



international bowel
ULTRASOUND GROUP

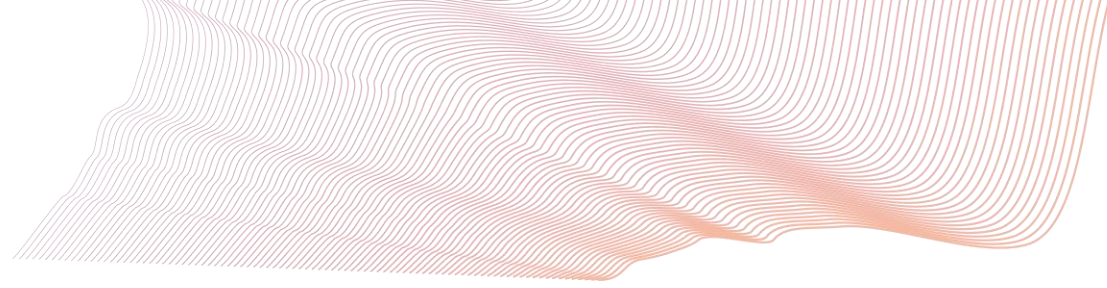
IUS in post-operative CD Complications in CD

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University of British Columbia, Vancouver, Canada



Seattle, 16-October-2026



Thank you to all contributors who helped create this presentation:

Dr. Mariangela Allocca

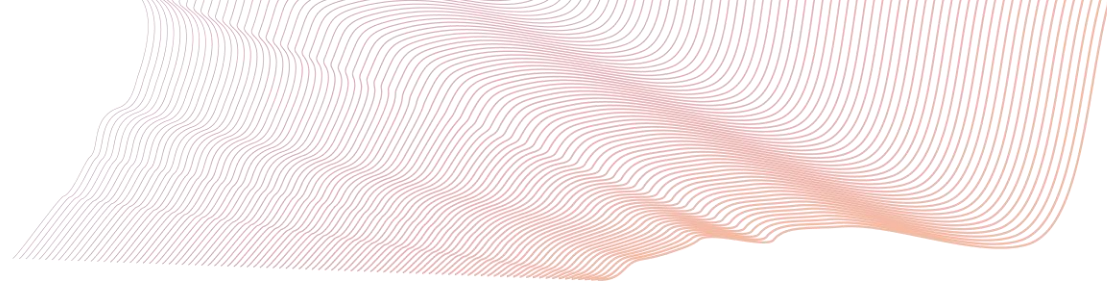
Dr. Frauke Petersen

Dr. Kayal Vizhi

Dr. Federica Furfaro

Dr. Bincy Abraham

Dr. Michael Dolinger

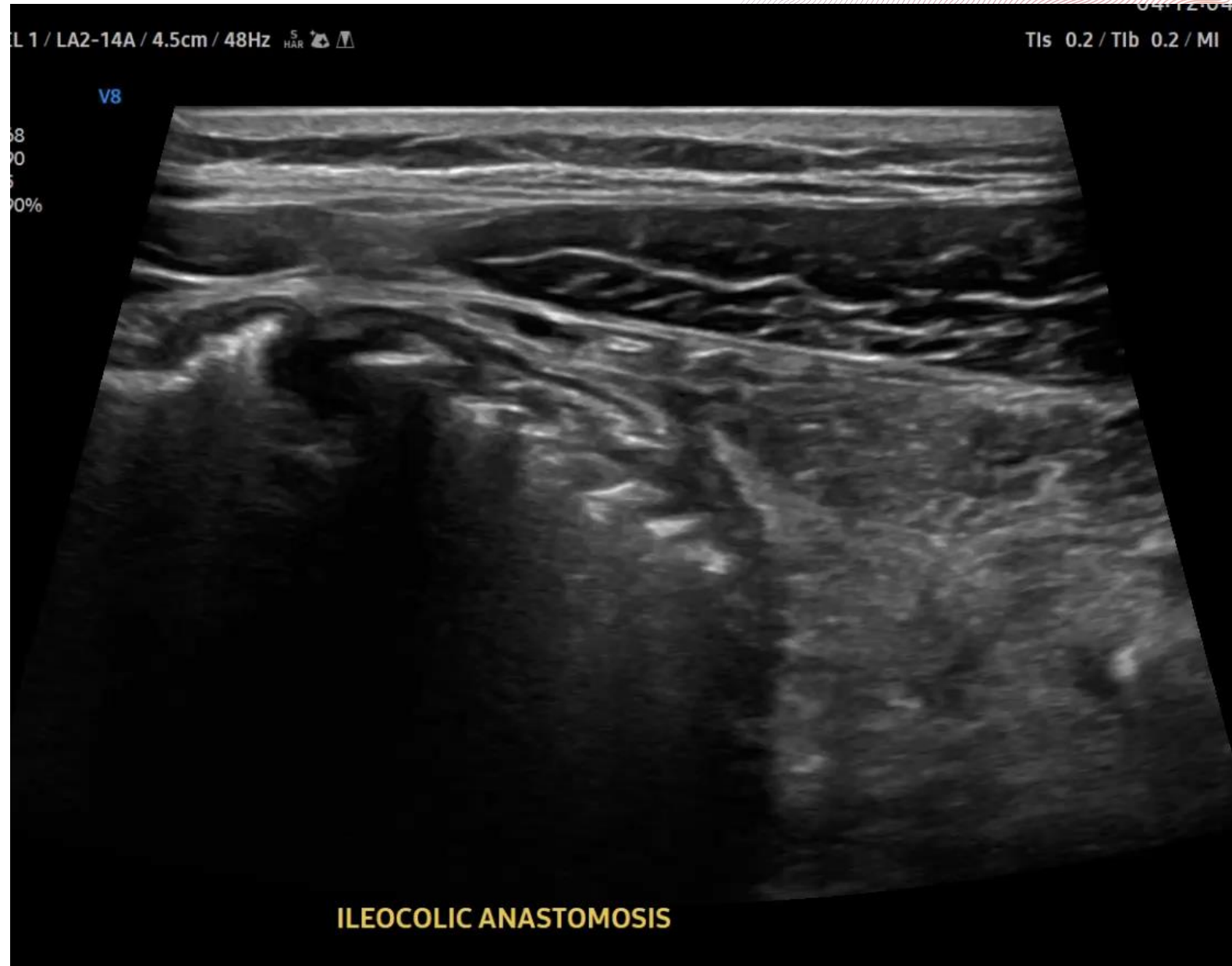


Intended Learning Outcomes (ILOs):

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

1. Evaluate post-operative anastomoses using appropriate imaging techniques (e.g., transabdominal ultrasound) and interpret findings to identify recurrence of inflammation at the anastomotic site.
2. Identify anatomical variations or abnormalities (e.g., altered surgical anatomy, skip lesions, adhesions, altered bowel loops position) that could modify the typical localization of bowel segments on IUS and impact the interpretation of findings in the post-operative setting.

Surgery in Crohn's disease

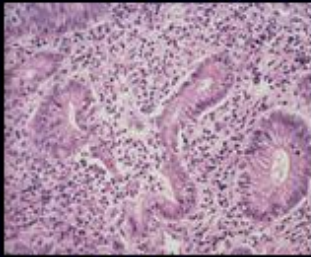




The Natural Course of postop CD

Recurrence is clinically silent initially

Histologic



**Within
1 week**

Endoscopic



**70-90%
by 1 yr**

Radiologic



**Tissue
damage**

Clinical



**30% 3 yr
60% 5 yr**

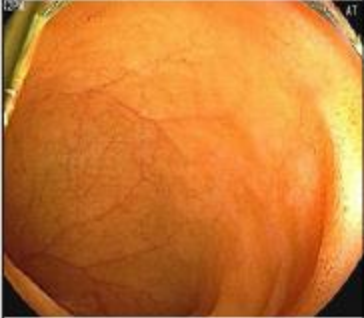
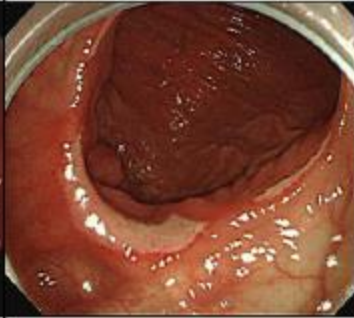
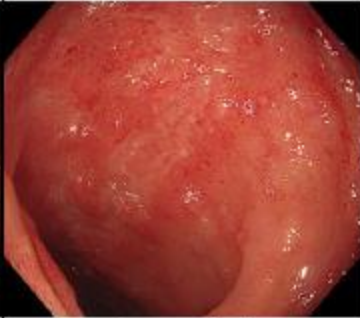
Surgical



50% by 5 yrs

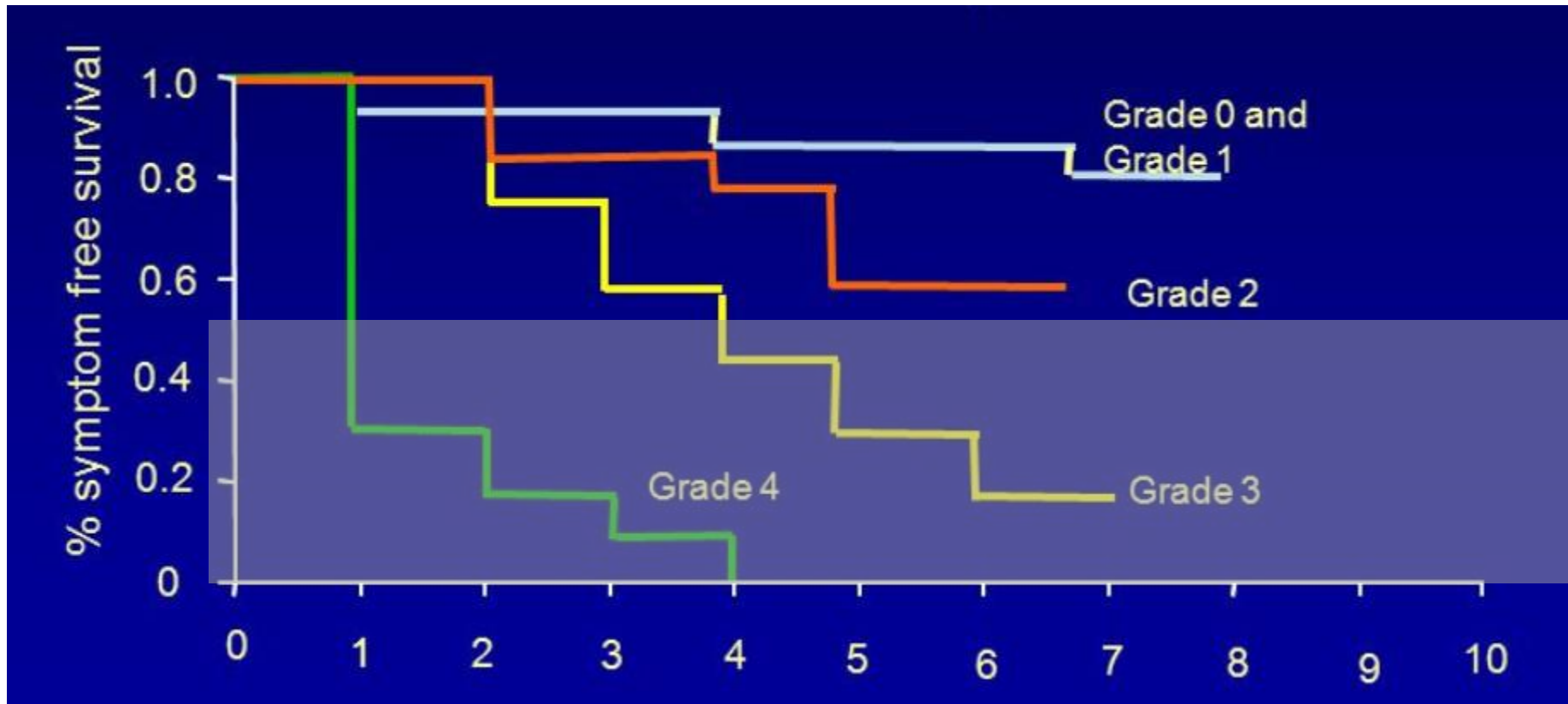
Surgery

Modified Rutgeert's score

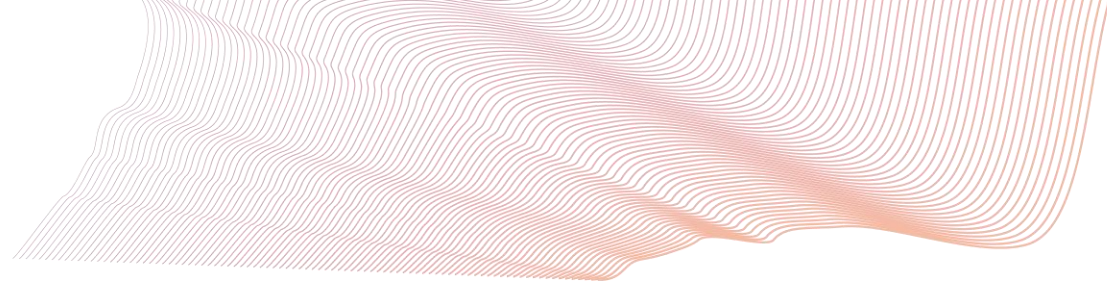
i0	i1	i2		i3	i4
		i2a	i2b		
					
No lesion in distal ileum	≤5 Aphthous lesions	Lesions confined to ileocolonic anastomosis	>5 Aphthous lesions with normal mucosa between the lesions	Diffuse aphthous ileitis with diffusely inflamed mucosa	Diffuse inflammation with already large ulcers and/or narrowing

Remind Group: Ileal and anastomotic lesions graded separately

Rutgeert's score at 6 months ... risk of symptomatic recurrence



Rutgeert's et al Gastro 1990



Non-invasive tools ?

Non-invasive alternatives - calprotectin

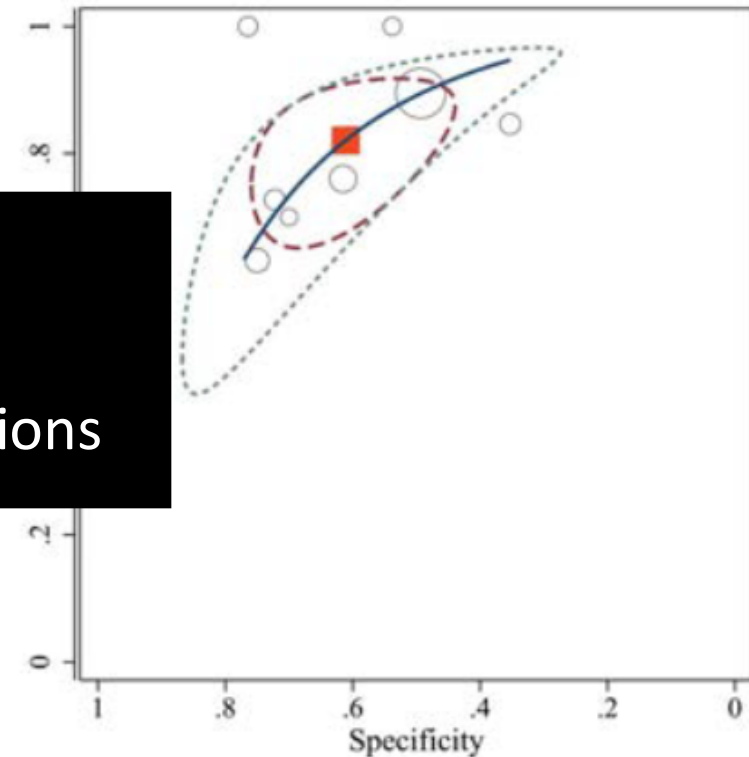
Meta-analysis 10 studies:

- Sensitivity 0.82
- Specificity 0.6

Prospective study

- FC > 100mcg/g predicted $\geq$ RIZ
- Sensitivity 89%
- Specificity 58%

- Low Specificity
- No information on severity
- Inability to detect complications



Non-invasive alternatives – MRE

Sensitivity 0.54-0.85

Specificity 0.65-0.82

MaRIA

- Sens 0.61
- Spec 0.82

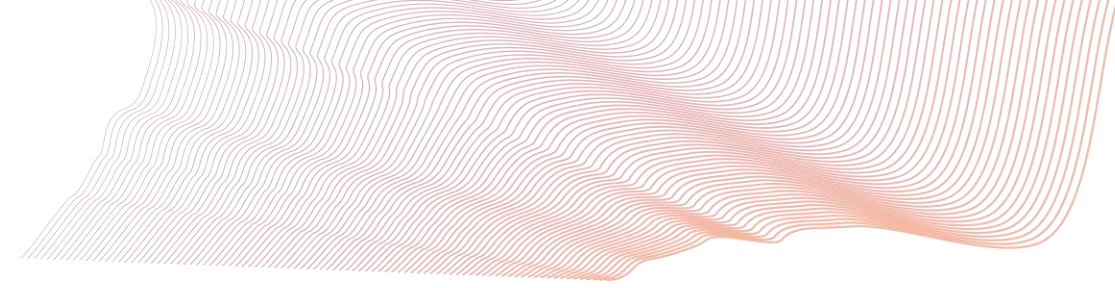
A Magnetic Resonance Imaging Index to Predict Crohn's Disease Postoperative Recurrence: The MONITOR Index

Marion Schaefer,^{*} Valérie Laurent,[‡] Aurélie Grandmougin,[‡] Lucine Vuitton,[§] Arnaud Bourreille,^{||} Amandine Luc,[¶] Isabelle Clerc-Urnes,[¶] Xavier Orry,[‡] Eric Frampas,[#] Marjolaine De Billy,^{**} Lieven Pouillon,^{*} Catherine Le Berre,^{||} Claire Gay,[§] Jeremy Meyer,[#] Cédric Baumann,[¶] and Laurent Peyrin-Biroulet^{*,‡‡}

- 7 items – ulcers weighted highest
- Validation cohort
- Sensitivity 85%, Specificity 75%

2022 Clin Gastro Hep

Performances of clinical, biological and magnetic resonance imaging parameters to detect endoscopic postoperative recurrence within the first year after surgery in patients with Crohn's disease.



Non-invasive tools ?

Role of IUS.....



Diagnostic Accuracy of Ultrasonography in the Detection of Postsurgical Recurrence in Crohn's Disease: A Systematic Review with Meta-analysis

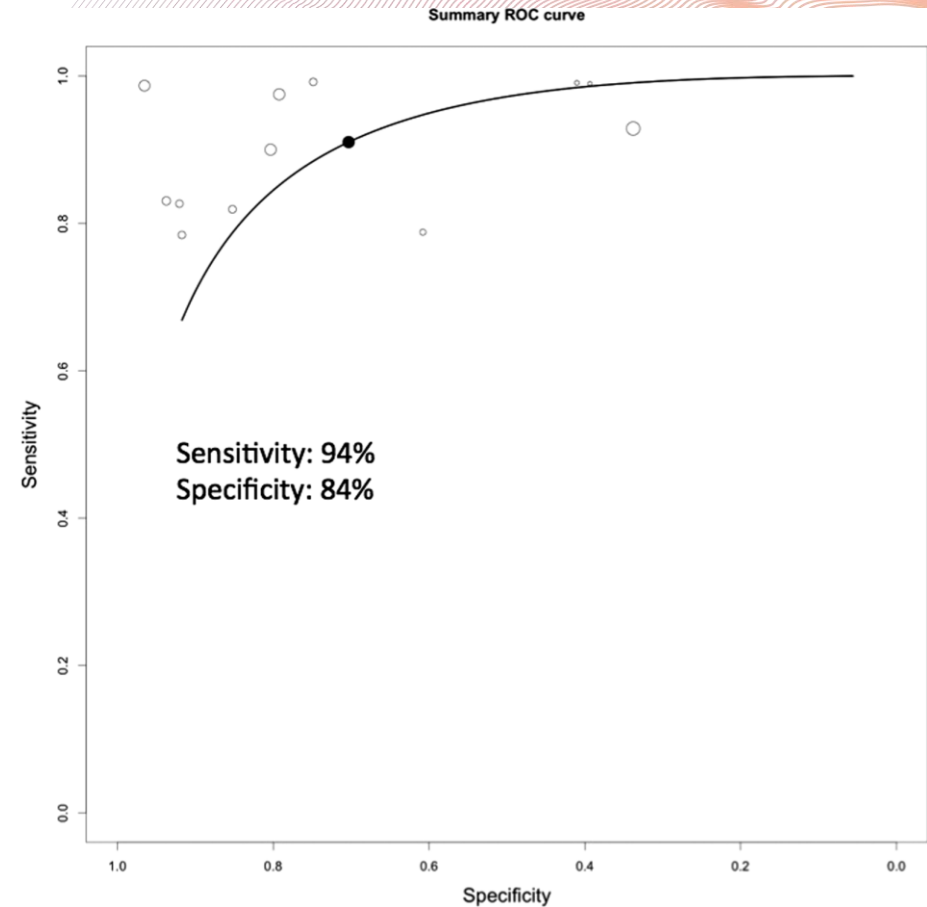
Antonio Rispo, MD, PhD,* Nicola Imperatore, MD,* Anna Testa, MD, PhD,*
Olga Maria Nardone, MD,* Gaetano Luglio, MD,† Nicola Caporaso, MD,* and Fabiana Castiglione, MD*

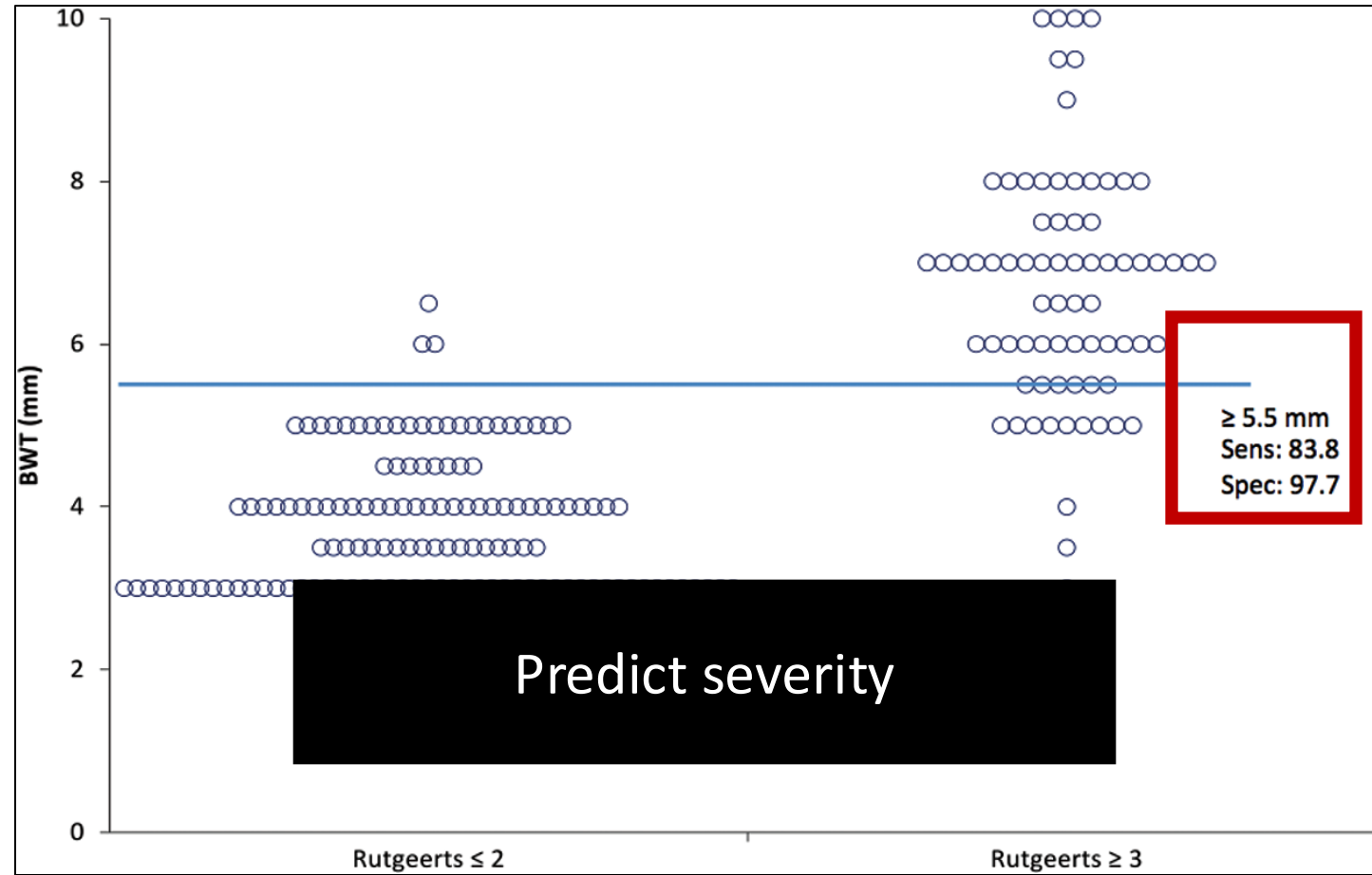
IUS comparison with Ileocolonoscopy

10 studies (n:536)

BWT in Neoterminal ileum > 3mm

Detection of inflammation





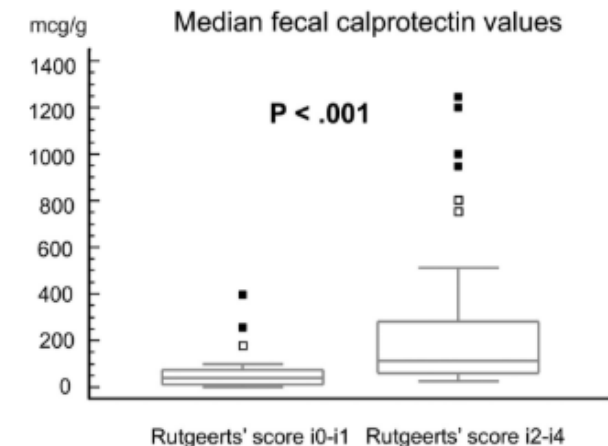
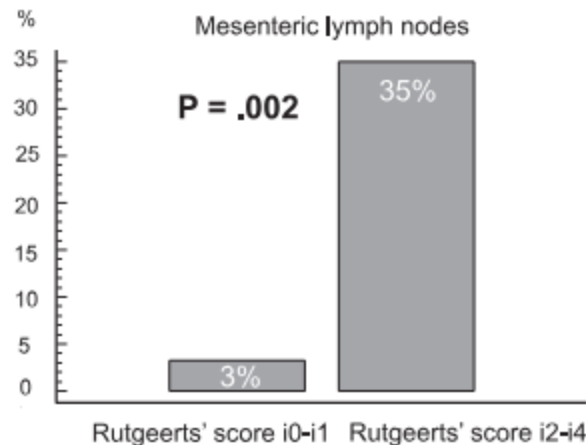
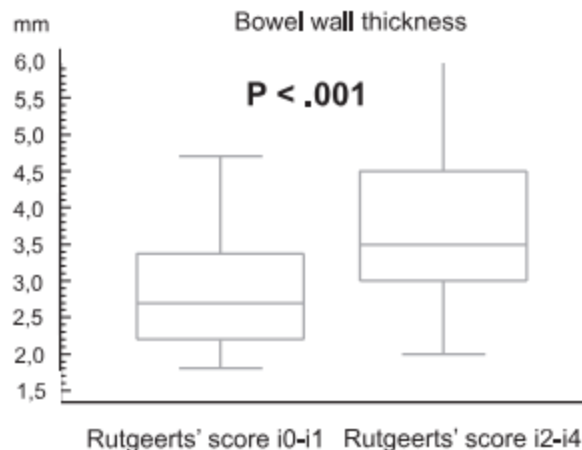
Post—operative Assessment

- Prospective, multi-centre observational cohort study.
- All post op ICR patients underwent blinded IUS and C-scope within 1 year of surgery.
- 66% had POR.
- IUS (wall thickening $\geq 3\text{mm}$) with fecal cal ≥ 50 correctly classified endoscopic recurrence with $< 5\%$ falsely classified.

Noninvasive Assessment of Postoperative Disease Recurrence in Crohn's Disease: A Multicenter, Prospective Cohort Study on Behalf of the Italian Group for Inflammatory Bowel Disease

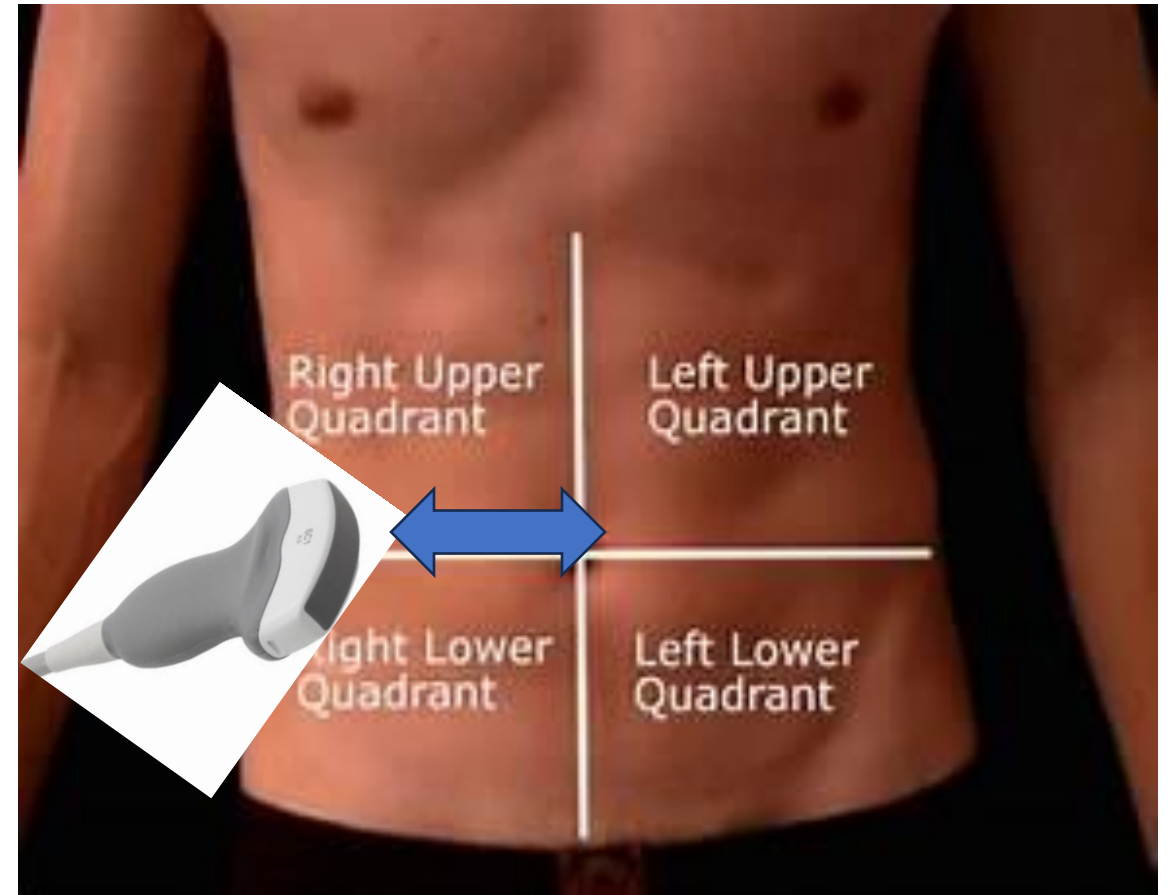
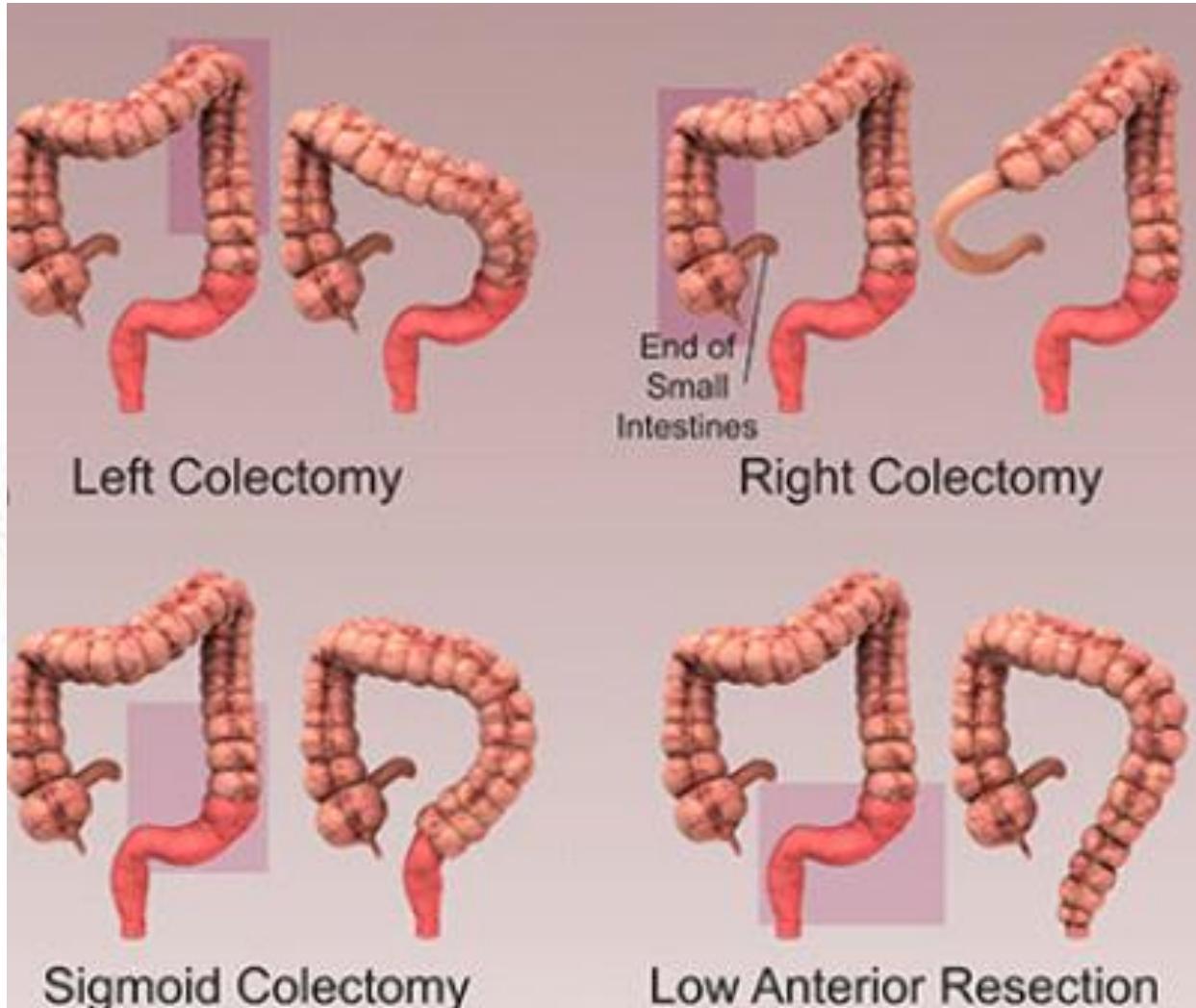
Federica Furfaro,¹ Ferdinando D'Amico,^{1,2} Alessandra Zilli,¹ Vincenzo Craviotto,³ Annalisa Aratari,⁴ Cristina Bezzio,⁵ Antonino Spinelli,³ Daniela Gilardi,⁶ Simona Radice,¹ Simone Saibeni,⁵ Claudio Papi,⁴ Laurent Peyrin-Biroulet,^{7,8} Silvio Danese,^{1,6} Gionata Fiorino,^{1,6} and Mariangela Allocca^{1,6}

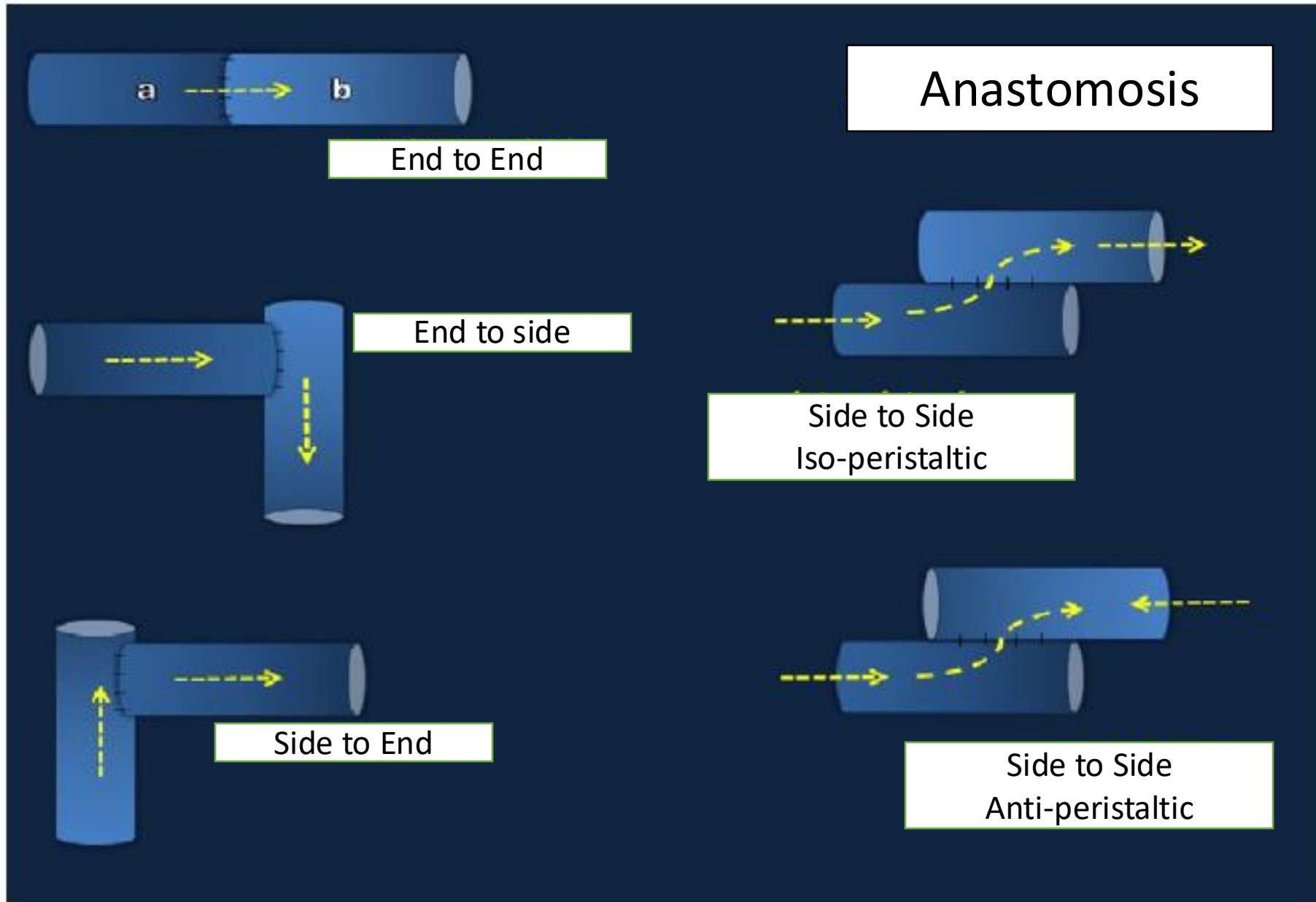
IBD, 2023

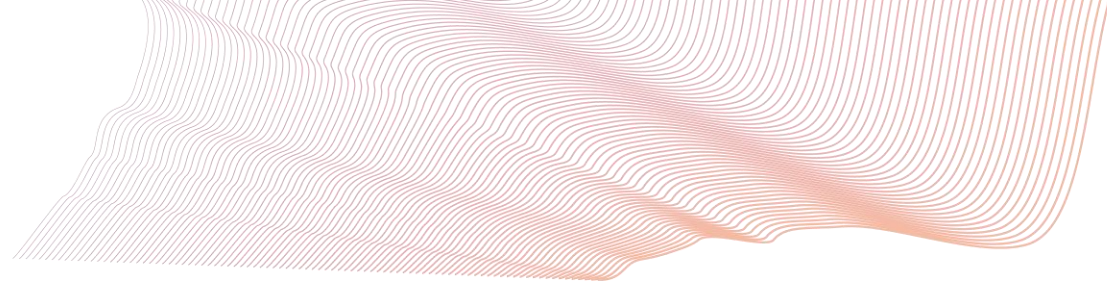


Anatomy – Post Surgery

Hemicolectomy

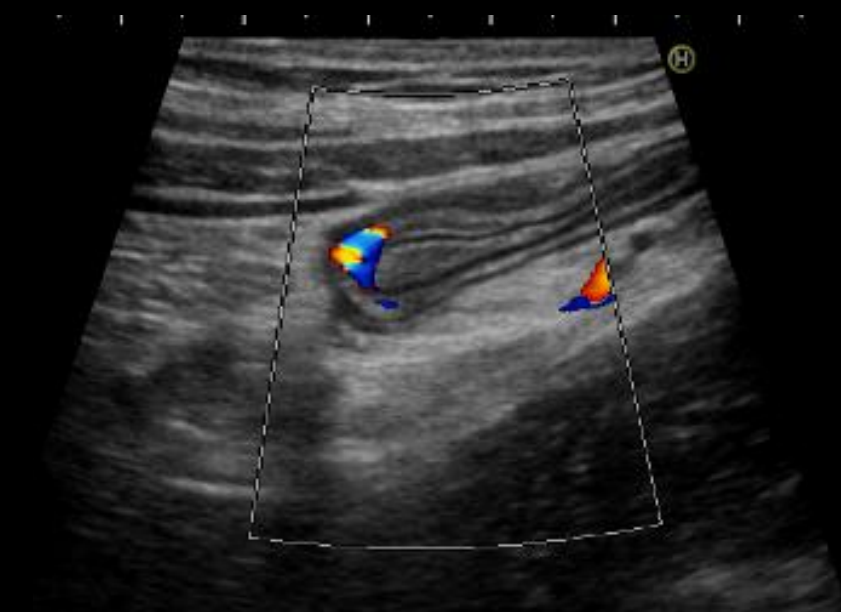


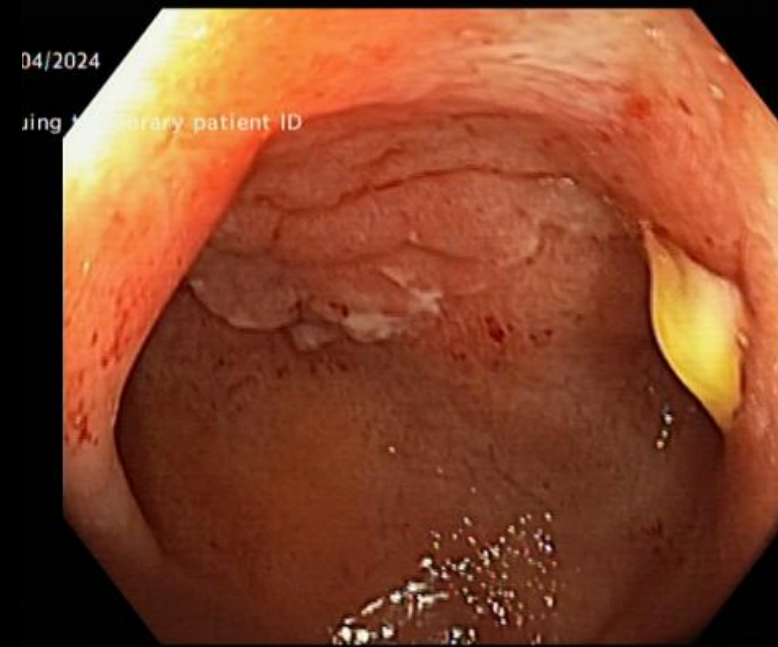
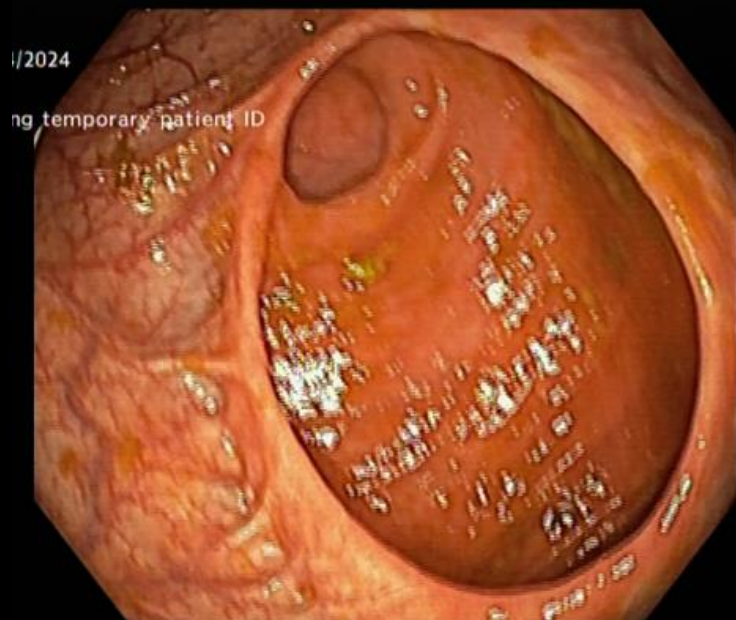




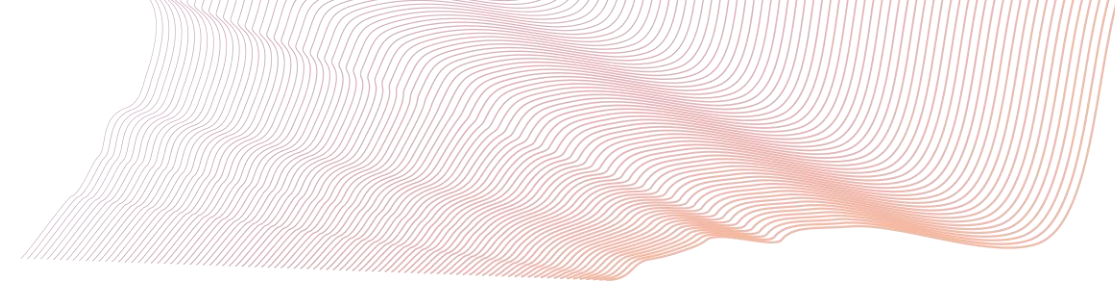
Case Capsule #1

- 26 year old girl,
- Recurrent pain abdomen ~ 6 months
- Ileocolonic disease: Short segment, inflammatory
- Ileocolic resection and anastomosis (LIRIC data)
- Low risk for recurrence: Started on Azathioprine
- IUS 1 year later.....





Rutgeert's i3

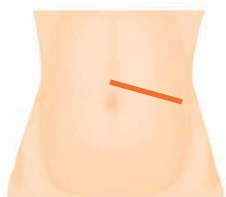
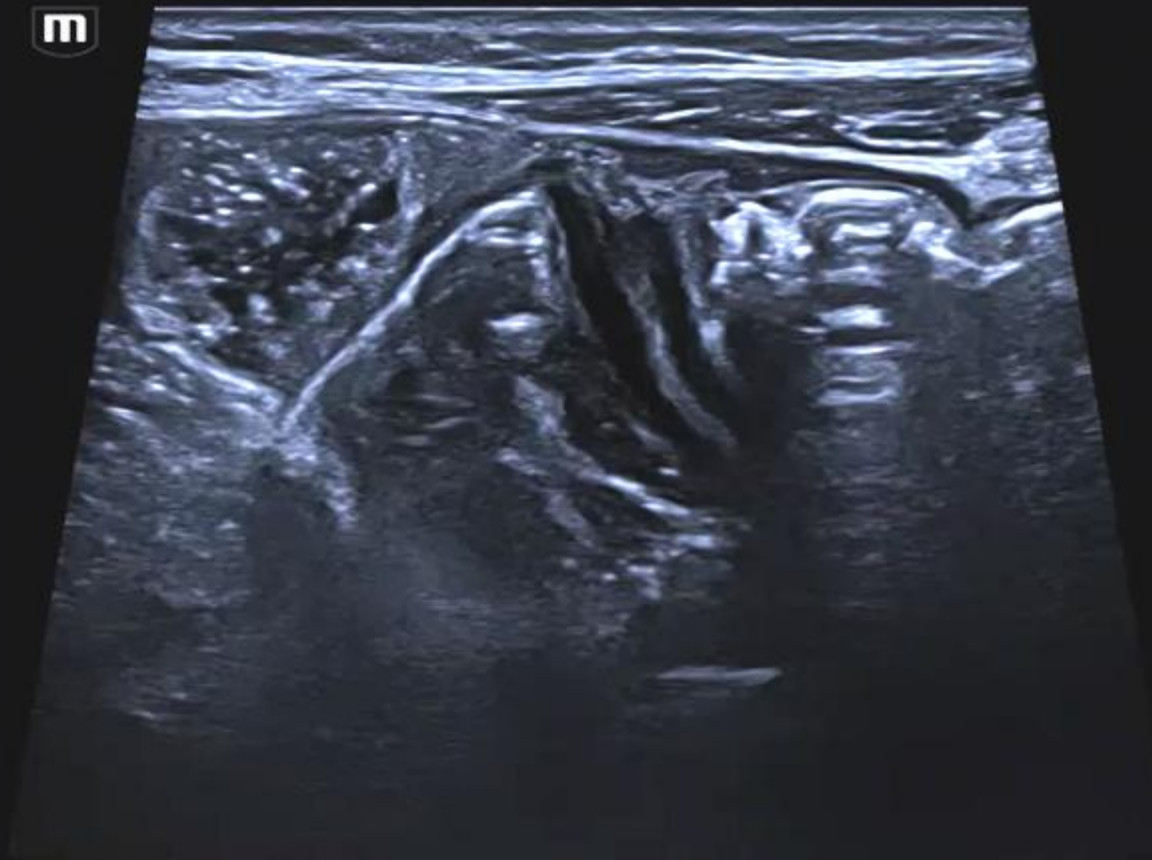


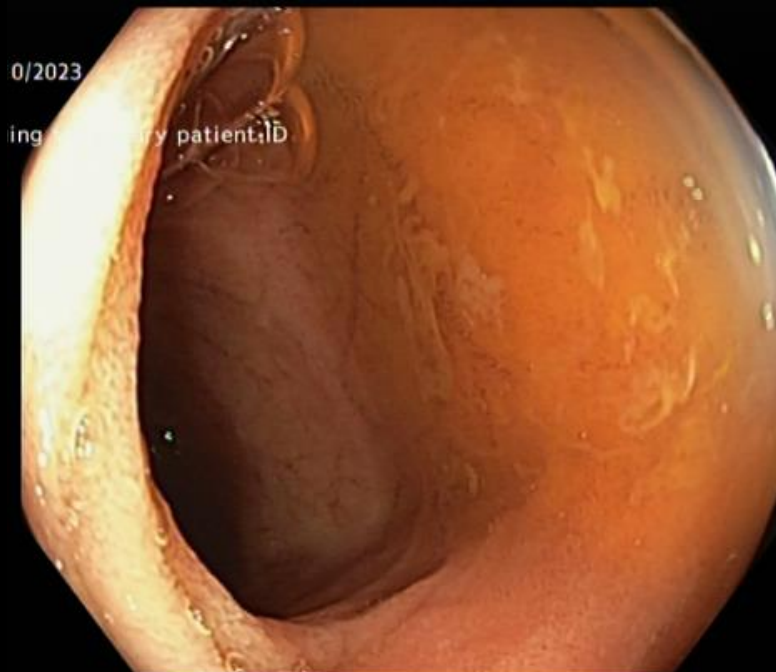
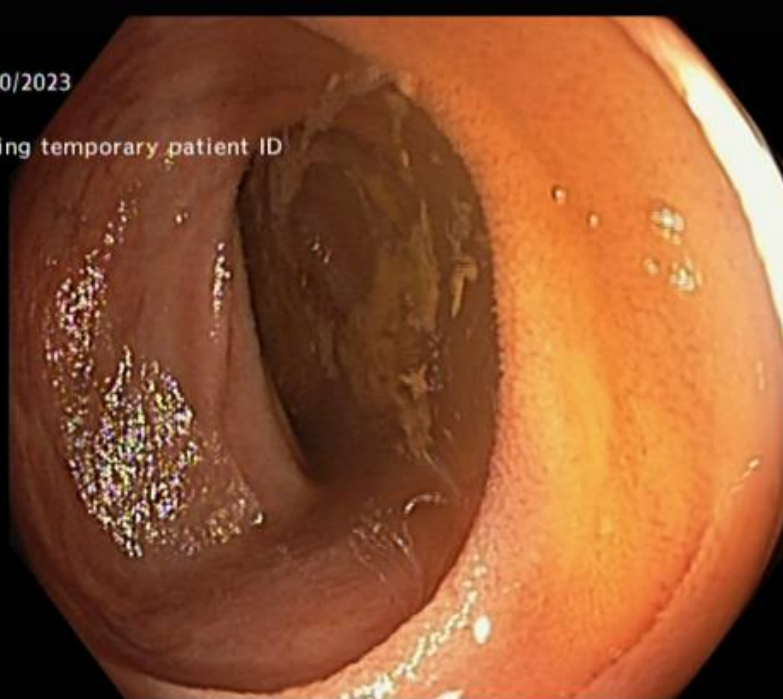
Case Capsule #2

- 46 year old,
- IBD: Crohn's disease
- Post surgery since 2019: On Infliximab since surgery
- Asymptomatic
- Fecal calprotectin: 30mcg/gm
- Follow up IUS



m





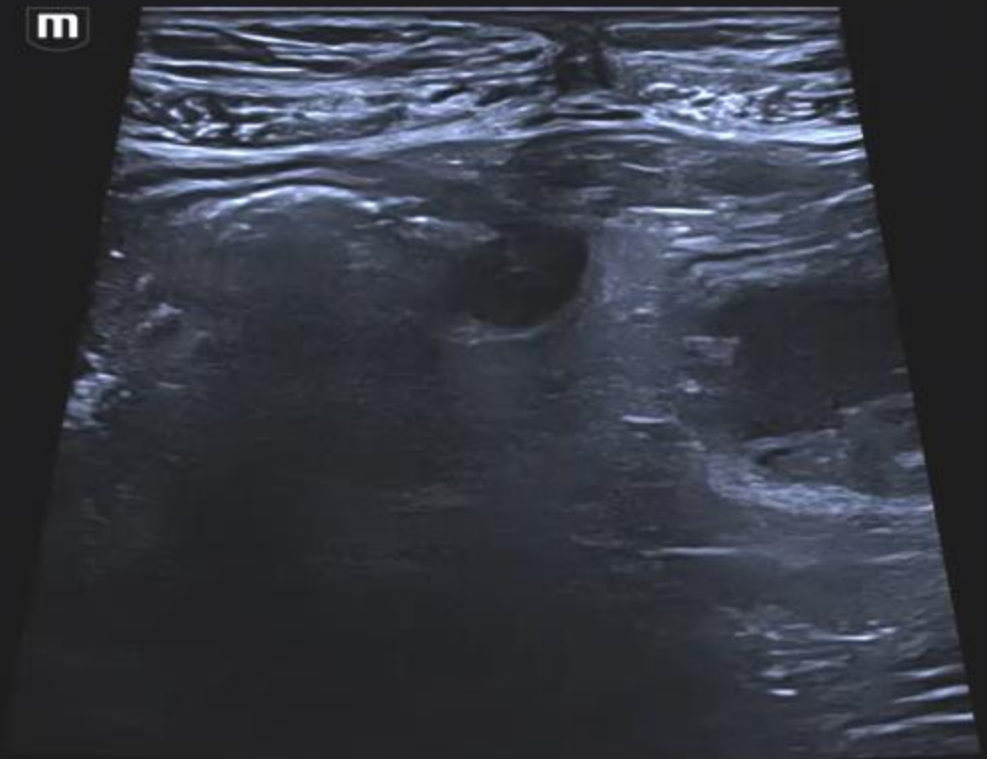
Rutgeert's i0



Case Capsule #3:

Small bowel resection and anastomosis

m



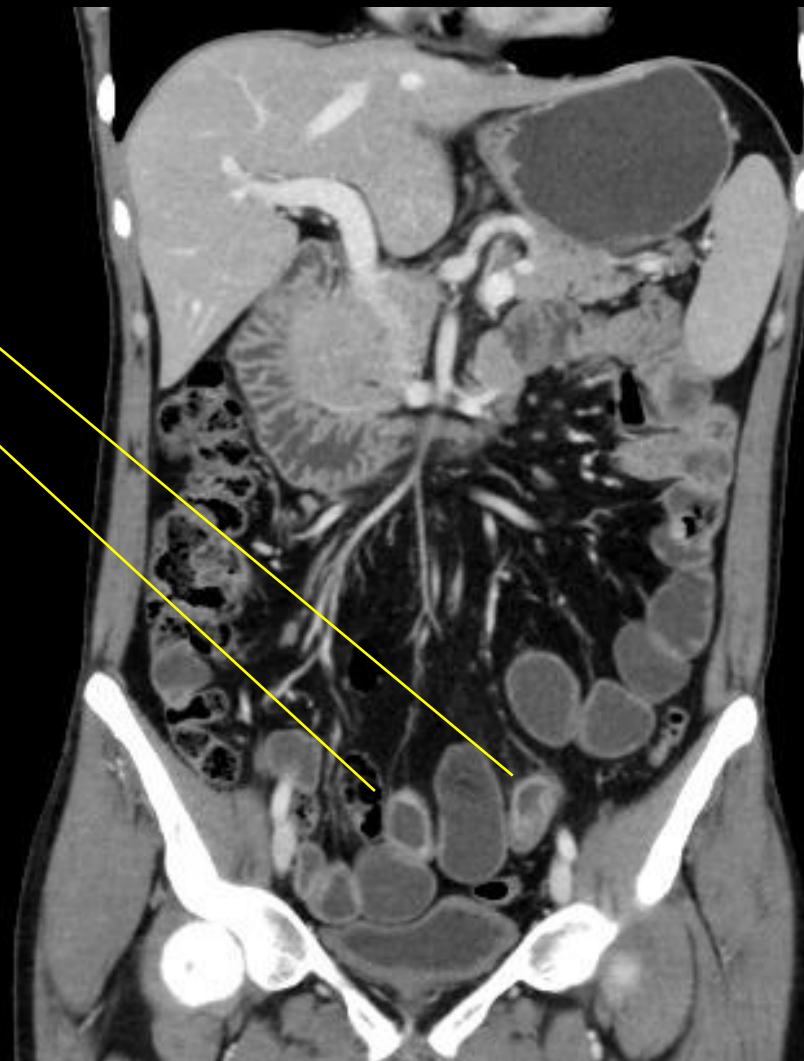
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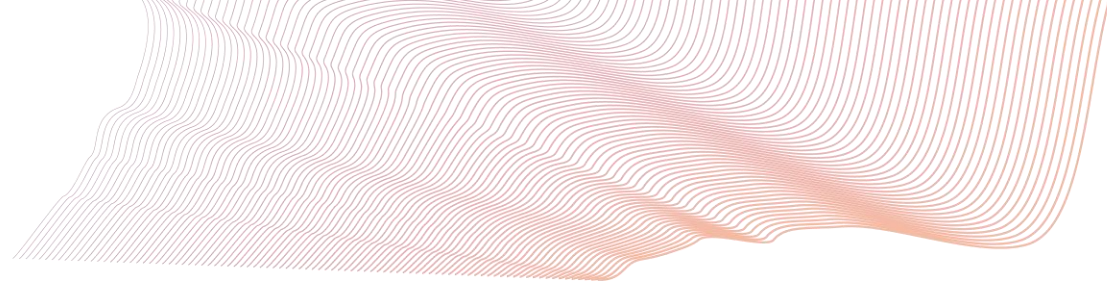




CT Enterography

Anastomotic site

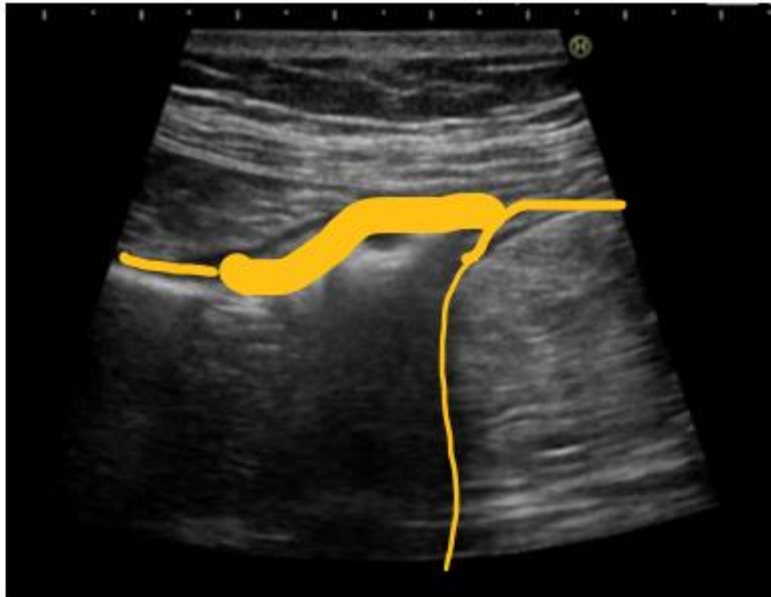
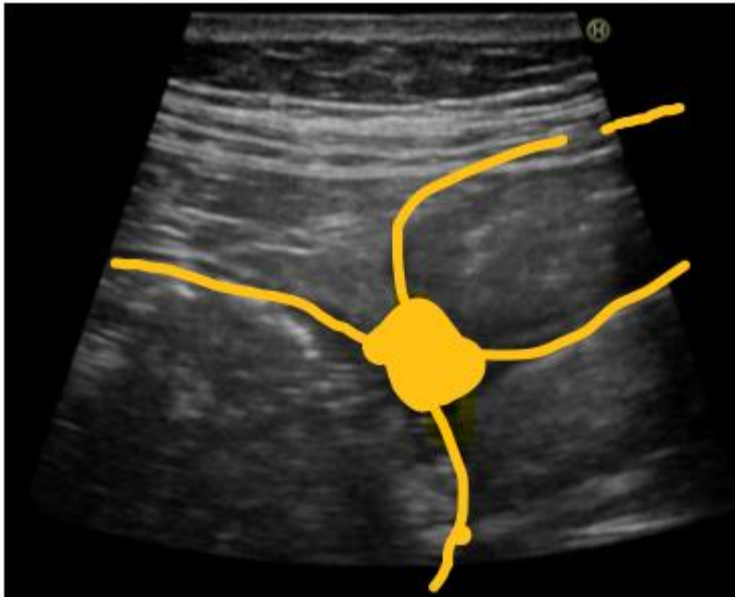


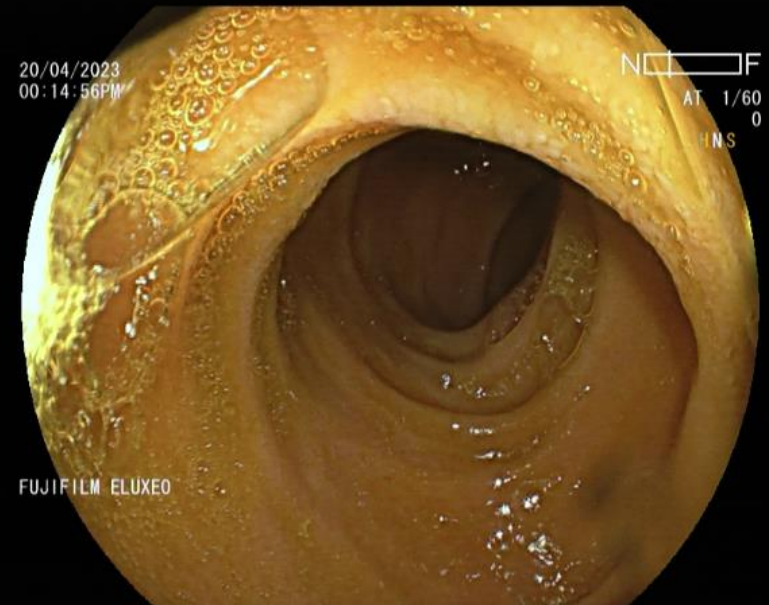
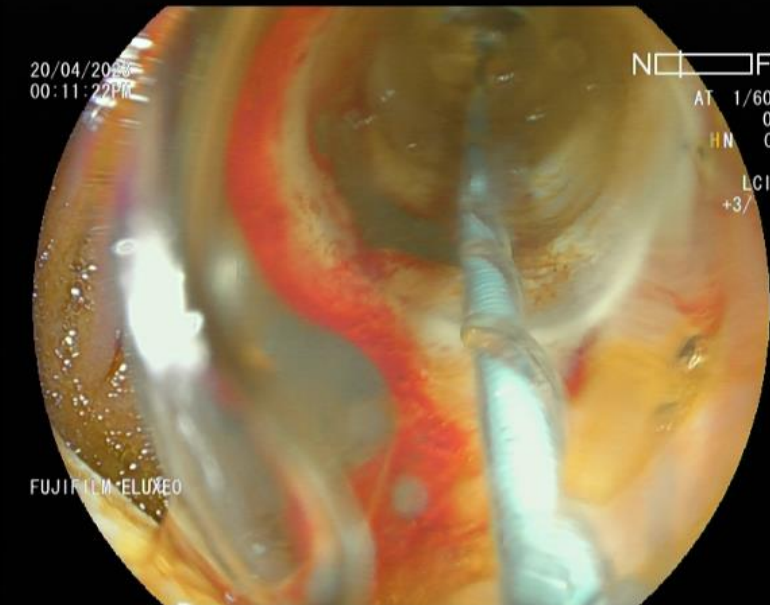
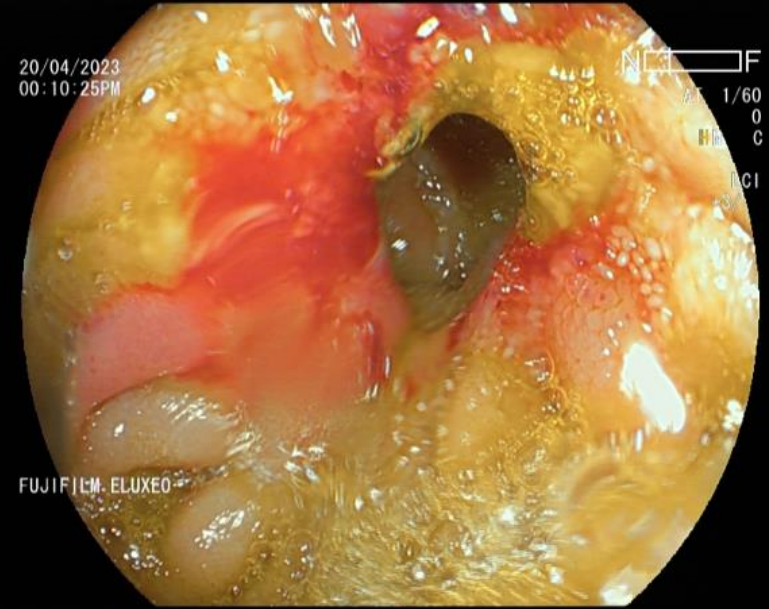
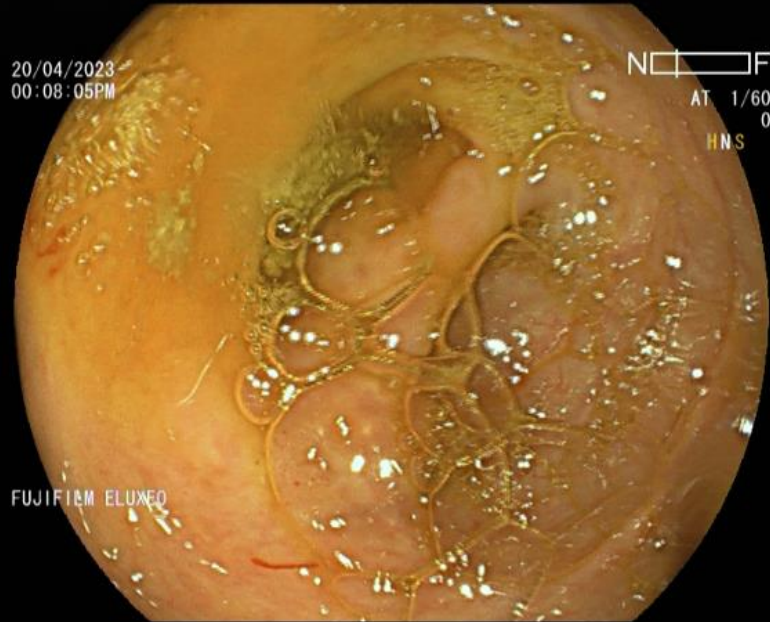


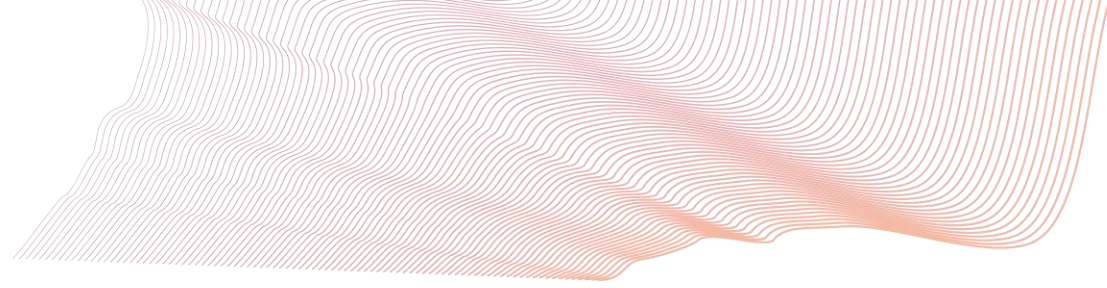
Case Capsule #4

- 28 year old gentleman,
- IBD- Crohns disease; A2L3B2p
- S/p Small bowel resection and anastomosis 2 years ago
- On Infliximab since surgery
- Clinical and endoscopic remission documented about a year ago
- Last 6 weeks:
- 2 episodes of partial bowel obstruction – resolved with conservative management
- IUS done



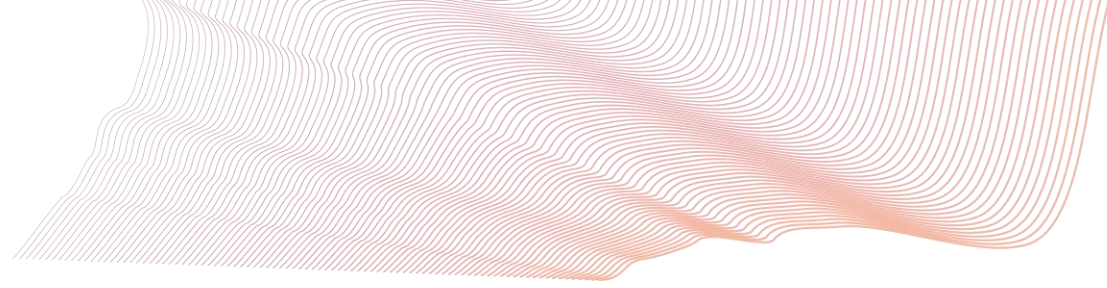






Limitations...

- Thick abdominal wall
- Difficulty in identifying the anastomotic site
- Higher learning curve than for IUS in patients without surgery



Learning objectives

- IUS accurately **detects** post operative recurrence
 - (Lower accuracy if performed less than 6 months after surgery)
- IUS suggests **severity** of post-operative recurrence
- IUS + Fecal Calprotectin : **Non-invasive** monitoring
 - Potential to replace colonoscopy for monitoring
- IUS should be integrated in routine post-operative monitoring for recurrence



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Complications in CD

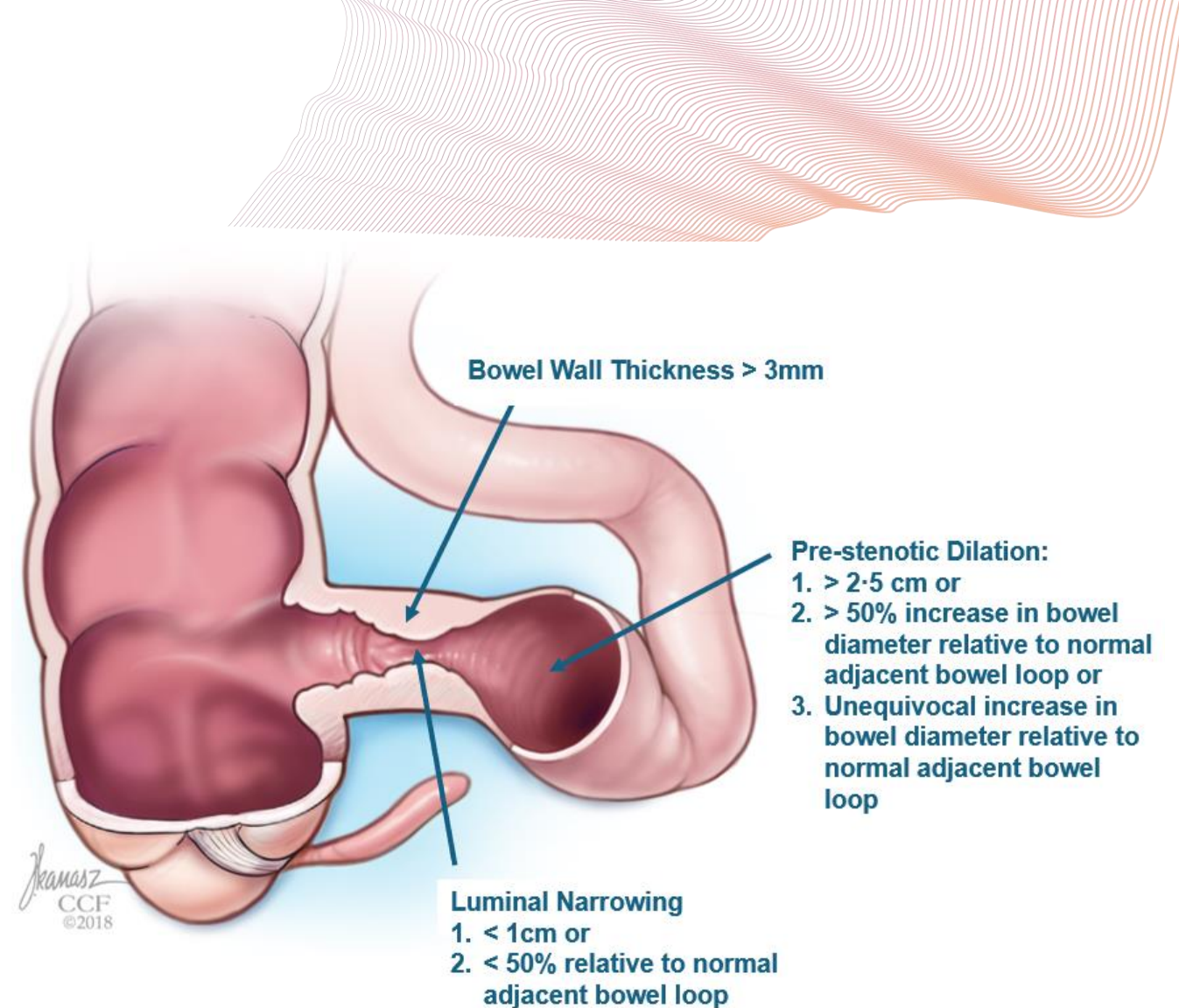
Intended Learning Outcomes (ILOs)

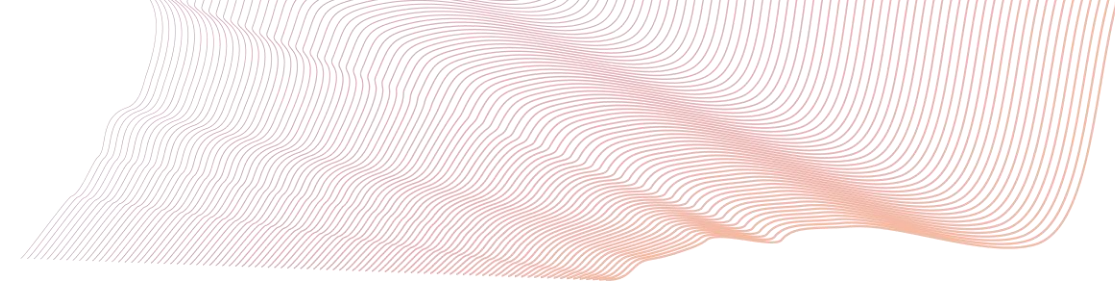
By the end of this session, the learner will be able to:

- Compare and contrast the distribution, characteristics, and complications of inflammatory features in Crohn's disease (CD) and ulcerative colitis (UC).
- Evaluate post-operative anastomoses using appropriate imaging techniques (e.g., transabdominal IUS, CEUS, SICUS) and interpret findings to identify potential complications or abnormalities, such as strictures, leaks, or abscesses.
- Explain the current clinical role for elastography and CEUS by referring to guidelines
- Explain the principles and clinical relevance of contrast-enhanced ultrasound (CEUS) and small intestine contrast ultrasound (SICUS), and describe how they support visualization and evaluation of bowel pathologies such as:
 - Active inflammation
 - Complicated fistulizing disease
 - Differentiation of inflammatory vs fibrotic lesions

Strictures

- > 50% of patients with CD develop strictures over their lifetime. The terminal ileum is the most common stricture location.
- Strictures develop >30-35 % of patients in the first decade of a diagnosis of CD.
- Strictures are characterized by different degrees of inflammation & fibrosis.
- Identification of these two components can improve the quality of IBD management.



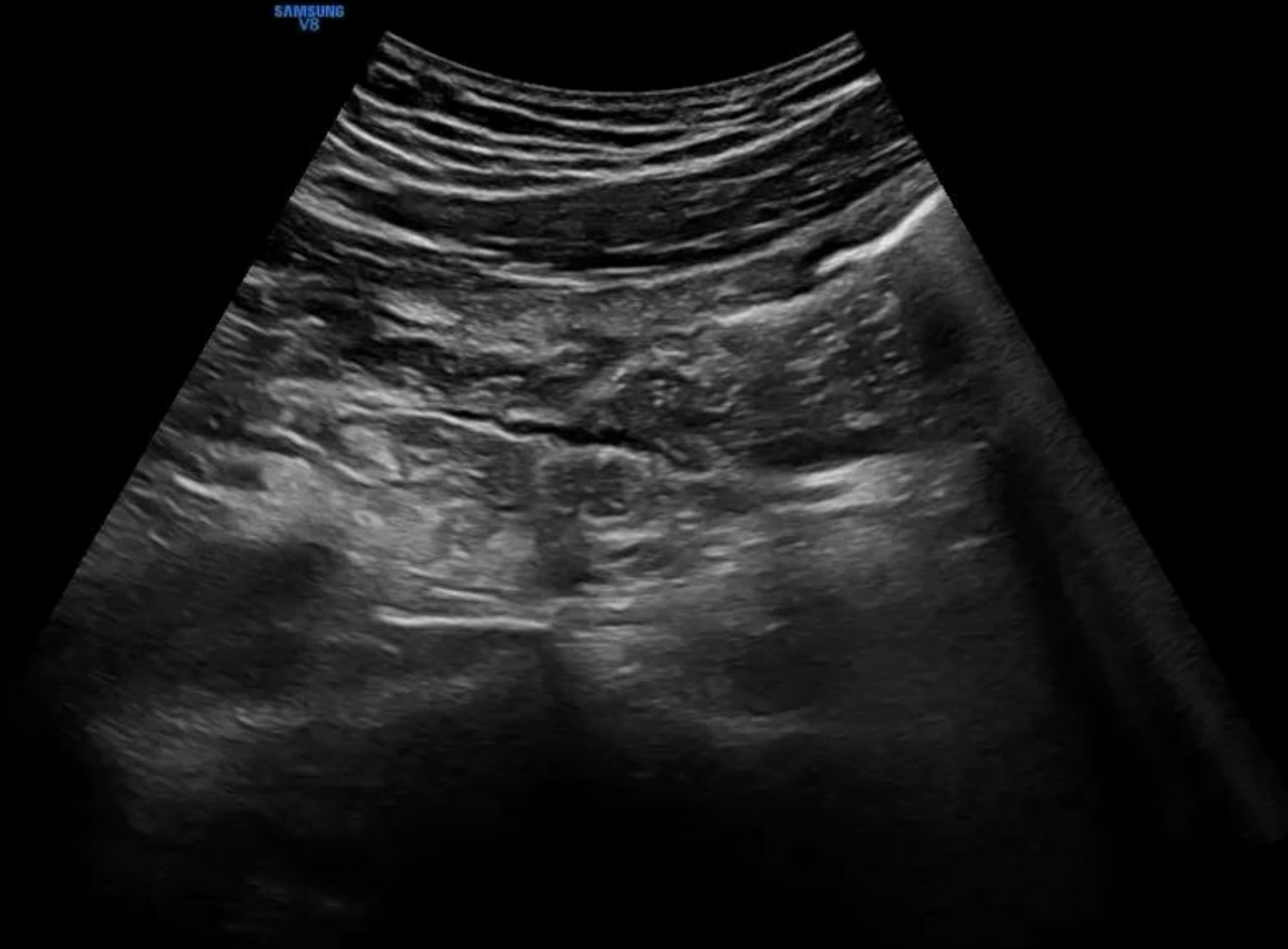


Diagnostic accuracy of B-mode IUS for strictures

- Systemic review
- 45 of 56 studies reported on the diagnostic accuracy of IUS in small bowel CD based on a gold standard; *(Histopathology, endoscopy and CT/MRI images as reference)*.
- Estimates for stricture diagnosis in IUS using the various 'gold standards':
 - The pooled sensitivity → 68% to 100%.
 - The Pooled specificity → 86% to 100%.



Stricture



TERMINAL ILEUM

M. Dolinger



Small Parts / BOWEL- / LA2-14A / FPS46 / 4.5cm / MI1.4 / TIs0.1 / 01-15-2026 04:33:27 PM
[2D] Frq Res.1/GN 61/DR 49/FA 8/P 100



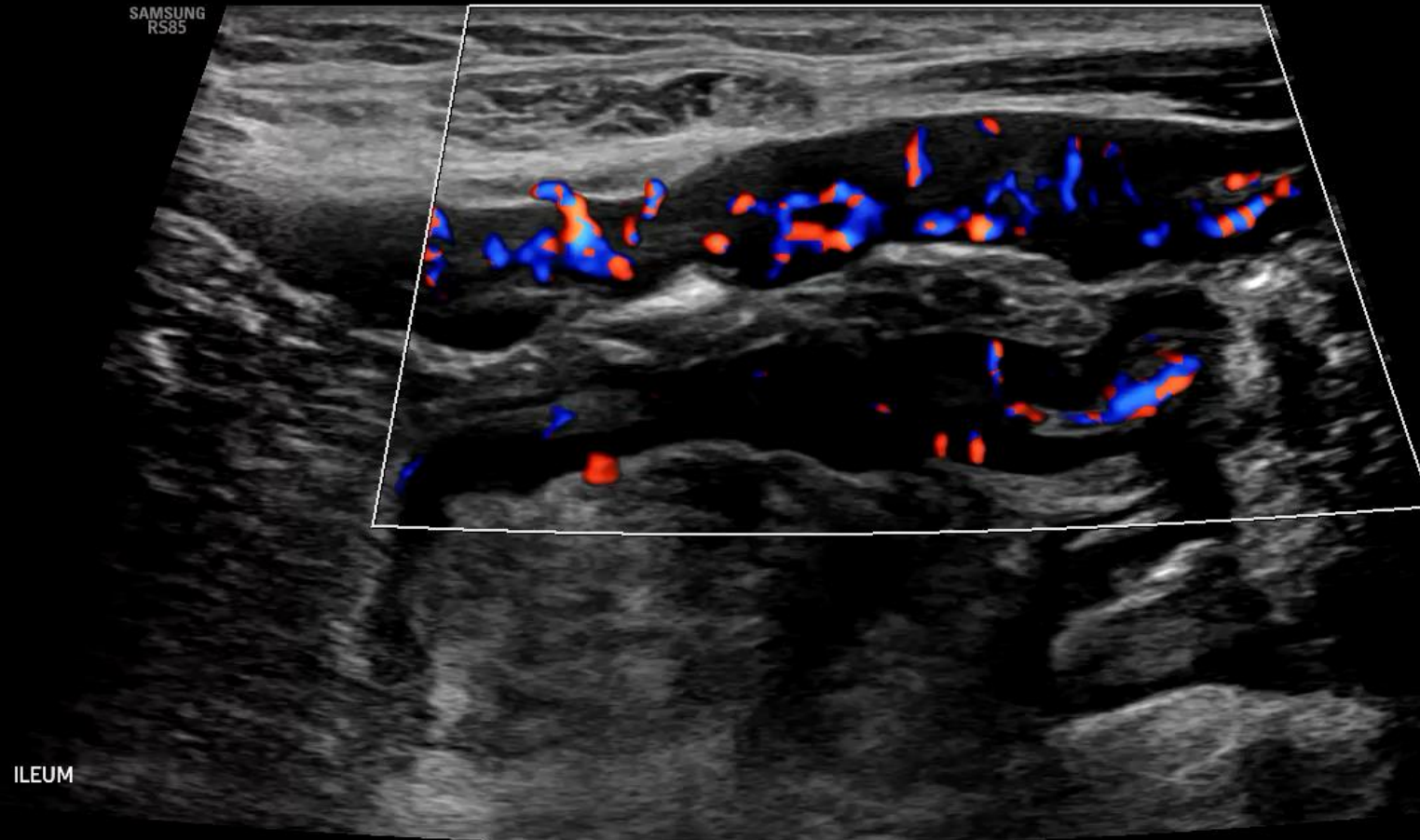
SAMSUNG
RS85

ILEUM





Small Parts / BOWEL- / LA2-14A / FPS13 / 4.0cm / MI1.4 / TIs0.4 / 01-15-2026 04:31:28 PM
[2D] Frq Res.1 / GN 61 / DR 49 / FA 4 / P 100
[PD] Frq Gen. / GN 61 / 0.80kHz / P 100



MI 0.8 TIS<0.4 AP:100% 28 FPS 1



HdT-4.0P R:7.00 BG:61 BD:76

*Abdo C42 GP Probe: C42

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



1498 studies screened

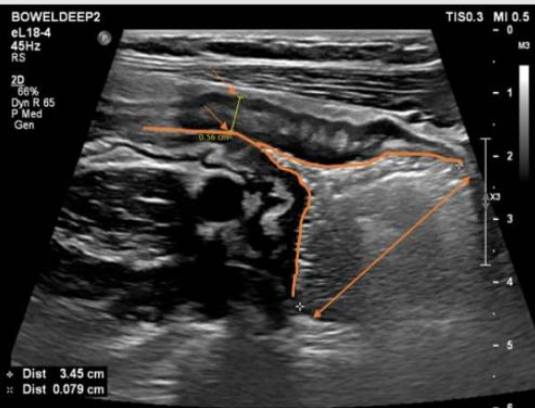


68 studies included in this review
23 studies in the meta-analysis



3863 patients

STRICTURES



Sensitivity
Specificity
Accuracy

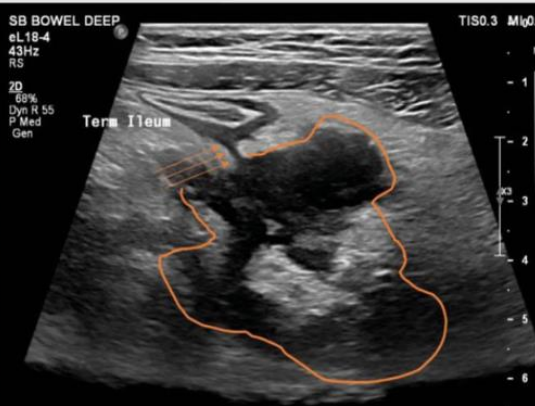
B-mode

81%
90%
86%

SICUS

94%
95%
94%

INFLAMMATORY MASSES



Sensitivity
Specificity
Accuracy

B-mode

87%
95%
91%

SICUS

91%
97%
94%

FISTULAS



Sensitivity
Specificity
Accuracy

B-mode

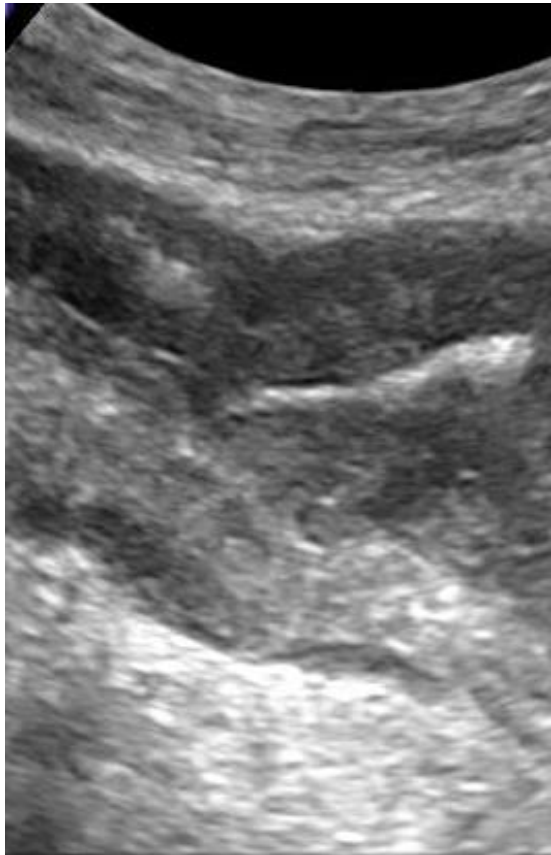
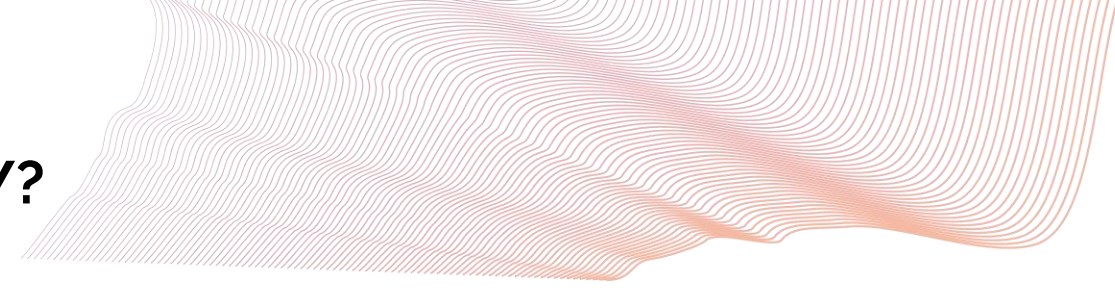
67%
97%
82%

SICUS

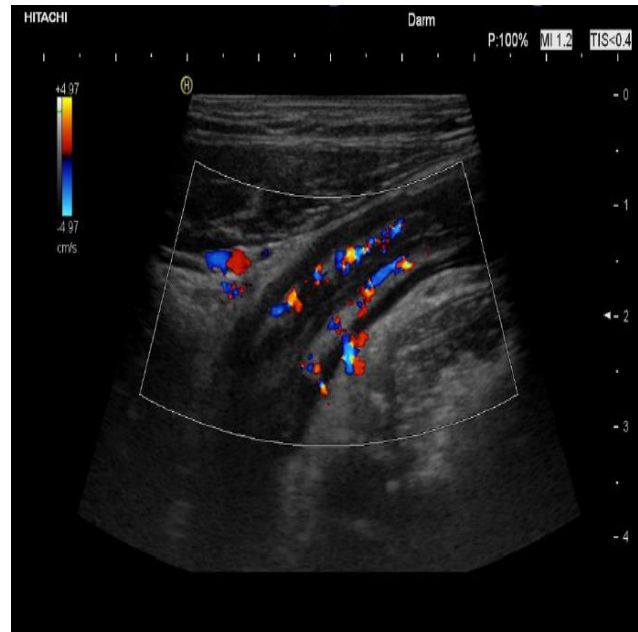
90%
94%
92%

STENOSIS

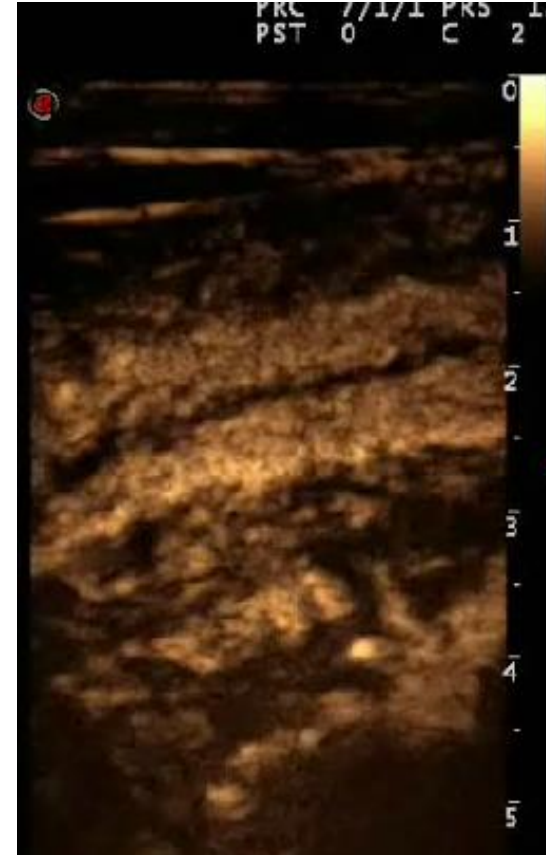
FIBROTIC OR INFLAMMATORY?



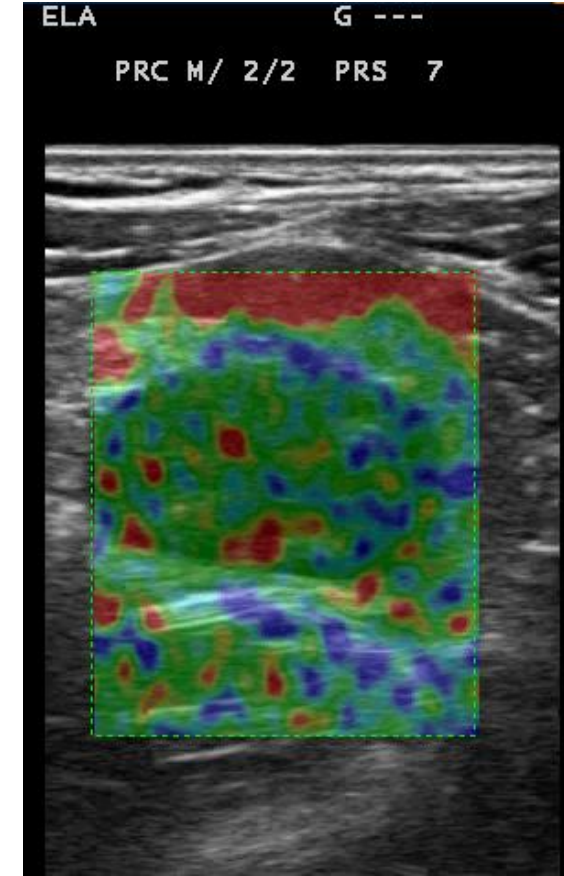
Echopattern
Ipoechoic vs normal
stratification



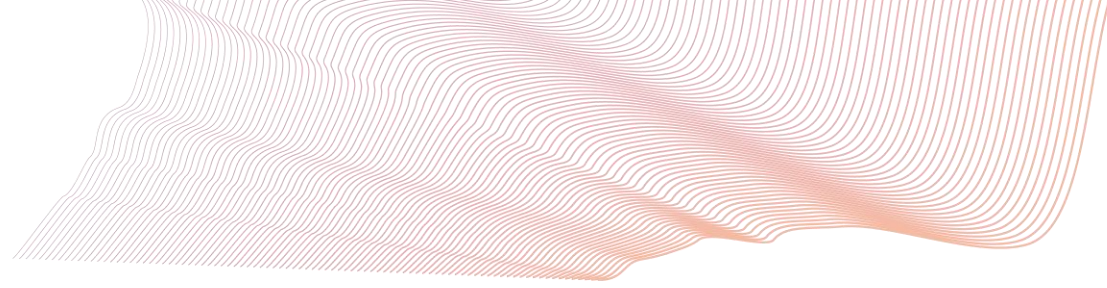
Color Doppler



CEUS
vascularization



Elastography



Fistulae

- Internal Fistulae
 - Entero-enteric
 - Entero-mesenteric
 - Entero-vesical
 - Entero-vaginal
- External fistulae
 - Entero-cutaneous
- Sinus tract: tract not connecting 2 epithelial linings



FISTULAE/Sinus tract ENTERO-MESENTERIC





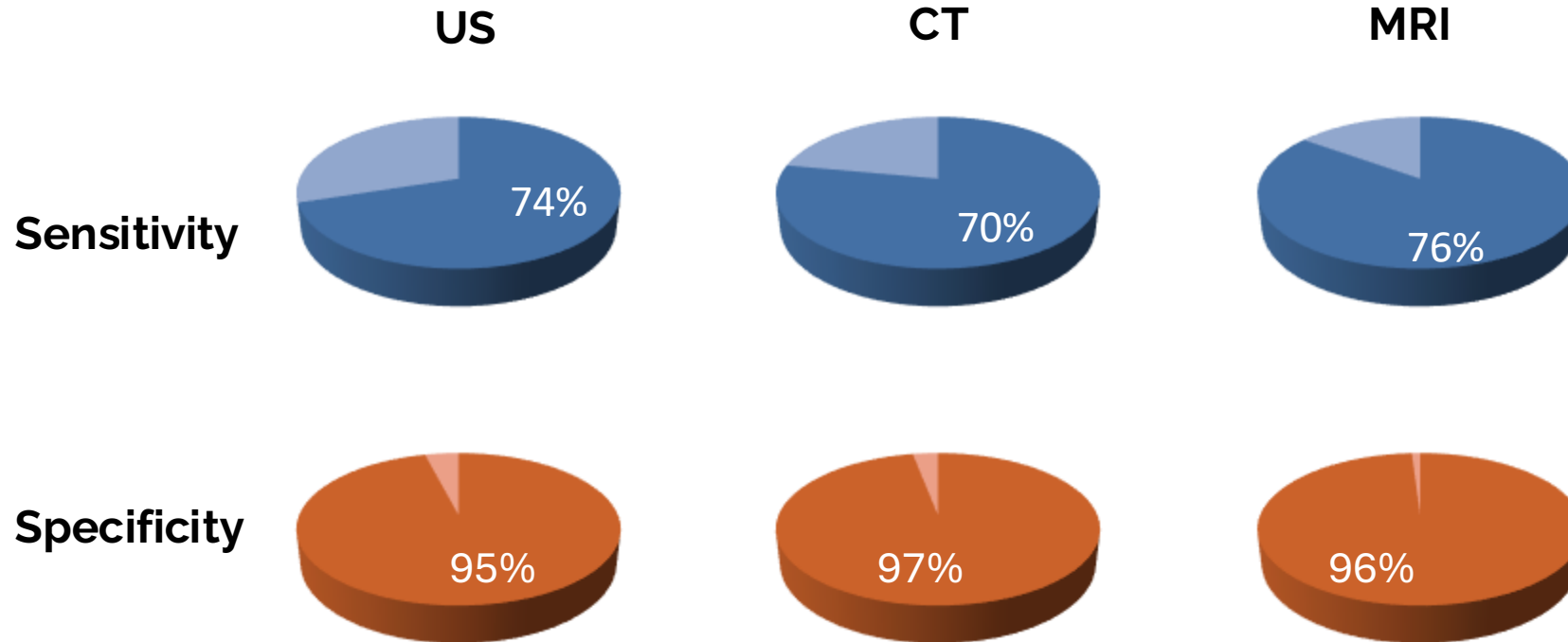
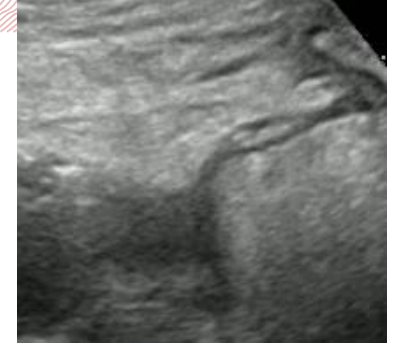
Fistula



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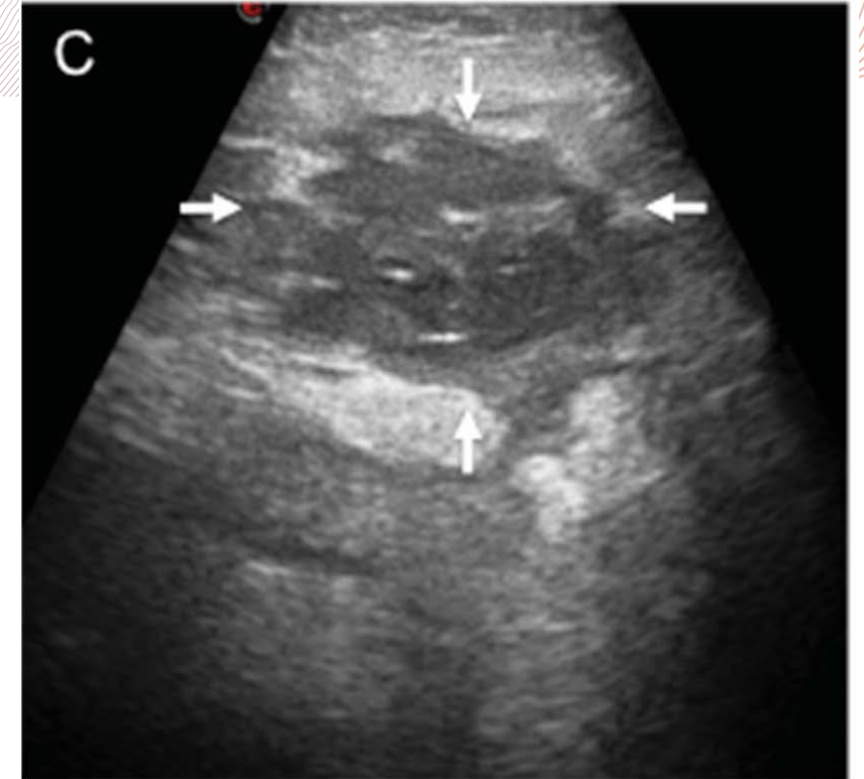
M. Dolinger

Accuracy of cross-sectional imaging for extramural complications: fistula



Definitions: Abscess

- Hypo-anechoic lesions containing fluid and gaseous artifacts
- Posterior enhancement
- Irregular margins sometimes within hypertrophic mesentery



Calabrese et al, Inflamm Bowel Dis Volume 22, Number 5, May 2016



- 0
-
- 2
-
- 4
-
- 6
-
- 8
◀ -

FR:25
C532

BG:12 DR:70
HdTHI-P

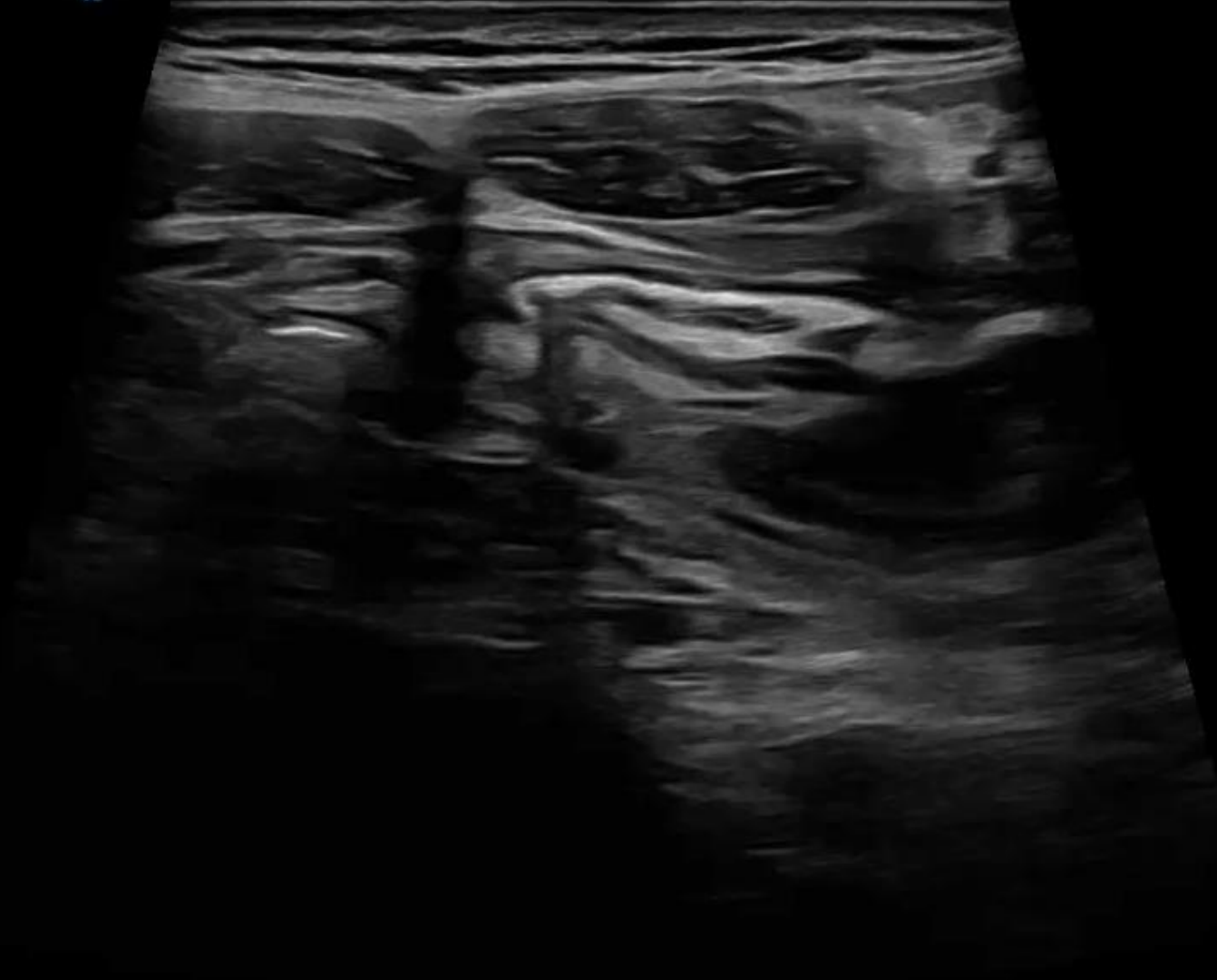


SAMSUNG
V8

Abscess

TERMINAL ILEUM

M. Dolinger





SAMSUNG
VS



TERMINAL ILEUM

M. Dolinger

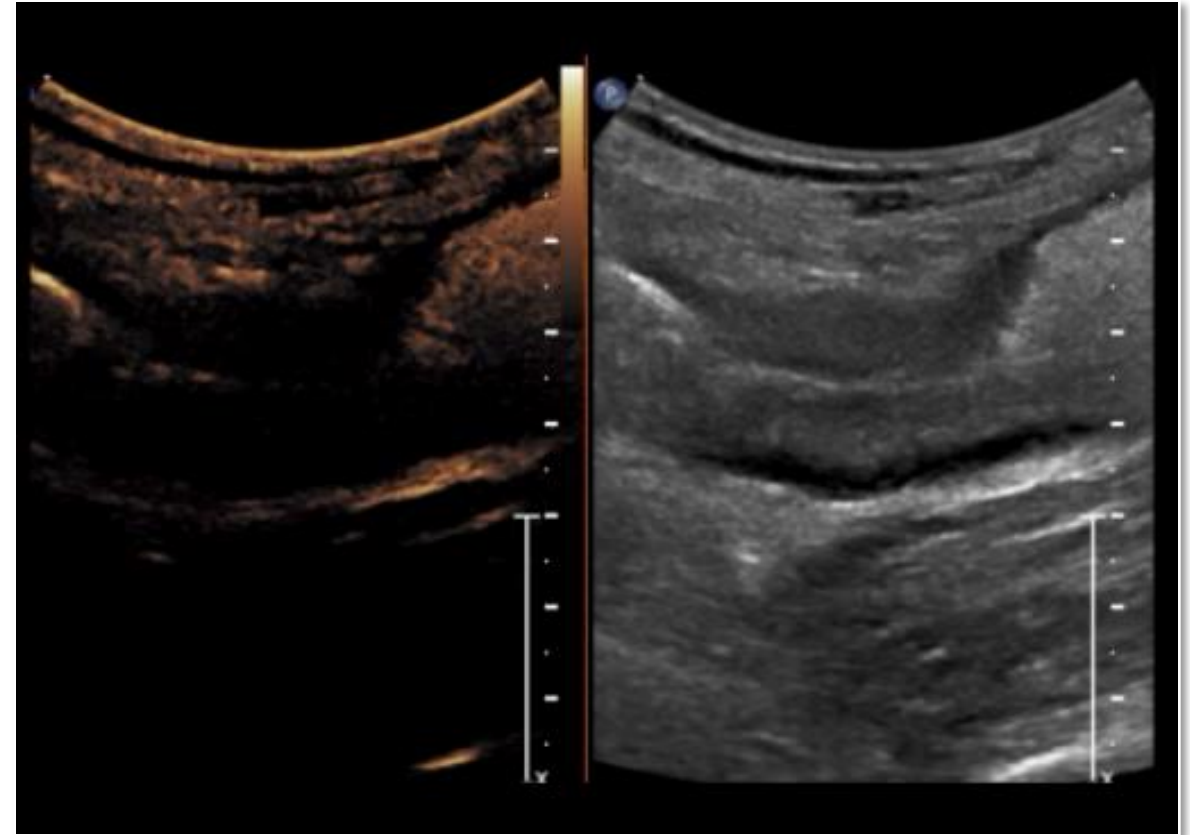
Contrast-enhanced ultrasound (CEUS)

Usage in CD complications:

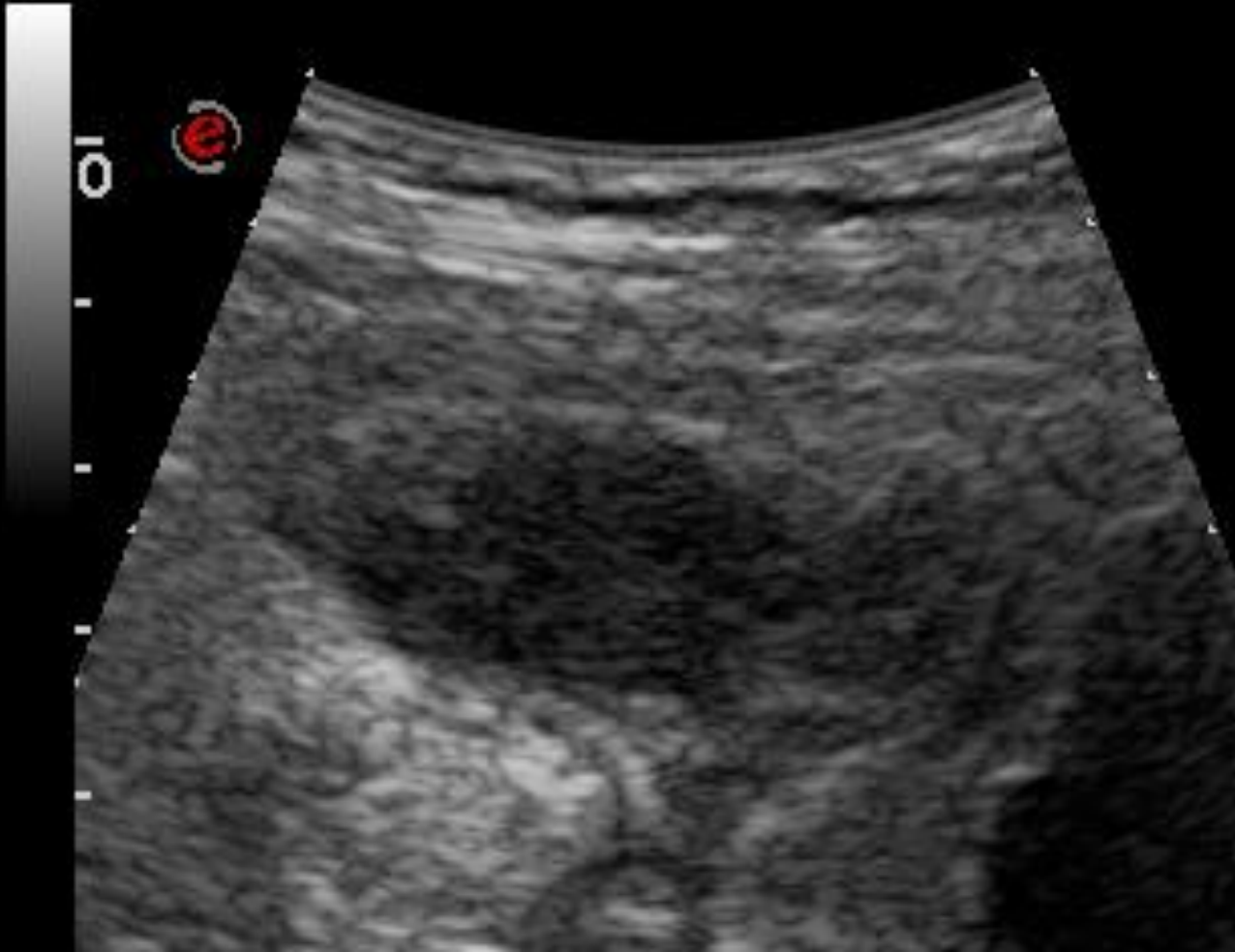
- Provide bowel wall & mesentery enhancement parameters that reflect inflammation & assess disease activity.
- Help in differentiation between of inflammatory vs fibrotic intestinal strictures.
- Rule in the differentiation of inflammatory masses as either phlegmon or abscess

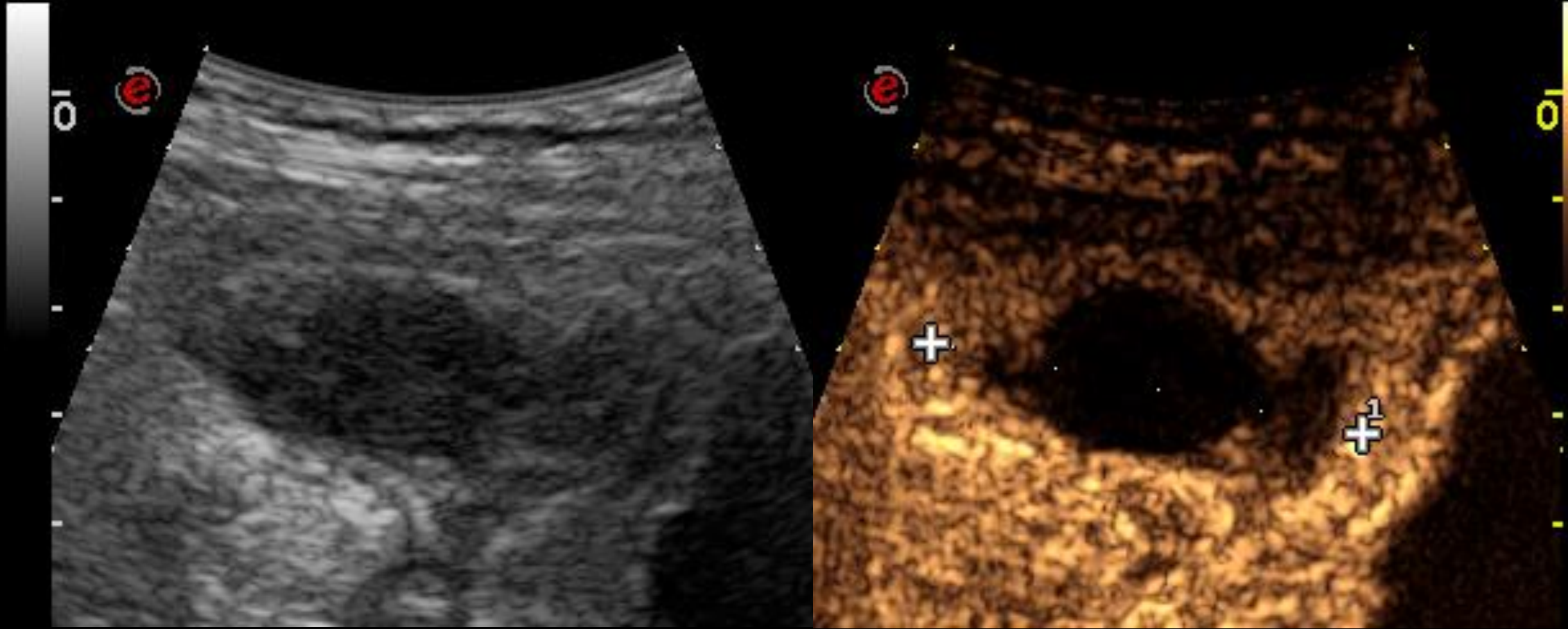
• How is CEUS Performed?

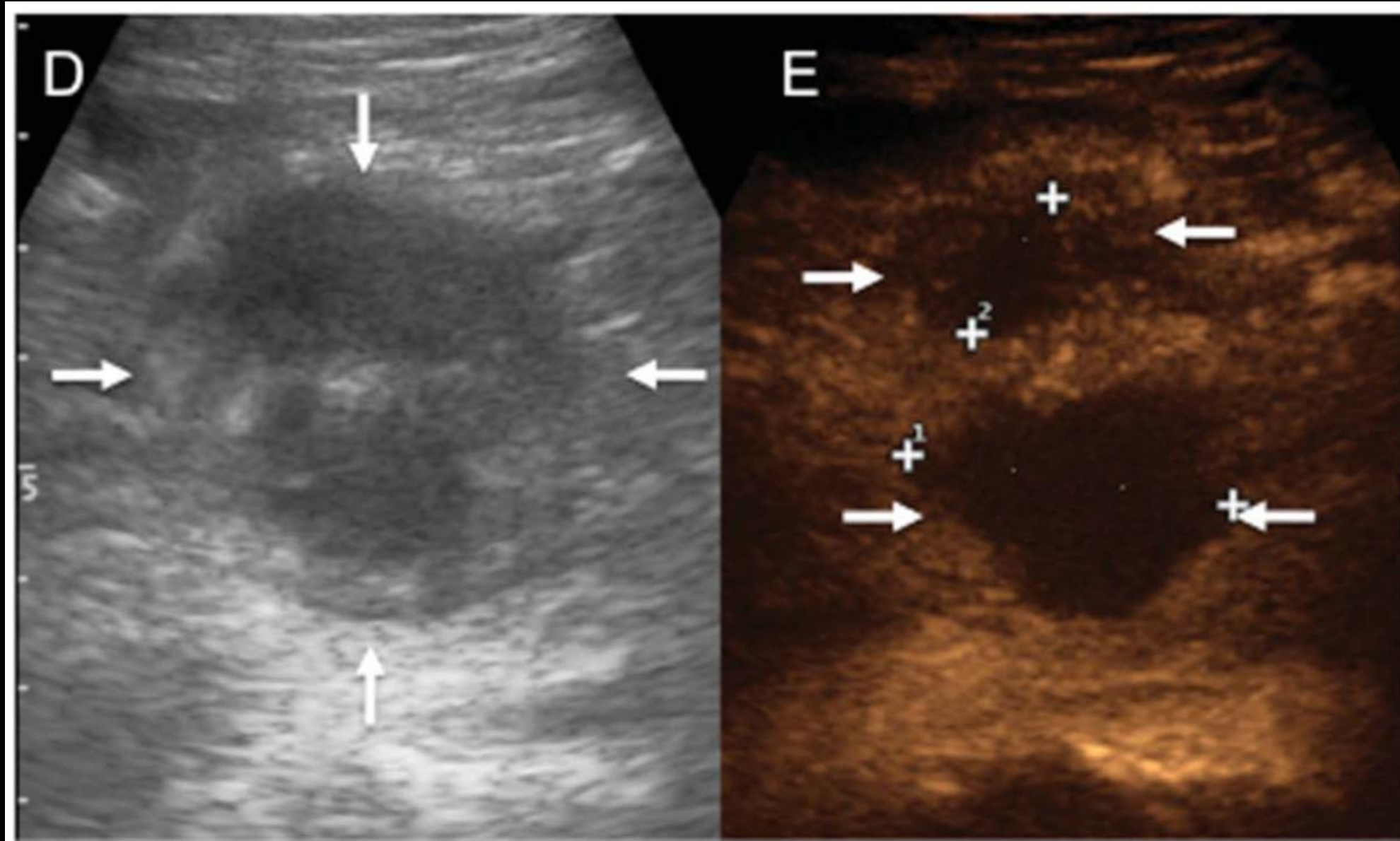
- Gas-filled microbubbles with a phospholipid shell.
- Microbubbles remain within capillaries & oscillate in the bloodstream in response to application of an ultrasound field, producing non-linear harmonic frequencies that are detected at CEUS.
- 2 Minutes video file. Followed by Quantification with raw linearized data



- Maconi G et al. EFSUMB Recommendations 2018
- Nylund K et al. EFSUMB Recommendations 2017
- Medellin et al. Abdom Radiol 2018.
- C. Maaser et al. UEG J, Feb 2022

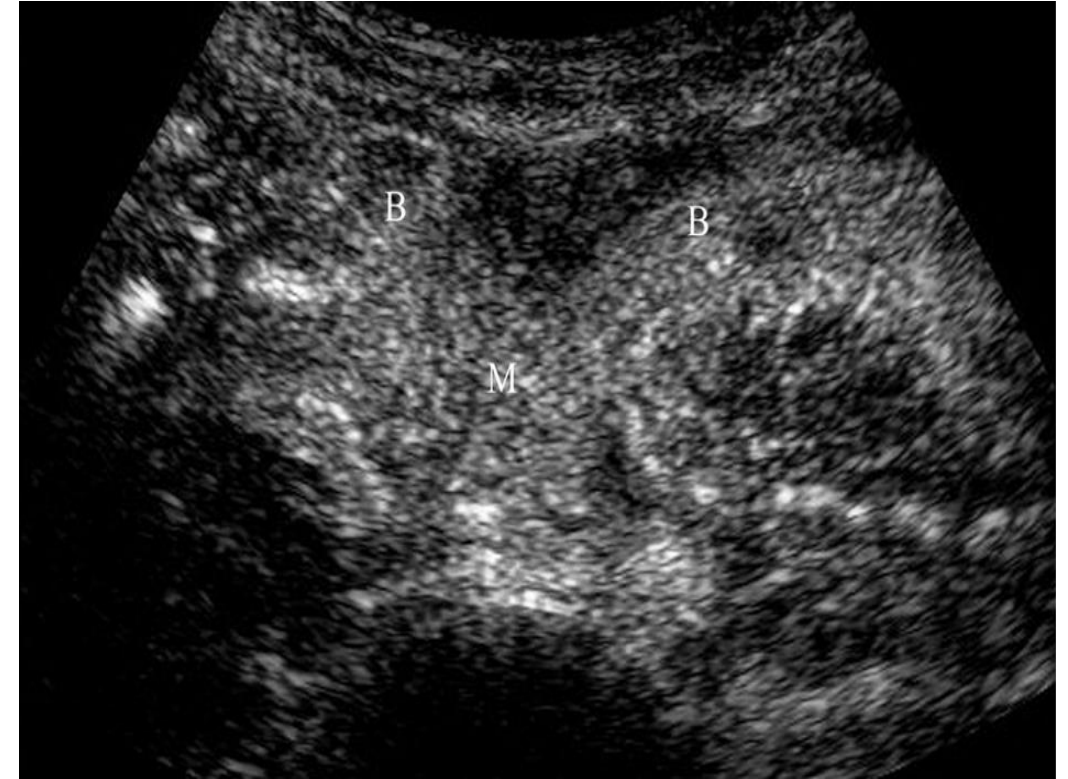
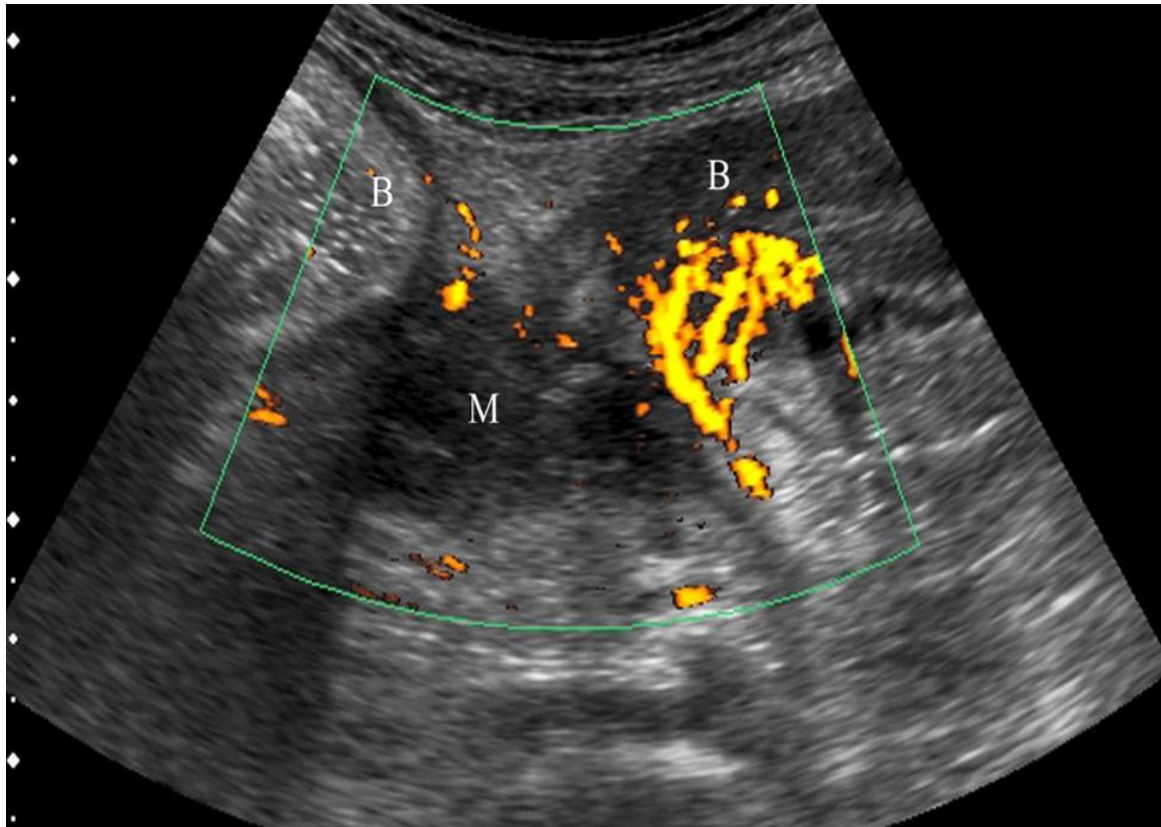




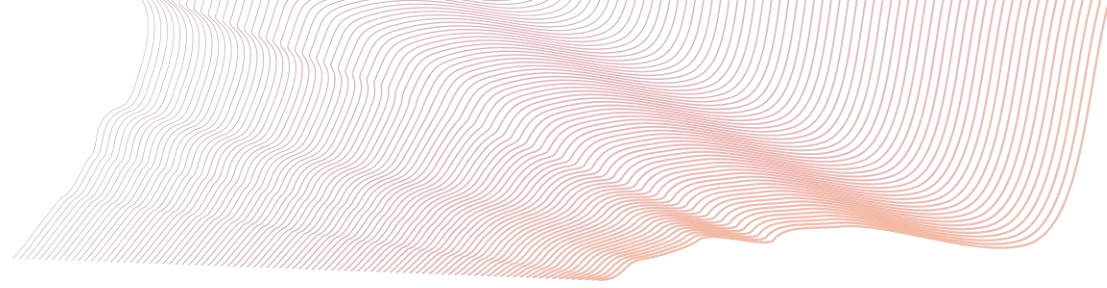


Contrast-enhanced ultrasound in the differentiation between phlegmon and abscess in Crohn's disease and other abdominal conditions

- 71 inflammatory masses were confirmed by other imaging techniques, percutaneous drainage or surgery.
- CEUS specificity for the diagnosis of abscess was 100%.



Kappa coefficient = 0.972 CEUS and other techniques in the diagnosis of phlegmon or abscess



TAKE HOME MESSAGES

Intestinal US is useful in diagnosis of stenosis, fistulas and abscesses in CD

SICUS may increase IUS accuracy in diagnosis of CD stenosis

CEUS may increase IUS accuracy in diagnosis of abscesses



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Thank you!