TAVR and Coronary artery disease

SOLACI-CACI 2024

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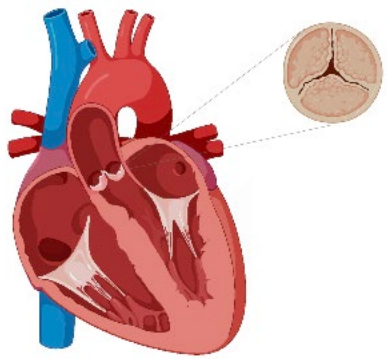
Disclosures

Affiliation/Financial Relationship	Company
Consultant/Advisory/Speaking Engagements:	Daiichi-Sankyo

Impact of aortic stenosis on coronary anatomy and physiology

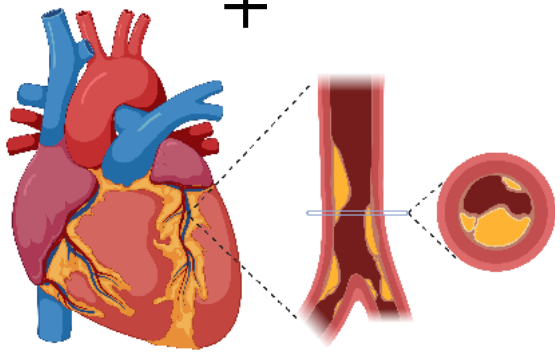
Reduced coronary perfusion pressure due to reduced stroke volume, systolic and mean arterial pressure



Upregulation of vasoactive factors, leading to **increased resting blood flow**

Reversal of normal **endocardial-epicardial blood flow** ratio at rest

+



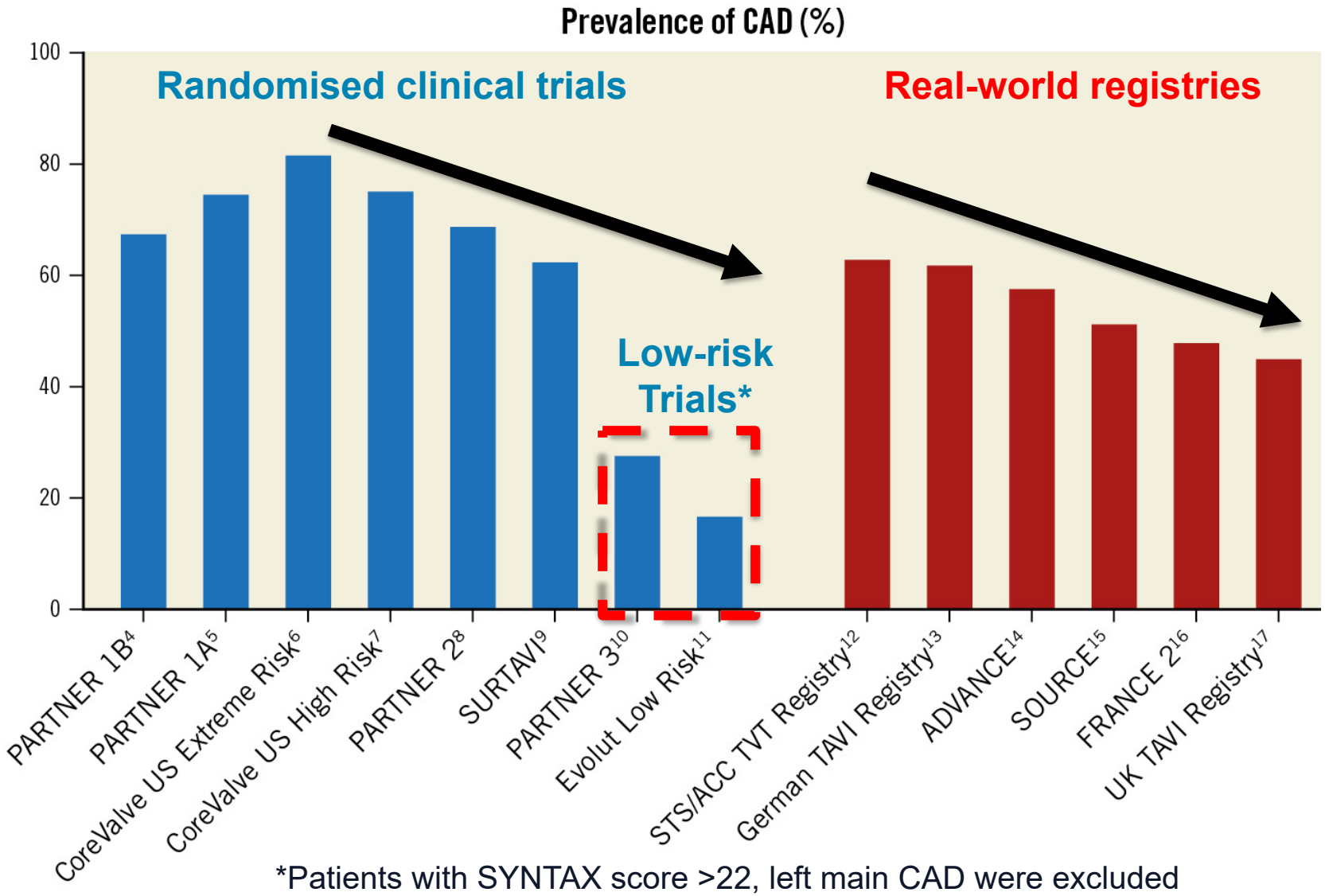
Reduced diastolic coronary perfusion phase

Increased resting diastolic backward expansion wave

Attenuated coronary flow reserve

Attenuated and delayed systolic forward compression wave of coronary blood flow

Prevalence of coronary artery disease (CAD) in patients treated with TAVR



*Patients with SYNTAX score >22, left main CAD were excluded

Tarantini G et al. EuroIntervention. 2023 May 15;19(1):37-52.

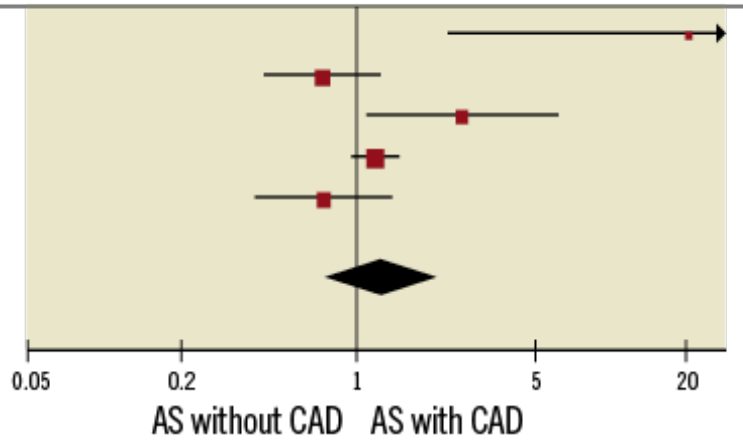
Outcome of patients undergoing TAVR with concomitant CAD

Meta-analysis of 8,334 patients from 13 studies

Presence of CAD did not impact one-year mortality

Study or Subgroup	log[Odds ratio]	SE	Weight	Odds ratio IV, Random, 95% CI
Dewey et al, 2010	3.0106	1.1111	4.9%	20.30 [2.30, 179.17]
Franzone et al, 2017	–0.3147	0.27	24.4%	0.73 (0.43, 1.24]
Mancio et al, 2015	0.9555	0.4389	17.3%	2.60 [1.10, 6.15]
Snow et al, 2015	0.1655	0.1053	30.9%	1.18 (0.96, 1.45]
Ussia et al, 2013	–0.3011	0.3139	22.4%	0.74 (0.40, 1.37]
Total (95% CI)			**100.0%**	**1.25 [0.74, 2.11]**

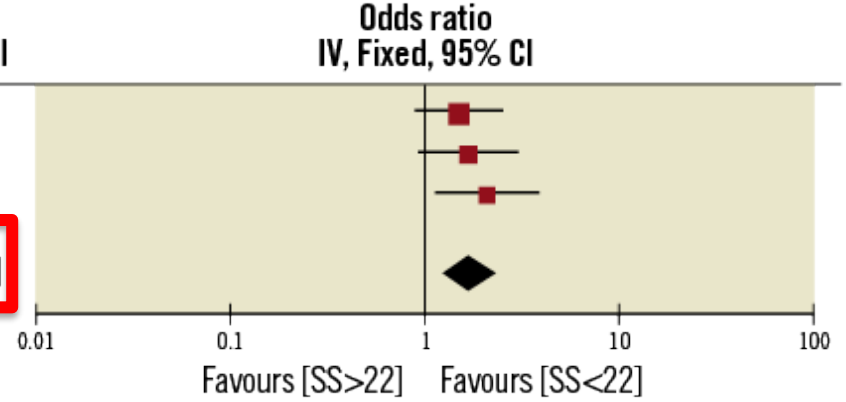
Heterogeneity: Tau²=0.22; Chi²=14.97, df=4 (*p*=0.005); I²=73%
Test for overall effect: Z=0.82 (*p*=0.41)



However, CAD complexity seems to matter - SYNTAX Score >22 showed higher one-year mortality

Study or Subgroup	log[Odds ratio]	SE	Weight	Odds ratio IV, Fixed, 95% CI
Shamekhi et al, 2017	0.4055	0.2606	40.3%	1.50 [0.90, 2.50]
Stefanini et al, 2014	0.5188	0.2963	31.1%	1.68 [0.94, 3.00]
Witberg et al, 2017	0.7372	0.3093	28.6%	2.09 [1.14, 3.83]
Total (95% CI)			**100.0%**	**1.71 [1.24, 2.36]**

Heterogeneity: Chi²=0.68, df=2 (*p*=0.71); I²=0%
Test for overall effect: Z=3.24 (*p*=0.001)



D'Ascenzo F, et al. EuroIntervention. 2018 Dec 7;14(11):e1169-e1177

Assessment of Coronary Artery Disease in aortic stenosis

Recommendations	Class[a]	Level[b]
Diagnosis of CAD		
Coronary angiography is recommended before valve surgery in patients with severe VHD and any of the following: • History of cardiovascular disease. • Suspected myocardial ischaemia.[c] • LV systolic dysfunction. • In men >40 years of age and postmenopausal women. • One or more cardiovascular risk factors.	I	C

COR	LOE	Recommendations
1	C-EO	1. In patients undergoing TAVI, 1) contrast-enhanced coronary CT angiography (in patients with a low pretest probability for CAD) or 2) an invasive coronary angiogram is recommended to assess coronary anatomy and guide revascularization.

ICA and FFR/iFR

- Remains first approach to diagnosis of CAD for most patients
- Invasive hemodynamics can be flawed due to increased LV mass and intracavity pressure in AS

COMPUTED TOMOGRAPHY ANGIOGRAPHY

- **Coronary artery calcium** common in TAVR patients > limits the diagnostic performance of coronary CT angiography
- Potential utilization in patients with low surgical risk and low pre-test probability for CAD

Vahanian et al. Eur Heart J. 2022 Feb 12;43(7):561-632 ; Otto CM et al. Circulation. 2021 Feb 2;143(5):e35-e71.

Timing of PCI in patients undergoing TAVR

PCI before TAVR

Disadvantages	Benefits
➢ Committed to DAPT prior to TAVR	➢ Free access to coronaries
➢ Repeated vascular access, large bore if BAV performed	➢ May increase hemodynamic stability and procedural safety of TAVR
➢ Less reliable FFR/iFR	➢ Reduced contrast use compared with concomitant PCI and TAVR

PCI before TAVR

1) >70% proximal (LAD - FRANCE 2)
2) ACS
3) Angina
4) >90% lesions

PCI after TAVR

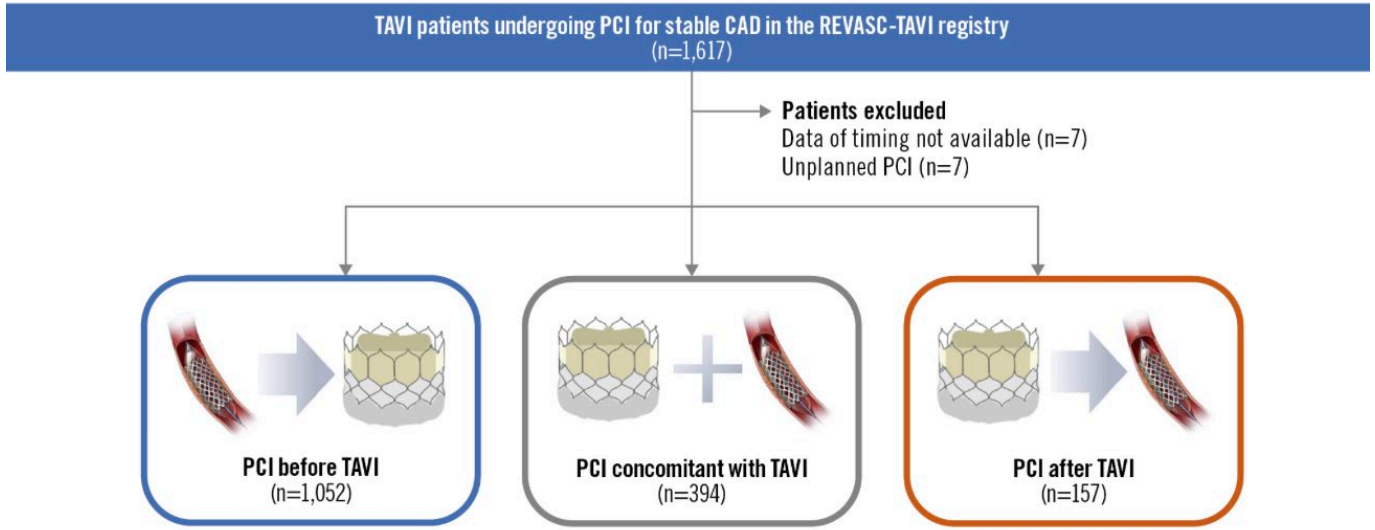
Disadvantages	Benefits
➢ Not free access to coronaries	➢ Re-evaluation without SAS
➢ Repeated vascular access	➢ May increase hemodynamic stability and procedural safety of PCI
➢ Less support of the guiding catheter	➢ Reduced contrast use compared with concomitant PCI and TAVR

PCI after TAVR

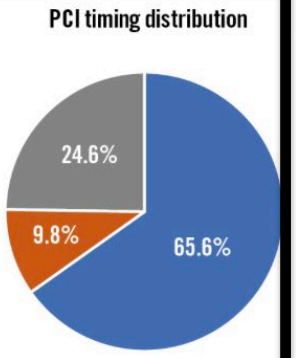
THV choice and implantation technique should be aimed at preserving coronary access

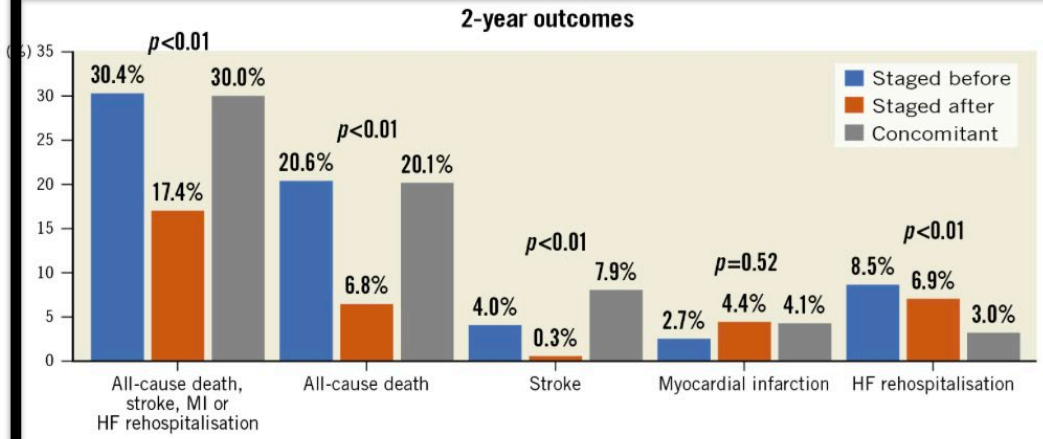
Tarantini G. EuroIntervention 2023;18 February 2023 and Tarantini G. TVT 2023

Timing of CAD treatment in patients undergoing TAVR



- 66% of patients underwent PCI before TAVR
- 25% underwent PCI concomitant with TAVR



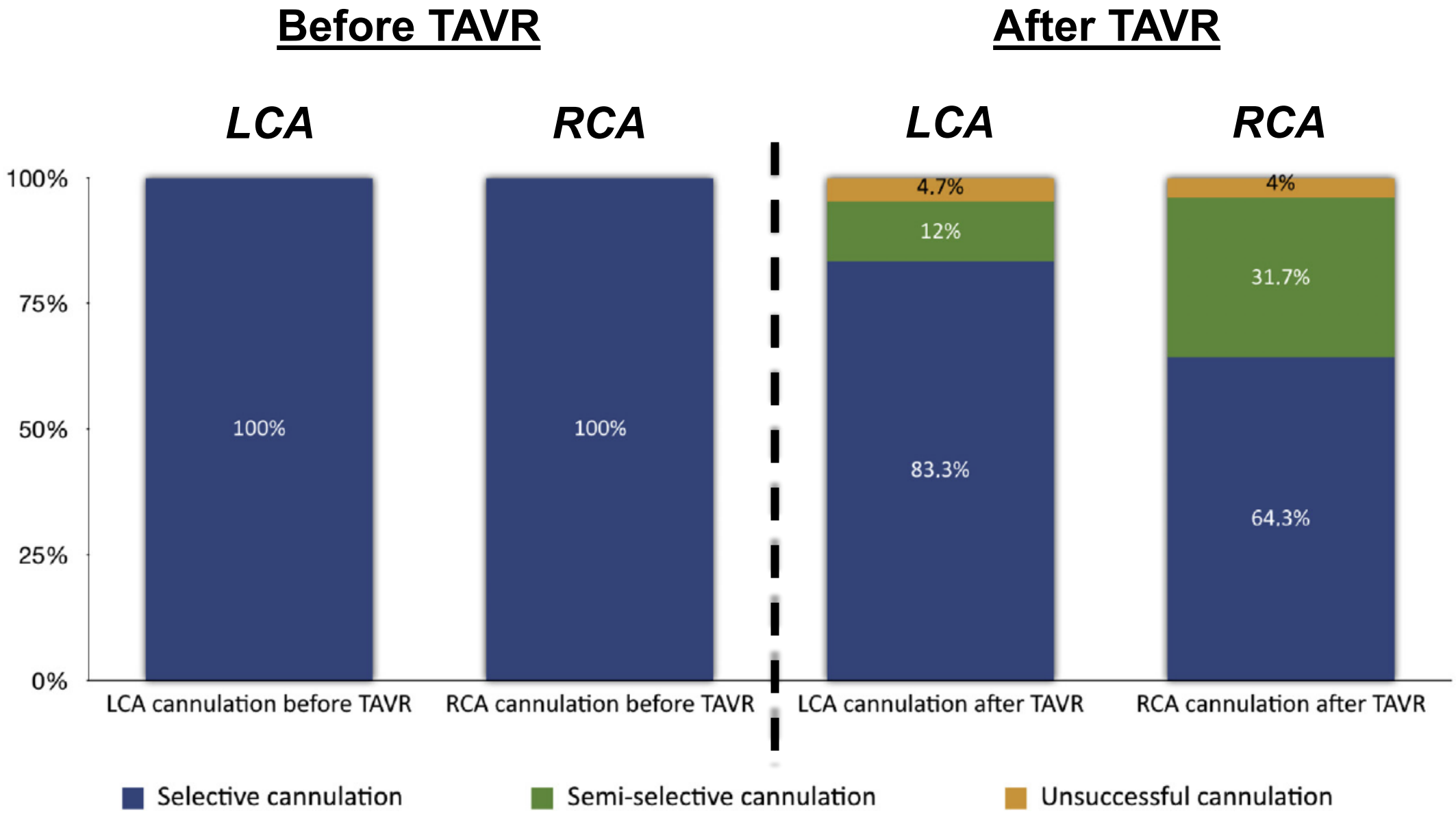


- Staged PCI was consistently linked with lower event rates

- Performance of PCI after TAVR seems to be associated with improved 2-year clinical outcomes
  - To be confirmed by RCTs

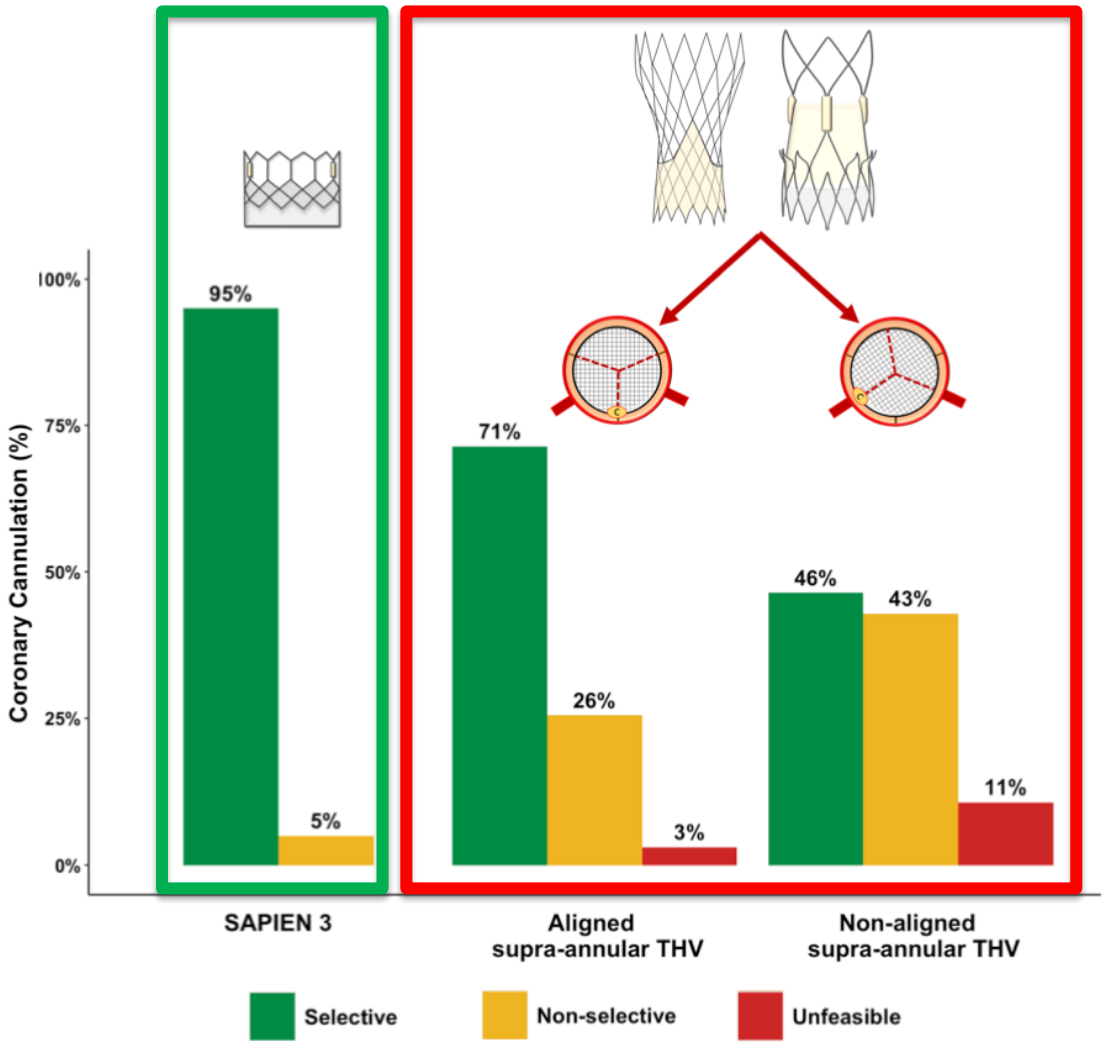
Rheude T et al. EuroIntervention. 2023 Sep 18;19(7):589-599

Coronary access after TAVR may be challenging

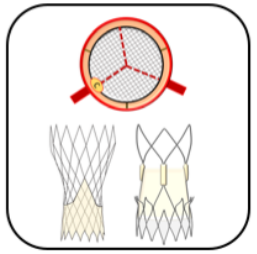


Barbanti M et al. JACC Cardiovasc Interv. 2020 Nov 9;13(21):2542-2555

Valve alignment for coronary access after TAVR

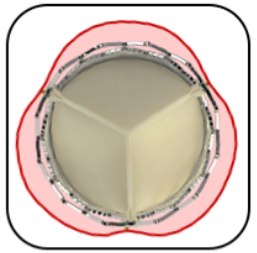


Predictors of impaired CA after TAVR

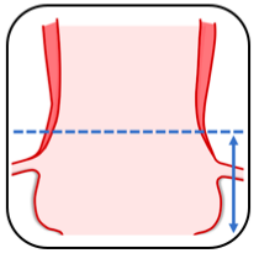


Non-aligned supra-annular THV
(OR 4.59, 95% CI 1.81-11.61, p<0.01

Alignment of THV matters!!



THV-Sinus of Valsalva relation
(OR 1.06, 95% CI 1.02-1.1, p<0.01)



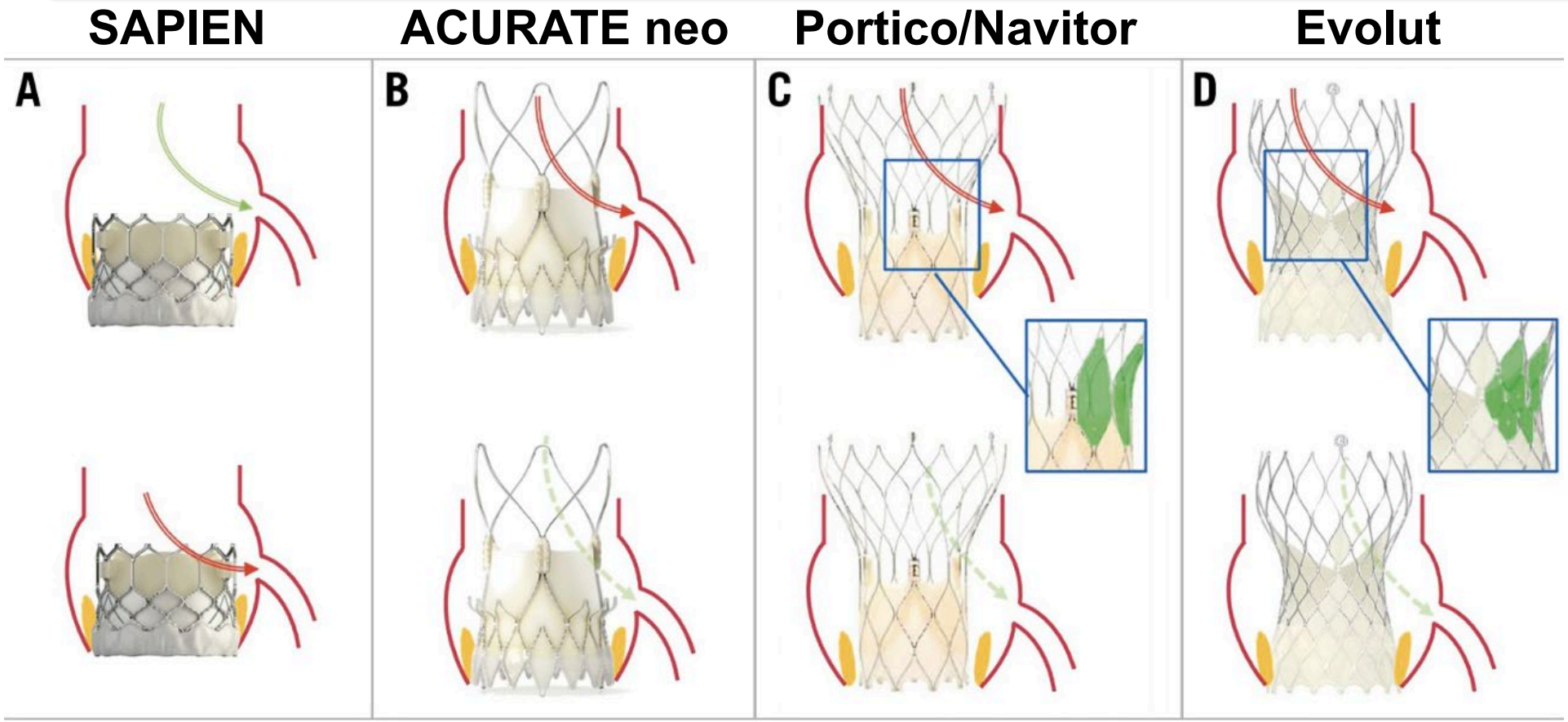
Sinus of Valsalva height
(OR 0.83, 95% CI 0.7-0.98, p=0.03)

Tarantini G et al. Circ Cardiovasc Interv. 2022 Feb;15(2):e011045.

Valve choice also matters for coronary access

Coronary access route

- Above the stent frame
- Across the stent frame
- Via the stabilization arches
- From outside the valve frame
- Across the uncovered stent struts above the leaflet plane



Tarantini G et al. EuroIntervention. 2023 May 15;19(1):37-52

TAVR+PCI or SAVR+CABG?

Aims:

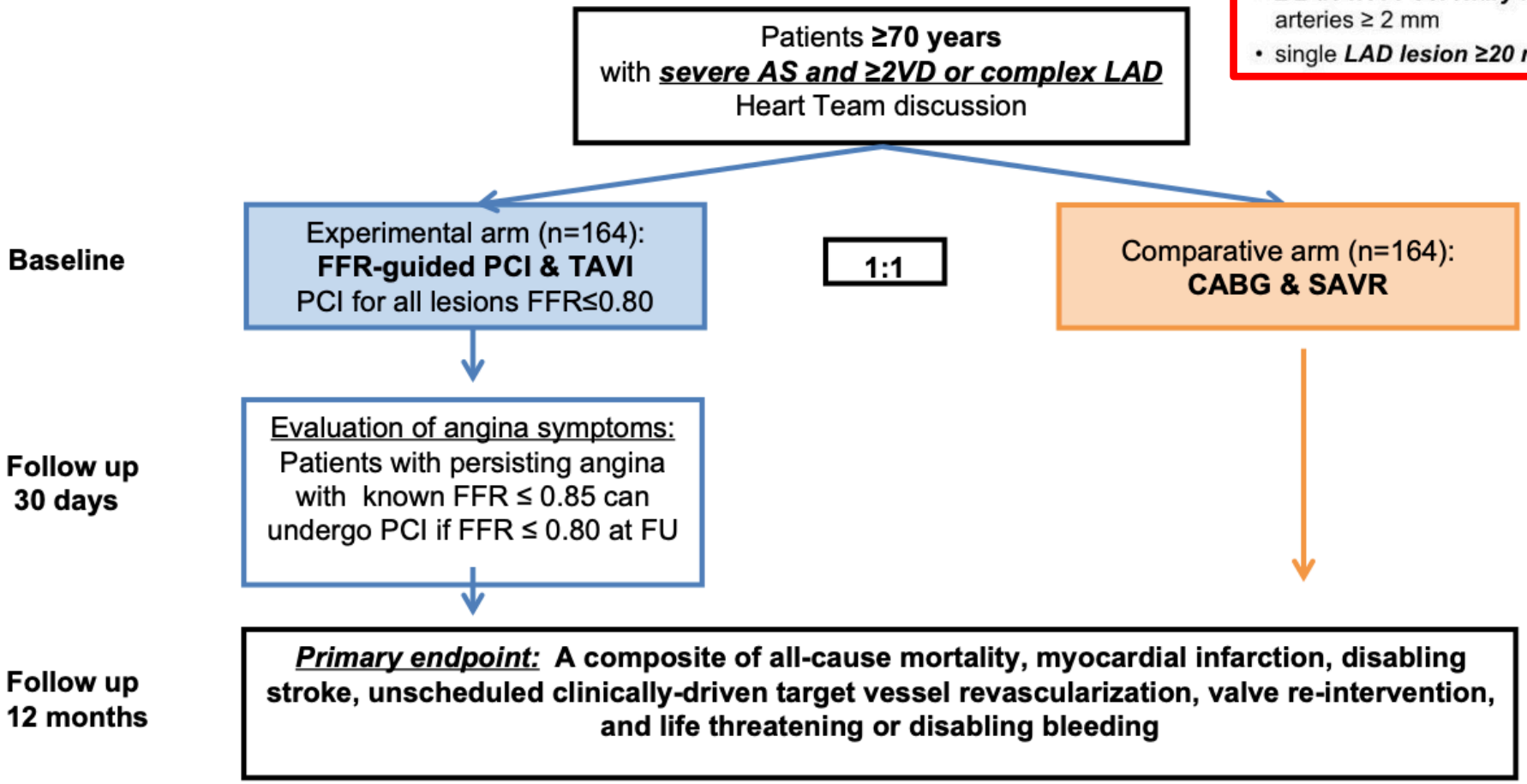
To investigate whether fractional-flow reserve (FFR)-guided PCI and TAVI is noninferior to combined CABG and SAVR for the treatment of severe AS and multivessel or advanced CAD.

Kedhi E, EuroPCR 2024

TCW Trial Design

PATIENTS HAD COMPLEX CAD!!

Coronary Disease:
- **≥ 2 *de novo coronary lesions*** of ***DS ≥ 50%*** located in any of native coronary arteries ≥ 2 mm
- single ***LAD lesion ≥20 mm length*** *or* ***involving a bifurcation***

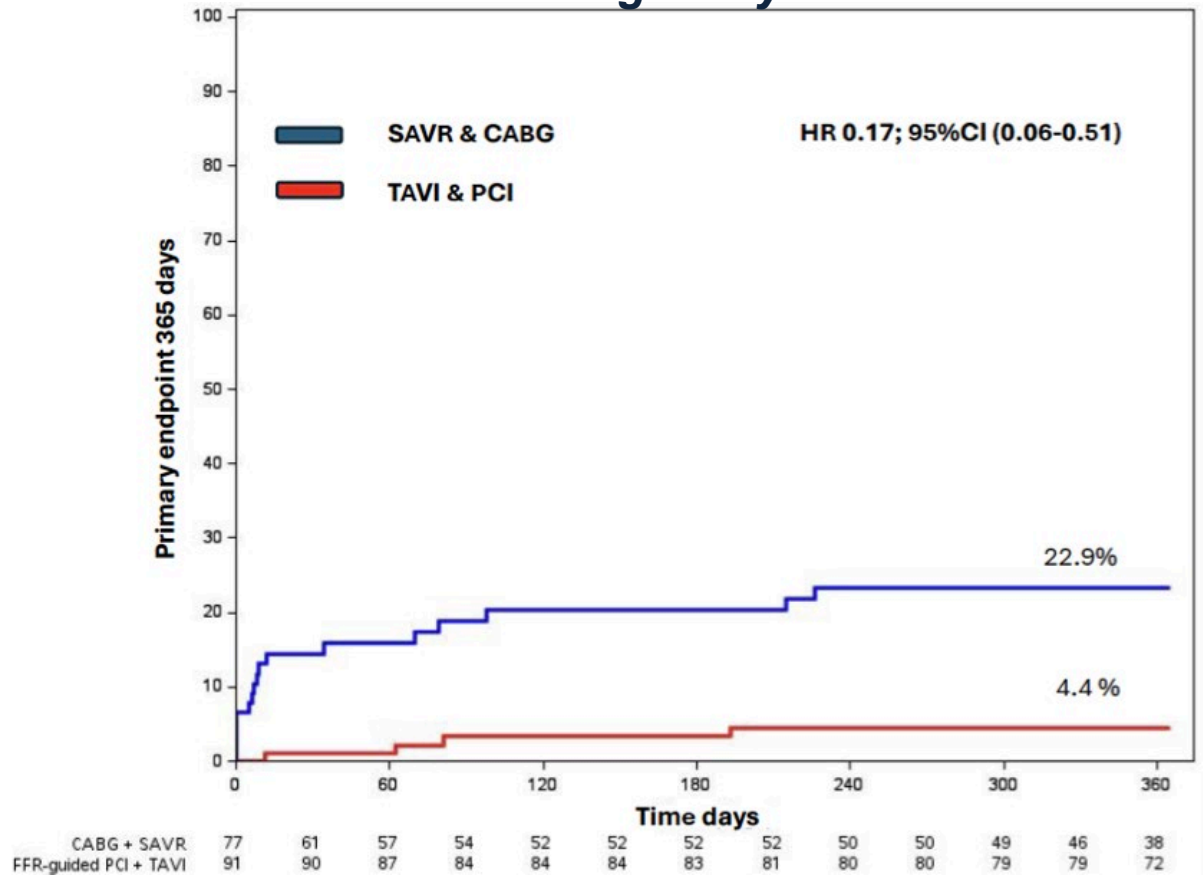


Trial prematurely halted by the DSMB (after 50% enrolment) due to significant difference between the two treatment arms.

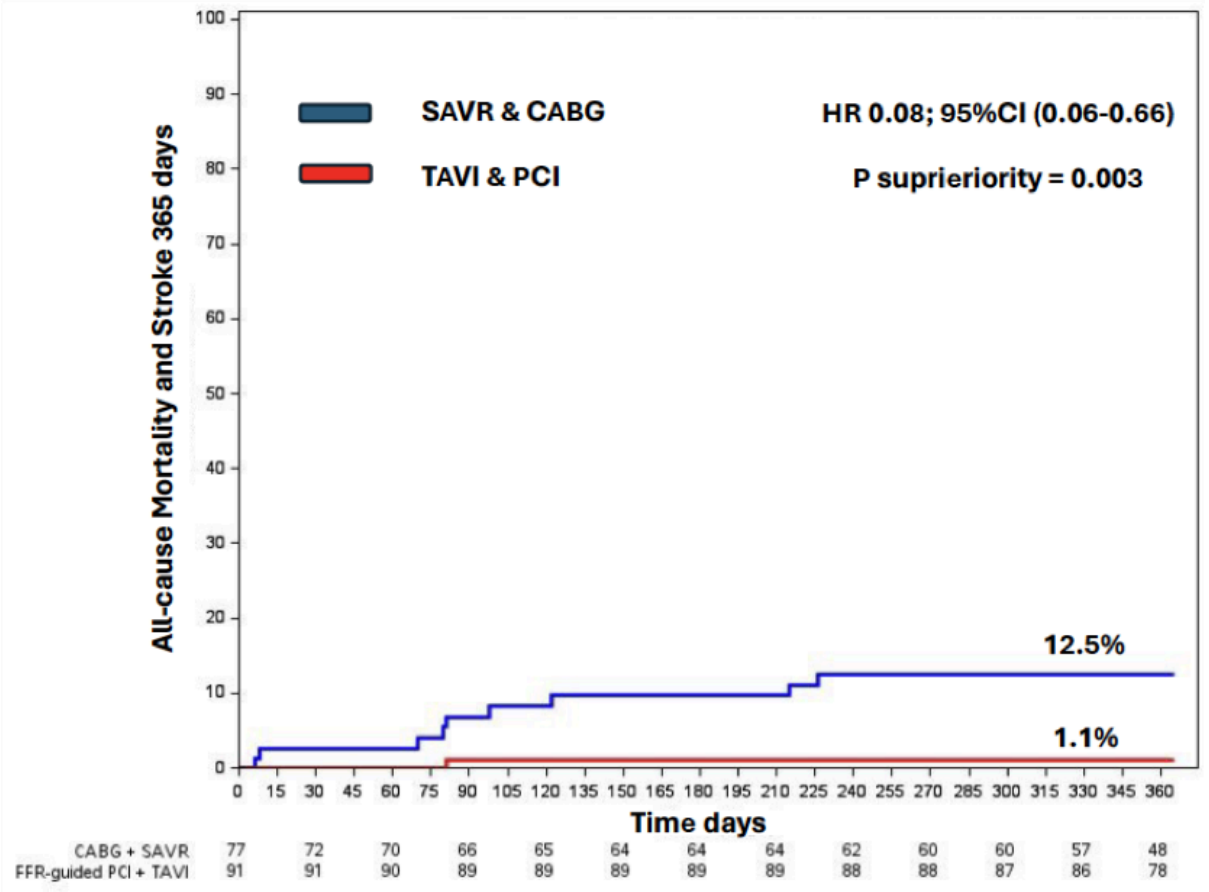
Kedhi E, EuroPCR 2024

Outcomes after 1 year in the TCW trial

Primary endpoint:
All-cause mortality, MI, stroke, TVR, valve reintervention, and life threatening or disabling bleeding at 1 year



Secondary endpoint:
All-cause mortality and stroke



Kedhi E, EuroPCR 2024

Secondary Outcomes after 1 year

	FFR-Guided PCI + TAVI (n= 91)	SAVR+CABG (n= 77)	HR (95% CI)	P value
Death – all cause	0 (0)	7 (9.74)		***0.002***
Death - cardiovascular	0 (0)	6 (8.35)		***0.005***
All Stroke and TIA	1 (1.11)	3 (4.20)	0.25 (0.03-2.45)	0.20
Disabling stroke	1 (1.11)	2 (2.85)	0.38 (0.03-4.19)	0.41
Non-disabling stroke	0 (0)	0 (0)		
TIA	0 (0)	1 (1.35)		0.27
Myocardial infarction (any)	2 (2.21)	1 (1.30)	1.58 (0.14-17.48)	0.71
Periprocedural myocardial infarction	1 (1.10)	1 (1.30)	0.82 (0.05-13.18)	0.89
Spontaneous myocardial infarction	1 (1.11)	0 (0)		0.40

	FFR-Guided PCI + TAVI (n= 91)	SAVR +CABG (n= 77)	HR (95% CI)	P value
Any revascularization	0 (0)	1 (1.30)		0.28
CD-TVR	0 (0)	1 (1.30)		0.28
Valve reintervention	0 (0)	1 (1.30)		0.28
Life threatening or disabling bleeding (VARC-2)	2 (2.21)	9 (12.10)	0.17 (0.04-0.80)	***0.01***
Major bleeding (VARC-2)	5 (5.56)	7 (9.21)	0.57 (0.18-1.79)	0.32
Minor bleeding (VARC-2)	12 (13.27)	4 (5.40)	2.52 (0.81-7.81)	0.10
Permanent pacemaker implantation	9 (9.89)	2 (2.87)	3.74 (0.81-17.30)	0.07
Major Vascular Complication	4 (4.40)	1 (1.35)	3.36 (0.38-30.09)	0.25
Re-thoracotomy	0 (0)	4 (5.19)		***0.02***
Atrial Fibrillation	2 (2.20)	11 (13.05)	0.28 (0.09-0.88)	***0.03***

The TCW trial showed that FFR-guided PCI & TAVI as compared to CABG & SAVR was associated with significantly lower primary endpoint and mortality rates.

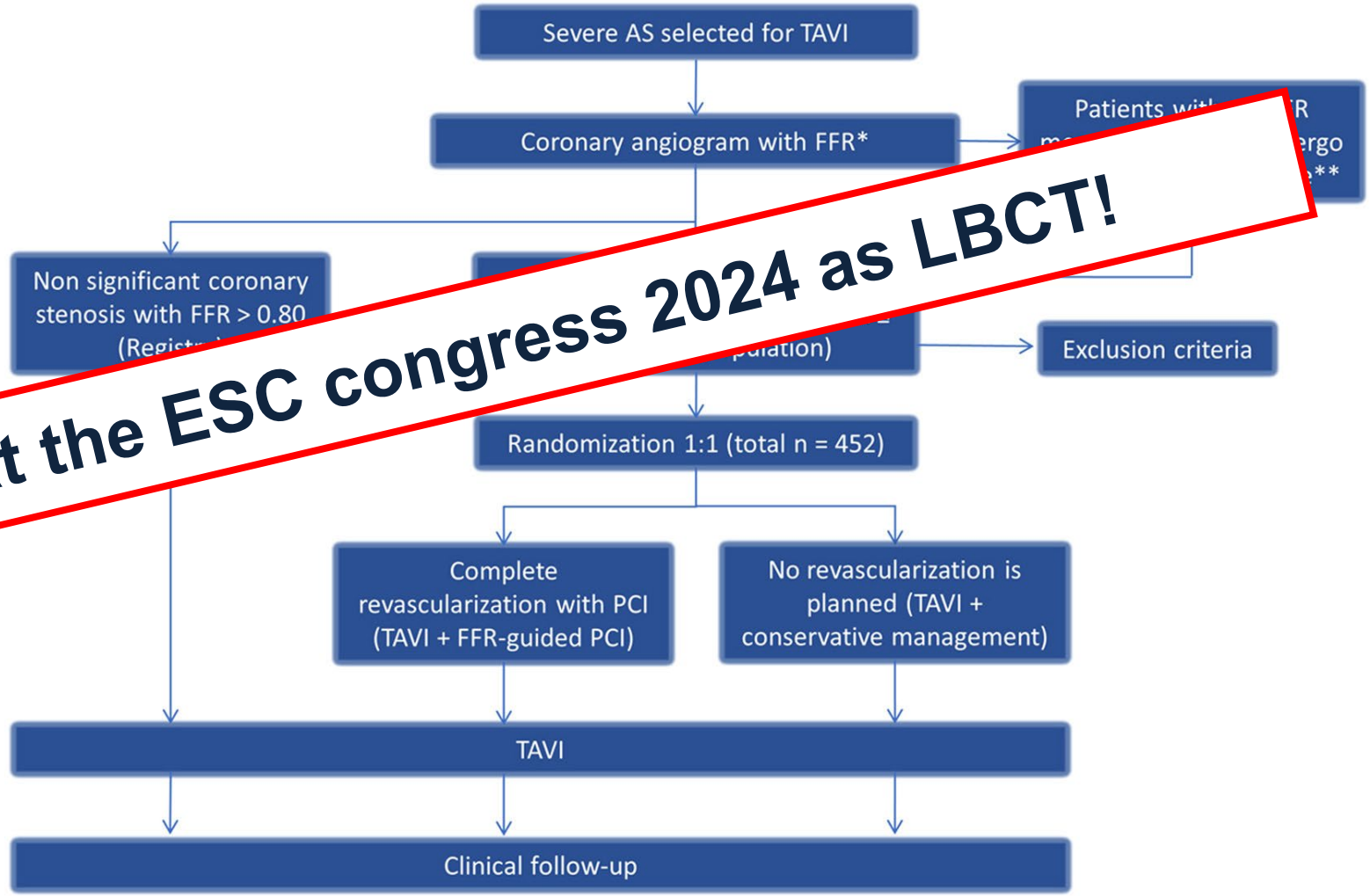
Kedhi E, EuroPCR 2024

Ongoing trials: PCI vs. conservative treatment – NOTION 3

Trial Designs

Routine revascularization with percutaneous coronary intervention in patients with coronary artery disease undergoing transcatheter aortic valve implantation – the third nordic aortic valve intervention trial – NOTION-3

- Randomized open-label trial
- Patients with AS selected for TAVR and at least one coronary stenosis with FFR ≤0.80 or diameter stenosis >90%
- TAVR [illegible] guided revascularization
- [illegible]s: All-cause mortality, MI, or urgent revascularization at 1 yr
- N=452 patients



Will be presented at the ESC congress 2024 as LBCT!

Sabbah M et al. Am Heart J. 2023 Jan;255:39-51

What do the Guidelines tell us?

2021 ESC/EACTS Guidelines for the management of valvular heart disease

Recommendations	Class[a]	Level[b]
Diagnosis of CAD		
Coronary angiography is recommended before valve surgery in patients with severe VHD and any of the following: • History of cardiovascular disease. • Suspected myocardial ischaemia.[c] • LV systolic dysfunction. • In men >40 years of age and postmenopausal women. • One or more cardiovascular risk factors.	I	C
Indications for myocardial revascularization		
PCI should be considered in patients with a primary indication to undergo TAVI and coronary artery diameter stenosis >70% in proximal segments.	IIa	C

2020 ACC/AHA Guideline for the Management of Valvular Heart Disease

COR	LOE	Recommendations
1	C-EO	1. In patients undergoing TAVI, 1) contrast-enhanced coronary CT angiography (in patients with a low pretest probability for CAD) or 2) an invasive coronary angiogram is recommended to assess coronary anatomy and guide revascularization.
2a	C-LD	2. In patients undergoing TAVI with significant left main or proximal CAD with or without angina, revascularization by PCI before TAVI is reasonable.[1,2]
2a	C-LD	3. In patients with significant AS and significant CAD (luminal reduction >70% diameter, fractional flow reserve <0.8, instantaneous wave-free ratio <0.89) consisting of complex bifurcation left main and/or multivessel CAD with a SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) score >33, SAVR and CABG are reasonable and preferred over TAVI and PCI.[3,4]

Ongoing trials will impact future guidelines!

Vahanian et al. Eur Heart J. 2022 Feb 12;43(7):561-632 ; Otto CM et al. Circulation. 2021 Feb 2;143(5):e35-e71.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