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What if it's not IBD?

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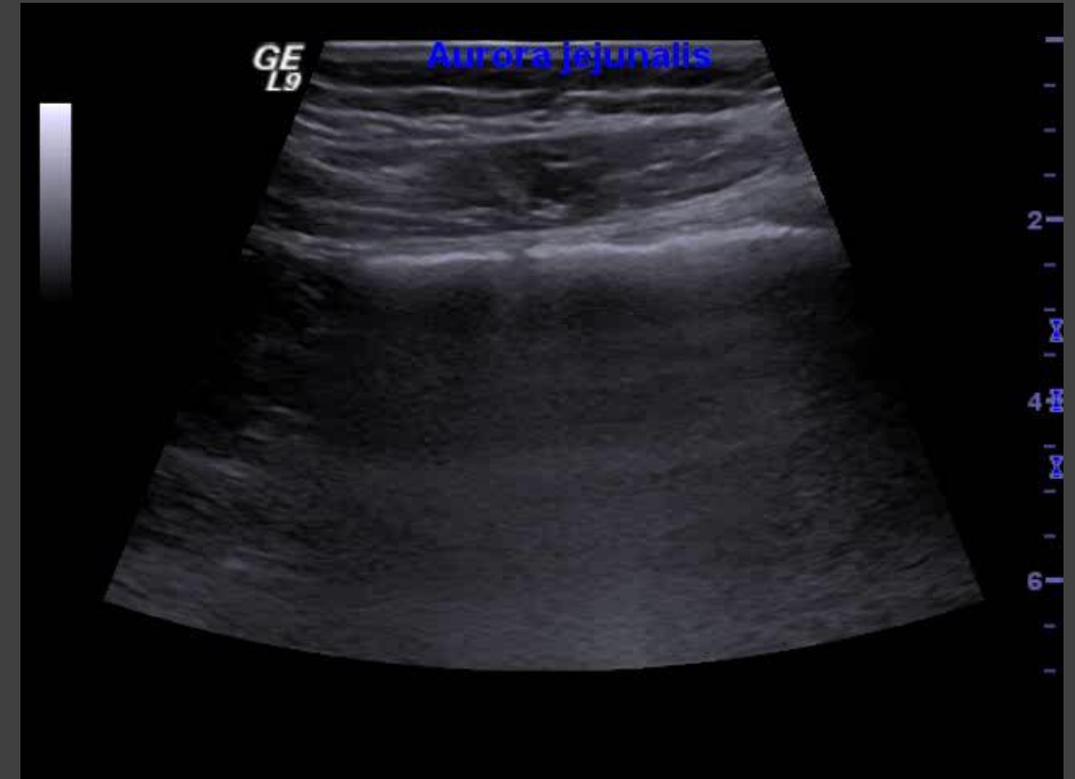
Bergen, Norway

UNIVERSITETET I BERGEN



Overview

- Clinical indications of GIUS
- Disease conditions
 - Inflammatory
 - Obstructions
 - Vascular
 - Tumors
 - Interventions
 - Others
- Summary



«Gentlemen, we will skip the next chapter since there are no recognized diseases of the small intestine, except tuberculosis»

Prof. M. Evans lecturing for the medical student Burril B. Crohn

Learning objectives

Learn how different diseases of the GI tract present on GIUS

Clinical indications

- Diarrhea
 - (Acute)
 - Chronic
- Stomach pain
 - Acute
 - Chronic
 - Diffuse
 - Localised → «Self-localisation»
- Bowel obstruction/Ileus
- Weight loss



Inflammatory disorders

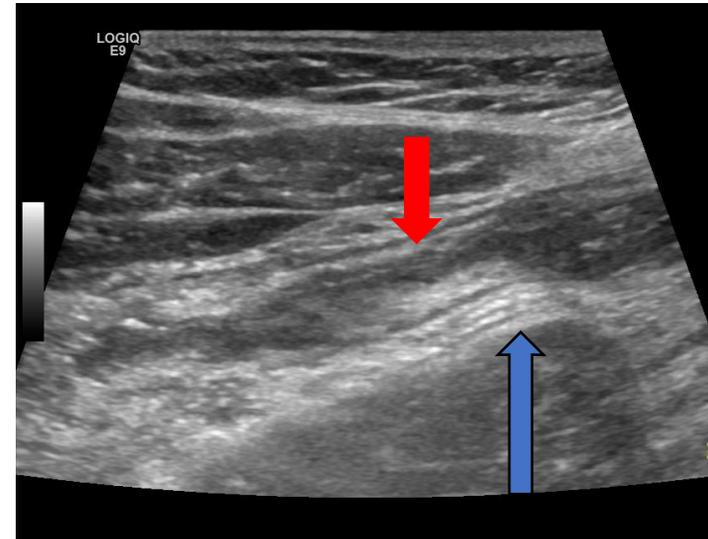
Overview

- (Inflammatory bowel disease)
- Gastroenteritis
- Toxic/Drug induced
- Appendicitis
- Diverticulitis
- Graft vs host disease
- Celiac disease

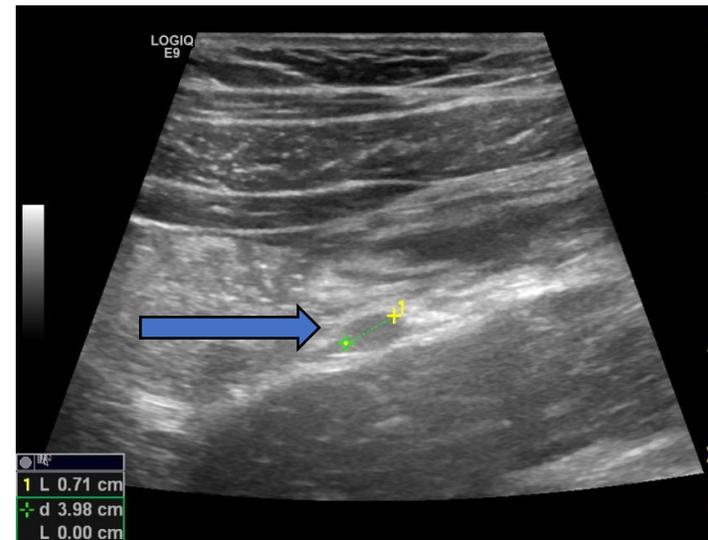
Inflammatory disorders

Example 1:

- **Male in his twenties**
 - **6 days abdominal pain**
 - **Central wandering towards right fossa**
 - **No fever, nausea, vomiting or diarrhea.**
 - **No travel history or known exposure**
 - **Hb 13.8, CRP 12, LPC 10,6**
 - **Slight tenderness right fossa.**
-
- **Diffs?**
 - **Stool sample revealed:**
 - ***Yersinia enterocolitica***



Normal appendix. (Blue arrow), slightly thickened terminal ileum (red arrow)

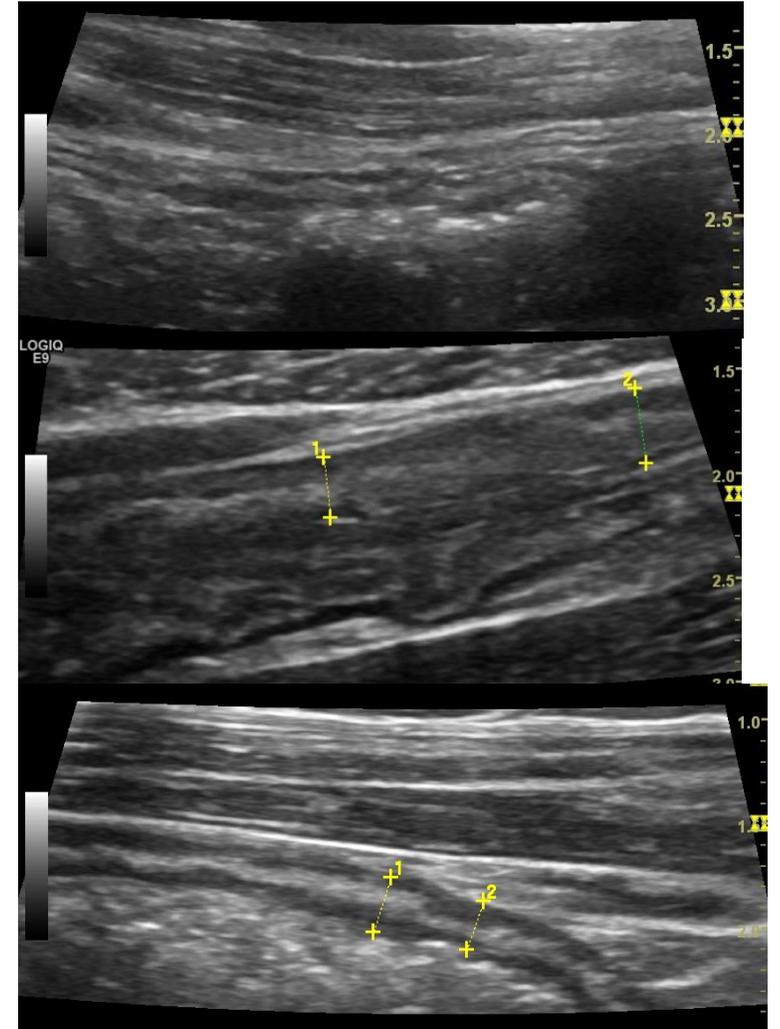


Visible mesenteric lymph node nearby.

Inflammatory disorders

Example 2:

- Woman in her thirties
- Treated with drainage, penicillin and clindamycin for a peritonsillar abscess
- Developed dysuria, loose stools and stomach pain and treated with amoxicillin
- Worsening of diarrhea and stomach pain.
- Supposed negative stool culture
-
- Diffs?
- Stool cultures had not been taken
 - *Cl. difficile*.



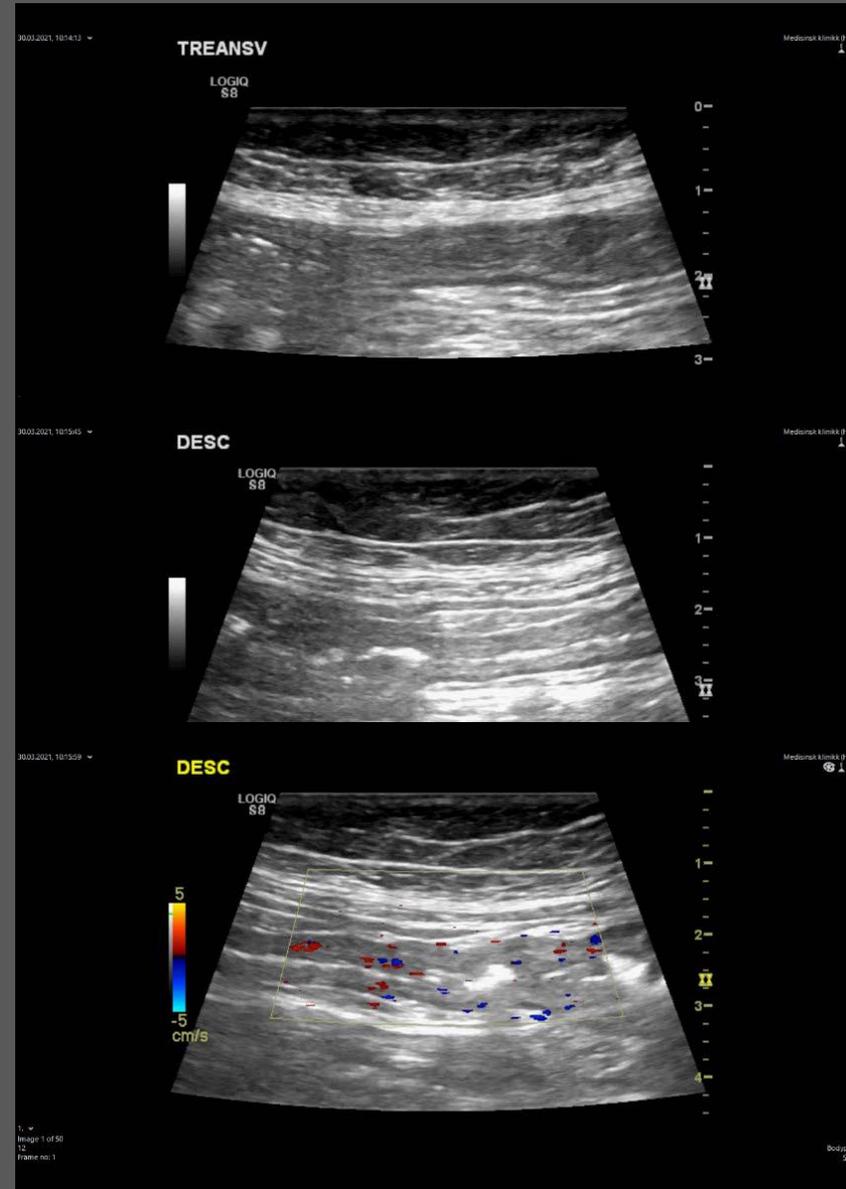
Slightly thickened wall in ascending, descending and sigmoid colon

Inflammatory disorders

Example 3

- Female in her 90-ties
- Diarrhea 3-4/day over several months.
- No blood and negative stool samples
- Used cream containing diclofenac on her entire left leg and back several times per day for 1,5 years for pain relief

- **Diffs?**
- **NSAID-colitis**
- **Symptoms stopped day after the cream was stopped**
- **Endoscopy showed slight colitis confirmed by biopsies**

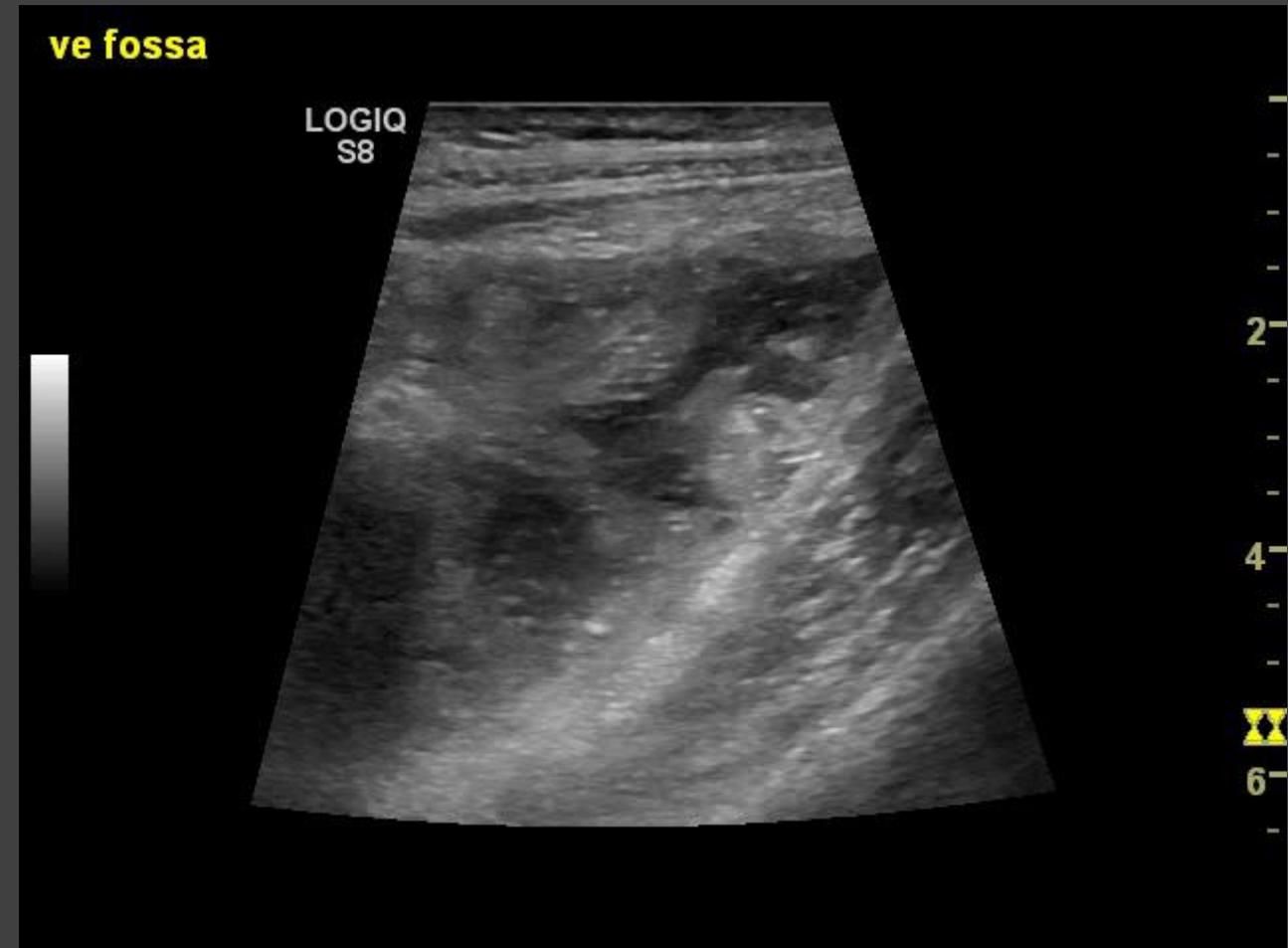


Slight wall thickening in whole colon with loss of haustra and visible vessels with colour Doppler

Inflammatory disorders

Example 4

- Male in his 20-ties with ileostoma after colectomy for supposed acute severe ulcerative colitis
- High output stoma (20 litres!) and severe enteritis with large ulcerated areas of the small bowel
- Diffs?
- „Exfoliating enterocolitis“
- (Perhaps a toxic reaction to isotretinoin that the patient used just before his “Ulcerative colitis“ started)

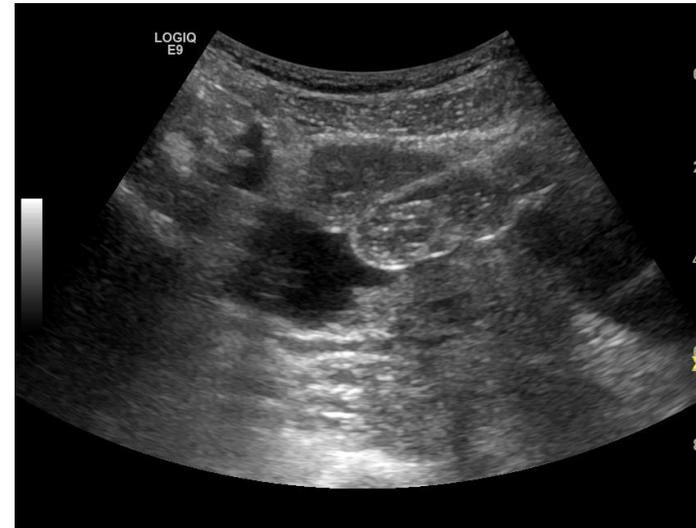


Video of small bowel loop with fluid filled lumen. There are small air bubbles inside the mucosal layer. The patient had repeated «sloughing» of the mucosa with the mucosa coming off in large pieces and passing through the stoma.

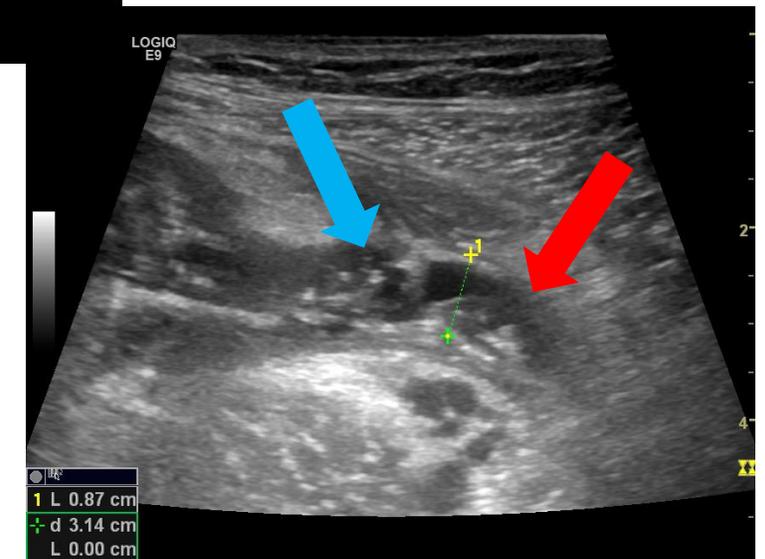
Inflammatory disorders

Example 5

- Colleague wants to talk to gastroenterologist doing GIUS due to stomach pain (before going on call)
- **Pale, sweating and febrile with localised peritonitis in right fossa.**
- **Diffs?**
- **Appendicitis**
- **Surgeon operated without CT but only because the patient had peritonitis**



Free fluid in right fossa

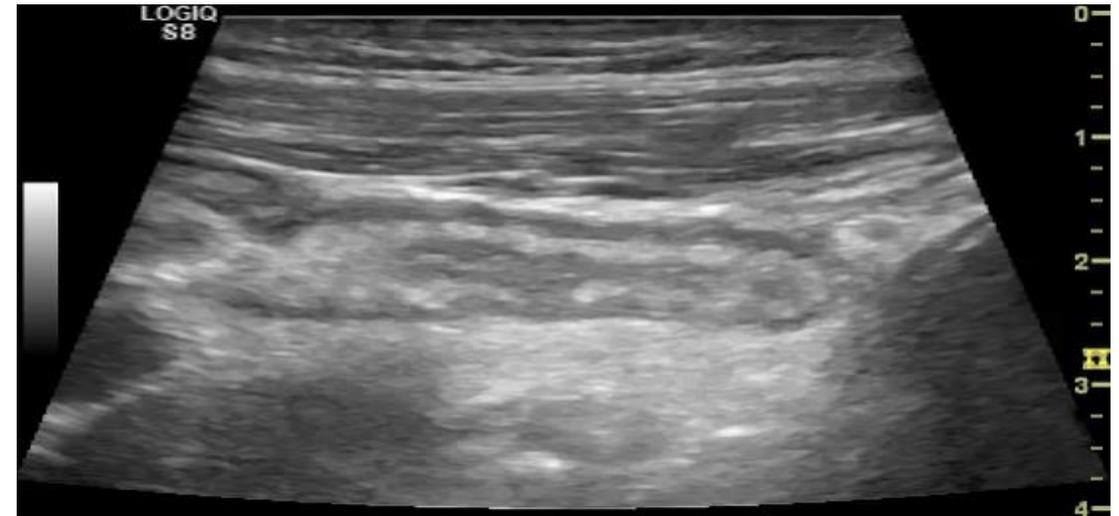


Thickened appendix with fecalith (blue arrow and distended lumen (red arrow)

Inflammatory disorders

Appendicitis

- >6mm diameter
- Non-compressible
- Probe tenderness
- Hyperechoic changes in surrounding fatty tissue
- Early: Normal stratification
- Late: Loss of stratification
- Defects in sin submucosa
- Dilated lumen
- Localised free fluid



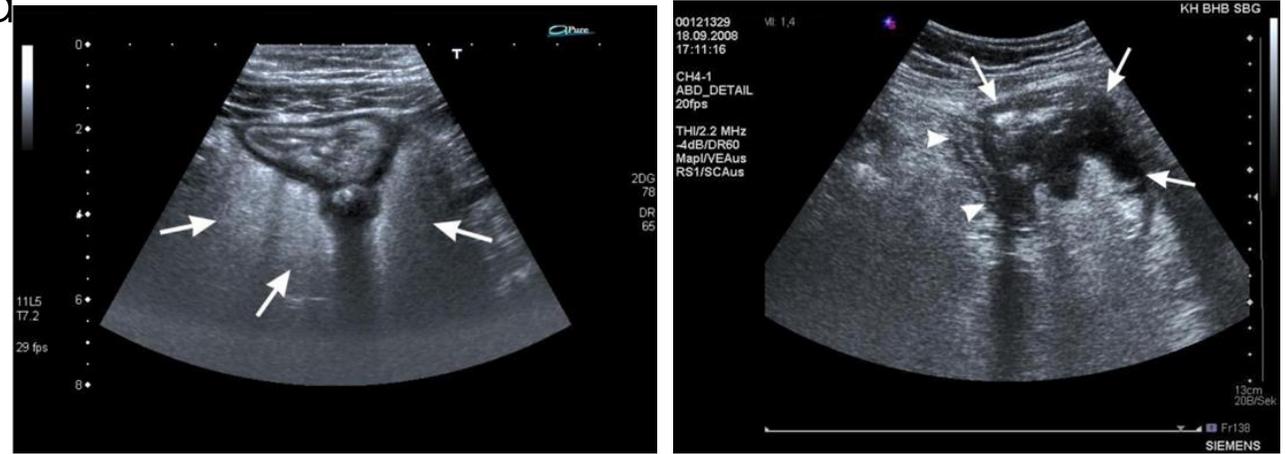
A thickened appendix.

Inflammatory disorders

- Diverticula
 - Focal wall thickening
 - Hypoechoic outcropping of colon wall >5 mm w/without hyperechoic content.
- **Diverticulitis**
 - Tenderness w/probe pressure
 - Changes in pericolic fat
 - Hyperechoic and firm
 - Hypoechoic halo around the inflamed diverticula



Diverticula (yellow arrow)

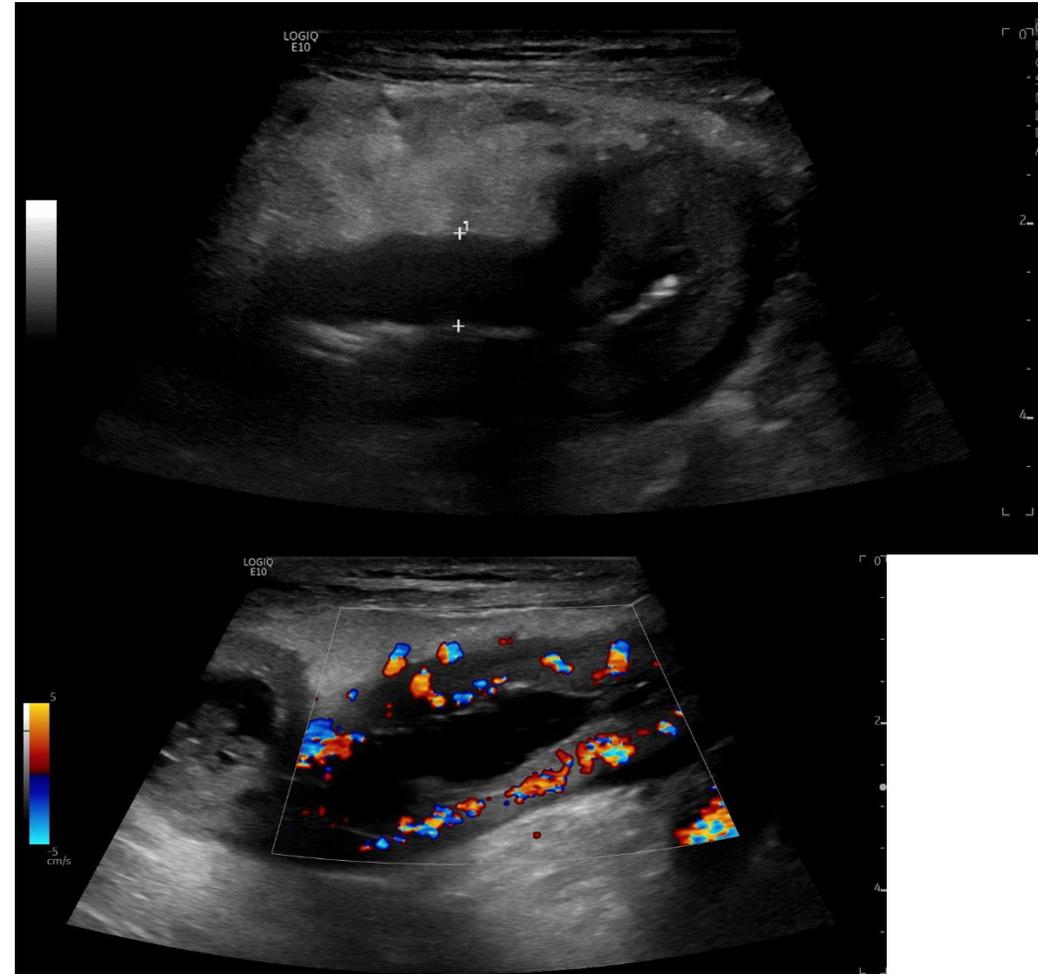


Thickened wall and fatty tissue reaction (left). Abscess formation (right)

Inflammatory disorders

Example 6

- Man in his 60ies
- Bone marrow transplant due to hematological cancer
- Increasing problems with stomach pain and diarrhea
- Diffs?
- Acute graft vs host disease



Acute: Gross thickening of colon wall with increased vessel signal, loss of layers and inflammatory fat

Inflammatory disorders

Example 6

- Man i hos 60ies
- Bone marrow transplant due to hematological cancer
- Treated for GVHD with steroids
- Still stomach pain and diarrhea
- Diffs?
- Chronic graft vs host disease

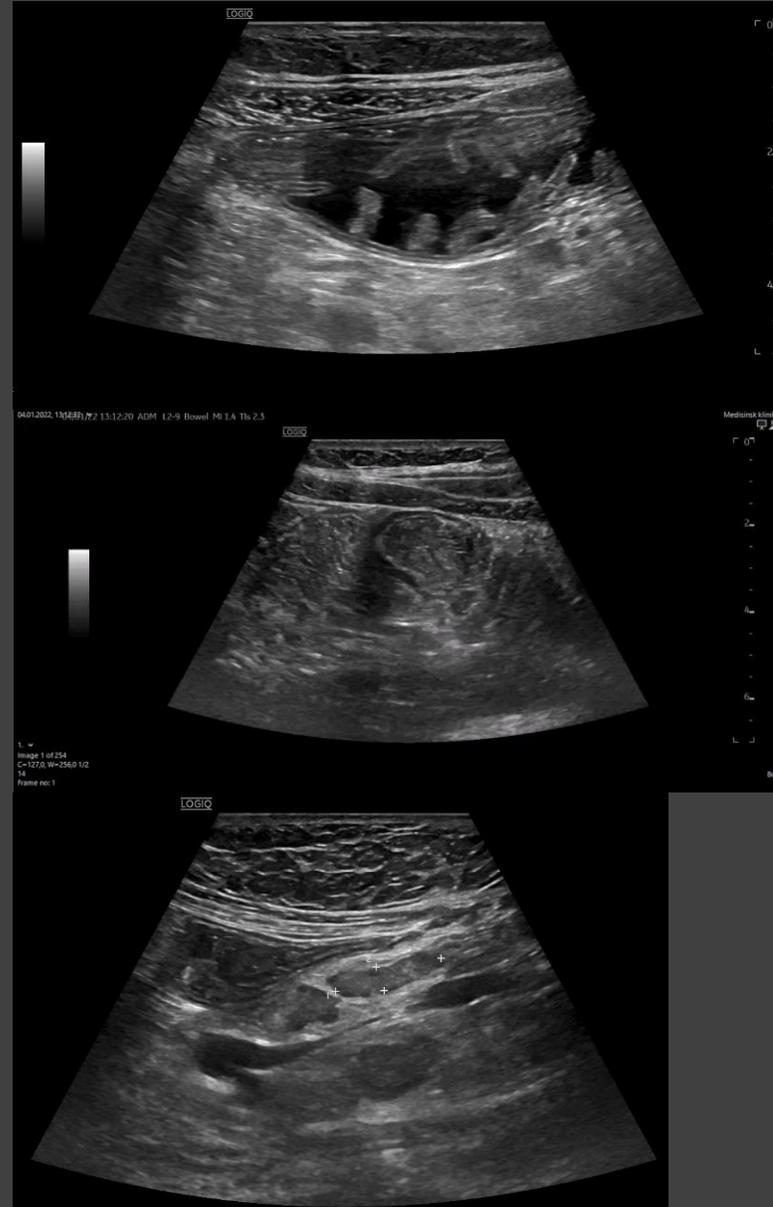


Chronic: Still thickened colon wall with increased vessel signal, but clear thickening of submucosa

Inflammatory disorders

Example 7

- Man in his fifties
- Anemia, weightloss, night sweats and multiple lymph nodes seen in the abdomen
- Low folate, ferritin
- Gastroscopy: Normal. Colonoscopy normal
- Diff's?
- Celiac disease
 - (We'd failed to measure anti-tissue transglutaminase ab's)



Fluid filled small bowel with marked mucosal folds

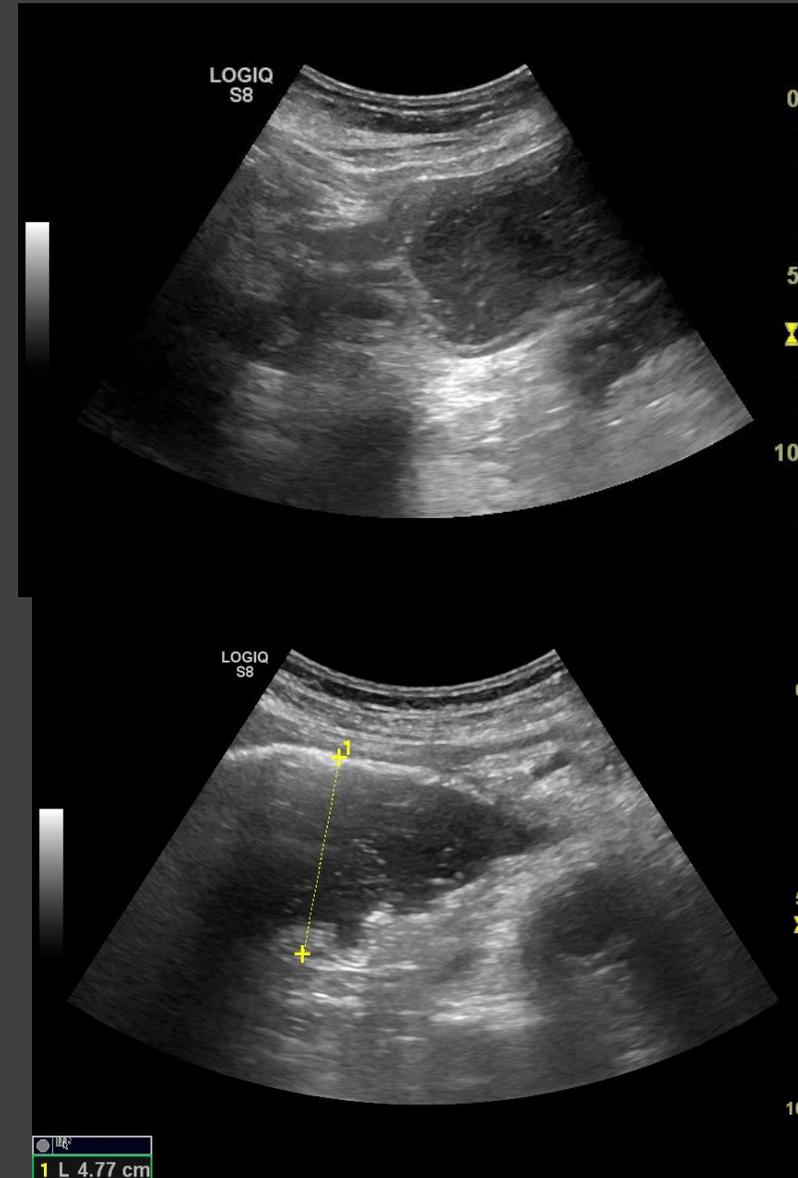
Motility in all small bowel segments despite fasting. Slight edema.

Enlarged mesenteric lymph nodes

Bowel obstruction

Example 1

- Man in his 60ies
- Admitted to hospital due to repeated vomiting over several weeks
- Previous surgery aortic aneurism
- Diffs?
- Upper GI obstruction
 - Endoscopy with long scope later revealed stricturing tumor in jejunum just after lig of Treitz



Stomach is filled with fluid even though the patient is fasting

Dilated pars horizontalis of duodenum narrowing towards the abdominal aorta

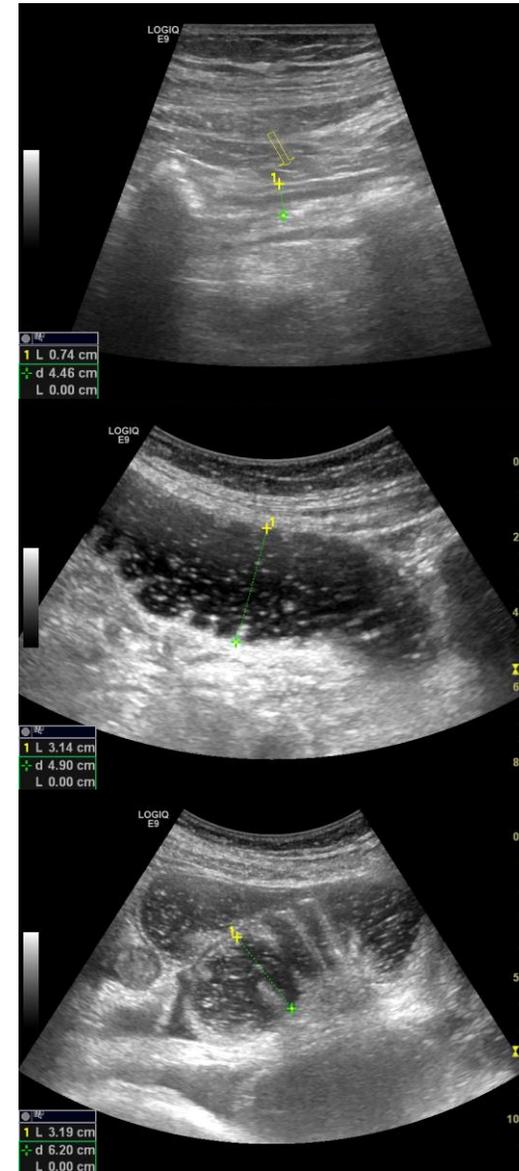
Bowel obstruction

Example 2

- Female in her 70ies
- Stomach pain for 4 days starting right fossa moving to upper abdomen
- 2 days of hematemesis

- Diffs?

- Ileus (cause not found on GIUS)
 - Previous appendectomy. Adhesion in right fossa identified as cause at surgery



Fecal content i stomach

Collapsed colon

Dilated jejunal loops

Dilated ileal loops

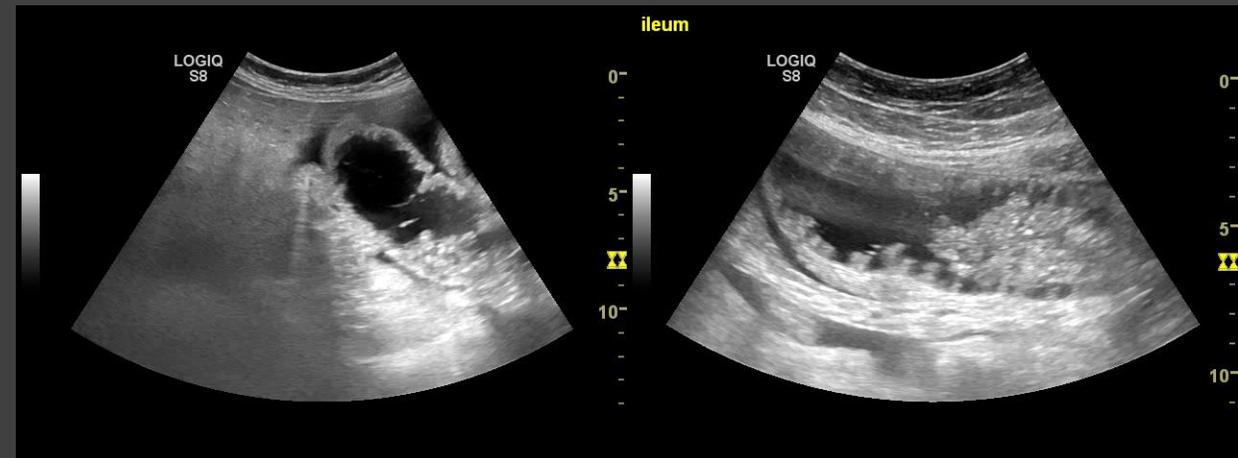
Bowel obstruction

Example 3

- Man in his fifties with decompensated alcoholic cirrhosis
- Recurring ascites and admitted for drainage
- After drainage, abdominal pain, confusion and no bowel movements
- Leucocytes in ascites and suspected peritonitis
- Diff's?
- Paralytic ileus



Fluid filled stomach

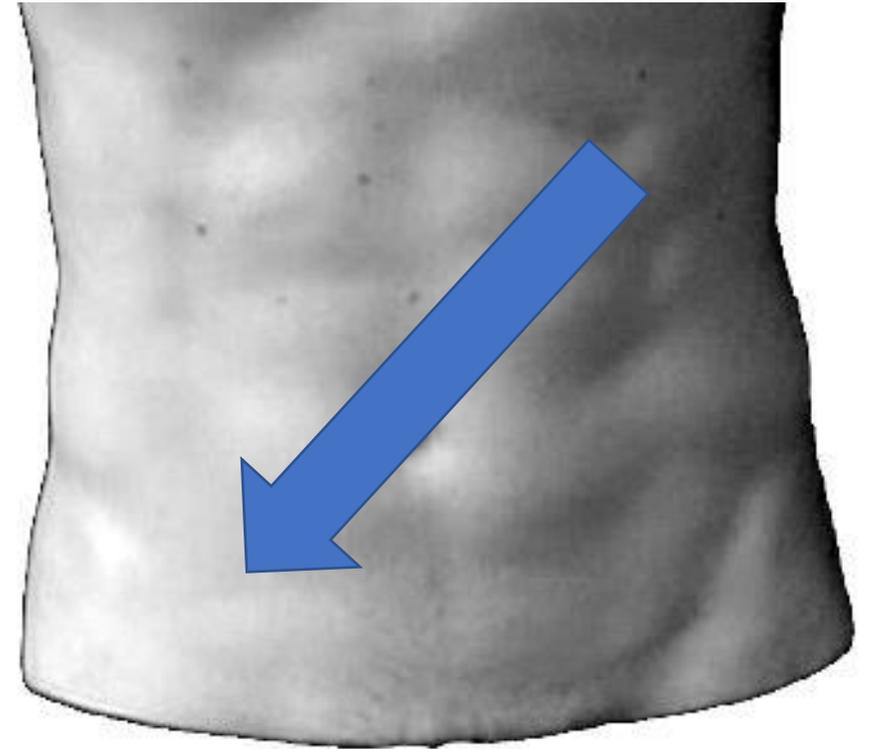


Dilated jejunum and ileum with no peristalsis

Bowel obstruction

Overview

- Vomiting, abdominal distention stomach pain
- GIUS can identify ileus and possible cause
 - Level of obstruction
 - Separate paralytic bowel from hyperperistalsis
- CT better at identifying underlying cause

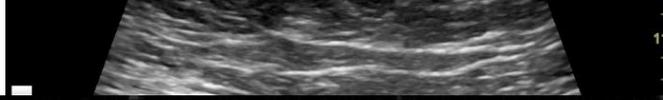
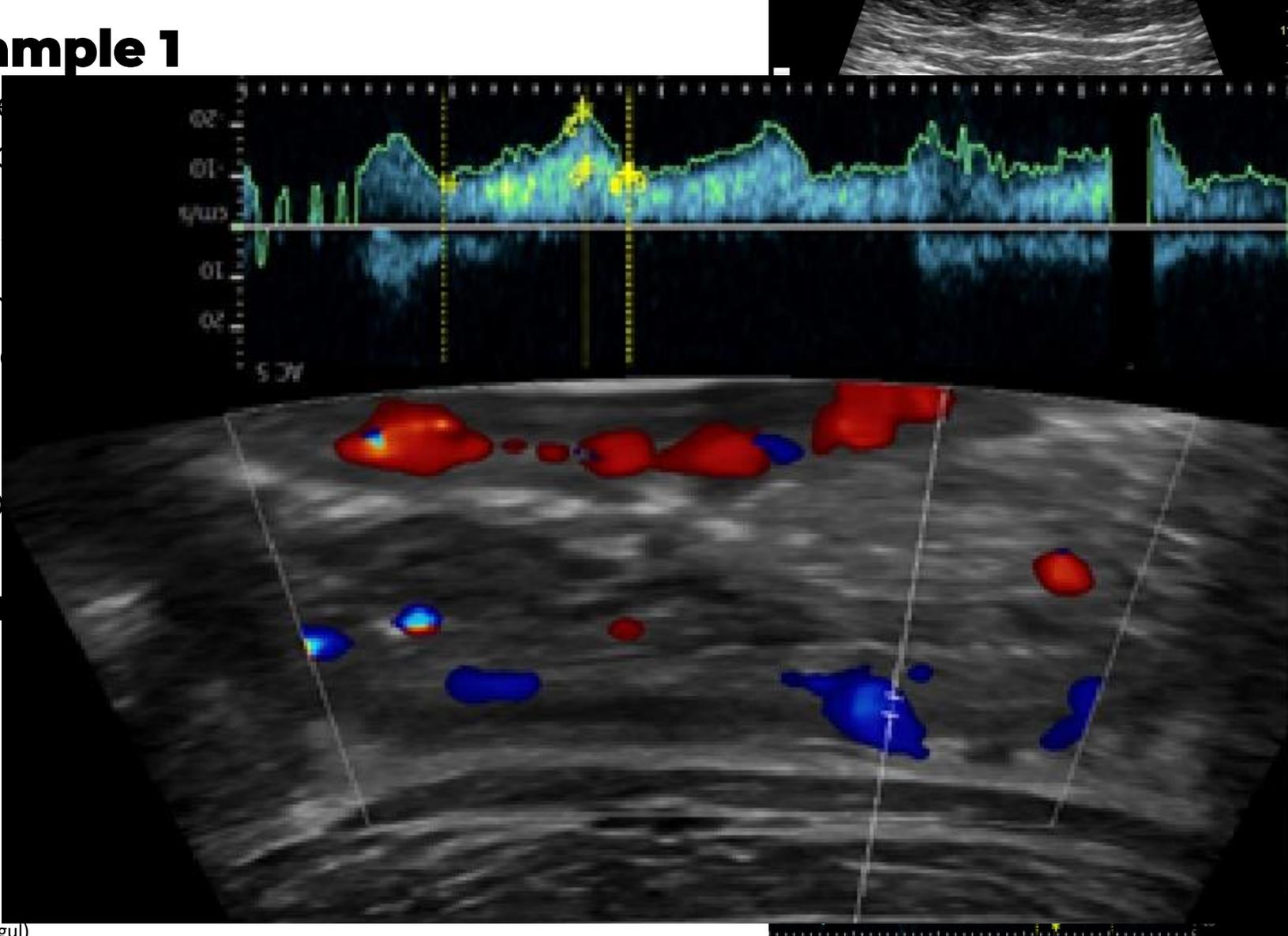


Start the examination at the level of the stomach in the upper left quadrant and move down to lower right quadrant

Vascular

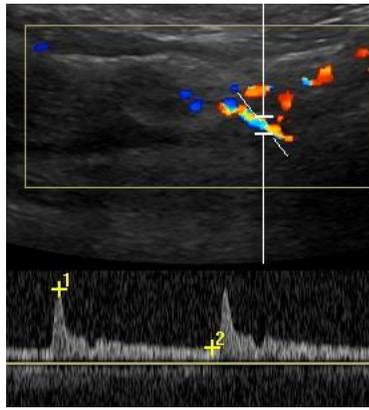
Example 1

- F
- L
- C
- d
- in
- A
- b
- D
- T



Early: Loss of wall layers and edema

Late: Return of wall layers and hyperemia. Increased acceleration time in intramural arteries

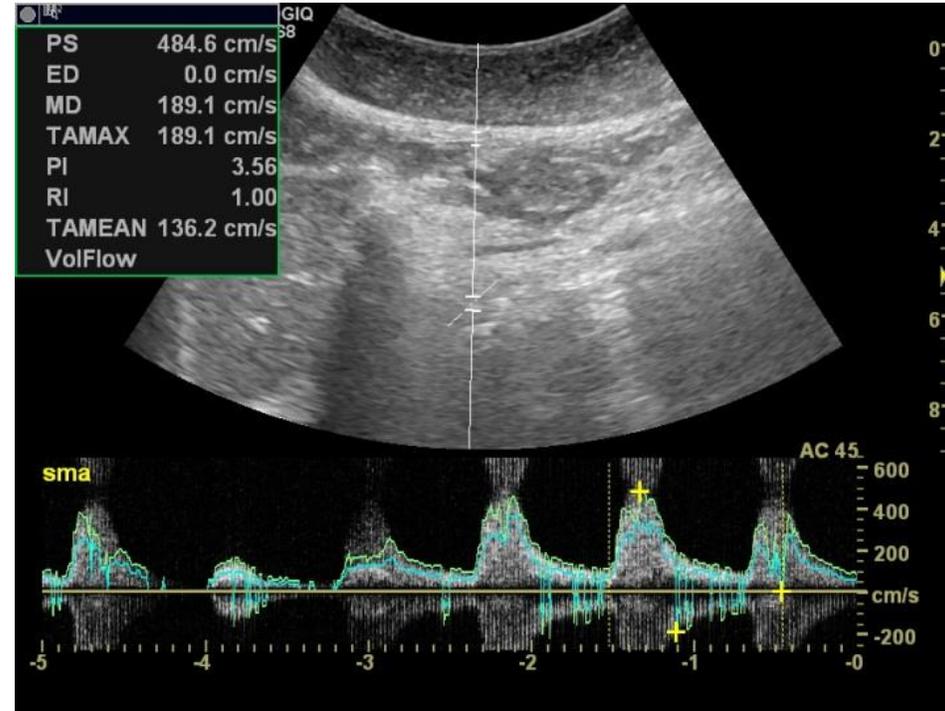


Intramural vessel in Crohns disease

Vascular

Abdominal angina

- Postprandial pain and weight loss
- Occluded or stenotic mesenteric vessels (at least two)
- Difficult to find inferior mesenteric artery with GIUS. (Especially if occluded.)

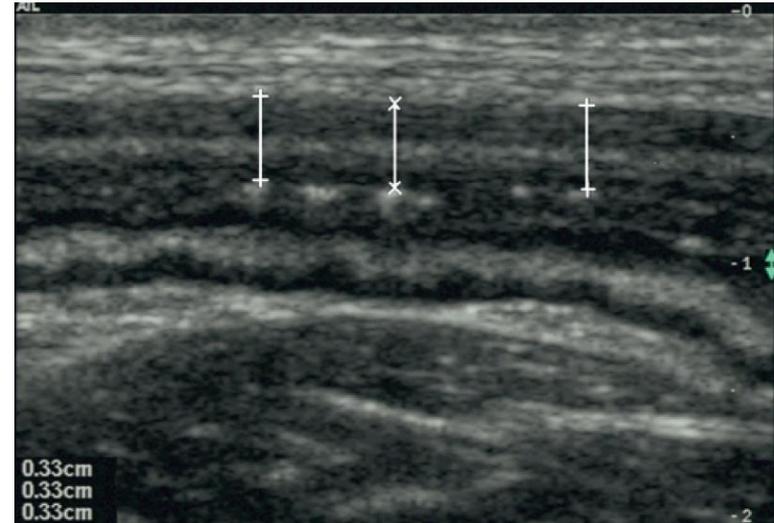


Stenosis in superior mesenteric artery with very high peak systolic velocity

Vascular

Venous congestion

- Portal hypertension
- Acute thrombosis of splanchnic vessels
- Heart failure



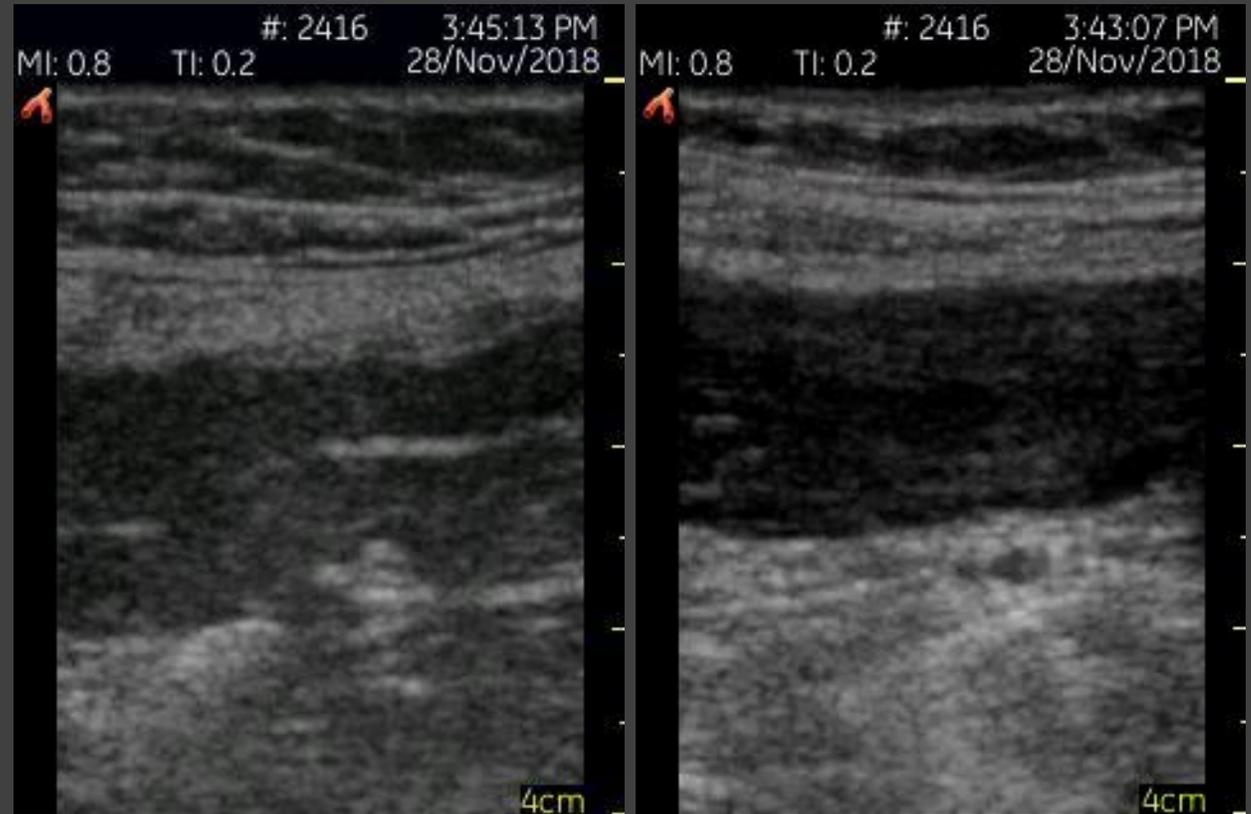
Thickened small bowel wall in patient with heart failure

Vascular

Example 2

- Female in her 80ies with vascular dementia
- Sudden stomach pain with bloody diarrhea
- Brief loss of consciousness
- Ph 7,00 upon admittance
- Stable after fluid resuscitation with almost normal lactate.
- Examined at ICU

- Diffs?
- **Global bowel ischemia due to dissection of thoracic aorta**



Thickened bowel wall and loss of wall layers in ascending (left) *and* descending (right) colon (Images from handheld ultrasound device.)

Tumors

Example 1:

- Female in her 50ies
- Epigastric pain, nausea and vomiting
- Difficult to invert scope and inflate stomach
- Diffuse wall changes in the antrum
- Stomach wall hard and inelastic

Diffs?

Linitis plastica



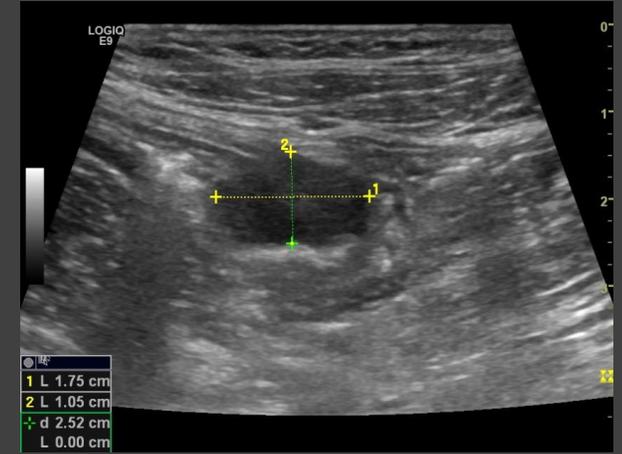
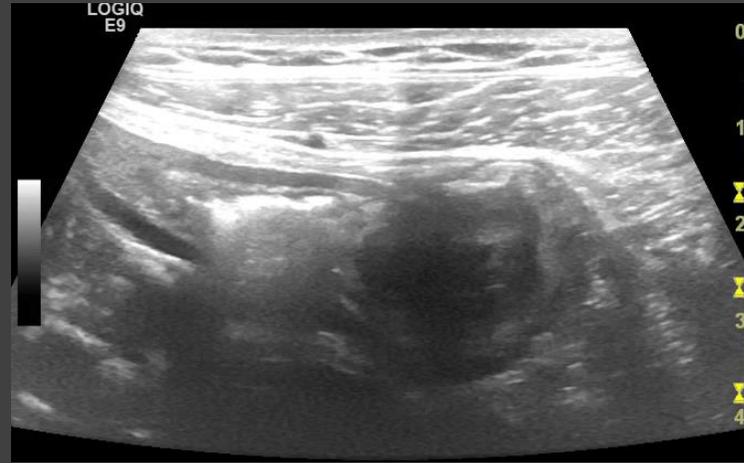
Upon admission: Sweep from antrum towards corpus. Gross wall thickening in antrum (>1 cm) and retained food in corpus

Tumors

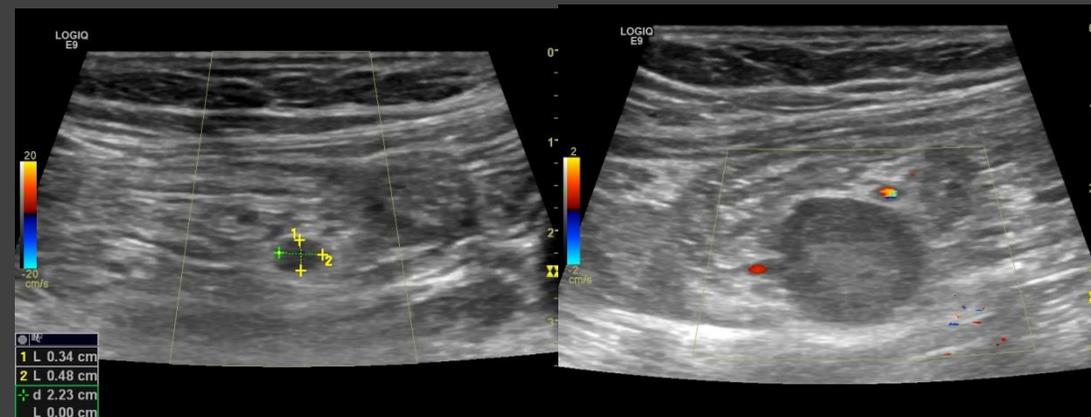
Example 2:

- Man in his 60ies
- Postprandial pain 1,5 years
- Gastroscopy and colonoscopy normal
- Abdomen CT possible tumor small bowel

- Diff's?
- GIST with multiple lymph node mets



GIUS with probe over the point off maximum tenderness. Tumor compressing small bowel lumen. Seems to be outside mucosa and submucosa



Two rounded lymph node found in mesentery

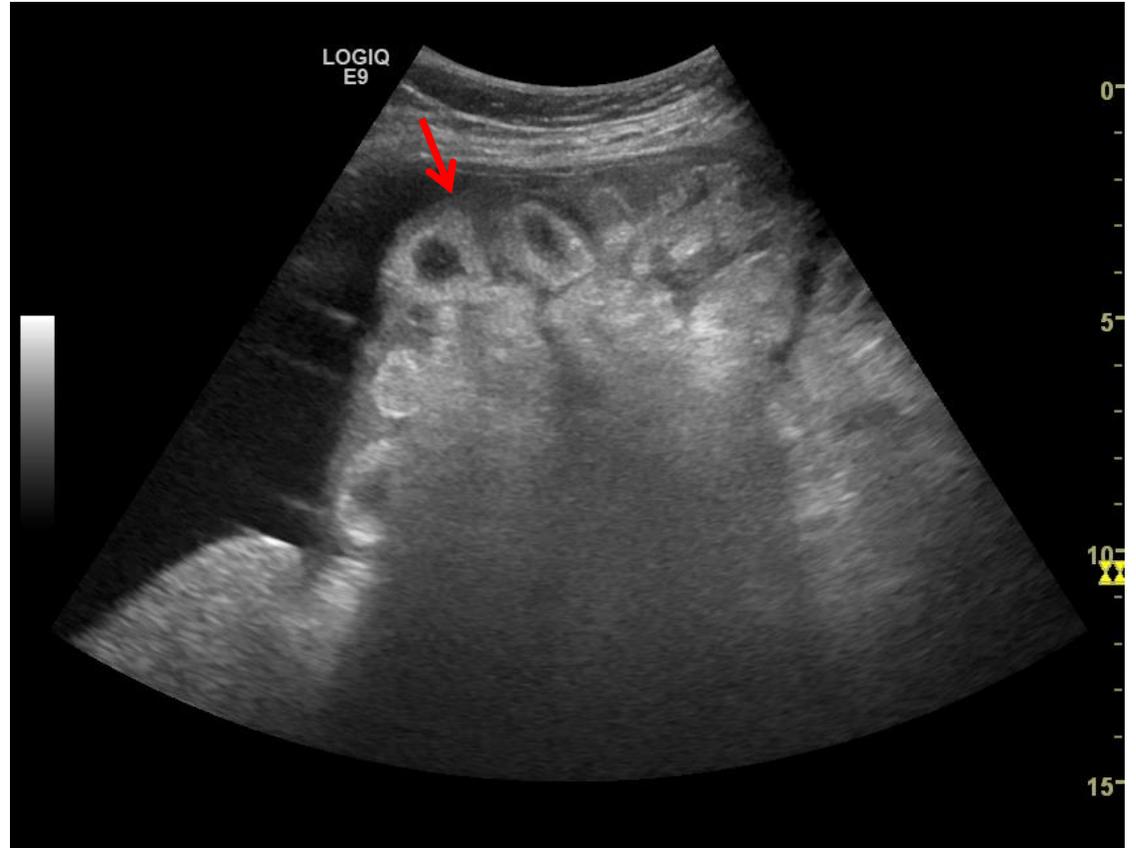
Tumors

Example 3:

- Male in his 60ies
- Nausea and vomiting
- Normal gastroscopy and ileocolonoscopy
- Abdominal CT : Ascites (without malignant cells)
- Diffs?

Carcinomatosis from adenocarcinoma of unknown origin

GIUS used to guide biopsies.



Fixed, adherent small bowel loops. Diffuse mass around and between small bowel loops (red arrow).

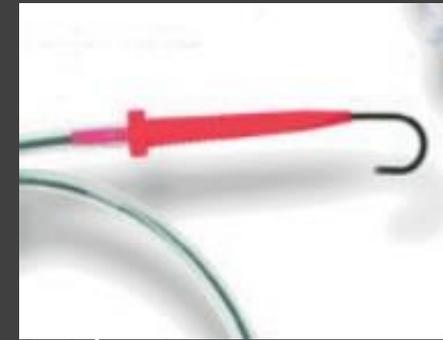
Intervention

Example:

- Mann in his 70ies with PEG due to dysphagia after stroke 3 months ago
- PEG pulled out by accident the day before the hospital was contacted
- Not possible to find opening to the stomach through the fistula
- What to do?
- Grey venflon for probing fistula



Venflon



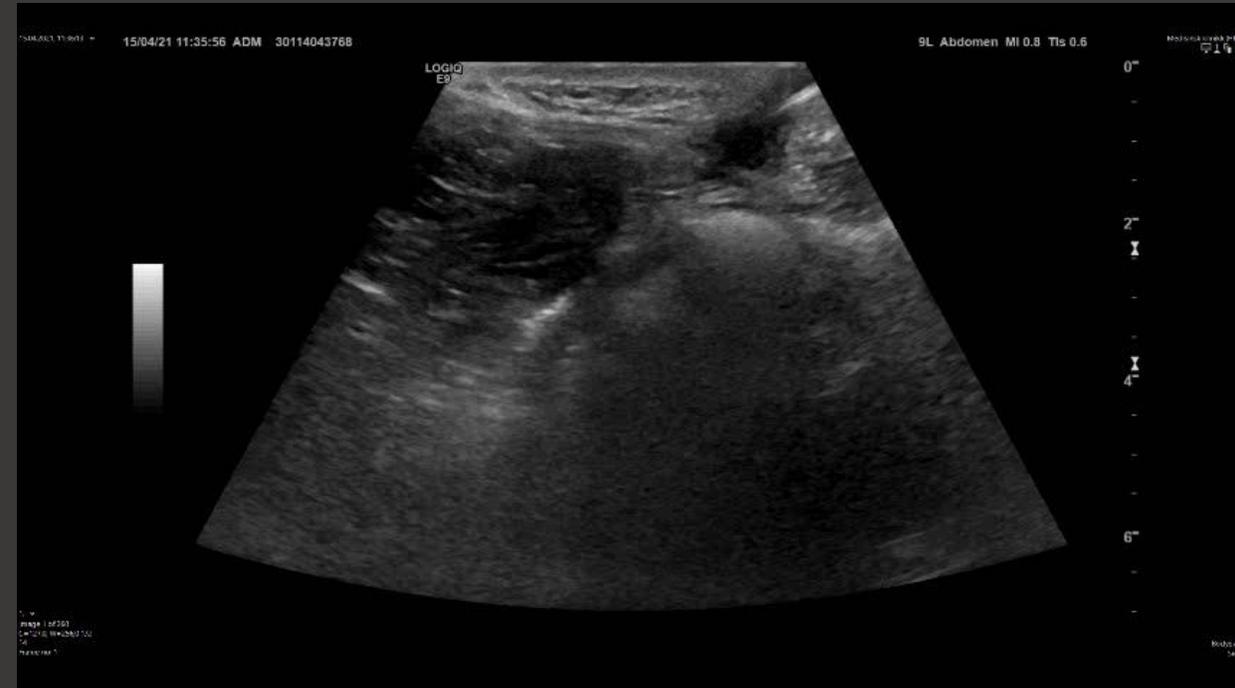
Guidewire



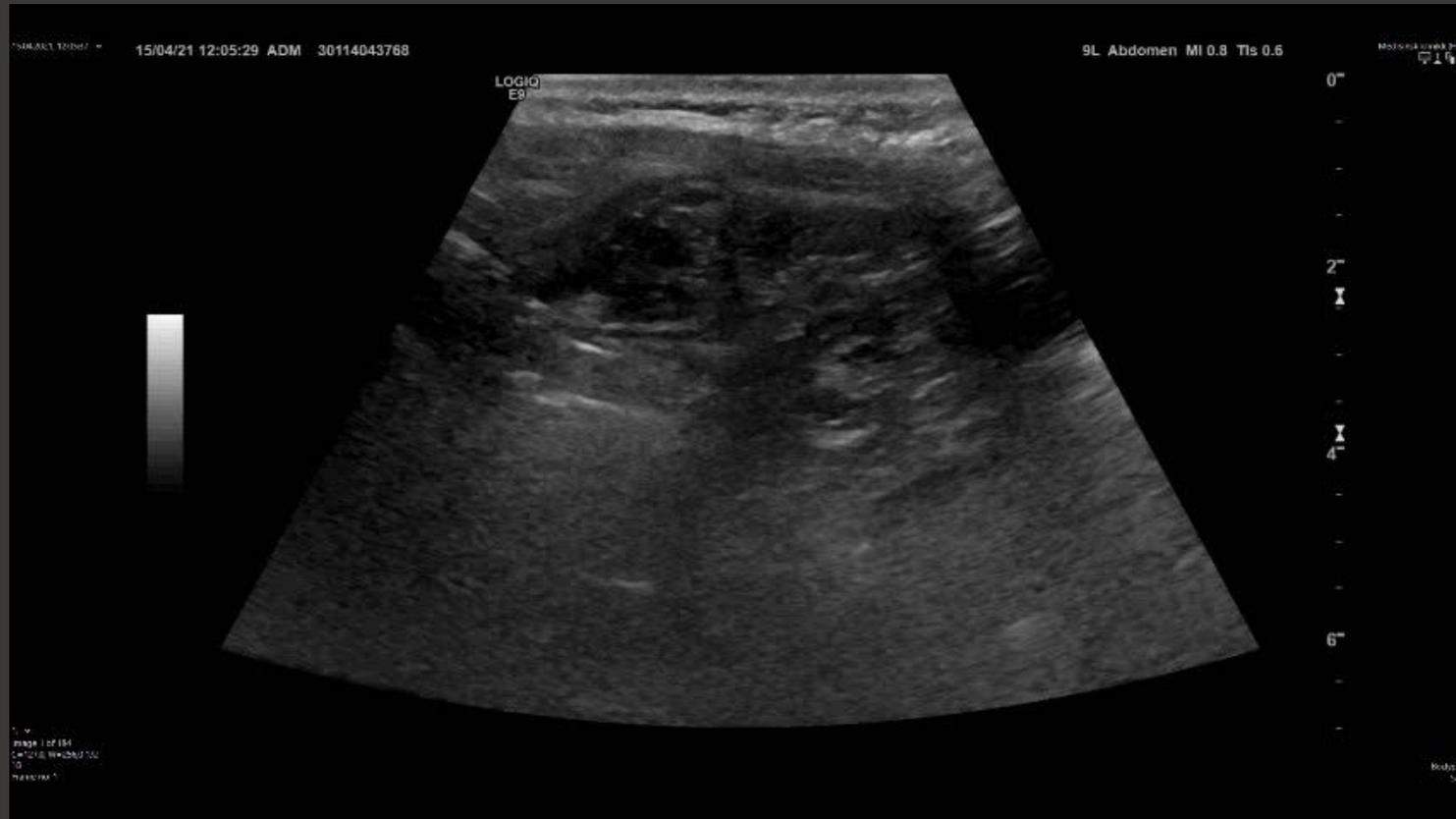
GIUS for guiding venflon to the stomach



Stomach in cross section. The guidewire is seen, but is it inside the stomach?



The longitudinal section confirms the placement of the guidewire in the stomach



Finally, the anchoring balloon can be seen inside the stomach

Other

Invagination

- Most common in children
- In adults
 - Symptoms
 - Substrate (tumor/inflammation)
 - No symptoms
 - Crohns disease
 - Familial diarrheal disease
 - (Giardia?)
 - (Celiac disease?)

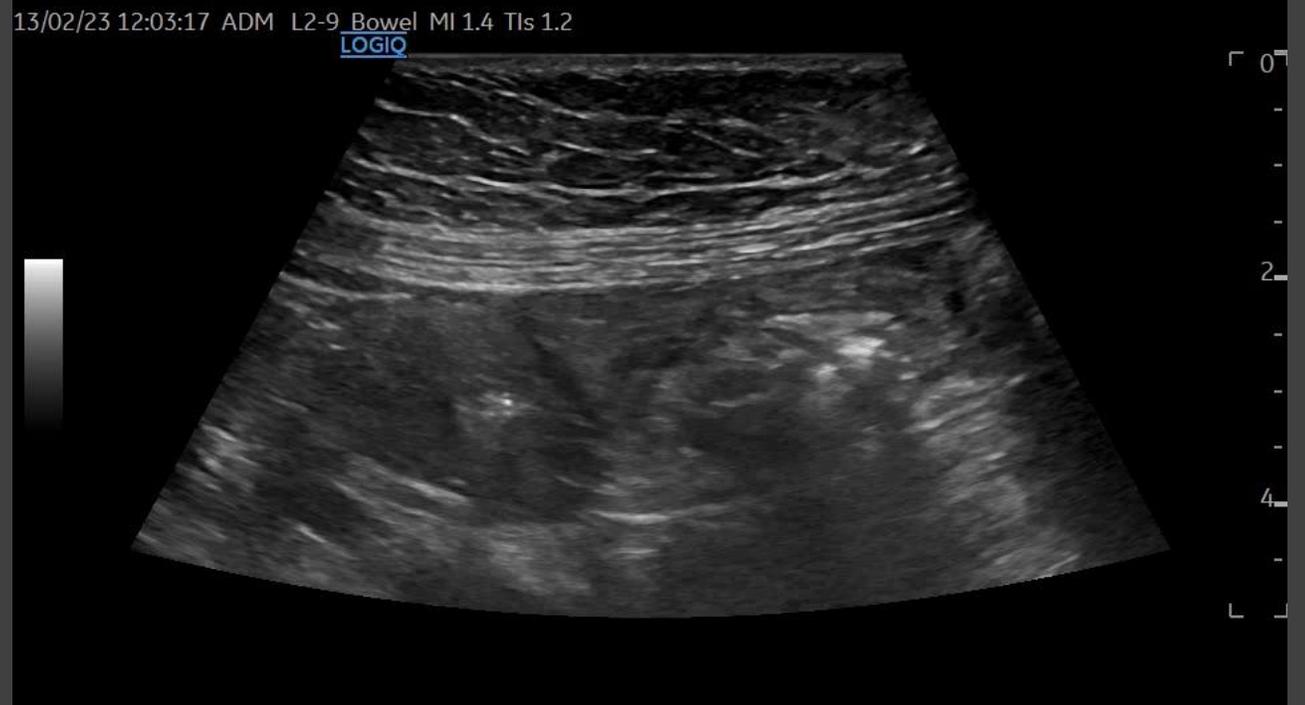
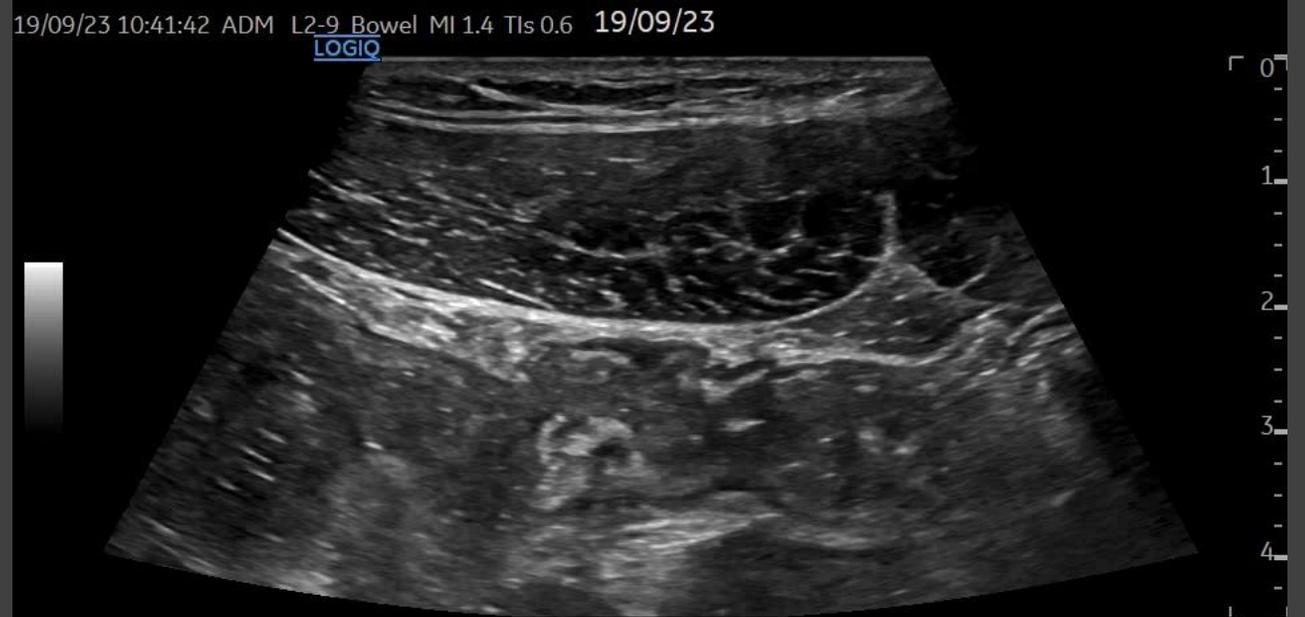


Juvenile polyp causing invagination (Video courtesy of Hilde von Volkmann)

Other

Adhesions

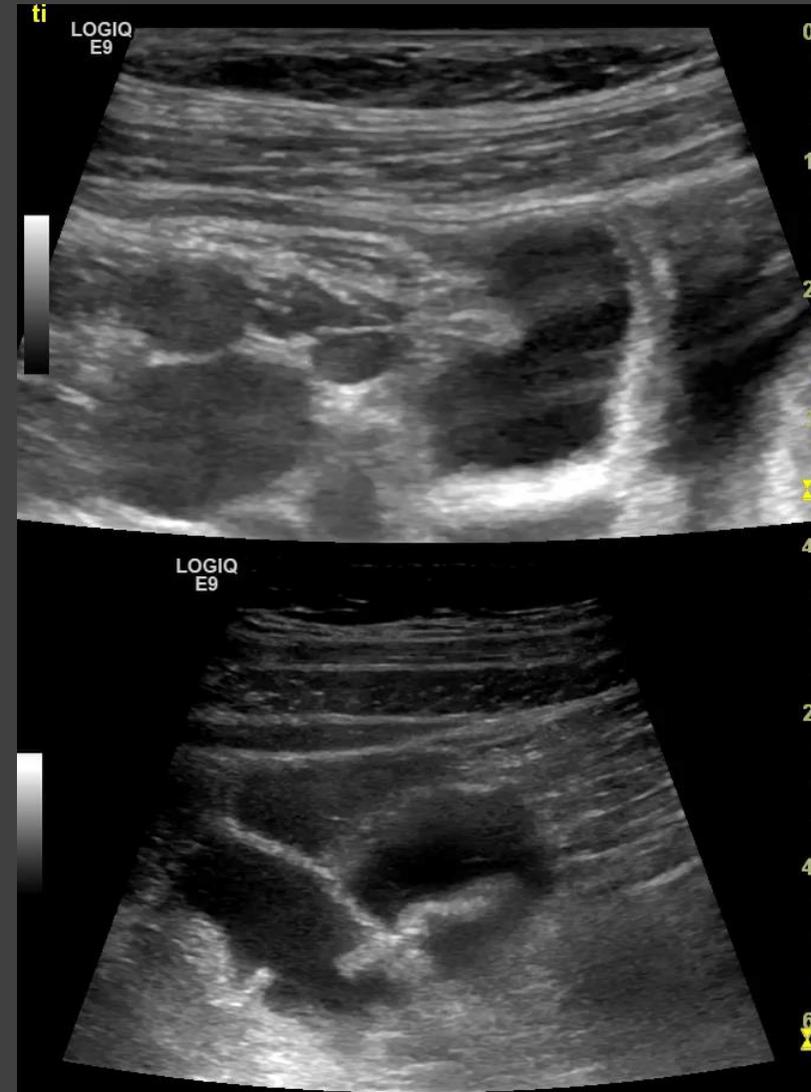
- Stomach pain
- Ileus/subileus
- Complication after surgery



Other

Example

- Family in Western Norway where some family members normale have loose stools several times a day.
- Gastroenteritis causes severe disease and ICU admissions with dehydration, especially in children
- Diffs?
- Familial diarrheal disease: Autosomal dominate mutation in the gene for guanyl cyclase causing leakage of Cl⁻ into the bowel lumen (Gucy2C).



Fluid filled small bowel loops during fasting with little or no peristalsis

Peristaltic contraction frequently non-occlusive

Summary

- GIUS is useful for several clinical problems.
- Well established for diagnosing IBD, appendicitis, diverticulitis and bowel obstruction
- Can be used as supplementary tool for diagnosing other GI disorders
- Recognizing these disorders is useful to improve your clinical skills

Literature:

EFSUMB guidelines:

- Dietrich et al 2019 : EFSUMB Gastrointestinal Ultrasound (GIUS) Task Force Group: Celiac sprue and other rare gastrointestinal diseases ultrasound features
- **Dirks et al 2019: EFSUMB position paper: recommendations for gastrointestinal ultrasound (GIUS) in acute appendicitis and diverticulitis**
- **Hollerweger et al 2020: Gastrointestinal Ultrasound (GIUS) in Intestinal Emergencies–An EFSUMB Position Paper**

WFUMB Ultrasound book, chapter 19:

- **http://wfumb.info/wfumb-ultrasound-book/additional-pages/html5_output/index.html**