

# **IBUS *Nordic* Module 1**

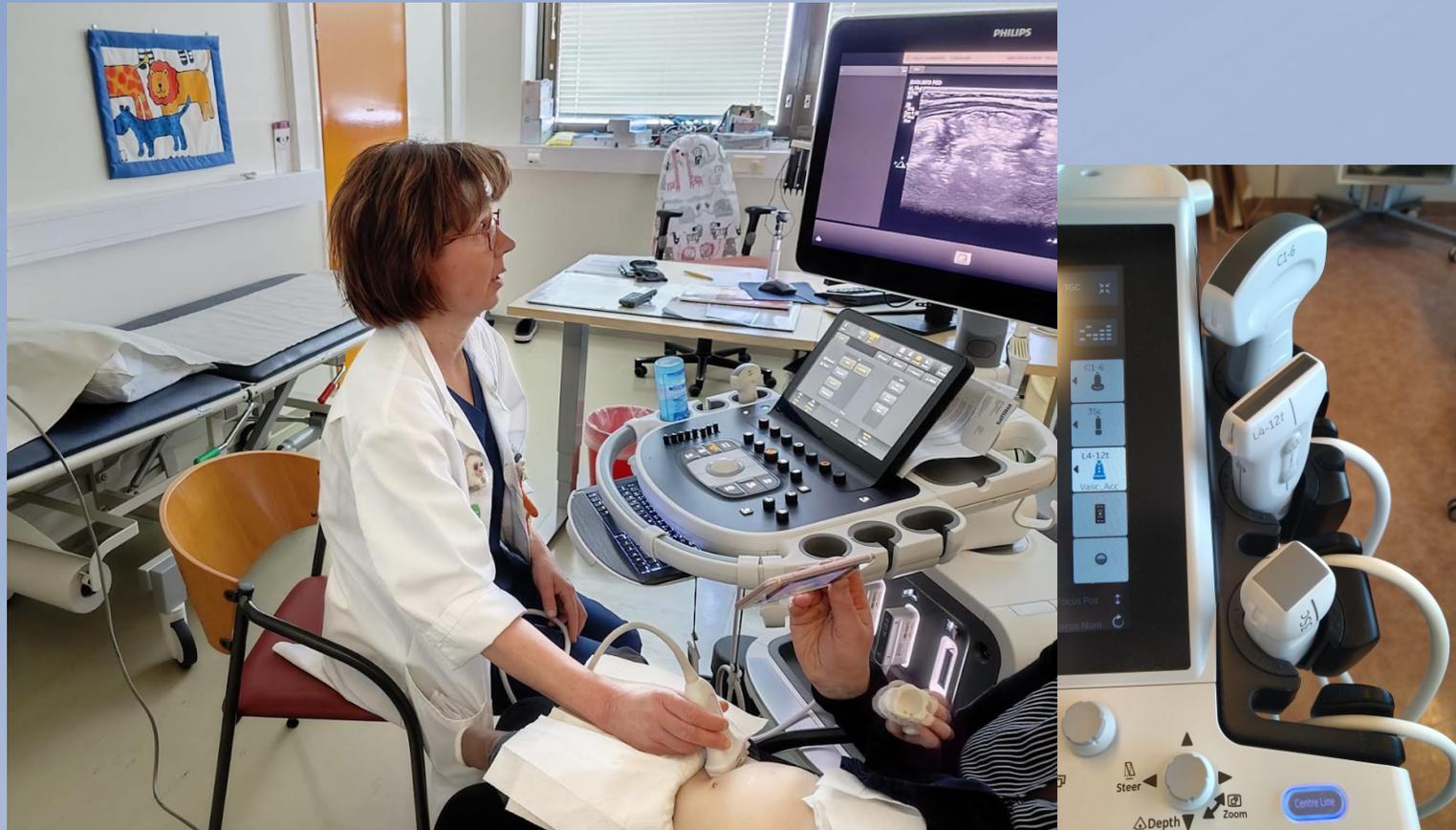
## Workshop

# Intestinal Ultrasonography of normal bowel

Mladen Makitan, Department of Gastroenterologi, Skane University hospital,  
Malmö/Lund



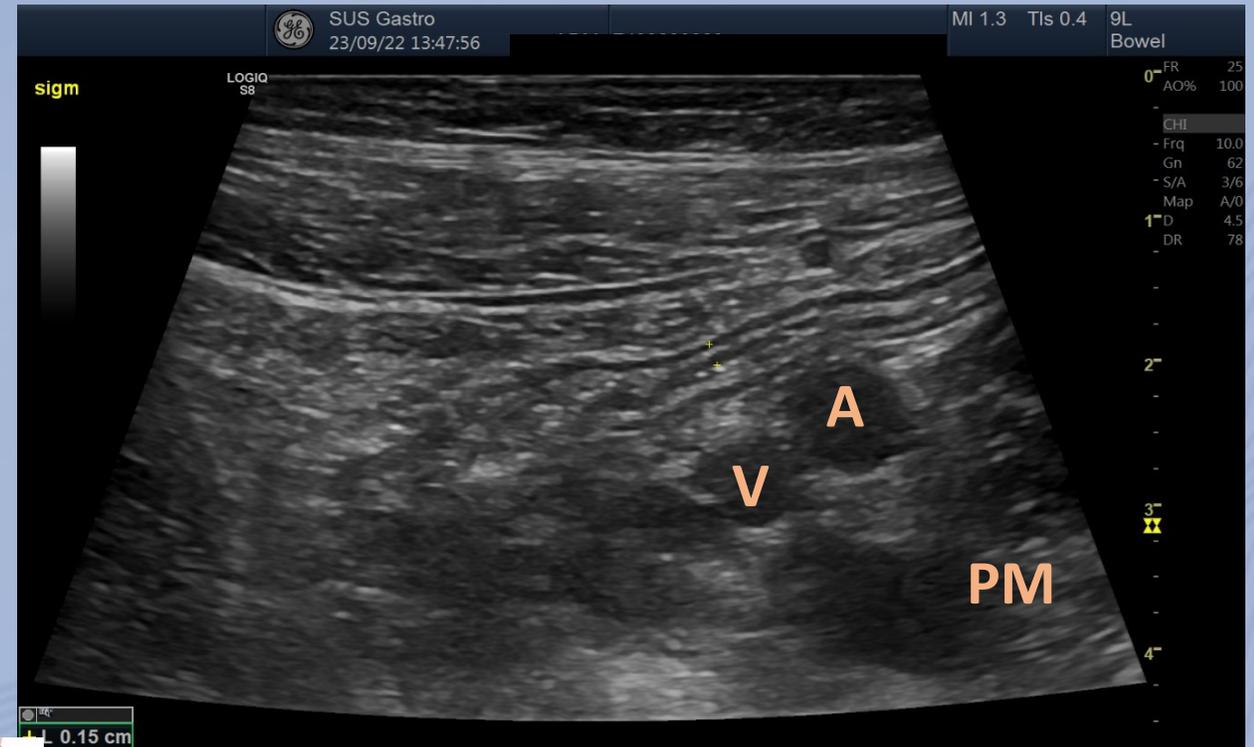
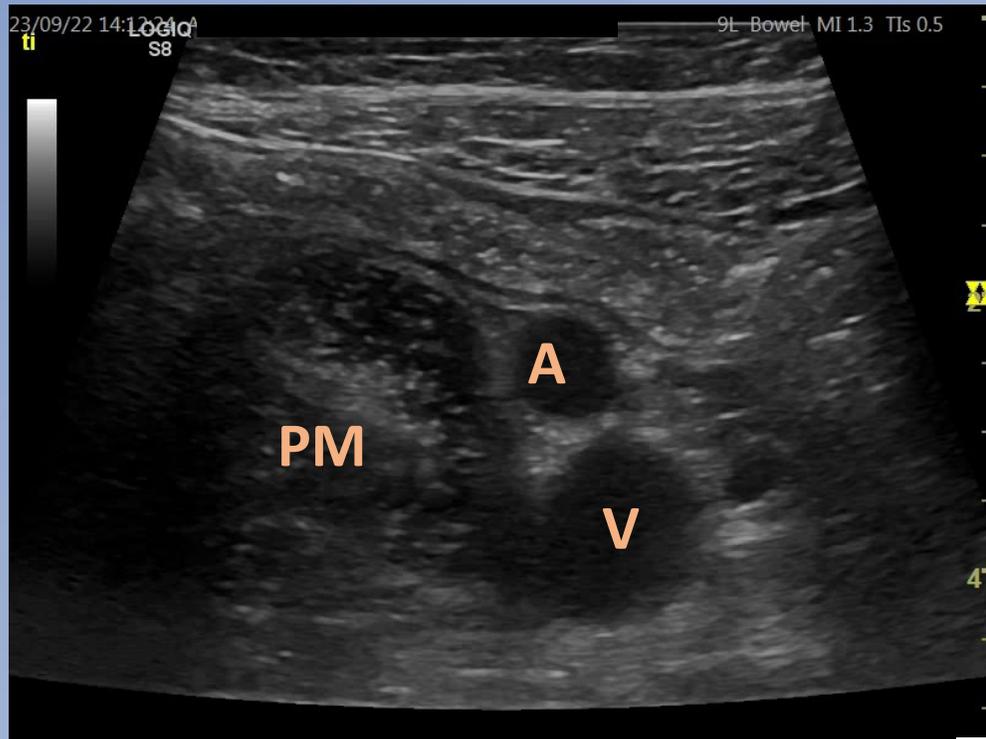
# How to start?



- Convex (low frequency)
  - 1-5 MHz
  - Overview
  - Deeper bowel segments
- Linear (high frequency)
  - 5-10 MHz
  - Higher resolution
  - Detailed examination
- Microconvex probe (low frequency)
  - 4-8 MHz



# Looking for anatomical landmarks



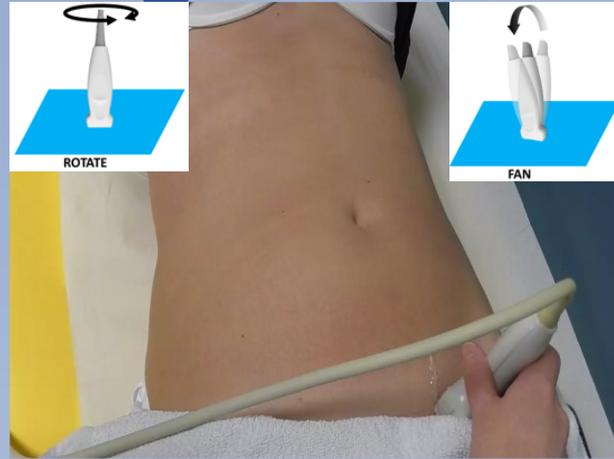
## Anatomical landmarks

- V. and a. iliaca
- M. psoas
- Crista iliaca



# Scanning bowel segments

- Proximal sigmoid colon



Courtesy of Prof. Dr. K Nylund, Bergen



# Scanning bowel segments

- Distal sigmoid colon



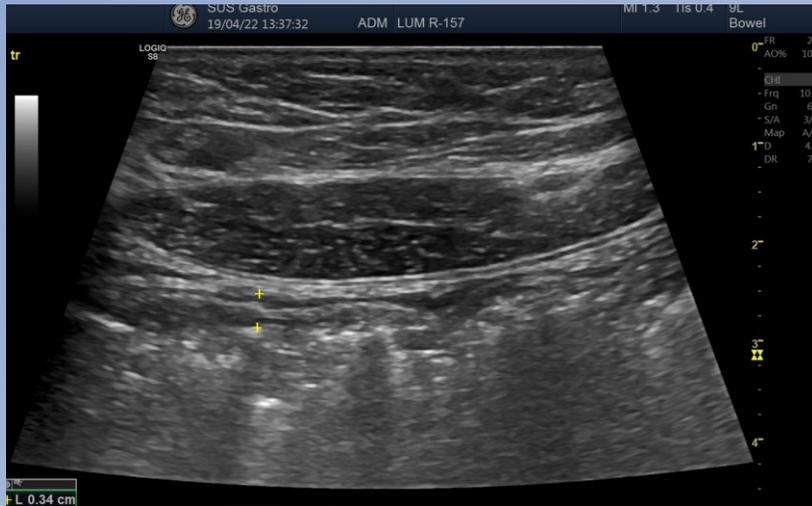
# Scanning bowel segments

- Descending colon



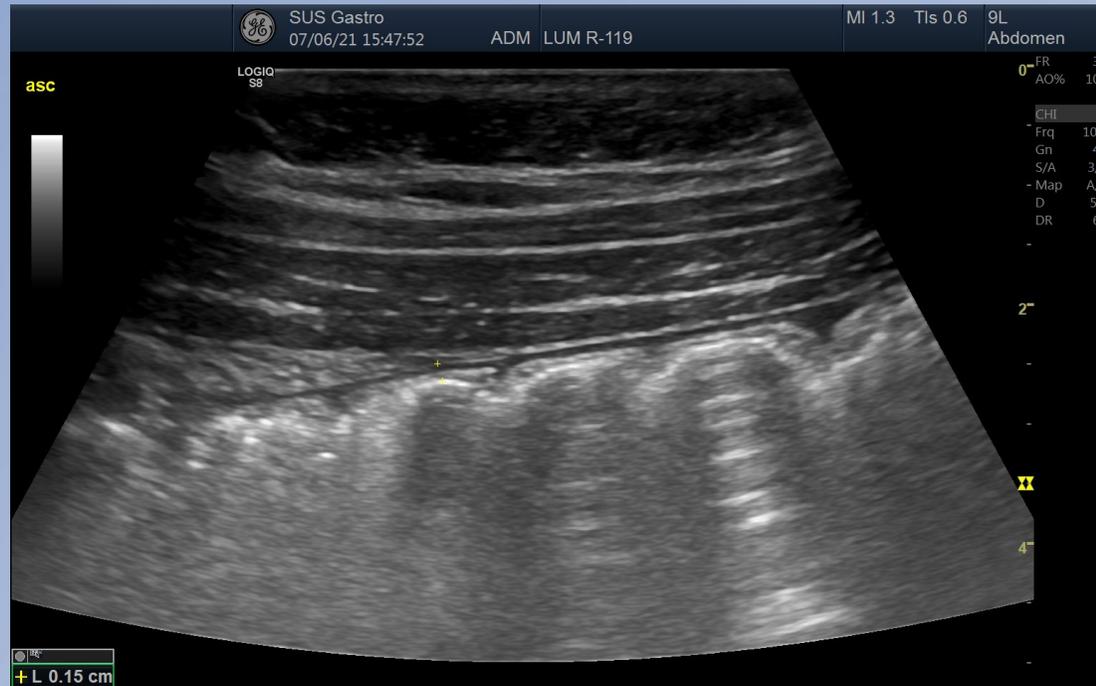
# Scanning bowel segments

- Transverse colon



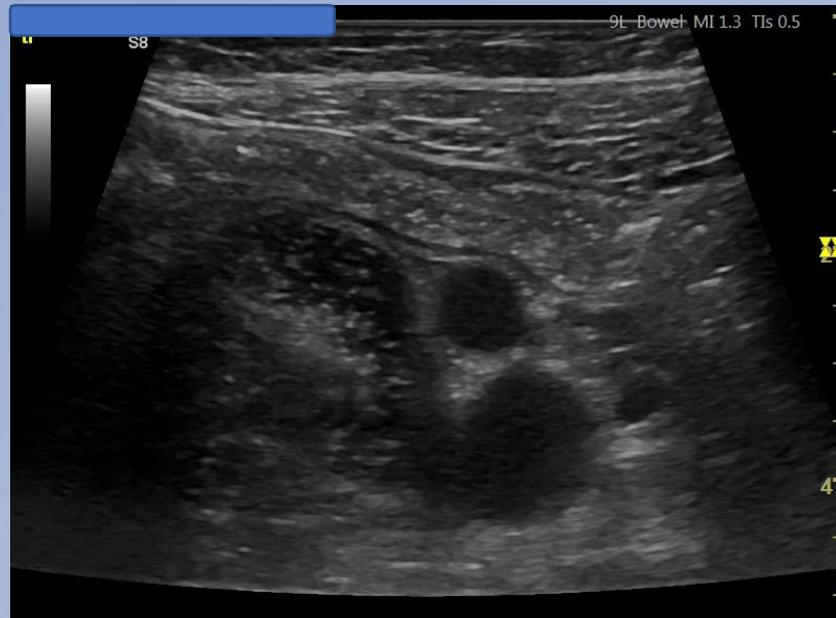
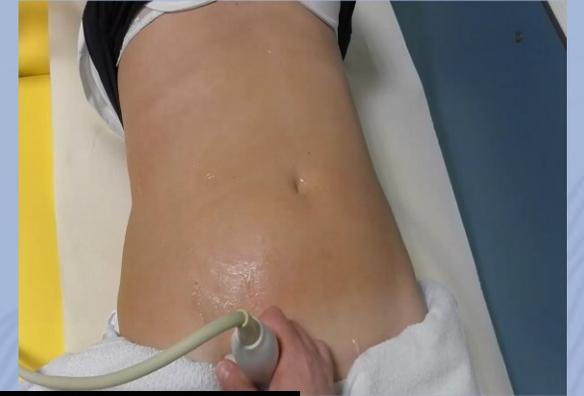
# Scanning bowel segments

- Ascending colon



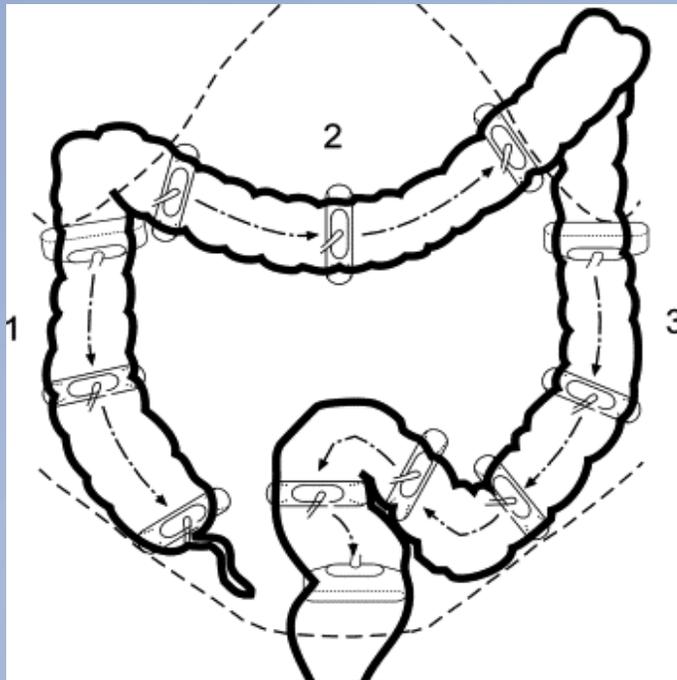
# Scanning bowel segments

- Terminal ileum



# Scanning bowel segments

- Ultrasound technique – systematic approach



Courtesy of Dr Rune Wilkens, Copenhagen

# Scanning bowel segments

- How do I know if it is **COLON** or **SMALL BOWEL**?



**Normal jejunum**  
*(empty, peristalsis,  
kerckring folds)*



**Normal colon**  
*(air-filled colon, no  
peristalsis)*

# Ultrasound features to be assessed

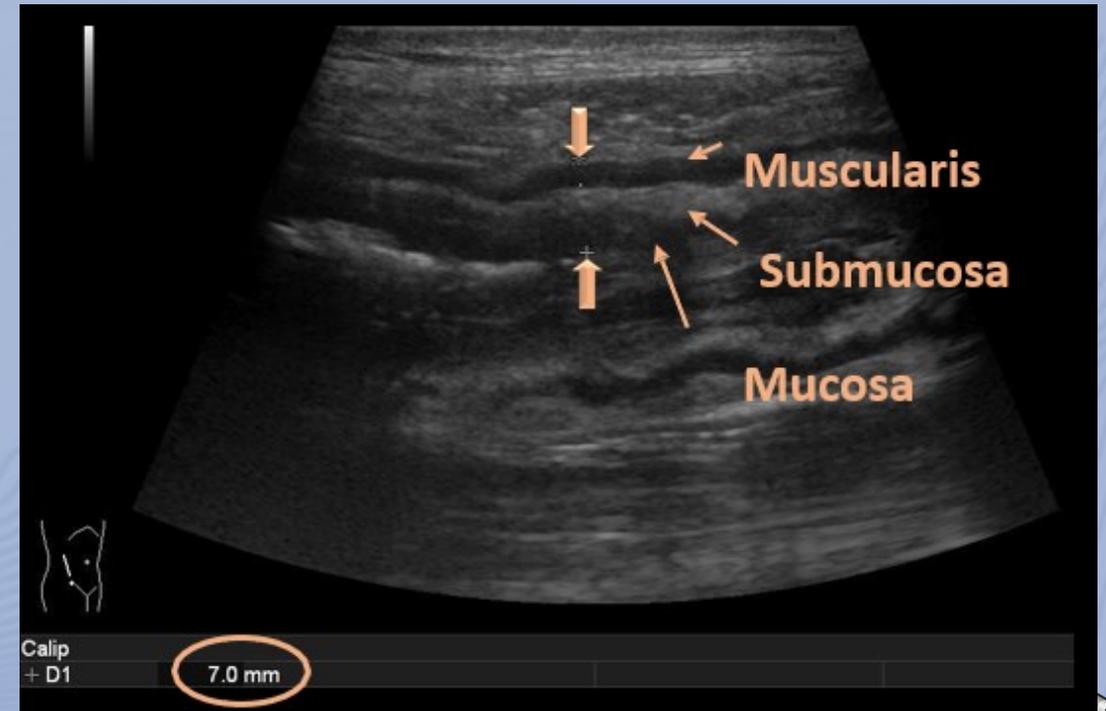
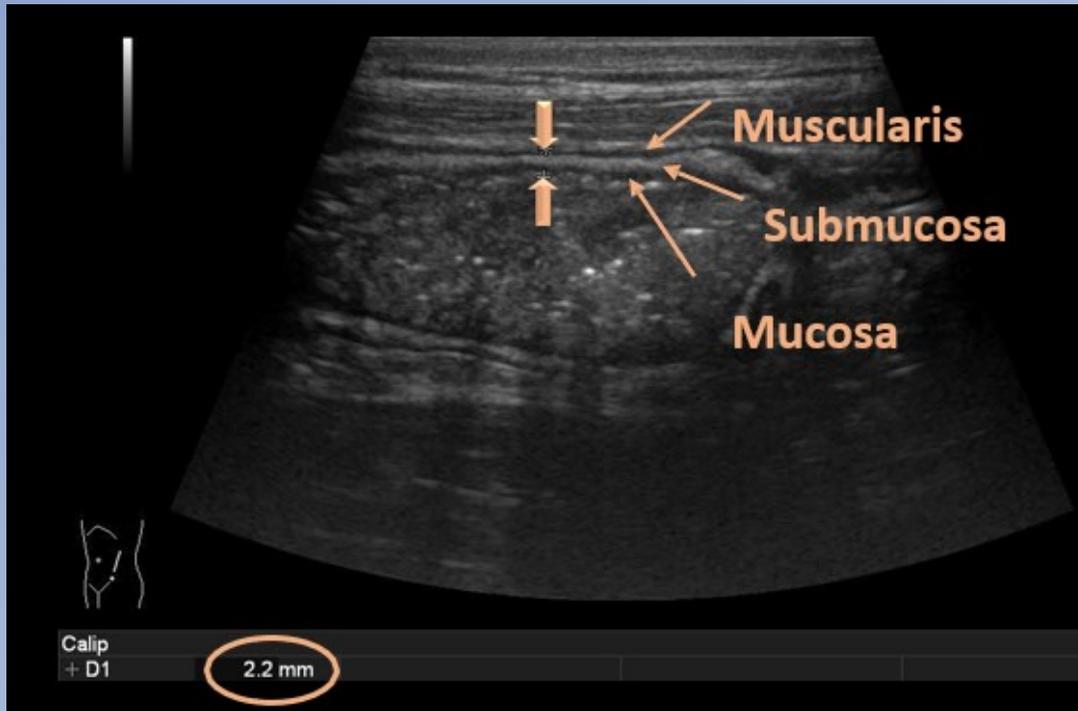
- Bowel wall thickness
- Bowel wall stratification
- Vascularity (Colour doppler/Power doppler)
- Mesenteric inflammatory fat proliferation (i-fat)
- Peristalsis
- Lymph nodes



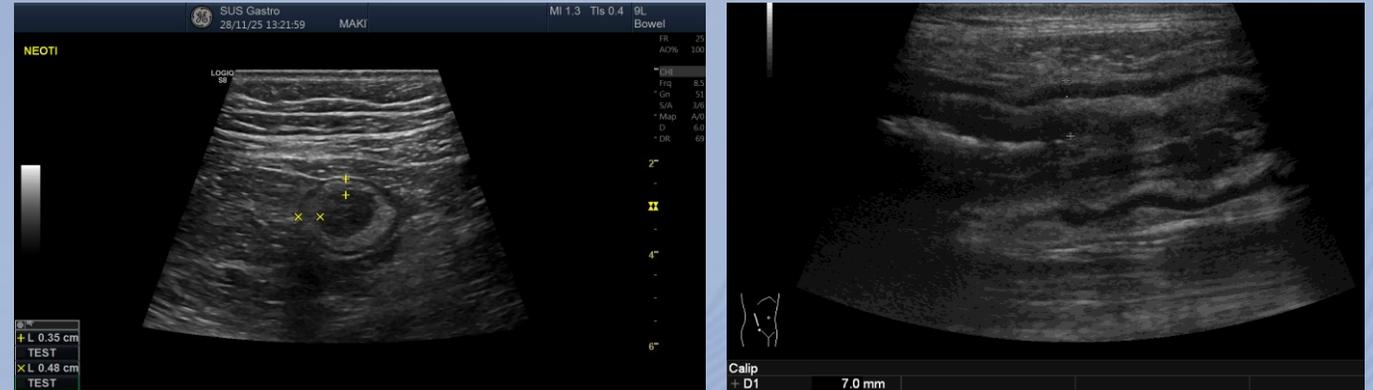
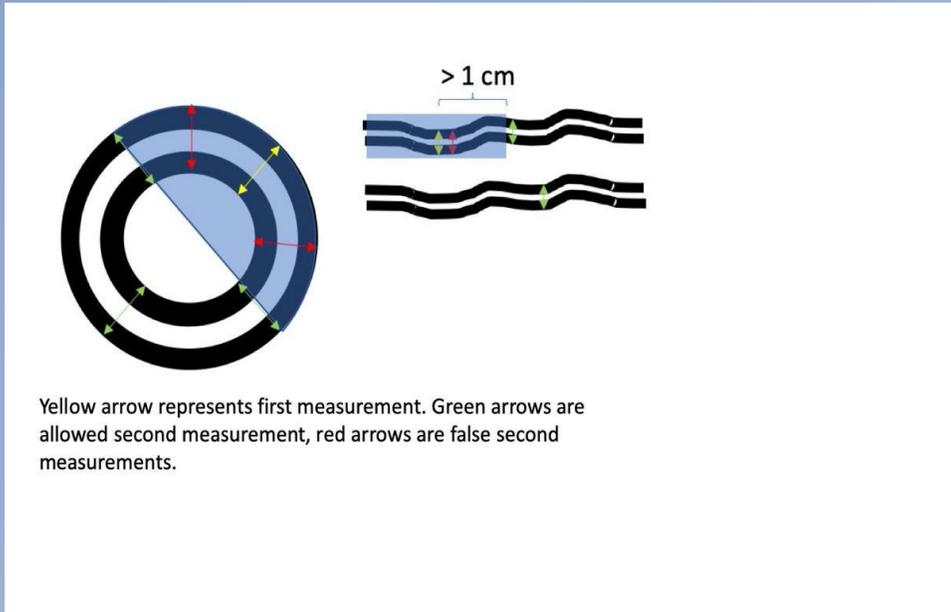
- Do I see some other pathologies?
  - STRICTURE
  - DILATATION
  - FISTULA
  - FLUID COLLECTION



# Bowel Wall Thickness - a “3 mm story”



# Bowel Wall Thickness - a “3 mm story”

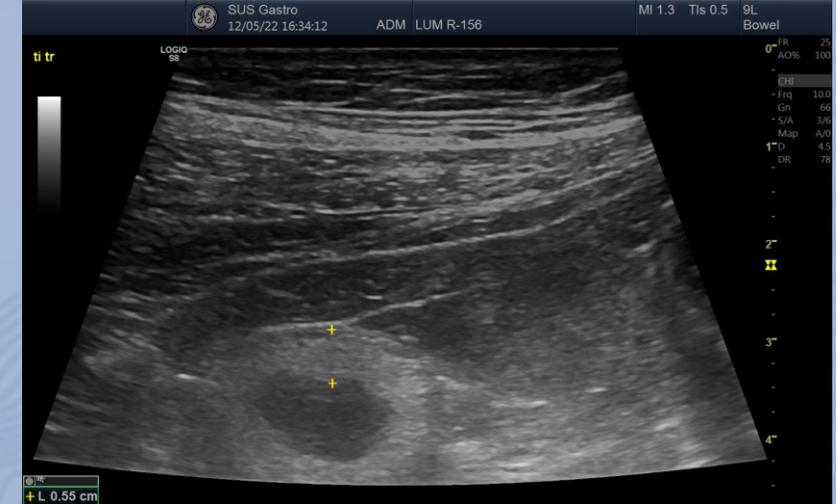
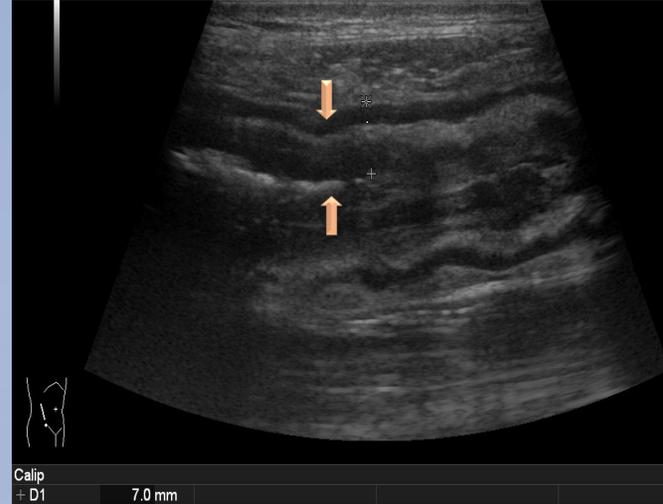
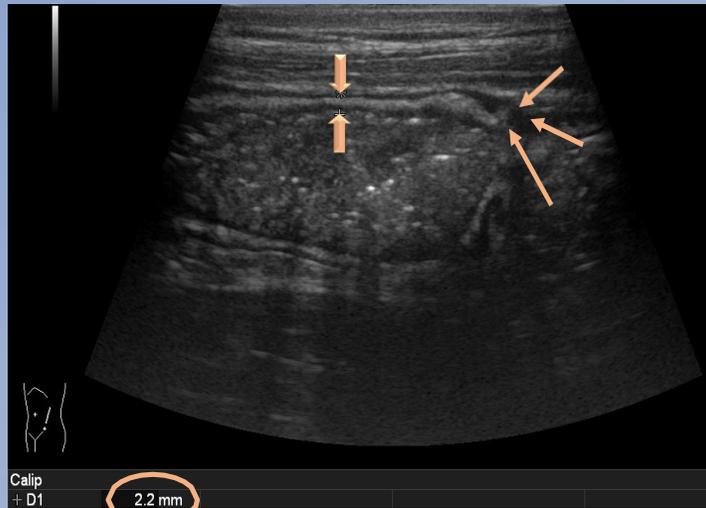


1. Novak, K.L., et al., *A Simple Ultrasound Score for the Accurate Detection of Inflammatory Activity in Crohn's Disease*. *Inflamm Bowel Dis*, 2017. **23**(11): p. 2001-2010.

2. Ilvemark, J.F.K.F., et al., *Early Intestinal Ultrasound Predicts Intravenous Corticosteroid Response in Hospitalised Patients With Severe Ulcerative Colitis*. *Journal of Crohn's and Colitis*, 2022.



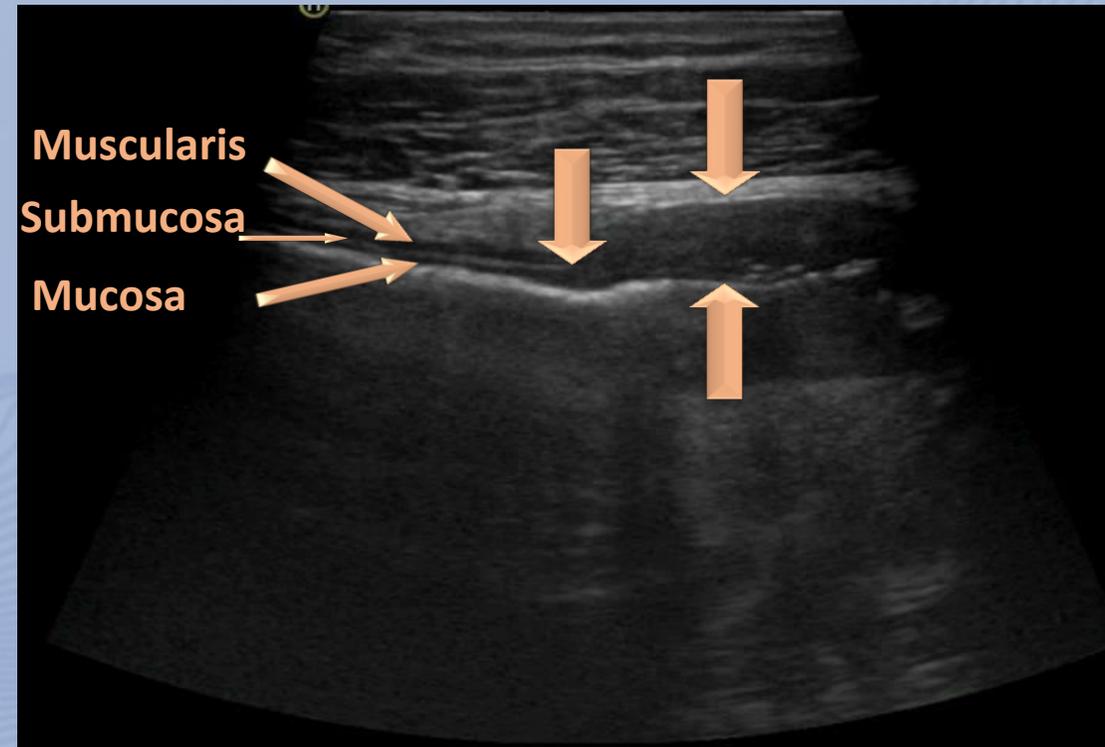
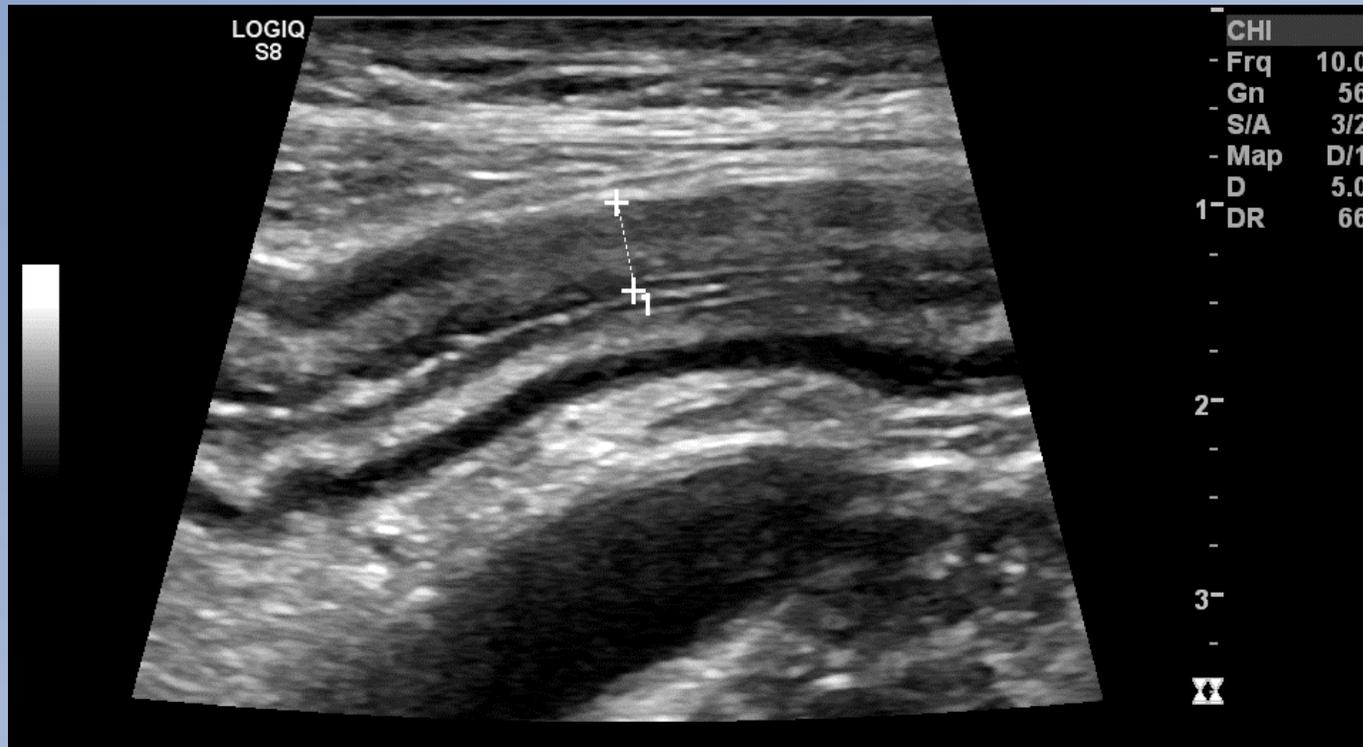
# Bowel Wall Stratification



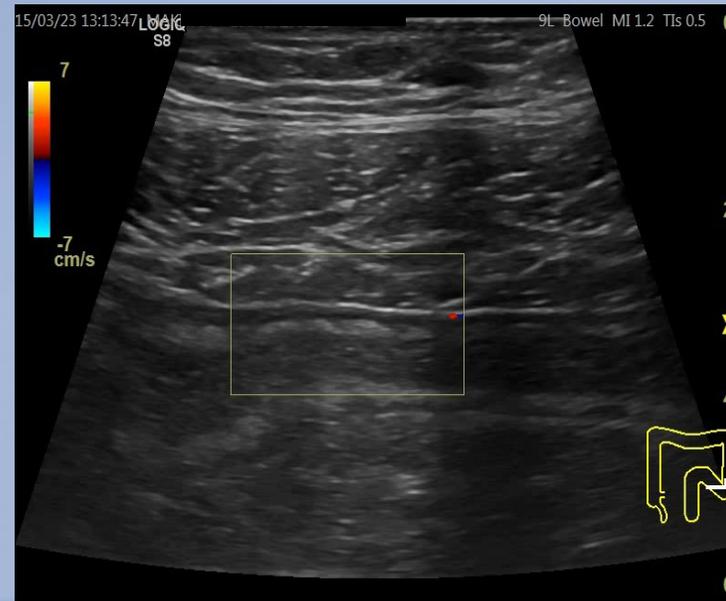
1. Novak, K.L., et al., *A Simple Ultrasound Score for the Accurate Detection of Inflammatory Activity in Crohn's Disease*. *Inflamm Bowel Dis*, 2017. **23**(11): p. 2001-2010.
2. Ilvemark, J.F.K.F., et al., *Early Intestinal Ultrasound Predicts Intravenous Corticosteroid Response in Hospitalised Patients With Severe Ulcerative Colitis*. *Journal of Crohn's and Colitis*, 2022.



# Bowel Wall Stratification



# Bowel Wall Vascularisation



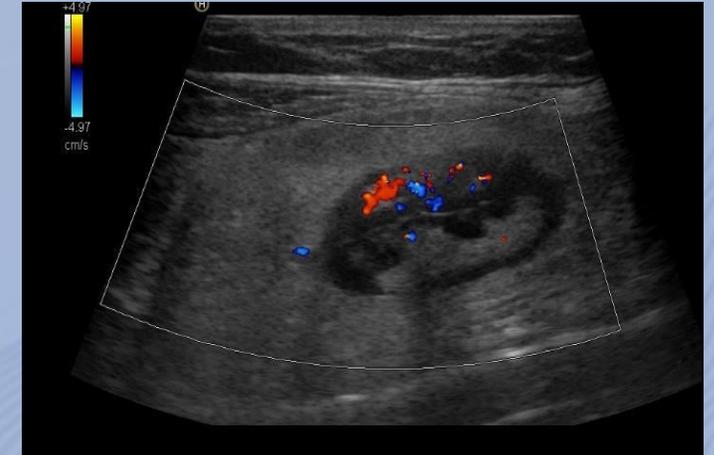
1. Limberg B. Diagnostik von chronisch-entzündlichen Darmerkrankungen durch Sonographie [Diagnosis of chronic inflammatory bowel disease by ultrasonography]. *Z Gastroenterol.* 1999 Jun;37(6):495-508. German. PMID: 10427656.
2. Sjekavica I, Barbarić-Babić V, Krznarić Z, Molnar M, Cuković-Cavka S, Stern-Padovan R. Assessment of Crohn's disease activity by doppler ultrasound of superior mesenteric artery and mural arteries in thickened bowel wall: cross-sectional study. *Croat Med J.* 2007 Dec;48(6):822-30. doi: 10.3325/cmj.2007.6.822. PMID: 18074417; PMCID: PMC2213815.



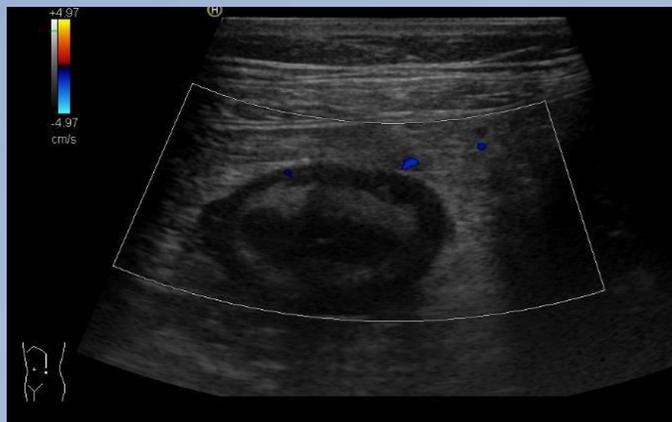
# Bowel Wall Vascularisation – The Limberg score



1 – minimal pixels, scant



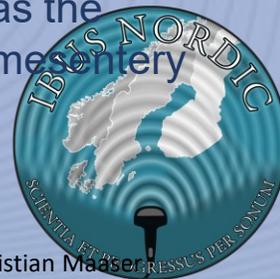
2 – increased color signal limited to the wall



0 – No signal



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



# Mesenteric Inflammatory fat



1. Christian M, Giovanni M, Torsten K, Mariangela A. Ultrasonography in inflammatory bowel disease - So far we are? United European Gastroenterol J. 2022 Mar;10(2):225-232. doi: 10.1002/ueg2.12196. Epub 2022 Feb 8. Erratum in: United European Gastroenterol J. 2022 May;10(4):439. PMID: 35132795; PMCID: PMC8911535.

2. Bots, S., et al., *Ultrasound for Assessing Disease Activity in IBD Patients: A Systematic Review of Activity Scores. J Crohns Colitis*, 2018. **12(8)**: p. 920-929.



# Lymph nodes



- Long axis < 10 mm
- Short axis < 4 mm

Multiple, visible and slightly enlarged lymph nodes in Crohn's disease

1. Christian M, Giovanni M, Torsten K, Mariangela A. Ultrasonography in inflammatory bowel disease - So far we are? United European Gastroenterol J. 2022 Mar;10(2):225-232. doi: 10.1002/ueg2.12196. Epub 2022 Feb 8. Erratum in: United European Gastroenterol J. 2022 May;10(4):439. PMID: 35132795; PMCID: PMC8911535.  
2. Maconi, G., et al., *Diagnostic significance of mesenteric lymph node involvement in proximal small bowel Crohn's disease. Therap Adv Gastroenterol, 2022. 15: p. 17562848221118664.*



# Ultrasound of normal bowel

**TABLE 1** Intestinal ultrasound (IUS) parameters

Bowel wall thickness (BWT)	Normal values up to 3 mm, both for colon and ileum. BWT should be measured as the mean of 4 measurements: 2 in longitudinal (at least 1 cm apart) and 2 in transverse section (more than 90° apart), from the interface between the mucosa and the lumen to the interface between the muscle layer and serosa layer (with calipers perpendicular to the wall)
Bowel wall flow (BWF)	0 = no blood flow on colour Doppler imaging; 1 = small, circular intramural vascular signal on colour Doppler imaging; 2 = longer linear intramural vascular signal on colour Doppler imaging; 3 = longer stretches of vascular signal with extension into mesentery on colour Doppler imaging
Bowel wall stratification (BWS)	Defined as normal echostratification (0); focal ( $\leq 3$ cm) disruption (1); extensive ( $> 3$ cm) disruption (2)
Mesenteric inflammatory fat	White hyperechoic zone surrounding the inflamed bowel, classified as: absent (0); present (1)
Mesenteric lymph nodes	Mesenteric lymphadenopathy should be defined as lymph nodes greater than 4.0 mm in short axis diameter that are located in the mesentery adjacent to an affected segment and should be classified as: absent (0); present (1)
Small bowel peristalsis	Small bowel peristalsis should be scored within the context of inflammatory intestinal segment as absent, reduced, present or increased
Colonic haustra coli	Colonic haustra coli should be scored as absent (0); present (1)
Ulcers	Defined as depressions in the mucosal layer
Stricture	Wall thickening with a narrowed lumen with or without a dilatation of a proximal loop
Fistula	Hypoechoic tract with or without hyperechoic content
Abscess	Roundish anechoic lesion with an irregular wall, without signs of blood flow

1. Christian M, Giovanni M, Torsten K, Mariangela A. Ultrasonography in inflammatory bowel disease - So far we are? United European Gastroenterol J. 2022 Mar;10(2):225-232. doi: 10.1002/ueg2.12196. Epub 2022 Feb 8. Erratum in: United European Gastroenterol J. 2022 May;10(4):439. PMID: 35132795; PMCID: PMC8911535.



# Take away

- Check the probe orientation
- Choose the starting point and anatomical landmarks
- Do the assessment and measurements using a systematic approach

**Thank you and good luck!**

