



4th Asia Pacific Congenital & Structural Heart Intervention Symposium 2013

6 – 8 Sep 2013, Hk Convention & Exhibition Centre

Organizer: Hong Kong Society of Congenital & Structural Heart Disease

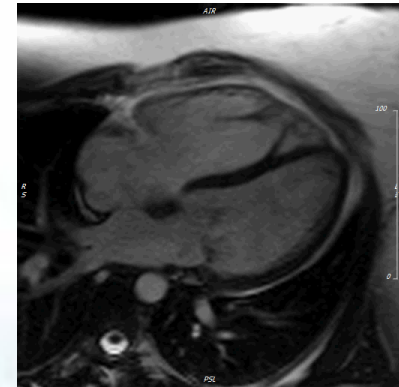
Role of 3D Trans-Esophageal Echo (TEE) and Cardiac MRI (CMR) in Management of ASD

**Dr. Andrew YW Li, MD, FHKCP
(Hong Kong)**

Role of Imaging in ASD

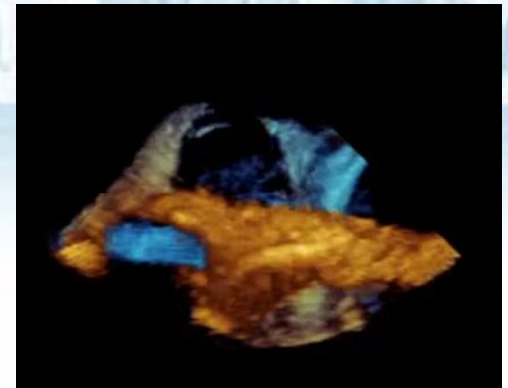
Pre-operative:

- Determine need for closure
- Select patients for transcatheter approach



Intra-operative:

- Guidance of the closure procedures



ACC/AHA 2008 Guidelines for the Management of Adults With Congenital Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines on the Management of Adults With Congenital Heart Disease): Developed in Collaboration With the American Society of Echocardiography, Heart Rhythm Society, International Society for Adult Congenital Heart Disease, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

Carole A. Warnes, Roberta G. Williams, Thomas M. Bashore, John S. Child, Heidi M. Connolly, Joseph A. Dearani, Pedro del Nido, James W. Fasules, Thomas P. Graham, Jr, Ziyad M. Hijazi, Sharon A. Hunt, Mary Etta King, Michael J. Landzberg, Pamela D. Miner, Martha J. Radford, Edward P. Walsh and Gary D. Webb

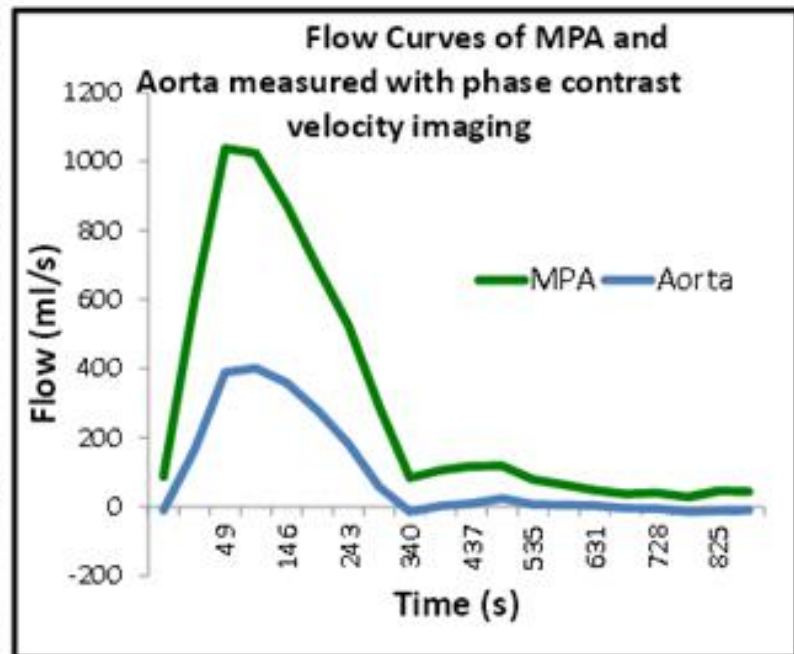
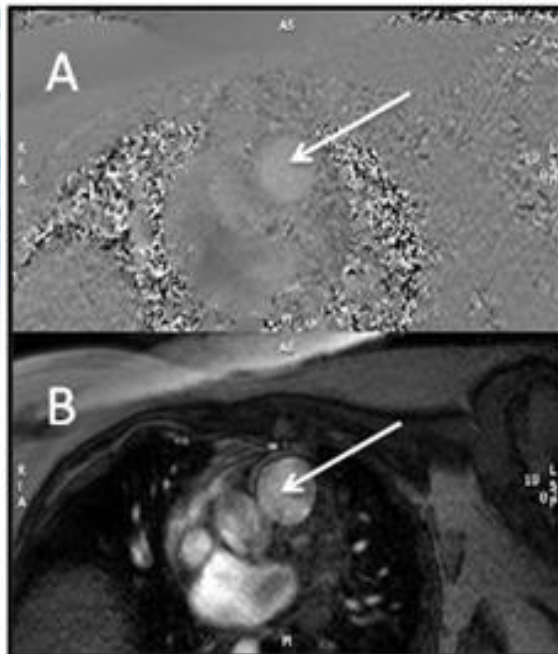
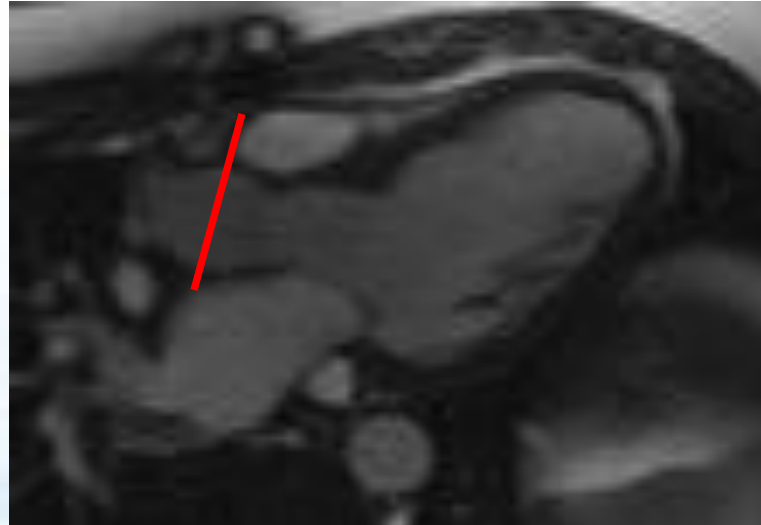
In younger patients with uncomplicated ASD for whom noninvasive imaging results are adequate, diagnostic cardiac catheterization is not indicated. (*Level of Evidence: B*)



One-stop-shop with CMR in ASD pre-op assessment

- Assess hemodynamic indication for closure:
 - RV or RA enlargement (class I)
 - Net L to R shunt (class IIb)
(Qp:Qs quantification)

Shunt assessment in CMR





One-stop-shop with CMR in ASD pre-op assessment

- Assess suitability of percutaneous approach:
 - Location and size of ASD
 - Rims of ASD
- Exclude contra-indications for percutaneous closure
 - Non-secundum type ASD
 - Anomalous pulmonary venous drainage

Cases 1

- 41yo/ F
- Secundum ASD incidentally found during transthoracic Echo
- Sinus rhythm in ECG
- Shunt ratio (in CMR) $Q_p: Q_s = 1.7: 1$

Case 1: Rims measurement

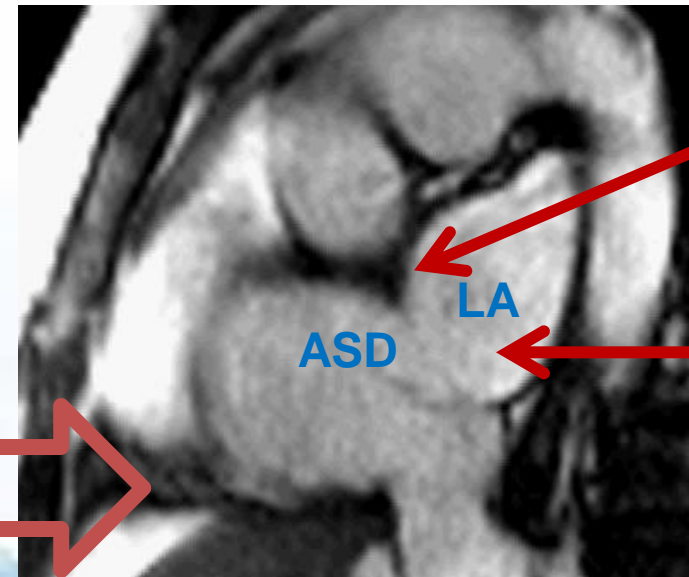
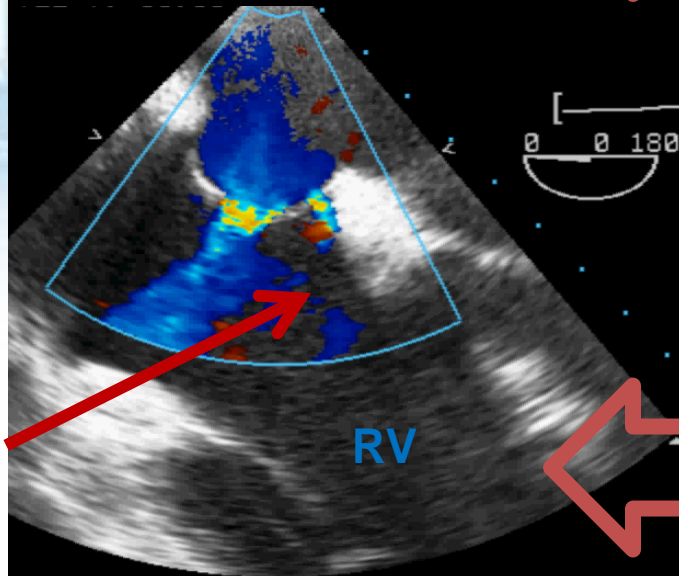
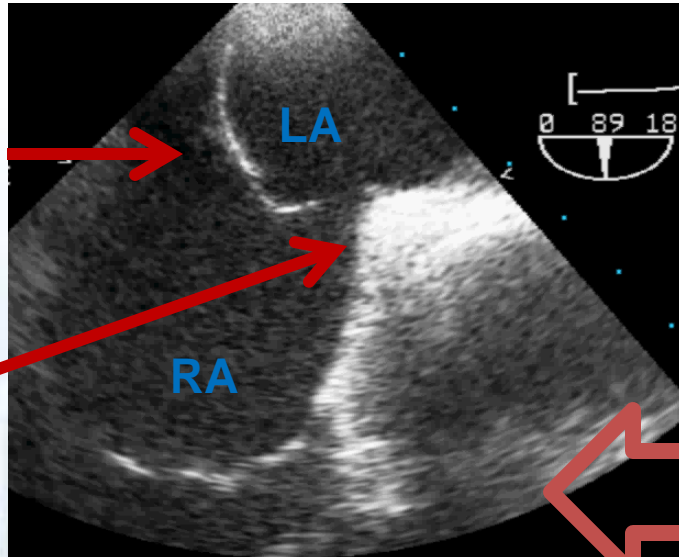
TEE

CMR

PI rim:
25 mm

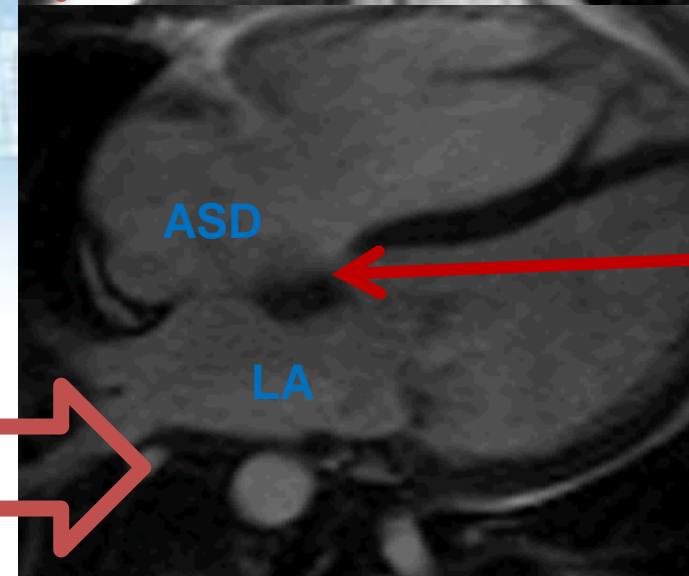
PS rim:
Not
seen

AI rim:
26 mm



PS rim:
11mm

PI rim:
30mm

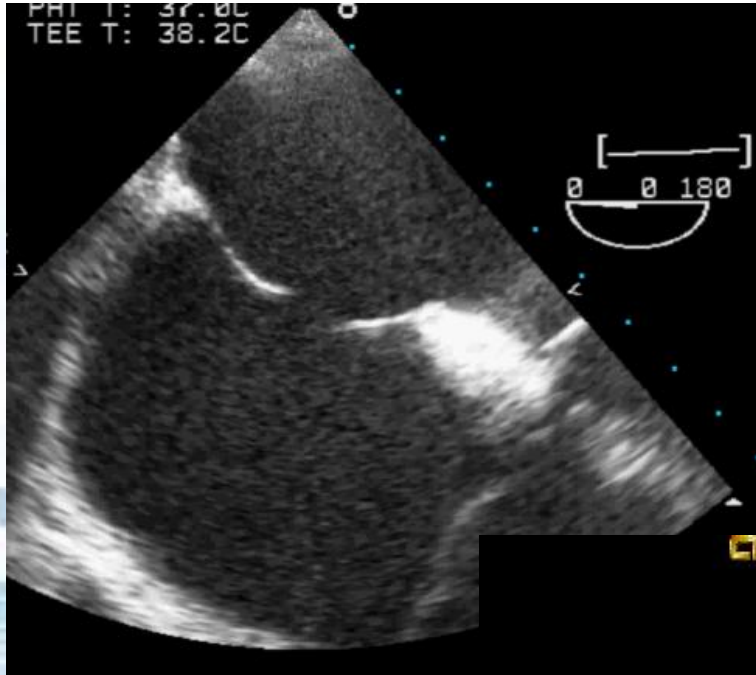


AI rim:
28mm

Case 1: Size measurement

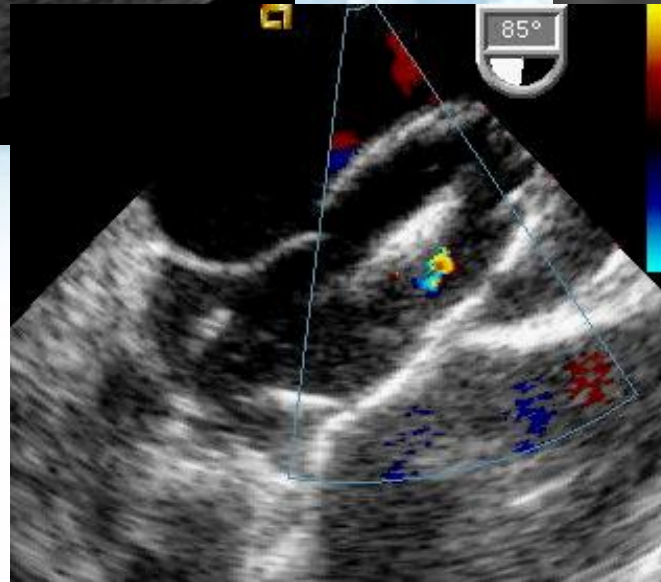
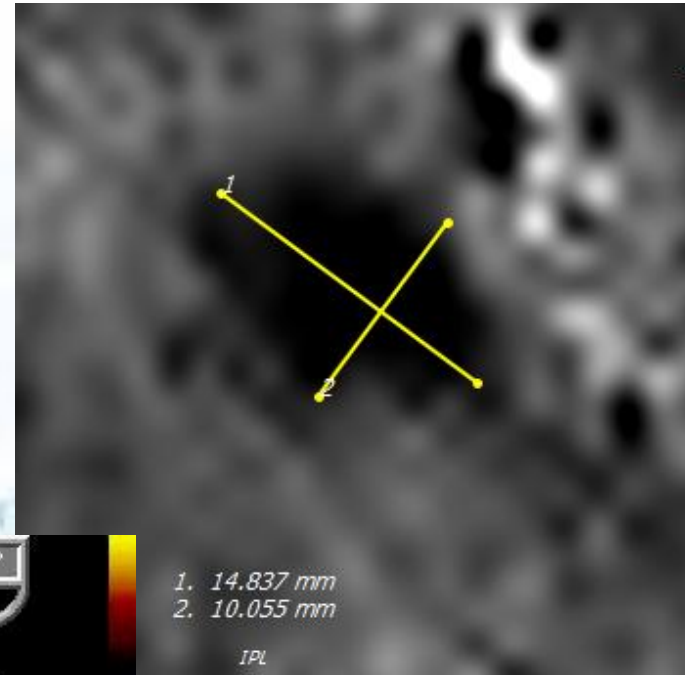
2D TEE:

10 x 13mm



CMR:

12 x 14mm



Stop-flow

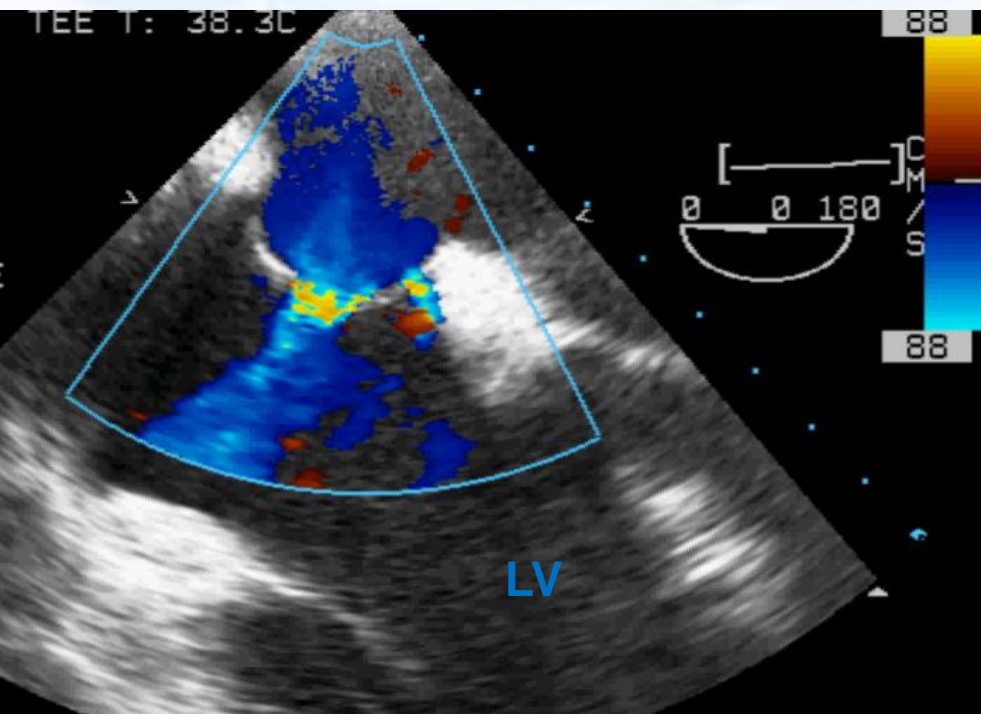
diameter:

16 mm

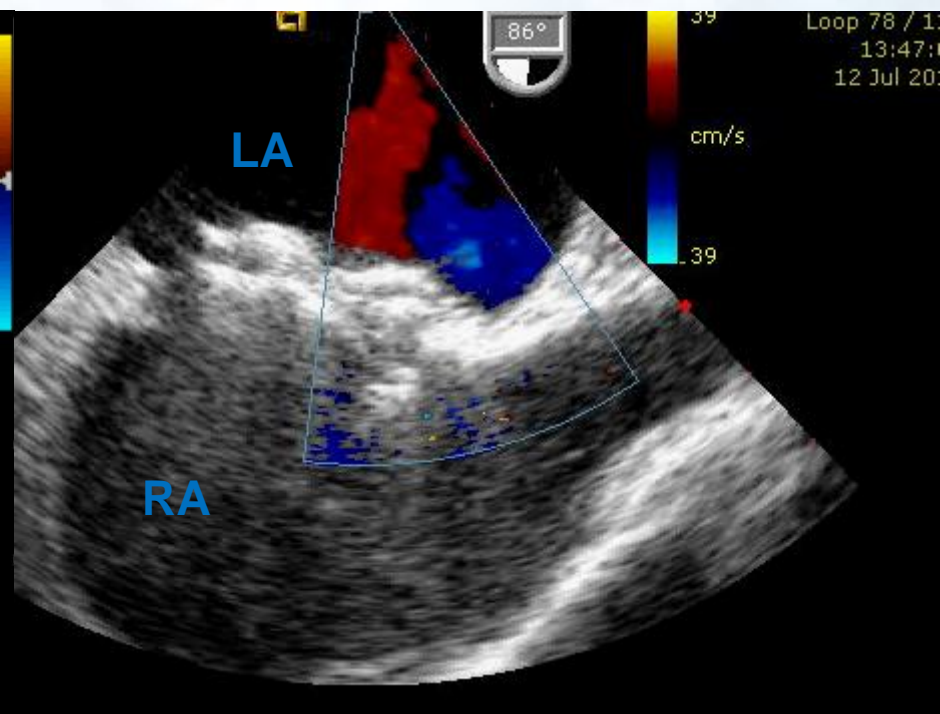
Case 1: Outcome

- Successful percutaneous closure with 18mm amplatzer occluder delivered over 8 Fr sheath
- Under GA and 2D TEE guidance

Before



After



Shunt assessment in CMR

- Adult patients with L-> R shunts
- Correlate Qp:Qs by MRI vs invasive oximetry

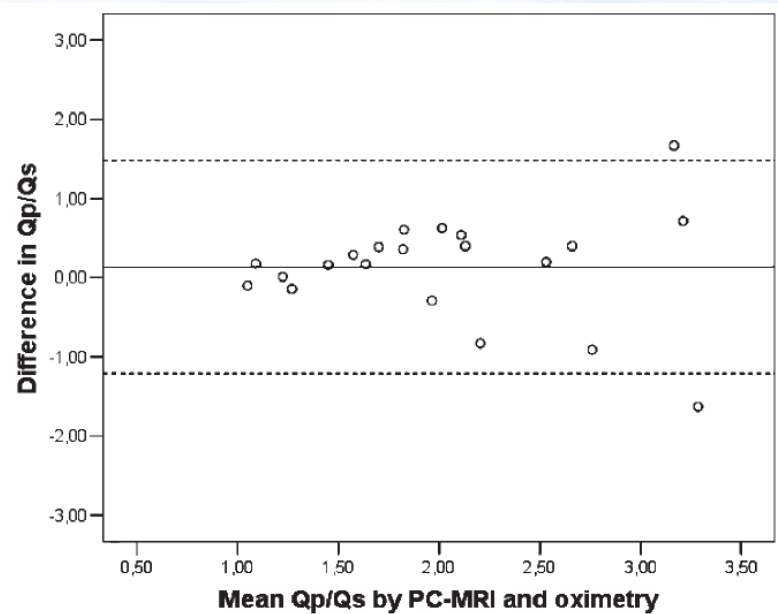
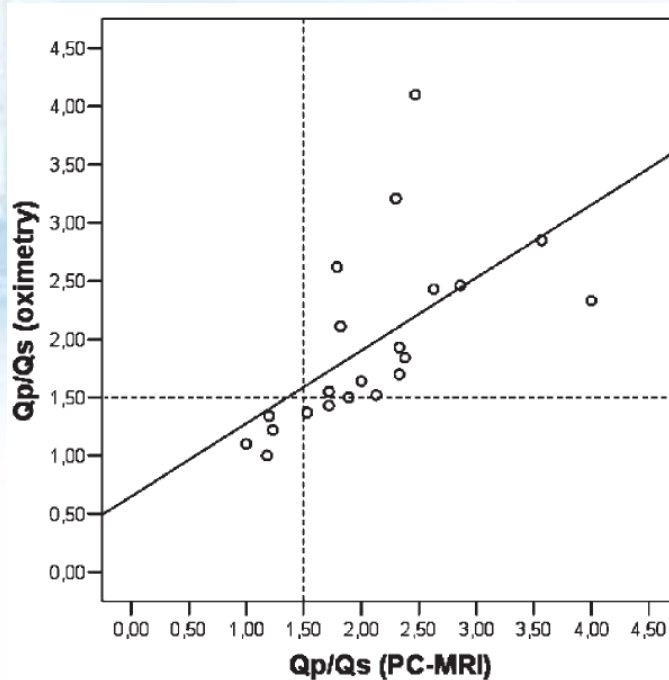
Patient characteristics

	Qp/Qs <1.5 (n=6)	Qp/Qs ≥1.5 (n=15)
Age	47.0 ± 14.0	50.9 ± 16.9
Gender (% male)	66	53
SR (%)	50	80
Mean PAP (mm Hg)	19.0 ± 7.2	25.4 ± 12.7
Cardiac shunts		
ASD (n)	2	11
VSD (n)	4	1
PDA (n)	0	2

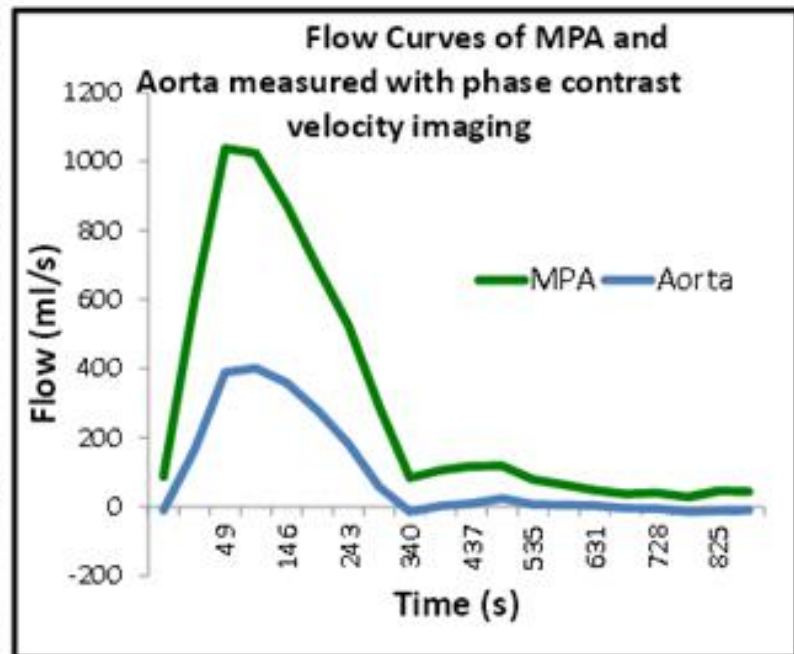
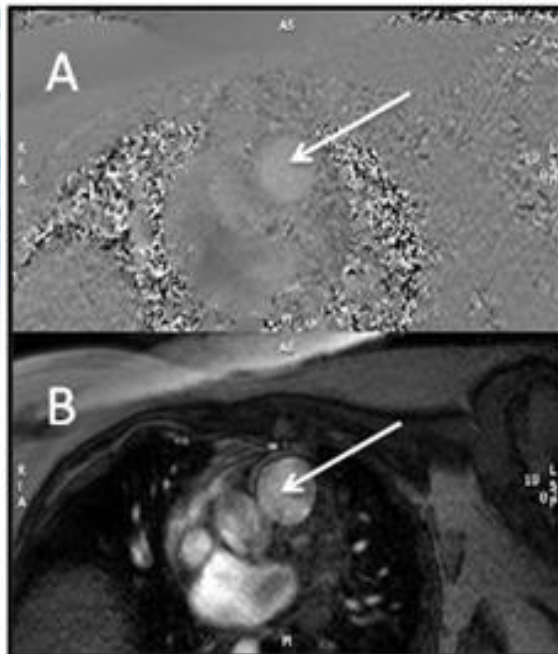
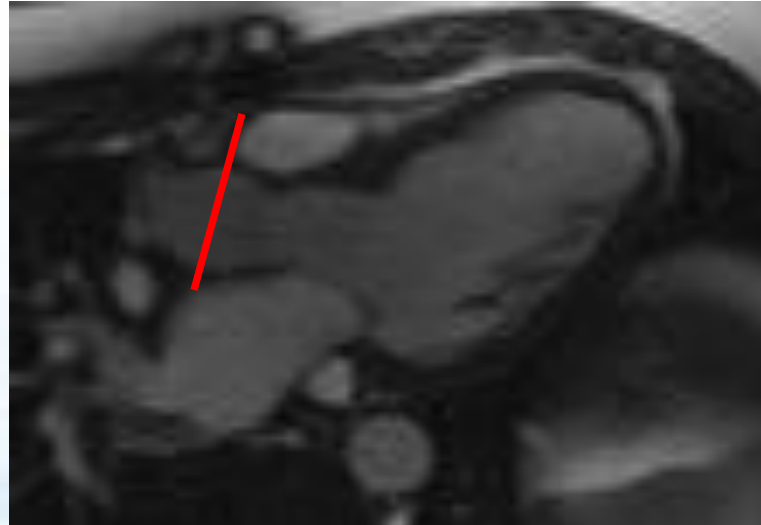
Shunt assessment in CMR

	Cases /Total (n)
CATH-Qp/Qs $\geq 1.5:1$	15/21

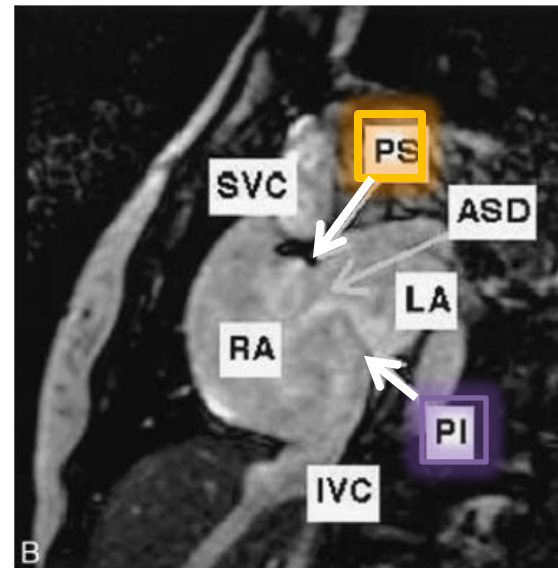
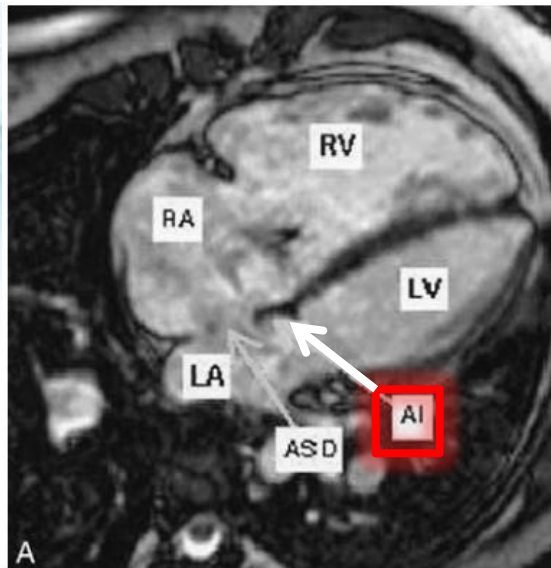
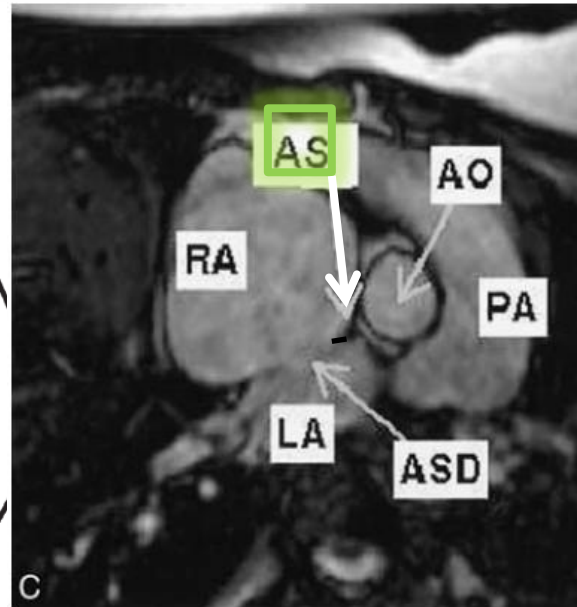
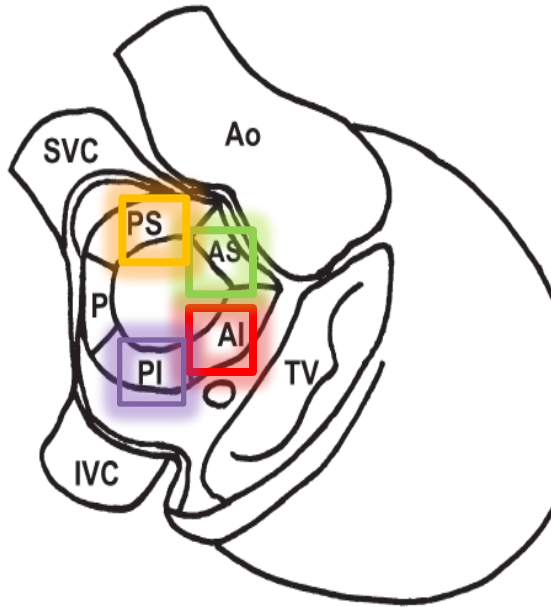
PC-MRI cut-off	ROC area (95% CI)	Sensitivity (%)/specificity (%)
1.75:1	0.99 (0.97–1.02)	93/100



Shunt assessment in CMR



Size and Rim of ASD in CMR



Durongpitskul K
et al. *Pediatr
Cardiol*
2004;25:124-30

Sizing: CMR vs. TEE vs. Surgery

- n = 65, mean age 5.4y

- Defect size in CMR:

- vs. TEE

- mean diff. < 1mm

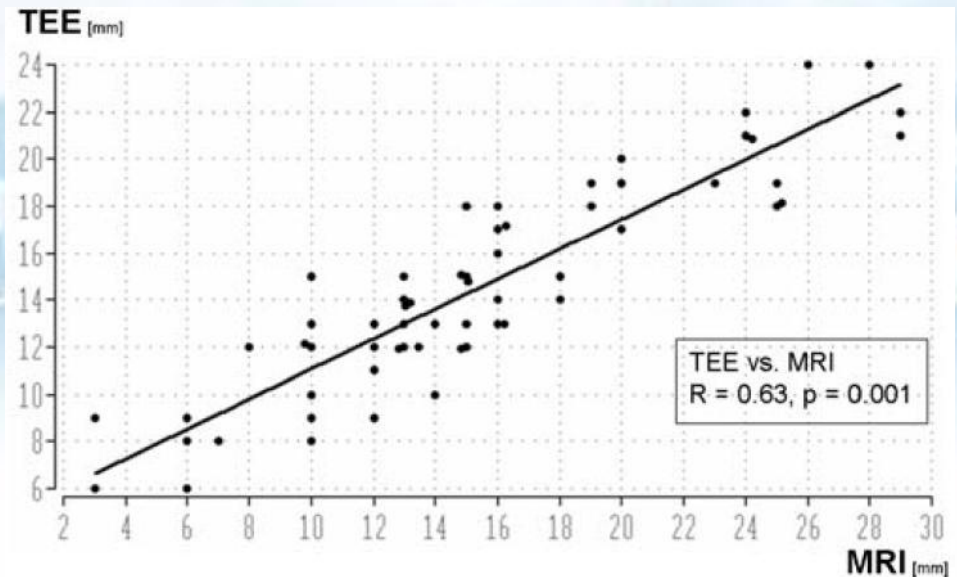
- vs. surgery

- mean diff. 1.2 to -1.6mm

- n = 60, adult secundum ASDs

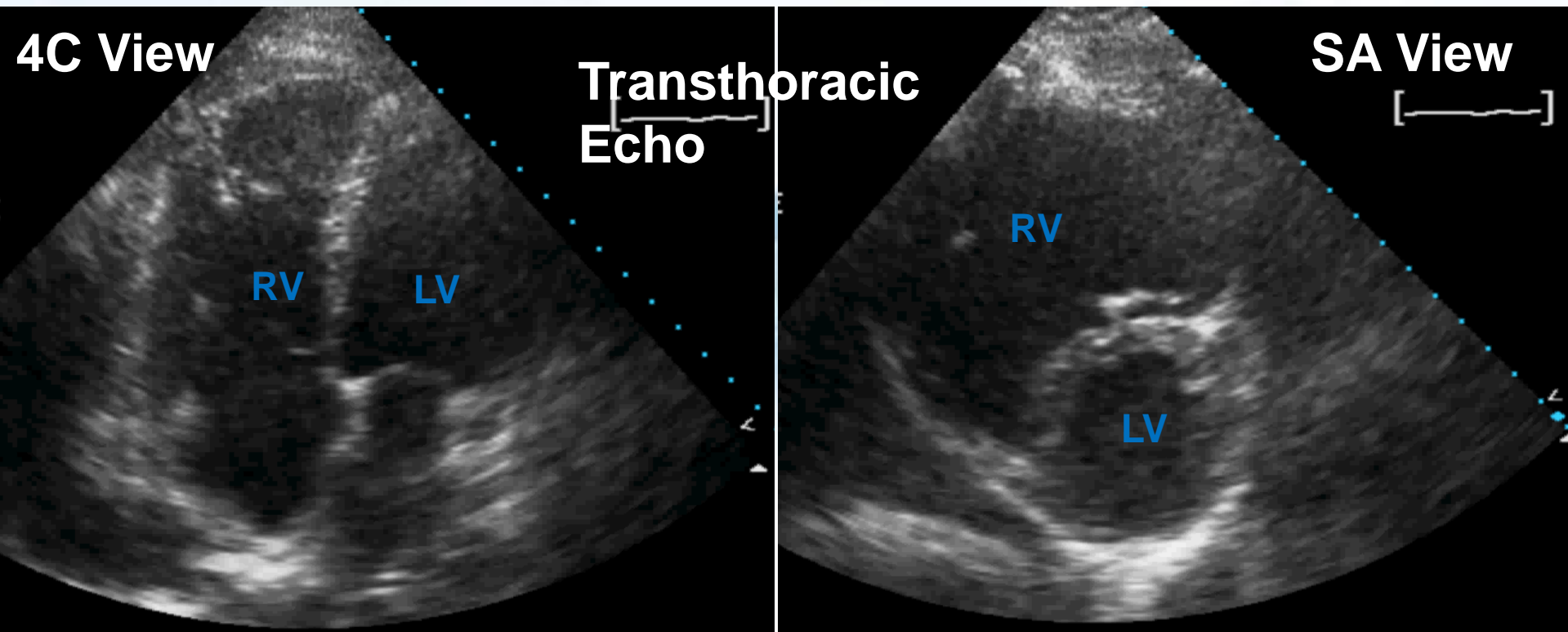
- ASD diameter:

- Good correlation between MRI and TEE sizing

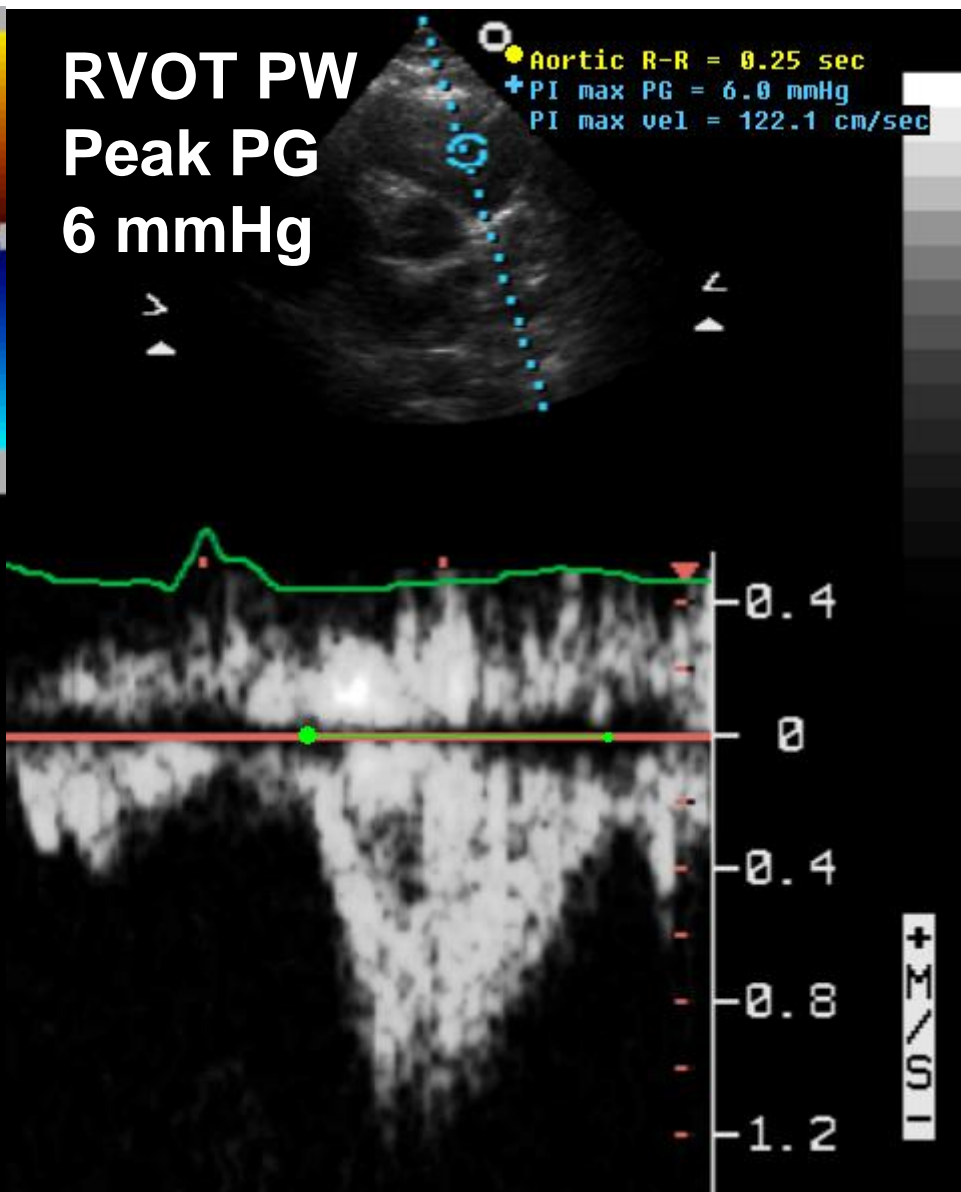
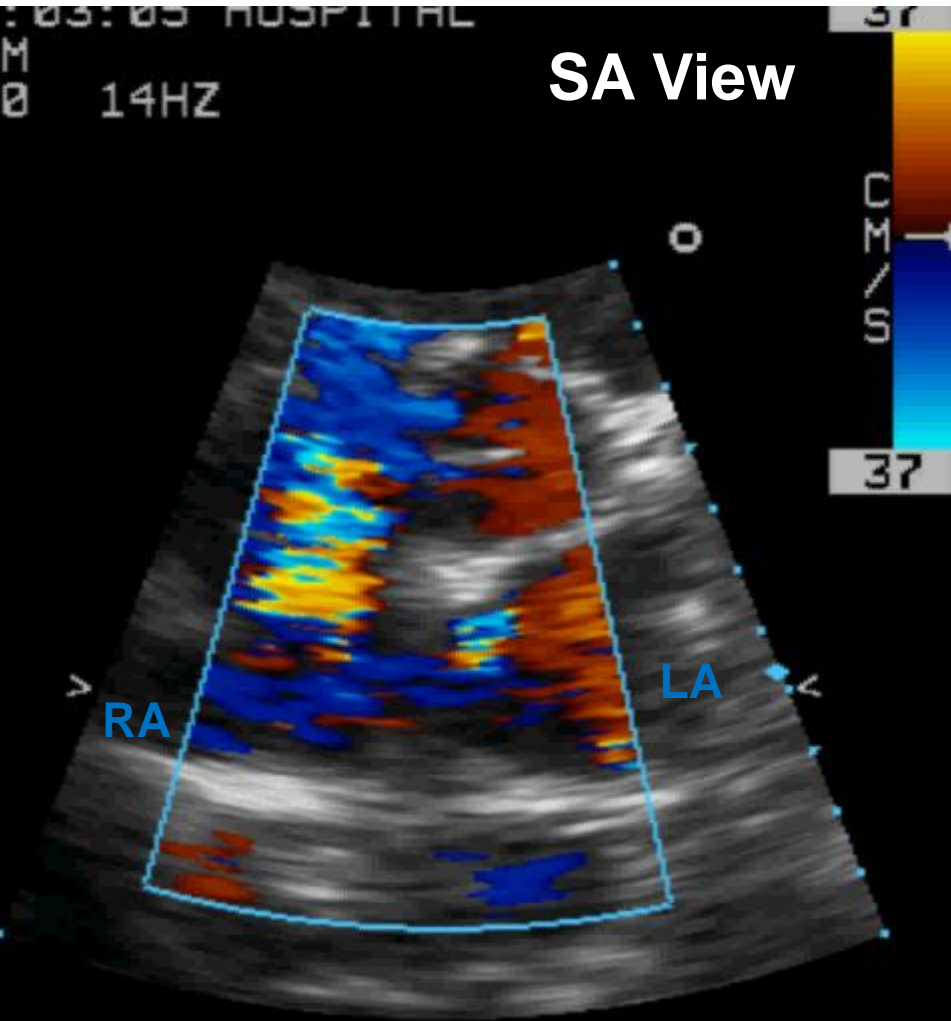


Cases 2

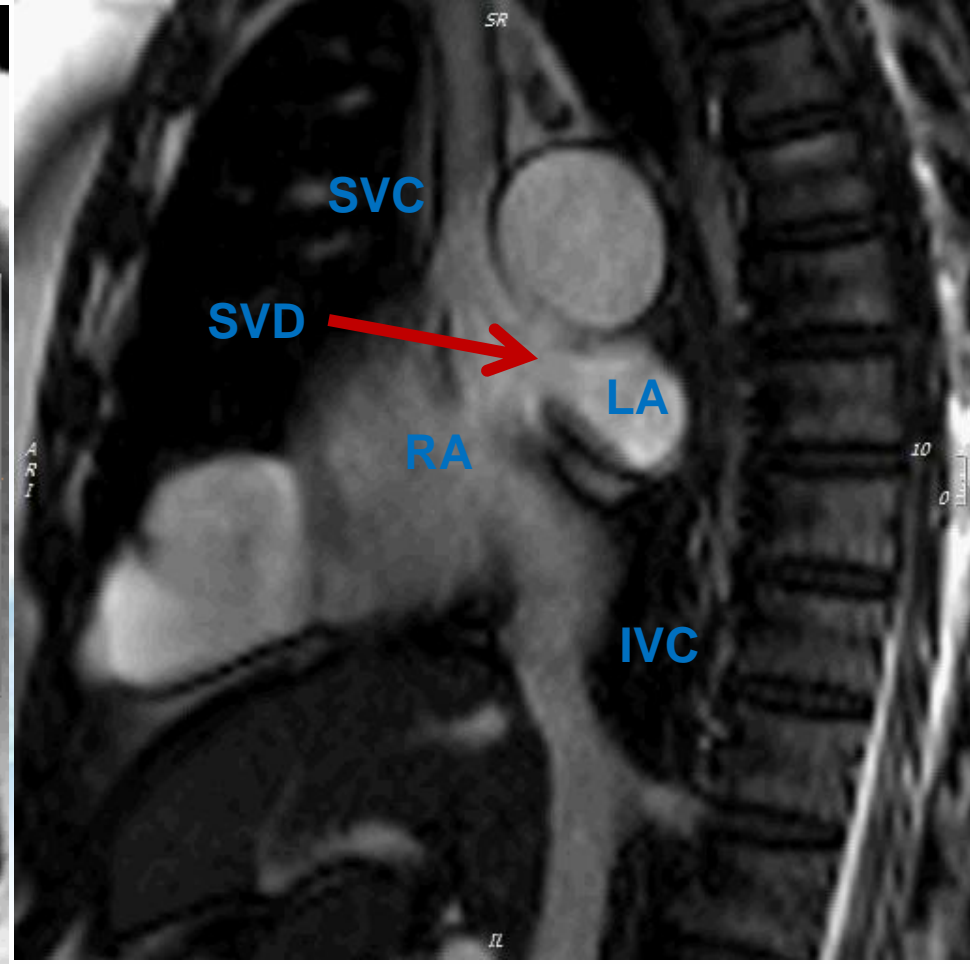
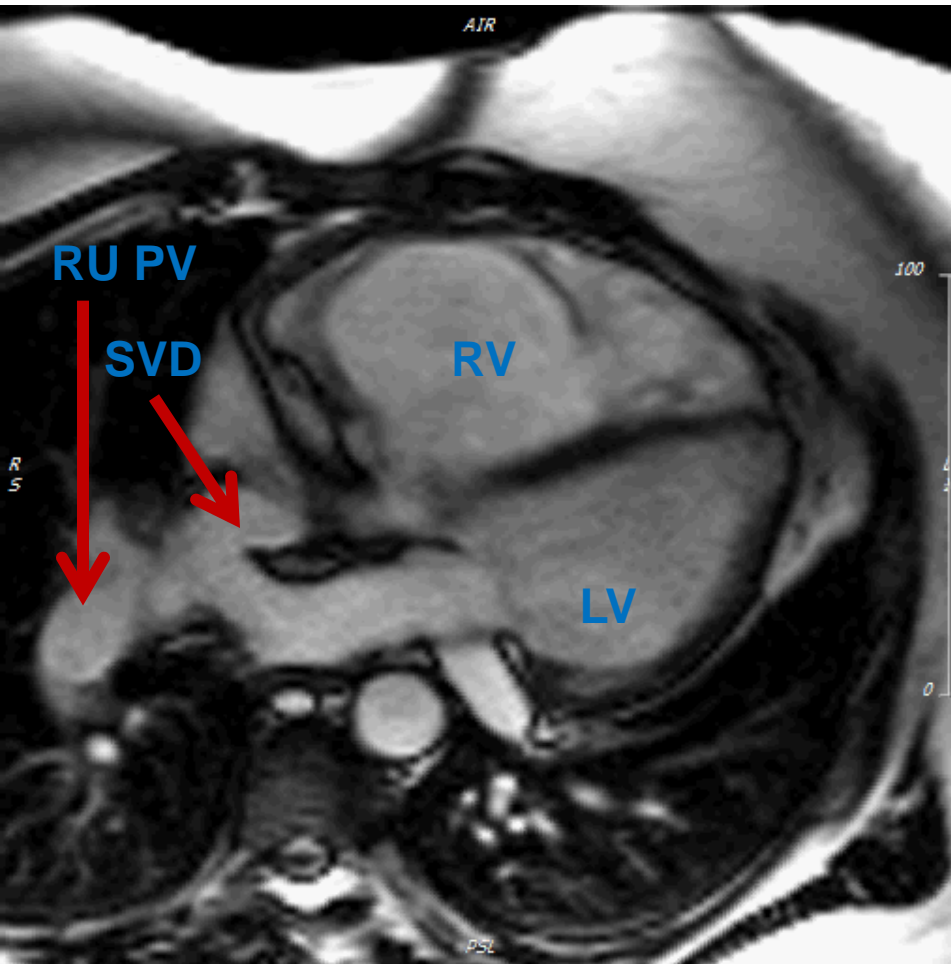
- 56yo/ F
- Non-smoker with no major past illness
- Shortness of breath for 2 years
- CXR: Clear lung field



Cases 2: Echo



Cases 2: CMR



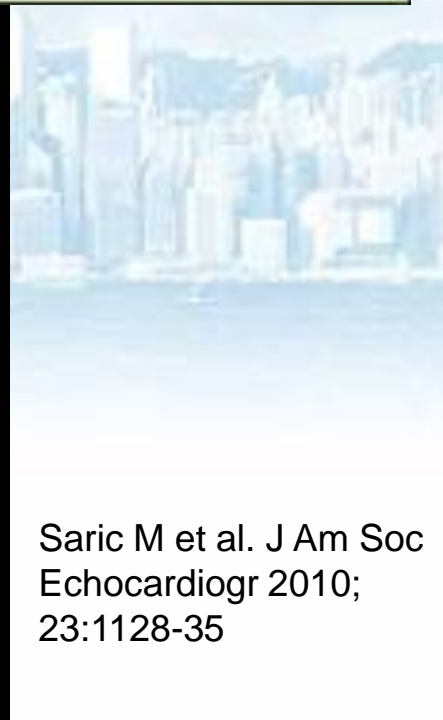
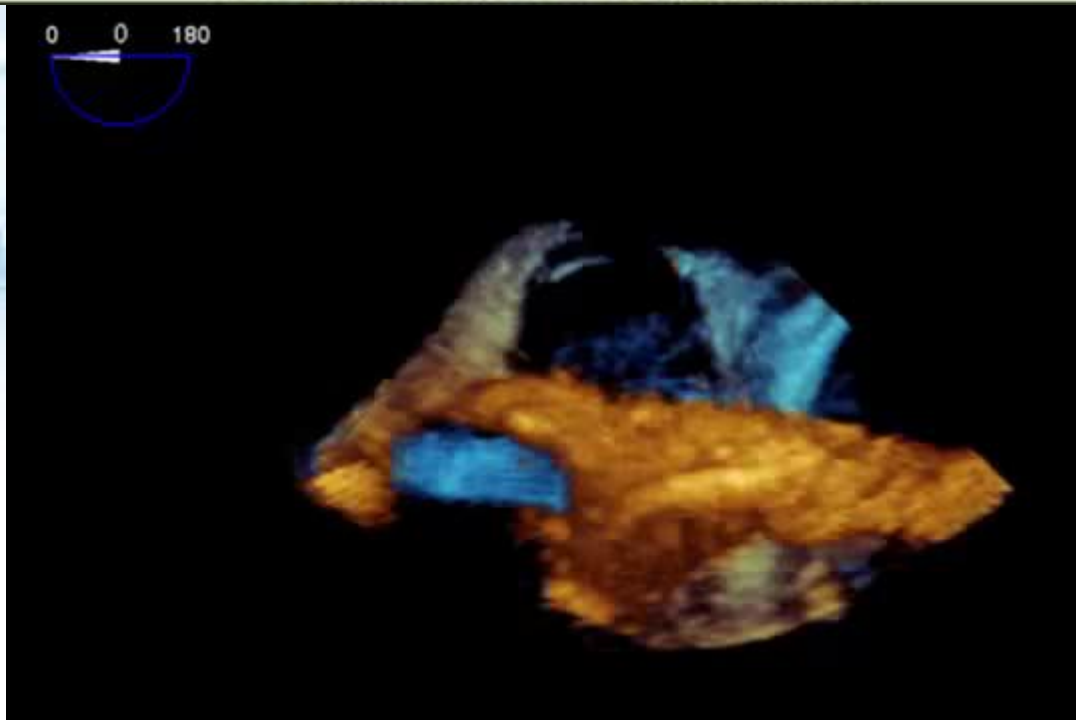
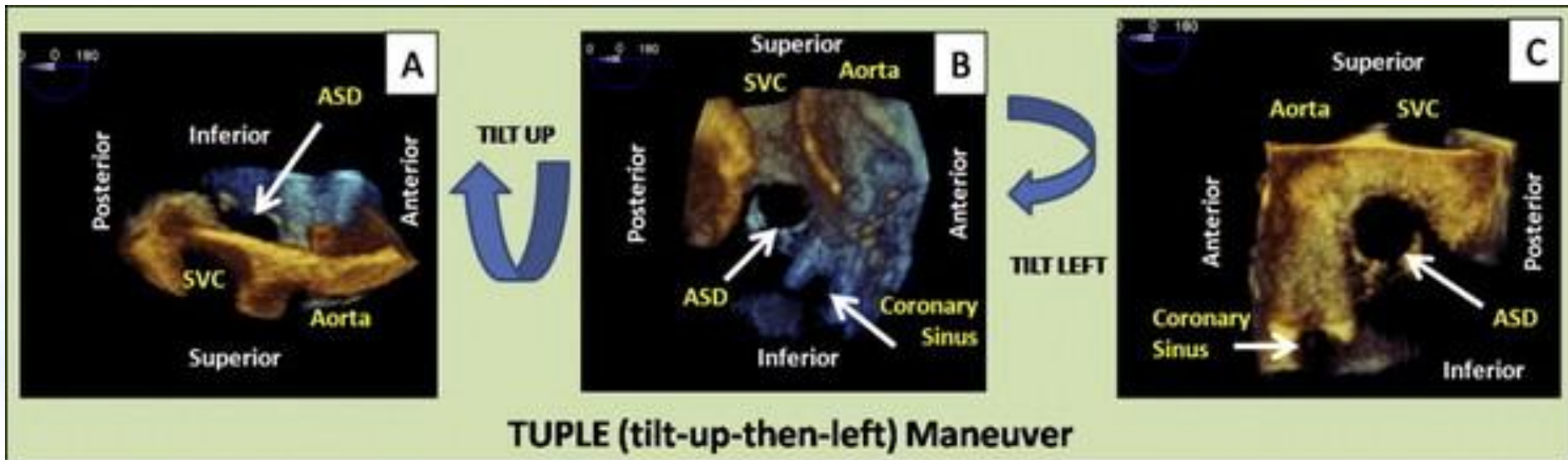
SVD: Sinus Venosis Defect , RU PV: Right upper pulmonary vein (anomalous)



Real-time 3D TEE guidance on complex ASD intervention

- Advantageous in evaluation of:
 - spatial relationship between multiple defects and catheter itself
 - en face view of ASD
- Three modes:
 - Narrow-angled acquisition
 - 3D zoom
 - Wide-angled full-volume acquisition

To get ASD en face view

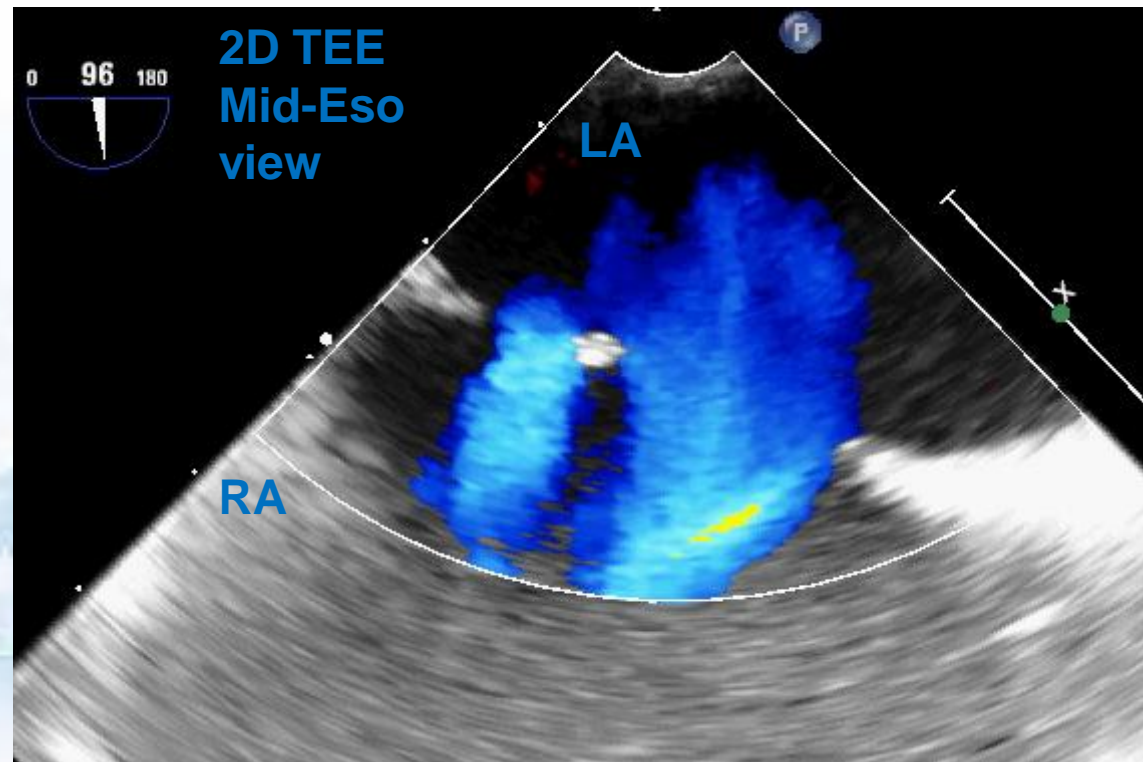


Saric M et al. J Am Soc
Echocardiogr 2010;
23:1128-35

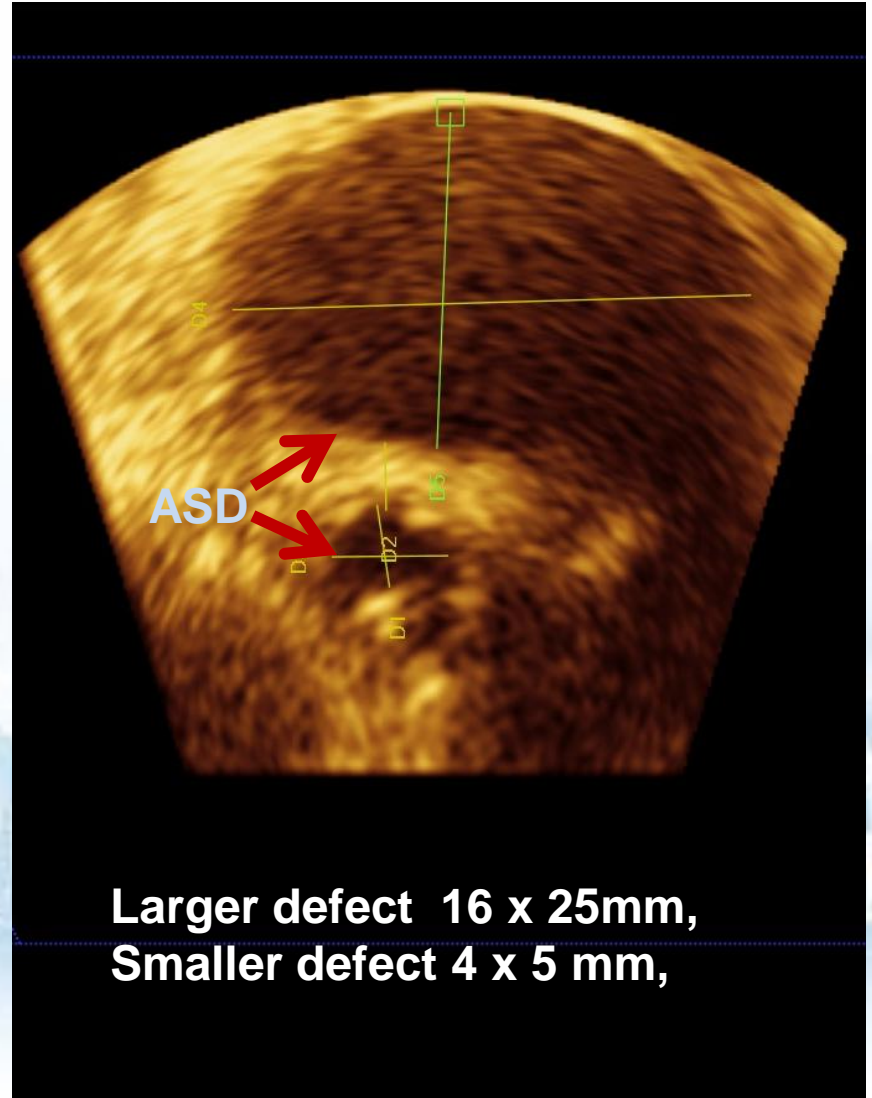
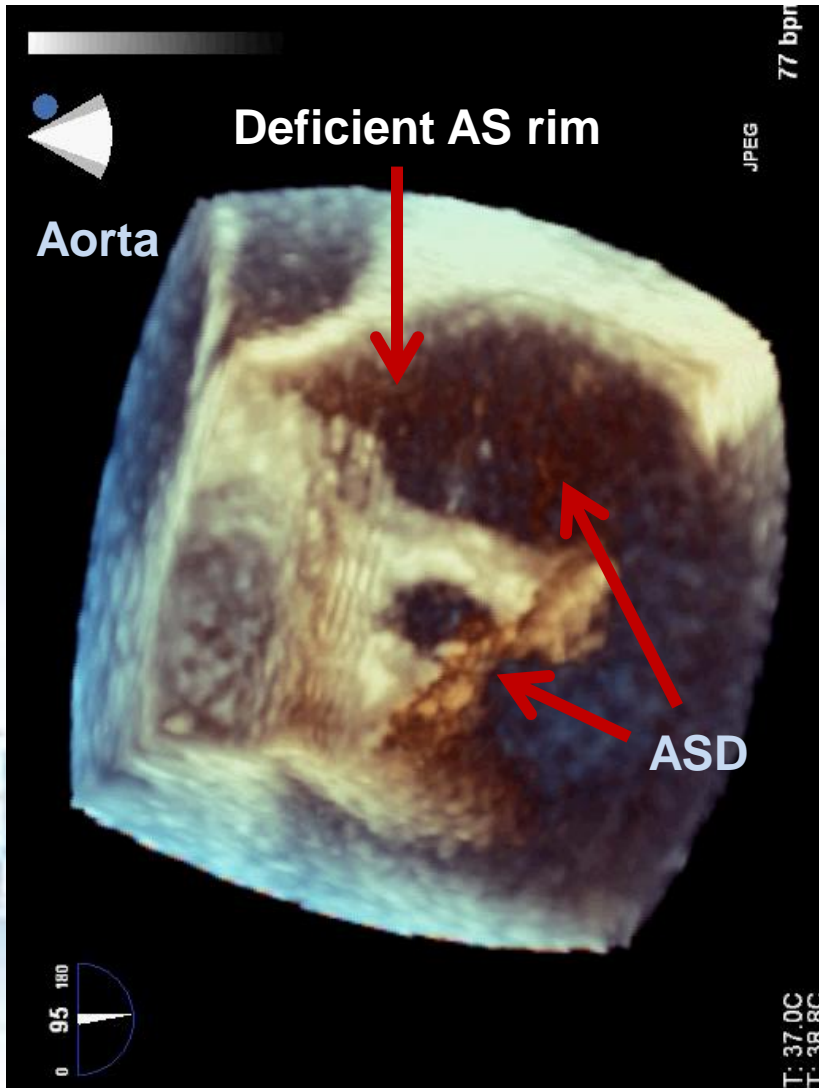
Case 3

- 38yo/ M, 75kg
- Exertional dyspnoea for months

- Dilated RV in TT Echo
- Two secundum ASD in 2D TEE
- To deploy single Amplatzer septal occluder (ASO) in larger ASD
- to occlude both defects



- Via RF venous access, under GA with 3D TEE guidance



**3D Zoom en face view
ASD viewed from LA perspective**

Wide angle en face view

Size based on balloon

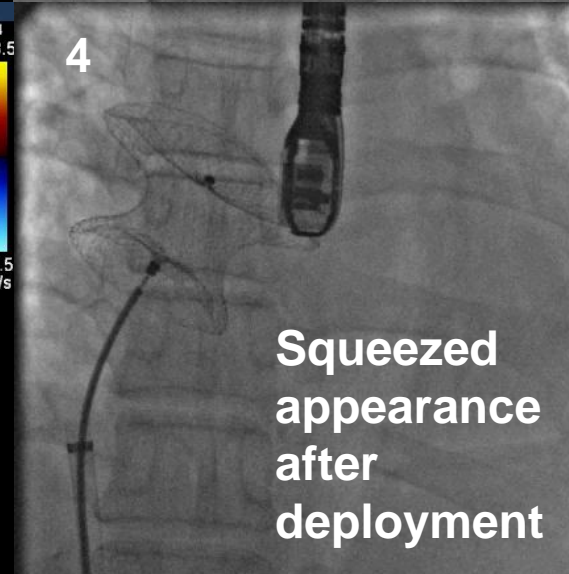
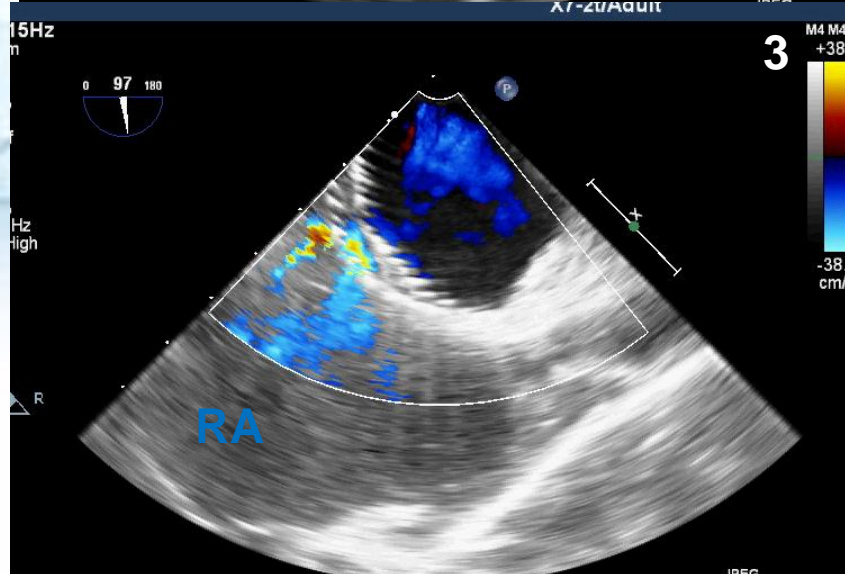
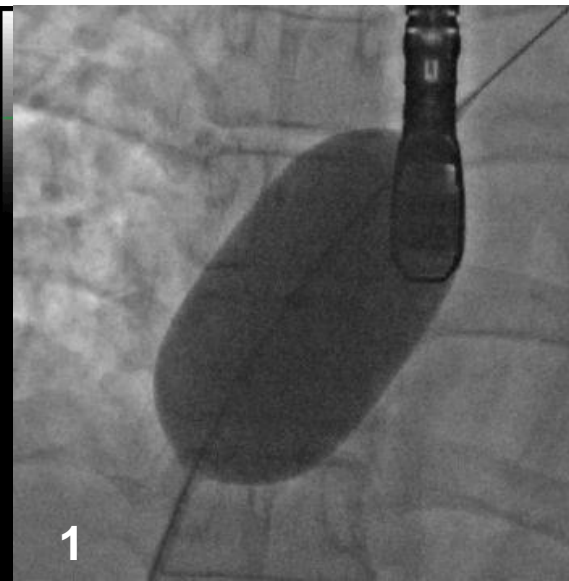
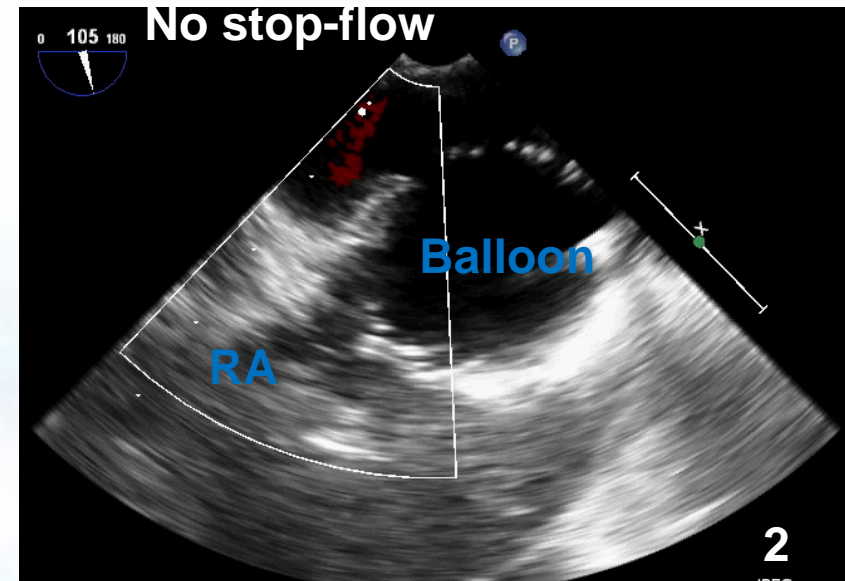
No waist of 40mm

Sizing balloon

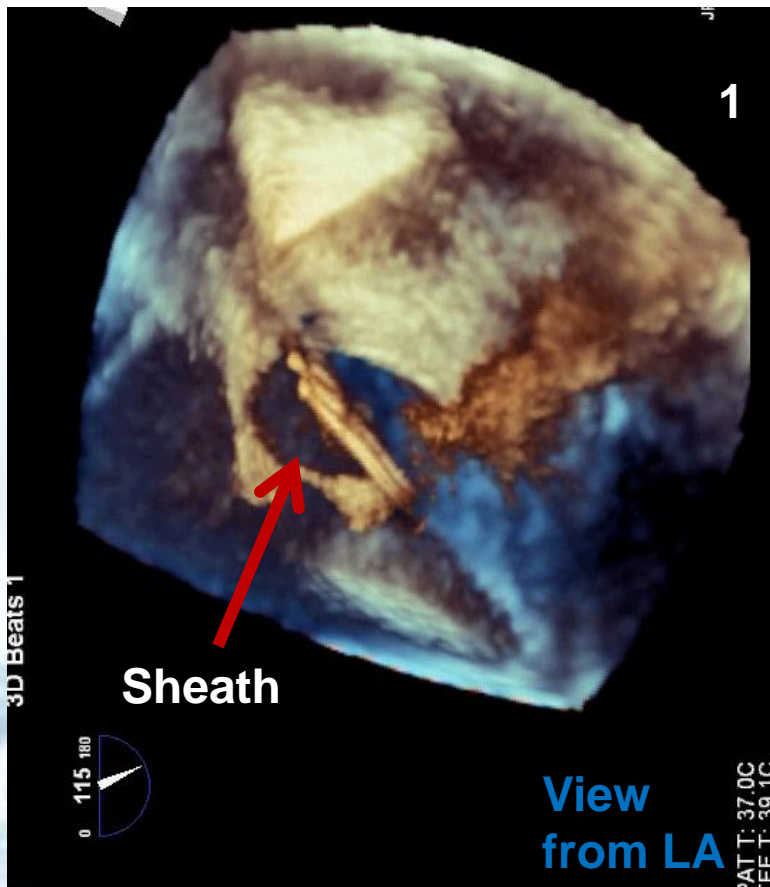
Despite maximum balloon inflation

But 40mm occluder oversized !

Wrong size based on balloon.



Size based on echo

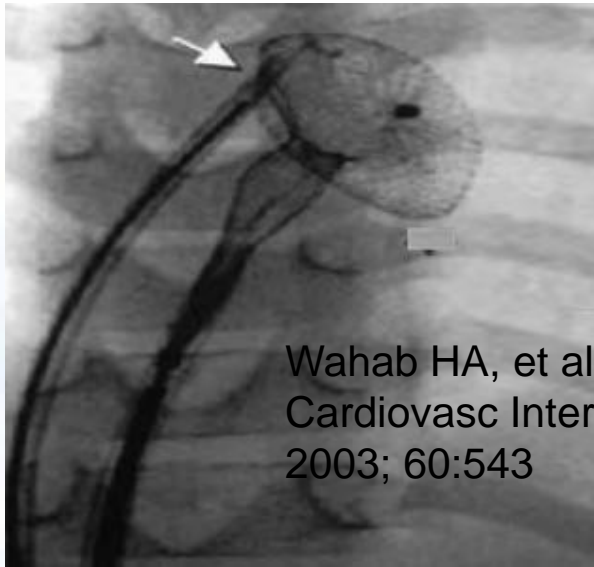


Delivery sheath loaded with 28 mm device
re-enter LA under 3D TEE
guidance

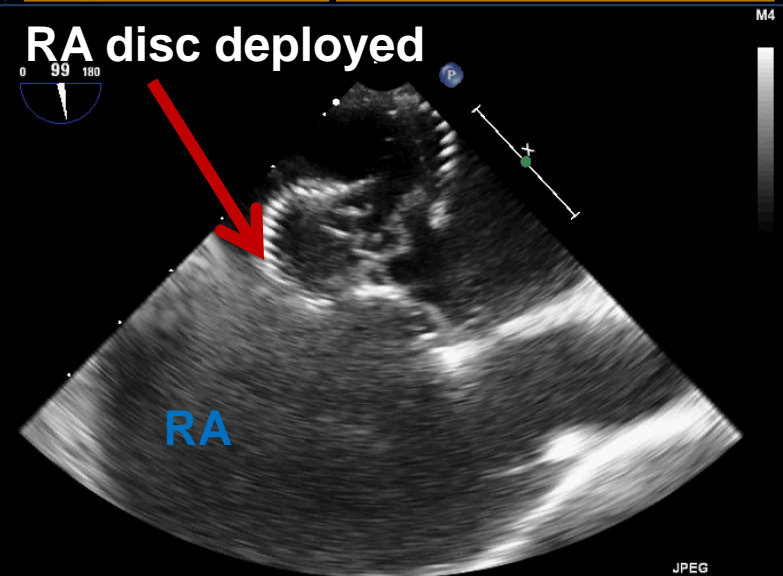
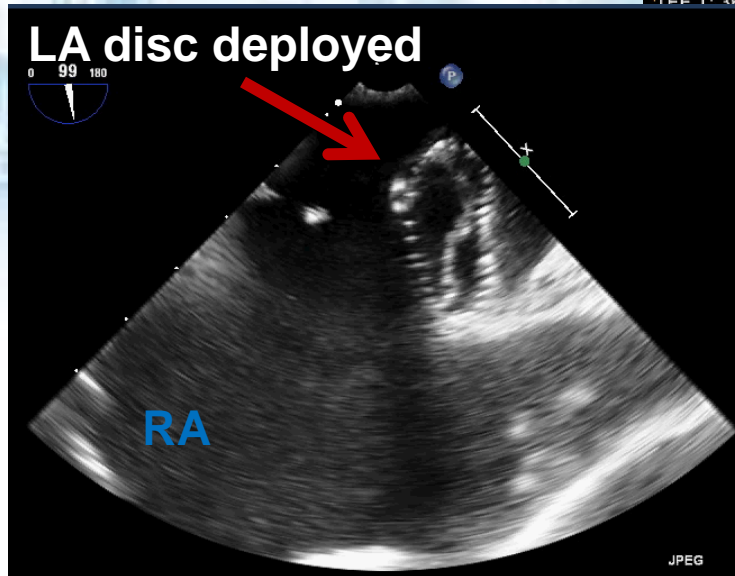
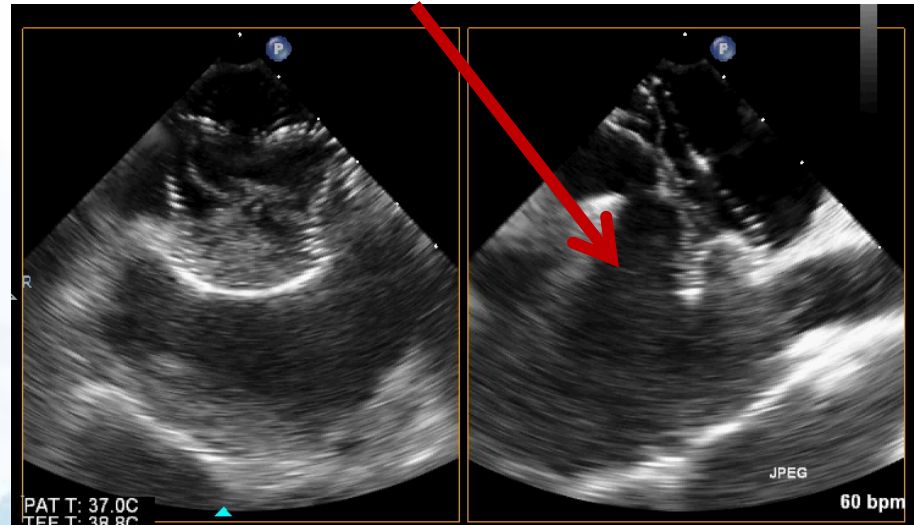


LA disc of 28 mm occluder failed to anchor with
standard technique
due to deficient AS rim

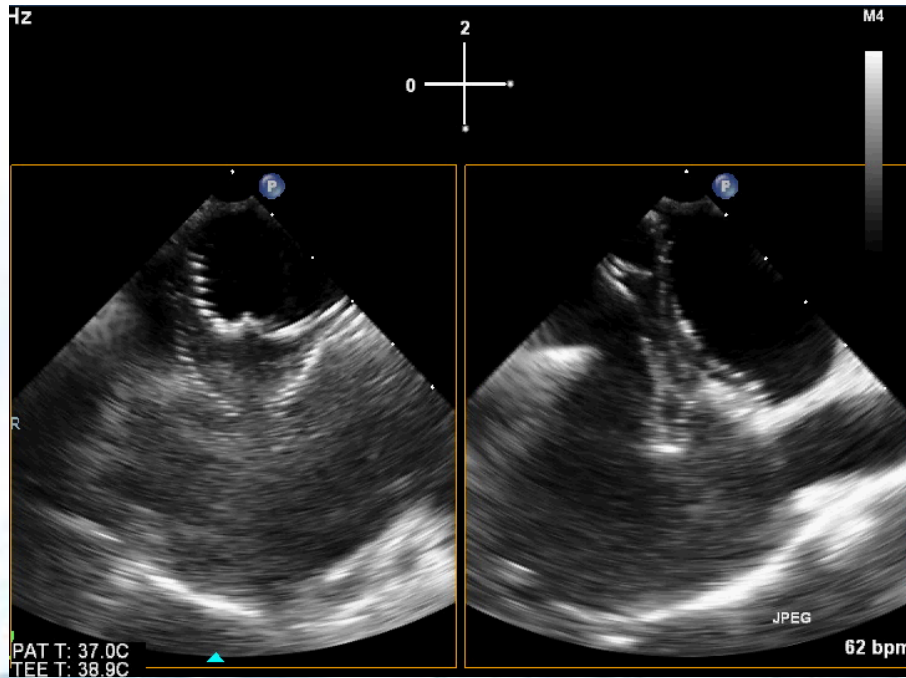
Retry with Wahab technique



Through left femoral venous access, MP catheter gently push LA disc towards LA

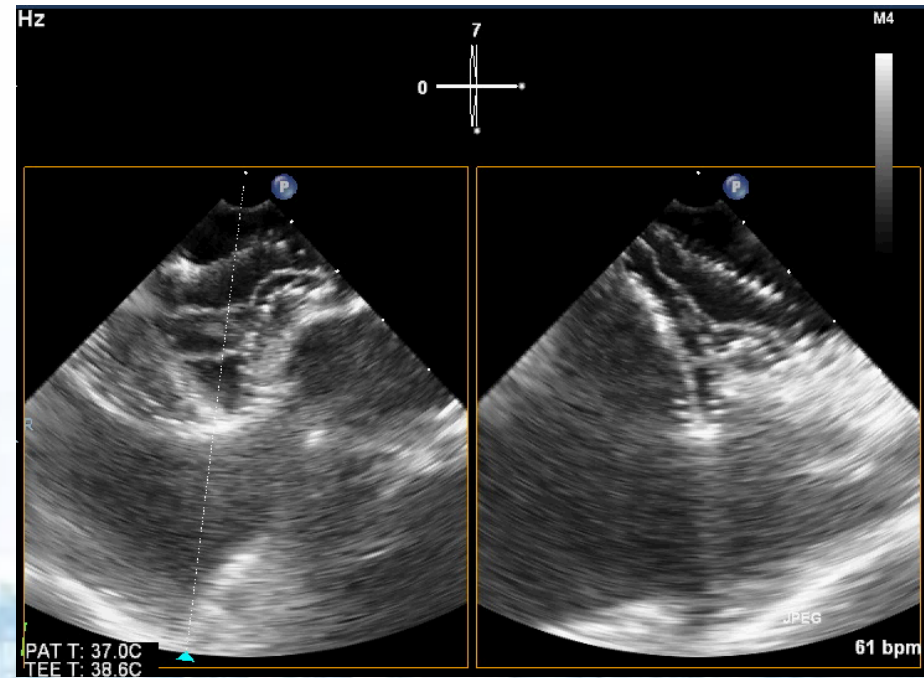


Simultaneous bi-plane imaging



Pre Wahab push

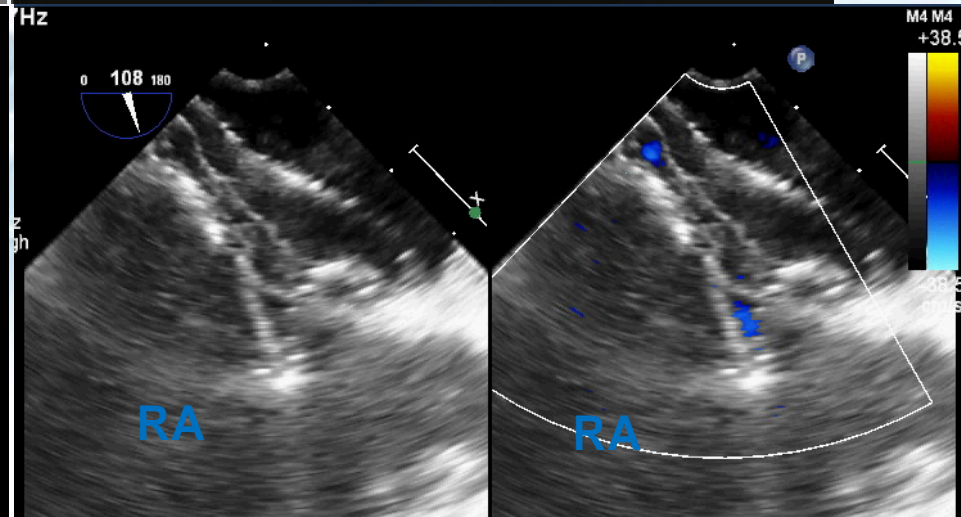
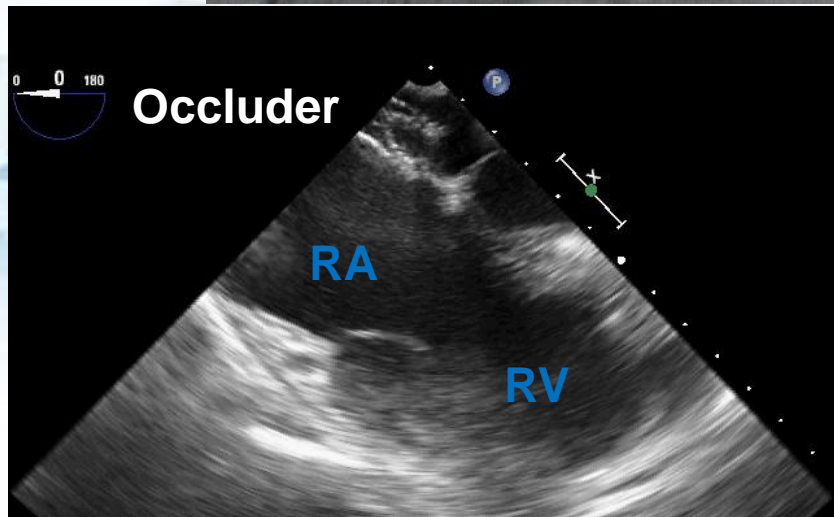
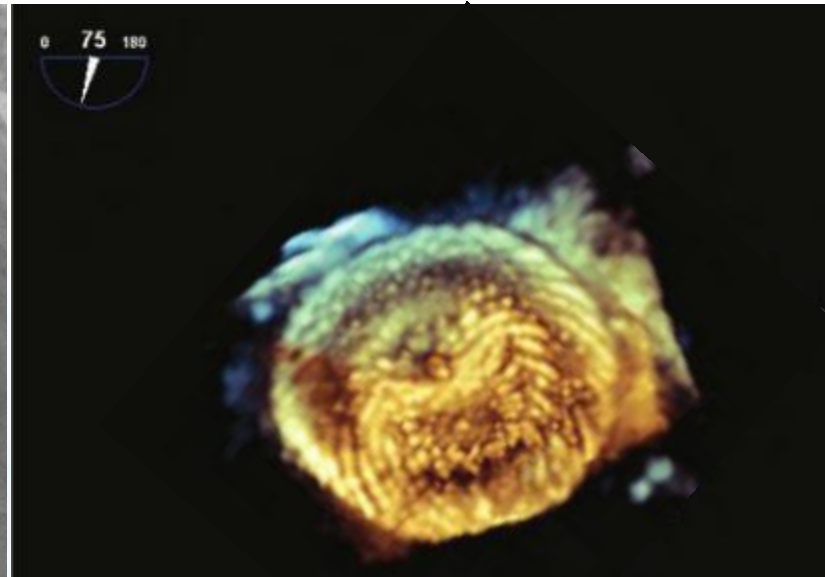
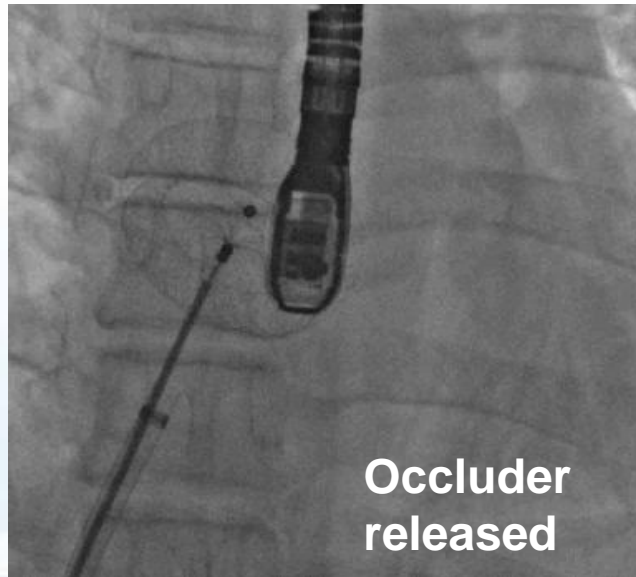
Device just touching antero-superior rim



Post Wahab push

Proper entrapment of antero-superior rim by device

Successful implantation



TEE confirmed good position and no residual shunt or interference with surrounding structures.

Summary:

Role of 3D TEE and CMR in ASD

- **Pre-operative CMR:**
 - Assess indication for closure
 - Select/ Exclude patients for transcatheter approach
- **Intra-operative 3D TEE:**
 - Reveals spatial relationship between multiple defects and catheter itself
 - Shows entrapment of rim around device by Real time en face view

Thank you

WE'LL DO AN MRI TO
BE SURE, BUT I'M FAIRLY
CERTAIN IT'S A SWANNOMA

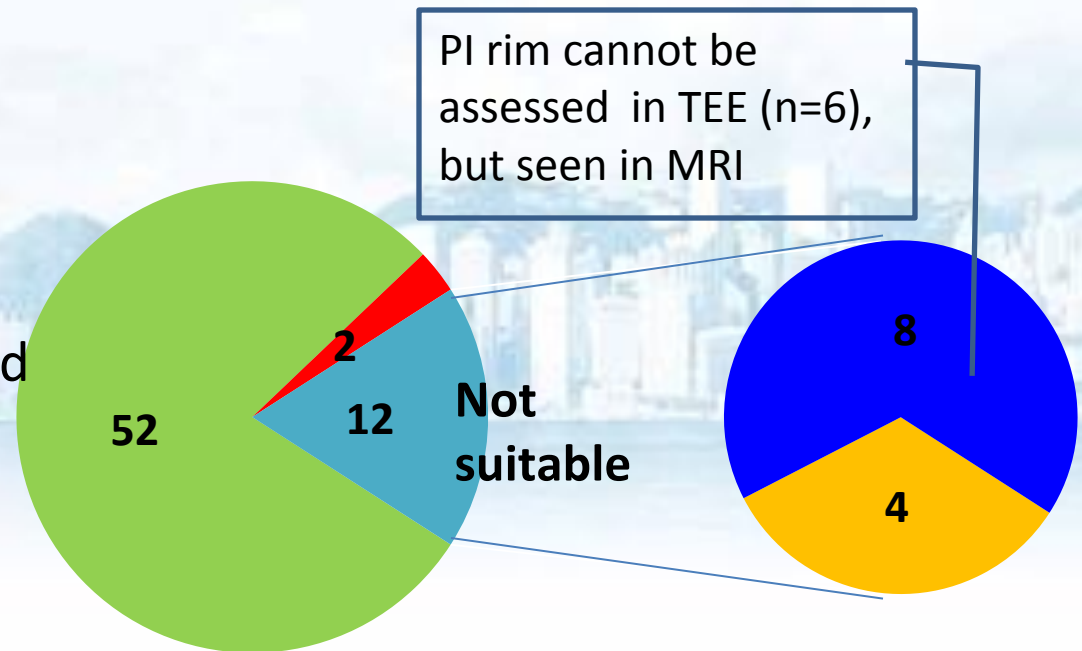


CMR guided ASD intervention

- Patients:
 - Isolated secundum ASD
 - both TEE and CMR
 - n = 66, mean age 35y
 - single center
 - evaluate for percutaneous closure
- Result:
 - Postero-inferior (PI) rim not adequately visualized in 15% of TEE studies
 - All could be assessed in CMR

ASD outcome (no. of patients)

- Successful closure
- Failed closure
- Size > 4cm or multiple
- Insufficient Rim



Because of its superior location, the superior sinus venosus defect is most often missed by TTE.²⁴⁸ Patients with an unexplained RV volume overload by TTE should be studied by TEE or another imaging modality to fully evaluate the atrial septum and pulmonary veins and to rule out defects in the roof of the coronary sinus

- En face view
- Sinous ASD pic

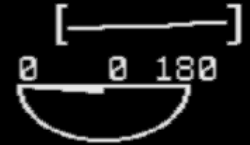
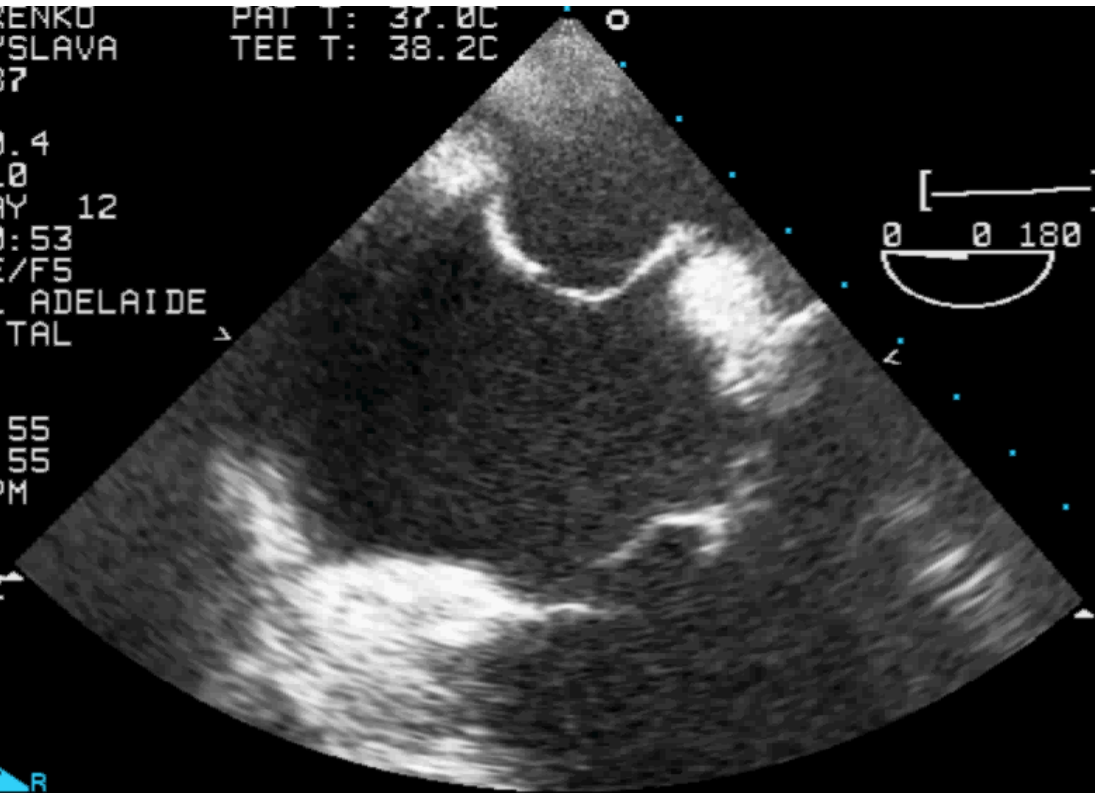
SYDURENKO
VLADYSLAVA
896387

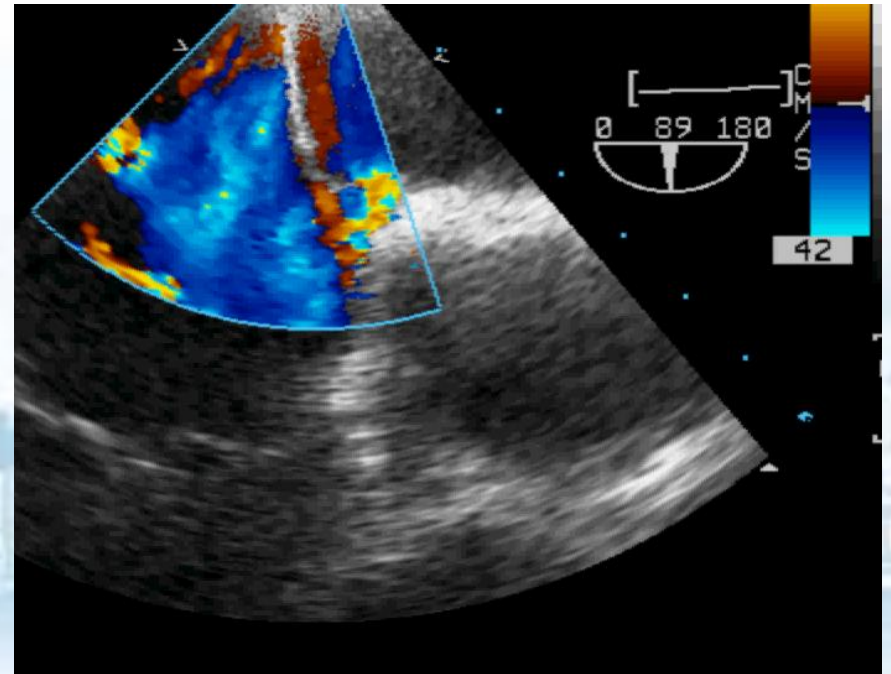
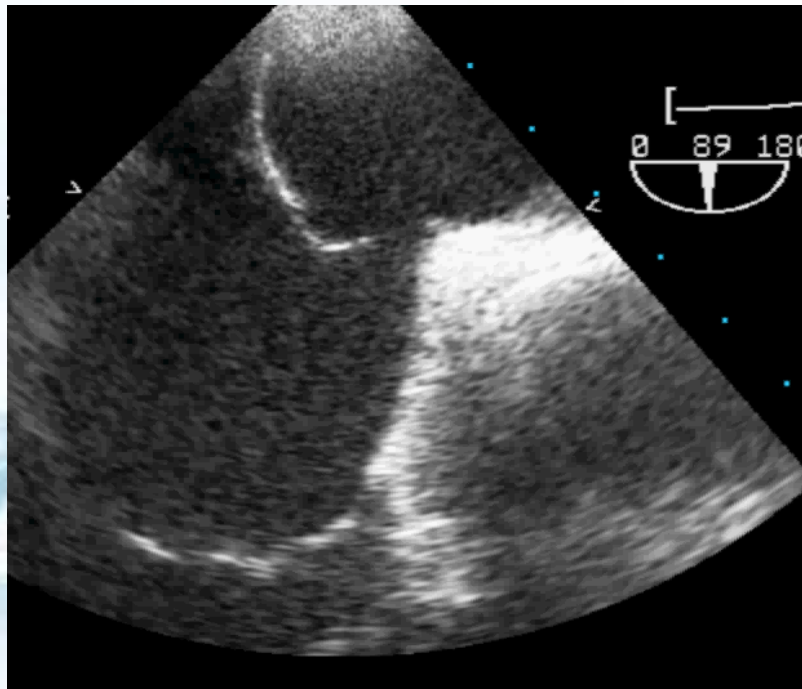
PAT T: 37.0C
TEE T: 38.2C

MI: 0.4
T6210
04 MAY 12
15:30:53
2/0/E/F5
ROYAL ADELAIDE
HOSPITAL
TOE

GAIN 55
COMP 55
74BPM

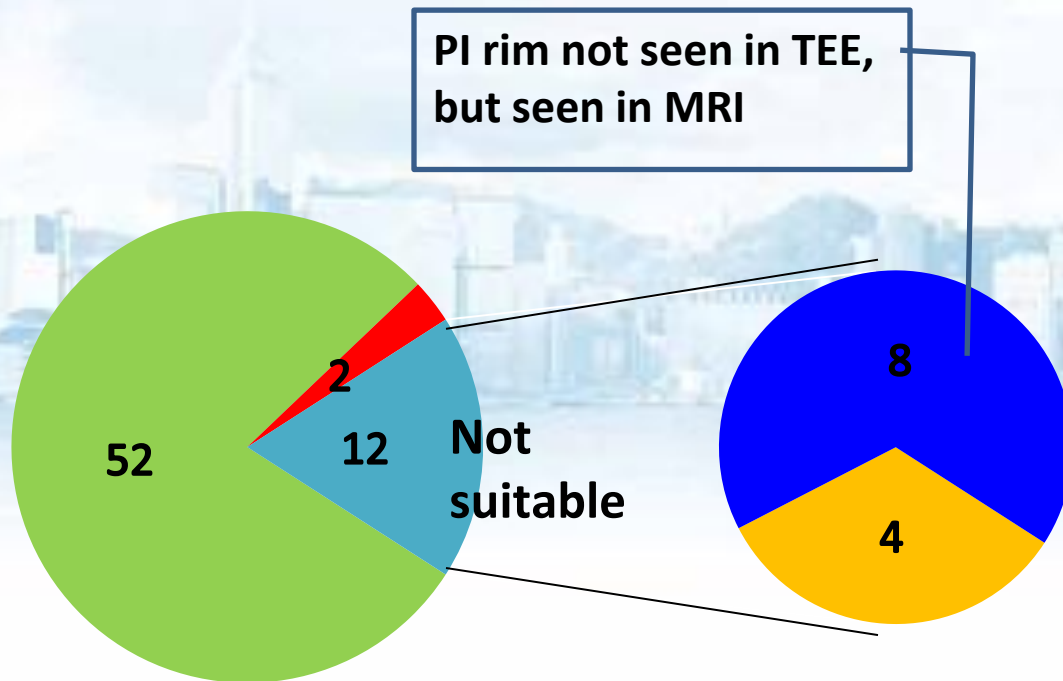
10CM
67HZ





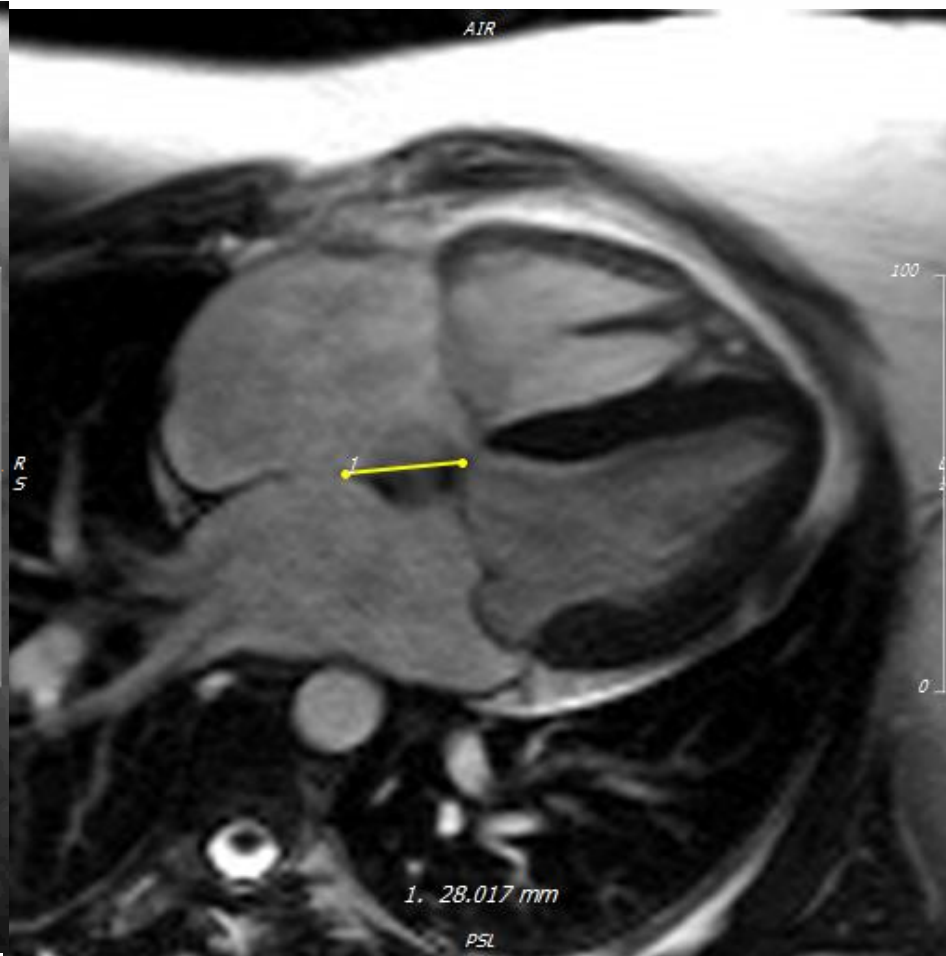
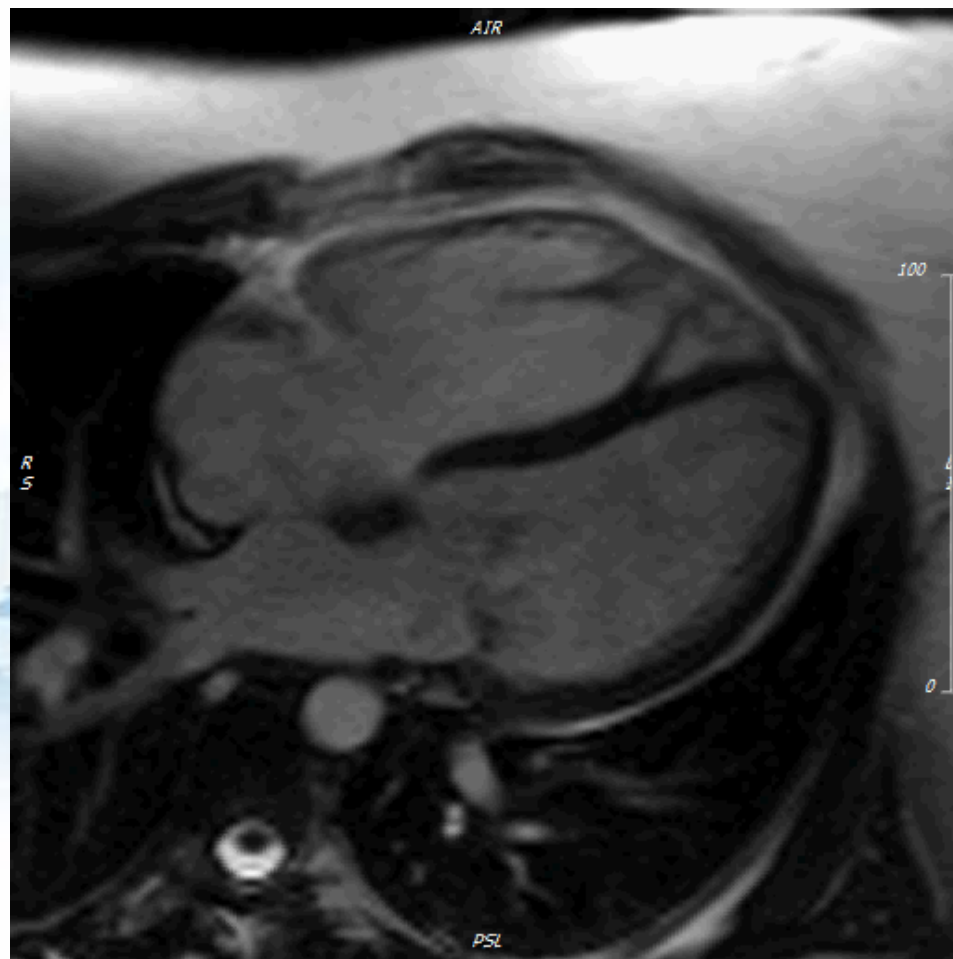
Size and Rim measurement

ASD outcome (no. of patients)

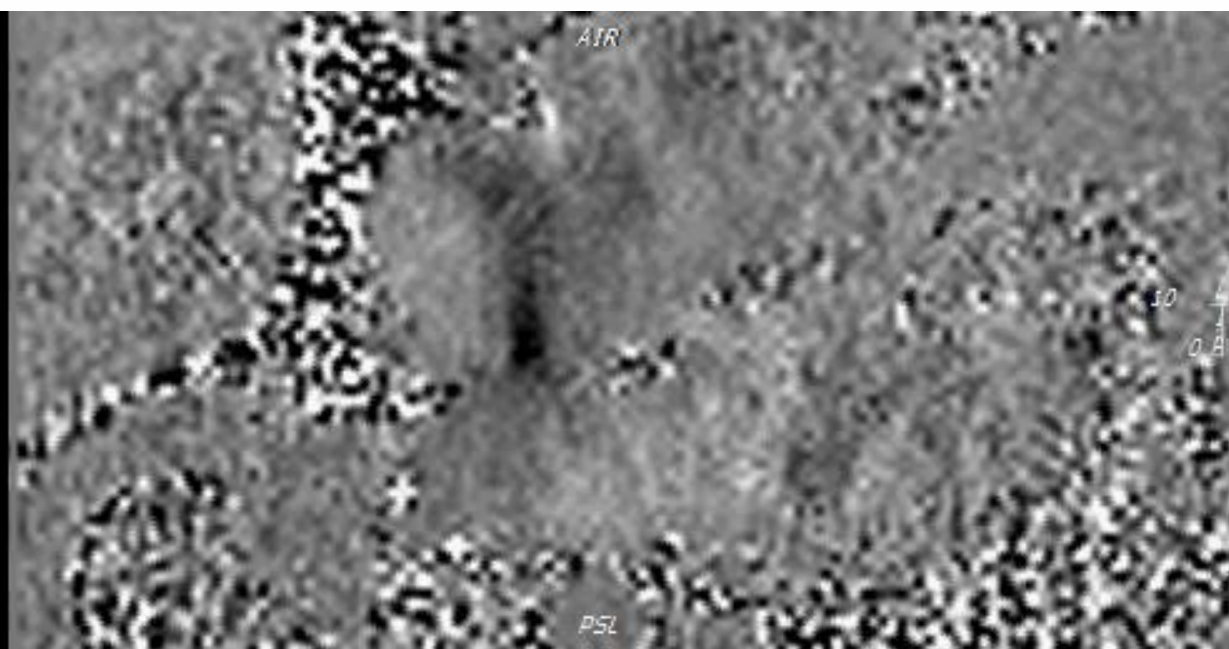


- 66 secundum ASD patients evaluated for amplatzer closure
- Patients with successful closure had significantly smaller size and larger postero-inferior (PI) rim compared to those excluded for procedure



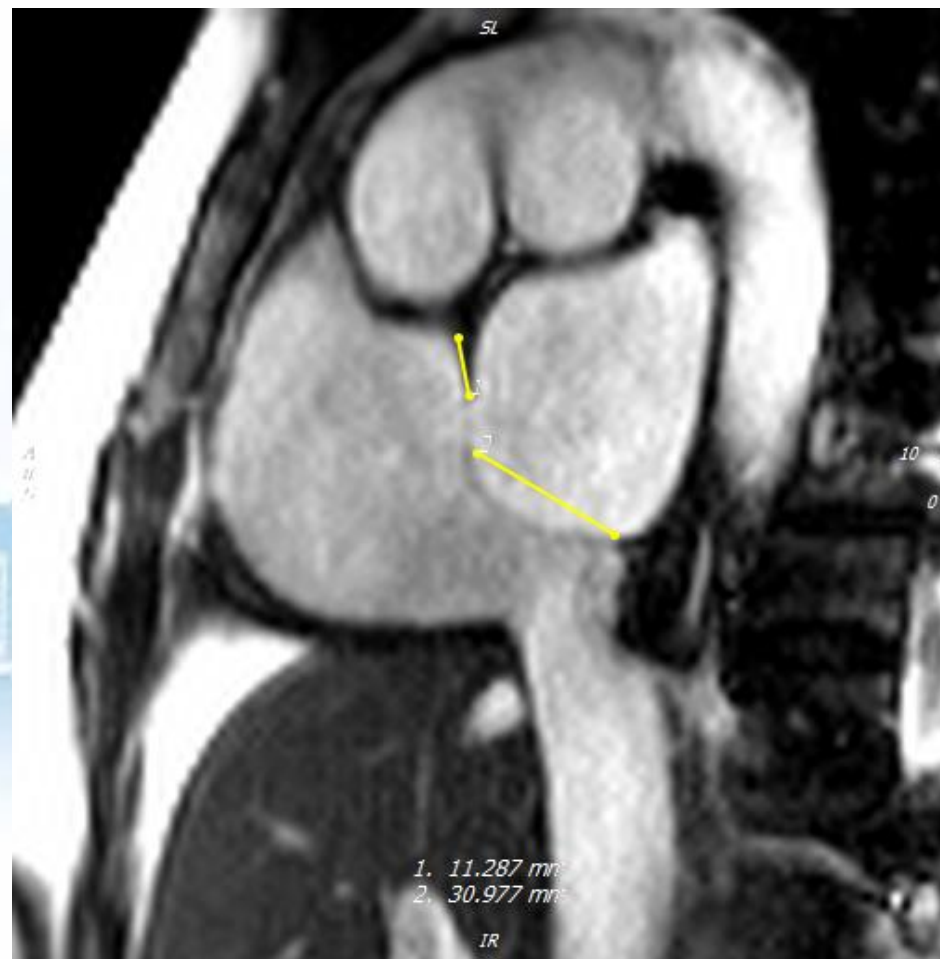


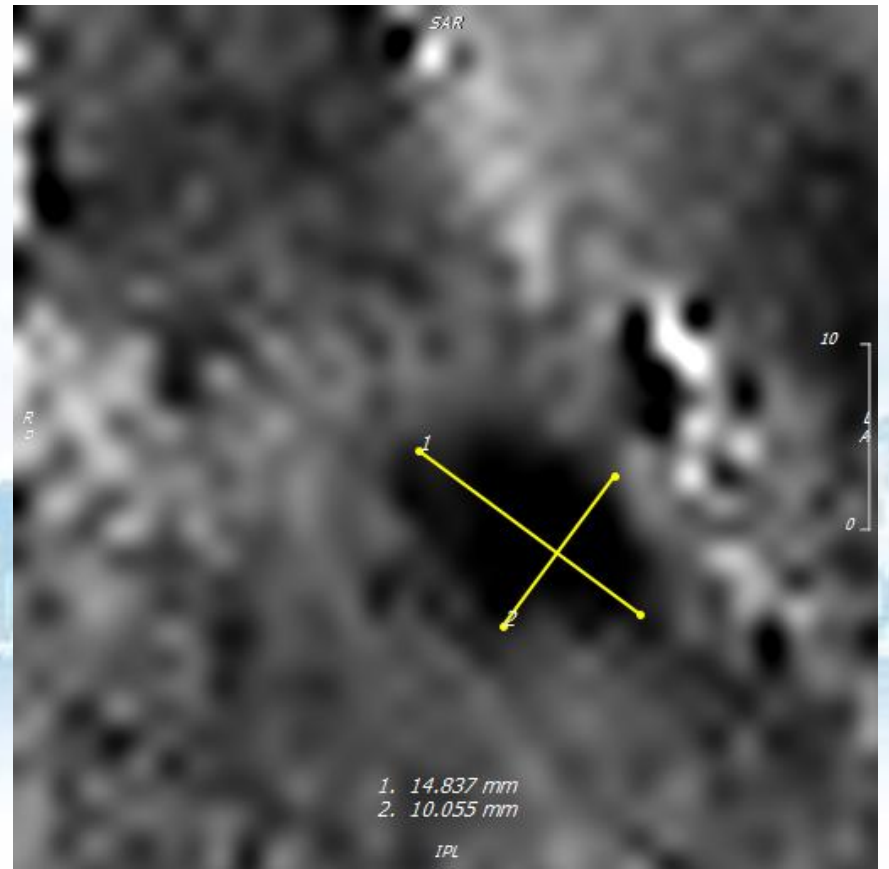
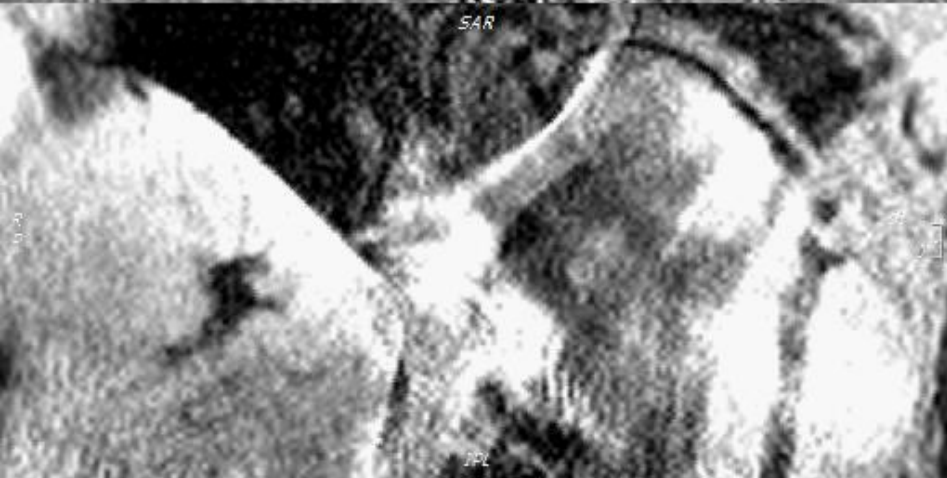
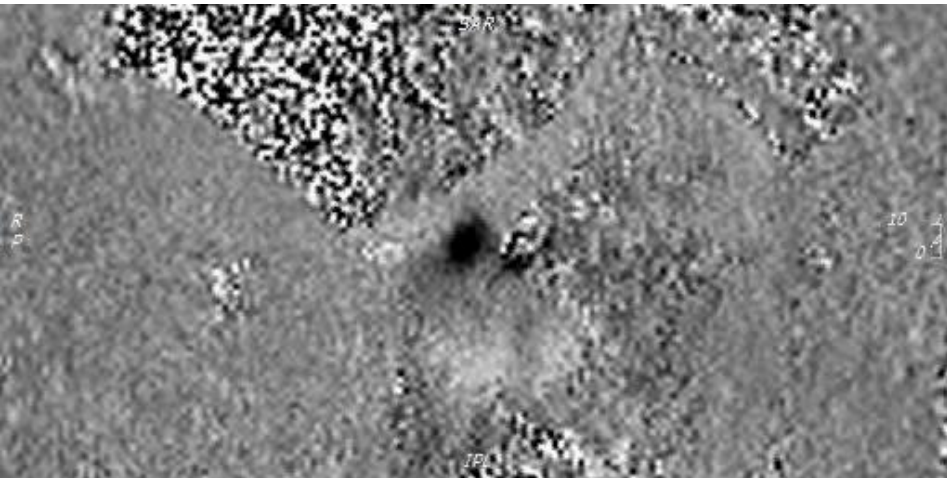
R
S
A



R
S
A





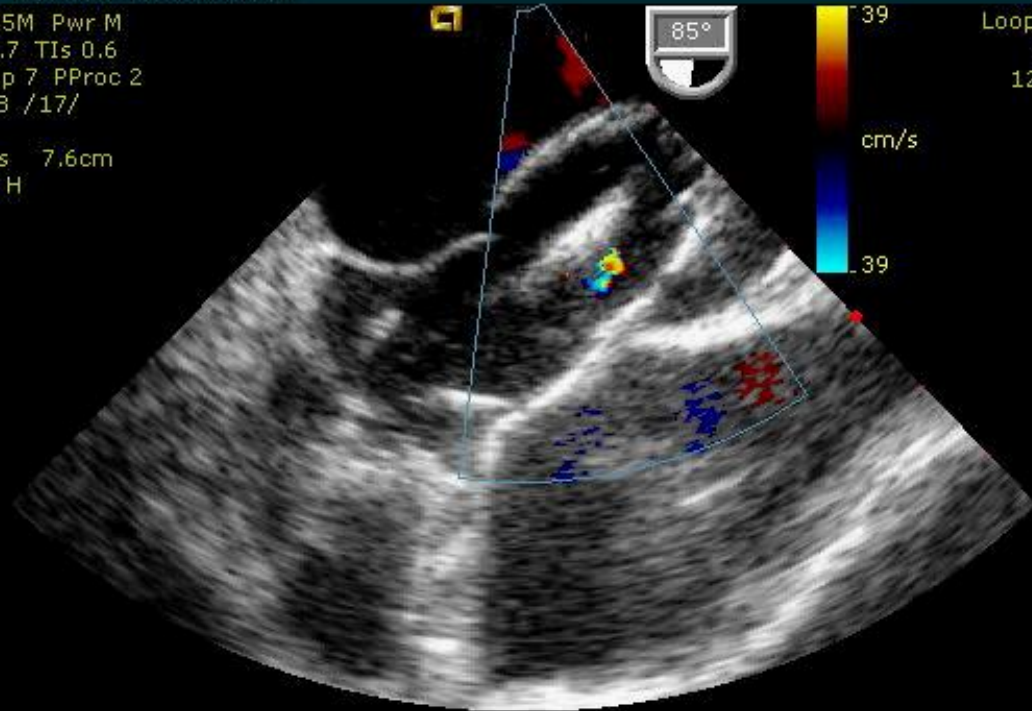


ROYAL ADELAIDE HOSPITAL
le. van hien 1413226

TE-V5M Pwr M
MI 0.7 TIs 0.6
Comp 7 PProc 2
GN 8 /17/
F5
20fps 7.6cm
Freq H

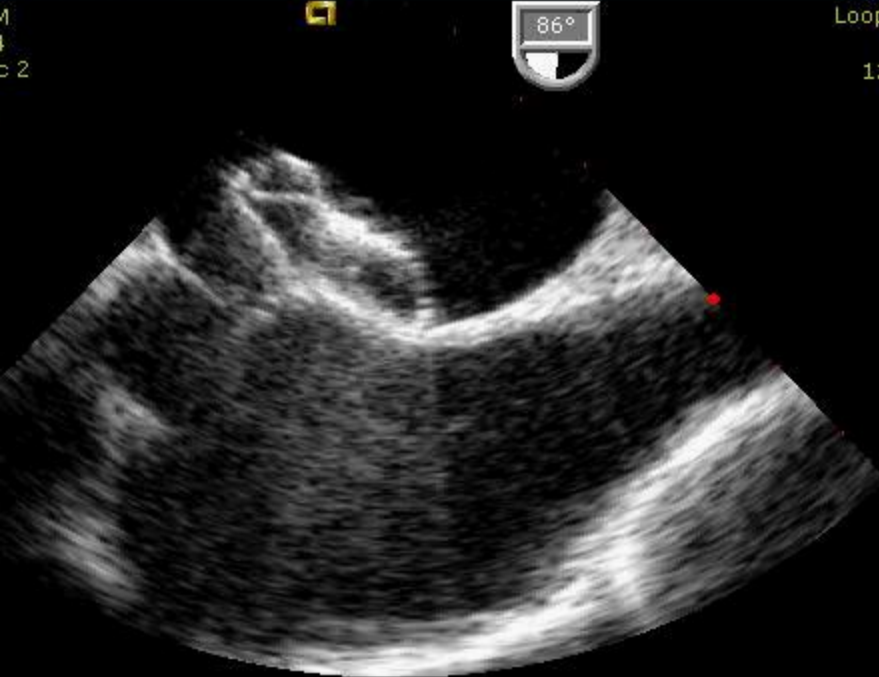


Loop 54 / 110
13:33:18
12 Jul 2012

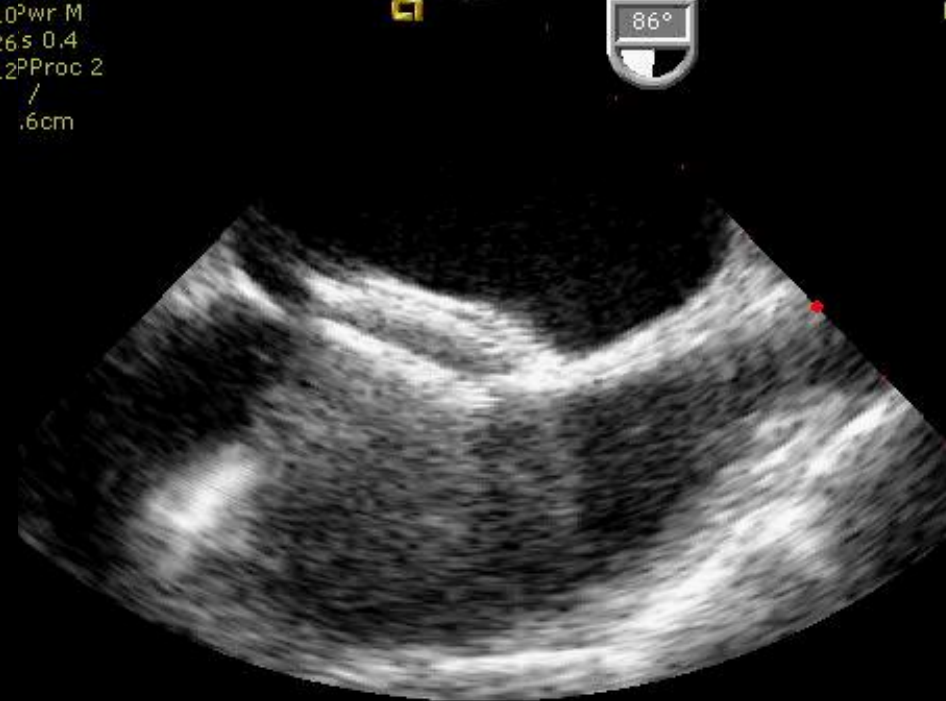


ADELAIDE HOSPITAL
hien 1413226

YAL ADELAIDE HOSPITAL
van hien 1413226



Loop 67 / 110^{pr} M
13:46:26 s 0.4
12 Jul 2012 PProc 2
/ .6cm

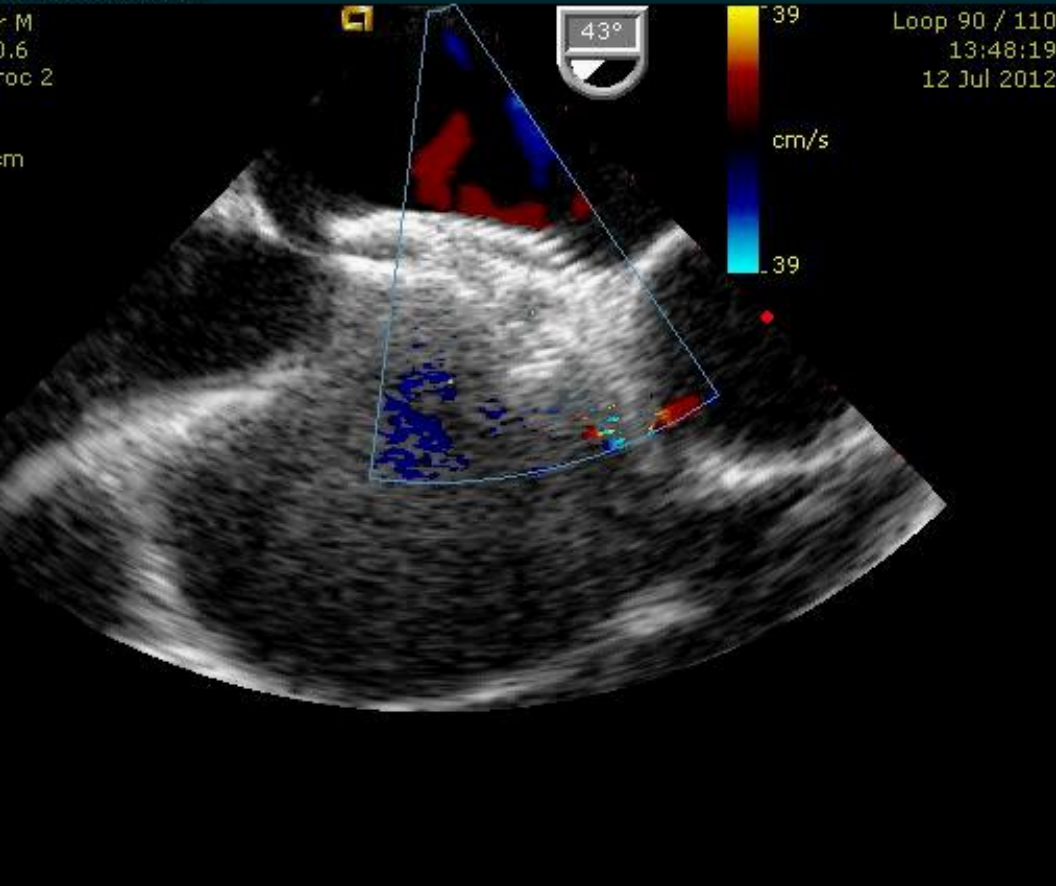


ST. ADELAIDE HOSPITAL

patient ID: 1413226

Operator: M
Gain: 0.6
Proc 2

cm





- No stop flow despite waisting of sizing balloon inflated to a diameter of 40mm
- 40mm device via 12F delivery sheath
- Oversized
- Failed with standard technique (everytime LA disc prolapsed into RA or form perpendicular angle with the atrial septum)

Wahab technique

- Another 5F femoral venous access in left side
- LA disk deployed in LA
- MP catheter loaded on J wire thro' LFV
- Gentle push to hold LA disk in place
- Both disk successfully deployed
- Device did not interfere with any structure
- TEE confirmed good position and no residual shunt
- Antibiotic prophylaxis and anti-platelet for ?

- 2 ASD:
- even balloon occlude 1, still may confuse with doppler flow across another
- Difficult to wire across smaller one

- Use MP catheter to probe anterior rim of the disc, esp. use the knuckle part.

