Interesting VSD Cases

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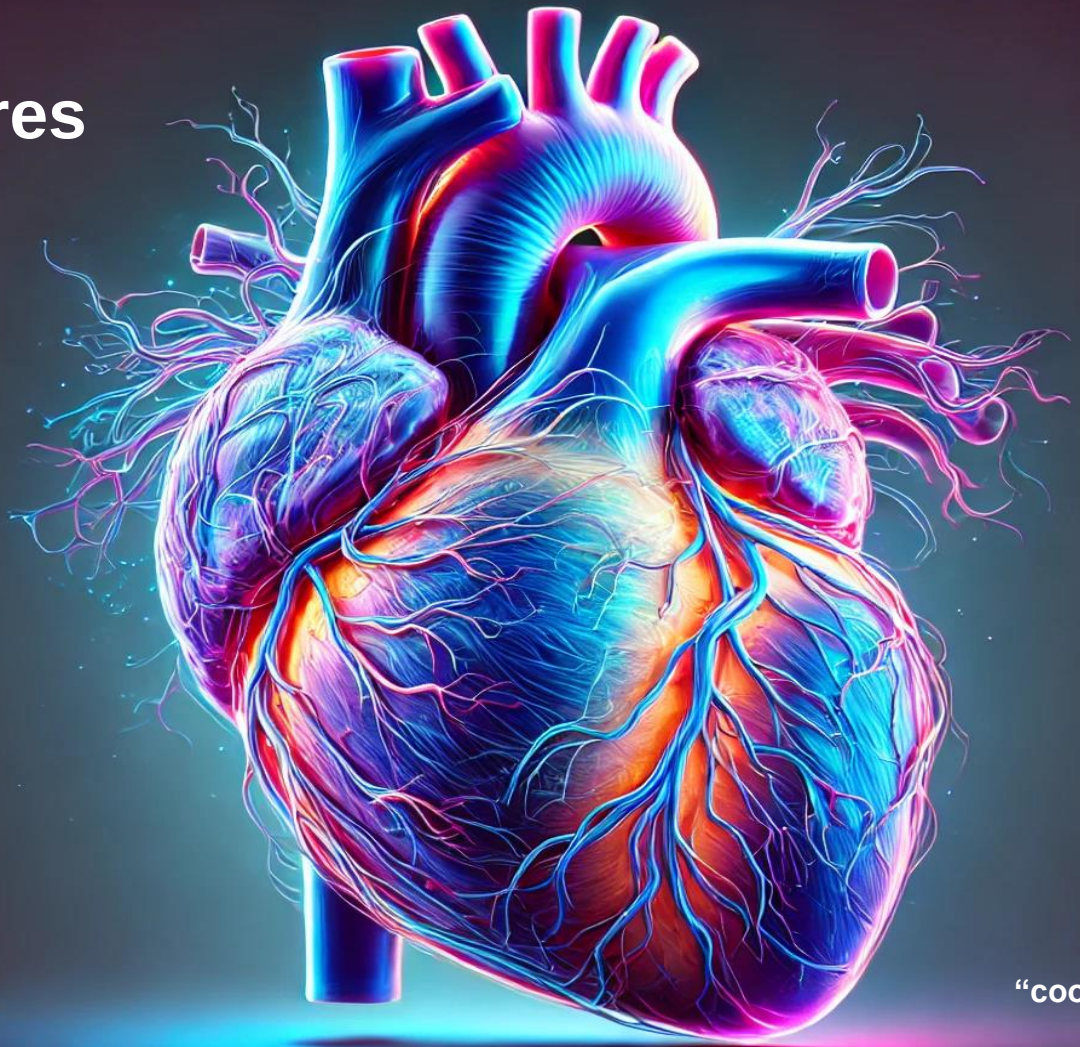
Children's Hospital Colorado
Here, it's different.™

No Disclosures



“cool anatomic heart”

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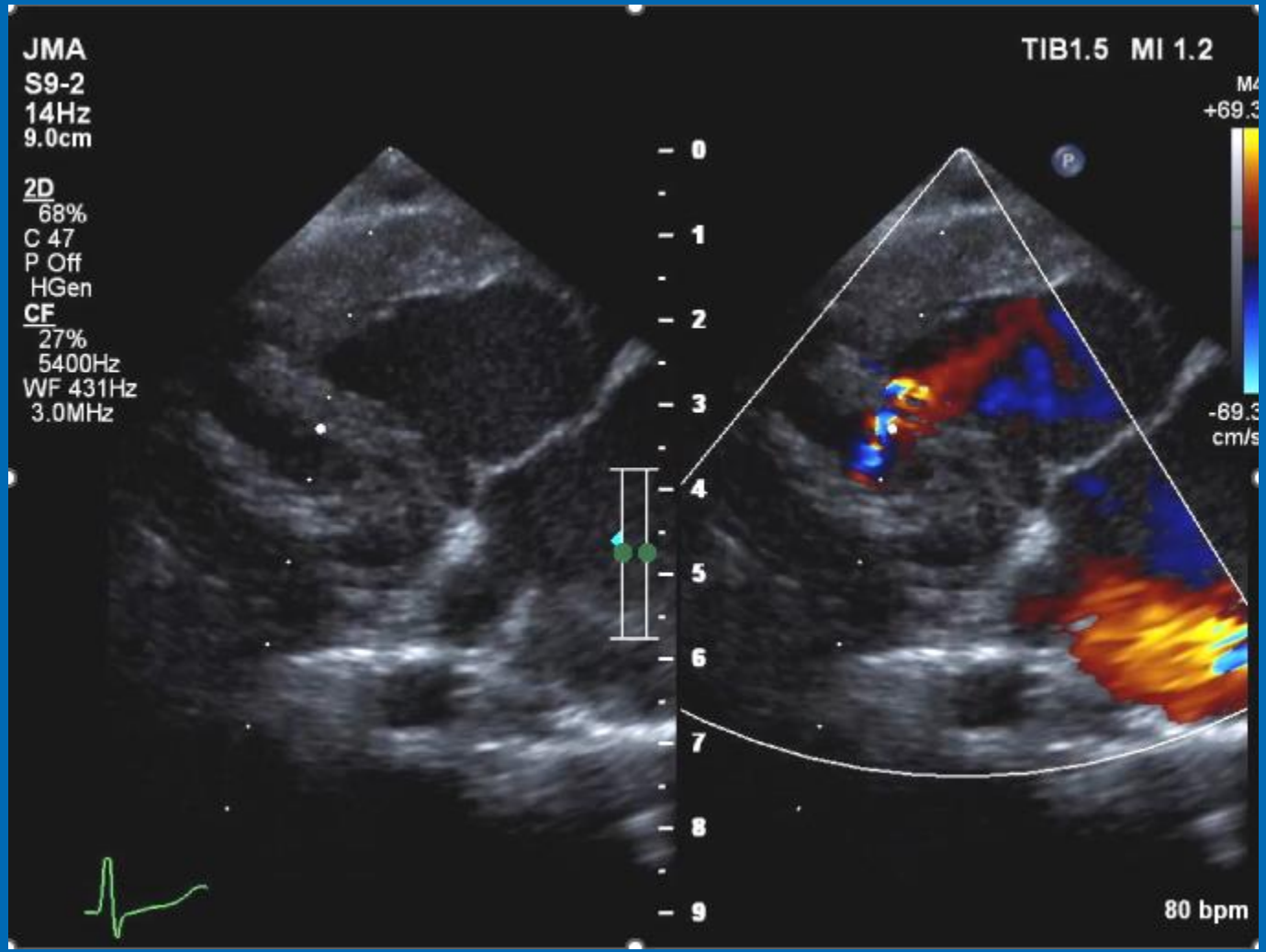
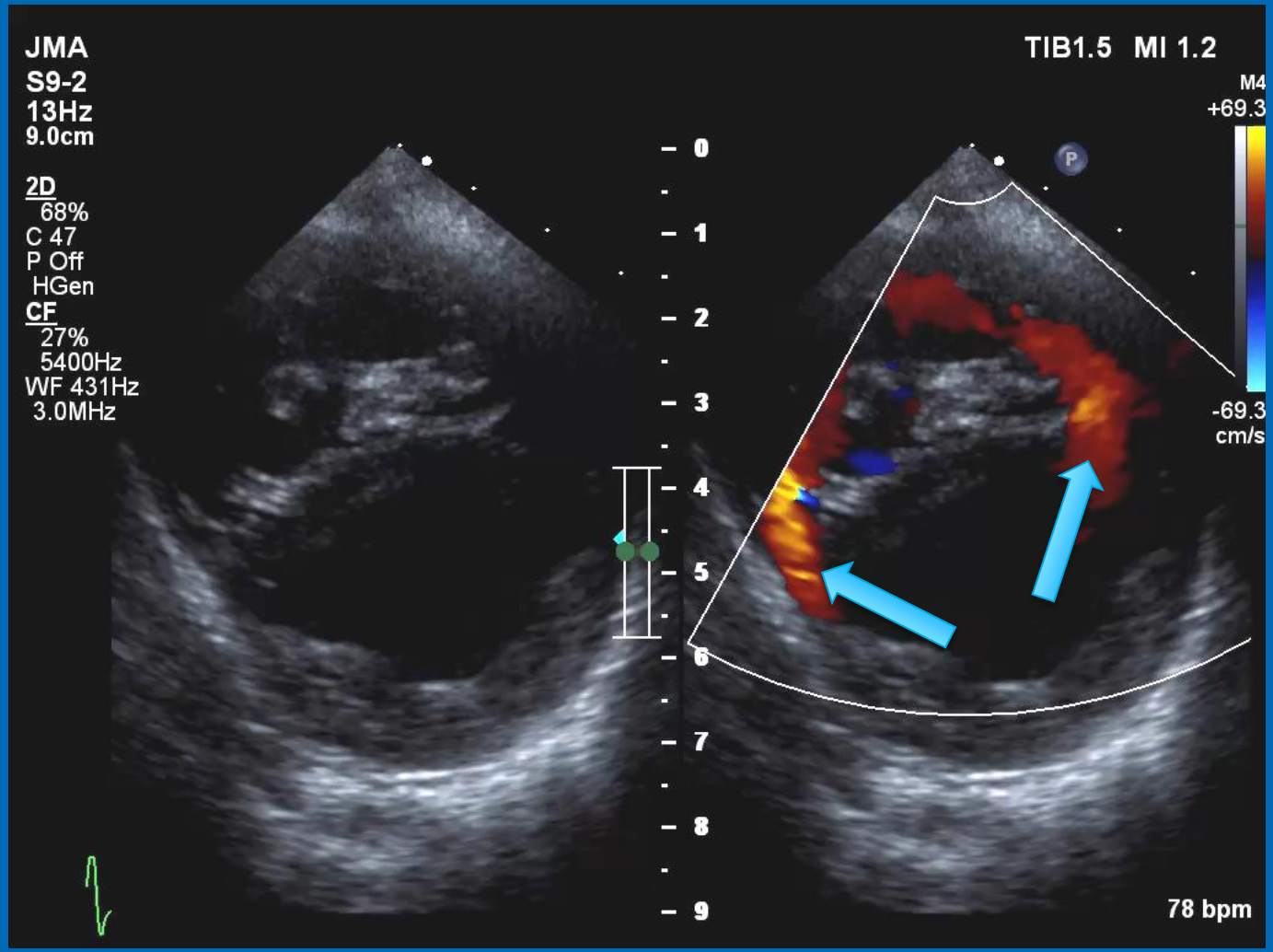
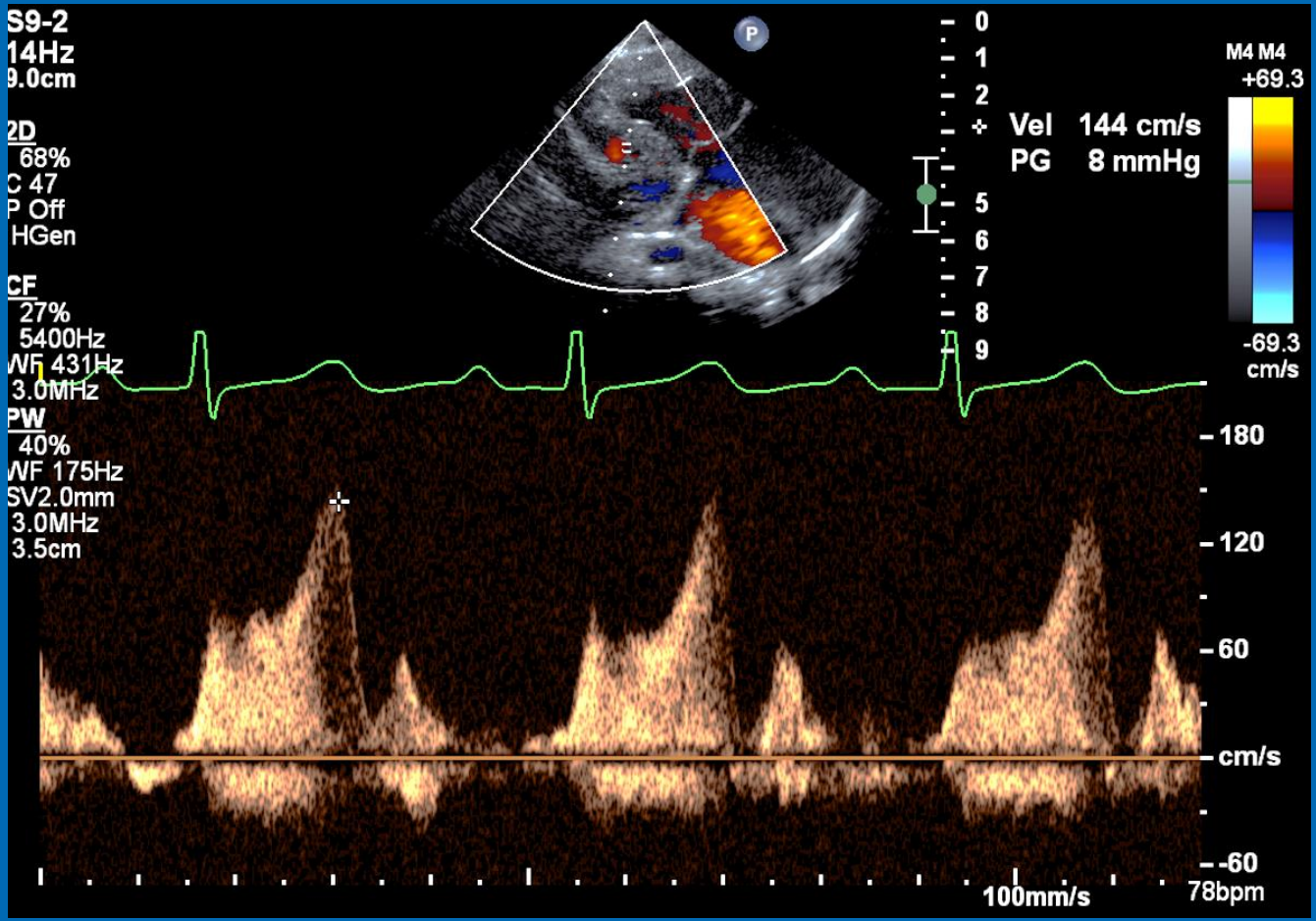
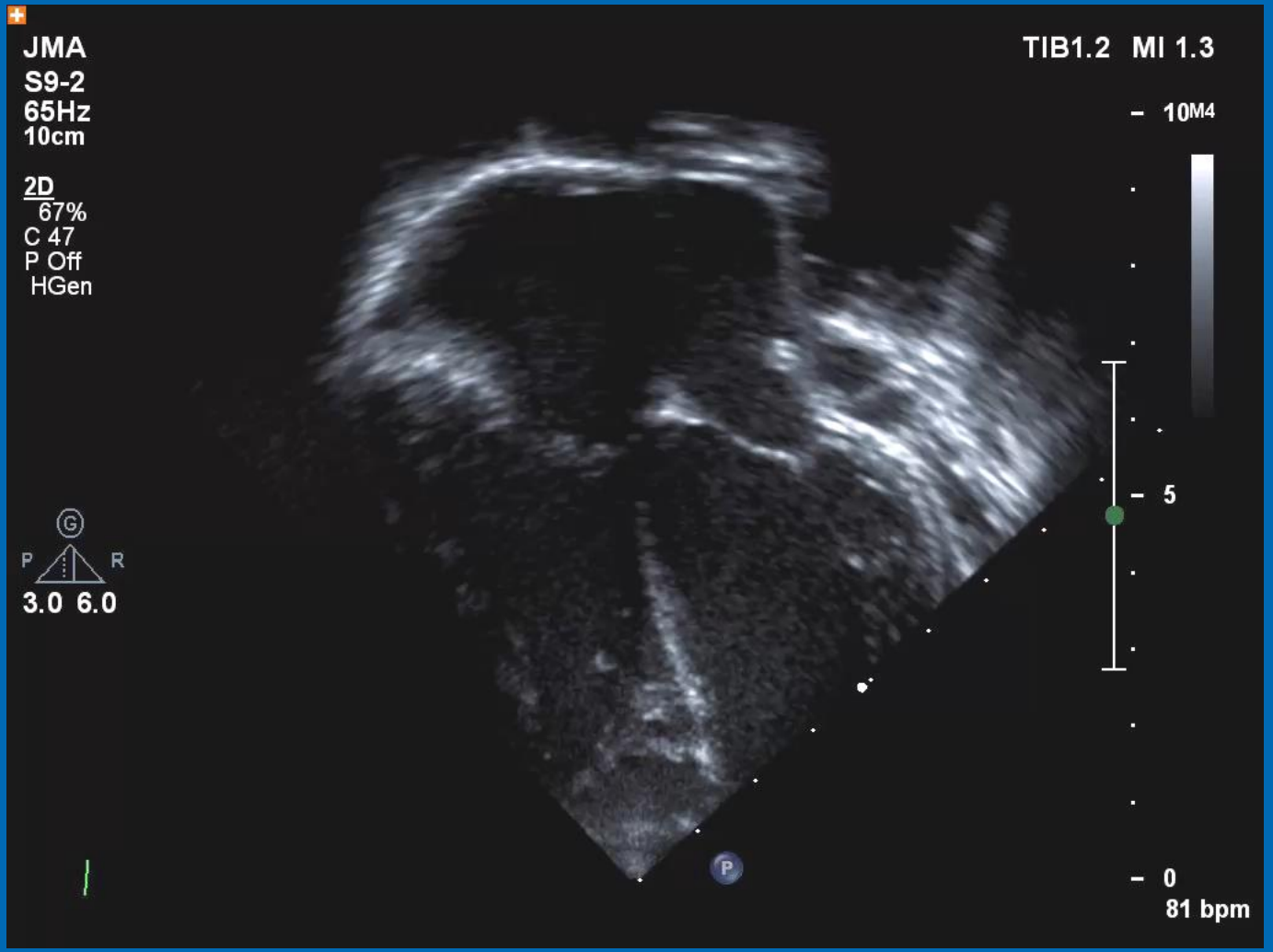
Case #1

- 21 month old male
- Presents for general surgical pre-op clearance
- Sedated echocardiogram performed
- TDS study due to hernia causing cardiac displacement


JMA
S9-2
14Hz
9.0cm
2D
68%
C 47
P Off
HGen
CF
27%
5400Hz
WF 431Hz
3.0MHz
TIB1.5 MI 1.2
+69.3
-69.3
cm/s
0
1
2
3
4
5
6
7
8
9
80 bpm


JMA
S9-2
13Hz
9.0cm
2D
68%
C 47
P Off
HGen
CF
27%
5400Hz
WF 431Hz
3.0MHz
TIB1.5 MI 1.2
M4
+69.3
-69.3
cm/s
78 bpm

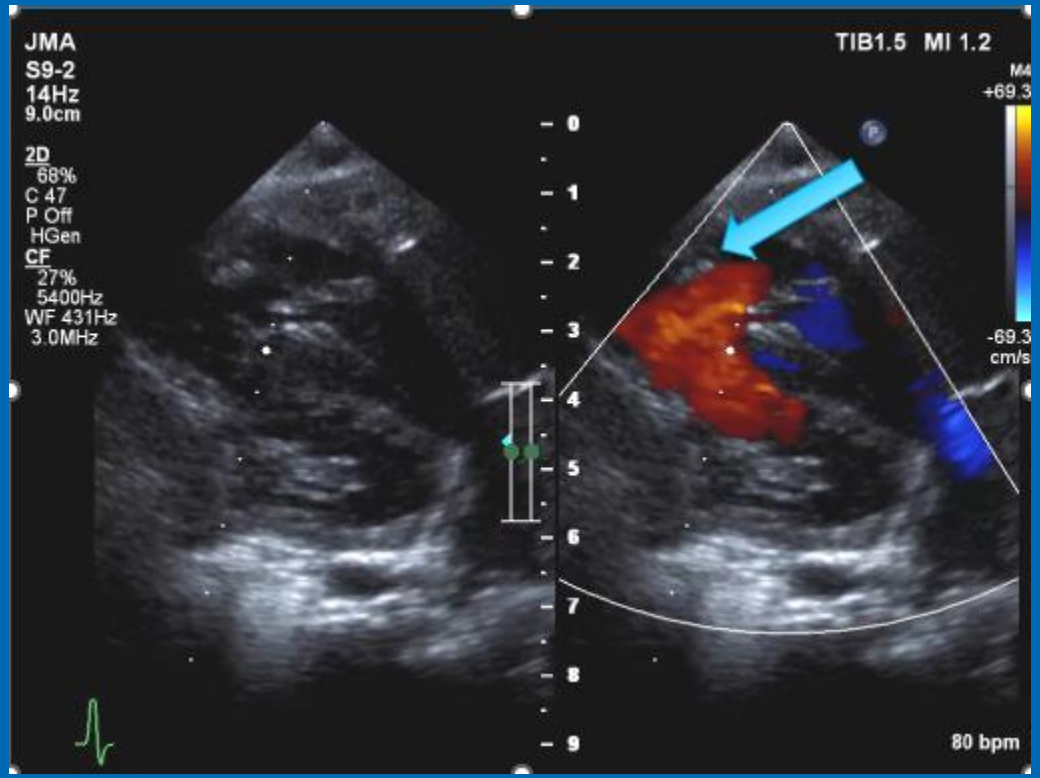

S9-2
14Hz
9.0cm
2D
68%
C 47
P Off
HGen
CF
27%
5400Hz
WF 431Hz
3.0MHz
PW
40%
WF 175Hz
SV2.0mm
3.0MHz
3.5cm
Vel 144 cm/s
PG 8 mmHg
M4 M4
+69.3
-69.3
cm/s
180
120
60
cm/s
-60
100mm/s
78bpm

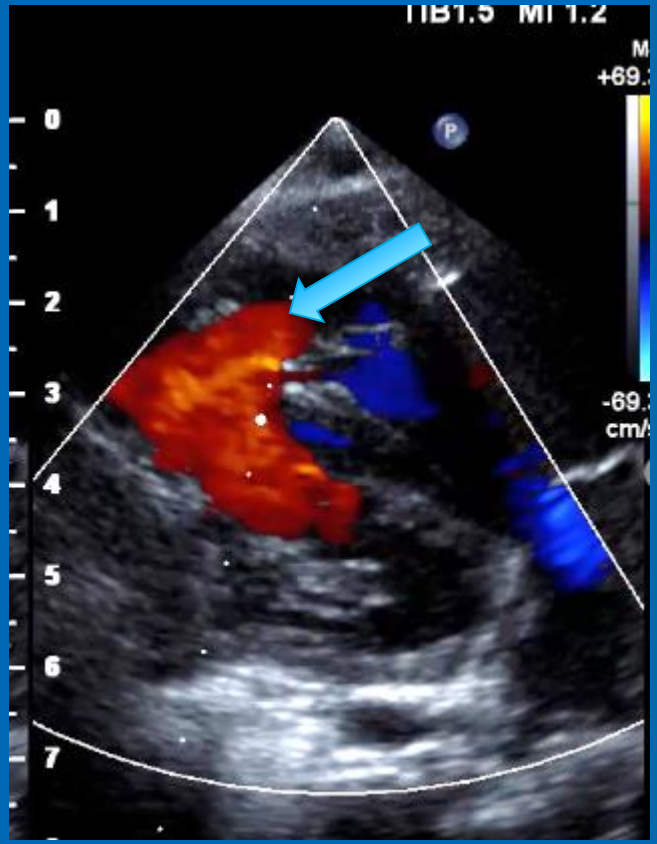

JMA
S9-2
65Hz
10cm
2D
67%
C 47
P Off
HGen
TIB1.2 MI 1.3
10M4
5
0
81 bpm
G
P
R
3.0 6.0

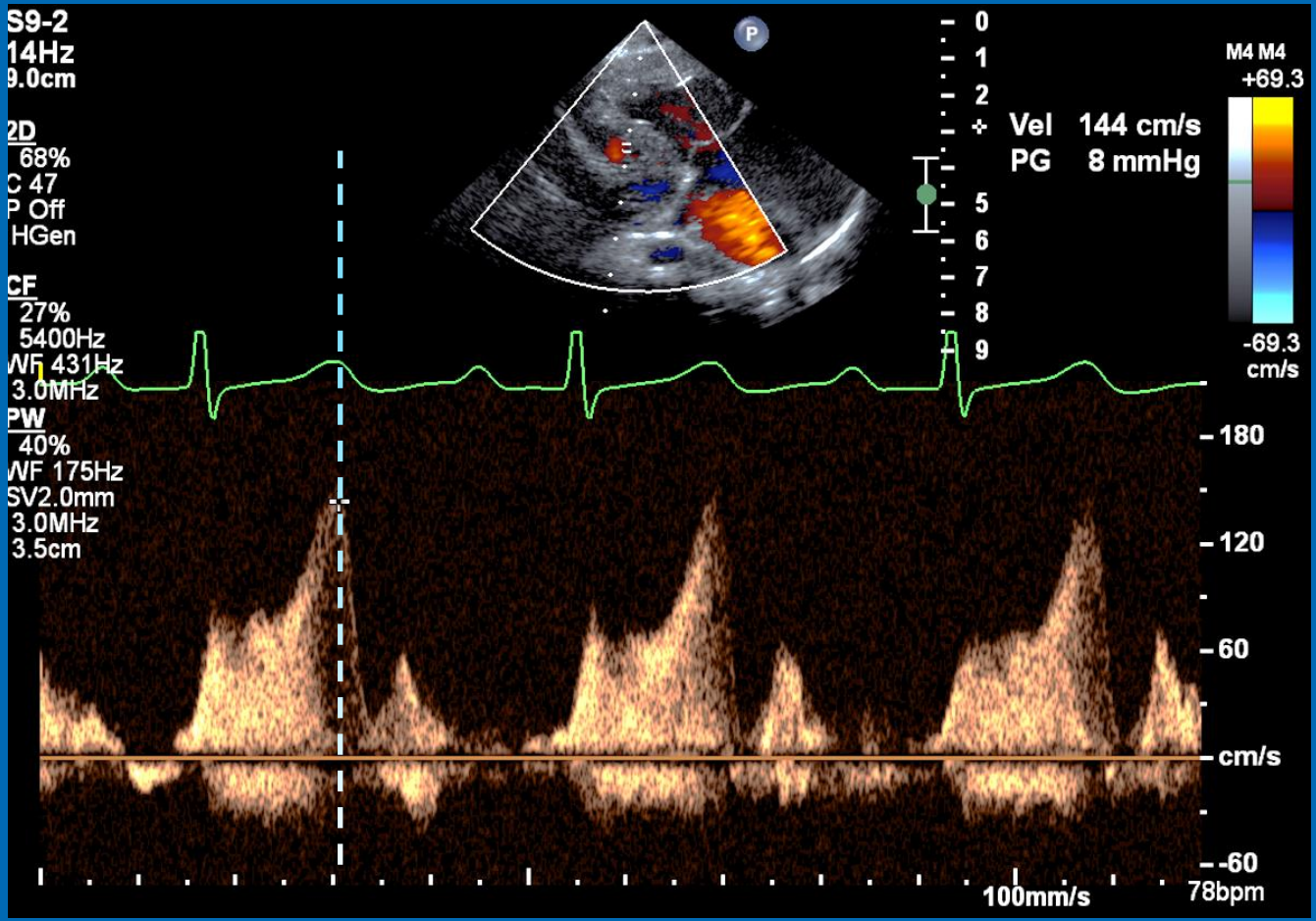
Case #1

- Initial echo findings

- Small posterior muscular VSD (left to right shunt)
- Small to moderate anterior muscular VSD (left to right)
- Shunting is low velocity 1.5 m/s
- Tiny PDA (left to right)
- Dilated RV, RA, PAs, IVC & hepatic veins
- Mild septal flattening
- Fenestrated ASD


JMA
S9-2
14Hz
9.0cm
2D
68%
C 47
P Off
HGen
CF
27%
5400Hz
WF 431Hz
3.0MHz
TIB1.5 MI 1.2
+69.3
-69.3
cm/s
80 bpm


TIB1.5 MI 1.2


S9-2
14Hz
9.0cm
2D
68%
C 47
P Off
HGen
CF
27%
5400Hz
WF 431Hz
3.0MHz
PW
40%
WF 175Hz
SV2.0mm
3.0MHz
3.5cm
Vel 144 cm/s
PG 8 mmHg
M4 M4
+69.3
-69.3
cm/s
180
120
60
cm/s
-60
100mm/s
78bpm

Case #1

- Follow up echo 4 months later
- Indication to evaluate VSD, ASD and PDA
- Patient seen in a network of care clinic
- Echo performed without sedation

“echocardiogram on a toddler”

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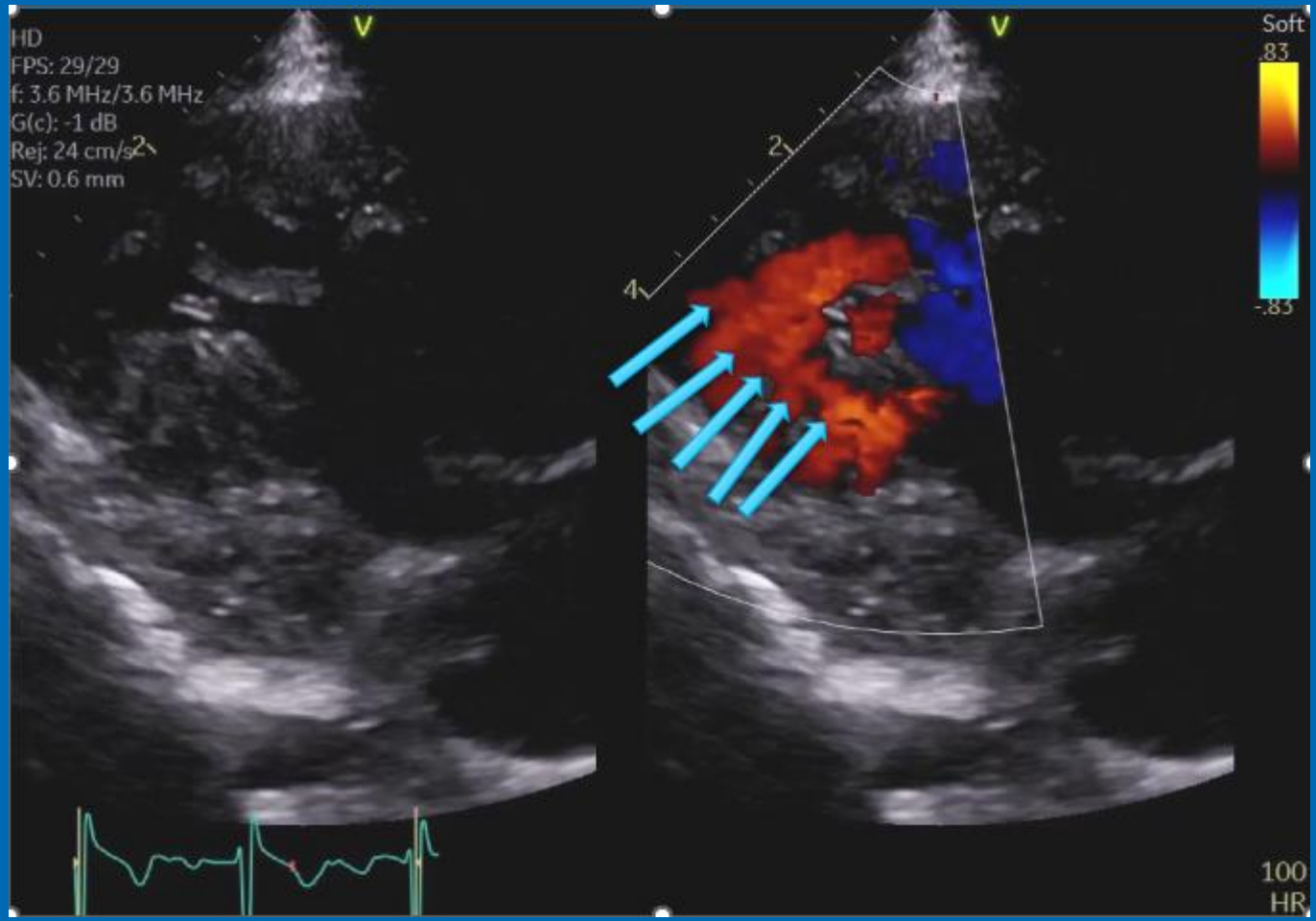
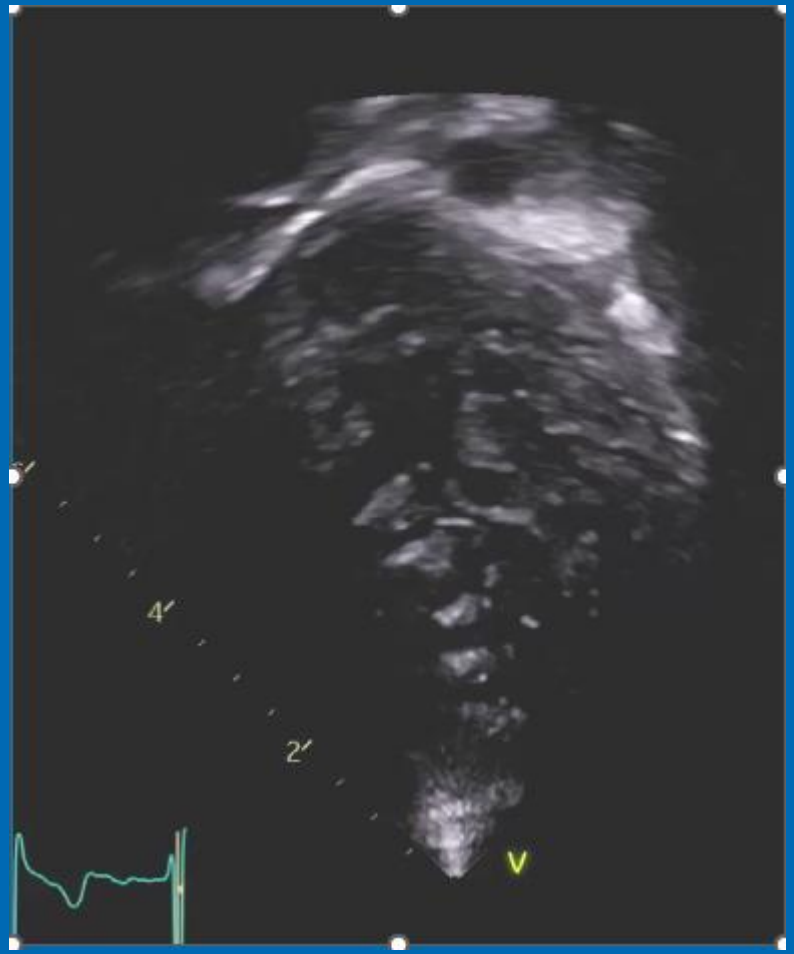
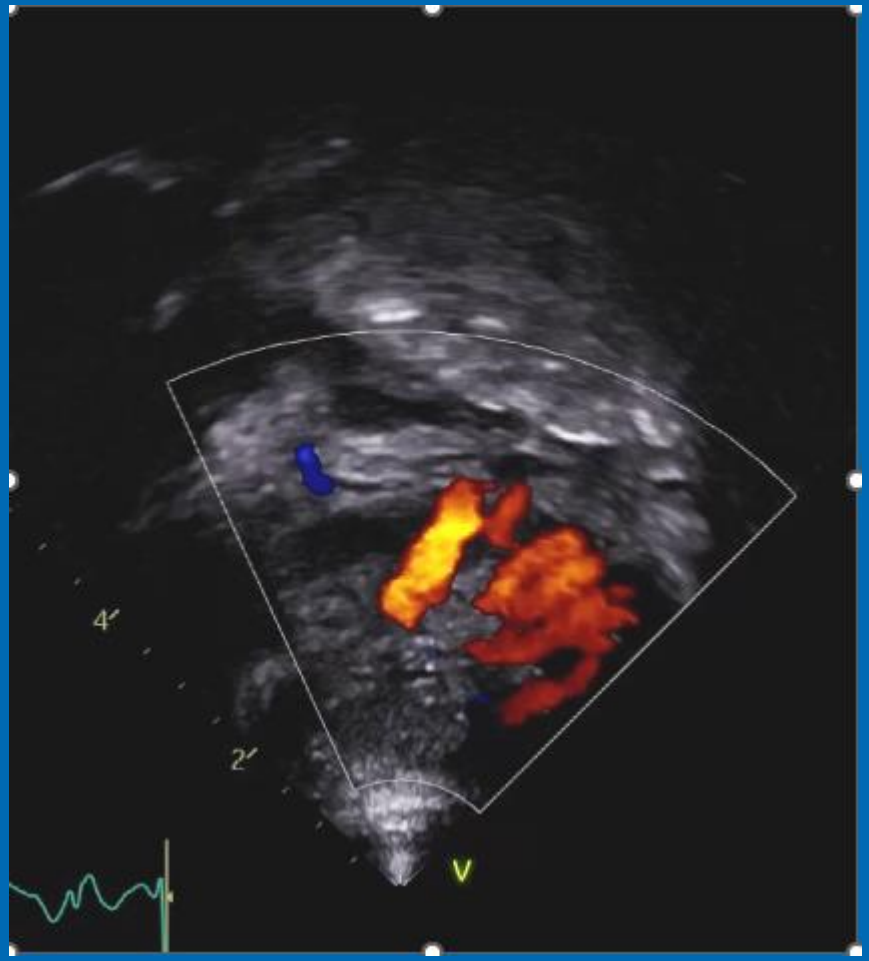
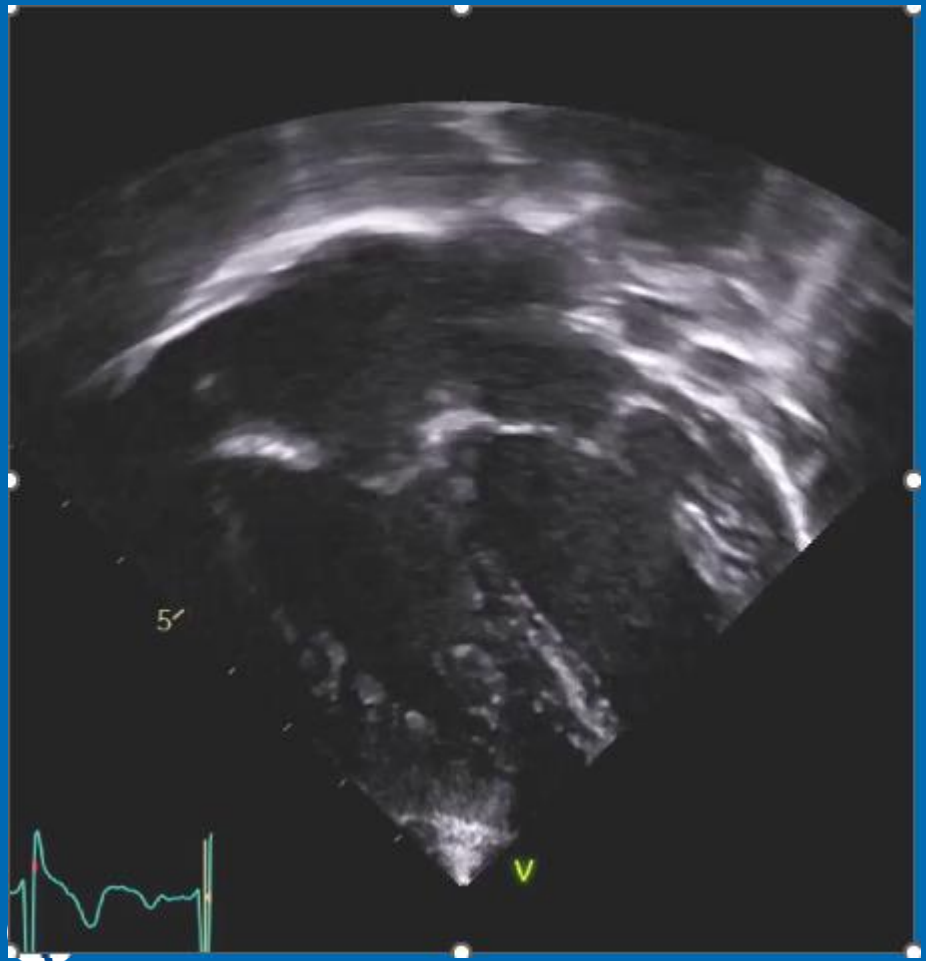
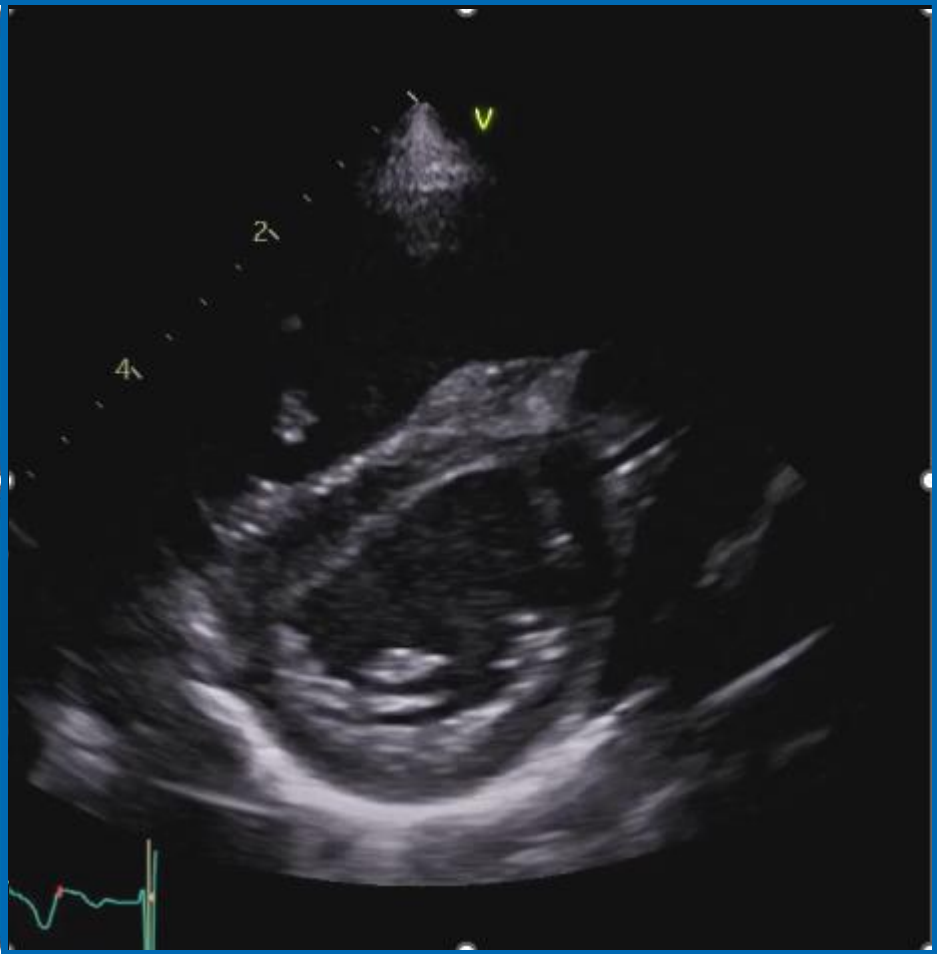

HD
FPS: 29/29
f: 3.6 MHz/3.6 MHz
G(c): -1 dB
Rej: 24 cm/s
SV: 0.6 mm
V
V
2
4
Soft
.83
-.83
100
HR


4
2
V


4
2
V


5
V


V
2
4

Case #1

- Follow up echo findings

- Multiple VSDs
- Dilated RV, RA, PAs, IVC & hepatic veins
- Increased septal flattening
- Fenestrated ASD

- “Swiss Cheese” VSDs

- Rare & Complex defect
  - 4+ muscular VSDs

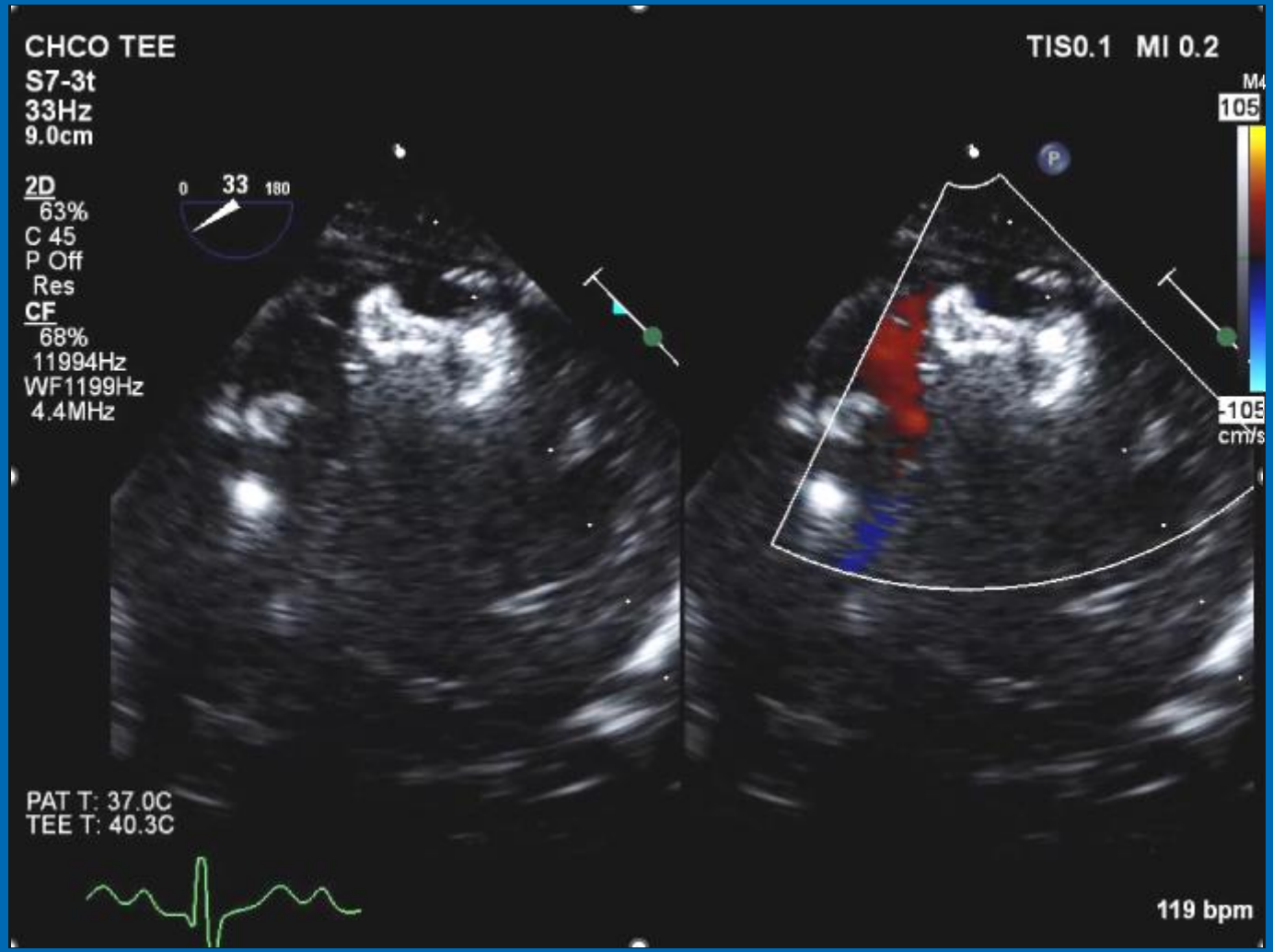
- Treatment is complicated
  - difficulty in visualizing and closing every hole
  - variation in size of VSDs
  - likely involvement of a large component of the ventricular septum

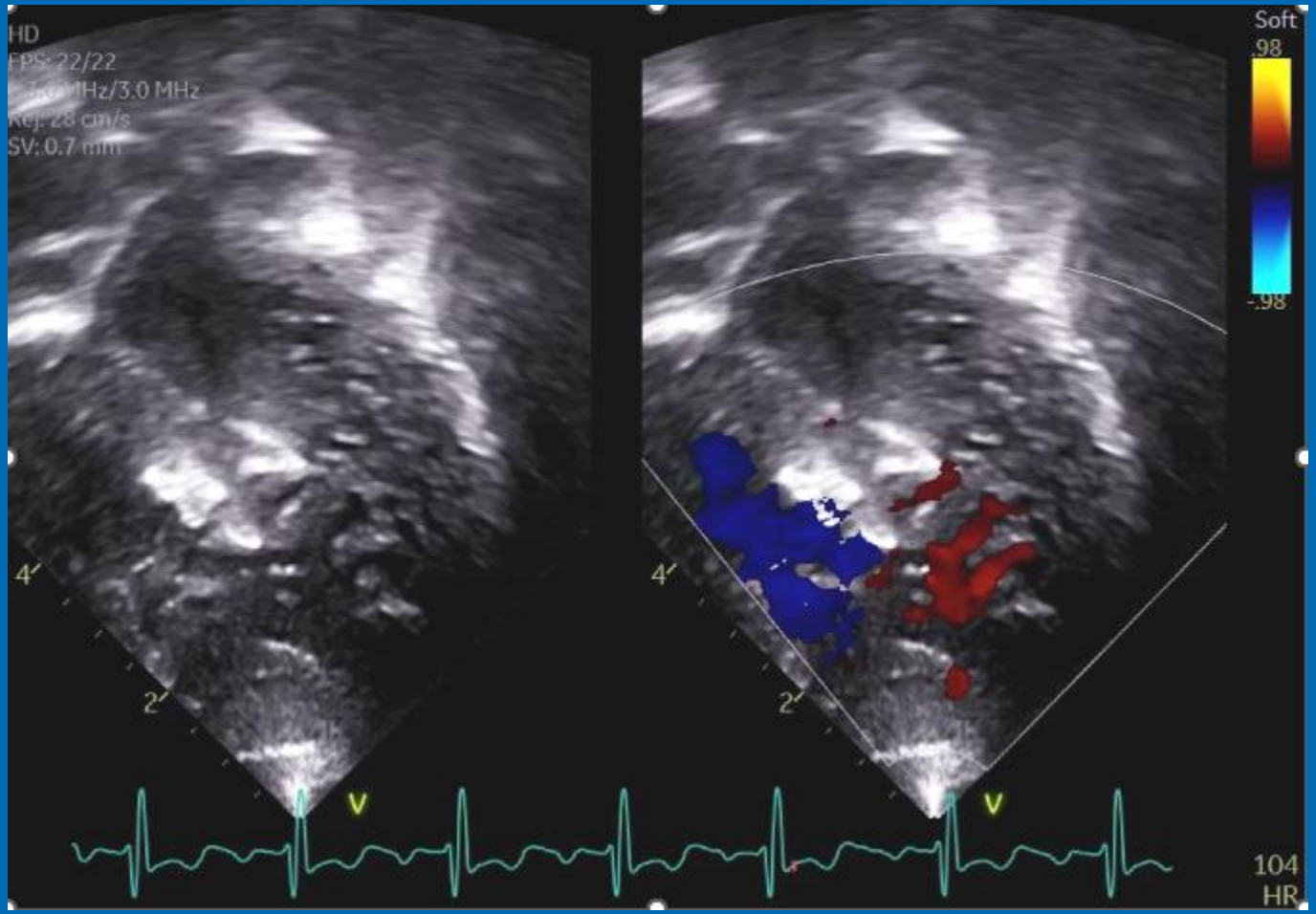
- Large patch closure could cause ventricular dysfunction

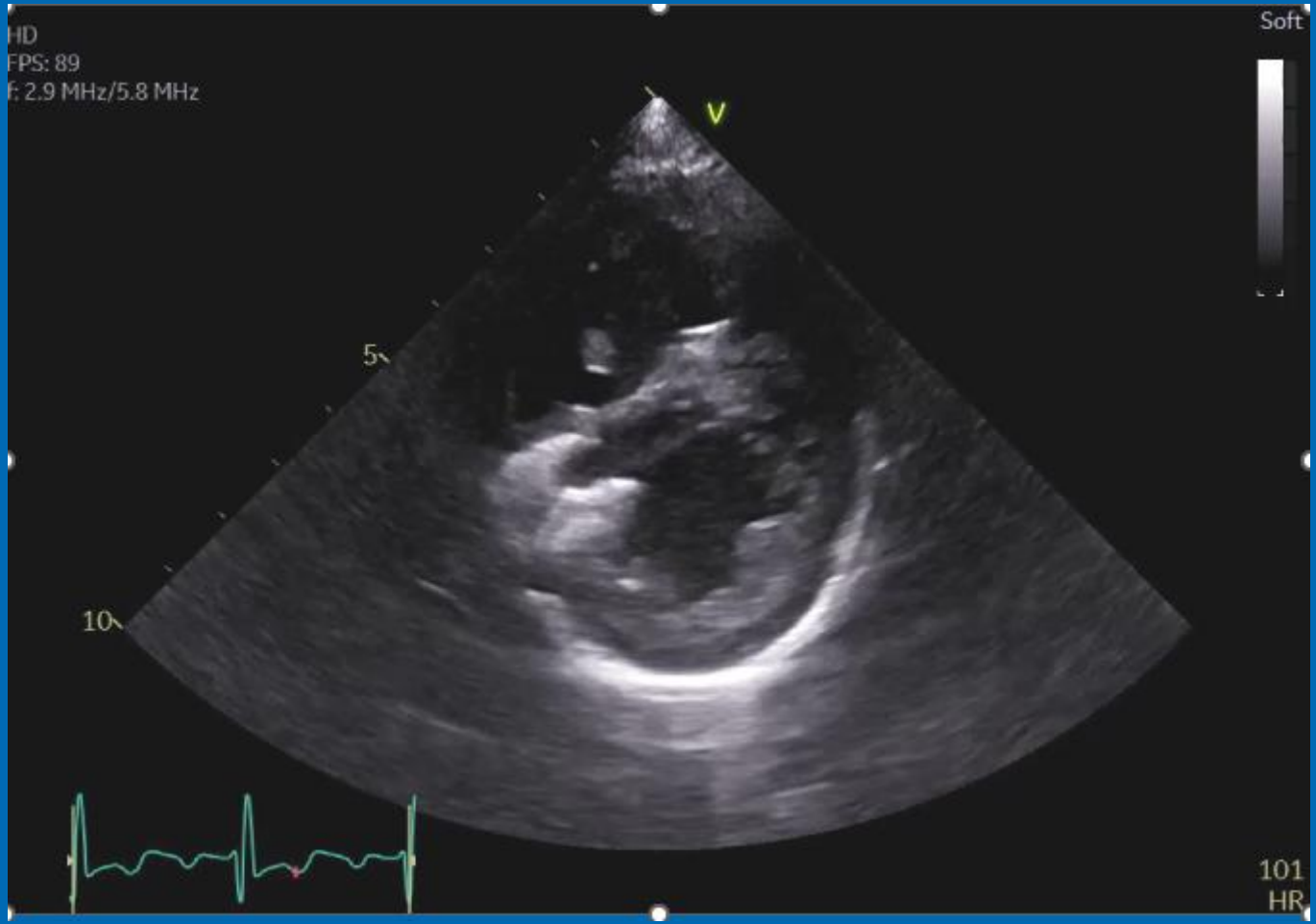
- Difficult to assess by echo due to the large degree of shunting causing increased pulmonary blood flow = PH = LV and RV pressure equalization = low velocity shunting = easy to miss by echo

Case #1

- Month later – to the Cath Lab
- TEE guidance of a muscular VSD closure
- Posterior/inferior mid-ventricular defect closed with a 8mm Amplatzer VSD occluder device
- TR demonstrated near systemic PH

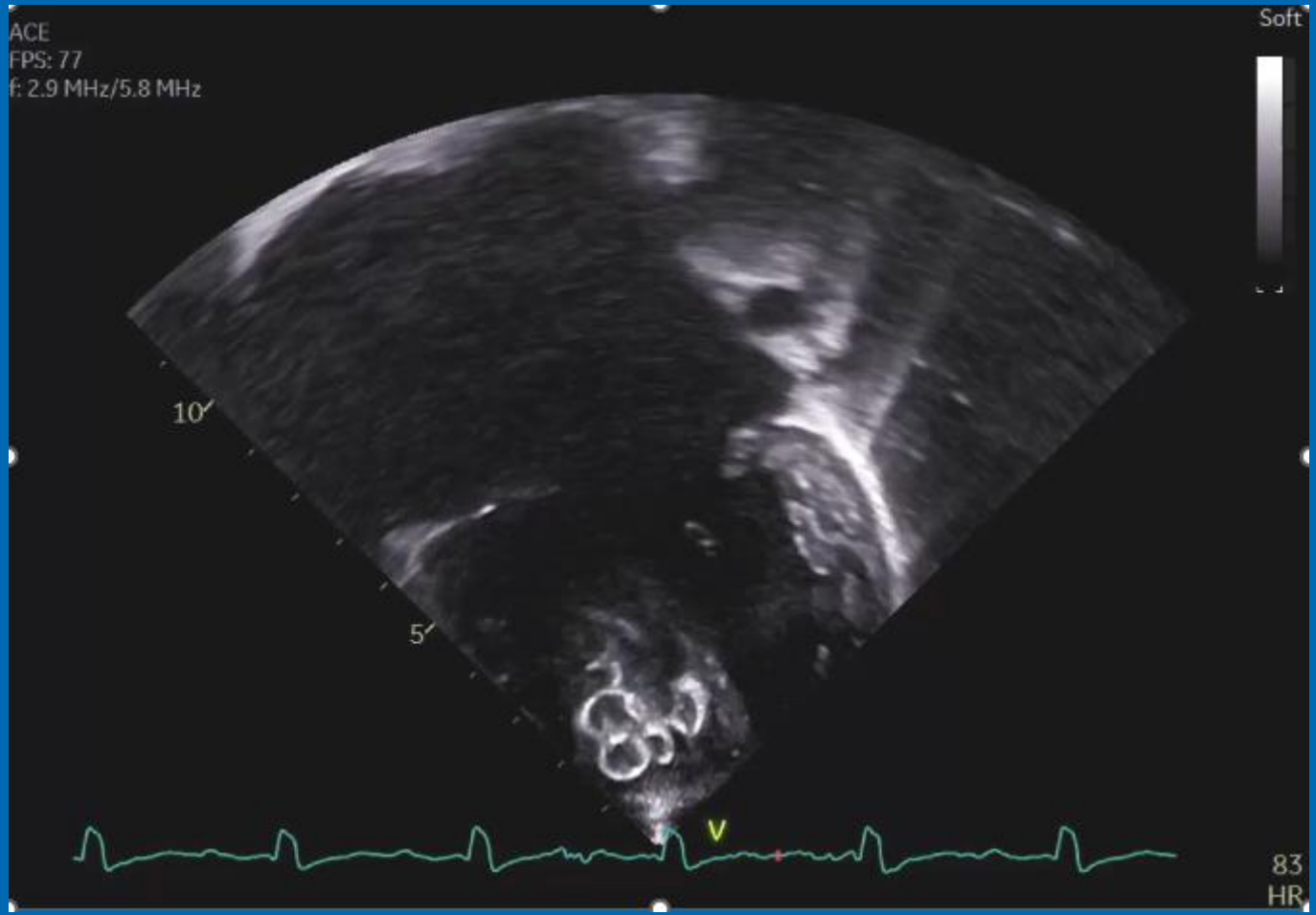

CHCO TEE
S7-3t
33Hz
9.0cm
2D
63%
C 45
P Off
Res
CF
68%
11994Hz
WF1199Hz
4.4MHz
0
33
180
TIS0.1 MI 0.2
M4
105
-105
cm/s
PAT T: 37.0C
TEE T: 40.3C
119 bpm


HD
FPS: 22/22
Rej: 28 cm/s
SV: 0.7 mm
4
2
V
Soft
.98
-.98
104
HR


HD
FPS: 89
f: 2.9 MHz/5.8 MHz
V
5
10
Soft
101
HR

Case #1

- Update: 4 year old
- 4 cath lab interventions multiple attempts to close VSDs with devices
- One attempt resulted in migration of device resulting in visit to CVOR
- While in OR, PDA and ASD closure, extraction of migrated device and patch closure of multiple VSDs
- Still has multiple areas of shunting around devices and patches and continues treatment of PH


ACE
FPS: 77
f: 2.9 MHz/5.8 MHz
Soft
10
5
V
83
HR

Take Aways

- If there is 1 VSD, be suspicious for more
- Sweep Sweep Sweep
  - from all views (slow sweeps)
- Interrogate
  - looking for 2D “drop out”
  - lowering Nyquist on color Doppler
- Not all VSDs will be a high velocity shunt
  - especially those with a large VSD
  - or multiple resulting in a large amount of shunting
  - = equal LV and RV pressure

Case #2

- Adult male presents with known perimembranous VSD
- Thought to be restrictive with minimal shunt but patient was symptomatic with signs of PH

- To the cath lab…


PHILIPS
TIS0.2 MI 0.5
CX7-2t/Adult
FR 20Hz
8.1cm
3D Beats 1
M4
3D
3D 52%
3D 40dB
0 120 180
JPEG
PAT T: 37.0C
TEE T: 40.2C
66 bpm

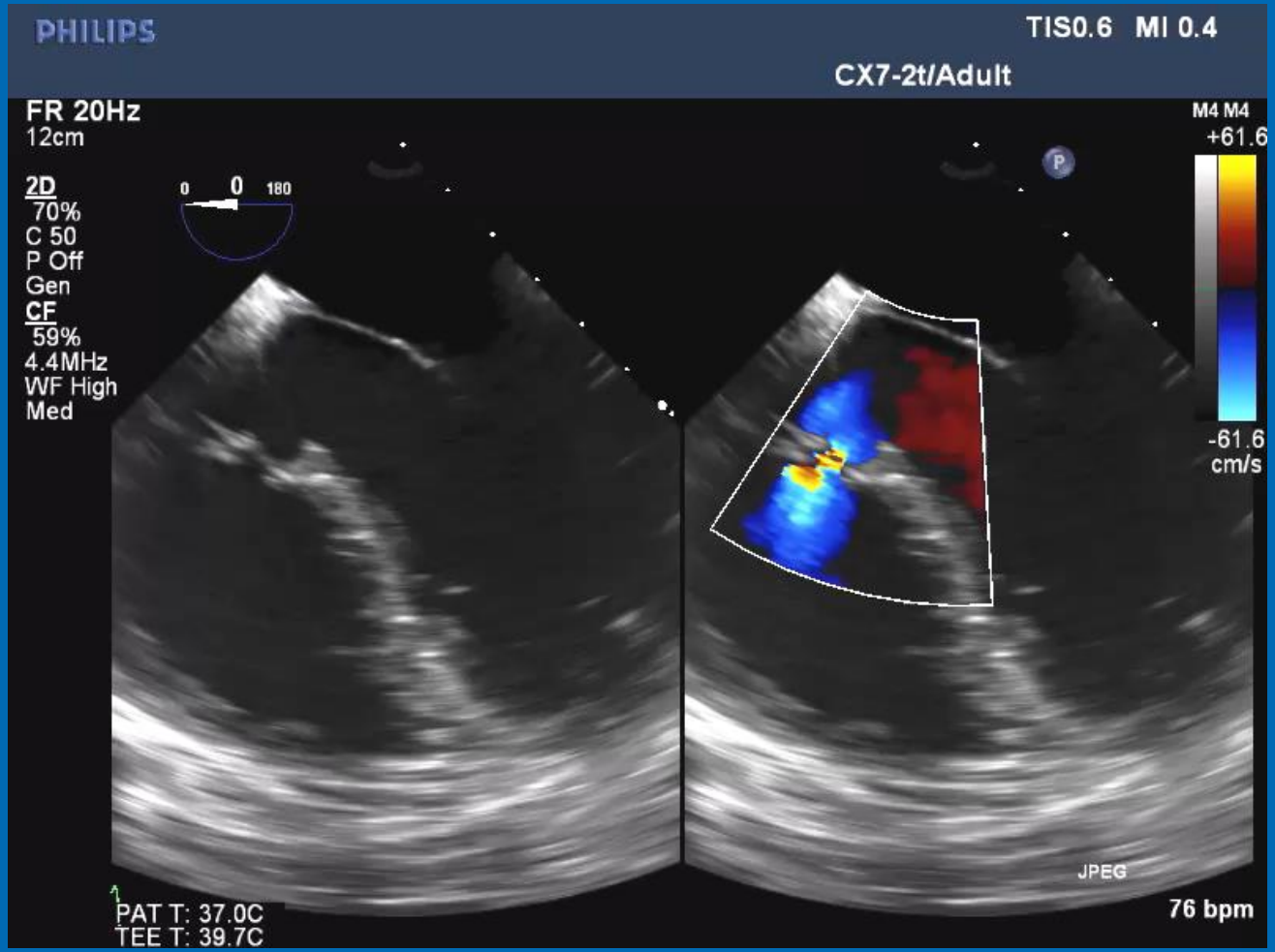

PHILIPS
TIS0.2 MI 0.5
CX7-2t/Adult
FR 12Hz
9.2cm
3D Beats 1
M4
3D
3D 47%
3D 32dB
0 135 180
JPEG
PAT T: 37.0C
TEE T: 40.5C
67 bpm


PHILIPS
TIS0.2 MI 0.5
CX7-2t/Adult
FR 20Hz
8.1cm
3D Beats 1
M4
3D
3D 47%
3D 32dB
0 140 180
JPEG
PAT T: 37.0C
TEE T: 39.6C
64 bpm


PHILIPS
TIS0.2 MI 0.5
CX7-2t/Adult
FR 20Hz
9.2cm
3D Beats 1
M4
3D
3D 47%
3D 32dB
0 135 180
JPEG
70 bpm
PAT T: 37.0C
TEE T: 40.5C

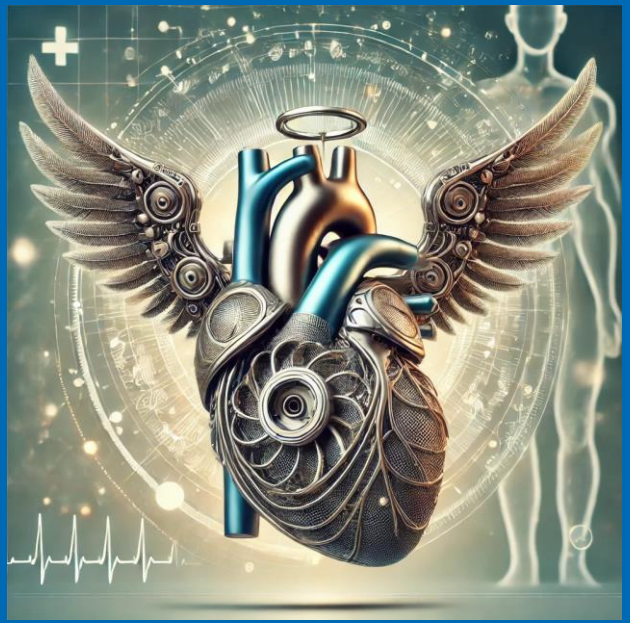
Case #2

- 3 attempts at device closure with device embolization
- Don’t worry… the device was retrieved successfully
- Patient then went to the CVOR for VSD patch closure


PHILIPS
TIS0.6 MI 0.4
CX7-2t/Adult
FR 20Hz
12cm
2D
70%
C 50
P Off
Gen
CF
59%
4.4MHz
WF High
Med
0 0 180
M4 M4
+61.6
-61.6
cm/s
JPEG
76 bpm
PAT T: 37.0C
TEE T: 39.7C

Take Aways

- 3D imaging during complex procedures can be helpful in identifying defect rims
- Not all VSDs can be closed with a device
- Post procedural imaging is very important to evaluate for
  - Residual shunting
  - Surrounding structures for impingement
  - Stability of device



“flying VSD device”

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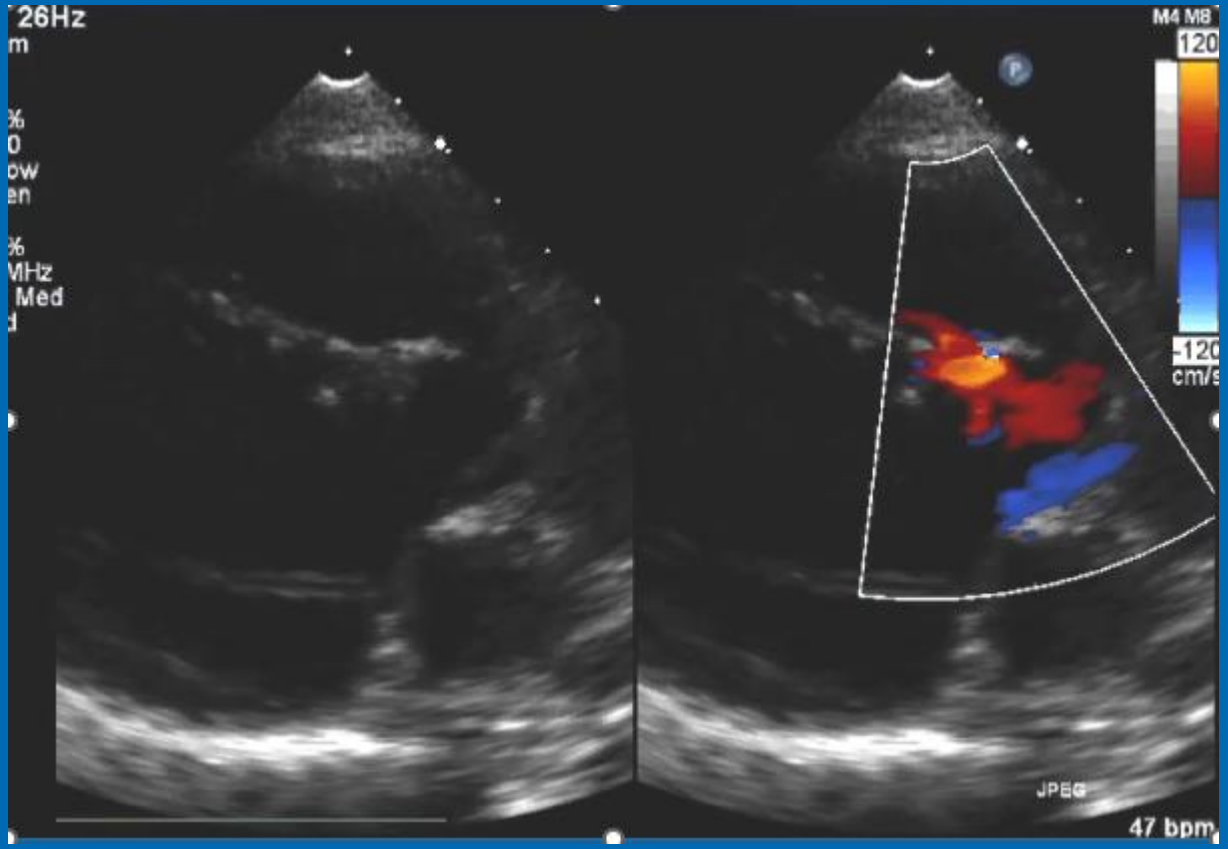
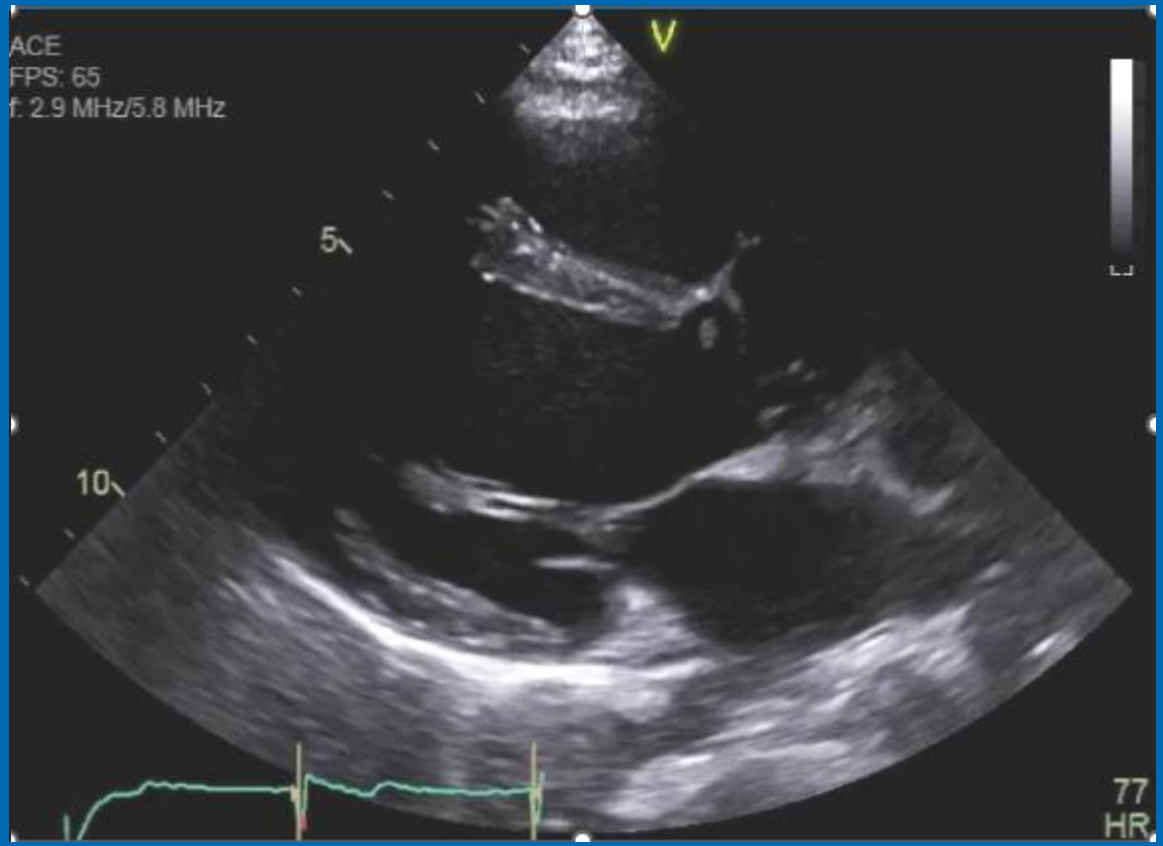
Case #3

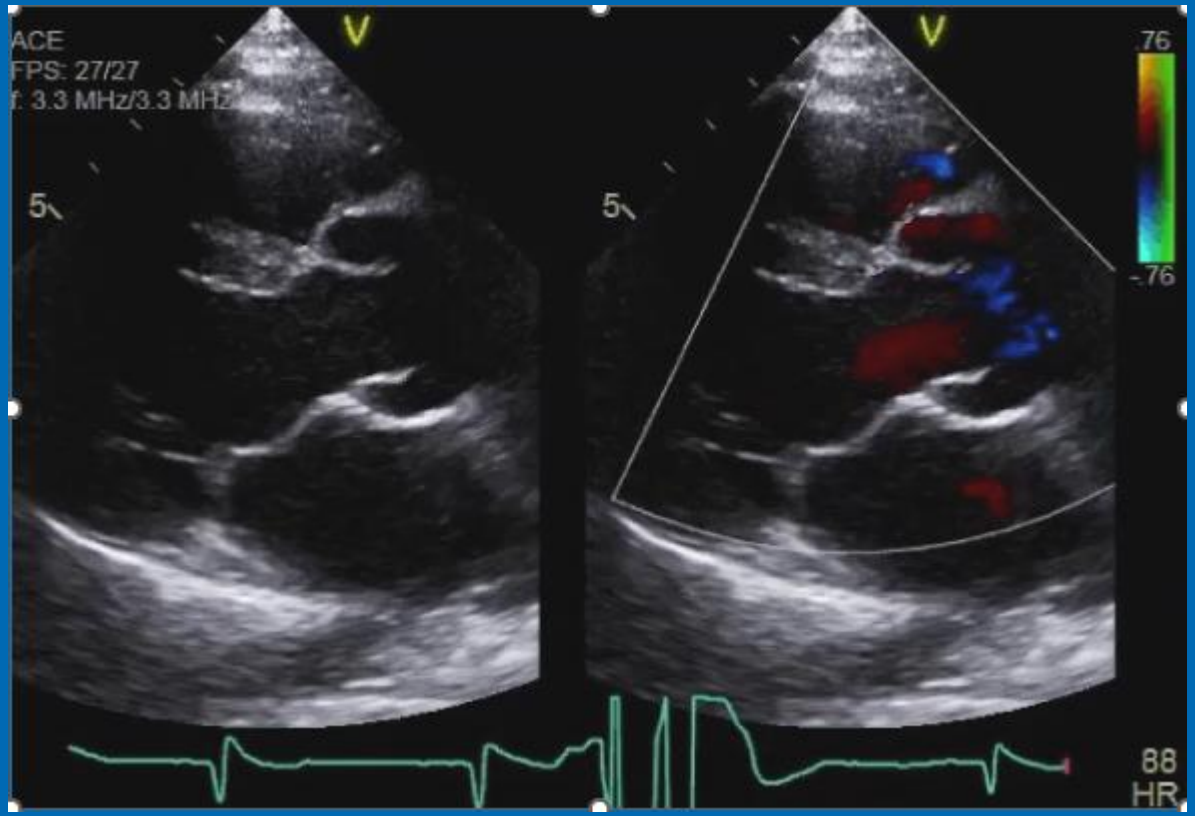
- 13 year old female with history of bicuspid aortic valve and perimembranous VSD
- Presented to local ED with light headedness, chest pressure and palpitations

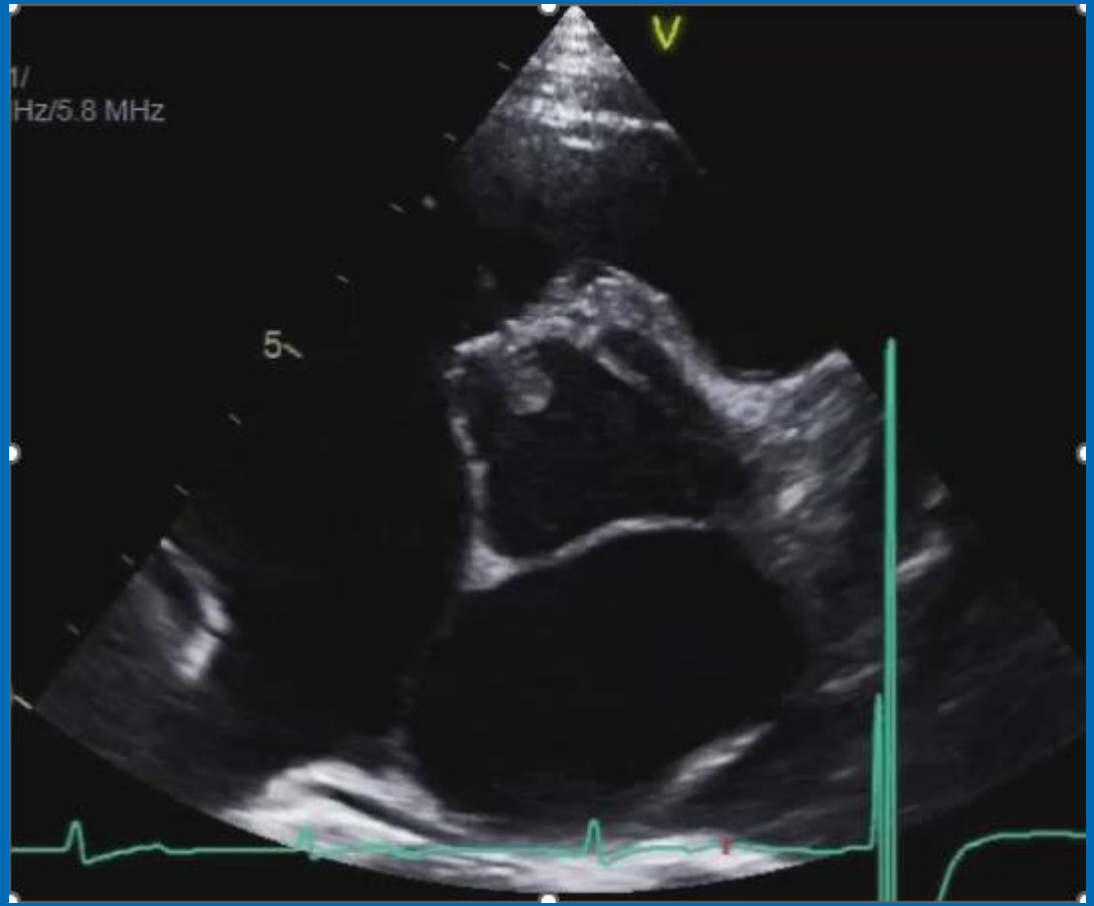
Prior to ED admission – routine VSD follow up

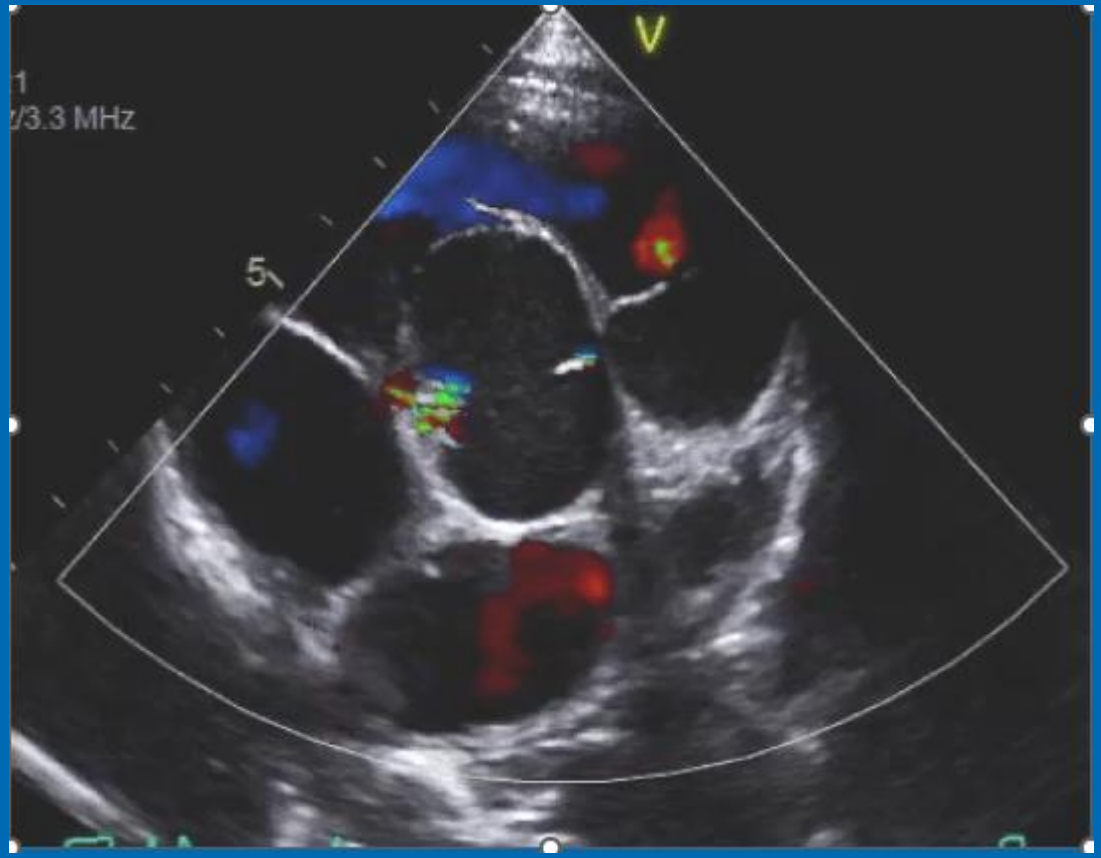


Echo while in the ED



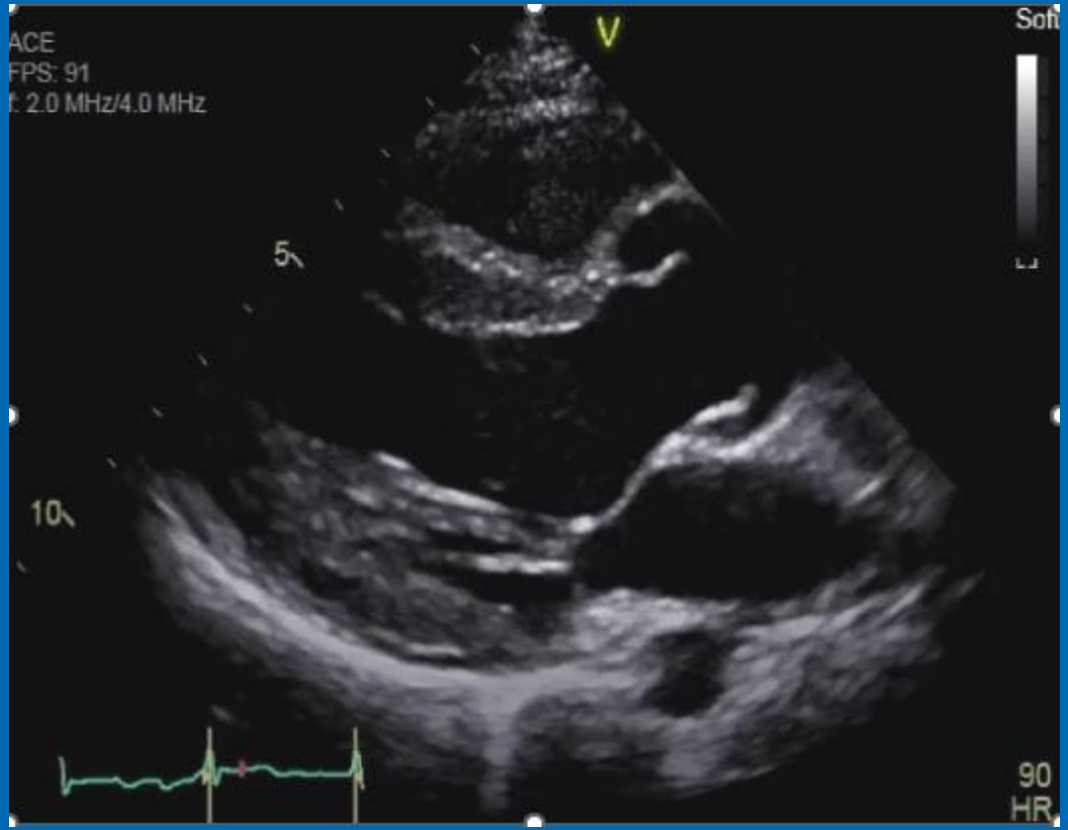

ACE
FPS: 27/27
f: 3.3 MHz/3.3 MHz
5
V
5
V
76
-76
88
HR


V
1/
Hz/5.8 MHz
5


V
1
z/3.3 MHz
5

Case #3

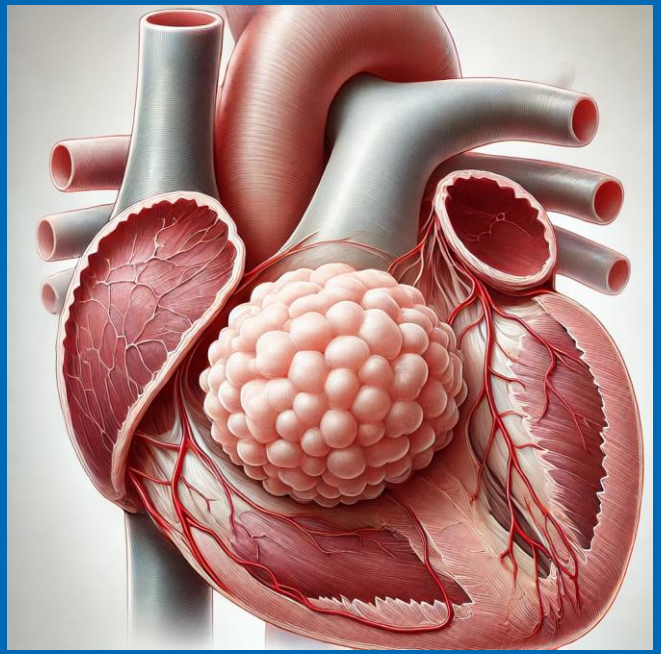
- Mobile mass identified in the LVOT at the region of the prior identified perimembranous VSD
- Prior study showed trivial shunting across the VSD – no shunting seen on this study
- Mass is occluding the perimembranous VSD shunt
- Patient started on heparin – 3 days later….


ACE
FPS: 91
f: 2.0 MHz/4.0 MHz
V
Soft
5
10
90
HR


ACE
FPS: 31/31
2.2 MHz/2.2 MHz
Soft
63
-63
86
HR

Take Aways

- Slow sweeps will save the day
- Size and degree of shunting across a VSD isn’t the only concern for patients with intracardiac lesions
- Reviewing patient history / prior imaging can significantly assist with diagnosis



“mass in the perimembranous ventricular septum”

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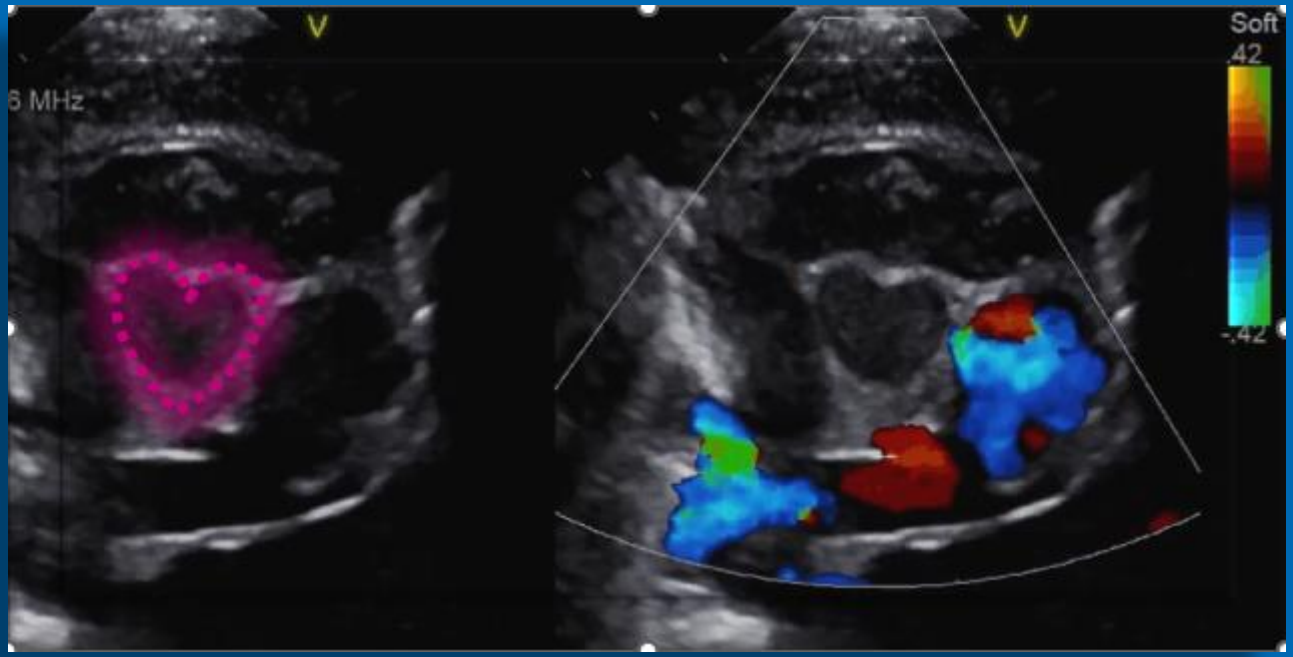

Thank You!