international bowel ULTRASOUND GROUP

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How to perform IUS in IBD and what to look for?

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Thank you for the images/cine loops/slides:

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- Frauke Petersen
- Katharina Mitrova
- Matina-Lydia Chatzinikolaou
- Christian Maaser

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Outline

- Preparation
- Orientation and scan planes
- What to look for
- Examination technique

Preparation (songrapher)

- Know the indication, clinical setting and history of patient
- Previous imaging? (CT, MRI, endoscopy)
- Previous ultrasound images, on which machine?
- Patient identification, worklist
- Hygiene (hands, probes with special wipes, even room in some circumstances), cover the probes in special circumstances
- Choice of the probe/ adequate preset on the machine

Prepare the machine and yourself

- Clean probe (NO alcoholic solutions)
- On the right side of the patient
- Cord does not belong on the floor or around your neck
- Probe in right hand
- Left hand on buttons

Tricks

- Your right hand is to use the probe , to touch the patient and the gel

- Your left hand is to steer the machine

- Don‘t switch

- Don‘t contaminate the control panel with gel

(from the patient’s surface)

- The control panel is designed ergonomically for your left hand

Preparation (patient)

Fasting

- not necessary

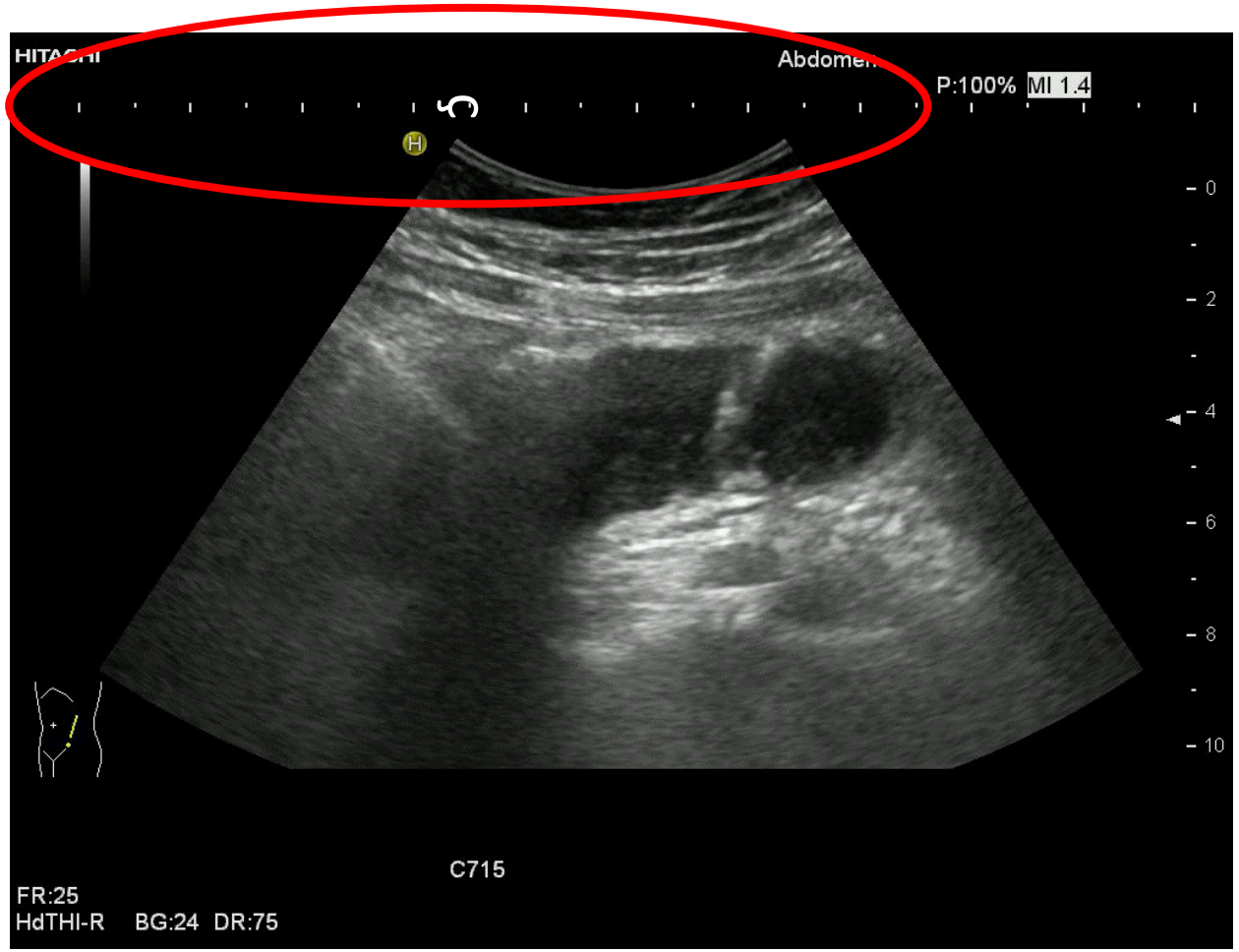
->4 h → reduce amount of food and air in the small bowel

->6 h → recommended before assessing splanchnic blood flow and GI motility

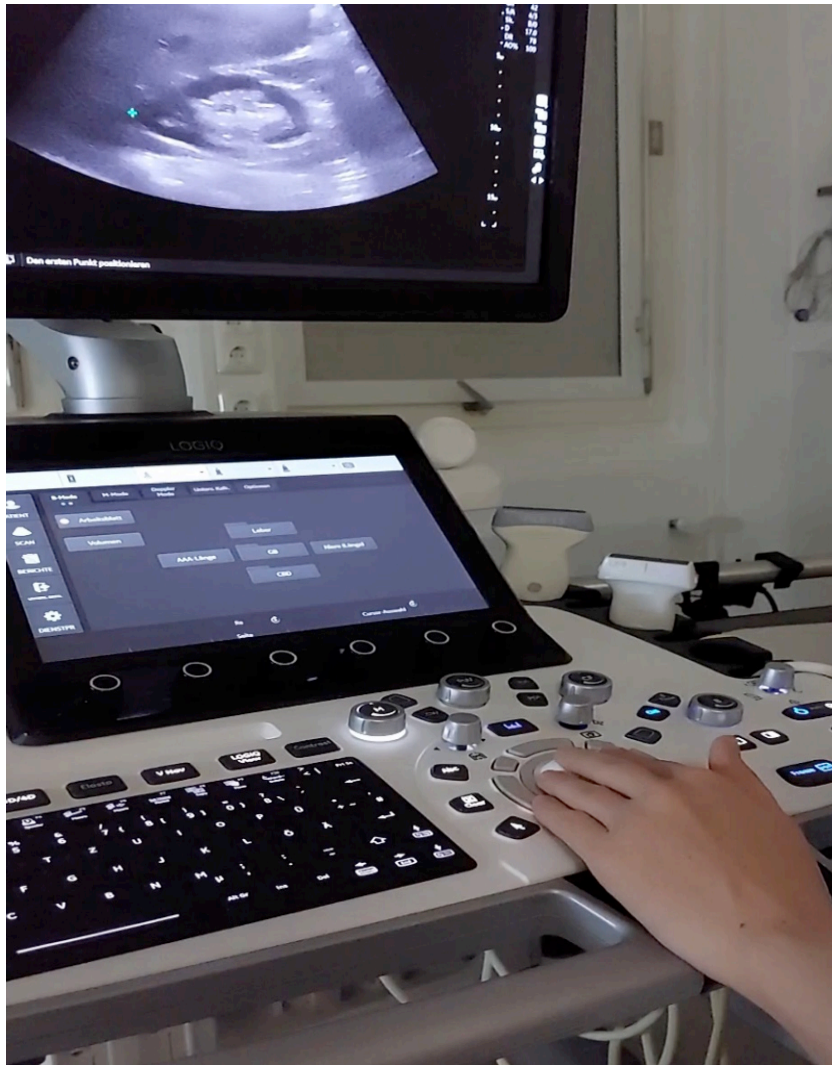
Nylund K et al. EFSUMB Recommendations and Guidelines for Gastrointestinal Ultrasound, Ultraschall Med 2017

Prepare the machine – Insert patient's details

- Check patient ID / details
- Save examination when you finish



Ultrasound machine



Monitor

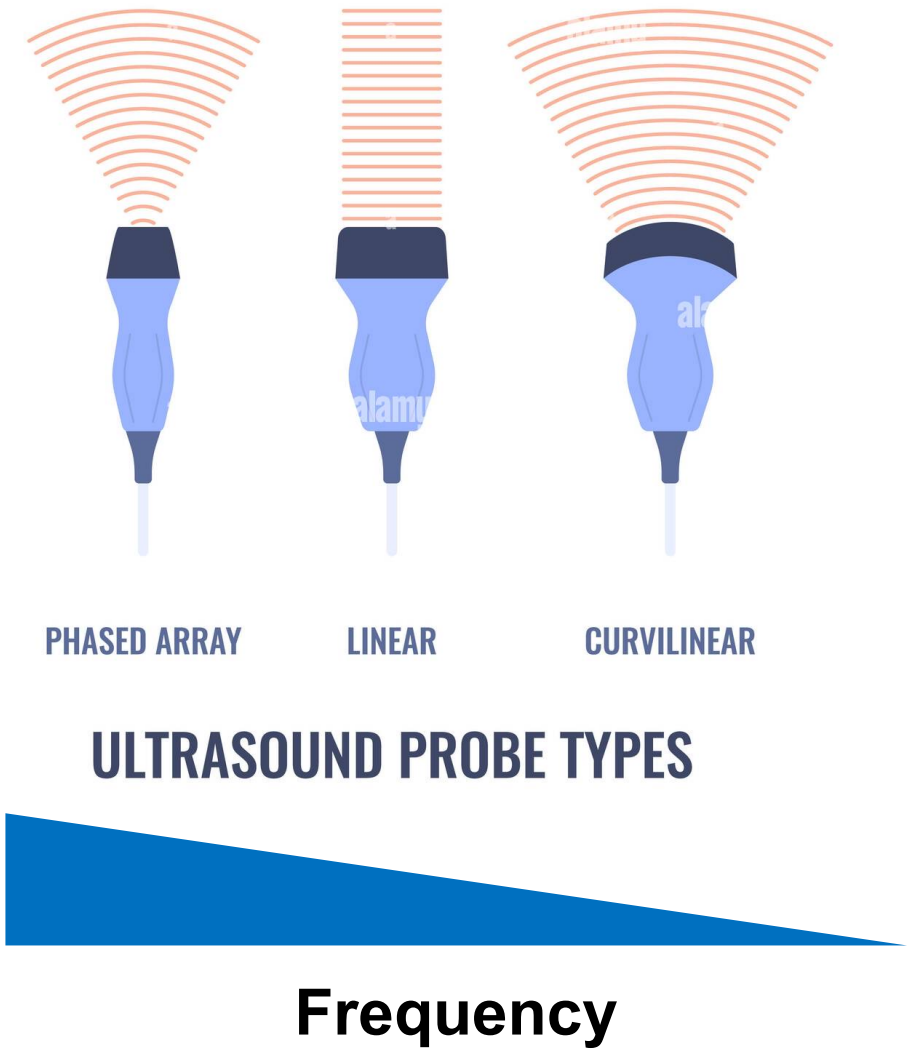
Touchscreen

Probes

Control panel

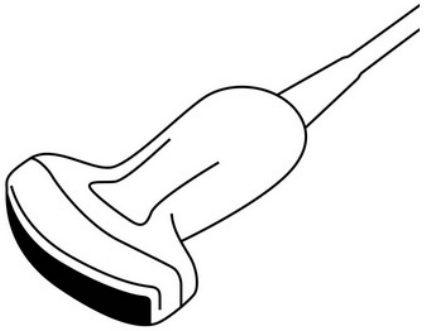
Gel

Ultrasound probes



Properties of the different probes

Low frequency: 1-6 MHz, overview, more depth, less resolution



curved array for a larger field, de

pathology

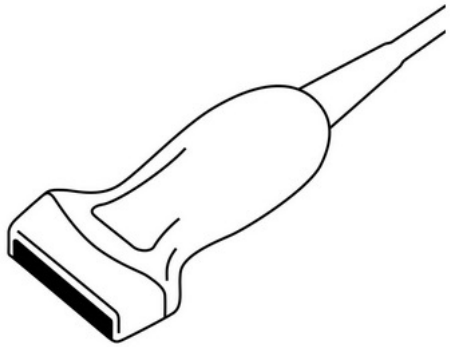
RECOMMENDATIONS:

1. For a complete examination of the bowel both a low and high resolution probe are needed, LoE 5, GoR C, Strong consensus 13/13

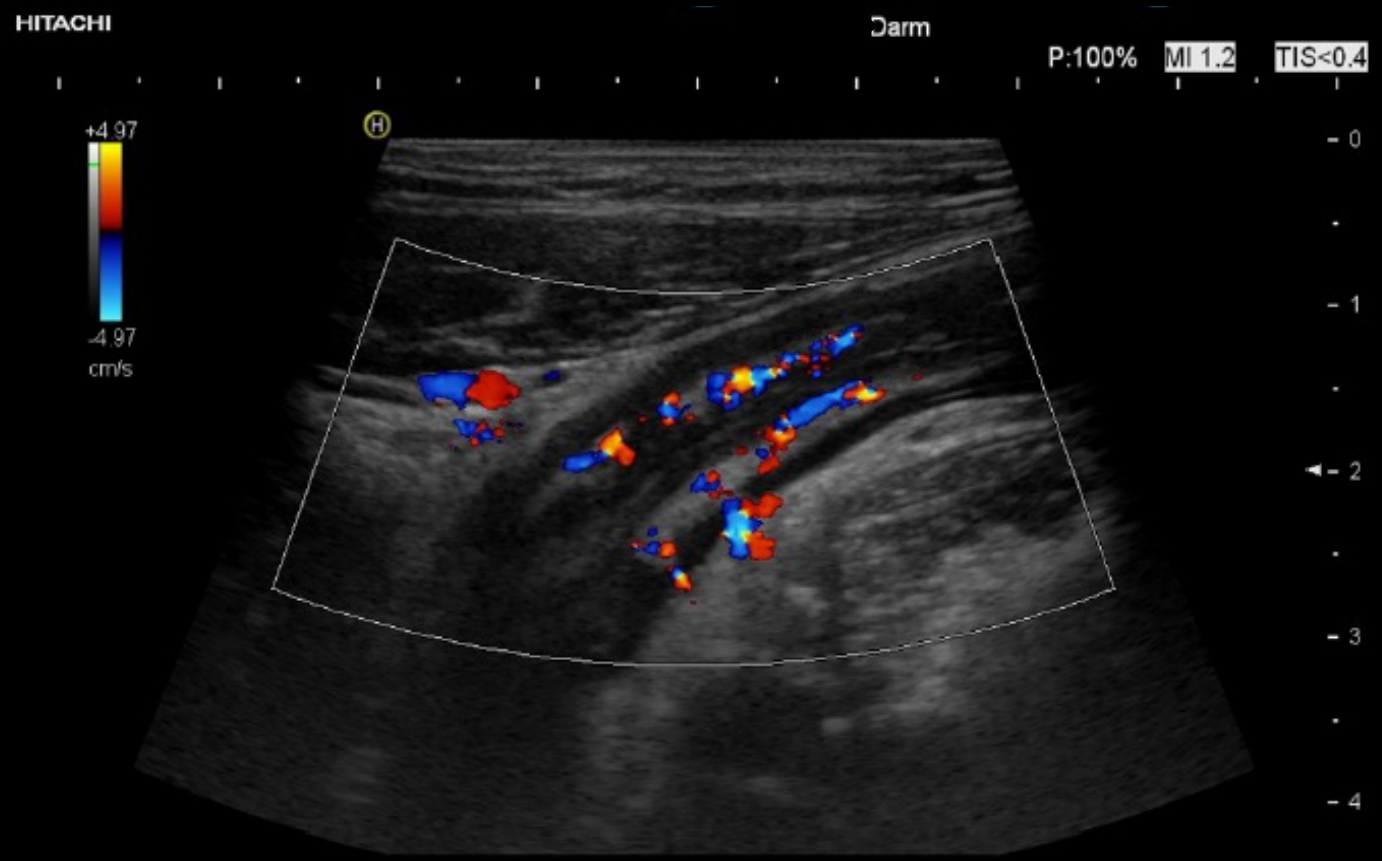
2. A probe with a frequency above 5 MHz should be used when measuring wall thickness, LoE 4, GoR B, Strong consensus 13/13

Nylund K et al. EFSUMB Recommendations and Guidelines for Gastrointestinal Ultrasound, Ultraschall Med 2017

High frequency: > 5MHz (5-10 MHz), only surface accessible (8-10 cm depth penetration), high resolution, detailed examination (discrimination of stratification of the bowel wall)



Preparation of image



Object in the centre
Depth adjusted
Focus in the good postion
Color scale
Color gain

Technical requirements

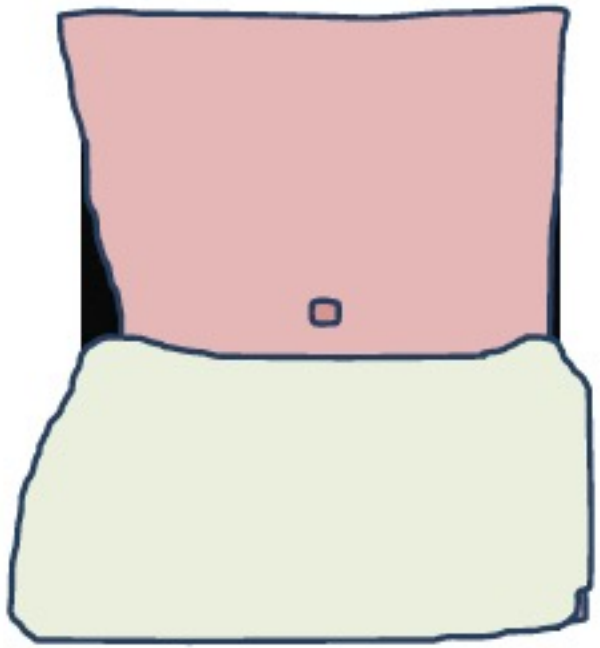
- Ultrasound machine with B-mode and Doppler mode
- Possibility to register video loops, digital documentation
- At least two probes

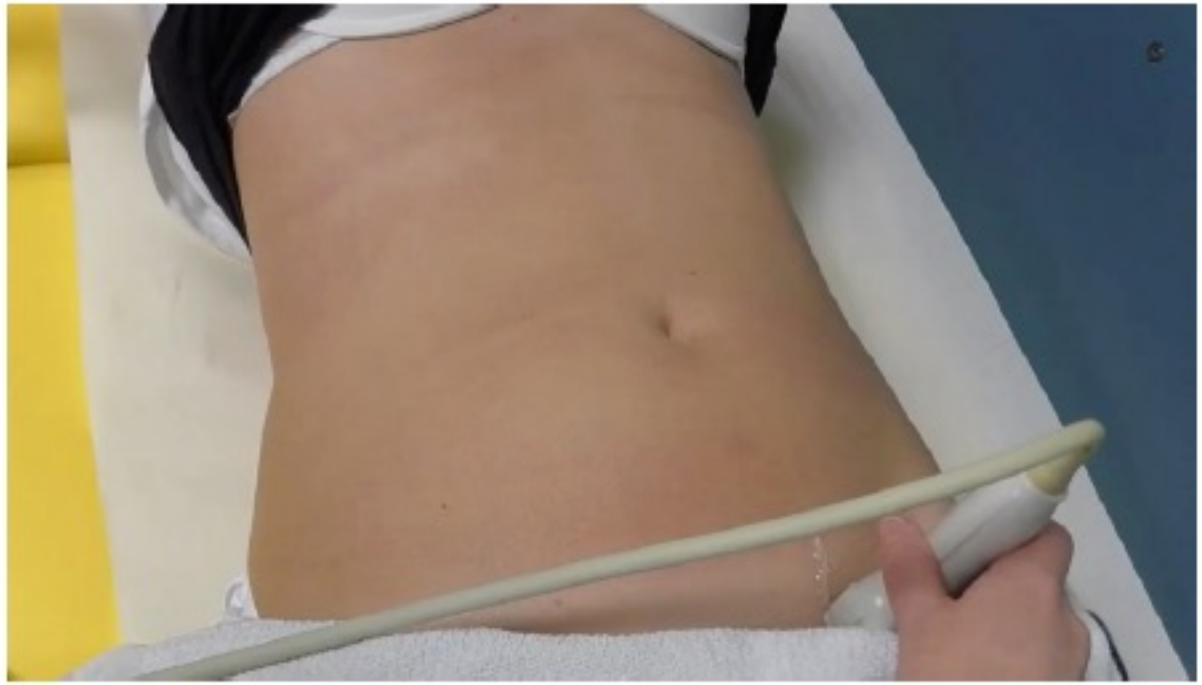
  curved array 1-5 mHz or microconvex 4-8 mHz

  linear array 5-10 mHz
- Optional CEUS / Elastography

Ultrasound technique

Prepare the patient

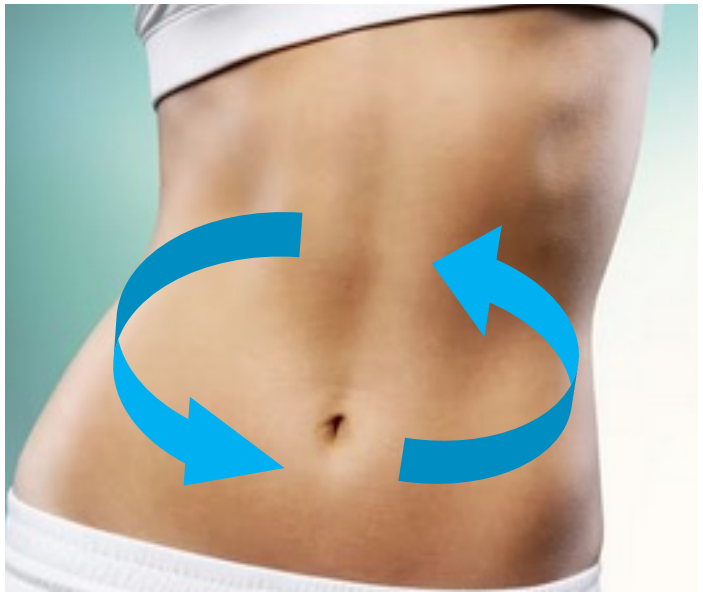


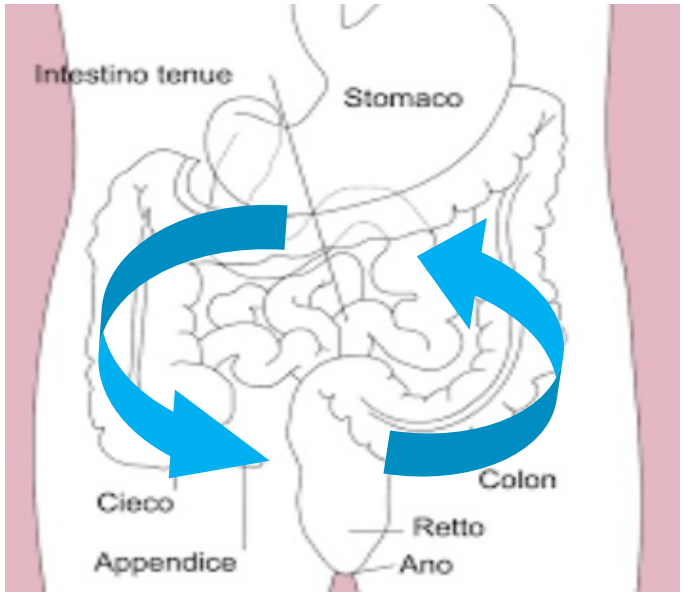


Do it right from the beginning

- Expose abdominal area adequately
- Water-based ultrasound gel
- Hold the probe correctly

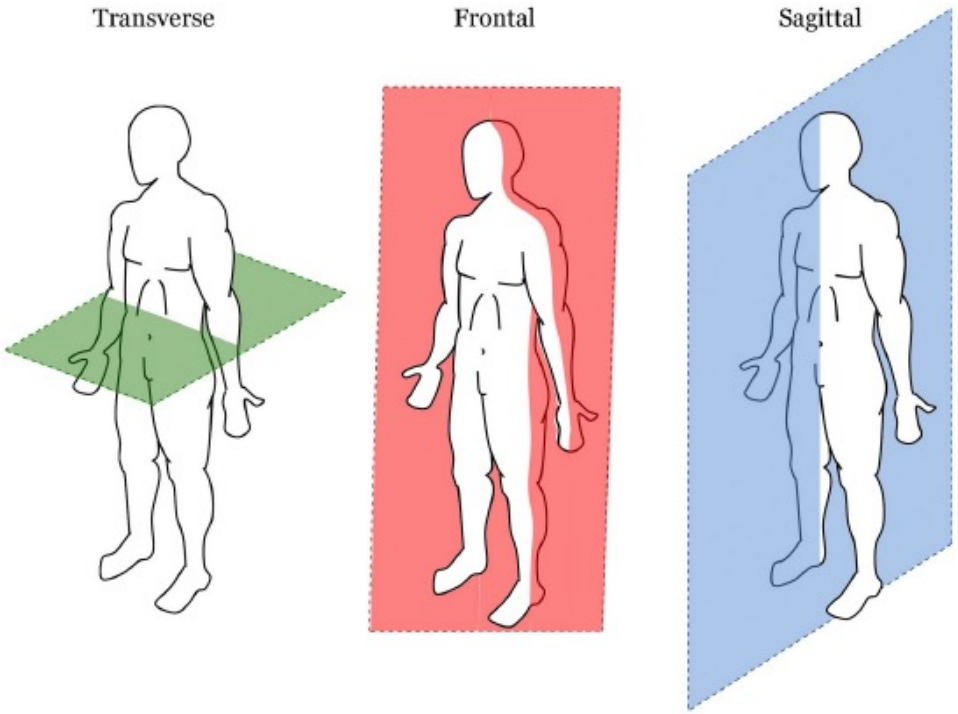
Ultrasound technique



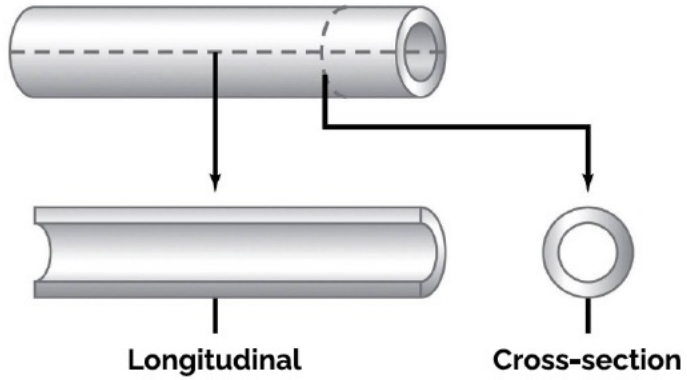


All portions of the bowel are scanned in long and short axes, and images are simultaneously captured to ensure **a continuous assessment**

Scan planes



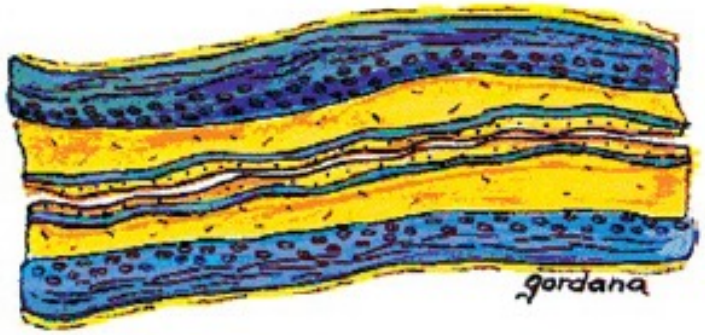
Imaging

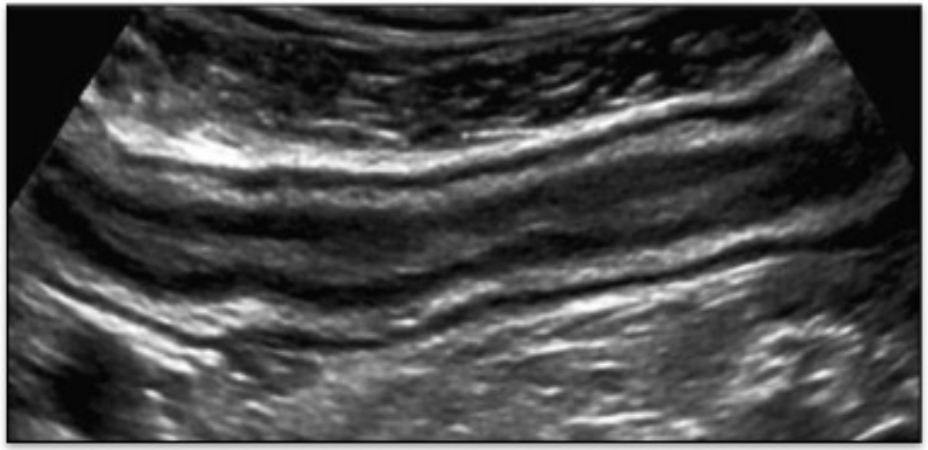


Intestinal ultrasound

Scan plans

Longitudinal

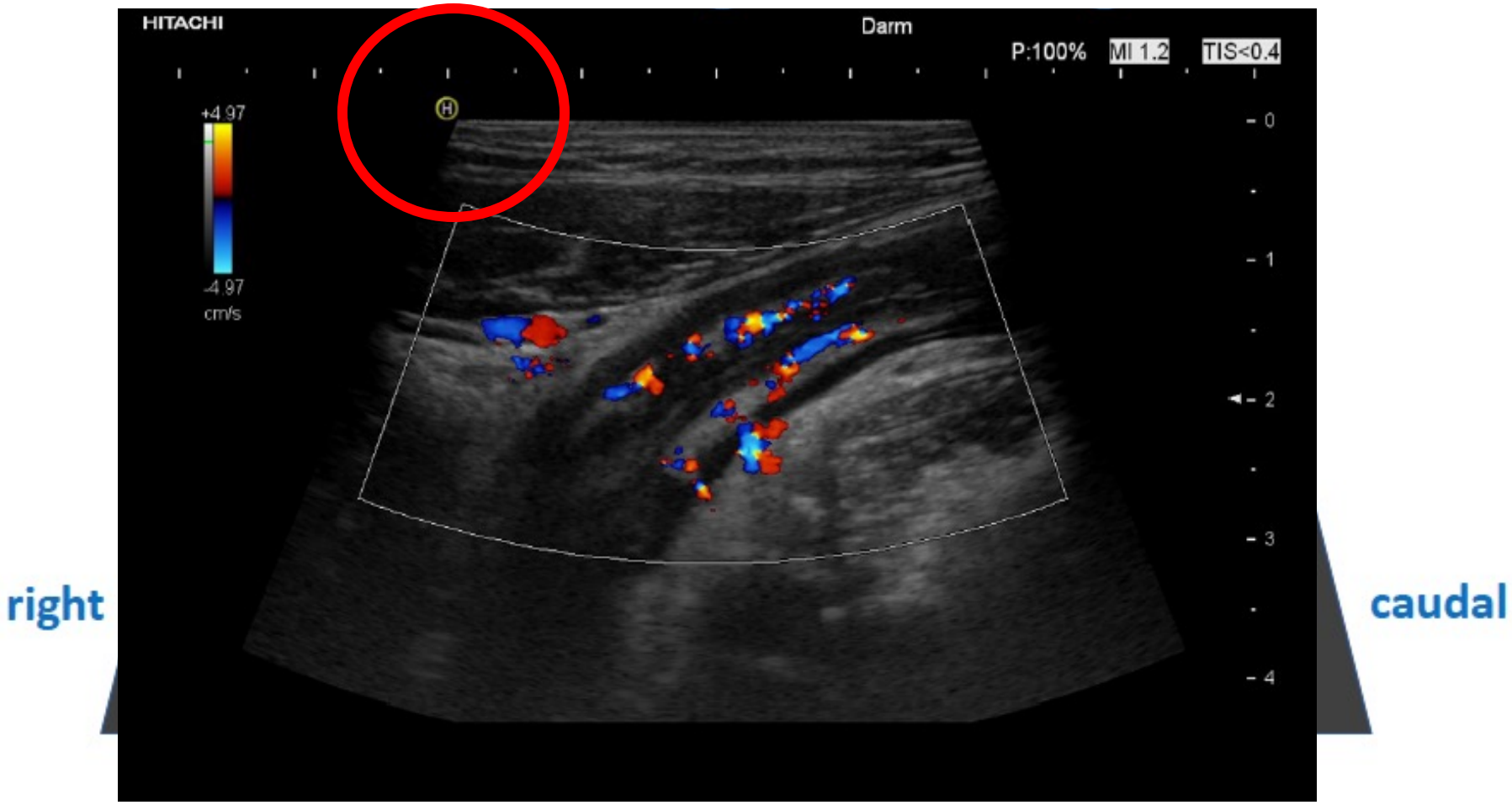




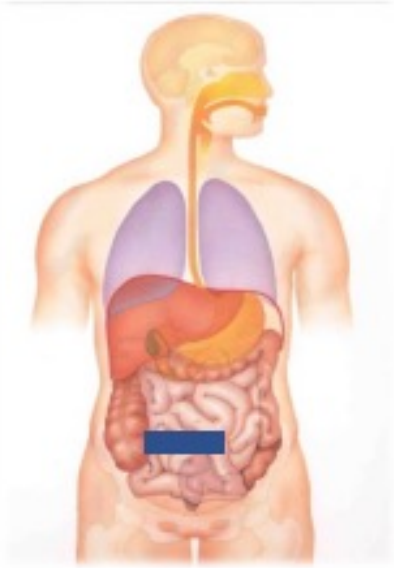
Cross-section

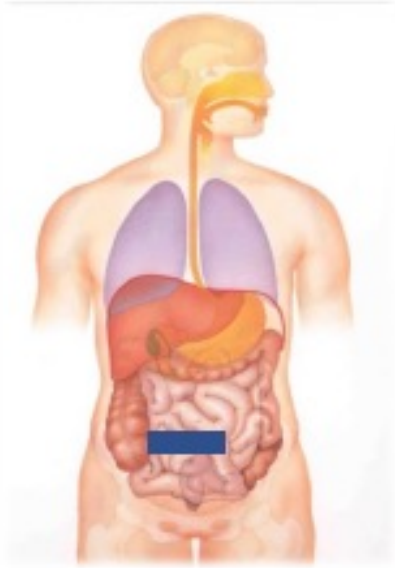
Wilson SR et al. Diagnostic Ultrasound, Mosby 2010; Nylund et al. Scand J Gastroenterol 2008

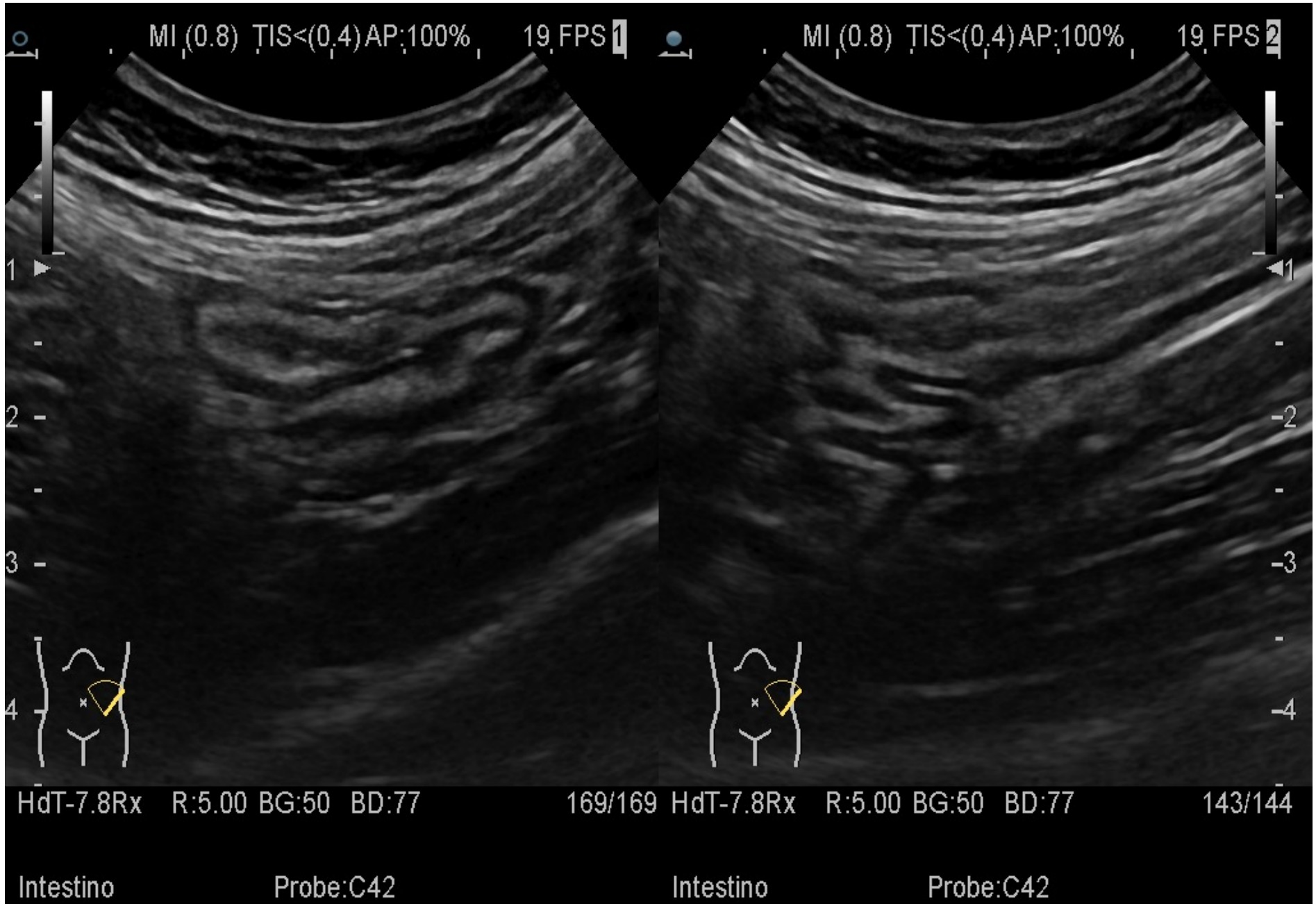
Probe orientation



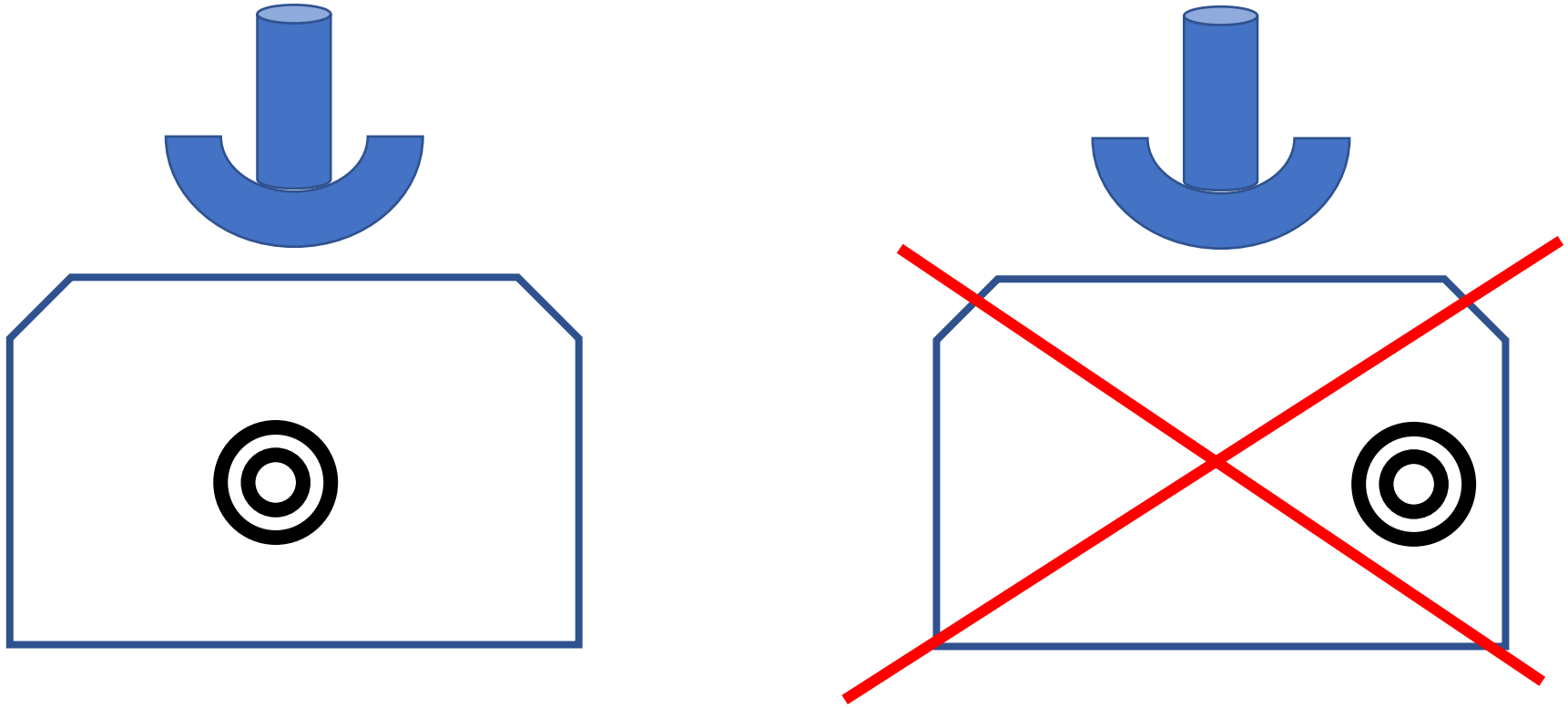
Turning the probe






MI (0.8) TIS<(0.4) AP:100% 19 FPS 1
MI (0.8) TIS<(0.4) AP:100% 19 FPS 2
HdT-7.8Rx R:5.00 BG:50 BD:77 169/169
HdT-7.8Rx R:5.00 BG:50 BD:77 143/144
Intestino Probe:C42
Intestino Probe:C42

Keep your region of interest in the center



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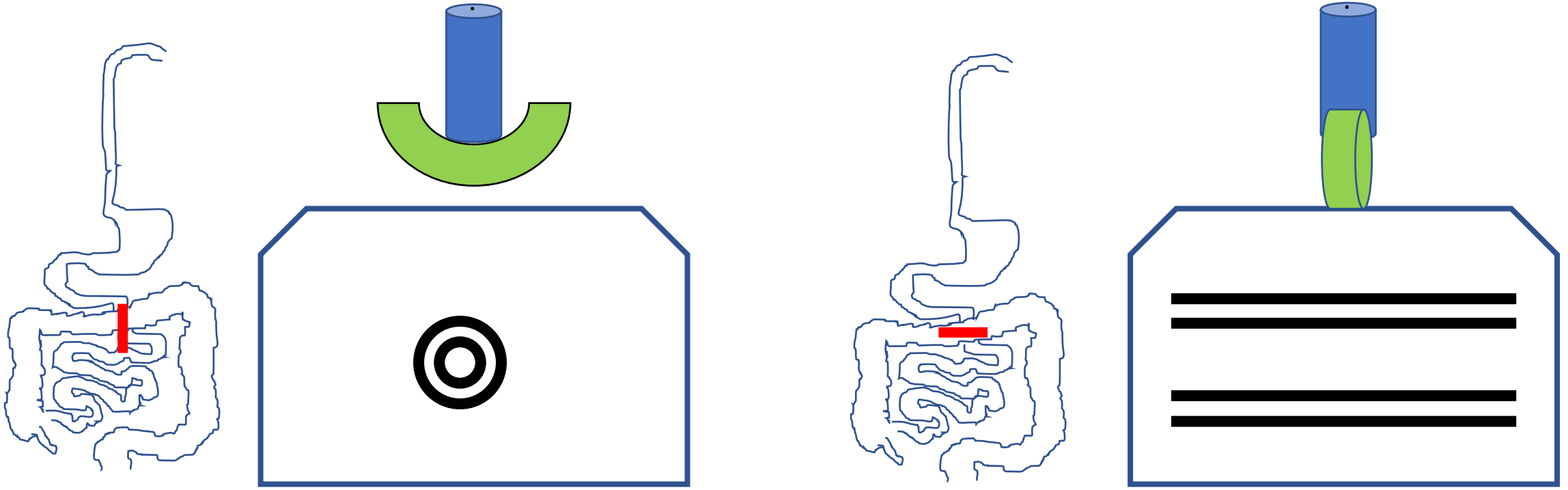
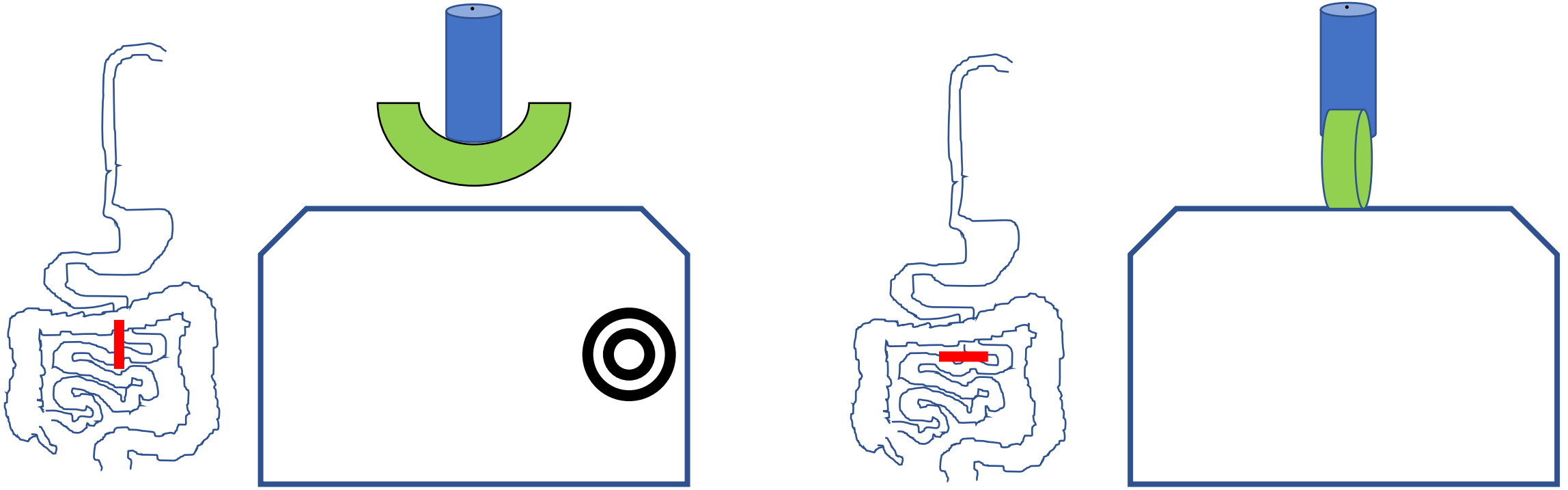


Keep your region of interest in the center



What to look for

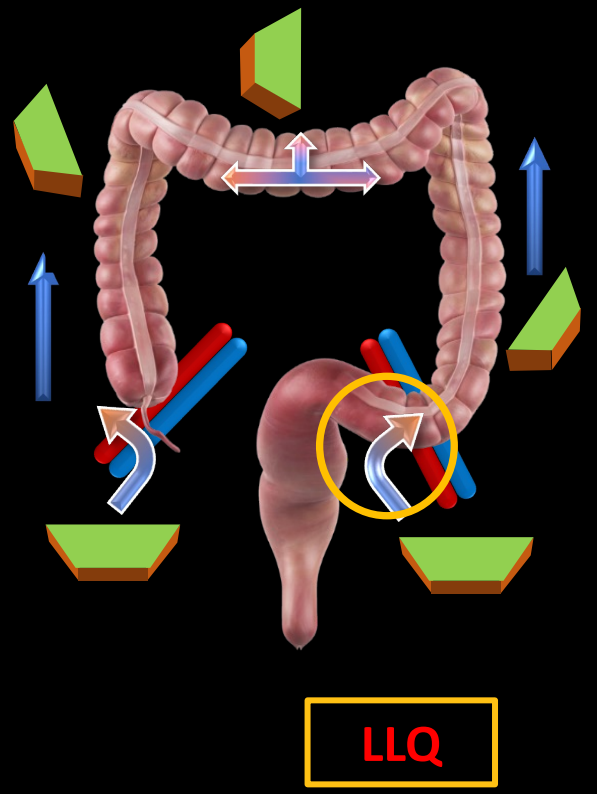
- What am I looking at – recognizing the different parts of the bowel and surrounding structures

  → **Landmarks!!**

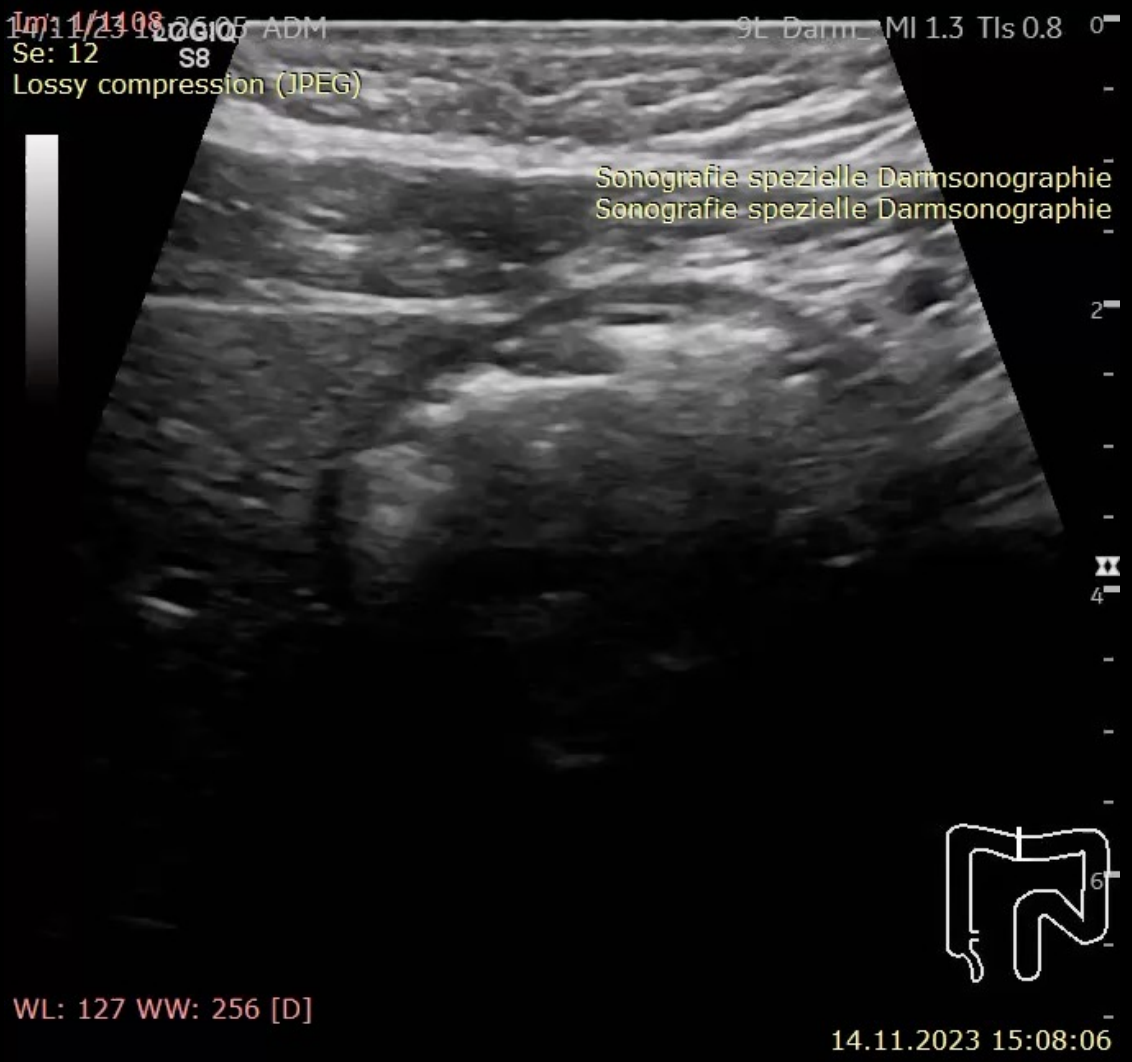
- Normal vs. abnormal bowel wall

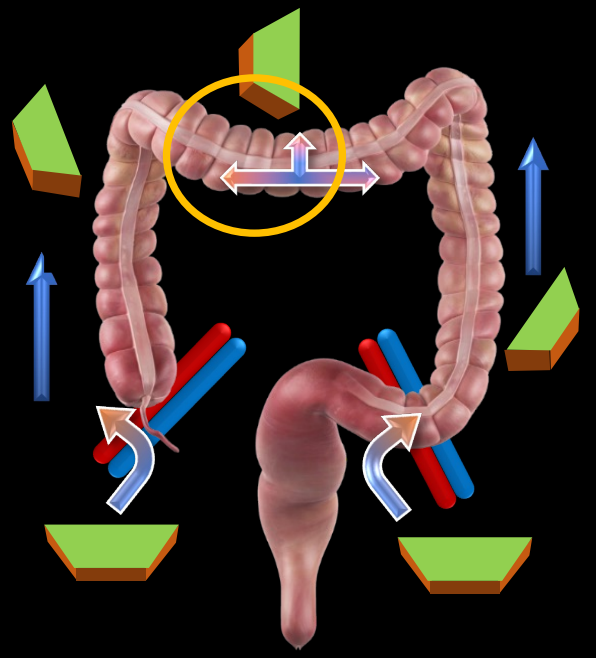
- What parameters do I need to look for?

Anatomical landmarks in the left lower quadrant – Finding the Sigmoid

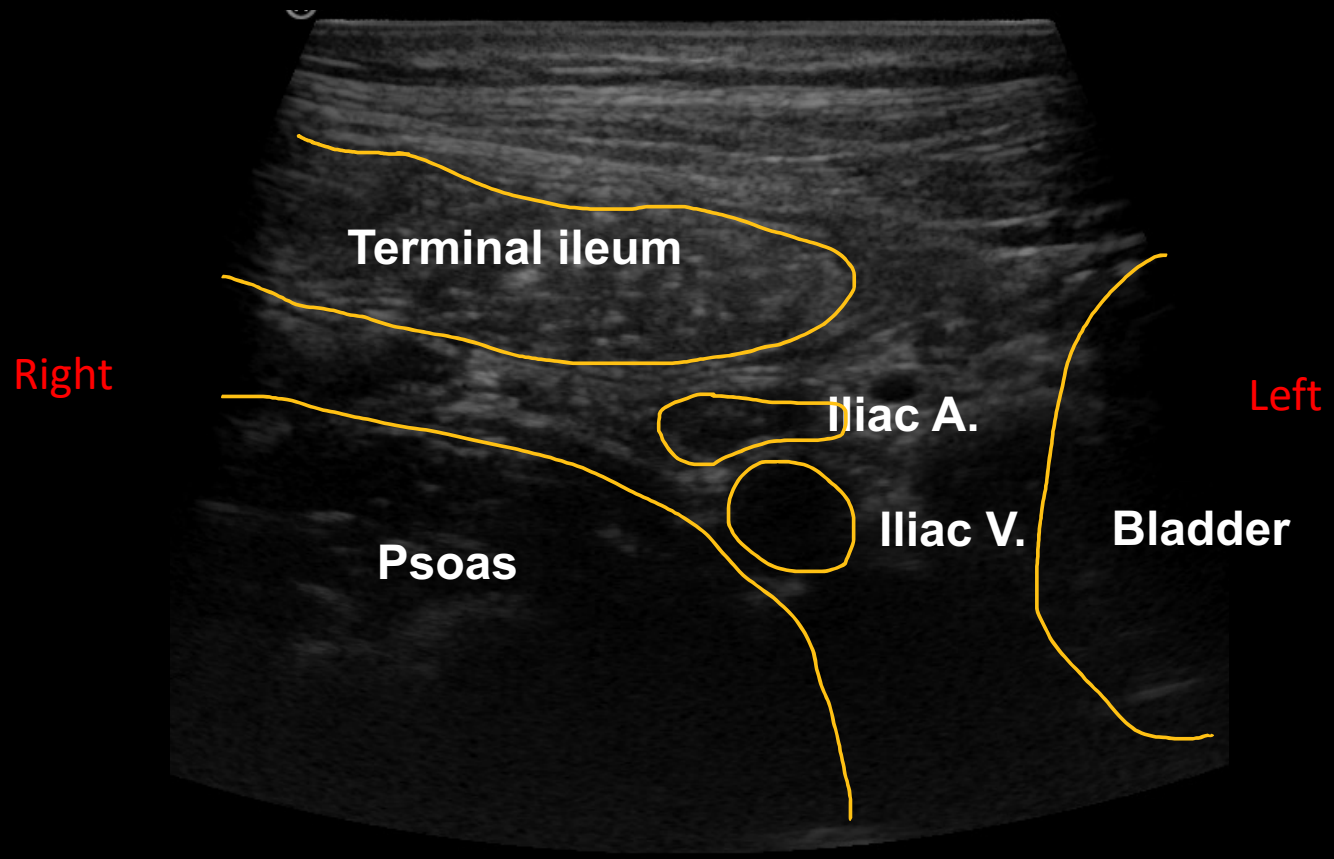


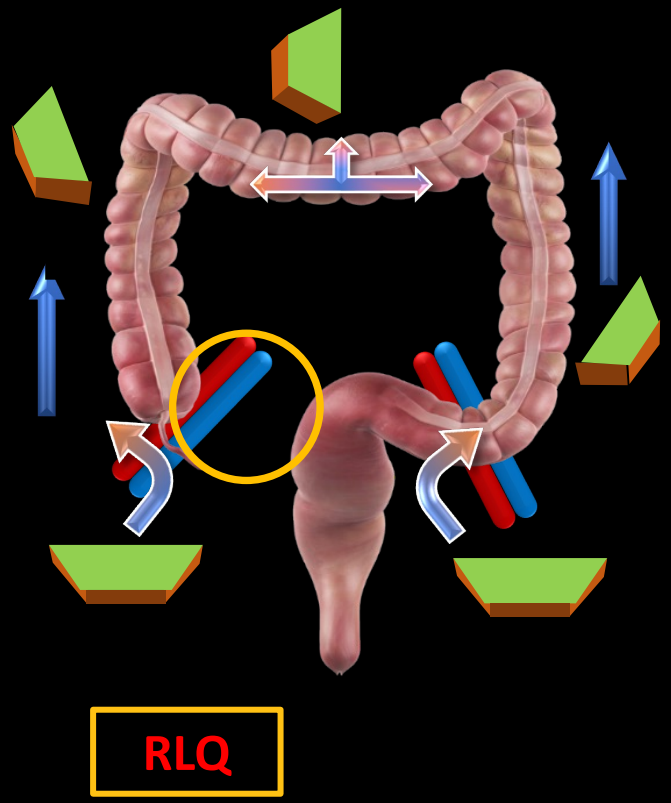
Anatomical landmarks in the mid upper andomen – Finding the Transverse





Anatomical landmarks in the right lower quadrant – Finding the TI



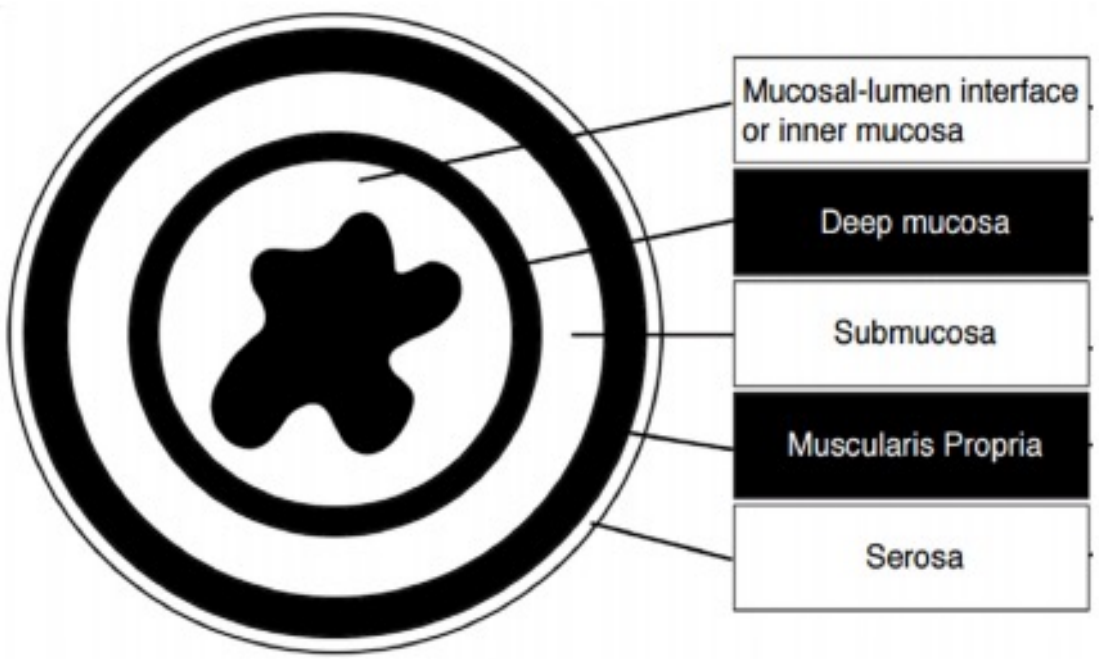


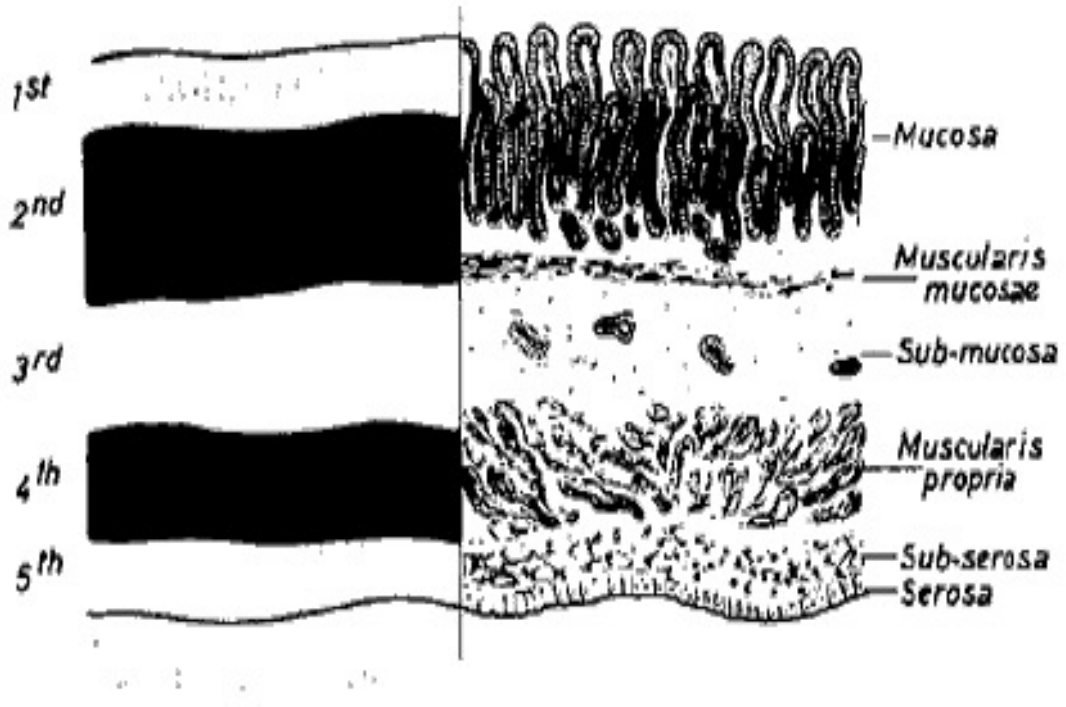
Why are landmarks important?

- to make sure the orientation of the probe is correct
- to optimize the settings of the machine
- to find the correct bowel segment
- to re-orientate if lost

Normal bowel wall

- 5 distinct sonographic layers



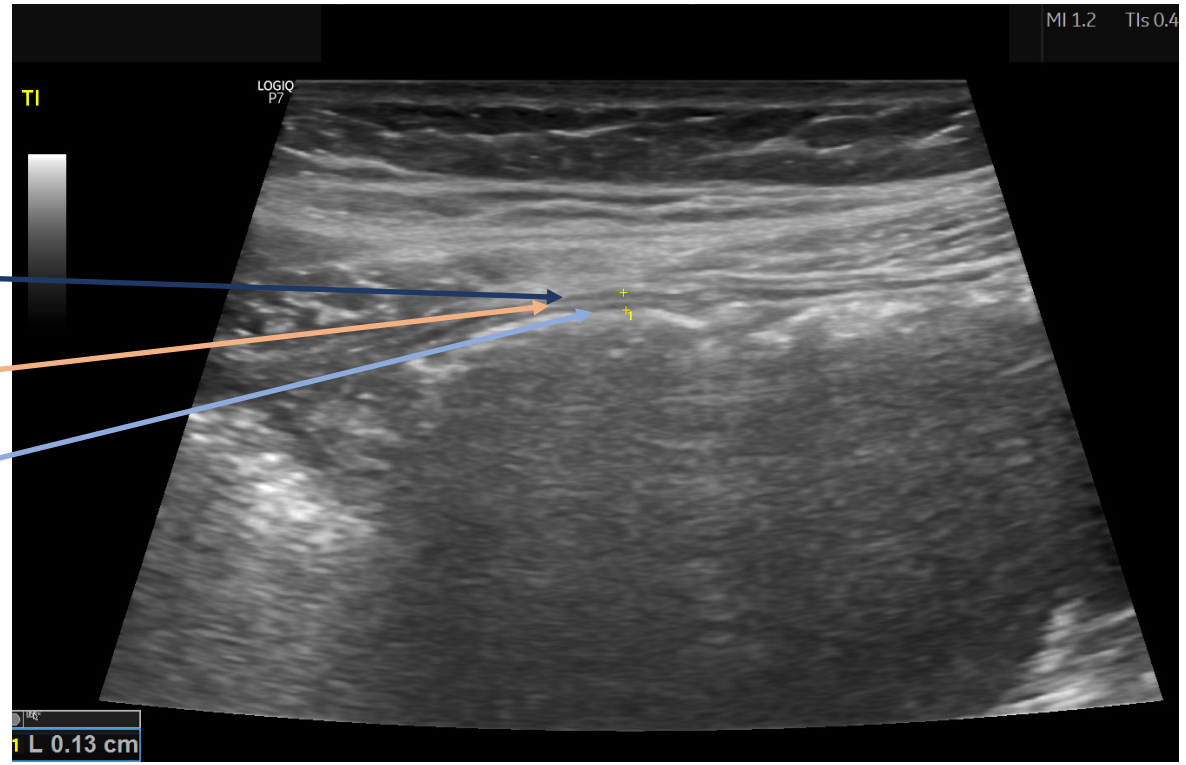


Normal bowel wall in ultrasonography

Muscularis (hypoechoic)

Submucosa (hyperechoic)

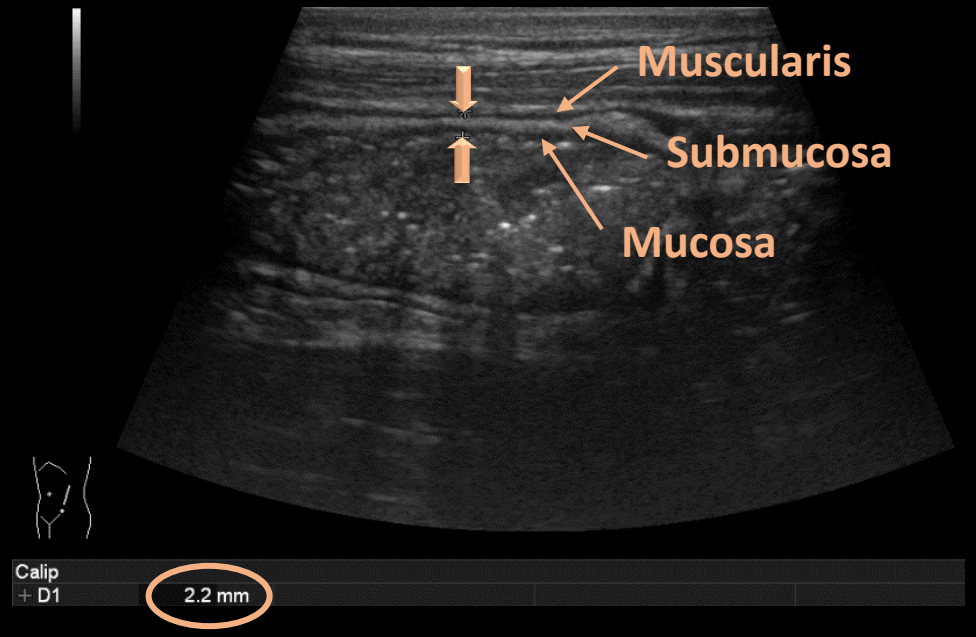
Mucosa (hypoechoic)

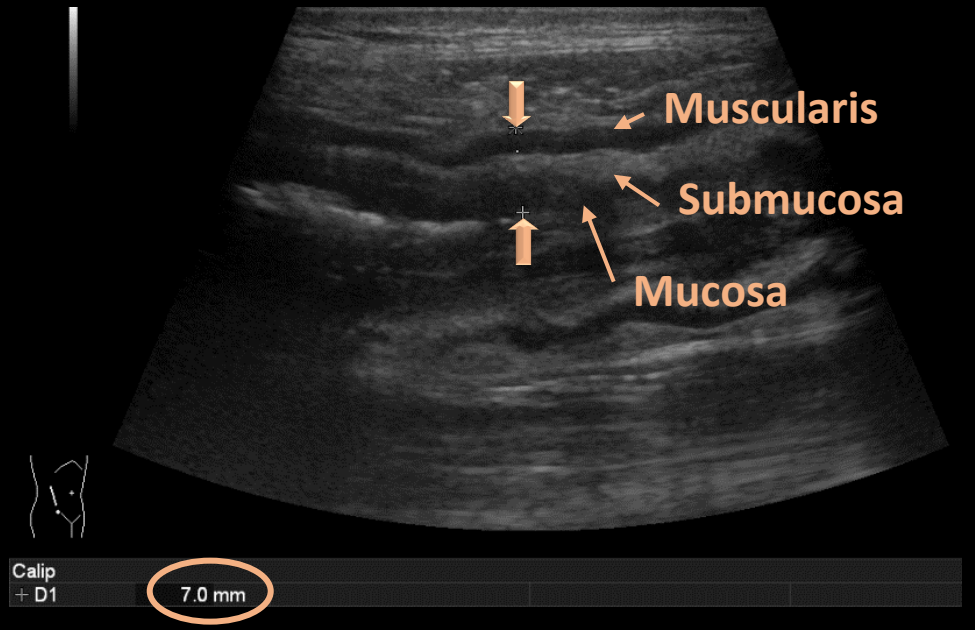


Some practical points:

- Interface echo of serosa mixed in with interface from peritoneum
- Posterior bowel wall often not possible to see due to air in the lumen ➔ Measurements in anterior wall!
- Measure from mucosal hypoechoic layer to muscularis hypoechoic layer
- Avoid measuring at points of haustrations and mucosal folds (overestimation!)
- Careful: Do NOT compress too much! ➔ Graded compression
- Keep probe perpendicular to GI wall

Bowel wall thickness (BWT)



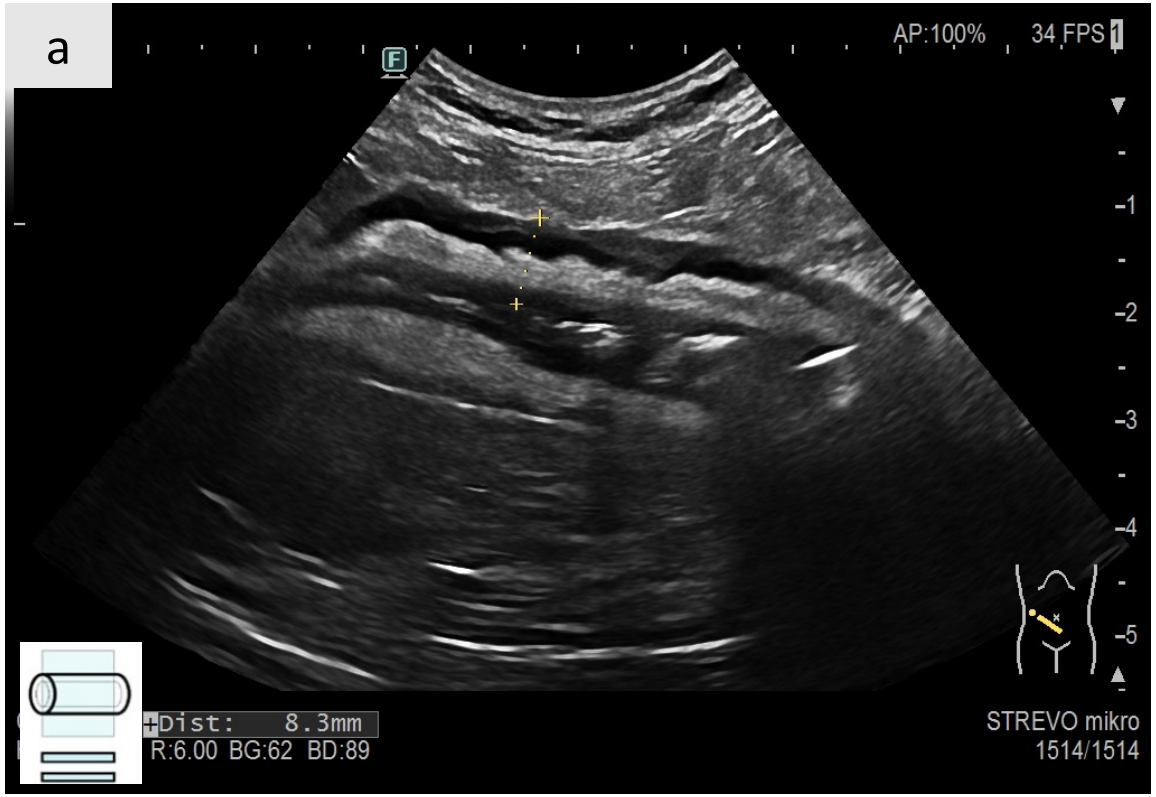


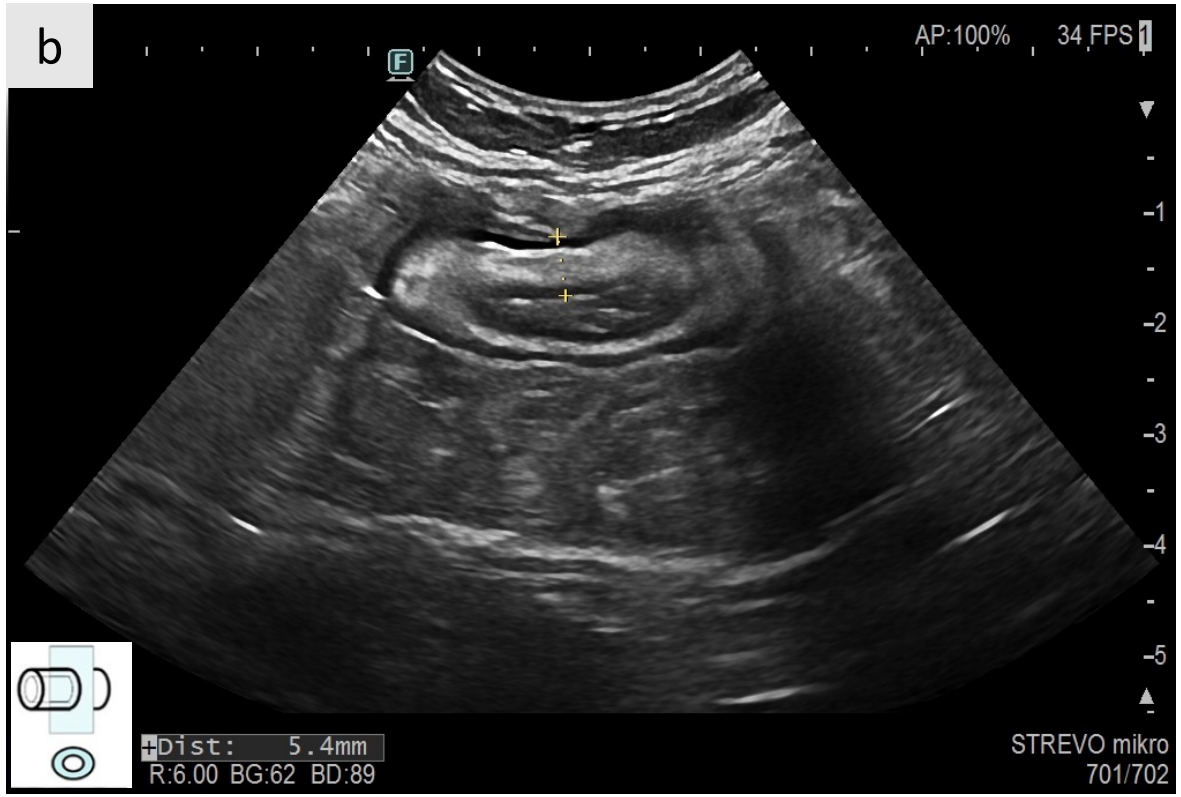
*Measure at right angles to bowel wall layers.

IUS

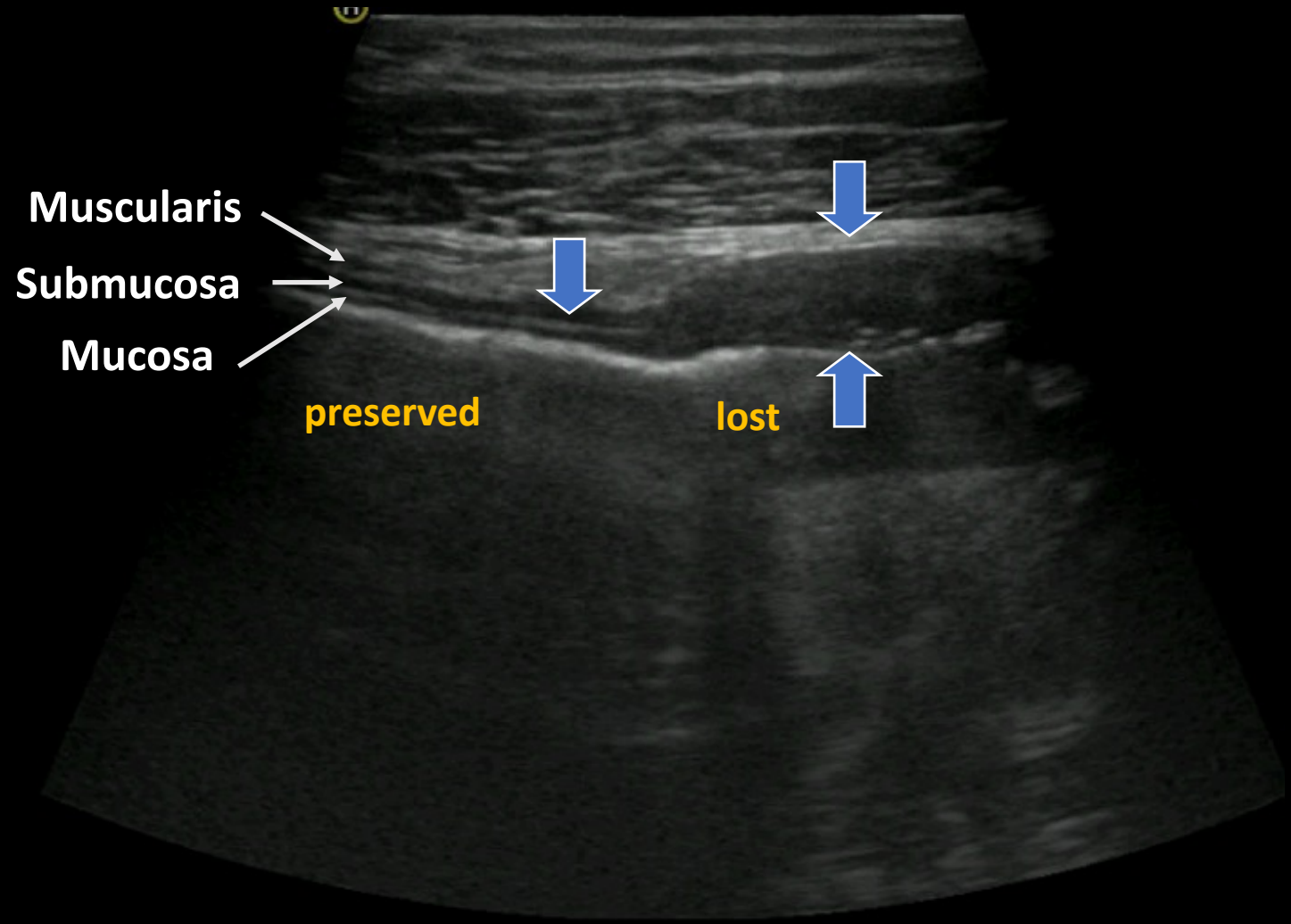
BW Thickening

Cut-off	Sensitivity	Specificity
3 mm	88%	93%
4 mm	75%	97%

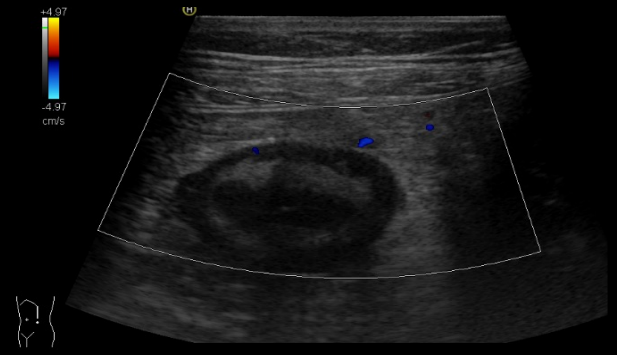




Bowel wall stratification



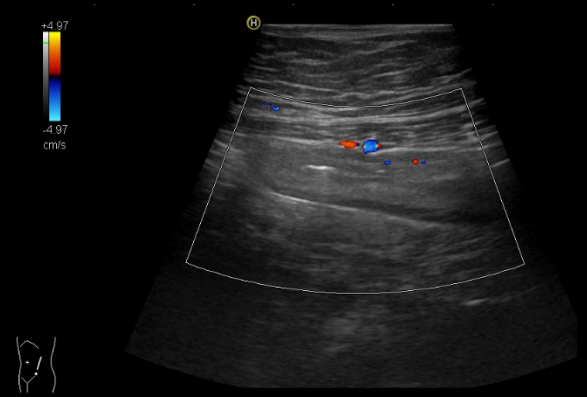
Vascularisation – Colour Doppler



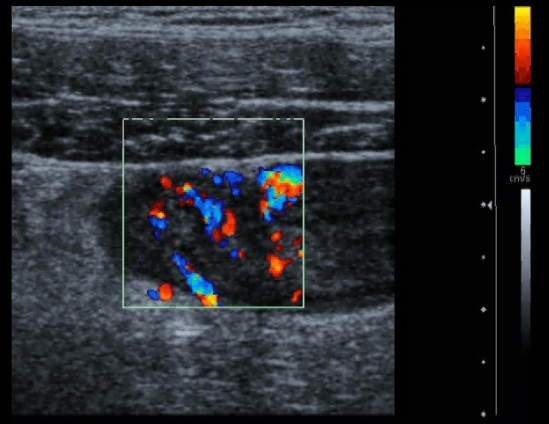
0 – No signal

Modified Limberg score

2 – increased colour signal limited to the wall

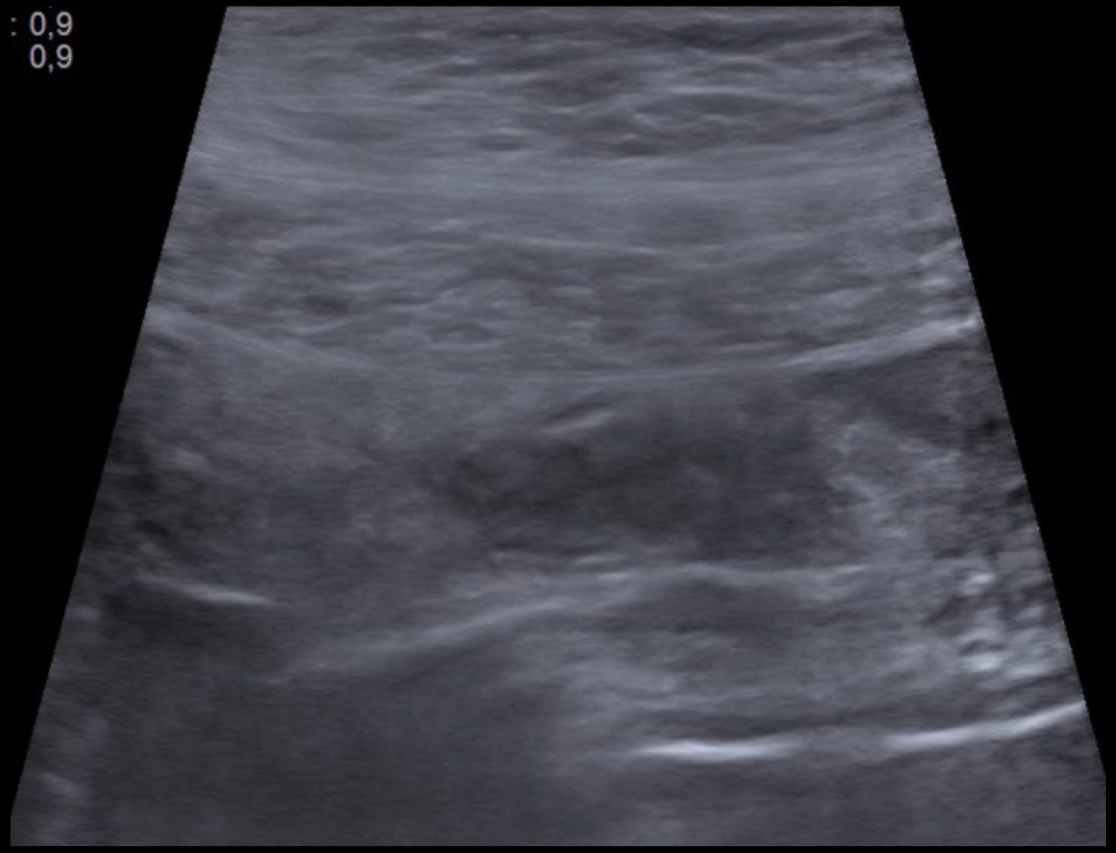


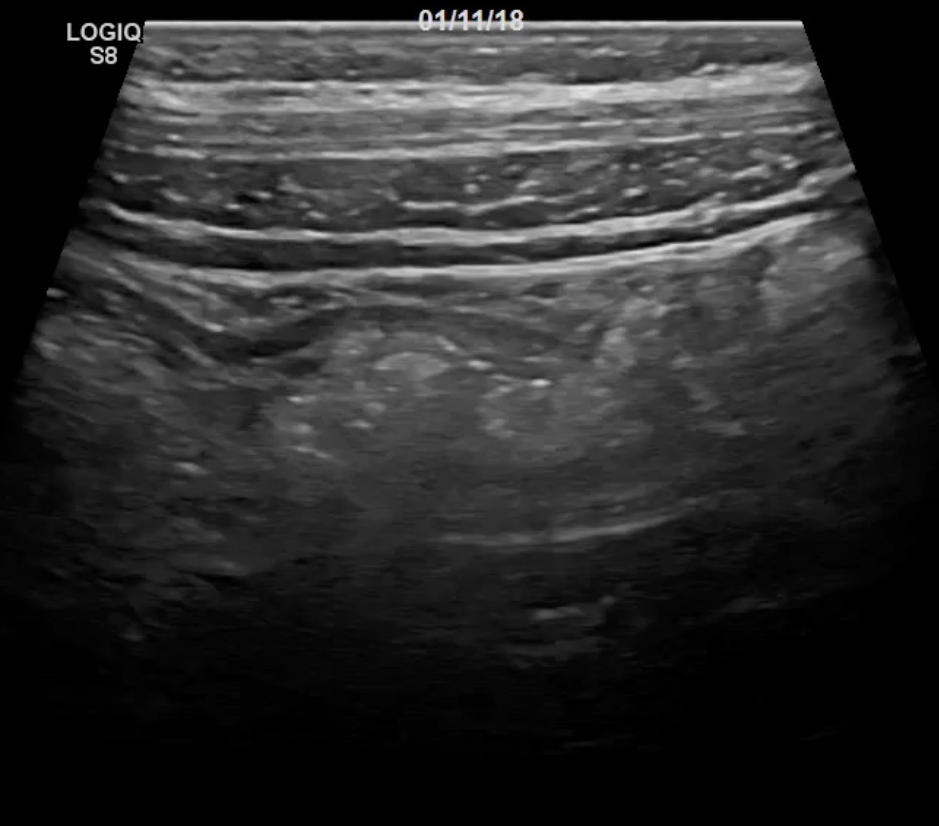
1 – minimal pixels, scant



3 – signal is significant in the wall as well as the mesentery

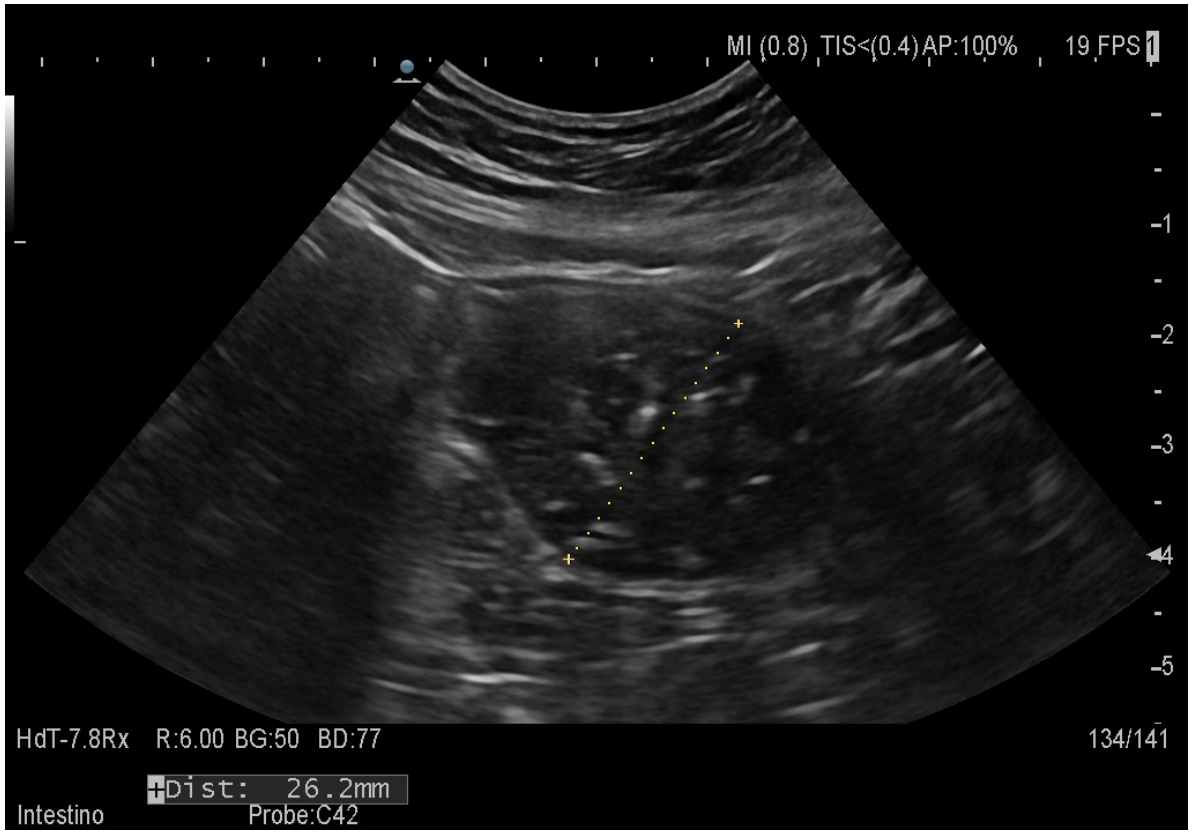
Motility - Small bowel vs. colon

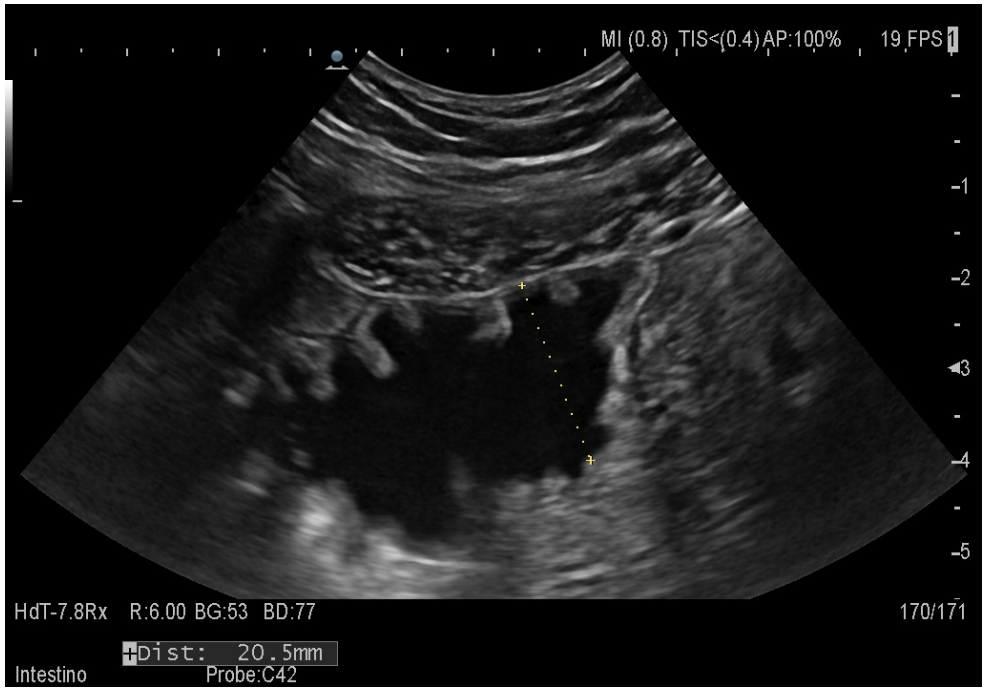




Lumen

- <u>Small bowel</u> → Normal maximum diameter: **2 – 2.5 cm**



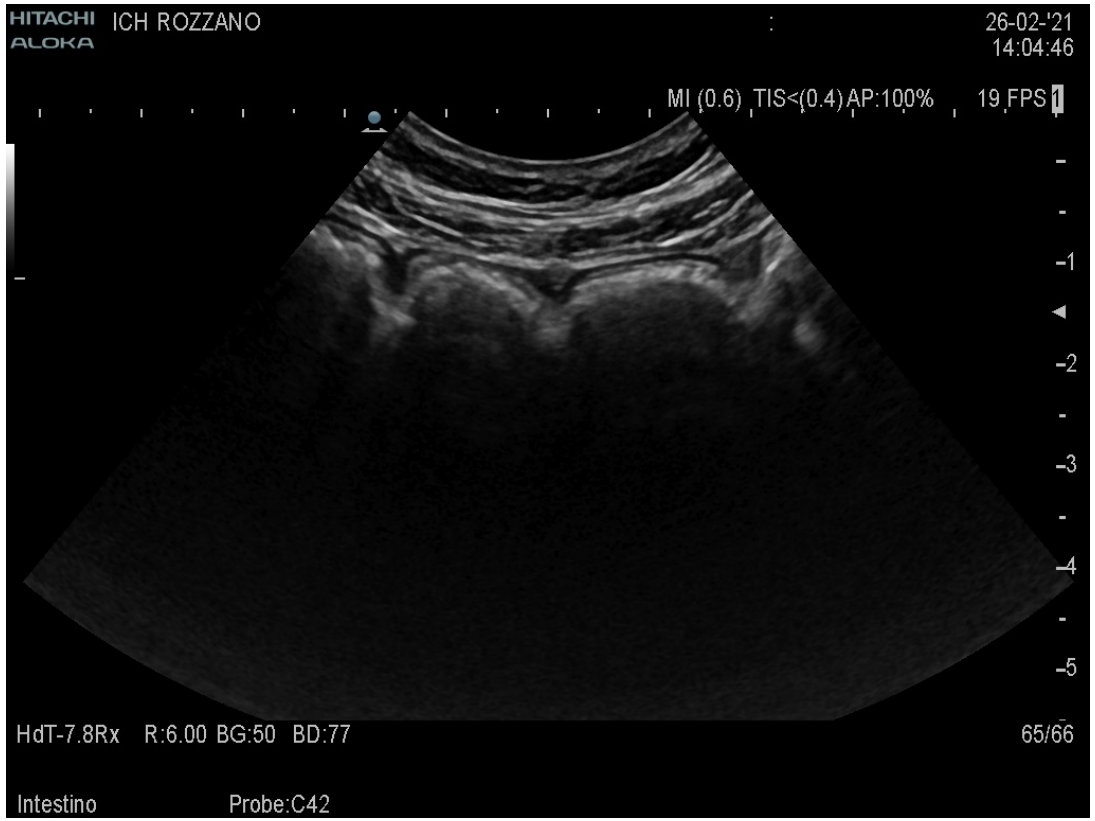


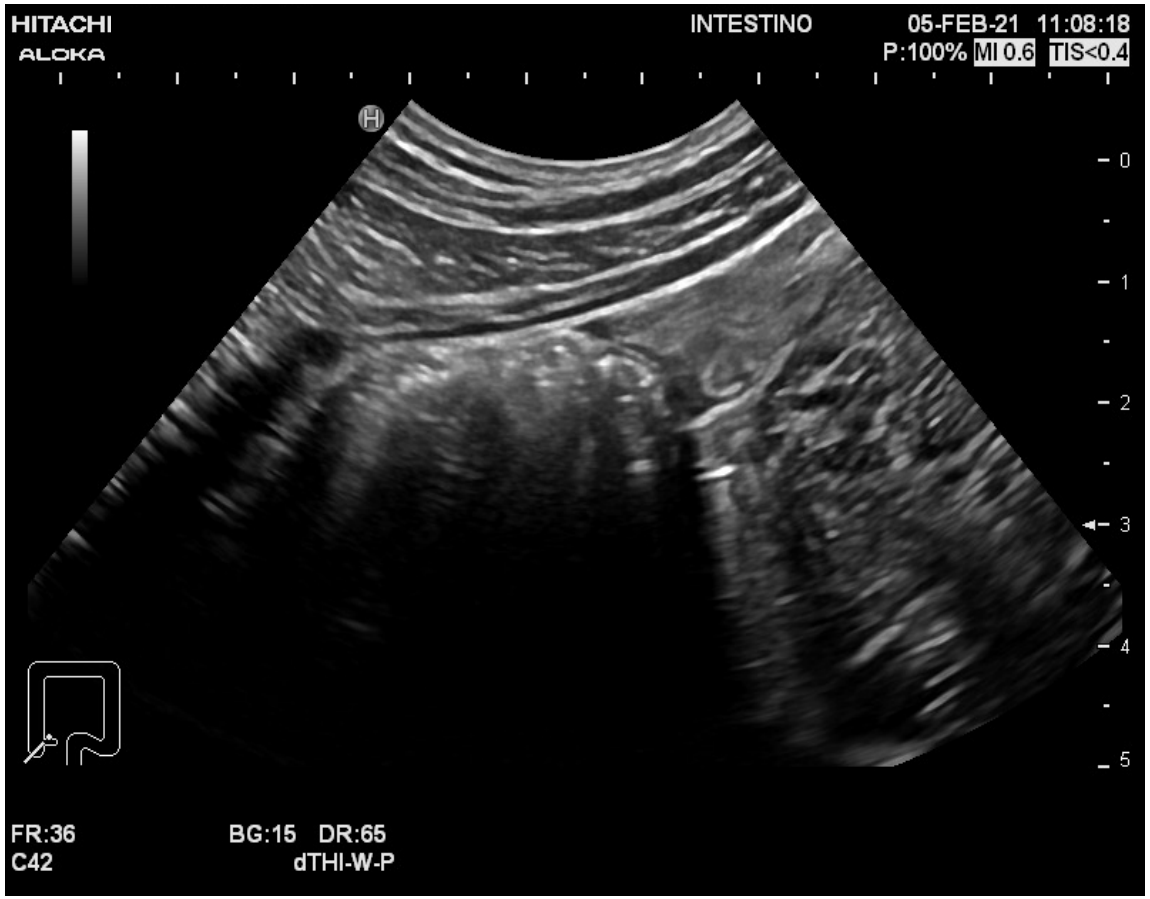
Nylund K et al. Ultraschall in Med 2017; 38: e1–15.

Lumen

- Large bowel → Normal diameter: **up to 5 cm**

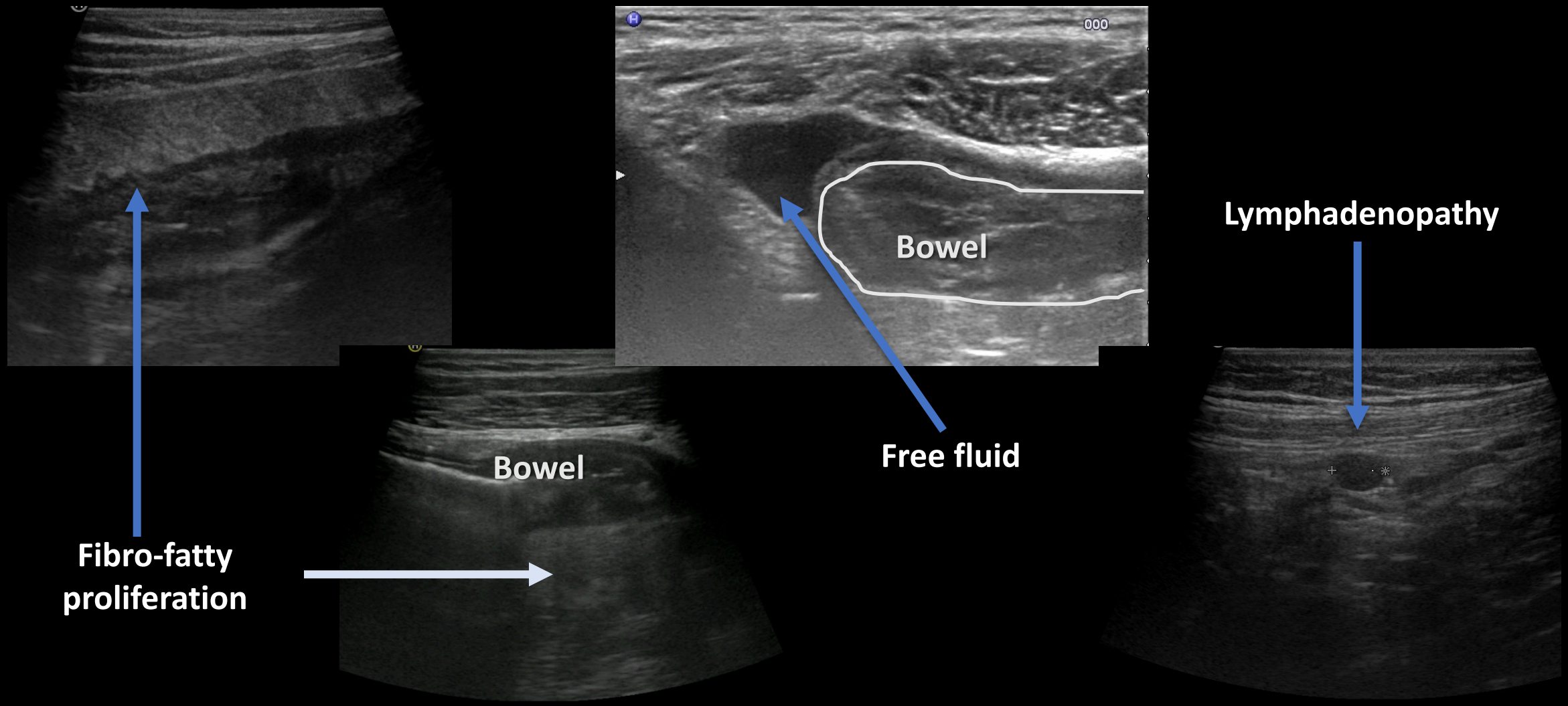
  (the cecum may exceed this width)

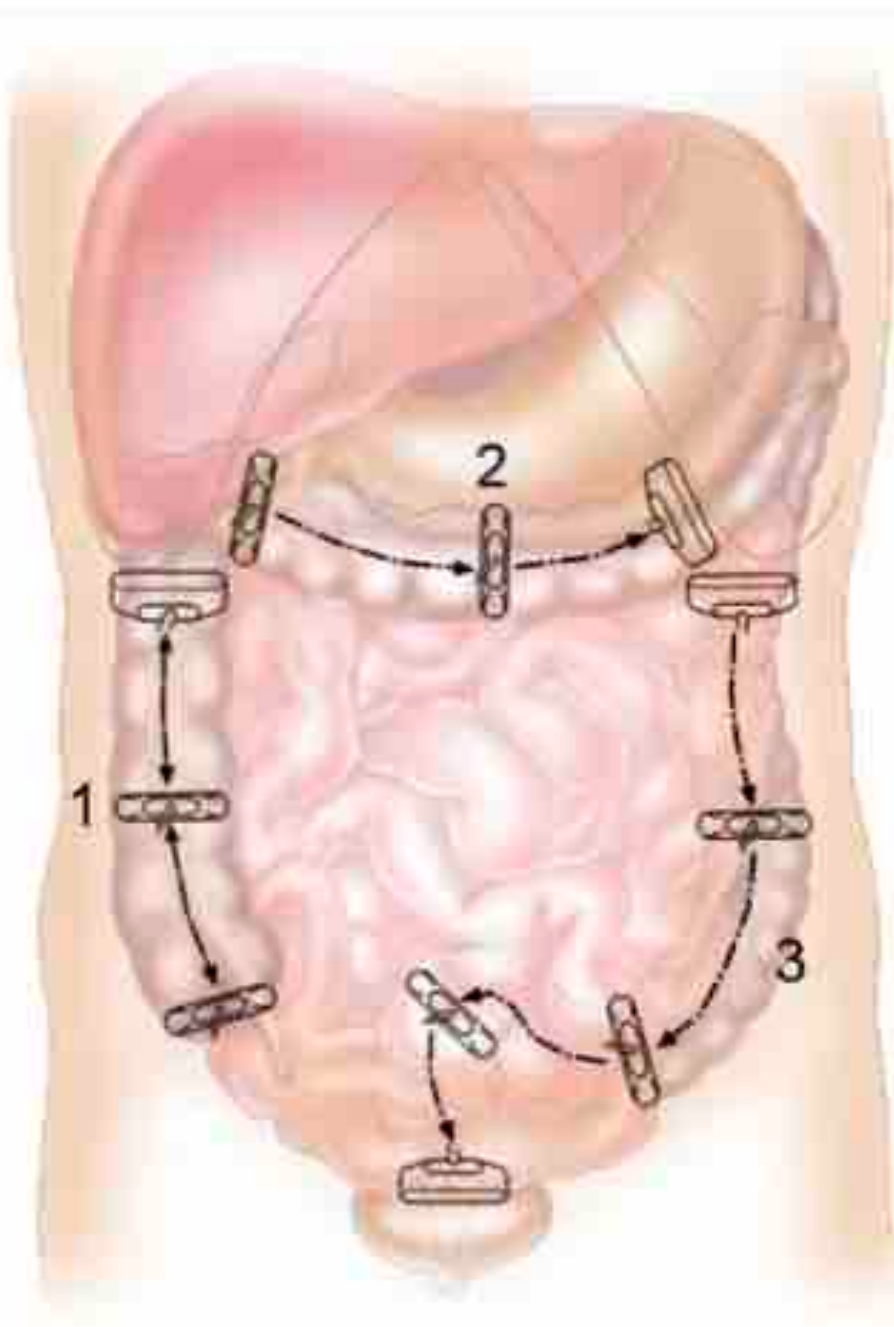




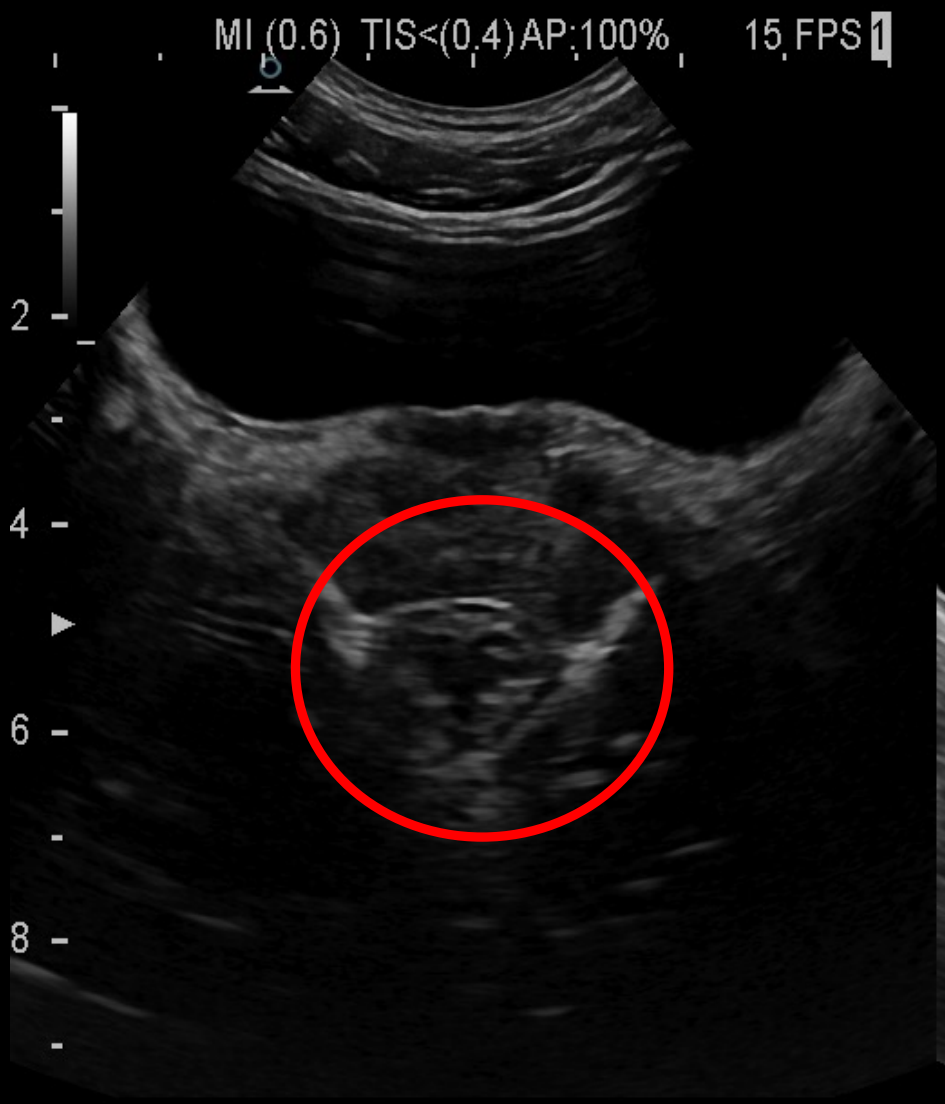
Nylund K et al. Ultraschall in Med 2017; 38: e1–15.

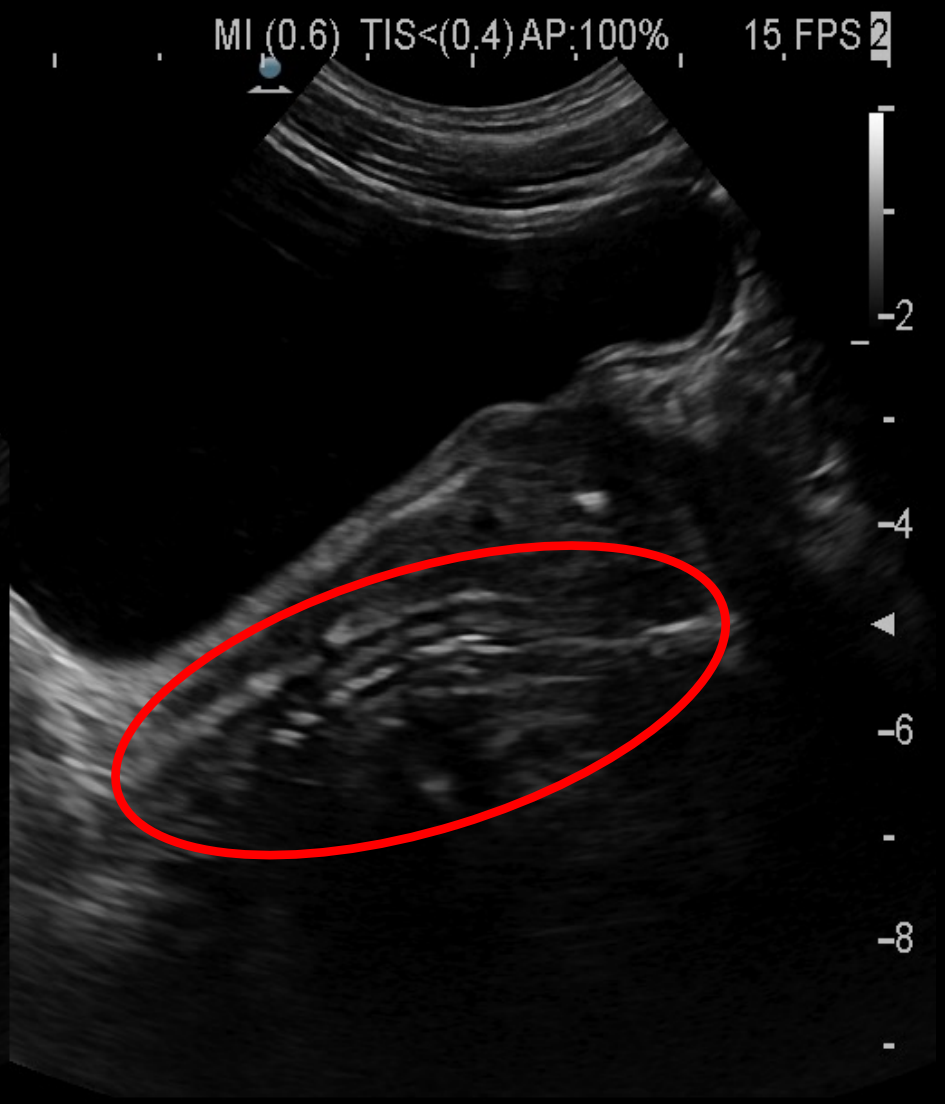
Extraluminal



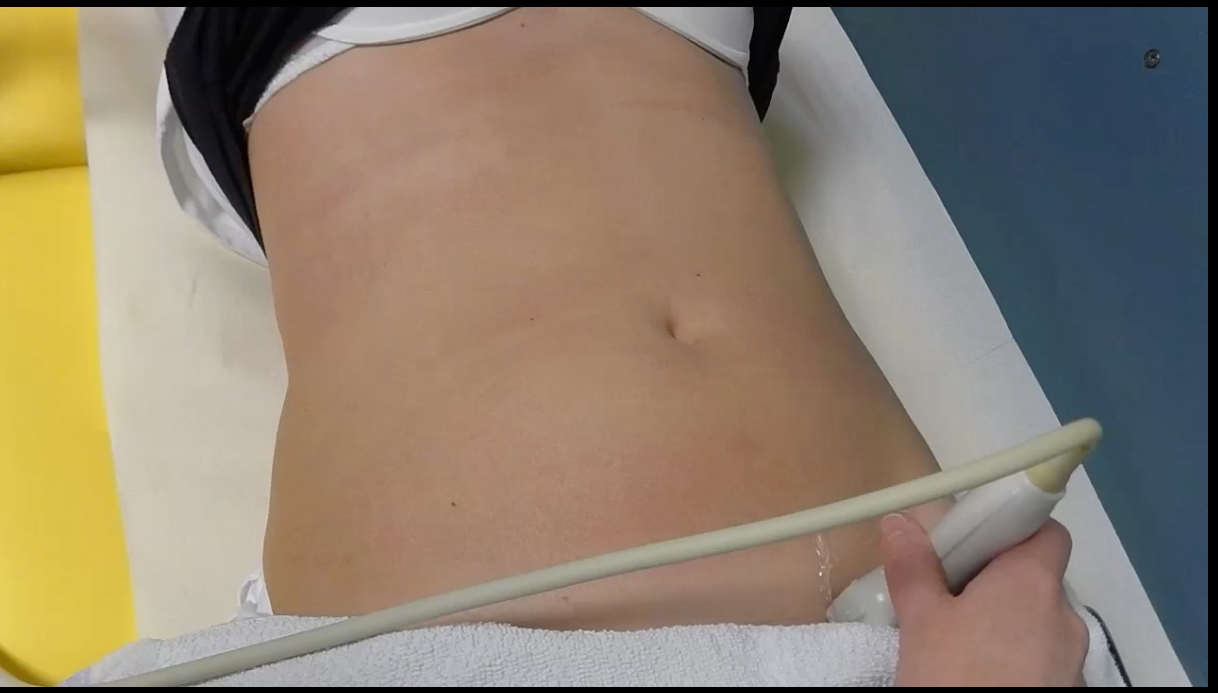

2
1
3

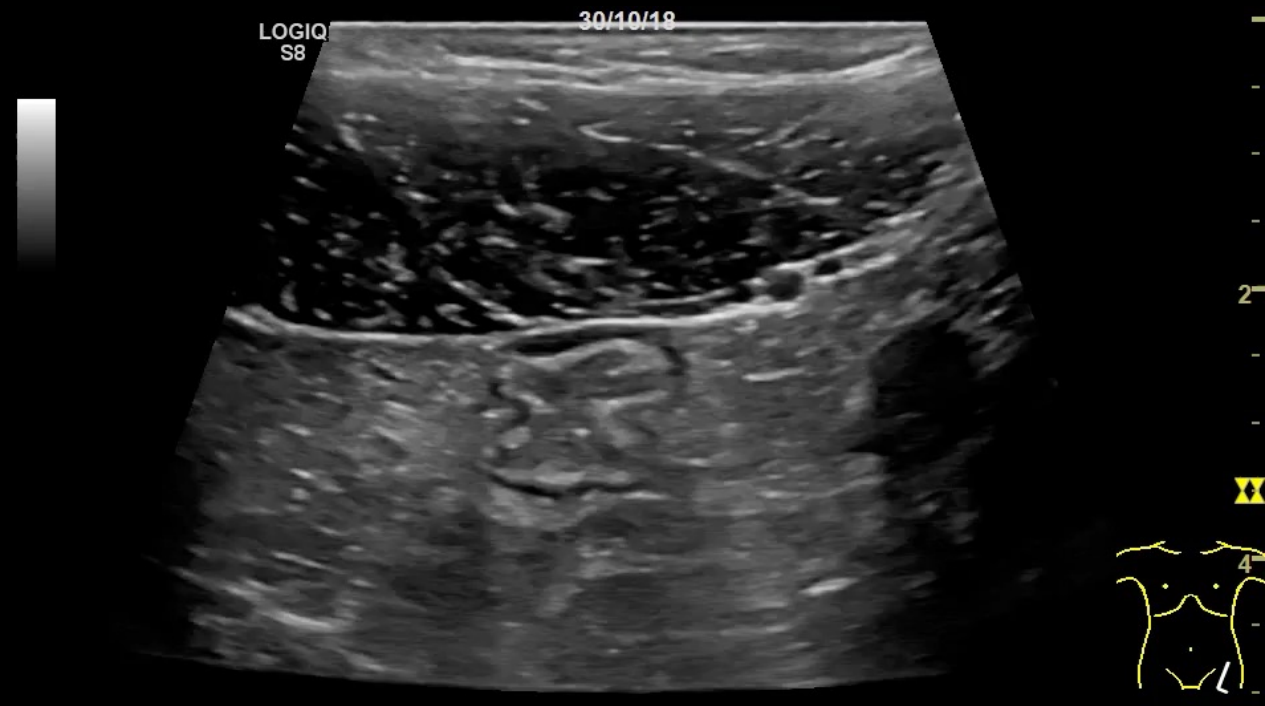
Rectum


MI (0.6) TIS<(0.4) AP:100%
15 FPS 1
2
4
6
8
HdT-7.8Rx R:10.0 BG:48 BD:77
60/61
Intestino
Probe:C42

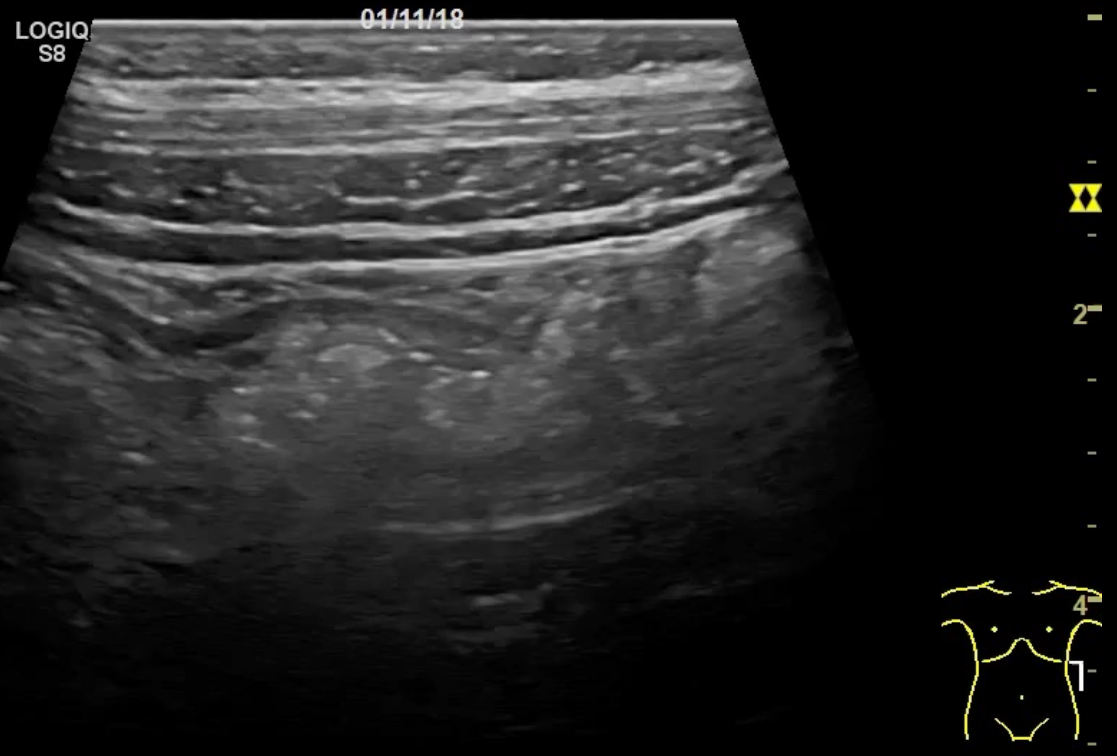

MI (0.6) TIS<(0.4) AP:100%
15 FPS 2
-2
-4
-6
-8
HdT-7.8Rx R:10.0 BG:48 BD:77
63/64
Intestino
Probe:C42

Sigmoid Colon

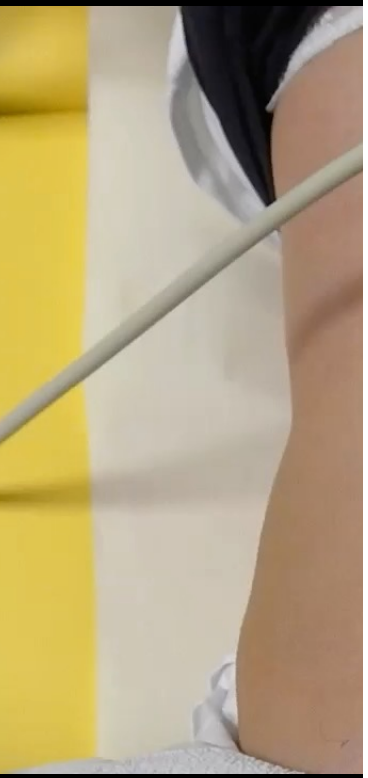


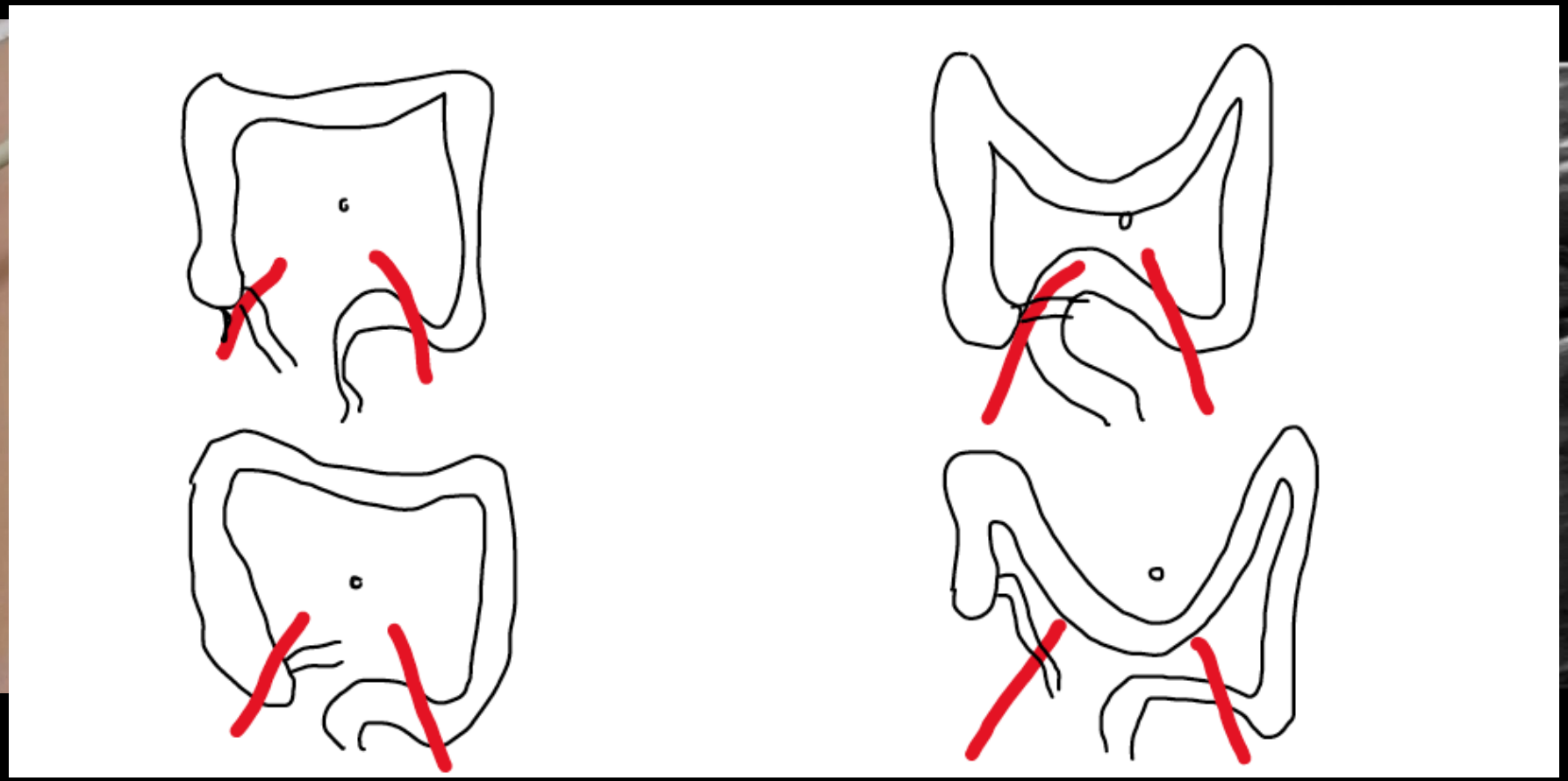


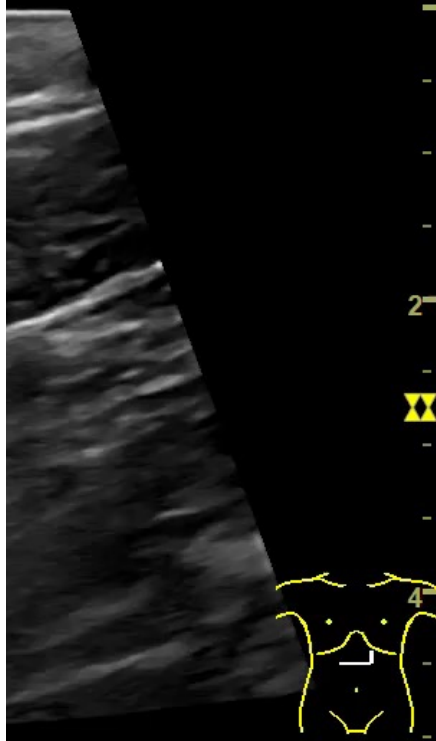
Descending colon



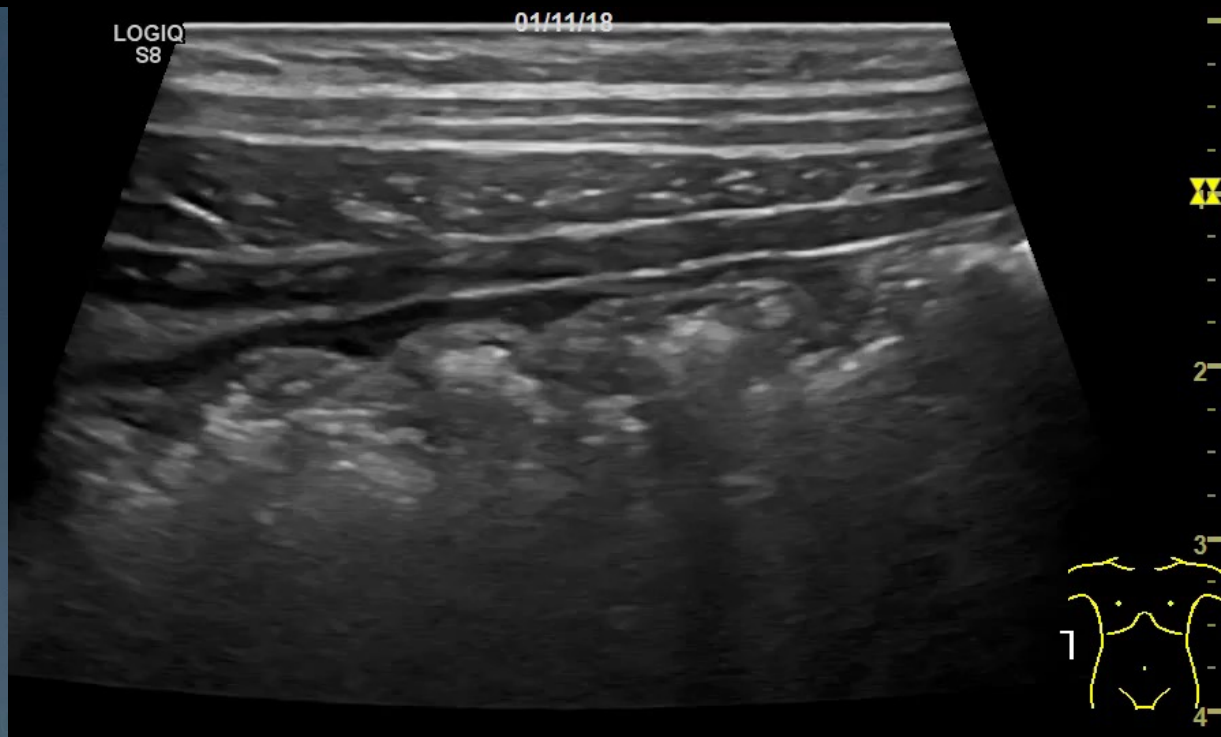
Transverse colon



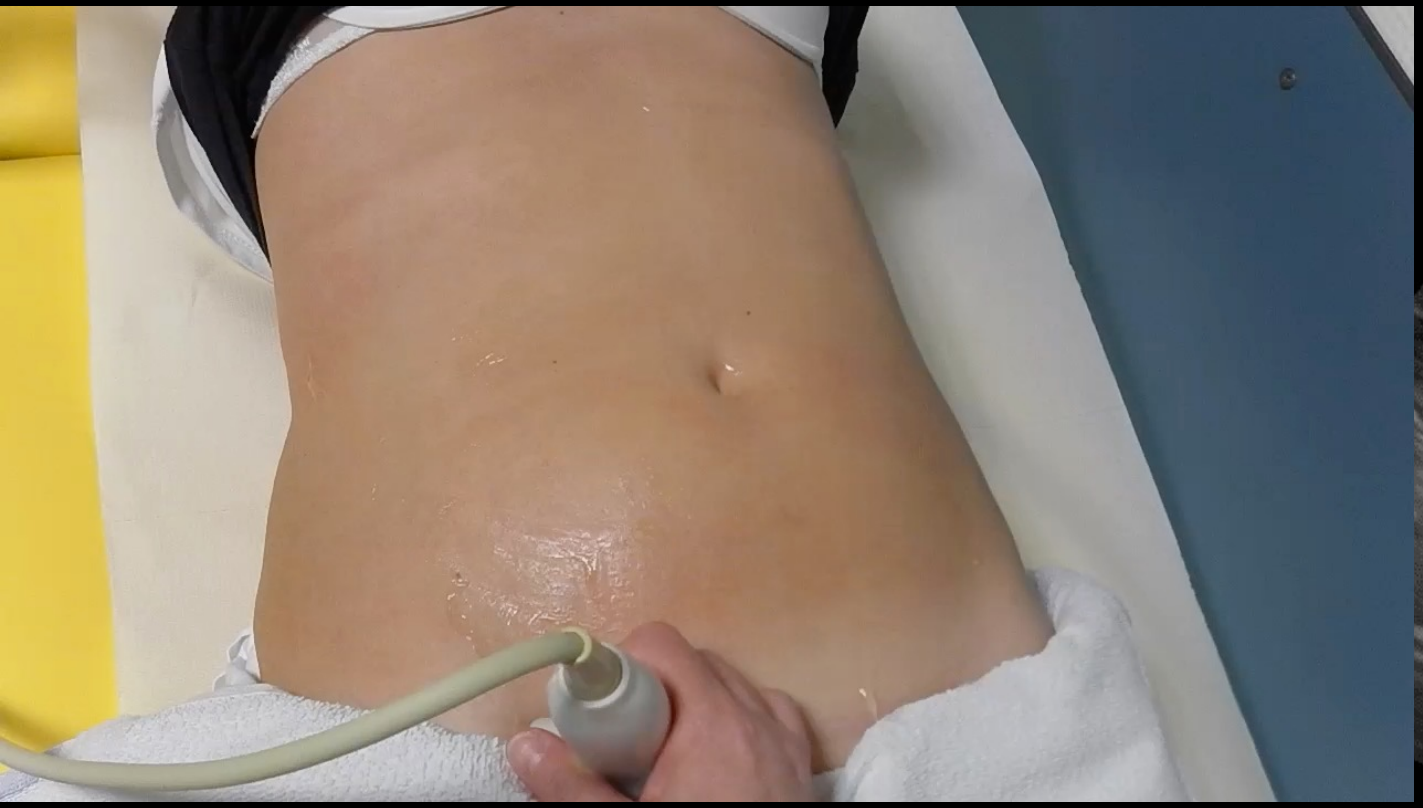


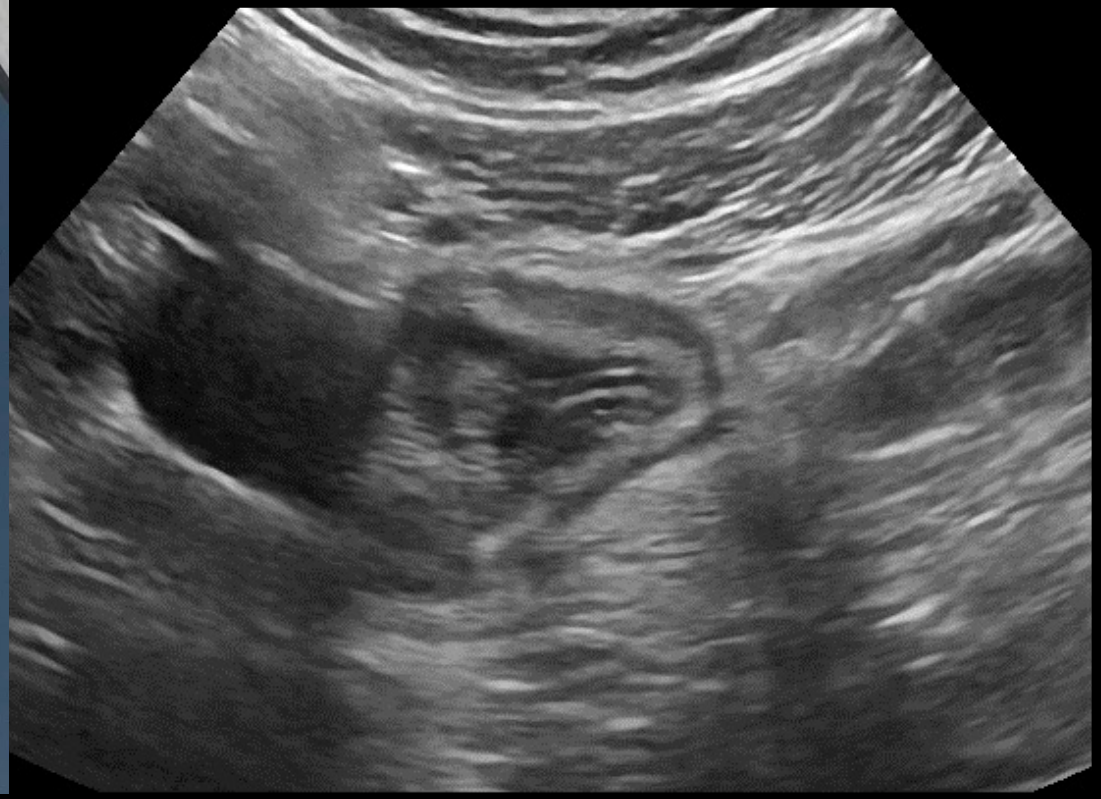


Ascending colon



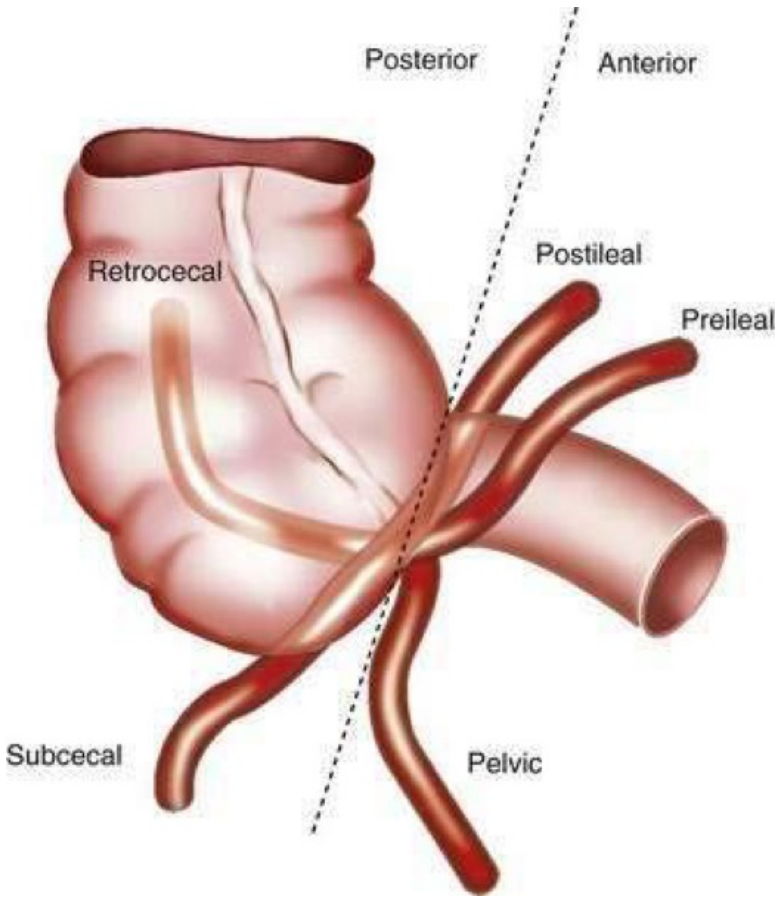
Terminal ileum





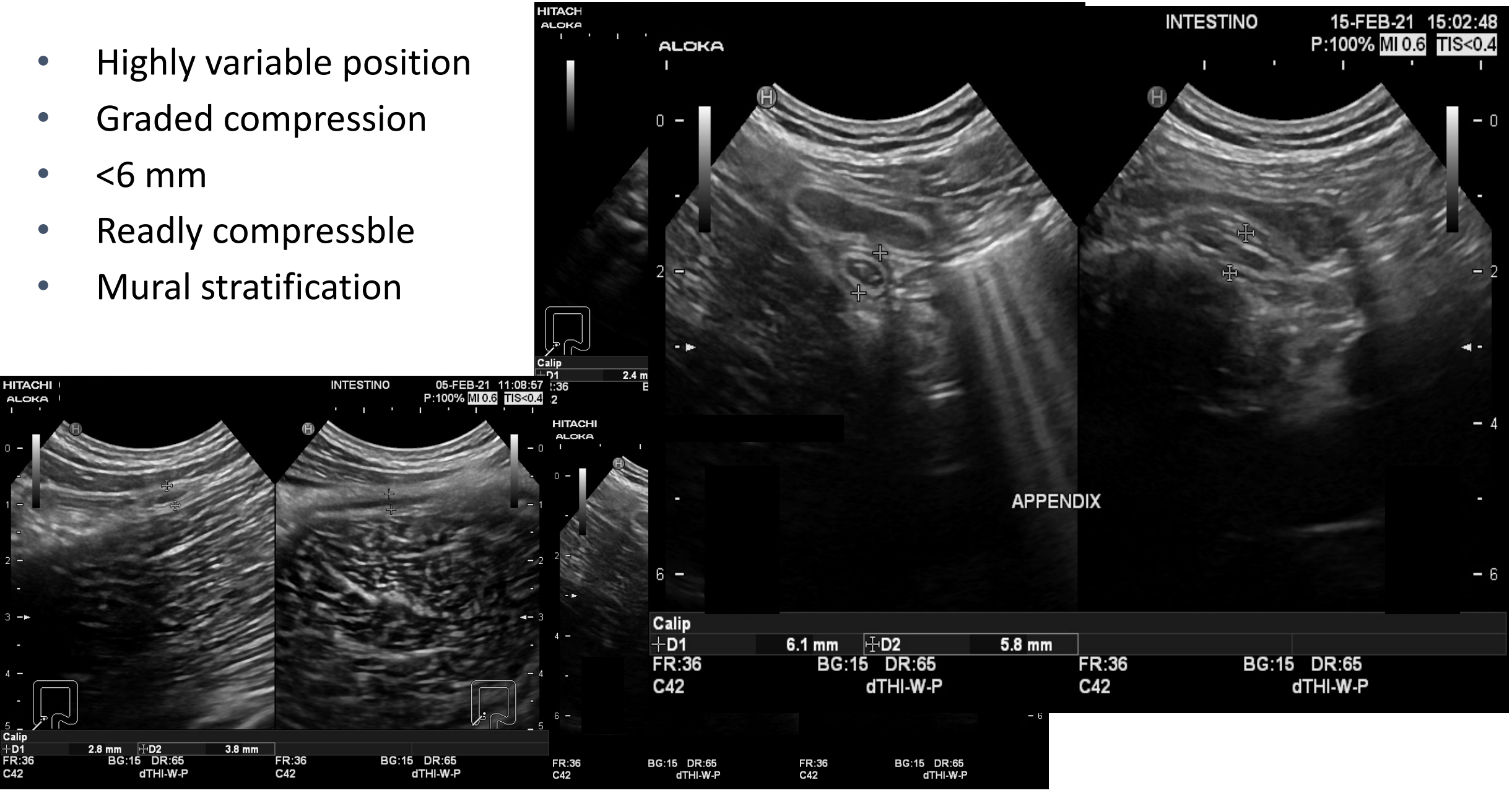
Appendix

- Highly variable position



Appendix

- Highly variable position
- Graded compression
- <6 mm
- Readly compressble
- Mural stratification



How to perform intestinal ultrasound

- Small bowel

“mowing the lawn” technique

Limitations in bowel segments examination

Optimal bowel segments	Limited bowel segments
Sigmoid colon	Rectum
Descending colon	Splenic flexure
Transverse colon	Proximal ileum
Ascending colon	Jejunum
Ileocecal valve	
Terminal ileum	

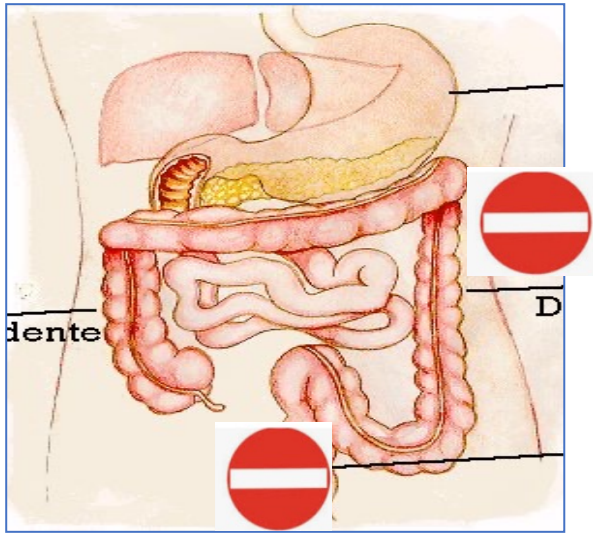
Dollinger MT et al. *World J Gastroenterol* 2023

Take home messages

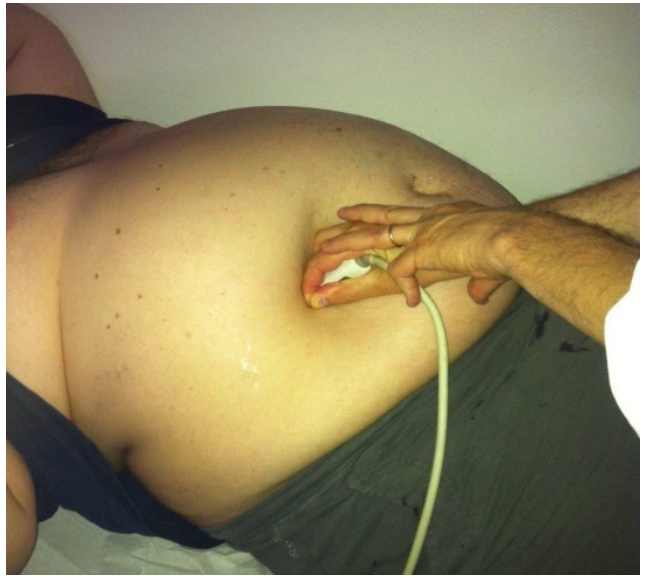
- Preparation: none
- Probe 5-8 MHz
- orientation
- know what to look for
- anatomical landmarks
- ultrasound scan plans
- systematic approach

Untrained sonographer

Anatomic location



Obesity



"But the starting point is awareness of the limits.."

Bezzio C, DLD 2021

Thank you for your attention