TAVR in Asia:
Current Challenges and Future Direction

Duk-Woo Park, MD, PhD
Professor of Medicine, University of Ulsan College of Medicine,
Heart Institute, Asan Medical Center, Seoul, Korea

TAVR in Asian
What is the Difference ?

Anatomical Concerns
TAVR in Asian

1. *Small aortic annulus*
2. *Small vascular access*
3. *Prevalence of Bicuspid Aortic Valve*

Comparison of Aortic Annulus
Asian vs Caucasian

	Asian	Caucasian	
	N=202	N=106	P value
Annulus Area, mm^2	406 ±70	430 ± 77	0.007
Annulus Perimeter, mm	73 ± 6	75 ± 7	0.008
Mean Diameter, mm	23 ± 2	24 ± 2	0.009
RCA height, mm	17 ± 3	17 ± 4	0.82
LCA height, mm	12 ± 3	13 ± 3	< 0.001

Body height showed the highest correlation with annulus area. Co-existence of lower height of left coronary artery ostia (<12 mm) and small diameter of left coronary cusp (<30 mm) were more frequent in Asian group.

Yoon et al., AJC 2015; 116: 1566-73

The Asian TAVR Registry

Sponsored Investigator; Park Seung-Jung,MD
Collaboration with CVRF, ClinicalTrials.gov: NCT02308150

5 Countries,	11 centers
HongKong	Queen Elizabeth Hospital
Singapore	National University Heart Centre
Taiwan	National Taiwan University
	Cheng-Hsin Hospital
Korea	Seoul National University Hospital
	Asan Medical Center
Japan	Shonan Kamakura General Hospital
	Keio University Hospital
	Teikyo University Hospital
	Saiseikai Yokohama Eastern Hospital
	Kokura Memorial Hospital

Baseline Characteristics (n=848)

	N=848
Age	81.8 ± 6.6
Female	53.3%
STS score	5.2 ± 3.8
BMI, kg/m^2	23.0 ± 3.8
Diabetes mellitus	30.1%
NYHA class III/IV	63.0%
CAD	44.7%
Previous stroke	10.5%
Peripheral vascular disease	15.4%
COPD	11.7%
Sapien	549(65%)
CoreValve	299(35%)

Asian TAVR Registry, 2017

Procedural Outcomes

	N=848
Access site	
Transfemoral	86.2%
Transapical	12.6%
Transsubclavian,Tranaortic	0.4%, 0.8%
Procedural success	97.5%
Conversion to surgery	1.8%
Coronary obstruction	1.3%
Implantation of two valves	4.5%
New permanent pacemaker	9.5%
Paravalvular leakage (PVL) ≥ moderate to severe	9.8%

Asian TAVR Registry, 2017

Standard TAVR
Defined by VARC

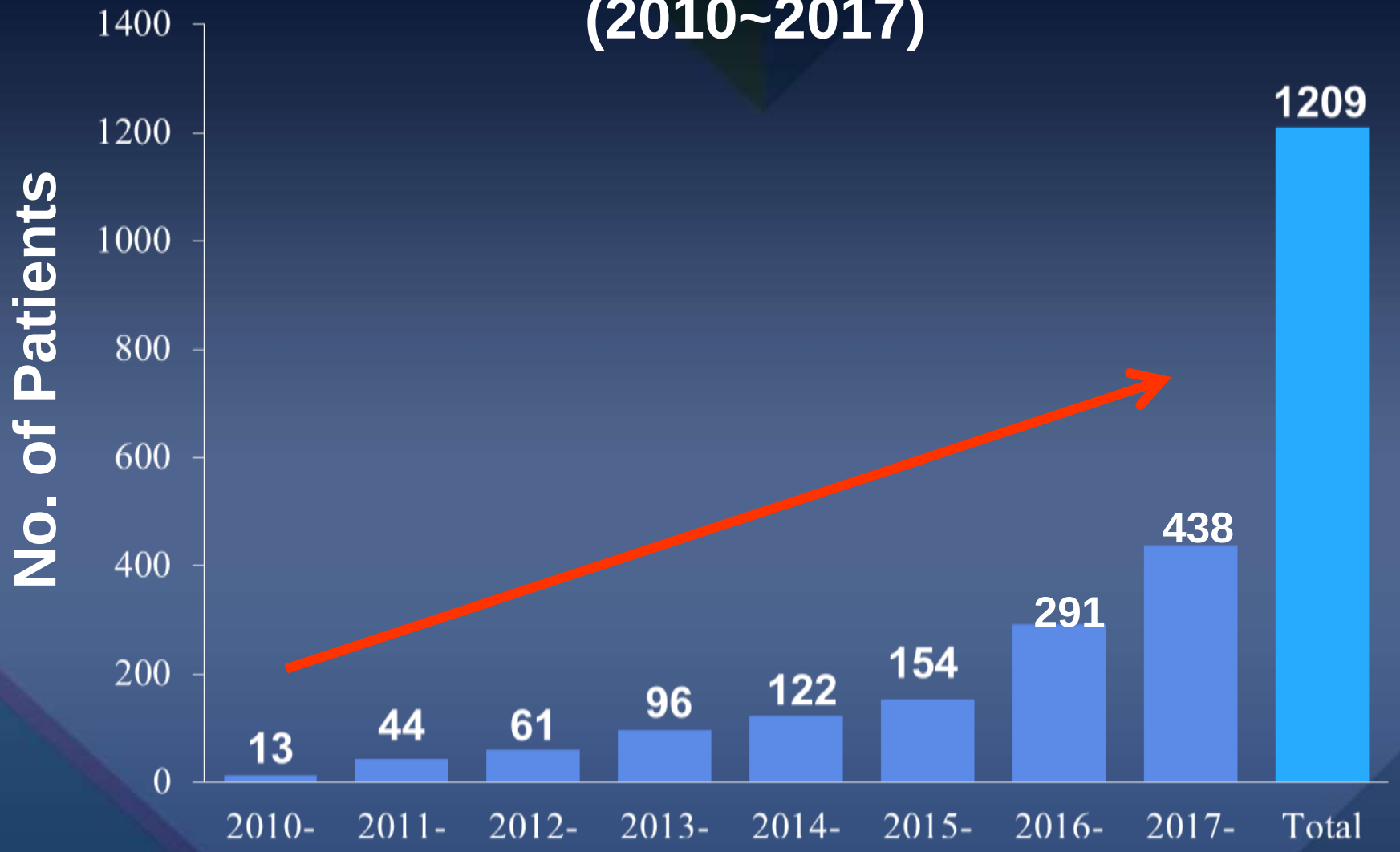
Standard Performance (VARC-2) for High-Risk AS patients (@ 30 days)*		*Asian 2017*
All-cause mortality	< 3%	2.5%
Major (disabling) strokes	< 2%	2.2%
Major vascular complications	< 5%	5.0%
New permanent pacemakers	< 10%	9.5%
Mod-severe PVR	< 5%	9.8%

VARC Vascular Academic Research Consortium*

TAVR in Korea
What is the Difference ?

TAVR in Korea

(2010~2017)

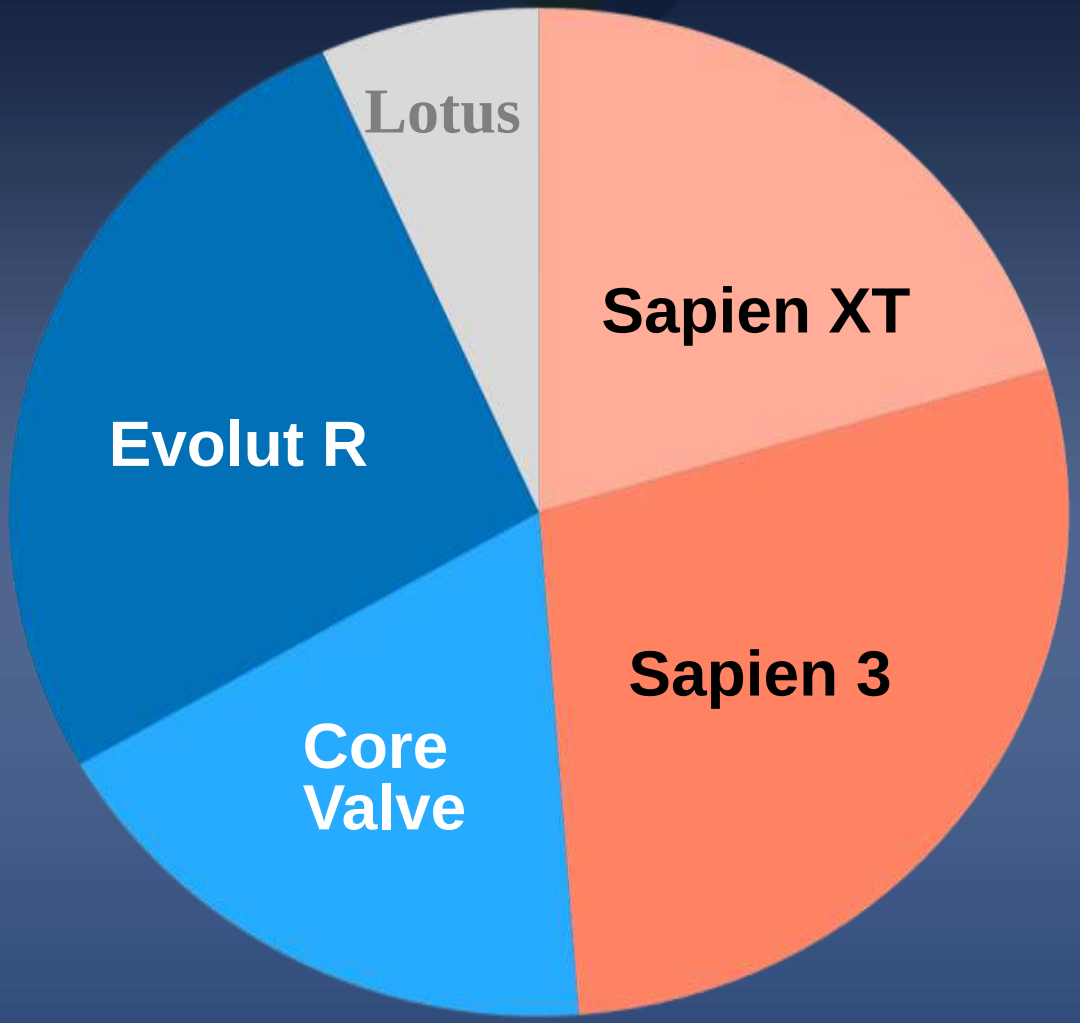


Active Devices in Korea

S3

Evolut R

Type of Valve



Baseline Characteristics (n=623)

	N=623
Age (Years)	78.6±6.3
Female	51.6 %
STS score	7.83± 8.86
DM	34.6 %
HTN	77.1 %
Stroke or TIA	15.3 %
PAOD	12.7 %
CKD on dialysis	6.4 %
Hospitalization period (Days)	12.1±7.5
TAVR to discharge (Days)	7.8±6.2

K-TAVI registry, 2018

Procedural Characteristics

	N=623
Approach	
Femoral	614 (97.8%)
Apical	11 (1.8%)
Subclavian	3 (0.5%)
Operation room	
Hybrid room	358 (57.0%)
Cath room	270 (43.0%)
Anesthesia duration (mins)	131.5±43.2
General anesthesia	533 (84.9%)
Conscious sedation	95 (15.1%)

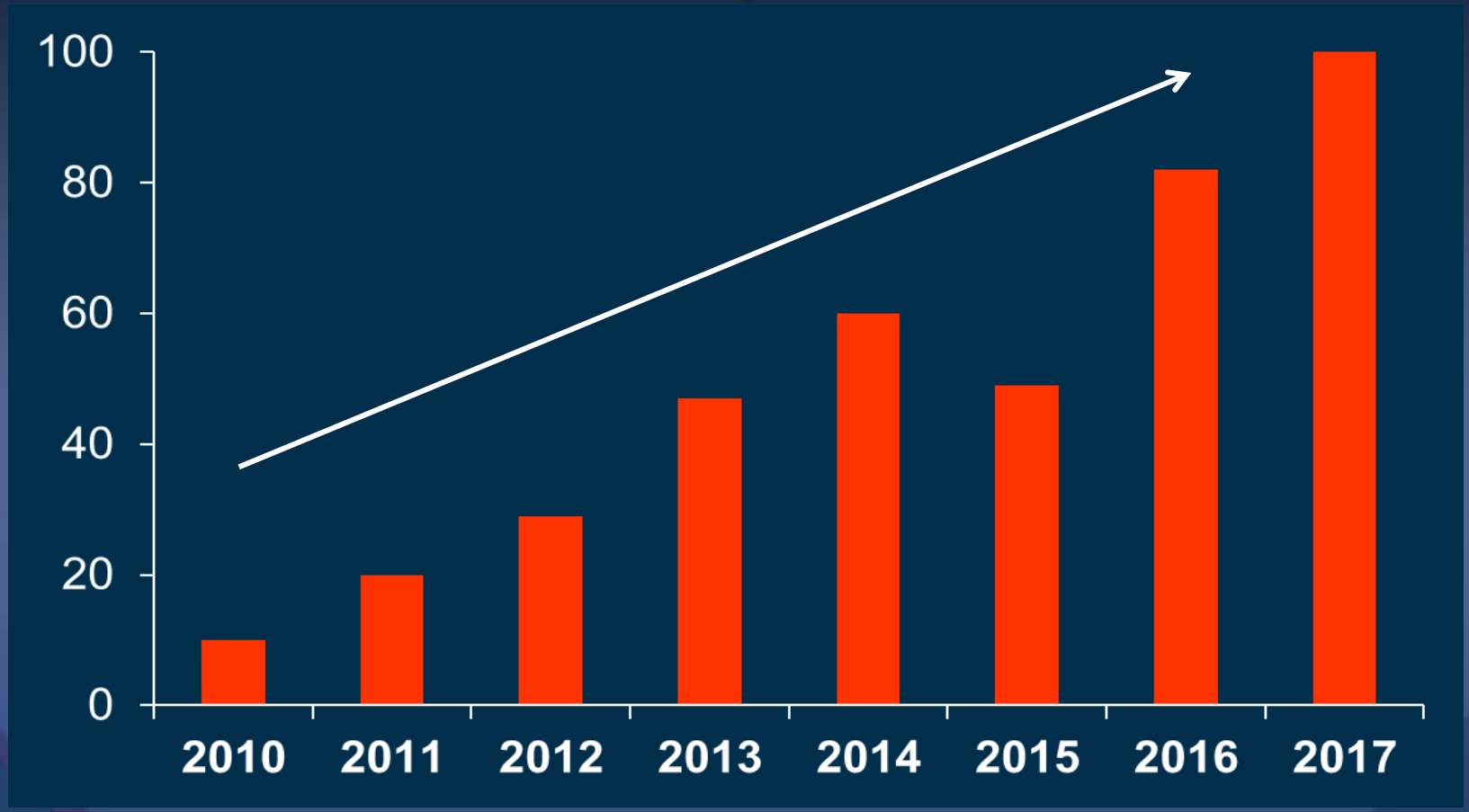
Standard TAVR
Defined by VARC

Standard Performance (VARC-2) for High-Risk AS patients (@ 30 days)*		*Asian 2017*	*Korea 2017*
All-cause mortality	< 3%	2.5%	4.5%
Major (disabling) strokes	< 2%	2.2%	1.4%
Major vascular complications	< 5%	5.0%	? %
New permanent pacemakers	< 10%	9.5%	5.3%
Mod-severe PVR	< 5%	9.8%	5.4%

VARC Vascular Academic Research Consortium*

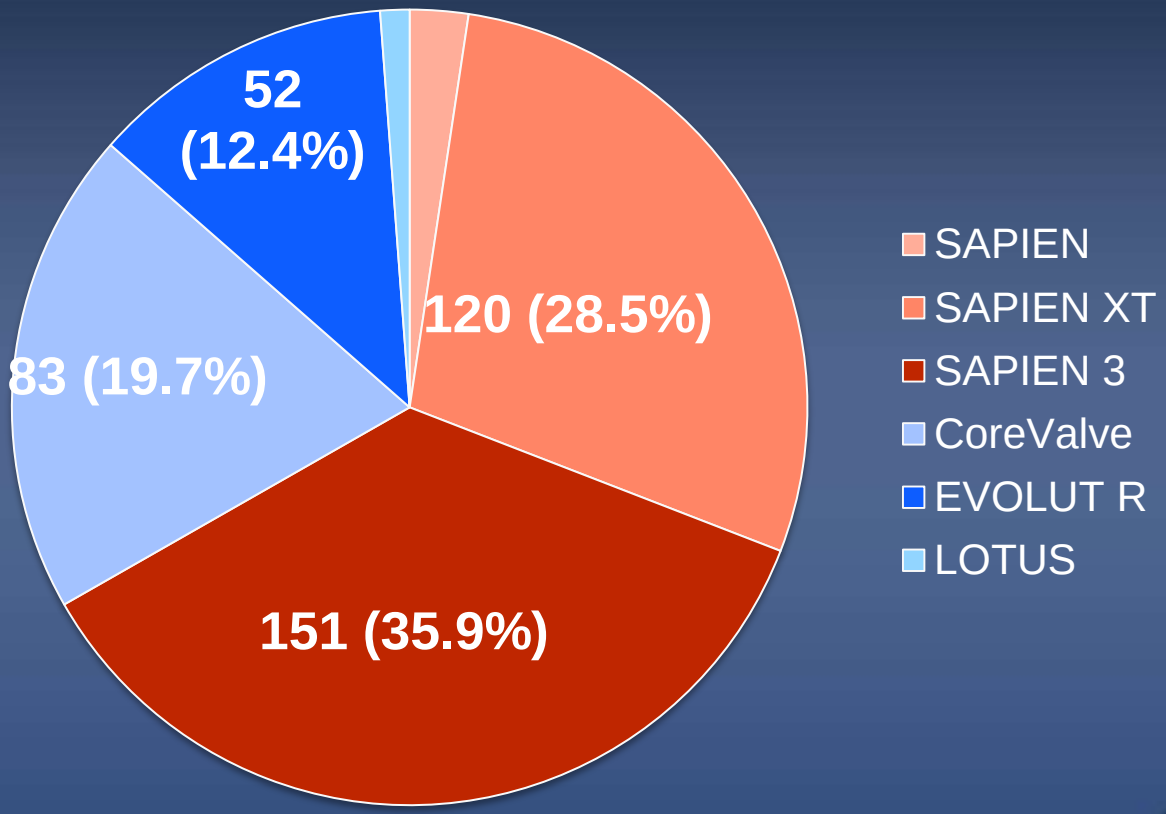
TAVR in AMC

TAVR in AMC (2010-2018.4, n=451)



TAVR in AMC

Device



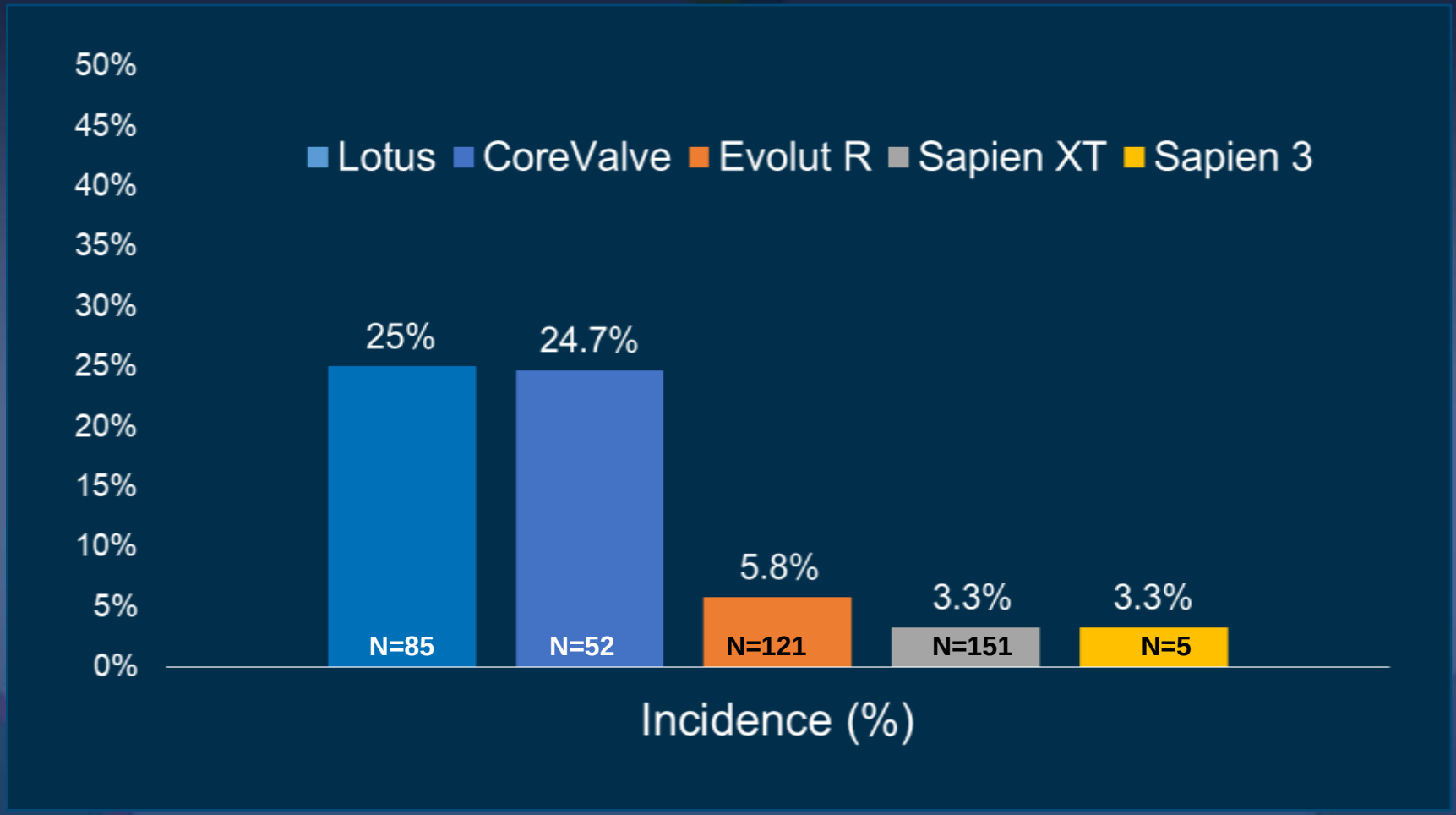
TAVR in AMC

	N = 421
Age, years	78.7 ± 5.2
Male sex	202 (48.0%)
BMI, kg/m^2	23.9 ± 3.4
Logistic Euroscore (%)	15.6 ± 12.2
STS risk score (%)	4.3 ± 4.4
DM	59 (14.0%)
Hypertension	358 (85.0%)
Atrial fibrillation	59 (14.0%)
Coronary artery disease	153 (36.3%)
Previous MI	22 (5.2%)
Previous stroke	42 (10.0%)
Peripheral vascular disease	22 (5.2%)
Chronic Kidney Disease	125 (29.7%)
COPD	64 (15.2%)
LV Ejection fraction, %	58.5 ± 10.9

TAVR in AMC
Procedural Outcomes

	Overall (N = 403)
Device success	393 (97.5%)
Conversion to surgery	6 (1.5%)
Coronary obstruction	1 (0.2%)
Implantation of two valves	12 (3.0%)
New permanent pacemaker	34 (8.4%)
PVL ≥ moderate	25 (6.3%)
Major vascular complication	19 (4.7%)
Length of hospital stay (days)	8.6±13.5

Incidence of PPM



Standard TAVR
Defined by VARC

Standard Performance (VARC-2) for High-Risk AS patients (@ 30 days)*		*Asian 2017*	*AMC 2018*	*AMC "MAC"*
All-cause mortality	< 3%	2.5%	2.5%	0.5%
Major (disabling) strokes	< 2%	2.2%	3.2%	1.0%
Major vascular complications	< 5%	5.0%	4.7%	1.0%
New permanent pacemakers	< 10%	9.5%	8.4%	6.9%
Mod-severe PVR	< 5%	9.8%	6.3%	2.5%

VARC Vascular Academic Research Consortium*

What is the Difference ?

TAVR in AMC

TAVR in AMC, 2018

1. Good Collaborative “Heart Team”,
2. Simplification of the Procedure,
   “Minimalist Approach”
3. Consistent, Meticulous CT Measurement,
   “Own CT Algorithm for Device Selection”

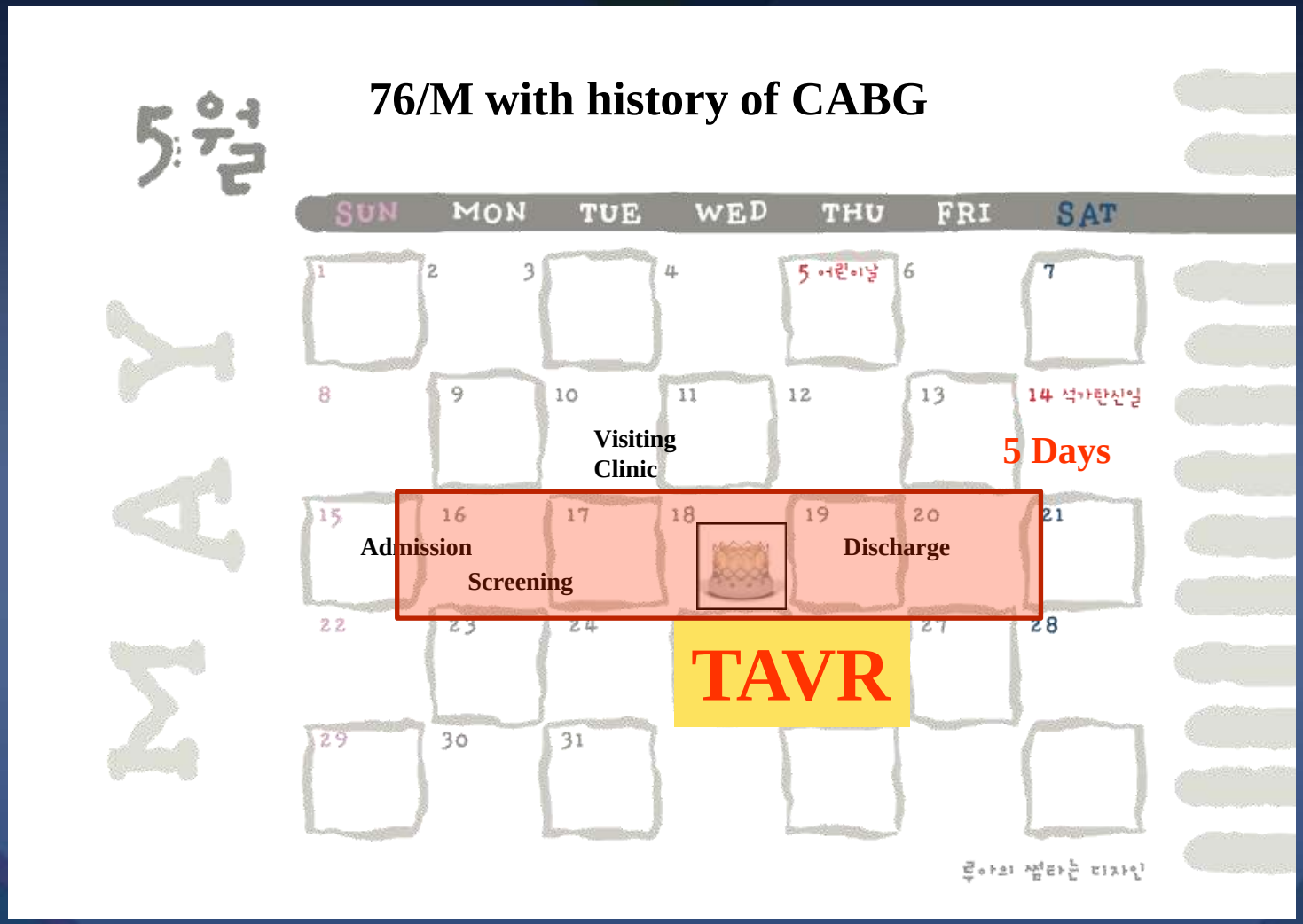
'Good Collaborative' Heart Team

Surgeon, Interventionist, Anesthesiologist, Echocardiologist, Technicians and Nurses.

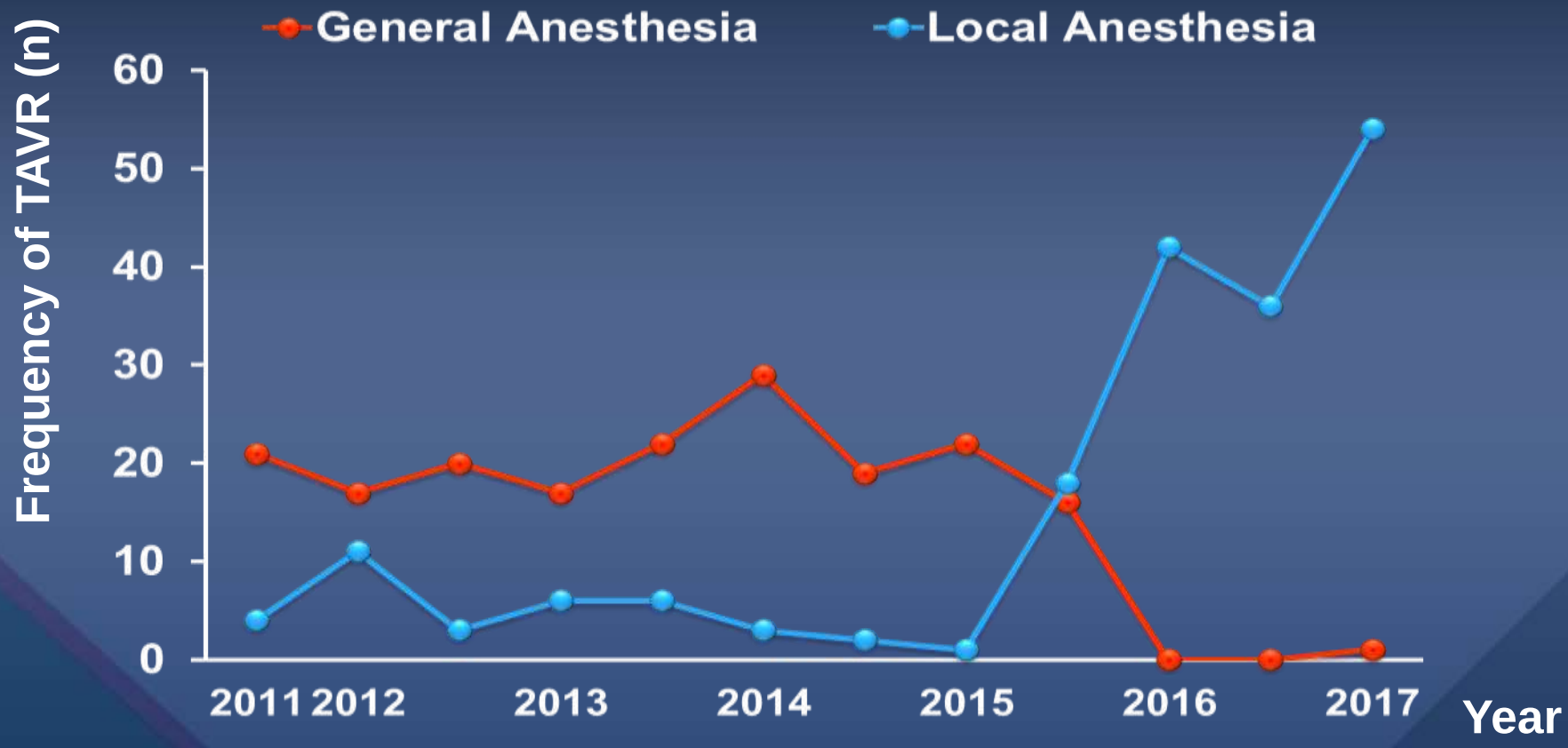
"Minimalist Approach"
TAVR in AMC

Conscious Sedation, No General Anesthesia
Requires High Operator/Team Experience
No TEE, but TTE
No central venous catheter
30 min. Procedure
Early assessment of neurologic status
Early recovery, shorter length of stay,
Discharge on Day #3
Less Complications, Better Outcomes

In 2018, TAVR is a Routine Practice



"Minimalist Approach"
TAVR in AMC



"Minimalist Approach"
Post TAVR Care in AMC

- Short stay (1 day) in ICU
- Optional temporary pacemaker
- Early mobilization
- Avoid polypharmacy
- Cardiac Rehabilitation Clinic

TAVR in AMC
Procedural Outcomes

	Overall (N = 403)	General Anesthesia (N = 200)	MAC (N = 203)	P value
Device success	393 (97.5%)	193 (96.5%)	200 (98.5%)	0.16
Conversion to surgery	6 (1.5%)	5 (2.5%)	1 (0.5%)	0.10
Coronary obstruction	1 (0.2%)	1 (0.5%)	0	0.50
Implantation of two valves	12 (3.0%)	10 (5.0%)	2 (1.0%)	0.02
New permanent pacemaker	34 (8.4%)	20 (10.0%)	14 (6.9%)	0.26
PVL ≥ moderate	25 (6.3%)	20 (10.2%)	5 (2.5%)	0.002
Major vascular complication	19 (4.7%)	17 (8.5%)	2 (1.0%)	<0.001
Length of hospital stay (days)	8.6±13.5	9.7±8.8	7.4±16.8	<0.001

TAVR in AMC
30 Days Outcomes

	Overall (N = 403)	General Anesthesia (N = 200)	MAC (N = 203)	P value
Death, all	10 (2.5%)	9 (4.5%)	1 (0.5%)	0.01
Cardiac death	6 (1.5%)	5 (2.5%)	1 (0.5%)	0.10
Non-cardiac death	4 (1.0%)	4 (2.0%)	0	0.043
Stroke, all	13 (3.2%)	11 (5.5%)	2 (1.0%)	0.01
Disabling	6 (1.5%)	4 (2.0%)	2 (1.0%)	0.40
Non-disabling	7 (1.7%)	7 (3.5%)	0	0.07
Death or disabling stroke	15 (3.7%)	12 (6.0%)	3 (1.5%)	0.015
Bleeding	130 (32.3%)	86 (43.0%)	44 (21.7%)	<0.001
Life-threatening	30 (7.4%)	21 (10.5%)	9 (4.4%)	0.02
Major	117 (29.0%)	79 (39.5%)	38 (18.7%)	<0.001

Standard TAVR
Defined by VARC

Standard Performance (VARC-2) for High-Risk AS patients (@ 30 days)*		*Asian 2017*	*AMC 2018*	*AMC "MAC"*
All-cause mortality	< 3%	2.5%	2.5%	0.5%
Major (disabling) strokes	< 2%	2.2%	3.2%	1.0%
Major vascular complications	< 5%	5.0%	4.7%	1.0%
New permanent pacemakers	< 10%	9.5%	8.4%	6.9%
Mod-severe PVR	< 5%	9.8%	6.3%	2.5%

VARC Vascular Academic Research Consortium*

TAVR in AMC

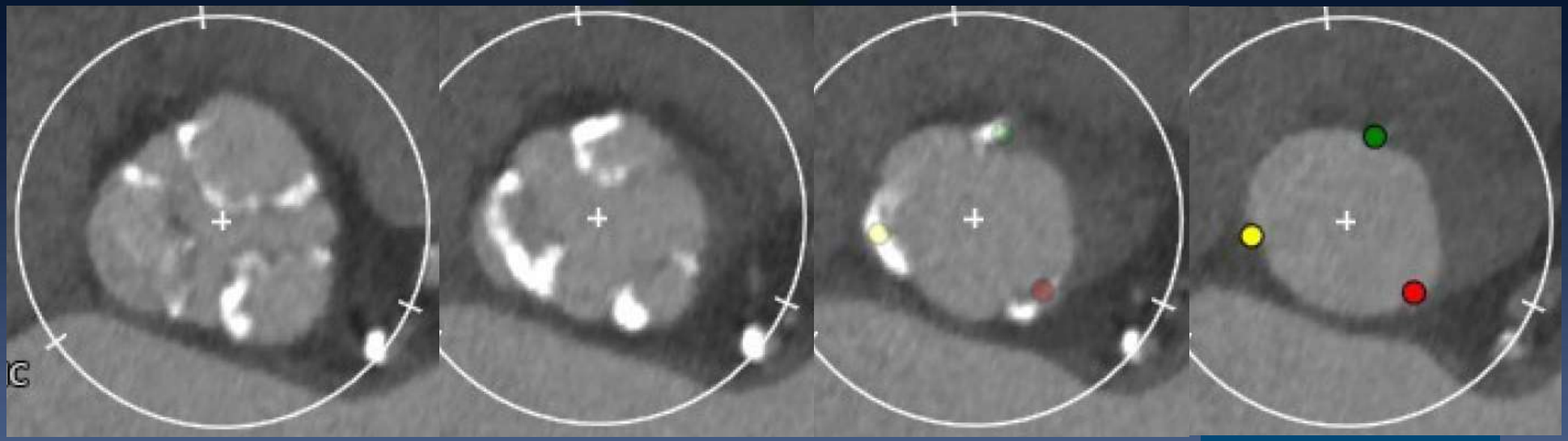
1. Good Collaborative “Heart Team”,
2. Simplification of the Procedure,
   “Minimalist Approach”
3. Consistent, Meticulous CT Measurement,
   “Own CT Algorithm for Device Selection”

Comprehensive Pre-TAVR CT Planning

Avoid Routine Pre-TAVR Angiogram,
Aortogram/Peripheral/Coronary angiogram

1. Suitable Aortic Root Anatomy
2. Device and Size Selection
3. Iliac and Femoral Anatomy
4. Coronary Disease Status

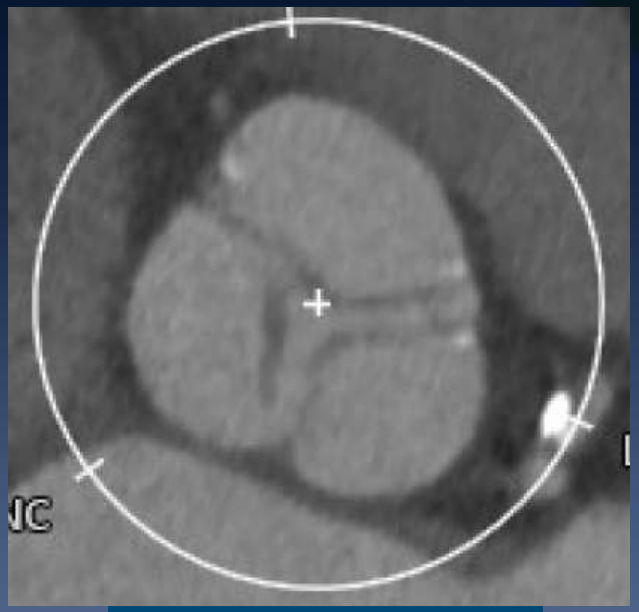
Aortic Annulus Measurement



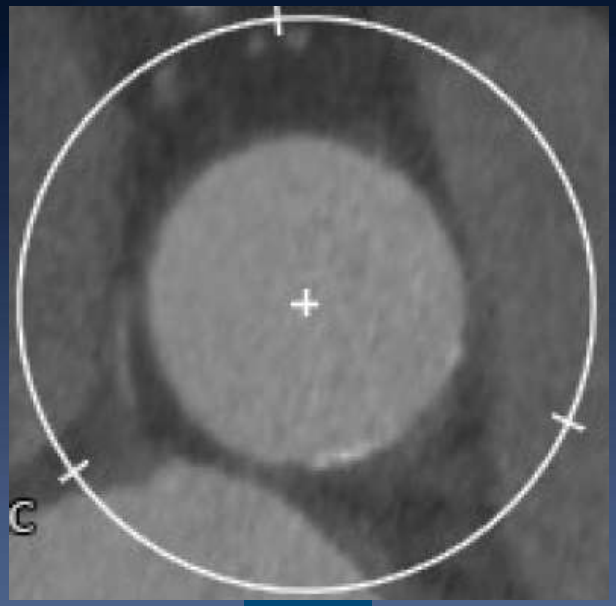
Annulus plane

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

Sinus of Valsalva and STJ size



Sinus of Valsalva

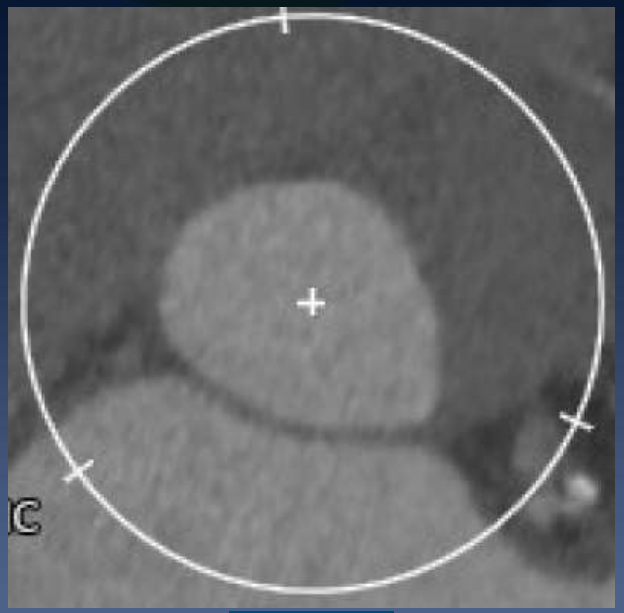


STJ

Sinus of Valsalva		STJ	
Area	830 mm^2	Area	630 mm^2
Sinus / Annulus Area Ratio	1.91	STJ/ Annulus Area Ratio	1.45
NCC diameter	30.6 mm	Mean diameter	28.2 mm
LCC diameter	33.5 mm		
RCC diameter	31.0 mm		

Mean Sinus / Annulus Area Ratio 1.83 ± 0.27 **Mean STJ / Annulus Area Ratio** 1.49 ± 0.29

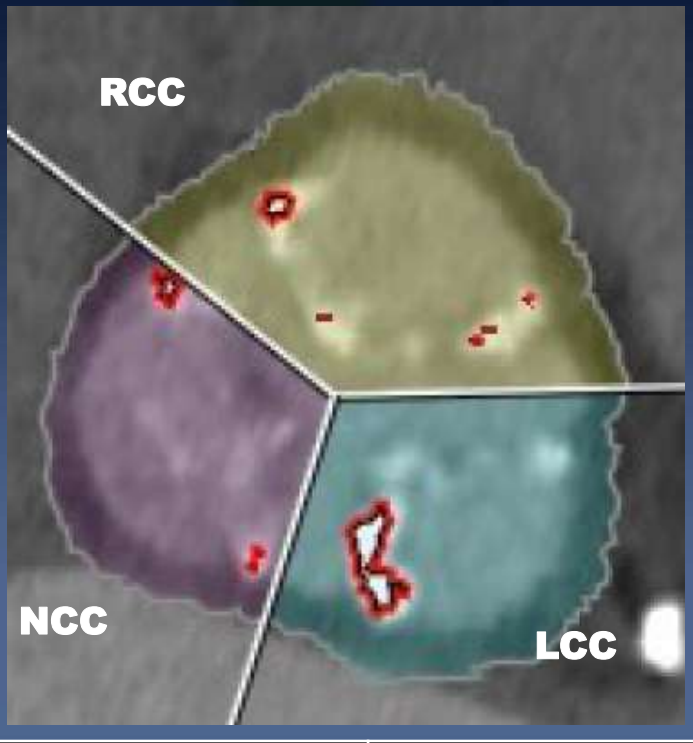
LVOT size



LVOT

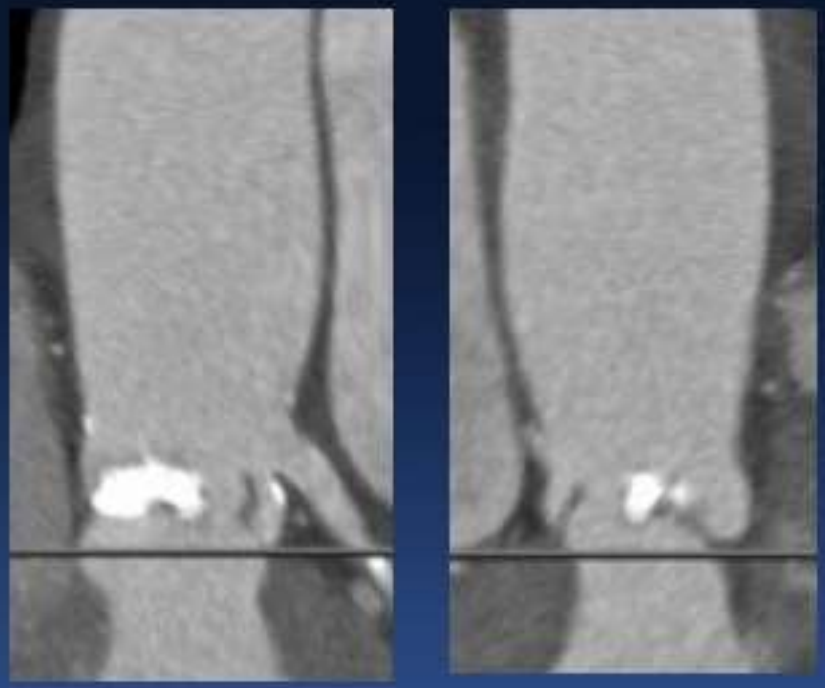
LVOT	
Area	417 mm^2
LVOT / Annulus Area Ratio	0.96
Short diameter	20.7 mm
Long diameter	26.4 mm
Mean LVOT / Annulus Area Ratio	**0.95 ± 0.12**

Degree of Calcium



Calcium volume	
NCC	84 mm^3
RCC	62 mm^3
LCC	48 mm^3
Total	194 mm^3

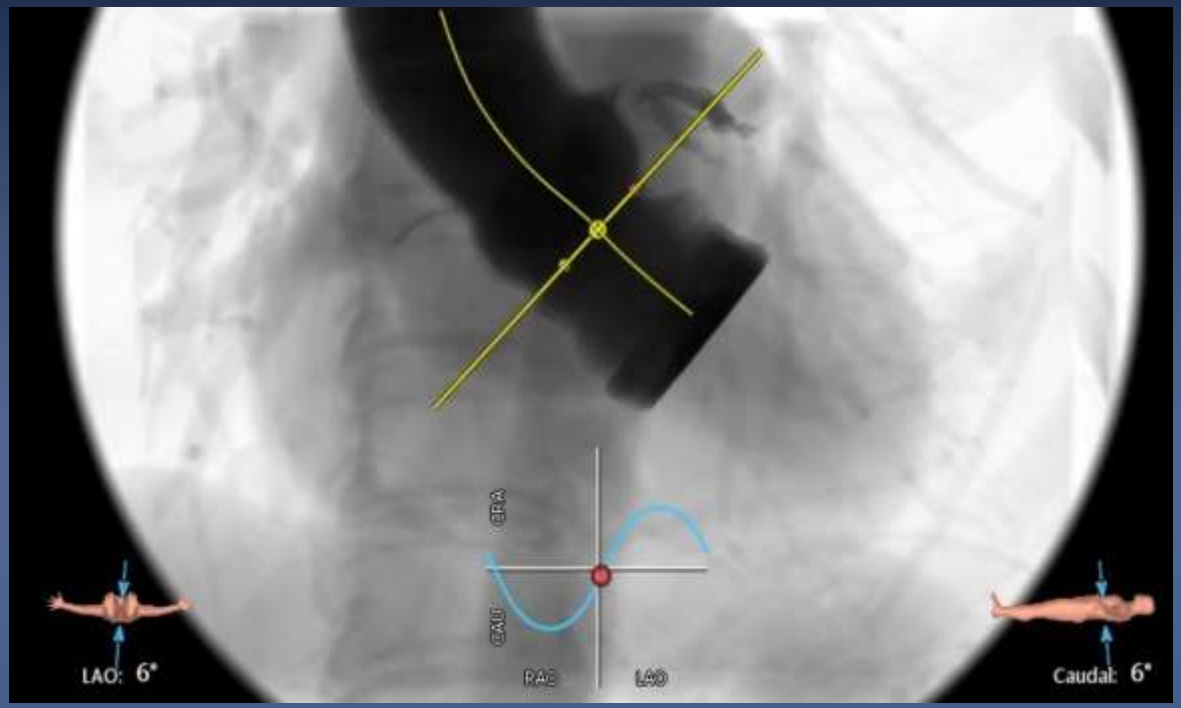
Coronary Height



Anomalous origin of RCA from LCC

Coronary Height	
LCA	10.5 mm
RCA	13.5 mm

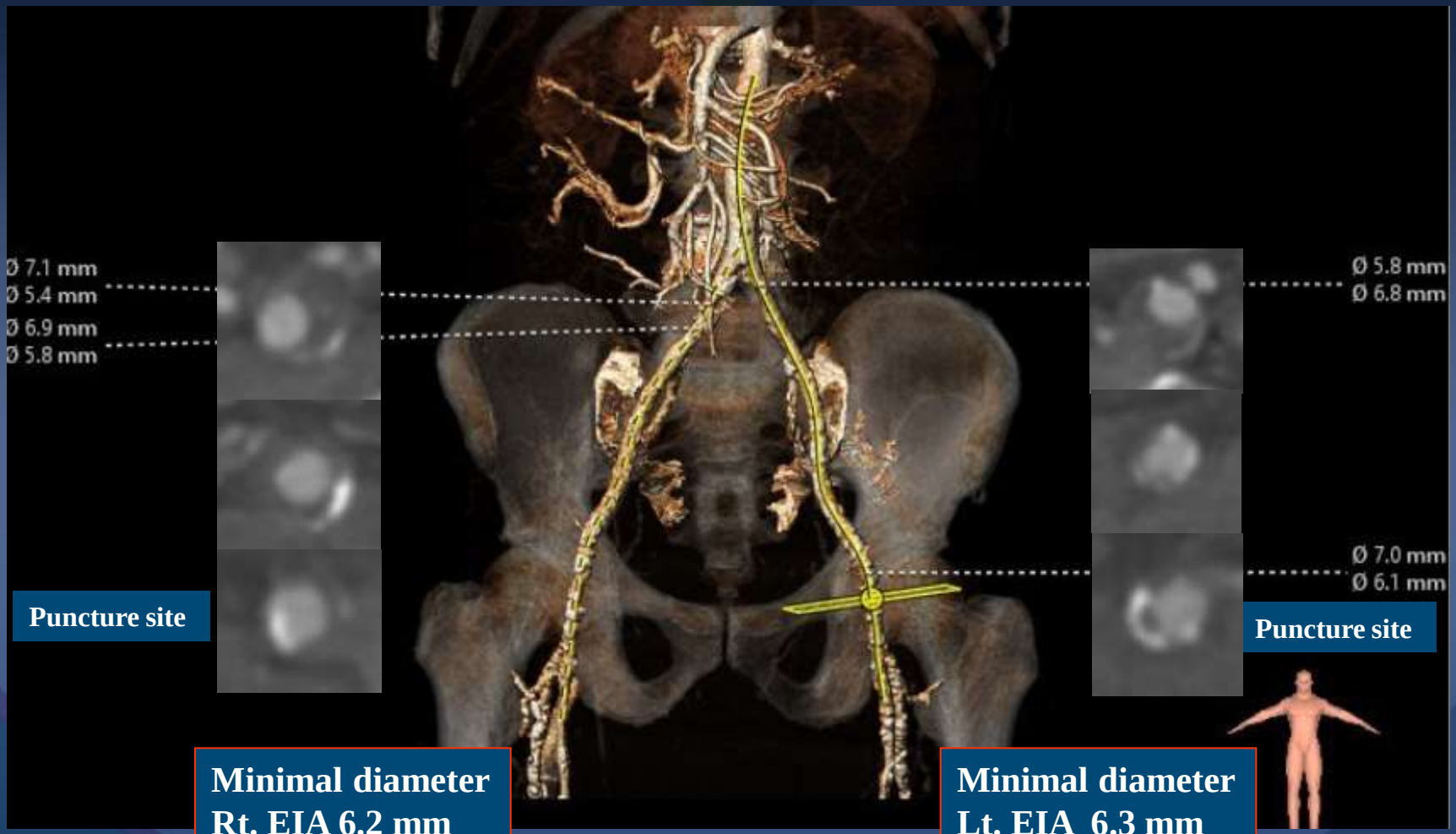
CT Aortography



- Right coronary
- Non-coronary
- Left coronary

LAO 6
CAUD 6
RR-interval 30%

Ileofemoral Angiogram



AMC S3 Sizing Algorithm: Minimizing PVL and PPM Insertion

Based on the CT Assessment

Severe AS with Tricuspid	***10~15% Area Oversizing***
Heavy Calcification (Ca volume > 400 mm3)	**5% Lesser Oversizing**
Sinus of Valsalva to Annulus Area ratio < 1.5 & Coronary Height <10mn	**5% Lesser Oversizing (or Self-Expandable Valve)**
Small LVOT with Severe LVOT Calcification	**Consider Lesser Oversizing**

Adjusting S3 Size by Balloon Volume

TAVR in Perspective

Reduction in Complications

Standard Performance (VARC-2) for High-Risk AS patients (@ 30 days)*		*AMC 2017*
• All-cause mortality	< 3%	1.0%
• Major (disabling) strokes	< 2%	0%
• Major vascular complications	< 5%	1.0%
• New permanent pacemakers	< 10%	**4.0%**
• Mod-severe PVR	< 5%	**4.0%**

** VARC; The Vascular Academic Research Consortium*

Summary – TAVR in Asia
Current Challenges

- Because East Asian ethnics are among the most populous (more than 1.5 billion people), potential TAVR candidates may be huge.
- Contradict to exponential increase of TAVR in Western population, Asia has been relatively slow to adopt TAVR.
- Multifactorial reasons might be exist for this slow adoption:
  - Reimbursement challenges,
  - High cost of TAVI devices,
  - Lack of screening and treatment infrastructure,
  - Lack of a Heart Team and structured training programme,
  - The presence of potentially challenging anatomical features.

Summary – TAVR in Asia
Future Directions

- Despite the various challenges, results of TAVI procedures performed in Asia have been good and comparable to those from high-volume Western countries.
- The volume of TAVI procedures is definitely growing in Asia. Asian registries are also growing, improving and maturing.
- Structured TAVI education programme, learning opportunities, well-constructed screening process, and improving reimbursement policy will rapidly stimulate and expand the TAVR procedures and indications in Many Asian countries.


Thank You !!
summitMD.com