Ablation Techniques / Implantations

How to Ablate Paroxysmal AF with Cryo-energy

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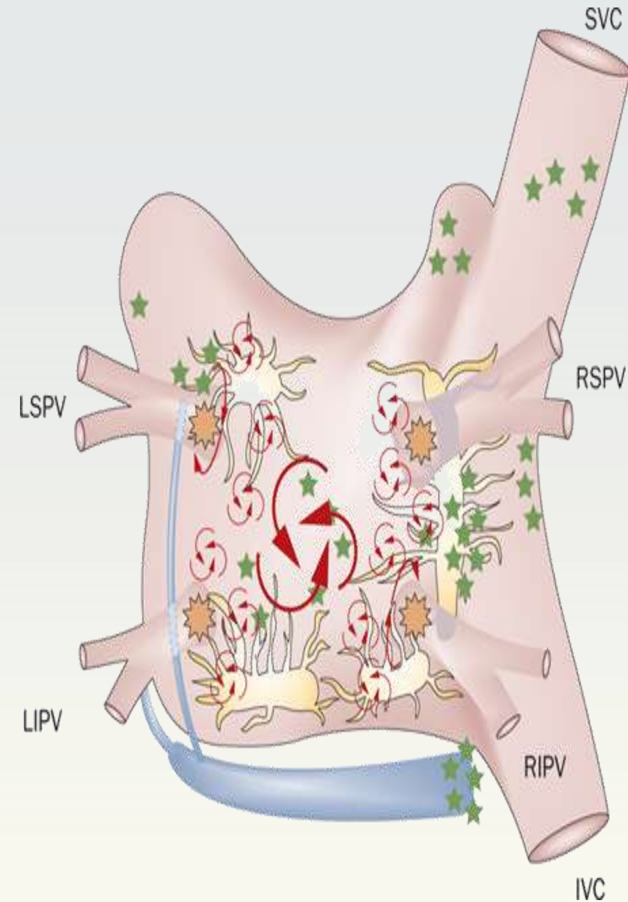
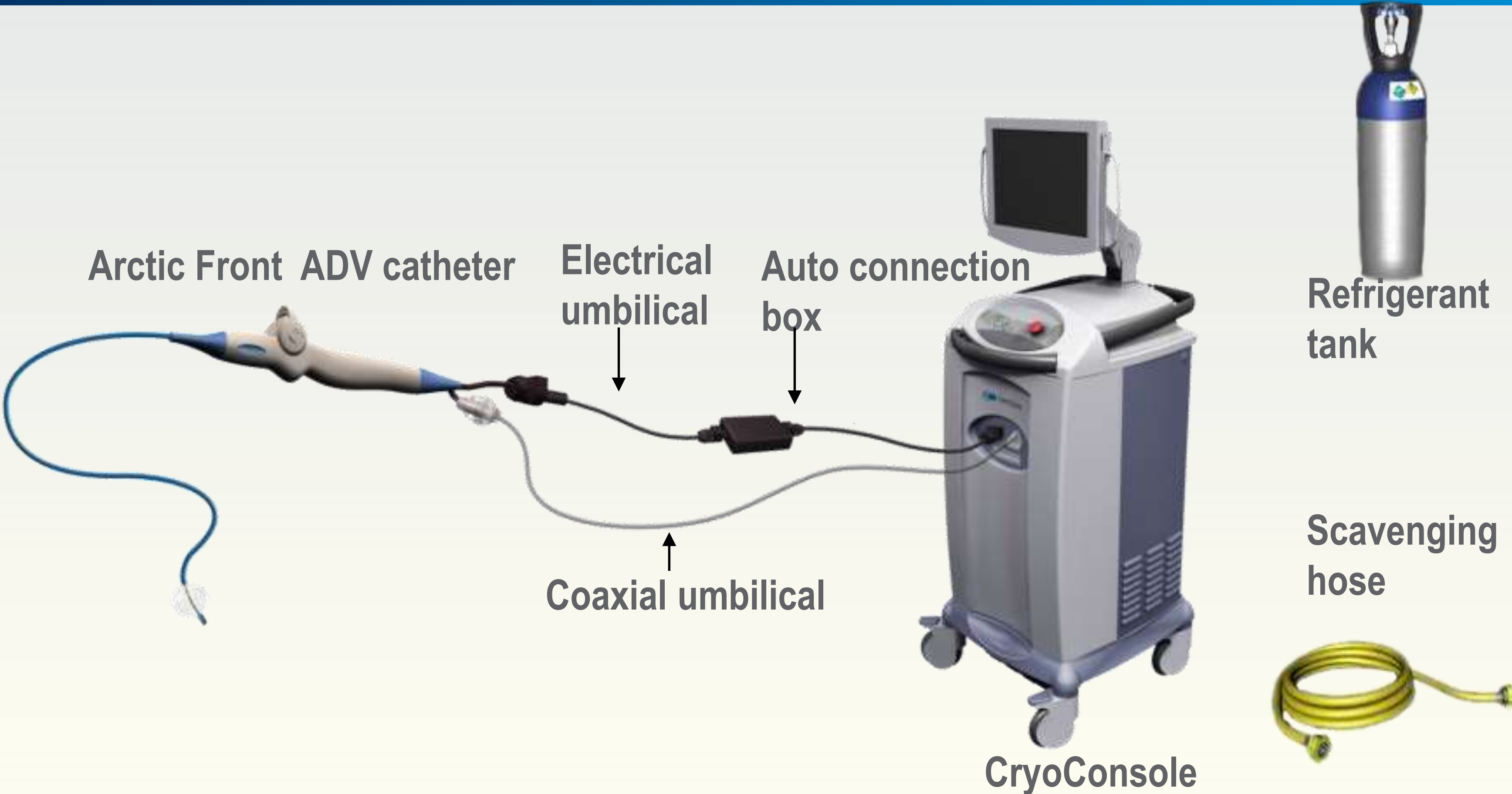


- **Ablation strategies that target the PVs are the cornerstone for most AF ablation procedures**
  - **If the PVs are targeted, electrical isolation should be the goal pulmonary vein isolation**

FIRE and ICE or FIRE vs. ICE

Pulse & Cardio Electrics 2016

Arctic Front Advance System components



FlexCath® Advance Steerable Sheath

- 12 F ID / 15 F OD
- Overall length 81 cm
- Useable length 65 cm
- Catheter compatibility: up to 10.5 Fr
- Guide wire compatibility: .032" to .035"

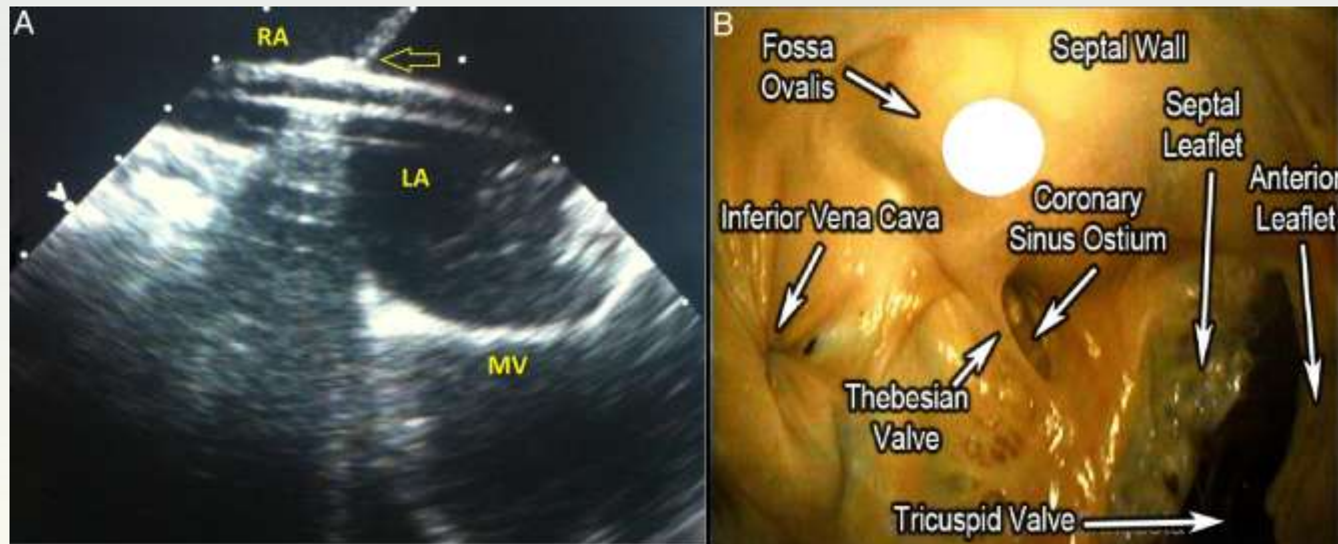
- Unidirectional deflection
- 135° with Cryoballoon and Achieve / guidewire inside

- FlexCath Advance is not approved for transseptal puncture

The Cryoballoon Ablation Procedure: Femoral and Left Atrial Access

- Initial femoral vein access with a shallow angle of entry and then predilation with a 14Fr short dilator
- Initial LA access is best achieved using a standard transseptal sheath
- Full anticoagulation with IV heparin bolus

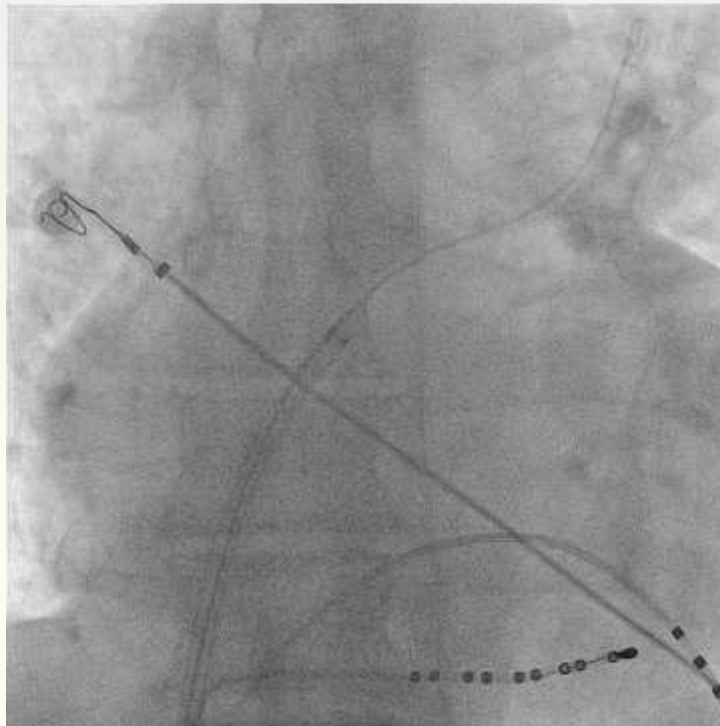
The Cryoballoon Ablation Procedure: Femoral and Left Atrial Access



Lower and more anterior transseptal access

The Cryoballoon Ablation Procedure: Femoral and Left Atrial Access

- The FlexCath can be **exchanged** over a long stiff guidewire using a corkscrew motion or rotation for initial engagement
- Place the stiff exchange guidewire in the **left superior PV** or maneuver the guidewire to the **right superior PV**



The Cryoballoon Ablation Procedure:
Femoral and Left Atrial Access

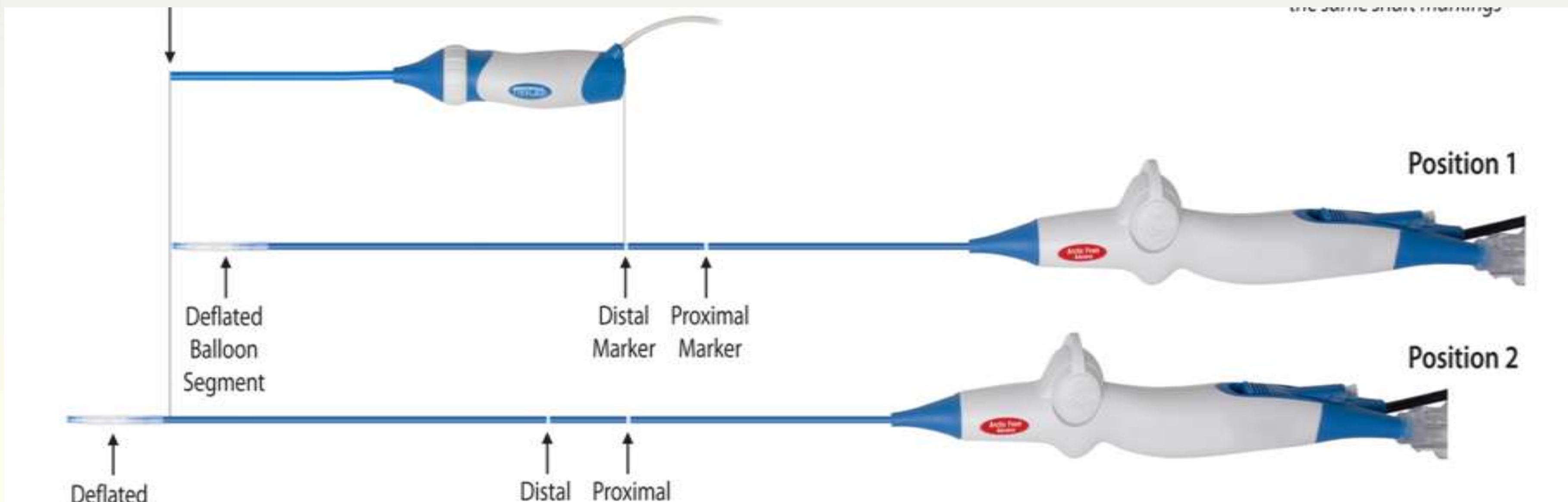
Ablation Steps with Achieve

6. Reposition

5. Thawing/
Deflation

Prior to Inflation, Confirm Balloon Position

- ❑ **Use the shaft marker rings to confirm balloon position relative to the sheath tip**



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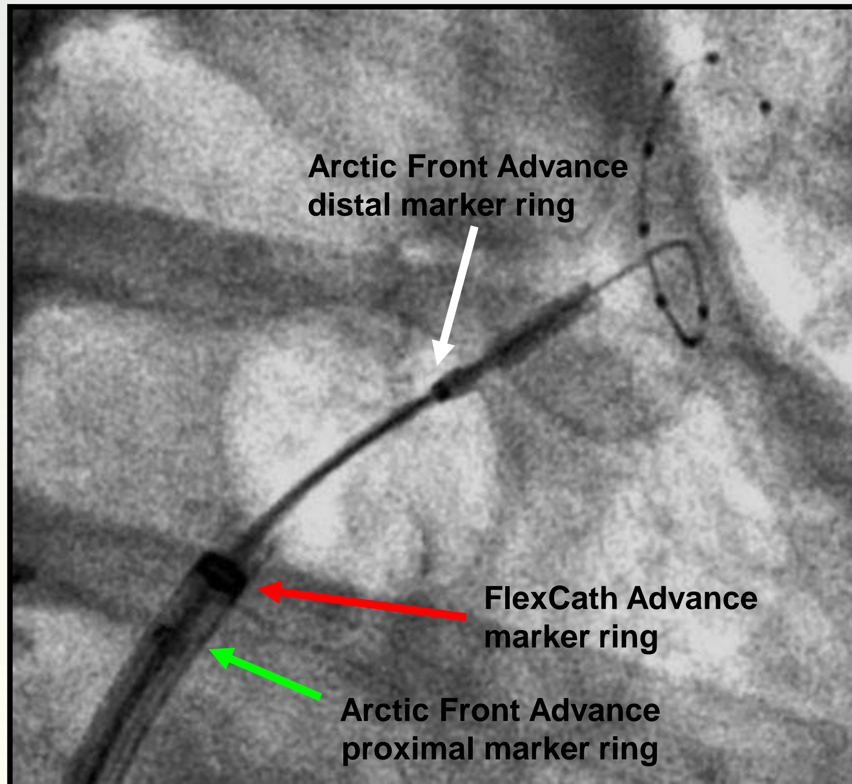
Position Achieve

- ❑ Fully deploy the Achieve loop in the left atrium
- ❑ Advance Achieve into the target pulmonary vein
  - If Achieve rotation is required: Always rotate clockwise
- ❑ Advance the balloon into the left atrium
- ❑ Position Achieve at the PV ostium to record pre-ablation signals
- ❑ For balloon positioning, advance Achieve again distal into the PV

Prior to Inflation, Confirm Balloon Position

- Use fluoro and radiopaque marker rings to confirm balloon position outside of pulmonary vein and outside of sheath prior to inflation



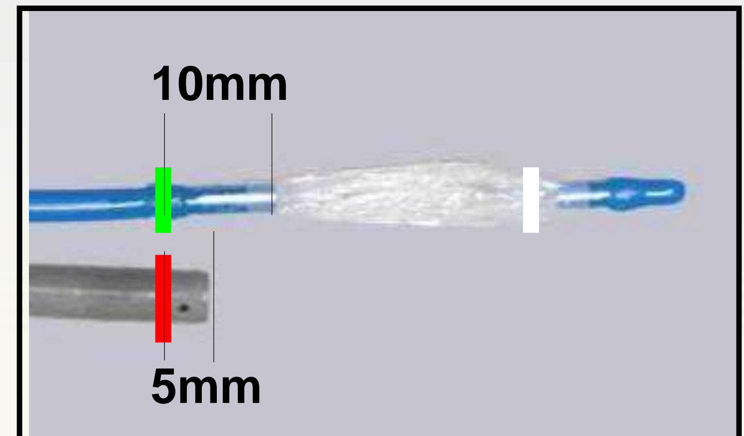


Image courtesy of Dr. Koller, Klinikum Kaufbeuren

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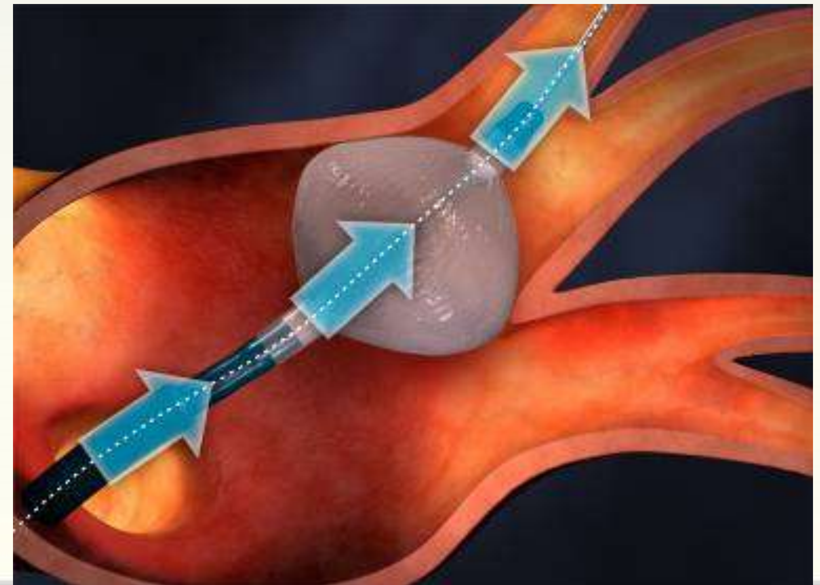
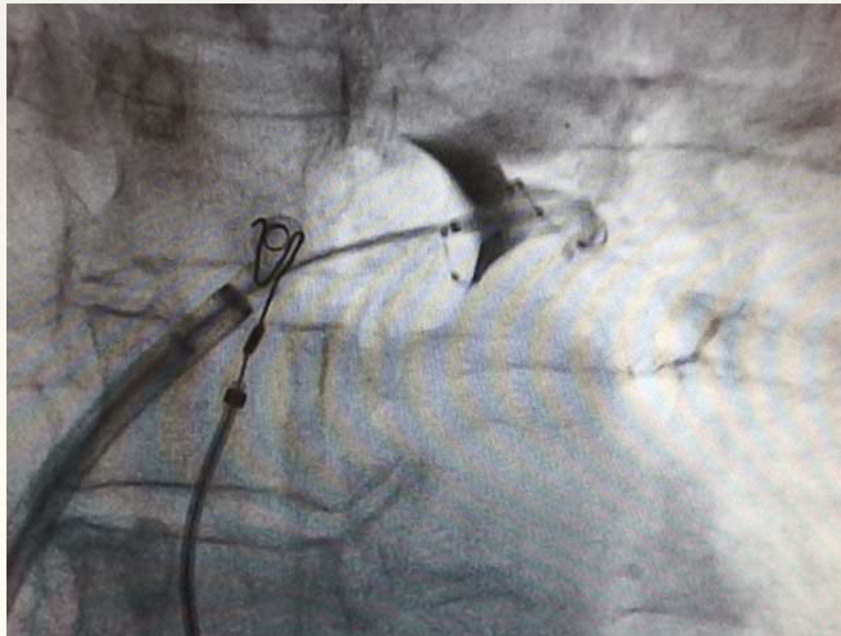
Positioning and Occluding the Veins

- Always lead the balloon with the soft-tipped mapping catheter
- Distal positioning of the Achieve will facilitate advancement of the balloon to the respective PV
  - use the lower PV branch for isolation of inferior veins
- The Achieve mapping catheter should be used to obtain PV potential recordings
- The sheath should be aligned with the angle of the targeted PV



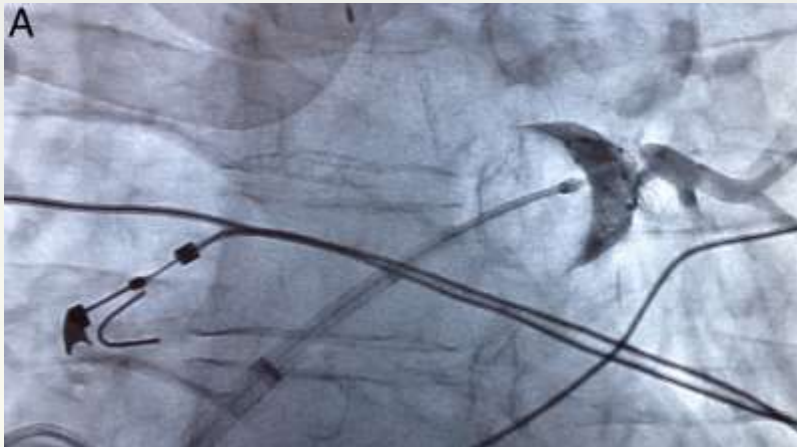
Positioning and Occluding the Veins

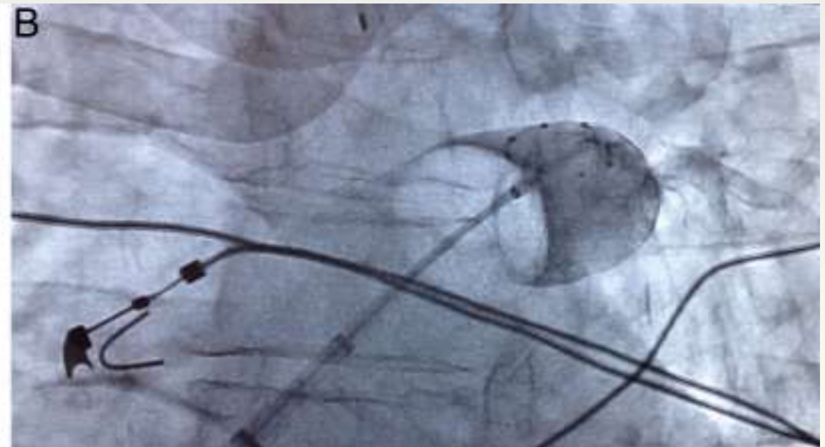
- The majority of the control of balloon–PV engagement is via the deflectable FlexCath sheath
- Injection of radiopaque contrast will provide venographic evidence of balloon occlusion or leak detection



Positioning and Occluding the Veins

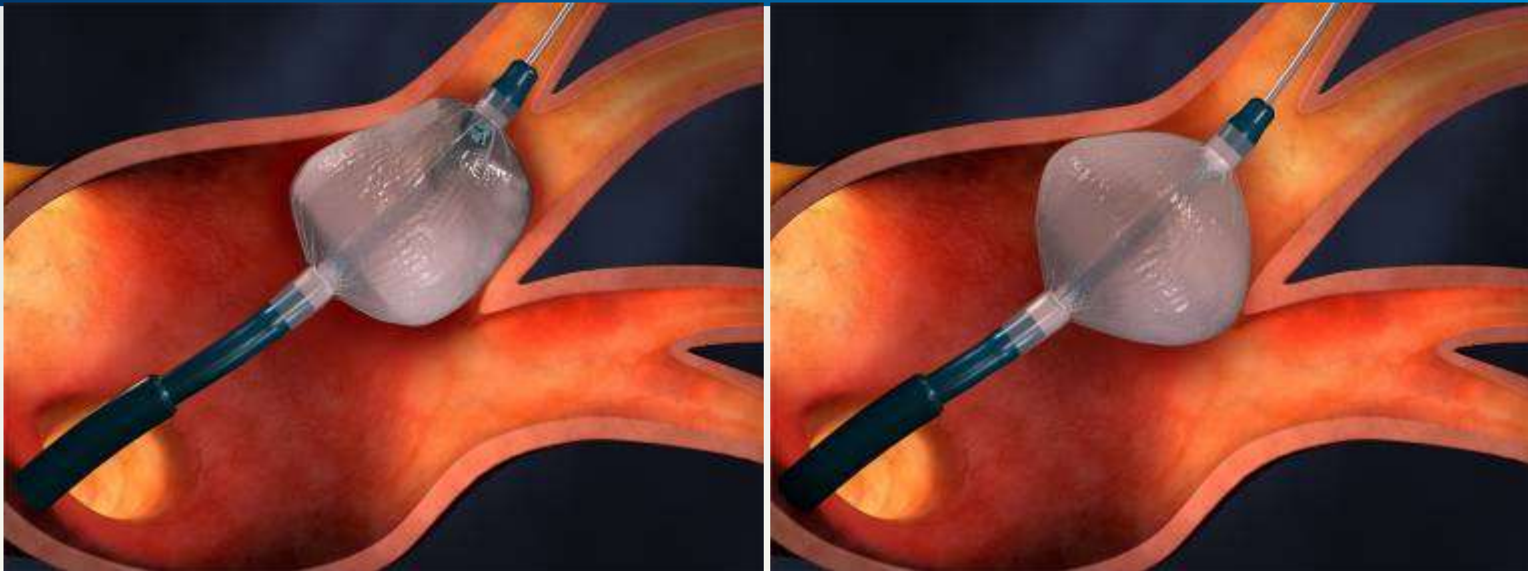
- If the venogram does not reveal a leak at the ostium, do not immediately ablate
  - The "proximal-seal" technique





- If the venogram detects a leak, small adjustments with additional pressure toward the side of the leak will often secure occlusion
  - separate application of ablation from a different angle should be performed
  - exchange Achieve for a stiff / extra stiff guidewire

Do not Inflate or Ablate Inside a Pulmonary Vein



Check the balloon shape on fluoro.
If the balloon appears longer than wide, it is likely inside a PV.

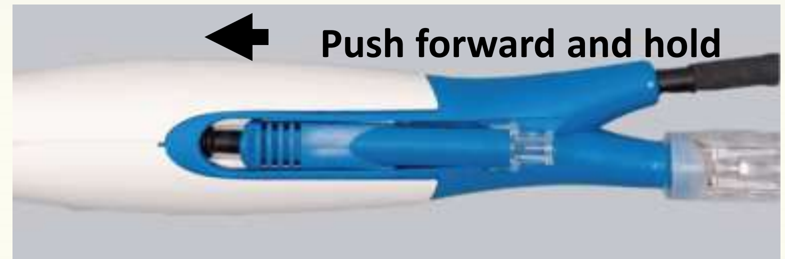
Deflate the balloon, retract the balloon into the LA and inflate again.

Always have Achieve or a Guidewire Inside the Cryoballoon

- If the balloon is not supported by Achieve or a guidewire, it may kink
- The Achieve loop / the floppy J-tip of the guidewire should be outside the balloon at all times

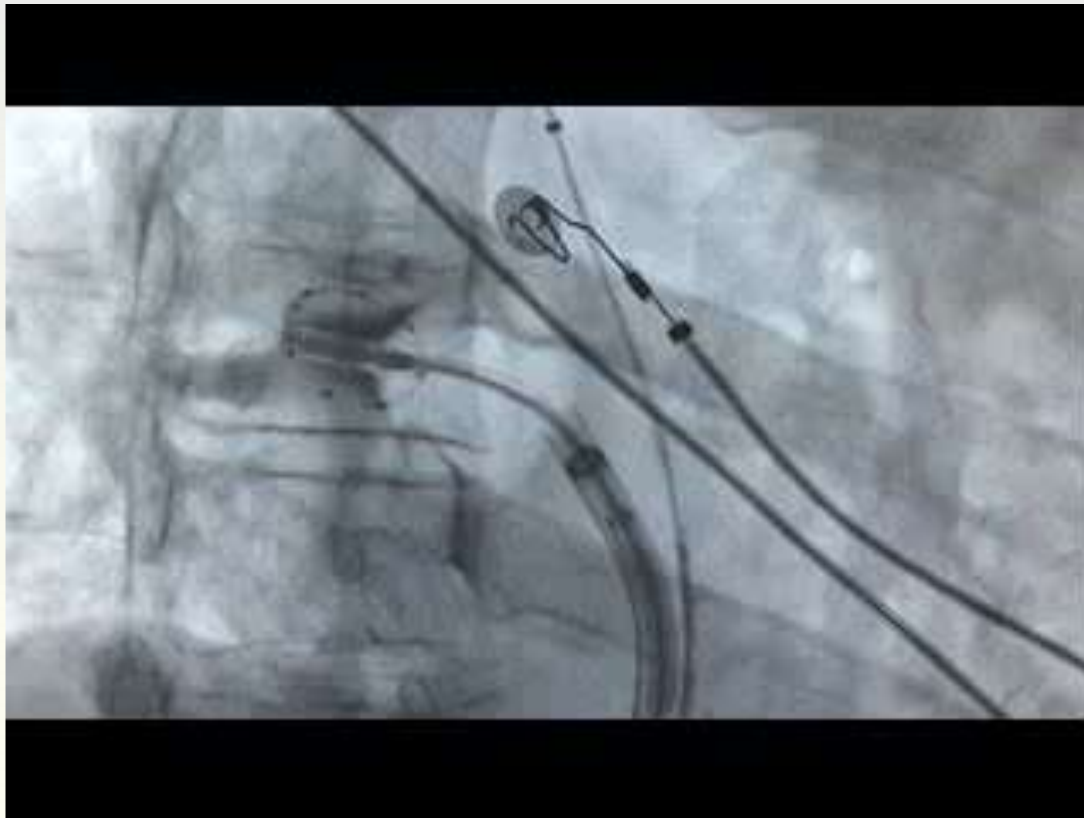
When to Use the Push Button

Correct Use	Precaution
❑ Prior to retracting the cryoballoon into the FlexCath sheath, use the following steps: ❑ Inflate the cryoballoon ❑ Advance the Push Button ❑ Deflate the cryoballoon	❑ Do not manipulate the cryoballoon during the freeze ❑ Prior to repositioning, ensure the cryoballoon is not adhered to the pulmonary vein

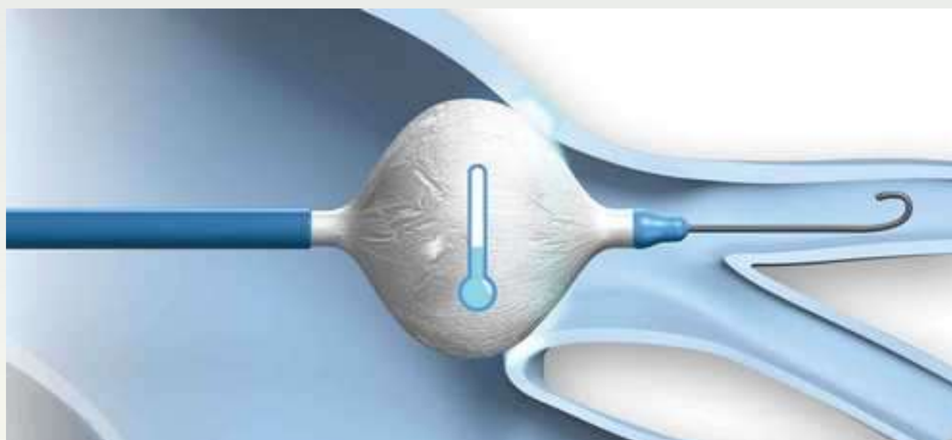


PV Antrum Ablation

- Ensure continued occlusion after freeze initiation
  - small 1-mL injection of contrast



PV Antrum Ablation



- Hold Arctic Front Advance in place for ~90 seconds for the best occlusion, adhesion and ablation

PV Antrum Ablation

- Avoid maneuvering the cryoballoon after initiation of ablation
  - within the first 15 seconds of ablation,a layer of ice can be observed on the surface of the balloon
  - 2 full separate applications
  - initiate the freeze and allow the balloon to enlarge and stiffen, then engage the PV ostium
- After freeze application, allow the balloon and tissue interface to thaw
  - Do not move the balloon catheter until the catheter temperature reading reaches 35ºC
  - “late adhesion”

Cryoballoon Dosing and Temperature

- Cryoballoon energy transfer is dependent on
  - the source of cryoenergy
  - balloon–tissue contact area
  - collateral warming
  - time
- Lesion depth is dependent on
  - nadir temperature
  - time
  - balloon–tissue contact area

Cryoballoon Dosing and Temperature

- The temperature displayed on the CryoConsole is not tissue temperature
  - instead it is a return gas temperature measure- ment
- Temperature is influenced by several parameters, among others:
  - Grade of occlusion
  - Balloon position (distal / proximal)
  - Balloon diameter
- Temperature may be used as indicator, but is not the primary predictor of successful isolation

Cryoballoon Dosing and Temperature

- Incomplete occlusion results in higher temperatures
- More distal balloon positions result in deeper temperatures
- A steep and rapid descent in temperature (colder than –40ºC at 30 seconds) is also a sign of a distal balloon position

- The best predictor of isolation is complete occlusion, not the achieved temperature

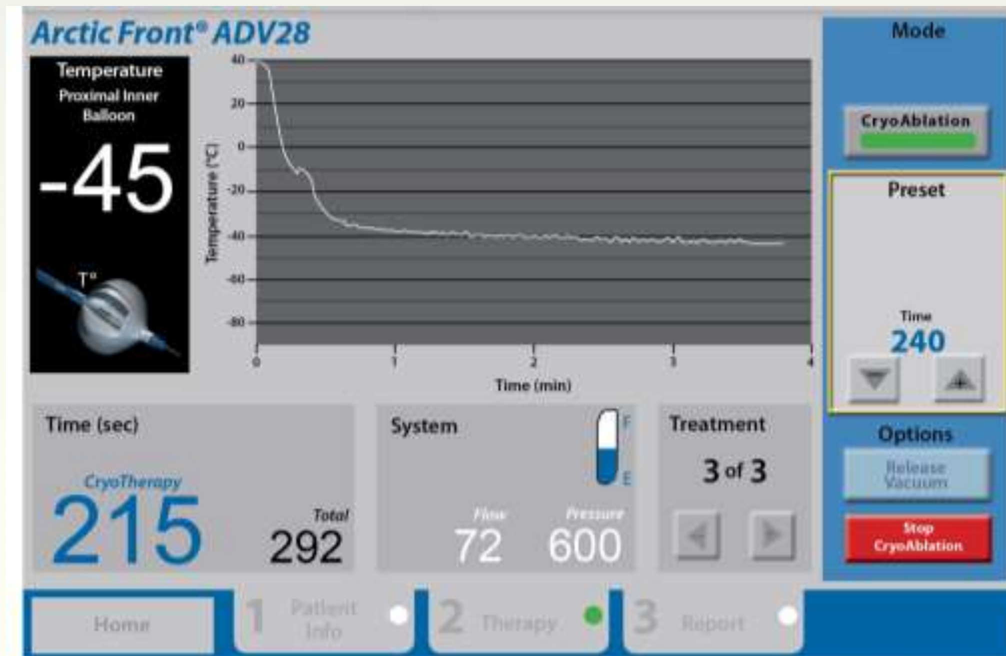
–40 to –50ºC for optimal lesions

Permanent PVI

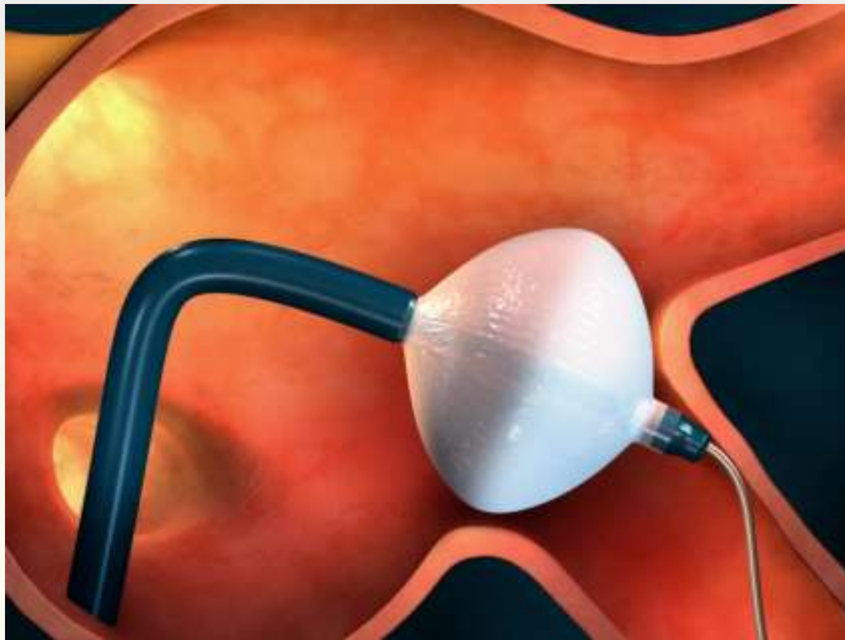
- Time To Isolation (TTI) is the most critical indicator and predictor of permanent PVI
  - best if < 90 seconds
  - reduction of the ablation time to150 seconds when a short TTI is seen (30 seconds)

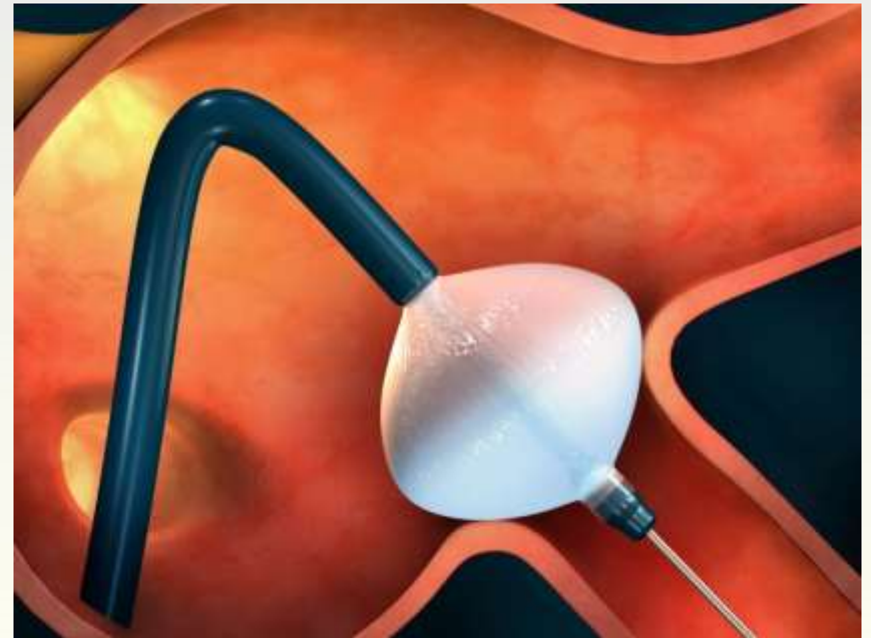
Cryoballoon Dosing and Temperature

- The standard ablation time was 240s (preset ablation time on the console)…
- The cryo lesion significantly grows for ~ 3 minutes, after 3 minutes there is not much lesion growth
- If the PV is not isolated within 180 modify the cryoballoon–tissue contact

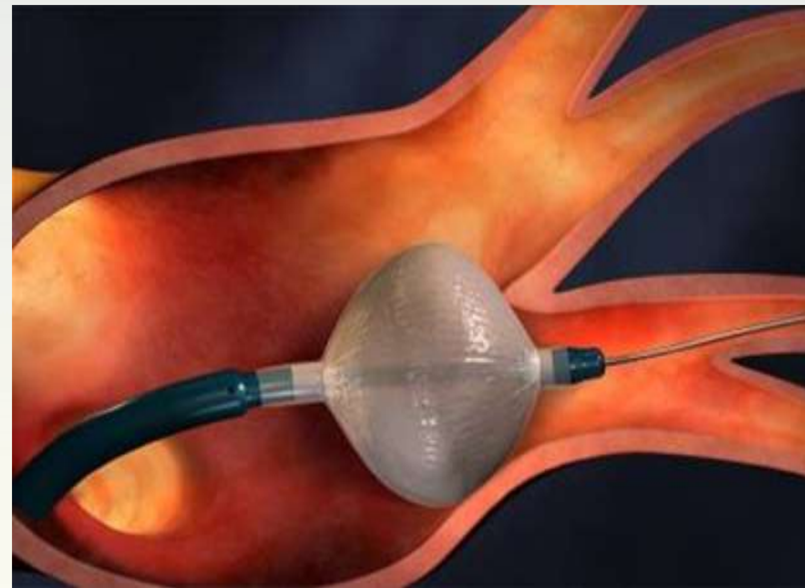


Cryoballoon Positioning to Improve Occlusion

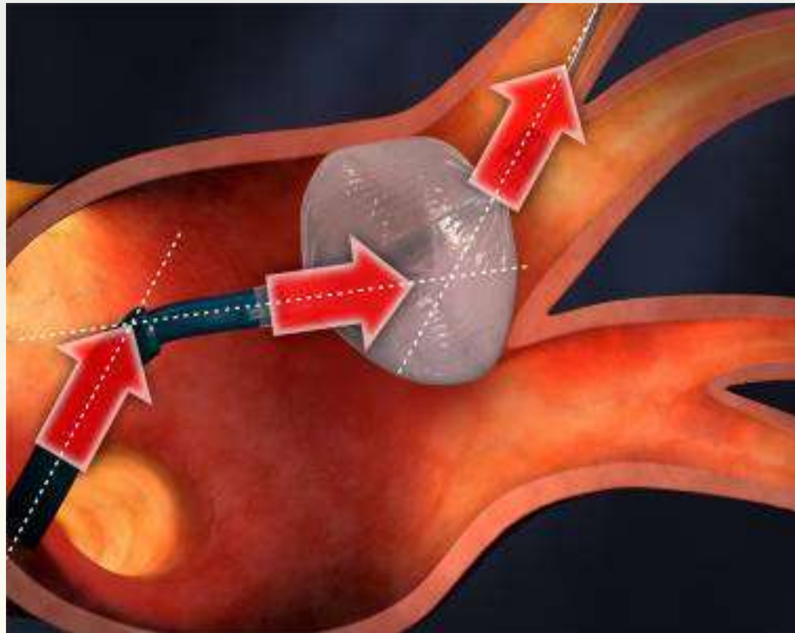


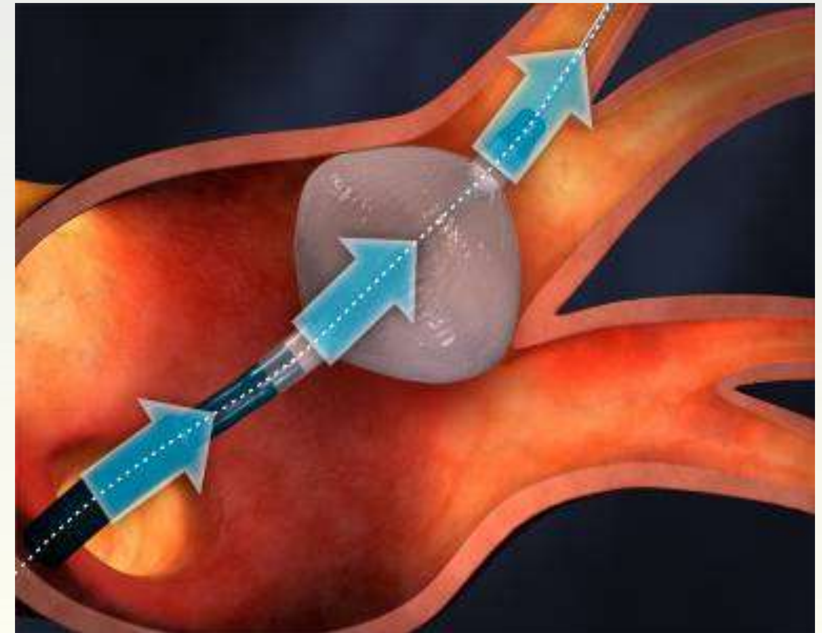


Deflect / Rotate FlexCath

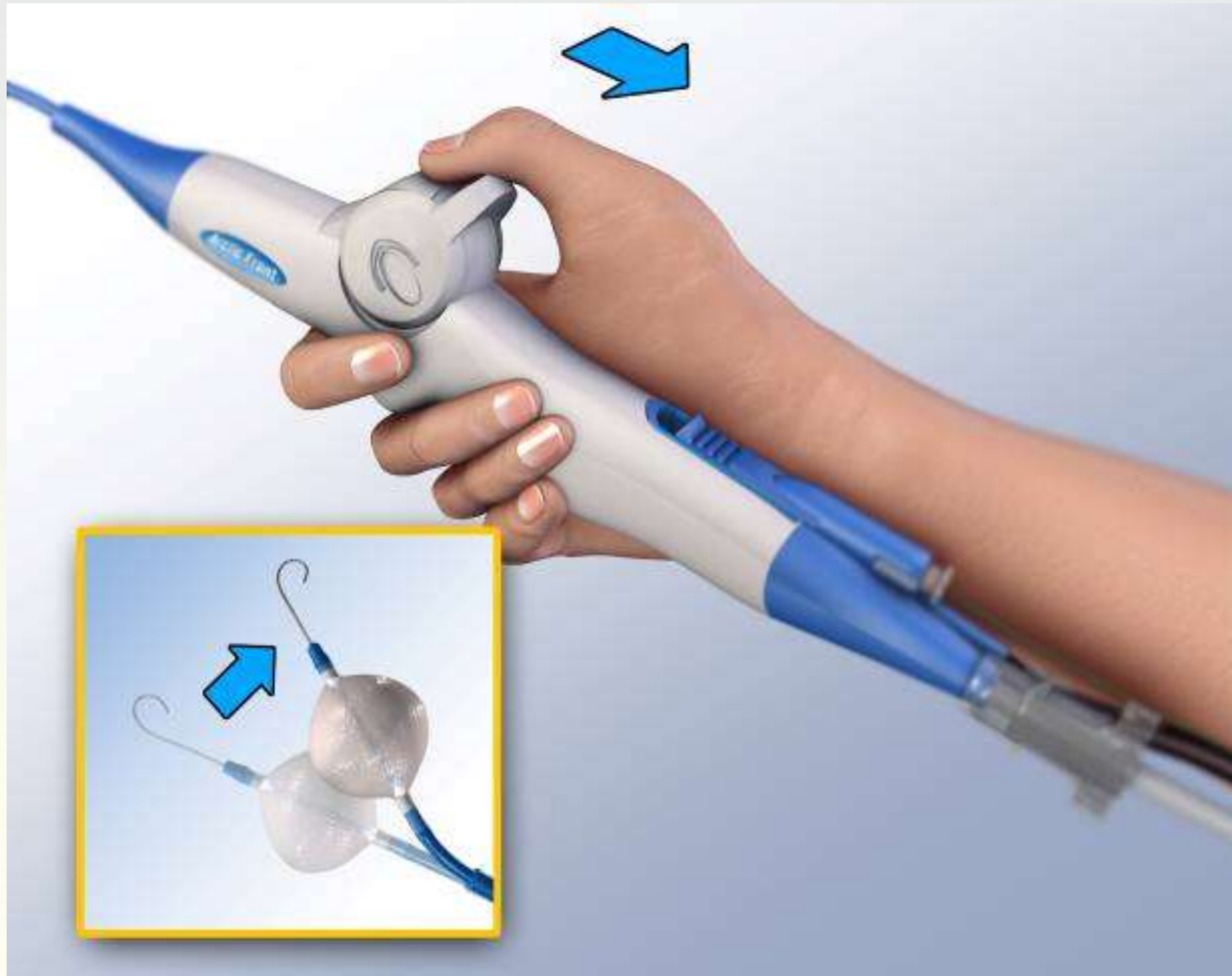


Align Guidewire, Balloon, Sheath

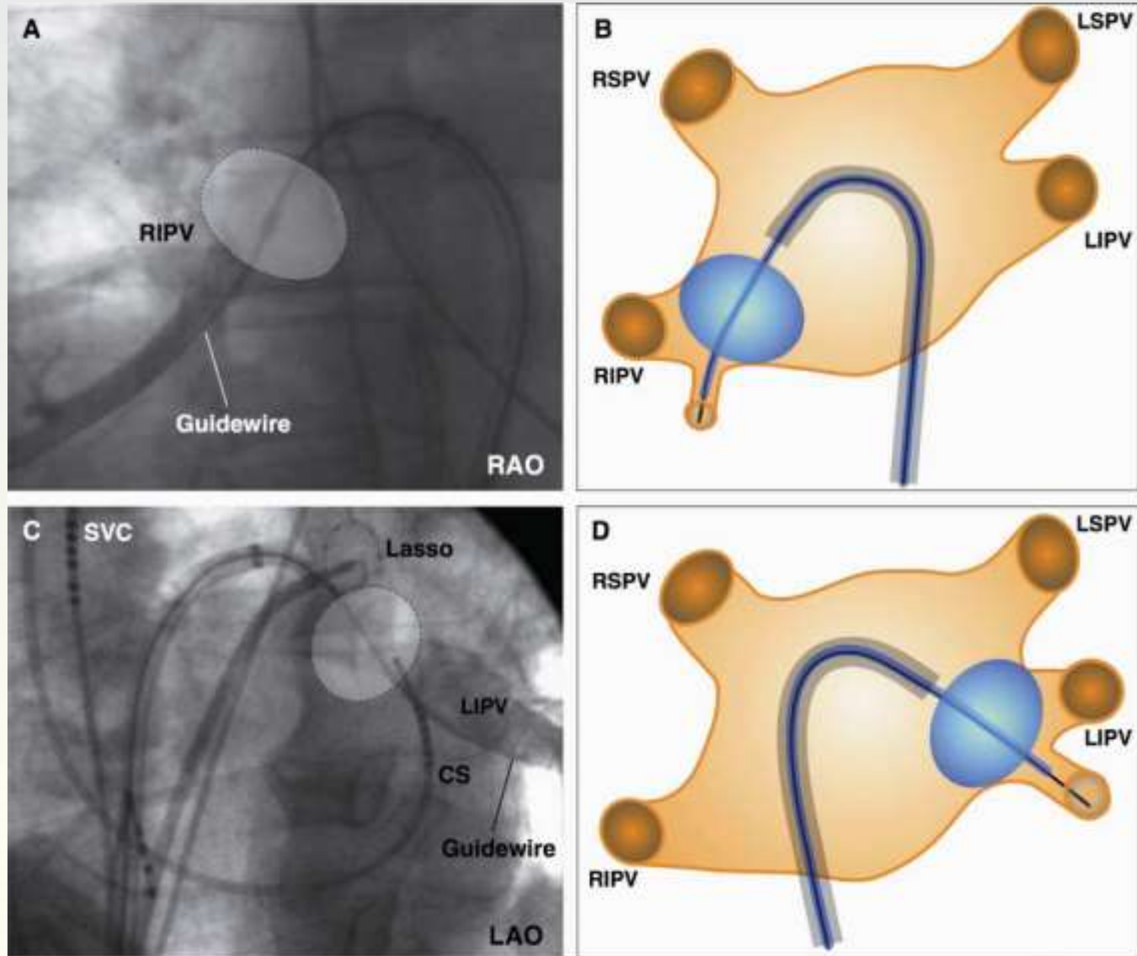


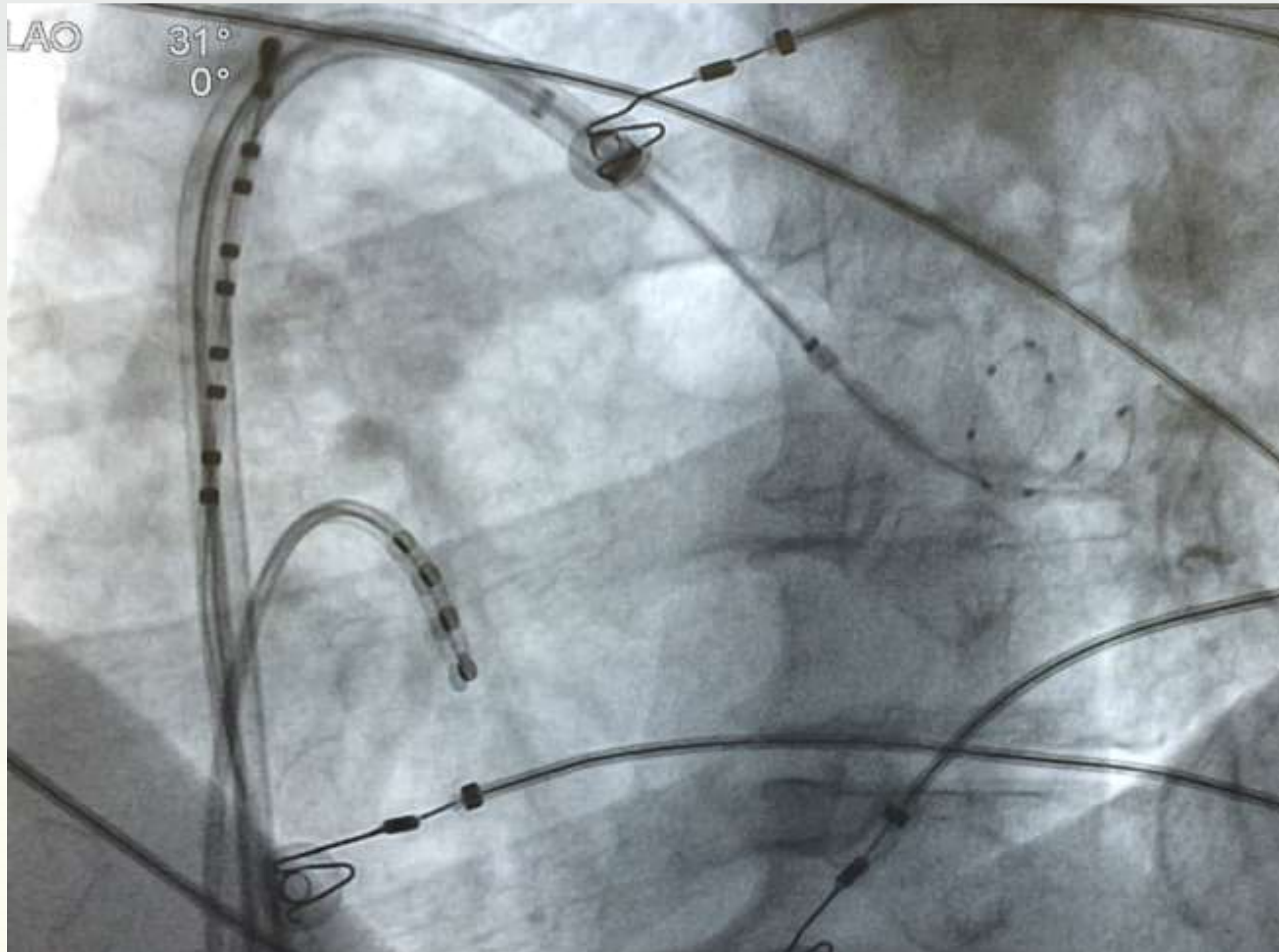


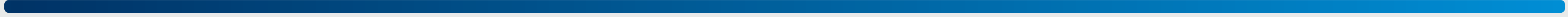
Use Cryoballoon Deflection



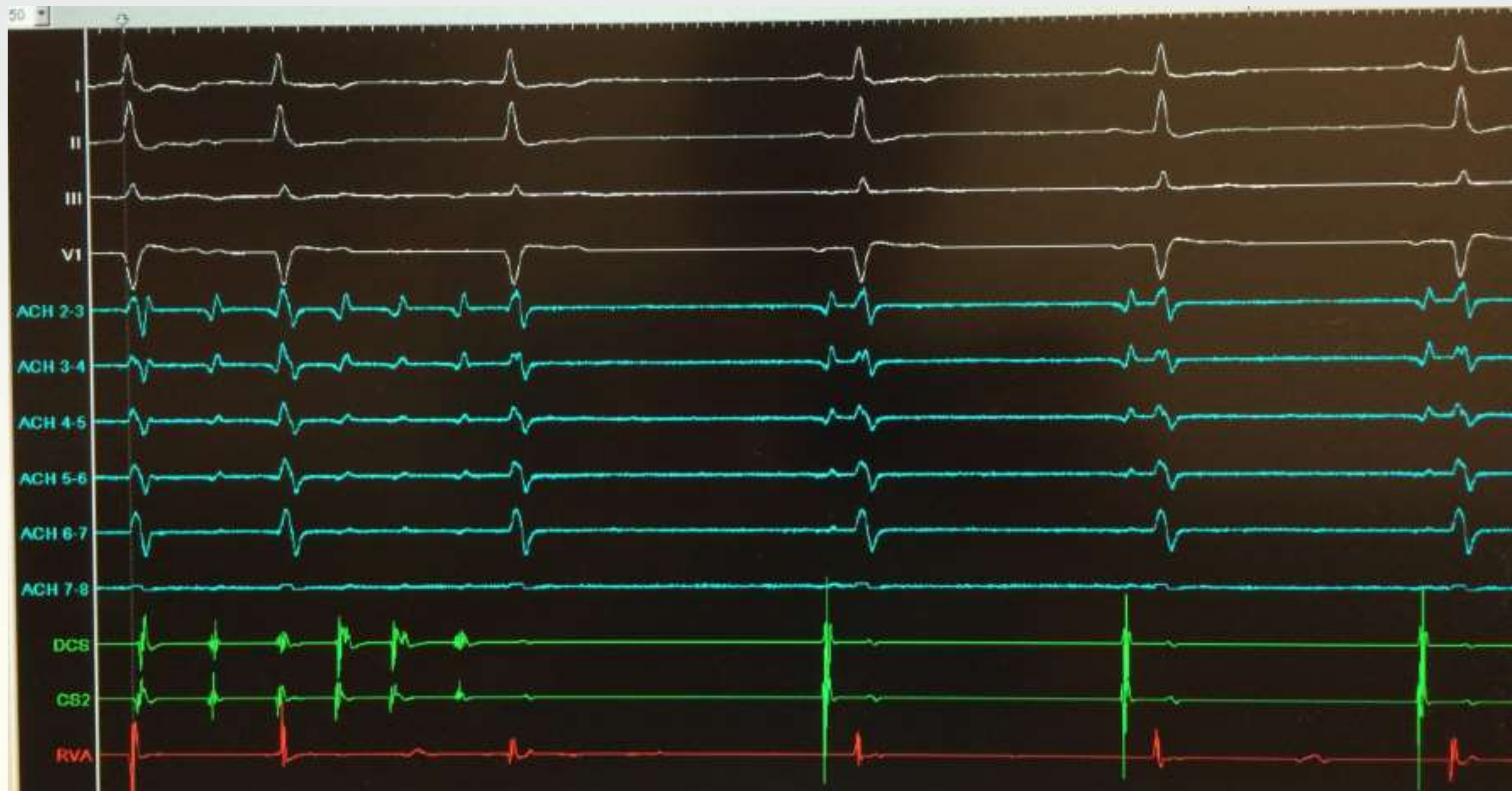
Hockey Stick Technique



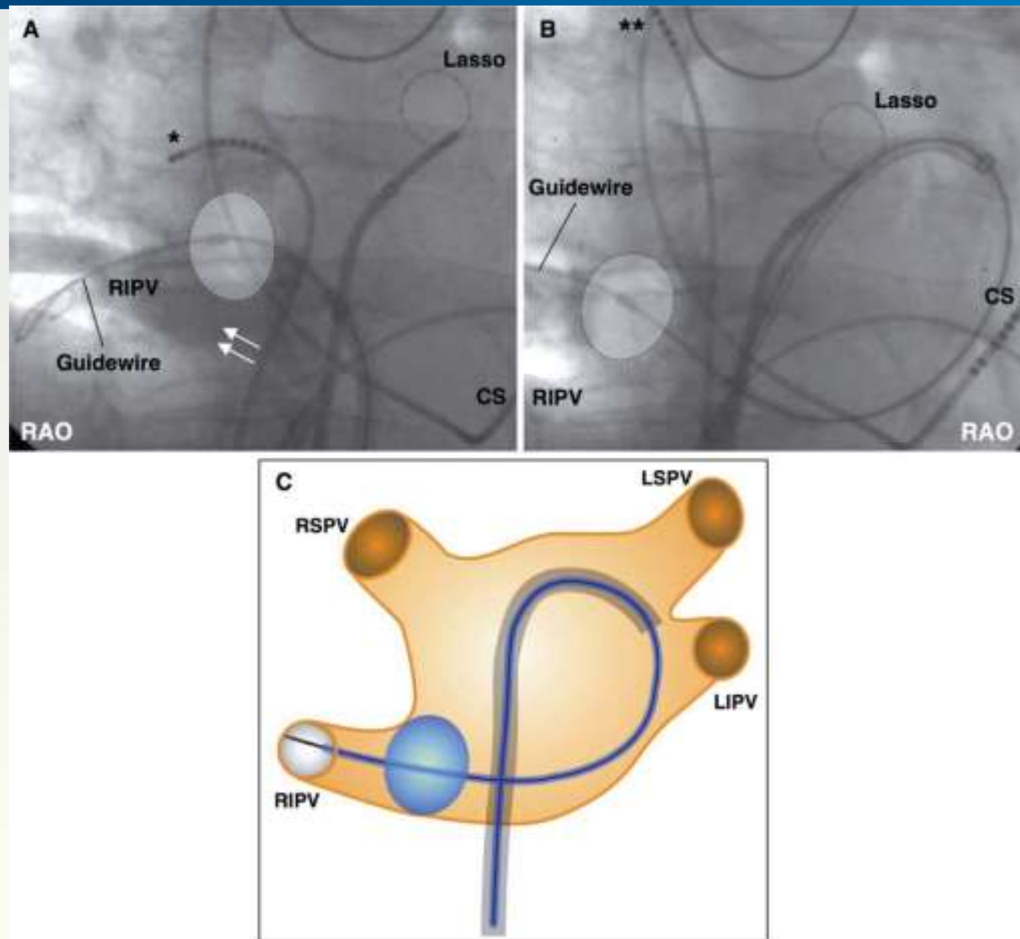

LAO
31°
0°



LIPV Isolation

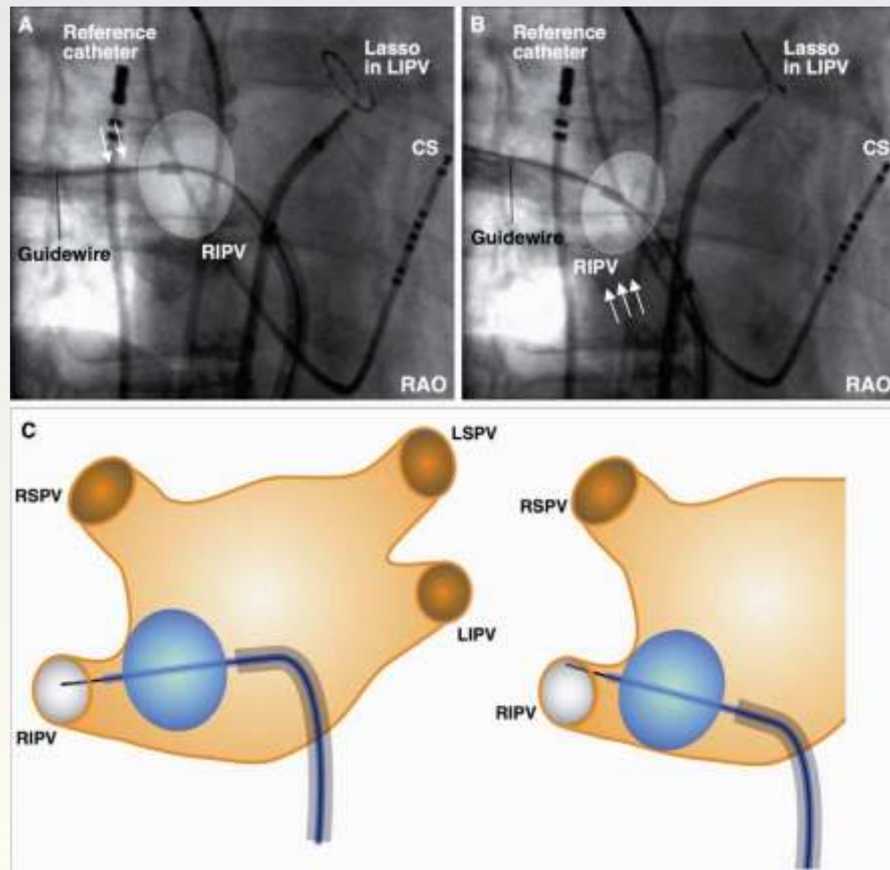


Big loop Technique



Big loop technique: (A) right inferior pulmonary vein (RIPV) with a large inferior gap (arrows) lacking an early PV branch

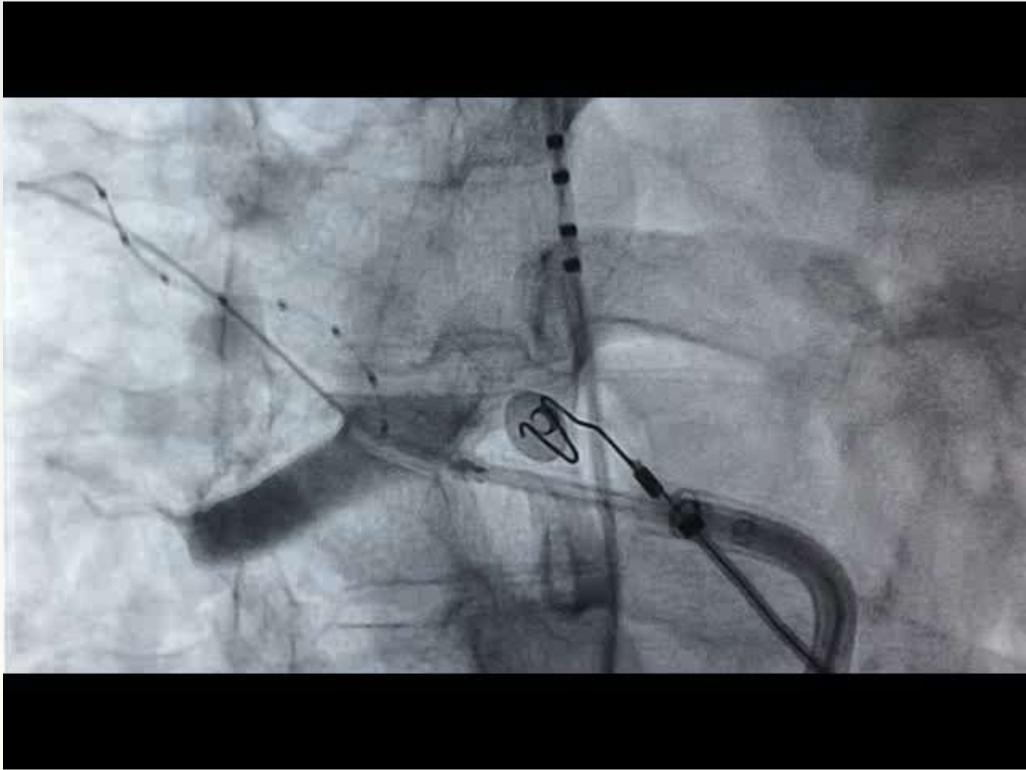
Pull-down Technique



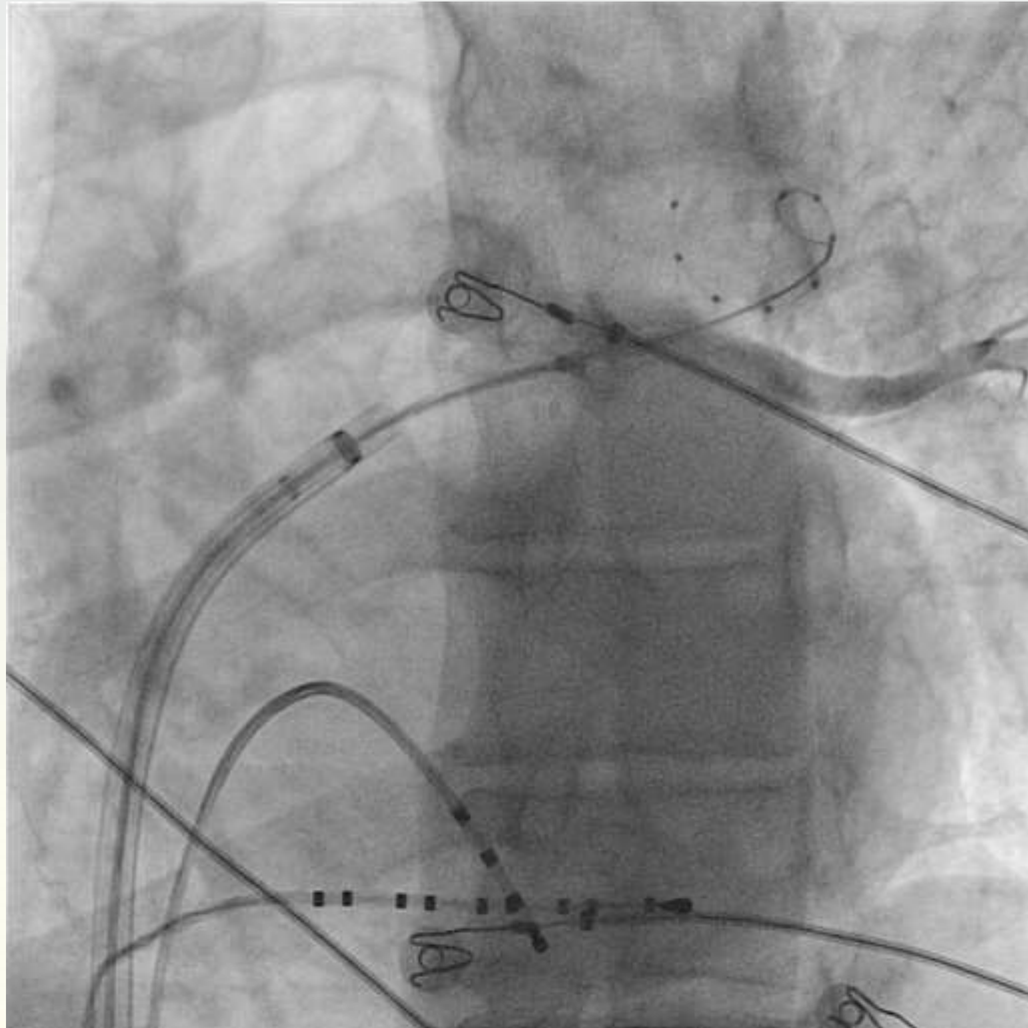
The balloon is positioned parallel to the pulmonary vein (PV) ostium. Both the sheath and the frozen cryoballoon attached to the superior PV circumference are pulled down to close the inferior gap (arrows).

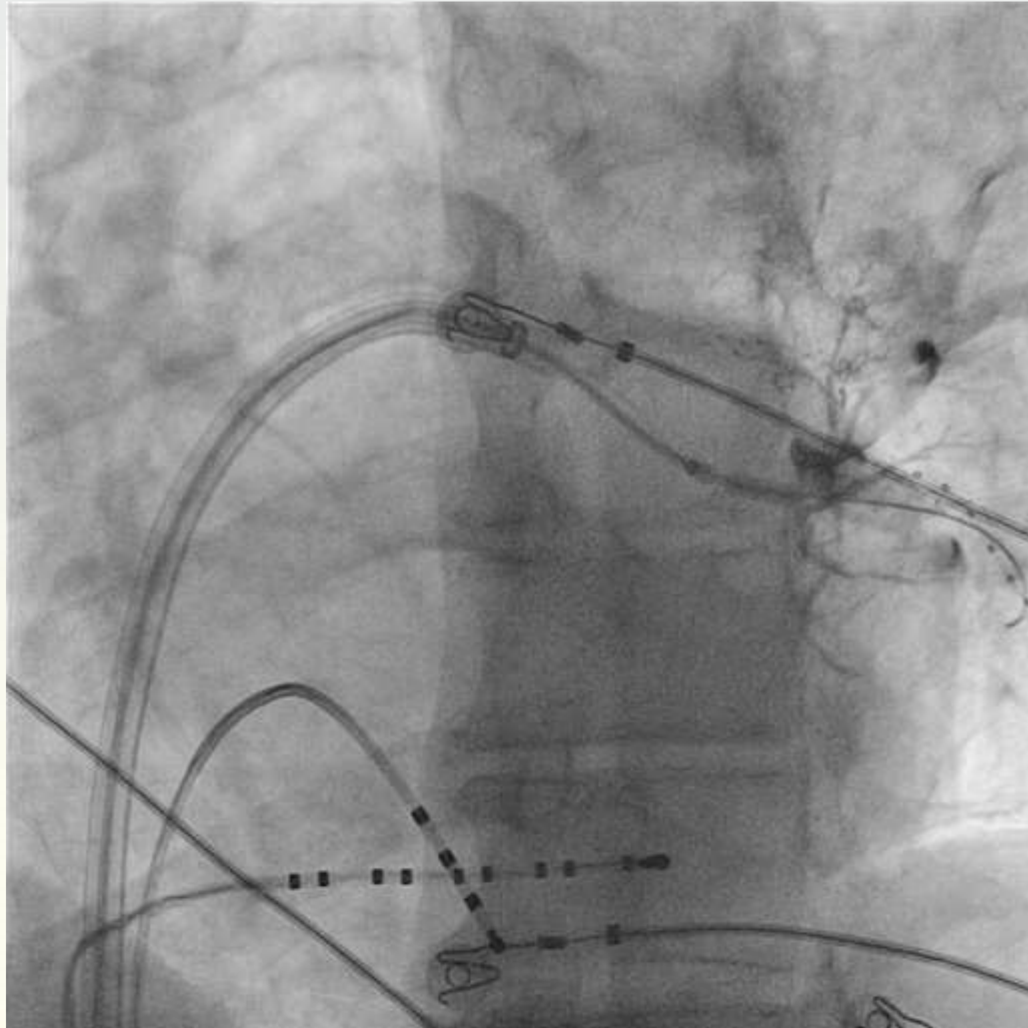
01-Jan-06
Frame Rate: 15.0

RIPV 2:1

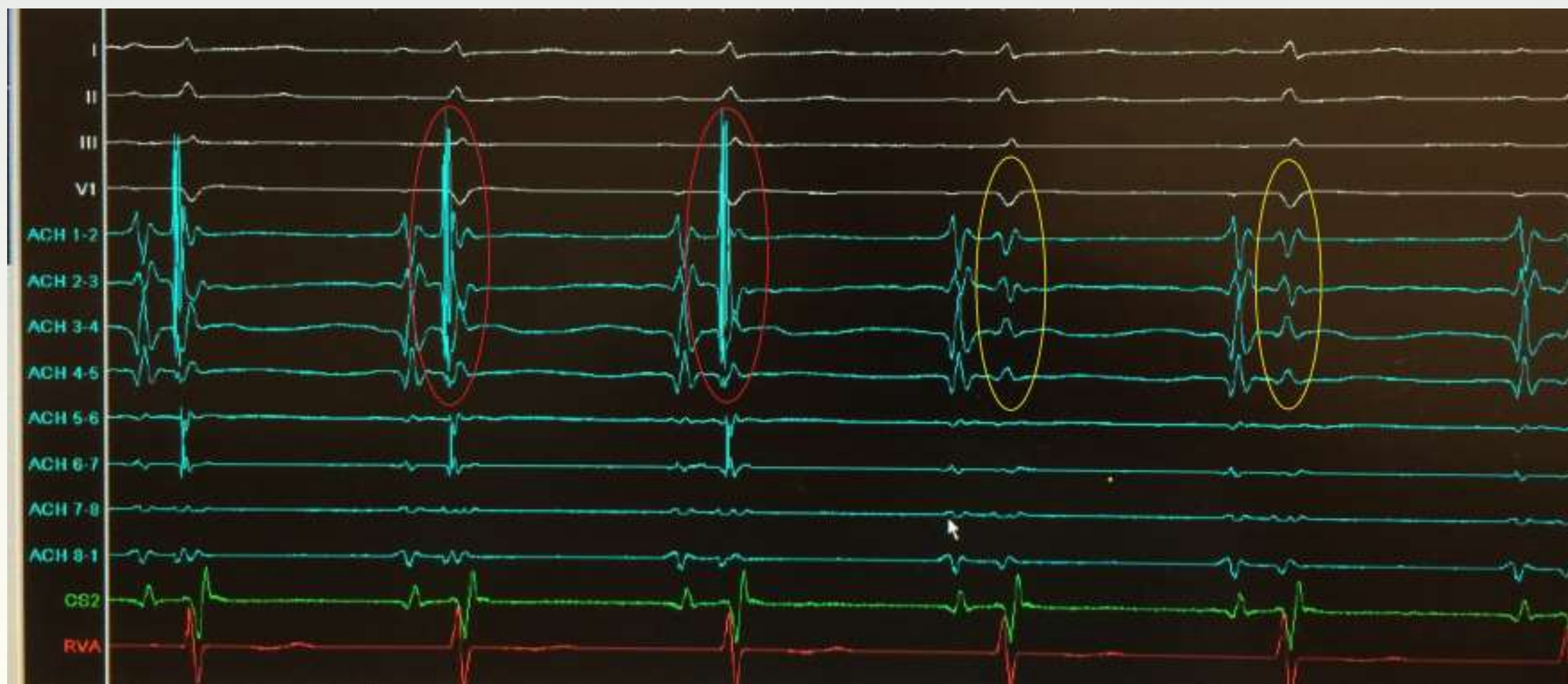


RIPV Isolation



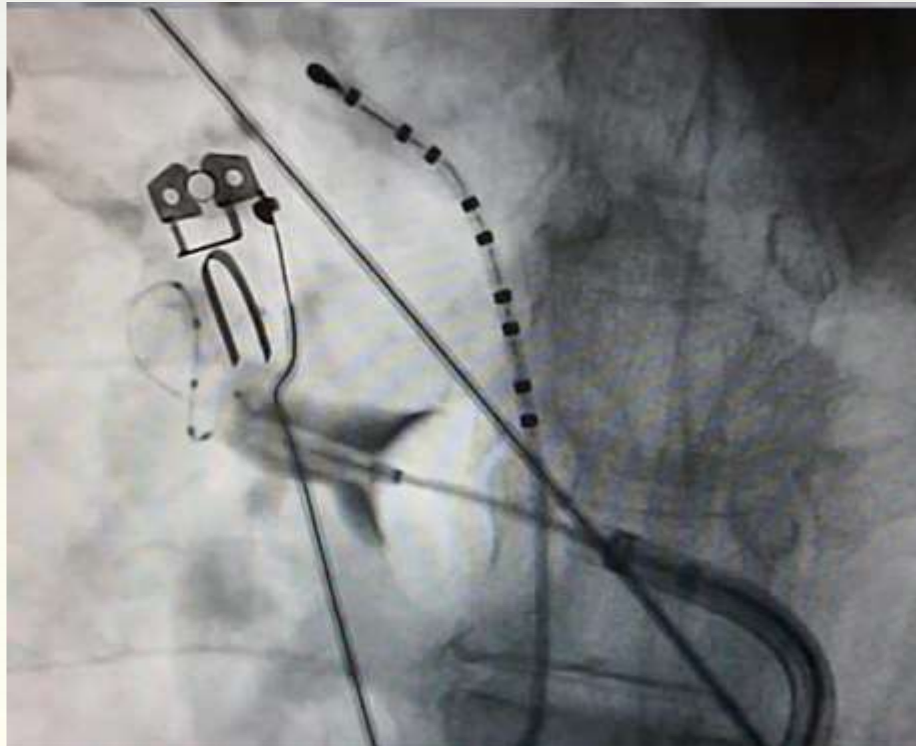


LIPV Isolation



Safety Considerations: Prevention of PNI

- Cryoballoon position should be as antral as possible
- The nerve should be paced at twice the capture threshold using a deflectable catheter
  - in the superior vena cava and above the level of the ablation



Safety Considerations: Prevention of Esophageal Injury

- Luminal esophageal temperature monitoring
- No direct correlation has been made between esophageal fistula formation and temperature
- Caution should be used when
  - treatment time exceeds 4minutes
  - more than 2 freezes are applied to a PV
  - balloon nadir temperatur esexceed – 60ºC

Conclusion

- Cryo ablation is a safe and effective tool for the treatment of paroxysmal AF with a high rate of durable procedural PVI and long-term freedom from AF
- The specific technical recommendations will make the cryoballoon procedure a safer and more effective tool for treatment of AF