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Part I:

How to perform IUS Fundamentals of bowel & the mesentery

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Disclosure

- Advisory board member for Abbvie and Celltrion
- Conference travel support from Organon and Johnson & Johnson

Acknowledgment

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Intended Learning Outcomes (ILOs)

By the end of this session, the learner will be able to:

1. Identify common ultrasound probes used in gastrointestinal imaging.
2. Select the appropriate ultrasound probe for the target anatomy and adjust settings for optimal visualization of intestinal structures.
3. Effectively and correctly position the probe, optimize images, and freeze to ensure accurate measurement and interpretation of IUS findings.
4. Describe the principles of ergonomics and hygiene in IUS practice.
5. Evaluate the impact of scanning conditions (e.g., proper lighting, patient positioning, and gel application) on IUS image quality and diagnostic accuracy.
6. Demonstrate the ability to navigate and scan the gastrointestinal tract systematically.
7. Execute precise probe movements including slide, sweep, rotate, and tilt to effectively visualize different structures.
8. Locate and annotate specific bowel segments on IUS images using labels or anatomical landmarks to facilitate interpretation and documentation.
9. Differentiate between small and large bowel on IUS based on their anatomical location and features.
10. Identify anatomical variations or abnormalities that could alter the typical bowel localization on IUS.
11. Effectively and correctly position the probe, optimize images, and freeze to ensure accurate measurement and interpretation of IUS findings.
12. Describe the steps involved in storing ultrasound images and cine loops, including considerations for data security and retrieval.
13. Understand how to maneuver between different anatomical planes during scanning

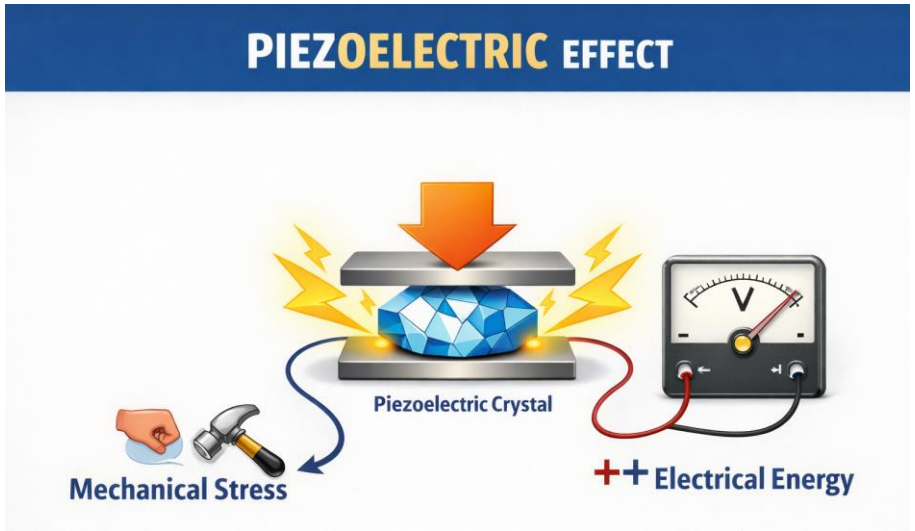
Objectives

1. To appreciate basic US physics
2. To identify distinguishing features of normal small & large intestine on IUS
3. To understand probe selection and movement
4. To describe a systematic approach to evaluating the intestines

1794

Echolocation

1877



Piezoelectric crystals

1915

The first ultrasound transducer

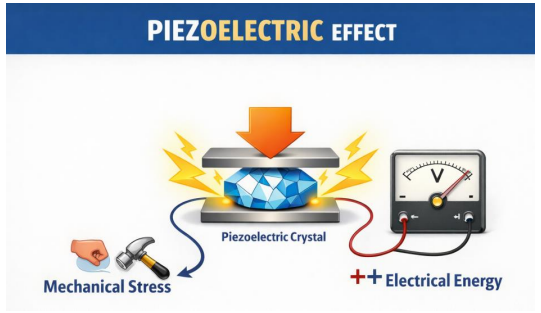
Google Images

Understanding ultrasound physics

1794

Echolocation

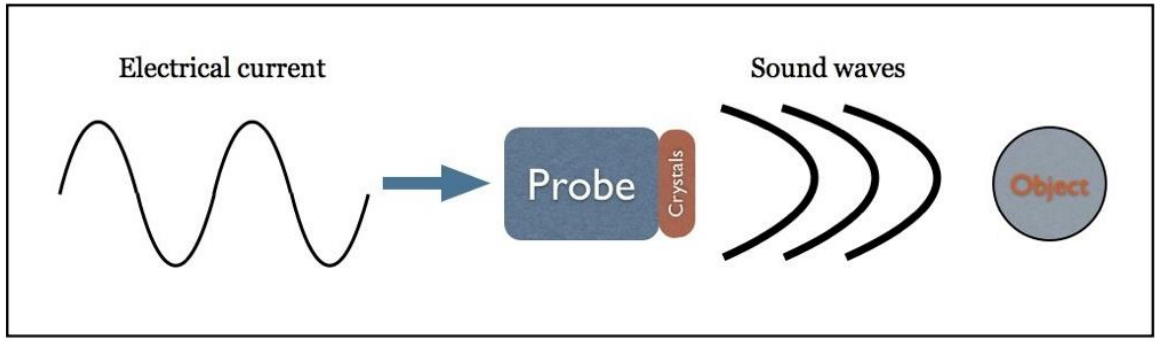
1877

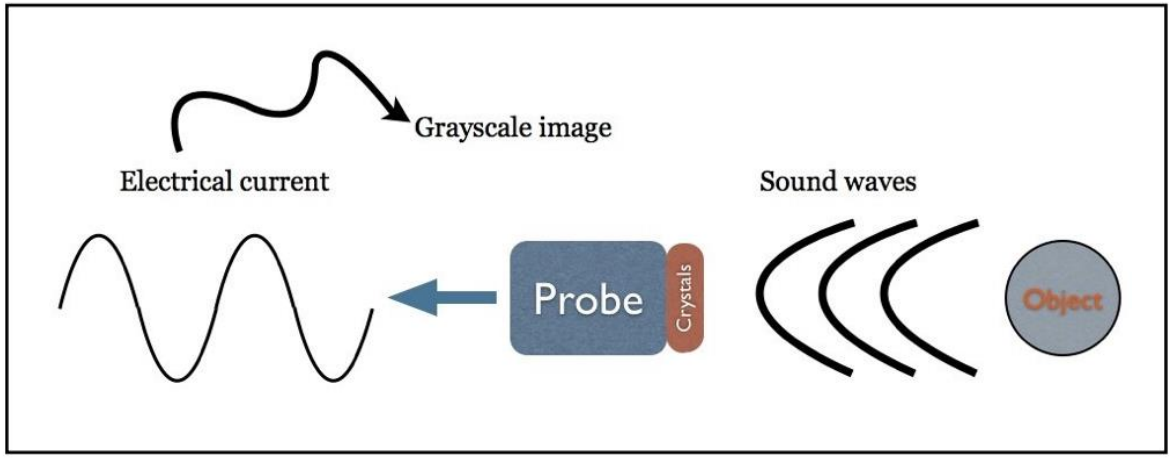


Piezoelectric crystals

1915

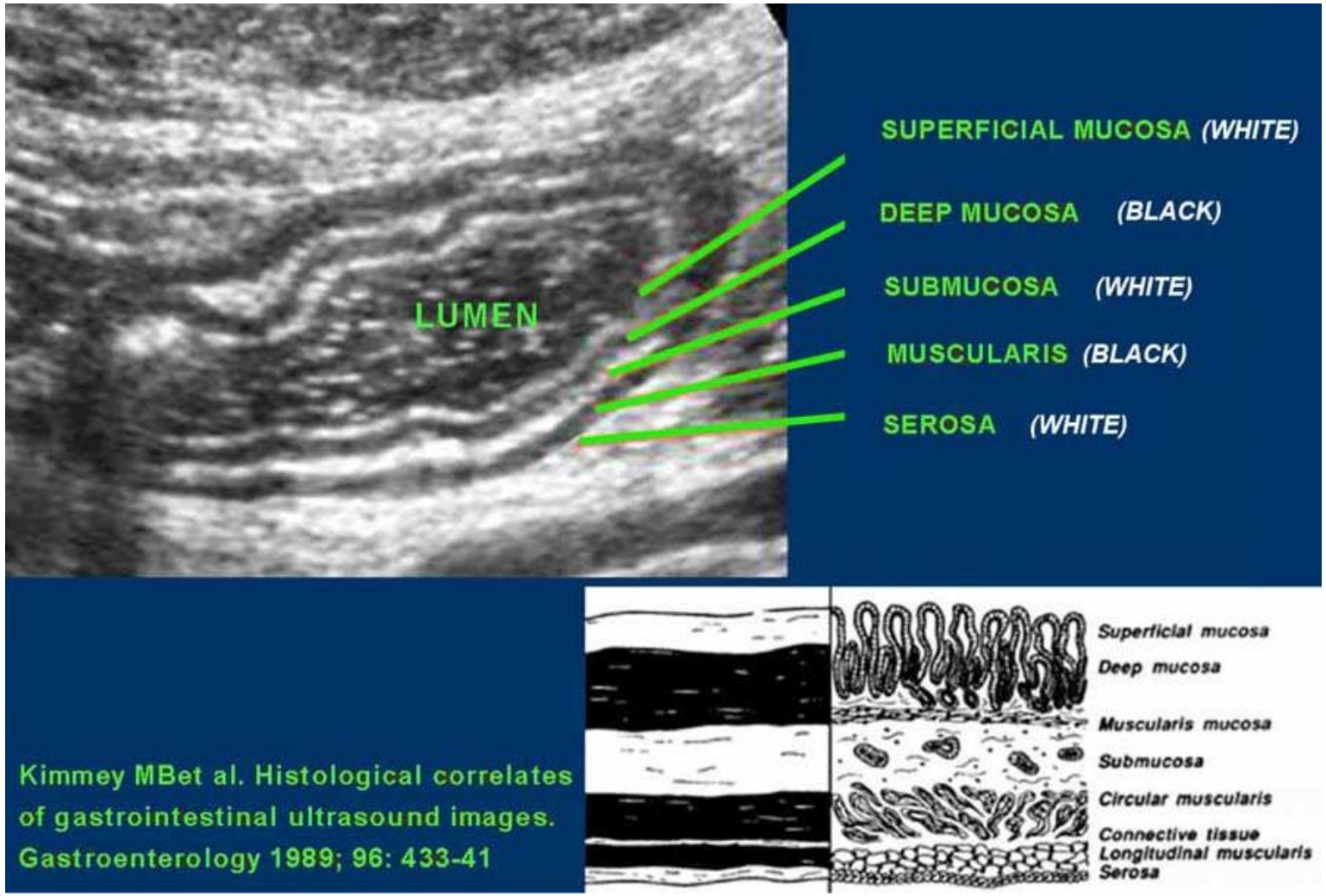
The world's first US transducer

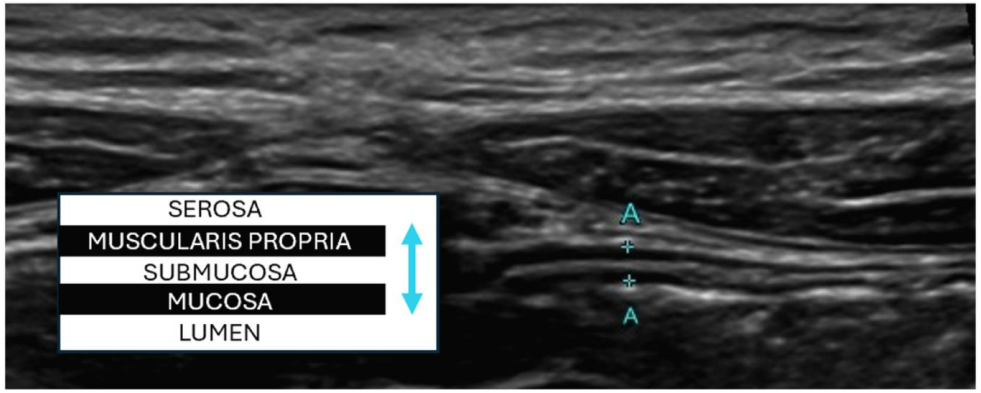




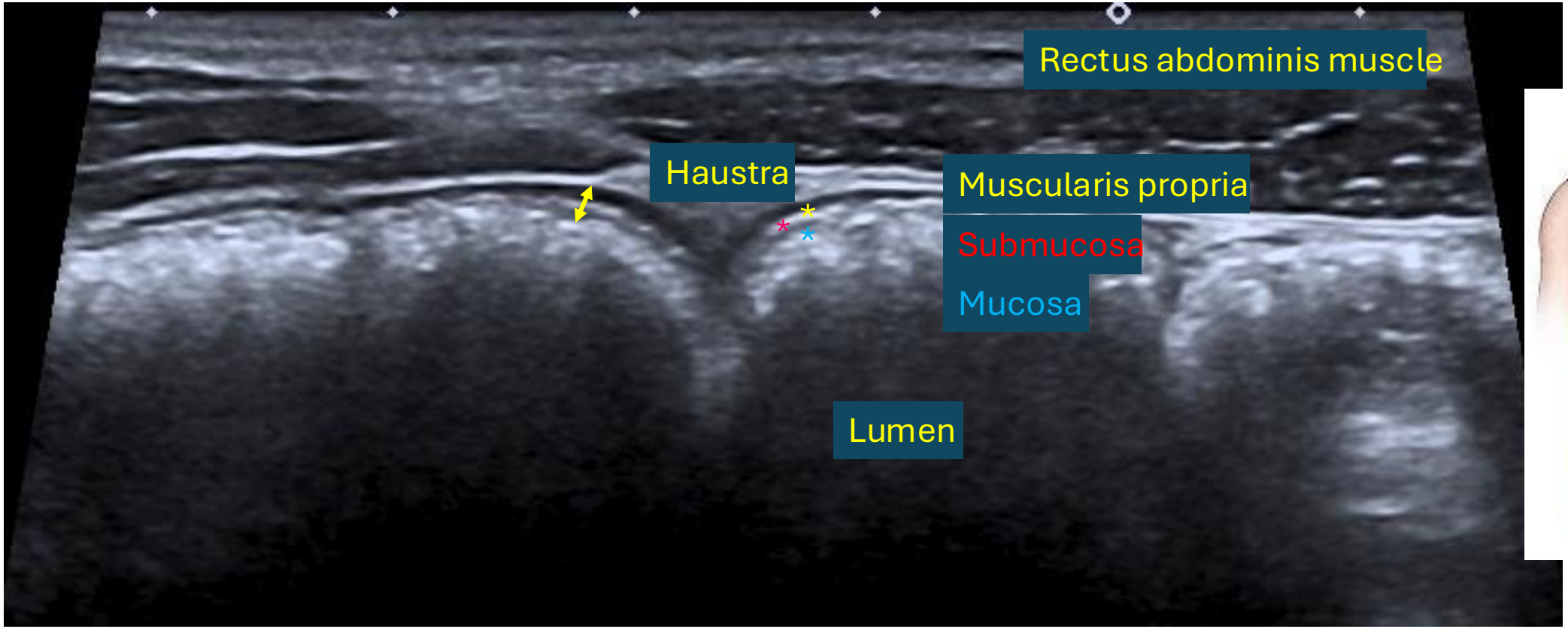
- Run time of Acoustic Beam – Based on acoustic velocity => Depth (**POSITION**)
- Intensity of Acoustic Beam – Influenced by degree of reflection & attenuation of sound waves => **BRIGHTNESS**

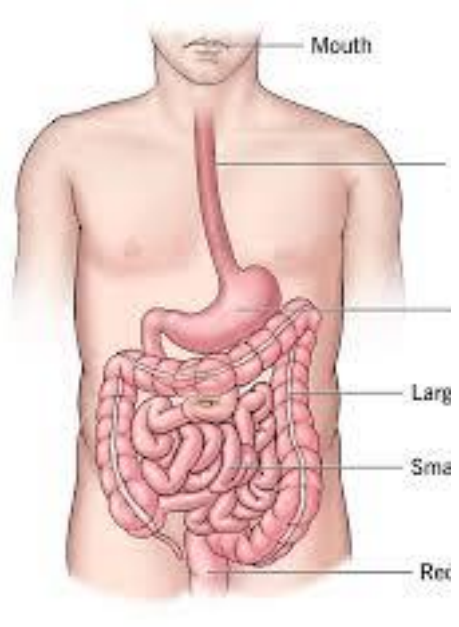
Normal Intestine - Layers of the bowel wall





Normal colon – Longitudinal view





Identifying features of colon: Location, absence of motility, haustra

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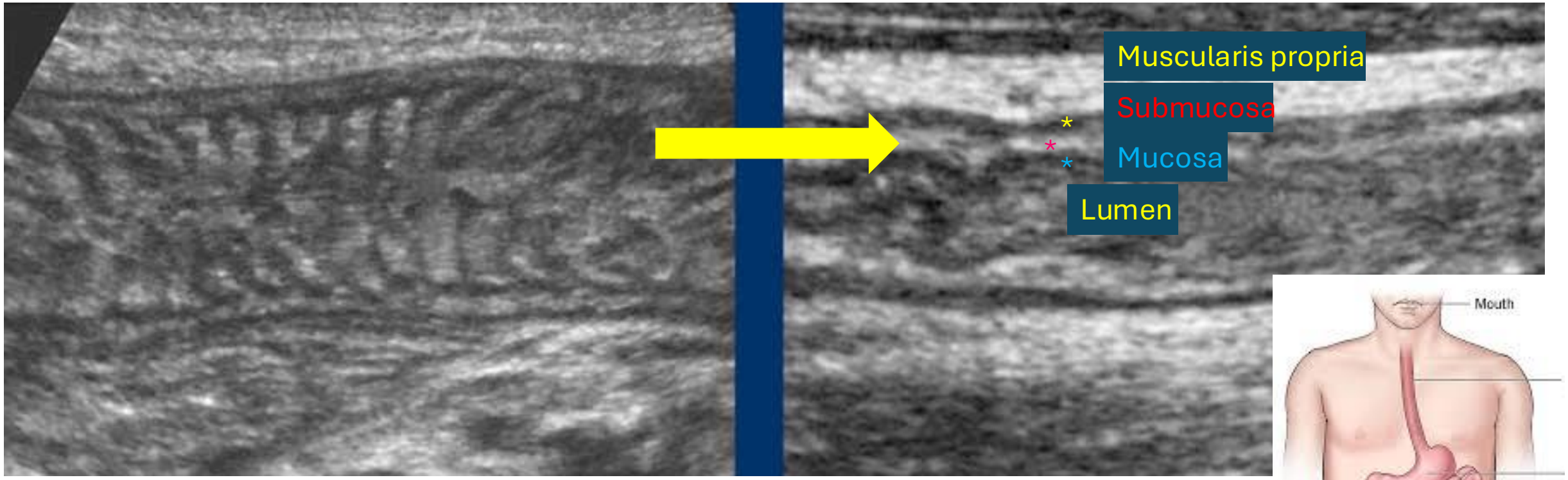
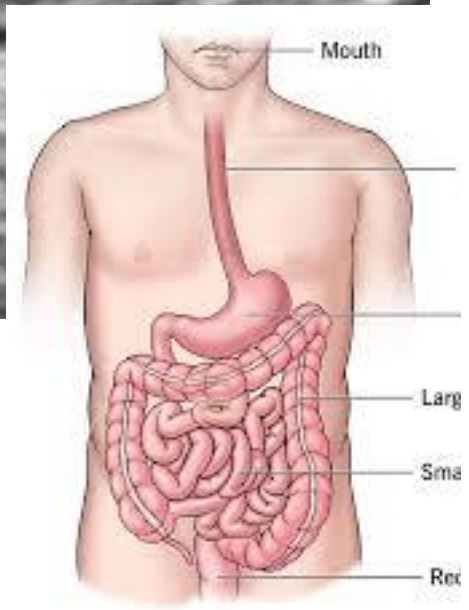
Normal small intestine - Longitudinal view





Identifying features of small intestine:

Location, motility, and Kerckring folds

https://radiologyassistant.nl/abdomen/bowel/lk-jg-1-1

How to perform the scan – Setting the stage

- Quiet, dimly-lit room
- Screen time can help
- No fasting or bowel preparation required
- Full bladder for optimal rectum visualization

- Core ergonomic principles
  - Magic triangle - patient, control panel, screen
  - Neutral posture - back, shoulders, neck
  - Arm positioning - keep arm close to the body
  - Transducer grip
    - Relaxed palm-based grip
    - Keep wrist straight
    - Avoid sustained pressure

- Expose the abdomen adequately
- Water-based ultrasound gel

Coffin C, Reports in Medical Imaging 2014

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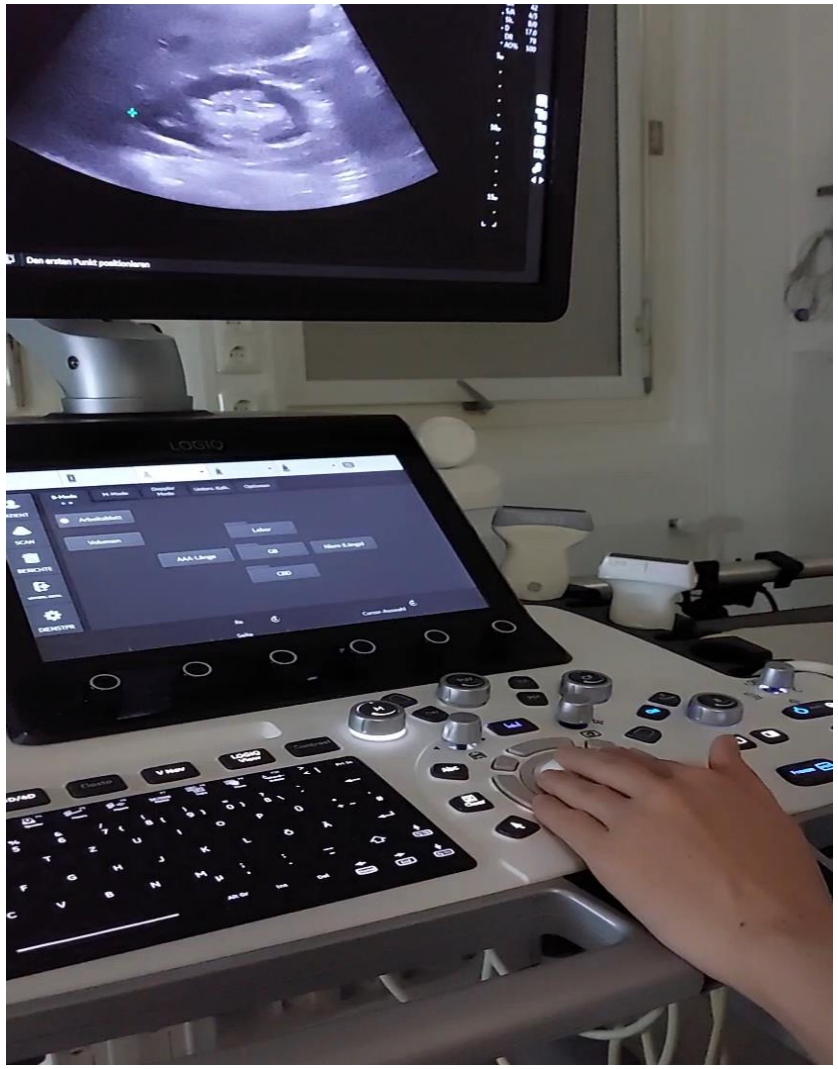
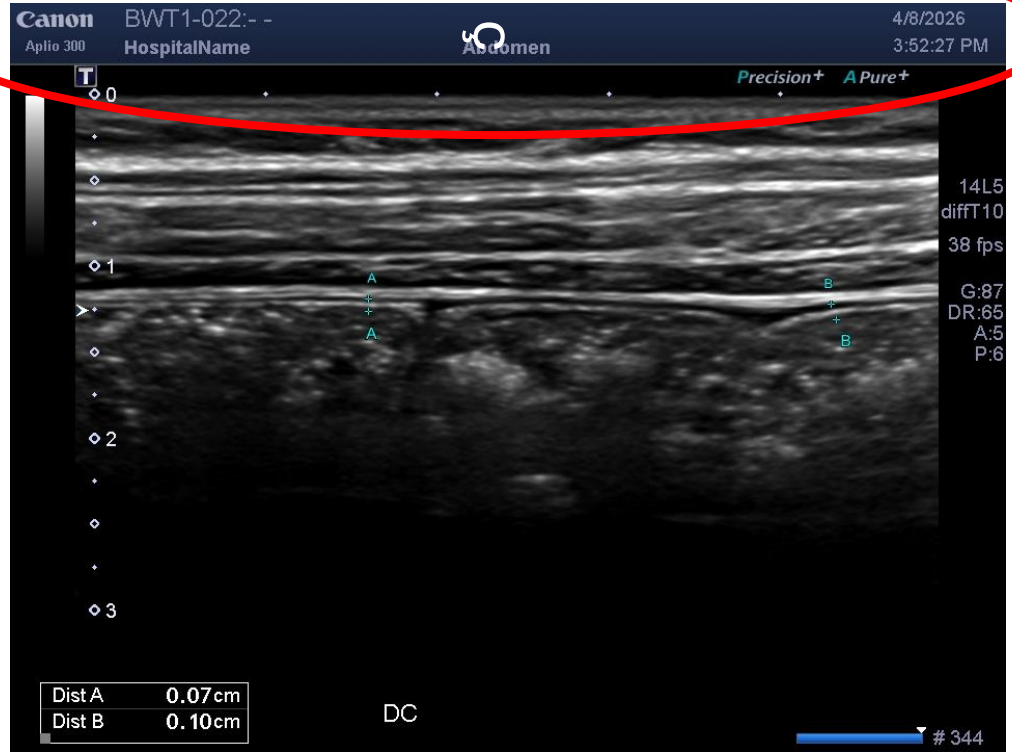
How to perform the scan – Getting started



Enter patient ID / details
Save examination when finished



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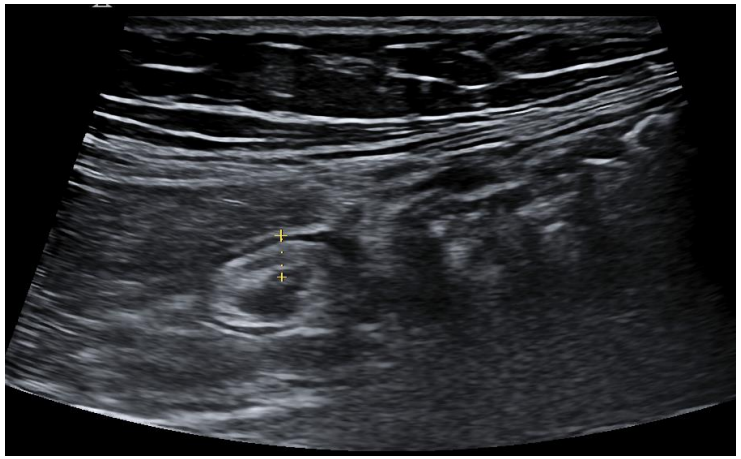
Probe Selection

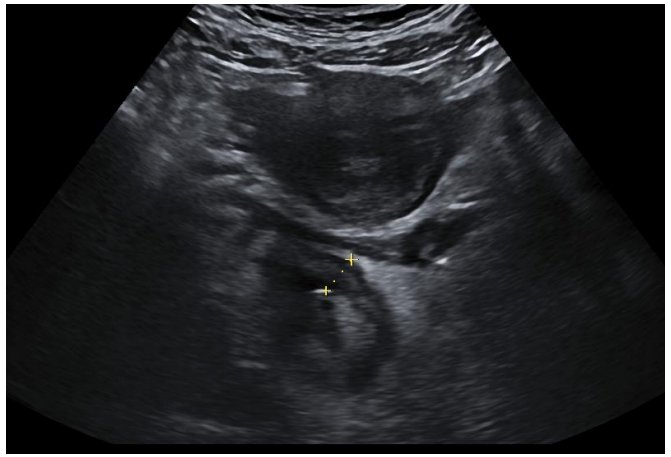
Linear

- Higher frequency (5-15 MHz)
- Higher resolution
- Shallow structures (<8 cm)
- Linear footprint
- Measure BWT



Curvilinear

- Lower frequency (3-5 MHz)
- Lower resolution
- Deeper structures
- Large / wide footprint



Higher-frequency Curvilinear and Micro-convex

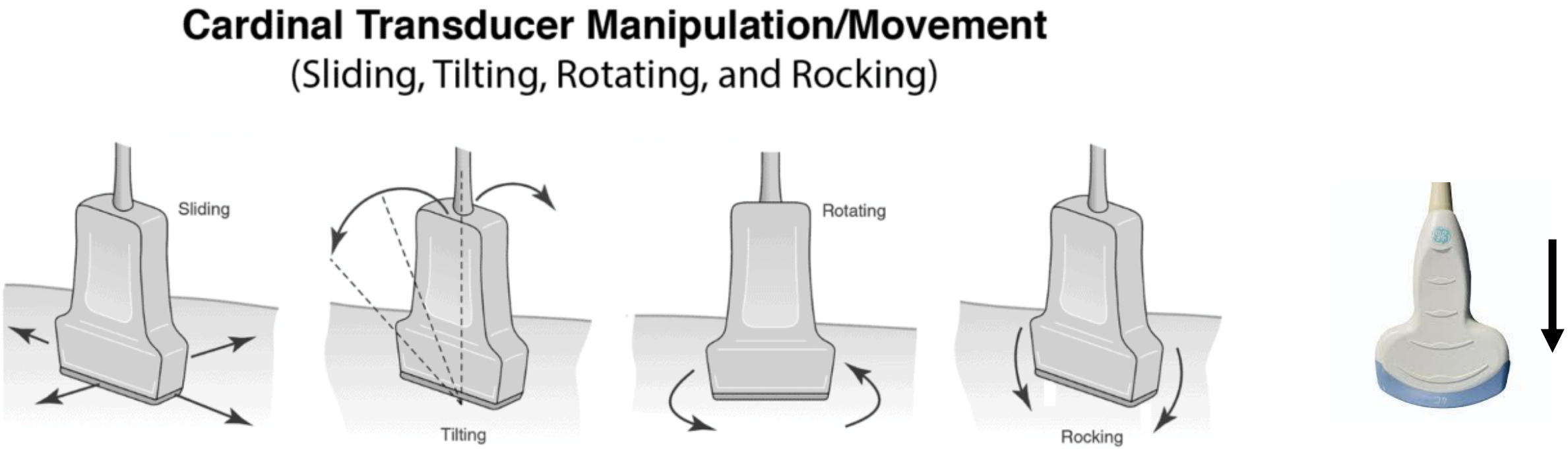
- Med-higher frequency (3.5-9 MHz)
- High resolution
- Wider field of view
- Superficial and mod-deep structures
- Rectum

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

Performing the scan - Probe Movements



Sliding

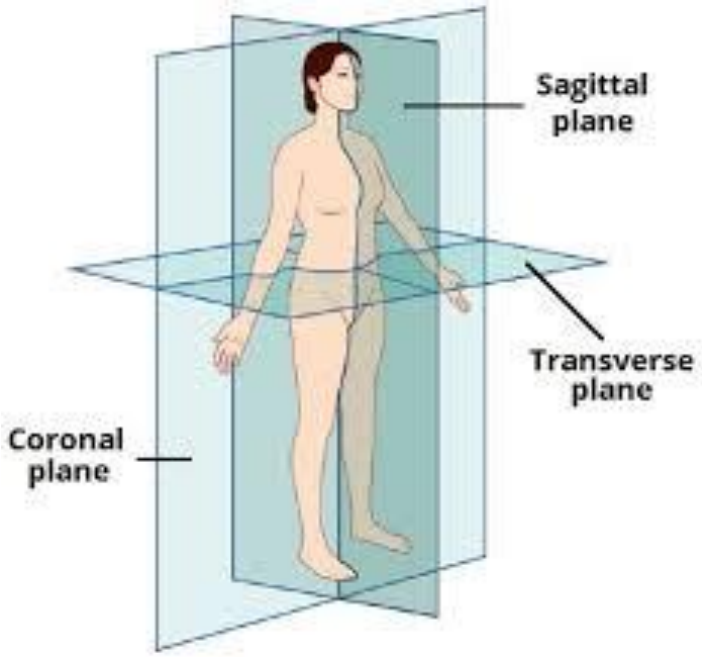
Fanning / Tilting

Rotating

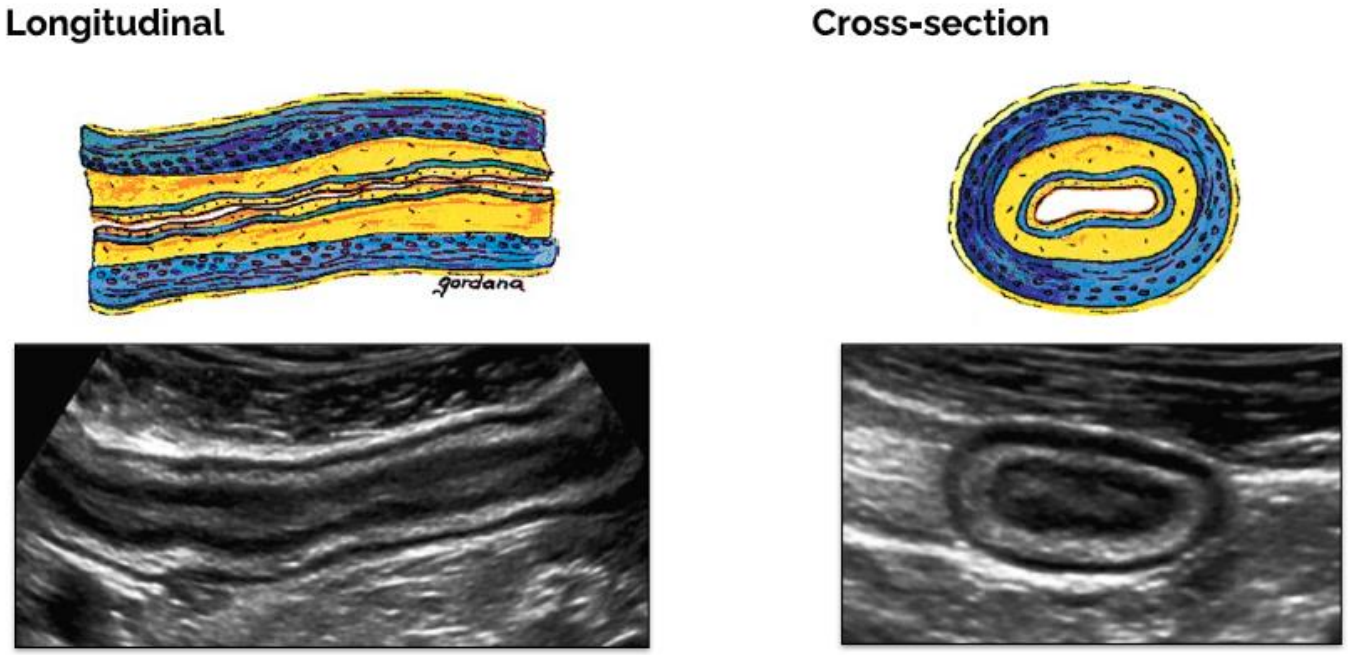
Rocking

Graded Compression

Planes of the probe

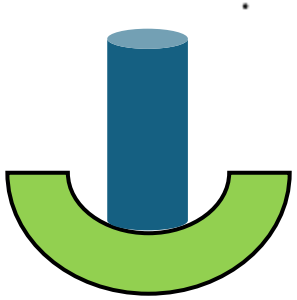


Planes of the intestine



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

Keep your region of interest in the center



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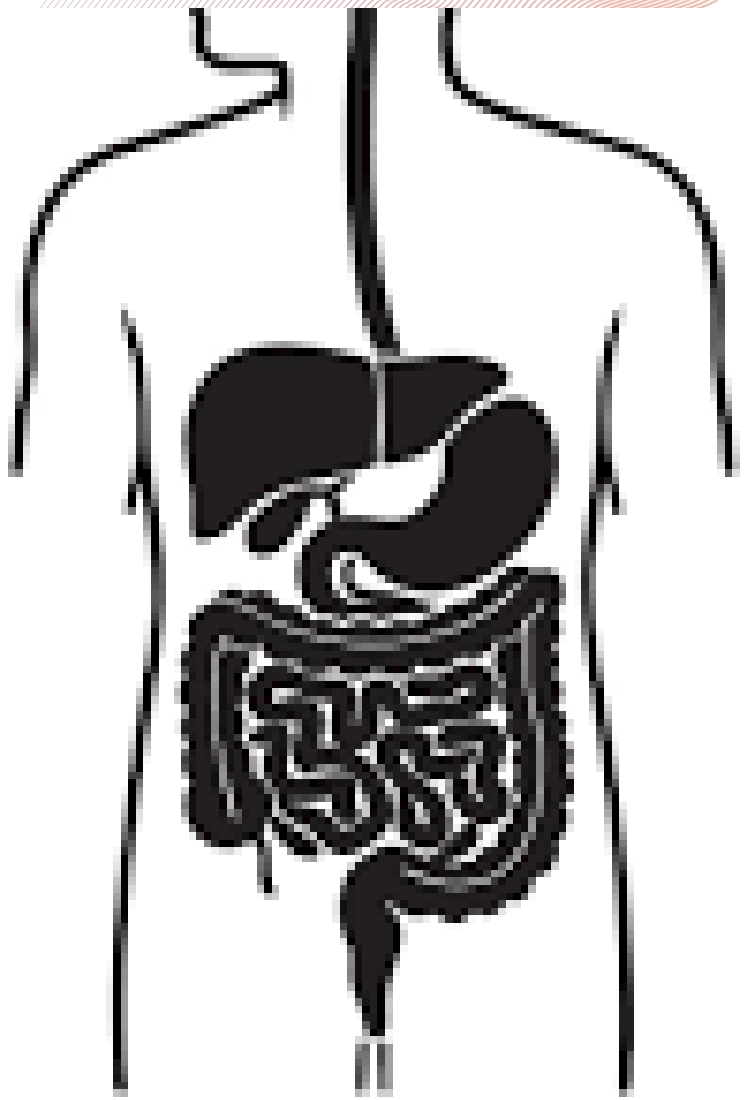
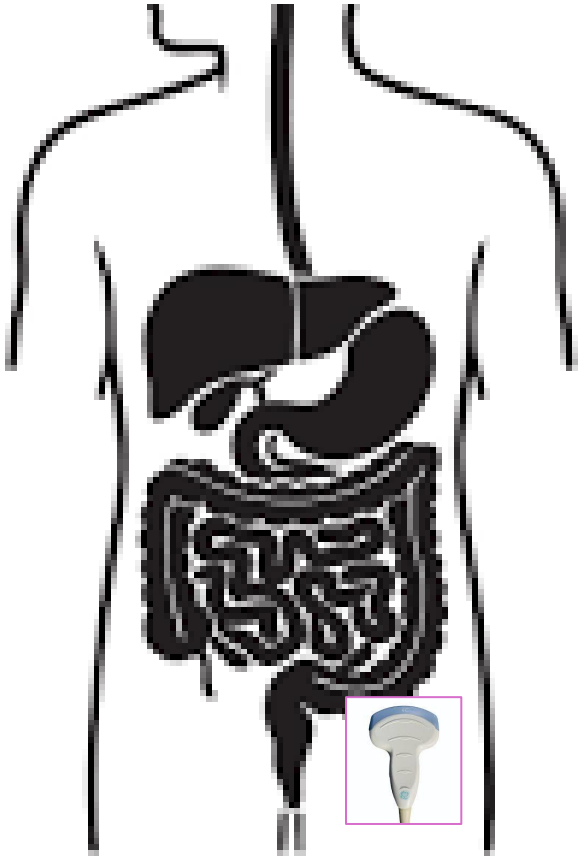
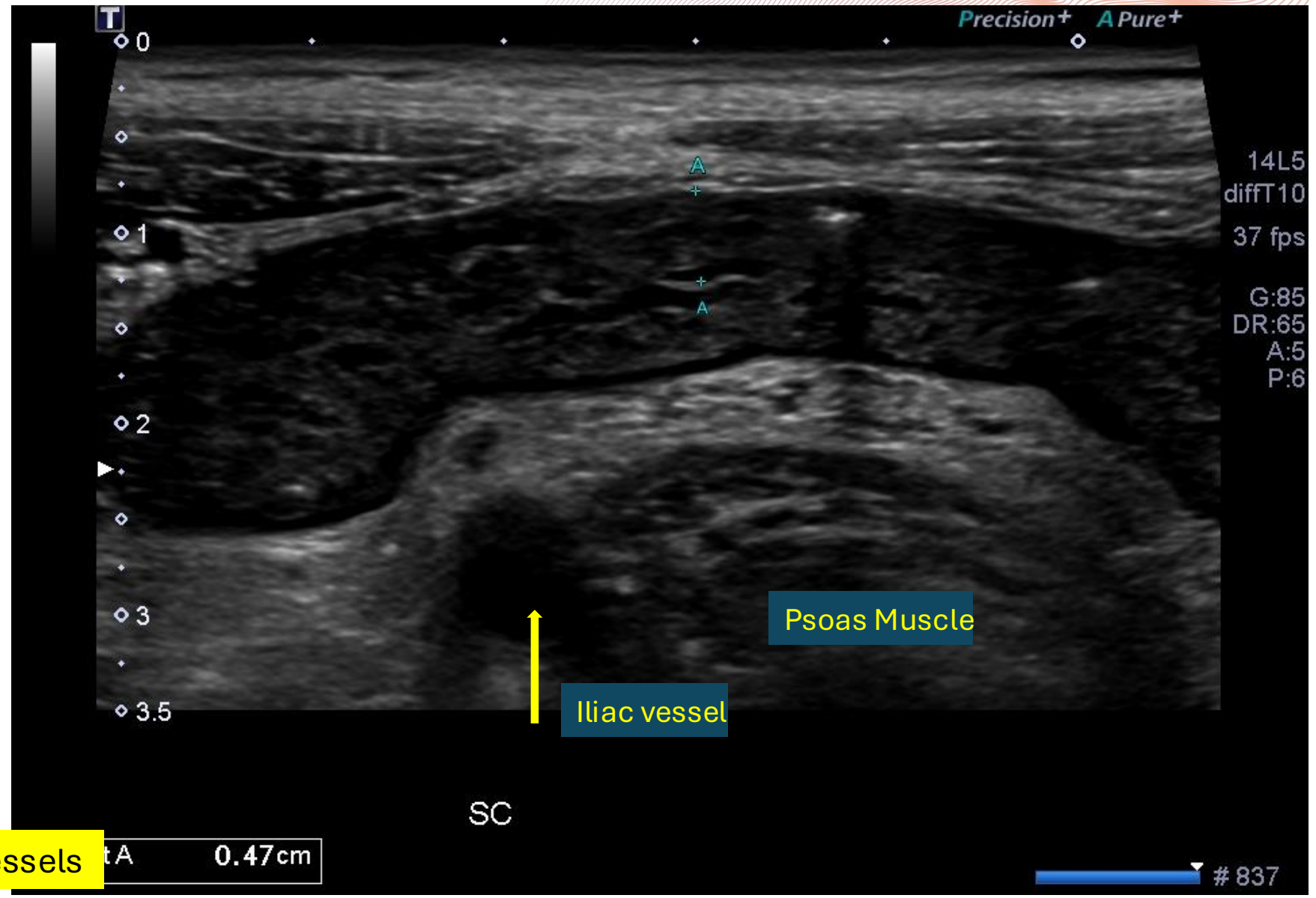
Performing the Scan – A systematic approach

1. Sigmoid to Terminal ileum
2. Rectum
3. Lawnmower 4-quadrant



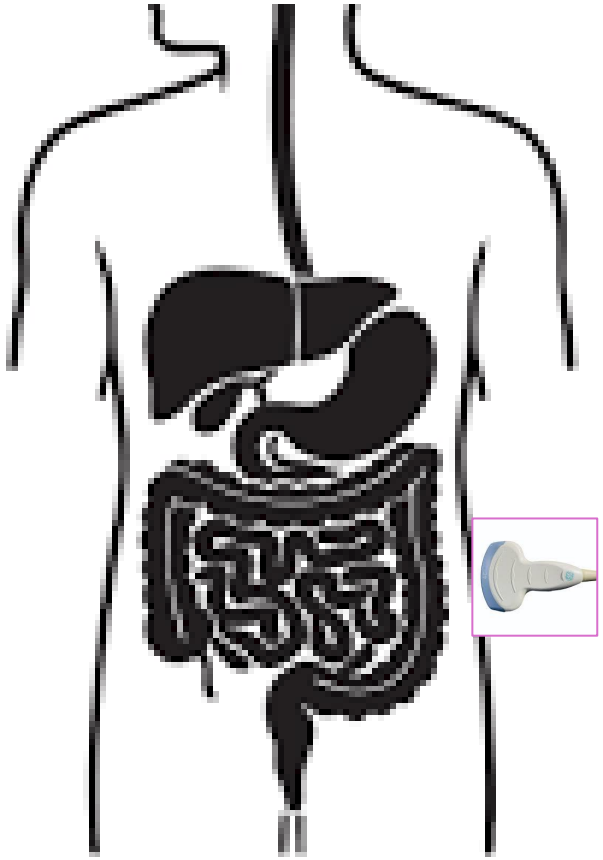
Performing the Scan – Sigmoid Colon

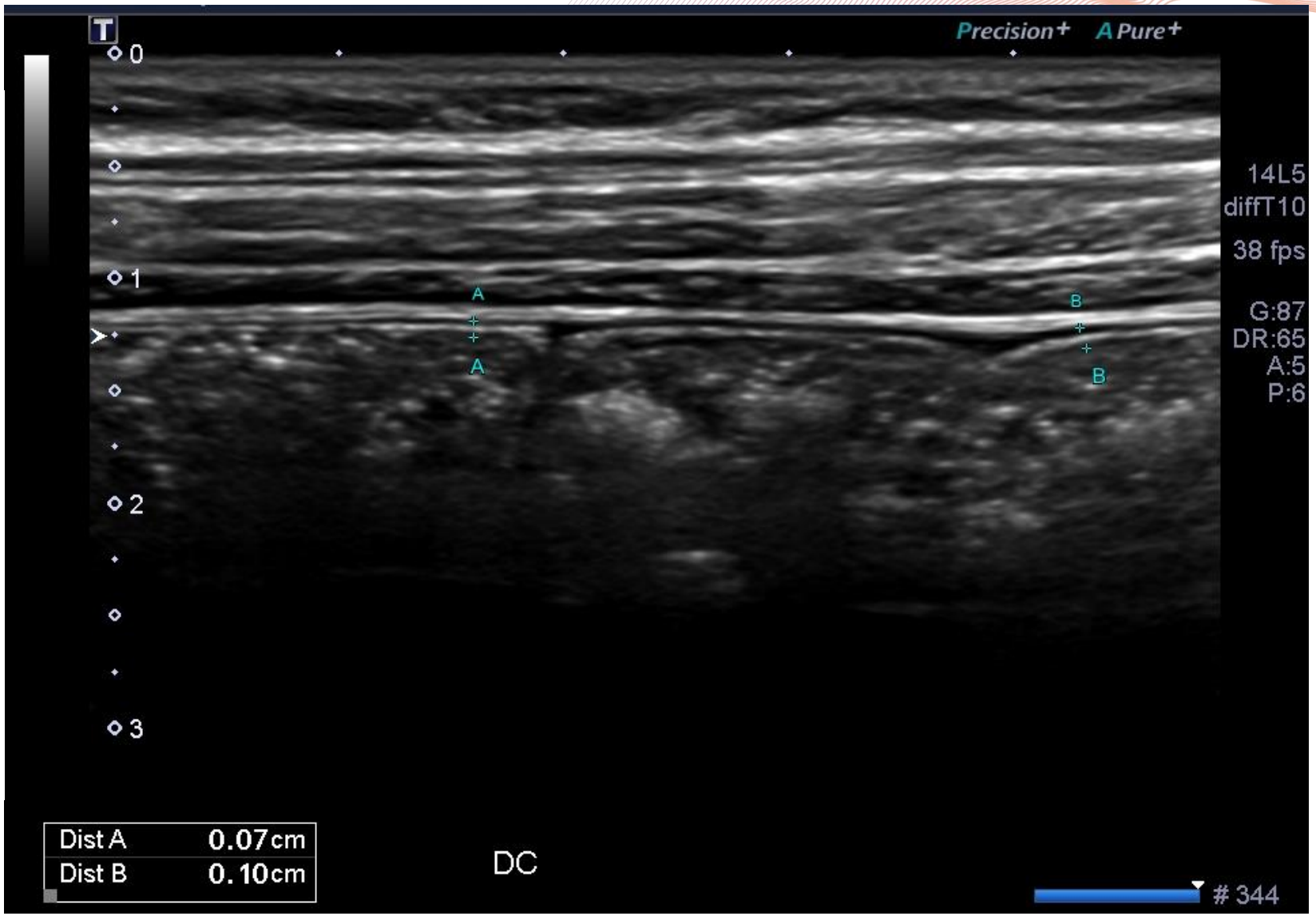




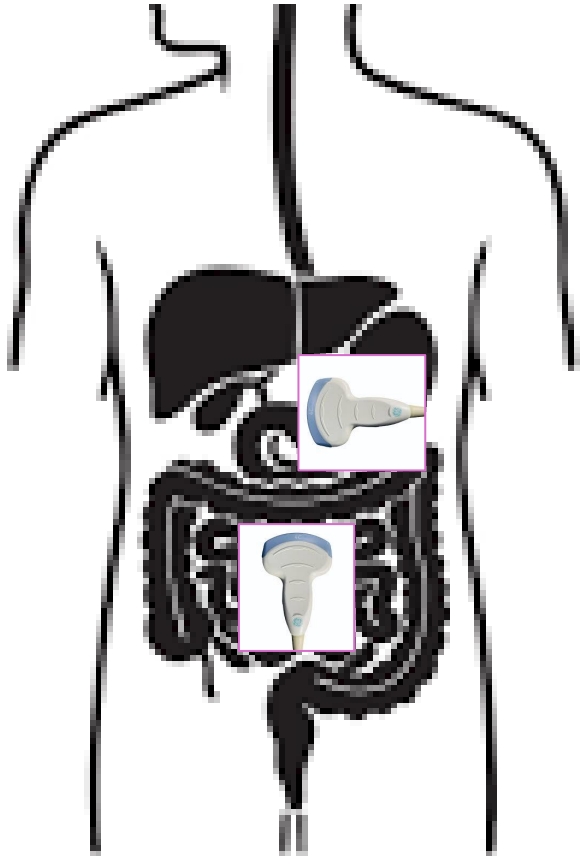
*Landmarks: Psoas muscle, iliac vessels

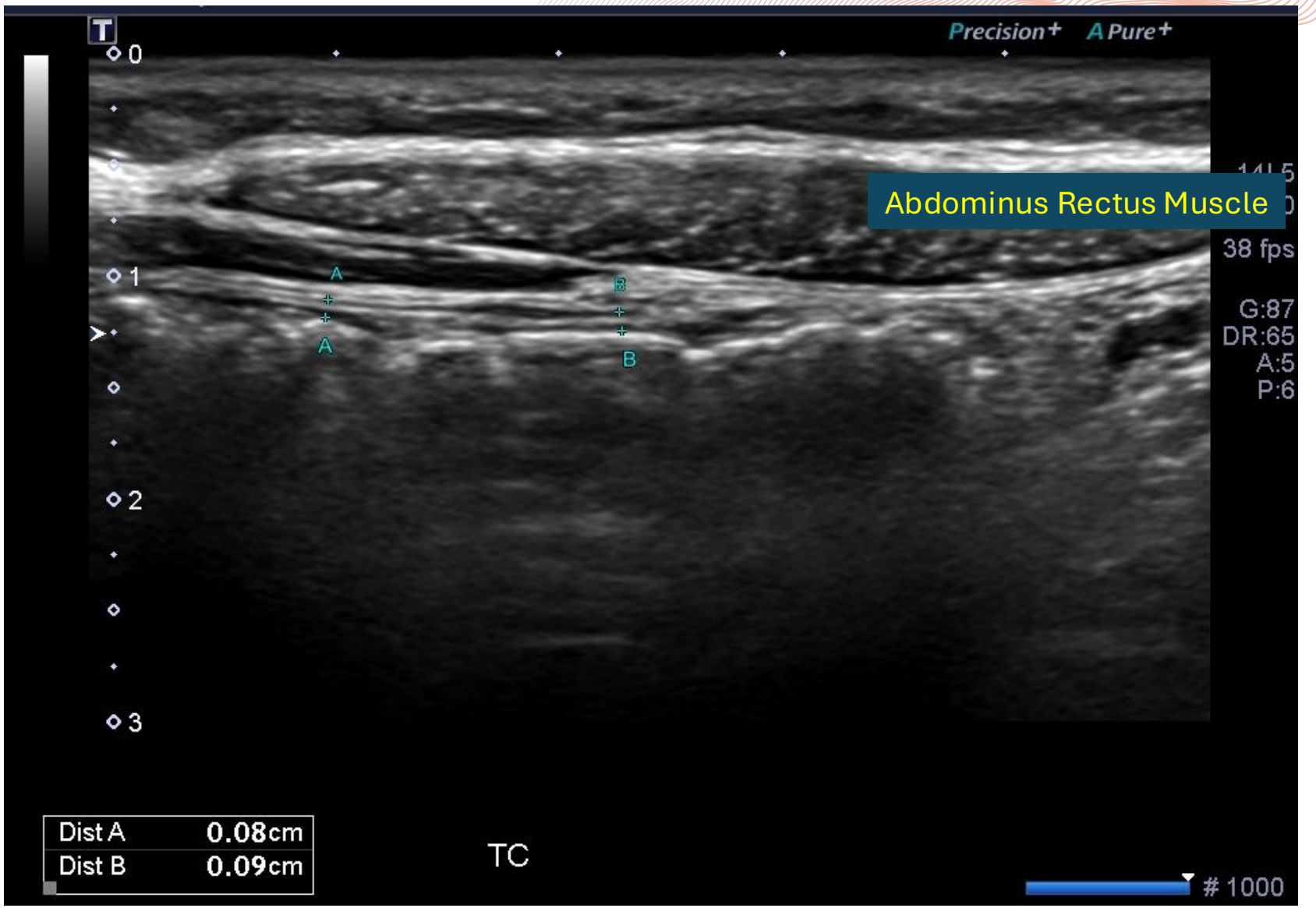
Performing the Scan – Descending Colon





Performing the Scan – Transverse Colon





Low transverse colon
Overlapping SB and stomach

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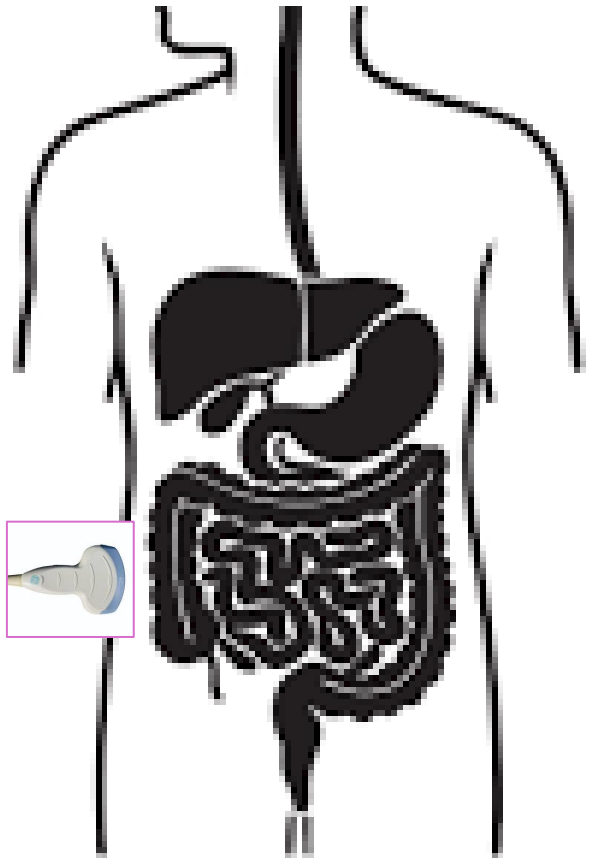
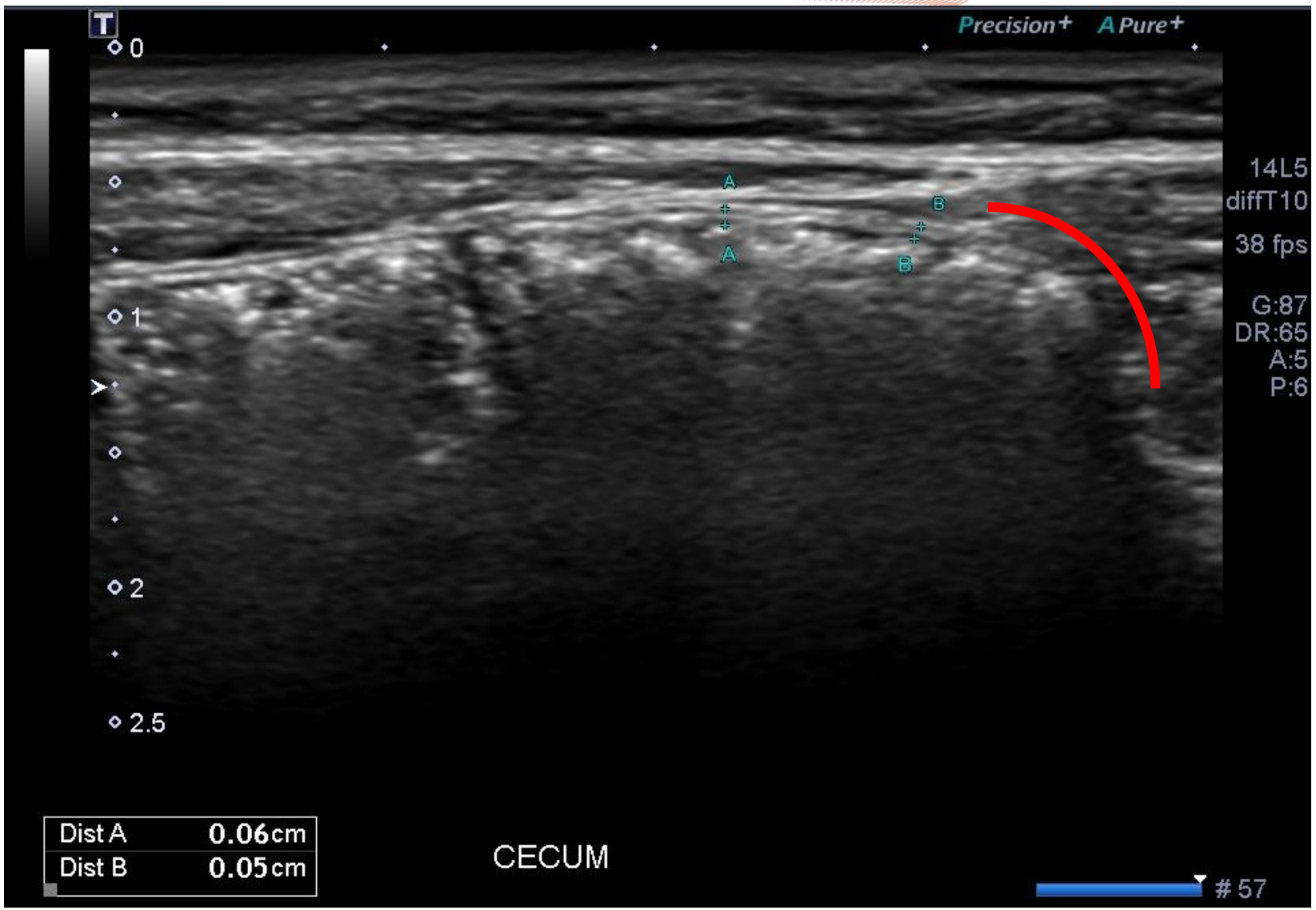
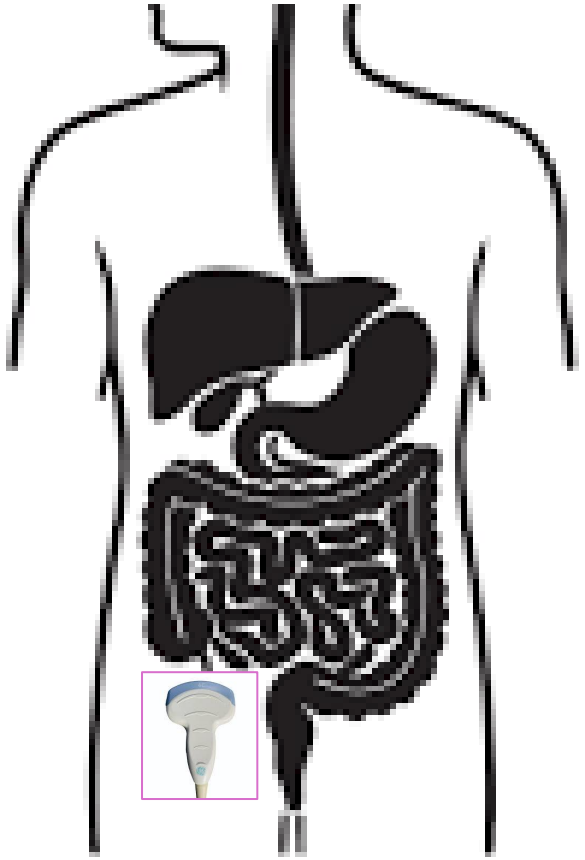
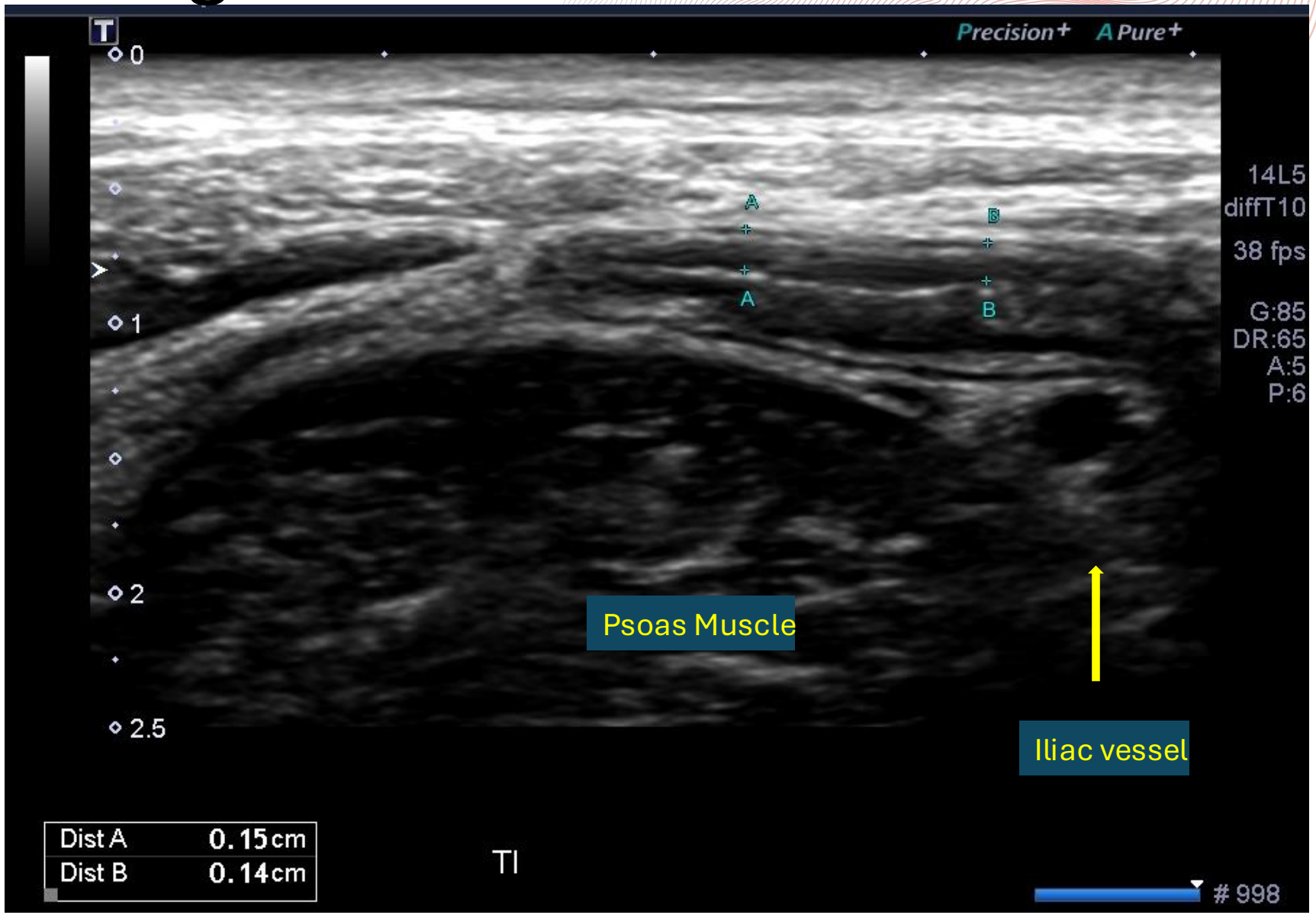
Performing the Scan – Ascending Colon





Performing the Scan – Terminal ileum





*Appendix – blind ended structure

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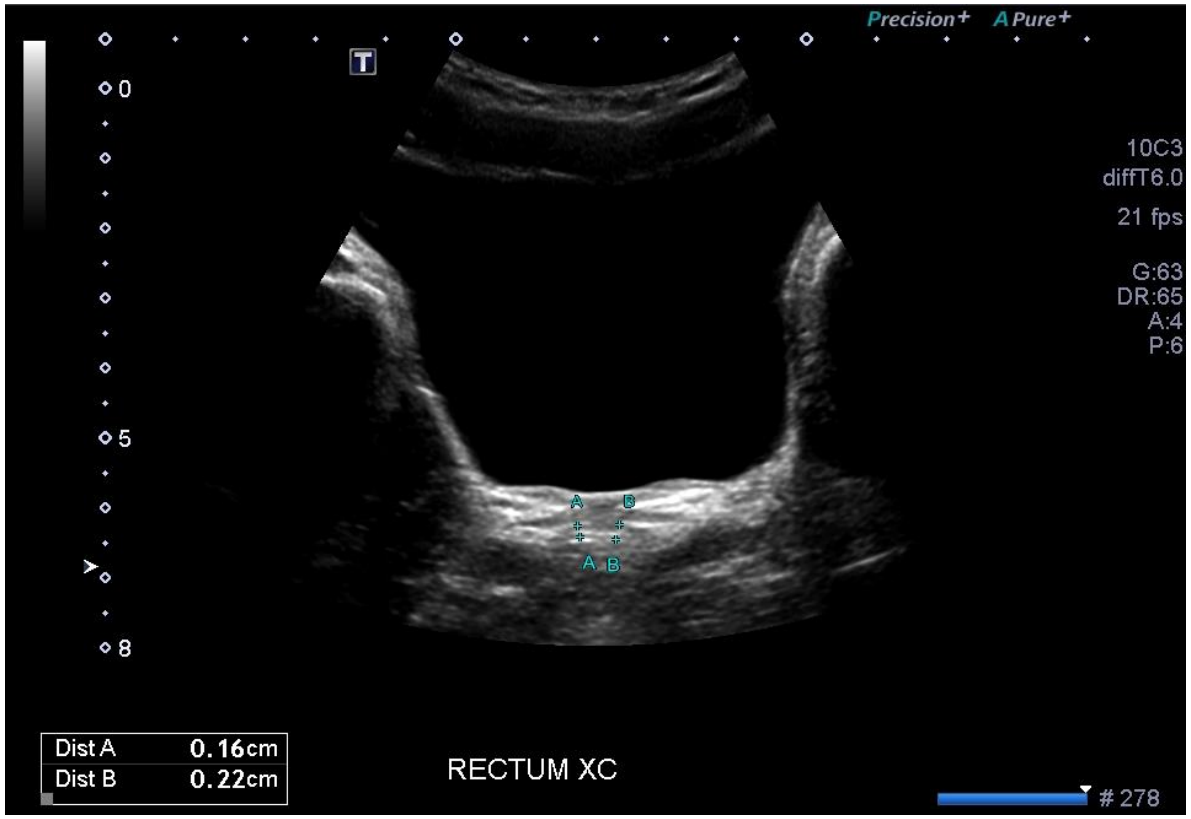
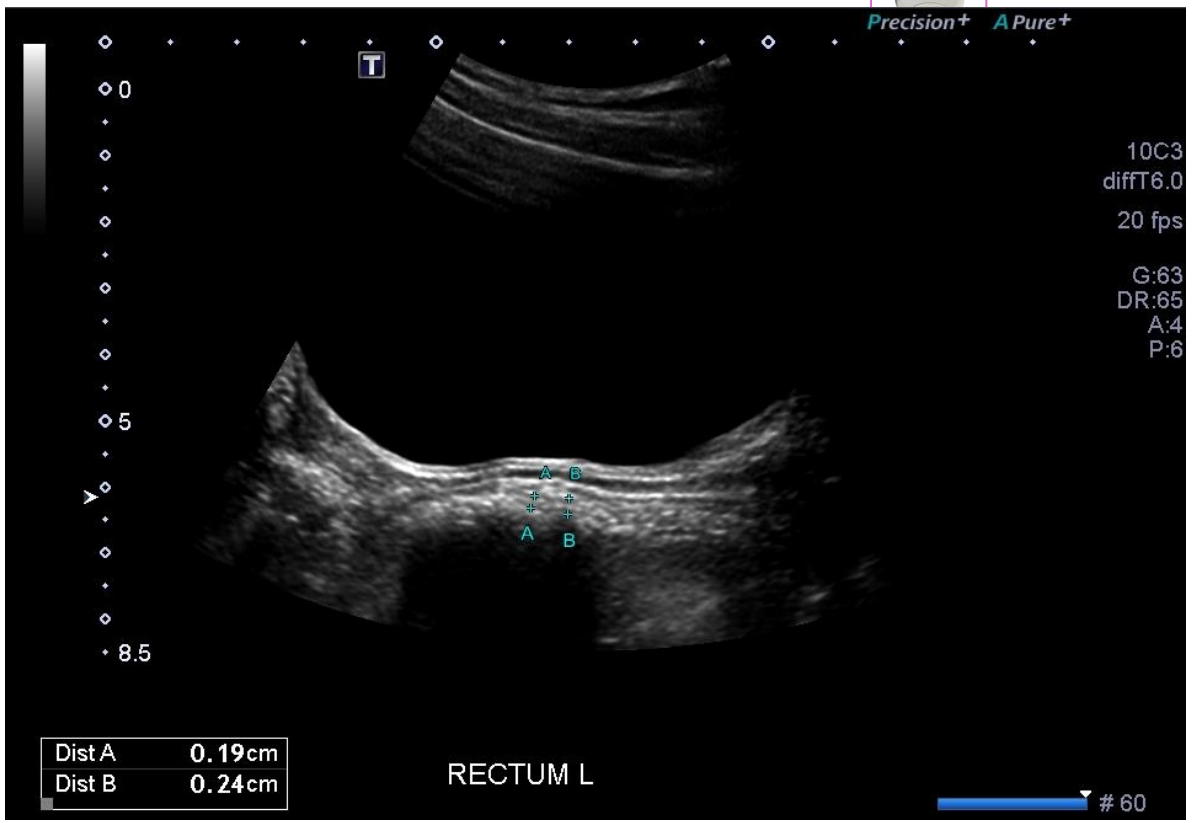
Performing the Scan – Rectum





A full bladder helps!
Evaluate in both longitudinal and cross-sectional. Keep you eyes locked in when rotating the probe.

Performing the Scan – 4 quadrant scan

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Welcome to the future!

Questions?