

Issue of coronary obstruction in TAVI :

Low height of coronary ostium & Countermeasure

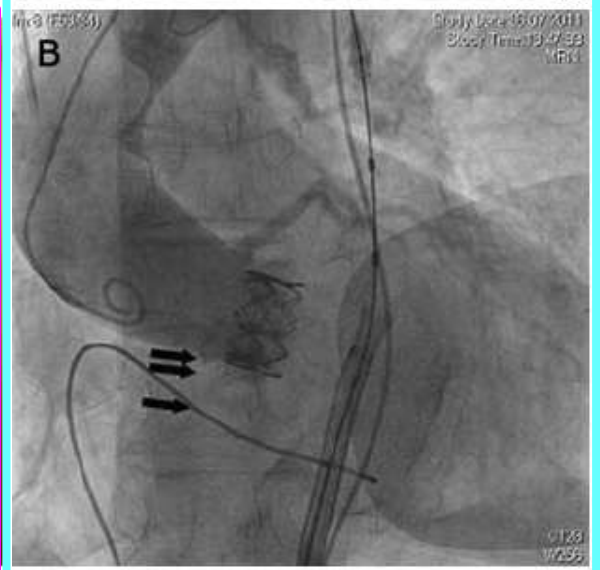
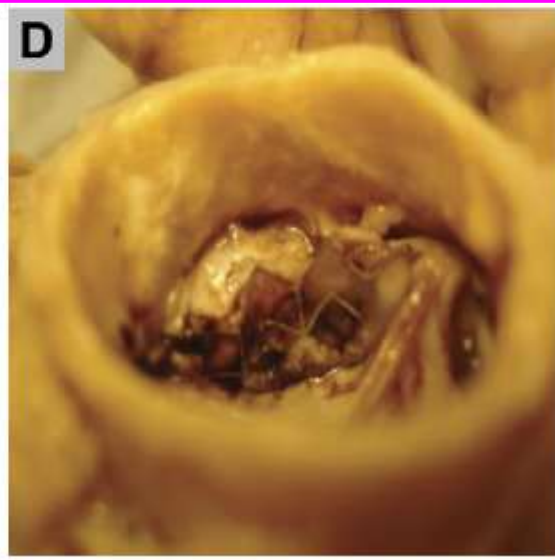
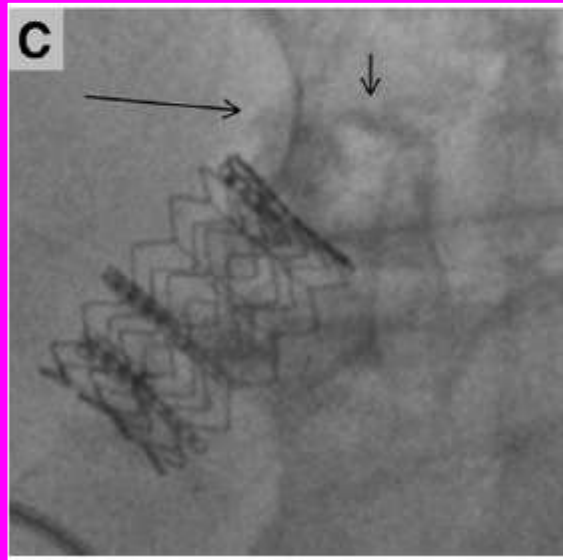
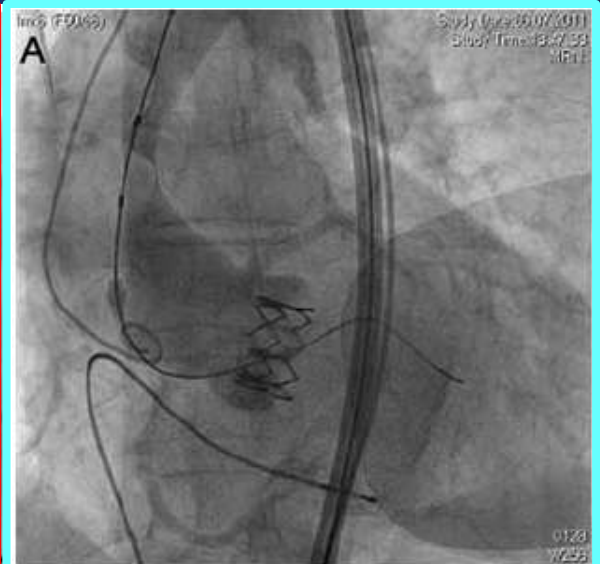
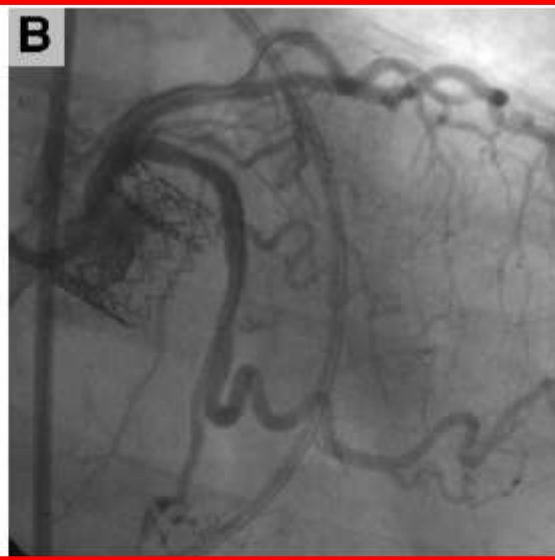
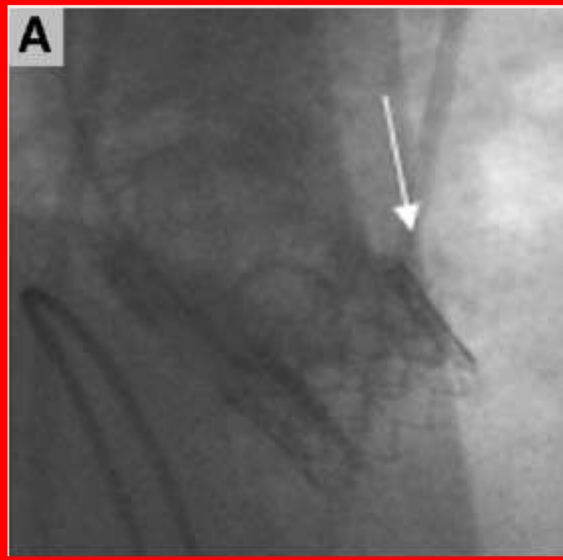
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Coronary Obstruction during TAVI



Coronary Obstruction during TAVI

Incidence

Registries reported large variability regarding the incidence

Publication, Year	Valve	Number	Incidence
Webb et al. 2006	SAPIEN	1 / 18 patients	5.6%
Himbert et al. 2009	SAPIEN	0 / 160 patients	0.0%
Seipelt et al. 2012	SAPIEN XT	3 / 270 patients	1.11%
SOURCE registry, 2010	SAPIEN	6 / 1038 patients	0.58%
Canadian registry, 2010	SAPIEN, SAPIEN XT	3 / 345 patients	0.90%
Zierer et al. 2008	SAPIEN	2 / 26 patients	7.69%
Griese et al. 2013	SAPIEN, SAPIEN XT	2 / 411 patients	0.49%

Webb et al. *Circulation*. 2006

Seipelt et al. *Inter CardioVasc and Thorac Surgery*. 2012

Thomas M et al. *Circulation* 2010

Rodes-Cabau J et al. *JACC* 2010

Coronary Obstruction during TAVI

Incidence

TABLE IV. Additional Complications Reported in Patients Undergoing TAVR

Meta-analysis: TAVR		
Complication		
Major vascular	%	6.60%
Complication	<i>n/n</i> total	234/3,559
	<i>N</i> studies	6
Cardiac tamponade		1.40%
		6/401
		3
Aortic dissection		0.71%
		9/1,270
		3
Aortic/annular		0.49%
Rupture		4/812
		4
Coronary		0.72%
Obstruction		12/1,675
		4
Myocardial		0.56%
Infarction		5/900
		5
Blood		11.60%
Transfusion		149/1,282
		2
Valve		0.56%
Embolization		10/1,770
		5
Paravalvular aortic regurgitation		11.6%
≥Moderate		80/692
		7
Endocarditis		0.39%
		2/514
		2

Meta-analysis comparing SAVR vs TAVI

16 Studies with 5024 TAVI patients

Overall Incidence of Coronary

Obstruction → 0.72%

Coronary Obstruction during TAVI

Epidemiology

18 Publications between 2002-2012

- Women 83%
- Mean age 83 ± 7 years
- Balloon expandable valve (Edwards) : 88%
- Self-expandable valve (CoreValve) : 12%

Incidence by vessels

- RCA : 12.5%
- LCA : 83.3%
- Both : 4.2%

Coronary Obstruction during TAVI

Clinical Presentation and Consequences

Clinical Presentations

- Severe Hypotension : 21 / 24 patients (87.5%)
- ST-segment change : 13 / 24 patients (54.2%)
- ST-segment elevation : 6 / 24 patients (25.0%)
- Ventricular arrhythmia : 6 / 24 patients (25.0%)

Consequences of the Events

- Need for “CPR” : 9 / 24 patients (37.5%)
- Need for Hemodynamic Support : 6 / 24 patients (25.0%)
- Conversion to Open heart surgery : 2 / 24 patients (8.3%)
- In-Hospital Death : 2 / 24 patients (8.3%)

Coronary Obstruction during TAVI Consequences

Patient# (Ref#)	Coronary Obstruction	Clinical Presentation			Treatment			Successful PCI	Stent Type	Need for Hemodynamic Support	Hospital Stay (days)	In-Hospital Death
		Severe Hypotension	ST-Segment Changes	Ventricular Arrhythmias or CPR	PCI	CABG						
1 (9)	Both	Yes	Yes	No	Yes	No	Yes	BMS	No	11	No	
2 (10)	LCA	Yes	No	No	No	No	—	—	No	5	Yes	
3 (11)	LCA	Yes	Yes	Yes	Yes	No	Yes	DES	No	5	No	
4 (12)	LCA	Yes	Yes	Yes	Yes	No	Yes	BMS	Yes	13	No	
5 (12)	RCA	Yes	Yes	No	Yes	Yes	Yes	—	Yes	12	No	
6 (12)	RCA	Yes	Yes	No	Yes	Yes	Yes	—	Yes	14	No	
7 (13)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	4	No	
8 (13)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	0	Yes	
9 (13)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	5	No	
10 (13)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	4	No	
11 (13)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	3	No	
12 (14)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	—	No	
13 (15)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	5	No	
14 (16)	LCA	Yes	No	Yes	Yes	No	Yes	BMS	No	5	No	
15 (17)	RCA	Yes	Yes	No	Yes	No	Yes	—	No	4	No	
16 (18)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	—	No	
17 (19)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	8	No	
18 (20)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	5	No	
19 (21)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	—	No	
20 (22)	LCA	Yes	Yes	No	Yes	No	Yes	—	No	11	No	
21 (23)	LCA	Yes	Yes	No	Yes	No	Yes	Both	No	—	No	
22 (24)	LCA	No	Yes	No	Yes	No	Yes	BMS	No	—	No	
23 (25)	LCA	No	No	No	Yes	No	Yes	BMS	No	—	No	
24 (26)	LCA	Yes	No	Yes	Yes	No	Yes	DES	Yes	—	No	

PCI was attempted in 23 cases (95.8%)

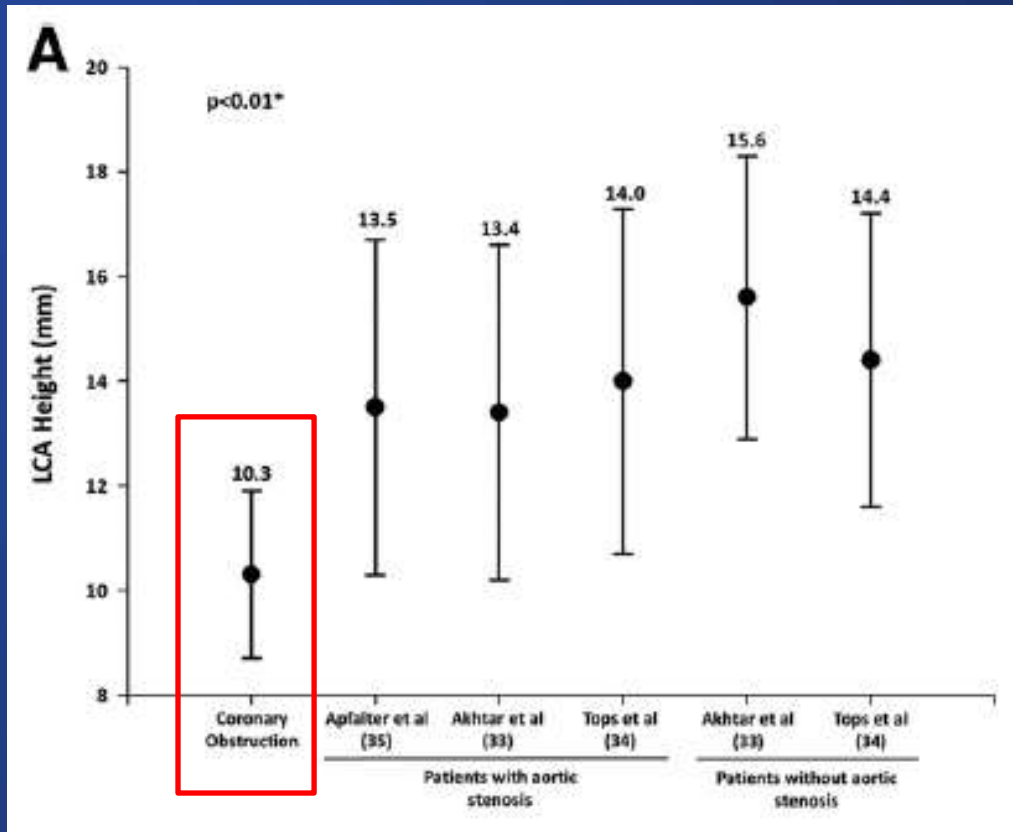
→ Success rates 91.3%

30-day mortality rates

→ 8.3%

Five Factors to Determine Coronary Obstruction

[1] Height of Coronary Ostium



Significantly Smaller Height of Coronary Ostium than

1. Patients undergoing TAVI due to AS

2. Patients without AS

Current Safety Cut-Off ≥ 10 mm
Is Safe ??

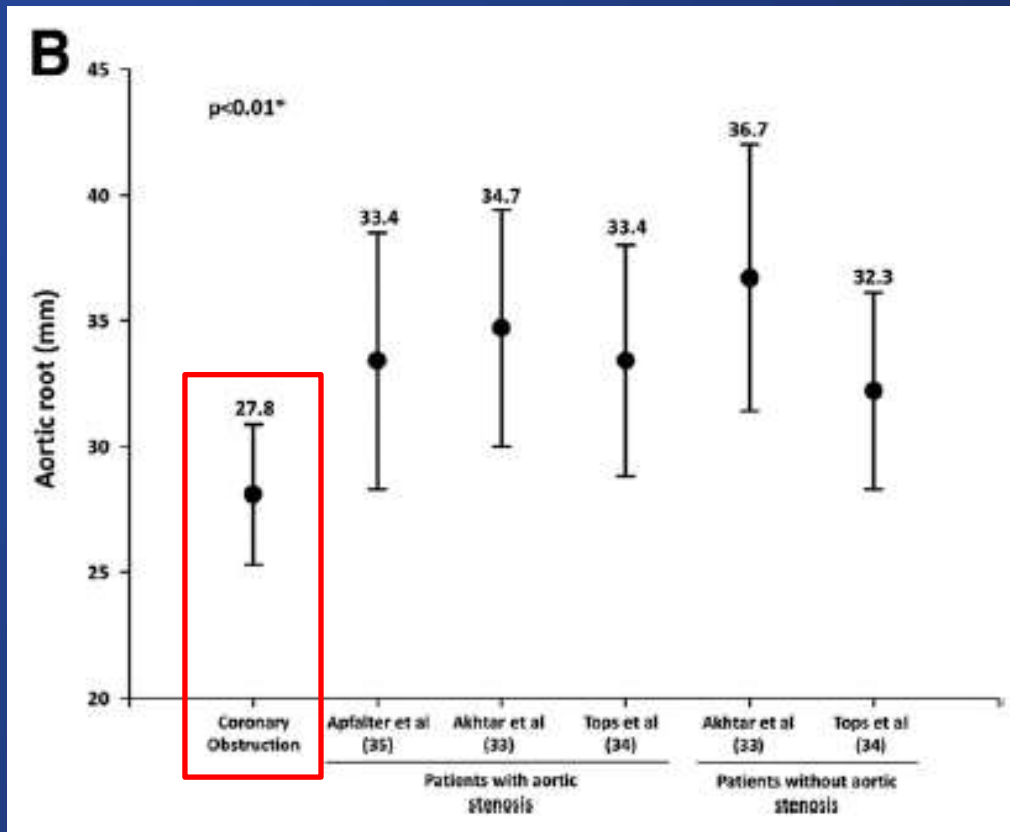
→ 60% of cases with coronary obstruction

→ Had ostial height > 10 mm

Mean Coronary Ostial Height : 10.3 mm

Five Factors to Determine Coronary Obstruction

[2] Aortic Root Size and Space of Sinus Valsalva



Significantly Smaller Aortic Root Size than

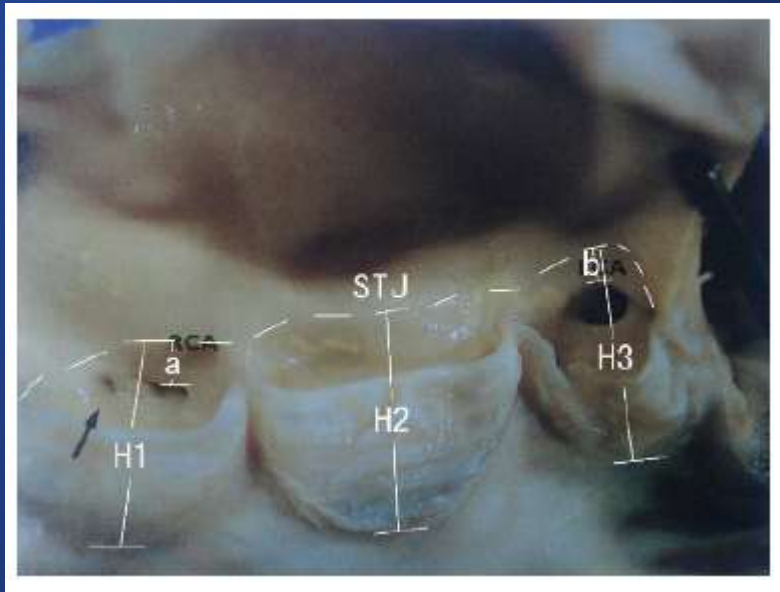
1. Patients undergoing TAVI due to AS
2. Patients without AS

Mean Aortic Root Size : 27.8 mm

Five Factors to Determine Coronary Obstruction

[3] Length of Aortic Valve Leaflet

Currently, No available data regarding
the association between length of native valve leaflet
and the risk of coronary obstruction

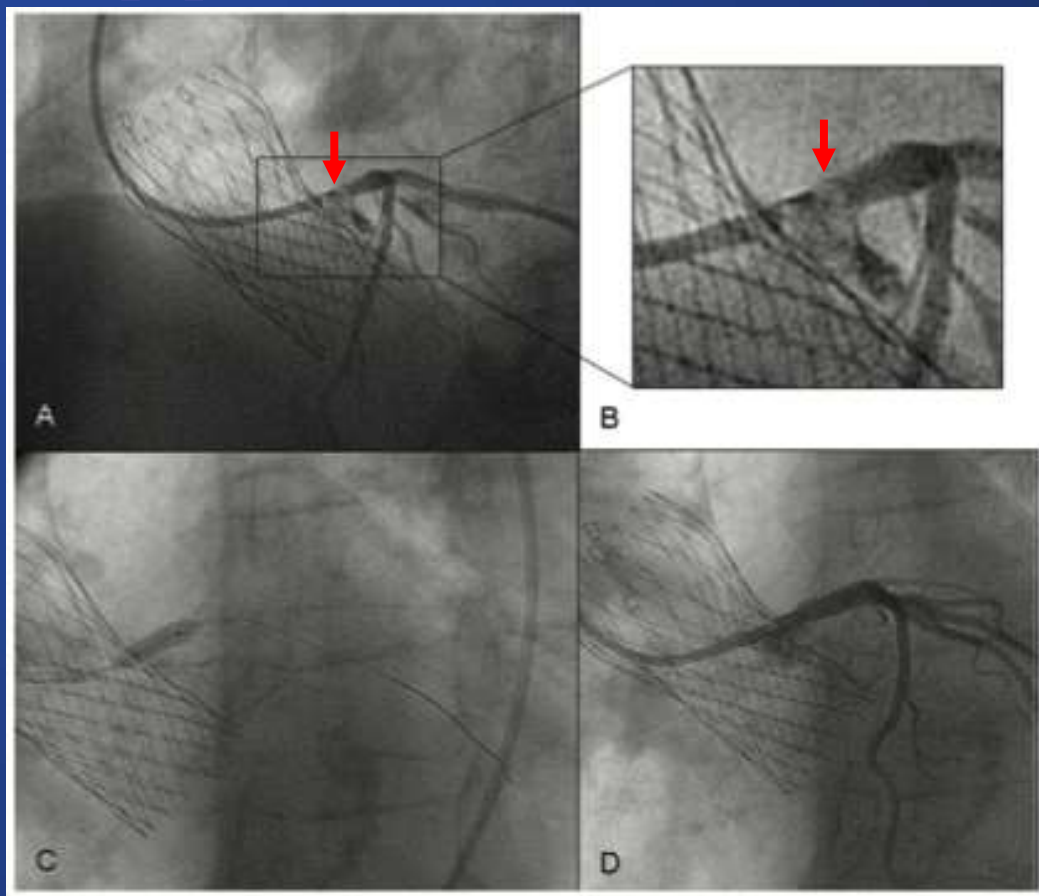


40 post-mortem heart harvested
from the TAVI patients
72.5% of coronary ostium were
located below the ST junction

Longer leaflet may
more easily cover the ostium
(personal thought)

Five Factors to Determine Coronary Obstruction

[4] Presence of Calcium Chunk on Valve Leaflet



None of previous study
quantitatively measured the
volume of leaflet calcium
chunk

But, we already know that
“Heavy” Calcium Chunk in
Leaflet will “Obstruct”
the Ostium

Currently, There was No cases of coronary obstruction related to
the struts of valve frame or to the cuff/leaflet of prosthetic valve

Five Factors to Determine Coronary Obstruction

[5] Self-expandable vs. Balloon-expandable

Table 5. Data on Coronary Obstruction From Large TAVI Registries and the PARTNER Trial

Study (Ref. #)	n	Valve/Approach	TF	TA	All Procedures	Cases SAPIEN	Cases CoreValve
ADVANCE (3)	996	CoreValve	0.1%	—	0.1%	—	1
Canadian (4)	345	Cribier-Edwards, SAPIEN, SAPIEN XT/49% TF, 51% TA	0.6%	1.1%	0.9%	3	—
FRANCE (2)	244	SAPIEN or CoreValve/66% TF, TS 5%, 29% TA	SAPIEN (2.1%) CoreValve (1.5%)	0%	1.2%	2	1
German (8)	670	SAPIEN or CoreValve/96% TF, 4% TA	—	—	0.1%	—	—
SOURCE (6)	1,038	SAPIEN/45% TF, 55% TA	0.7%	0.5%	0.6%	6	—
PARTNER (5)	348	SAPIEN/70.1% TF, 29.9% TA	0%	0%	0%	—	—
Source XT (7)	2,600	SAPIEN XT/63% TF, 34% TA	0.3%	0.3%	0.3%	8	—
Pooled studies			13/3,726 (0.35%)	8/1,833 (0.44%)	22/6,241 (0.35%)	19	2
SAPIEN					19/4,497 (0.42%)		
CoreValve					2/1,074 (0.19%)		

ADVANCE = Medtronic CoreValve study; FRANCE = French Aortic National CoreValve and Edwards registry; PARTNER = Placement of Aortic Transcatheter Valve trial; SOURCE = SAPIEN aortic bioprosthesis European outcome registry; TAVI = transcatheter aortic valve implantation; other abbreviations as in Table 1.

Overall incidence from the largest registry and RCT

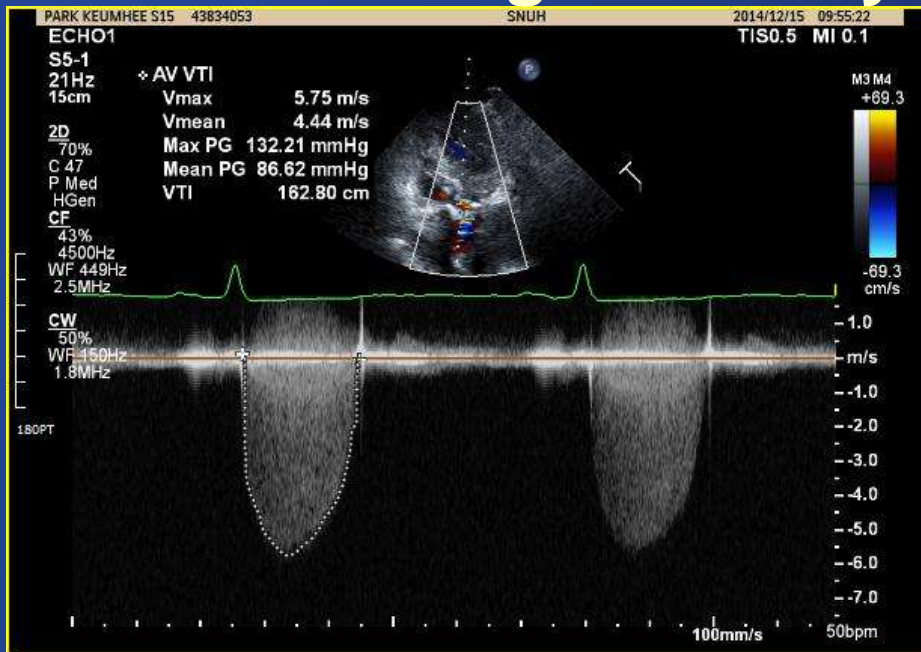
SAPIEN → 0.42 %

CoreValve → 0.19%

Overcoming Coronary Obstruction during TAVI

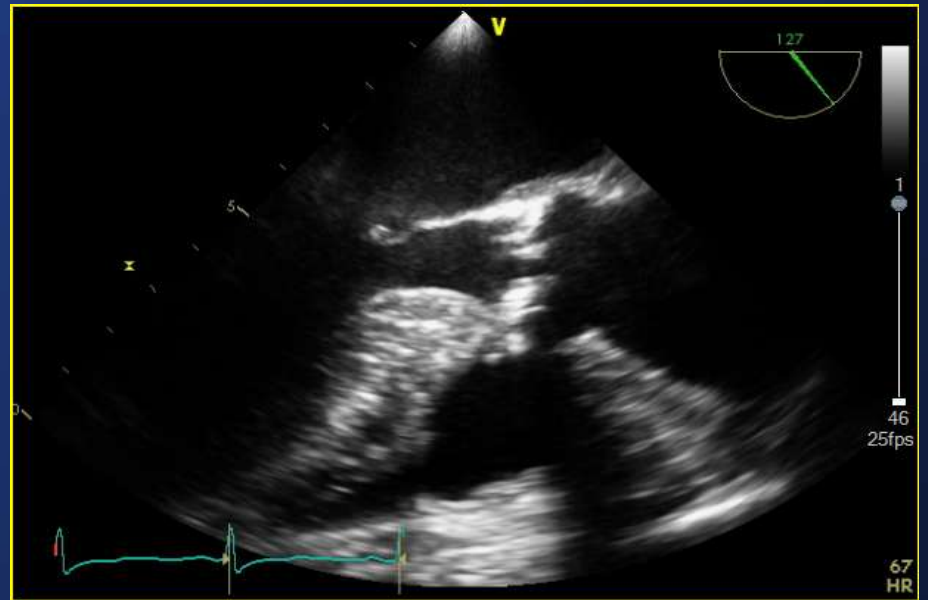
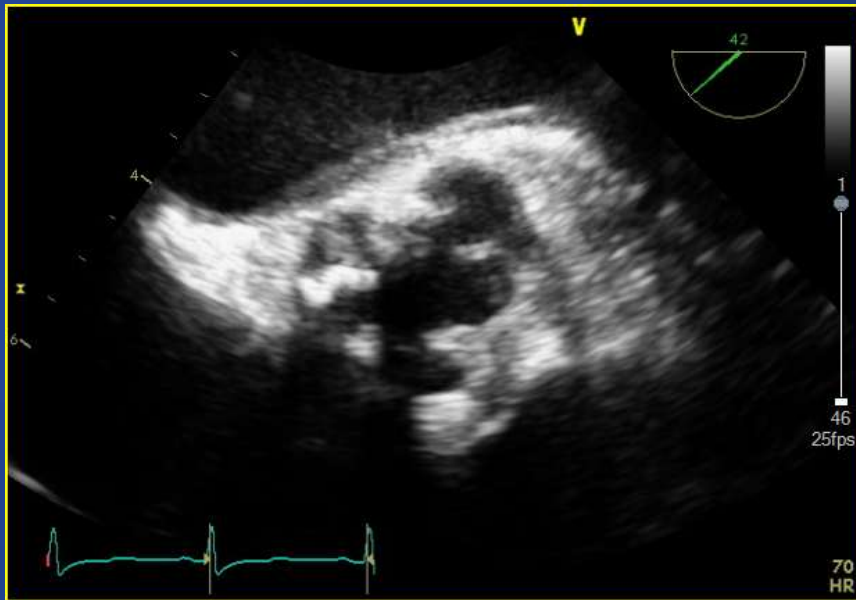
- 65 YO FeMale , 147.2 Cm, 50.8 Kg, BMI : 23.44
- Chief complaint>
Dyspnea on exertion (NYHA III), 2YA
- Present Illness>
DOE since 2YA → Local hospital Echo → Dxed as AS
→ Other Tertiary Center → F/U with Echo
→ Recent F/U Echo : Severe AS
→ Referred for TAVI
- Patient strongly refused surgical AVR.

Overcoming Coronary Obstruction during TAVI

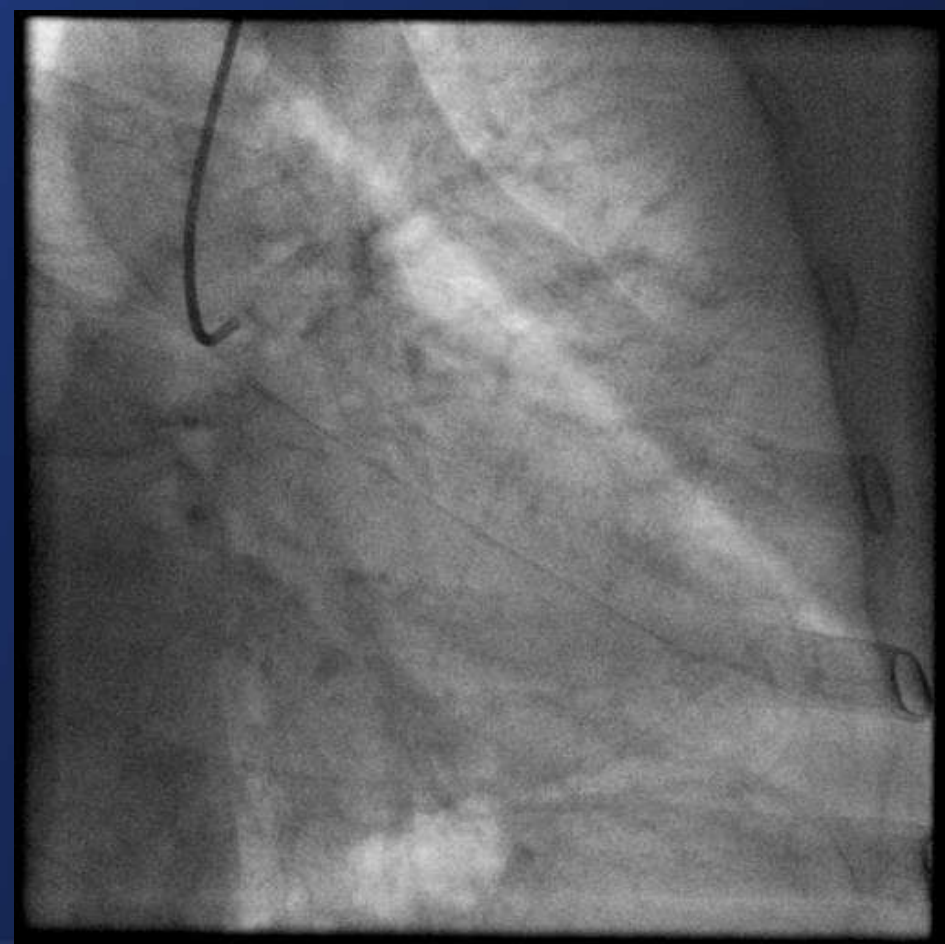
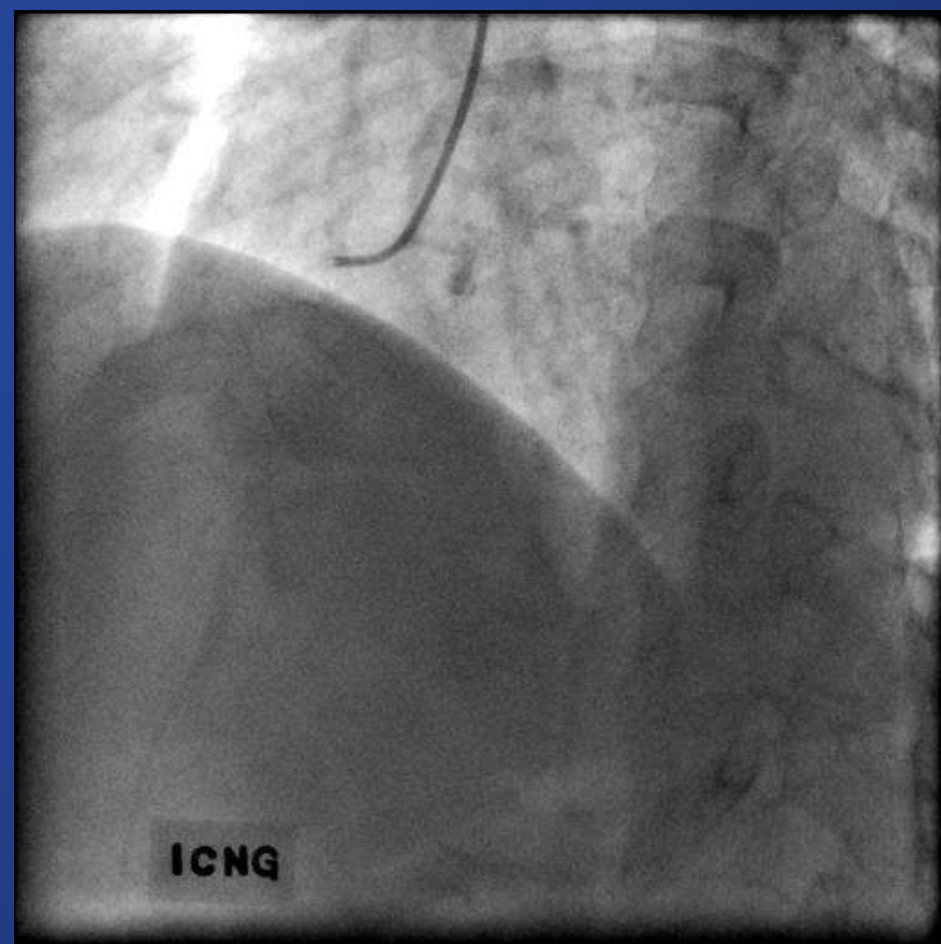


- ✓ Severe AS with Severe Valvular Calcification
- ✓ Trans AV mean Pr gradient = 86.6 mmHg, AV Vmax = 5.75 m/s
- ✓ AVA = 0.65 cm²
- ✓ Normal LV cavity size and normal systolic function
 - LVEDD/ESD 38/24, LVEF 60%, LA size 40mm
- ✓ Dilated ascending aorta (40mm)
- ✓ Increased LV wall thickness, RWMA (-)

Overcoming Coronary Obstruction during TAVI



Overcoming Coronary Obstruction during TAVI

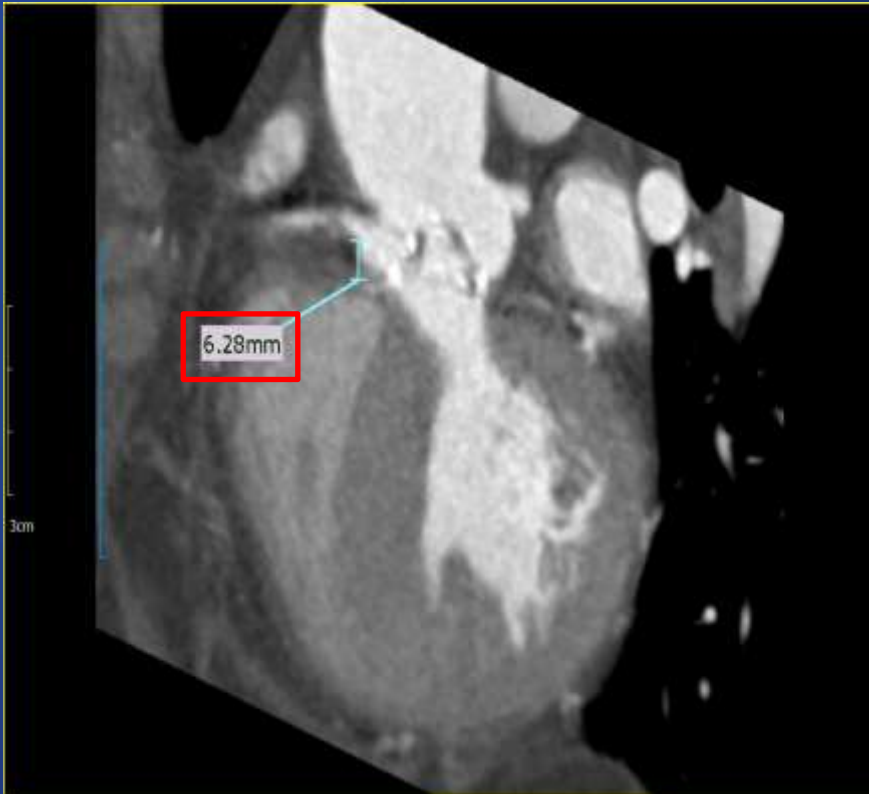


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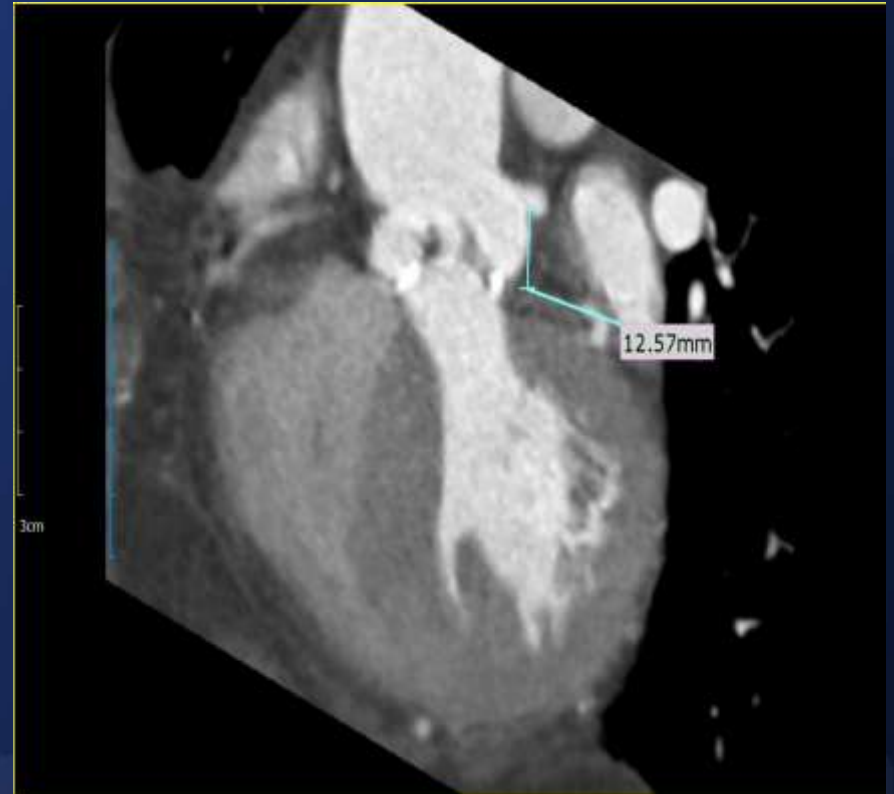
Five Factors to Determine Coronary Obstruction

[1] Height of Coronary Ostium

RCA



LCA

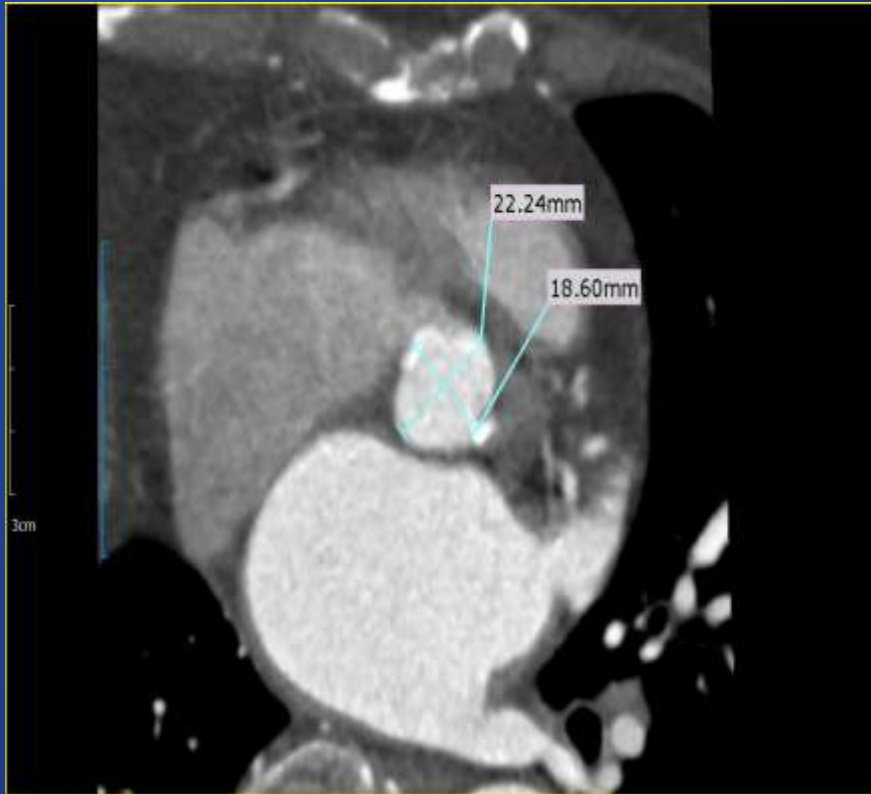


Significantly Lower RCA ostial height

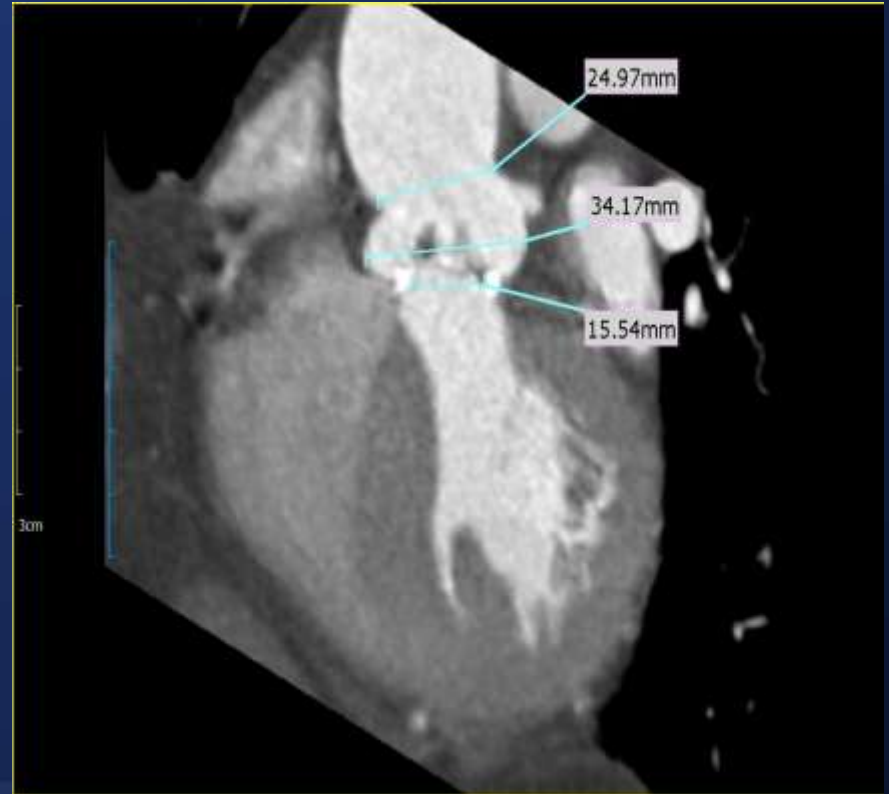
Five Factors to Determine Coronary Obstruction

[2] Aortic Root Size and Width of Sinus Valsalva

Aortic Root Size



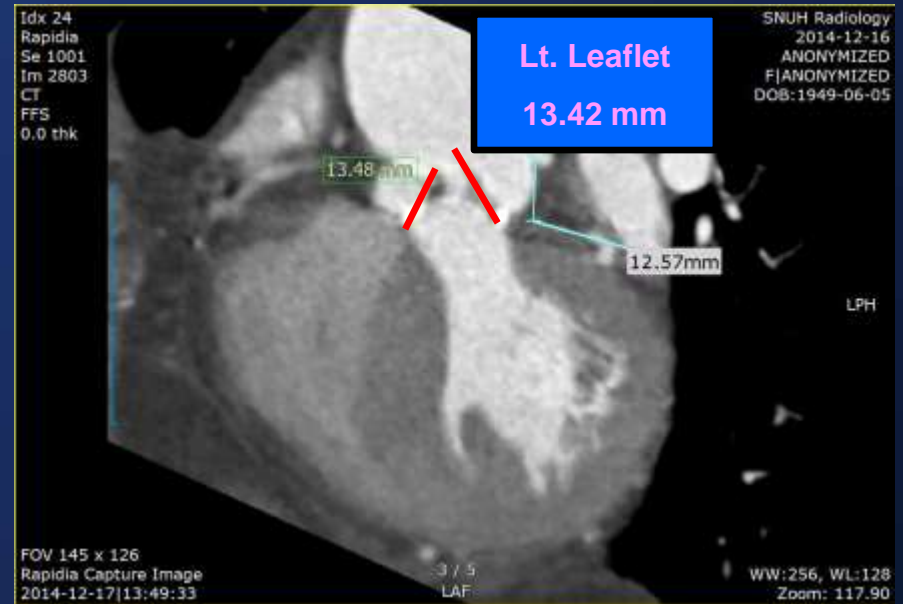
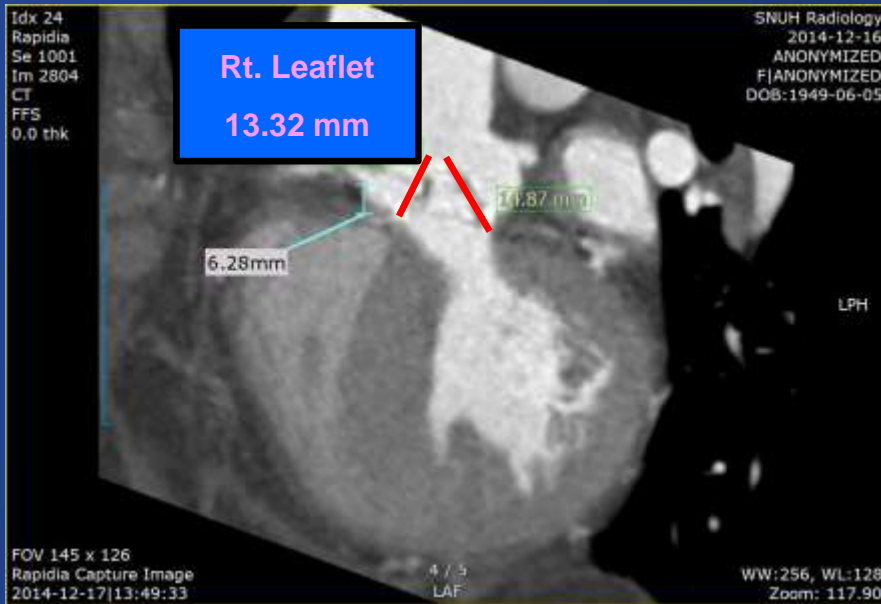
Sinus Valsalva Width



**Smaller Annulus Size
Sufficient Space of Sinus Valsalva**

Five Factors to Determine Coronary Obstruction

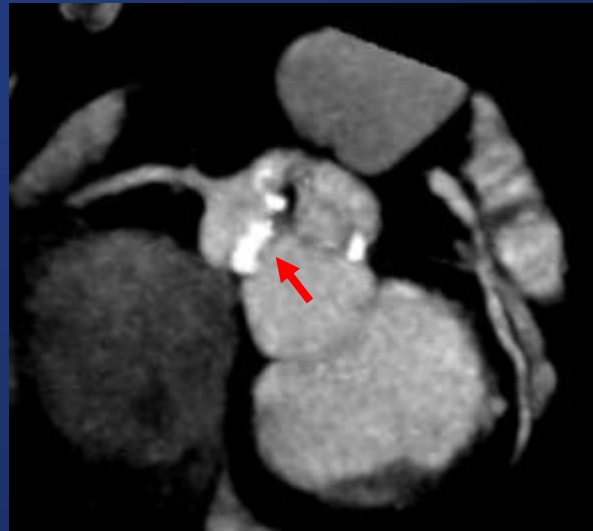
[3] Length of Aortic Valve Leaflet



**Relatively longer Rt. Leaflet Length
Than RCA ostial height**

Five Factors to Determine Coronary Obstruction

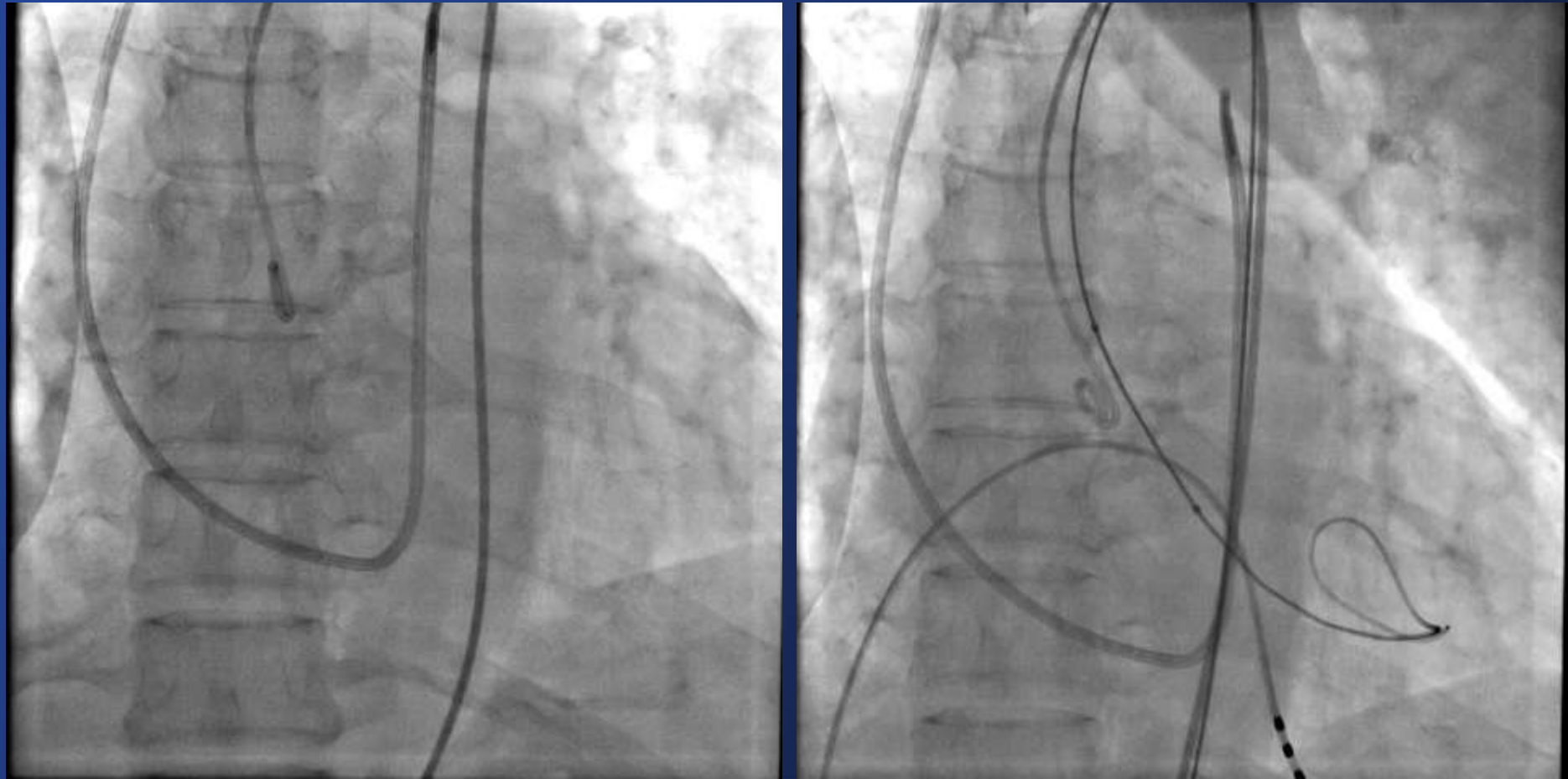
[4] Presence of Calcium Chunk on Valve Leaflet



Extremely Heavy Calcification in Rt. leaflet

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Overcoming Coronary Obstruction during TAVI



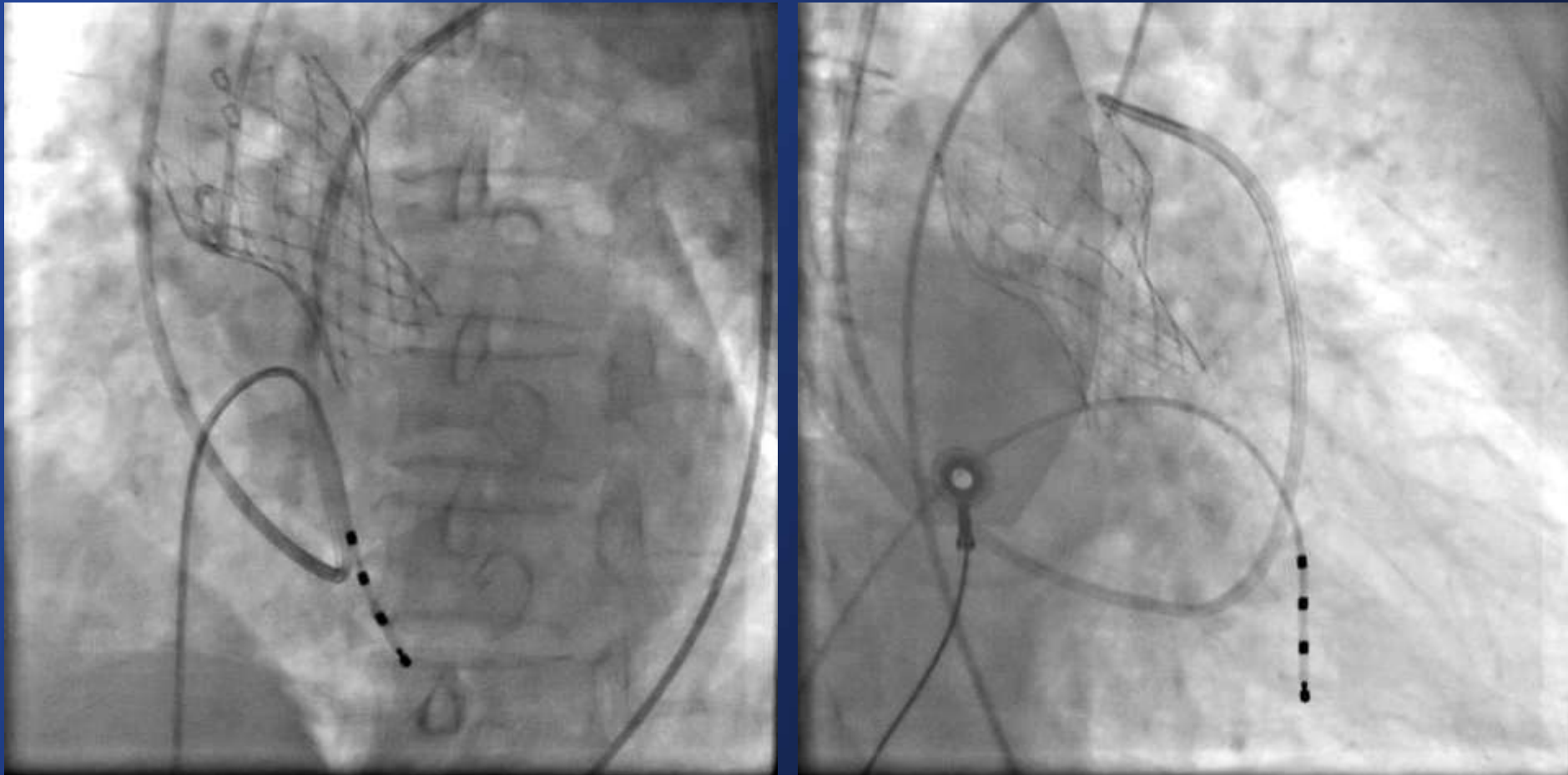
RCA obstruction during BAV

Overcoming Coronary Obstruction during TAVI



**Implantation of CoreValve 23 mm
Under engagement of guiding catheter into RCA**

Overcoming Coronary Obstruction during TAVI



**No obstruction of coronary artery.
Discharged at POD #5 without Any Complication**

Conclusions

Coronary Obstruction During TAVI

- Rare but Fatal Complication : Overall Mortality 8.3%
- Meticulous Pre-TAVI Planning is Essential to “Do No Harm”
- Five Factors Predisposing This Detrimental Complications
 - Coronary Ostial Height
 - Space of Sinus of Valsalva
 - Length of Leaflet
 - Calcium Chunk on Leaflet
 - Balloon-expandable Valve
- If worrisome factor is present, test during BAV before valve implantation
- If coronary obstruction suspected → engage guiding catheter, then implant prosthetic valve