Sténose Aortique et Coronaropathie:

Comment l'évaluer
Prise en charge à l'heure du TAVI

CardioRun, 29 Septembre 2021

Gilles Rioufol MD, PhD

Interventional cardiology dpt
Cardiovascular Hospital - Lyon - France

Hospices Civils de Lyon

UNIVERSITÉ DE LYON

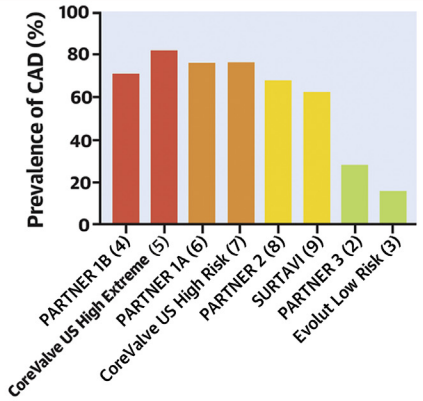
Inserm
Institut national
de la santé et de la recherche médicale

CarMeN LYON

CENTRAL ILLUSTRATION **Coronary Artery Disease Management Before and After Transcatheter Aortic Valve Replacement**

CAD Management Before TAVR

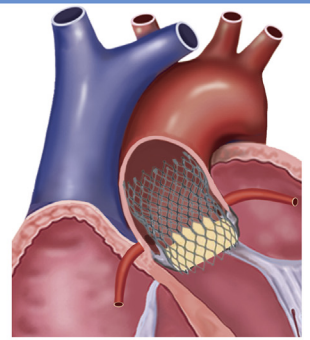
Prevalence of CAD in TAVR Recipients According to Surgical Risk



Future Perspectives

- CTA: Reasonable alternative to coronary angiography for the evaluation of CAD pre-TAVR
- FFR/iFR: Feasible and safe, promising preliminary results

CAD Management After TAVR



Coronary Access After TAVR

- No expected difficulties (in most cases) for coronary access (particularly valves with shorter stent frame/sealing skirt, larger stent cell size)
- Potential increased difficulties for coronary access (particularly RCA) in some cases (taller stent frame/sealing skirt, small sinus of Valsalva, low coronary height)

Poor Outcomes Associated With ACS Post-TAVR

Faroux, L. et al. J Am Coll Cardiol. 2019;74(3):362-72.

Current evidence and future perspectives of CAD management before and after TAVR. ACS = acute coronary syndrome; CAD = coronary artery disease; CTA = computed tomography angiography; FFR = fractional flow reserve; iFR = instantaneous wave-free ratio; PCI = percutaneous coronary intervention; RCA = right coronary artery; TAVR = transcatheter aortic valve replacement.

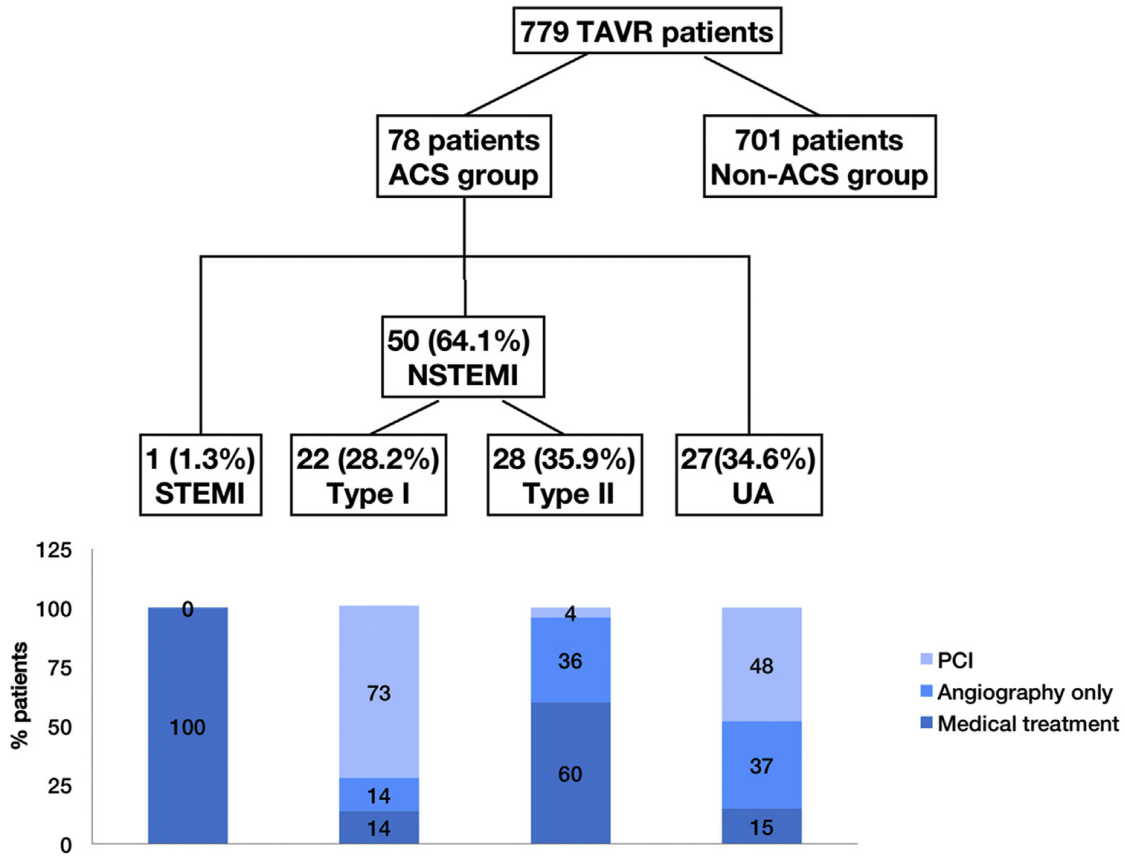
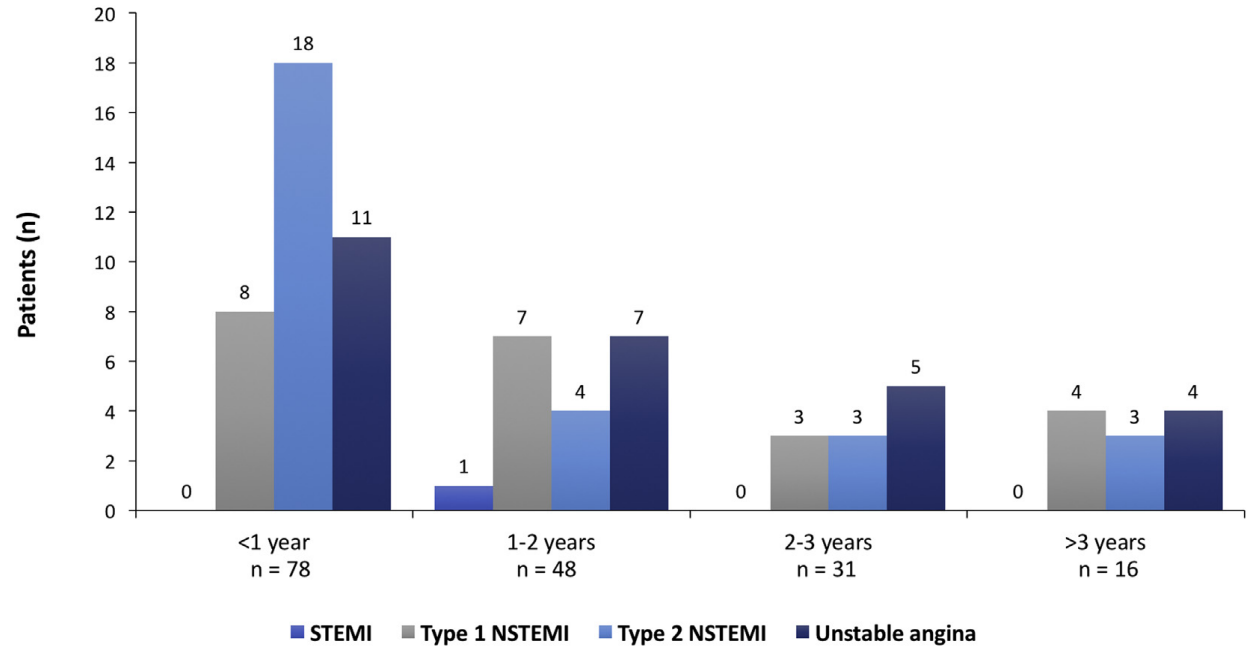


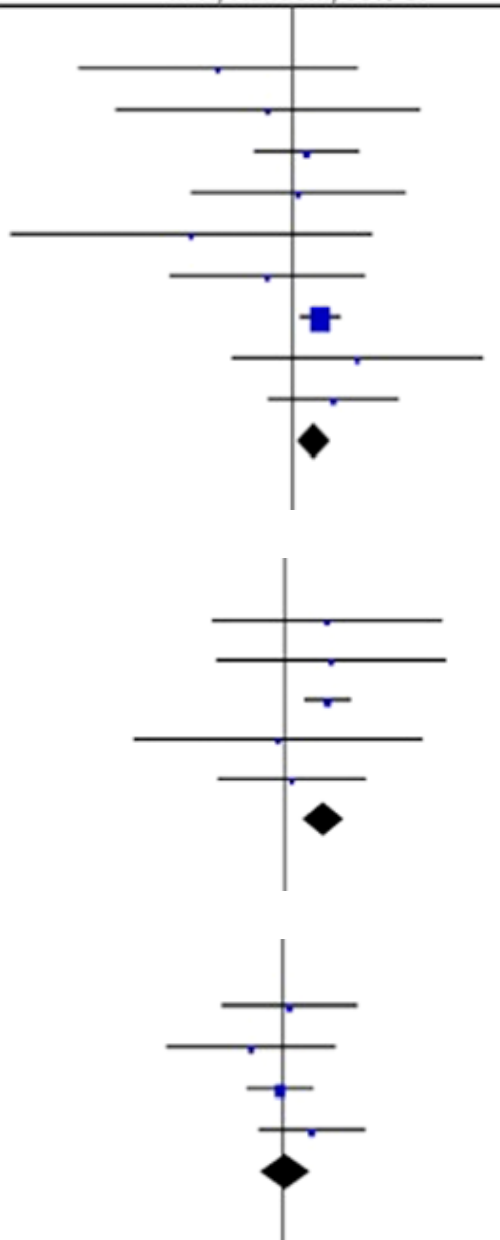
FIGURE 2 Time to First Acute Coronary Event Following TAVR



Vilalta JACC Intv 2018

Revascularization in TAVI

Study or Subgroup	TAVI+PCI Events	Total	TAVI alone Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Mortality at 30 days						
Abdel-Wahab 2012[12]	1	55	4	70	1.0%	0.31 [0.03, 2.82]
Abramowitz 2014[31]	1	61	2	83	0.8%	0.68 [0.06, 7.62]
Aktug 2013[25]	8	66	27	272	6.9%	1.25 [0.54, 2.90]
Khawaja 2015[37]	2	25	5	68	1.7%	1.10 [0.20, 6.05]
Masson 2010[9]	0	15	12	89	0.6%	0.20 [0.01, 3.56]
Penkalla 2015[35]	2	76	9	232	2.0%	0.67 [0.14, 3.17]
Singh 2016[40]	60	588	120	1761	46.1%	1.55 [1.12, 2.15]
Tatar 2014[32]	2	38	2	103	1.2%	2.81 [0.38, 20.66]
Wenaweser 2011[10]	6	59	11	197	4.5%	1.91 [0.68, 5.42]
Subtotal (95% CI)		**983**		**2875**	**64.8%**	**1.42 [1.08, 1.87]**
Total events	82		192			
Major vascular and vascular access complications						
Abdel-Wahab 2012[12]	3	55	2	70	1.6%	1.96 [0.32, 12.17]
Abramowitz 2014[31]	3	61	2	83	1.7%	2.09 [0.34, 12.94]
Singh 2016[40]	50	588	79	1761	7.8%	1.98 [1.37, 2.86]
Tatar 2014[32]	1	38	3	103	1.1%	0.90 [0.09, 8.94]
Wenaweser 2011[10]	4	59	12	197	3.2%	1.12 [0.35, 3.62]
Subtotal (95% CI)		**801**		**2214**	**15.4%**	**1.86 [1.33, 2.60]**
Total events	61		98			
Mortality at 1 year						
Khawaja 2015[37]	6	25	15	68	4.2%	1.12 [0.38, 3.29]
Masson 2010[9]	3	15	26	89	2.7%	0.61 [0.16, 2.33]
Penkalla 2015[35]	30	76	94	232	17.4%	0.96 [0.56, 1.63]
Tatar 2014[32]	11	38	21	103	6.7%	1.59 [0.68, 3.72]
Subtotal (95% CI)		**154**		**492**	**31.0%**	**1.05 [0.71, 1.56]**
Total events	50		156			



Kotronias et al. JAHA 2017

Revascularization in TAVI

Table 7. Metaregression Examining the Influence of CAD on Outcomes

Outcome	Exp(b) (95% CI)	*P* Value
30-d mortality	0.98 (0.94–1.02)	0.23
1-y mortality	0.99 (0.94–1.04)	0.36
Cardiovascular mortality	0.92 (0.15–5.71)	0.68
Myocardial infarction	Insufficient observations	…
Major or life threatening bleeding	1.05 (0.99–1.10)	0.074
Major vascular or access site complication	0.99 (0.91–1.07)	0.72
Acute kidney injury or hemodialysis	1.01 (0.90–1.13)	0.77
Stroke	0.98 (0.74–1.31)	0.81
Permanent pacemaker	1.01 (0.94–1.09)	0.64
Combined safety	1.03 (0.65–1.64)	0.57

Kotronias et al. JAHA 2017

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

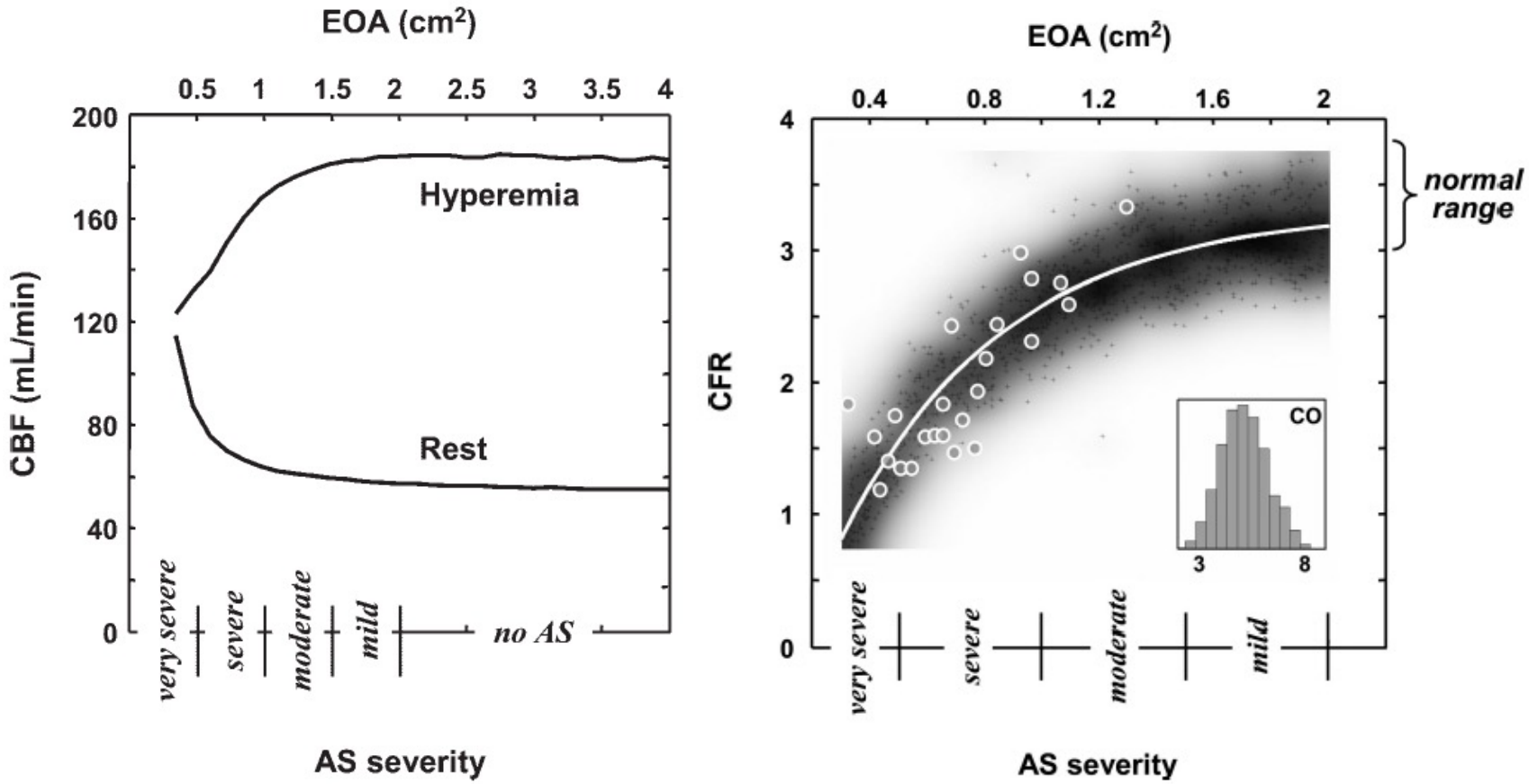
Indications for myocardial revascularization		
PCI should be considered in patients with a primary indication to undergo TAVI and coronary artery diameter stenosis >70% in proximal segments.	IIa	C

2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease: Executive Summary

Recommendations for Management of CAD in Patients Undergoing TAVI

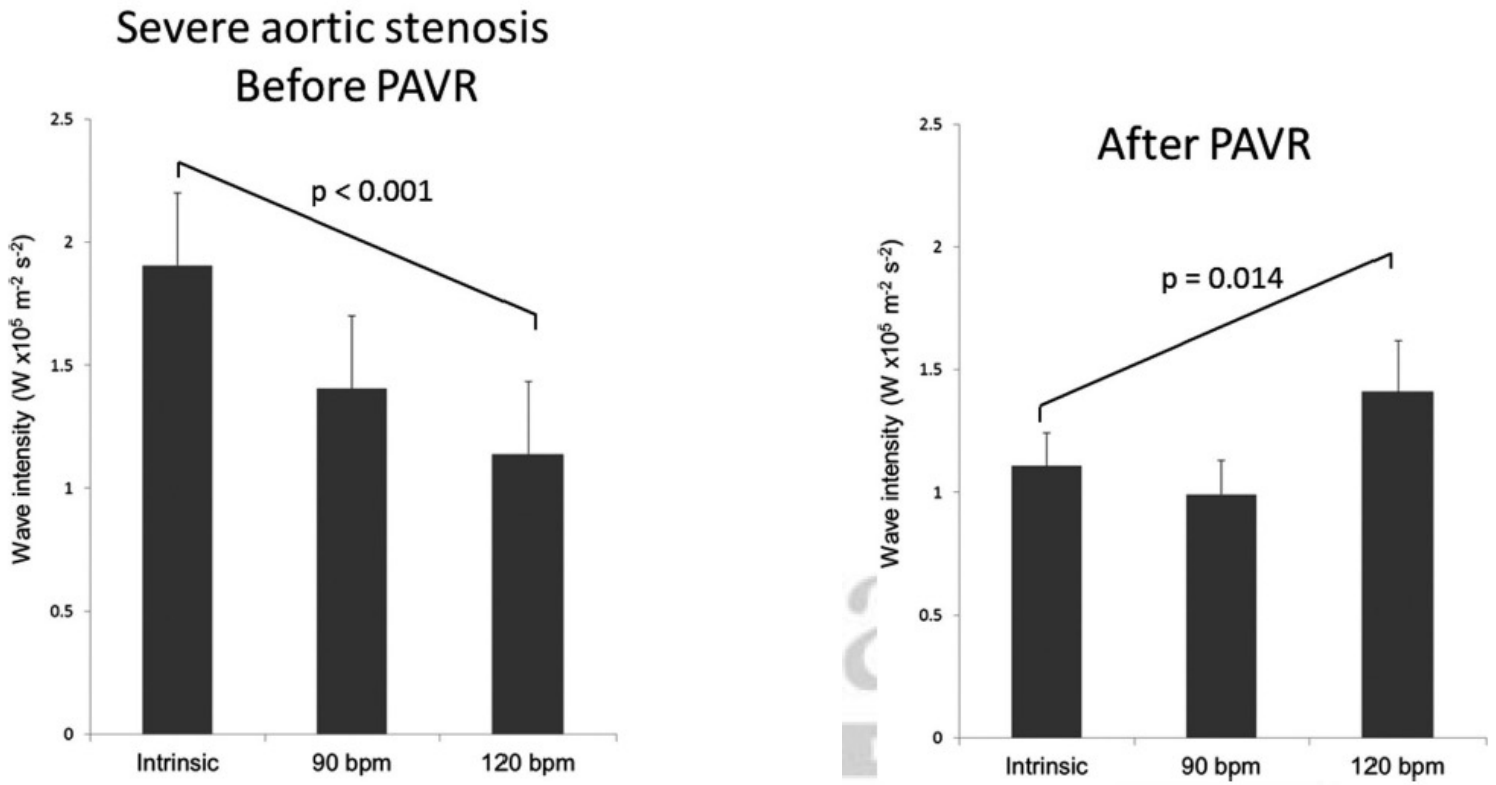
2a	C-LD	2. In patients undergoing TAVI with significant left main or proximal CAD with or without angina, revascularization by PCI before TAVI is reasonable (751,752).
2a	C-LD	3. In patients with significant AS and significant CAD (luminal reduction >70% diameter, fractional flow reserve <0.8, instantaneous 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 (753,754).

FFR and myocardial hypertrophy: Aortic stenosis – simulation (II)



Garcia et al. J Appl Physiol 2009;106:113

n=11 pre- and post- TAVI



Improvement of physiological reserve with TAVI

Davies et al. Circulation 2011

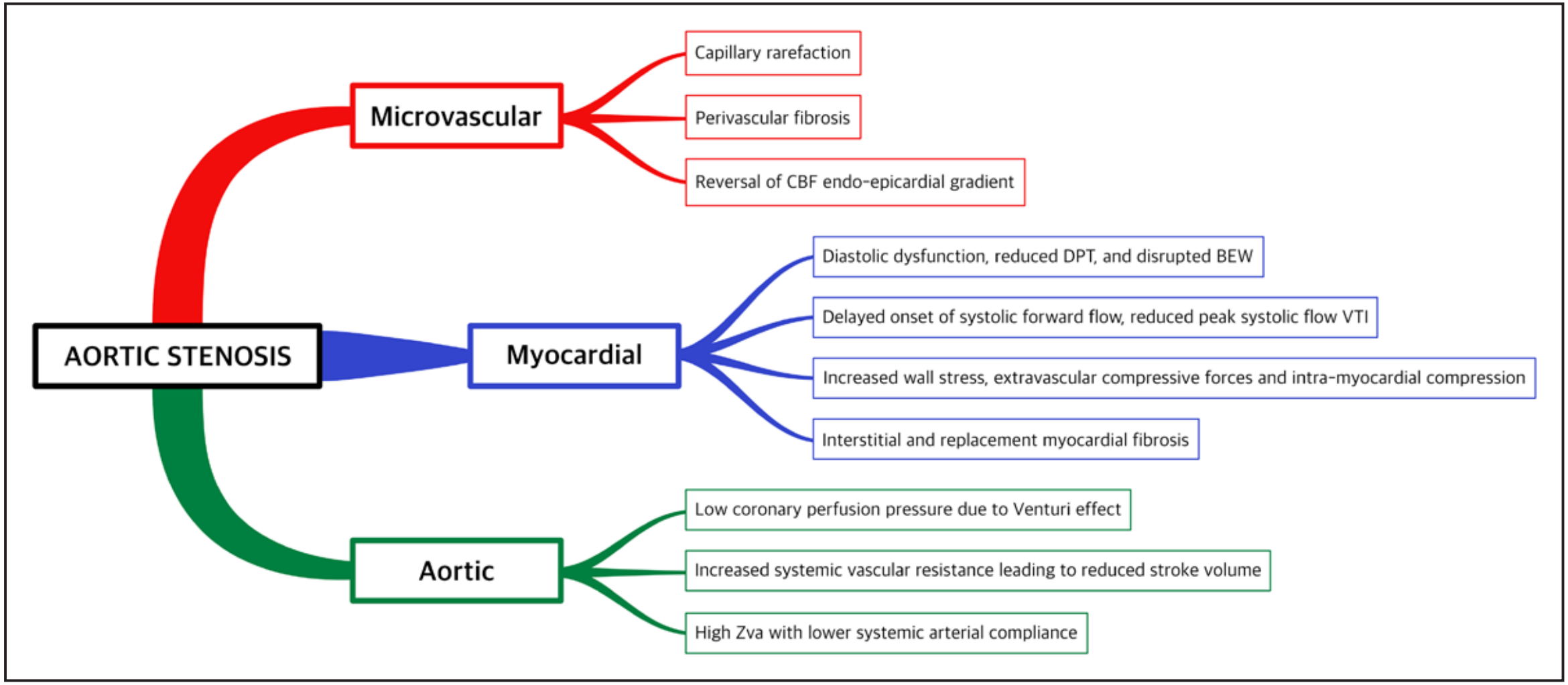
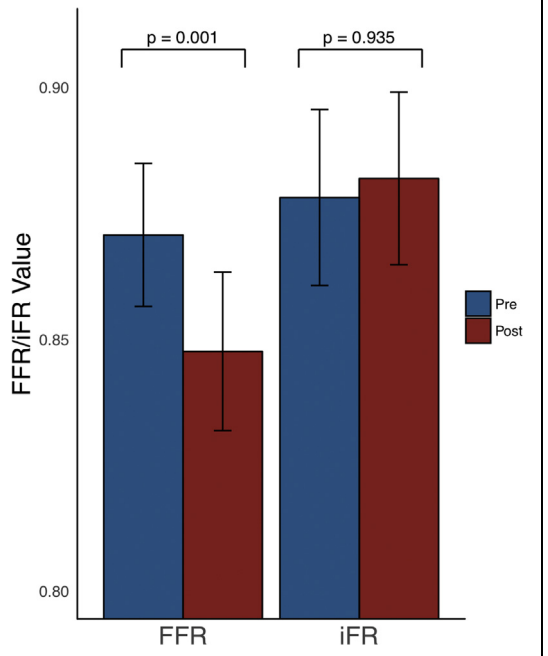


Figure 5. **Factors implicated in disrupted coronary flow and reduced coronary flow reserve in aortic stenosis.**

Table 6. Values of Common Coronary Physiological Indices Pre- and Post-TAVI

	Pre-TAVI	Post-TAVI	*P* Value
Fractional flow reserve	0.86 (±0.08)	0.83 (±0.09)	<0.001
Instantaneous wave–free ratio	0.87 (±0.10)	0.87 (±0.09)	0.80
Coronary flow reserve	1.56 (±0.50)	1.74 (±0.50)	0.03
Whole cycle resting flow (PdPa-flow)	22.54 (±8.86)	23.02 (±10.45)	0.71
Whole cycle hyperemic flow (FFR-flow)	33.44 (±12.69)	38.51 (±16.31)	0.005
Wave-free period resting flow (iFR-flow)	28.29 (±12.77)	27.64 (±16.10)	0.63

FIGURE 5 Changes in Fractional Flow Reserve and Instantaneous Wave-Free Ratio After Transcatheter Aortic Valve Replacement



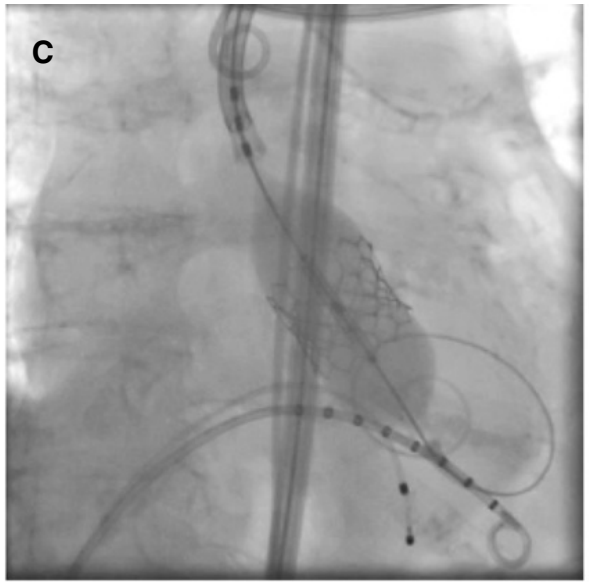
TAVI/AVR restore/improve microcirculation and increase hyperemia capacity

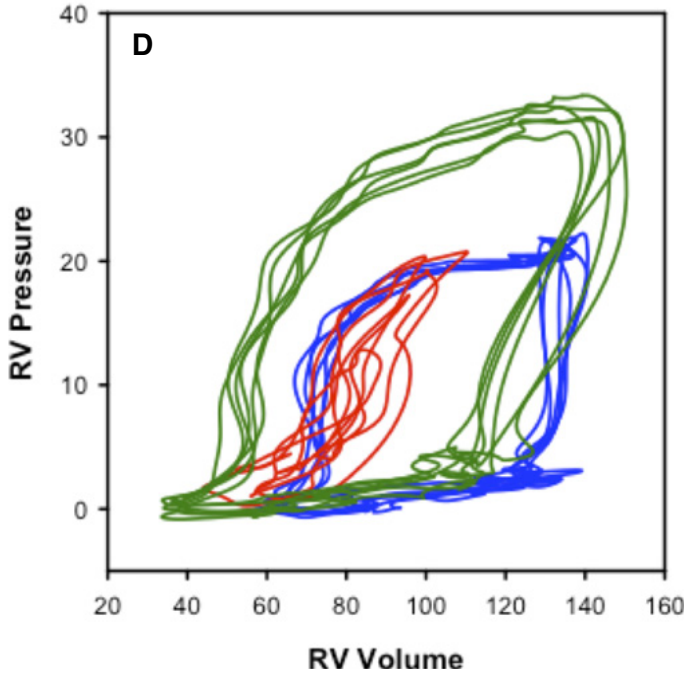
FFR before TAVI/AVR underestimate stenosis severity
iFR probably less sensitive to AS severity

Ahmad JACC Intv 2018

Ahmad Circ Intv 2019

Temporal RV Dysfunction After Ischemia in Humans

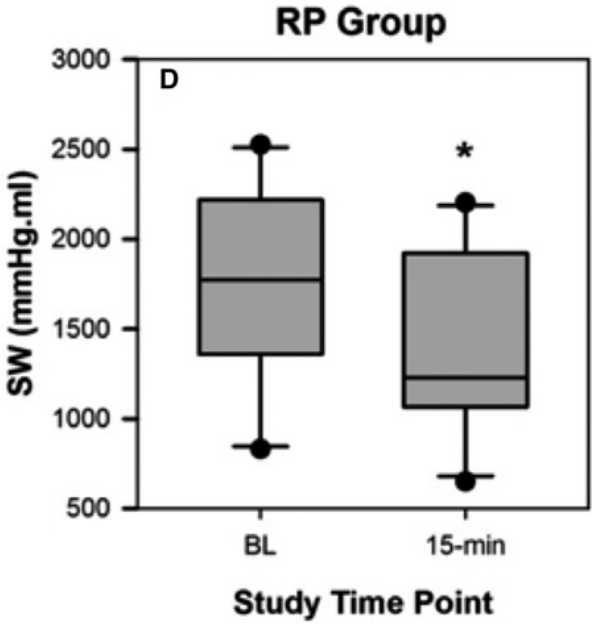


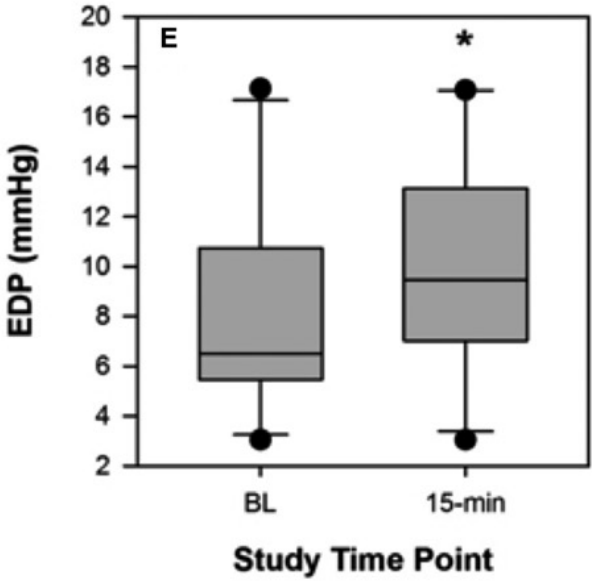


baseline

Post pacing

15’ post pacing





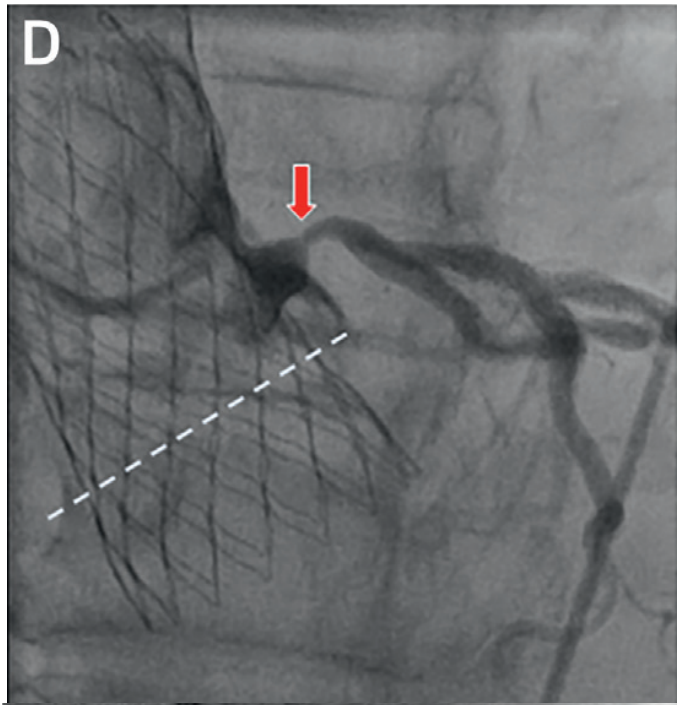
Axell et al. JAHA 2017

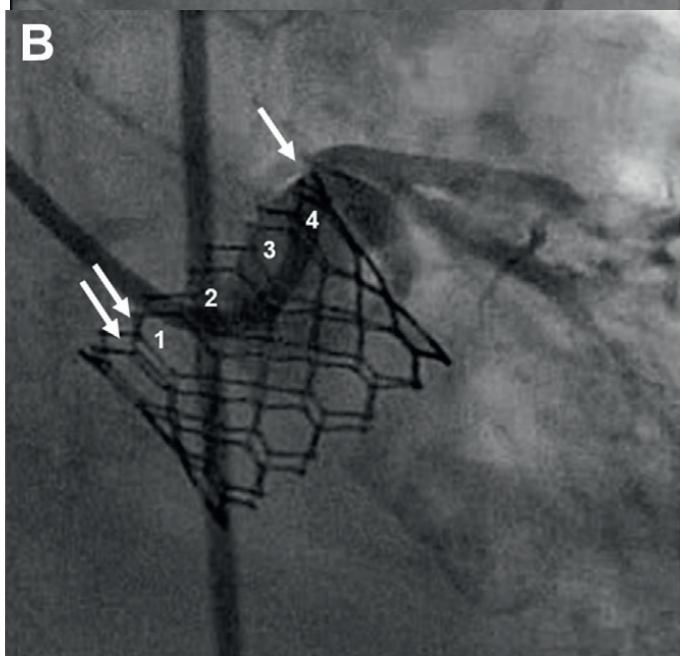
Rapid Pacing and TAVR

Table 3. In-Hospital Outcomes and 1-Year Mortality

	No Pacing Episodes (n=54)	1 to 2 Pacing Episodes (n=247)	3+ Pacing Episodes (n=111)	*P* Value
AKI				0.001
Stage 1	5 (9.3)	35 (14)	18 (17)	
Stage 2	4 (7.4)	7 (2.9)	4 (3.7)	
Stage 3	1 (1.9)	1 (0.4)	9 (8.3)	
Vascular complications				0.89
Minor	16 (30)	58 (24)	28 (26)	
Major	1 (1.9)	5 (2)	3 (2.7)	
Bleeding				0.6
Minor	9 (17)	26 (11)	13 (12)	
Major	2 (3.7)	11 (4.5)	5 (4.5)	
Life threatening/disabling	2 (3.7)	4 (1.6)	5 (4.5)	
Prolonged hypotension	0	39 (16)	28 (25)	<0.001
New atrial fibrillation	3 (5.6)	18 (7.3)	16 (15)	0.047
New onset left bundle branch block	15 (28)	81 (33)	27 (25)	0.3
High-degree atrioventricular block	5 (9.3)	41 (17)	18 (17)	0.38
Permanent pacemaker implantation	6 (12)	46 (19)	20 (19)	0.46
Postprocedure troponin >x15 ULN	18 (33)	128 (52)	70 (63)	0.002
Postprocedural CPK >x5 ULN	4 (7.4)	18 (7.3)	21 (19)	0.003
Stroke	3 (5.6)	6 (2.4)	8 (7.3)	0.09
Peri-procedural mortality	0	0	1 (0.9)	0.26
In-hospital mortality	1 (2)	4 (1.7)	7 (6.5)	0.045
1-y death	6 (11)	19 (7.7)	20 (18)	0.015

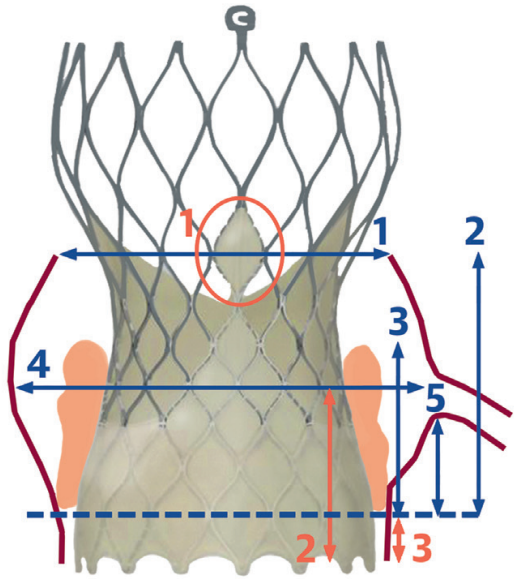
Fefer et al. JAHA 2018





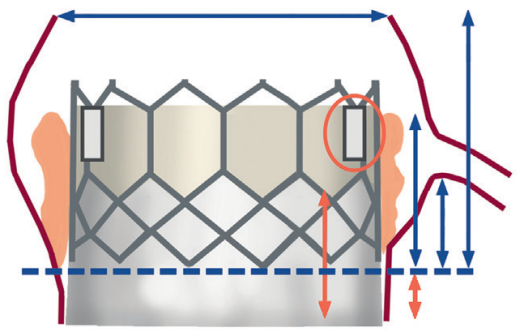
CENTRAL ILLUSTRATION Coronary Reaccess After TAVR

Factors Impacting Coronary Access



Anatomical

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



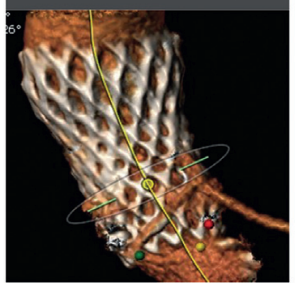
Device and Procedural

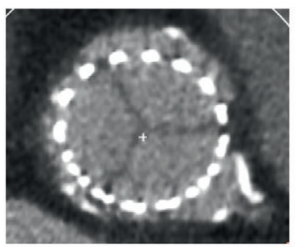
1. Commissural tab orientation
2. Sealing skirt height
3. Valve implant depth

Imaging Evaluation

Fluoroscopy

MDCT

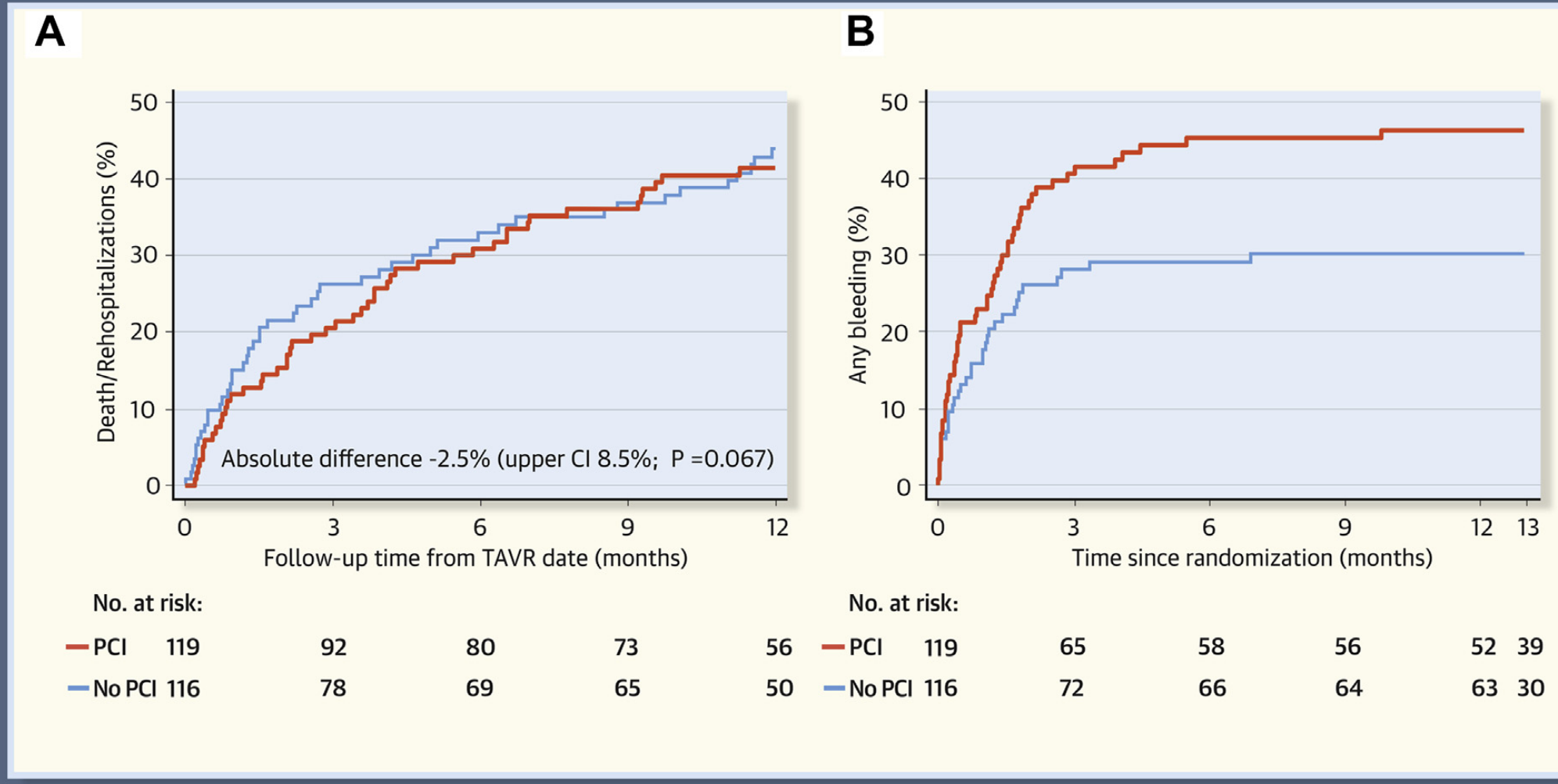




Yudi, M.B. et al. J Am Coll Cardiol. 2018;71(12):1360-78.

Summary of factors impacting coronary access and imaging evaluation after TAVR. MDCT = multidetector computed tomography; TAVR = transcatheter aortic valve replacement.

ACTIVATION Trial of PCI Before TAVR



Patterson, T. et al. J Am Coll Cardiol Intv. 2021;14(18):1965-1974.

Conclusions

Sténose proximale sévère >70%

Risque hémorragique

Préservation accès coronaire

FFR/iFR?

Rapid pacing

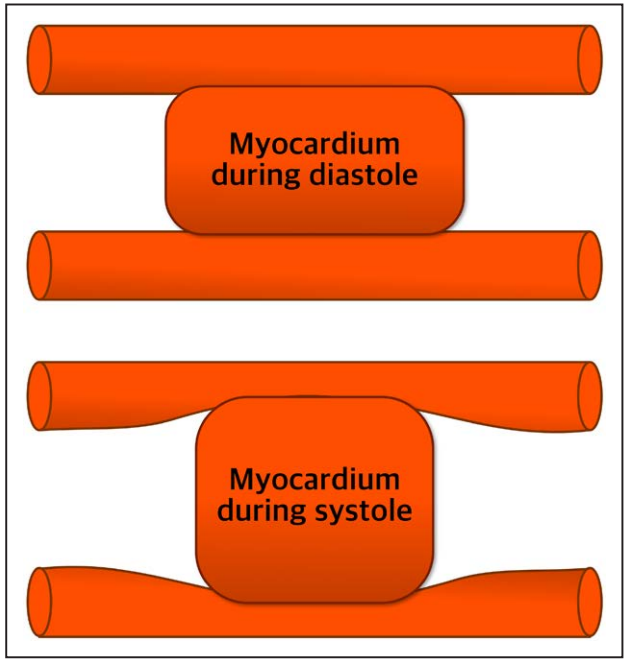


Figure 1. Myocardial contraction results in muscle shortening and thickening to cause extravascular coronary compression.