TAVR
¿Como Seleccionar la Estrategia y la Técnica?

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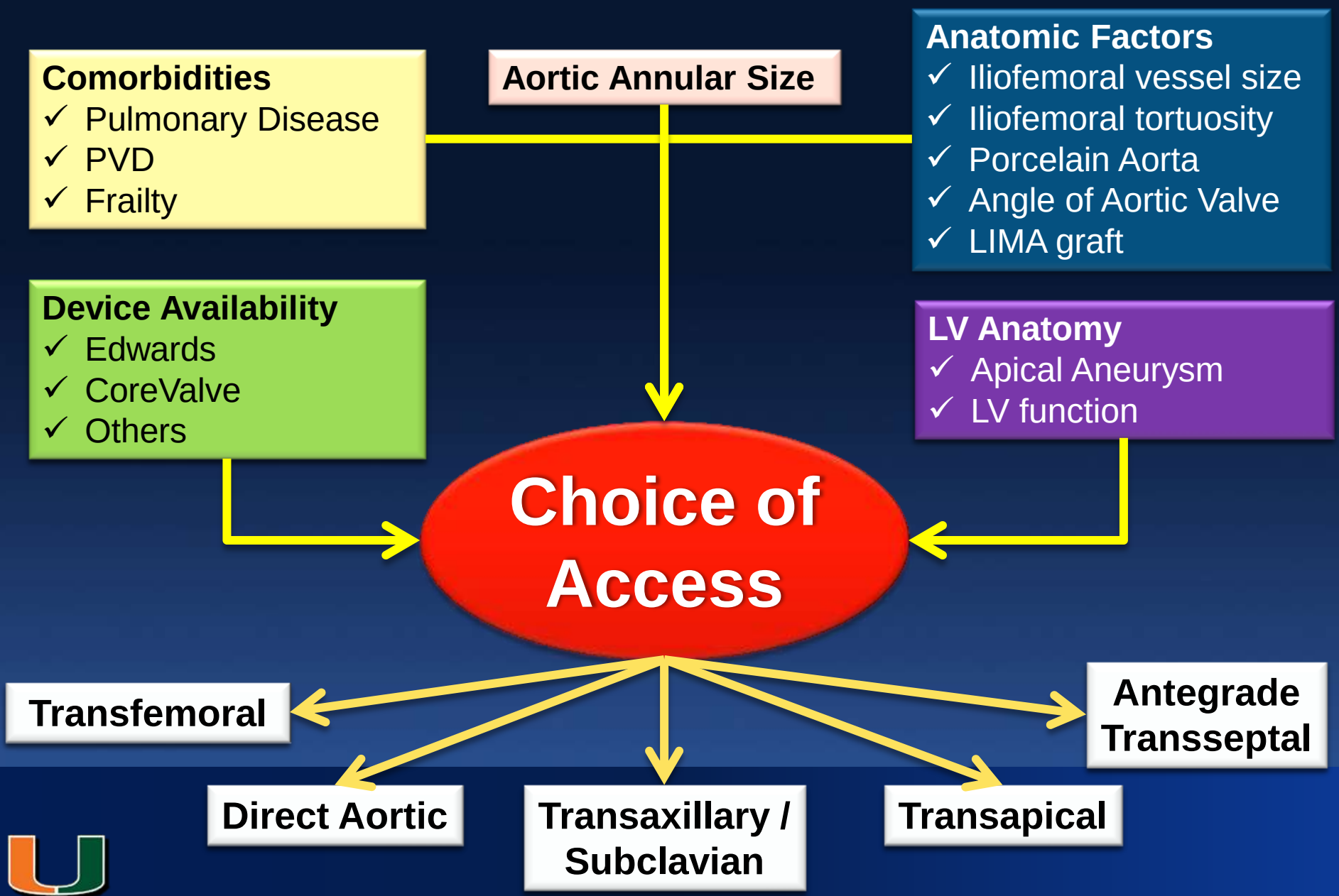
MILLER SCHOOL
of MEDICINE

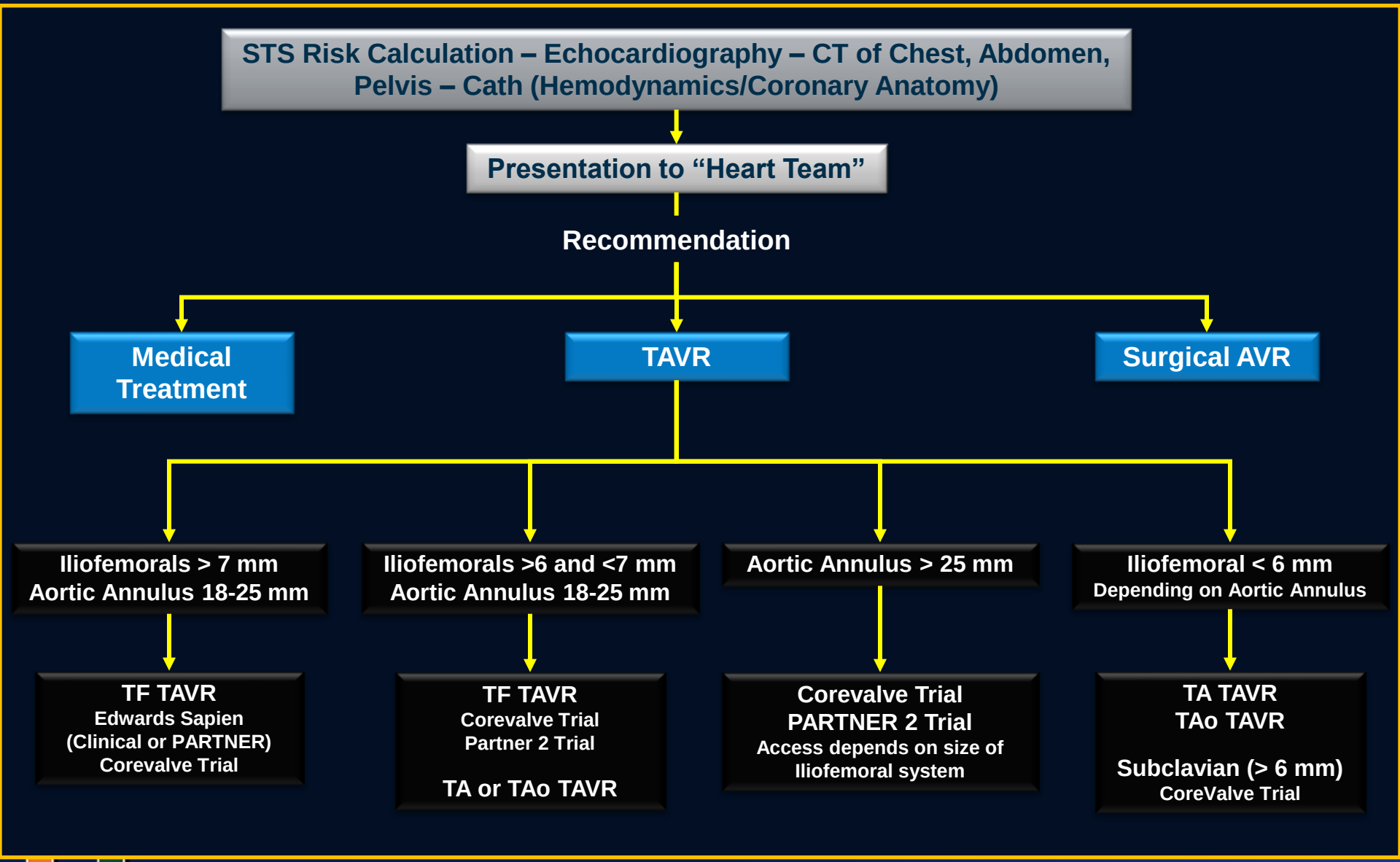
Choice of Strategy



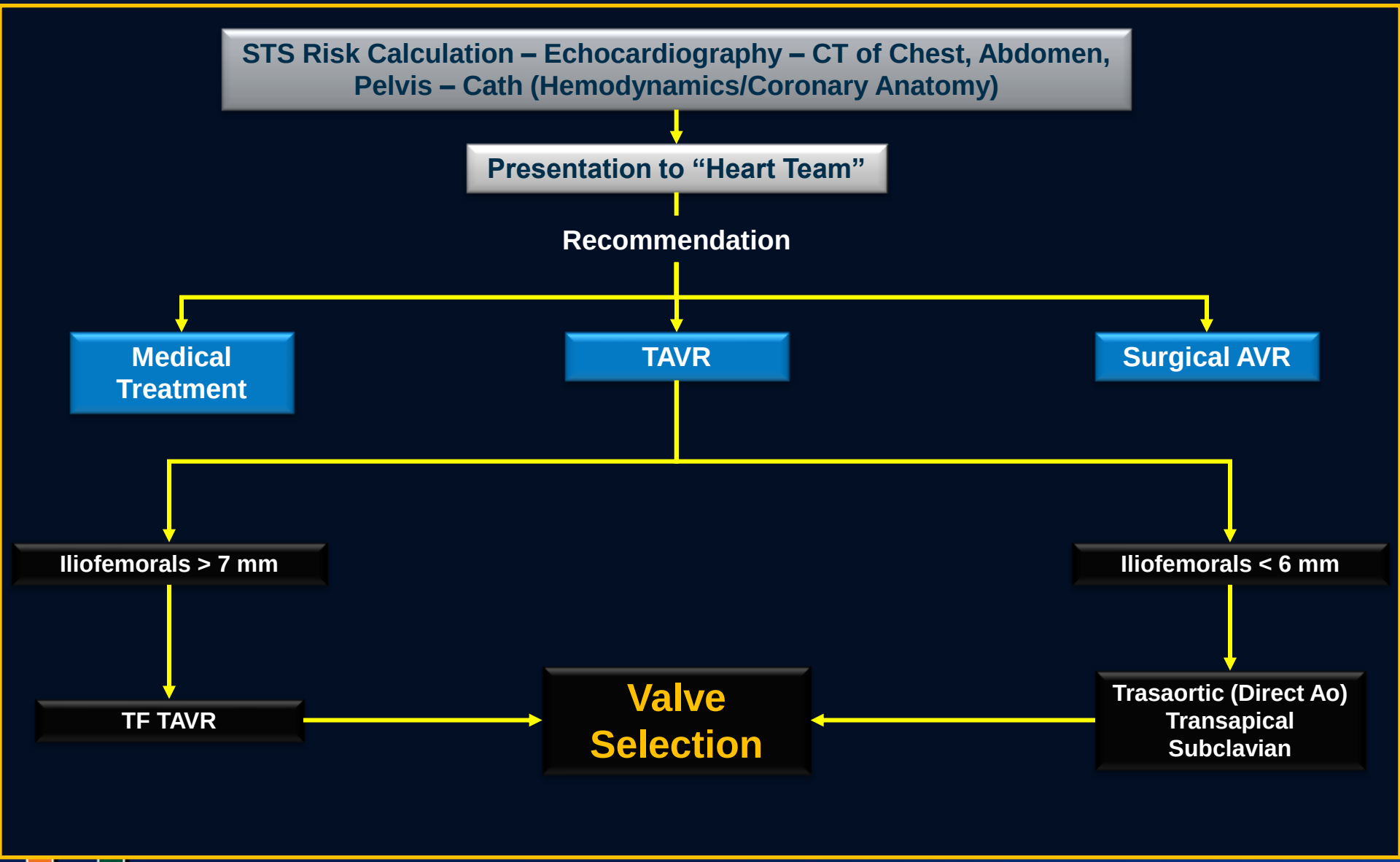
General Rules

- **Femoral is always better**
  - Improved survival
  - Shorter recovery
- **Look at the CT very carefully**
  - Choose the valve
  - Oversize as much as you can

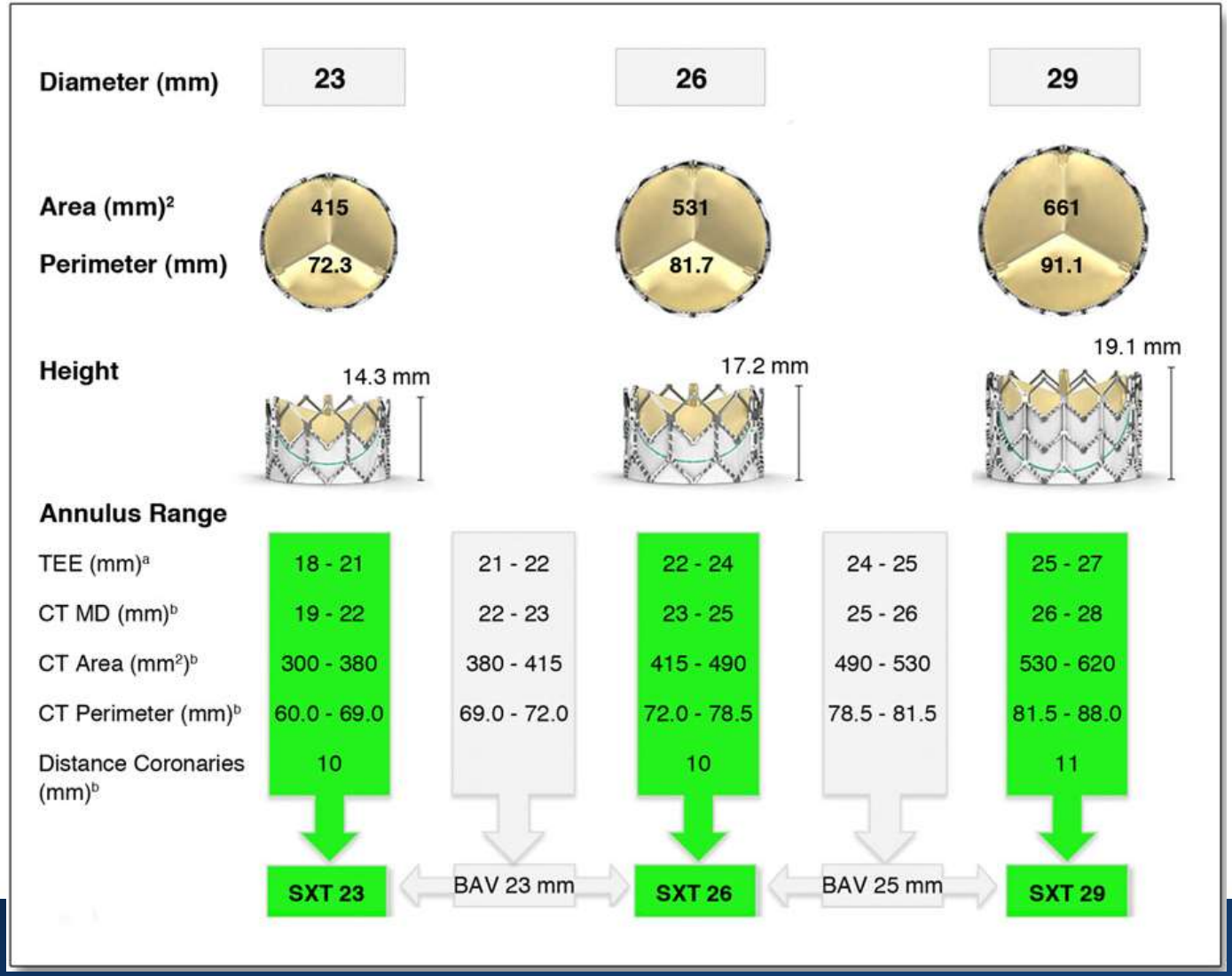
Selection Algorithm (US)



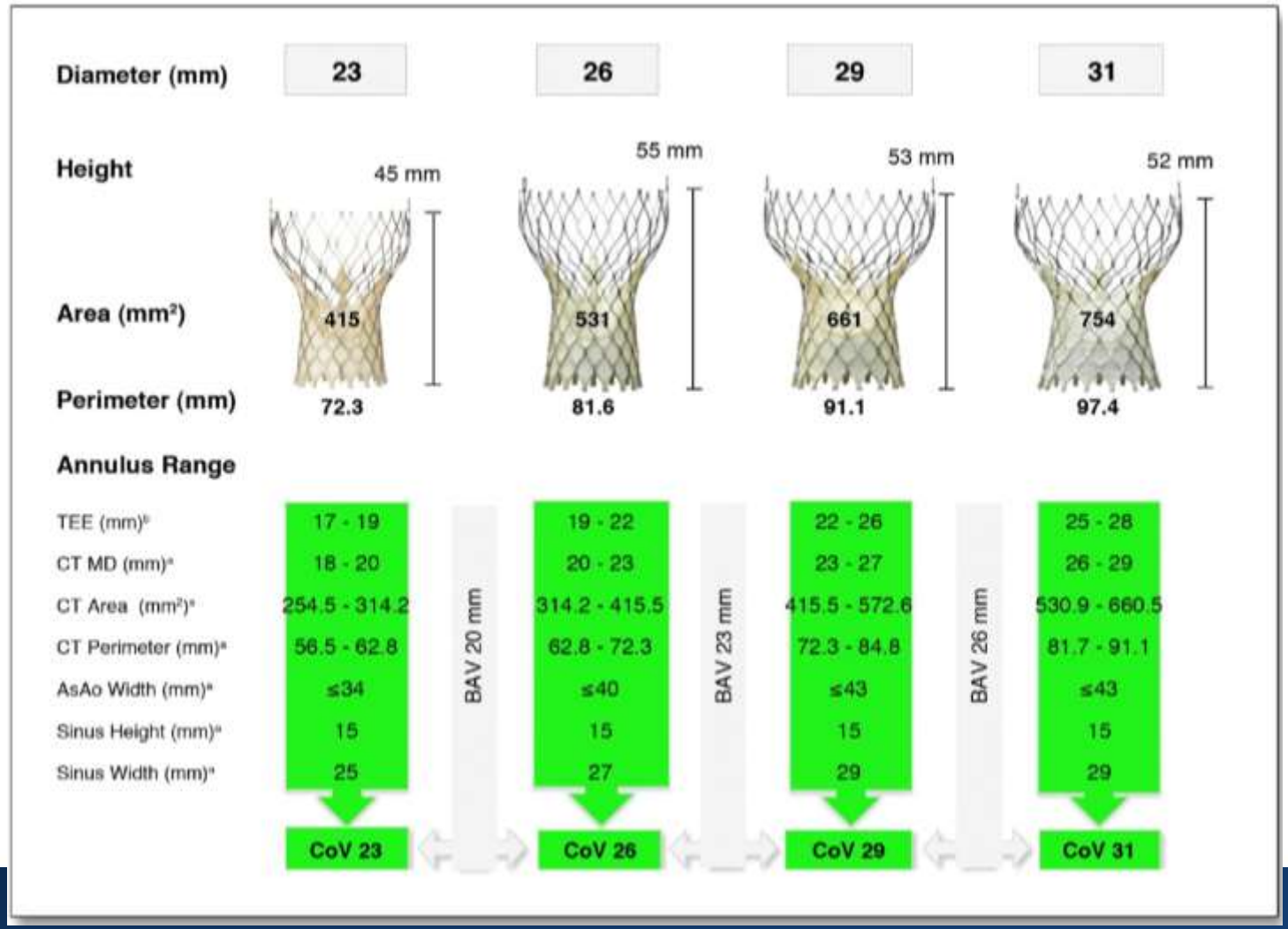
Selection Algorithm (US)



Recommendations for XT Sapien Selection



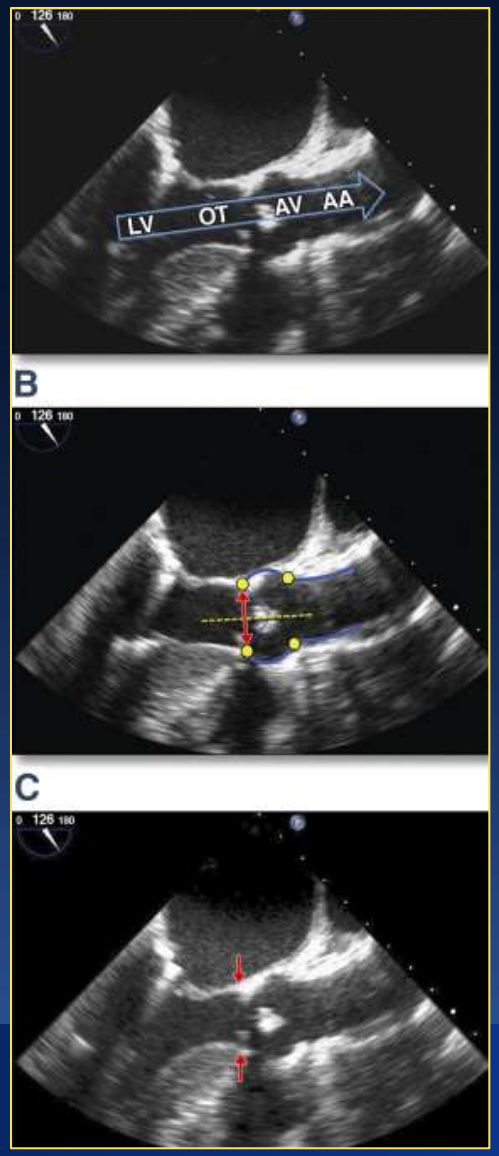
Recommendations for CoreValve Selection



Kasel AM et al. J Am Coll Cardiol Img 2013; 6:249 – 62

Sizing the Annulus - ECHO

- A single-dimensional measurement is no longer accepted as the sole determinant of THV sizing
- TEE measurements are ~1 mm larger than TTE
- 3-D TEE is an valid alternative for more precise pre-procedural measurements



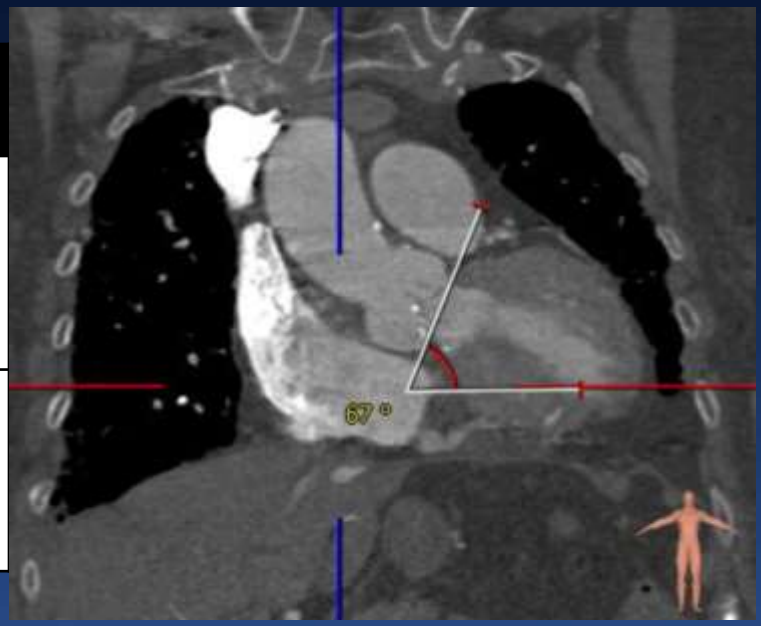
CT Imaging

- 64 detectors – spatial resolution of 0.5-0.6 mm
- More reproducible than echocardiography
- Prediction of the aortic root angle before the procedure
- Do it yourself!!!

Access Selection and Aortic Root Angulation

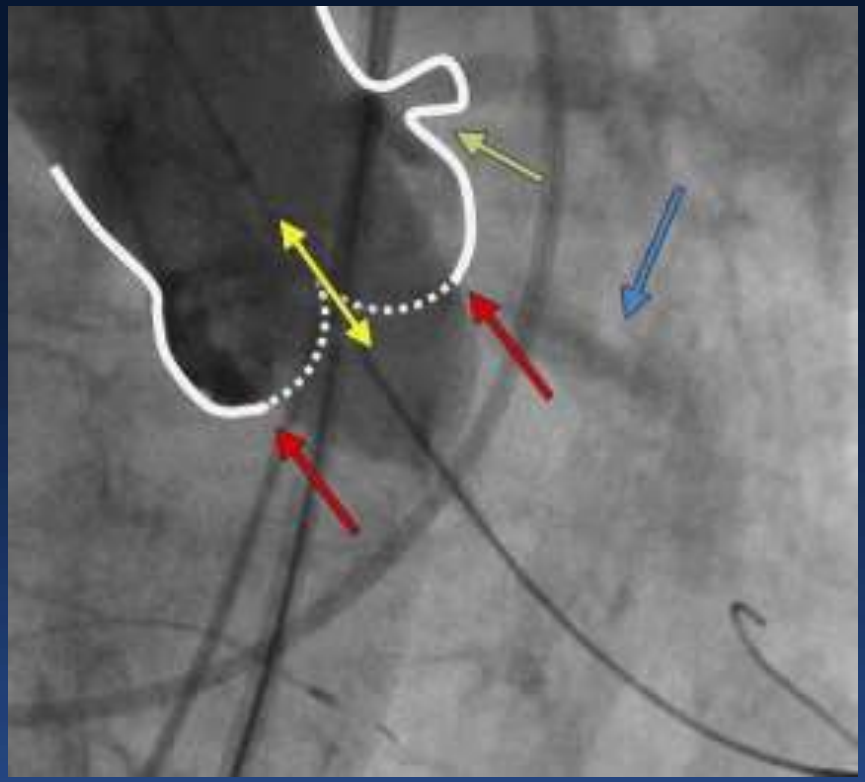
- **Strongly consider non-TF access**

Approach			
	Left Subclavian/ Axillary	Right Subclavian/ Axillary	Iliofemoral
Aortic Root Angle*	**>70°**	**>30°**	**>70°**



* Aortic root angle = angle between plane of aortic valve annulus and horizontal plane

Sizing Balloon Aortic Valvuloplasty



- Lack of movement of the balloon within the aortic valve
- Waist of the balloon at the level of the annulus (red arrows),
- Residual contrast regurgitation between the balloon and the hinge points of the valve
- Calcified leaflets splayed against coronary ostia

Kasel AM et al. J Am Coll Cardiol Img 2013; 6:249 – 62

Case Planning

Max Ascending Aorta Diameter (mm) _____

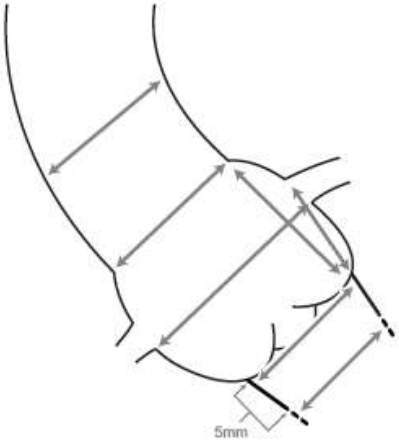
Sinotubular Junction Diameter (mm) ____x____
Max Min

ANNULUS

Diameter (mm) _____x_____, _____
Max Min Mean

Perimeter (mm) _____, _____
Derived Diameter

Area _____mm², _____mm
Derived Diameter



Sinus of Valsalva Diameter (mm) _____ _____ _____
LCC RCC NCC

Sinus of Valsalva Height (mm) _____ _____ _____
LCC RCC NCC

Coronary Ostia Height (mm) _____ _____
Left Right

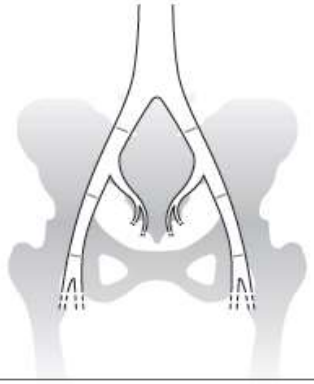
LVOT Diameter (mm) _____x_____
Max Min

RIGHT

CIA Min Diameter (mm)
____x____

EIA Min Diameter (mm)
____x____

Femoral Min Diameter (mm)
____x____



LEFT

CIA Min Diameter (mm)
____x____

EIA Min Diameter (mm)
____x____

Femoral Min Diameter (mm)
____x____

Calcium: Mild ☐ Moderate ☐ Severe ☐

RIGHT

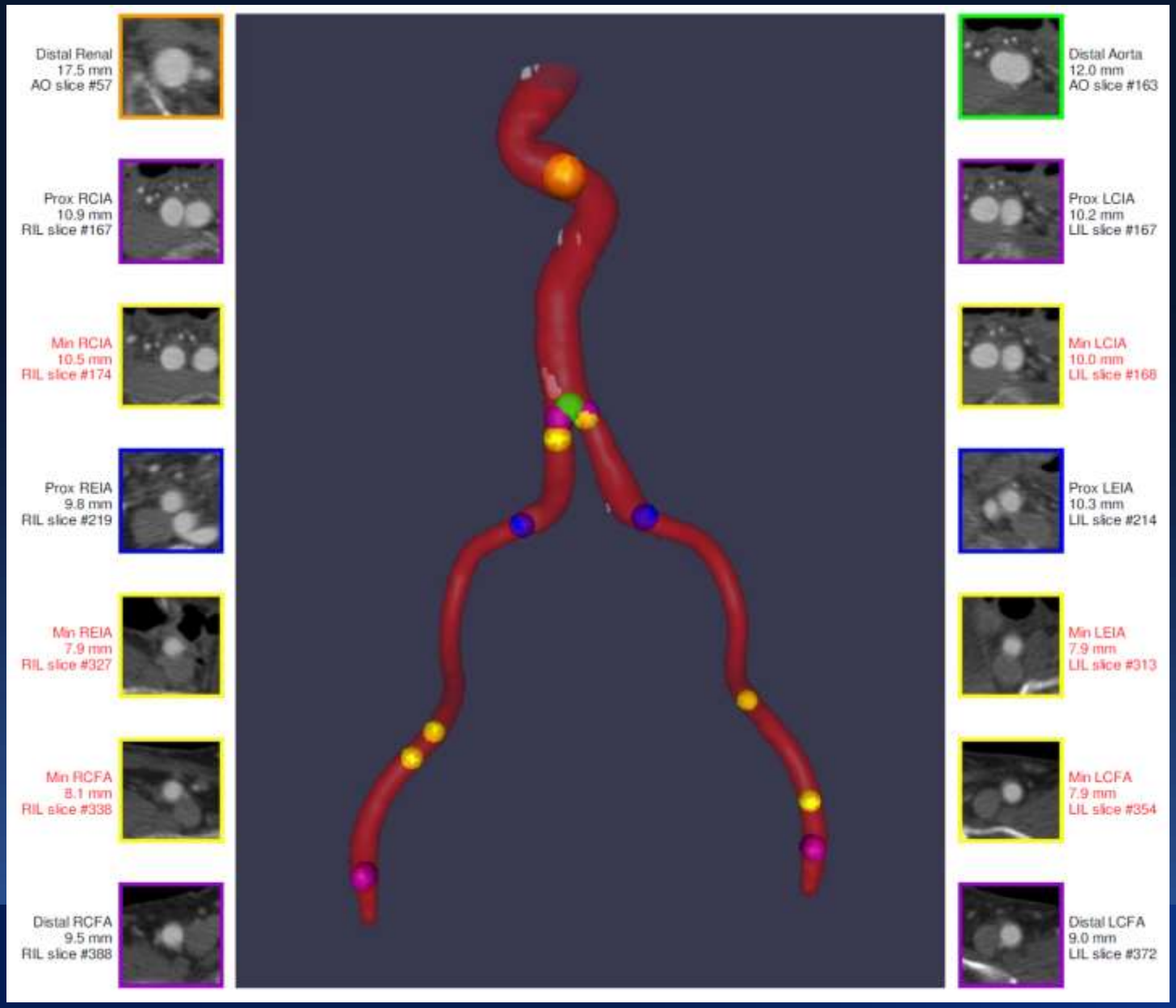
Subclavian Min Diameter (mm)
____x____

Aortic Root Angle_____

LEFT

Subclavian Min Diameter (mm)
____x____

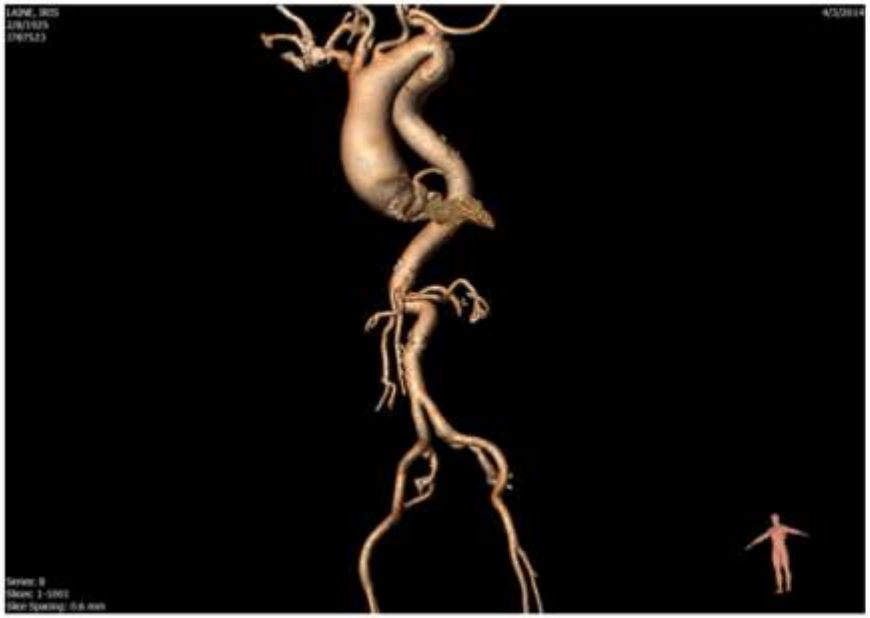
Please review images for direct aortic access evaluation.


Distal Renal
17.5 mm
AO slice #57
Prox RCIA
10.9 mm
RIL slice #167
Min RCIA
10.5 mm
RIL slice #174
Prox REIA
9.8 mm
RIL slice #219
Min REIA
7.9 mm
RIL slice #327
Min RCFA
8.1 mm
RIL slice #338
Distal RCFA
9.5 mm
RIL slice #388
Distal Aorta
12.0 mm
AO slice #163
Prox LCIA
10.2 mm
LIL slice #167
Min LCIA
10.0 mm
LIL slice #168
Prox LEIA
10.3 mm
LIL slice #214
Min LEIA
7.9 mm
LIL slice #313
Min LCFA
7.9 mm
LIL slice #354
Distal LCFA
9.0 mm
LIL slice #372

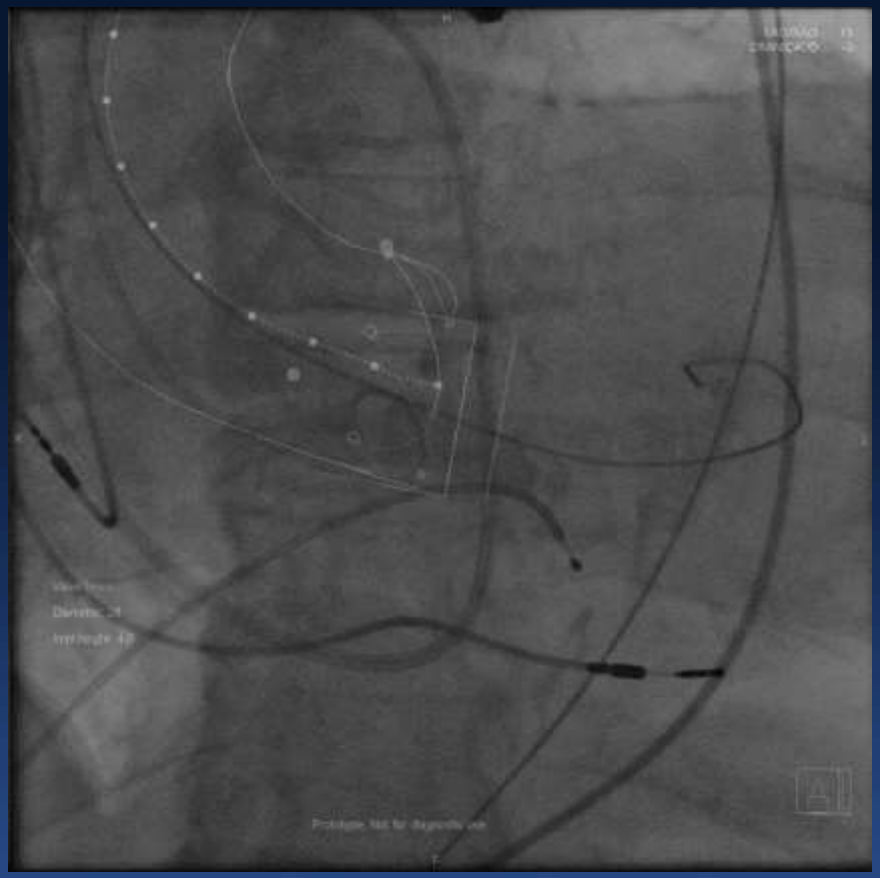
Volume Rendering

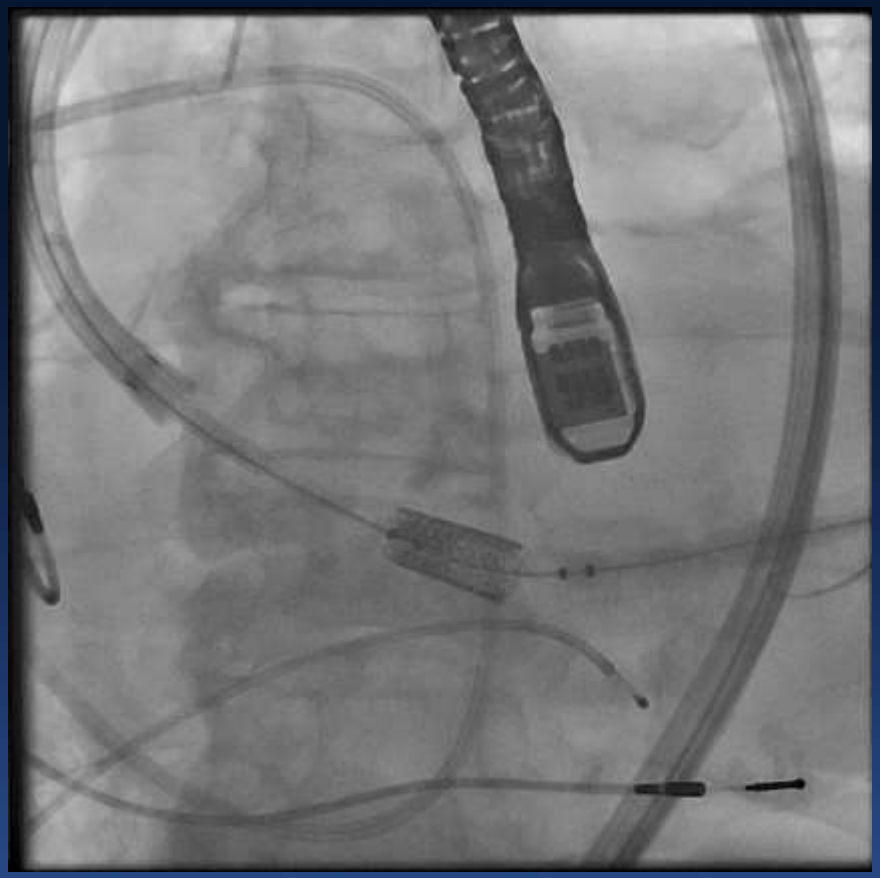
Volume Rendering

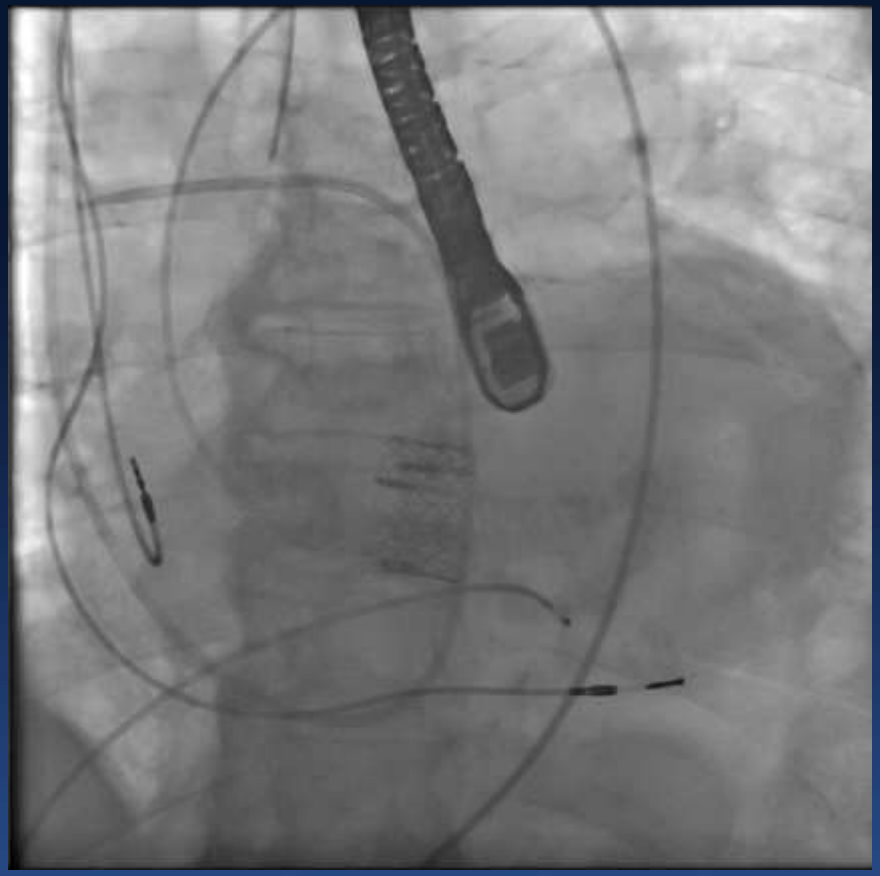
Volume Rendering



Volume Rendering



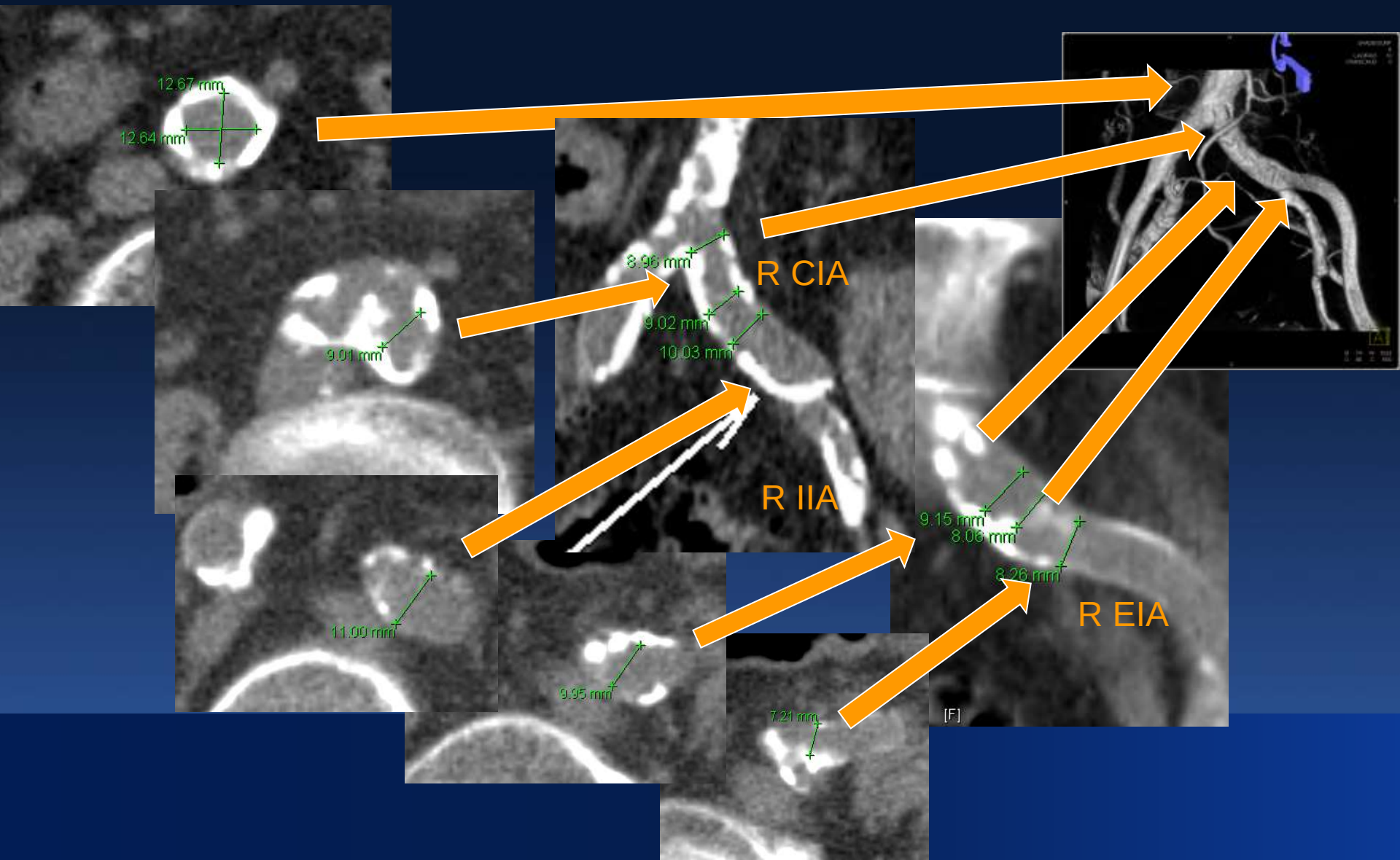




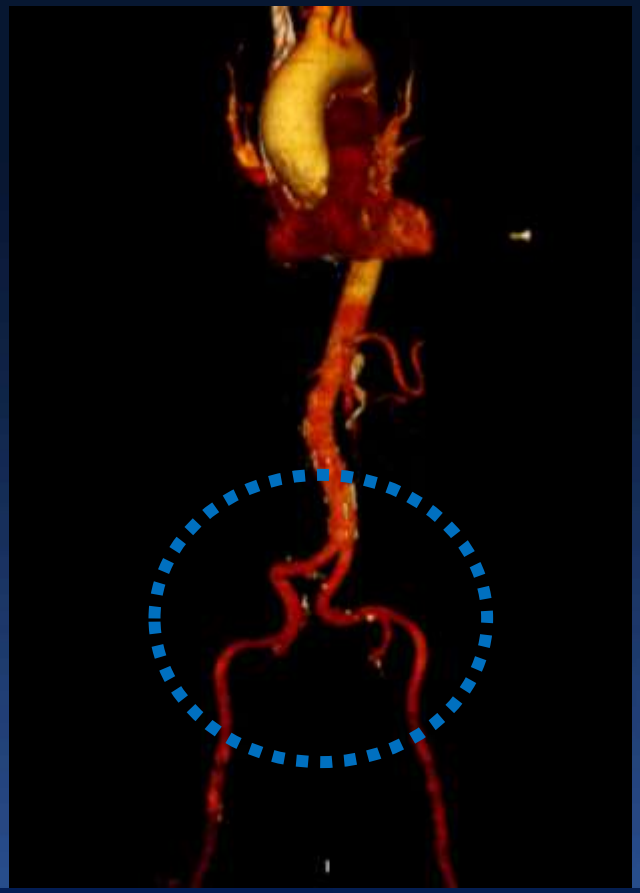
Femoral Large Vascular Access

- **Large vascular access has become common in the new era of structural heart disease interventions and percutaneous LVADs**
  - The cardiologist should be fully familiar with closure
- **Planning and Strategy**
  - Non-invasive assessment of iliofemoral axis
  - Studies carefully reviewed by entire team with focus on vessel size, tortuosity, pathology and calcification (especially at bifurcations)
- **Perfect access technique is critical**
  - Ultrasound guided
  - Micropuncture

Careful Evaluation of Iliofemoral Arteries

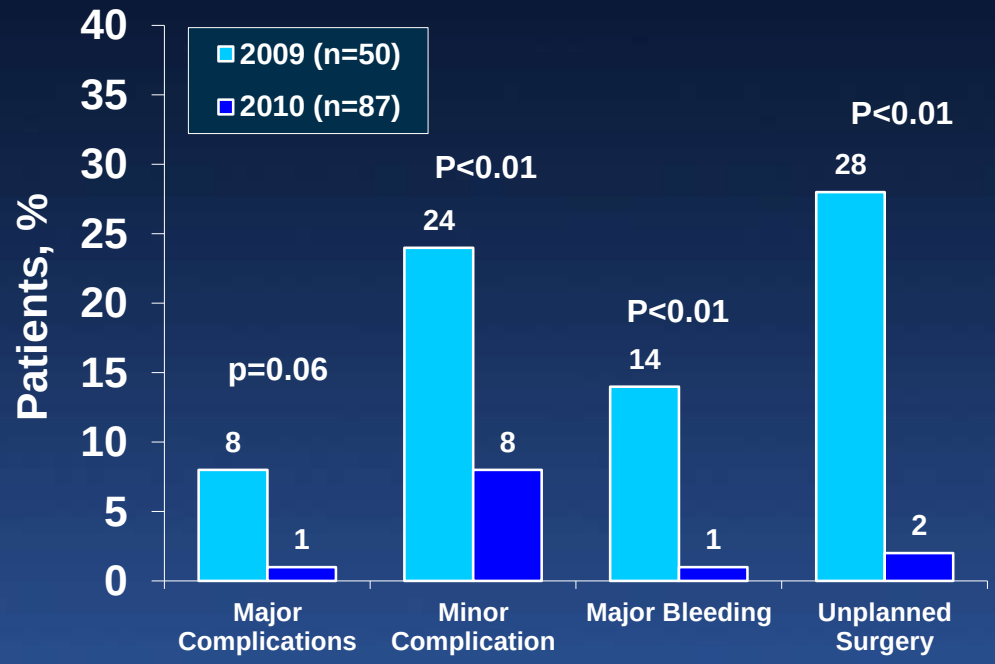


Severe tortuosity in the access route



Access Technique, Closure, and Vascular Outcomes

Systematic MDCT screening, smaller sheaths, U/S or fluoro-guided and "Preclosure"



Toggweiler S, et al. *JACC* 2012;59:113-118


2012Apr19
Depth
Gain
Near
Far
LR
CPD
4.6

Closure Devices

	Prostar XL	ProGlide
Profile	10F	6F
Sutures	Braided	Monofilament
Knot	Operator tied	Pre-formed
No of devices	1	2 or more

- ***Predictors of Vascular Complications***
  - **Moderate/Severe calcification**
  - **Sheath-to-Femoral Artery Ration > 1.05**
  - **Obesity**
  - **Too low access (SFA or Profunda)**
  - **Too high access (above the epigastric)**

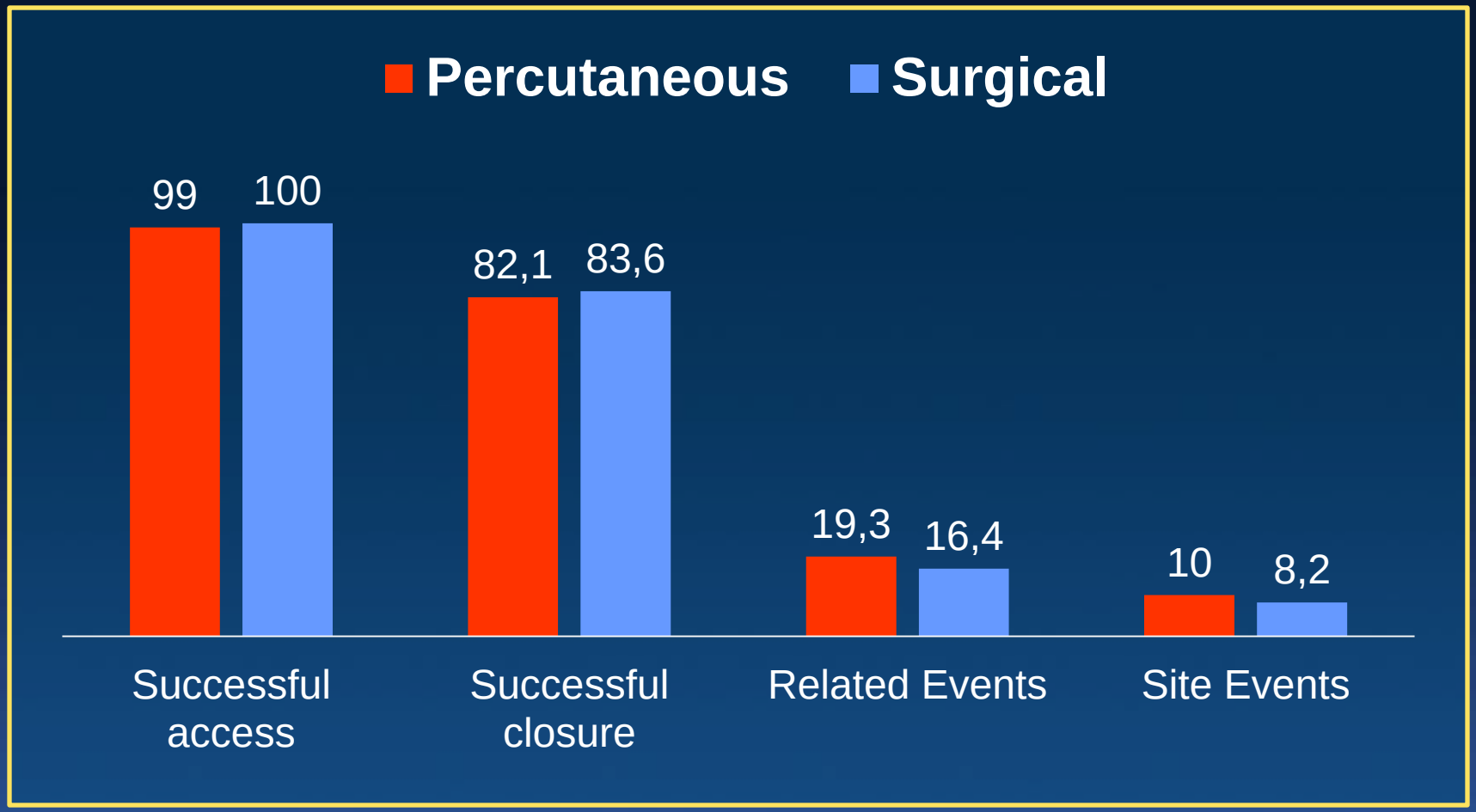
Surgical Cut-down vs. Percutaneous Closure

Cedars-Sinai Experience

- Observational data
- n=274 patients, treated Nov 2007 – May 2012
- Surgical cut-down (n=134)
  - **Primary closure method from 2007-2011**
  - **All these patients enrolled in PARTNER I**
- Preclosure with 2 ProGlide devices (n=140)
  - **Primary closure method since 2011**
  - **Enrolled in Partner I, Partner II and commercial**

Nakamura M et al. CCI 2013, in press

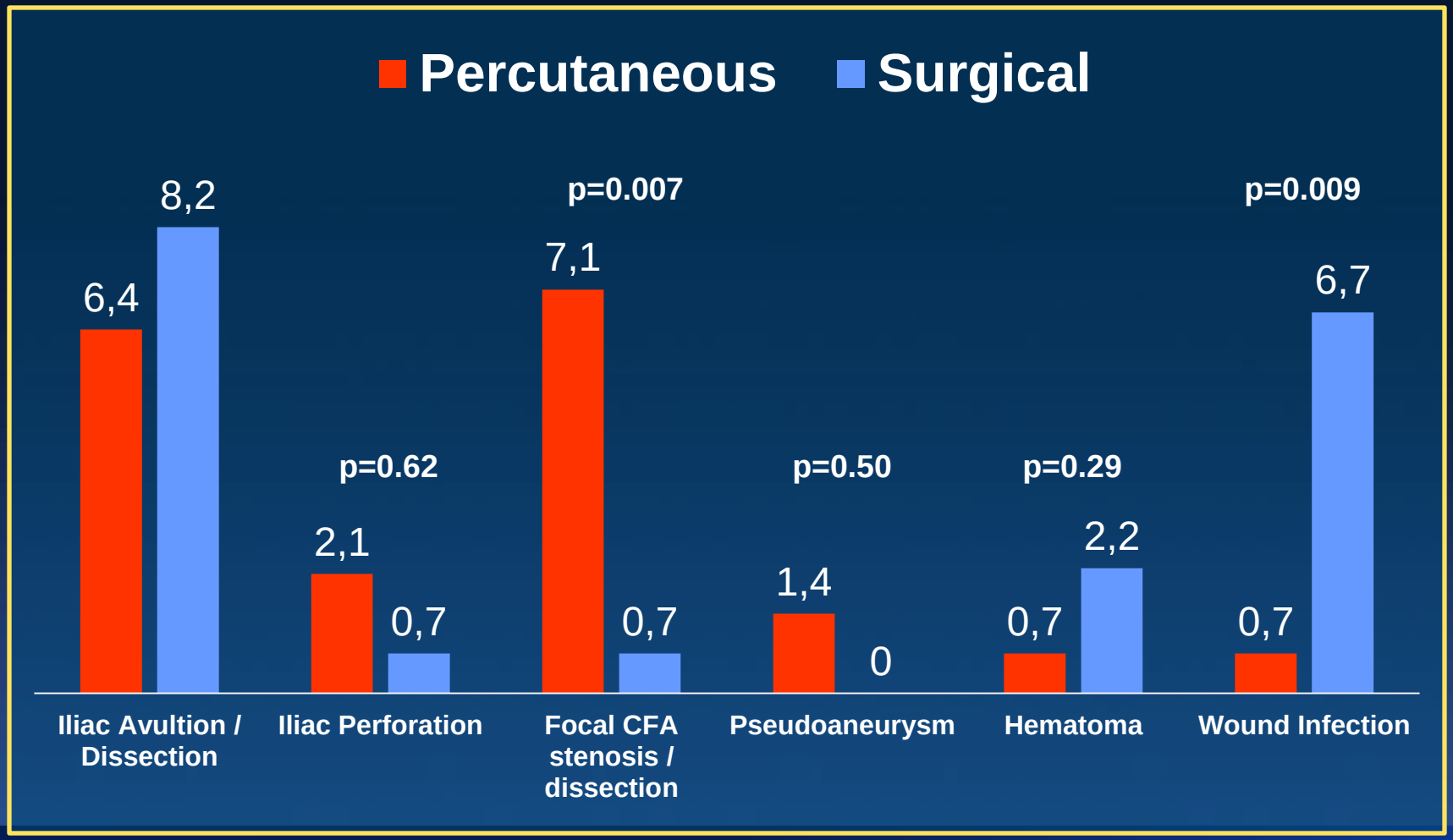
Cedars Sinai Experience



Nakamura M et al. CCI 2013, in press

Cedars Sinai Experience

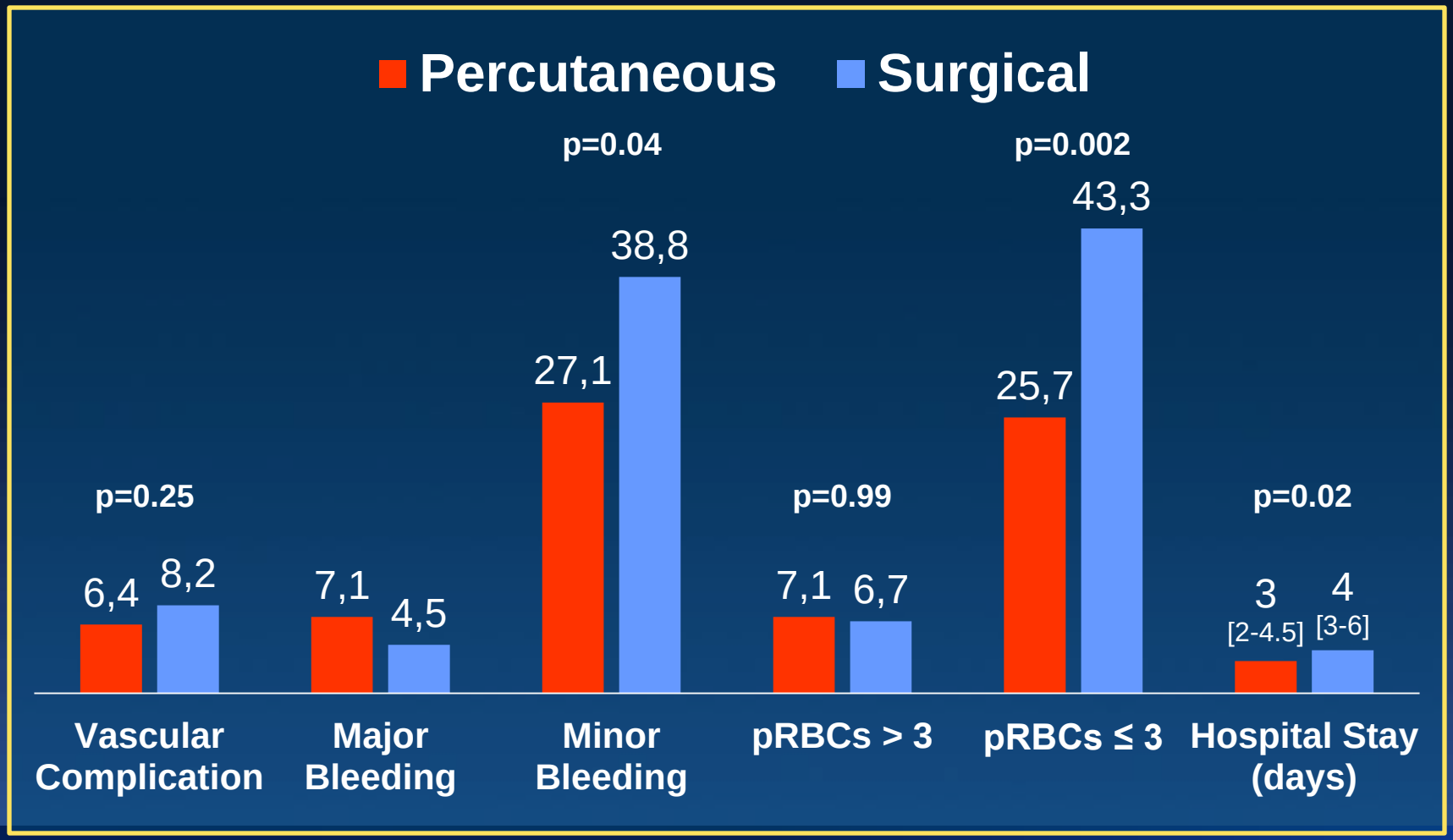
Acute Success



Nakamura M et al. CCI 2013, in press

Cedars Sinai Experience

In-Hospital Outcomes

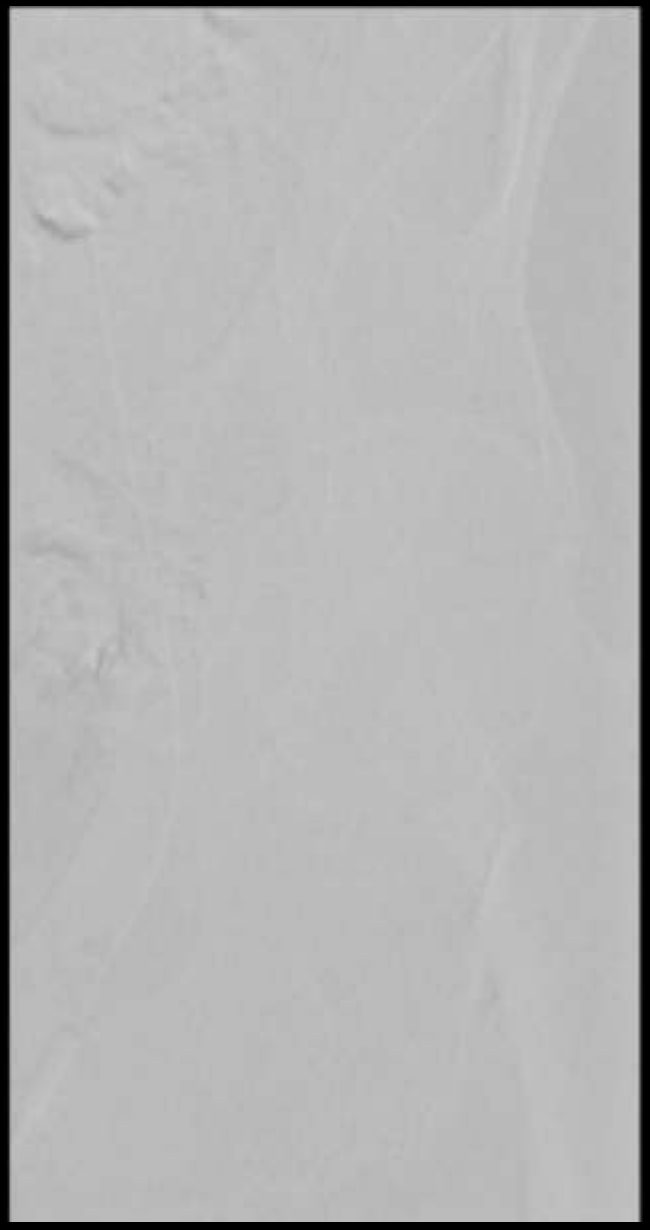


Nakamura M et al. CCI 2013, in press

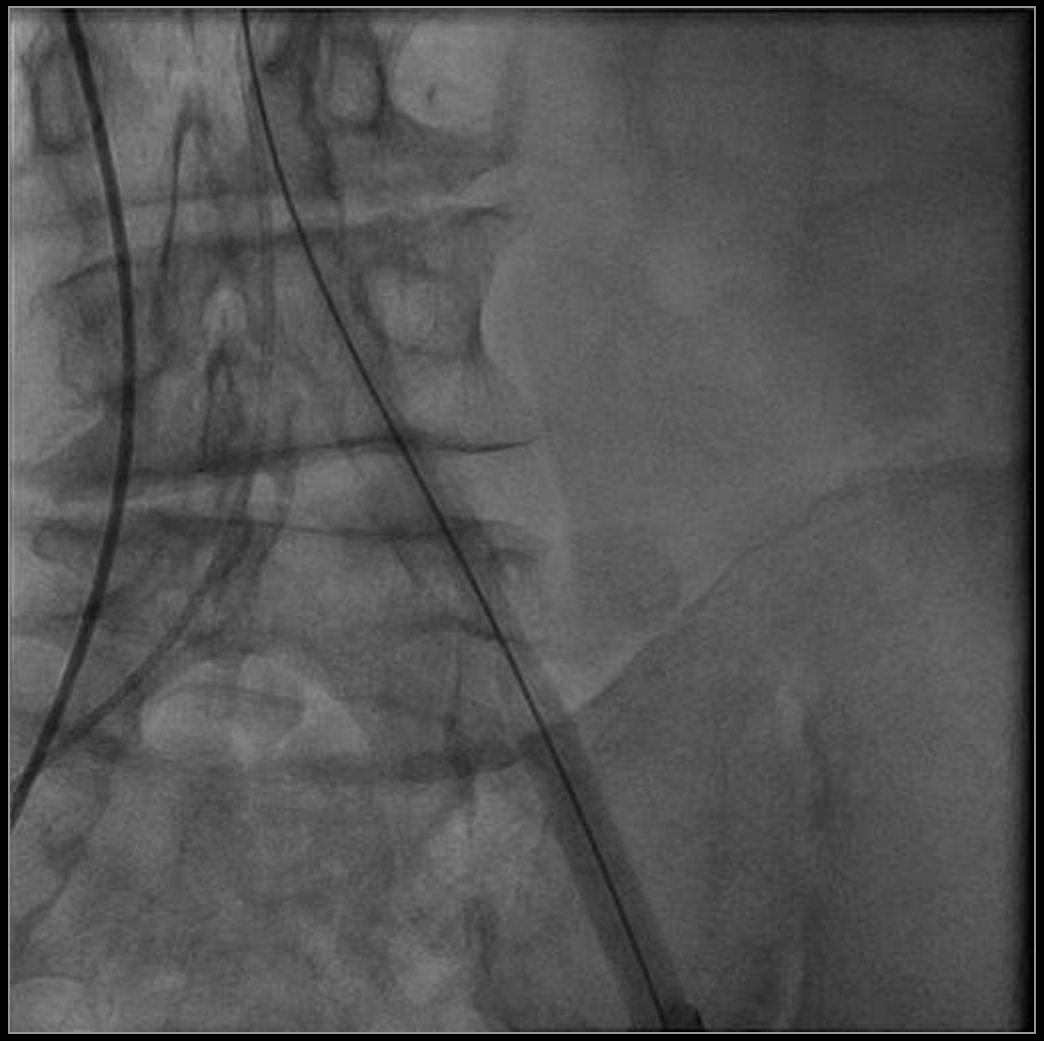
Crossover Balloon Occlusion Technique for Percutaneous Closure

- Withdraw the large sheath until positioned in external iliac artery
- Crossover using a Contra or Omniflush catheter
- Advance stiff glidewire into lumen of large sheath
- Advance and inflate an appropriately sized peripheral balloon (usually 7 x 40 mm)
- Tighten the ProGlide® sutures as you pull the large sheath
- Perform final angiogram

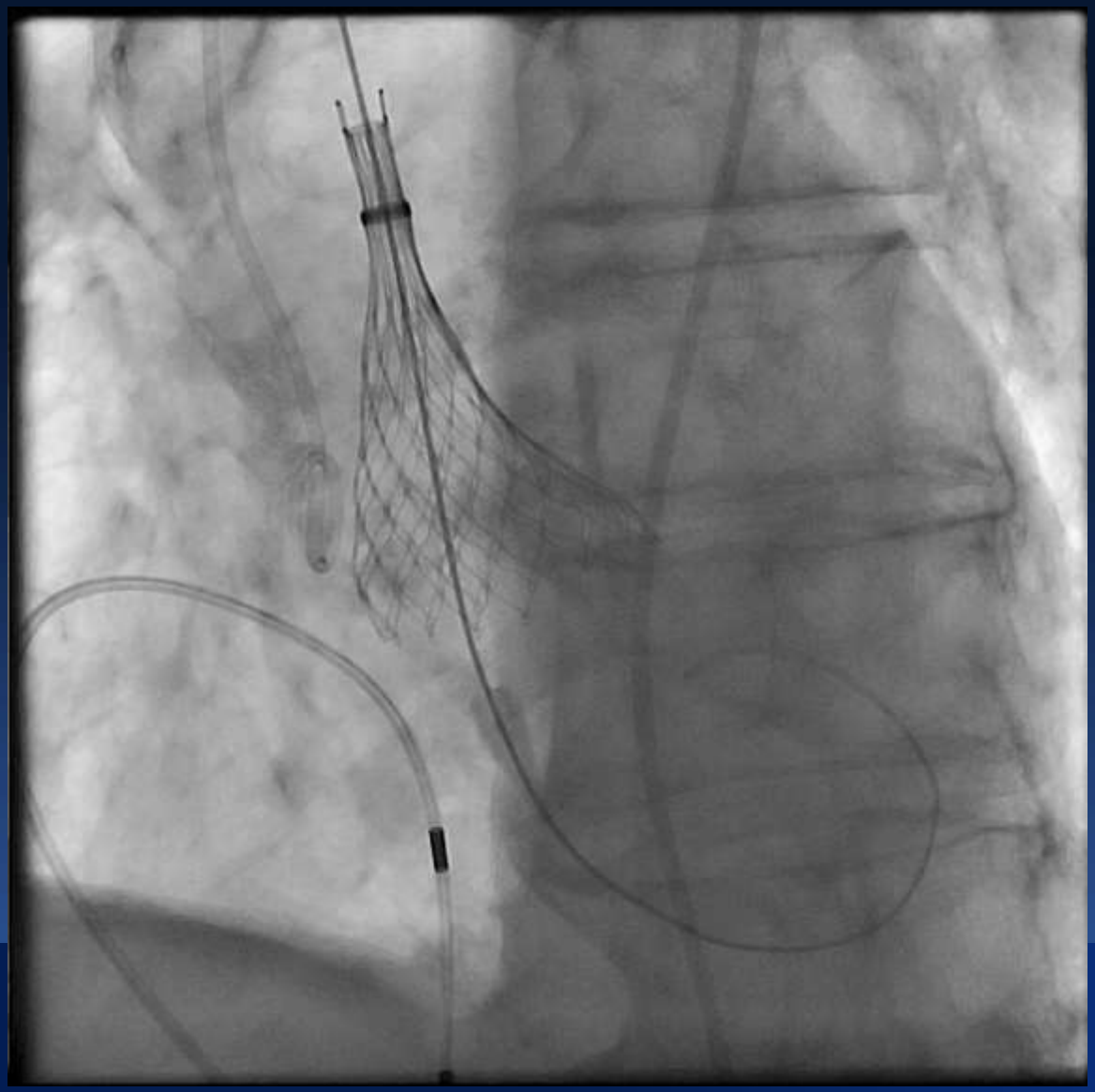
Genereux P, et al. JACC Intv, 2011; 4:861-867



We should try to avoid these situations…



Subclavian Approach



Subclavian vs. Femoral

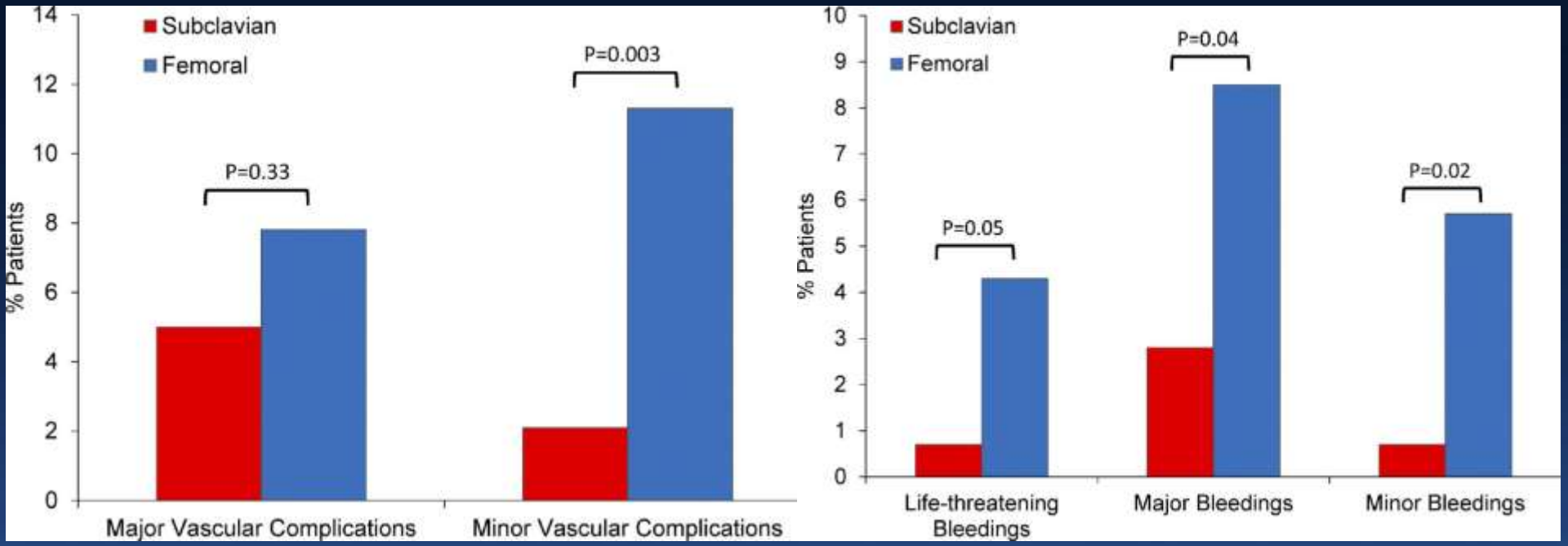
Propensity Matched Comparison

30-day outcomes	Subclavian (n=141)	Femoral (n=141)	p value
All-cause mortality	8 (5.7)	9 (6.4)	0.8
Cardiac mortality	8 (5.7)	7 (5.0)	0.79
Cardiac rehospitalization	2 (1.4)	2 (1.4)	0.99
Stroke	3 (2.1)	3 (2.1)	0.99
Myocardial infarction	0 (0)	0 (0)	0.99
Aortic valve reintervention	0 (0)	1 (0.7)	0.31
Combined safety endpoint	28 (19.9)	36 (25.5)	0.26
New pacemaker	35 (24.7)	35 (24.7)	0.99

Petronio AS, et al. JACC 2012;60:502-7

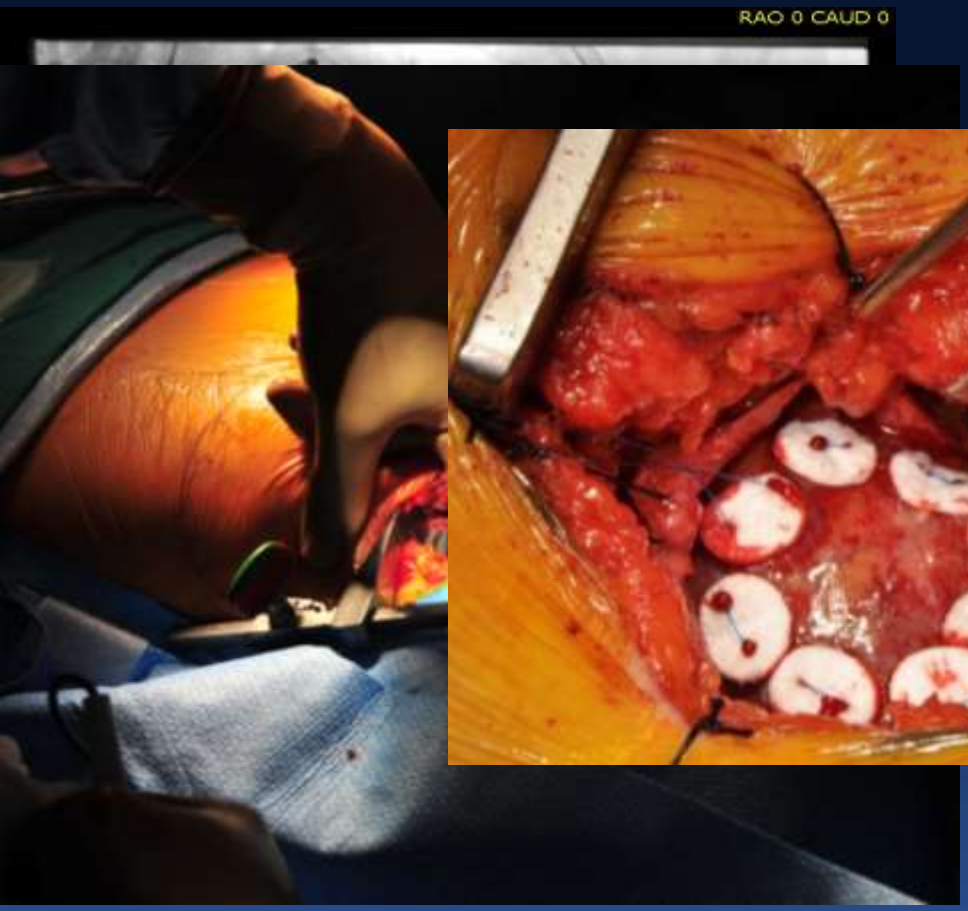
Subclavian vs. Femoral

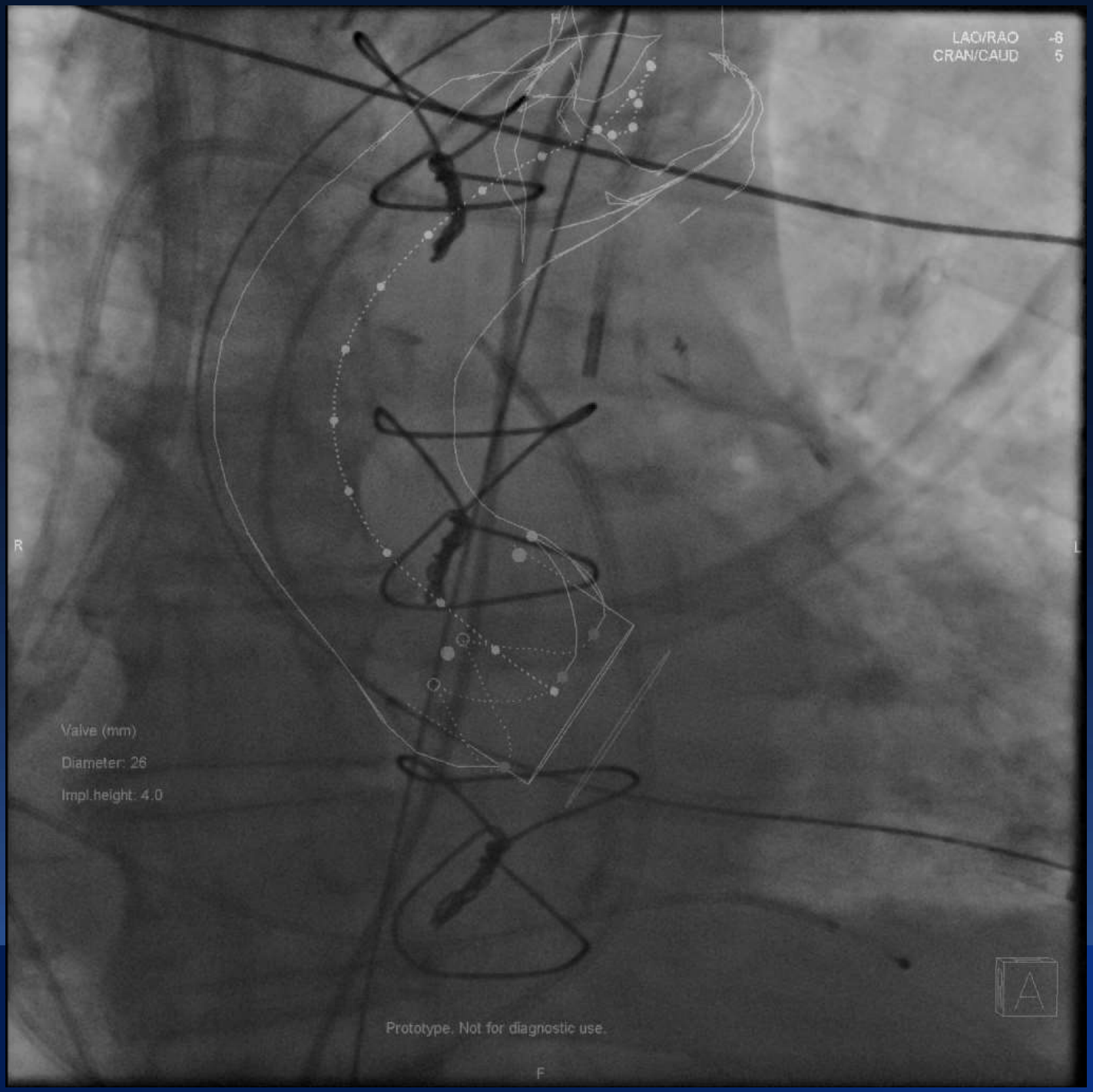
Propensity Matched Comparison

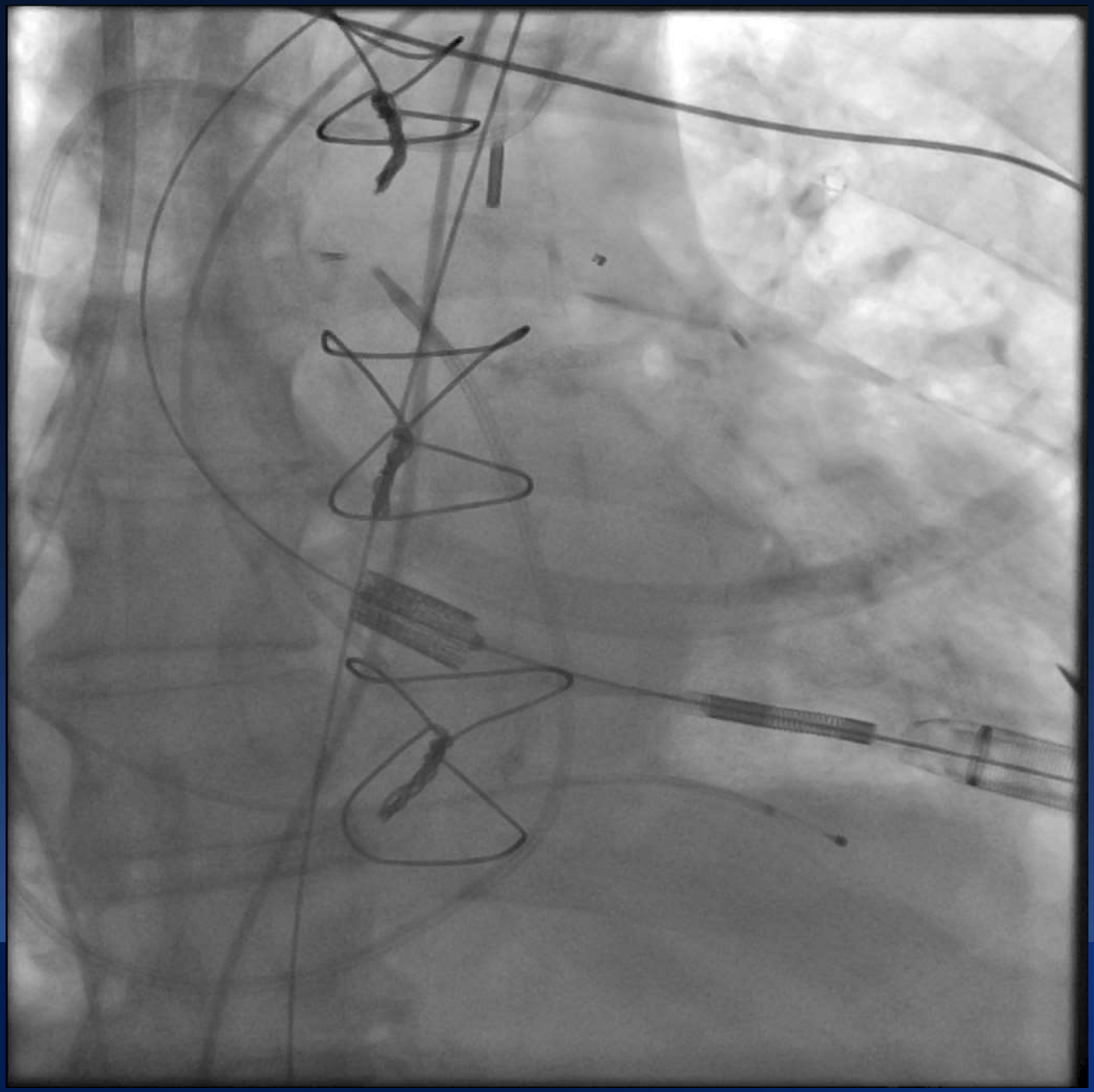


Petronio AS, et al. JACC 2012;60:502-7

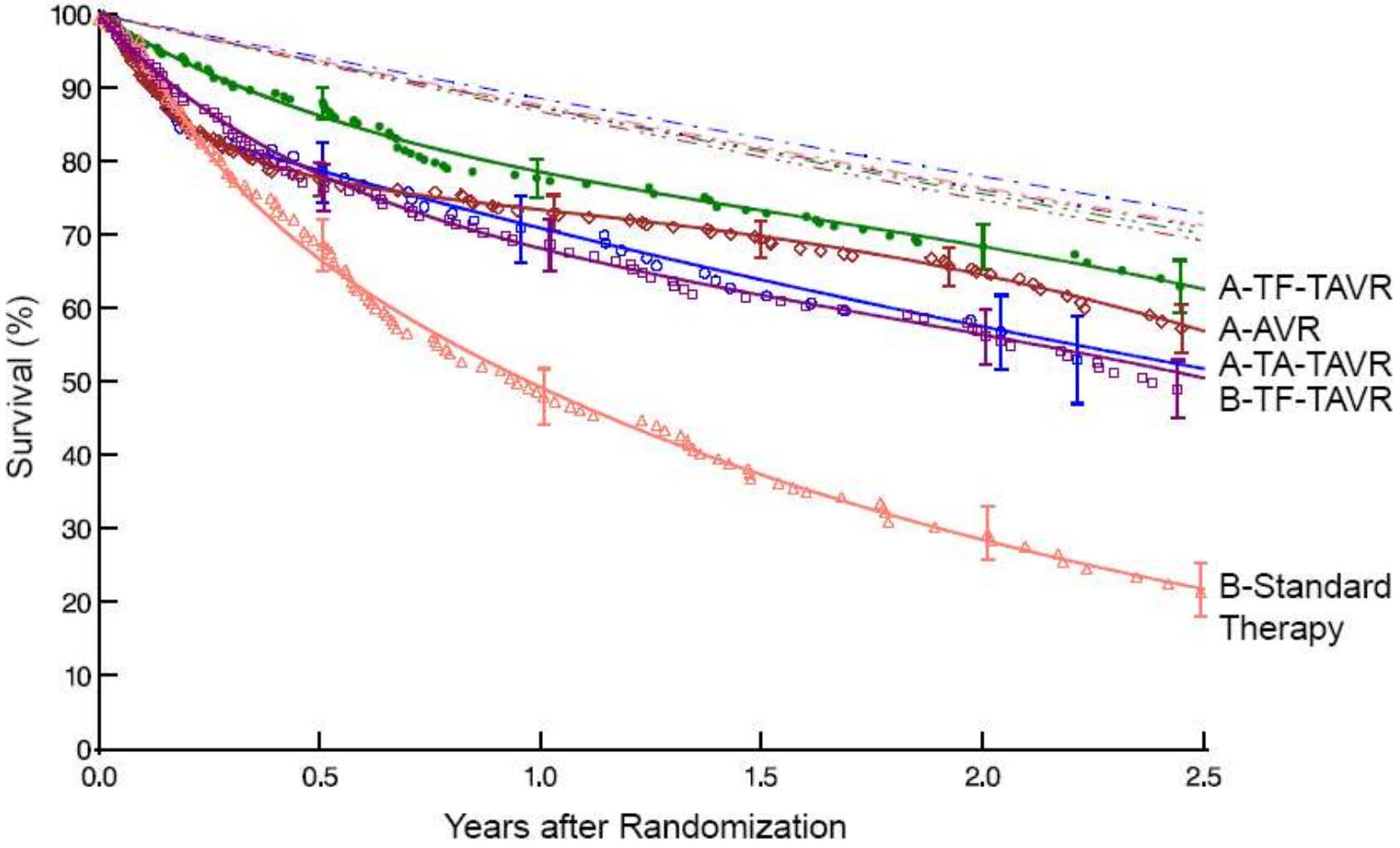
Transapical TAVR




H
LAO/RAO -8
CRAN/CAUD 5
R
L
Valve (mm)
Diameter: 26
Impl.height: 4.0
A
Prototype. Not for diagnostic use.
F



PARTNER Trials: Survival stratified by group



Svensson L et al. *J Am Coll Cardiol*. 2014;64:158-168

PARTNER High Risk (Cohort A) Index Procedure/Admission

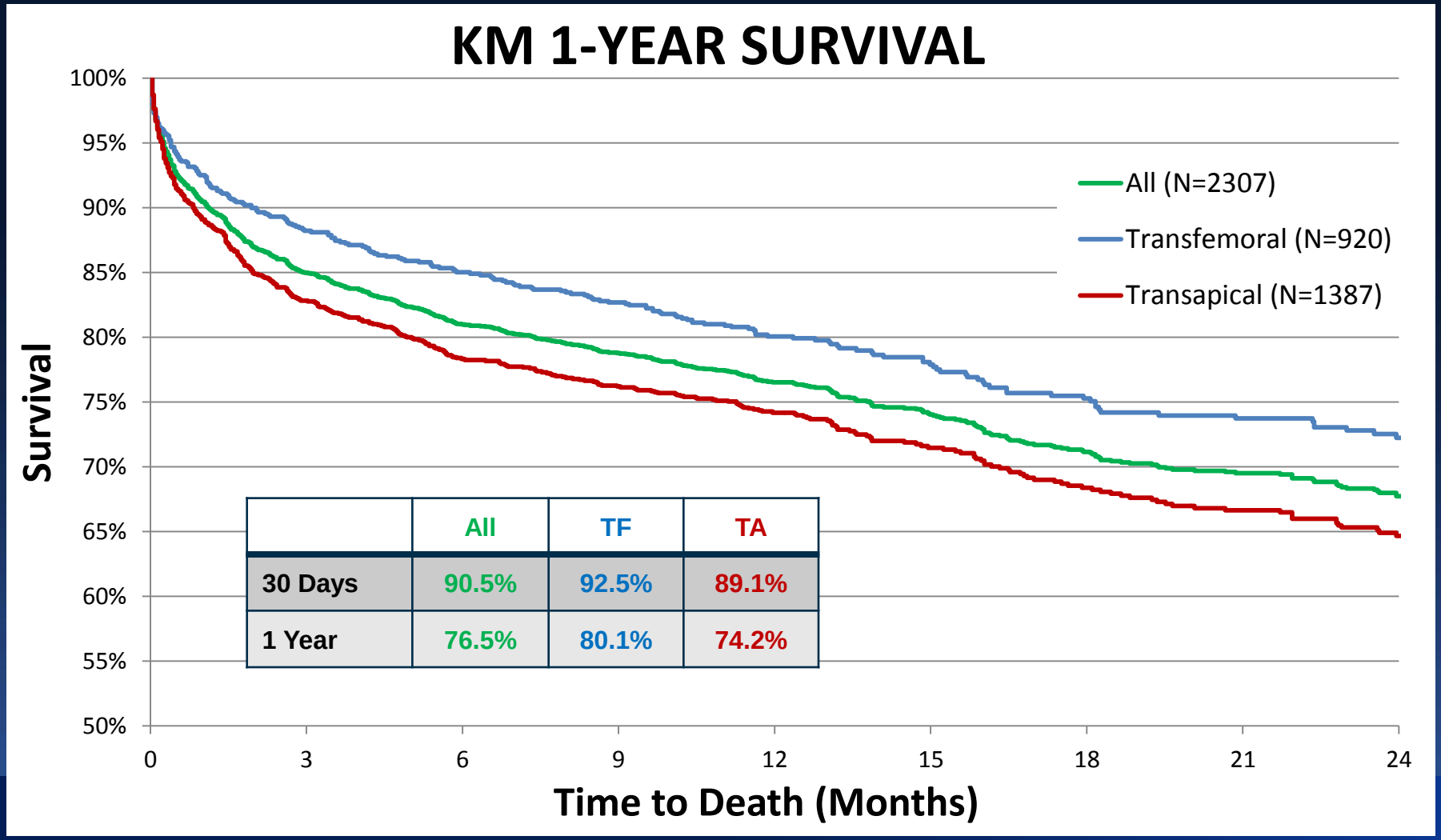
Resource use (per-protocol population)

Resource Category	TF-TAVR (N = 234)	AVR (N= 221)	P-value	TA-TAVR (N = 101)	AVR (N = 91)	P-value
Procedure duration (min)	*244 ± 78*	*330 ± 102*	*<0.001*	*224 ± 76*	*354 ± 104*	*< 0.001*
Total hospital LOS, days	*10.2 (7)*	*16.4 (12)*	*<0.001*	*14.7 (10)*	*16.1 (12)*	*0.39*
ICU	*3.3 (2)*	*5.6 (3)*	*<0.001*	*6.6 (3)*	*8.0 (4)*	*0.33*
Non-ICU	*6.9 (4)*	*10.8 (8)*	*<0.001*	*8.1 (6)*	*8.1 (7)*	*1.0*
Post procedure	*7.4 (5)*	*13.5 (10)*	*<0.001*	*12.4 (9)*	*14.4 (9)*	*0.22*
Major vasc. complication	*13.2%*	*3.2%*	*<0.001*	*4.0%*	*4.4%*	*1.0*
Major bleeding	*9.4%*	*22.6%*	*<0.001*	*5.9%*	*20.9%*	*0.002*

LOS data are shown as mean (median)

Reynolds M et al. TCT 2011

Survival

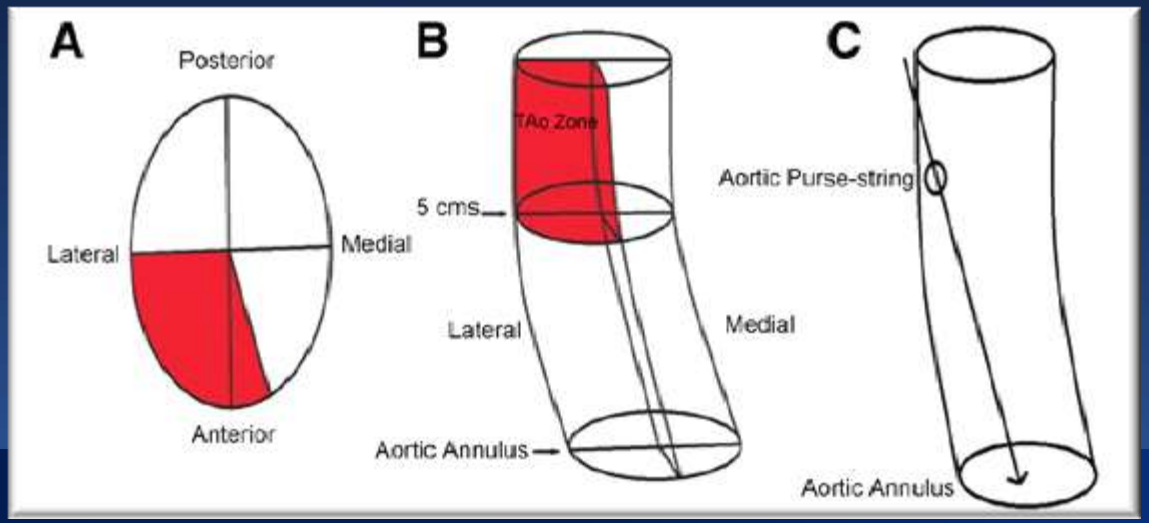


	All	TF	TA
30 Days	90.5%	92.5%	89.1%
1 Year	76.5%	80.1%	74.2%

Thomas M et al. Circulation 2011;124:425-433

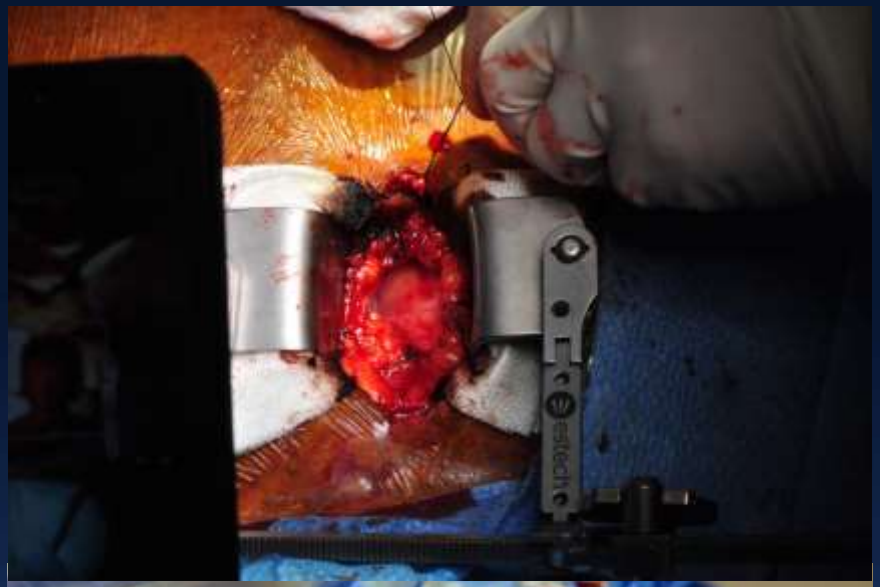
Transaortic Access

- Ascending aorta free of calcium
- Allows directing the sheath in a straight line to deploy the device
- Leaves enough room between the tip of the sheath and the aortic annulus to allow the balloon to expand fully during deployment of the device
  - > 50mm from the aortic annulus



Bapat V, et al. Semin Thoracic Surg 2012;24:206-211

Trasaortic Access



The Transaortic Approach for Transcatheter Aortic Valve Replacement

Initial Clinical Experience in the United States

Joel A. Lardizabal, MD, Brian P. O'Neill, MD, Harit V. Desai, MD, Conrad J. Macon, MD, Alexis P. Rodriguez, MD, Claudia A. Martinez, MD, Carlos E. Alfonso, MD, Martin S. Bilsker, MD, Roger G. Carillo, MD, Mauricio G. Cohen, MD, Alan W. Heldman, MD, William W. O'Neill, MD, Donald B. Williams, MD

Miami, Florida

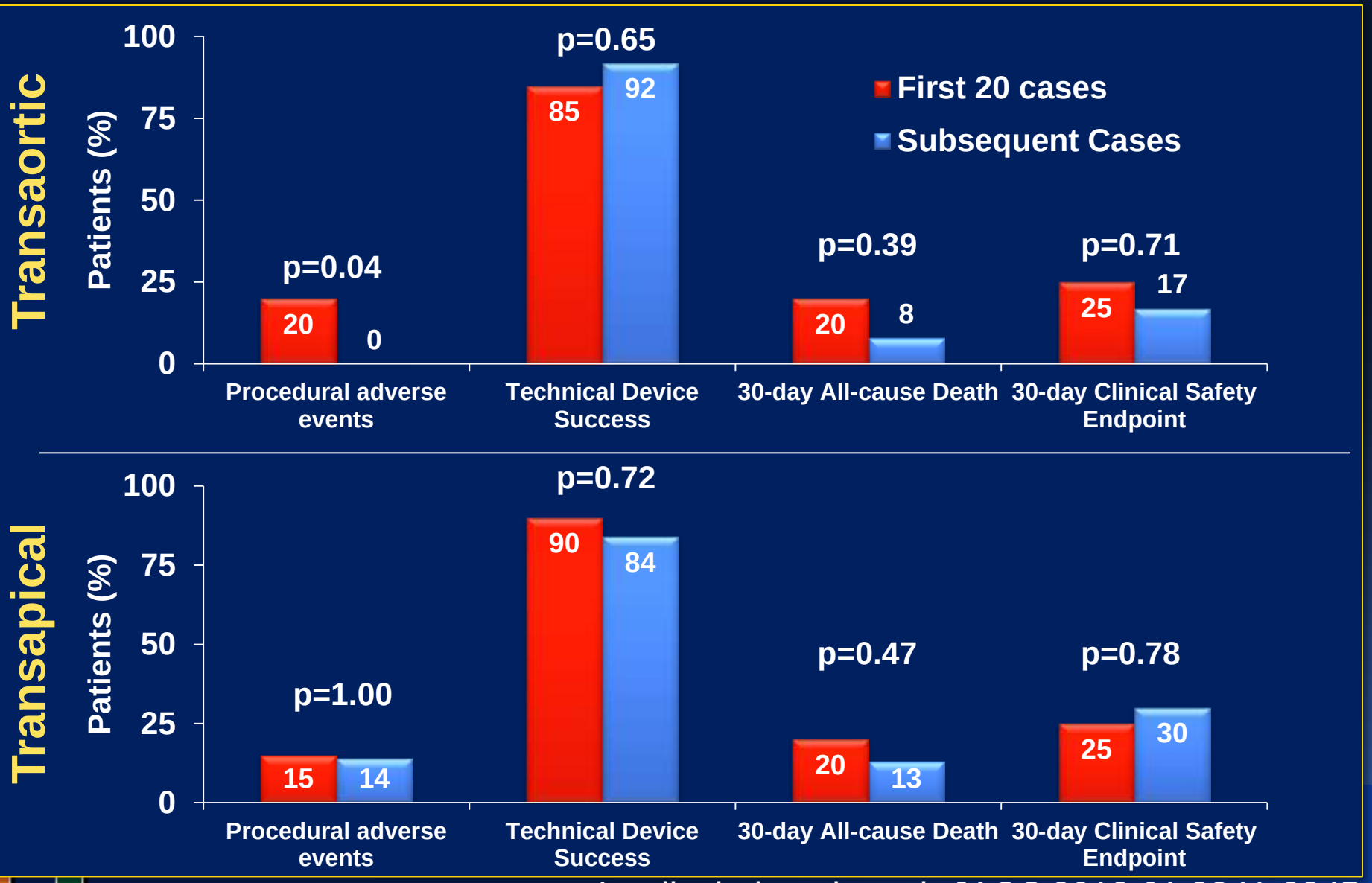
Lardizabal et al, et al. *JACC* 2013;61:2341-2345

30-day Clinical Events

	TAo (n = 44)	TA (n = 76)	P-Value
Combined Clinical Safety Endpoint	9 (20%)	22 (29%)	0.50
All-Cause Death	6 (14%)	11 (14%)	1.00
CV Mortality	1 (2%)	9 (12%)	0.09
Myocardial Infarction	0 (0%)	2 (2%)	0.53
Major Stroke	0 (0%)	1 (1%)	1.00
Minor Stroke	1 (2%)	0 (0%)	0.37
Severe AKI (Stage 3)	1 (2%)	1 (1%)	1.00
New Atrial Fibrillation	6 (14%)	15 (20%)	0.32
New Permanent Pacemaker	1 (2%)	5 (7%)	0.41
Rescue Cardiac Surgery	3 (7%)	1 (1%)	0.14
Life-Threatening Bleeding	6 (14%)	10 (13%)	1.00
Major Bleeding	5 (11%)	21 (28%)	0.04
Major Vascular Complications	1 (2%)	4 (5%)	0.65
Total Bleeding & Vascular Events	12 (27%)	35 (46%)	0.05

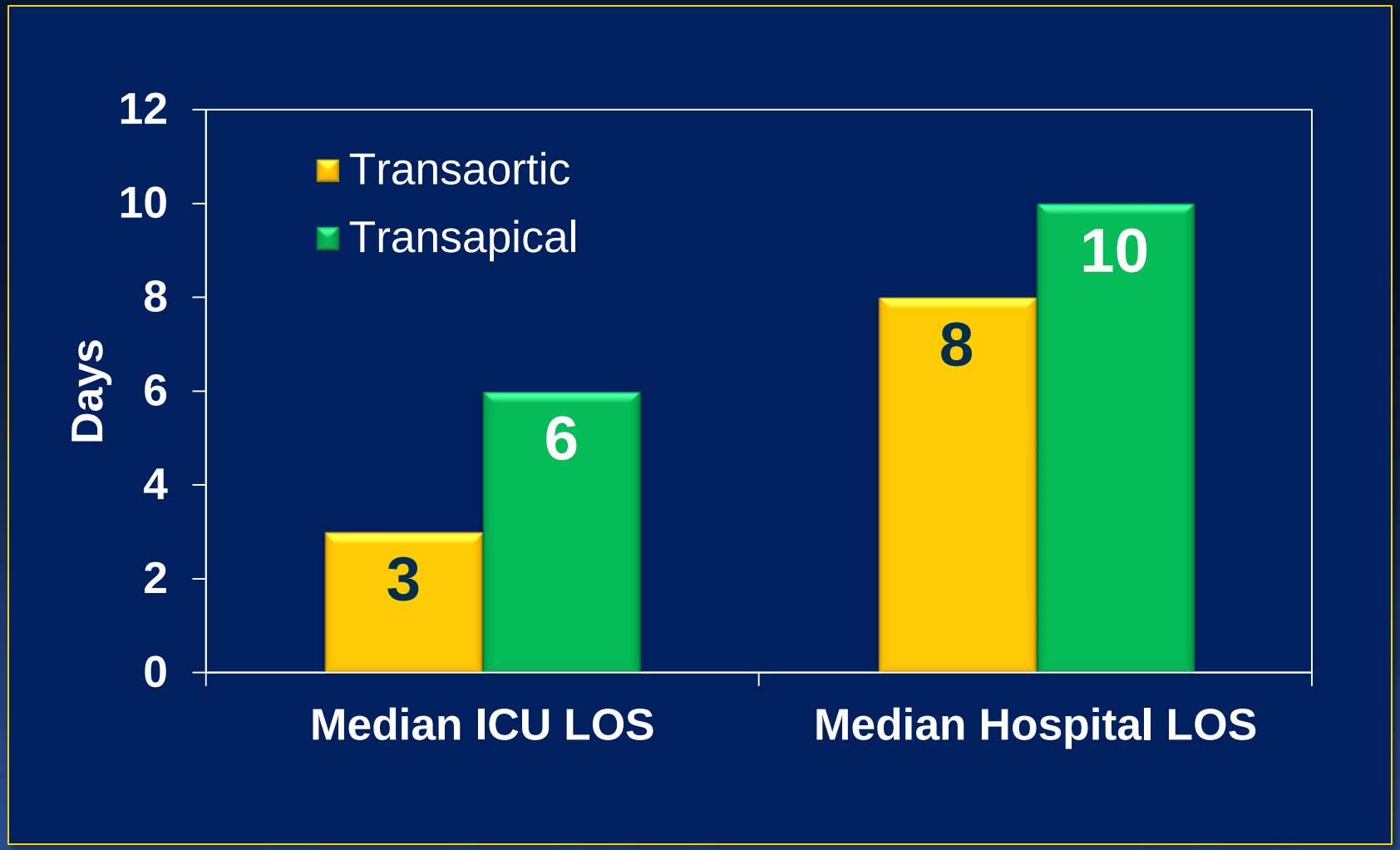
Lardizabal et al, et al. *JACC* 2013;61:2341-2345

Learning Curve by TAVR Approach

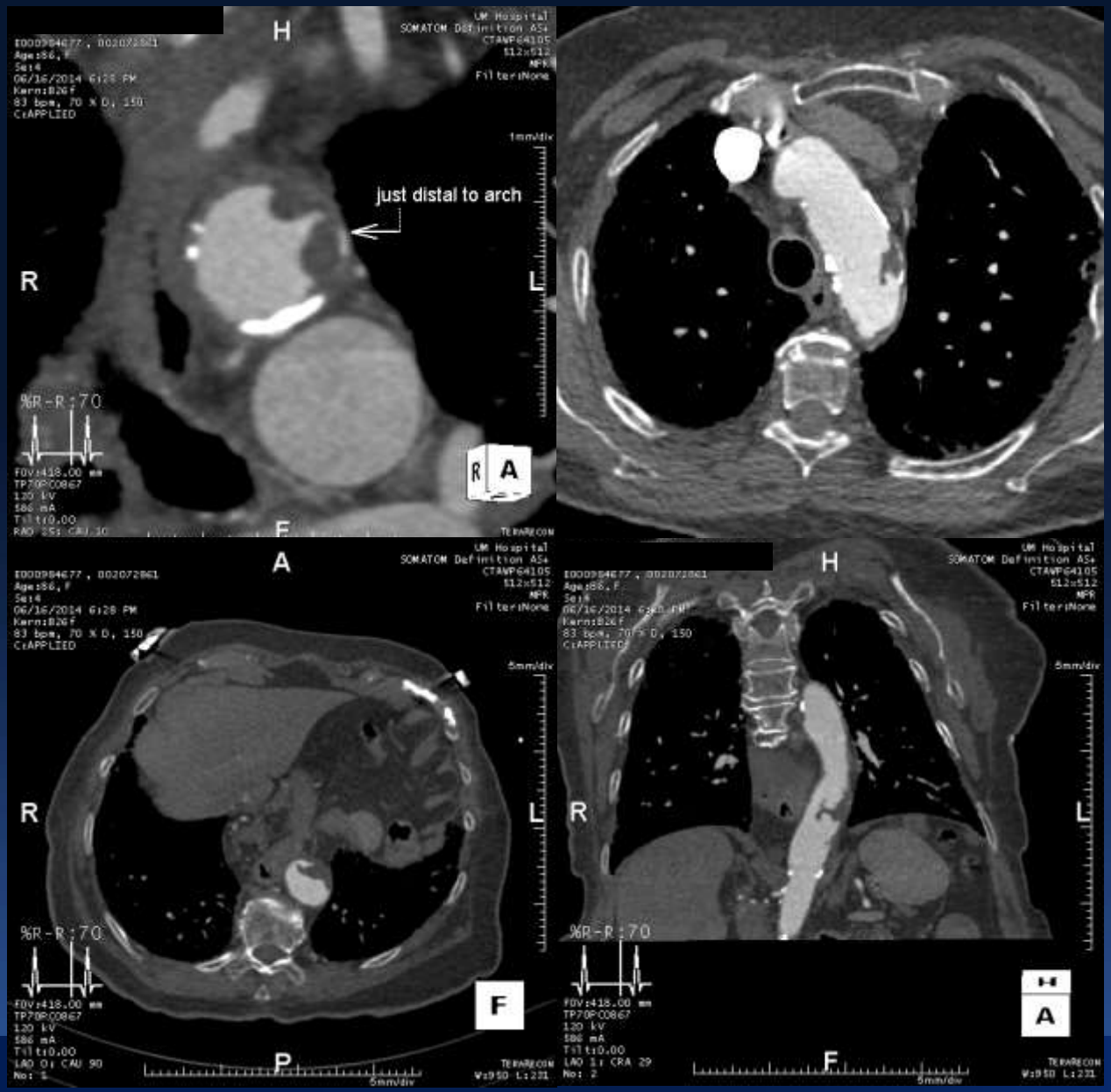


Lardizabal et al, et al. *JACC* 2013;61:2341-2345

Length of Stay by TAVR Approach



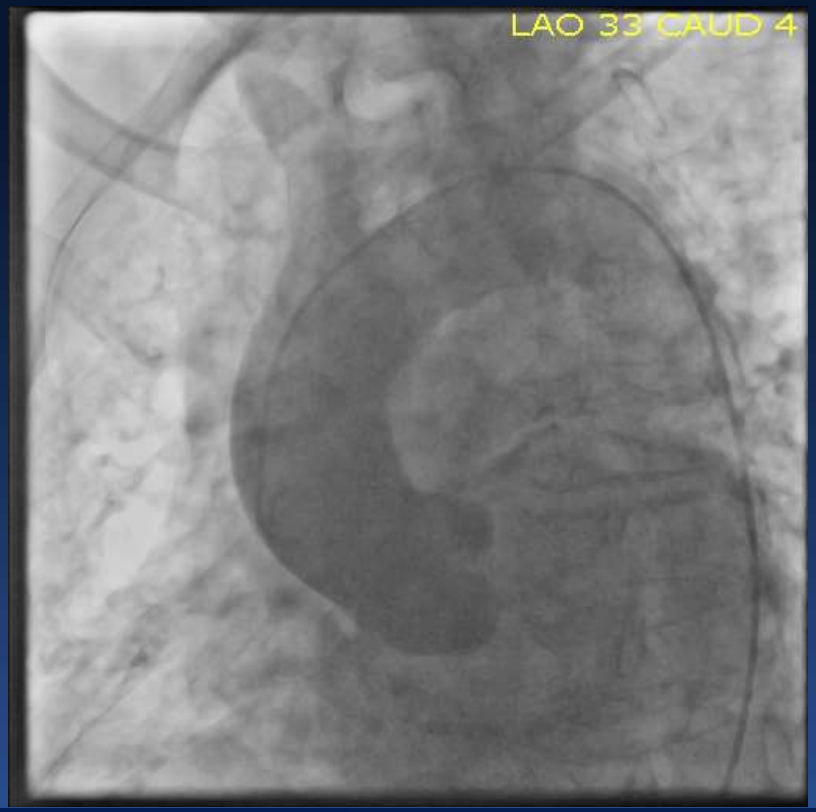
Lardizabal et al, et al. *JACC* 2013;61:2341-2345

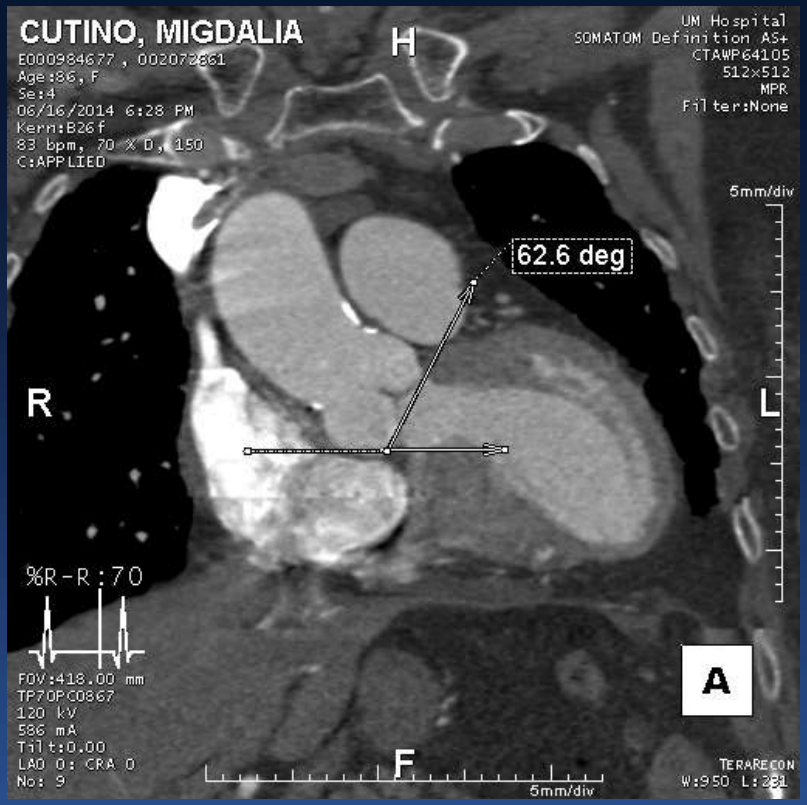


Atheroma distal to Arch – Contraindication for TF?

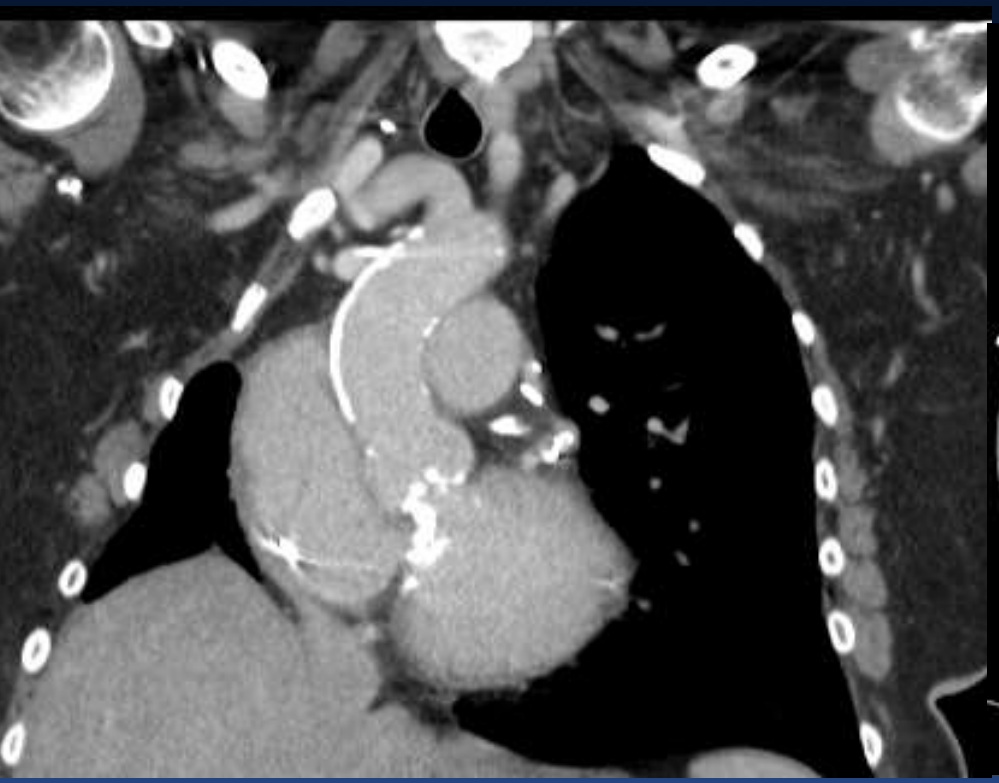
Additional Notes

- Horizontal Aorta, steep angulation
- Carefully review angle of implant
- She may be better off with TA
- However, wires will go through atheromatous aorta
- May not be convenient for TF or CoreValve





Help me Choose Access!!



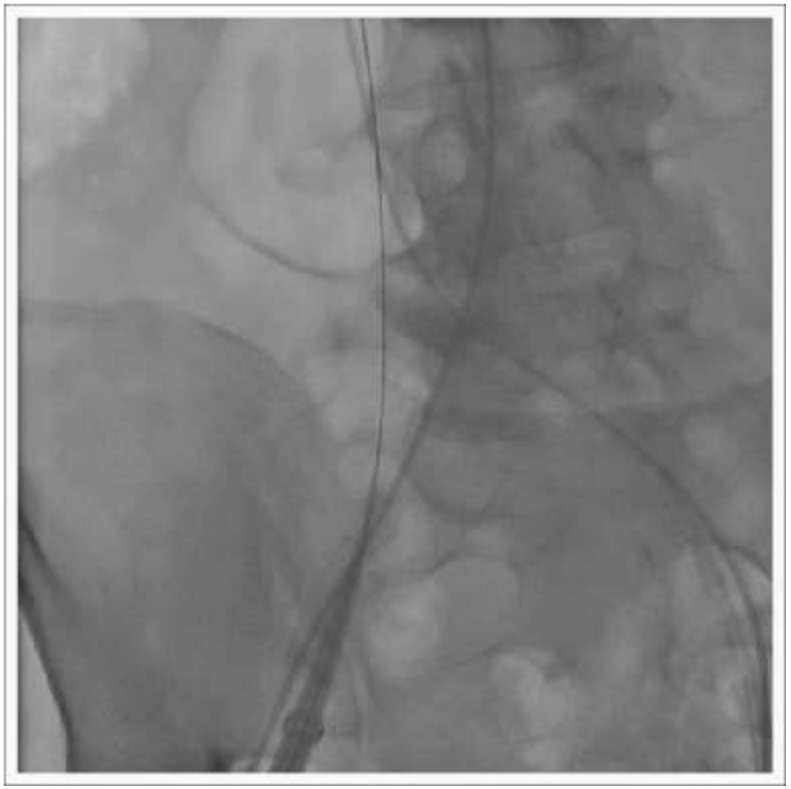

MIP 1.0
LAO/RAO
CRAN/CAUD
View C-osta
(mm) Perim Area
74.2 369.4
Eff diam 23.6 21.7
23 = -3% +6 %
26 = +10% +20 %
29 = +23% +34 %
Min diam 17.9
Max diam 25.6
Valve (mm)
Diameter: 23
Impl height: 4.0
kV 120
mA 593
SL 0.75
SP 0.40
PX 0.41
512x512x343 [12 bit]
Prototype: Not for diagnostic use
entation Tools Measure Volumes Options Help
H
View: N-nadir
BestSyst 3...
MIP 1.0mm
LAO/RAO 136
CRAN/CAUD -2
3.2 FPS
15:04:20
CT
L
R
kV 120
mA 593
SL 0.75
SP 0.40
PX 0.41
512x512x343 [12 bit]
Prototype: Not for diagnostic use.
LP
W 700
C 400
F
H

What to do?
The "No-Option Patient"

- **Contraindication for transfemoral access**
  - PVD with iliofemoral vessels diameter smaller 6 mm (Edwards XT or Corevalve)
- **Contraindication for transaortic access**
  - Porcelain aorta
  - Hostile chest
- **Contraindication for transapical access**
  - Severe pulmonary disease
  - LV aneurysm
- **Contraindication for Subclavian/Axillary access**
  - Not available for Edwards valves

Cohen, MG et al. *Catheter Cardiovasc Interv*. 2013;82:987-993

Venous Insertion of Retroflex Sheath

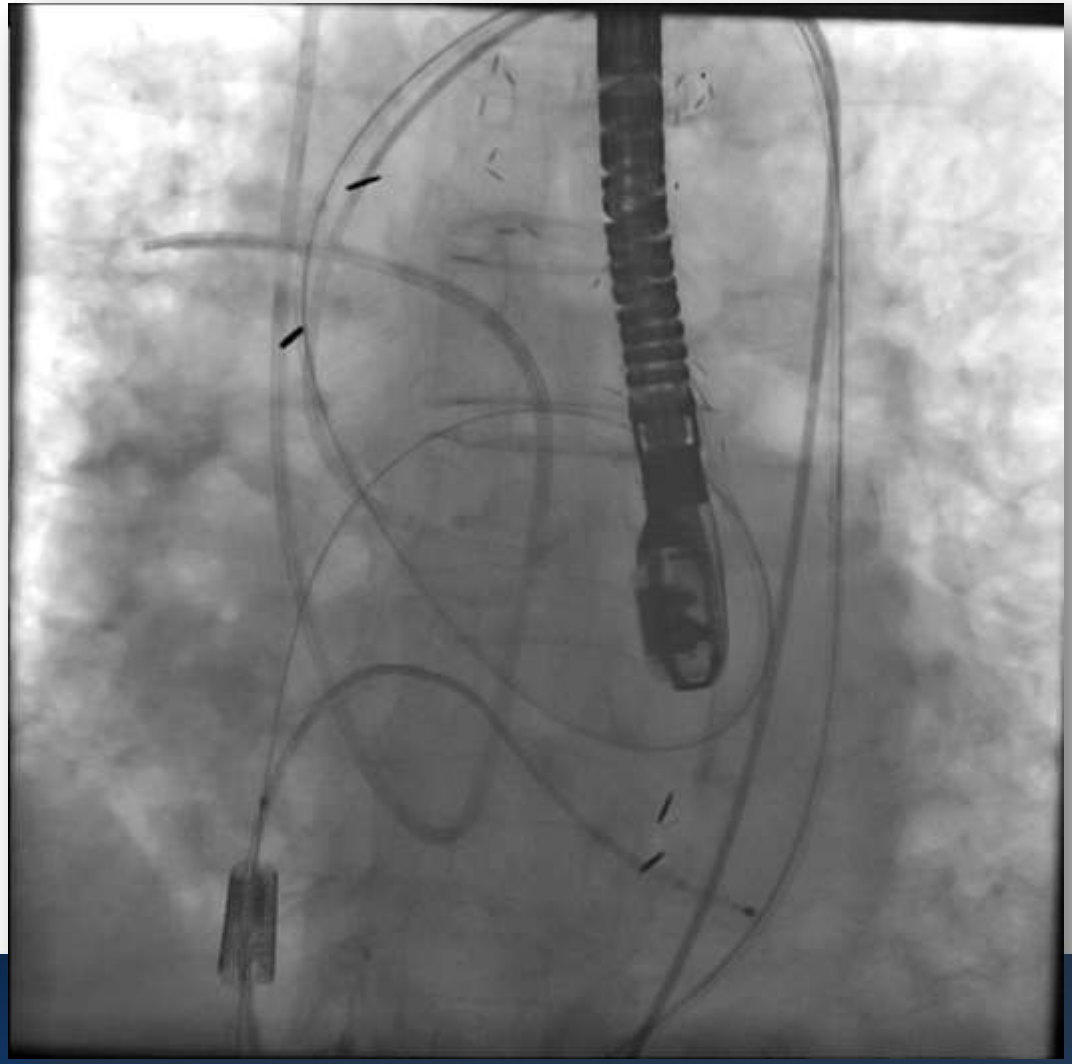


Transseptal Antegrade Approach

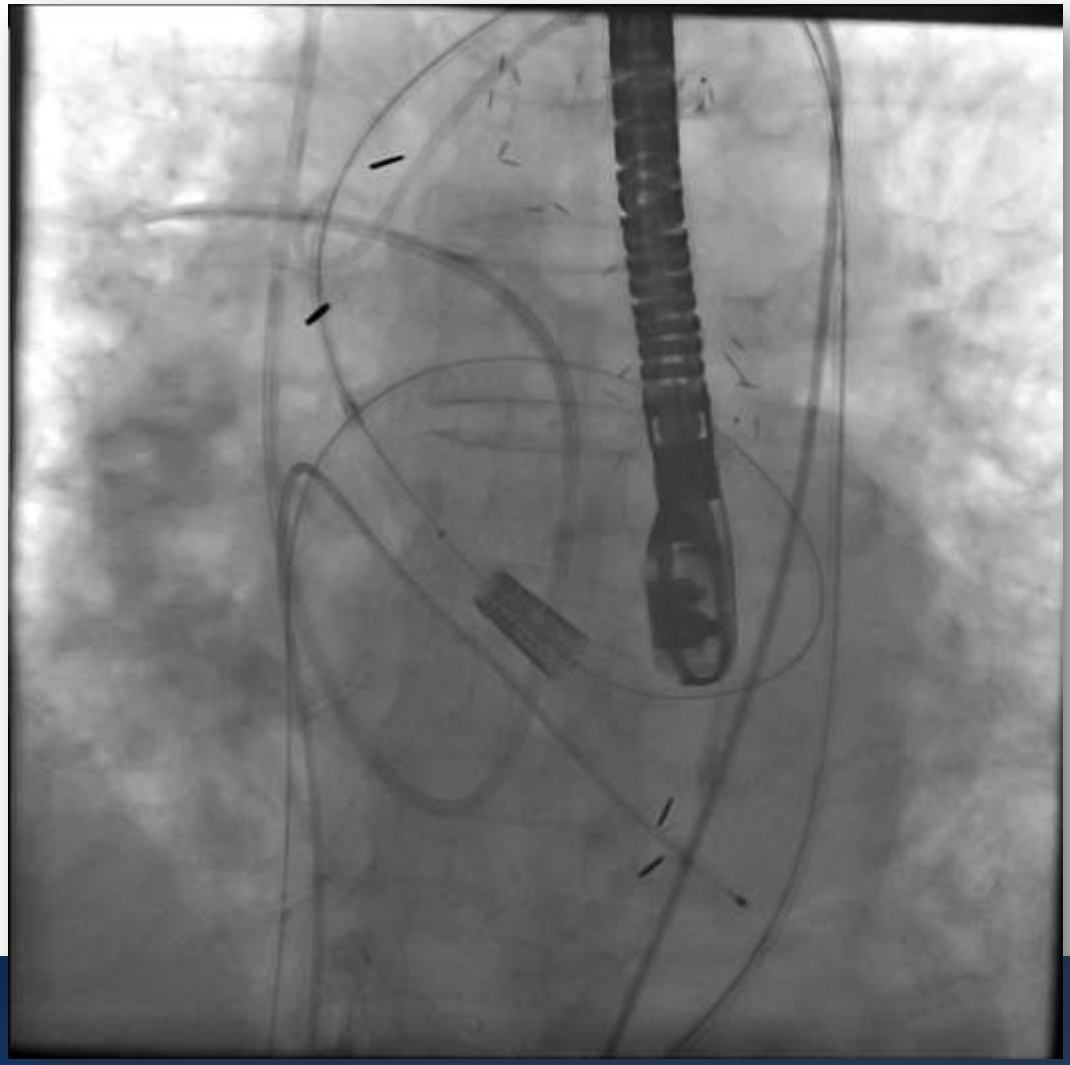




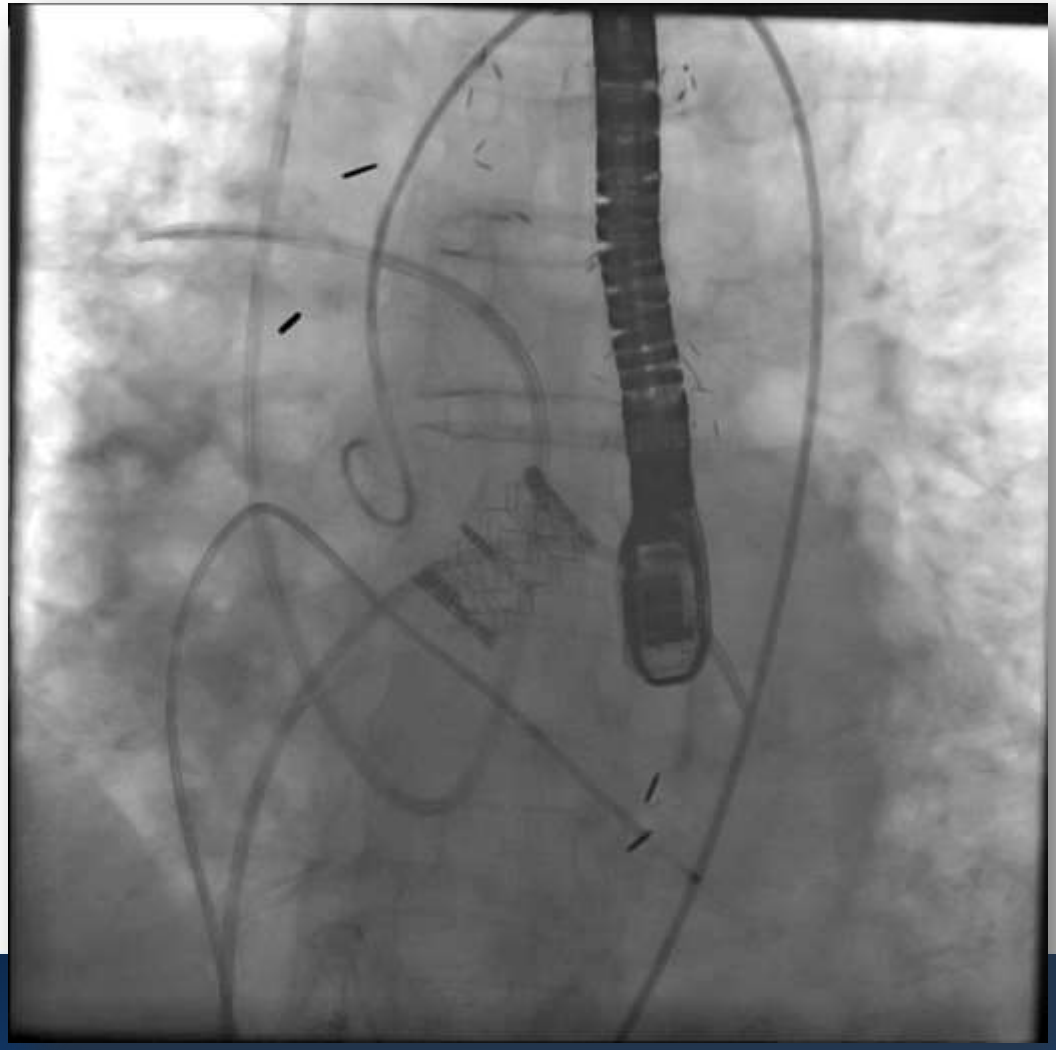
Advancing the Valve



Valve Deployment



Final Supravalvular Aortography



CLINICAL RESEARCH Interventional Cardiology

Caval-Aortic Access to Allow Transcatheter Aortic Valve Replacement in Otherwise Ineligible Patients

Initial Human Experience

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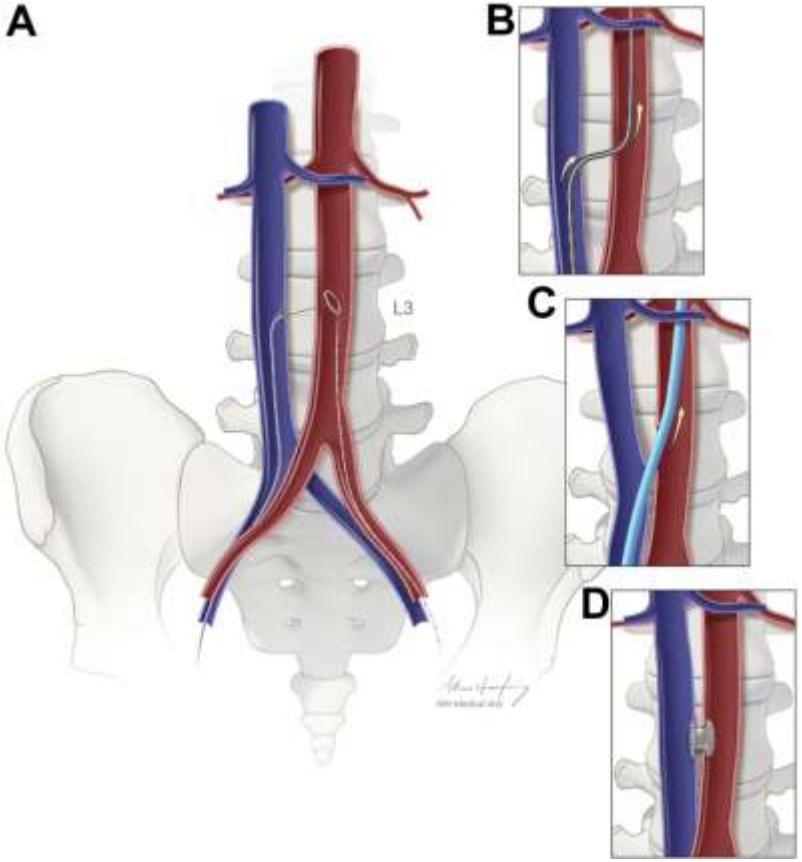
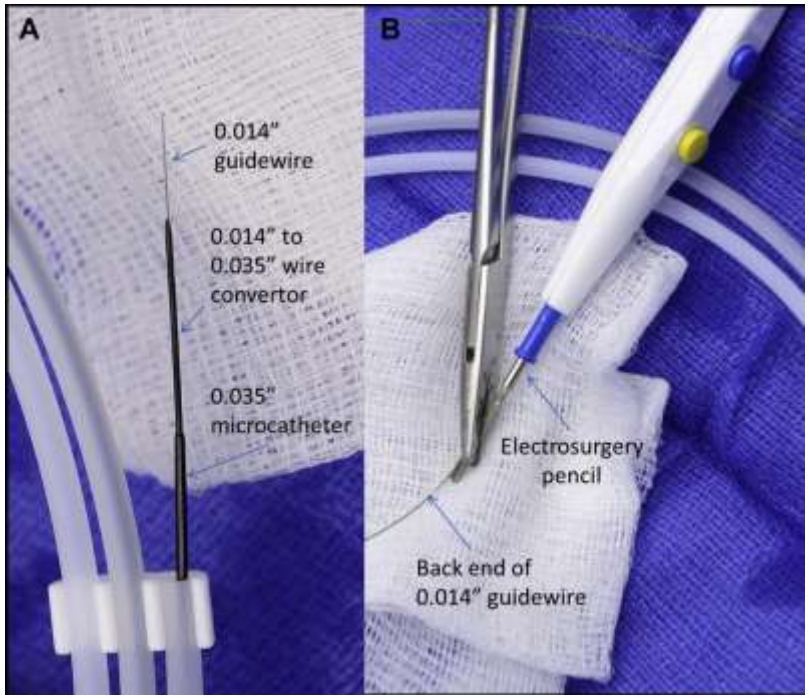
Mayra E. Guerrero, MD,* Janet F. Wyman, DNP,* R. Lebron Cooper, MD,‡ Robert J. Lederman, MD§
Detroit, Michigan; and Bethesda, Maryland

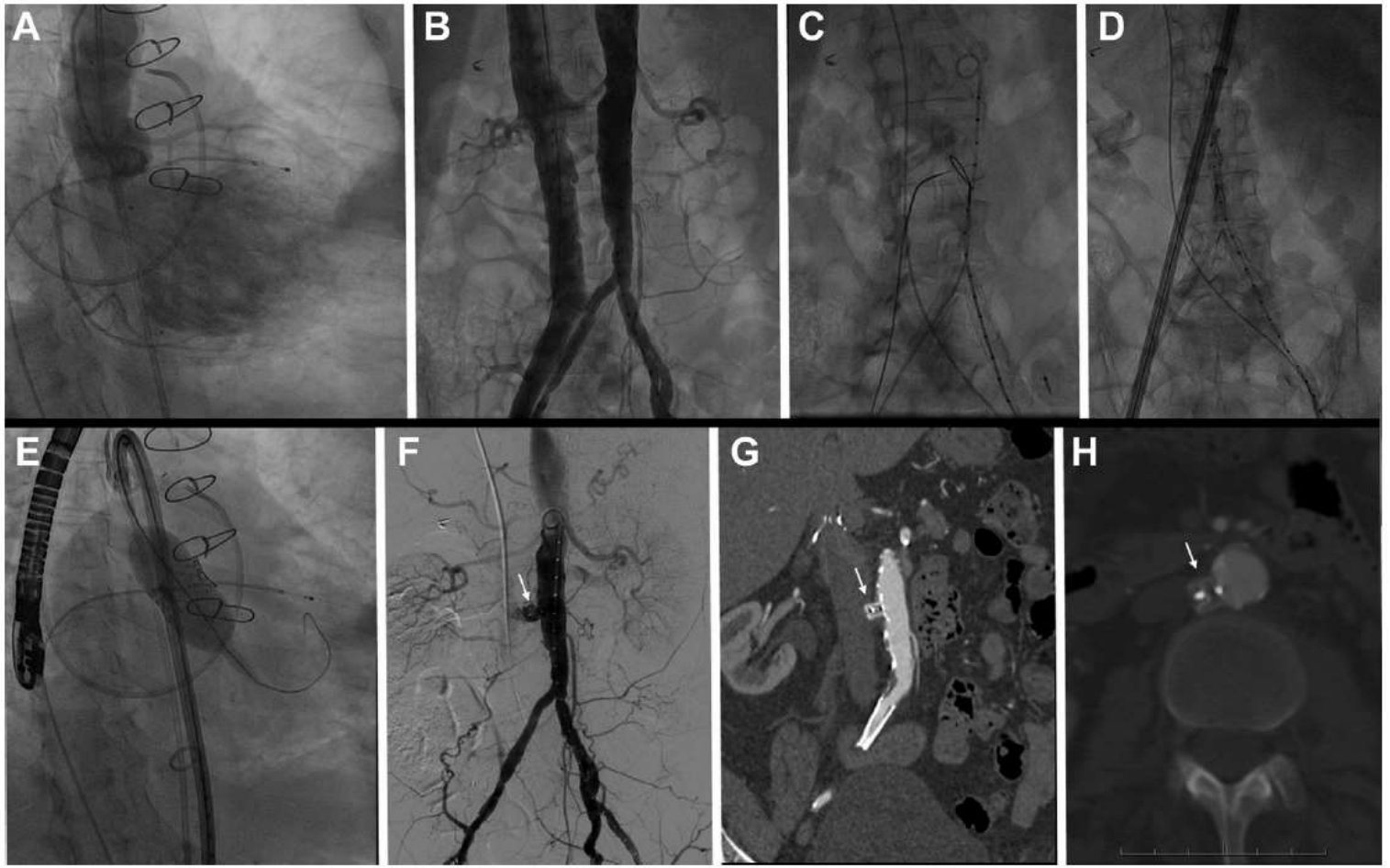
Greenbaum AB et al. JACC 2014;63:2795–804

Trans-Caval Technique



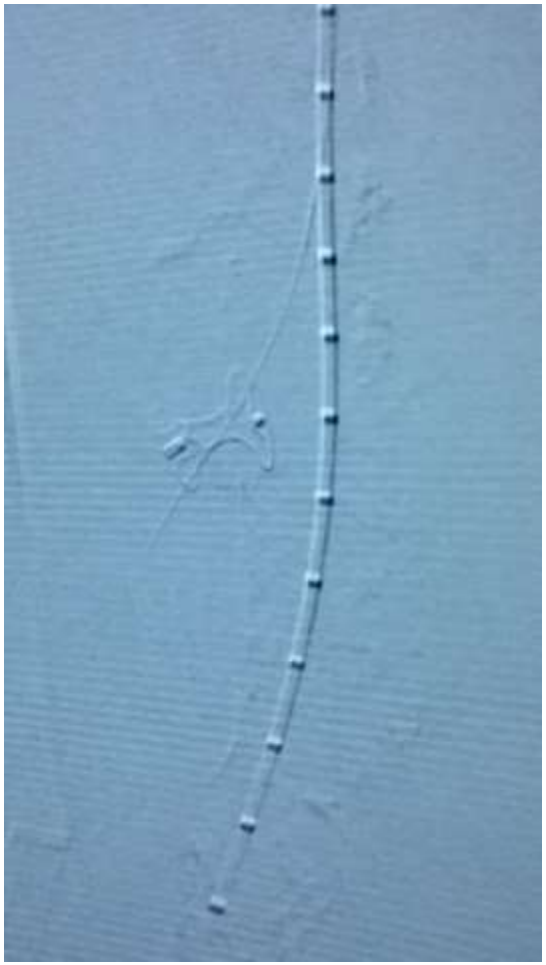


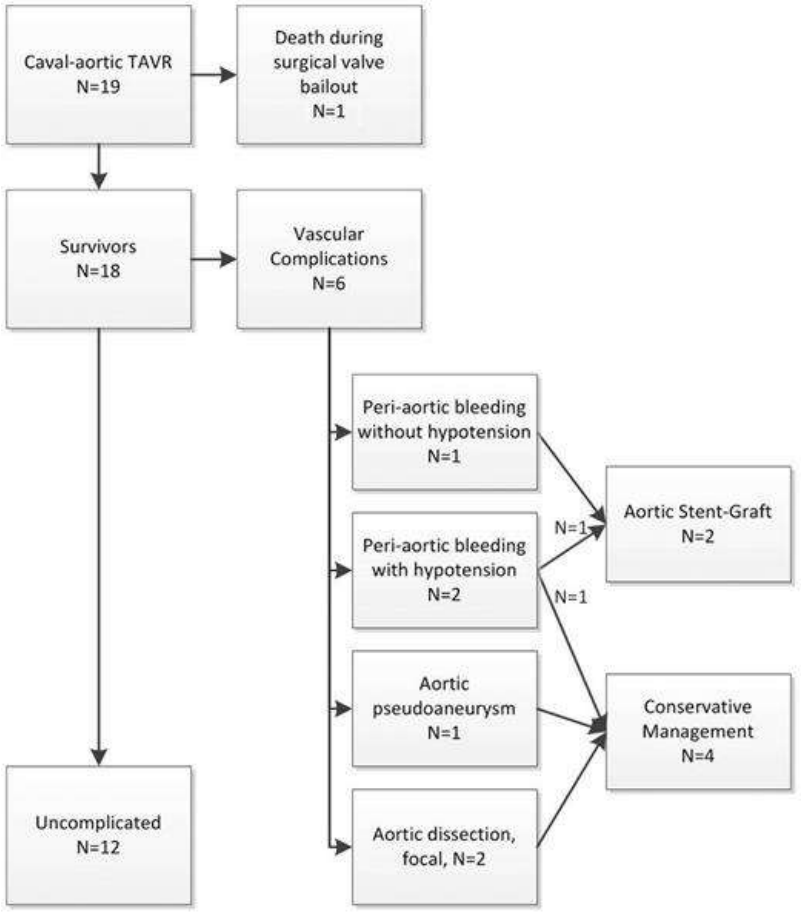
Trans-Caval Techique



Greenbaum AB et al. JACC 2014;63:2795–804

Trans-Caval Technique





Greenbaum AB et al. JACC 2014;63:2795–804

Video: Courtesy of Dr. William O'Neill

Conclusions

- **Careful patient evaluation**
- **Femoral access is always preferred**
  - Shorter length of stay, improved recovery
  - Improved survival (compared to TA)
- **Alternative access**
  - Patients have more comorbidities
  - Longer recovery
  - Transaortic access has shorter learning curve and faster recovery than transapical access
  - Transseptal Antegrade may still have a role and should be performed by experienced operators.
  - Transcaval seems to be a promising option.