DEVICE CLOSURE OF DIFFICULT & LARGE ASD- TECHNIQUE and TRICKS

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Patient Selection

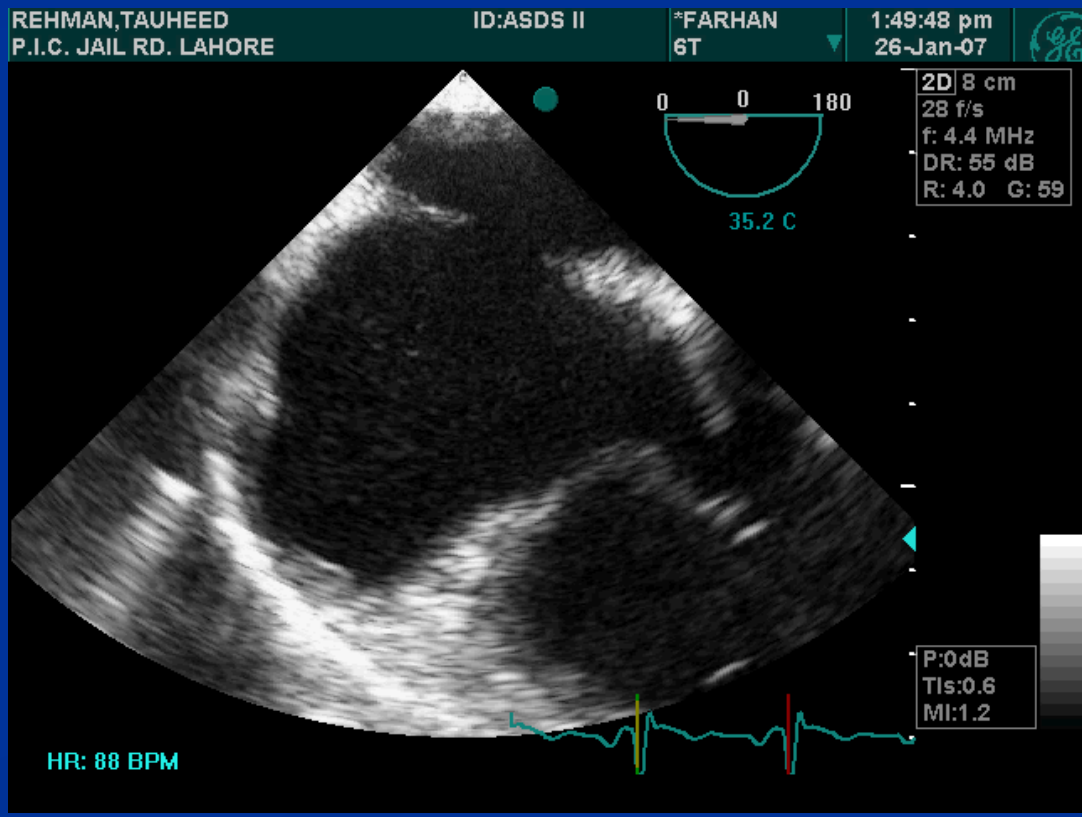
- Key to success!
- Is the defect suitable for transcatheter closure
- Criteria:
  - ASD secundum with max diameter of 34mm
  - Rims except aortic rim of at least 5mm
  - Dimensions of total septal length not smaller than LA disc of chosen device

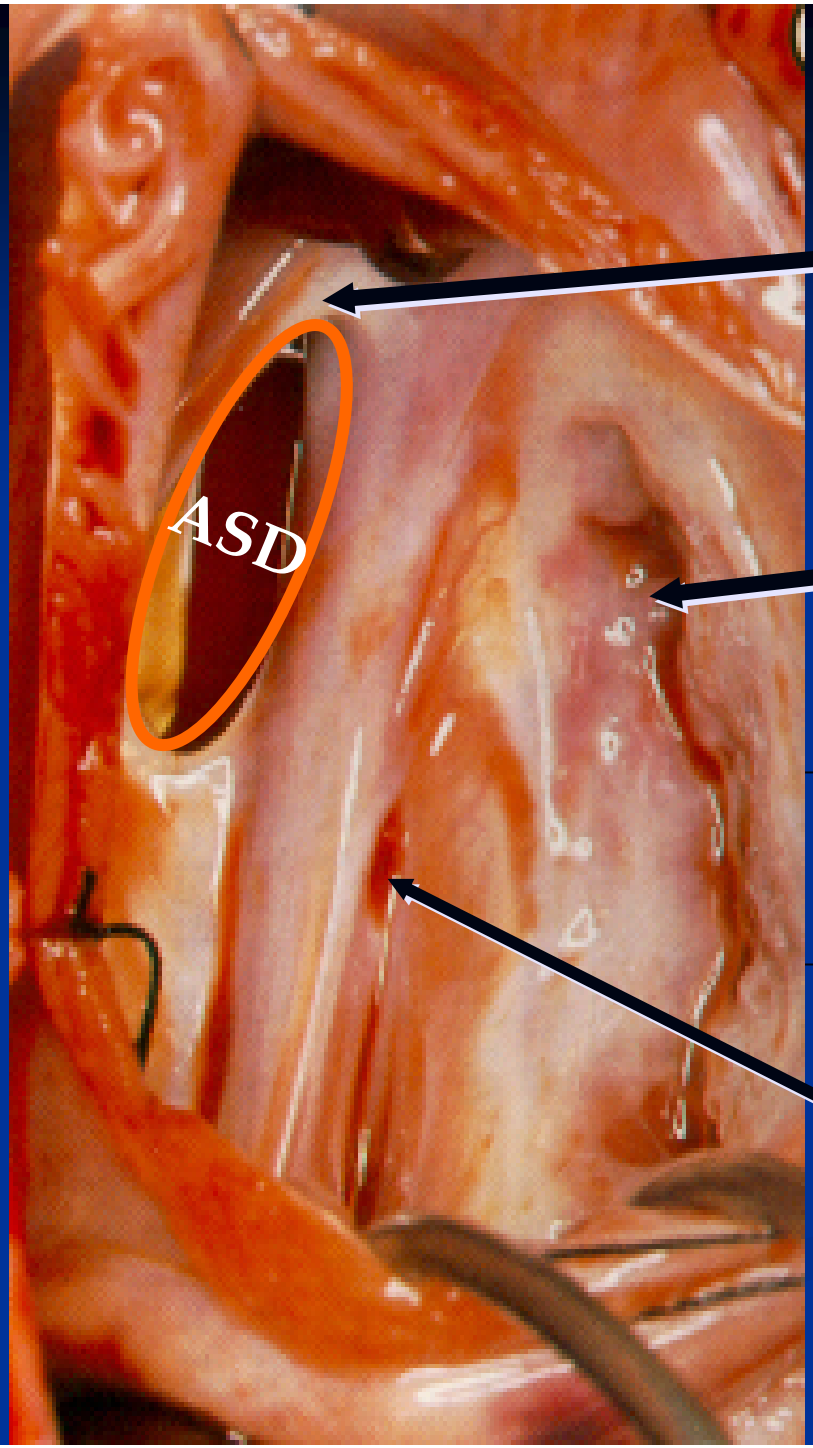
Echocardiography

- TTE
  - Patient selection
- TEE
  - Important in patient selection
  - Guide implantation and assess correctness of position
- ICE
  - Anatomy of postero-inferior secundum ASD
  - Capture of the postero-inferior rim by the device
  - **3-D**

Large ASD

- No universal definition
- Size > 2o mm ? Device
  > 25mm





•A sound knowledge of the Atrial septal rims

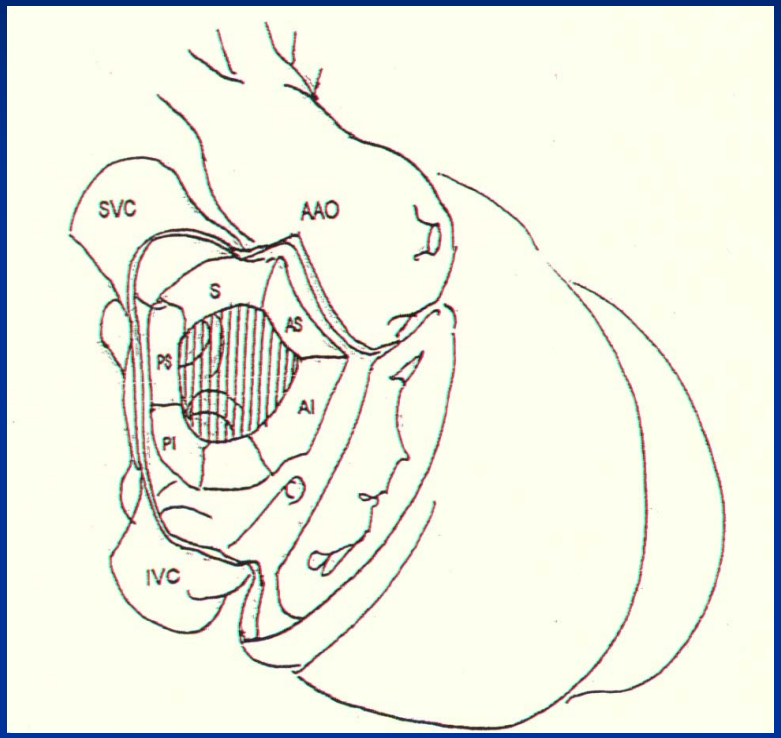
Limbus of Fossa Ovale

Tricuspid Valve

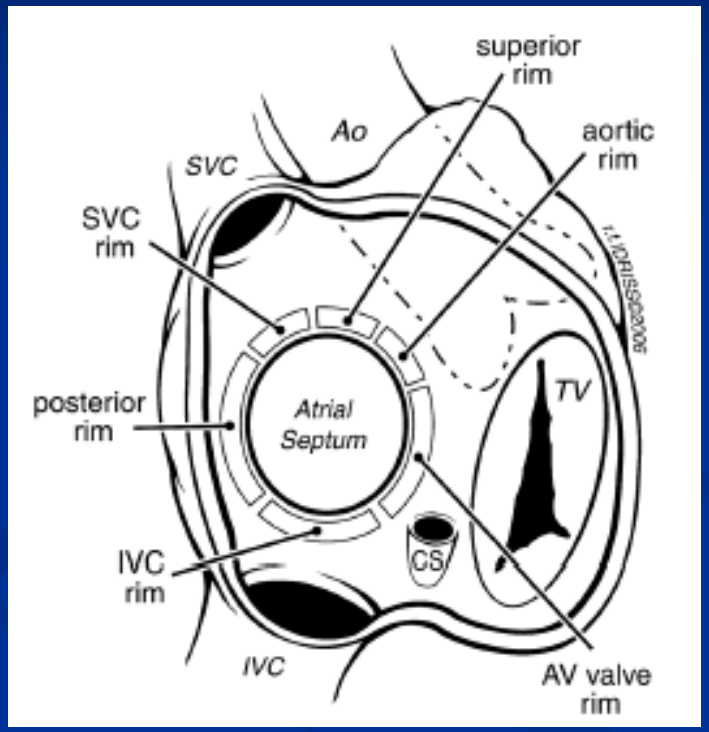
Structures that surround the secundum ASD

Coronary Sinus

Atrial Septal Rims

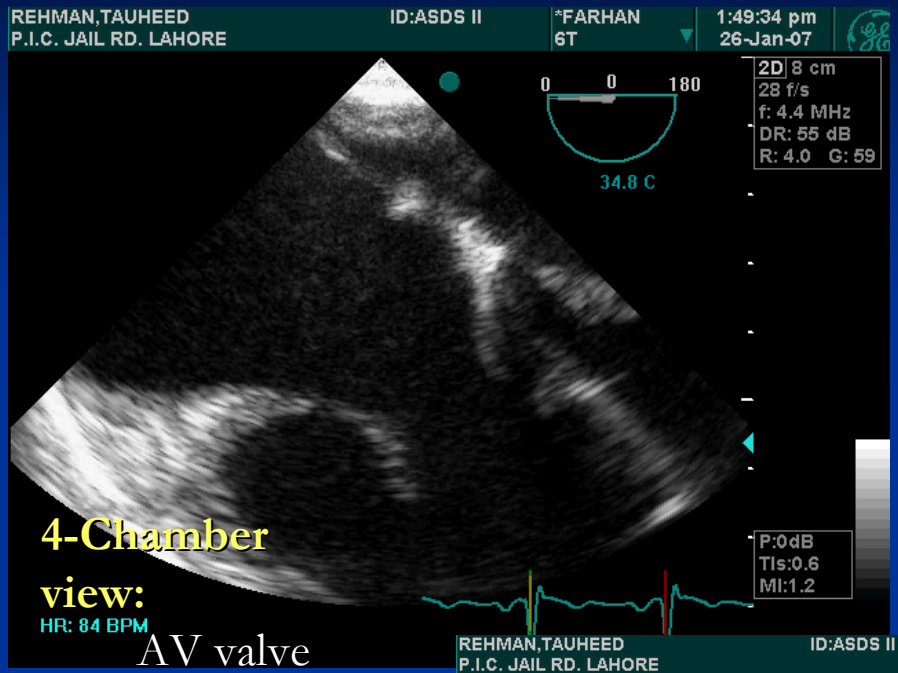


(Dr. Mathewson, San Diego Children's Hospital)



Shrivastava S et al Ind Heart J 2003;55:88-89
Amin Z. Catheter Cardiovasc Interv 2006;68:

4-Chamber view



4-Chamber view:

- AV valve rim
- Superior rim

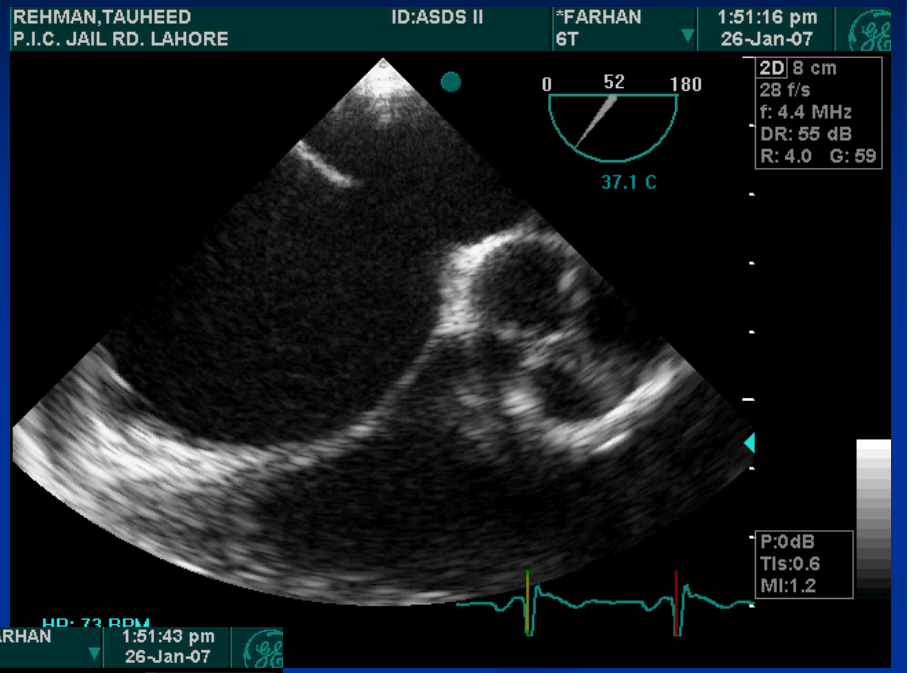
Short axis view:

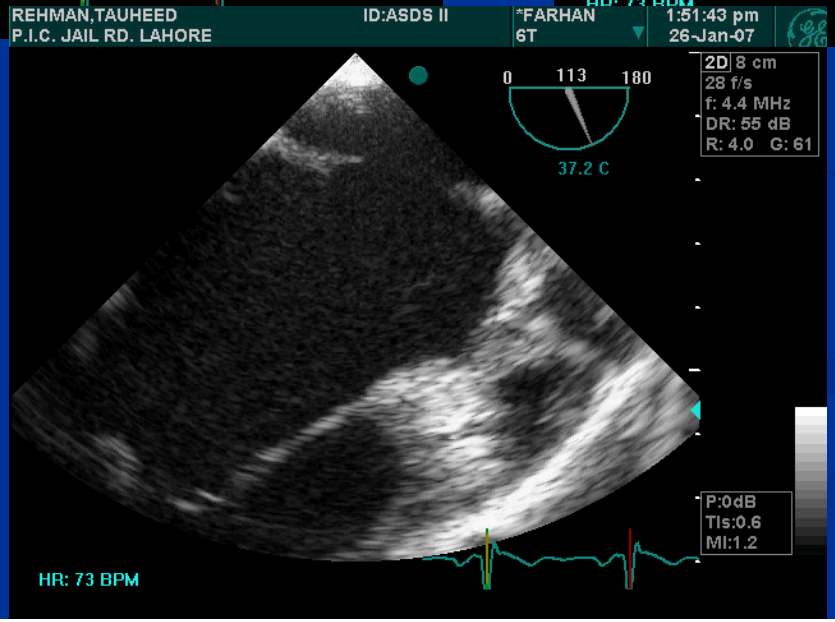
- Aortic rim
- Posterior rim

Bi-Caval view:

- SVC rim
- IVC Rim

Short Axis view





Bi-caval view

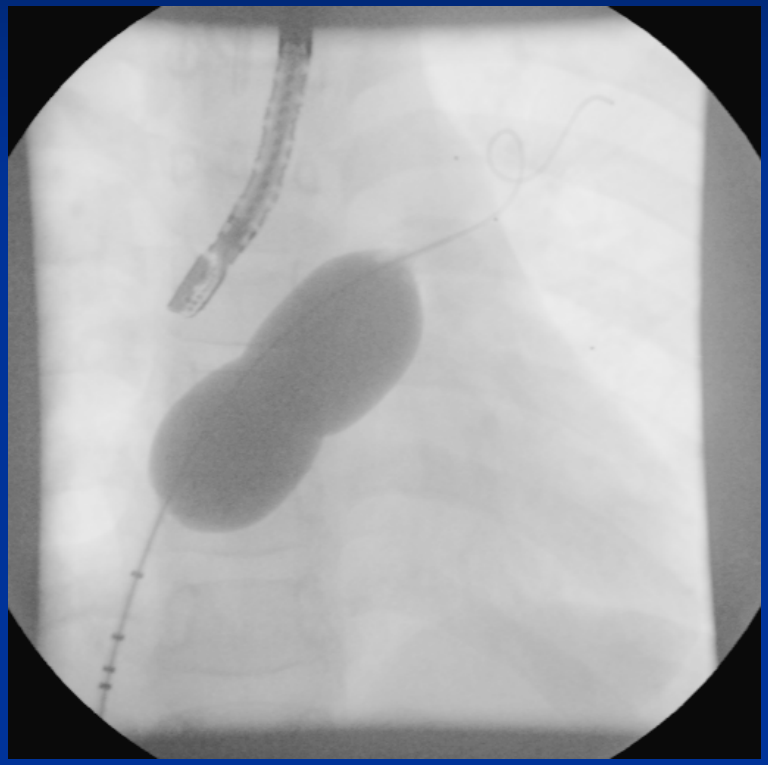
Balloon Sizing

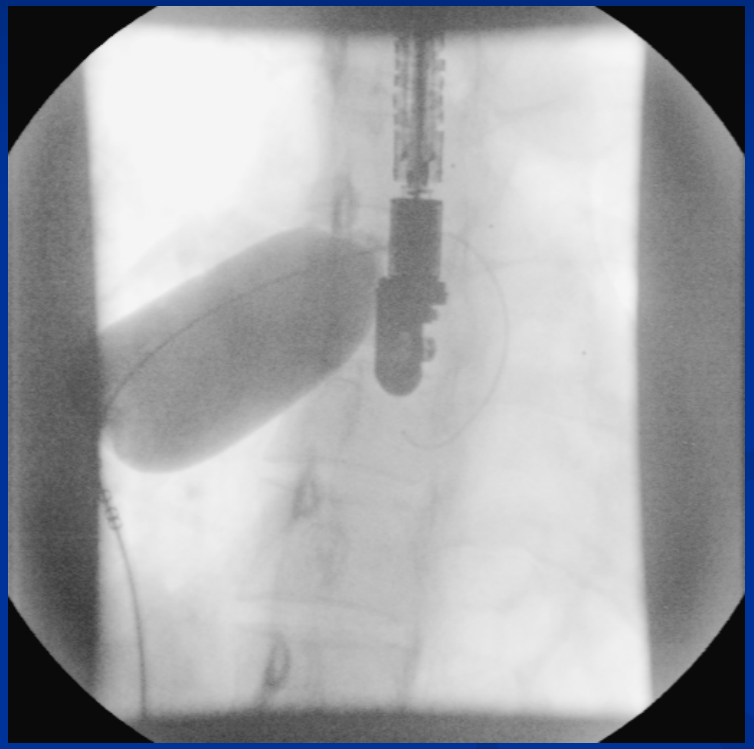
- Useful – most defects are oval
- Balloons can falsely stretch the ASD – oversize
- "Balloon-stretched diameter" needs avoiding

- "Stop-flow technique"
  - Inflate the balloon until no shunt on Colour
  - Deflate the balloon until shunting appears
  - Re-inflate to eliminate the shunt (stop-flow diameter of ASD)

Amin Z. Catheter Cardiovasc Interv 2006;68:588-94

Balloon Sizing





- Thin flailing septum primum
- Patience is a virtue

Size of the device

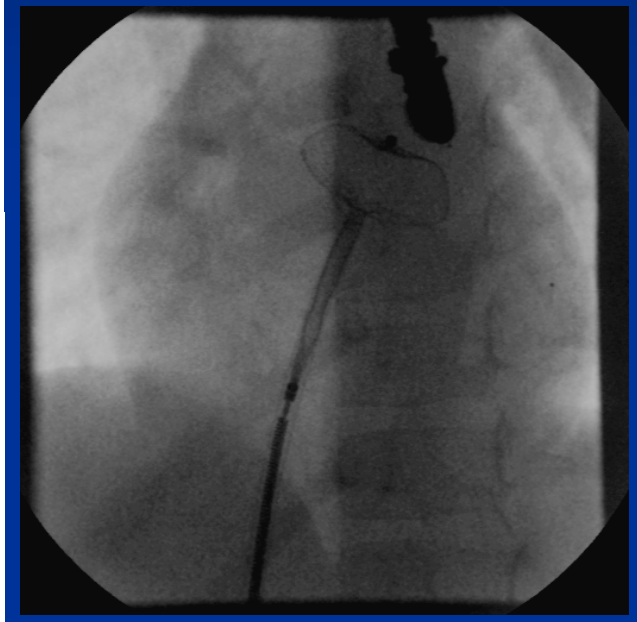
- Waist 1-2 mm greater than the sizing balloon diameter-stop flow diameter
- Waist 1-2 mm greater than largest size measured on colour by TEE
- Extra 2-4 mm or so when aortic margin is absent or margins are floppy
- LA must be able to accommodate the device!

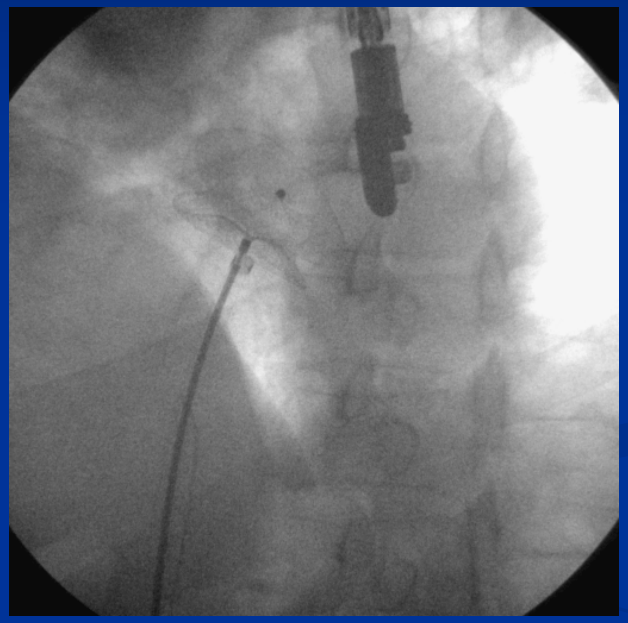
Selection of device

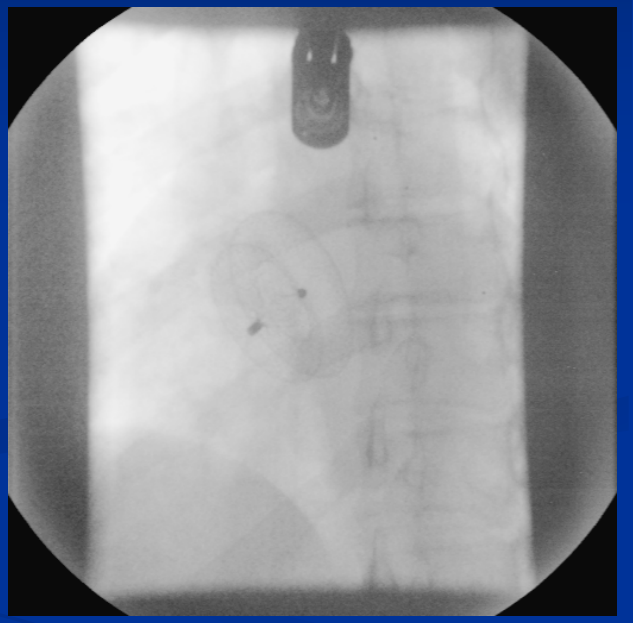
- Amplatzer septal occluder is the only one capable of closing large defects

•Self-Expandable
• Short-connecting Waist
• Nitinol wire .004” - .008”
• Sizes: 4-40 mm

Standard Approach

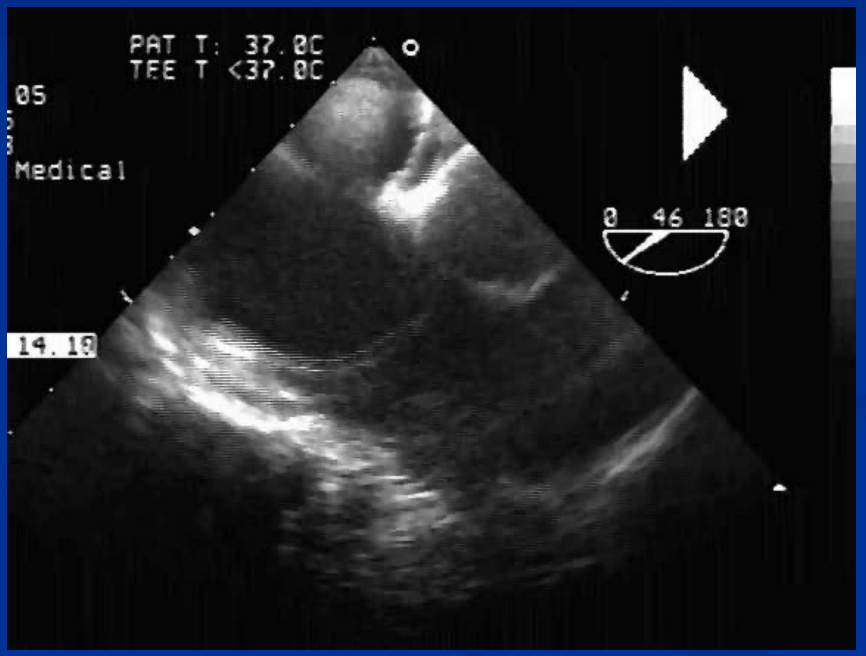




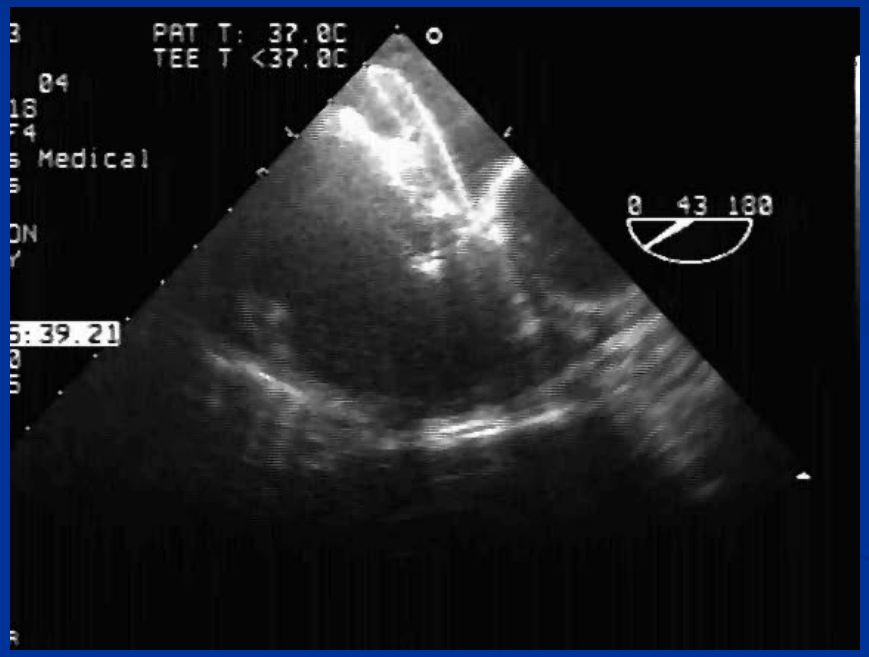


Why standard approach does not work?

- Small LA size
- Abnormal LA curvature
- Floppy inferior rim
- Deficient rims



Small trick can work?



Large Challenging ASD's

- Deficient aortic rim
- Deficient posterior rim
- Deficient aortic and posterior rims

- Floppy rims

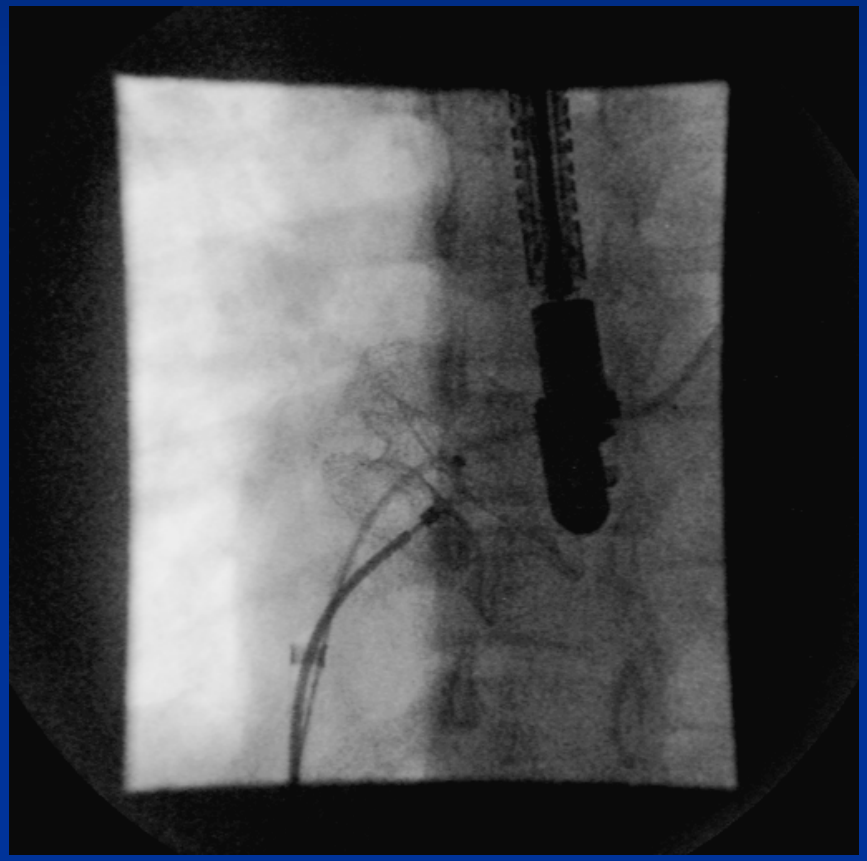
- Small child with a large ASD
- Unusually placed ASD
- Multiple ASD

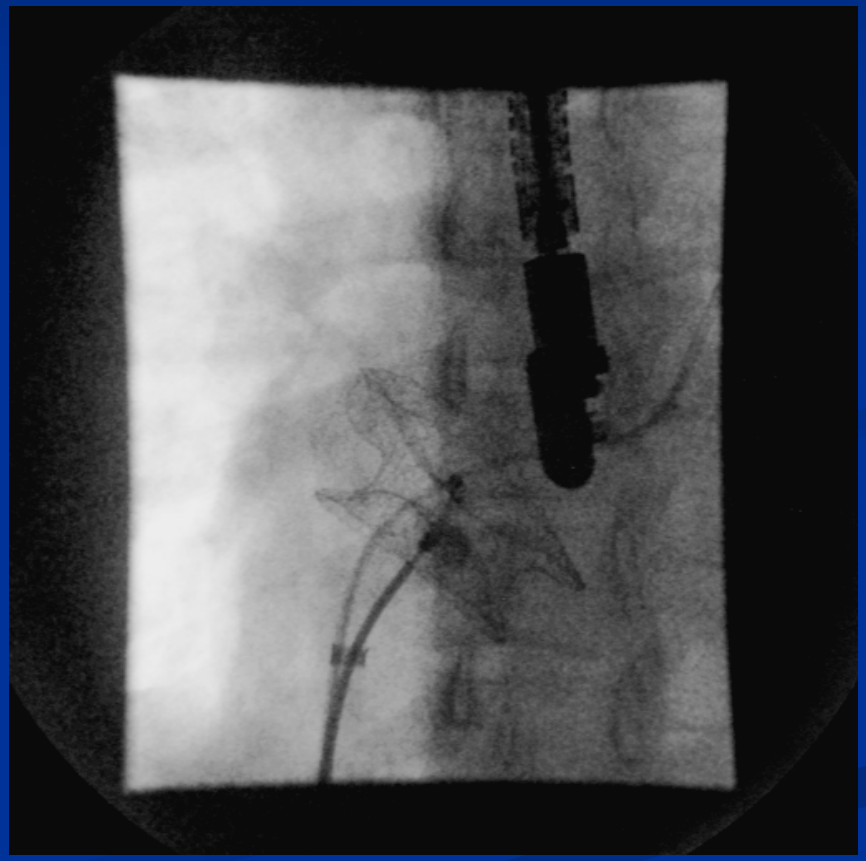
- Any large ASD (diameter >25mm)

Deficient Aortic rim

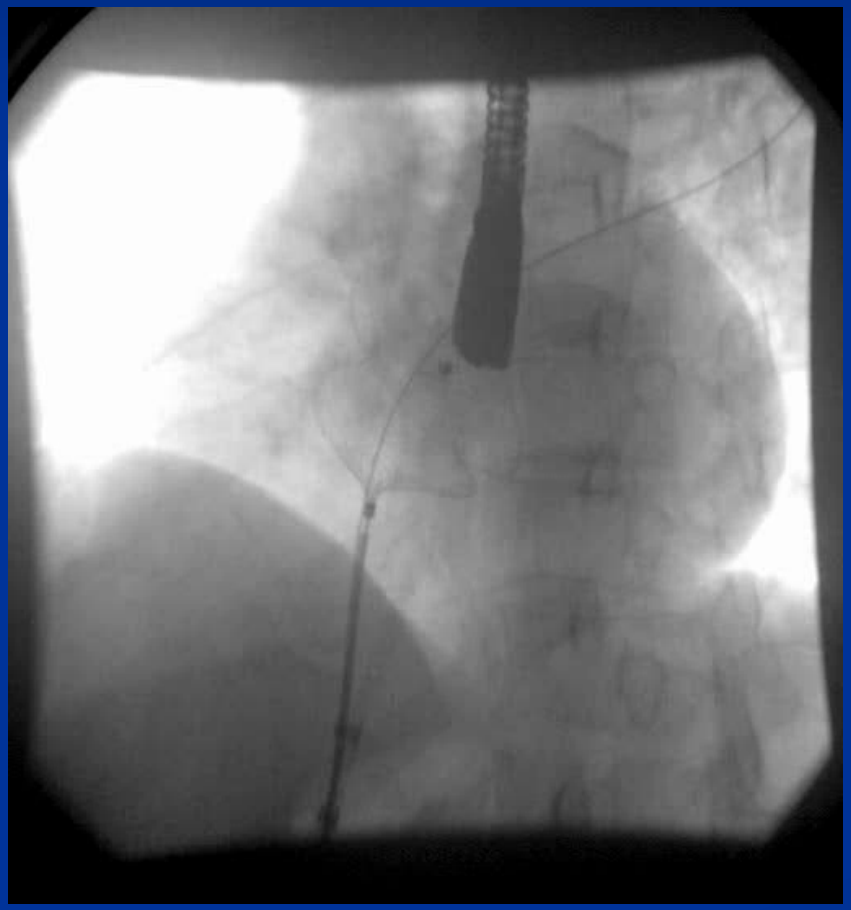
- Catheter/Dilator tip
- Hausdorff sheath
- Left Upper pulmonary vein technique
- Balloon assisted technique (BAT)

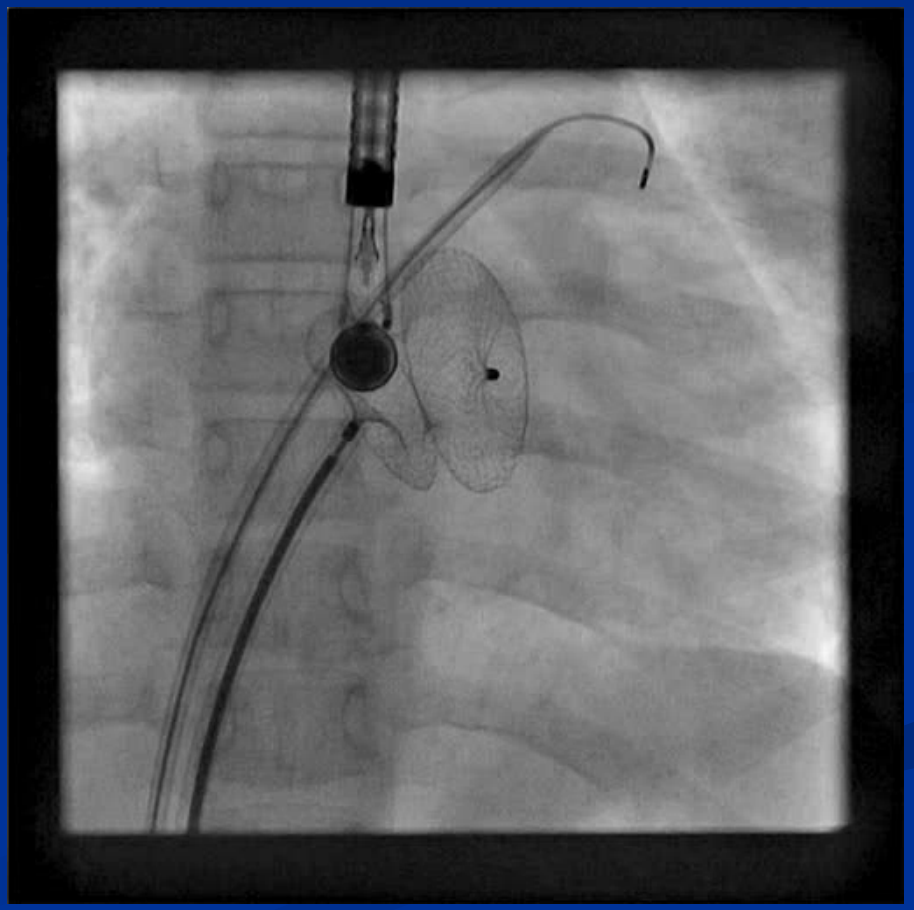
Catheter Assisted technique



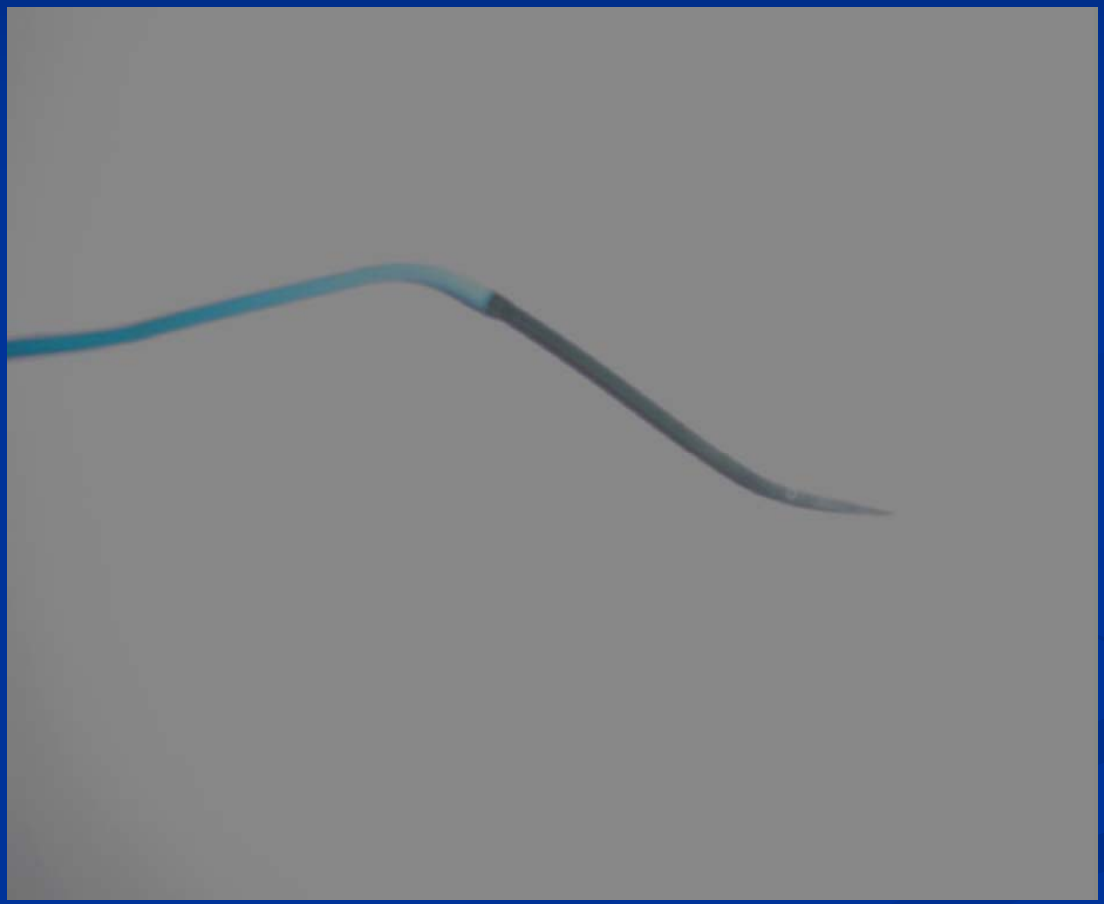


Over the wire or assisted delivery

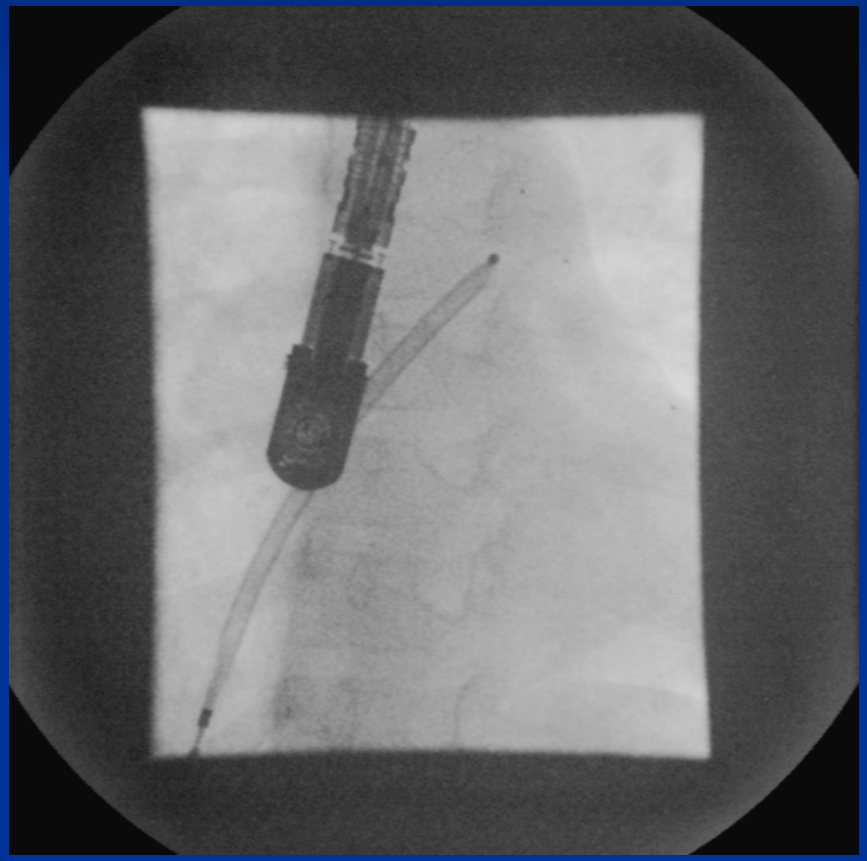


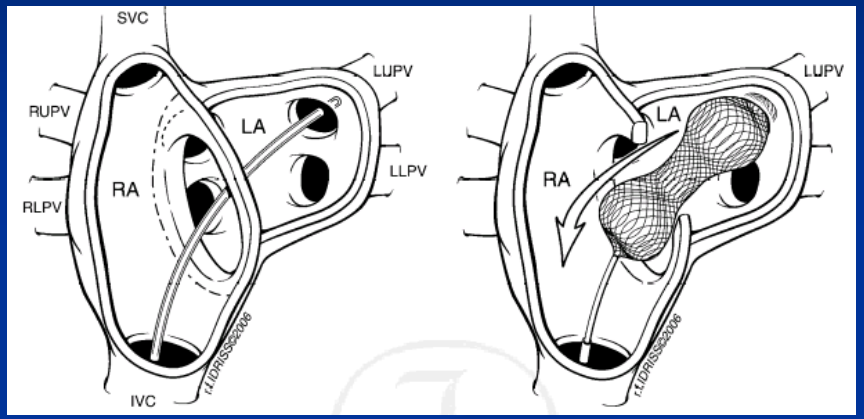


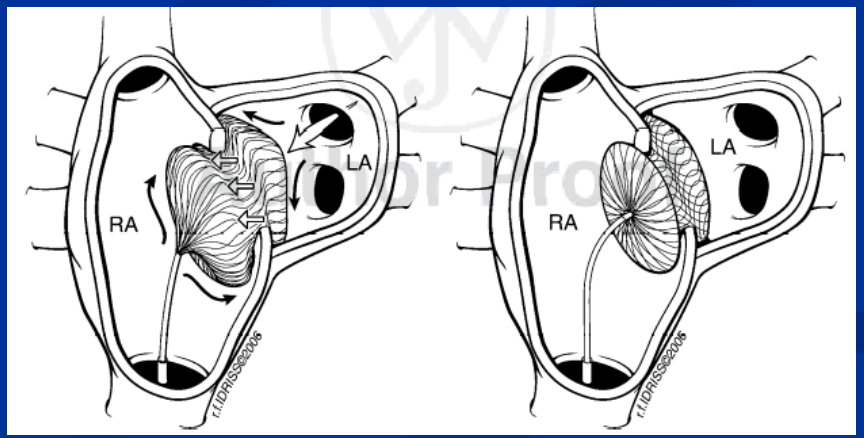
Hausdorf-Lock sheath



Left upper pulmonary vein technique

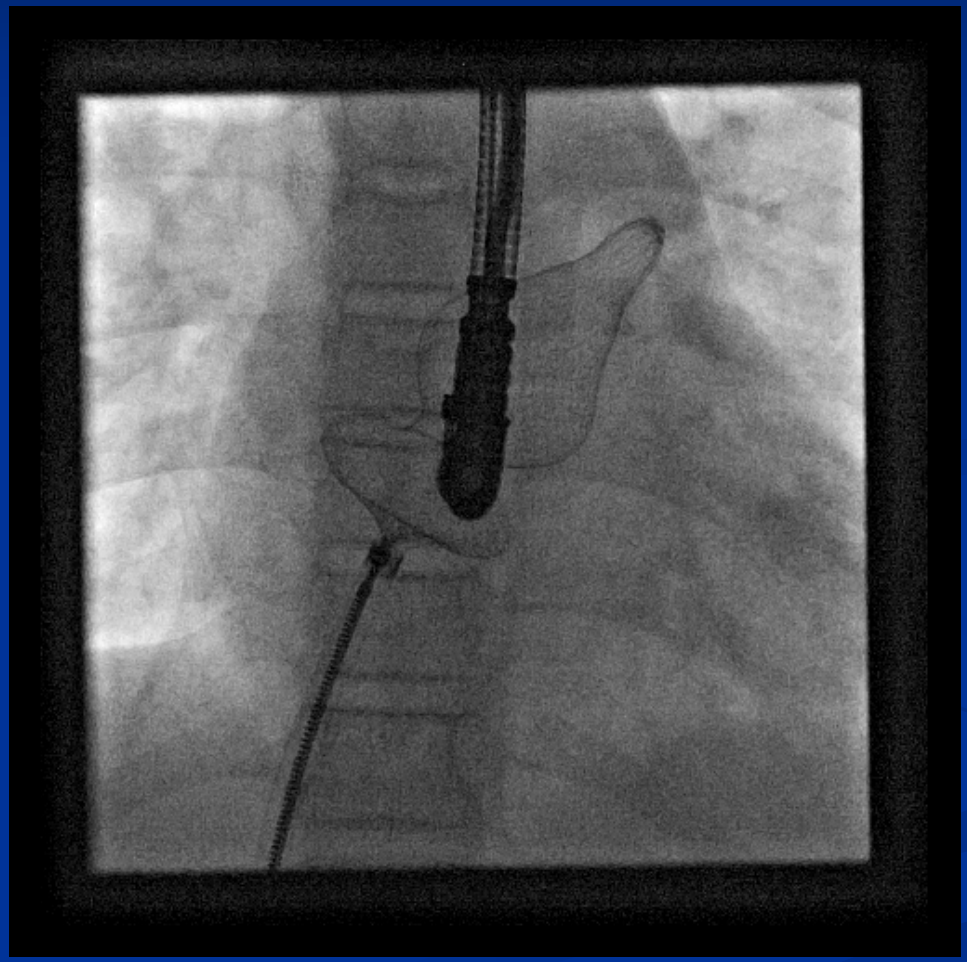




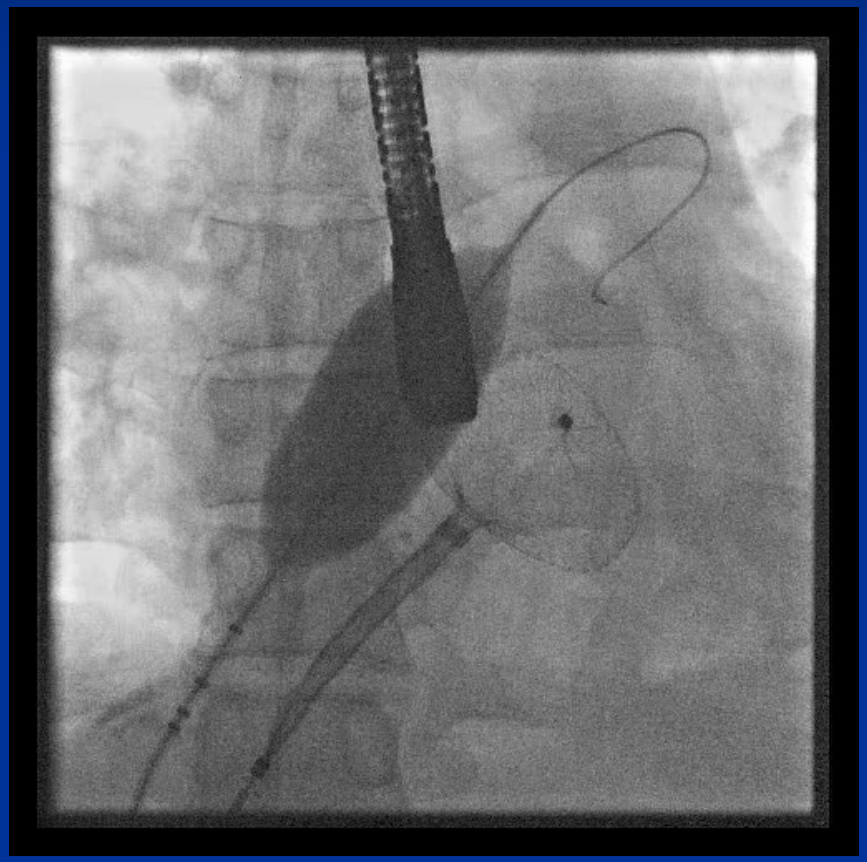


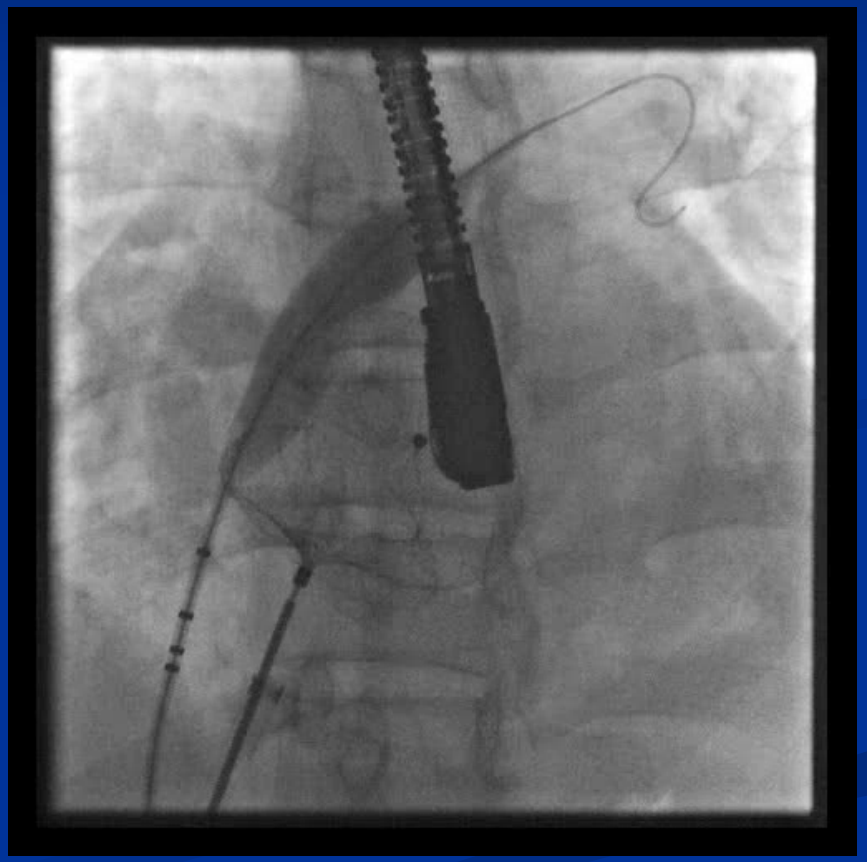
Amin Z. Catheter Cardiovasc Interv 2006;68:588-94

LUPV Technique



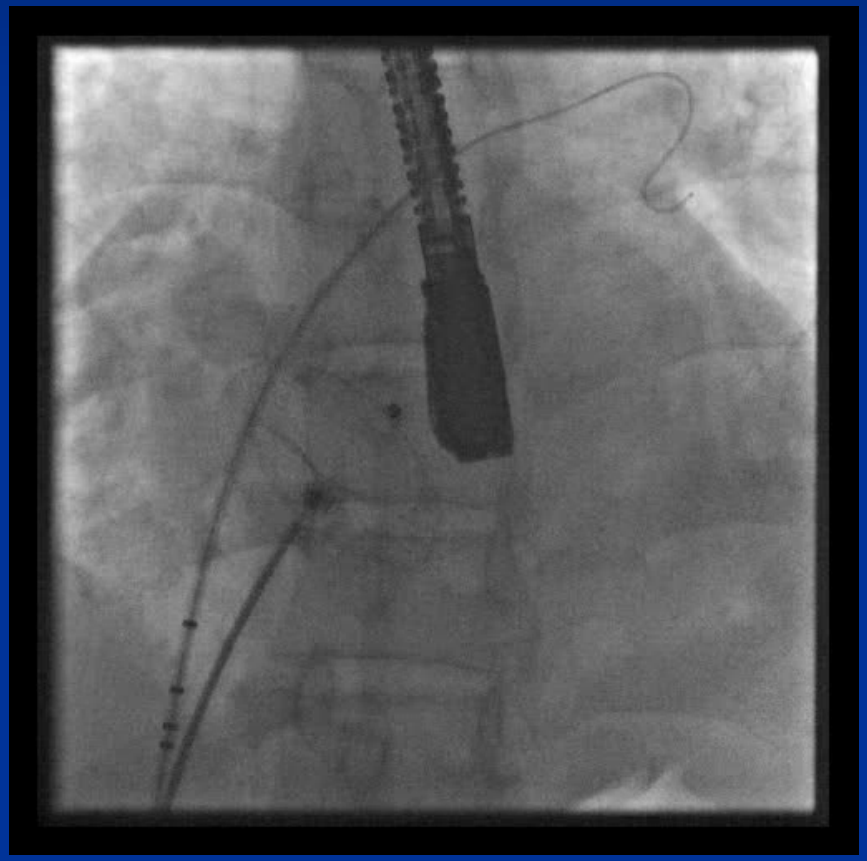
Balloon Assisted Technique-
Balloon in LUPV, device in LA

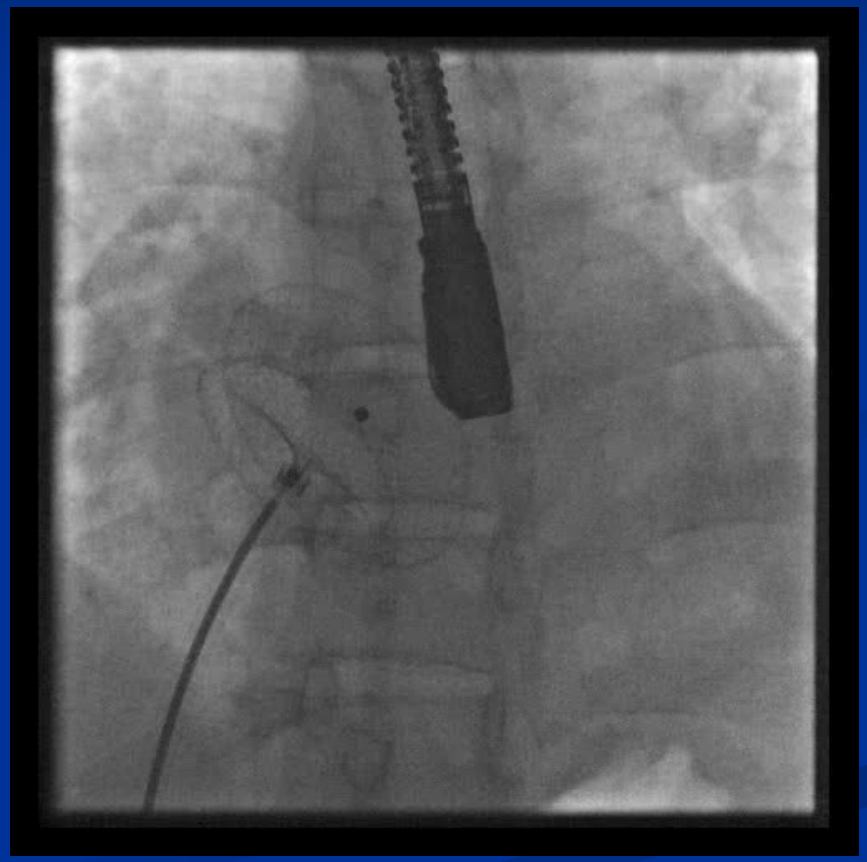




Dalvi BV, Pinto RJ, Gupta A. Cath Cardiovasc Interv 2005;64:102-107

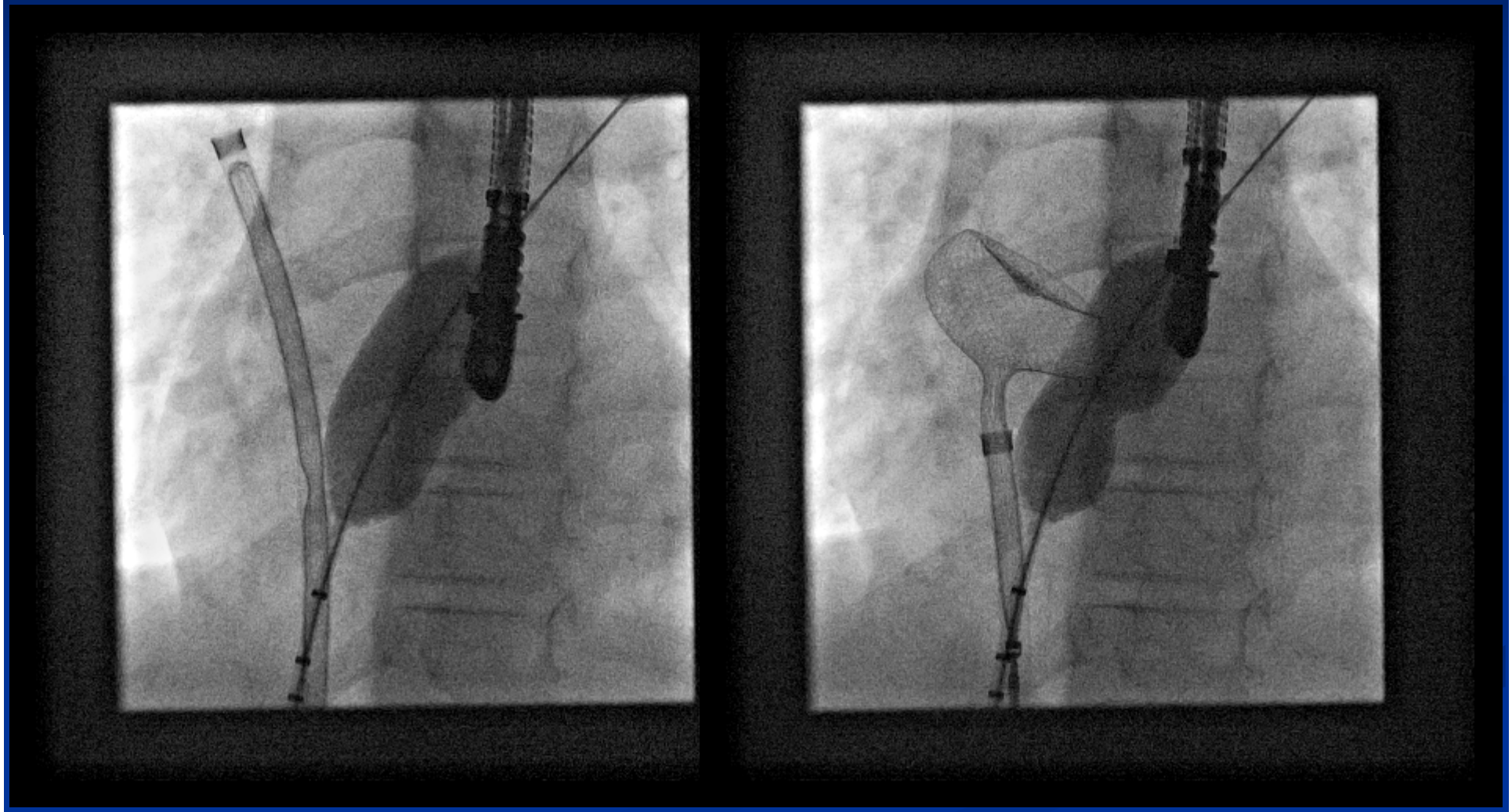
Balloon in LUPV, device in LA



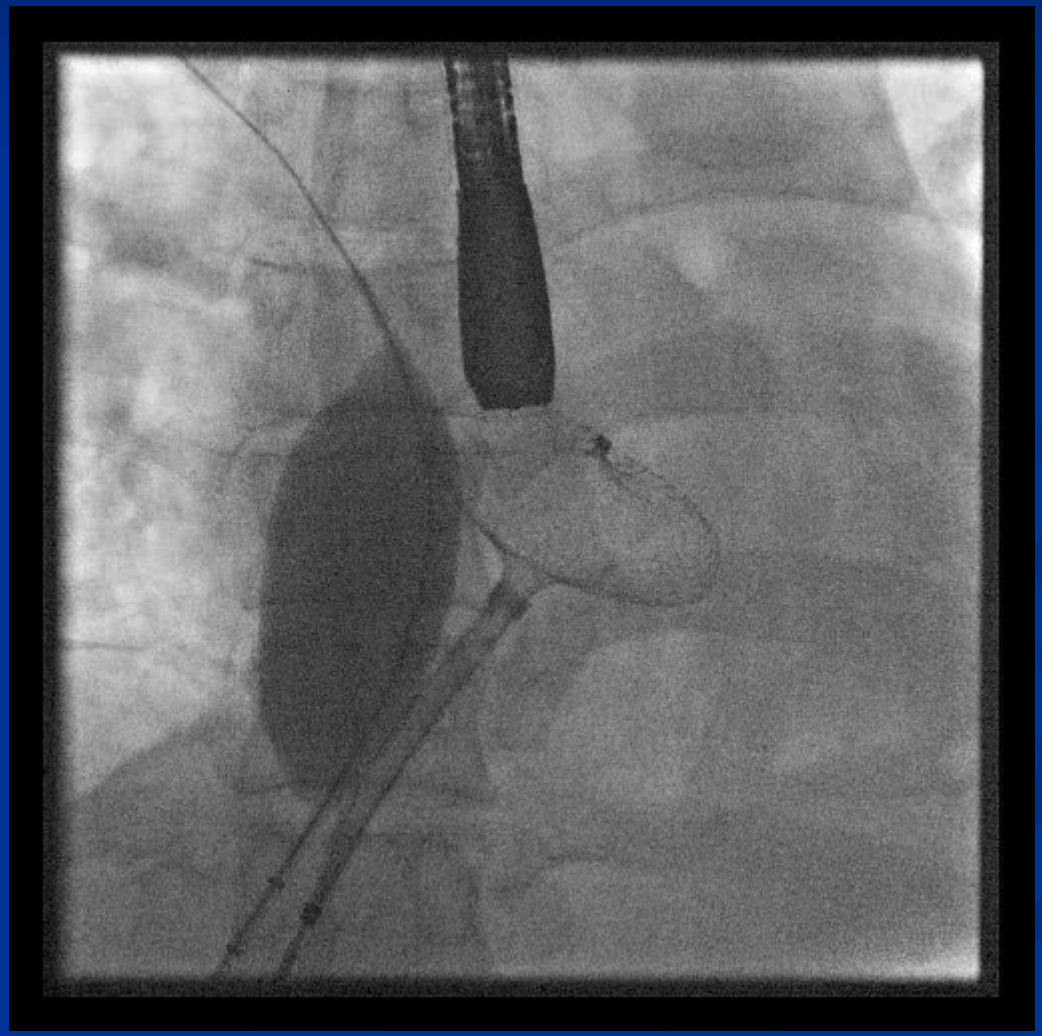


Balloon Assisted Technique-

Balloon in LUPV, device in RUPV



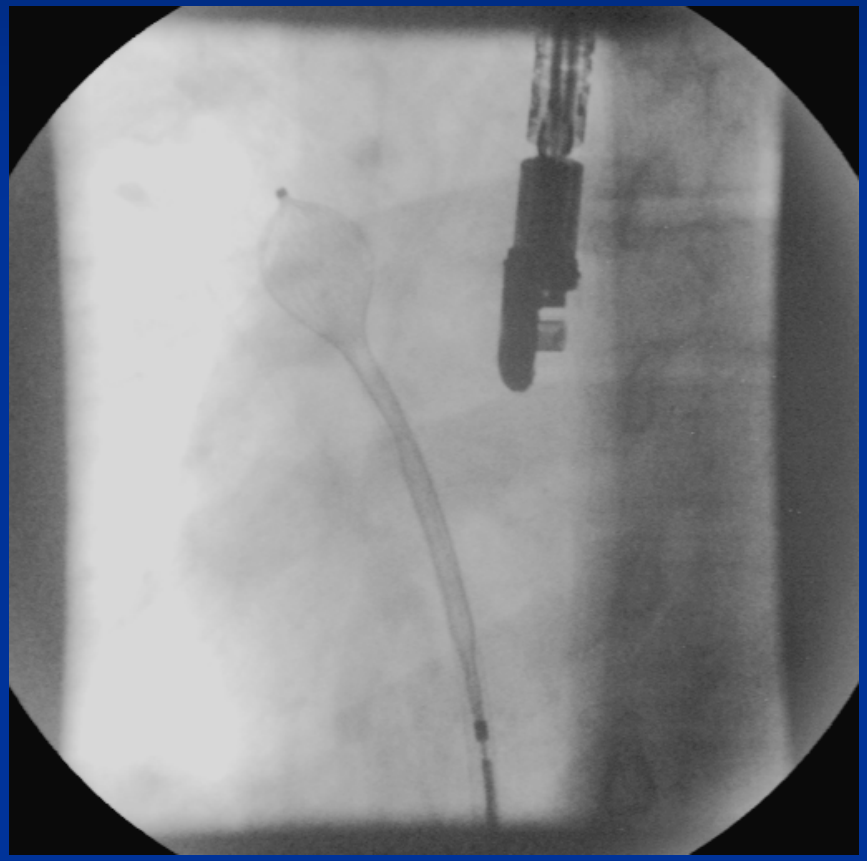
Balloon in RUPV, device in LA

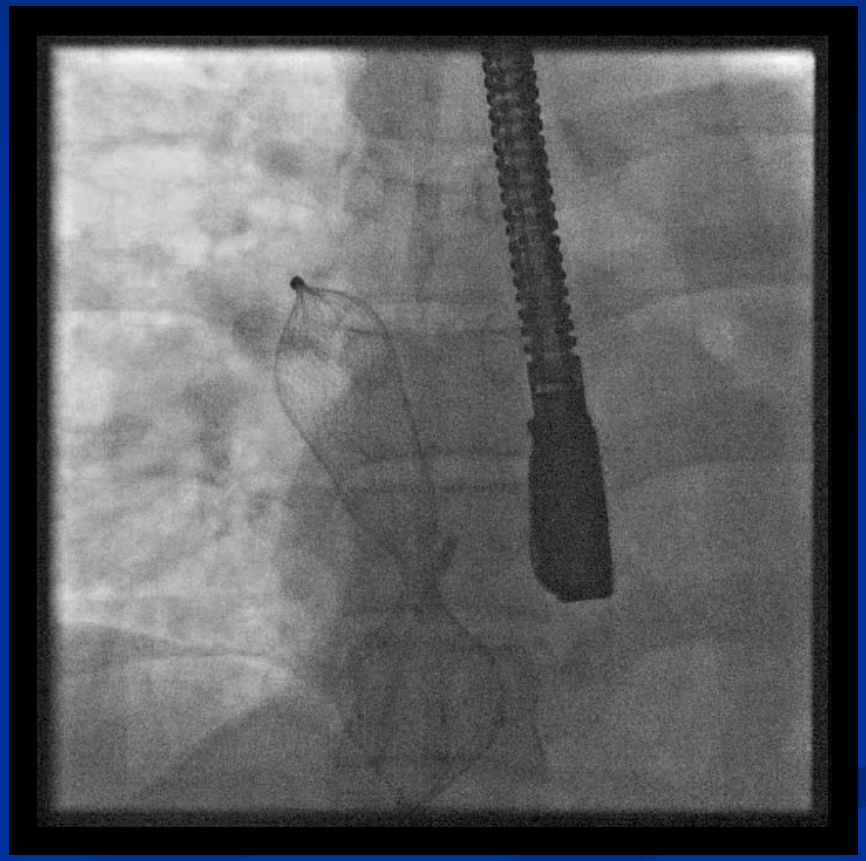


Deficient posterior rim

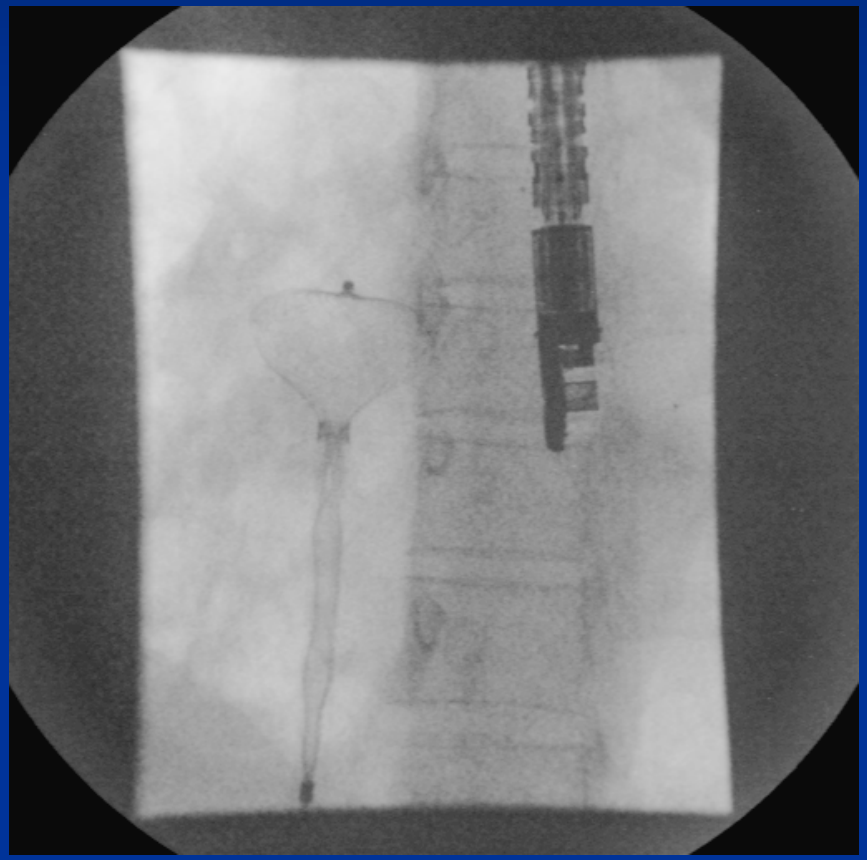
- Right upper pulmonary vein technique
- Left atrial roof technique

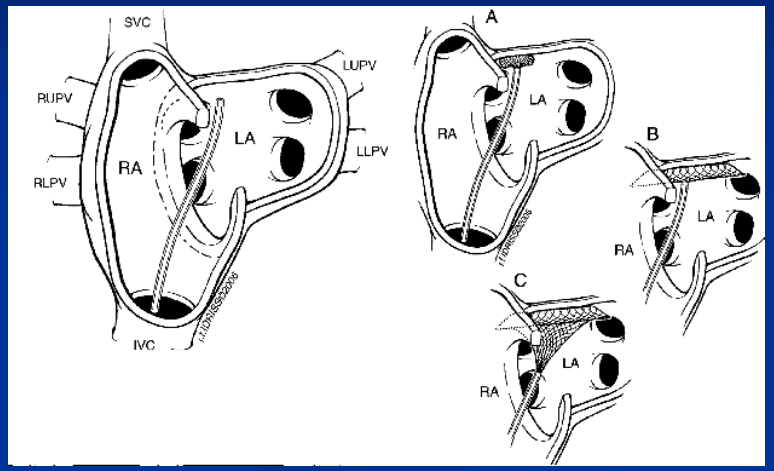
Right Upper pulmonary vein technique

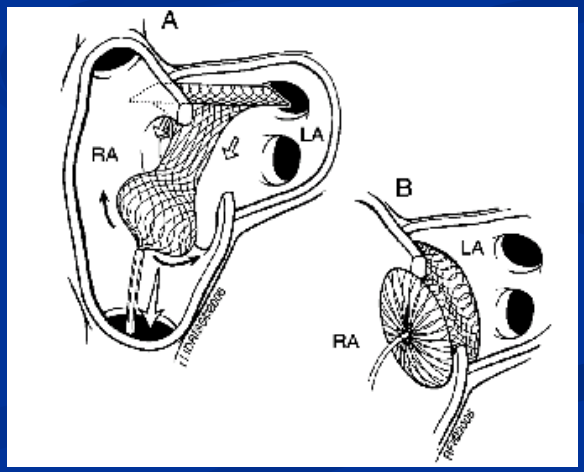




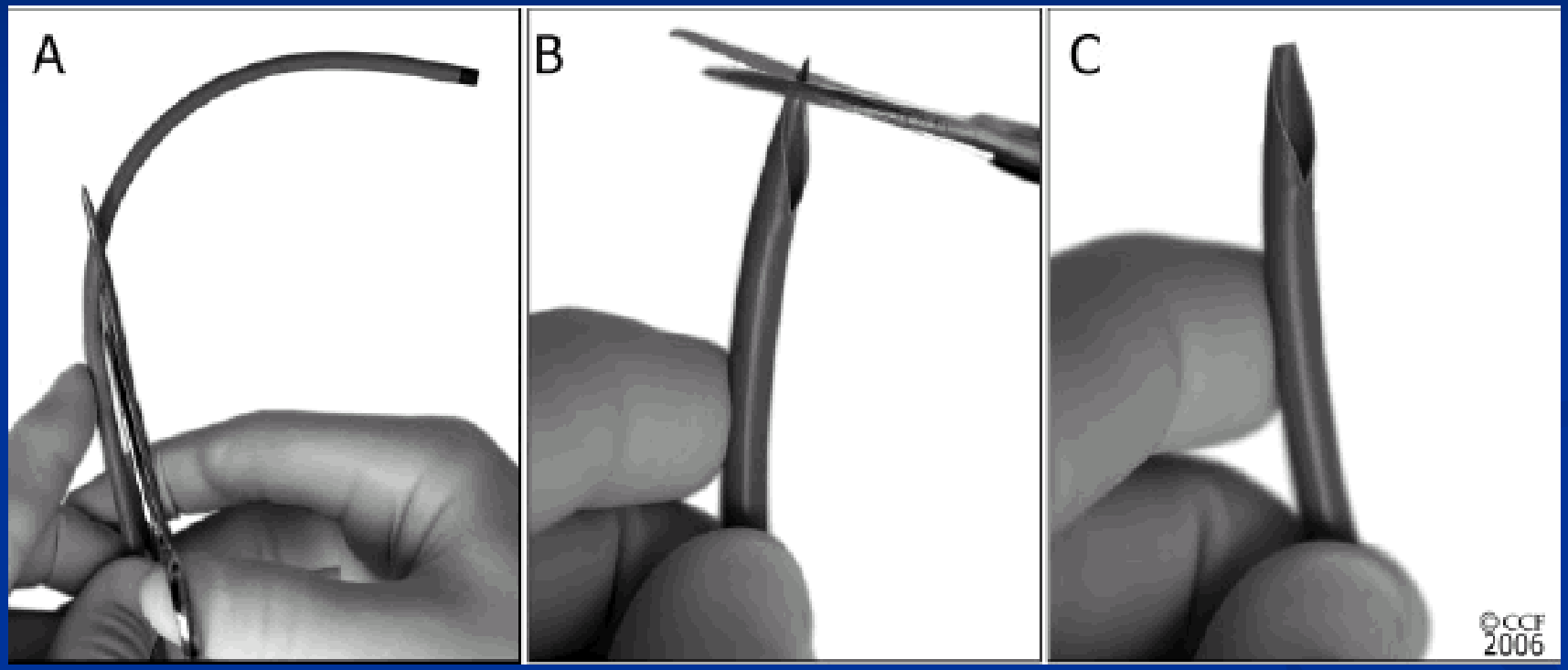
Left Atrial Roof technique



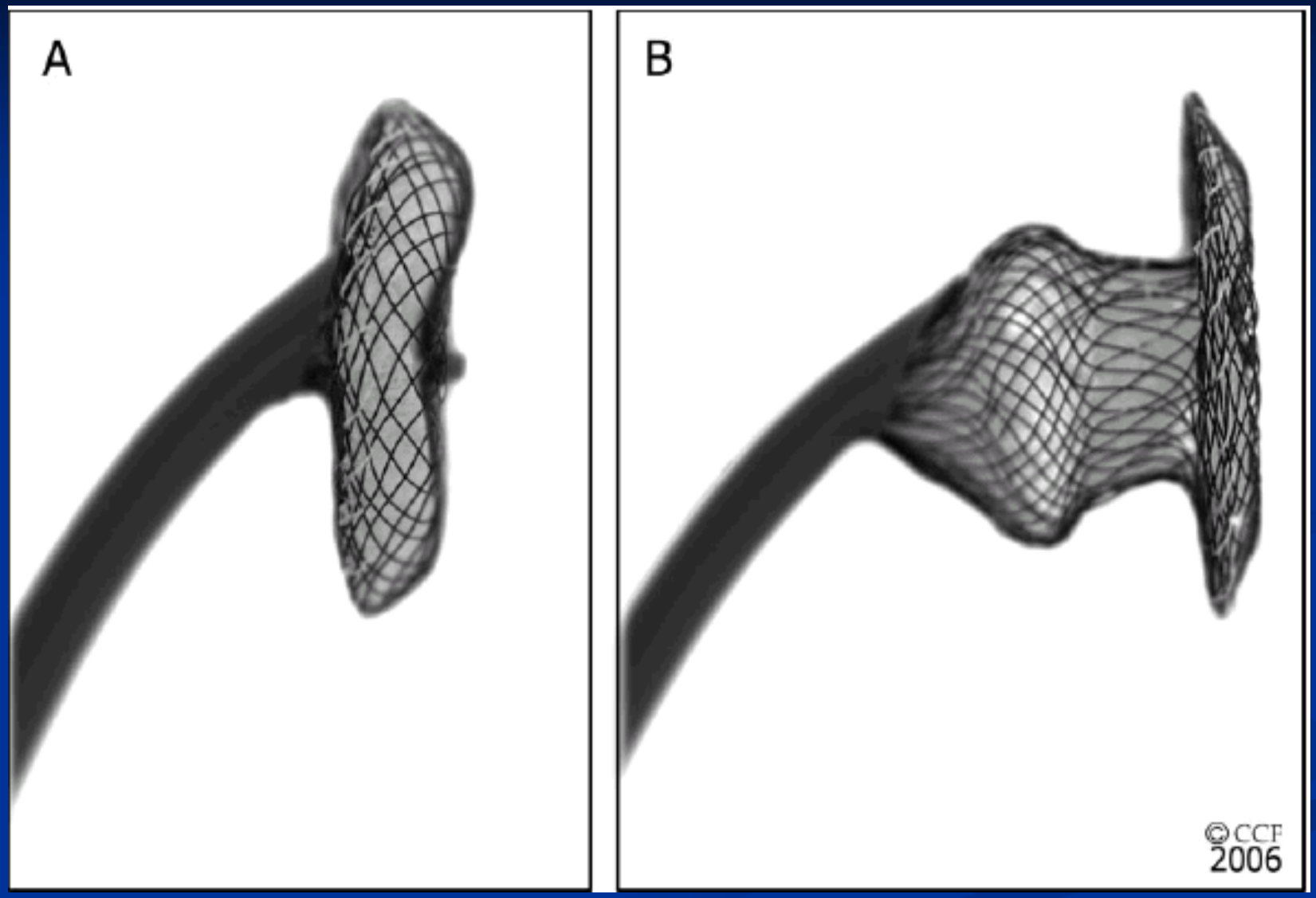


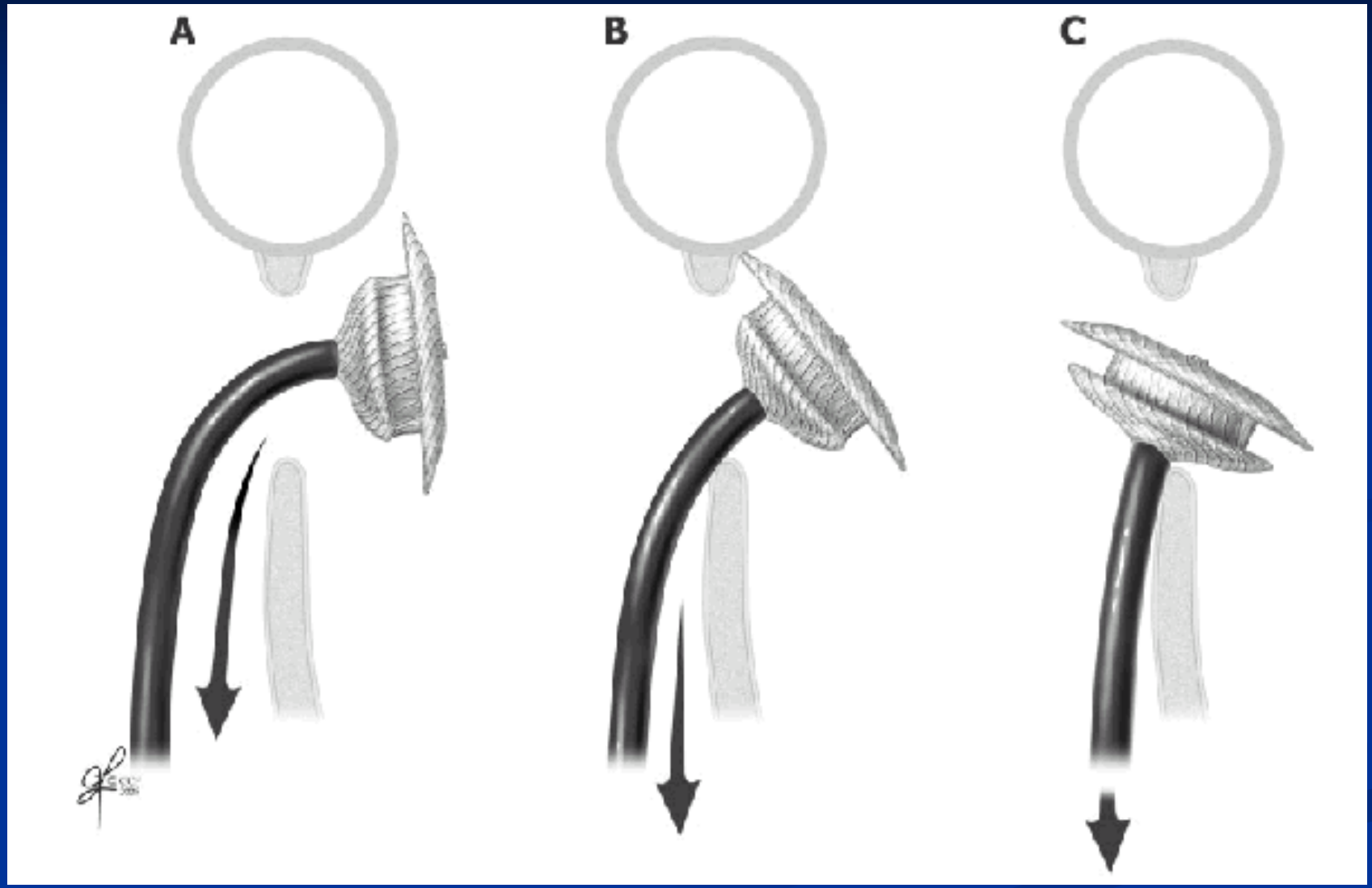


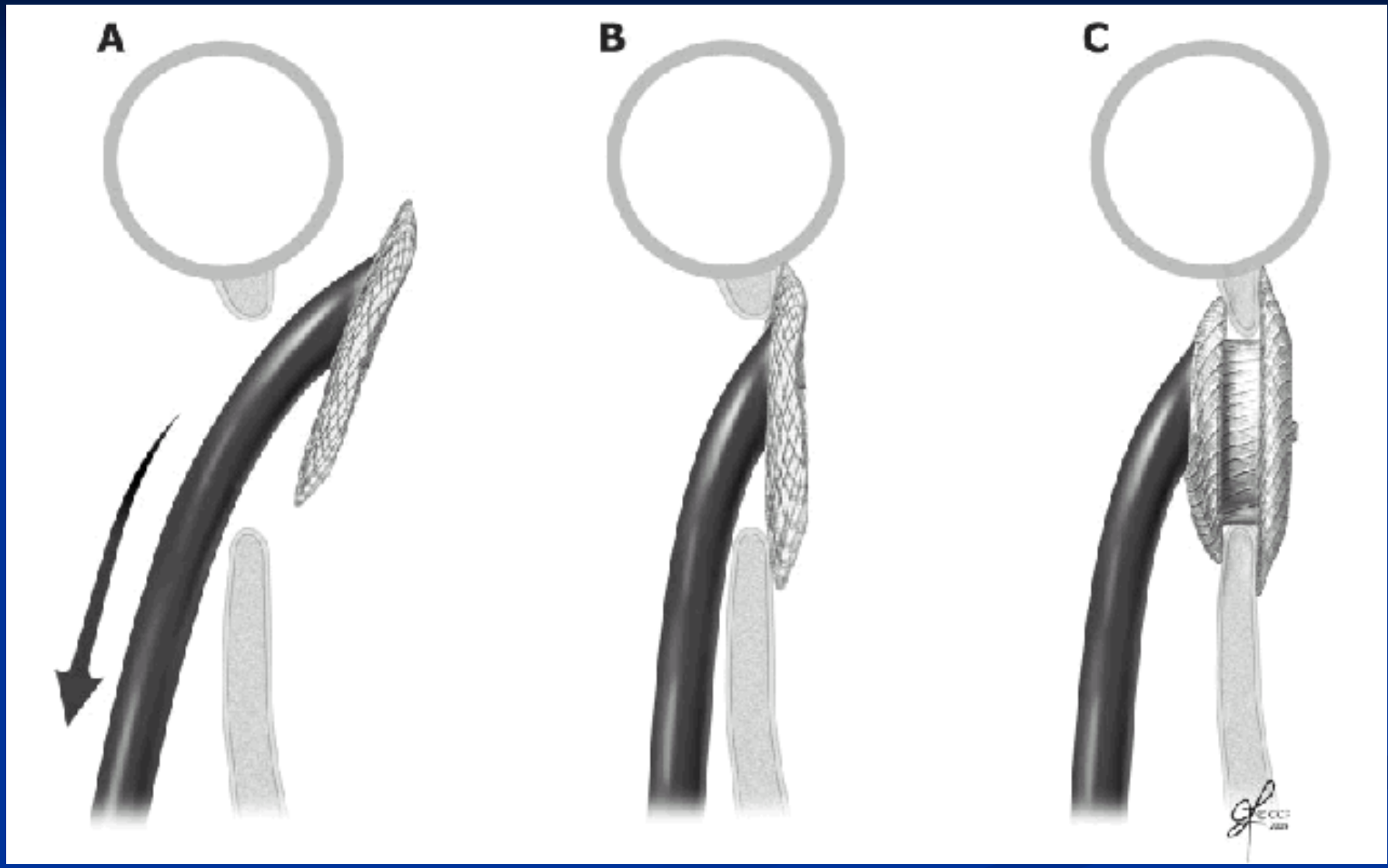
Use of Straight, Side-hole sheath



Kutty S, Asnes JM, Srinath G, Preminger TJ, Prieto LR, Latson L. Cath and Cardiovasc Interv 2007;69:15-20.


A
B
©CCF
2006


A
B
C


A
B
C

Avoidance of complications

- Air embolism
- Secondary bleeding/haematoma
- Arrhythmias

- Device embolisation
- Thromboembolism

- Erosions/perforation

Conclusions

- ASDs as large as 36-38 mm diameter can be closed
- The size, rims and stability of the septum define limits
- Amplatzer device is the only choice
- Use of an “adequate” size device that safely fits

Conclusion-1

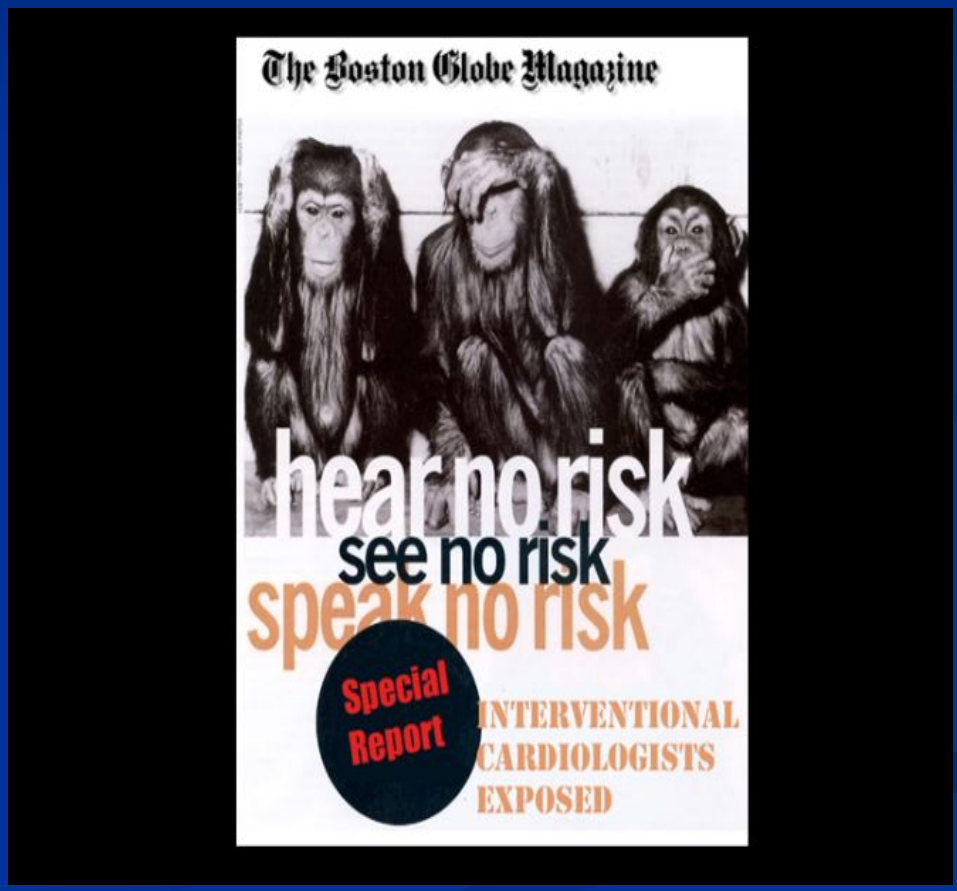
- Standard deployment may not be adequate in large challenging ASDs
- Different methods/manoeuvres needed:
  - Device deployed in R or LUPV, left atrial roof
  - Device loaded over a guidewire & deployed in a PV
  - Device deployed with assistance from a catheter/dilator/**balloon assisted technique**
  - Hausdorf sheath / Straight side-hole sheath
- Most complications are well understood, hence avoidable

Large but unsuitable ASD's

- Absent IVC or deficient both IVC and posterior margins
- Larger than 36-38mm

Closure of large ASDs

- Safety shall be paramount:
  - I can do it but shall I do it?

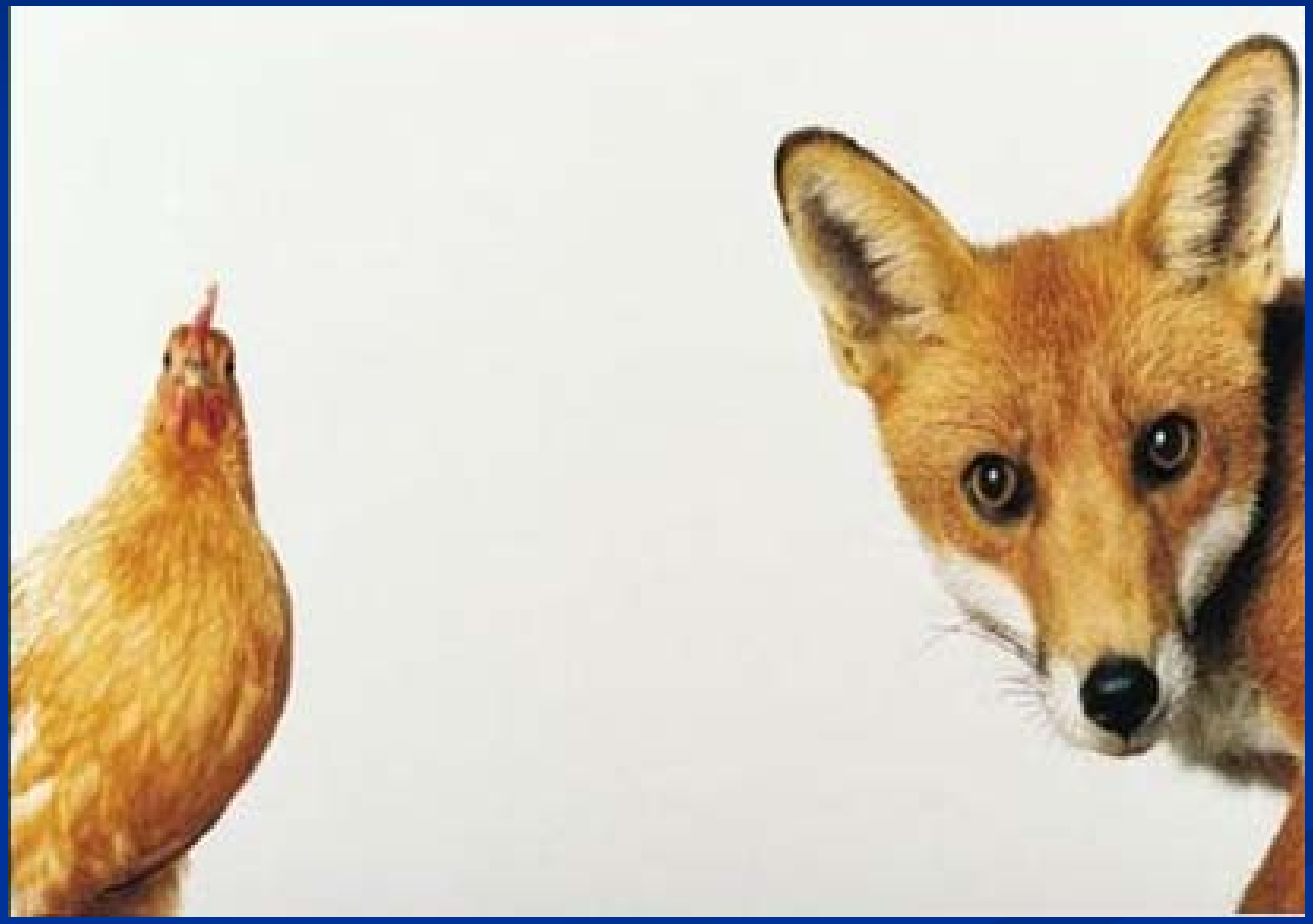


Gatekeeper role of the cardiologist for surgical referrals

- Pre-op assessment
- Peri-op assessment
- Post-op assessment
- Judgment regarding adequacy of surgical results determining continued surgical referral

Ziyad Hijazi

Who is the gatekeeper for cardiologist self referrals?



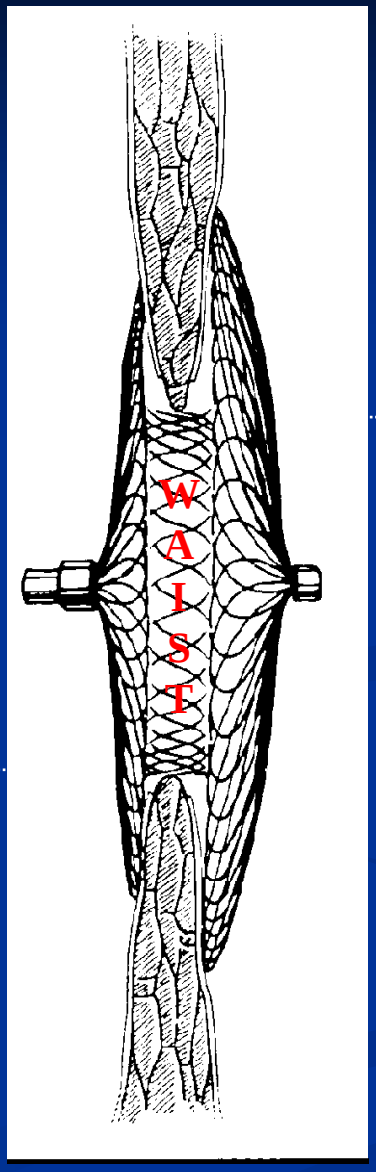
ASD devices

Cardioseal

Starflex

Amplatzer

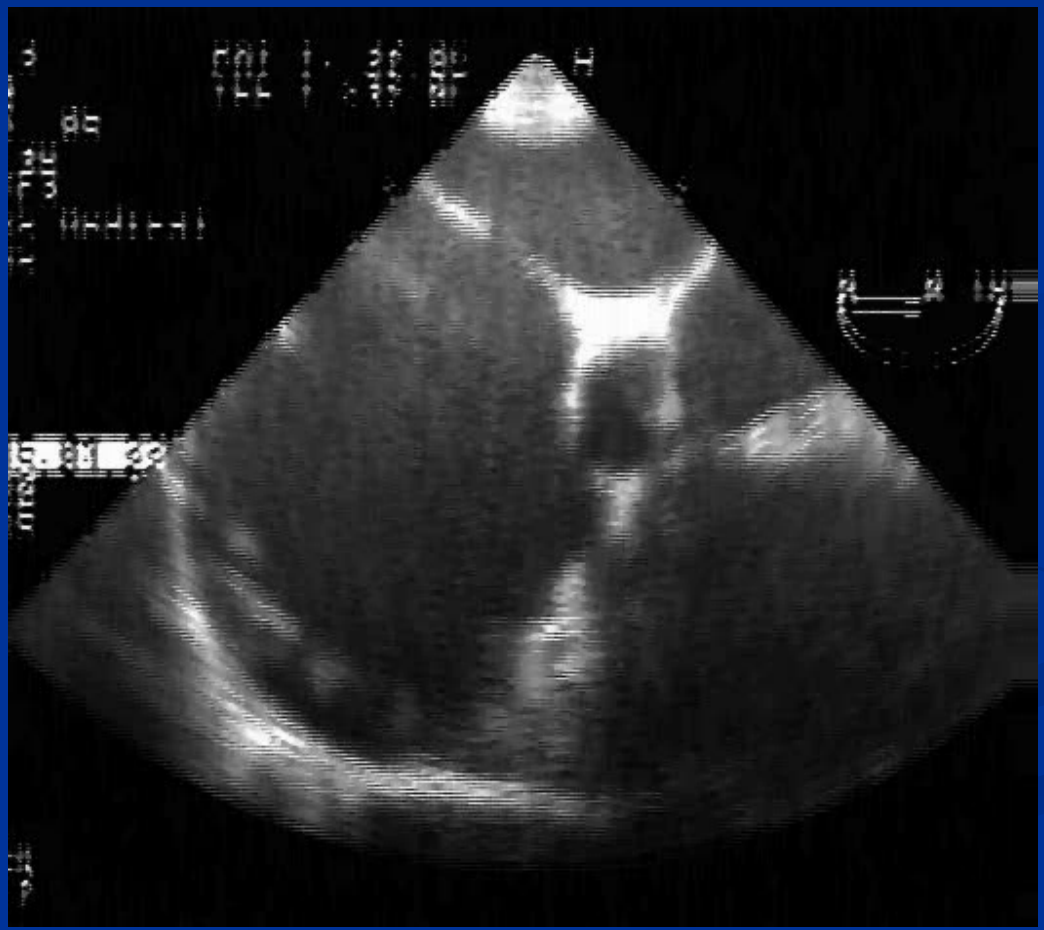
Helex



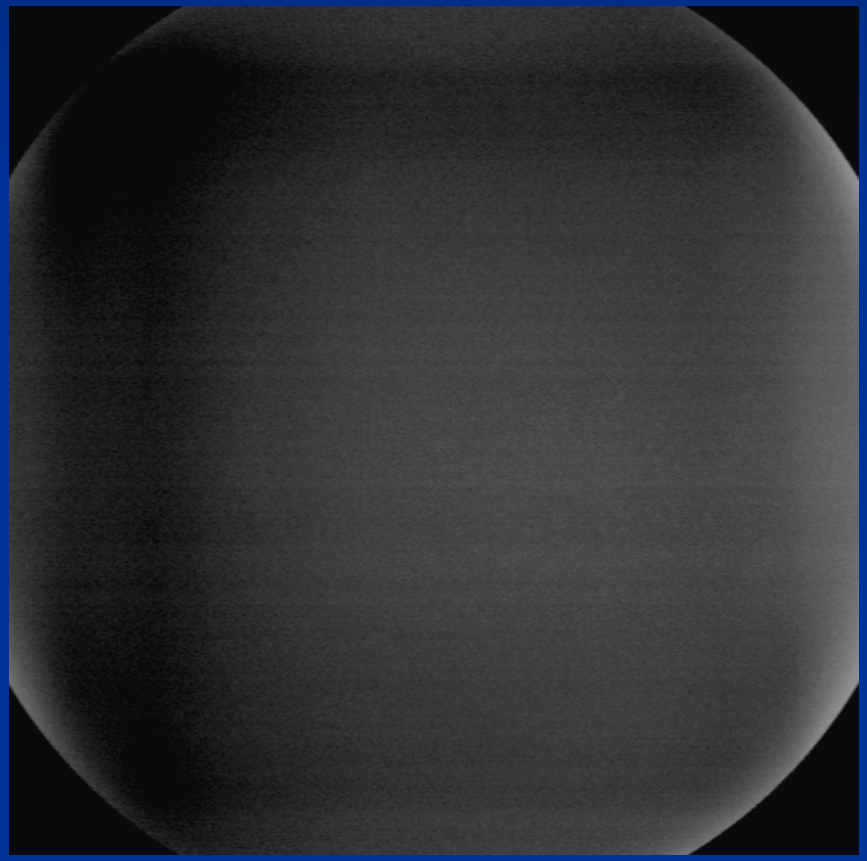
- Self-Expandable
- Short-connecting Waist
- Nitinol wire .004” - .008”
- Sizes: 4-40 mm

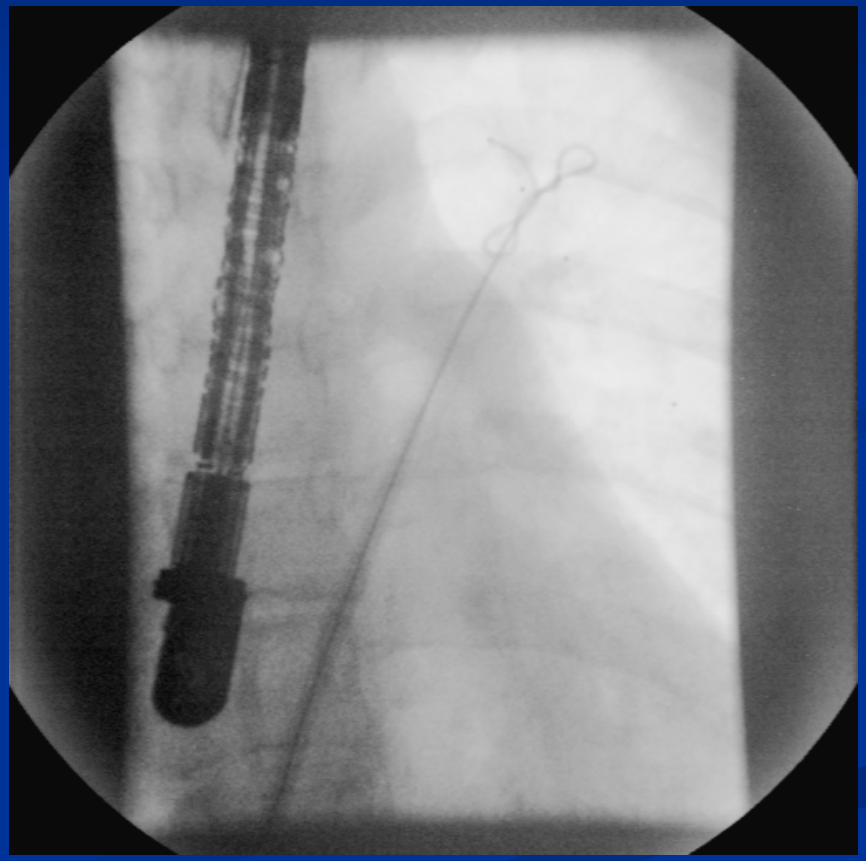
Device closure of secundum ASD

Moderate ASD – colour jet width & balloon sizing, device closure



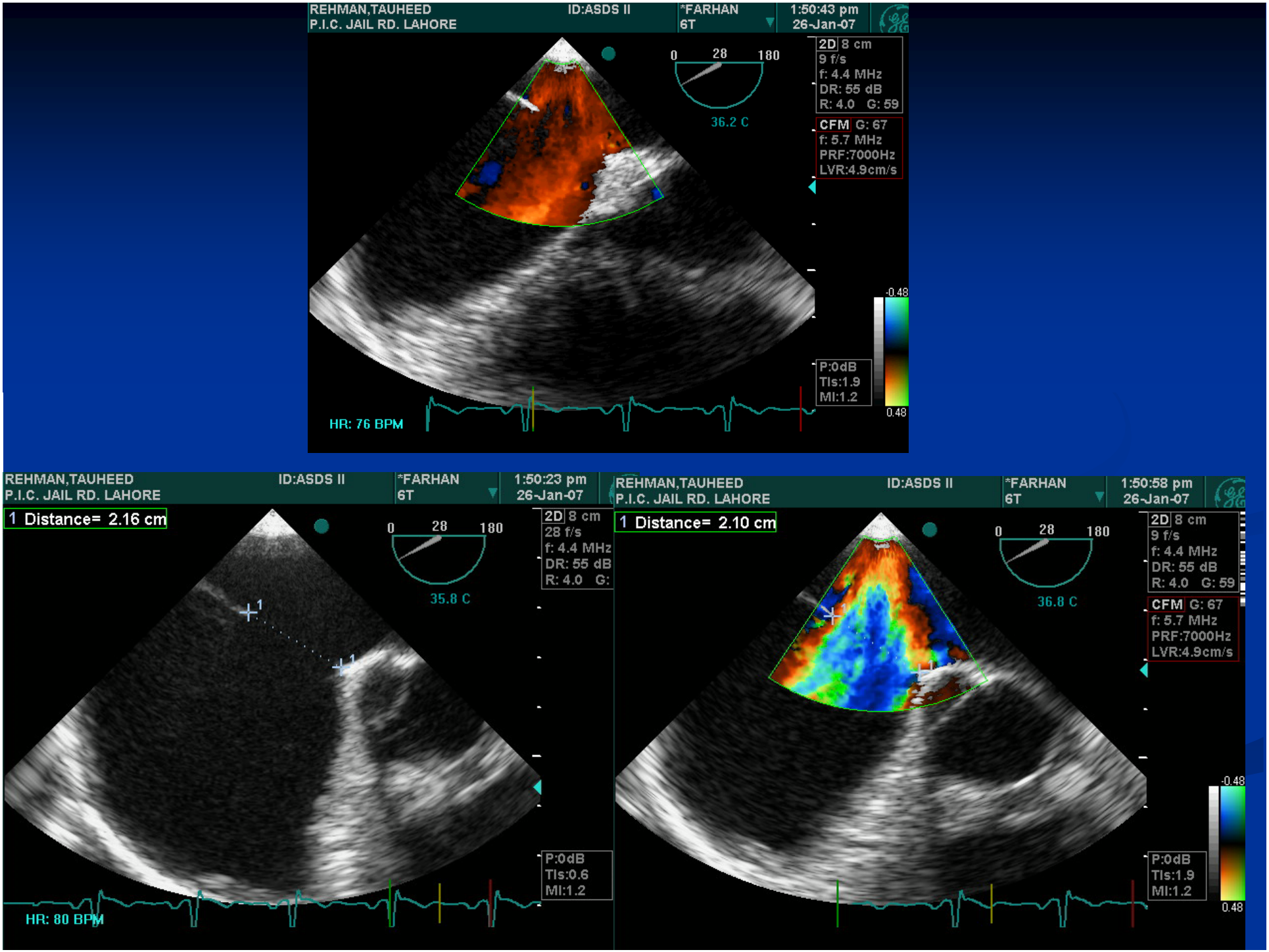
Procedure





Procedure

- Dilator and wire removed slowly to ensure no air is sucked into the sheath
- Device inserted in saline and examined before screwing to delivery cable
- Device loaded into the loader
- Loader attached to delivery sheath by clockwise rotation (make sure cable is not partly unscrewed)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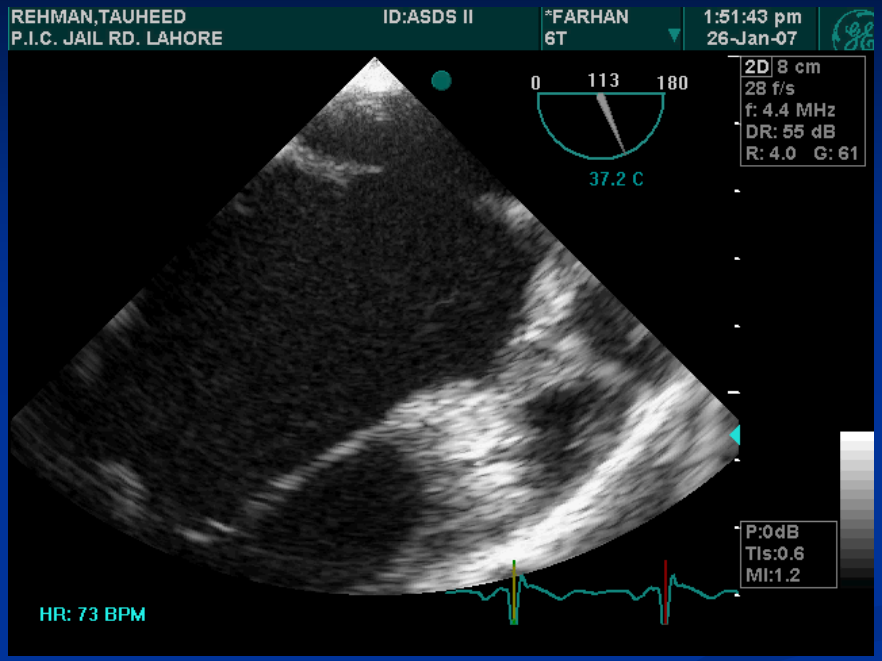
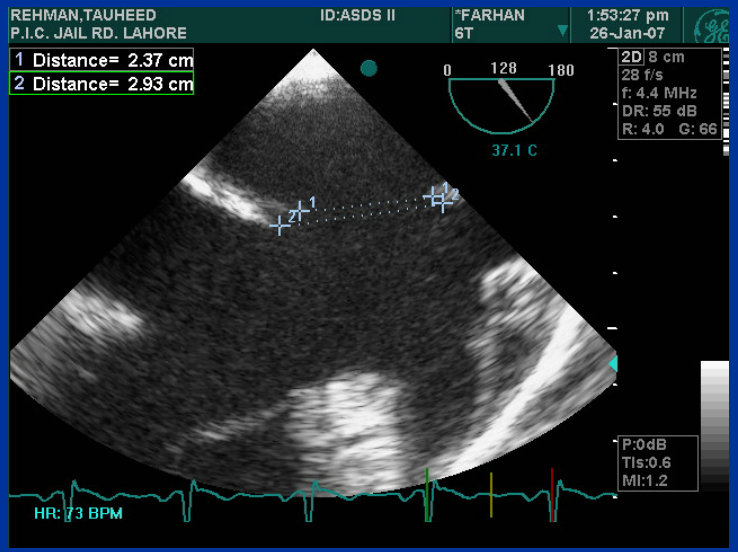
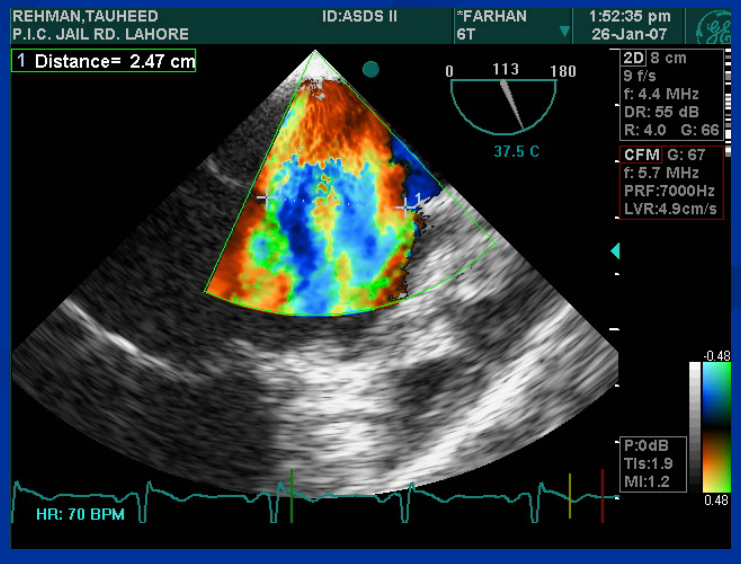
P.I.C. JAIL RD. LAHORE
ID:ASDS II
*FARHAN
6T
1:50:43 pm
26-Jan-07
2D 8 cm
9 f/s
f: 4.4 MHz
DR: 55 dB
R: 4.0 G: 59
CFM G: 67
f: 5.7 MHz
PRF:7000Hz
LVR:4.9cm/s
0 28 180
36.2 C
-0.48
0.48
P:0dB
TIs:1.9
MI:1.2
HR: 76 BPM
REHMAN,TAUHEED
P.I.C. JAIL RD. LAHORE
ID:ASDS II
*FARHAN
6T
1:50:23 pm
26-Jan-07
1 Distance= 2.16 cm
0 28 180
35.8 C
2D 8 cm
28 f/s
f: 4.4 MHz
DR: 55 dB
R: 4.0 G:
P:0dB
TIs:0.6
MI:1.2
HR: 80 BPM
REHMAN,TAUHEED
P.I.C. JAIL RD. LAHORE
ID:ASDS II
*FARHAN
6T
1:50:58 pm
26-Jan-07
1 Distance= 2.10 cm
0 28 180
36.8 C
2D 8 cm
9 f/s
f: 4.4 MHz
DR: 55 dB
R: 4.0 G: 59
CFM G: 67
f: 5.7 MHz
PRF:7000Hz
LVR:4.9cm/s
-0.48
0.48
P:0dB
TIs:1.9
MI:1.2

Bi-caval View



Deficient IVC rim shall be considered a contraindication to device closure!





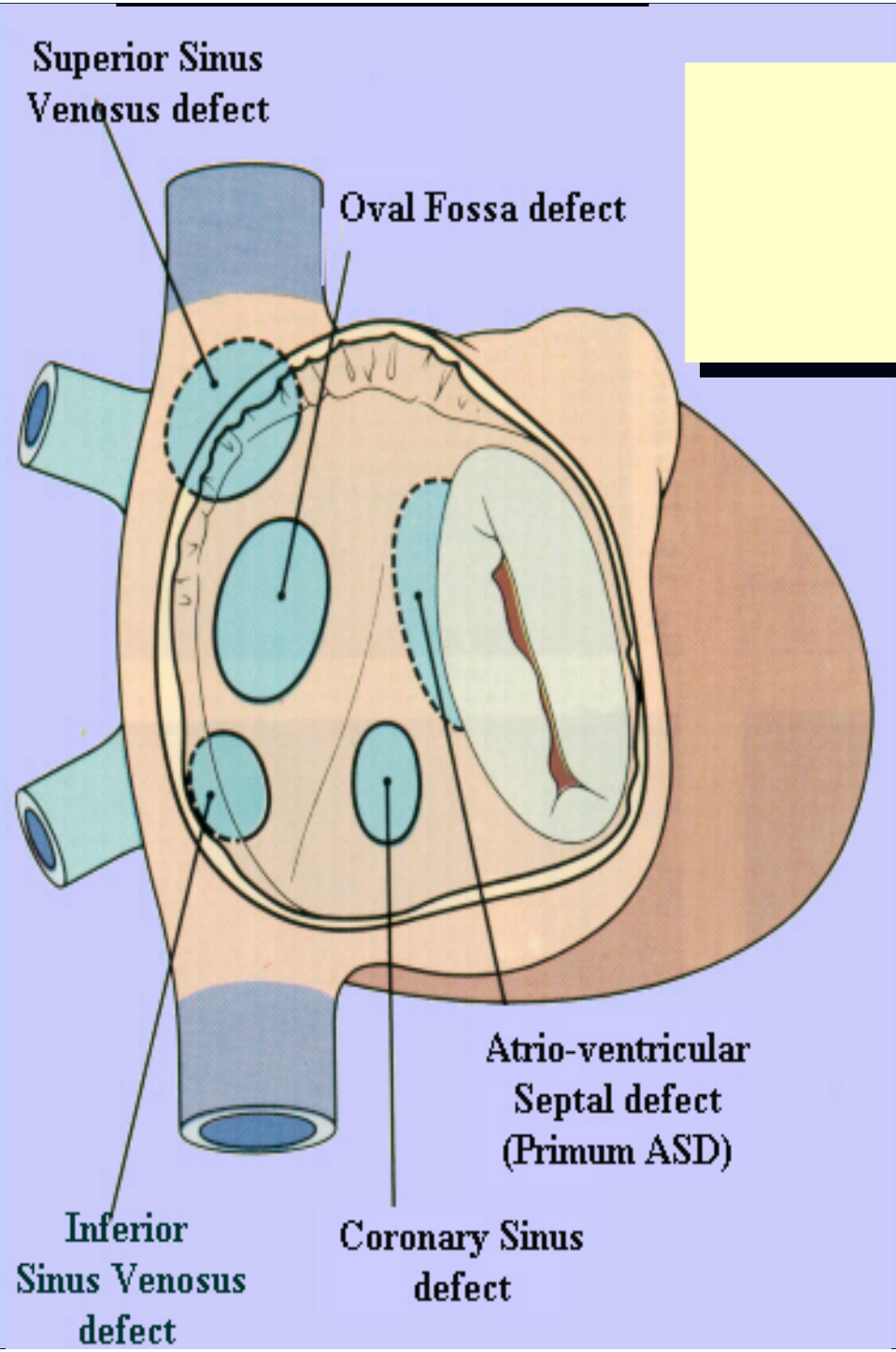
Data required from echocardiography

- Type of ASD
- Pulmonary veins (at least two one right and one left)
- RV pressure
- Mitral valve regurgitation
- Measurements

What to measure?

- Number of ASDs
- Size of ASD
- Total septal length
- Rims

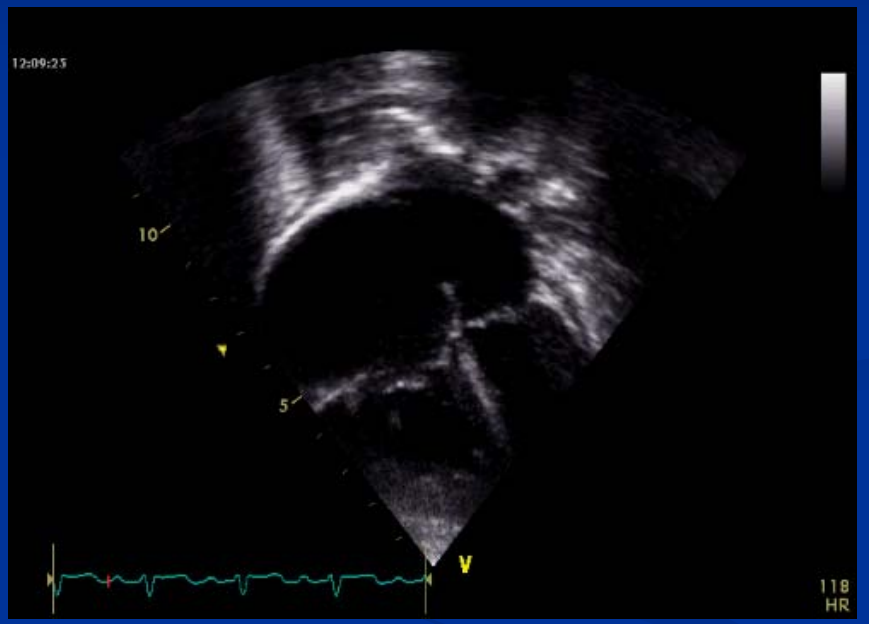
ASD sites


Superior Sinus Venosus defect
Oval Fossa defect
Atrio-ventricular Septal defect (Primum ASD)
Inferior Sinus Venosus defect
Coronary Sinus defect

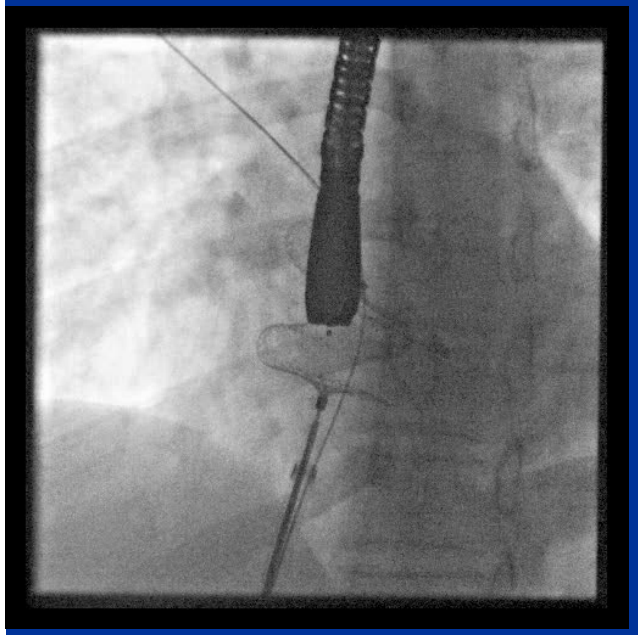
Sizing of defect

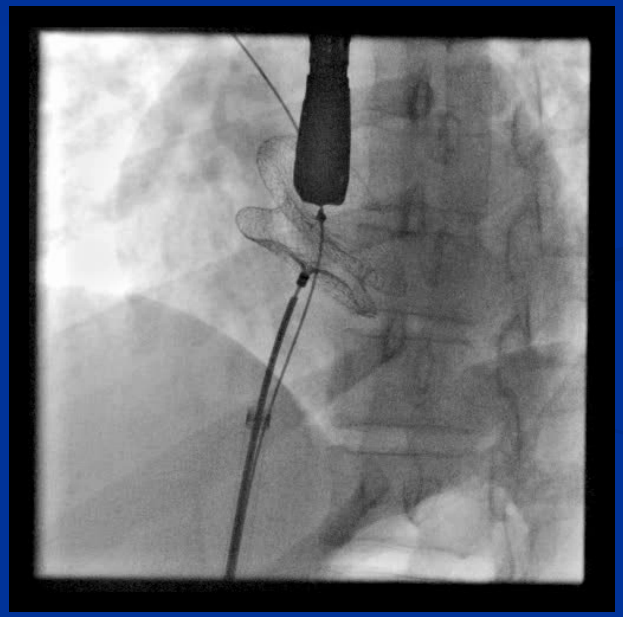
- In 4-chamber view by TTE or TEE
- AV valve rim + average size of ASD + superior rim
- A device where LA disc of ASO is equal to or smaller than the total septal length may be used

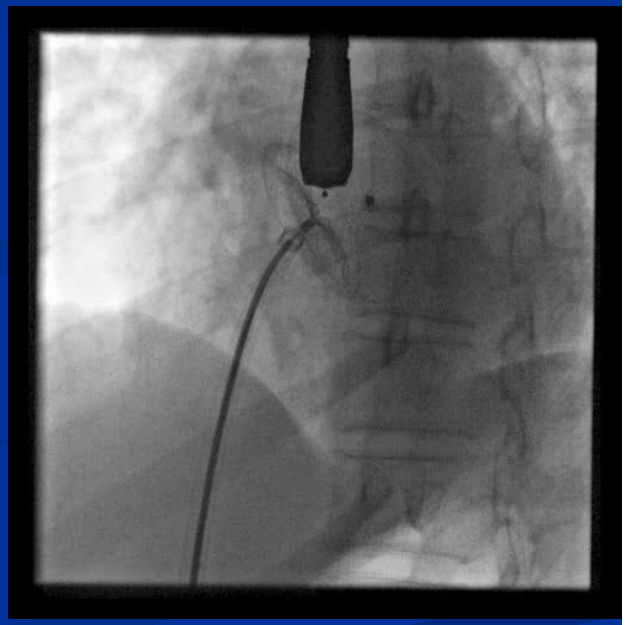
Total septal length



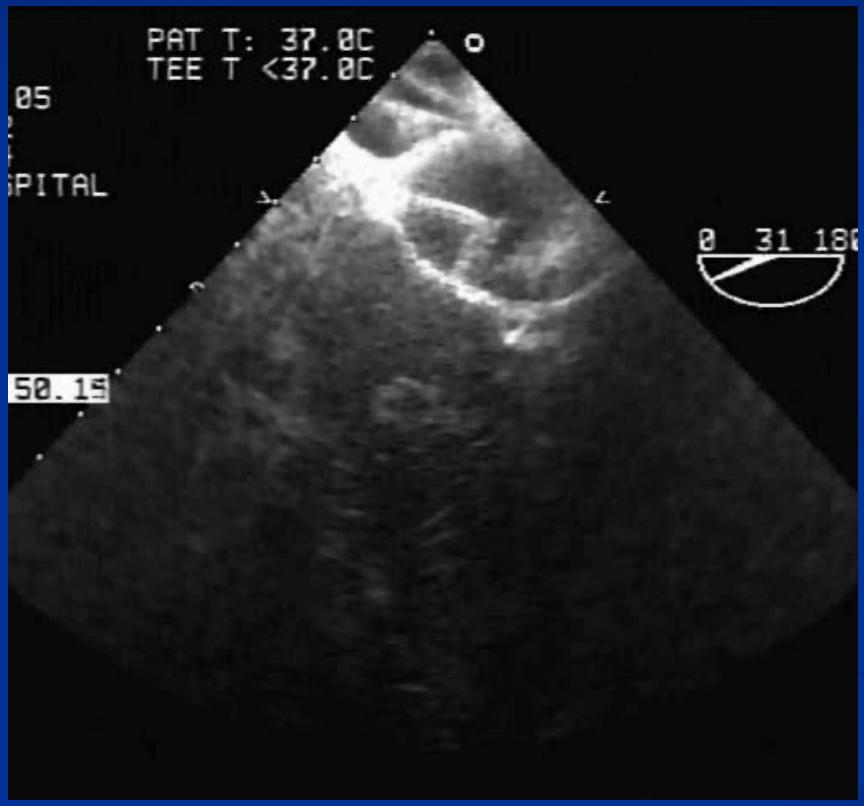
Delivery of device over wire in RUPV







Delivery in LUPV

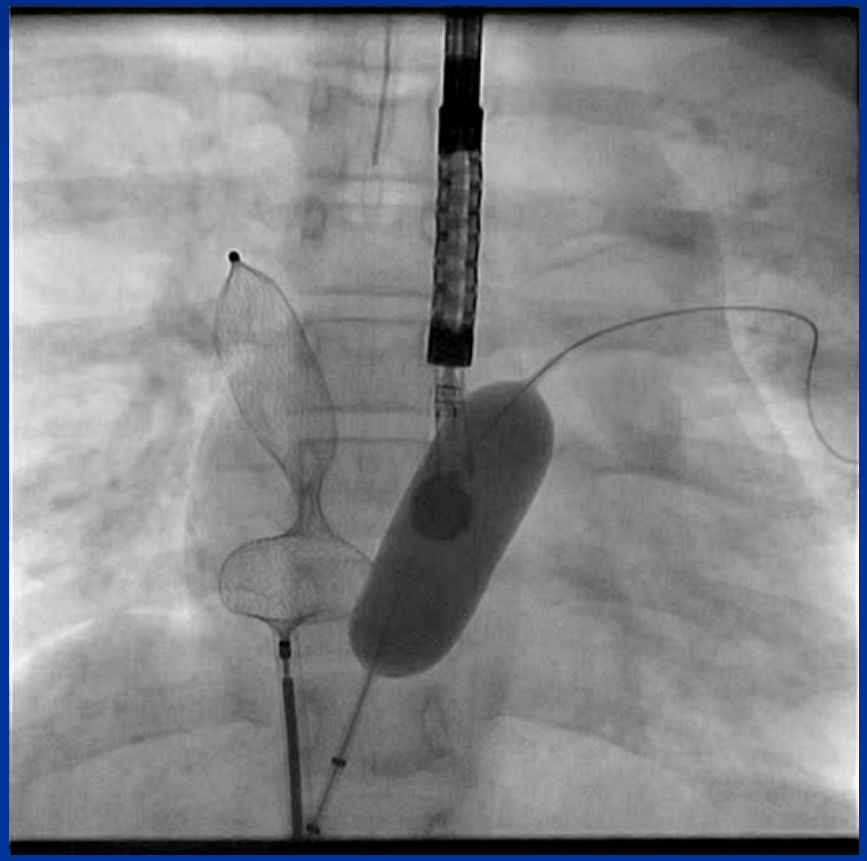


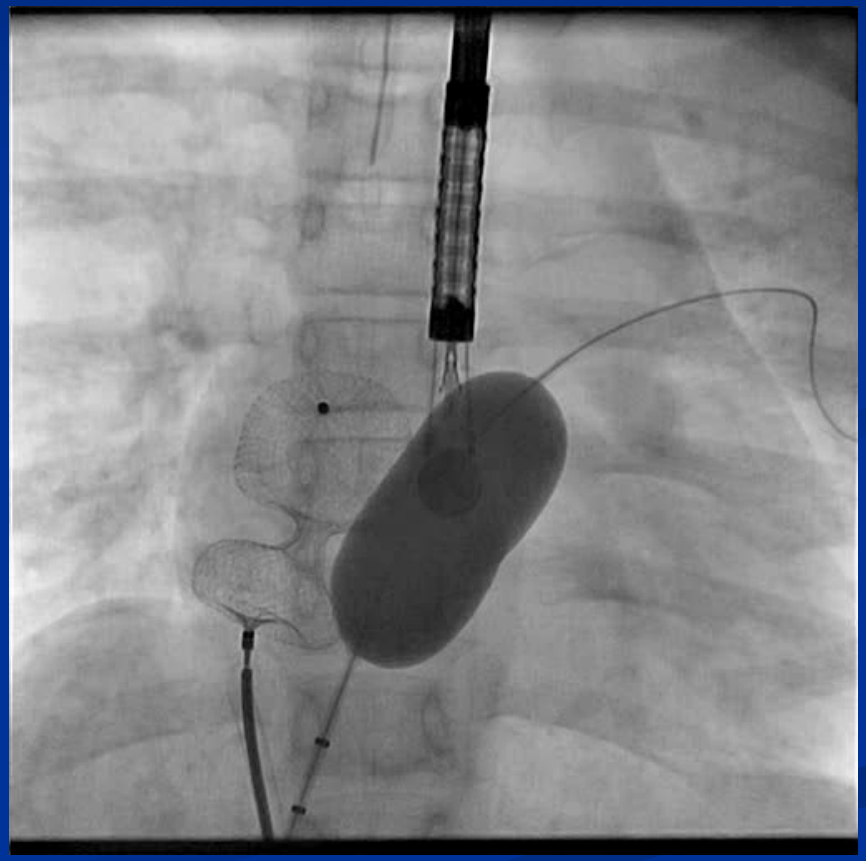
Deployment in LUPV over a wire

Size of the ASD

- In at least two orthogonal views – "Oval"
- Three standardised views on TOE:
  - 4 Chamber view
  - Short axis view
  - Bi-caval view

Balloon Assisted Technique
Balloon in LUPV, device in RUPV

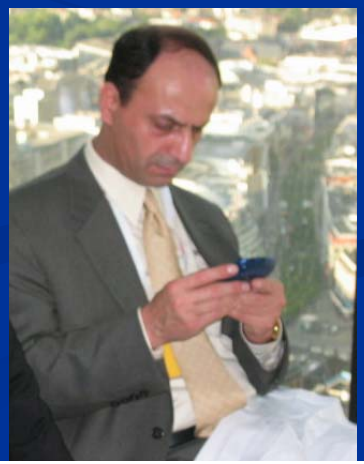




Dalvi BV, Pinto RJ, Gupta A. Cath Cardiovasc Interv 2005;64:102-107

Complications of ASD Closure
Surgery *versus* devices

	Device n=442	Surgery N=154	p
Arrhythmia needing Rx	2	0	0.03
Device embolization with surgical removal	3		
Marker band embolism with surgical removal	1		
Cerebral embolism	1	0	1.0
Pericardial effusion with tamponade	0	3	0.017
Pulmonary oedema	0	1	0.26
Repeat surgery	0	2	0.066
Wound complications	0	2	0.066
Total	7 (1.6%)	8 (5.4%)	0.30

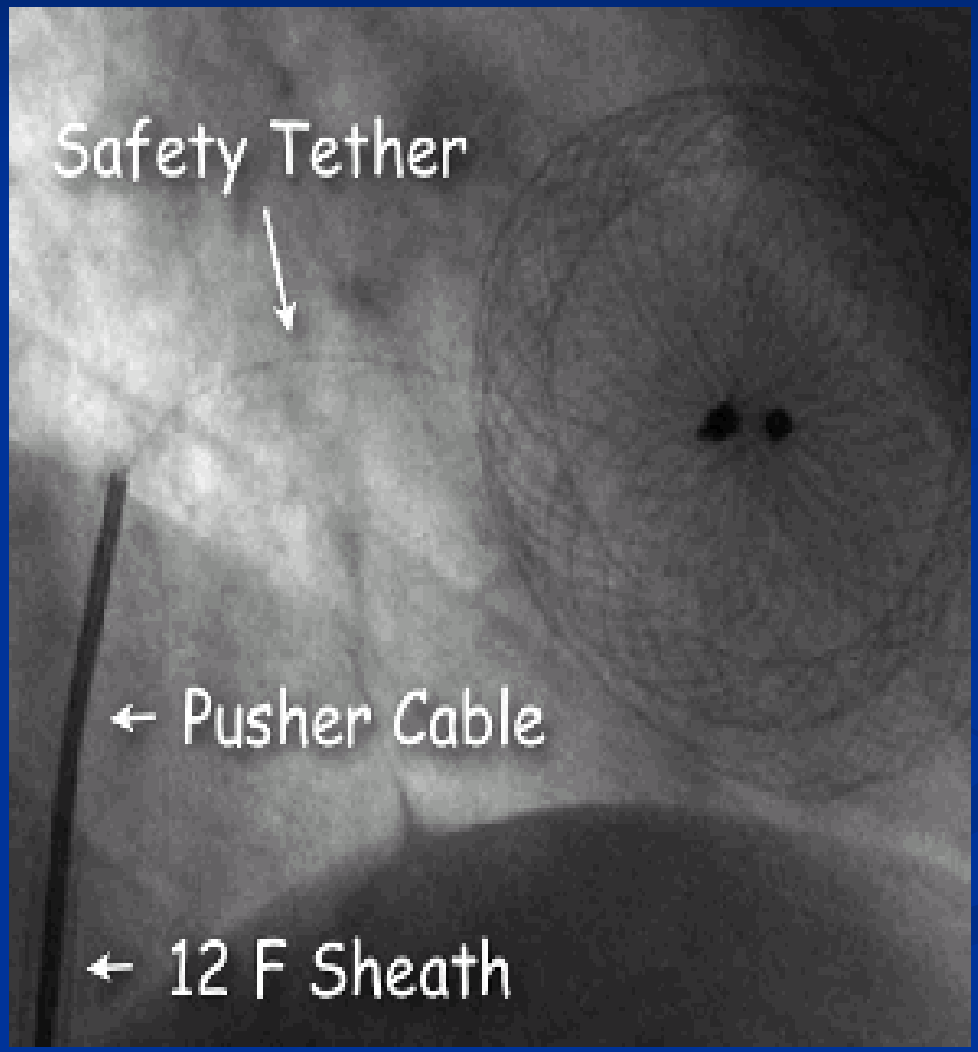


Ziyad Hijazi

Gatekeeper role of the cardiologist for surgical referrals

- Pre-op assessment
- Peri-op assessment
- Post-op assessment
- Judgment regarding adequacy of surgical results determining continued surgical referral

Modification of pusher cable



Avoidance of complications

Device embolisation

- Risk varies 0.5-1%
  - Undersizing
  - Improper deployment
- Especially failing to recognise deficient IVC rim
- Gentle wiggle
- Constant pull and push
- If device is not parallel to septum, it must be recaptured and redeployed

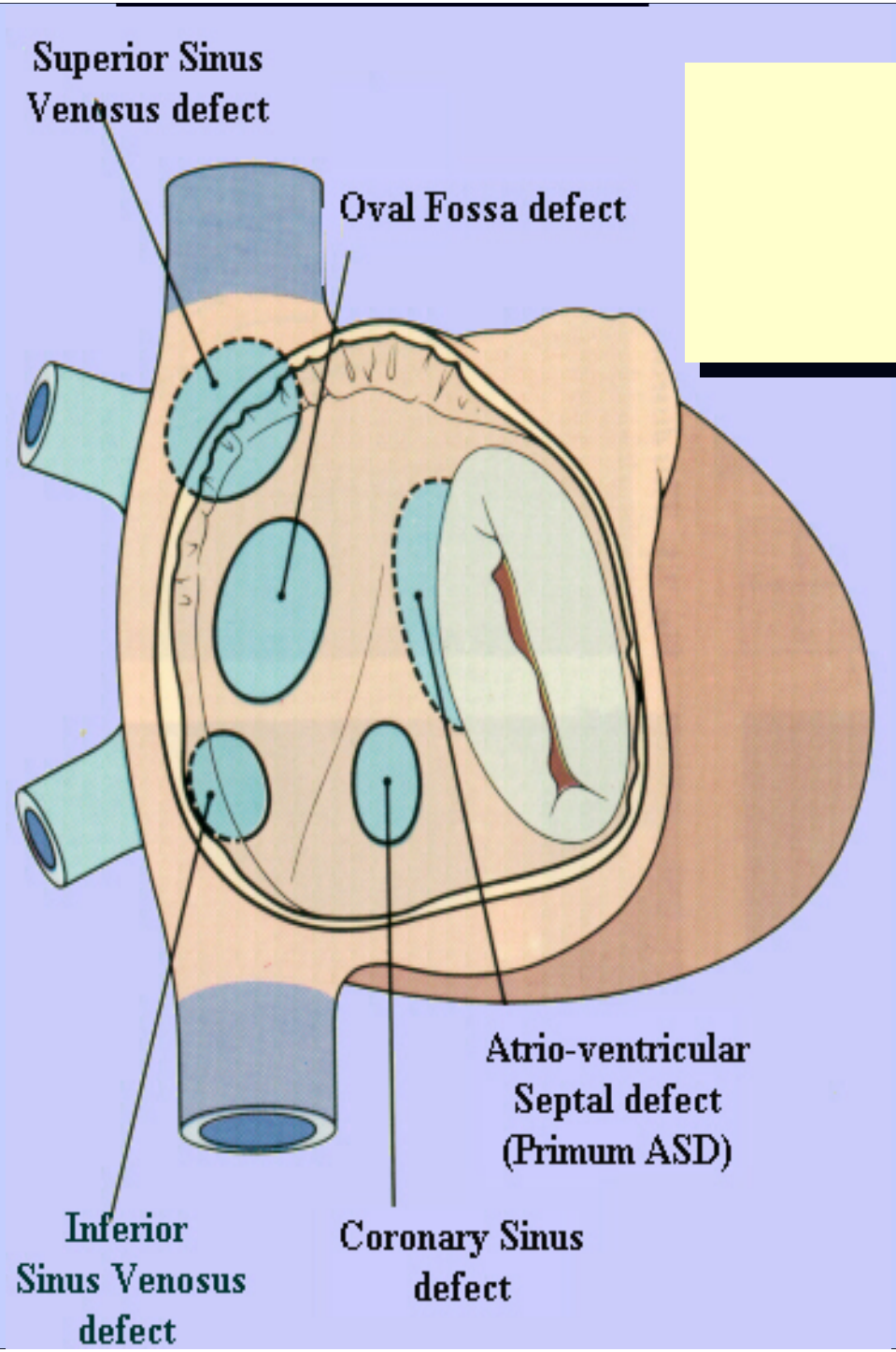
Avoidance of complications

Erosion/Perforation/PE

- Incidence of haemodynamic compromise 1/1000
  - Deficiency of aortic rim/superior rim
  - Oversizing
- Edge of RA or LA disc eroded through free atrial wall
- If extended to aorta, tamponade was rapid
- Majority occurred within 05 days
- Shape memory may play a role
- Rarely aorta to RA or LA fistula

Amin Z, Hijazi ZM, Bass JL et al. Cath and Cardiovasc Interv 2004;63:496-502

ASD sites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