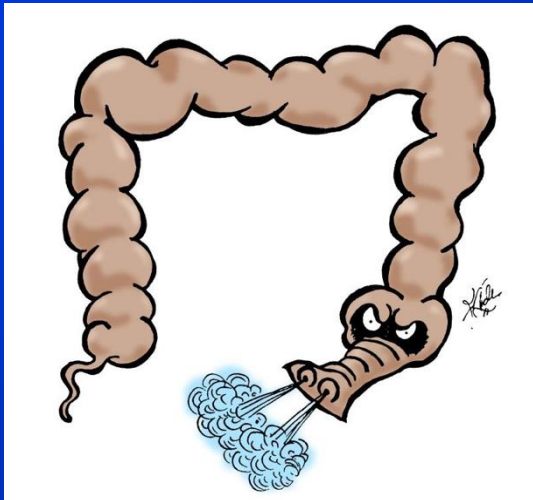




# Nasjonalt Senter for Gastroenterologisk Ultrasonografi

National Centre for Ultrasound in Gastroenterology  
Haukeland University Hospital, Bergen, Norway

## Ultralyd av tarm



Odd Helge Gilja, MD, PhD  
Professor  
Department of Medicine  
Haukeland University Hospital  
Bergen, Norway





# GIUS – EFSUMB guidelines on Gastro-Intestinal Ultrasound

- Task Force Group of over 20 experts from Europe
- Started at UEG Week October 2014
- 7 guideline/position papers are published / in progress:
  - 1. Methodology and examination technique (published EJU 2016)
  - 2. IBD (Published – EJU 2018)
  - 3. Perineal and transrectal US (Published- UIO - 2019)
  - 4. Acute appendicitis and diverticulitis (Published EJU 2019)
  - 5. Misch./ Coeliac / Upper GI (Published Med Ultrason -2019)
  - 6. Intestinal Emergencies (Published EJU 2020)
  - 7. Functional Disorders (Published UIO 2021)



# New Guidelines on GIUS

Guidelines & Recommendations

## EFSUMB Recommendations and Guidelines for Gastrointestinal Ultrasound

Part 1: Examination Techniques and Normal Findings  
(Long version)

EFSUMB-Empfehlungen und Leitlinien des Gastrointestinalen Ultraschalls  
Teil 1: Untersuchungstechniken und Normalbefund (Langversion)

### Authors

K. Nylund<sup>1</sup>, G. Maconi<sup>2</sup>, A. Hollerweger<sup>3</sup>, T. Ripolles<sup>4</sup>, N. Pallotta<sup>5</sup>, A. Higginson<sup>6</sup>, C. Serra<sup>7</sup>, C. F. Dietrich<sup>8</sup>, I. Sporea<sup>9</sup>, A. Saftoiu<sup>10</sup>, K. Dirks<sup>11</sup>, T. Hausken<sup>12</sup>, E. Calabrese<sup>13</sup>, L. Romanini<sup>14</sup>, C. Maaser<sup>15</sup>, D. Nuernberg<sup>16</sup>, O. H. Gilja<sup>17</sup>

### Affiliations

Affiliation addresses are listed at the end of the article.

## 19 recommendations included

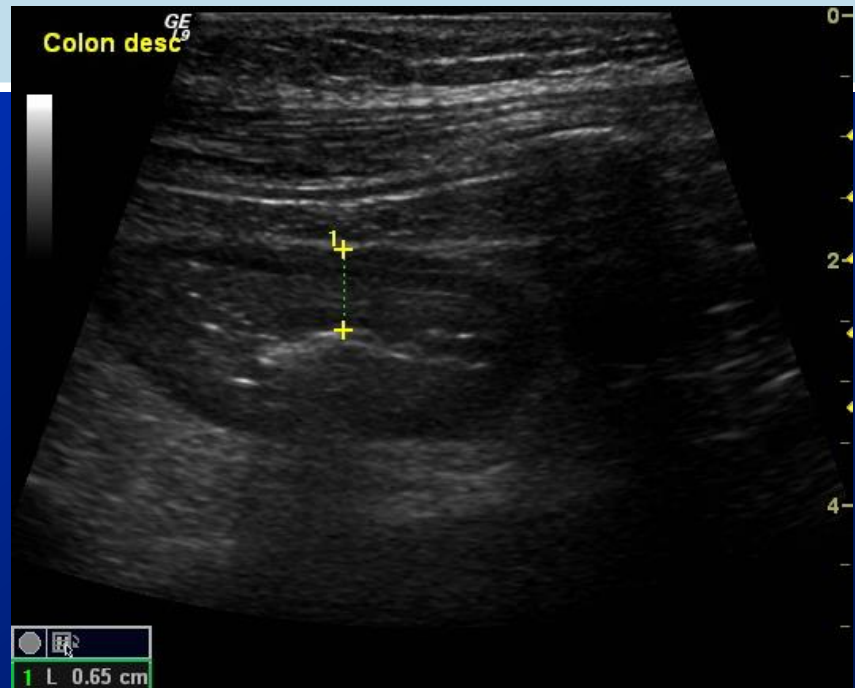
*Nylund K , Maconi G, ..., Gilja OH, Ultraschall in Med 2016*



# New EFSUMB Guidelines on GIUS

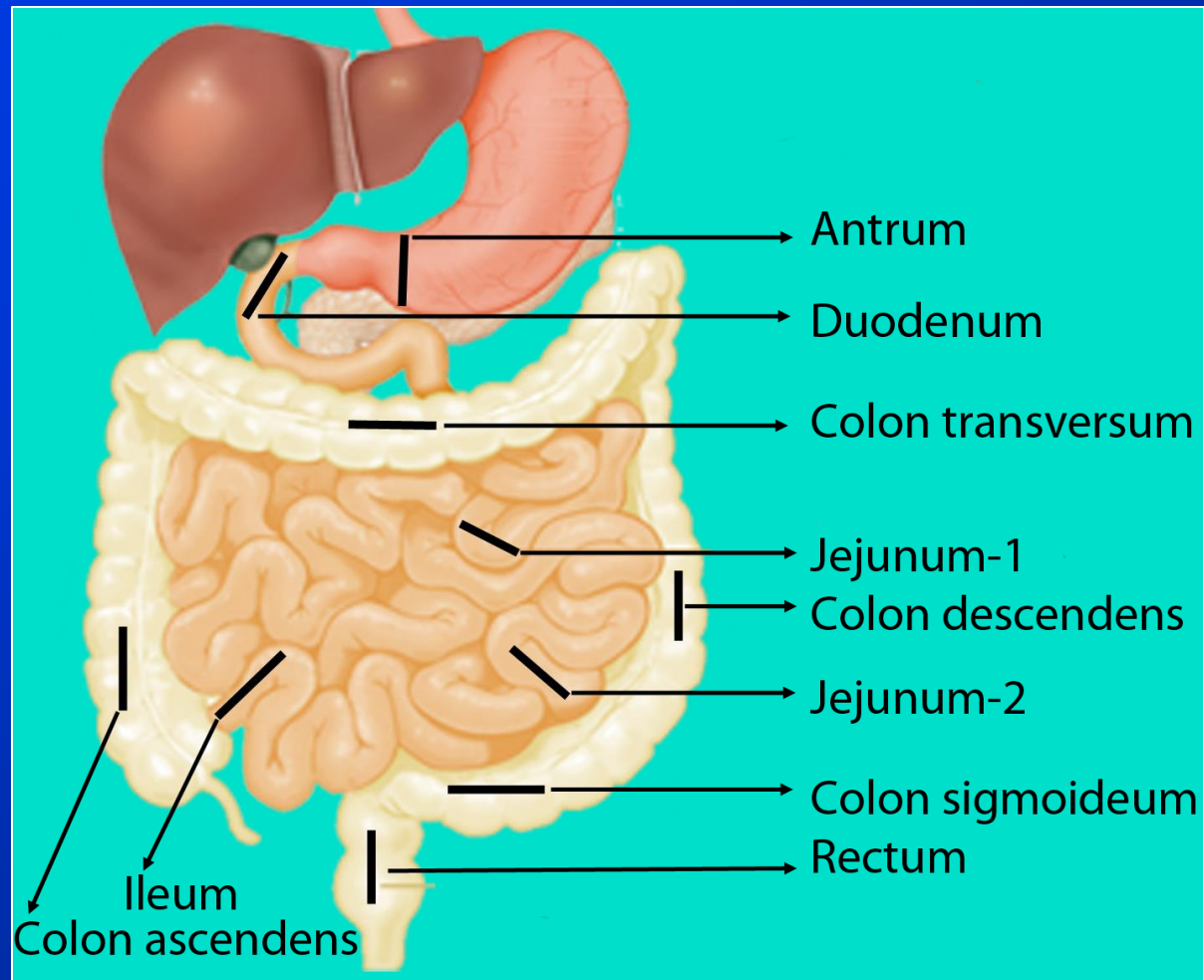
## Recommendations:

1. For a complete examination of the bowel both a low and high resolution probe are needed, LoE 5, GoR C, Strong consensus 13/13
2. A probe with a frequency above 5 MHz should be used when measuring wall thickness, LoE 4, GoR B, Strong consensus 13/13





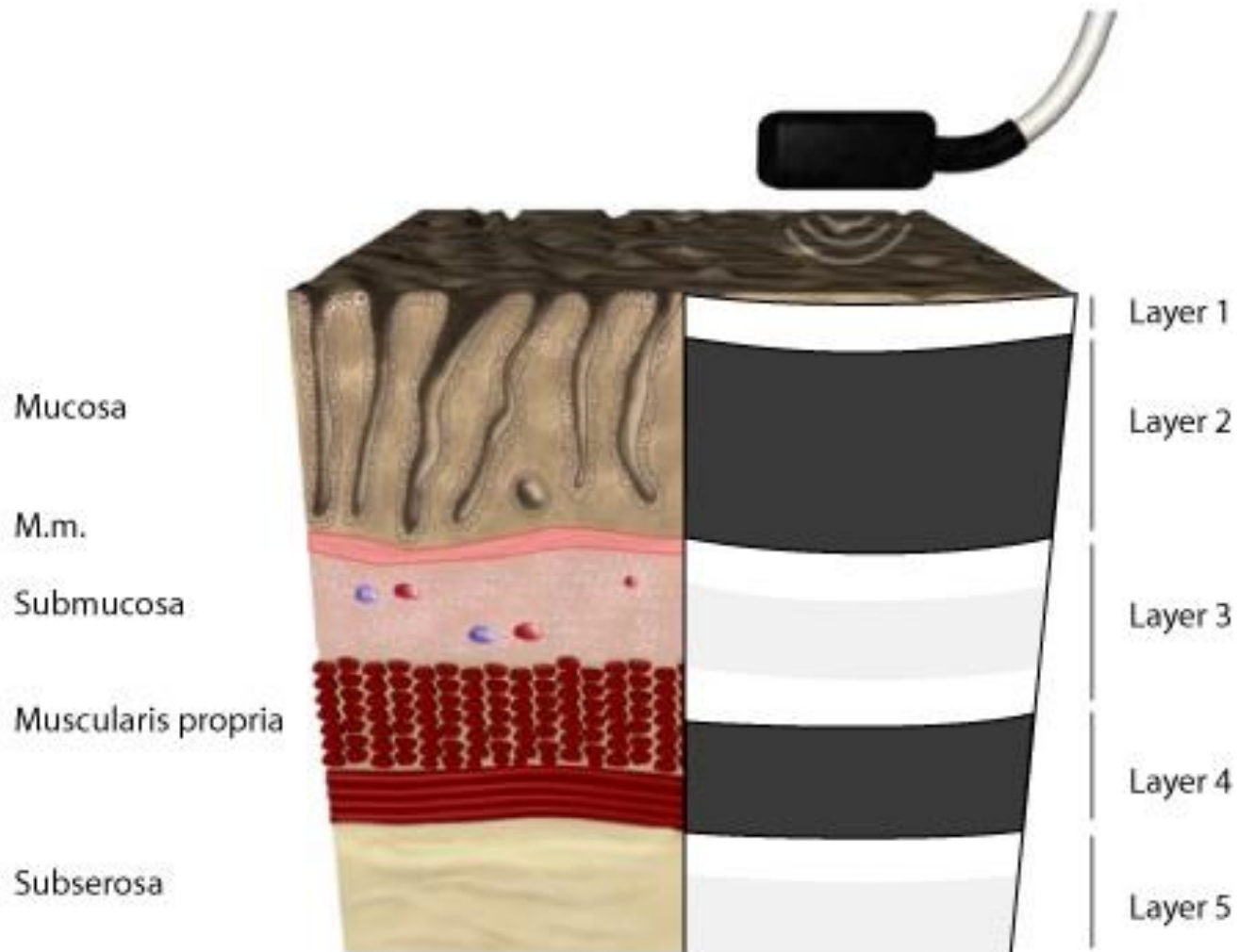
# Locations for US measurement



*Nylund K et al. Ultraschall/EJU 2012*

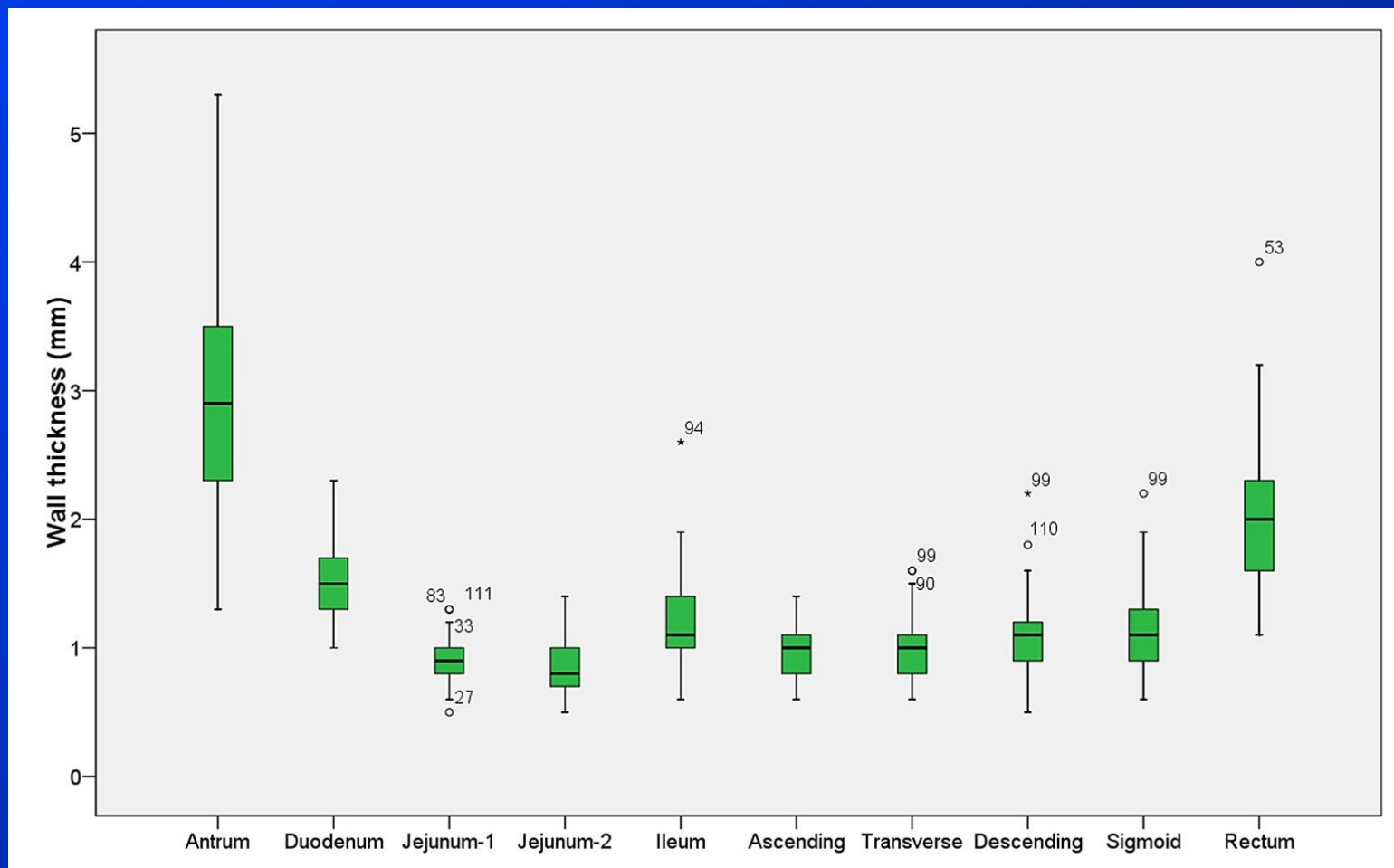


# GI Wall Layers





# Wall thickness in different parts of the GI tract



Box-plot of wall thickness measurements in the gastrointestinal wall in 122 healthy volunteers (12MHz).

*Nylund K et al. Ultraschall/EJU 2012*



# Ultrasound of the GI Tract

## A journey from above

- Oesophagus
- Ventriculus
- Duodenum
- Jejunum
- Ileum
- Colon
- Rectum

# Lake Chamo

Taking a last breath before  
travelling down the GI tract



*Photo: OH Gilja*

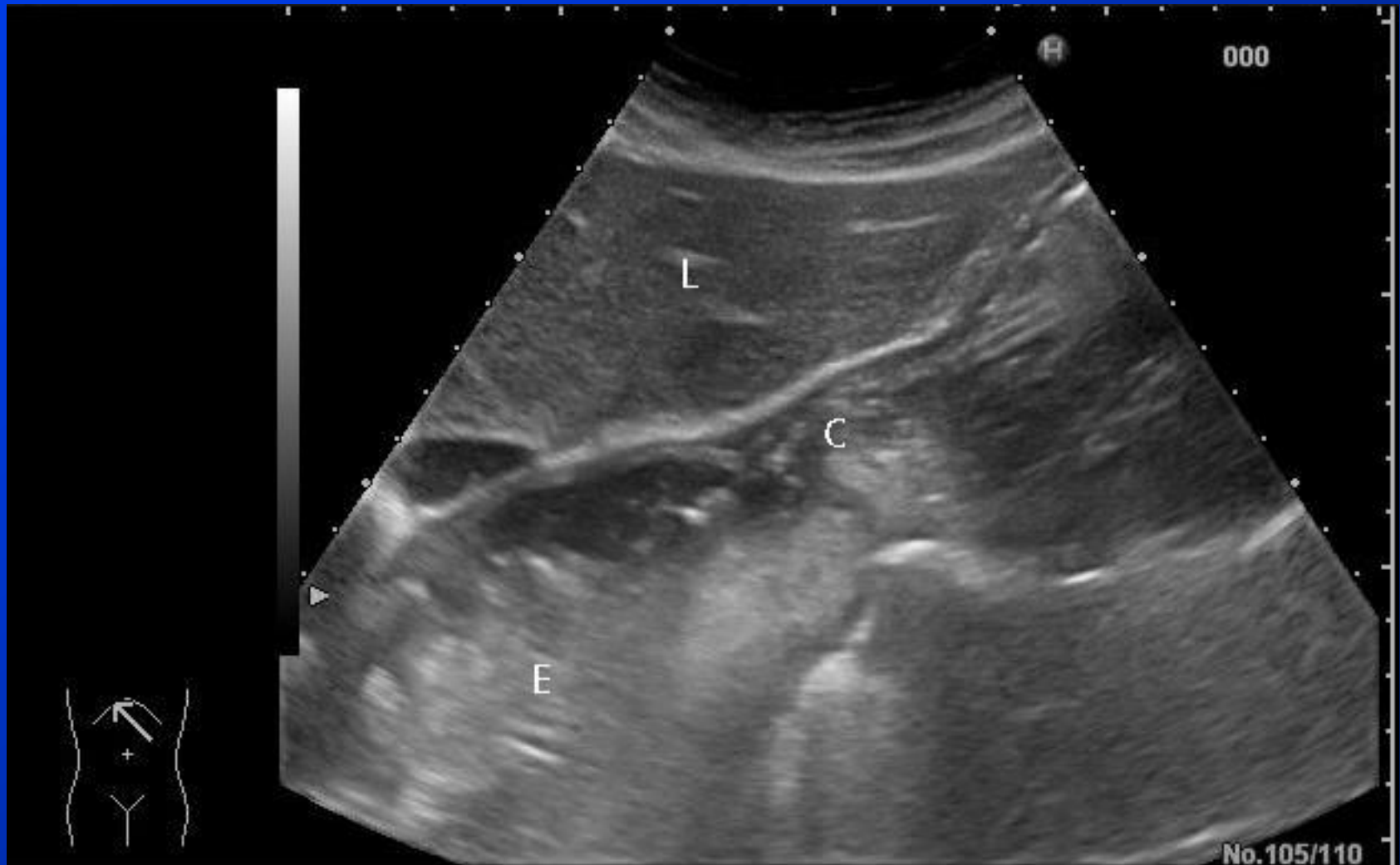


# Stricture of the Esophagus in Crohn's disease



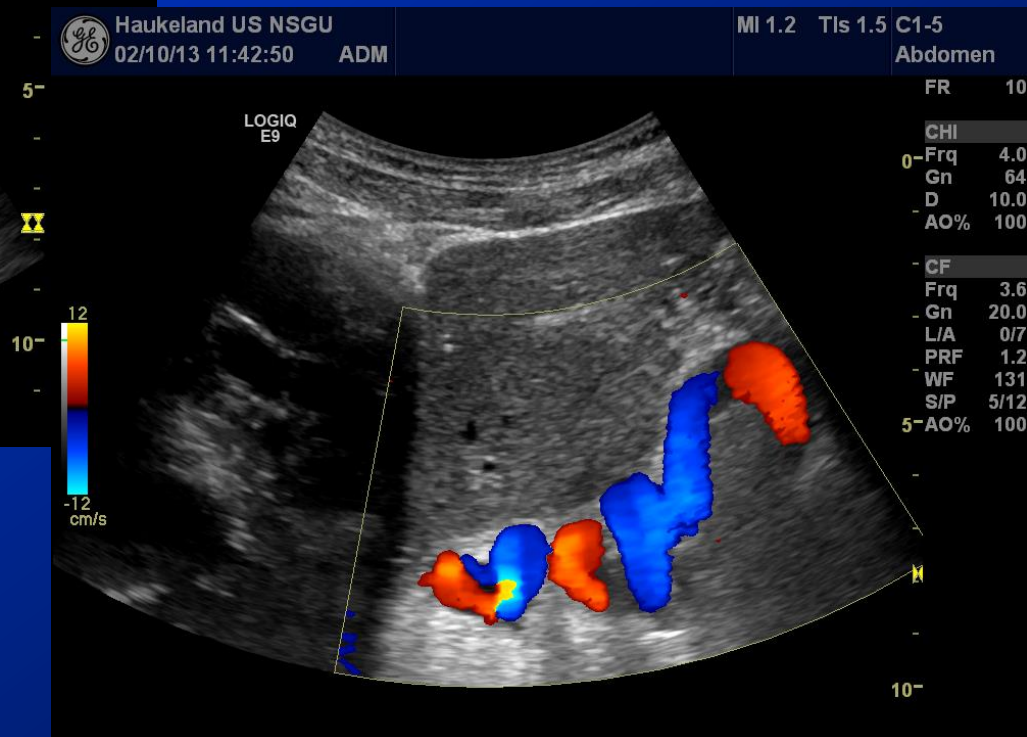


# Achalasia of the Esophagus



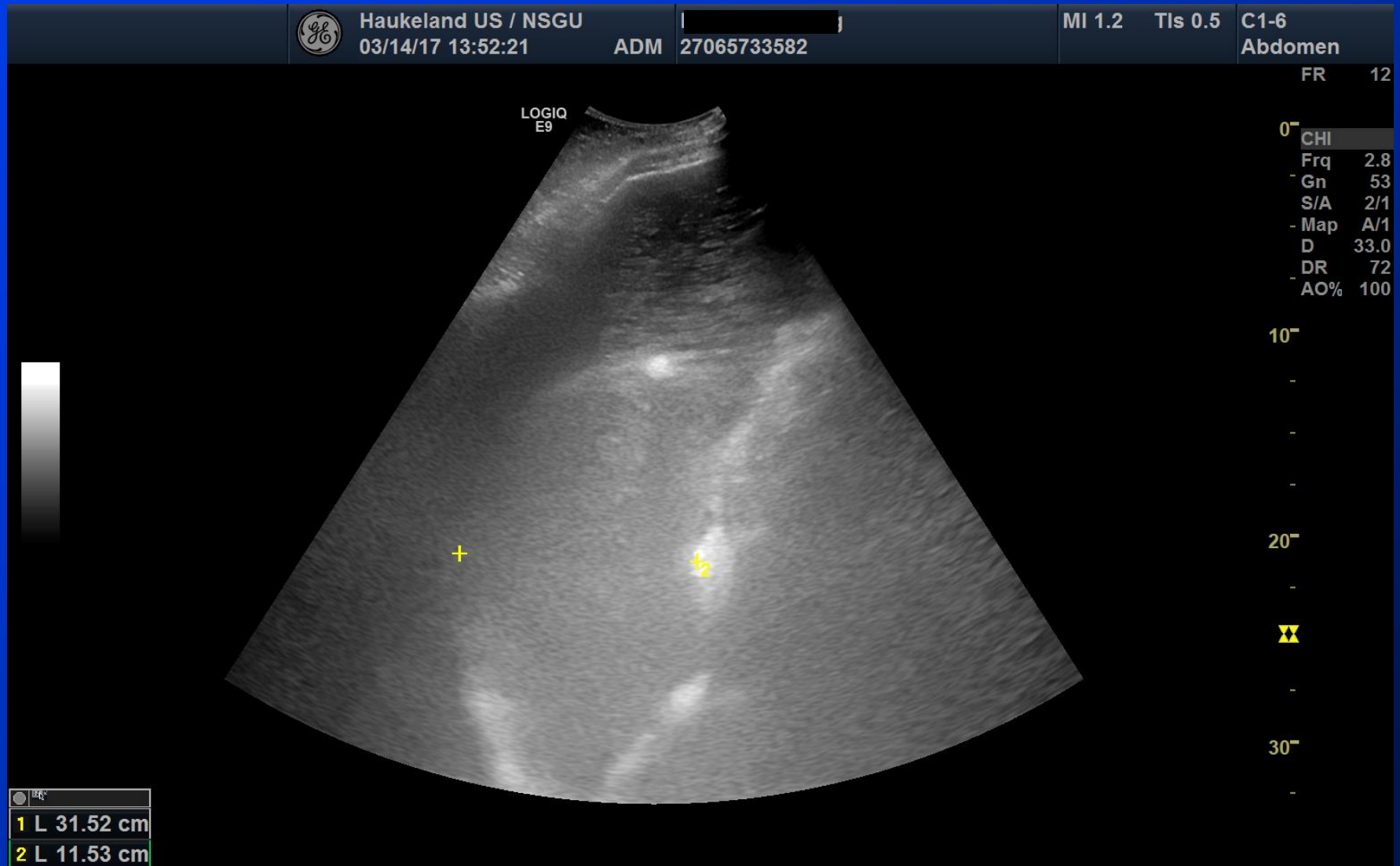


# Esophageal and Gastric Varices



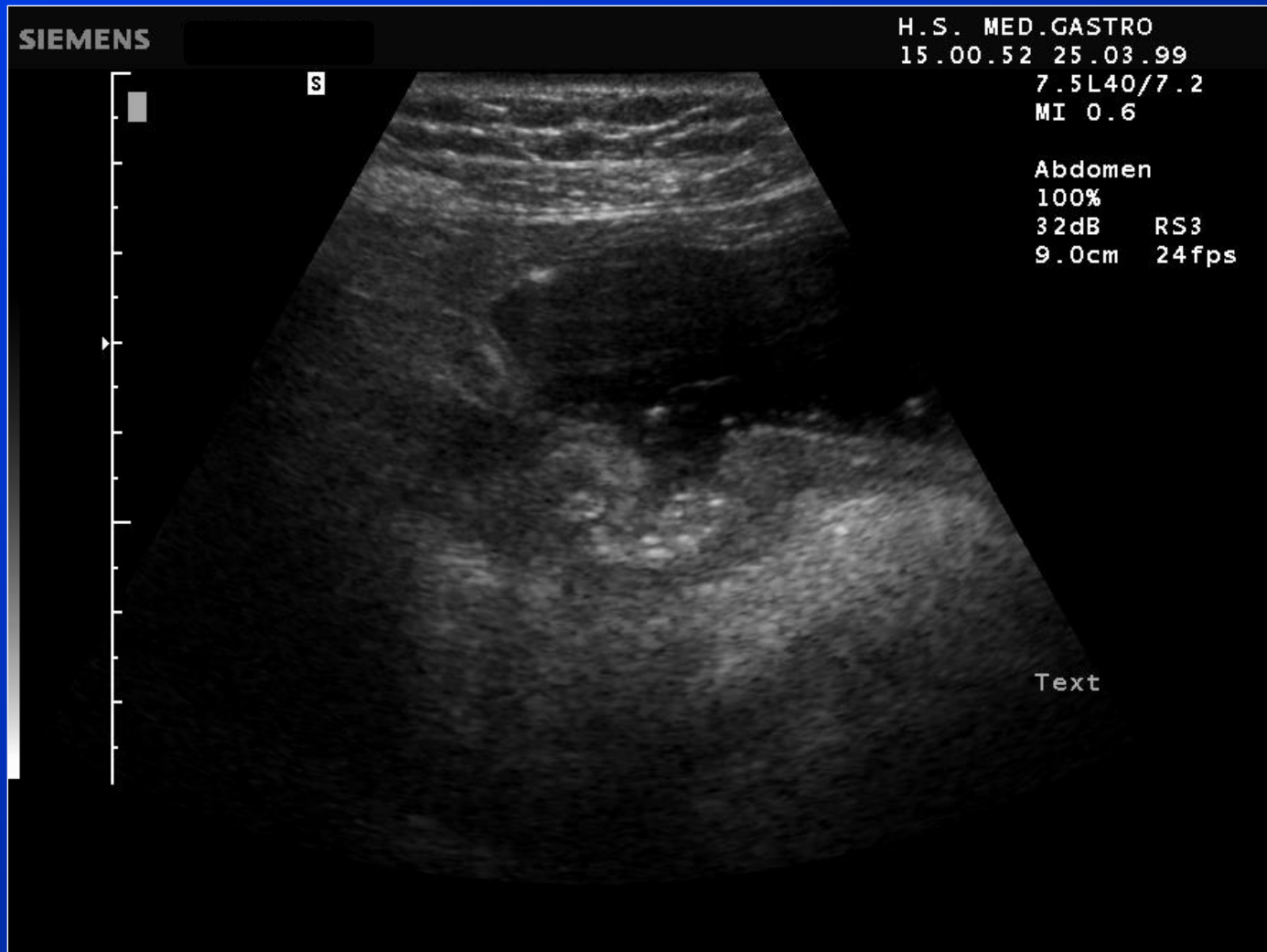


# Gastric retention



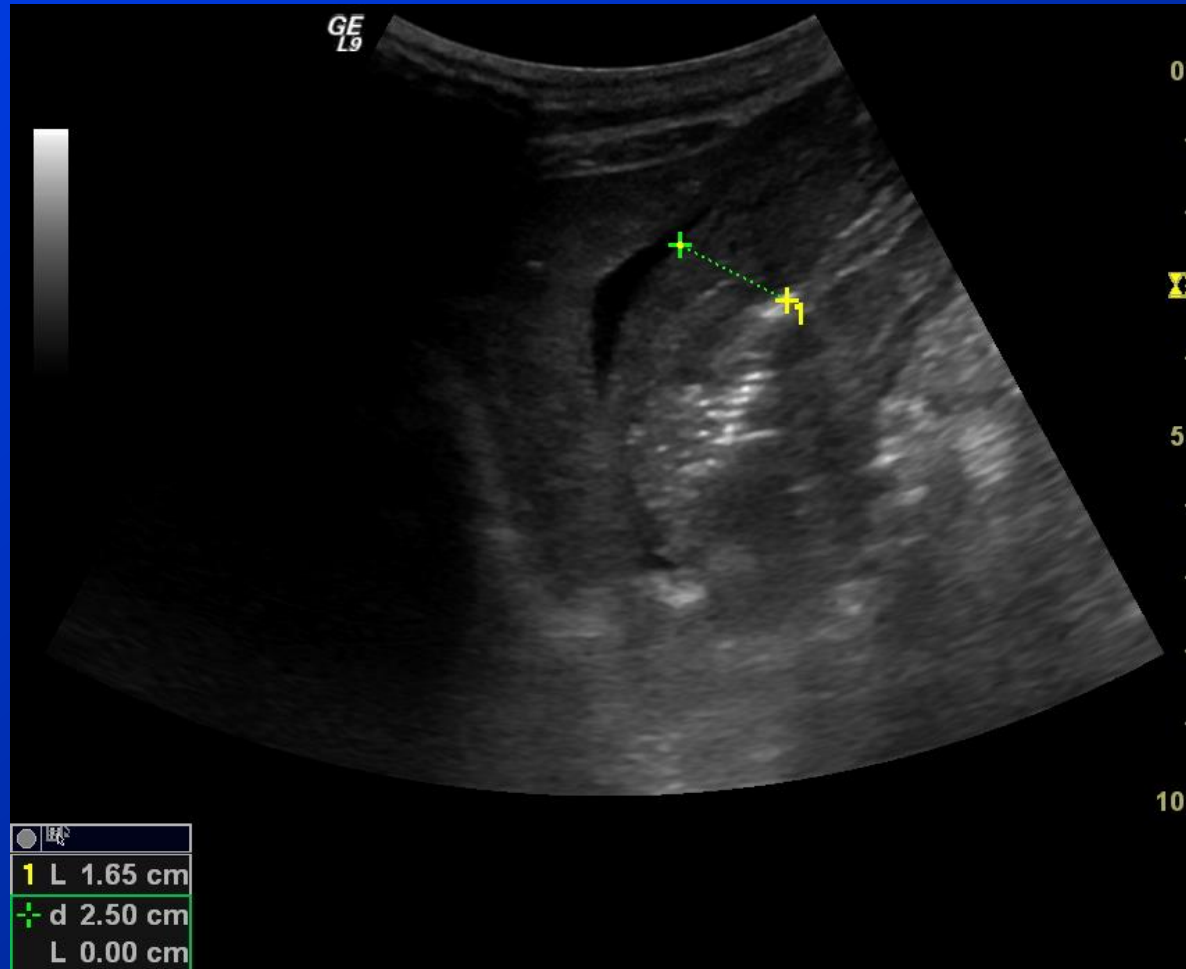


# Gastric Ulcer



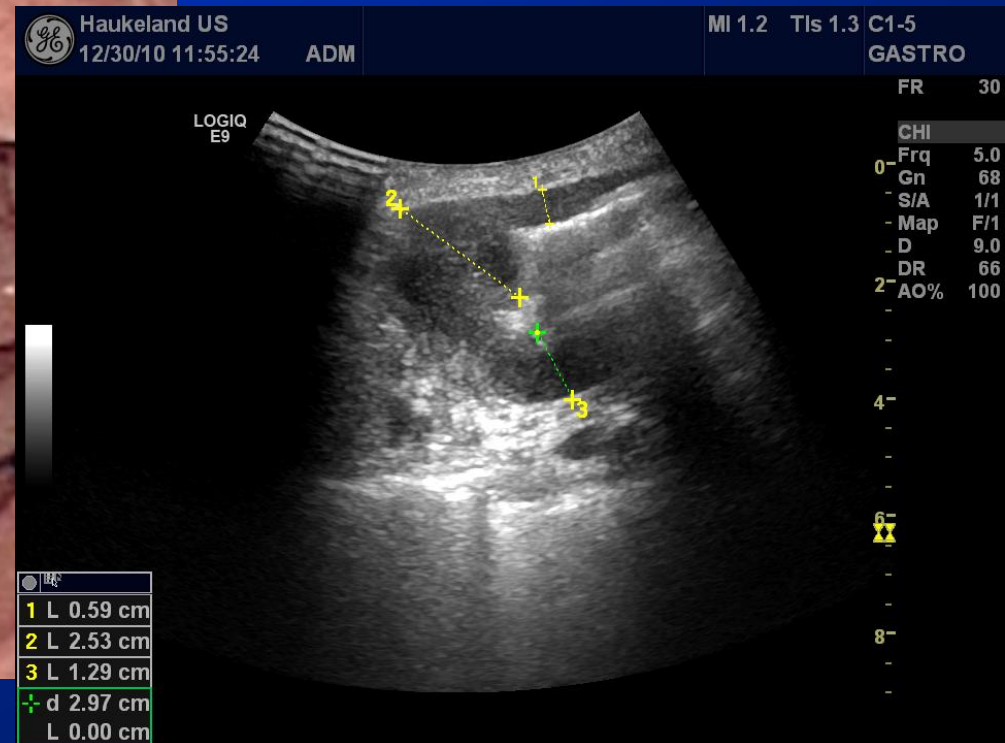
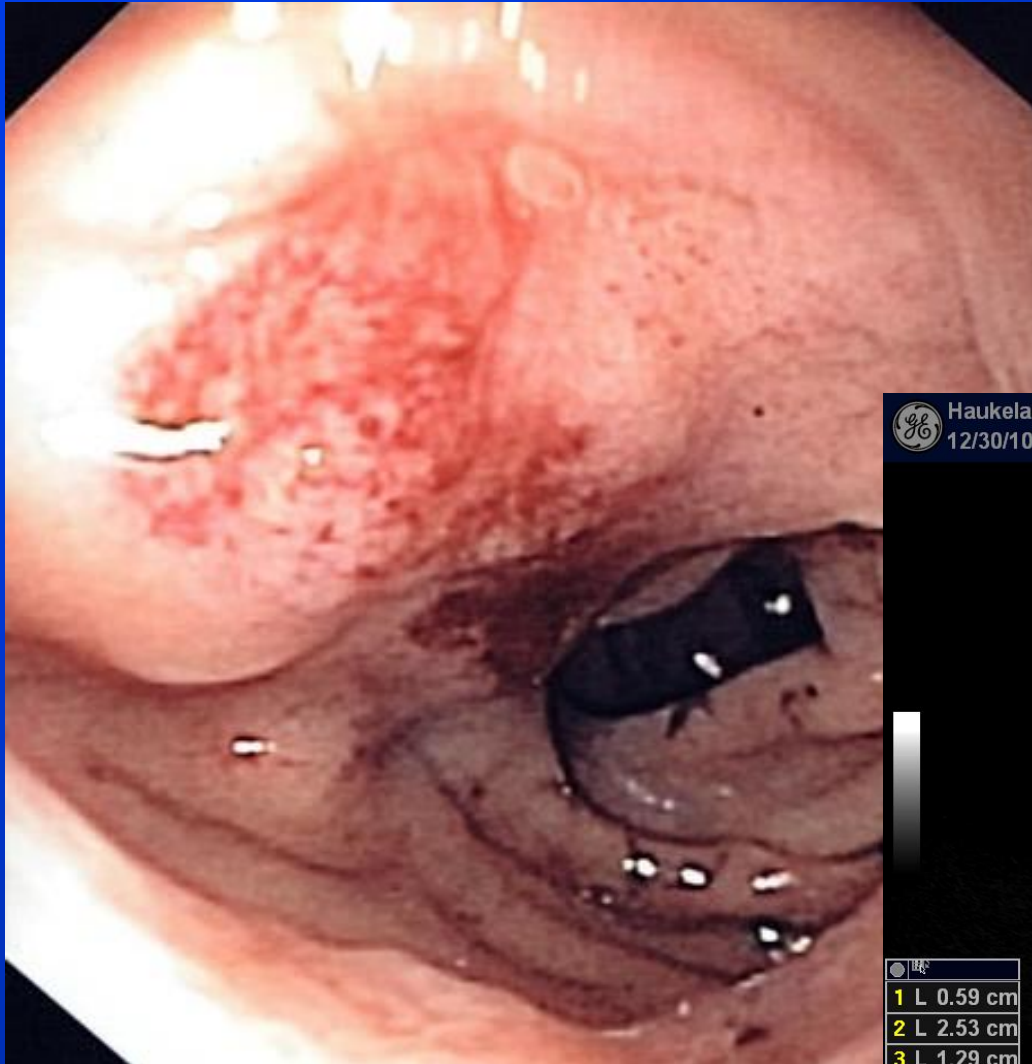


# Case: A 67 year female with epigastric pain, weightloss and anorexia





# Cancer of the Antrum





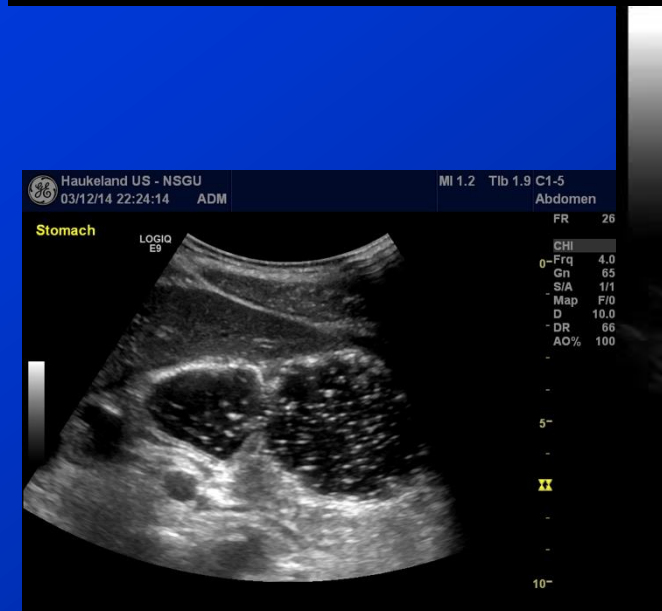
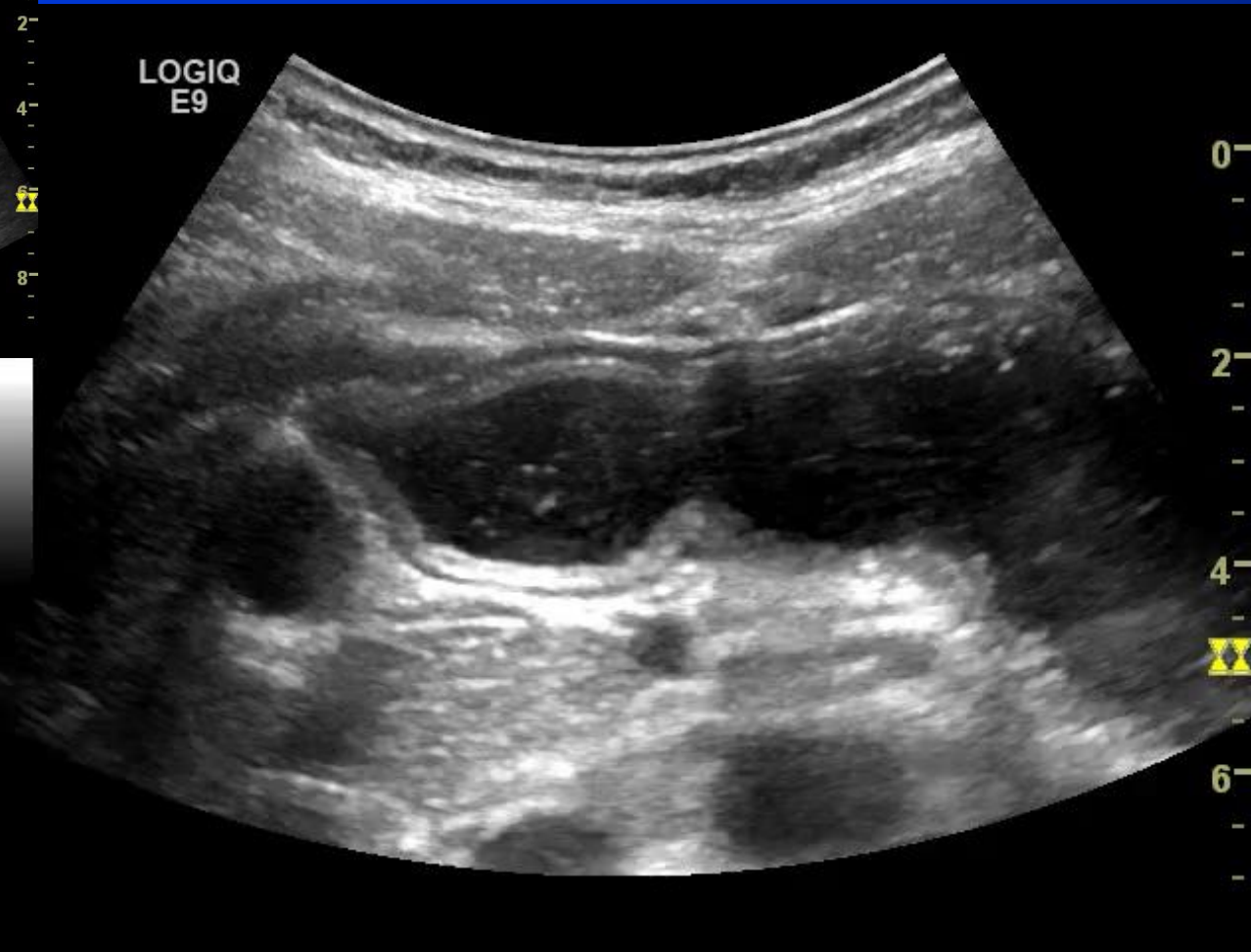
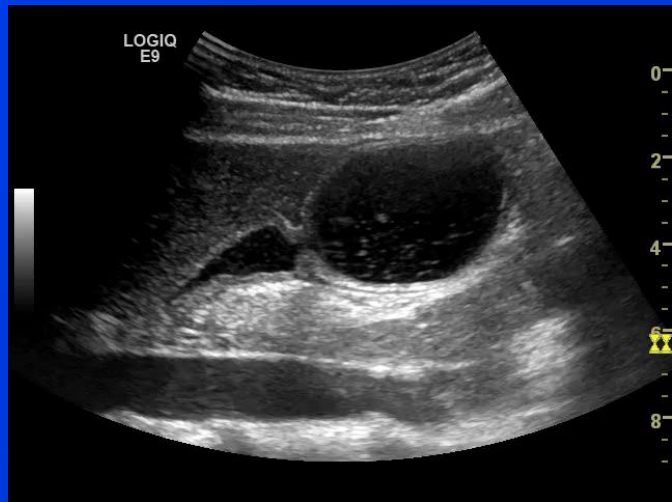
# The Role of Ultrasound in FGID

- Rule out organic diseases
- **Detect disturbances in motility**
- **Disclose pathophysiological abnormalities**
- Provide hints for therapy
- Guide further work-up





# Gastric contractility





# Transpyloric flow





# The Ultrasound Meal Accommodation Test

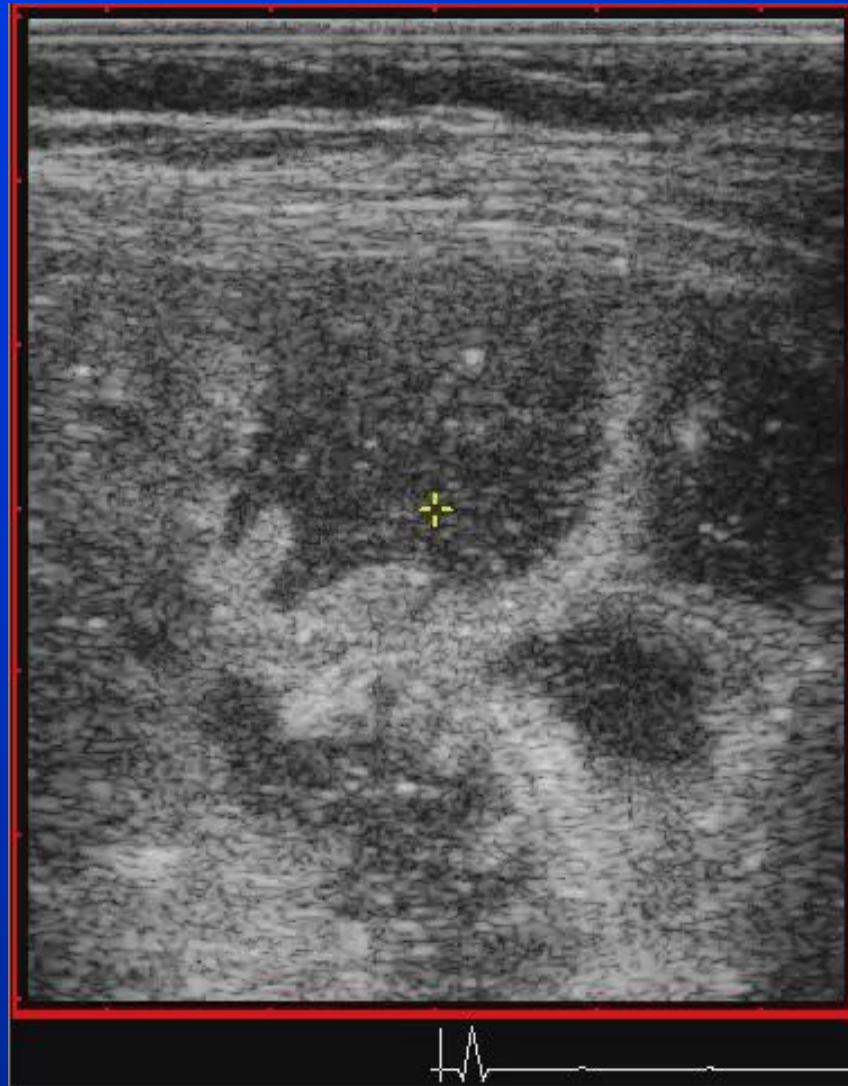
## A Clinical Stress Test

- Test Meal
  - 500 ml in 4 min
- Ultrasound scanning
  - Distal and proximal stomach
  - 2D and 3D ultrasound
- Morphometry
- Evaluation of Symptoms
- Psychological assessment





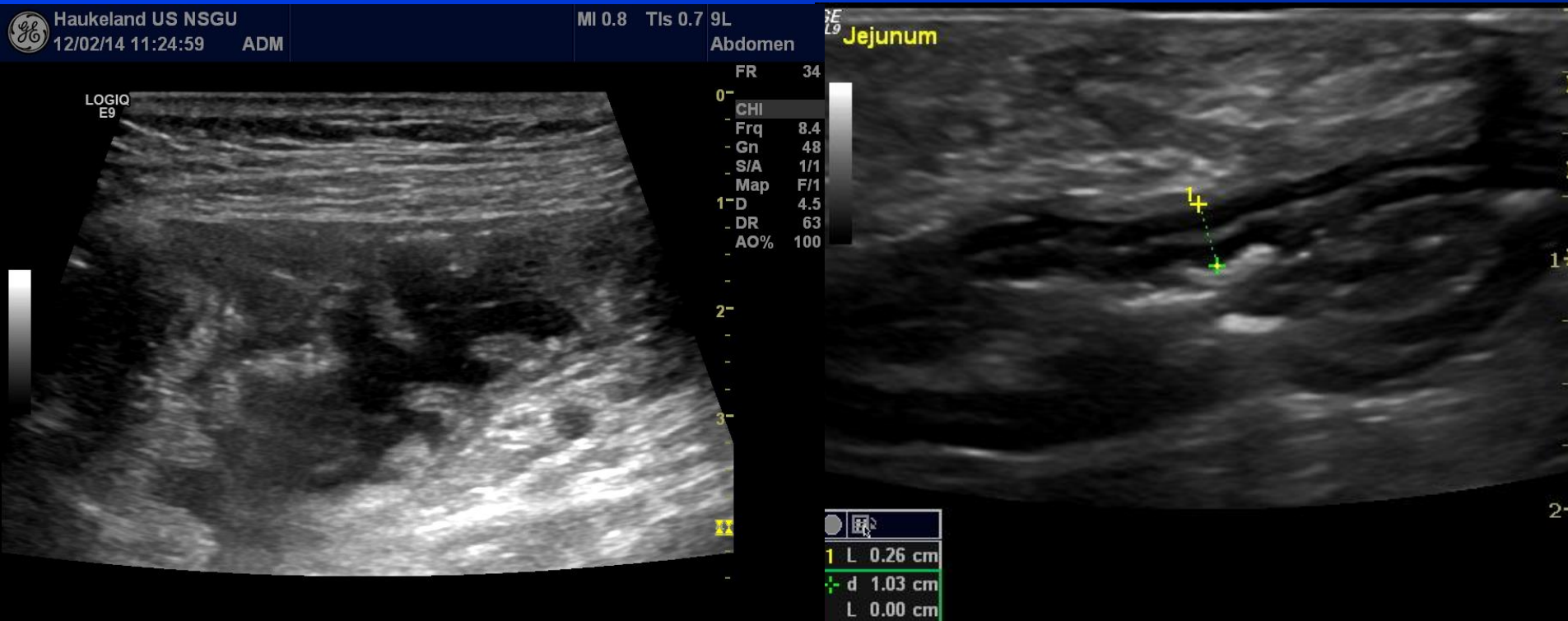
# "Waschmaschinen-phenomen"





# IBS or IBD?

## In jejunum

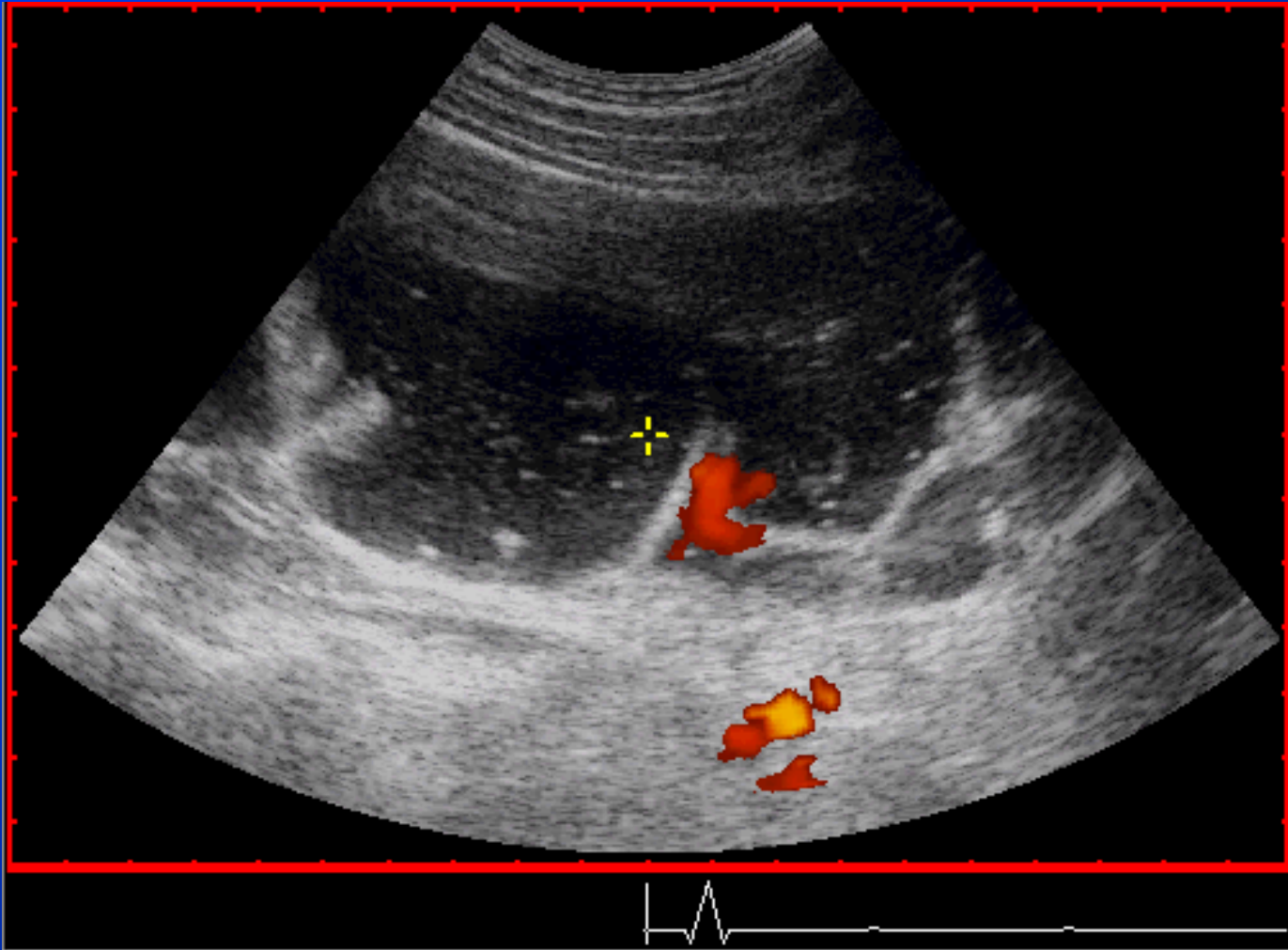


Normal wall  
Note valvula conniventes

Note thickened wall, no valvula,  
and irregular luminal contour



# Most frequent Site of Crohn Affection: Terminal ileum



Flow across Valvula Bauhini



# Valvula Bauhini in IBD



Haukeland US / NSGU  
11/29/17 11:33:43

ADM

MI 0.7

TIs 0.4

9L

Abdomen

FR 25

B

Frq 9.0

Gn 52

S/A 2/1

Map A/1

D 5.0

DR 69

AO% 100

-

2"

-

4"

-

-

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-

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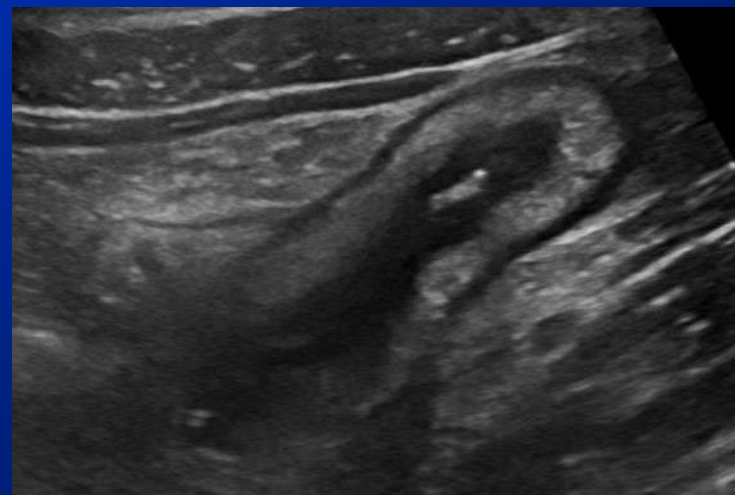
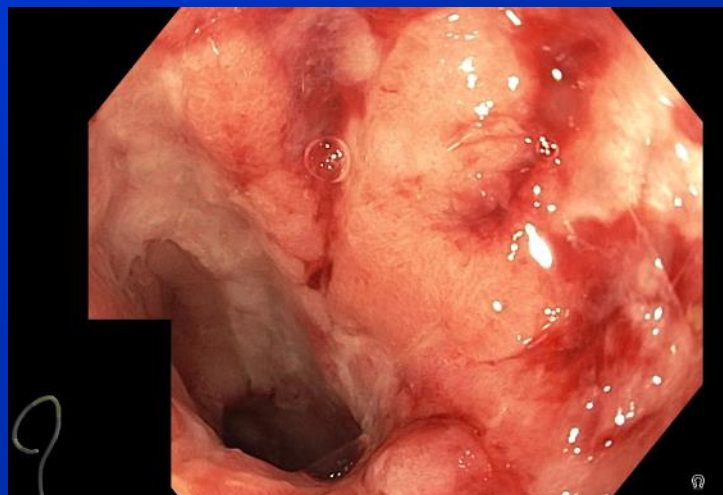
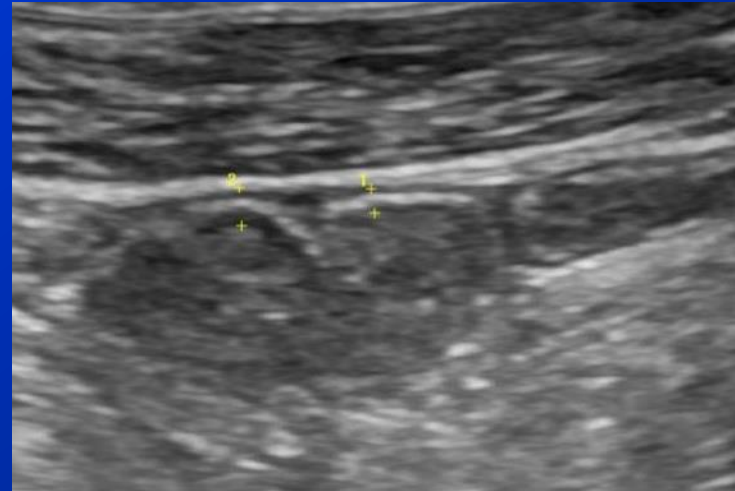
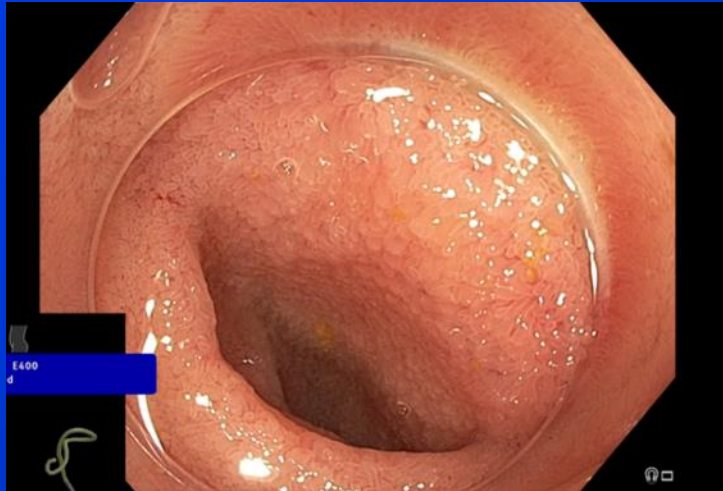
-

LOGIQ  
E9





# Normal vs. Crohn ileum





# Valve emptying in Crohn's





# Transmural Infiltrate in Crohn





# Crohn ulcerations



Haukeland  
03/08/21 11:58:51

ADM

MI 1.4

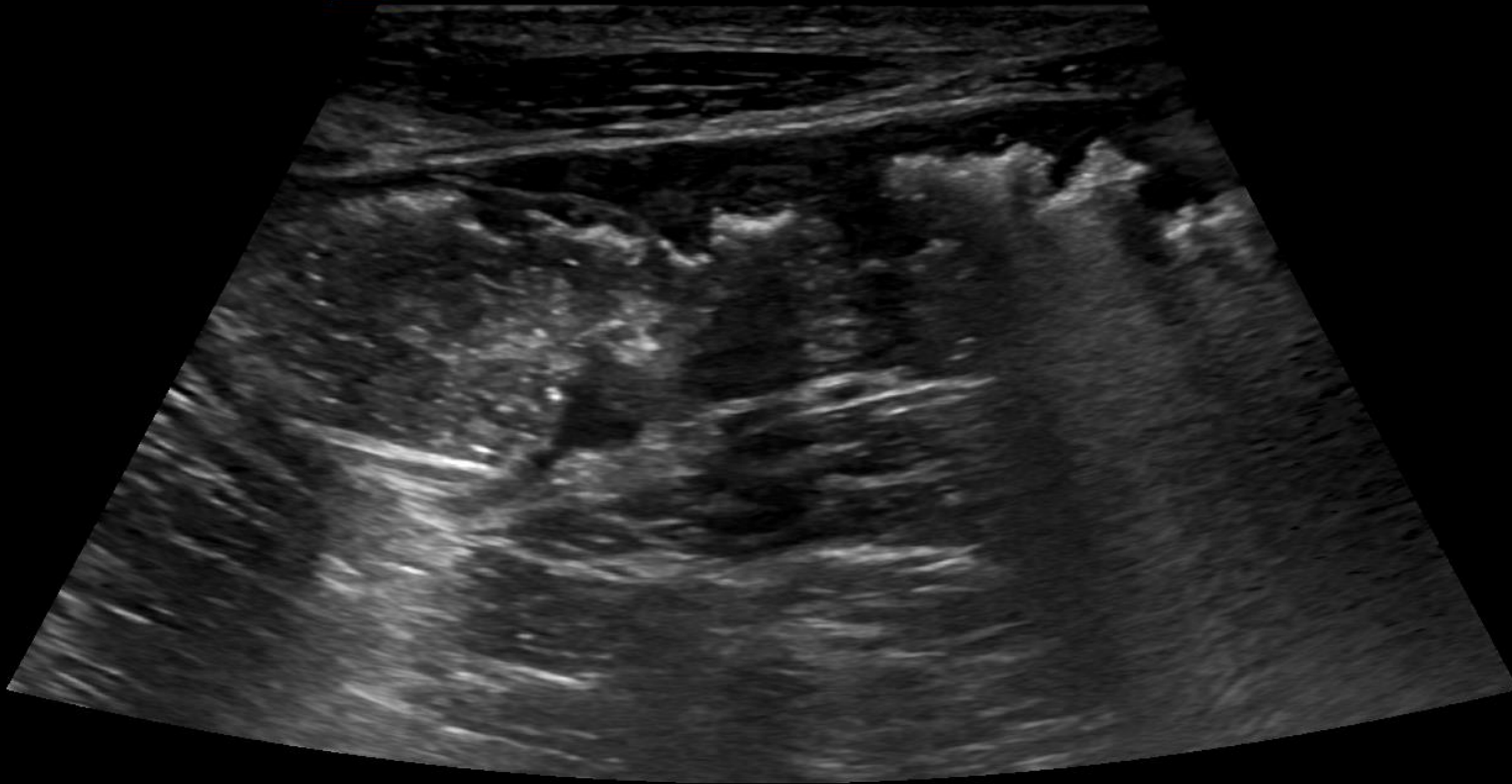
TIs 0.6

L2-9  
Bowel

FR 34

Ilium og coecum

LOGIQ

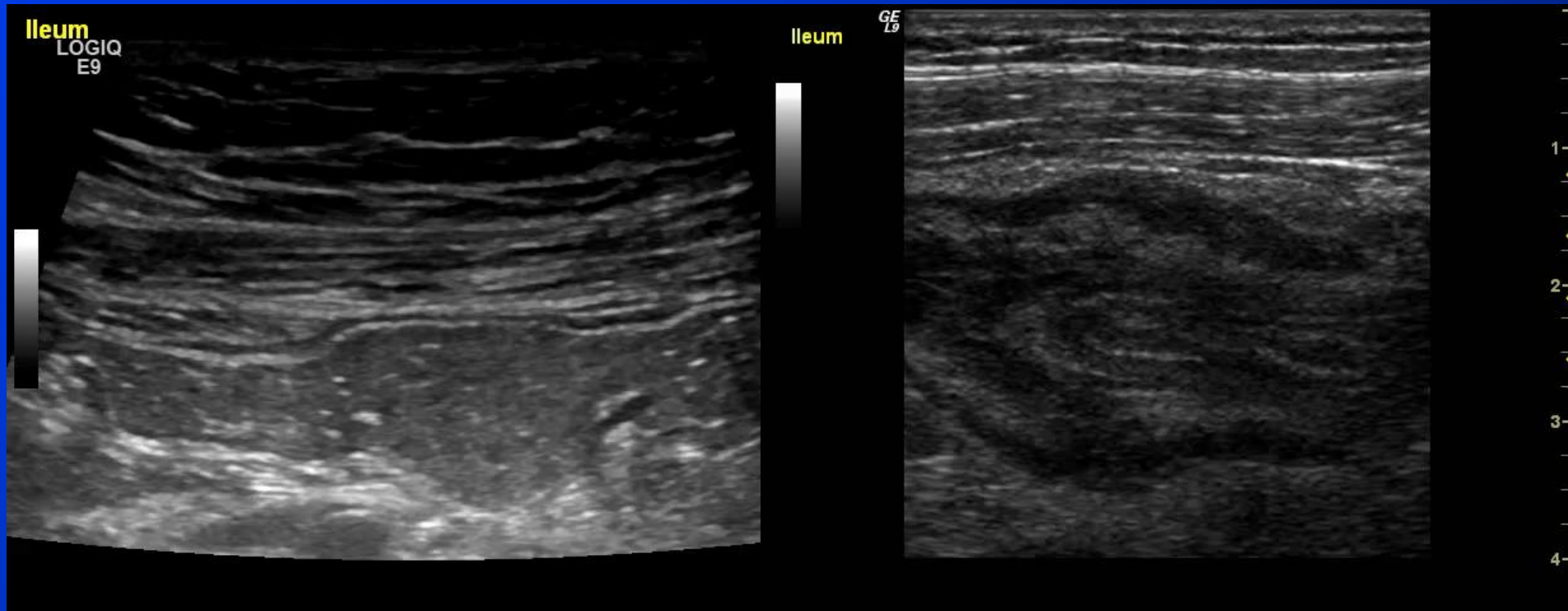


|   |     |     |
|---|-----|-----|
| 0 | CHI | X   |
| - | Frq | 9.0 |
| - | Gn  | 33  |
| - | S/A | 2/3 |
| - | Map | B/2 |
| 1 | D   | 4.5 |
| - | Zm  | 0   |
| - | DR  | 66  |
| - | AO% | 100 |
| - |     |     |
| 2 |     |     |
| - |     |     |
| - |     |     |
| - |     |     |
| 3 |     |     |
| - |     |     |
| - |     |     |
| - |     |     |
| 4 |     |     |
| - |     |     |
| - |     |     |
| L |     |     |



# US is a real-time method

## Impaired Motility is easily observed



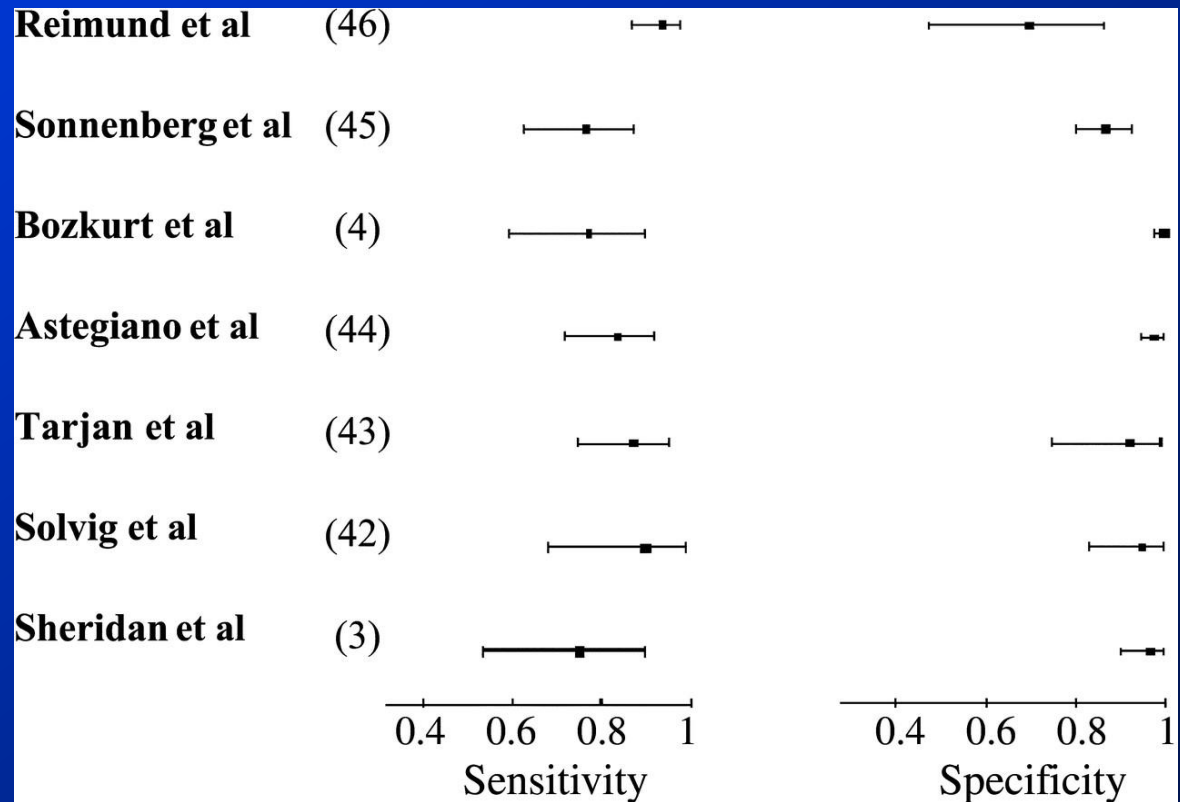
Normal ileal motility

Abnormal ileal motility



# Meta-analysis of US in Crohn's Sensitivity and Specificity

Graph shows the sensitivity and specificity of US in the detection of Crohn disease reported for the seven studies. Reimund et al (46) and Sonnenberg et al (45) were case-control studies; the other five studies were prospective cohort studies. Mean values (■) and 95% confidence intervals (error bars) are indicated; the heterogeneity of the results prevented the calculation of a cumulative value.





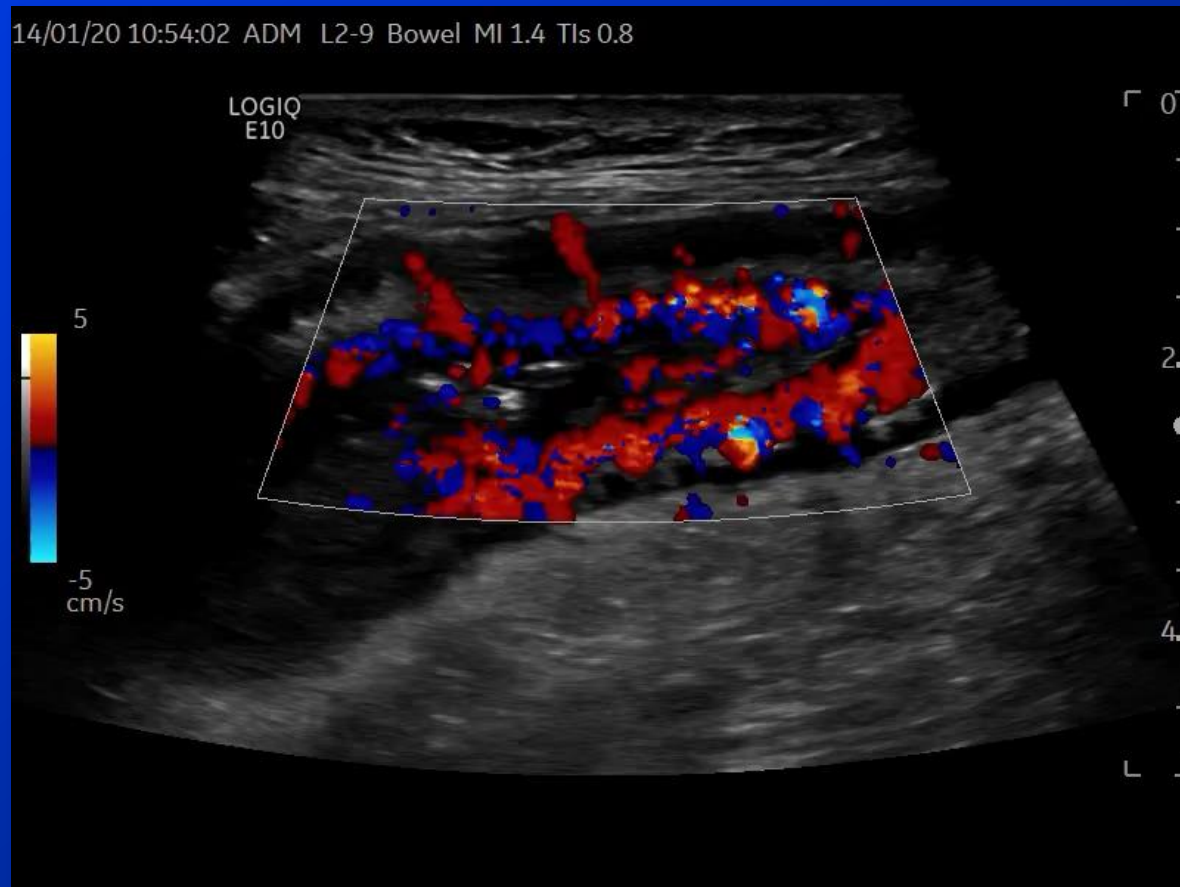
# Extent of GI Wall Disease





## Recommendations:

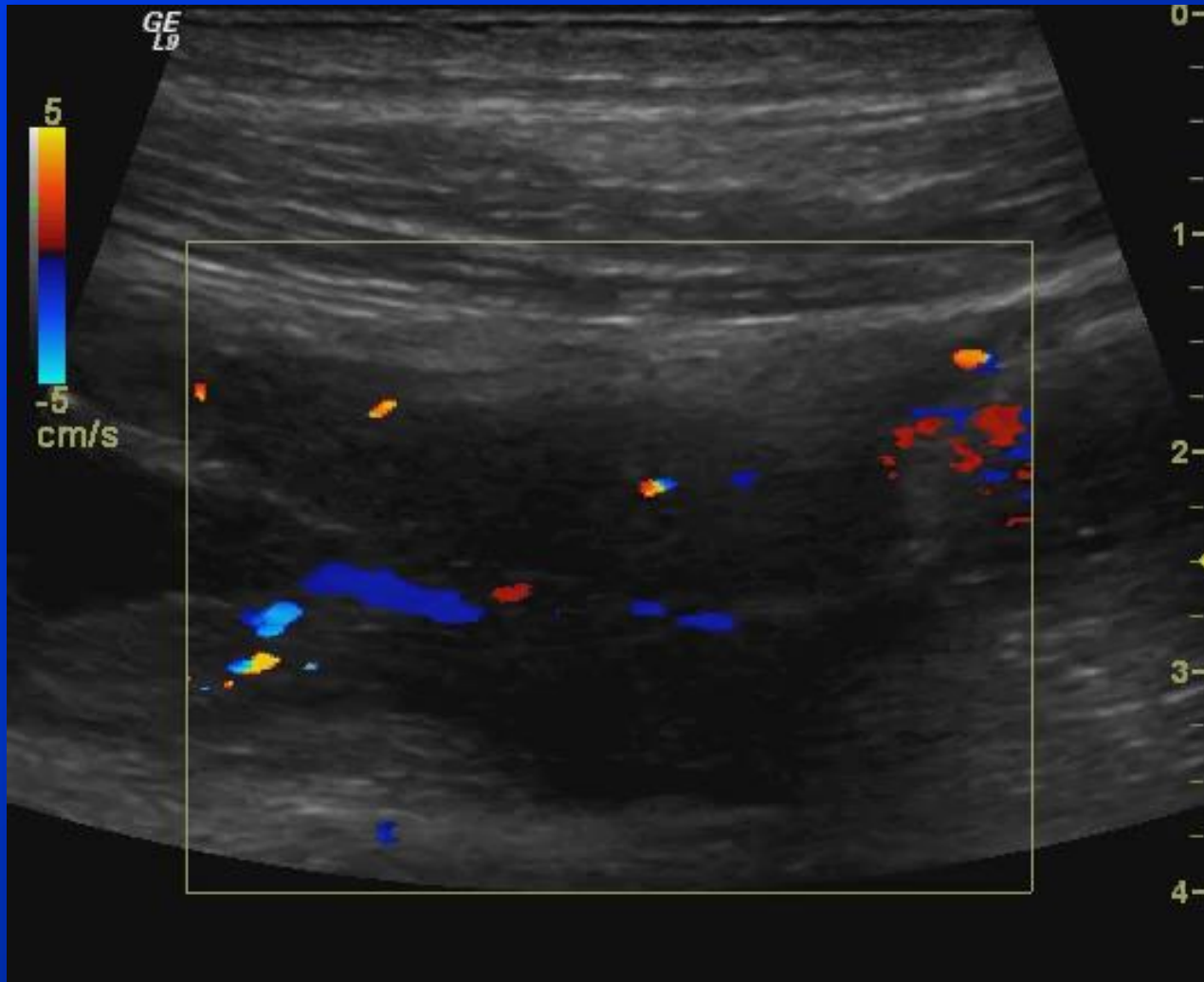
3. Colour Doppler imaging should be used to evaluate the vascularisation of pathological bowel wall, LoE 2b, GoR B, Broad consensus 12/13



*Courtesy: OH Gilja*

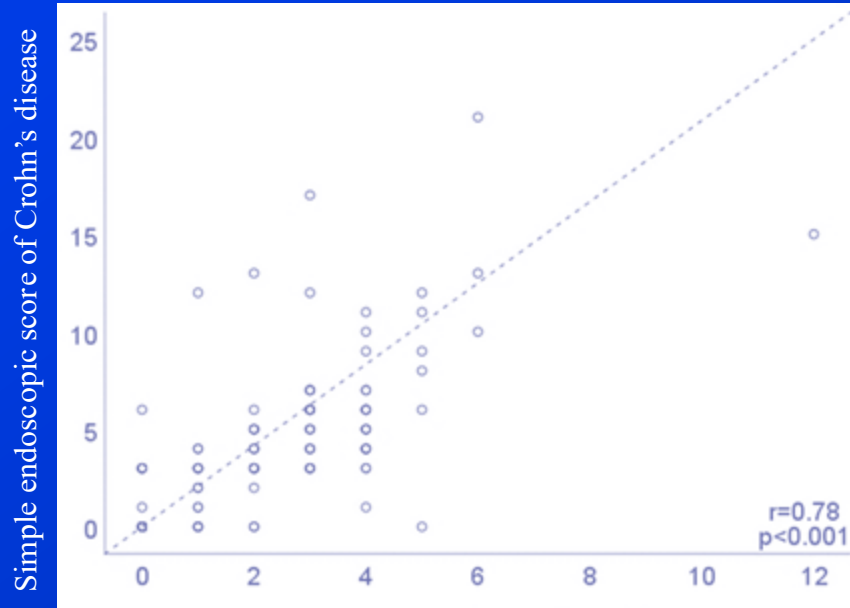


# Low flow in a Crohn Stenosis

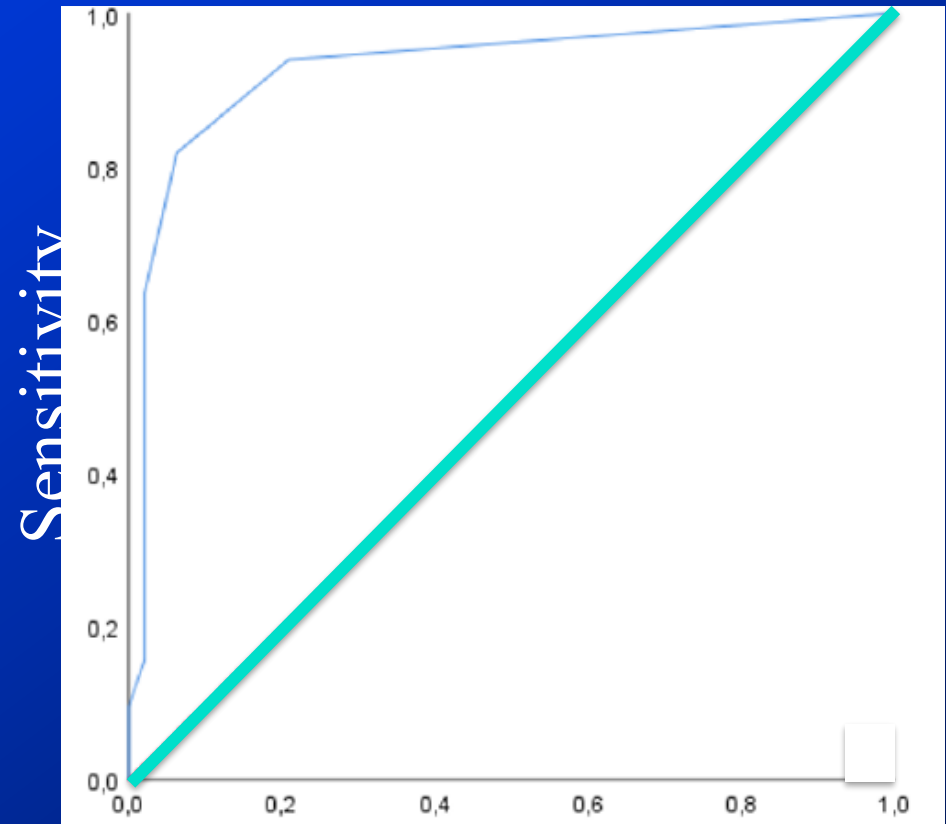




# SUS-CD -Crohn's disease



- Crohns patients receiving ileocolonoscopy
- 7 parameters: wall thickness, colour Doppler, stratification, fatty wrapping, length of affection, stenosis, fistula
- 40 patients in development cohort
- 124 patients in validation cohort.



1-Specificity

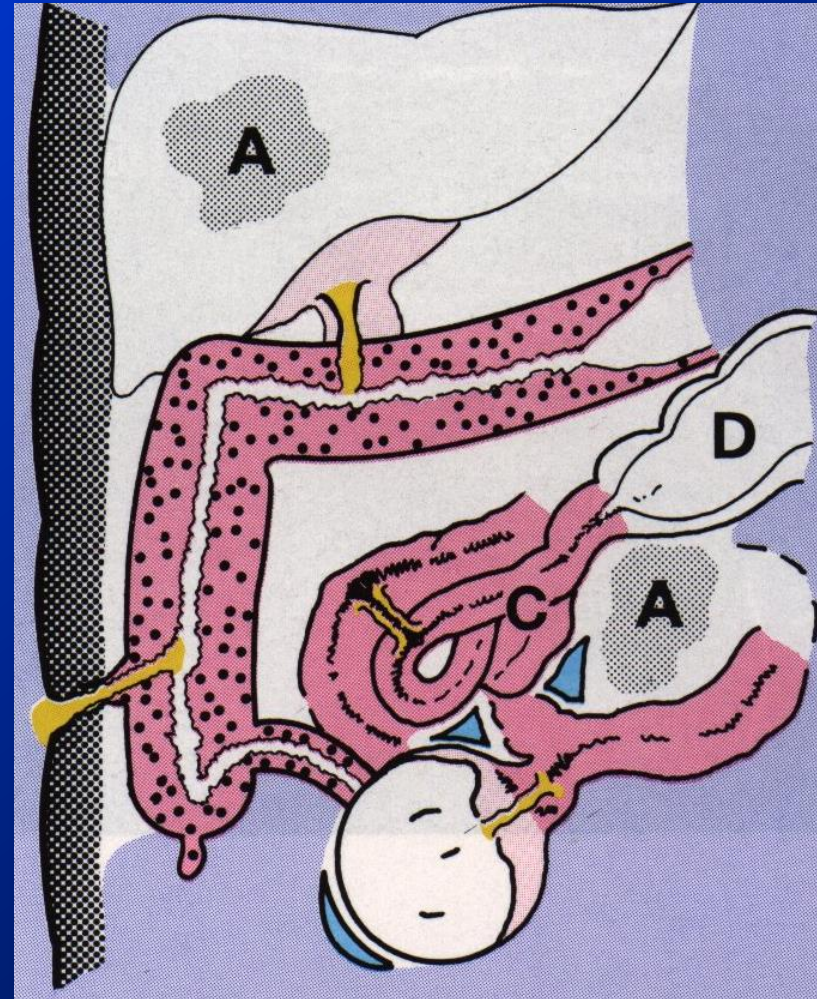
SES-CD >2, SUS-CD ≥1

Sens=95, Spec=70 for disease activity



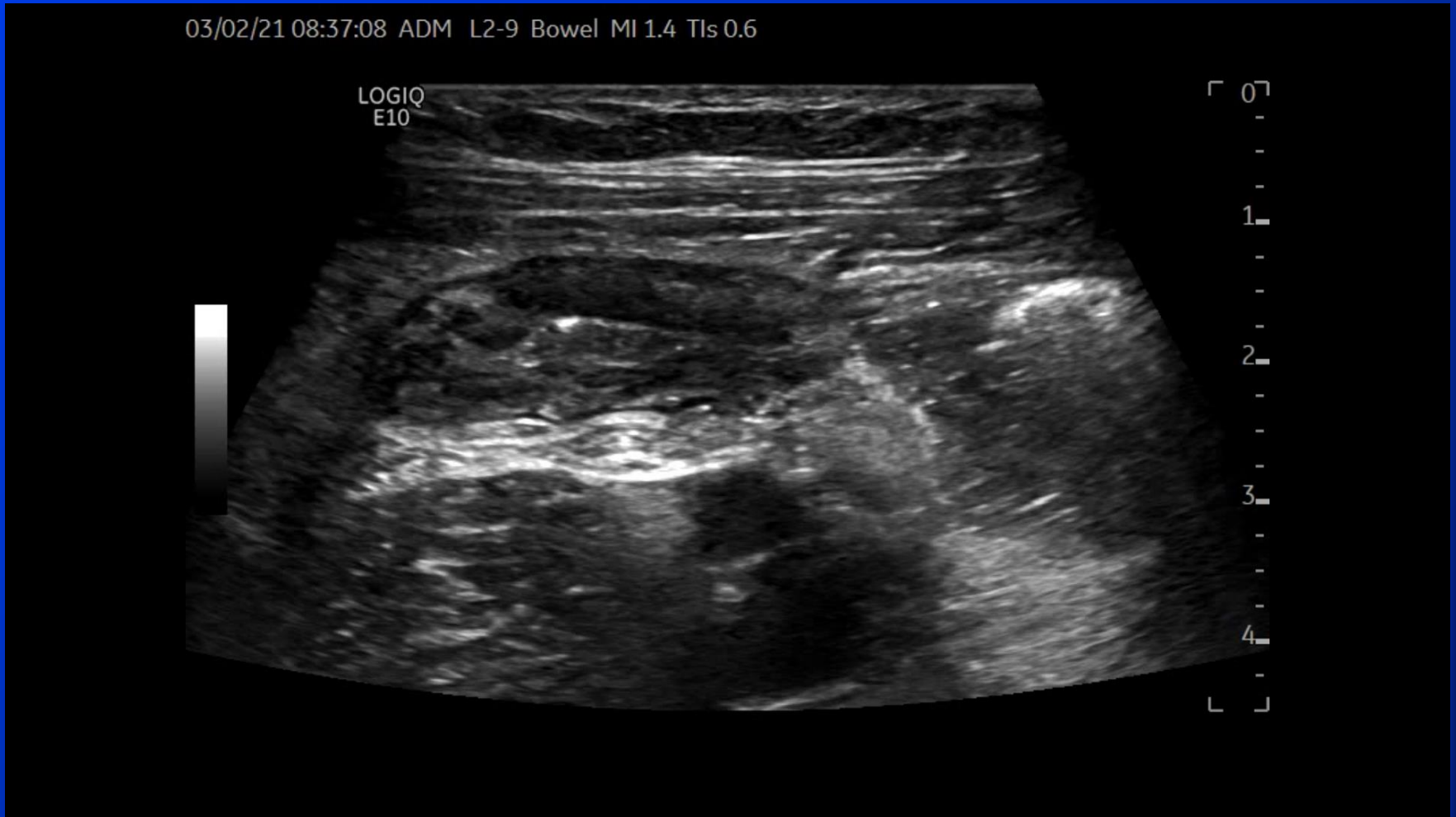
# Complications of Crohn's

- Abscess
- Fistulas
- Stricture
- Malignancy
- Other findings:
  - Ascites
  - Mesenteric lymphnodes
  - Fatty infiltration
  - Focal cystitis





# Flow through a Crohn stenosis





# Abscess in Crohn's

Table III. Prospective studies assessing accuracy of bowel US in detection of intra-abdominal abscesses complicating CD

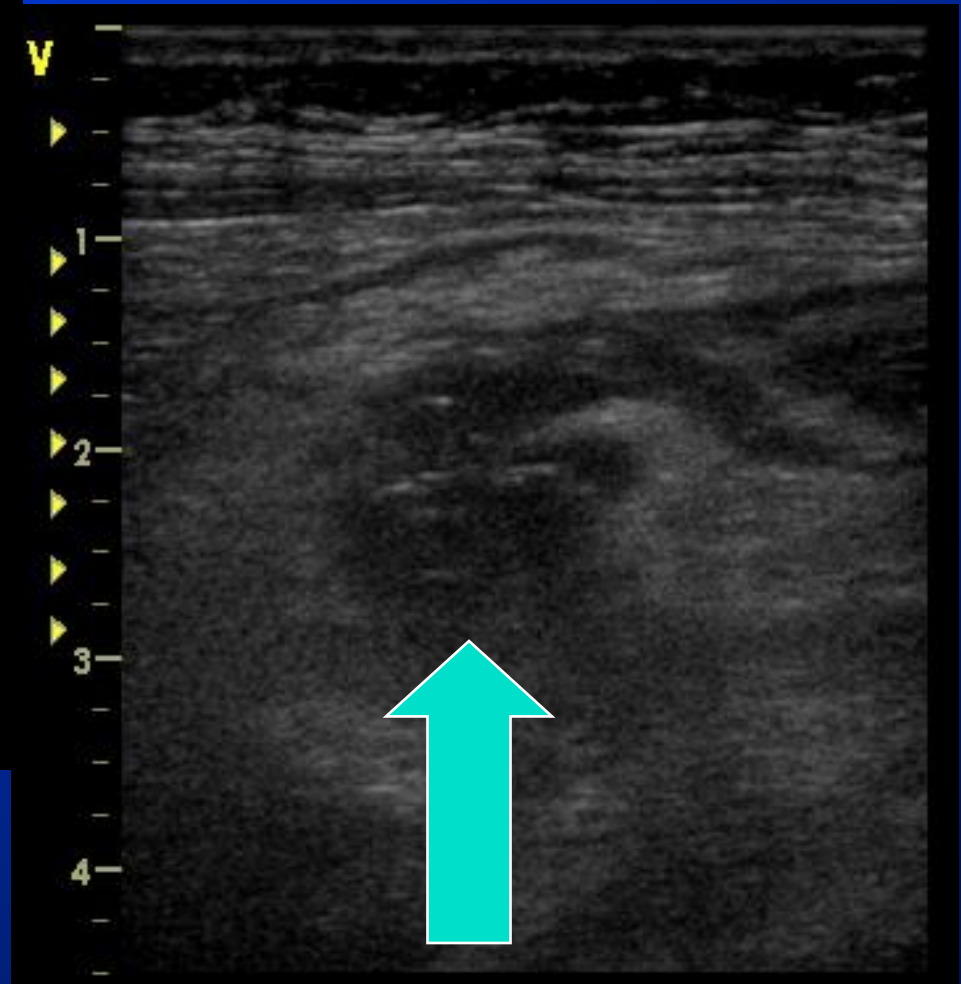
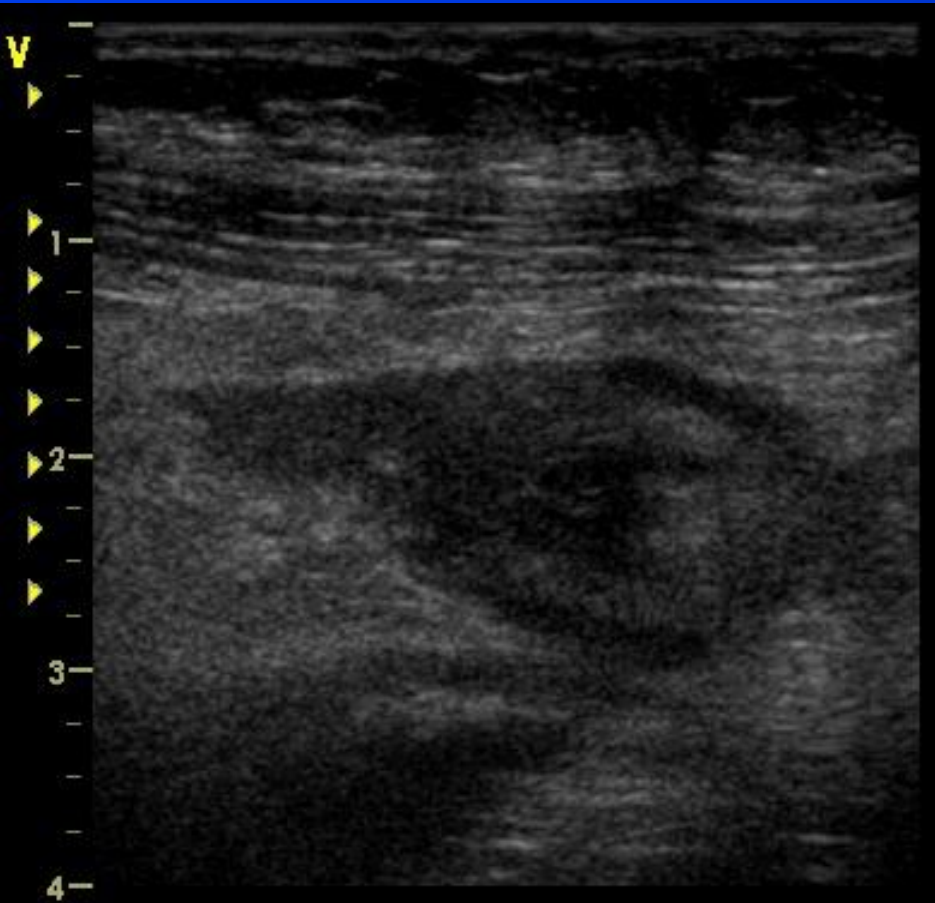
|                          | No. of patients | Comparator        | Sensitivity, % | Specificity, % |
|--------------------------|-----------------|-------------------|----------------|----------------|
| Schwerk et al. 1992 (13) | 20              | Surgery           | 92             | 100            |
| Maconi et al. 1996 (19)  | 58              | CT scan           | 83             | 94             |
| Gasche et al. 1999 (20)  | 33              | Surgery/pathology | 100            | 92             |
| Maconi et al. 2002 (25)  | 128             | Surgery           | 91             | 87             |

- CT > US in deep abscesses (pelvis)
- US = CT in less deep abscesses
- US > CT in inflammatory infiltrates and abscesses that are close to the GI wall

*Parente F, SJG 2002 (8). Review.*

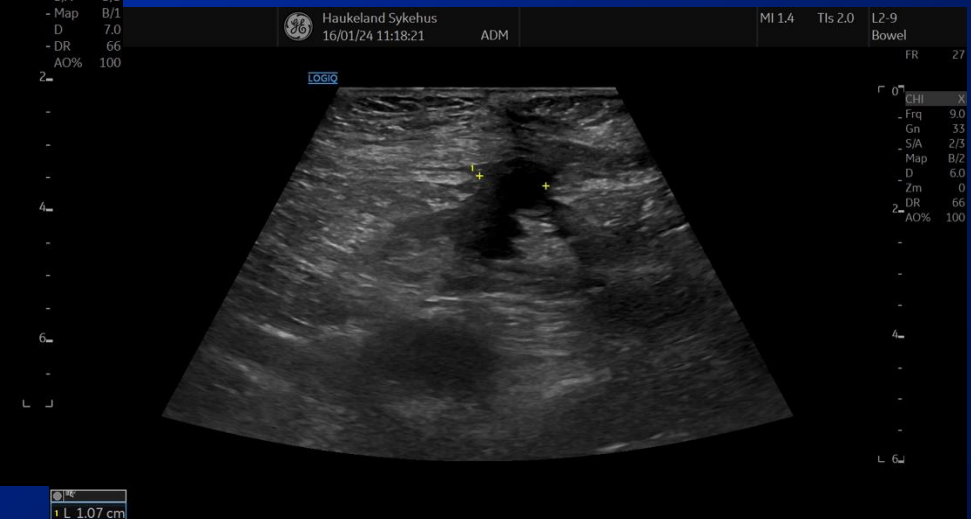
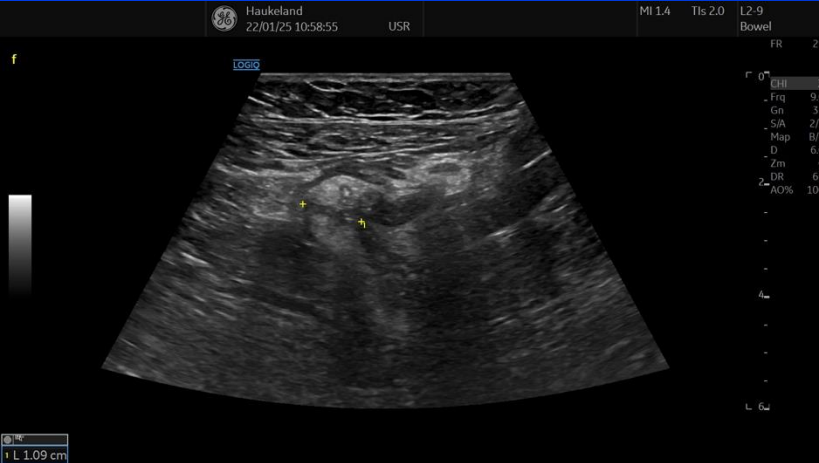


# Abscess near the Ileum



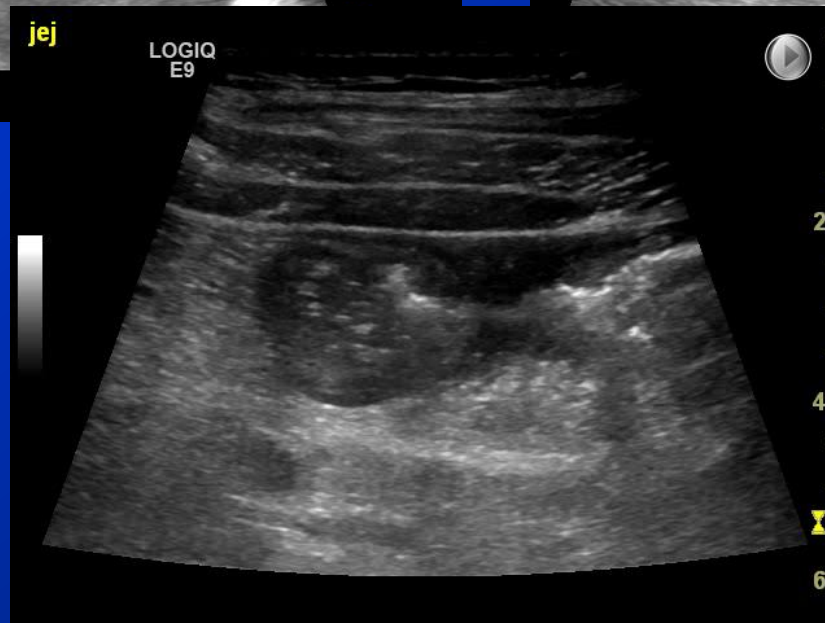
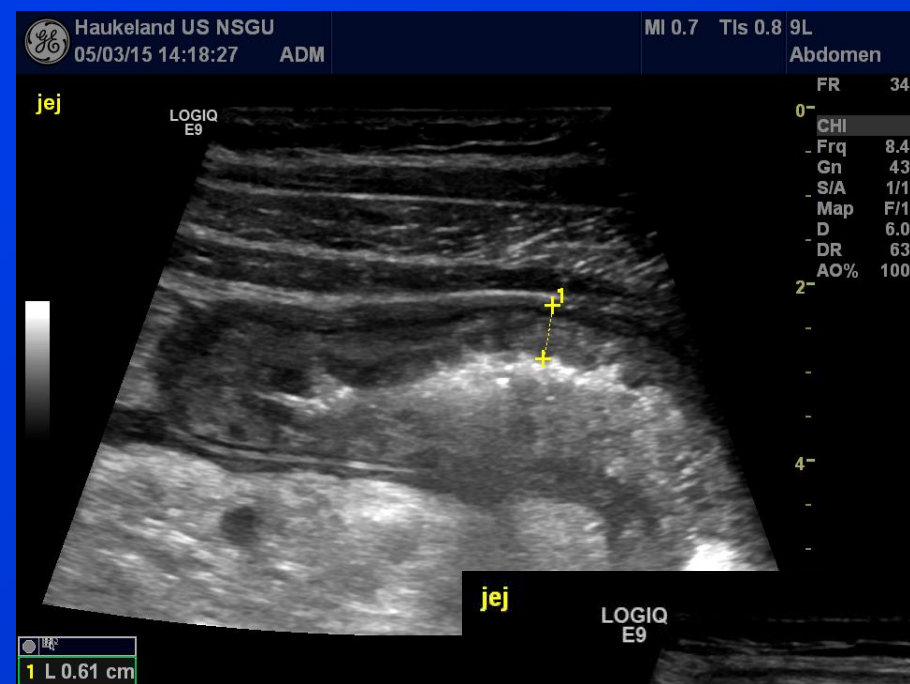


# Crohn Fistulas



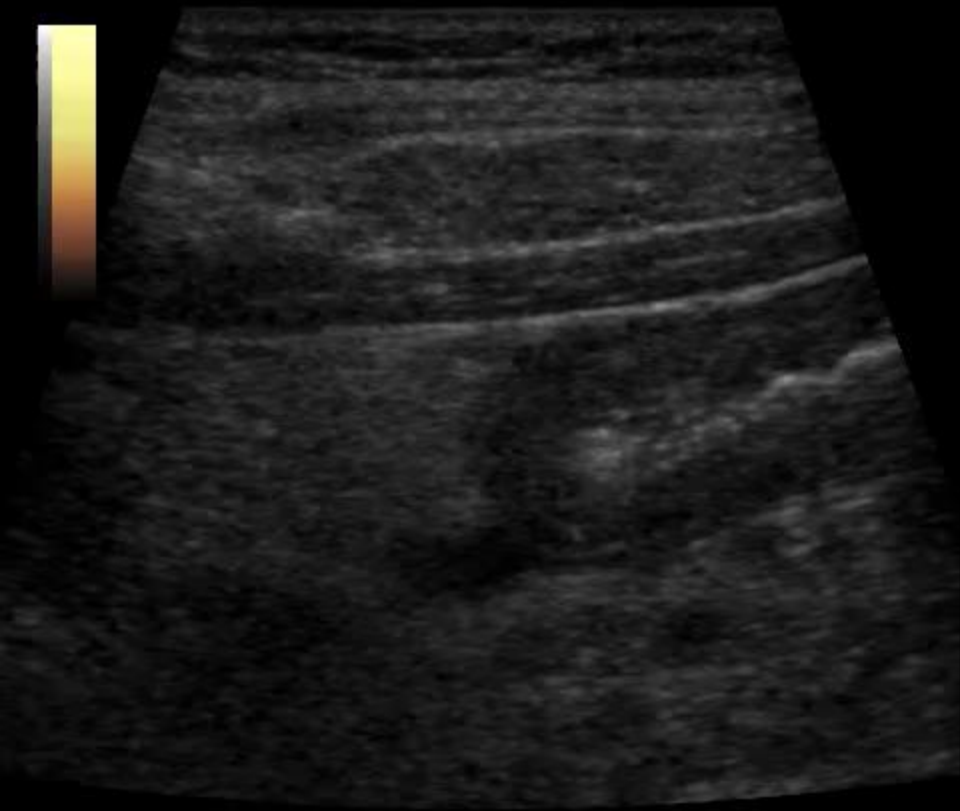


# Crohn of the jejunum



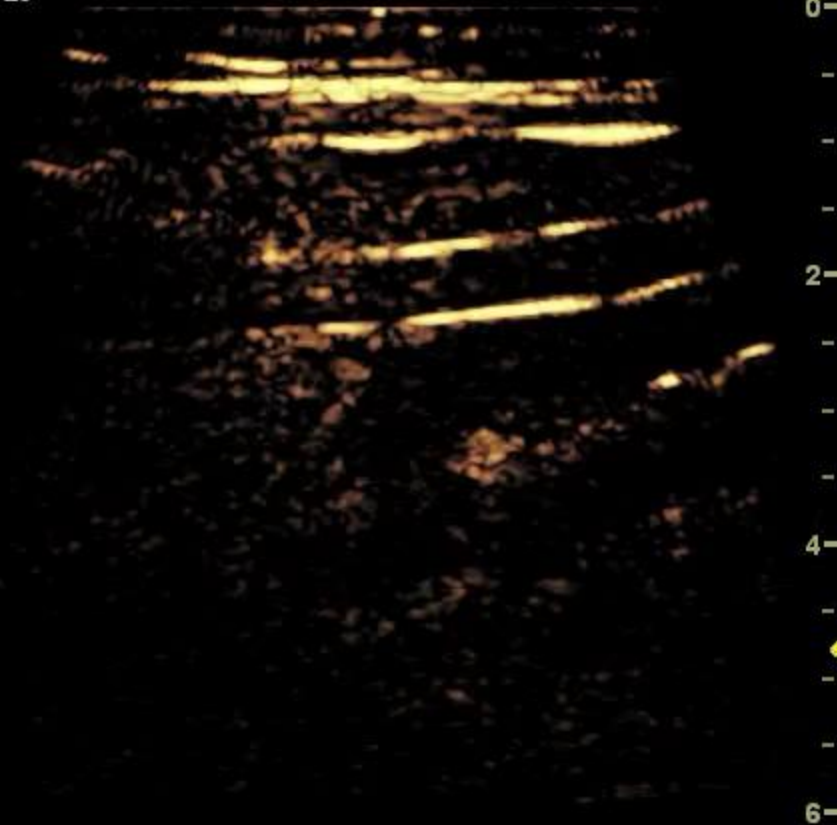


# CEUS of Jejunal loop and surrounding tissue



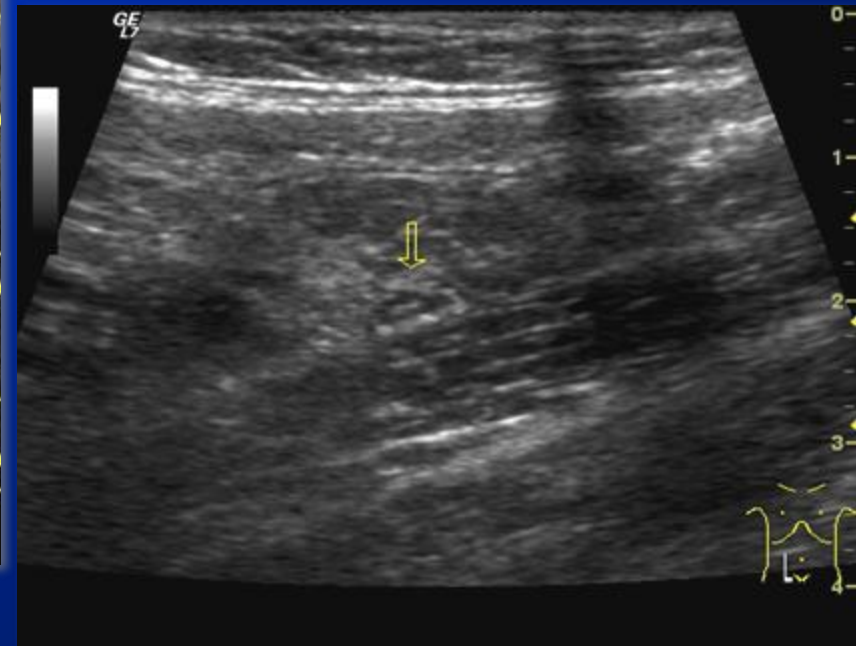
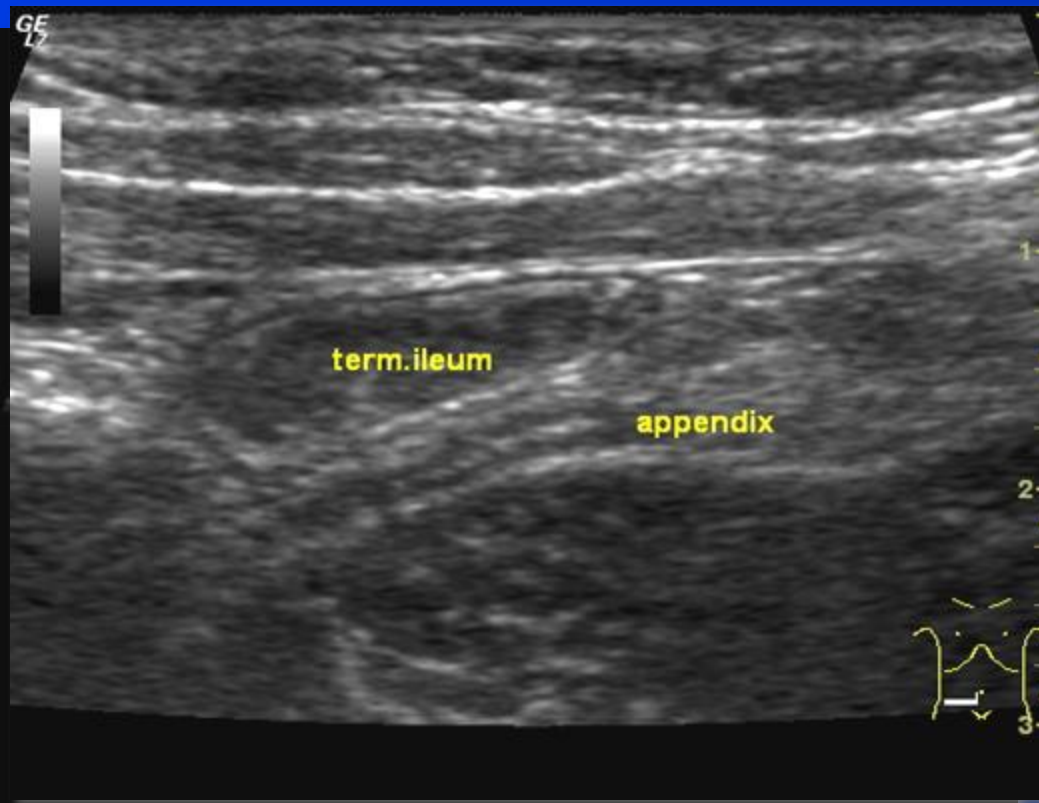
T1: 0:01

LOGIQ  
E9



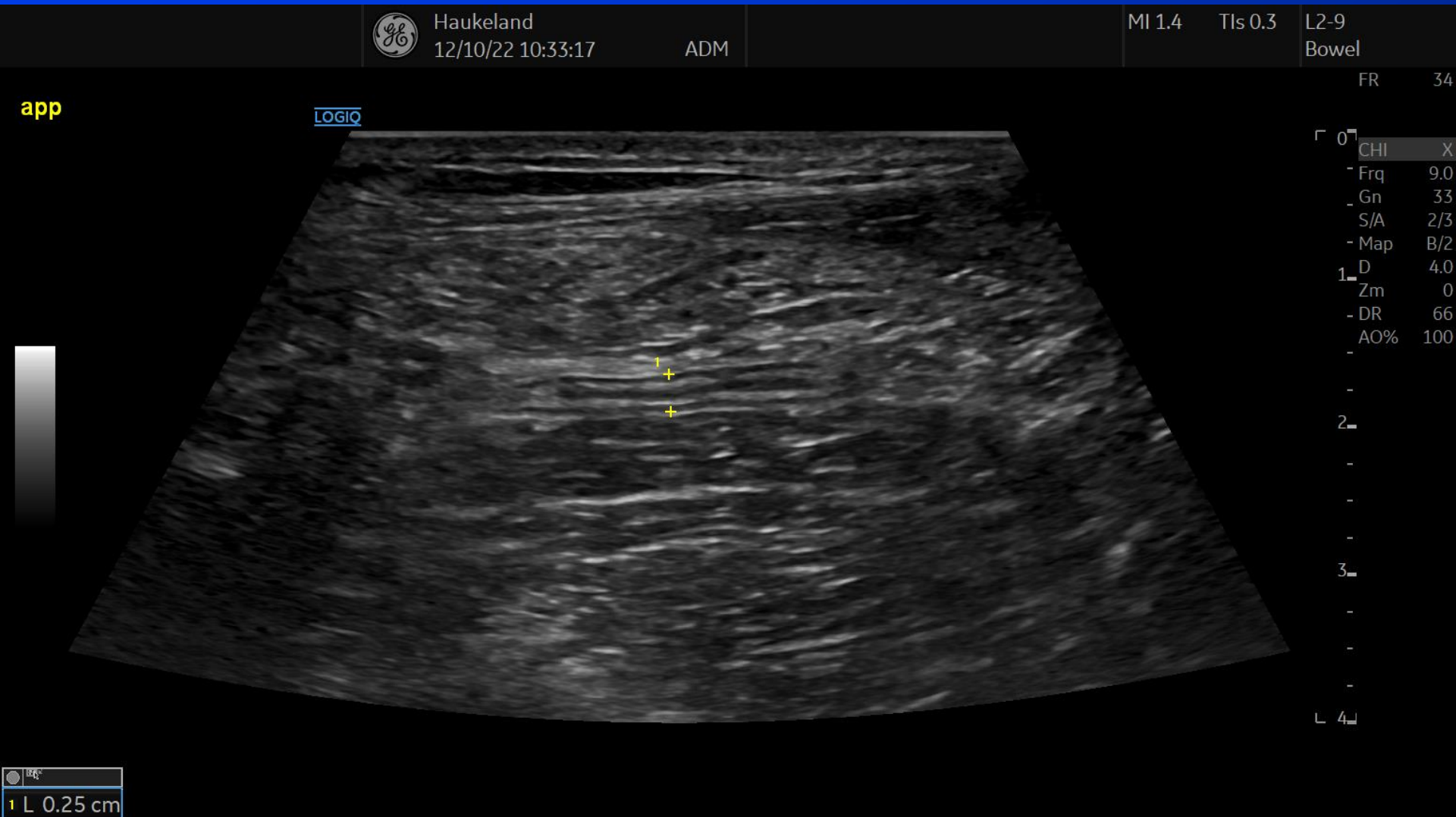


# The Appendix





# The normal appendix





# Appendix with fecalith



Haukeland  
30/12/20 11:02:05

ADM

MI 1.4

TIs 0.6

L2-9  
Bowel

FR 34

fecalith in app

LOGIQ  
E10

+ +1

| CHI  | X   |
|------|-----|
| Frq  | 9.0 |
| Gn   | 52  |
| S/A  | 3/3 |
| Map  | B/1 |
| D    | 4.5 |
| 1-DR | 66  |
| AO%  | 100 |
| -    | -   |
| -    | -   |
| -    | -   |
| 2-   | -   |
| -    | -   |
| -    | -   |
| -    | -   |
| 3-   | -   |
| -    | -   |
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| 4-   | -   |
| -    | -   |
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1 L 0.22 cm

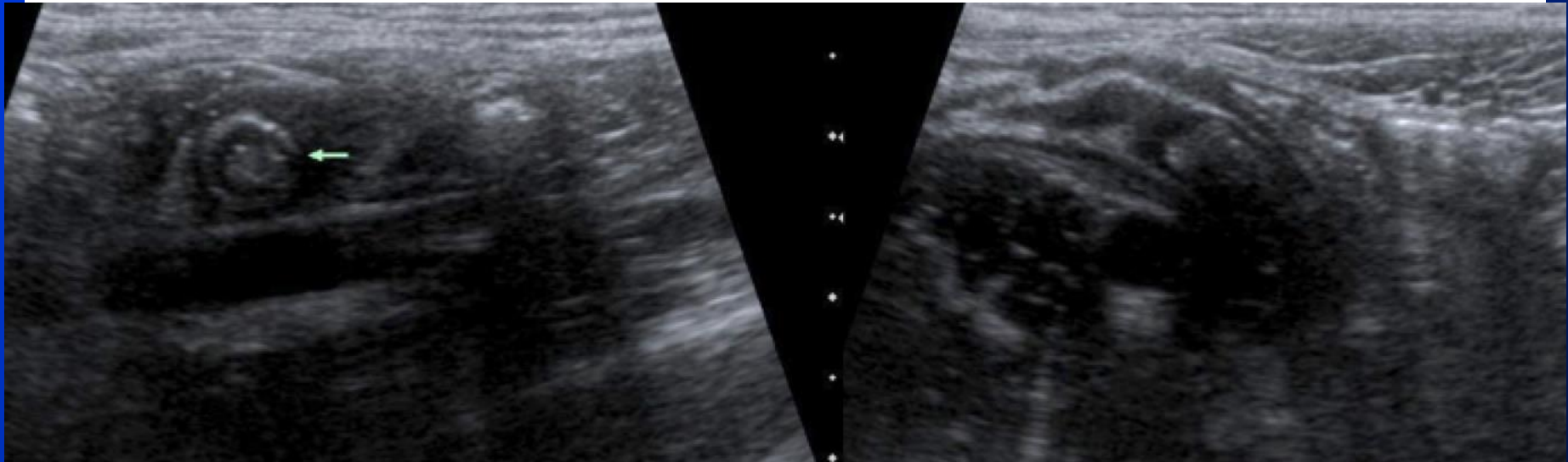


# Acute appendicitis

## STATEMENT 10

In any case of suspected appendicitis, an “ultrasound first” strategy should be used in both children and adults.

*Consensus levels of agreement: A+ 18/18*



*Dirks K et al. EFSUMB Position Paper... Ultraschall in Med 2019; 40*

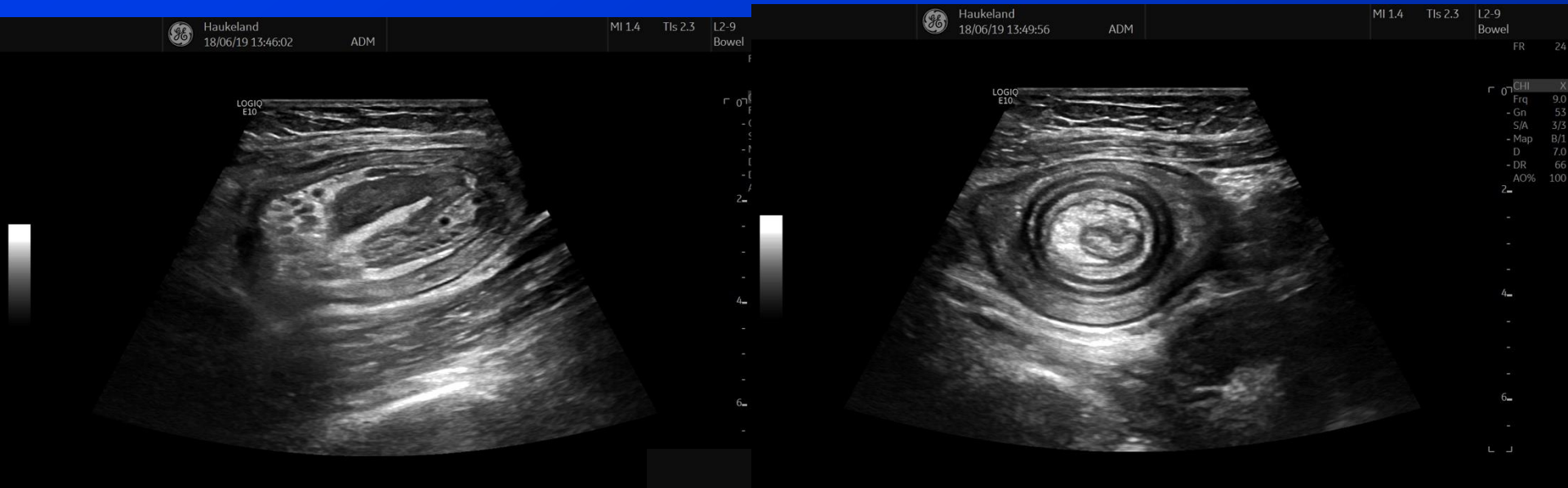


# US Criteria for Appendicitis

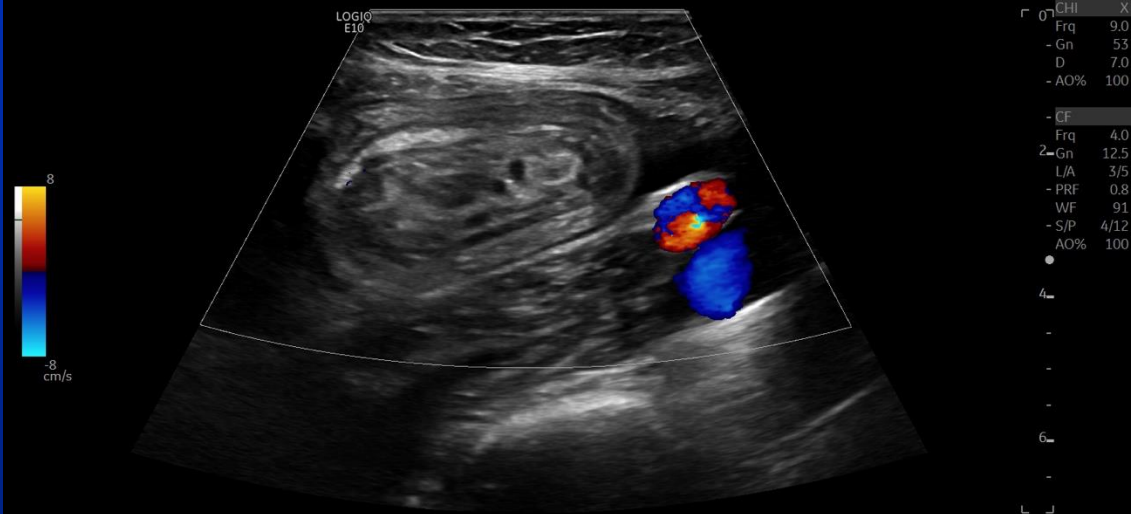
- Distended appendix  $> 6$  mm
- Presence of fecalith
- Periappendiceal oedema and/or infiltrate
- Doppler: Increased vascularity
- Local pain upon transducer palpation
- (Low resistive index)

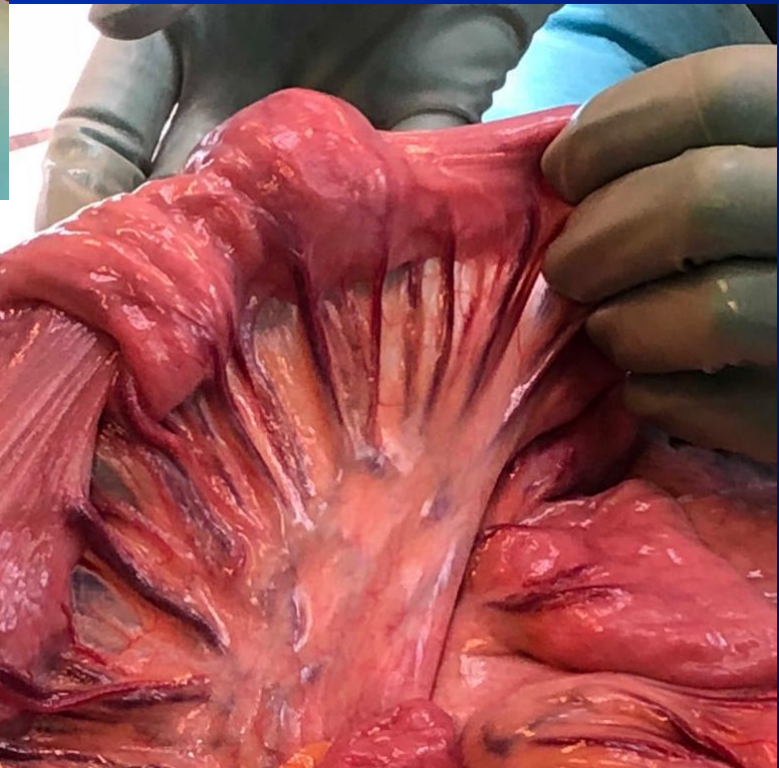


# Invagination



«The onion sign»







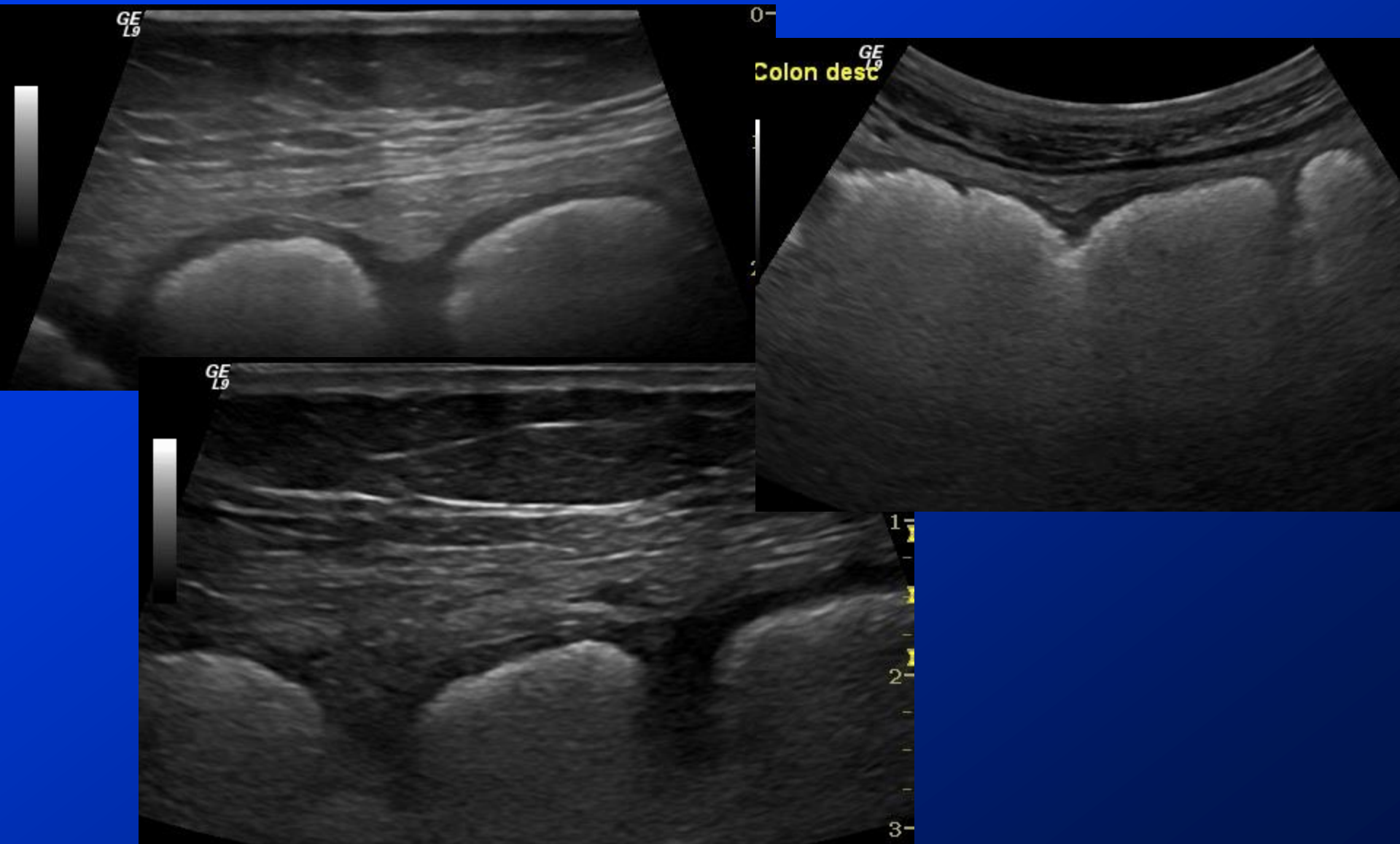
# Ultrasound of the GI Tract

## Agenda

- Esophagus
- Ventriculus
- Duodenum
  - Jejunum
  - Ileum
- **Colon / Rectum**

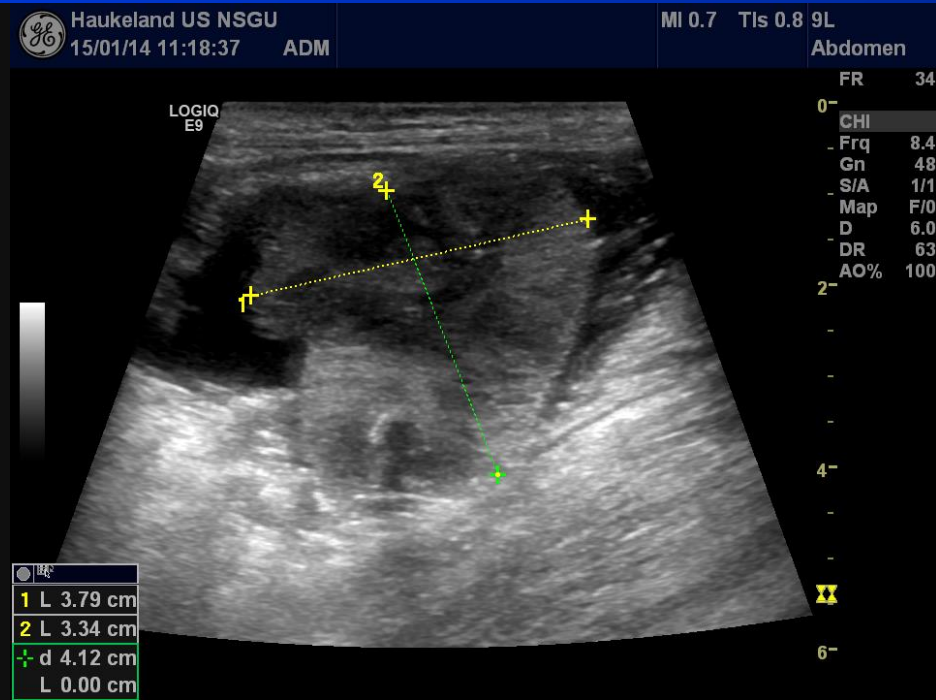
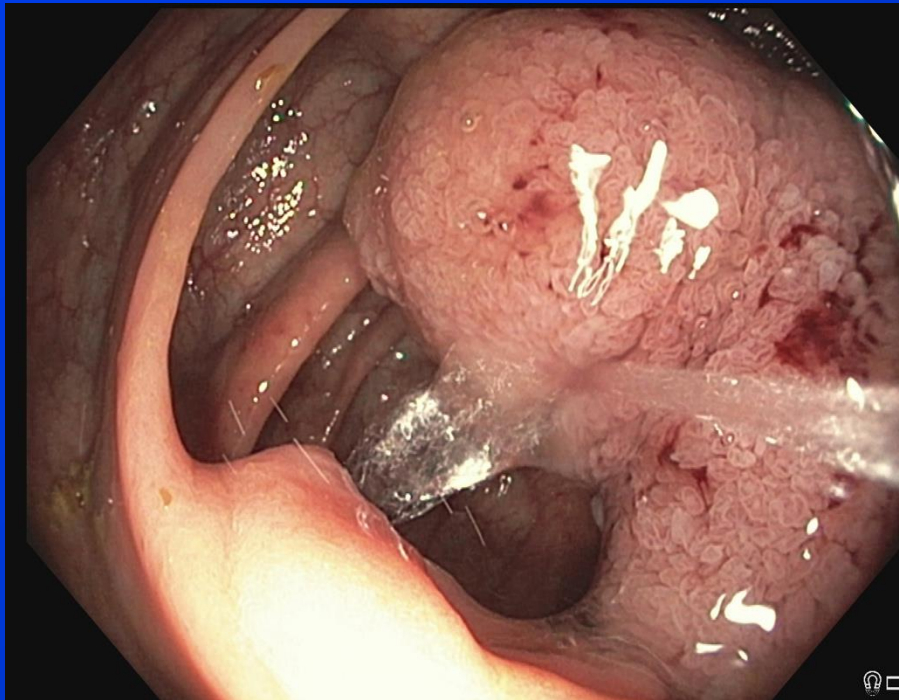


# Wall Layers of Normal Colon



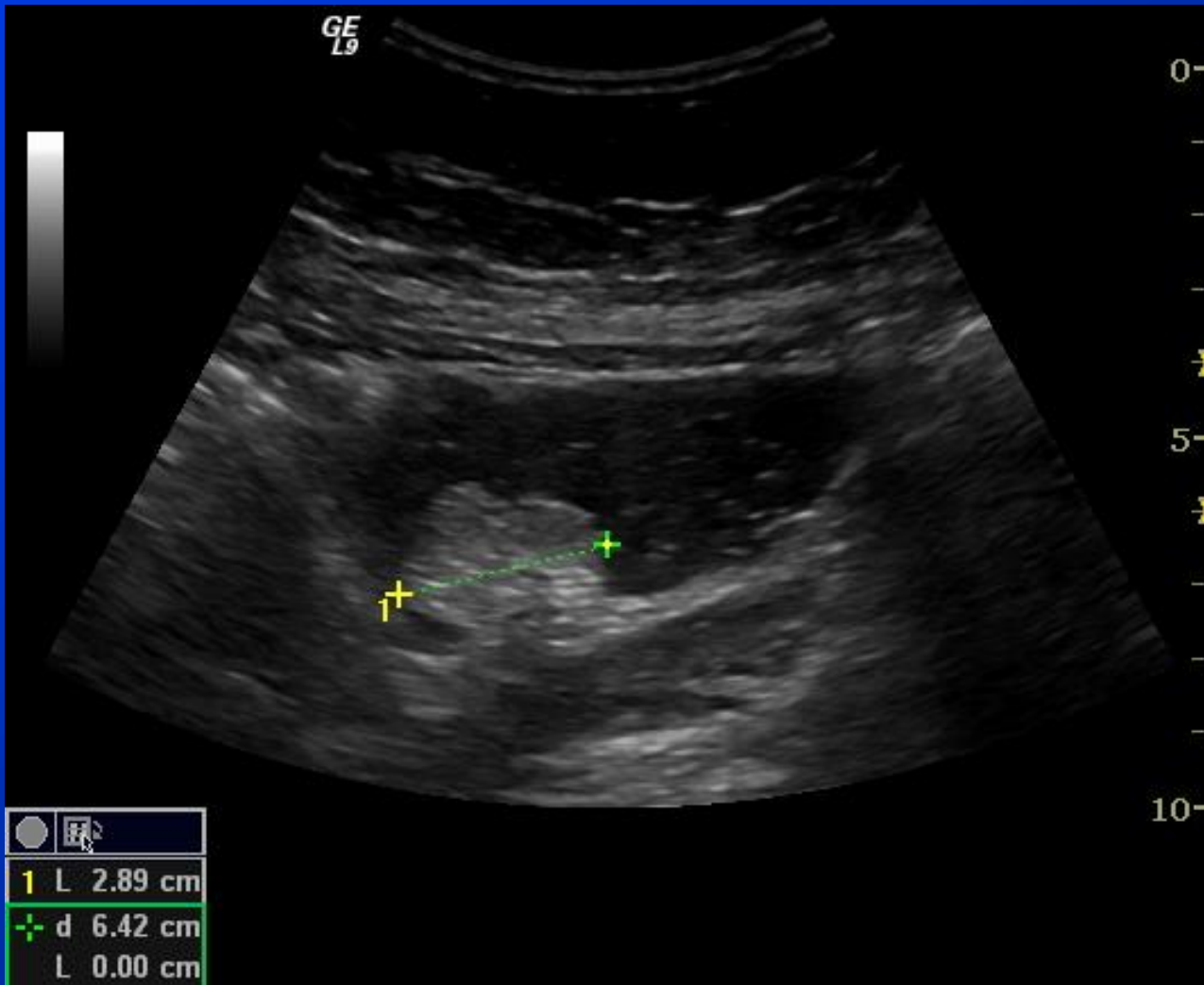


# Large Polyp in Coecum





# Tumor of the Coecum





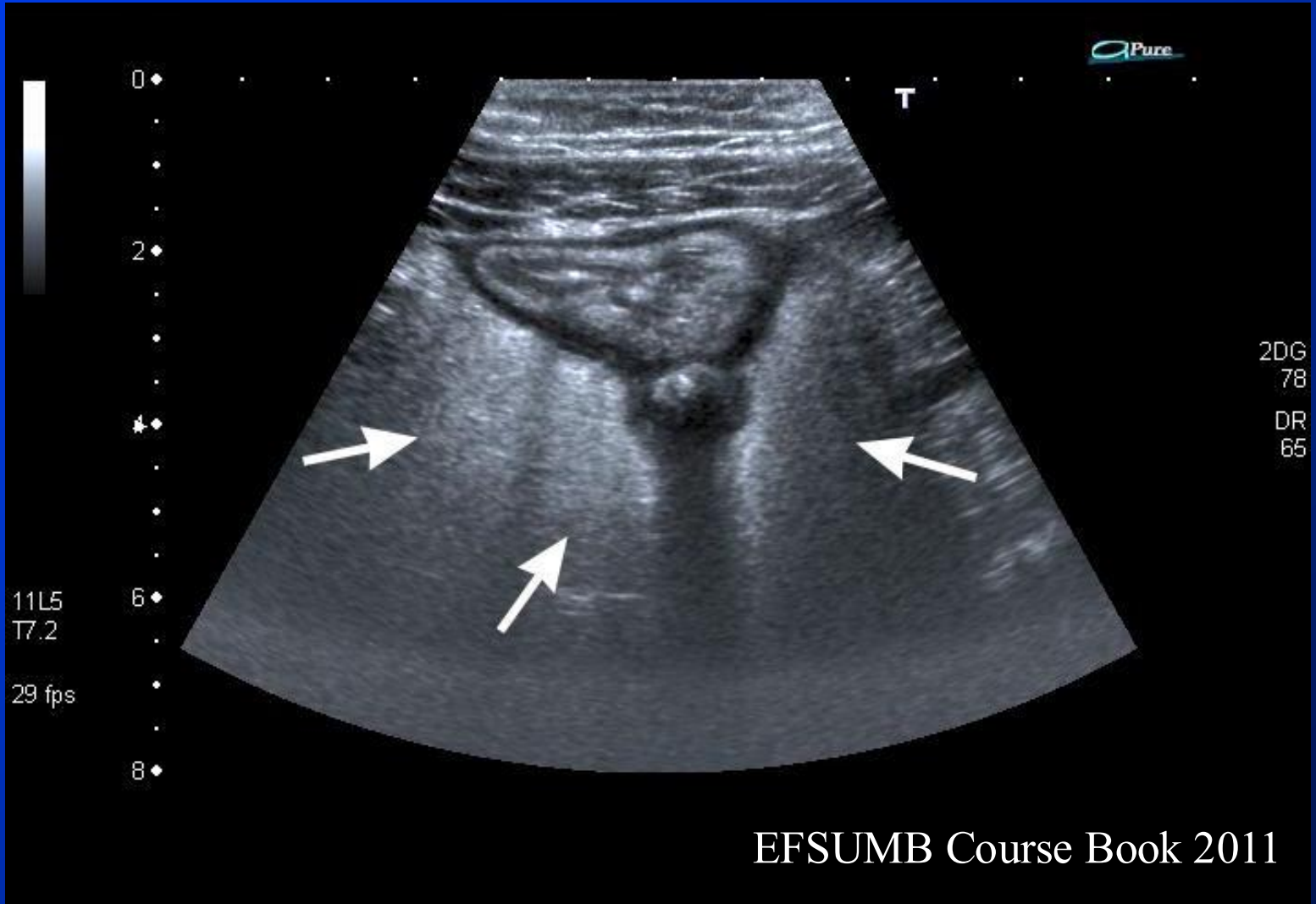


# Diverticulum in the Colon



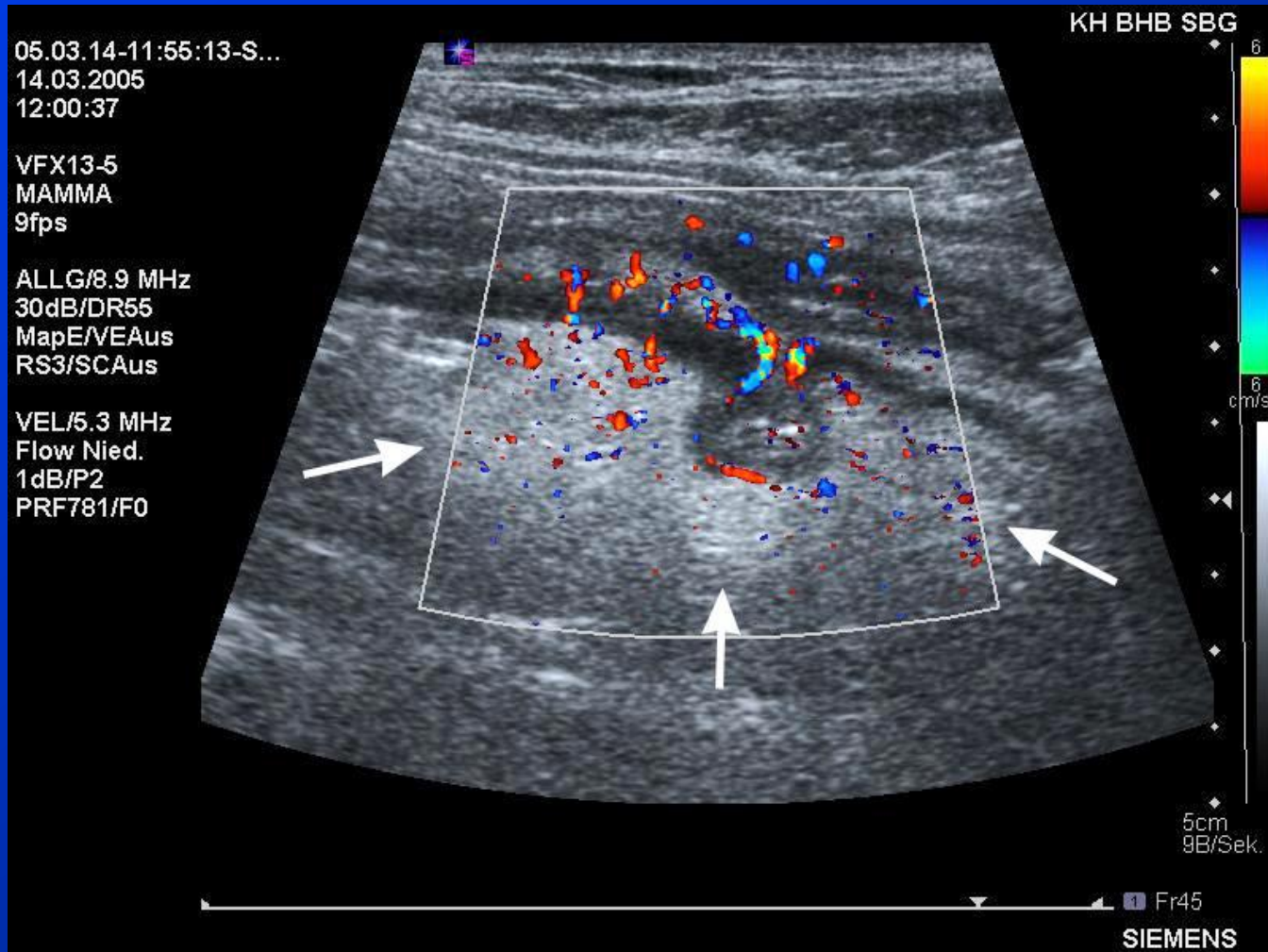


# Diverticulitis



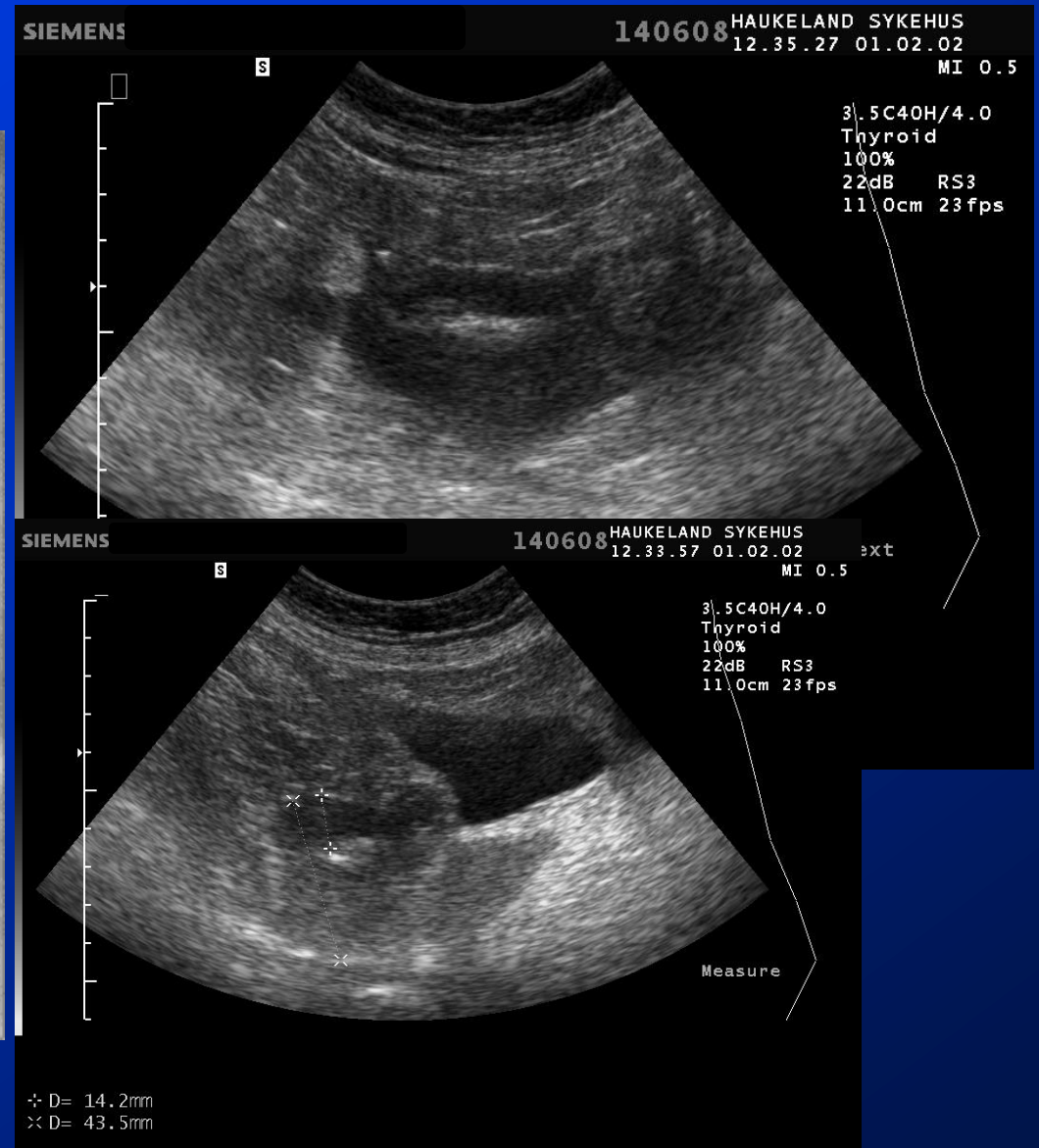


# Diverticulitis of the Sigmoid Colon



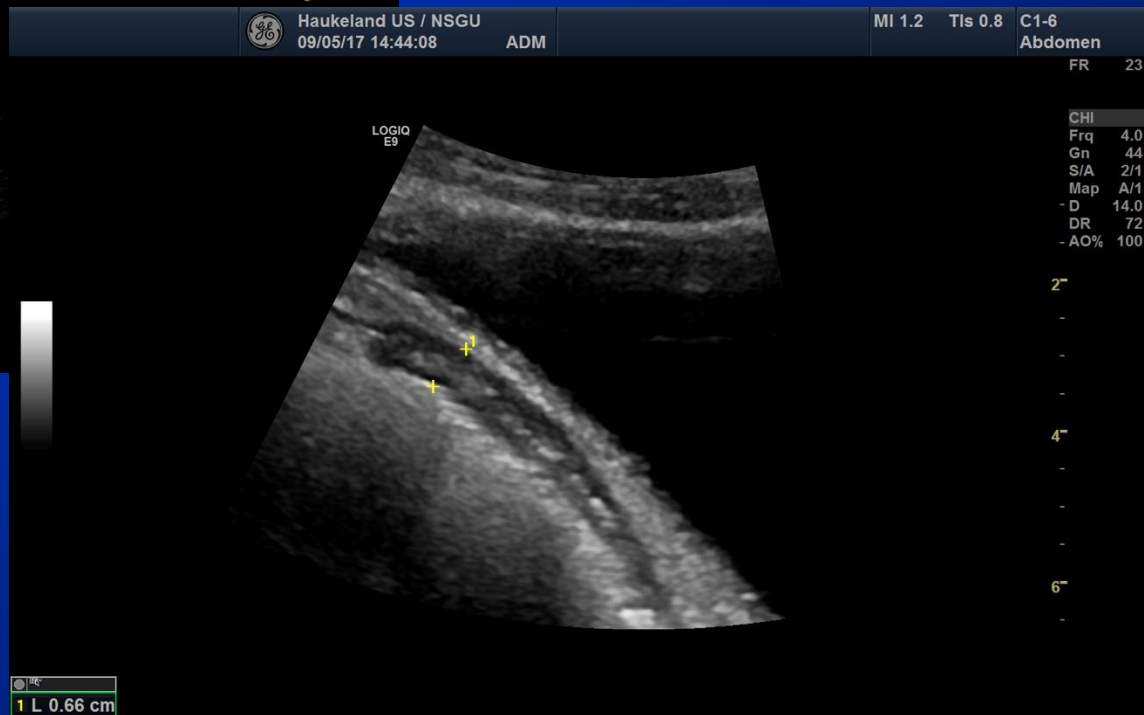
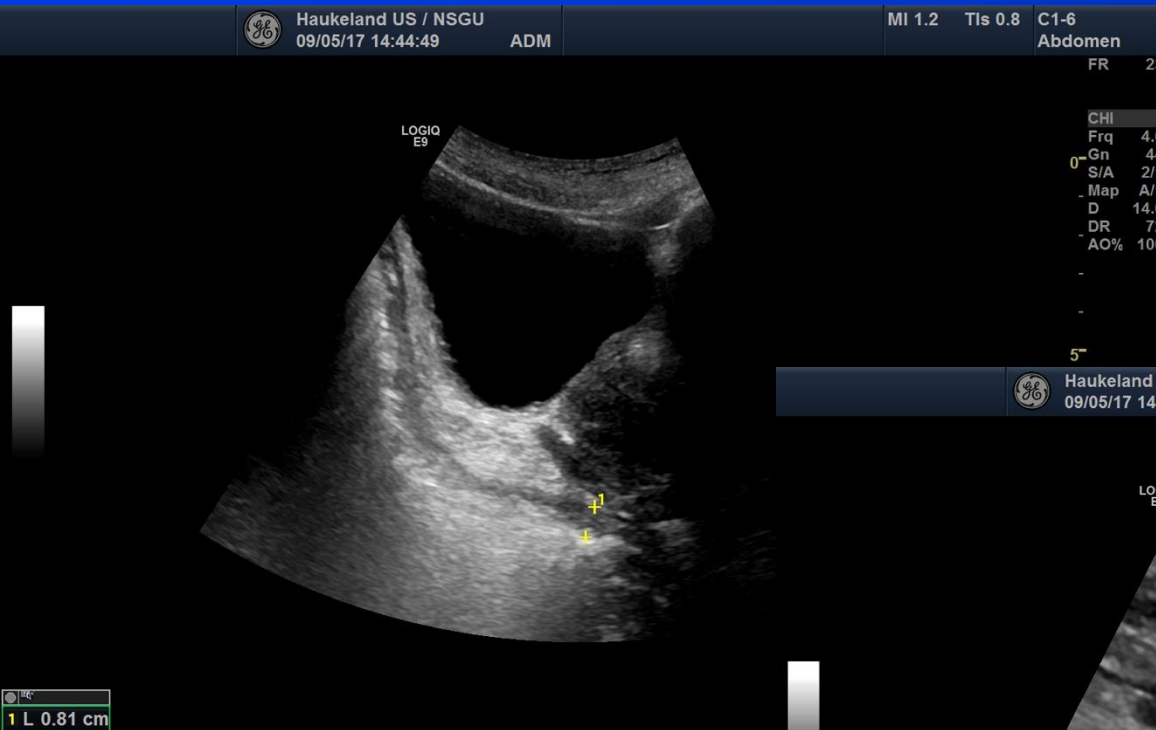


# Ca. Coli Sigmoides





# Look beyond the bladder !





# A new ultrasound book

## [www.wfumb.org](http://www.wfumb.org)

