Prevention, Prediction, and Treatment of Vascular Complication

Won-Jang Kim, MD, PhD
Clinical Assistant Professor of Medicine, Heart Institute,
Asan Medical Center, Seoul, Korea

For Successful TAVI,
There are several factors.

Among them, vascular manuplation is the beginning and end of successful procedure

82/F, 70kg/153cm

Chief complaint

DOE NYHA III

Co-morbidity

PCI at LAD, RCA & LCX (2009)

Hypertension

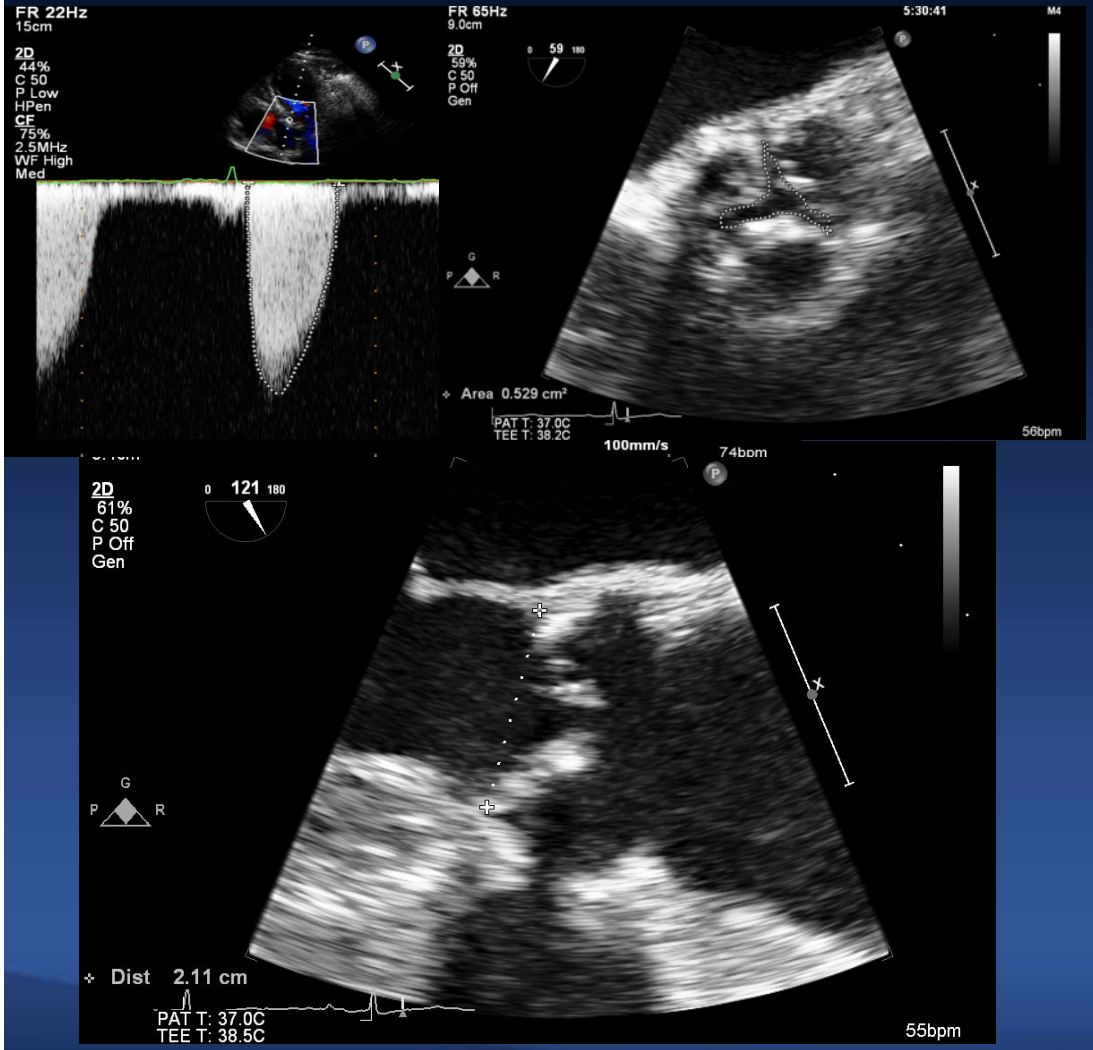
Chronic lung disease (asthma)

History of Stroke

Lab : Cr 0.8 mg/dL

Logistic Euroscore : 29.54 %

Severe Degenerative Aortic Stenosis



Aortic valve area: 0.6 cm^2

Vmax: 3.9 m/sec

Max gradient: 69 mmHg

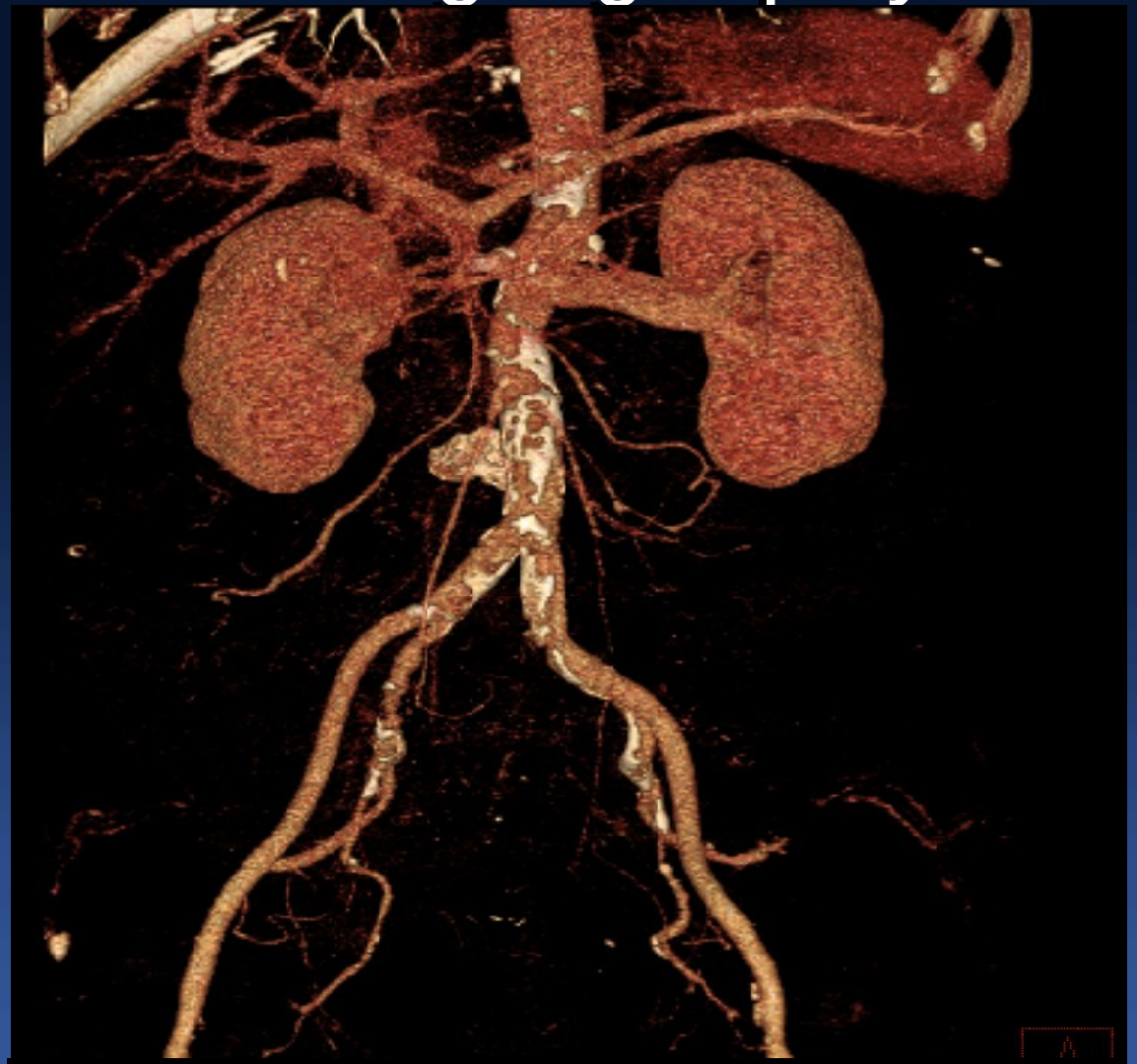
Mean gradient: 47 mmHg

Annulus: 21 mm

EF: 62%

TR Vmax = 34 mmHg

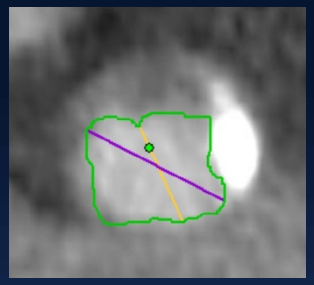
CT Angiography



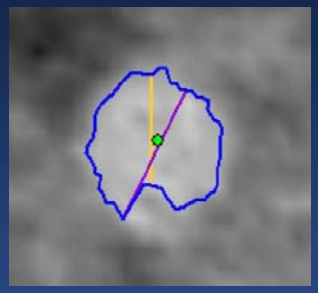
Adequate vessel tortuosity

Vessel Size on CT scan

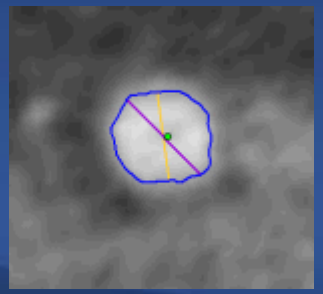
Right



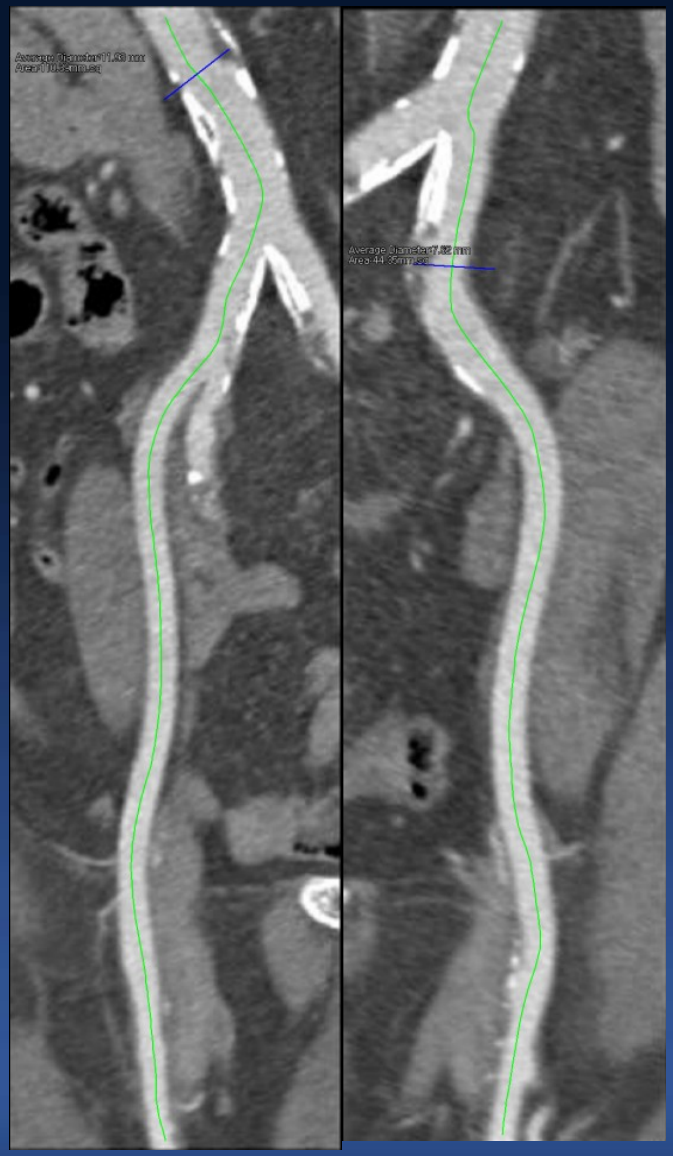
7.77 mm



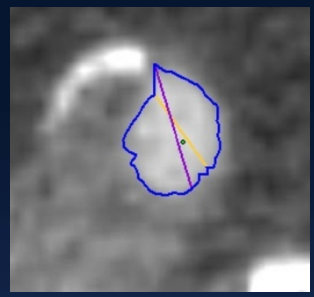
7.46 mm



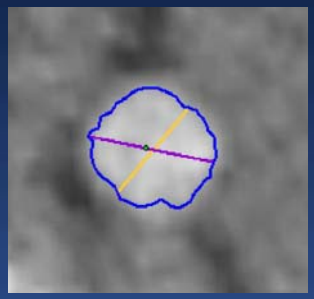
7.26 mm



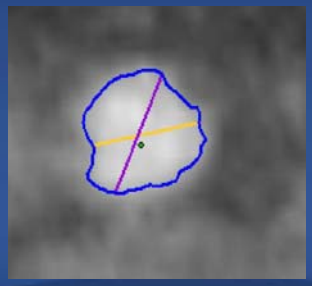
Left



7.62 mm

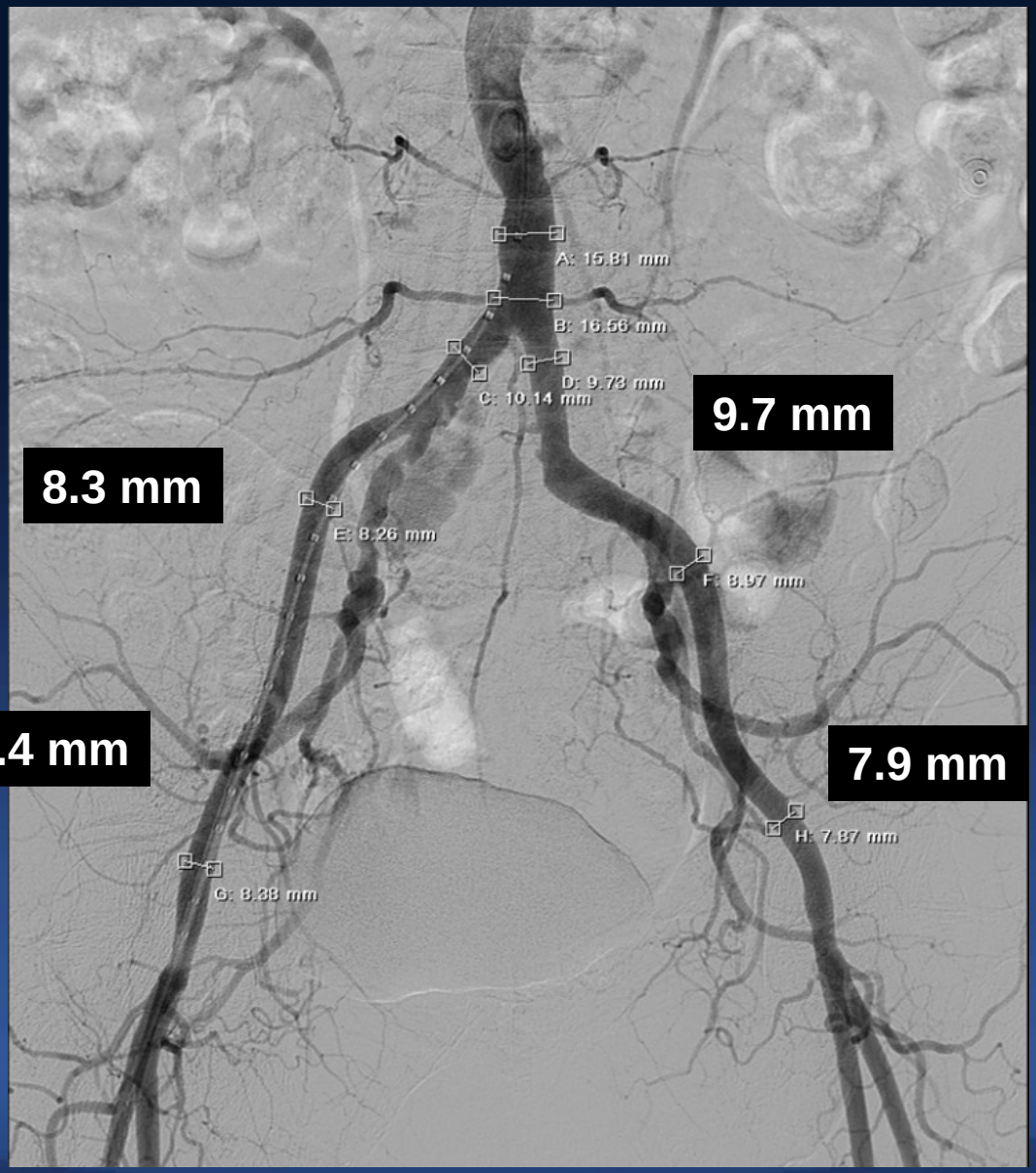


7.28 mm

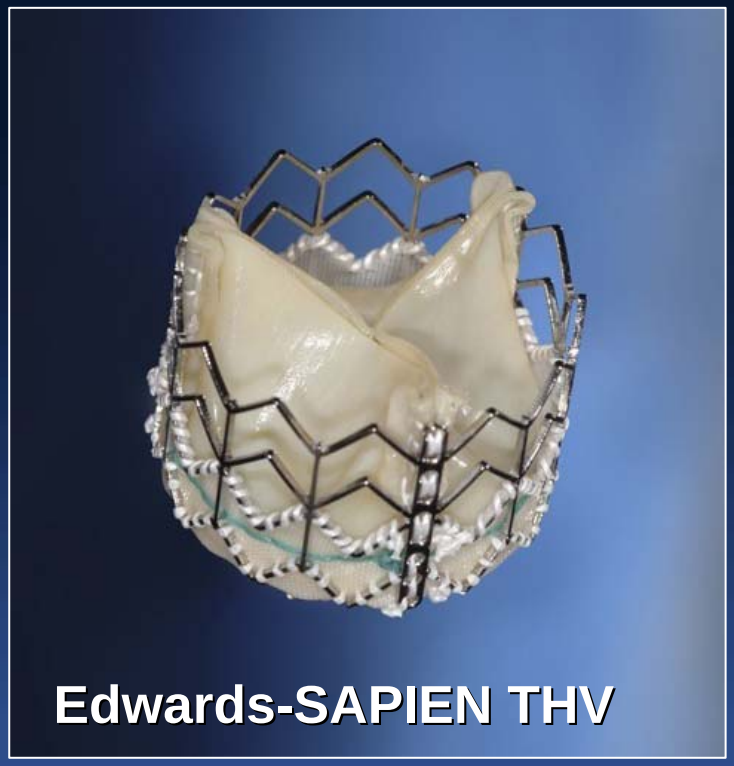


6.79 mm

Aorto-iliac angiogram



Edwards SAPIEN™



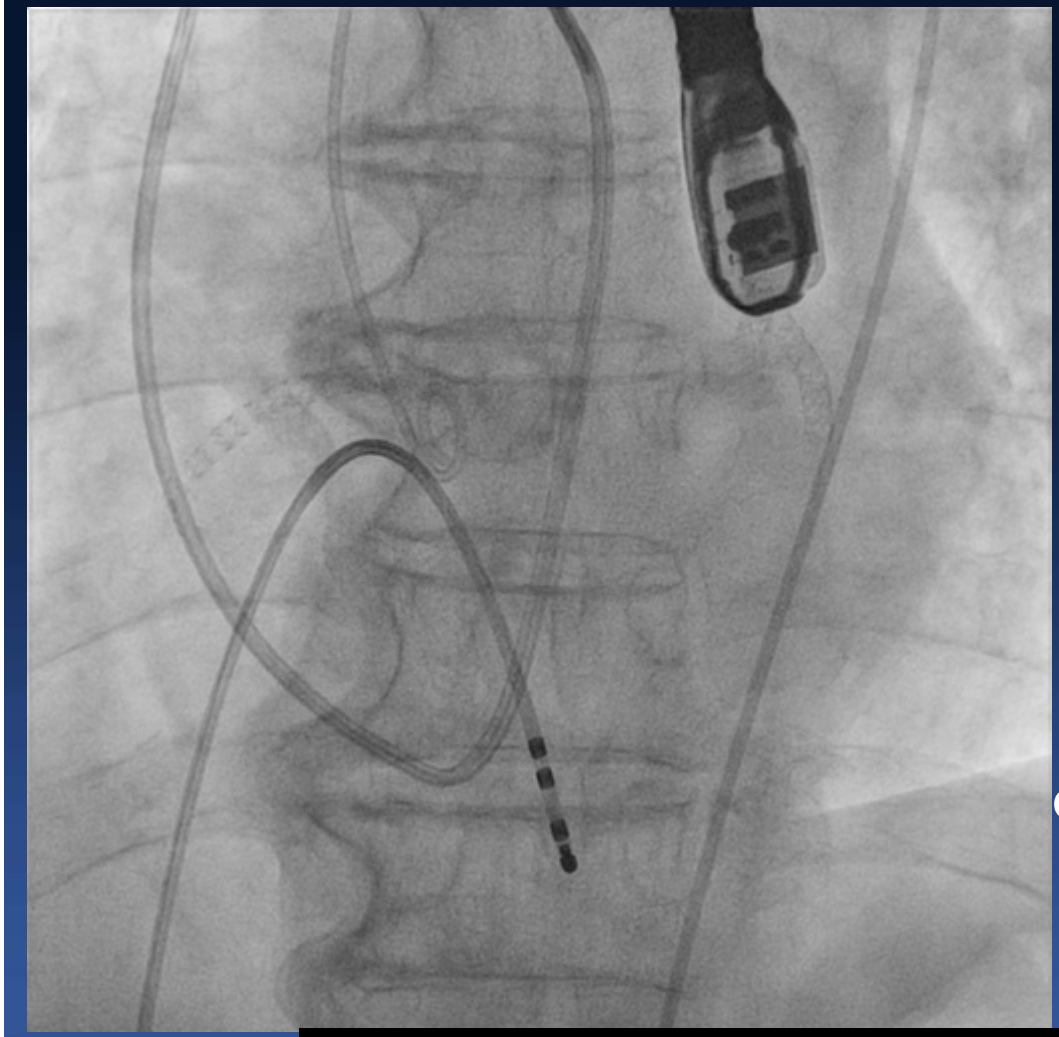
23mm
valve sizes

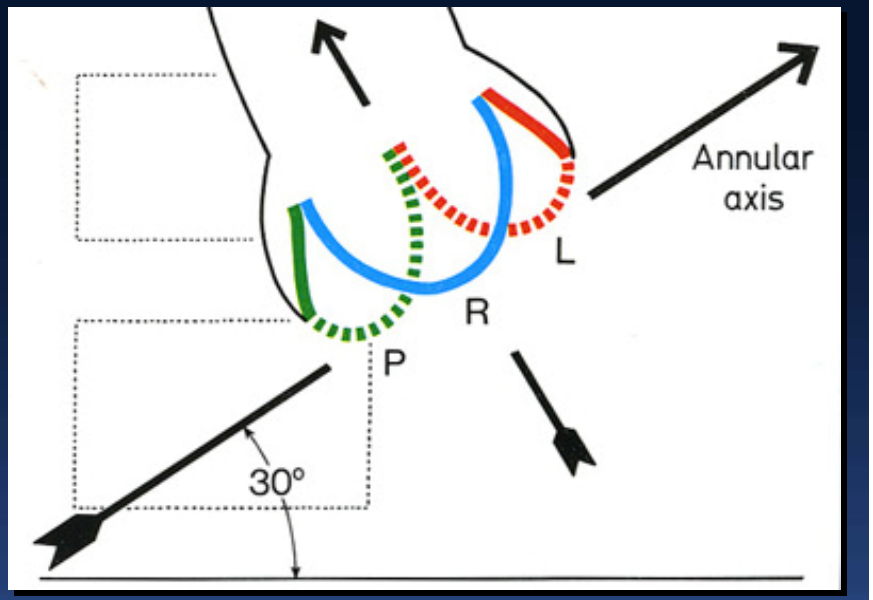
22F
sheath sizes

Procedure

- Rt. femoral artery cut-down
  with 14 Fr sheath
- Lt. femoral vein puncture & pacing
  wire into the RV
- Check the rapid pacing (200 bpm)
- Preparing Edward valve 23 mm

Aortogram



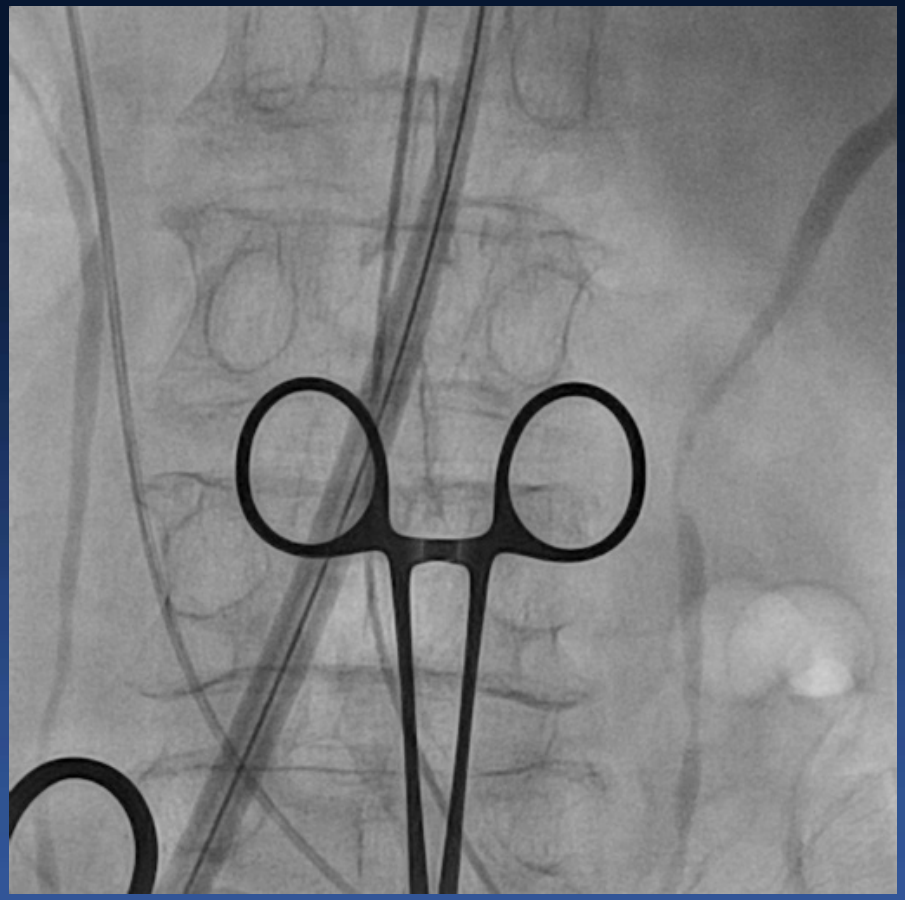


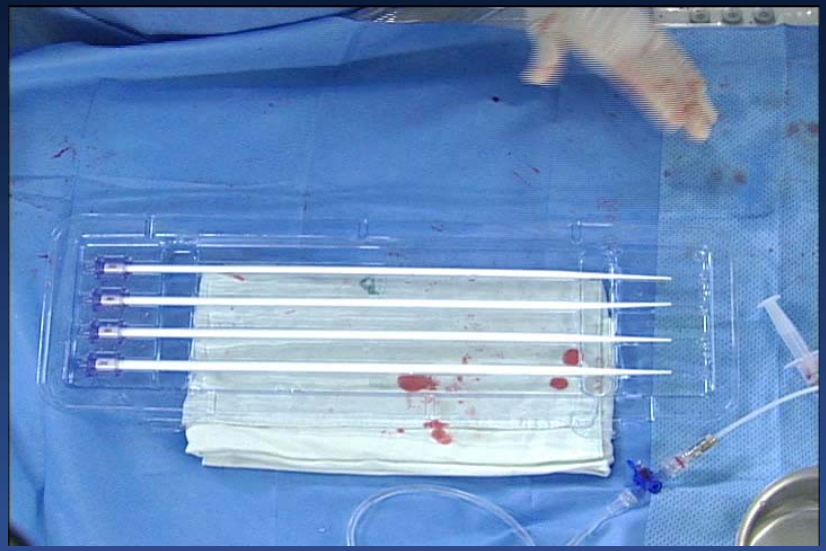
3 sinuses are visualized
on 1 single line - perpendicularity

Slightly LAO cranial or caudal

Three cusps in same plane : RAO 0 CAUD 0

Stepwise Dilation (16-25Fr)
22Fr Sheath Insertion

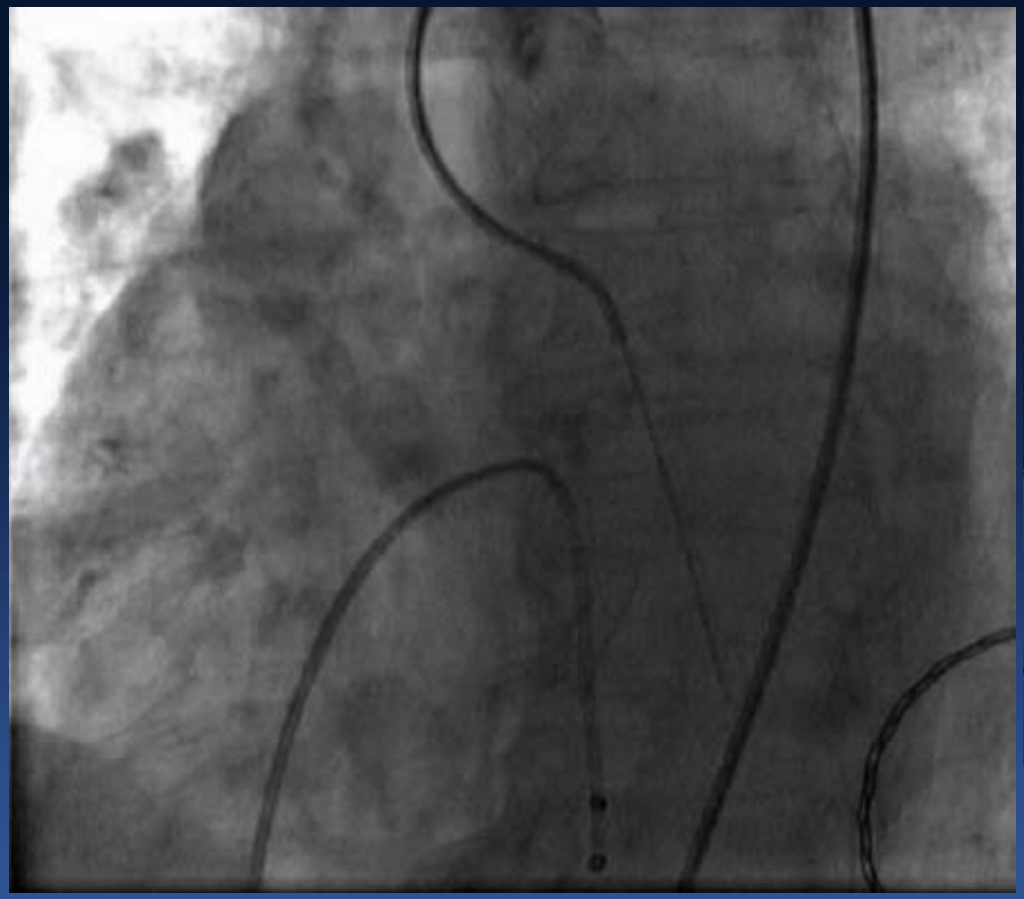




Start the Procedure, 22F

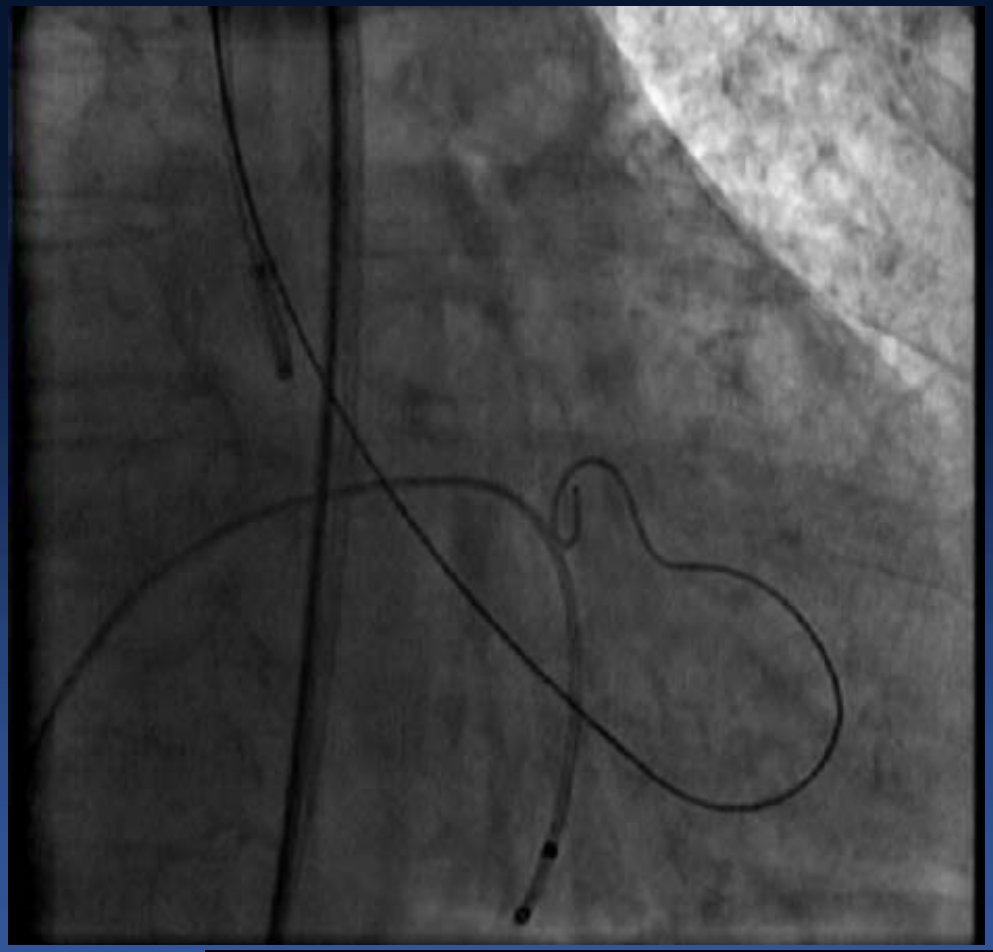
Rt. femoral artery approach

Crossing the Aortic Valve



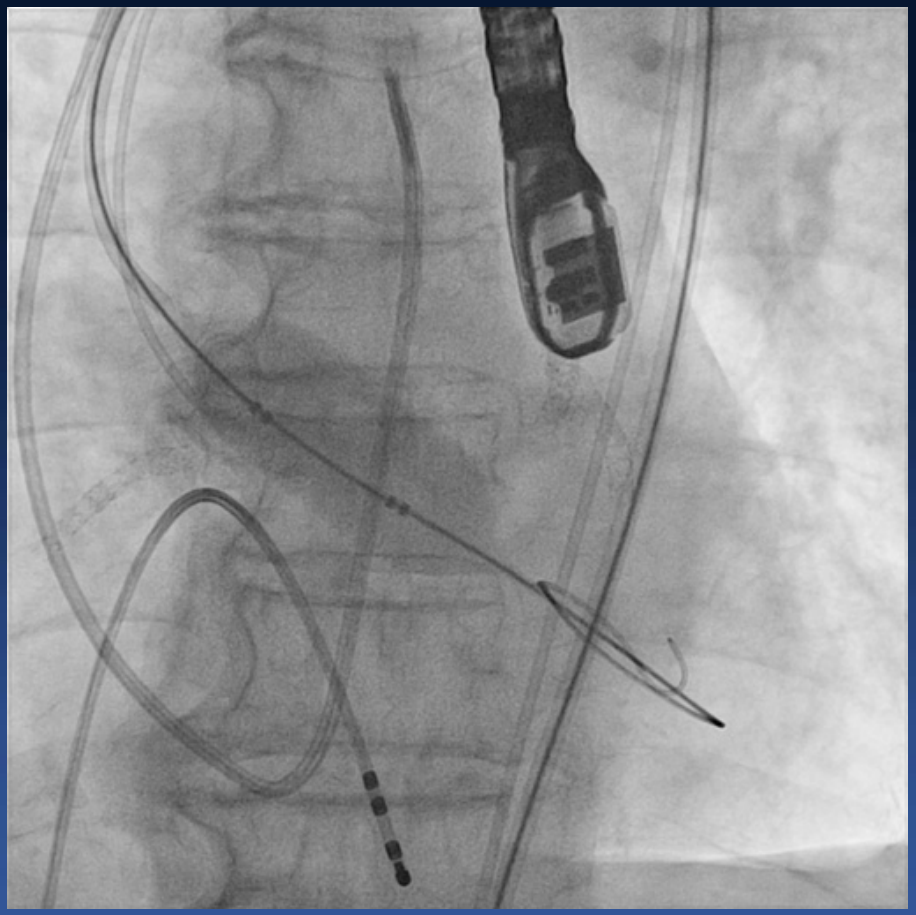
6Fr Lt. Amplatz catheter with 0.035” straight guidewire for cross the aortic valve (40’ LAO view)

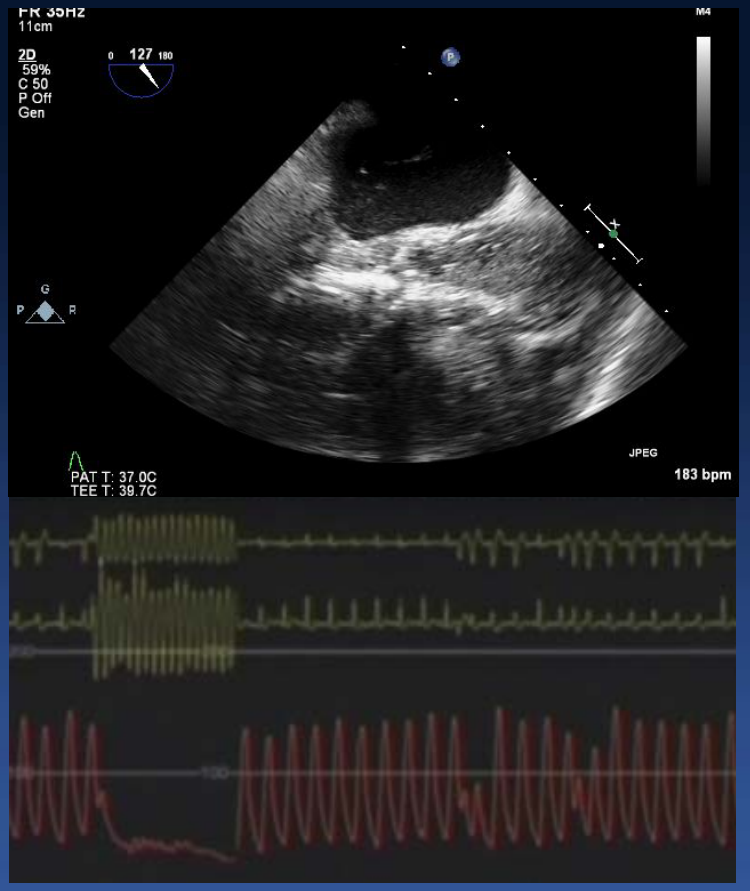
Pre-shaping Extrastiff Guidewire



Preshaping (J-shaped) the 0.035/260cm extrastiff guidewire advanced into the LV

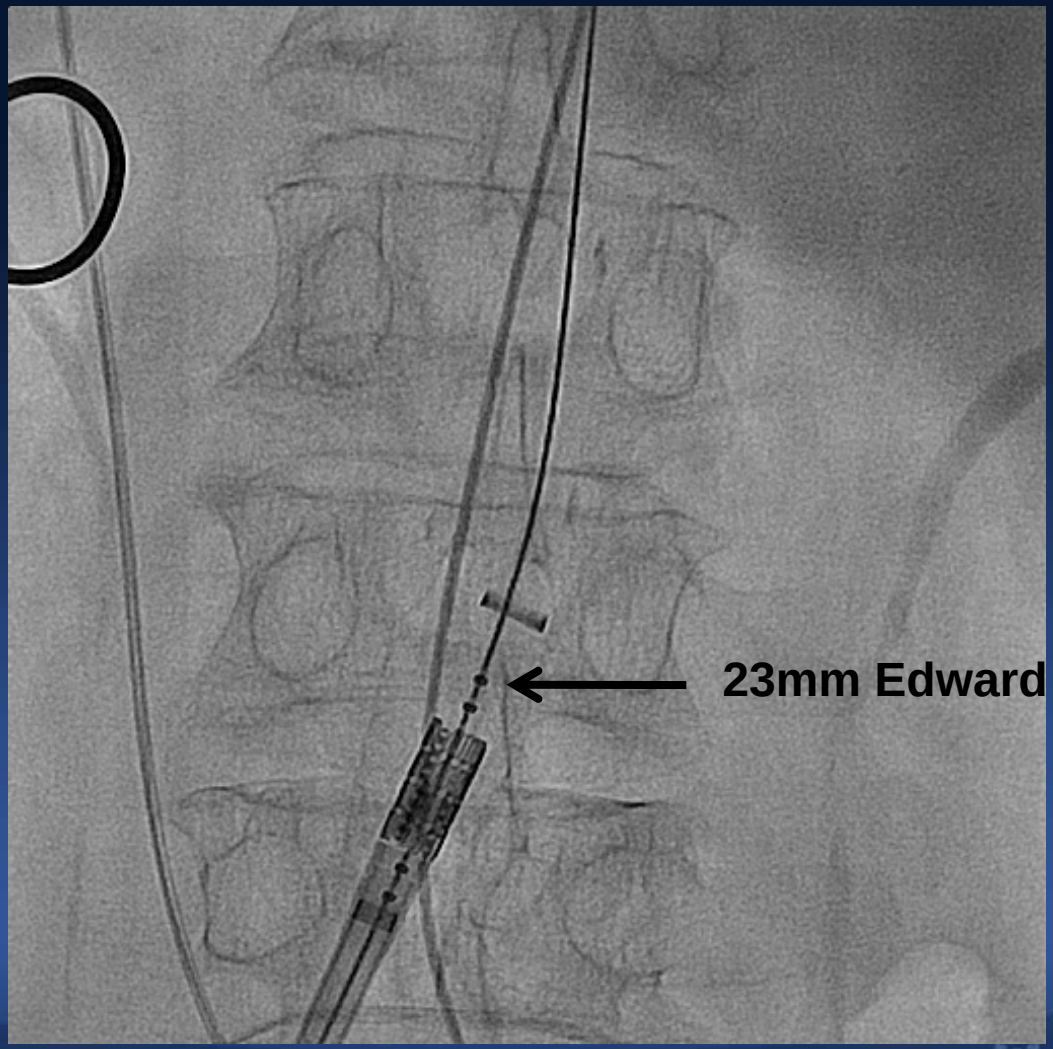
Pre-dilatation Ballooning under rapid pacing



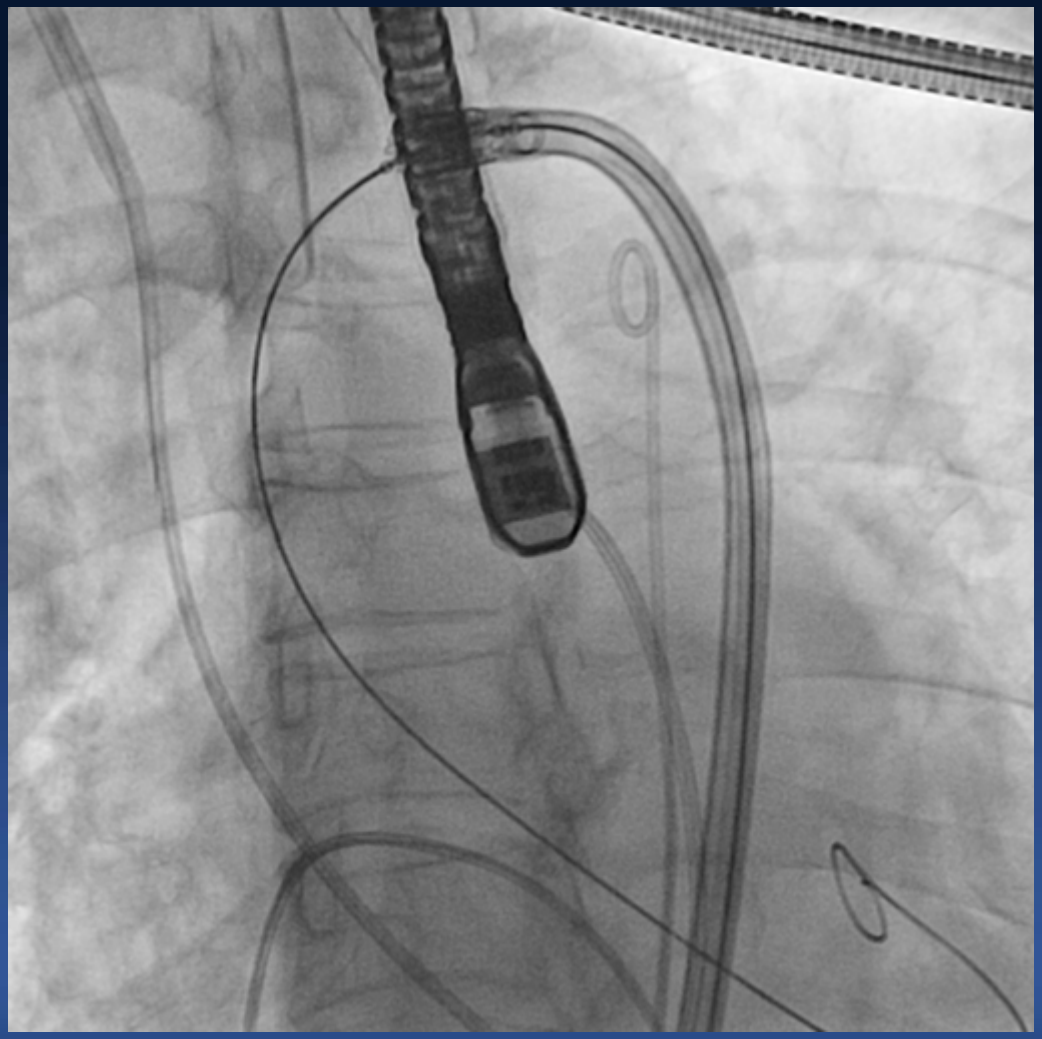


NuMed Z-Med II 20 mm balloon

Advanced RetroFlex-1 System

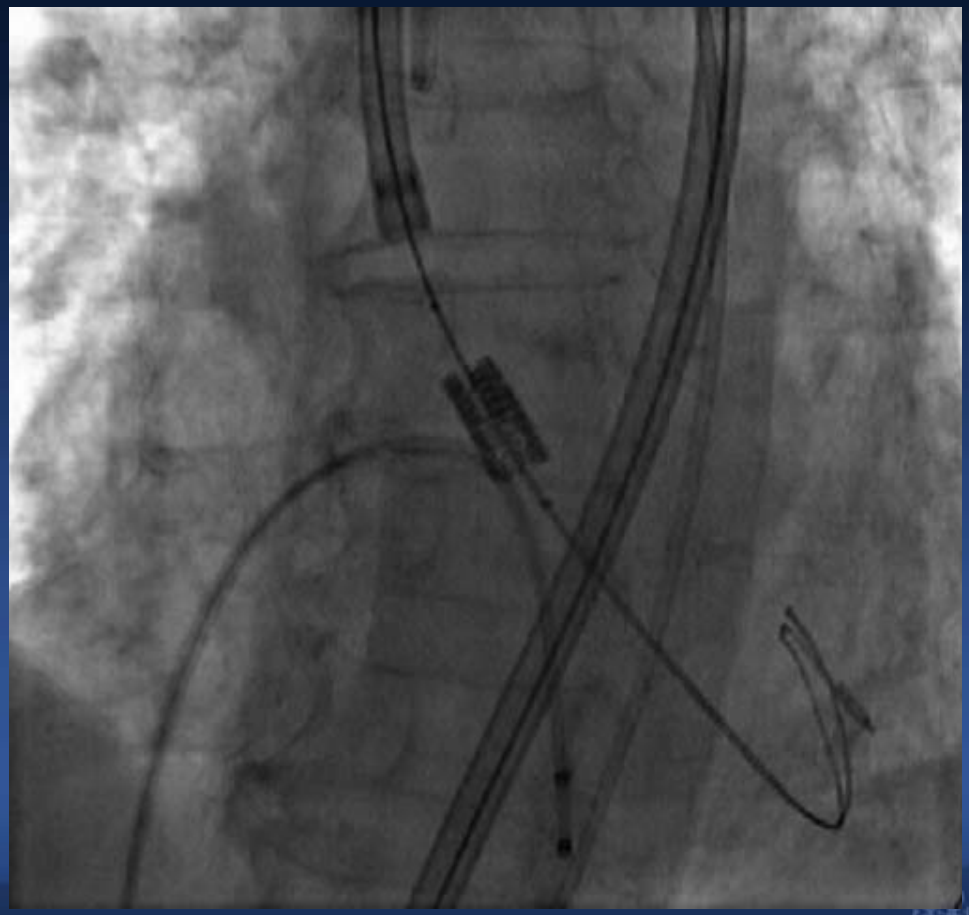


Advanced RetroFlex-1 System

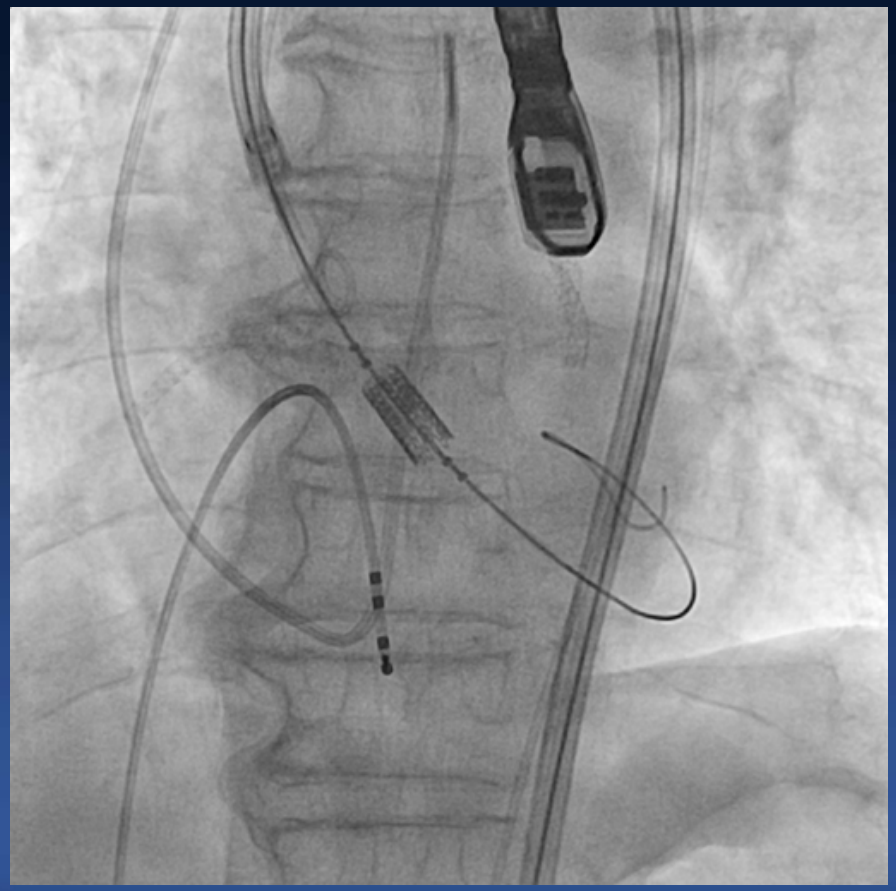


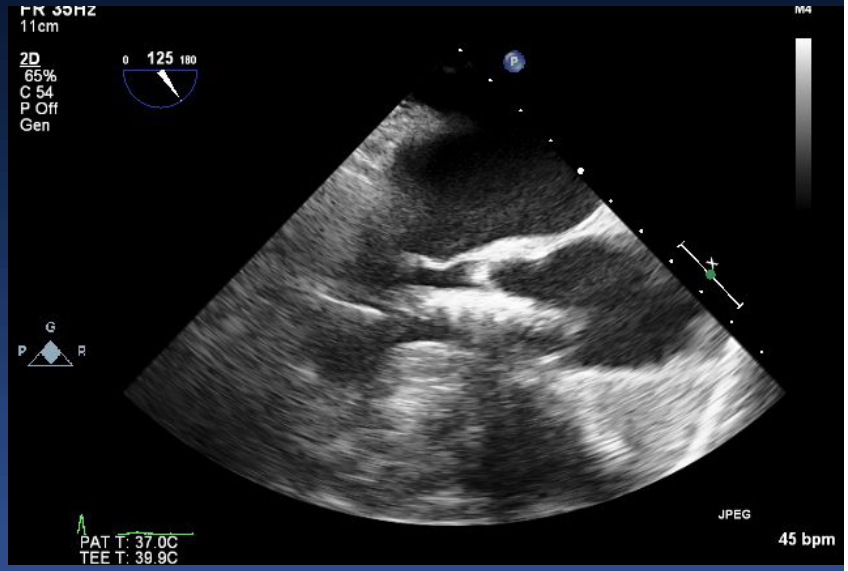
Main Procedure

The Edward valve crossed the native aortic valve
Withdrawal of the Flex catheter

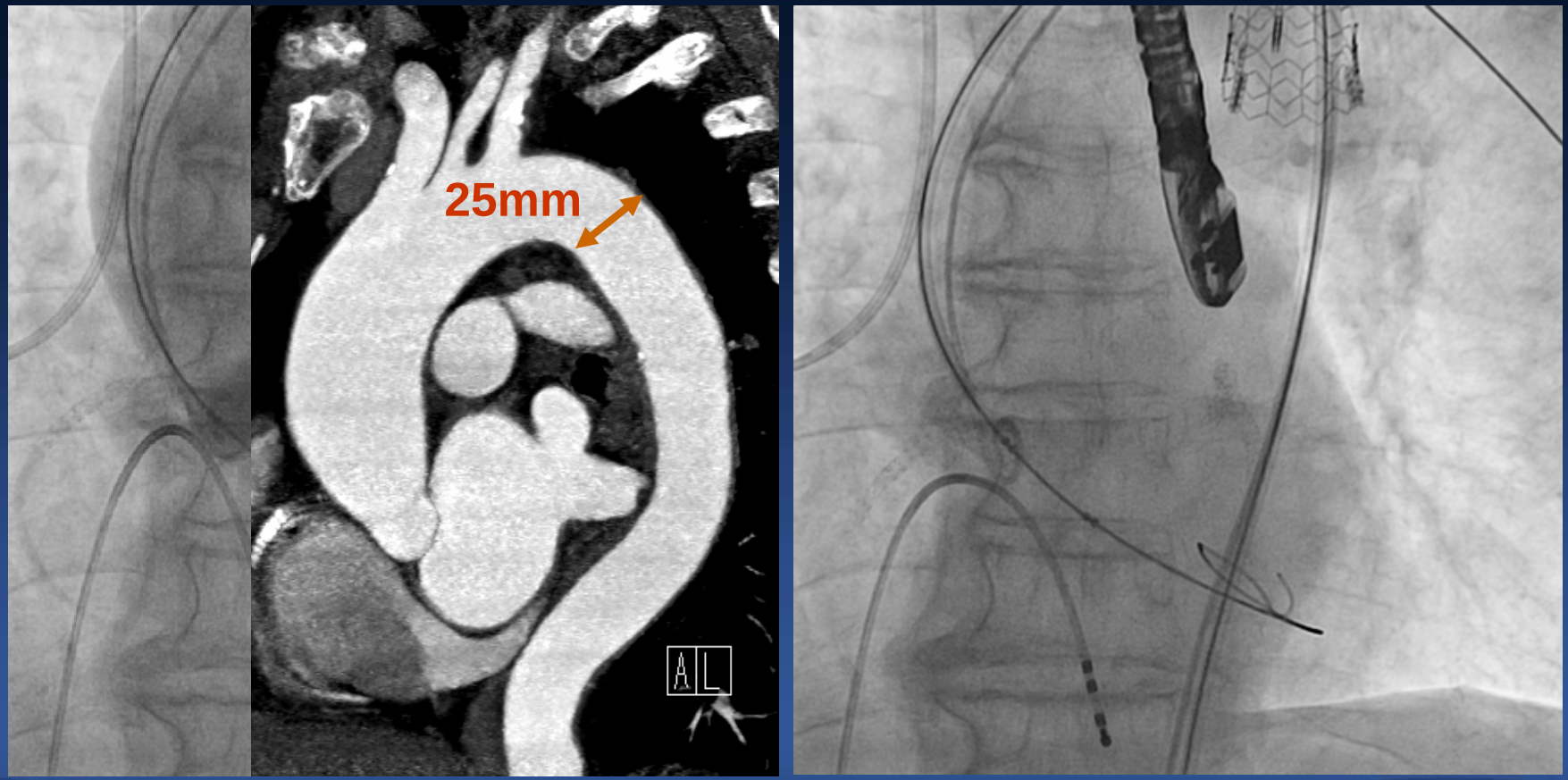


Valve Positioning under the TEE Guidance





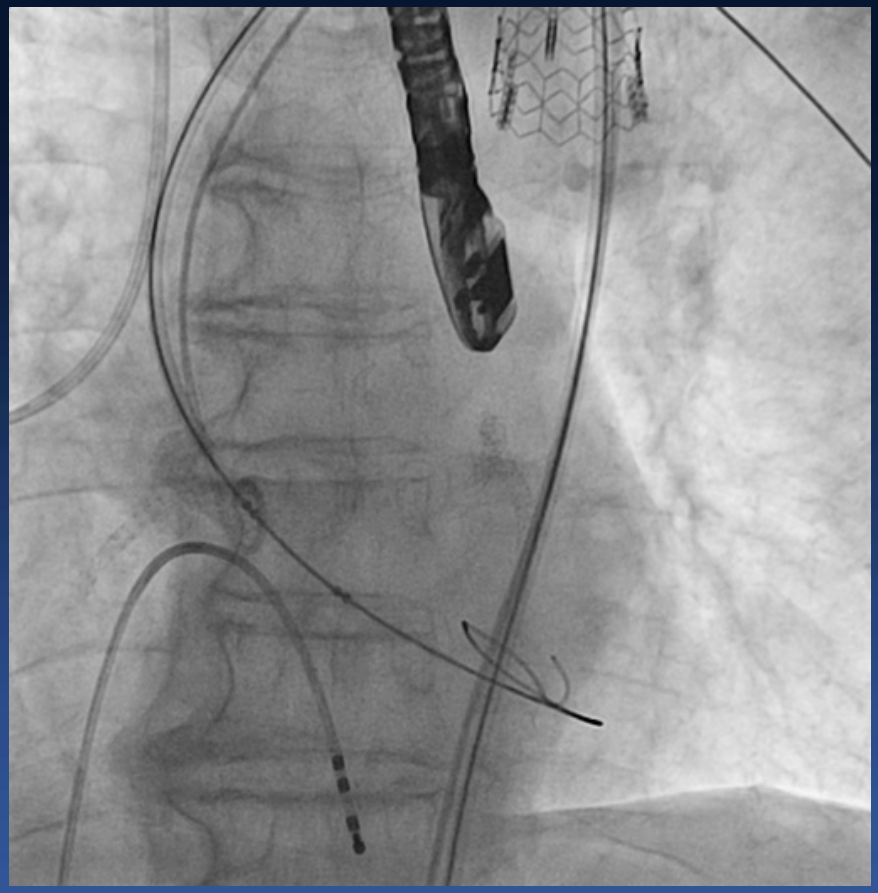
During deployment, valve embolized cranial due to loss of capture

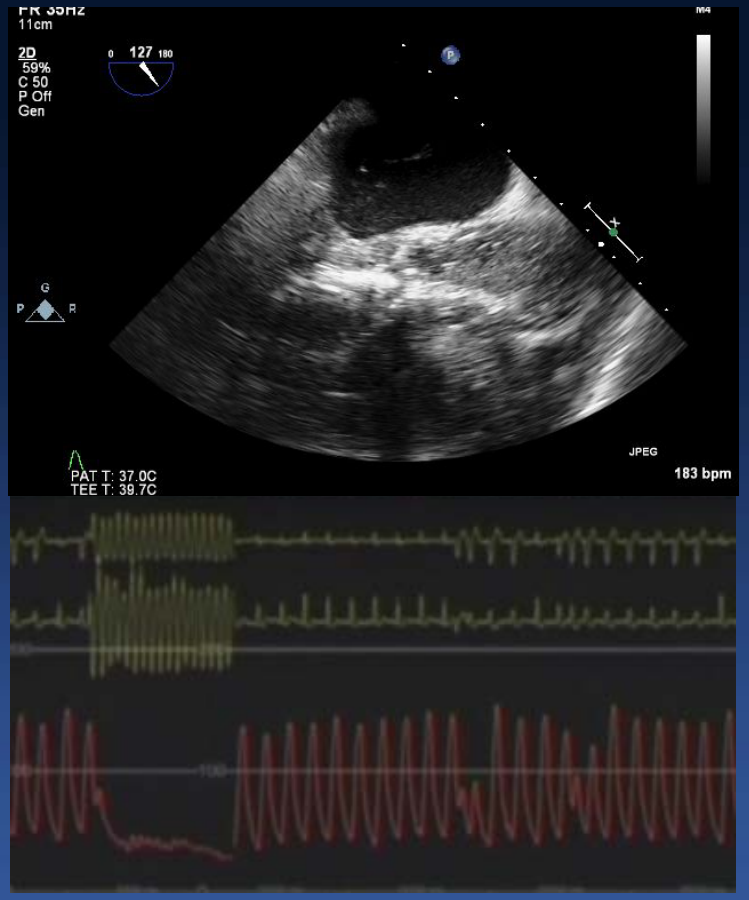


Embolized valve was deployed at descending aorta

We tried Valve-in-Valve again...

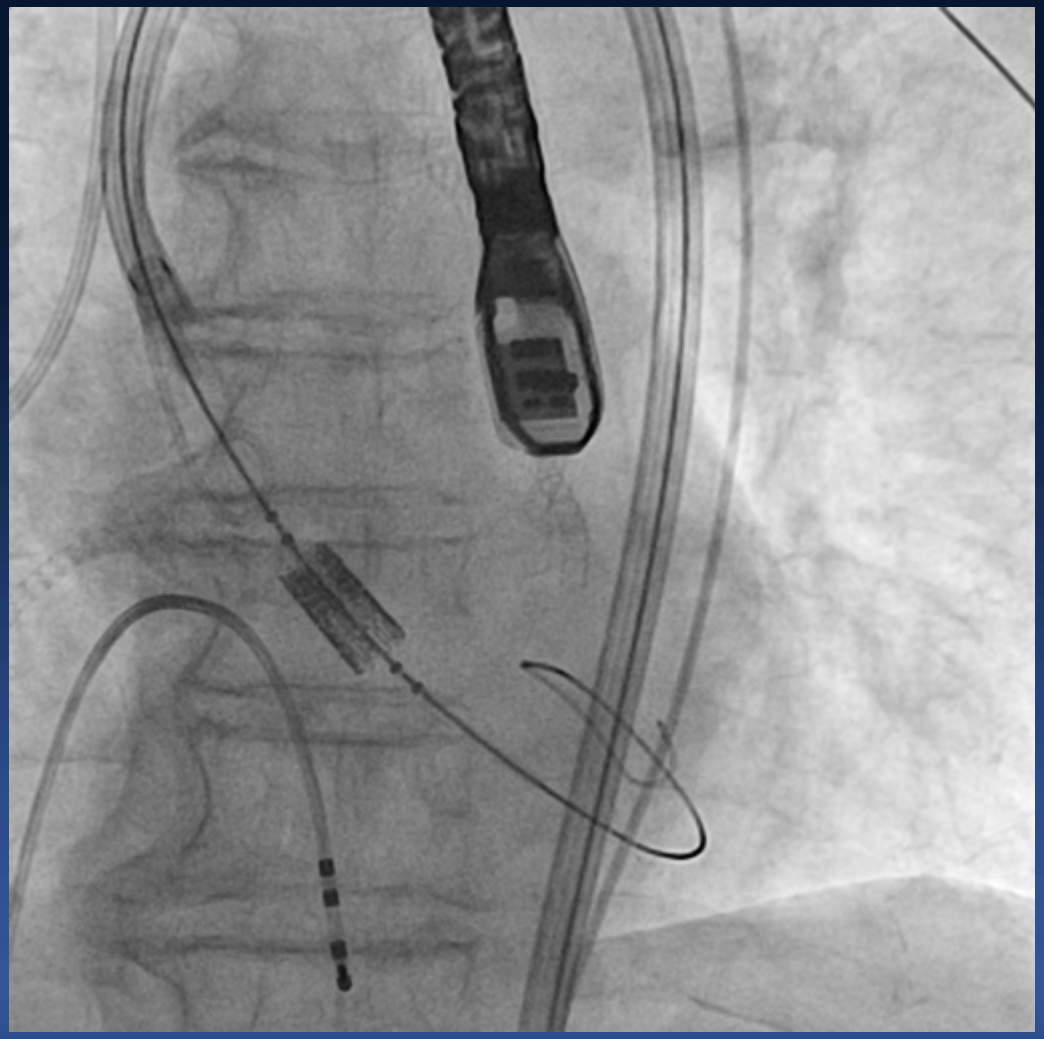
Pre-dilatation Ballooning Again



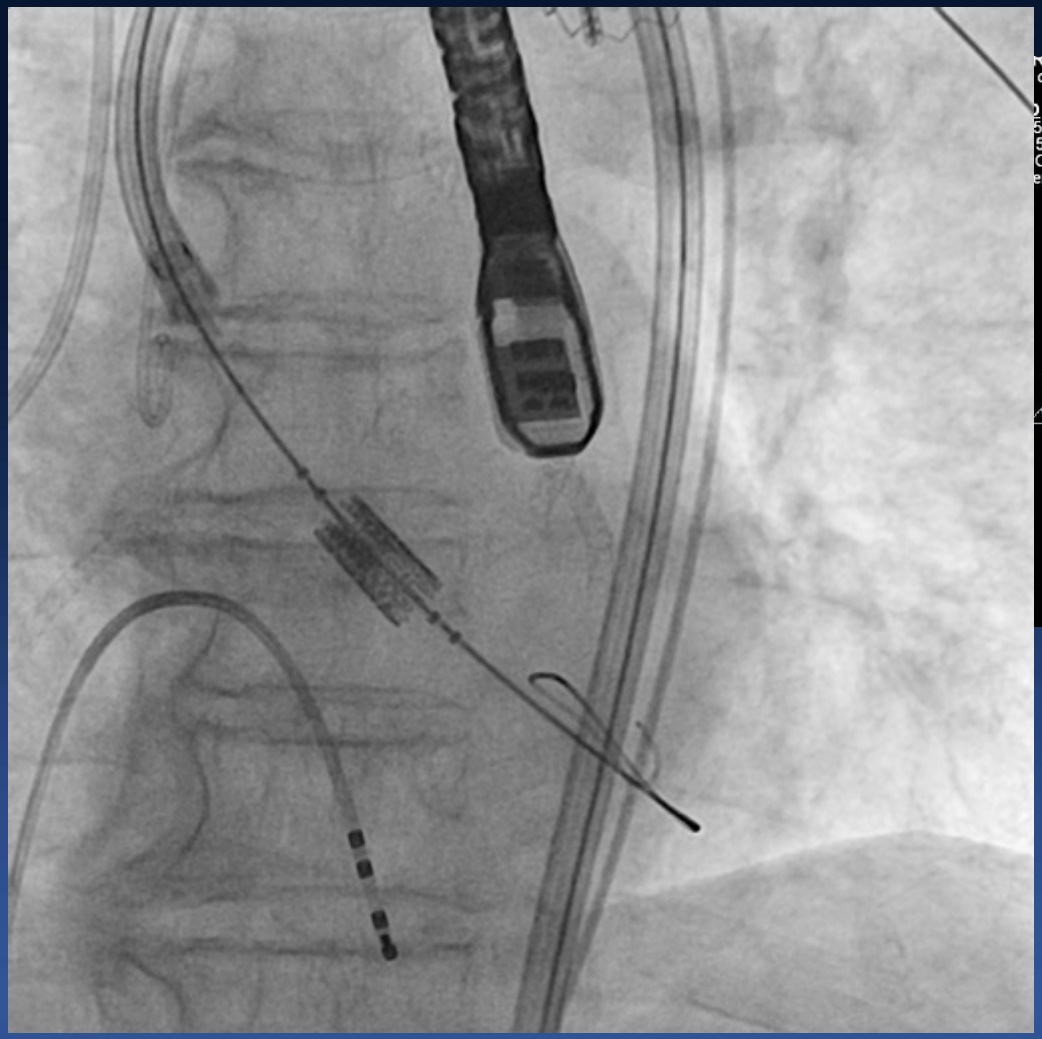


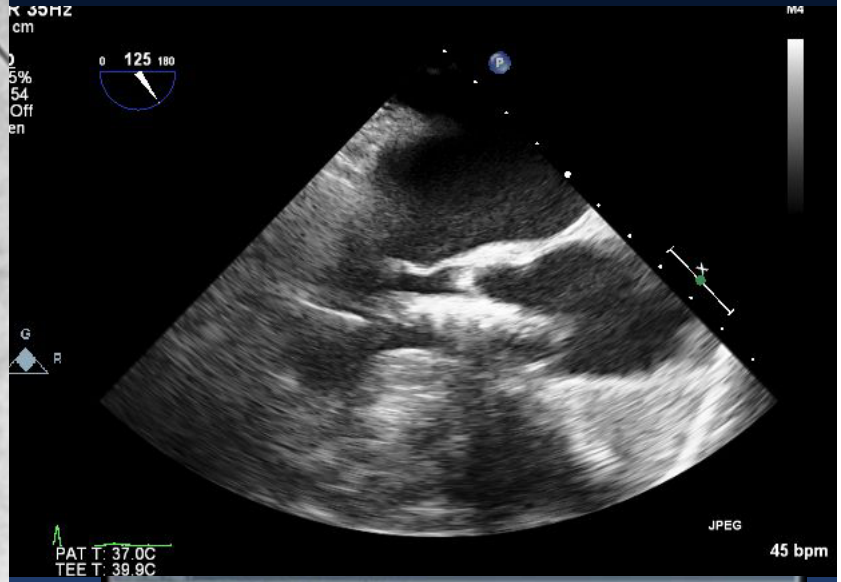
NuMed Z-Med II 20 mm balloon

2nd Valve positioning

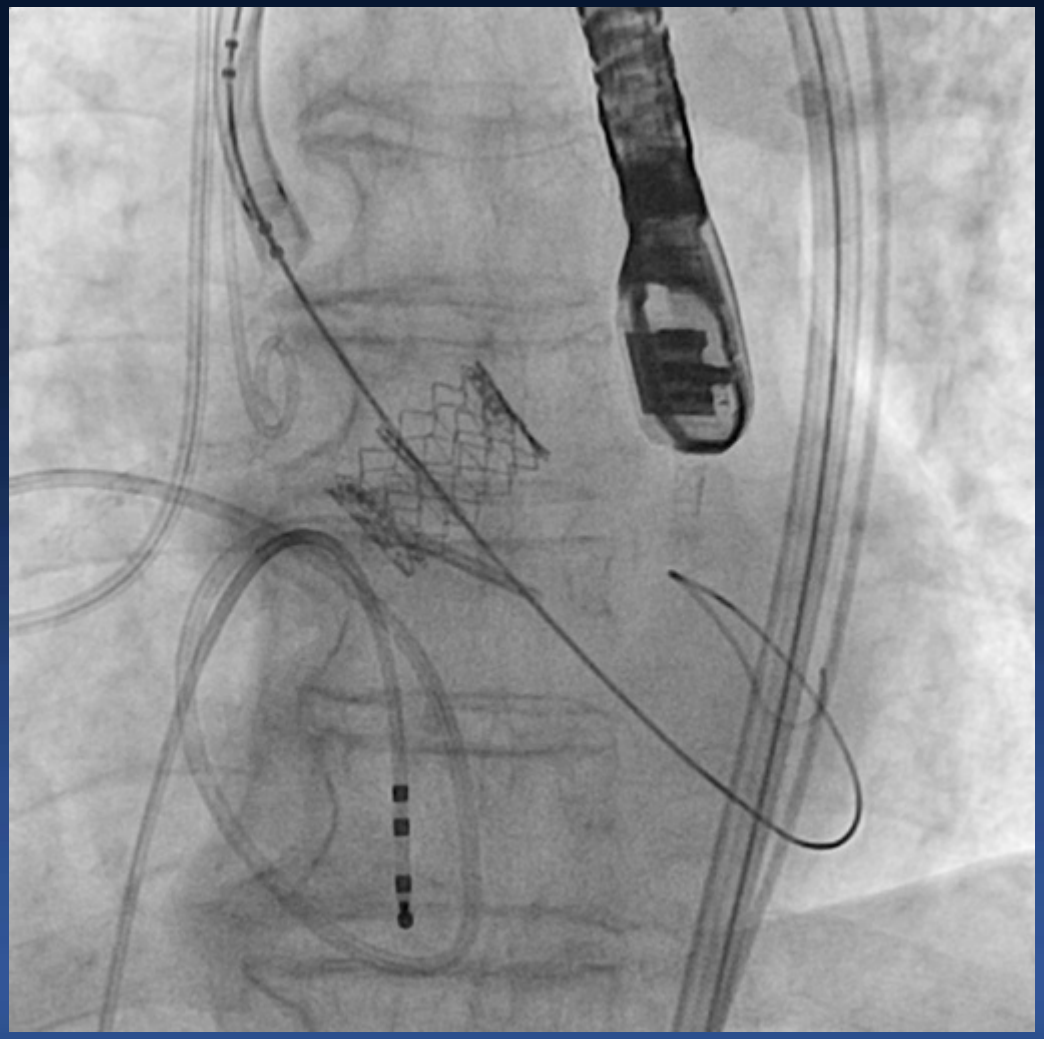


2nd Valve Deployment

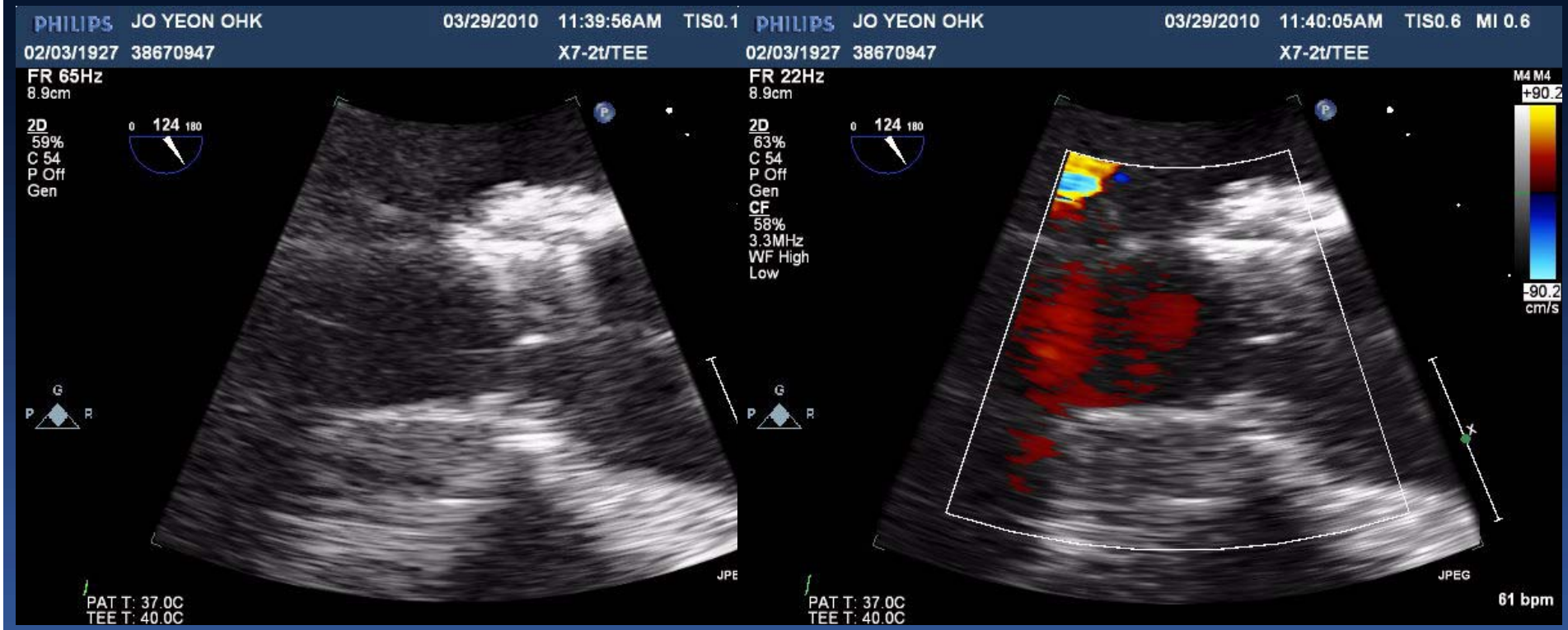




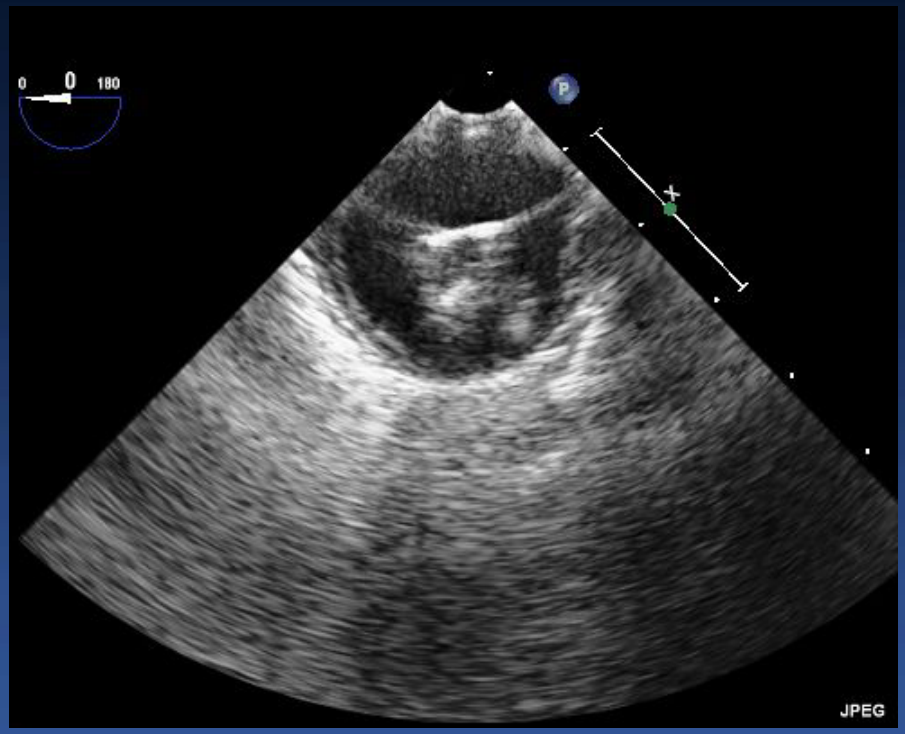
Post-Deployment Aortogram



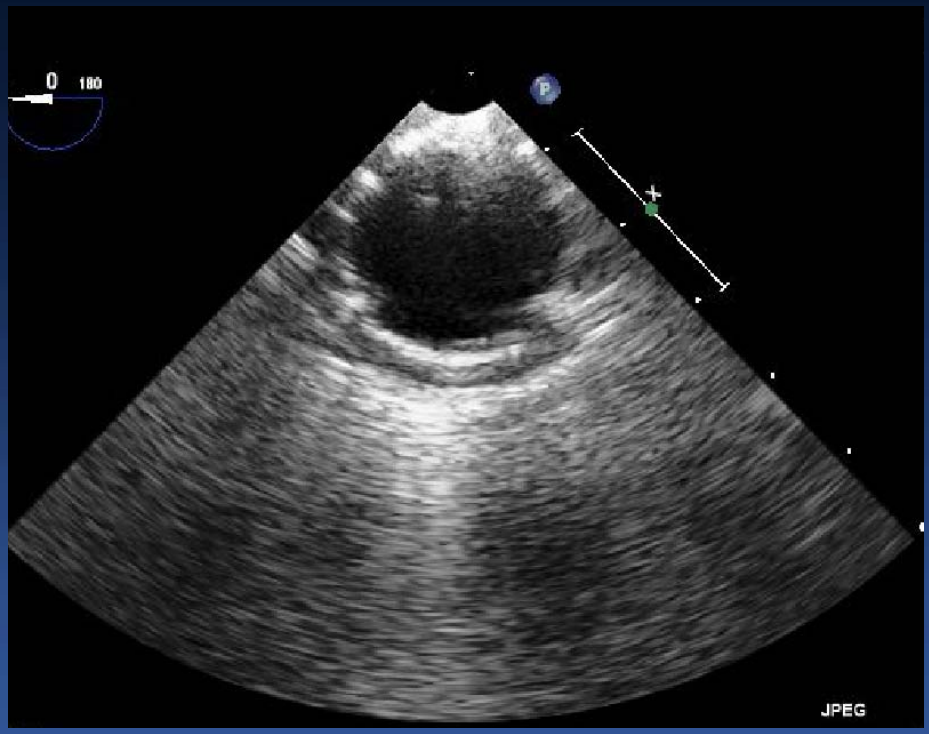
Immediate after Valve Deployment TEE



Embolic Edwards Valve was repositioned at descending aorta (TEE)



Closed Valve leaflet

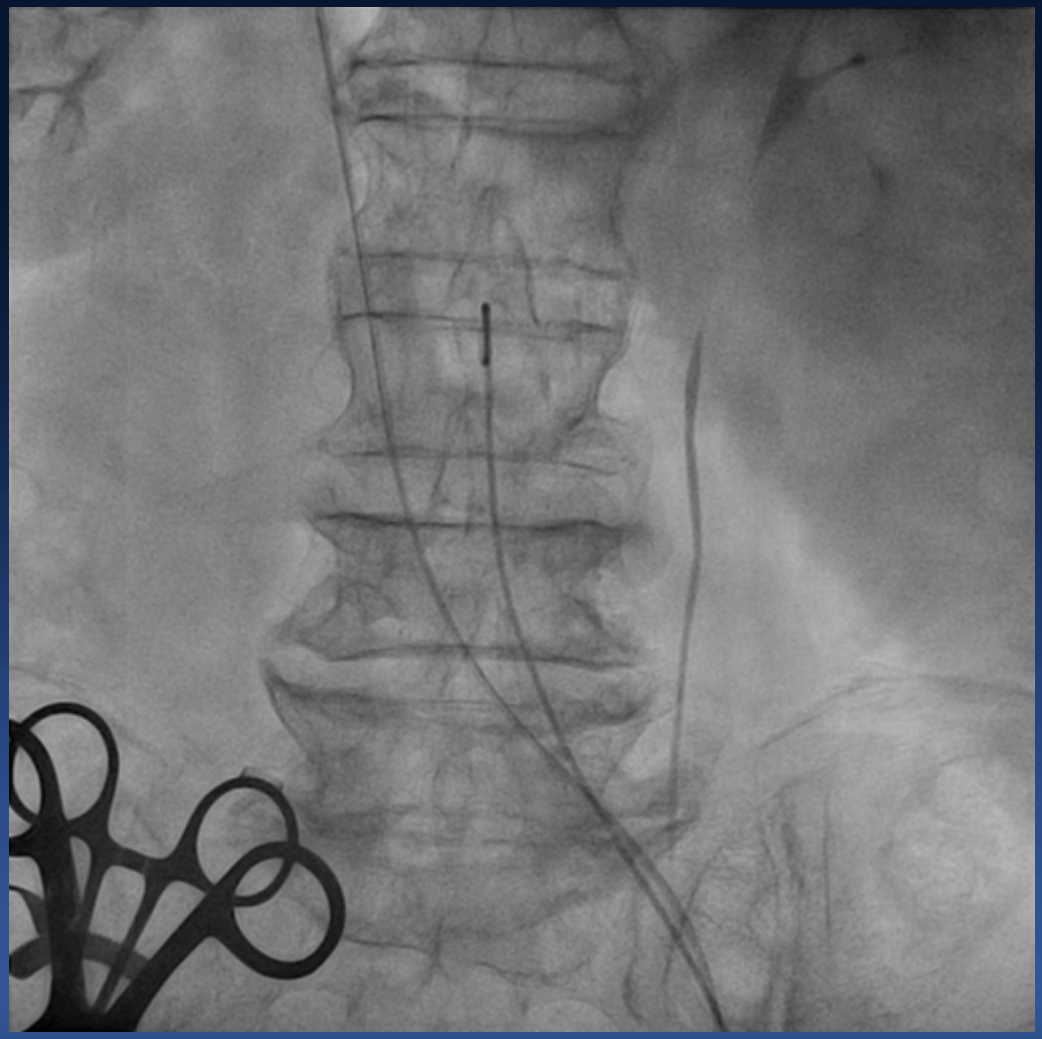


Opened Valve leaflet

Successful
Valve-in-Valve,

We have some difficulty in retrieval of sheath.

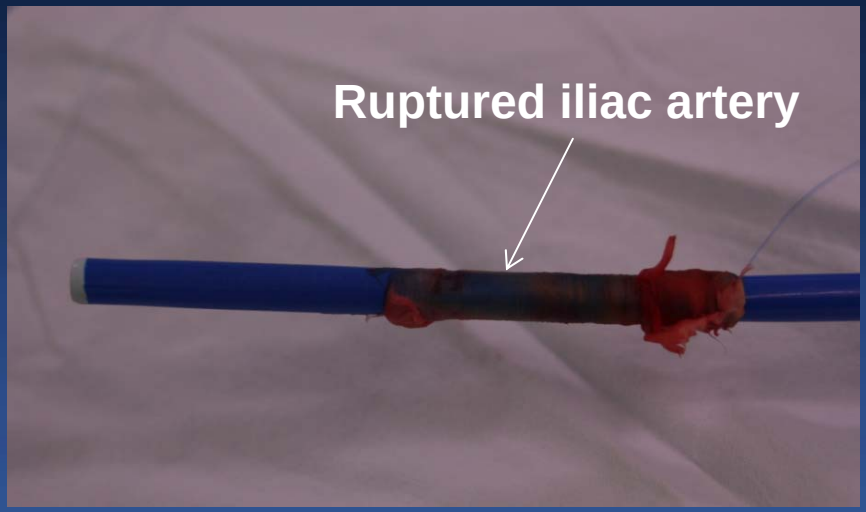
During keep removing, sudden hemodynamic collapse developed



➡ ***Balloon occlusion, emergent surgical repair***

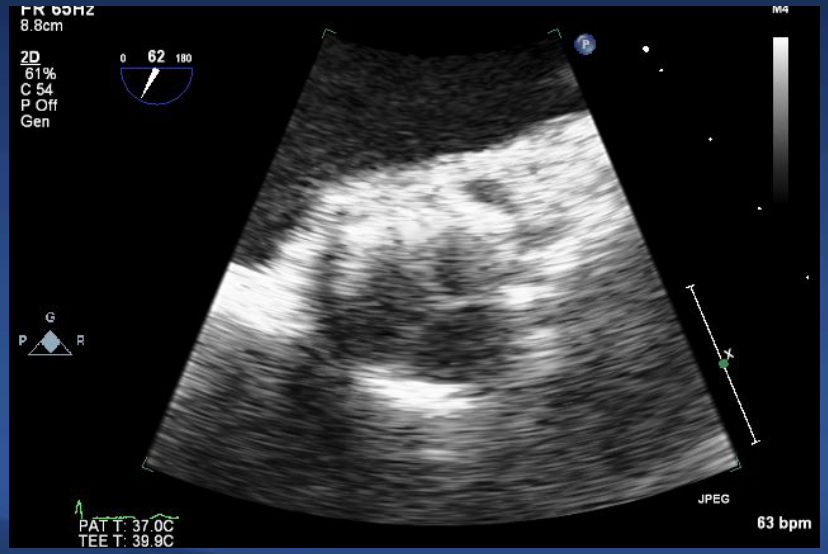
Vascular Operation

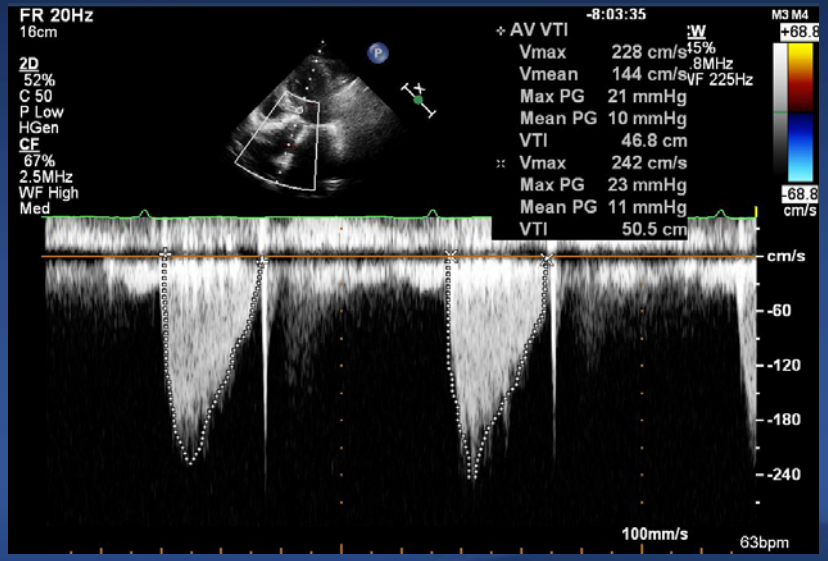
Common iliac artery ligation with Femoral-Femoral bypass graft surgery



After surgery, patient was fully recovered. F/U Echocardiography

Minimal paravalvular leakage
AV Vmax = 2.7 m/s
mean pressure gradient = 16 mmHg





Vascular Complications
Potential risk factors

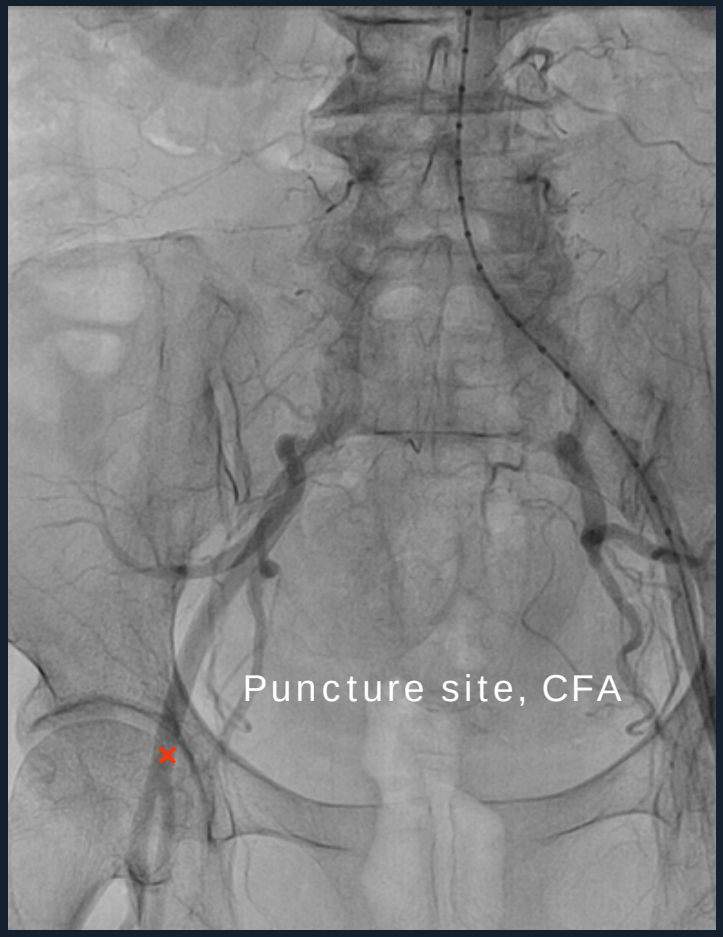
- Patient related
  - Vessel Size
  - Calcification
  - Tortuosity
  - Vessel stenosis
  - Plaque
- Device related
  - TAVI system
  - Sheath
  - Guide wires
  - Balloon
  - Closure device
- Technique/operator related
  - Aggressive manipulation
  - Inaccurate calibration and measurements
  - Poor control
  - Prolonged procedural time

After initial 5 cases,

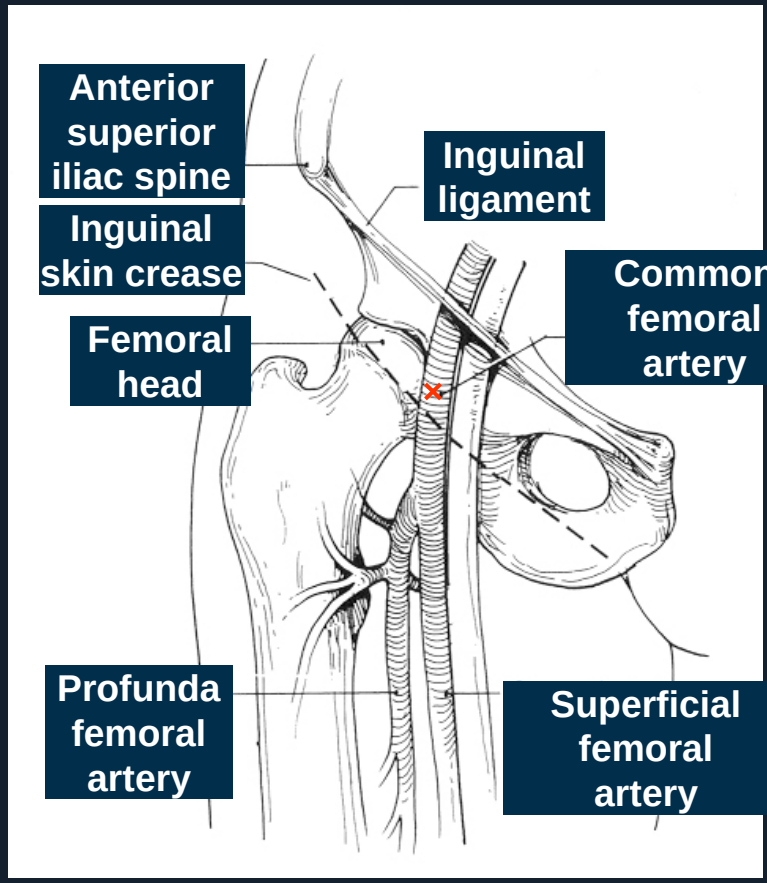
We changed
the approach technique,

We used the RF-3 system

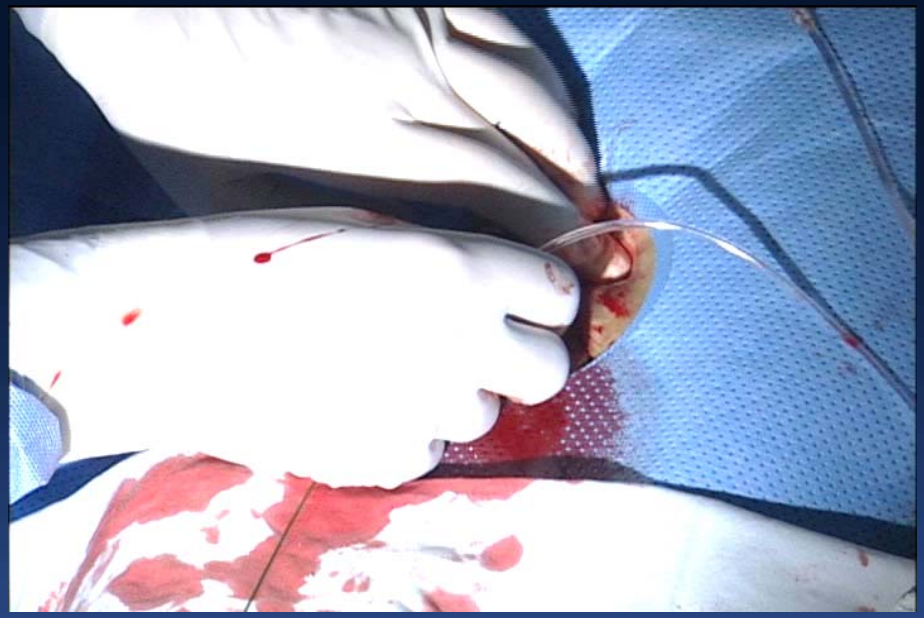
Femoral Artery Puncture under Fluoroscopic Guidance

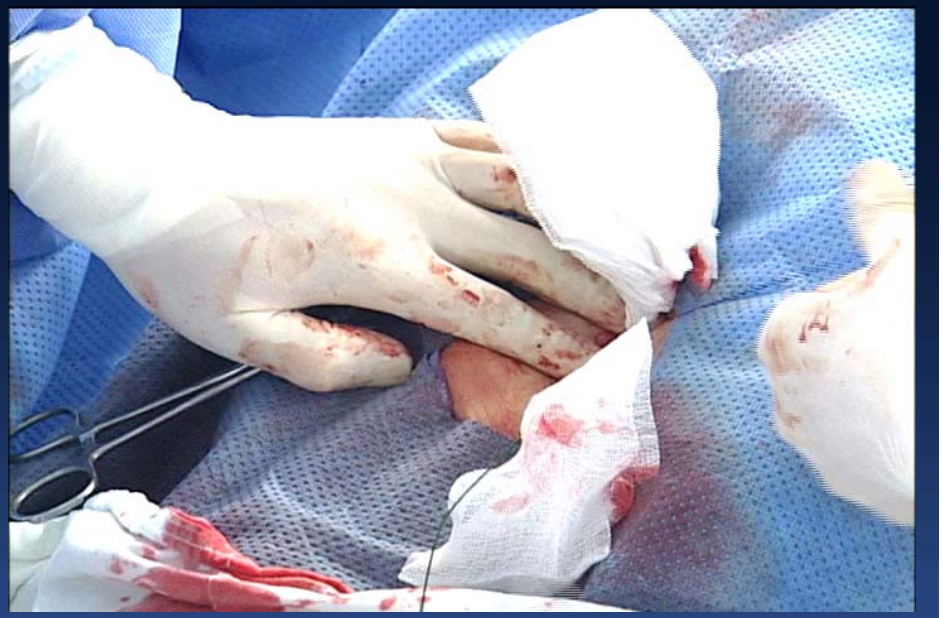


Initial Ileofemoral Aortography



Percutaneous Closure Proglide



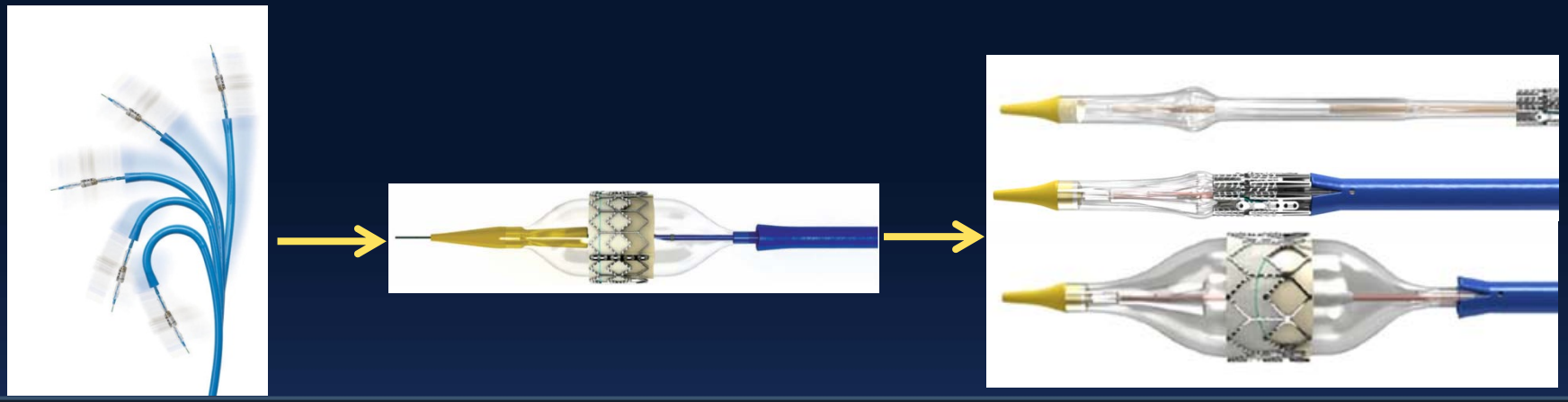


Before Procedure

After Procedure

No need to surgical exposure

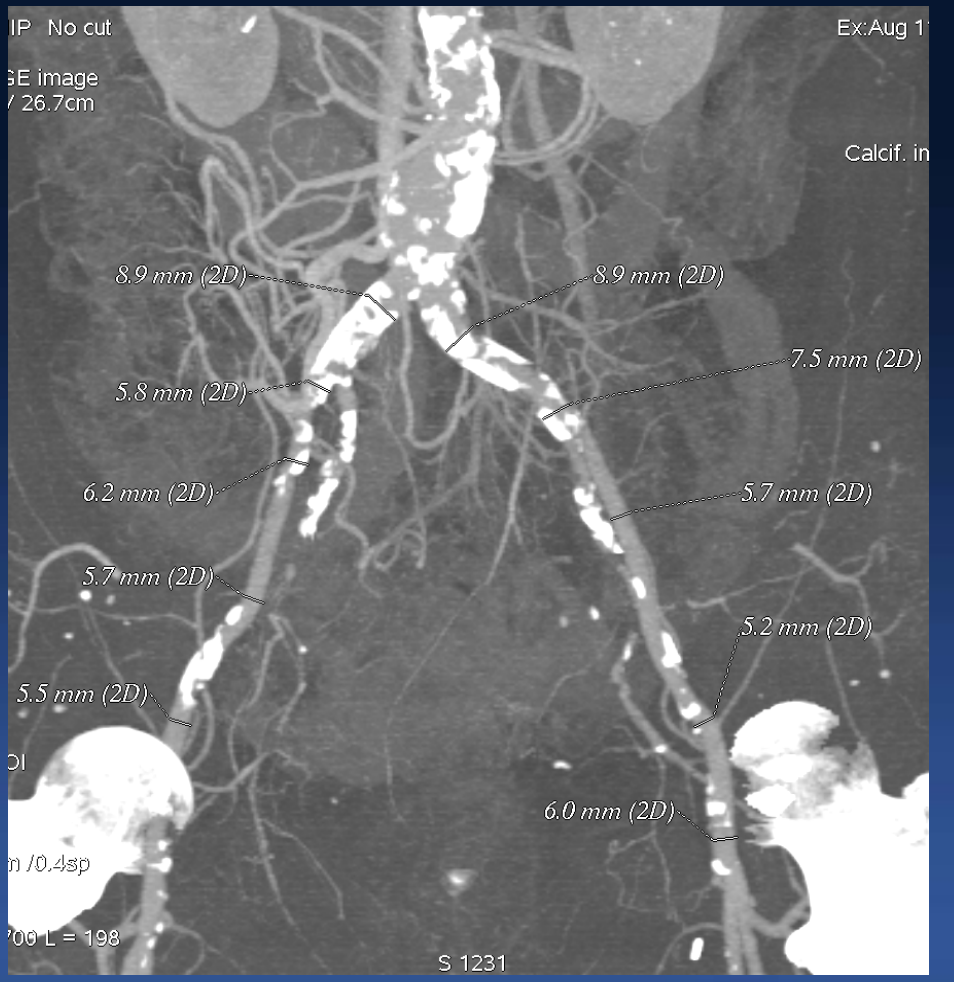
Evolution of the Edwards Transfemoral Delivery System



22F, 24F → 18F, 19F

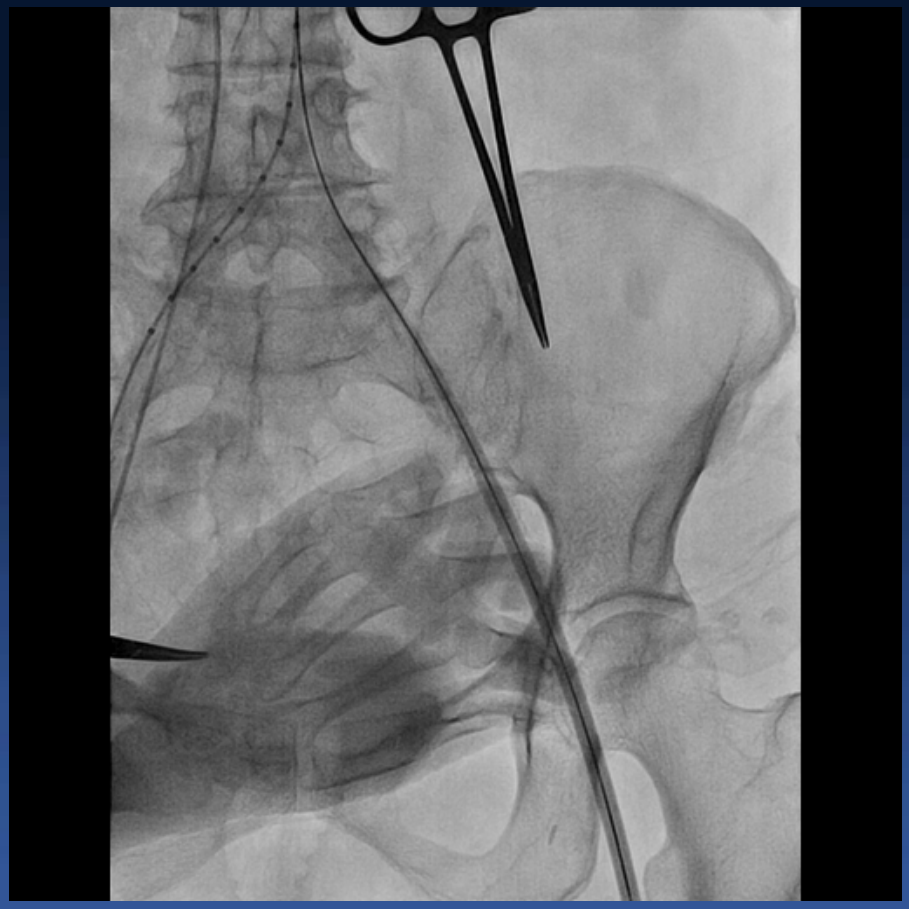
Getting Smaller in Size

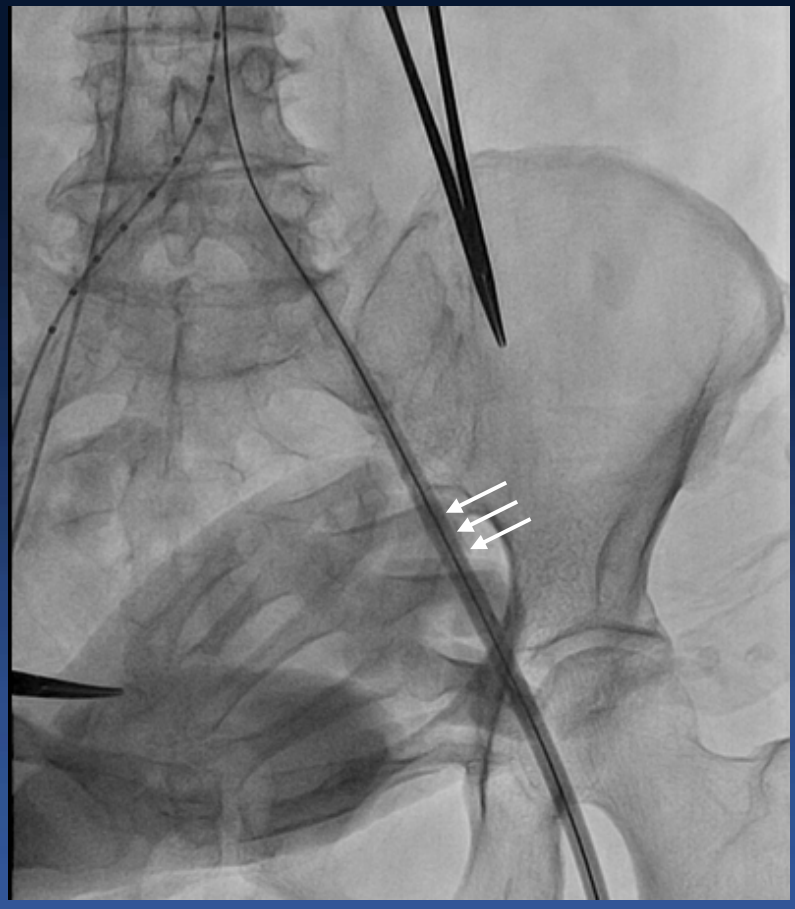
Baseline Angiography & CT



Made by Adw 4.5, GE healthcare system

Difficulty in Advancement
Severe calcific small vessel

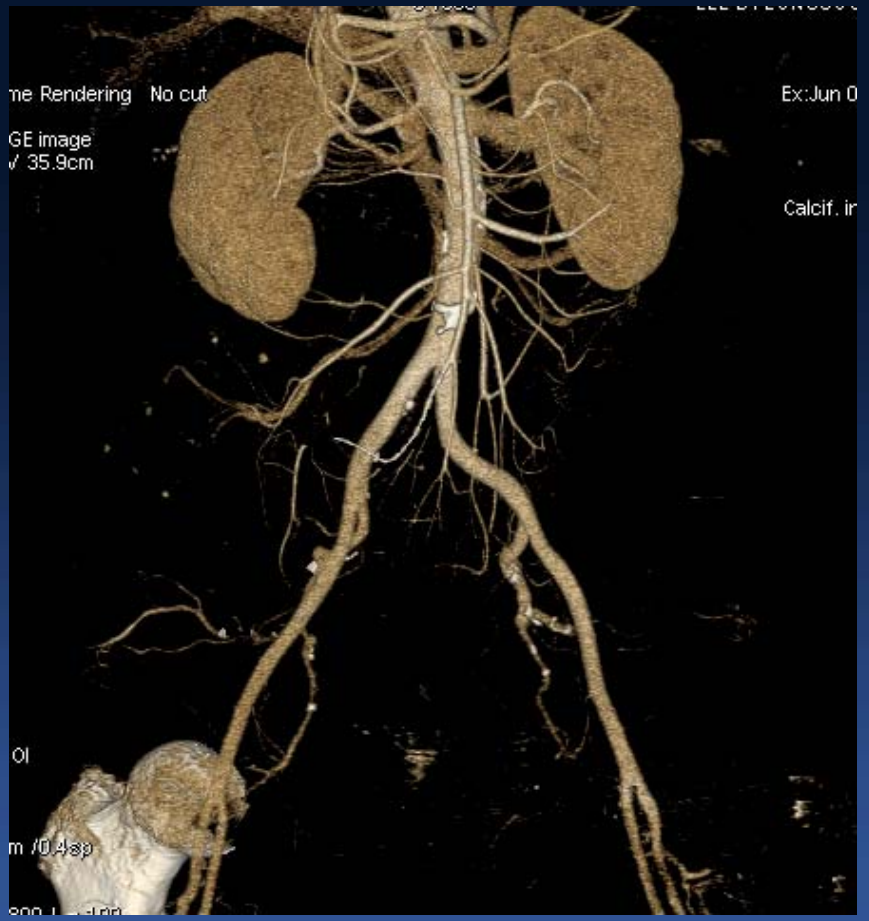




Vascular Complications
Potential risk factors

- Patient related
  - Vessel Size
  - Calcification
  - Tortuosity
  - Vessel stenosis
  - Plaque
- Device related
  - TAVI system
  - Sheath
  - Guide wires
  - Balloon
  - Closure device
- Technique/operator related
  - Aggressive manipulation
  - Inaccurate calibration and measurements
  - Poor control
  - Prolonged procedural time

CT – Ileofemoral Artery

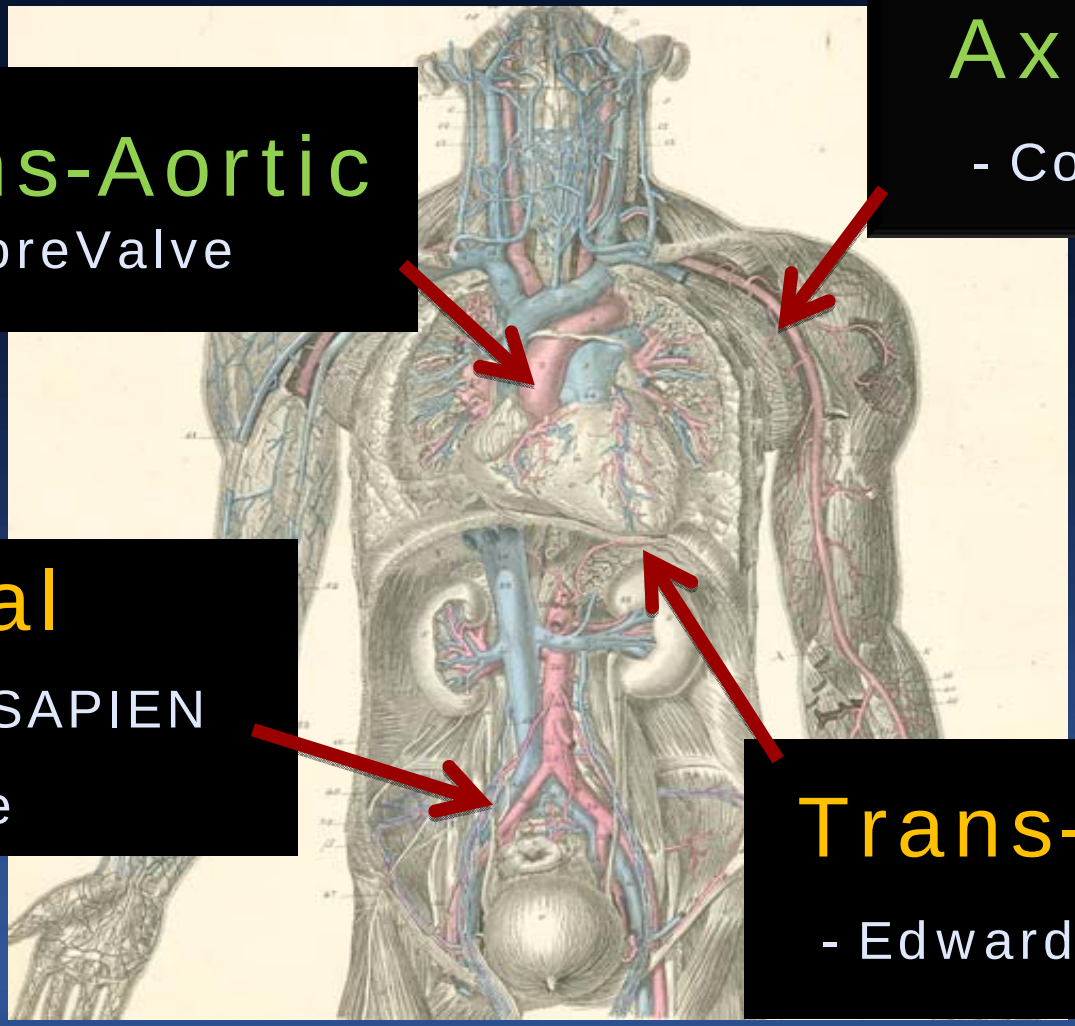


Size Measure, Calcium distribution, Tortuosity,,,

Made by Adw 4.5, GE healthcare system

Angiography

Access Routes For TAVR



Trans-Aortic
- CoreValve

Axillary
- CoreValve

Femoral
- Edwards SAPIEN
- CoreValve

Trans-apical
- Edwards SAPIEN

Lessions from Our Cases
Vascular Problem

- **Baseline evaluation of ileofemoral arterial system is very important : CT, Angiogram**
- **Adequate access site : TF, TA**
- **Prompt recognition and diagnosis will save lives**
- **Ensure all back-up equipment is available in the room**
- **With advance in device technology, vascular problem will decrease in the future**