BMUS

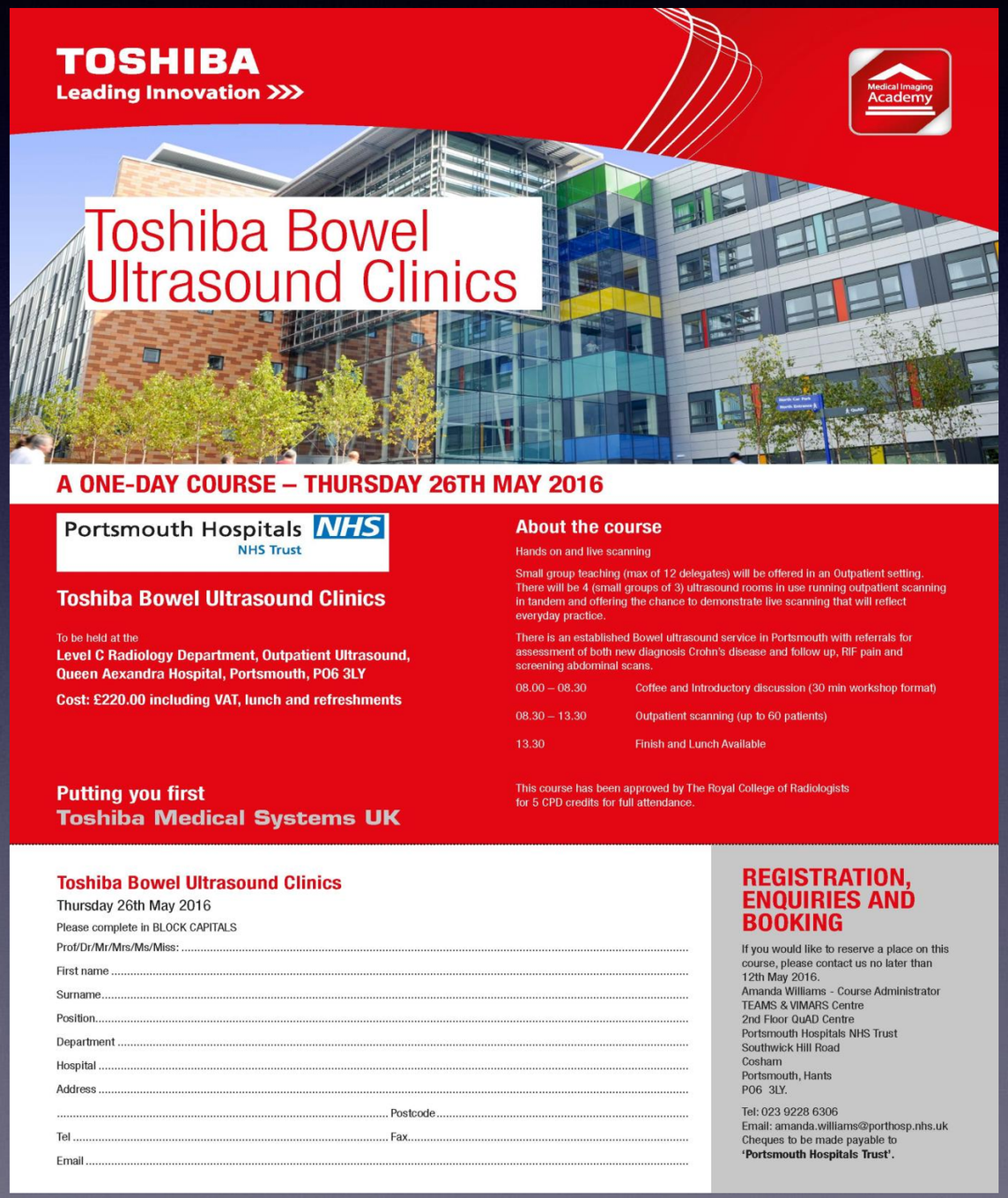
Bowel Ultrasound

Richard Beable

Queen Alexandra Hospital

Portsmouth Hospitals NHS Trust

Disclosures



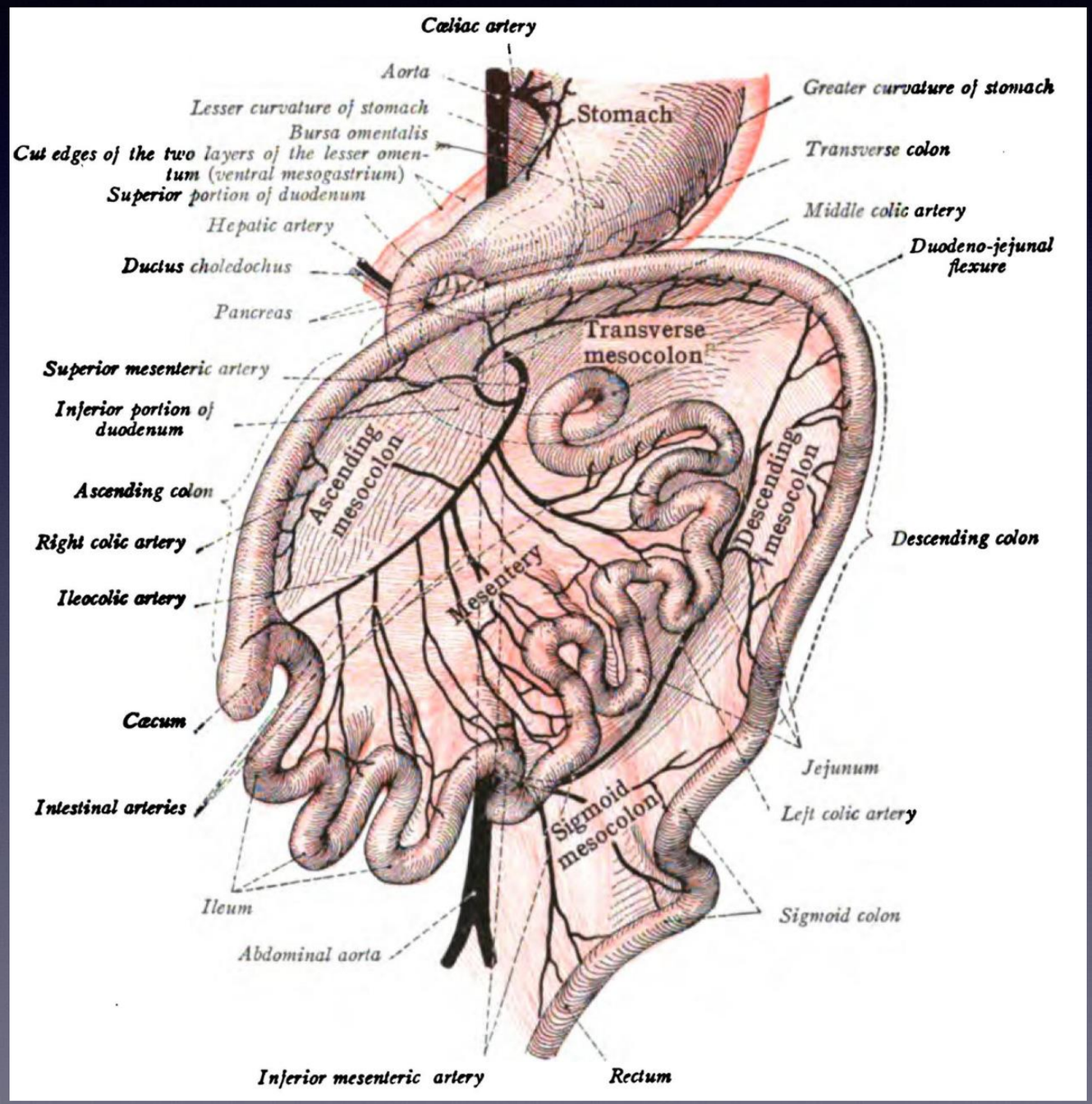
Running Order

- Imaging the bowel
- Sonographic Technique
- Normal Sonographic Anatomy
- Uses of Ultrasound in Bowel Imaging
- Inflammatory Bowel Disease
- Bowel tumours
- Acute Lower Abdominal Pain and the Appendix

1. Investigating the Bowel

Imaging the Bowel - Anatomy

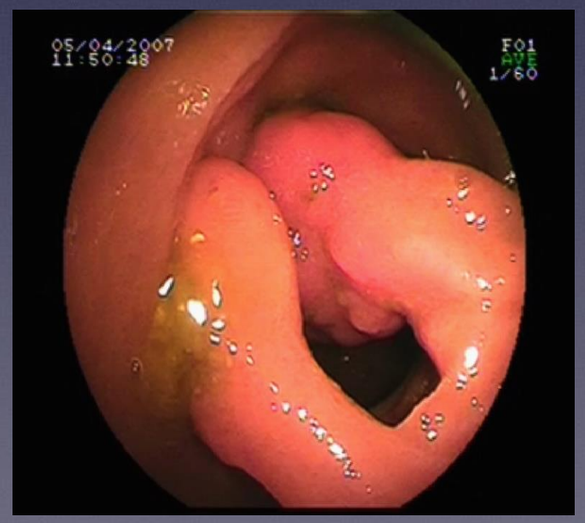
- Duodenum: 20 -25 cm long
- Jejunum: ~2.5 m long
- Ileum: ~ 3 m long
- Colon
- Mesentery
- Vessels
  - Celiac Axis
  - SMA
  - IMA

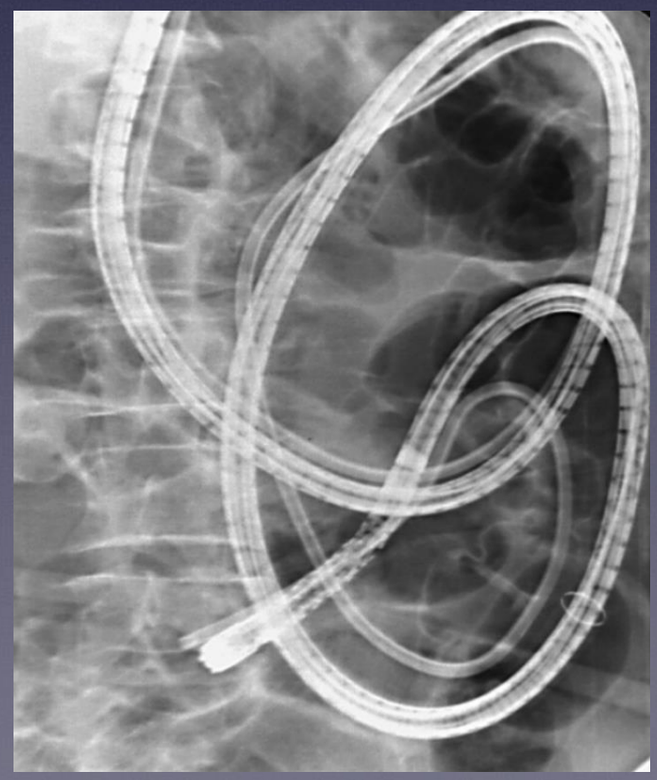


Endoscopic Evaluation

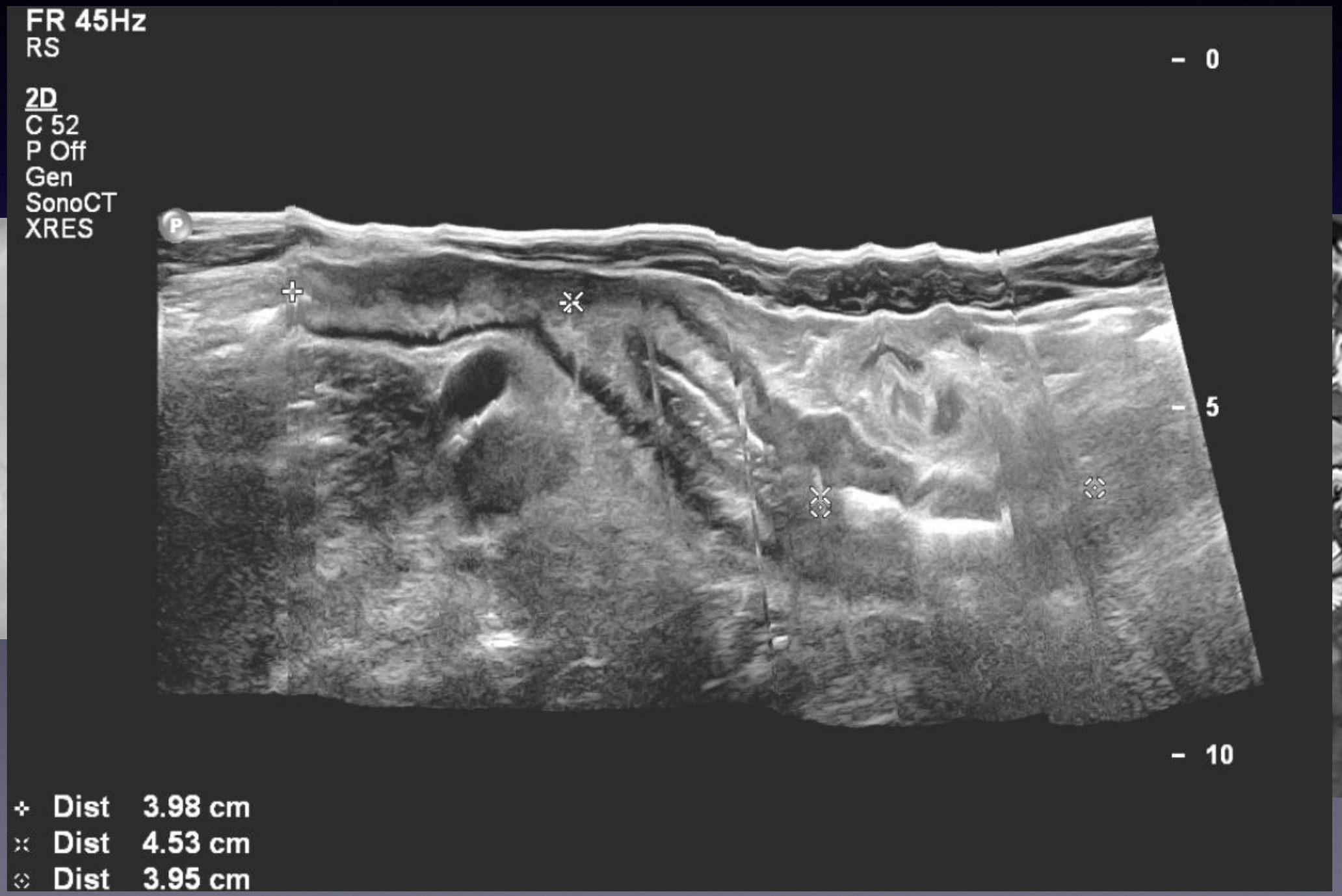
Capsule Endoscopy

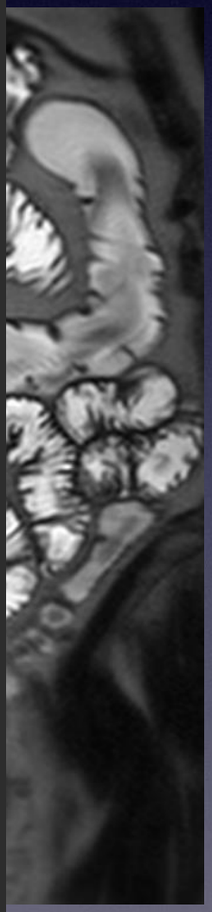
Double Balloon Enteroscopy





Radiological Evaluation





Ultrasound - The Hard Sell

- **Accessible**
  - Minimal preparation
  - Perform and Report
  - Relative Quick
  - Portable ‘bedside test’
  - Increasing use in clinic setting (Europe).
- **Safe**
  - Well tolerated by patient
  - No radiation
  - No contrast (gadolinium conundrum)
- **Cost Effective**
- **Repeatable**
- **Specific**

	2016-17 Tariff - Unbundled Services		
HRG code	HRG name	Tariff (including cost of reporting) (£)	Cost of reporting (£)
RA16Z	Contrast Fluoroscopy Procedures, less than 20 minutes	76	-
RA05Z	Magnetic Resonance Imaging Scan, two to three areas, with contrast	211	29
RA12Z	Computerised Tomography Scan, two areas with contrast	107	28
RA23Z	Ultrasound Scan, less than 20 minutes	43	-

Monitor
Making the health sector work for patients

NHS England

2016/17 National Prices and National Tariff Workbook

2. Sonographic Technique

Technique of Bowel Ultrasound

Guidelines & Recommendations

EFSUMB Recommendations and Guidelines for Gastrointestinal Ultrasound

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

EFSUMB-Empfehlungen und Leitlinien des Gastrointestinalen Ultraschalls

Teil 1: Untersuchungstechniken und Normalbefund (Kurzversion)

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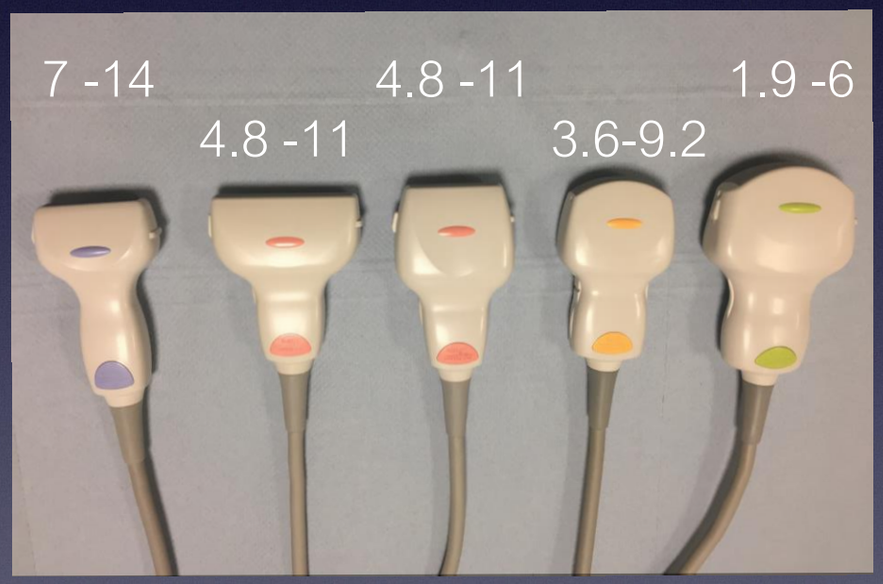
Affiliations Affiliation addresses are listed at the end of the article.

European Federation of Societies for Ultrasound in Medicine and Biology

European Federation of Societies for EFSUMB Ultrasound in Medicine and Biology

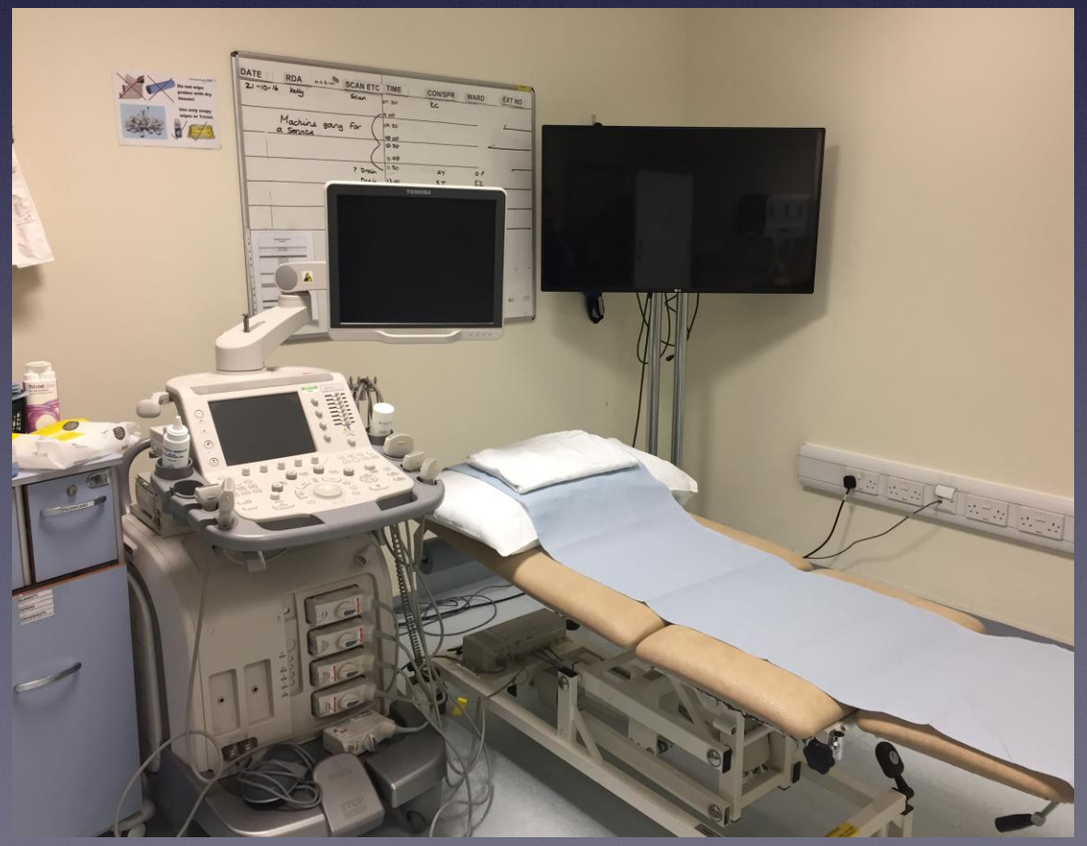
Bowel Ultrasound-Equipment

- Need capability to resolve structures in the bowel wall
- Resolution ~ Probe frequency, speed of sound in tissue and number of cycles in US pulse
- Compromise between resolution and depth



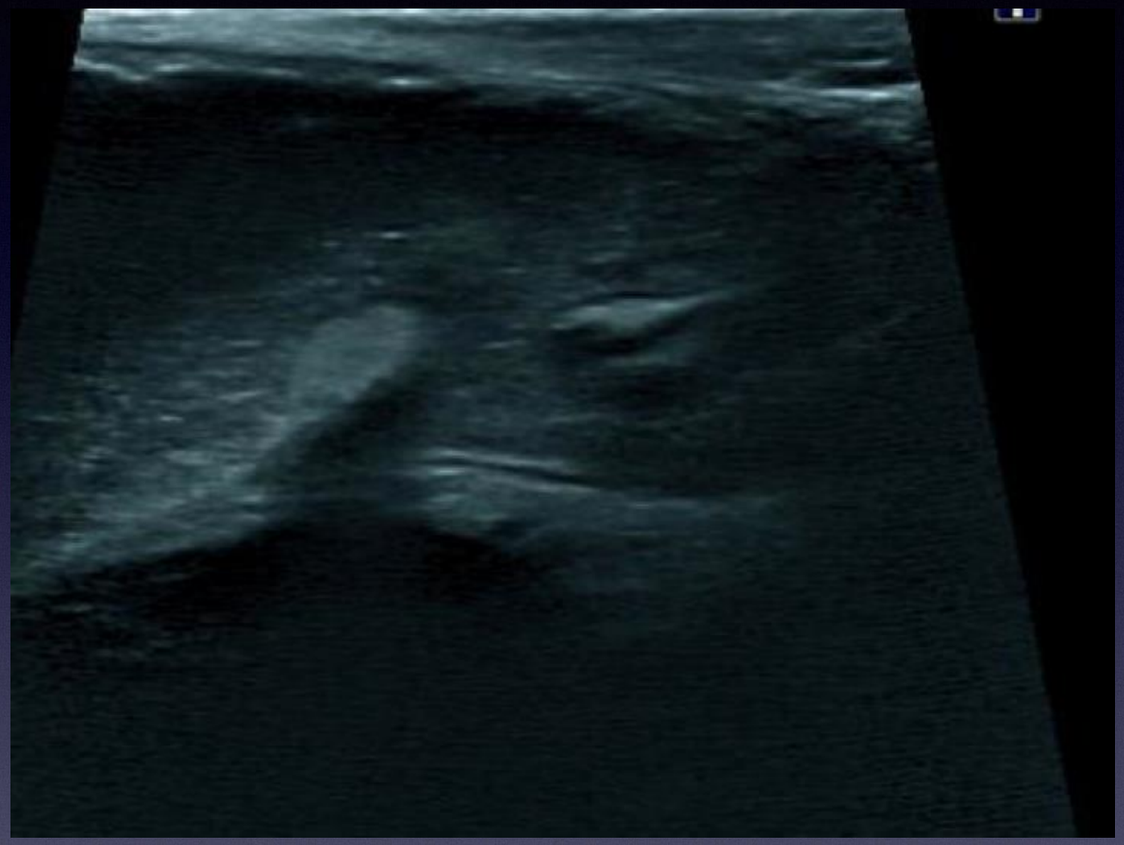
Recommendations:

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



Bowel Ultrasound Technique

- Patient Preparation
  - Fasted 4 - 6 hours
    - Laxatives and anti-flatulence drugs does not improve the images
    - Fullish bladder
  - Oral fluids (Hydrosonography, SICUS)
    - Stomach - Water very useful
    - Hydrocolonic instillation
    - Hyperosmolar agents for small bowel (PEG)
- Patient and Probe Movement
  - Graded compression
  - Left lateral position

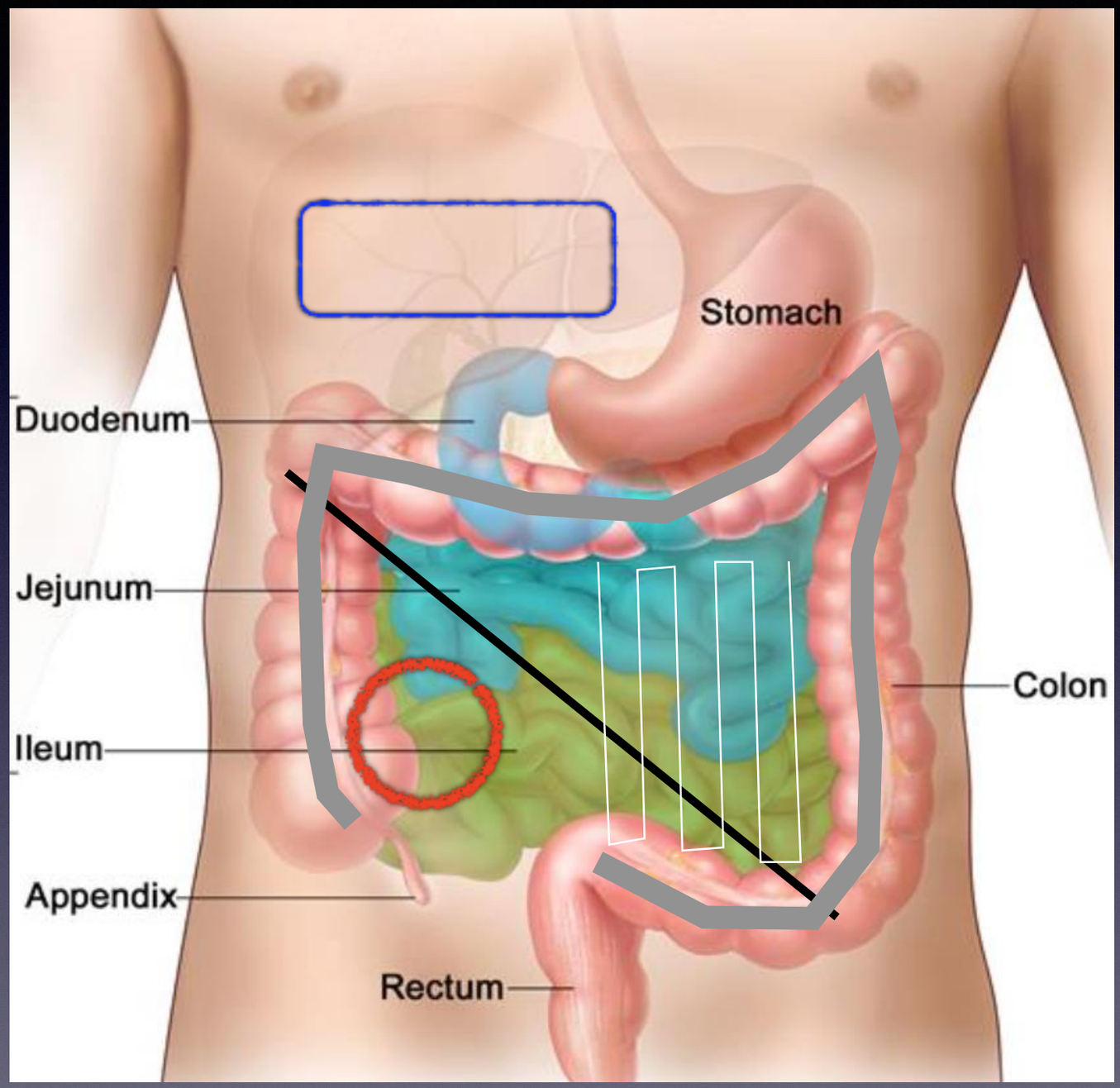


Recommendation:

11. Oral fluid contrast can improve visualisation of small bowel disease, LoE 1b, GoR A, Strong consensus 12/12

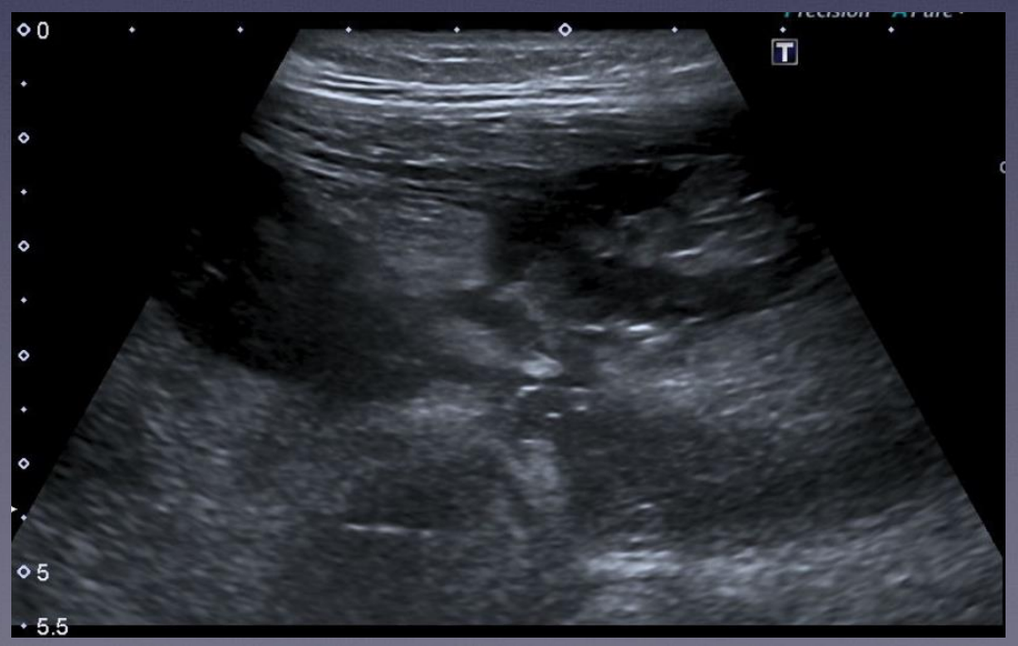
Recommendations:

7. A standard examination of the intestine does not need specific preparation, LoE 4, GoR B, Strong consensus 12/12
8. Fasting > 6 hours is recommended before measuring splanchnic blood flow, LoE 4, GoR B, Strong consensus 12/12
9. Overnight fasting is recommended before assessing gastrointestinal motility, LoE 5, GoR C, Strong consensus 12/12


Stomach
Duodenum
Jejunum
Ileum
Appendix
Rectum
Colon

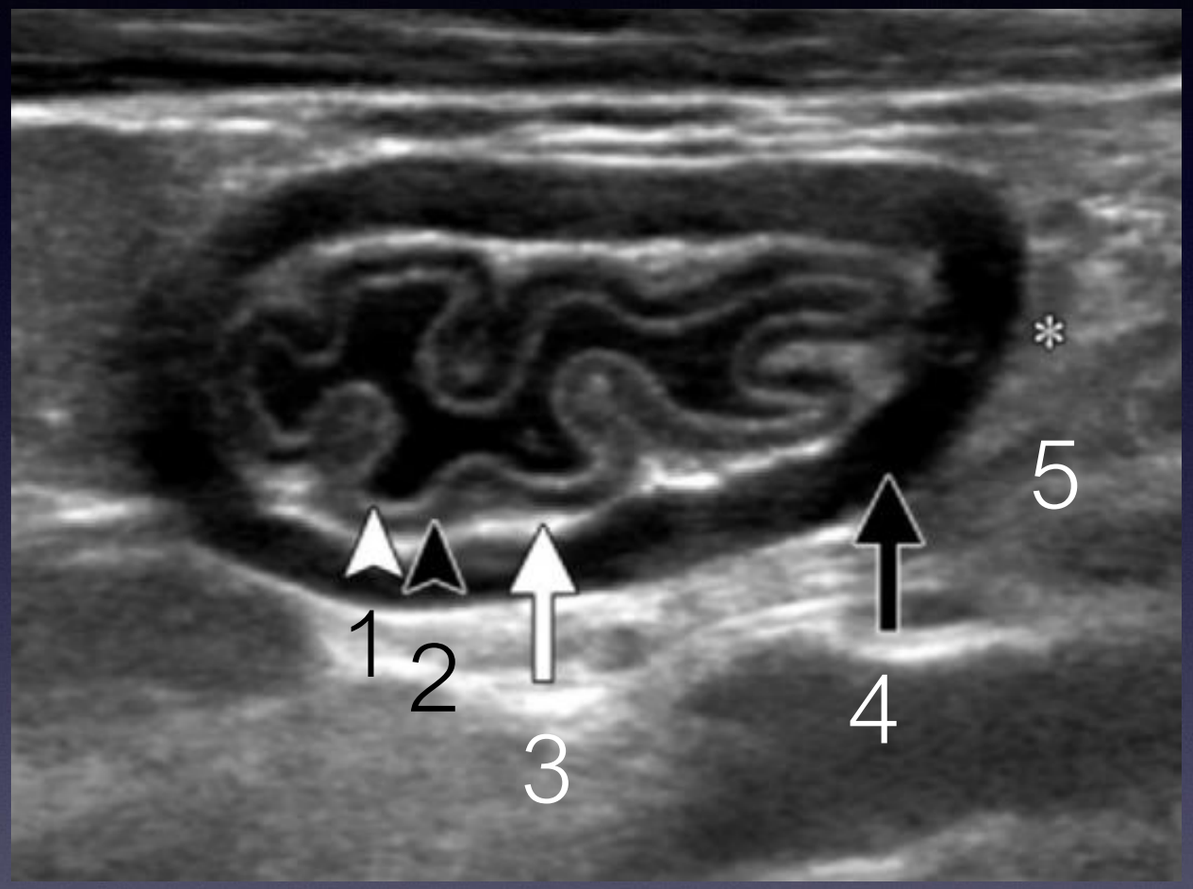
Bowel Ultrasound - The Caveats

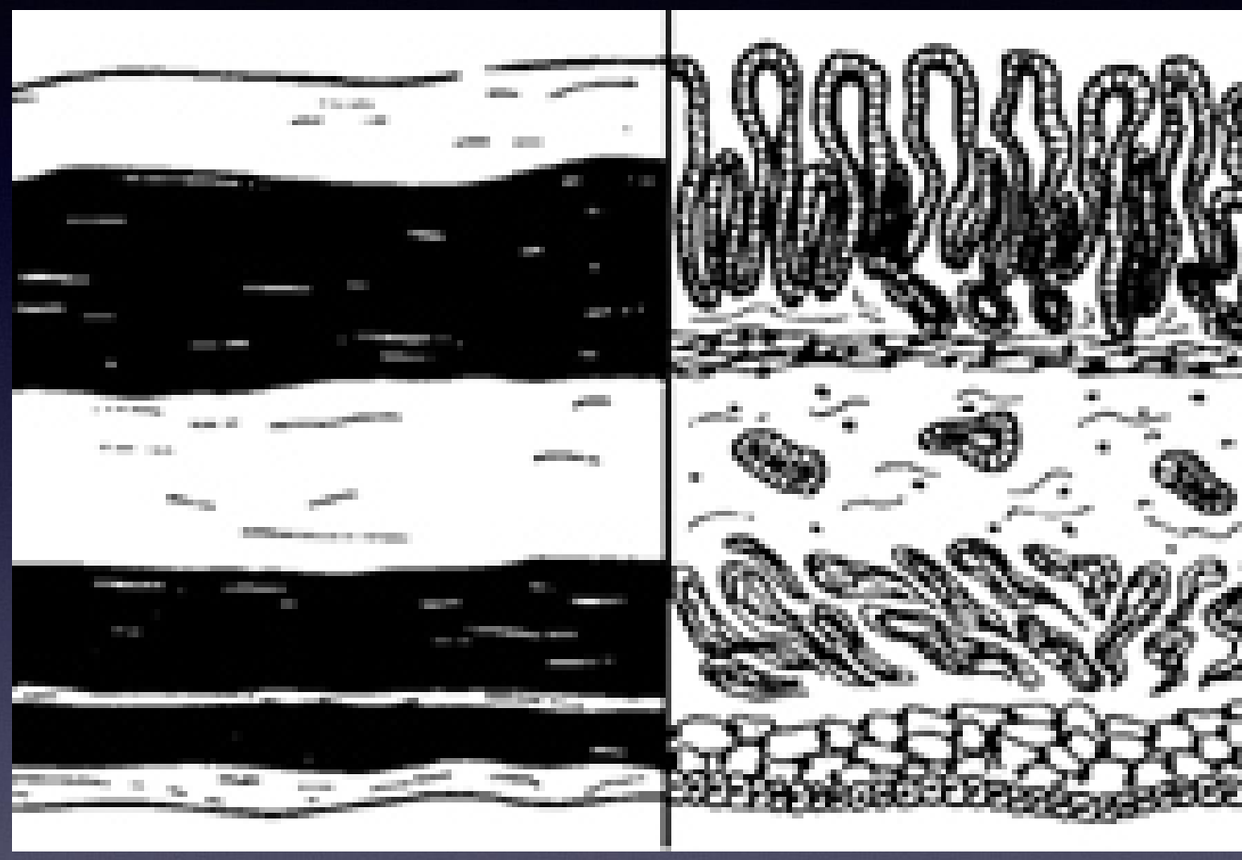
- Operator dependent
- Steep learning curve
- The sub-optimal image (patient)
  - Patient Habitus
  - Bowel Gas
  - Stomas and Surgery
  - Deep pelvic disease
  - Complex fistulas

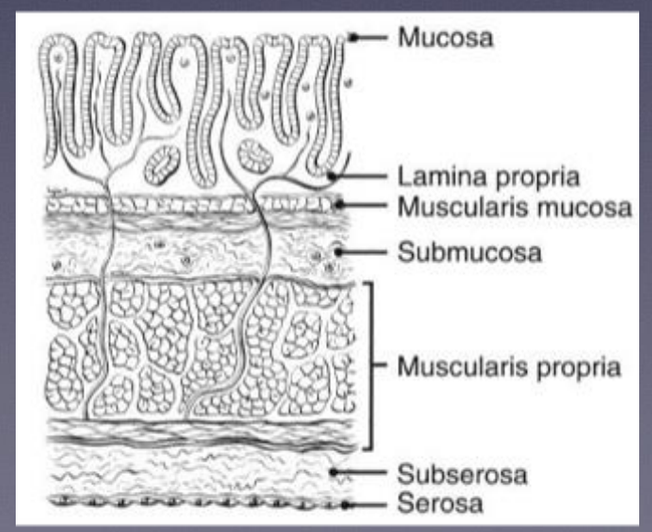


3. Normal Sonographic Anatomy

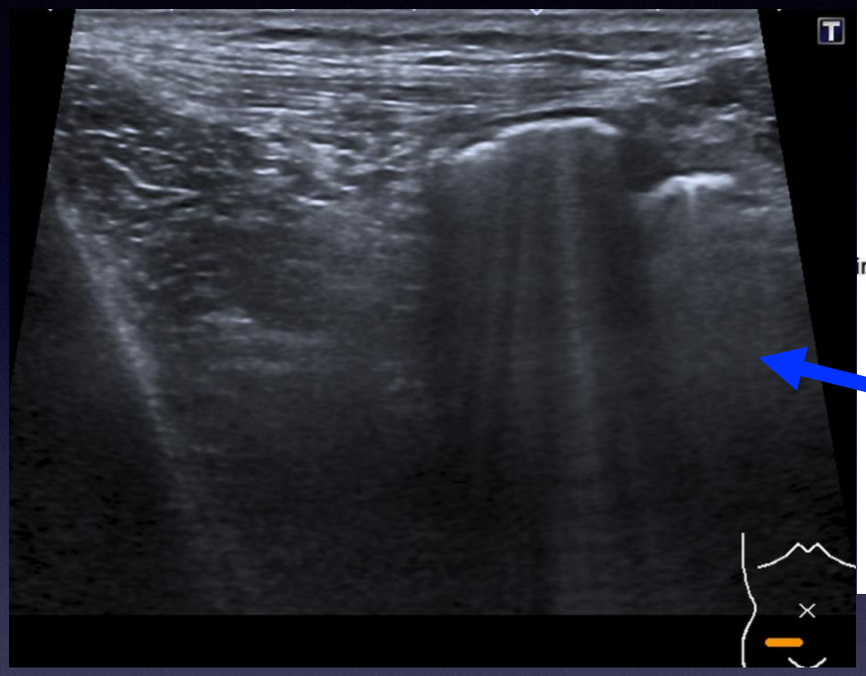
Sonographic Mural Signature

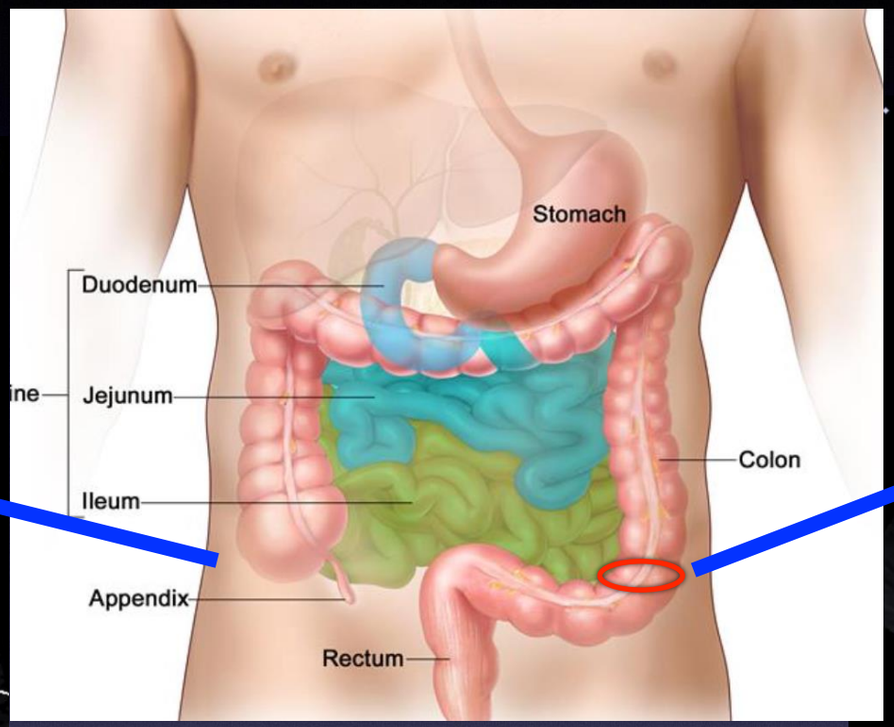


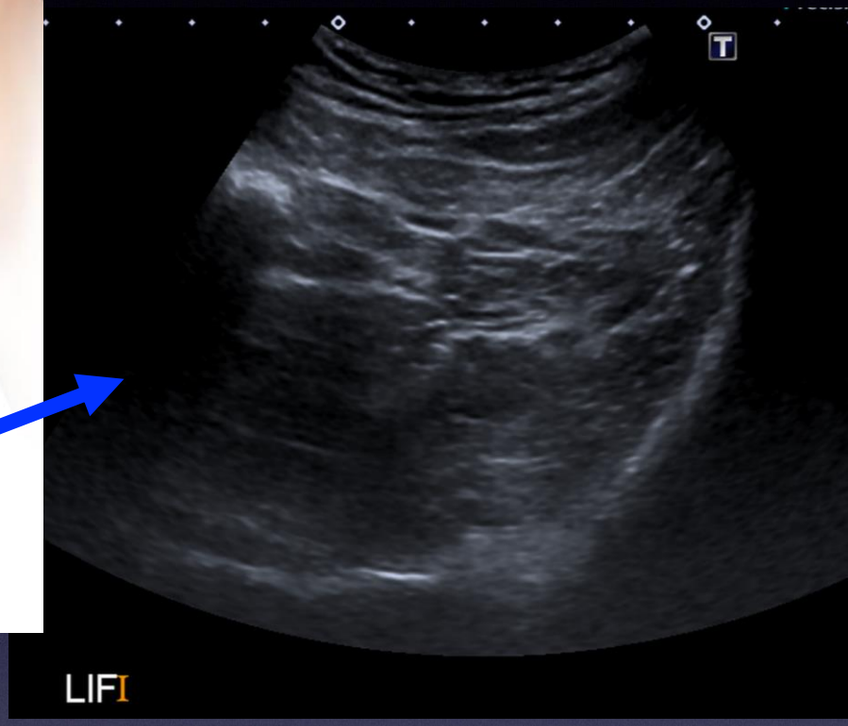




The Colon




Stomach
Duodenum
Jejunum
Ileum
Colon
Appendix
Rectum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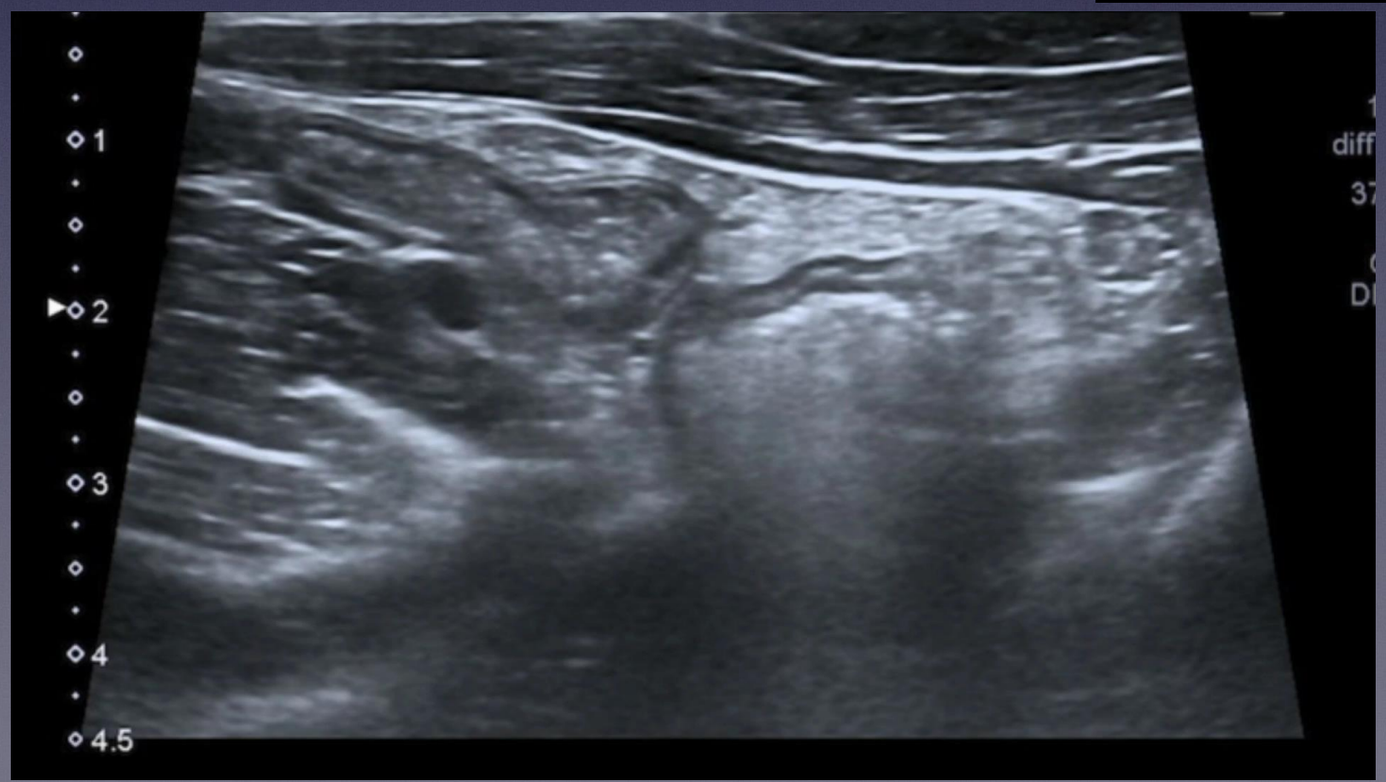
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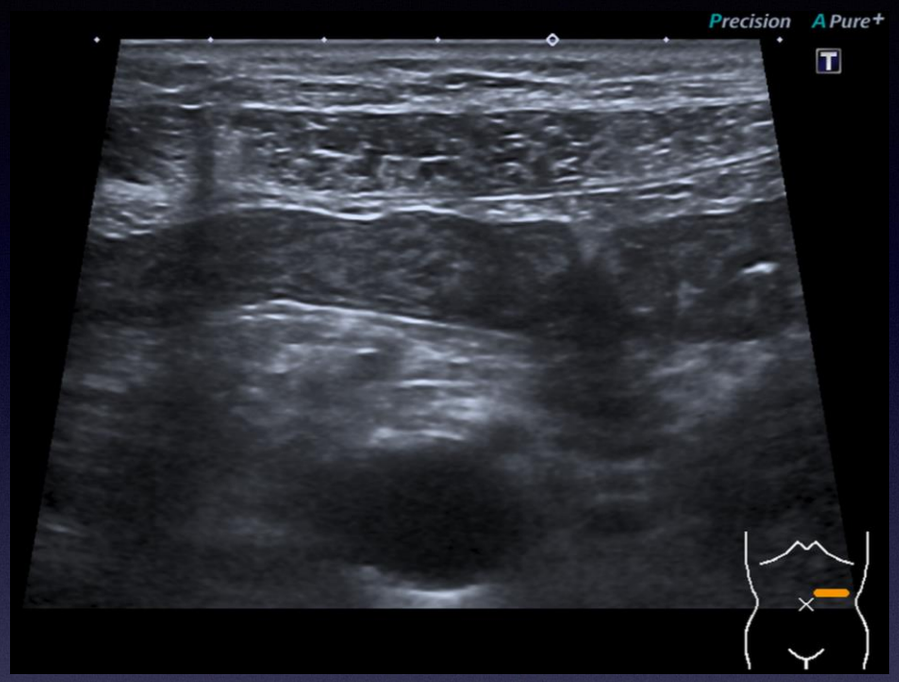
Jejunum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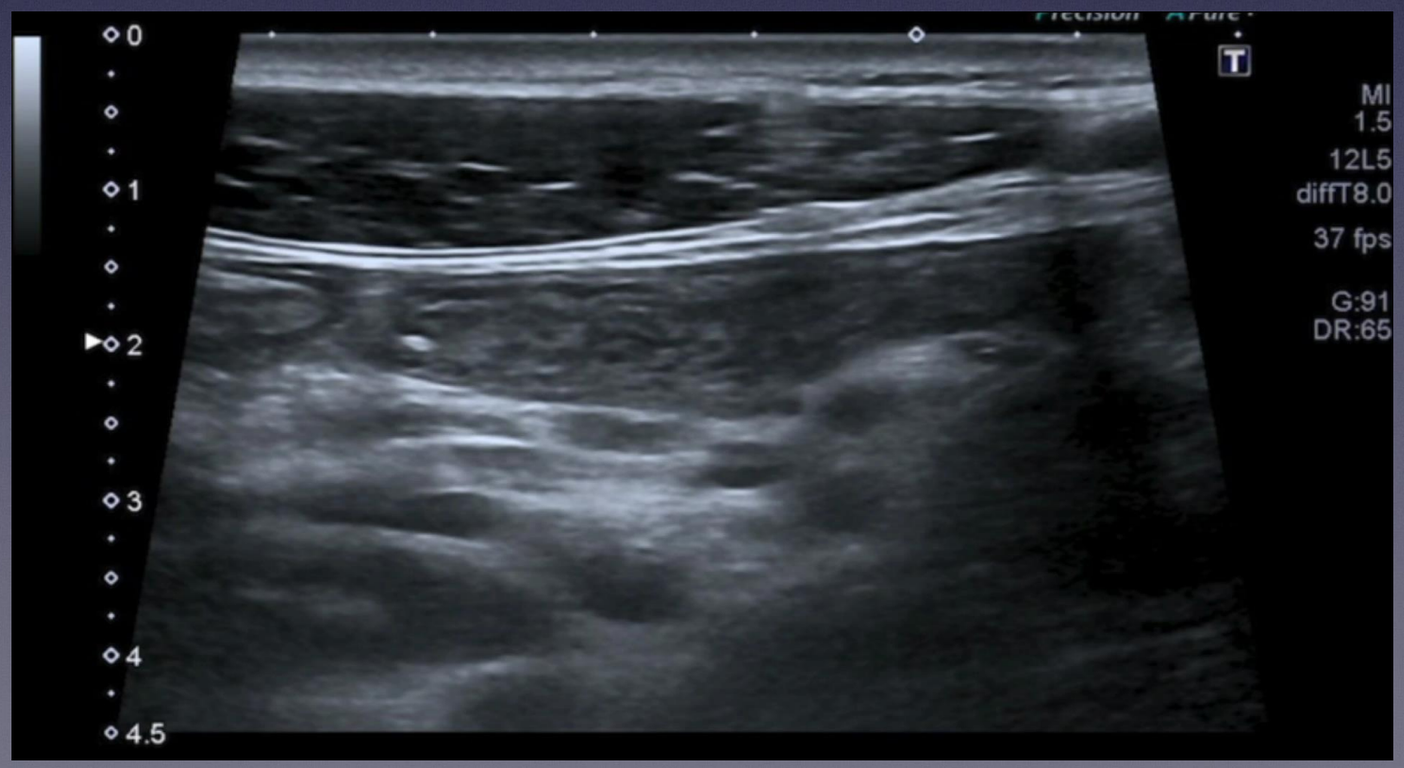
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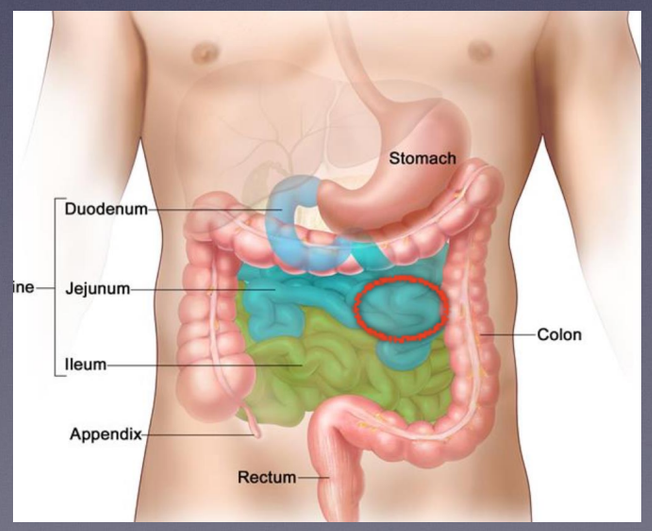
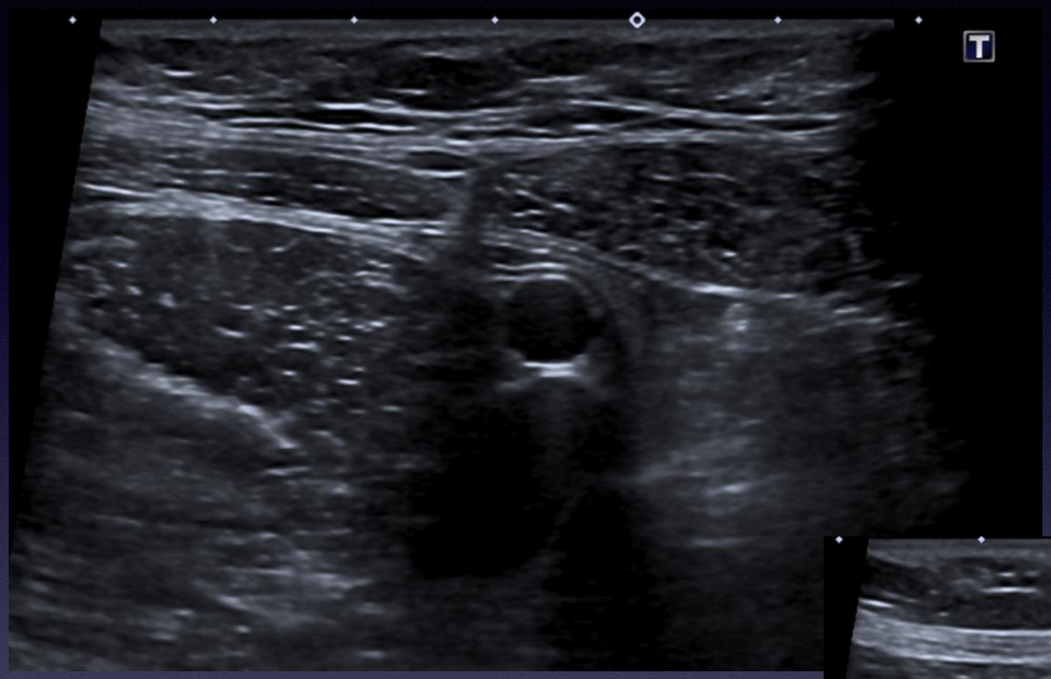
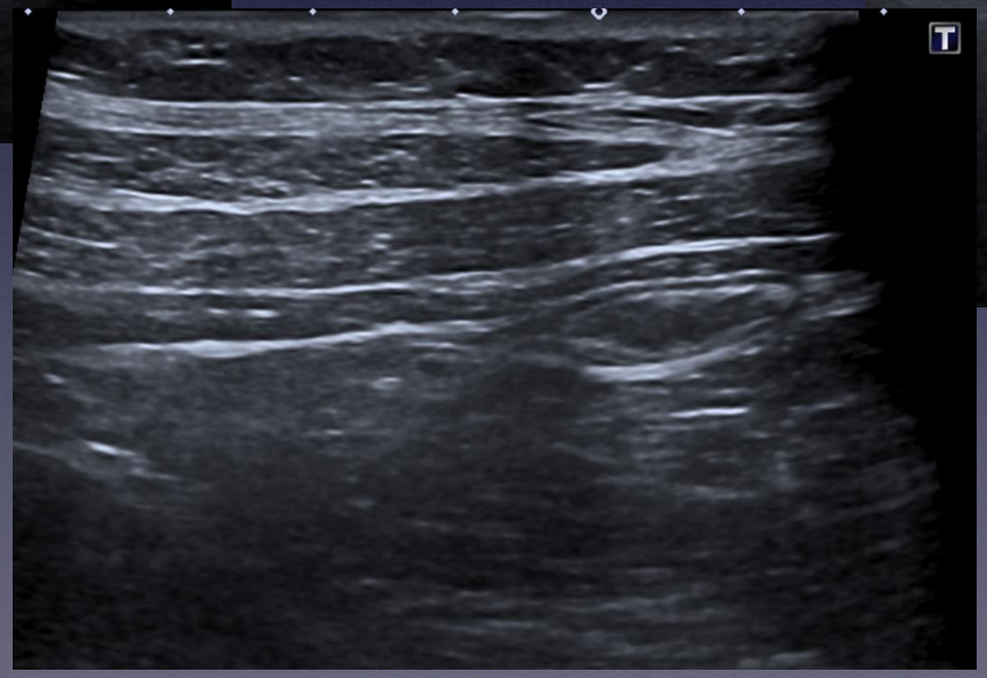
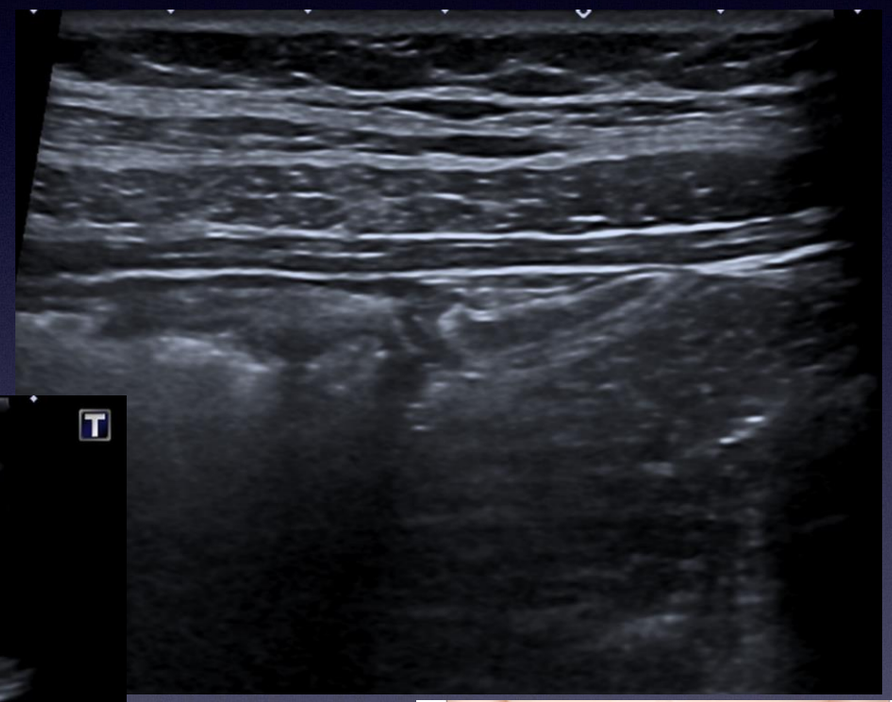
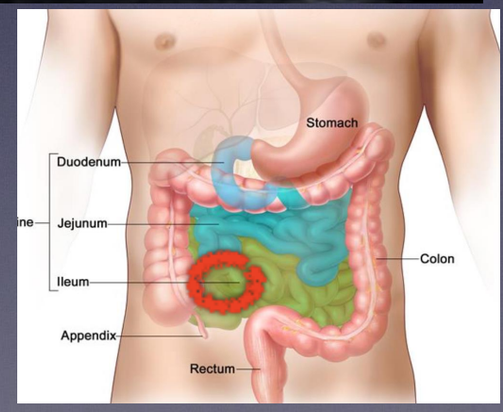

Stomach
Duodenum
Jejunum
Ileum
Colon
Appendix
Rectum

Ileocaecal junction and Terminal Ileum

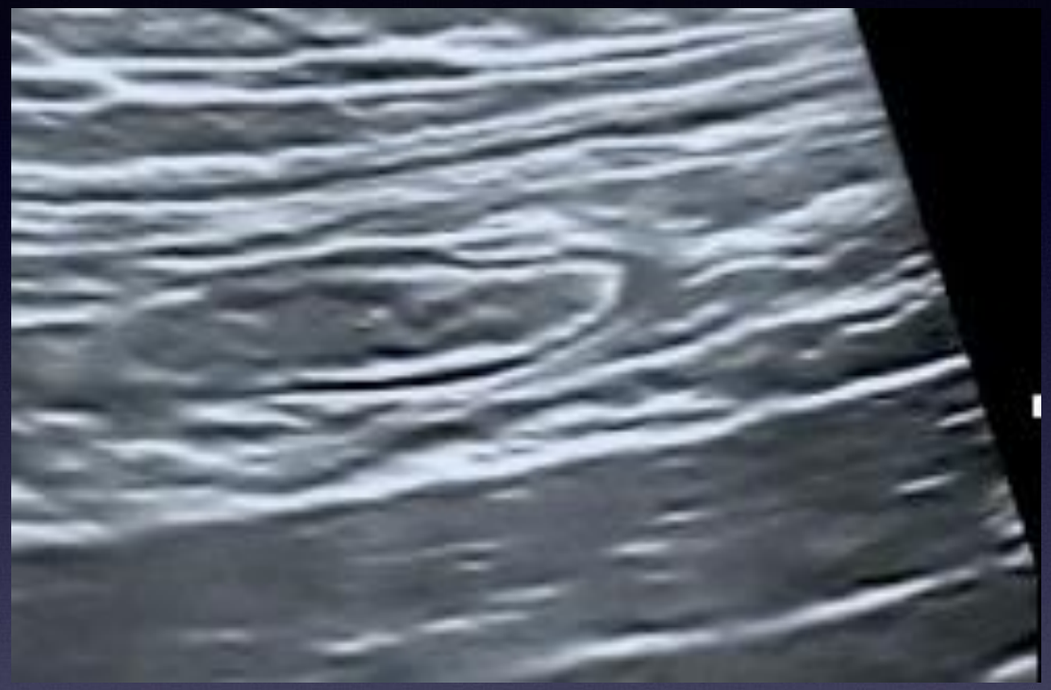


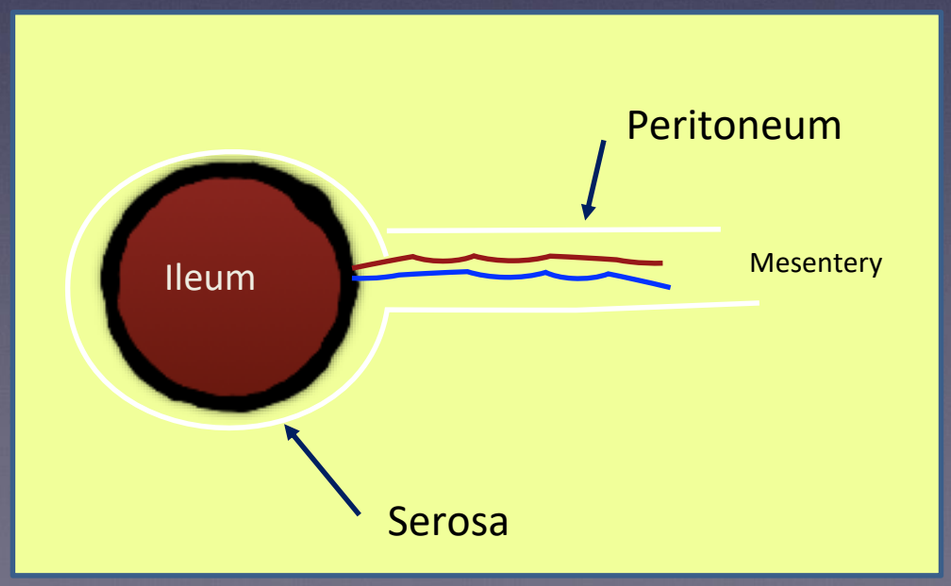






The Mesentery



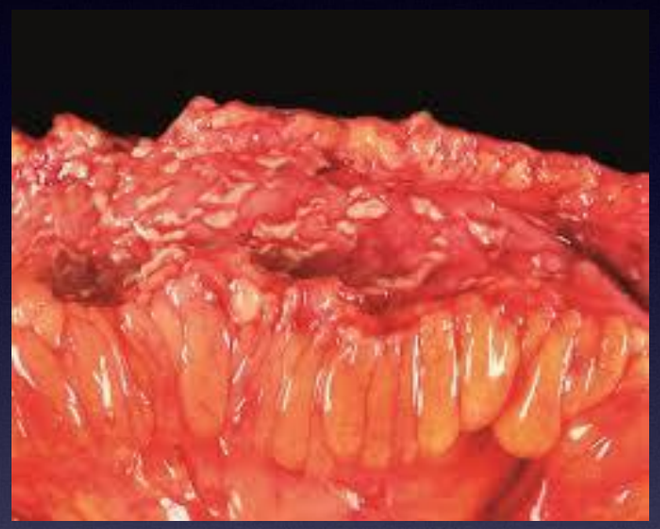


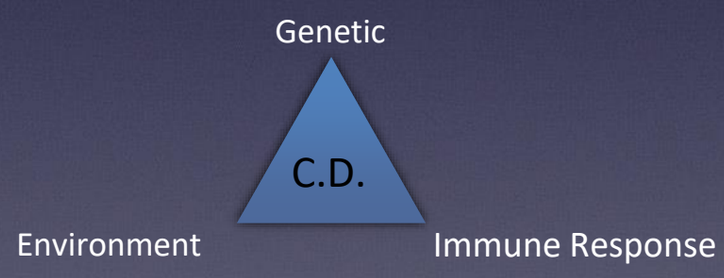
4. Uses of Ultrasound in Bowel Imaging

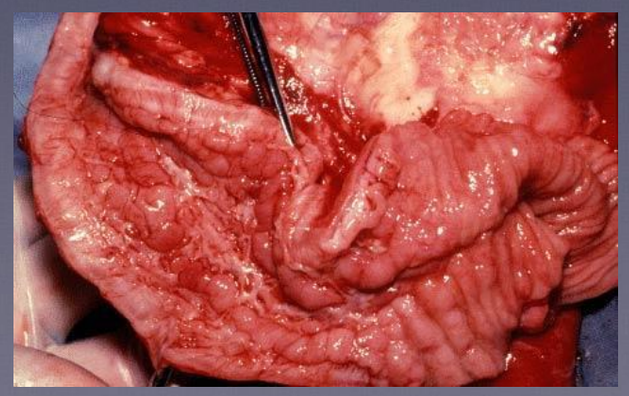
- Inflammatory Bowel Disease
- Acute Abdomen
  - RIF Pain
  - LIF Pain
- Bowel Tumours

Crohns Disease

- Chronic relapsing inflammatory condition
  - Histological characterisation : Non-caeseating granulomas
- Unknown aetiology
- Can affect any part of the GI tract
  - Ileocaecal (45%)
  - Terminal Ileum (20%)
  - Colon (25%)
  - Extensive small bowel involvement (5%)
  - Anorectal, oral, gastroduodenal (5%)
- Skip lesions







- **Epidemiology**
- On the increase
- Western prevalence
- Slight female predominance
- 7/1000,000
- Bi-modal age distribution
  - 20 -40 yrs
  - 60 -80 yrs

Crohn's Disease

Superficial Inflammation

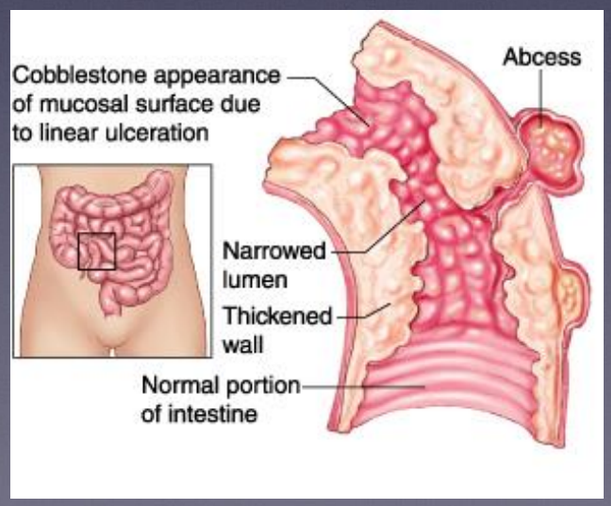
- Lymphoid hyperplasia
- Apthous Ulceration

Transmural Inflammation

- Longitudinal and horizontal ulceration
- Transmural Ulceration, mucosal islands "Cobble Stoning"

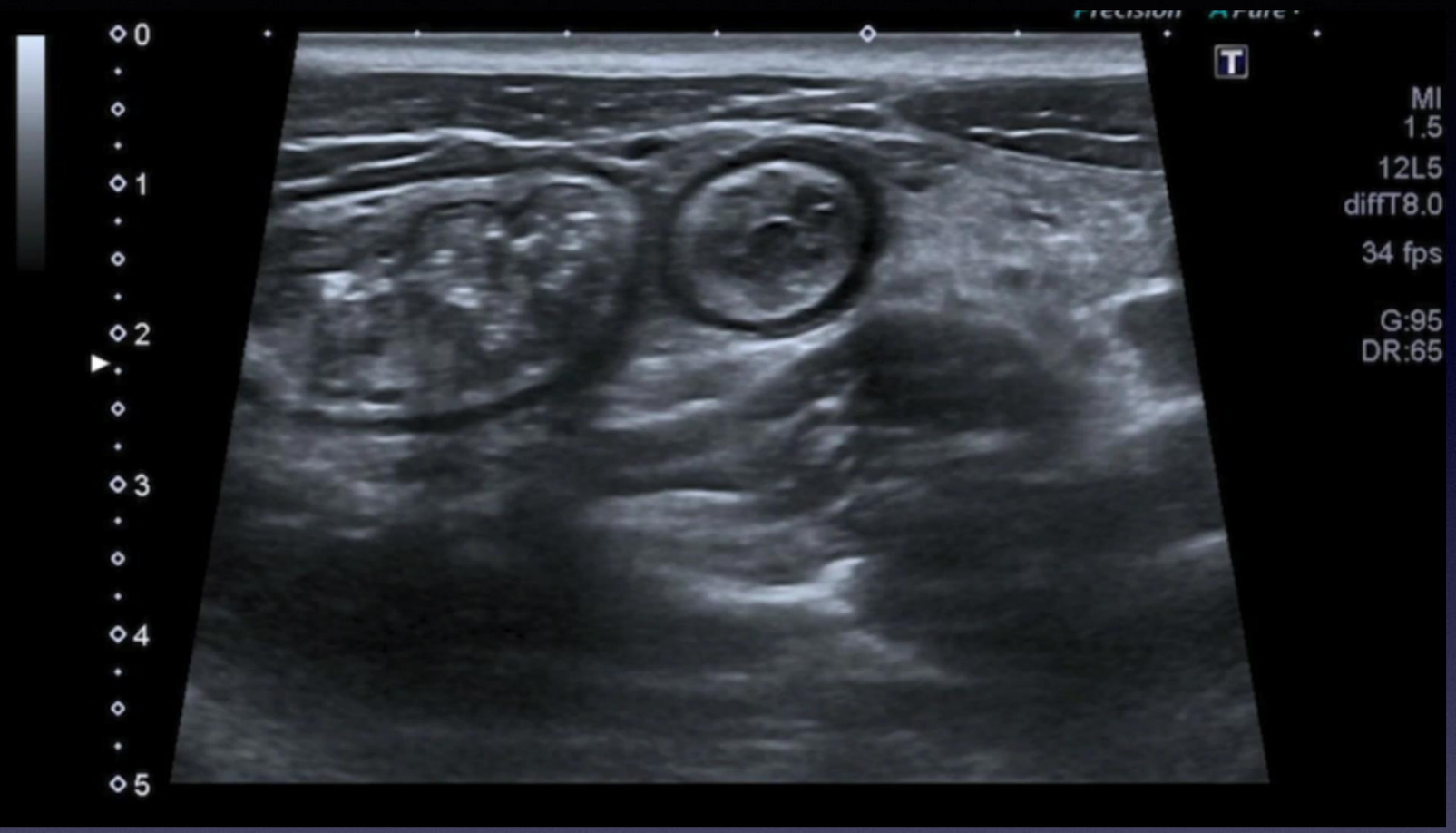
Extramural Disease

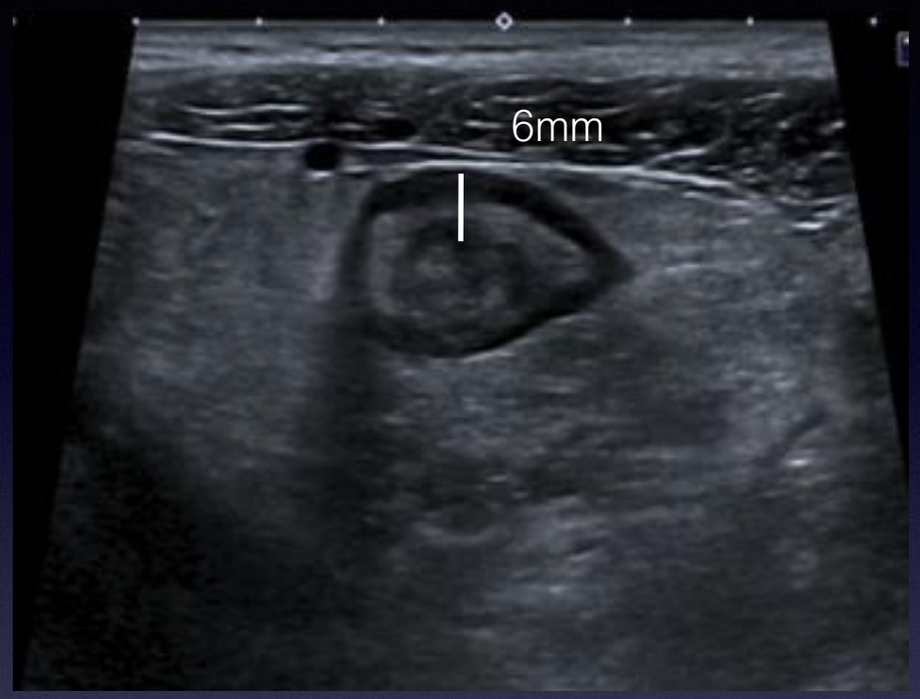
- Sinuses
- Fistulas
- Peri-enteric Abscess



Sonographic Features of Crohn's Disease

Mural Changes - Wall Thickening

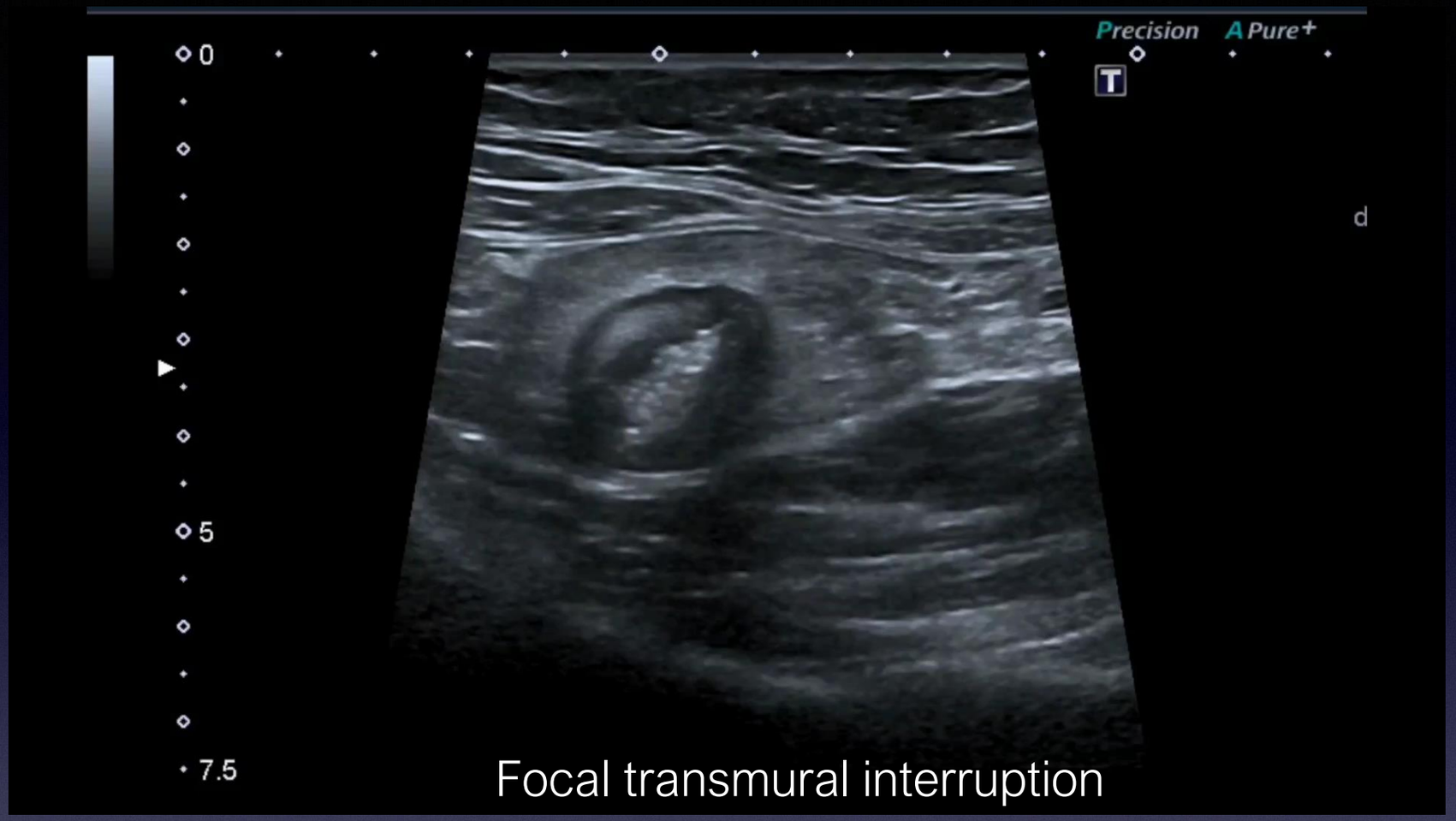




Recommendations:

12. A bowel wall thickness less than 2 mm (not the cut-off value for pathology) could be considered as normal, when measured in the normal filling state except in the duodenal bulb and rectum, LoE 4, GoR B, Majority consensus 9/12

Mural Changes

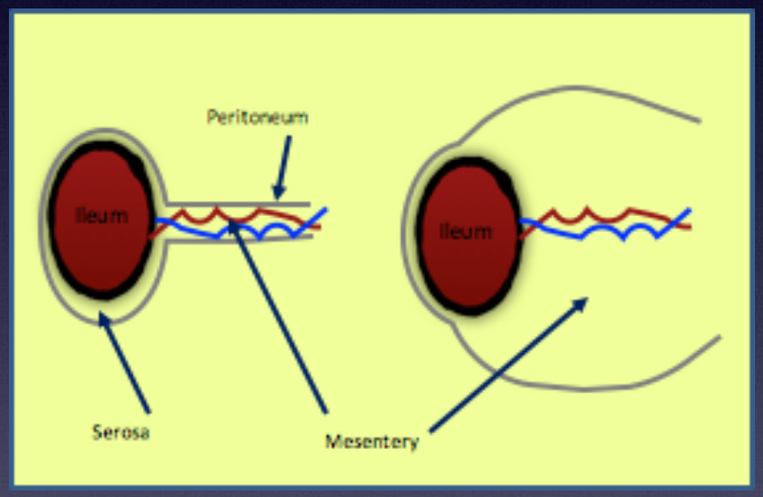


Focal transmural interruption

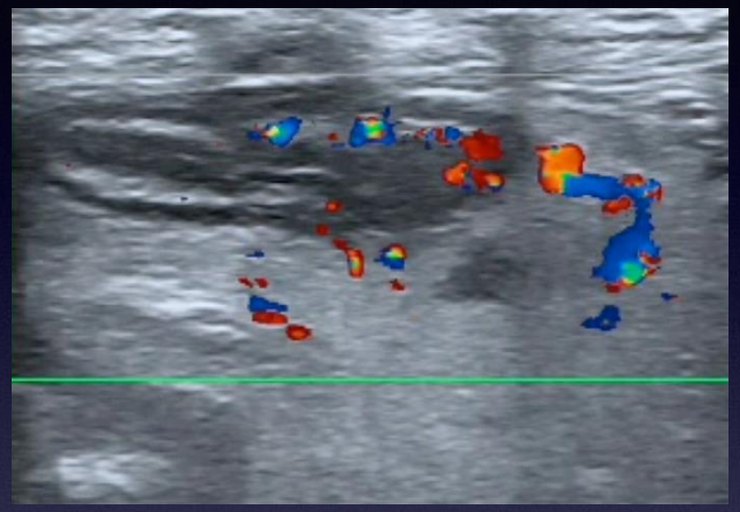
Complete loss of stratification

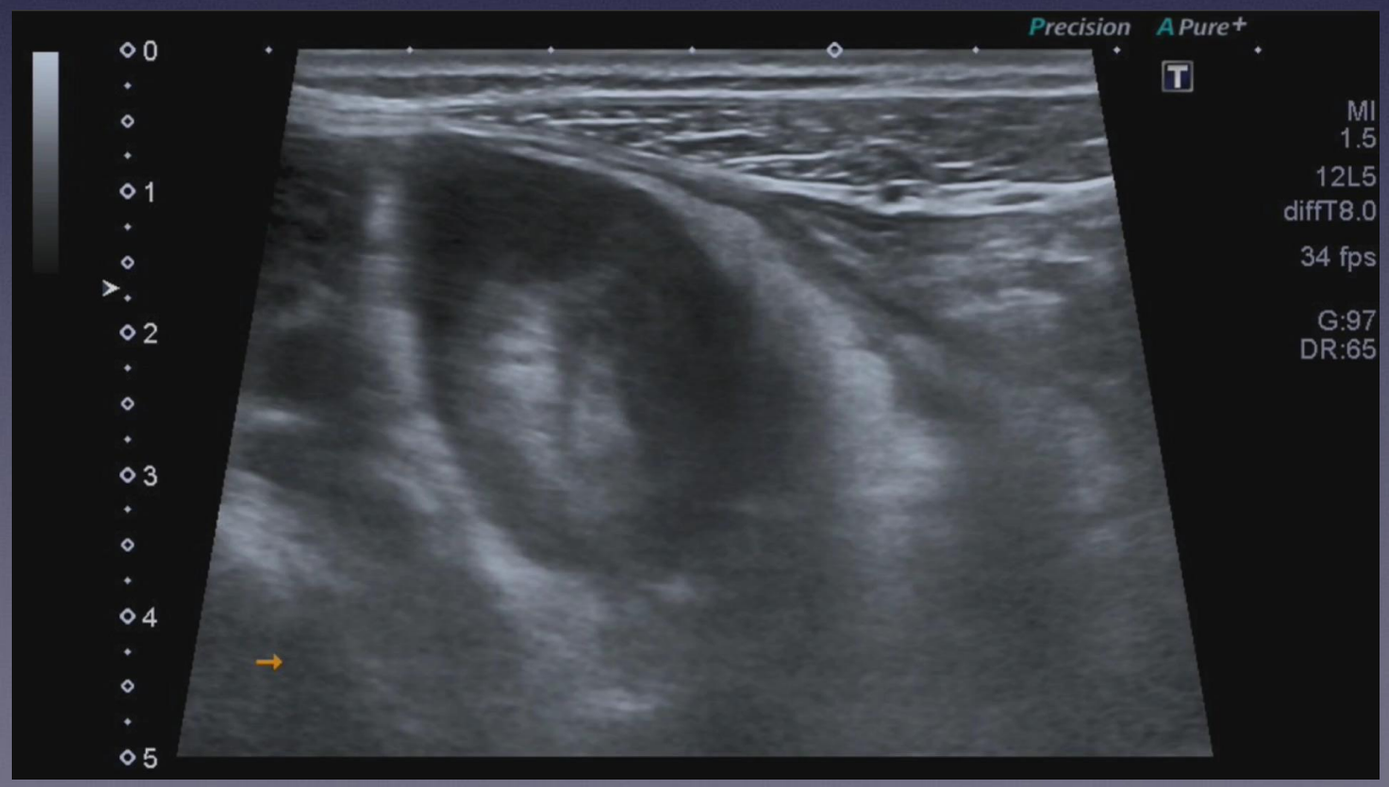
Thickened with Maintained Stratification

Mesenteric Changes

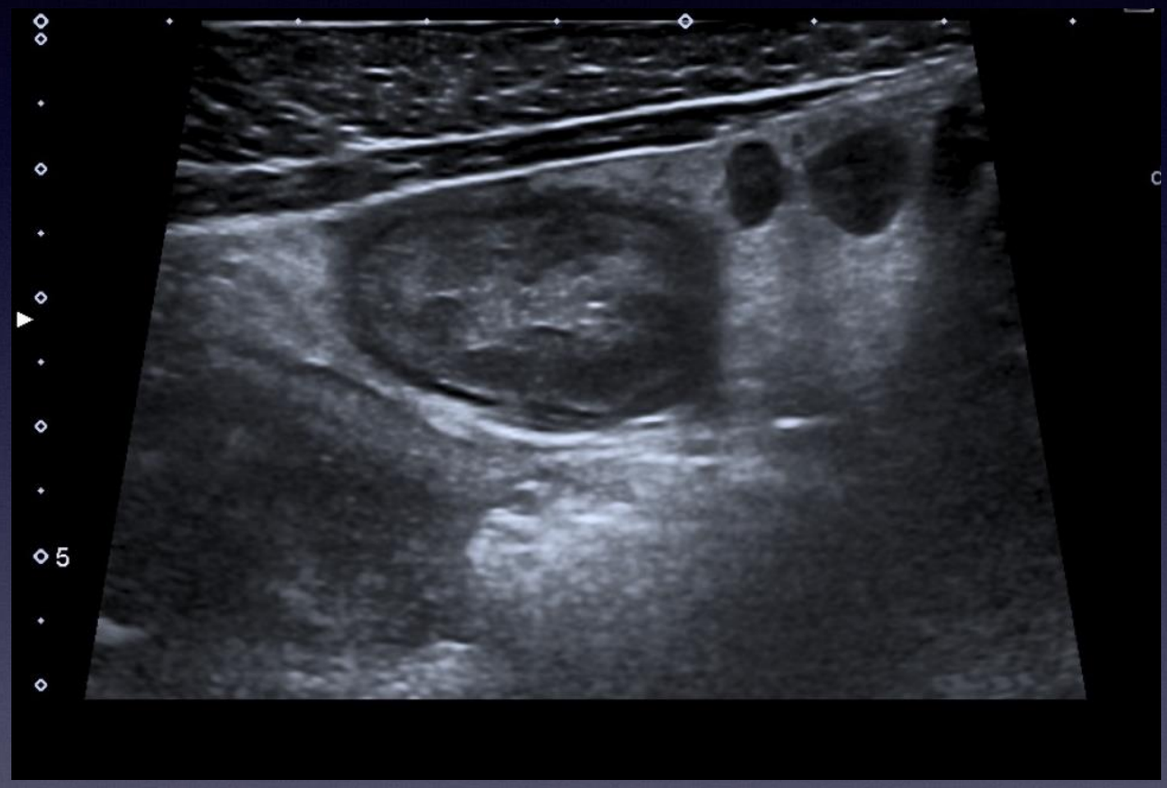


Doppler Vascular Patterns





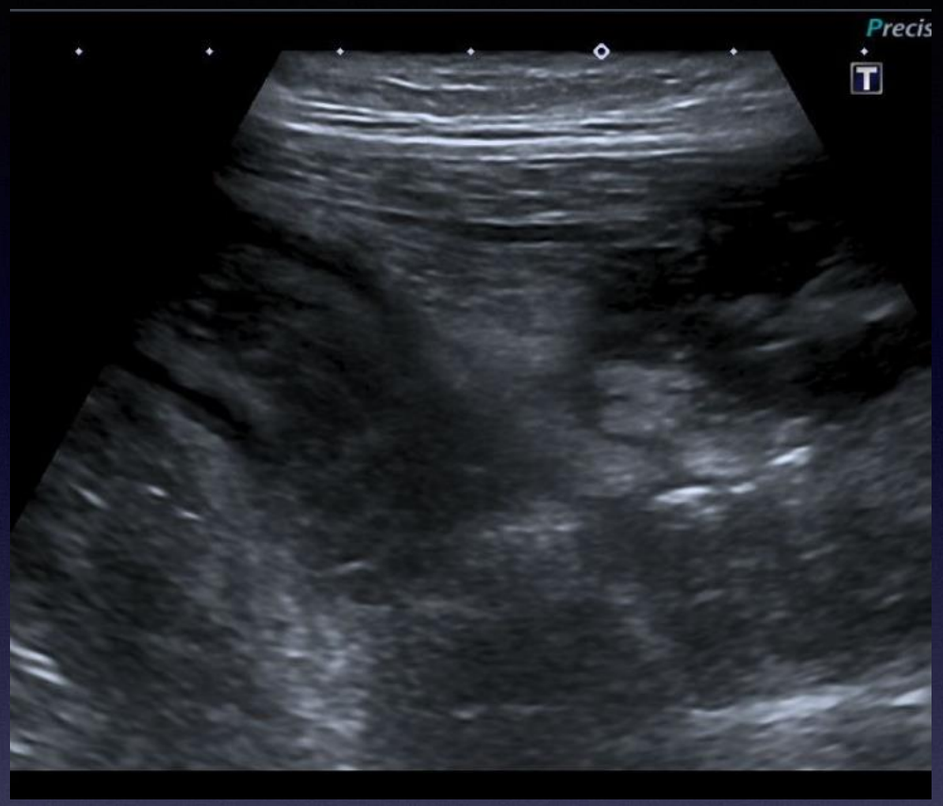
Mesenteric Lymphadenopathy

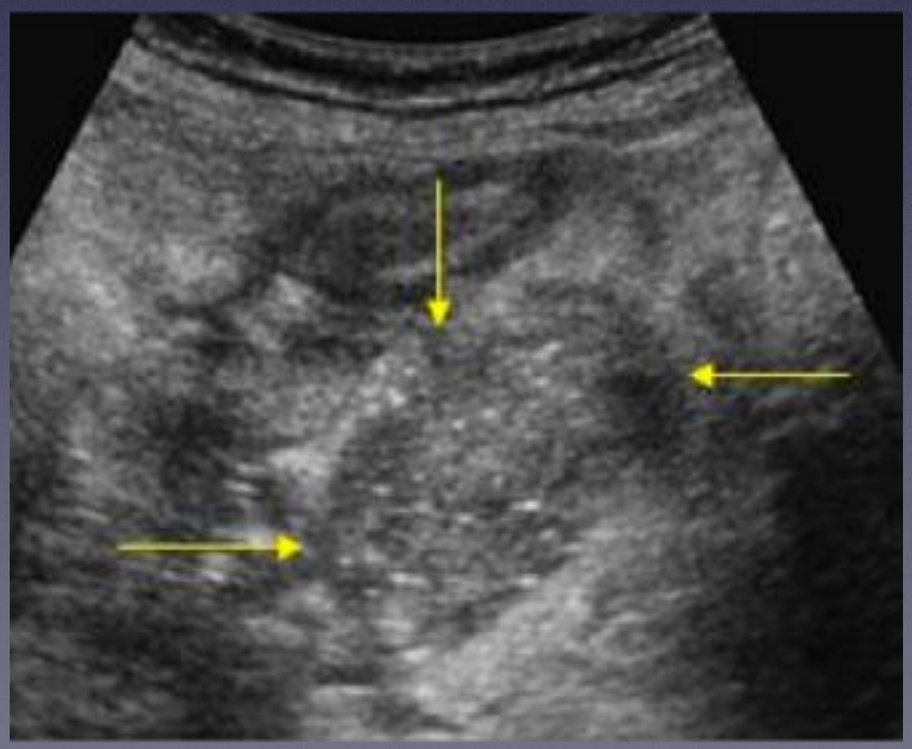


Recommendations:

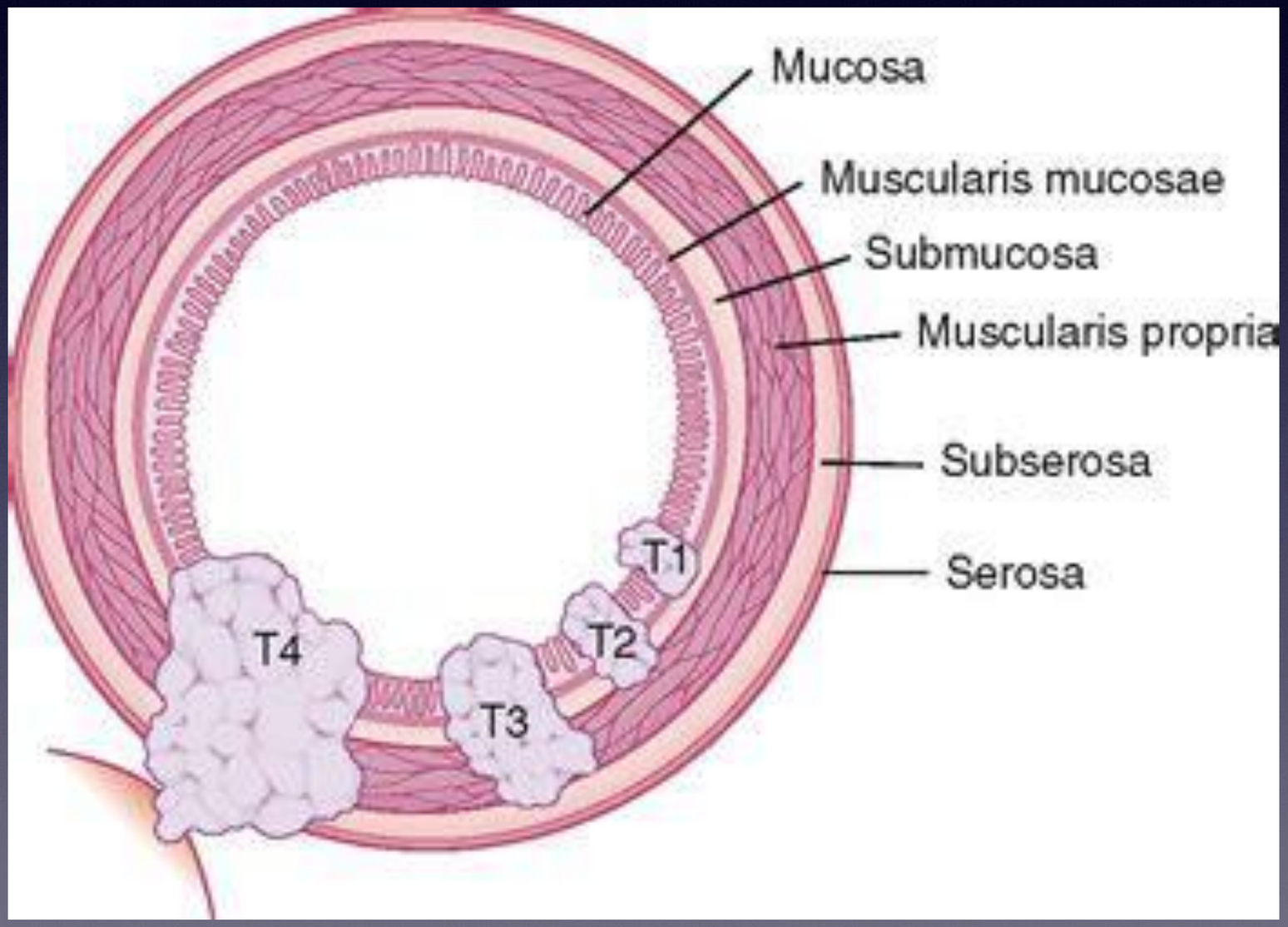
18. Ultrasound can assess lymph nodes and mesenteric tissue. LoE 4, GoR B, 4, Strong consensus 10/10

Penetrating Disease - Abscess and Fistulae

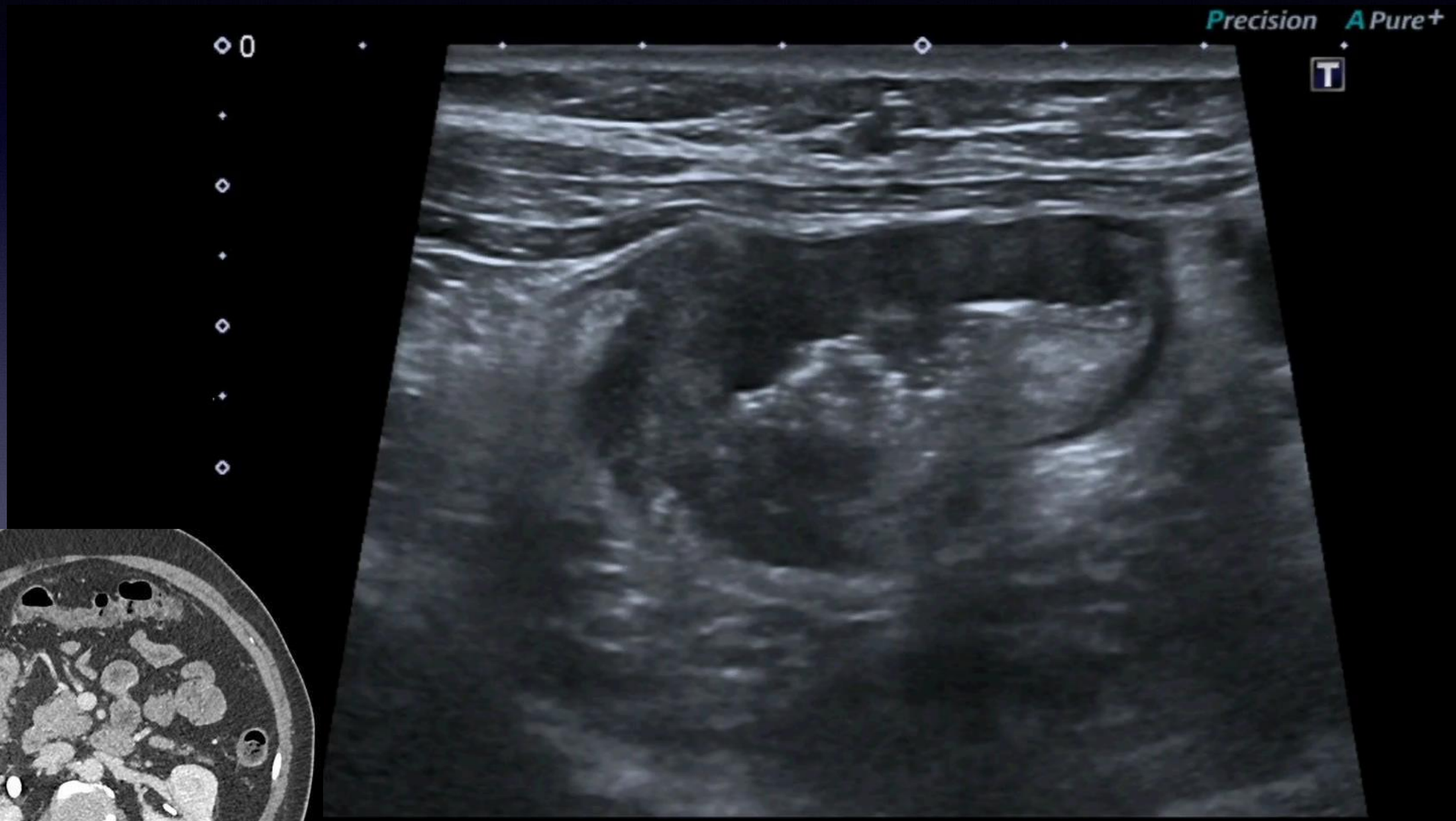


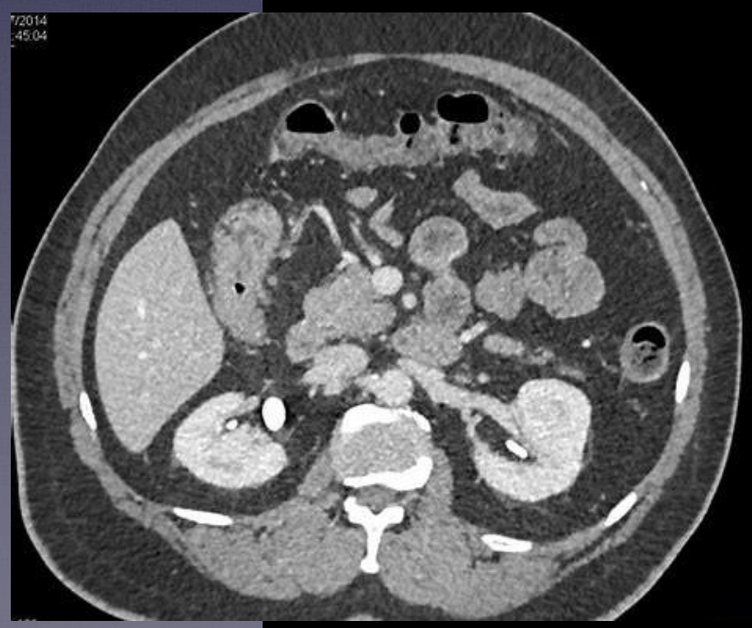


Bowel Neoplasia
Polyps and Carcinoma

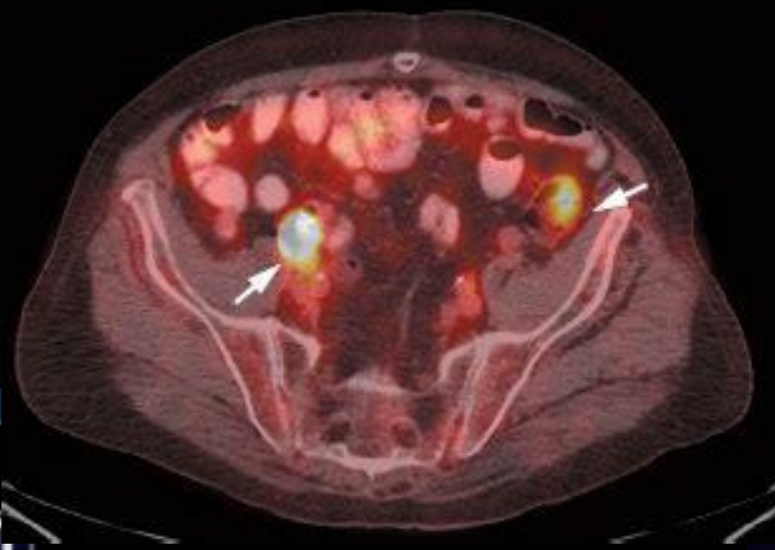


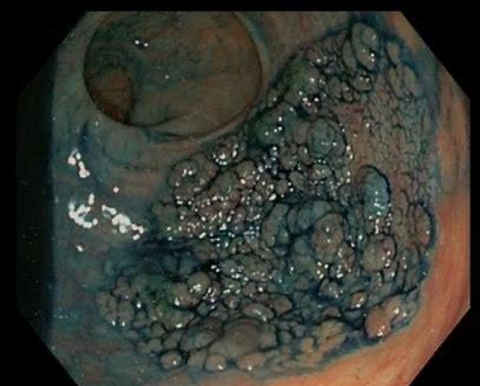
Colonic Carcinoma



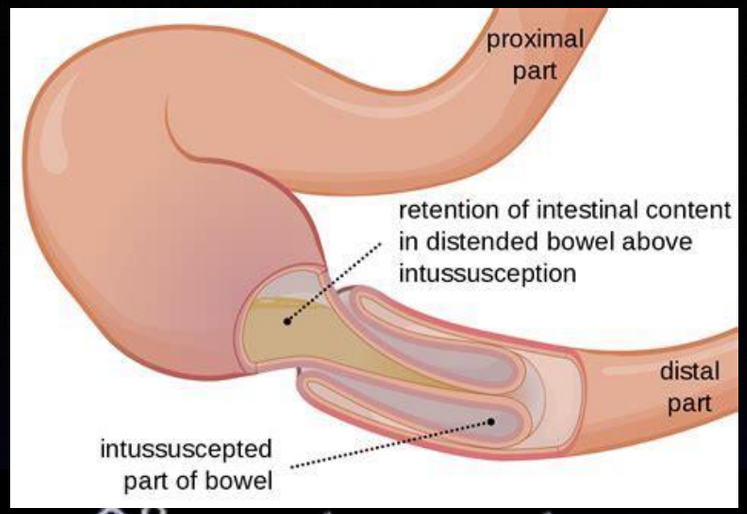


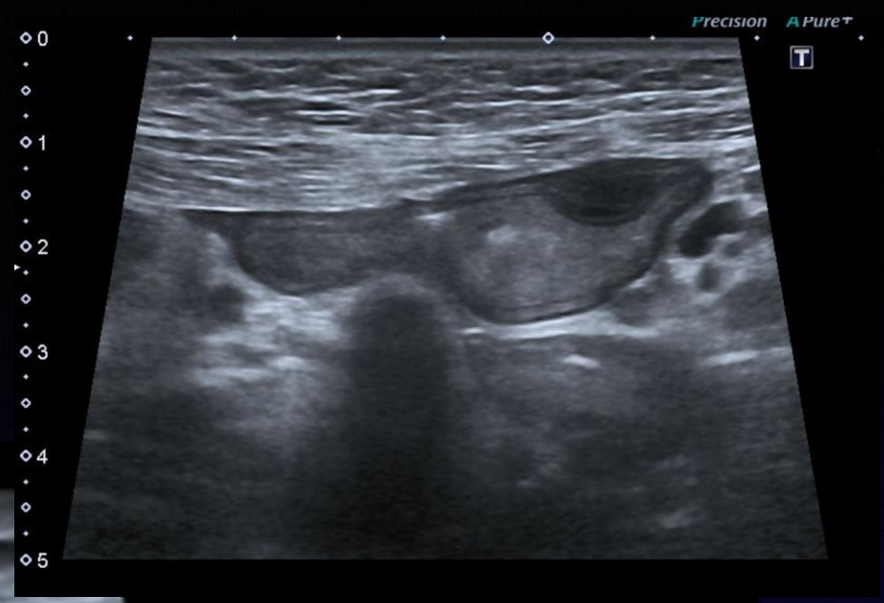
Colonic Polyps

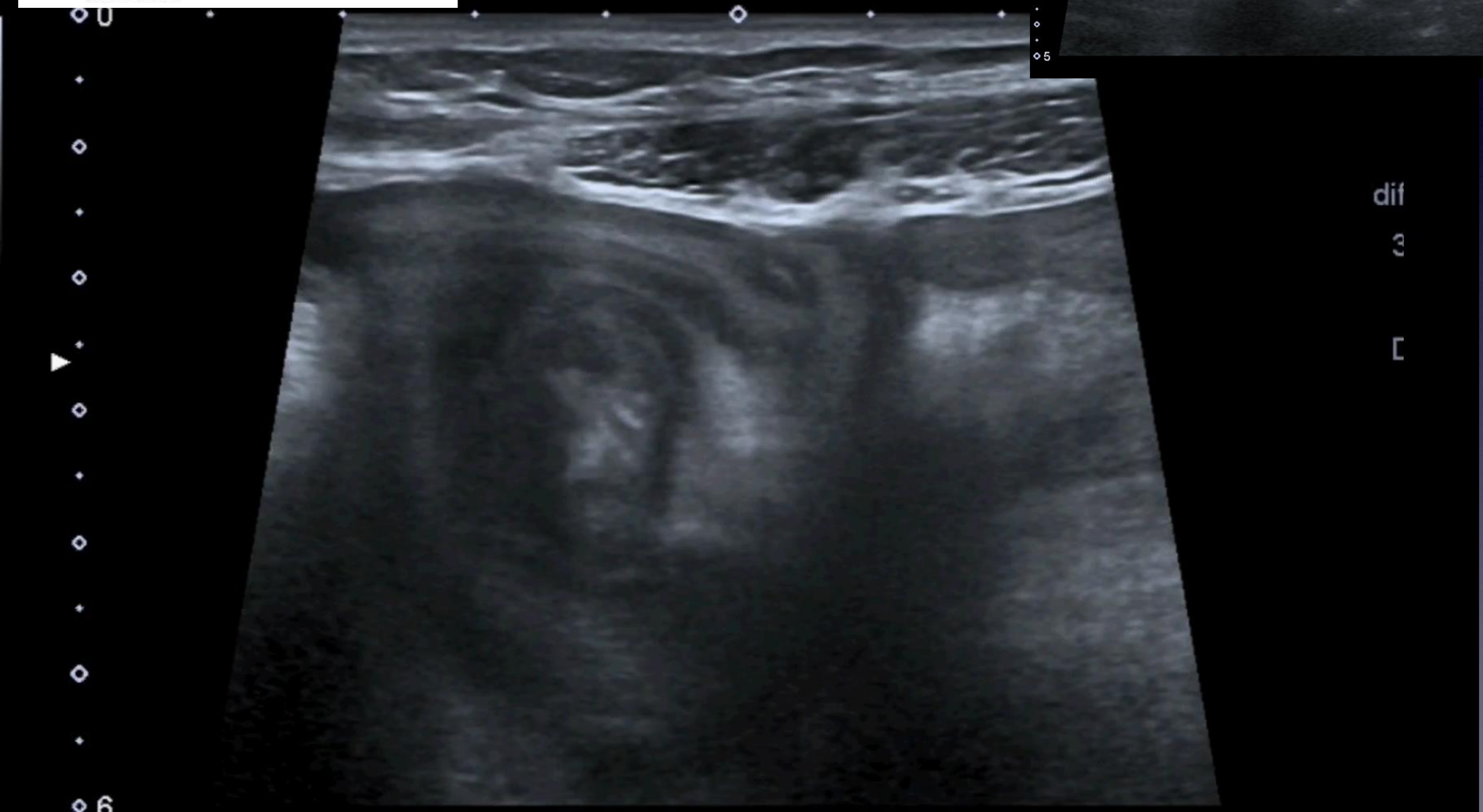




Jejunal Polyps





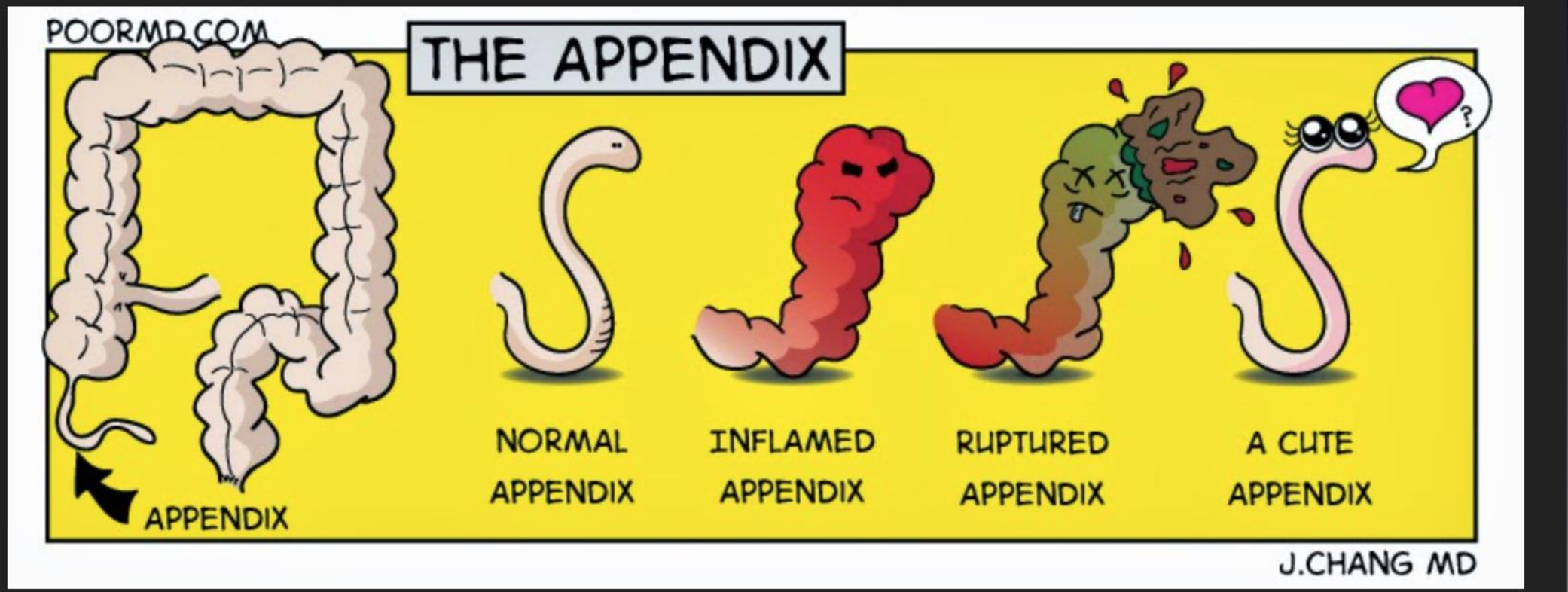


Bowel Ultrasound and the Acute Abdomen

Acute Lower Abdominal pain ? Appendicitis

- Diverticulitis
- Epiploic Appendagitis
- Colits
- Acute inflammatory Bowel
- Uro-Gynaecological
- Appendicitis

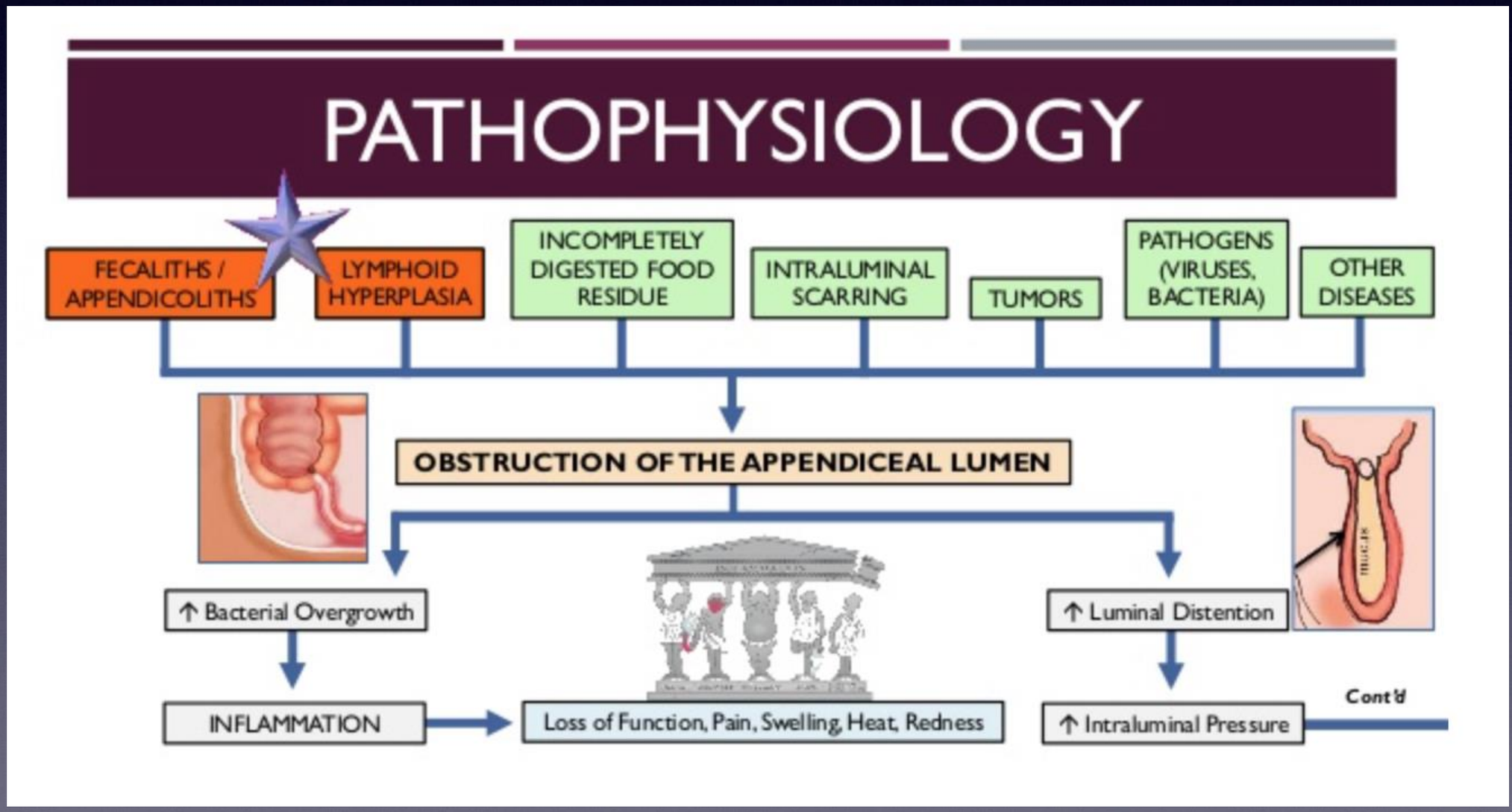
Appendicitis



Diagnosing Appendicitis - The Issues

- Audit Aim: Improvement of the quality of care for patients undergoing emergency laparotomy through the provision of high quality comparative data from all providers of emergency laparotomy.
- Aim to reduce the numbers of negative laparotomy
- **Reliance on accurate radiological diagnosis**
- **Literature quotes range 44- 100% Sens/Spec!**

Appendicitis- Pathophysiology

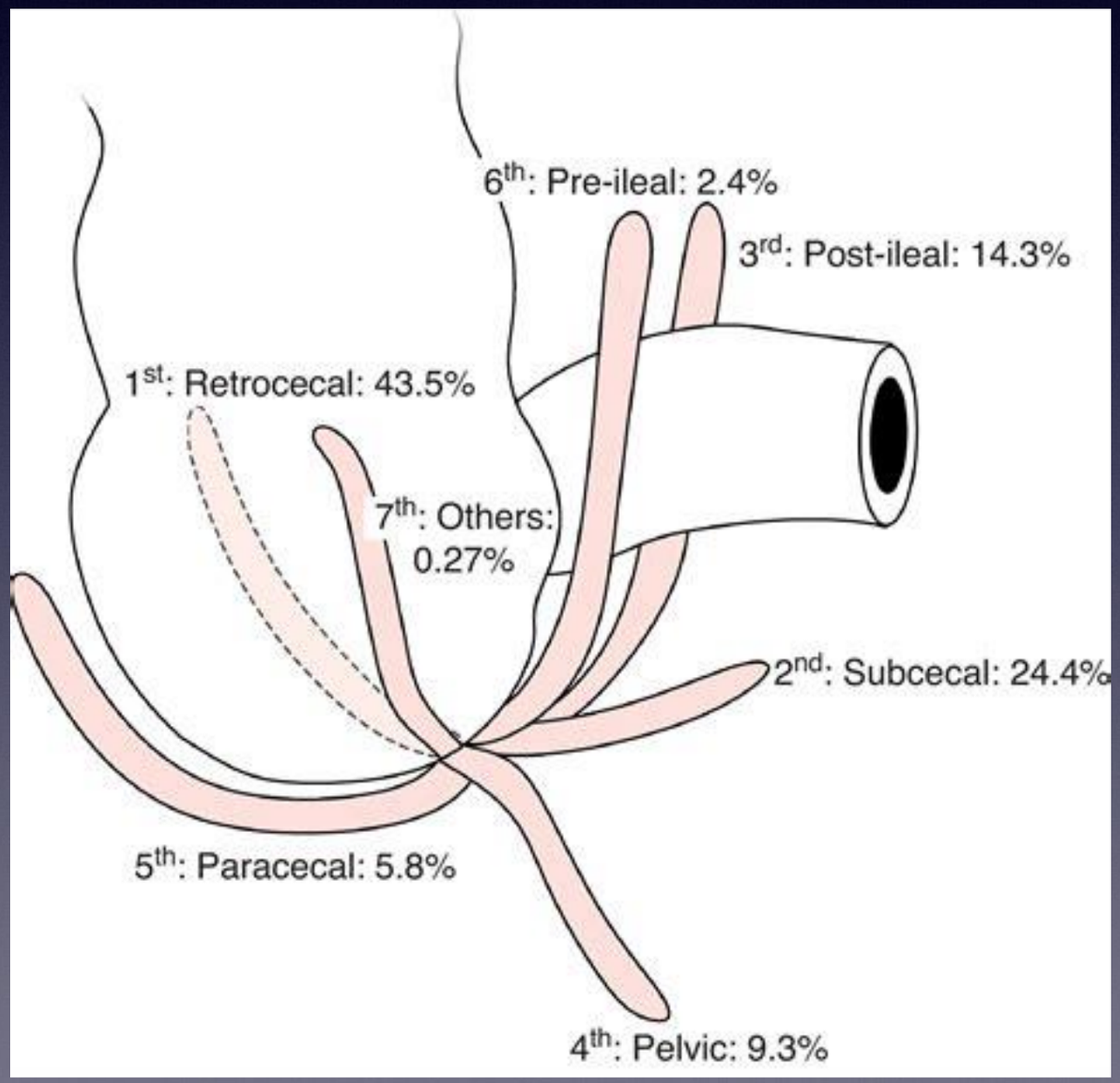


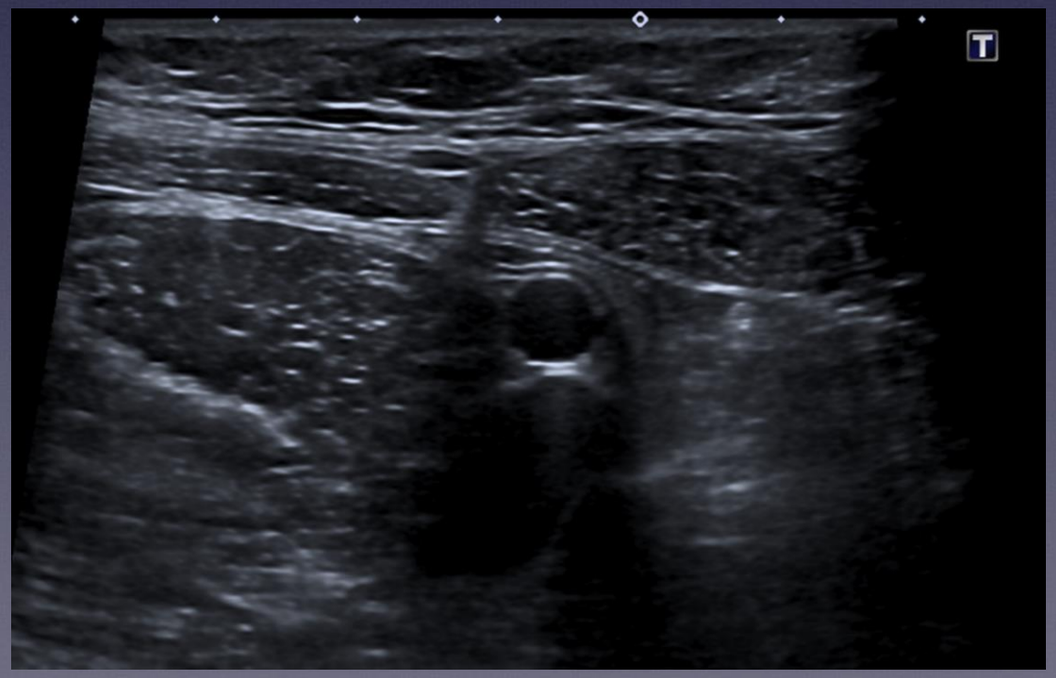
Scanning the Appendix - Tips and Tricks

- Start Big ! (curvilinear to linear)
- Identify the Ascending colon
- Scan down to the RIF with variable pressure
- Identify Landmarks
- Fasted patient
- Gastrografin
- Bladder full/ empty
- Patient Position
  - Left lateral position
  - Standing the patient

Finding the Appendix

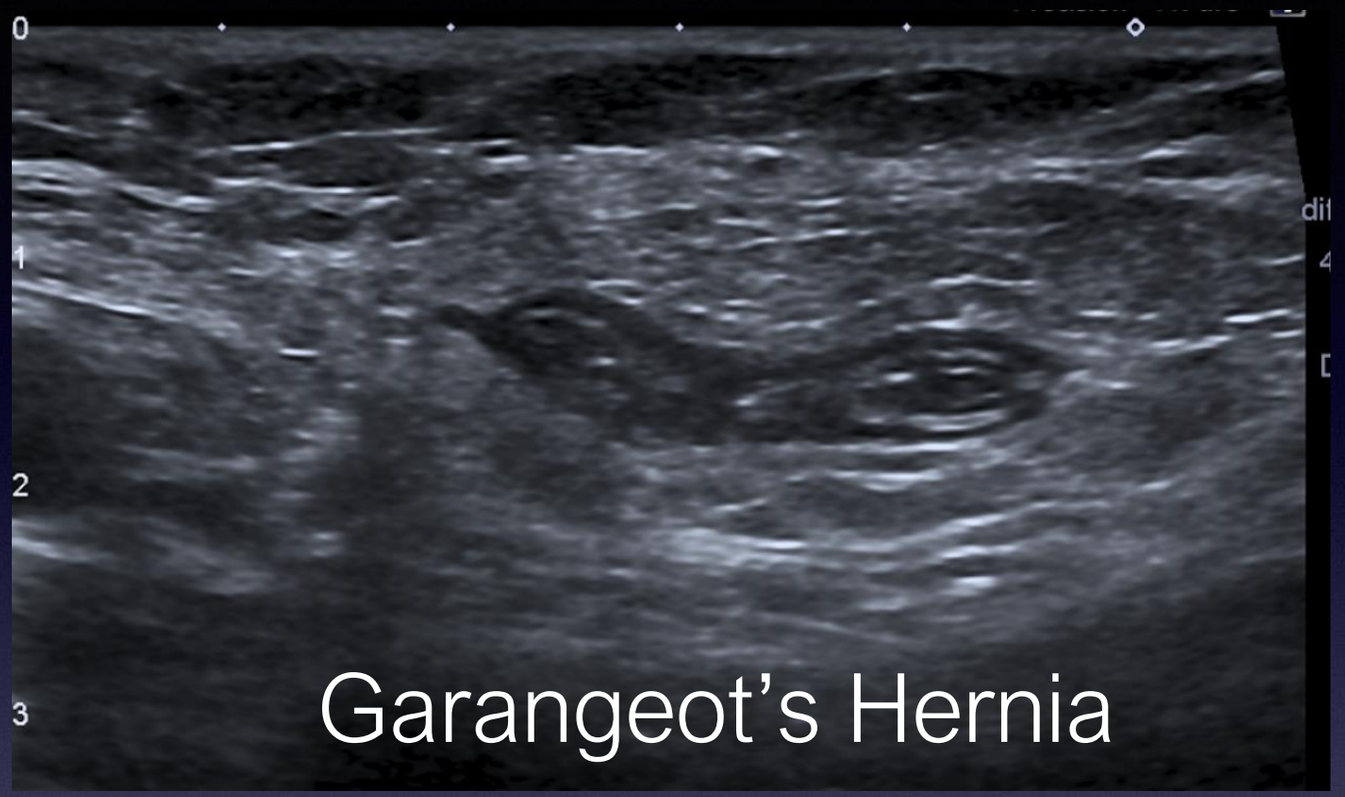
- Where does it hurt ?



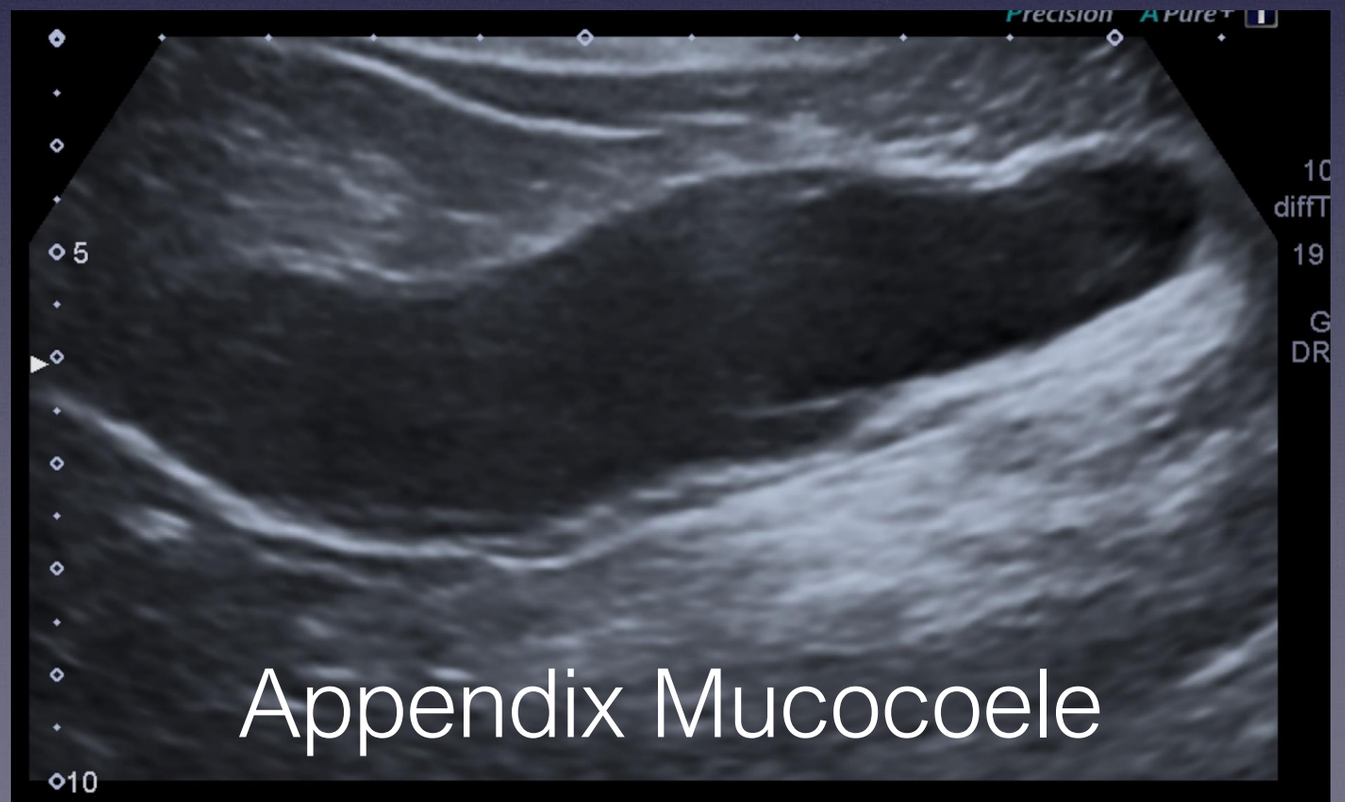


Appendicitis - Sonographic Criteria

- Mural
  - Thickness 3mm/7mm
  - Mucosal Thickening
  - Submucosal changes
- Luminal
  - Compressibility
  - Fluid/ Mucin
  - Caecal pole tumours
  - Appendicolith
- Mesoappendix
  - Bright expanded mesoappendix
  - Abcess
- Terminal Ileum



Garangeot's Hernia



Appendix Mucocoele

Appendicitis - The report

- **THE US FINDINGS/REPORT IS ONLY PART OF THE PICTURE**

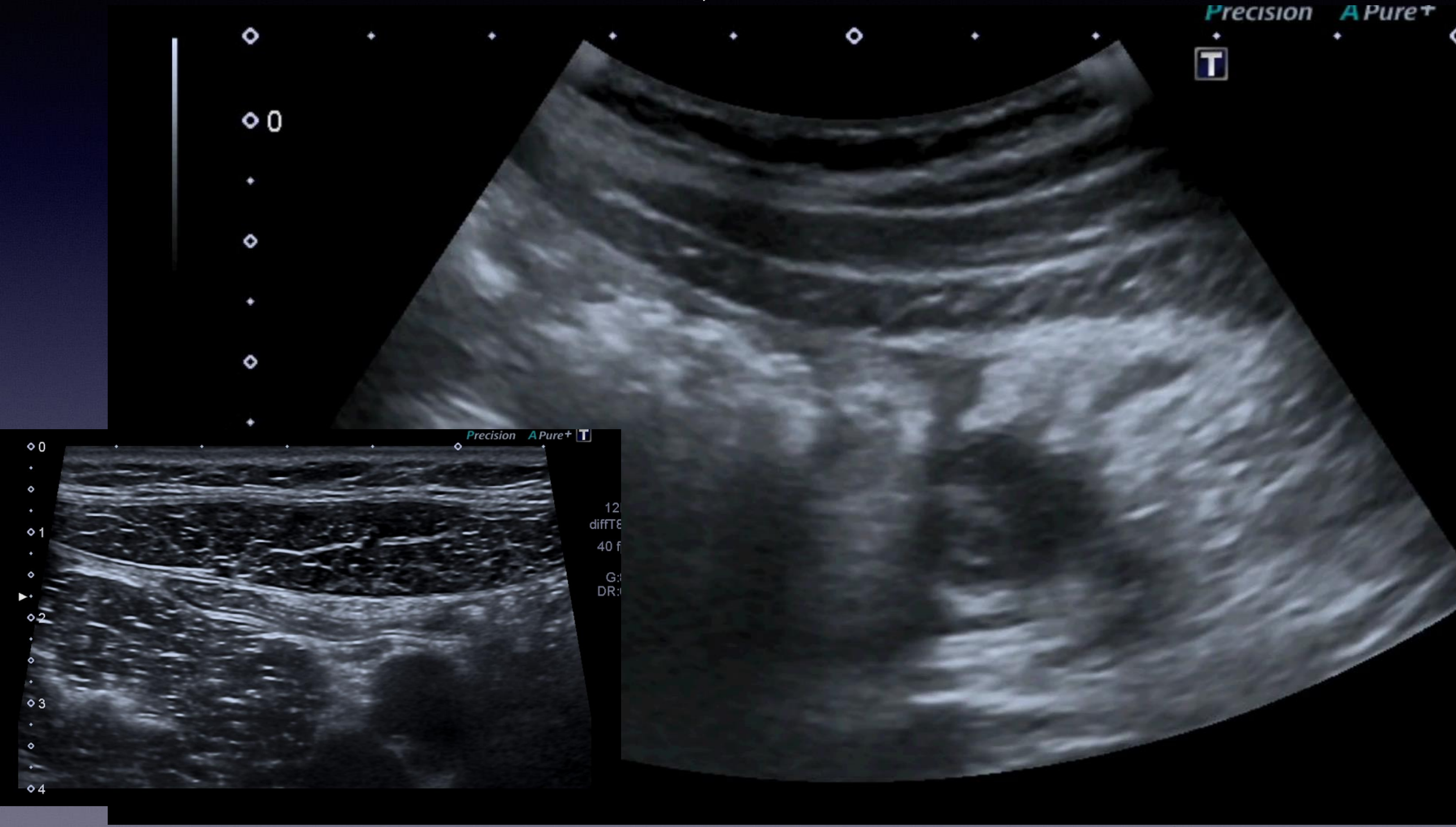
Appendix Seen

- Confidently Normal
- Confidently Abnormal
- Not sure
- Blockage
  - Stone
  - Tumour
- Perforated / Abscess

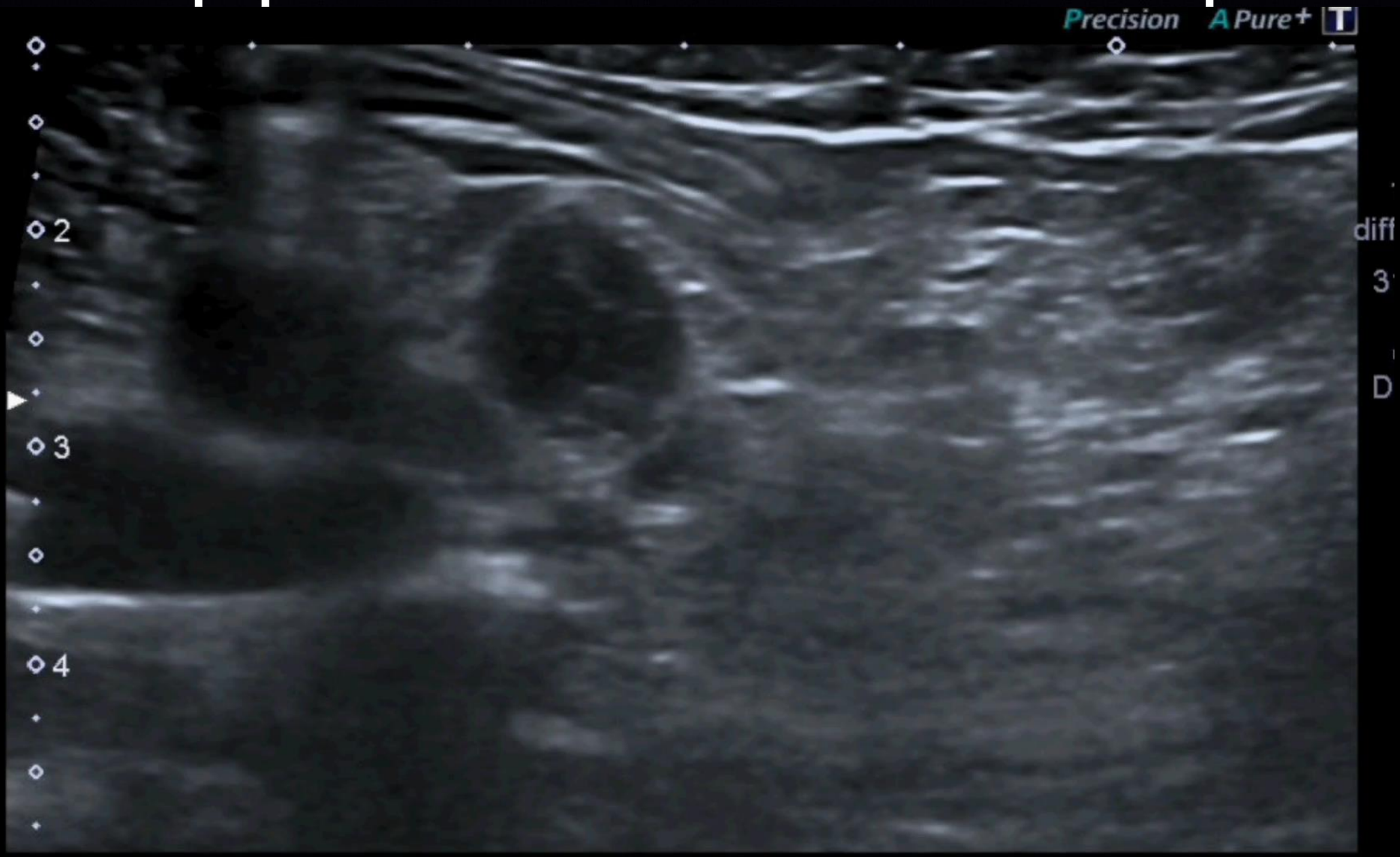
Appendix Not Seen

- Secondary Features
  - Free Fluid
  - Bright mesenteric fat
  - Abscess
- Other causes

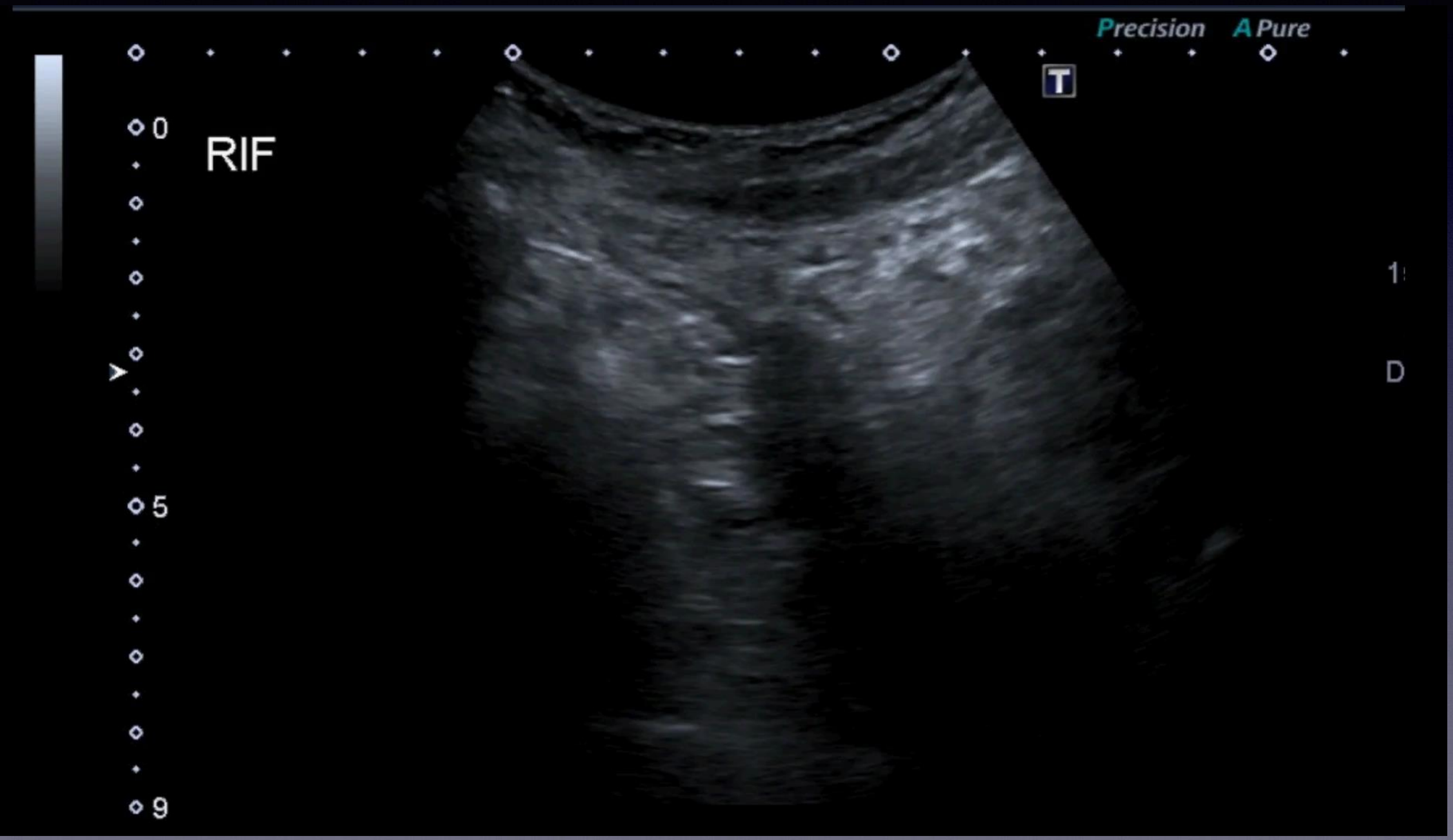
23 Male RIF Pain
WCC 16, CRP 112



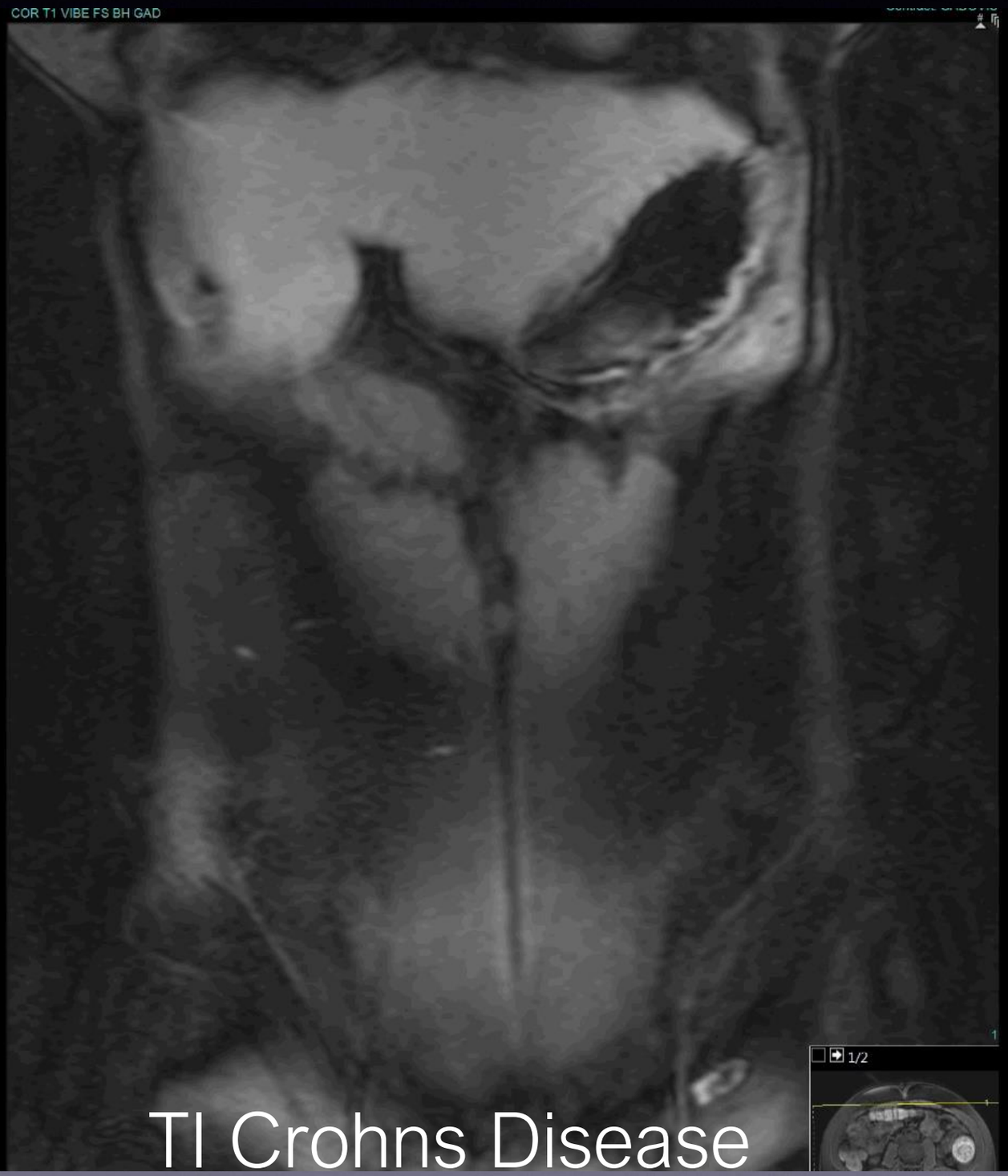
Appendicitis Follow up



Appendicitis Pitfall



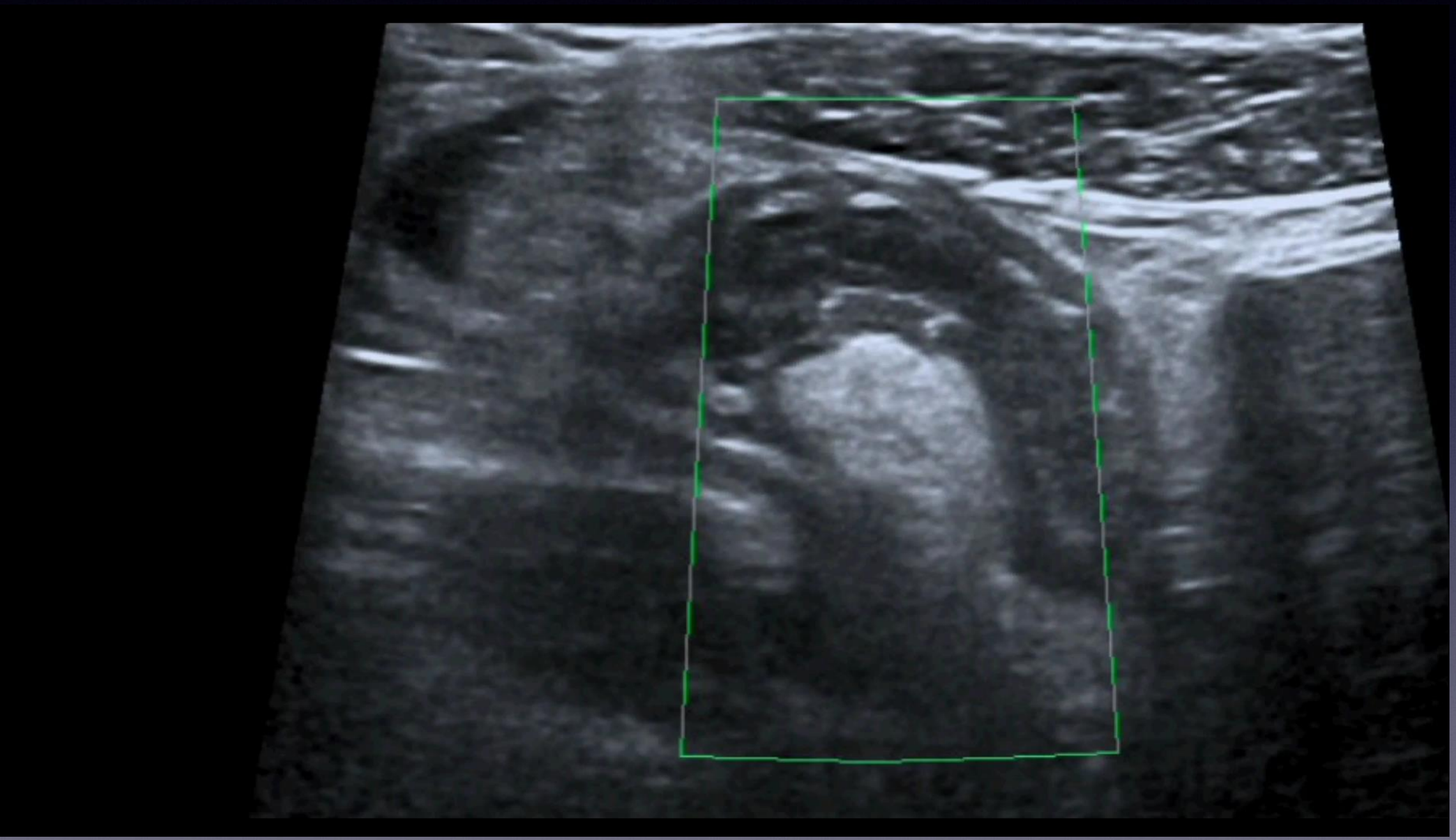
Appendicitis Pitfall



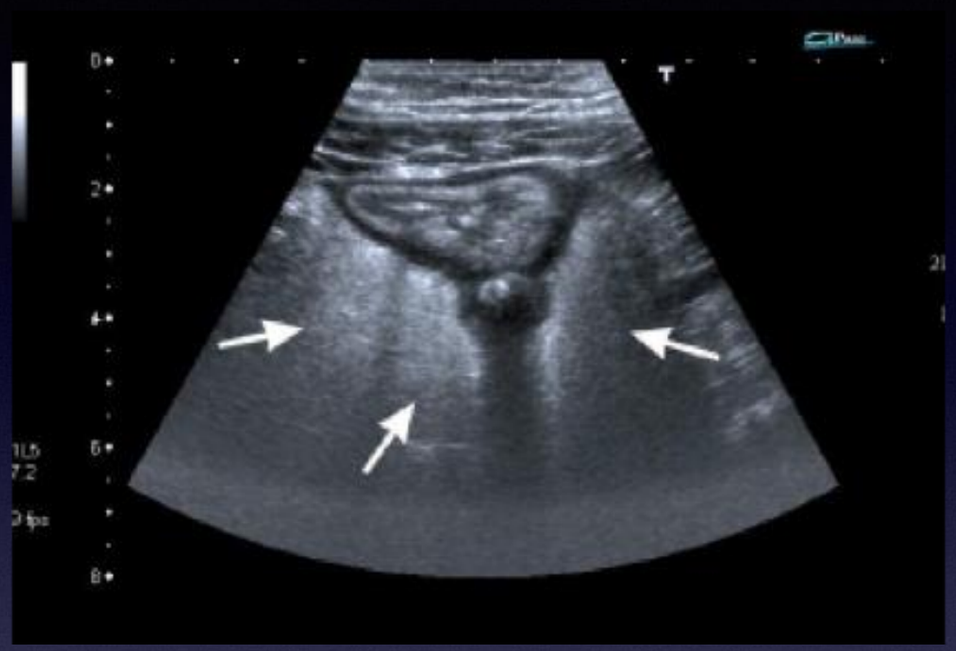
TI Crohns Disease

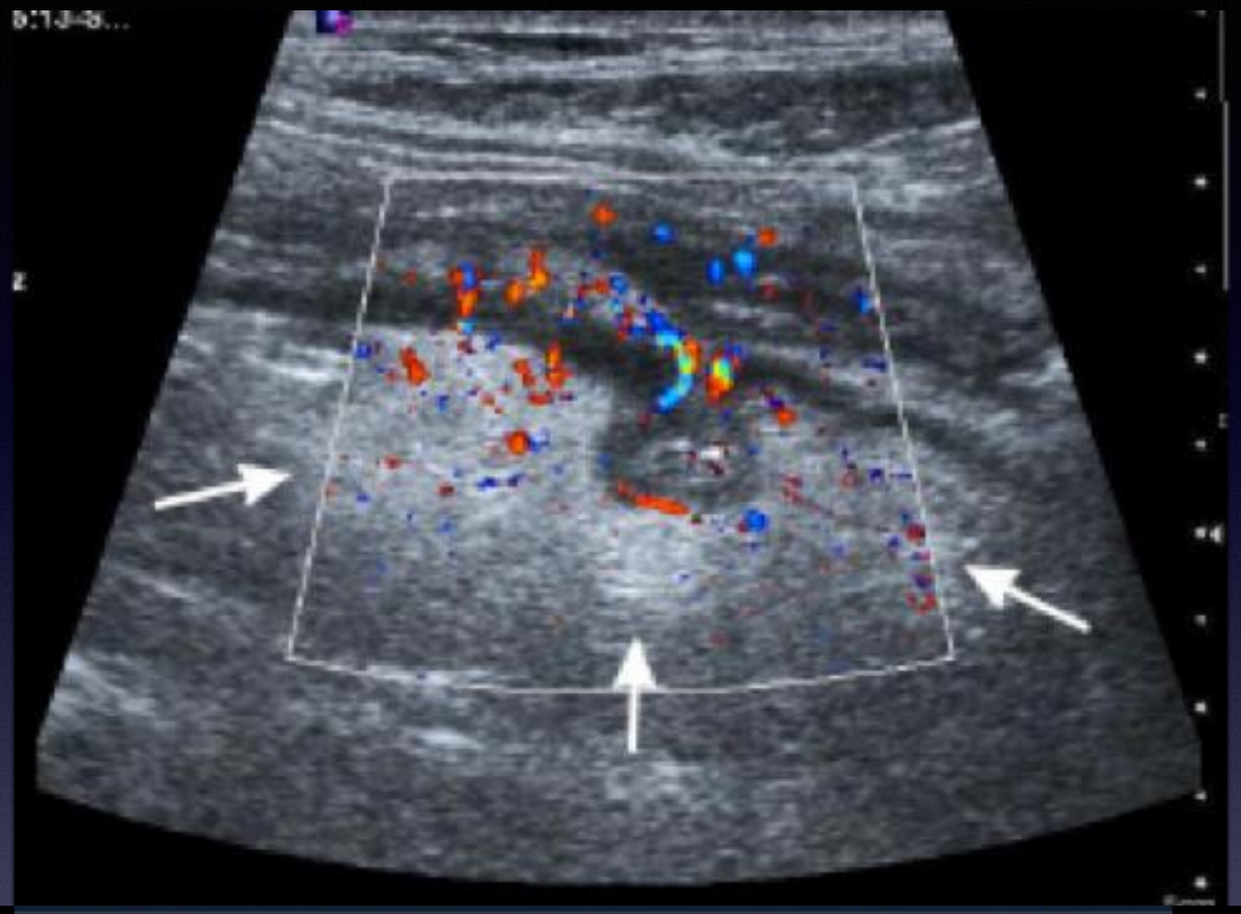
- Blind Appendix
- Blind Clinicians - Patient had had previous appendicectomy !!

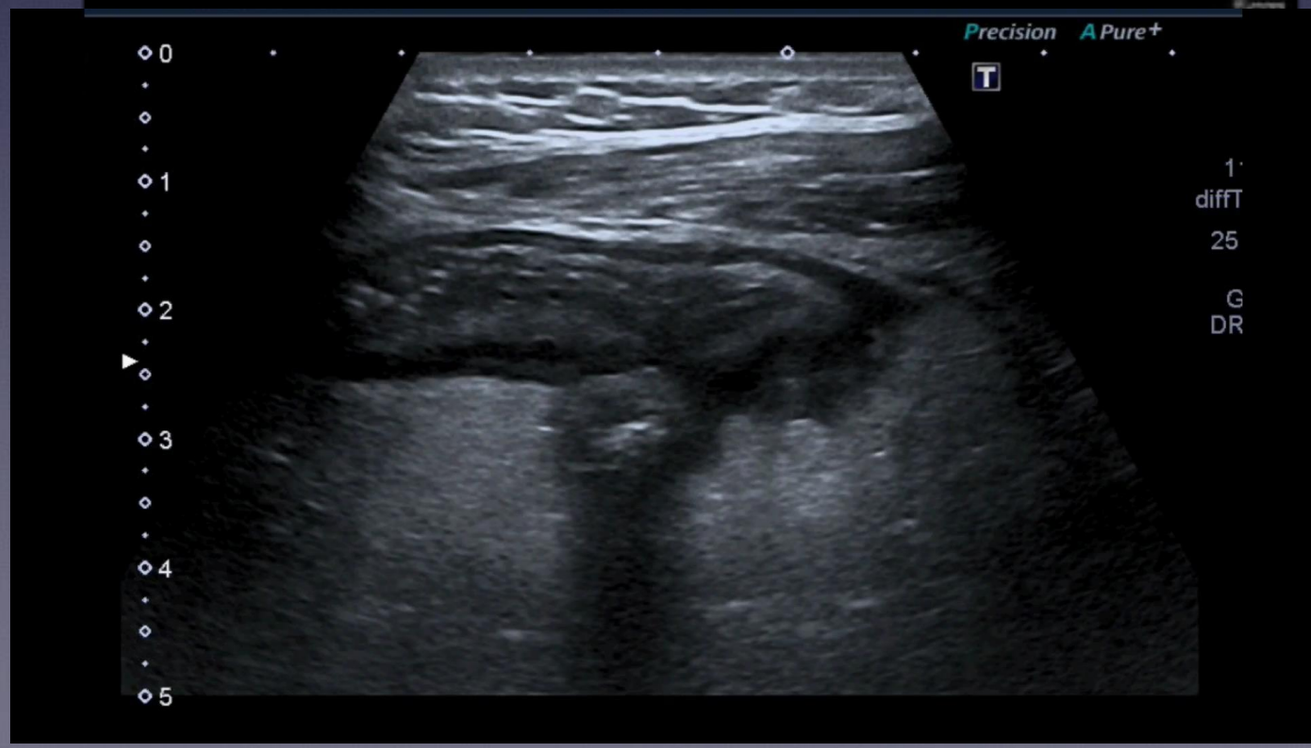
Crohns and Appendicitis



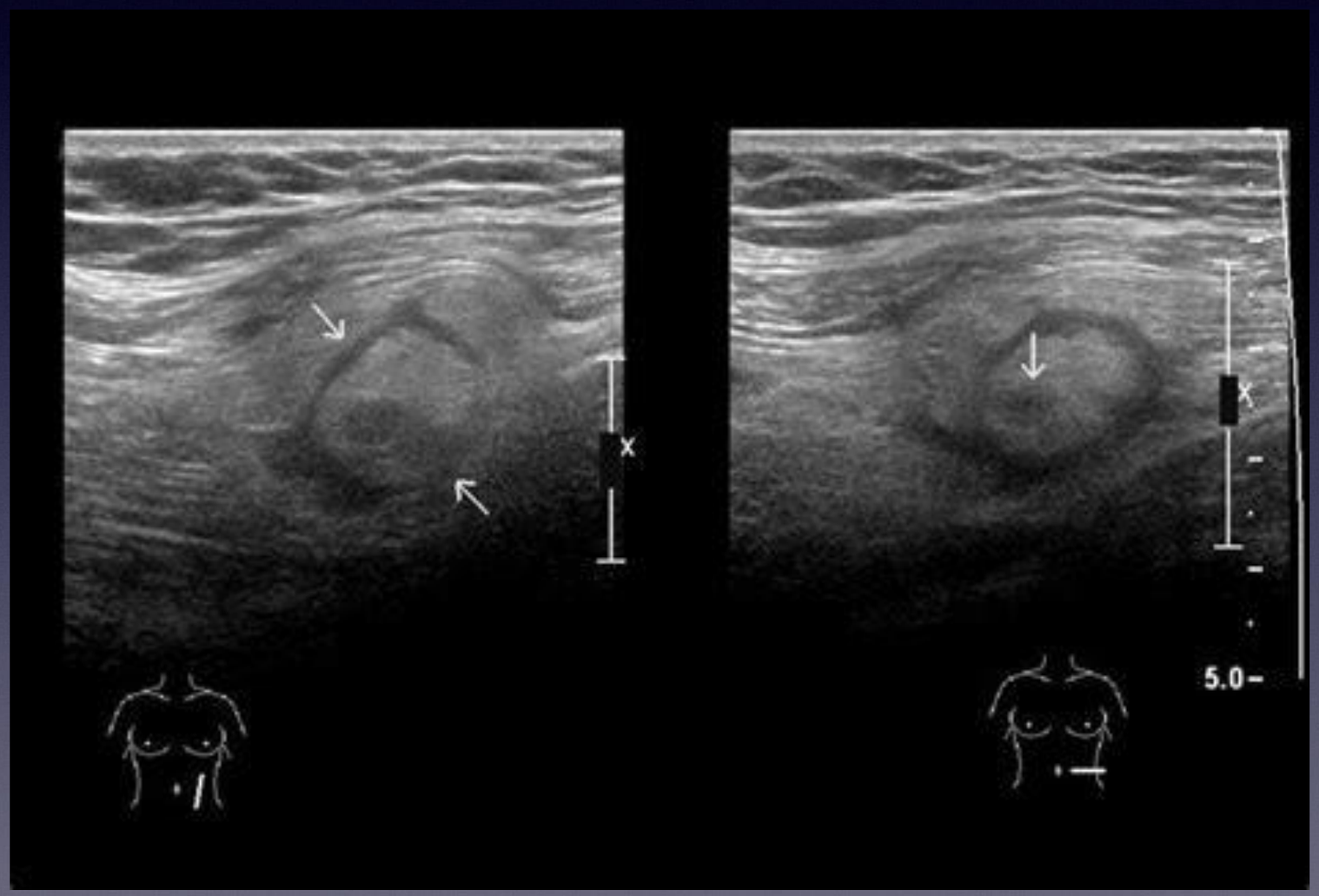
Acute Abdomen Other - Diverticulitis

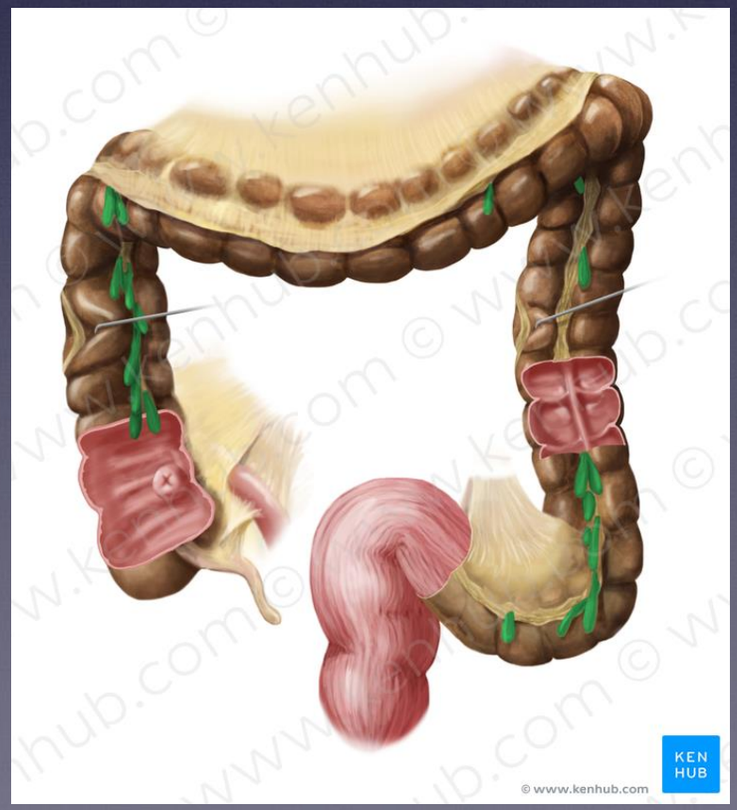






Acute Abdomen Other - Epiploic Appendagitis





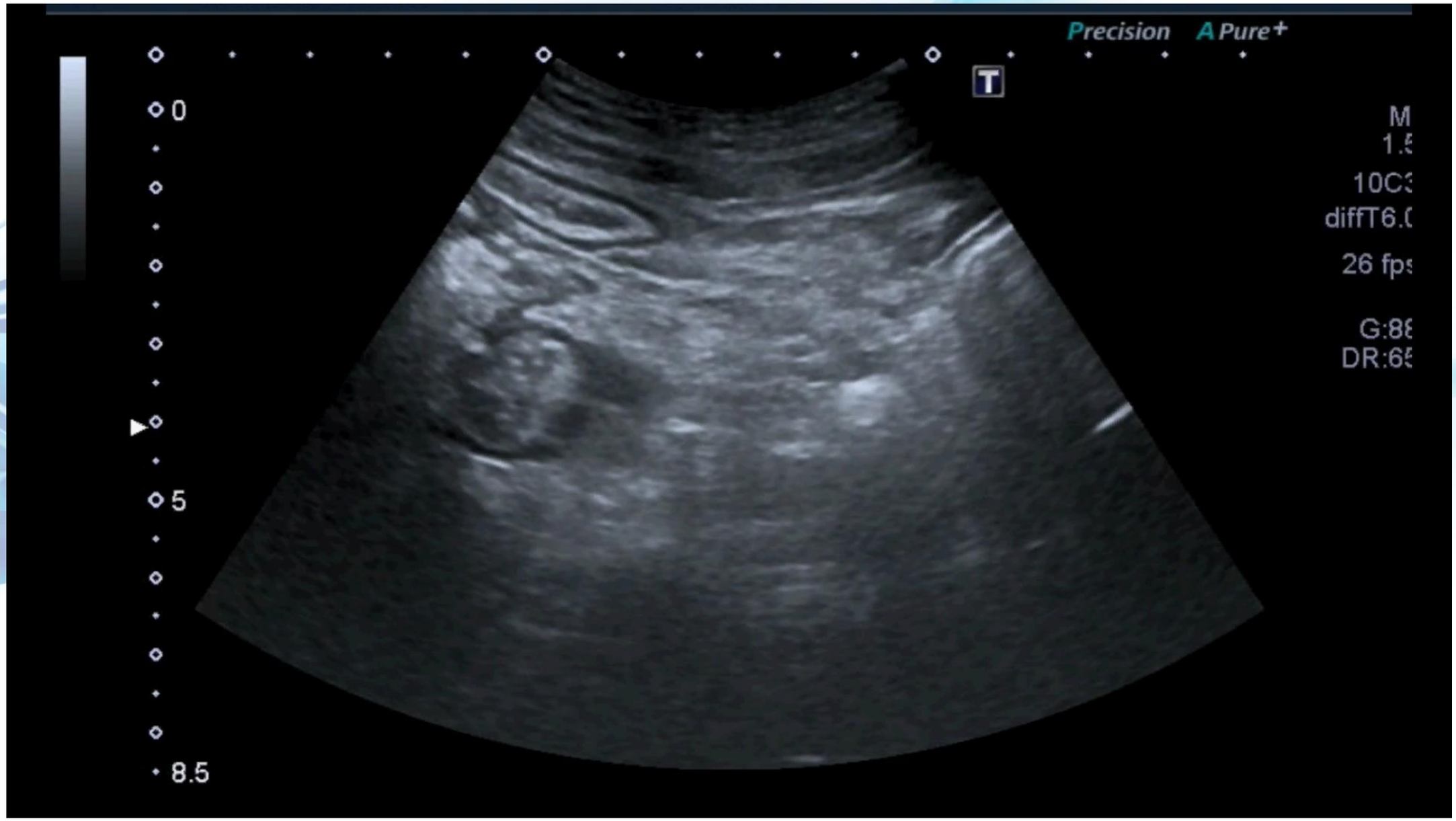
Interesting Case

- 35 year old
- Known Crohns patient , well controlled
- Presents with acute right iliac fossa pain
- Fever, now peritonitic
- WCC and CRP rasied.

- Crohns flare ? – Abscess/ perforation??

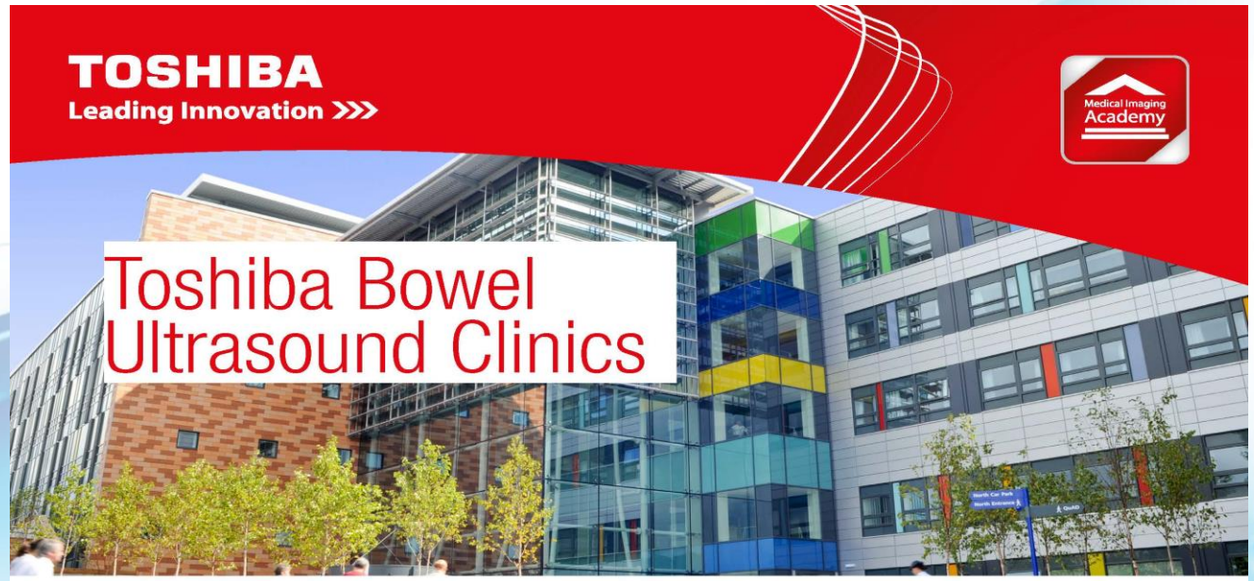
Crohns ??

Ultrasound RIF



BMUS

Thankyou……..



A ONE-DAY COURSE – THURSDAY 26TH MAY 2016

Portsmouth Hospitals NHS Trust

Toshiba Bowel Ultrasound Clinics

To be held at the
Level C Radiology Department, Outpatient Ultrasound, Queen Aexandra Hospital, Portsmouth, PO6 3LY

Cost: £220.00 including VAT, lunch and refreshments

Putting you first
Toshiba Medical Systems UK

About the course

Hands on and live scanning

Small group teaching (max of 12 delegates) will be offered in an Outpatient setting. There will be 4 (small groups of 3) ultrasound rooms in use running outpatient scanning in tandem and offering the chance to demonstrate live scanning that will reflect everyday practice.

There is an established Bowel ultrasound service in Portsmouth with referrals for assessment of both new diagnosis Crohn's disease and follow up, RIF pain and screening abdominal scans.

08.00 – 08.30	Coffee and Introductory discussion (30 min workshop format)
08.30 – 13.30	Outpatient scanning (up to 60 patients)
13.30	Finish and Lunch Available

This course has been approved by The Royal College of Radiologists for 5 CPD credits for full attendance.

Toshiba Bowel Ultrasound Clinics

Thursday 26th May 2016

Please complete in BLOCK CAPITALS

Prof/Dr/Mr/Mrs/Ms/Miss: .....

First name .....

Surname.....

Position.....

Department .....

Hospital .....

Address .....

..... Postcode.....

Tel ..... Fax.....

Email .....

REGISTRATION, ENQUIRIES AND BOOKING

If you would like to reserve a place on this course, please contact us no later than 12th May 2016.
Amanda Williams - Course Administrator
TEAMS & VIMARS Centre
2nd Floor QuAD Centre
Portsmouth Hospitals NHS Trust
Southwick Hill Road
Cosham
Portsmouth, Hants
P06 3LY.

Tel: 023 9228 6306
Email: amanda.williams@porthosp.nhs.uk
Cheques to be made payable to **'Portsmouth Hospitals Trust'.**