14 Year's Journey Of AMC TAVR

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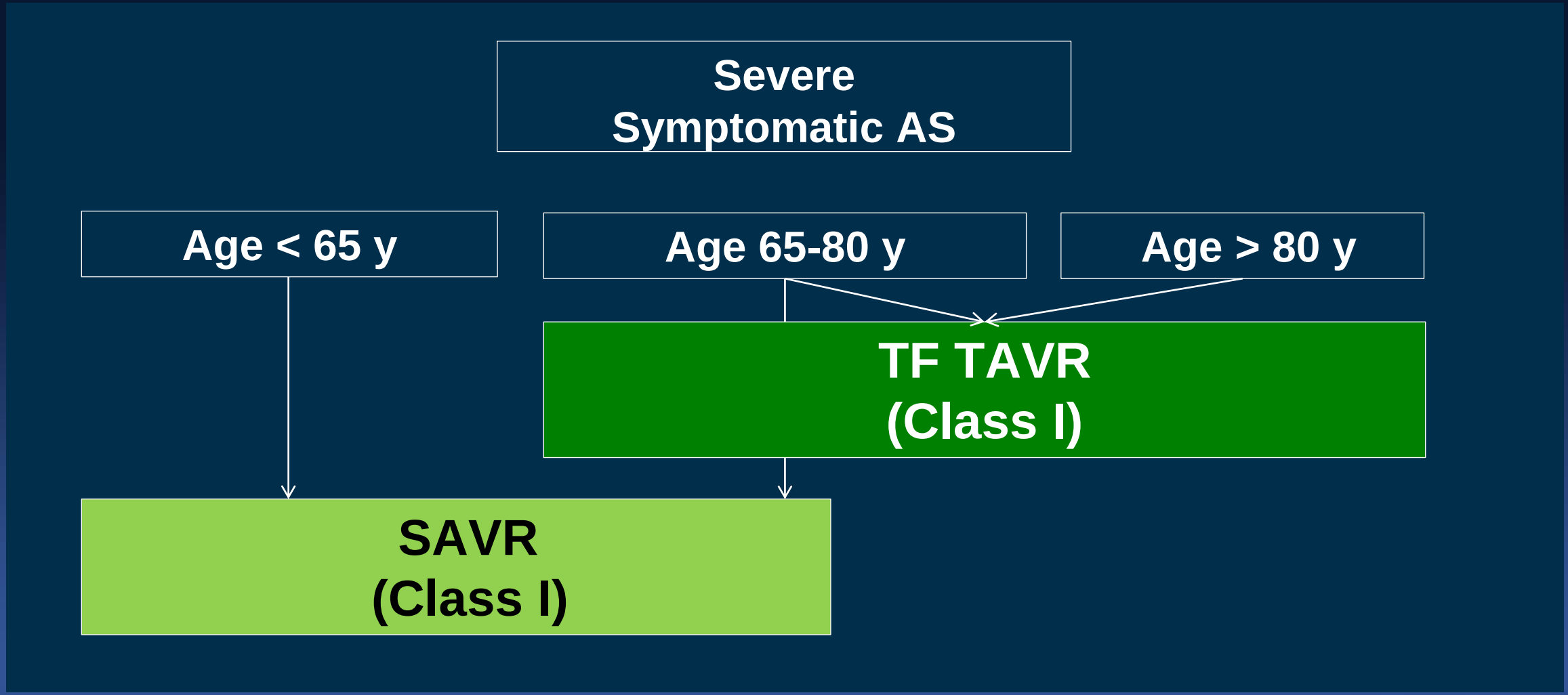
Current Status of TAVR

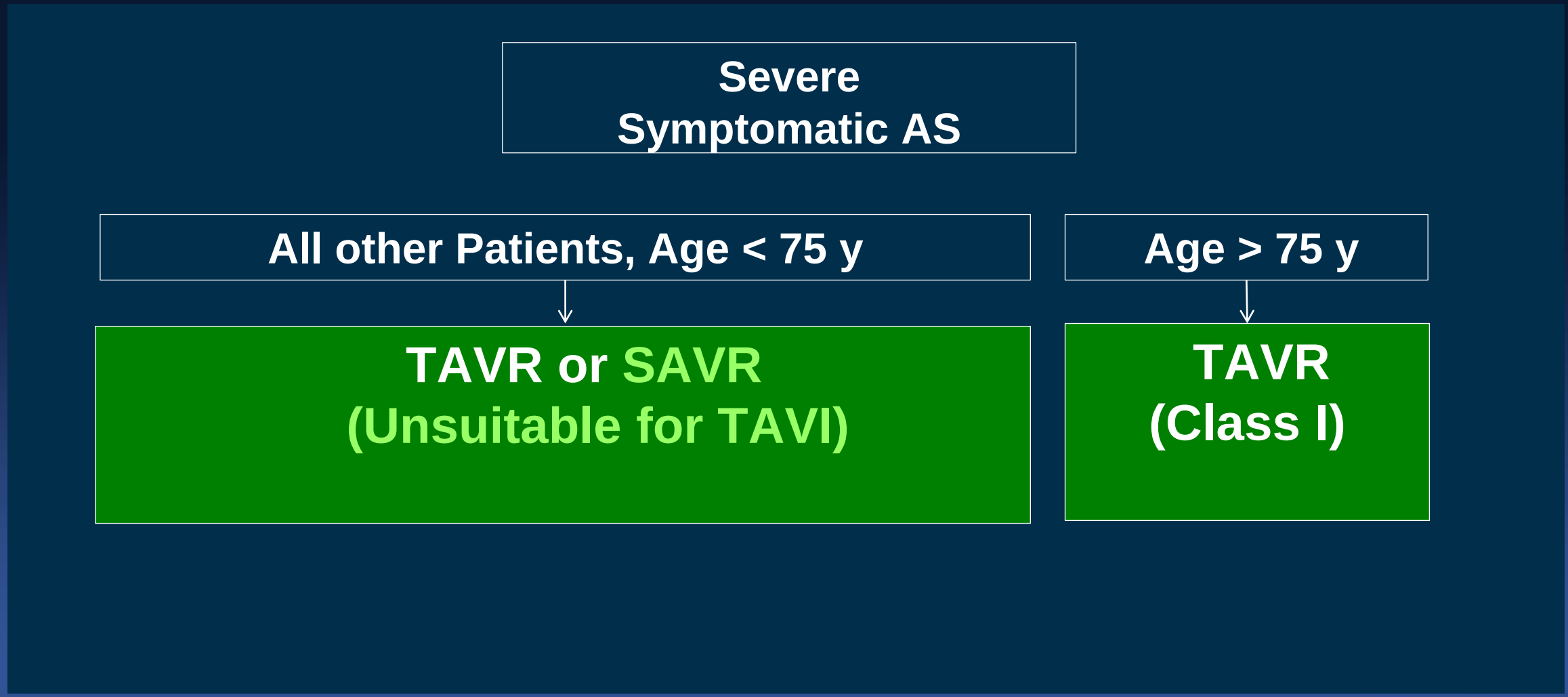
2023

2020 AHA/ACC Guidelines



2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines, Originally published17 Dec 2020, February 2, 2021 Vol 143, Issue 5

2021 ESC/EACTS Guidelines



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2023 Practical Guidelines

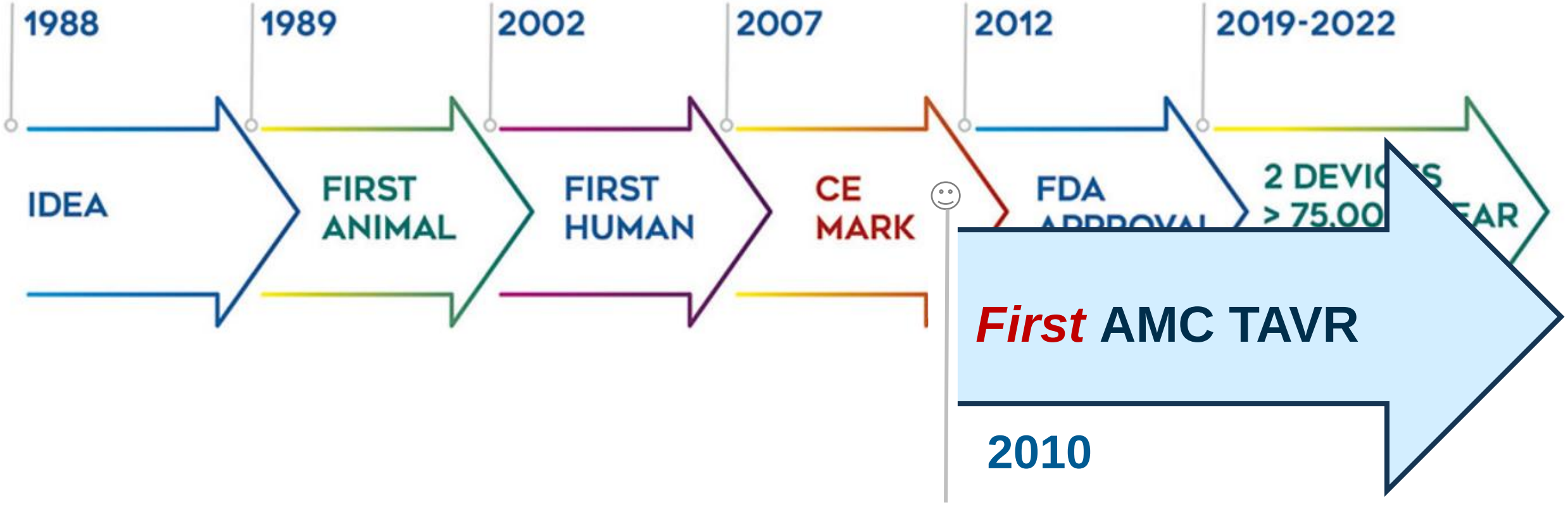
Severe
Symptomatic AS

Patients Who Needs A Tissue Valve

TAVI or
SAVR for Only Unsuitable TAVI

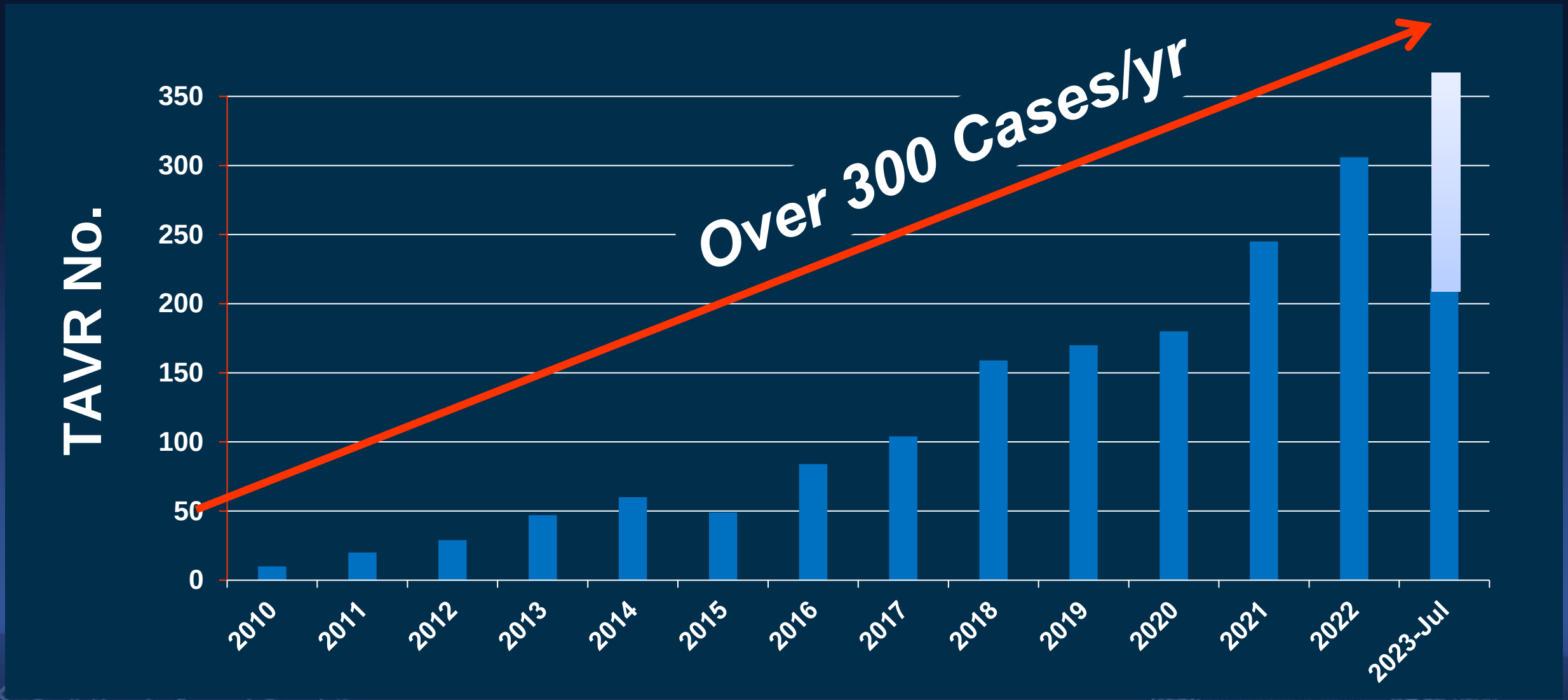
First AMC TAVR
Was Started at 2010

Timeline in Evolution of TAVR



Adapted from Michael Mack, MD, MACC.

TAVR Case Increased at AMC (Total no=1485)



Almost Perfect !!

Procedural Success Rate	99.5%
All-cause mortality	1.3%
Major (disabling) strokes	0.3%
Major vascular complications	4.2%
New permanent pacemakers	6.8%
Mod-severe PVR	0.4%

TAVR in AMC

What is the Difference ?

TAVR in AMC

1. ***Perfect “Heart Team”*** *Collaboration*
2. ***“Minimalist Approach” (MAC)***
   Simplify the Procedure
3. ***“AMC CT Algorithm”*** *for Device Selection.*
   Pre-TAVR Meticulous CT Measurement

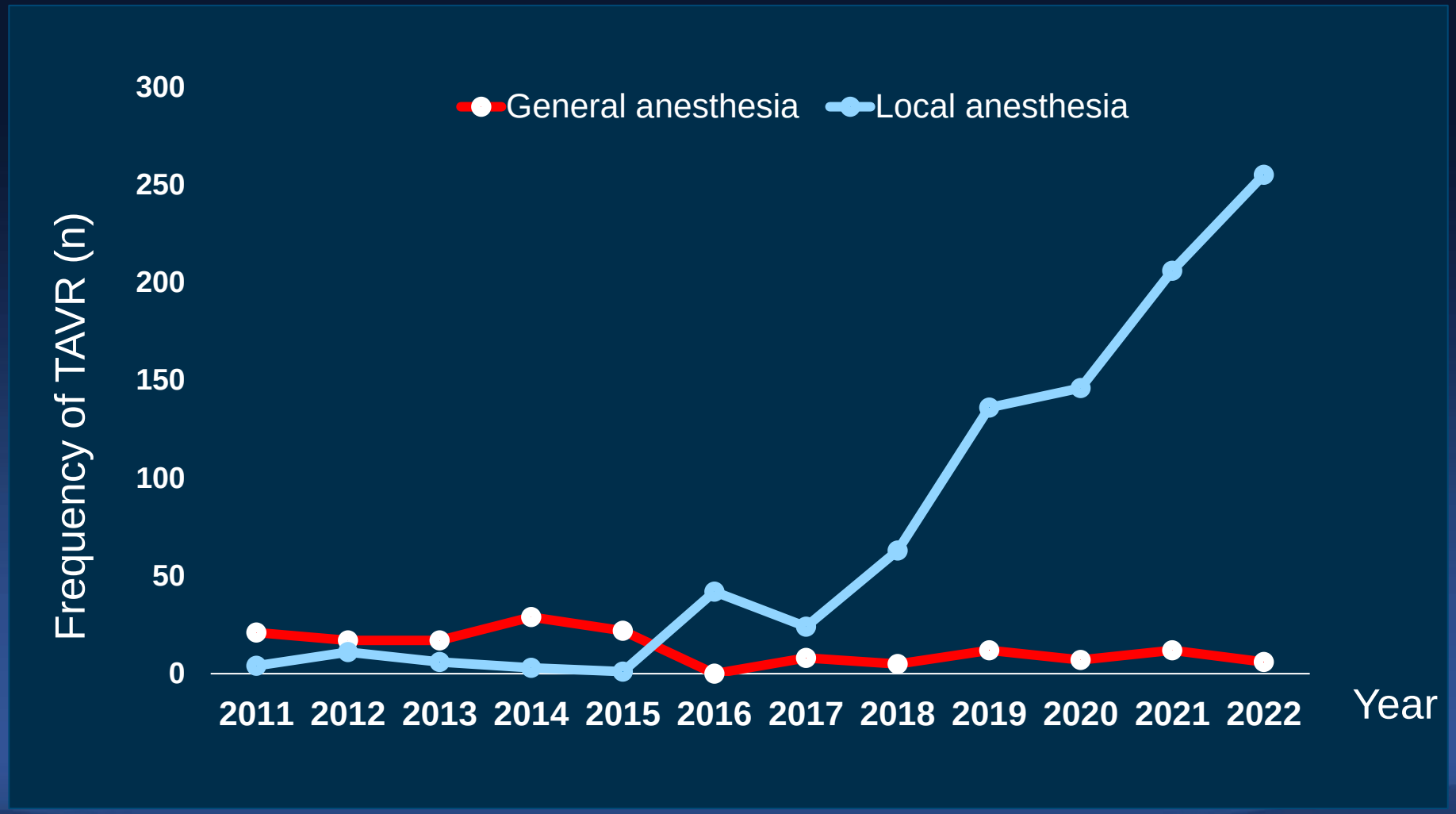
Perfect "Heart Team" Collaboration

AMC Smart Cardiac Surgeons Send the Patients to Cardiologists for TAVR.

"Minimalist Approach"

1. No General Anesthesia,
2. No TEE
3. 30 min. Procedure
4. No Complications
5. One Day stay in CCU
6. Discharge on Day #3
7. Cardiac Rehabilitation Program

“Minimalist Approach” in 99%



"AMC CT Algorithm"

for Size Selection

Major Key

for 99.5% of Procedural Success

Anatomic Risk for TAVR

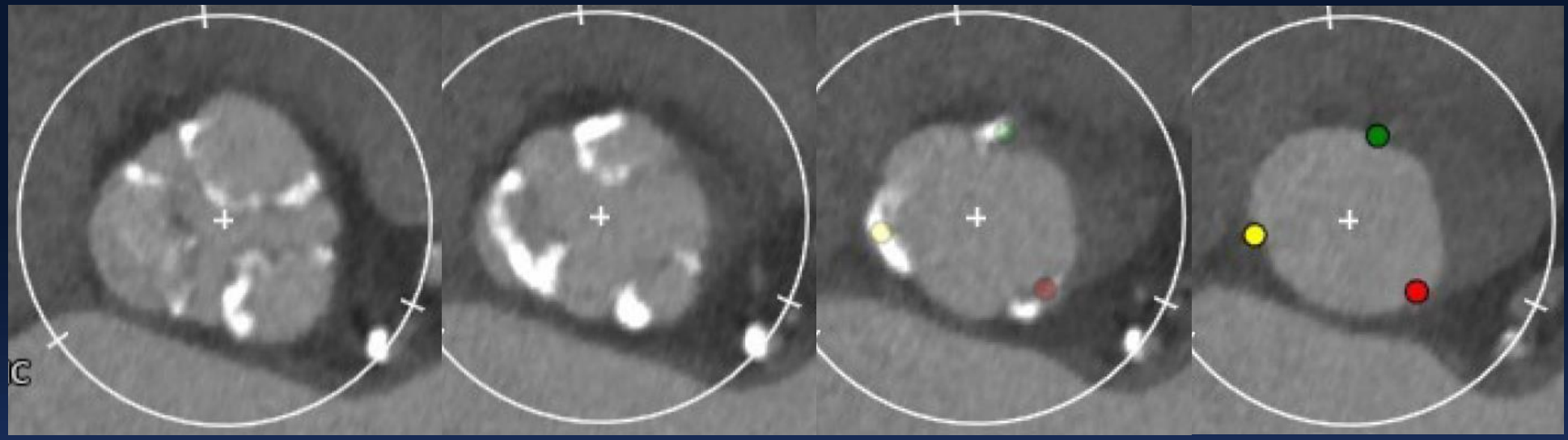
- Aortic valve size
- Heavy Calcification
- Low coronary height
- Coronary artery disease
- Porcelain aorta
- Bicuspid AV
- Bicuspid aortopathy
- Vascular access

CT Analysis for TAVR

1. Aortic, Iliac and Femoral Anatomy
2. Aortic Annulus Size
3. Structure Around The Valve
   (Sinus of Valsalva, STJ, LVOT)
4. Calcium (Amount, Distribution)
5. Coronary Disease, Coronary Height

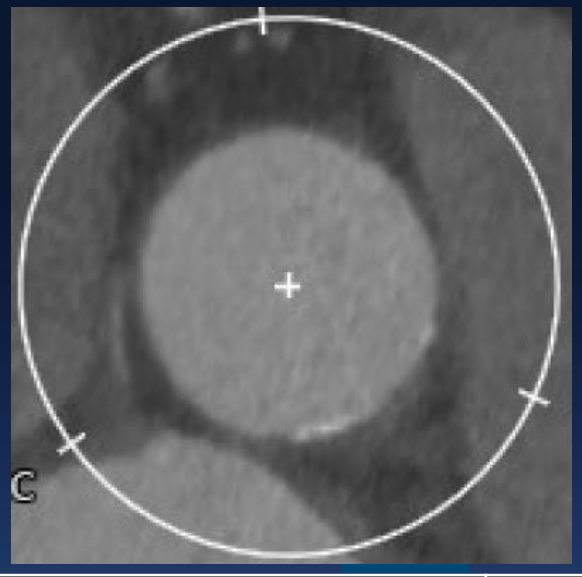
Aortic, Iliac and Femoral Artery Anantomy

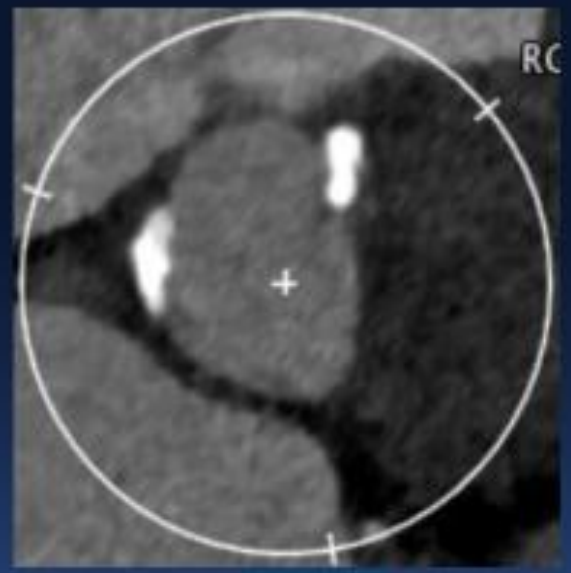
Aortic Annulus View, Annulus Size



Aortic Annulus parameters	
Annulus short diameter	21.8 mm
Annulus long diameter	25.6 mm
Annululs mean diameter	23.7 mm
Annulus area	435 mm^2
Annulus area-driven diameter	23.5 mm
Annulus perimeter	74.5 mm
Annulus perimeter-driven diameter	23.7 mm

Structure Around the Aortic Valve
(Sinus of Valsalva, STJ, LVOT)



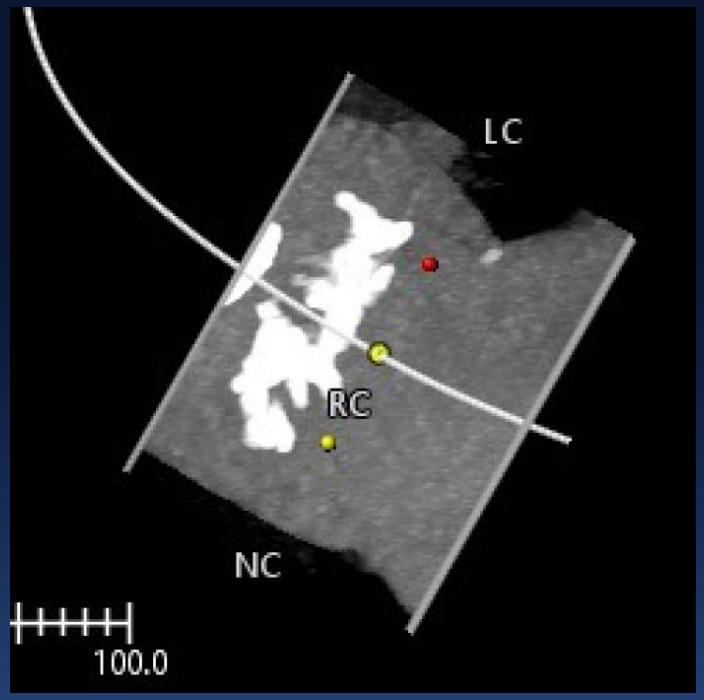


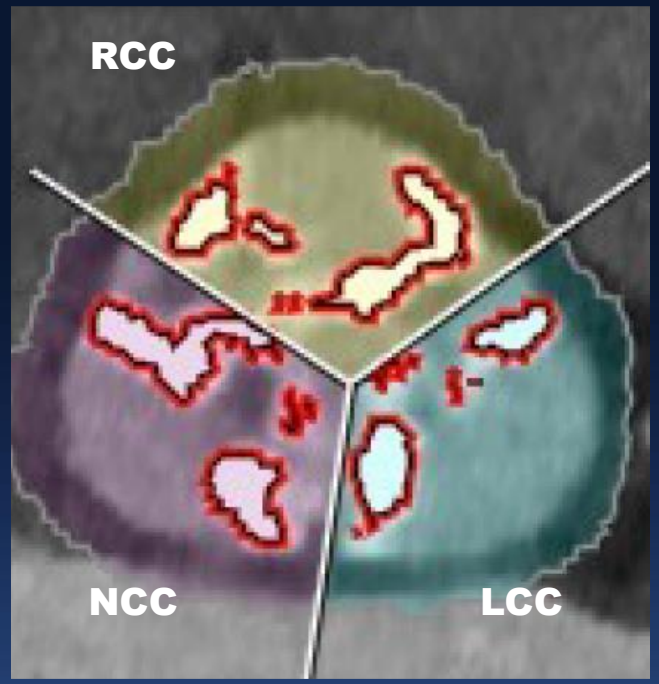
Sinus of Valsalva	
Area	830 mm²
Sinus / Annulus Area Ratio	1.91
NCC diameter	30.6 mm
LCC diameter	33.5 mm
RCC diameter	31.0 mm
Mean Ratio	1.83 ± 0.27

STJ	
Area	630 mm²
STJ/ Annulus Area Ratio	1.45
Mean diameter	28.2 mm
Mean Ratio	1.49 ± 0.29

LVOT	
Area	407 mm²
LVOT / Annulus Area Ratio	0.98
Short diameter	18.5 mm
Long diameter	26.9 mm
Mean Ratio	0.95 ± 0.16

Calcium Amount, Location and Distribution



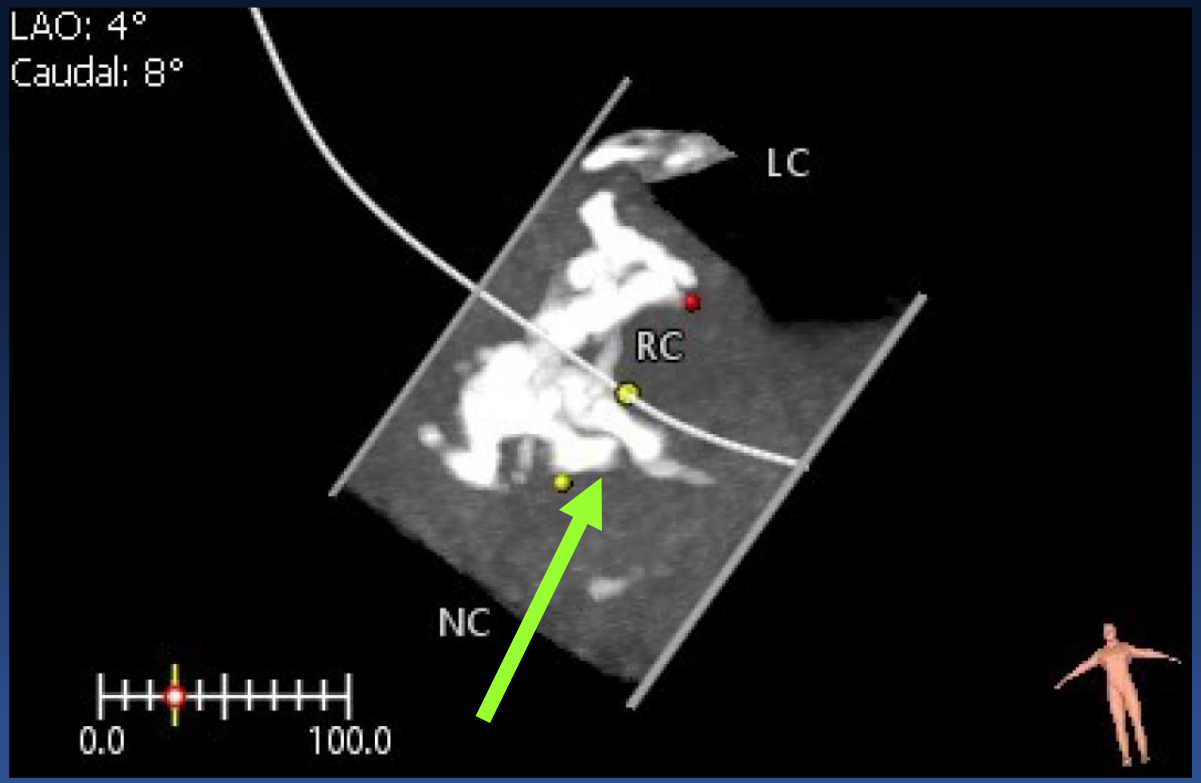


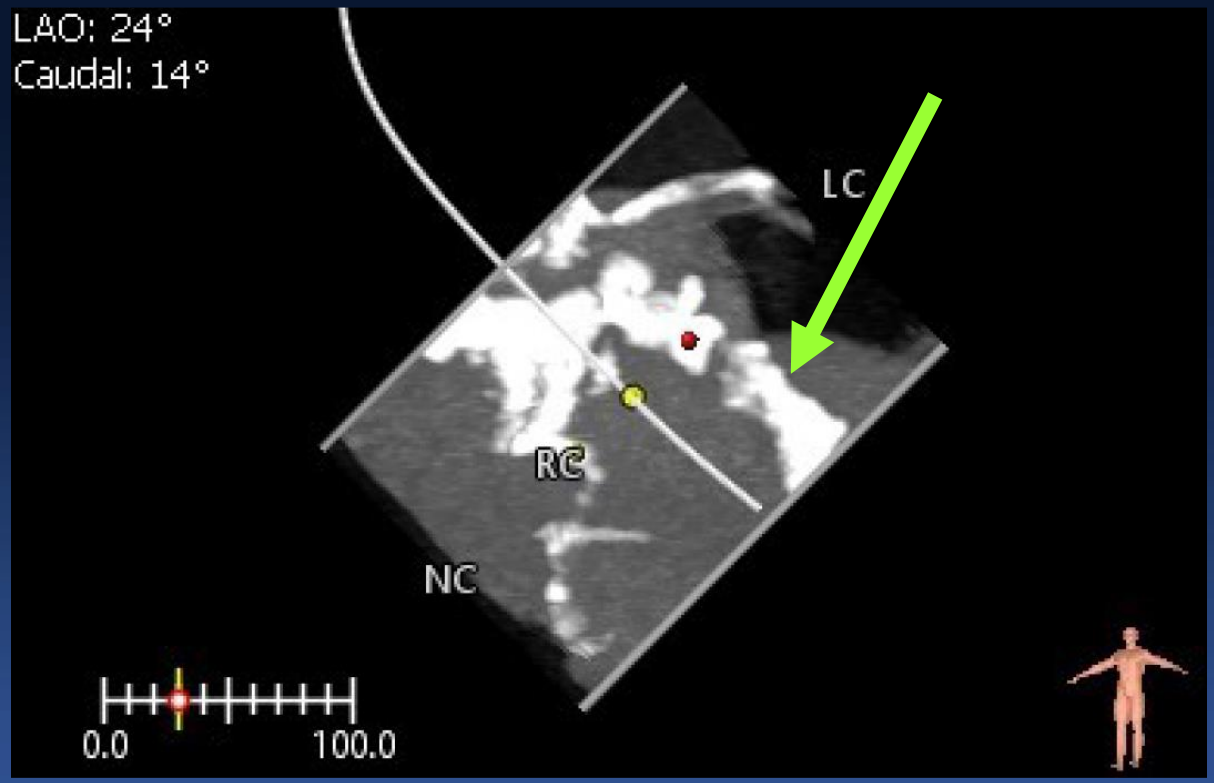
Calcium volume	
NCC	723 mm^3
RCC	438 mm^3
LCC	472 mm^3
Total	1633 mm^3

Heavy Calcium

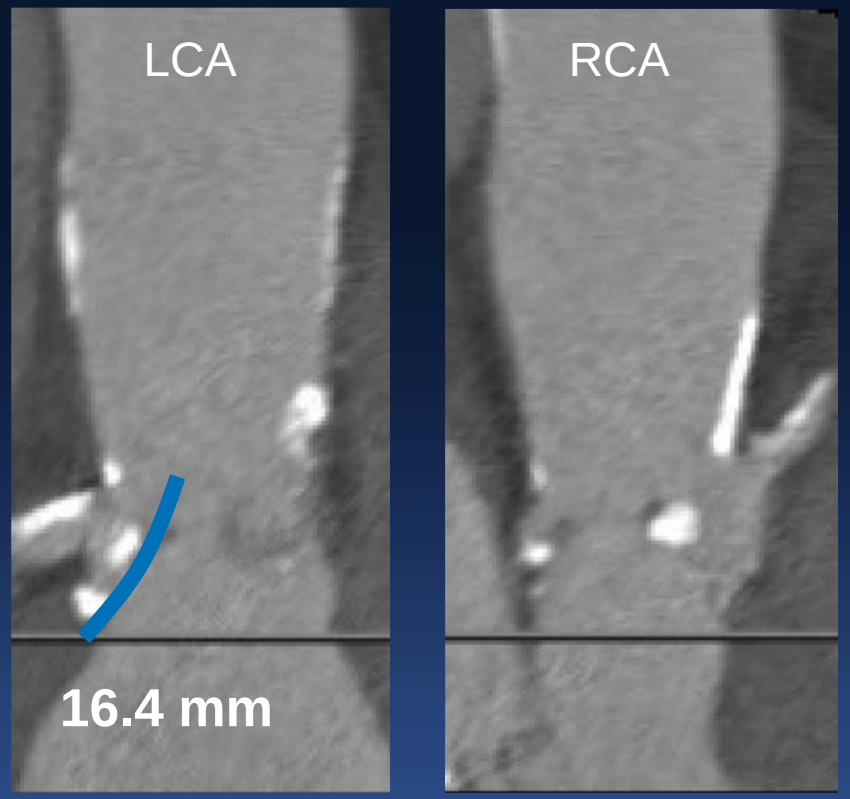
Mean Amount of total Calcium 355.4 ± 289.9

Calcification Extended to LVOT





High Risk Of Coronary Obstruction



Coronary Height	
LCA	10.0 mm
RCA	17.5 mm

Low Coronary Heigh, 10 mm

Long LCC Leaflet, 16.4 mm

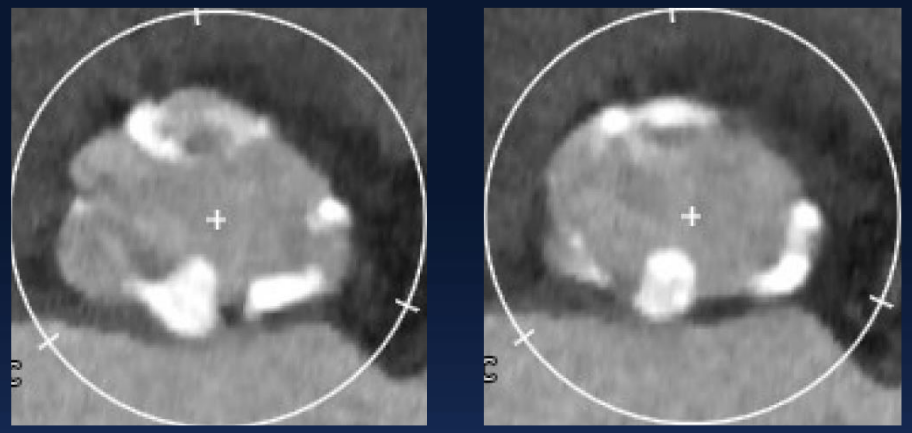
Heavy Calcium, 1320 mm3

Small Sinus Valsalva Ratio, 1.62

High Risk of Coronary Obstruction !

Case 1
90/M with Tricuspid AS

Case #1, 90/M with Tricuspid AS



Moderate Calcium

Aortic Annulus parameters	
Annulus short diameter	20.8 mm
Annulus long diameter	30.8 mm
Annululs mean diameter	25.8 mm
Annulus area	507 mm^2
Annulus area-driven diameter	25.4 mm
Annulus perimeter	82.8 mm
Annulus perimeter-driven diameter	26.3 mm

Calcium volume	
NCC	320 mm^3
RCC	134 mm^3
LCC	222 mm^3
Total	676 mm^3

Mean Amount of total Calcium 355.4 ± 289.9

S3, 26mm with 2cc Overfill
(10% Oversizing)

Size	Area_oversize (%)	Perimeter_oversize (%)
24	87.9	90.1
25	95.3	93.8
26	102.3	97.5
27	110.3	101.3
28	118.6	105.0
29	128.0	109.0
30	137.0	112.8

Calcium Amount Is Major Determinant !

For the Device Sizing.

S3, Area Oversizing Based on Calcium Amount

15% Is Cutoff

- ***Mild Calcification***
  (Ca volume < 400 mm^3)
- ***Moderate Calcification***
  (Ca volume 400-1000 mm^3)
- ***Severe Calcification***
  (Ca volume > 1000 mm^3)
- ***Bicuspid AS and***
  Heavy Calcification

10~15%, then Overfill

5~10%, then Overfill

0~5%, then Overfill

0%, then Overfill

Adjusting S3 Sizing By Balloon Volume
(Over or Under filled)

22 mm	- 1cc
23 mm	
24 mm	+ 1cc
25 mm	- 2cc
26 mm	
27mm	+ 2cc
28mm	- 3cc
29 mm	
30 mm	+ 3cc

Case 2
79/M with Bicuspid AS

Case #2, M/79 with Bicuspid AS

Aortic Annulus parameters	
Annulus short diameter	26.0 mm
Annulus long diameter	28.6 mm
Annululs mean diameter	27.3 mm
Annulus area	589 mm^2
Annulus area-driven diameter	27.4 mm
Annulus perimeter	86.5 mm
Annulus perimeter-driven diameter	27.5 mm

Calcium Amount

Calcium volume	
RCC	616 mm^3
LCC	48 mm^3
Total	664 mm^3

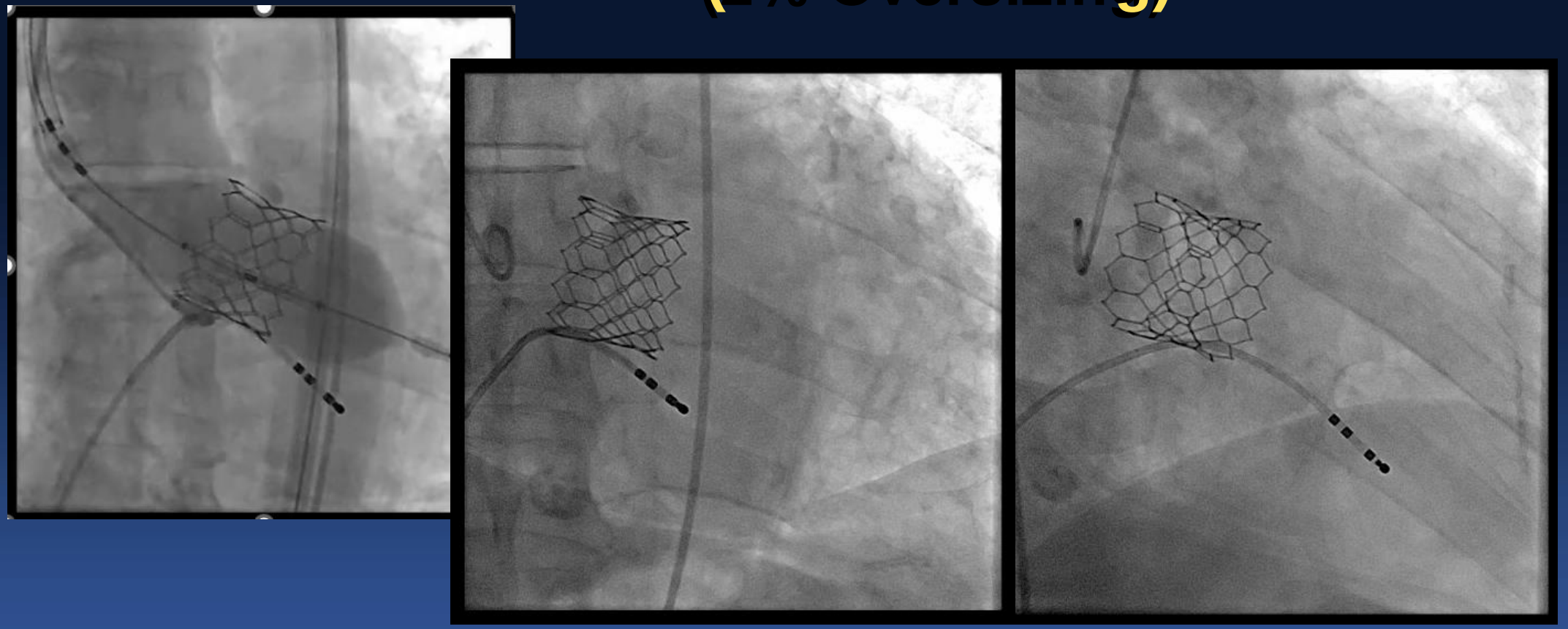
Moderate Calcium

Mean Amount of total Calcium 355.4 ± 289.9

S3, 29mm with 3cc Underfill
(2% Oversizing)

Size	Area_oversize (%)	Perimeter_oversize (%)
24	75.6	86.2
25	82.0	89.8
26	88.1	93.3
27	95.0	96.9
28	102.2	100.5
29	110.2	104.4
30	117.9	108.0

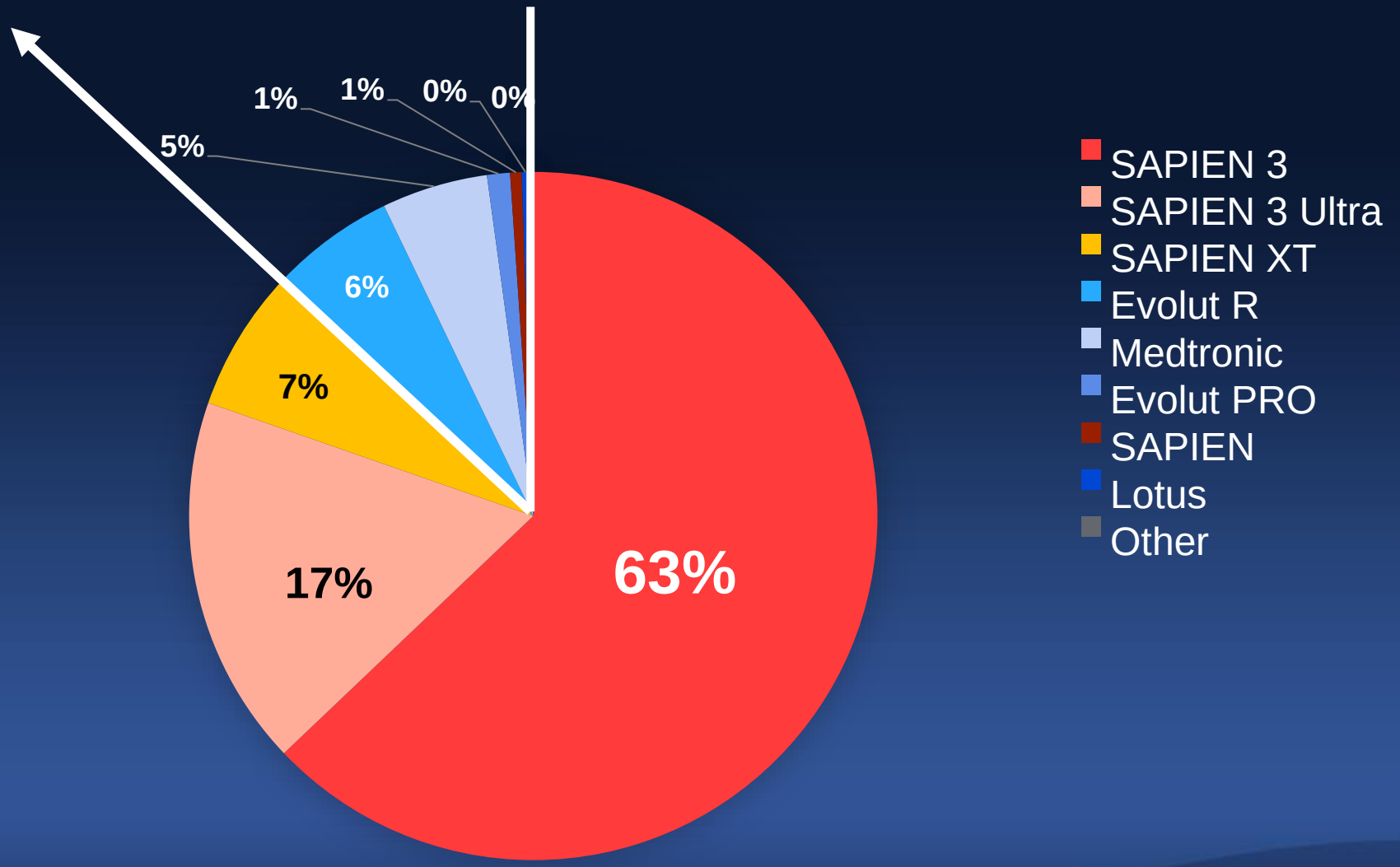
S3, 29mm with 3cc Underfill
(2% Oversizing)



Perfect Result !
No PVL

Clinical Outcomes of AMC TAVR

TAVR Devices in AMC

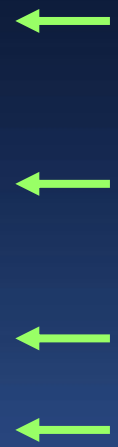


TAVR in AMC

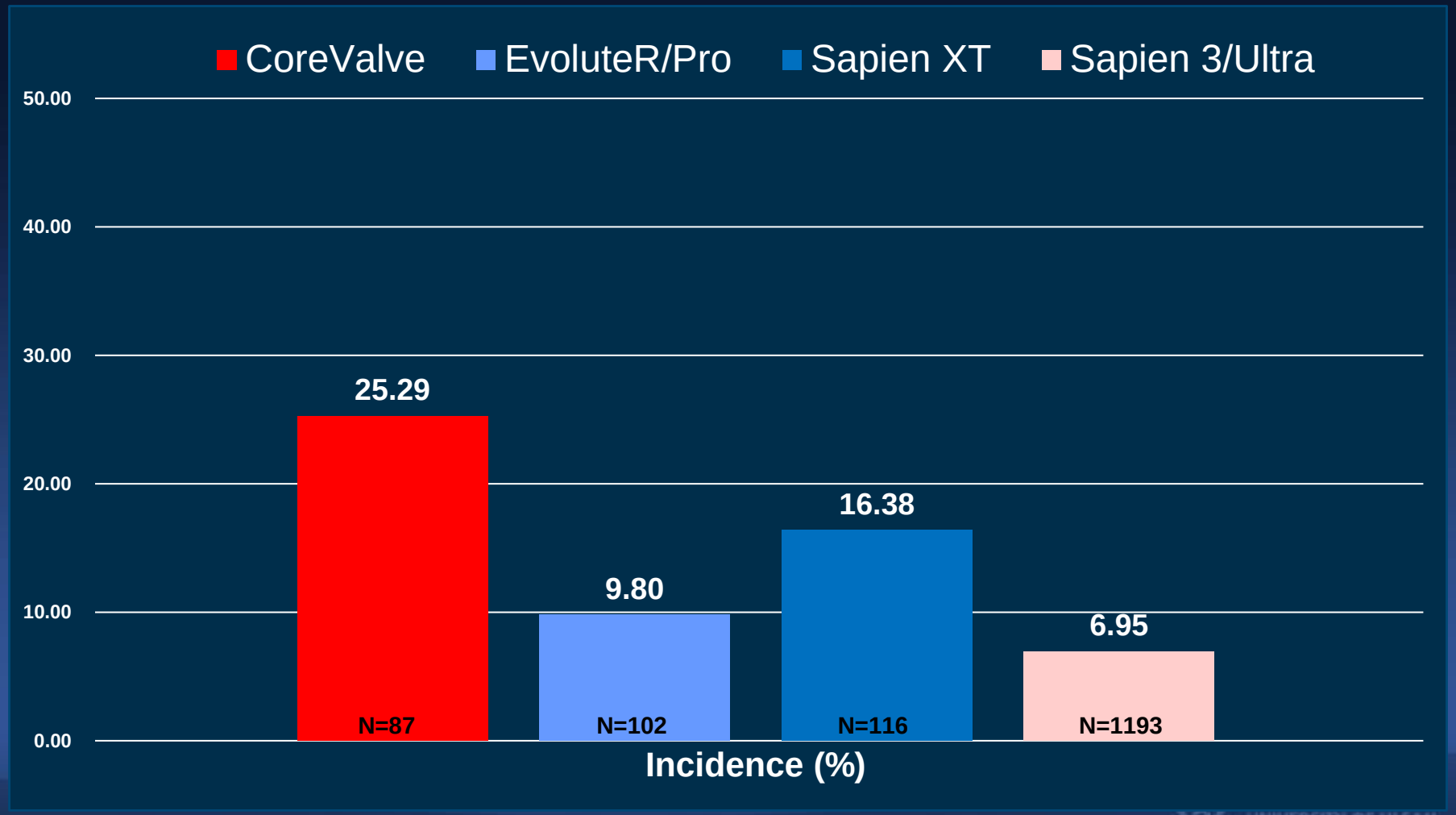
	N = 1485
Age, years	80.2 ± 5.91
Male sex	689 (46.40%)
BMI, kg/m^2	25.26 ± 4.9
STS risk score (%)	4.1 ± 2.7
DM	533 (35.9%)
Hypertension	1157 (77.9%)
Atrial fibrillation	248 (16.7%)
Coronary artery disease	588 (39.6%)
Previous MI	58 (3.9%)
Previous stroke	174 (11.7%)
Peripheral vascular disease	63 (4.2%)
Chronic Kidney Disease	123 (8.3%)
COPD	161 (10.8%)
LV Ejection fraction, %	59.0 ± 11.3

Procedural Outcomes
TAVR in AMC

	Overall (N = 1485)
Procedural success	1478 (99.5%)
Conversion to surgery	17 (1.1%)
Coronary obstruction	4 (0.2%)
Implantation of two valves	19 (1.2%)
New permanent pacemaker	118 (7.9%)
PVL ≥ moderate	41 (2.7%)
Major vascular complication	68 (4.5%)
Length of hospital stay (days)	6.6±10.1



Incidence of PPM
TAVR in AMC



30 Days Outcomes
TAVR in AMC

	Overall (N = 1485)
Death, all	23 (1.5%)
Cardiac death	16 (1.1%)
Non-cardiac death	7 (0.6%)
Stroke, all	49 (3.3%)
Disabling	9 (0.6%)
Non-disabling	40 (2.6%)
Death or disabling stroke	39 (2.6%)
Bleeding	470 (31.6%)
Fatal	19 (1.3%)
Non-fatal	451 (30.4%)

1 year Outcomes
TAVR in AMC

	Overall (N = 1178)
Death, all	99 (8.4%)
Cardiac death	26 (2.2%)
Non-cardiac death	73 (6.1%)
Stroke, all	66 (5.6%)
Disabling	16 (1.4%)
Non-disabling	40 (3.3%)
Death or disabling stroke	119 (10.1%)
Rehospitalization	249 (21.1%)
Infective endocarditis	19 (1.6%)

Outcomes of TAVR

Standard Performance (VARC-2*) for AS patients (@ 30 days)		***AMC All***	***AMC 2022***
All-cause mortality	< 3%	1.5%	1.3%
Major (disabling) strokes	< 2%	0.6%	0.3%
Major vascular complications	< 5%	4.5%	4.2%
New permanent pacemakers	< 10%	7.9%	6.8%
Mod-severe PVR	< 5%	2.7%	0.4%

"Minimalist Approach" (MAC)

Improved Clinical Outcomes !

TAVR in AMC
Baseline Characteristics

	Overall (N = 1485)	General Anesthesia (N = 256)	Conscious Sedation (MAC) (N = 1229)	P value
Age	80.2 ± 5.91	79.8 ± 5.5	80.3 ± 6.0	0.27
Male sex	689 (46.40%)	129 (50.4%)	560 (45.6%)	0.18
BMI, kg/m^2	25.26 ± 4.9	23.7 ± 3.4	25.6 ± 5.4	0.23
STS risk score, %	4.1 ± 2.7	4.4 ± 2.8	4.0 ± 2.7	0.07
DM	533 (35.9%)	85 (33.2%)	448 (36.5%)	0.36
HTN	1157 (77.9%)	222 (86.7%)	935 (76.1%)	<0.001
Atrial fibrillation	248 (16.7%)	34 (13.3%)	214 (17.4%)	0.12
CAD	588 (39.6%)	104 (40.6%)	484 (39.4%)	0.76
Previous MI	58 (3.9%)	14 (5.5%)	44 (3.6%)	0.21
Previous stroke	174 (11.7%)	27 (10.5%)	147 (12.0%)	0.59
PVD	63 (4.2%)	28 (10.9%)	35 (2.8%)	<0.001
Chronic Kidney Disease	123 (8.3%)	28 (10.9%)	95 (7.7%)	0.11
COPD	161 (10.8%)	40 (15.6%)	121 (9.8%)	<0.001

TAVR in AMC
Procedural Characteristics

	Overall (N = 1485)	General Anesthesia (N = 256)	Conscious Sedation(MAC) (N = 1229)	P value
Aortic-valve area, cm²	0.63 ± 0.15	0.62 ± 0.18	0.63 ± 0.15	0.21
AV Vmax, m/s	4.81 ± 0.79	4.86 ± 0.86	4.80 ± 0.77	0.30
Mean gradient, mmHg	56.8 ± 20.2	59.1 ± 22.4	56.3 ± 19.3	0.07
Bicuspid AV	162 (10.9%)	22 (8.5%)	140 (11.3%)	0.24
LV EF, %	59.0 ± 11.3	57.3 ± 12.1	59.4 ± 11.0	0.008
Device type				<0.001
Balloon-expandable	1301 (87.6%)	153 (59.7%)	1148 (93.4%)	
Self-expandable	184 (12.4%)	103 (40.2%)	81 (6.59%)	

TAVR in AMC
Procedural Outcomes

	Overall (N = 1485)	General Anesthesia (N = 256)	Conscious Sedation(MAC) (N = 1229)	P value	
Procedural success	1478 (99.5%)	250 (97.7%)	1228 (99.9%)	<0.001	←
Conversion to surgery	17 (1.1%)	7 (2.5%)	10 (0.8%)	0.053	
Coronary obstruction	4 (0.2%)	0 (0.0%)	4 (0.3%)	0.75	
New permanent pacemaker	118 (7.9%)	28 (10.9%)	90 (7.3%)	<0.001	←
PVL ≥ moderate	41 (2.7%)	23 (9.0%)	18 (1.5%)	<0.001	←
Major vascular complication	68 (4.5%)	27 (10.5%)	41 (3.3%)	<0.001	←
Length of hospital stay (days)	6.6±10.1	10.2 ± 12.7	5.9 ± 9.3	<0.001	

TAVR in AMC
30 Days Outcomes

	Overall (N = 1485)	General Anesthesia (N = 256)	Conscious Sedation(MAC) (N = 1229)	P value	
Death, all	23 (1.5%)	12 (4.7%)	11 (0.9%)	<0.001	←
Cardiac death	16 (1.1%)	8 (3.1%)	8 (0.7%)	0.002	
Non-cardiac death	7 (0.6%)	4 (1.5%)	3 (0.2%)	0.28	
Stroke, all	49 (3.3%)	14 (5.5%)	35 (2.8%)	0.07	
Disabling	9 (0.6%)	4 (1.6%)	5 (0.4%)	0.09	←
Non-disabling	40 (2.6%)	10 (3.9%)	30 (2.4%)	0.16	
Death or disabling stroke	39 (2.6%)	18 (5.4%)	21 (1.5%)	0.001	←
Bleeding	470 (31.6%)	138 (53.9%)	332 (27.0%)	<0.001	←
Fatal	19 (1.3%)	9 (3.5%)	10 (0.8%)	<0.001	
Non-fatal	451 (30.4%)	129 (50.4%)	322 (26.2%)	<0.001	

Outcomes of TAVR

Standard Performance (VARC-2*) for AS patients (@ 30 days)		***AMC All***	***AMC "MAC"***
All-cause mortality	< 3%	1.5%	0.9%
Major (disabling) strokes	< 2%	0.6%	0.4%
Major vascular complications	< 5%	4.5%	3.3%
New permanent pacemakers	< 10%	7.9%	7.3%
Mod-severe PVR	< 5%	2.7%	1.5%

TAVR in AMC

Sapien3 vs Evolut R

TAVR in AMC
Baseline Characteristics

	Overall (N = 1485)	Balloon Expandable (N = 1301)	Self Expandable (N = 184)	P value
Age	80.2 ± 5.91	80.2 ± 6.0	80.3 ± 5.0	0.88
Male sex	689 (46.4%)	613 (47.1%)	76 (41.3%)	0.16
BMI, kg/m^2	25.2 ± 4.9	25.5 ± 5.3	23.9 ± 3.5	0.30
STS risk score, %	4.1 ± 2.7	4.1 ± 2.7	4.2 ± 2.6	0.45
DM	533 (35.9%)	472 (36.3%)	61 (33.2%)	0.45
HTN	1157 (77.9%)	1012 (77.8%)	145 (78.8%)	0.82
Atrial fibrillation	248 (16.7%)	221 (17.0%)	27 (14.7%)	0.49
CAD	588 (39.6%)	520 (40.0%)	68 (37.0%)	0.48
Previous MI	58 (3.9%)	51 (3.9%)	7 (3.8%)	0.99
Previous stroke	174 (11.7%)	153 (11.8%)	21 (11.4%)	0.98
PVD	63 (4.2%)	49 (3.8%)	14 (7.6%)	0.02
Chronic Kidney Disease	123 (8.3%)	113 (8.7%)	10 (5.4%)	0.17
COPD	161 (10.8%)	129 (9.9%)	32 (17.4%)	0.03

TAVR in AMC
Procedural Characteristics

	Overall (N = 1485)	Balloon Expandable (N = 1301)	Self Expandable (N = 184)	P value
Aortic-valve area, cm²	0.63 ± 0.15	0.63 ± 0.15	0.62 ± 0.20	0.23
AV Vmax, m/s	4.81 ± 0.79	4.81 ± 0.8	4.85 ± 0.9	0.58
Mean gradient, mmHg	56.8 ± 20.2	56.5 ± 19.4	58.8 ± 23.6	0.20
Bicuspid AV	162 (10.9%)	140 (10.7%)	22 (11.9%)	0.71
LV EF, %	59.0 ± 11.3	59.2 ± 11.3	57.6 ± 12.0	0.07
Approach site				<0.001
Transfemoral	1454 (97.9%)	1272 (97.7%)	182 (98.9%)	
Transapical	29 (1.9%)	29 (2.2%)	0 (0.0%)	
Transaortic	2 (0.1%)	0 (0.0%)	2 (1.1%)	

TAVR in AMC
Procedural Outcomes

	Overall (N = 1485)	Balloon Expandable (N = 1301)	Self Expandable (N = 184)	P value
Device success	1478 (99.5%)	1298 (99.8%)	180 (97.8%)	0.002
Conversion to surgery	17 (1.1%)	14 (1.0%)	3 (1.6%)	0.90
Coronary obstruction	4 (0.2%)	4 (0.3%)	0 (0.0%)	1.00
New permanent pacemaker	118 (7.9%)	89 (6.8%)	29 (15.7%)	<0.001
PVL ≥ moderate	41 (2.7%)	22 (1.7%)	19 (10.3%)	0.001
Major vascular complication	68 (4.5%)	50 (3.8%)	18 (9.8%)	0.01
Length of hospital stay (days)	6.6±10.1	6.1 ± 9.6	10.2 ± 13.0	<0.001

TAVR in AMC
30 Days Outcomes

	Overall (N = 1485)	Balloon Expandable (N = 1301)	Self Expandable (N = 184)	P value
Death, all	23 (1.5%)	19 (1.5%)	4 (2.2%)	0.67
Cardiac death	16 (1.1%)	12 (0.9%)	4 (2.2%)	0.27
Non-cardiac death	7 (0.6%)	7 (0.7%)	0 (0.0%)	1.00
Stroke, all	49 (3.3%)	39 (3.0%)	10 (5.4%)	0.13
Disabling	9 (0.6%)	6 (0.5%)	3 (1.6%)	0.16
Non-disabling	40 (2.6%)	33 (2.5%)	7 (3.3%)	0.79
Death or disabling stroke	39 (2.6%)	21 (2.2%)	7 (3.8%)	0.28
Bleeding	470 (31.6%)	393 (30.2%)	77 (41.8%)	0.002
Fatal	19 (1.3%)	13 (1.0%)	6 (3.3%)	0.02
Non-fatal	451 (30.4%)	380 (29.2%)	71 (38.6%)	0.012

Outcomes of TAVR

Standard Performance (VARC-2*) for AS patients (@ 30 days)		***AMC All***	***AMC Sapien***	***AMC Core***
All-cause mortality	< 3%	1.5%	1.5%	2.2%
Major (disabling) strokes	< 2%	0.6%	0.5%	1.6%
Major vascular complications	< 5%	4.5%	3.8%	9.8%
New permanent pacemakers	< 10%	7.9%	6.8%	15.7%
Mod-severe PVR	< 5%	2.7%	1.7%	10.3%

TAVR in AMC, 2023

Whenever you choose tissue valve, (at any age or at any cases) TAVR has become the standard of treatment in patients with symptomatic severe aortic stenosis(>65y).

SAVR would be considered only for patients who are not suitable for TAVR.

Thank You !!

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