Weill Cornell Medicine

Hospital Medicine Point of Care Ultrasound
(HM POCUS) Program

POCUS
Case Conference

Gregory Mints

12/20/2018

Case Hx

CC: 81 yo man a/w progressive SOB x 2 weeks. Much worse x 3 days.

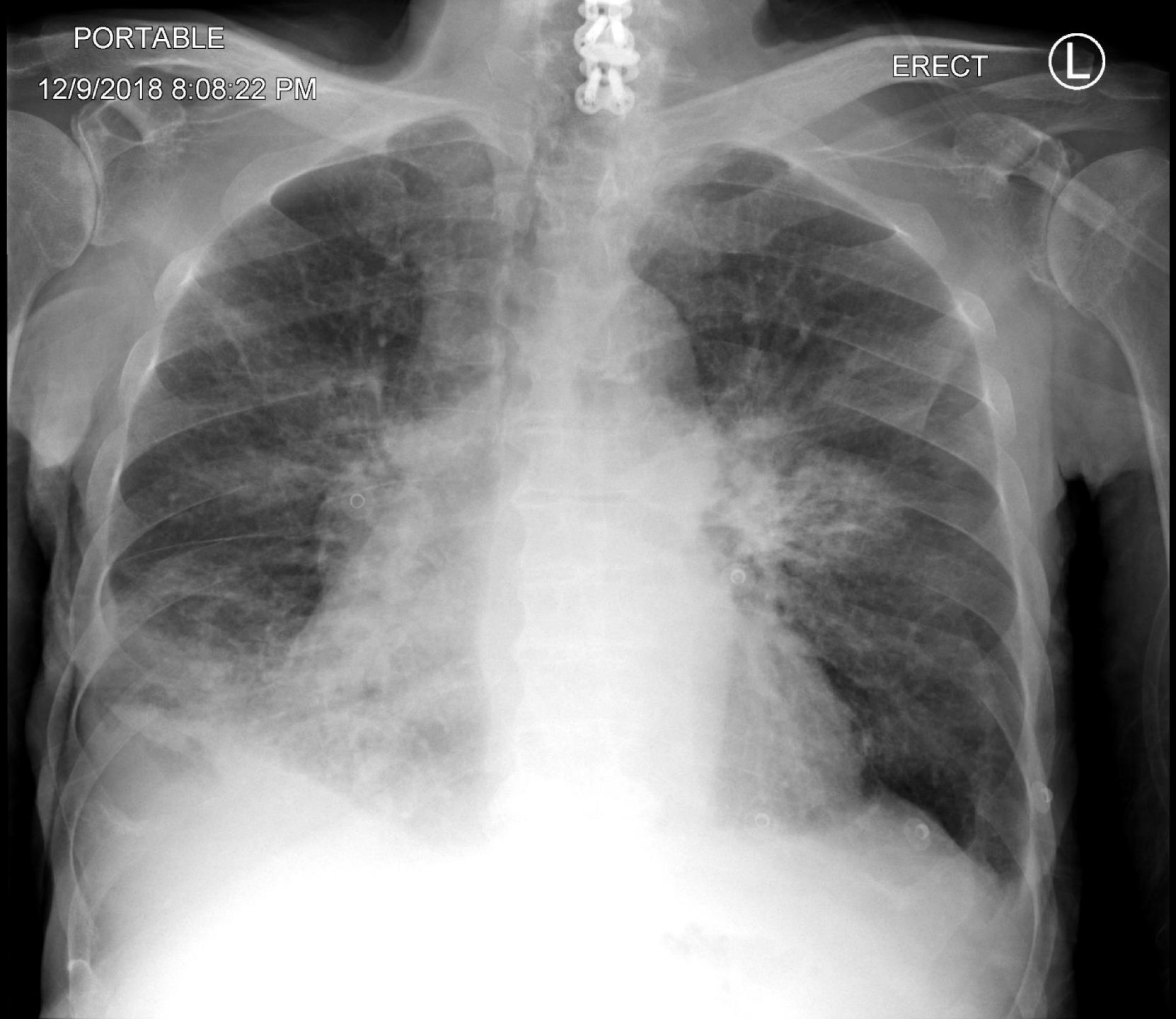
PMHx:

- lung cancer s/p XRT and chemo
- Was on immunotherapy, d/c'd secondary to side effects
- h/o of endovascular AAA repair 1 month PTA
- H/o DVT and PE, s/p IVC, on xarelto, self d/c'd 2 days PTA
- h/o mildly decreased EF w/ SWM abnormalities
- 7d PTA seen in office of vascular surgeon, CT showed b/l pleural effusion

Labs

Labs:

- AKI 0.9 to 2.2
- Normal WBC, unimpressive Hb
- BNP 2,800


PORTABLE
12/9/2018 8:08:22 PM
ERECT
L

[R]

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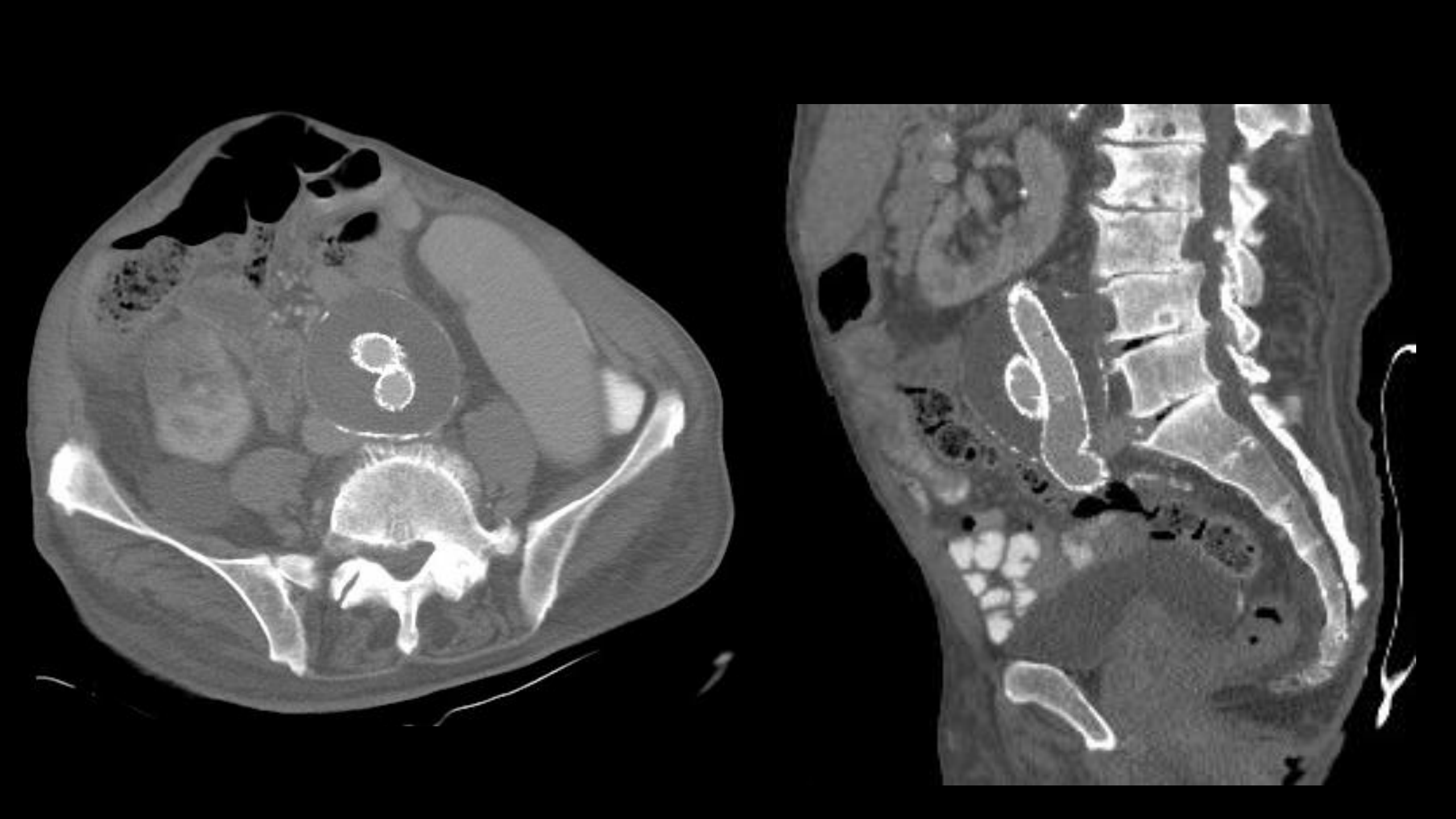
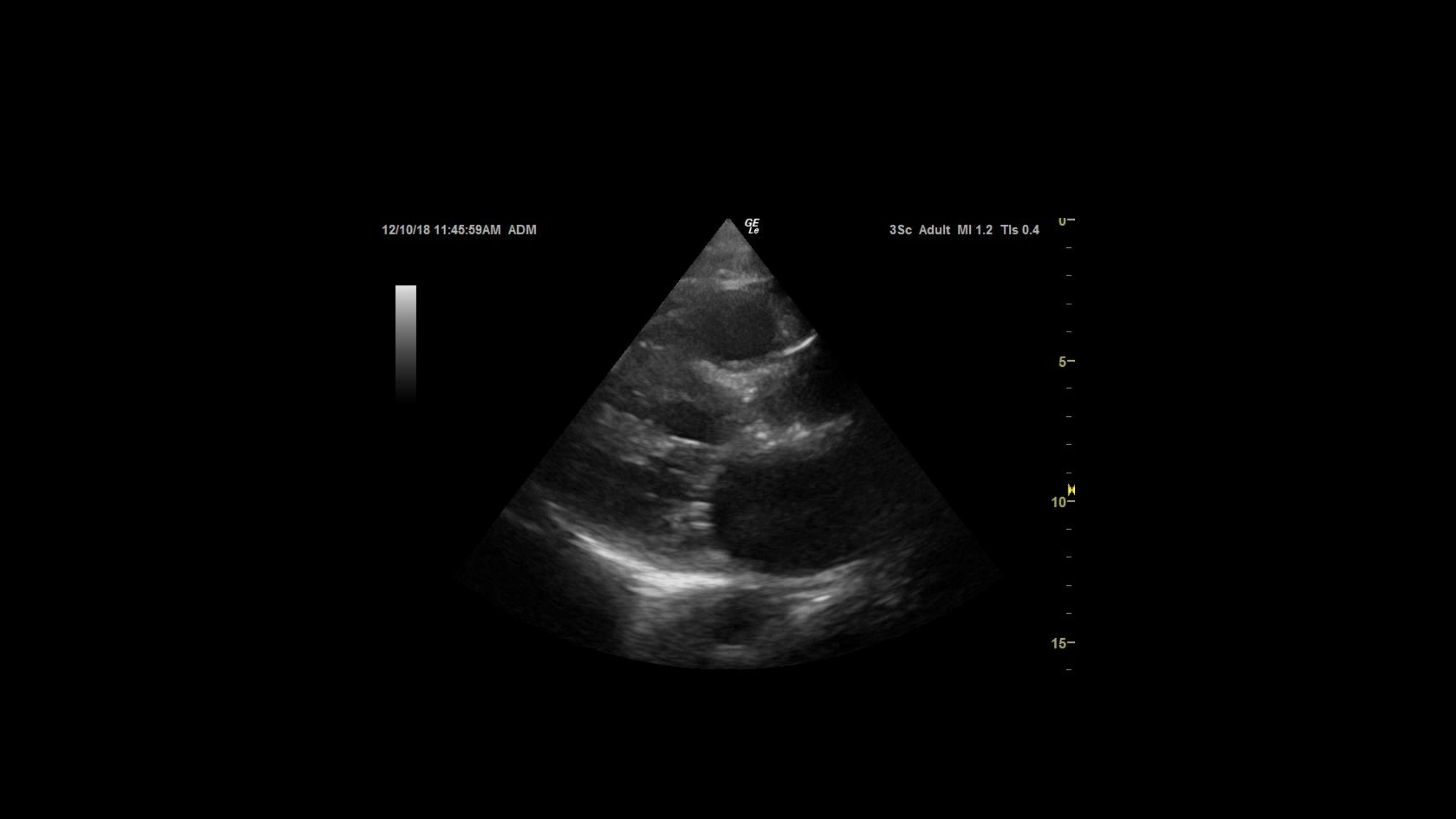


Exam

- Working Dx: CHF – Lasix in the ER
- On exam: tachypneic, hypoxemic, using accessory muscles.
- Other vitals stable
- Lungs: decreased
- Distended abdomen
- Normal JVP
- b/l LE edema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GE
3Sc Adult MI 1.2 TIs 0.4
0
5
10
15

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GE
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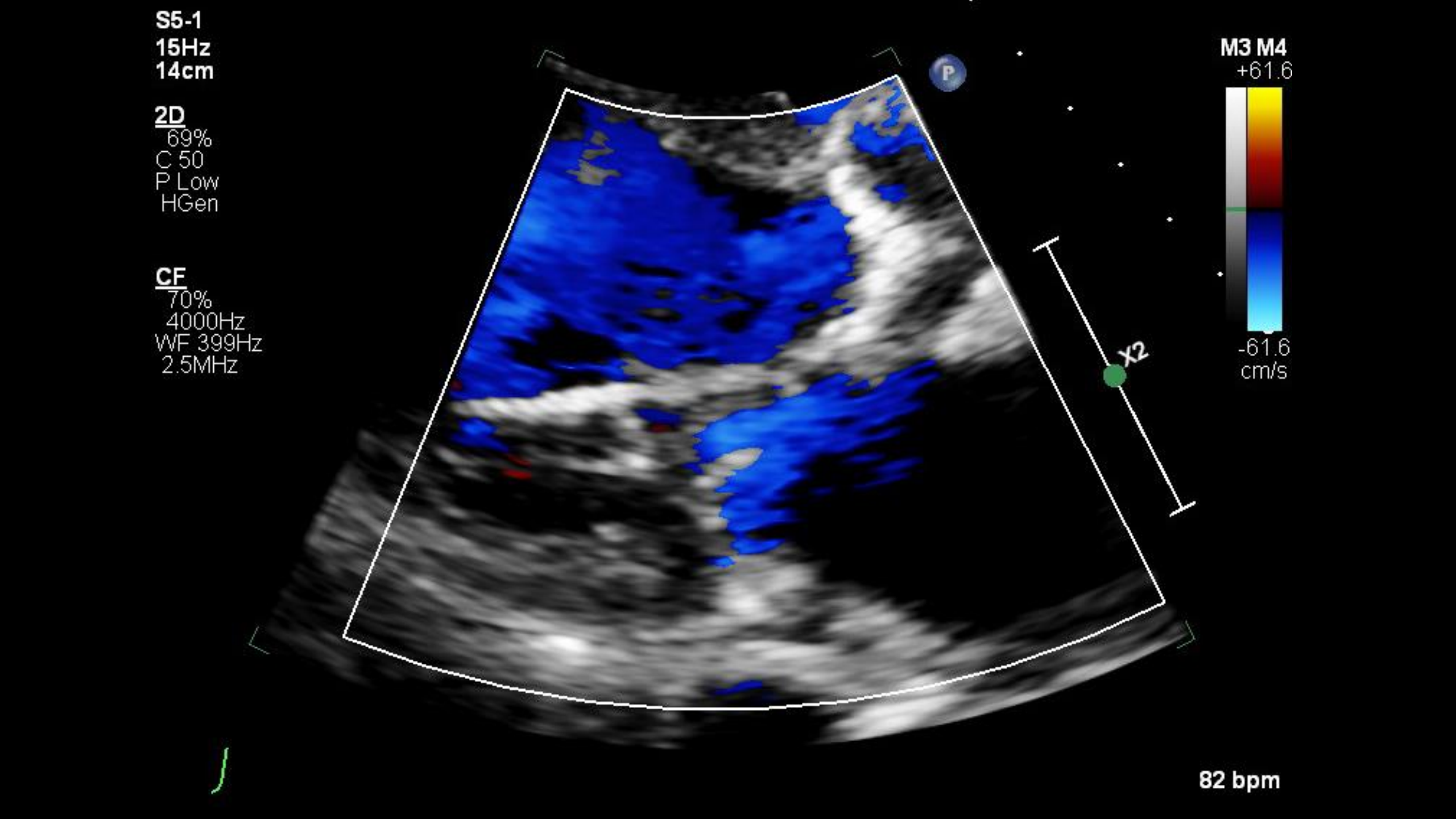
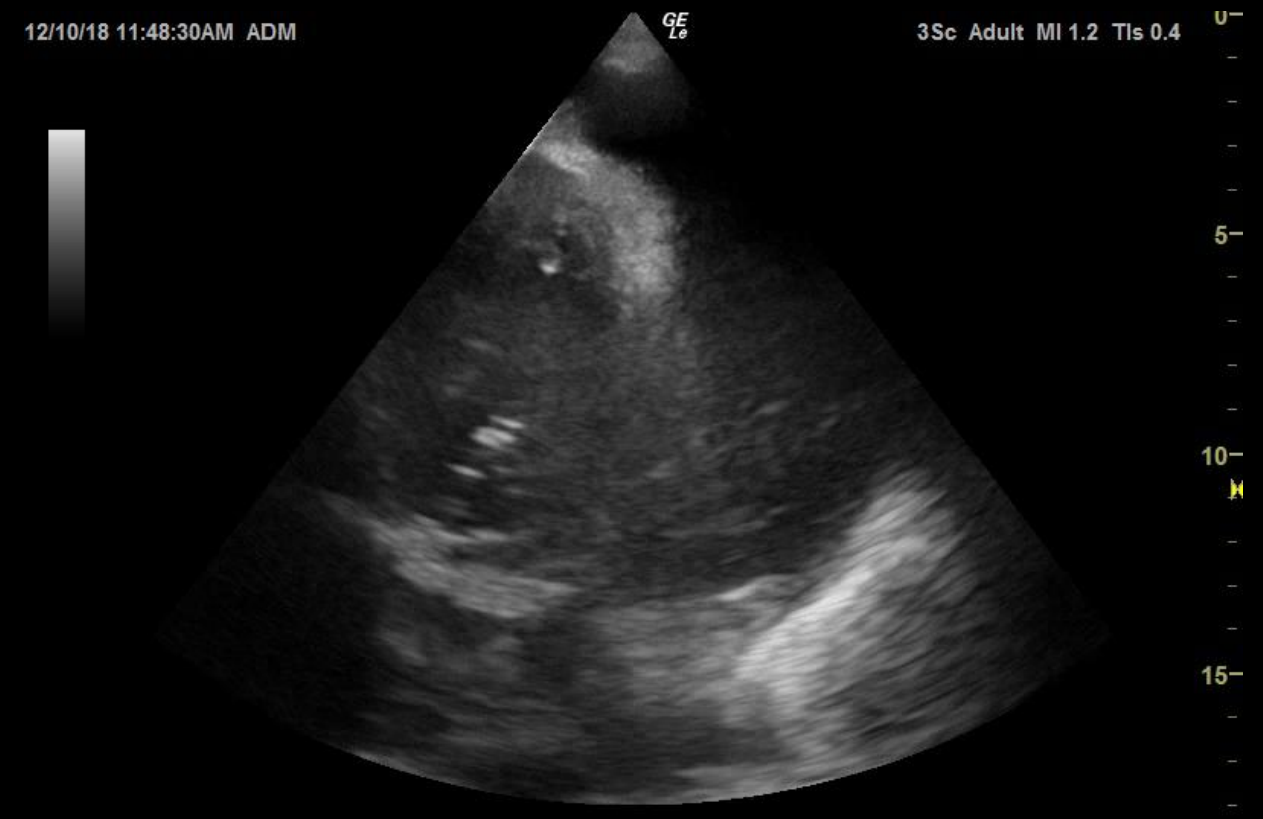
0
5
10
15


S5-1
15Hz
14cm
2D
69%
C 50
P Low
HGen
CF
70%
4000Hz
WF 399Hz
2.5MHz
M3 M4
+61.6
-61.6
cm/s
X2
82 bpm

12/10/18 11:46:32AM ADM
GE
3Sc Adult MI 1.2 TIs 0.4
0
5
10
15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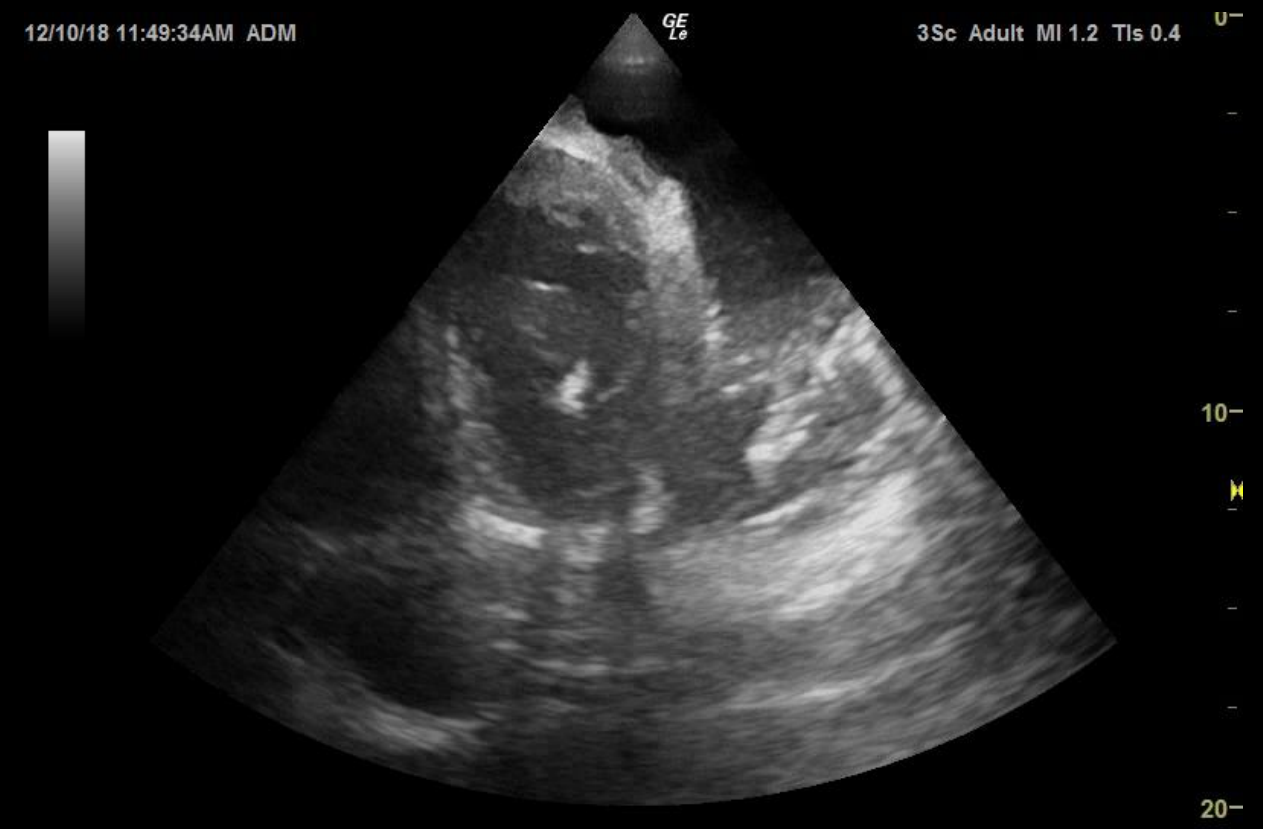
0
5
10
15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GE
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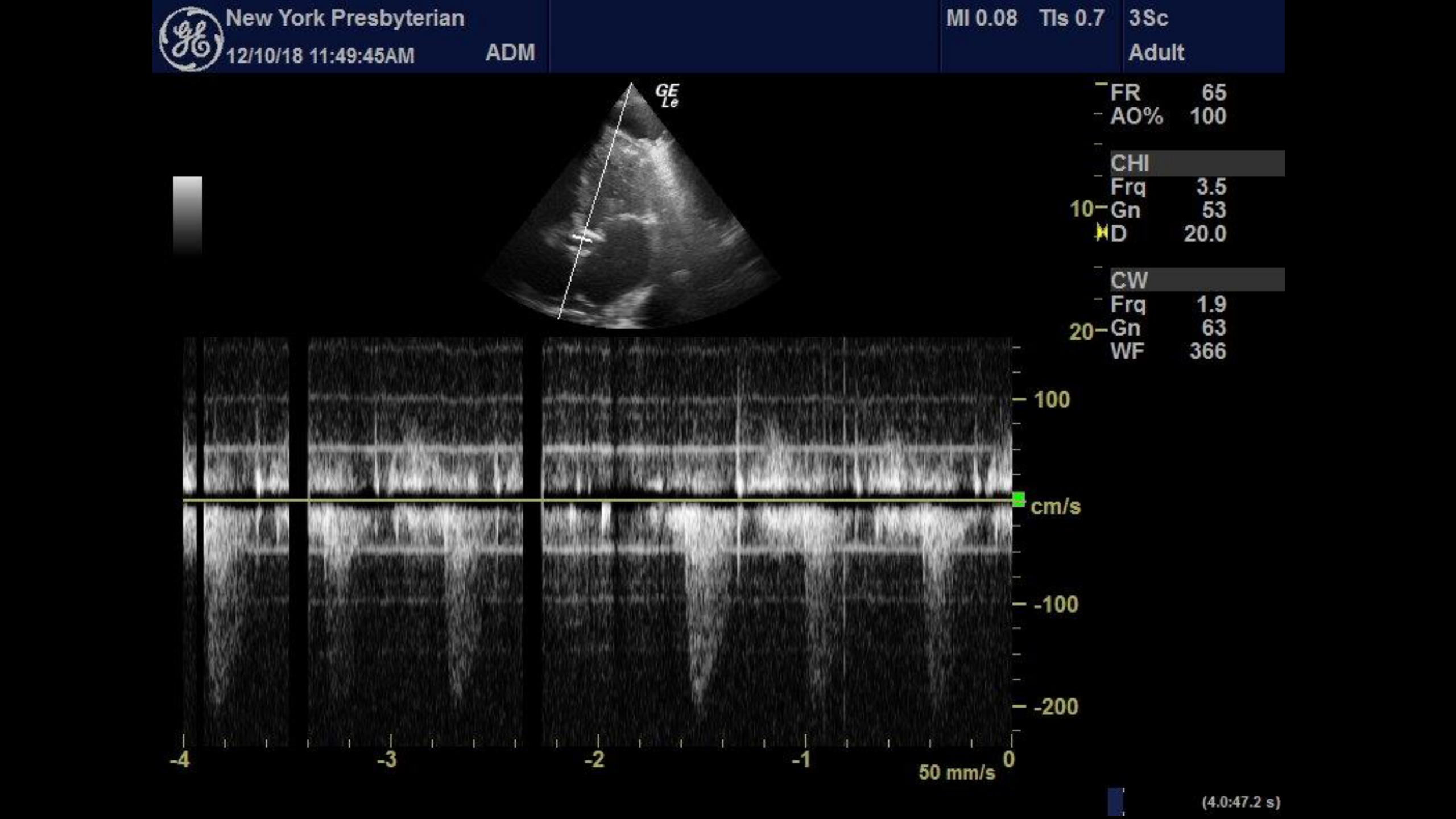
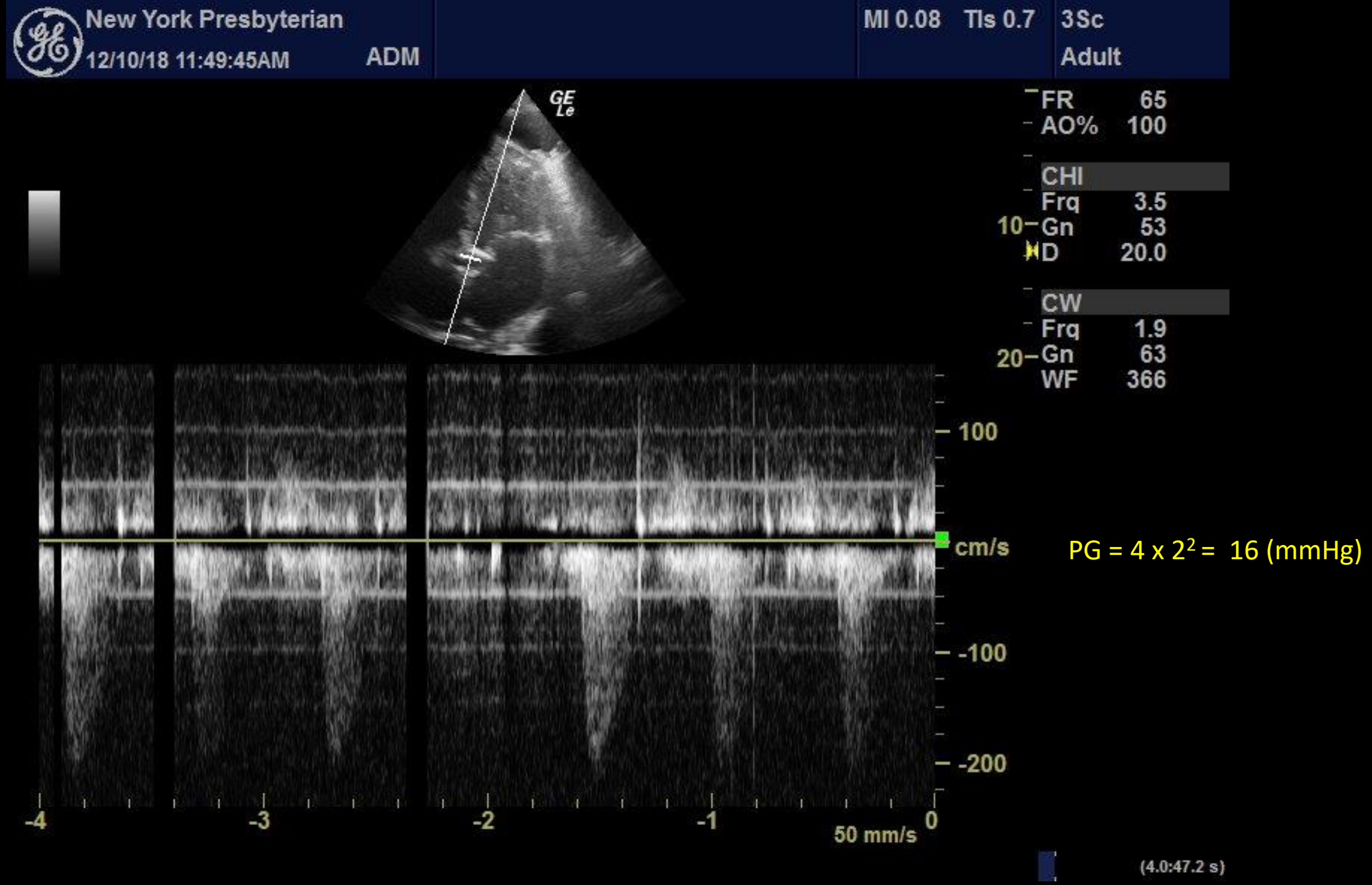
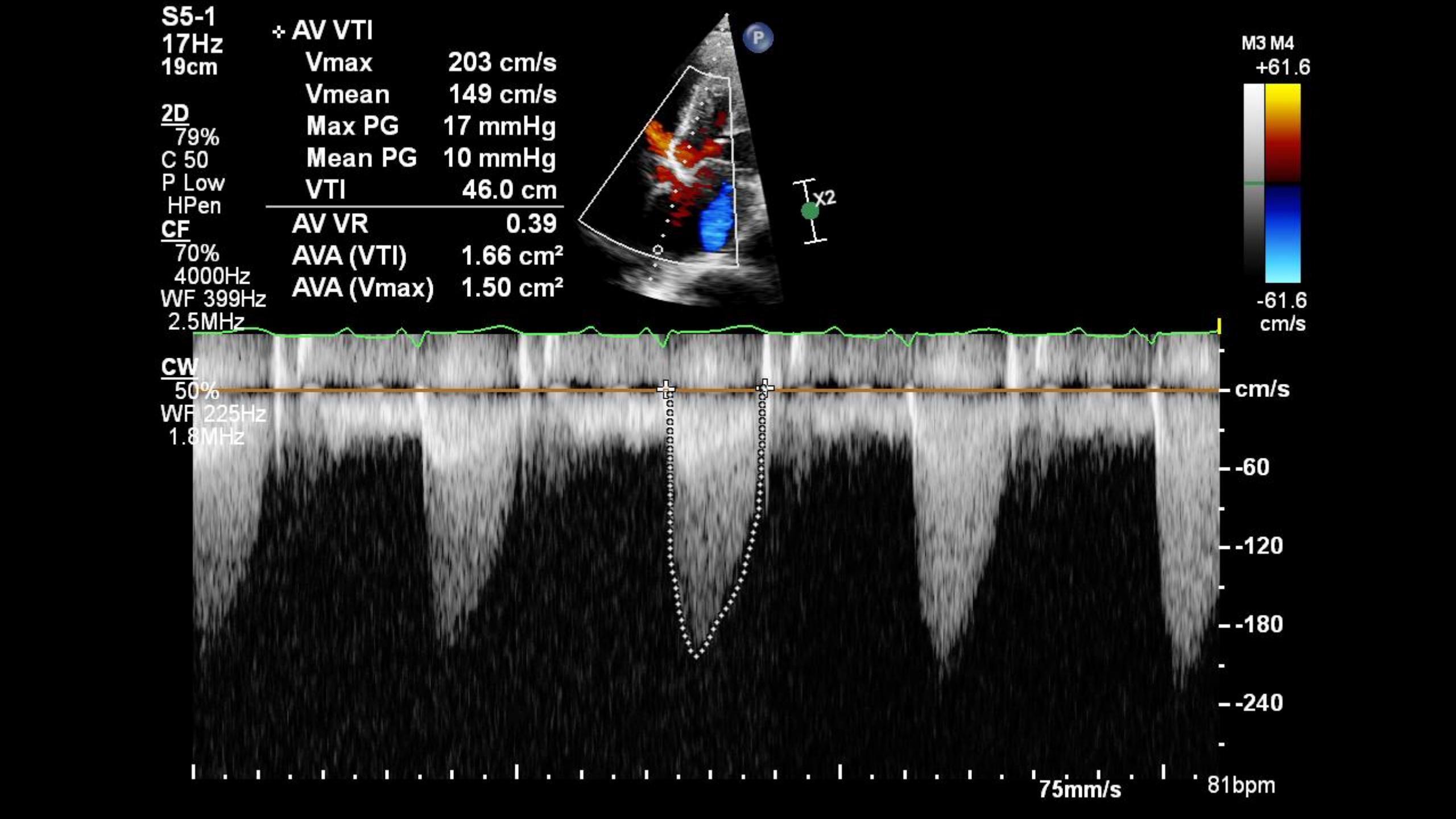
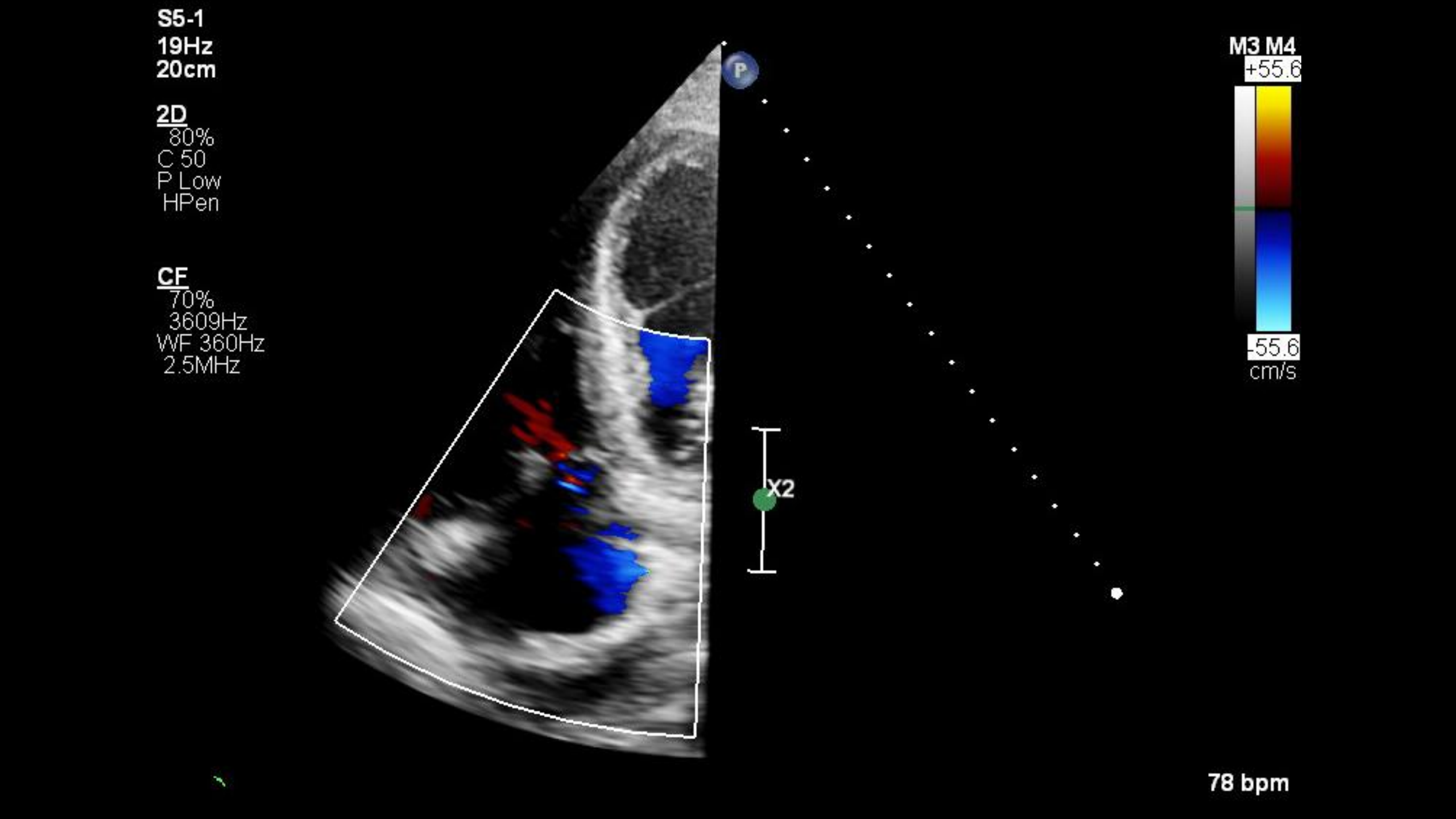
0
10
20


New York Presbyterian
12/10/18 11:49:45AM
ADM
MI 0.08
TIs 0.7
3Sc
Adult
GE
FR 65
AO% 100
CHI
Frq 3.5
Gn 53
D 20.0
CW
Frq 1.9
Gn 63
WF 366
100
cm/s
-100
-200
-4
-3
-2
-1
0
50 mm/s
(4.0:47.2 s)



PG = 4 x 2^2 = 16 (mmHg)


S5-1
17Hz
19cm
2D
79%
C 50
P Low
HPen
CF
70%
4000Hz
WF 399Hz
2.5MHz
CW
50%
WF 225Hz
1.8MHz
AV VTI
Vmax 203 cm/s
Vmean 149 cm/s
Max PG 17 mmHg
Mean PG 10 mmHg
VTI 46.0 cm
AV VR 0.39
AVA (VTI) 1.66 cm²
AVA (Vmax) 1.50 cm²
X2
M3 M4
+61.6
-61.6
cm/s
cm/s
-60
-120
-180
-240
75mm/s
81bpm


S5-1
19Hz
20cm
2D
80%
C 50
P Low
HPen
CF
70%
3609Hz
WF 360Hz
2.5MHz
M3 M4
+55.6
-55.6
cm/s
X2
78 bpm

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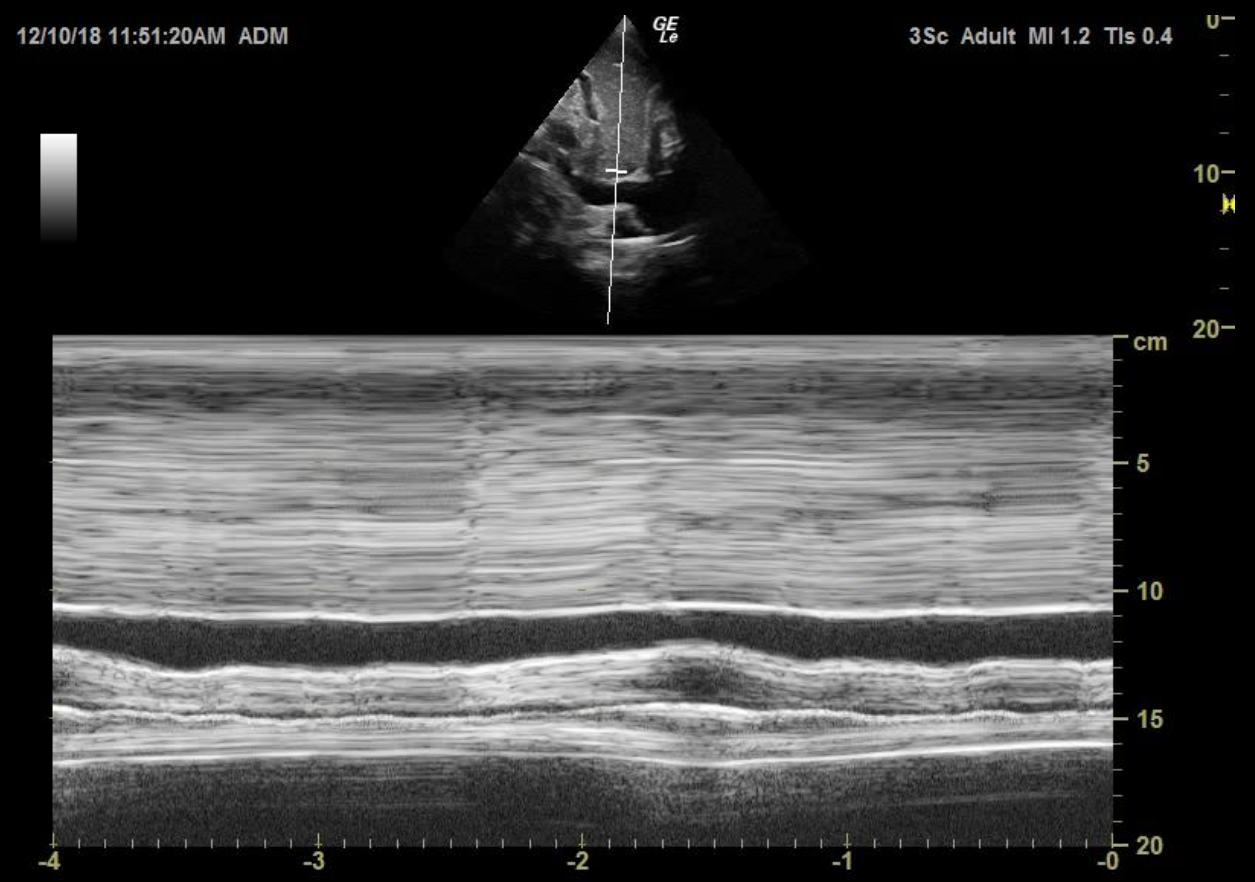
0
10
20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0
10
20
cm
5
10
15
20
-4
-3
-2
-1
-0

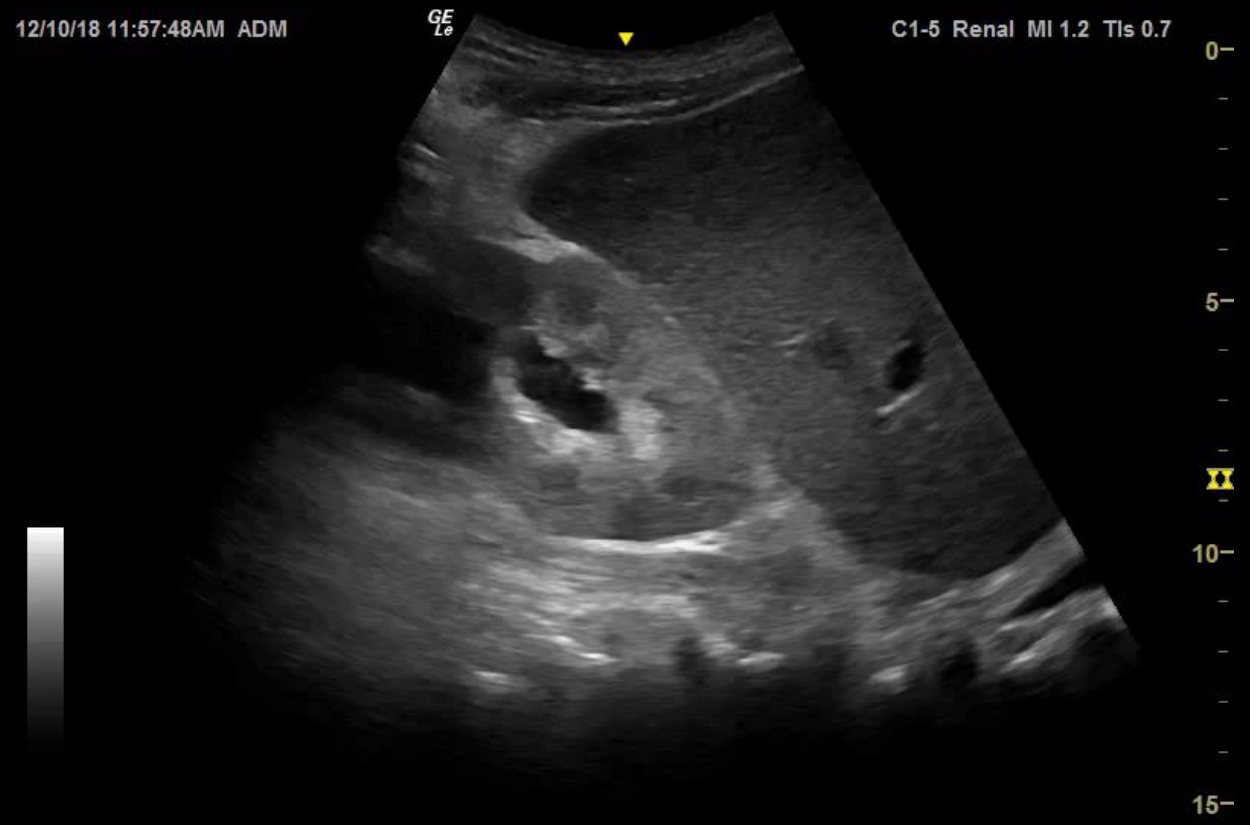
12/10/18 11:53:54AM ADM
3Sc Abdomen MI 1.2 TIs 0.3
5
10
15

12/10/18 11:58:59AM ADM
C1-5 Renal MI 1.2 TIs 0.7
0
5
10
15

12/10/18 11:52:57AM ADM
3Sc Abdomen MI 1.2 TIs 0.3
5
10
15

'18 11:53:01AM ADM
GE
Le
3Sc Abdomen MI 1.2 TIs (

12/10/18 11:56:26AM ADM
C1-5 Renal MI 1.2 TIs 0.7
0
5
10
15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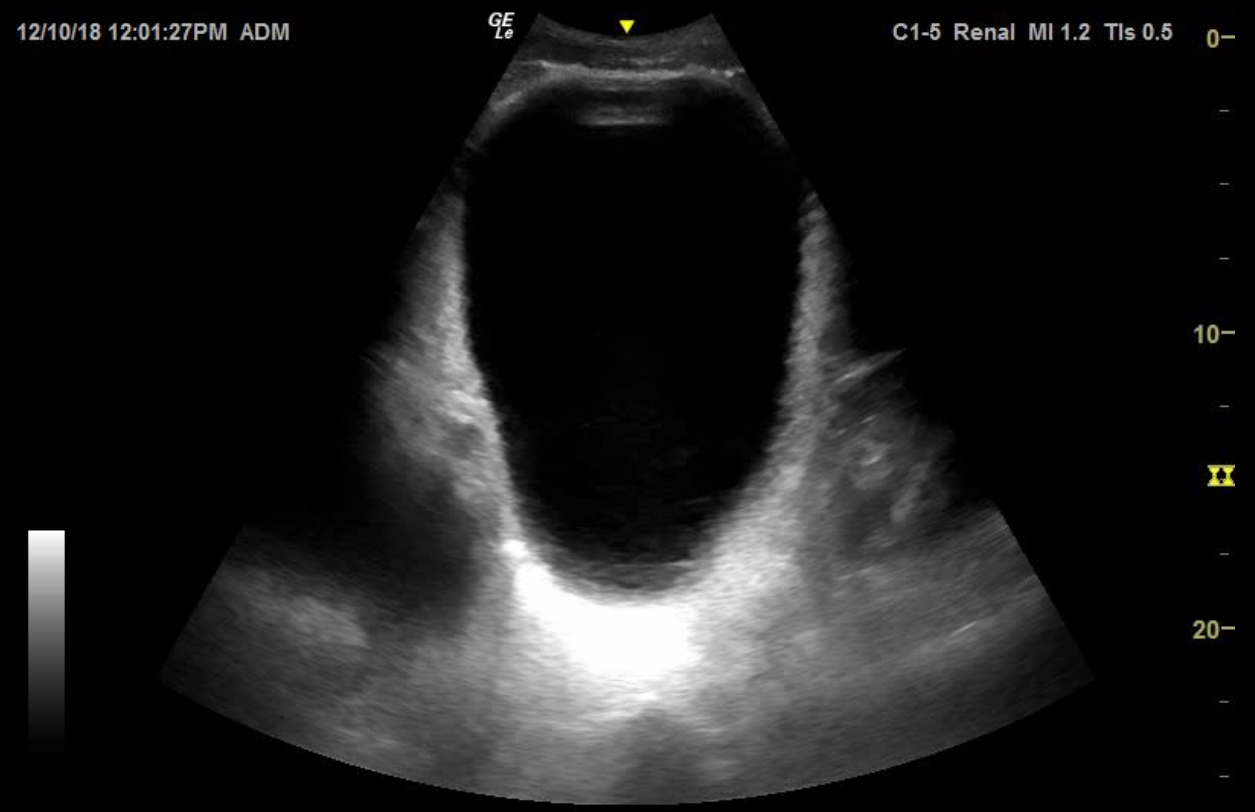
0
5
10
15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C1-5 Renal MI 1.2 TIs 0.5
0
10
20

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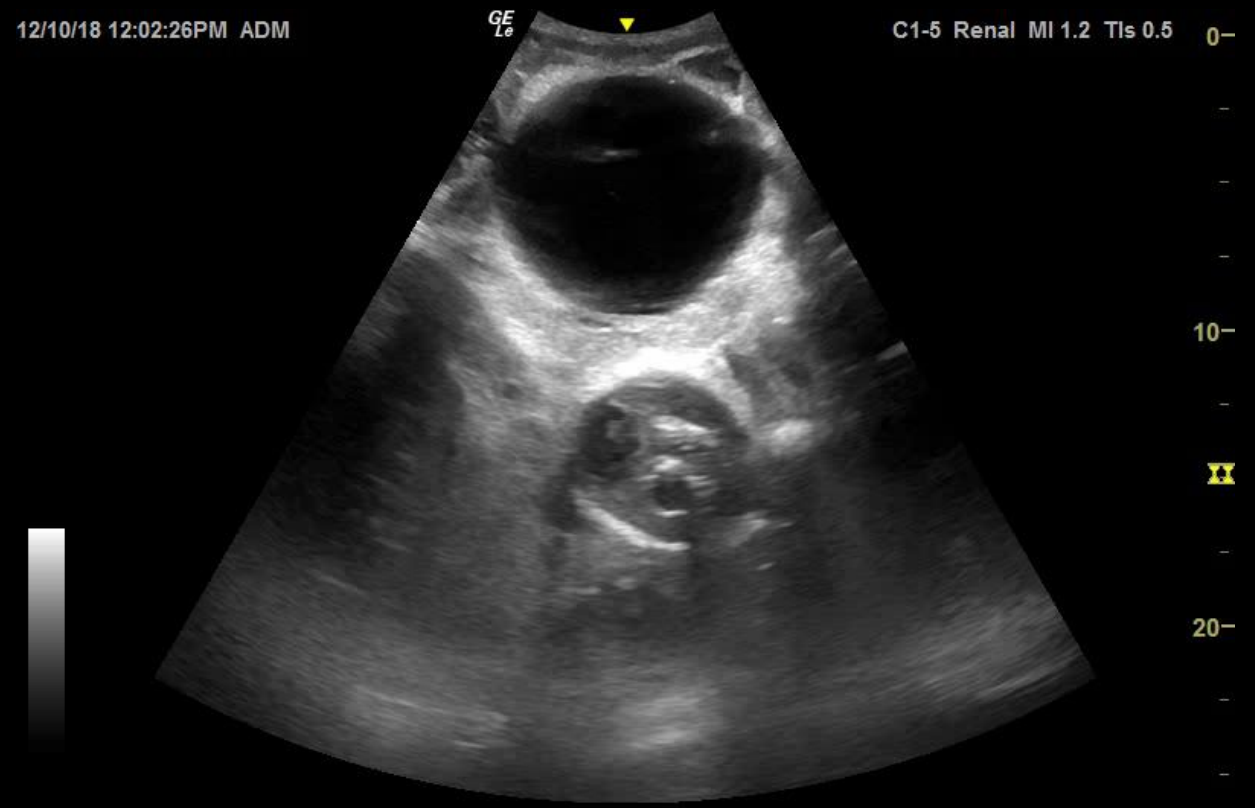
C1-5 Renal MI 1.2 TIs 0.5
0
10
20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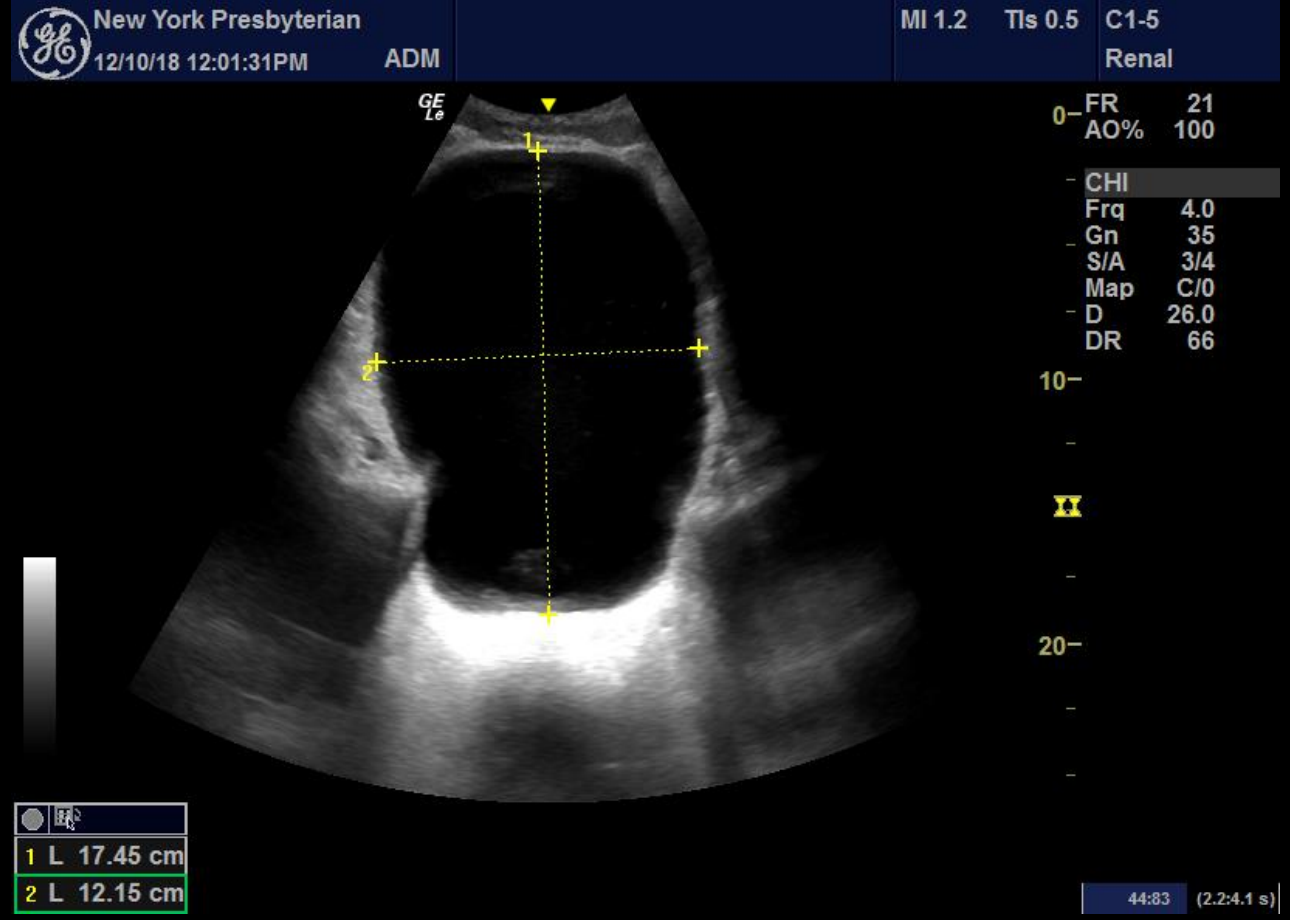
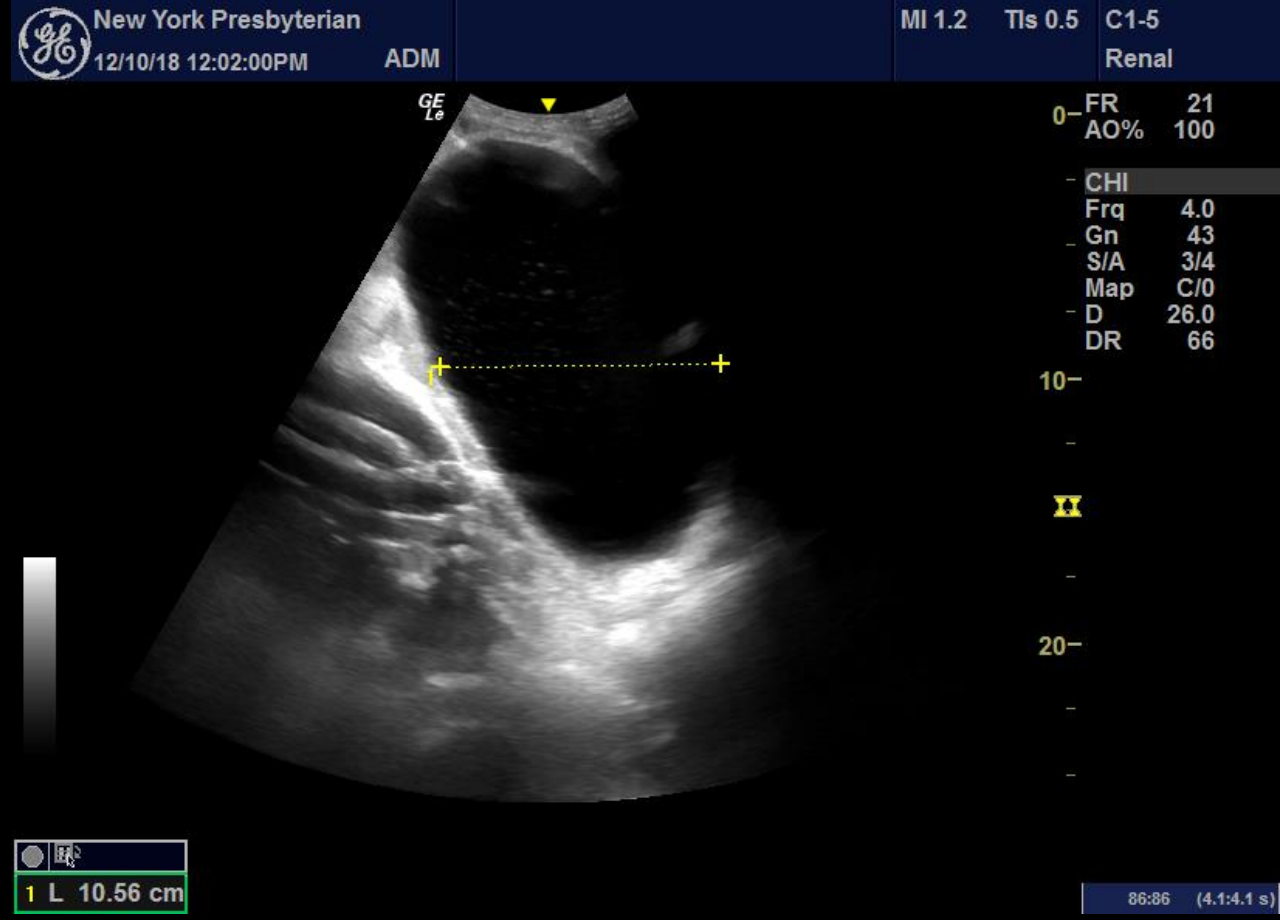
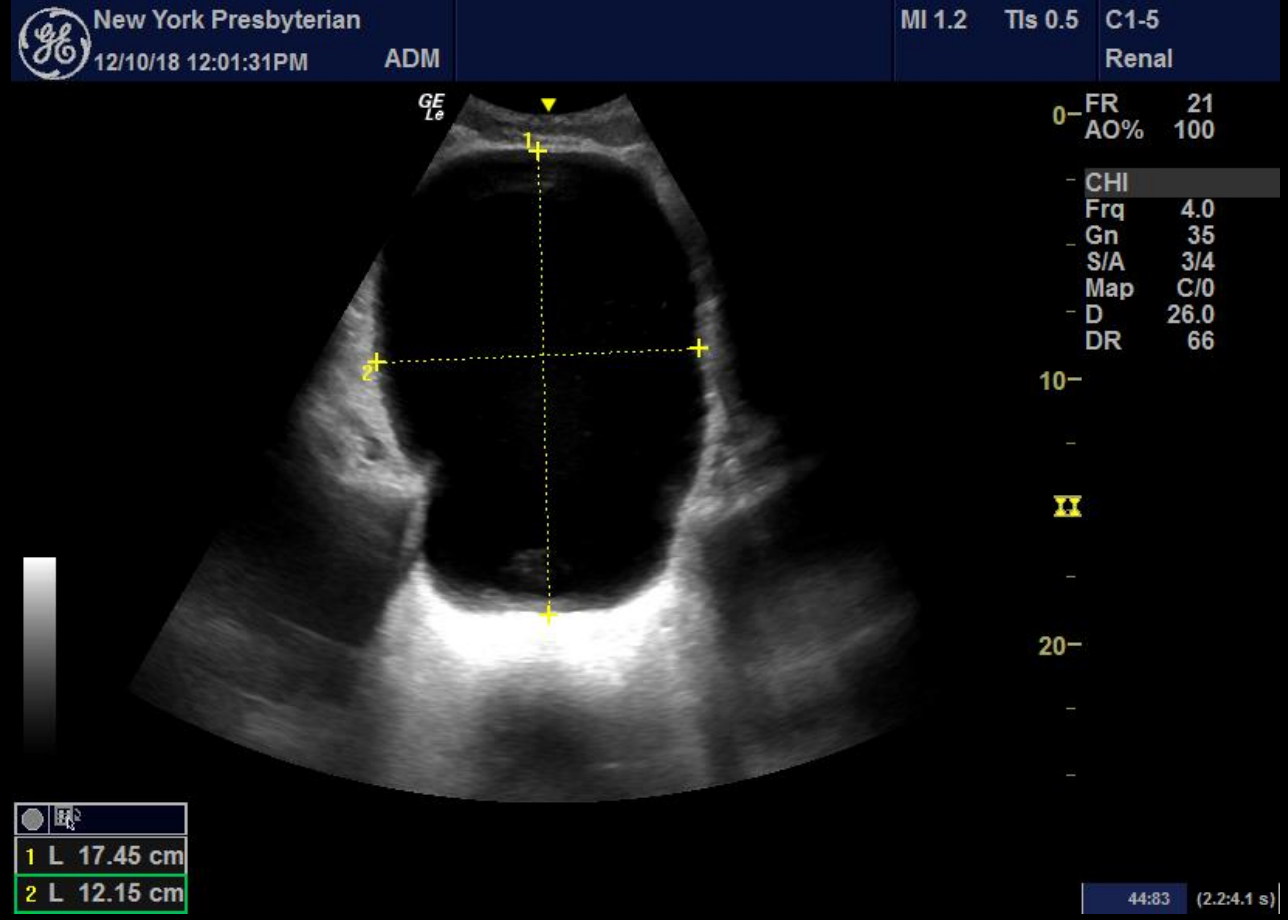
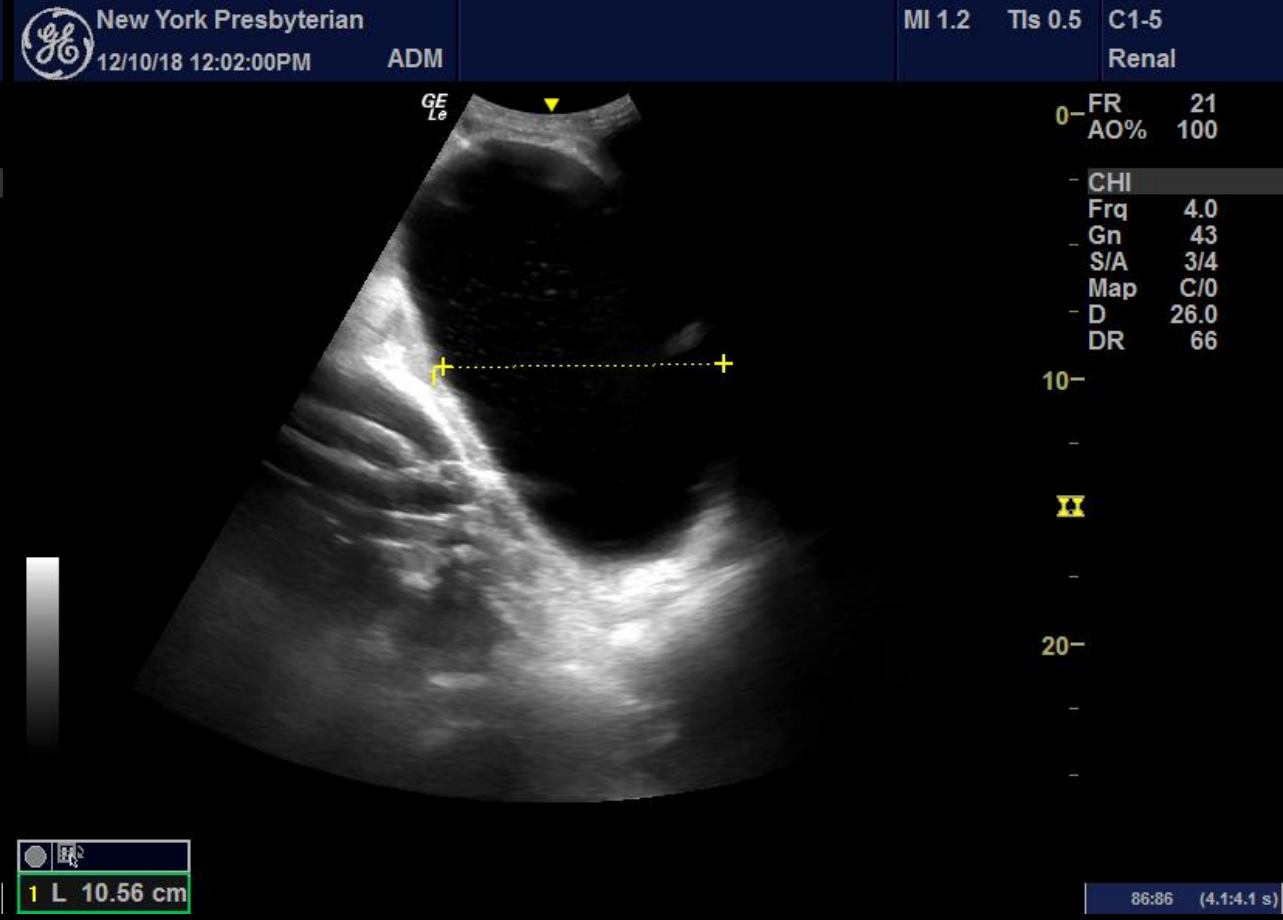
C1-5 Renal MI 1.2 TIs 0.5
0
10
20

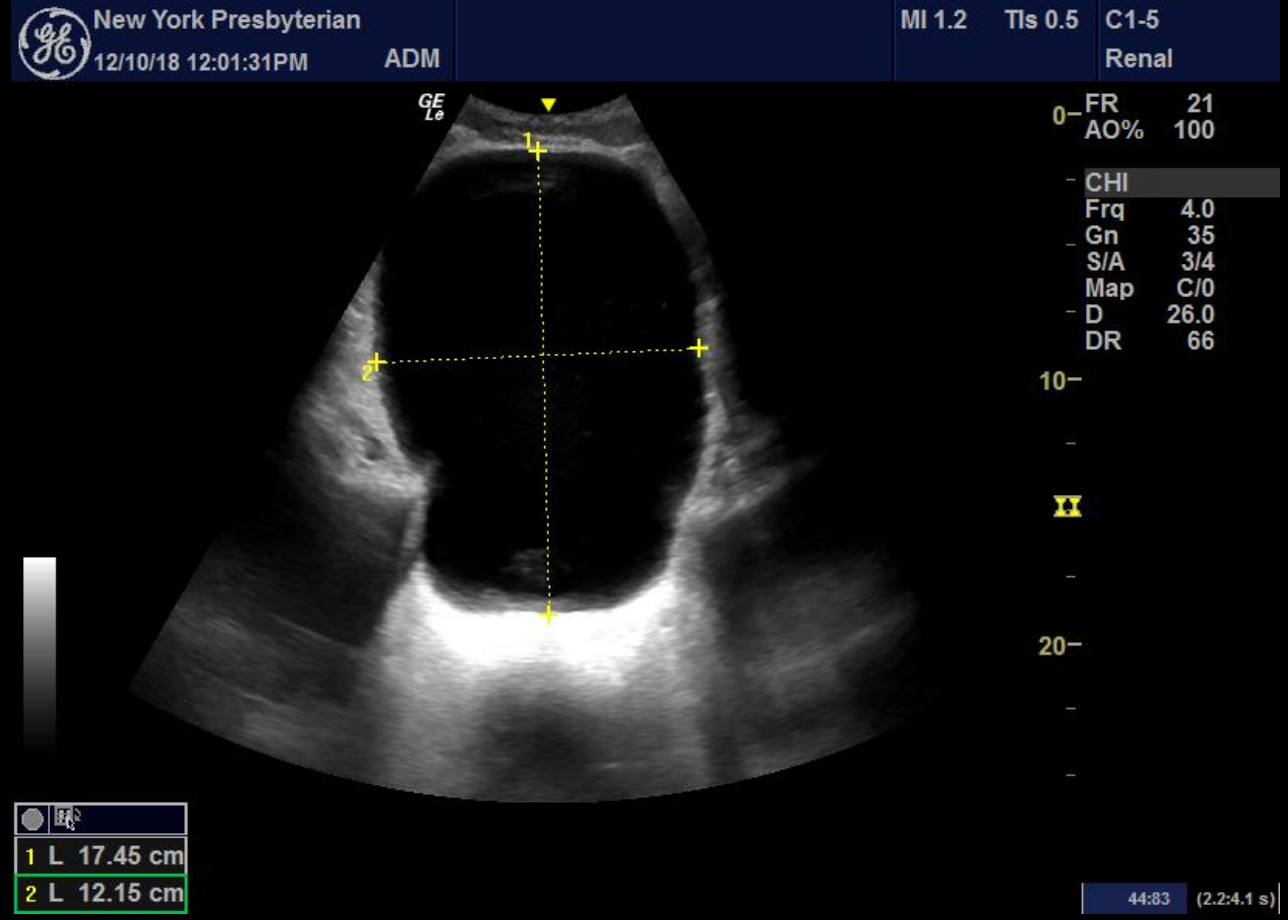

New York Presbyterian
12/10/18 12:01:31PM
ADM
MI 1.2
TIs 0.5
C1-5
Renal
FR 21
AO% 100
CHI
Frq 4.0
Gn 35
S/A 3/4
Map C/0
D 26.0
DR 66
0
10
20
1 L 17.45 cm
2 L 12.15 cm
44:83
(2.2:4.1 s)

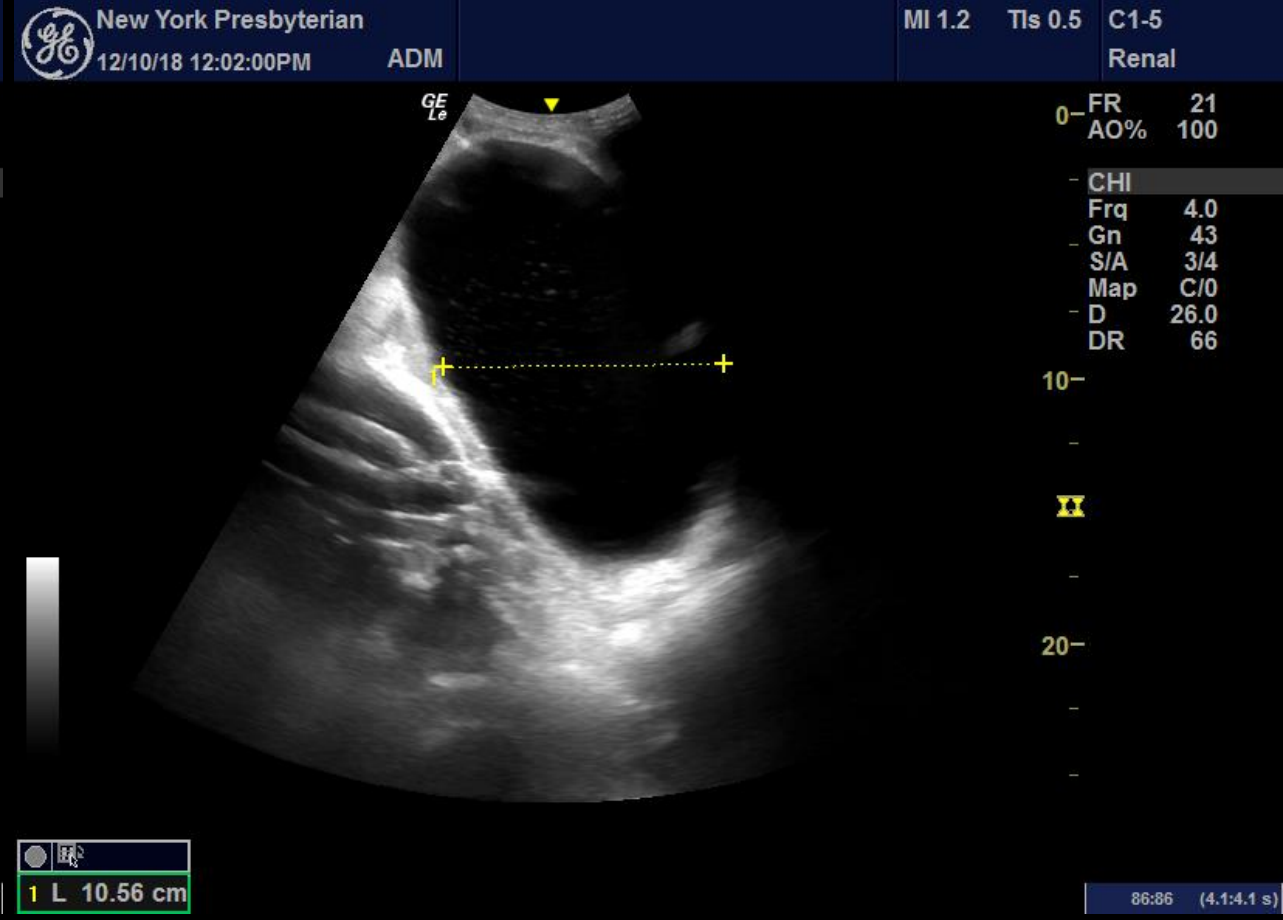

New York Presbyterian
12/10/18 12:02:00PM
ADM
MI 1.2
TIs 0.5
C1-5
Renal
FR 21
AO% 100
CHI
Frq 4.0
Gn 43
S/A 3/4
Map C/0
D 26.0
DR 66
0
10
20
1 L 10.56 cm
86:86
(4.1:4.1 s)





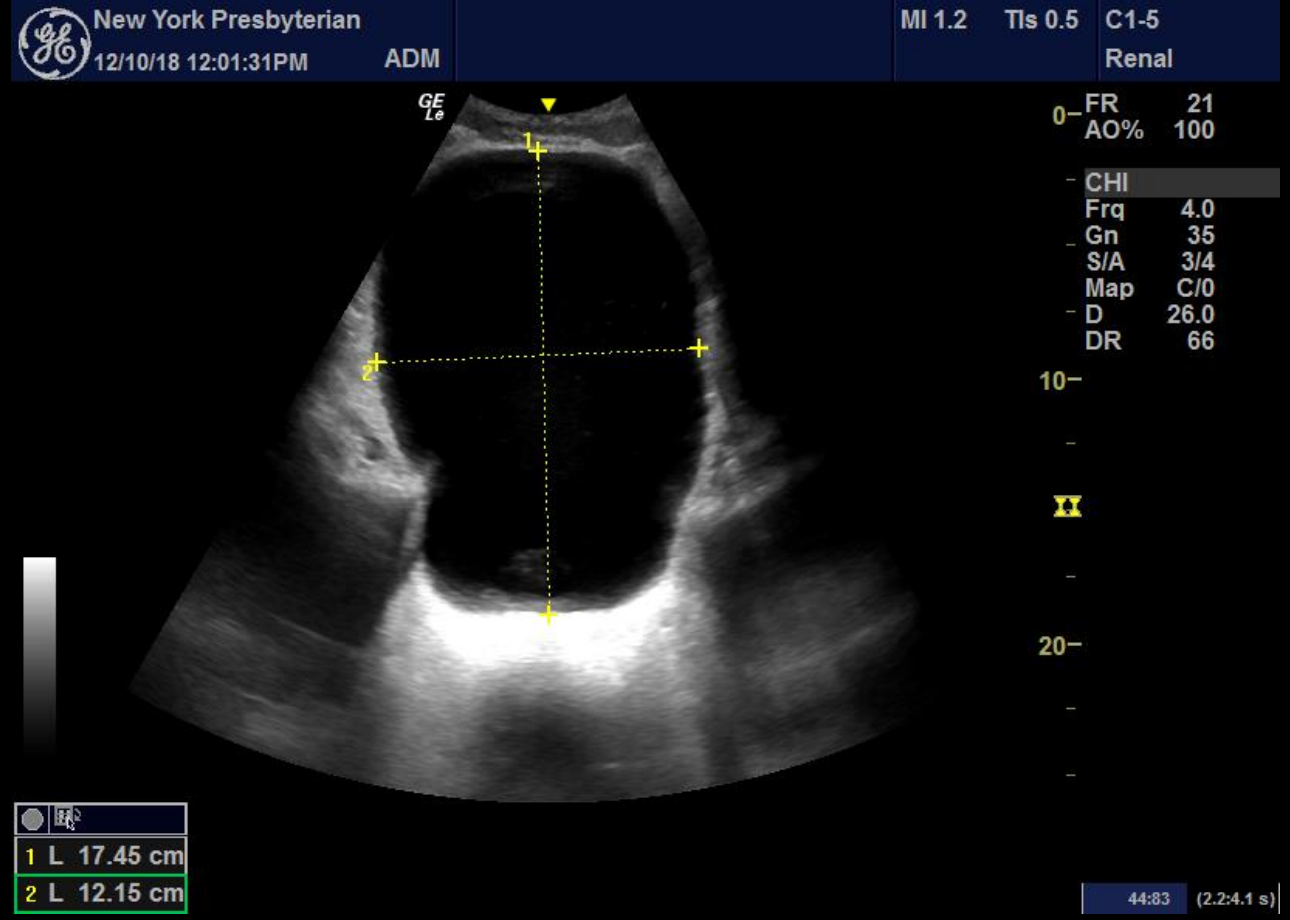
$$\text{Volume}_e = 0.5 \times W \times D \times H \approx 2{,}200 \text{ cc}$$

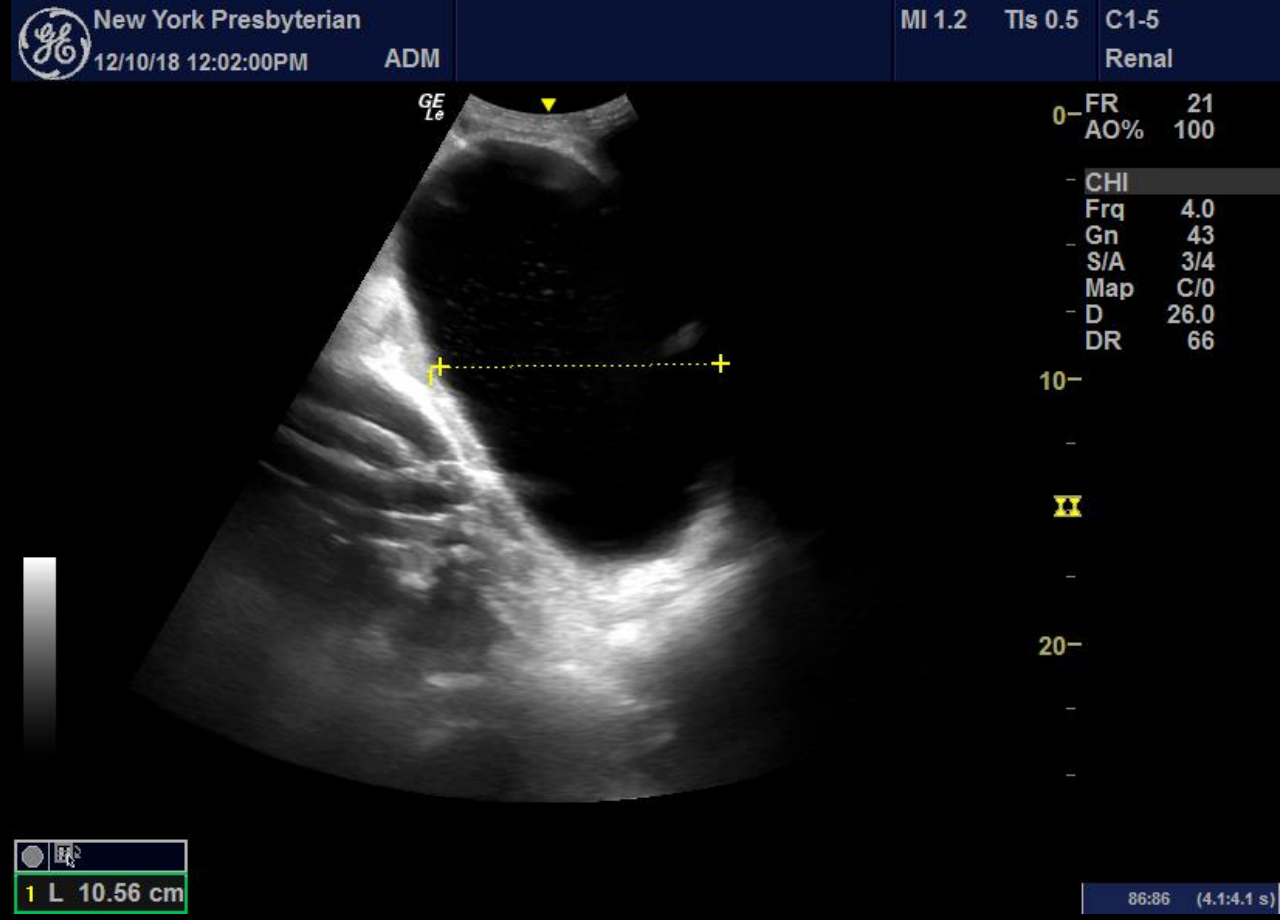




$$Volume_e = 0.5 \times W \times D \times H \approx 1{,}120 \text{ cc}$$

Foley: 1,630cc

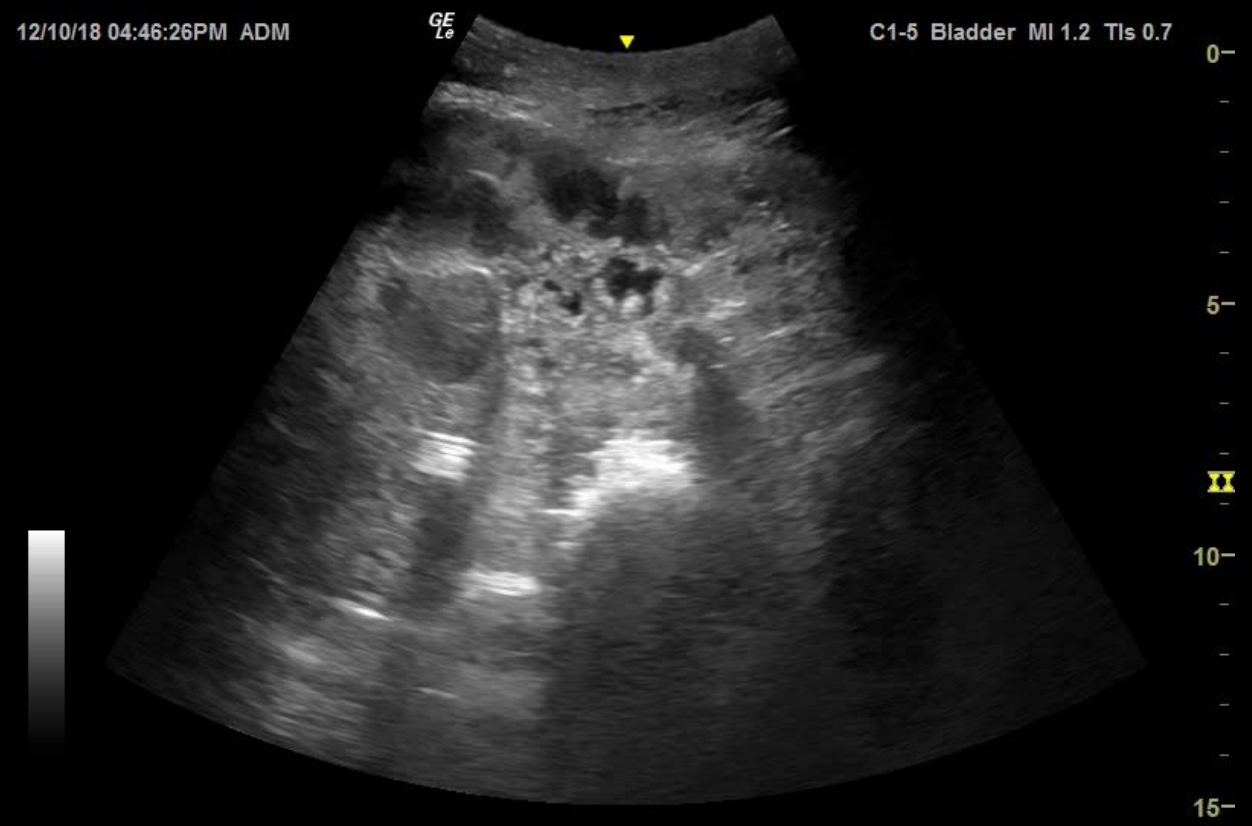




$Volume_e = 0.5 \times W \times D \times H \approx 1{,}120$ cc

Foley: 1,630cc

31% error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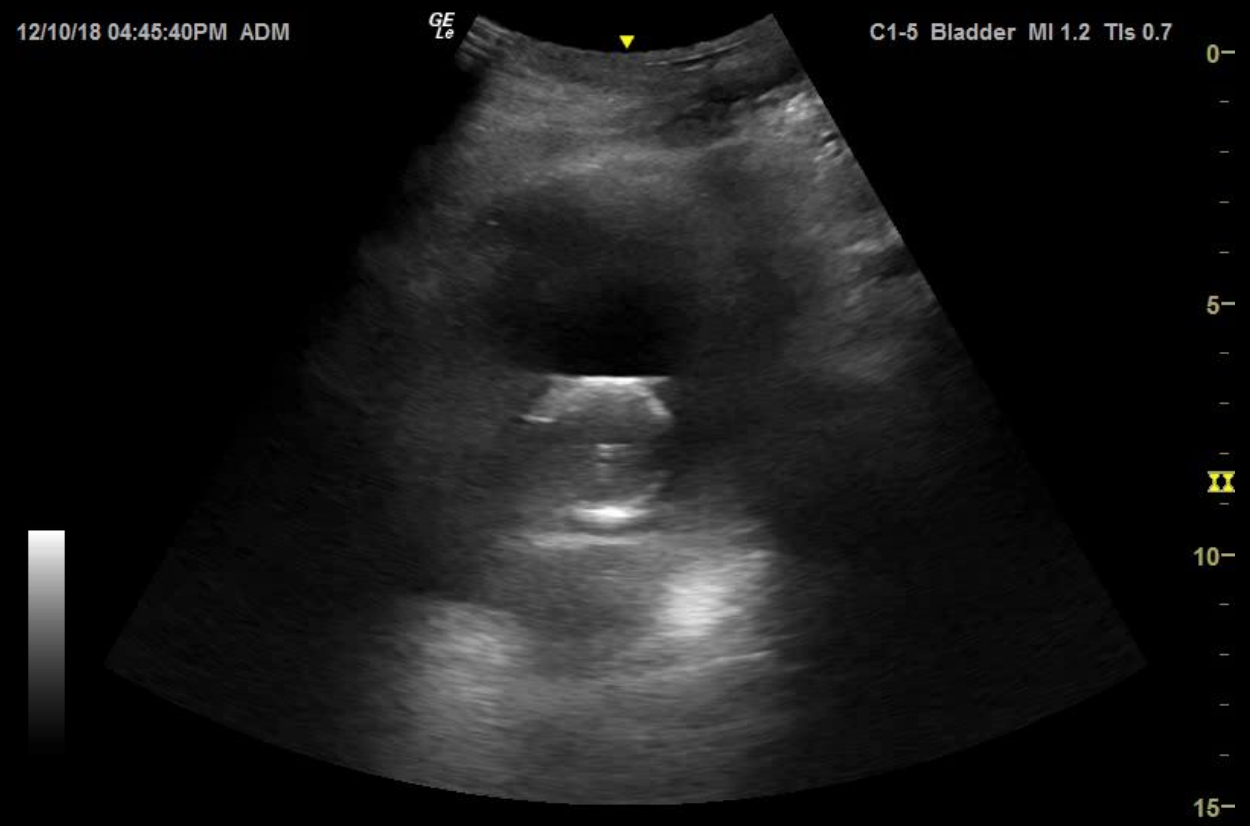
C1-5 Bladder MI 1.2 TIs 0.7
0
5
10
15


12/10/18 04:45:40PM ADM
C1-5 Bladder MI 1.2 TIs 0.7
0
5
10
15

Formulae

WCMC: $V = W \times L \times H \times 0.52$ (prolate ellipsoid)

error:

25% (Hakenberg, O.W., et al. J Urol 1983;130:249-51)

"with in 25%" (Dicuio, M., et al., Archivio Italiano di Urologia e Andrologia 2005; 77, 1)

38% (Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6)

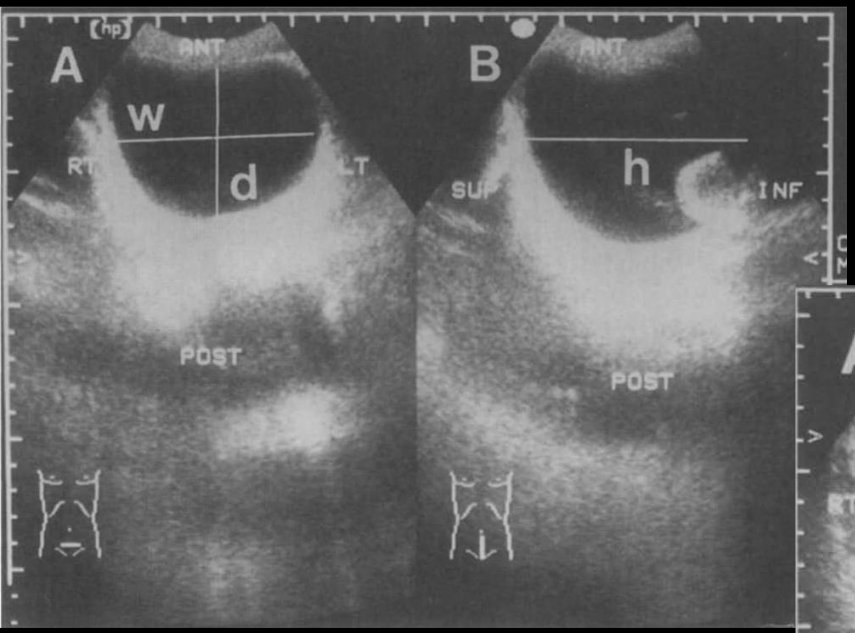
Soni: $V = W \times L \times H \times 0.75$ (Chan H. Journal of Neuroscience Nursing 1993: 25(5):309-312)

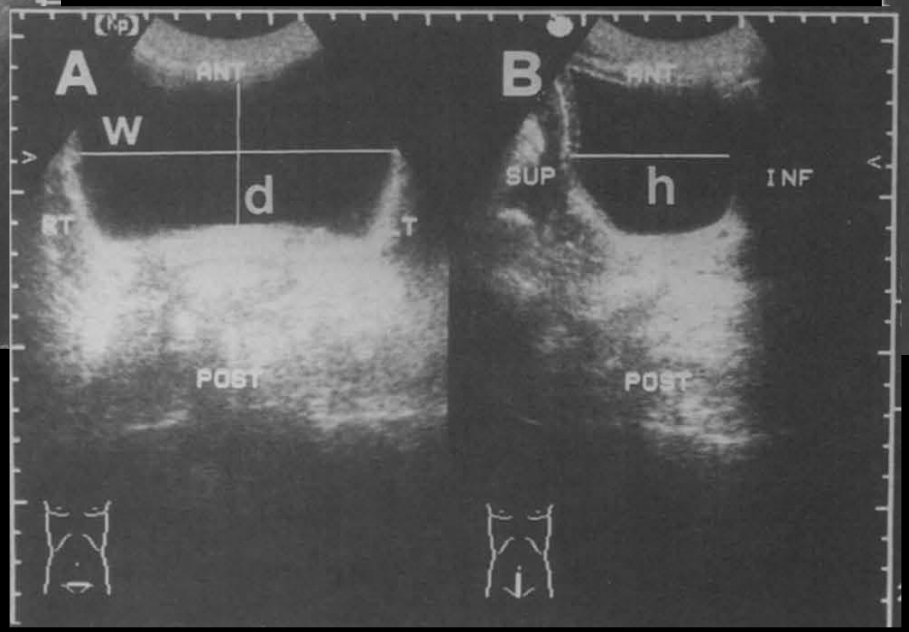
US Bladder Volume Estimation

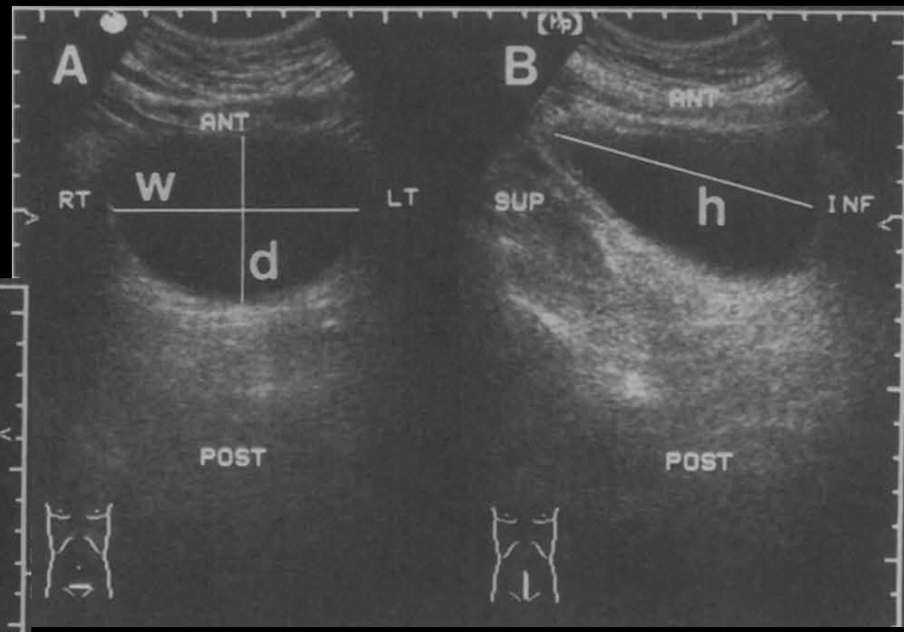
- 24 healthy volunteers + 55 spinal cord injury pts
- Prospectively tested 10 published formulas
- Overall best formula: H x D x W x 0.7. Mean error 17.4% ± 11.6%

Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

3 Bladder Geometries

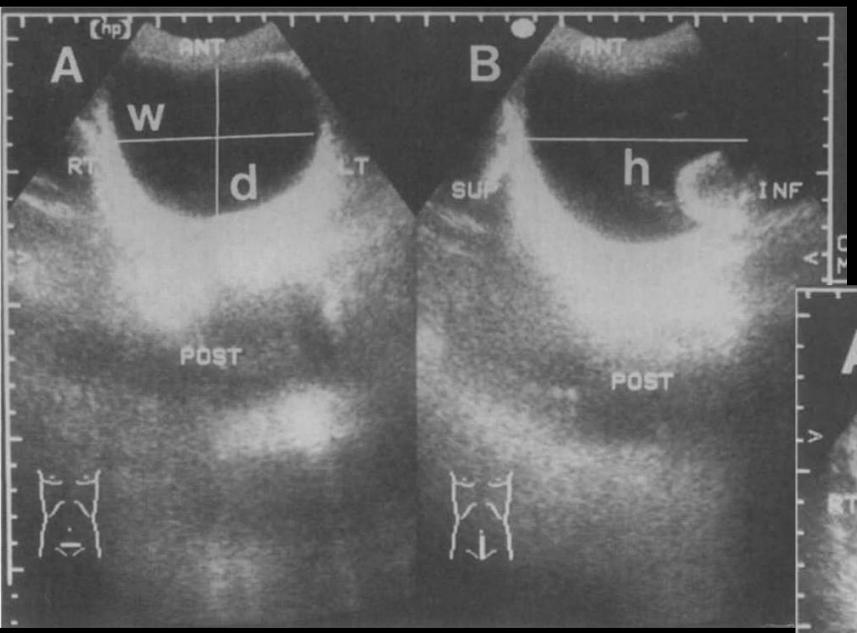




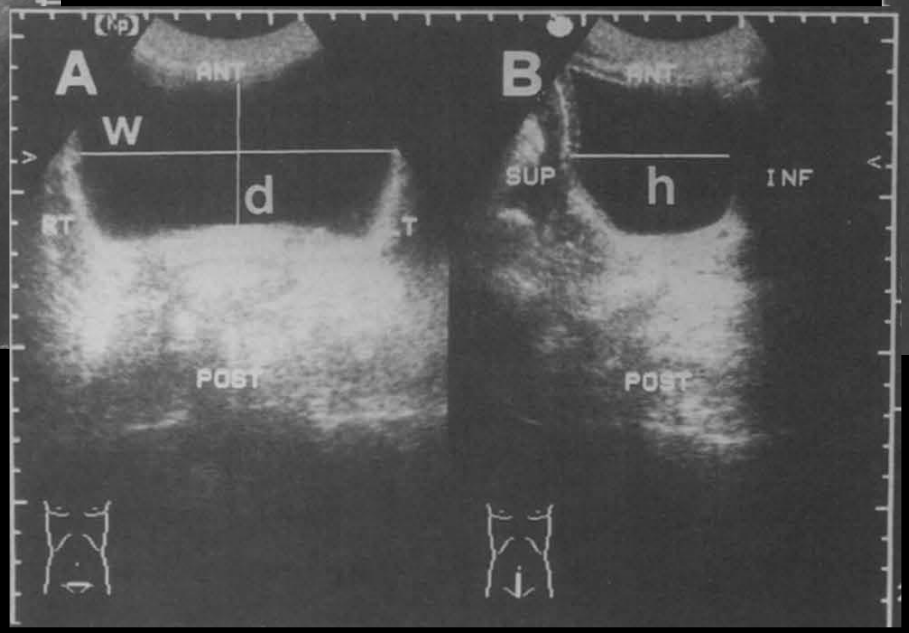


Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

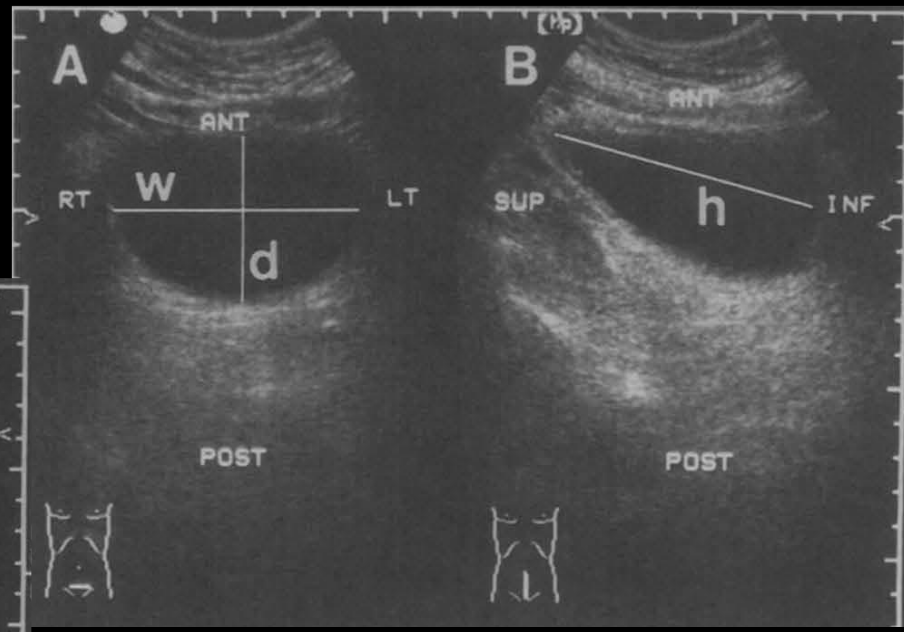
3 Bladder Geometries



"Ellipsoid"



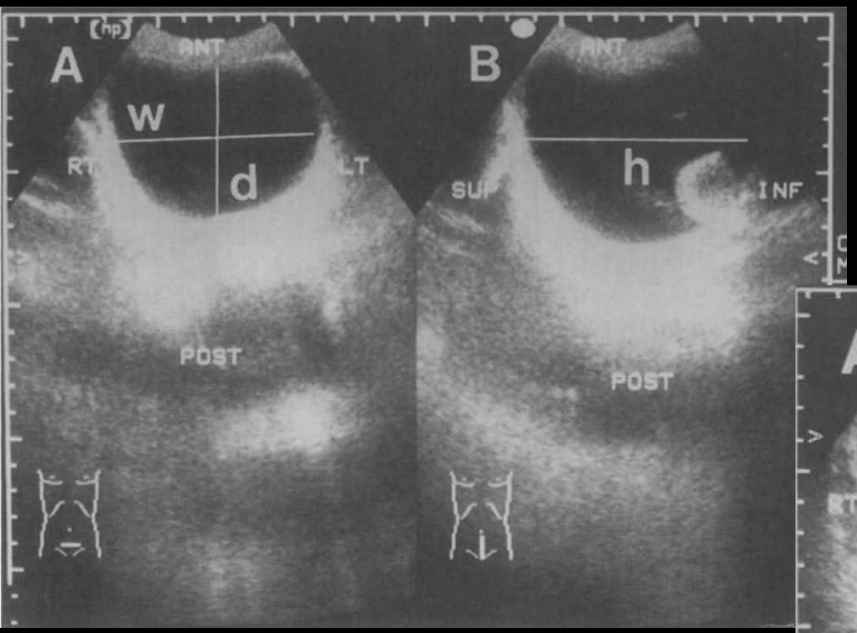
"Cuboid"



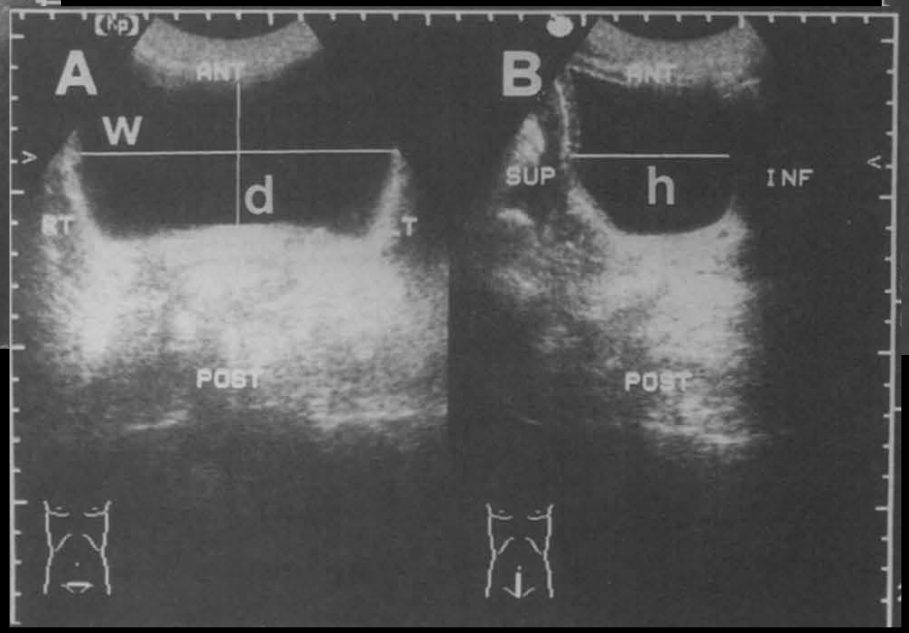
"Triangular Prism"

Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

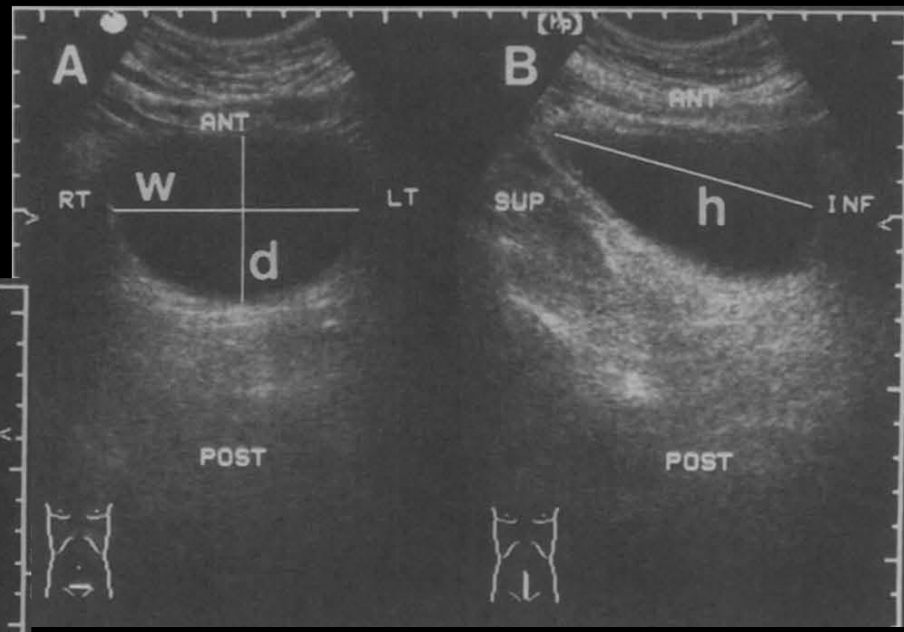
3 Bladder Geometries



"Ellipsoid"



"Cuboid"



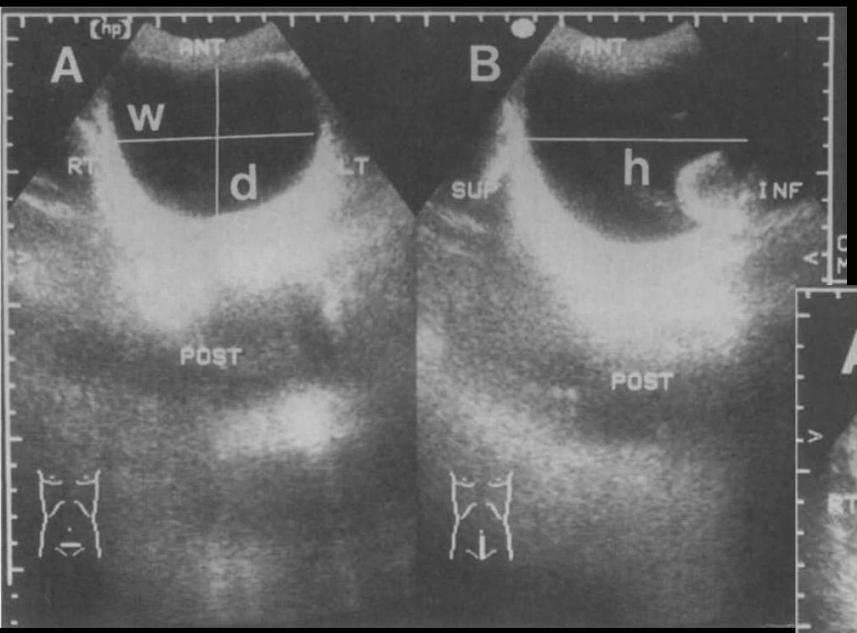
"Triangular Prism"

Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

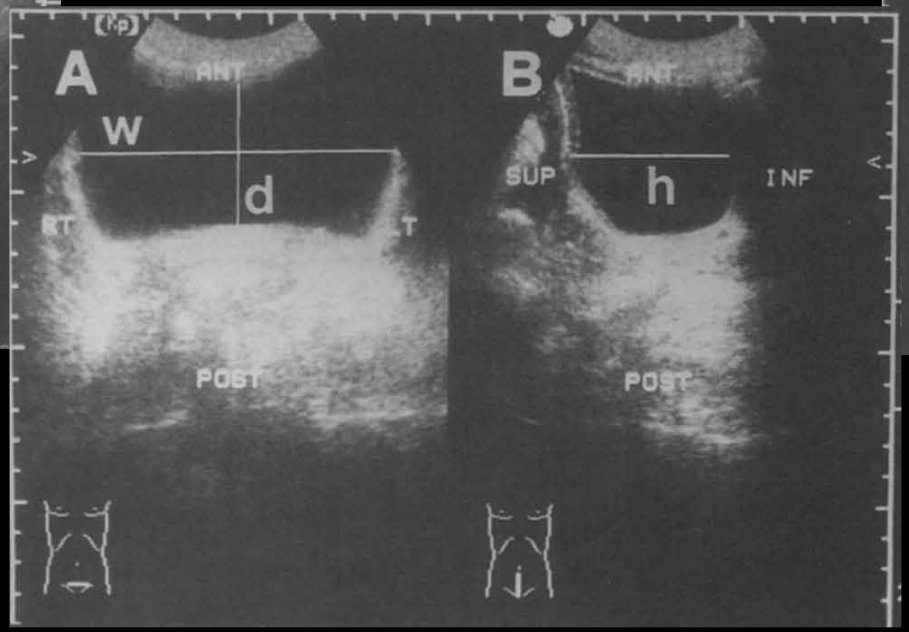
3 Bladder Geometries

1. If the bladder appeared to be four-sided on both transverse and longitudinal scans and opposite edges were parallel and similar in length, the shape was considered cuboidal.
2. If the bladder appeared to be round or elliptical on both transverse and longitudinal scans and the edges were approximately parallel in the upper or middle portion of the longitudinal scan, the shape was considered ellipsoid.
3. If the bladder appeared to be triangular or pear-shaped on the longitudinal scan and had a distinct upper tip and flat bottom, the shape was considered a triangular prism.

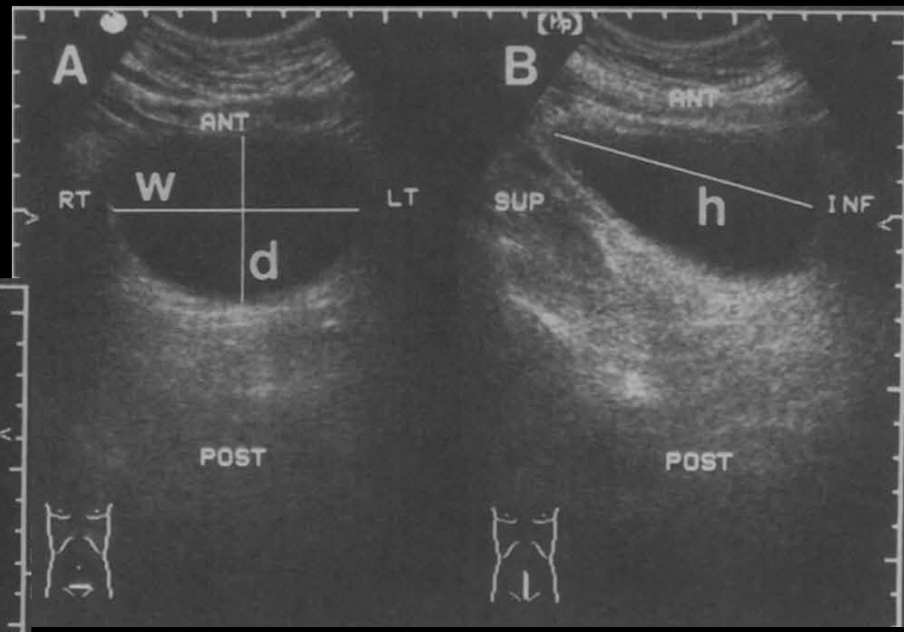
3 Bladder Geometries



"Ellipsoid"
H x D x W x 0.8



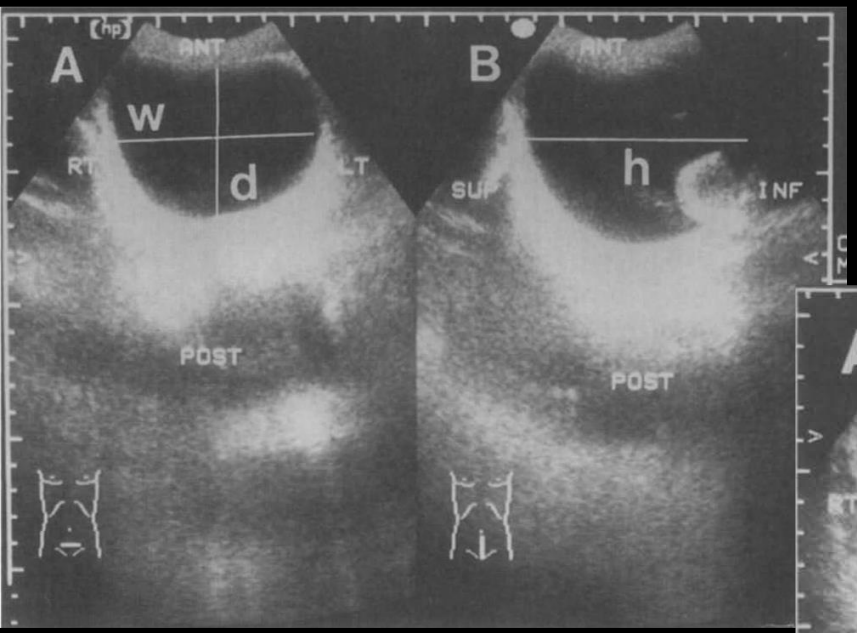
"Cuboid"
H x D x W x 0.9



"Triangular Prism"
H x D x W x 0.7

Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

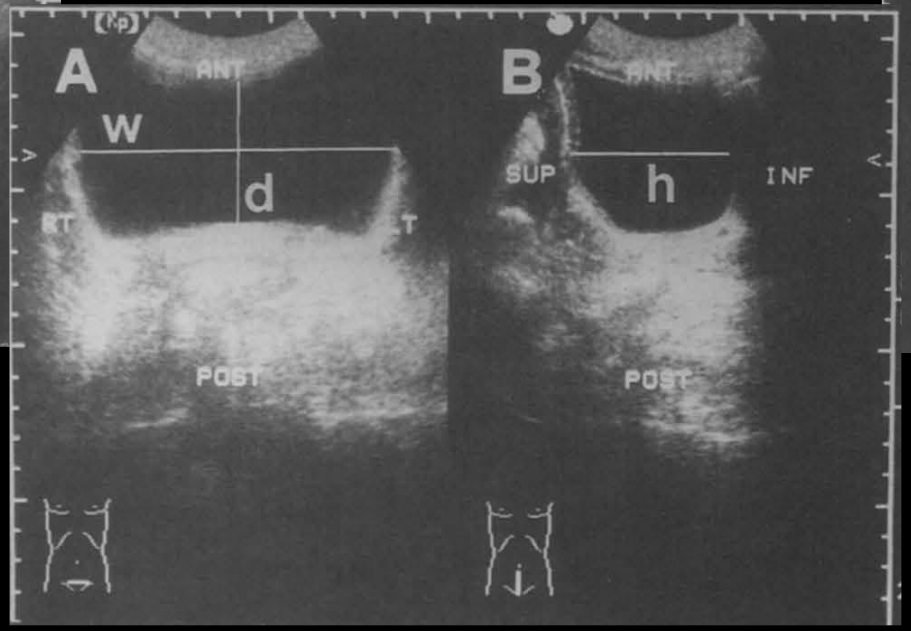
3 Bladder Geometries



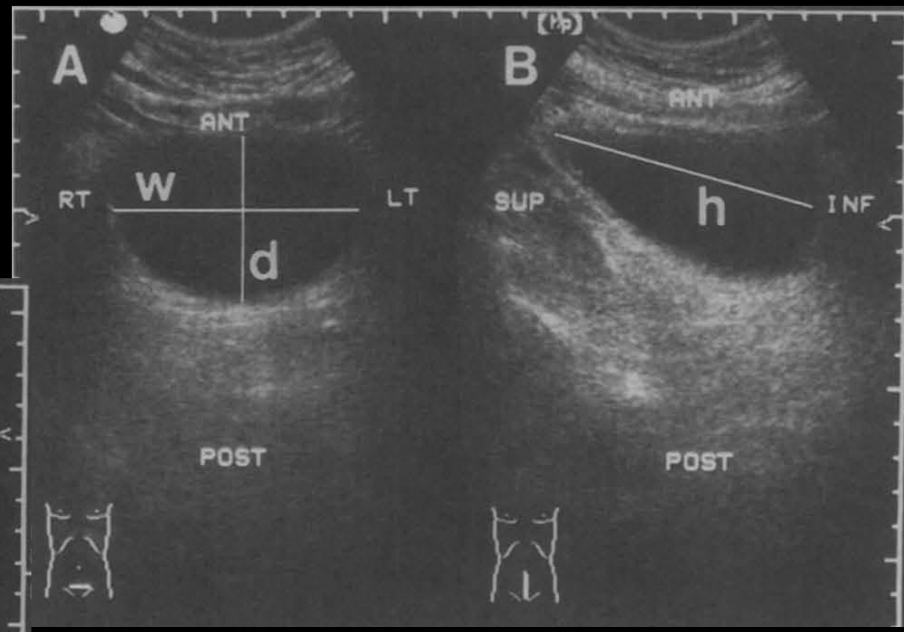
"Ellipsoid"
H x D x W x 0.8

Mean Error

17.4% ± 11.6% ⟶ 12.7% ± 10.1 %



"Cuboid"
H x D x W x 0.9

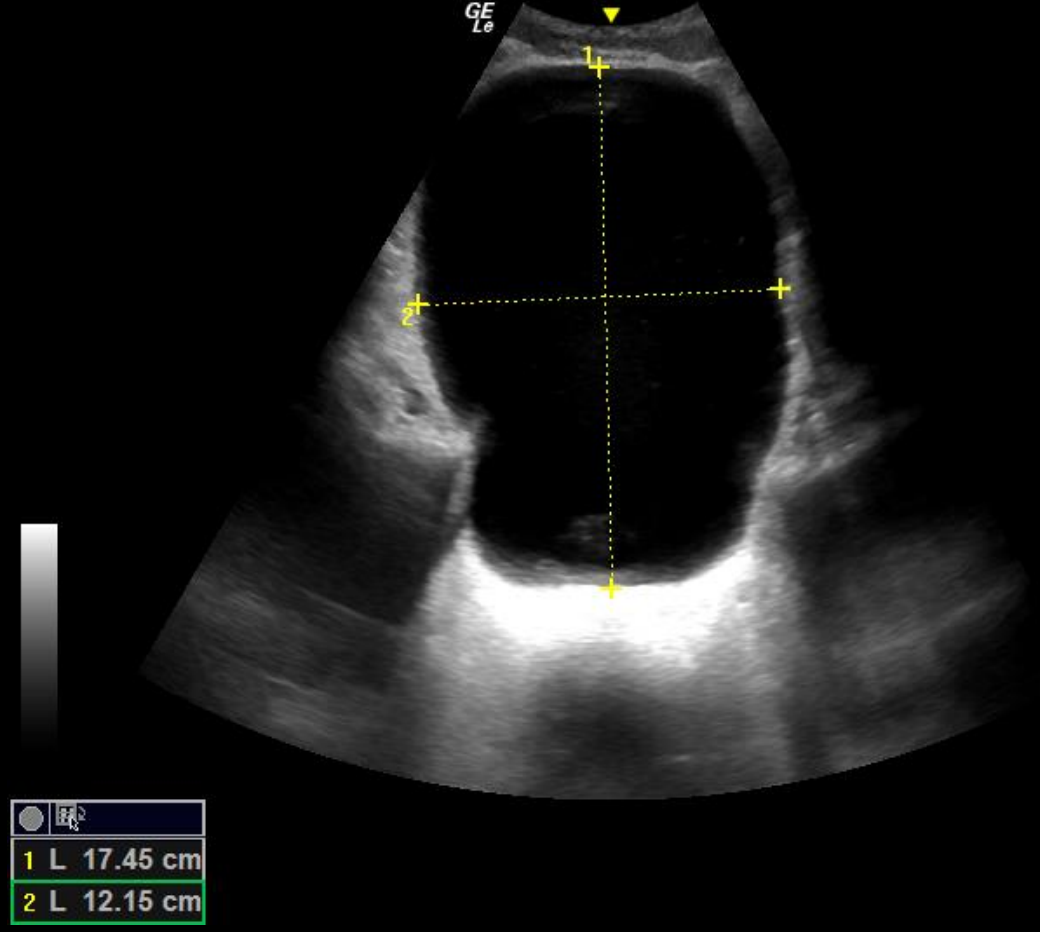


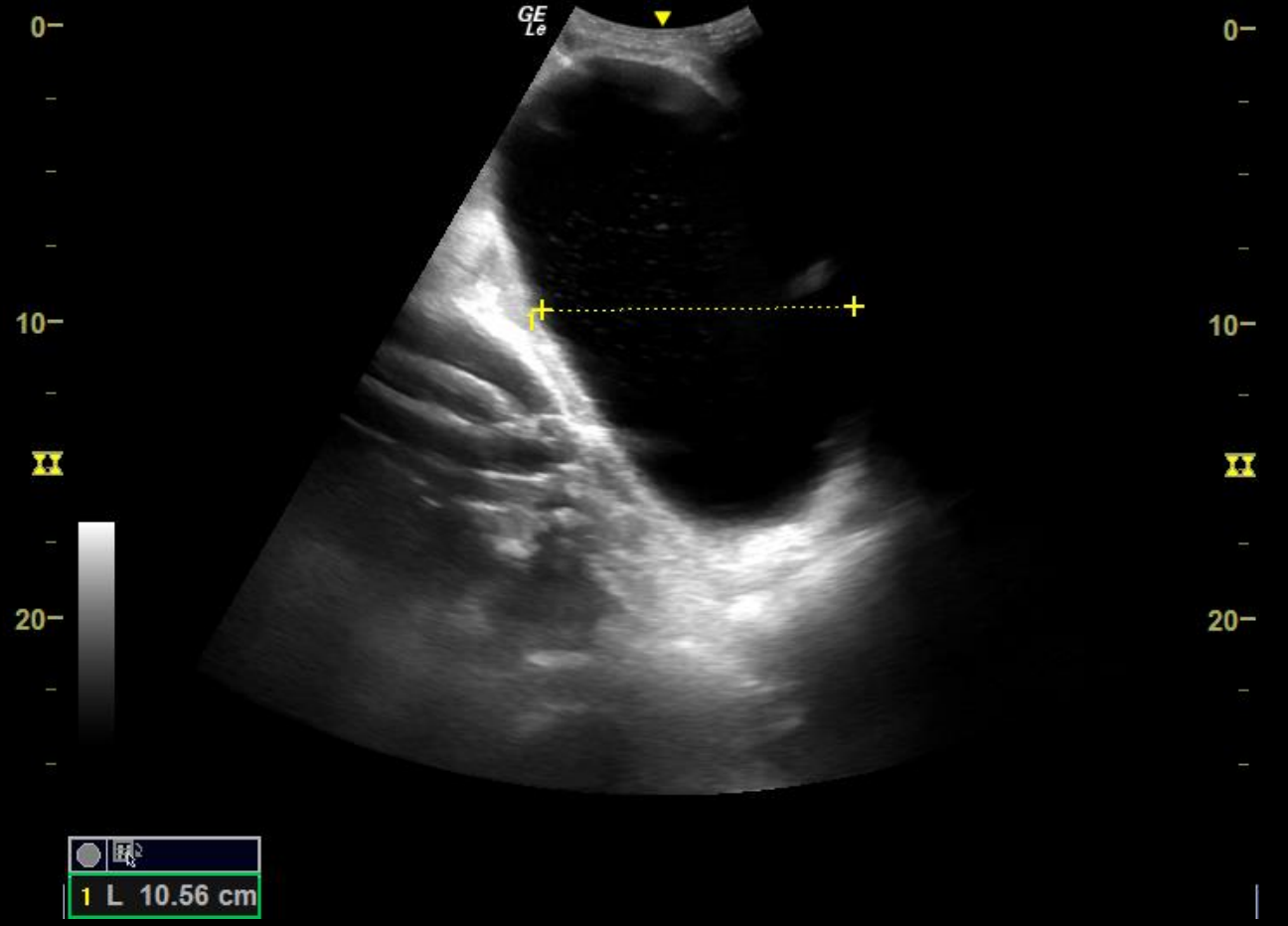
"Triangular Prism"
H x D x W x 0.7

Bih L-I., et al. Archives of Physical Medicine and Rehabilitation 1998;79:1553-6.

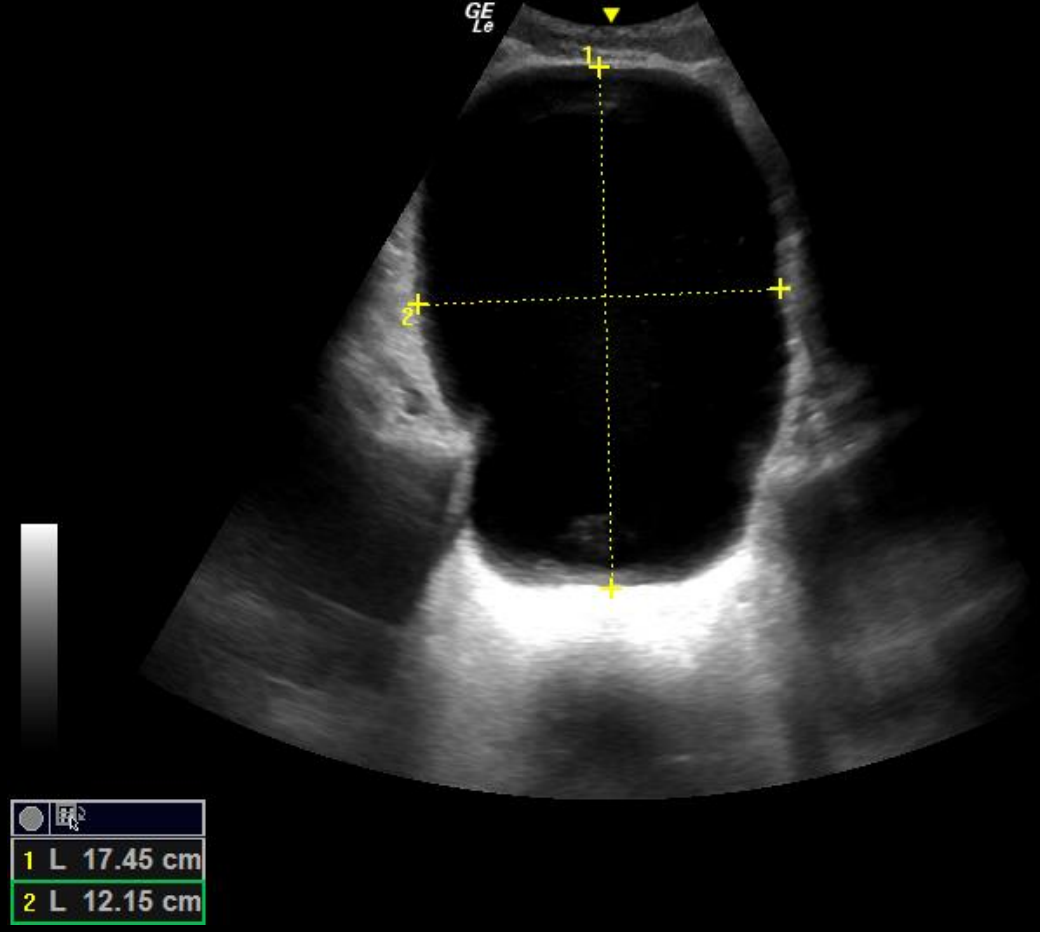
Table 2: Distribution of Bladder Shapes

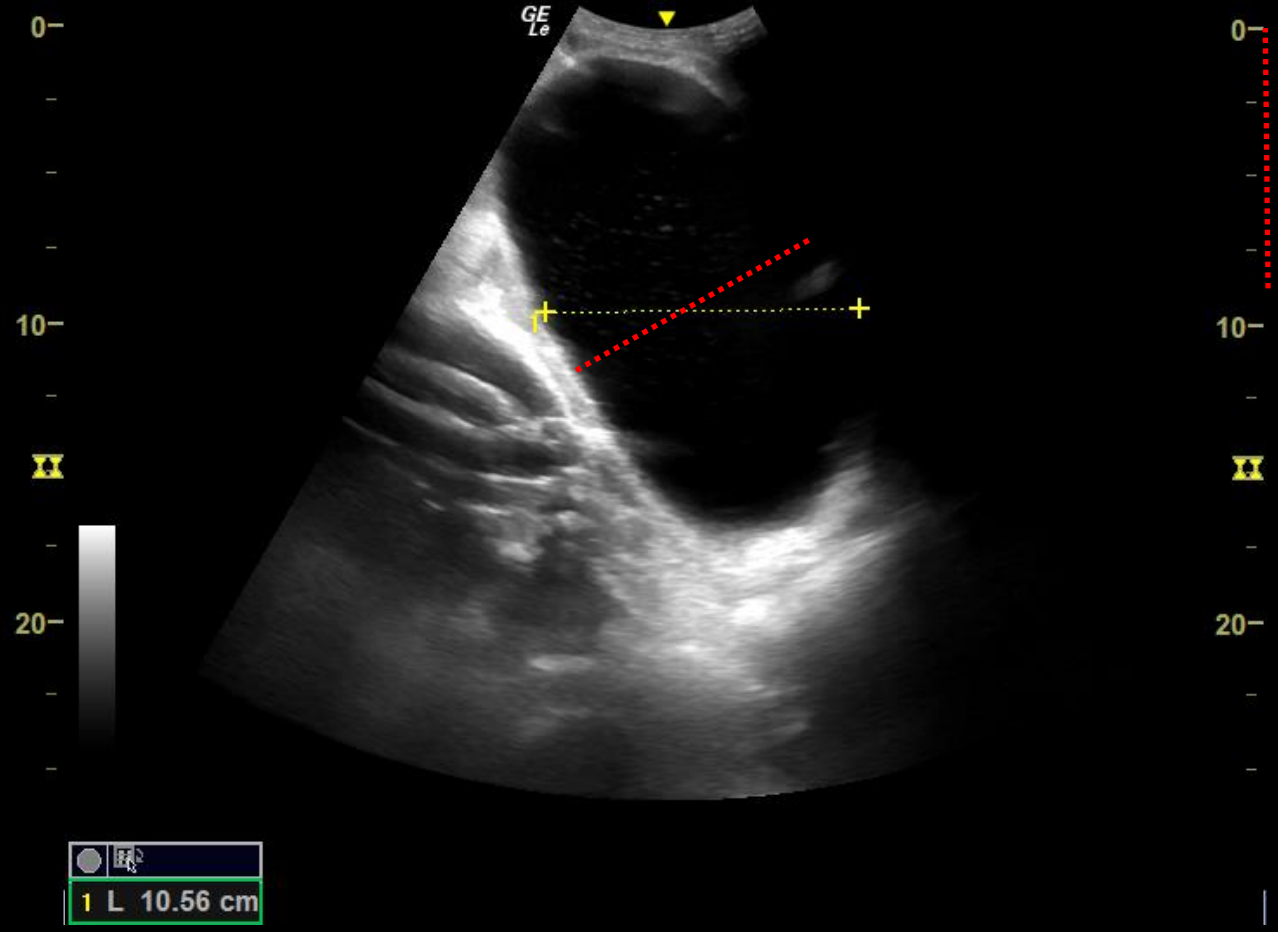
	Normal Group		SCI Group		
	Men	Women	Men	Women	
Cuboid	1 (5.9%)	10 (66.7%)	4 (7.8%)	1 (14.3%)	16 (18%)
Ellipsoid	9 (52.9%)	5 (33.3%)	20 (39.2%)	2 (28.6%)	36 (40%)
Triangular prism	7 (41.2%)	0 (0%)	27 (52.9%)	4 (57.1%)	38 (42%)
Total	17 (100%)	15 (100%)	51 (100%)	7 (100%)	90

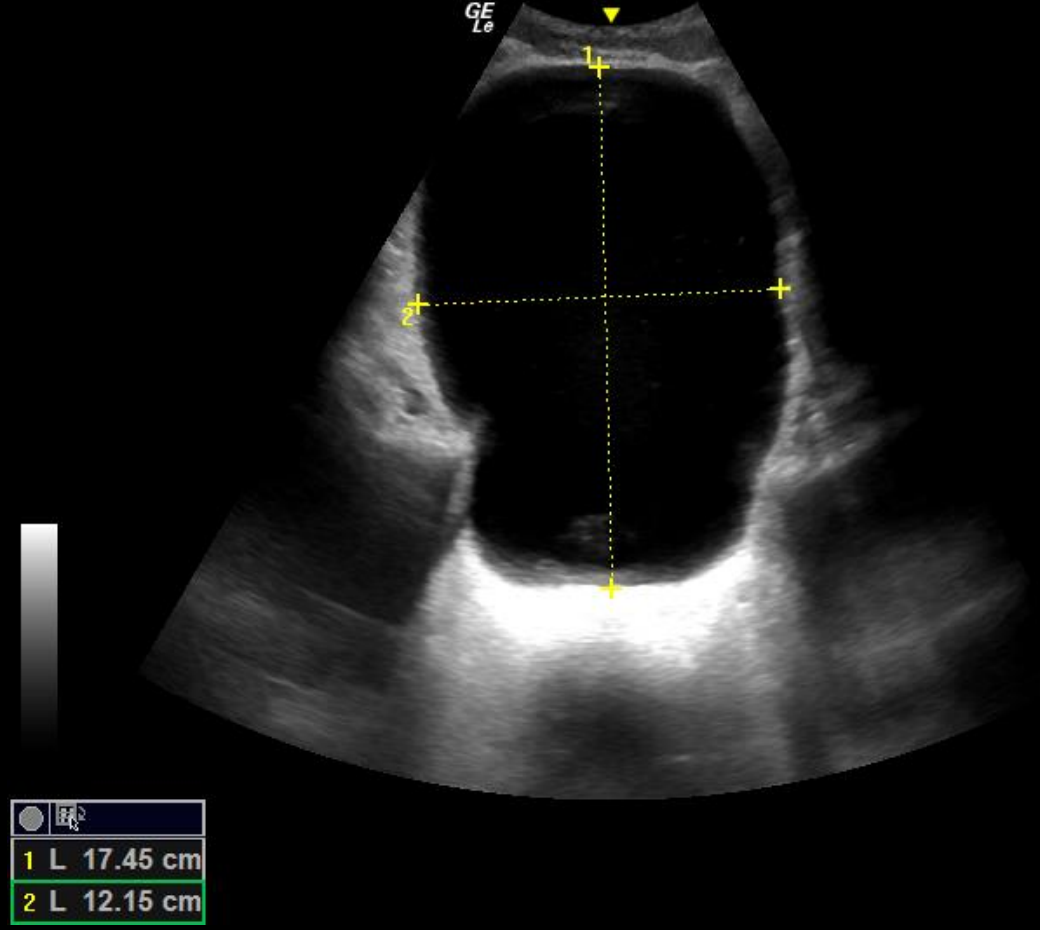


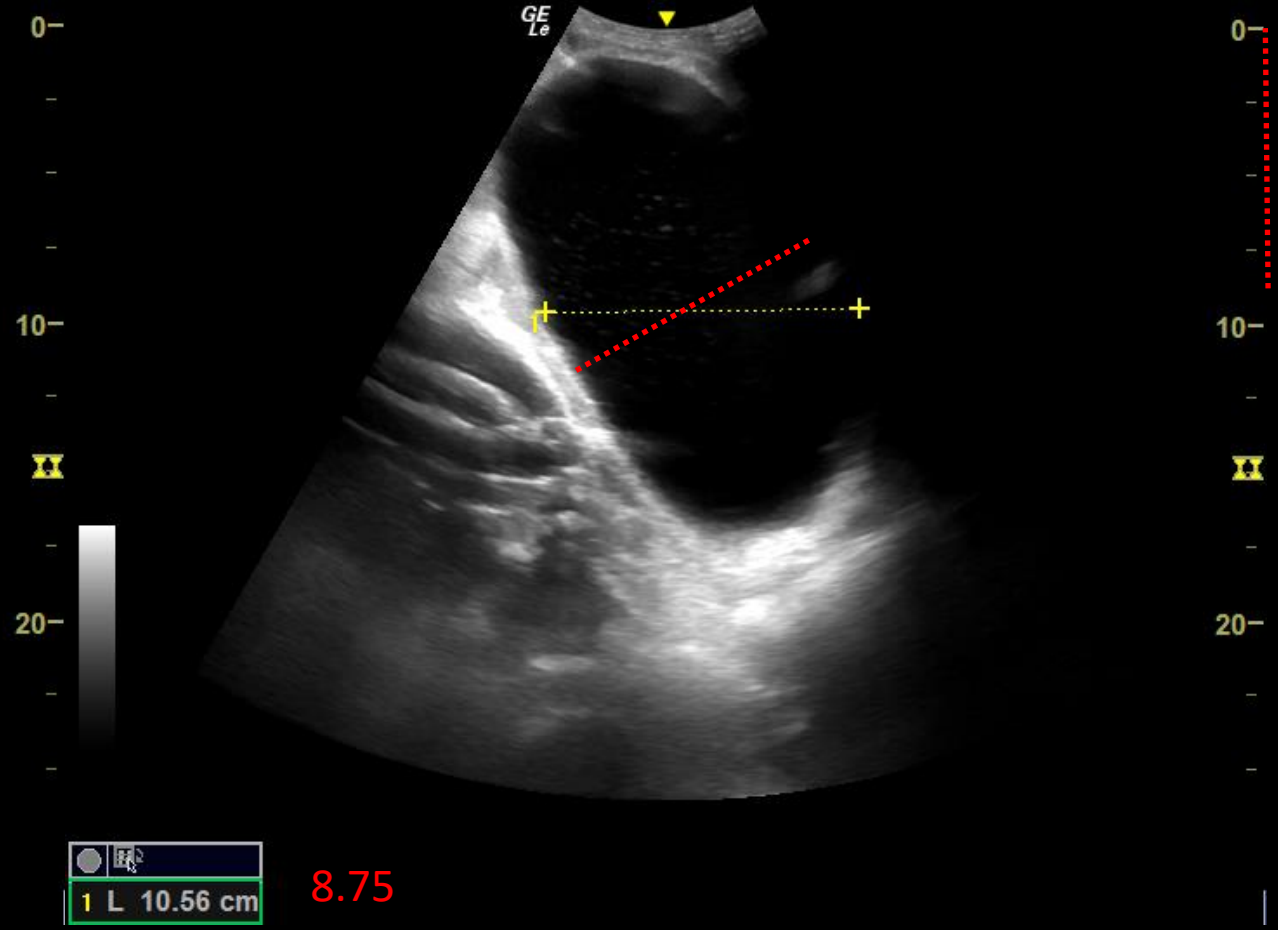


	K	Estimated V	Volume by Foley	%error
Prolate ellipsoid	0.5	1,120cc	1,630cc	31%
Bih, overall or Triangular Prism	0.7	1,570cc	1,630cc	3.6%
Soni	0.75	1,680cc	1,630cc	3%
Bih, Ellipsoid	0.8	1,790cc	1,630cc	10%
Bih, Cuboid	0.9	2,020cc	1,630cc	24%

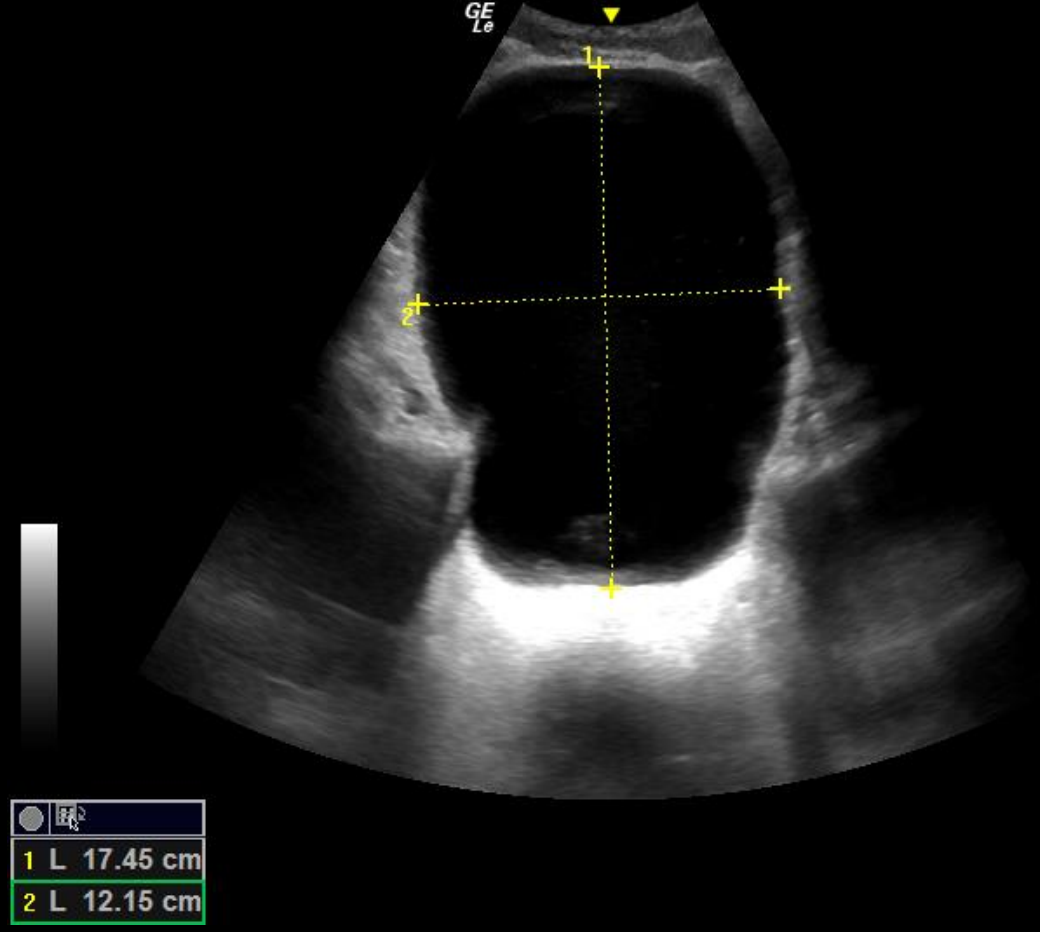

GE
1
2
1 L 17.45 cm
2 L 12.15 cm

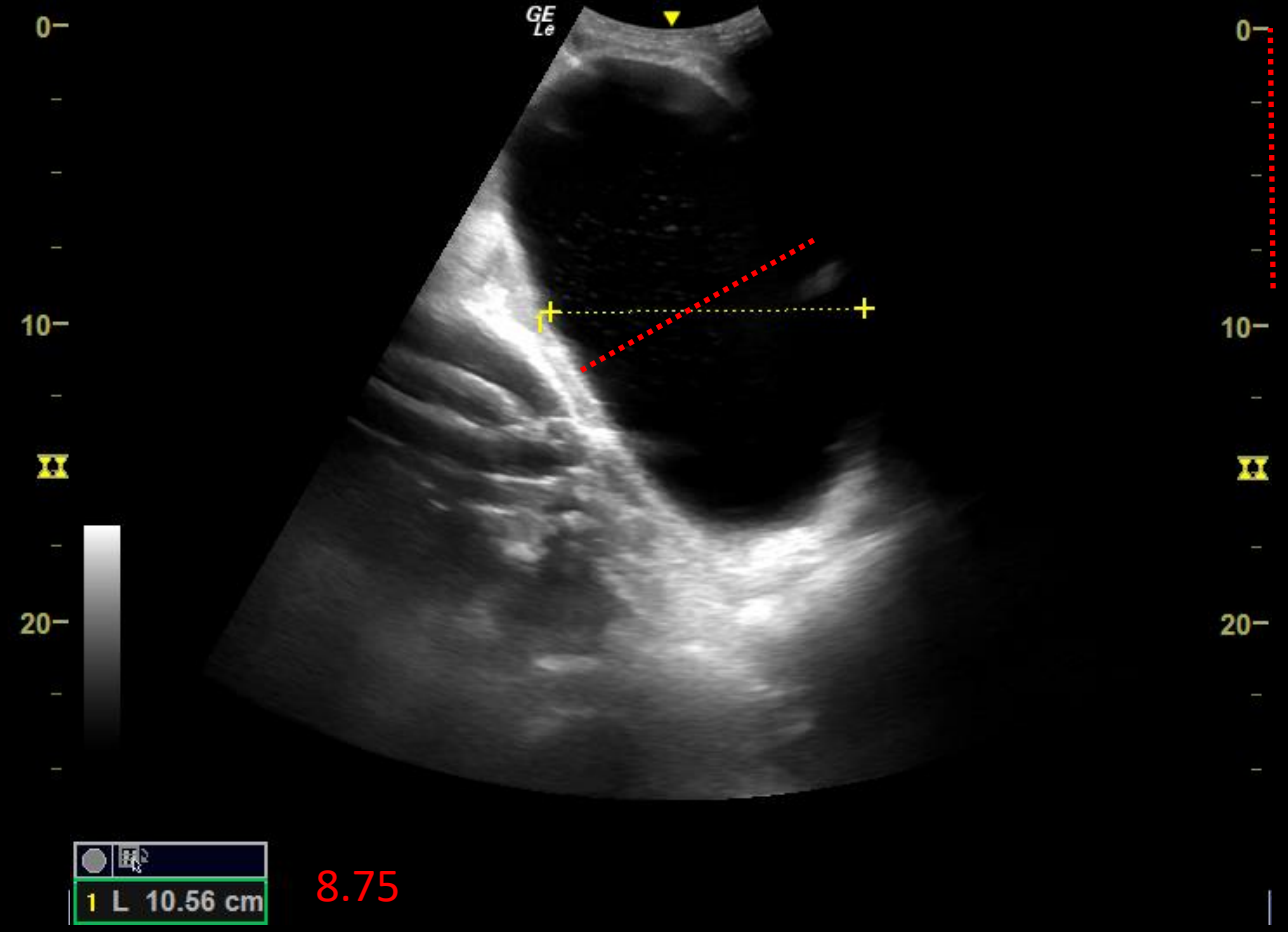

GE
0
10
20
1 L 10.56 cm





8.75





8.75

	K	Estimated V	Volume by Foley	%error
Bih, Cuboid	0.9	1,670cc	1,630cc	2%