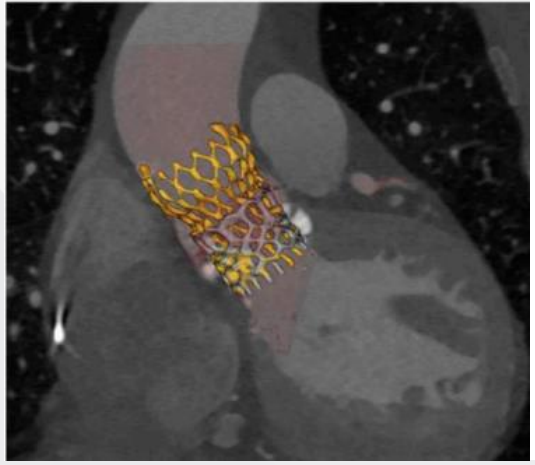

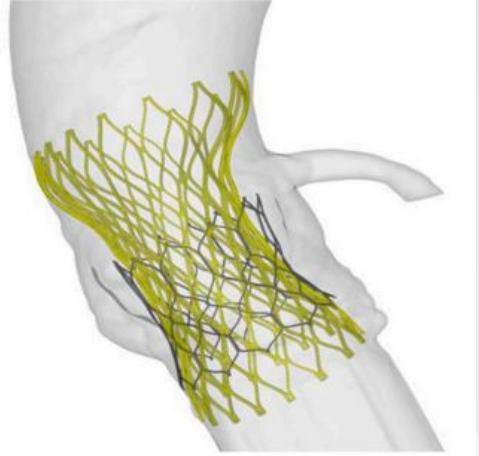

How to Treat Degenerated TAVI Valve?

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Cheng Hsin General Hospital and

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CHGH

NYCU NATIONAL YANG MING CHIAO TUNG UNIVERSITY

Disclosure

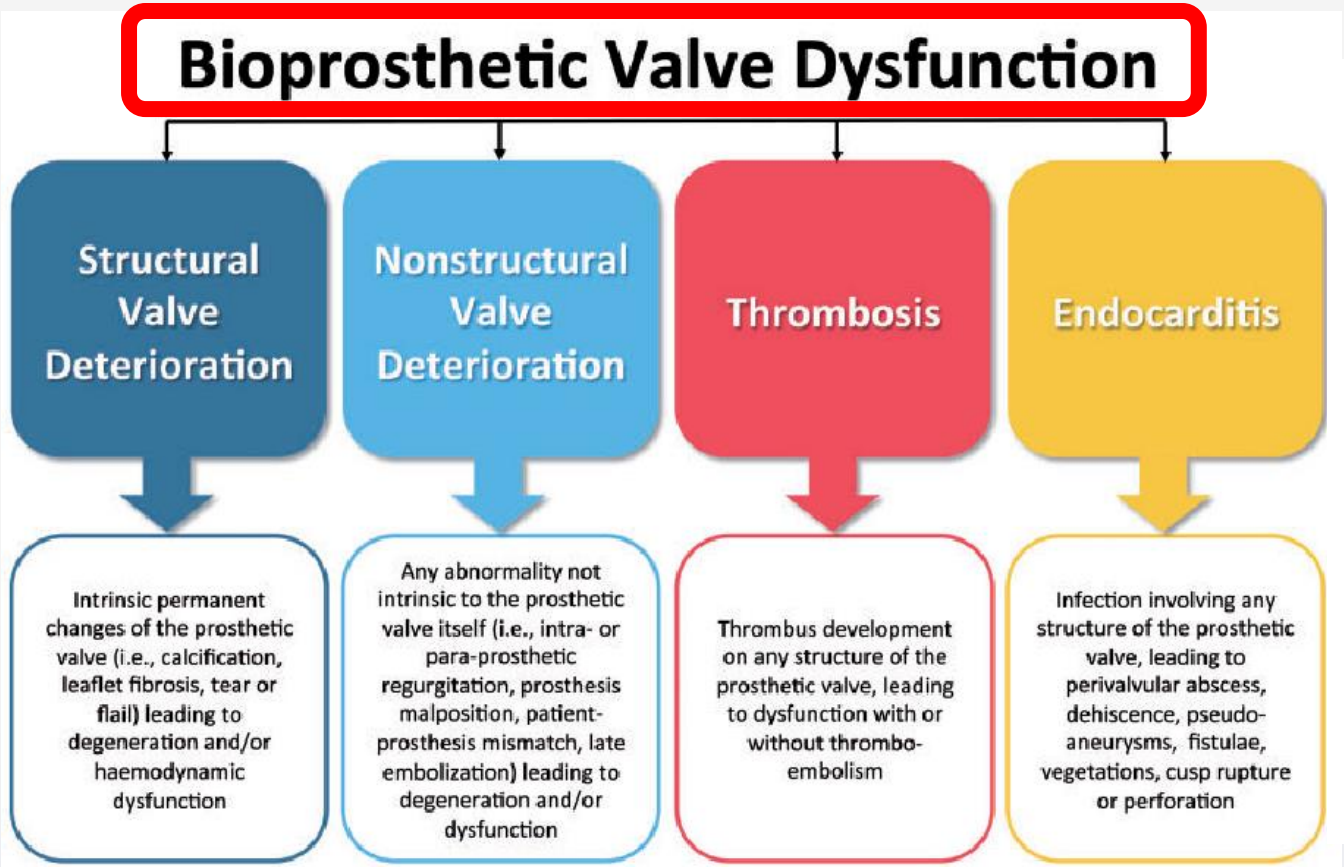
- Receipt of honoraria or consultation fees: Abbott Structural Heart, Boston Scientific, Edwards Lifesciences, Medtronic

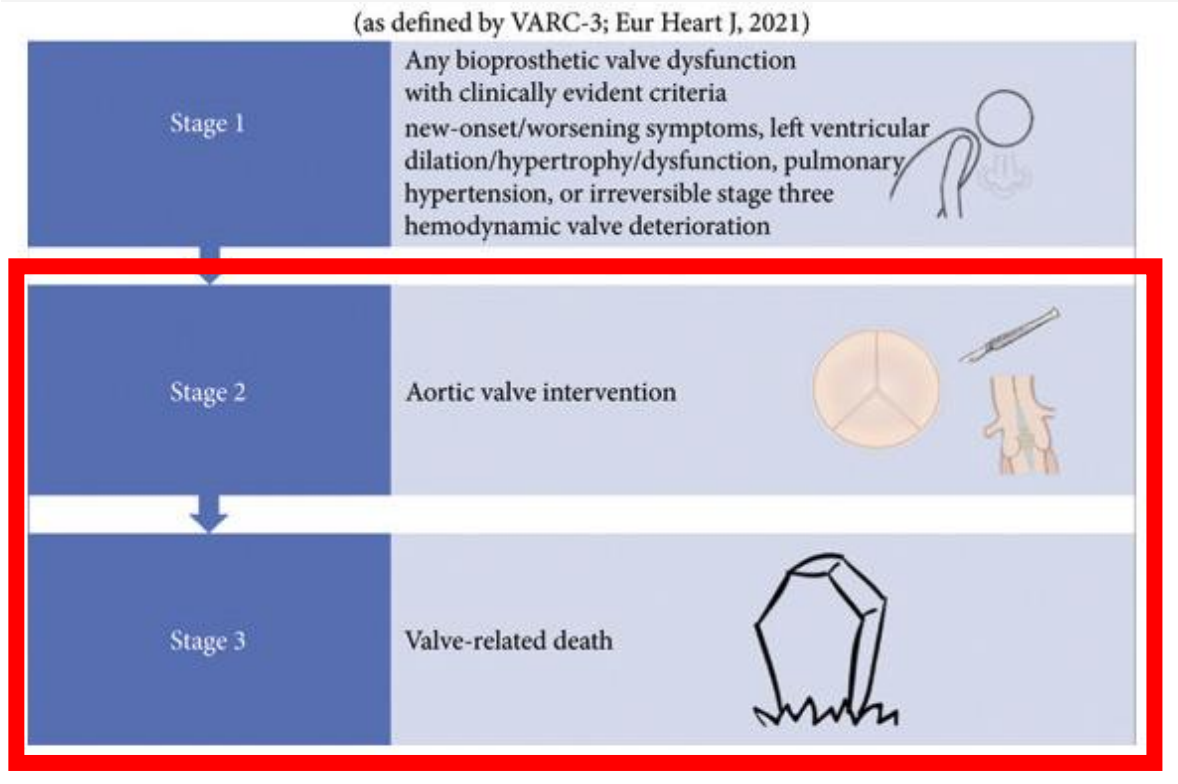
The 2020 valvular heart disease guidelines from the ACC/AHA include TAVR as a class I indication for patients aged 65–80 years and not at high or prohibitive risk.

By 2021, the odds a patient under 65 would receive TAVI versus SAVR were about 50/50, a large US database shows.

Dysfunction of a bioprosthesis is a well-known entity occurs with TAVR valves.

Eventually, bioprosthetic valve failure may happen and is categorized into three stages, ranging from the presence of clinical symptoms to reintervention to valve-related death.

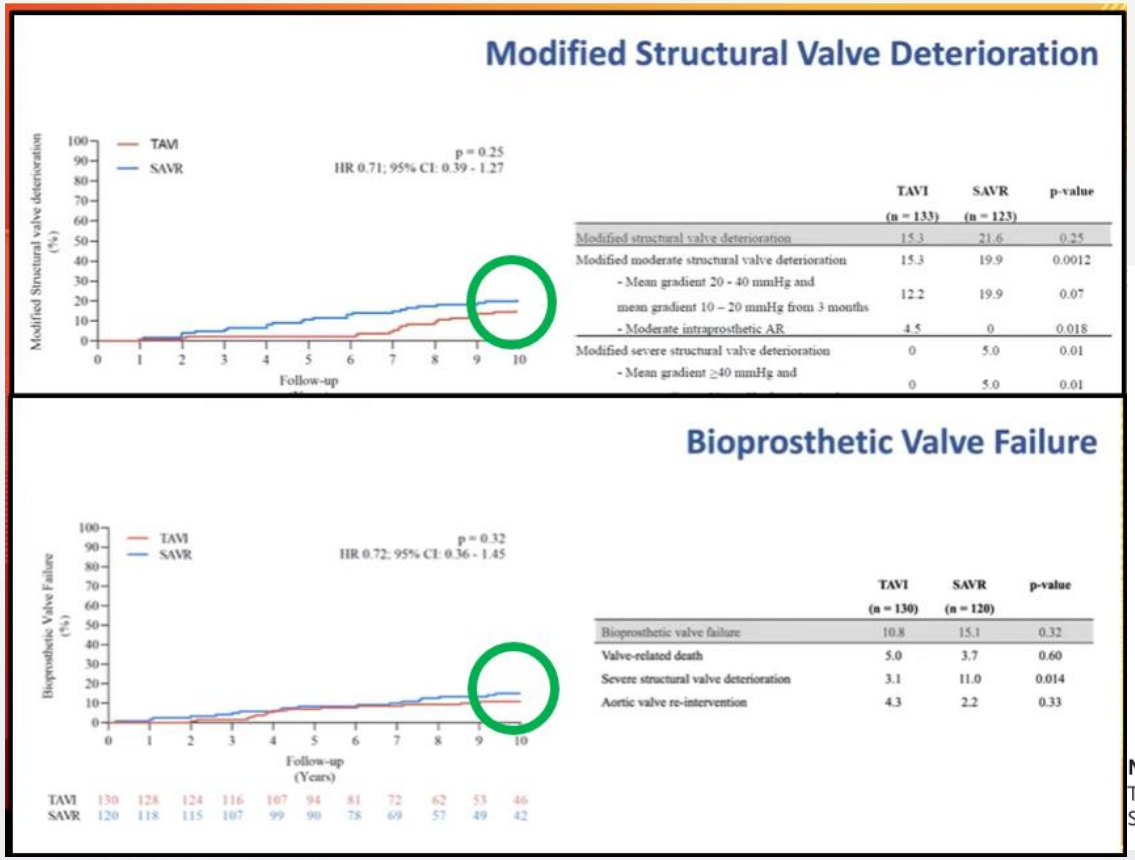




Bioprosthetic-Valve Failure of SEV and BEV

NOTION - 10 Years

Bioprosthetic-Valve Failure at 10 Yr 10.8%

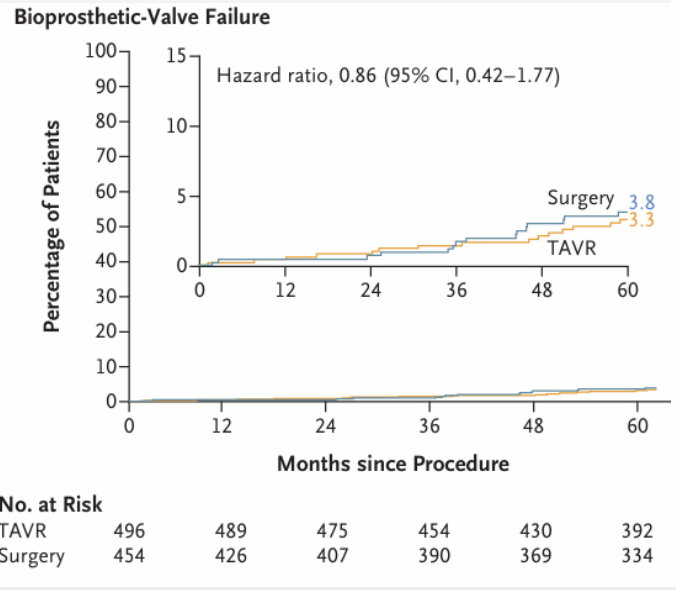


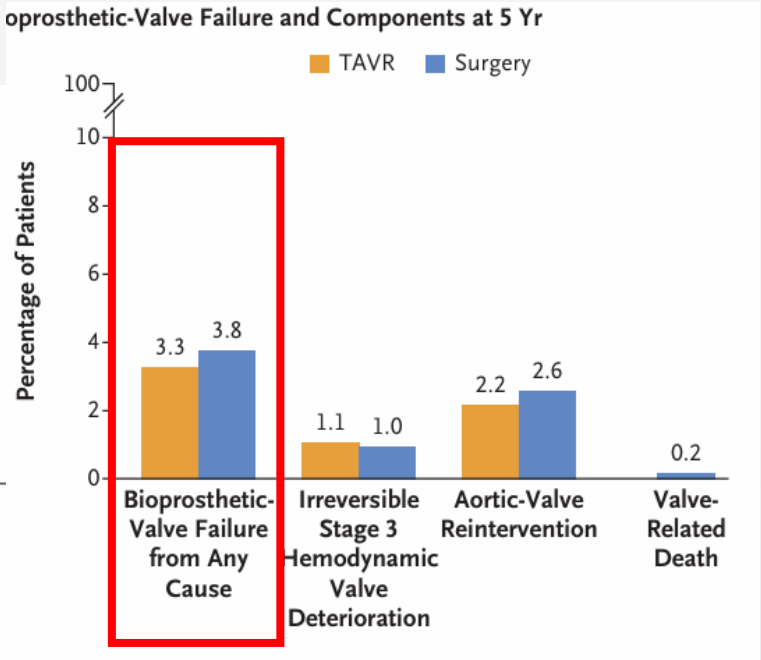
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Transcatheter Aortic-Valve Replacement in Low-Risk Patients at Five Years

Bioprosthetic-Valve Failure at 5 Yr 3.3%





TAVR Explant (TAVR-SAVR) vs. Redo-TAVR (TAVR-TAVR) for failed TAVR valve

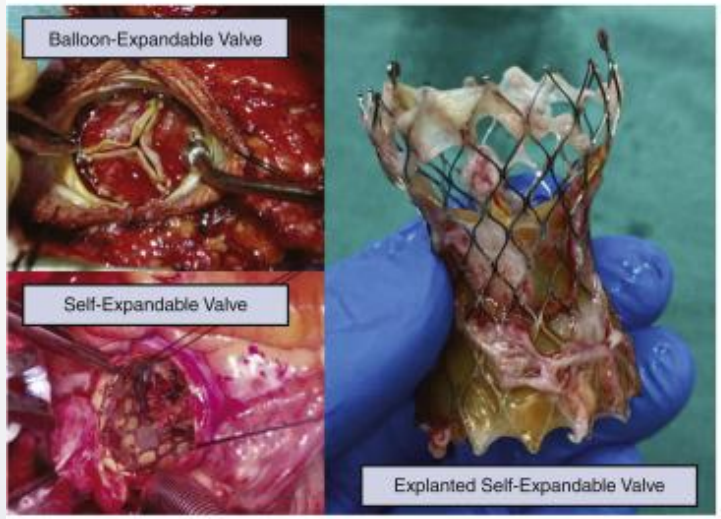
TAVR explantation (TAVR-then-SAVR)

Redo-TAVR (TAVR-in-TAVR)

The Surgical risks associated with TAVR explant are not negligible.

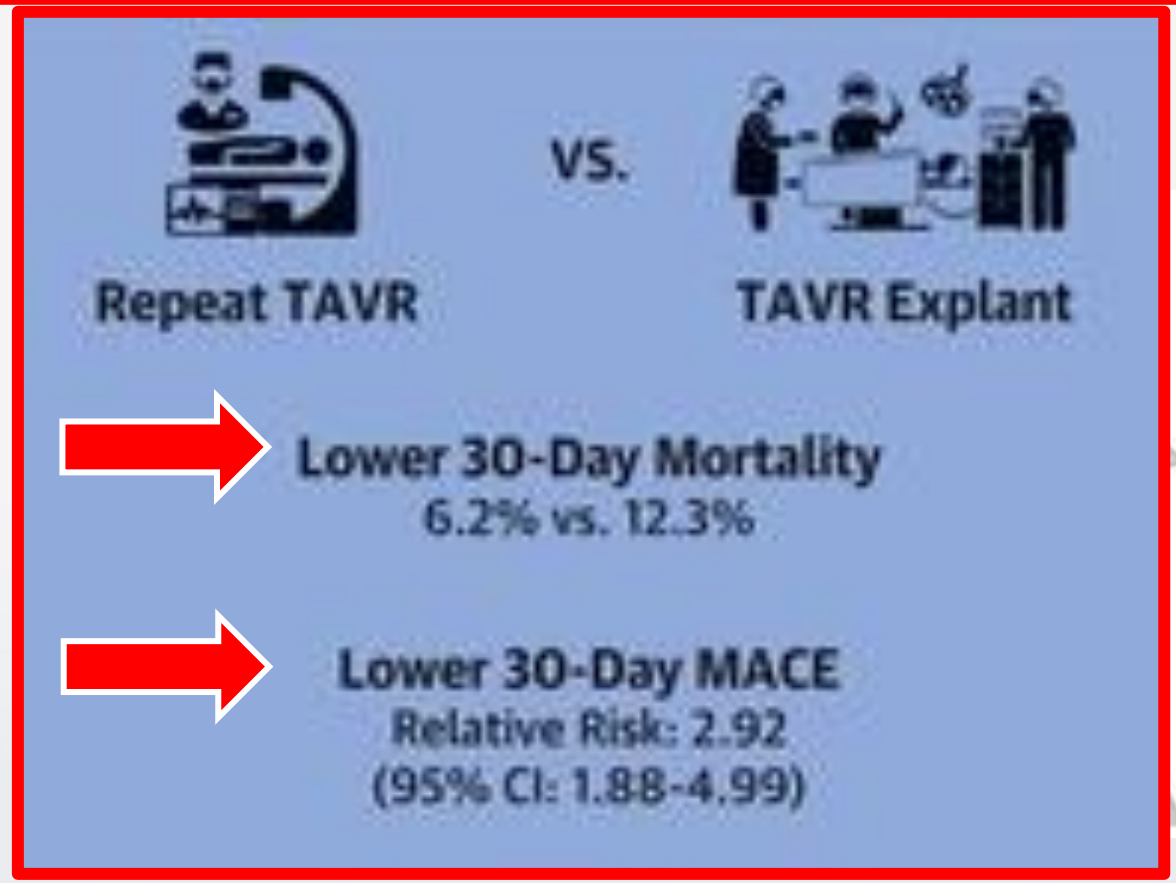
The surgical mortality was more than 10% and one-year mortality of around 25%.

1683 TAVR-Explants from 10 Studies



Supra-annular THV is associated with more extensive aortic wall endarterectomy.

TAVR-explant appears rare. However, the clinical impact is substantial. Implanters must be mindful of "lifetime management" strategy in younger and lower risk patients when planning the initial valve type.

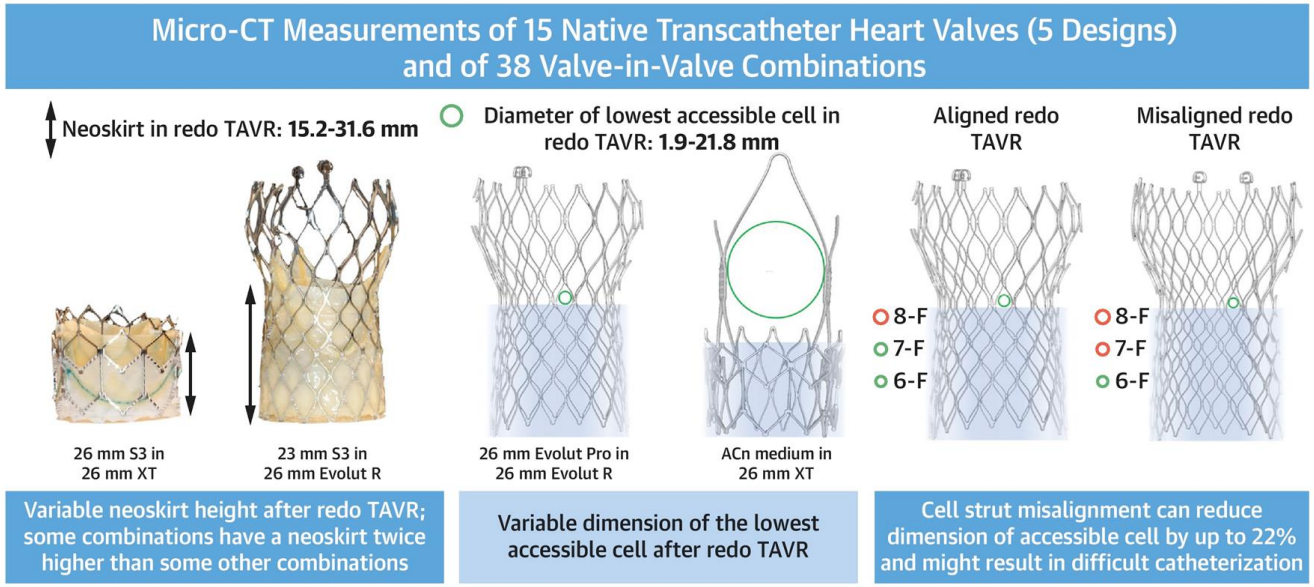



We will face a wave of
THV-in-THV tsunami
within 10 years!

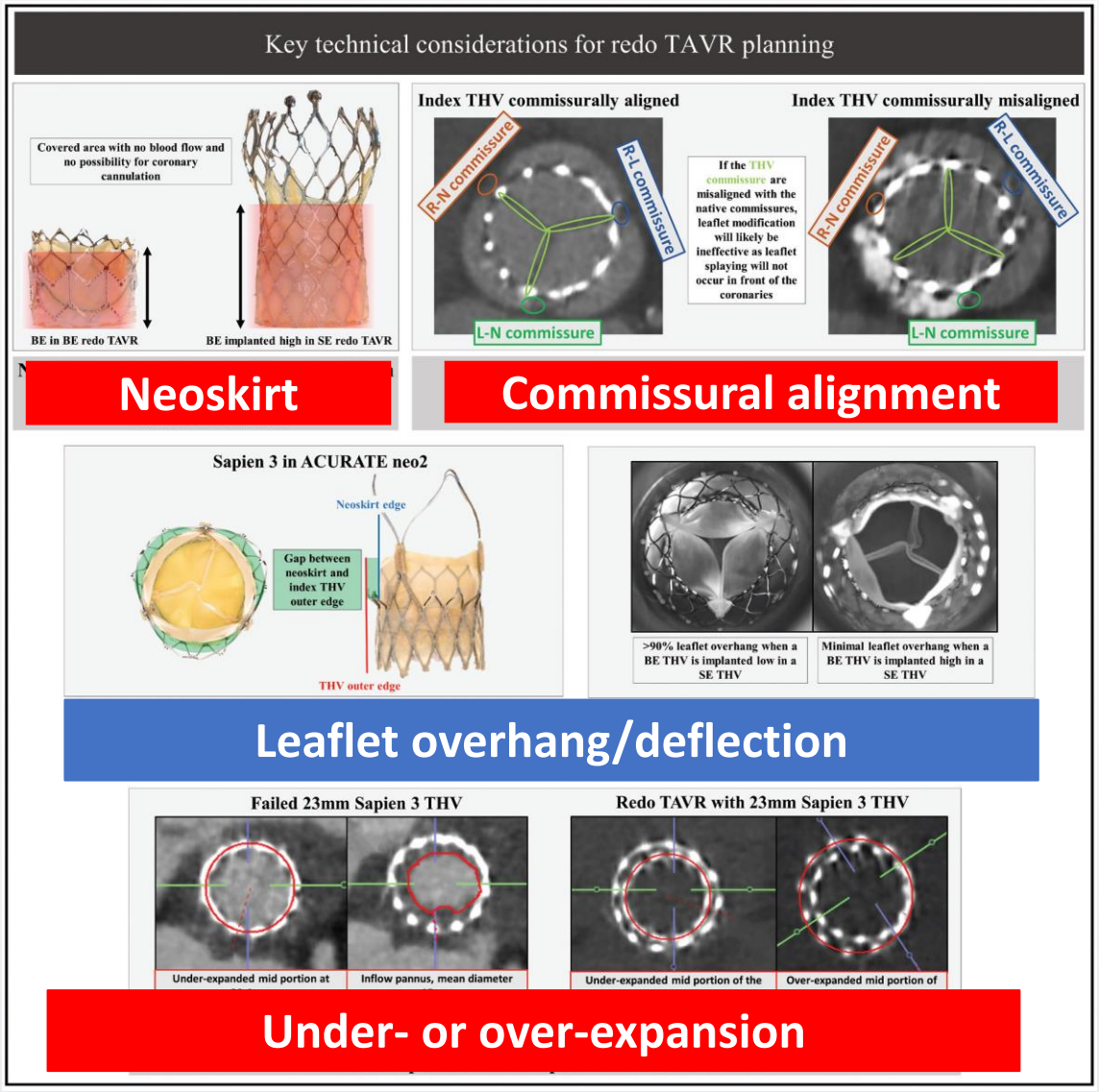
Considerations in redo-TAVR (THV-in-THV) procedures

Coronary risk
Hemodynamics

CENTRAL ILLUSTRATION: The Impact of Transcatheter Heart Valve Design and Implant Characteristics for Coronary Access After Transcatheter Aortic Valve Replacement and Redo TAVR

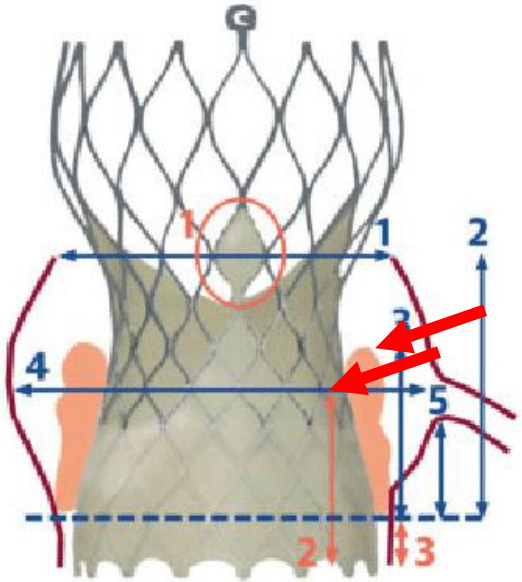


Meier D, et al. J Am Coll Cardiol Intv. 2022;15(15):1519-1531.



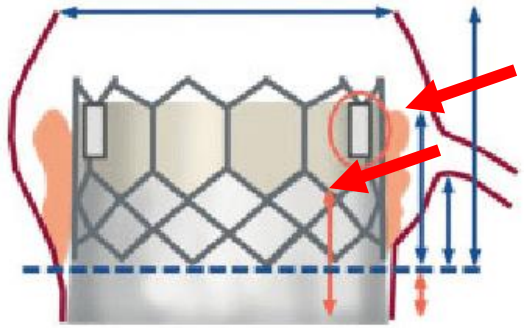
Risk plane (RP) in TAVR and Redo-TAVR (TAVR-in-TAVR)

First TAVR RP = sealing skirt height/leaflet length



Anatomical

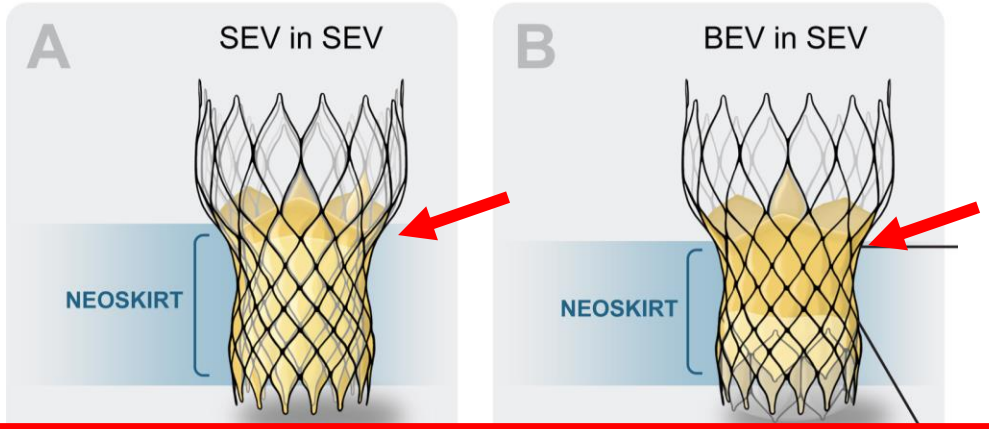
1. Sinotubular junction dimensions
2. Sinus height
3. Leaflet length and bulkiness
4. Sinus of Valsalva width
5. Coronary height



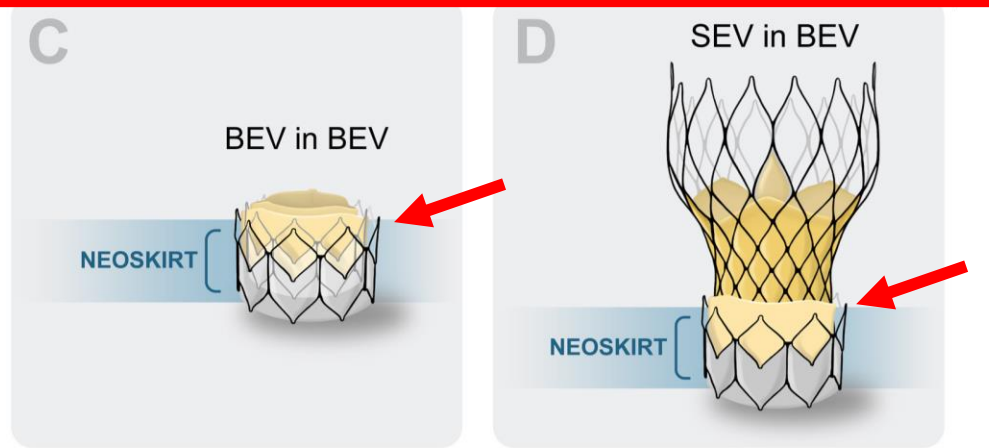
Device and Procedural

1. Commissural tab orientation
2. Sealing skirt height
3. Valve implant depth

Redo-TAVR RP = neoskirt height

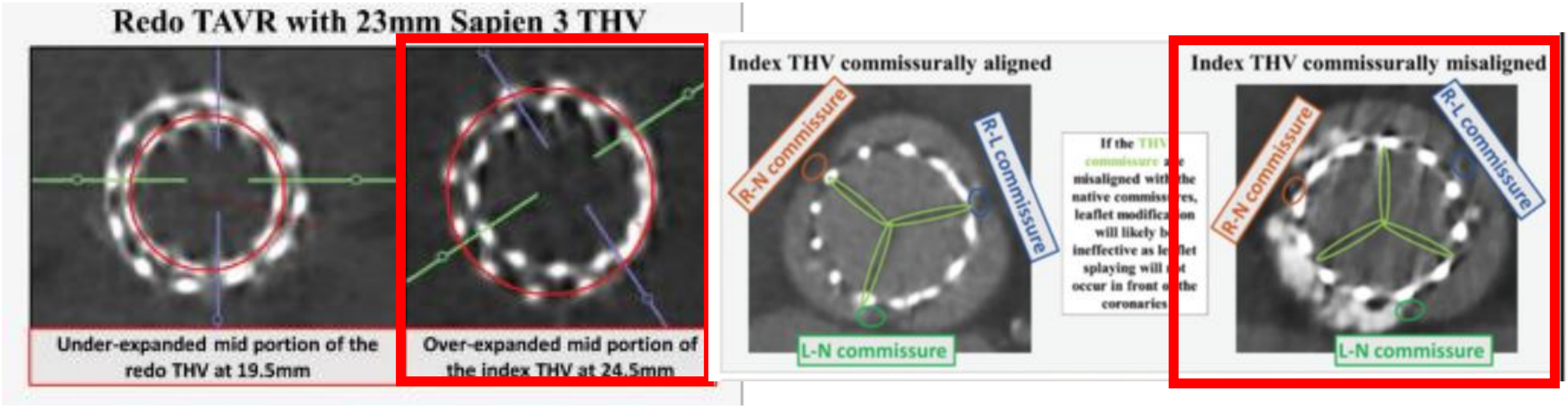


The neoskirt is always higher than during the first TAVR,

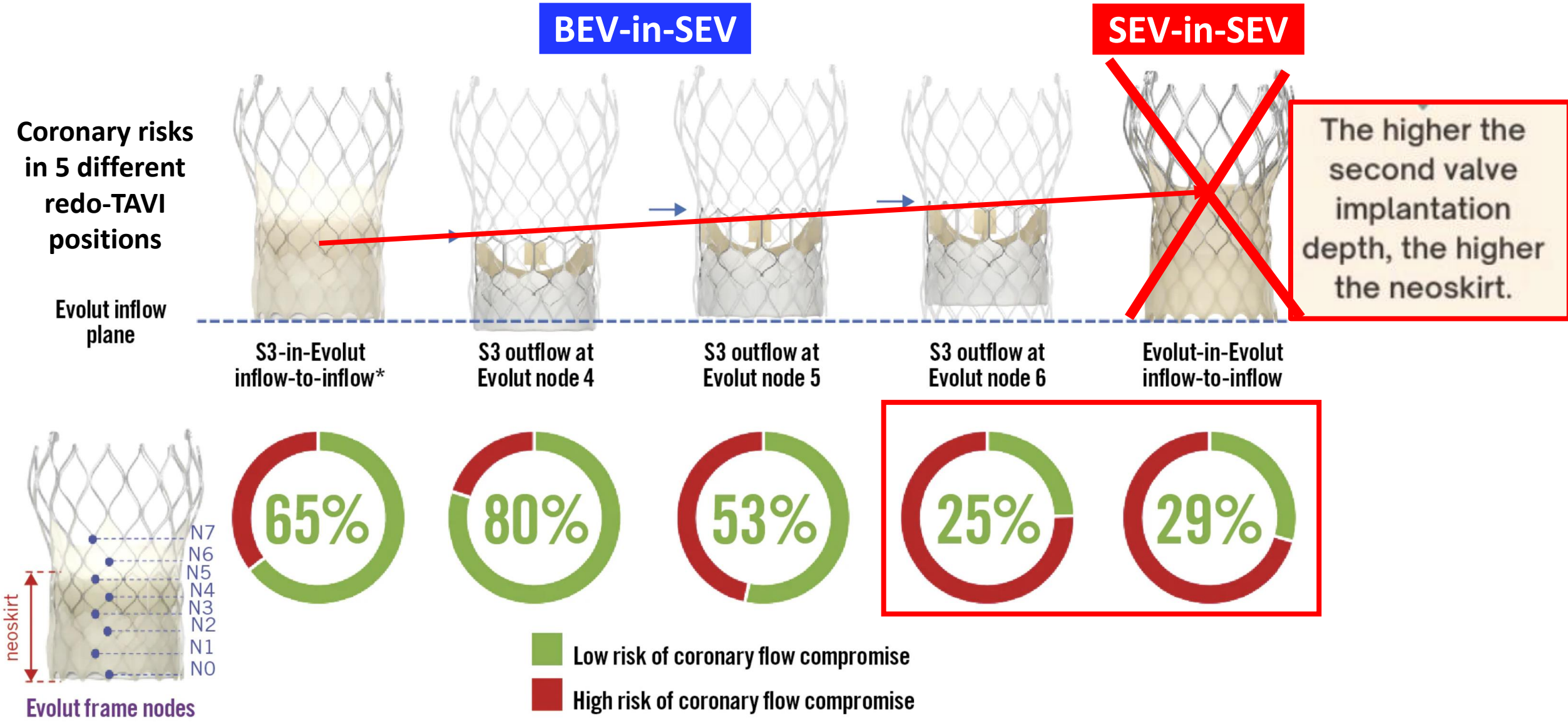


Front view

Valve Expansion in Redo-TAVR reduces VTSTJ and VTA and coronary misalignment may significantly increase coronary risk, especially in small anatomies

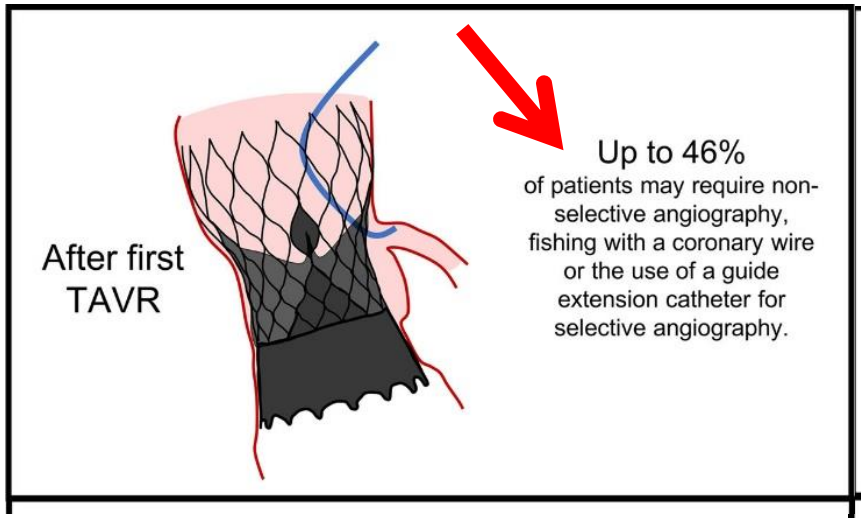


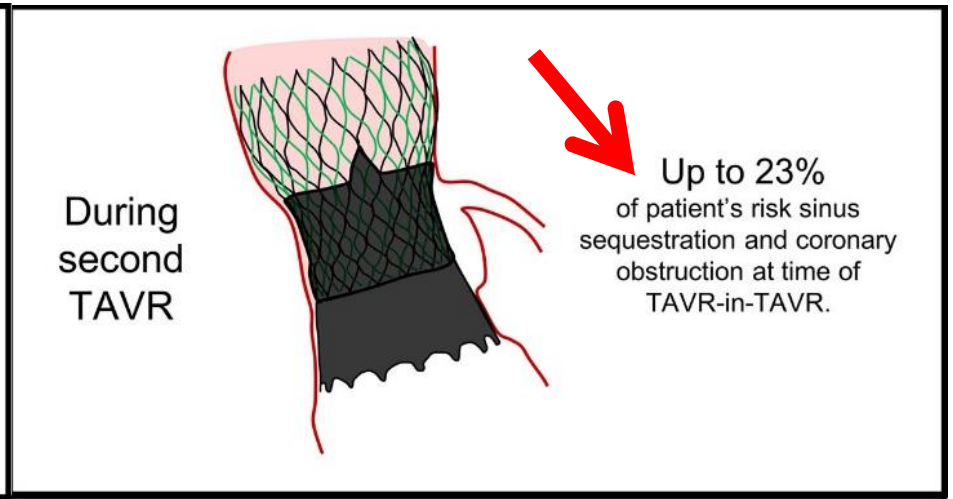
The implant position matters in Redo-TAVR



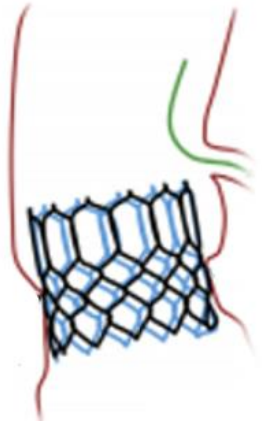
Coronary reaccess after TAVR with SEV-in-SEV

- Taller valves with risk plane above coronaries are at risk of unfeasible for coronary reaccess, based on the valve to STJ (VTSTJ) and valve to coronary artery (VTC) distances

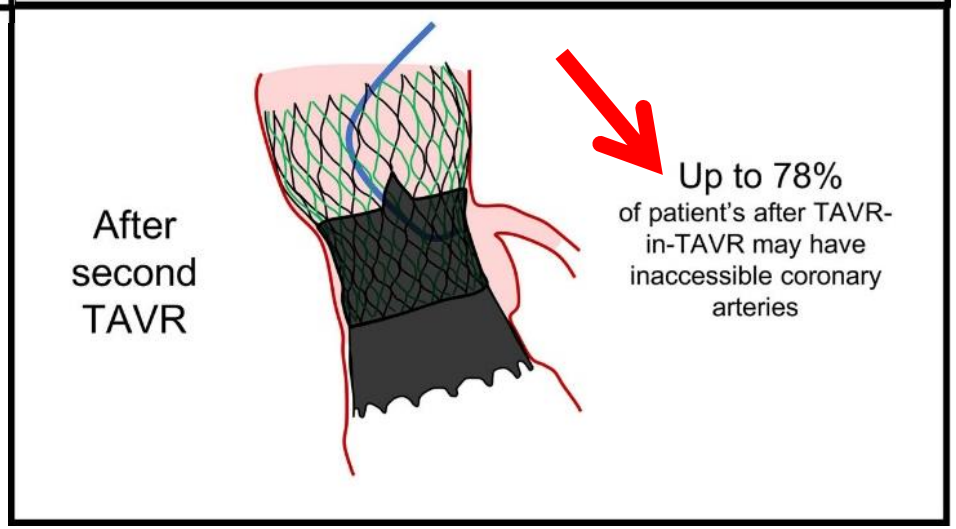




Short valves with risk plane sub-coronaries allows for future coronary access

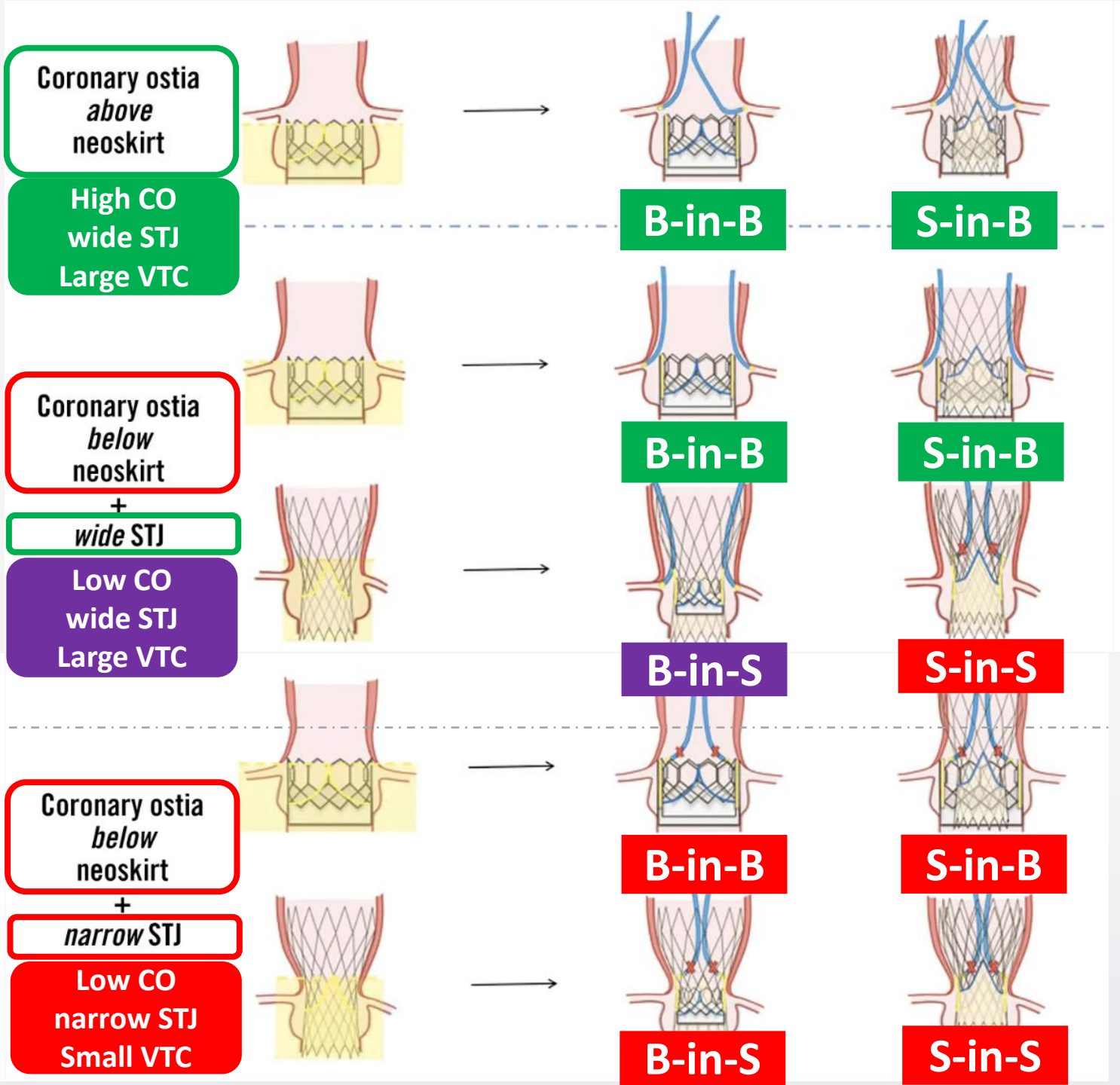


78.8%
unobstructed access to coronaries[1]
n=137



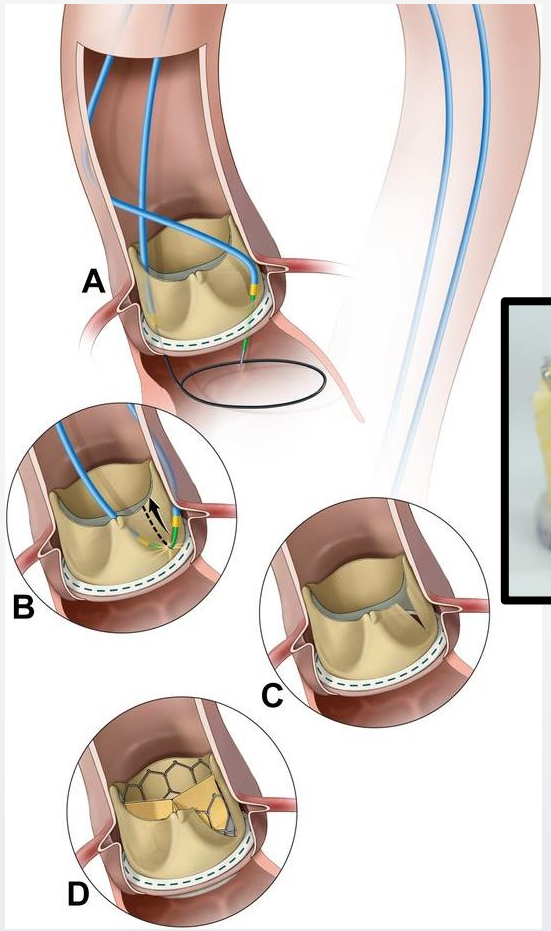
Coronary risk after TAVR and redo-TAVR with different combinations of BEV and SEV

- Neoskirt height (risk plane) vs. coronary height
- VTSTJ (risk of sinus sequestration)
- VTC (risk of coronary obstruction)
- Commissural alignment (effectiveness of leaflet modification).

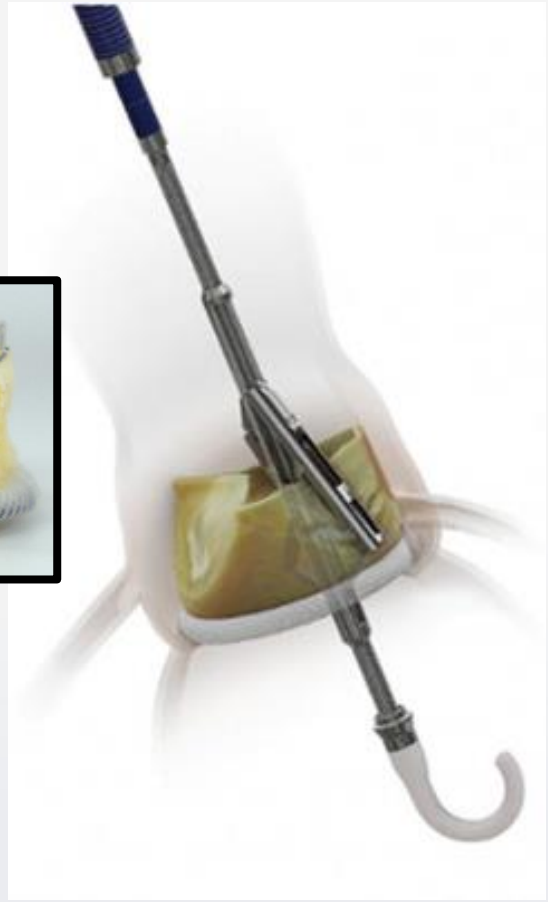


Leaflet modification for patients with extreme high coronary risk

BASILICA Procedure

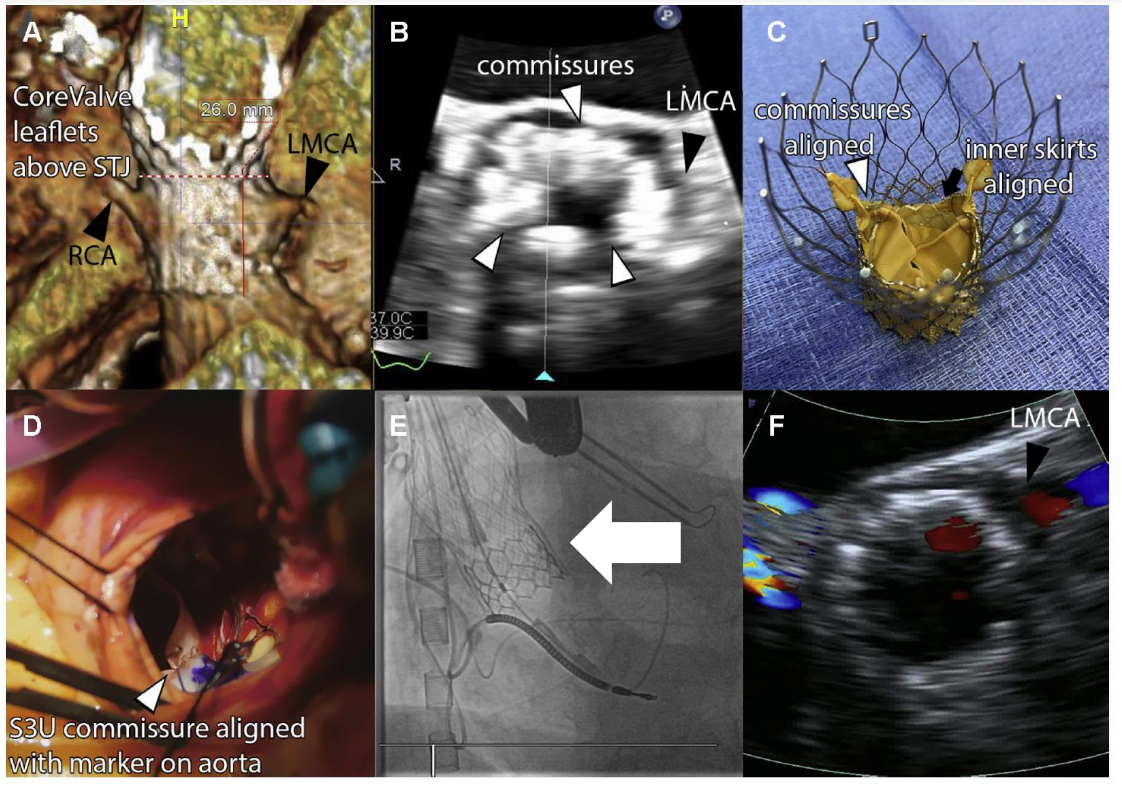


ShortCut device



Surgical Resection of Prosthetic Valve Leaflets Under Direct Vision (SURPLUS) for Redo TAVR

Luigi Pirelli, MD, Craig L. Basman, MD, Derek R. Brinster, MD, Denny Wang, BS, Nirav Patel, MD, S. Jacob Scheinerman, MD, Chad A. Kliger, MD



Hemodynamics following Redo-TAVR

Self-expandable second valve is associated with lower post-Redo gradients.

Prosthesis-patient mismatch following transcatheter aortic valve replacement for degenerated transcatheter aortic valves: the TRANSIT-PPM international project

- The prevalence of **severe and moderate PPM** after Redo-TAVR is **6.5% and 14.2%,** respectively.
- The incidence of **severe PPM** was notably higher among patients who received a **supra-annular SEV THV into a balloon-expandable device (SEV-in-BEV)**.

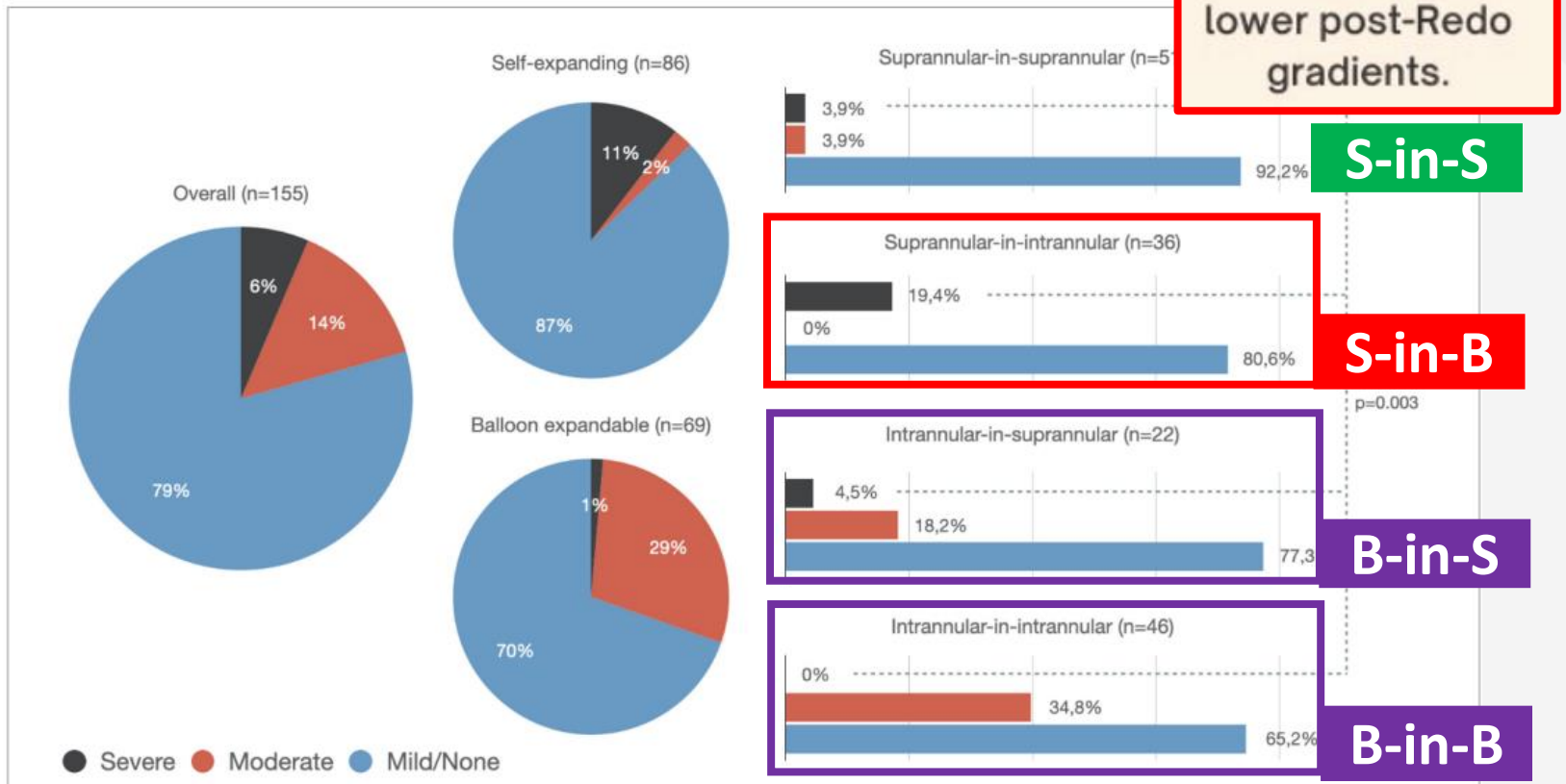


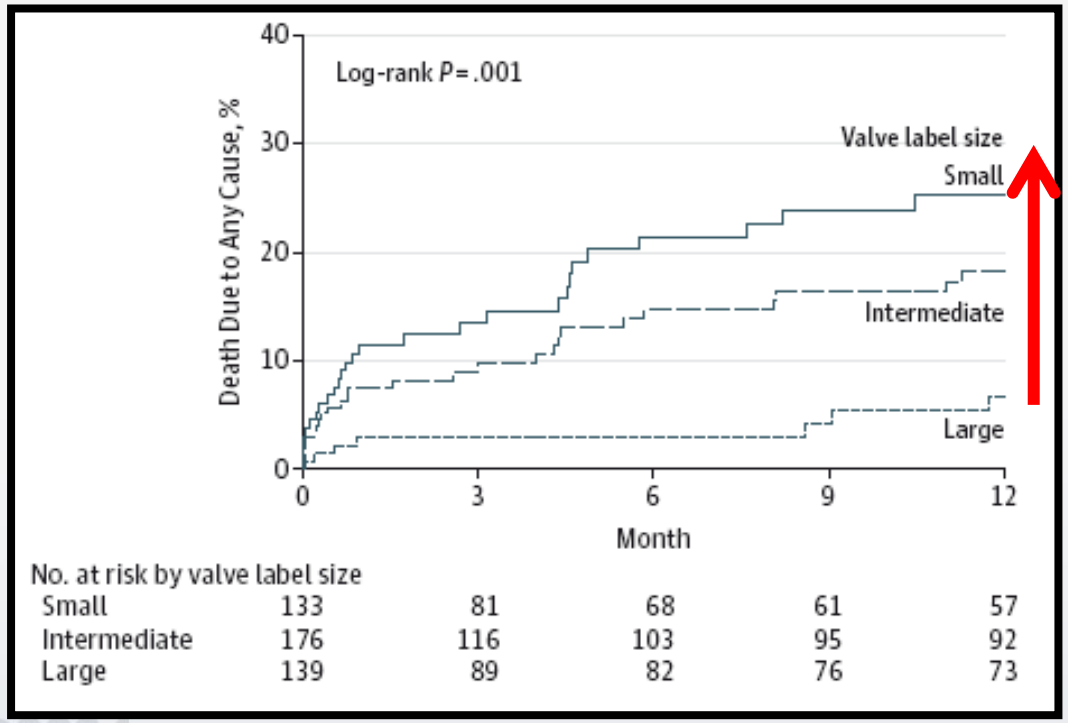
FIGURE 1

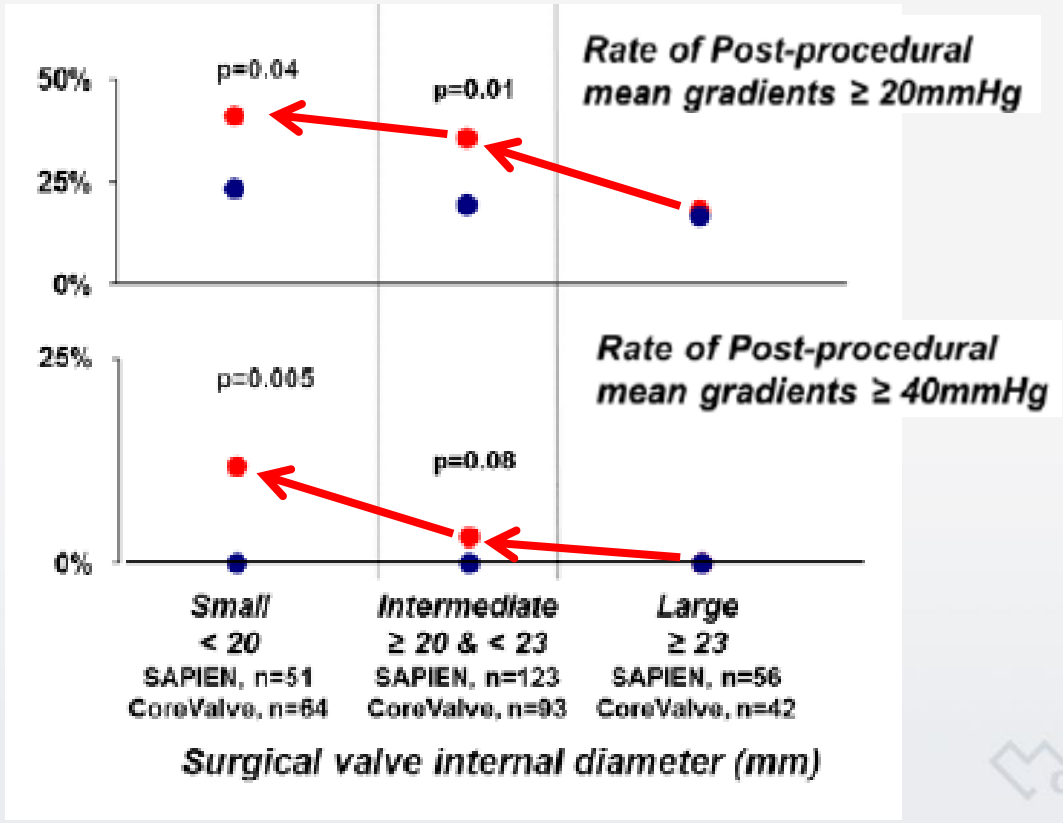
Rate of prosthesis-patient mismatch among the overall population (left-sided), patients treated with a second self-expanding transcatheter heart valve (THV) (top center), and patients treated with a second balloon-expandable THV (bottom center). Incidence of severe prosthesis-patient mismatch (PPM) was higher in patients with supra-annular-in-intra-annular THV (p = 0.003). Particularly, a higher rate of severe PPM was observed among the supra-annular-in-intra-annular group compared to the supra-annular-in-supra-annular or intra-annular-in-intra-annular groups (p = 0.02 and p = 0.002, respectively).

Zoro-tolerance policy against PPM must be adopted.

There was a negative trend between the surgical bioprosthesis size and high post-procedural PG, which may translate into poor survival.

Surgical valve label size

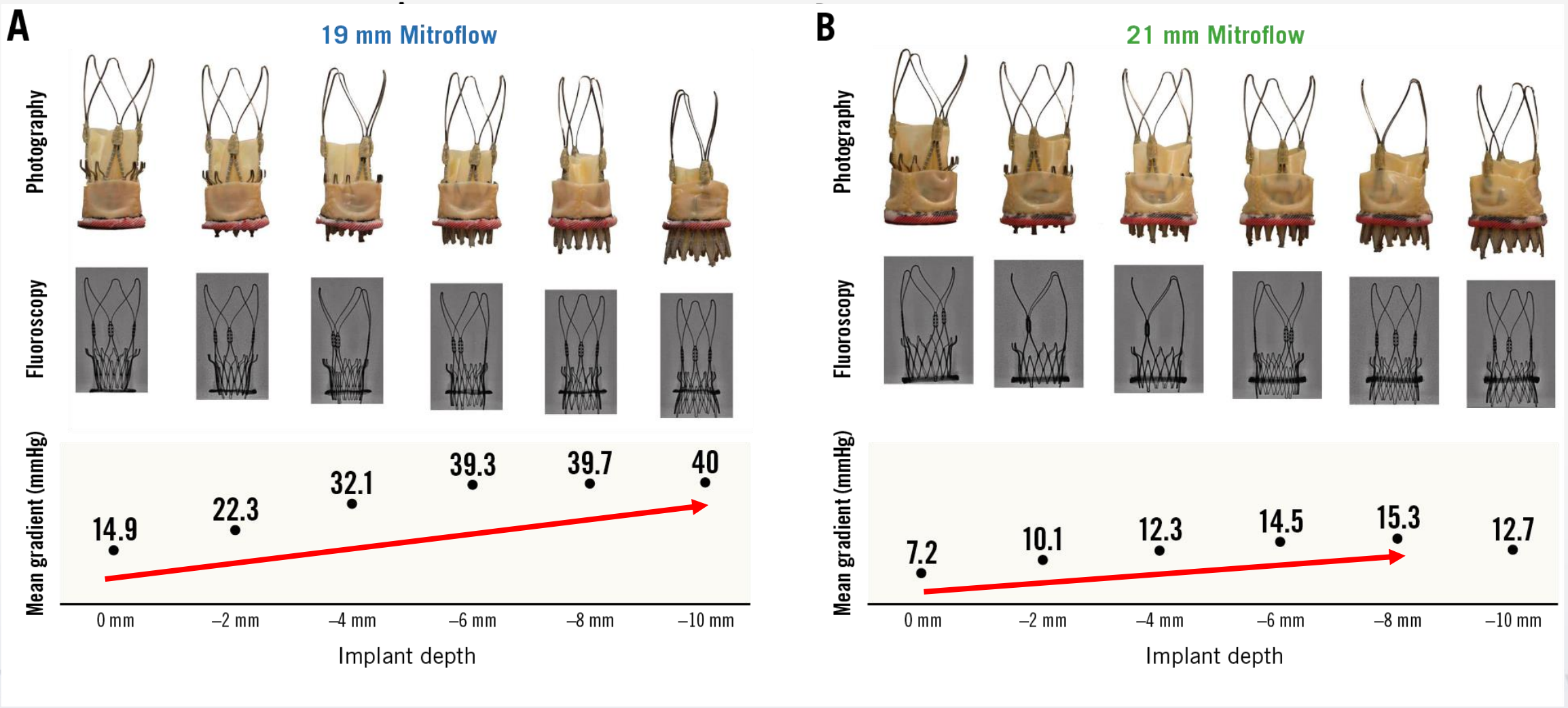




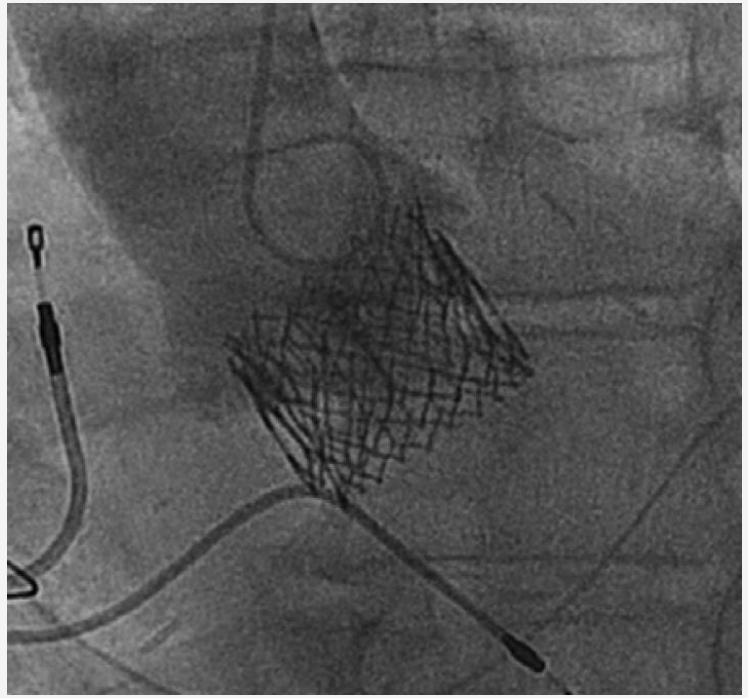
JAMA. 2014;312(2):162-170. doi:10.1001/jama.2014.7246

Implantation depth and hemodynamics of Redo-TAVR with SEV-in-BEV

Especially when the THV was implanted deeper in a small surgical bioprosthesis.



Hemodynamics of Redo-TAVR with BEV-in-BEV



Circulation Reports
Circ Rep 2019; **1:** 142–148
doi:10.1253/circrep.CR-18-0025

ORIGINAL ARTICLE
Valvular Heart Disease

Outcomes of Redo Transcatheter Aortic Valve Implantation for Structural Valve Degeneration of Transcatheter Aortic Valve

Although coronary risk is lower, but hemodynamics may be an issue in BEV-in-BEV (23mm)!

Background: The outcome of redo transcatheter aortic valve (TAV) implantation (TAVI) is unknown for TAV structural valve degeneration (SVD). This paper reports the initial results of redo TAVI for TAV-SVD in Japanese patients.

Methods and Results: Of 630 consecutive patients, 6 (1.0%) underwent redo TAVI for TAV-SVD (689–1,932 days after the first TAVI). The first TAV were 23-mm balloon-expandable bioprostheses (BEV, n=5) and a 26-mm self-expandable bioprosthesis (SEV, n=1). All patients

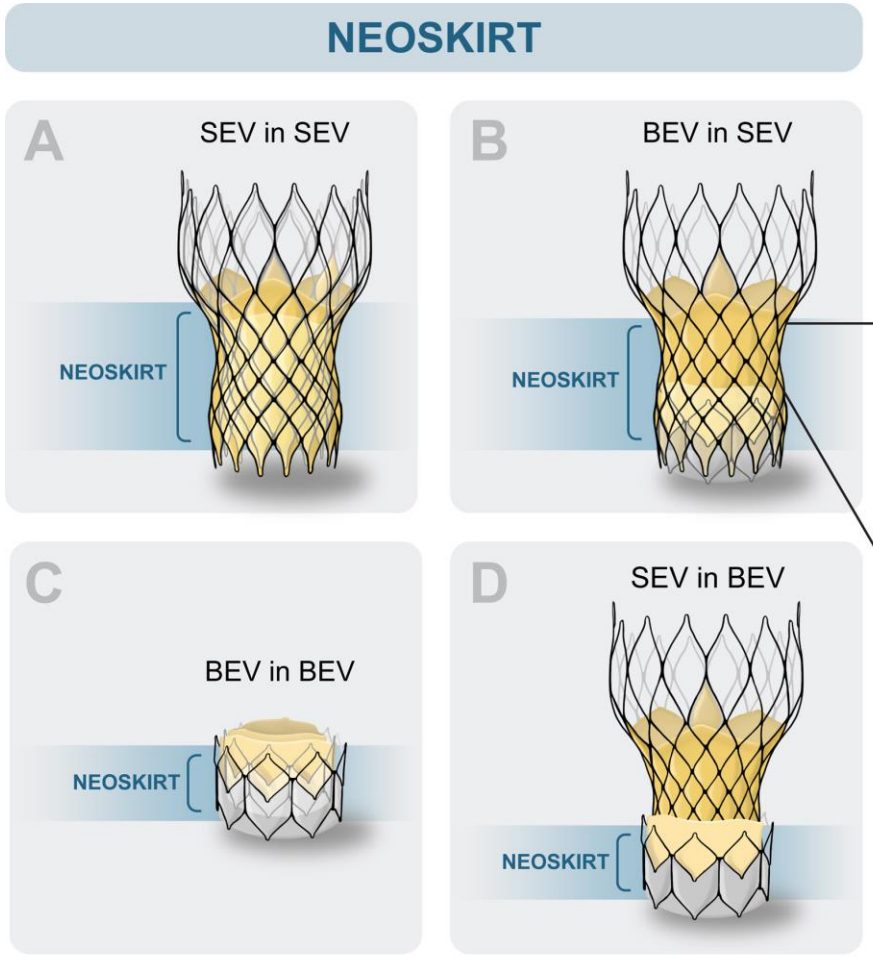
regurgitation or 30-day mortality. One of 2 patients with a BEV-inside-BEV implantation had a high transvalvular mean pressure gradient post-procedurally (34 mmHg) and required surgical valve replacement 248 days after the redo TAVI. This, however, was

gradient post-procedurally (34 mmHg) and required surgical valve replacement 248 days after the redo TAVI. This, however, was unnoted in patients with SEV implantation during redo TAVI. Planned coronary artery bypass grafting was concomitantly performed in 1 patient with a small sino-tubular junction and SEV-inside-SEV implantation because of the risk of coronary malperfusion caused by the first TAV leaflets. Five of the 6 patients survived during the follow-up period (range, 285–1,503 days).

Conclusions: Redo TAVI for TAV-SVD appears safe and feasible, while specific strategies based on MDCT and device selection seem important for better outcomes.

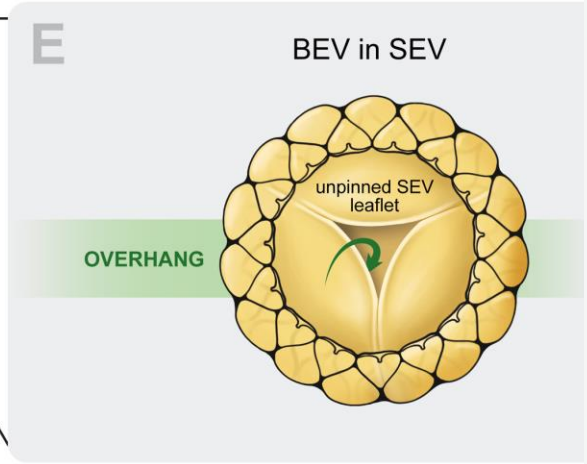
Leaflet overhang in Redo TAVR with BEV-in-SEV

Hemodynamic function is acceptable

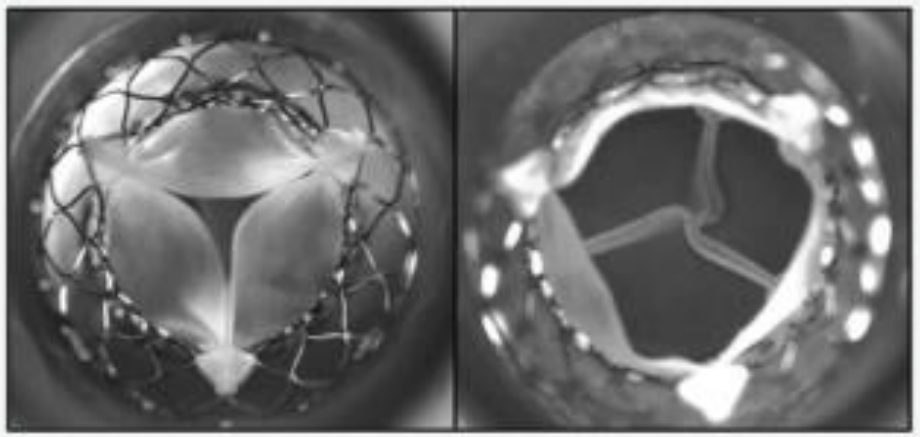


Front view

Leaflet overhang: deploying a short frame THV in a tall frame THV can create overhanging leaflet of the index THV which may have long term consequences



Top view



>90% leaflet overhang when a BE THV is implanted low in a SE THV

Minimal leaflet overhang when a BE THV is implanted high in a SE THV

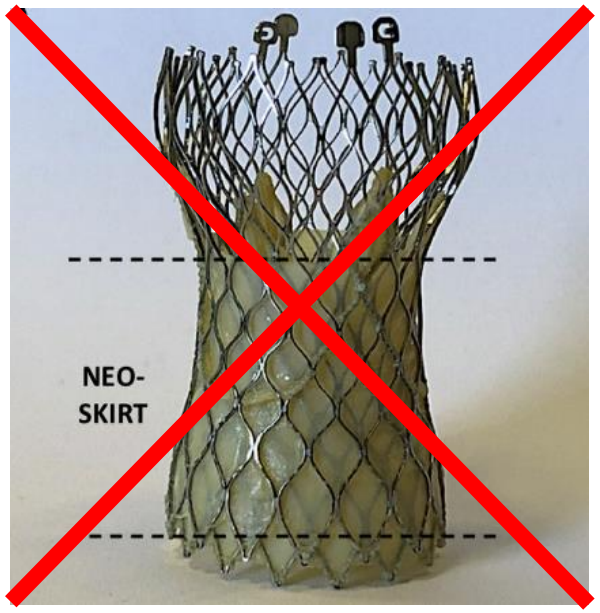
Balloon-expandable valve (BEV); self-expanding valve (SEV)

Valve choice today is also a valve choice for tomorrow

Avoided in patients at higher lifetime coronary risk

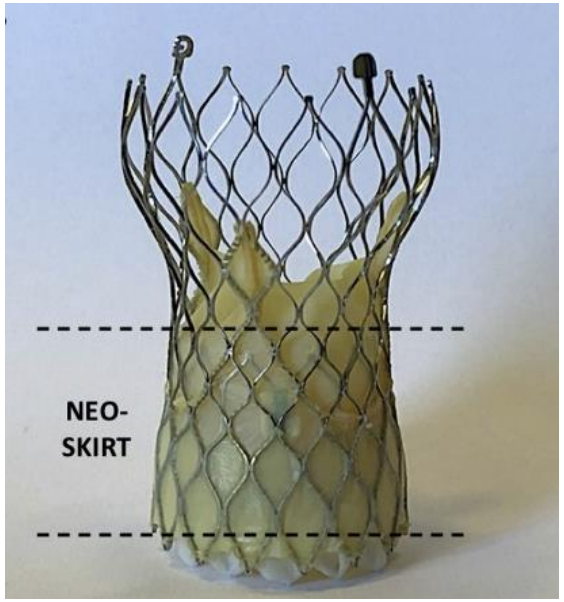
Coronary risk > PPM > PPI > PVL

SEV-in-SEV



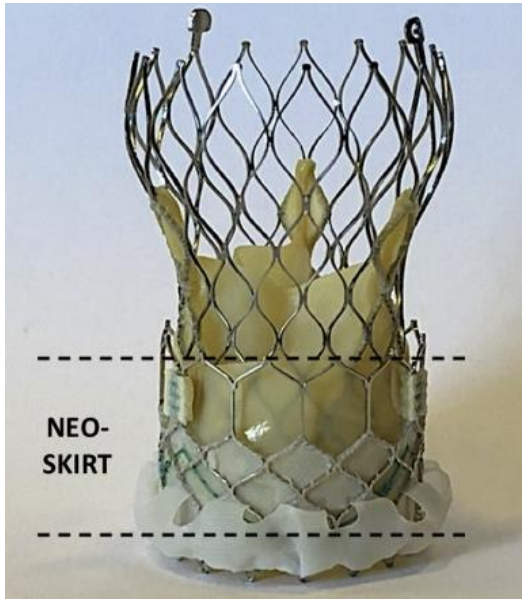
Less PPM
Highest coronary risk

BEV-in-SEV



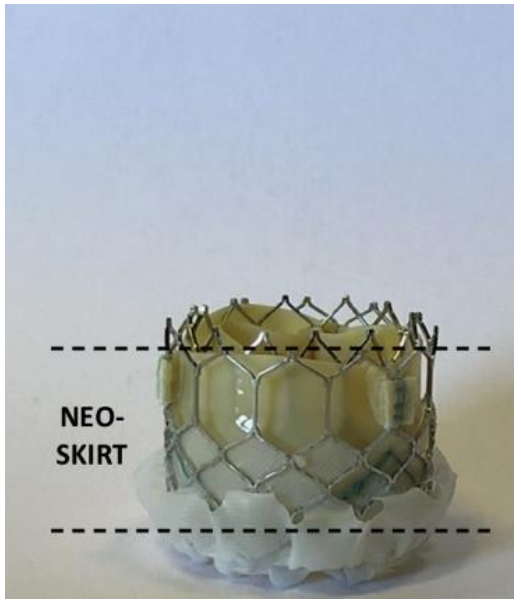
moderate PPM (small S)
Moderate coronary risk

SEV-in-BEV



Highest PPM (small B)
Lower coronary risk

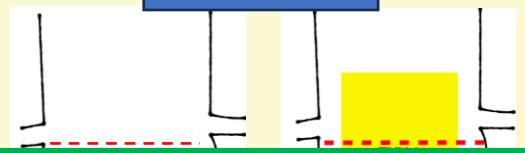
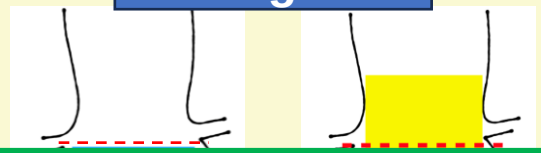
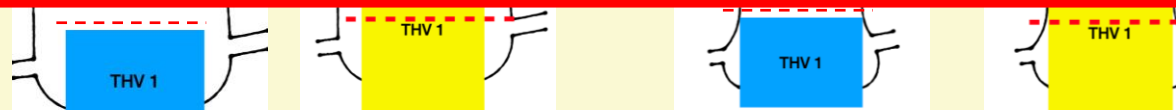
BEV-in-BEV



Moderate PPM (small B)
Lowest coronary risk

1. De Backer O, Landes Uri, Fuchs A, et al. Coronary access after TAVR-in-TAVR as evaluated by multidetector computed tomography. JACC: Cardiovascular Interventions. 2020;13(21).

Coronary First Approach for Redo-TAVR

Coronary Height	Type of Aortic Root Anatomy		
Type 1 CH ≧ RP (coronary ostia above RP or neoskirt) ***No coronary reaccess issue*** --- Risk plane height	**Type 1A** Wide VTC & VTSTJ (VTC >4mm, VTSTJ>2mm) **Barrel**	**Type 1B** Wide VTC Narrow VTSTJ (VTC >4mm, VTSTJ<2mm) **Hourglass**	**Type 1C** Narrow VTSTJ & VTC (VTC <4mm, VTSTJ<2mm) **Tube**
			
	Implant the THV with the RP/neoskirt below coronary ostia and keep commissural alignment (SEV).		
Type 2 **CH ≦ RP (coronary ostia below RP or neoskirt)** ***1. Avoid SEV-in-SEV!!!*** ***2. Watch for PPM in small THV 1. BVF/M is needed*** ***3. If coronary misaligned in THV 1, and leaflet modification ± snorkel stenting unsuccessful → surgery is indicated***	**Type 2A** Wide VTC & VTSTJ (VTC >4mm, VTSTJ>2mm)	**Type 2B** Wide VTC Narrow VTSTJ (VTC >4mm, VTSTJ<2mm)	**Type 2C** Narrow VTSTJ & VTC (VTC <4mm, VTSTJ<2mm)
	SEV-in-BEV or BEV-in-SEV Consider high implant for better hemodynamics and avoid PPI	**SEV-in-BEV or BEV-in-SEV** 1. Leaflet modification ± snorkel stenting 2. THV explant/SURPLUS if THV1 (SEV) has commissural misalignment	**SEV-in-BEV or BEV-in-SEV** 1. Leaflet modification ± snorkel stenting 2. THV explant/SURPLUS if THV1 (SEV or BEV) has commissural misalignment
	The outflow of the index THV should be below the coronaries, even though low BEV-in-SEV may have leaflet overhang.		
			

Redo-TAVR with different THV combinations

The **"Coronary-first" principle** proposed by our team should be followed during the first TAVR procedure so as to maximize the success rate of TAVR and minimize long-term complications.

S-in-S **B-in-S** **S-in-B** **B-in-B**