

# Interactive Case Presentation: Detecting complications in CD

**Cathy Lu**

University of Calgary, Canada

**IBUS Advanced Ultrasound Workshop – Module 3**

DDW, Chicago, IL, May 4<sup>th</sup>, 2026

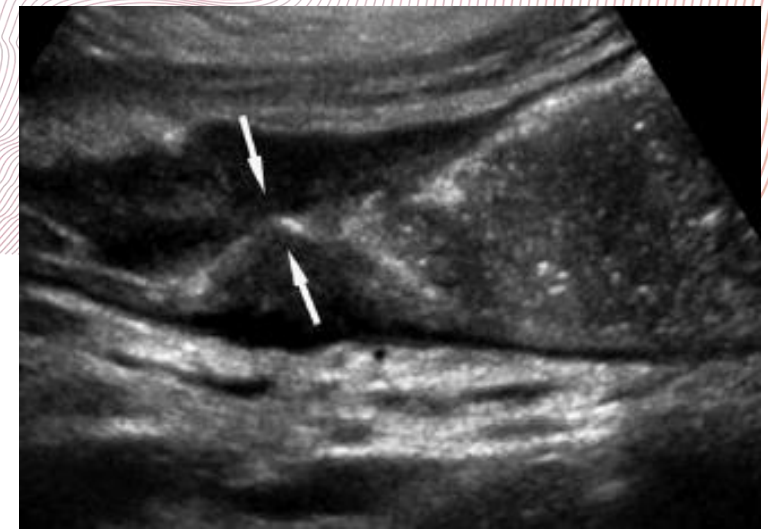
Workshop organised in collaboration with

## Disclosure

**Speaker Fees** – Abbvie, Avir, JnJ, Takeda

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

**Grant Funding**- Helmsley Charitable Trust, Abbvie



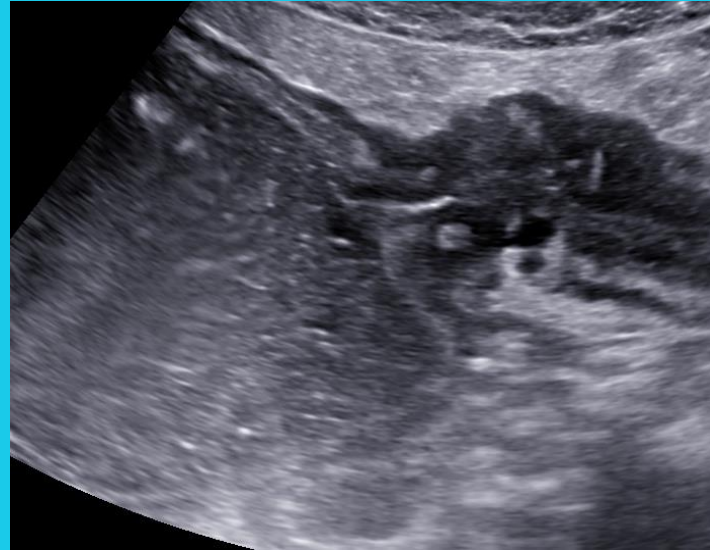
# 3 Criteria to Diagnose Small Bowel Strictures in Crohn's Disease on Intestinal Ultrasound

## Bowel Wall Thickness



**Bowel wall thickness > 3mm**

## Luminal Apposition



**Luminal narrowing < 1cm**

## Pre-Stenotic Dilation

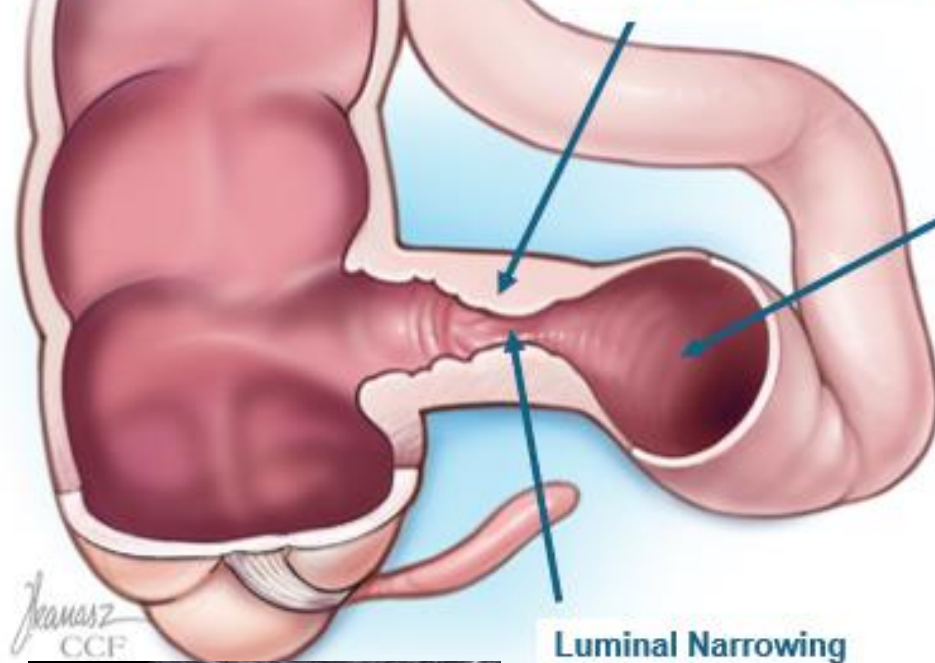


**Pre-stenotic dilation > 2.5cm**

# International expert guidance for defining and monitoring small bowel strictures in Crohn's disease on intestinal ultrasound: a consensus statement

Cathy Lu, Ryan Rosentreter, Claire E Parker, Julie Remillard, Stephanie R Wilson, Mark E Baker, Gauraang Bhatnagar, Jakob Begun, David H Bruining, Robert V Bryant, Britt Christensen, Brian G Feagan, Joel G Fletcher, Ilyssa Gordon, Gaylyn Henderson, Vipul Jairath, John Knudsen, Torsten Kucharzik, Kyle Lesack, Christian Maaser, Giovanni Maconi, Kerri Novak, Jordi Rimola, Stuart A Taylor, Rune Wilkens, Florian Rieder, on behalf of the Stenosis Therapy and Anti-Fibrotic Research (STAR) consortium

## Clinical Practice versus Clinical Trial



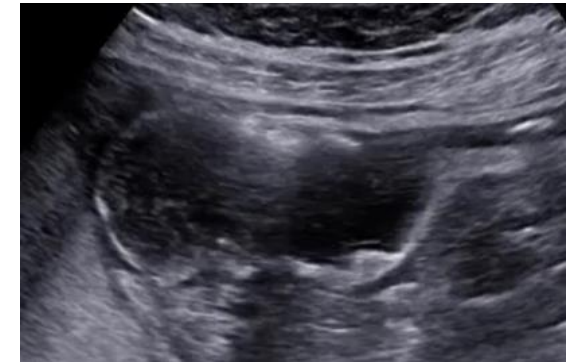
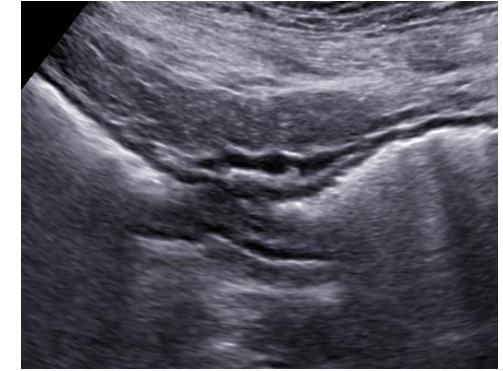
**Bowel Wall Thickness  $> 3\text{mm}$**

**Pre-stenotic Dilation:**

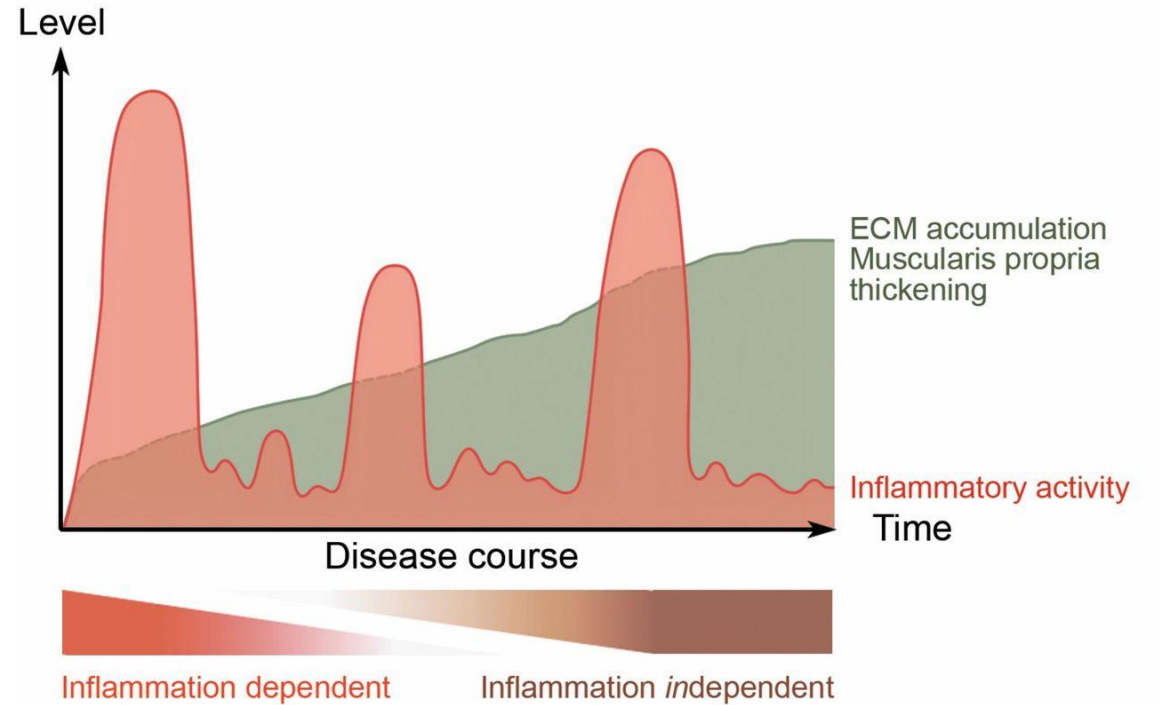
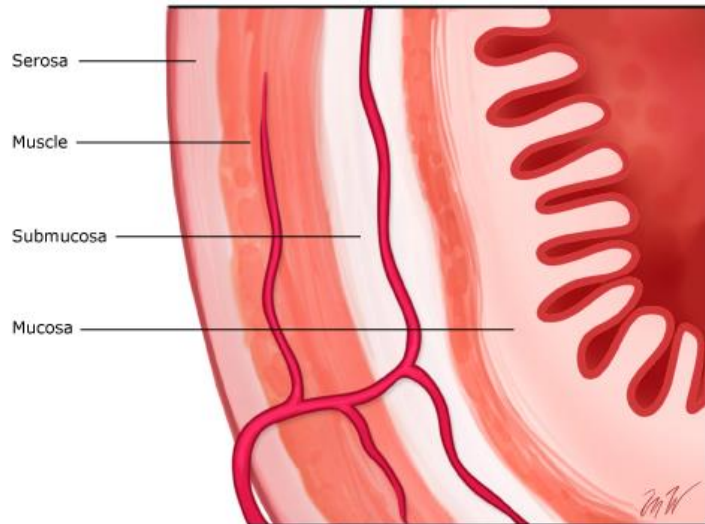
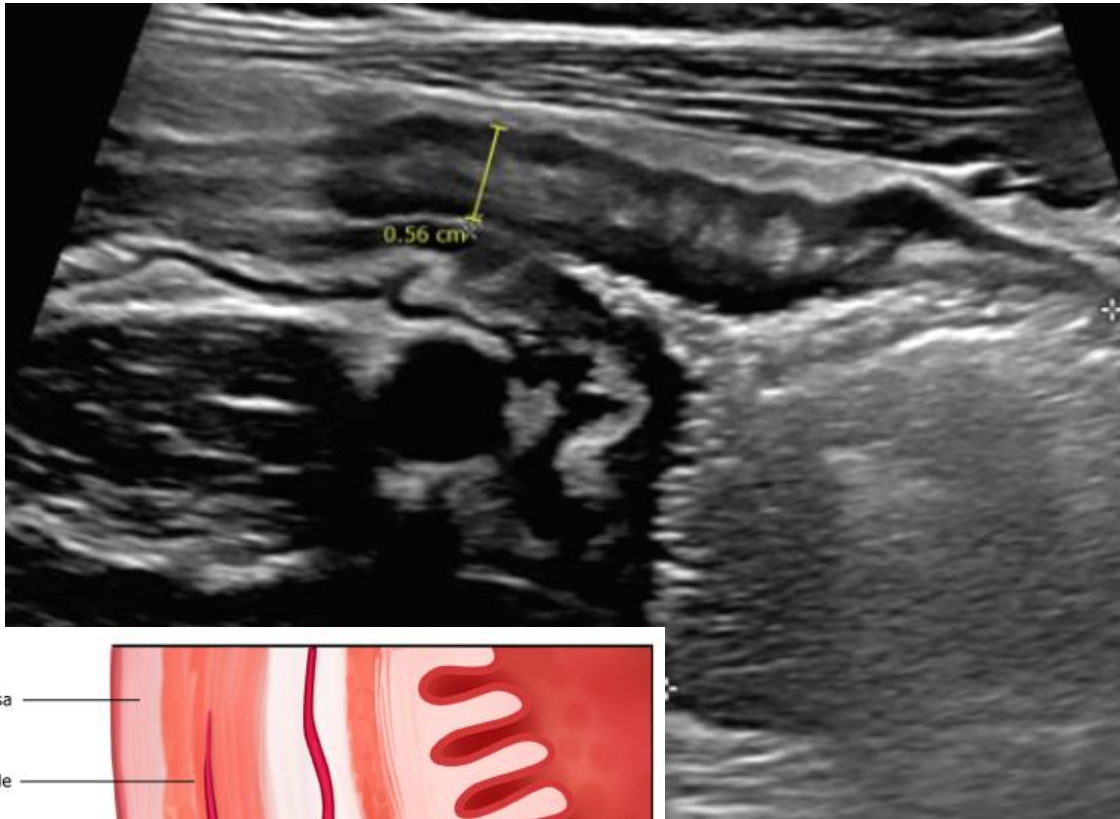
1.  $> 2.5\text{ cm}$  or
2.  $> 50\%$  increase in bowel diameter relative to normal adjacent bowel loop or
3. Unequivocal increase in bowel diameter relative to normal adjacent bowel loop

**Luminal Narrowing**

1.  $< 1\text{cm}$  or
2.  $< 50\%$  relative to normal adjacent bowel loop



# Where does fibrosis deposit in the bowel?



- Submucosa
- Muscularis Propria and mucosae

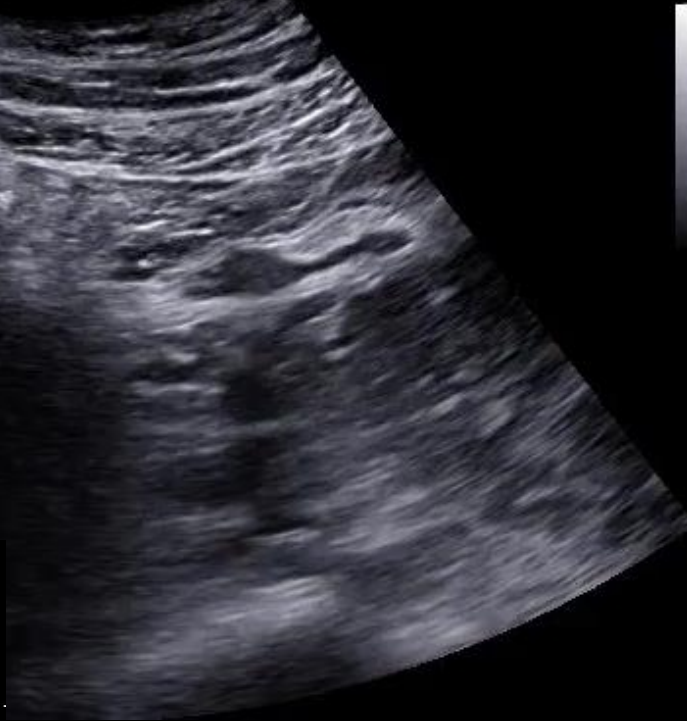
# Variants of Small Bowel CD Strictures

Consensus Recommendations  
for Evaluation, Interpretation,  
and Utilization of Computed  
Tomography and Magnetic  
Resonance Enterography in  
Patients With Small Bowel  
Crohn's Disease<sup>1</sup>

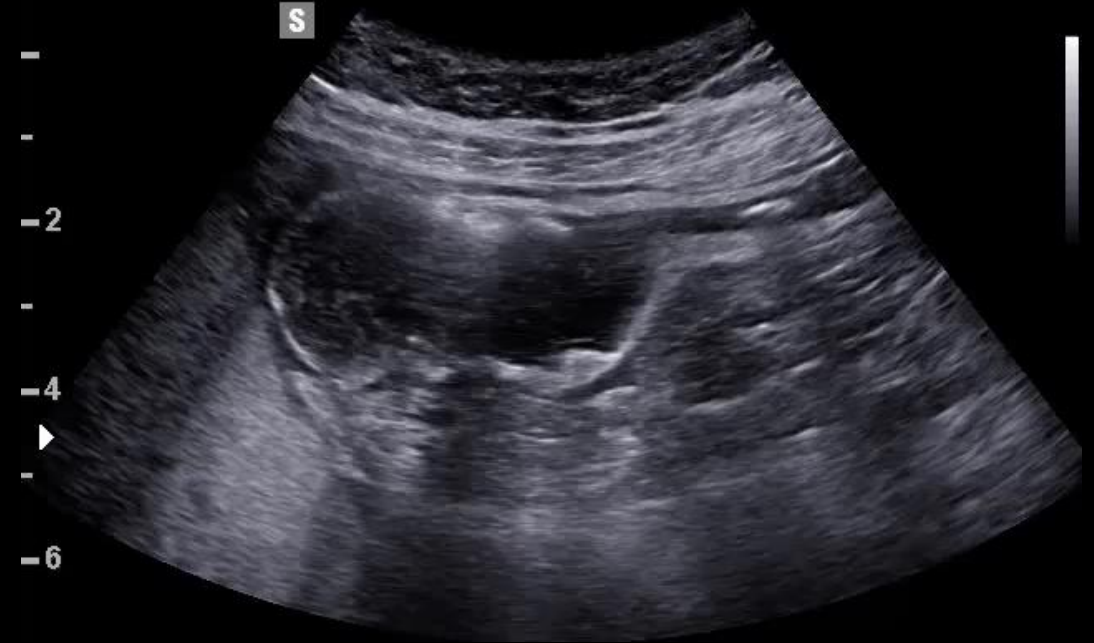
Radiology

Without upstream  
dilation

Upstream lumen <3 cm  
When multiple pulse sequences,  
fluoroscopic observation, or serial  
imaging exams demonstrated fixed  
narrowing without upstream dilation,  
it is appropriate to describe that a  
**probable stricture** is present



Without Dilation

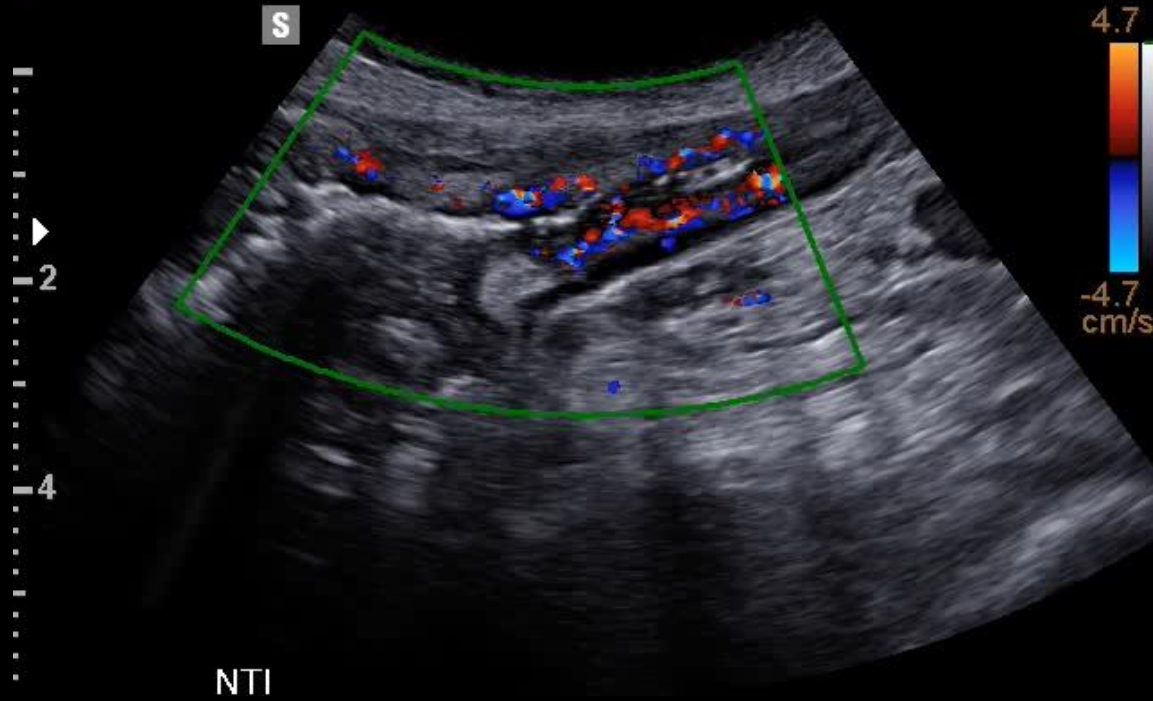


With Dilation



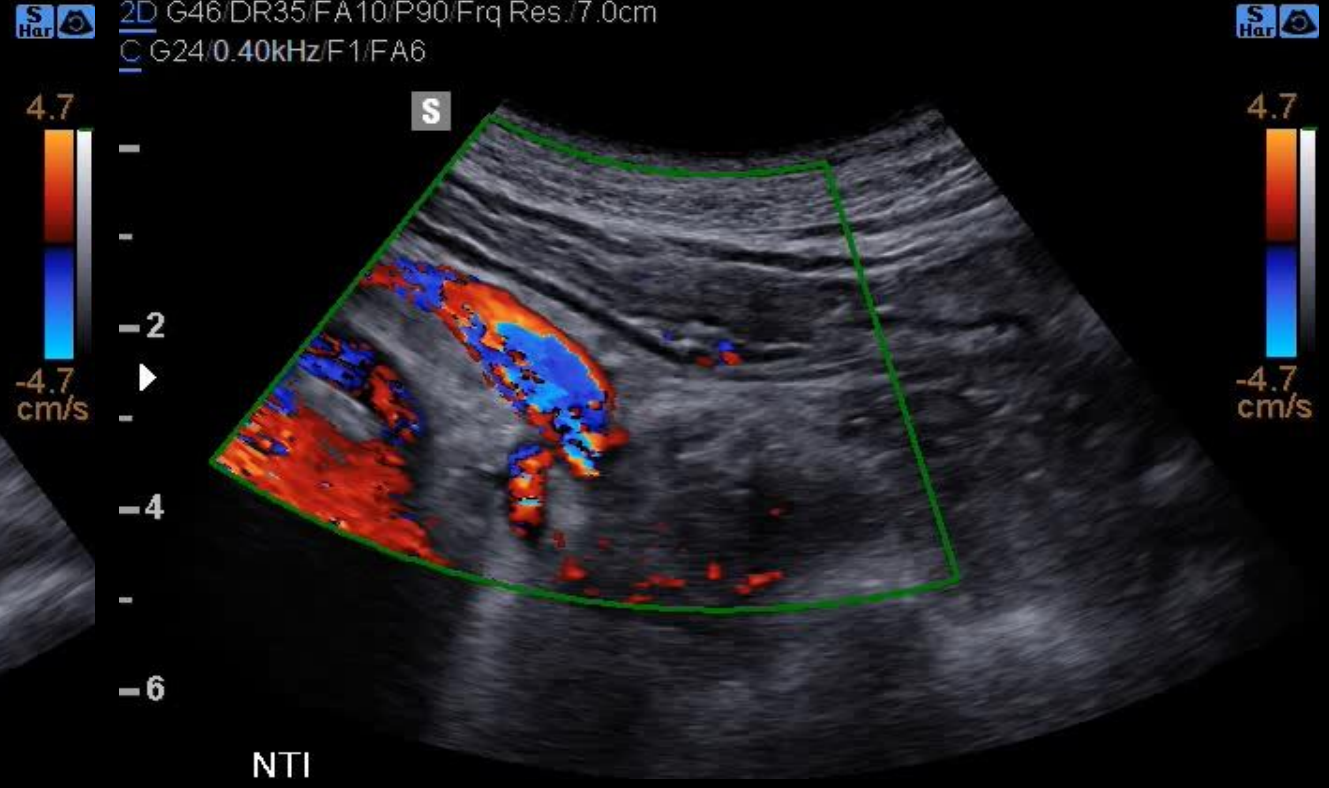
# Variants of Small Bowel CD Strictures

CA3-10A / Abdomen / FPS11 / MI1.1 / TIs0.4 / 2024-02-13 11:24:54 AM  
2D G46/DR35/FA10/P90/Frq Res./6.0cm  
C G56/0.40kHz/F1/FA6



**Hot Stricture**

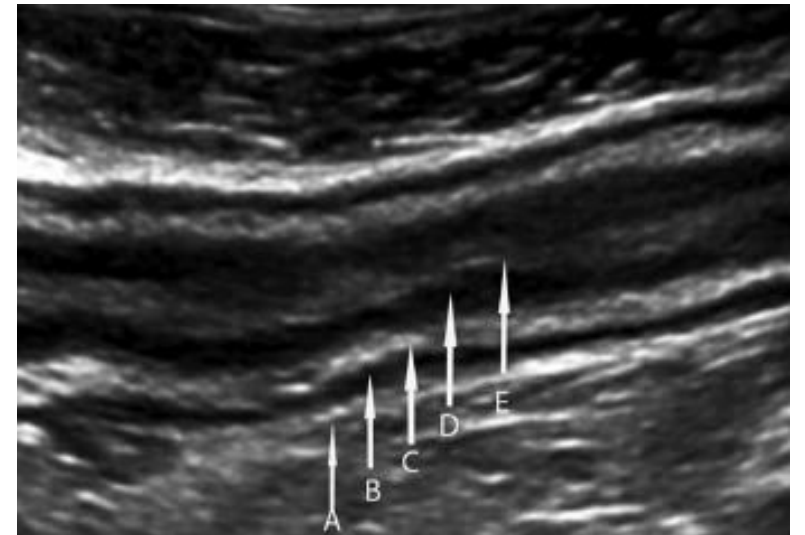
CA3-10A / Abdomen / FPS11 / MI1.0 / TIs0.4 / 2023-12-20 09:26:35 AM  
2D G46/DR35/FA10/P90/Frq Res./7.0cm  
C G24/0.40kHz/F1/FA6



**Cold stricture**

## Case

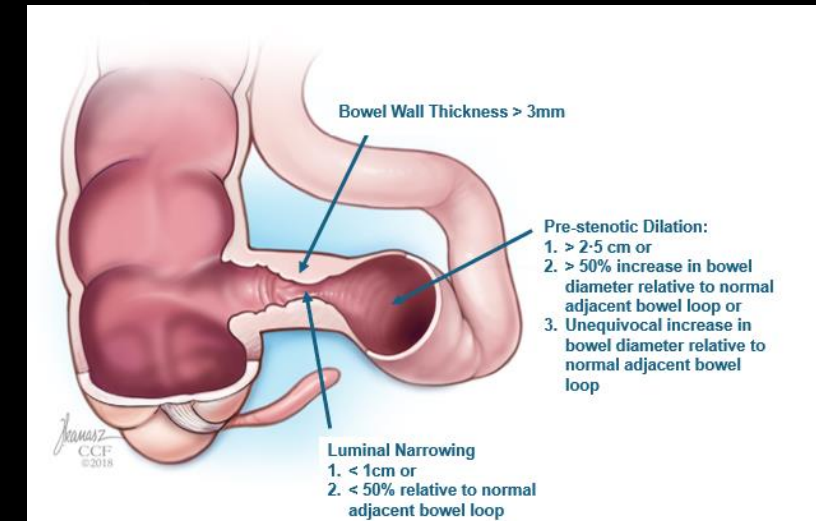
- 66 year old female with fibrostenotic CD x 20 years
- 2 past resections with last surgery 8 years ago
- No obstructive symptoms
- Bio naive; afraid of side effects of medications
- Fecal calprotectin 401 ug/g
  
- PMHX - HTN





# IUS of NTI

1. Bowel wall thickness
2. Color Doppler Signal
3. Inflammatory fat
4. Loss of stratification



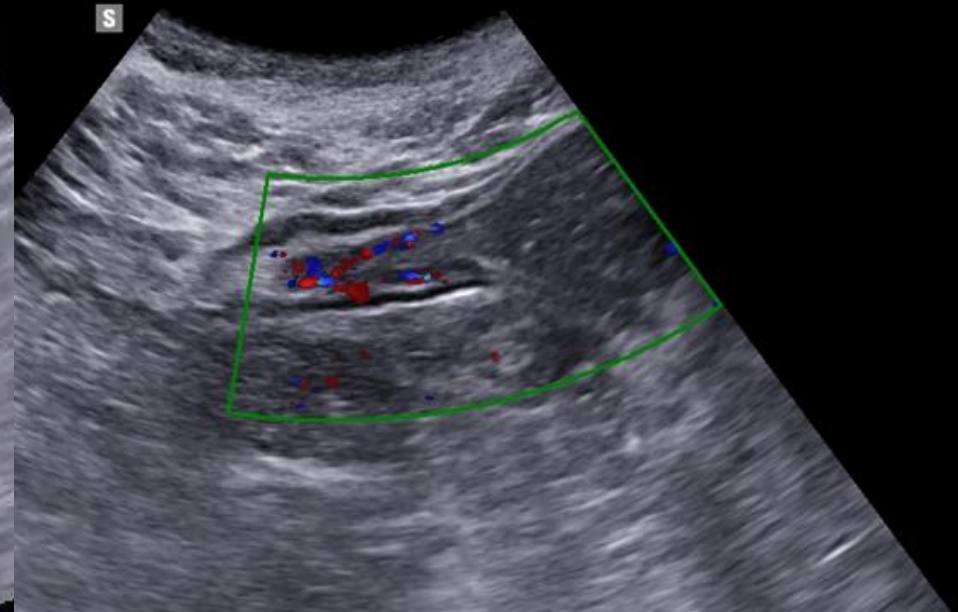
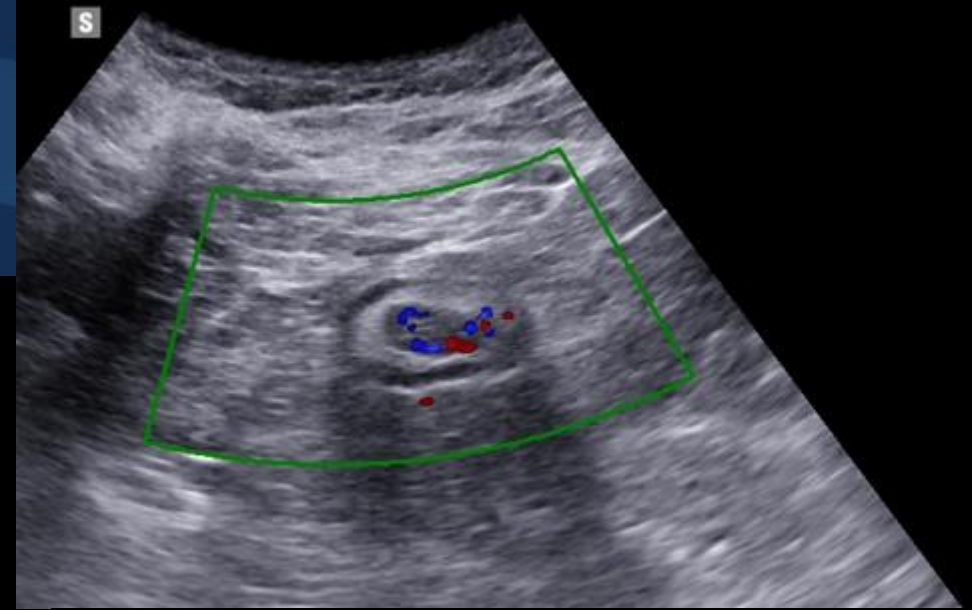
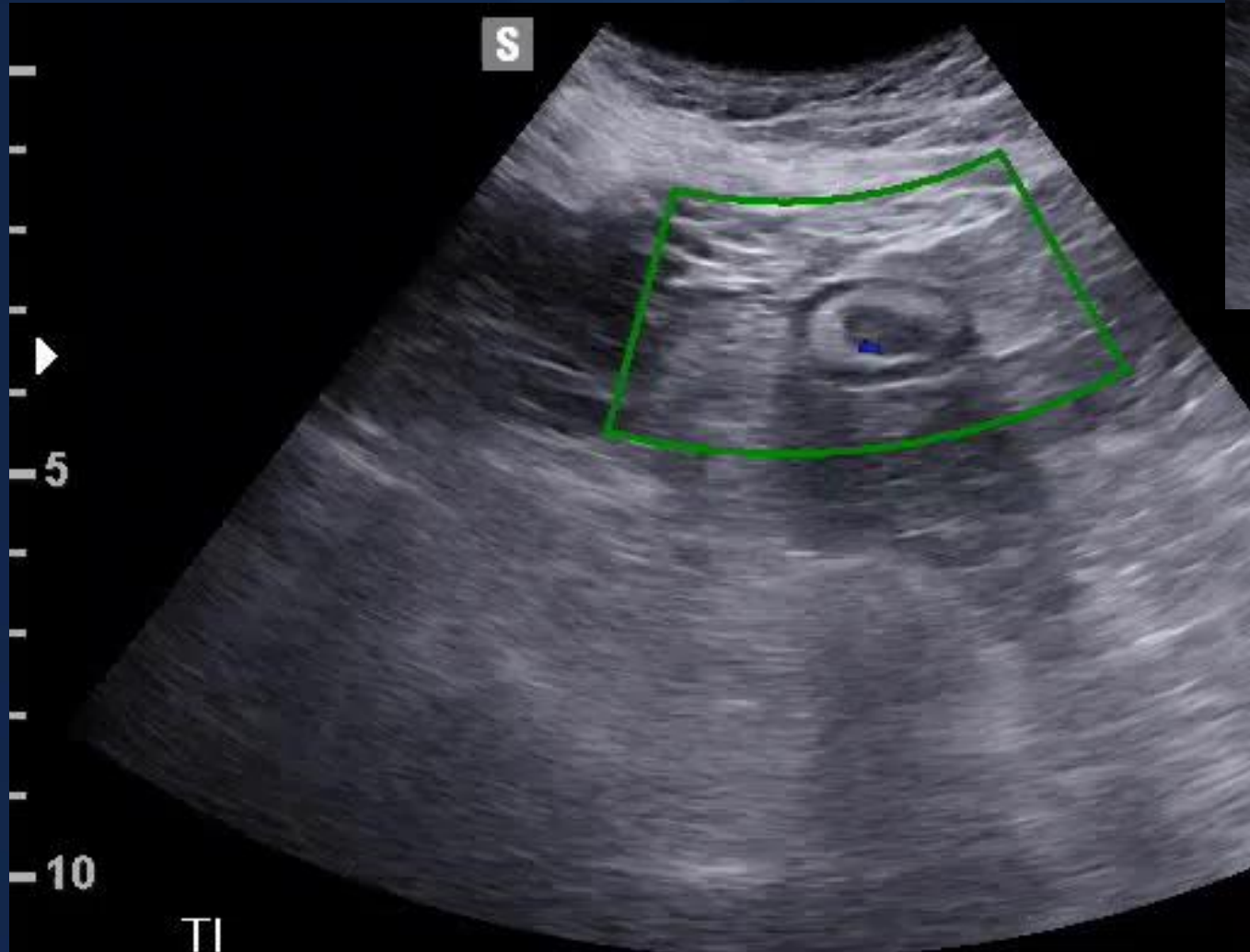


# Dysfunctional Peristalsis of PSD



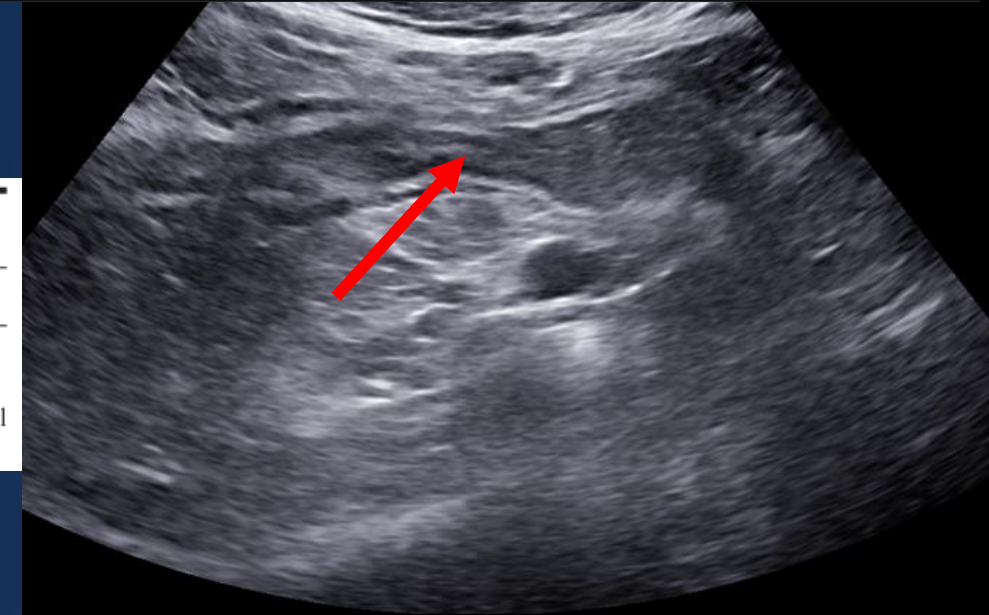
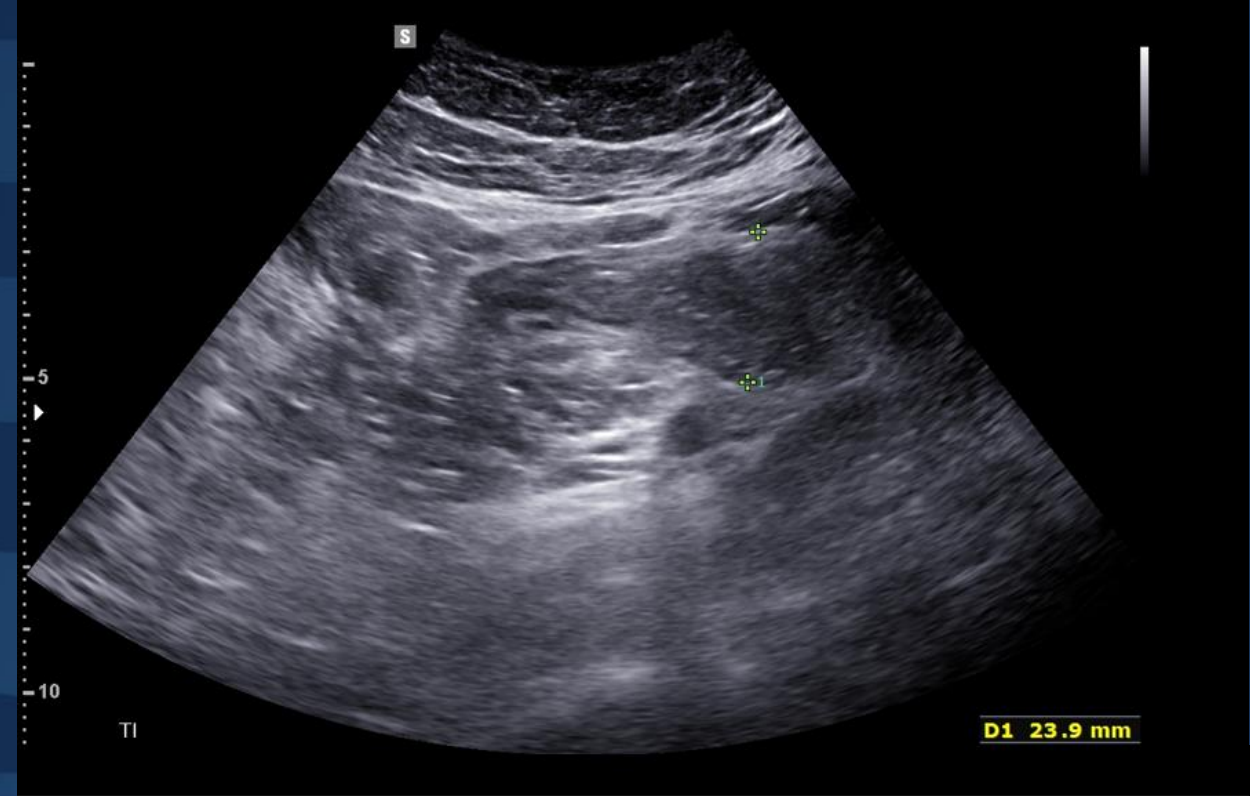


# CDS of NTI





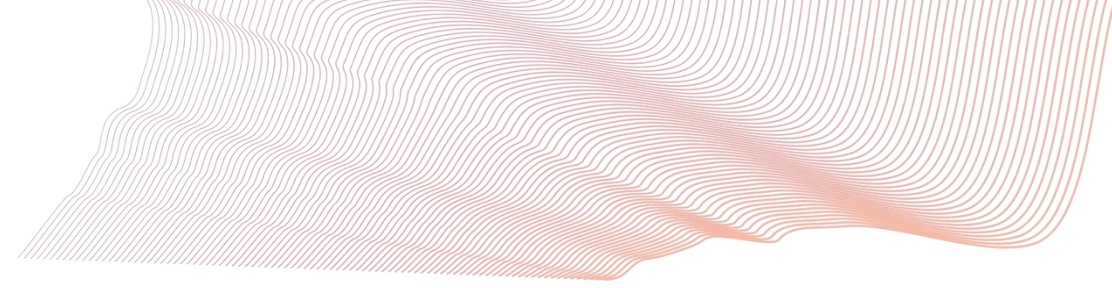
- BWT 5.2mm
  - Ifat = 2
  - CDS = 2
  - BWS = 2
  - Lumen 1.3mm, PSD > 2.4cm, Length 5 cm
- IBUS-SAS = 72.8**



**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]

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

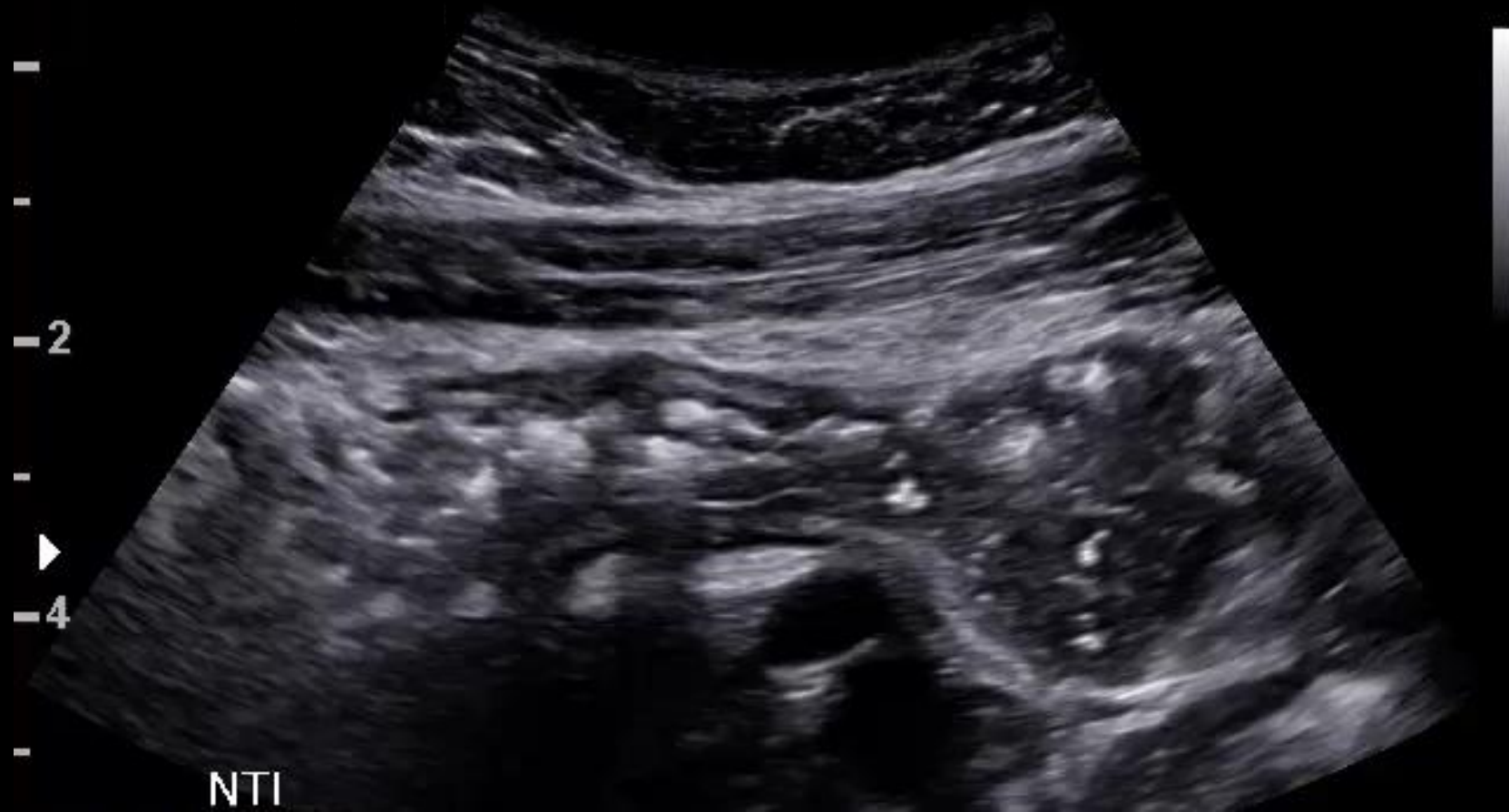


## Case cont'd

- She accepts vedolizumab therapy
- Remains asymptomatic
- 3 month IUS same as baseline.
- Fecal cal 380 ug/g
- Dose escalate to q4 weeks and start budesonide (entocort)
- Scan her at 6 months

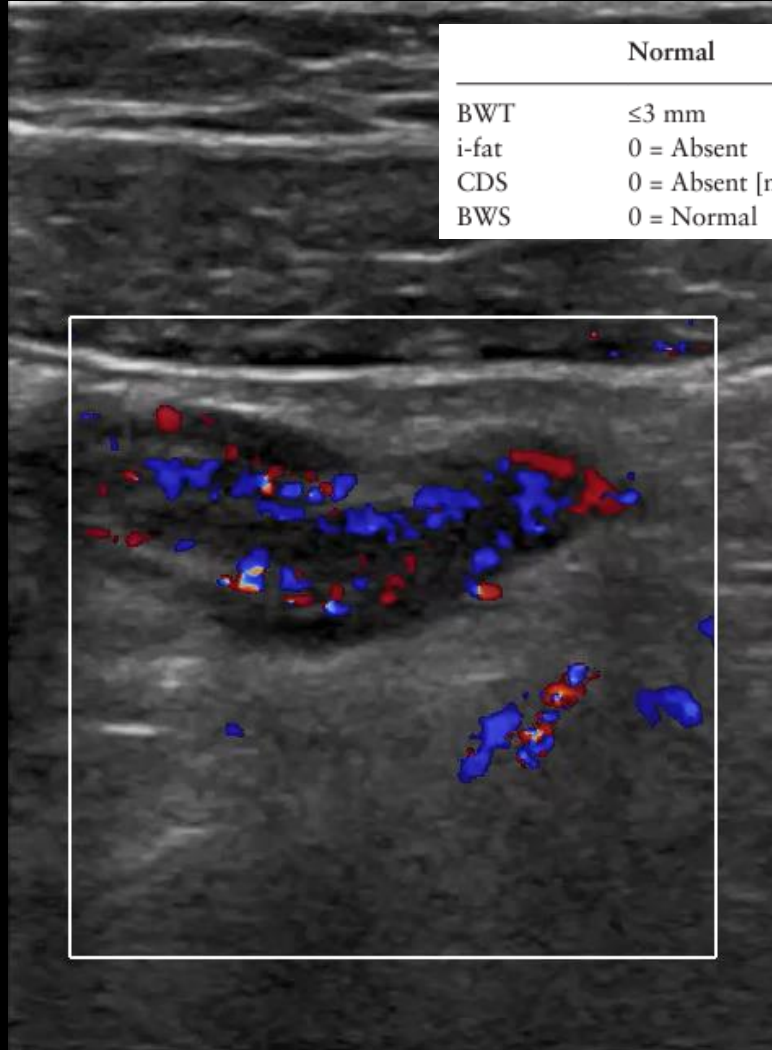


# IUS of NTI 6 months



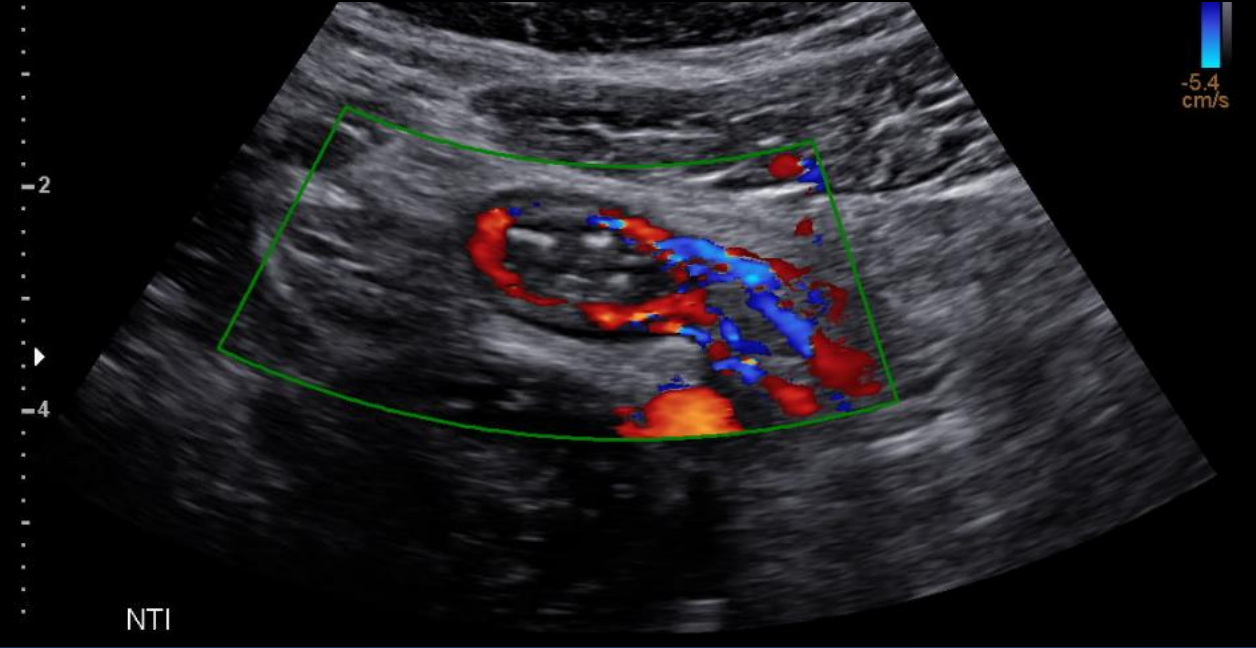
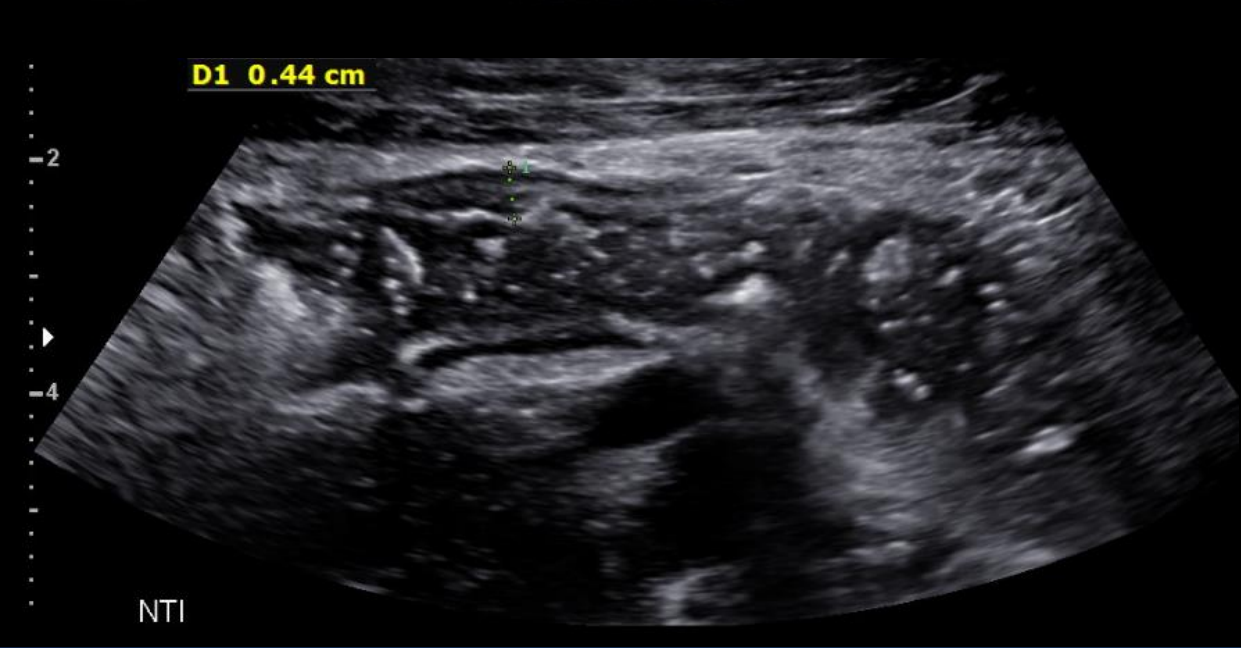
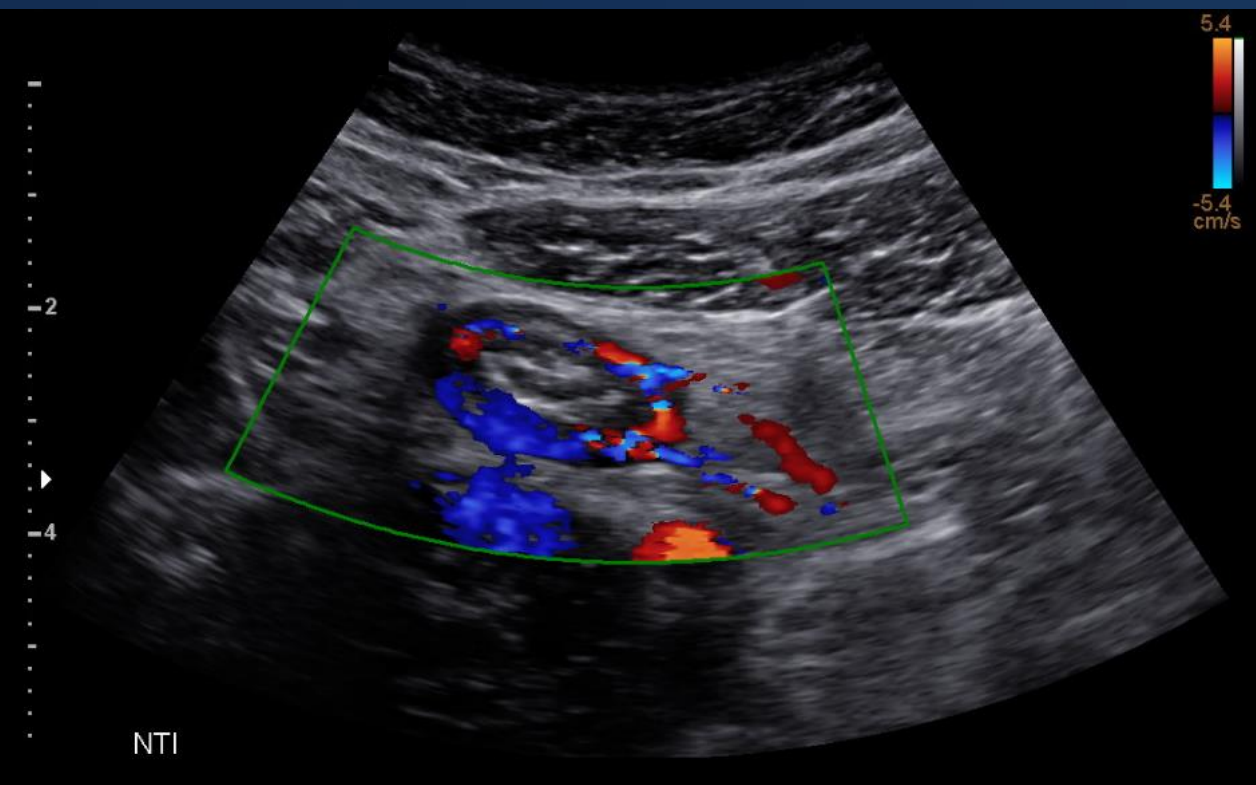
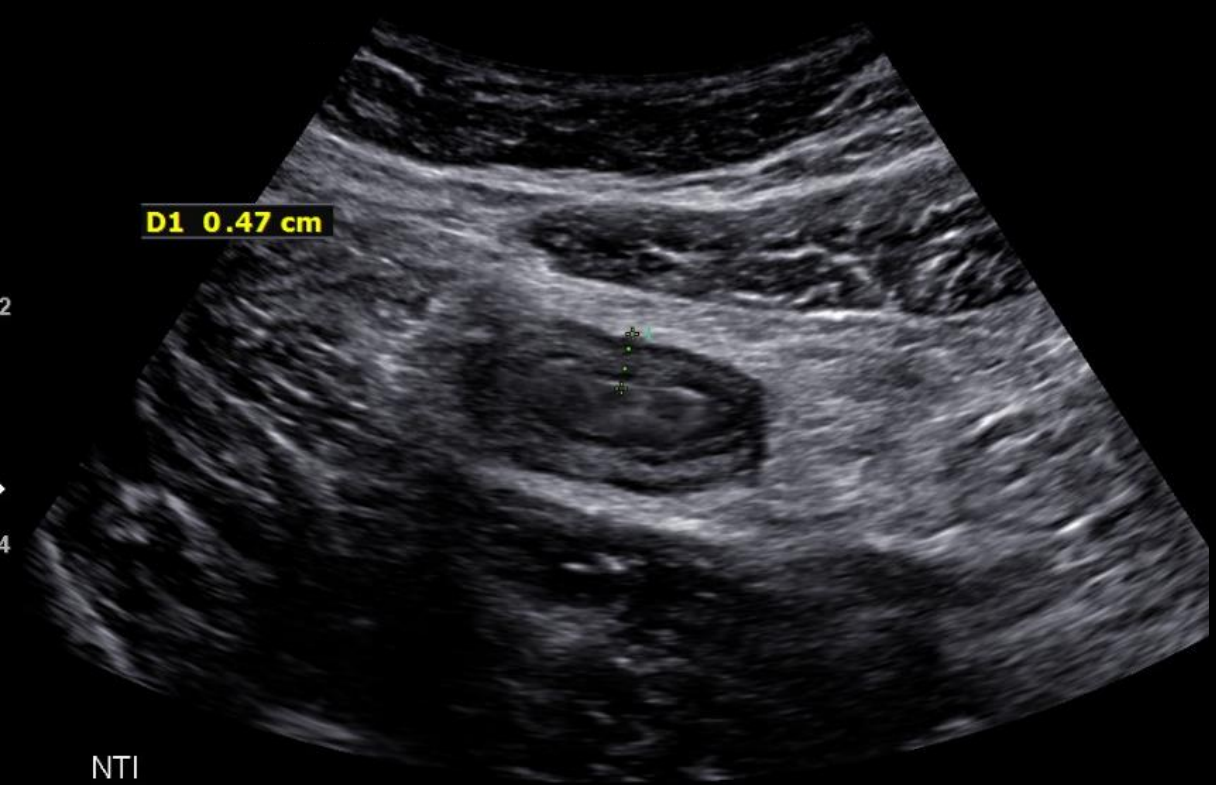


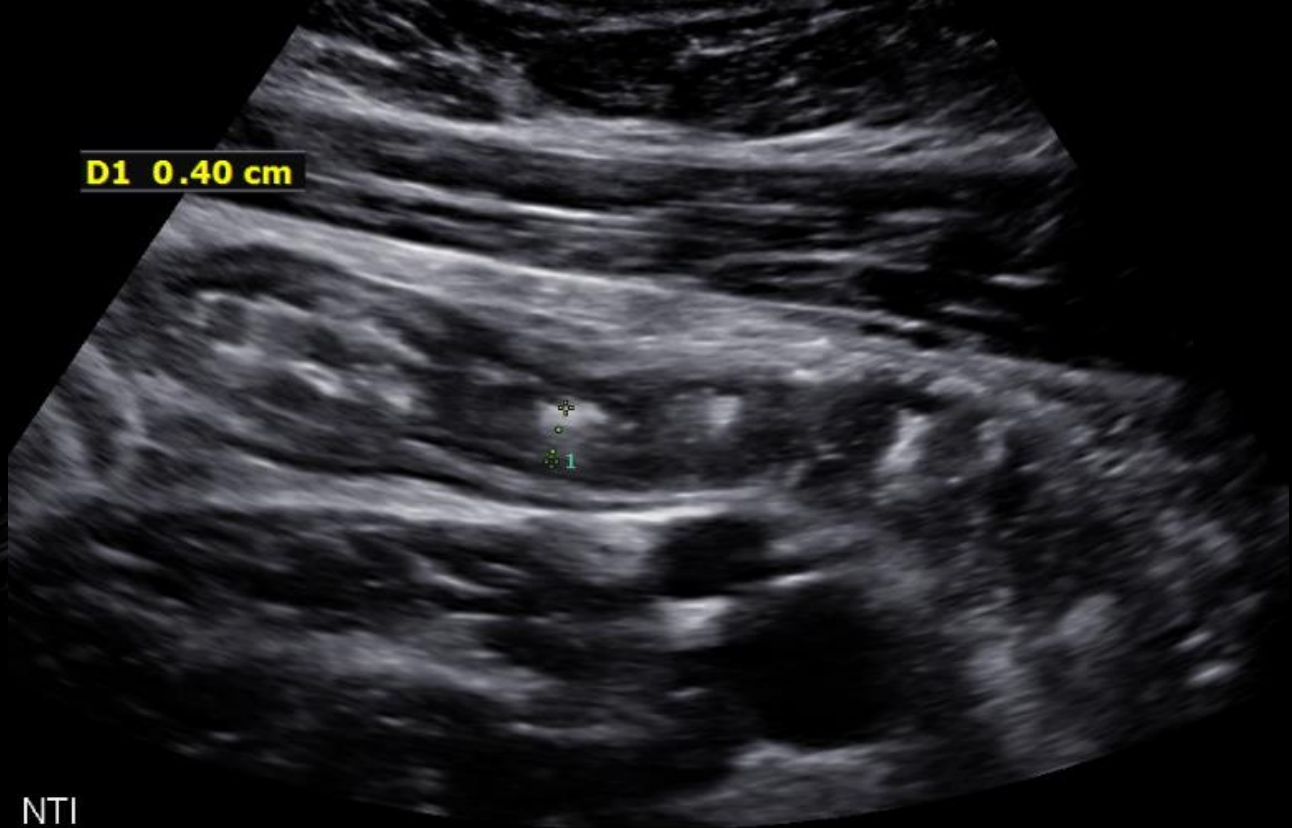
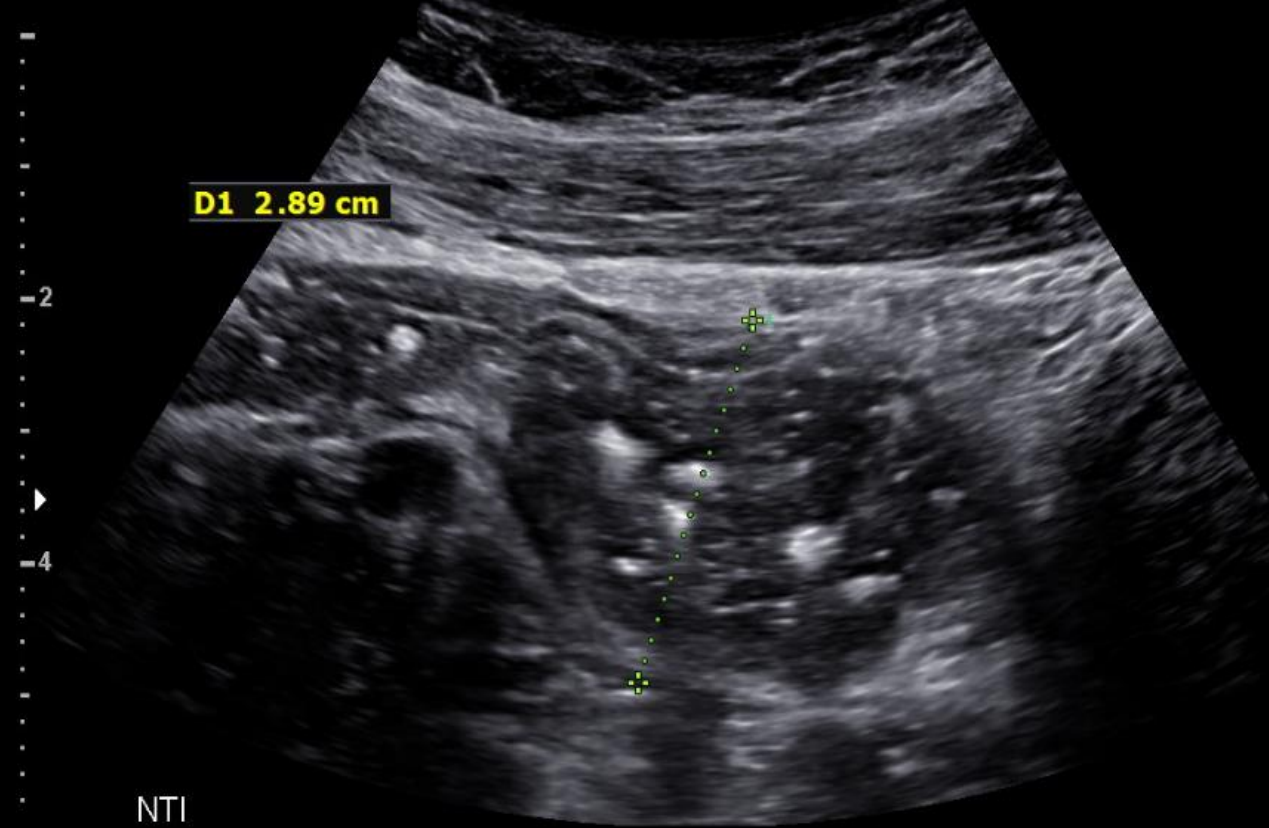
# CDS of NTI 6 months later



NTI

	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]





NTI

- 5cm TI stricture
- BWT 4.4 – 4.7mm
- Lumen 4mm
- PSD 2.89cm

NTI

BWT = 4.7  
 Ifat = 1  
 CDS = 3  
 BWS = 2  
**IBUS-SAS = 62.8**

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

	Normal	Uncertain	Activity	
BWT	≤3 mm	NA	>3 mm	
i-fat	0 = Absent	1 = Uncertain	2 = Present	
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BWS	0 = Normal	1 = Uncertain	2 = Focal [≤ 3 cm]	3 = Extensive [>3 cm]

## Case cont'd

- At 6 months, fecal cal 495ug/g

	Baseline	3 months	6 months
Fcal (ug/g)	401	380	495

### What would you do next?

- Switch to anti-TNF
- Switch to JAK-I
- Switch to IL23 inhibitor
- Continue to monitor to 12 months and repeat IUS
- Refer to surgery

# Example – Transverse colon

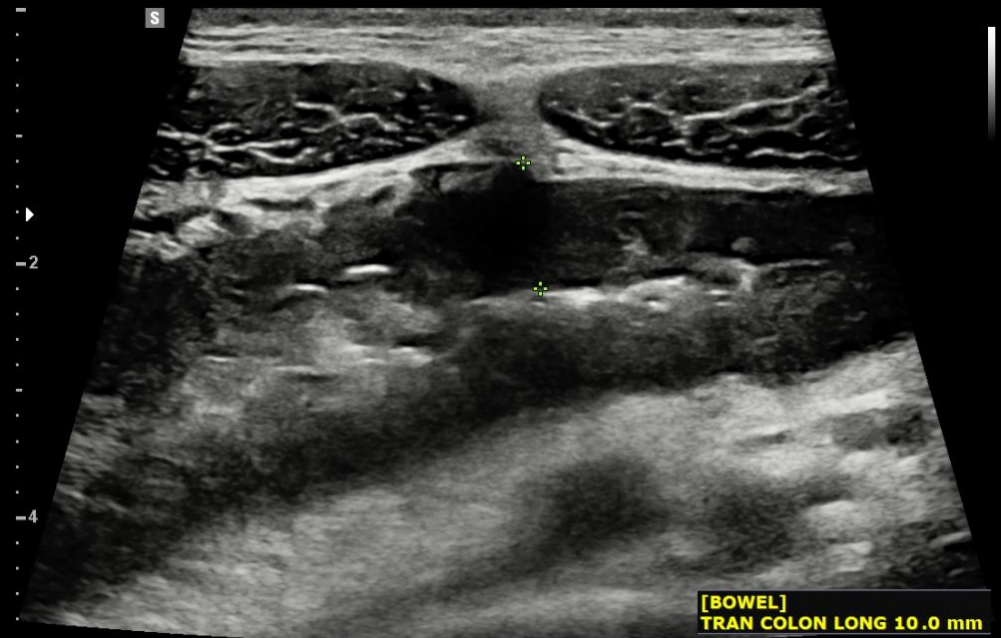
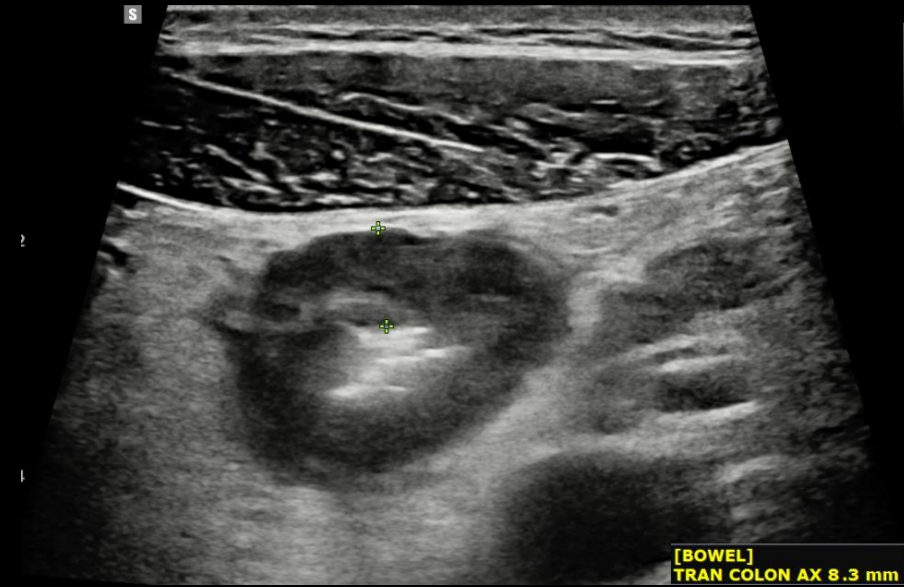
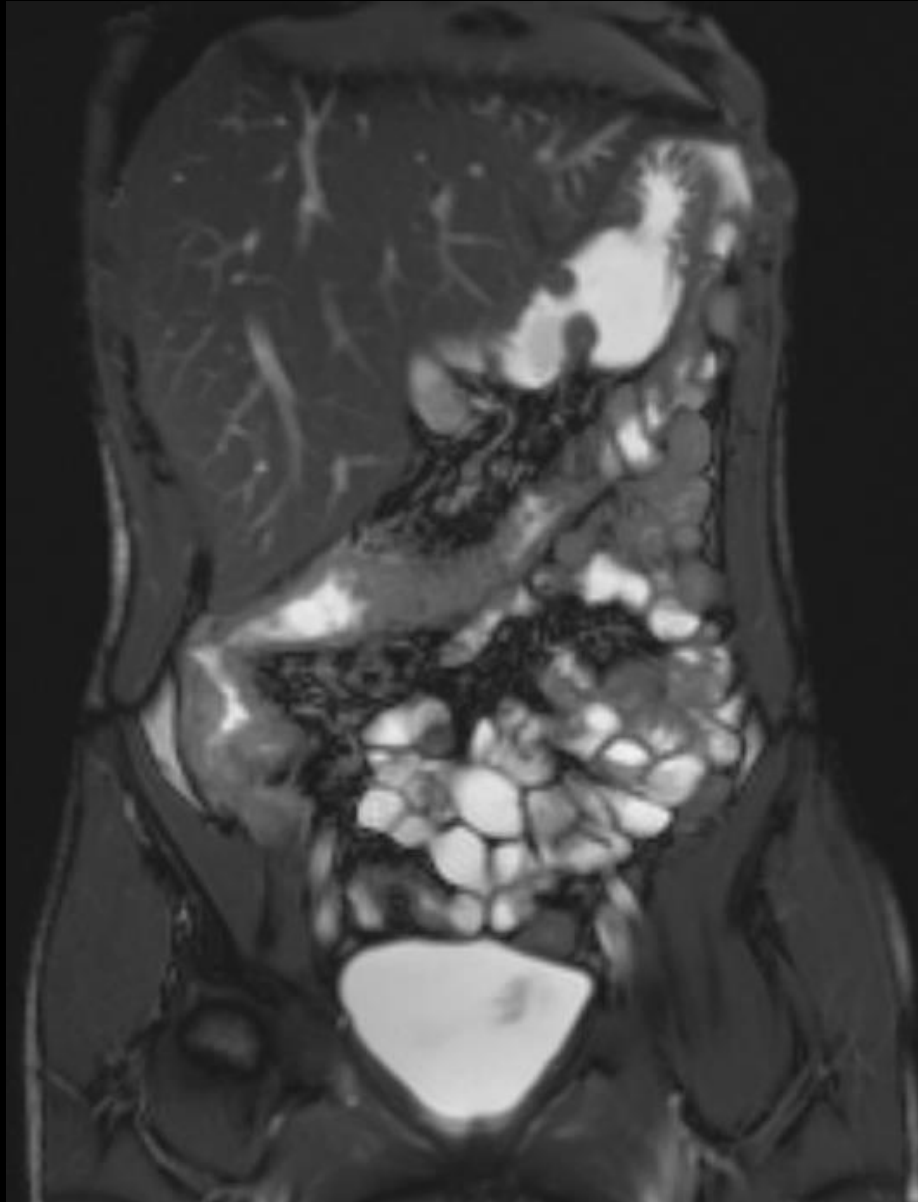
CA3-10A / Abdomen / FPS28 / MI1.2 / TIs0.2 / 2023-04-18 10:47:57 AM  
2D G47/DR35/FA10/P90/Frq Res./9.0cm



CA3-10A / Abdomen / FPS28 / MI1.2 / TIs0.2 / 2023-04-18 10:54:44 AM  
2D G47/DR35/FA10/P90/Frq Res./9.0cm

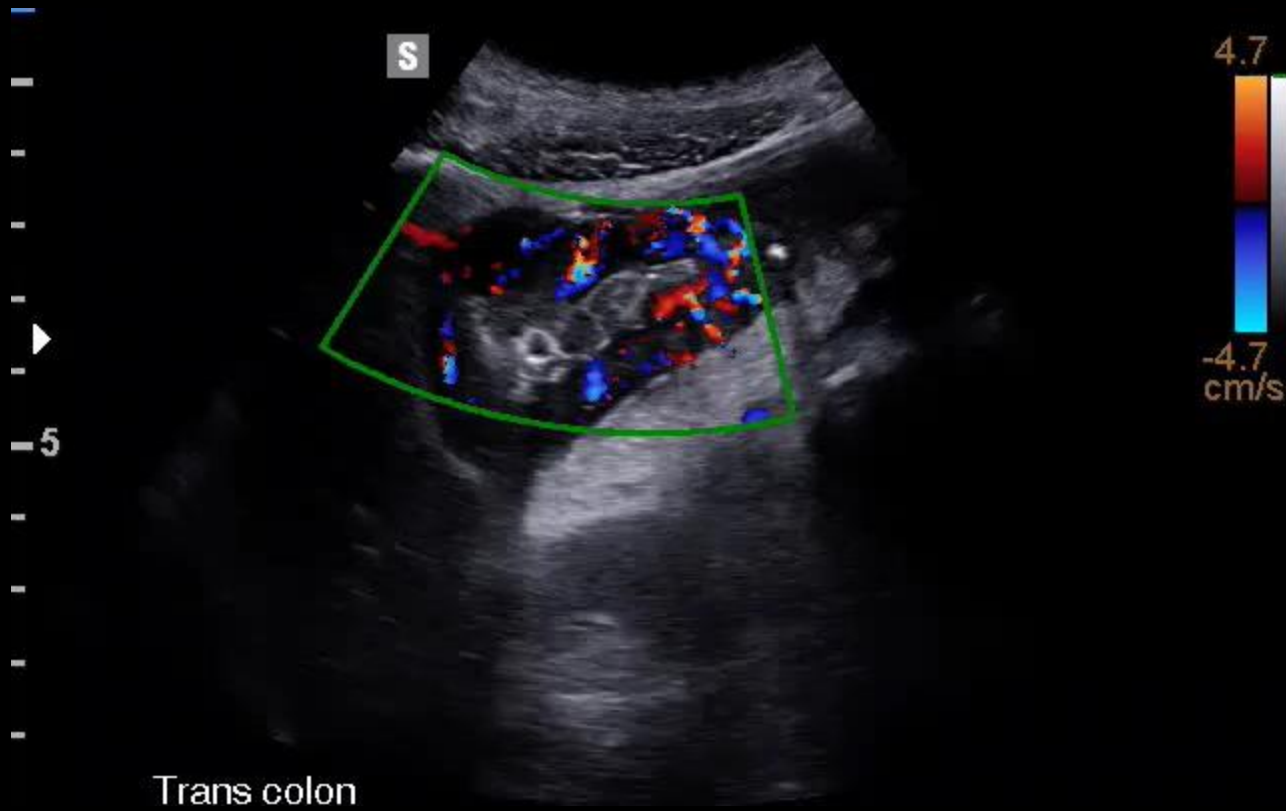


1. Bowel wall thickness
2. Color Doppler Signal
3. Inflammatory fat
4. Loss of stratification





# Colonic Stricture



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

**Table 2.** Core activity parameters, Delphi grading consensus

	Normal	Uncertain	Activity
BWT	≤3 mm	NA	>3 mm
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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]

BWT = 9.2mm

lfat = 2

CDS = 3

BWS = 3

**IBUS-SAS = 99.8**

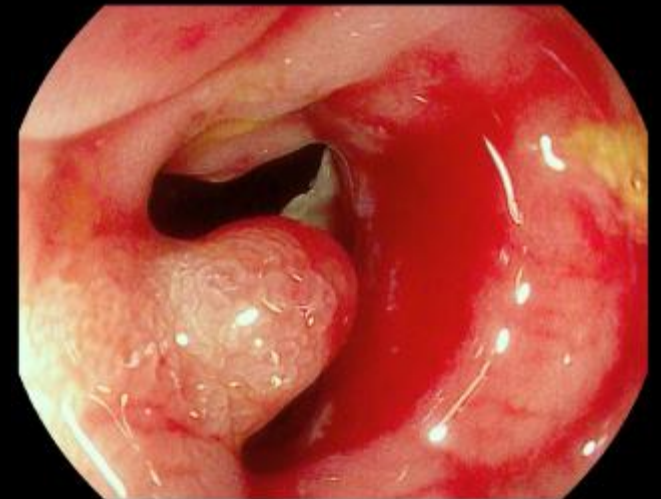


# Treatment

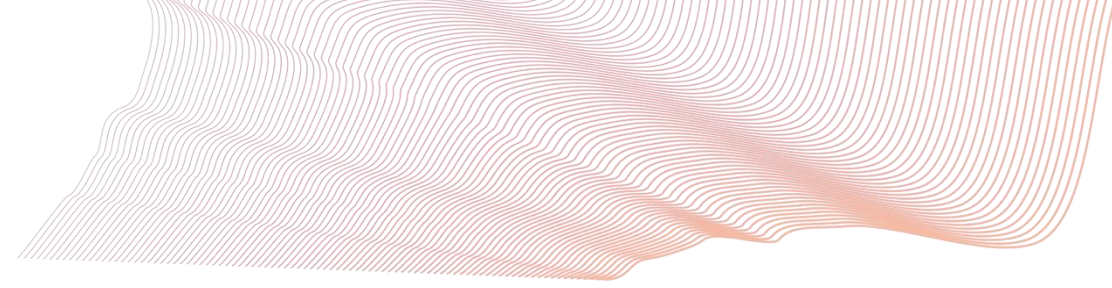
- Patient was started on infliximab 10mg/kg q4 weeks.
- Follow up colonoscopy 1 year later.



**Before Therapy**



Exan1



## **M/C Question:**

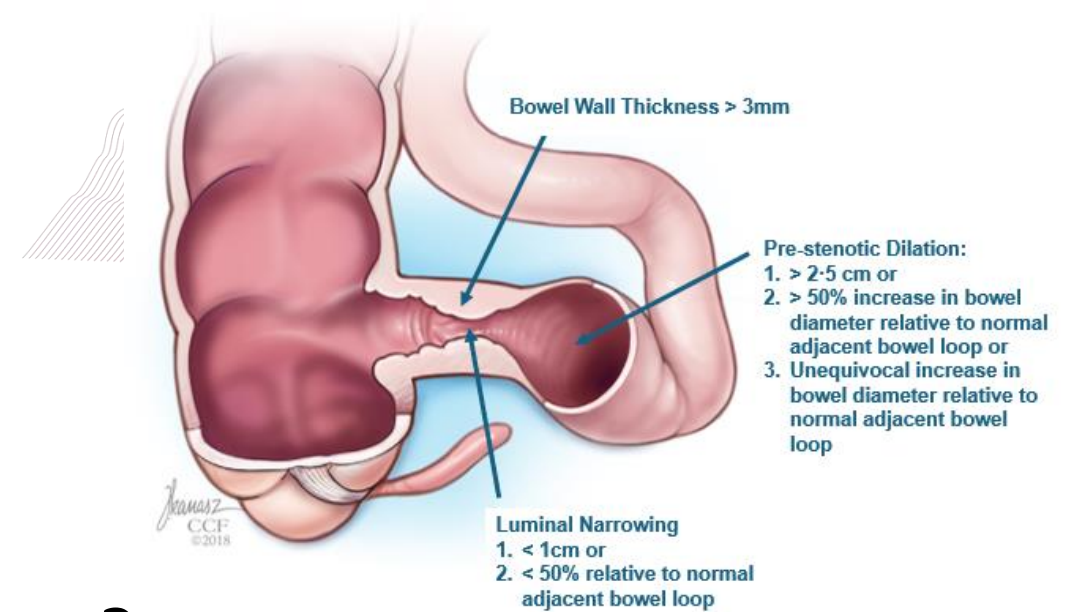
**Which luminal narrowing criterion is considered appropriate for defining a stricture?**

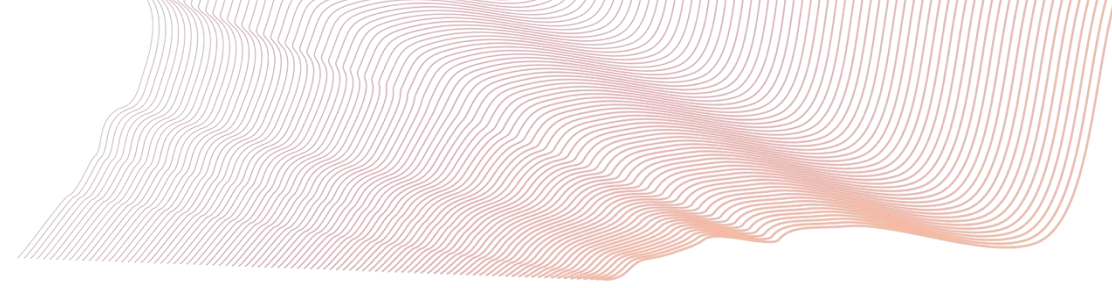
- A. Luminal diameter reduction of more than 25% only relative to a normal adjacent loop.
- B. Luminal diameter reduction of more than 50% relative to a normal adjacent loop.
- C. Luminal diameter reduction of more than 75% only relative to a normal adjacent loop.
- D. Luminal diameter less than 5mm

## M/C Question:

**Which luminal narrowing criterion is considered appropriate for defining a stricture?**

- A. Luminal diameter reduction of more than 25% only relative to a normal adjacent loop.
- B. Luminal diameter reduction of more than 50% relative to a normal adjacent loop.**
- C. Luminal diameter reduction of more than 75% only relative to a normal adjacent loop.
- D. Luminal diameter less than 5mm





## M/C Question:

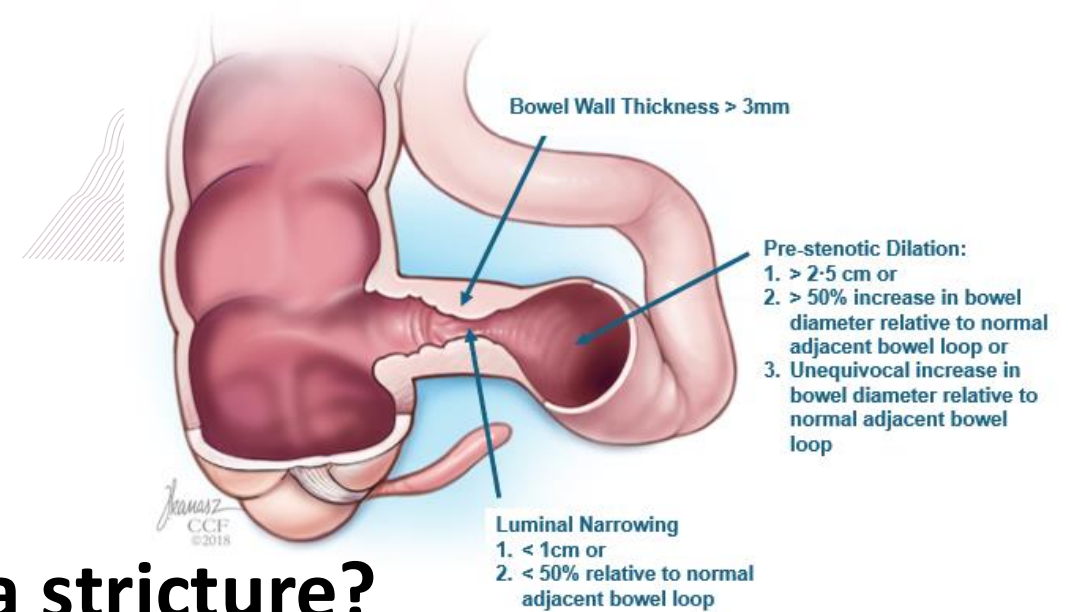
**Which pre-stenotic dilation criterion is considered appropriate for diagnosing a stricture?**

- A. Bowel diameter greater than 1 cm.
- B. Increase in bowel diameter by more than 25% relative to adjacent normal bowel.
- C. Bowel diameter greater than 2.5 cm.
- D. An unequivocal increase of PSD relative to a normal adjacent bowel loop.
- E. More than one answer above is correct

## M/C Question:

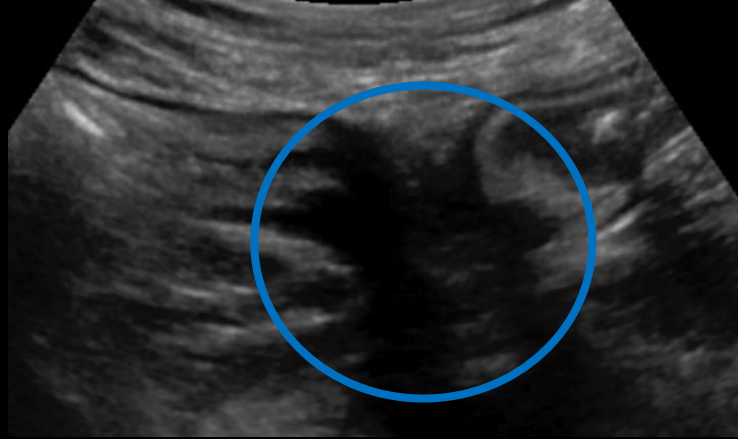
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# CD Complications



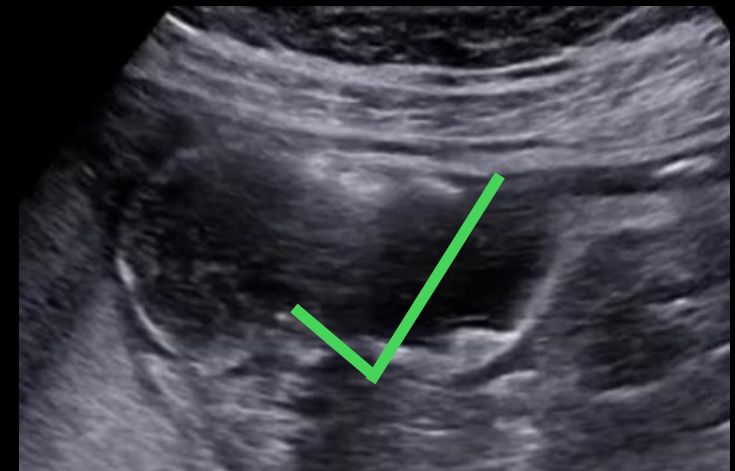
**Abscess**



**Inflammatory Mass**



**Fistula**



**Stricture**

# Diagnostic Accuracy of Intestinal Ultrasound in the Detection of Intra-Abdominal Complications in Crohn's Disease: A Systematic Review and Meta-Analysis

Journal of Crohn's and Colitis, 2024, 18, 958–972  
<https://doi.org/10.1093/ecco-jcc/jjad215>

Maarten J. Pruijt,<sup>a</sup> Floris A.E. de Voogd,<sup>a</sup> Nahid S.M. Montazeri,<sup>a</sup>  
Faridi S. van Etten-Jamaludin,<sup>b</sup> Geert R. D'Haens,<sup>a</sup> Krisztina B. Gece<sup>a</sup>

JCC SYSTEMATIC REVIEW & META-ANALYSIS

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



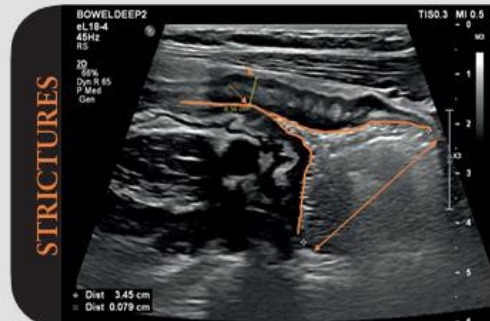
1498 studies screened



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

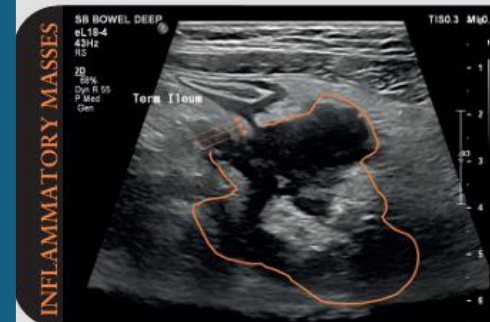


3863 patients



STRICTURES

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



INFLAMMATORY MASSES

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



FISTULAS

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

# Abscesses vs. Inflammatory Mass (Phlegmon)

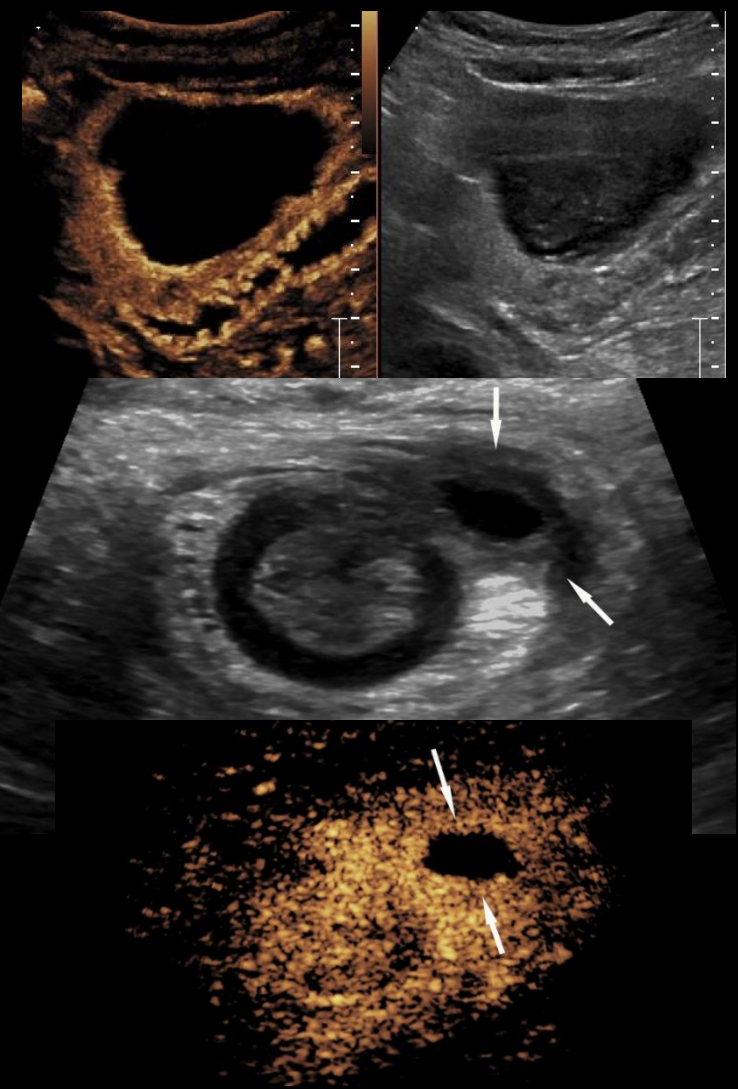
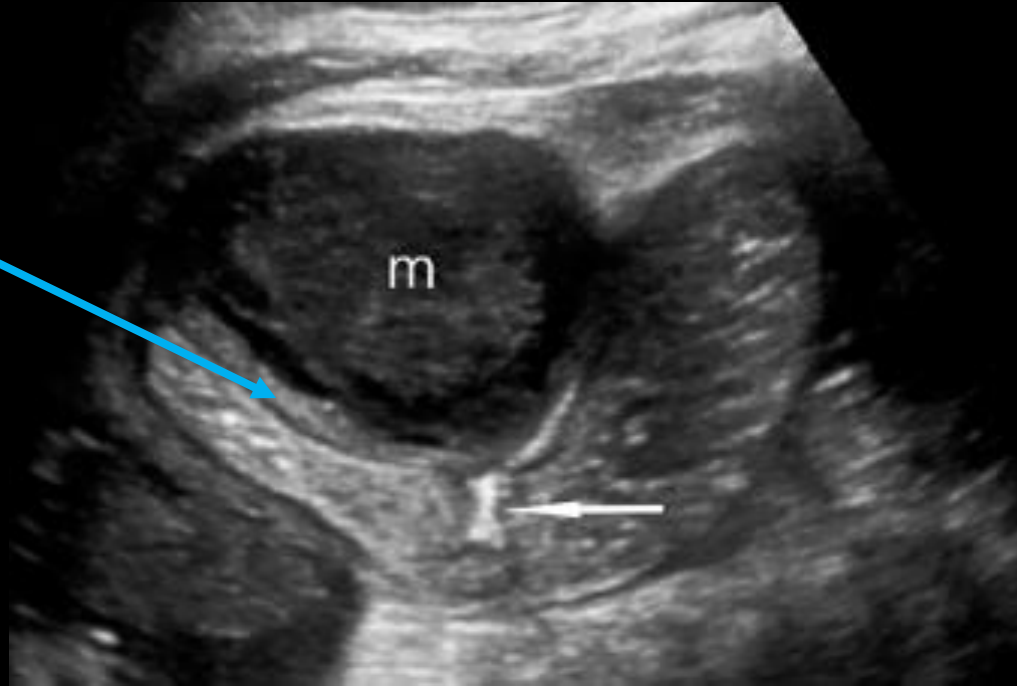
Abscess	Inflammatory Mass
<ul style="list-style-type: none"> <li>• Walled off pocket of pus with an air-fluid level.</li> <li>• Roundish anechoic lesions with irregular walls and no signs of blood flow.<sup>1,2</sup></li> <li>• Posterior acoustic enhancement</li> </ul>	Poorly organized inflammatory masses with no discernible wall/fluid content
<b>Avascular</b>	Often <b>vascular</b> on CDI
Internal debris, septations, echogenic gas	

- Both usually hypoechoic on grey scale
- May contain areas of bright echogenicity suggesting air outside bowel lumen
- Inflammatory mass may mimic abscesses; CEUS and CDI help to distinguish between the two.

1. Alloca et al. *Clin Pract J Am Gastroenterol Assoc* 2022; 20: e723–e740
2. Castiglione et al. *Inflamm Bowel Dis* 2013; 19: 991–998.
3. Calabrese et al. *Inflamm Bowel Dis* 2018; 24: 2001–2006.

# Abscess

When present,  
posterior acoustic  
enhancement  
seen here



- Hypoechoic well-circumscribed mass with internal echoes (m).
- Arrow – echogenic perforation tract.

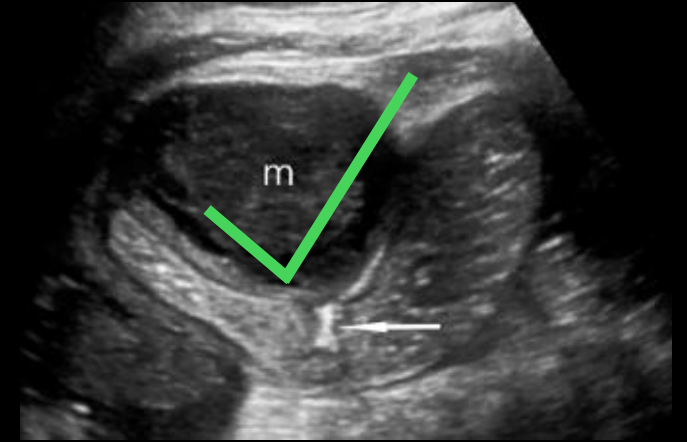
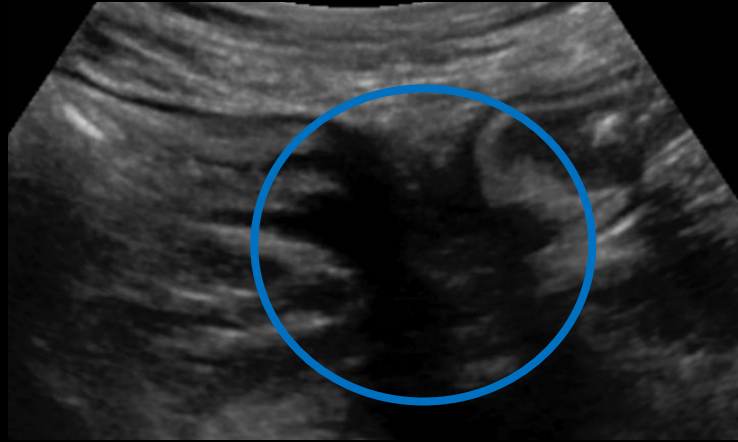
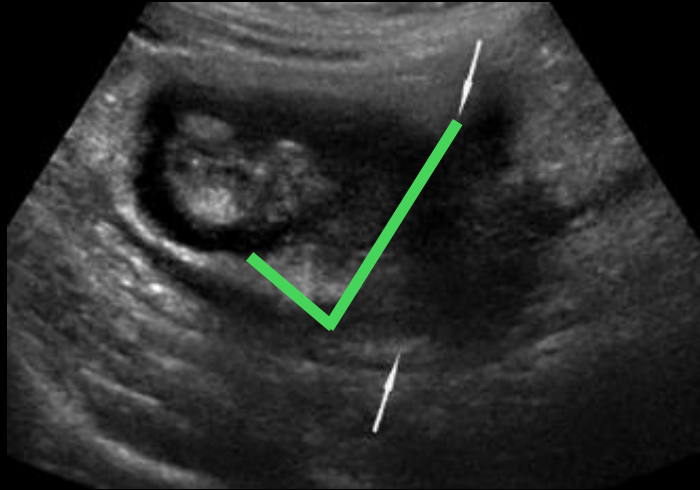


# Inflammatory Mass

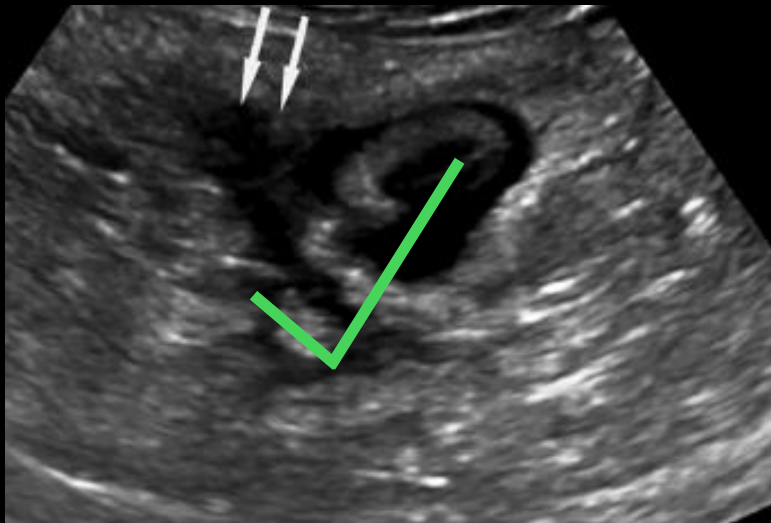




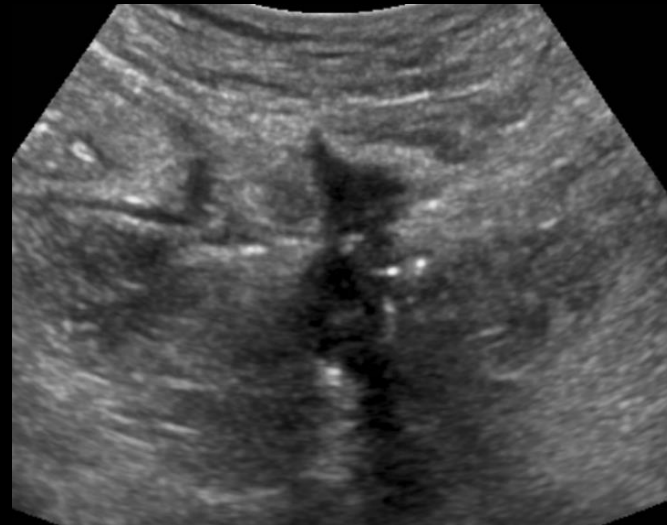
# CD Complications



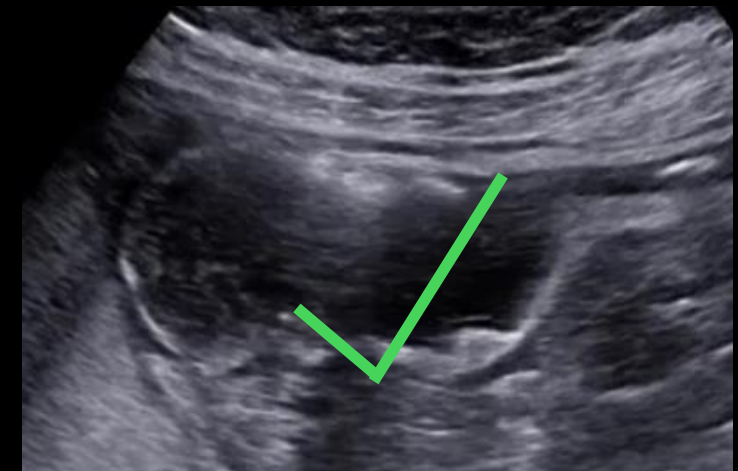
**Abscess**



**Inflammatory Mass**



**Fistula**

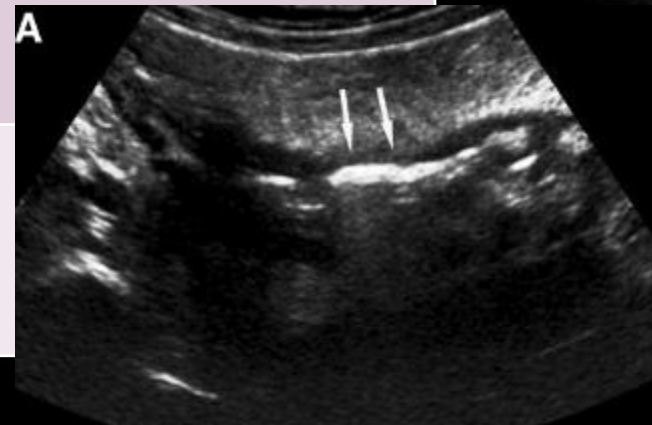
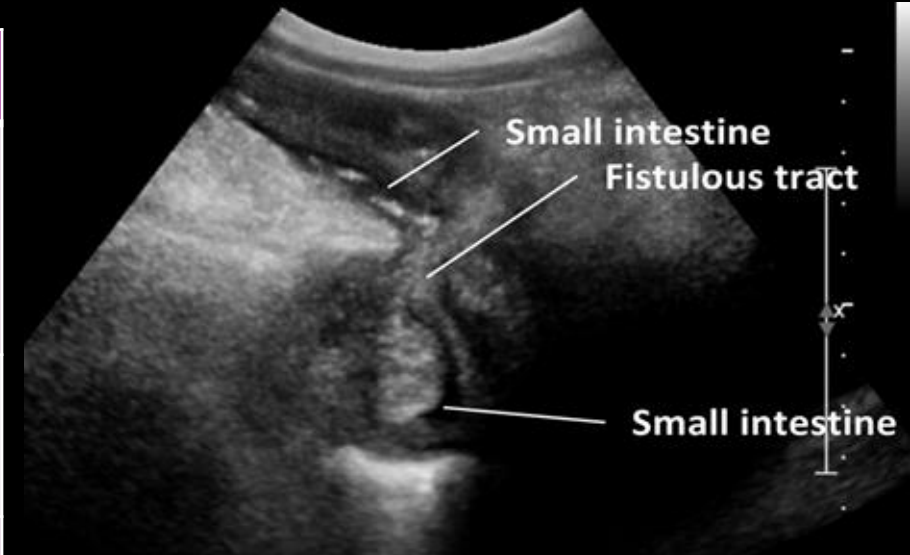


**Stricture**

# Fistula and Sinus Tracts

- 80% of intra-abdo fistulas are formed proximal to a stricture

Fistulas	Sinus Tracts
Abnormal communications between 2 epithelialized structures	Are blind ending formations
Linear echogenic bands – if contain air/debris.	Hypoechoic bands
May or may not contain fluid	
CDI of tracts may be increased when multiple tracts tethered together	





# CASE

- 41 yo female fibrostenotic CD dx as teenager
- Ileocolic resection 2015 and July 2023
- Past azathioprine, long standing adalimumab since 2013 up until resection in 2023.
- Referred to me in June 2023.
- Resection July 2023
- Risankizumab started post-operatively



# Pre-op

- **BWT** - 9mm
- **Length** – 6 cm
- **CDI** – Modified  
limberg 3
- **ifat** - Present
- **Stratification** – loss

## Complications:

1. **Inflammatory mass**
2. **Localized perf? Air  
pockets outside of  
bowel**





# Pathology Resection Sample

## A. Neoterminal ileum and descending colon:

- Active, transmural inflammation with ulceration, fibrosis and perimural abscess formation; no dysplasia and no granulomata.

Active inflammation present within the bowel wall at the colonic resection margin.

Ilium and Descending Colon. The specimen is received fresh and consists of a segment of bowel (small bowel and colon, however it cannot be ascertained where the transition is) measuring 15.6 cm in length, 7 cm in circumference at what appears to be the small bowel resection margin, 9 cm in circumference at what appears to be the colonic resection margin, with attached adipose tissue extending to a depth of 5.7 cm. The serosa is predominantly unremarkable with a focus of adherent brown to hemorrhagic soft tissue with possible fibrinous exudate measuring 4.5 x 3.5 cm. On the mucosa there is an irregular flattened area transitioning to ulcerative mucosa with skip lesions and pseudopolyps measuring 8 cm in length and ranging in circumference from 1.5 to 5.2 cm, it comes to within 3.1 cm of the small bowel resection margin and 5 cm of the colonic resection margin. Within this irregular area is a stricture measuring 1.5 cm in minimum circumference. The bowel wall adjacent to the stricture is fibrotic and thickened up to 0.8 cm. The adipose tissue adjacent to the stricture appears fibrotic with a small abscess cavity measuring 0.5 cm in maximum dimension, it is filled with yellow to red purulent material. Coming to within 0.2 cm of the fibrotic adipose tissue is a second abscess cavity measuring 2.5 cm in maximum dimension, it is filled with yellow purulent material. The remainder of the mucosa is unremarkable.



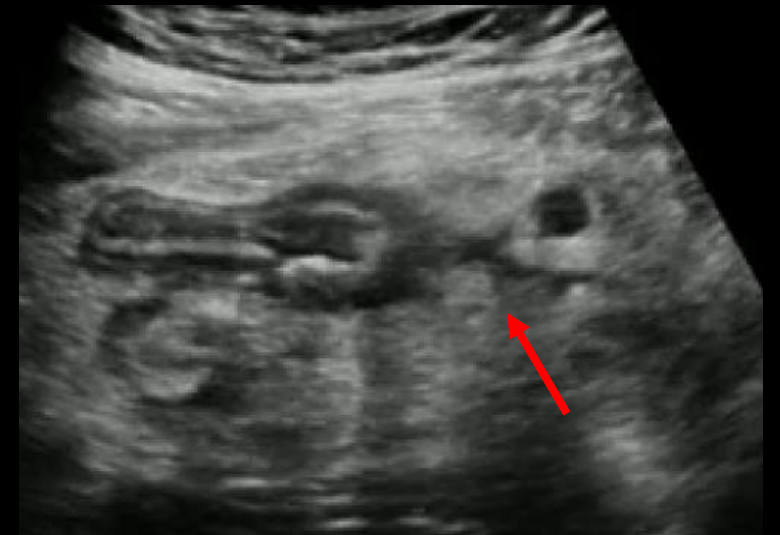
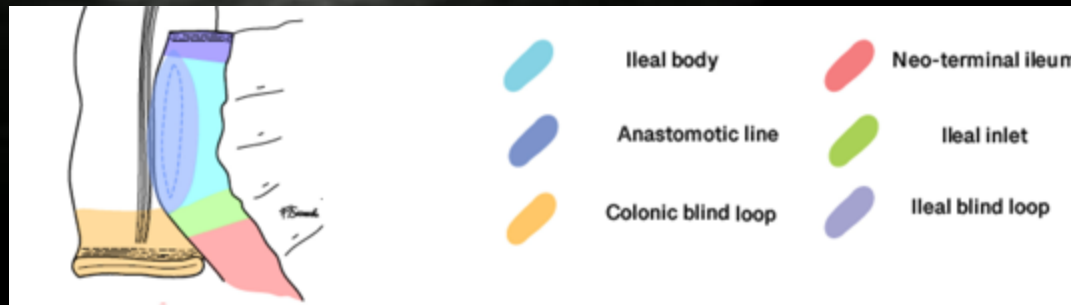
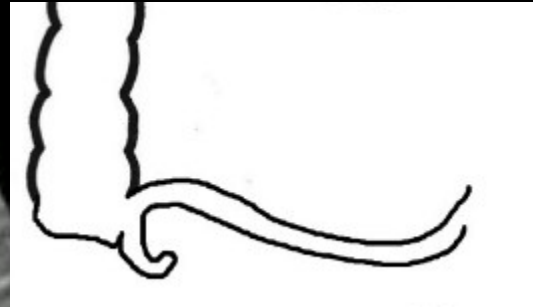
# 2 Weeks post 2<sup>nd</sup> ICR - end to side anastomosis

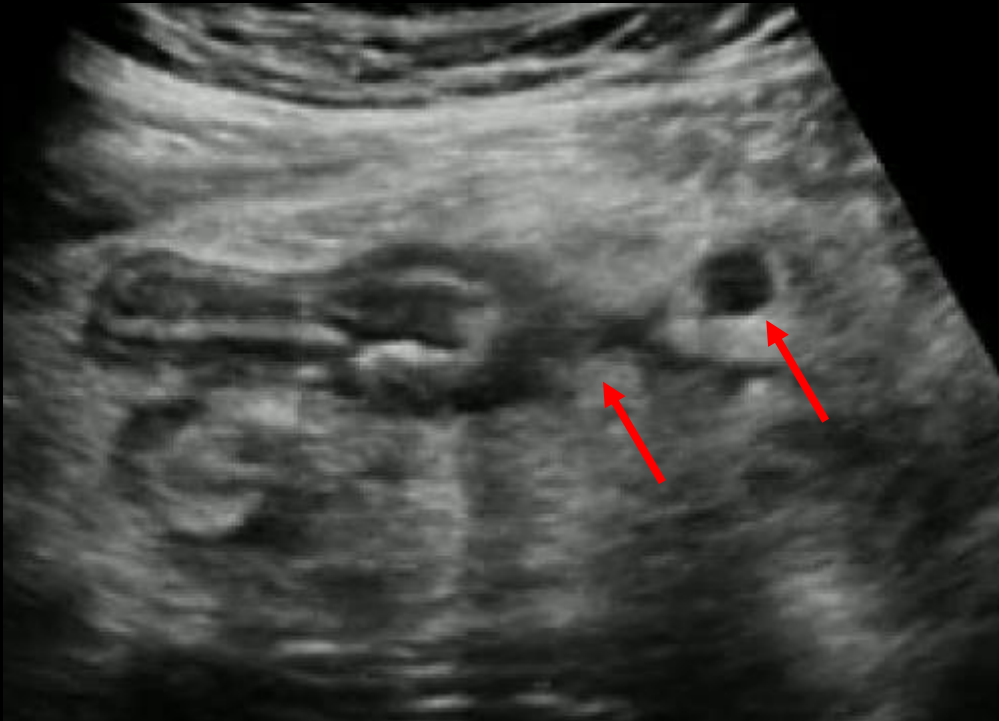
S

Significant abdo pain  
post-op

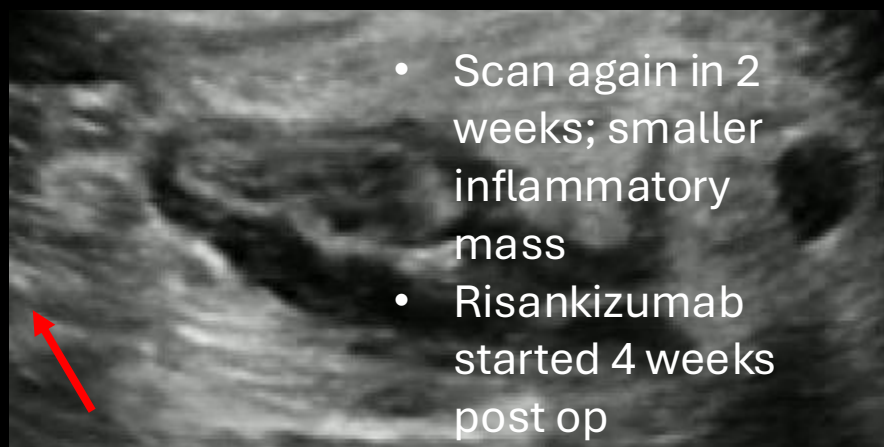
Findings

- Ileal blind ended pouch at anastomosis
- multiple sutures/staples
- multiple small tracts/severe spiculation
- lymphadenopathy
- inflammatory mass 1.6x1.1cm



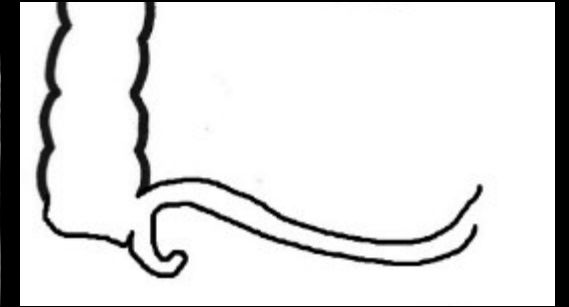
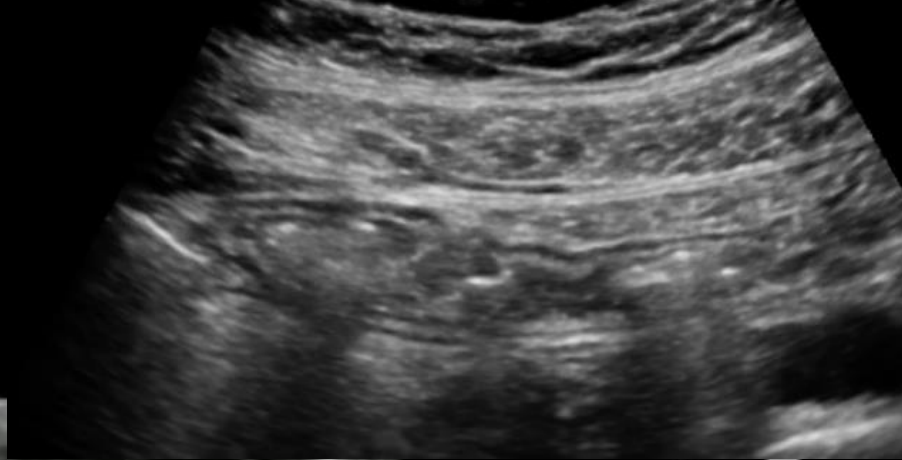
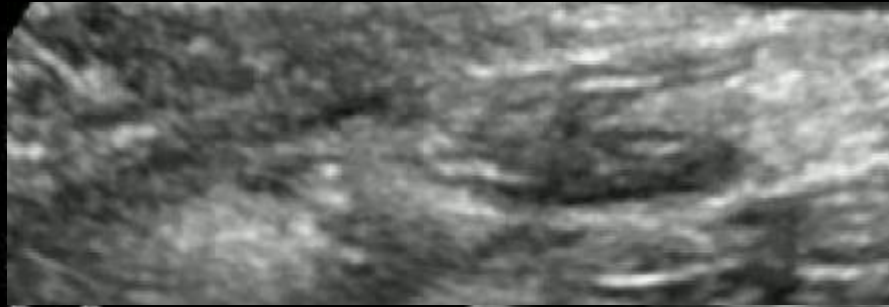


- Anastomotic leak?
- Started ciprofloxacin and metronidazole x 4 weeks



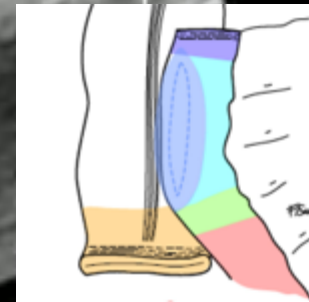
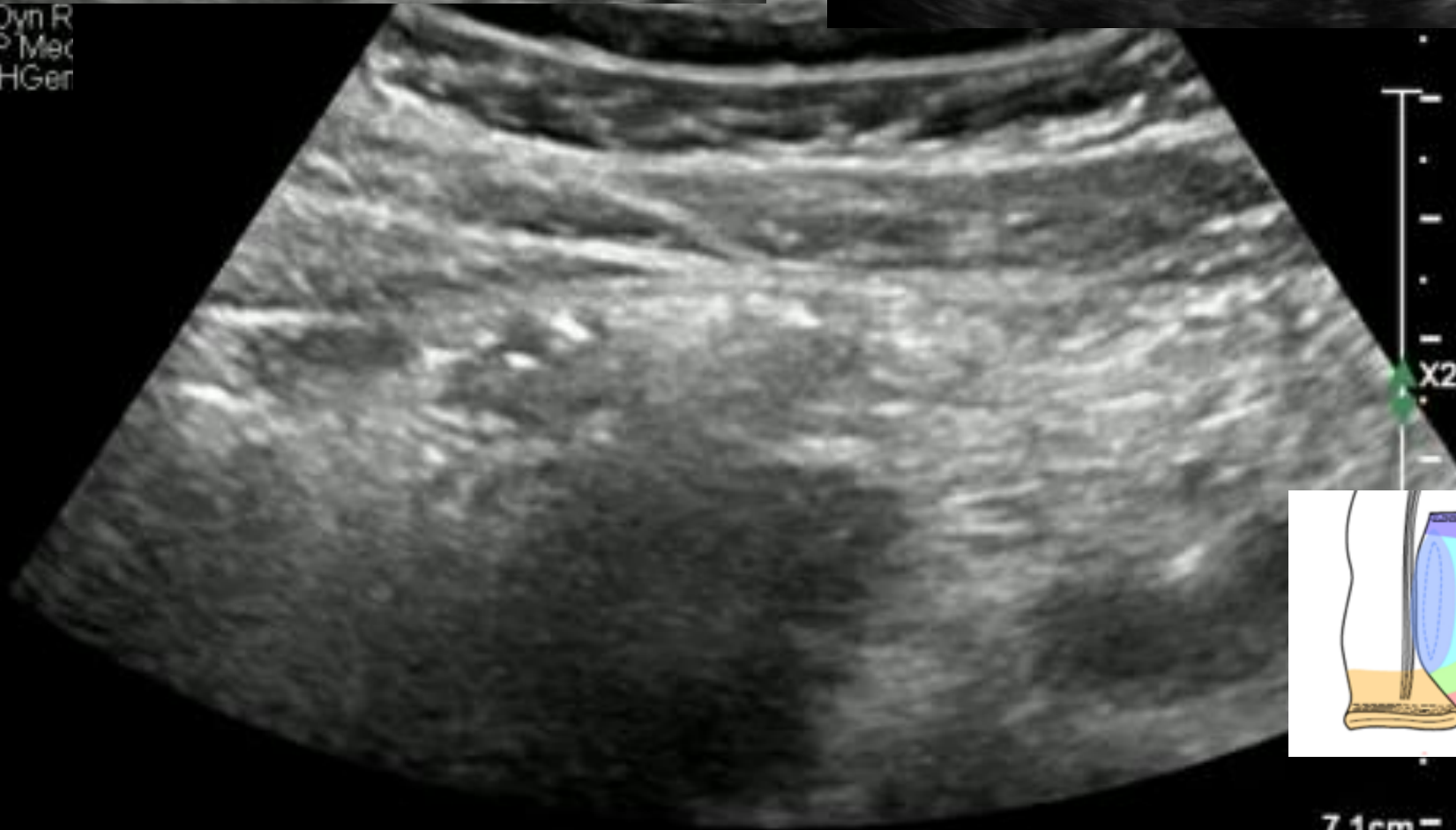
- Scan again in 2 weeks; smaller inflammatory mass
- Risankizumab started 4 weeks post op







Collected	10-Jul-23 02:57	14-Jul-23 03:36	01-Aug-23 11:01	14-Aug-23 13:00	10-Oct-23 13:10
Location	CGY F...	CGY F...	CGY D...	CGY D...	CGY D...
<b>C-Reactive Protein (CRP)</b>	6.3	<b>* 11.8</b>	<b>* 26.3</b>	4.1	1.2



# 6 Months Post Op

Dyn R  
P Mec  
H Ger



- |   |                    |   |                    |
|---|--------------------|---|--------------------|
|  | Ileal body         |  | Neo-terminal ileum |
|  | Anastomotic line   |  | Ileal inlet        |
|  | Colonic blind loop |  | Ileal blind loop   |

7.1cm

**Which IUS feature best helps to differentiate an inflammatory mass from a complex abscess in CD when both are heterogeneous areas adjacent to diseased bowel?**

- A. Detection of small mesenteric lymph nodes adjacent to inflammatory area.
- B. Identification of internal gas bubbles within a well-marginated cavity and posterior acoustic enhancement.
- C. Presence of surrounding hyperechoic mesenteric fat with increased vascularity on color Doppler.
- D. Association with thickened bowel with loss of wall stratification and increased Doppler signal.

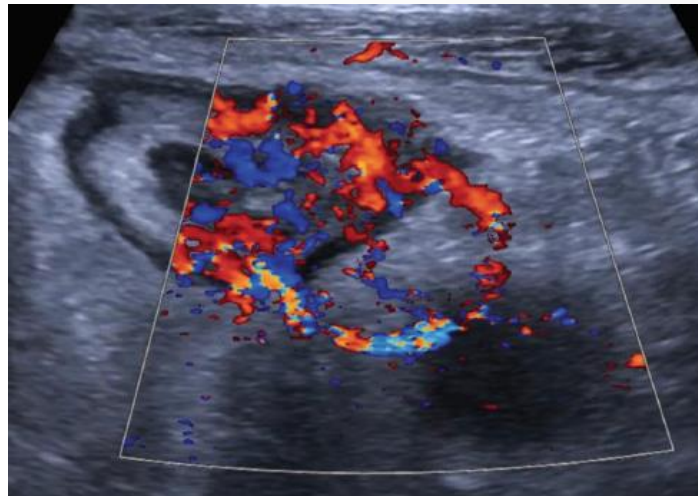
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# Thank You!

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@cathylumd



**DRIVING HOME**



**AFTER  
SCANNING ALL  
DAY**

PIZZACOLLAGE



international bowel  
**ULTRASOUND GROUP**

# Q&A