Treatment options for TAVR failure

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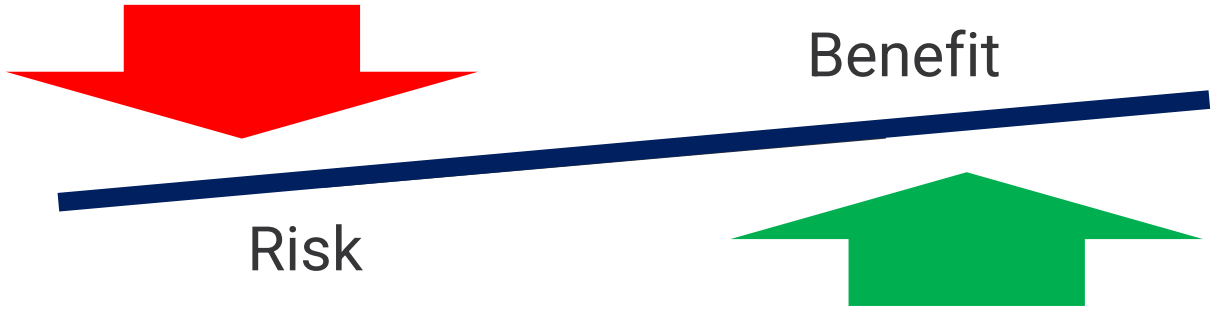
Minneapolis Heart Institute®

Disclosures

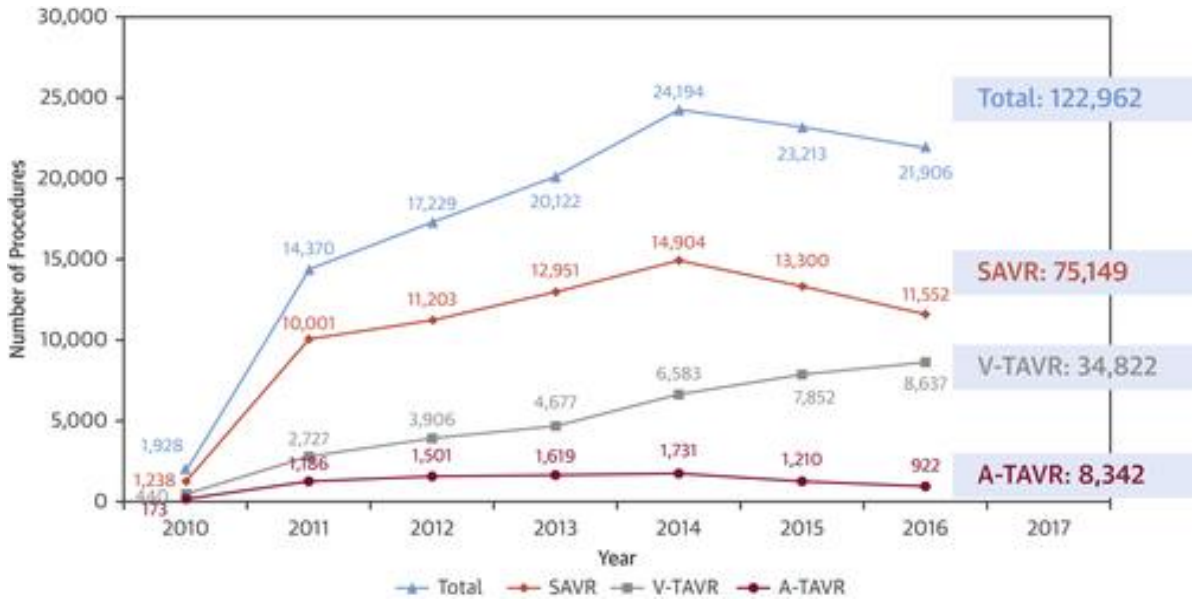
- Consultant / Honorarium / Grants
  - Edwards Lifesciences
  - Medtronic Inc
  - Boston Scientific
  - Abbott
  - 4C
  - Anteris

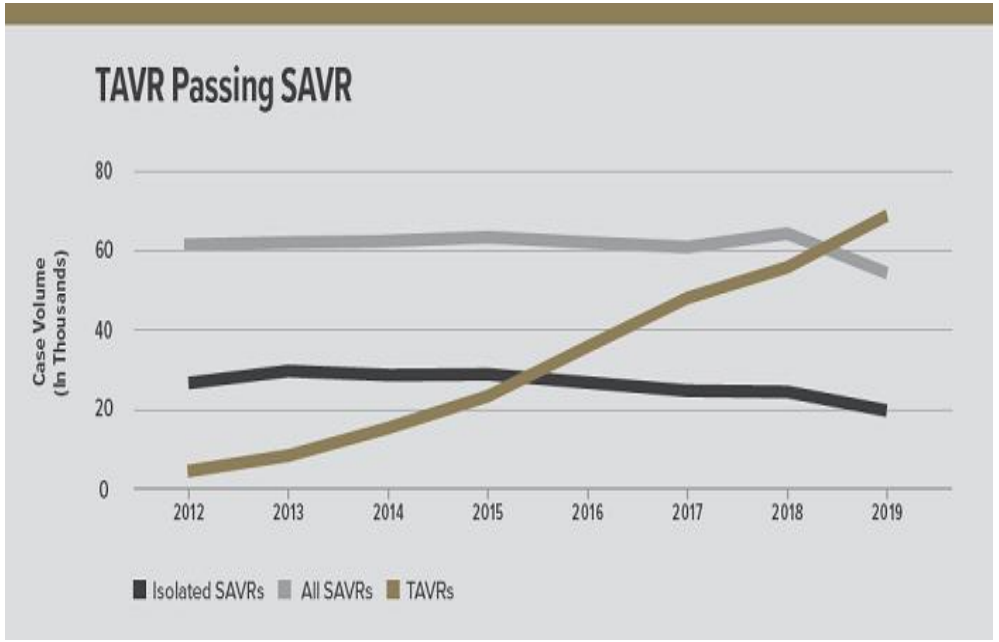
TAVI 2019-20

Inoperable, high-risk, Intermediate and Low risk patients



Writing was on the wall





HOPE DISCOVERED HERE

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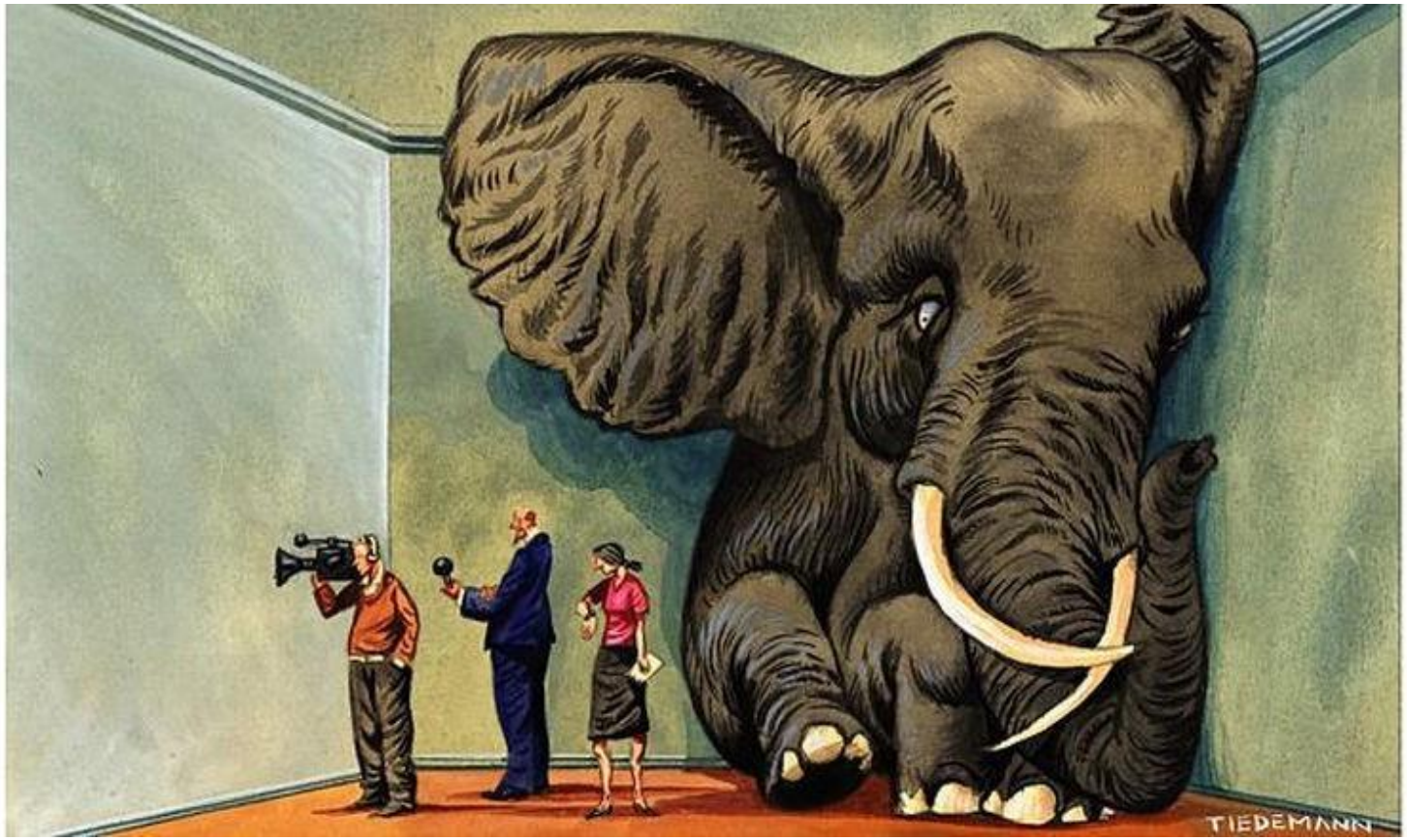
We forgot one thing…..



All biological valves degenerate

In an incense chamber, smoke and perfume are inseparable

Dr. Ionescue

Durability will need to be quantified for Each Device

- Based on current predictions TAVR will last for 5-10 years

- Hence, if we implant it in
  - A at age 65, or
  - Japan/Korea around age 75

Reintervention for SVD will not be uncommon

Redo TAV

- Basic Expectations
  - Low risk
  - Good hemodynamic results
  - Maintain coronary access
  - No anticoagulation

REDO TAVR REGISTRY

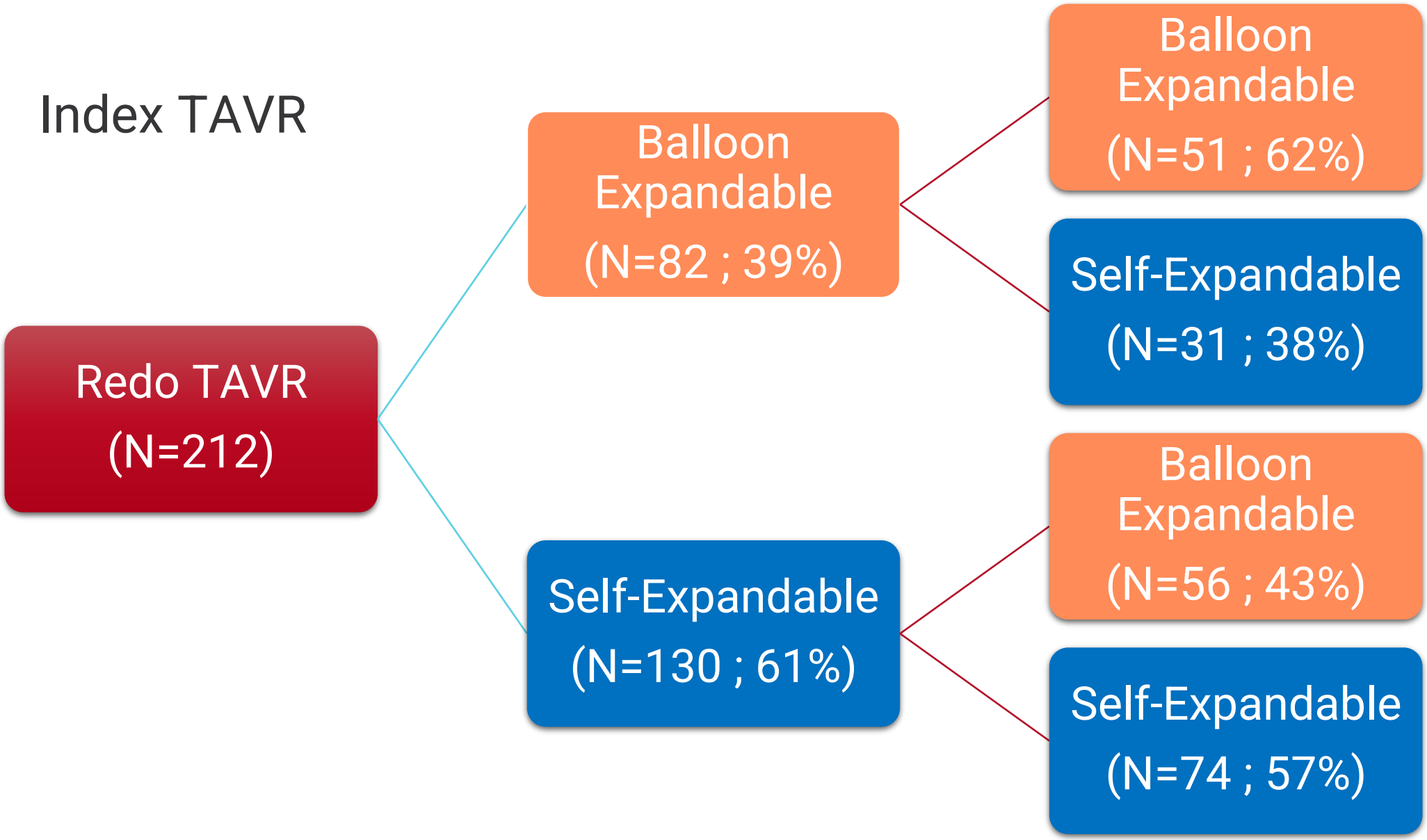
- The Redo-TAVR registry collected data on consecutive patients who underwent redo-TAVR at 37 centers (patients who were considered favorable)

- Patients were classified as:
  - Probable TAVR failure (procedure related; <1 year of index TAVR)
  - Probable THV failure (Prosthesis related; >1 year of index TAVR)

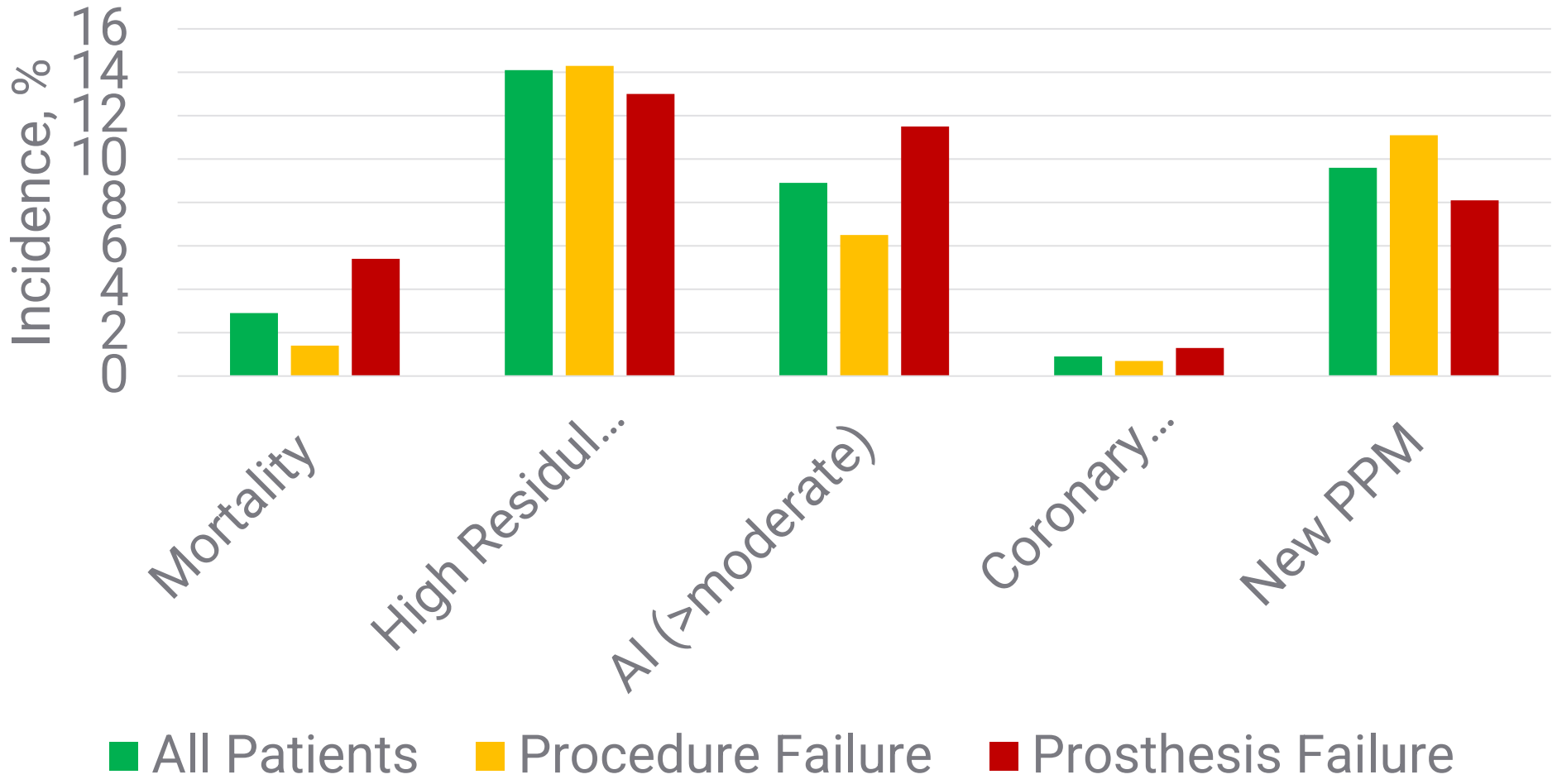
- Median follow-up (post redo-TAVR) was 15 (3 to 36) months

Landes U, JACC 2020

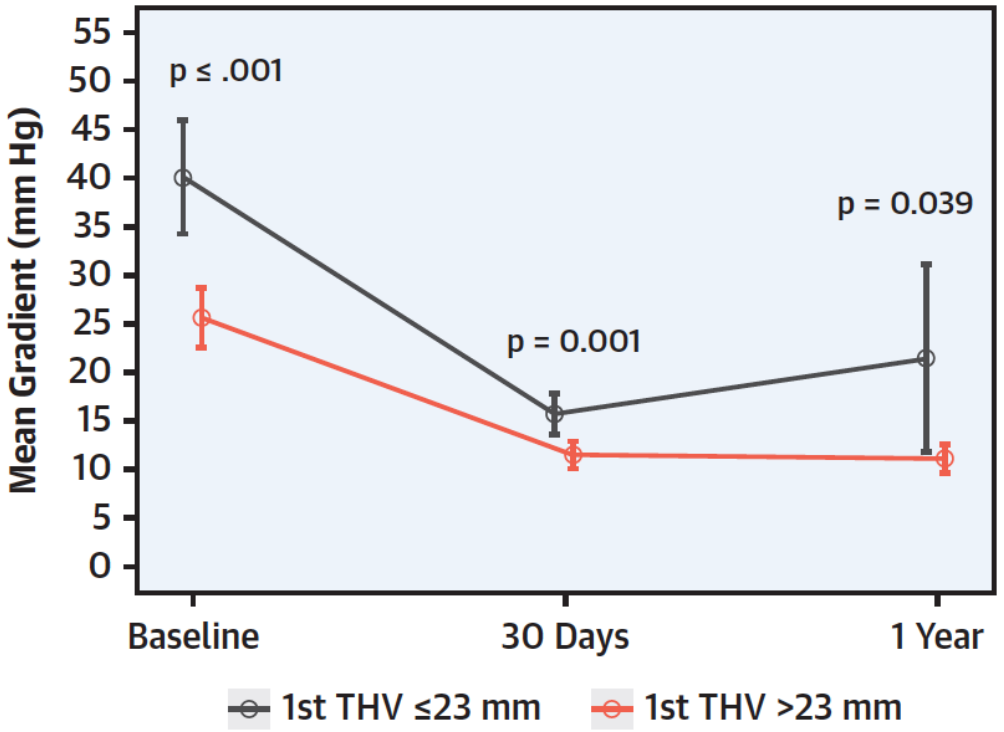
Index TAVR



REDO TAVR OUTCOMES



REDO TAVR VALVE PERFORMANCE



	Incidence	Residual Gradient	Coronary Flow Obstruction	Mortality at 30 days
Redo-TAVR For:				
Failed TAVR Valve	0.22%	13 mm Hg	0.7%	1.4%
Failed TAVR Procedure	0.11%	11.5 mm Hg	1.3%	5.4%

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CONCLUSION: TAVR IN TAVR APPEARS TO BE SAFE!

IS THAT THE FULL STORY ?!

Issues

TAV in SAVR

- All valves circular
- Similar height profile (neo-skirt)
- Leaflet overhang not an issue
- Neo-annulus: anchoring level
- True ID known: sizing easy
- Coronary obstruction risk

TAV in TAVR

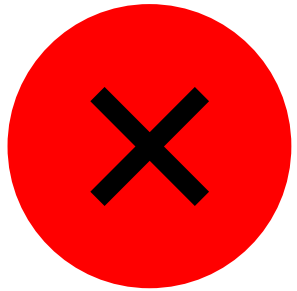
- Valves are not fully expanded
- Height profile different (neo-skirt)
- Leaflet overhang variable
- Depth of implant variable
- Anchoring level, Sizing & Coronary obstruction risk are interlinked
- All TAV valves can’t be used as 2nd TAV

Redo TAV IS going to be AN ART

MAINTAIN CORONARY PERFUSION

MAINTAIN CORONARY ACCESS

CHOOSING/POSITIONING THE SECOND VALVE



AVOID PATIENT PROSTHESIS MISMATCH

Important TAV in TAV considerations

- Prevent Coronary obstruction
- Maintaining Coronary access after TAV-in-TAV
- Hemodynamics
- Leaflet overhang? How much is acceptable?

- Sizing of 2nd TAV
- Which 2nd TAVs are compatible

KEY TERMINOLOGY

- **Coronary Risk plane (CRP):** Level below lowest coronary in relation to Index TAV
- **Neo-skirt Plane (NSP):** Top level of covered stent after Redo-TAV in relation to the Index TAV
- **Coronary risk prediction:** Multiple levels (narrowest measurement)
  - **VTC:** Valve To Coronary distance measured from the valve to coronary ostia
  - **VTA:** Valve To Aorta distance
  - **VTSTJ:** Valve to STJ distance
- **Leaflet overhang:** leaflet of Index TAV hanging over the 2nd TAV

Key points

- Compatibility
- Coronary Risk
- Sizing
- Hemodynamics

Compatibility

Sapien XT™

Sapien 3™

CoreValve™

CoreValve Evolut™

Portico™

Direct Flow™

Lotus™

Accurate™

Jenavalve™

Engager™

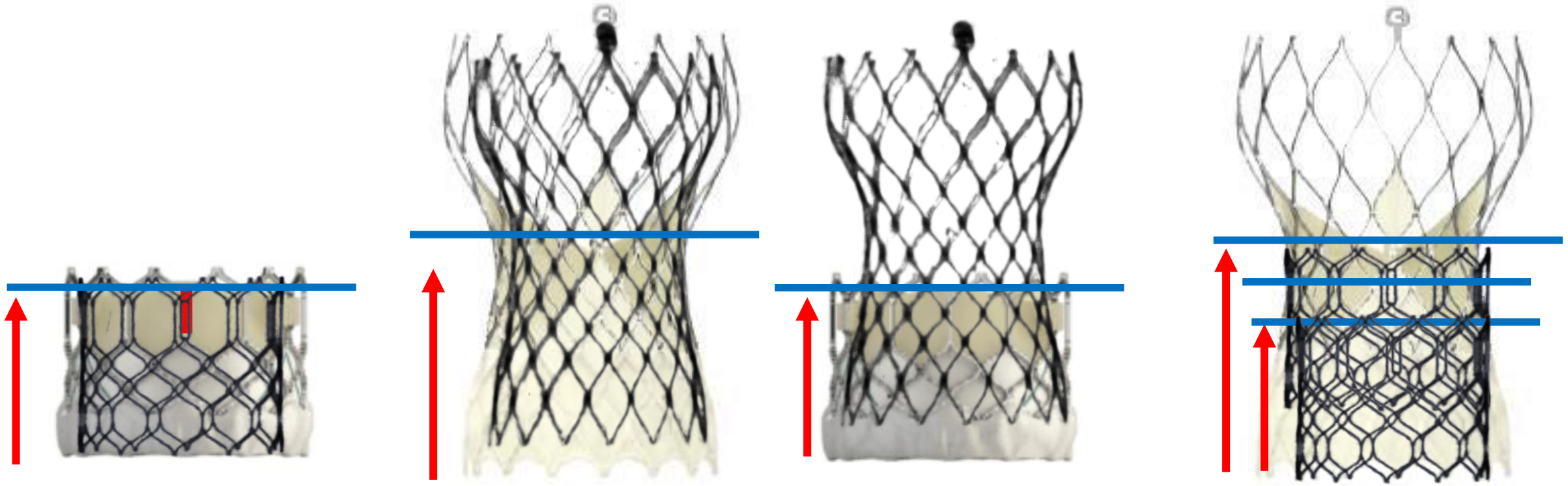
1st TAV – 2nd TAV Compatibility

- Usually:
  - Short valves – all TAVs can be used
  - Tall valves suprannular design– only short valves can be used
  - Tall valves intrannular design – most TAV valves can be used

- BE vs SE:
  - When 2nd TAV is BE, it can increase the 1st TAV dimensions and can ↓ VTA
  - When 2nd TAV is SE, it does not impact dimensions but may not fully expand

Combination determines Neo Skirt and Neo skirt plane

Index TAV **Pinned** leaflets + Skirt of Second TAV



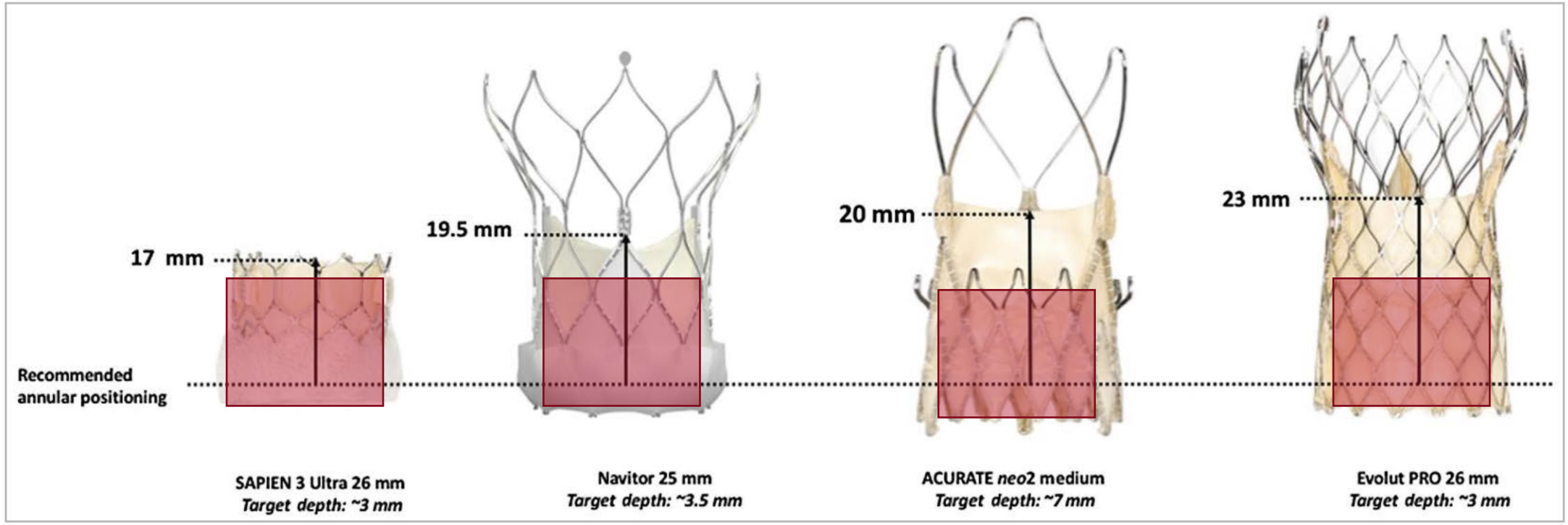
Short in Short

Tall in Tall

Tall in Short

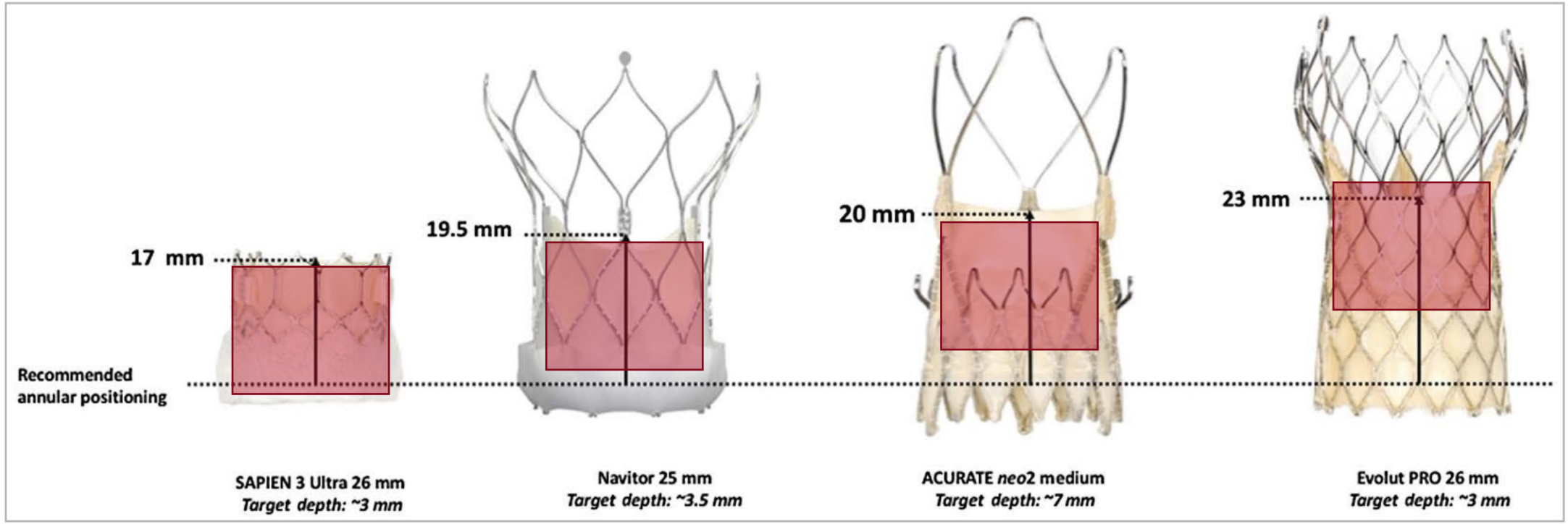
Short in Tall

Leaflet Overhang and Coronary Risk



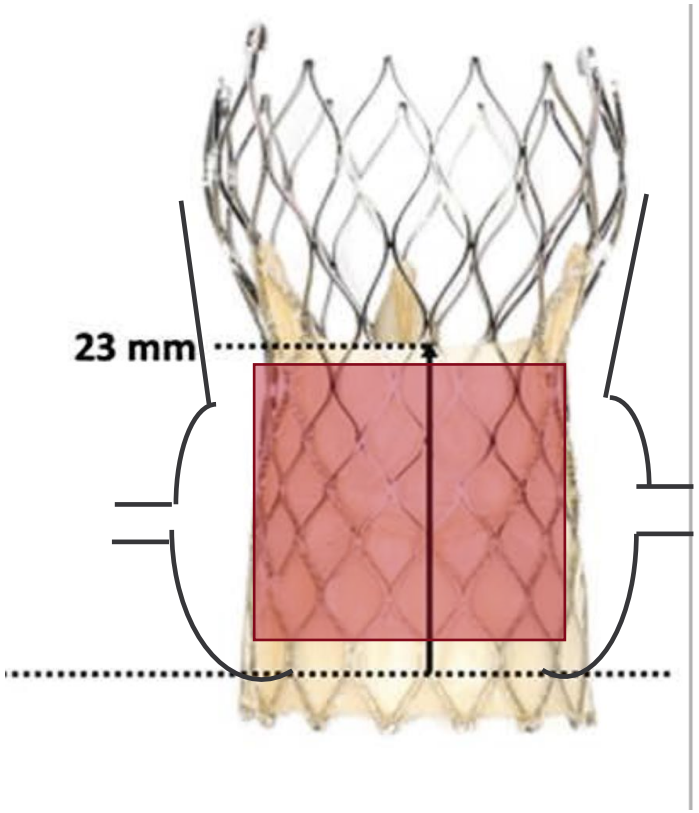
Leaflet overhang	nil	10%	40%	50%.

If implanted with no leaflet overhang



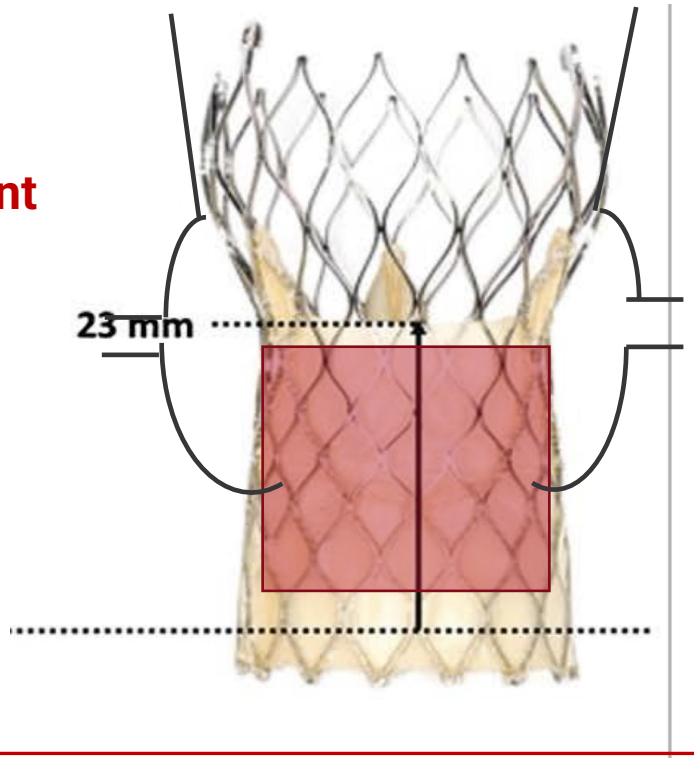
Coronary risk	+	+	+	++

Implant depth of Index TAVR matters



Coronary risk ++

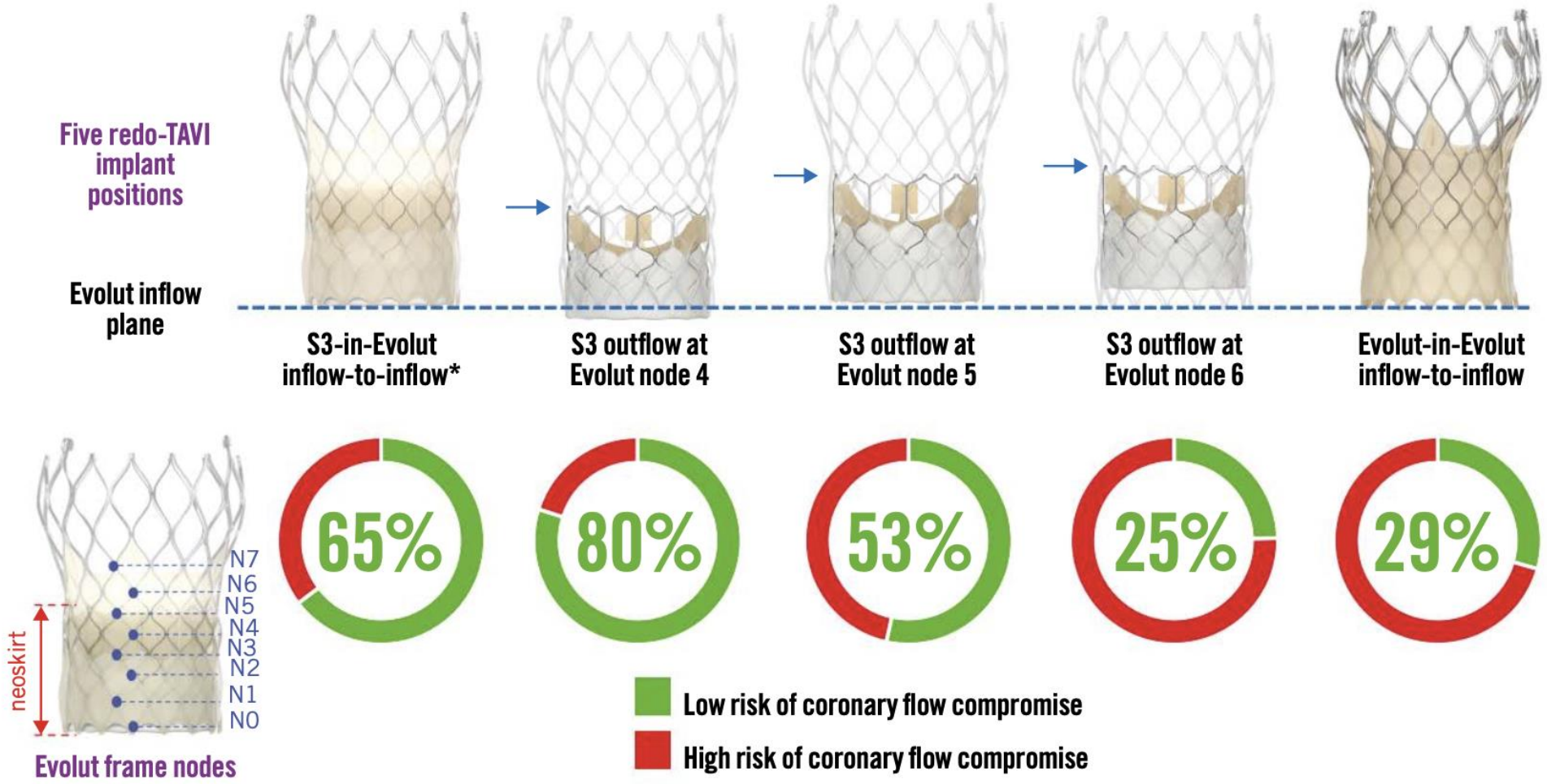
Node 6 Implant



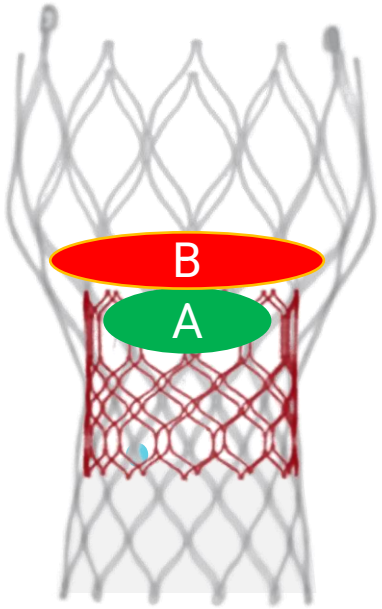
Coronary risk nil

Coronary risk

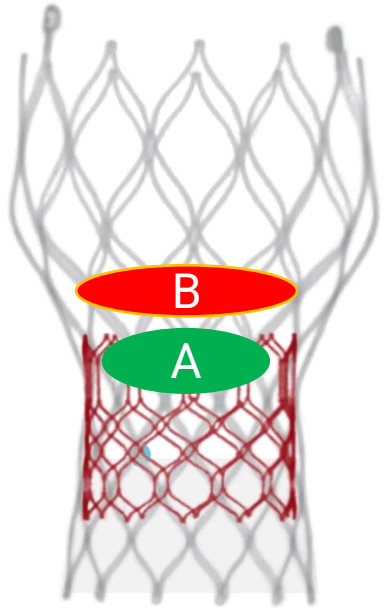
Coronary Risk



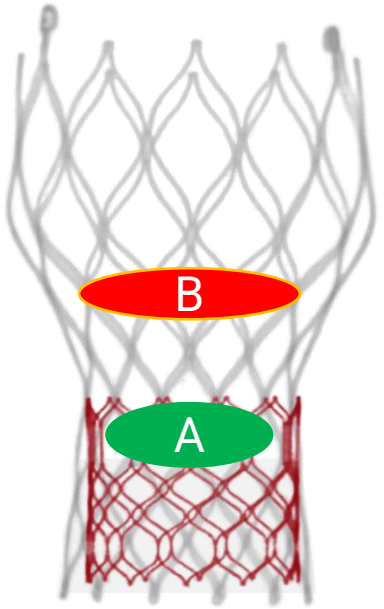
Example–ER and S3 (for illustration purpose only)



Node 6 Implant



Node 5 Implant



Node 4 Implant

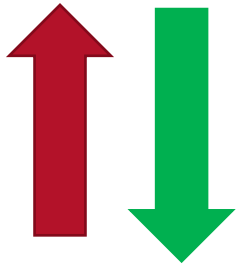
Implant Zone
Node 6
To Node 4

IF A > B: Then lower Implantation will be acceptable in certain cases

Coronary obstruction and Leaflet overhang

What is the best compromise???

Less Leaflet Overhang



Risk of Coronary Access or obstruction

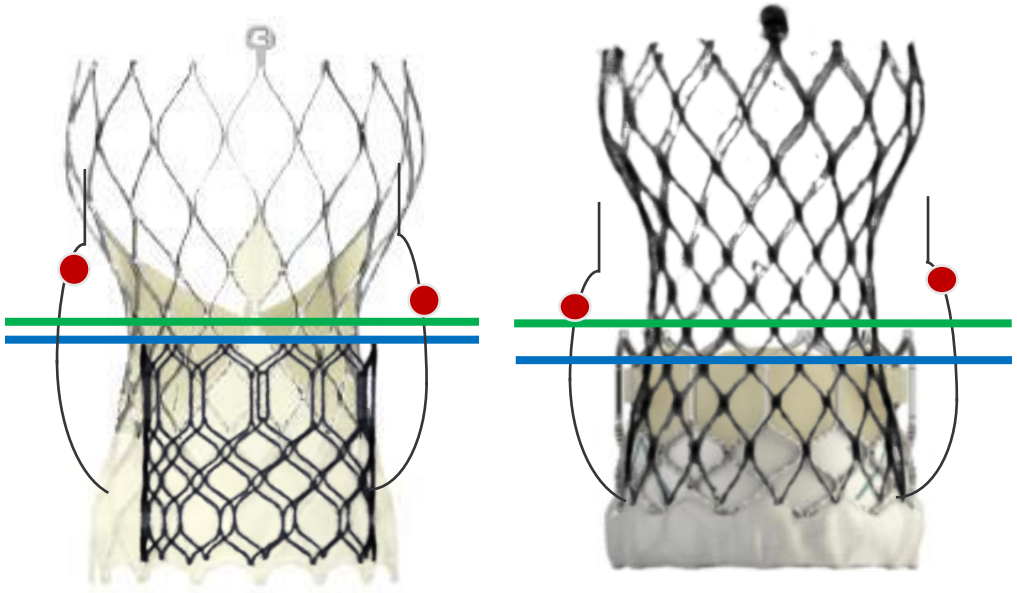
Can’t Compromise Coronary Flow

Hence, we need Individual Patient Assessment

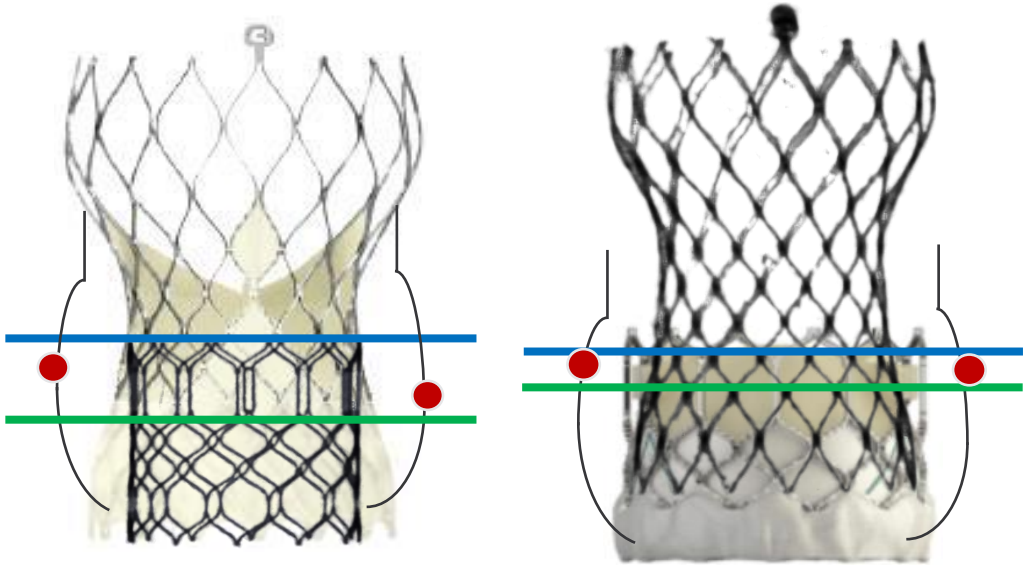
CRP = Coronary risk plane
NSP = Neo skirt plane

Relationship between CRP and NSP

CRP
NSP



NSP
CRP



No/Minimal risk to coronaries

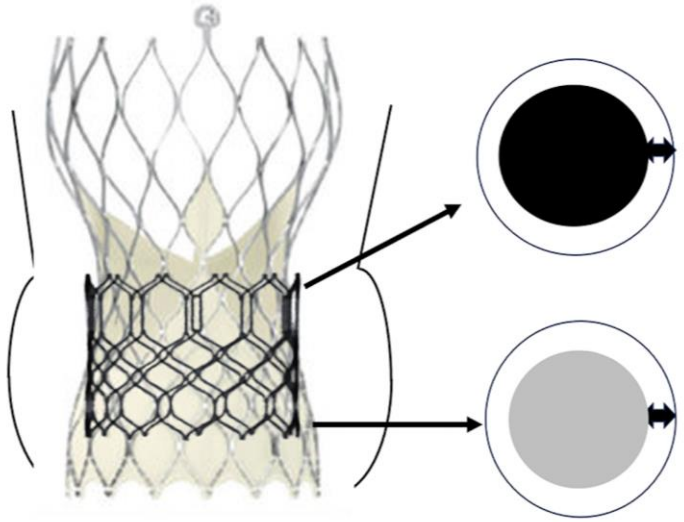
NSP below CRP

Risk to coronaries need assessment

NSP above CRP

Coronary Risk Analysis - Measurements

How:



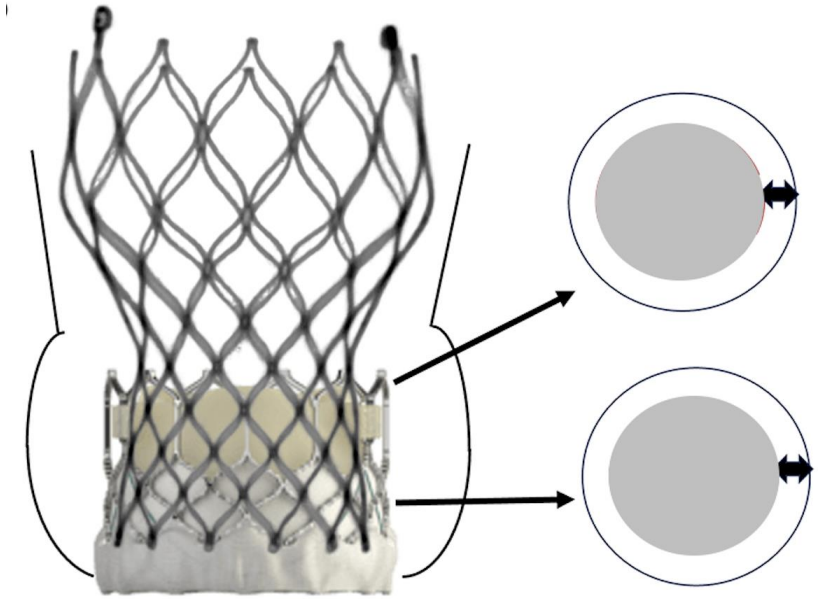
Second TAV = BEV

Use Virtual circle equal to Size Selected

Measure from whichever valve is outer most

Coronary Risk Analysis - Measurements

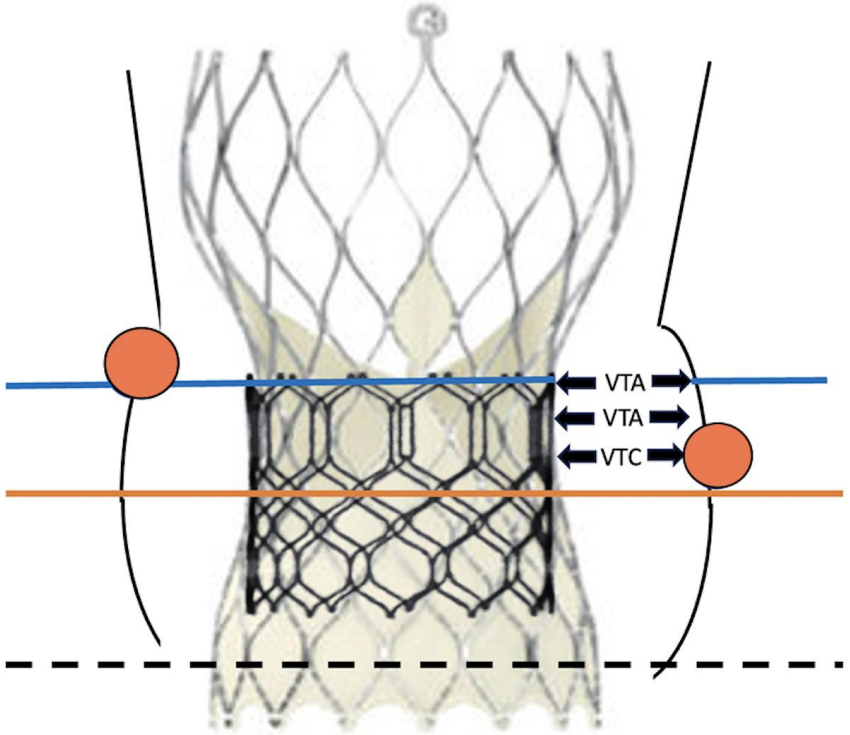
How:



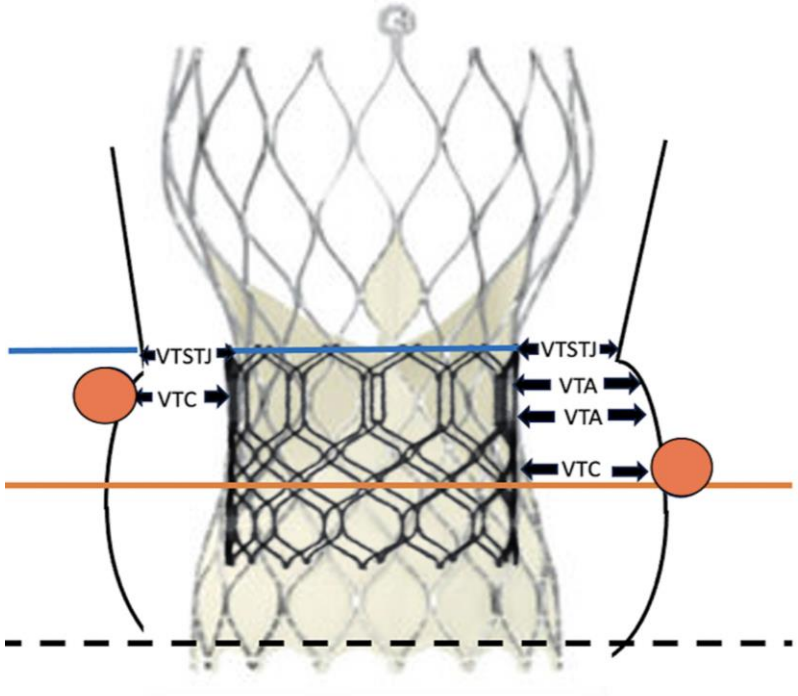
Second TAV = SEV

Measure from outer margin of Index TAV

What to measure:



NSP below STJ: VTA and VTC



NSP below STJ: VTSTJ, VTA and VTC

Risk based on NARROWEST MEASUREMENT

Risk classification

VTA >4

Minimal Risk of Coronary obstruction & good coronary access

VTA 2-4

Possible Risk of Coronary obstruction & difficult coronary access

VTA <2

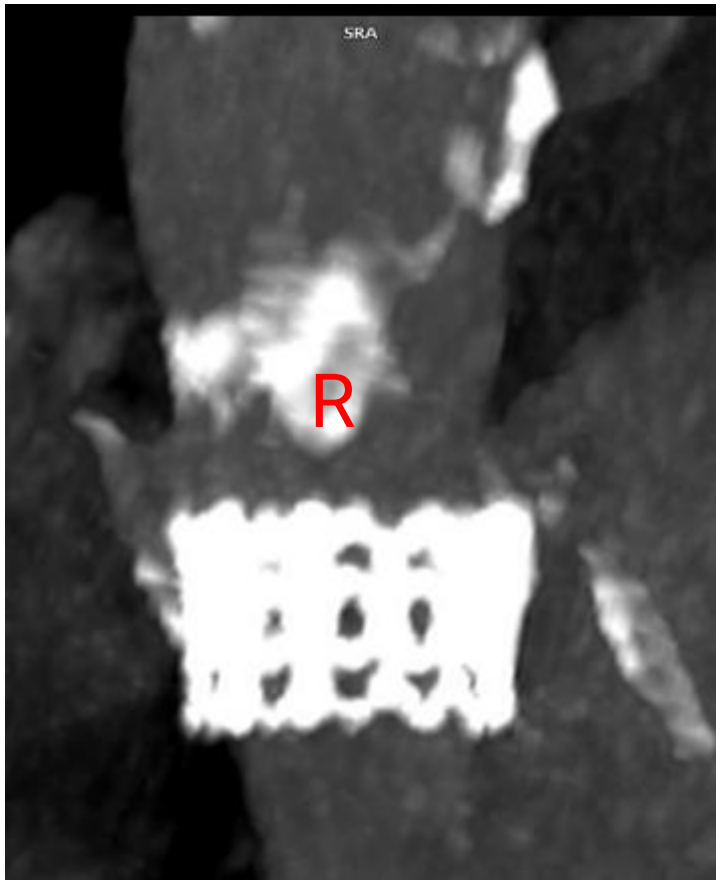
Very high risk of Coronary obstruction & Difficult coronary access

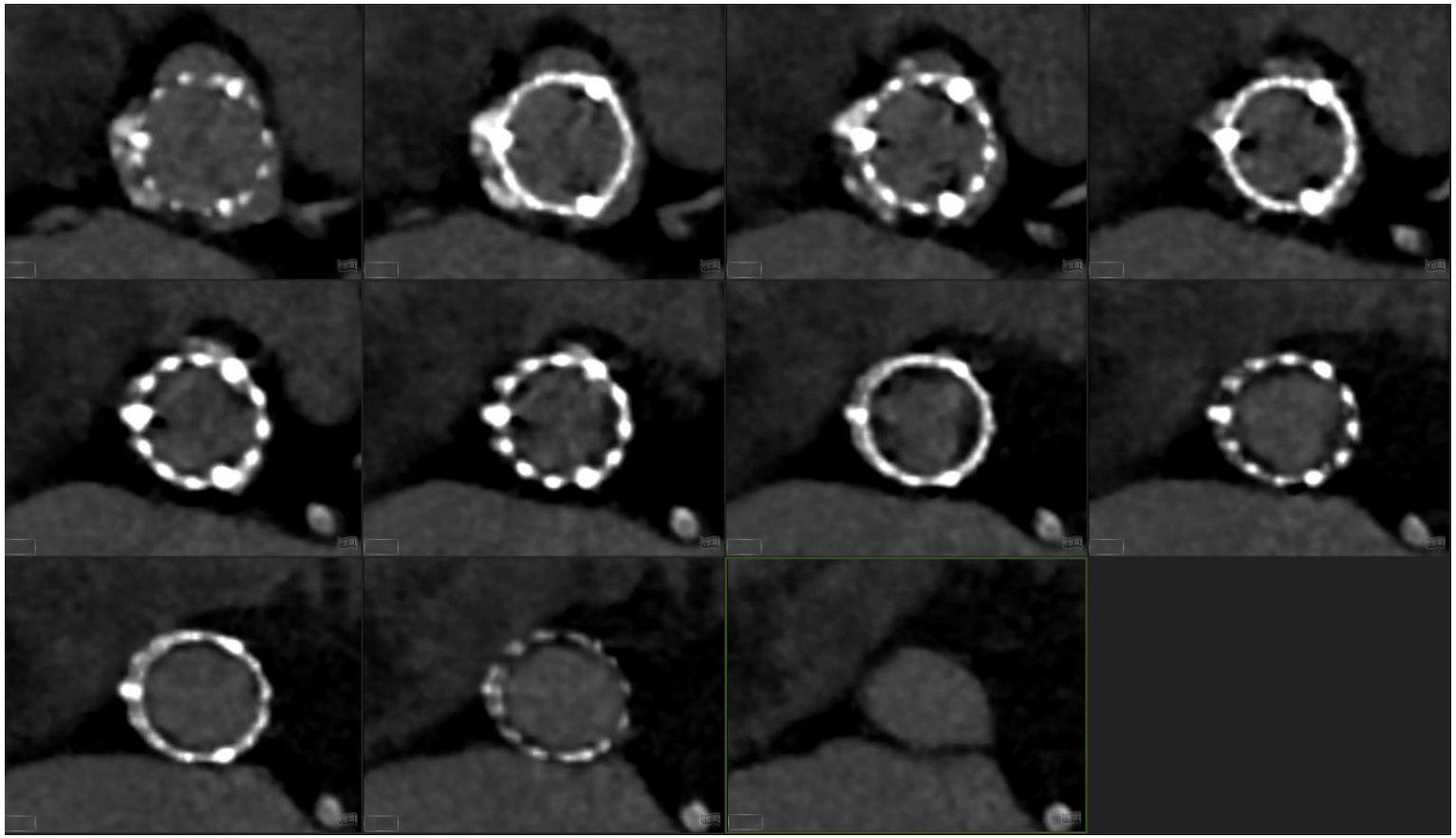
Second TAV Sizing

- 3 Ways to Size
    - In-Vitro
    - Based on Pre-Index native annulus
    - In-Vivo

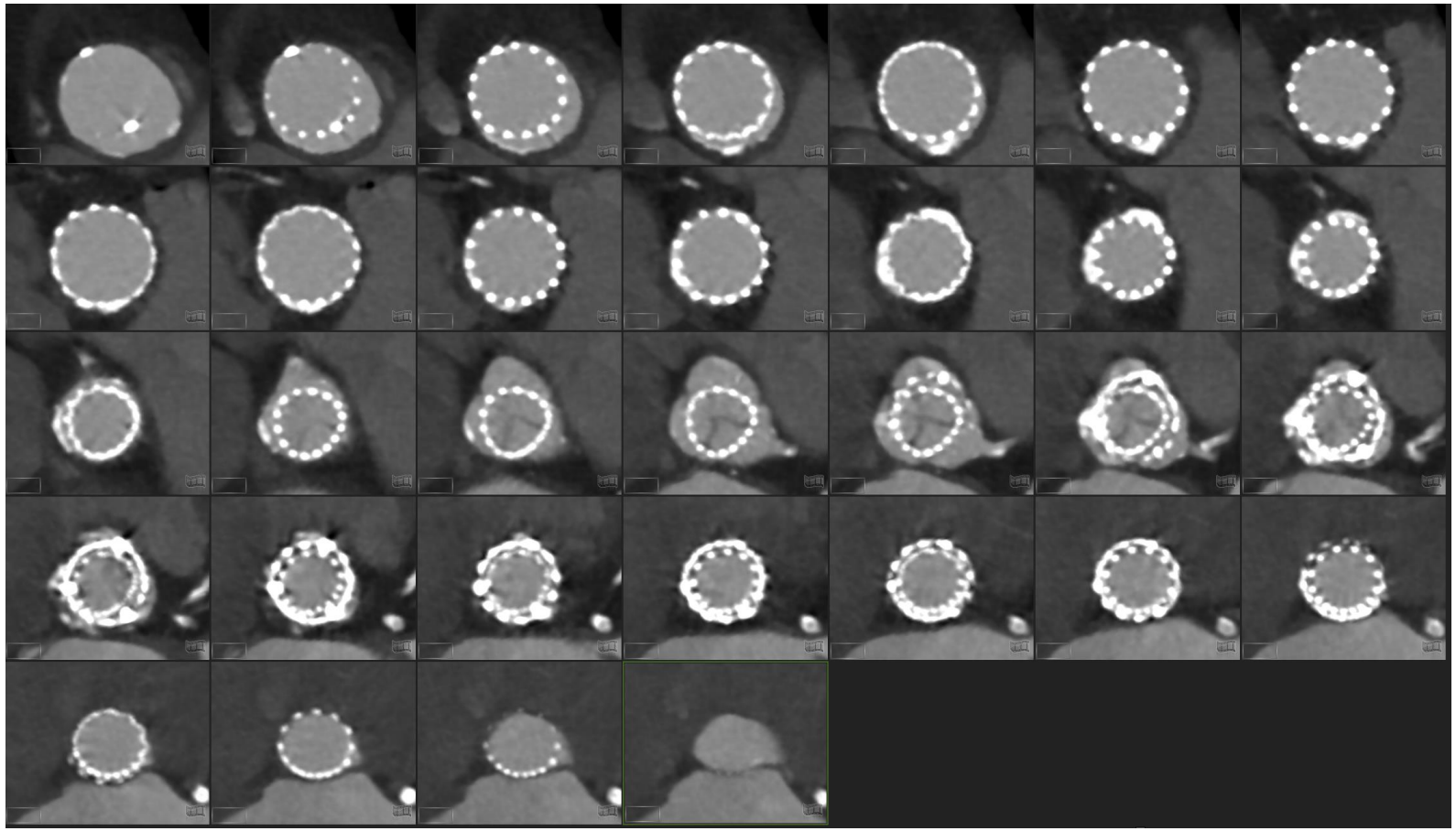
In-Vitro Sizing Example

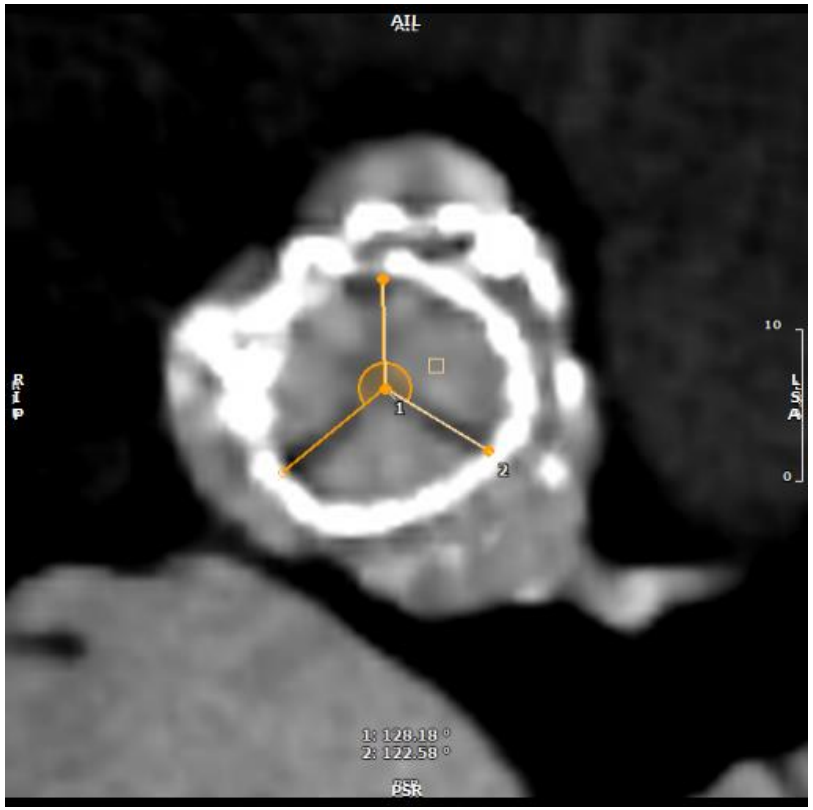
Sapien #23 Evolut R #26





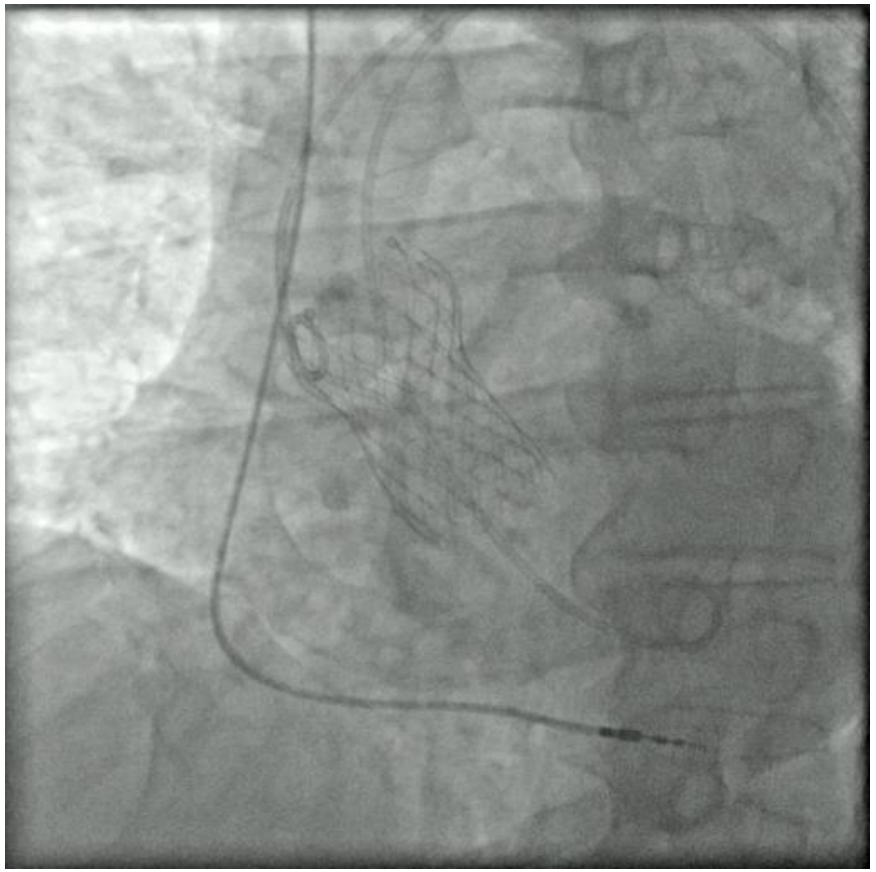
Under-expansion
Asymmetric Expansion
Higher Incidence of HALT

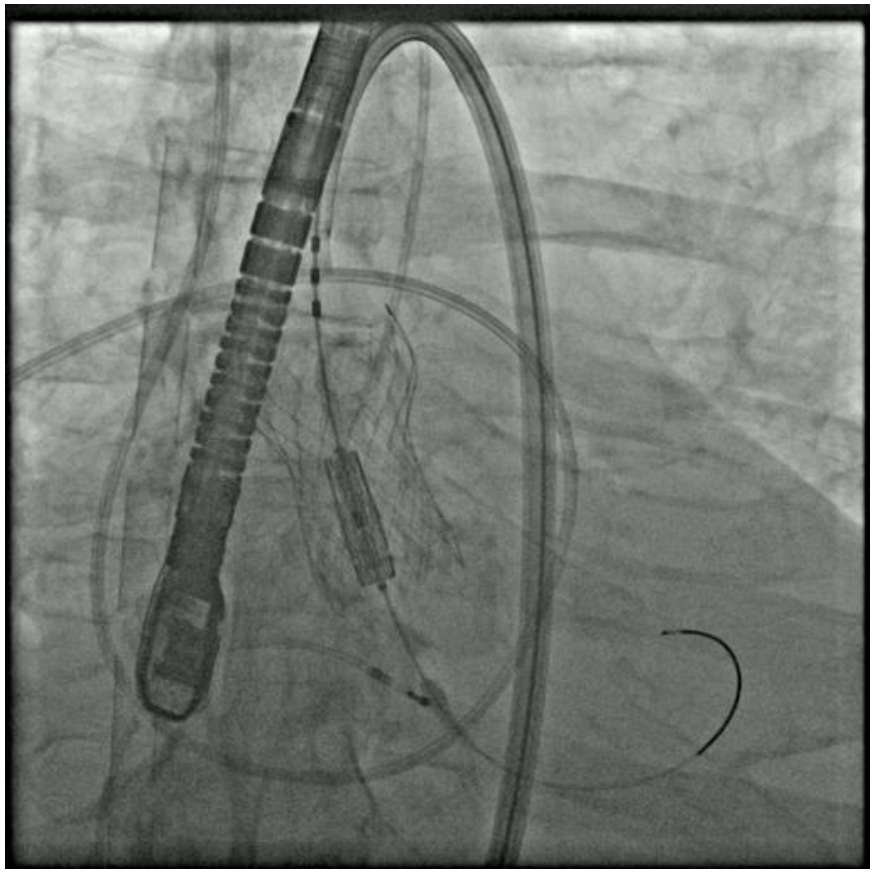




Case 2

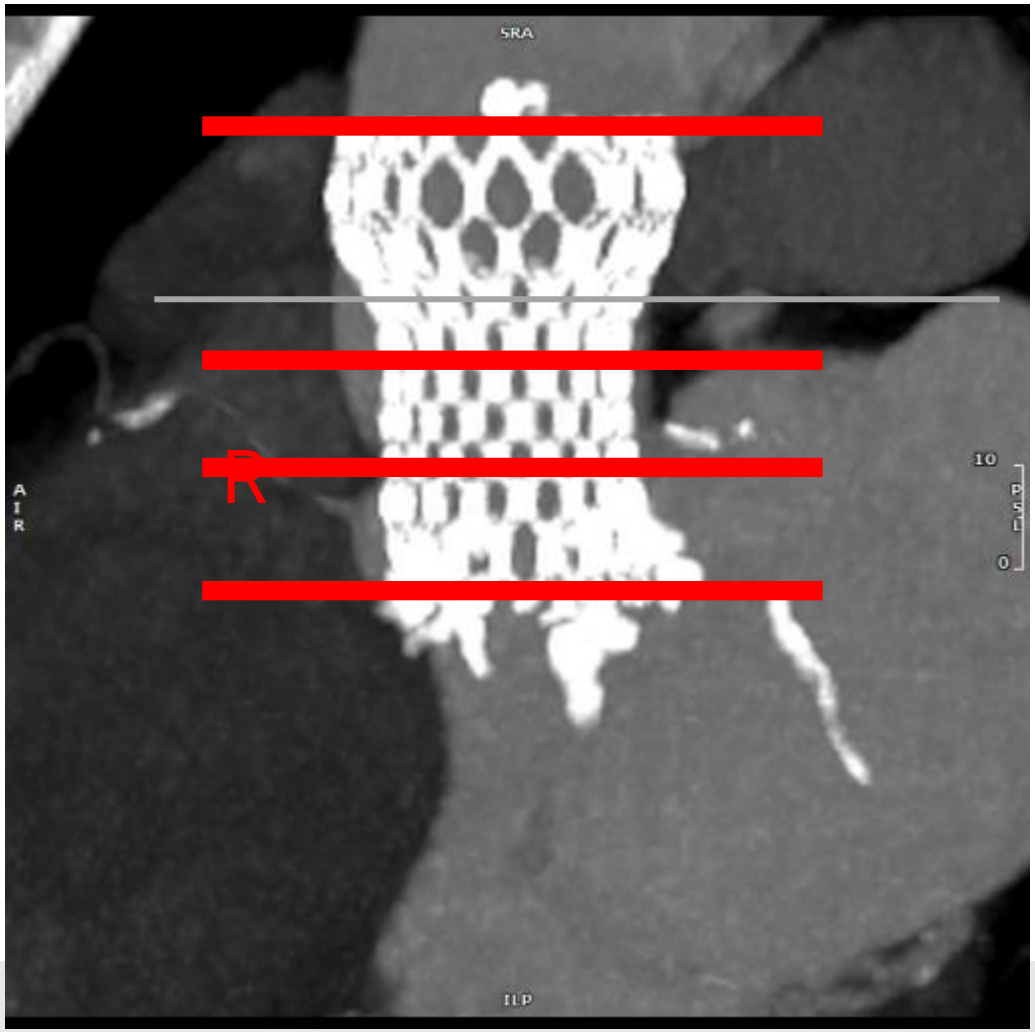
Evolut PRO #29 -> S Ultra #23 Pre-TAV in TAV

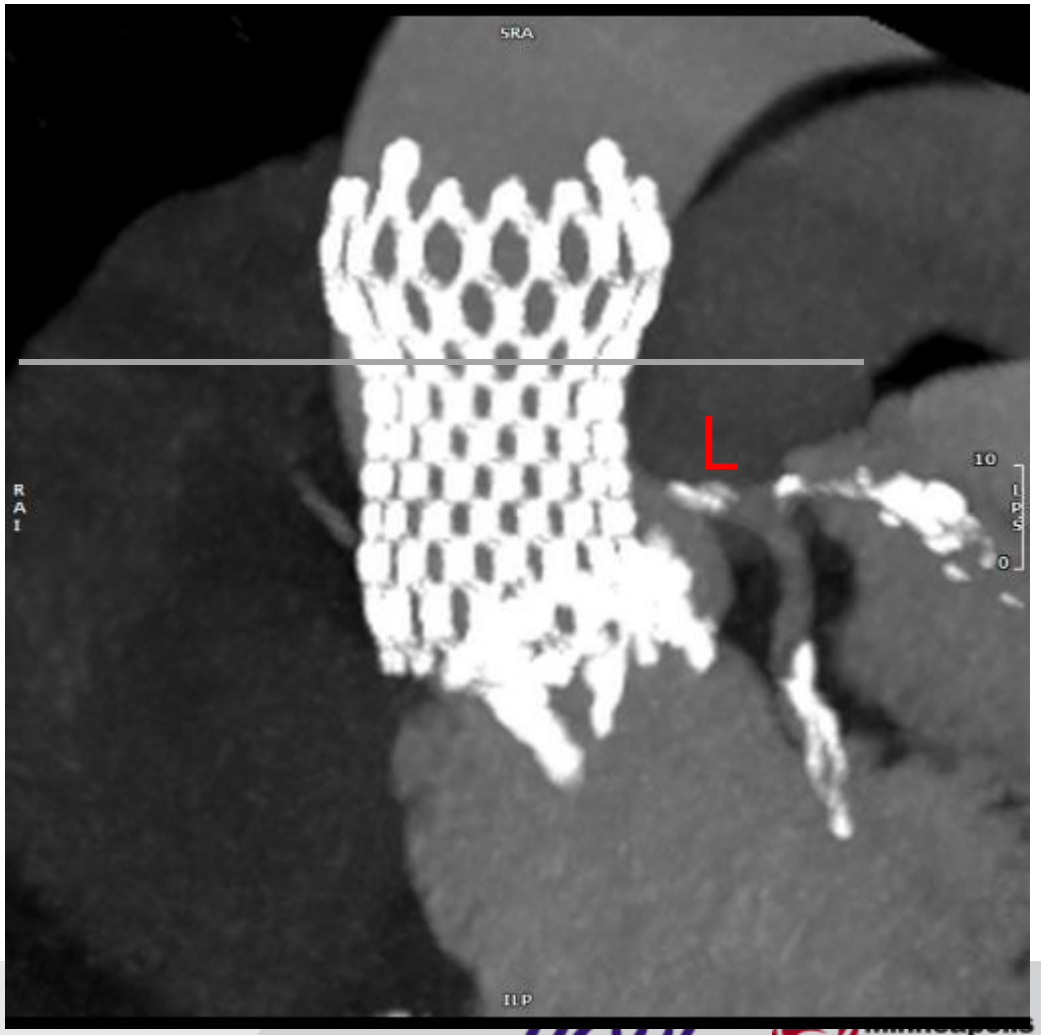




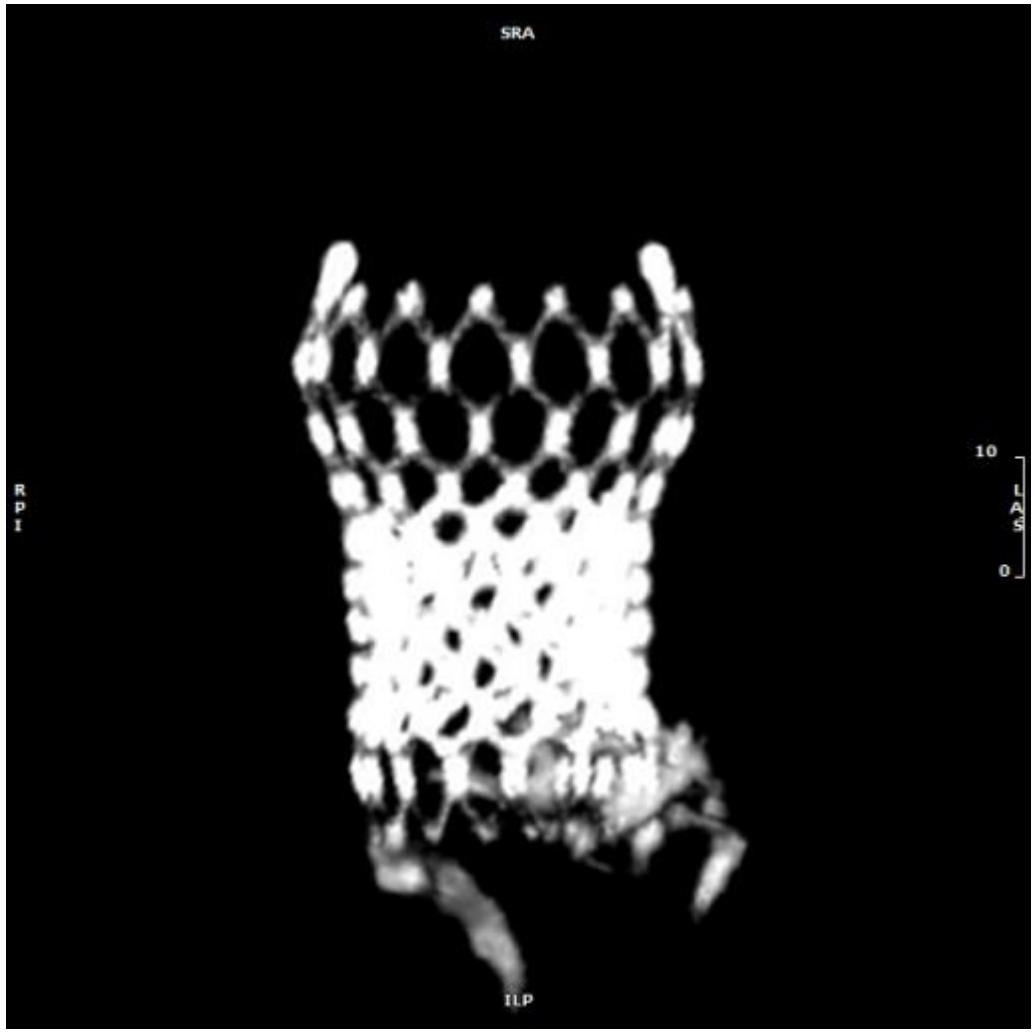
In-Vivo Sizing Example

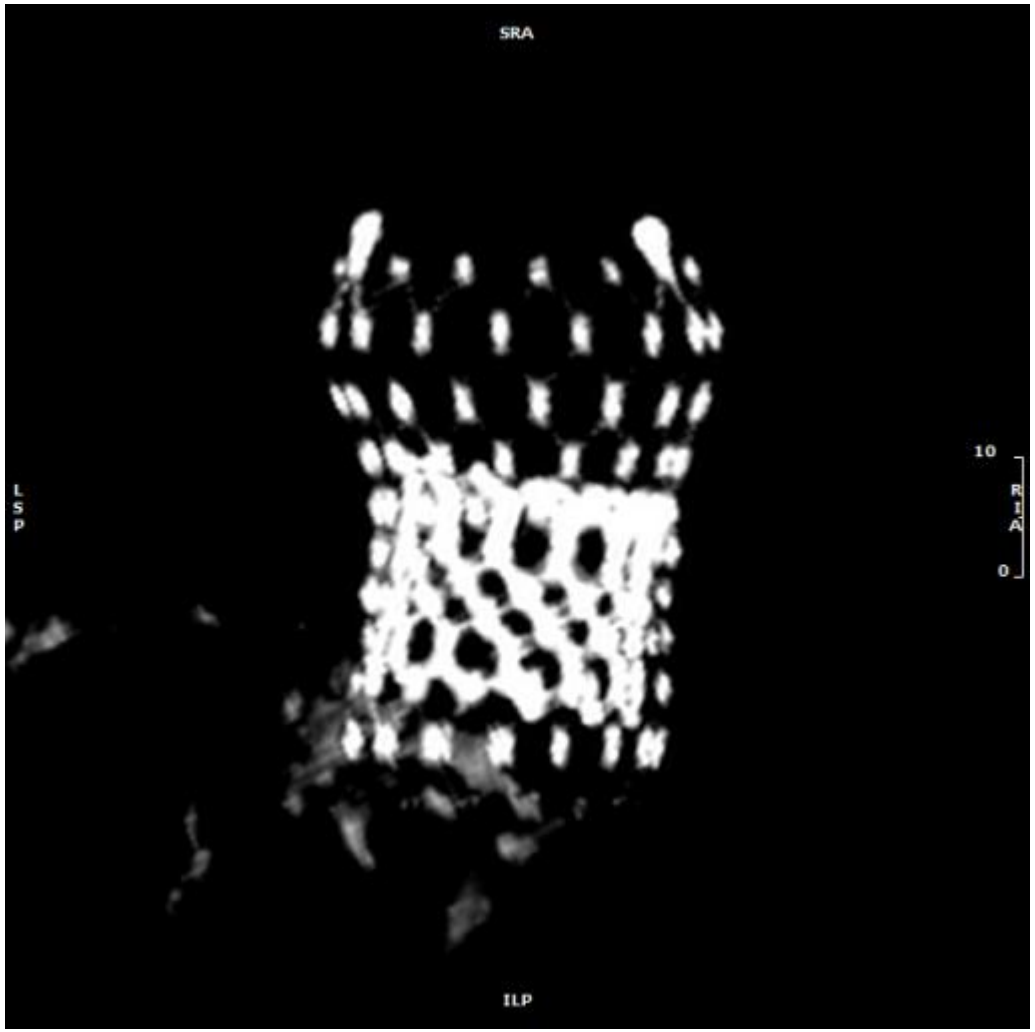
Sapien #23 Evolut R #29 SAPIEN Ultra 23 (not 26)



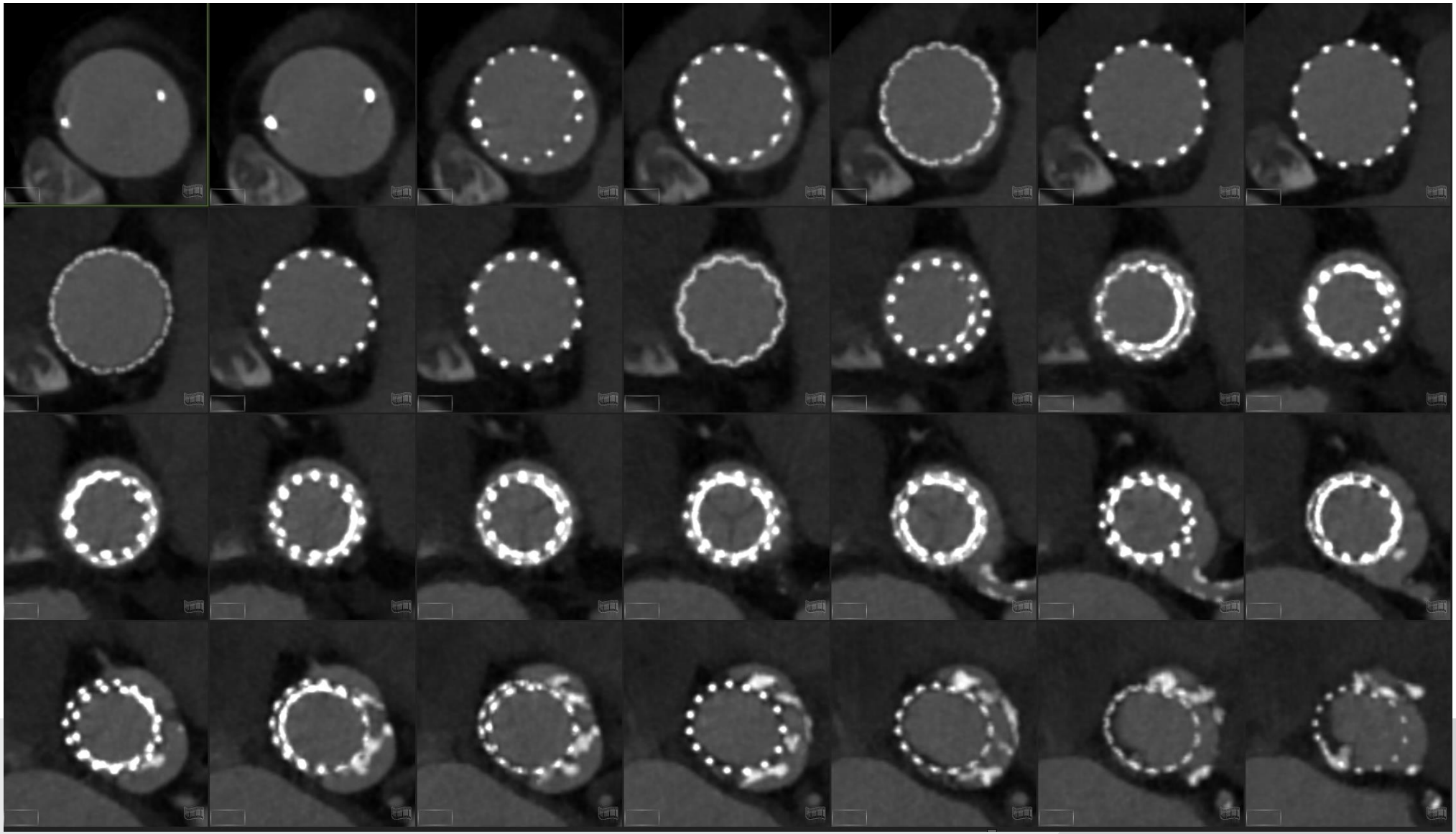


Evolut PRO #29 -> S Ultra #23





Better-expansion
Circular Expansion
Less Risk of HALT



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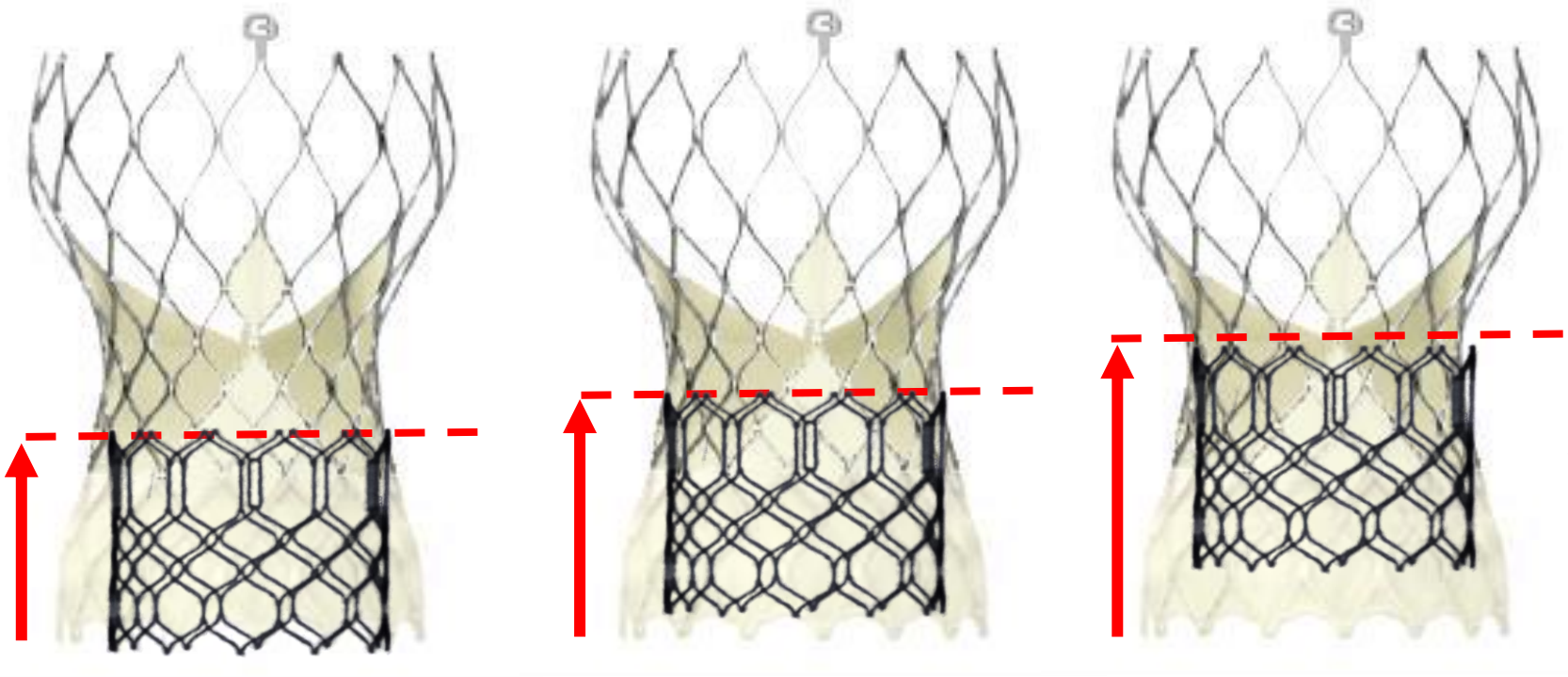
Choose Size of Second TAV before Coronary Analysis: Why?



Node 4 | Node 5 | Node 6

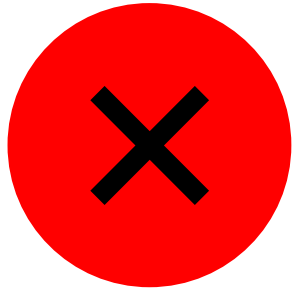
Sizing may change with
Level of implant

Can Redo be Logical

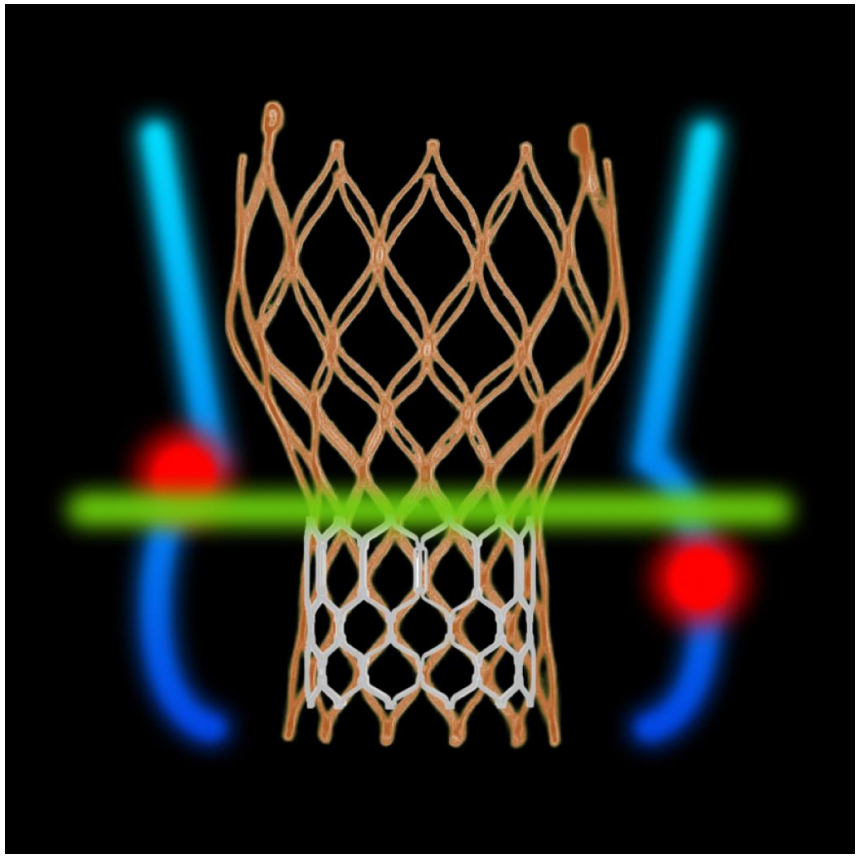
MAINTAIN CORONARY PERFUSION

MAINTAIN CORONARY ACCESS

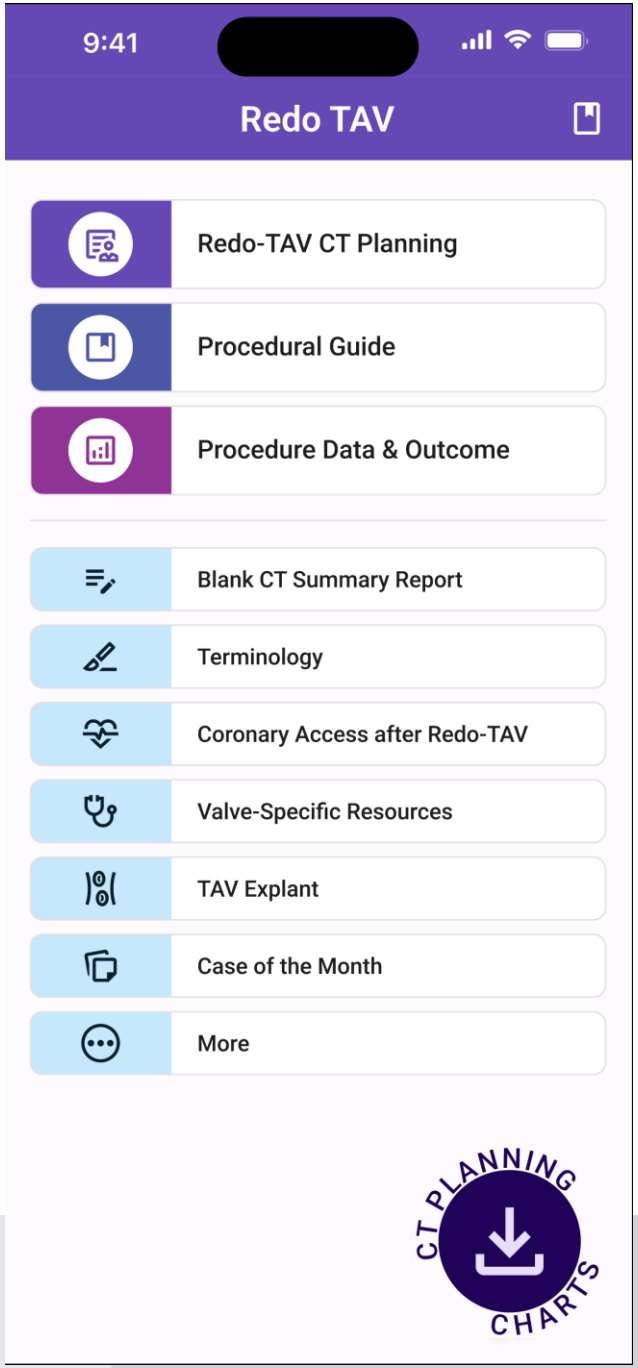
CHOOSING/POSITIONING THE SECOND VALVE



AVOID PATIENT PROSTHESIS MISMATCH



Redo TAV



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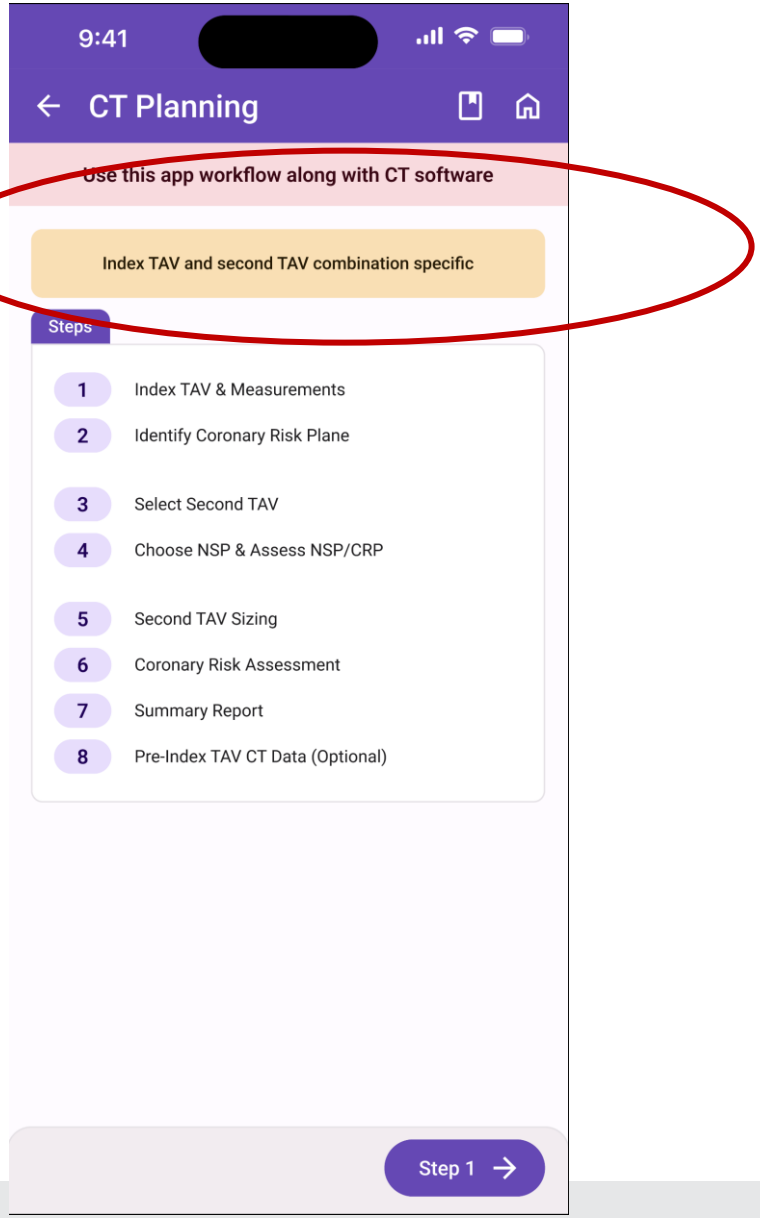
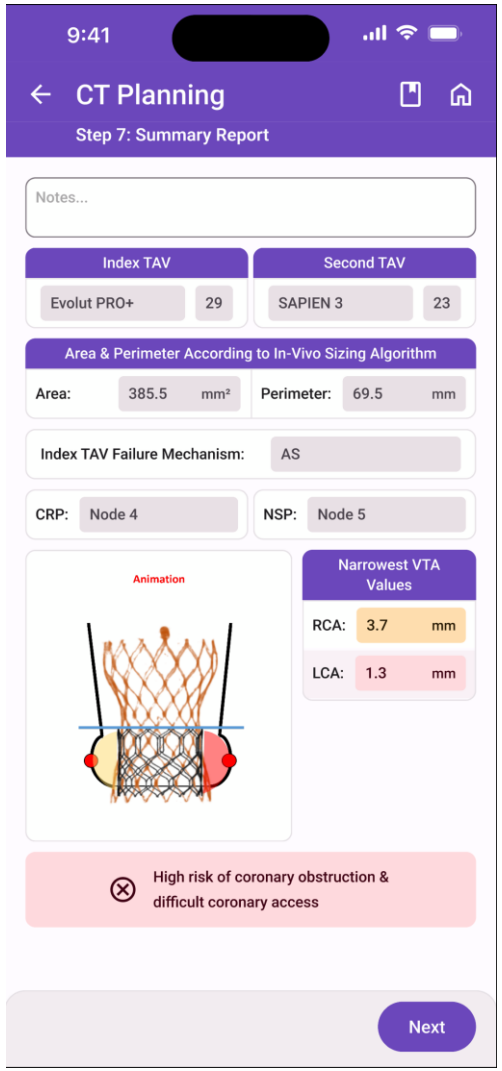
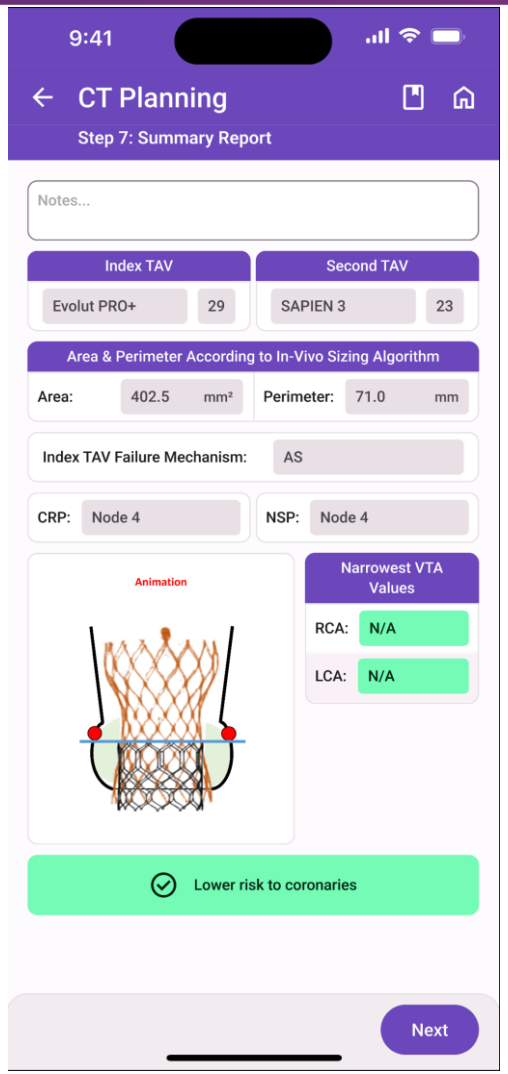
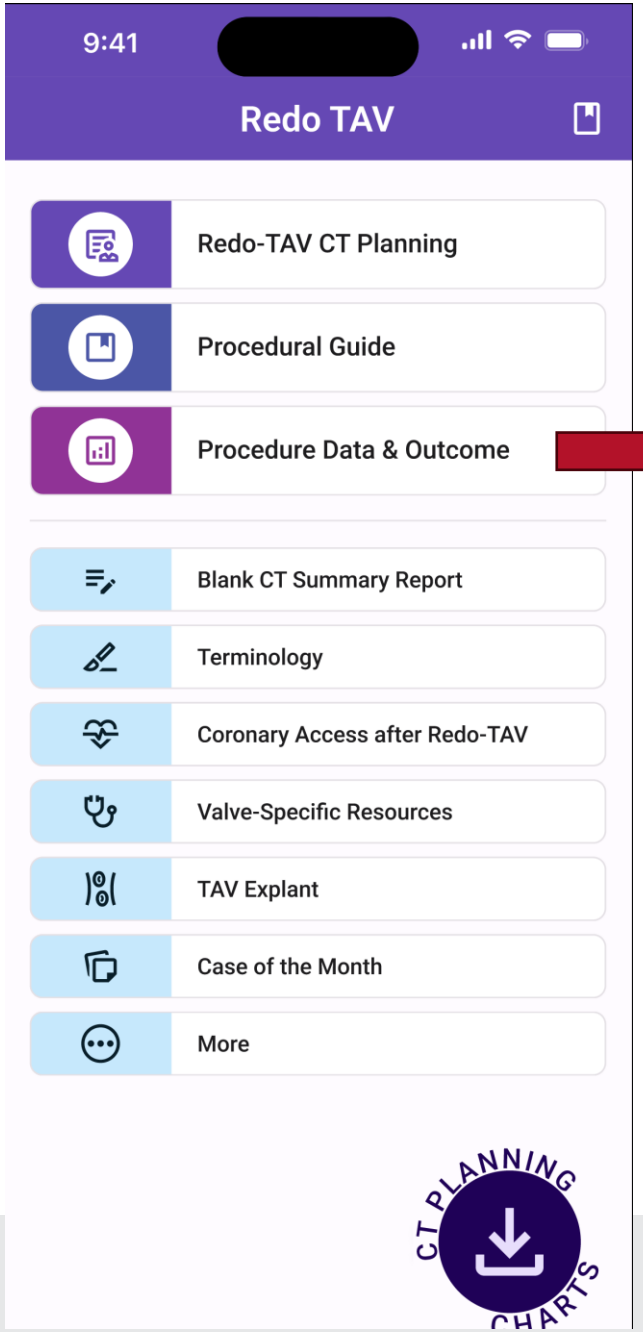


Steps

1. Index TAV & Measurements
2. Identify Coronary Risk Plane
3. Select Second TAV
4. Choose NSP & Assess NSP/CRP
5. Second TAV Sizing
6. Coronary Risk Assessment
7. Summary Report
8. Pre-Index TAV CT Data (Optional)


9:41
CT Planning
Step 7: Summary Report
Notes...
Index TAV
Second TAV
Evolut PRO+
29
SAPIEN 3
23
Area & Perimeter According to In-Vivo Sizing Algorithm
Area:
385.5
mm²
Perimeter:
69.5
mm
Index TAV Failure Mechanism:
AS
CRP:
Node 4
NSP:
Node 5
Animation
Narrowest VTA Values
RCA:
3.7
mm
LCA:
1.3
mm
High risk of coronary obstruction & difficult coronary access
Next


9:41
CT Planning
Step 7: Summary Report
Notes...
Index TAV
Second TAV
Evolut PRO+
29
SAPIEN 3
23
Area & Perimeter According to In-Vivo Sizing Algorithm
Area:
402.5
mm²
Perimeter:
71.0
mm
Index TAV Failure Mechanism:
AS
CRP:
Node 4
NSP:
Node 4
Animation
Narrowest VTA Values
RCA:
N/A
LCA:
N/A
Lower risk to coronaries
Next



Multi-Center Registry to assess Outcomes based on Systematic CT Analysis and procedure

1. In-Vivo Sizing
2. Coronary Risk: calculated vs observed
3. Hemodynamics according to positioning

HOPE DISCOVERED HERE

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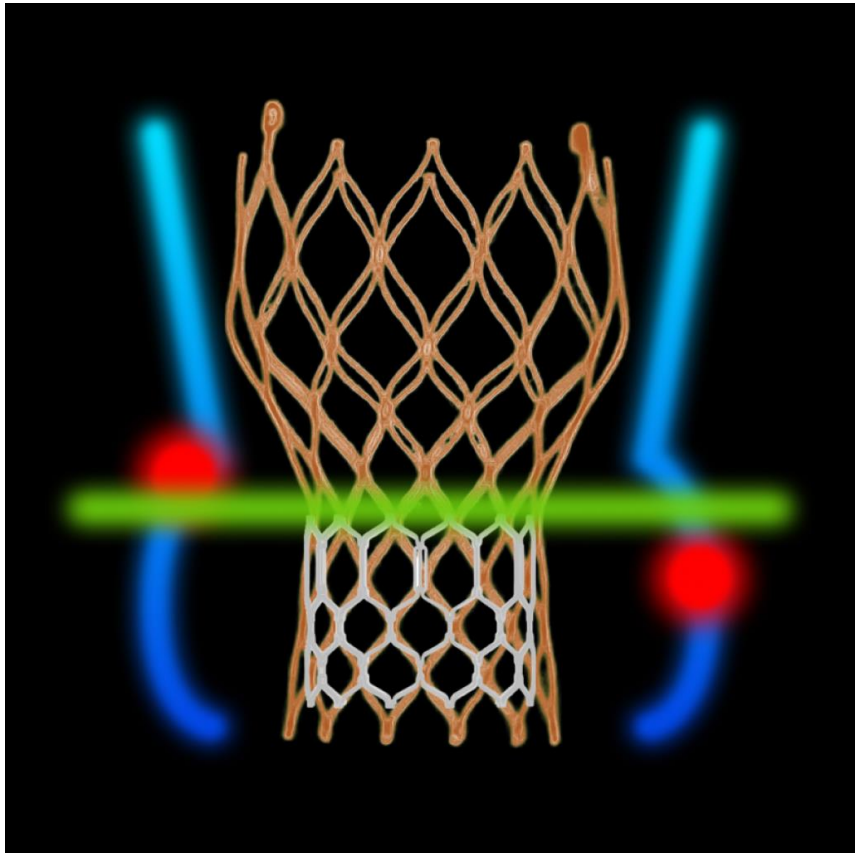
Creating a world without heart and vascular disease



APP will be available January 2024

Summary

- Familiarize with New Terminology
- Understand TAV designs and compatibility
- Undertake Systematic CT analysis
- Perform Procedure according to CT planning

Better Patient Selection
Better Patient Outcomes