ASD and PFO closure

AEPC intervention WG
Teaching course

Linz, Austria
2014

Dr John Thomson
Leeds, UK

ASD closure

- .....A big deal
- 25% of interventions by volume
- Over your career you will probably have more difficulties and complications relating to ASD closure than any other single procedure you carry out.....

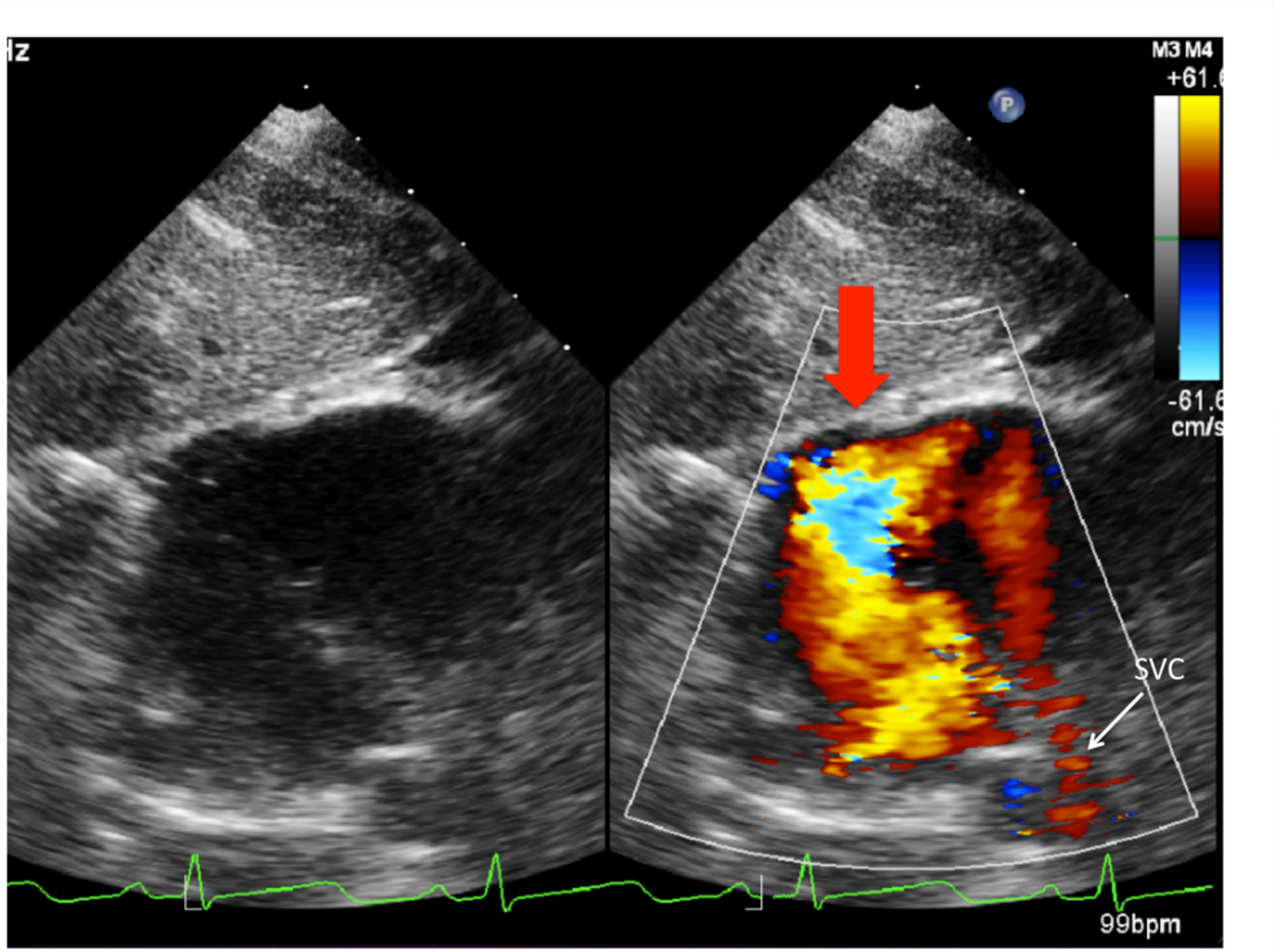
The basics: Patient selection

- Right heart dilation on TTE as a surrogate for a significant shunt
- Reject only those cases with unequivocally normal right hearts
- Physiology and complications progressive
- ASD's would fulfill ALL the criteria for a screening program

TTE: Children

- Defect size
  - For me in the under 8's maximum 1.25mm kg a good rule
- Margins (5mm)
- Pulmonary veins
- Associated defects

Pay particular attention to sub-costal views



Inferior ASD

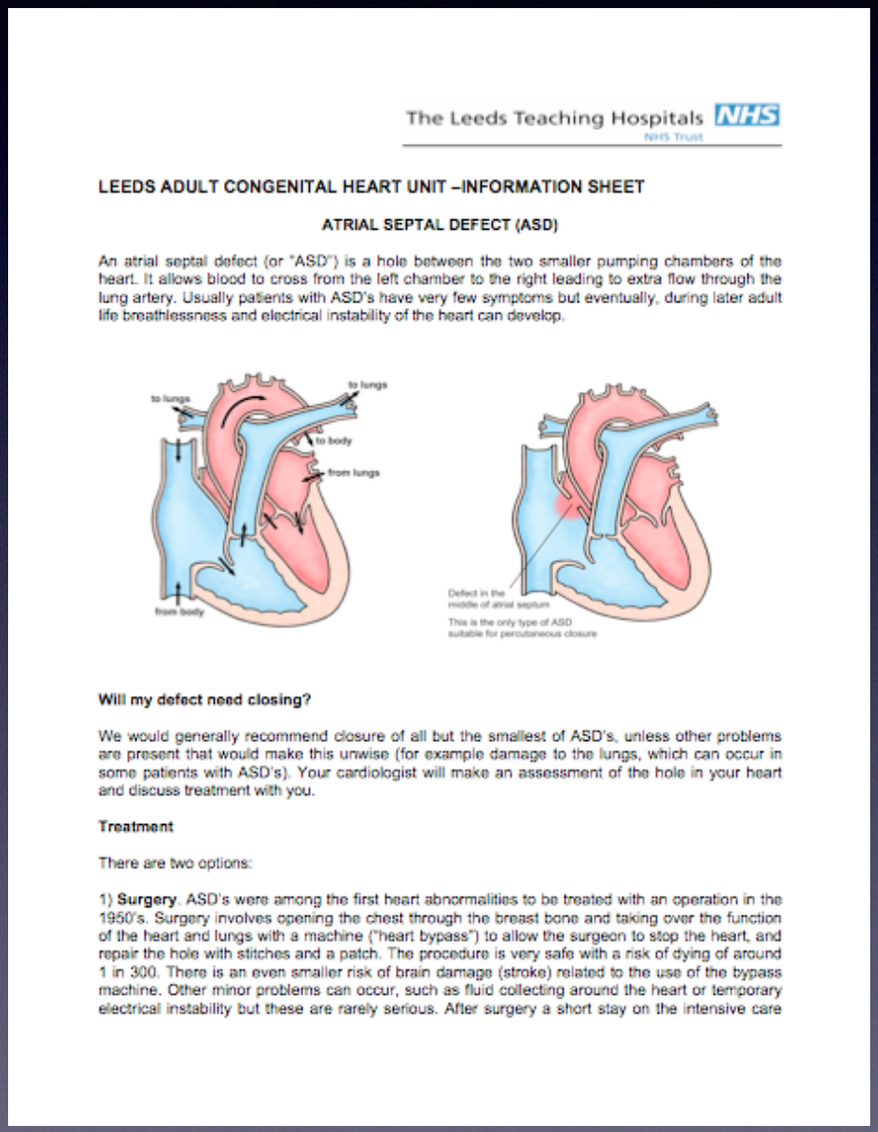
Selection: Adults

- Much less certainty with regard to the "fine detail" on TTE
  - Overall feel for defect size and margins
  - Associated problems important
    - Pulmonary hypertension
    - Particular attention to LV dysfunction

Additional TOE/MRI if absolutely necessary

The basics: Before

- Deal with these patients and families properly before the procedure



The Leeds Teaching Hospitals NHS
NHS Trust

LEEDS ADULT CONGENITAL HEART UNIT –INFORMATION SHEET

ATRIAL SEPTAL DEFECT (ASD)

An atrial septal defect (or "ASD") is a hole between the two smaller pumping chambers of the heart. It allows blood to cross from the left chamber to the right leading to extra flow through the lung artery. Usually patients with ASD's have very few symptoms but eventually, during later adult life breathlessness and electrical instability of the heart can develop.

Will my defect need closing?

We would generally recommend closure of all but the smallest of ASD's, unless other problems are present that would make this unwise (for example damage to the lungs, which can occur in some patients with ASD's). Your cardiologist will make an assessment of the hole in your heart and discuss treatment with you.

Treatment

There are two options:

1) **Surgery**. ASD's were among the first heart abnormalities to be treated with an operation in the 1950's. Surgery involves opening the chest through the breast bone and taking over the function of the heart and lungs with a machine ("heart bypass") to allow the surgeon to stop the heart, and repair the hole with stitches and a patch. The procedure is very safe with a risk of dying of around 1 in 300. There is an even smaller risk of brain damage (stroke) related to the use of the bypass machine. Other minor problems can occur, such as fluid collecting around the heart or temporary electrical instability but these are rarely serious. After surgery a short stay on the intensive care

www.yorkshirecongenitalhearts.nhs.uk

1.) The basics: Clinic

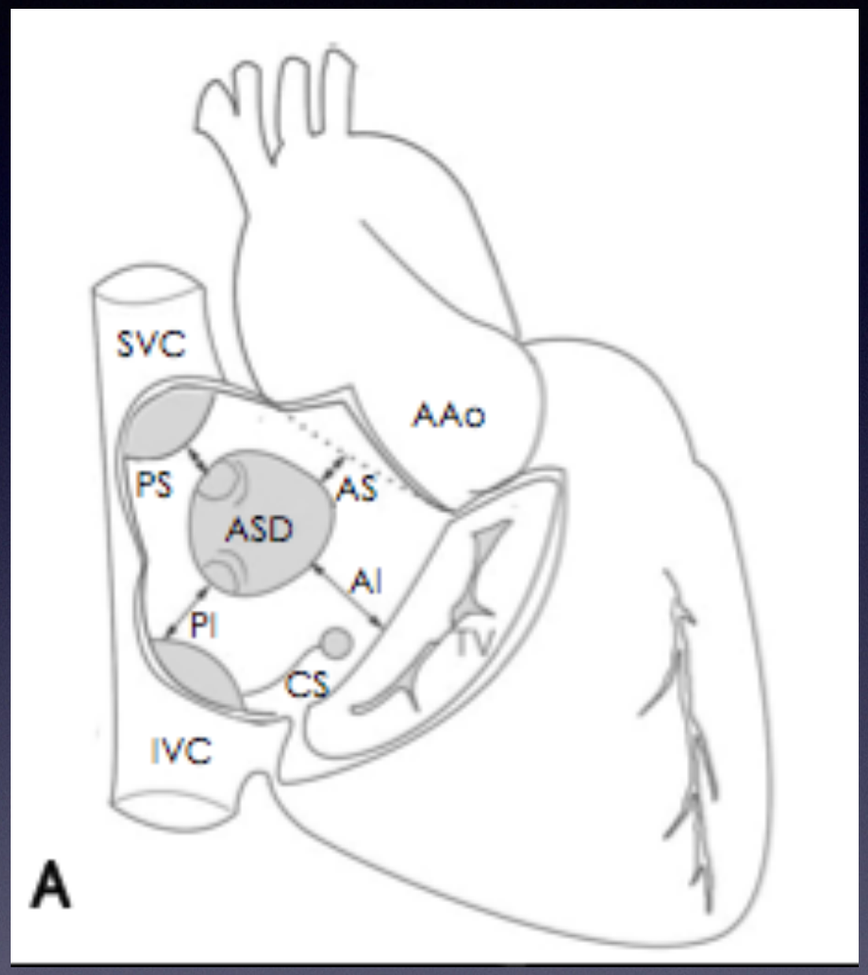
- See patients and families before in a calm environment
- Ideally an additional staff member present during discussions
- Record what is said-detail risks
    - Including long term erosion
- Consent
- NEVER CATHETERISE A PATIENT YOU HAVE NOT MET PERSONALLY

Basic procedure: preparation

- Single femoral venous access only
  - Ultrasound
- 100 iu/kg heparin after access secured
  - No ACT unless very prolonged procedure
- 5F MPA
  - Pre-determined diagnostic data
- Superstiff wire to left upper or middle lobe PV

2.) Understand the anatomy

Imaging and imagers are all important


SVC
AAo
PS
AS
ASD
AI
PI
CS
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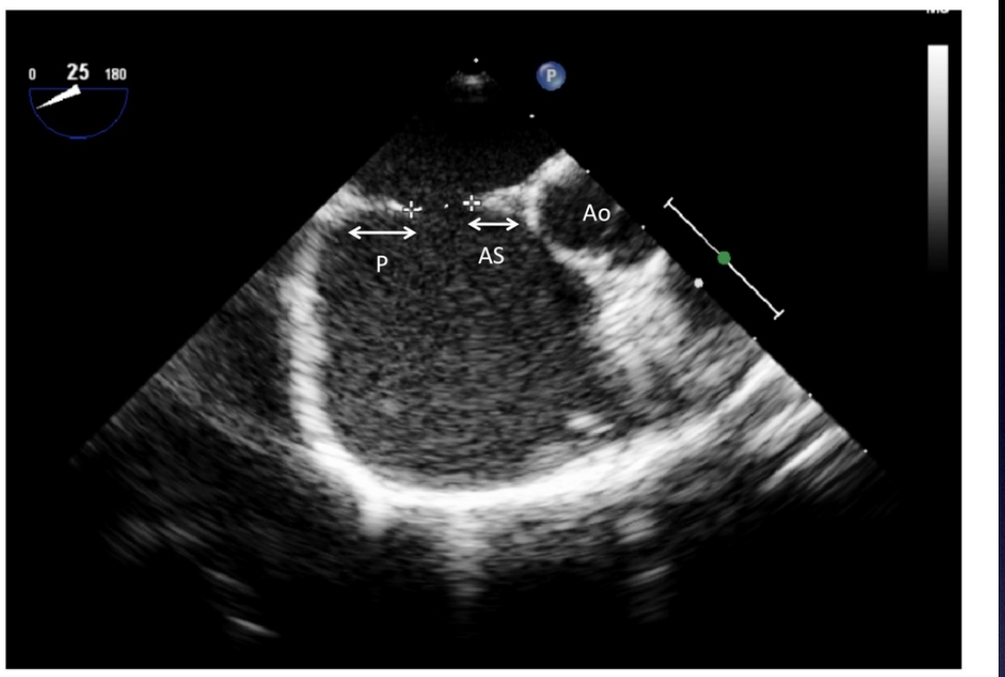
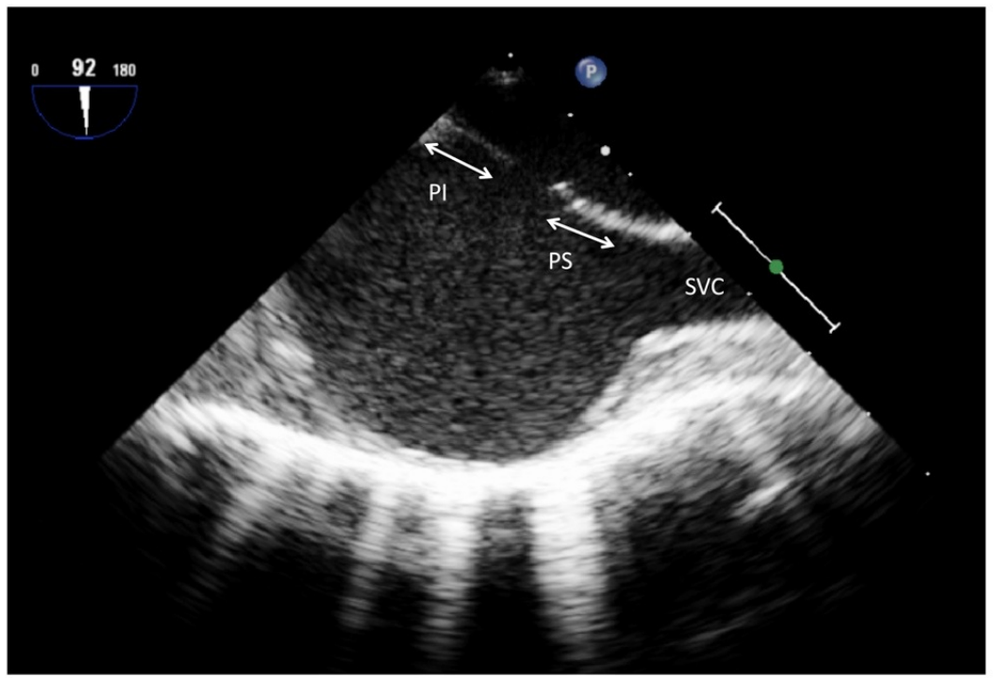
A

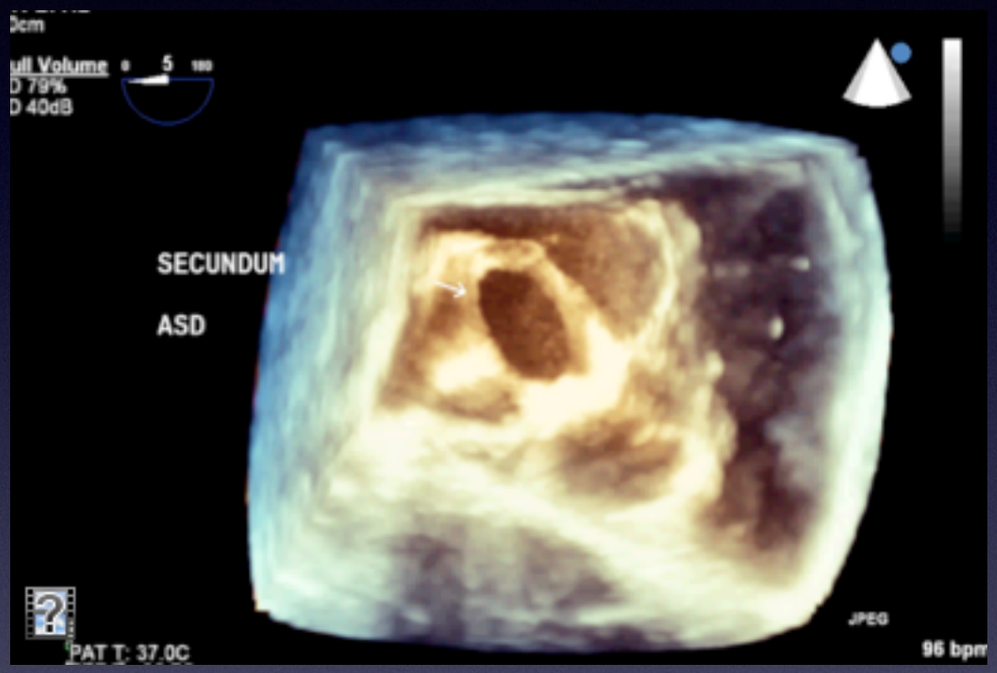

0
25
180
P
Ao
P
AS


0
92
180
P
PI
PS
SVC

Systematic TOE

- Margins
- Recheck Pulmonary vein's
- Mitral valve
- Eustachian valve/ridge
- Length of the septum
- Size of the LA
- Multiple defects

3D TOE



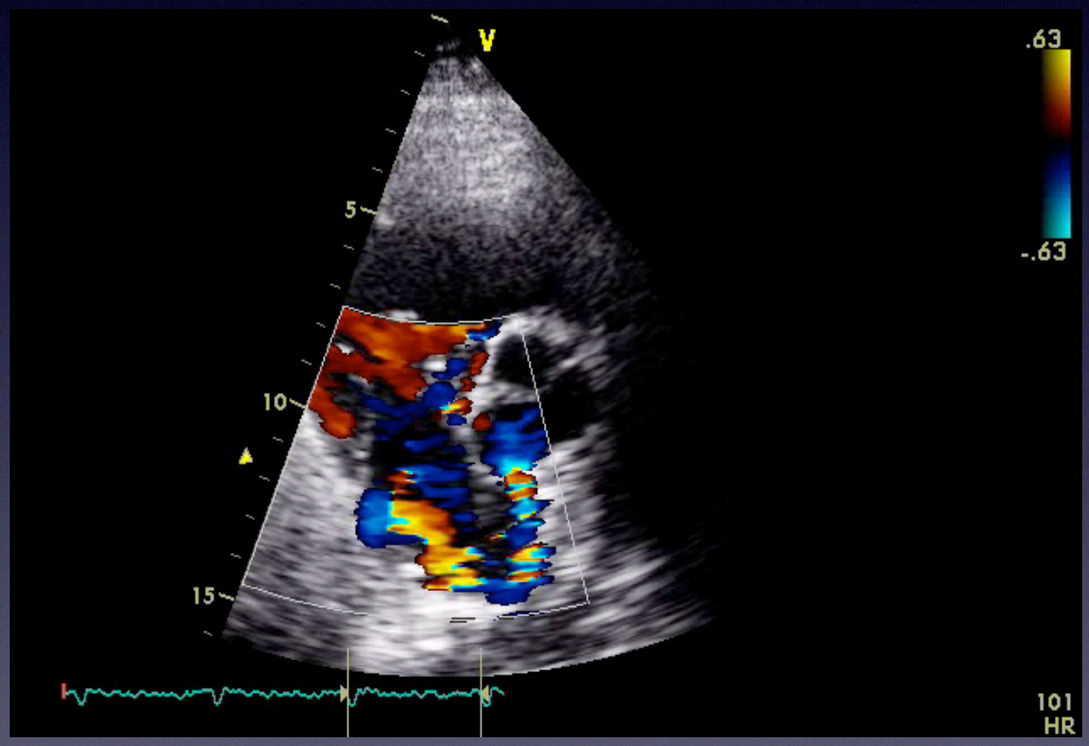
Sizing

- With consistent and systematic echo there is (virtually) no need for balloon sizing of ASD's
  - My last 150 cases without a balloon
  - 2 perpendicular measurements on TOE
  - Sense check with 3D TOE
  - Implant a device AT THAT SIZE

Why not balloon size?

- In our experience leads to the implantation of at least a 10-20% larger device
- Inaccurate at >30mm
    - In general ultrasound is the most accurate tool for measurement
- Balloon=Pressure on the septum

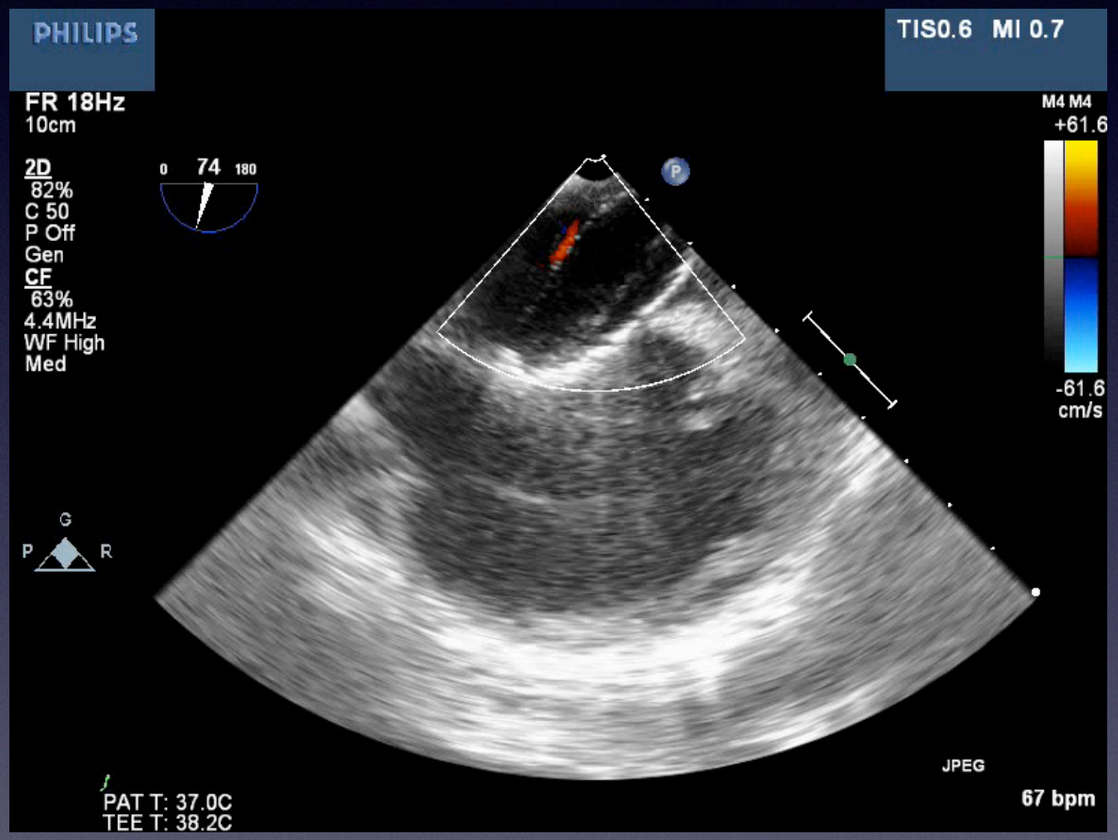
Avoiding oversizing



Thanks to
Paul Clift
Birmingham

Embolisation vs erosion?

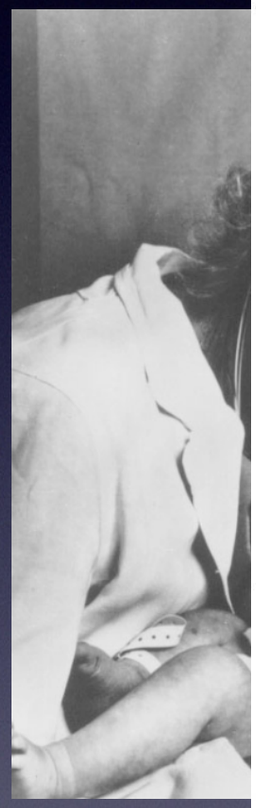
Stop flow


PHILIPS
TIS0.6 MI 0.7
FR 18Hz
10cm
2D
82%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0
74
180
M4 M4
+61.6
-61.6
cm/s
G
P
R
JPEG
67 bpm
PAT T: 37.0C
TEE T: 38.2C

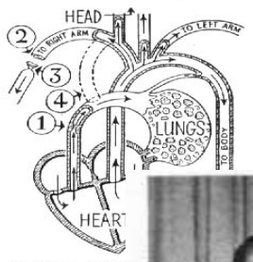
Devices

3.) Know your equipment

- These devices stay in patients for life
- Ultimately we choose what we implant
- Plenty of evidence that all devices are NOT equal
- Have a reason for using particular devices



Switching Arteries Sidetracks Blood and Oxygen to Otherwise Starved Lungs



The "Blue" Babies' Oxygen Because th the Heart to the L By Severing an A (2), Tying It Off It to the Lung Constriction

Saving our Doomed 'Blue' Babies

By Robert

Science

A WOMAN geous rese tion, and the world's great s bined to bring hop babies—hitherto c to early death—ma

These babies they are sufferin oxygen in their b condition known artery from their h is so constricted th gets oxygen to m

Their lips are b Their toes are b and they can w only a few feet w out exhausti Doctors used to them only a few tured years to liv

But now medi can give hope . . . more . . . for s Nov. 20, 1944, Blalock, Professor Surgery at Jo Hopkins Universit Baltimore, has b conquering the "b baby malady by routing an artery f the arm and mai it carry blood to lungs where it receive its oxygen.

Nearly 70 operations have been performed on "blue" babies. In many cases almost miraculous recovery has come.

It is Dr. Blalock's fingers that wield the knife in the delicate operation that exposes the heart and transplants its vital arteries. But behind the brilliant operation he has perfected are years of painstaking research by Dr. Helen B. Taussig.

Daughter of the late Prof. F. W. Taussig, world-famous Harvard economist, Dr. Taussig had watched "blue" babies come to her heart clinic at Johns Hopkins Hospital.

In many cases she discovered that the artery leading to the lung from the heart was narrowed so that an insufficient supply of blood was reaching the lungs to receive its vital oxygen. Dr. Taussig reasoned that a surgical operation might be able to short-circuit the constriction and sidetrack blood into the lungs. On paper, when the diagram of the art-

Six-Year-Old Mike Schirmer of Baltimore Could Walk Only Five Feet Without Resting Before the Operation. He Shows His "Itchy Zipper"—the Incision for the Operation.

Little Bonnie Stewart of Florida Is Another of the 70 Children Saved by the New Johns Hopkins Surgery.

Mike's "itchy zipper" is the healing incision over his heart where Dr. Blalock went in to do the operation. But let his mother tell his story:

"Michael could only walk five feet and then he'd have to squat down on the sidewalk and rest.

"I had to wheel him everywhere. Strangers would stop his carriage and

was no hope that Mike could grow up. But then came new hope, for Dr. Mansderfer told us about the operation of Dr. Blalock.

"They took him to the operating room and brought him back two hours later. It was a miracle.

"After only two weeks of convalescence he came home and he has been on the go ever since. If anyone wants anything he'll run and get it. He's up and down stairs 75 times a day. He climbs on bureaus and tables just for the joy of jumping off. He wears me out. But I love it."

The Blalock-Taussig operation is not a simple one. It takes from an

branches of the pulmonary artery (to the lungs) are two large blood vessels. One connects the heart and the arm, the other the heart and the head. Dr. Blalock chooses the most convenient—usually the arm artery—and severs it. One end is clamped off and the other closed permanently.

The end nearest the heart is then spliced to the nearest branch of the pulmonary artery. The clamps are removed and the blood that would ordinarily flow to the arm goes into the lung. There it becomes enriched with vital oxygen and the baby's blue lips quickly begin to turn red.

What happens to the arm?

Nature has provided other blood vessels which take up the blood load

Innovation

Sticking to what is known

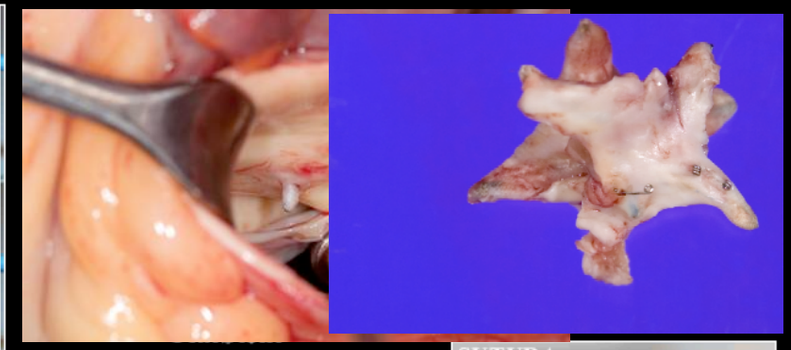
INTRASEPT

Amplatzer PFO Occluder

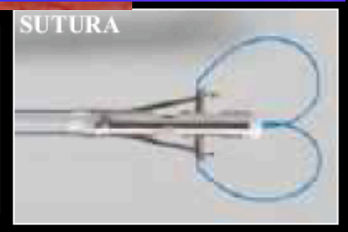
Figulla PFO Occluder

Solysafe

Figure 3. *Picture of the resected device completely endothelialized, as well as the embolized wire rescued.*

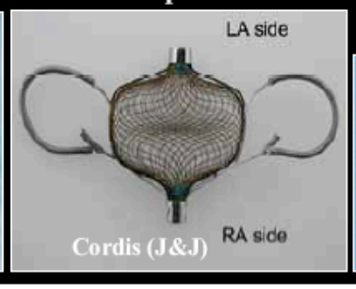


Helex Septal Occluder

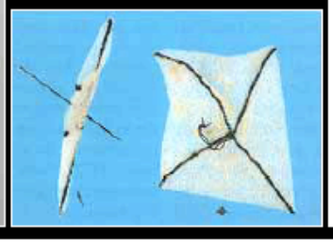


PFx

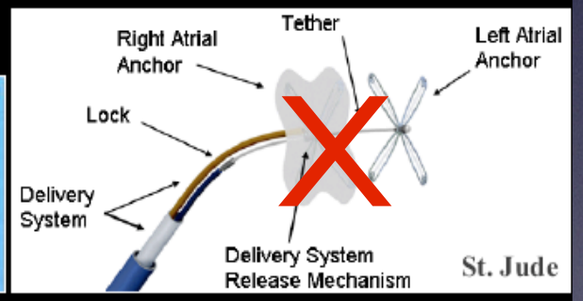
SeptRx



Buttoned Device



Premere



Familiarity with a few devices...

- My practice: About 70 atrial septal closure procedures per year
- I use 3 devices
- Developed a “deep(er) understanding” of how they work

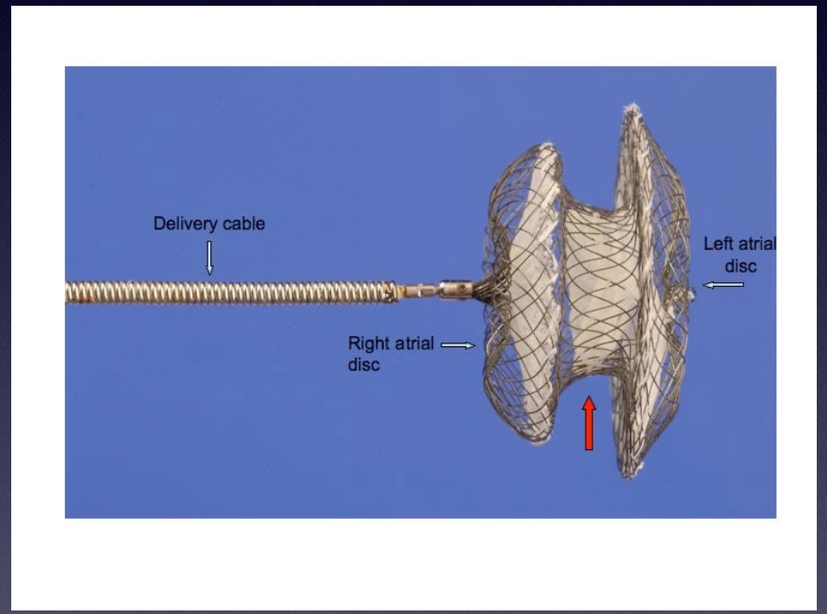
AGA/St Jude

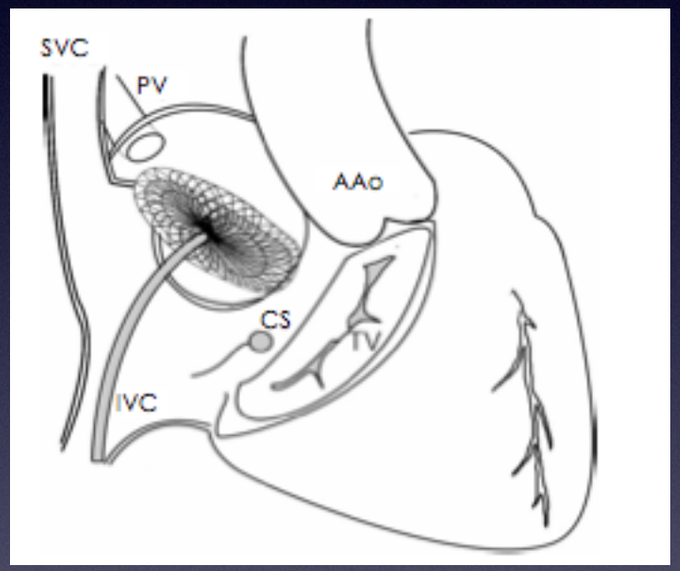
Occlutech

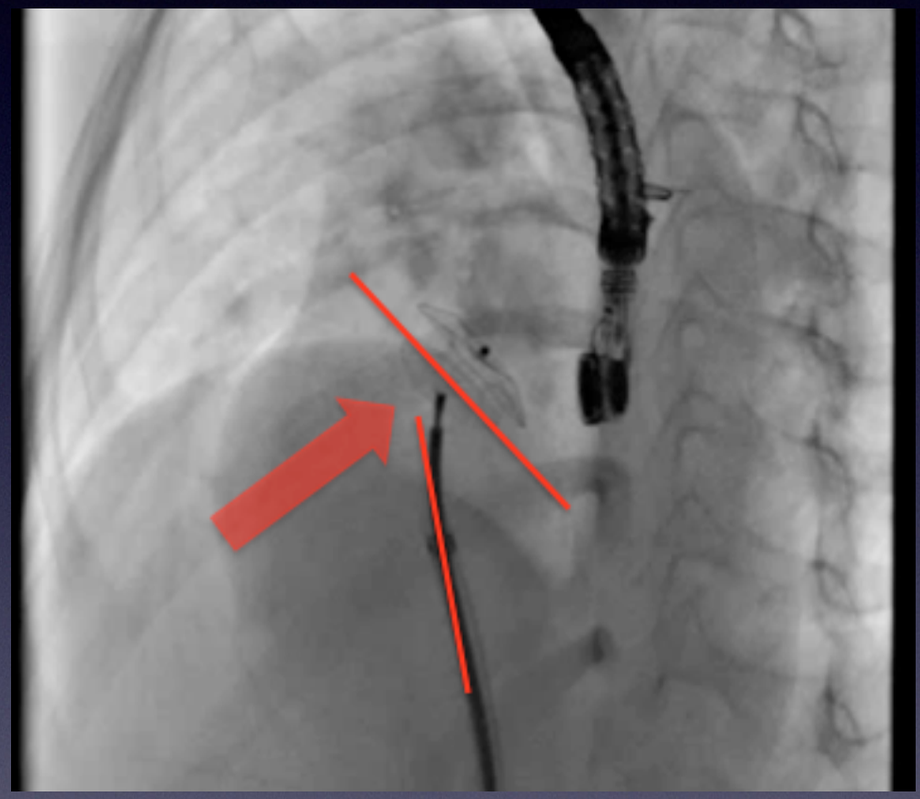
Gore
GSO

AGA/St Jude

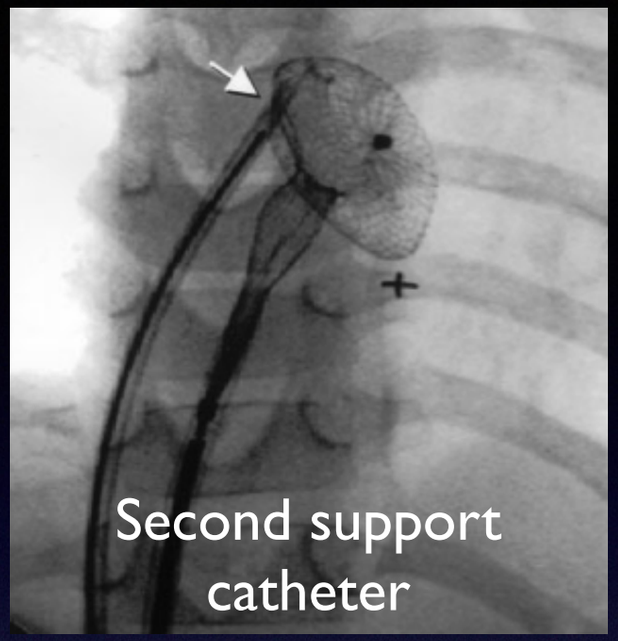
- Since 1996-Huge world wide experience
- Works well and is reliable
  - Few “material” issues
    - Data++
- Erosion
  - UK: 8/7000 implants (0.1%)
- Bulky/Fairly stiff/inadequate delivery wire



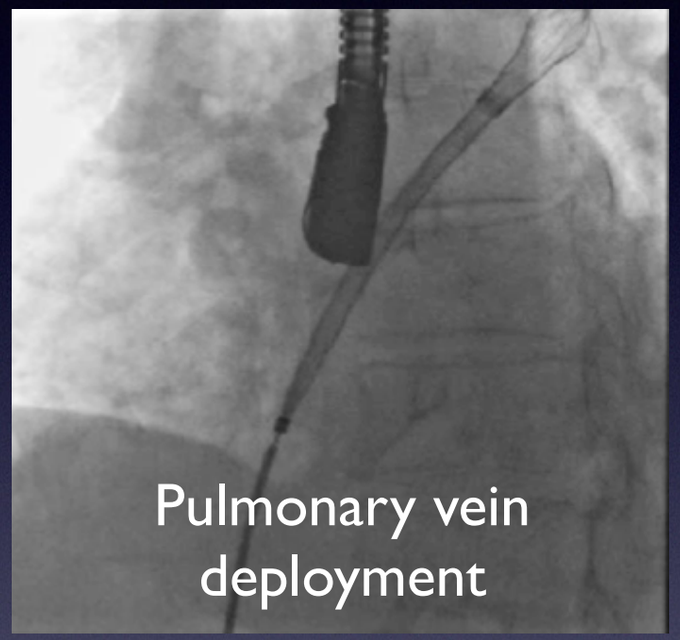

SVC
PV
AAo
CS
IV
IVC



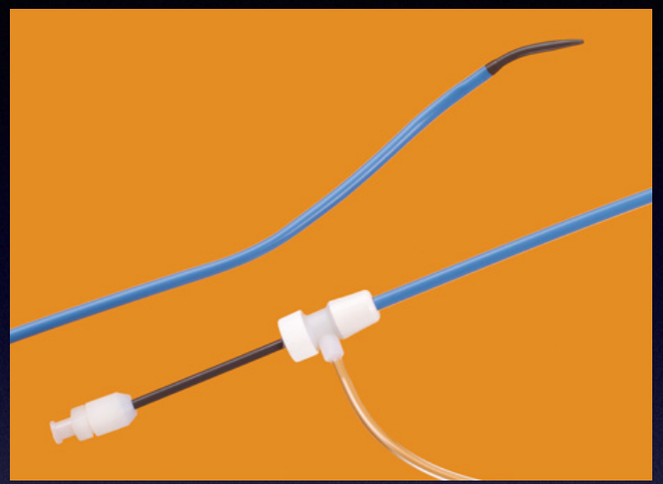
Tricks



Second support catheter

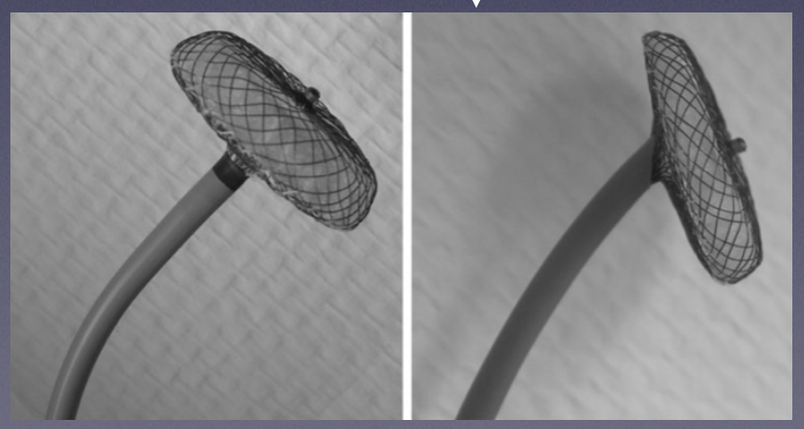


Pulmonary vein deployment



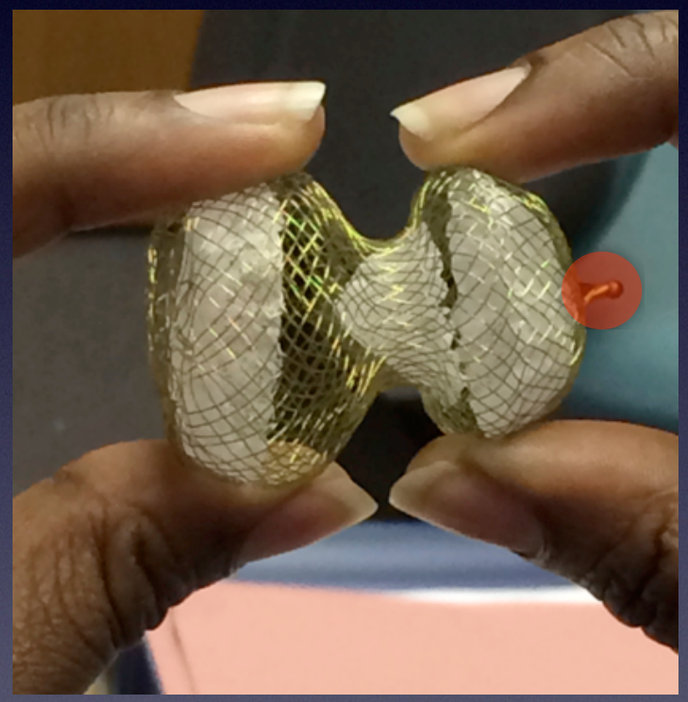
Altered delivery sheaths

Balloon assisted



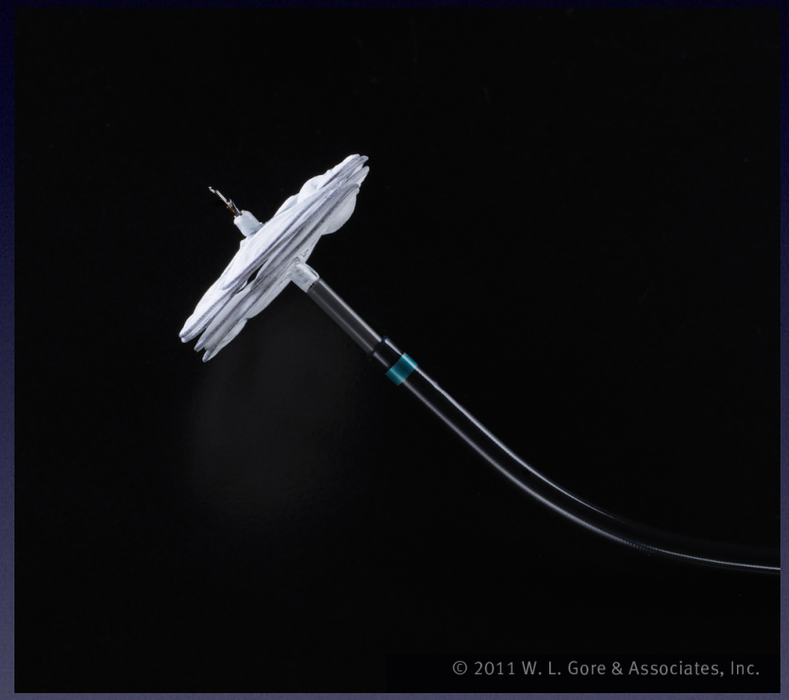
Occlutech

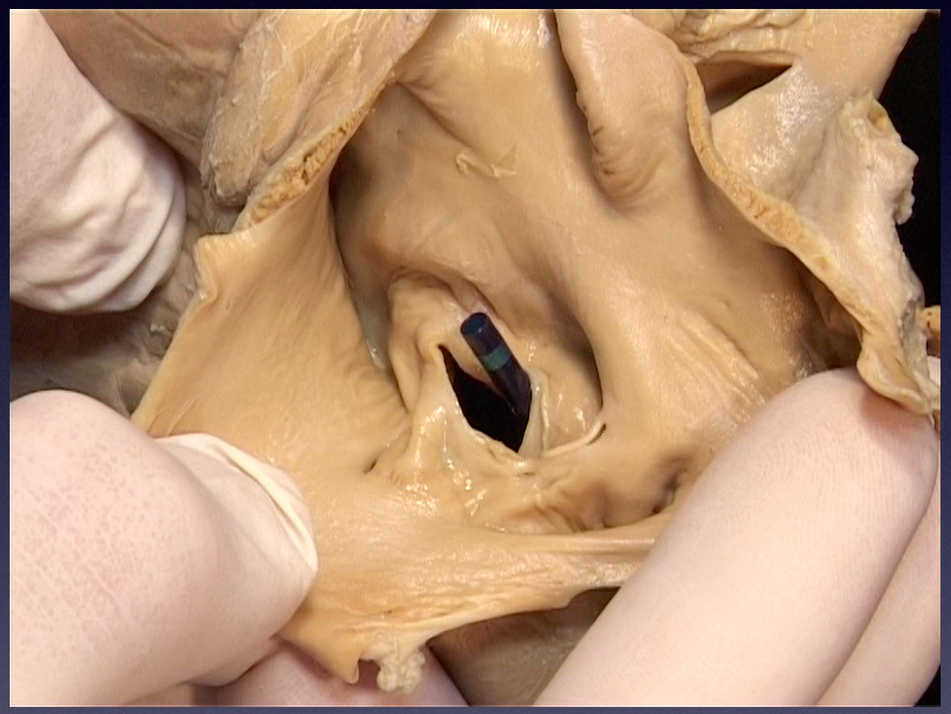
- Large(ish) numbers
- Seems to perform well
  - Less data
  - Erosion?
- Softer than ASO
- Articulated delivery wire
  - Particularly useful for Large defects/deficient aortic rim

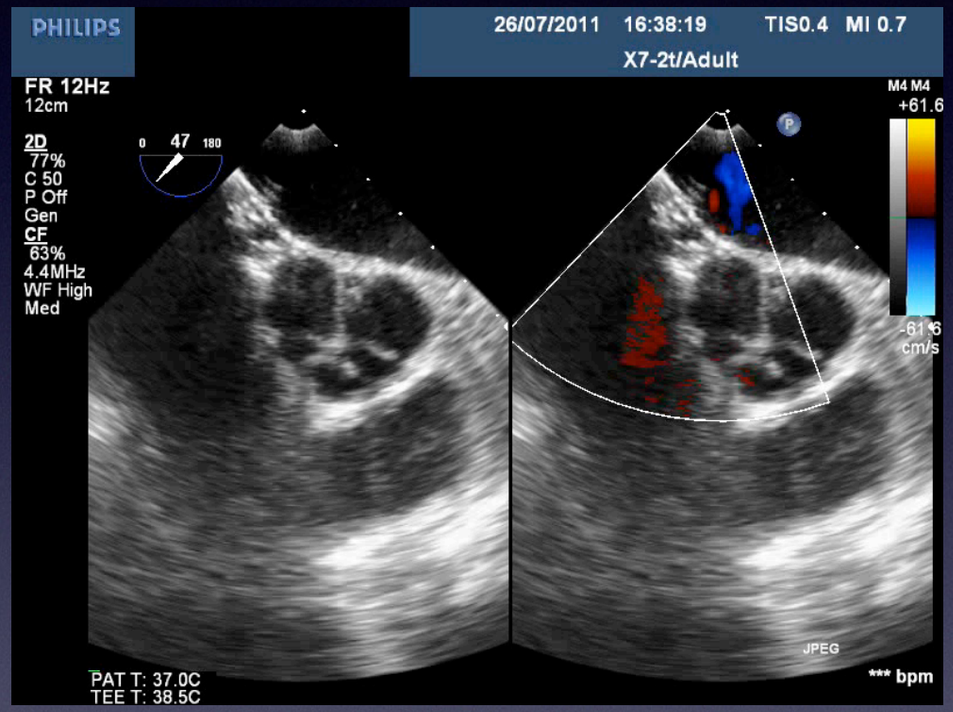


GSO

- New (2011-)
  - Data limited
- Painstaking development
- Flexible, soft, low profile
- “Cribriform” type of occluder
  - Small ASD’s (<18mm), PFO



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26/07/2011 16:38:19 TIS0.4 MI 0.7
X7-2t/Adult
FR 12Hz
12cm
2D
77%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 47 180
M4 M4
+61.6
-61.6
cm/s
JPEG
PAT T: 37.0C
TEE T: 38.5C
*** bpm

PFO

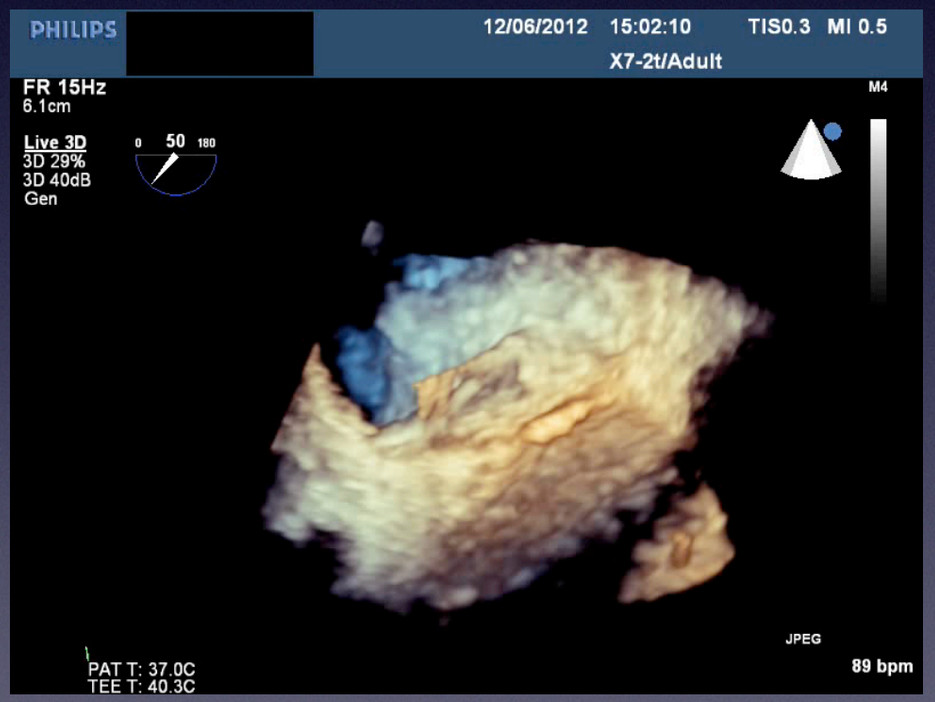
- Congenital interventionalists are very well placed to do this procedure
- Needs to be done with LOW COMPLICATION RATES
- Ability to deal with complications
  - Retrieval of embolised devices

Much in common with ASD closure

- Patient selection
  - Neurologists
    - Protocols (Anticoagulation etc)
- Patient preparation
- Procedure “set up”

PFO

- Flap not a hole
- Tunnel anatomy
- Aneurysmal septum

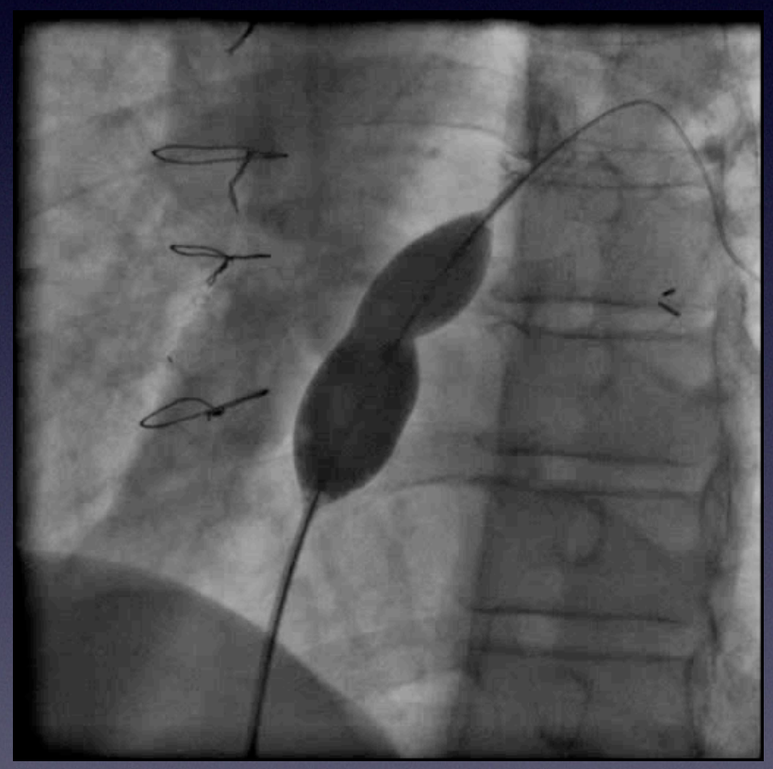


What is different about PFO?

- Patient selection
- Device performance-compete occlusion of the septum (bubble tightness) probably important
- Medical management more complex
- Issues relating to efficacy data

Procedure

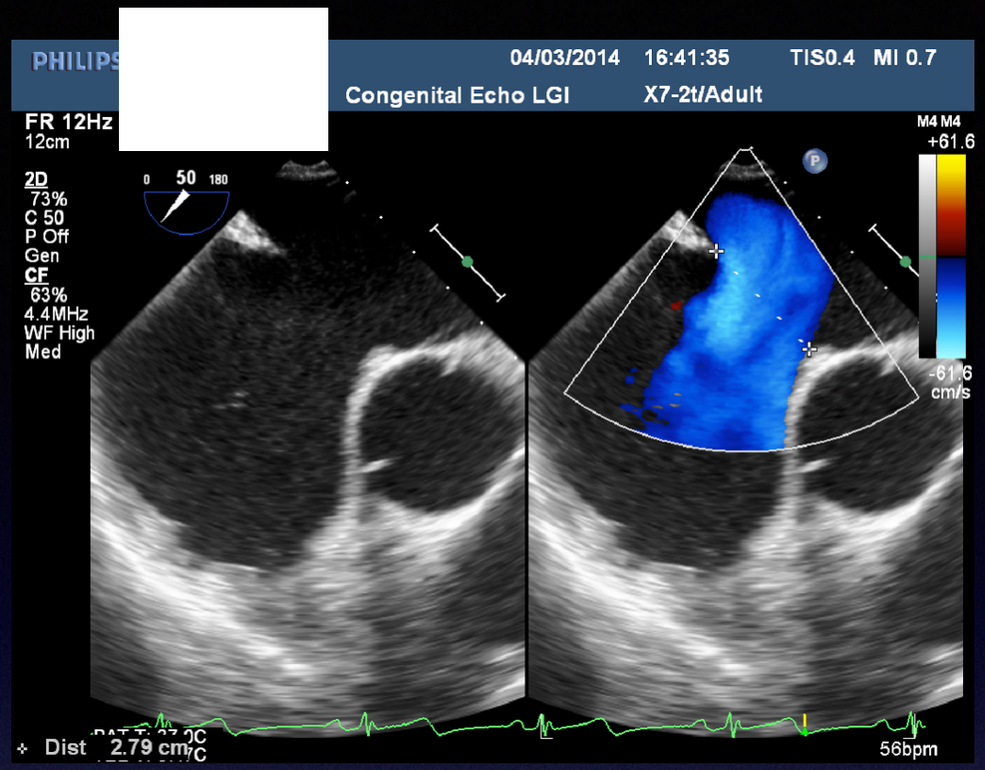
- Cribriform type occluder
  - AGA/GSO
- Generally 2:1 sizing

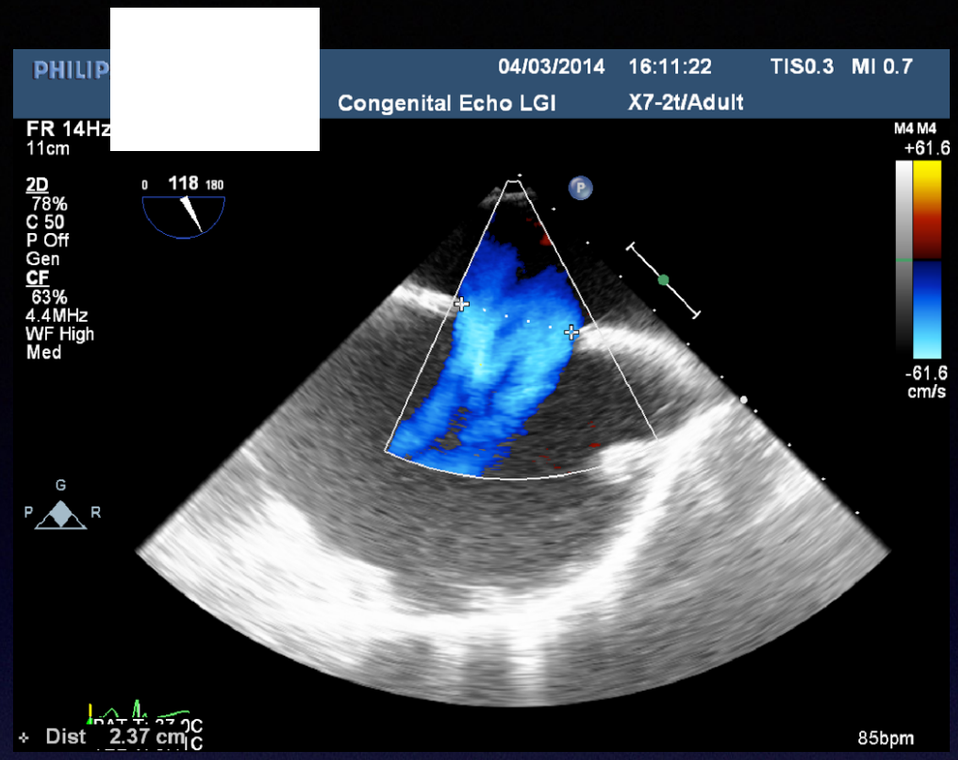


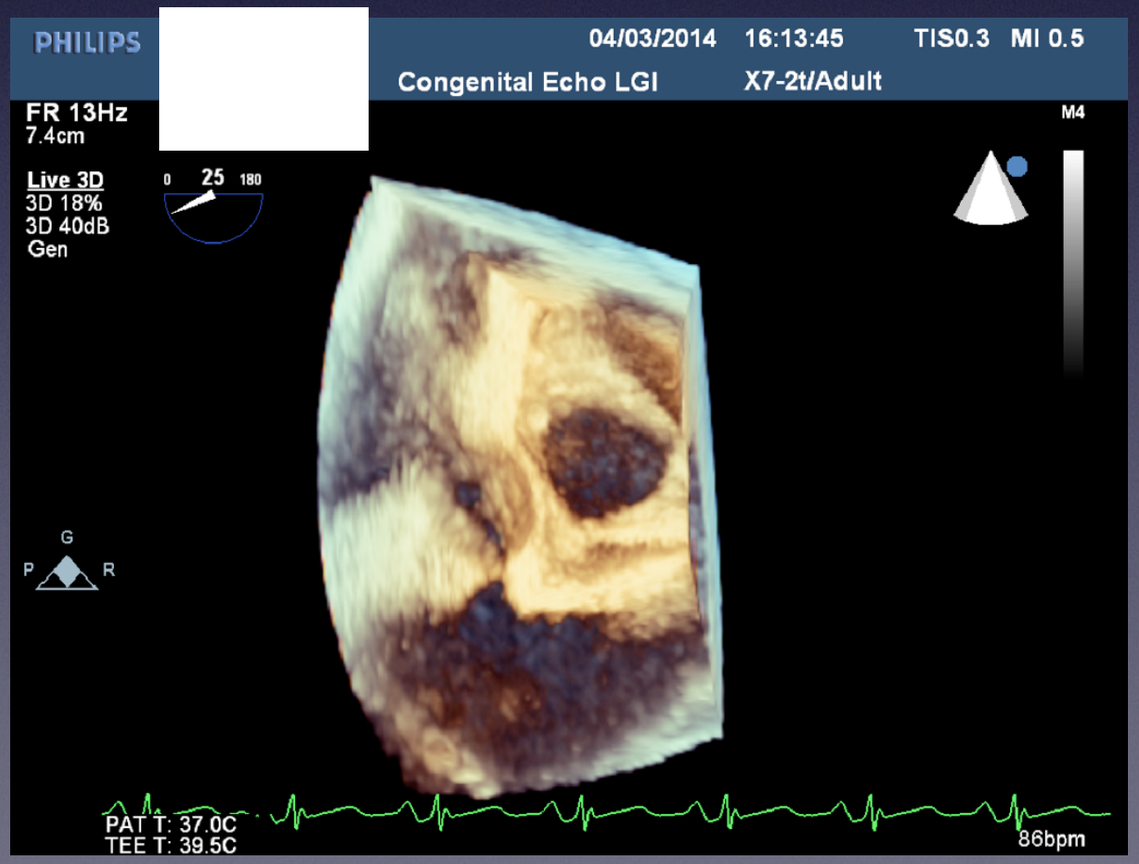
Conclusions

- Important topic
- Select and assess your patients well
- Talk to them and inform them properly
- Get the procedural imaging right
- Know your devices

Thank you


PHILIPS
04/03/2014 16:41:35 TIS0.4 MI 0.7
Congenital Echo LGI X7-2t/Adult
FR 12Hz
12cm
2D
73%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 50 180
M4 M4
+61.6
-61.6
cm/s
Dist 2.79 cm
56bpm


PHILIP
04/03/2014 16:11:22 TIS0.3 MI 0.7
Congenital Echo LGI X7-2t/Adult
FR 14Hz
11cm
2D
78%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 118 180
M4 M4
+61.6
-61.6
cm/s
G
P R
Dist 2.37 cm
85bpm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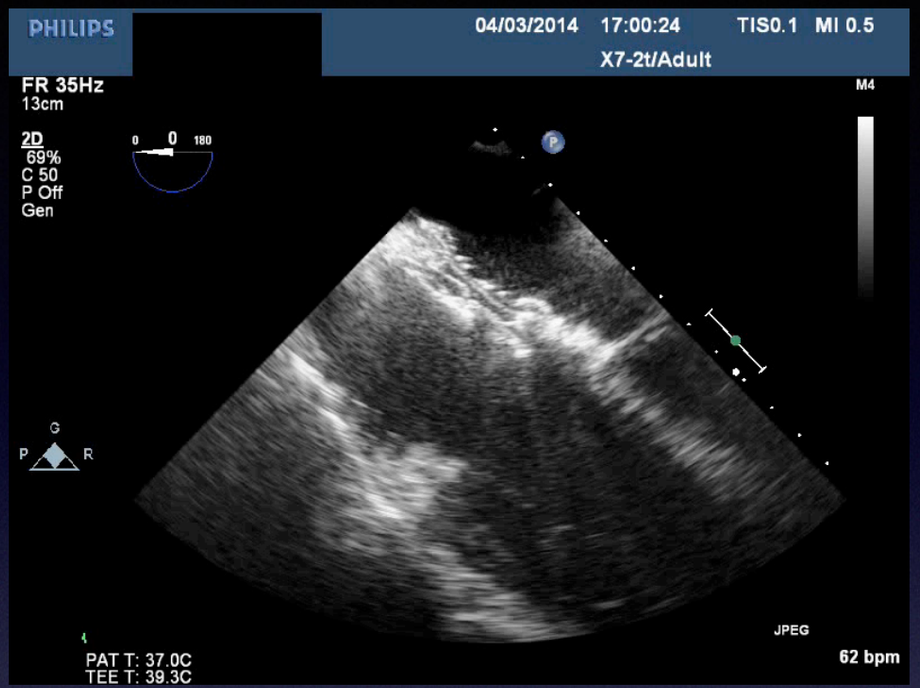
04/03/2014 16:13:45 TIS0.3 MI 0.5
Congenital Echo LGI X7-2t/Adult
FR 13Hz
7.4cm
Live 3D
3D 18%
3D 40dB
Gen
0 25 180
M4
G
P R
PAT T: 37.0C
TEE T: 39.5C
86bpm

LV dysfunction

- Age related LV stiffness accentuates L-R shunt
- Safety margins for ASD closure with LV dysfunction unclear-Literature very limited
- Practically be wary of patients with moderate to severe LV dysfunction
- Optimise medical treatment prior to ASD closure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X7-2t/Adult
FR 35Hz
13cm
M4
2D
69%
C 50
P Off
Gen
0 0 180
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P R
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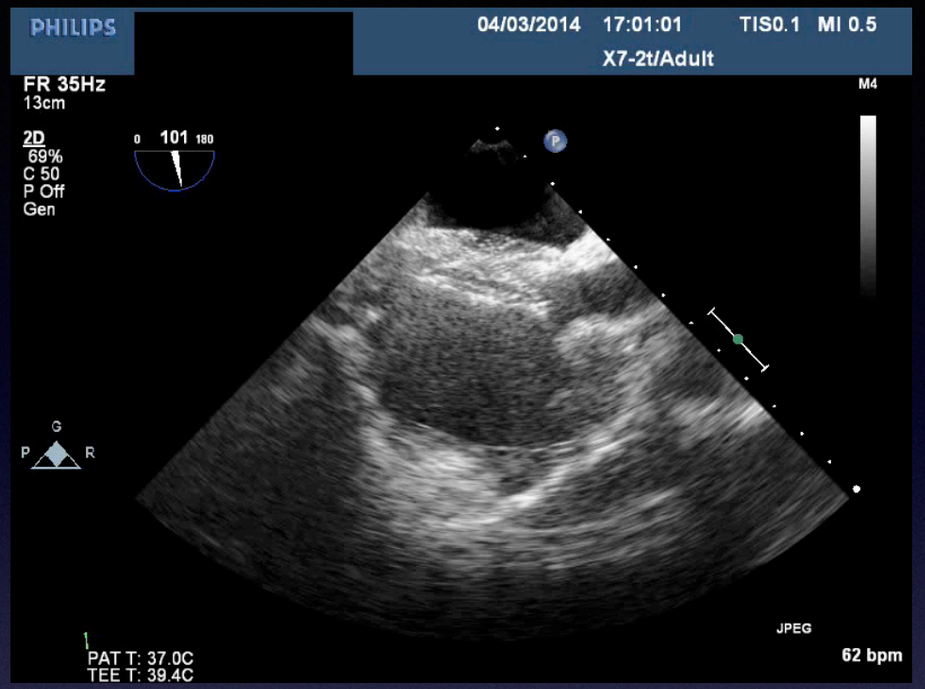
PAT T: 37.0C
TEE T: 39.3C
62 bpm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X7-2t/Adult
FR 35Hz
13cm
M4
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C 50
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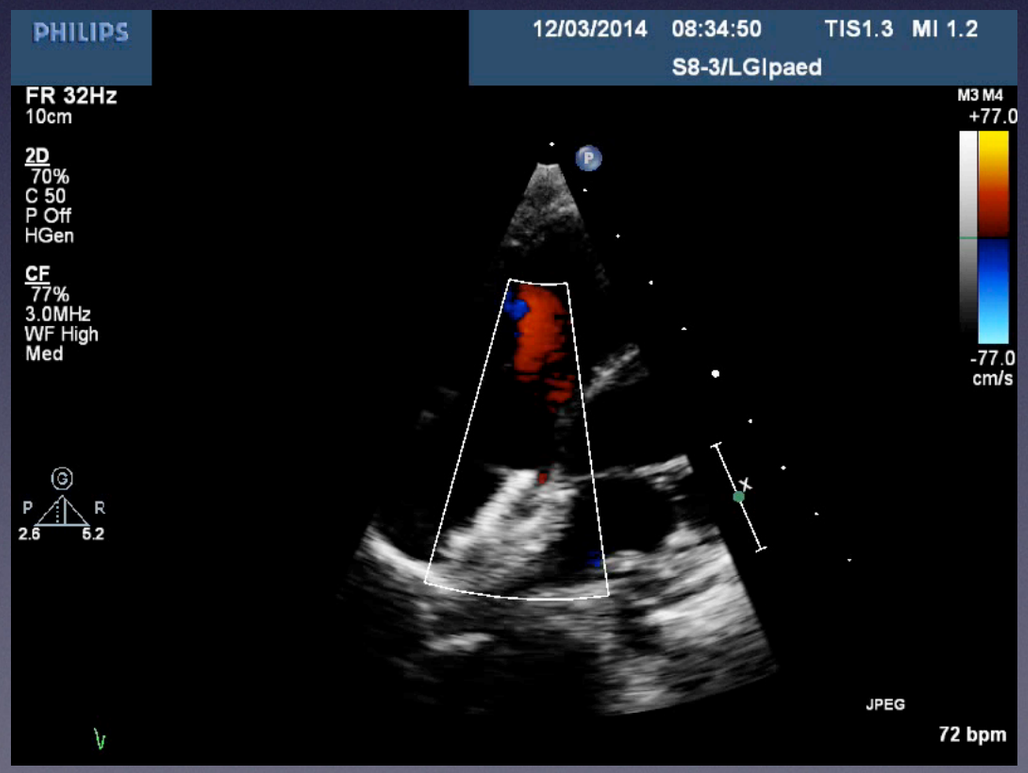
P R
JPEG
PAT T: 37.0C
TEE T: 39.4C
62 bpm


PHILIPS
12/03/2014 08:34:50 TIS1.3 MI 1.2
S8-3/LGIpaed
FR 32Hz
10cm
2D
70%
C 50
P Off
HGen
CF
77%
3.0MHz
WF High
Med
M3 M4
+77.0
-77.0
cm/s
G
P R
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