When to and when not to (and when to partially) close ASDs (using transcatheter techniques)

Bharat Dalvi

Glenmark Cardiac Centre

Mumbai, India

Ask yourself

- Is closure going to change quality of life?
- Is closure expected to prolong life?
- No place (as yet) for “Cosmetic Intervention” on the heart

How do we decide?

- ASD morphology
- Patient characteristics
- Hemodynamics
- Costing
- Experience and expertise

ASD Morphology

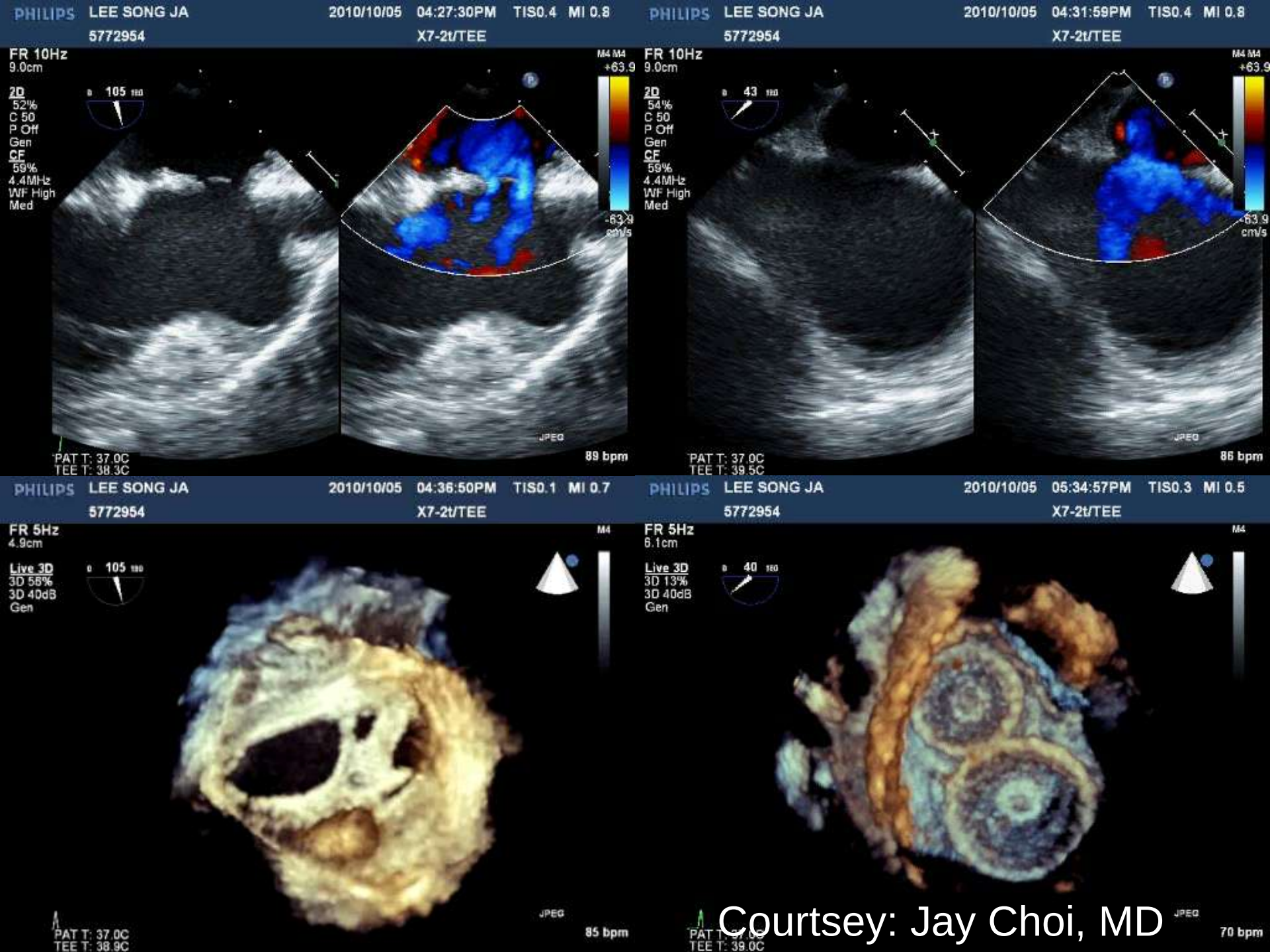
- Types:
  - Sinus venosus
  - Primum
  - Common atrium
  - ***Secundum*** ***√***
  - ***Coronary sinus*** ***√***

ASD Morphology

- Size:
  - Upto 36 mm with ASO
  - Upto 42 mm with Lifetech, Cacoon
  - Upto 46 mm with Occlutech
- Does size matter?
- Limiting factor is size of the device available

ASD Morphology

- Numbers:
  - One
  - Two (Using one or two devices)
  - Three
  - Fenestrated
- One or in two staged


PHILIPS LEE SONG JA 2010/10/05 04:27:30PM TIS0.4 MI 0.8
5772954 X7-2t/TEE
FR 10Hz
9.0cm
2D
52%
C 50
P Off
Gen
CF
59%
4.4MHz
WF High
Med
105
M4 M4
+63.9
-63.9
cm/s
JPEG
PAT T: 37.0C
TEE T: 38.3C
89 bpm
PHILIPS LEE SONG JA 2010/10/05 04:31:59PM TIS0.4 MI 0.8
5772954 X7-2t/TEE
FR 10Hz
9.0cm
2D
54%
C 50
P Off
Gen
CF
59%
4.4MHz
WF High
Med
43
M4 M4
+63.9
-63.9
cm/s
JPEG
PAT T: 37.0C
TEE T: 39.5C
86 bpm
PHILIPS LEE SONG JA 2010/10/05 04:36:50PM TIS0.1 MI 0.7
5772954 X7-2t/TEE
FR 5Hz
4.9cm
Live 3D
3D 58%
3D 40dB
Gen
105
M4
JPEG
PAT T: 37.0C
TEE T: 38.9C
85 bpm
PHILIPS LEE SONG JA 2010/10/05 05:34:57PM TIS0.3 MI 0.5
5772954 X7-2t/TEE
FR 5Hz
6.1cm
Live 3D
3D 13%
3D 40dB
Gen
40
M4
JPEG
PAT T: 37.0C
TEE T: 39.0C
70 bpm
Courtsey: Jay Choi, MD

ASD Morphology

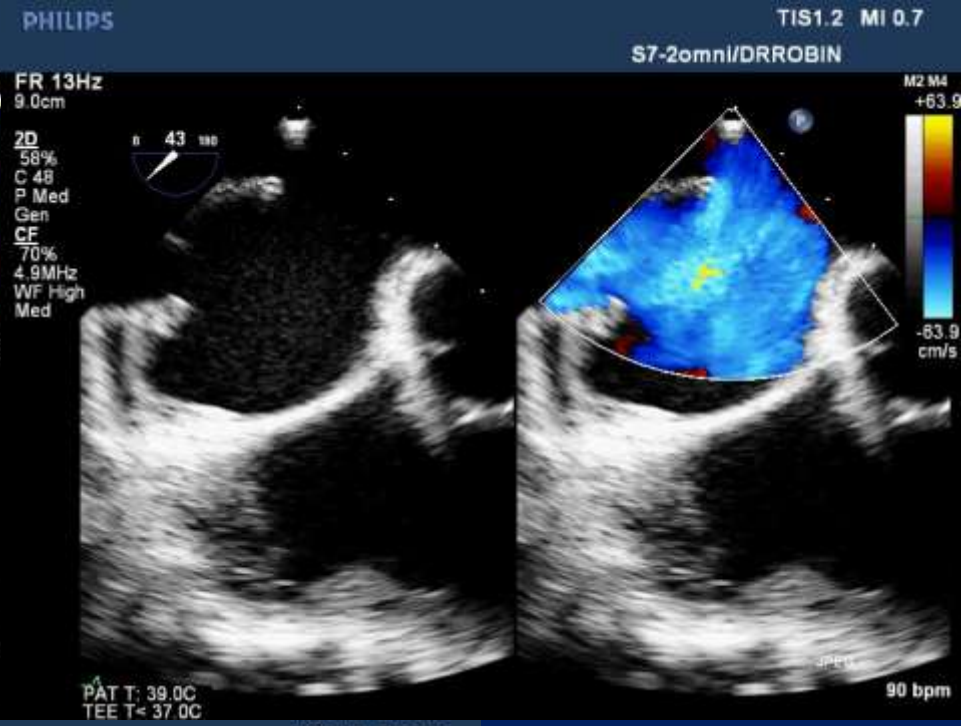
- Rims:
  - Length : What is adequate?
  - Strength
  - Alignment
- IAS length


PHILIPS
TIS1.1 MI 0.7
S7-2omni/DRROBIN
FR 15Hz
8.1cm
2D
62%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+69.3
-69.3
cm/s
PAT T: 37.0C
TEE T: 40.0C
115 bpm


PHILIPS
TIS1.1 MI 0.7
S7-2omni/DRROBIN
FR 15Hz
8.1cm
2D
62%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+69.3
-69.3
cm/s
PAT T: 37.0C
TEE T: 39.9C
117 bpm


PHILIPS
TIS1.2 MI 0.7
S7-2omni/DRROBIN
FR 22Hz
8.1cm
2D
63%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+69.3
cm/s
PAT T: 37.0C
TEE T: 39.4C
117 bpm


PHILIPS
TIS1.2 MI 0.7
S7-2omni/DRROBIN
FR 13Hz
9.0cm
2D
58%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+63.9
-63.9
cm/s
PAT T: 39.0C
TEE T< 37.0C
92 bpm


PHILIPS
TIS1.2 MI 0.7
S7-2omni/DRROBIN
FR 13Hz
9.0cm
2D
58%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+63.9
-63.9
cm/s
PAT T: 39.0C
TEE T< 37.0C
90 bpm


PHILIPS
TIS1.2 MI 0.7
S7-2omni/DRROBIN
FR 13Hz
9.0cm
2D
58%
C 48
P Med
Gen
CF
70%
4.9MHz
WF High
Med
M2 M4
+63.9
-63.9
cm/s
PAT T: 39.0C
TEE T: 39.3C
90 bpm

Patient Characteristics

- If asymptomatic: Age > 2 years, Weight > 12 Kg

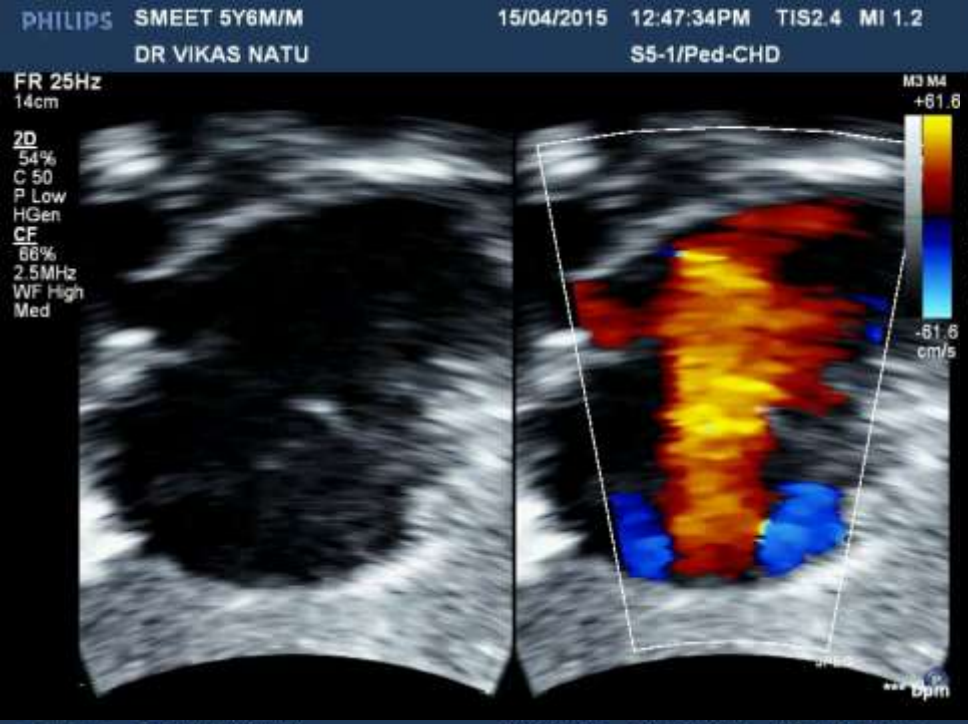
- If symptomatic: Less stringent with age and weight

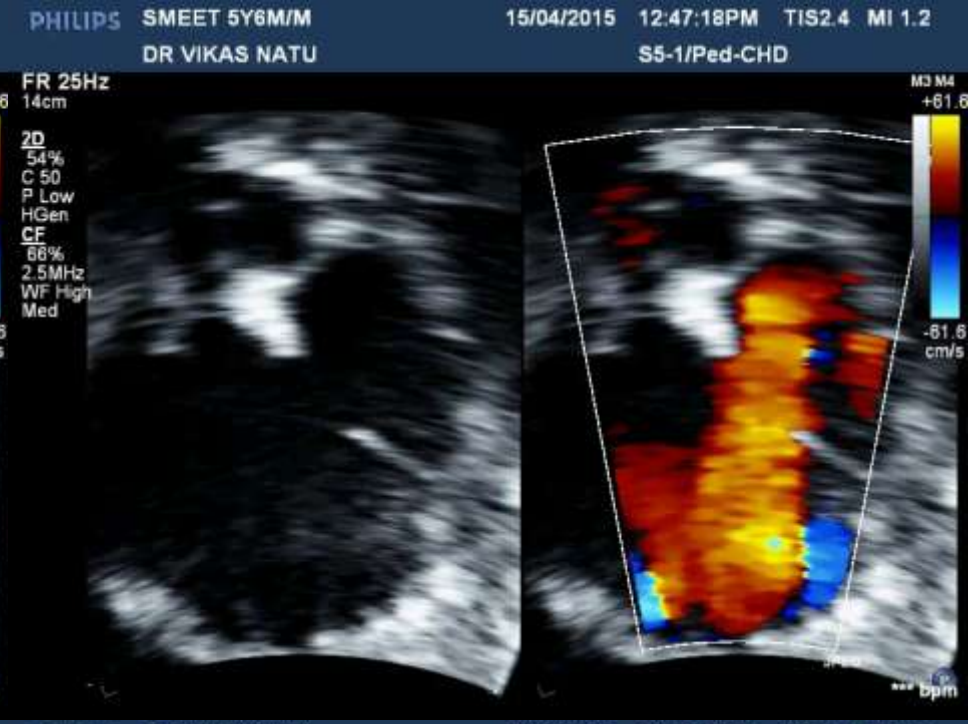
Hemodynamics

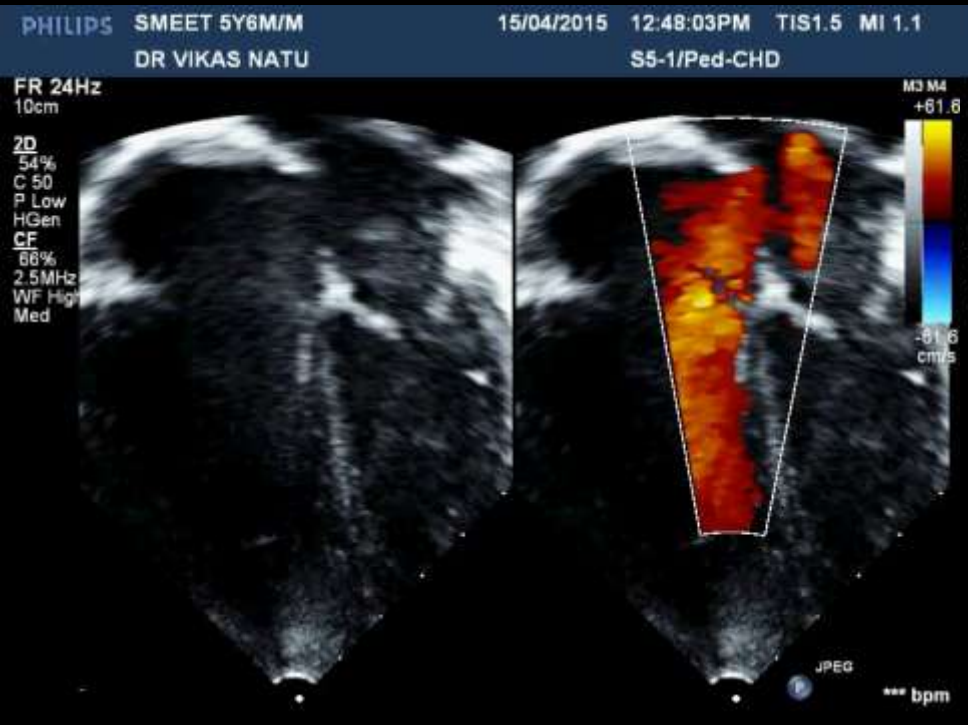
- Assessment is vital
  - Asymptomatic patient (Cardiac point of view)
  - Severe PAHT
  - LV restrictive physiology

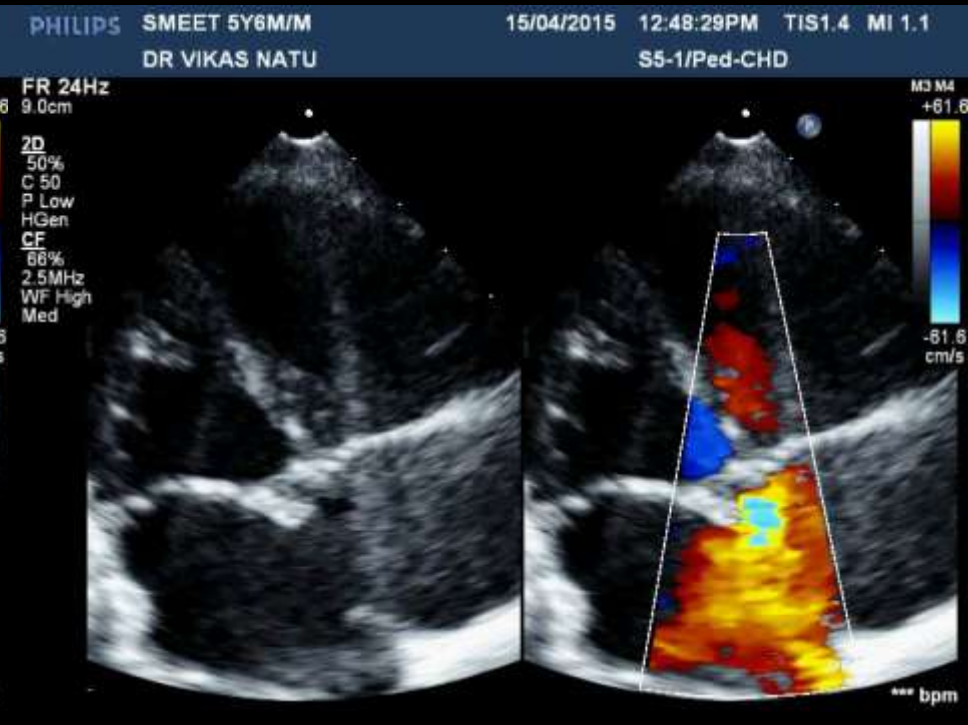
Asymptomatic

- Qp:Qs > 1.5 or 1.7: 1
- MDM in the tricuspid area
- ESM in the pulmonary area
- Wide and fixed A2P2
- RA and RVVO
- Transmitral Vs Transtricspid Doppler velocity

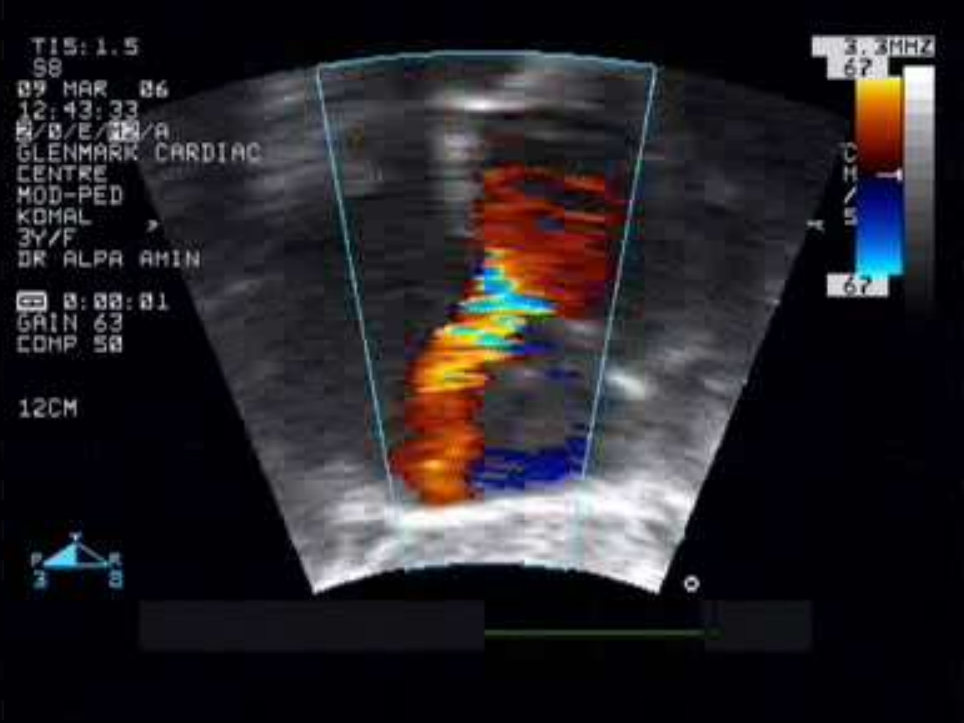

PHILIPS
SMEET 5Y6M/M
15/04/2015 12:47:34PM TIS2.4 MI 1.2
DR VIKAS NATU
S5-1/Ped-CHD
FR 25Hz
14cm
2D
54%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
M3 M4
+61.6
-61.6
cm/s
*** bpm


PHILIPS
SMEET 5Y6M/M
15/04/2015 12:47:18PM TIS2.4 MI 1.2
DR VIKAS NATU
S5-1/Ped-CHD
FR 25Hz
14cm
2D
54%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
M3 M4
+61.6
-61.6
cm/s
*** bpm

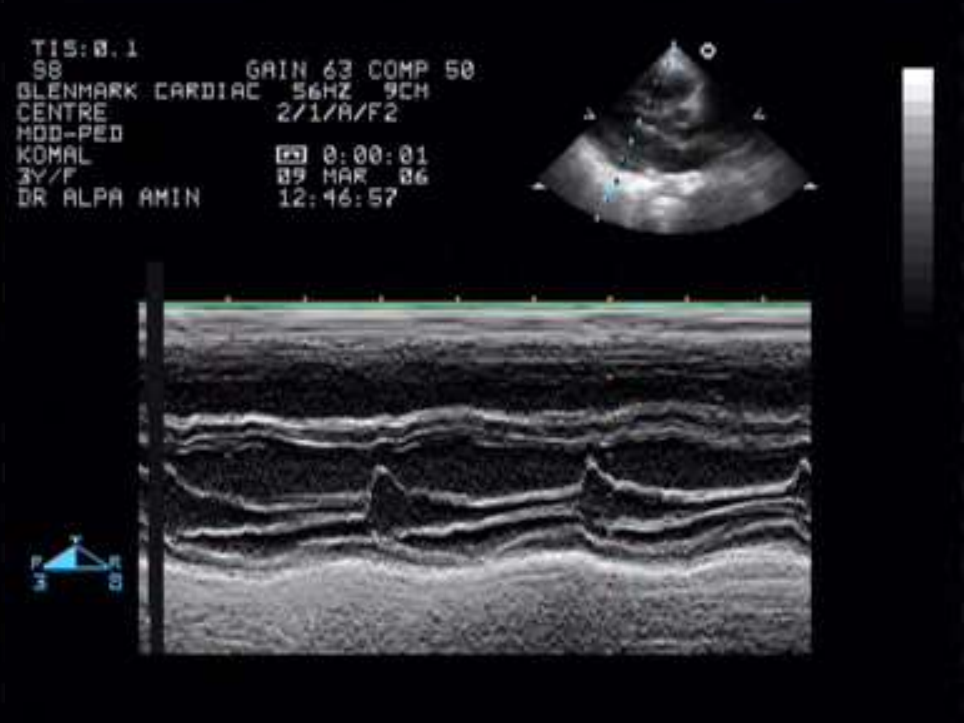

PHILIPS
SMEET 5Y6M/M
15/04/2015 12:48:03PM TIS1.5 MI 1.1
DR VIKAS NATU
S5-1/Ped-CHD
FR 24Hz
10cm
2D
54%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
M3 M4
+61.6
-61.6
cm/s
JPEG
*** bpm


PHILIPS
SMEET 5Y6M/M
15/04/2015 12:48:29PM TIS1.4 MI 1.1
DR VIKAS NATU
S5-1/Ped-CHD
FR 24Hz
9.0cm
2D
50%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
M3 M4
+61.6
-61.6
cm/s
*** bpm


MI:1.3
S8
09 MAR 06
12:43:26
2/1/E/F2
GLENMARK CARDIAC
CENTRE
MOD-PED
KOMAL
3Y/F
DR ALPA AMIN
0:00:01
GAIN 63
COMP 50
12CM


TIS:1.5
S8
09 MAR 06
12:43:33
2/0/E/F2/A
GLENMARK CARDIAC
CENTRE
MOD-PED
KOMAL
3Y/F
DR ALPA AMIN
0:00:01
GAIN 63
COMP 50
12CM
3.3MHZ
67
67


MI:0.9
S8
KOMAL
3Y/F
09 MAR 06 12:44:30
2/1/E/F2 9CM
DR ALPA AMIN
GAIN 63 COMP 50 77HZ
GLENMARK CARDIAC
CENTRE
MOD-PED
0:00:01


TIS:0.1
S8
GAIN 63 COMP 50
GLENMARK CARDIAC 56HZ 9CM
CENTRE 2/1/A/F2
MOD-PED
KOMAL
0:00:01
3Y/F
09 MAR 06
DR ALPA AMIN
12:46:57

To close or not to close?

- Those with severe PAHT : From long term point of view

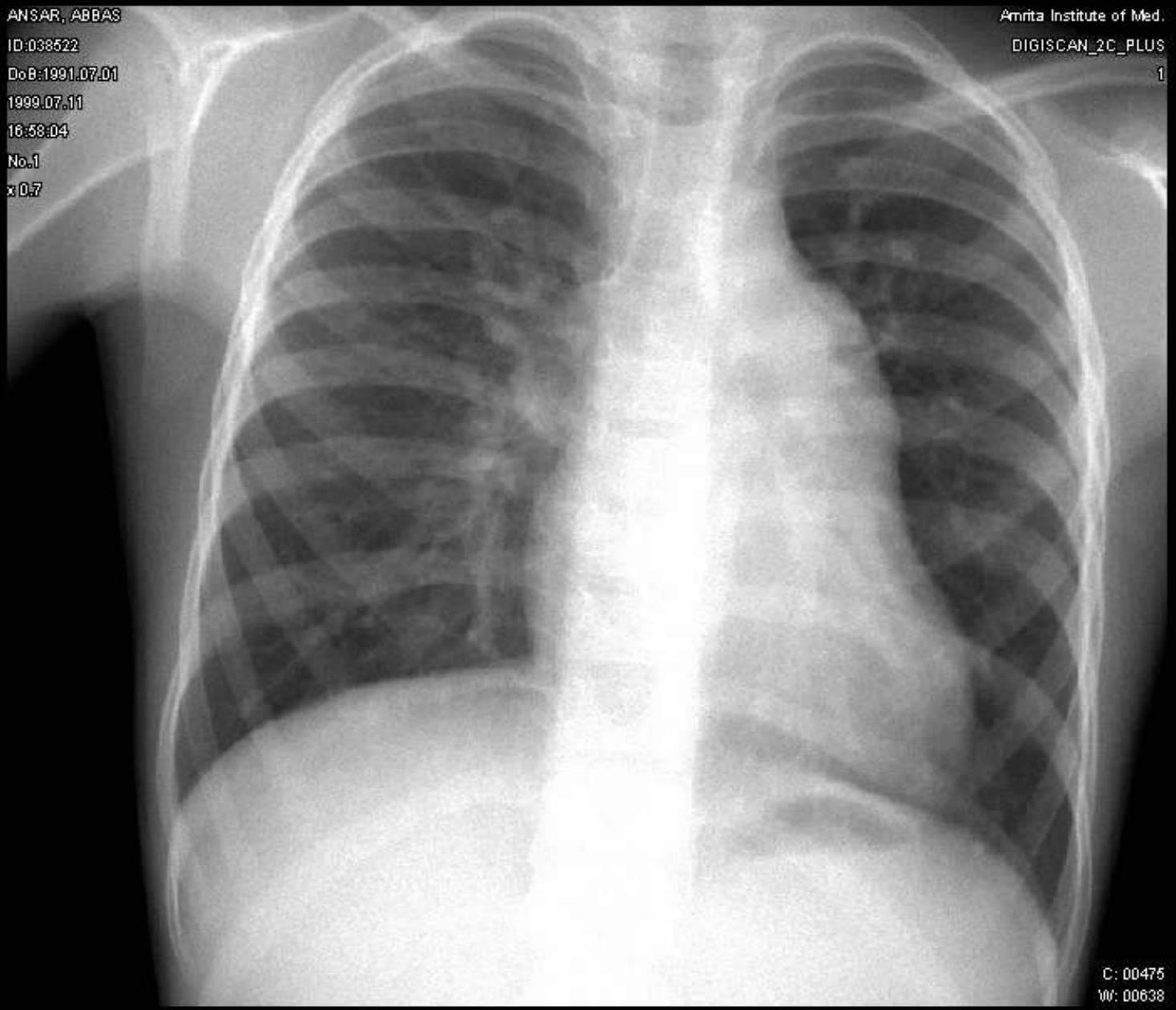
- Those with restrictive LV physiology : From short term point of view

Guidelines

- ACC/AHA
- ESC
- PAP, PVR or PVR/SVR, response to pulmonary vasodilators, response to balloon occlusion
- “Vague” NOT “Precise”
- Too many assumptions and finite sources of error
- “Holistic” approach in decision making

Case 1

- 27 year old with SOB and easy fatigability
- Cyanosis and clubbing
- Small heart
- Large secundum ASD (30mm) with a bidirectional shunt
- Qp:Qs < 1.5:1, PVRI 12 WU/m^2

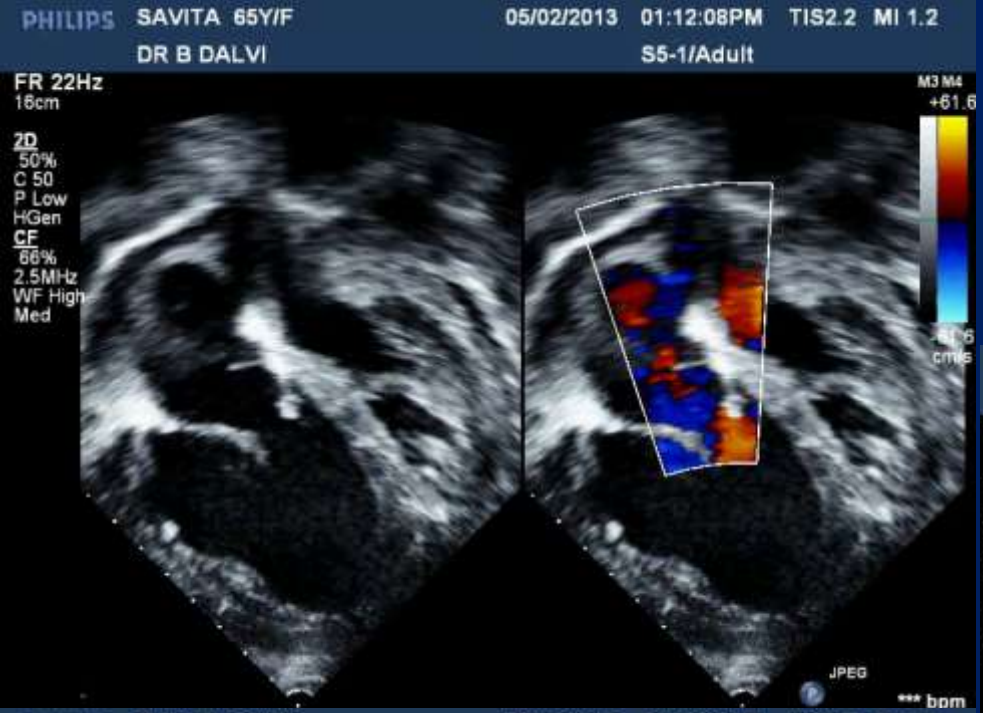

ANSAR, ABBAS
ID:038522
DoB:1991.07.01
1999.07.11
16:58:04
No.1
x 0.7
Amrita Institute of Med.
DIGISCAN_2C_PLUS
1
C: 00475
W: 00638

Treatment

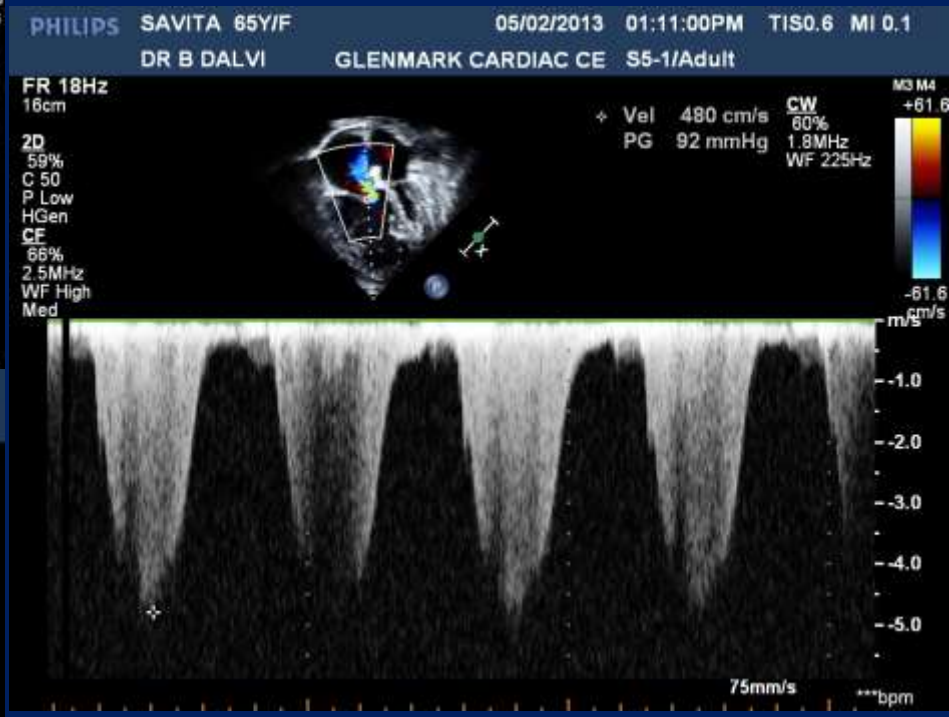
- Leave the ASD alone for the present
- Closing ASD - Counterproductive
- Follow up on pulmonary vasodilators

Case 2

- SOB and easy fatigability
- No cyanosis or clubbing
- Echo/CD showing small 18 mm ASD with left to right shunt
- Evidence of severe PHT
- PAP by TR jet 100 mm Hg


PHILIPS SAVITA 65Y/F 05/02/2013 01:12:08PM TIS2.2 MI 1.2
DR B DALVI S5-1/Adult
FR 22Hz
16cm
2D
50%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
M3 M4
+61.6
JPEG
*** bpm


PHILIPS SAVITA 65Y/F 05/02/2013 01:13:34PM TIS0.8 MI 1.4
DR B DALVI S5-1/Adult
FR 49Hz
16cm
2D
51%
C 50
P Low
HGen
M3
P
R
1.7
3.4
JPEG
*** bpm

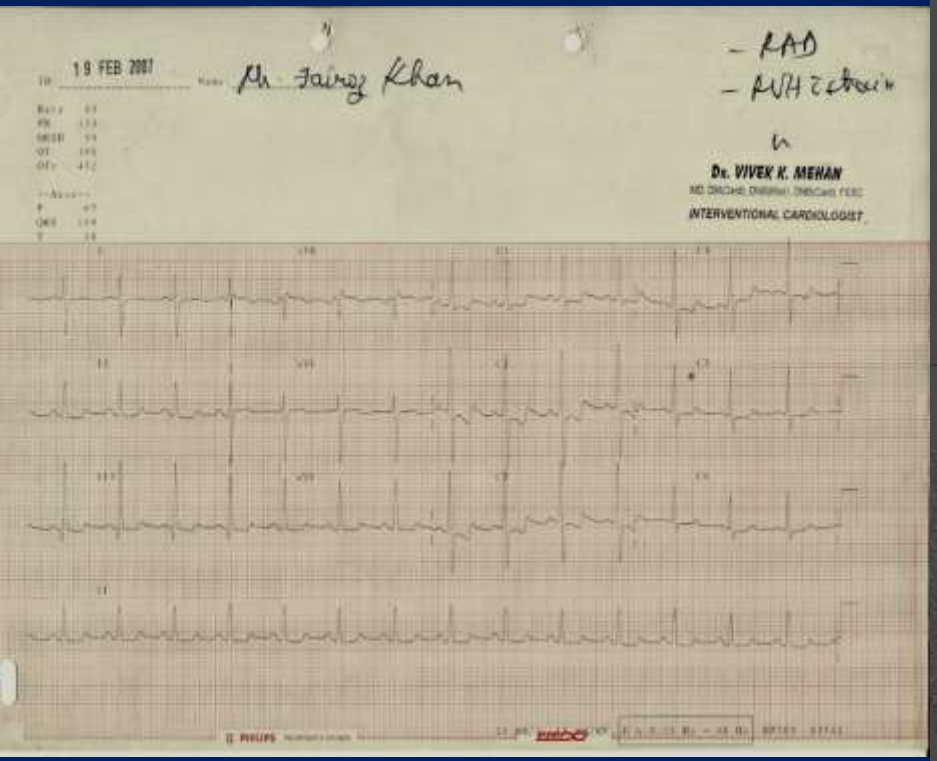

PHILIPS SAVITA 65Y/F 05/02/2013 01:11:00PM TIS0.6 MI 0.1
DR B DALVI GLENMARK CARDIAC CE S5-1/Adult
FR 18Hz
16cm
2D
59%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
Vel 480 cm/s
PG 92 mmHg
CW
60%
1.8MHz
WF 225Hz
M3 M4
+61.6
-61.6
cm/s
m/s
-1.0
-2.0
-3.0
-4.0
-5.0
75mm/s
***bpm

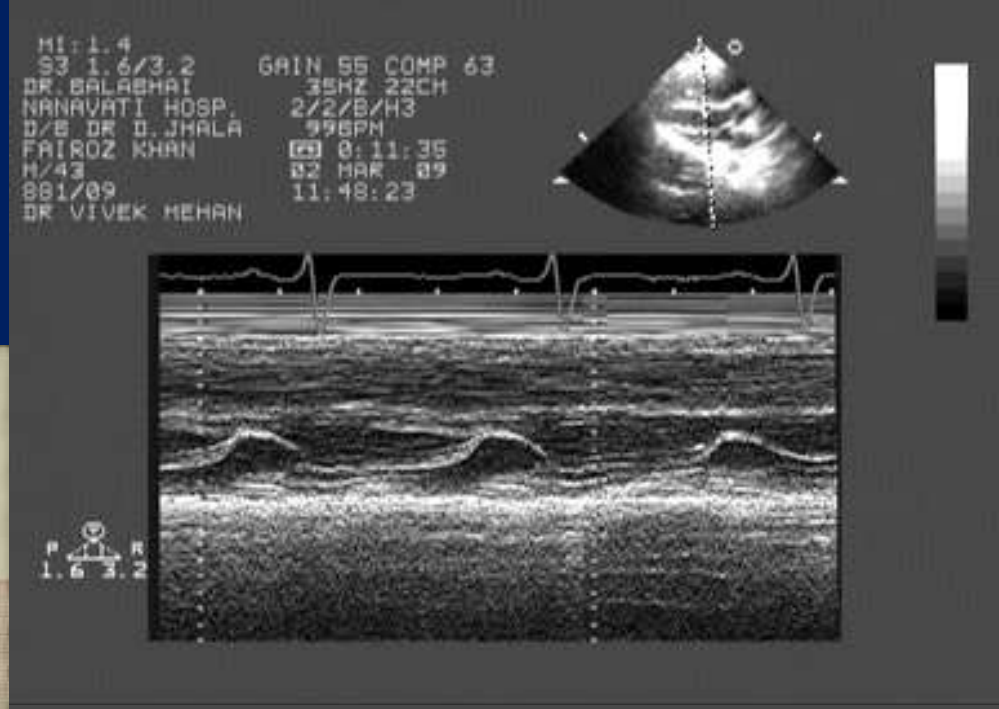
- Qp:Qs 1.7:1, PVRI 11.6 WU/m^2
- PHT is out of proportion to the size of the defect and magnitude of the shunt
- Pulmonary vasculopathy – ASD being an inosent bystander
- Better to leave the ASD alone
- Treatment with pulmonary vasodilators

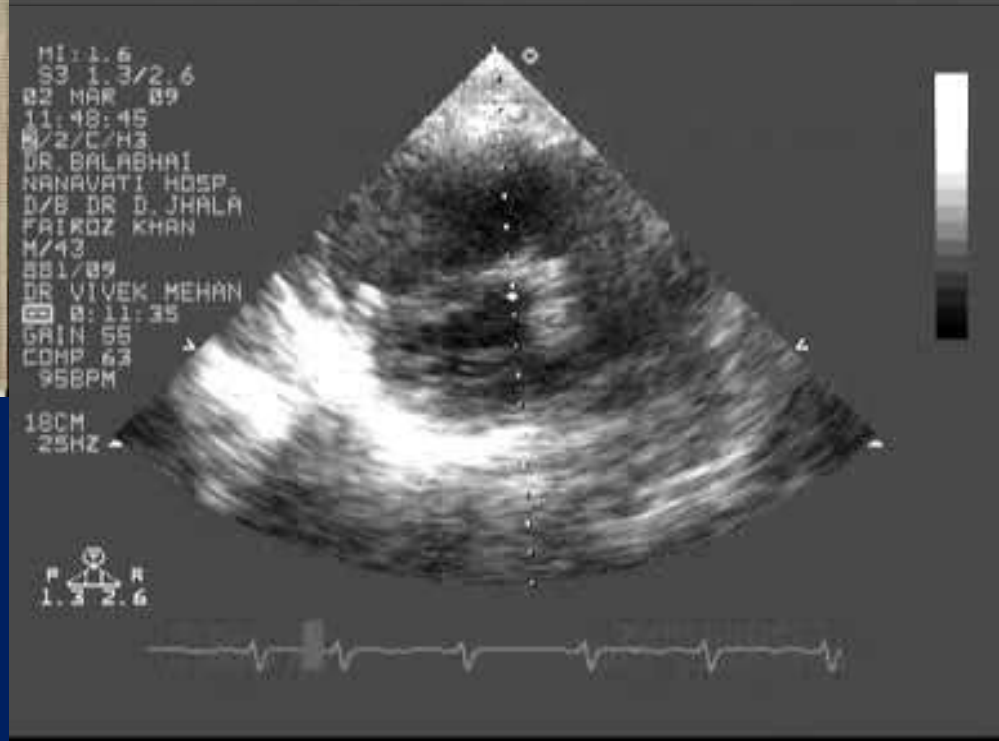
Case 3

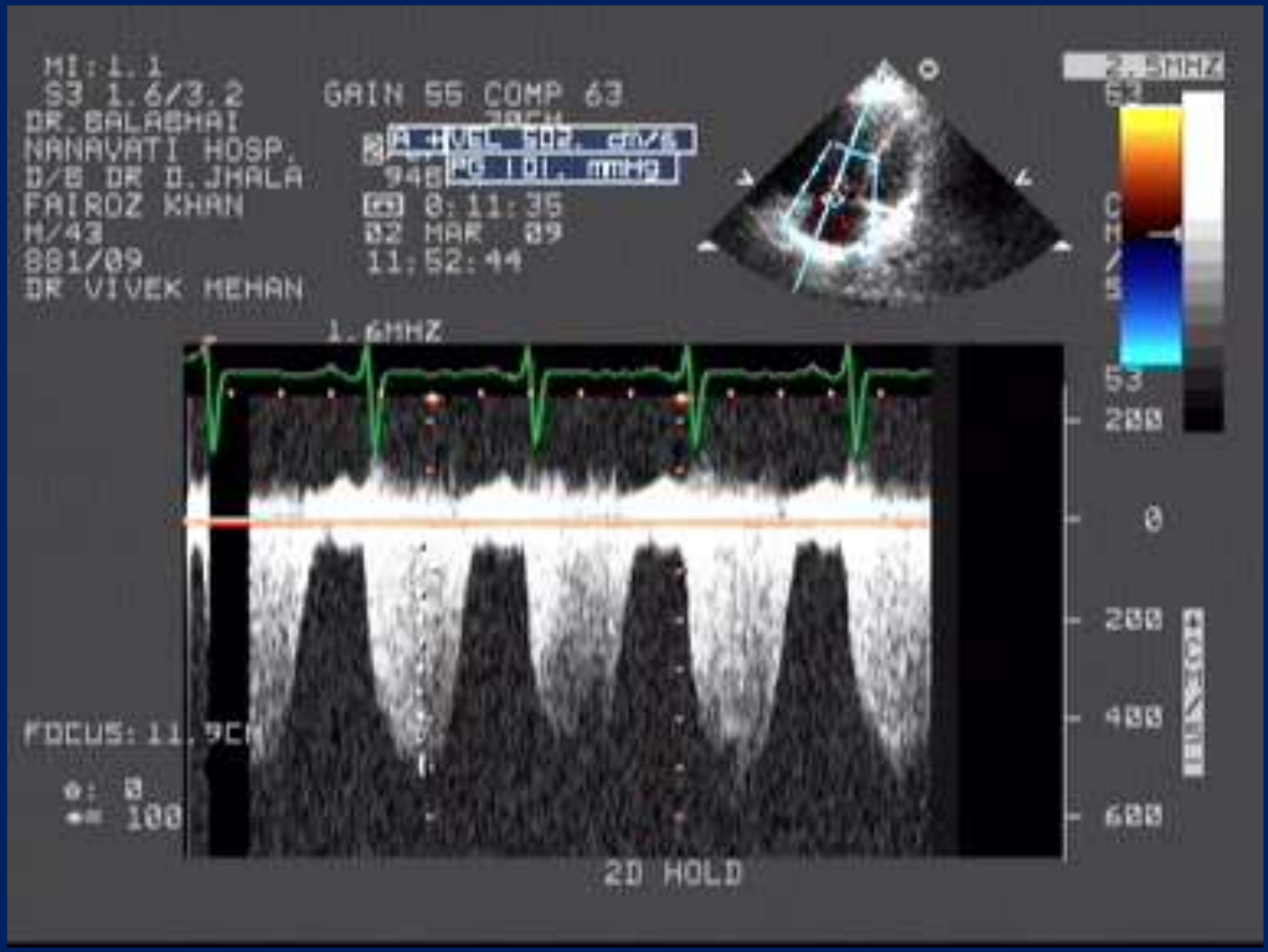
- 35 year old, SOB and palpitations
- Large heart
- Flow murmurs
- Normally splitting S2 with loud P2
- Mild cardiomegaly with plethoric lung fields
- Large secundum ASD – 28 mm with exclusive left to right shunt
- Severe PHT. PAP by TR jet is 110 mm Hg

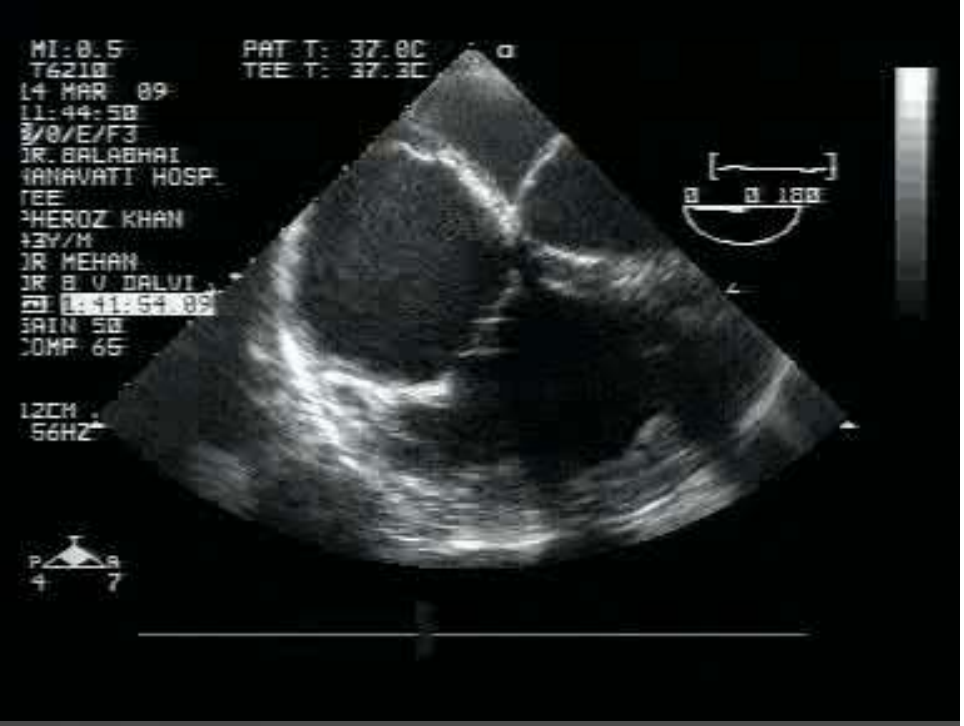

CHARITABLE
R3 25 JUN 05

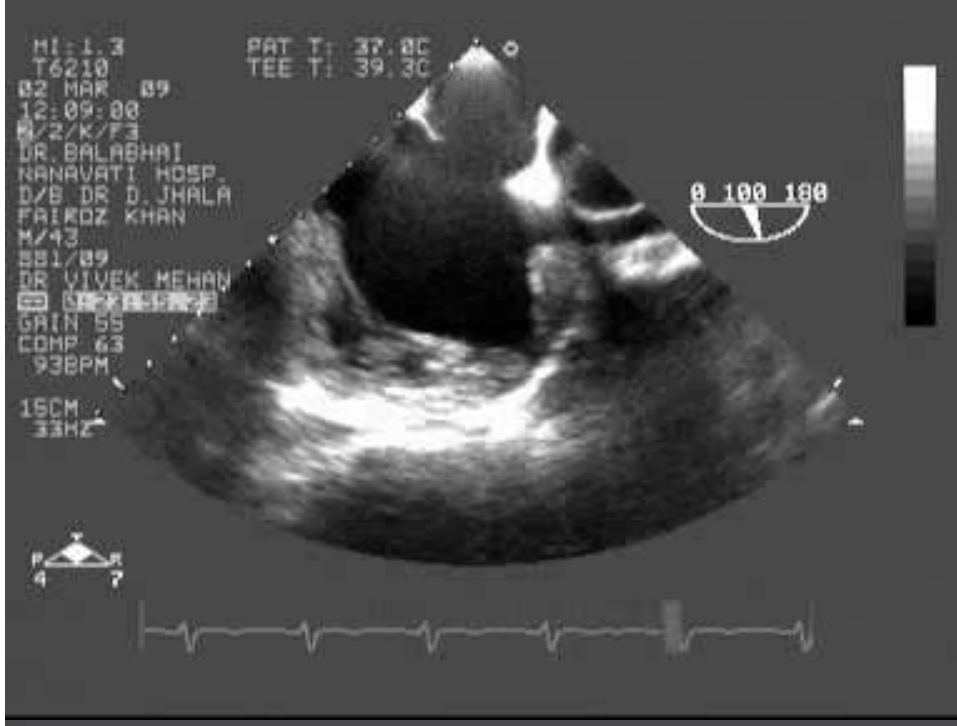

19 FEB 2007
Mr Fairoz Khan
- RAD
- AVH ? chronic
Dr. VIVEK K. MEHAN
INTERVENTIONAL CARDIOLOGIST

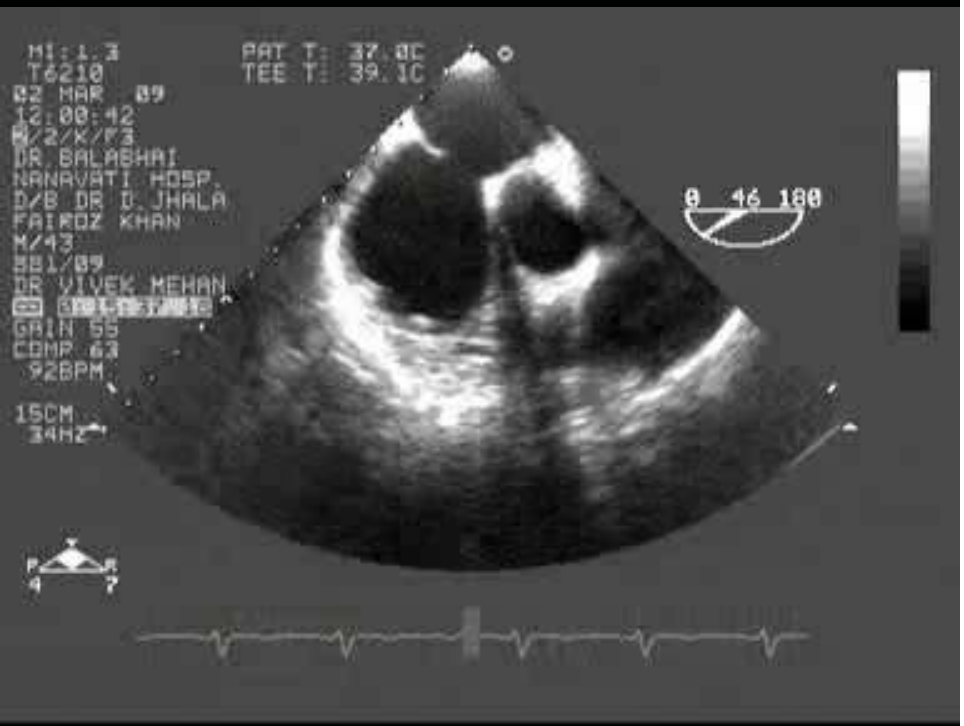

MI:1.4
S3 1.6/3.2
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55 COMP 63
3.5MZ 22CH
2/2/B/H3
996PM
0:11:35
02 MAR 09
11:48:23
P R
1.6 3.2

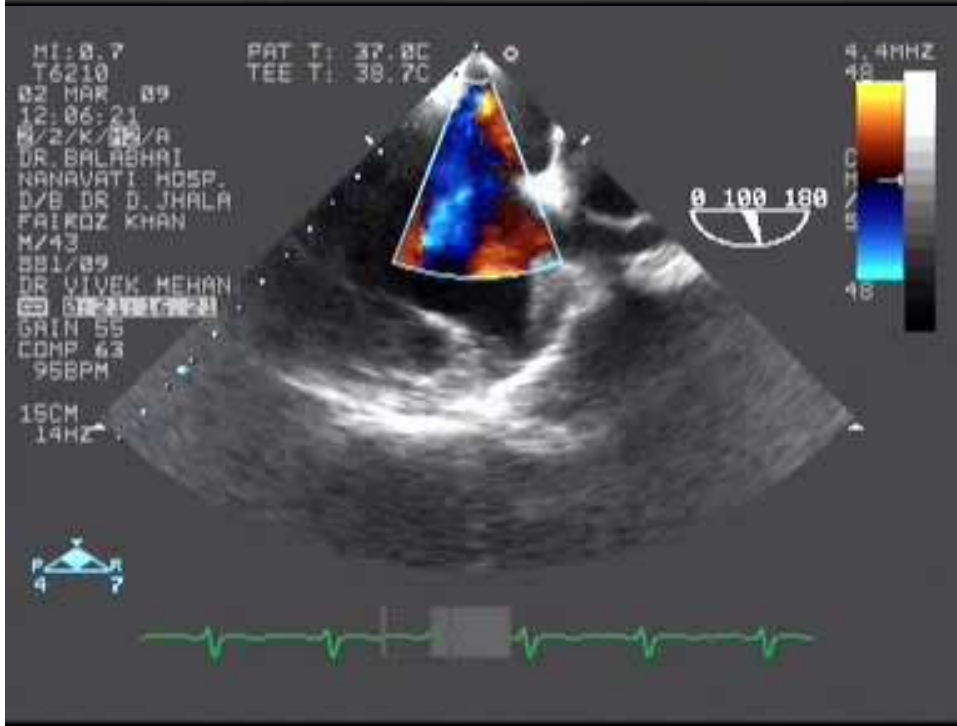

MI:1.6
S3 1.3/2.6
02 MAR 09
11:48:45
M/2/C/H3
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ KHAN
M/43
881/09
DR VIVEK MEHAN
0:11:35
GAIN 55
COMP 63
95BPM
18CM
25HZ
P R
1.3 2.6

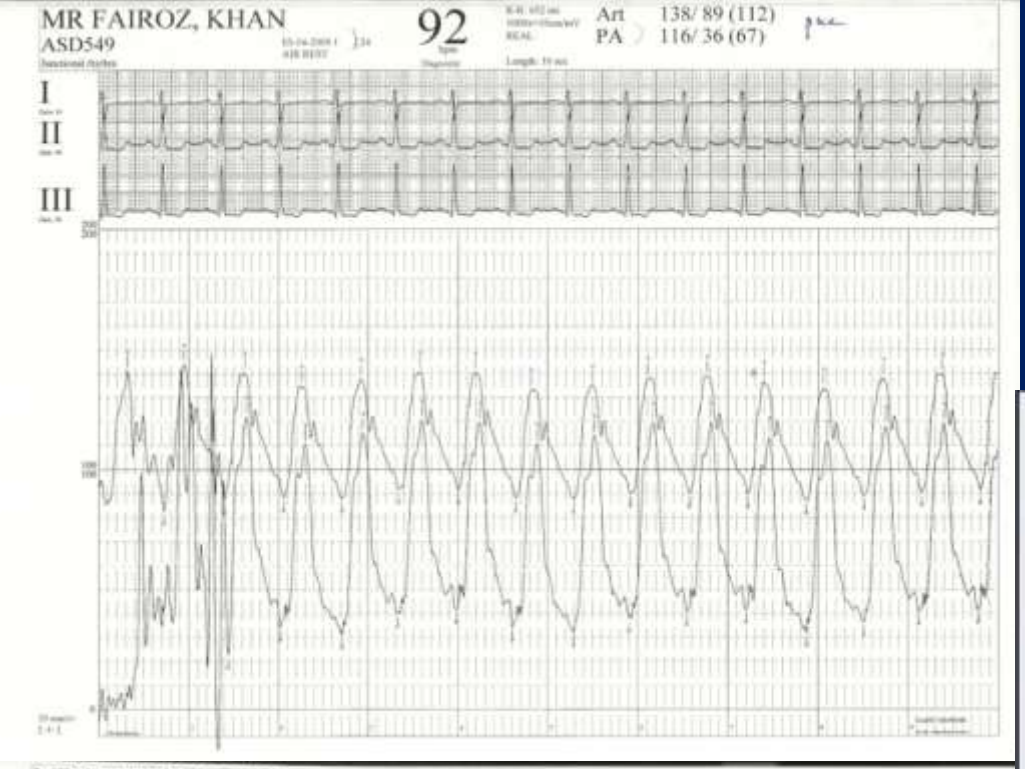

MI:1.1
S3 1.6/3.2
DR.BALABHAI
NANAVATI HOSP.
D/S DR D.JHALA
FAIROZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55 COMP 63
948
0:11:35
02 MAR 09
11:52:44
1.6MHZ
53
200
0
200
400
600
FOCUS: 11.9CM
100
2D HOLD

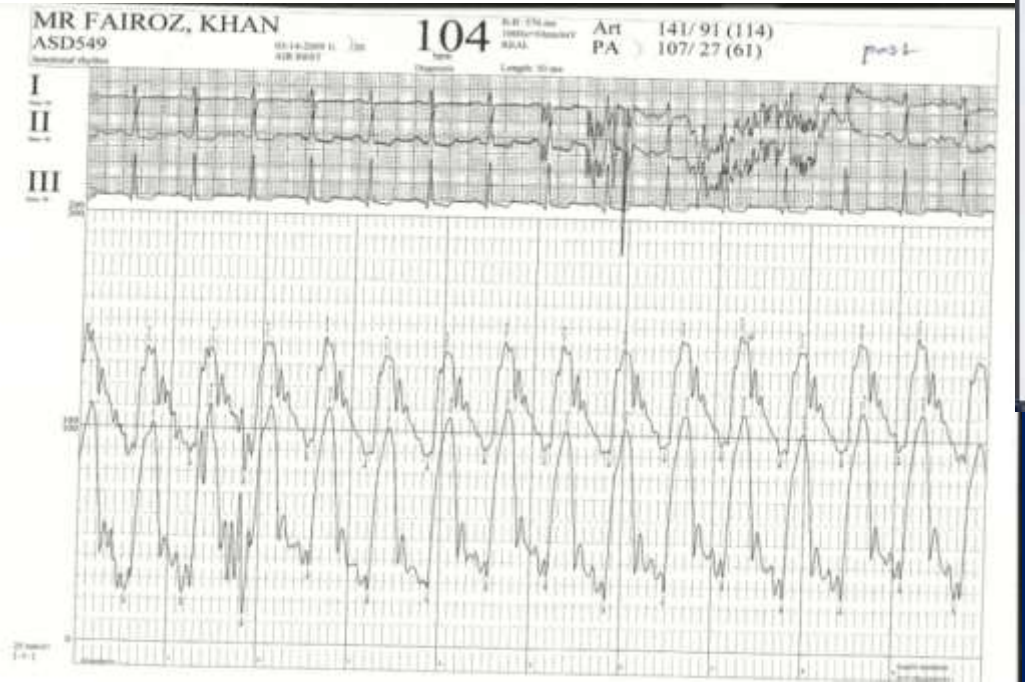

MI:0.5
T6210
14 MAR 09
11:44:58
0/0/E/F3
DR.BALABHAI
NANAVATI HOSP.
TEE
HEROZ KHAN
43Y/M
DR MEHAN
DR B V DALVI
11:41:54 09
GAIN 50
COMP 65
12CM
56HZ
PAT T: 37.0C
TEE T: 37.3C
0 0 180
P A
4 7


MI:1.3
T6210
02 MAR 09
12:09:00
M/2/K/F3
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIKOZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55
COMP 63
93BPM
15CM
33HZ
PAT T: 37.0C
TEE T: 39.3C
0 100 180
P A
4 7

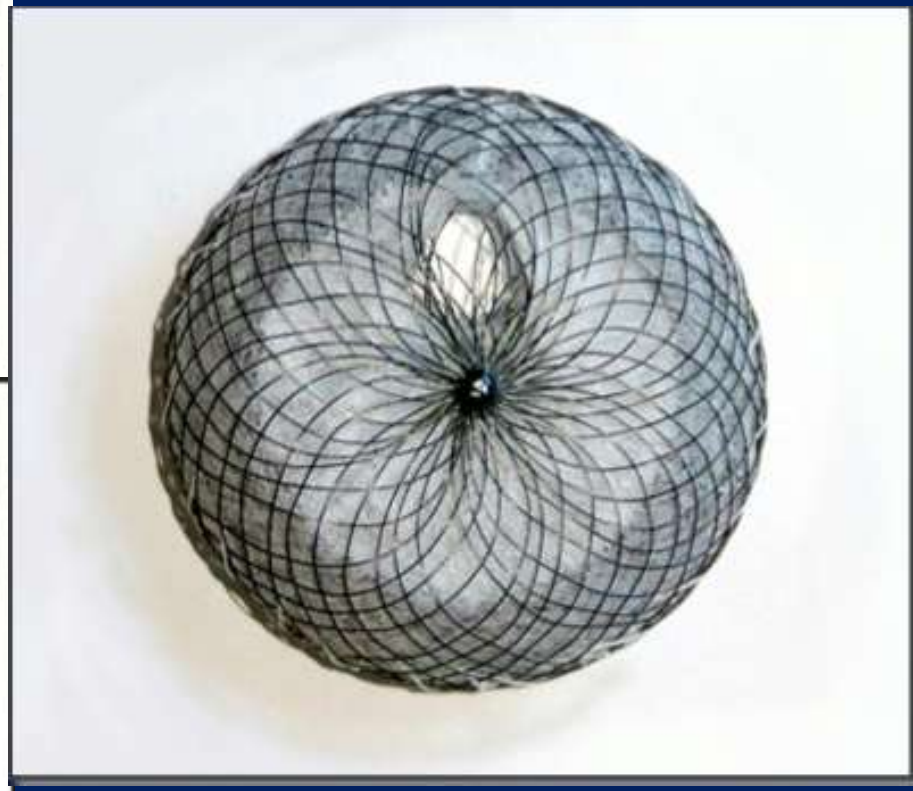

MI:1.3
T6210
02 MAR 09
12:00:42
M/2/K/F3
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIKOZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55
COMP 63
92BPM
15CM
34HZ
PAT T: 37.0C
TEE T: 39.1C
0 46 180
P A
4 7

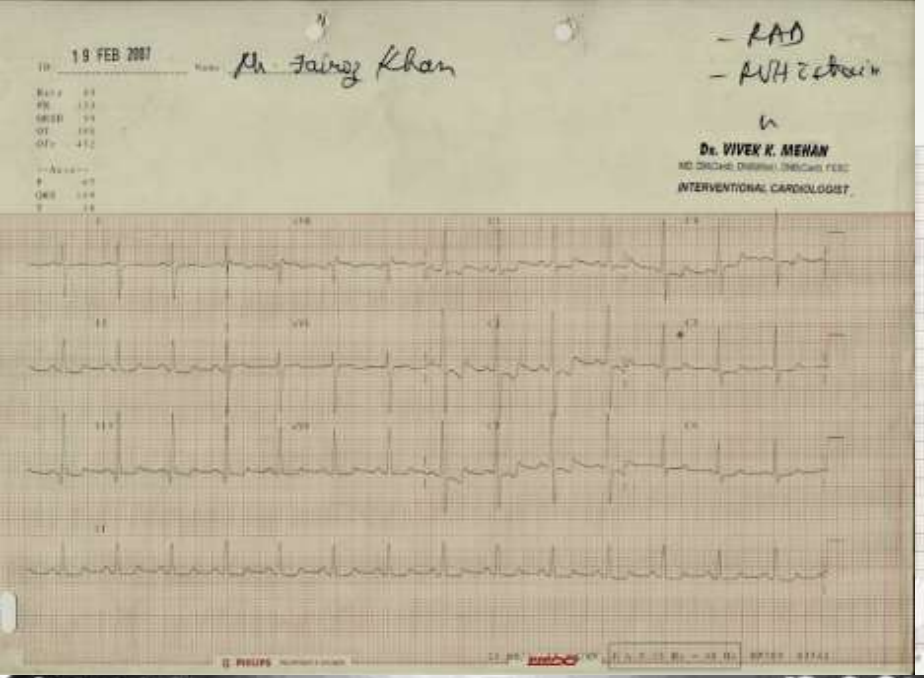

MI:0.7
T6210
02 MAR 09
12:06:21
M/2/K/F3/A
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIKOZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55
COMP 63
95BPM
15CM
14HZ
PAT T: 37.0C
TEE T: 38.7C
0 100 180
4.4MHZ
48
48
P A
4 7

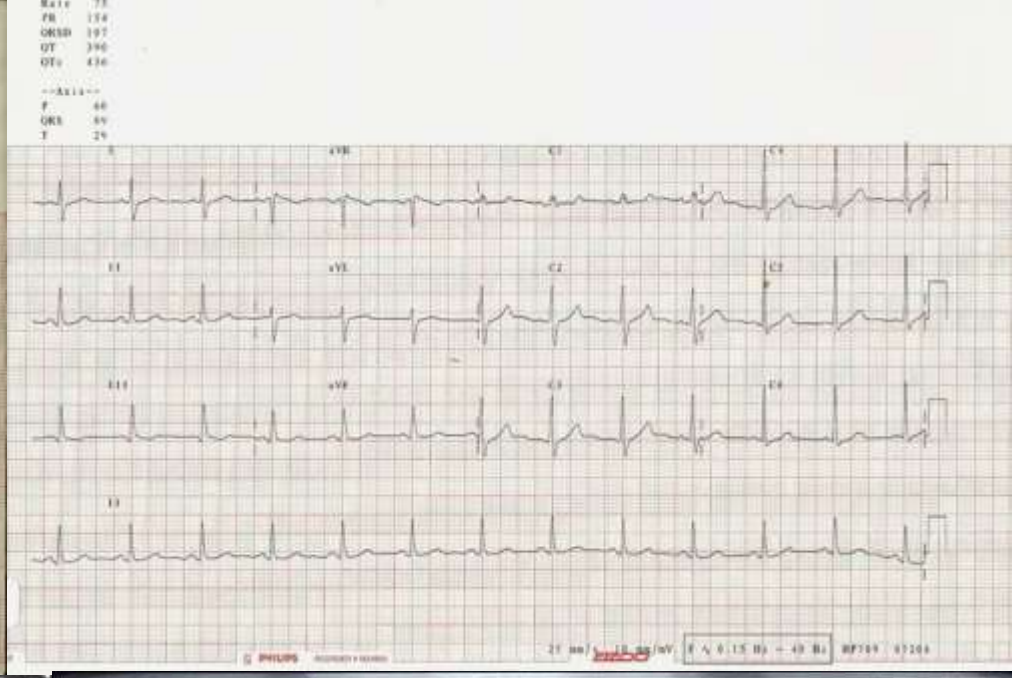


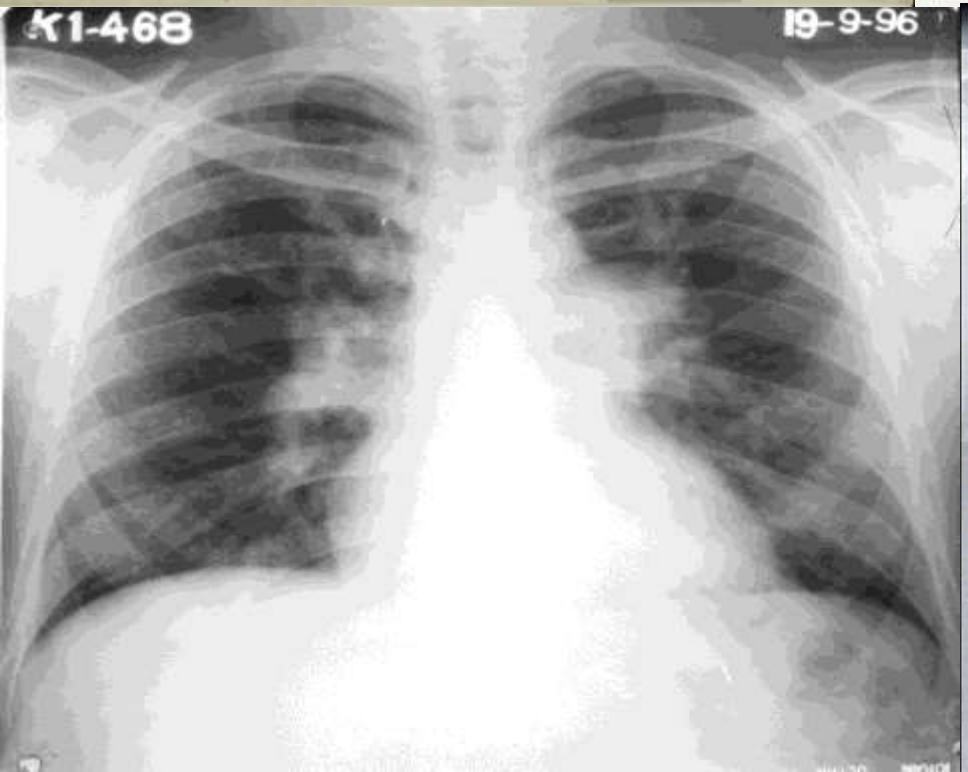


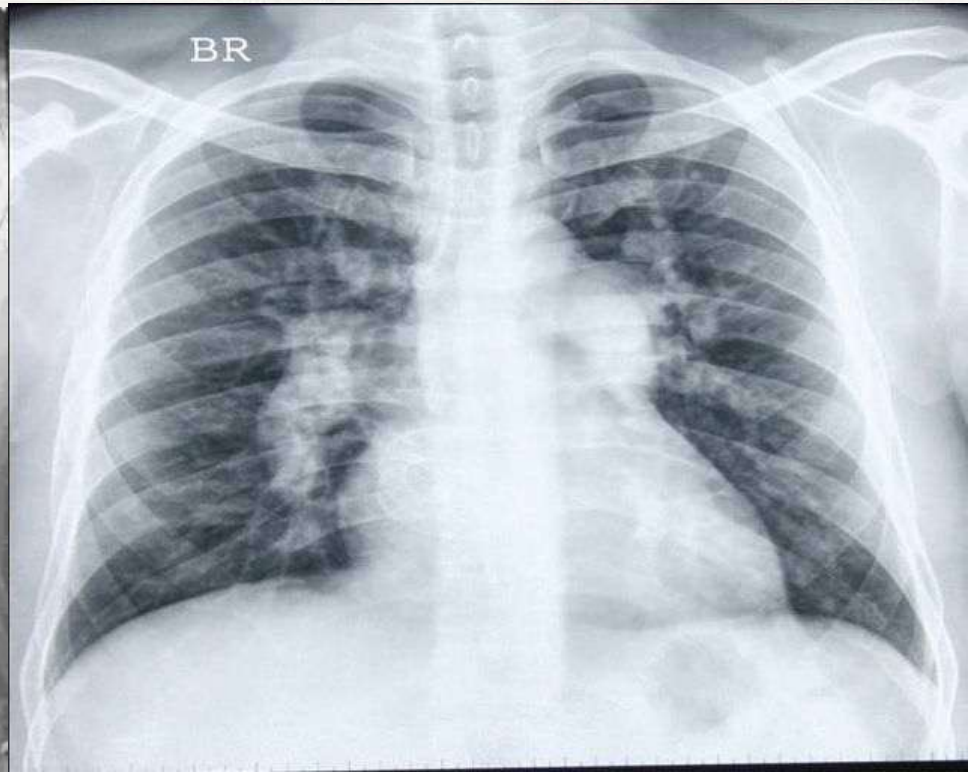
Qp:Qs = 3.2:1
PVRI 6.5 WU

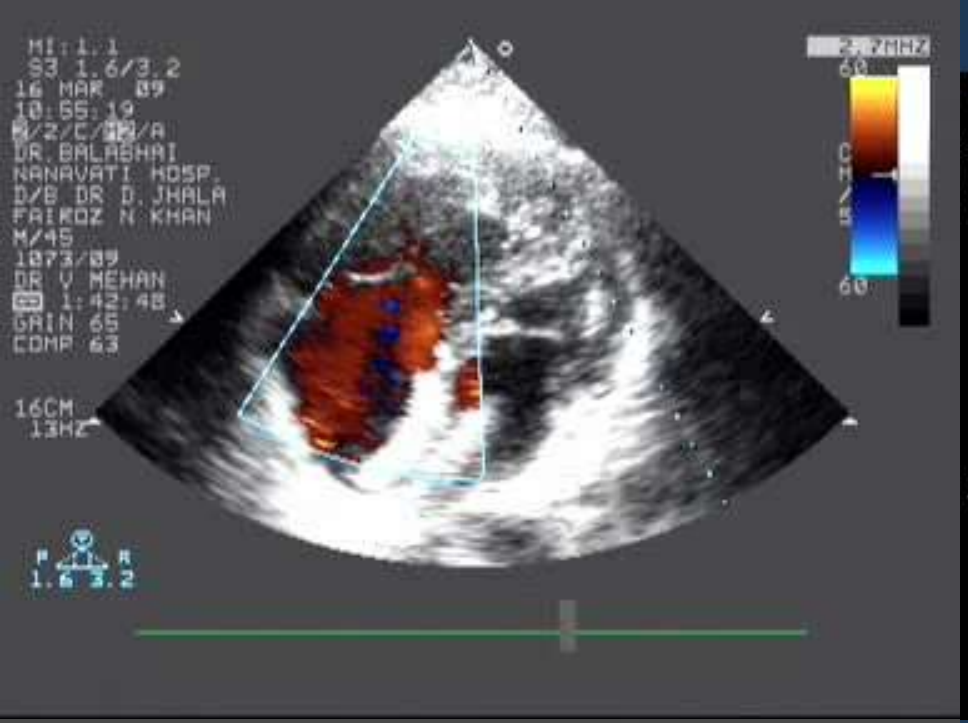



19 FEB 2007
Mr. Fairoz Khan
- RAD
- AVH
Dr. VIVEK K. MEHAN
INTERVENTIONAL CARDIOLOGIST

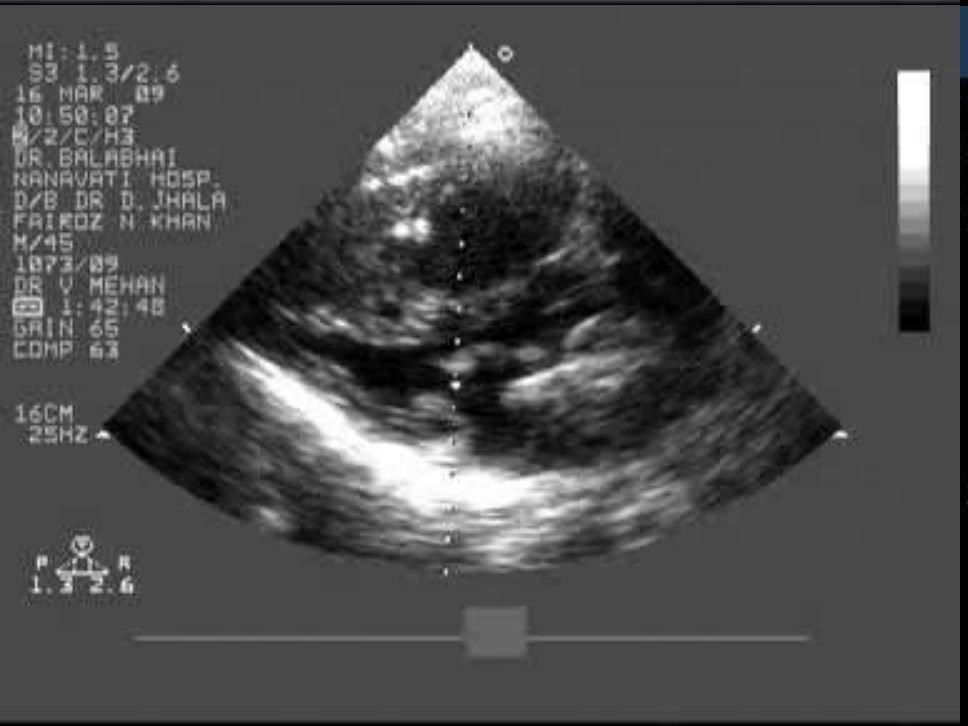



K1-468
19-9-96

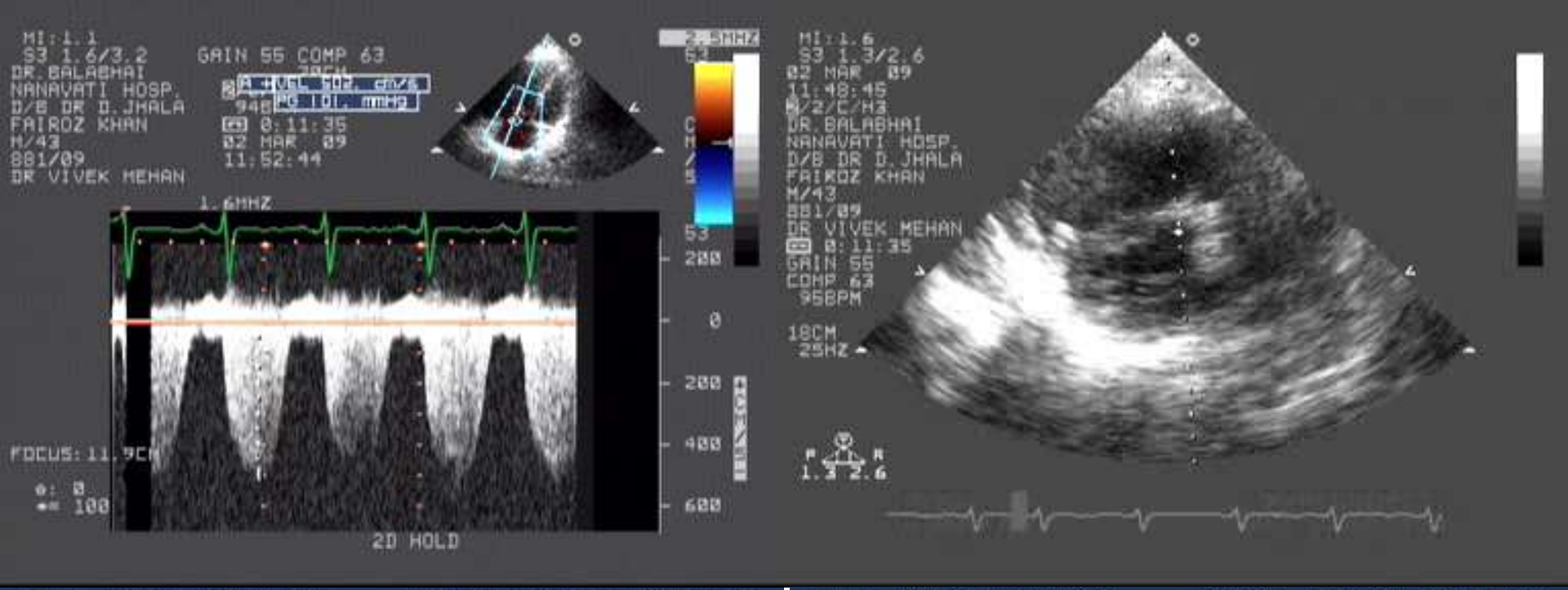

BR

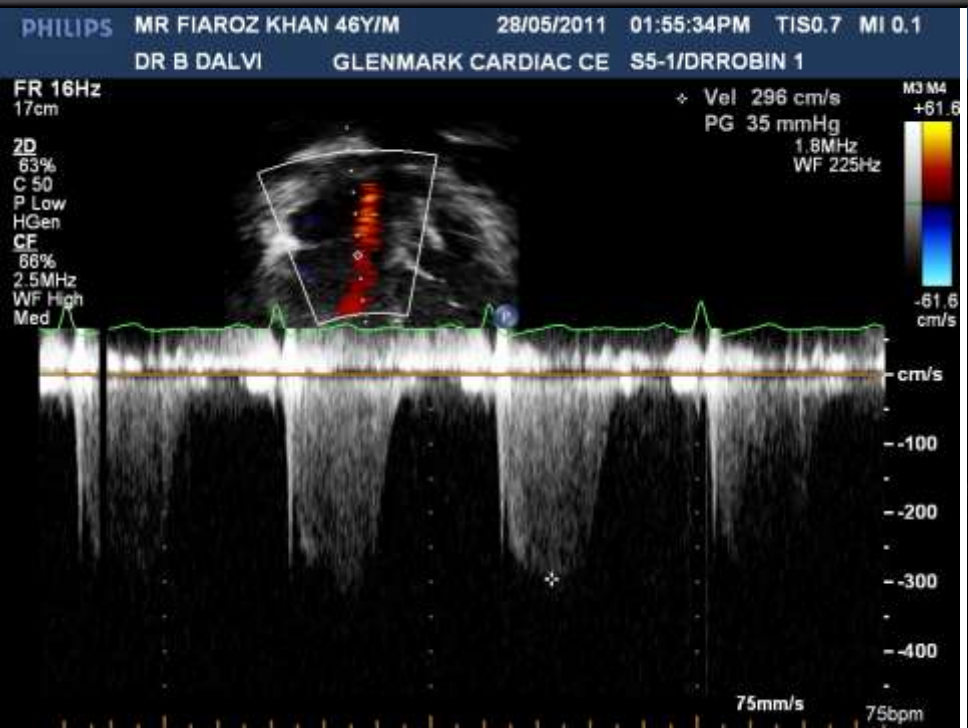

MI:1.1
S3 1.6/3.2
16 MAR 09
10:55:19
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ N KHAN
M/45
1073/09
DR V MEHAN
1:42:48
GAIN 65
COMP 63
16CM
13HZ
1.6 3.2


PHILIPS
MR FIAROZ KHAN 46Y/M
28/05/2011
01:52:18PM
TIS0.8 MI 1.4
DR B DALVI
S5-1/DRROBIN 1
FR 47Hz
17cm
2D
70%
C 50
P Low
HGen
M3
1.7 3.4
JPEG
75 bpm


MI:1.5
S3 1.3/2.6
16 MAR 09
10:50:07
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ N KHAN
M/45
1073/09
DR V MEHAN
1:42:48
GAIN 65
COMP 63
16CM
25HZ
1.3 2.6


PHILIPS
MR FIAROZ KHAN 46Y/M
28/05/2011
01:53:51PM
TIS0.8 MI 1.4
DR B DALVI
S5-1/DRROBIN 1
FR 50Hz
15cm
2D
63%
C 50
P Low
HGen
M3
1.7 3.4
JPEG
76 bpm


MI:1.1
S3 1.6/3.2
GAIN 55 COMP 63
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ KHAN
M/43
881/09
DR VIVEK MEHAN
11:52:44
1.6MHZ
FOCUS: 11.9CM
2D HOLD
MI:1.6
S3 1.3/2.6
02 MAR 09
11:48:45
DR.BALABHAI
NANAVATI HOSP.
D/B DR D.JHALA
FAIROZ KHAN
M/43
881/09
DR VIVEK MEHAN
GAIN 55
COMP 63
95BPM
18CM
2.5MHZ


PHILIPS
MR FIAROZ KHAN 46Y/M
28/05/2011
01:55:34PM
TIS0.7 MI 0.1
DR B DALVI
GLENMARK CARDIAC CE
S5-1/DRROBIN 1
FR 16Hz
17cm
2D
63%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med
Vel 296 cm/s
PG 35 mmHg
1.8MHz
WF 225Hz
M3 M4
+61.6
-61.6
cm/s
-100
-200
-300
-400
75mm/s
75bpm


PHILIPS
MR FIAROZ KHAN 46Y/M
28/05/2011
01:53:42PM
TIS0.8 MI 1.4
DR B DALVI
S5-1/DRROBIN 1
FR 50Hz
15cm
M3
2D
63%
C 50
P Low
HGen
JPEG
74 bpm

ASD in Elderly

- > 60 years of age
- HT, CAD
- Symptomatic by virtue of SOB and easy fatigability
- Mild to moderate PHT (50-60 mm Hg)
- Normal LV systolic function
- AV valve spectral Doppler and Tissue Doppler - LV restrictive physiology

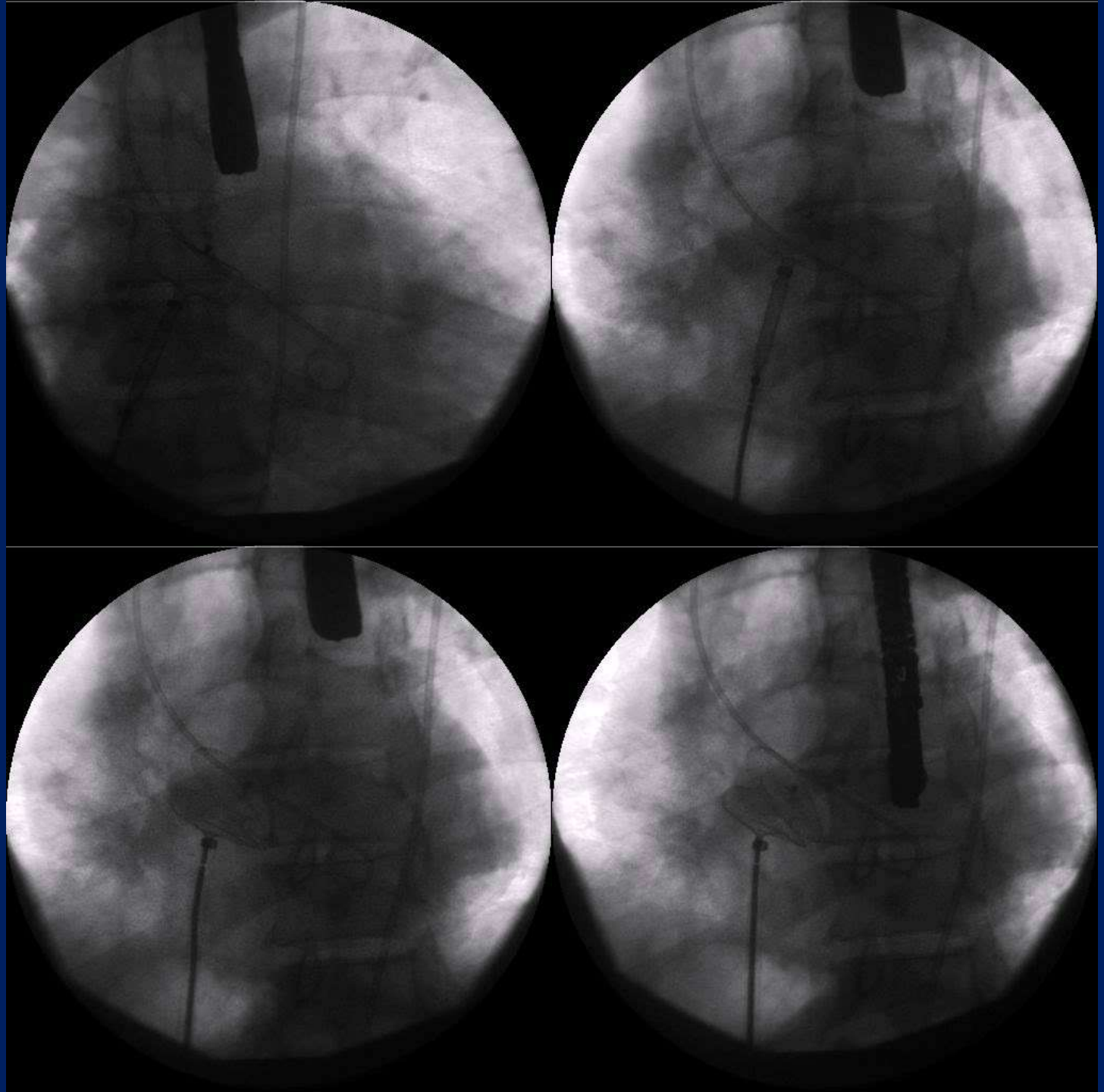
Currently used criteria

- > 5 mm Hg increase on balloon occlusion or > 25 mm Hg
- Diuretics
- Vasodilators
- Fenestrate the device

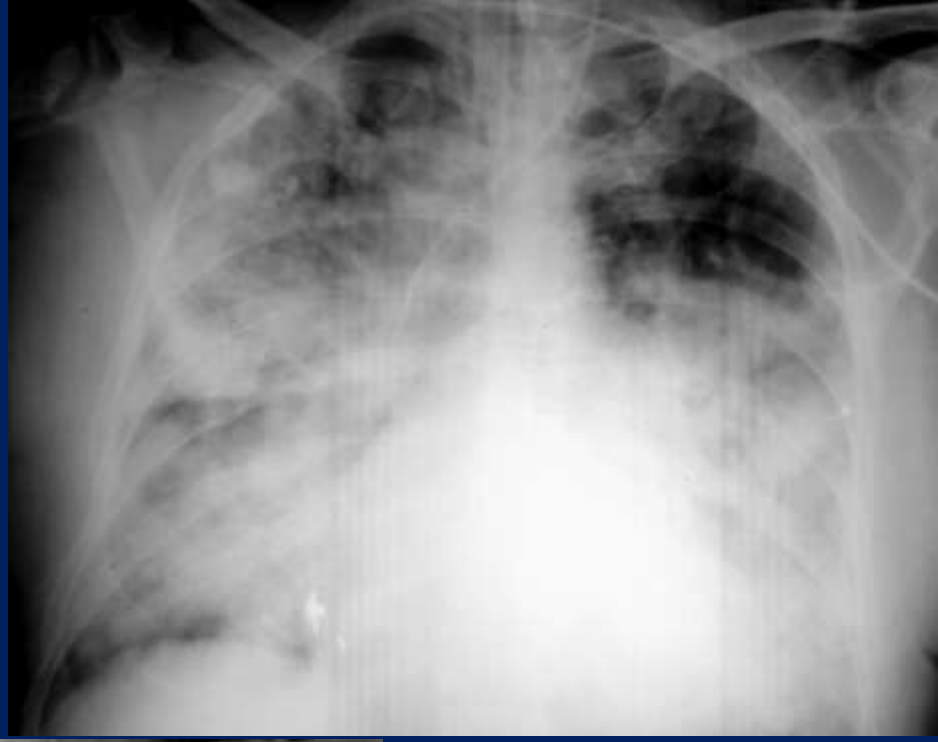
Case 1

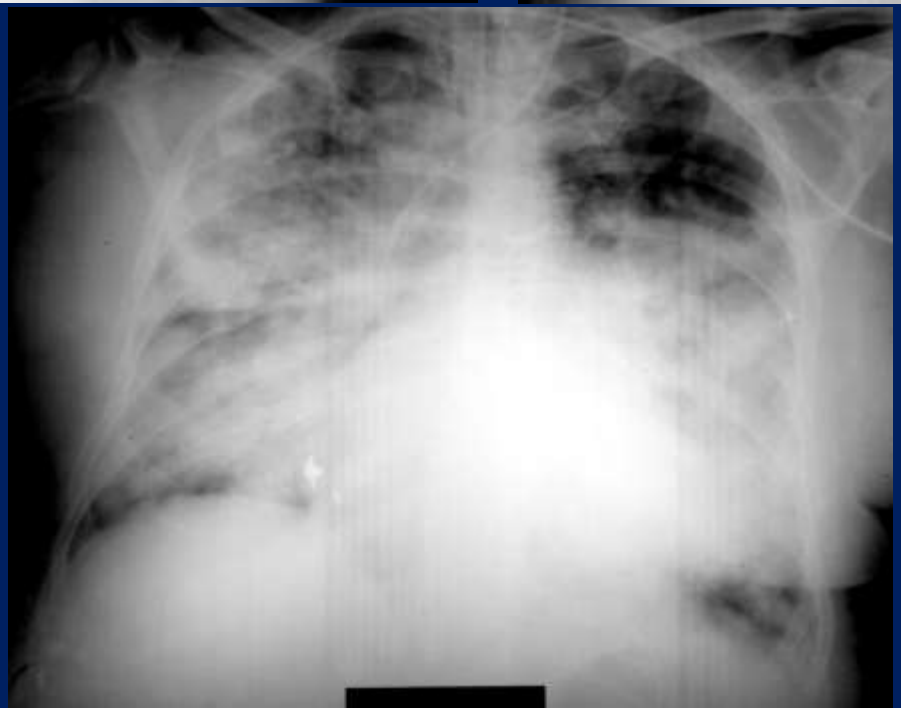
- 64 year old lady
- SOB and easy fatigability
- Non HT/Non DM
- H/O COPD on inhalers
- Coronary arteries normal on CAG
- Detected to have ASD accidentally – Evaluated for Sx for # neck femur

Courtesy: Biswajit Bandopadhyay




R 15/214





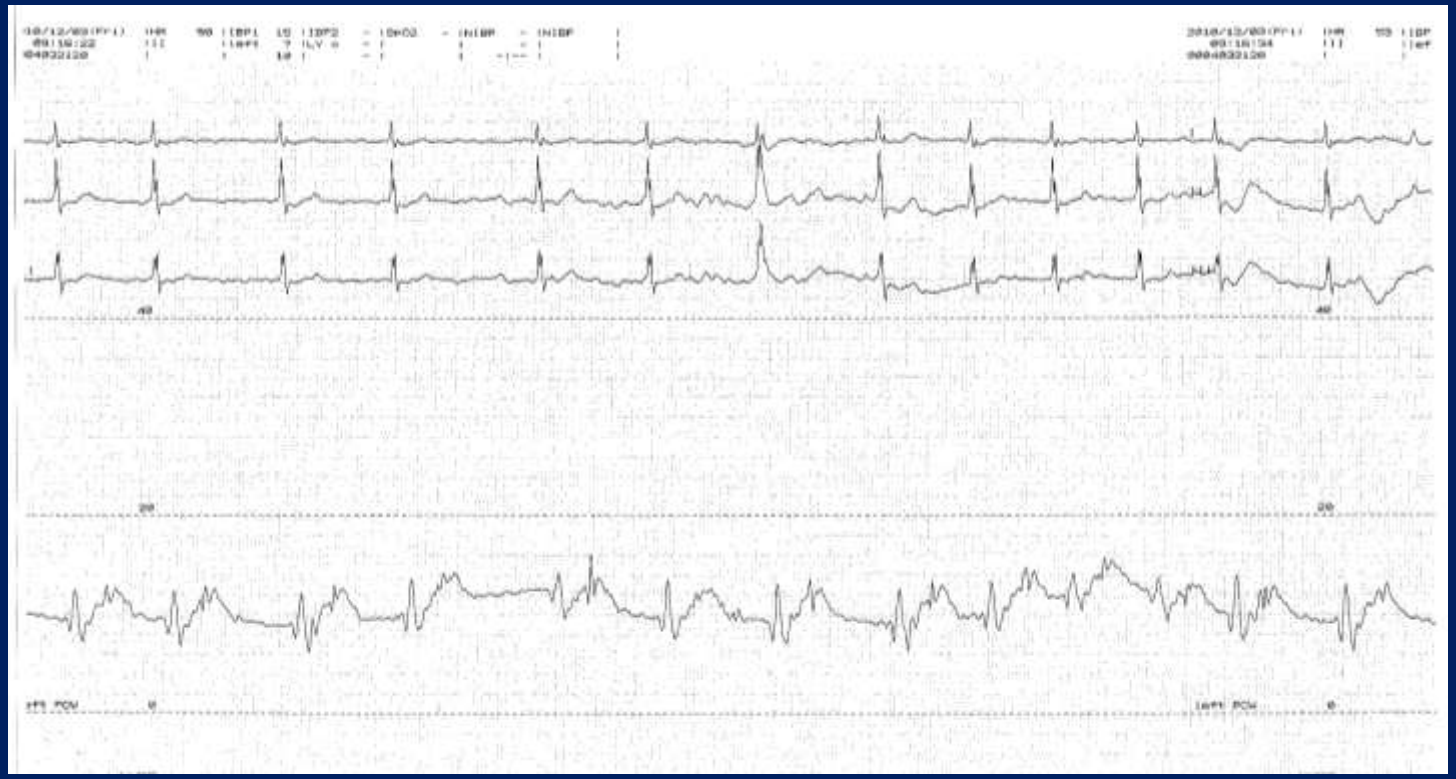
Case 2

- 75 year old male
- Hypertension, permanent Afib, CKD
- NYHA class III HF despite medication
- ASD diameter: 24mm
- Qp/Qs: 3.18
- PA pressure: 57/19/32 mmHg
- BNP 351 pg/ml

Courtsey: Teji Akagi

Change in PCWP

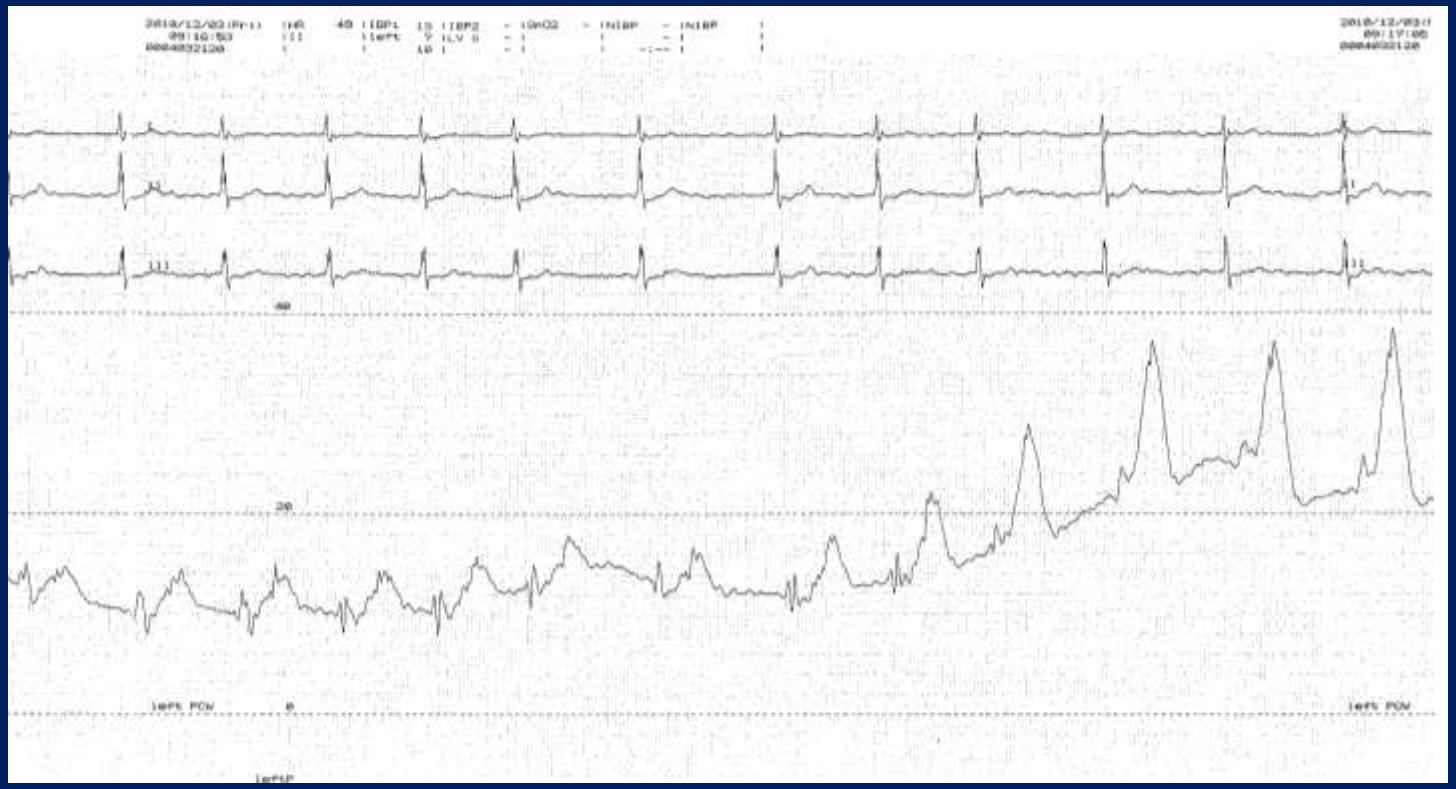
by test balloon occlusion



at rest

Change in PCWP

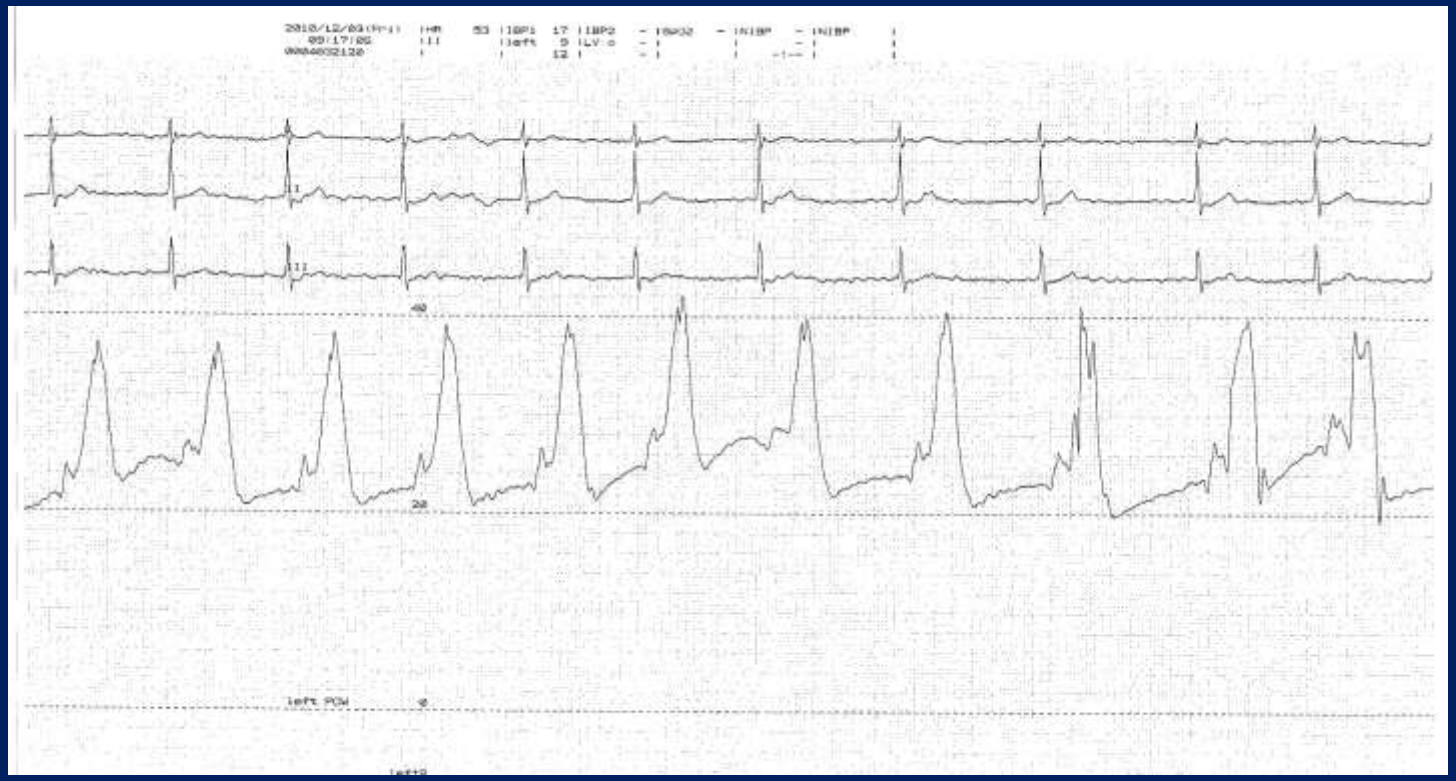
by test balloon occlusion



Balloon occlusion

Change in PCWP

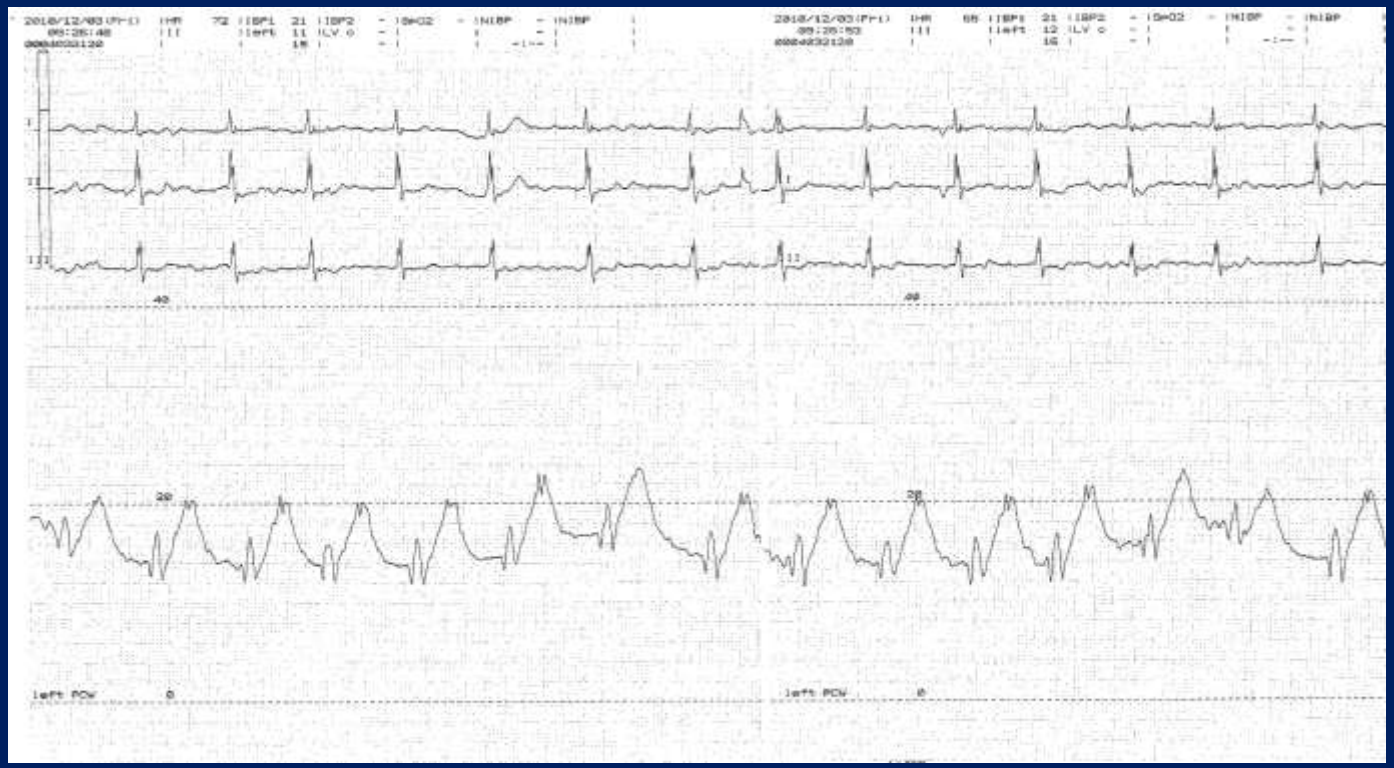
by test balloon occlusion



Completely closed of ASD

Change in PCWP

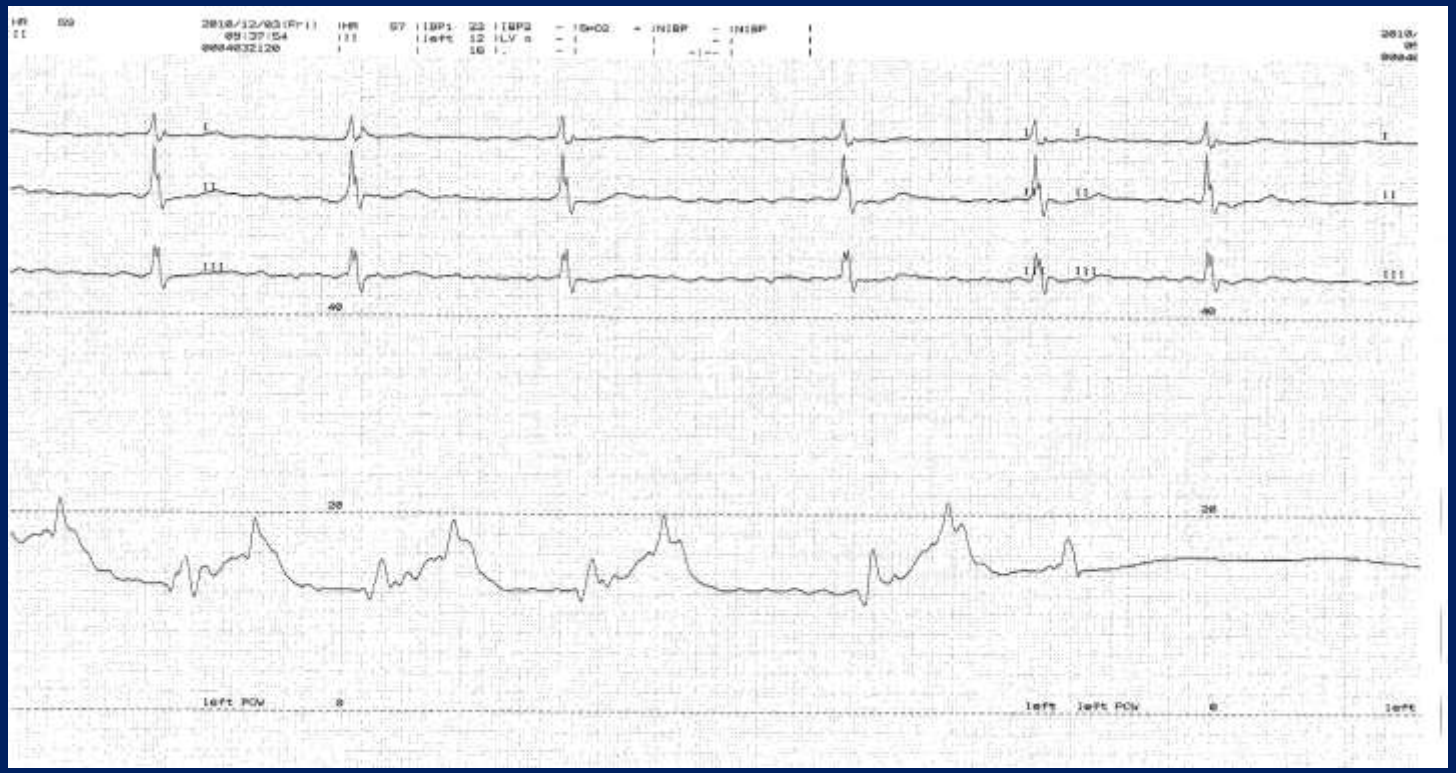
by test balloon occlusion



After the device deployment

Change in PCWP

by test balloon occlusion

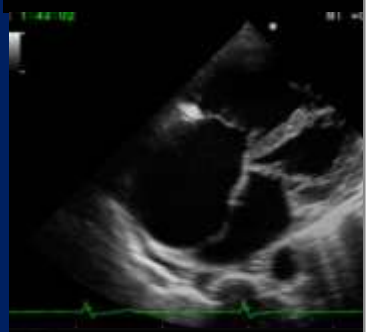


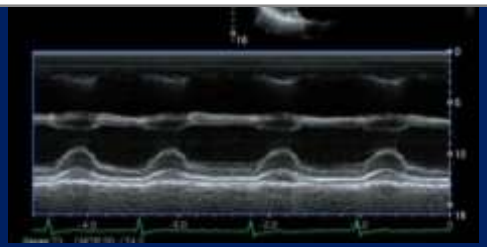
After the releasing of device

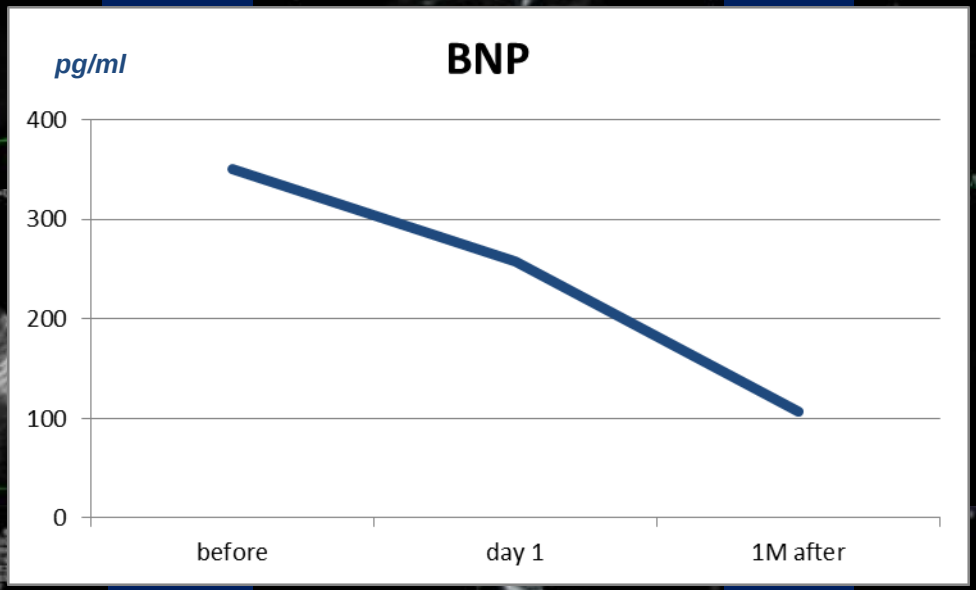
before

day 1

1M after







Conclusion

- All ASDs irrespective of symptoms IF hemodynamically significant – Complete closure .
- Hemodynamically insignificant ASDs : No closure
- ASD with irreversible PVD: No closure
- ASD with severe PHT but reversible PVR or LV restrictive physiology – Partial closure
- Always an element of UNCERTAINTY