



# TAVR vs SAVR in Young Patients -Surgeon's Perspective-

Tsuyoshi Kaneko

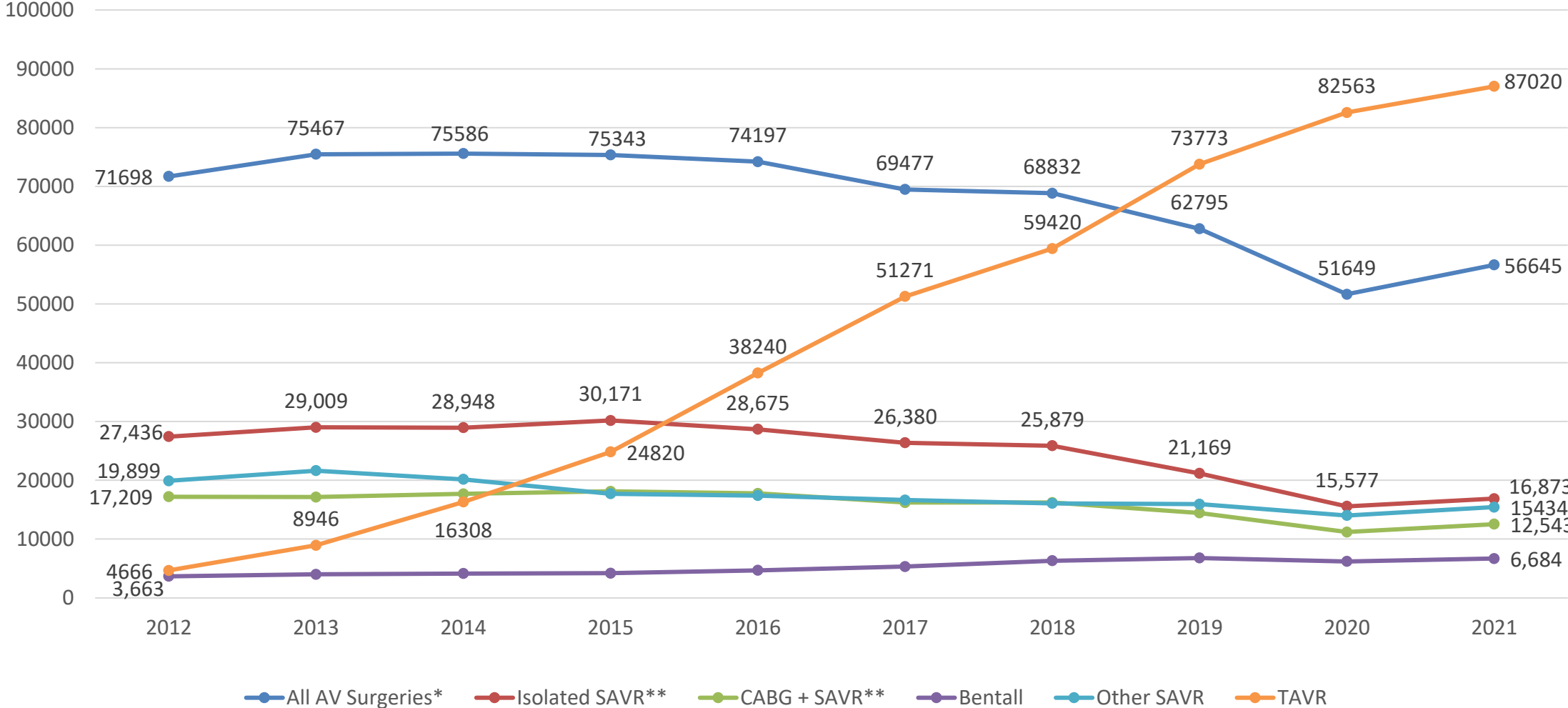
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**BARNES JEWISH**  
*Hospital*  
BJC HealthCare

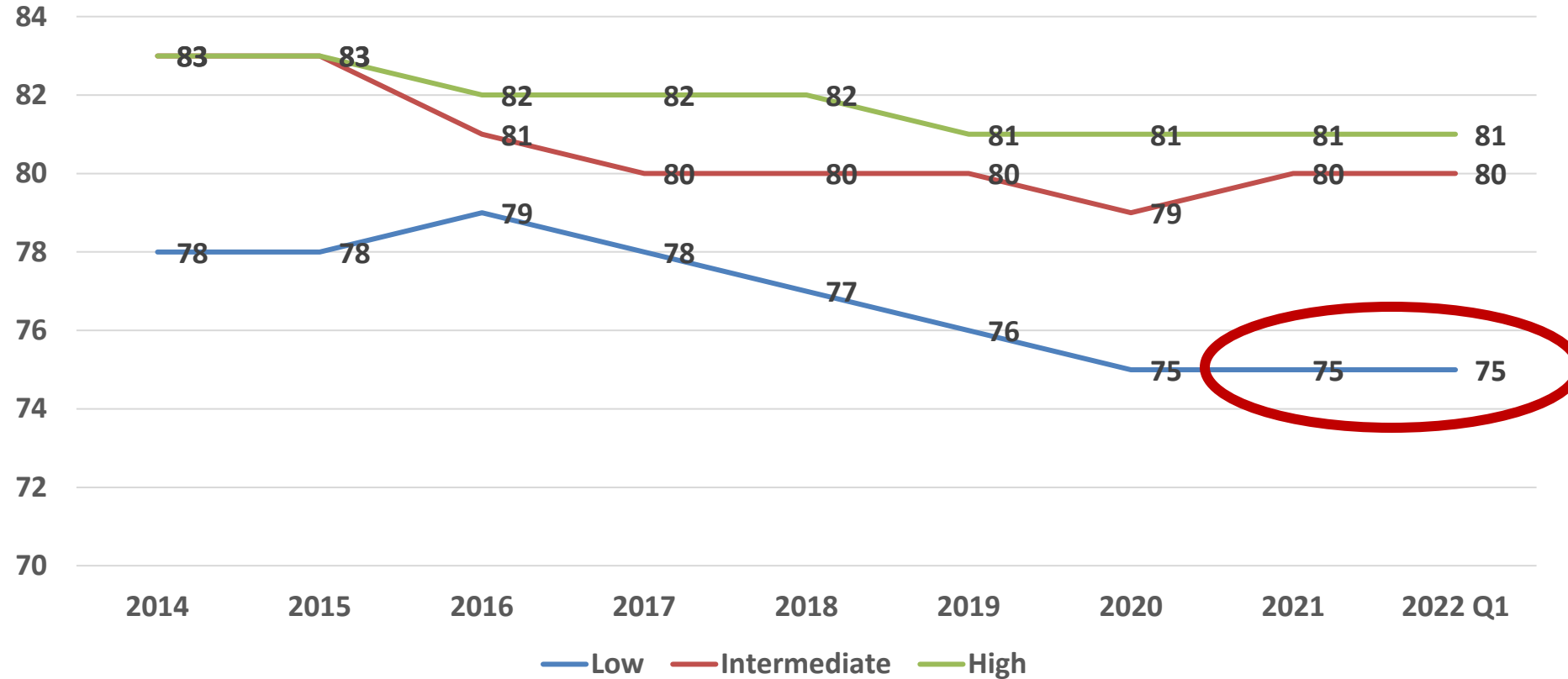
 **Washington**<sup>®</sup>  
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# SAVR TAVR Universe Slide 2012-2021



# TAVR Median Age



Source: STS/ACC TVT Registry Database



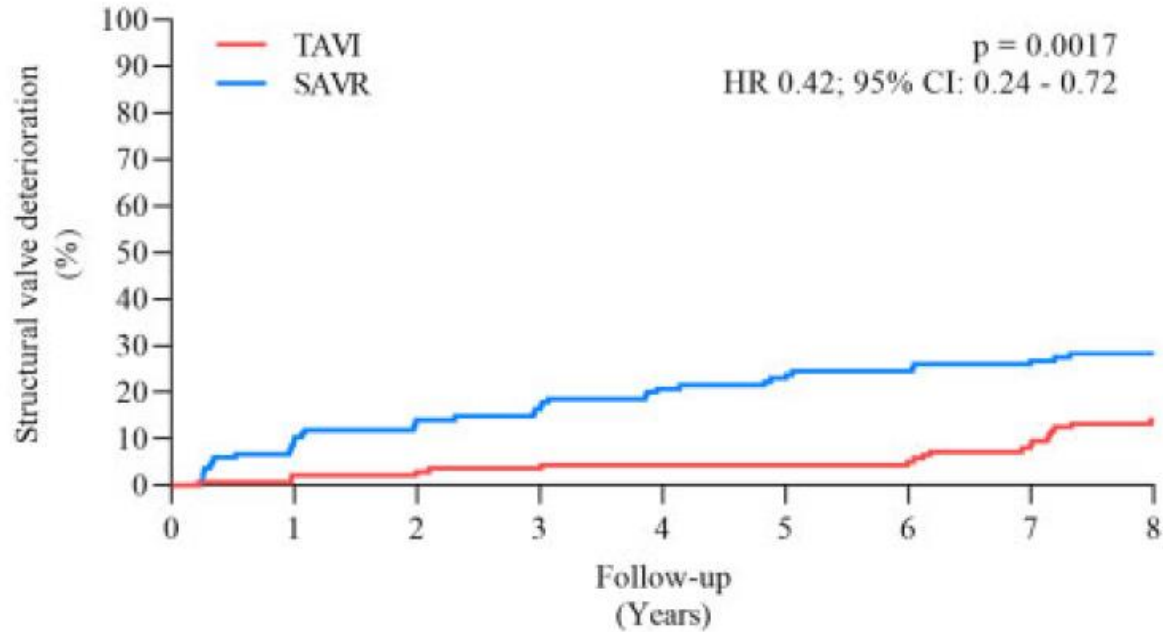
# Durability: NOTION 8-year outcome

## Structural Valve Deterioration

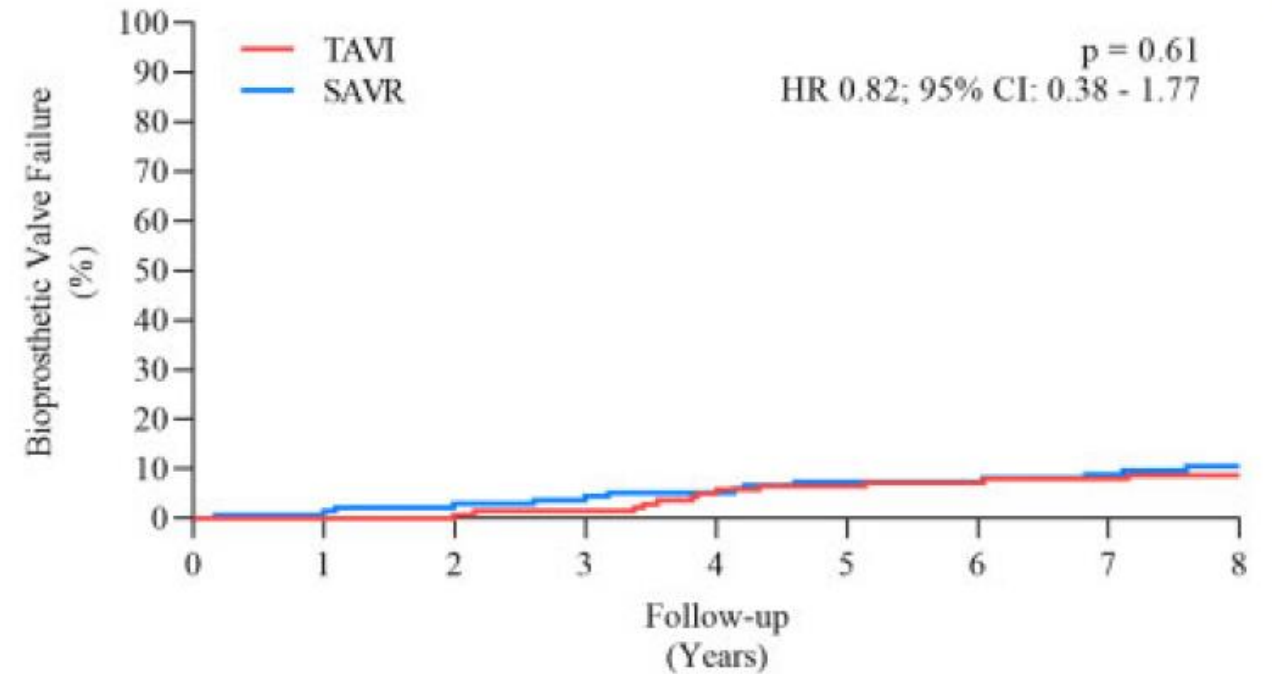
- 1)  $MG \geq 20$  OR  $\uparrow 10$
- 2) Mod PPM
- 3) BV Thrombosis
- 4) Endocarditis

## Bioprosthetic Valve Failure

- 1) Valve related Death
- 2) Hemodynamic severe SVD
- 3) AV Reintervention



TAVI	145	130	126	115	107	94	80	68	50
SAVR	135	113	105	97	84	75	62	54	40



TAVI	145	133	128	118	109	96	82	73	60
SAVR	135	125	121	113	103	94	82	73	55

SAVR

TAVR

# 1. Exclusion Criteria from RCT



## Key Exclusion Criteria

### Anatomic

- Aortic annulus diameter  $< 16$  mm or  $> 28$  mm (3D imaging)
- Bicuspid valve (CT imaging)
- Severe AR ( $> 3+$ ) or MR ( $> 3+$ )
- Severe LV dysfunction (LVEF  $< 30\%$ )
- Severe calcification of aortic valvar complex (esp. LVOT)
- Vascular anatomy not suitable for safe femoral access
- Complex CAD: ULM, Syntax score  $> 32$ , or not amenable for PCI
- Low coronary takeoff (high risk for obstruction)

### Clinical

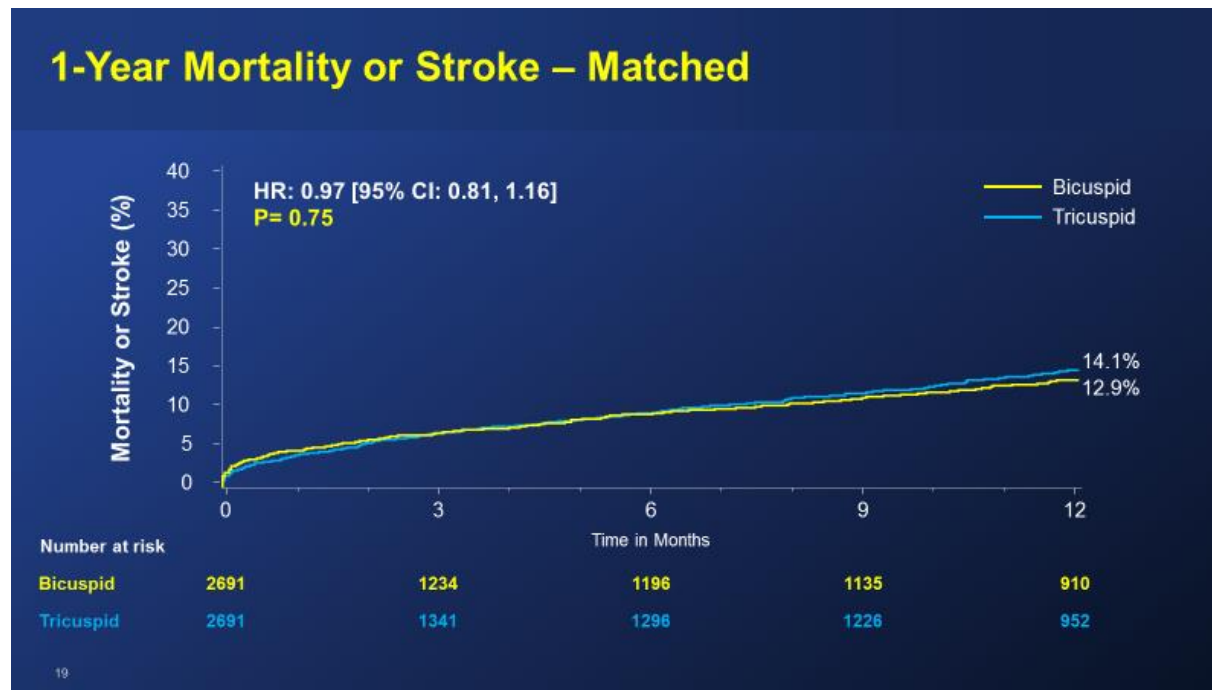
- Acute MI within 1 month
- Stroke or TIA within 90 days
- Renal insufficiency (eGFR  $< 30$  ml/min) and/or renal replacement Rx
- Hemodynamic or respiratory instability
- Frailty (objective assessment;  $> 2/4+$  metrics)

# TAVR in Bicuspid Aortic Valve

JAMA | Preliminary Communication

## Association Between Transcatheter Aortic Valve Replacement for Bicuspid vs Tricuspid Aortic Stenosis and Mortality or Stroke

Raj R. Makkar, MD; Sung-Han Yoon, MD; Martin B. Leon, MD; Tarun Chakravarty, MD; Michael Rinaldi, MD; Pinak B. Shah, MD; Eric R. Skipper, MD; Vinod H. Thourani, MD; Vasilis Babaliaros, MD; Wen Cheng, MD; Alfredo Trento, MD; Sreekanth Vemulapalli, MD; Samir R. Kapadia, MD; Susheel Kodali, MD; Michael J. Mack, MD; Gilbert H. L. Tang, MD, Msc, MBA; Tsuyoshi Kaneko, MD



Makkar, Kaneko et al. JAMA 2019

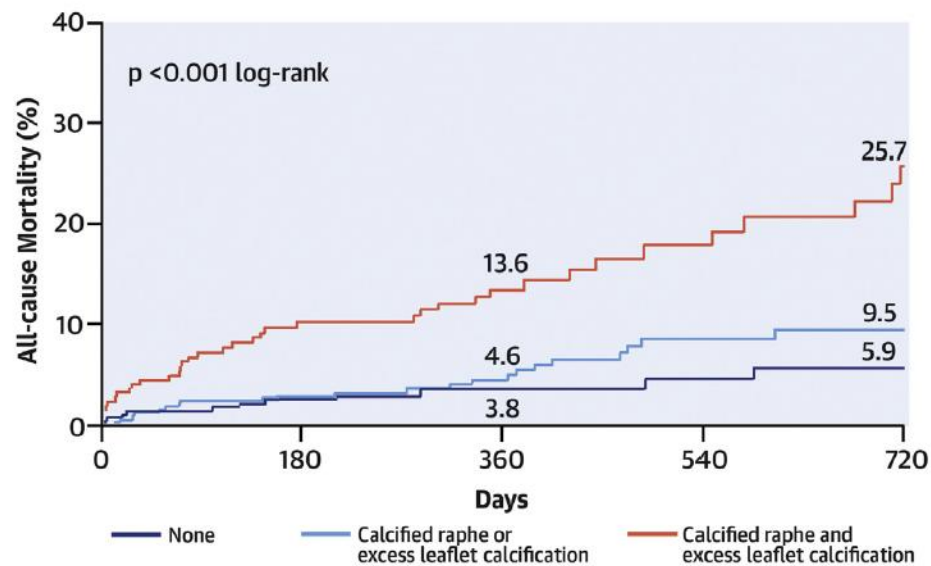
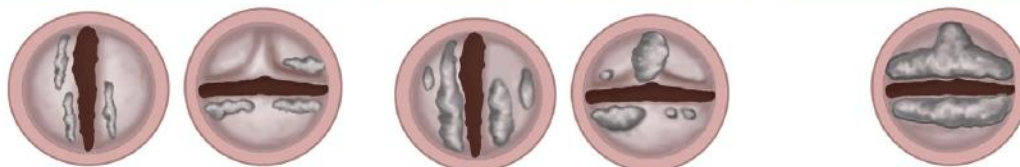
# TAVR in Bicuspid Aortic Valve

## Death From Any Cause, According to Morphological Features

No Calcified Raphe or  
Excess Leaflet  
Calcification  
(31.3%)

Calcified Raphe or  
Excess Leaflet  
Calcification  
(42.6%)

Calcified Raphe Plus  
Excess Leaflet  
Calcification  
(26.0%)

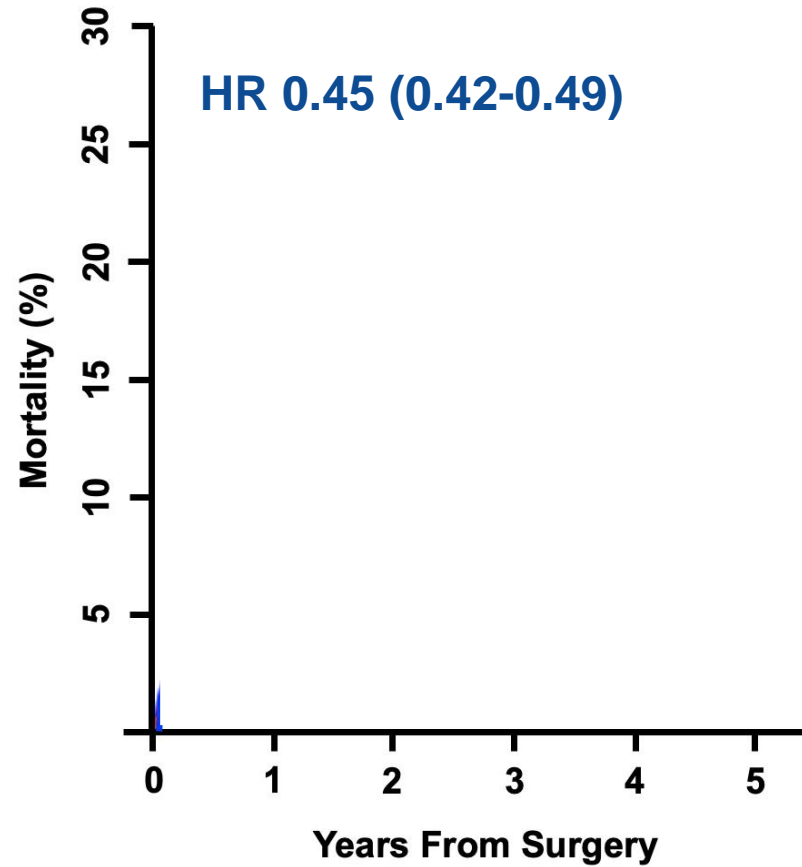


Yoon, S.-H. et al. J Am Coll Cardiol. 2020;76(9):1018-30.

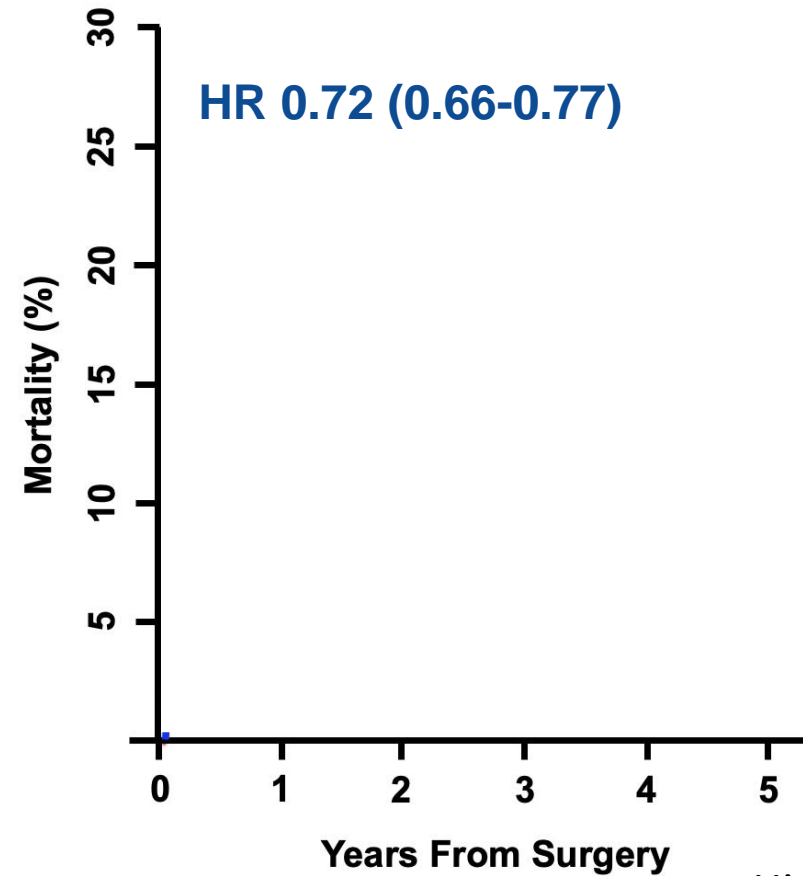


# SAVR in Bicuspid Aortic Valve

Unadjusted Curves



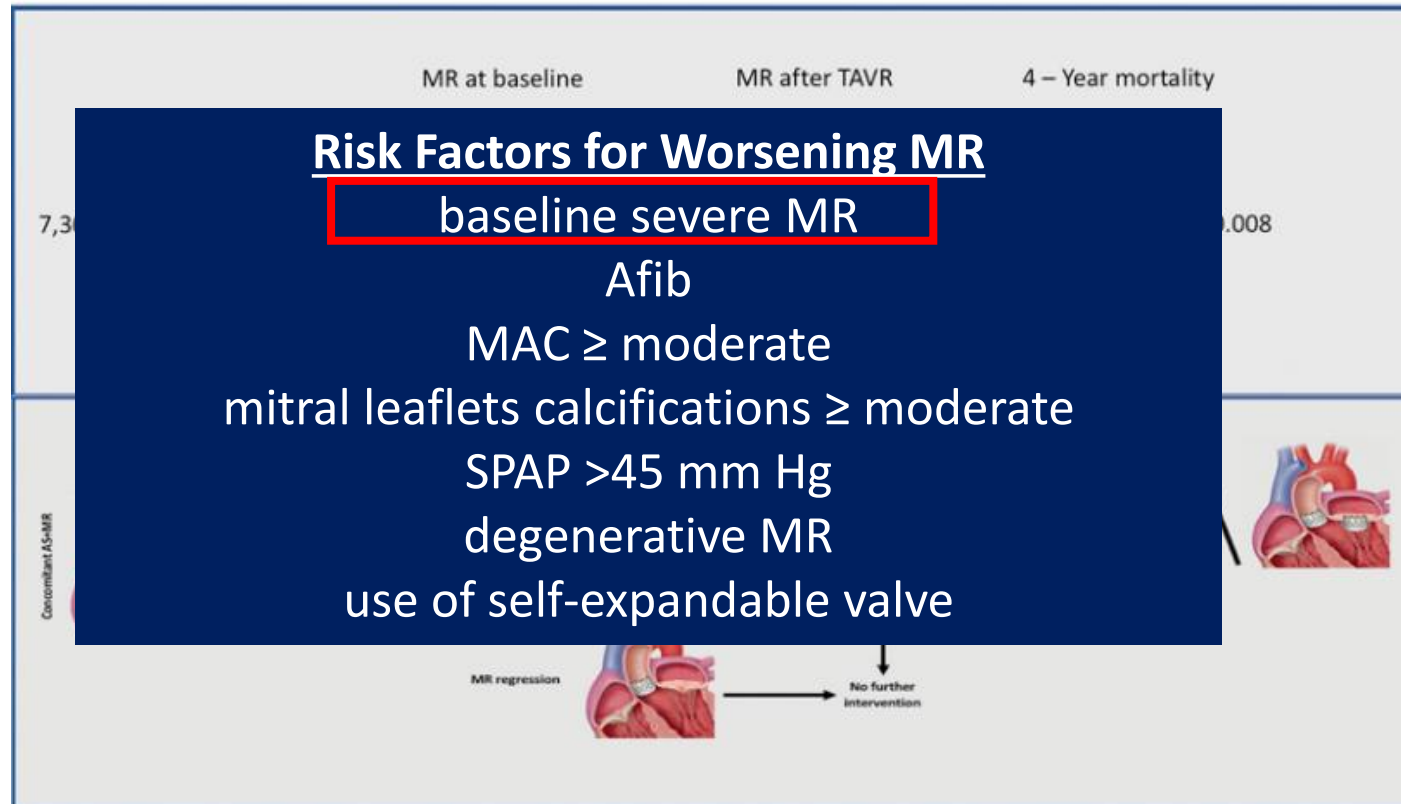
Risk-Adjusted Curves



Hirji, Kaneko et al. STS2022

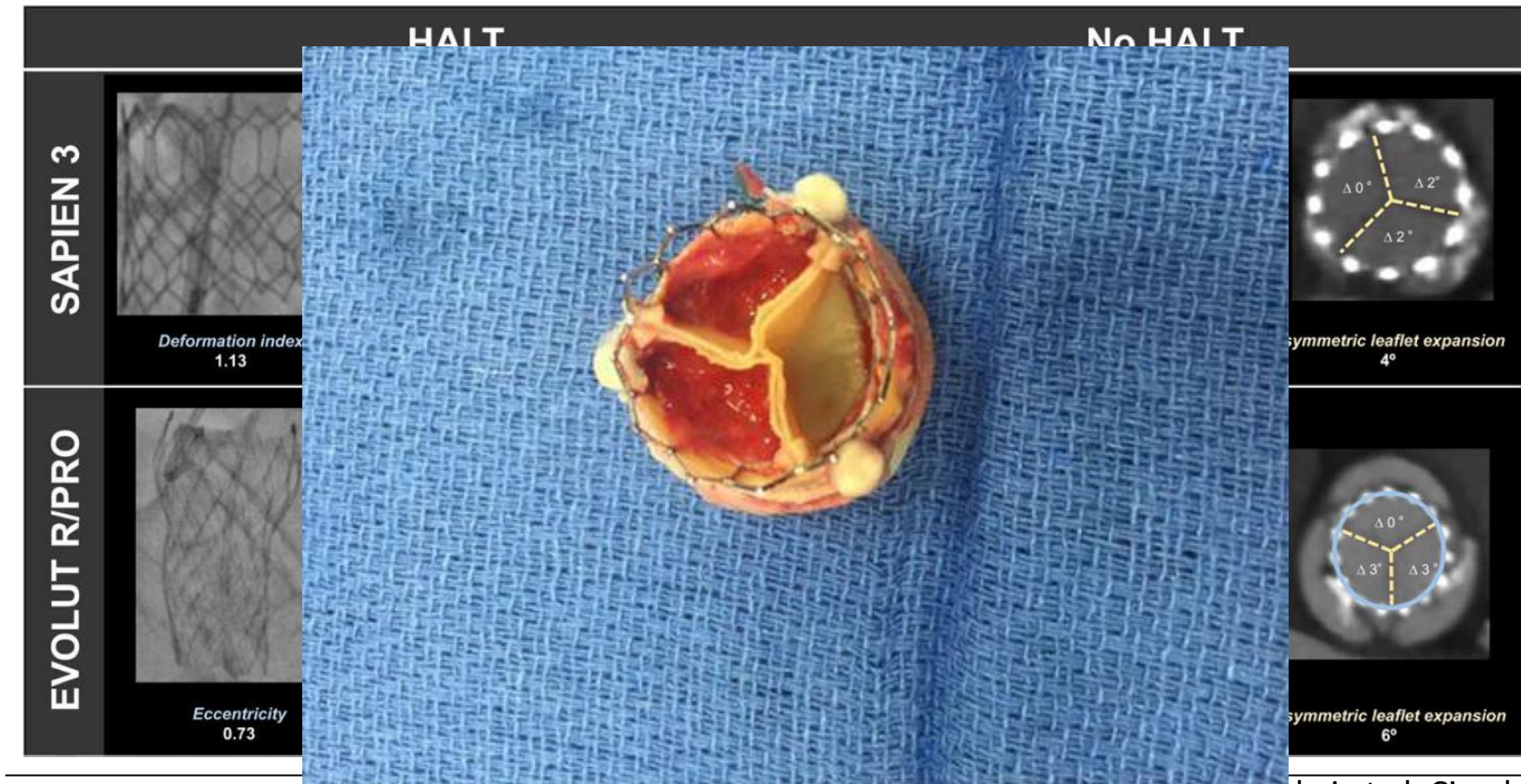
# Fate of MR after TAVR

**CENTRAL ILLUSTRATION: Outcomes of 7,303 Patients With Matched Baseline and Post-TAVR MR in 16 European Centers Between 2007 and 2019**



Witberg, G. et al. J Am Coll Cardiol Intv. 2021;14(11):1181-92.

## 2. HALT after asymmetric expansion



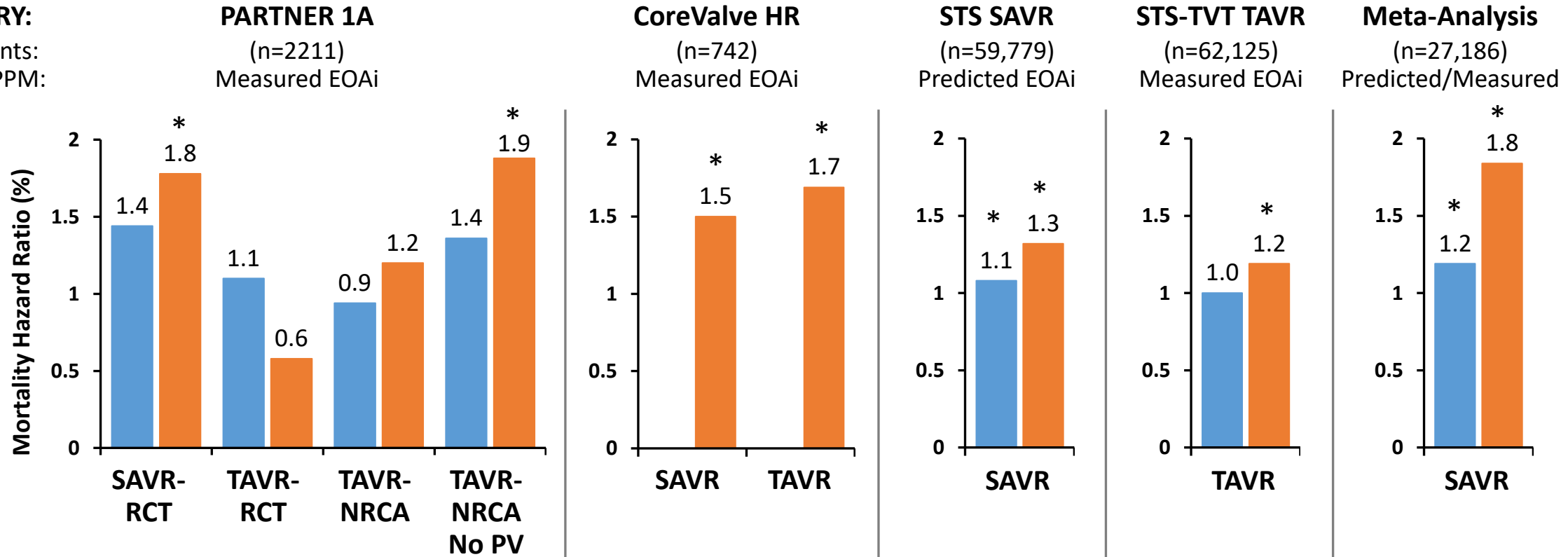
Fukui et al. Circulation 2022

# 3. Patient Prosthesis Mismatch

■ Moderate PPM     ■ Severe PPM

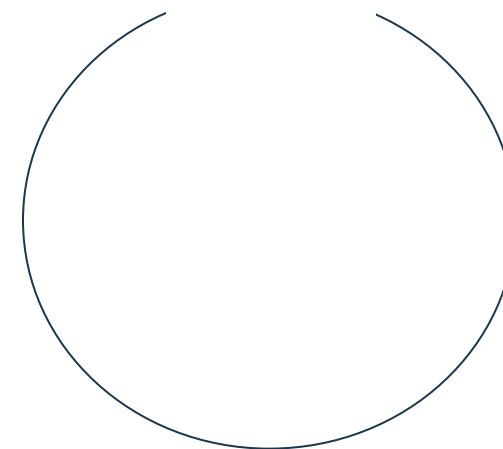
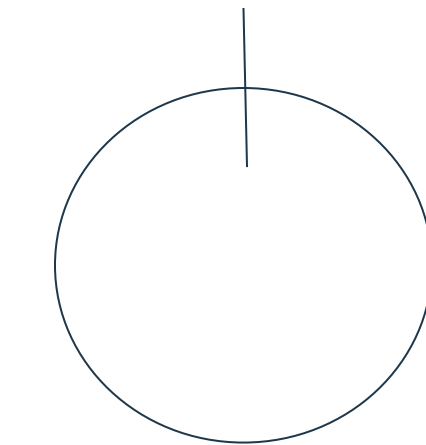
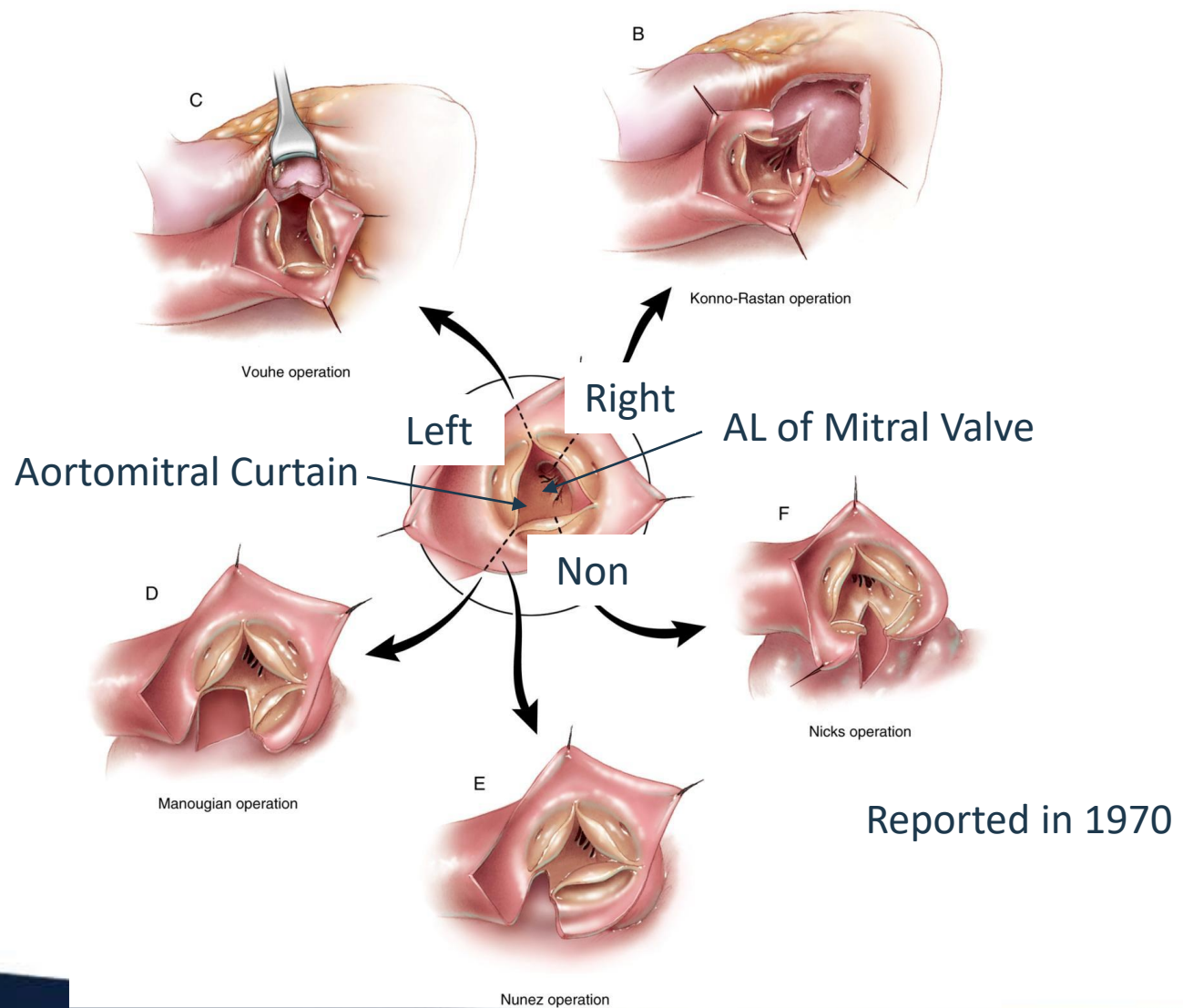
## TRIAL/REGISTRY:

Number of patients:  
 DEFINITION OF PPM:



\* Significant association between PPM and mortality

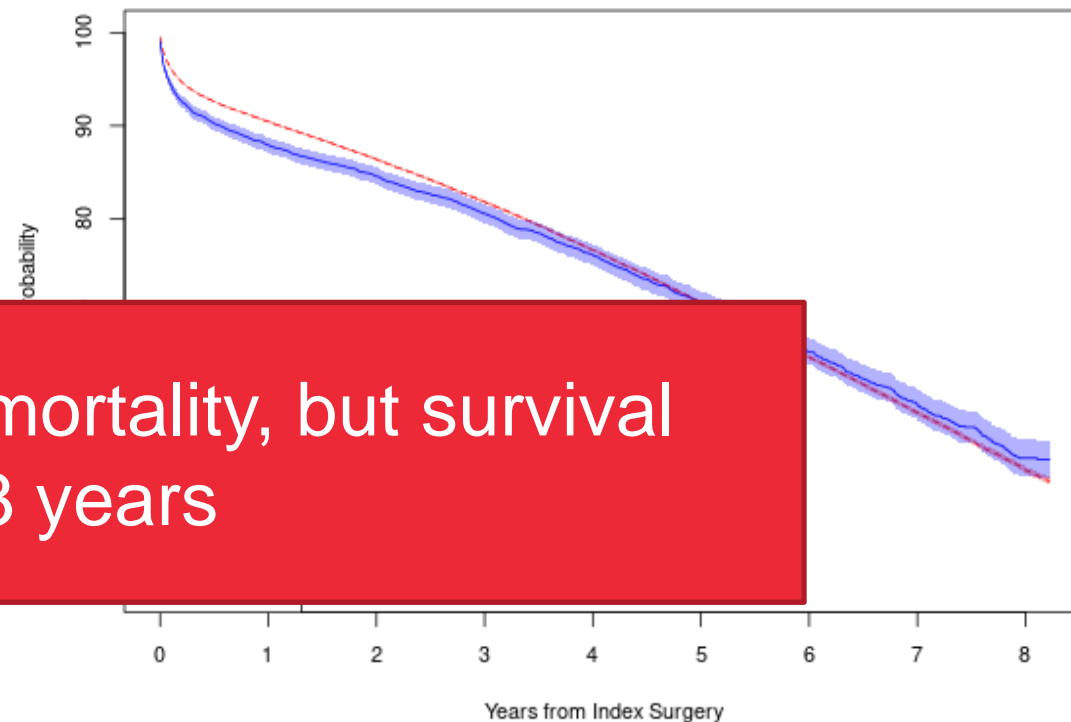
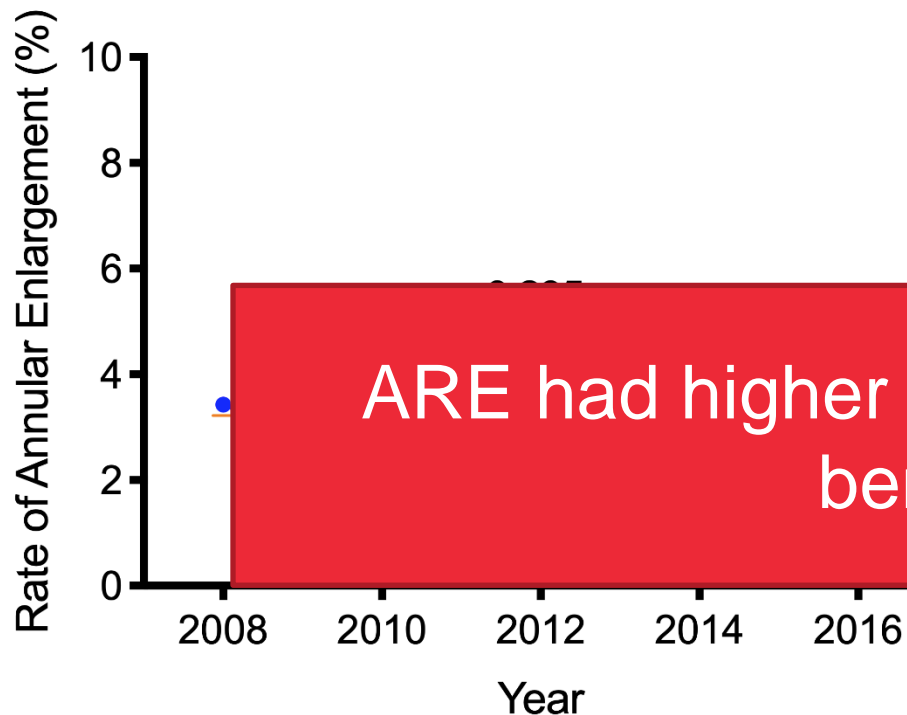
# Aortic Root Enlargement Techniques



Reported in 1970

# Outcomes of Surgical Root Enlargement (STS)

Yearly Trend In Annular Enlargement

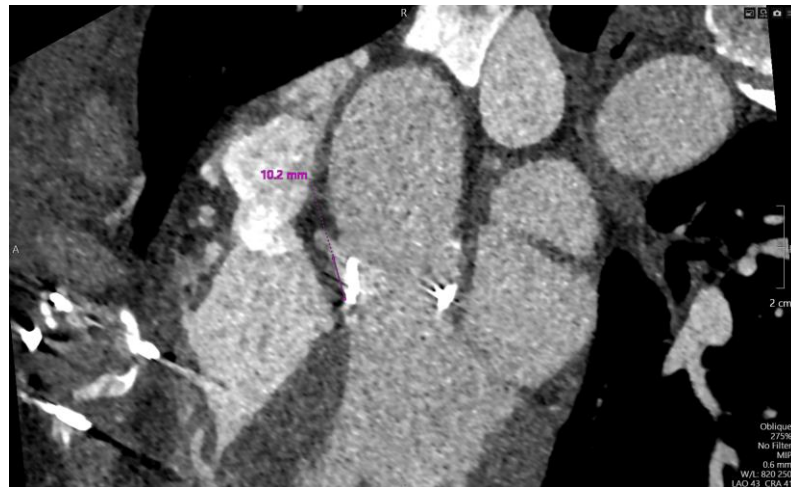


ARE had higher operative mortality, but survival benefit after 3 years

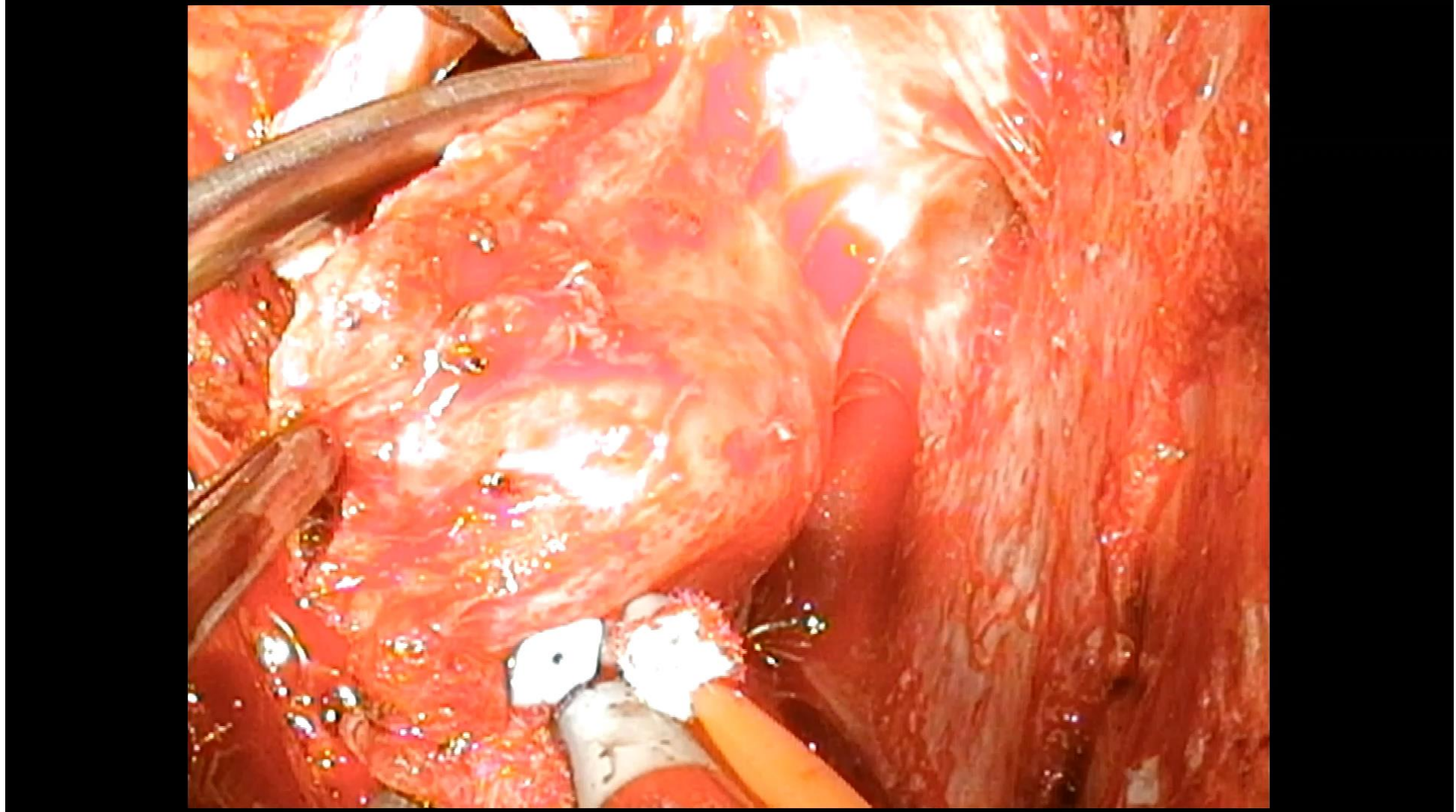
	OR* (95% CI)	P-Value	AOR** (95% CI)	P-value
Operative Mortality	1.59(1.41 - 1.80)	<0.0001	1.55 (1.37 - 1.75)	<0.0001
Major Morbidity	1.30(1.22 - 1.39)	<0.0001	1.32 (1.23 - 1.40)	<0.0001
Composite	1.34(1.25 - 1.43)	<0.0001	1.35 (1.26 - 1.45)	<0.0001
Pacemaker/ICD	1.00(0.85 - 1.18)	0.962	1.01 (0.86 - 1.20)	0.863

	HR# (95% CI)	P-Value	AHR## (95% CI)	P-value
Survival (First 3 Years)	1.14 (1.07 - 1.22)	0.002	1.1 (1.02 - 1.19)	0.015
Survival (After Year 3)	0.91 (0.84 - 0.99)	0.024	0.94 (0.87 - 1.02)	0.127

# Resurging interest in Surgical Root Enlargement

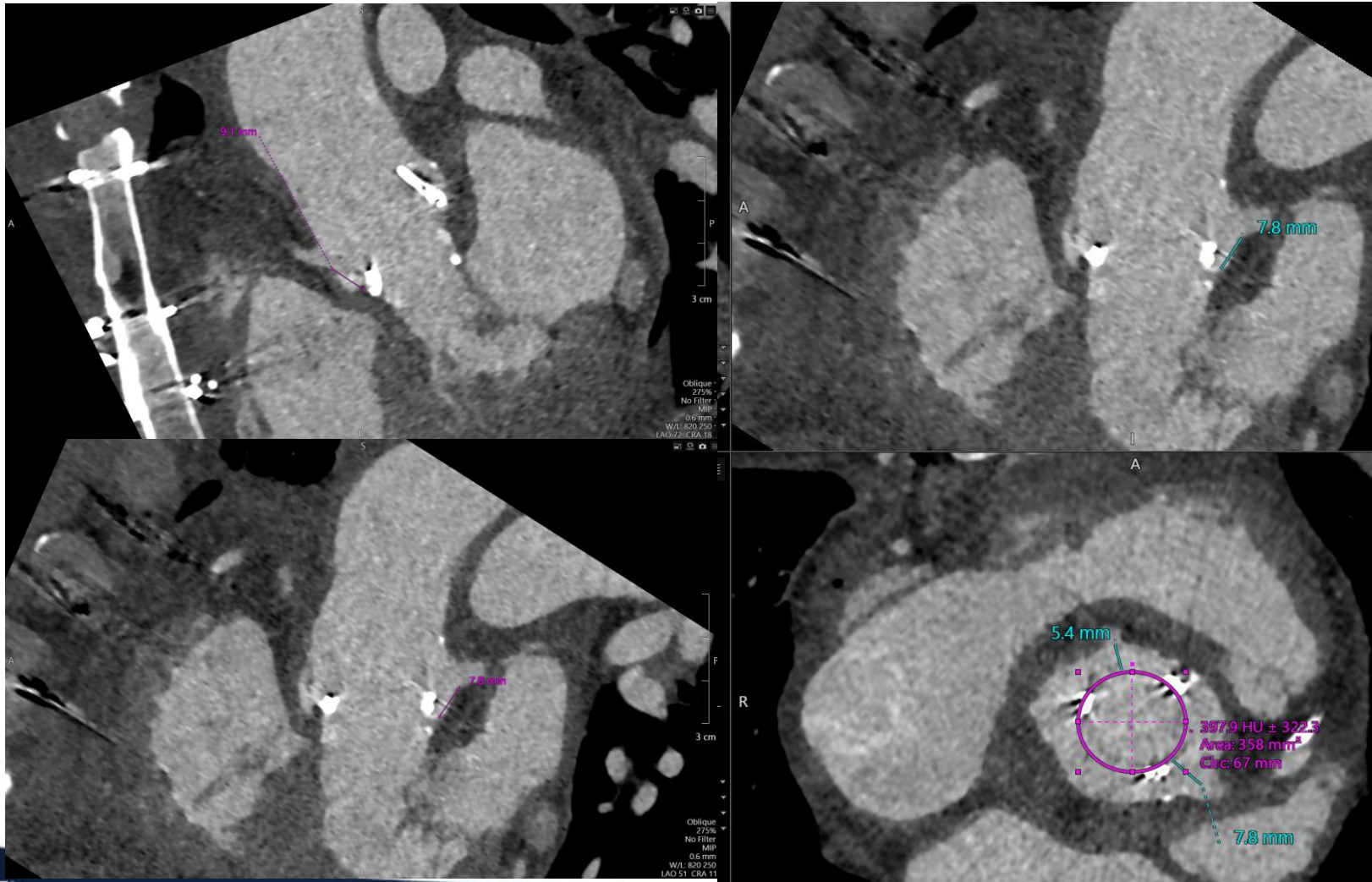


# Redo Surgical Root Enlargement (25mm Magna)



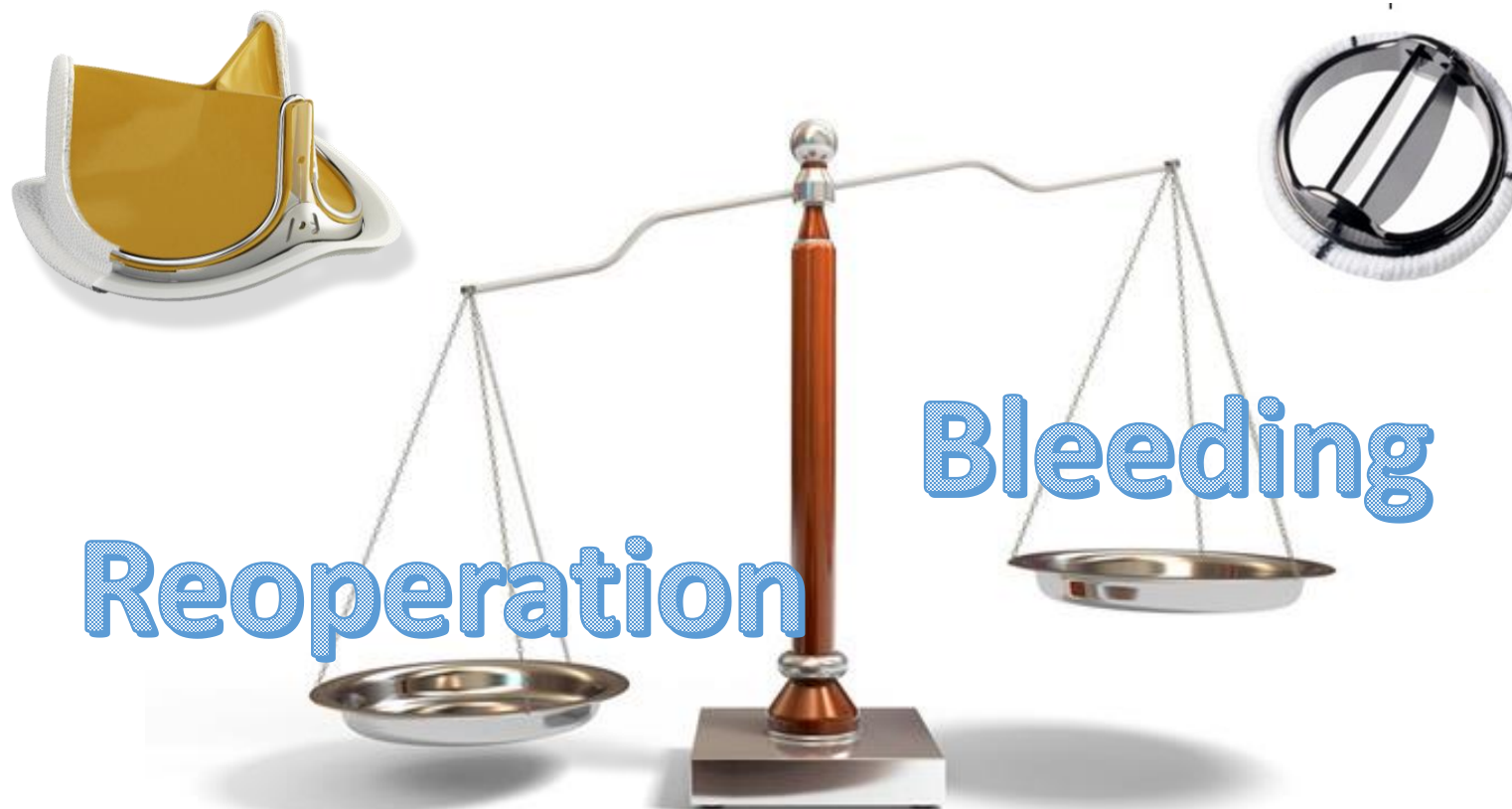


# CT scan after Surgical Root Enlargement

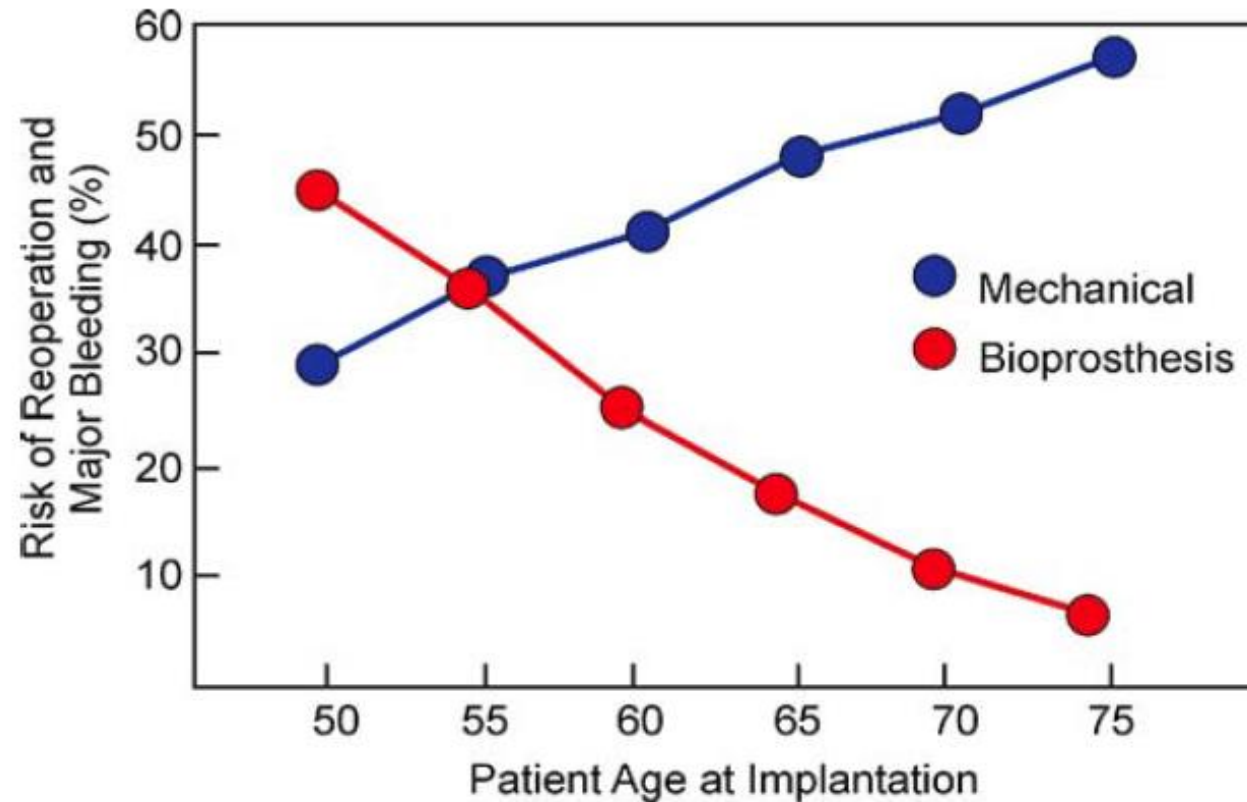


Preop	Postop
Coronary	
R 11.2	9.1
L 10.4	7.8
VTC	
R 2.6	5.4
L 5.0	7.8

## 4. Choice of Mechanical Valve



# The risk of reop/bleeding cross at age 55



Geldorp et al. J Thorac Cardiovasc Surg. 2009

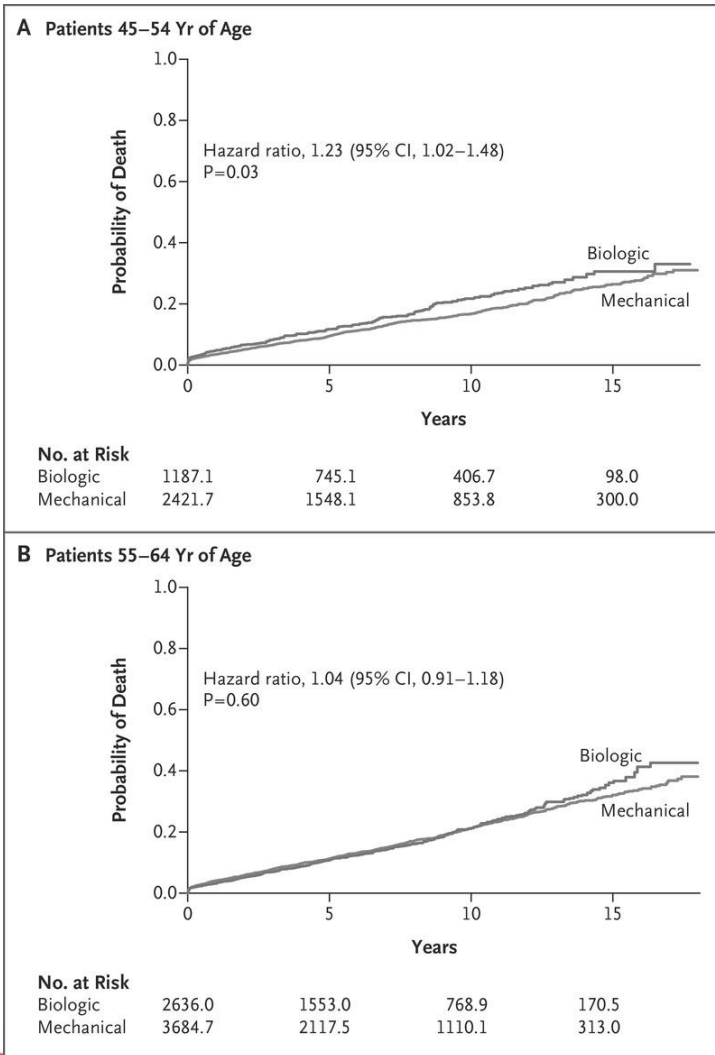
# Mechanical valve vs Bioprosthetic Valve

California State Database from 1996-2013

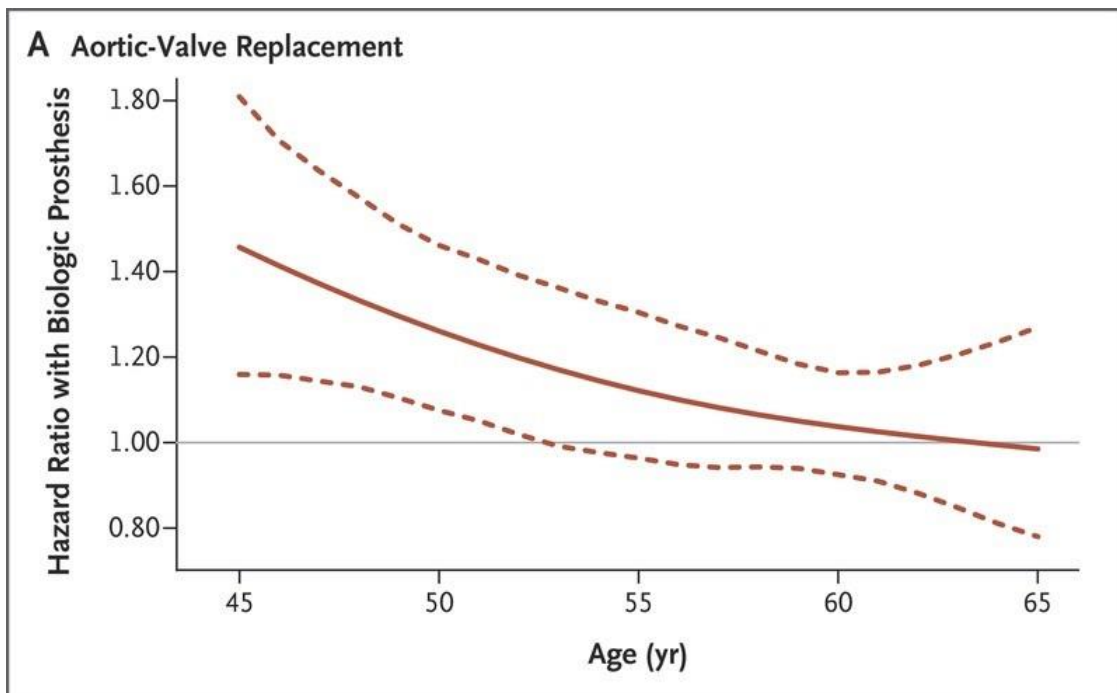
9942 isolated AVR

For Age 45-54, Mechanical valve had lower mortality than Bioprosthetic valve

Goldstein et al. NEJM 2017



# Mortality benefit of mechanical valve



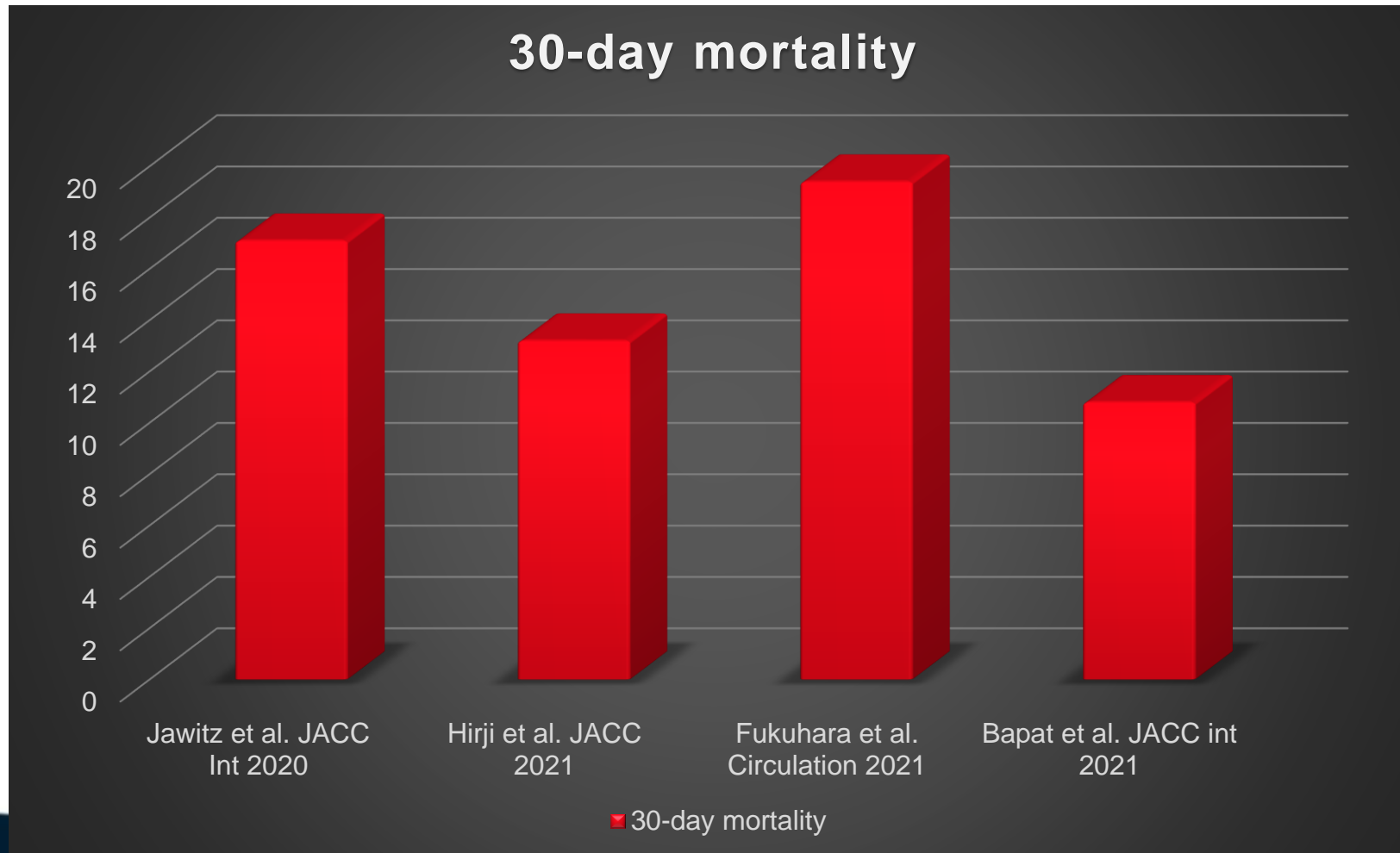
Relative mortality benefit with mechanical valves persisted until approximately **53 year-olds**

**Data until 2013- no VIV-TAVR**

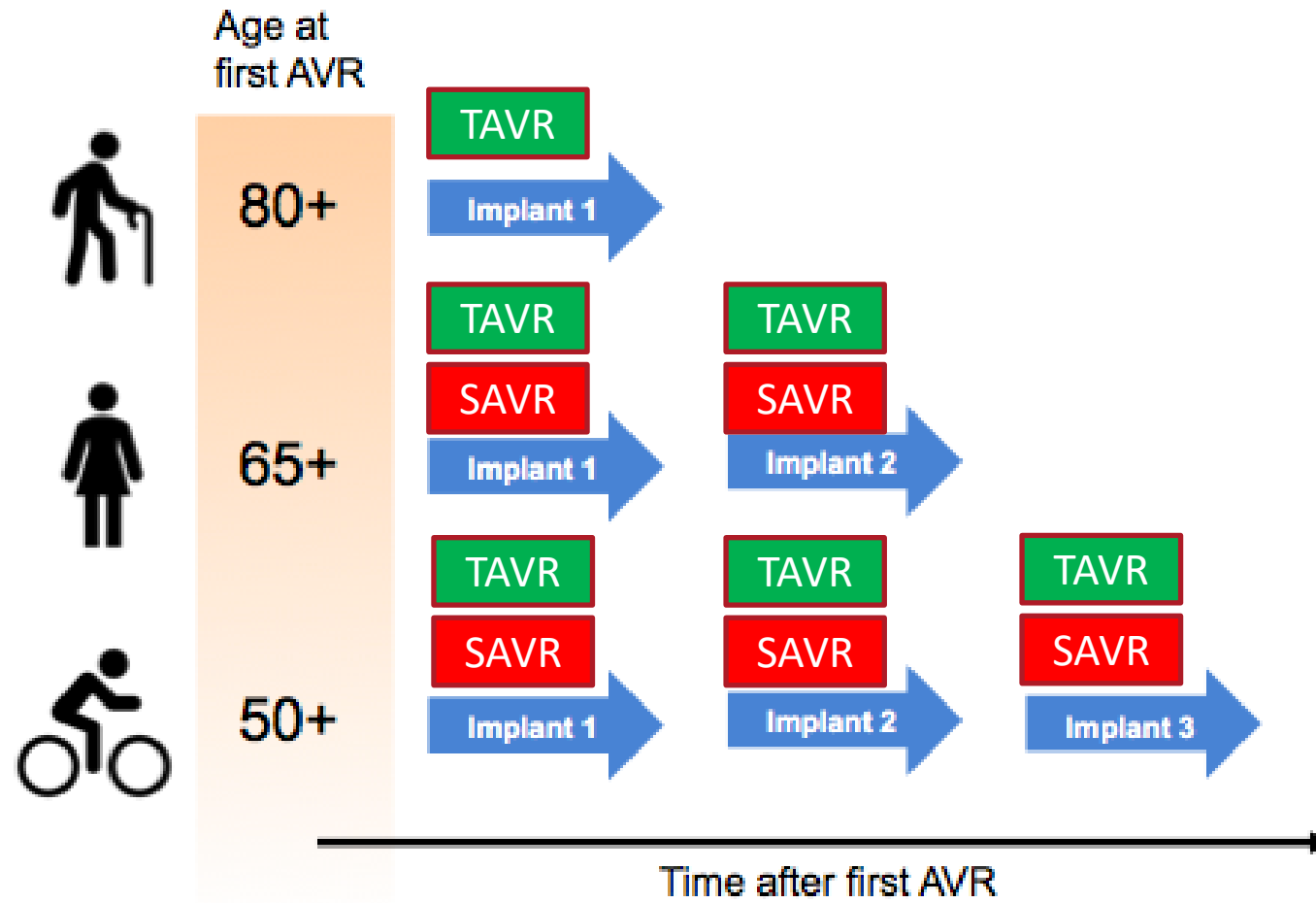
Goldstein et al. NEJM 2017

# 5. Concerns about TAVR Explant

## 1. TAVR Explant has high mortality



# Why is TAVI Explant so important?



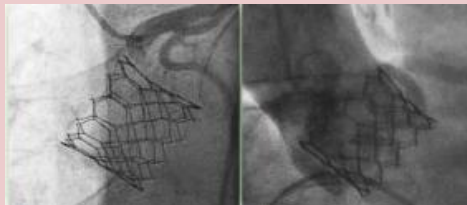
**SAPIEN 3/ULTRA**  
N = 72

**EVOLUT R/PRO**  
N = 26

**ACURATE NEO**  
N = 39

TAV-in-TAV  
feasible  
(40.9%)

CA above RP



68.1%

CA above RP



19.2%

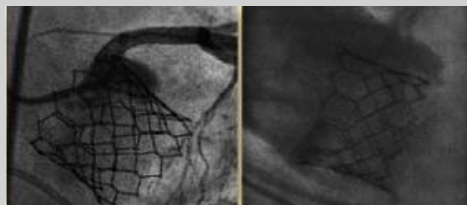
CA above RP



5.1%

TAV-in-TAV  
theoretically  
feasible  
(27.7%)

CA above RP – VTA > 2 mm



8.3%

CA above RP – VTA > 2 mm



42.3%

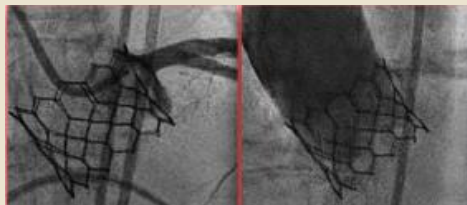
CA above RP – VTA > 2 mm



53.8%

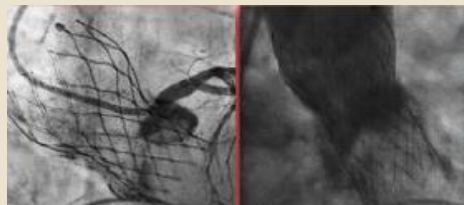
TAV-in-TAV  
unfeasible  
(31.4%)

CA above RP – VTA ≤ 2 mm



23.6%

CA above RP – VTA ≤ 2 mm



38.5%

CA above RP – VTA ≤ 2 mm

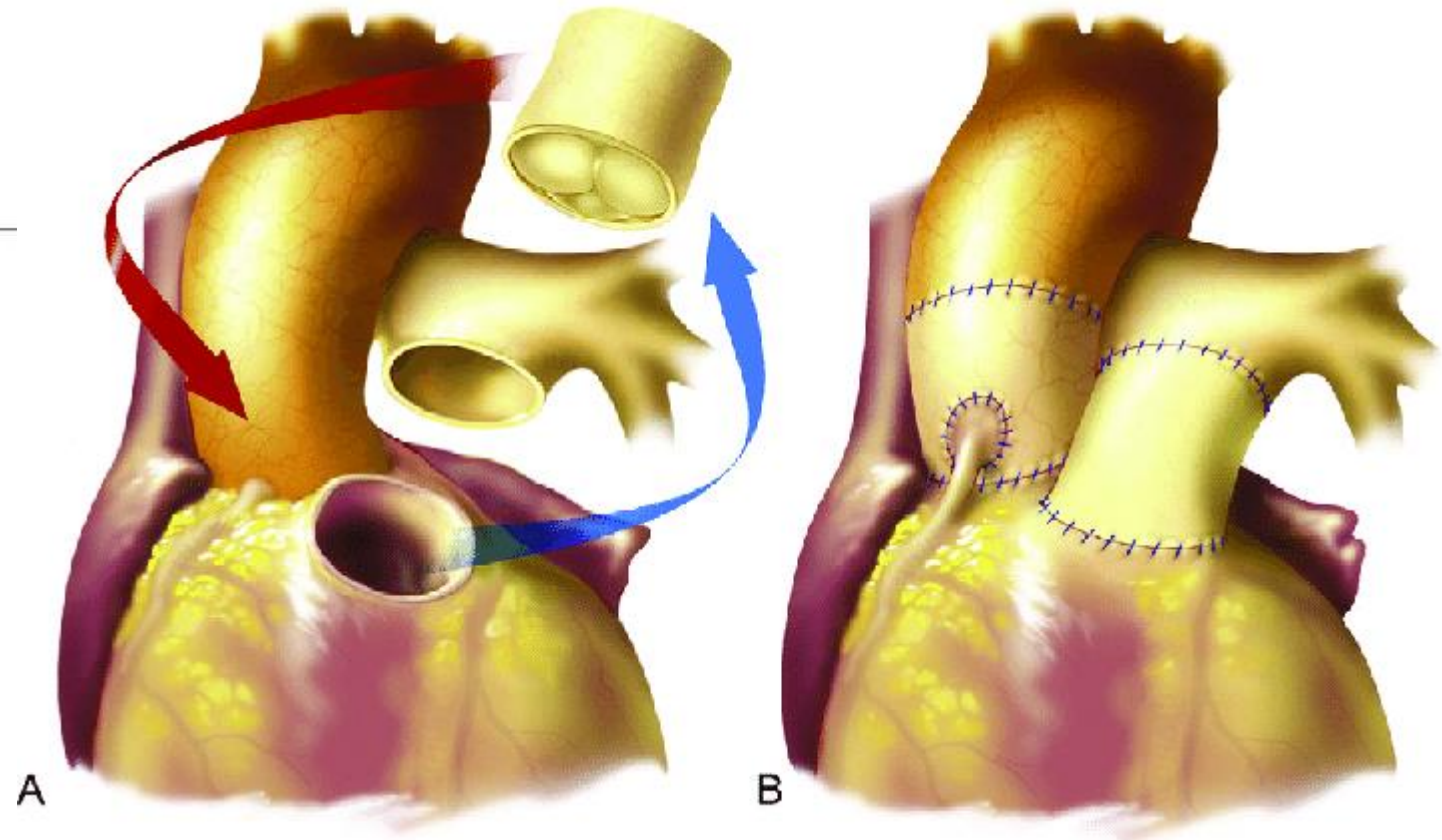
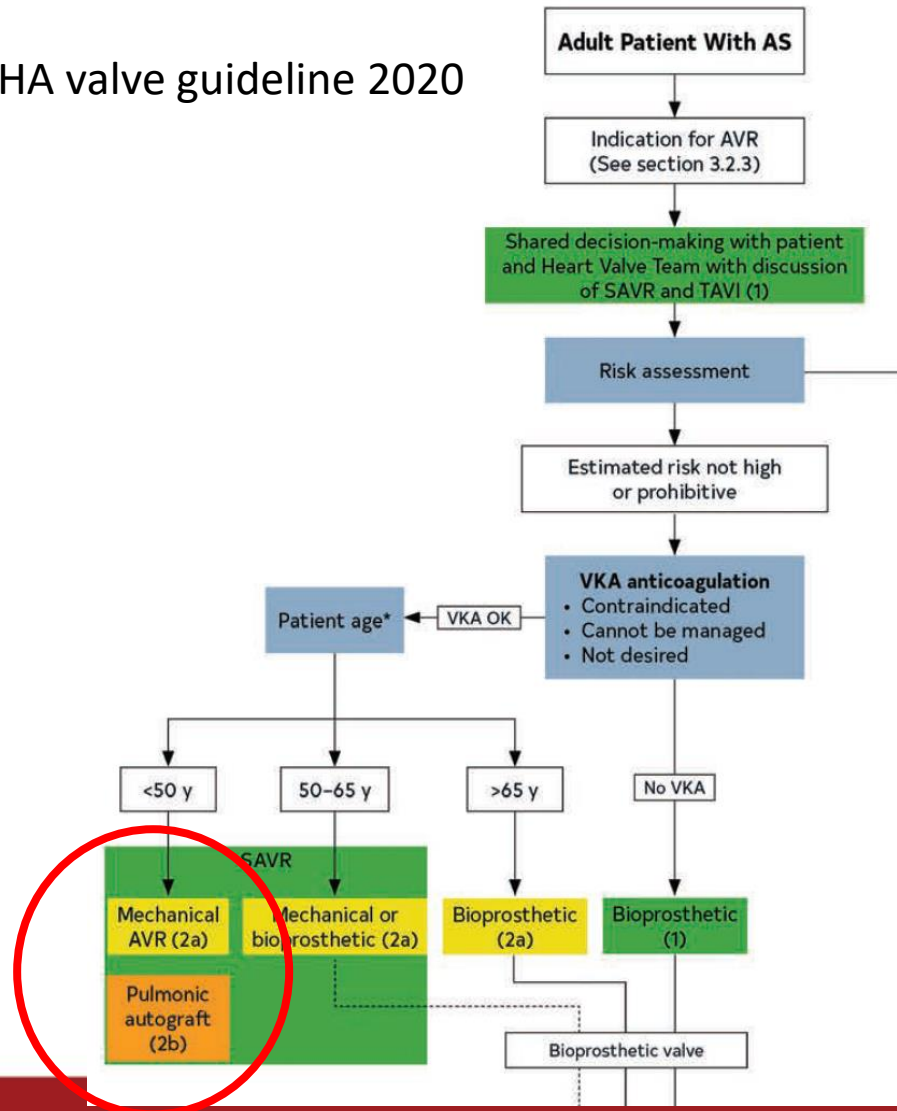


41.1%

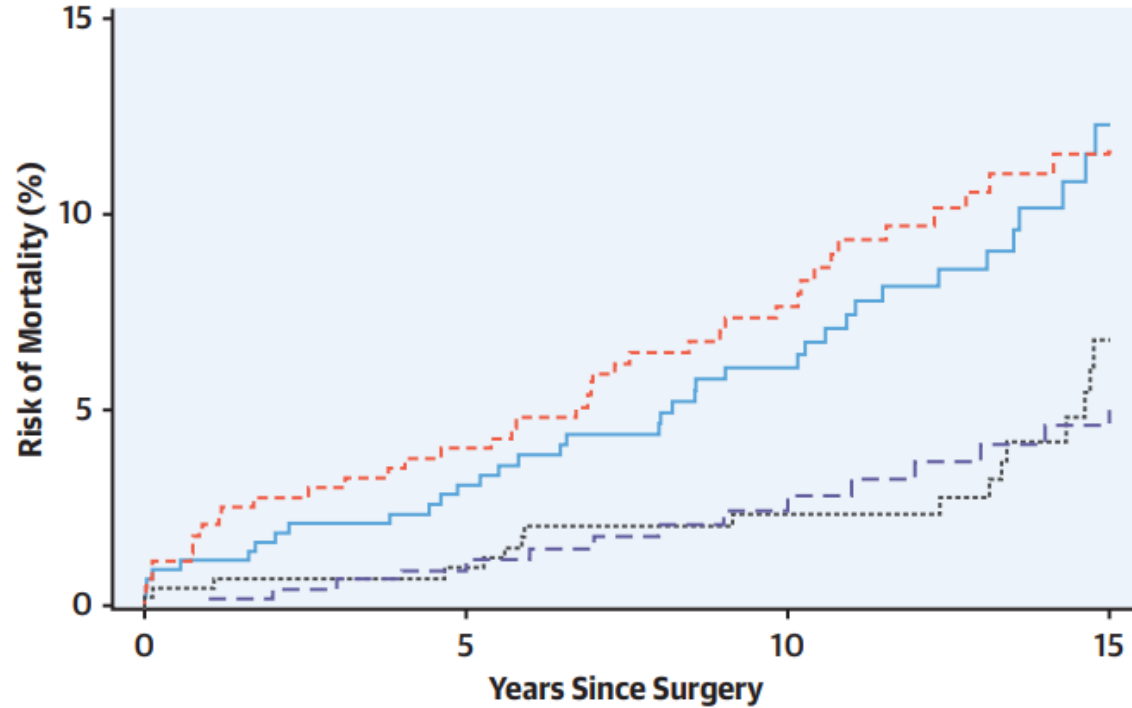


# 6. Ross Procedure

ACC/AHA valve guideline 2020



# Ross Procedure

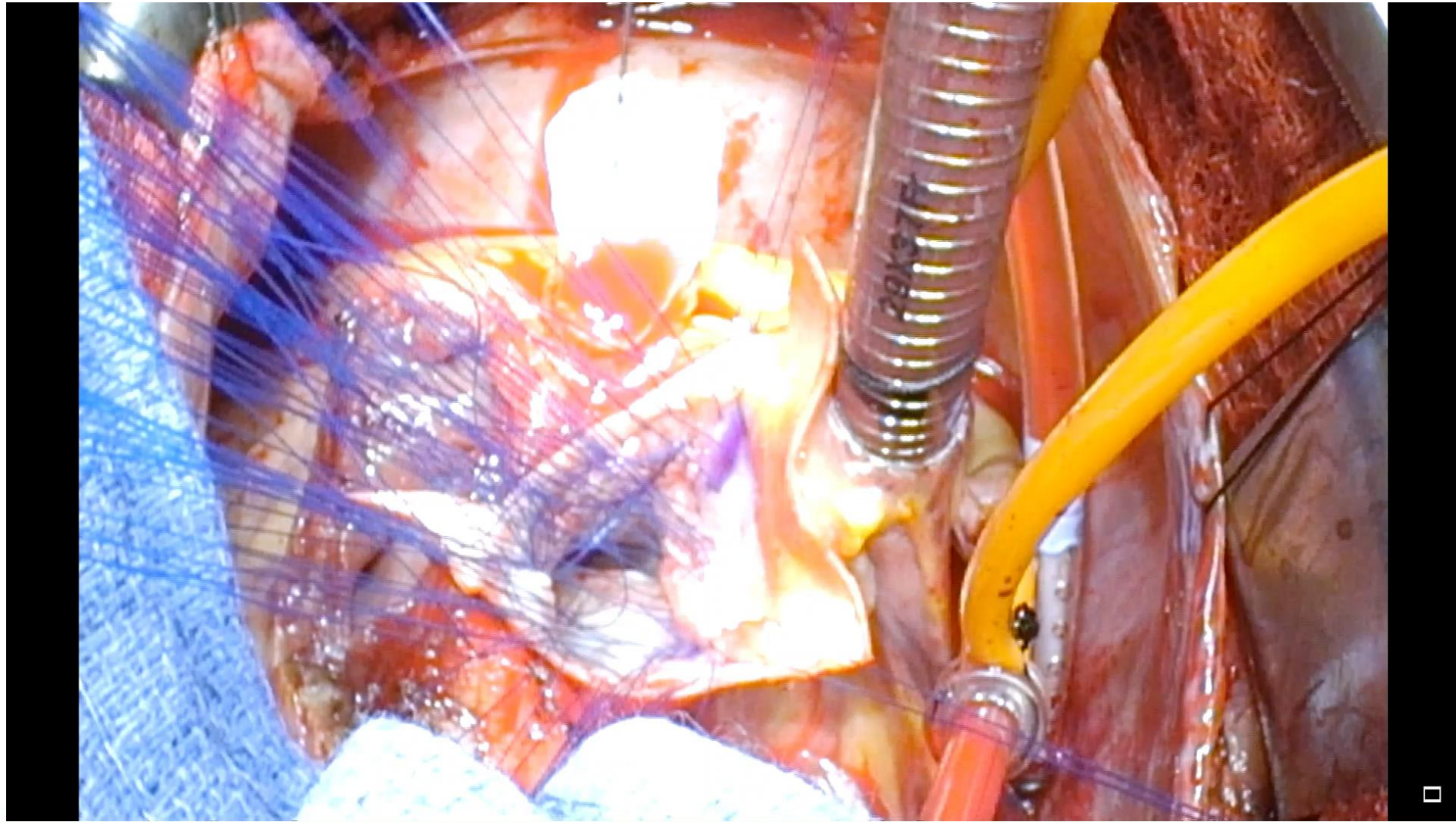


Number at Risk				
Bioprosthetic	434	386	290	113
Mechanical	434	369	287	131
Ross	434	376	298	129

— Bioprosthetic - - - Mechanical ..... Ross - - - General Population

El-Hamamsy et al. JACC 2022

# Ross procedure



# SAVR will stay!

- RCT excluded patients in low-risk should be considered for SAVR
  - BAV, severe MR/TR, complex CAD etc
- Asymmetric expansion will be a problem
- Aortic root enlargement SAVR in PPM patients
- TAVR explant is a high-risk procedure
- Ross/Mechanical Valve for young patients

