

# Transcatheter Aortic Valve Replacement

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December 8 2017

# Aortic Stenosis

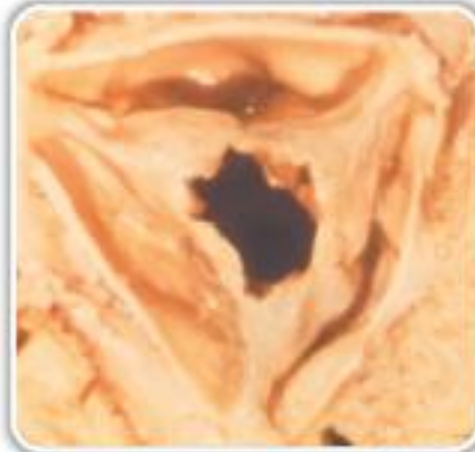
Less Common

More Common

**Congenital  
Abnormality**



**Rheumatic  
Fever**



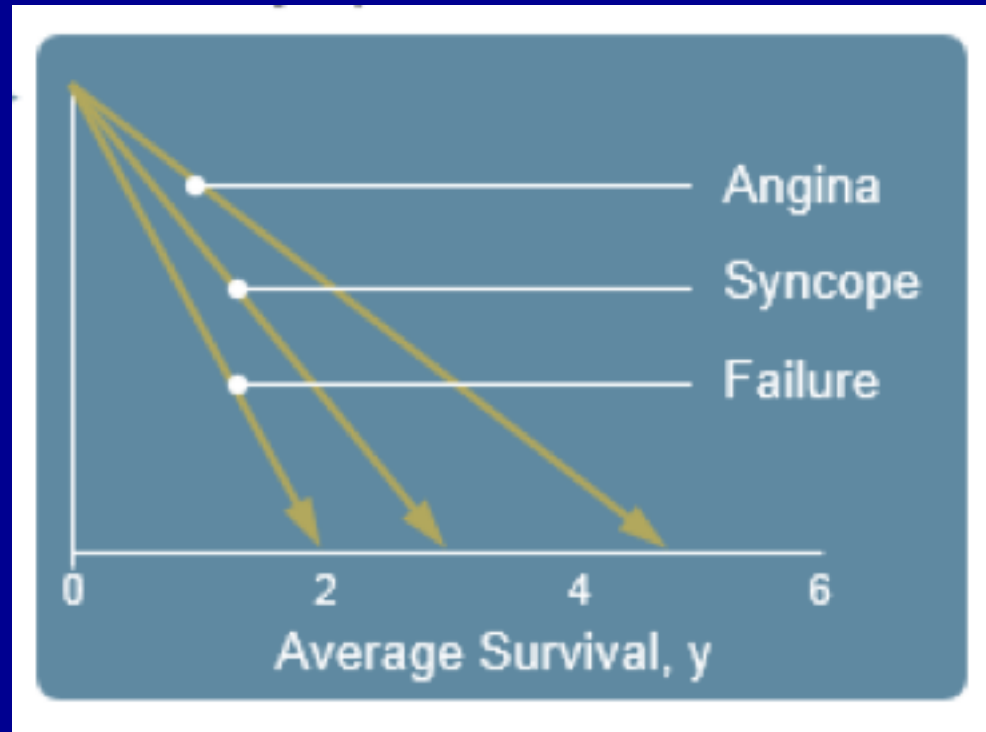
**Age-Related  
Calcific Aortic  
Stenosis**



# Severe Aortic Stenosis



# Why treat Aortic Stenosis?



- Angina → < 5 years
- Syncope → ~ 3 years
- Heart Failure → ~ 2 years

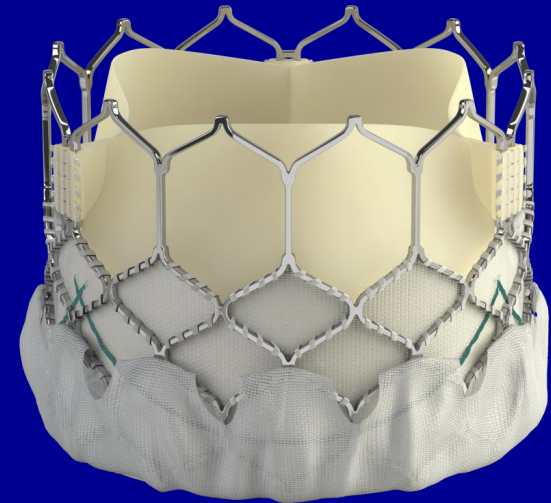
# Therapeutic Options



Bioprosthetic



Mechanical



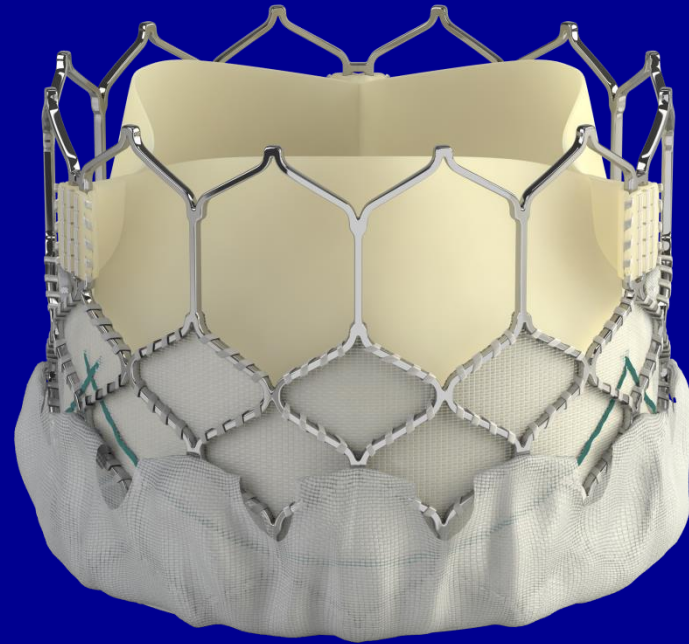
TAVR

Surgical

Transcatheter

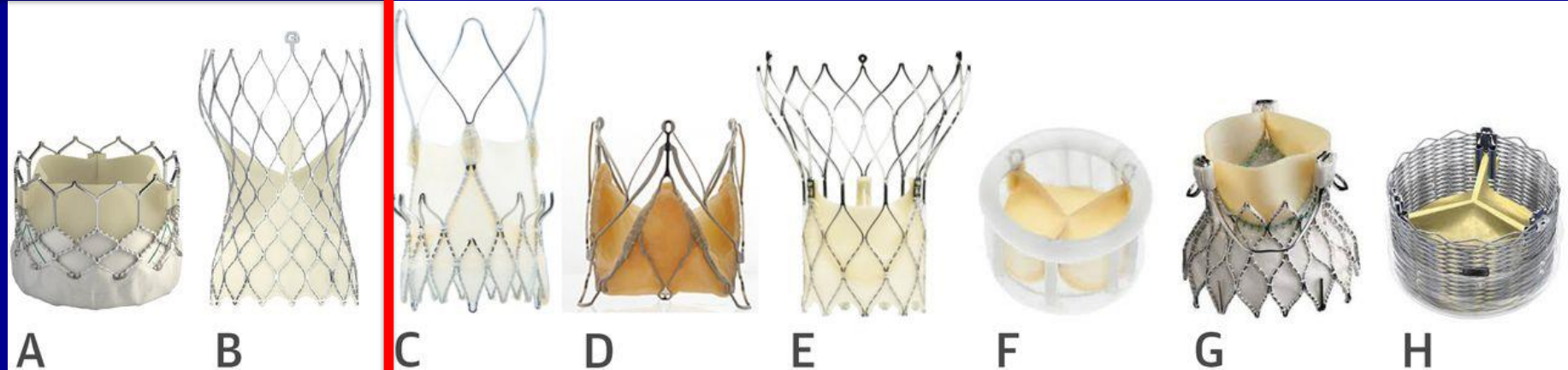
# Transcatheter Approaches

- TRANSFEMORAL
- Subclavian
- Transapical
- Transaortic



Edwards Sapien 3

# TAVR Valves



A) Edwards Lifesciences Sapien 3

B) Medtronic CoreValve Evolut R

C) Symetis Acurate *neo* Valve

D) JenaValve

E) St. Jude Medical Portico Valve

F) Direct Flow Medical Valve

G) Medtronic Engager Valve

H) Boston Scientific Lotus Valve



# Sapien 3 Deployment



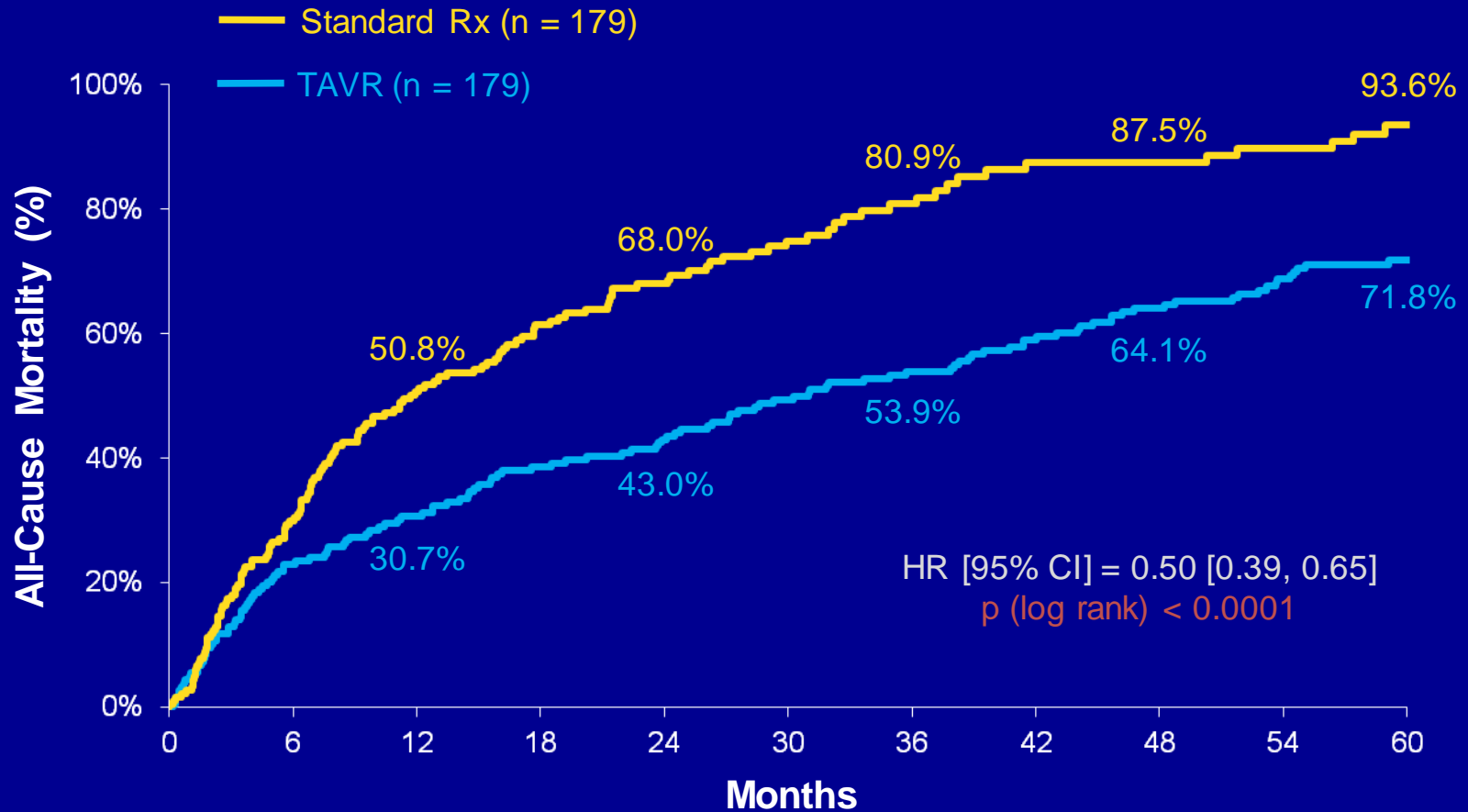


# The STS Score

Risk Model and Variables - STS Adult Cardiac Surgery Database	
<b>RISK SCORES</b>	
<a href="#">About the STS Risk Calculator</a>	
Procedure: AV Replacement	
Risk of Mortality:	4.595%
Morbidity or Mortality:	28.757%
Long Length of Stay:	15.893%
Short Length of Stay:	19.022%
Permanent Stroke:	1.49%
Prolonged Ventilation:	23.808%
DSW Infection:	0.557%
Renal Failure:	5.619%
Reoperation:	9.126%

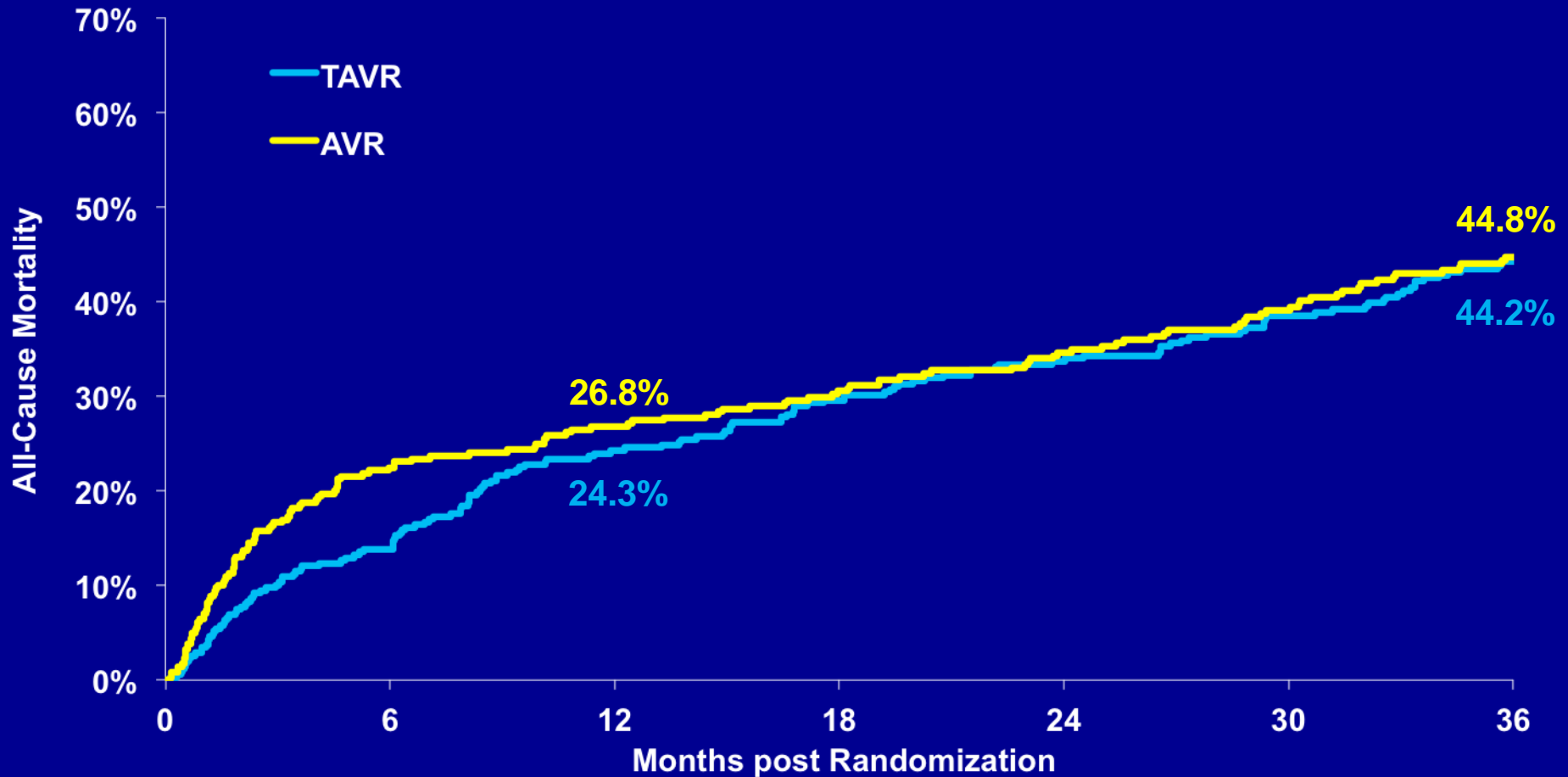
Risk	% Mortality
Low	$\leq 3\%$
Moderate	$>3\%$ or $<8\%$
High	$\geq 8\%$

# Cohort B (All Cause Mortality)



\* In an age and gender matched US population without comorbidities, the mortality at 5 years is 40.5%.

# Cohort A (All Cause Mortality)

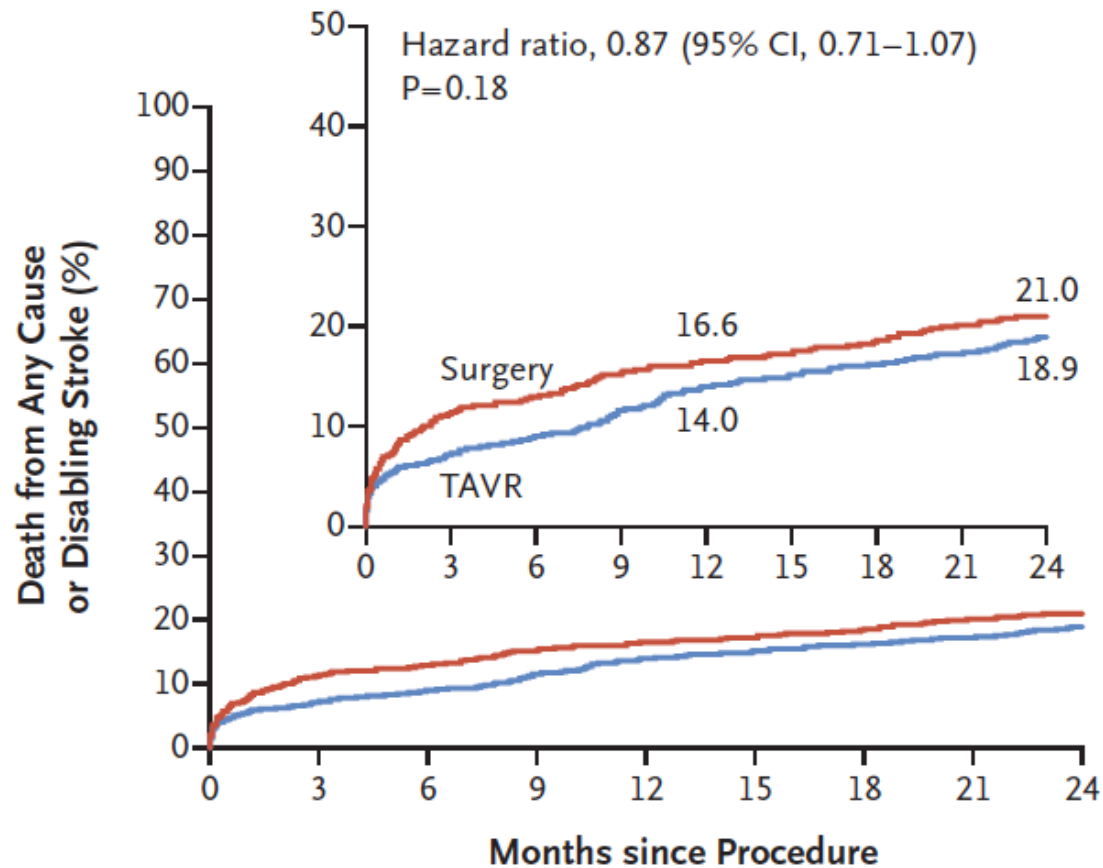


# Mortality and Disabling Stroke (All Patients)

■ Surgery

■ TAVR

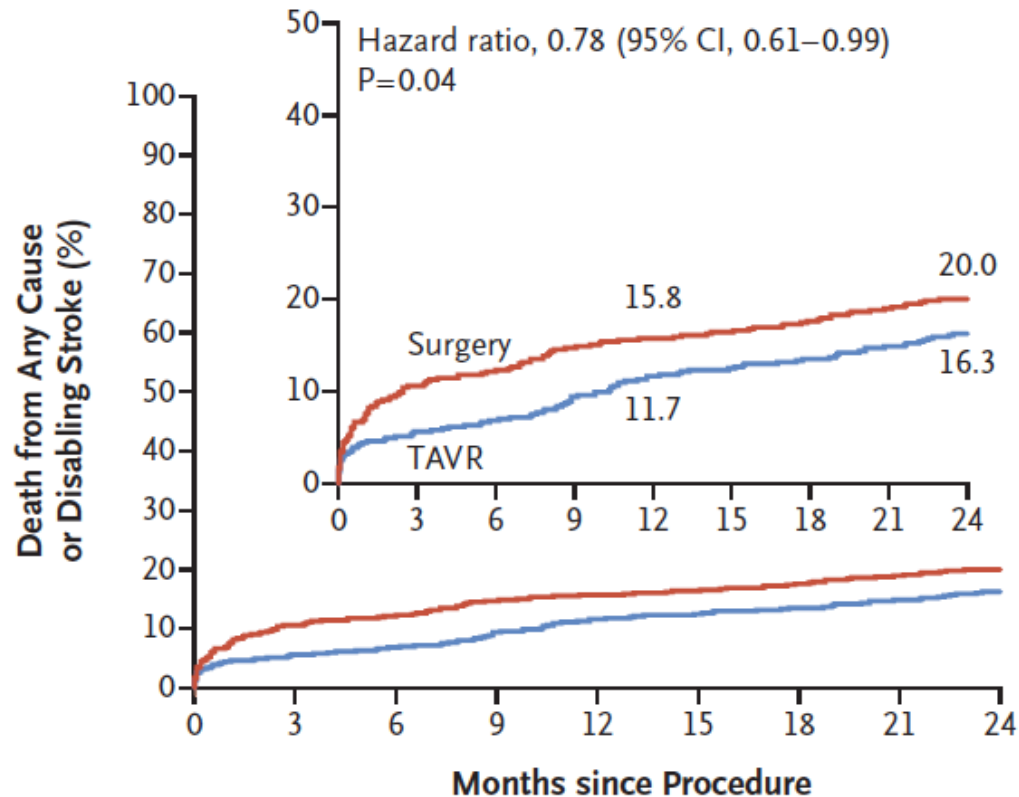
**B** As-Treated Population



# Mortality and Disabling Stroke (Transfemoral Cohort)

■ Surgery  
■ TAVR


D Transfemoral-Access Cohort, As-Treated Analysis





No. at Risk


TAVR	762	717	708	685	663	652	644	634	612
Surgery	722	636	624	600	591	573	565	555	537

# Guidelines

	TAVR is recommended for symptomatic patients with severe AS (Stage D) and a <u>prohibitive risk</u> for surgical AVR who have a predicted post-TAVR survival greater than 12 months (58-61).
See Online Data Supplements 5 and 9 (Updated From 2014 VHD Guideline)	

	Surgical AVR or TAVR is recommended for symptomatic patients with severe AS (Stage D) and <u>high risk</u> for surgical AVR, depending on patient-specific procedural risks, values, and preferences (49-51).
See Online Data Supplement 9 (Updated From 2014 VHD Guideline)	

	TAVR is a reasonable alternative to surgical AVR for symptomatic patients with severe AS (Stage D) and an <u>intermediate surgical risk</u> , depending on patient-specific procedural risks, values, and preferences (62-65).
See Online Data Supplements 5 and 9 (Updated From 2014 VHD Guideline)	

	TAVR is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS (61).
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# Partner 3 Trial

 Surgery TAVR

COMING SOON

Comparing surgical AVR to TAVR in the low risk patient population



# Guidelines

I

C

For patients in whom TAVR or high-risk surgical AVR is being considered, a heart valve team consisting of an integrated, multidisciplinary group of healthcare professionals with expertise in VHD, cardiac imaging, interventional cardiology, cardiac anesthesia, and cardiac surgery should collaborate to provide optimal patient care.

# When Aortic Stenosis is Identified

- Mean gradient  $> 40\text{mmHg}$
  - Peak Velocity across aortic valve  $> 4\text{m/s}$
  - Aortic valve area less than  $1\text{mm}^2$
- or
- Symptoms out of proportion to echo findings



Referral for *Heart Team* evaluation

# The Heart Team

- Multidisciplinary team approach
  - Valve coordinator, cardiac surgeon, interventional cardiologist, imaging cardiologist
- Evaluate the patient together and formulate a treatment/management recommendation


# Requirements

- Evaluation by an interventional cardiologist
- Evaluation by TWO cardiac surgeons
- Patient must be at *moderate* to *high risk* for surgery or *inoperable* (as determined by the heart team)

# Surgery vs TAVR vs Observation

- The STS score
- The patients comorbidities
- Frailty metrics
- Findings on imaging
  - CT scan, TTE/TEE
- Patient's wishes

# The STS Score

 [Home](#) [Calculate](#) [Support](#)

### Procedure Type

CAB Only

**AV Replacement**

MV Replacement Only

MV Repair

AV Replacement + CAB

MV Replacement + CAB

MV Repair + CAB

### Patient Age

78

### Sex

Male

**Female**

Risk Model and Variables - STS Adult Cardiac Surgery Database Version 2.6

## RISK SCORES

[About the STS Risk Calculator](#)

Procedure: AV Replacement

Risk of Mortality:	3.224%
Morbidity or Mortality:	18.116%
Long Length of Stay:	8.522%
Short Length of Stay:	26.588%
Permanent Stroke:	1.706%
Prolonged Ventilation:	12.434%
DSW Infection:	0.475%
Renal Failure:	4.471%
Reoperation:	7.456%

# The STS Score

Probably Surgery {

TAVR vs Surgery {

Probably TAVR {

Risk	% Mortality
Low	$\leq 3\%$
Moderate	$>3\%$ or $<8\%$
High	$\geq 8\%$



# Other Comorbidities

- Advanced dementia
- Severe liver disease
- Malignancy
- Life expectancy
- Anemia
- Debility

# Frailty Metrics

- 5 Meter walk test:
  - > 6seconds → slow      > 10seconds → Very Slow
- Activity of Daily Living (ADLs)
- Albumin
- Grip Strength

# Imaging for TAVR

What if the patient is a good candidate for both?

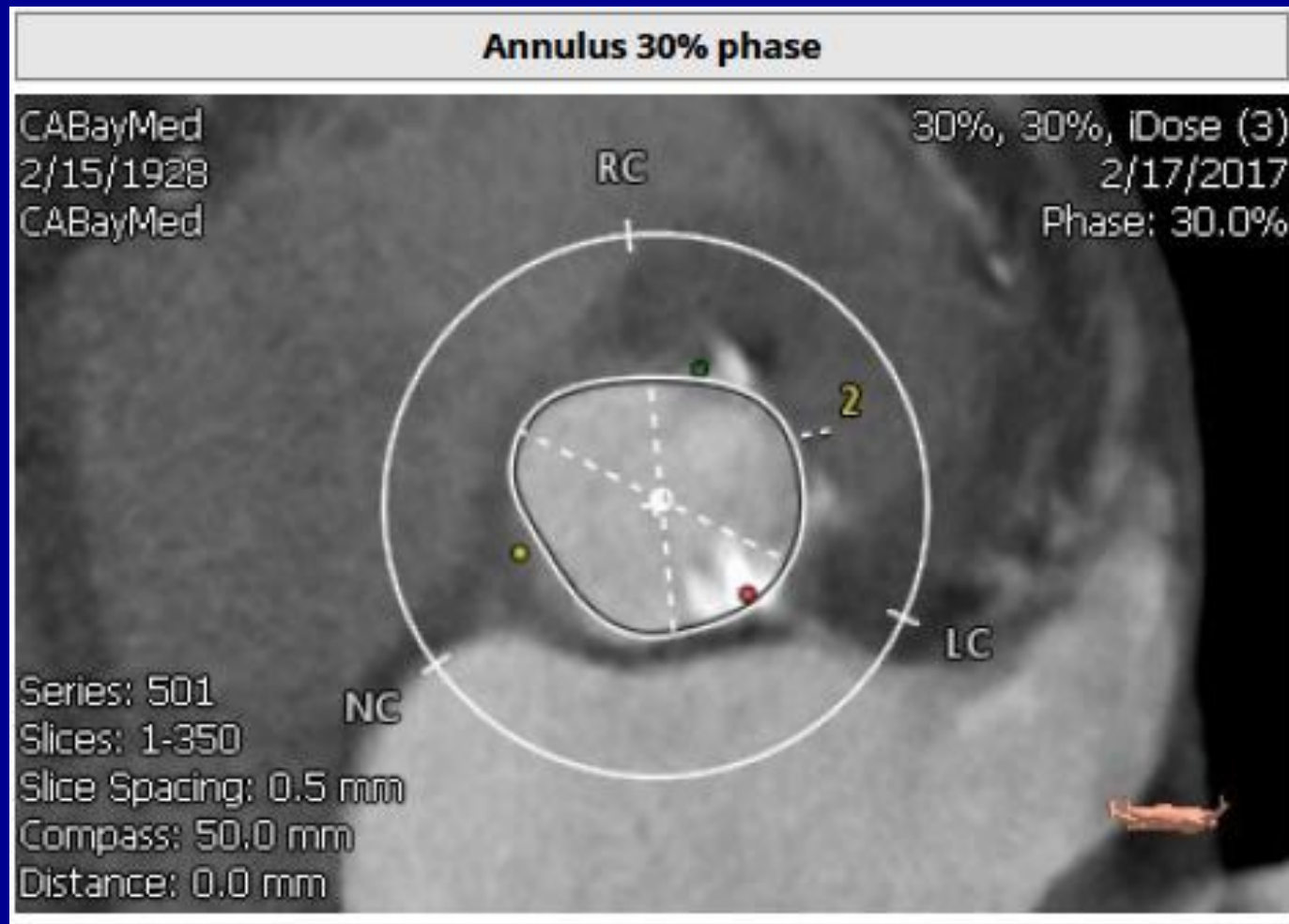
- TTE +/- TEE
- Left heart cardiac catheterization +/- RHC
- Carotid ultrasounds
- CT angiography of the heart and vasculature

# Planning for TAVR

Valve Sizing is very important

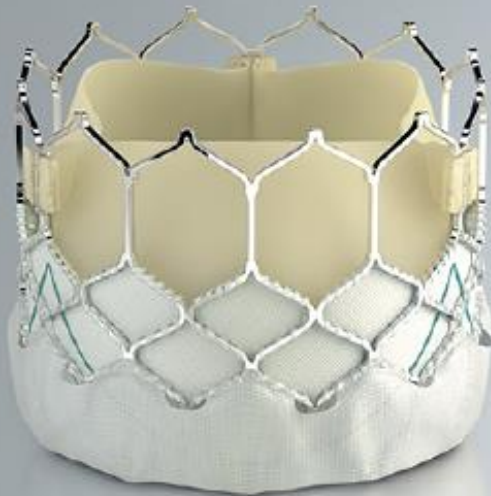
- post-procedure paravalvular leak
- prosthesis migration
- coronary artery occlusion
- annulus rupture

# Screening for TAVR: CT Angio



# Edwards Sapien 3

Complete range of valve sizes expands the treatable patient population



20 mm



23 mm



26 mm



29 mm



15.5 mm



18 mm



20 mm

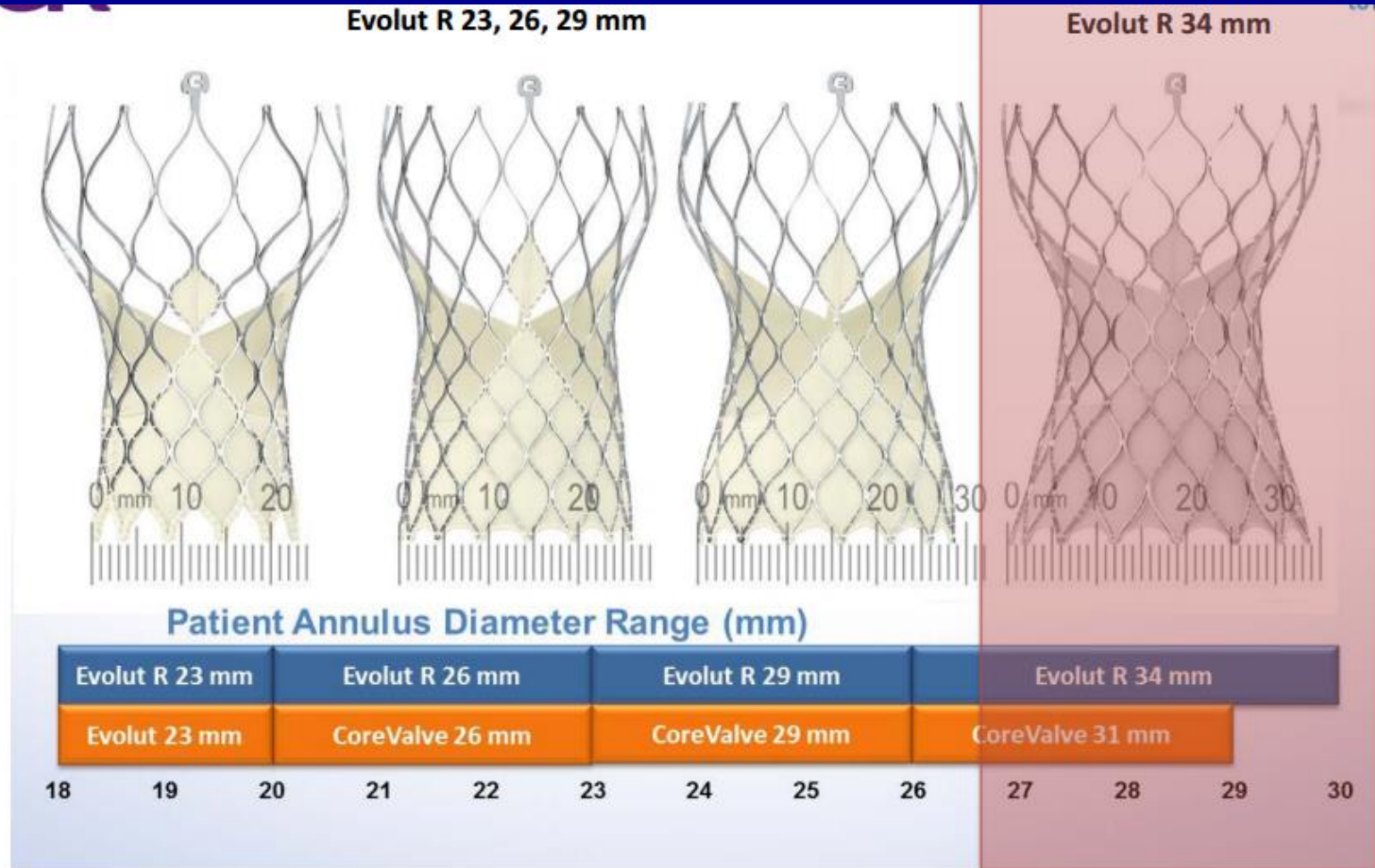


22.5 mm



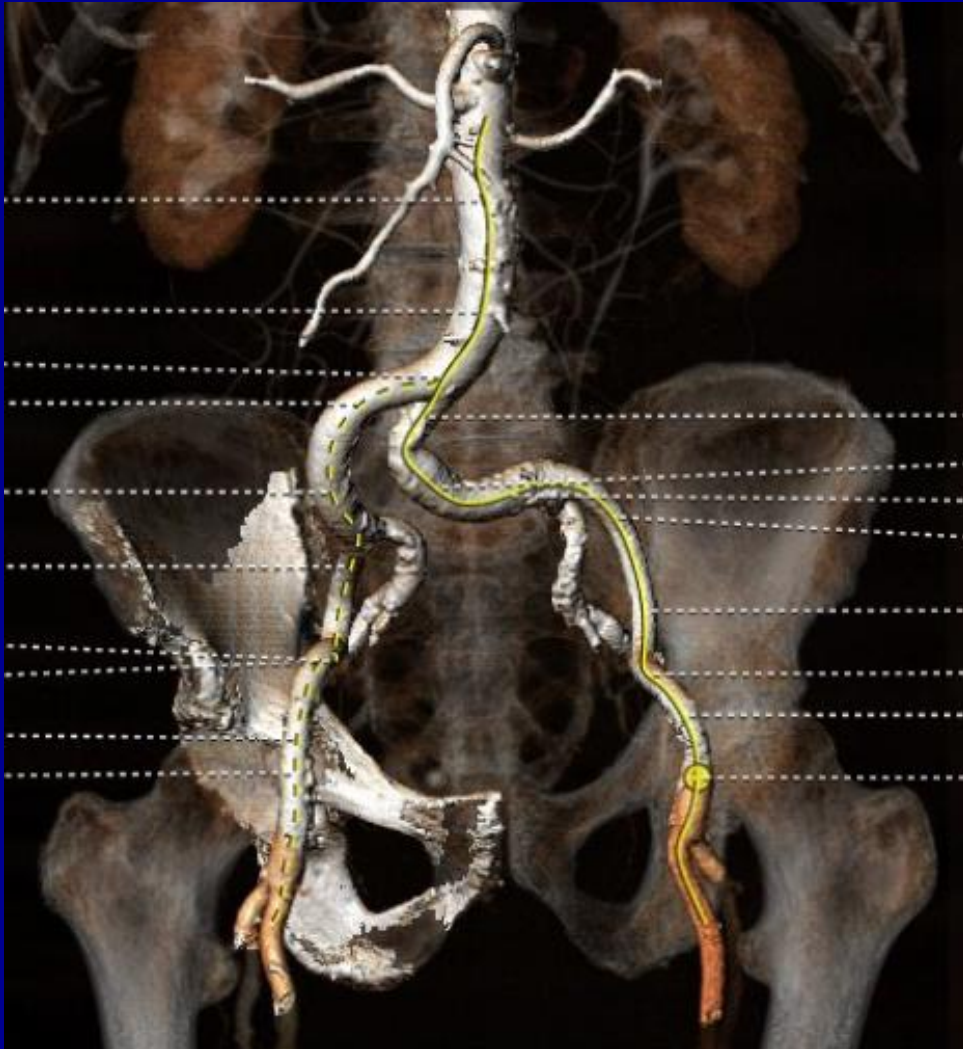
Annulus Sizing		20 mm	23 mm	26 mm	29 mm
Native Valve Annulus Size (CT)	Area	273 - 345 mm <sup>2</sup>	338 - 430 mm <sup>2</sup>	430 - 546 mm <sup>2</sup>	540 - 683 mm <sup>2</sup>
	Area Derived Diameter	18.6 - 21 mm	20.7 - 23.4 mm	23.4 - 26.4 mm	26.2 - 29.5 mm
Native Valve Annulus Size TEE		16 - 19 mm	18 - 22 mm	21 - 25 mm	24 - 28 mm

# CoreValve Evolute

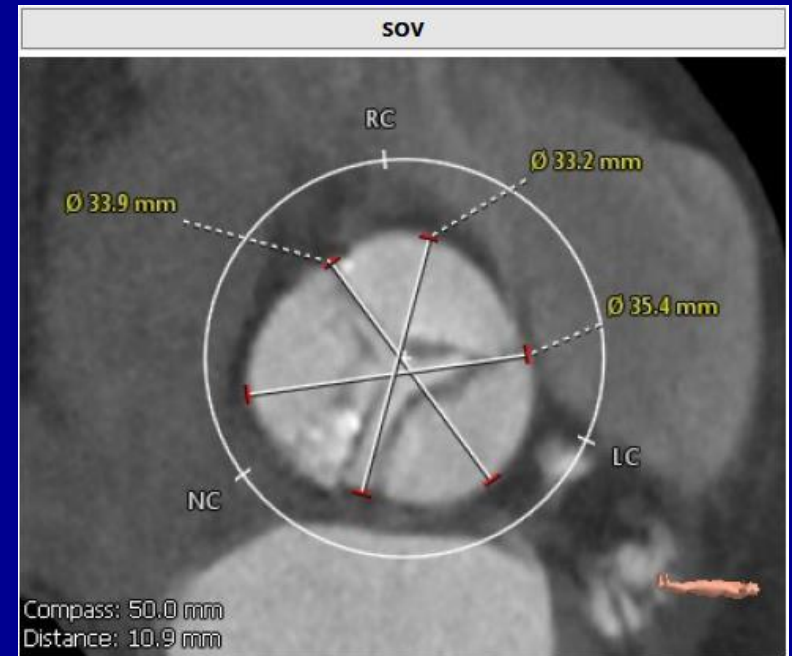




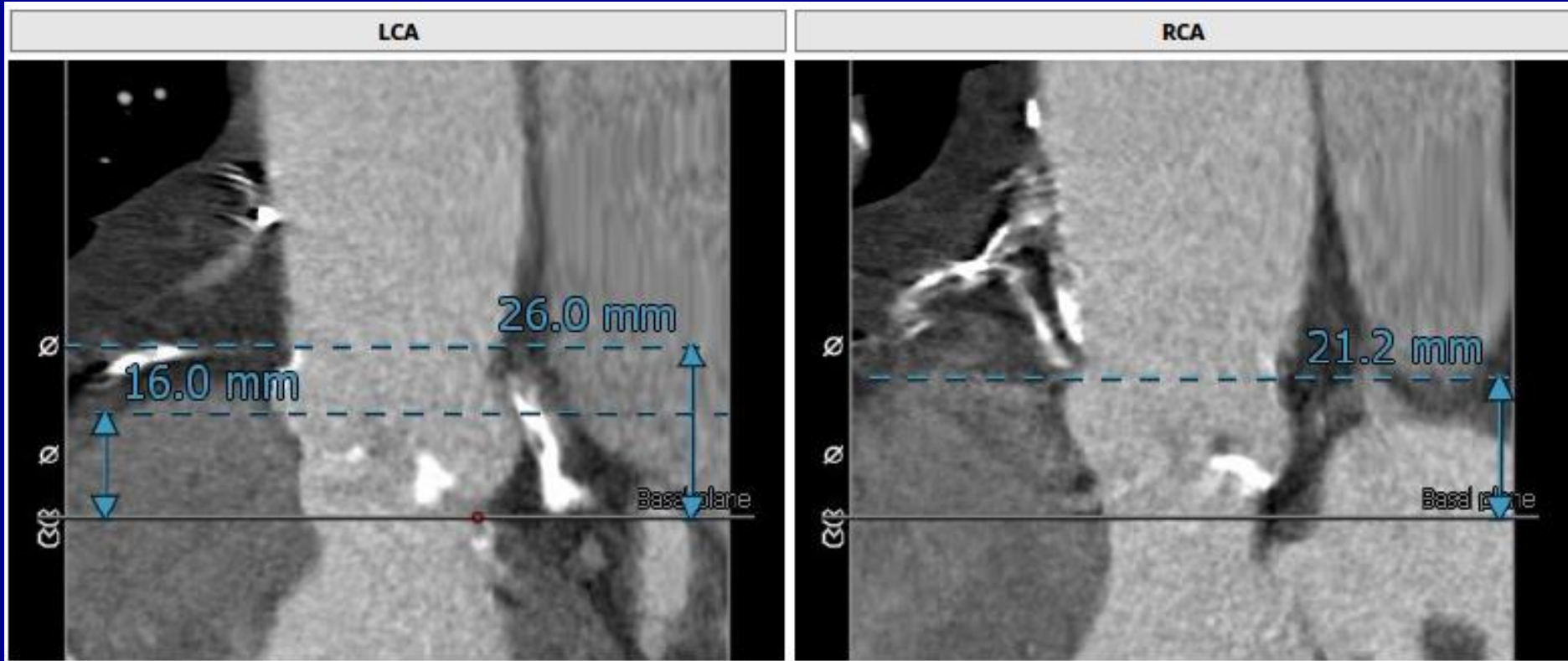
# Screening for TAVR: Peripheral Vasculature



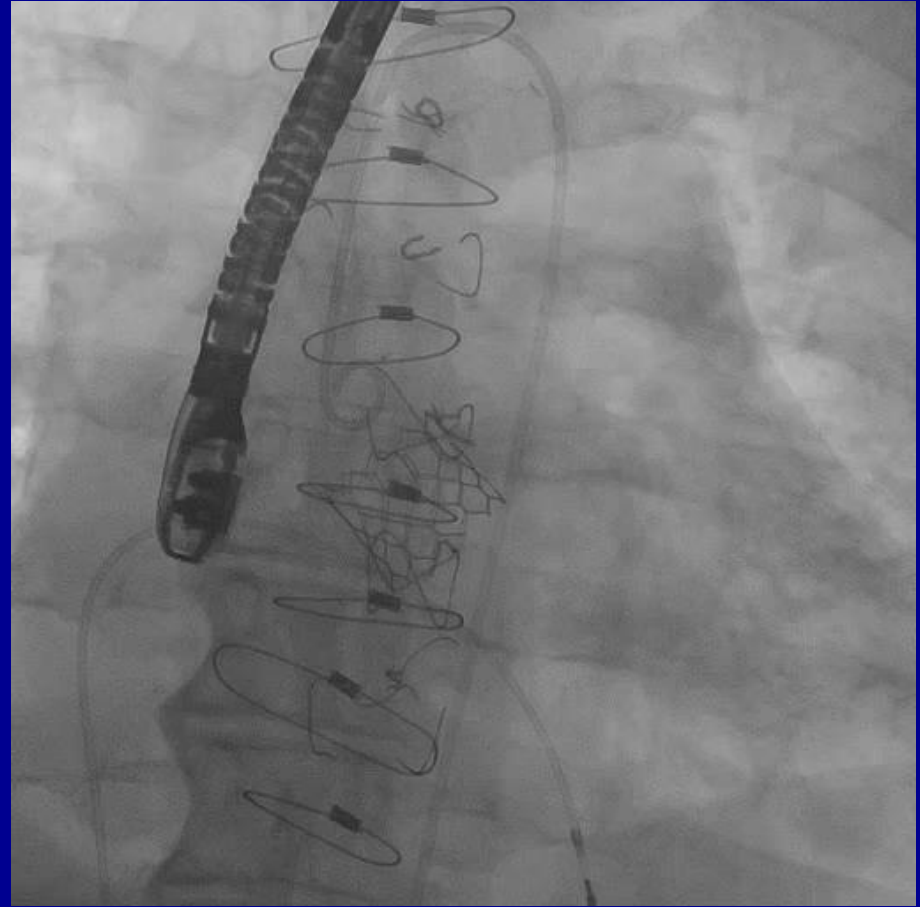
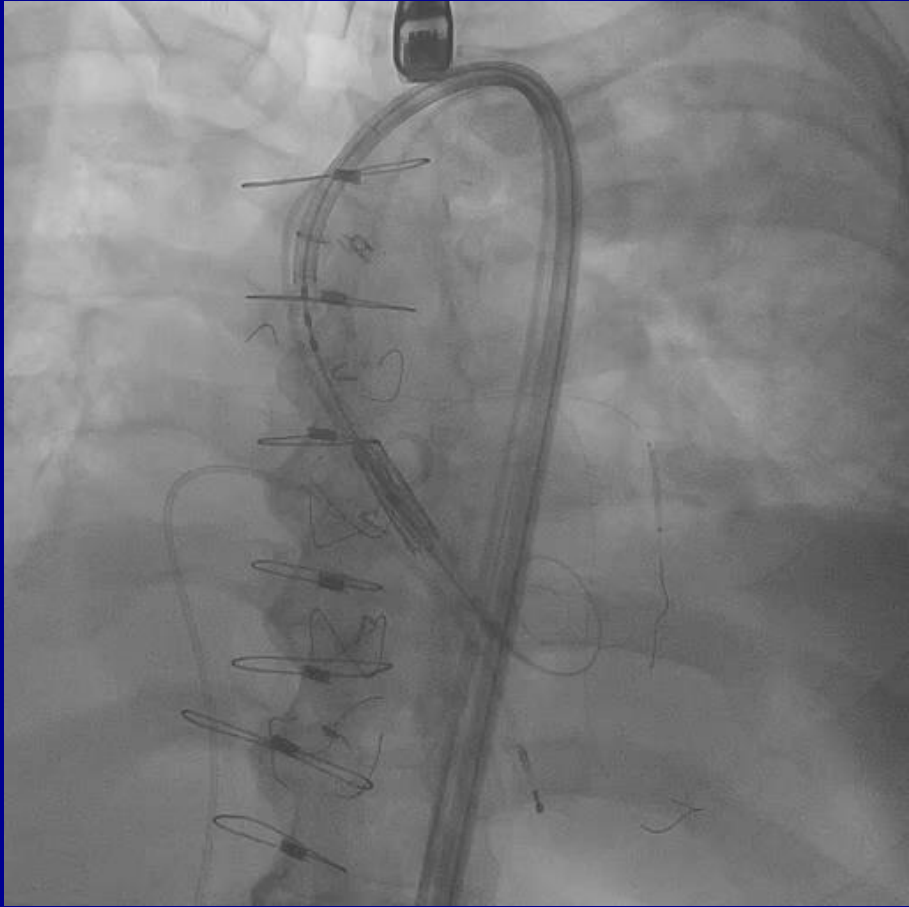
# Screening for TAVR: Sinus of Valsalva



# Screening for TAVR: Coronary Heights



# Procedural Fluoro

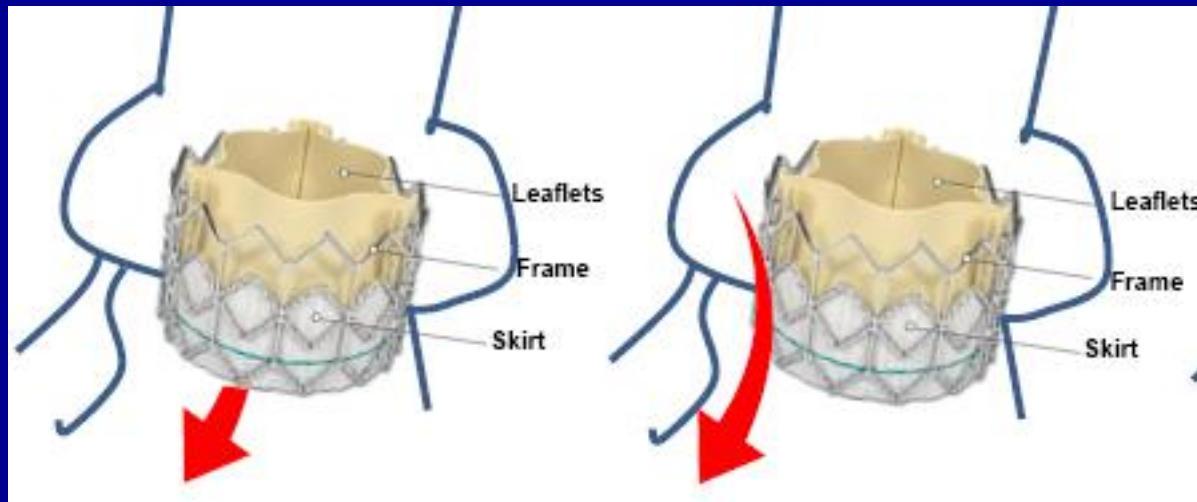




# Complications

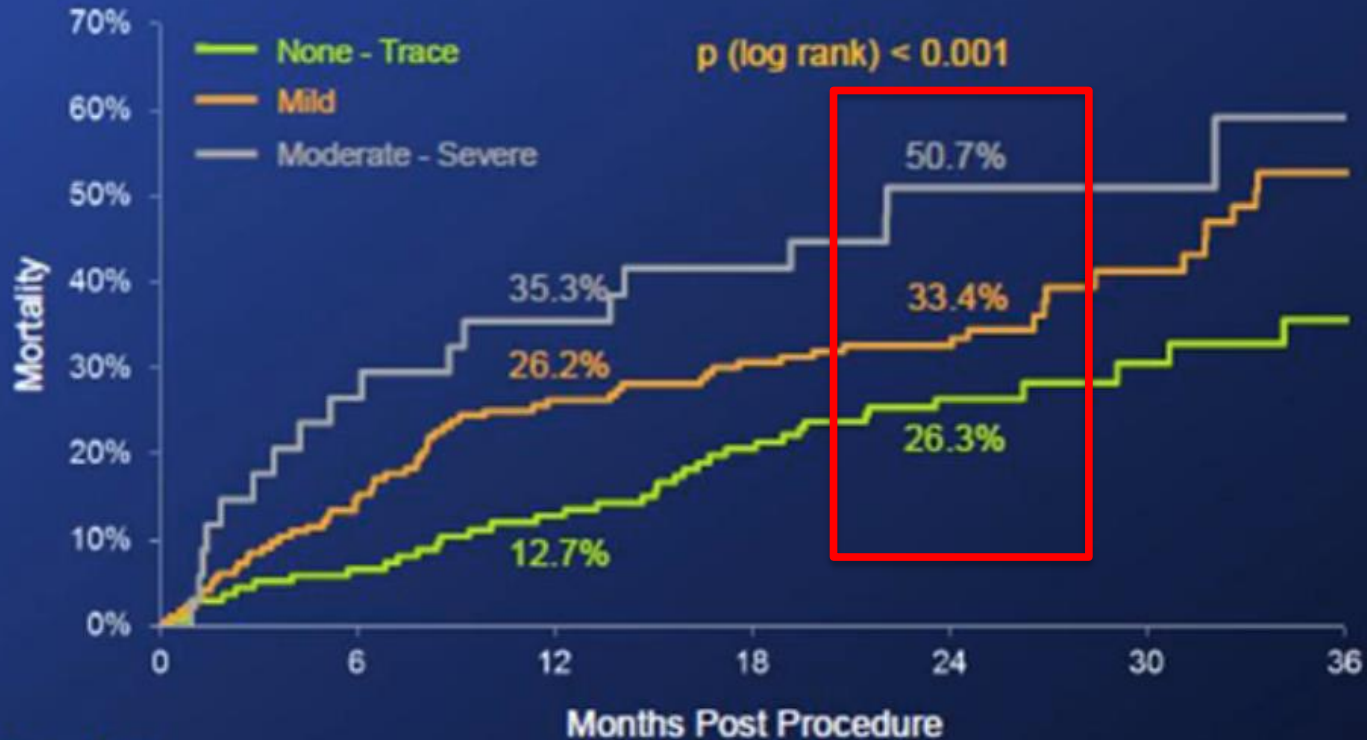
Events (%)	SAPIEN 3 Valve HR (TF)
Major Vascular Comps.	5.3
Disabling Bleeding	5.5
New Permanent Pacemaker	13.2 (real world 2.5%)
Paravalvular Leak (mod to severe)	2.5
Stroke	1.4
Myocardial Infarctions	0.4
Coronary Obstruction	0.0
Acute Kidney Injury	0.8
Aortic Valve Re-intervention	0.8
Endocarditis	0.2
Annular Rupture	0.0

# Paravalvular Leak



- Regurgitation that occurs between the valve and the native annulus → May cause hemolysis and anemia

# Paravalvular Leak



## Numbers at Risk

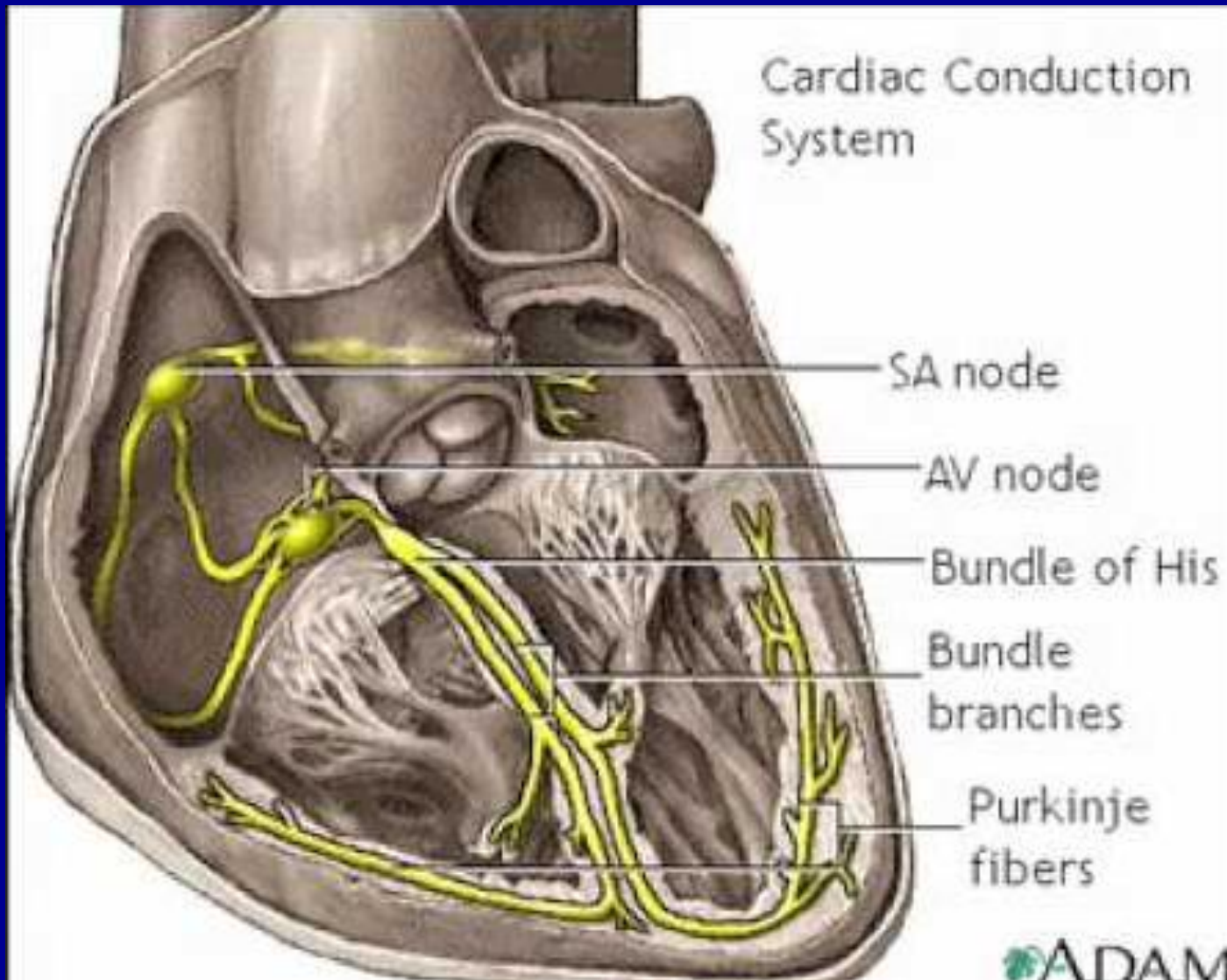
	0	6	12	18	24	30	36
None-Tr	135	125	115	101	68	31	11
Mild	165	139	121	111	71	33	16
Mod-Sev	34	25	22	19	15	6	2

# Complications

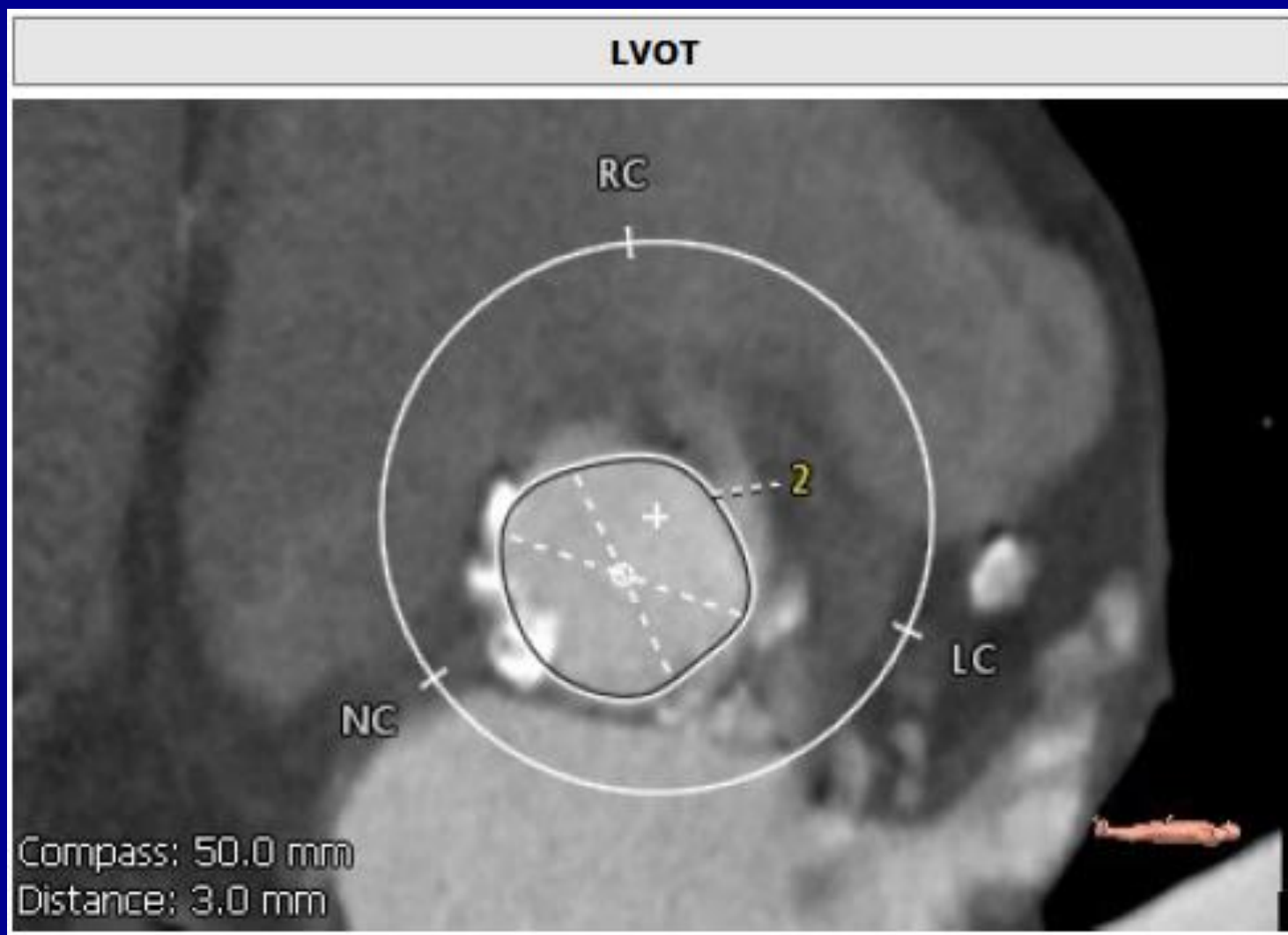
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Stroke	1.4
Myocardial Infarctions	0.4
Coronary Obstruction	0.0
Acute Kidney Injury	0.8
Aortic Valve Re-intervention	0.8
Endocarditis	0.2
Annular Rupture	0.0



# Heart Block



# Screening for TAVR: LVOT



# TAVR Follow up

- Patients discharged on aspirin + plavix or aspirin and anticoagulant for 6 months
- Follow up in heart clinic:
  - 1 week (routine post op check)
  - 1 month with an echo
  - 1 year with an echo
- Otherwise routine follow up with referring cardiologist or primary care provider

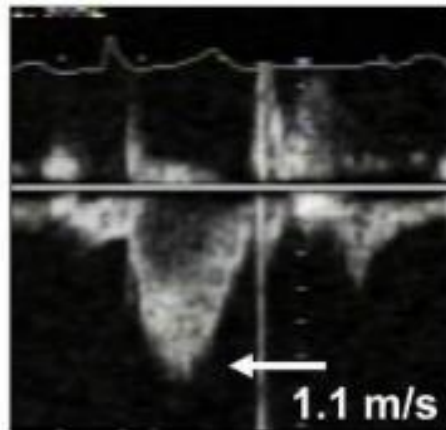
# Post-Procedural Echo

	Normal	Suggests Stenosis
Peak Velocity	< 3 m/s	> 4 m/s
Mean Gradient	< 20 mmhg	> 35 mmhg
Doppler Velocity Index	$\geq 0.3$	< 0.25
Effective Orifice area	> 1.2 cm <sup>2</sup>	< 0.8 cm <sup>2</sup>
Contour of Jet	Triangular Early Peaking	Rounded Symmetrical contour
Acceleration Time	< 80 ms	> 100 ms

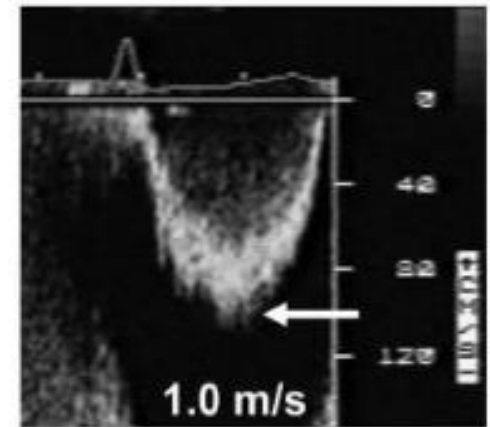
# Post-Procedural Echo

**Pulsed Doppler  
LVO**

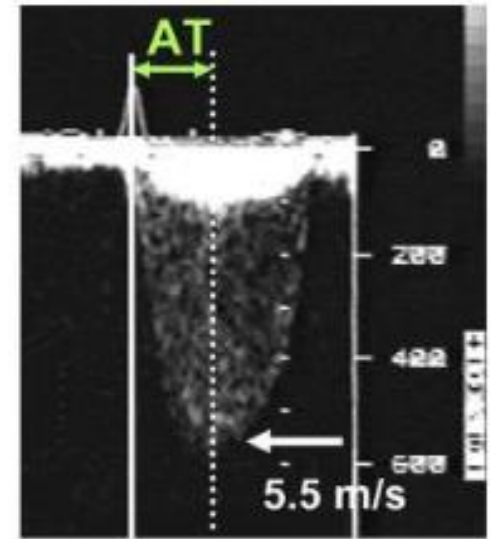
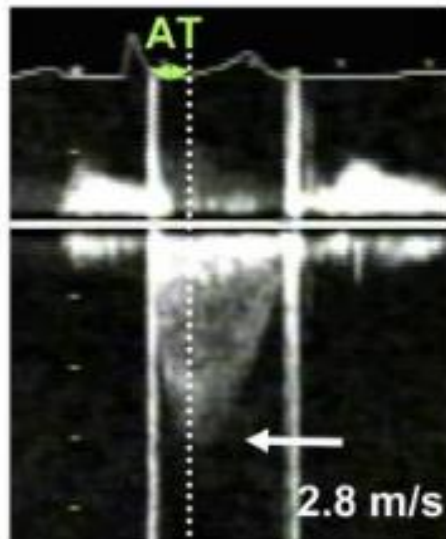
**Normal**



**Obstructed**



**CW Doppler  
Prosthetic AV**



# Thank you



Before TAVR



After TAVR

- I am always available:
  - Pager: 929-1401
  - Cell phone: 202-258-8309
  - Direct office line: 989-894-6913