Coronary protection technique in high-risk patients

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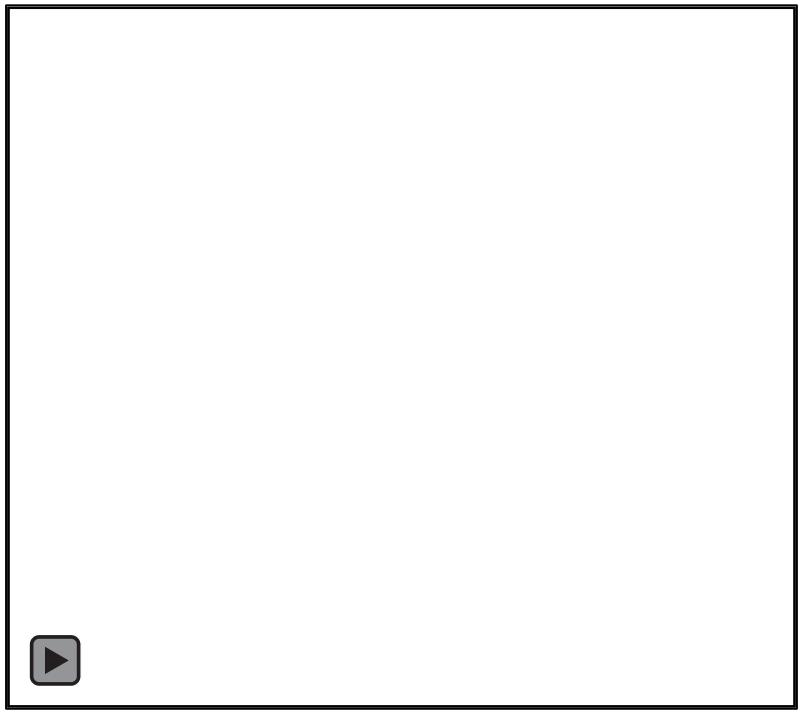
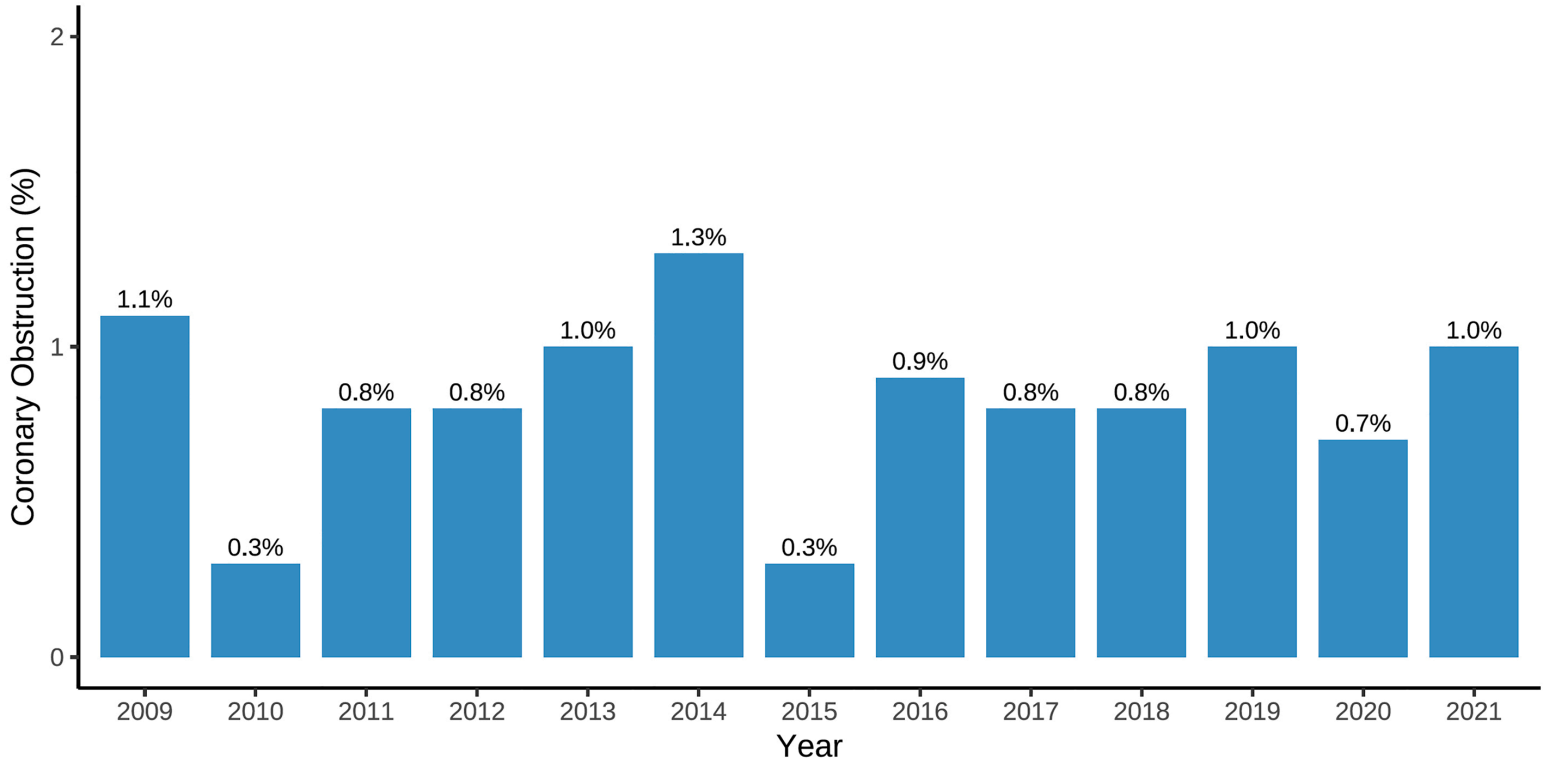
Incidence of Coronary Obstruction Following TAVI: the size of the problem

Spanish TAVI Registry:

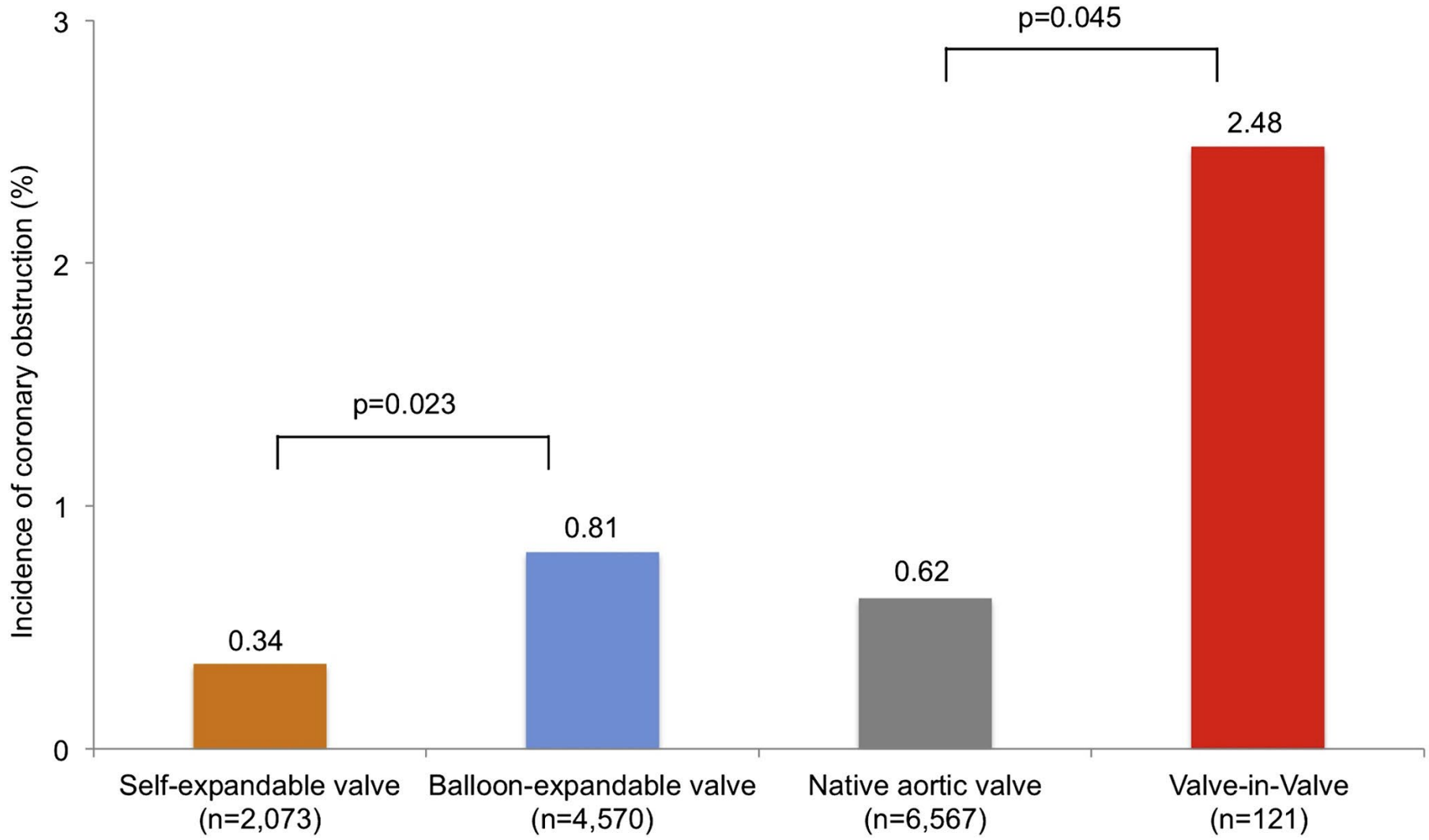
Of 13.675 patients undergoing TAVI, 115 (0.80%) presented with a Coronary Obstruction





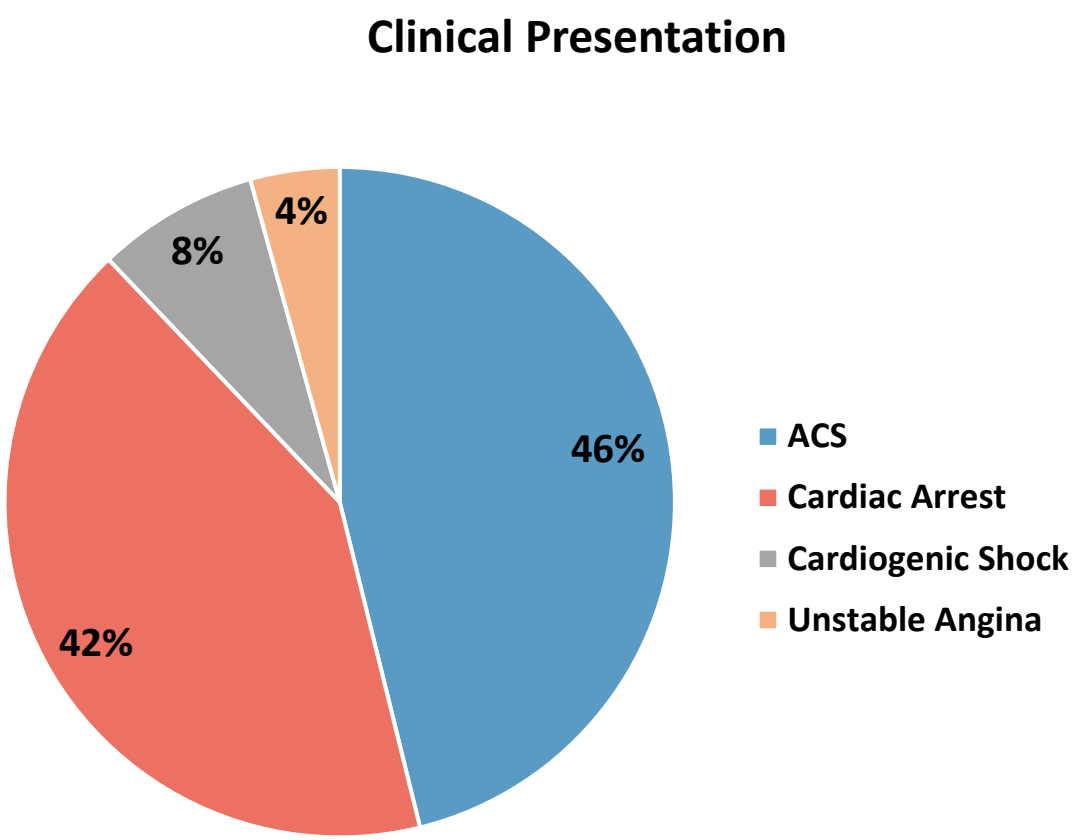
Ojeda S, et al. *JACC Cardiovasc Interv*. 2023;16(10):1208-1217.

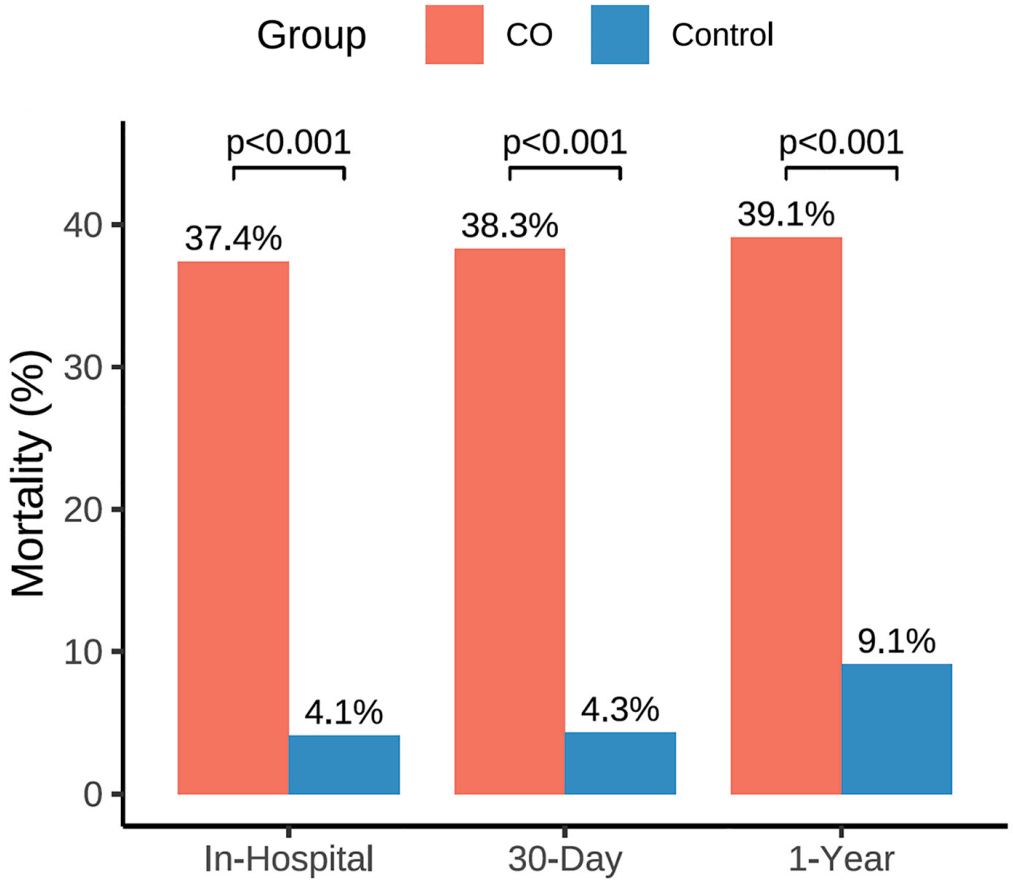
Incidence of Coronary Obstruction Following TAVI: the size of the problem



Ribeiro HB, et al. *J Am Coll Cardiol*. 2013;62(17):1552-1562.

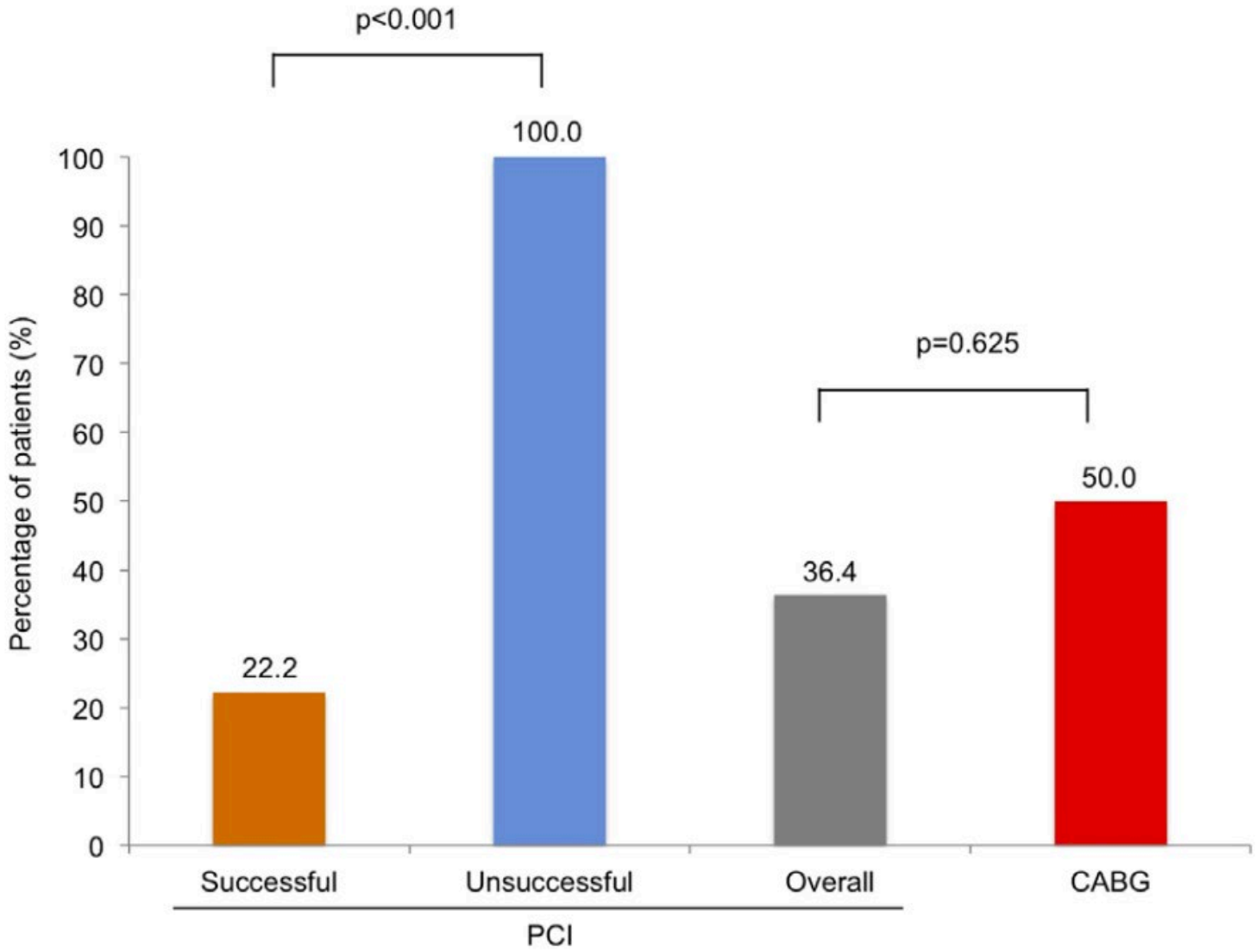
Coronary Obstruction Following TAVI: clinical presentation and outcomes





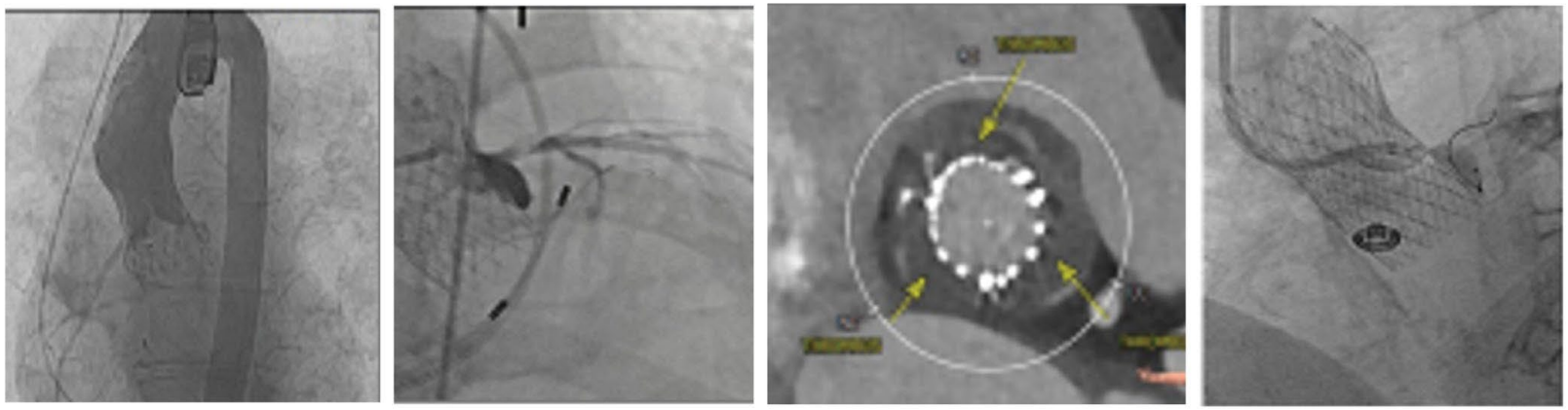
Ojeda S, et al. *JACC Cardiovasc Interv*. 2023;16(10):1208-1217.

Mortality rate at 30 days according to the treatment and related success



Ribeiro HB, et al. *J Am Coll Cardiol*. 2013;62(17):1552-1562.

Coronary Obstruction Following TAVI: proposed classification

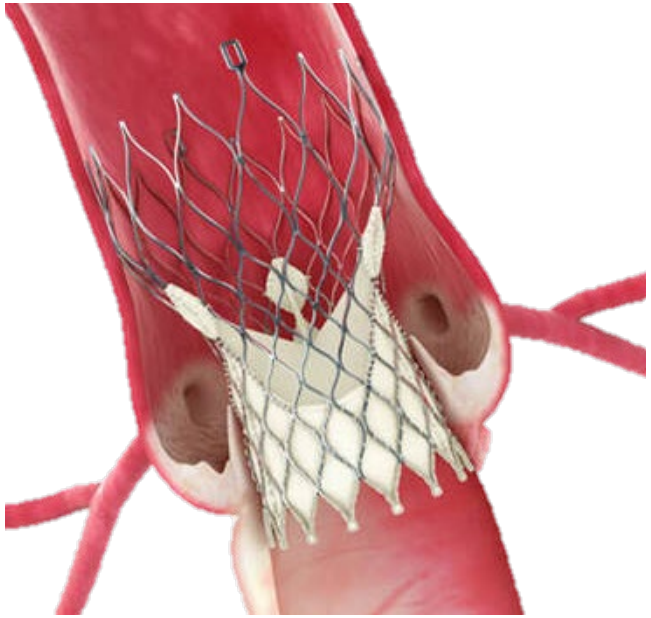


Classification	**Acute**	**Subacute**	**Late**	**Very Late**
Timing	**Intraprocedural**	**Post procedure but in-hospital**	**After discharge up to 60 days after discharge**	**More than 60 days after the index procedure**
Proposed Mechanisms	**Thrombosis (inadequate ACT, post op antithrombotic treatment)**			
	Anatomic considerations (Low STJ height, Small sinuses, VTC < 4 mm)			
	Dissection, Device migration, Embolization		**Late sinus sequestration, Metal hypersensitivity**	
			Atherosclerosis, Intimal hyperplasia	

83.5% of the CO were detected during the index procedure, immediately after valve implantation

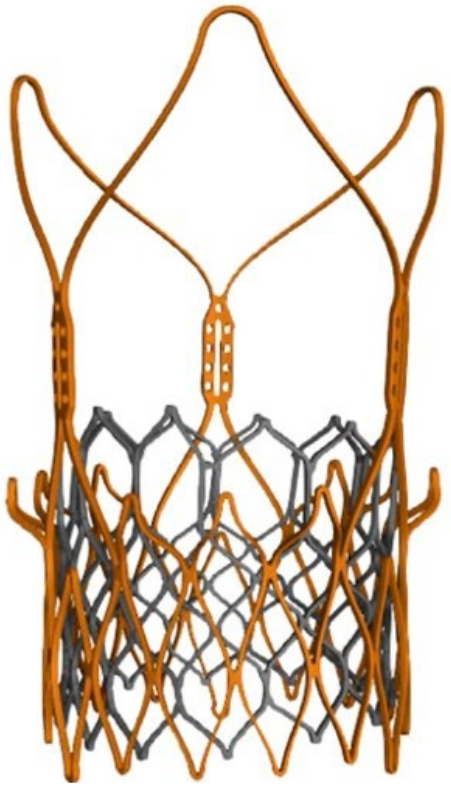
Ibrahim H, et al. *Circ Cardiovasc Interv*. 2024;17(6):e012827; Ojeda S, et al. *JACC Cardiovasc Interv*. 2023;16(10):1208-1217.

Coronary Obstruction Following TAVI: the three different scenarios



Native Aortic Valve

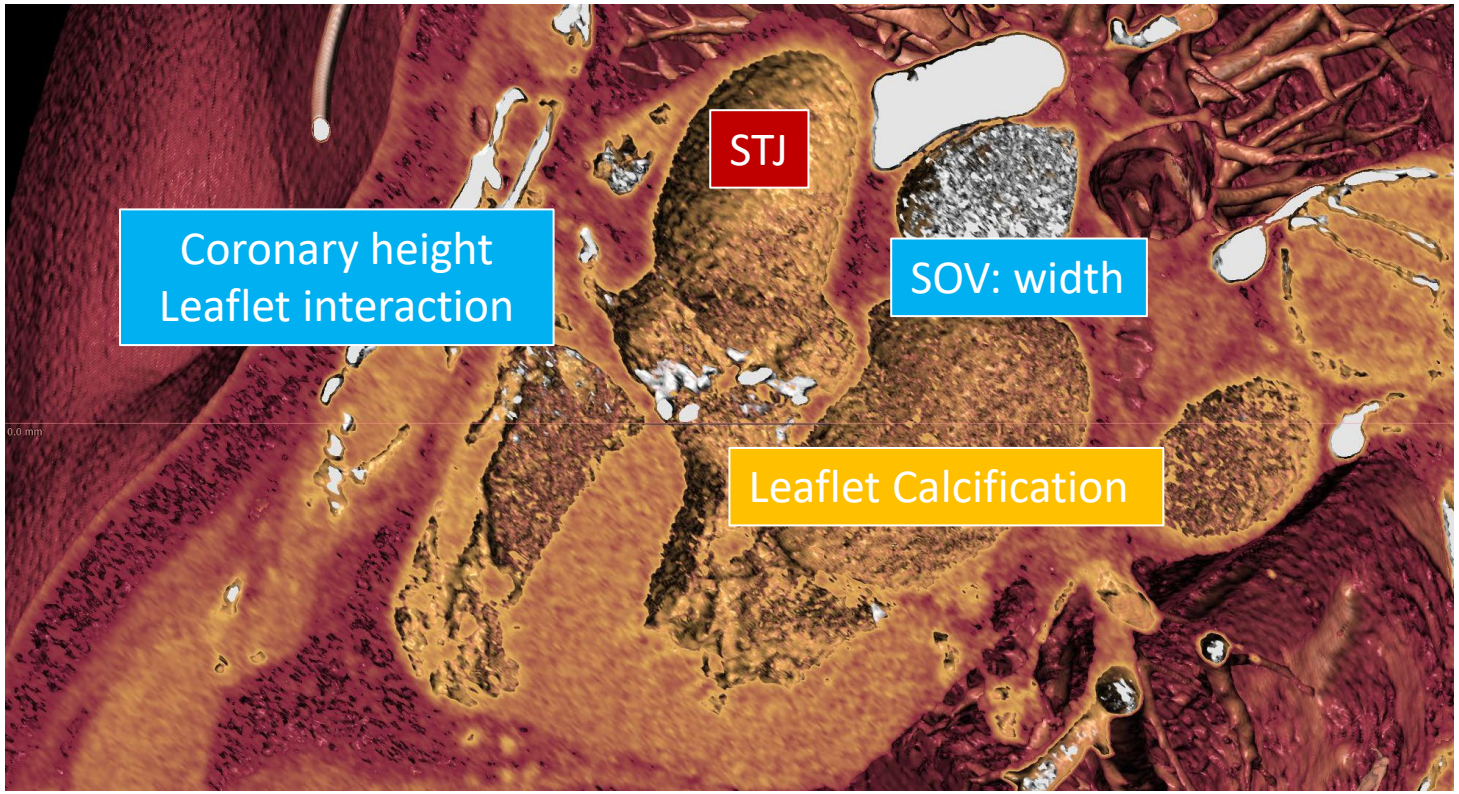
Valve-in-Valve



Redo-TAVI

Predictors of Coronary Obstruction Following TAVI: Native Aortic Valve

Direct obstruction by displacement of a native leaflet caused by the transcatheter heart valve



Low STJ height and narrow STJ diameter

Coronary ostia height < 12 mm

Sinus of Valsalva diameter < 30 mm

Cusp height > coronary height

Left leaflet length >16.5 mm

Reduced residual sinus width (<5 mm)

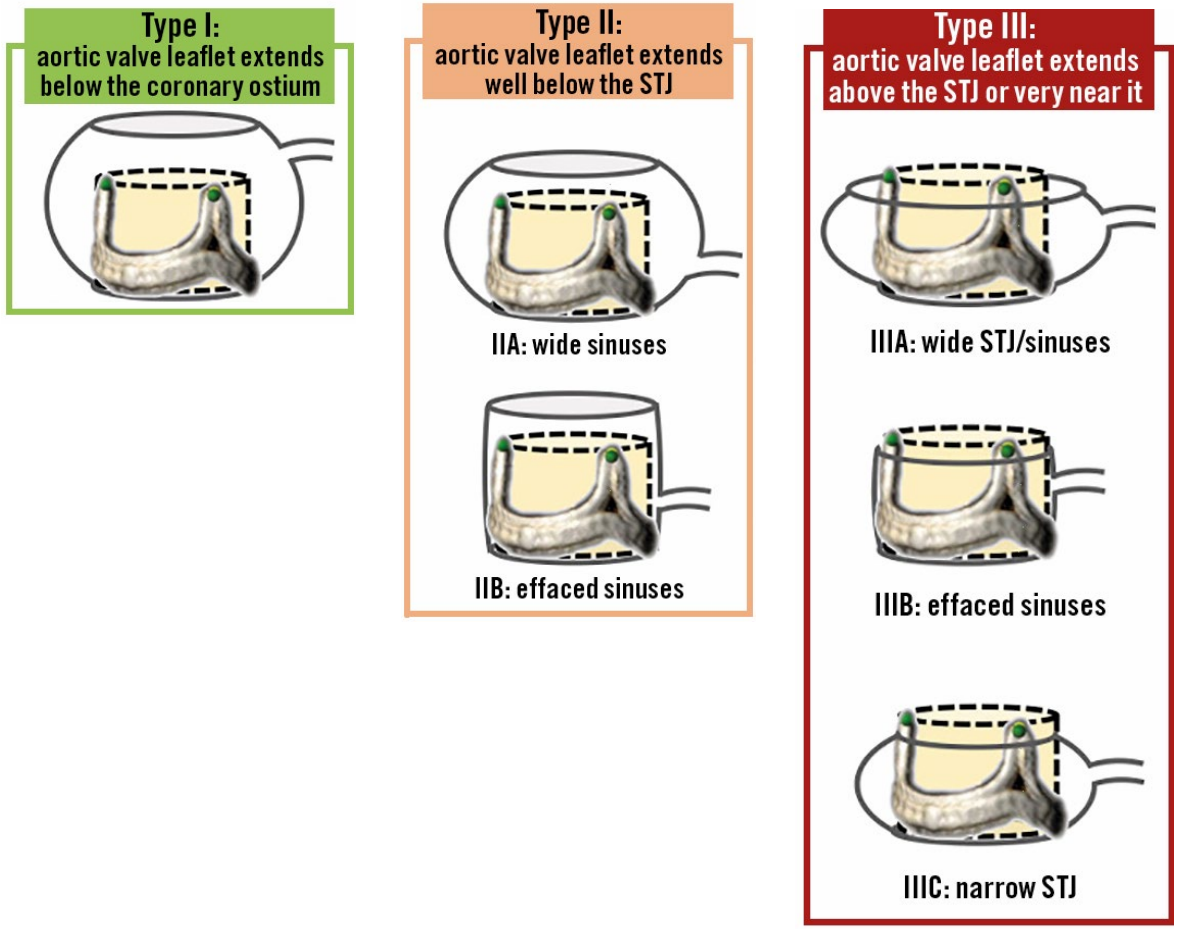
Culprit leaflet calcification > 600 mm3

Ibrahim H, et al. *Circ Cardiovasc Interv*. 2024;17(6):e012827.

Predictors of Coronary Obstruction Following TAVI: Valve-in-Valve

- Direct obstruction by displacement of a native leaflet caused by the transcatheter heart valve
- Indirect obstruction wherein the leaflet is also displaced, occluding STJ

The VIVID Classification

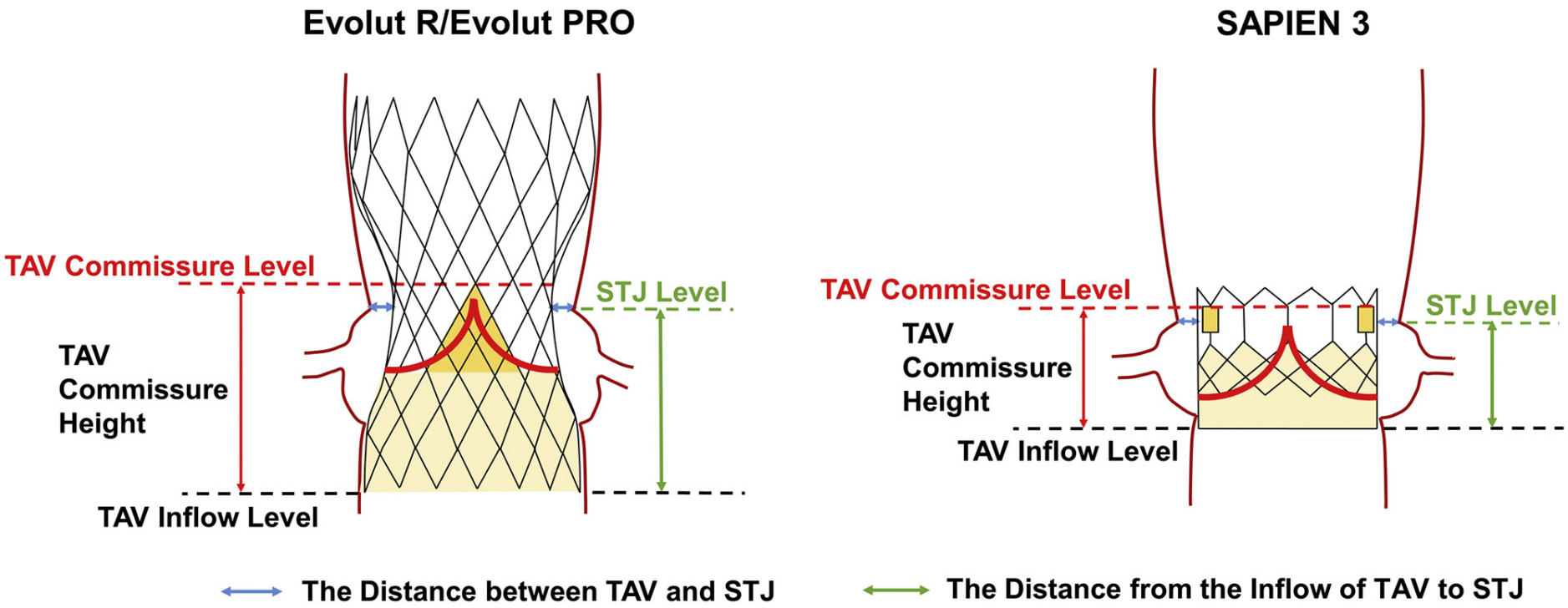


- VTC<4 mm
- Effaced sinus of valsalva
- Stentless bioprosthesis
- Stented bioprosthesis w/external leaflets
- Short VTSTJ distance (VTSTJ<2 mm)

Tang GHL qt al. *EuroIntervention*. 2020;16(9):e757-e759

Predictors of Coronary Obstruction Following TAVI: TAV-in-TAVI

Indirect obstruction wherein the leaflet is also displaced, occluding STJ



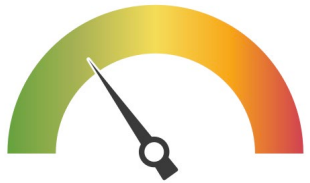
First TAV Commissure Level > STJ Level TAV-in-TAV at Risk of Coronary Obstruction

+

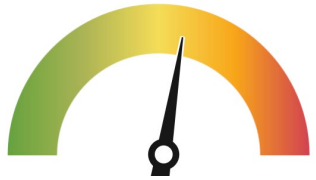
Distance between TAV and STJ < 2.0 mm

Ochiai T et al *JACC Cardiovasc Interv*. 2020;13(22):2617-2627.

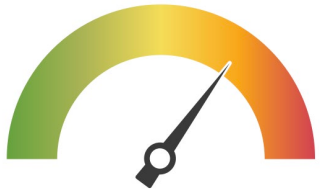
Coronary Obstruction Following TAVI: strategies to prevent CO



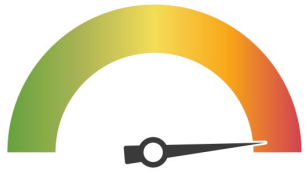
Coronary protection with wire or guiding catheter extension



Chimney/snorkel stenting technique



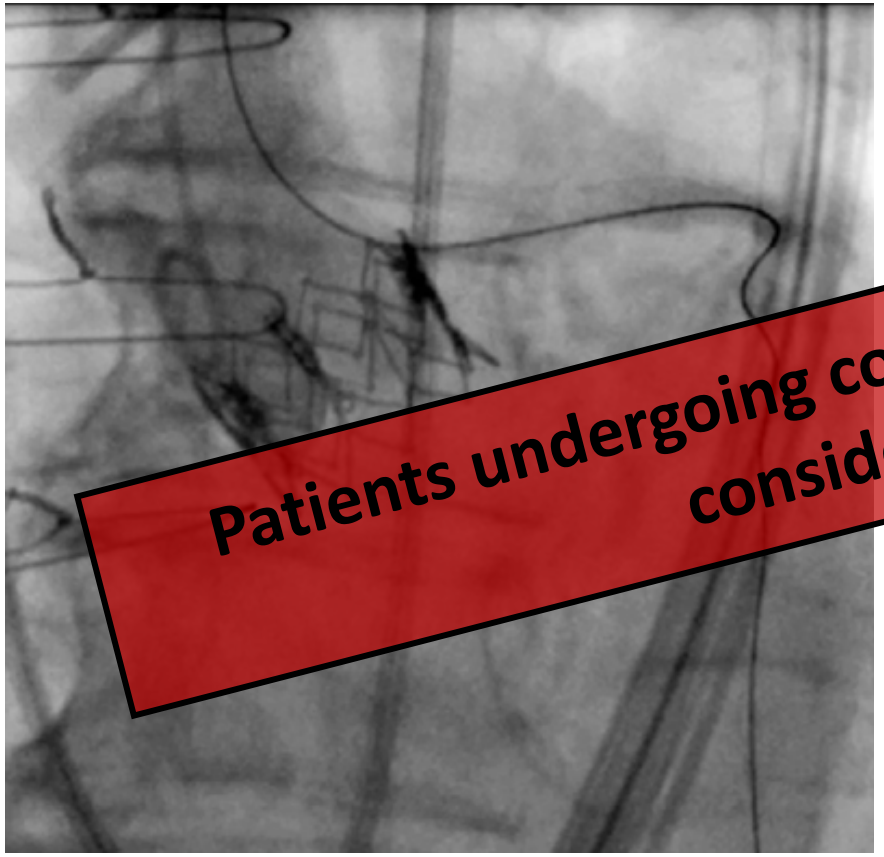
Leaflet splitting devices



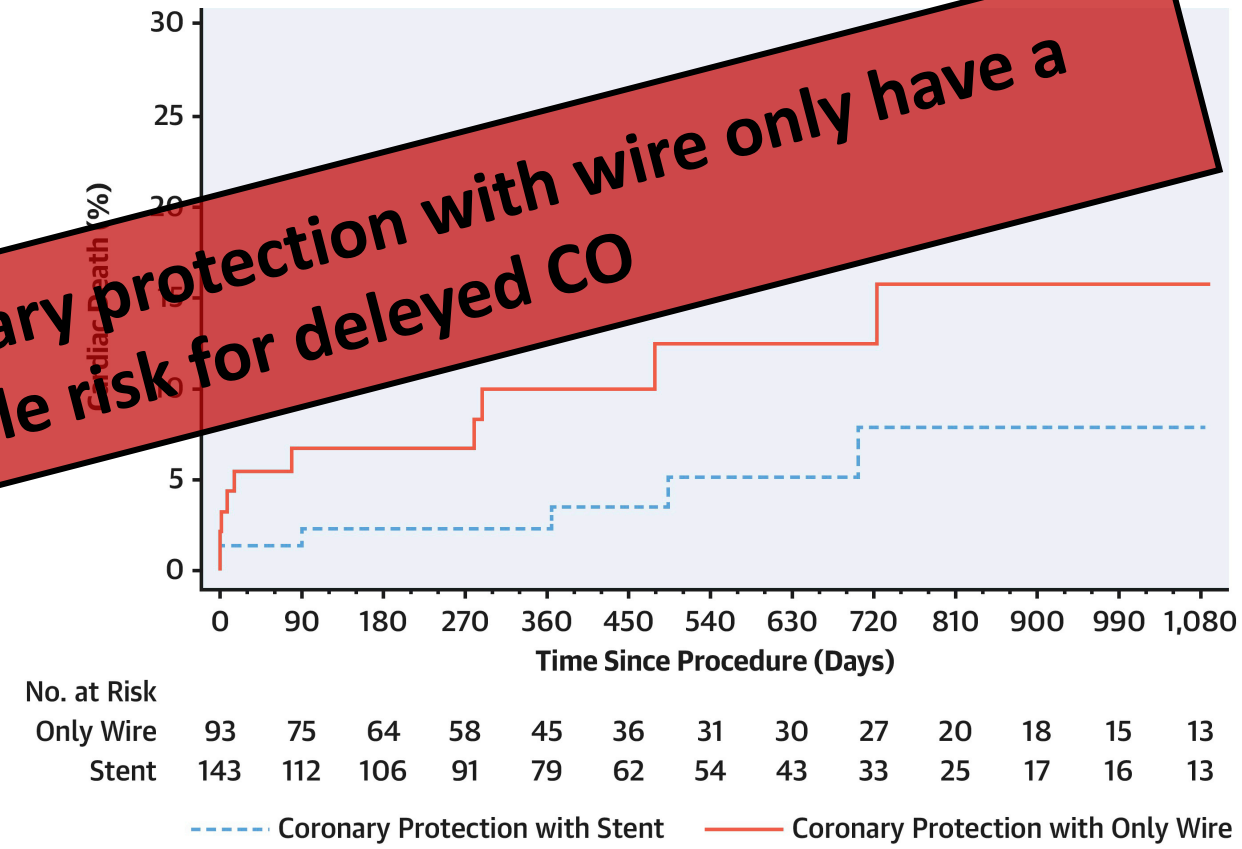
BASILICA/Unicorn techniques

Strategies to prevent Coronary Obstruction Following TAVI: coronary wire protection

This is the simplest protection technique in the setting of TAVI with a high risk of CO and was one of the first protective strategies reported



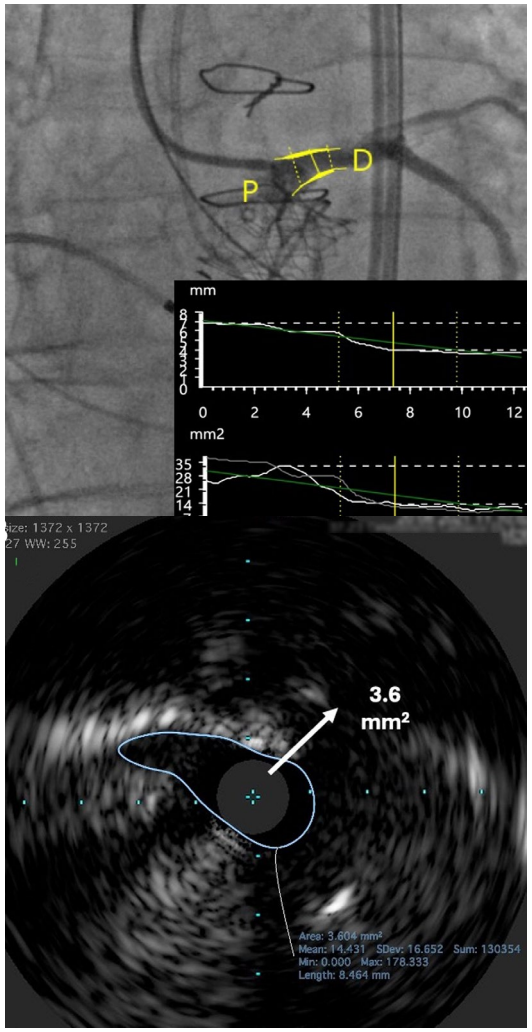
Patients undergoing coronary protection with wire only have a considerable risk for deleyed CO



At 3-year follow-up, rates of cardiac death were 7.8% in patients receiving stents and 15.7% in those not receiving stents (adjusted HR: 0.42; 95% confidence interval: 0.14 to 1.28; p = 0.13)

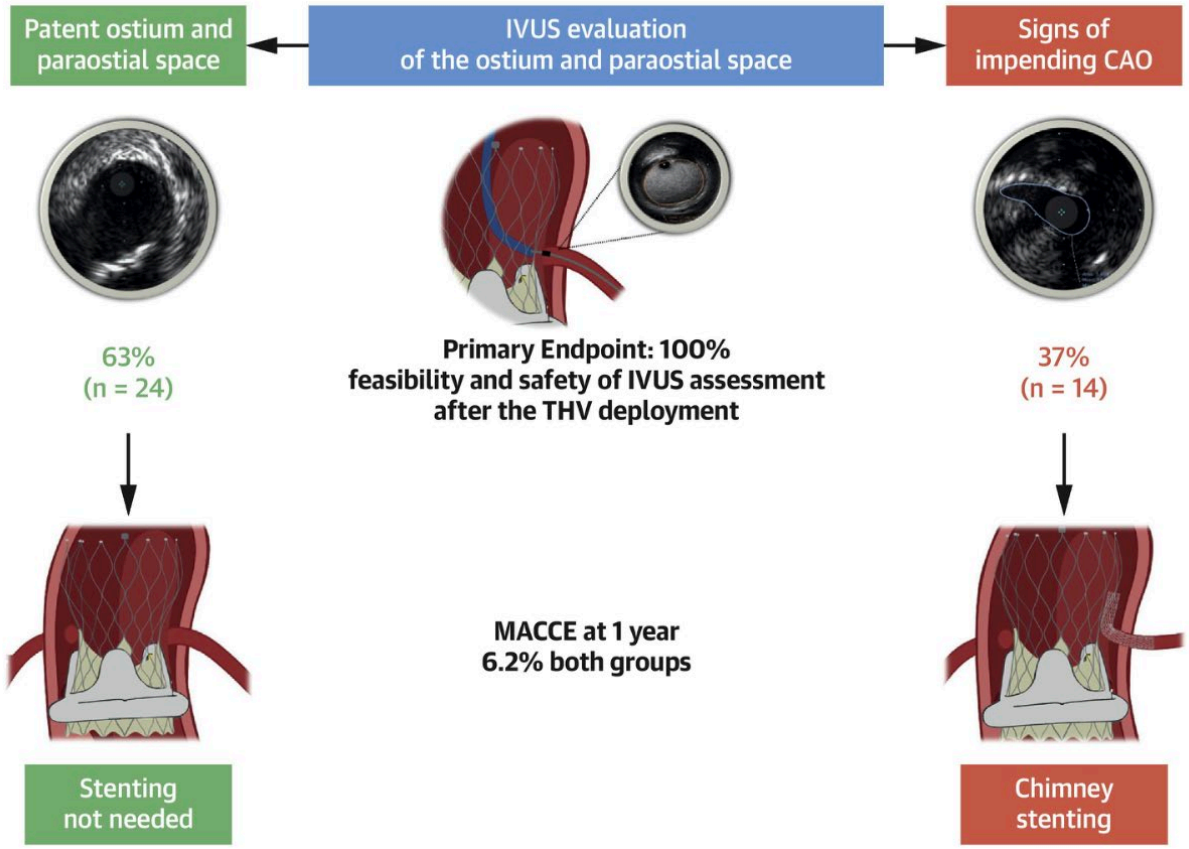
Palmerini T. *JACC Cardiovasc Interv*. 2020;13(6):739-747.

Strategies to prevent Coronary Obstruction Following TAVI: the role of IVUS



The ICARO study:

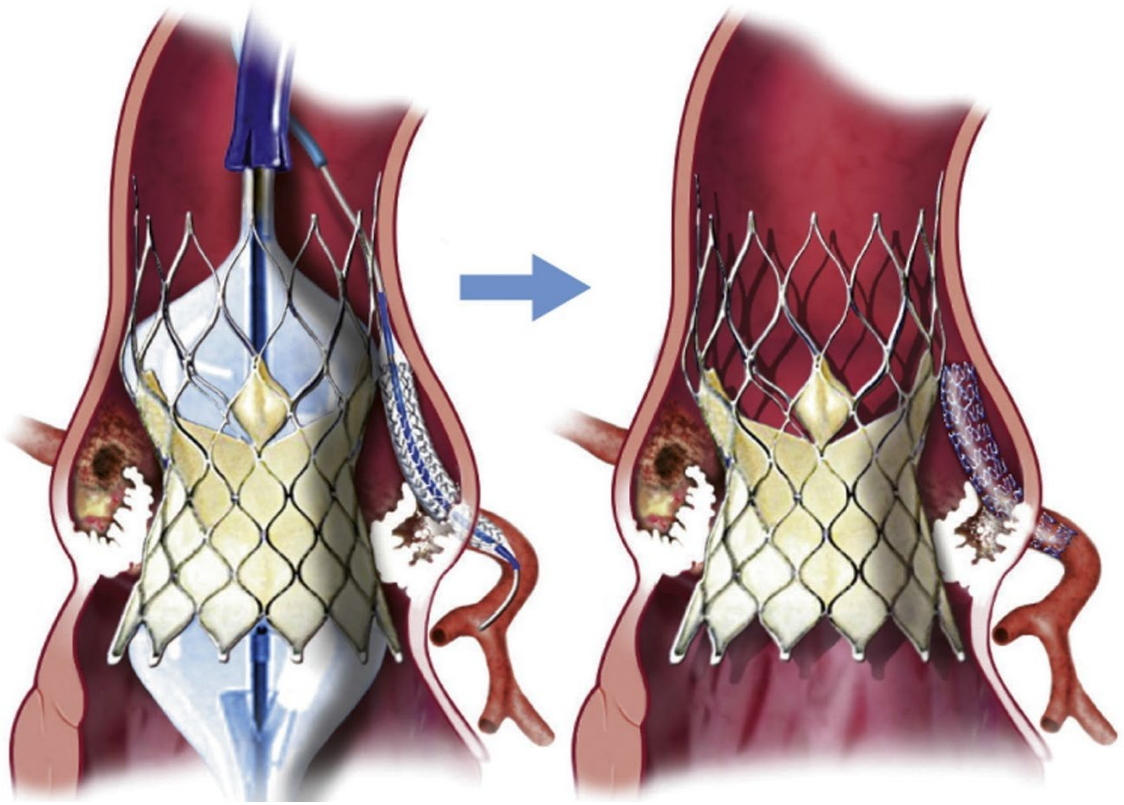
32 enrolled patients (40 vessels). 2 experienced sudden CAO requiring urgent CS



Implementing IVUS in decision making on the need for CS may provide additional information, helping operators limit stent implantation only when really needed.

Lunardi M. et al. *JACC Cardiovasc Interv*. 2025;18(9):1147-1160

Strategies to prevent Coronary Obstruction Following TAVI: Chimney/snorkel stenting

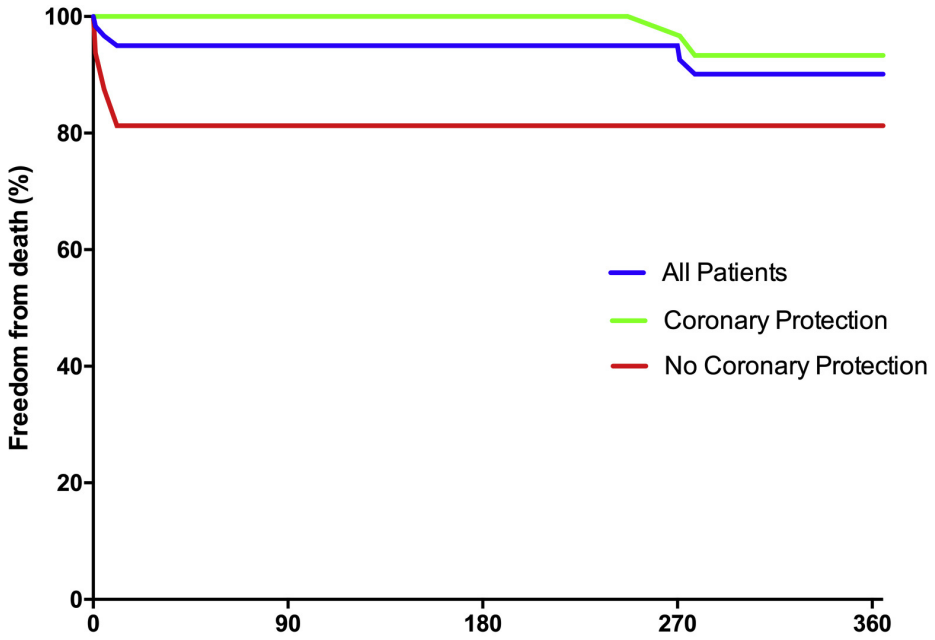


- **Position the 0.014-inch coronary guidewire in the artery at risk.**
- **Advance stents over the coronary guidewires, ensuring they are long enough to anchor and protrude above the THV leaflets.**
- **A guiding catheter extension may be used to protect the stent from interacting with the THV**
- **Maintain a low threshold for stent implantation, as recrossing the THV structure can be challenging**

Mercanti F. et al. *JACC Cardiovasc Interv*. 2020;13(6):751-761.

Strategies to prevent Coronary Obstruction Following TAVI: Chimney/snorkel stenting

The Chimney Registry:
60 cases among 12.800 TAVI procedures (0.5%). **Chimney stenting was performed for 2 reasons:** 1) due to the development of an established CAO (41.6%); 2) due to an impending CAO (58.3%).



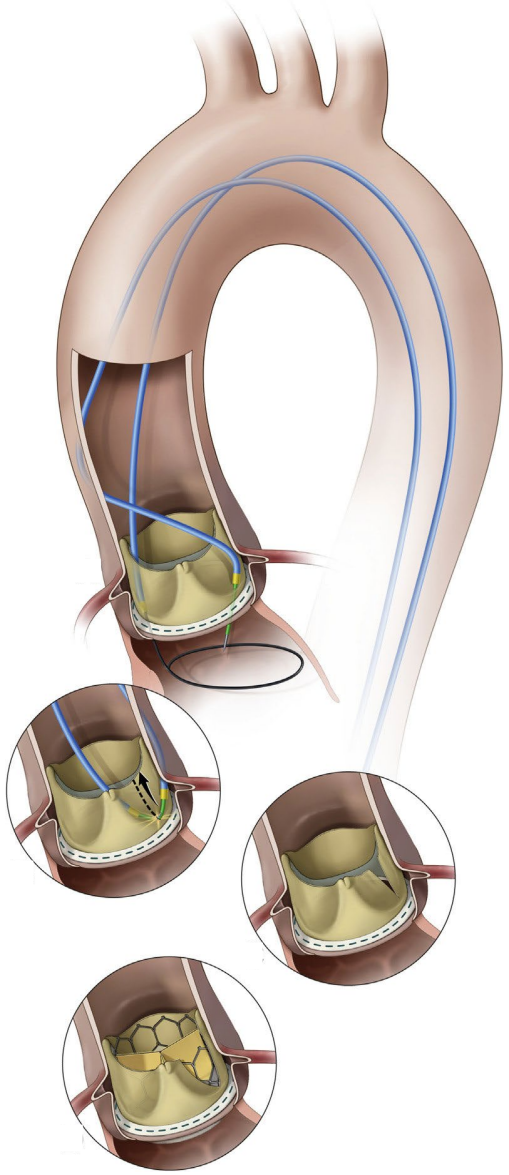
Patients at risk:					
All Patients	60	57	49	40	35
Protection Yes	44	44	37	31	26
Protection No	16	14	13	10	10

- Clinical outcome data suggest that **chimney stenting** is a **successful bailout strategy** for treating iCAO or eCAO, but there remain concerns around **late stent failure (3.5% at 1 year)**
- The **absence of upfront coronary protection** was the **sole independent risk factor** for the combined endpoint of **death, cardiogenic shock, or myocardial infarction**.

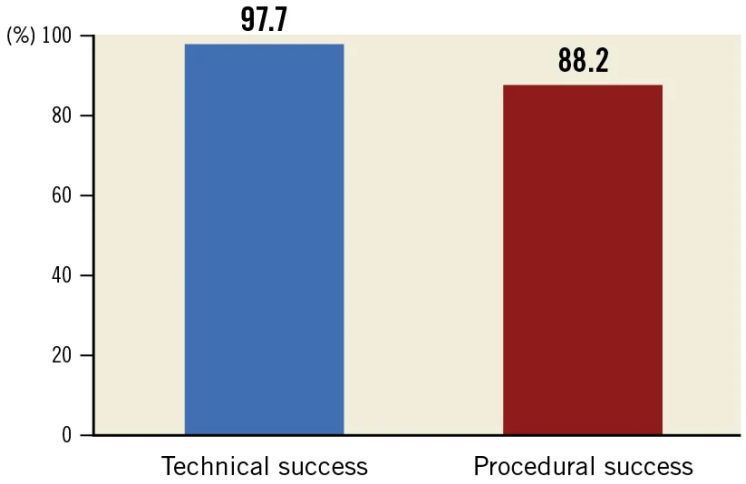
Mercanti F. et al *JACC Cardiovasc Interv*. 2020;13(6):751-761.

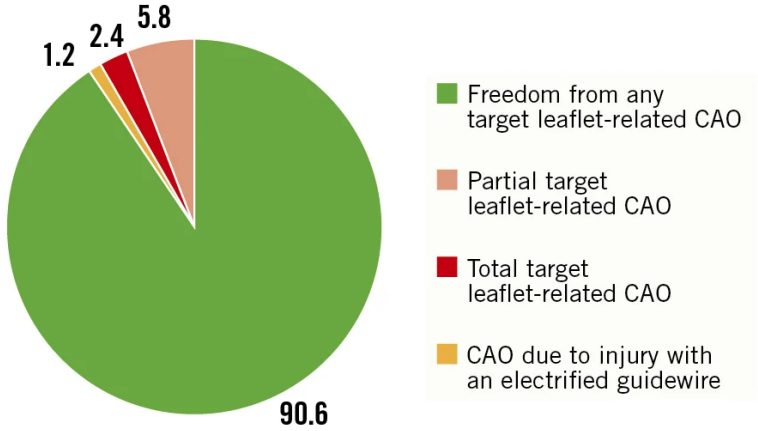
Strategies to prevent Coronary Obstruction Following TAVI: BASILICA technique

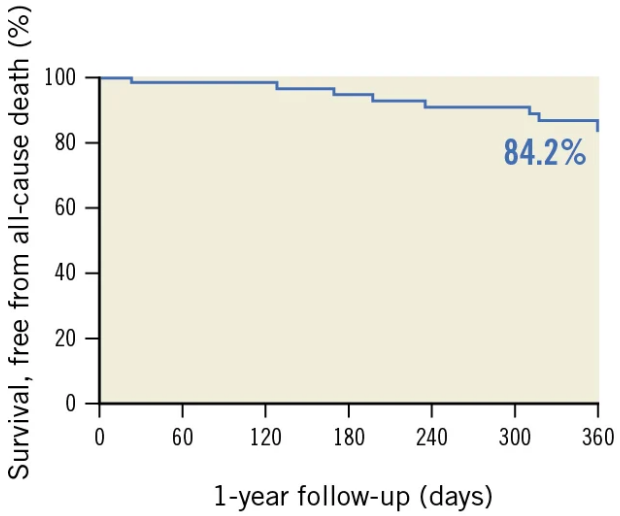
BASILICA was developed as an **alternative to stent-based techniques**, aiming to prevent acute CO by **intentionally lacerating the leaflets.**

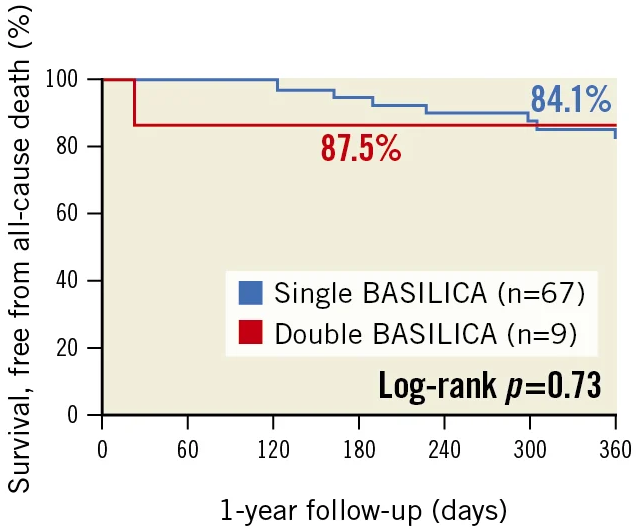


EURO-BASILICA Registry: 76 patients (85 leaflets) undergoing BASILICA and TAVI at 10 European centres







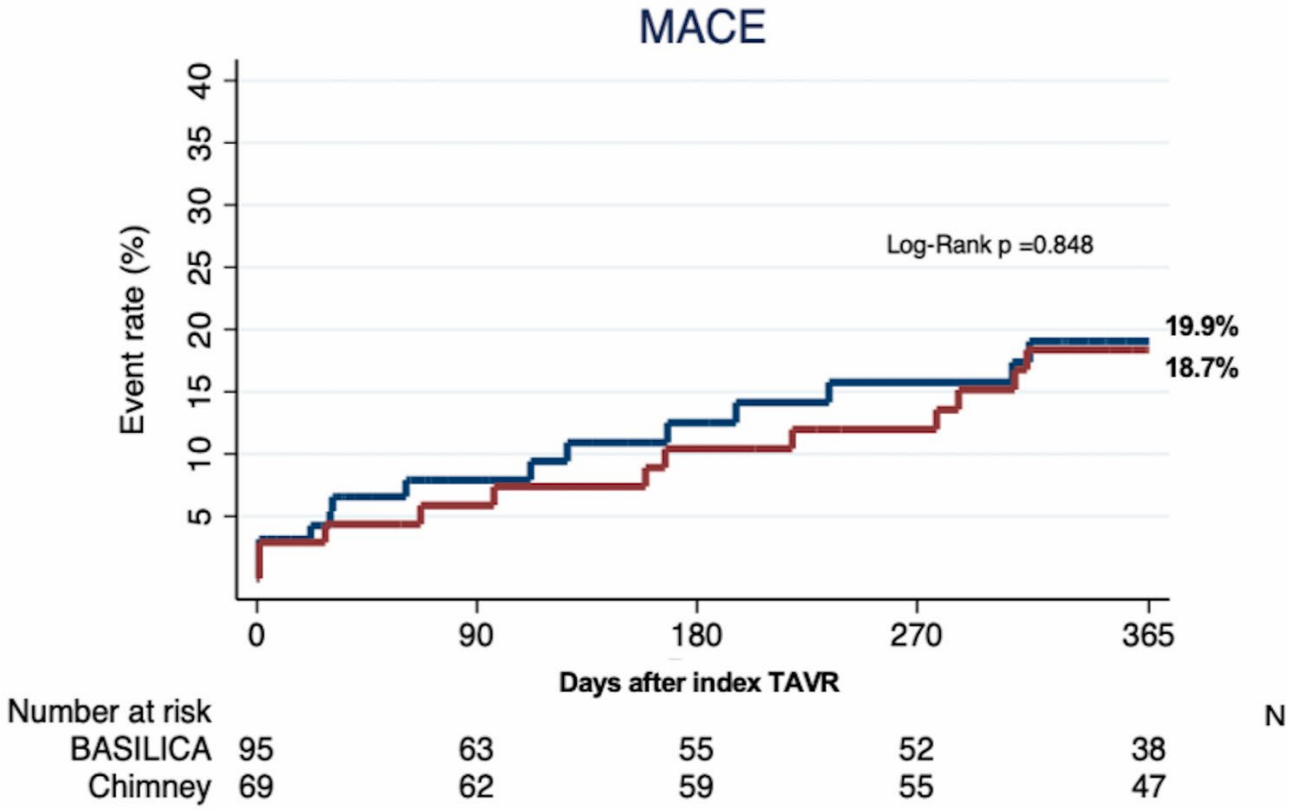


Abdel-Wahab M. et al. *EuroIntervention*. 2023;19(5):e432-e441.

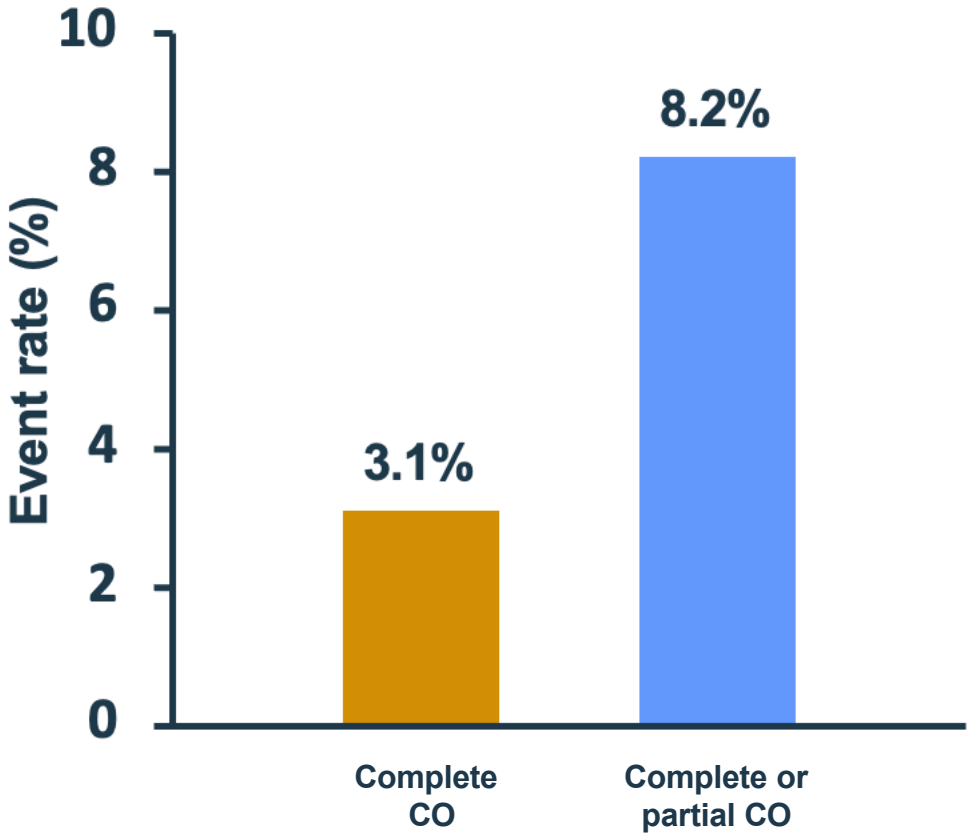
Strategies to prevent Coronary Obstruction Following TAVI: BASILICA technique

Chimney vs BASILICA: 168 patients were included: 71 (42.3%) received CS, and 97 (57.7%) underwent BASILICA.

Similar 1-year outcomes



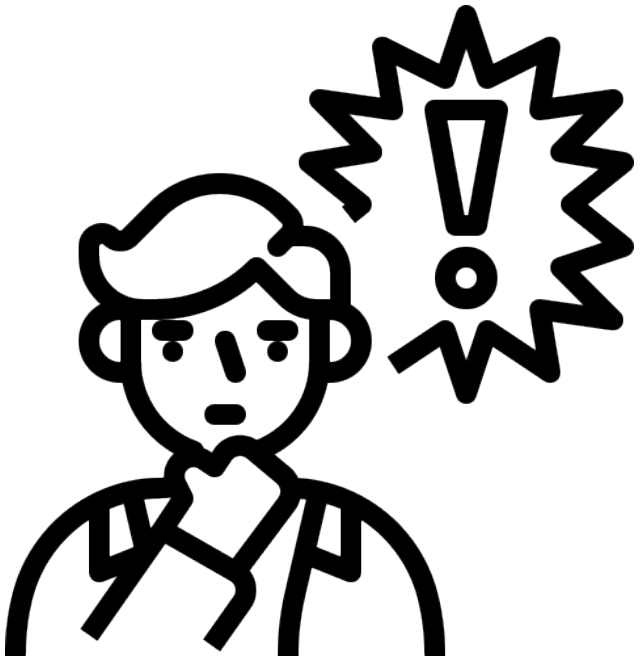
Cross-over to stenting in ~10% of patients in the BASILICA group



Mangieri A. et al. *JACC Cardiovasc Interv*. 2024;17(6):742-752

Strategies to prevent Coronary Obstruction Following TAVI: Why BASILICA failed

- **High valve implant in small STJ?**
- **Asymmetric leaflet splitting?**
- **Leaflet prolapse?**

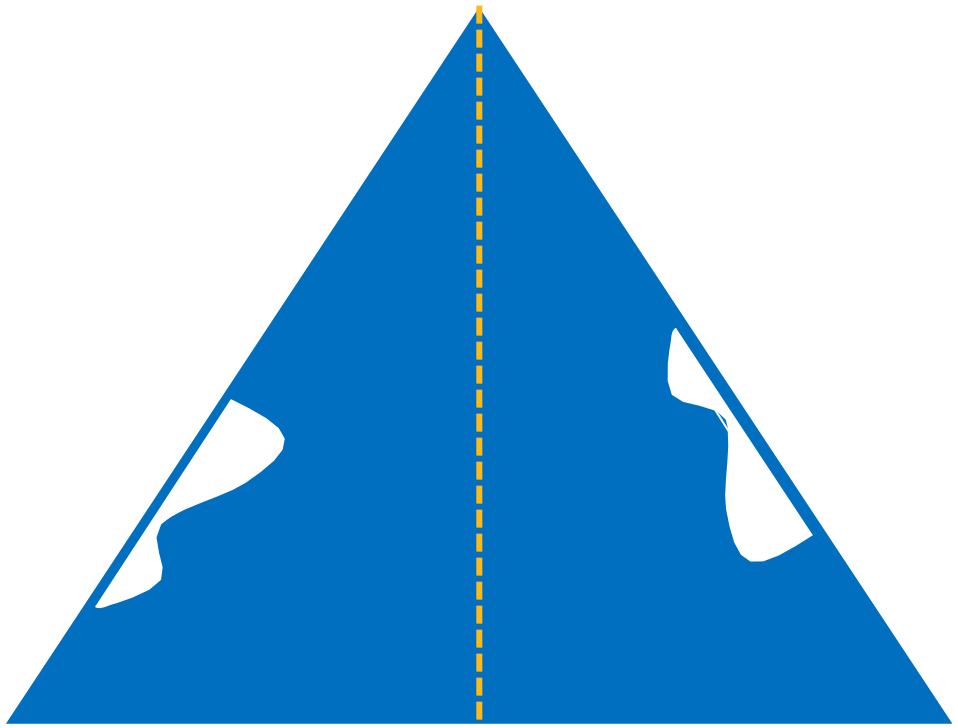


Sometimes BASILICA has an unpredictable result

Mangieri A. et al. *JACC Cardiovasc Interv*. 2024;17(6):742-752

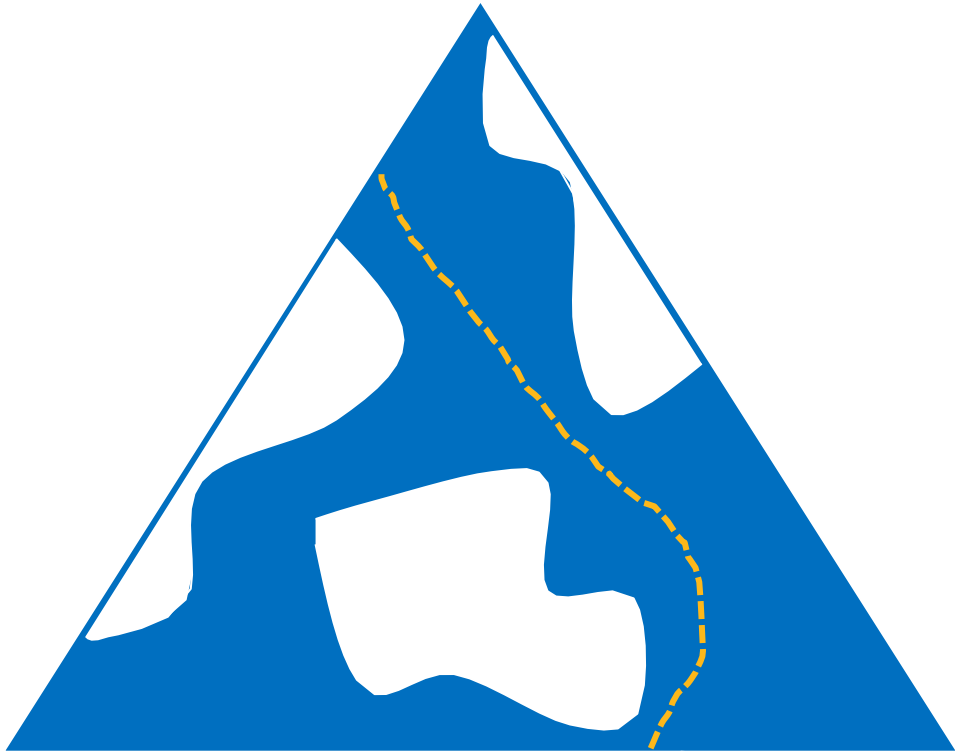
Strategies to prevent Coronary Obstruction Following TAVI: When Chimney is preferable

High risk leaflet anatomy



Normal leaflet

Good case for BASILICA



Calcified leaflet

Risk of asymmetric splitting

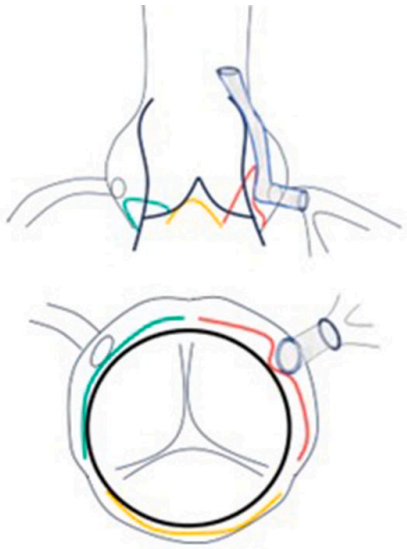
Risk of leaflet prolapse

Risk of AR

Risk of embolization

Strategies to prevent Coronary Obstruction Following TAVI: BASILICA vs Chimney

Chimney



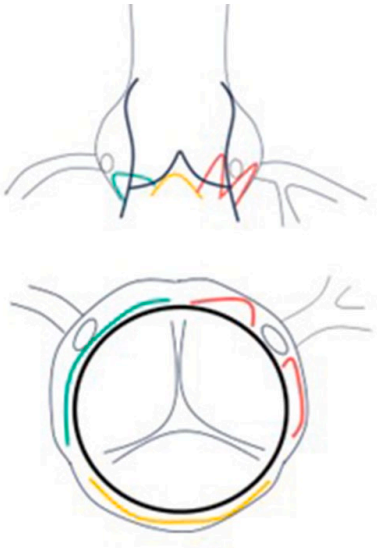
PROs:

- Simply and widely practiced
- Standby procedure
- Few additional resources

Contra:

- Difficult coronary re-access
- Stent thrombosis/failure
- Need for DAPT

BASILICA



PROs:

- Preserved anatomy
- Simple coronary access
- Future TAV-in-TAV feasible
- Chimney possible for bailout

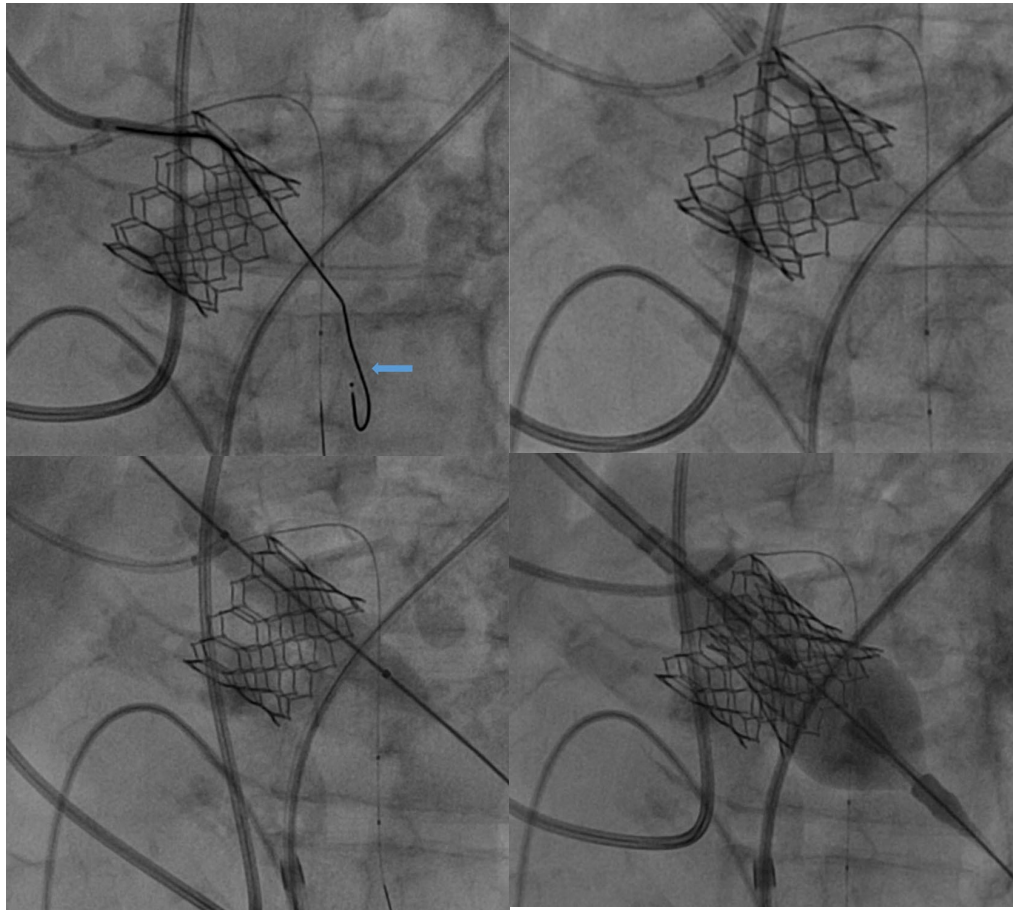
Contra:

- Technically demanding
- Limited training opportunities
- Require additional resources
- Not possible if misalingned THV

Mylotte D. et al. *JACC Cardiovasc Interv*. 2024;17(6):753-755.

Strategies to prevent Coronary Obstruction Following TAVI: UNICORN Technique

The **UN**dermining **I**atrogenic **C**oronary **O**bstruction with **R**adiofrequency **N**eedle (UNICORN) procedure is a novel technique aiming to address the CO risk in patients undergoing a TAVI-in-TAVI

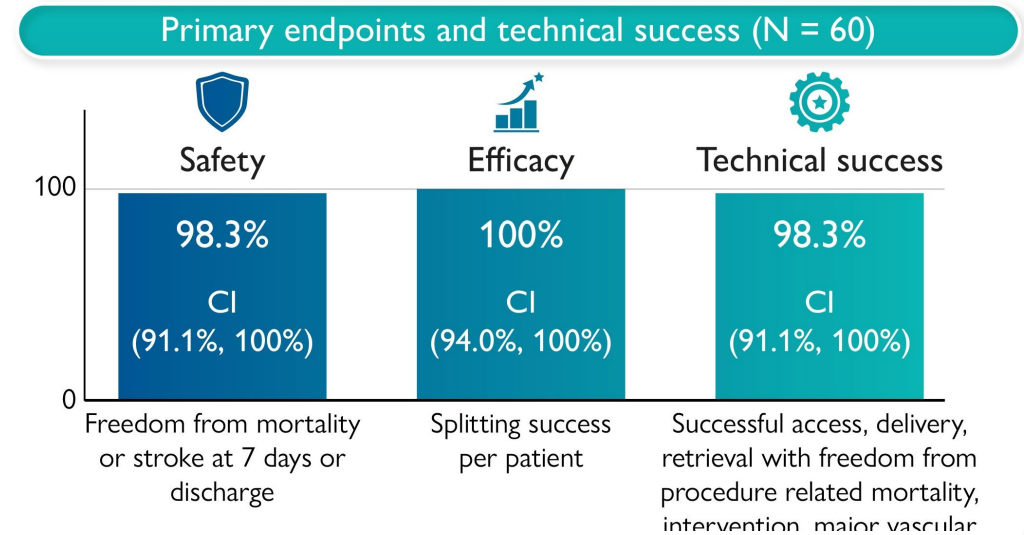


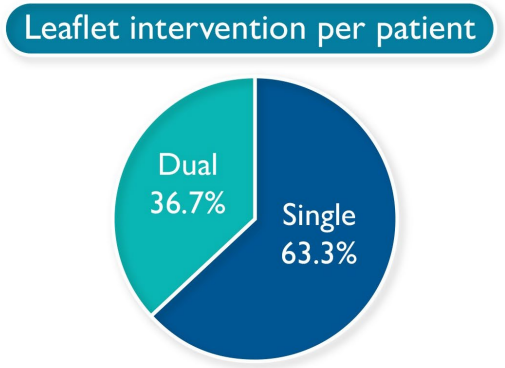
- Traverse the leaflet with the help of a radiofrequency impulse.
- Once the leaflet was perforated, successive dilatations of the fenestration with balloons of increasing caliber were performed.
- The last step allowed a balloon-expandable valve to be advanced through the perforated leaflet and subsequently deploy the transcatheter valve

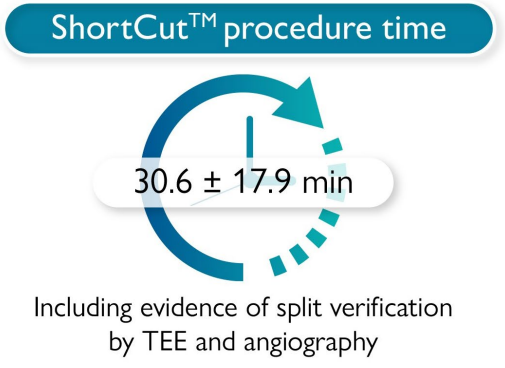
The first experience was successful and demonstrated the feasibility of this strategy
More data on long-term outcomes are needed.

Strategies to prevent Coronary Obstruction Following TAVI: Leaflet splitting devices

The ShortCut study: 60 pts (96.7% failed surgical bioprosthesis, 63.3% single splitting and 36.7% dual splitting)







Single splitting was performed in 38 (63.3%) patients

Dual splitting was performed in 22 (36.7%) patients

Single split 26.9 ± 19.7 min

Dual split 37.0 ± 14.7 min

Dvir D. et al. *Eur Heart J*. 2024;45(33):3031-3041.

Take-home messages

Patients at high risk of coronary obstruction (CO) are best identified through specific CT measurements (e.g. cusp height, coronary height, valve-to-coronary distance, calcium volume as well as other anatomical and procedural risk factors)

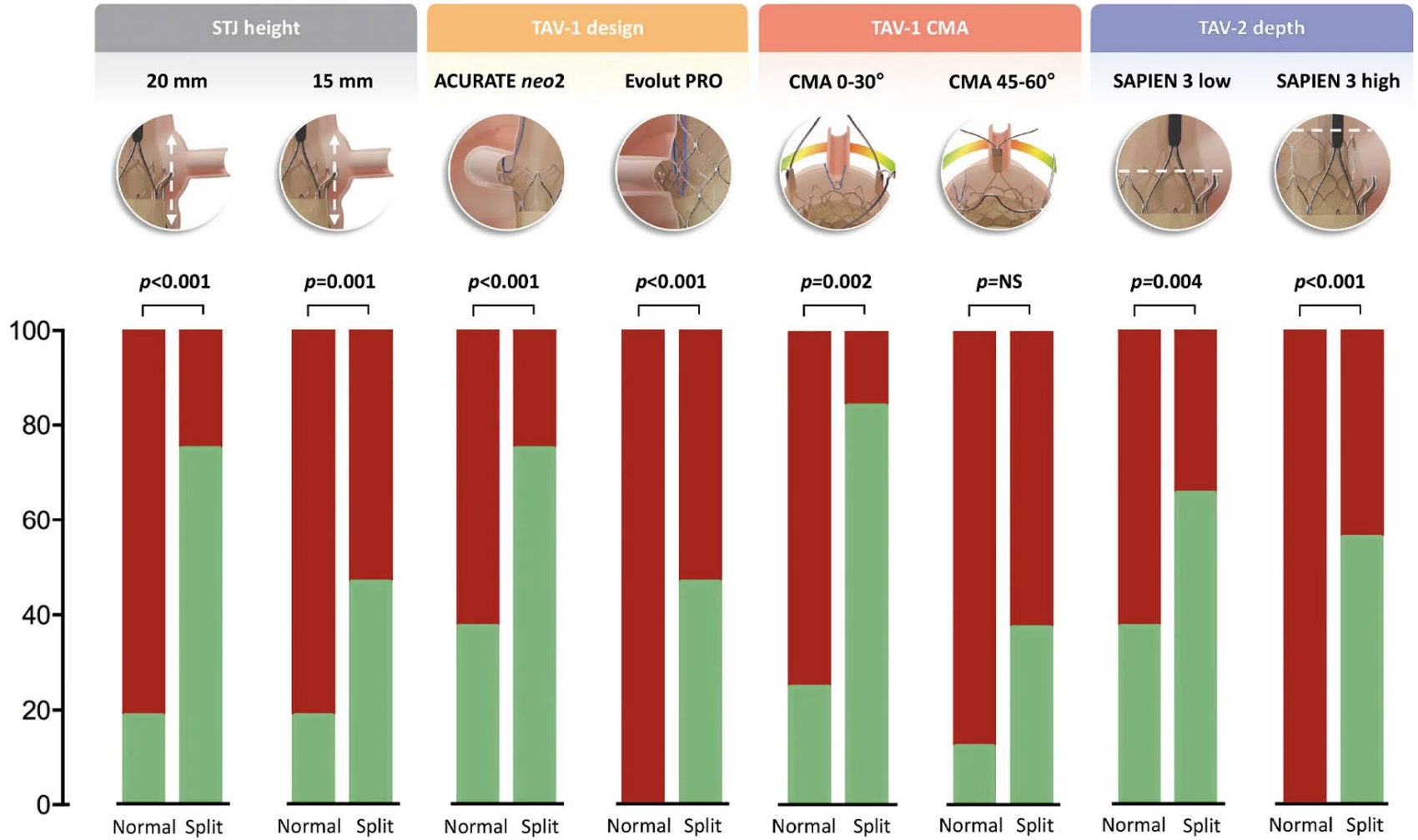
The **Chimney technique** has shown to be effective in retrospective observational studies. However, it is associated with risk of stent deformation or delivery failure, impaired future coronary access, and the need for prolonged dual antiplatelet therapy

While **BASILICA** offers recognized benefits, its use is largely restricted to highly experienced operators, leading to underutilization of leaflet modification techniques

Leaflet modification of failed bioprosthetic valves using ShortCut has proven to be safe, **riproducibile**, achieved successful leaflet splitting in all treated patients, and was associated with favorable clinical outcomes in patients at risk of coronary obstruction undergoing TAVI

Strategies to prevent Coronary Obstruction Following TAVI: Focus on TAV-in-TAVI

Anatomical and procedural variables affecting the efficacy of leaflet splitting after redo-TAVI: (1) STJ height, (2) TAV-1 type with relative implant depth, and (3) TAV-1 degree of CMA.



Beneduce A. et al. *EuroIntervention*. 2024;20(12):e770-e780.