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Interactive Case Presentation: IUS in Pediatrics

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IBUS Advanced Ultrasound Workshop – Module 3
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Disclosure

- Consultant for Neurologica Corp., a subsidiary of Samsung Electronics Co., ltd.

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Case 1

6-year-old female referred by her pediatrician for:

- Abdominal pain
- Iron deficiency anemia
- Fecal occult blood +

Labs 3/7/2025
AST 20
ALT 11
GGT 7
% Iron saturation 3
Iron 10
Ferritin 3
WBC 5.8
Hgb 7.7
Hct 27.5
Plt 376
TSH 1,67
Free T4 1.24
ESR 13
CRP 0.1 mg/L
IgE 239
IgA 125
TTG IgA negative
Endomysial IgA negative

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History of Present Illness

- Feeling more tired than usual since December
- Fatigue is stable, not worsening, but also not improving
- Abdominal pain every other day
  - Generalized
  - 15-30 minutes
  - Every other day, unrelated to eating or bowel movements
  - Appetite is normal, without weight loss,
  - Normal growth velocity
- Stool
  - Visible blood, currant jelly like
  - Formed stool with blood mixed in
  - 1-2 bowel movements daily
  - Usually formed, occasional diarrhea
  - Denies urgency, tenesmus, or nocturnal bowel movements

Labs 3/7/2025
AST 20
ALT 11
GGT 7
% Iron saturation 3
Iron 10
Ferritin 3
WBC 5.8
Hgb 7.7
Hct 27.5
Plt 376
TSH 1,67
Free T4 1.24
ESR 13
CRP 0.1 mg/L
IgE 239
IgA 125
TTG IgA negative
Endomysial IgA negative

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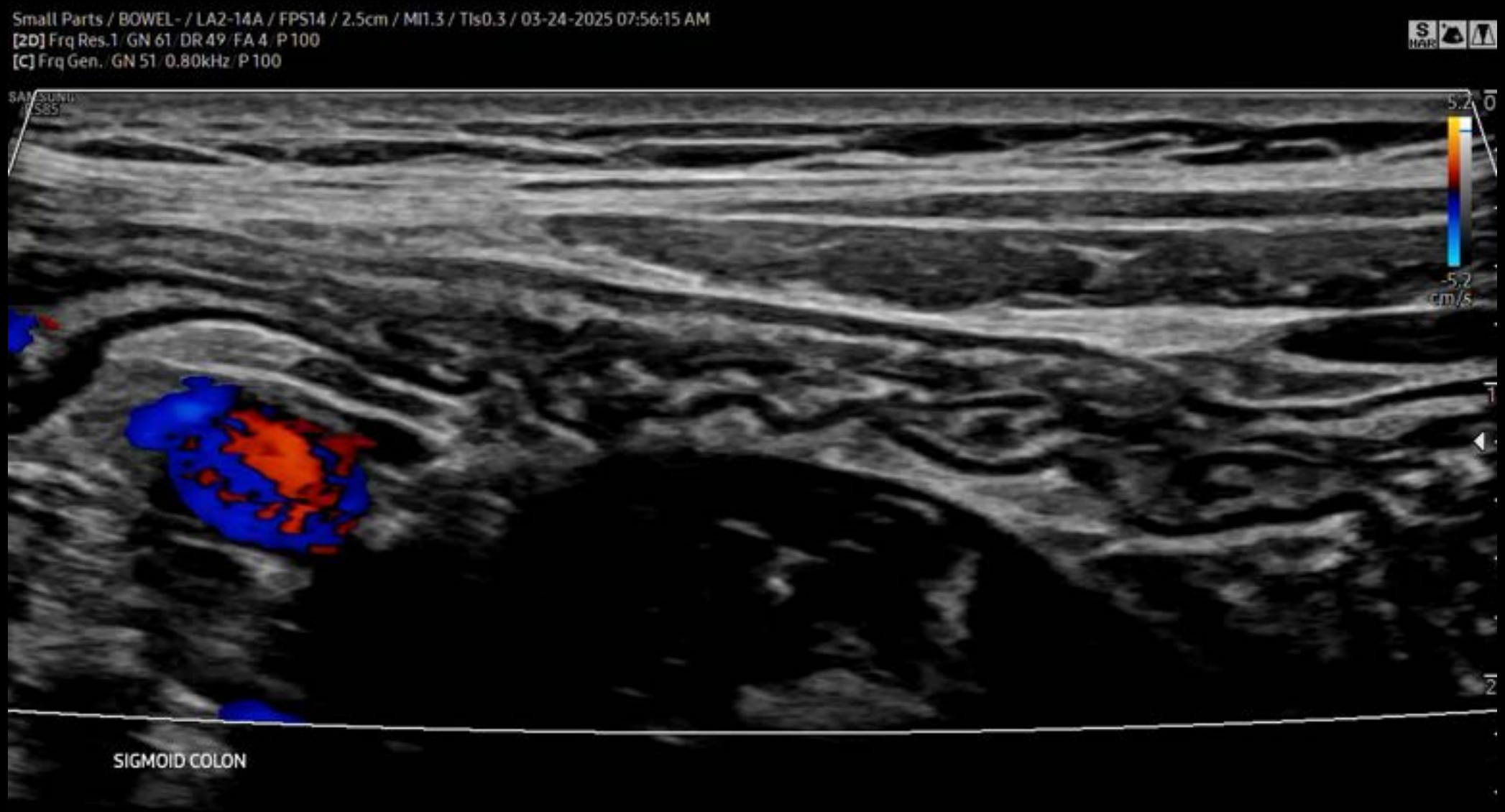
Additional History

- Diet: Does not include a lot of dairy (6-8 oz per day in the form of milk), otherwise well rounded and diverse with sufficient quantity
- Ethnic Background: Saffardic Jewish
- Family History: Oldest of 4 children, 3 healthy siblings,
  - Father with mild Crohn's disease on 6-MP

Physical Exam is Unremarkable

Differential Diagnosis?

What Do You Want to Do Next?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[2D] Frq Res.1 / GN 61 / DR 49 / FA 4 / P 100
[C] Frq Gen. / GN 51 / 0.80kHz / P 100
5.2
-5.2
cm/s
SIGMOID COLON


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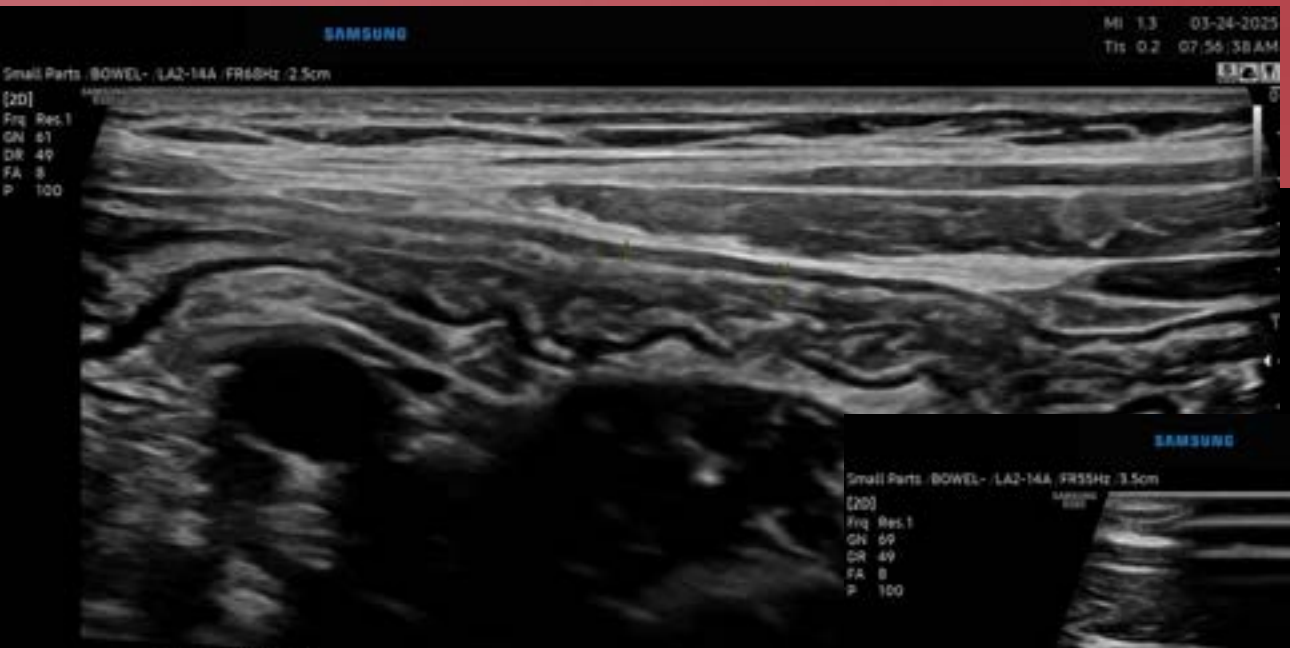
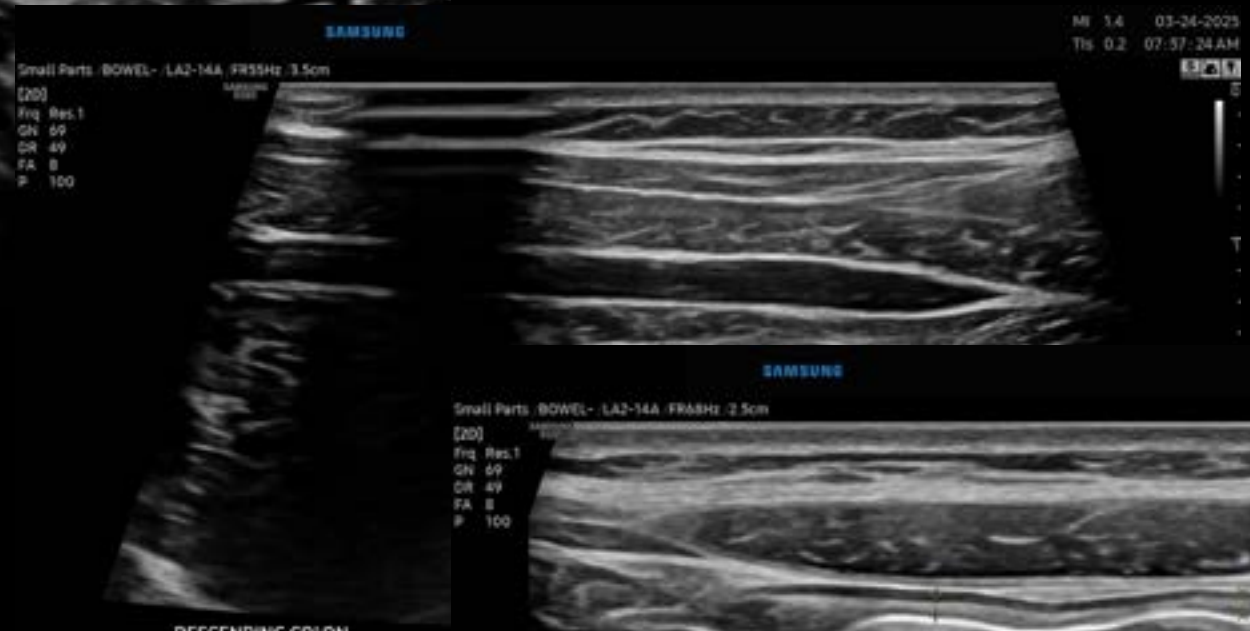
SAMSUNG
R585
5.2
-5.2
cm/s
DESCENDING COLON



SIGMOID COLON



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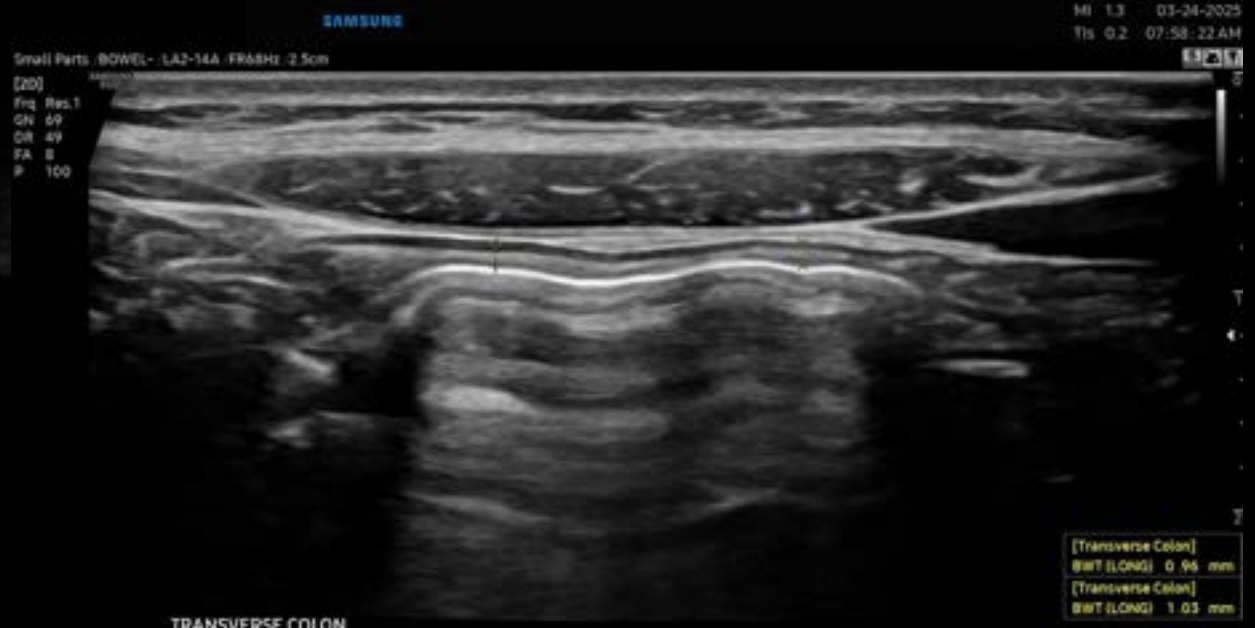

TRANSVERSE COLON


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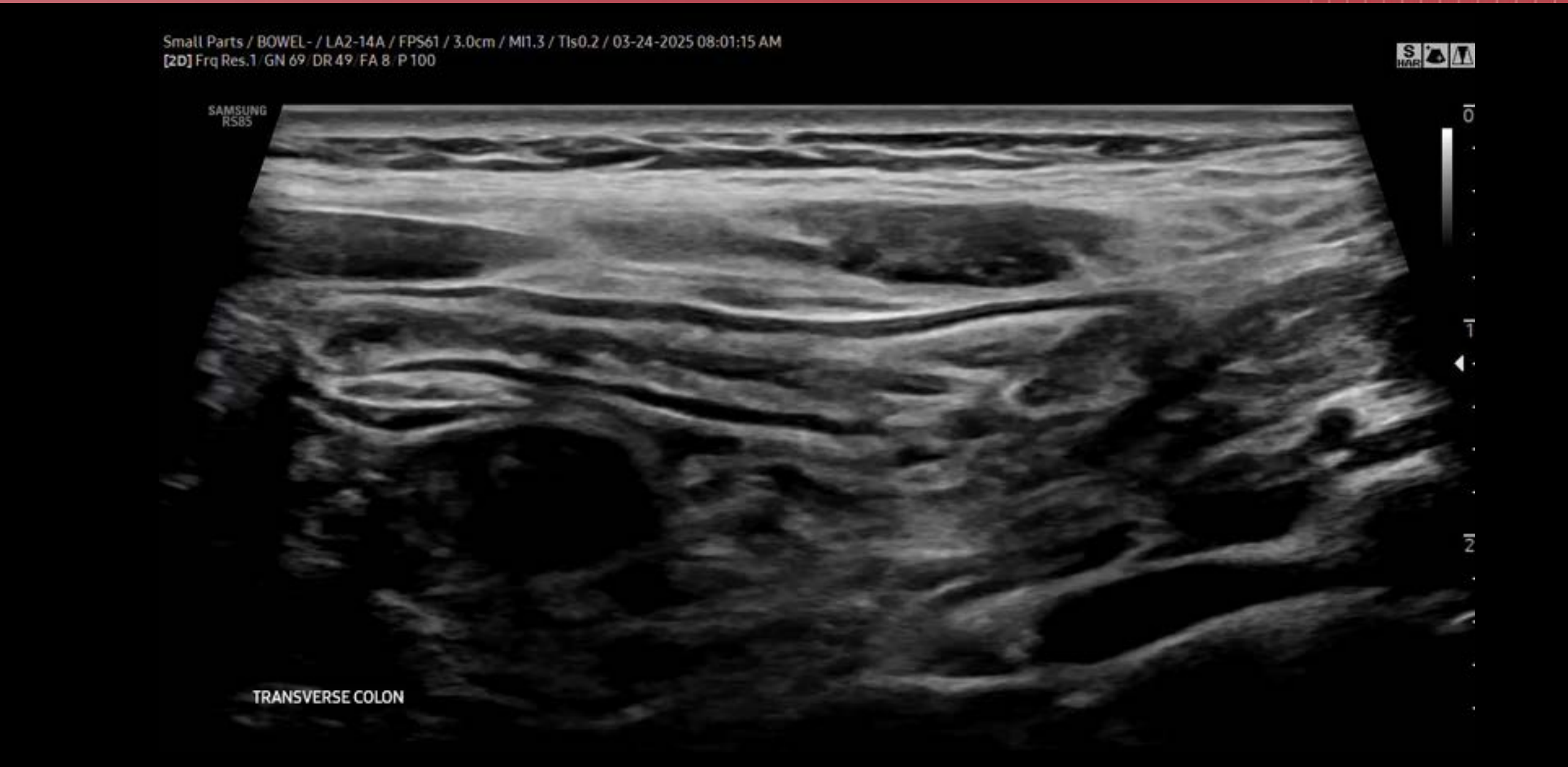
SAMSUNG
RS85
5.2
-5.2
cm/s
TRANSVERSE COLON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SAMSUNG
RS85
TRANSVERSE COLON


Small Parts / BOWEL- / LA2-14A / FPS68 / 2.5cm / MI1.3 / TIs0.2 / 03-24-2025 08:02:12 AM
[2D] Frq Res.1 GN 69 DR 49 FA 8 P 100
SAMSUNG
RS85
TRANSVERSE COLON


Small Parts / BOWEL- / LA2-14A / FPS19 / 2.5cm / MI1.3 / TIs0.6 / 03-24-2025 08:01:53 AM
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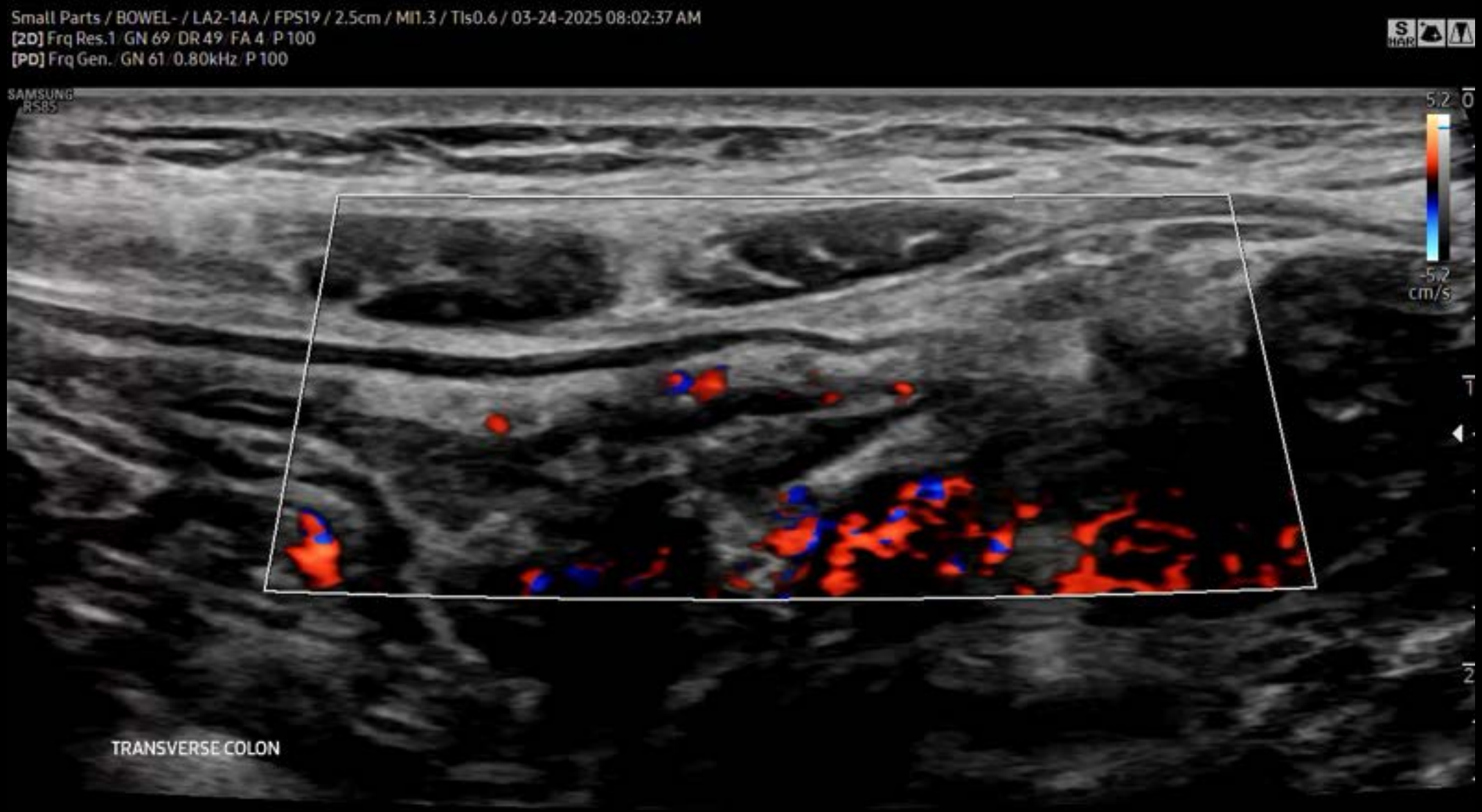
[PD] Frq Gen. / GN 61 / 0.80kHz / P 100
SAMSUNG
RS85
TRANSVERSE COLON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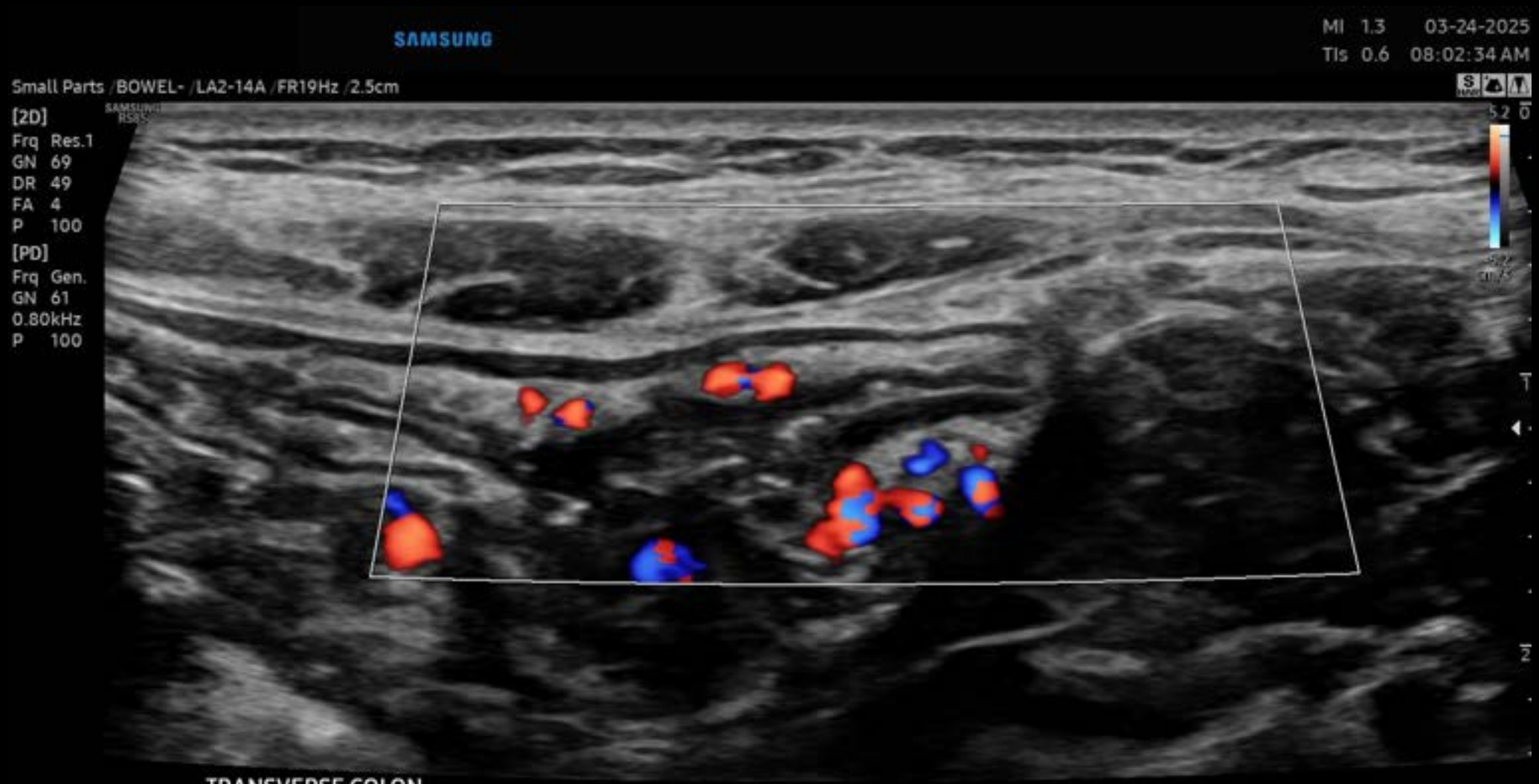
SAMSUNG
RS85
5.2
-5.2
cm/s
TRANSVERSE COLON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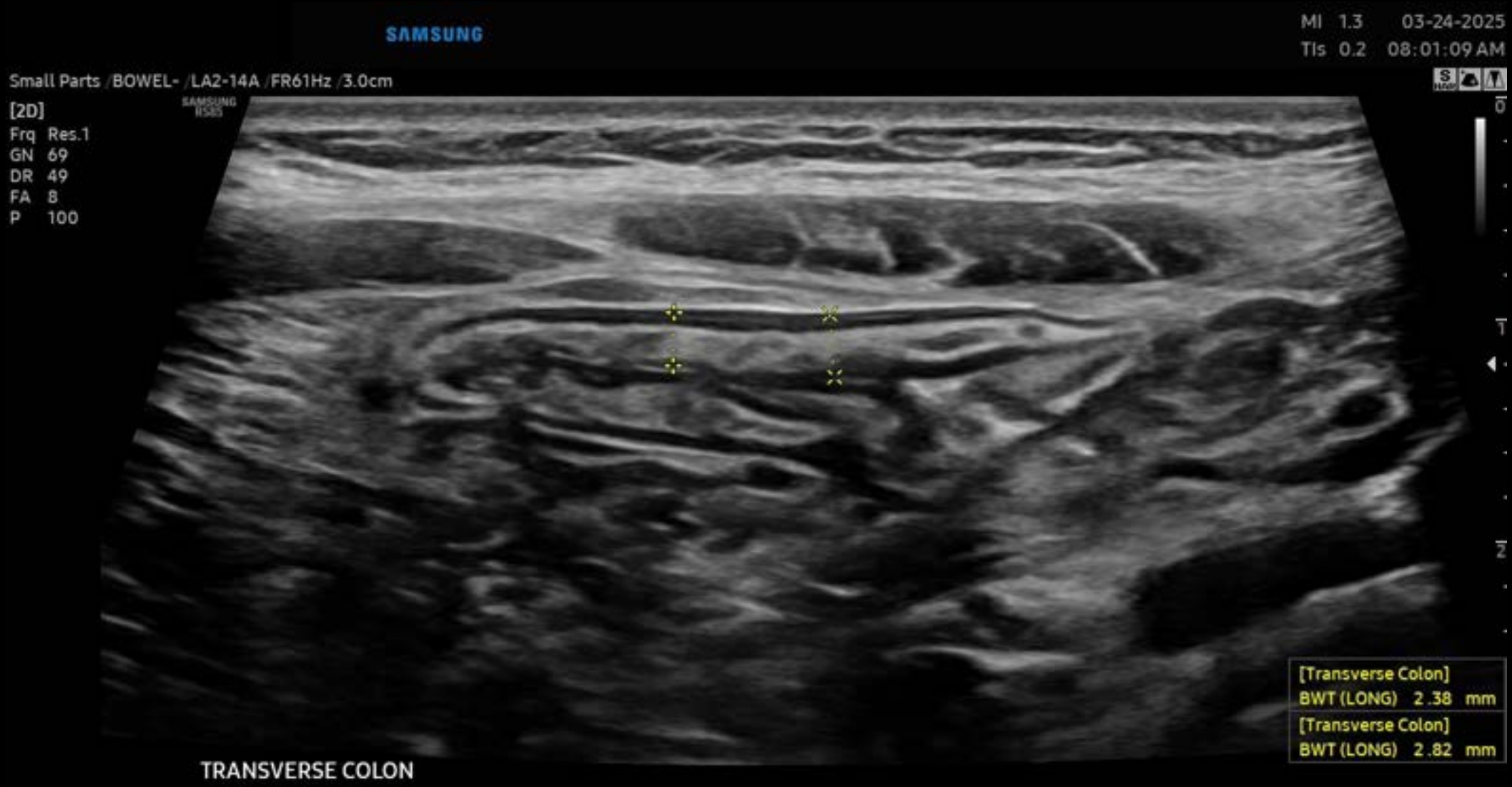
Frq Res.1
GN 69
DR 49
FA 4
P 100
[PD]
Frq Gen.
GN 61
0.80kHz
P 100
TRANSVERSE COLON


SAMSUNG
MI 1.3
TIs 0.2
03-24-2025
08:01:33 AM
Small Parts /BOWEL- /LA2-14A /FR61Hz /3.0cm
[2D]
Frq Res.1
GN 69
DR 49
FA 8
P 100
D1 19.25 mm
D2 8.81 mm
Avg(All) 14.03 mm
TRANSVERSE COLON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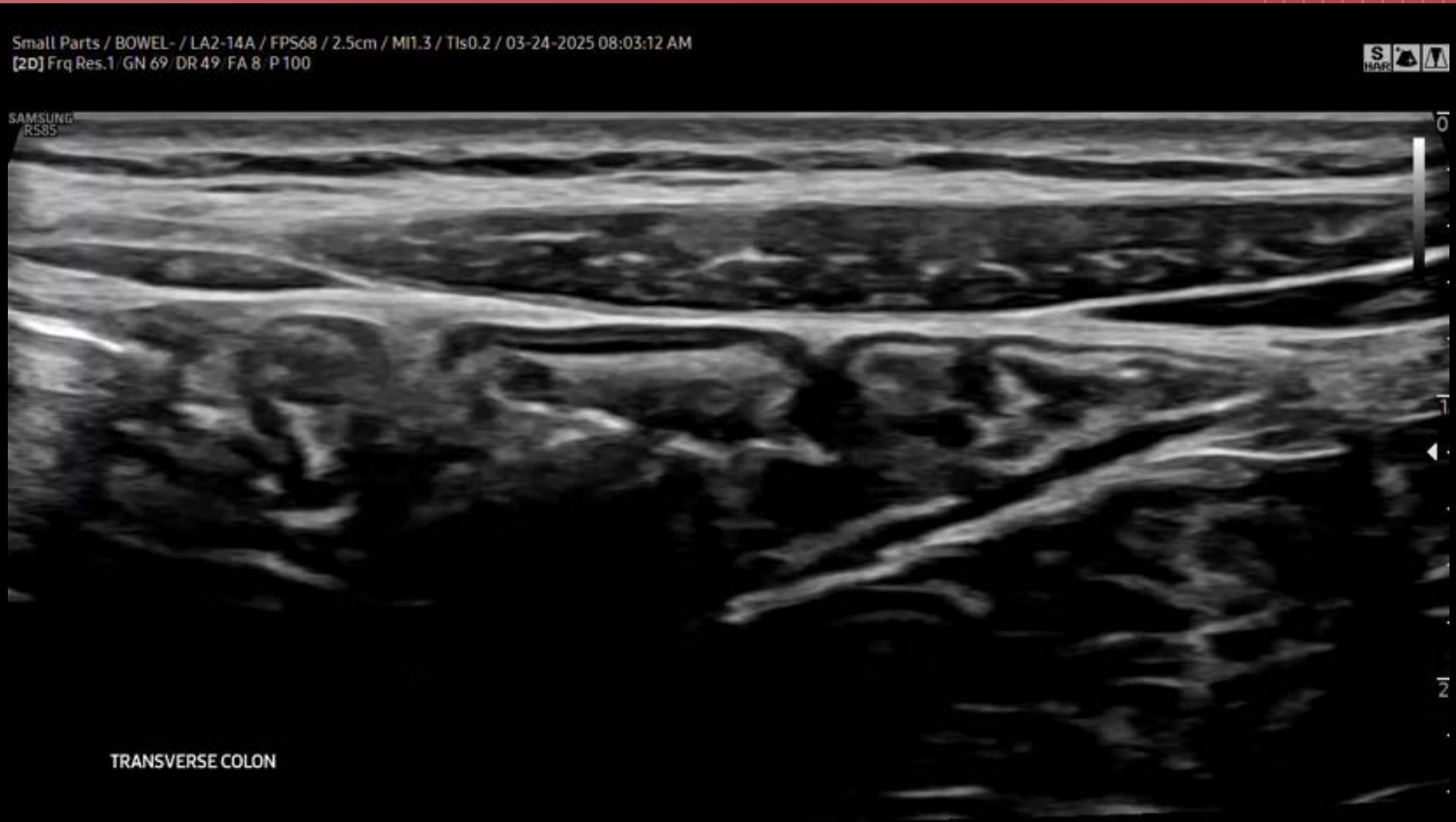
MI 1.3
TIs 0.2
03-24-2025
08:01:09 AM
Small Parts /BOWEL- /LA2-14A /FR61Hz /3.0cm
[2D]
Frq Res.1
GN 69
DR 49
FA 8
P 100
[Transverse Colon]
BWT (LONG) 2.38 mm
[Transverse Colon]
BWT (LONG) 2.82 mm
TRANSVERSE COLON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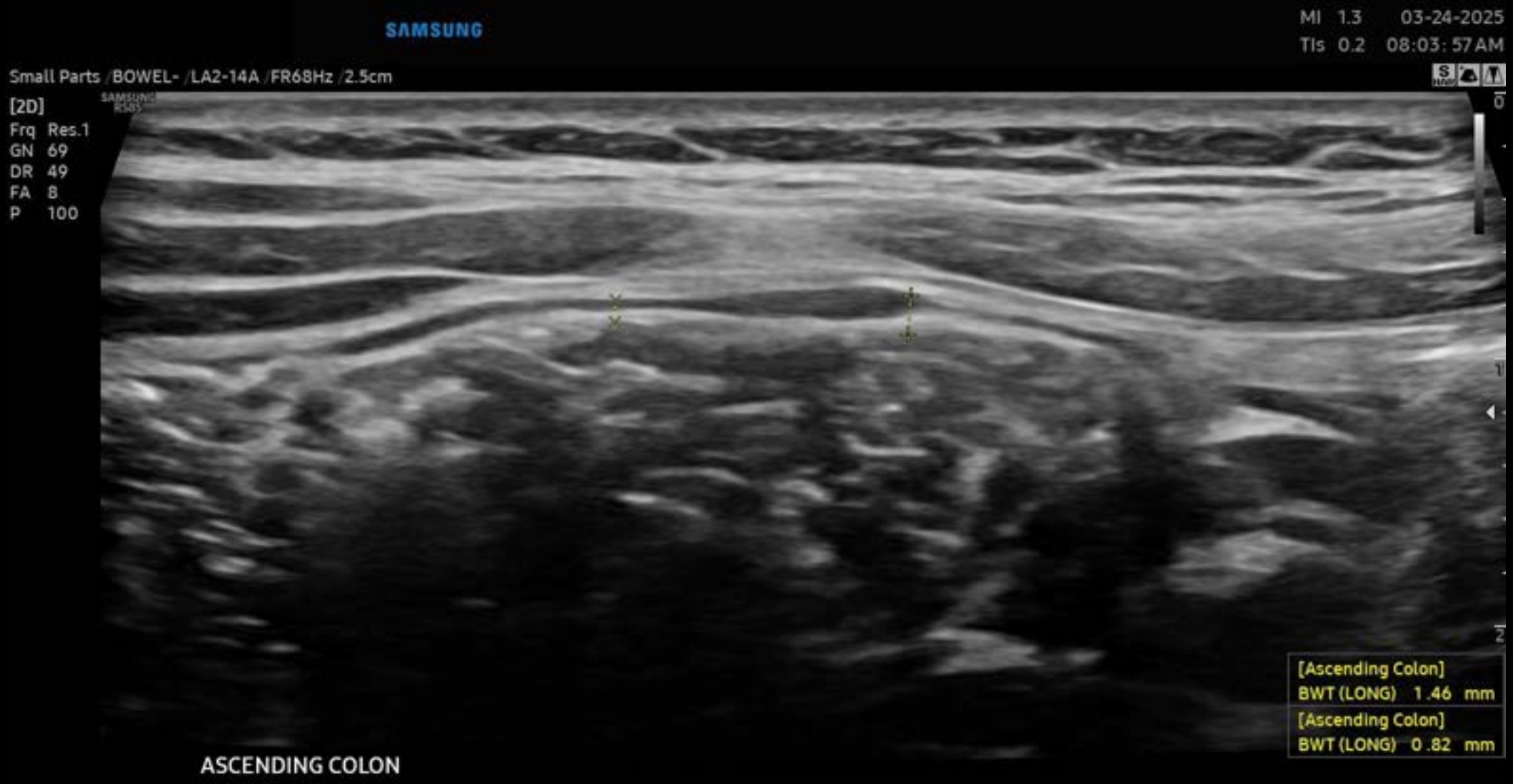
[2D] Frq Res.1 GN 69 DR 49 FA 8 P 100
SAMSUNG
RS85
TRANSVERSE COLON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MI 1.3
TIs 0.2
03-24-2025
08:03:57 AM
Small Parts /BOWEL- /LA2-14A /FR68Hz /2.5cm
[2D]
Frq Res.1
GN 69
DR 49
FA 8
P 100
[Ascending Colon]
BWT (LONG) 1.46 mm
[Ascending Colon]
BWT (LONG) 0.82 mm
ASCENDING COLON


Small Parts / BOWEL- / LA2-14A / FPS19 / 3.0cm / MI1.3 / TIs0.6 / 03-24-2025 08:04:56 AM
[2D] Frq Res.1 / GN 69 / DR 49 / FA 4 / P 100
[PD] Frq Gen. / GN 61 / 0.80kHz / P 100
SAMSUNG
RS85
5.2
-5.2
cm/s
CECUM


Small Parts / BOWEL- / LA2-14A / FPS55 / 3.5cm / MI1.4 / TIs0.2 / 03-24-2025 08:05:40 AM
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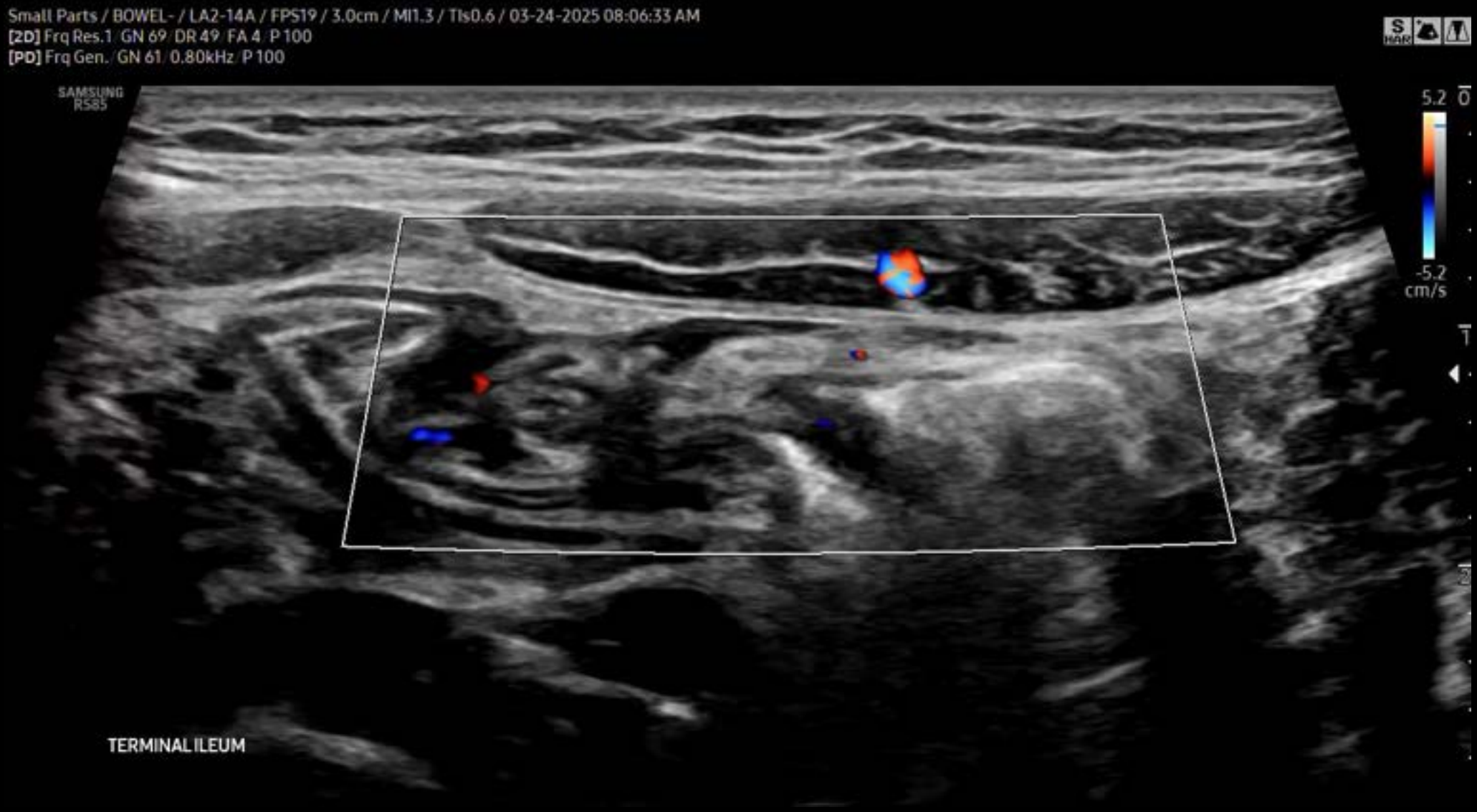
SAMSUNG
RS85
TERMINAL ILEUM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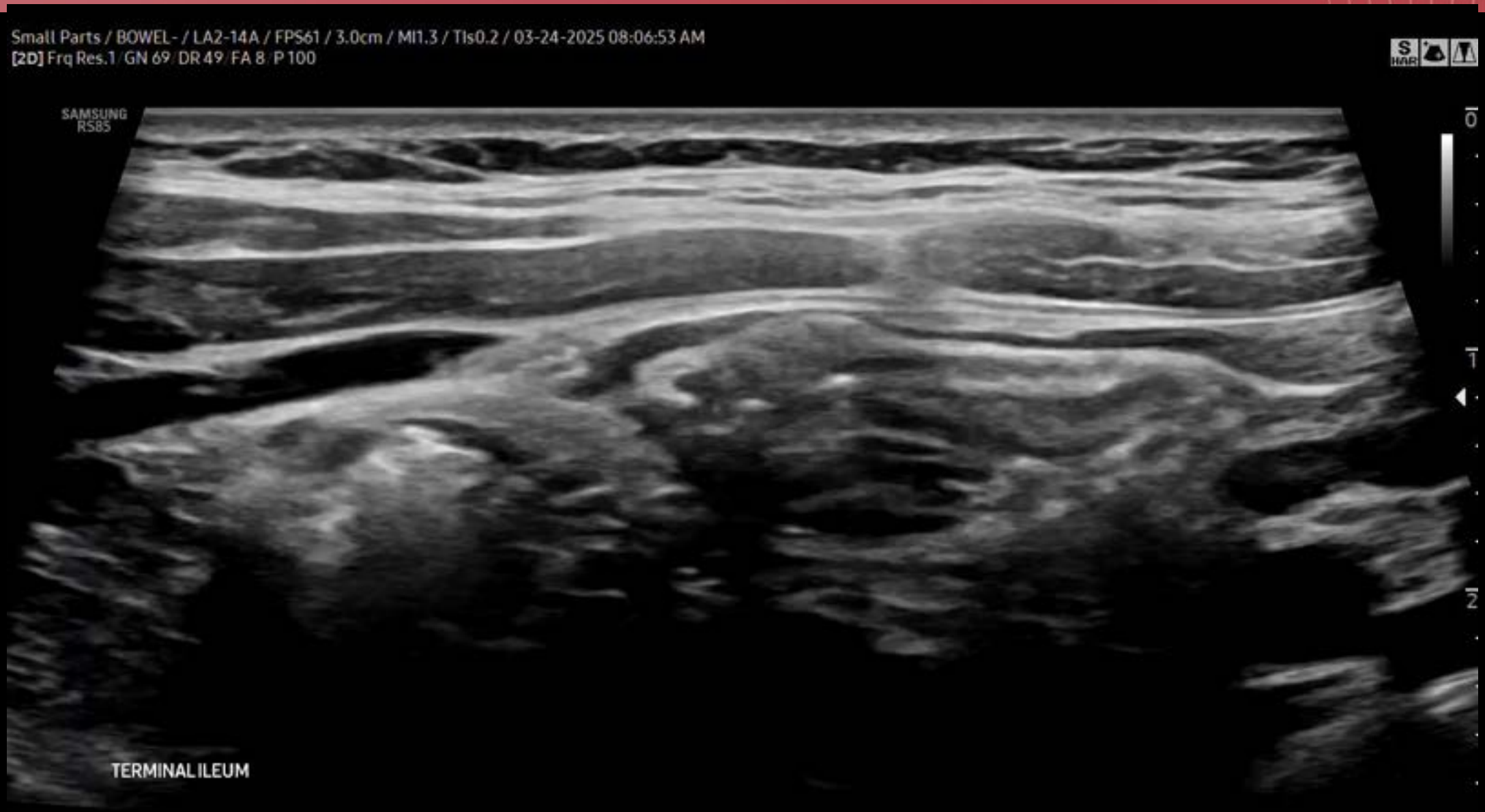
[2D] Frq Res.1 GN 69 DR 49 FA 4 P 100
[PD] Frq Gen. GN 61 0.80kHz P 100
SAMSUNG
R585
5.2
-5.2
cm/s
TERMINAL ILEUM


SAMSUNG
MI 1.3
TIs 0.2
03-24-2025
08:06: 19 AM
Small Parts /BOWEL- /LA2-14A /FR61Hz /3.0cm
[2D]
Frq Res.1
GN 69
DR 49
FA 8
P 100
[Terminal ileum]
BWT (LONG) 1.58 mm
[Terminal ileum]
BWT (LONG) 2.34 mm
[Terminal ileum]
BWT (LONG) 1.58 mm
TERMINAL ILEUM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[2D] Frq Res.1 / GN 69 / DR 49 / FA 8 / P 100
SAMSUNG
RS85
TERMINAL ILEUM


Small Parts / BOWEL- / LA2-14A / FPS19 / 2.5cm / MI0.98 / TIs0.6 / 03-24-2025 08:07:21 AM
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[PD] Frq Gen. GN 61 0.80kHz P 100
SAMSUNG
R585
5.2
-5.2
cm/s
TERMINAL ILEUM

What Do You Want To Do Next?

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Additional Tests

- She refuses to undergo any additional lab evaluation
- Stool studies
  - GI PCR Panel negative
  - C.diff PCR negative

Component	3/27/25 1321
Ref Range & Units	
CALPROTECTIN, FECAL	1,820 ^
0 - 120 ug/g	

Comment: **Results verified by repeat testing**

Concentration	Interpretation	Follow-Up
< 5 - 50 ug/g	Normal	None
>50 -120 ug/g	Borderline	Re-evaluate in 4-6 weeks
>120 ug/g	Abnormal	Repeat as clinically indicated

Endoscopy and Colonoscopy

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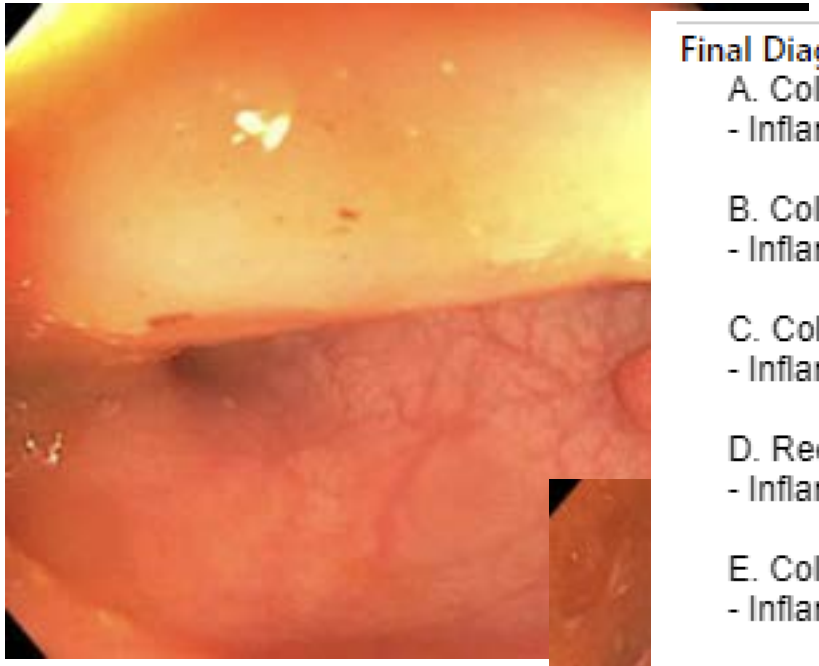
Colonoscopy



Final Diagnosis

A. Colon, descending, polyps, hot snare polypectomy:
- Inflammatory/juvenile polyps, see comment

B. Colon, transverse, polyp, hot snare polypectomy:
- Inflammatory/juvenile polyp, see comment

C. Colon, cecum, polyp, hot snare polypectomy:
- Inflammatory/juvenile polyp, see comment

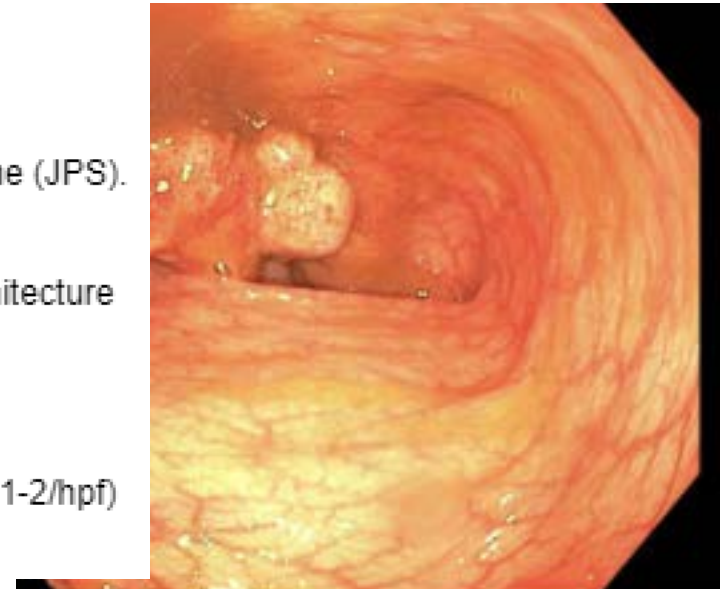
D. Rectal polyp, hot snare polypectomy:
- Inflammatory/juvenile polyp, see comment

E. Colon, hepatic flexure, hot snare polypectomy:
- Inflammatory/juvenile polyp, see comment

Comment: The number and distribution of inflammatory/juvenile polyps throughout the colon raises consideration for juvenile polyposis syndrome (JPS).

F. Duodenum, biopsy:
- Duodenal mucosa within normal limits, including preserved villous architecture and no increased intraepithelial lymphocytosis
- No pathogenic microorganisms or parasites identified

G. Esophagus, distal, biopsy:
- Esophageal squamous epithelium with rare intraepithelial eosinophils (1-2/hpf) and mild reactive changes



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Key Takeaways

- Protruding polyps in children often present with visible transmural changes on IUS that can mimic IBD
- Systematic approach is key
- Children age ≤ 6 may have difficulty cooperating or sitting still
- Abnormalities on diagnostic screening IUS should prompt earlier endoscopy and colonoscopy for further diagnostic evaluation

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Case 2

- 15-year-old female referred by pediatrician for initial evaluation of abdominal pain and weight loss
- Abdominal Pain
  - Mostly RLQ, can be epigastric too
  - Not associated with eating
  - Constant over the last 4 months, daily, lasting 10 min to 2 hours
  - Takes Tylenol and/or motrin and provides relief usually
  - Scale ranges from 1-10 and pain can be sharp or dull
- Decreased appetite
- 15-lb weight loss over the past 4 months
- Daily nausea with 1 episode of emesis over the last 2 months
- 1-2 formed bowel movements daily, without blood or urgency

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History of Present Illness Continued

- She does not have any fevers, night sweats, mouth sores, joint pains, or skin rashes
- Occasional metallic or bitter taste in her mouth
- Pediatrician saw her in February and felt she was fatigued, consistent with mono and told her she will improve with time
- Menstrual: Menarche at age 11, regular cycles for a year until February 2025 when she missed her last period
- Family hx: Ashkenazi Jewish, 2nd oldest of 9 siblings, 2 brothers 17 years and 8 years with Crohn's disease, both on infliximab

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Physical Exam

Physical Exam:
Visit Vitals

BP	112/77 (Site: Right Arm, Position: Sitting)
Pulse	**(!) 116**
Temp	36.7 °C (98 °F) (Temporal)
Resp	16
Ht	161.9 cm (5' 3.75")
Wt	**(!) 43.8 kg (96 lb 9 oz)** Comment: shoes on
LMP	(LMP Unknown)
SpO2	100%
BMI	16.70 kg/m²

<1 %ile (Z= -2.33) based on CDC (Girls, 2-20 Years) BMI-for-age based on BMI available on 4/1/2025.
2 %ile (Z= -2.08) based on CDC (Girls, 2-20 Years) weight-for-age data using data from 4/1/2025.
42 %ile (Z= -0.20) based on CDC (Girls, 2-20 Years) Stature-for-age data based on Stature recorded on 4/1/2025.

- Tachycardic
- Thin, pale appearing
- Right lower quadrant tenderness on deep palpation
- No rebound or guarding
- Normal perianal exam without skin tags


V8
NYU IBD CTR
04-01-2025
02:00:25 PM
IBD / LA2-14A / 6.5cm / 44Hz
TIs 0.1 / TIb 0.1 / MI 1.4
[2D]
Res2
Gn 54
DR 96
FA 5
P 100%
TERMINAL ILEUM

What do you want to do next on IUS?


V8
NYU IBD CTR
04-01-2025
01:56:23 PM
IBD / CA3-10A / 14.0cm / 23Hz
TIs 0.1 / TIb 0.1 / MI 0.92
[2D]
Res1
Gn 68
DR 104
FA 2
P 100%
TERMINAL ILEUM


V8
NYU IBD CTR
04-01-2025
01:54:18 PM
IBD / CA3-10A / 6.0cm / 46Hz
TIs 0.1 / TIb 0.1 / MI 0.82
[2D]
Res1
Gn 68
DR 104
FA 2
P 100%
TERMINAL ILEUM


V8
NYU IBD CTR
04-01-2025
02:02:02 PM
IBD / LA2-14A / 5.5cm / 50Hz
TIs 0.1 / TIb 0.1 / MI 1.4
[2D]
Res2
Gn 54
DR 96
FA 5
P 100%
TERMINAL ILEUM


V8
NYU IBD CTR
04-01-2025
02:03:19 PM
IBD / LA2-14A / 5.5cm / 50Hz
TIs 0.1 / TIb 0.1 / MI 1.4
[2D]
Res2
Gn 54
DR 96
FA 5
P 100%
TERMINAL ILEUM


V8
NYU IBD CTR
04-01-2025
02:01:14 PM
IBD / LA2-14A / 5.5cm / 5Hz
TIs 0.3 / TIb 0.3 / MI 1.4
[2D]
Res2
Gn 54
DR 96
FA 5
P 100%
[S-Flow]
Res1
Gn 50
PRF 0.86kHz
P 100%
6.0
-6.0
cm/s
TERMINAL ILEUM

Point of Care Intestinal Ultrasound 4/1/2025

Technique: Greyscale/color Doppler graded compression ultrasound evaluation of the 4 abdominal quadrants was performed. Static images and AVI clips of the 4 abdominal quadrants was saved.

Previous IUS: Yes

Diagnosis: Diagnostic IUS Indicated for Symptoms Consistent with Possible IBD

Indication: Abdominal pain and weight loss

Bowel segment(s) Visualized: Sigmoid colon, Descending Colon, Transverse colon, Ascending colon/Cecum, Terminal ileum

	Sigmoid Colon	Descending Colon	Transverse Colon	Ascending colon/Cecum	Terminal ileum
Maximum BWT (mm)	1.7	1.5	5.7	1.3	10.5 (average, largest measurement 16 mm)
Color Doppler Signal (Modified Limberg 0-III)	I	I	I	0	III
Loss of Bowel Wall Stratification	No	No	No	No	Yes (complete)
Inflammatory Mesenteric Fat	No	No	No	No	Yes (severe and complete wrapping)
Lymphadenopathy	No	No	No	No	Yes, multiple RLQ nodes

Complications (Abscess/Stricture/Fistula): Stricture Fistula Phlegmon - Destruction of the wall of the distal terminal ileum just proximal to the ileocecal valve with a fistulous appearance between the distal ileum and the appendix and an inflammatory mass anteriorly tethered with proximal small bowel loops
Small Bowel Segment length involved if abnormal (cm): 20+ cm
Procedure length of time (minutes): 25
Confidence Level: High

Impression: Severely active and chronic inflammation in the distal terminal ileum, including involvement of the ileocecal valve. The distal terminal ileum from 2-10 cm proximal to the ICV was severely inflamed with significant hyperemia and complete loss of bowel wall stratification, with hypoechoic appearance of all bowel wall layers. Anteriorly and just proximal to the stricture (no proximal dilation but severe luminal narrowing with bowel wall thickening) there was an inflammatory mass with a stellate appearance of tethered small bowel loops, of which there was a proximal small bowel loop in the right upper quadrant with significantly increased bowel wall thickness and moderately active inflammation. There was also appearance of a connection posteriorly, just proximal to the ICV between the distal terminal ileum and the appendix. There was no clearly identified abscess, only an inflammatory mass. In the colon, there was mild patchy active inflammation, more moderate in the transverse colon. This was characterized by submucosal prominence and hyperemia in the sigmoid and descending and increased bowel wall thickness with hyperemia in the transverse colon. The ascending colon appeared normal aside from the ileocecal valve. The results of the examination were communicated to the patient during the course of the examination in real-time.

Refuses ER and Admission

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Assessment and Plan

- Diagnosis: Severe, penetrating Crohn's disease
- Start on oral antibiotics
- Obtain urgent CTE or MRE
- Obtain labs
- Follow up in 1 week with clinic visit with me, IBD surgeon, nutrition team for primary laparoscopic ICR

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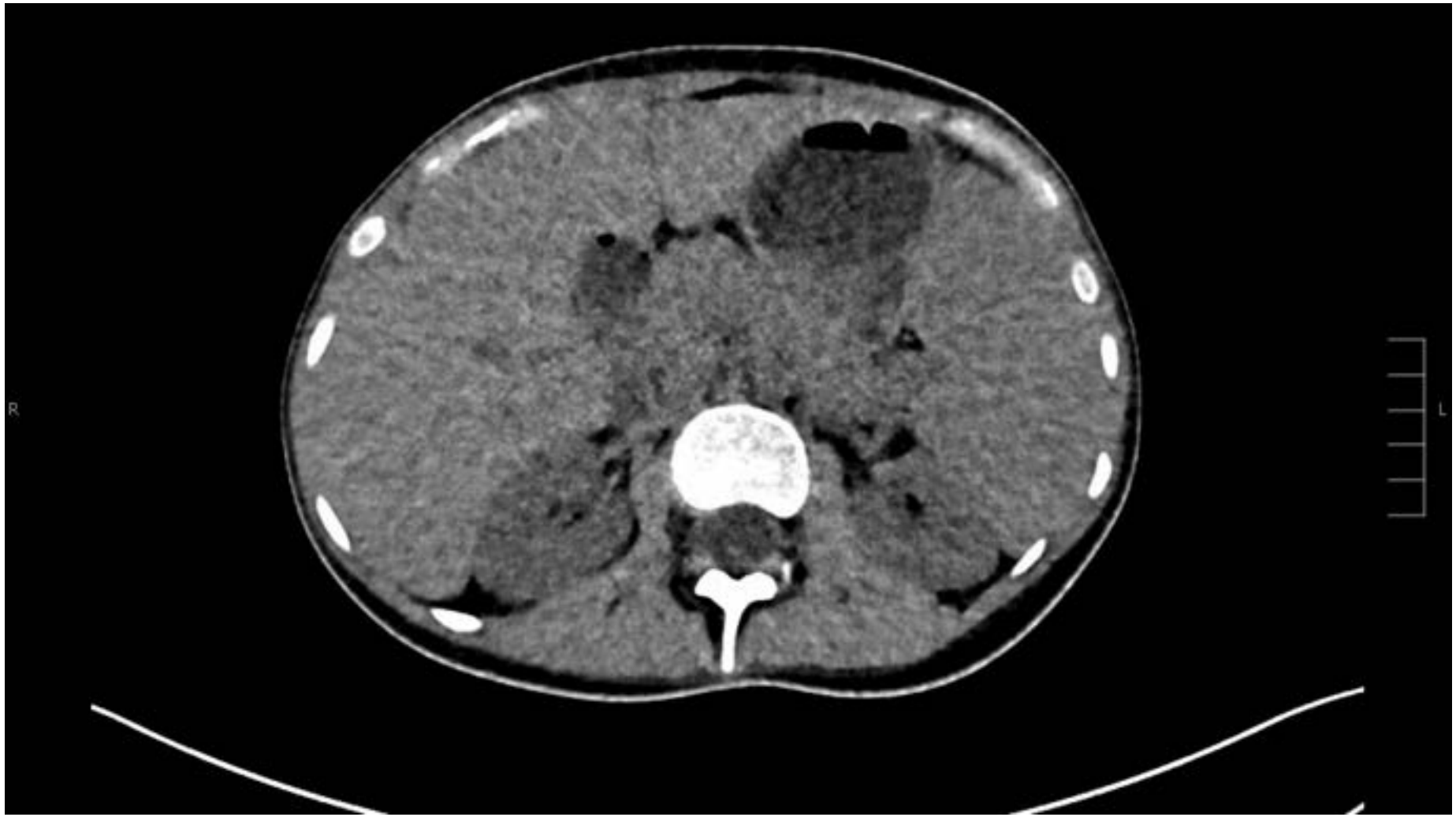
Lab and CTE Results

WBC 10.3
Hgb 10.8
Hct 36.7
Plt 433
CRP 55.5 mg/L
ESR 39
Albumin 3.5
AST 13
ALT 7
Folate > 24
Vitamin B12 383
Vitamin D 12
TSH 1.21



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CTE Impression

4/3/2025: There is wall thickening and mucosal hyperenhancement of approximately 7.3 cm segment of distal terminal ileum (series 900, image 44). Fistulization of the inflamed segment of distal ileum to the appendix with associated appendiceal dilation and inflammation to 1.7 cm (series 900, image 48). There is also an enhancing fistulous tract measuring 1.2 cm to adjacent loop of ileum. Additional short segment of inflammation, 3.2 cm in length, in the left lower quadrant (series 3, image 69), and left upper quadrant, 3.8 cm in length (series 901, image 81), without upstream dilatation to suggest stricture. Engorged vasa recta (series 3, image 56) There is no bowel wall thickening or mural hyperenhancement. No perienteric abnormality.

- Impression: Findings compatible with active bowel inflammation, with active ileitis involving a 7.2 cm segment of distal to terminal ileum and associated fistulization to adjacent loop of ileum and appendix. Additional skip lesions in the left upper and lower quadrants. No discrete/drainable abscess. No evidence of stricture

Follow Up 1-Week Later


V8
NYU IBD CTR
04-08-2025
12:00:04 PM
IBD / CA3-10A / 14.0cm / 23Hz
TIs 0.1 / TIb 0.1 / MI 0.98
[2D]
Res1
Gn 62
DR 104
FA 2
P 100%


V8
NYU IBD CTR
04-08-2025
12:00:44 PM
IBD / CA3-10A / 11.0cm / 28Hz
TIs 0.1 / TIb 0.1 / MI 0.92
[2D]
Res1
Gn 62
DR 104
FA 2
P 100%
TERMINAL ILEUM


V8
NYU IBD CTR
04-08-2025
11:57:20 AM
IBD / LA2-14A / 9.5cm / 31Hz
TIs 0.4 / TIb 0.4 / MI 1.2
[2D]
Res2
Gn 65
DR 96
FA 5
P 100%
TERMINAL ILEUM

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IUS Report

Point of Care Intestinal Ultrasound 4/8/2025

Technique: Greyscale/color Doppler graded compression ultrasound evaluation of the 4 abdominal quadrants was performed. Static images and AVI clips of the 4 abdominal quadrants was saved.

Previous IUS: Yes 4/1/2025

Diagnosis: Crohn's Disease

Indication: Crohn's Disease: Evaluation for Complications

Bowel segment(s) Visualized: Sigmoid colon, Descending Colon, Transverse colon, Ascending colon/Cecum, Terminal ileum

	Sigmoid Colon	Descending Colon	Transverse Colon	Ascending colon/Cecum	Terminal ileum
Maximum BWT (mm)	1.0	0.8	0.9	1.0	11.6
Color Doppler Signal (Modified Limberg 0-III)	0	0	0	0	III
Loss of Bowel Wall Stratification	No	No	No	No	Yes
Inflammatory Mesenteric Fat	No	No	No	No	Yes
Lymphadenopathy	No	No	No	No	Yes

Complications (Abscess/Stricture/Fistula): Fistula Phlegmon
Small Bowel Segment length involved if abnormal (cm): 10 cm
Procedure length of time (minutes): 20
Confidence Level: High

Impression: Severely active inflammation in the distal terminal ileum with luminal narrowing and increased bowel wall thickness without proximal dilation still consistent with stricture formation. There were at least 2 fistulae, one from the ileum to the appendix and one anteriorly to a more proximal loop of small bowel. There was fluid and a tethering of bowel loops in the right lower quadrant consistent with possible inflammatory mass but without a clear drainable collection. The results of the examination were communicated to the patient during the course of the examination in real-time.

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Pre-Surgery Rehabilitation

- TPN with minimal PO for comfort
- IV antibiotics
- Gains 5 lbs and pain significantly improved
- Nausea present, but diminished
- No emesis
- Surgery in 2 weeks, after Passover holiday

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Surgery 4/24/2025

Procedure Details:
After successful induction, patient was positioned in modified lithotomy position. The chest was strapped to the operating table prior to prepping and draping of the patient. One 10 mm infra umbilical Hasson canula was placed initially and pneumoperitoneum was established. Two 5 mm ports were placed under direct vision in left upper and lower quadrants. A large terminal ileum phlegmon and a ileotransverse colonic fistula was seen. Patient was placed into steep Trendelenburg and left tilted position. The dissection began medial to lateral fashion with identification and takedown of ileocolic vascular pedicle using ligasure device which facilitated exposure and preservation of underlying secon and third parts of duodenum. Right ureter was also identified. The medial dissection was carried out caudate to cephalad to expose the undersurface of transverse colon and gall bladder. Retroperitoneal attachments of terminal ileum and lateral attachements of right colon were taken down. After the patient was placed into reverse Trendelenburg, hepatic flexure was mobilized which allowed complete medialization of right colon. A small midline incision was made and the pneumoperitoneum was discontinued. A wound protector was placed. The right colon and terminal ileum was removed from this incision. Ileocecectomy was performed. The transverse fistula was incorporated into the specimen length. The specimen was then removed from the field. An end to side ileocolic anastomosis was done using EEA 29 circular stapler. Proximal colon was closed with EndoGIA 60 mm purple stapler. Fascia in midline incision was closed using running number 1 PDS sutures. 19 Fr Blake drain was laced into the pelvis and right lower quadrant. Abdominal skin incisions were closed, and the surgery was completed. The patient tolerated the procedure well.

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Surgical Specimen

Thank you!