IV Curso "José Gabay" para Intervencionistas em Treinamento de ProEducar

SOLACI & SBHCI Congress 2013

TAVR tecnique: Fundamental steps, Tricks & Secrets

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The procedure overview

- **3 principles for successful TAVI:**
  - ✓ ***Patient selection***
  - ✓ ***Teamwork = Heart Team***
  - ✓ ***Attention to the technical details of the procedure***

The procedure overview

➢ Fundamentals steps:

- ✓ *Obtain vascular access*
- ✓ *Cross stenotic native valve and position LV stiff wire*
- ✓ *Balloon aortic valvuloplasty*
- ✓ *Transcatheter heart valve deployment*
- ✓ *Assess results: haemodynamics / TEE / angio*

The procedure overview

- **Before the procedure:**
  - ✓ *Anesthesia / sedation > "this is not cardiac surgery !!!"*
  - ✓ *Monitor ECG and hemodynamics*
  - ✓ *Review TEE findings*
  - ✓ *Insert and test pacemaker – IJV for CoreValve*
    FV for Sapien XT
  - ✓ *Essential material on table (sheaths, guidewires, catheters)*
  - ✓ *Check contrast volume on power injector (50/50 saline and contrast) and define who is responsible for specific actions (pacing, injectors)*

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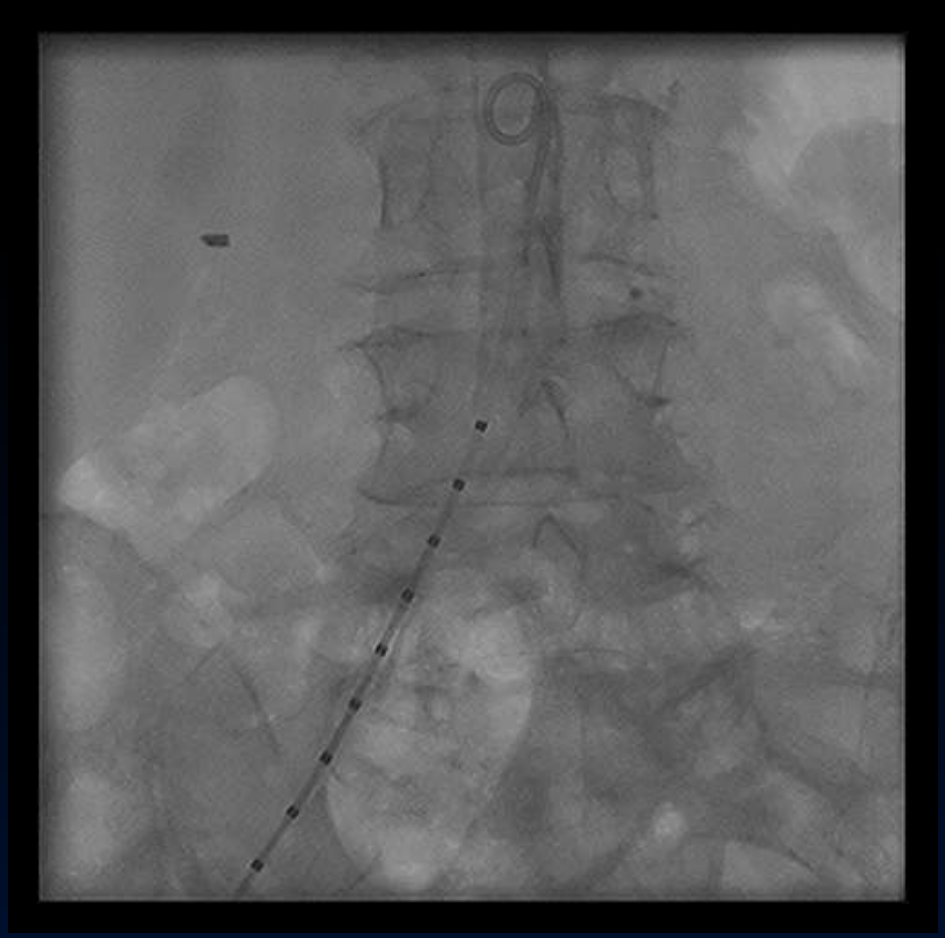
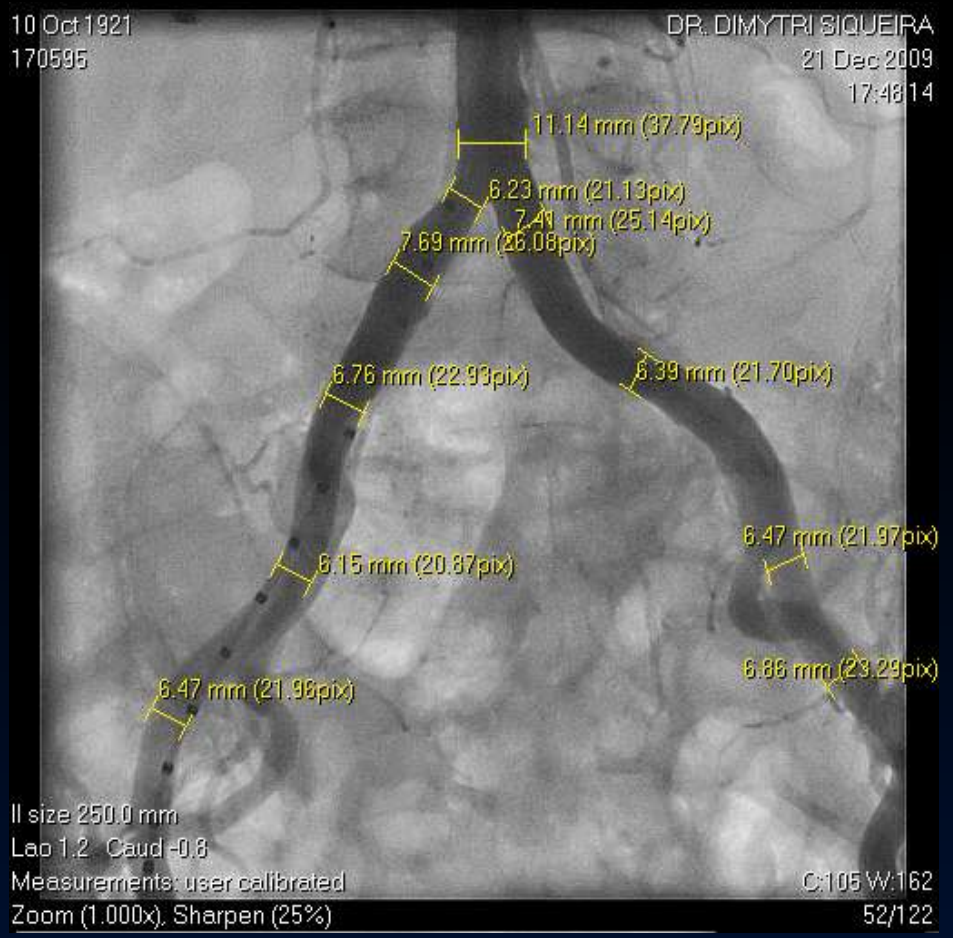
Arterial Access

Basic Guidelines

Determine size for femoral, external iliac and common iliac





Arterial Access

Basic Guidelines

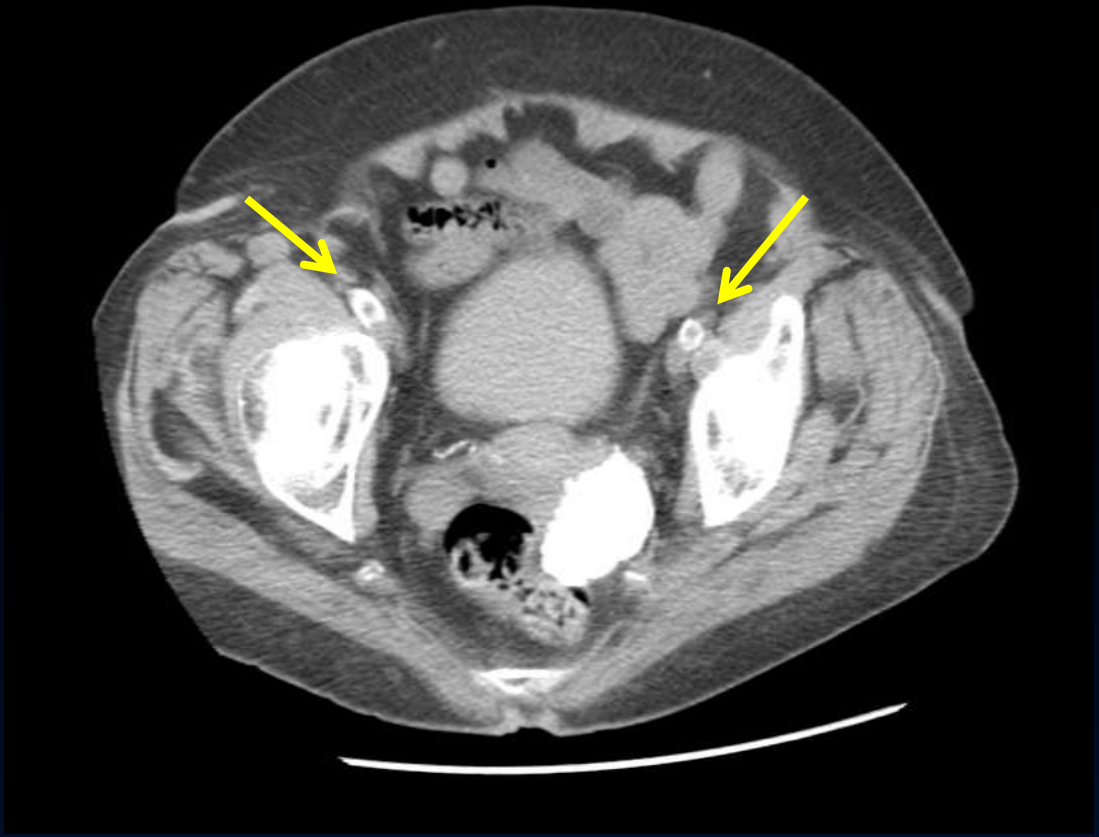
Focus on calcification, especially at bifurcations

(CTA or CT w/o contrast very helpful)

Arterial Access

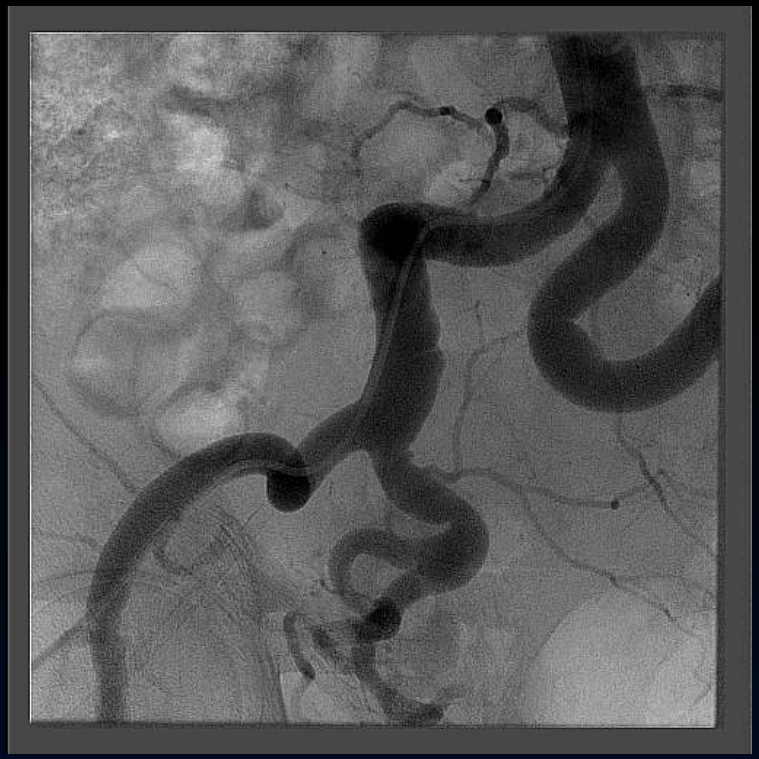
Basic Guidelines

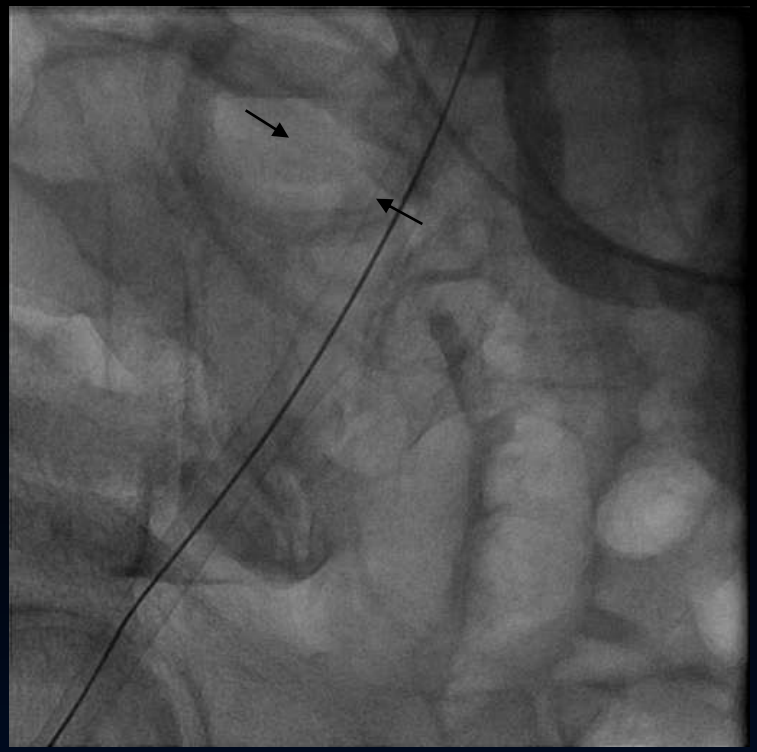
Be extremely cautious with circumferential calcium



Evaluation of tortuousity

Choose side with larger caliber and less tortuousity





Vessels can be straightened with a stiff wire…

Arterial Access

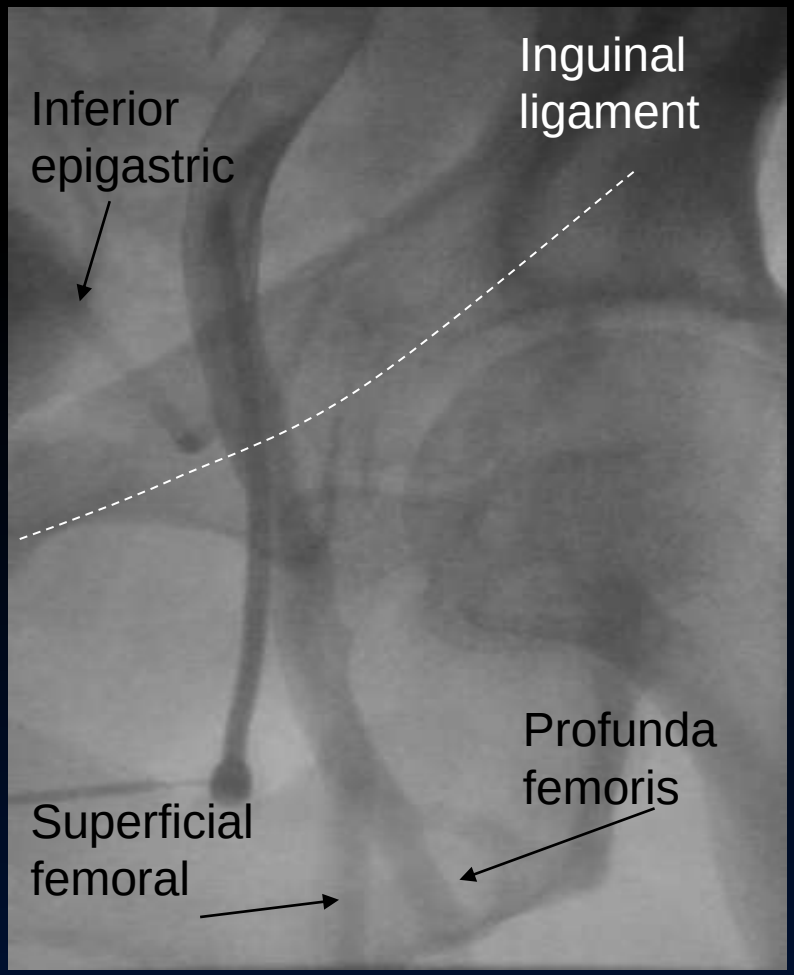
Basic Guidelines

… But not always !

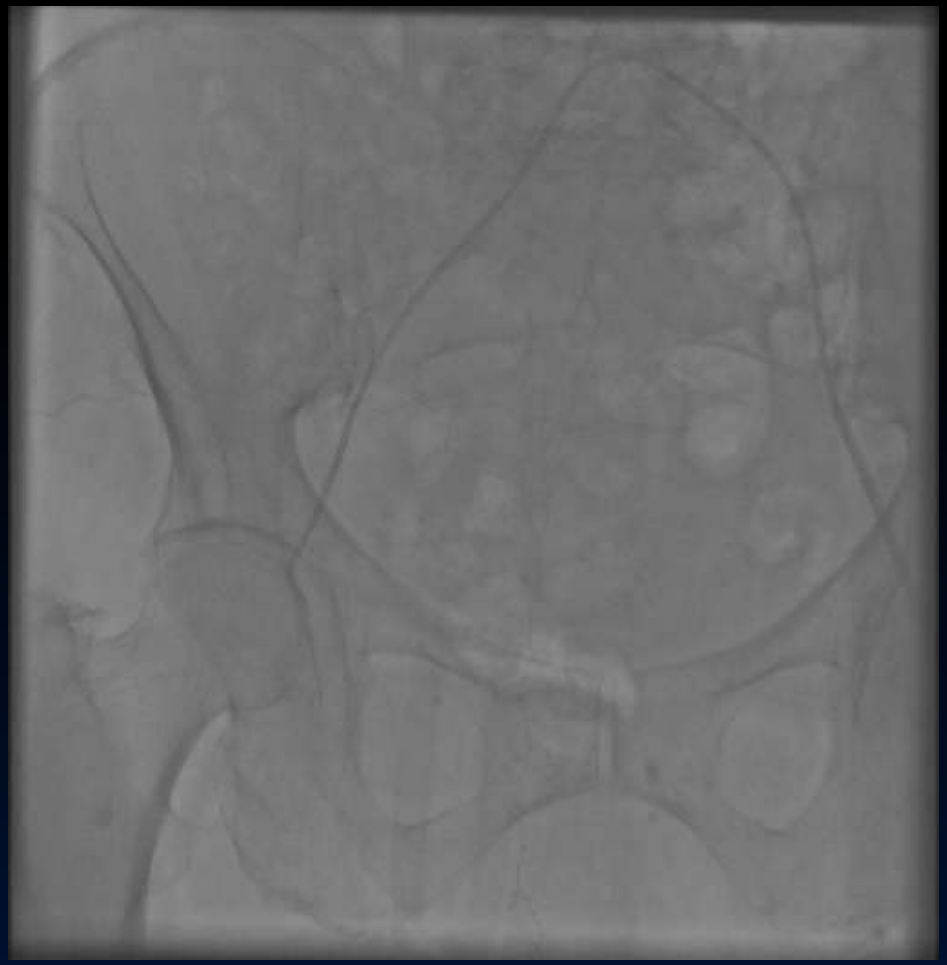
Arterial Access

Rules for a Perfect Puncture

Landmarks for puncture from prior angiogram



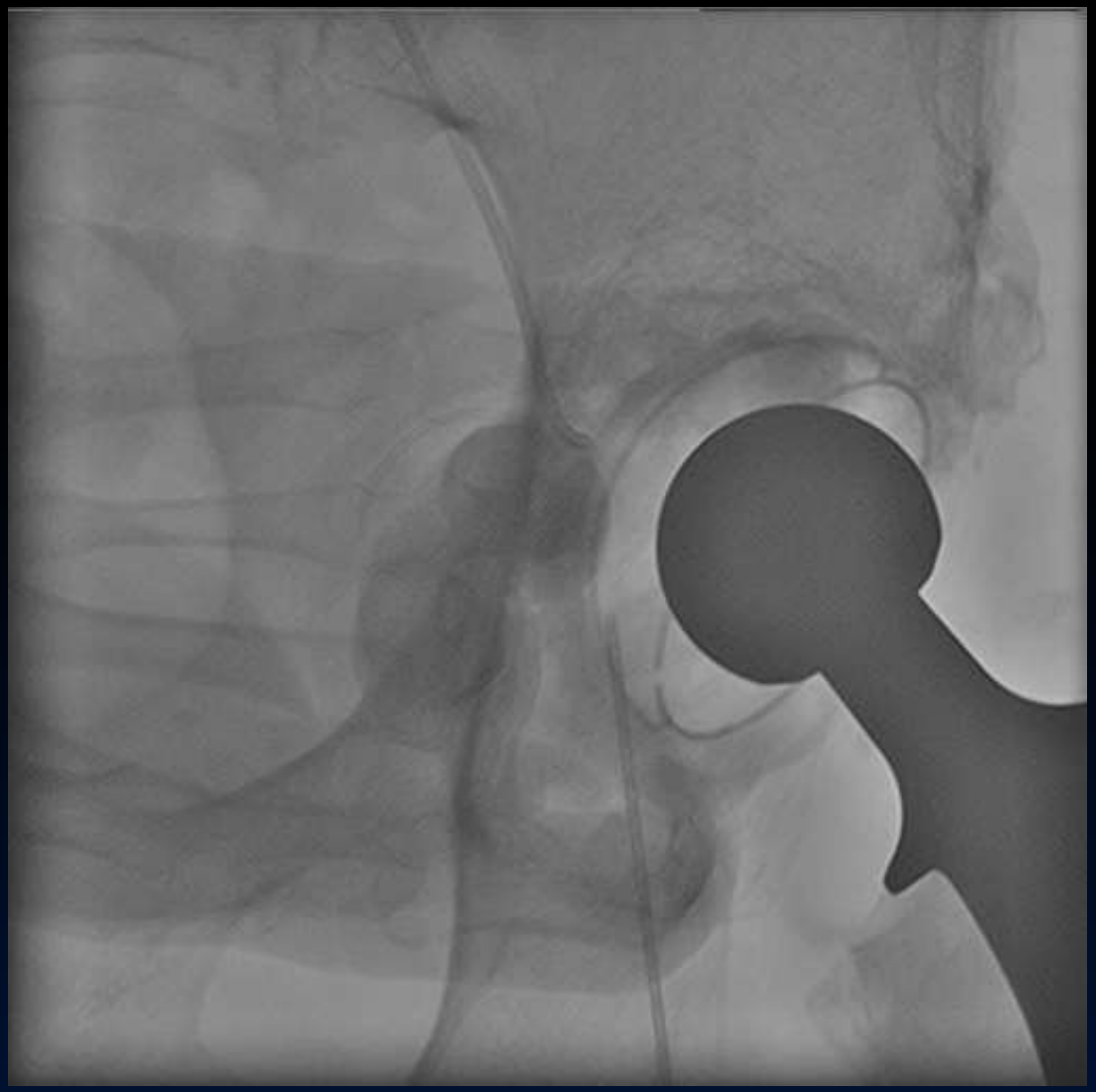
Locate puncture site before 16-18F sheath (contralateral injection)



Arterial Access

Golden rules for a Perfect Puncture

Contralateral injection to achieve anterior wall puncture

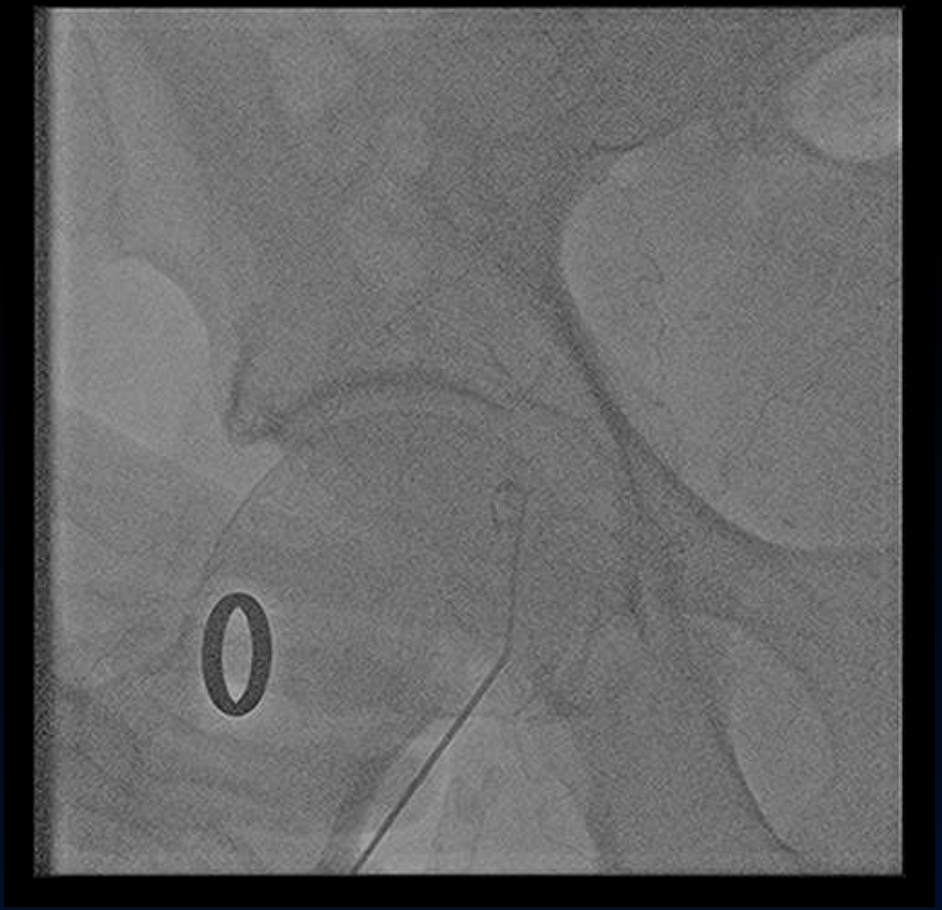


Arterial Access

Perfect Puncture

Investigate arterial access before preclosure

(Proglides or Prostar)

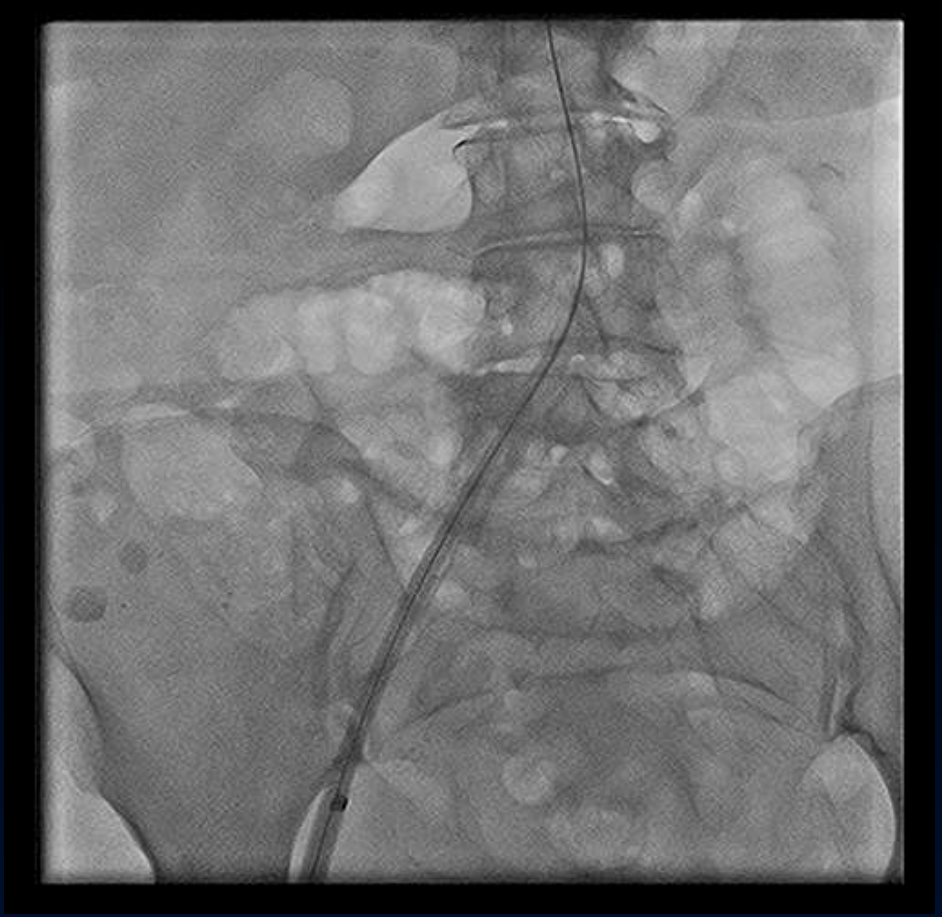


Placing Large Sheath

- **Option 1:**
  - 6F-7F sheath: 2 Percloses, place stiff wire in descending aorta with JR
  - 16-18 F sheath: cross valve, get gradients, place stiff wire in LV, perform BAV and Sapien XT or CoreValve implantation
- **Option 2:**
  - 7 F or 8 F sheath: 2 Percloses, cross valve, get gradients, place stiff wire in LV
  - 18 F sheath: BAV and Sapien XT or CoreValve implantation

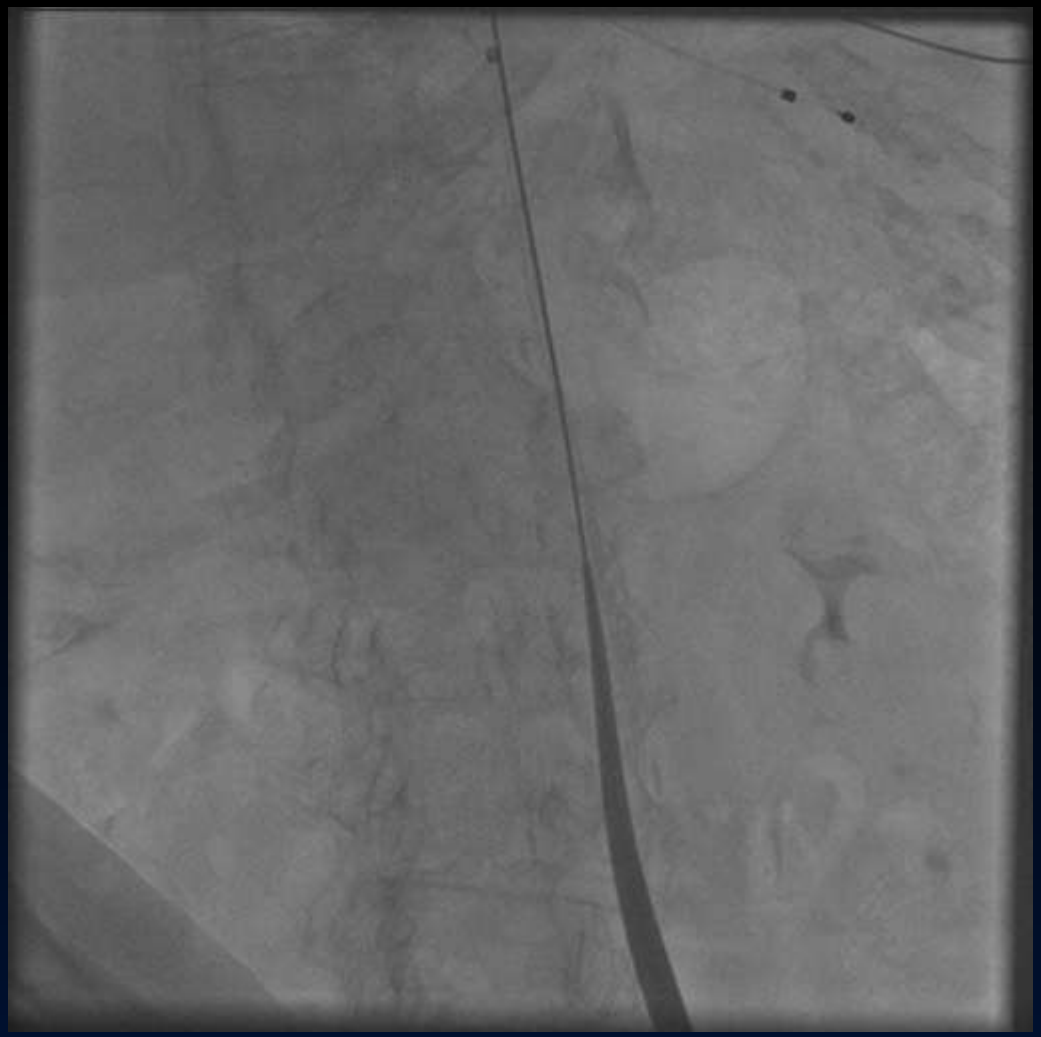
16-18 F sheath advancement

Always on fluoroscopy … Look to guide wire in LV, too.



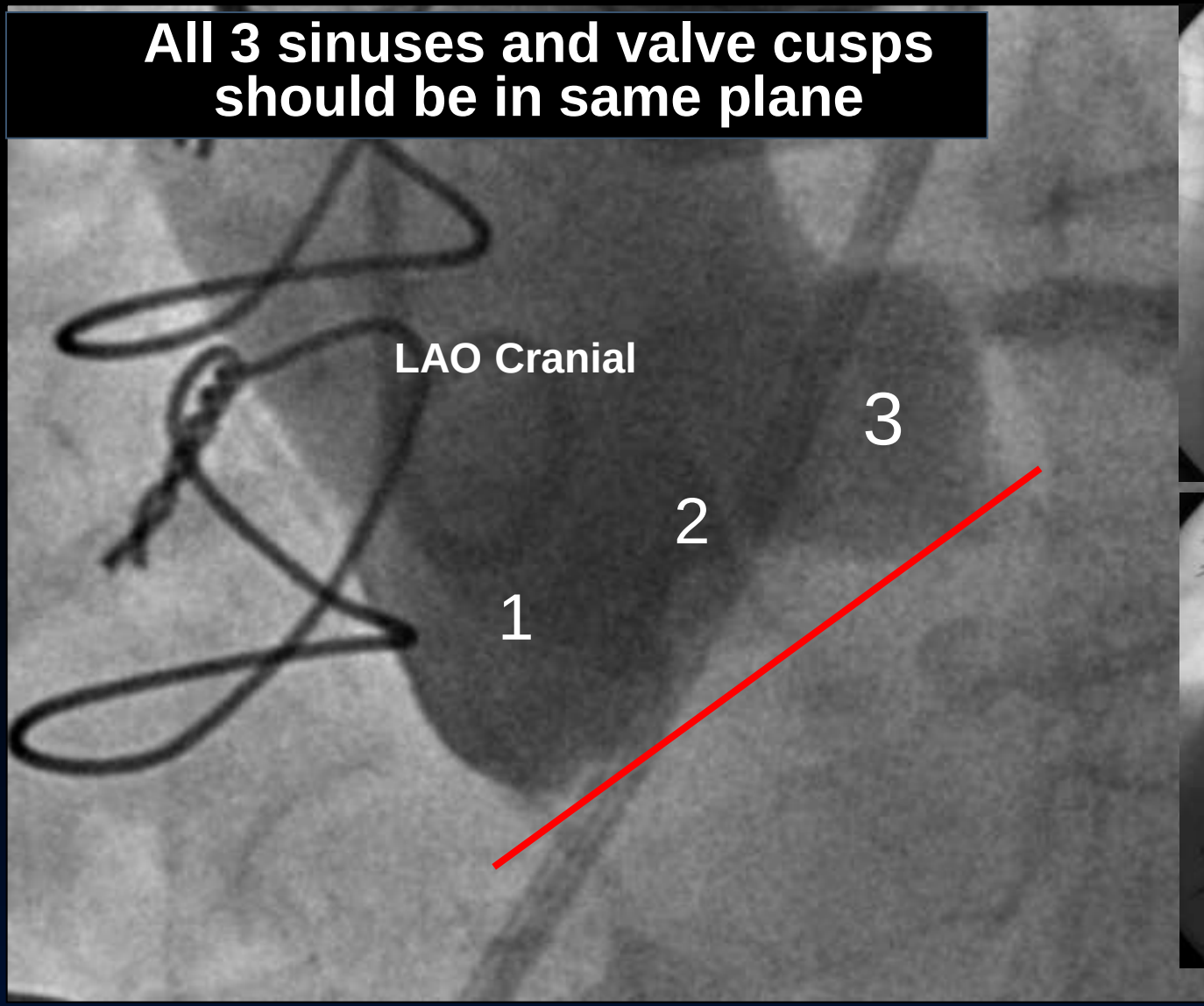
16-18 F sheath advancement

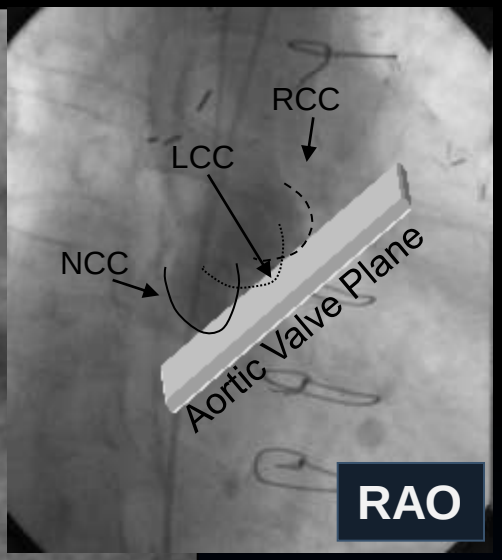
Stop if a calcified vessel moves while you are pushing the sheath…

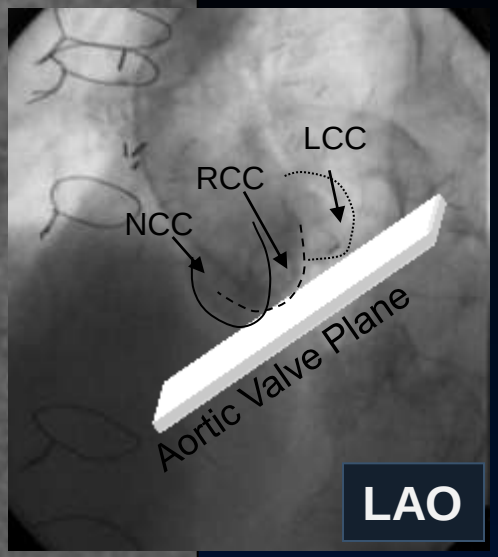


Positioning of Pigtail

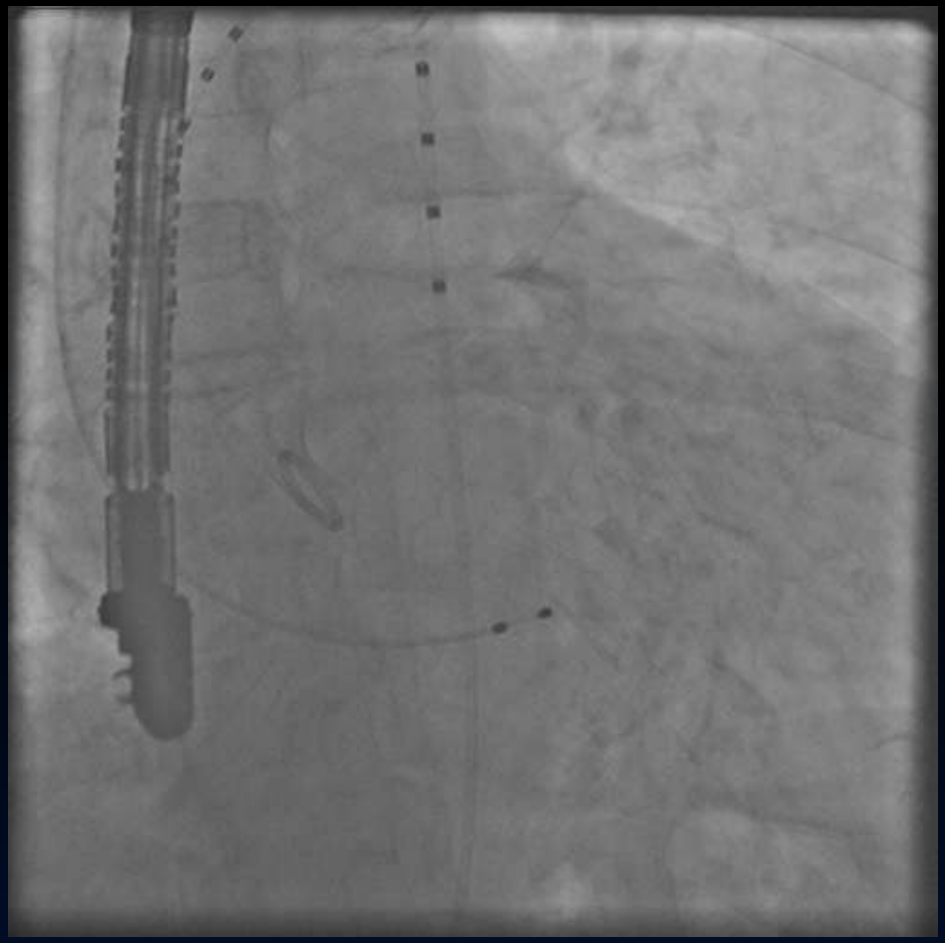
All 3 sinuses and valve cusps should be in same plane

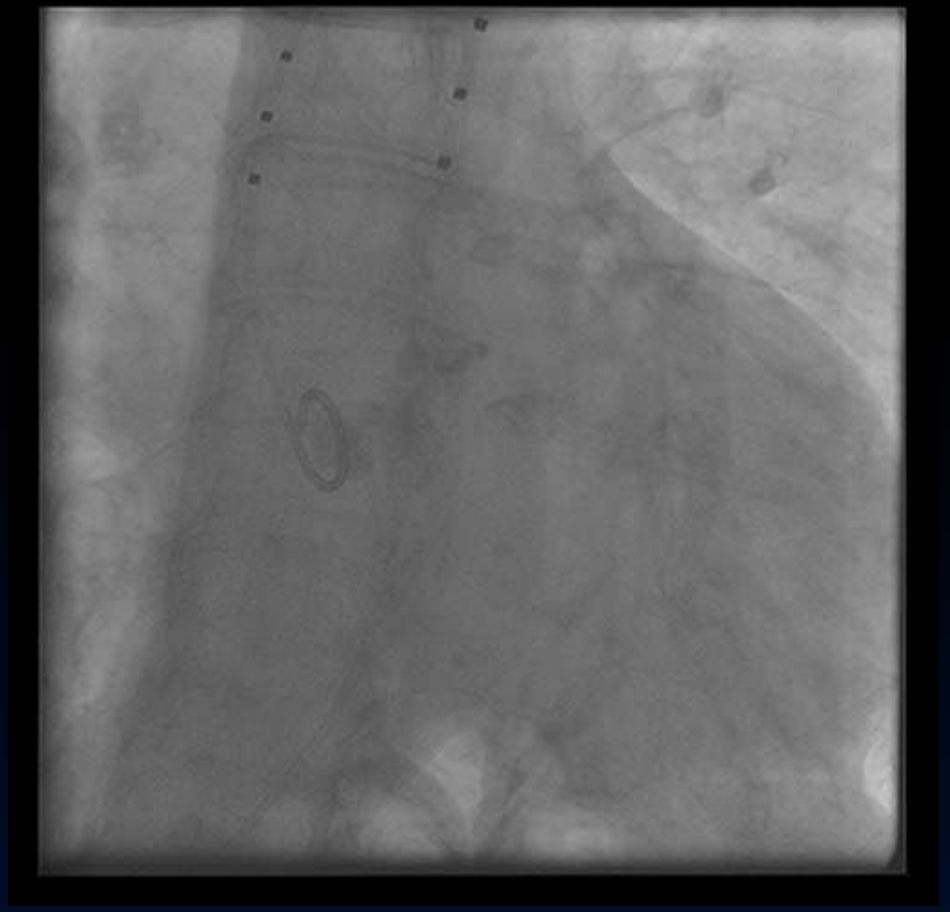




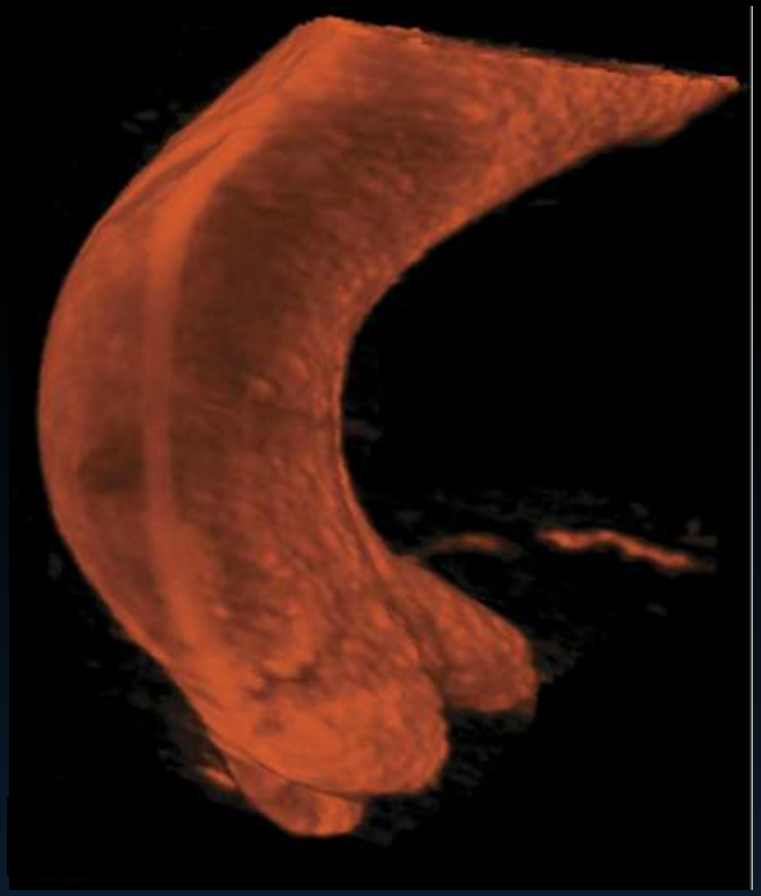


All 3 sinuses and valve cusps on the same plane





Finding the “working projection”

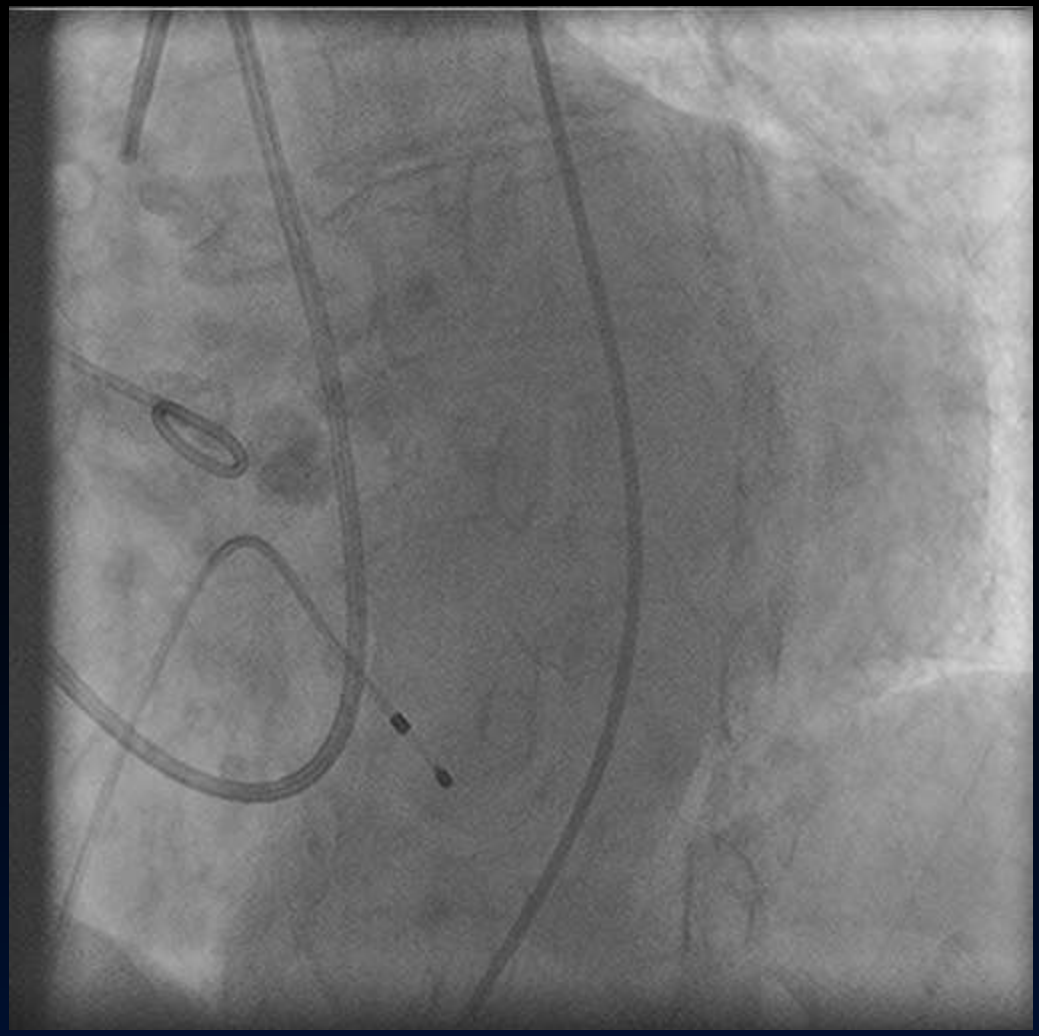


Intraoperative
rotational angiography with 3-D reconstruction (Dyna CT, Siemens)

CT Angiography

All 3 sinuses and valve cusps on the same plane

“Manual” rotational aortography



Positioning of Pigtail

Incorrect position

Correct position

The procedure overview

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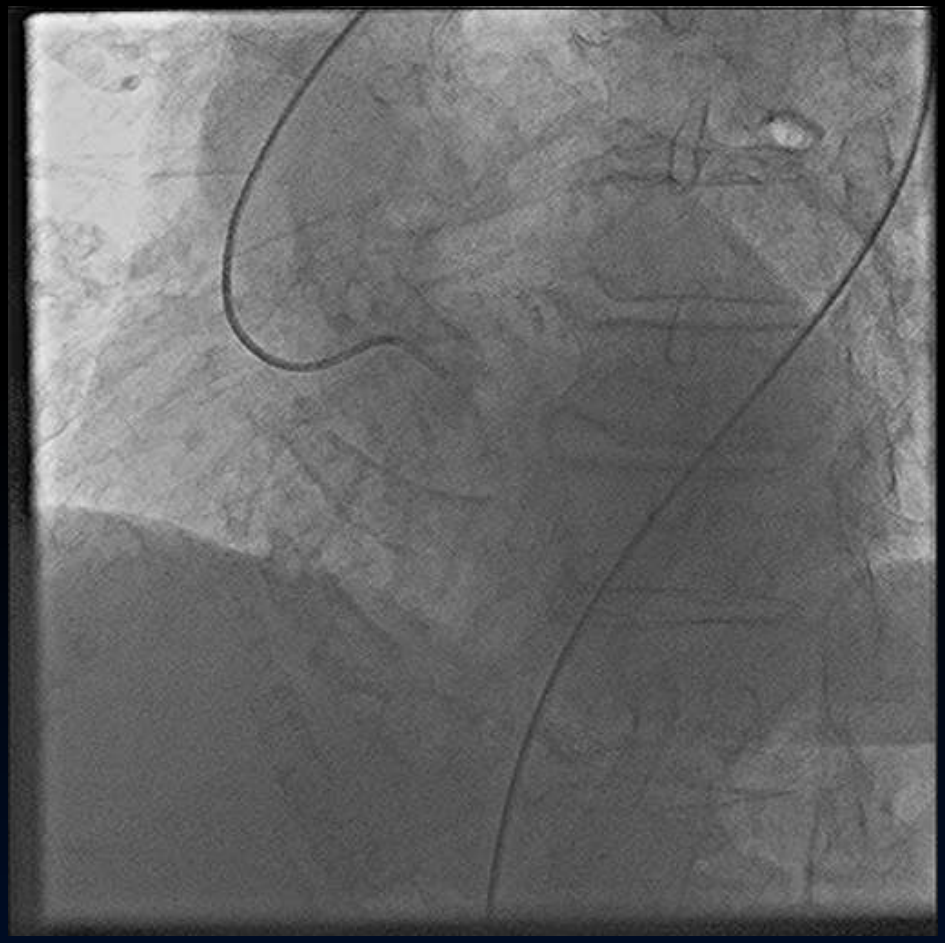
Crossing the Stenotic Aortic Valve

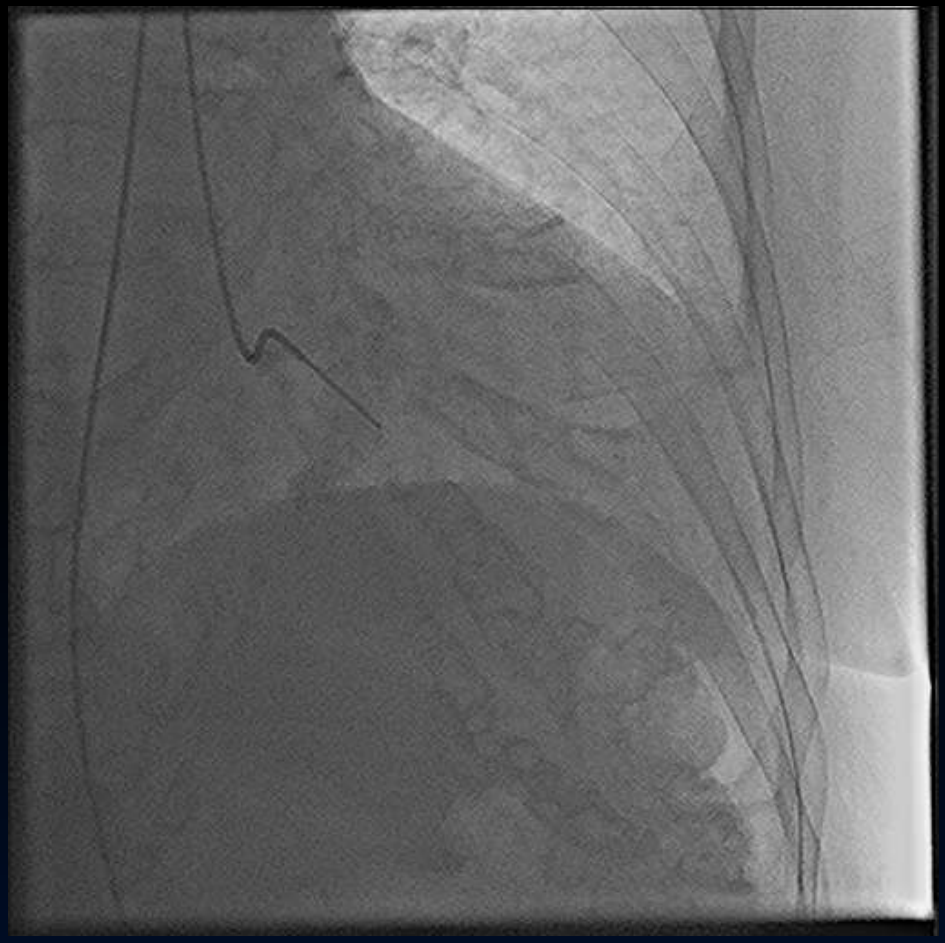
You can see where your target is…!!!

- **Locate the aortic valve orifice:**
  - ***Calcified leaflet movement***
  - ***"Jet" movement***
  - ***Aortography***

Crossing the Stenotic Aortic Valve



Cross in LAO



Check wire orientation in RAO

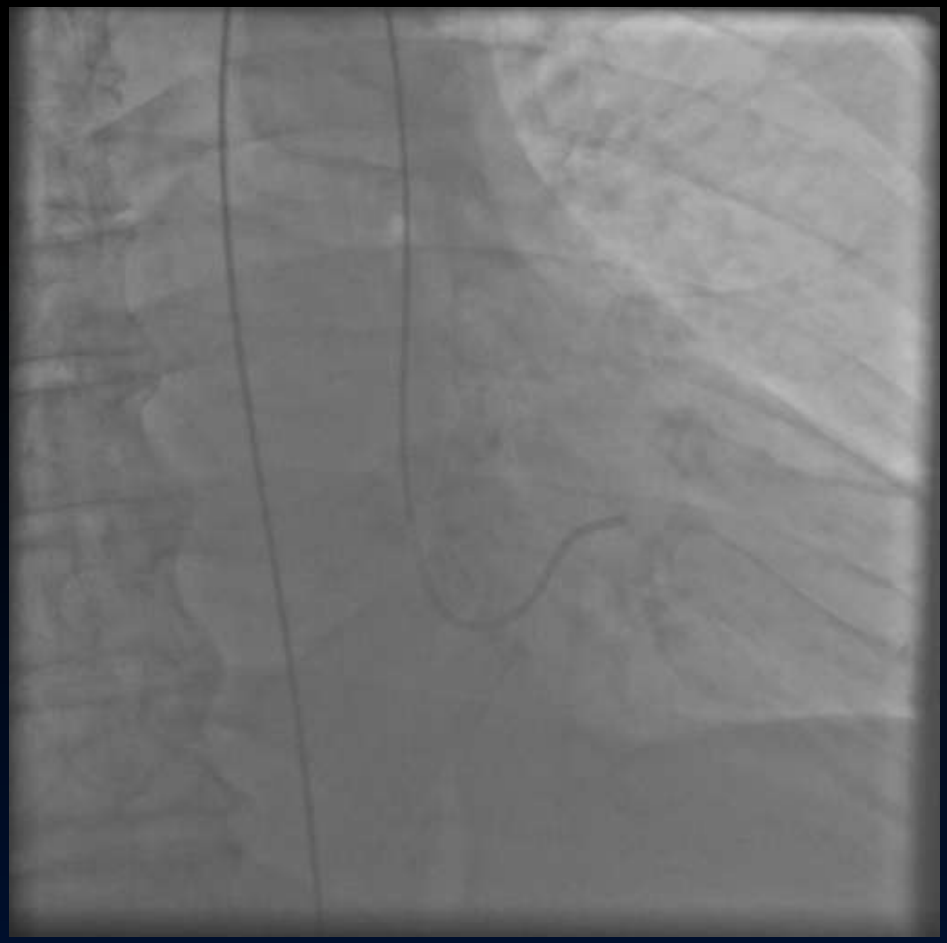
(avoid inferior wall)

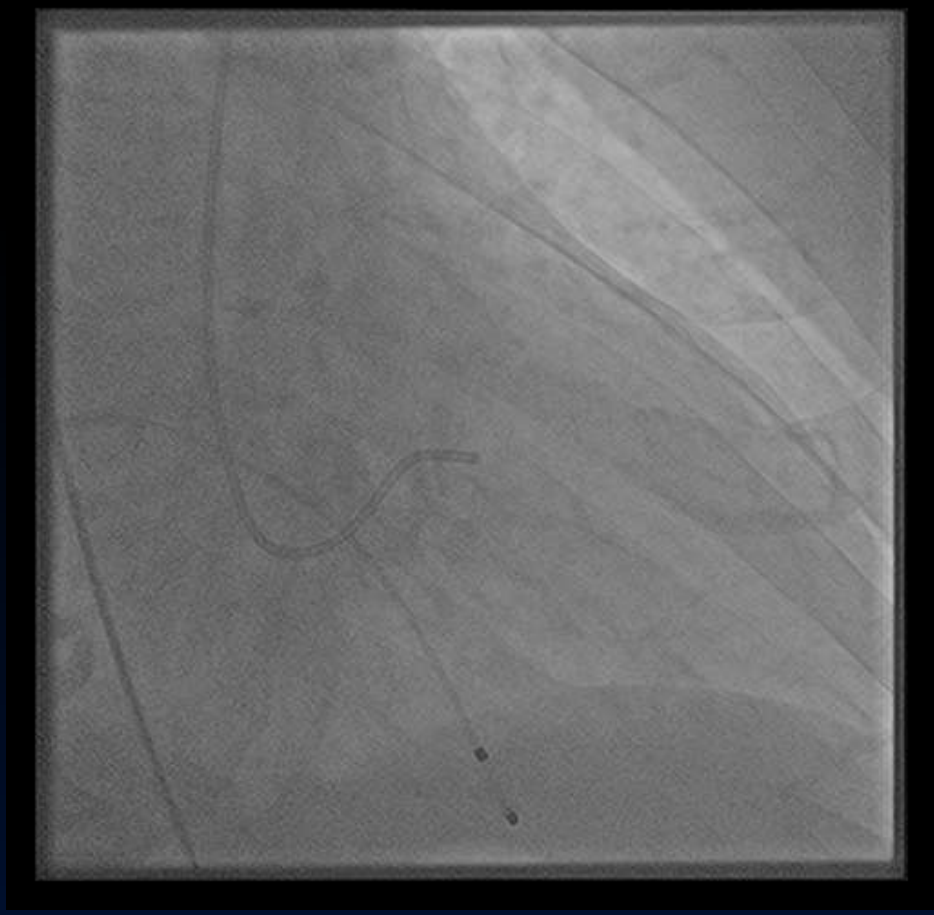
Crossing the Stenotic Aortic Valve

- Use both LAO and RAO projection
- Left Amplatz catheter (5F AL 1 & 2)
- 0.35” regular, straight wire (Terumo hydrophilic RADIFOCUS in difficult cases)
- Control movement
  - Catheter counterclockwise
  - Wire protrusion
- Avoid coronaries and SVG
- Cross and advance wire into LV

Crossing the Stenotic Aortic Valve

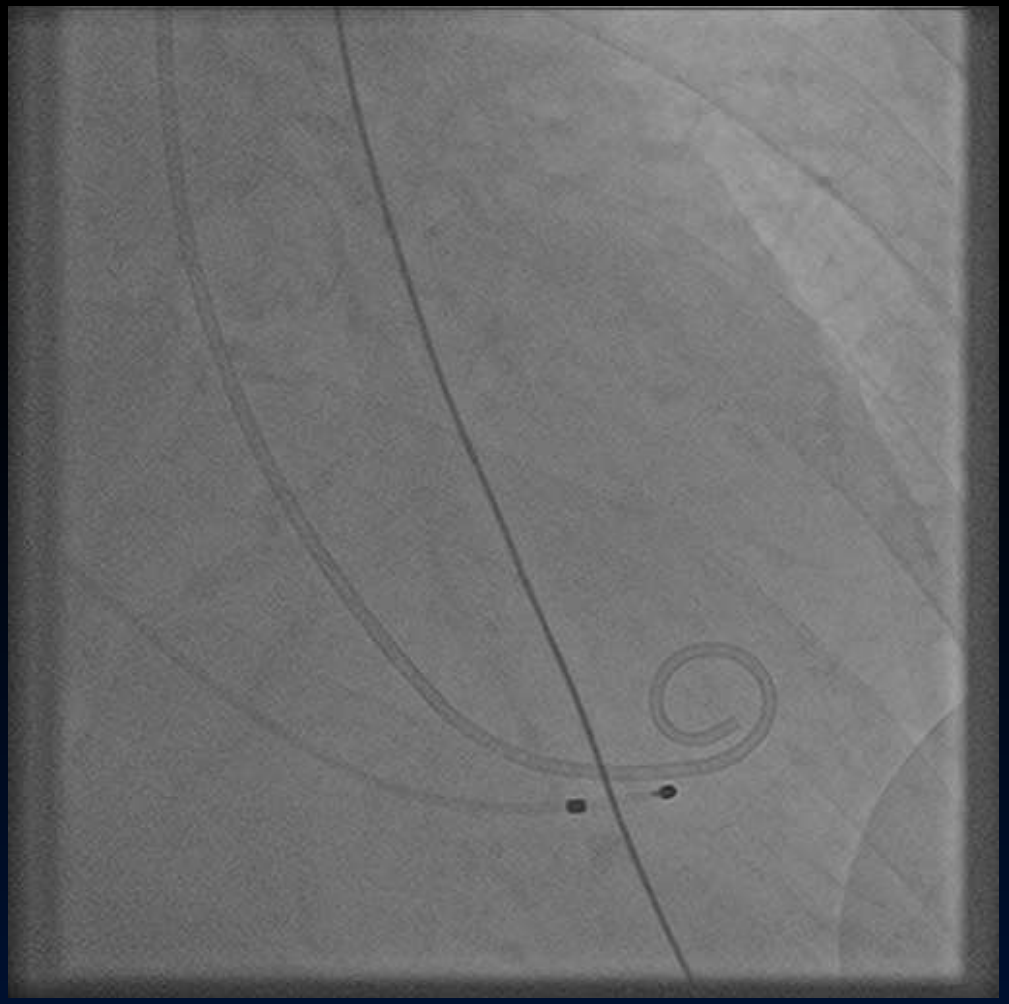
After crossing with AL diagnostic catheter, exchange straight wire for a long (260 cm) J wire carefully in RAO



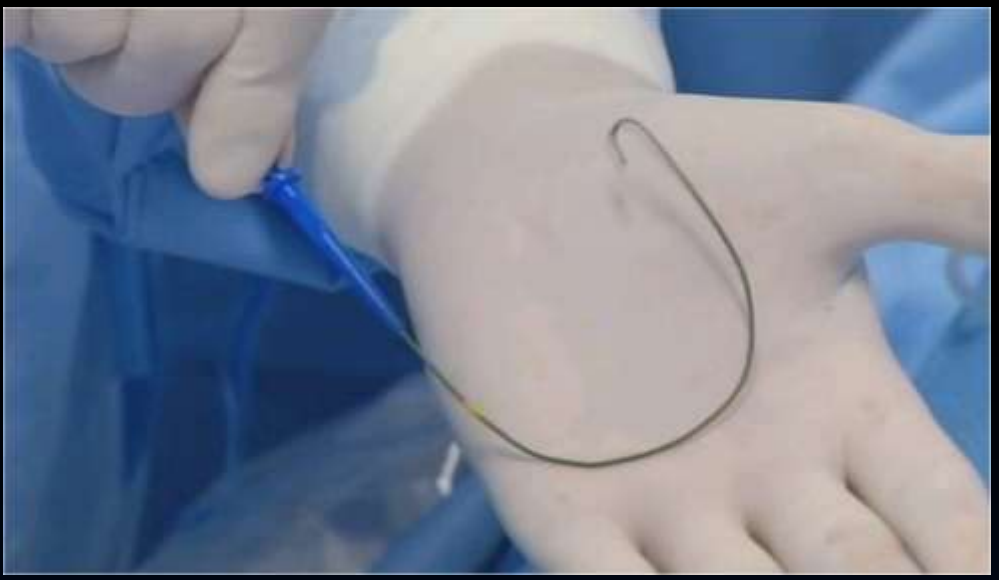


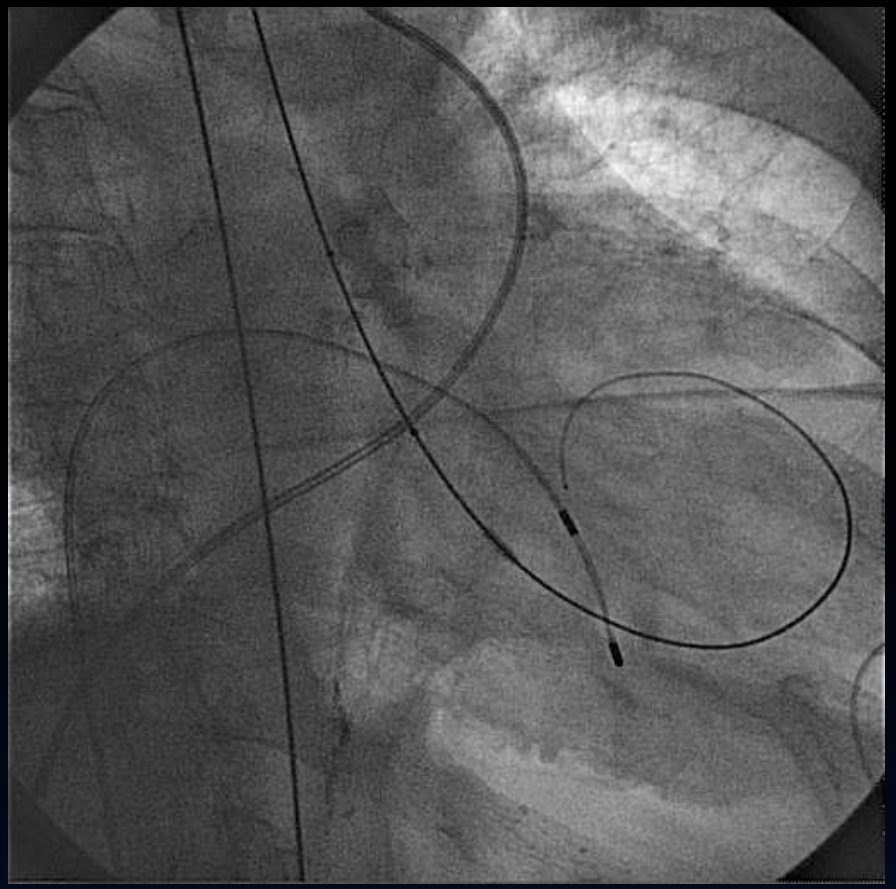
Wire Shape and Position

Use pig-tail to positioned extra-stiff or super-stiff wire (in RAO projection)



Wire Shape and Position



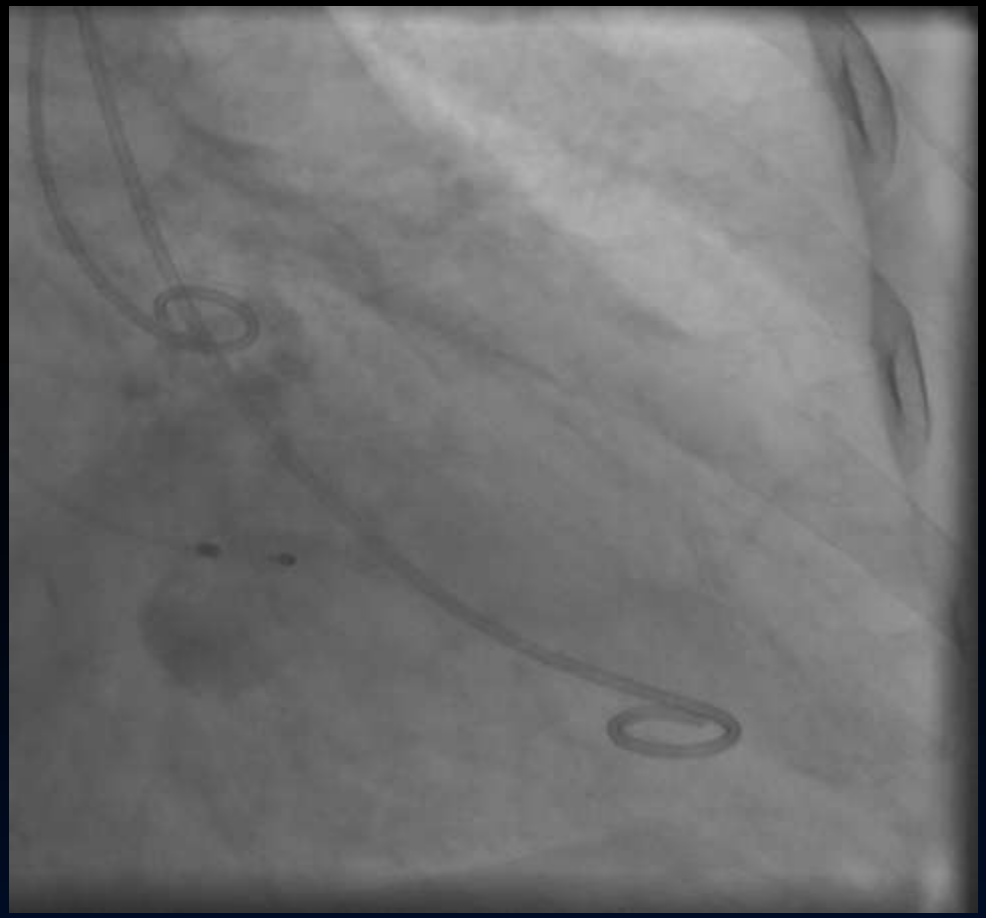


Place 0.035” extra-stiff or super-stiff guidewire with soft tip via the pigtail into LV (RAO projection)

- Shape the distal tip with a broad curve

Wire Shape and Position

Poor orientation of pig-tail = Dangerous guide position



Use pig-tail to positioned extra-stiff or super-stiff guide wire (RAO projection)

The procedure overview

➢ Fundamentals steps:

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Rapid pacing during BAV

- Extremely cautious with PM placement / positioning
- Prefer to use balloon-tiped 4 or 5F pacemaker
- Use LAO projection to ensure septal orientation

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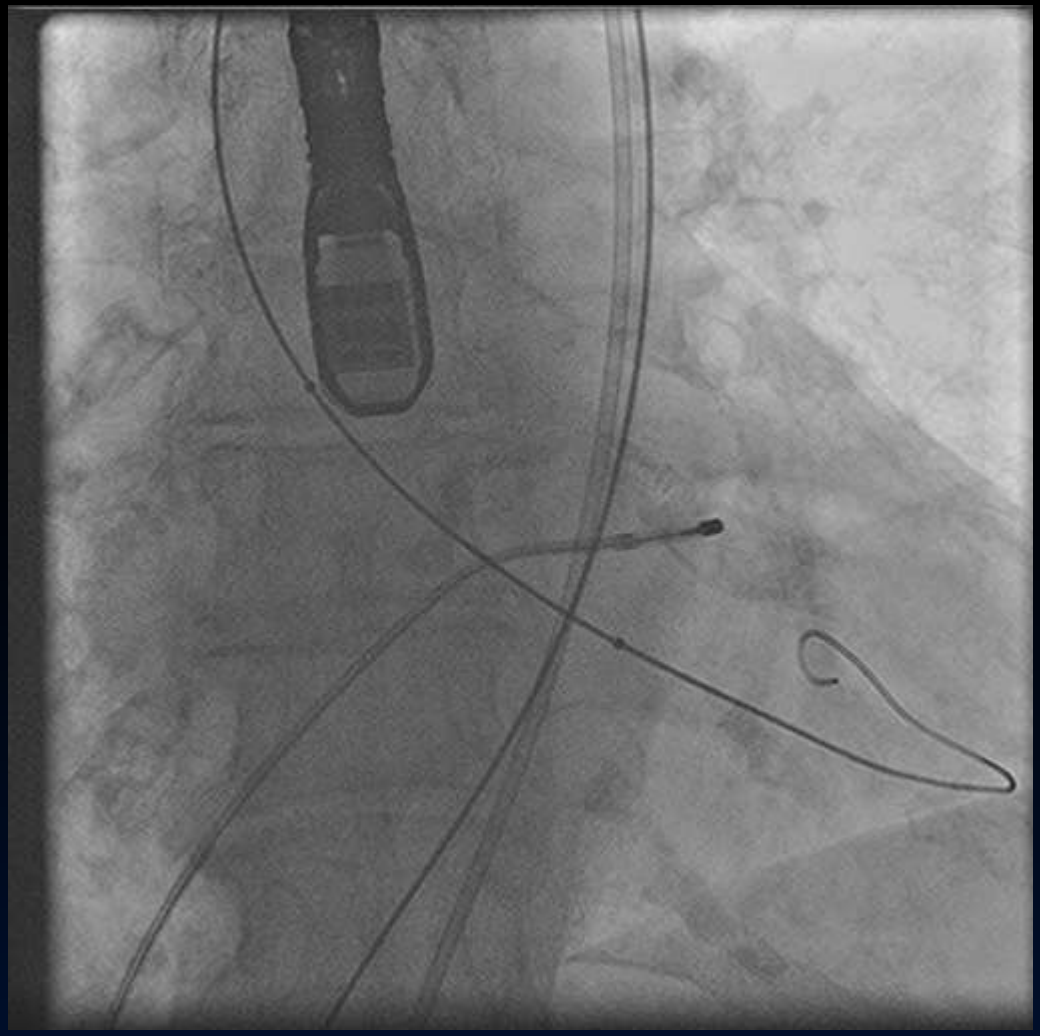
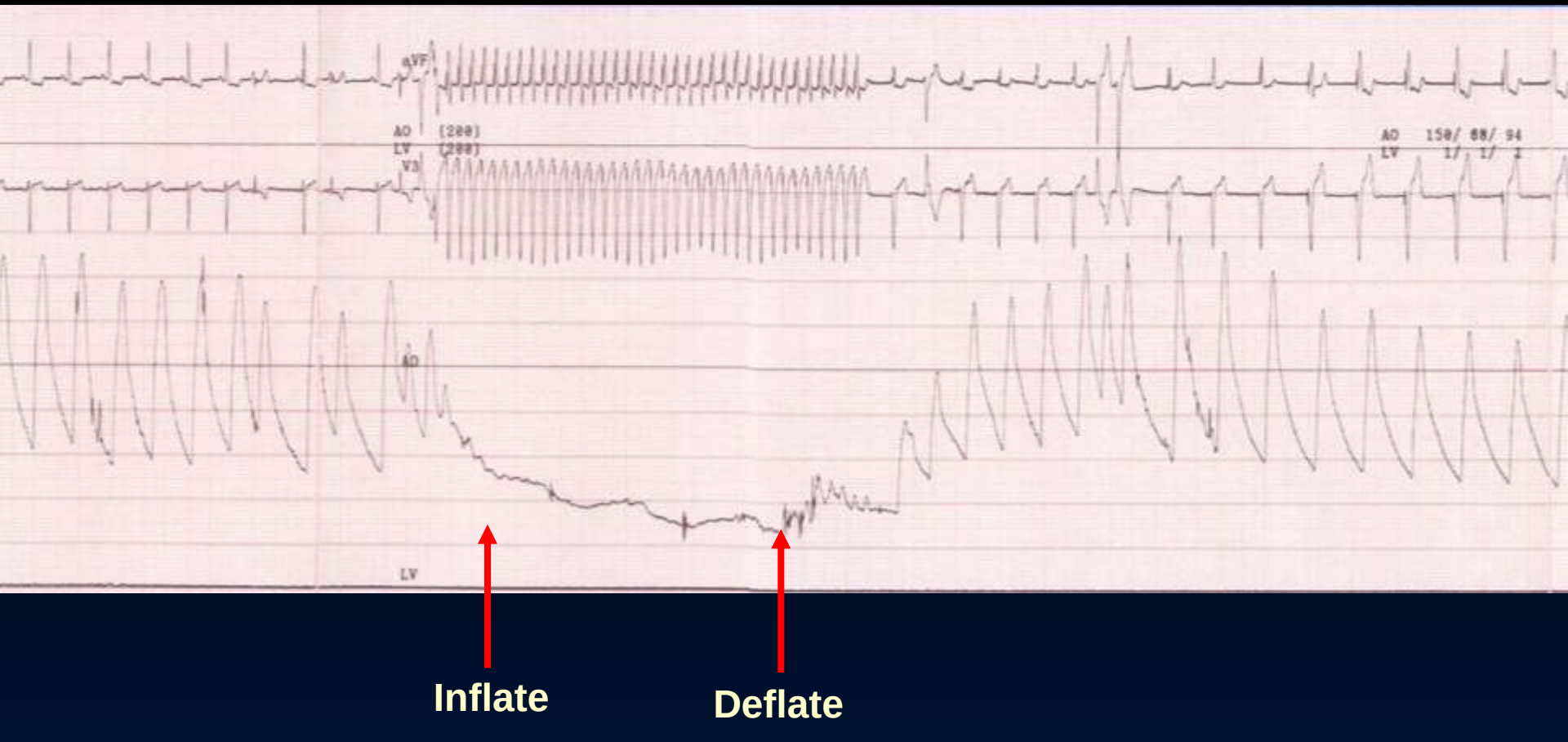


Rapid pacing during BAV

RV temporary pacing lead - via FVein or IJVein sheath

If 1:1 capture does not occur at 180-200 BPM, then initiate pacing at 100 BPM (after 1:1 capture increase to 180)

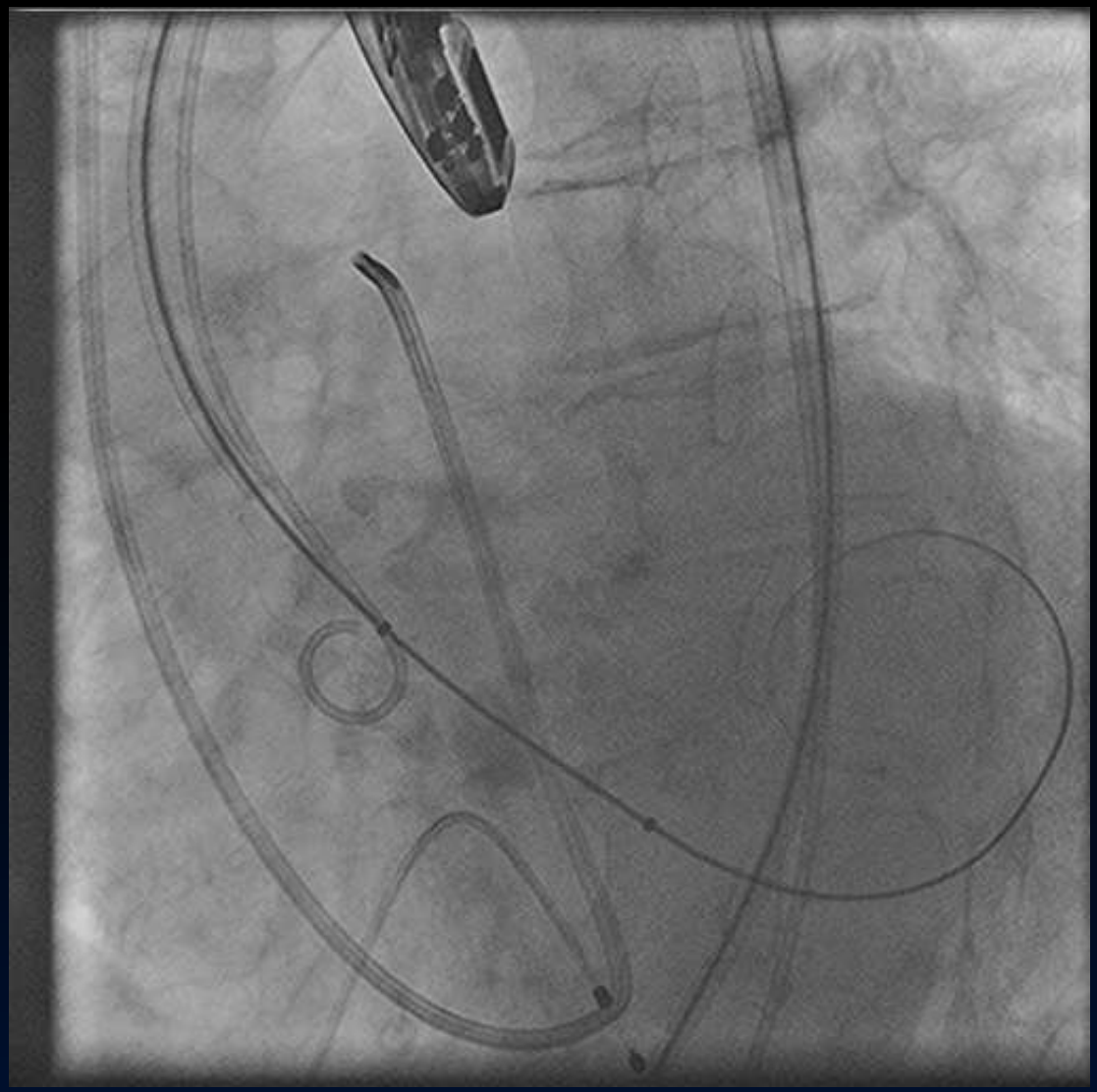


BAV Technique

Have valve crimped and ready to go before BAV

Especially important for decompensation after BAV

Contrast injection during BAV to assess coronary occlusion



Differential diagnosis of persistent hypotension after TAVI

(preferable to have portable echo in room)

- Acute LV systolic failure (patients with severe baseline LV dysfunction)
- LV perforation with tamponade
- Ruptured AV annulus with aortic dissection and/or severe AI
- Blood loss from expanding hematoma or retroperitoneal bleed
- Vagal mediated hypotension (can be sustained)
- Heart block
- Disrupted submitral apparatus and severe MR

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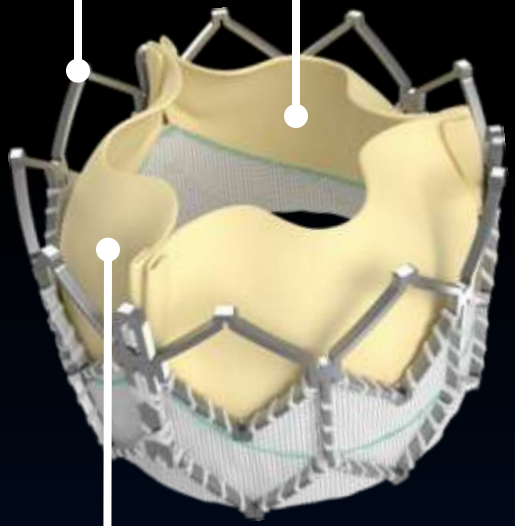
SAPIEN XT (Edwards Lifesciences Inc.)
Implantation steps

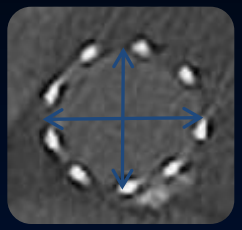
Sapien XT Transcatheter Heart Valve

Balloon-expandable system

Frame height designed to respect the surrounding cardiac anatomy



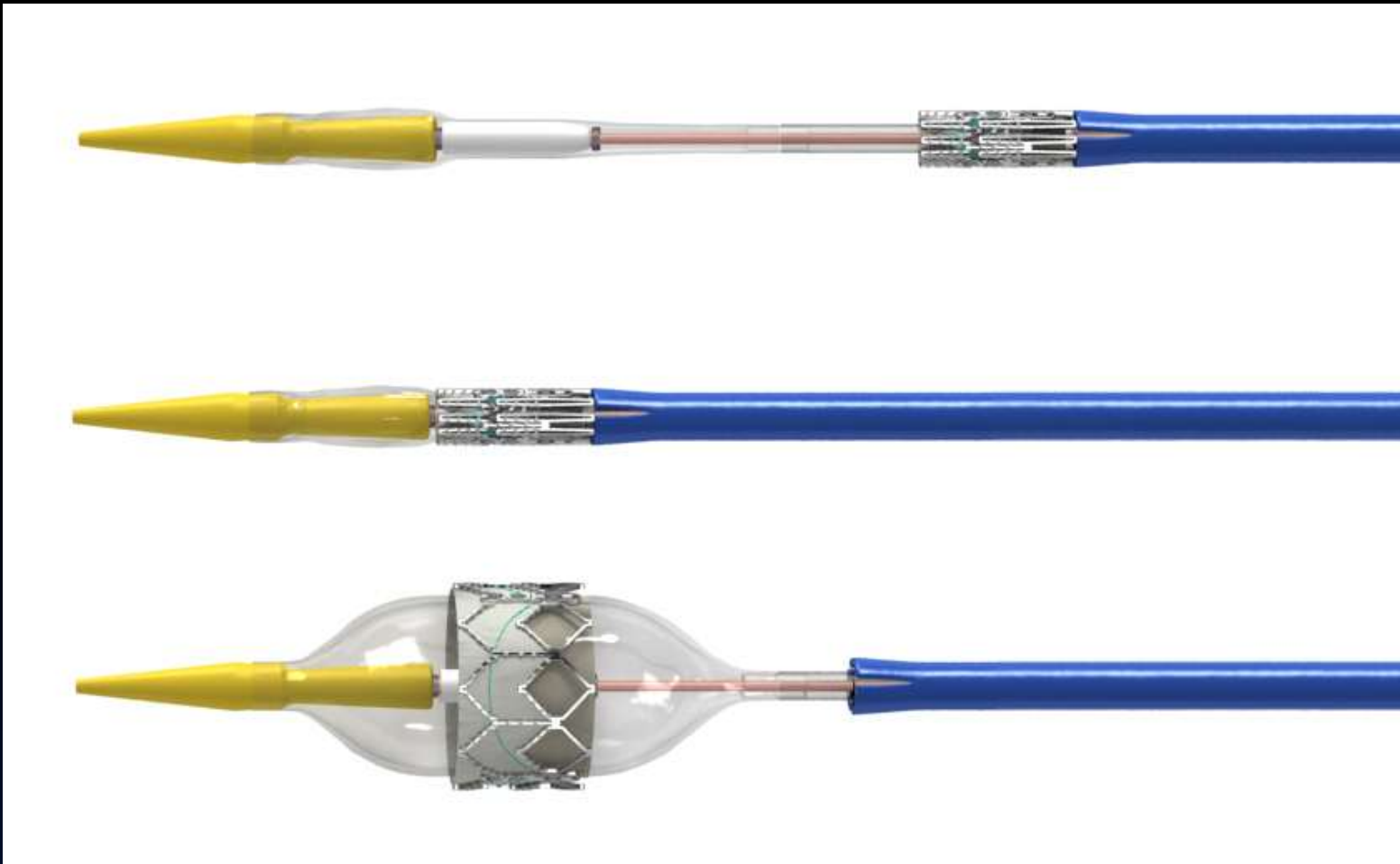
Bovine pericardial tissue leaflets



Cobalt-chromium frame with high radial strength

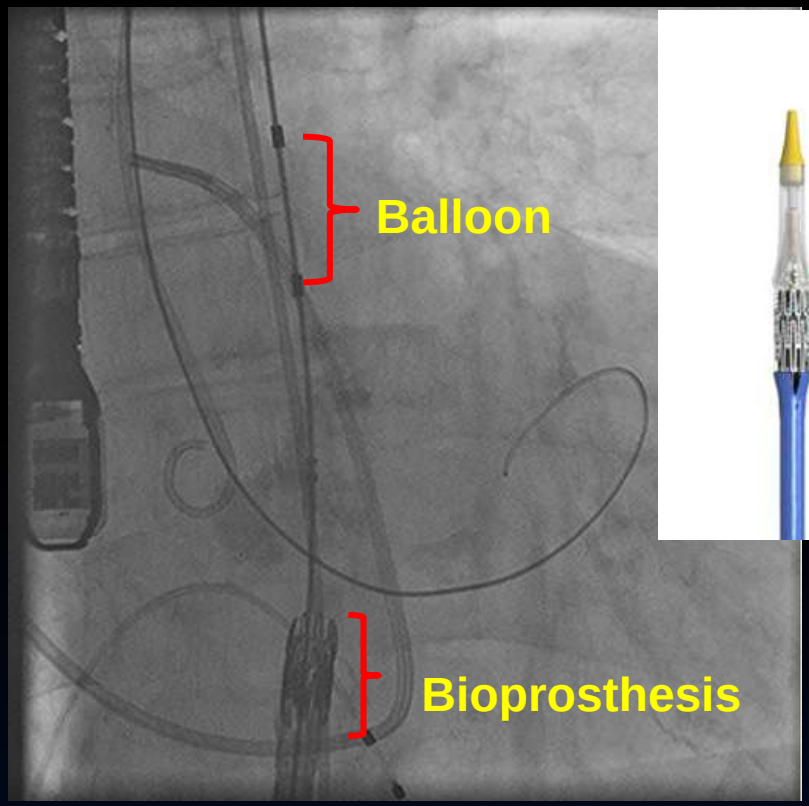
Sapien XT Transcatheter Heart Valve

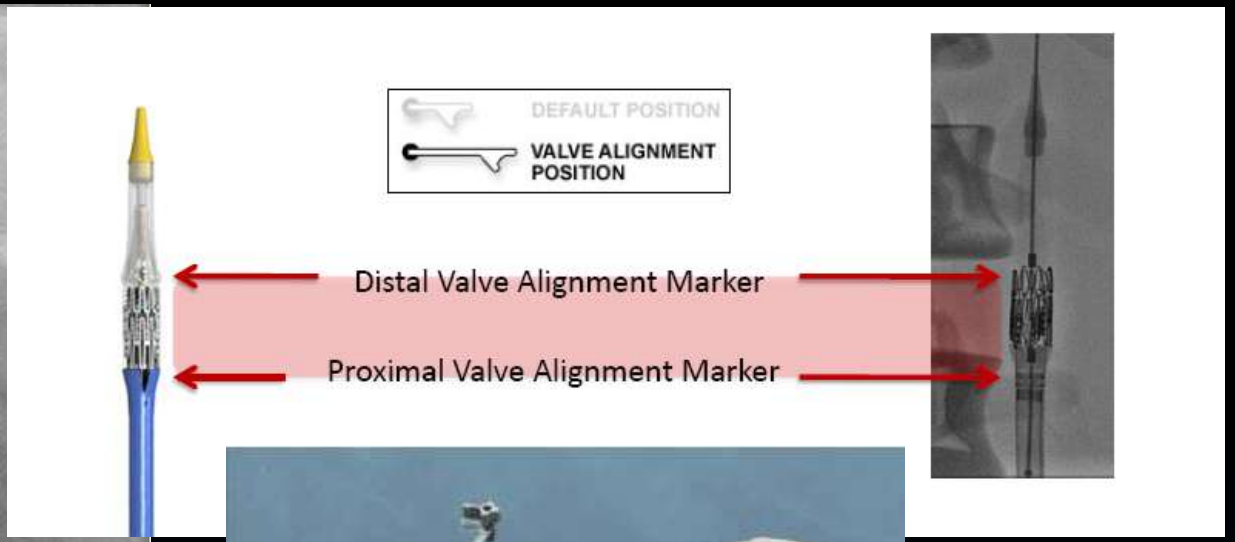
NovaFlex delivery system

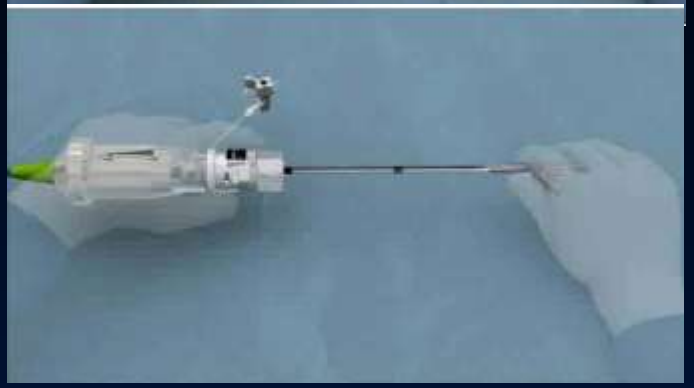


Sapien XT Implantation steps

Valve aligment

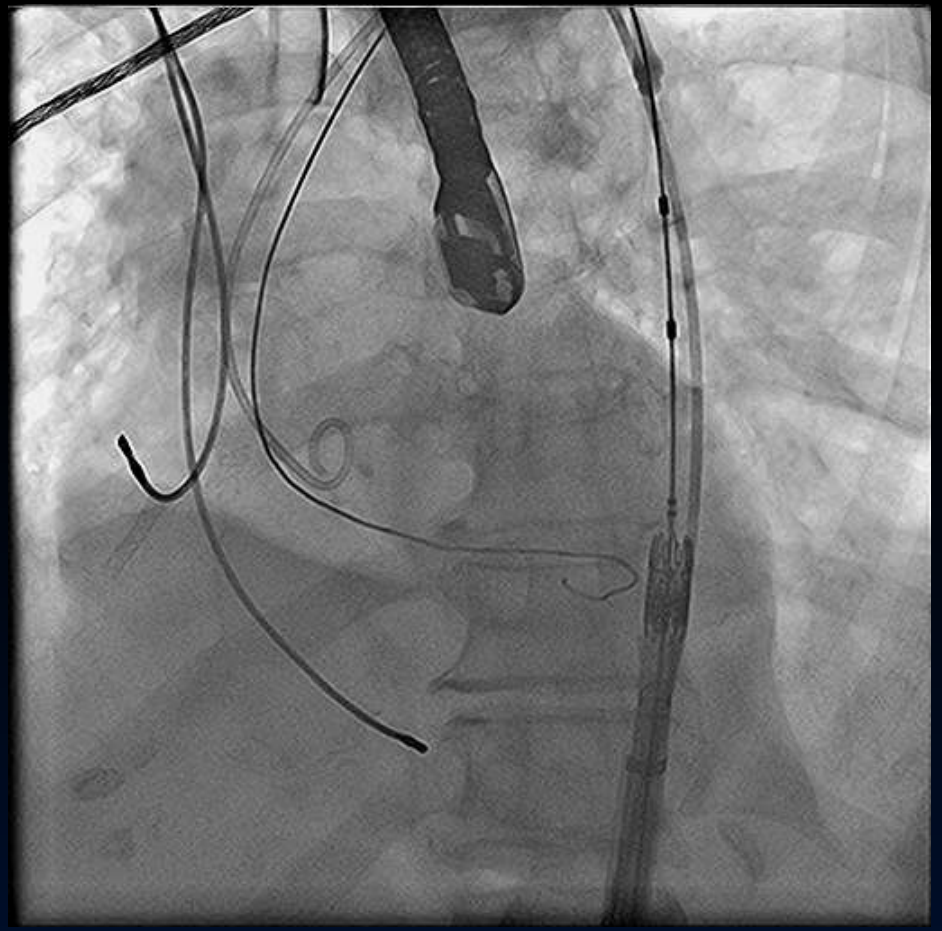






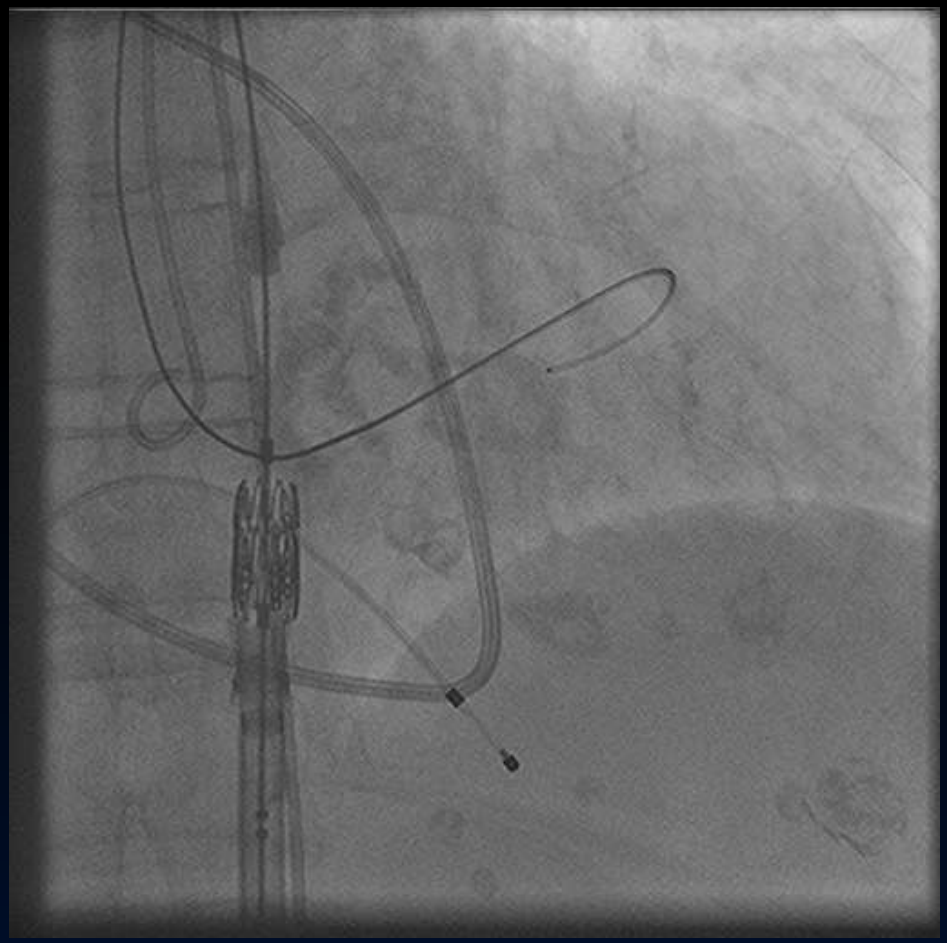
Sapien XT Implantation steps

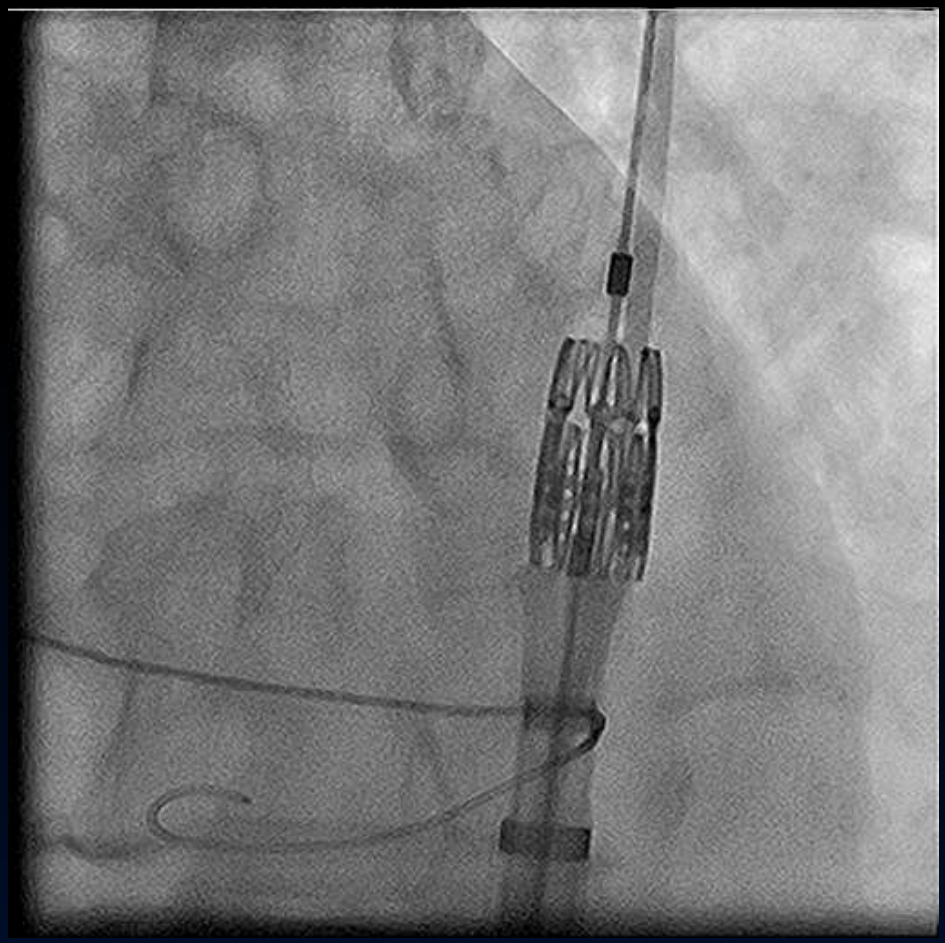
Valve aligment



Sapien XT Implantation steps

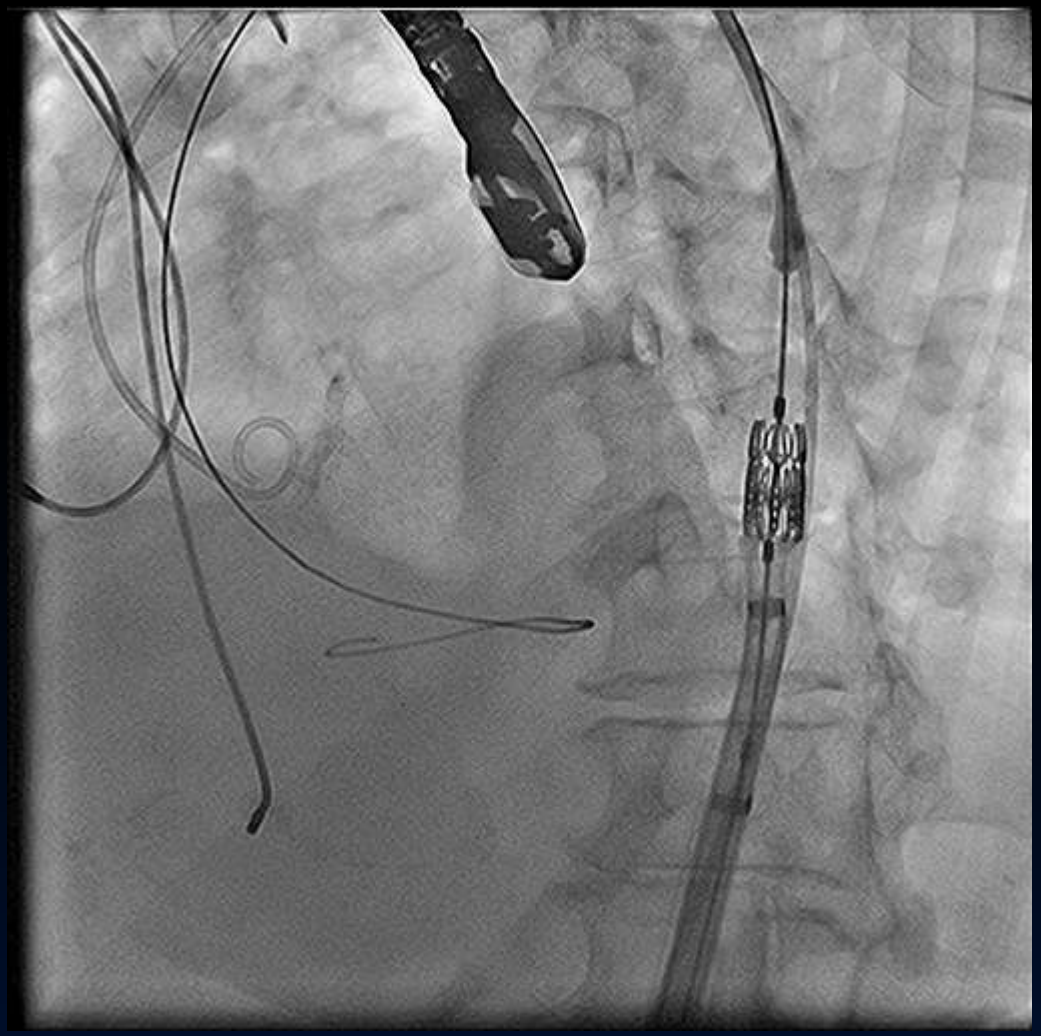
Fine adjustment





Sapien XT Implantation steps

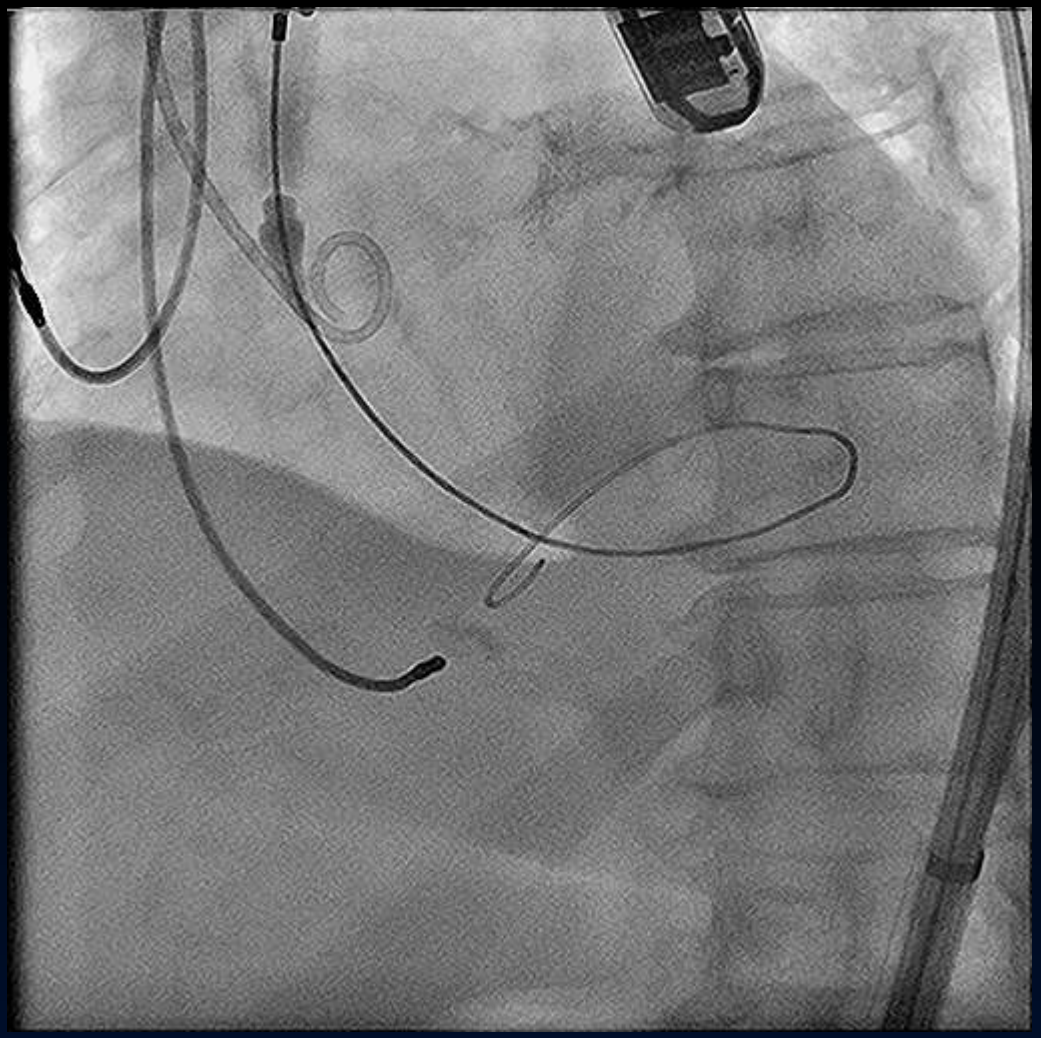
Crossing the aortic arch



- **Ensure optimum wire position**
- **Rotate Flex Wheel to track over aortic arch**
- **Use LAO 30 to 40 to provide view of aortic arch**
- **Observe navigation through aorta**

Sapien XT Implantation steps

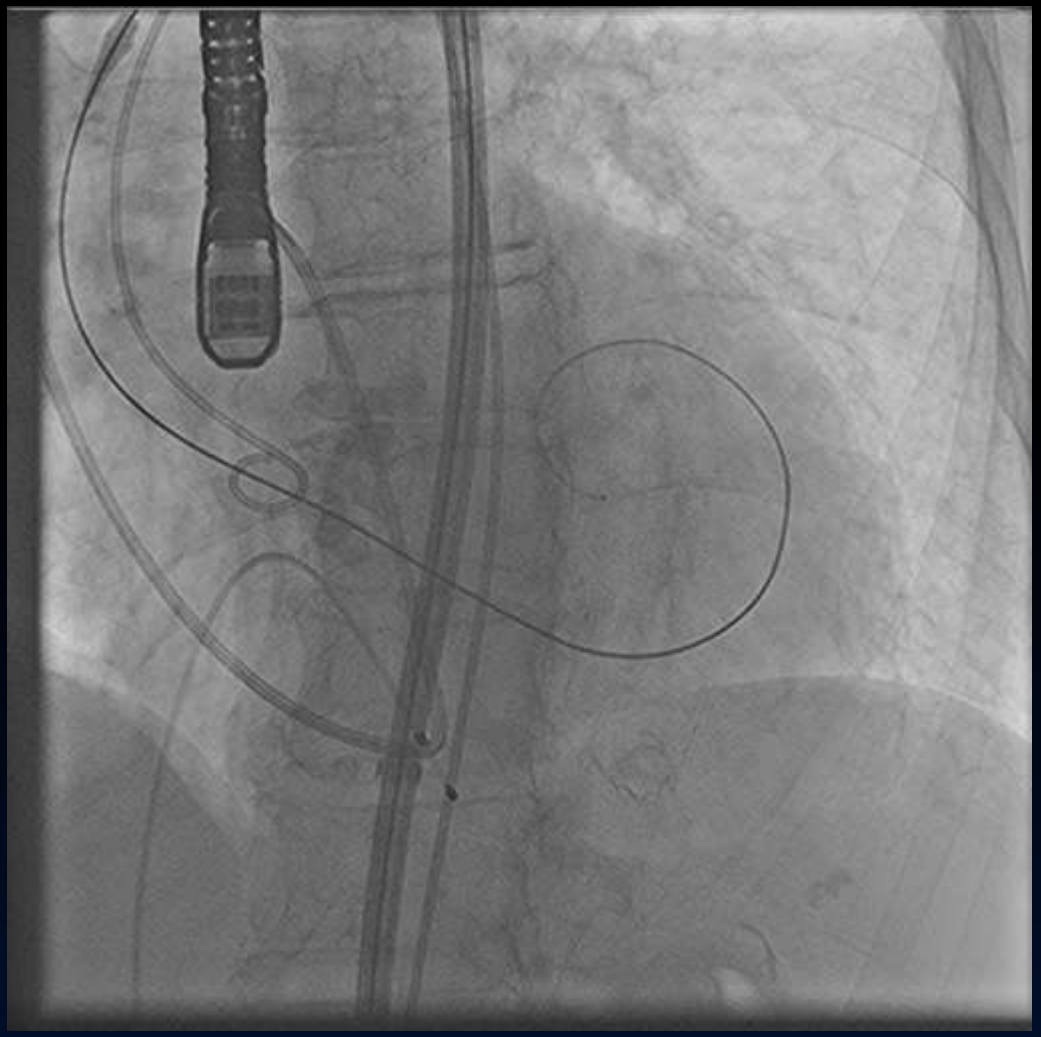
Crossing the aortic valve



- **Pause before crossing**
- **Ensure optimum wire position**
- **Briefly assess the hemodynamics**

Sapien XT Implantation steps

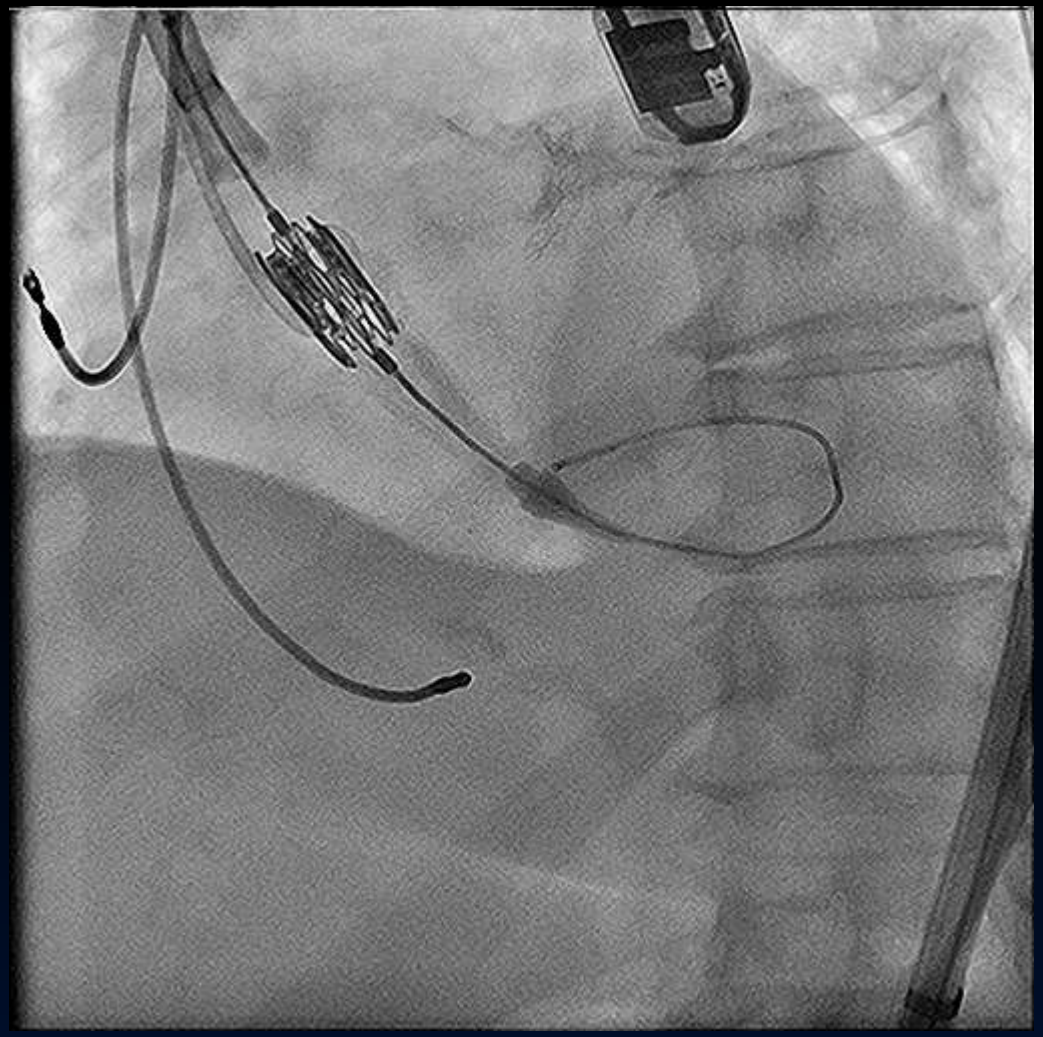
Crossing the aortic valve

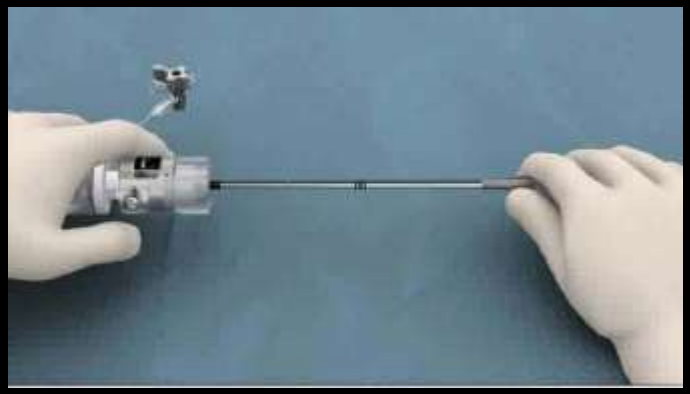


- Ensure optimum wire position
- If it doesn't cross, it won't cross with sheer force
- Problem may be
  - Commisural location of the valve
  - LV – Ao angle
  - Inadequate valvuloplasty
  - Severely tortuous unfolded aorta
- Readjust your approach
  - Readjust wire
  - Try to change approach angle
  - Buddy wire
  - Valvuloplasty
  - Alternate approach

Sapien XT Implantation steps

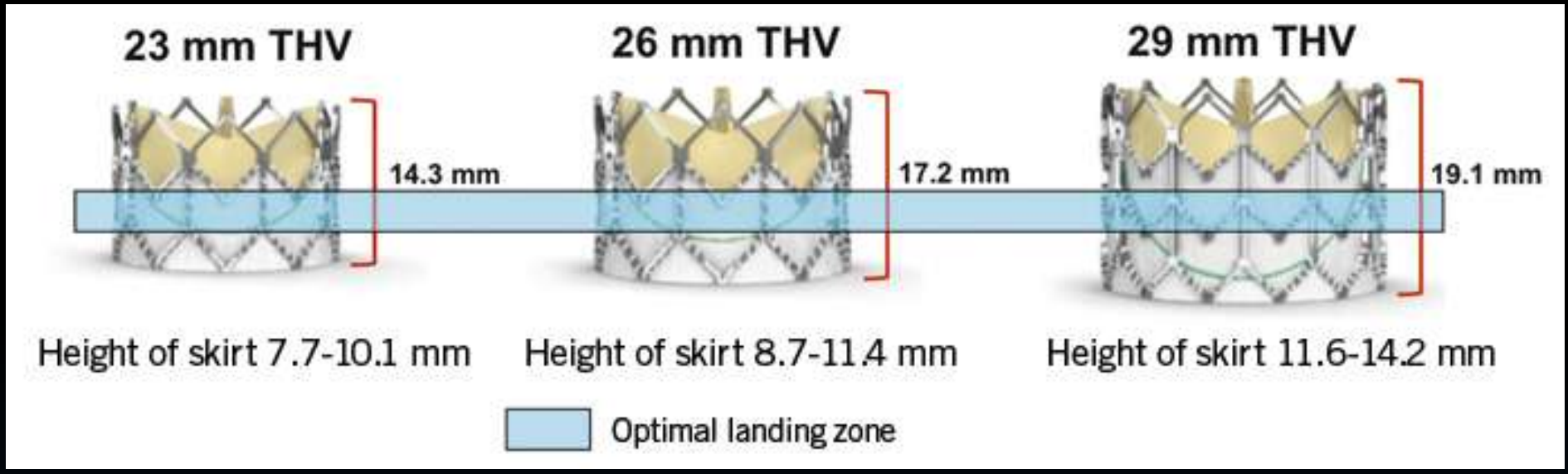
Retracting (pulling back) the Nova-Flex sheath

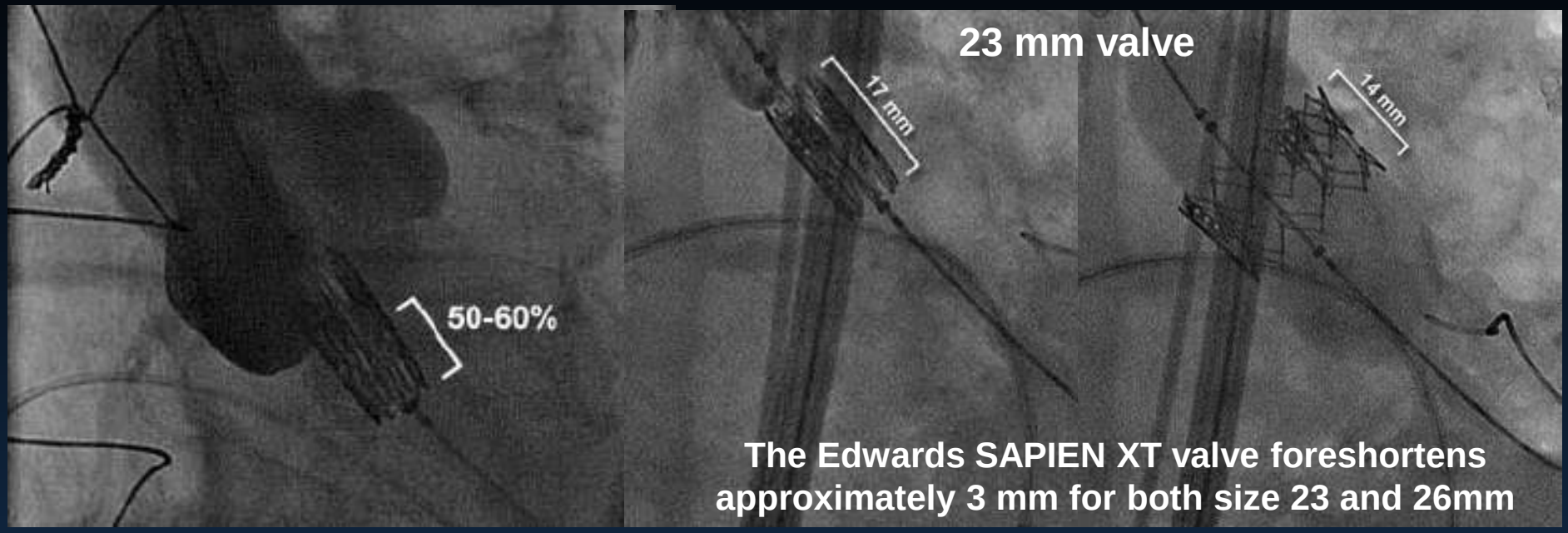




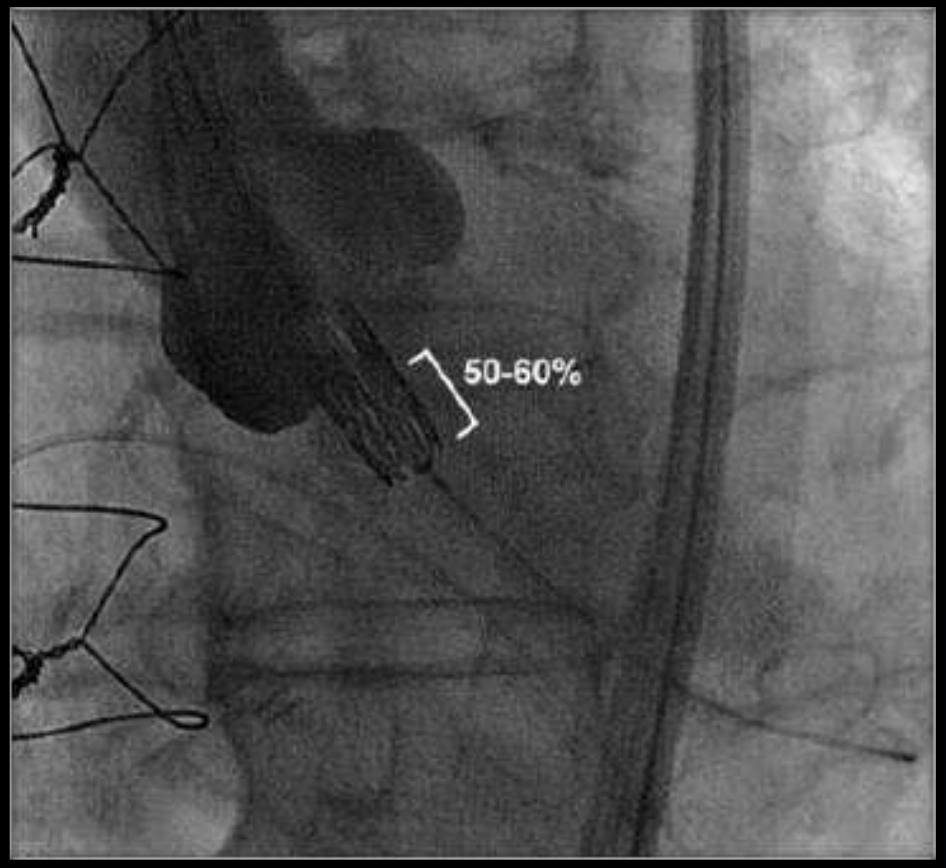
- Pull back the flex catheter just proximal to the double marker
- May need to unflex the catheter

Optimal landing zone for Sapien XT





Optimal Positioning of Sapien XT



- Confirm x-ray angles are correct
- Use calcified landmarks
- Small injections via pigtail
- TEE may help as adjunctive imaging
- Aortogram during rapid pacing can be useful
- Anticipate cranial motion

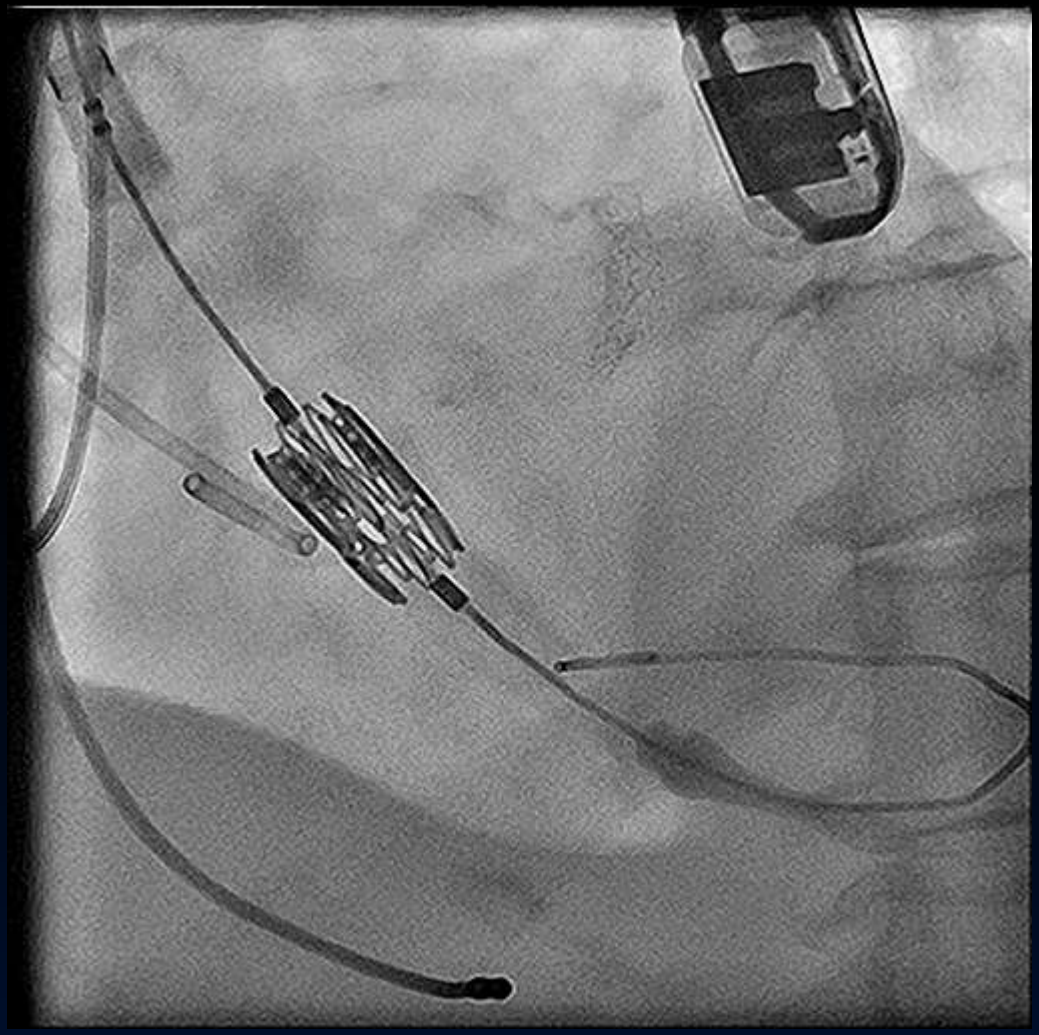
Optimal Placement of Sapien XT

TAKE YOUR TIME !!!

. If the patient becomes hemodynamically unstable, pull the THV out of the LV and allow BP to recover

. Confirm that pigtail is located deeply in non-coronary sinus

Sapien XT Implantation technique



2-step inflation:

. Rapid pacing

. Inflate 30%

. Angiography to ensure proper positioning

. Pull the pig tail

. Slow inflation, hold for 3 sec

Sapien XT Implantation technique

- 1-step SLOW inflation:
- Rapid pacing
- Confirm uninterrupted capture
- Wait until BP drops
- Fully inflate for 3-5 seconds
- Stop pacing after complete deflation
- Remove the balloon from the LV

CoreValve (Medtronic Inc.)
Implantation steps

Prótese aórtica CoreValve®

Stent auto-expansível de nitinol

Válvulas de pericárdio porcino

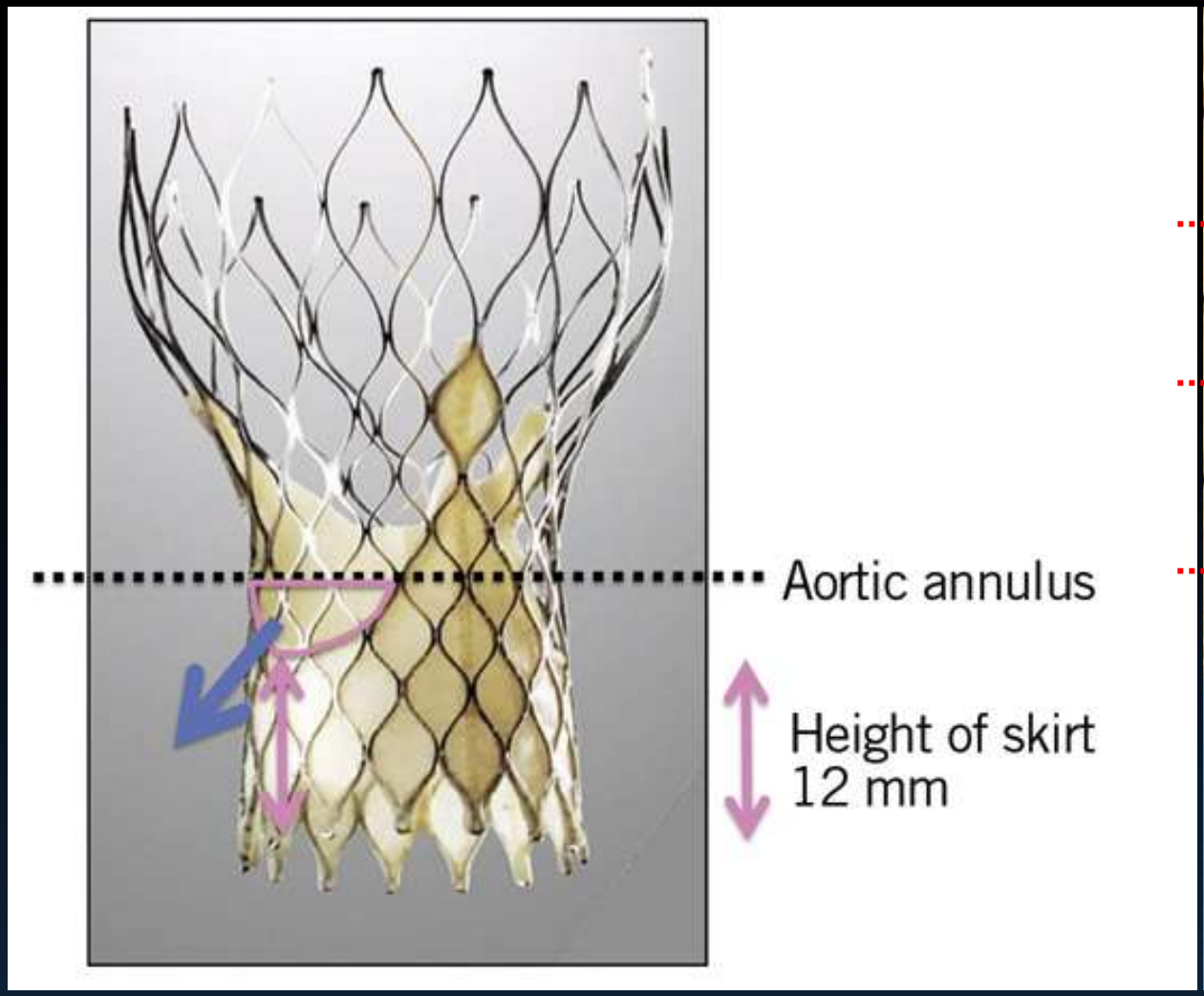
3 níveis de força radial > aposição

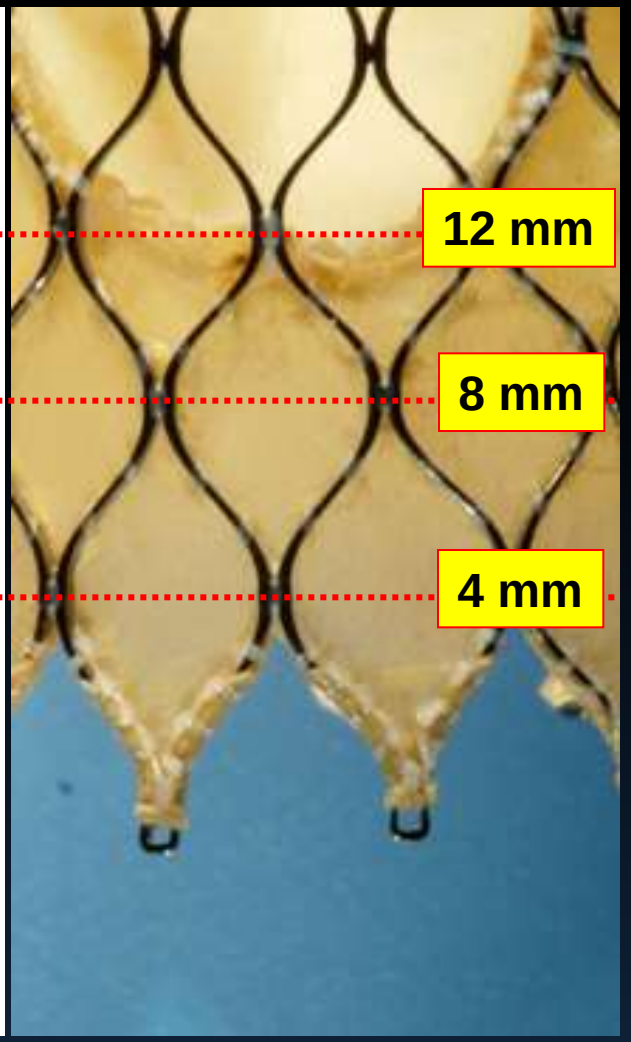
Acesso aos óstios coronários

Bom acoplamento , impede a migração ou desposicionamento

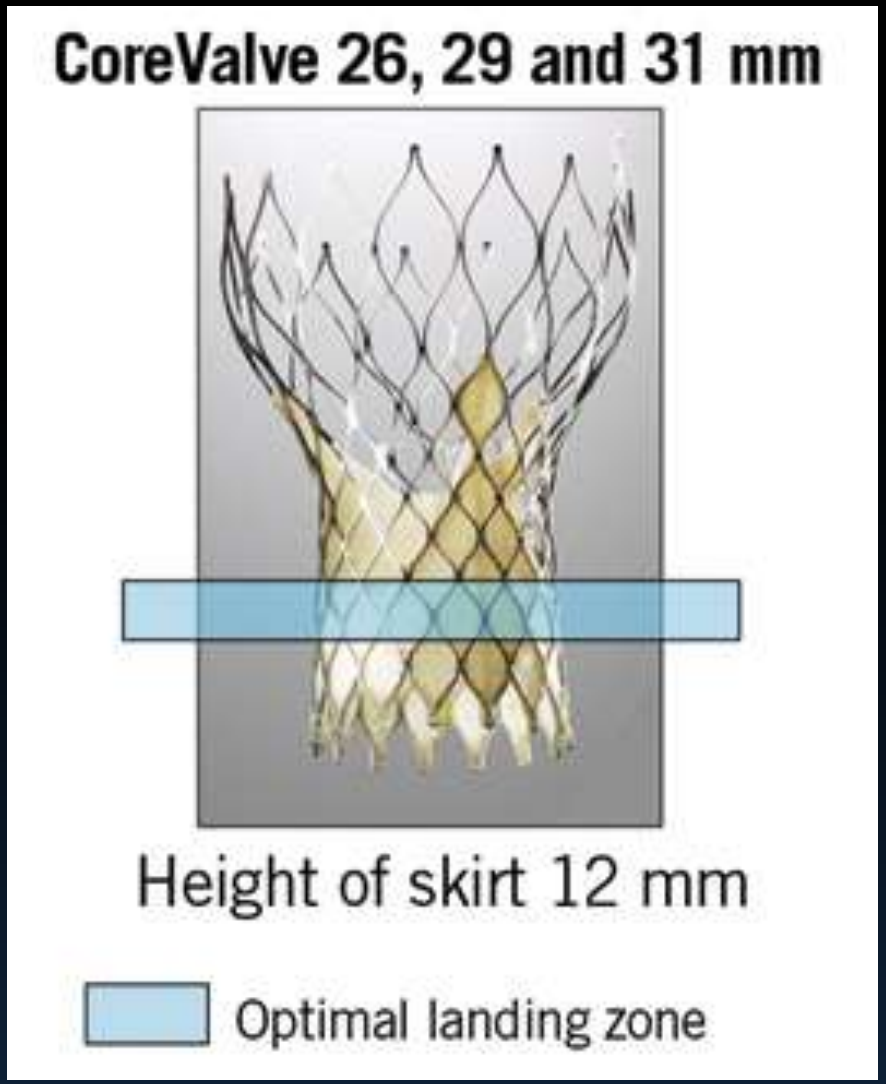
Sistema de entrega

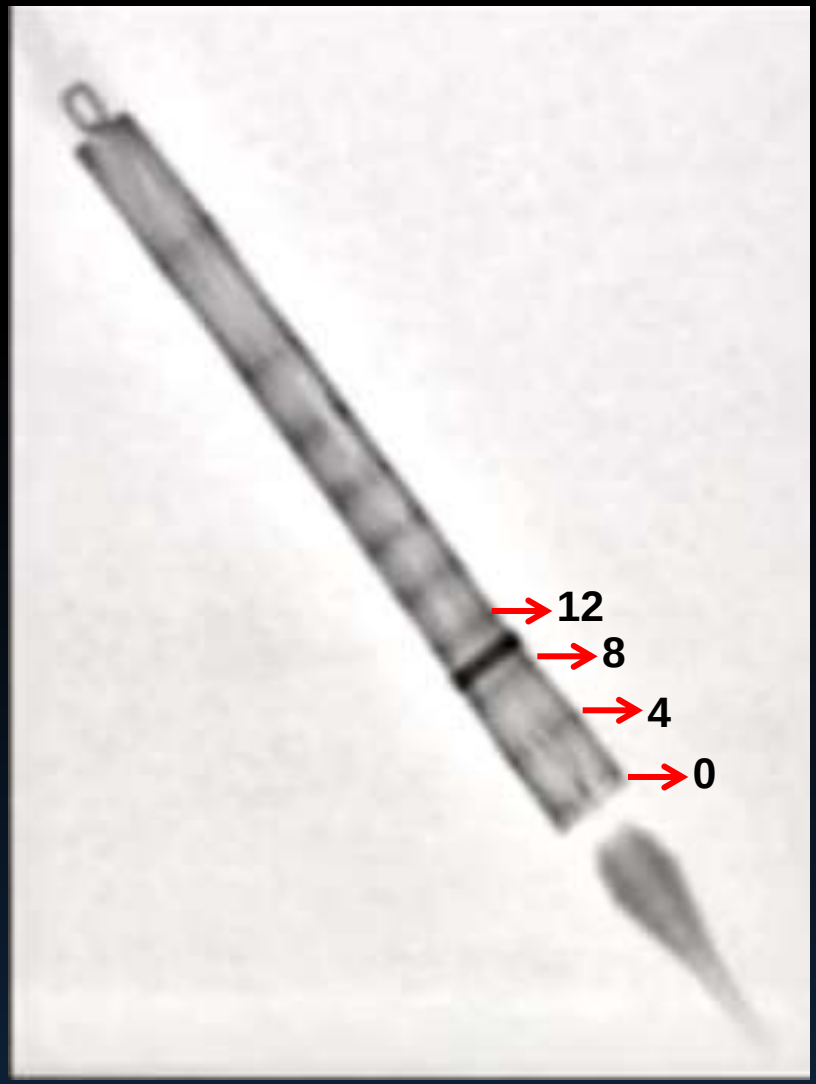
Optimal landing zone for Corevalve





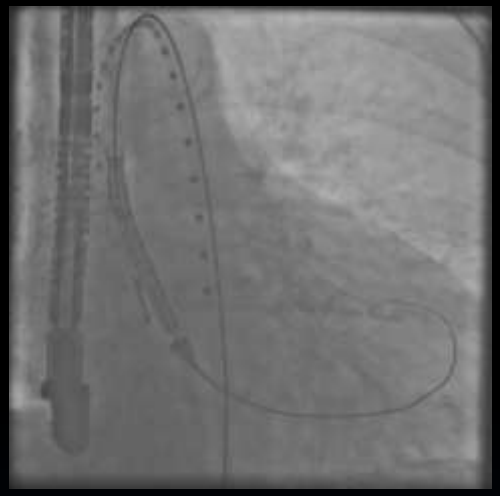
Optimal landing zone for Corevalve

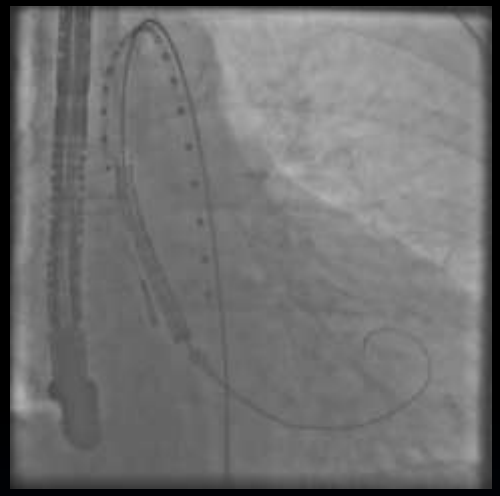


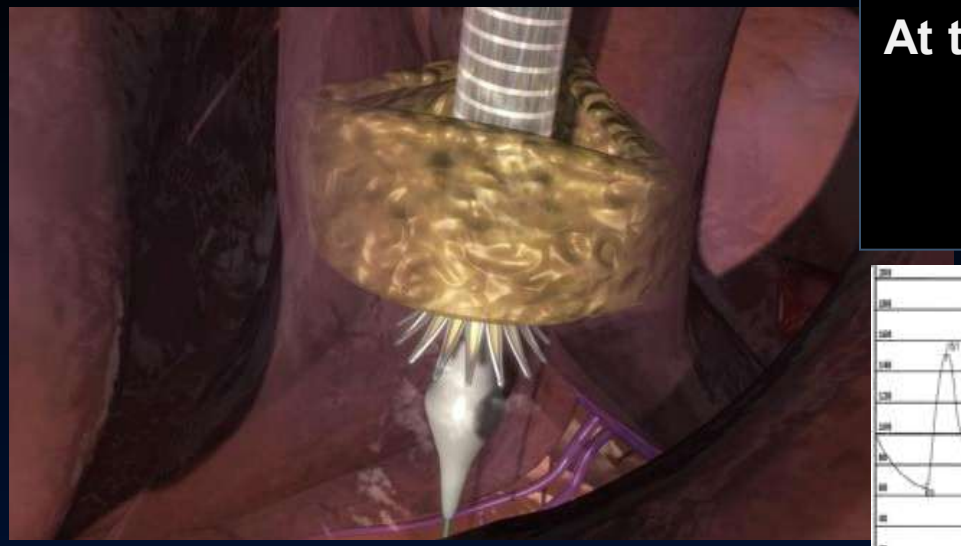


Deployment of Corevalve

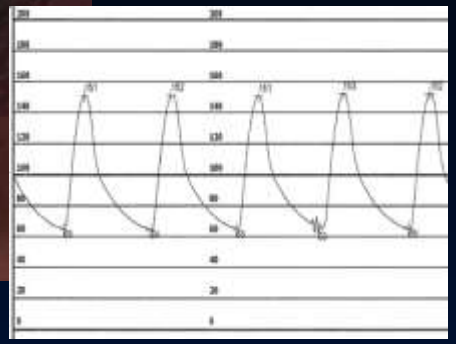
First stage





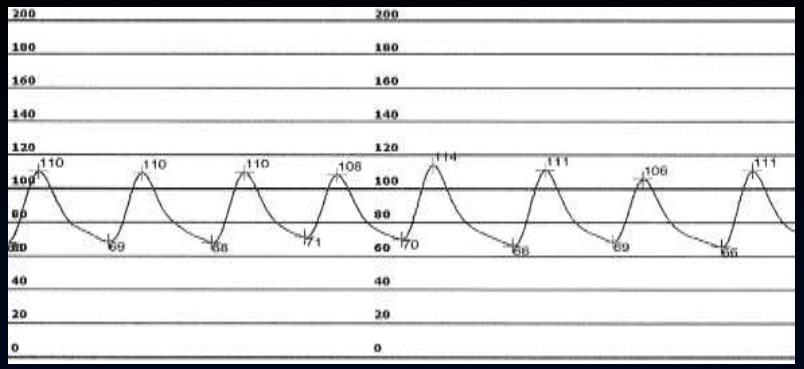


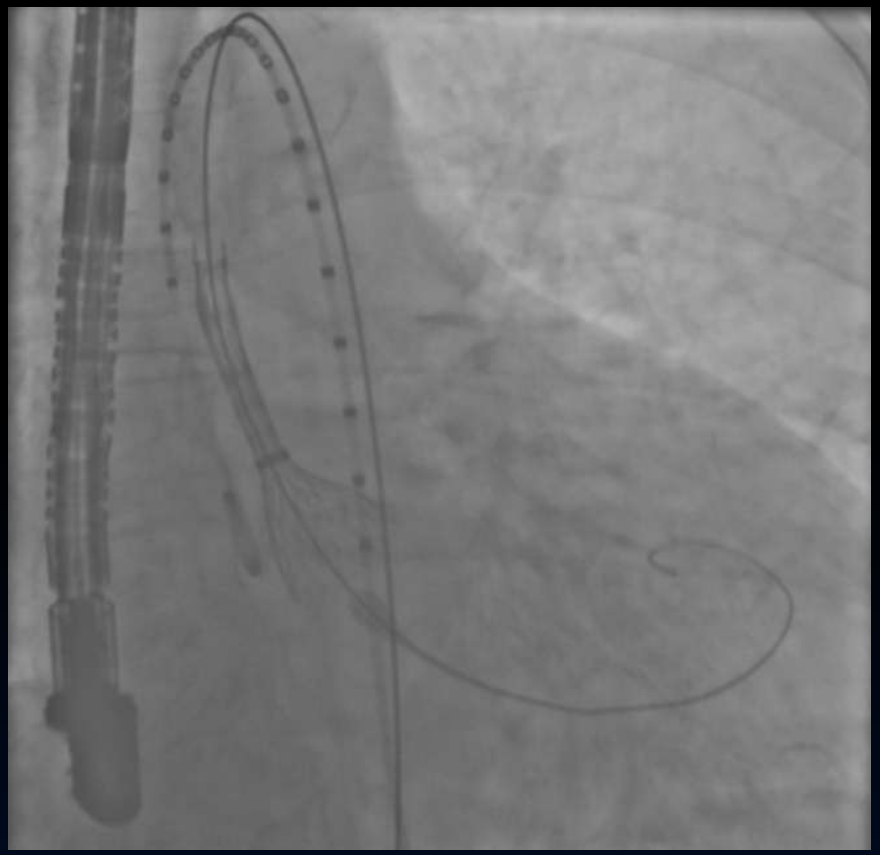
At this stage, you have time…remember that AR or AV block post TAVI could impact prognosis



Deployment of Corevalve

Second stage



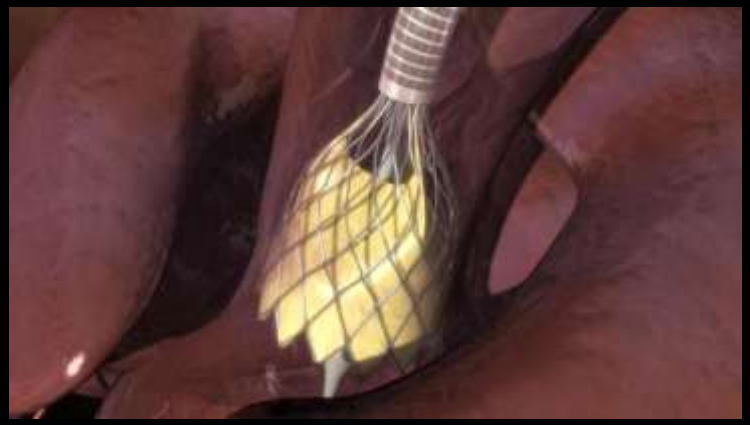


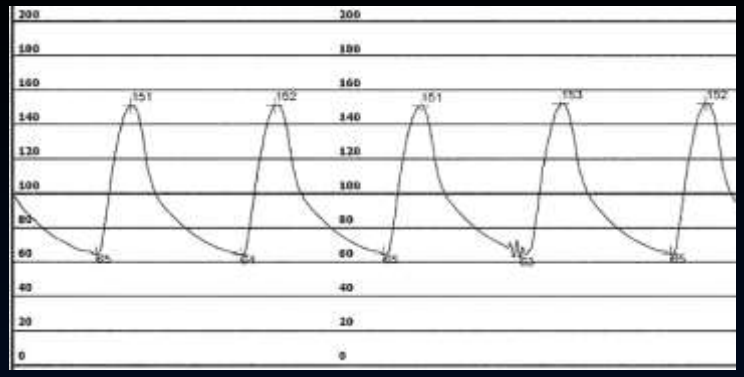
Annulus contact, pressure will drop in a minute …

Slowly and coordinated, keep an eye on haemodinamics. Always on fluoro !

Deployment of Corevalve

Third stage





Now you have time again… Pressure returns to baseline .

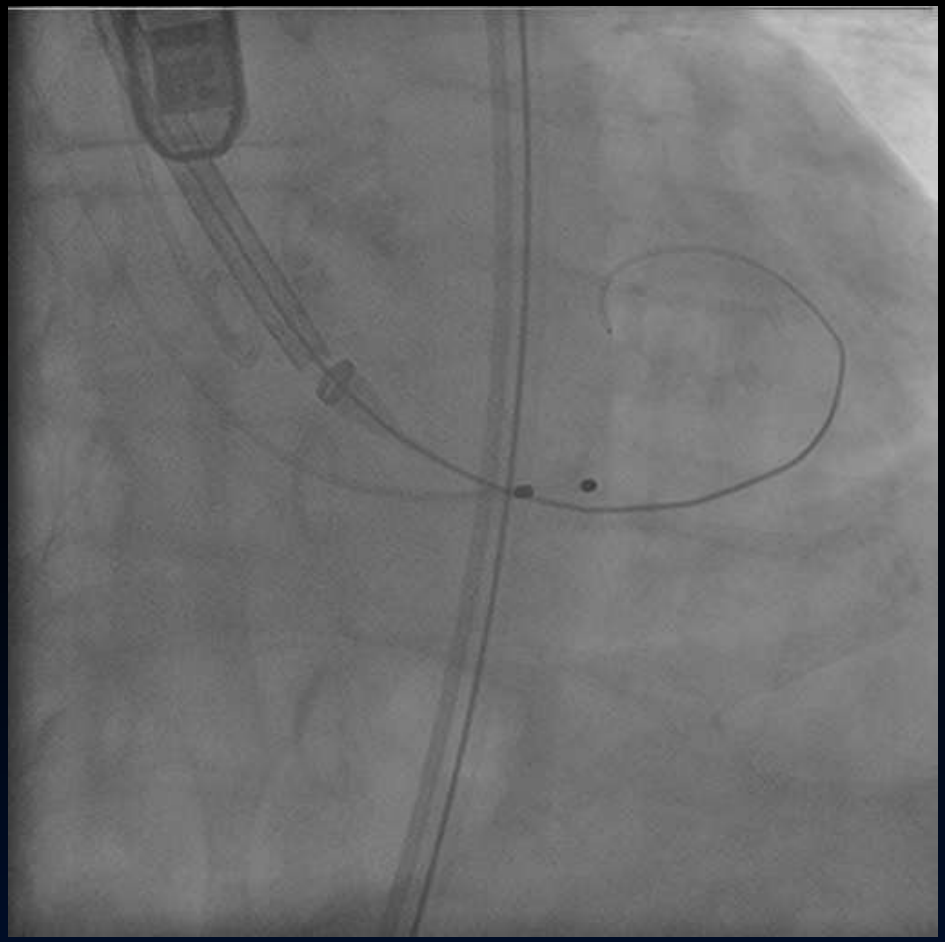
Check position with pig tail injections.

Crossing the aortic valve with Corevalve

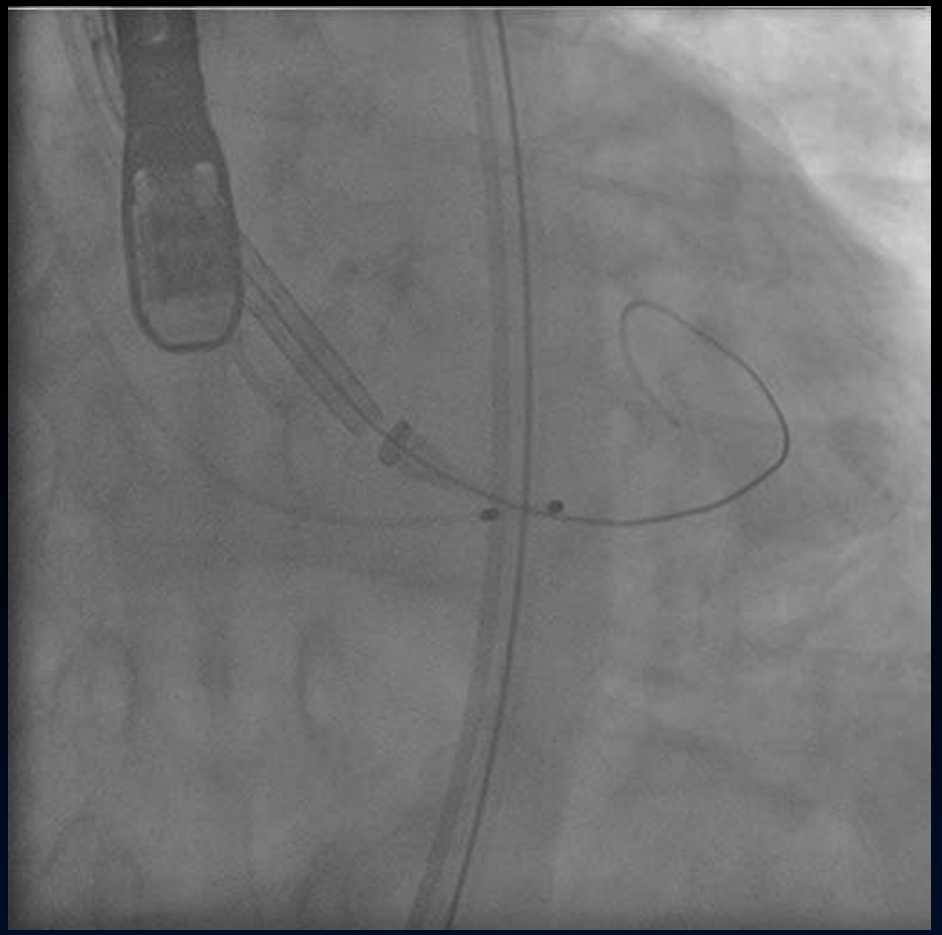
- Ensure optimum wire position
- Observe navigation through aorta
- Gentle push
- If it doesn't cross, it won't cross with sheer force

Optimal Placement of Corevalve

What to look for before starting…

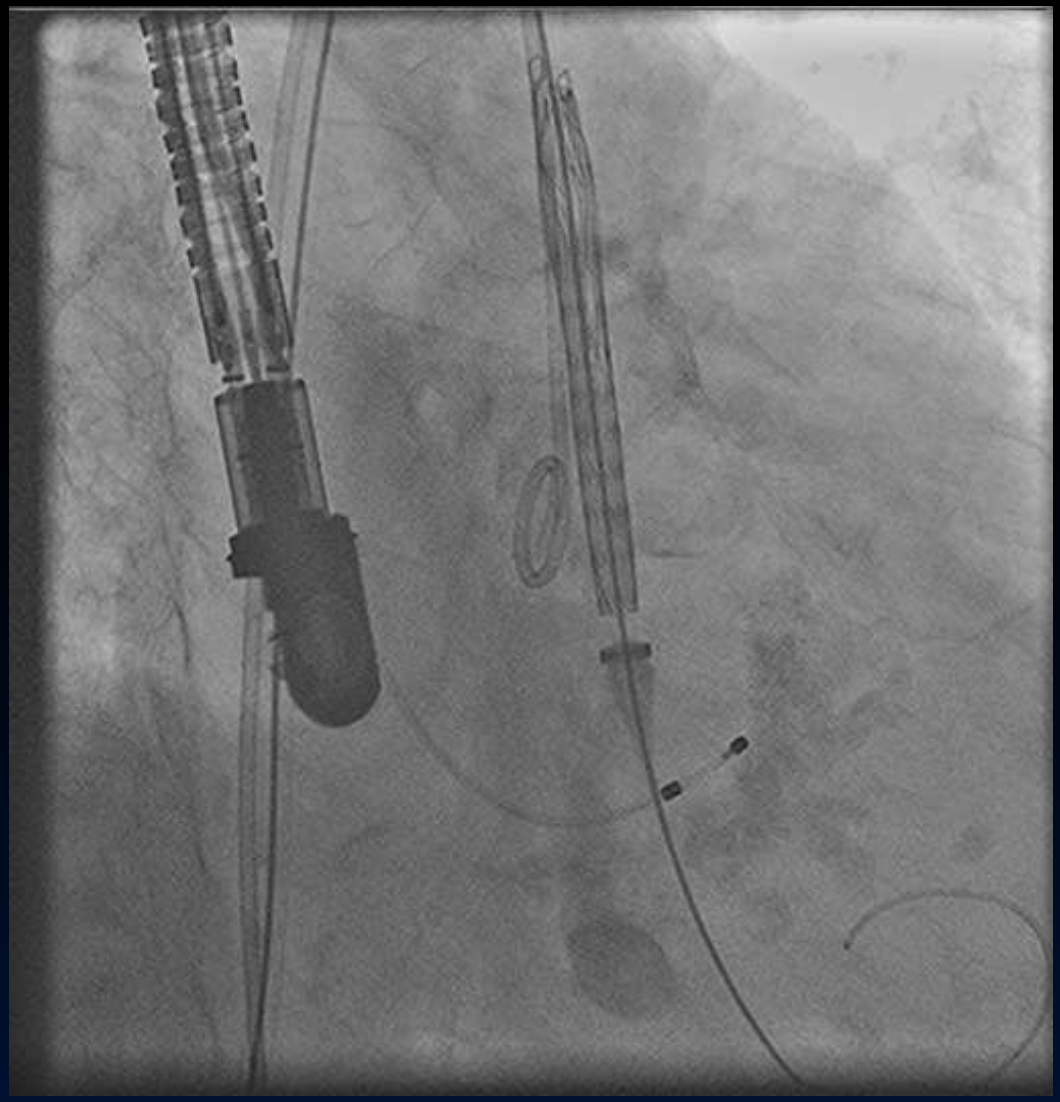


No alignment



Good alignment

CoreValve implantation
1st Step



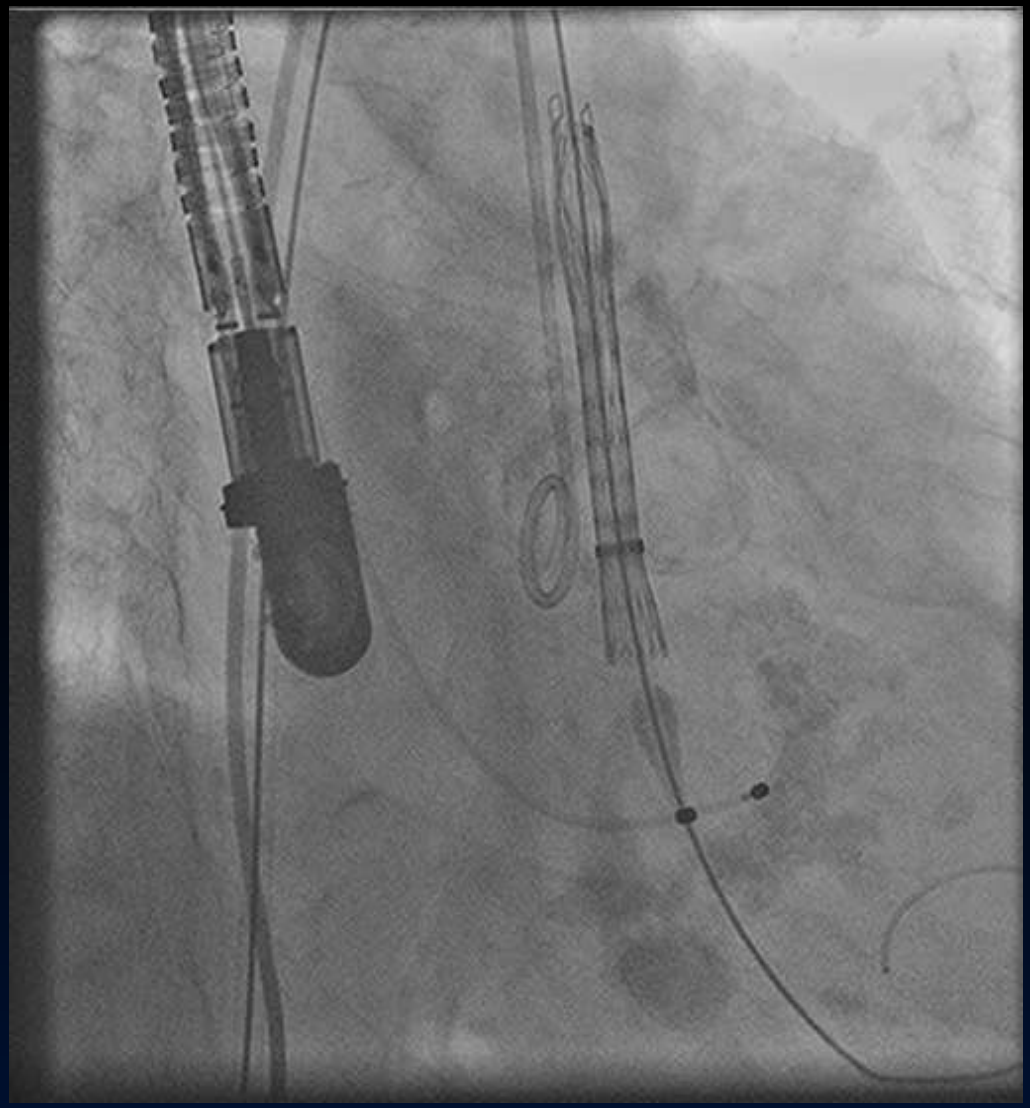
Step 1:

Positionate the valve 4-6 mm below the annulus

↓

(1ST and 2nd radiopaque marker)

CoreValve implantation
2nd Step



Step 2:

Unsheath the valve until 2nd and 3th radiopaque marker and perform angio

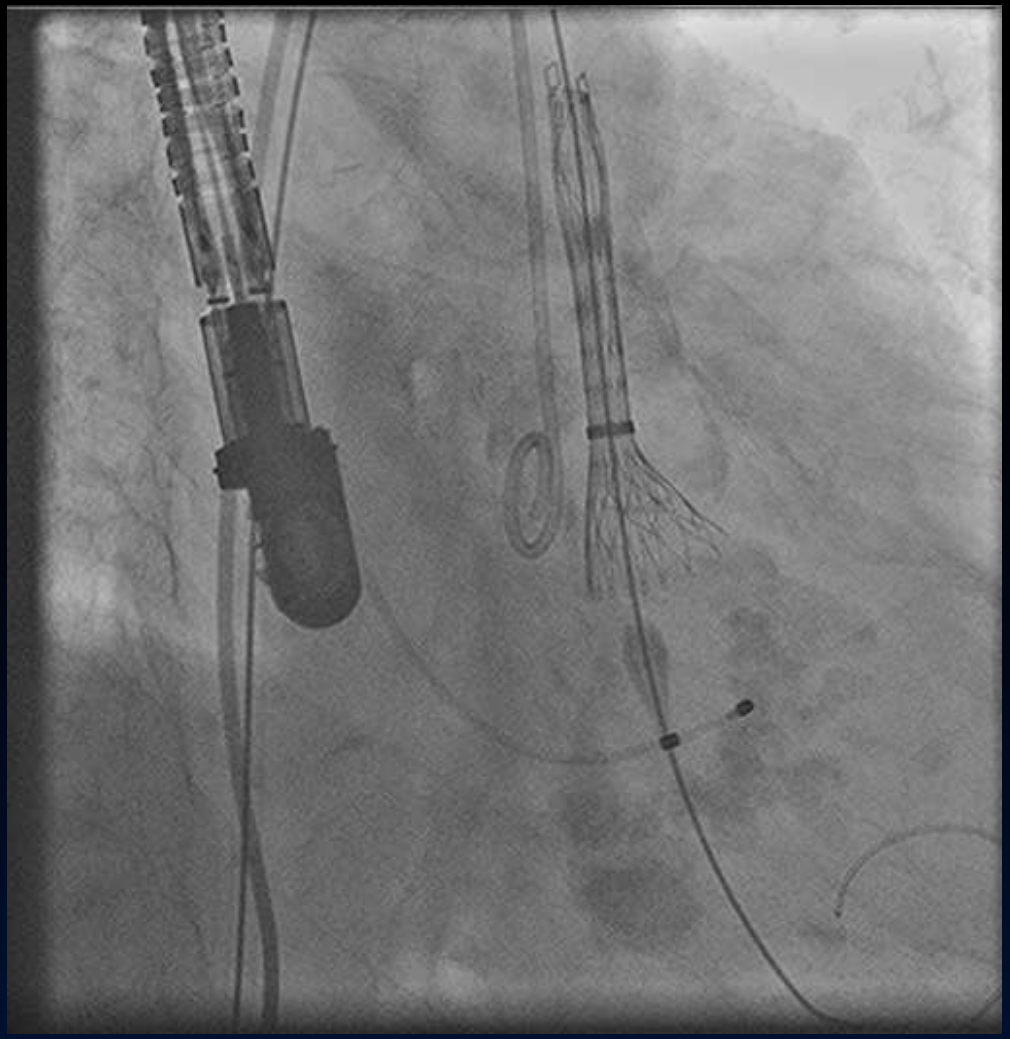
Valve is still in its vertical, collapsed shape

Not flared yet

Cranial and caudal adjustment permitted

CoreValve implantation
3rd Step

50% opened, not functioning



Step 3:

. Valve is flared

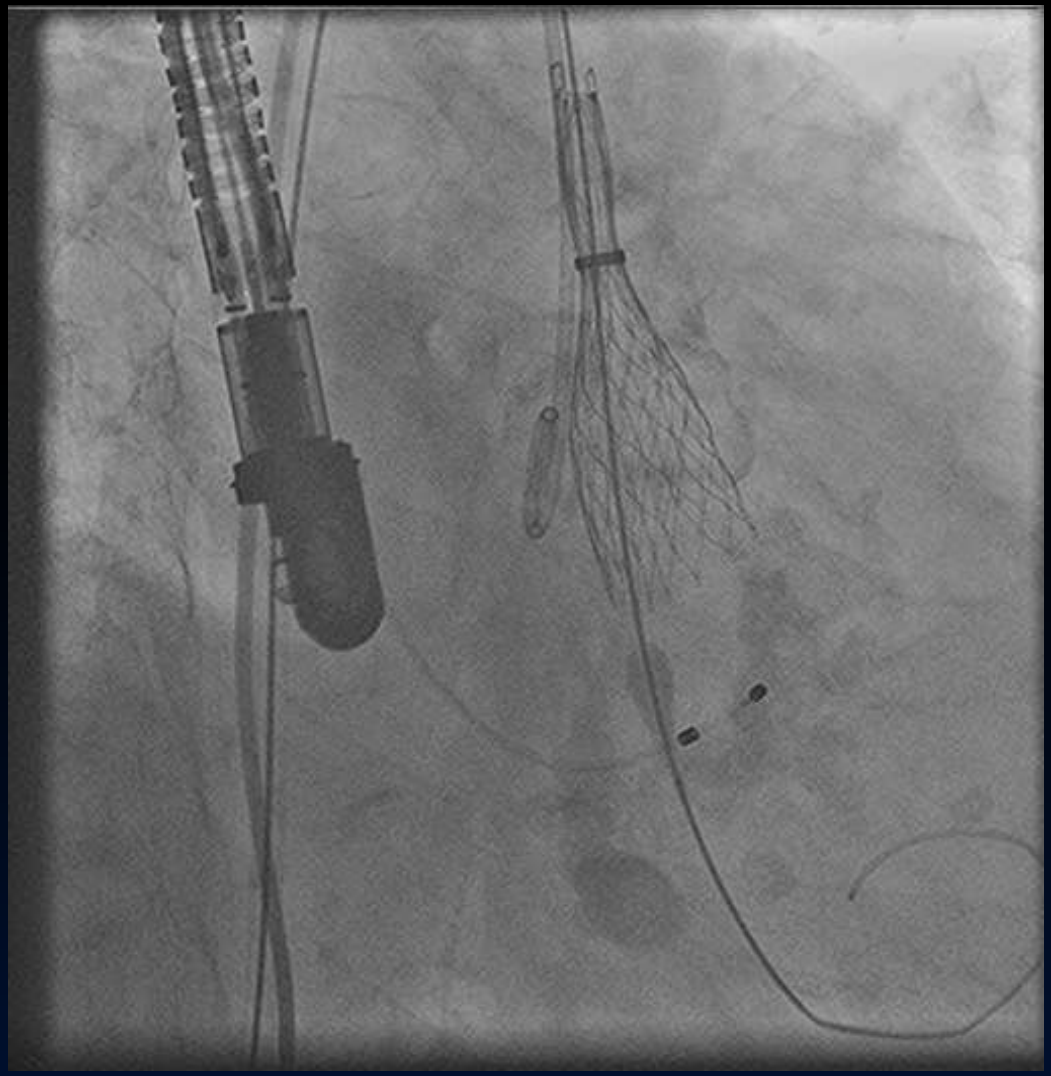
. When valve is 50% from touching the opposite wall, perform another angiogram

From Step 1 to step 3:

VERY SLOWLY

DEPLOYMENT

CoreValve implantation
4th Step



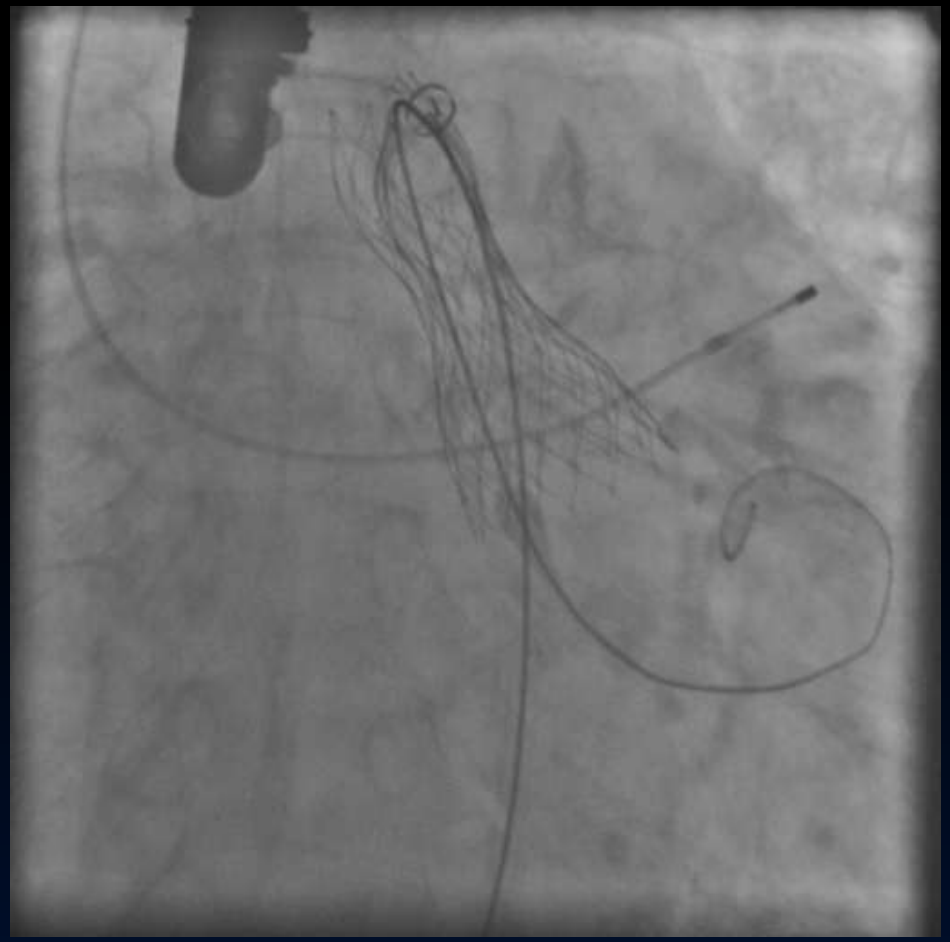
Step 4:

. After full contact, unsheath the valve until ¾

. Perform angiogram

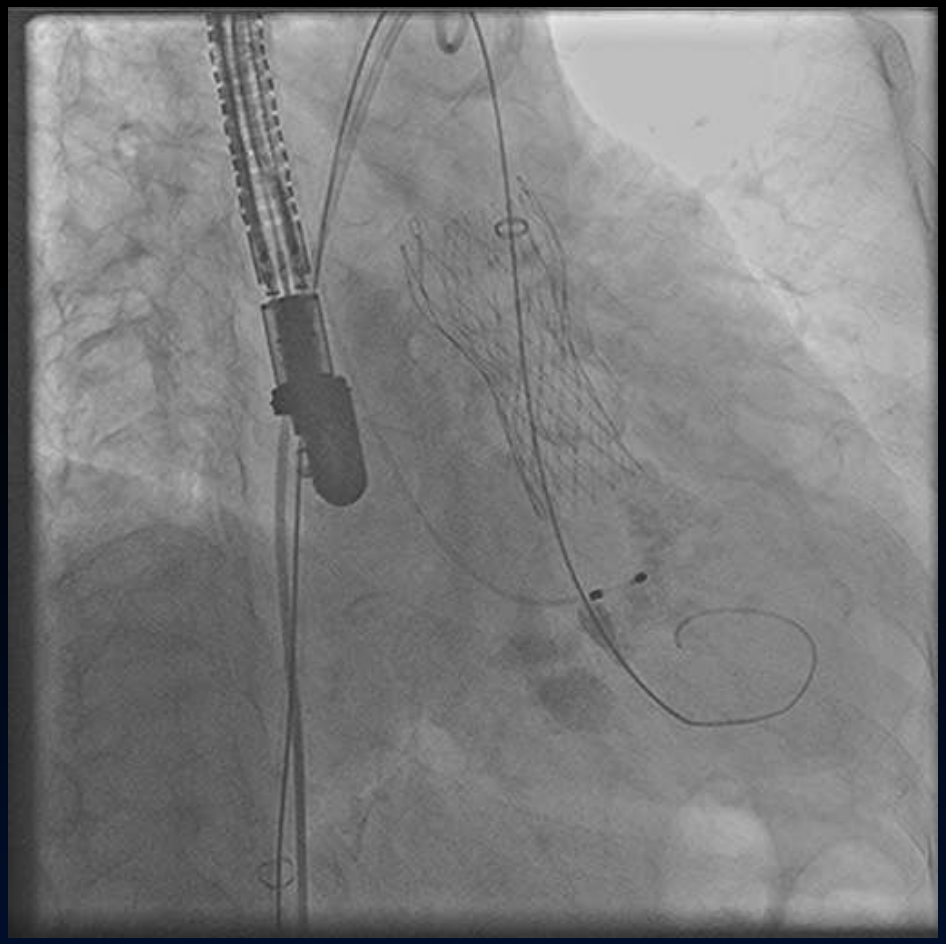
. Pull the pig tail

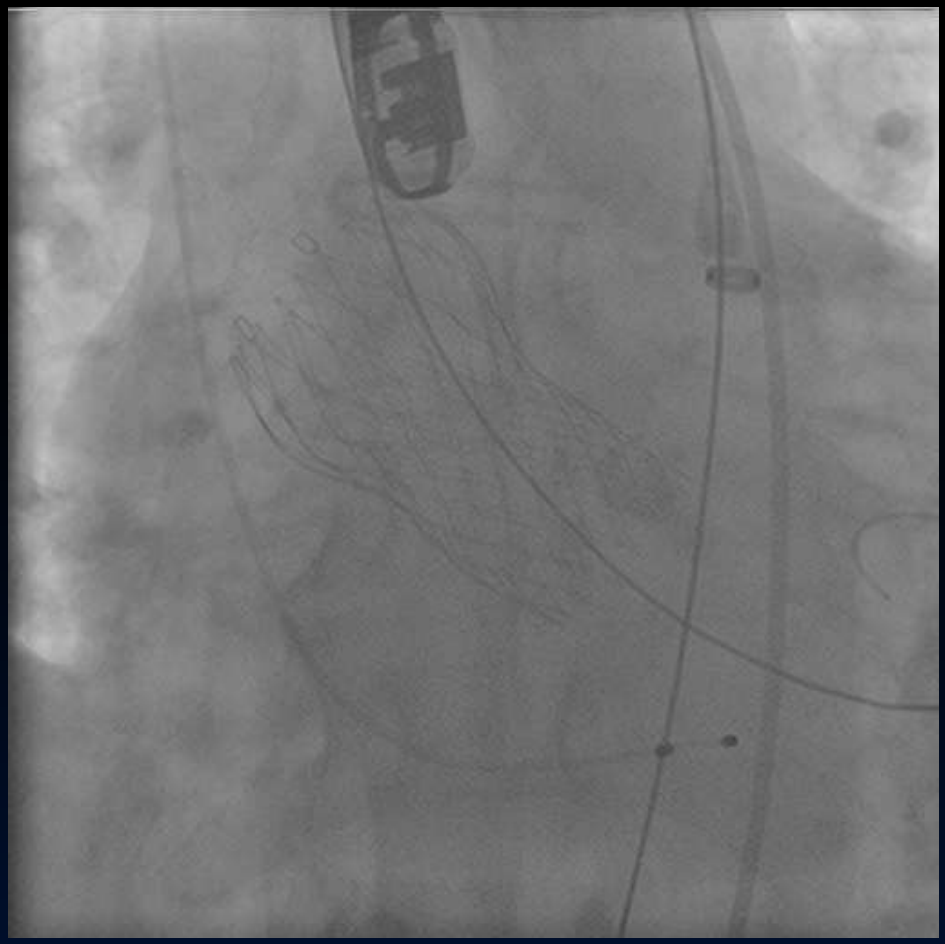
Detachment of Corevalve



Detachment of Corevalve

Extremely caution with nose cone…





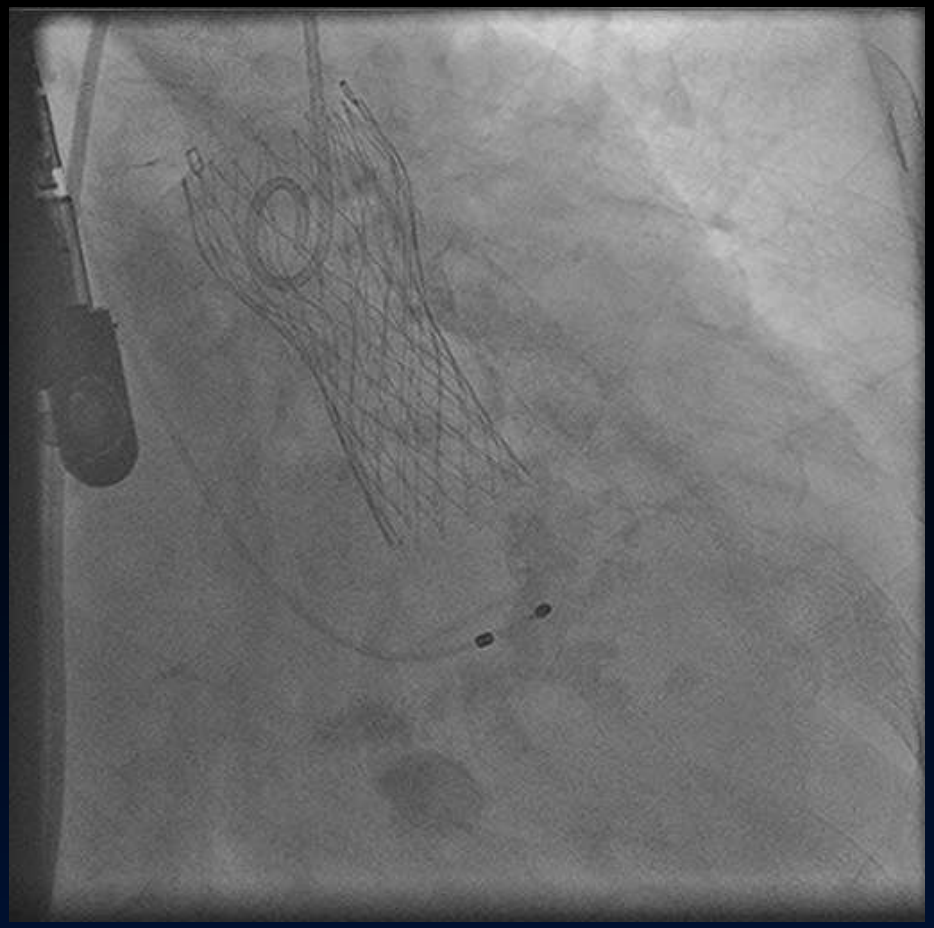
The procedure overview

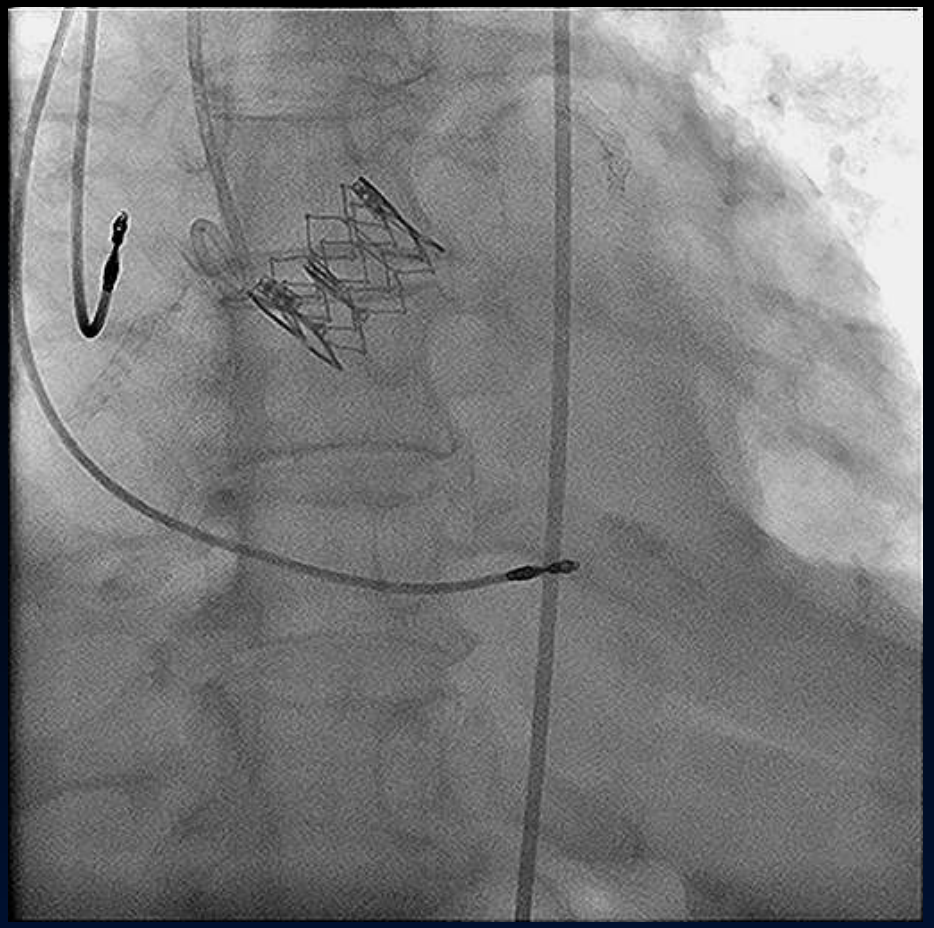
➢ Fundamentals steps:

- ✓ *Obtain vascular access*
- ✓ *Cross stenotic native valve and position LV stiff wire*
- ✓ *Balloon aortic valvuloplasty*
- ✓ *Transcatheter heart valve deployment*
- ✓ ***Assess results: haemodynamics / TEE / angio***

Assessment immediately after TAVI

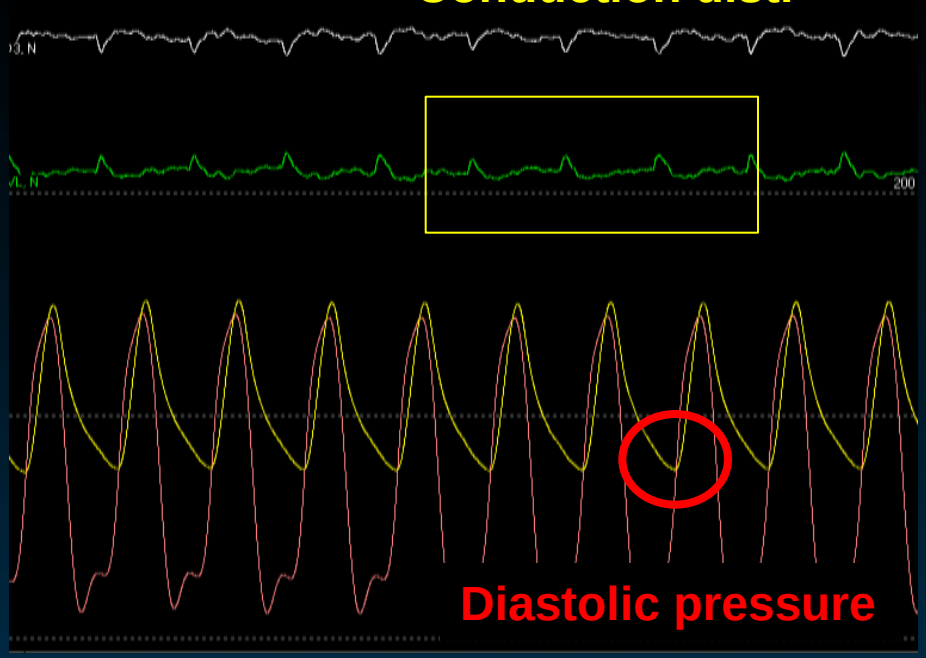
- Assess
  - Valve location, expansion & movement
  - AR severity
  - Coronary patency





Assessment immediately after TAVI

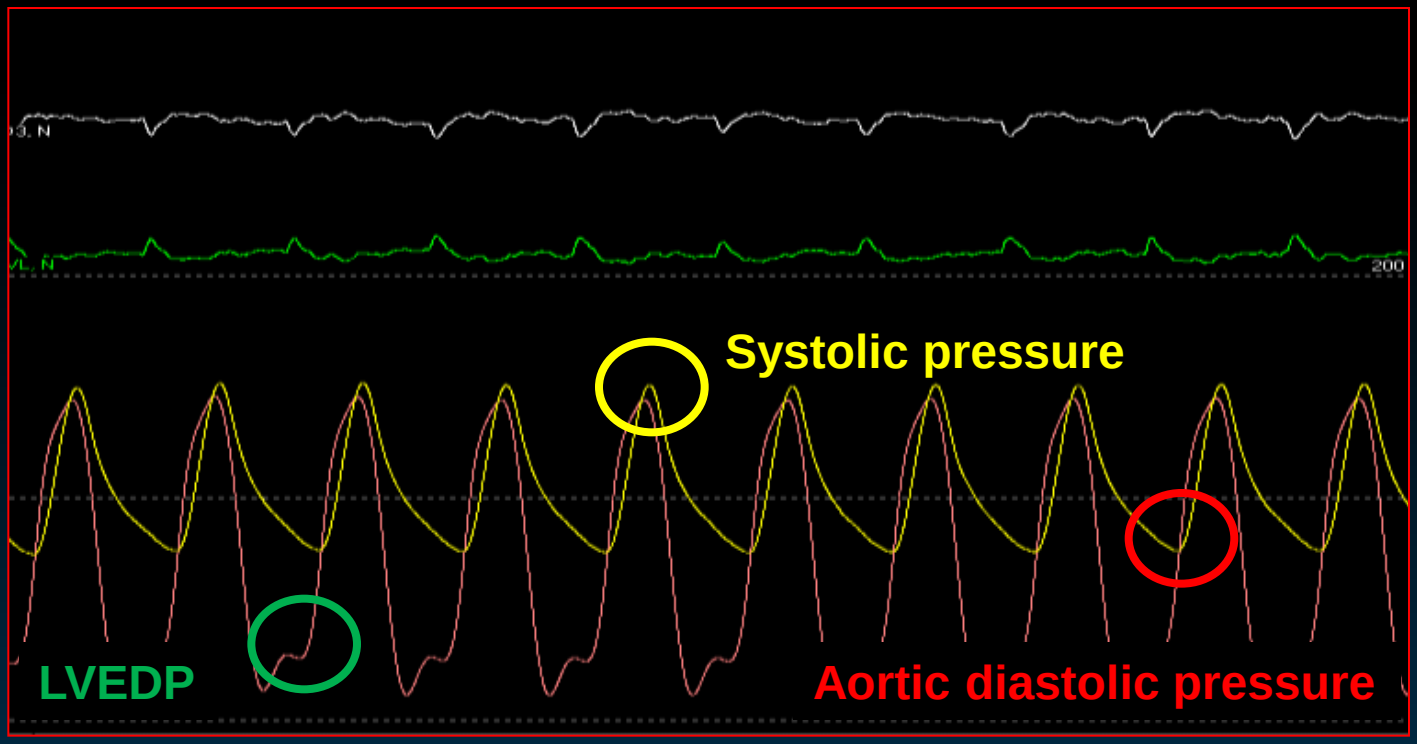
- Assess
  - BP waveform, gradient, diastolic pressure
  - HR, PAP
  - ECG, ST-T, conduction disturbances



Assessment immediately after TAVI

AR index – prognostic information

$$\frac{\text{Aortic diastolic pressure – LVEDP}}{\text{Systolic aortic pressure}} \times 100$$

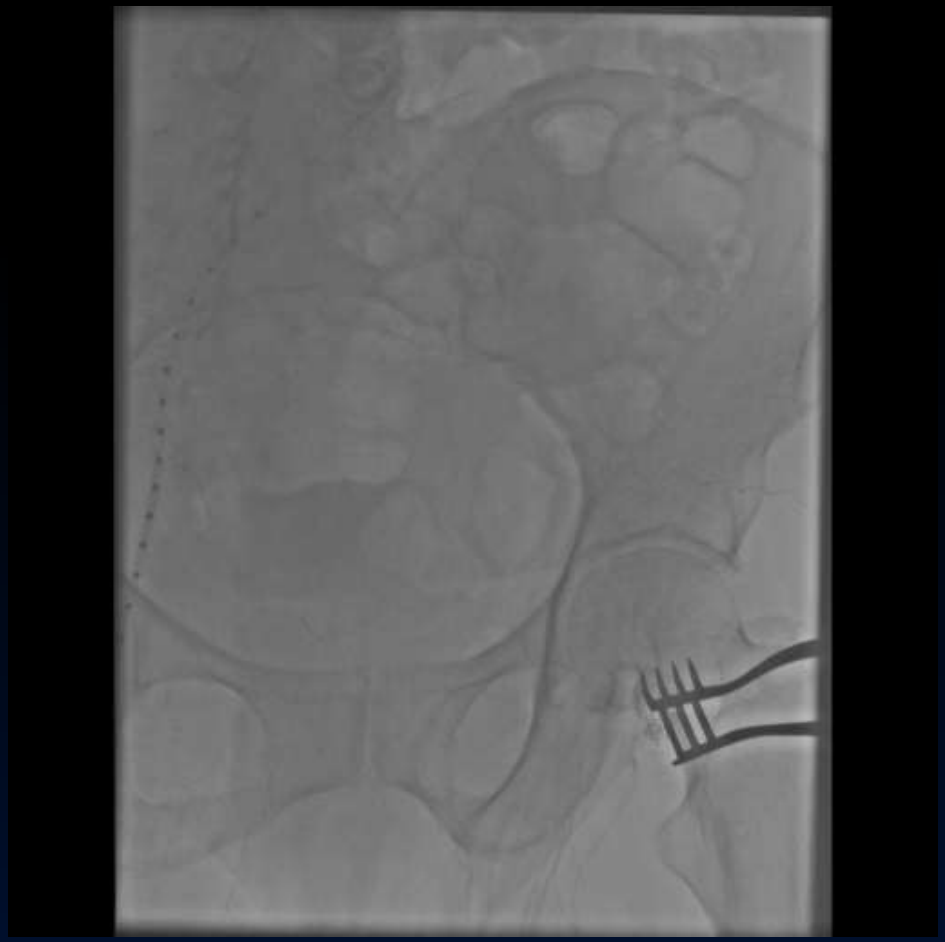


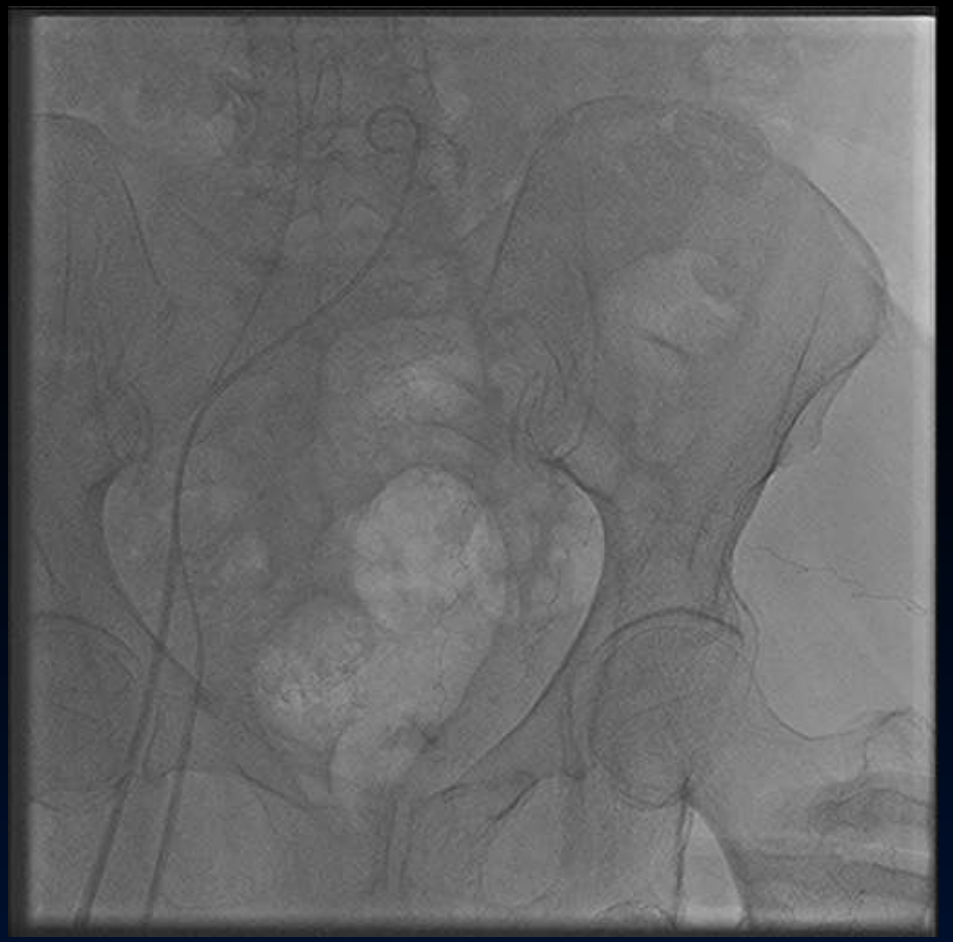
Assessment immediately after TAVI

- By TEE , look for:
  - Valve location & movement
  - Leaflet motion
  - Para-valvular AR
  - Valvular AR (after removing stiff wire)
  - Mitral regurgitation
  - LV wall motion
  - Pericardium
  - Aortic wall (haematoma / dissection ?)

Angiography after access closure

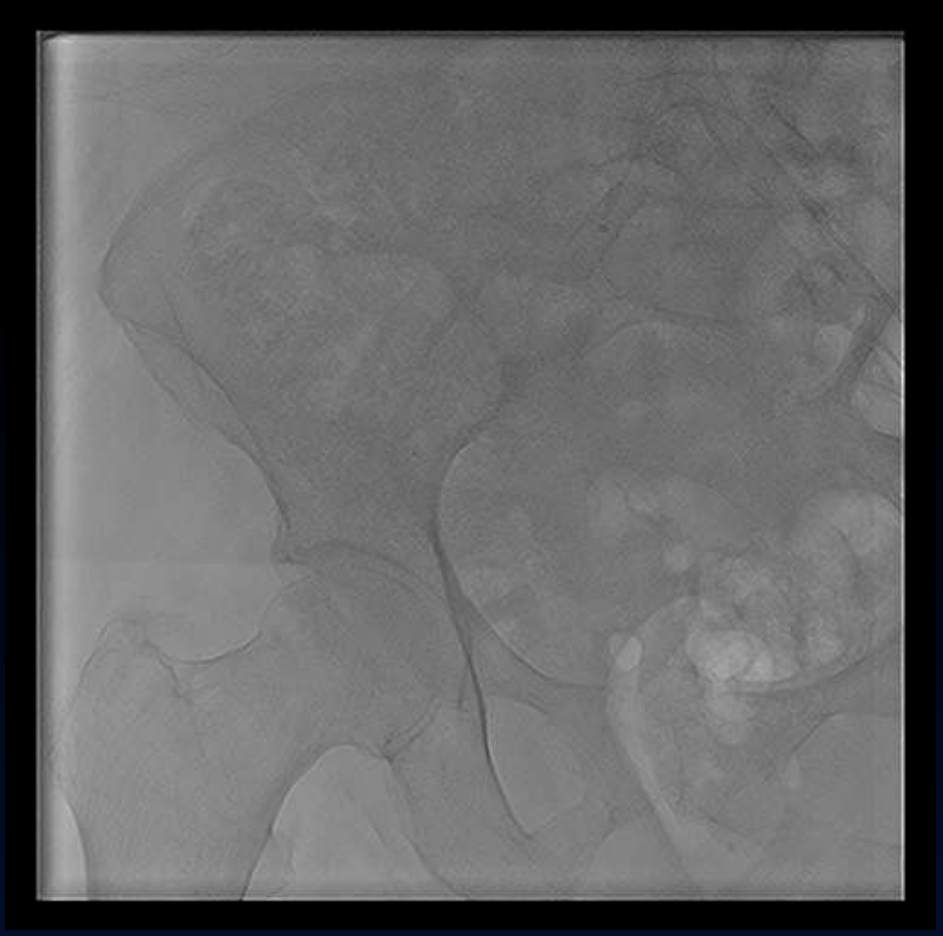
- Surgical cutdown with repair or
- Percutaneous closure (1 Prostar, 2 Proglides)





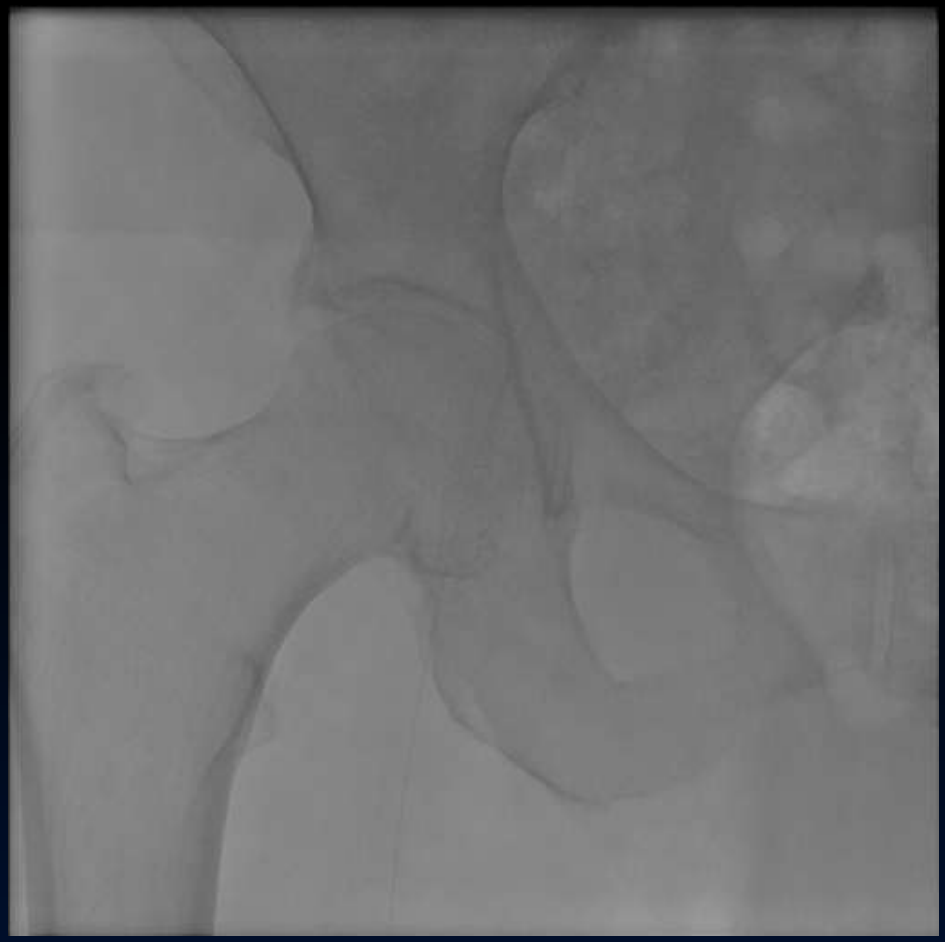
Angiography after access closure

Many complications are detected after sheath removal



Angiography after access closure

Many complications are detected after sheath removal and must be treated promptly



The procedure overview

Conclusions

- **Transcatheter AVI is a Unique Procedure:**
  - **Attention to the technical details of implantation is mandatory for a successful TAVI**
  - **Multiple people must act in perfect coordination during the crucial seconds**
  - **We should optimize the chances for success and mitigate against the risk of failure**
  - **Detailed post-op deconstruction of cases accelerates learning curve and improves team cohesion**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