

Refresher: How to Perform Intestinal Ultrasound

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Disclosure

I have accepted **lecture fees** for ultrasound talks from

Janssen

Takeda

BMS

I am contracted **central reader** for

Alimentiv

I have signed for a contract for an **educational research project** with the
Helmsley foundation

What the talk is about

Preparations

Hygiene

Probe orientation

Standardised scanning protocol

Landmarks

Steering techniques

Anatomic features of normal bowel

Pat. Preparations for the exam

No preparation needed !

(fluids, laxatives, anti-flatulent preparations)

- No clinically relevant difference in wall thickness in the small and large bowel after a meal

Colonscopy prep might affect the aspect!

Fasting ?

Not necessary for point-of-care IUS !!!

- > 4 h – to reduce amount of food and air in the small bowel
- > 6 h/overnight – recommended before assessing splanchnic blood flow and GI motility

Preparation for the examiner

- Find out about the indication for the examination!
- Who is the referring physician?
- Know the patient's history
- Look at previous imaging, as well from other modalities
- Transportability of the patient, mobility
- Active infections?
- Oxygen supply required?
- Special limitations and needs of the patient:
- Language barrier?
- Other communication limitations/visual or hearing impairment
- Presence of an assistant required?
- (Seperate consent agreement)

Room and equipment



Keep sufficient consumables in the rooms, for example:

-
- Gel bottles
- towels
- disinfectants (hands, transducers, spray)
- paper rolls for couches
- contrast agent
- venules
- syringes
- consent sheets, ballpoint pens



If you perform CEUS

Boot up devices and computers, inspect for functionality, if necessary filter cleansing.

Ultrasound transducers for Intestinal Ultrasound



Optional
f.e. for
perianal ultrasound

Transducers

❖ **Convex** (low frequency)

- 1-6MHz
- Overview
- Deeper bowel segments (rectum , obese patients)

❖ **Linear** (mid-range frequency)

- > 5 MHz (5-10MHz)
- Higher resolution , 8-10cm depth penetration
- Detailed examination



RECOMMENDATIONS:

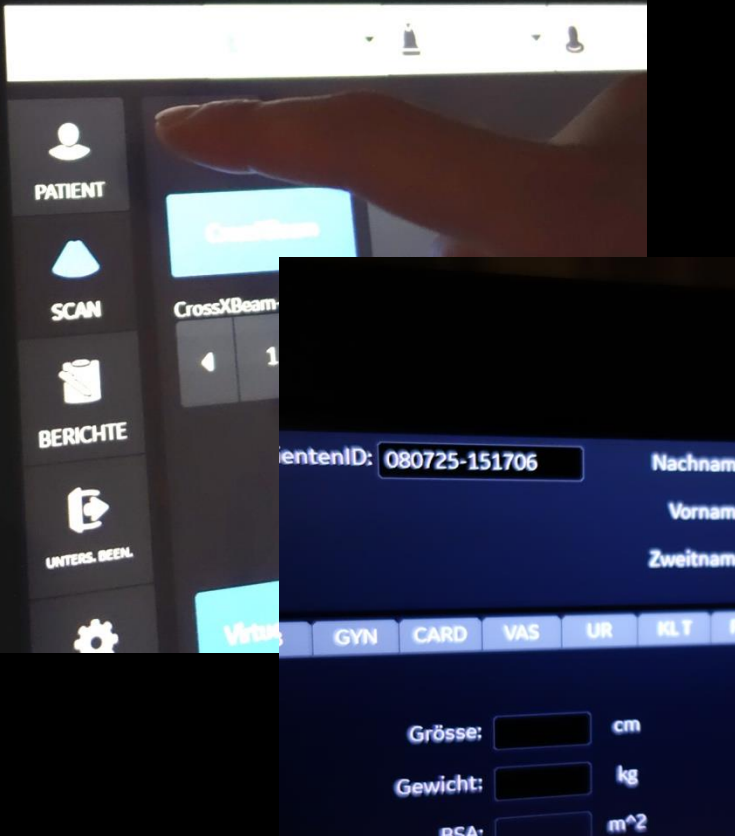
1. For a complete examination of the bowel both a low and high resolution probe are needed, LoE 5, GoR C, Strong consensus 13/13
2. A probe with a frequency above 5 MHz should be used when measuring wall thickness, LoE 4, GoR B, Strong consensus 13/13

Initial image adjustments

Put the patient's name on the screen

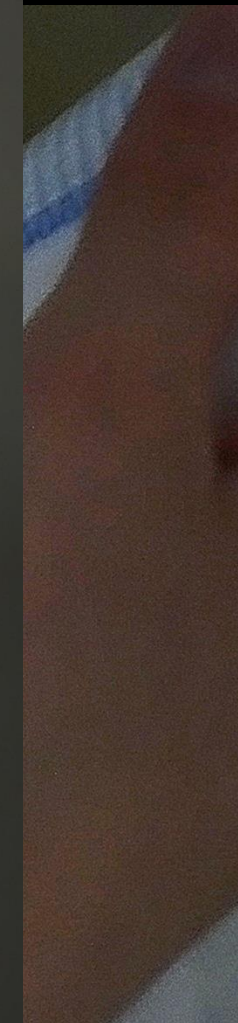
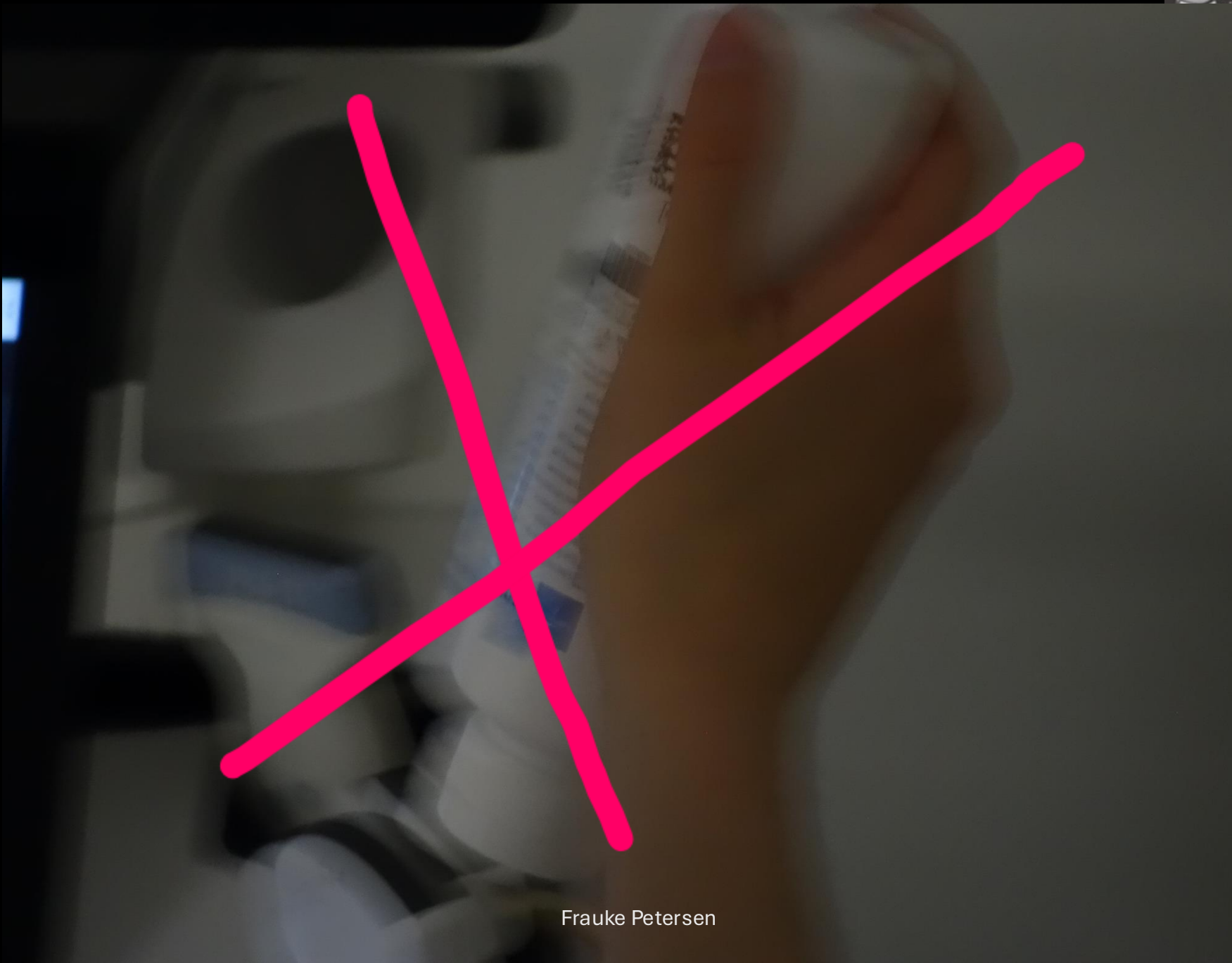
Choose the appropriate transducer

Choose an initial preset (f.e. " bowel", "abdomen" , " pregnant")



The patient should not read your scheduled exams

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Use pre-warmed gel, if possible ,
Inform the patient and have a friendly interaction



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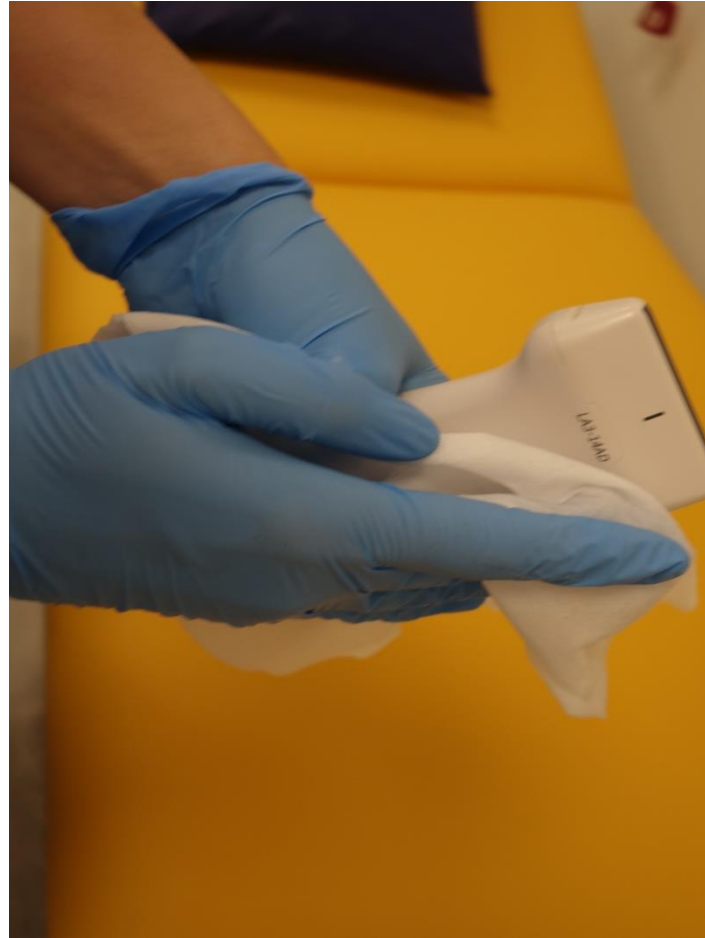
Standardised scanning protocol

Landmarks

Steering techniques

Anatomic features of normal bowel

Hygiene



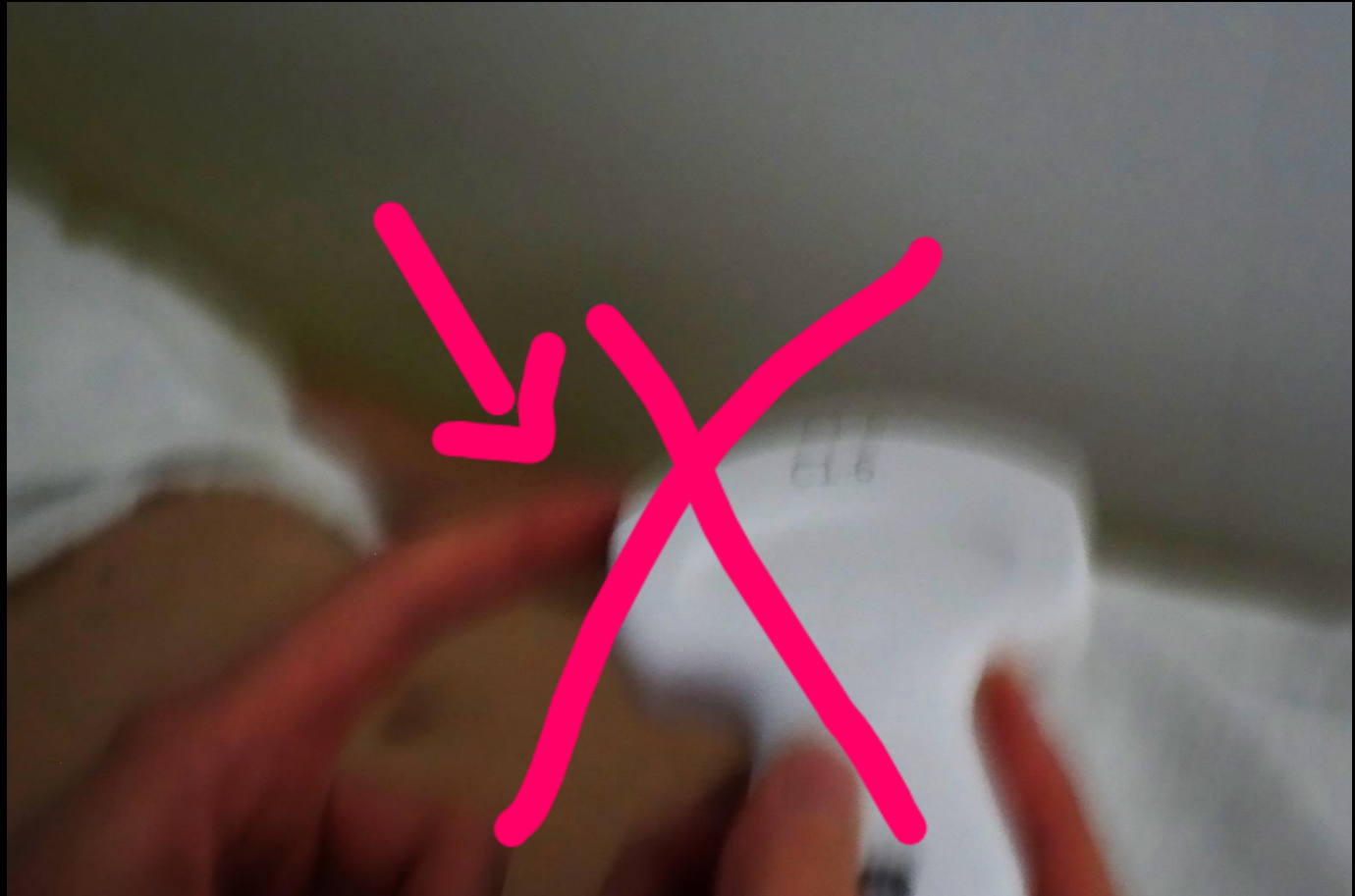
Desinfect your hands

Desinfect the probe with special cleansing tissue

Gloves are not mandatory during the scan

They are recommended in infectious patients and perianal ultrasound

Your left hand has to stay on the panel, do not touch the probe



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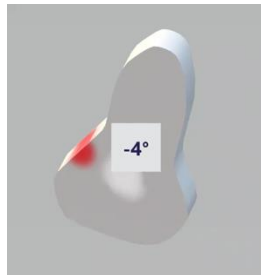
The probe must be oriented the way
that the left side of the image on the screen



1 points to the **right** side of the body

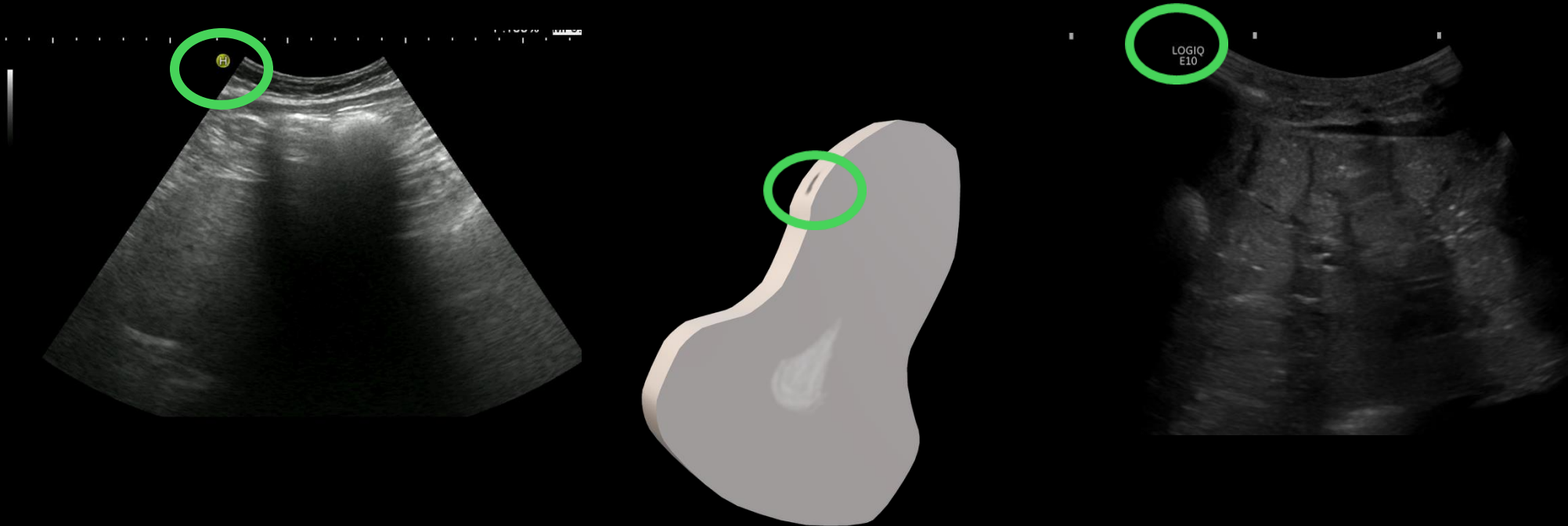



2 or points to the **cranial** part of the body

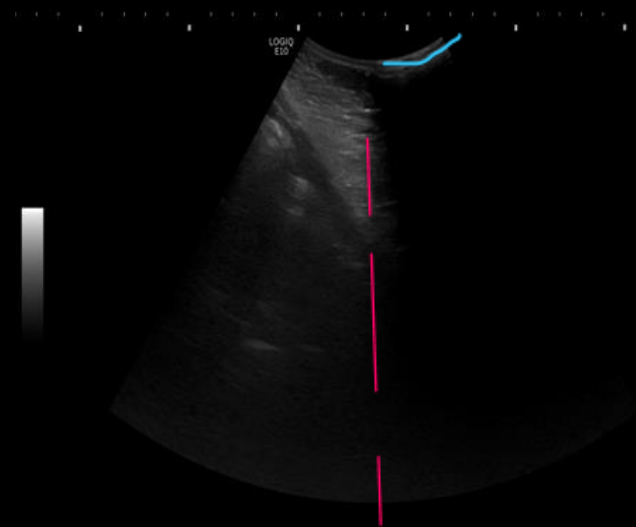
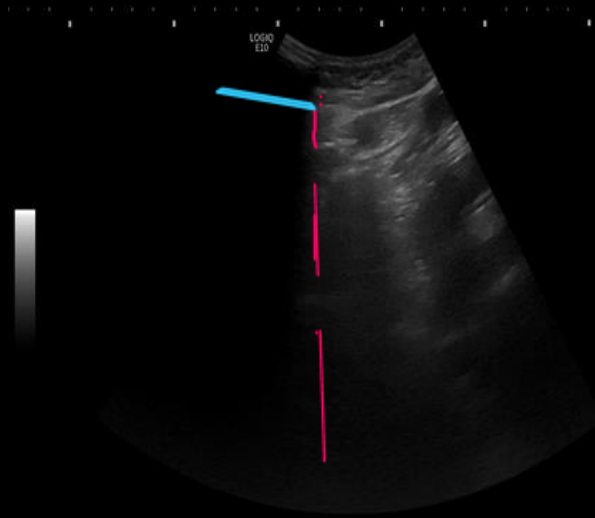


The notch on many probes typically should align with the position of the brand marker displayed on the screen.

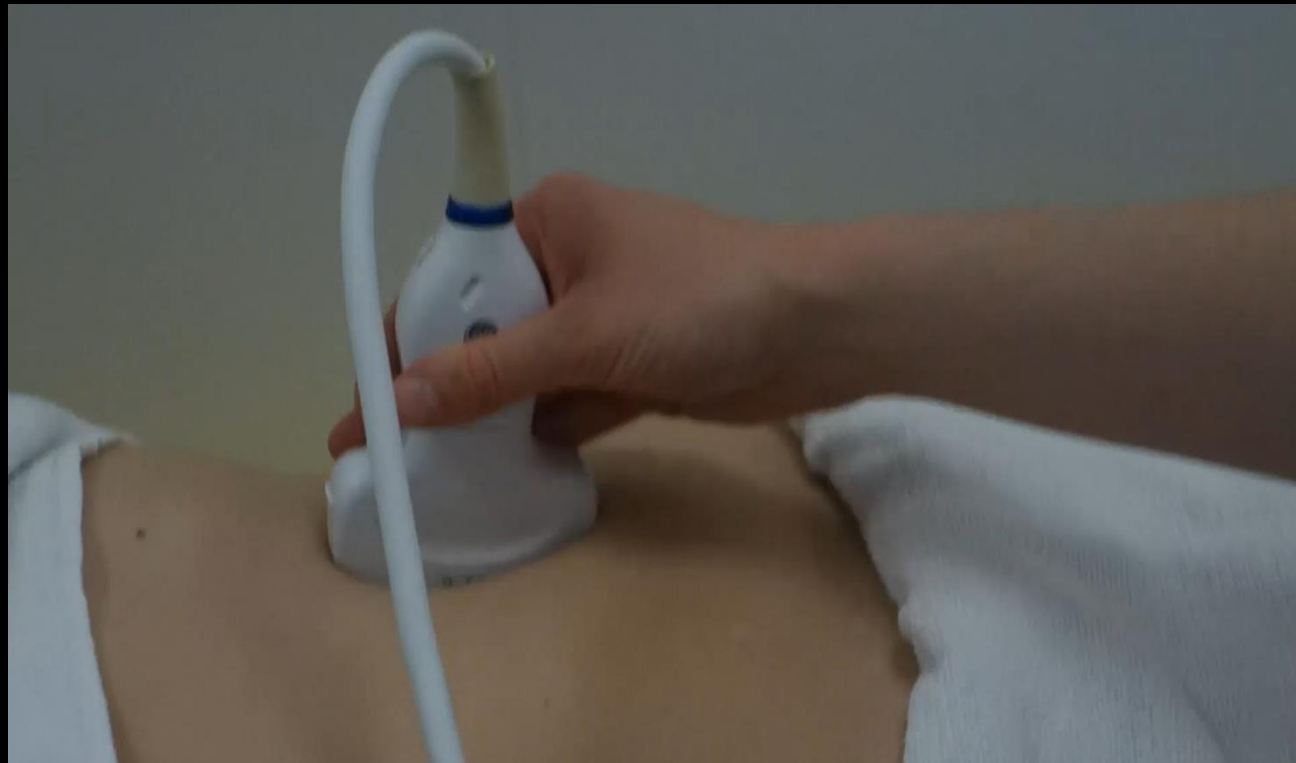
Check that it is left if you rely on the notch



Check probe orientation
by detaching 
part of the probe
of the skin:
Is the dark
shadow on the
screen
corresponding to
the correct probe
orientation?



**The probe should rotate
anticlockwise from sagittal to horizontal
clockwise from horizontal to sagittal**



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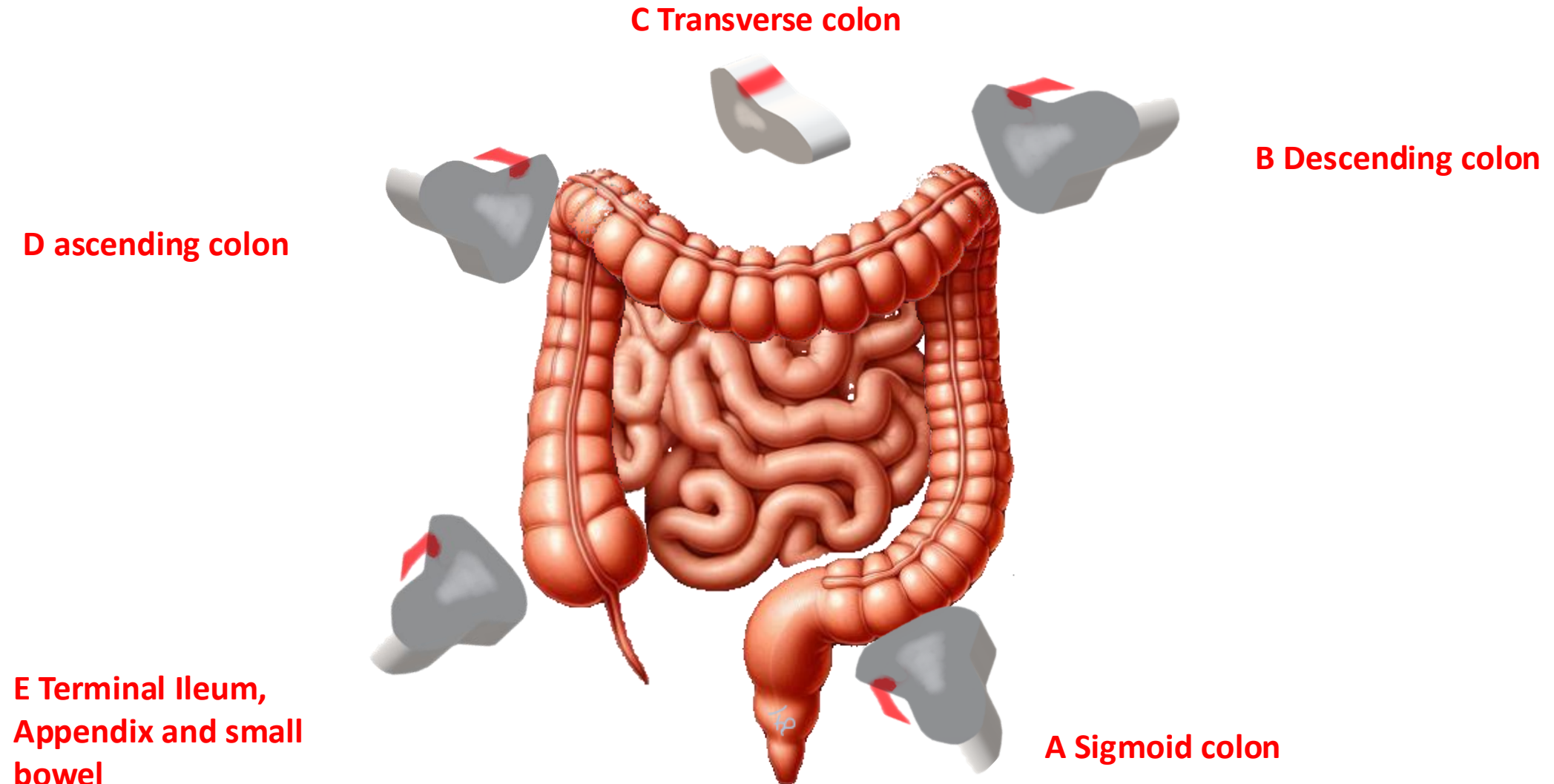
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Anatomic features of normal bowel

A structured examination that evaluates most intestinal components



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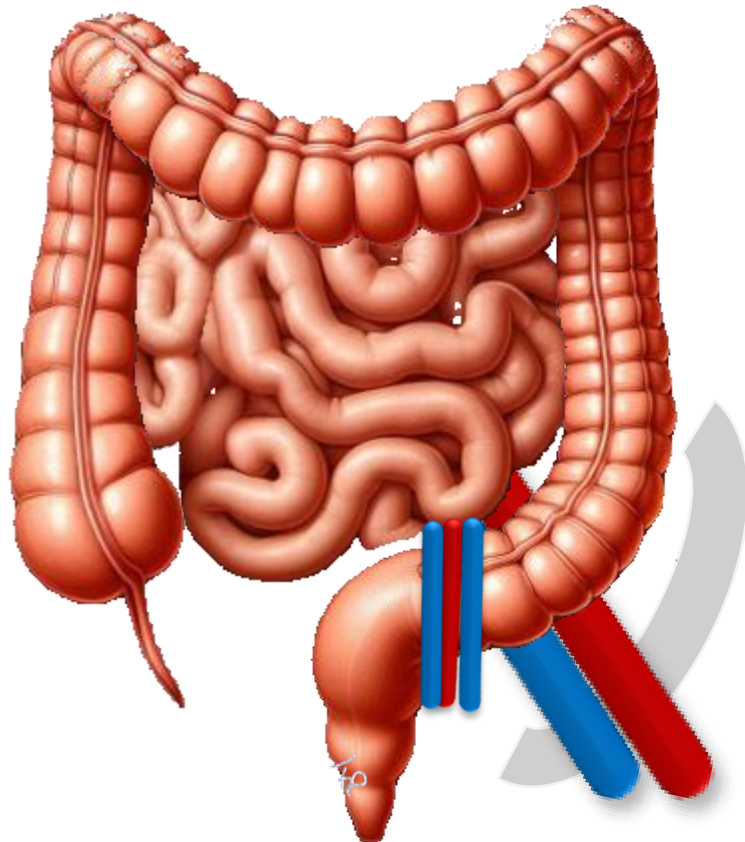
Landmarks

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A structured examination
that evaluates most intestinal components:
Landmarks for the sigmoid

Iliac bone
Iliac vessels
Epigastric vessels



**A Sigmoid
colon**

Using landmarks for orientation and documentation

A: Sigmoid colon

Start low at the left inguinal ligament

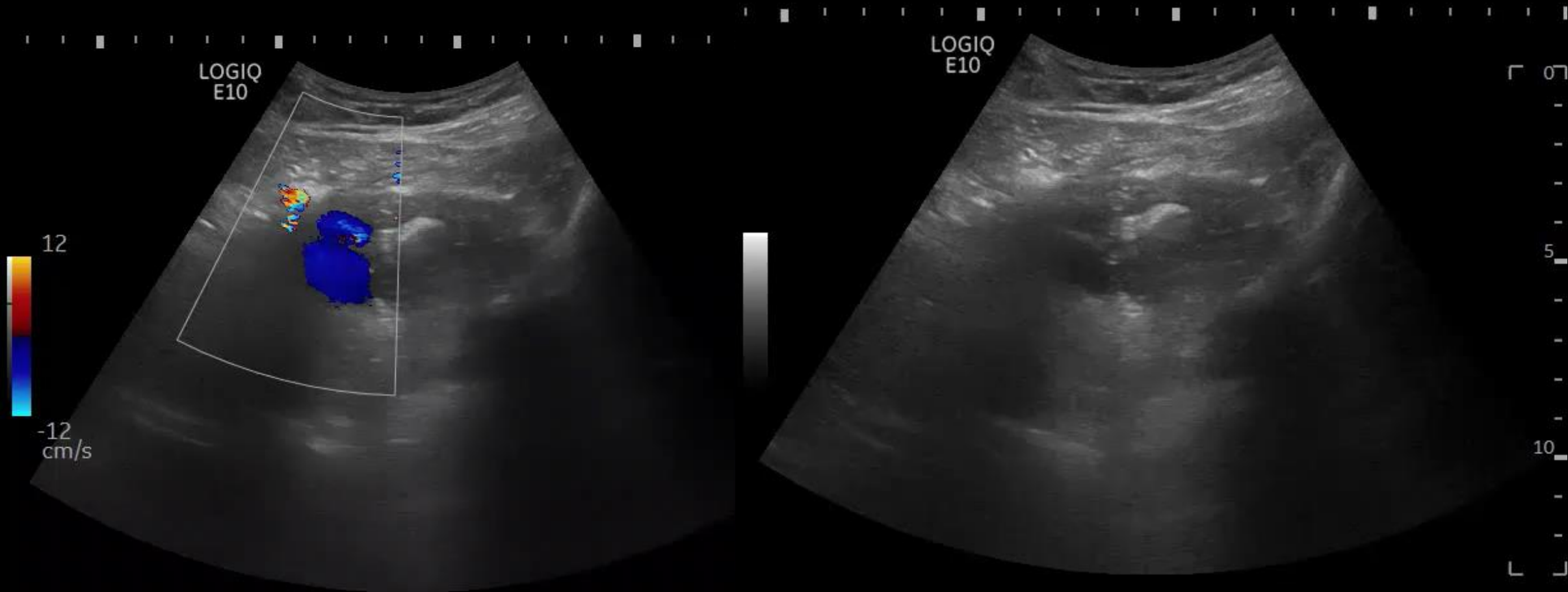
- Left Iliac vessels
- Left epigastric vessels

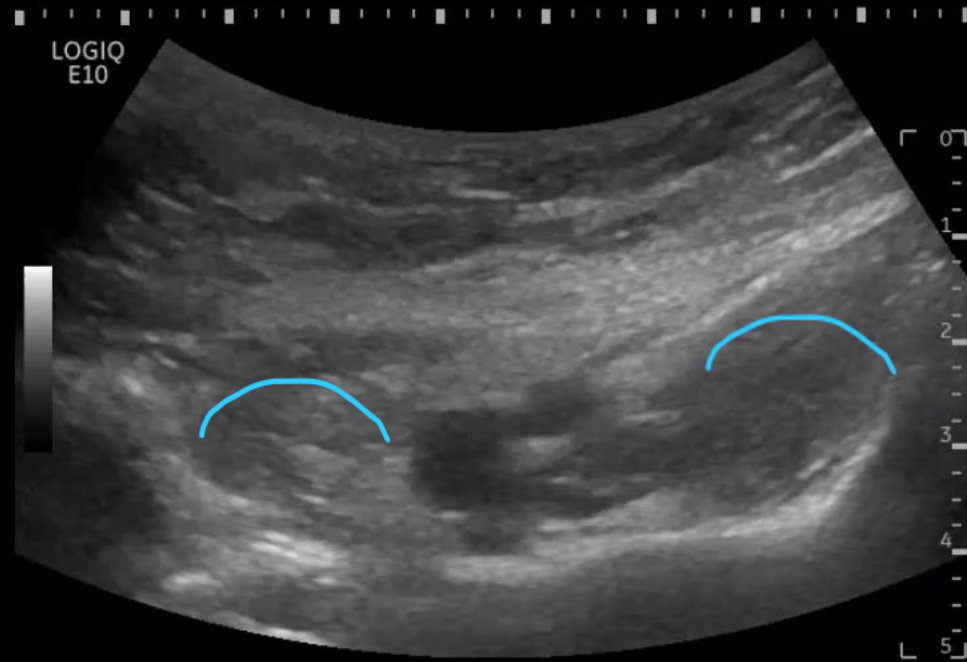
Iliopsoas muscle and Iliac bone

- Once you have identified these structures,
- **adjust depths** and focus* accordingly
- *Some machines do not have focus in B Mode any longer



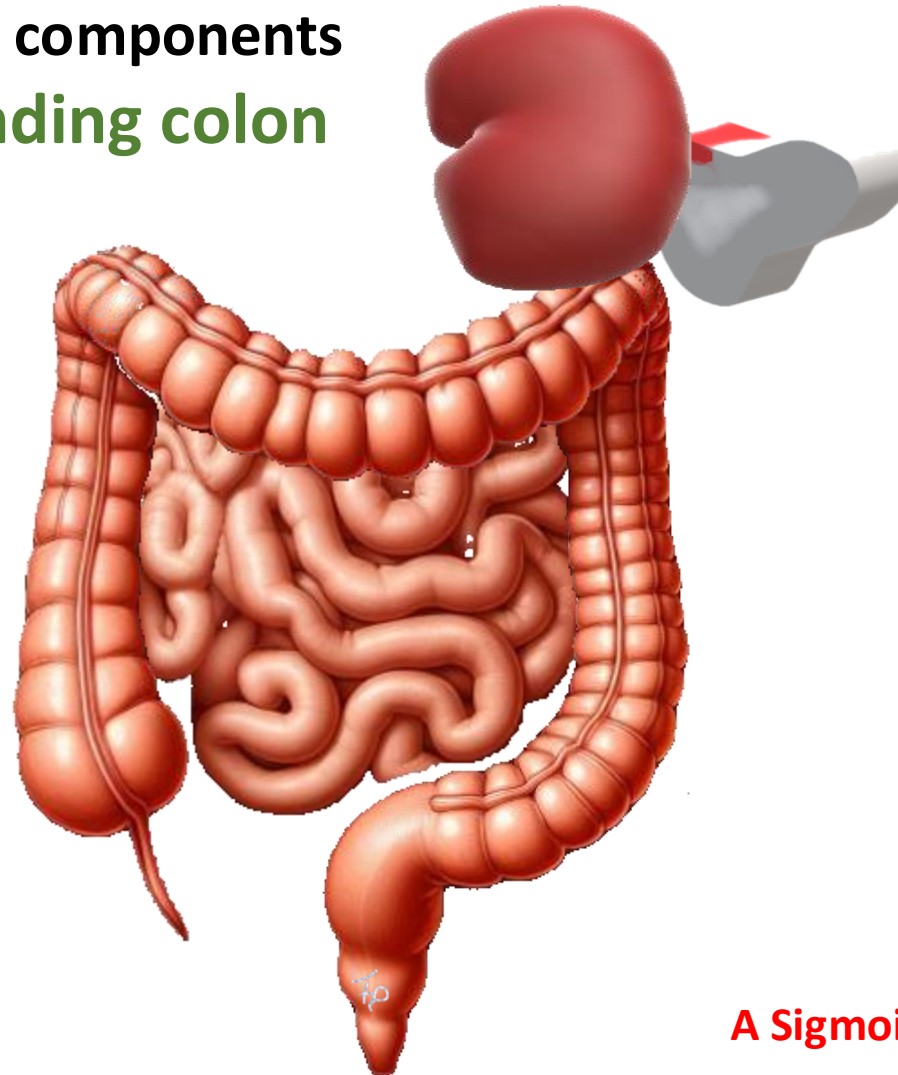
If you have difficulties to identify the vessels, Color Doppler might help





A structured examination
that evaluates most intestinal components
Landmarks for the descending colon

**Spleen and
Iliopsoas muscle**



B Descending colon

A Sigmoid colon

B Descending colon

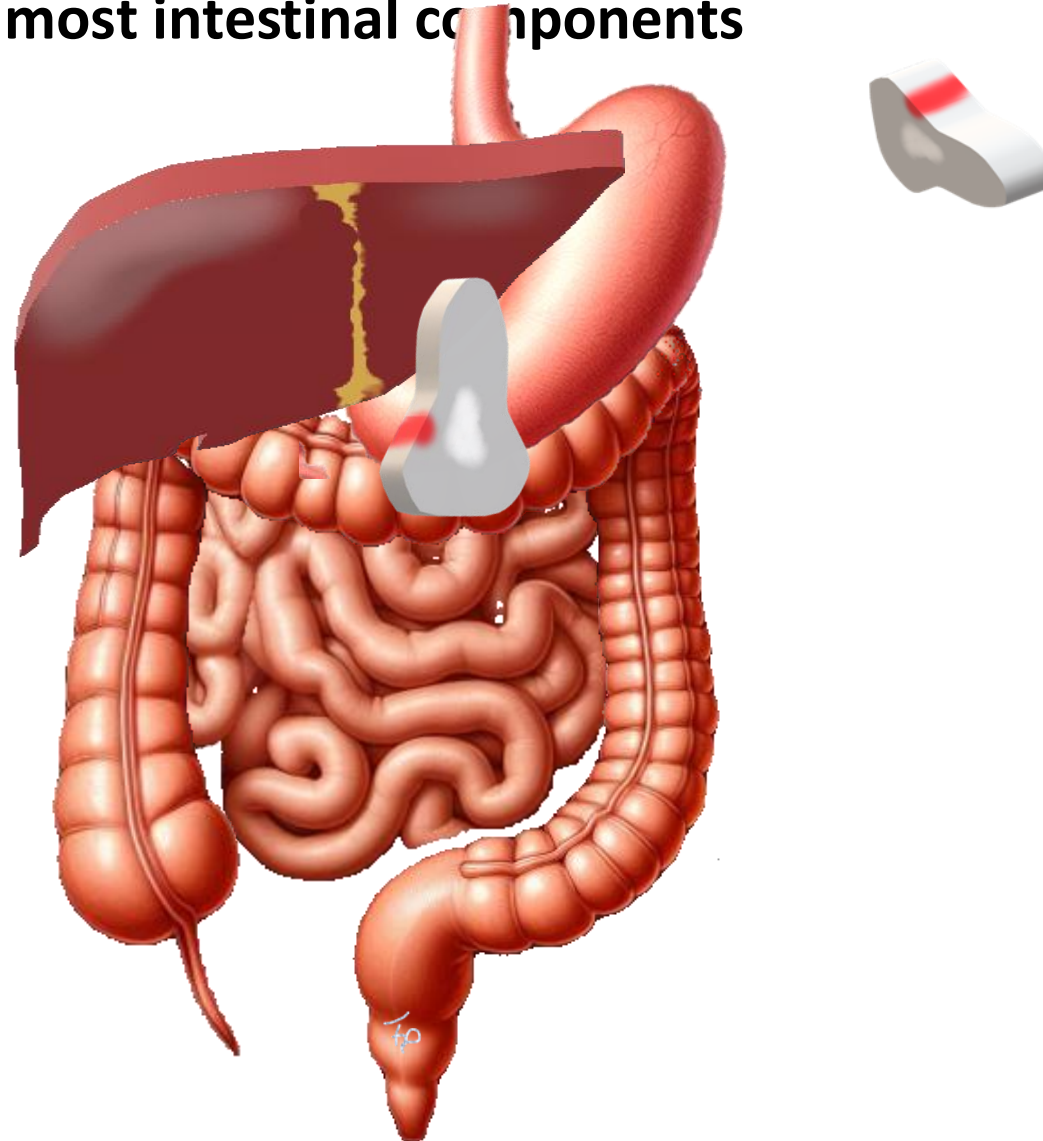


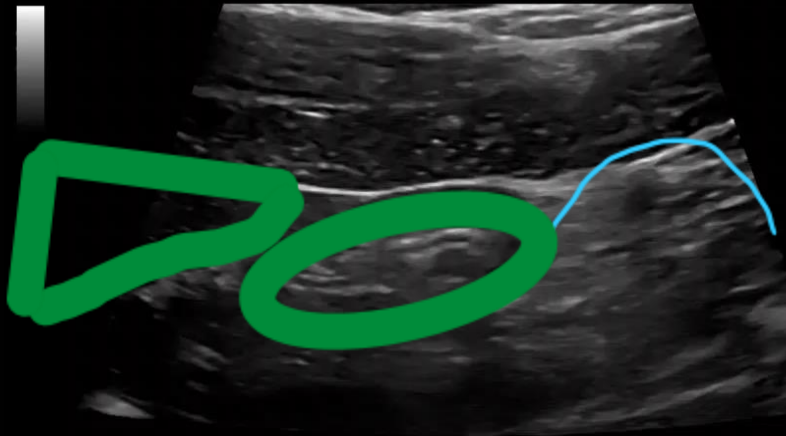
Caudal splenic pole and left colonic flexure

A structured examination
that evaluates most intestinal components

Landmarks for the transverse colon

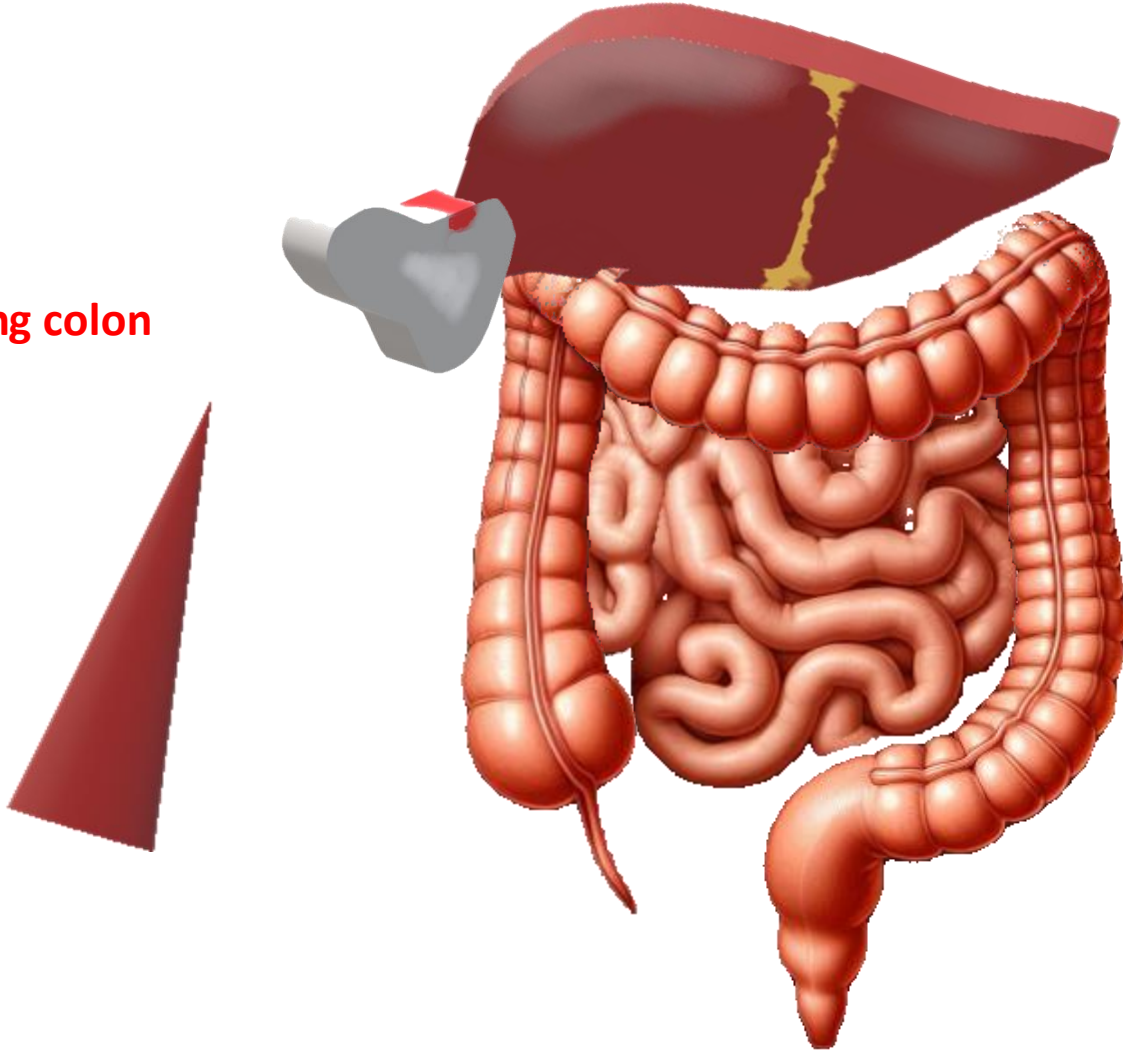
Liver
Stomach

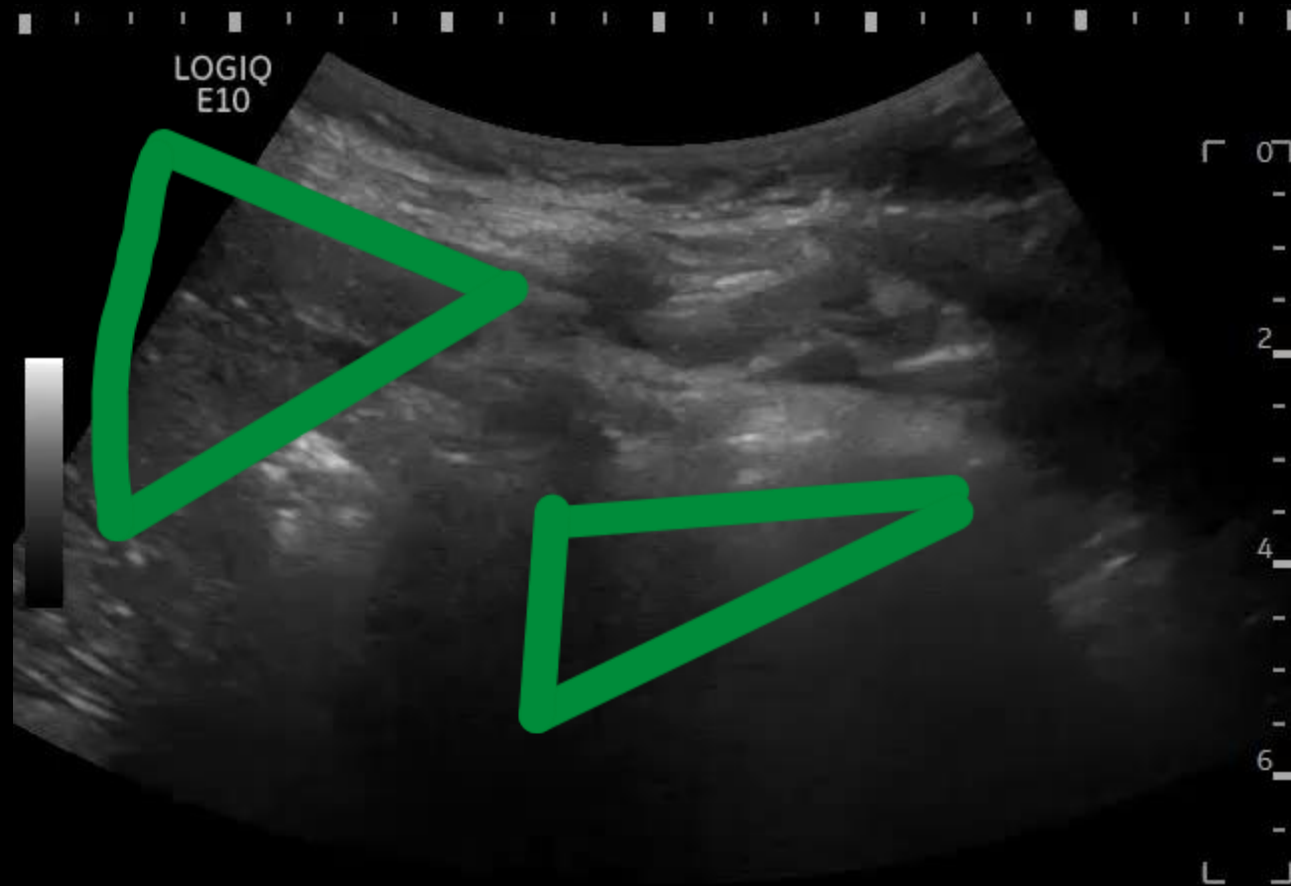




A structured examination that evaluates most intestinal components

D ascending colon



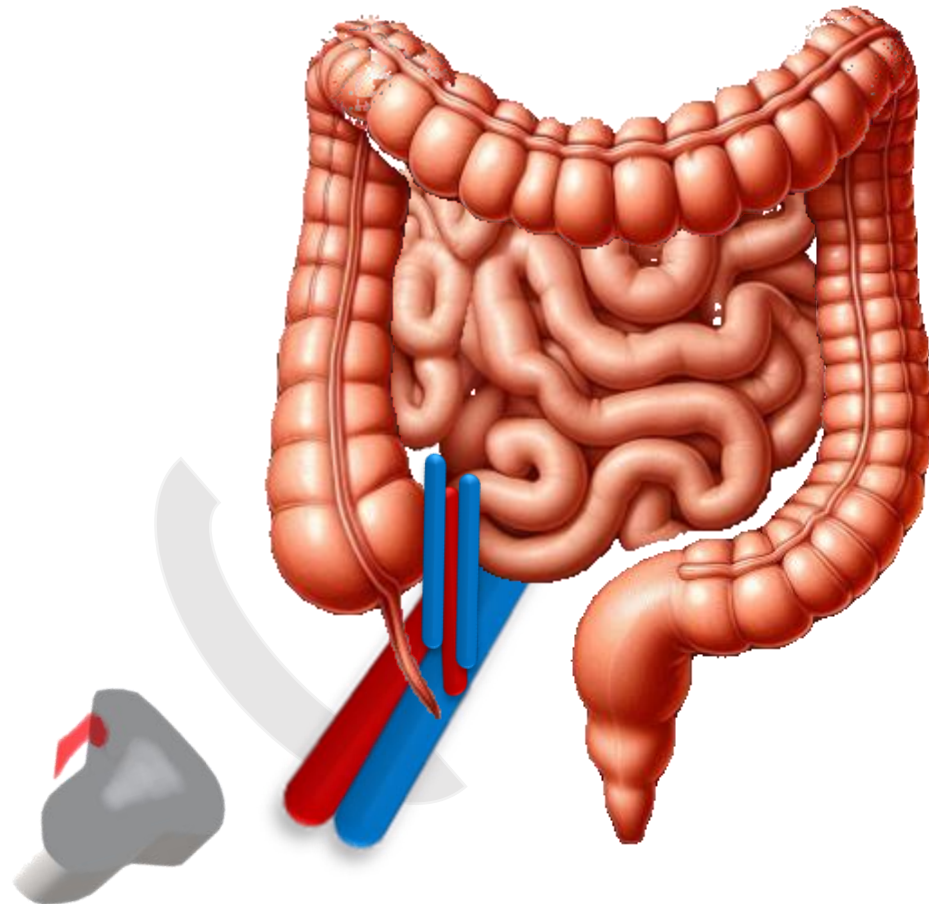


A structured examination that evaluates most intestinal components

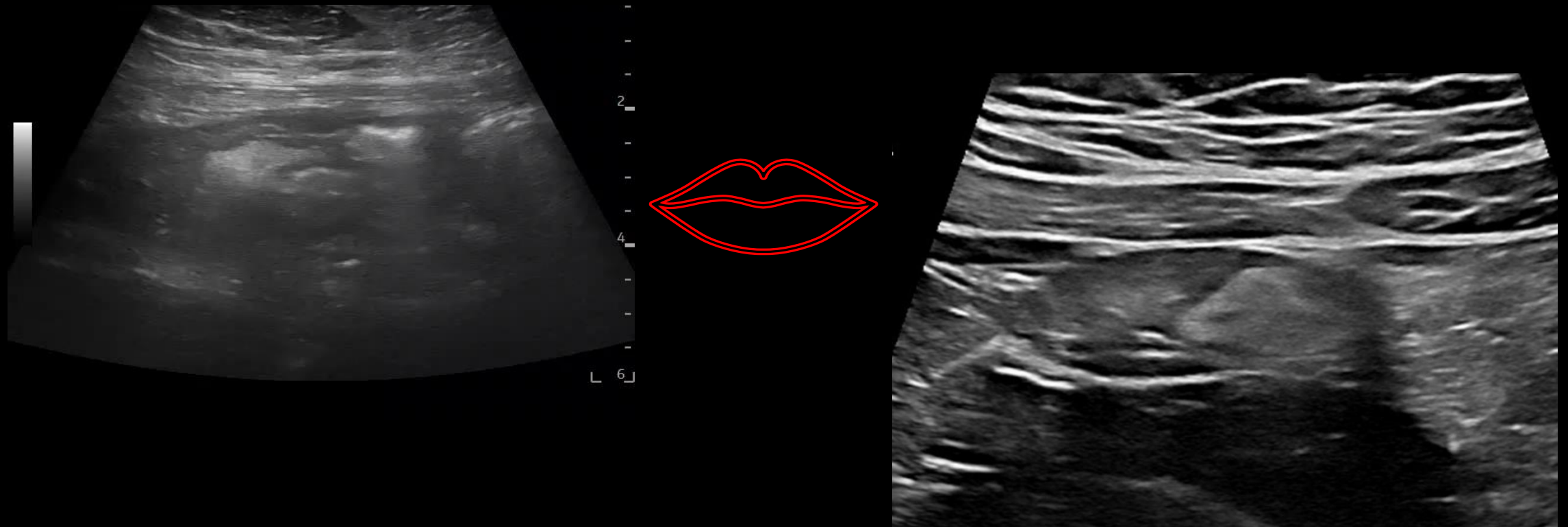
The ileocecal valve



**E Terminal Ileum,
Appendix and small
bowel**



Landmark for the TI : Ileocecal valve



Questions to be answered first with the overview transducer

- Free fluid?
- Obstruction signs?
- Filling state of small and large intestine?
- Obvious bowel wall thickening?
- Mesenteric adipose tissue reaction?
- Peristaltic activity?

Changing the probe to evaluate a crucial zone



Questions to be answered with the high-resolution transducer

- At least evaluate the critical parts:
Sigmoid and right lower quadrant in every patient , even the obese or pregnant
- Evaluate every zone the patient indicates as painful
- Evaluate every zone which had been prominent with the overview scan
- Take bowel wall measurements in cross section and longitudinal at the worst part
- Notice changes in bowel wall stratification
- Evaluate the color doppler signal
- Look at the surroundings of the bowel to evaluate extramural findings

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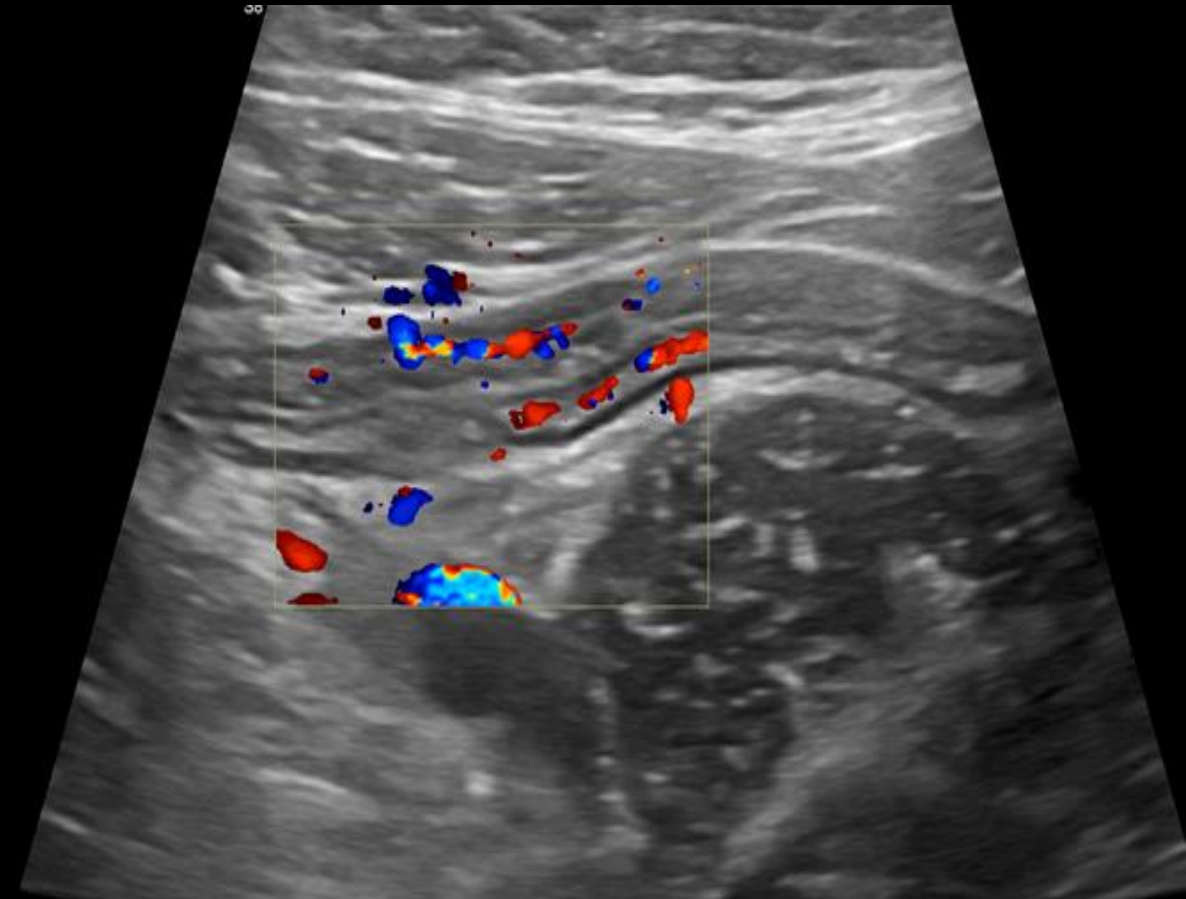
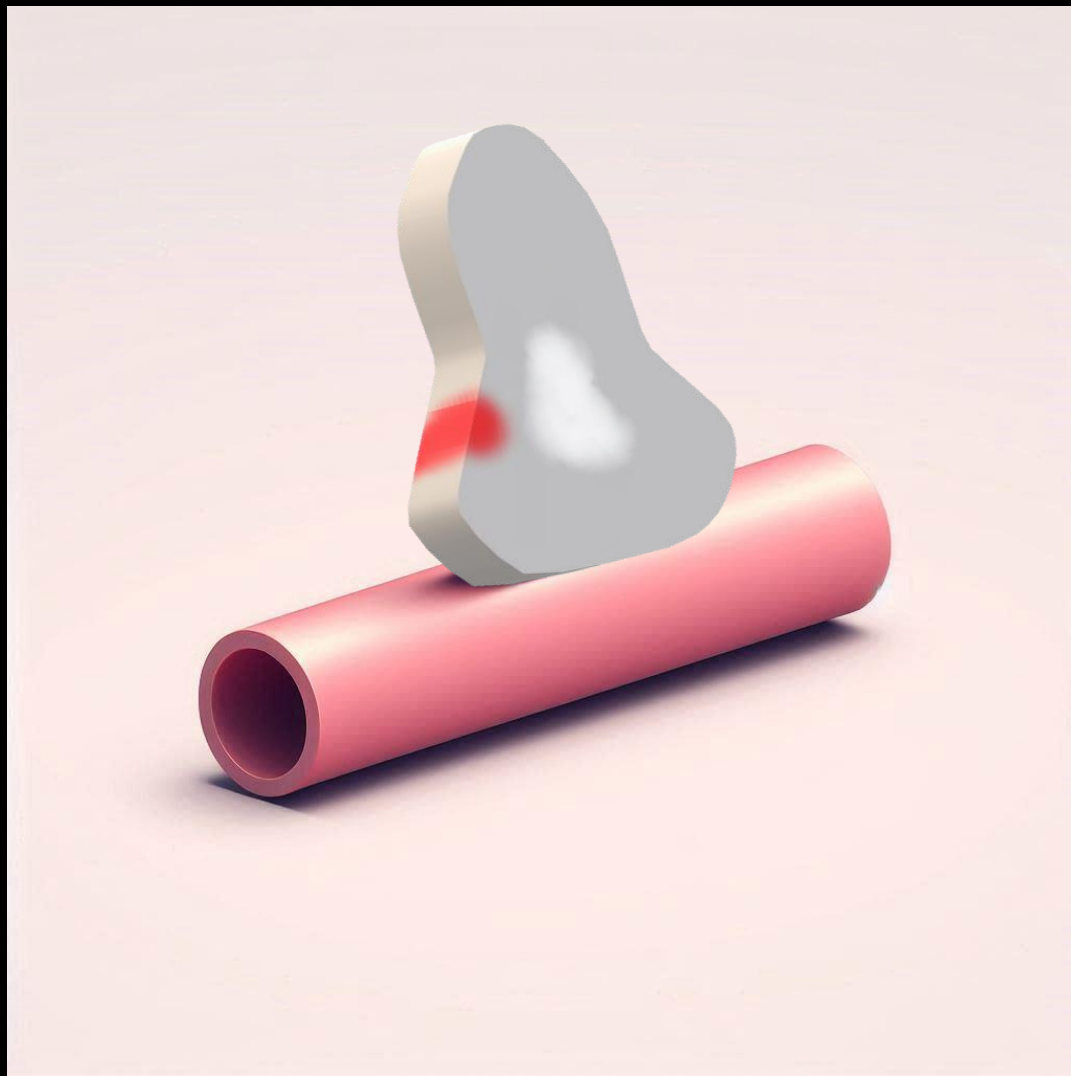
Steering techniques

Anatomic features of normal bowel

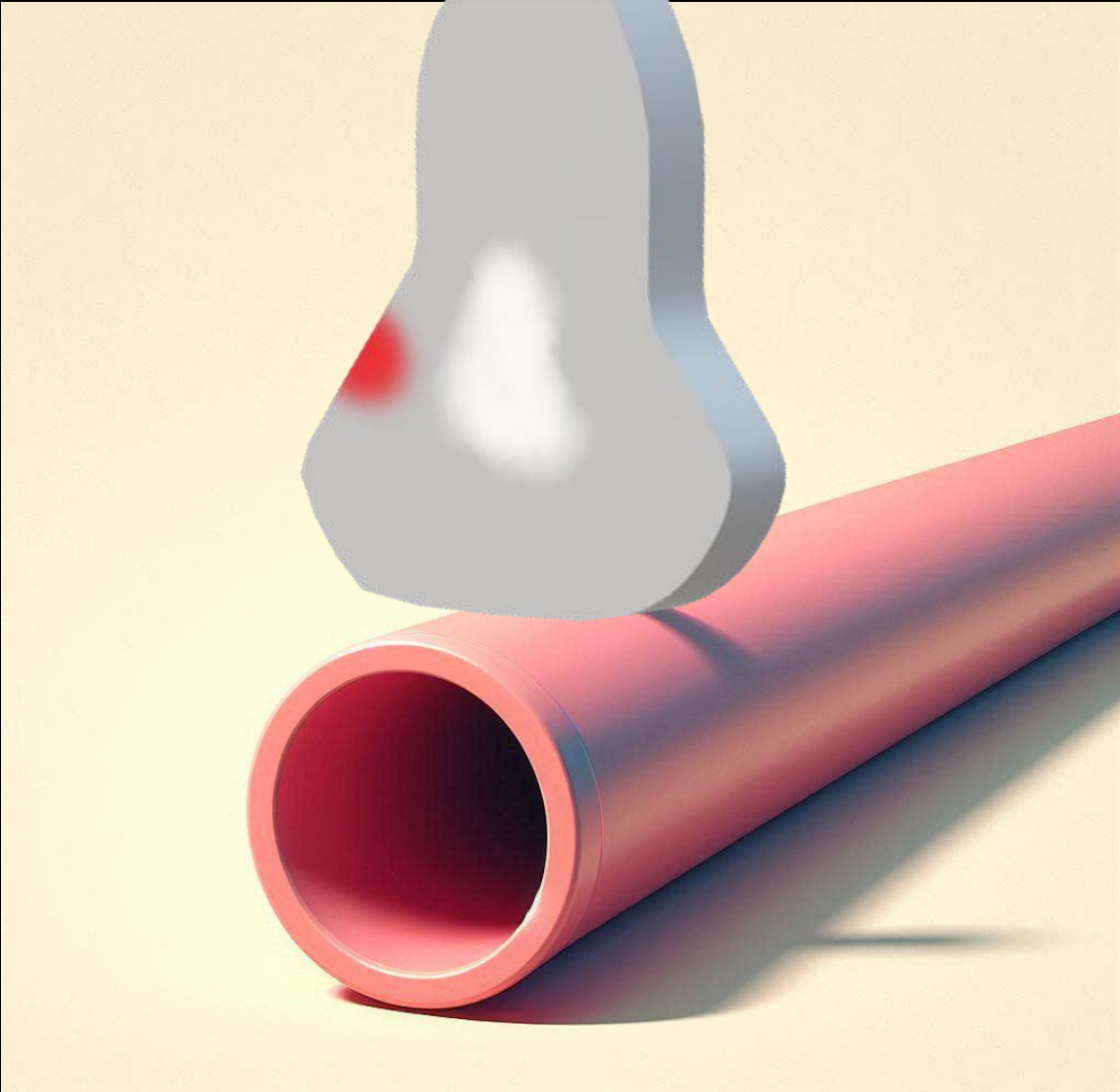


Intestinal scanning planes

longitudinal plane

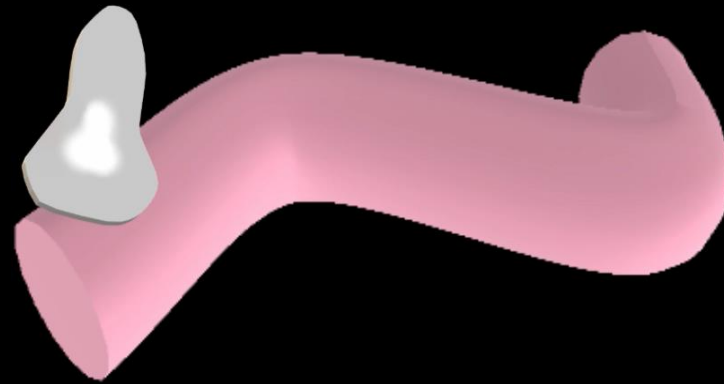


transversal (cross) plane



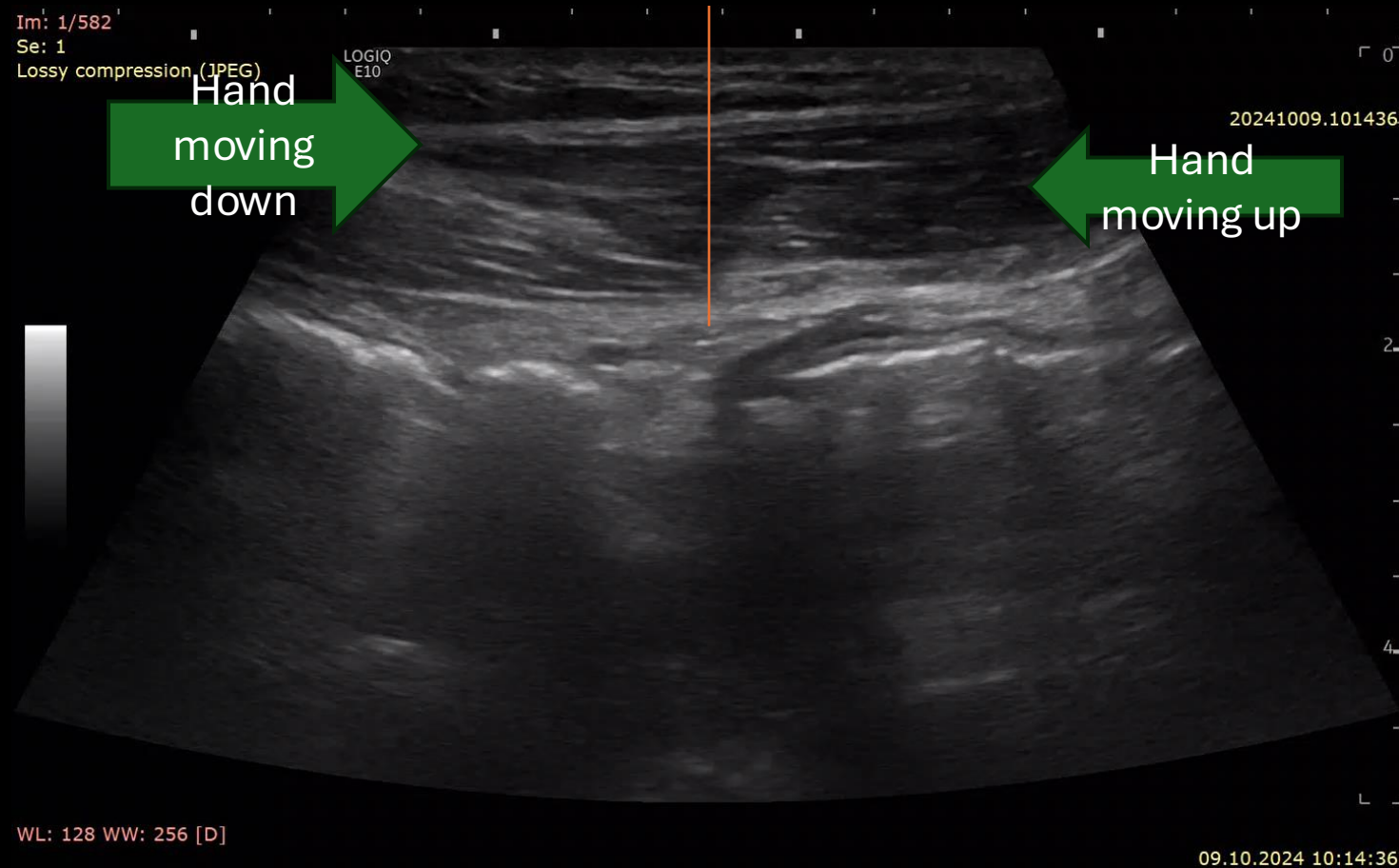
Long and
winding road

keep track!

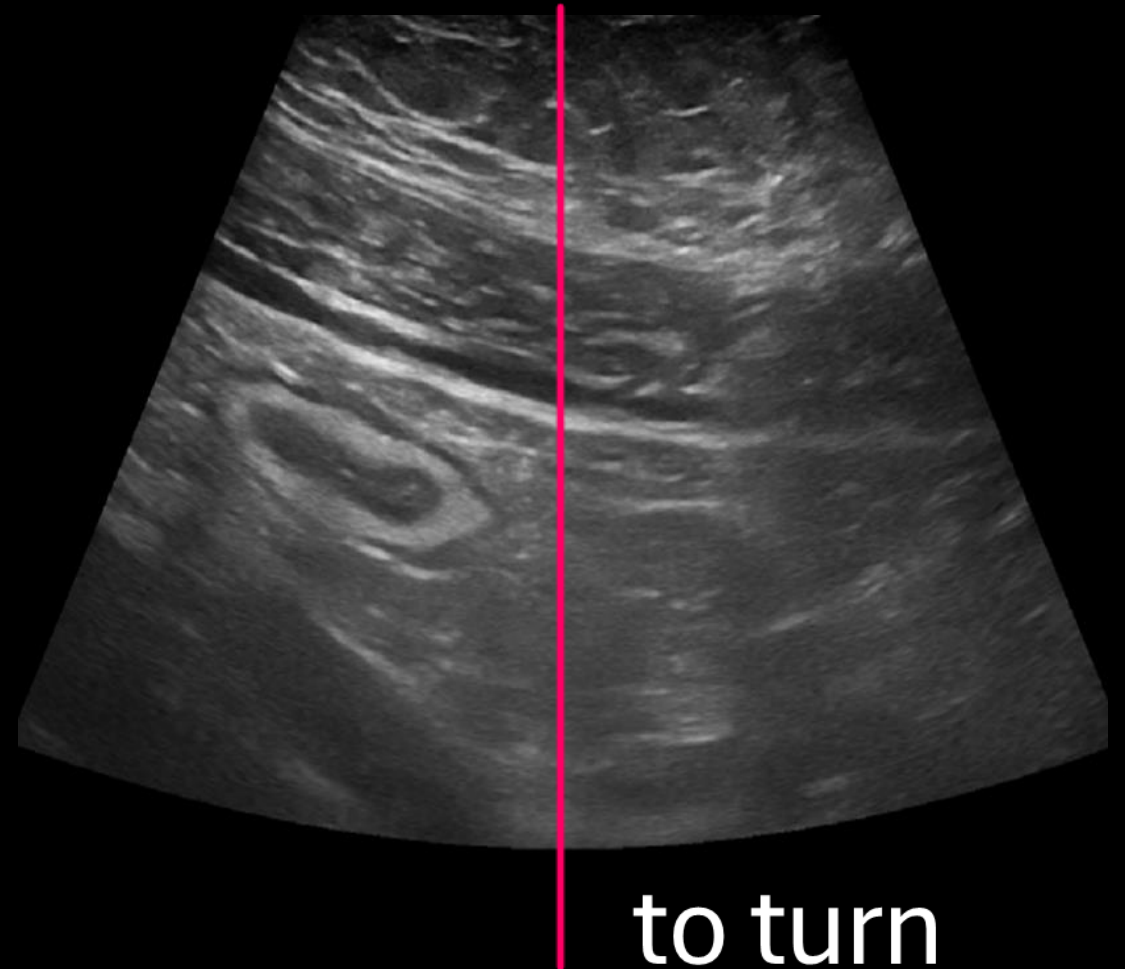
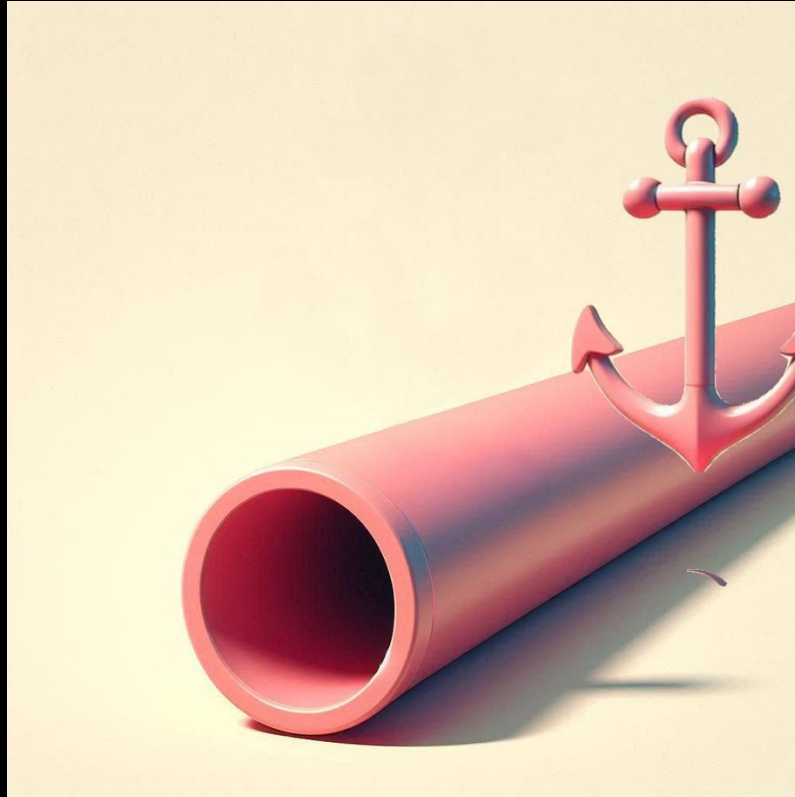


Centering the bowel image to the middle of
the screen is crucial for steering manoeuvres
and image quality in cross section

Centering during scanning the sigmoid



This is not a position



to turn

If you turn the probe without former centering,
you will „fall off the boat“



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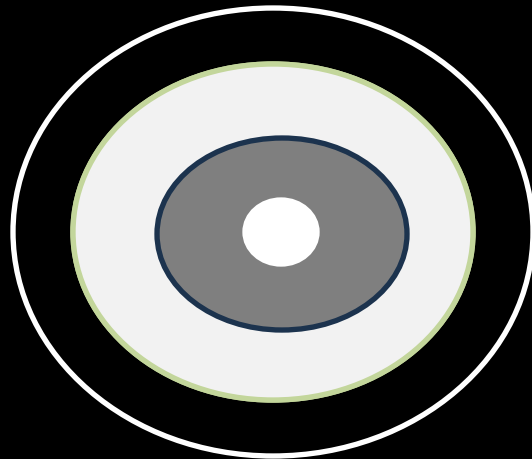
Sonoanatomy of the bowel wall with stratification:

Serosal echo

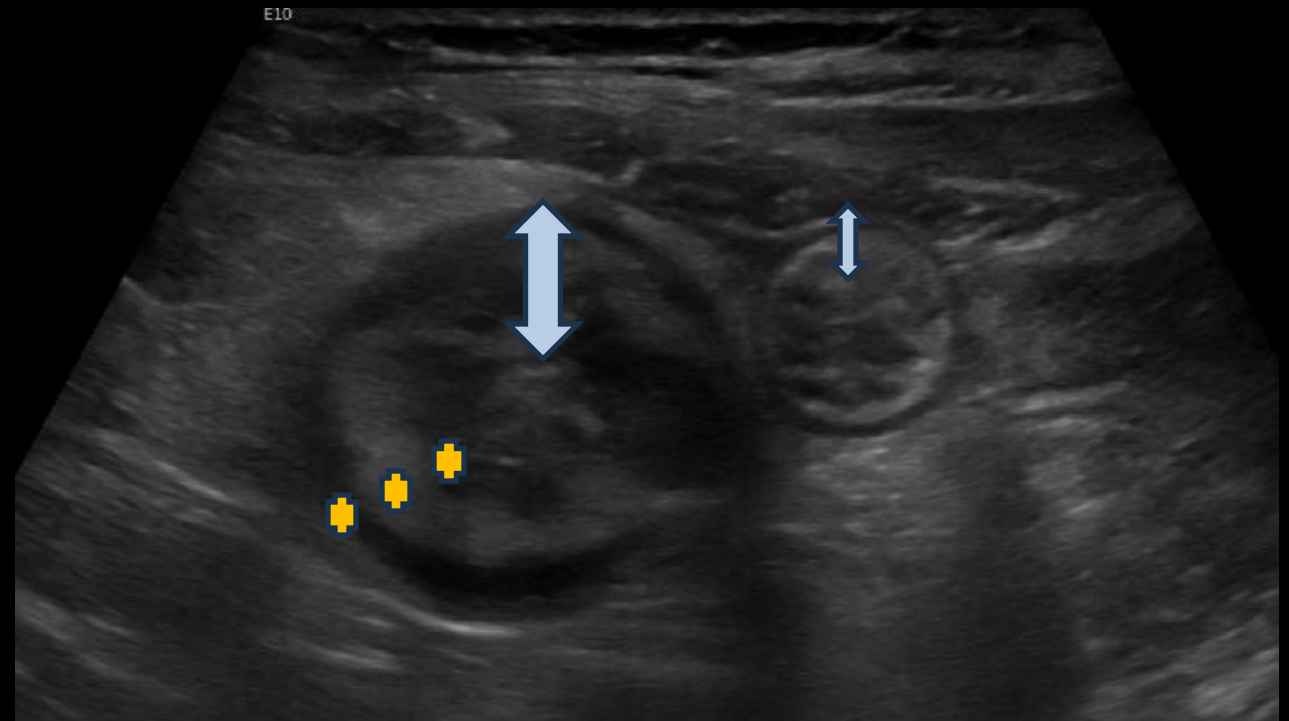
Muscularis propria

Submucosa

Mucosa



Luminal interface,
gas reflexes



**Bowel wall thickness is the key
parameter in bowel ultrasound**

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Sonoanatomic features of healthy large bowel

Haustration

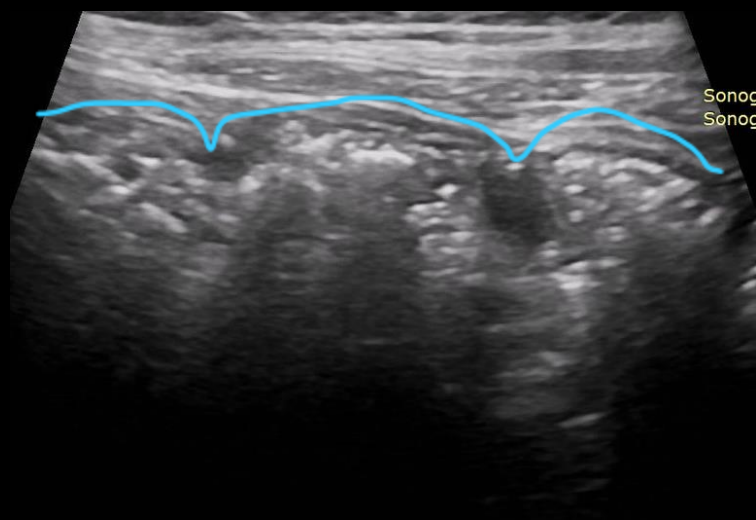
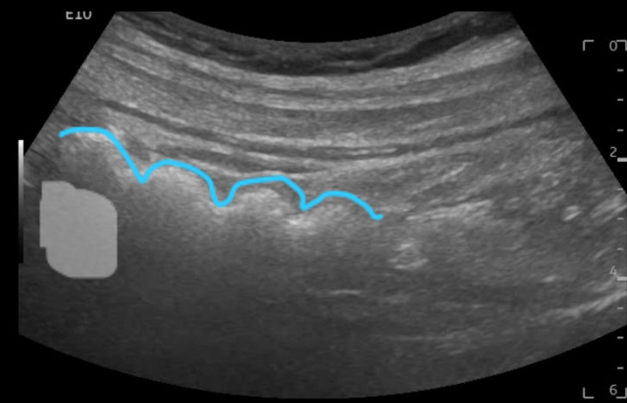


Contents: gas in „clouds“
„shower curtain“-shadowing

Luminal width 2-4 cm

In general no visible peristalsis

Teniae in high resolution visible



Sonoanatomic features of healthy large bowel

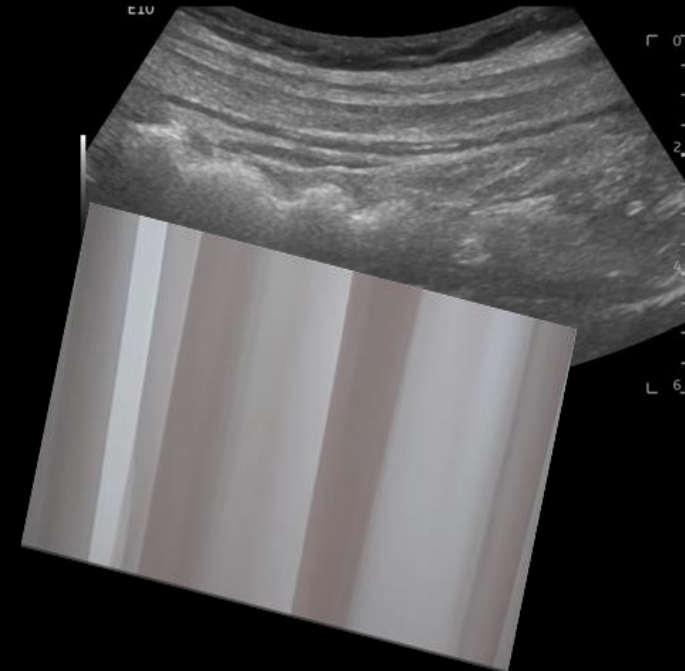
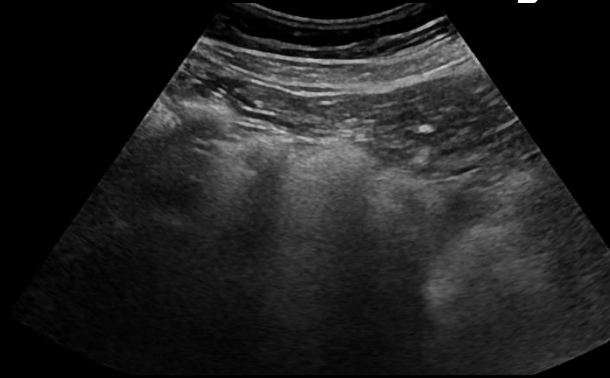
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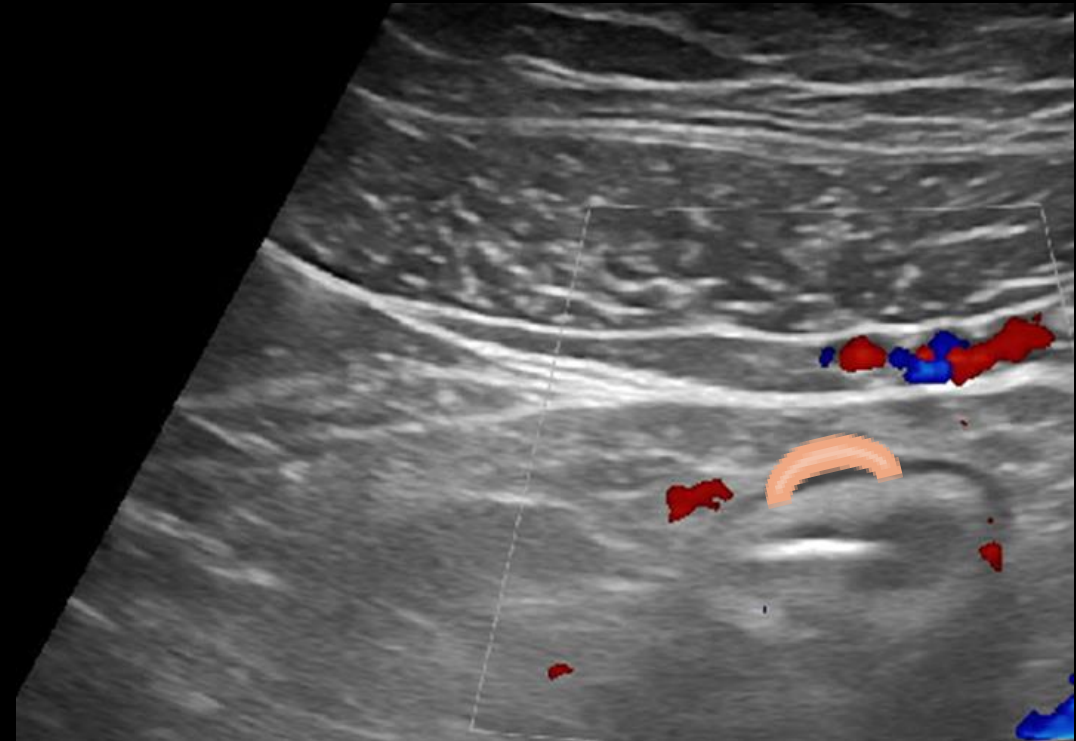
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Luminal width 2-4 cm

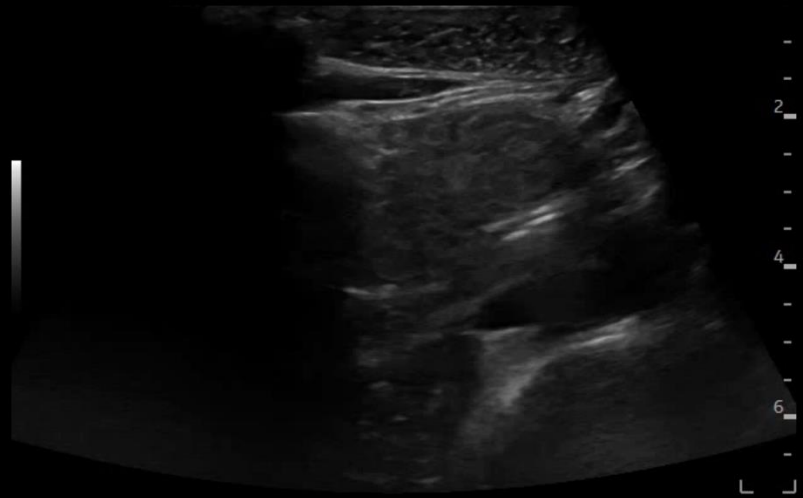
In general no visible peristalsis



Teniae in high resolution visible



Sonoanatomic features of healthy small bowel



Semilunar (Kerckring) folds

Almost empty, small amounts of liquid or gas

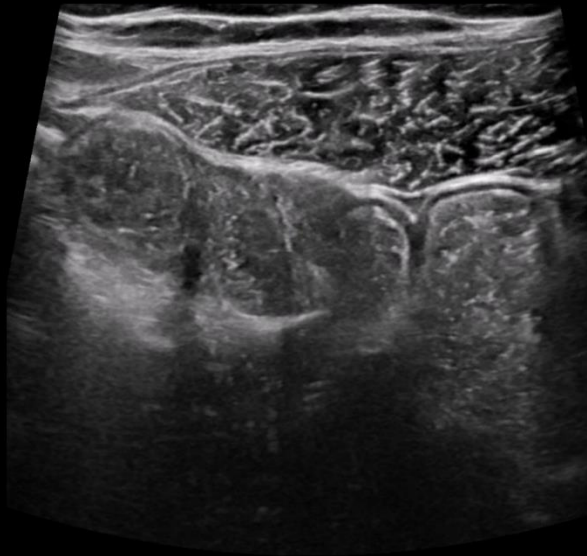
Luminal width < 2 cm

Active peristalsis

Round shape in cross section



Sonoanatomic features of healthy small bowel



Semilunar (Kerckring) folds

Almost empty, small amounts of liquid or gas

Luminal width <2 cm

Active peristalsis

Round shape in cross section



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Sonoanatomic features of healthy small bowel



Semilunar (Kerckring) folds

Almost empty, small amounts of liquid or gas

Luminal width <2 cm

Active peristalsis

Round shape in cross section

Distinguishing

LARGE

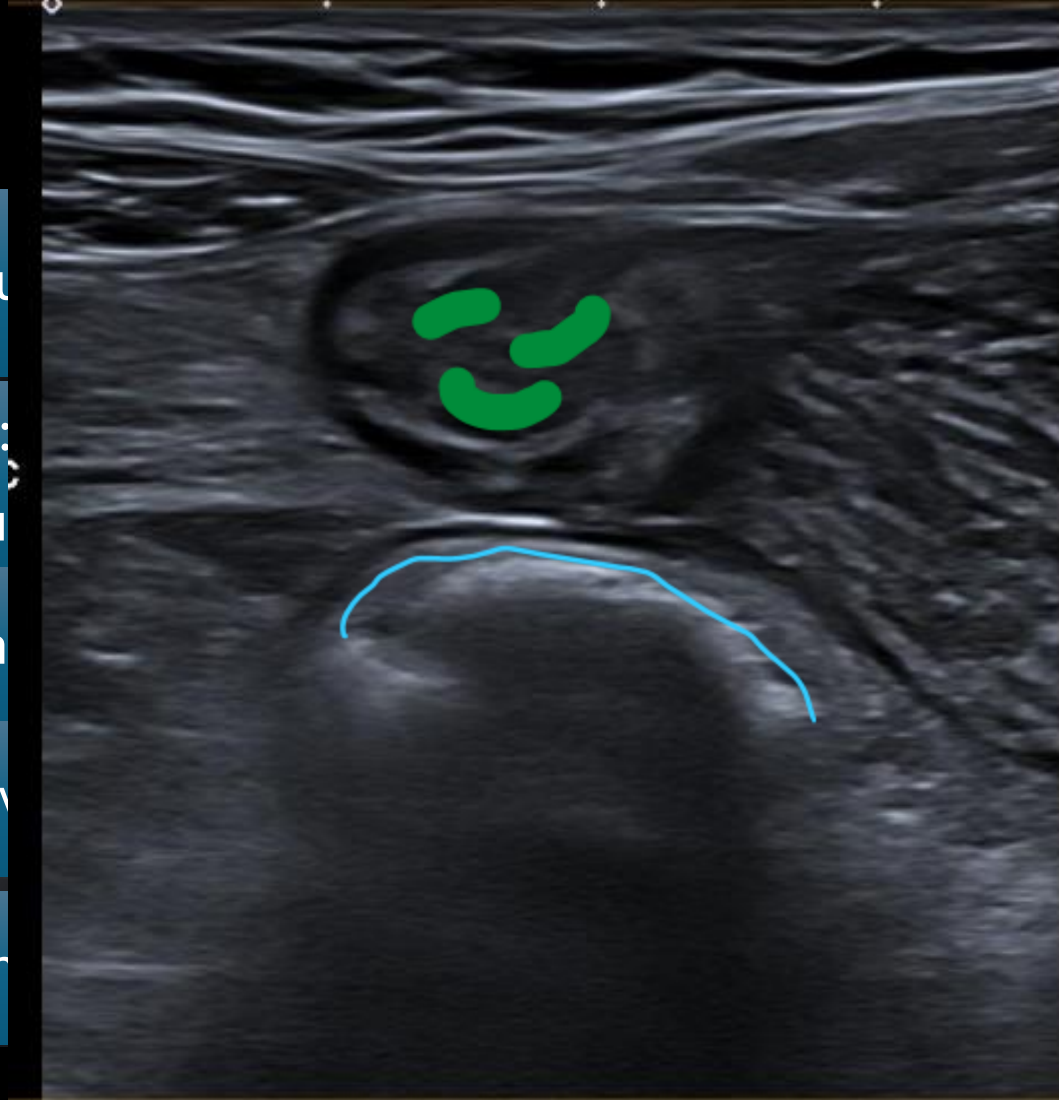
Hau

Contents:
„shower cu

Lumina

In general NO V

Teniae in high



bowel

(puckering) folds

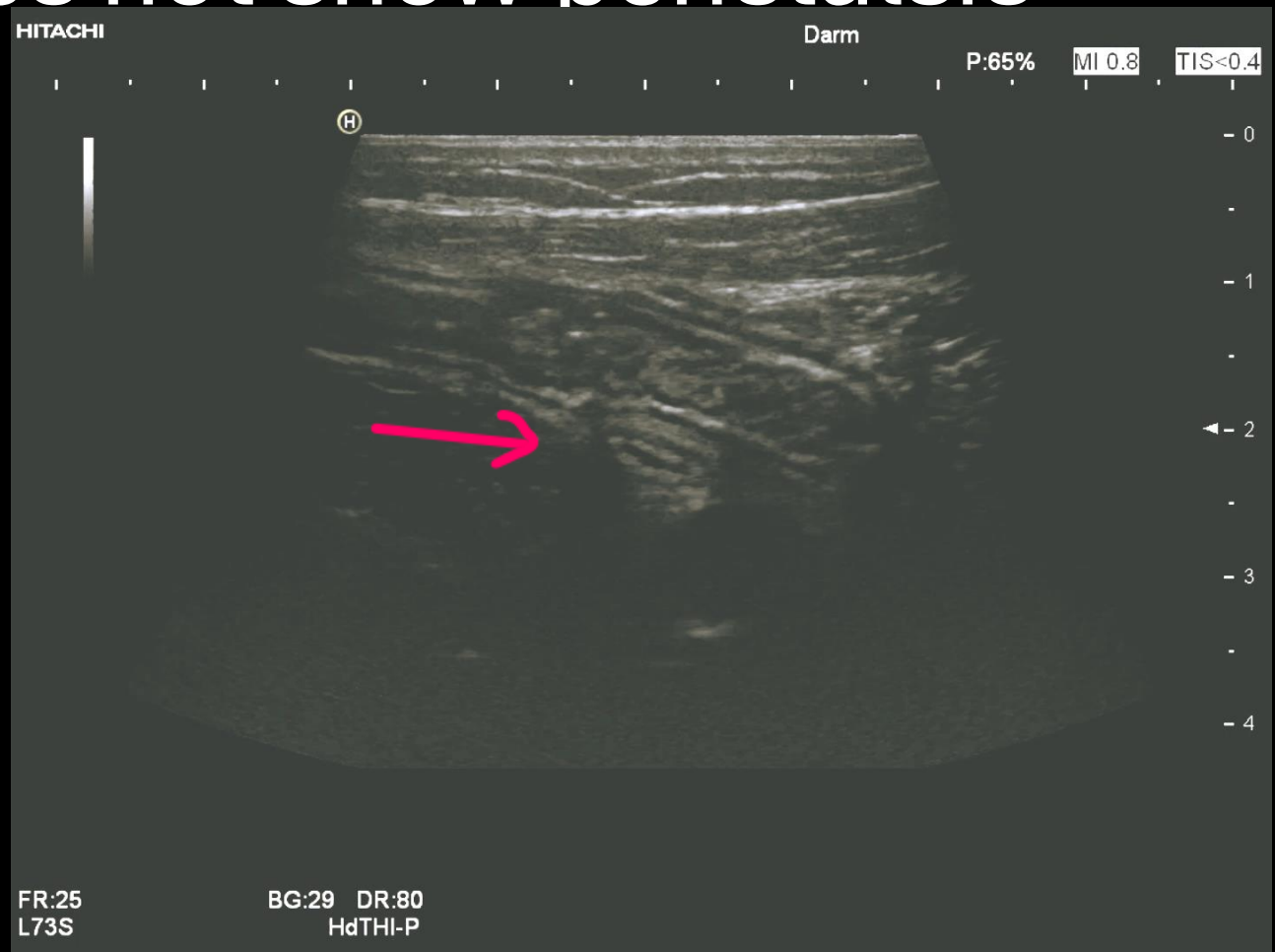
small amounts of liquid

2 cm

is

cross section

The appendix belongs to the large bowel and does not show peristalsis



You have to notice!

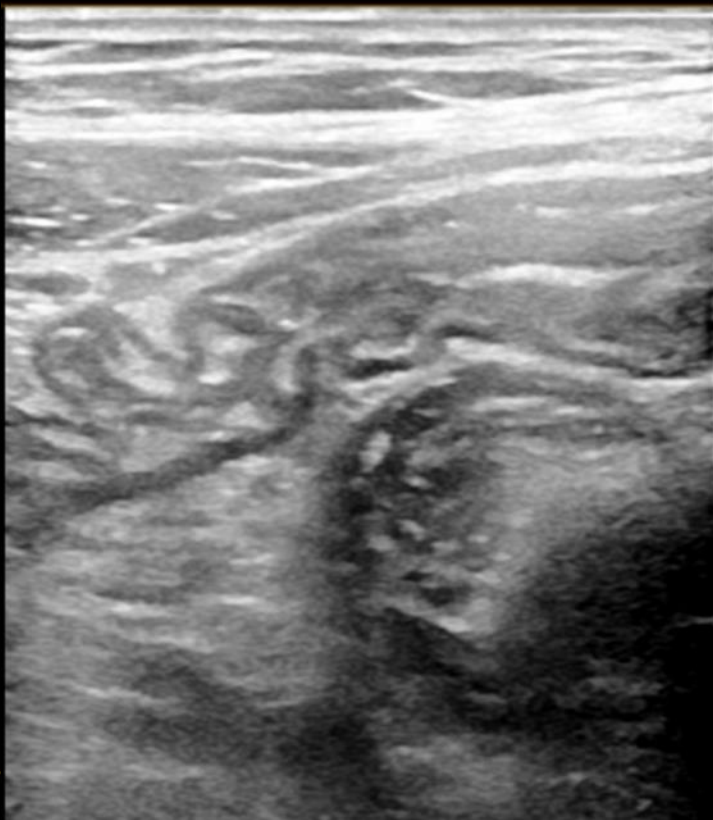
Diseased bowel might **change it's natural properties**

Examples : **peristalsis vanishes** in diseased small bowel
haustration vanishes in diseased large bowel
luminal contents change in obstruction or
diarrhea

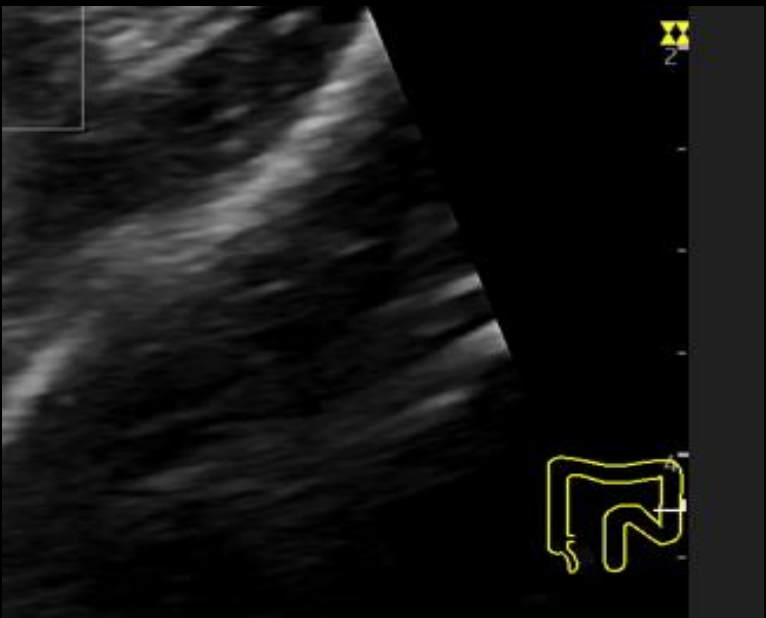
Differentiation might be difficult!

Look for adjacent, healthy parts to be sure about the identification

Crucial for documentation of images / cine-loops: Labeling or Body-marker



SC L



After the exam

Communicate the key findings to the patient clearly and compassionately

Encourage the patient to ask questions

Outline the forthcoming steps

Arrange transportation, if necessary

Ensure proper cleaning of equipment and room

Store representative and retrievable images digitally linked to the report

Confirm data security standards

Prepare the report

Express gratitude to the team for their support



Give everybody a smile



Thank you for your attention!