



international bowel
ULTRASOUND GROUP

IBUS HYBRID module 1

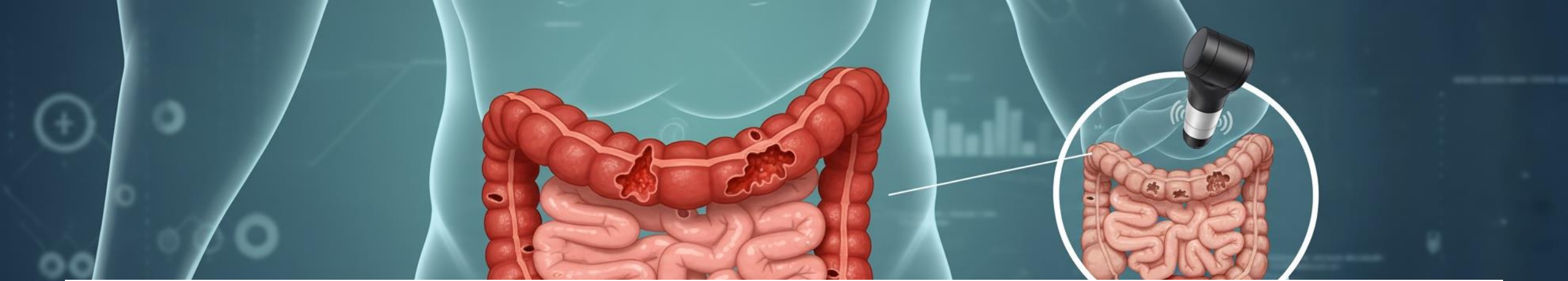
7-8TH
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MILAN, ITALY

Not all you see with IUS is IBD!

Sara Massironi, MD, PhD

Associate Professor Vita-Salute San Raffaele, Milan,
Italy



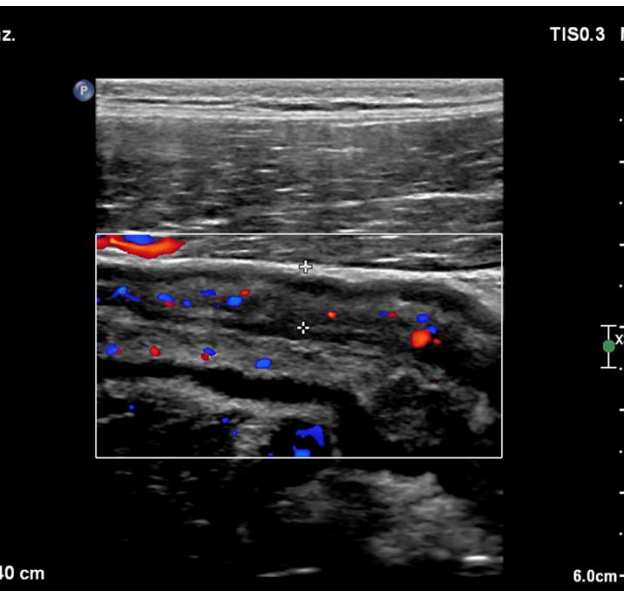
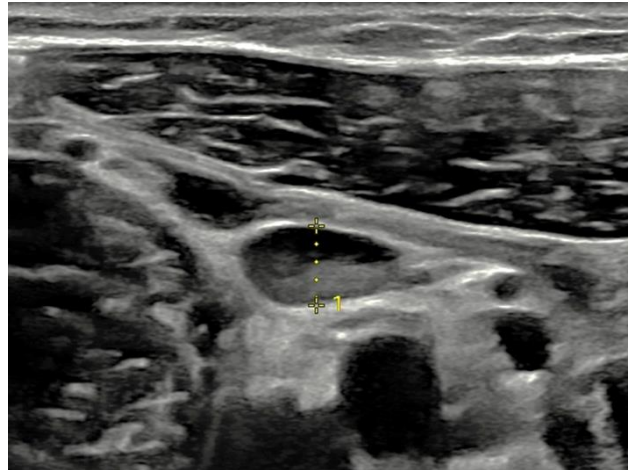
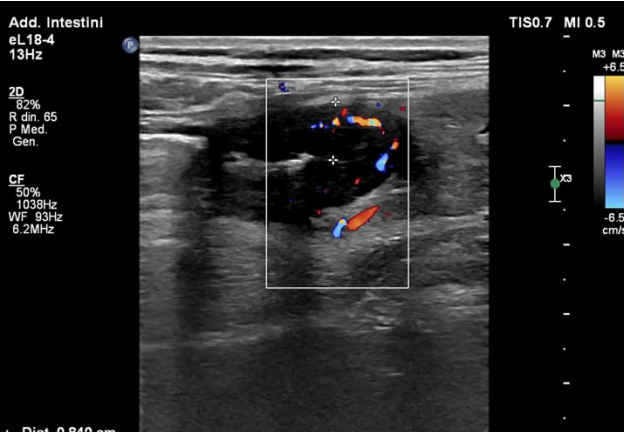
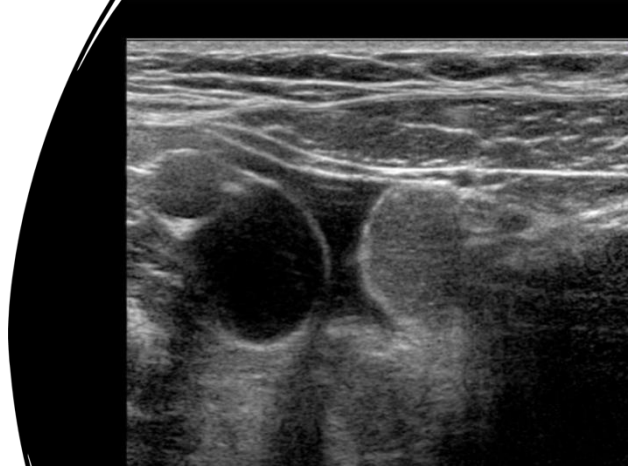
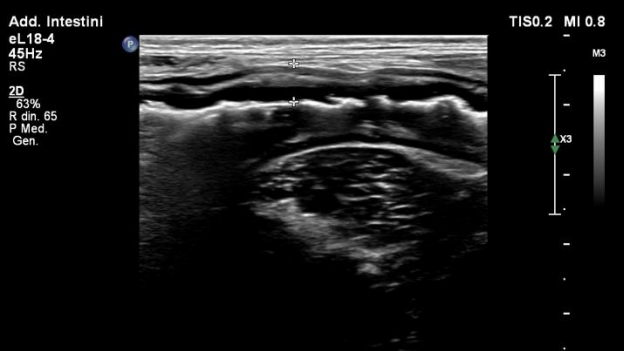


- IUS is a powerful, non-invasive tool
- increasingly used for IBD diagnosis and monitoring
- Real-time imaging of bowel wall, mesentery, and adjacent structures
- High sensitivity and specificity
- But not exclusive to IBD
- Several conditions can mimic IBD, and misinterpretation may lead to misdiagnosis

Key IUS features suggestive of IBD

- Bowel wall thickening (>3 mm)
- Loss of the typical five-layer structure (edema, inflammation)
- Hypervascularity on color Doppler (Inflammation)
- Mesenteric fat proliferation
- Enlarged lymph nodes
- Free fluid

But these findings are not exclusive to IBD... and all that causes transmural inflammation or edema can produce these findings



Ultrasound Mimics

Campylobacter,
Yersinia,
C. difficile, CMV

Infectious
(entero)Colitis



Appendicitis,
diverticulitis,
celiac disease

Other
Inflammatory
Conditions



Ischemic Colitis

Vascular
diseases



NSAIDs,
checkpoint
inhibitors,
mycophenolate

Drug-Induced
Colitis



Adenocarcinoma
lymphoma
neuroendocrine
tumors

Neoplastic
Conditions



Bowel
Endometriosis

Endometriosis



Radiation
enteritis, diversion
colitis

Others



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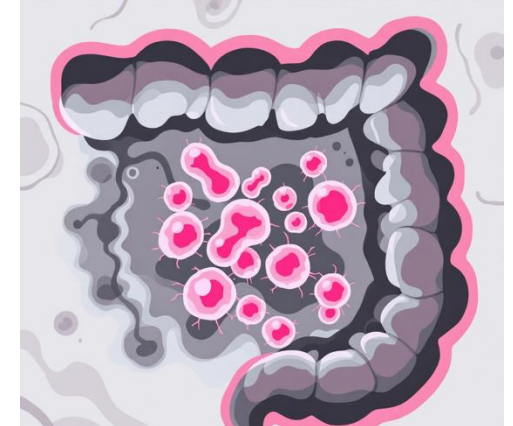
Infectious (entero)colitis: the great pretender



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Acute self-limited colitis

- Bacterial causes: Campylobacter, Salmonella, Shigella, Yersinia, E. coli, C. difficile.
- Viral: CMV, adenovirus
- Parasitic: Giardia, Entamoeba histolytica.



Clinical

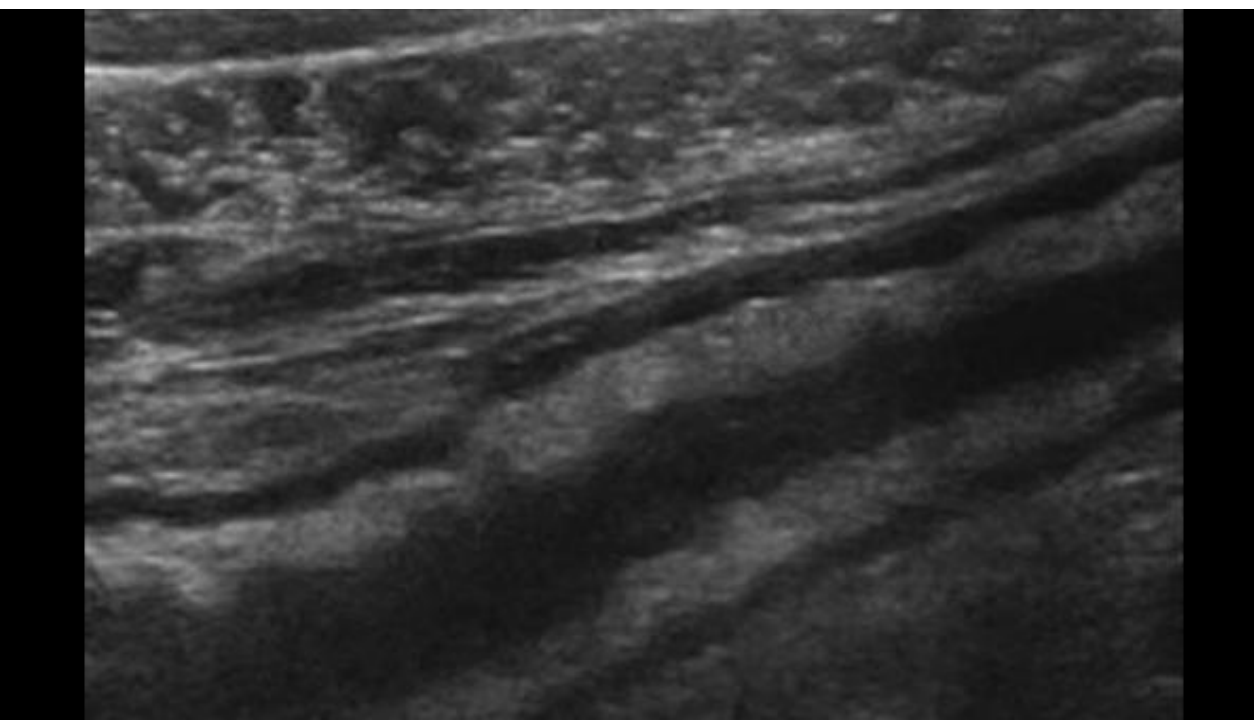
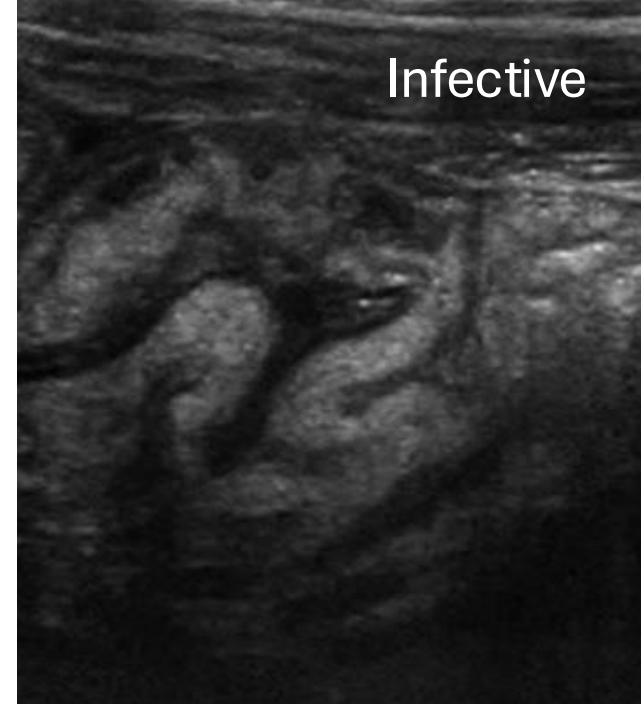
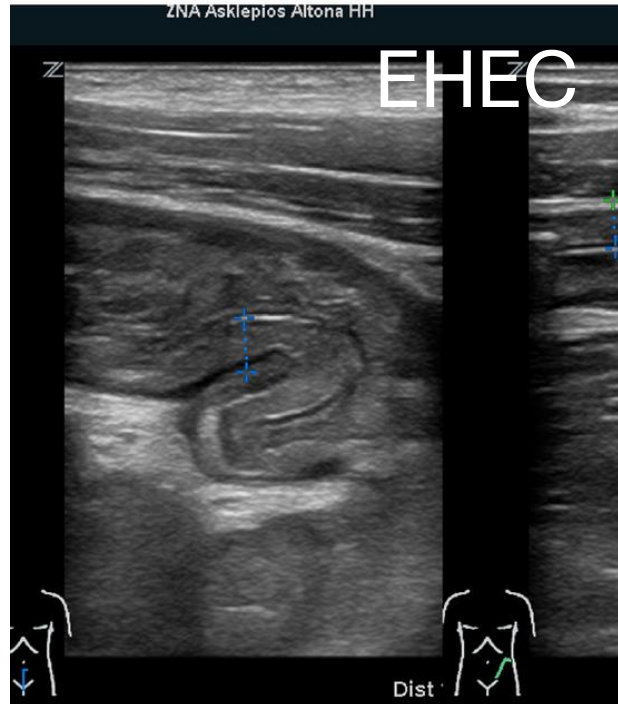
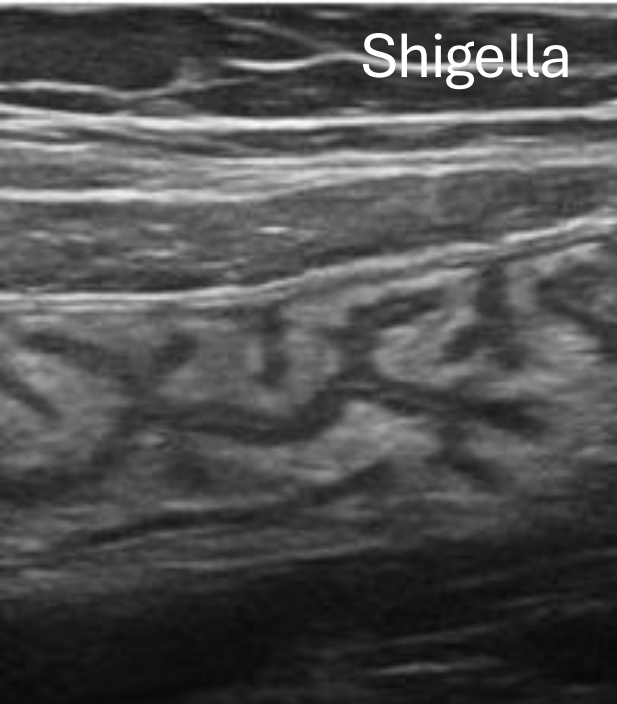
- **Acute onset** vs. chronic course
- **Rapid normalization** after therapy

Ultrasound features

- Bowel wall thickening and hypervascularization, but can be **segmental**
- Preserved **wall stratification** or prevalent submucosal edema
- Prominent reactive lymph nodes
- Minimal mesenteric **fat hypertrophy** (except for Yersinia, creeping fat → IBD)

Aprile, F et al. Medicina 2024; 60, 1402.

Gecse, K., & Vermeire, S. The lancet. Gastroenterology & hepatology, 2018; 9, 644-653

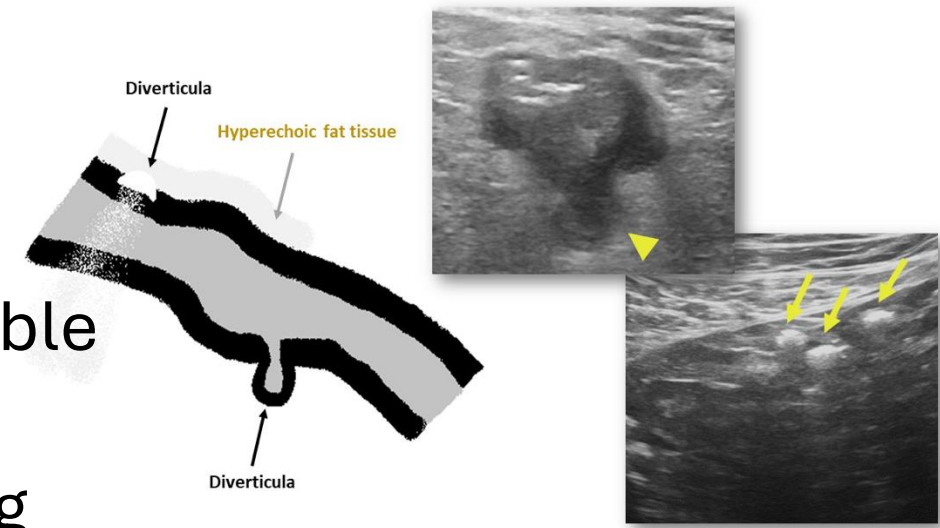


- Mainly submucosa thickening
- Preserved curvatures
- The loop maintains its elasticity and is not as rigid, straightened, and incompressible as seen in IBD



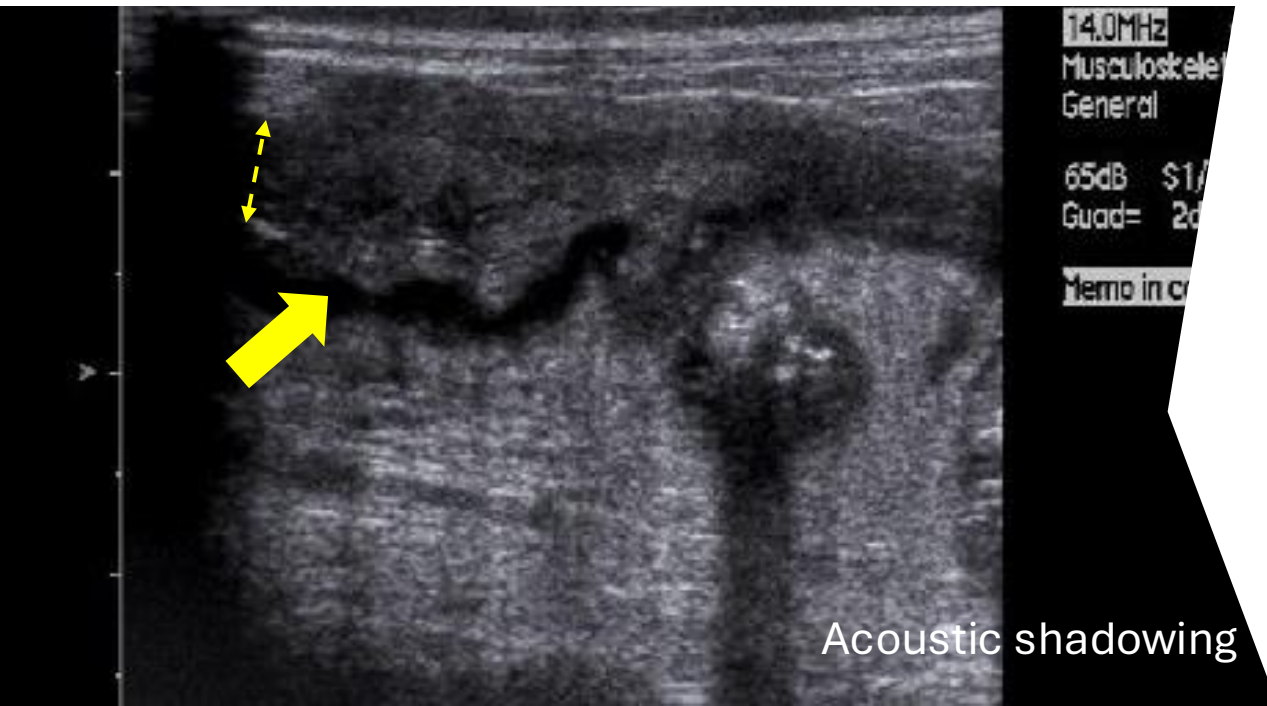
Diverticular disease

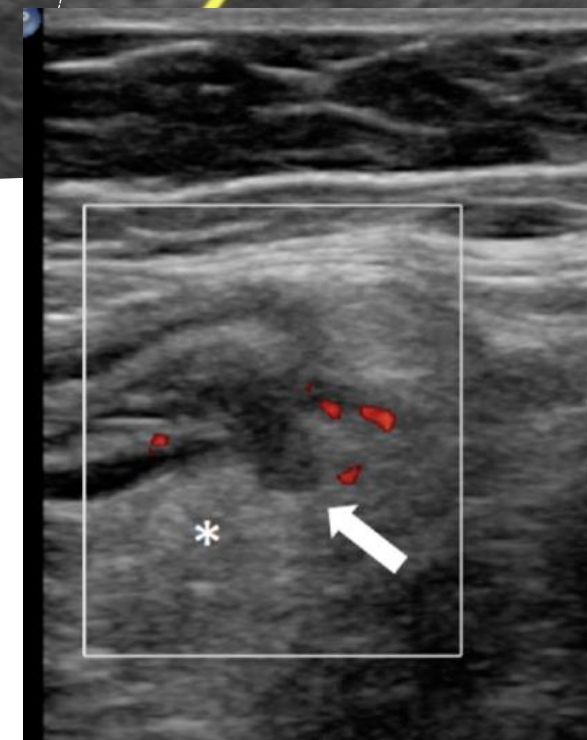
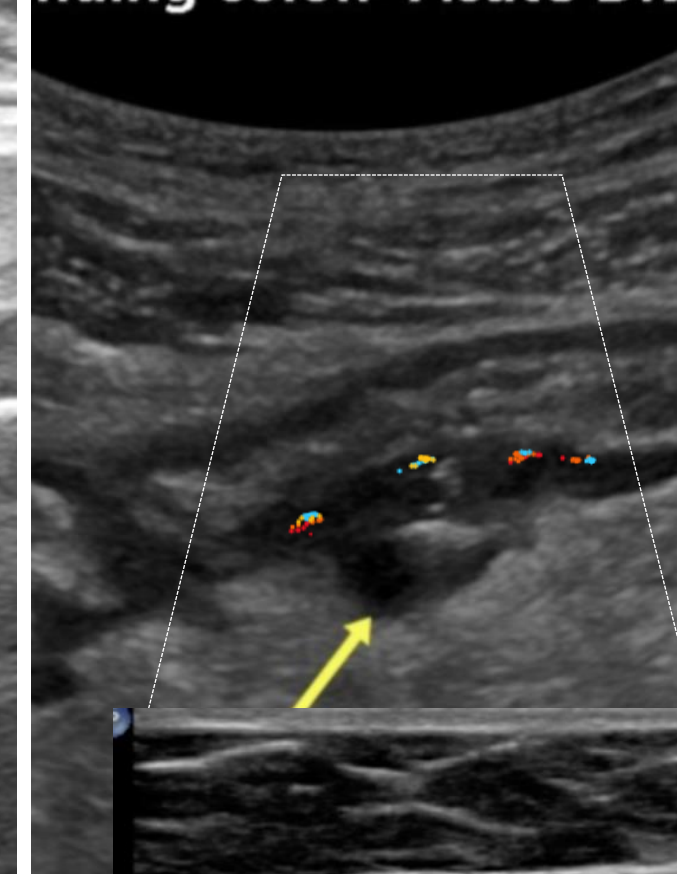
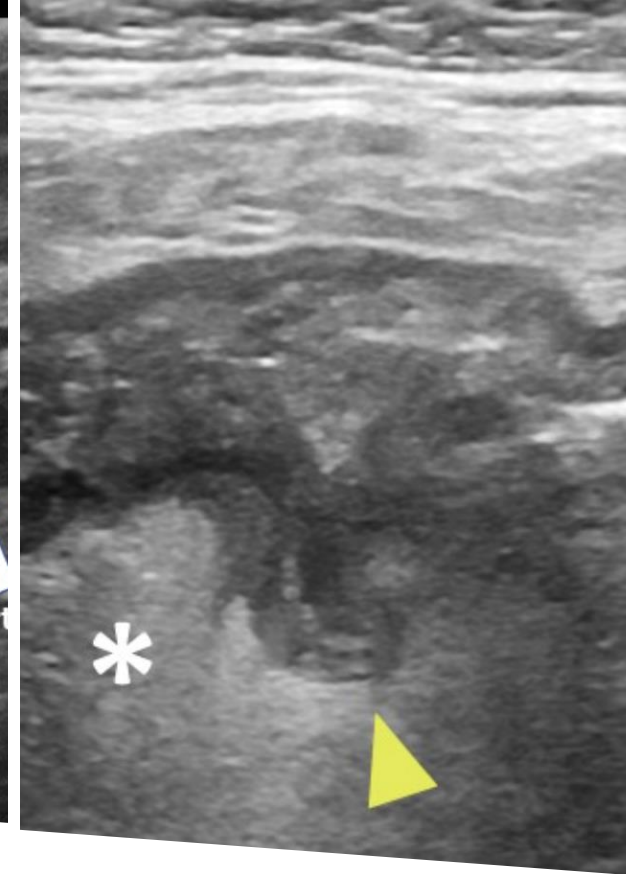
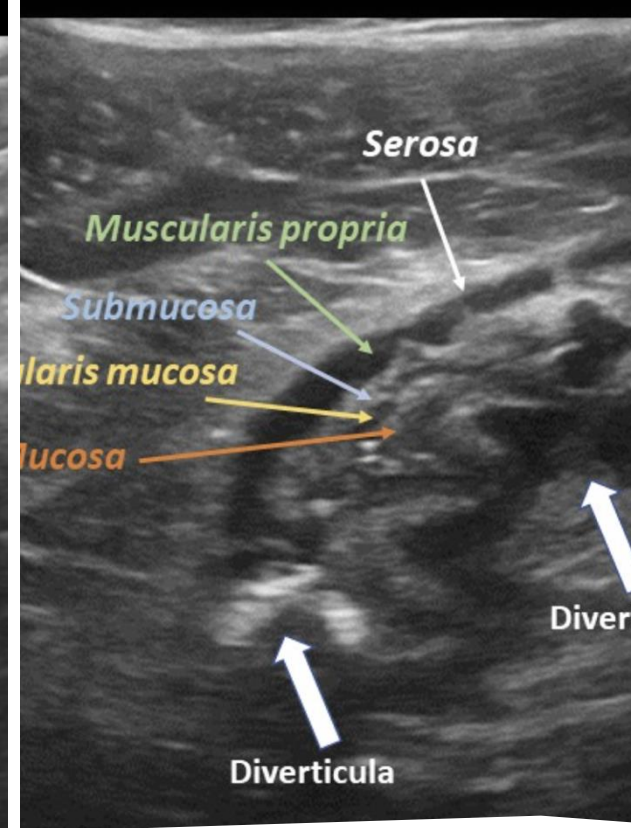
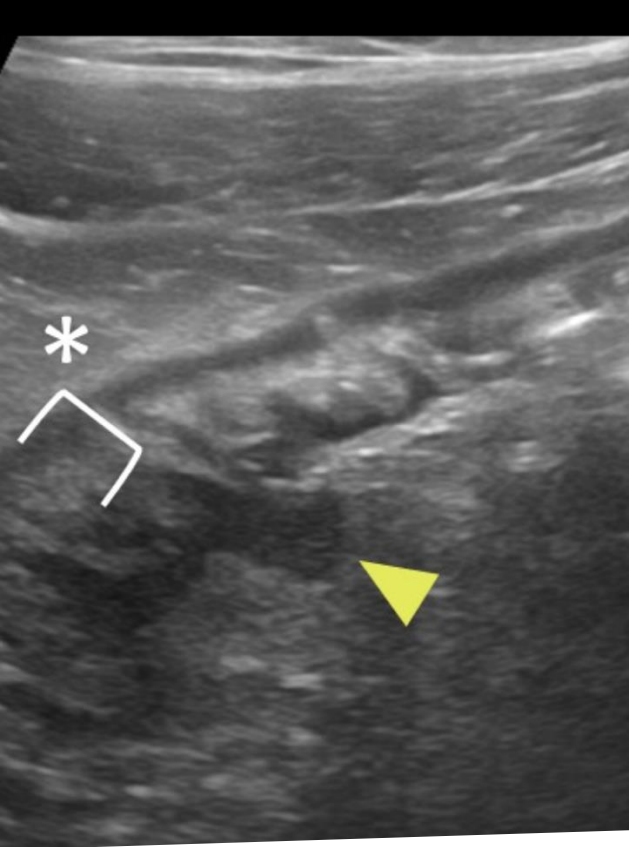
- Intestinal ultrasound has emerged as a reliable diagnostic tool for acute diverticulitis, with performance approaching that of CT imaging
- **Sensitivity:** from 61% to 98%
- **Specificity:** from 76% to 99%
- A large prospective multicenter study showed **92.7% sensitivity** and **90.9% specificity**
- In a 203-patient study, ultrasound reached **94% sensitivity** overall
- A recent prospective comparison found **ultrasound had 93.8% sensitivity and 86.7% specificity**, very close to CT



Acute diverticulitis

- Segmental bowel wall thickening
- Prevalence of the hypoechoic muscular layer
- Irregular profile of the colonic wall with loss of the smooth luminal surface and outer border
- Hypoechoic peridiverticular inflammatory reaction
- Surrounding Hyperechoic fat
- Presence of "hyperechoic sickle sign" (this likely refers to the gas/feces/fecalith within the diverticulum)
- Diverticula in surrounding segments





Acute diverticulitis

Examples with

- Single diverticulum visible
- Hyperechoic sickle
- Hyperechoic fat
- Hypertrophy of muscular layer
- Hypervascularization

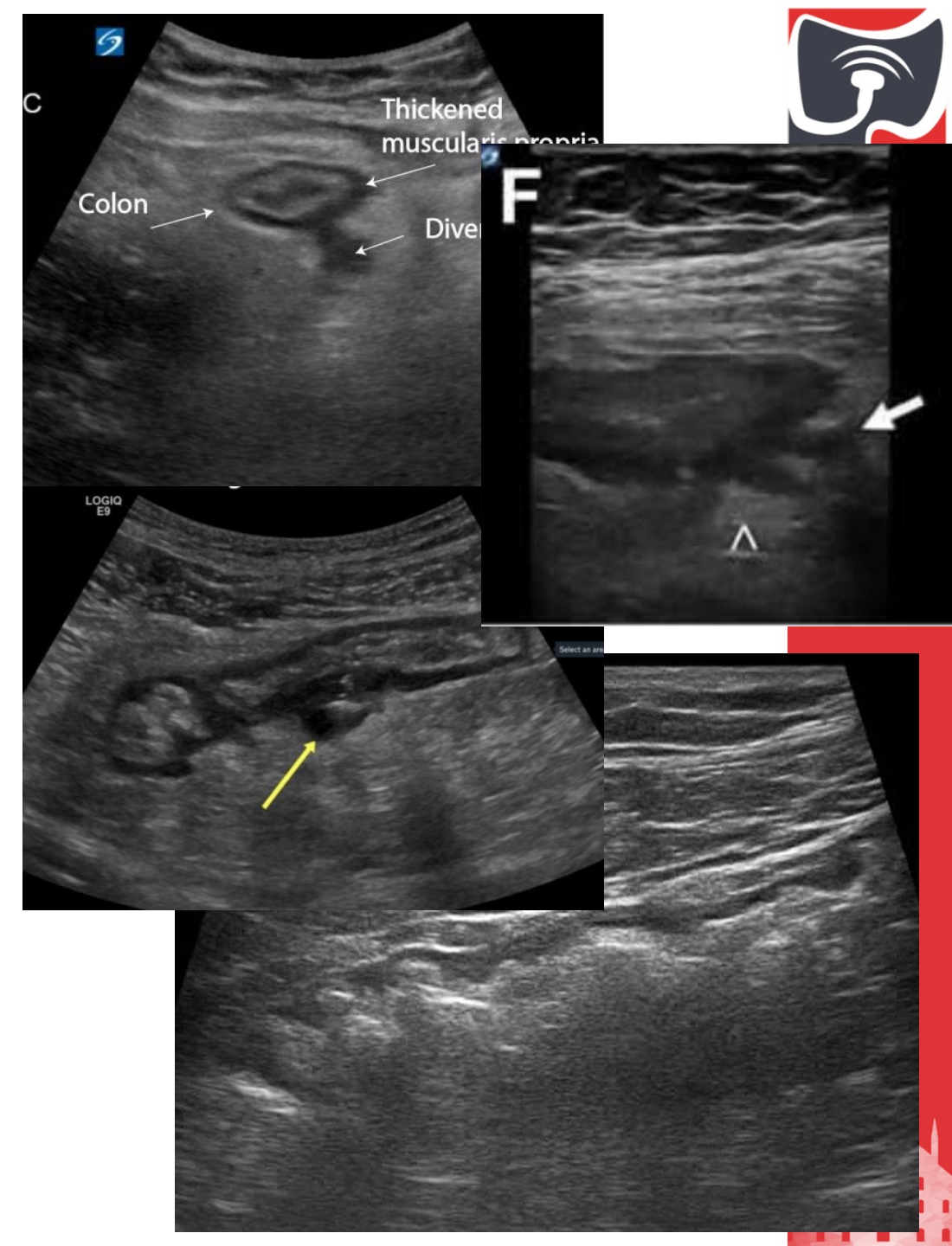
Diverticulosis

Ultrasound has been shown to be highly accurate for detecting diverticulosis

- In a study comparing ultrasound to colonoscopy, IUS detected diverticulosis with 96% sensitivity and 98.5% specificity

Typical sonographic signs include:

- Thickening of the intestinal wall (mainly muscular layer)
- Cyst-like outpouchings near the colon
- loss of the smooth colonic profile
- Presence of gas, fecaliths (sickle sign)



Diverticular disease – Diverticulosis and SUDD

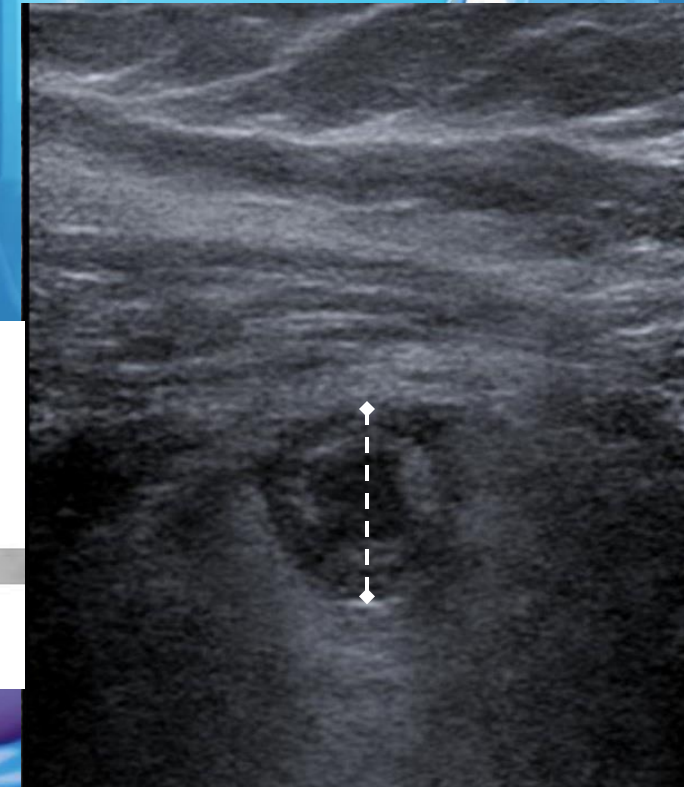
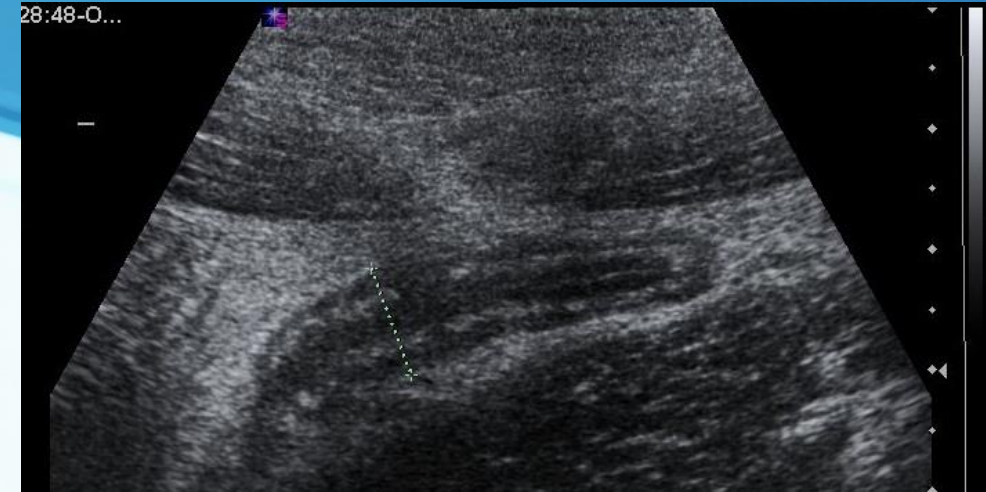


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Acute appendicitis

- IUS is an extremely important and often first-line imaging modality for the diagnosis of acute appendicitis
- Especially in children and pregnant women, due to its non-invasiveness and lack of radiation
- The appendix appears as a non-peristaltic, blind-ending tubular structure arising from the cecum
- In the transverse view, the inflamed appendix shows the classic "target" or "onion-ring" sign
- The inflamed appendix is non-compressible when graded pressure is applied with the probe.
- Diameter: The outer transverse diameter is greater than 6 mm. A diameter < 6 mm almost always excludes AA



Diagnostic Accuracy of Ultrasound



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How reliable is ultrasound for acute appendicitis?

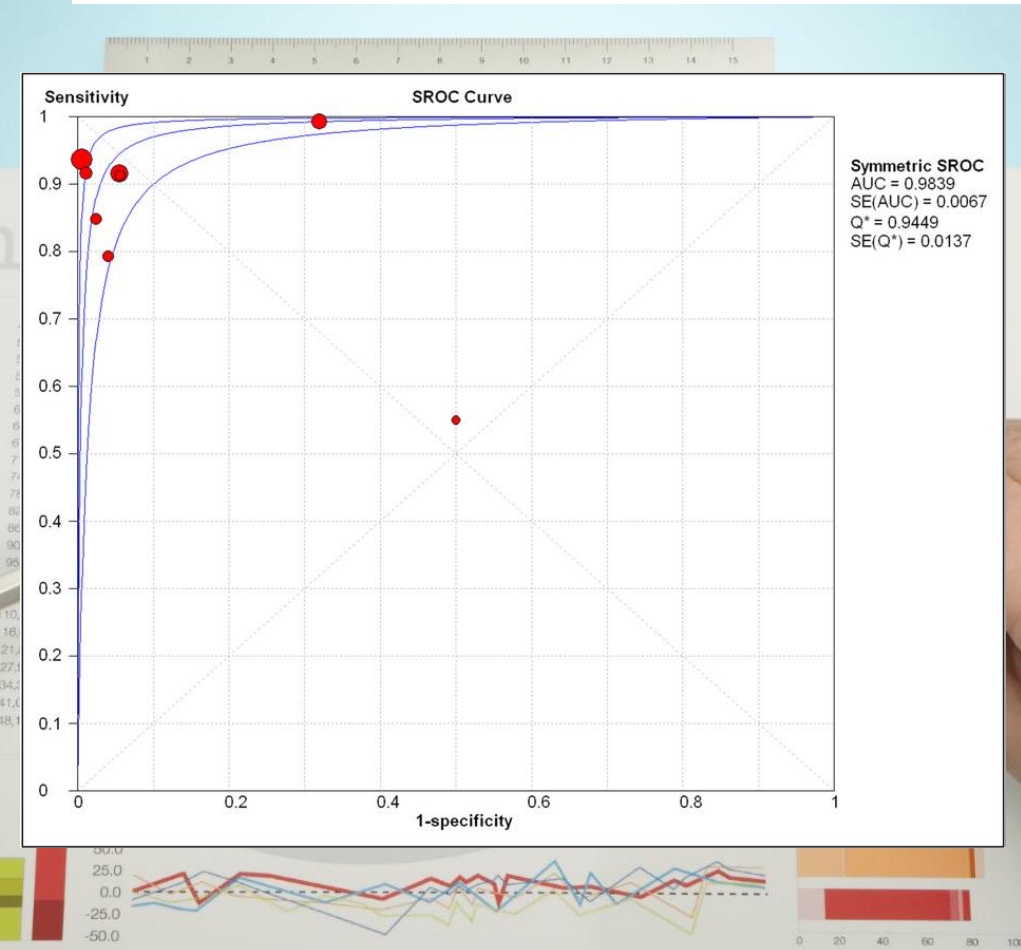
MA (By Carroll)

- Number of studies (appendicitis): 8
- Total patients: 1,268
- Pooled sensitivity: **0.92** (95% CI: 0.887–0.939)
- Pooled specificity : **0.96** (95% CI: 0.946–0.974)
- Subsequent papers reported
 - Sensitivity **80-95%**
 - Specificity **84-100%**

S. Xifara et al. *Hellenic Journal of Surgery*, 85 (2013): 35-41.

Hamdan et al. *International Journal of Advanced Research* (2021)

M. Hanafi et al. *International Journal of Pediatrics*, 7 (2019): 8787-8793



Celiac disease

Ultrasound can detect small bowel changes suggestive of celiac disease.

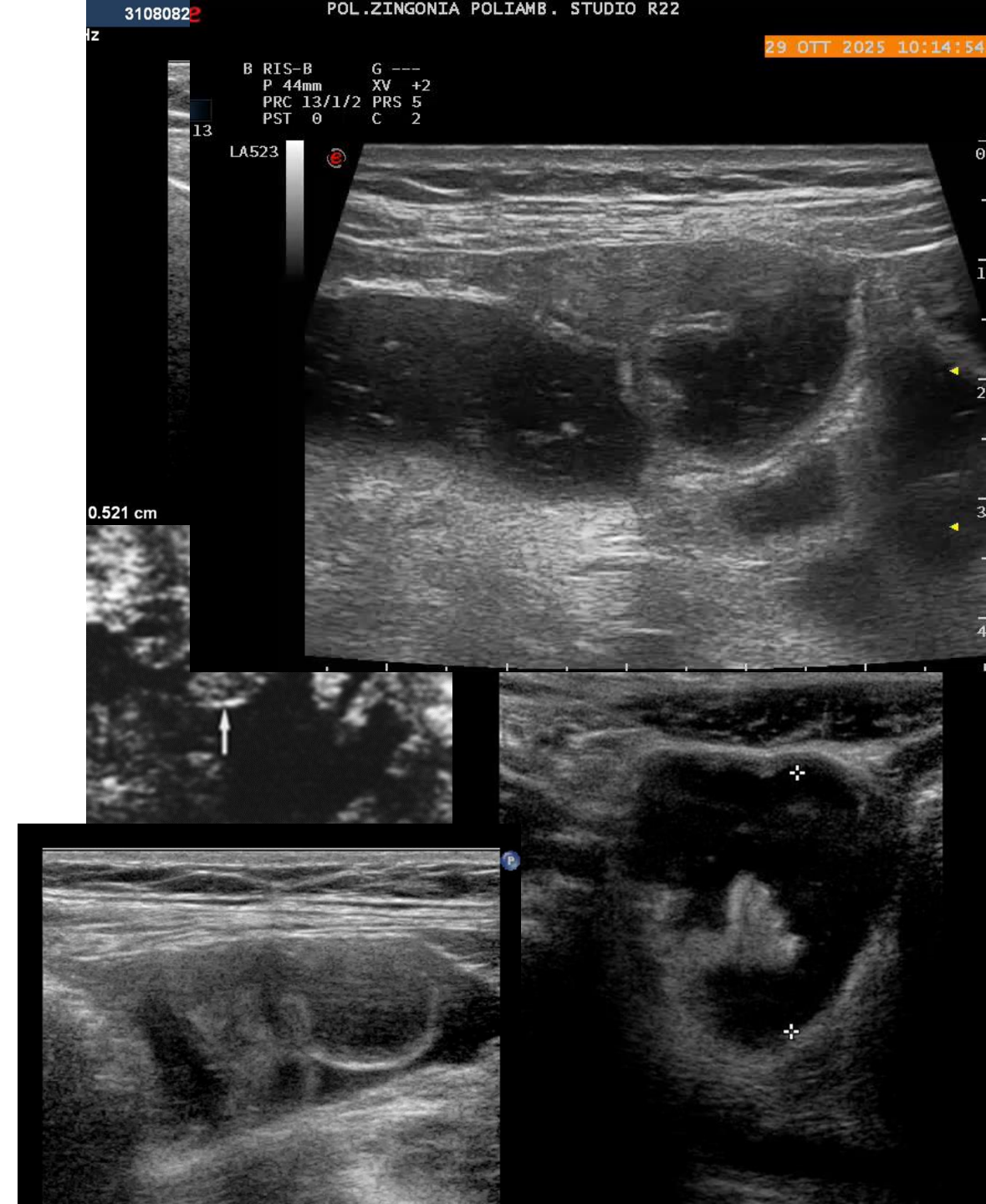
Common ultrasound findings include:

- Thickened intestinal wall
- Reversed Fold Pattern: This shows compensatory changes, including developing prominent folds, leading to a "jejunization of the ileum"
- Dilated small bowel (increased liquid content)
- Focal or segmental thickening
- mesenteric lymphadenopathy
- Increased peristalsis

Intestinal ultrasound can detect several indirect signs of celiac disease and may support/suggest diagnosis

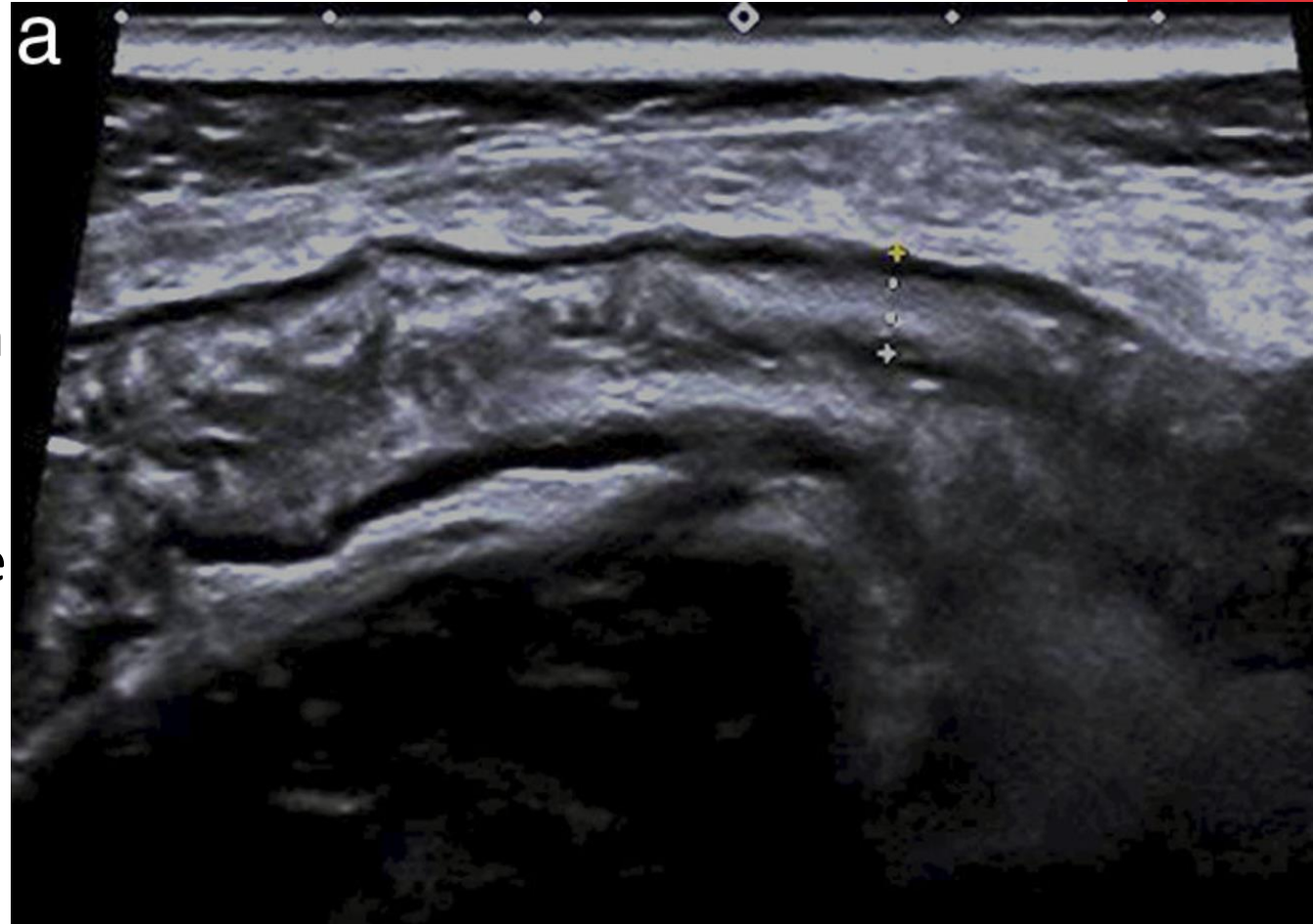
Fraquelli et al. Arch Intern Med 2004

Rossi R.E. et al. Current Gastroenterology Reports, 25 (2023): 430-439.



Ischemic colitis

- Bowel wall thickening: uniform and symmetric segmental thickening
- Armonic: The five-layer structure of the colon wall may be preserved
- Pericolic Changes: fat stranding or edema or free peritoneal fluid can be observed.
- Important finding in acute IC is the absence of visible color Doppler flow in the thickened bowel wall (unfavorable outcome)
- The most common location for IC is the left colon (splenic flexure, descending colon, and sigmoid colon).



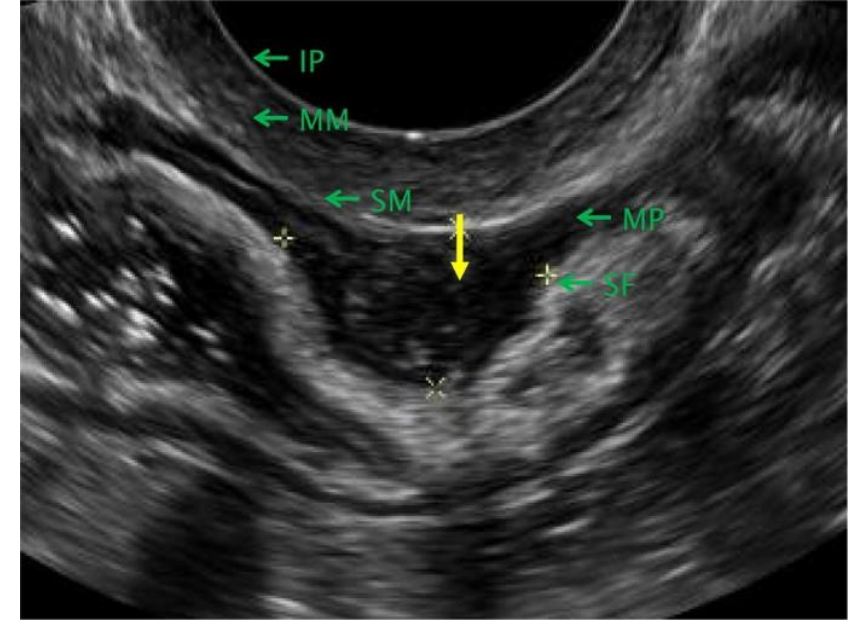
Drug-induced colitis

- Intestinal ultrasound can detect inflammatory changes in drug-induced colitis (including immune checkpoint inhibitors – and mycophenolate-related colitis)
- Picture similar to IBD
- Diagnostic specificity is limited
- Integration with clinical information (drug exposure, symptoms, timing, laboratory findings) is mandatory
- IUS may help monitor disease activity or treatment response (Bowel wall thickening, Increased vascularity, Loss of wall stratification)



Bowel Endometriosis

- Typical sites of intestinal involvement
 - Rectosigmoid colon ($\approx 70\%$)
 - Ileum
 - appendix (less common)
- Lesions are serosal, muscular or submucosal → endoscopy may be normal

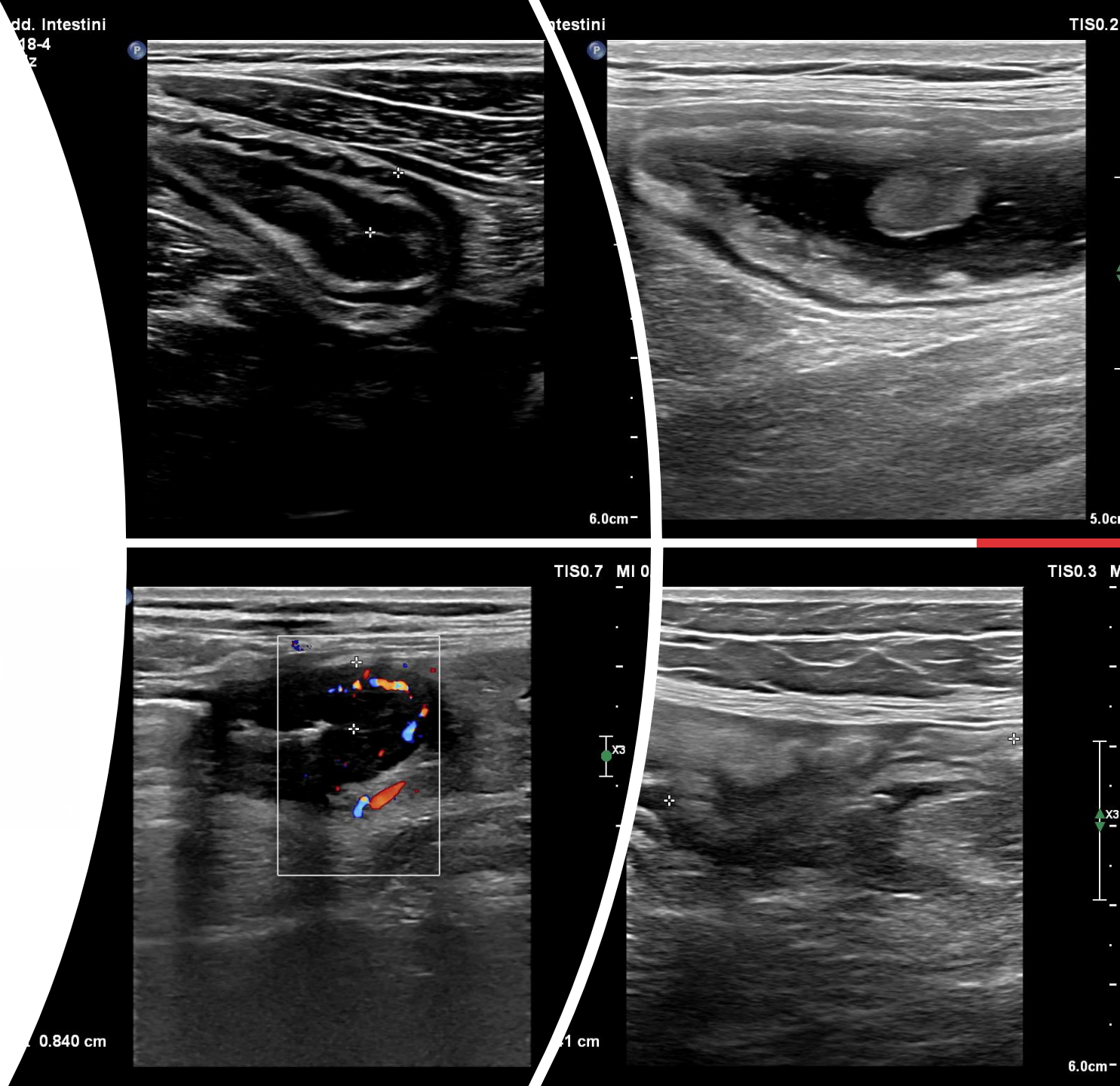


	Bowel Endometriosis	IBD (Crohn/UC)
Lesion morphology	Focal hypoechoic nodule infiltrating muscular layer	Diffuse wall thickening
Wall stratification	Often preserved or focally disrupted	Diffuse loss
Vascularity (Doppler)	Low to moderate	Marked hypervascularity
Perilesional fat	Minimal, no “creeping fat”	Common in Crohn’s
Peristalsis	Reduced or absent (fixed loop)	Variable
Other findings	Adhesions, fixed bowel loop, uterine/ovarian lesions nearby	Systemic inflammation, lymphadenopathy

**...in some cases
bowel wall
thickening is
neoplastic**

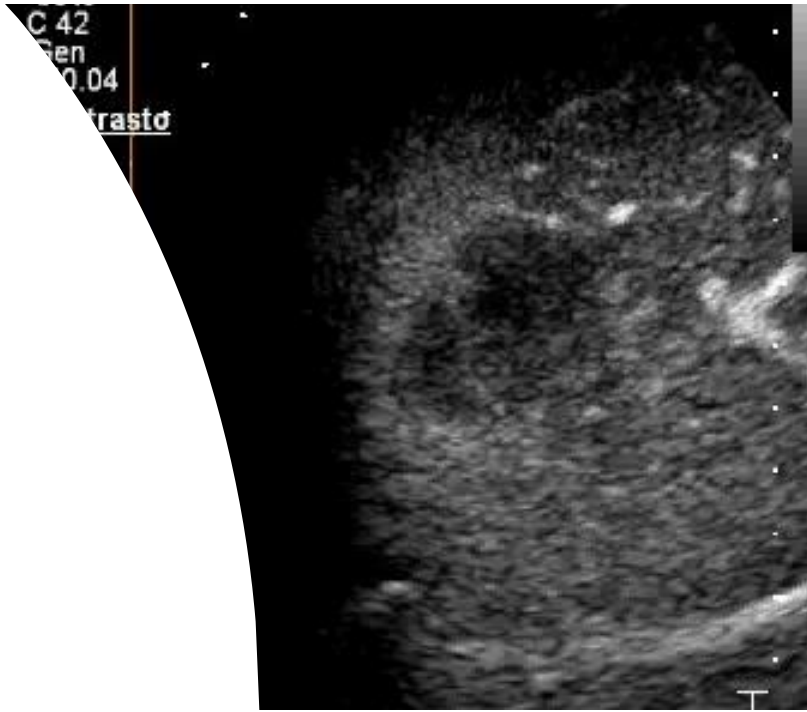


→ Key red flags: Focal, asymmetric, or mass-forming thickening → consider tumor.



...Not All Neoplastic Thickening Follows Expected Patterns

- This was a patient followed for Crohn's disease
- who then was diagnosed as having an ileal neuroendocrine neoplasm
- Diagnosis was made as he also had hepatic lesions visible at ultrasound, that were biopsied



Take-Home Messages

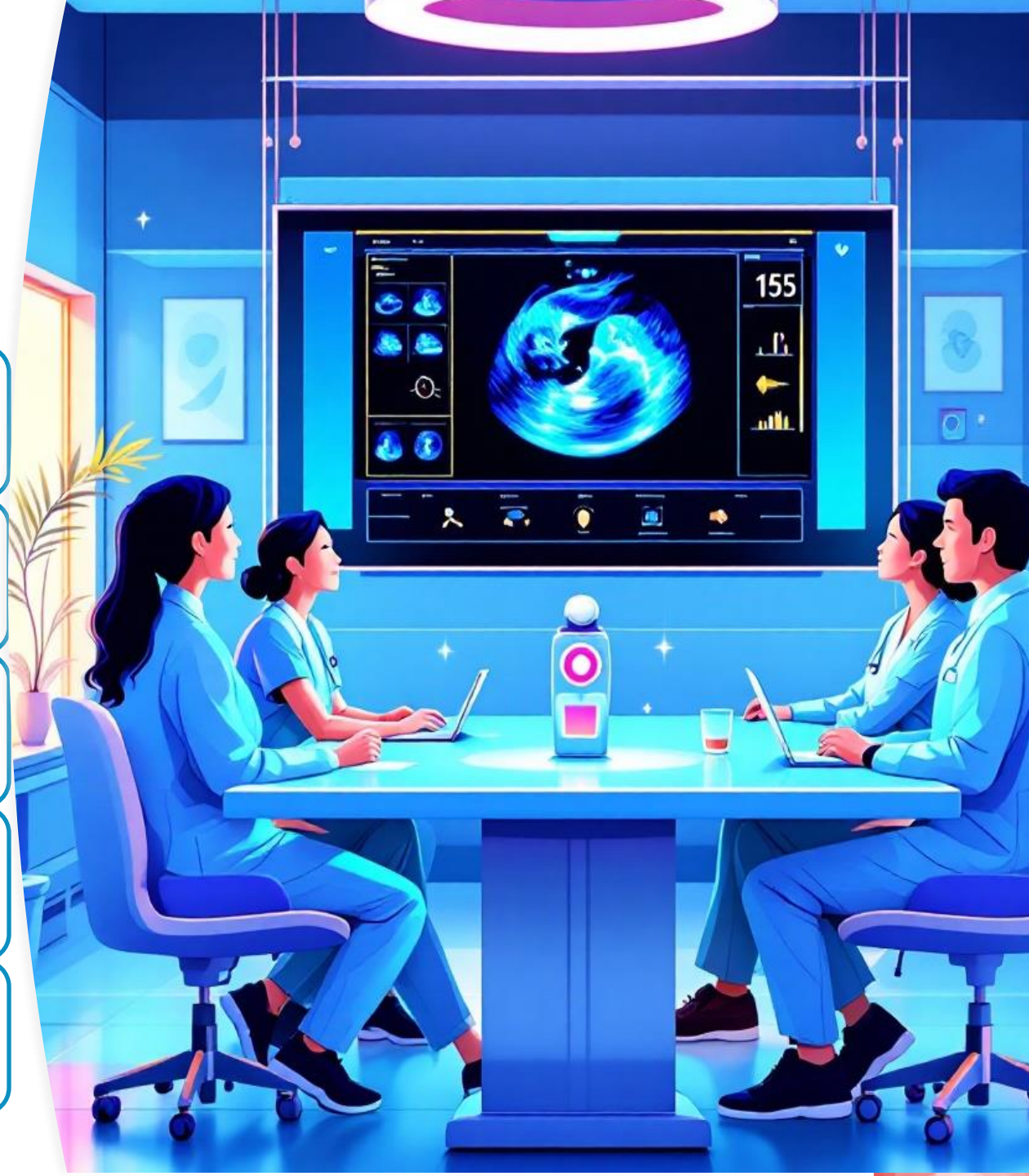
IUS is powerful but not specific

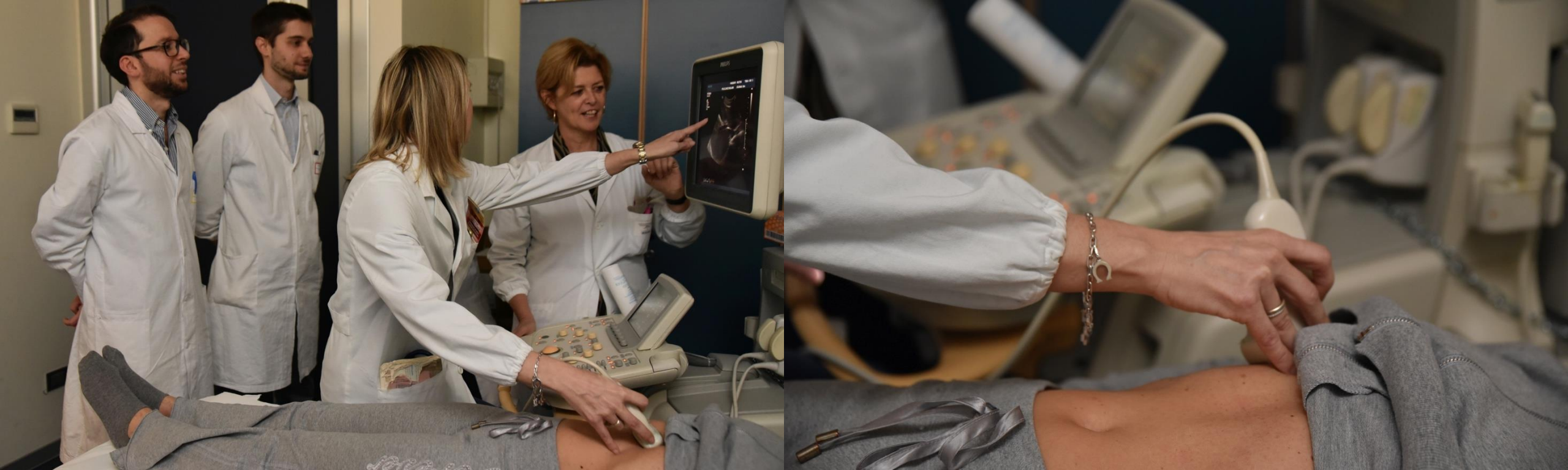
It continues to be an indispensable tool in clinical practice

Infectious, ischemic, drug-induced, and neoplastic causes can all mimic IBD

Clinical and laboratory context are mandatory

Repeat and integrate your exam if doubts





Thank You

Massironi.sara1@hsr.it





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Thank you