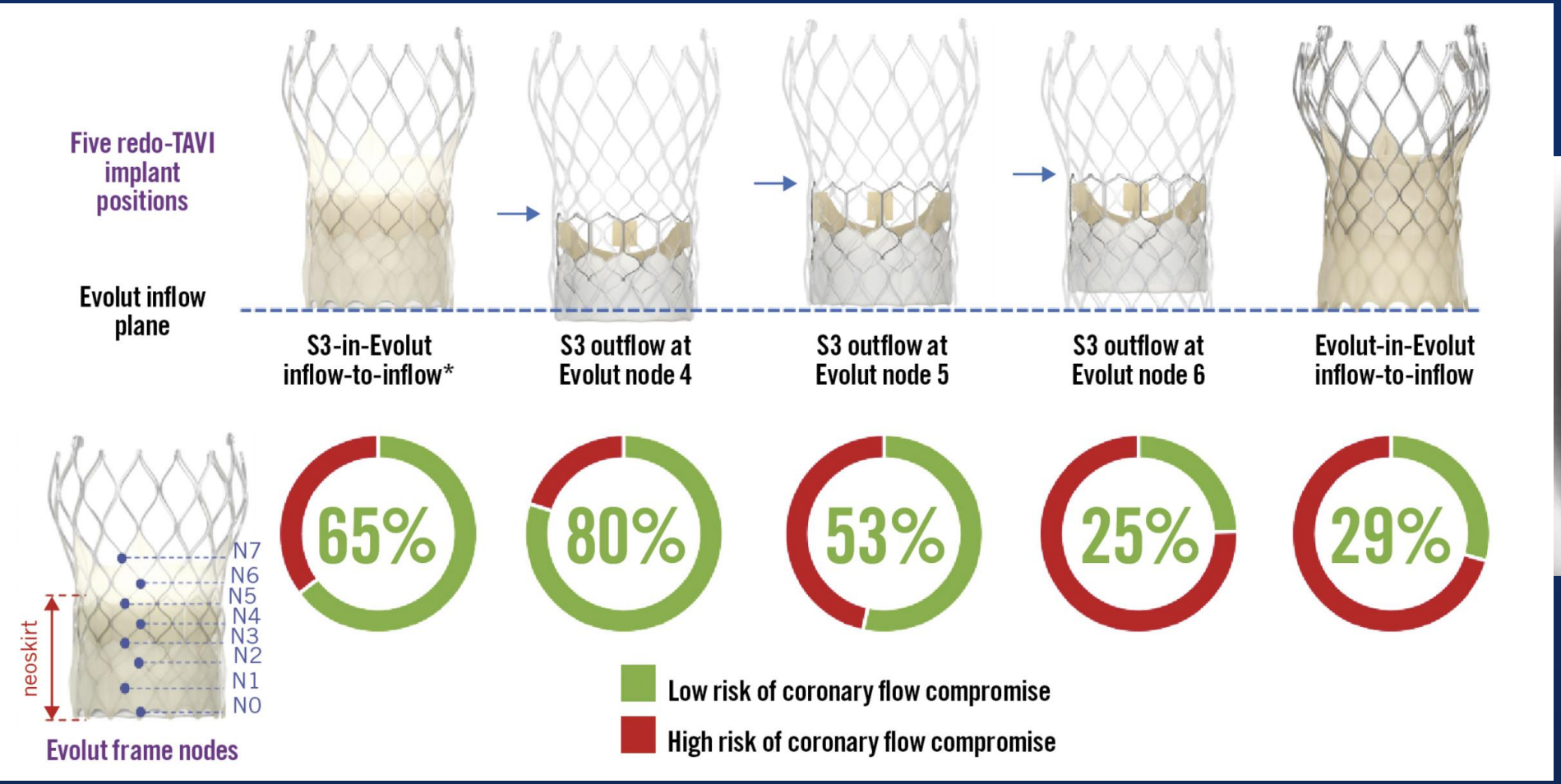
Ochiai T et al. Risk of Coronary Obstruction Due to Sinus Sequestration in Redo Transcatheter Aortic Valve Replacement JACC Intv 2020;13:2617-27
Forrestal BJ, Risk of Coronary Obstruction and Feasibility of Coronary Access After Repeat Transcatheter Aortic Valve Replacement With the Self-Expanding Evolut Valve: A Computed Tomography Simulation Study, Circ Intv 2021

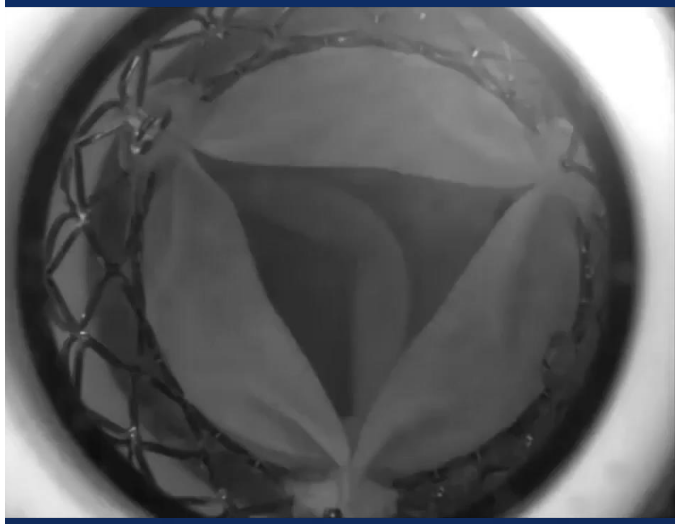
TAV-in-TAV in Asian population – more difficult?



Miyawaki, N, et al Assessing Potential Risks of Future Redo Transcatheter Aortic Valve Replacement in Asian Patients, JACC Asia 2024

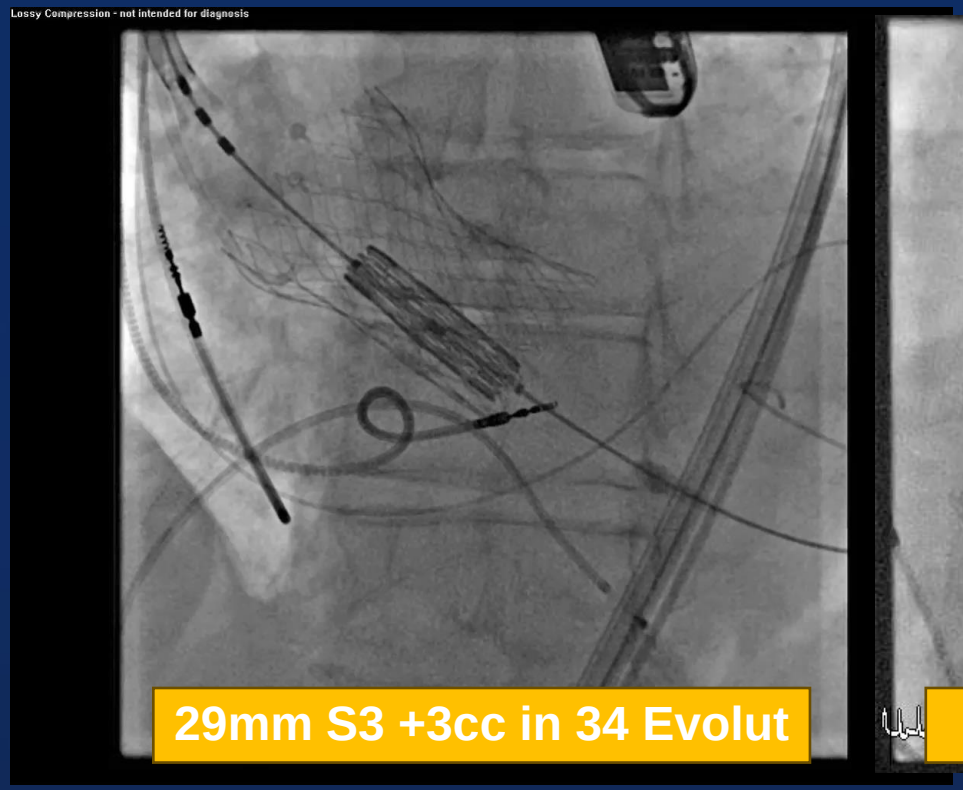
S3U in Evolut – implant lower to avoid coronary obstruction – in exchange for leaflet overhang

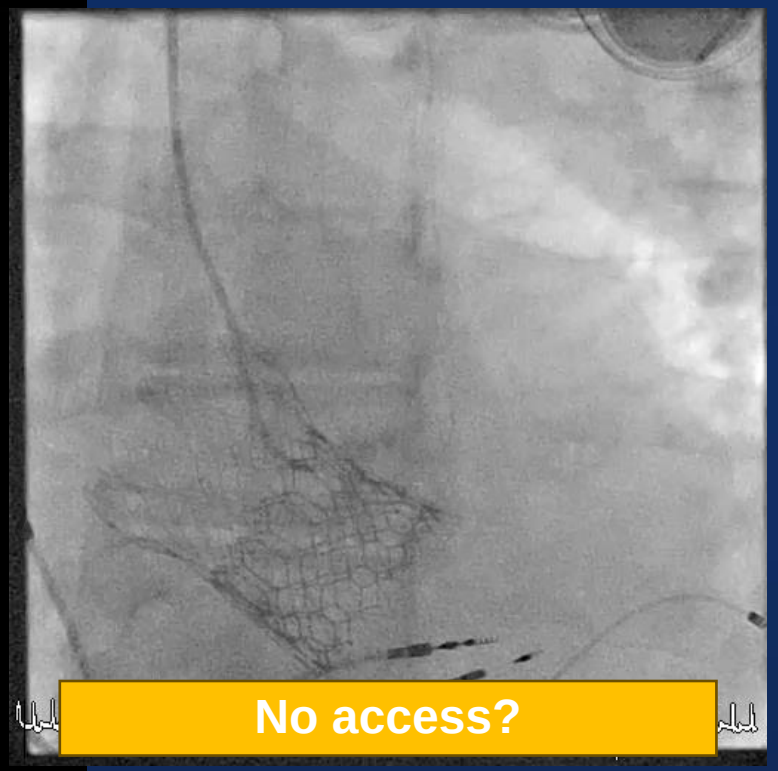


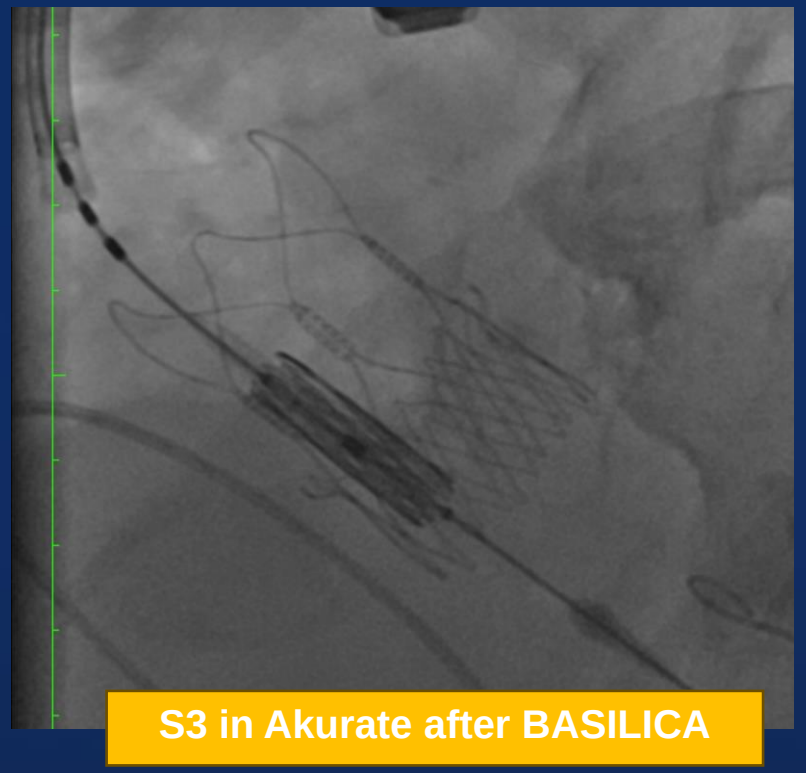


Sathananthan J, Eurointervention 2021
Grubb, Eurointervention 2023

TAV-in-TAV – no coronary obstruction does not mean coronary access







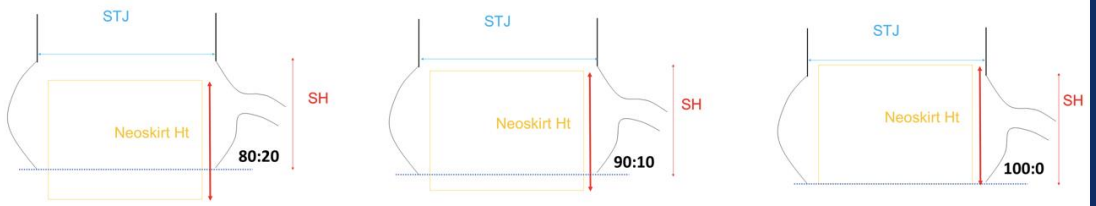
Sinus sequestration risk worsens with high implant

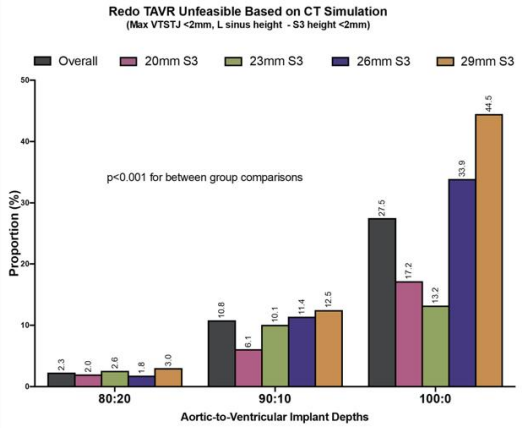
CENTRAL ILLUSTRATION: TAVR Device Implantation Depth and Outcomes

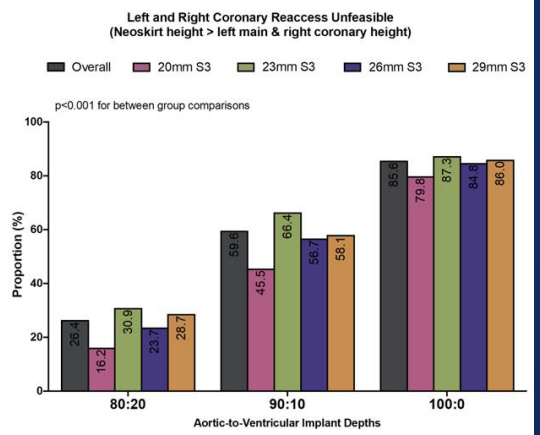
Impact of High Implantation of Transcatheter Aortic Valve on Subsequent Conduction Disturbances and Coronary Access, N = 418

	Evolut R/PRO/PRO+		SAPIEN 3	
	Conventional Implantation Technique	High Implantation Technique	Conventional Implantation Technique	High Implantation Technique
	3-Cusp Coplanar View	Cusp Overlap View / Commissural Alignment	3-Cusp Coplanar View	3-Cusp Coplanar View
	Pigtail Catheter; NCC RCC LCC	NCC RCC LCC; Flush Port at 3 o'clock	NCC RCC LCC	NCC RCC LCC
	Target Implantation Depth 3 to 5 mm at NCC	Target Implantation Depth 1 to 3 mm at NCC	Central Balloon Marker-Guided Implantation	Radiolucent Line-Guided Implantation
Conduction Disturbances After TAVR				
30-Day Permanent Pacemaker Implantation	10.8%	0.0%	2.2%	2.0%
New-Onset Persistent Left Bundle Branch Block	11.3%	4.2%	7.0%	1.1%
Coronary Access After TAVR Assessed by Post-TAVR CT				
THV Implantation Depth (Mean of the Depth at NCC, RCC, and LCC)	5.4 ± 2.2 mm	3.5 ± 1.2 mm	4.3 ± 1.4 mm	2.6 ± 0.9 mm
Interfered by THV Skirt	9.1%	22.0%	0.7%	0.9%
Interfered by THV Commissural Posts	42.7%	26.0%	15.3%	15.7%
CT-Identified Risk of Sinus Sequestration in TAVR-in-TAVR				
Risk of Sinus Sequestration in TAVR-in-TAVR	41.8%	64.0%	5.3%	17.6%

CT analysis of 1,900 consecutive patients simulating SAPIEN 3 TAVR across 3 targeted implant depths





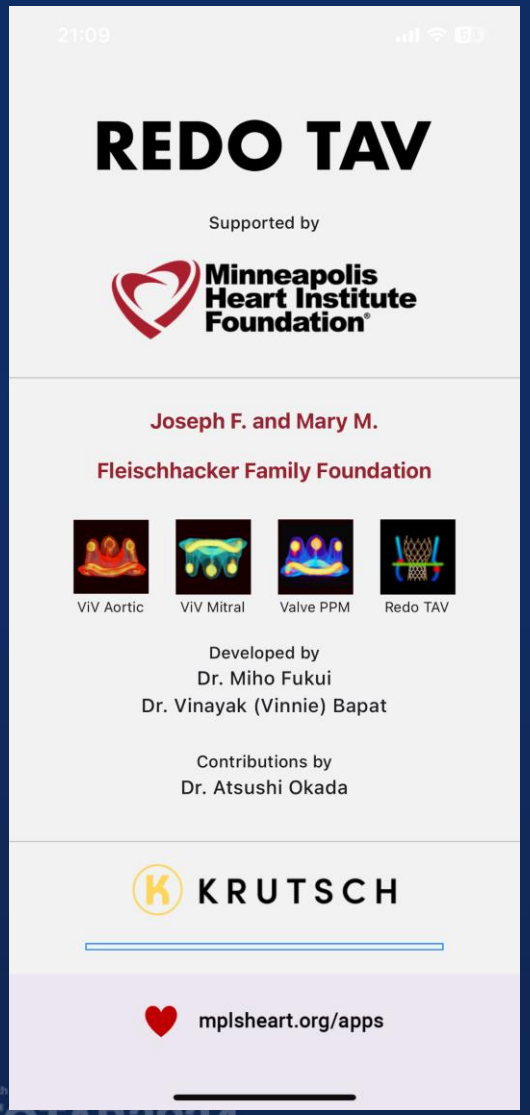


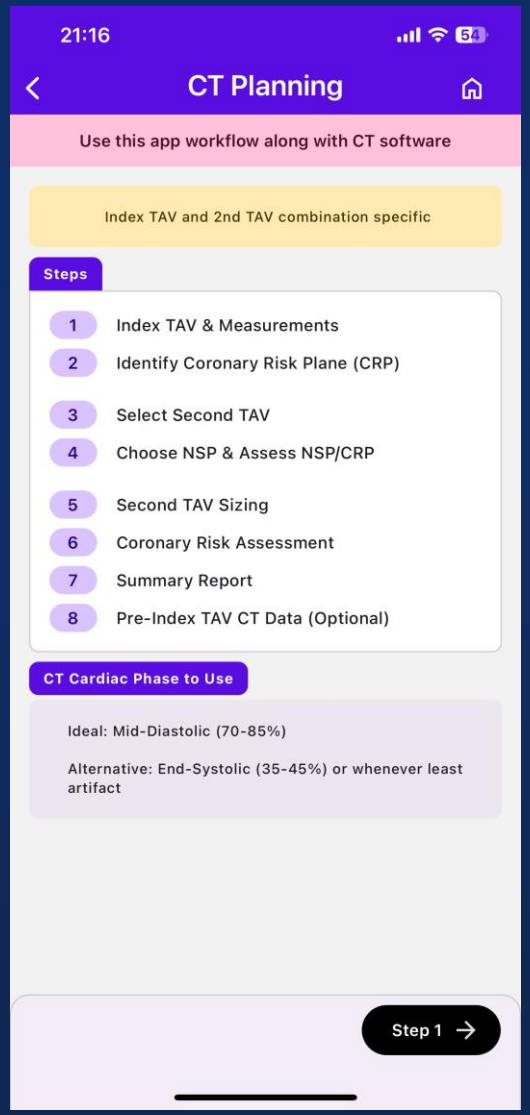
Key Findings:

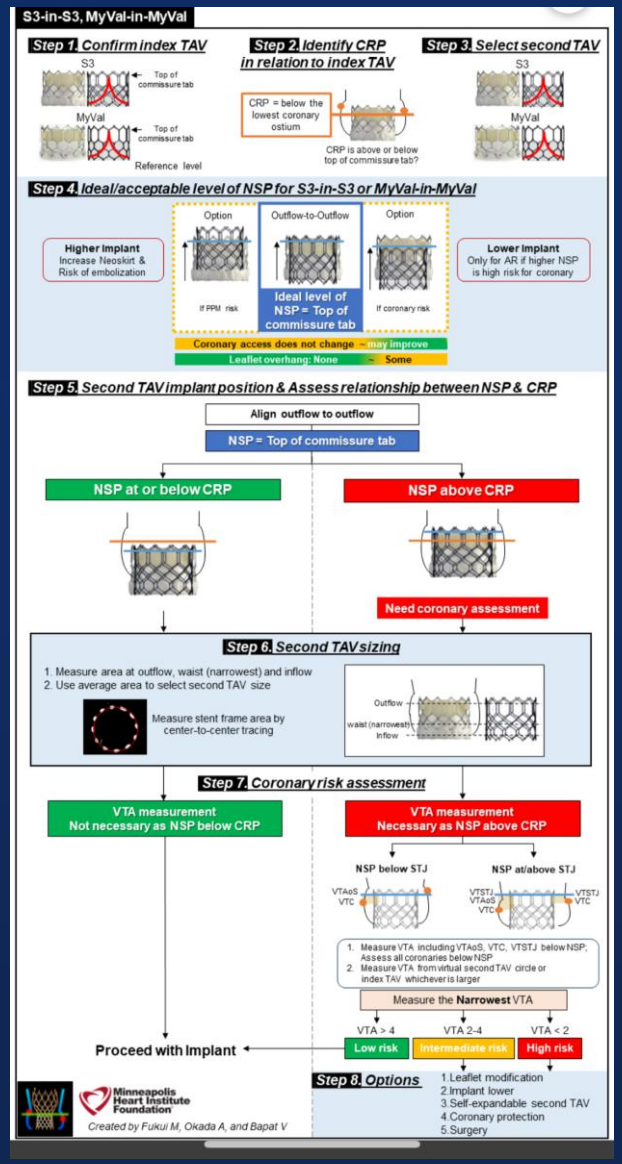
1. **Stepwise reduction in redo-TAVR feasibility with:**
   - Shallow implant depth (p<0.001)
   - Increasing THV size, but only at 100:0 implant (p<0.001)
2. **Challenging coronary access with:**
   - Shallow implant depth
   - Increasing THV size (across all implant depths)
3. If Commissural Alignment is attained (assuming utilization of leaflet modification techniques) → **Redo-TAVR 100% feasible**

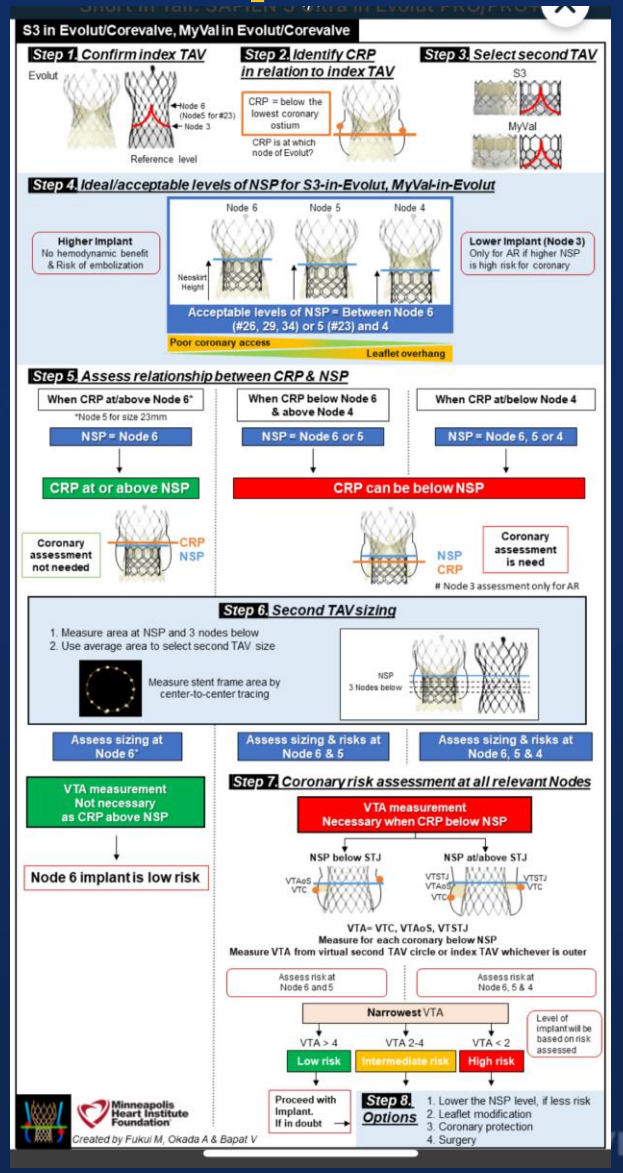
Koshy AN, GHL Tang, Circ Intv 2024
Ochiai T JACC Intv 2023

Redo TAVI App – Thanks Dr Fukui & Bapat!









Several key take home practical tips

- TAV-in-TAV perhaps with GA?
  - Millimeter precision – aim for that Node 4
- Predilate/TRUE balloon 1st THV particularly BEV
  - Recognize and correct underexpansion of 1st THV
- Beware of further expansion of 1st THV particularly Evolut/CoreValve
  - VTA distance could be even less
- Cerebral embolic protection?

Conclusion

- TAV-in-TAV requires meticulous pre-procedural planning to avoid coronary obstruction.
- TAV-in-TAV requires optimized procedural set-up.
- There are **significant knowledge gaps** in TAV-in-TAV and whilst feasible in most cases with good outcomes ongoing collaboration particularly **post**procedural CTs will add to our understanding on this impending problem.
- Current data would support the use of a short-frame THV if future TAV-in-TAV is to be considered.
- Further, the index procedure should be optimized.