HIGH TECH MARSEILLE

1·2·3 FÉVRIER 2023

MARSEILLE·PALAIS DU PHARO

Toutes les bicuspidies se valent-elles ?

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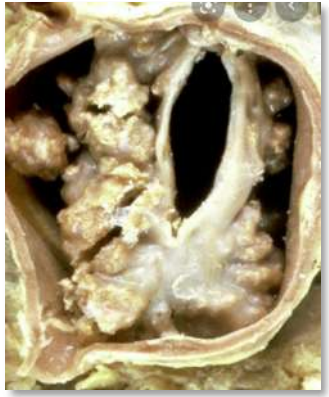
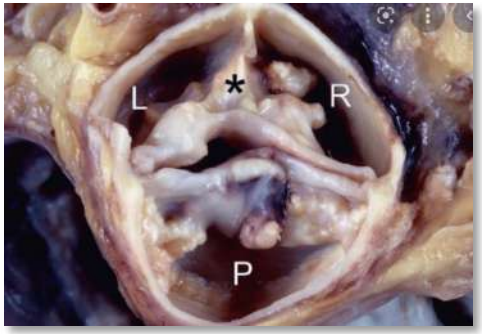
Centre Hospitalier Régional Universitaire de Lille

Inserm

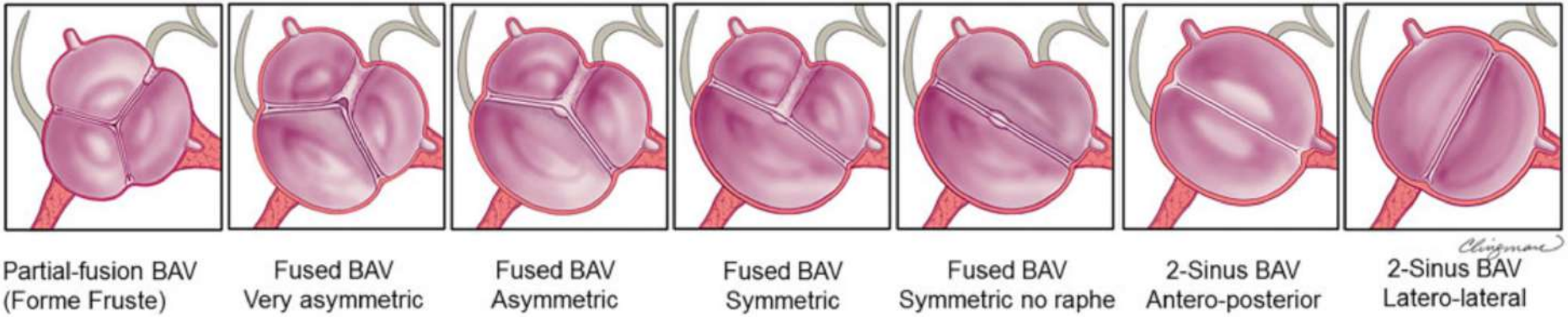
FACULTE DE MEDECINE

Large anatomic heterogenity





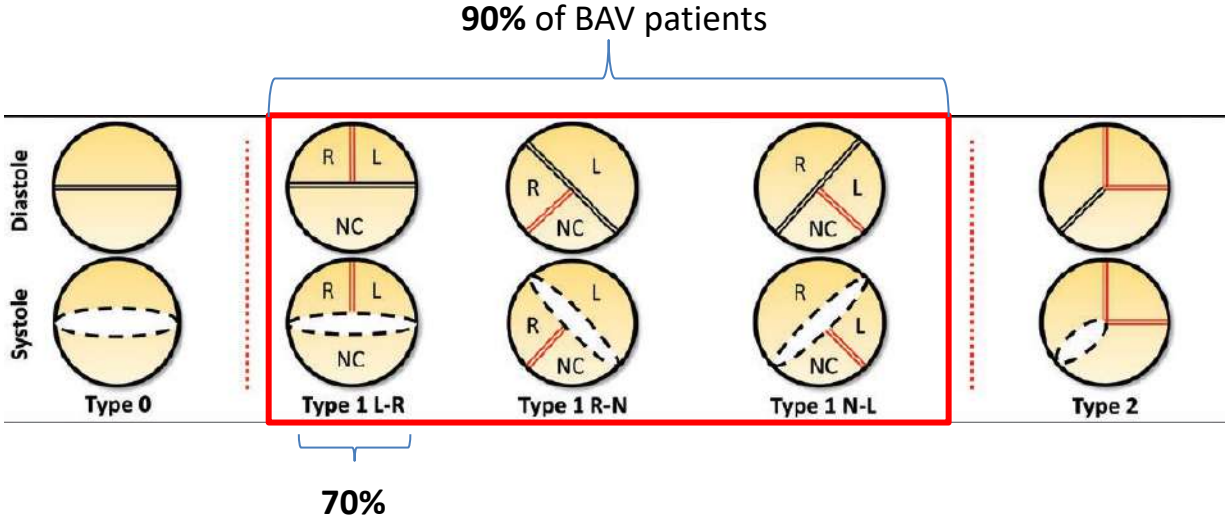
Anatomical Spectrum of BAV



Vincent F., Ternacle J. et al, Circulation 2021

BAV morphology classification

Sievers classification



- Based on **number of Raphe** and orientation
- Insufficient to delineate the complexity of BAV

Adapted from Sievers et al, J Thorac Cardiovasc surgery, 2007

Anatomic features and procedural challenges

	Anatomic challenges	Procedural challenges
Annulus	Elliptical annulus (type 0 > 1) Large size	PVL risk
Calcification	Dense calcium Middle leaflet	Root injury, pacemaker, stroke risk, coronary obstruction
Raphe	Calcified raphe Position, Assymetry	PVL, underexpansion, root injury, unpredictable valve movement
Aortopathy	Dilated ascending aorta Horizontal aorta	Aortic injury (weak media tunica) Crossing valve issues Positioning issues

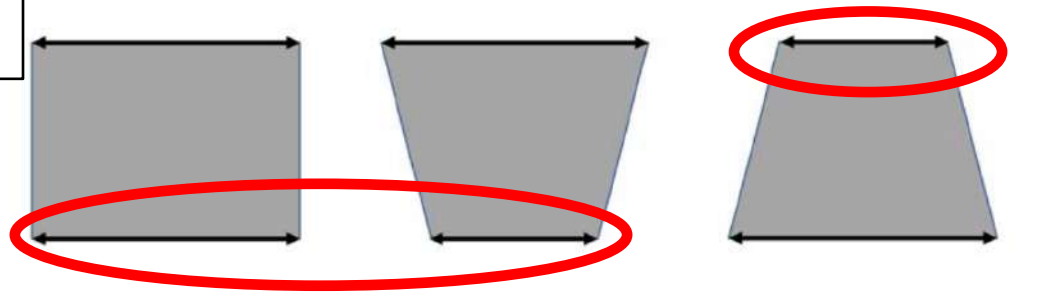
Vincent F., Ternacle J. et al, Circulation 2021

Select the smallest dimension

Intercommissural diameter (**ICD**)

4 mm

Aortic annulus



Tube

Sizing based on the annulus

Flare

Sizing based on the annulus

Taper

Sizing based on the ICD

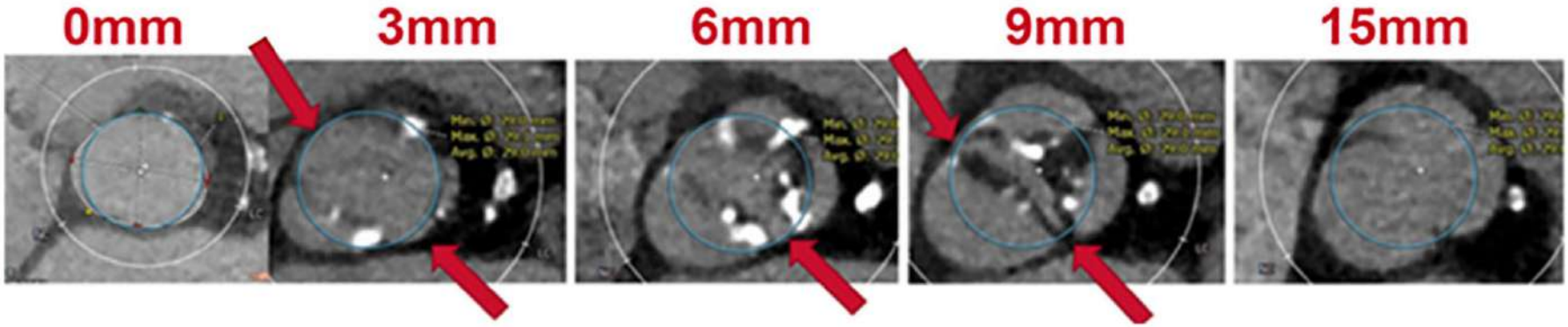
Annular sizing ≃ 90% of the pts

Use ICD

Tchetche et al., Circulation: Cardiovascular Interventions. 2019;12

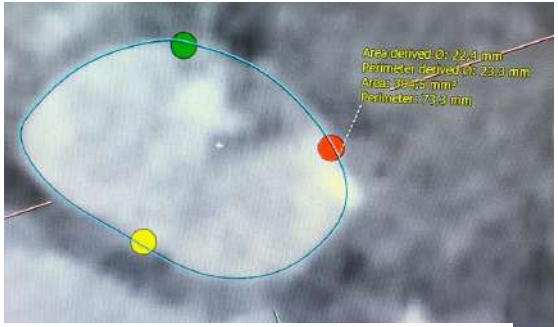
Sizing for BE-valve

Circle line technique



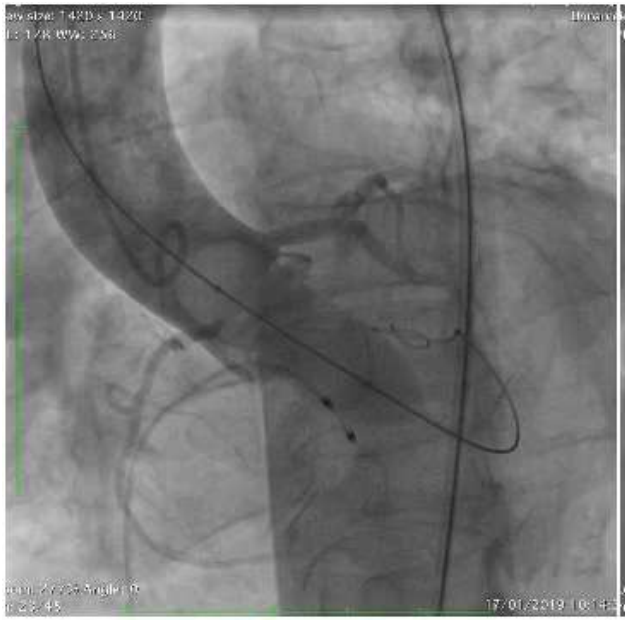
Blackman, Tchetche et al, Cardio Ther 2021

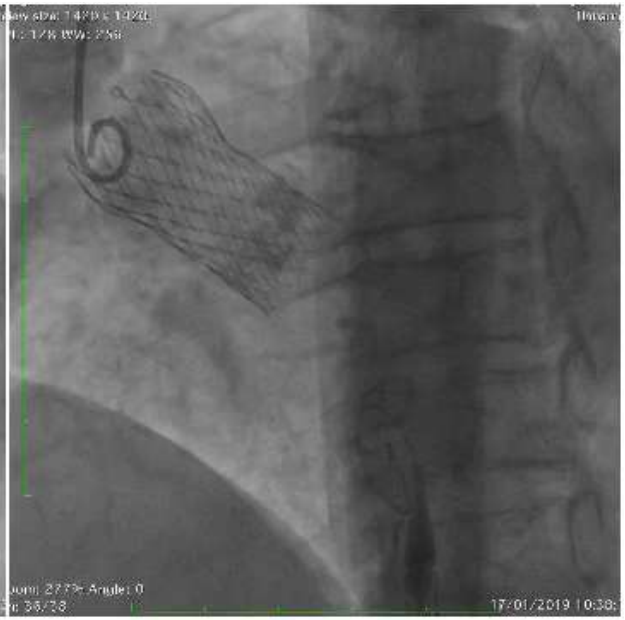
Perimeter derived Diam = 23.3mm



4mm IDC= 22.8mm

Evolut Pro 26mm



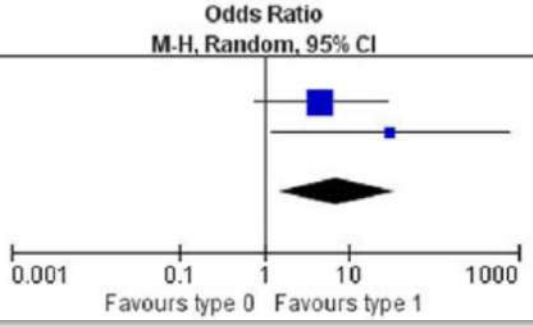


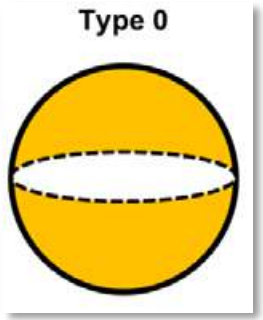
Absence of raphe

coronary compromise

Study or Subgroup	Type 0 Events	Type 0 Total	Type 1 Events	Type 1 Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Jilaihawi 2016	0	21	0	74		Not estimable	2016
Yoon 2017	2	61	3	409	76.3%	4.59 [0.75, 28.03]	2017
Forrest 2020	1	14	0	136	23.7%	30.33 [1.18, 781.60]	2020
Total (95% CI)		**96**		**619**	**100.0%**	**7.18 [1.48, 34.88]**	
Total events	3		3				

Heterogeneity: Tau² = 0.00; Chi² = 0.99, df = 1 (P = 0.32); I² = 0%
Test for overall effect: Z = 2.44 (P = 0.01)

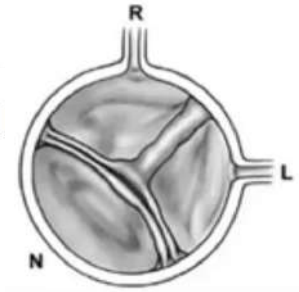




- Increased risk of coronary obstruction
- Elevated mean gradient (more elliptical ?)
- More frequently treated with SE-valve

Du et al. TAVR in Sievers Type 0 vs type 1 : meta-analysis, Frontiers Cardiovasc Medecine 2021

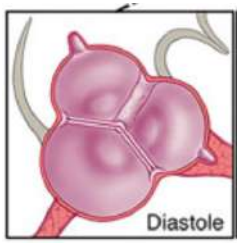
Presence of Raphe

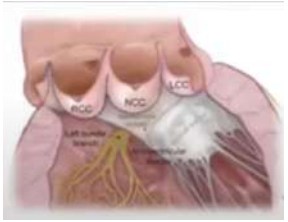


Calcified raphe = **<u>calcification > half the raphe</u>**

Yoon et al, JACC 2020

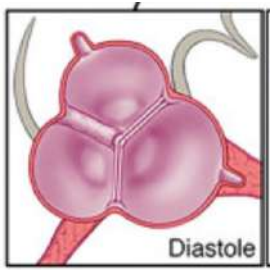
Position of Raphe



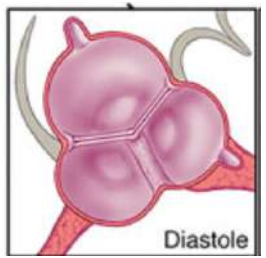


Type 1 LR fusion

- Increase new PPI risk (increase compression of the membranous septum / His Bundle under NCC)



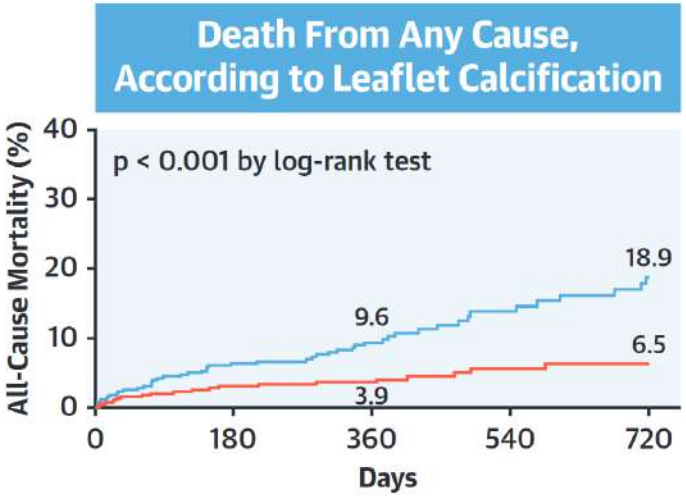
Type 1 RC fusion



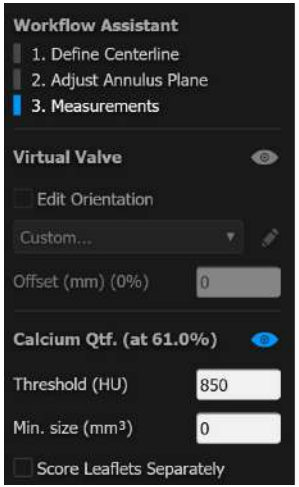
Type 1 LN fusion

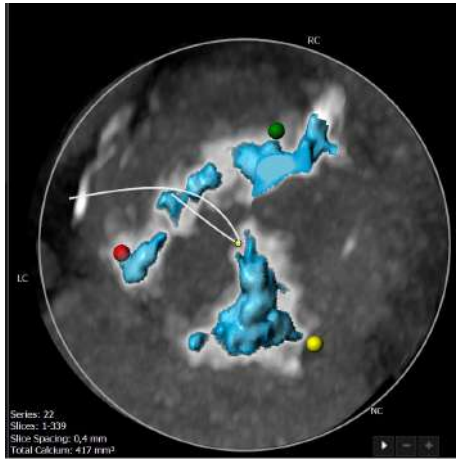
- Increase risk of coronary obstruction (long lealets, calcified tips)

Calcium burden



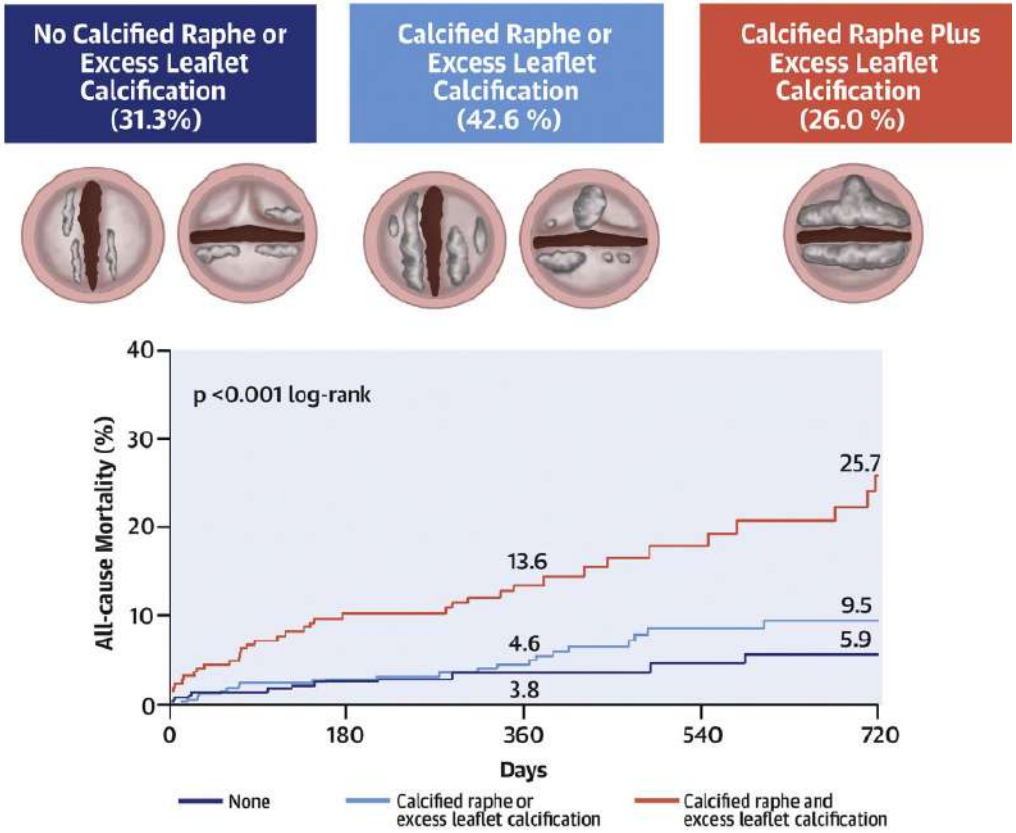
- Excess calcification = calcium volume **> 382mm³**





Yoon et al, JACC 2020

Excessive leaflet calcification + calcified raphe

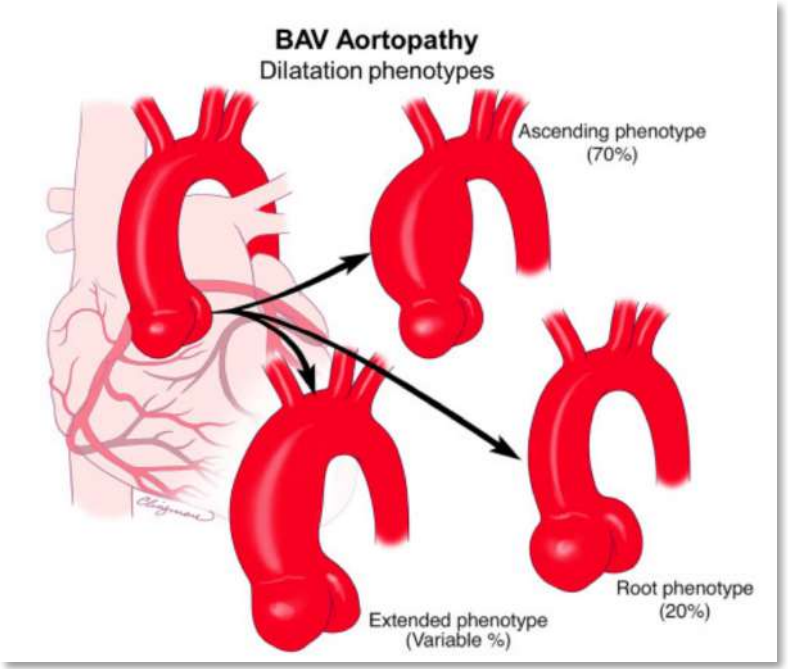


- Aortic root injury x 3
- New PPI 15%
- PVL, conversion to surgery

Yoon et al, JACC 2020

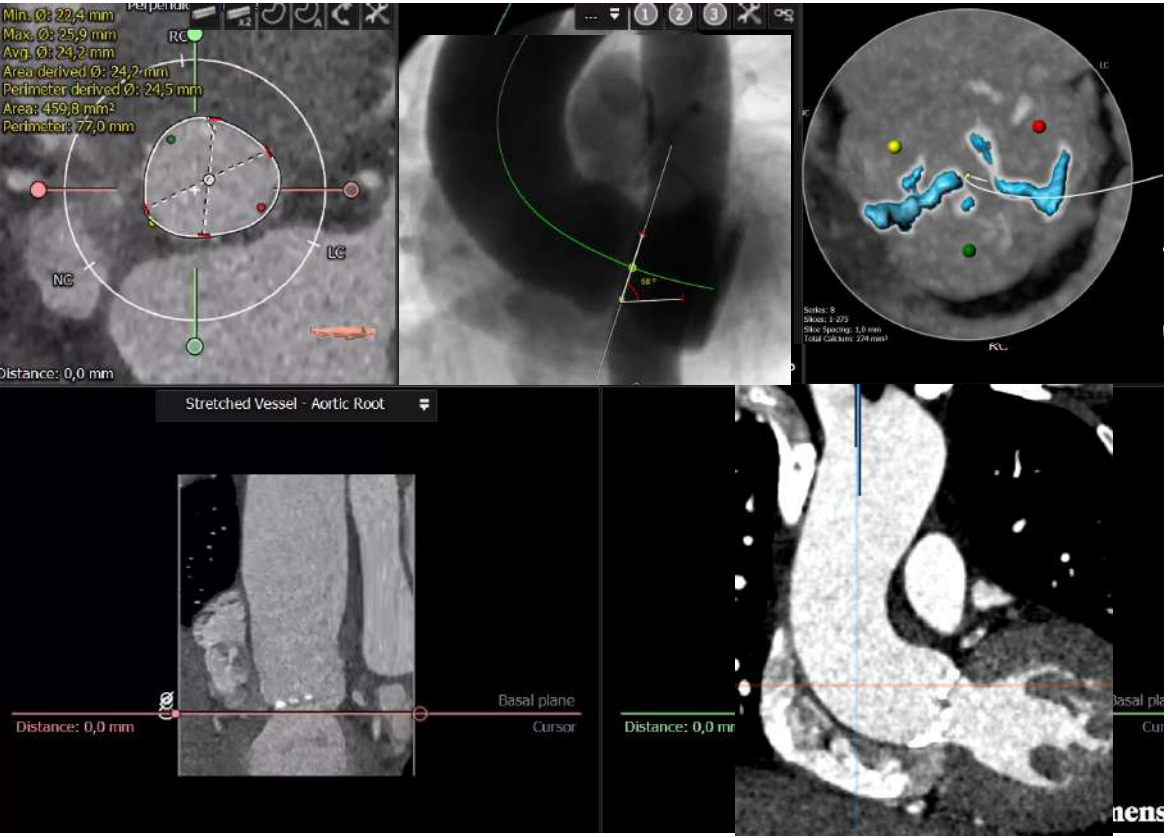
Aortopathy

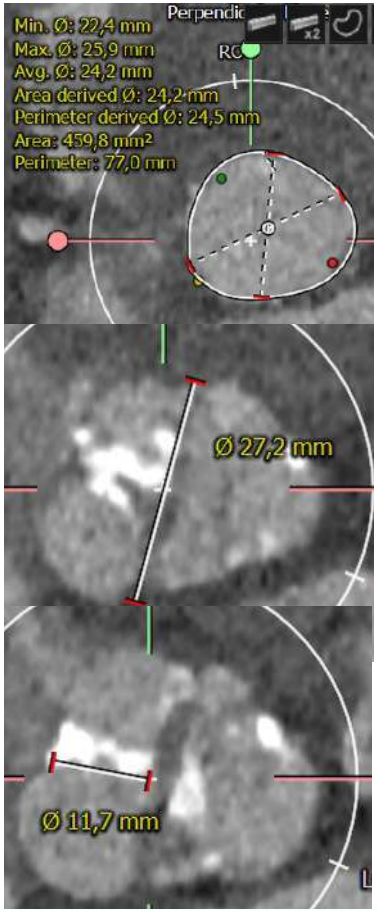
- Larger and more horizontal vs tricuspid
- 3 phenotypes :
  - Ascending (70%) : most common, older BAV, stenosis, type 1 R/N
  - Root (20%) : younger, regurgitation, type 1 L/N and L/R
  - Entire aorta (10%): type 2



Michelena et al, International consensus on bicuspid aorti valve, EJCTS 2021

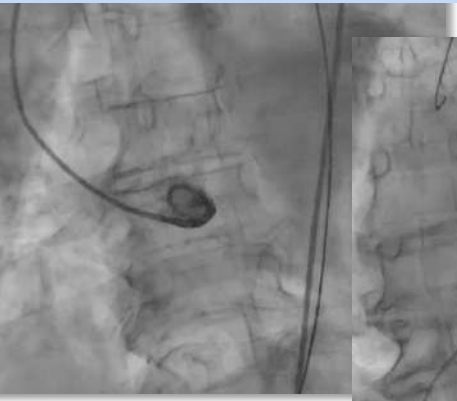
Type 1 R/N



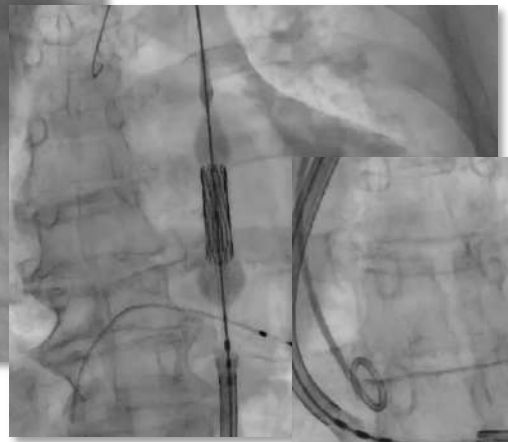


- Annulus sizing (flared)
- No excess leaflet calcification
- Calcified Raphe
- Horizontal dilated aorta

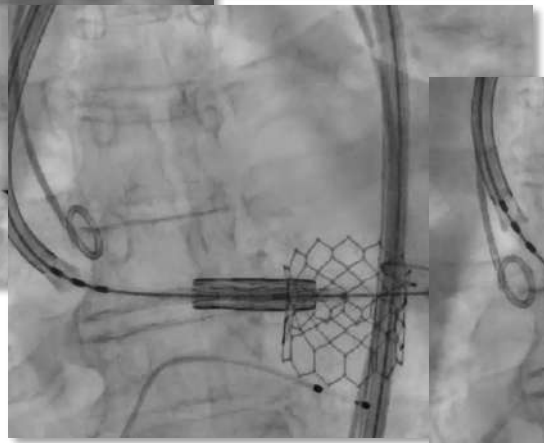
Type 1 R/N



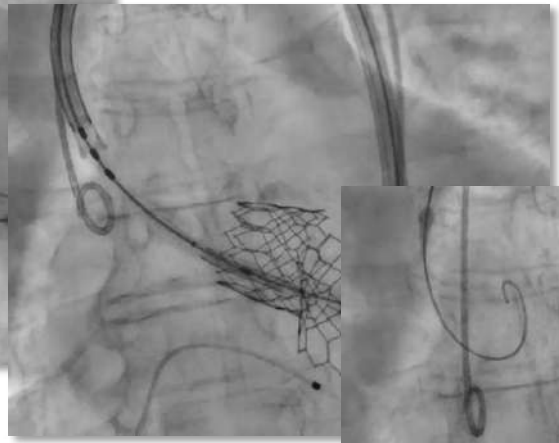
No predilatation



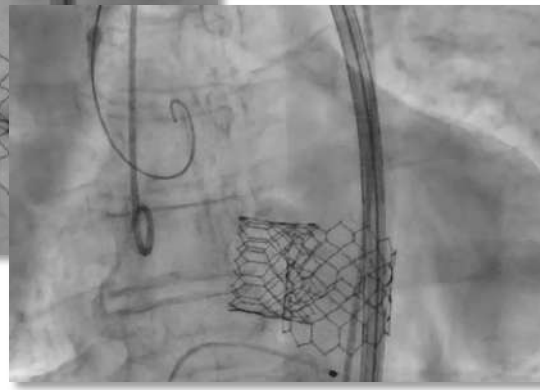
Crossing failure



2nd valve implantation



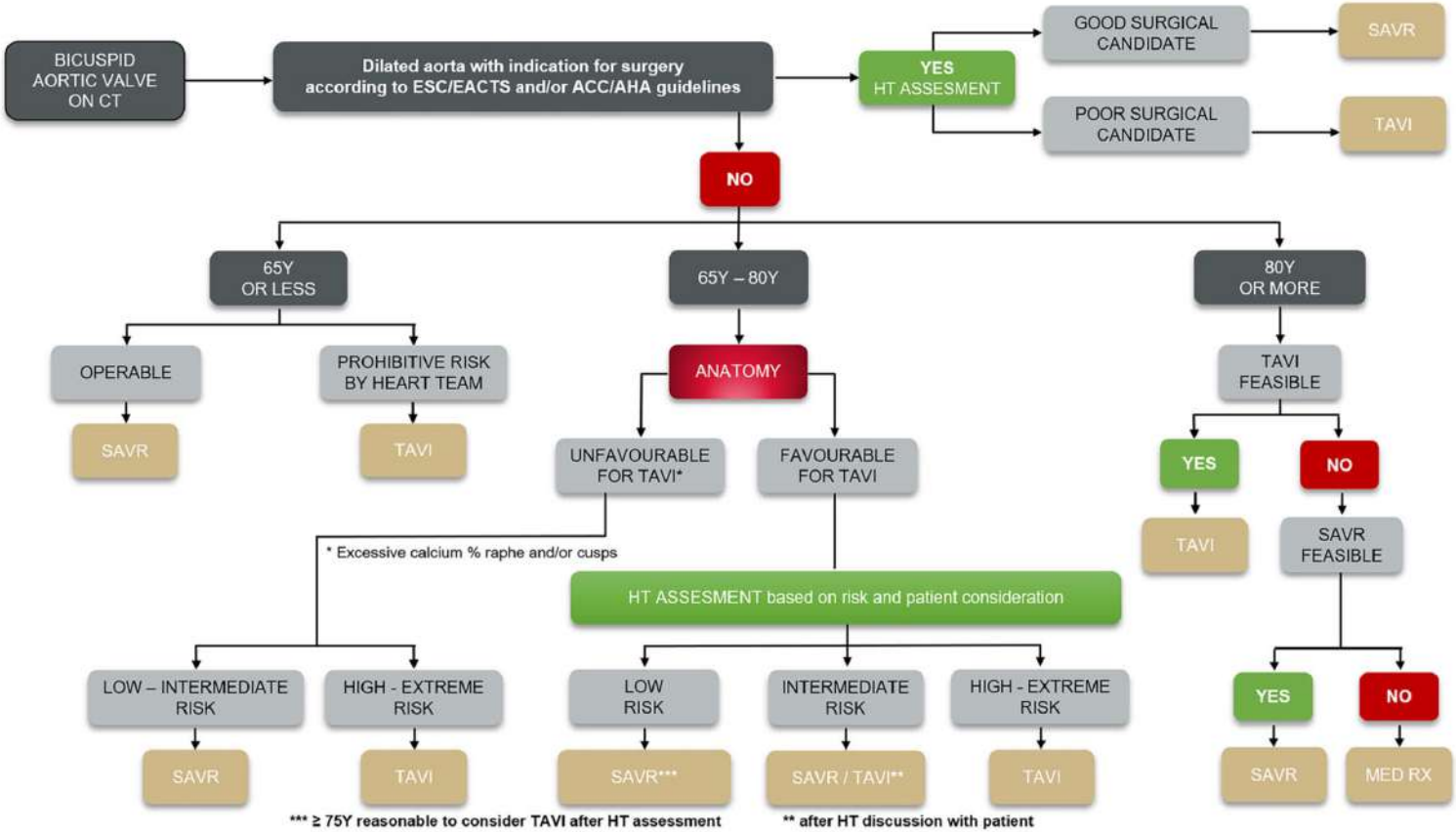
Postdilation



Final angio

Courtesy of Dr X

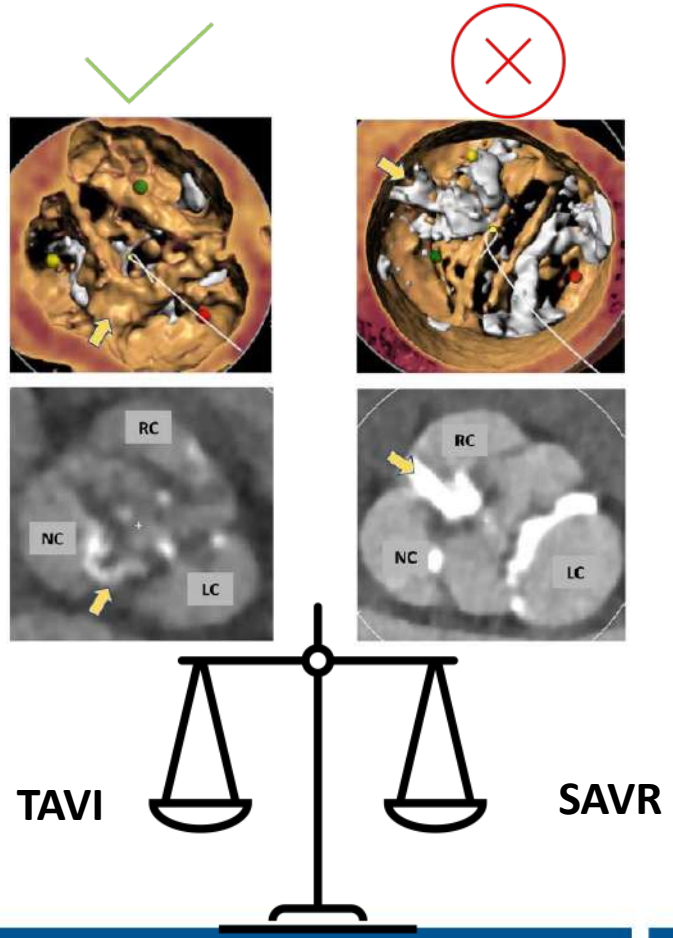
Decision tree TAVR vs SAVR



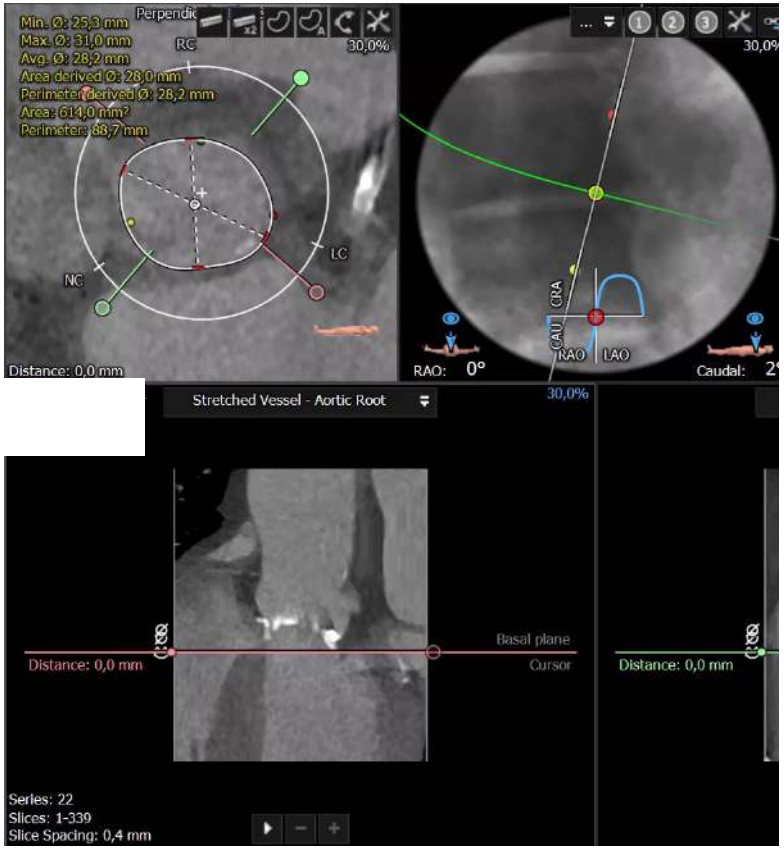
Blackman, Tchetche et al, Cardio Ther 2021

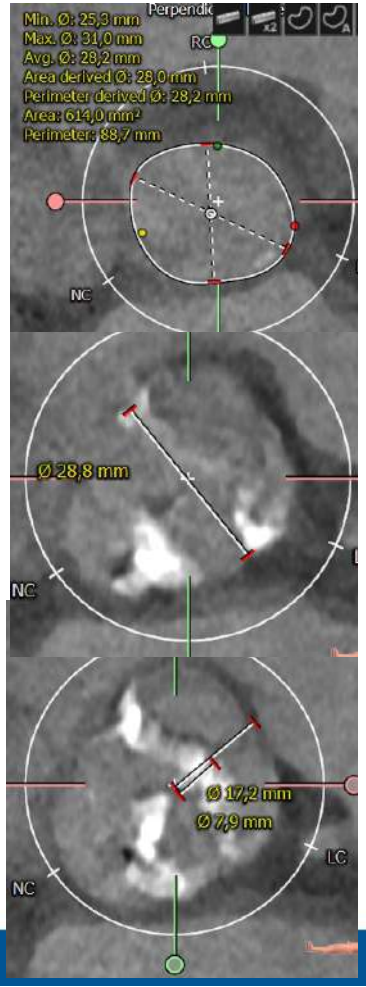
Weight of anatomical complexity to choose between TAVR and SAVR

Favorable for transcatheter aortic valve replacement	Favorable for surgical aortic valve replacement
Tricommissural bicuspid aortic valve with incomplete raphe (Incomplete or acquired Type 1 Sievers)	Sievers type 1 with heavily calcified raphe and excess leaflet calcification
Sievers type 1 with noncalcified raphe or incomplete raphe	Sievers type 2
Sievers type 0 (if circularity preserved)	Extreme elliptic shape
Annulus dimensions within transcatheter heart valve sizing range	highly calcified leaflet
Homogenous and moderate calcified leaflets	Circumferential calcifications
Absence of aortopathy or aorta dimension <45 mm (50 mm in high-risk patients)	Highly calcified left ventricular outflow tract
	Low calcium burden and large annulus (mixed aortic regurgitation and aortic stenosis)
	Shallow/effaced sinus and long calcified leaflet or low coronary takeoff
	Anomaly of coronary implantation

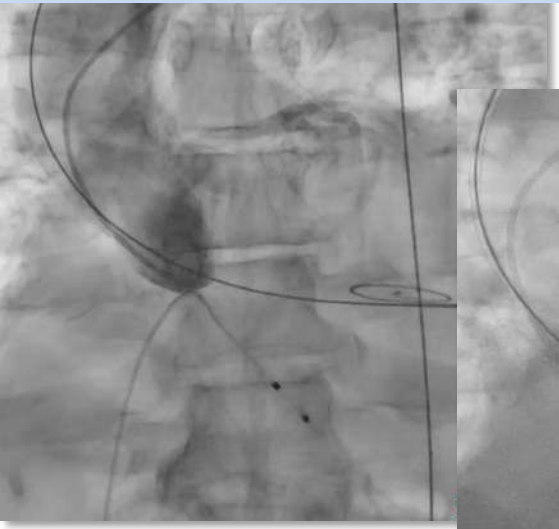


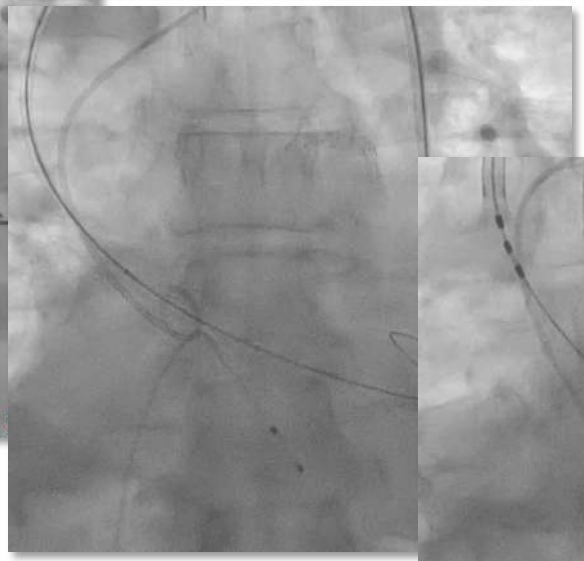
Vincent F, Ternacle J, et al. Circulation 2021





- Annulus sizing (flared)
- High Calcium volume 486mm^3
- No calcified Raphe
- Horizontal aorta

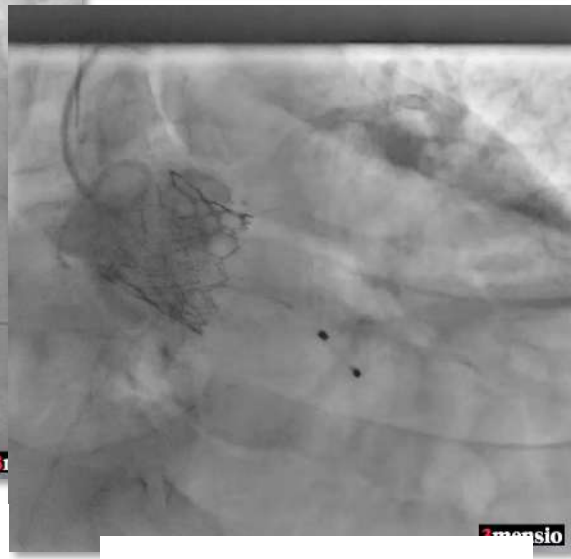




Prédilatation ballon 20mm+1mL

SAPIEN 3 29mm

Cusp overlap technique

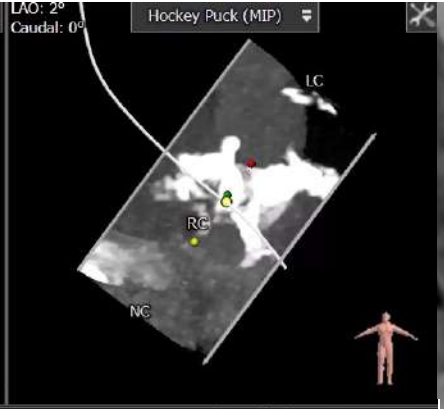


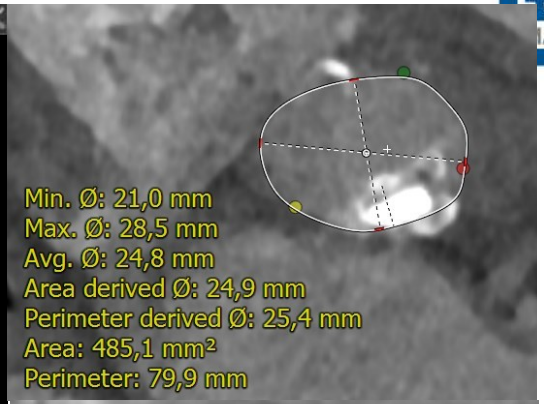
No PVL, MG 9mmHg

Type 1 L/R


Min. Ø: 21,0 mm
Max. Ø: 28,5 mm
Avg. Ø: 24,8 mm
Area derived Ø: 24
Perimeter derived
Area: 485,1 mm²
Perimeter: 79,9 m

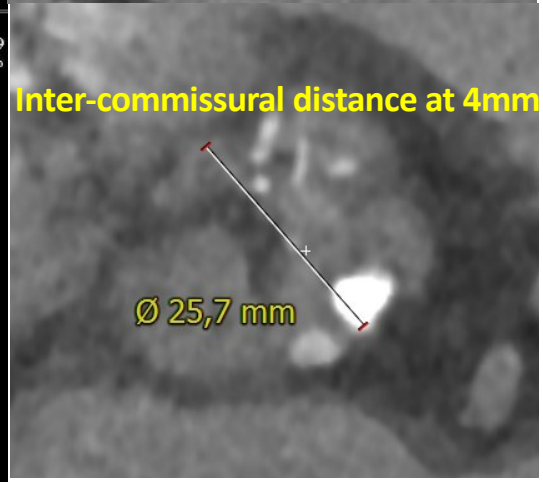

Angio
CRA
CAU
RAO
LAO
LAO: 1°
Caudal: 1°

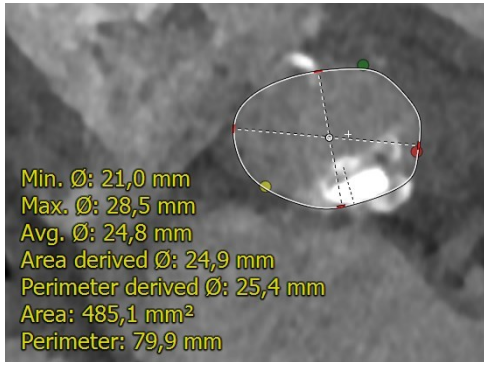

LAO: 2°
Caudal: 0°
Hockey Puck (MIP)
LC
RC
NC


Min. Ø: 21,0 mm
Max. Ø: 28,5 mm
Avg. Ø: 24,8 mm
Area derived Ø: 24,9 mm
Perimeter derived Ø: 25,4 mm
Area: 485,1 mm²
Perimeter: 79,9 mm


Stretched Vessel
Basal plane
Cursor


Stretched Vessel
Cor FI_ChestPain 0.75 I26...
06/02/2019
Phase: 7,0%
Basal plane
Distance: 0,3 mm
Cursor
3mensio


Inter-commissural distance at 4mm
Ø 25,7 mm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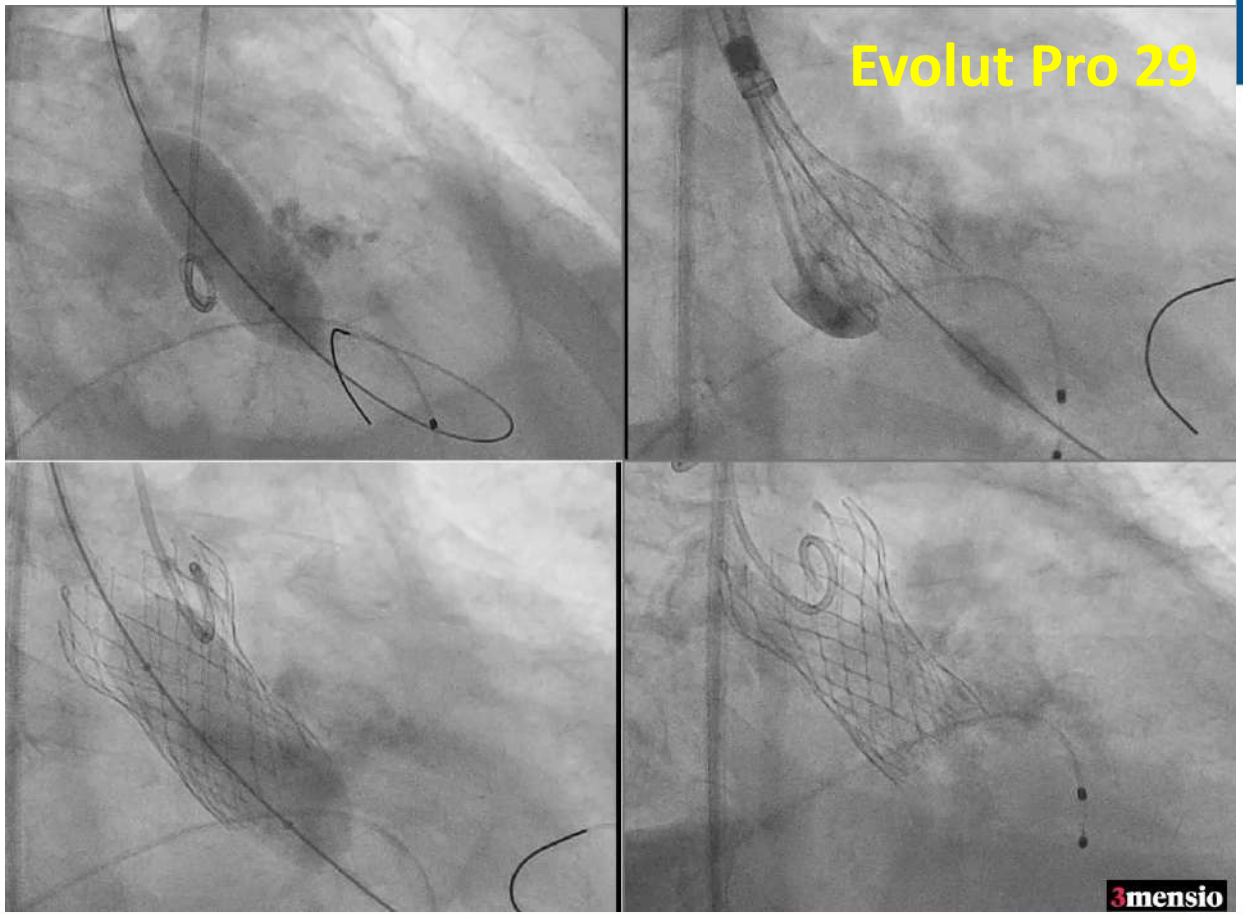

Evolut Pro 29
3mensio

BE or SE-valve ?

VS

Device success, 1-year mortality : Similar

Paravalvular regurgitation

- Low but higher ≥ moderate PVR with vs SE-valve (9.3% vs 0%, p=0.043)

Annulus injury

- Higher with BE-valve (OR: 5.81 [3.78; 8.92])

New Pacemaker

- Higher with SE-valve (STS registry : 15.4% with Evolut and 9.1% with SAPIEN 3)

Mangieri et al, Circulation intervention, 2020
Montaldo et al, JACC 2021
Pompeu et al, CCI 2021

BE or SE-valve ?

CIHR IRSC
Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

MINISTÈRE DES SOLIDARITÉS ET DE LA SANTÉ
Liberté
Égalité
Fraternité

PHRC-N 2020

BEST Study

Patients eligible to percutaneous transfemoral TAVI either with BE-valve or SE-valve

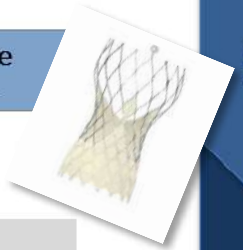
1862 Patients 1:1 Randomized

Stratification sur anatomie (BAV vs TAV)

BE-Valve
N=931

Versus

SE-Valve
N=931



Primary endpoint : all-cause death at 90 days

Secondary endpoints including all-cause death at 12 months

Screening Consent

Randomization

TAVI

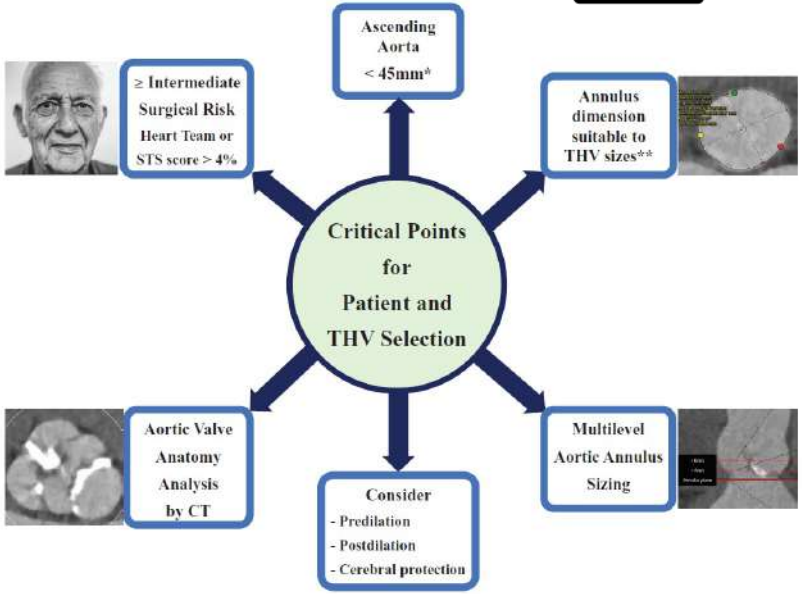
Follow-up

Centre Hospitalier Régional Universitaire de Lille

UNIVERSITÉ LAVAL

Conclusion

#NotAllBicuspid !



- Be able to analyze pro-procedural CT / detect bicuspid anatomy
- Be aware of bicuspid specificities
- Beware of most calcified leaflets / raphe
- To prevent complications / troubleshoot difficulties
- More studies are warranted to better delineate the best TAVR/SAVR candidates

Vincent F, Ternacle J, et al. Circulation 2021