Coronary access post TAVI

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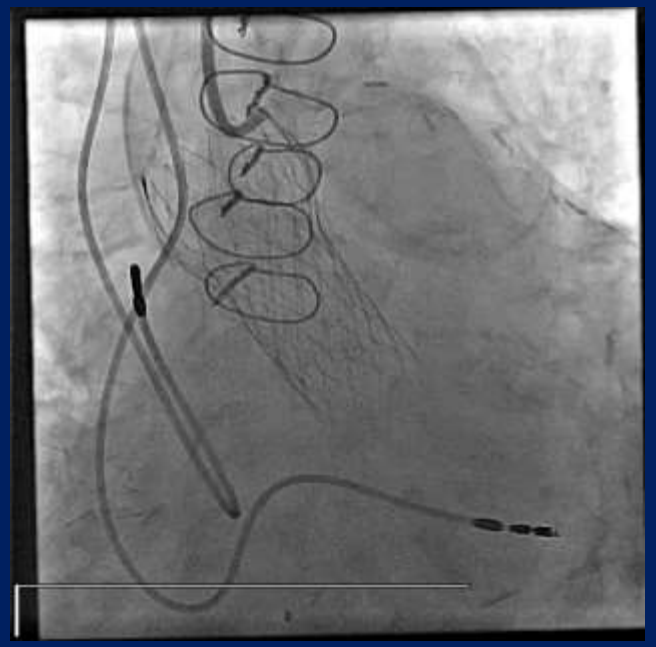
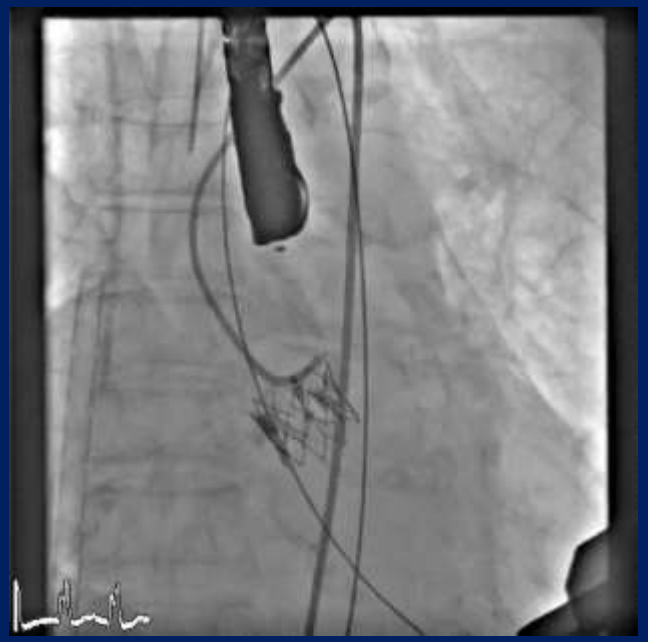



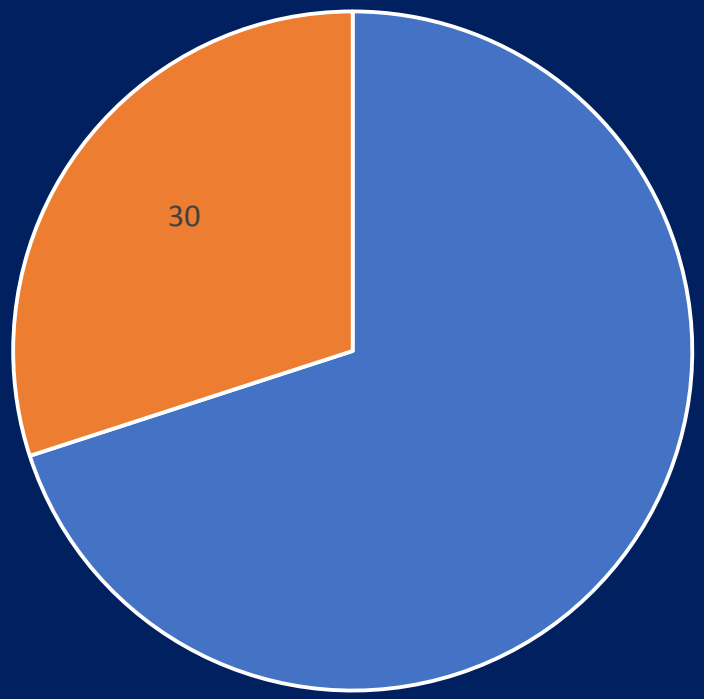
Coronary disease co-exists with AS

- Up to 60% of SAVR patients and 65% of TAVI patients have co-existing CAD
- CAD is progressive
- The indications of TAVI is moving towards lower risk patients who may be younger increasing the probability of needing coronary intervention

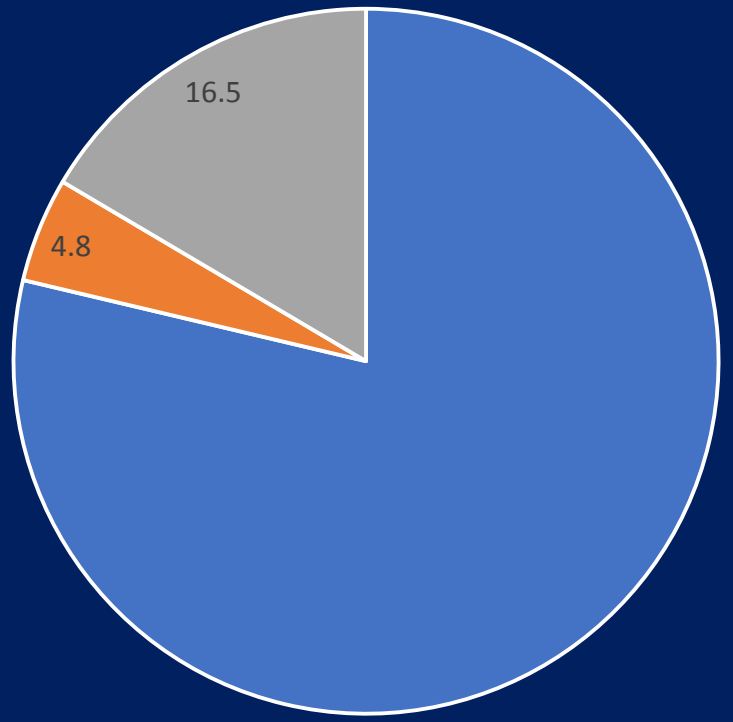
Kvidal et al. JACC 2000
Hamm et al. EHJ 2013
D'Ascenzo et al Int J Cardiol 2013
Milan-Iturbe et al CCI 2018

Coronary angiogram and PCI

Pre TAVI



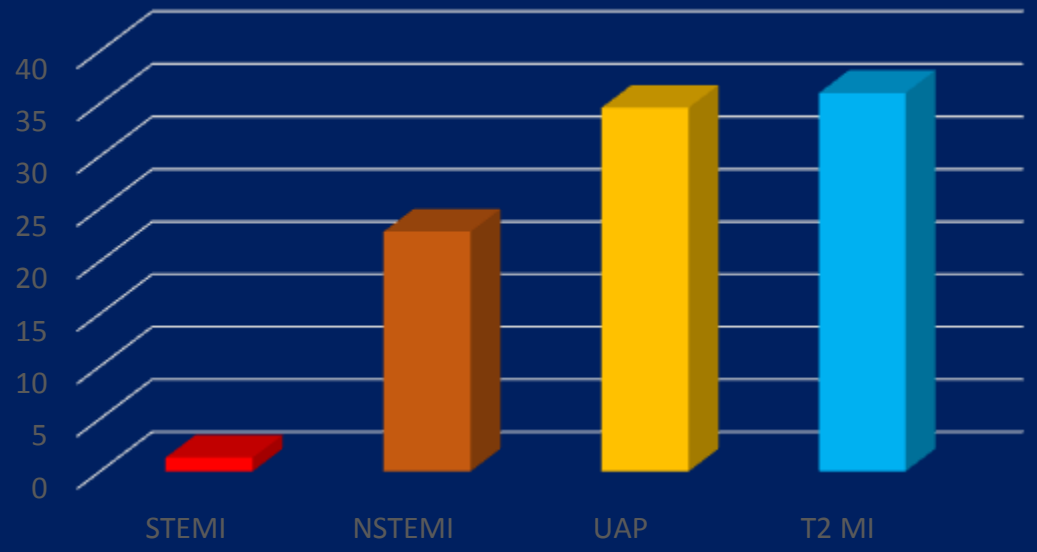
Post TAVI



Milan-Iturbe et al CCI 2018

Indications for coronary angiogram after TAVI

- Majority were progression of CAD (stable angina), ACS (13.3%)
- Another study on ACS post TAVR 10% (follow up of 25 months)
- 67% had coronary angiogram while 56.6% underwent PCI
- In-hospital death 3.8%



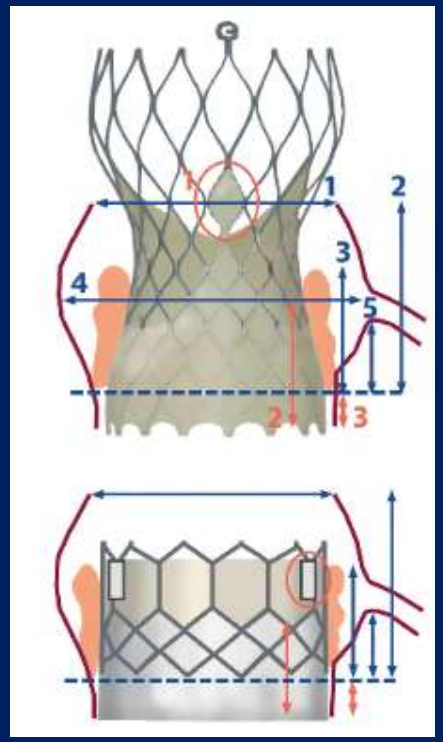
Blumenstein et al. Clin Res Cardiol. 2015
Rodes Cabau et al. JACC 2018

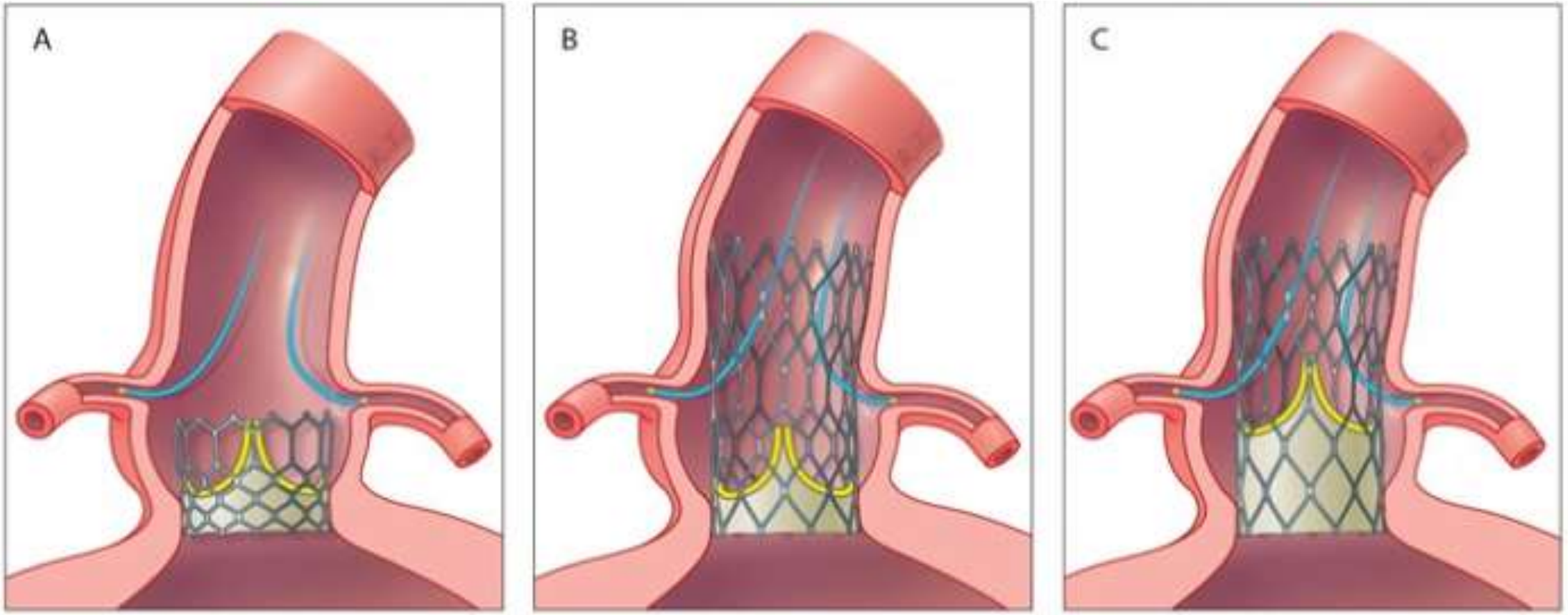
Potential difficulties post TAVI

- Factors impacting coronary intervention

Anatomical
STJ dimensions
Sinus Height
Leaflet length and bulkiness
Sinus of Valsalva width
Coronary height

Device and procedural
Commisural tab orientation
Sealing skirt Height
Valve implantation depth
Valve type





Low-frame
Intra-annular leaflets

High-frame
Intra-annular leaflets

High-frame
supra-annular leaflets

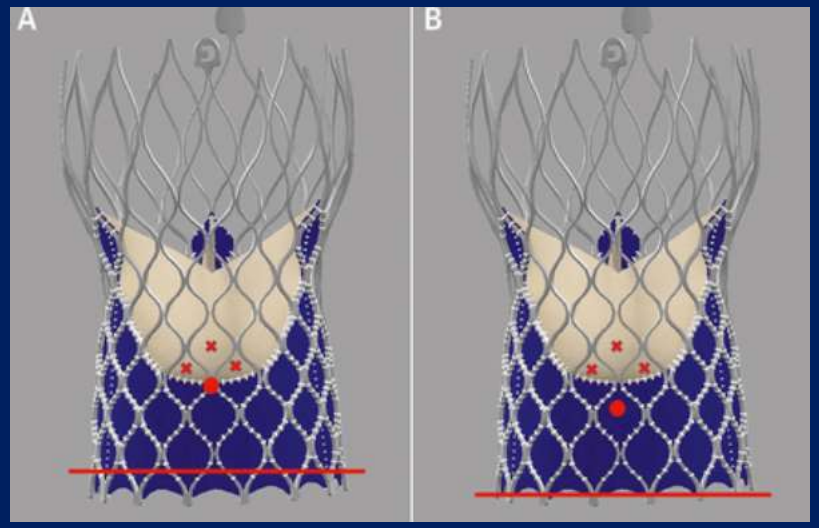
Sondergaard et al. Eurointervention

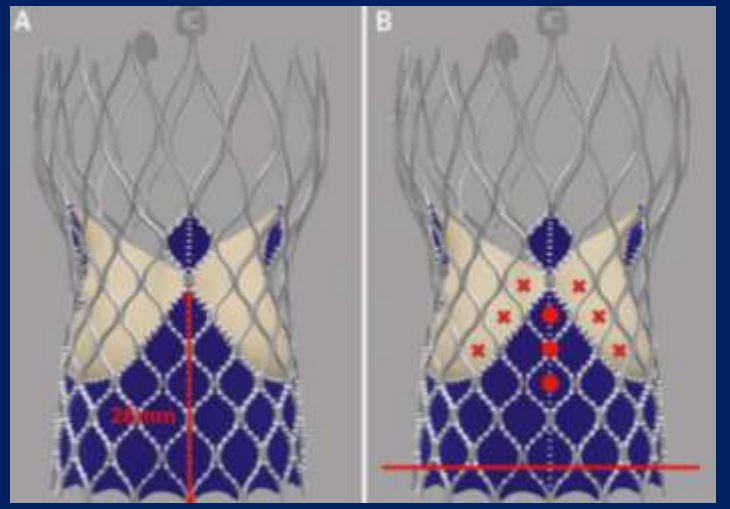
Valve types?

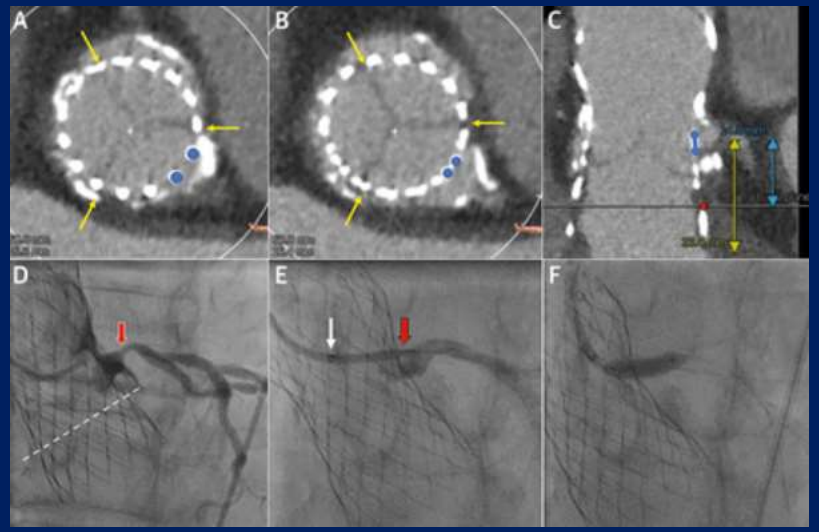
- Case series of 1000, 35 patients required coronary angiogram
- Subcoronary valves– all successful
- 3/15 unsuccessful for valves that cover the coronary ostium

Name	Prosthesis	Correct position	Characteristics	Tipps for CA or PCI
Subcoronary aortic valve prostheses				
JenaValve			- Self expandable nitinol stent - Three nitinol feelers - Self orientating - TA and TF approach - Total height: 30-32mm	Standard Catheters
SAPIEN XT			- Balloon expandable - TF and TA approach - Total height: 14-19mm	Standard Catheters
Partially supracoronary aortic valve prostheses				
CoreValve			- Self expandable nitinol stent - TF approach only - Total height: 53-55mm	LCA: - Smaller catheter size (JL 3.5) RCA: - Amplatz right 1.0
Portico			- Self expandable nitinol stent - TF and TA approach - Total height: 47mm	LCA: - Smaller catheter size (JL 3.5) RCA: - Amplatz right 1.0
Acurate			- Self expandable nitinol stent - Three stabilization arches - TA and TF approach - Total height: 44-46mm	LCA: - Amplatz left 2.0 RCA: - Amplatz right 1.0

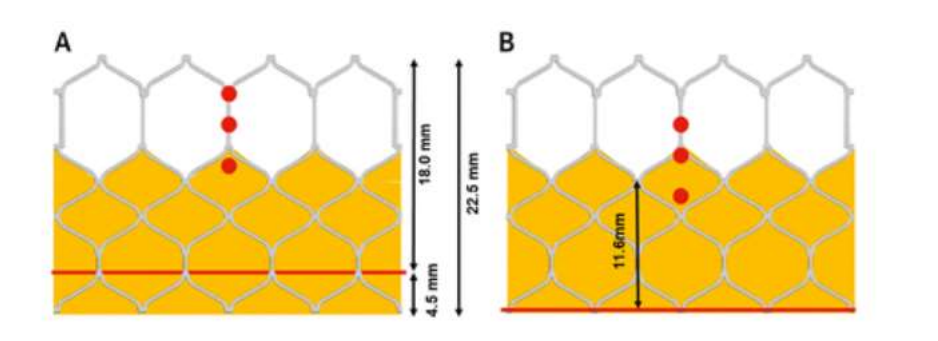
Blumenstein et al. Clin Res Cardiol. 2015

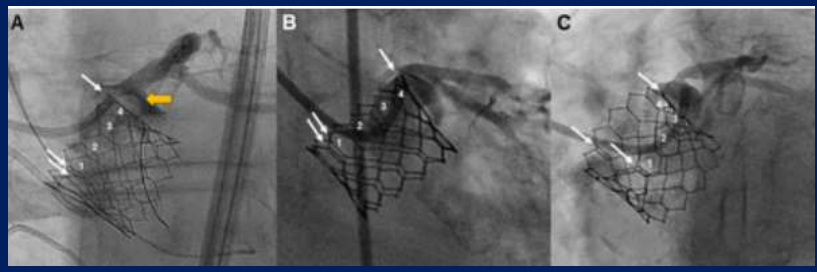


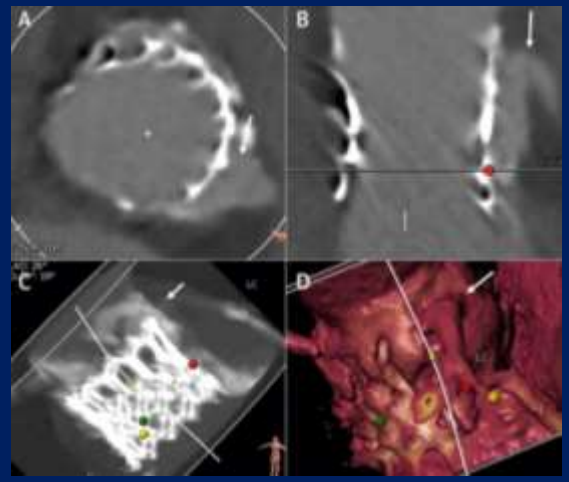




Yudi et al. JACC 2019



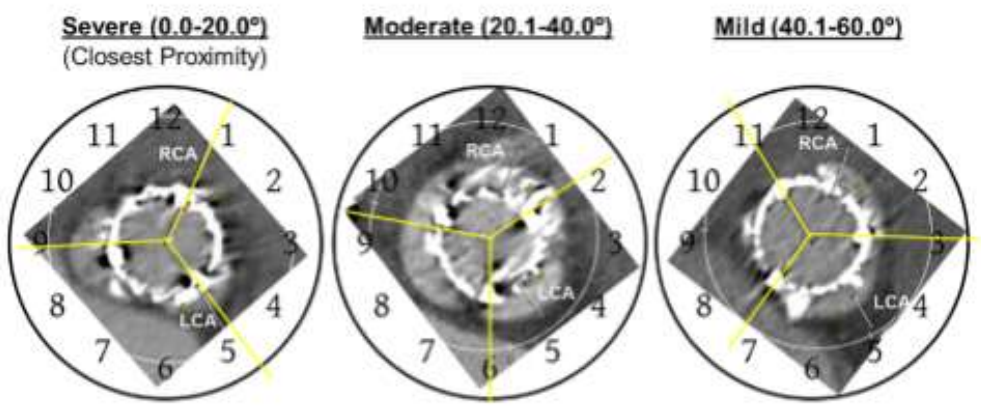




Yudi et al. JACC 2019

Impact of neo-commissure on coronary access

A



B

		LCA – Neo-Commissure (NCo) Overlap			P Value
		0-20.0°	20.1-40.0°	40.1-60.0°	
VALVE TYPE	RCA – NCo Overlap				
Sapien (N=11)	0.0-20.0°	3 (27.3%)	1 (9.1%)	0 (0%)	0.19
	20.1-40.0°	3 (27.3%)	2 (18.2%)	0 (0%)	
	40.1-60.0°	0 (0%)	1 (9.1%)	1 (9.1%)	
Sapien XT (N=17)	0.0-20.0°	8 (47.1%)	0 (0%)	1 (5.9%)	**0.019**
	20.1-40.0°	1 (5.9%)	0 (0%)	2 (11.8%)	
	40.1-60.0°	0 (0%)	1 (5.9%)	4 (23.5%)	
Sapien 3 (S3) (N=25)	0-20.0	3 (12.0%)	3 (12.0%)	1 (4.0%)	0.15
	20.1-40.0	3 (12.0%)	3 (12.0%)	4 (16.0%)	
	40.1-60.0	0 (0%)	2 (8.0%)	6 (24.0%)	
Sapien/XT/S3 (N=53)	0.0-20.0°	14 (26.4%)	4 (7.5%)	2 (3.8%)	**<0.001**
	20.1-40.0°	7 (13.2%)	5 (9.4%)	6 (11.3%)	
	40.1-60.0	0 (0%)	4 (7.5%)	11 (20.8%)	
CoreValve / Evolut R (N=17)	0.0-20.0°	3 (17.6%)	4 (23.5%)	1 (5.9%)	0.34
	20.1-40.0°	1 (5.9%)	1 (5.9%)	2 (11.8%)	
	40.1-60.0°	0 (0%)	2 (11.8%)	3 (17.6%)	
Total (N=70)	0.0-20.0°	17 (24.3%)	8 (11.4%)	3 (4.3%)	**<0.001**
	20.1-40.0°	8 (11.4%)	6 (8.6%)	8 (11.4%)	
	40.1-60.0°	0 (0%)	6 (8.6%)	14 (20.0%)	

Tang et al. Circ Cardiovasc Interv 2018

Coronary re-access studies

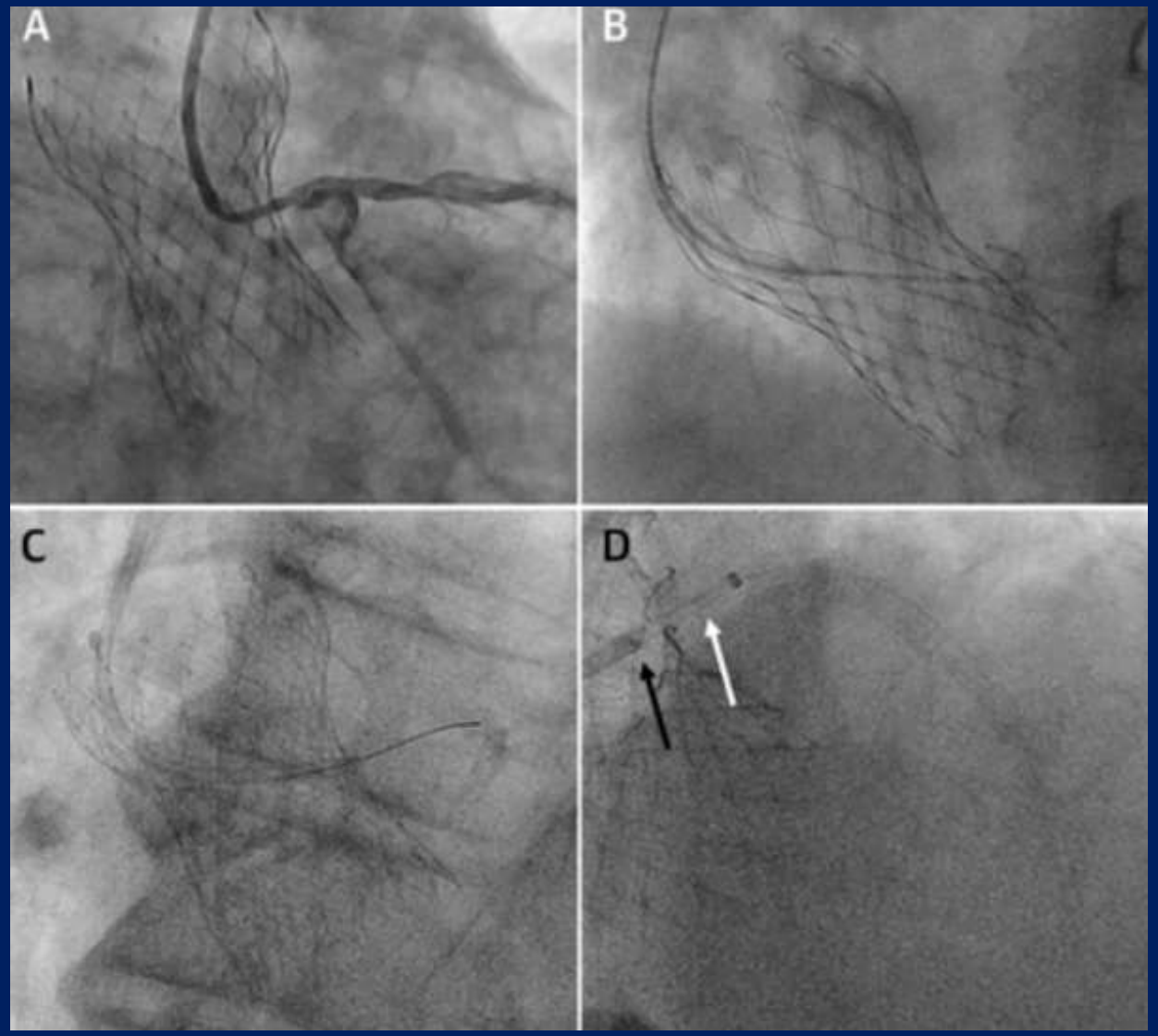
Study	n	Coronary angiography	PCI
Zivelonghi et al	66 (25 CVE, 41 S3)	4% needed coronary wire. 1 failed	Possible in all
Blumenstein et al	35 (19 Sapien and Sapien X), 1 Jena, CV 10, Accurate 4, Portico 1	All successful in subcoronary valves. Selective intubation failed in 9 out of 15 (valves above coronaries) full accessibility in 3 2 cases RCA could only be imaged with aortogram	
Boukantar et al	16 self expanding	9 successful for both only 2 had selective engagement of right	7 attempted, successful in 6
Allali et al	17 self expanding		Procedural success in 95.8%, 1 case of STEMI unsucessful
Chetcuti	169 patients (Corevalve)	190 coros (2.1% can't access)	113 PCIs, 91.2% successful PCI

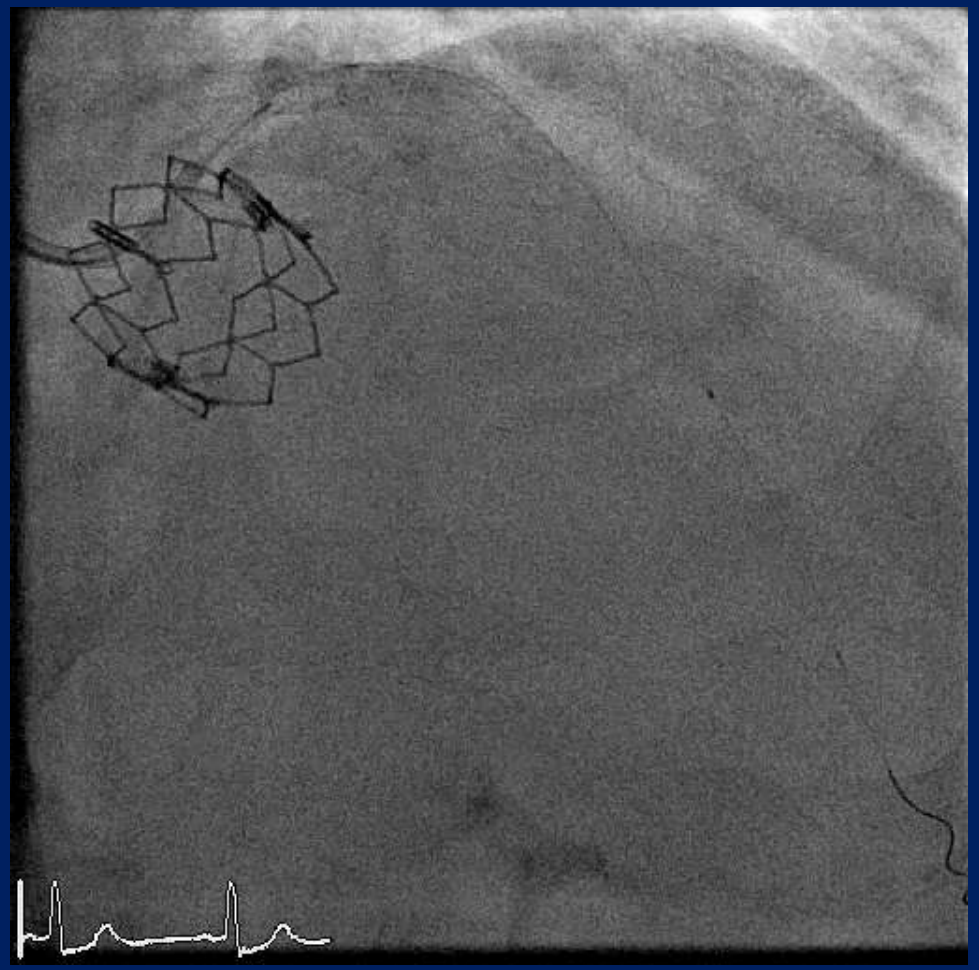
Yudi et al. JACC 2019

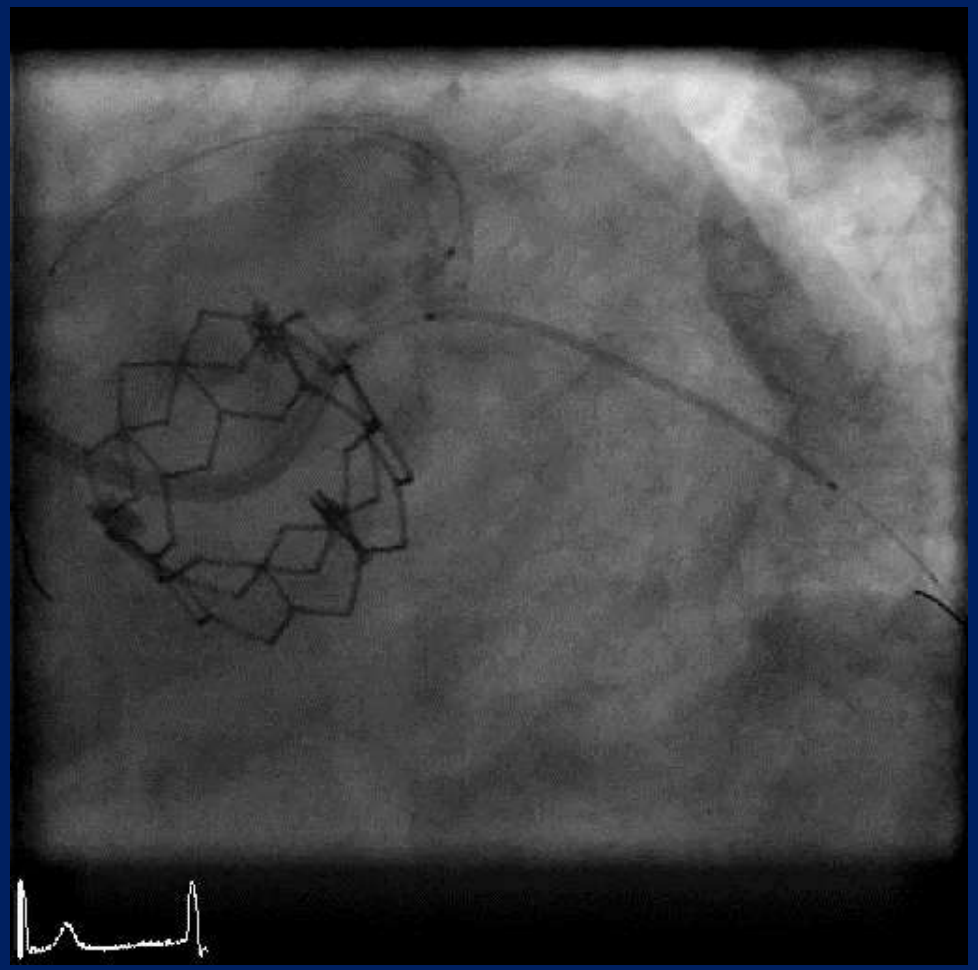
Techniques

- Femoral or left radial access
- Use J wire to enter the diamond in front or adjacent to the coronary ostium (Alternatively a stiff angled glidewire can be used to guide the catheter)
- For left coronary artery: JL 3.5
- Use coronary wire to help if difficult
- For right: Use JR4 (second line Ikari right 1.5 or MP)
- For PCI consider balloon support/guide extension catheters

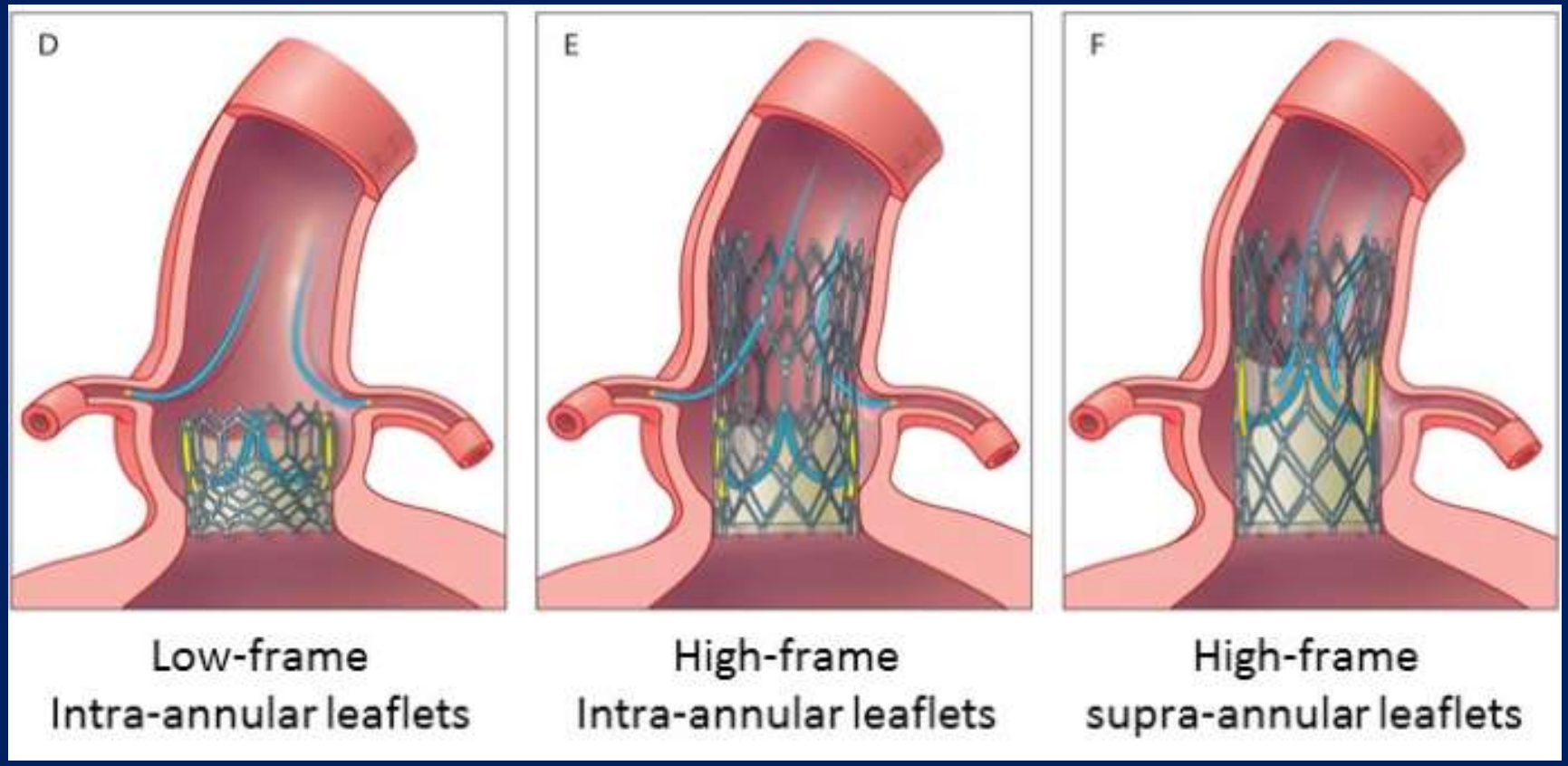
Friends, peers et al.


A
B
C
D



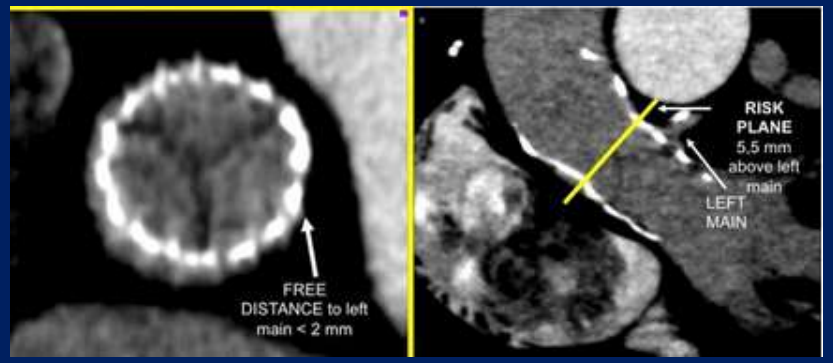


Valve in Valve



Valve in valve

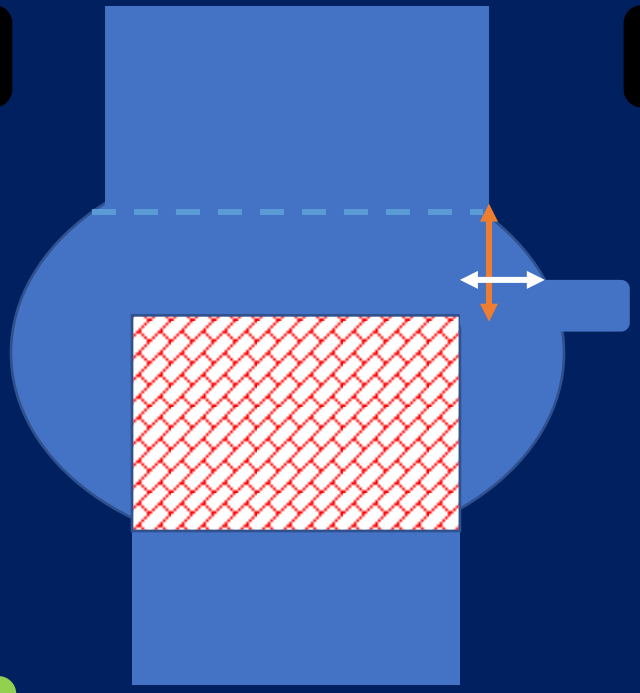
- Post CT analysis of VIV
- Defined risk plane and Estimated Free Distance
- 1/3 of patients were deemed high risk of impaired coronary access
- Predictors include STJ, supra-annular design, height of implant



Buzzatti et al. JACC 2018

TAV in TAV

58%



0%

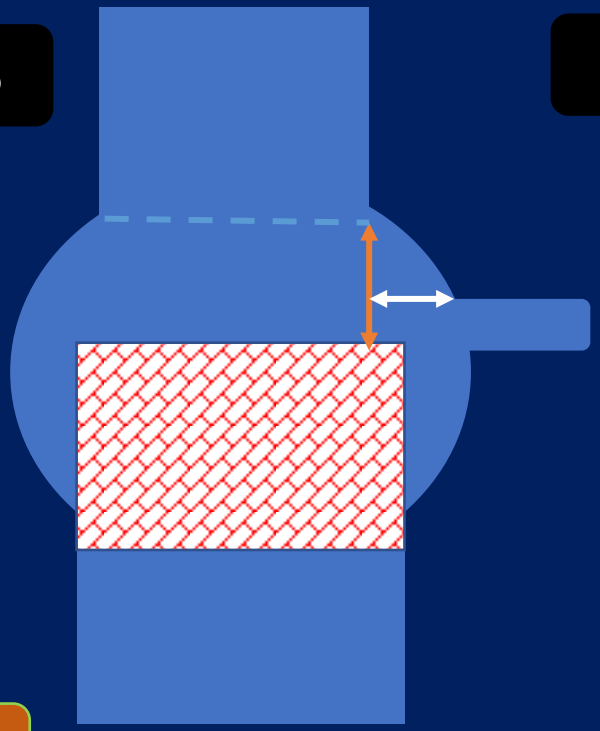
Type 1

STJ>TVD

SH>TVH

Low obstruction risks

13%



26%

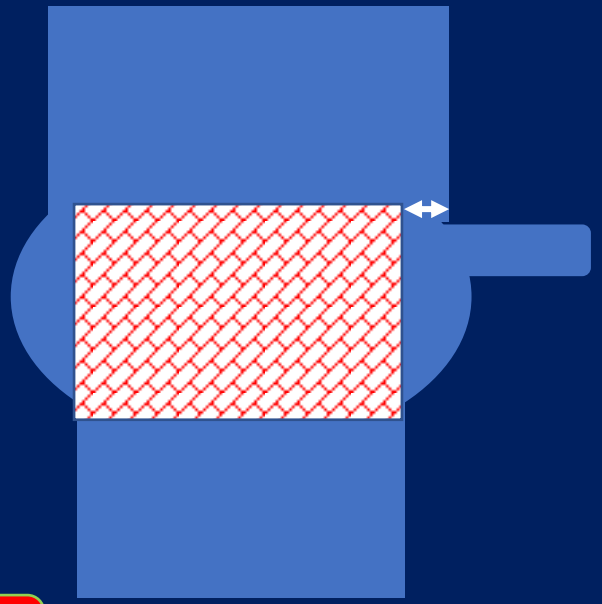
Type 2

STJ≤TVD

SH>TVH

Need to assess VSD and VSH

29%



53%

Type 3

STJ≥TVD

SH<TVH

Need to assess VSD and VSH

CATH

(Coronary Artery Access after Trancatheter Heart Valve) Registry

Investigators

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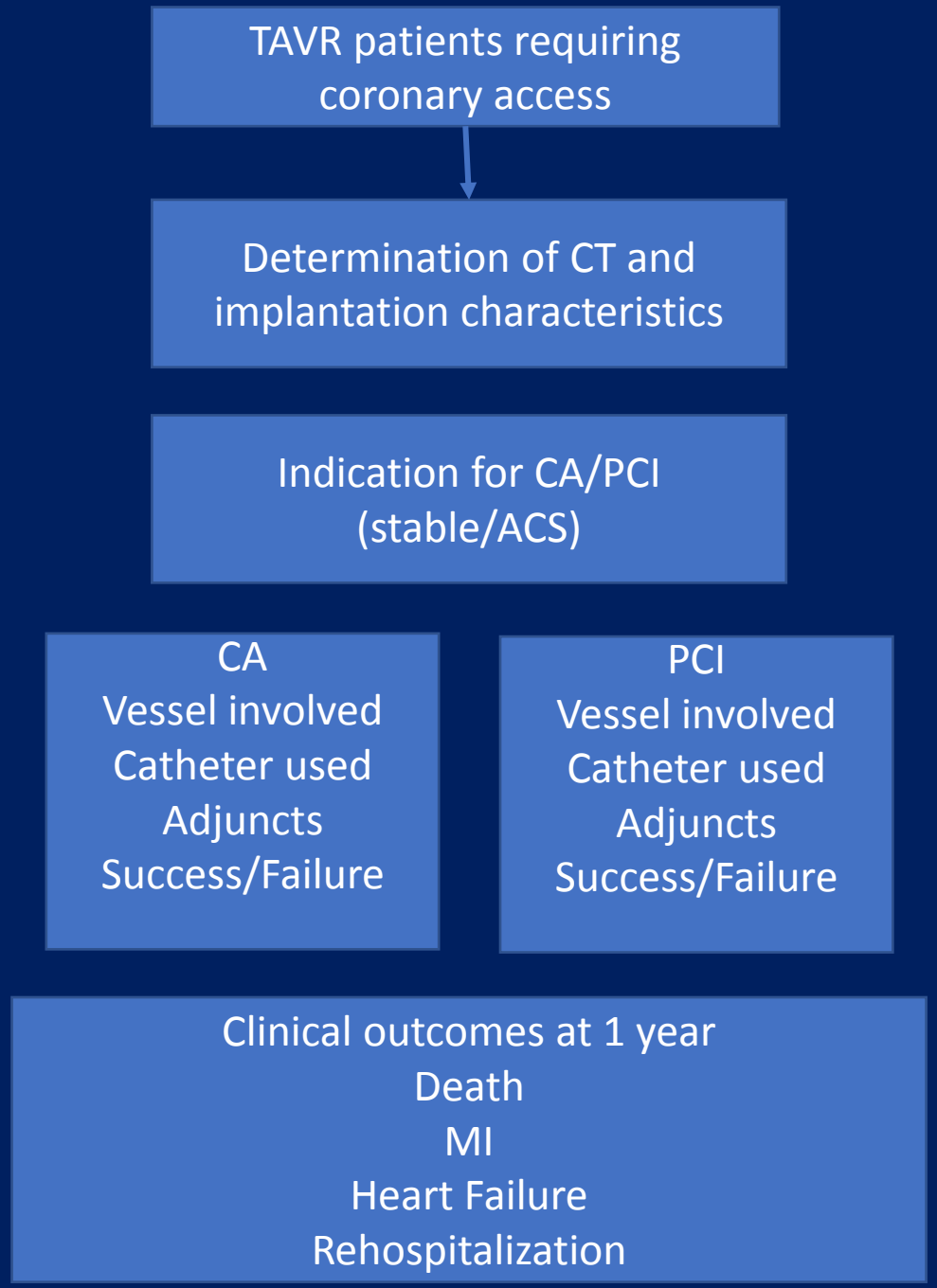
Background

- There is an increased utilization of TAVI to treat younger patients many of whom are in the lower surgical risk groups
- Expected survival after these procedures are longer
- Concomitant coronary artery disease with AS is well known and reaccess to the coronary arteries would need to be considered
- There are several reports of difficulties in reaccess to coronaries after TAVI
- This study attempts to assess possible baseline risk factors which predict difficult coronary access in patients following TAVI


TAVR patients requiring coronary access
Determination of CT and implantation characteristics
Indication for CA/PCI (stable/ACS)
CA
Vessel involved
Catheter used
Adjuncts
Success/Failure
PCI
Vessel involved
Catheter used
Adjuncts
Success/Failure
Clinical outcomes at 1 year
Death
MI
Heart Failure
Rehospitalization

Definitions of coronary artery access

- Coronary angiogram difficulty:
  - Grade 1 - Normal
  - Grade 2 – Partial catheter engagement (able to opacify vessel without streaming)
  - Grade 3 – Partial catheter engagement (unable to opacify fully with streaming) or subselective
  - Grade 4 – Completely unsuccessful (or need for pigtail)

EASY

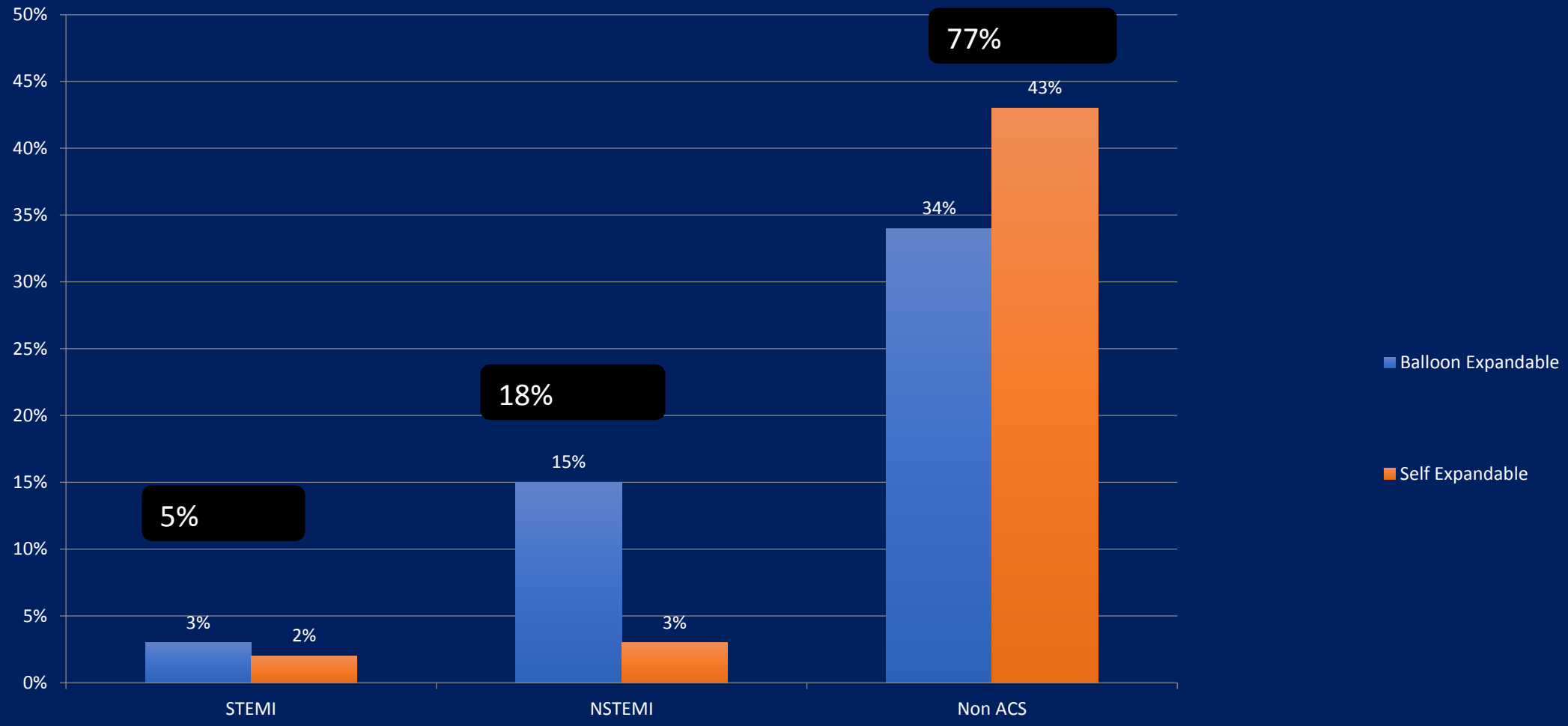
Difficult

- Difficult PCI
  - Grade 1 - Normal engagement
  - Grade 2 - Multiple guide exchanges with subsequent engagement
  - Grade 3 - Subselective engagement
  - Grade 4 – Unsuccessful
- Delivery of devices
  - Grade 1 - Easy
  - Grade 2- Use of adjuncts eg guideliners
  - Grade 3 - Unable to deliver device

Demographics

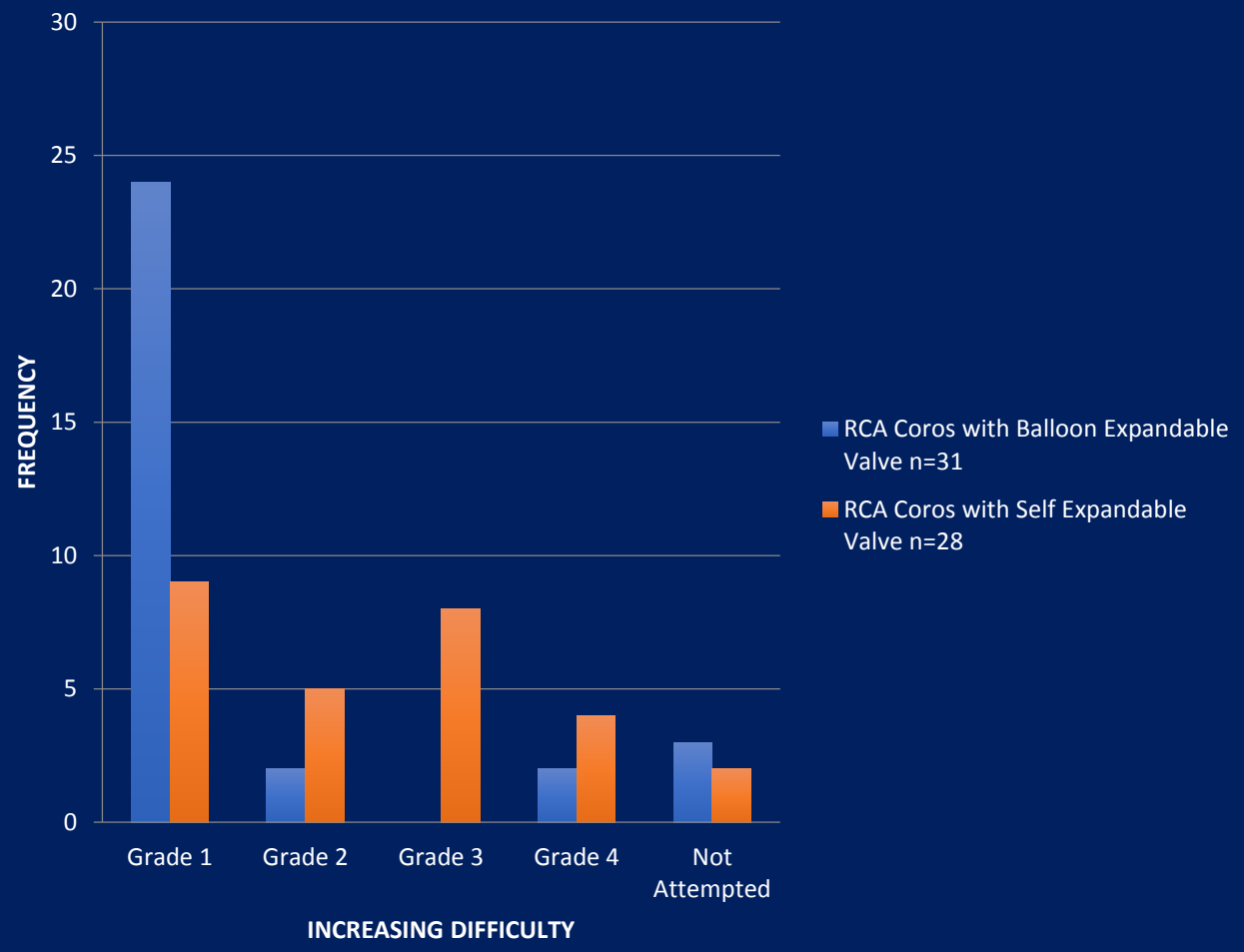
	Total = 59	Easy n = 31 (53%)	Hard n = 28 (47%)	P value
Age	74.78 ± 9.29	74.84 ± 8.85	73.93 ± 10.62	p = 0.992
Male	27 (46%)	16 (51%)	11 (39%)	P = 0.343
Female	32 (54%)	15 (49%)	17 (61%)	P = 0.343
CKD eGFR< 60	41 (69%)	23 (39%)	18 (31%)	P = 0.992
Diabetes	30 (51%)	17 (29%)	13 (22%)	P = 0.992
Hypertension	51 (86%)	28 (47%)	23 (39%)	P = 0.992
Hyperlipidemia	46 (78%)	26 (44%)	20 (34%)	P = 0.992
CAD	48 (81%)	25 (42%)	23 (39%)	P = 0.992
Previous PCI	35 (59%)	20 (34%)	15 (25%)	P = 0.510
Previous CABG	15 (25%)	11 (19%)	4 (7%)	P = 0.510
CVA	5 (8%)	4 (7%)	1 (2%)	P = 0.510
PAD	15 (25%)	8 (14%)	7 (12%)	P = 0.510
Logistic Euroscore II	17.69 ± 15.09	14.8 ± 11.69	20.89 ± 17.8	P = 0.061
STS score	6.39 ± 5.05	5.3 ± 4.43	7.46 ± 5.49	P = 0.04

Indications for coronary angio/PCI



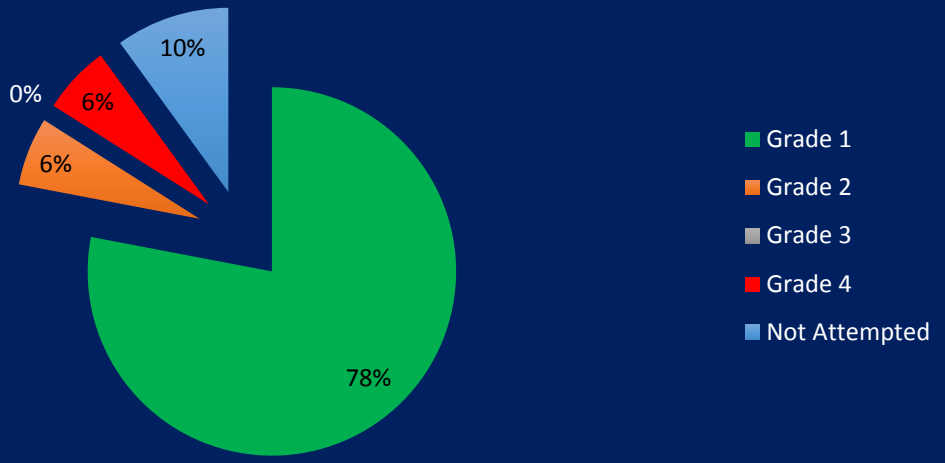
	Total = 59	Easy (Grade 1)	Hard (all others)	P Value
BSA	1.57 ± 0.19	1.58 ± 0.16	1.55 ± 0.22	P = 0.242
BMI	24.05 ± 4.28	24.31 ± 3.96	23.76 ± 4.67	P = 0.312
Annulus area	395.51 ± 72.99	389.85 ± 75.85	401.16 ± 71.74	P = 0.324
Annulus perimeter	72.27 ± 6.69	71.63 ± 7.43	72.75 ± 6.19	P = 0.298
Horizontal aorta	2 (3%)	0 (0%)	2 (3%)	P = 0.990
Bicuspid aortic valve	3 (5%)	1 (2%)	2 (3%)	P = 0.990
Coronary height to LM	12.92 ± 2.88	13.1 ± 3.09	12.76 ± 2.73	P = 0.351
Coronary height to RCA	15.67 ± 2.95	15.44 ± 3.05	15.87 ± 2.9	P = 0.319
Valve agatston score	1839 ± 1525.42	1552.66 ± 1066.05	2151.37 ± 1913.99	P = 0.179
Sinus width RCC	29.2 ± 3.27	28.57 ± 2.64	29.75 ± 3.7	P = 0.128
Sinus width LCC	30.49 ± 3.74	29.87 ± 3.15	31.03 ± 4.17	P = 0.164
Sinotubular junction	25.82 ± 3.51	24.98 ± 3.56	26.88 ± 3.38	P = 0.134
Valve type self expandable	29 (49%)	8 (14%)	21 (36%)	P = 0.0003
Optimal position	56 (95%)	31 (53%)	25 (42%)	P = 0.0003

RIGHT CORONARY ANGIOGRAM

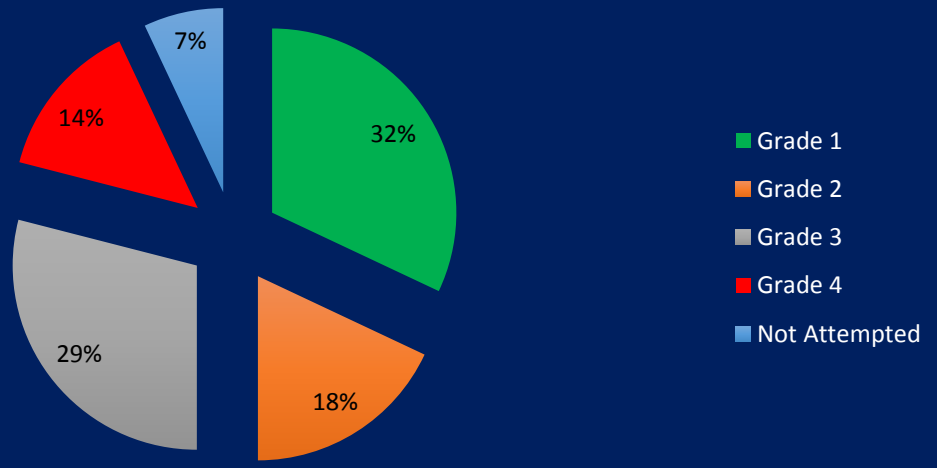


Grade 1: Normal
Grade 2: Partial engagement but fully opacified
Grade 3: Cannot fully opacify vessel
Grade 4: Unsuccessful engagement

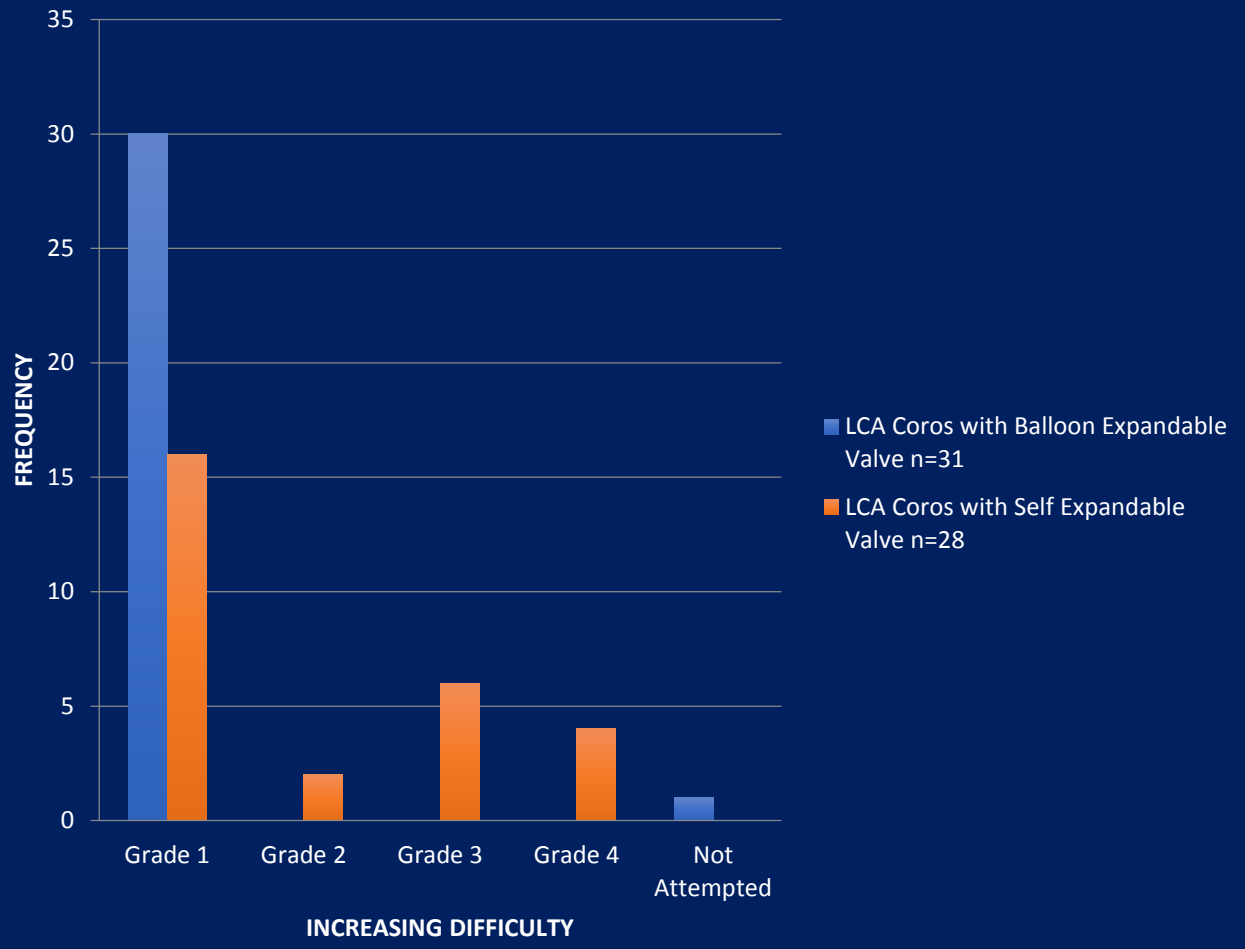
RCA Angiogram with Balloon Expandable Valve



RCA Angiogram with Self Expandable Valve

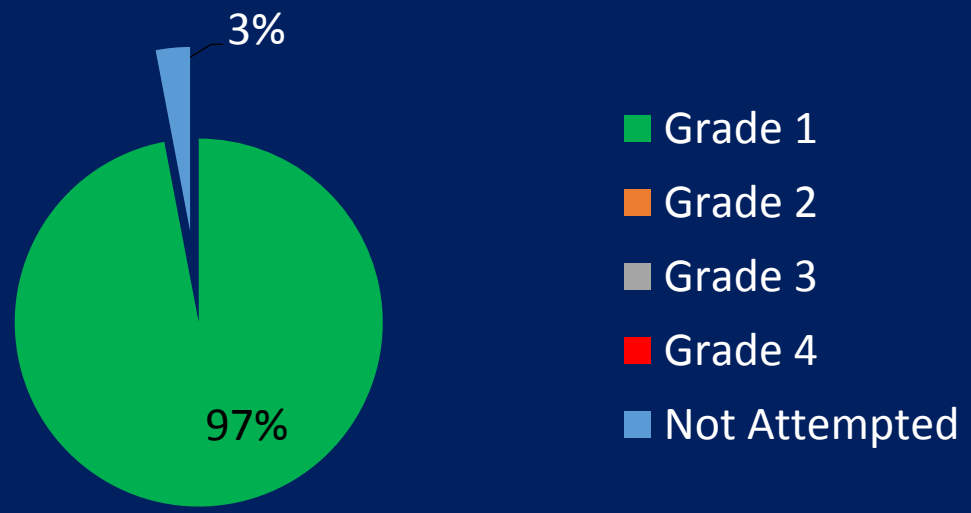


LEFT CORONARY ARTERY ANGIOGRAM

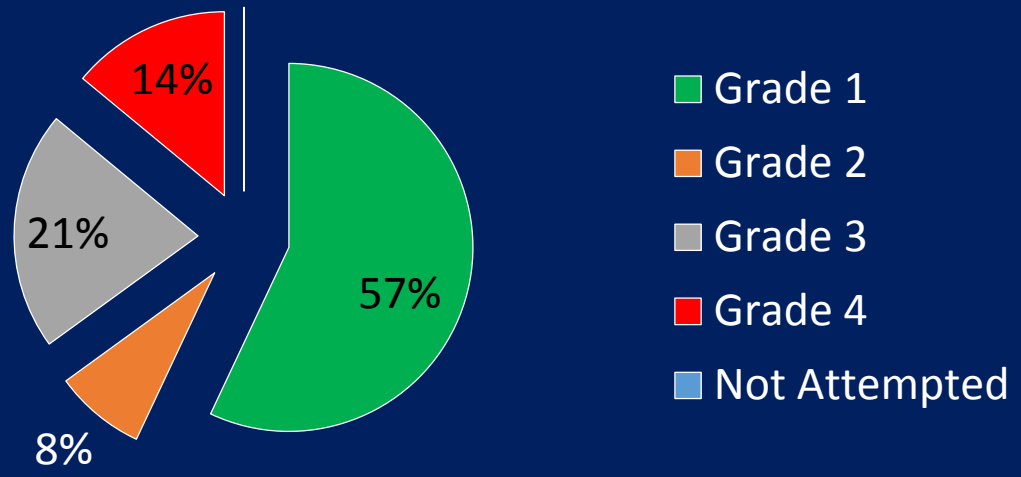


Grade 1: Normal
Grade 2: Partial engagement but fully opacified
Grade 3: Cannot fully opacify vessel
Grade 4: Unsuccessful engagement

LCA Angiogram with Balloon Expandable Valve



LCA Angiogram with Self Expandable Valve



Conclusion

- Difficulty with coronary access post TAVI is common
- There are potential risk factors that should be further explored
- The implication of longer term outcomes related to poor coronary access should be investigated
- Pre-TAVI consideration of coronary access is important especially in younger patients and those with significant CAD

CATH

(Coronary Artery Access after Trancatheter Heart Valve) Registry

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