



international bowel
ULTRASOUND GROUP

Intestinal Ultrasound in Crohn's Disease

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University of Calgary, Canada



Calgary, Canada, April 10th – 11th, 2026

Disclosure

Speaker Fees – Abbvie, JnJ.

Advisory Board/Consulting Fees – Abbvie, Agomab, Celltrion, Ferring, Janssen, Lilly, Merck, Pendopharm, Pfizer, Takeda

Grant Funding- Helmsley Charitable Trust, Abbvie



Intended Learning Outcomes (ILOs):

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3. Integrate and weigh the importance of **multiple individual IUS signs** to form a **comprehensive assessment** of Crohn's disease activity and potential complications.
4. Evaluate the **overall diagnostic** and **monitoring performance** of IUS for Crohn's disease assessment against established **reference standards** (e.g., endoscopy, cross-sectional imaging, histology).
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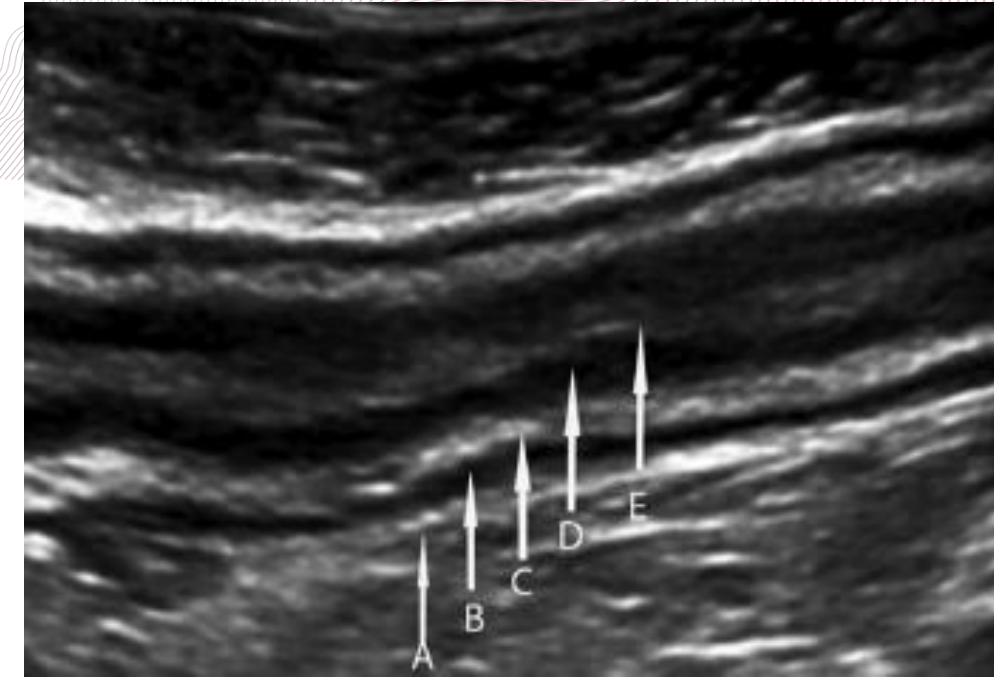
4 Key Sonographic Components of Active IBD

1. Bowel wall thickness*
2. Color Doppler Blood Flow*
3. Inflammatory fat
4. Loss of stratification

* Found in disease activity scores

$$\text{IBUS} - \text{SAS} (0-100) = 4 \cdot \text{BWT} + 15 \cdot \text{i-fat} + 7 \cdot \text{CDS} + 4 \cdot \text{BWS}$$

Novak et al. JCC 2021.



A - Serosa

B - Muscularis Propria

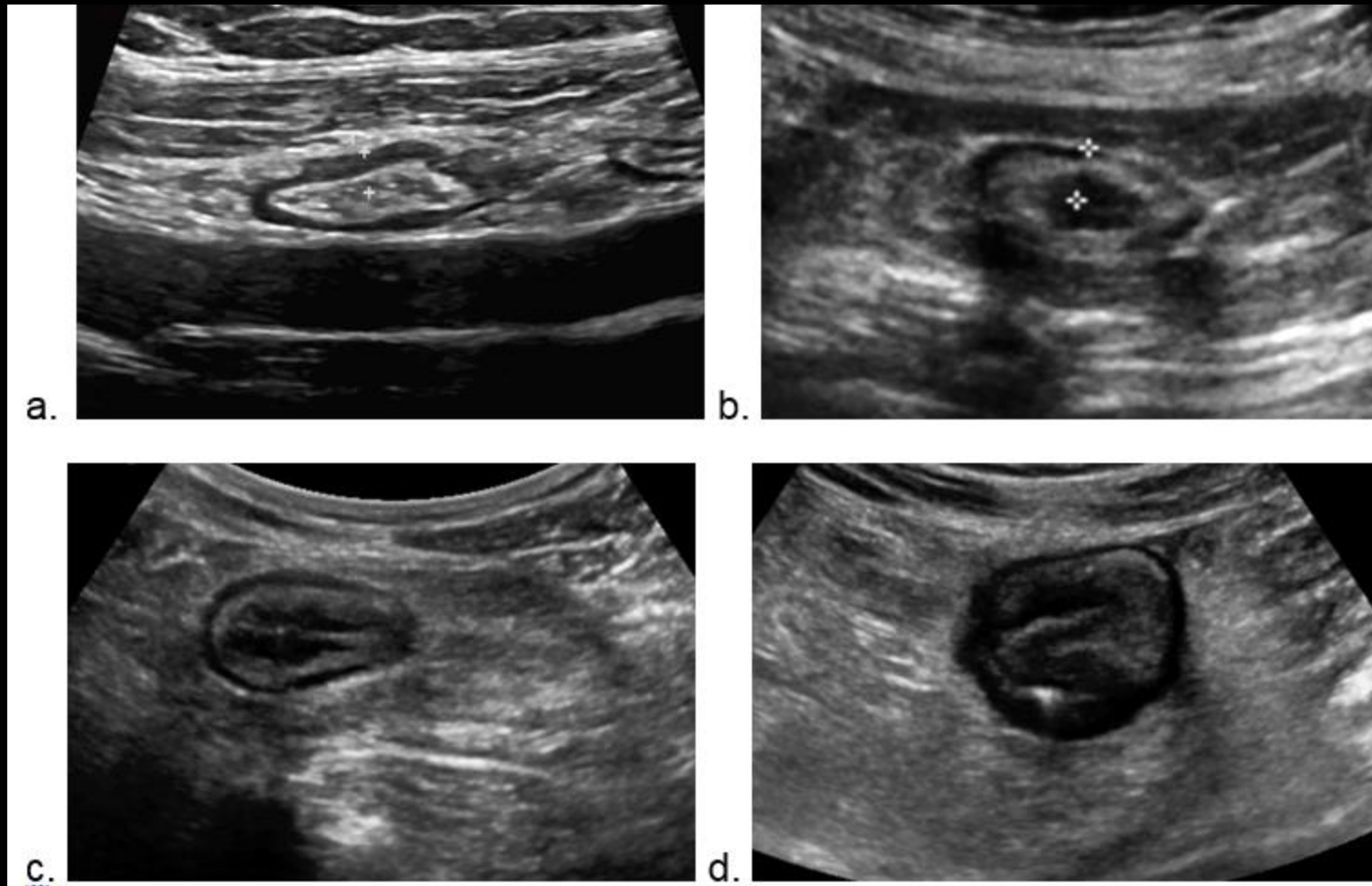
C - Submucosa

D - Muscularis Mucosa

E - Mucosa



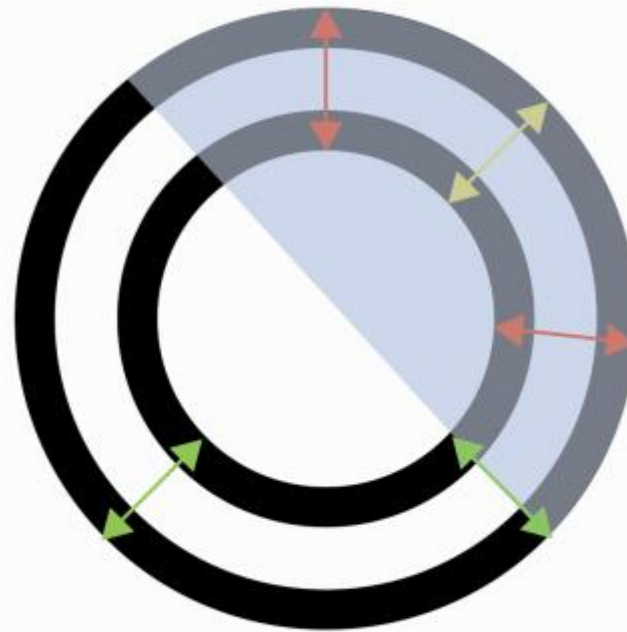
Pathologic if BWT $> 3.0\text{mm}$



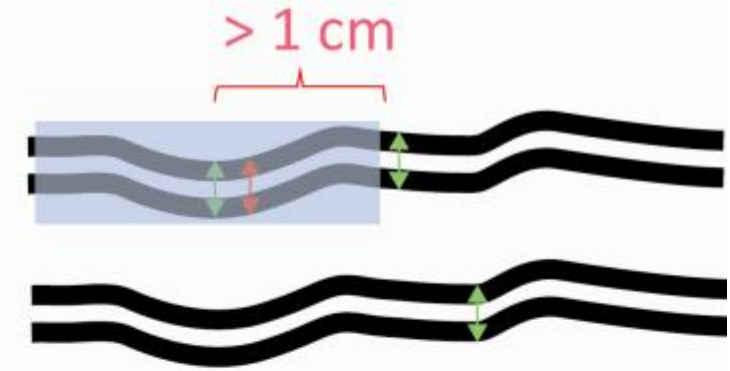
1. Bowel Wall Thickness

How to measure BWT?

- Calipers perpendicular to wall
- Place calipers at mucosa/lumen interface and outer border of muscularis propria.
- 2 measures at least 1cm apart in longitudinal and $> 90^\circ$ in cross-sectional.



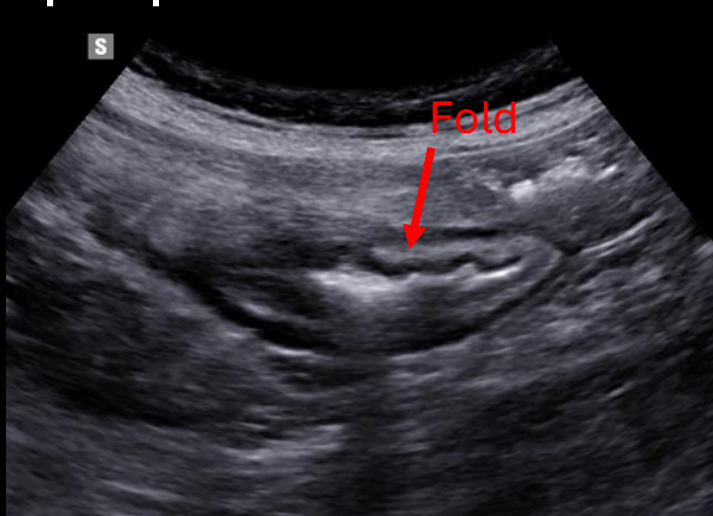
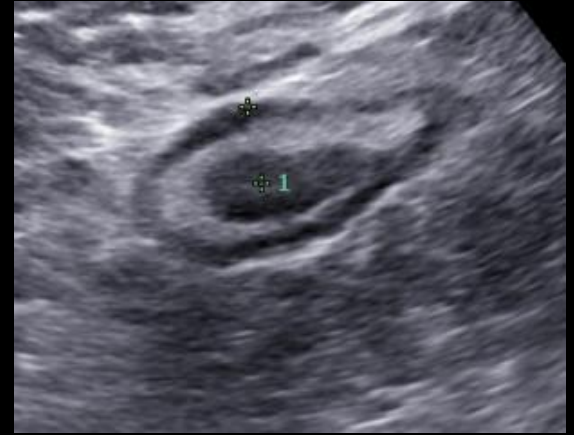
Yellow arrow represents first measurement. Green arrows are allowed second measurement, red arrows are false second measurements





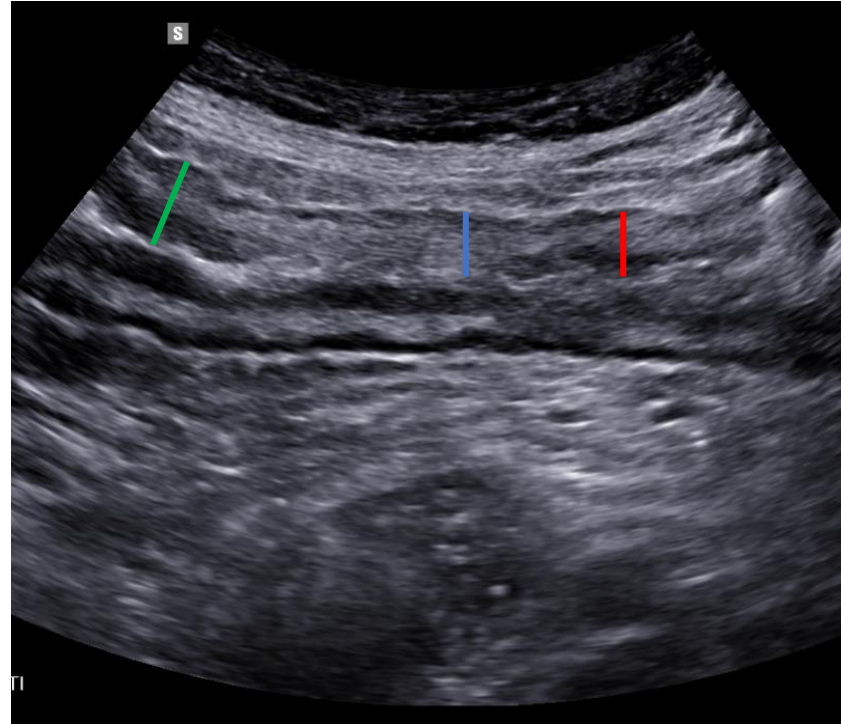
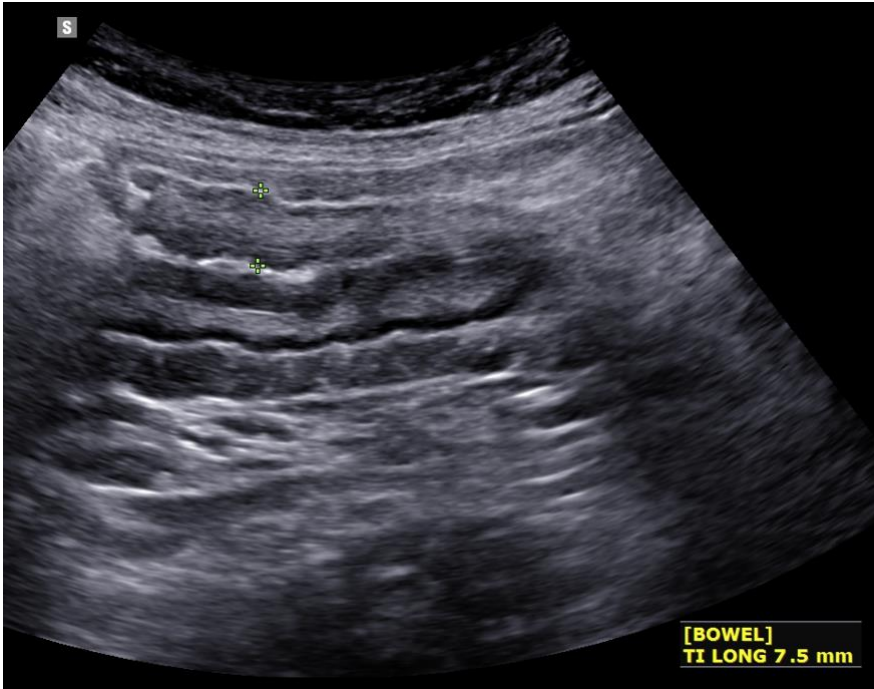
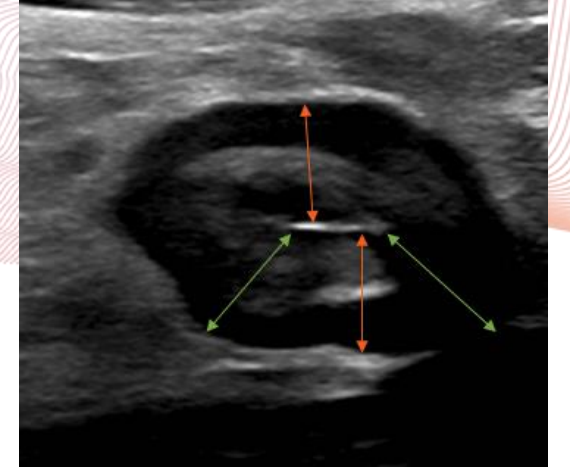
BWT: What to Avoid?

- Collapsed bowel without luminal content; sometimes unavoidable.
- Mid-contraction
- Over mucosal folds.
- Oblique view will make wall thicker. Imaging plane needs to be perpendicular to bowel surface.



Bowel Wall Thickness

- Easier said than done sometimes!
- Need a balance between reliability and does it represent the segment?



- Red – easiest to measure
- Blue – loss of stratification
- Green – loss of stratification

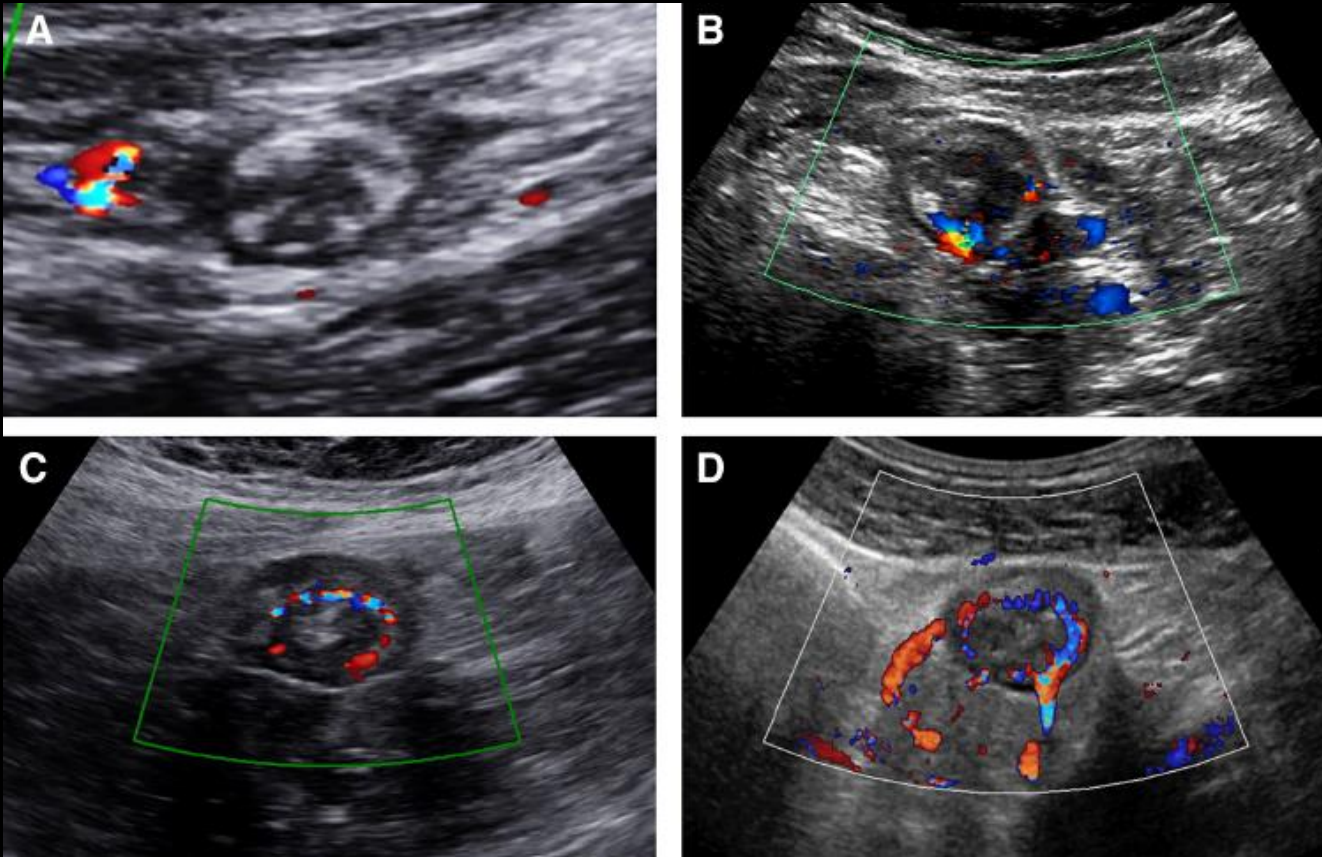
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2. Mural Inflammation – Grading Color Doppler Signals



Modified Limberg Score (IBUS) or
IBUS CDS Score

0 = absent

1 = short signals (single vessels within
wall, panel B)

2 = long signals inside bowel (stretches
of vessels within wall, panel C)

3 = long signals inside bowel and
outside into mesentery/fat (comb sign)

ICC = 0.62 (0.42-0.82)

- Depth
- Cross-section versus longitudinal assessment
- Correct frequency setting as -4 to – 8cm/s to 4 to 8cm/s



2. Mural Inflammation - Hyperemia - Ensure Doppler box encompasses wall and ≥ 1 cm of surrounding mesentery.

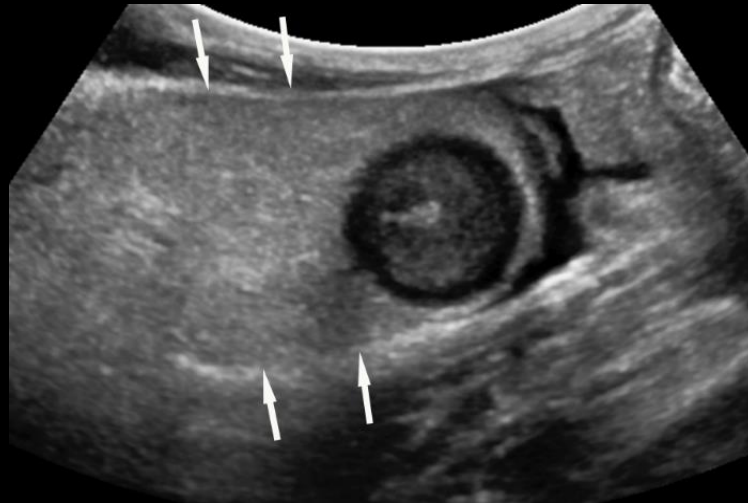


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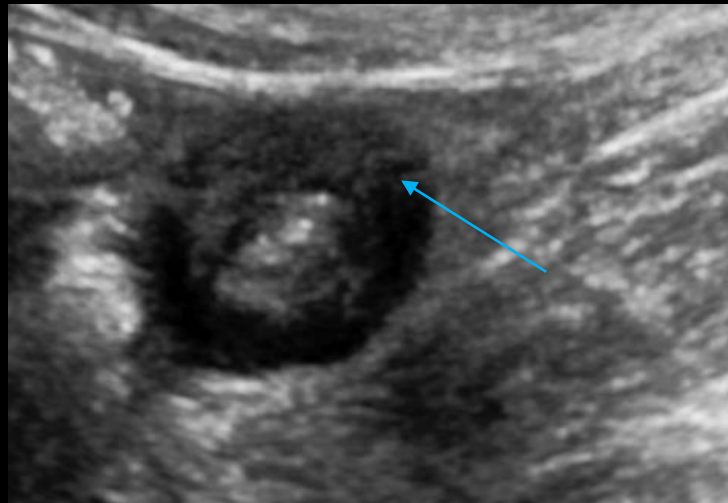
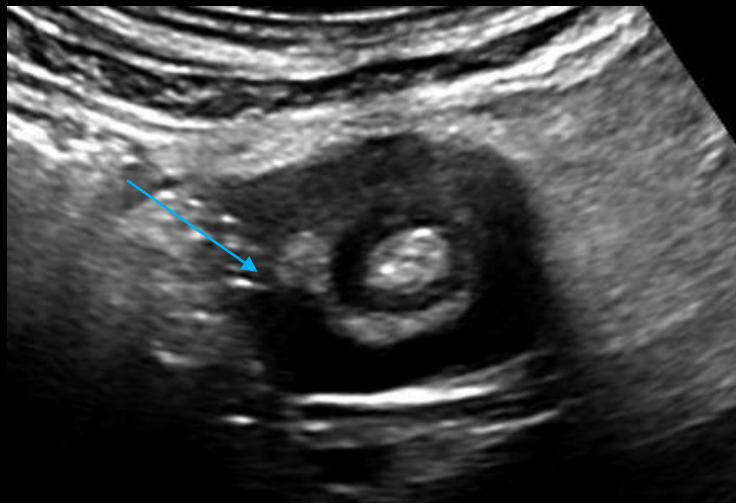
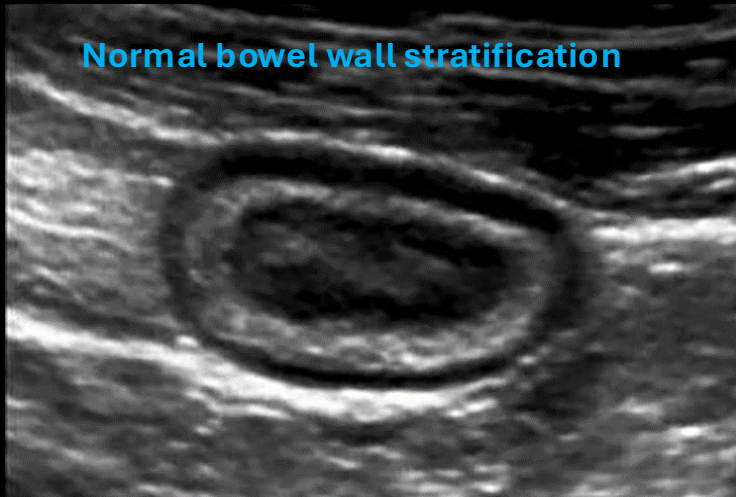
2. Extra Mural Inflammation – Grading Inflammatory Fat

Grade:
0 = Absent
1 = Uncertain
2 = Present





2. Extra Mural Inflammation – Grading Loss of Wall Stratification



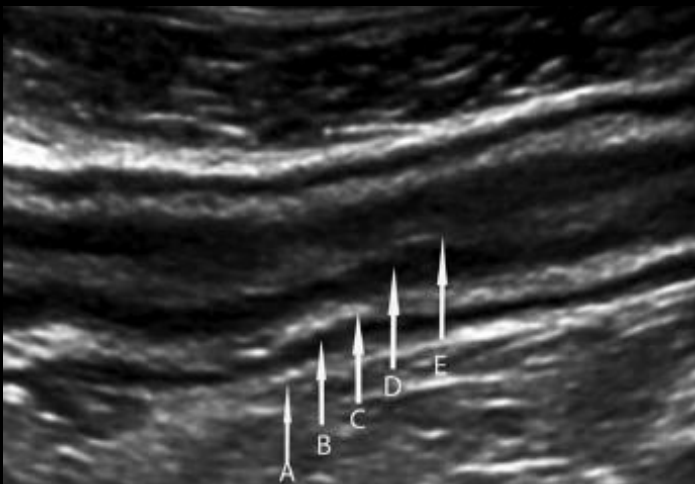
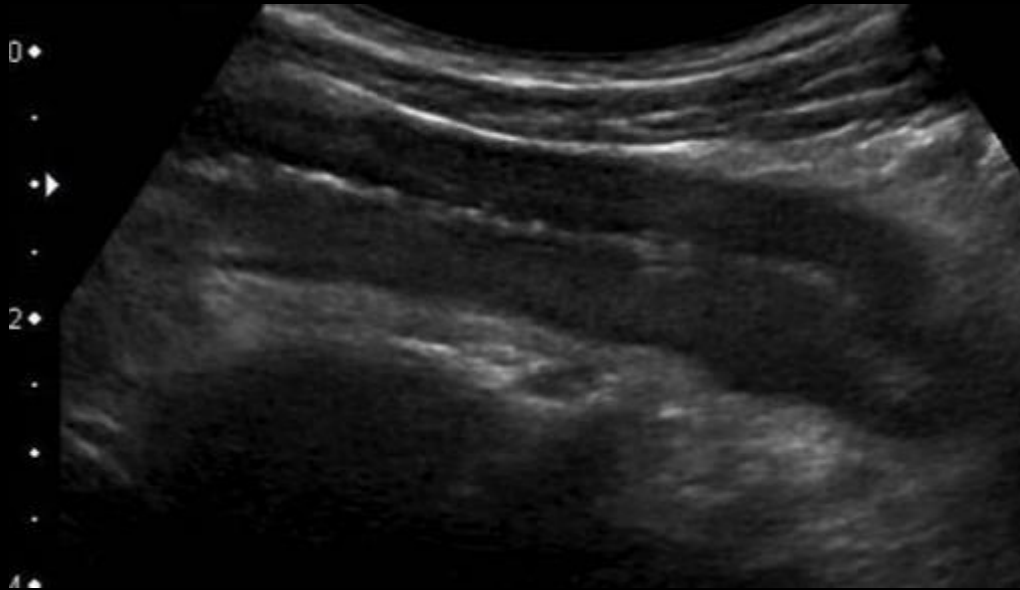
Grade:

- Normal
- Uncertain
- Focal $\leq 3\text{cm}$
- Extensive $> 3\text{cm}$

*best graded in
longitudinal view



2. Extra Mural Inflammation – Grading Loss of Wall Stratification



Normal wall
stratification



Grade:

- Normal
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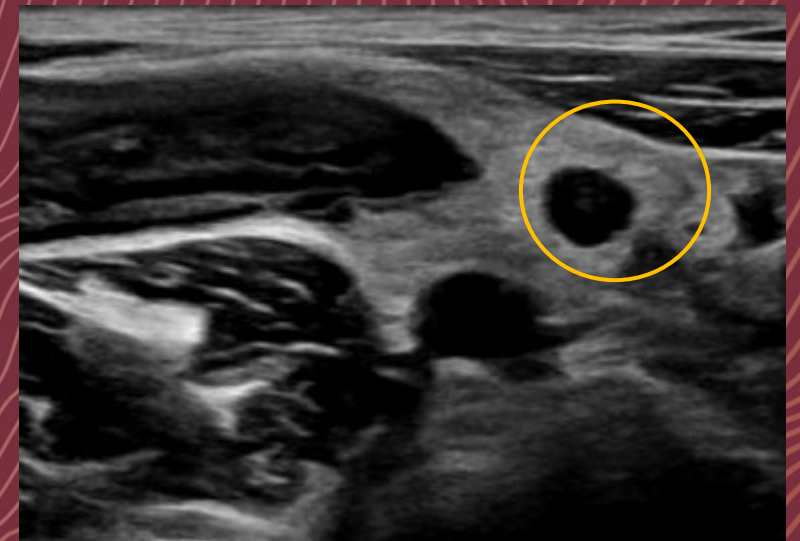
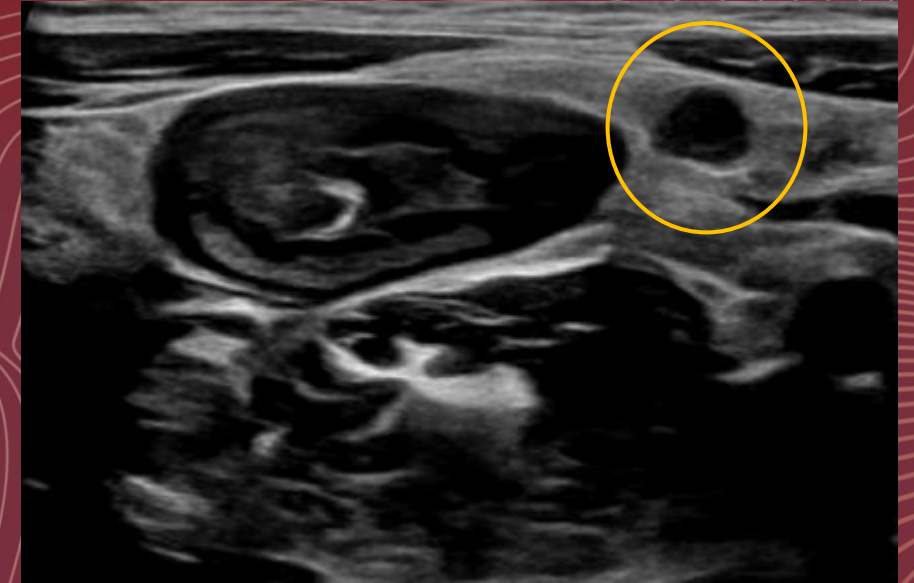
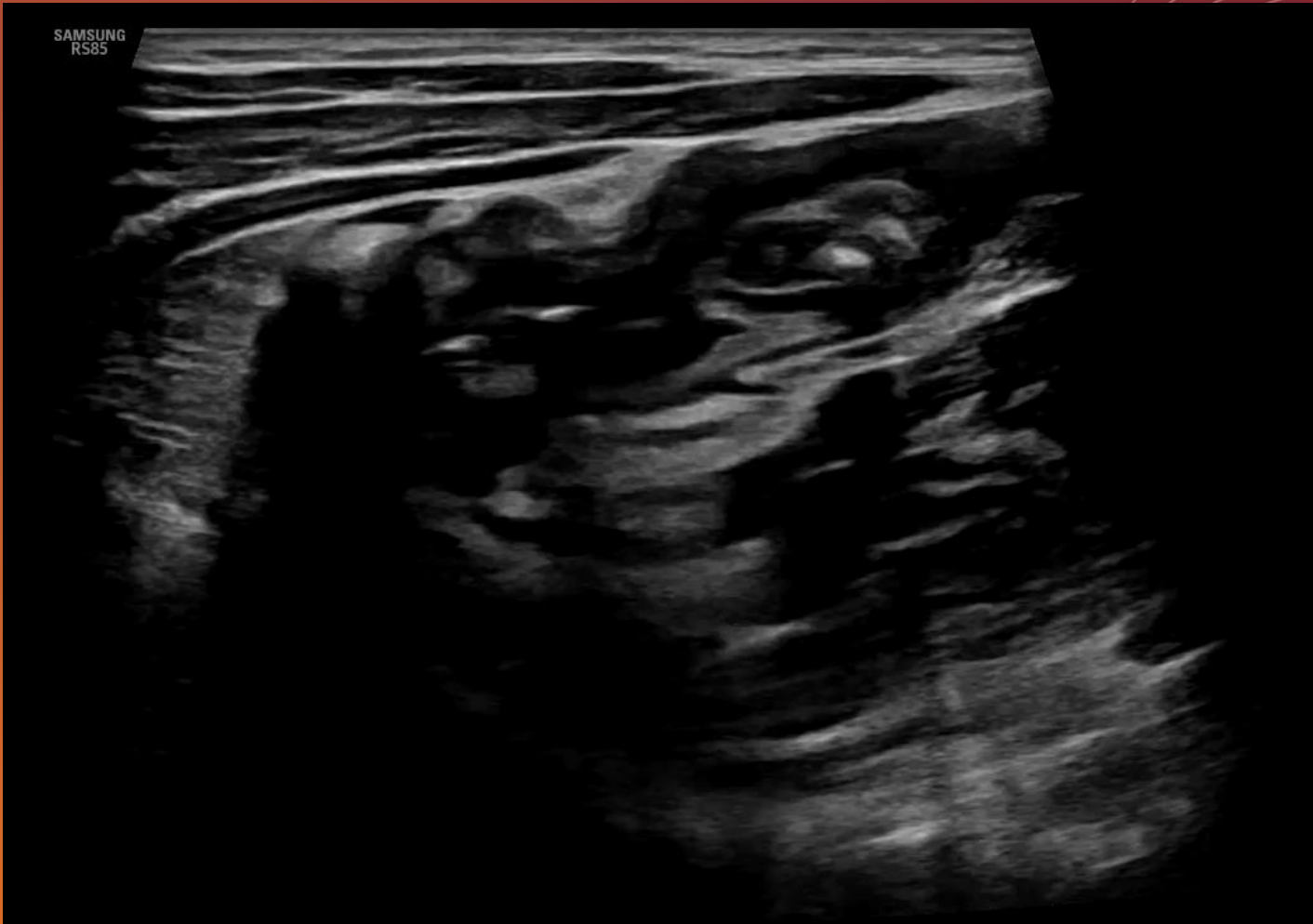
2. Extra Mural Inflammation – Lymphadenopathy



- Black to grey oblong
- Measure largest node in short axis

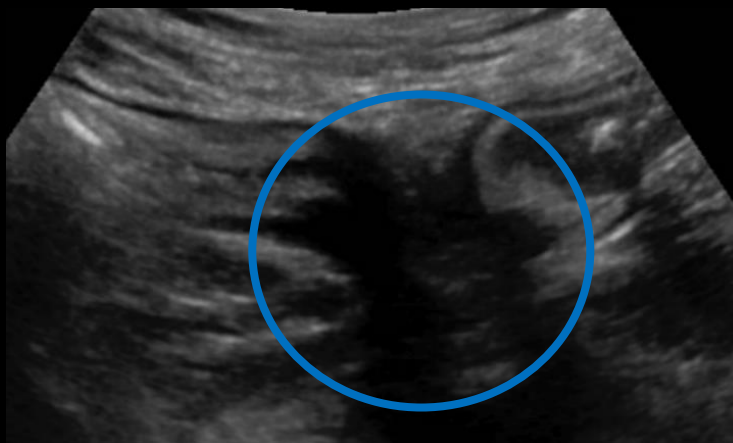


Lymph Nodes - Wink or Blink Sign and Absence of Color Doppler signal





2. Extramural Complications



Abscess



Inflammatory Mass



Fistula



Stricture

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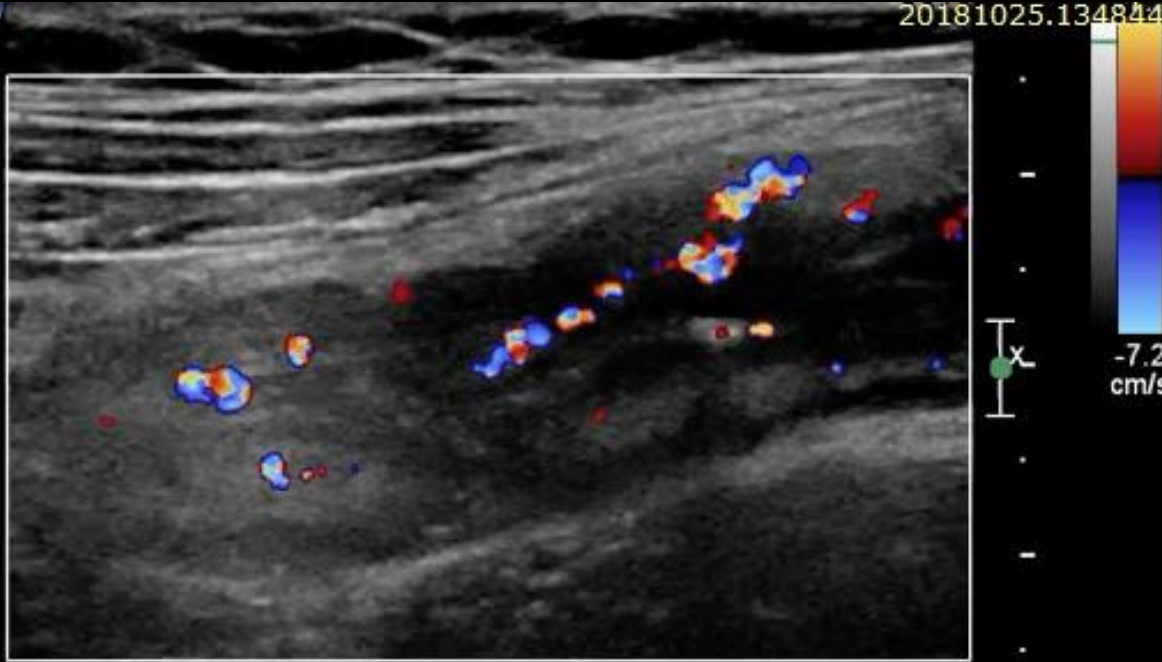
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IBUS SAS-Score

INSTRON

TI



Active CD L1B1

- BWT (8 mm)
- Vascularization (CDS 2)
- Echostratification (extensive=3)
- Mesenteric fat (present=2)

IBUS SAS-Score: 88

IBUS – SAS (0–100) = 4 · BWT +
15 · i-fat + 7 · CDS + 4 · BWS

WL: 128 WW: 256 [D]

Table 2. Core activity parameters, Delphi grading consensus

	Normal	Uncertain	Activity	
BWT	≤3 mm	NA	>3 mm	
i-fat	0 = Absent	1 = Uncertain	2 = Present	
CDS	0 = Absent [none]	1 = Short signals	2 = Long signals inside bowel	3 = Long signals inside & outside bowel
BWS	0 = Normal	1 = Uncertain	2 = Focal [≤ 3 cm]	3 = Extensive [>3 cm]

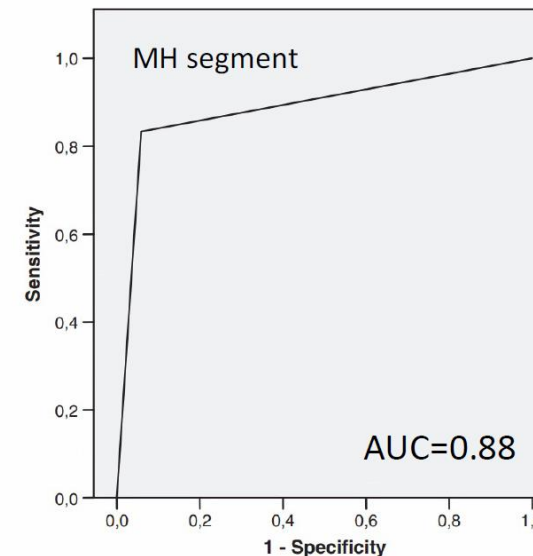
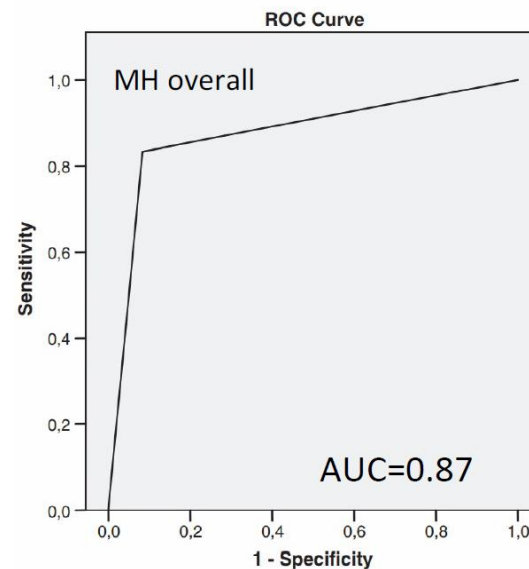
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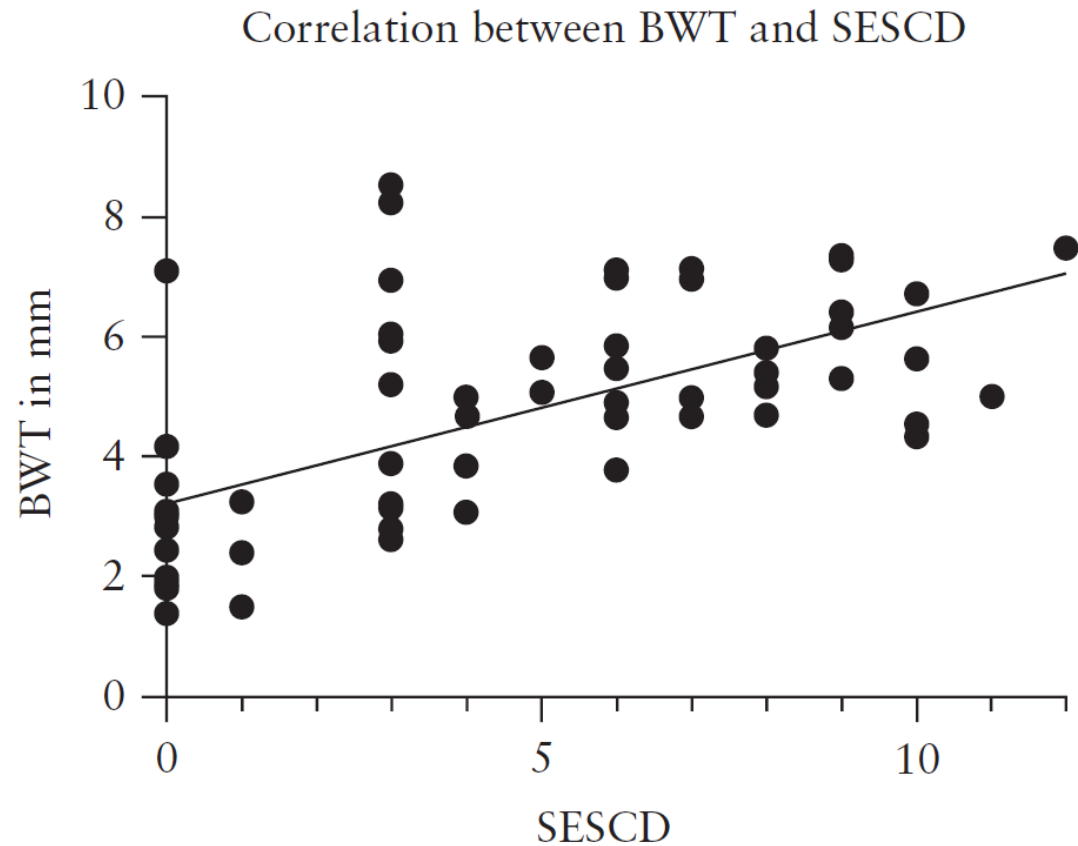
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Accuracy of IUS compared to endoscopy

- IUS has a pooled sensitivity of 86% (95% CI 83-88%) and a pooled specificity of 94% in CD (95% CI 93-95%) to identify disease activity when compared to endoscopy
- BWT<3mm of all ultrasound variables showed the best correlation with endoscopic remission ($k=0.86$, $p<0.001$)



Correlation of IUS parameters with Endoscopic activity



$r=0.61$, $p=0.0001$

Endoscopic vs. transmural remission

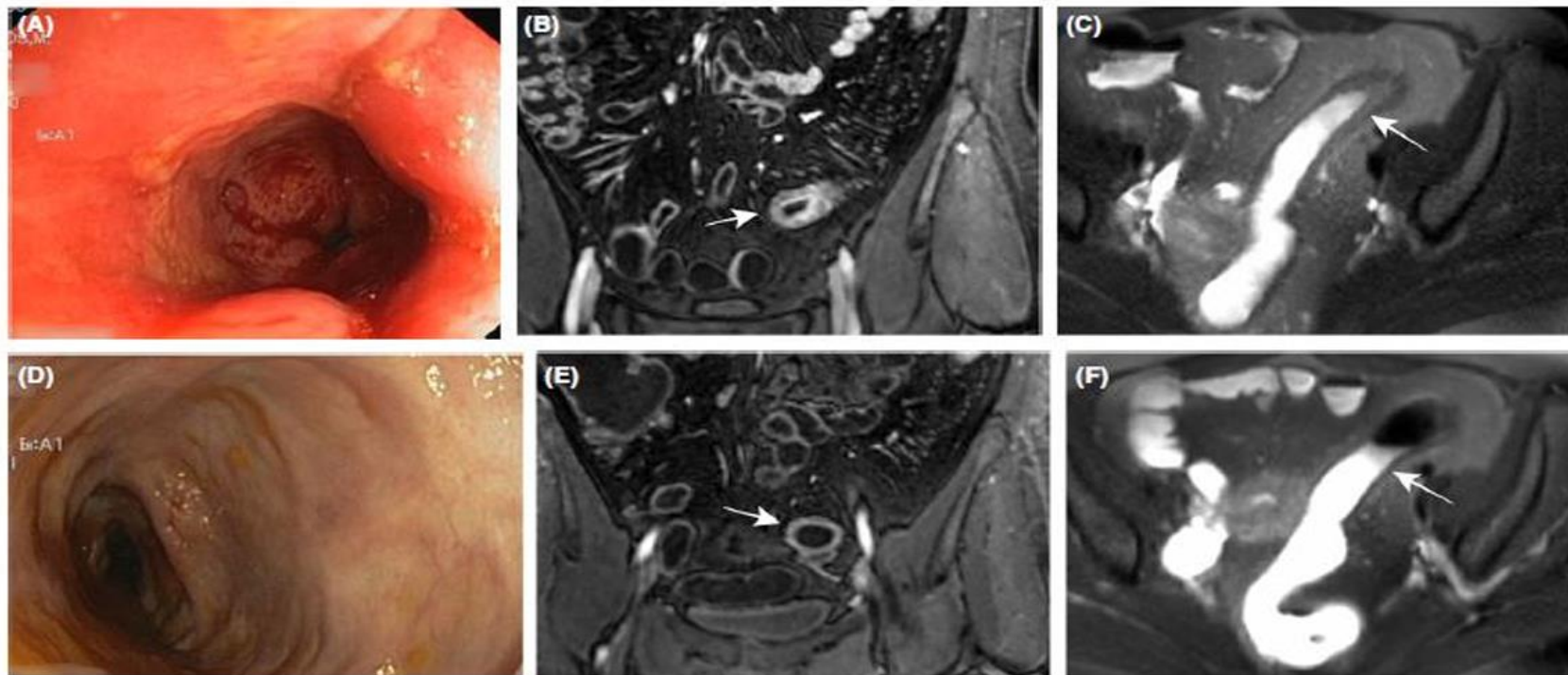


FIGURE 3 Ileocolonoscopy of a 31-year-old female with CD showed severe inflammation and ulcers of the sigmoid colon (A). MRE of the same patient showed a moderate thickening and hyperenhancement of the sigmoid wall in T1-gadolinium enhanced sequences (arrow in B) together with mural oedema on T2-weighted sequence with fat saturation at the same segment (arrow in C). After 52 wk of HSCT, the same patient reached endoscopic remission (D). MRE confirms disease transmural improvement by showing reduction of wall thickening on T1-gadolinium enhanced sequence (arrow in E) and absence of oedema on T2-weighted sequence (arrow in F) but persistence of some bowel wall thickening (arrow in E)

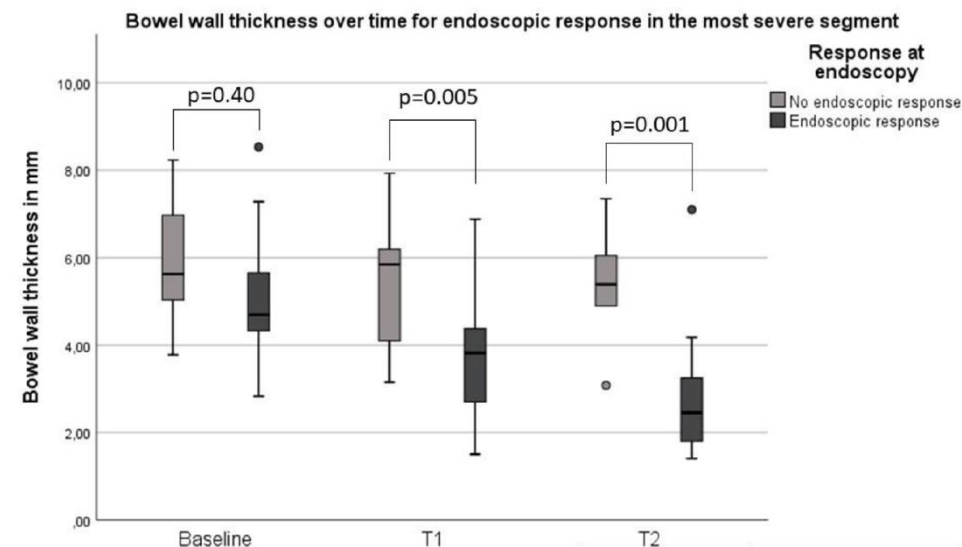
Only **68%** (49/72) of the segments with **ER** also reached **TR** (BWT<3 mm)

→ In almost 1/3 of patients ongoing transmural inflammation

IUS can predict endoscopic outcomes in CD

Single-center prospective cohort: 40 consecutive patients with endoscopically active CD starting anti-TNF went through IUS and CEUS at baseline, at 4-8 weeks and 12-34 weeks and endoscopy at 12-34 weeks

- At early and late follow up, 18% (AUROC: 0.77; OR: 10.80, $p=0.012$) and 29% (AUROC: 0.833; OR: 37.50, $p=0.006$) BWT decrease predicted endoscopic response
- 3.2 mm was most accurate to determine endoscopic remission (AUROC: 0.94; OR: 39.42, $p<0.0001$) at late FU

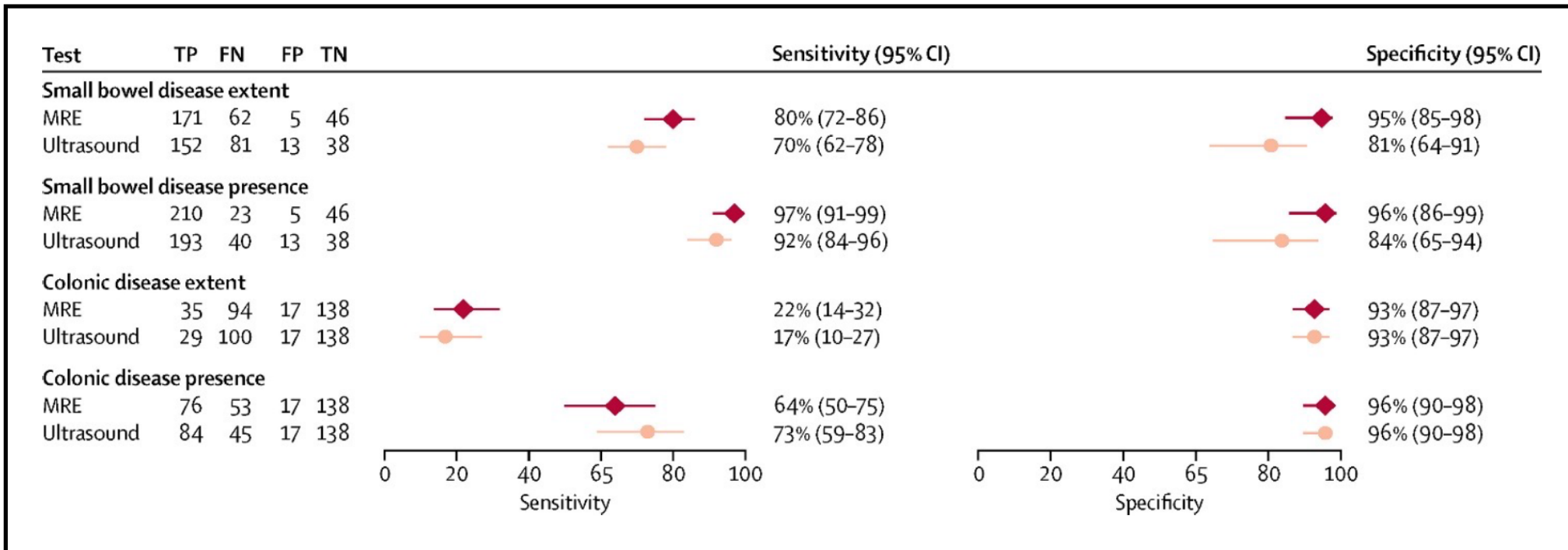


Time-point	Endoscopic response	Endoscopic non-response	p-value
Median BWT [IQR] at T0	4.7 mm [4.2-6.8]	5.4 mm [4.7-7.0]	0.40
Median BWT [IQR] at T1	3.9 mm [2.5-4.8]	5.4 mm [3.4-6.4]	0.005
Median BWT [IQR] at T2	2.5 mm [1.8-3.3]	5.3 mm [4.0-6.4]	0.001



Accuracy of IUS compared to MRE: METRIC study

- Patients had newly diagnosed CD, or established disease with suspected relapse
- **284** patients completed the trial





Detection of Complications



SYSTEMATIC REVIEW
& META-ANALYSIS

Diagnostic accuracy of
intestinal ultrasound and its
advanced modalities in the
detection of intra-abdominal
complications in Crohn's
disease



1498 studies screened



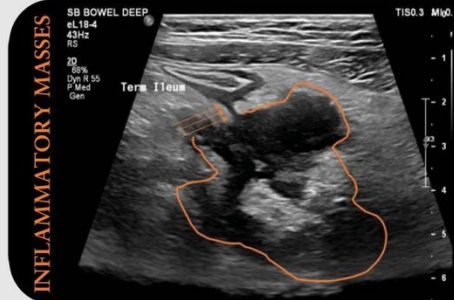
68 studies included in this review
23 studies in the meta-analysis



3863 patients



	B-mode	SICUS
Sensitivity	81%	94%
Specificity	90%	95%
Accuracy	86%	94%



	B-mode	SICUS
Sensitivity	87%	91%
Specificity	95%	97%
Accuracy	91%	94%



	B-mode	SICUS
Sensitivity	67%	90%
Specificity	97%	94%
Accuracy	82%	92%

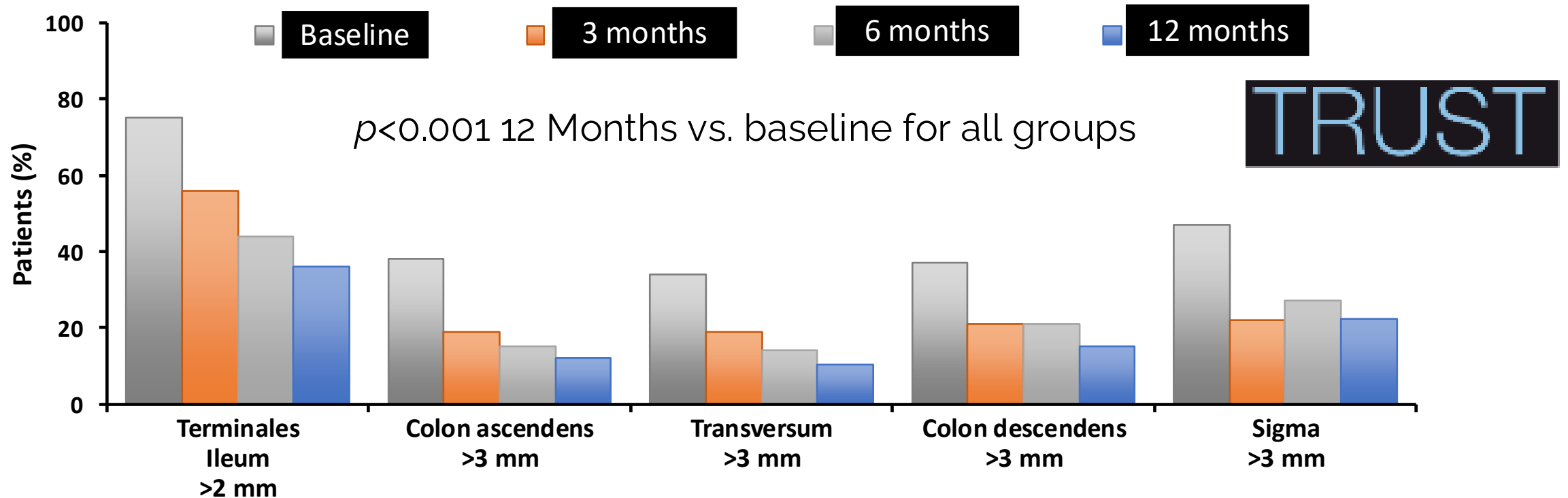
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TRUST-CD Study: Normalisation of BWT in Crohn's disease during treatment

Percentage of patients with normalization of BWT improves over time



n=243 patients

Kucharzik T *et al. Clin Gastro Hepatol* 2017

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IUS Response and Transmural Remission

Transmural Remission (same in UC and CD)

- $BWT \leq 3\text{mm}$
- Normal color doppler signal (CDS 0)

Treatment response

- $BWT \downarrow > 25\%$, $> 2\text{mm}$, or
 $\downarrow > 1\text{mm}$ and one color doppler signal

Journal of Crohn's and Colitis, 2022, 554–580
<https://doi.org/10.1093/ecco-jcc/ijab173>
Advance Access publication October 6, 2021
Original Article

OXFORD

Original Article

Defining Transabdominal Intestinal Ultrasound Treatment Response and Remission in Inflammatory Bowel Disease: Systematic Review and Expert Consensus Statement

Johan F. K. F. Ilvemark,^{a,○} Tawnya Hansen,^b Thomas M. Goodsall,^{c,d}
Jakob B. Seidelin,^a Heba Al-Farhan,^e Mariangela Allocca,^{f,g}
Jakob Begun,^{h,○} Robert V. Bryant,ⁱ Dan Carter,^j Britt Christensen,^{k,○}
Marla C. Dubinsky,^l Krisztina B. Gecse,^m Torsten Kucharzik,ⁿ Cathy Lu,^o
Christian Maaser,^p Giovanni Maconi,^q Kim Nylund,^{r,s} Carolina Palmela,^t
Stephanie R. Wilson,^u Kerri Novak,^{o,*} Rune Wilkens,^{v,w,*}; on behalf of
the International Bowel Ultrasound [IBUS] Group



Consensus – when should response be assessed?

Response should initially be assessed in the small and large bowel after treatment initiation (regardless of treatment) at 14 ± 2 weeks. However, in a subset of patients' response after steroids or biologics may occur already after 4 weeks. Early IUS assessment may in certain situation be beneficial between week 4-8.

Ideal assessment of intestinal ultrasound response within 1st year of treatment initiation/escalation/change is at baseline, week 14 ± 2 , AND between week 26 - 52 + IUS depending on elevated calpro OR symptoms OR clinical suspicion of flare

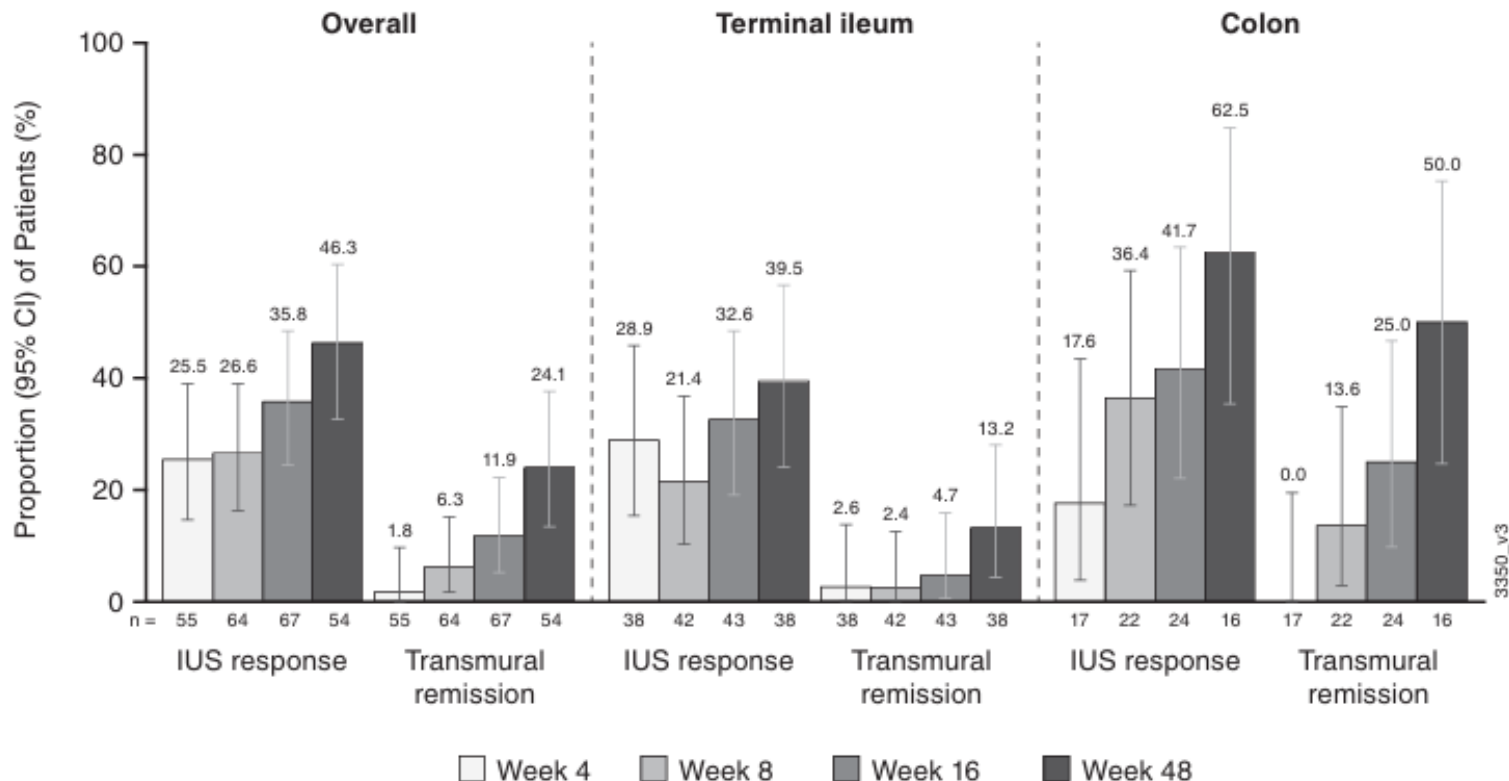
Rate of Transmural Healing Depends on Timing of Assessment and CD Location

77 patients were evaluated

Most affected segments at baseline:
terminal ileum (65%) & colon (35%)

IUS responses as early as **Week 4**

The most robust responses to **ustekinumab** therapy were observed in the **colon** (62.5% for IUS response at Week 48 vs. 39.5% for the terminal ileum) and in **biologic-naïve** patients (59.1% vs. 37.5% for patients previously exposed to 1 biologic therapy)

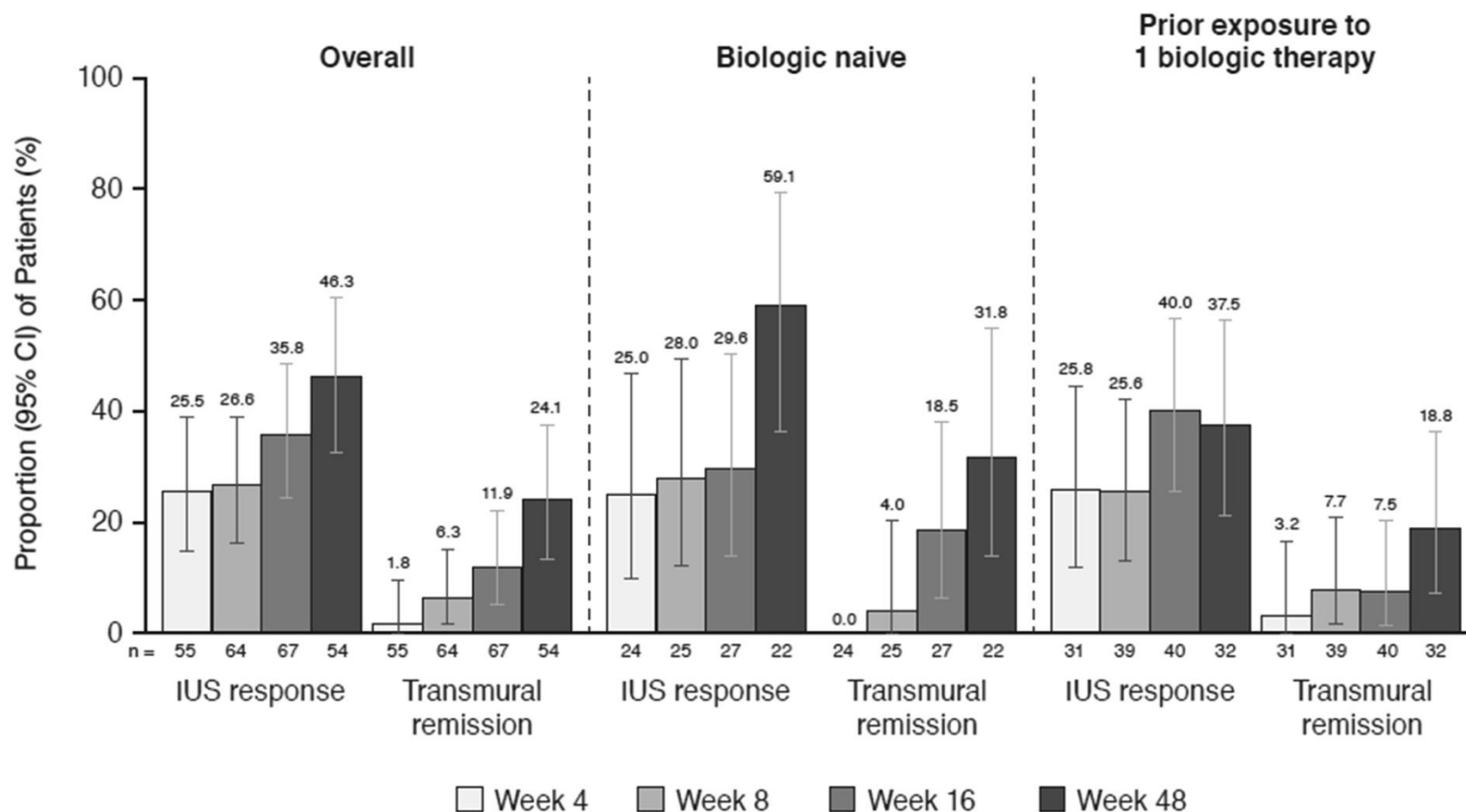


CONCLUSIONS

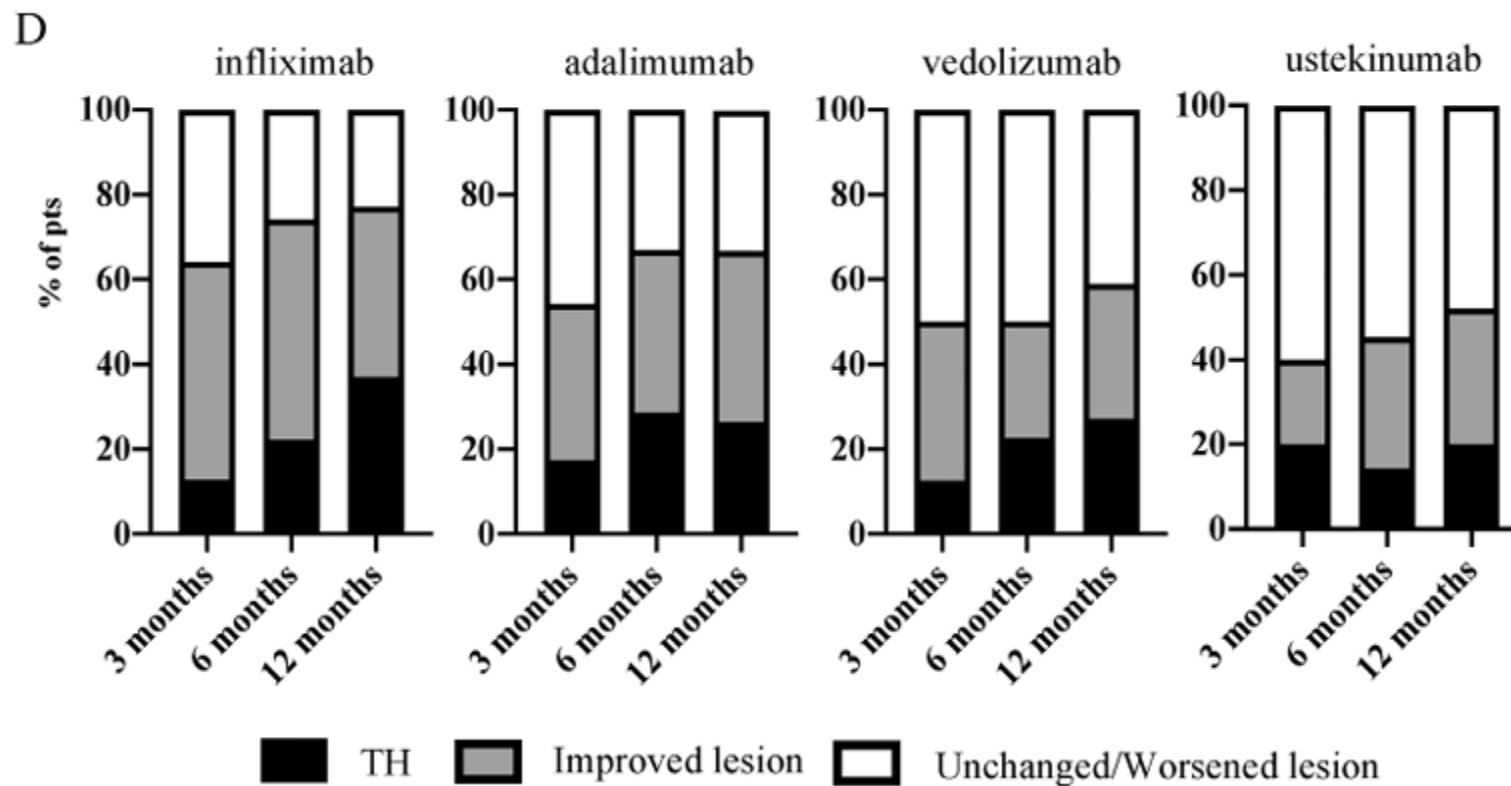
(ie, ≤ 3 mm in the colon and ≤ 2 mm in the ileum).

Patients with Crohn's disease treated with **ustekinumab** achieved progressive IUS response or transmural remission from **Weeks 4 to 48**

IUS response and transmural remission is more pronounced in biologic naive patients



188 CD Patients Starting Biologics

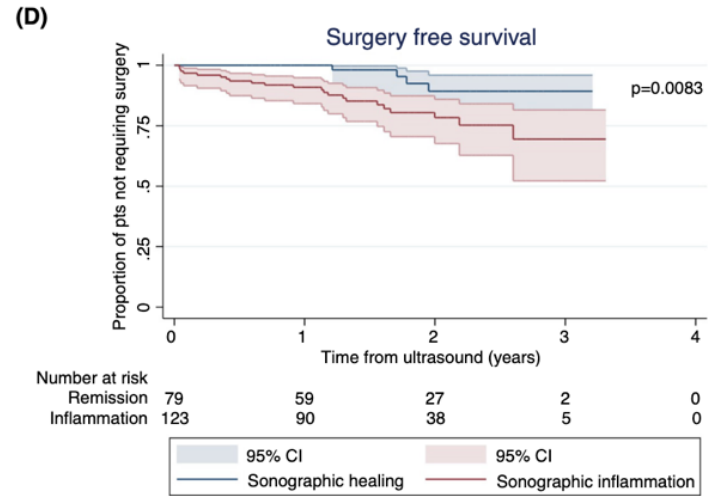
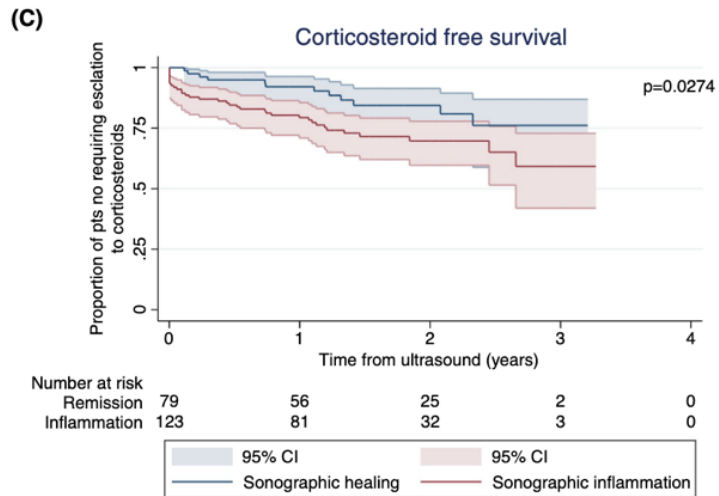
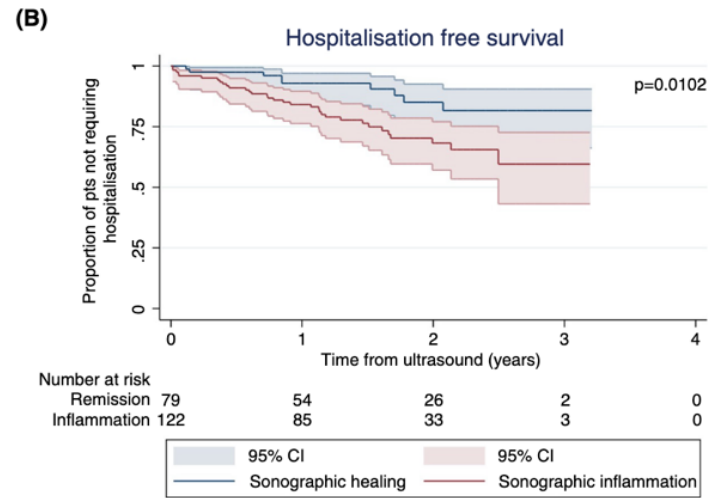
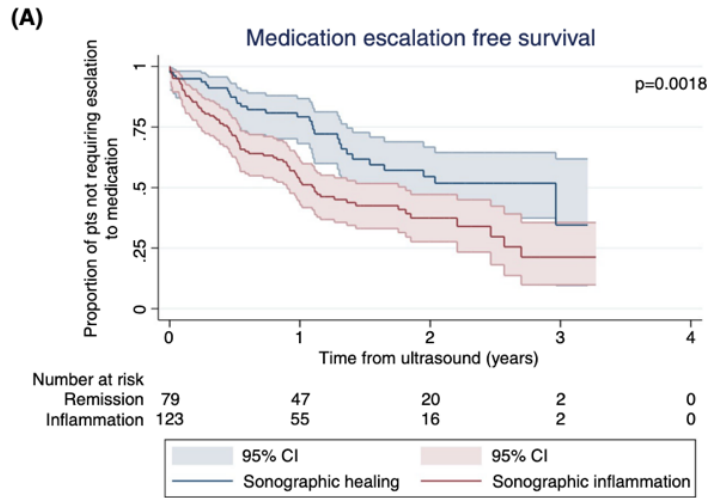


TH rates at 12 months

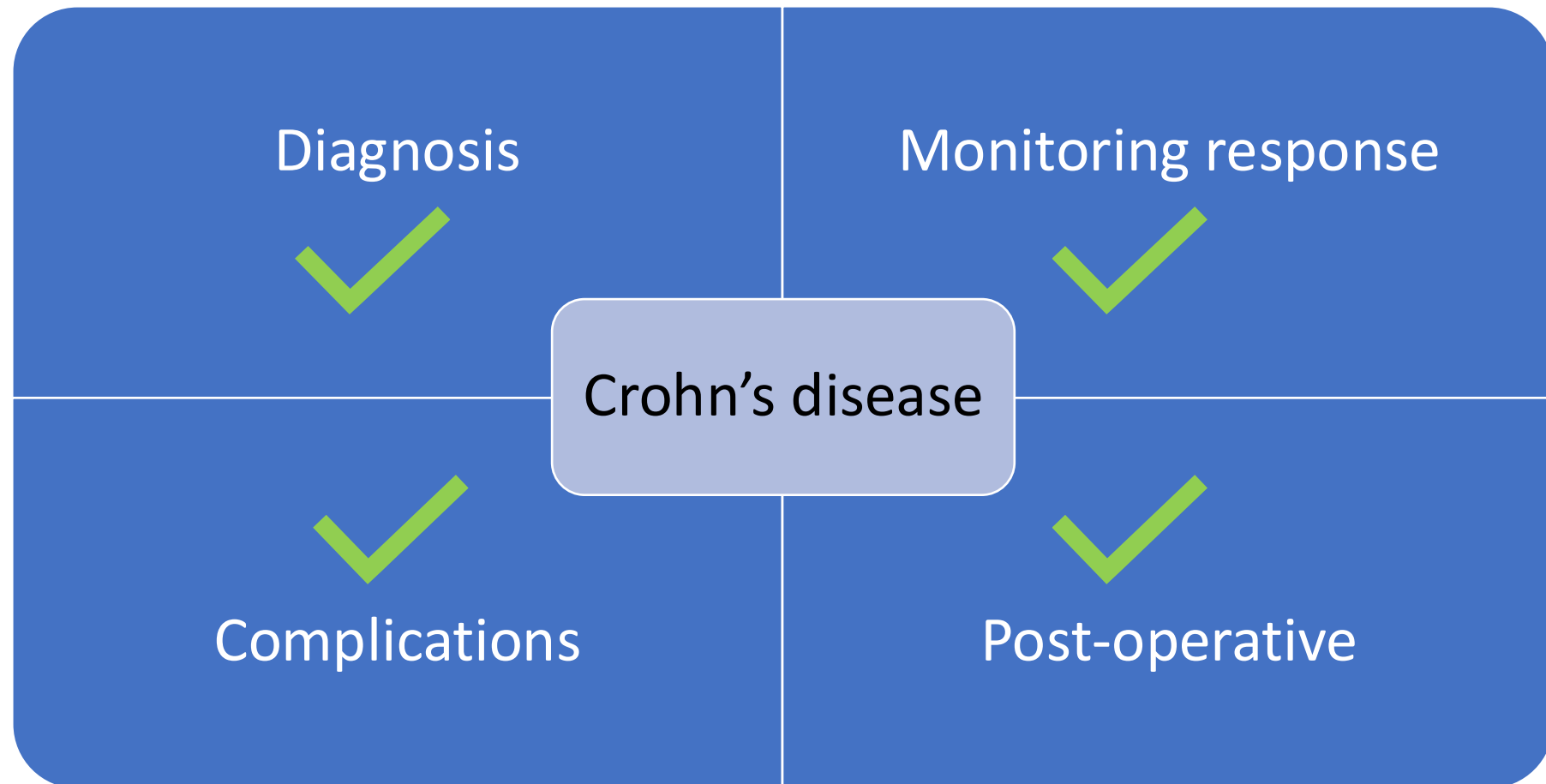
- IFX = 37%
- ADA = 26.8%
- Vedo = 27.2%
- Ust = 20%

- Transmural remission – normalization of all parameters

Early IUS improvement in CD is predictive of long-term outcome



IUS in Crohn's disease.... Ticks all the boxes.



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Q&A