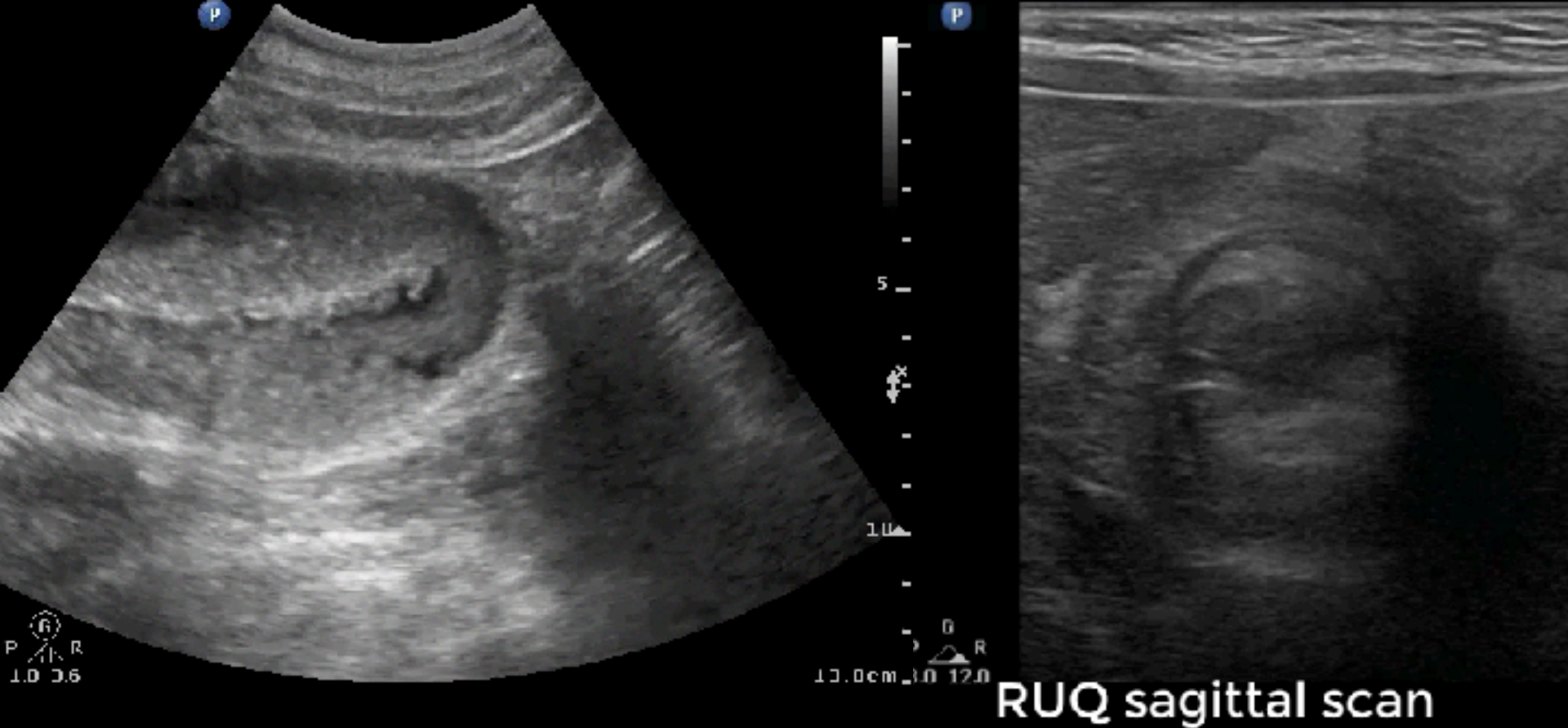




SEEING YOUR GUT FEELING

POINT-OF-CARE GASTROINTESTINAL ULTRASOUND

陳國智 醫師 / POCUSAcademy.com



台灣疼痛醫學會專科醫師
急診超音波臨床評核醫師
醫用超音波學會指導醫師
WINFOCUS director / instructor
Certified Interventional Pain Sonologist

急診 / 重症 / 介入 / 急性疼痛

經歷

新光急診超音波訓練中心主任
西園醫院急診醫學科主任
急診醫學會超音波委員會主委
台灣疼痛醫學會大體模擬手術講師
急救加護醫學會重症超音波負責人

juice119@gmail.com

Resuscitative
急救復甦

Diagnostic
臨床診斷

Procedural
Guidance
處置導引

Symptom- or
Sign-Based
症狀導引

Therapeutic
輔助治療



Core Applications (2023 ACEP Emergency Ultrasound Guidelines)
15項急診超音波核心應用

陳國智醫師

Aorta

DVT

Trauma

Thoracic/Airway

Cardia/HD assessment

Procedural Guidance

US-guided NB

Testicular

Ocular

Skin & Soft tissue

Hepatobiliary

Urinary tract

Pregnancy

Bowel

MSK

解剖

Anatomy

形態

Pattern

診斷

Diagnosis

HOLISTIC ULTRASOUND

Holistic medicine

Treatment that deal with the whole person,
not just the injury or disease



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jmu-online.com

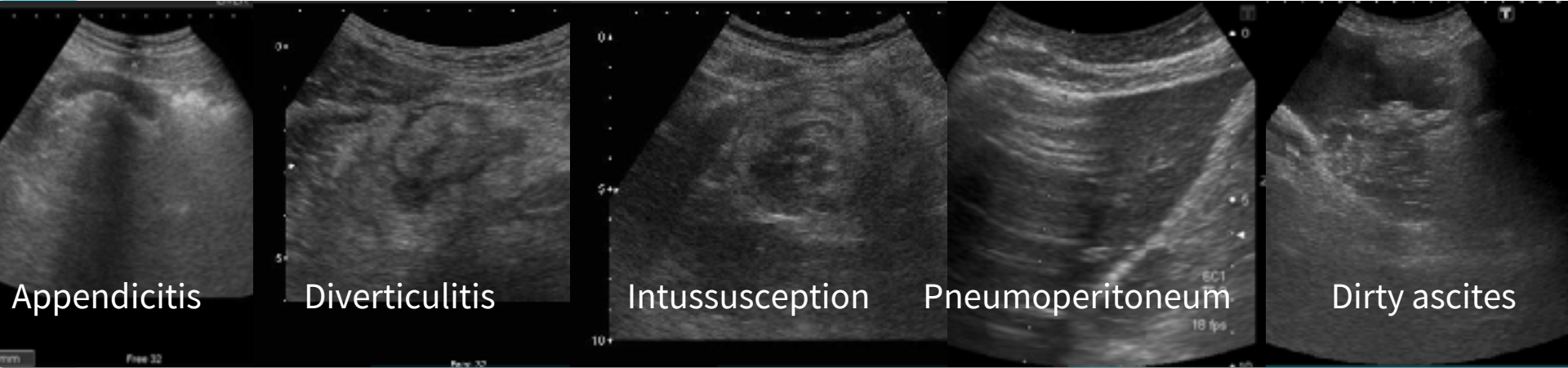


EDUCATIONAL FORUM

Application of Gastrointestinal Tract Ultrasound in Emergency and Critical Medicine

Jen-Tang Sun ¹, Wan-Ching Lien ², Hsiu-Po Wang ^{3*}

- Layers: 5
- Thickness: 5 mm
- Size: 2.5 cm & 5 cm
- Peristalsis



Appendicitis

Diverticulitis

Intussusception

Pneumoperitoneum

Dirty ascites

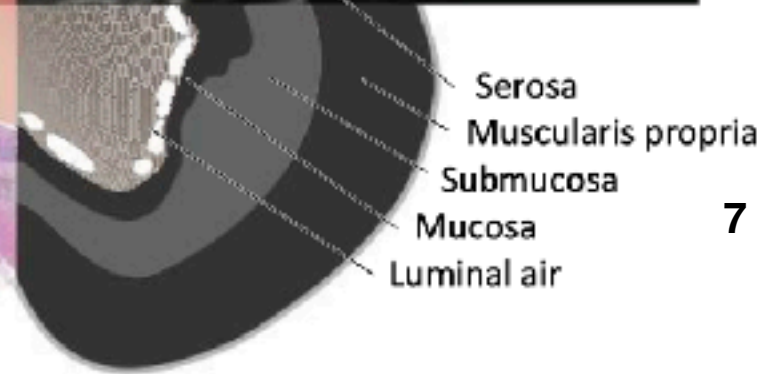
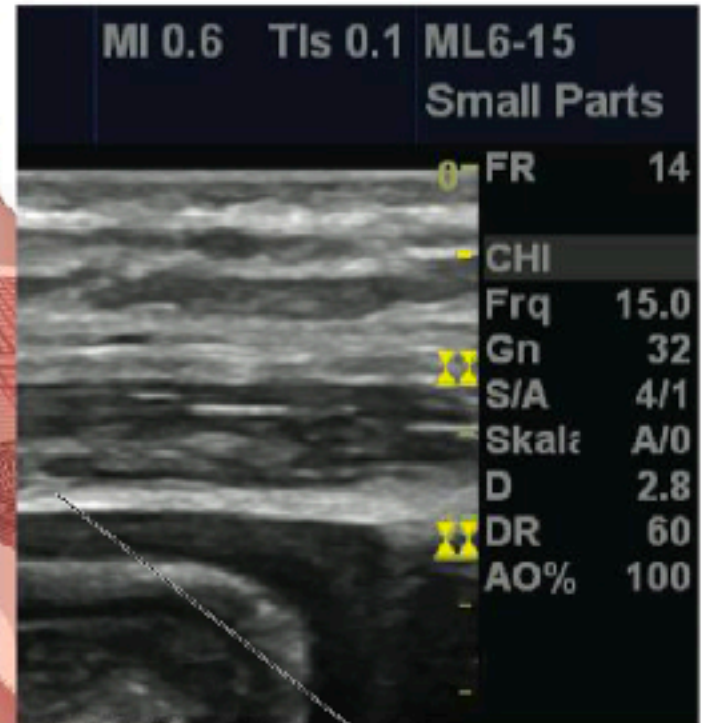
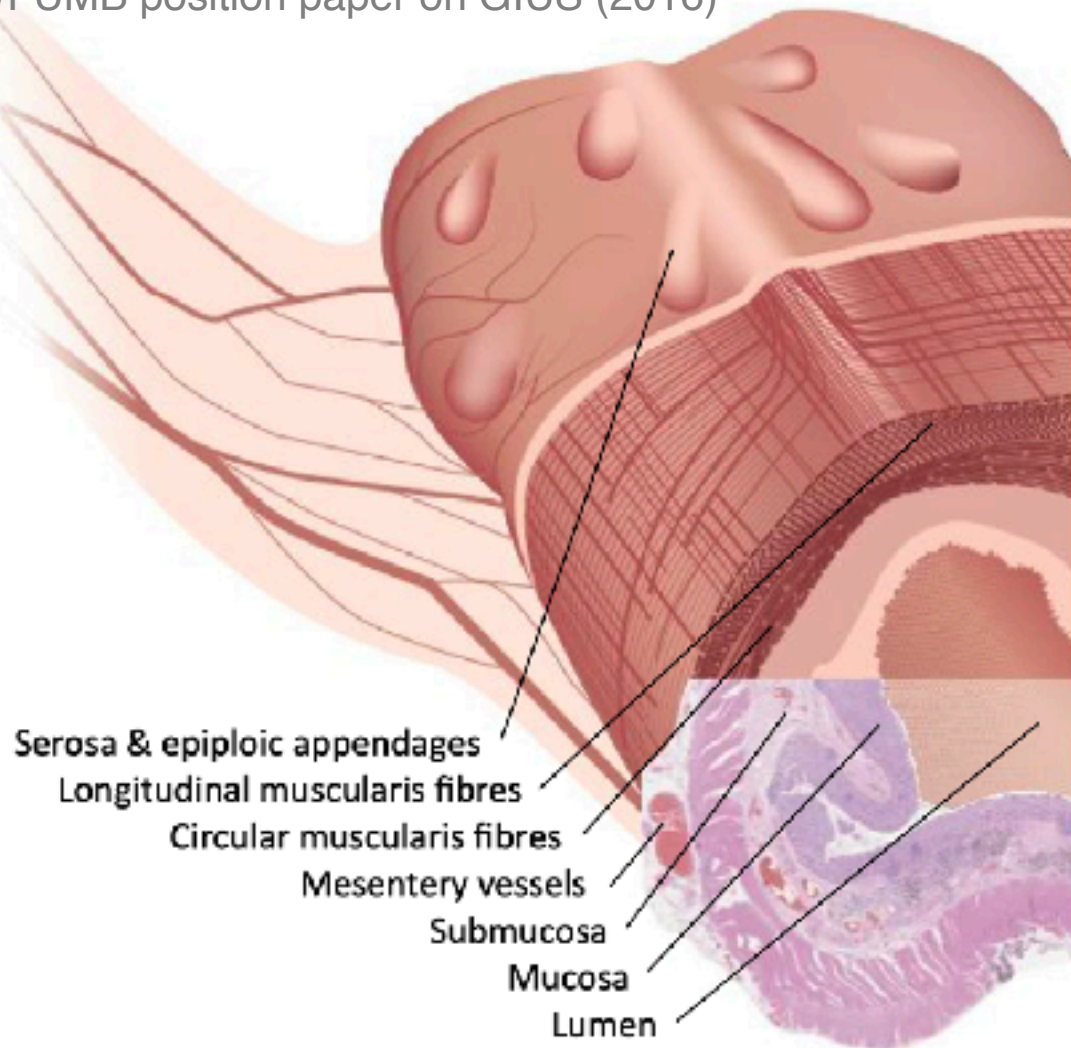
GI ULTRASOUND: PATHOLOGIC PATTERNS



1. **Diameter** distended (3cm & 5cm)
2. **Unable to compress** during examination
3. **Wall** thickening (>5mm/1cm for stomach)
4. **Wall** stratification disappeared
5. **Luminal content** decreased at lesion sites
6. **Peristalsis** decreased
7. **Associated findings** (LN, Fat, ascites, abscess)

SONOANATOMY OF BOWEL WALL LAYERS

WFUMB position paper on GIUS (2016)



5 LAYERS >5 mm (wall thickening)

White — Serosa

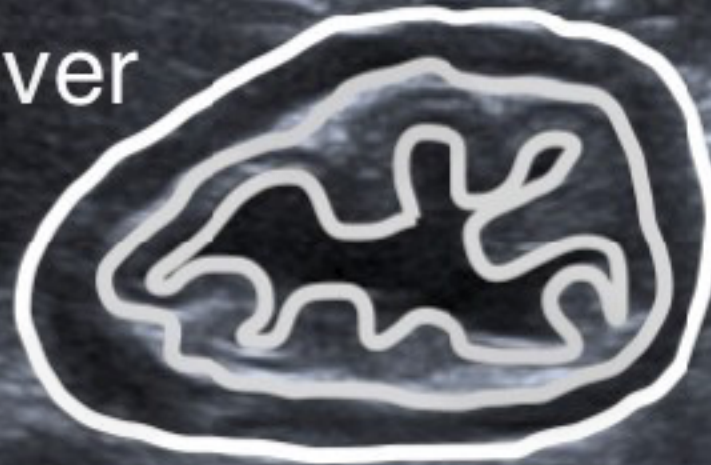
Black — Muscularis propria

White — Submucosa

Black — Muscularis mucosa

White — Mucosa/lumen interface

Liver



Cranial - Longitudinal axis - Caudal

5 LAYERS >5 mm (wall thickening)

POCUSAcademy©ChenKC



longitudinal scan at subxyphoid area



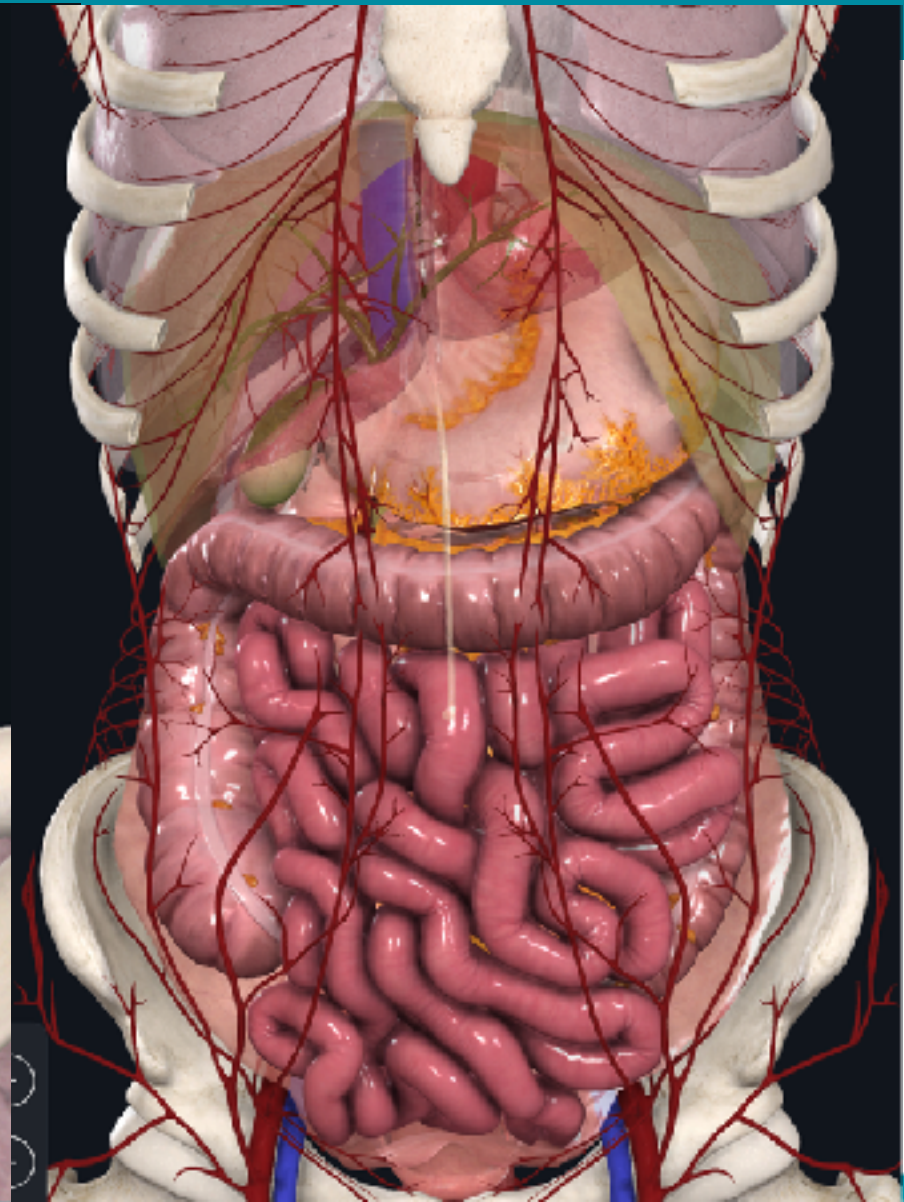
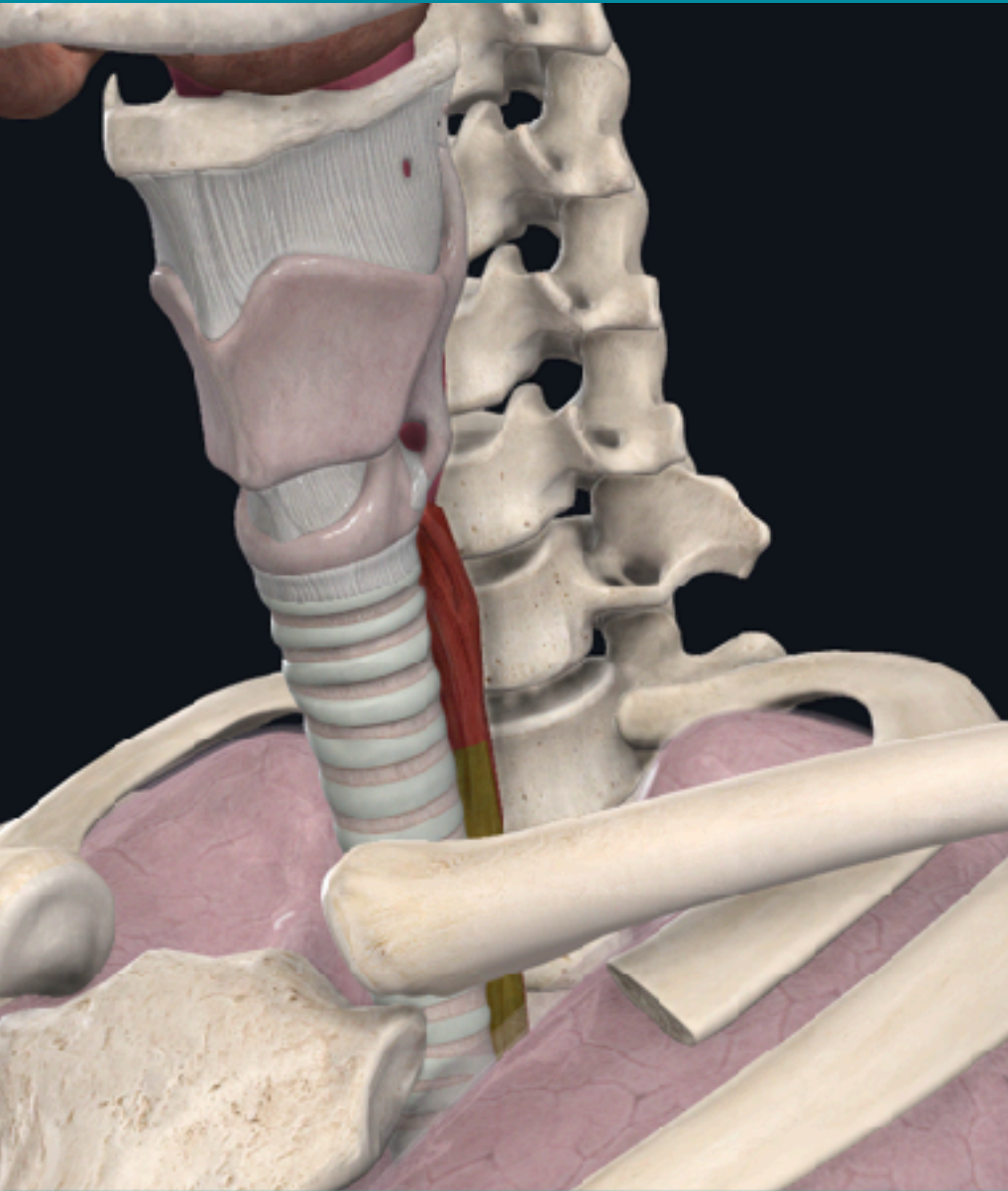
External landmarks

Find GI tracts

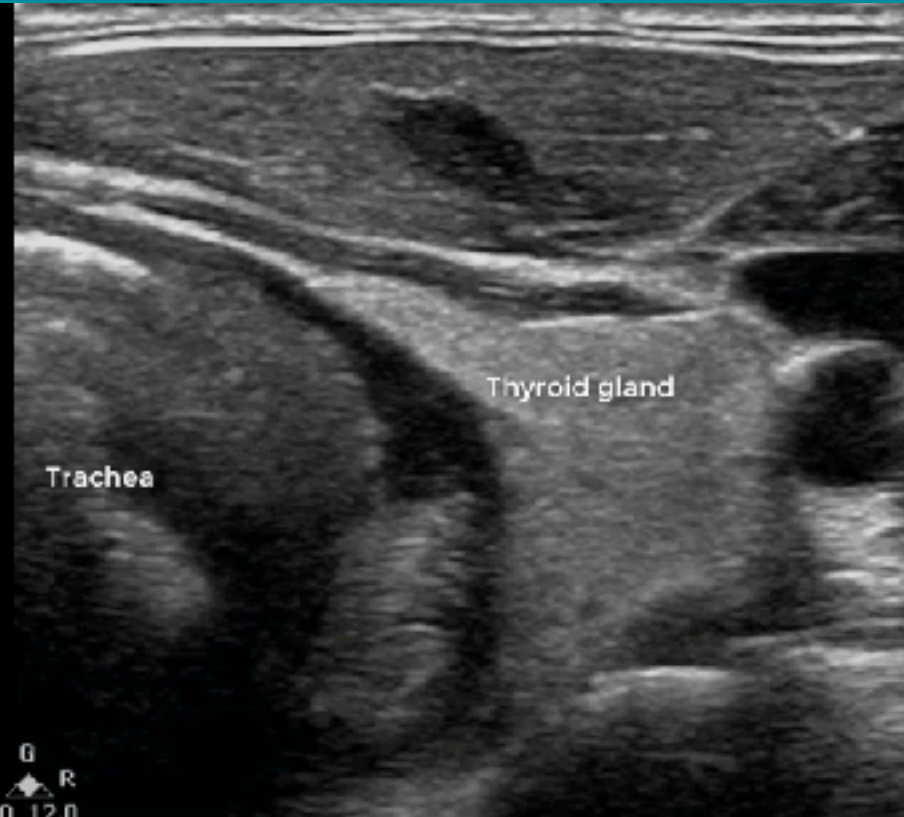
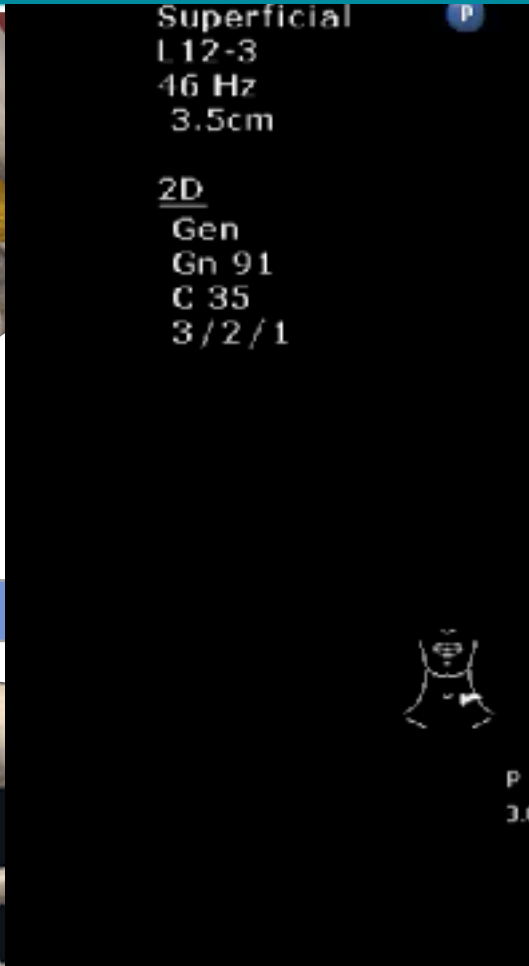
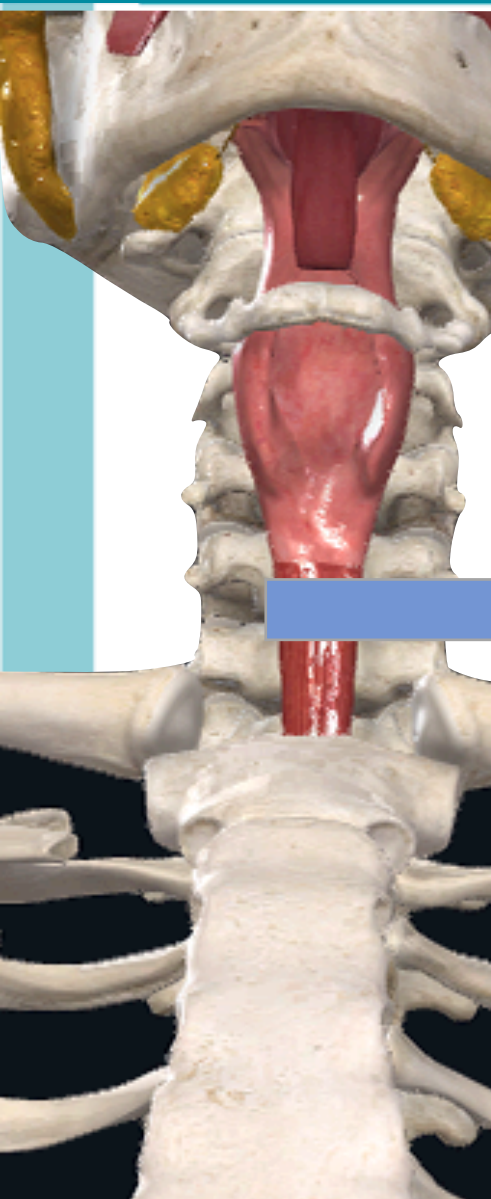
Recognize sonoanatomy

Fixed parts first

GI TRACTS



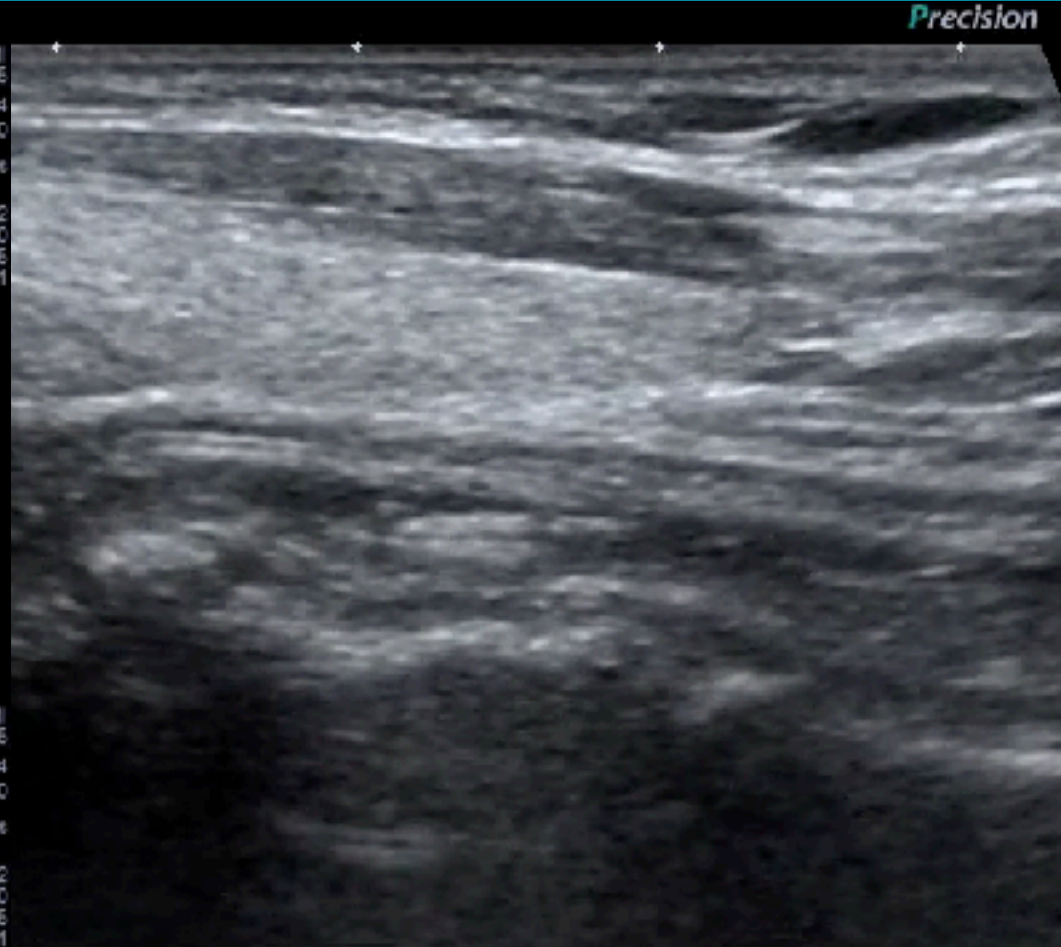
CERVICAL ESOPHAGUS



CERVICAL ESOPHAGUS



M
1.6
11L4
dBT9.0
30 fps
G 82
DR 60
Λ 6
P.1



M
1.6
11L4
dBT9.0
30 fps
G 82
DR 60
Λ 6
P.1



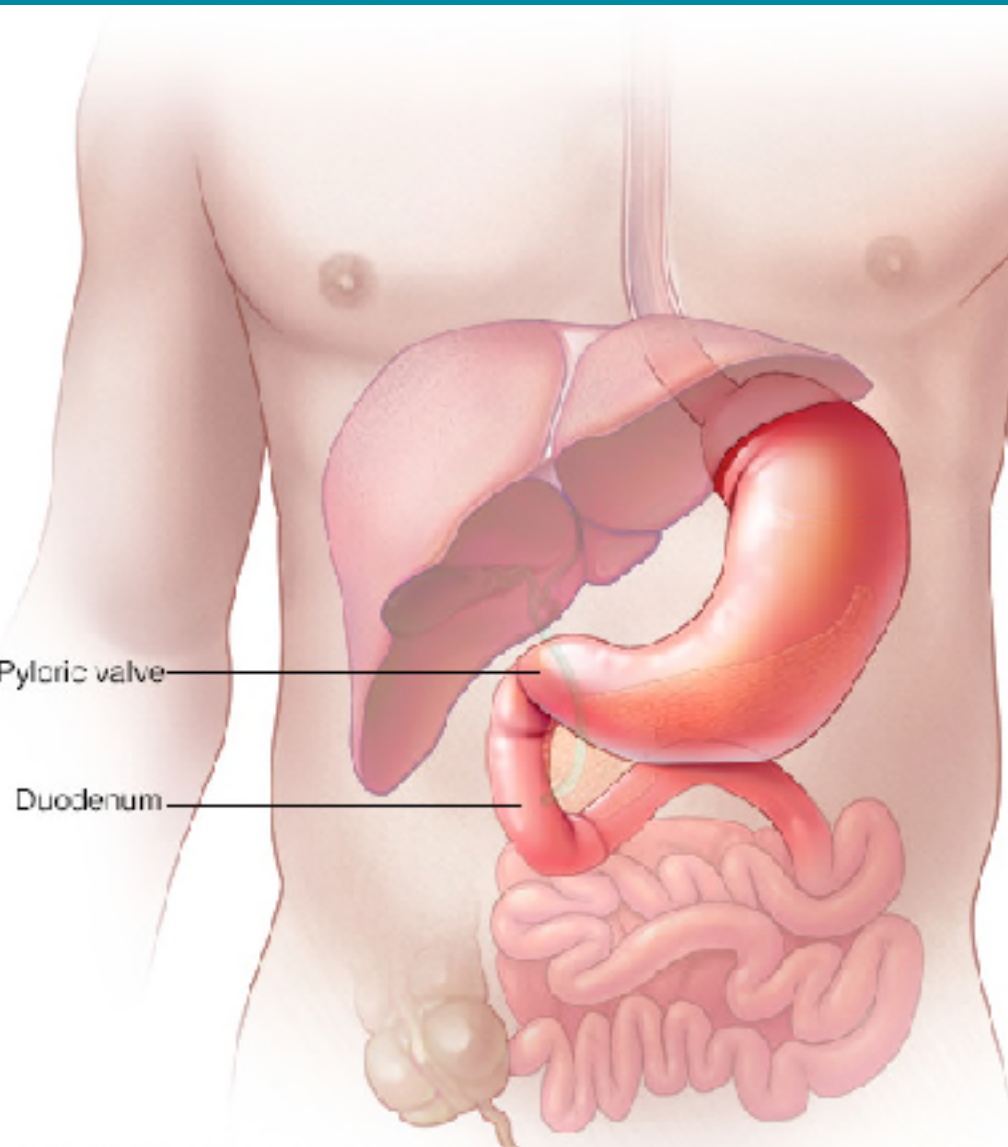
T

11
diffT9
30 f
Qsc
G:
DR:
A
P

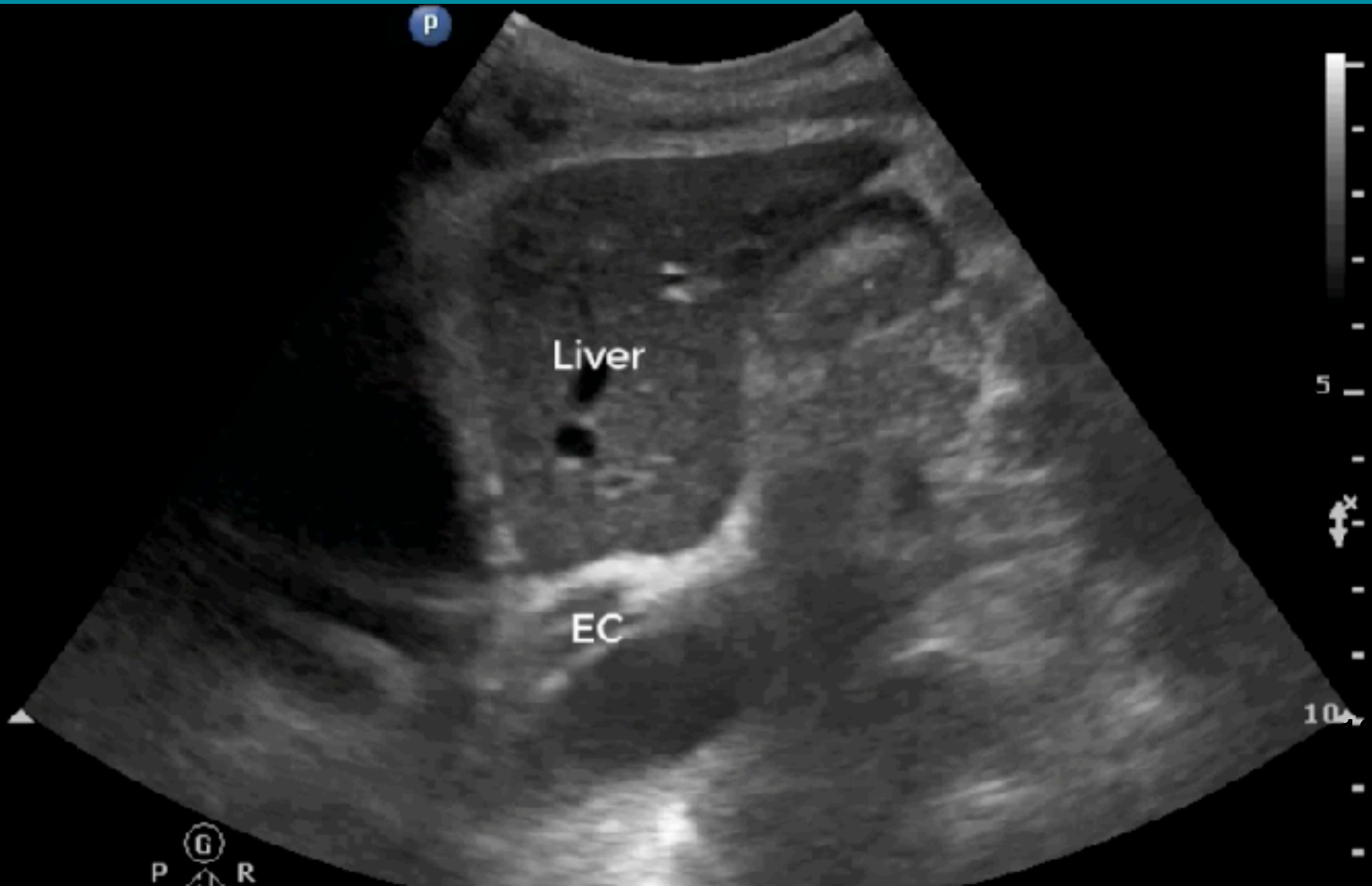


ETT & NG confirmation

EC JUNCTION



EC JUNCTION

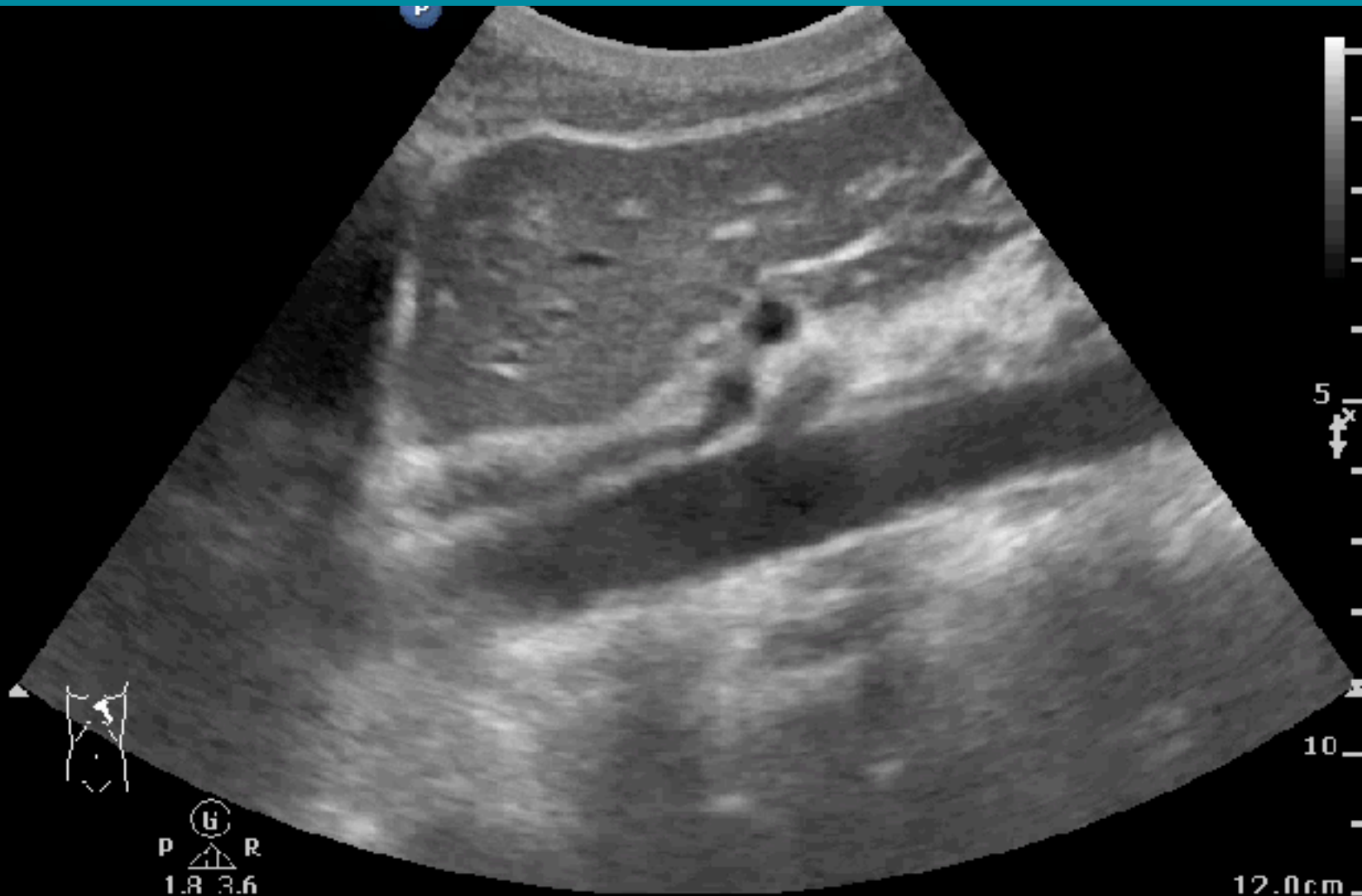


PNEUMOPERITONEUM LANDMARK

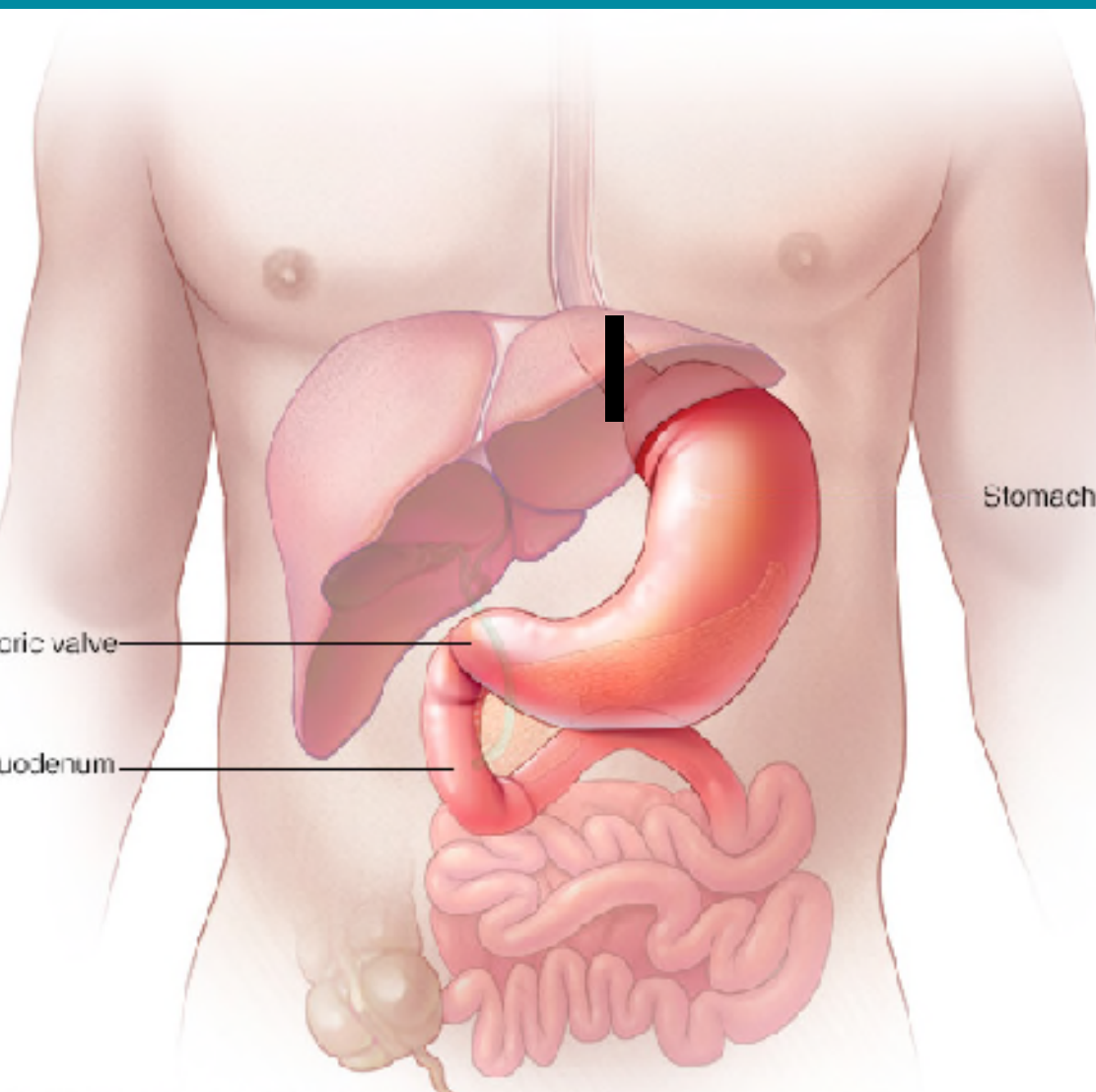
Abd Gen
C5-1
39 H7
12.0cm

2D

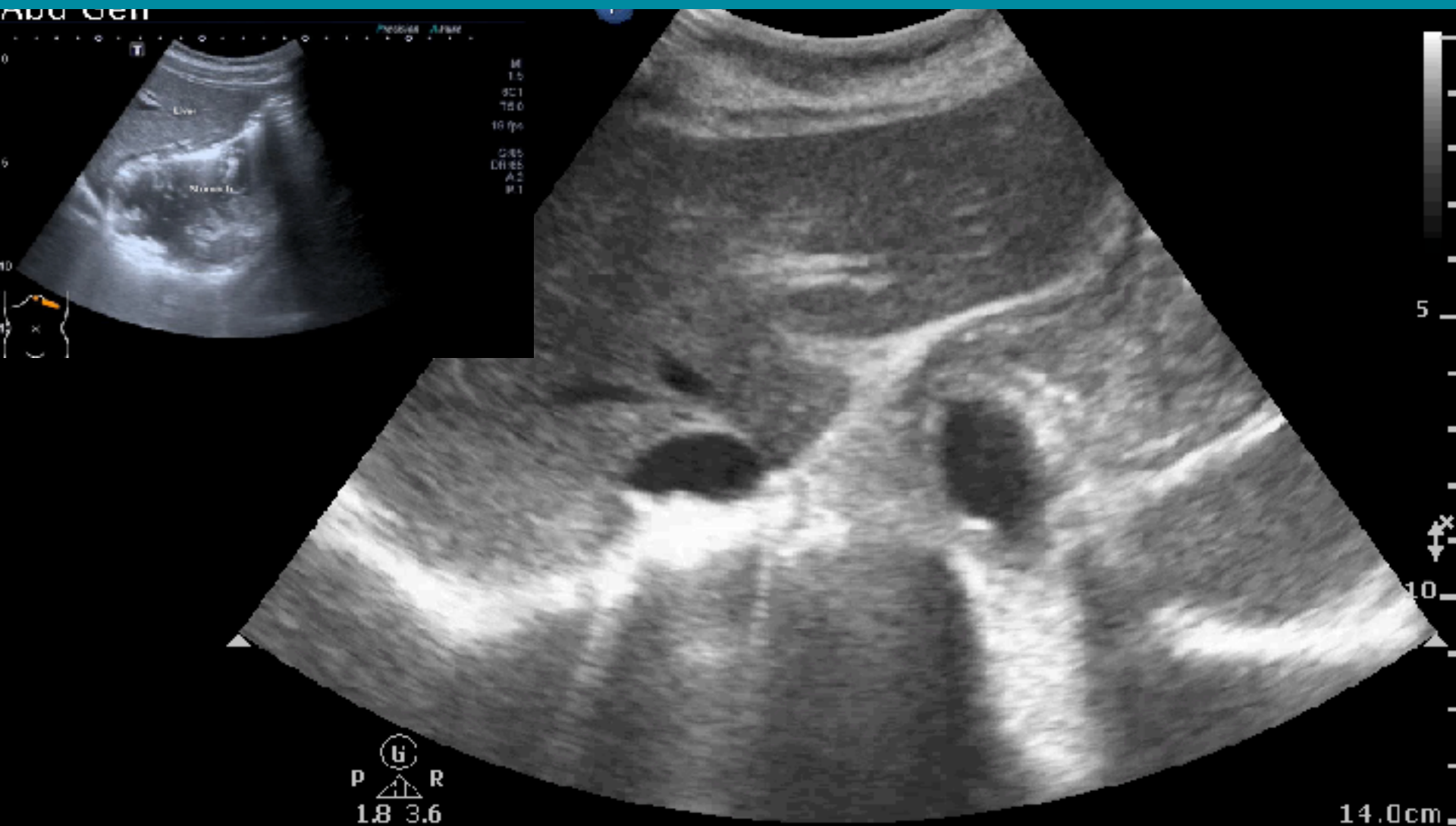
HGen
Gn 100
C 56
3/3/3



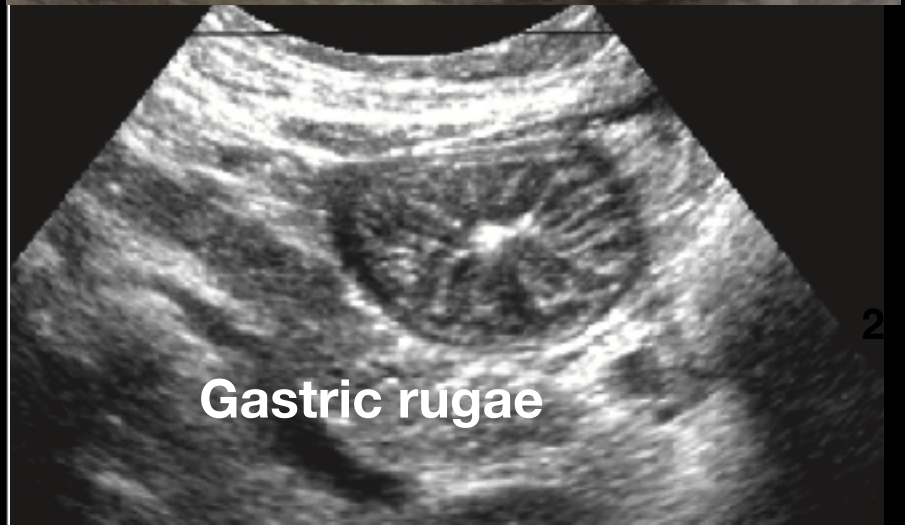
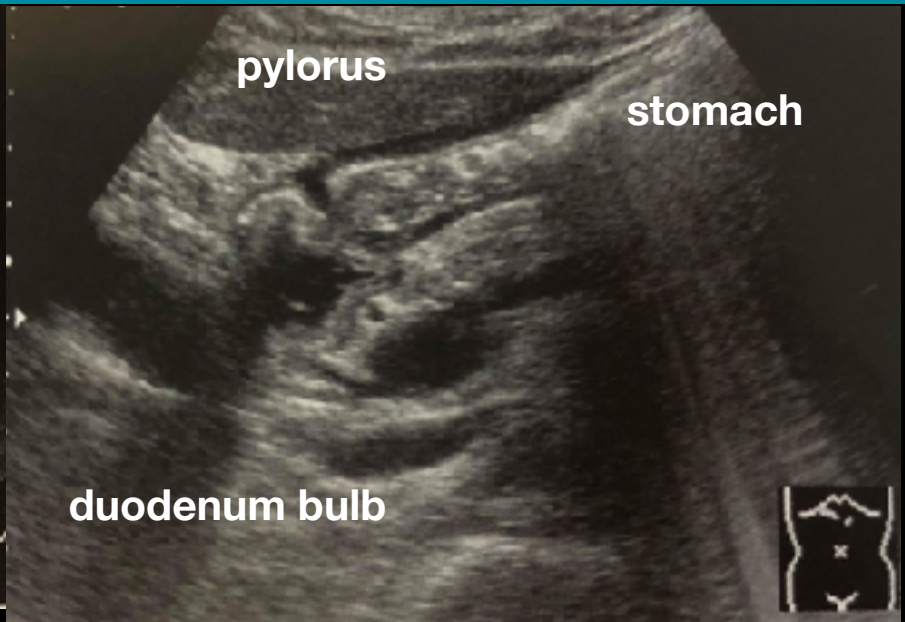
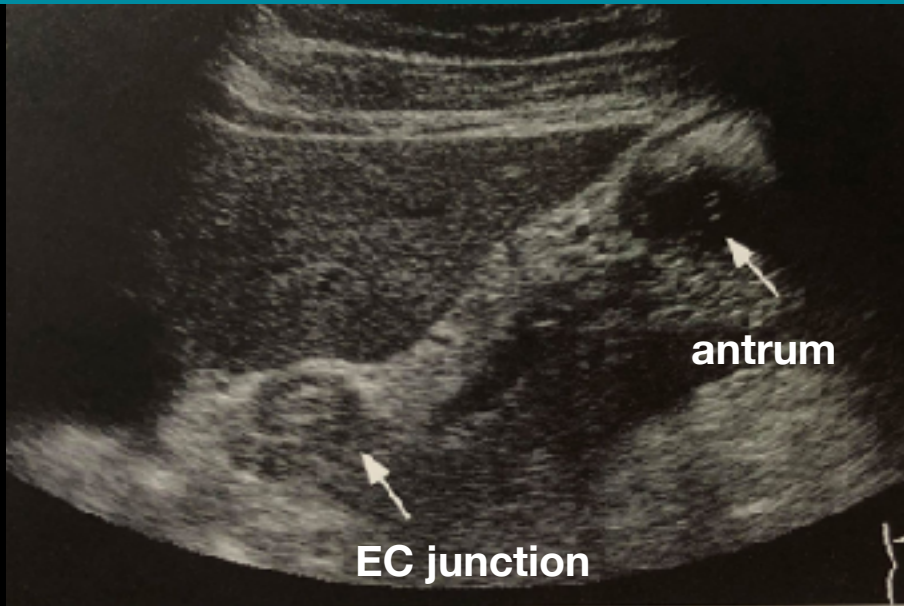
EC JUNCTION - STOMACH



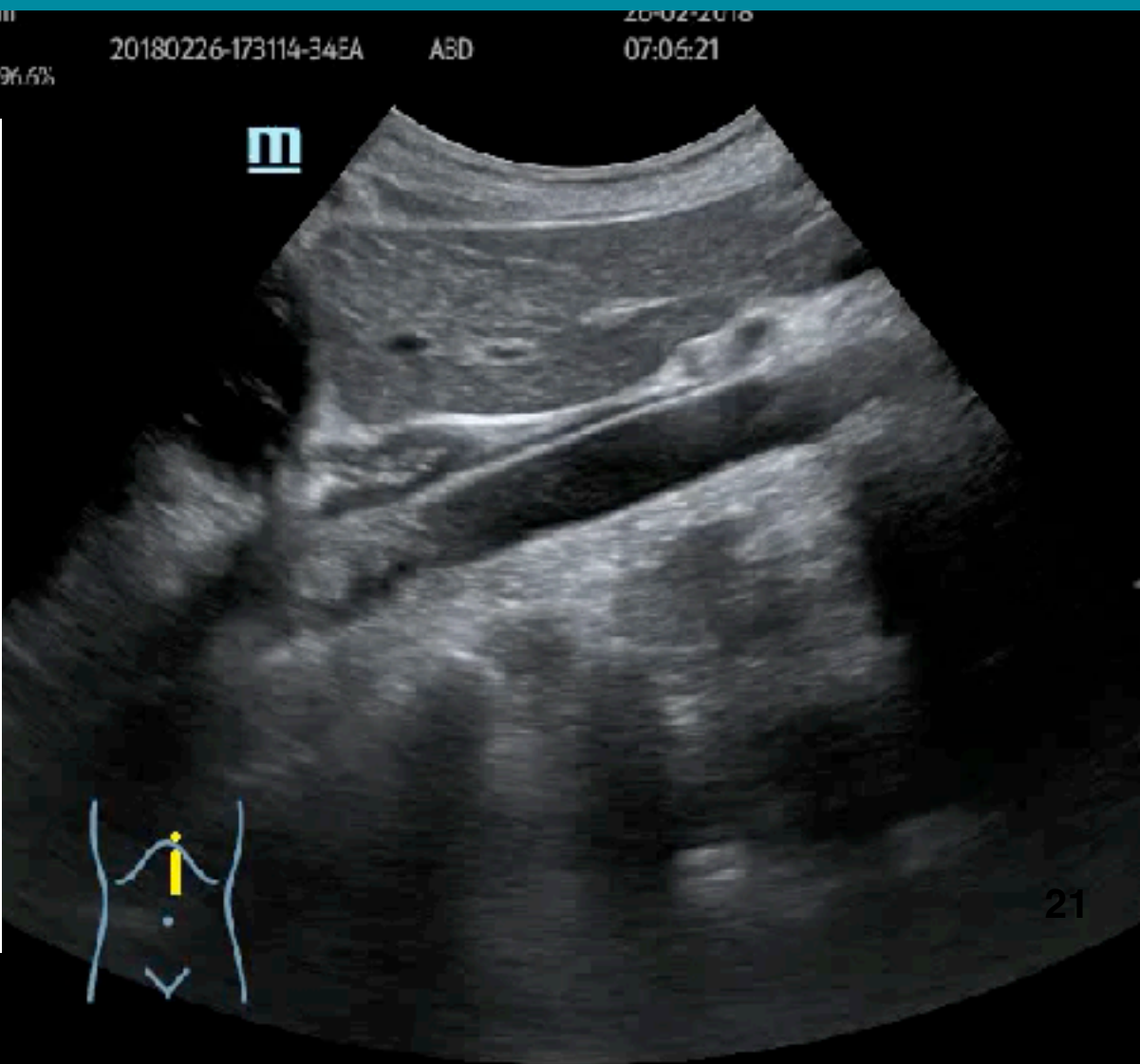
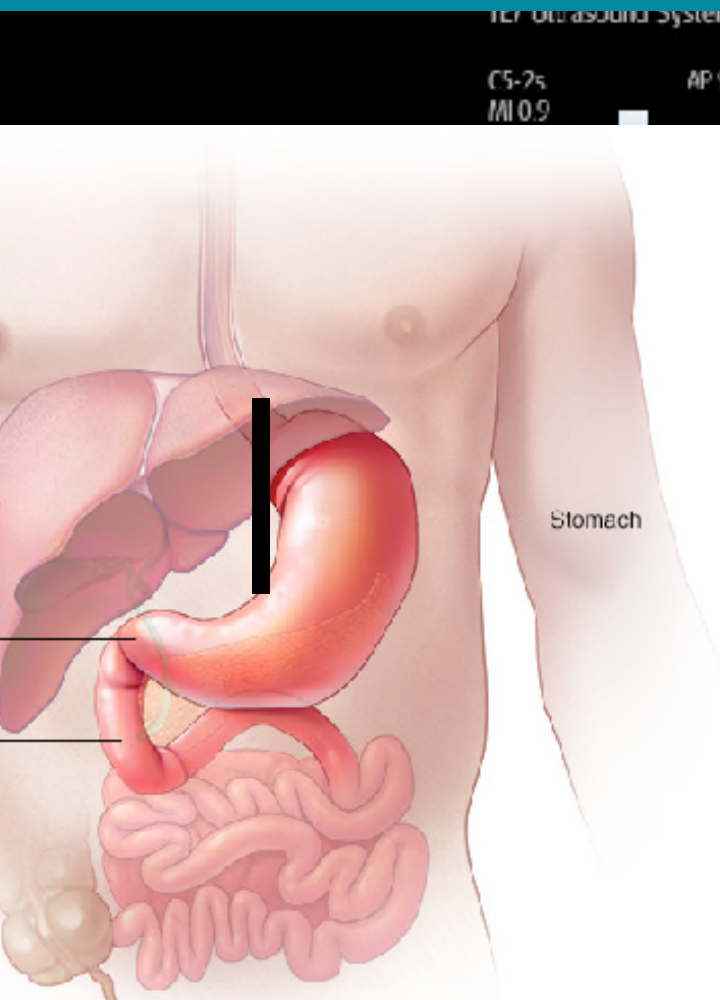
EC JUNCTION - STOMACH



STOMACH



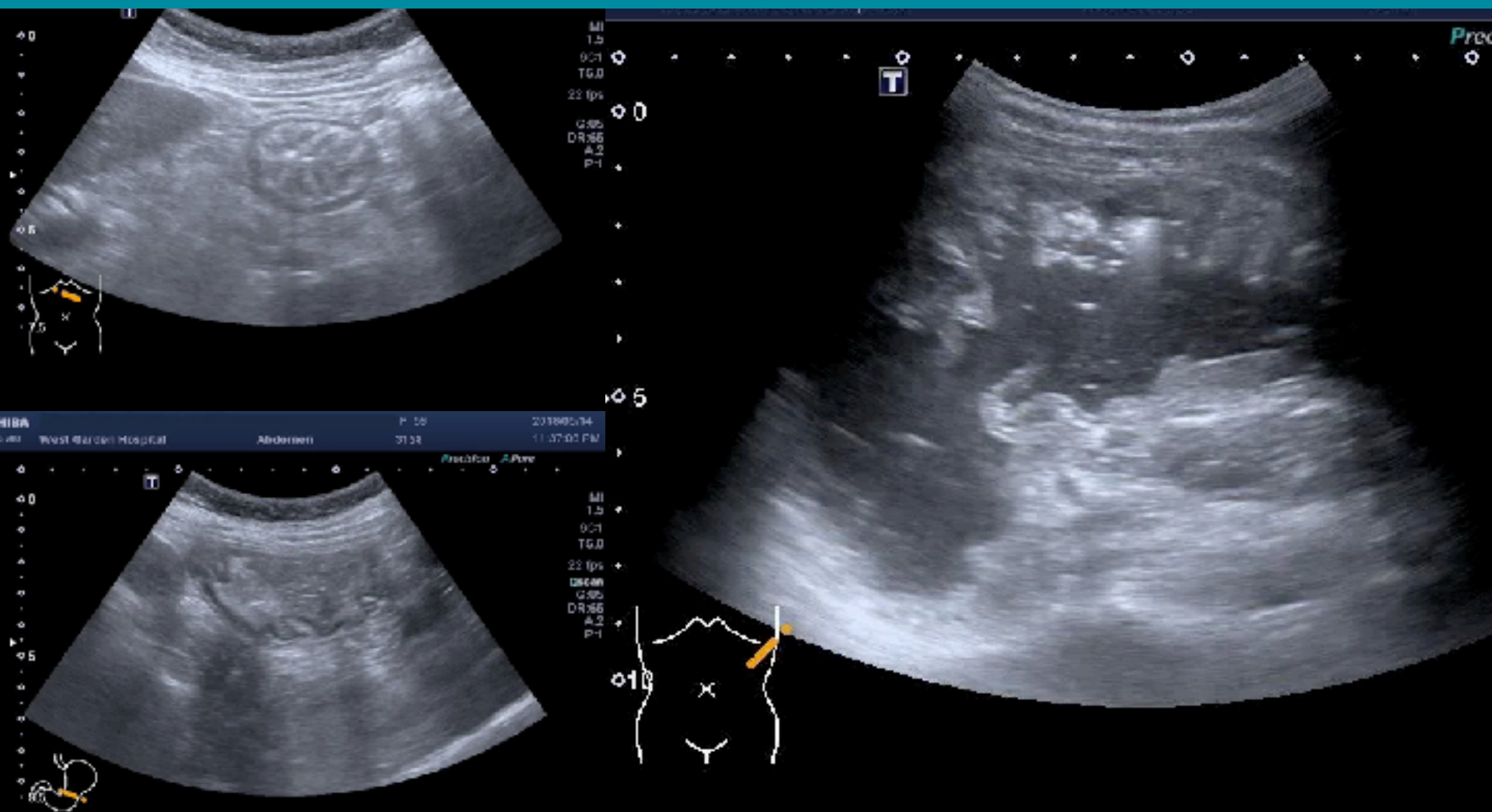
STOMACH



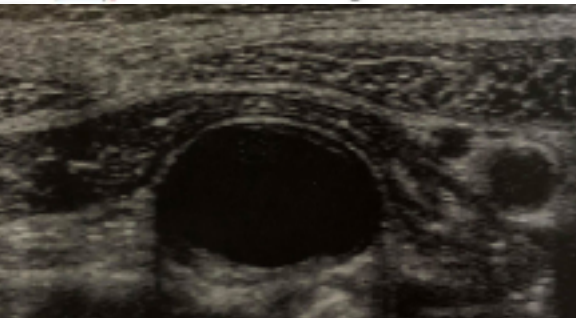
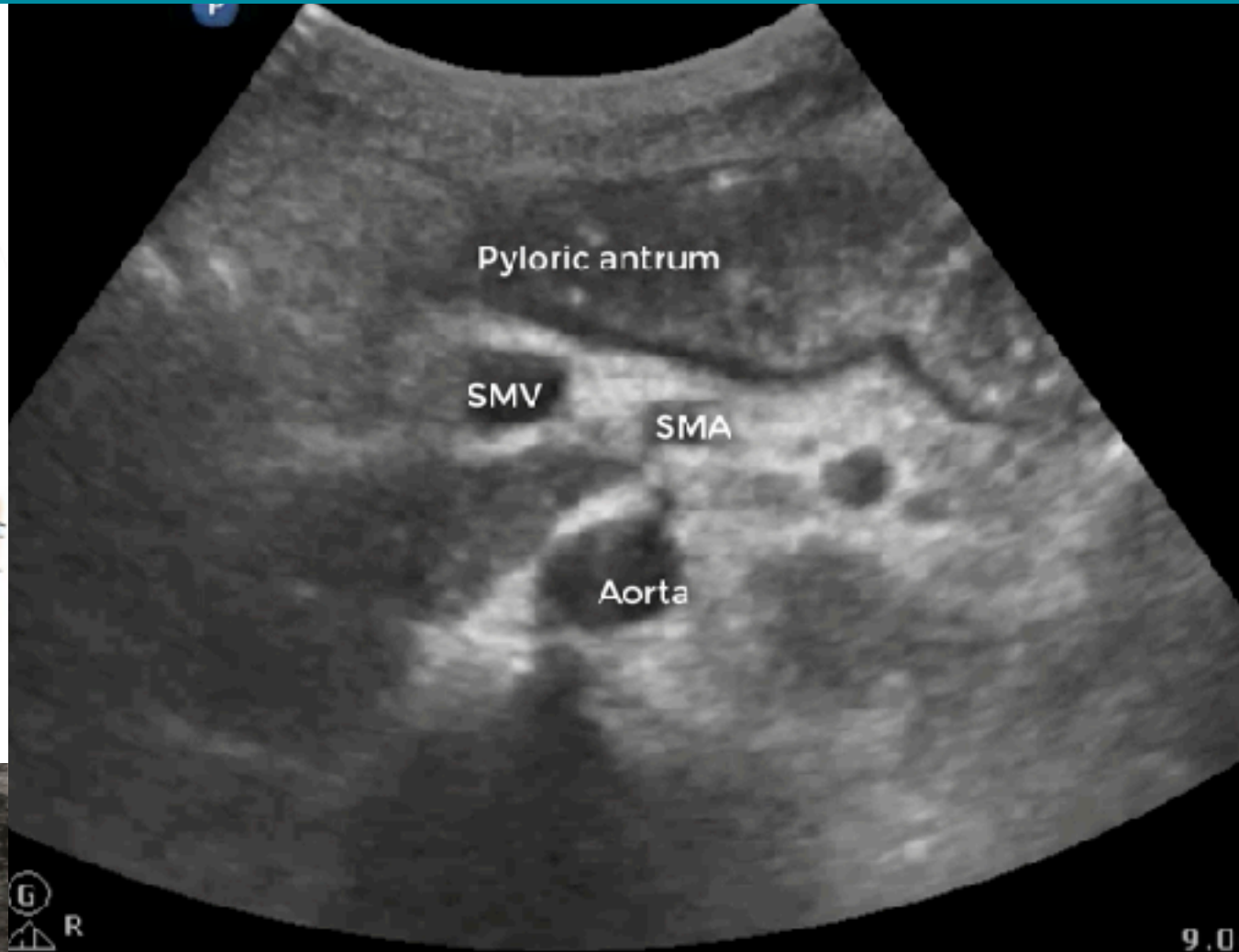
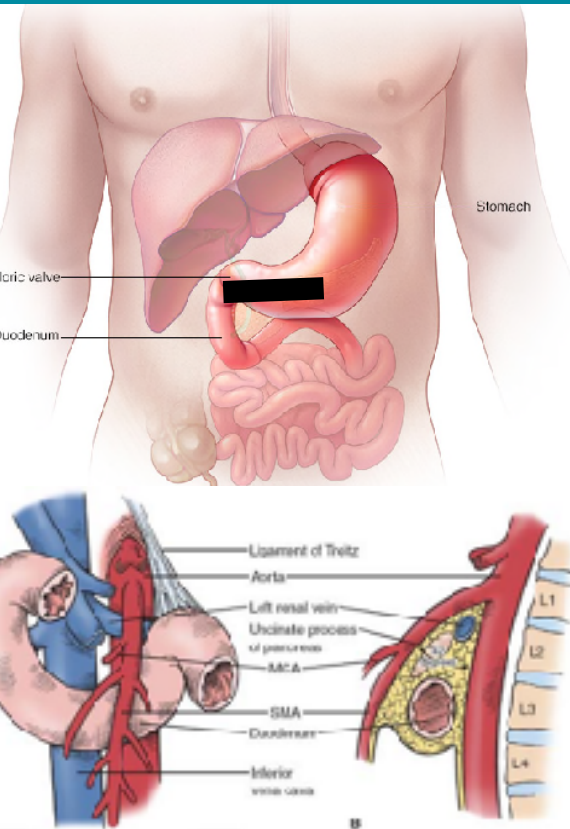
RUGAE



RUGAE



STOMACH-ANTRUM-DUODENUM



G
R
3 3.6

9.0

STOMACH-ANTRUM-DUODENUM



STOMACH

Abd Gen
C5-1
36 Hz
14.0cm

2D

HGen
Gn 100
C. 56
3/3/3



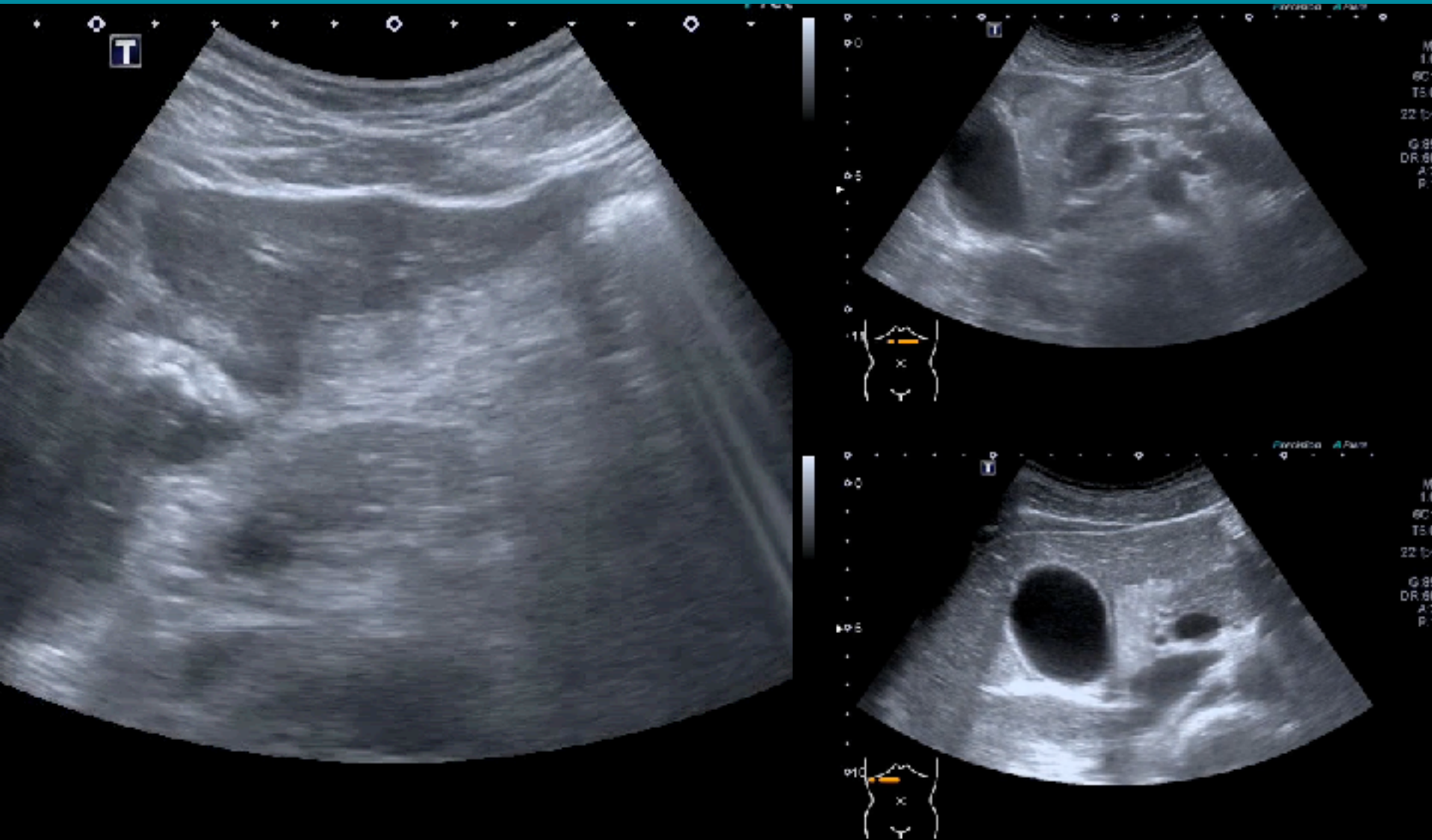
ANTRUM



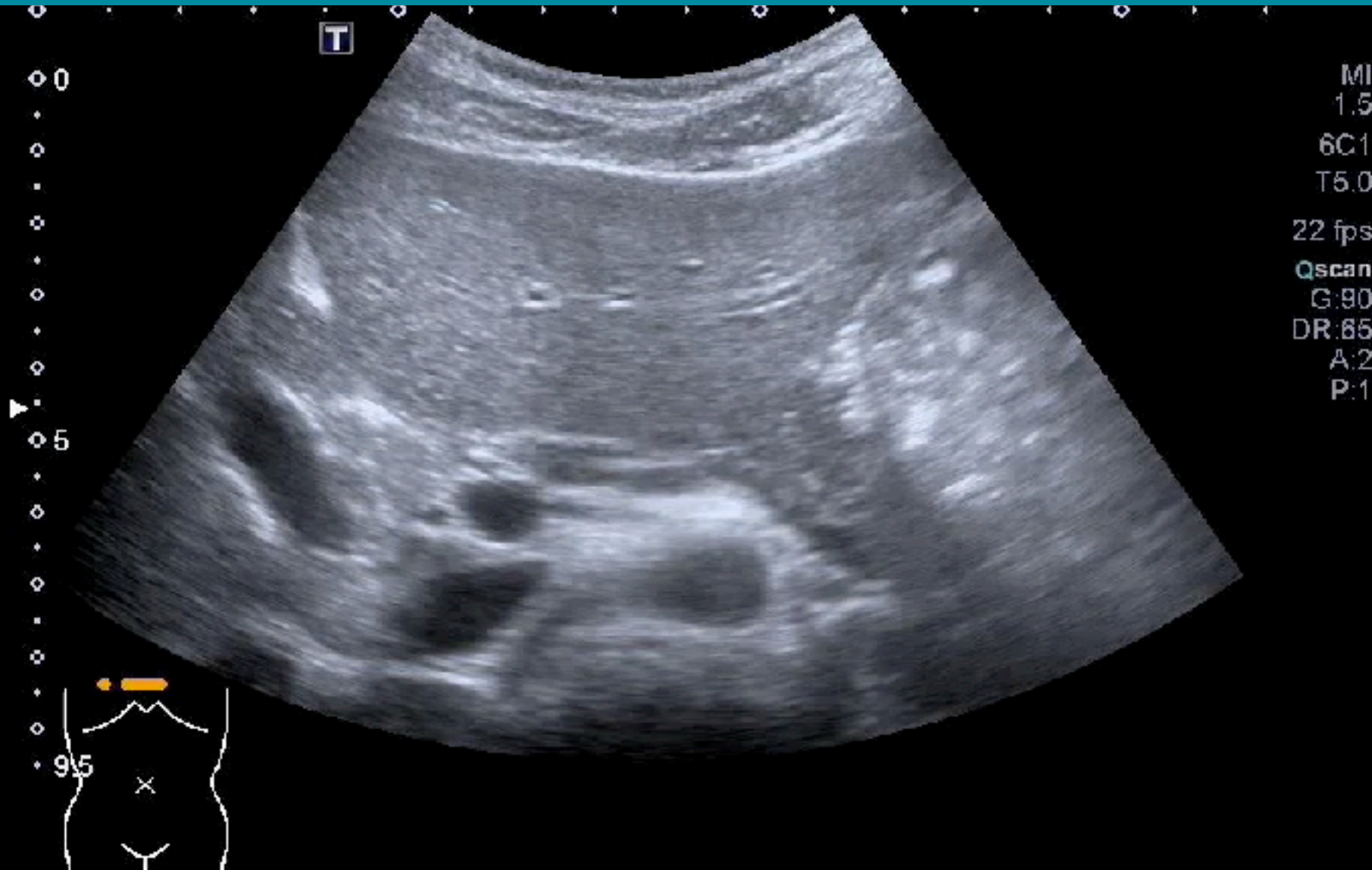
ANTRUM



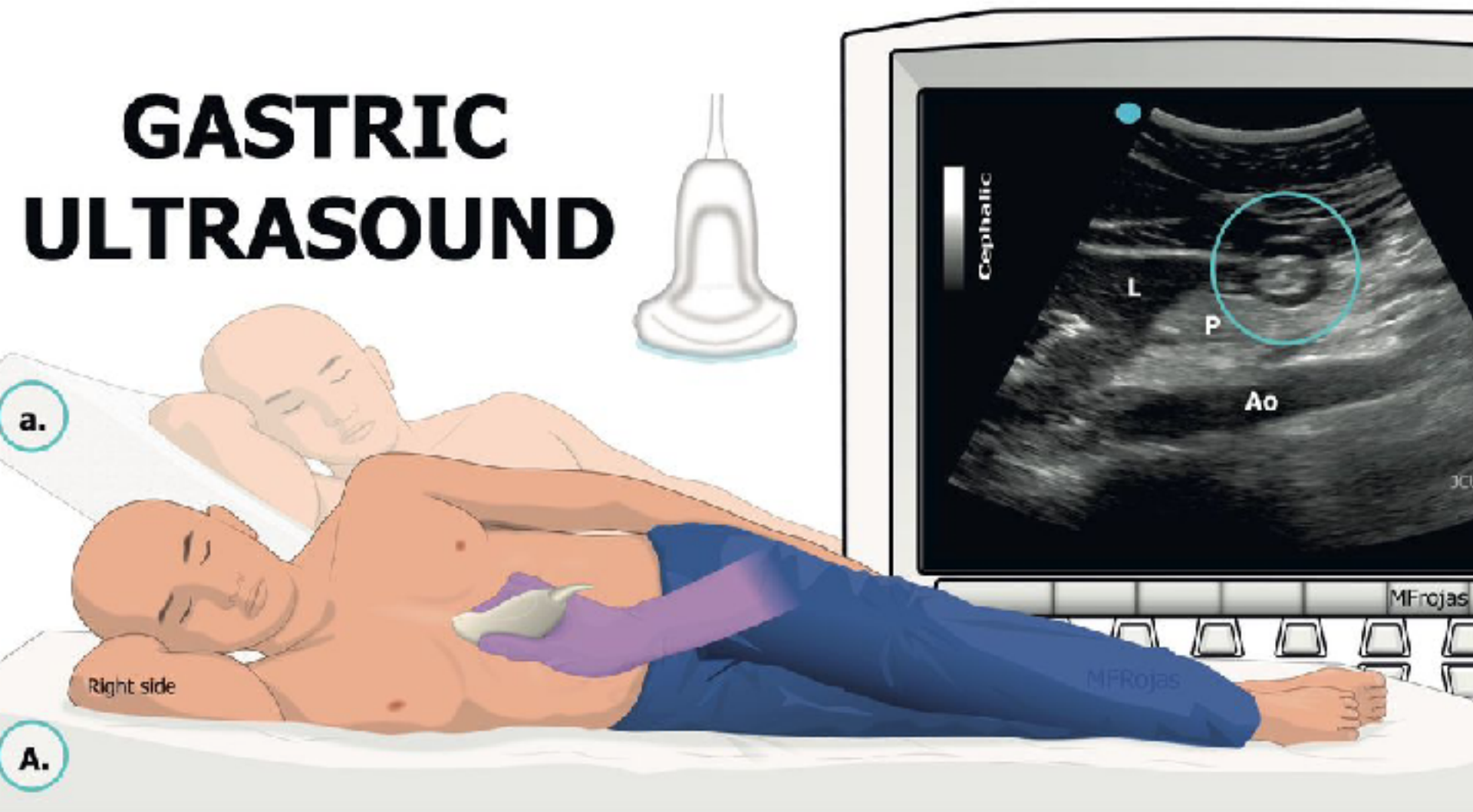
ANTRUM-DUODENUM



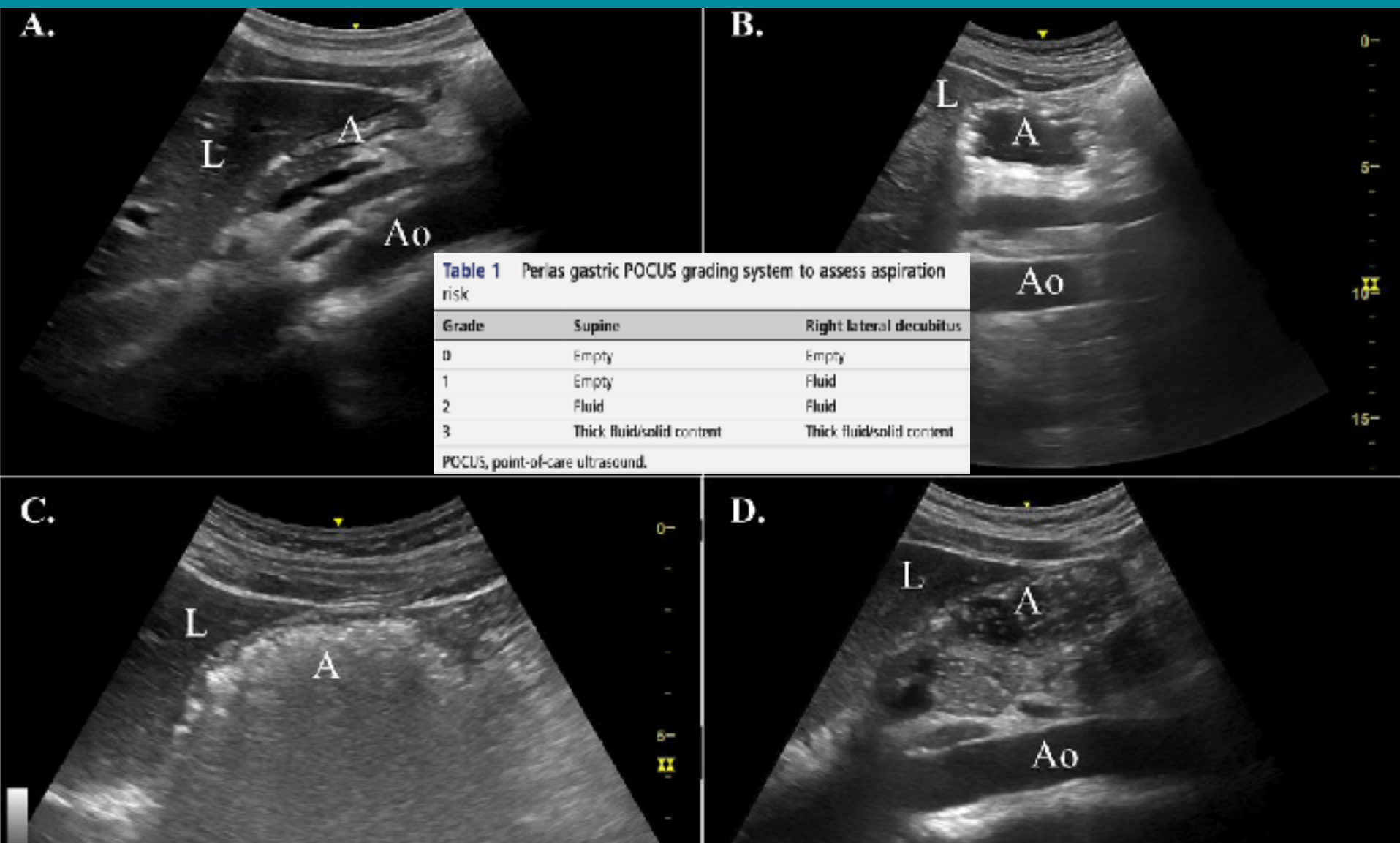
GASTRIC OUTLET OBSTRUCTION EVALUATION



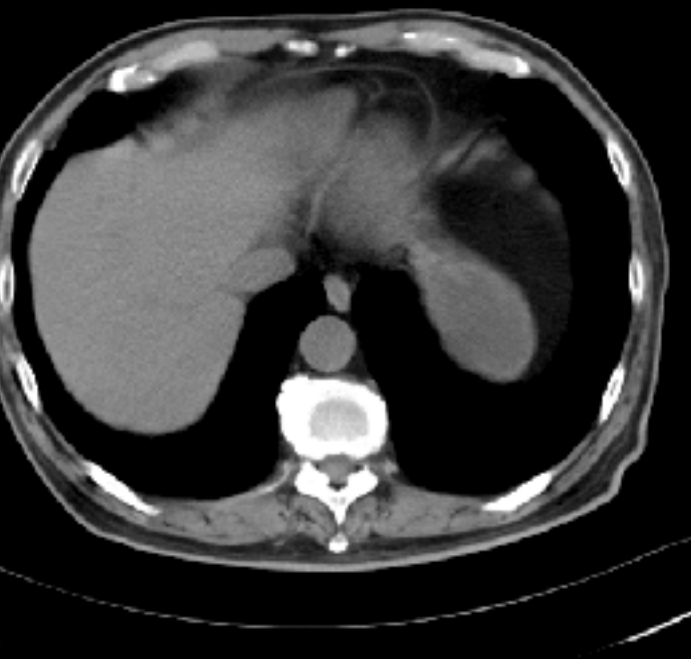
GASTRIC ULTRASOUND



GASTRIC ULTRASOUND



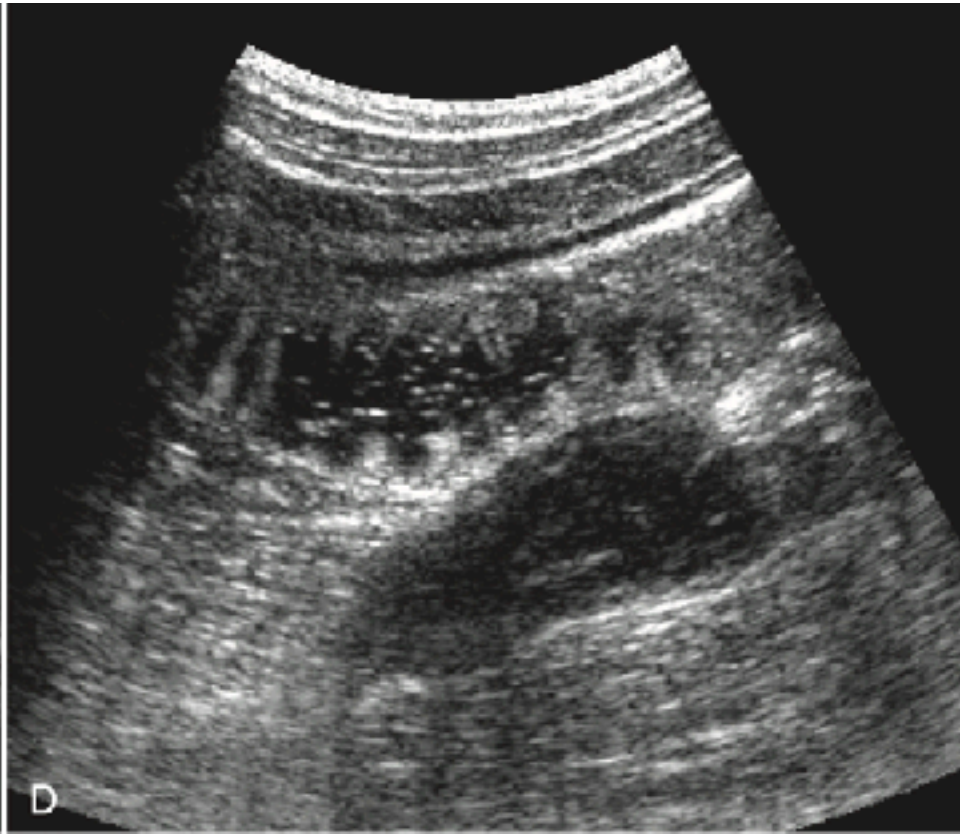
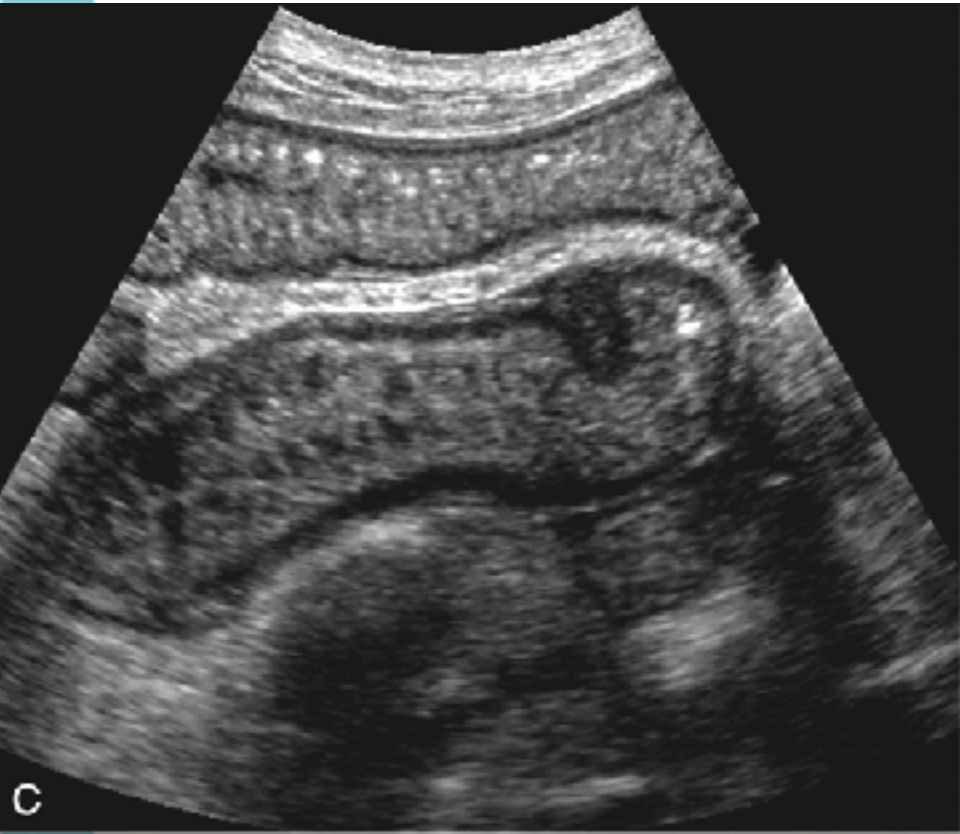
63M , EPIGASTALGIA



Duodenal adenocarcinoma

SMALL BOWEL

Fold of Kerckring (Valvulae conniventes)



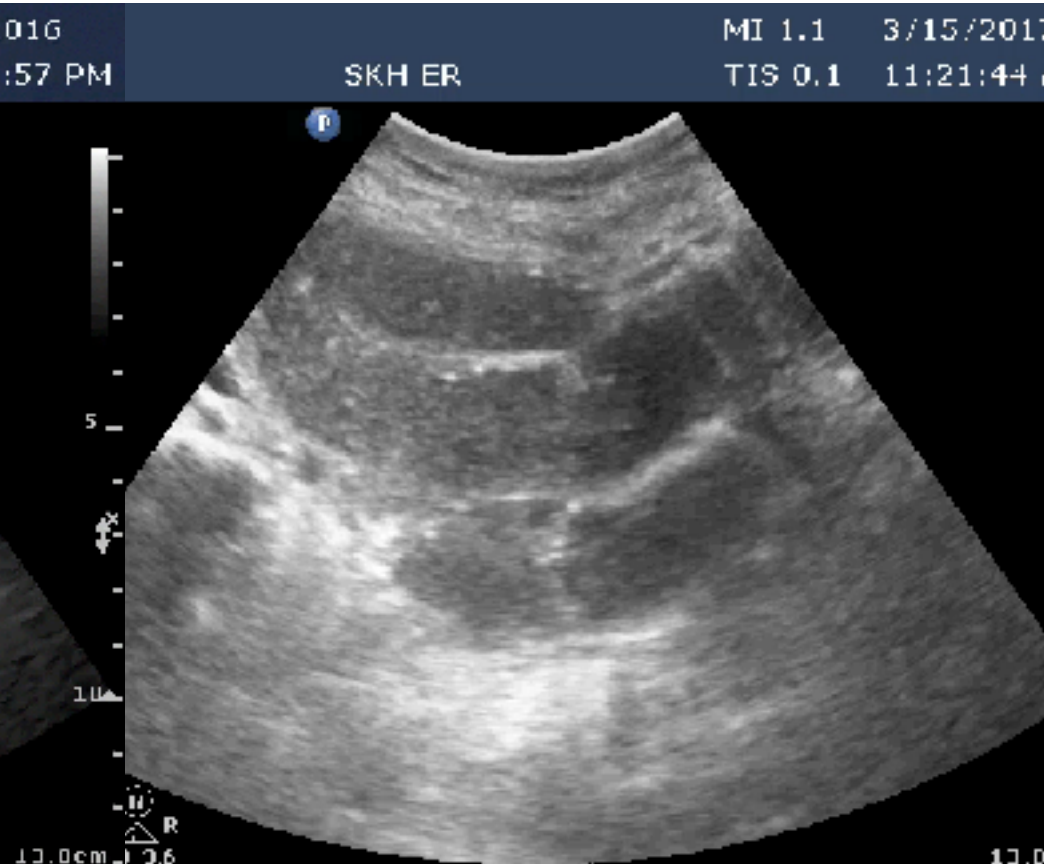
SMALL BOWEL

Fold of Kerckring (Valvulae conniventes)

Jejunum



Ileum



SMALL BOWEL

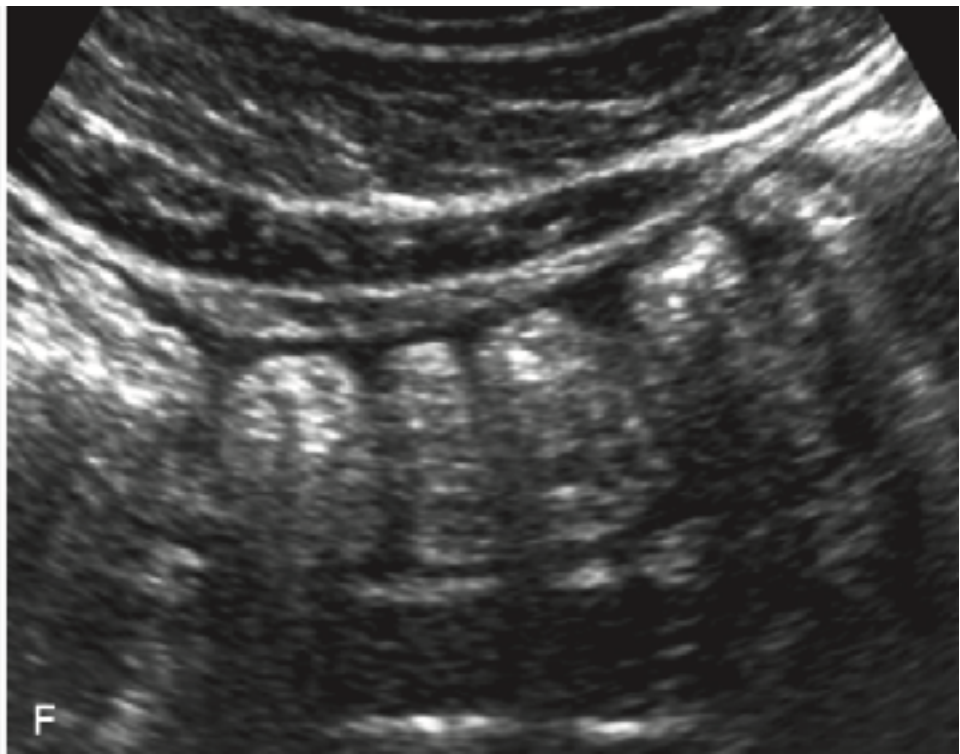
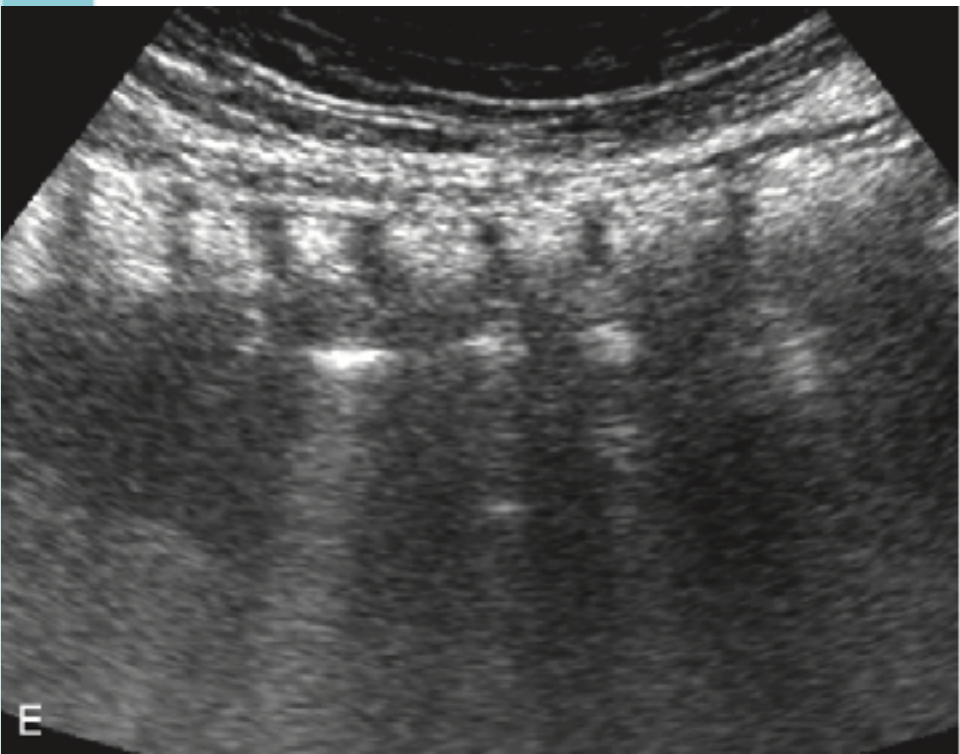
MI 0.9
TIS 0.7

B
FH5.0
DR120
FR26
D 12.0
G 50

m



COLON-HAUSTRATION



COLON: A COLON

Abd Gen
C5-1
51 Hz
8.0cm

2D
HGen
Gn 100
C. 56
3/3/3



COLON: D COLON

Abd Gen
C5-1
55 Hz
7.0cm

2D
HGen
Gn 86
C. 56
3/3/3



P R
1.8 3.6

7.0cm

COLON-HAUSTRATION

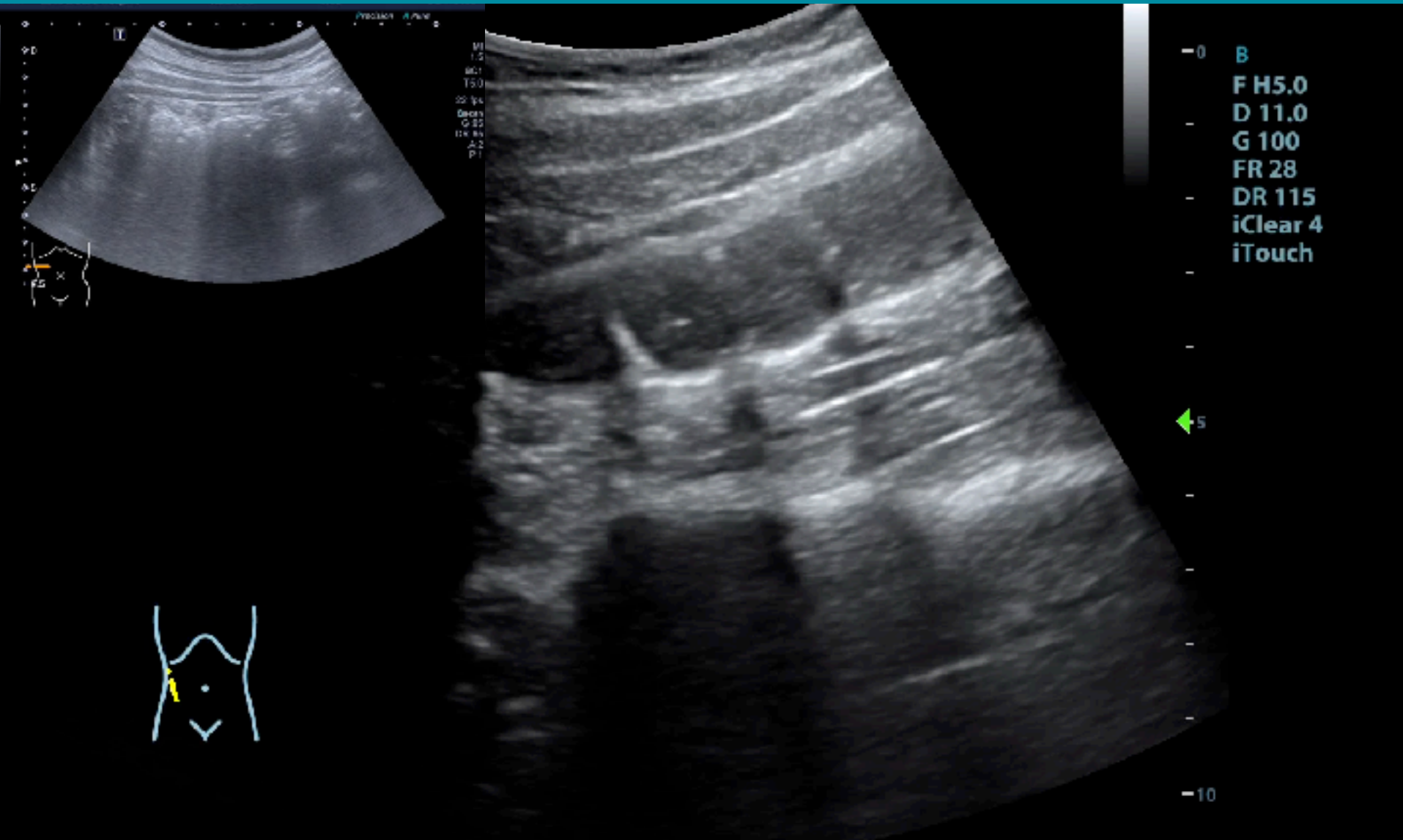
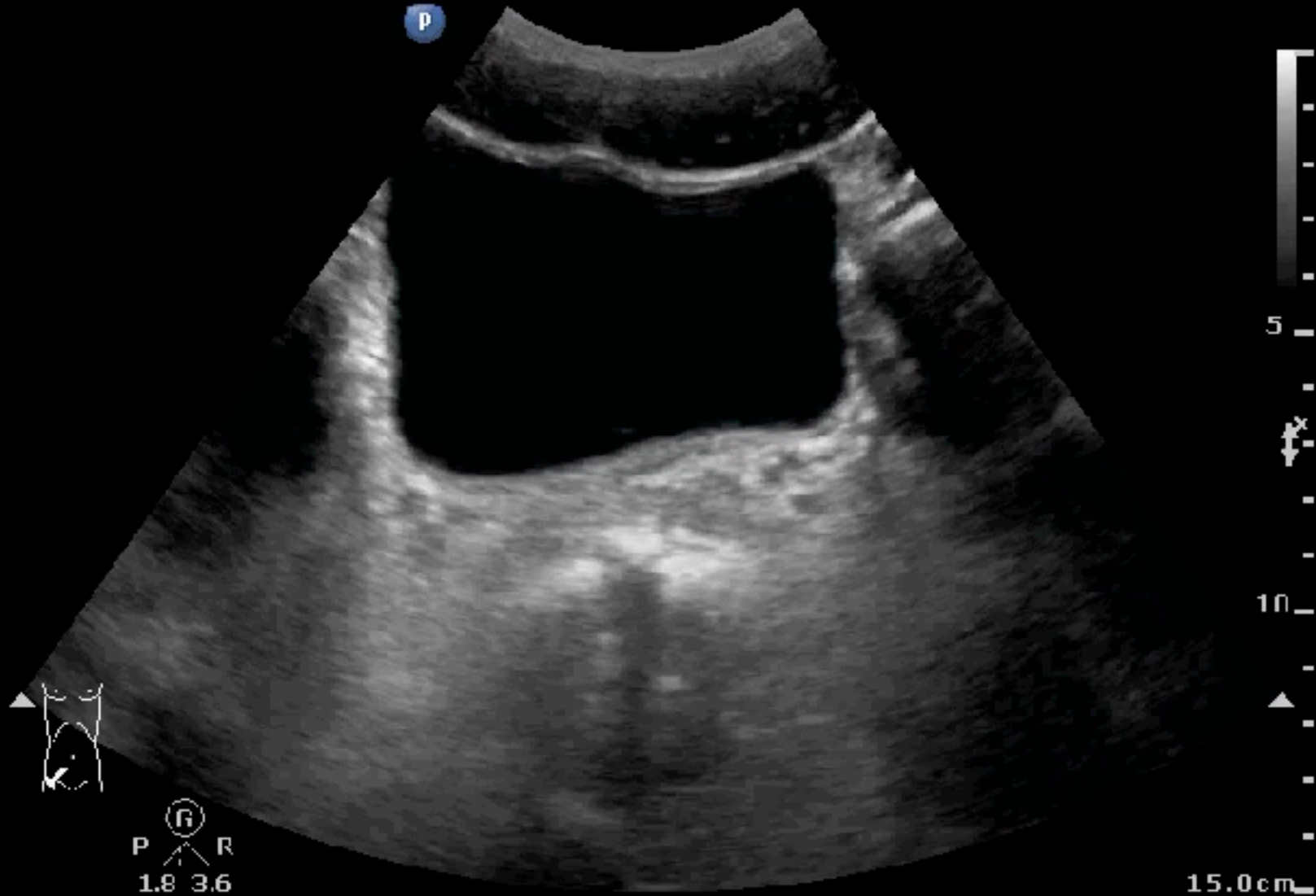


Figure 1 consists of two ultrasound images. Image (a) is a longitudinal view of the lumbar spine, showing the L5/S1 disc space. The disc is labeled 'D-C' and the psoas muscle is labeled 'psoas muscle'. Image (b) is an axial view of the lumbar spine, showing the L5/S1 disc space. The disc is labeled 'D-C' and the psoas muscle is labeled 'psoas muscle'. The images are labeled 'D-C' and 'psoas muscle'.

RECTUM

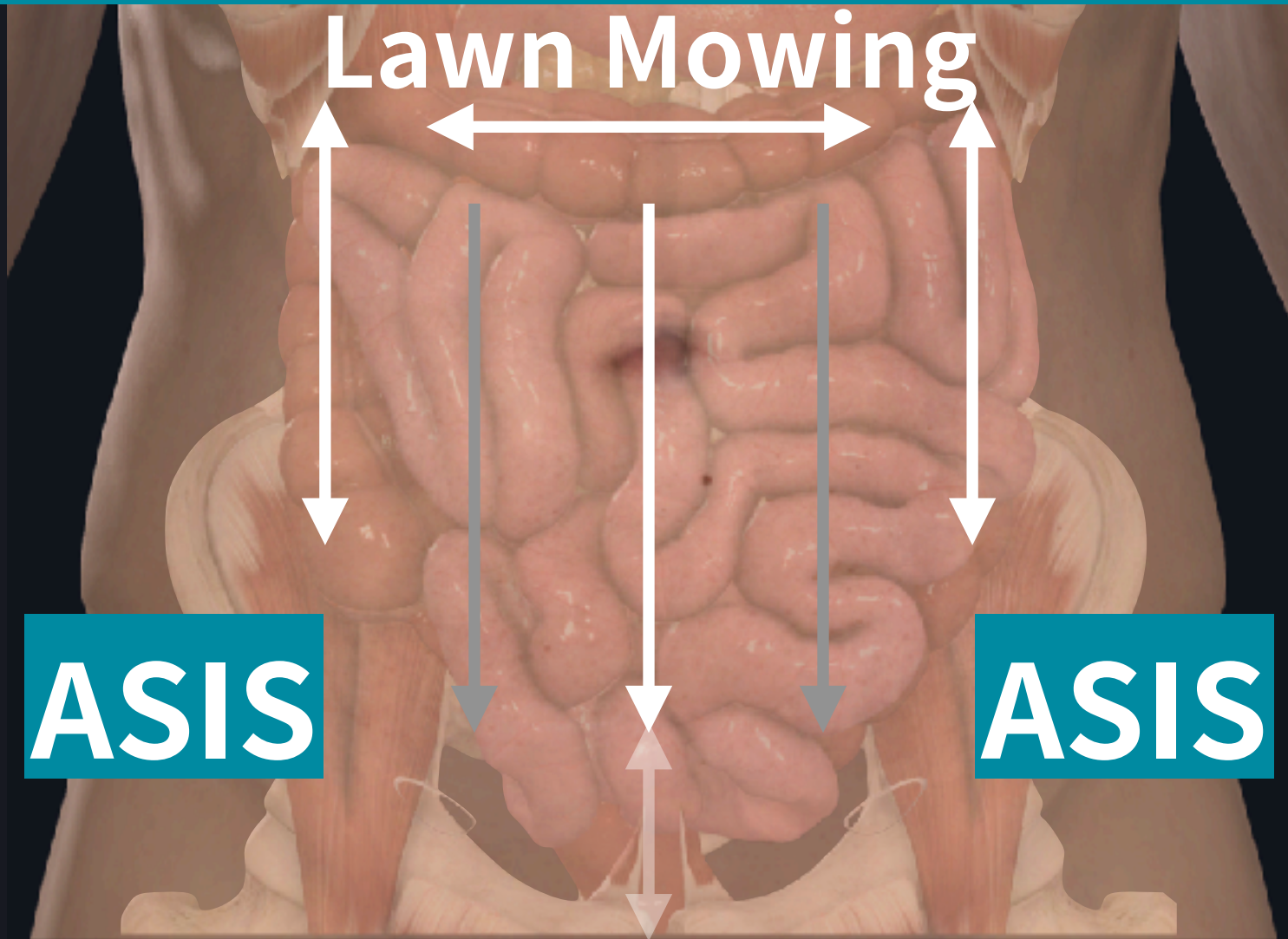
Abd Gen
C5-1
34 Hz
15.0cm

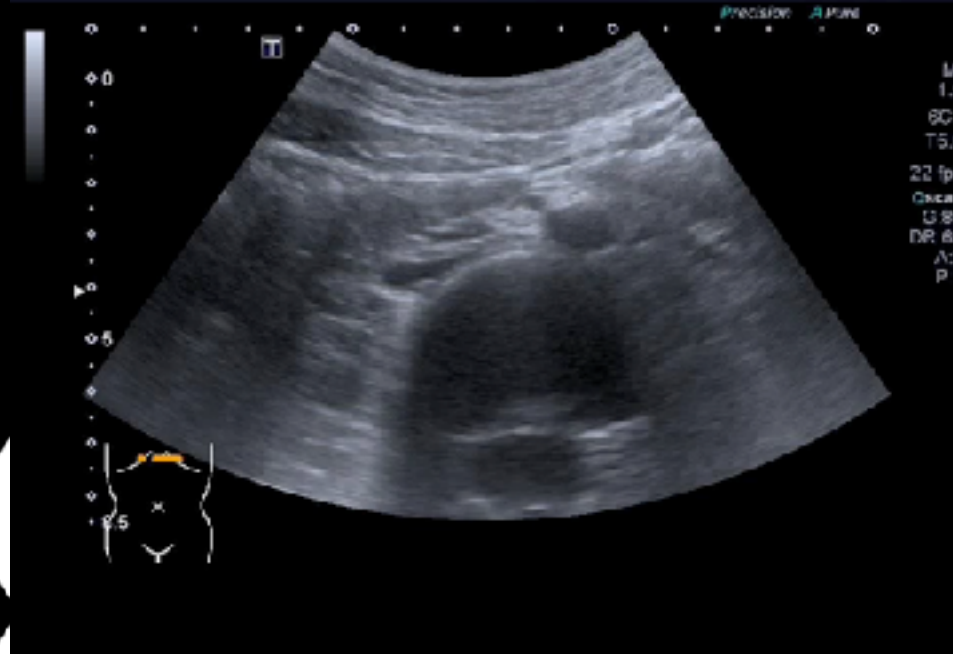
2D
HGen
Gn 55
C. 56
3/3/3



FIXED PARTS FIRST

FOR SMALL & LARGE INTESTINE





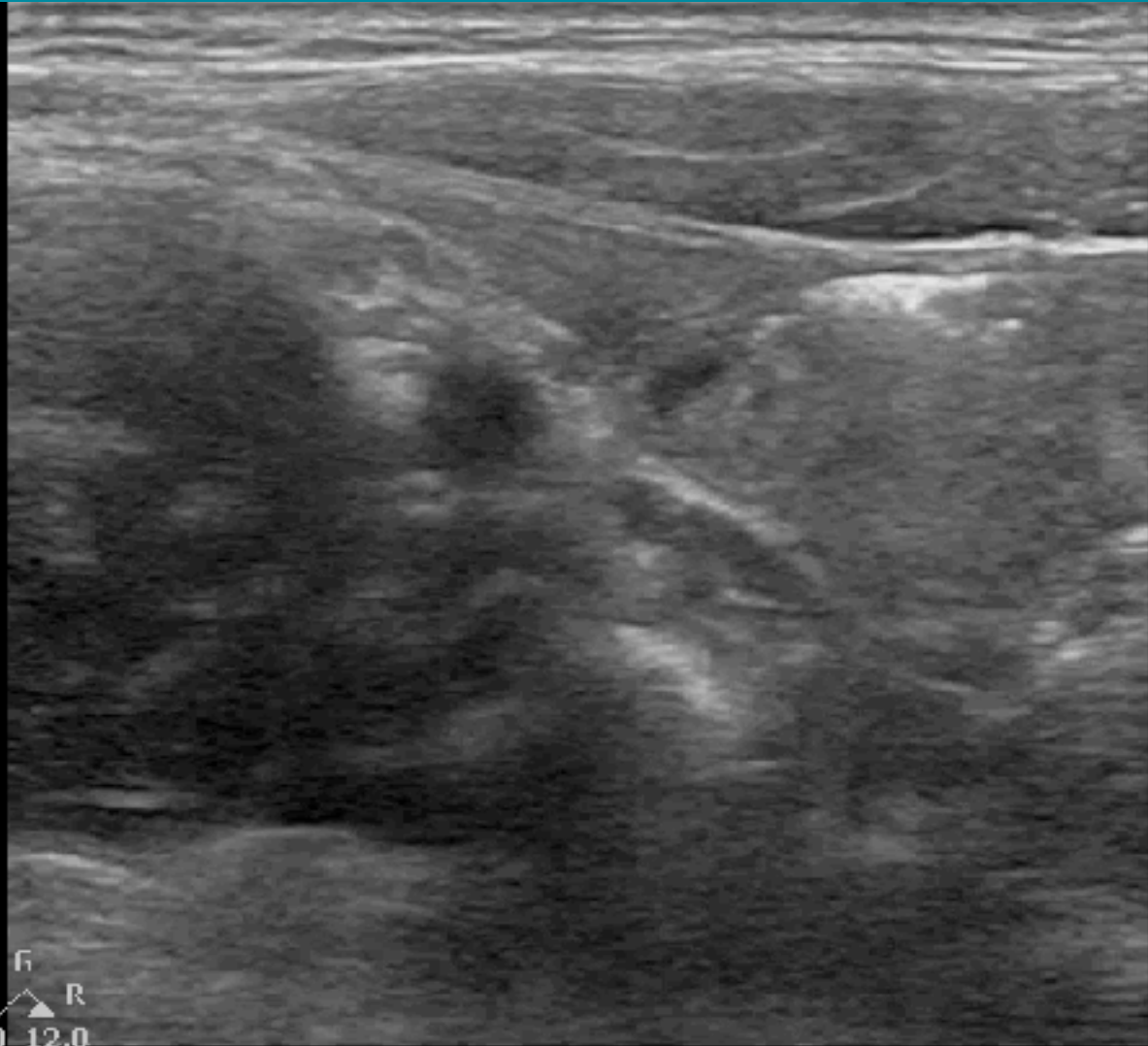
SMALL BOWEL / LYMPH NODES

Superficial
L12-3
46 Hz
3.5cm

2D
Res
Gn 100
C. 56
3/2/1



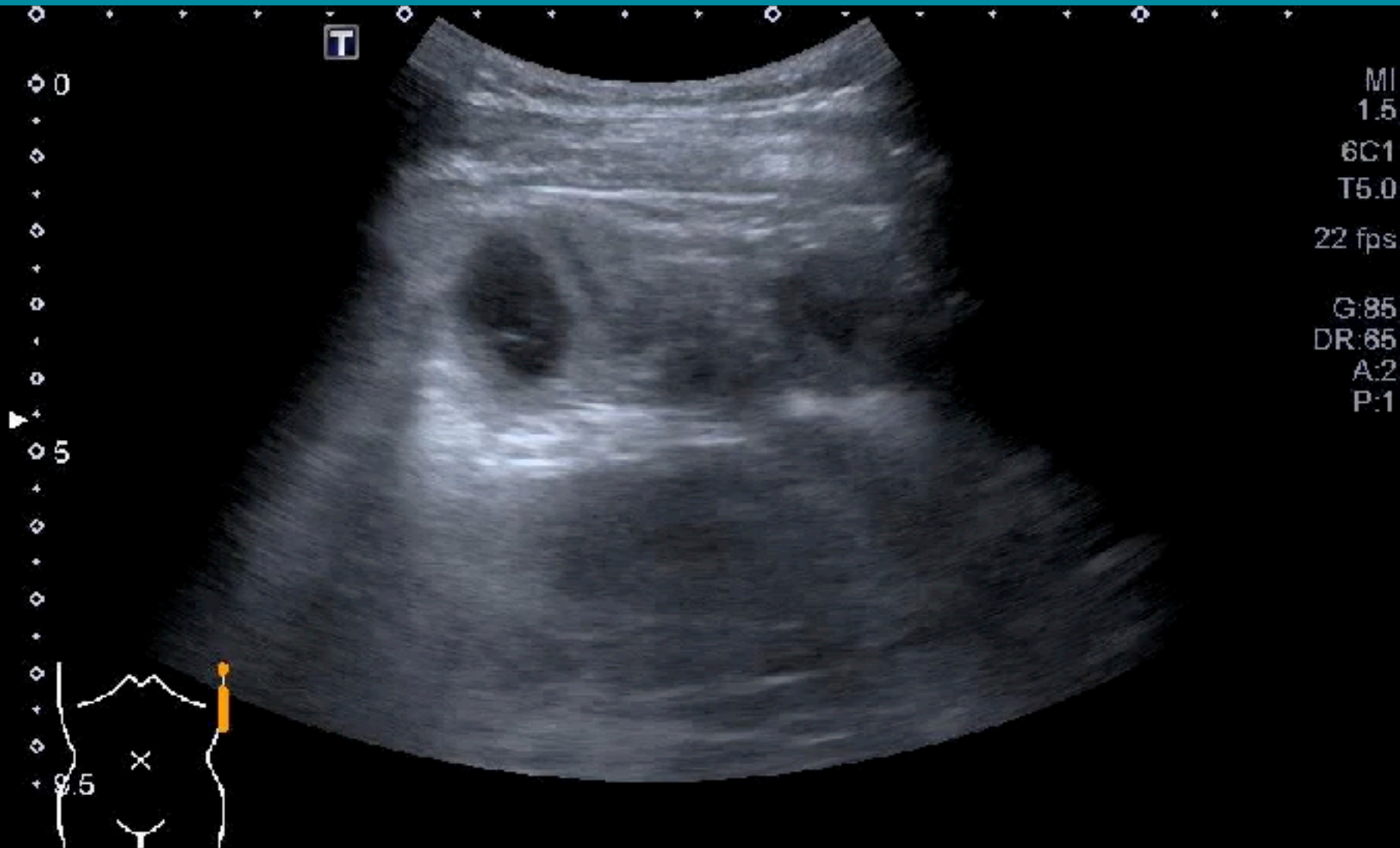
P R
3.0 12.0



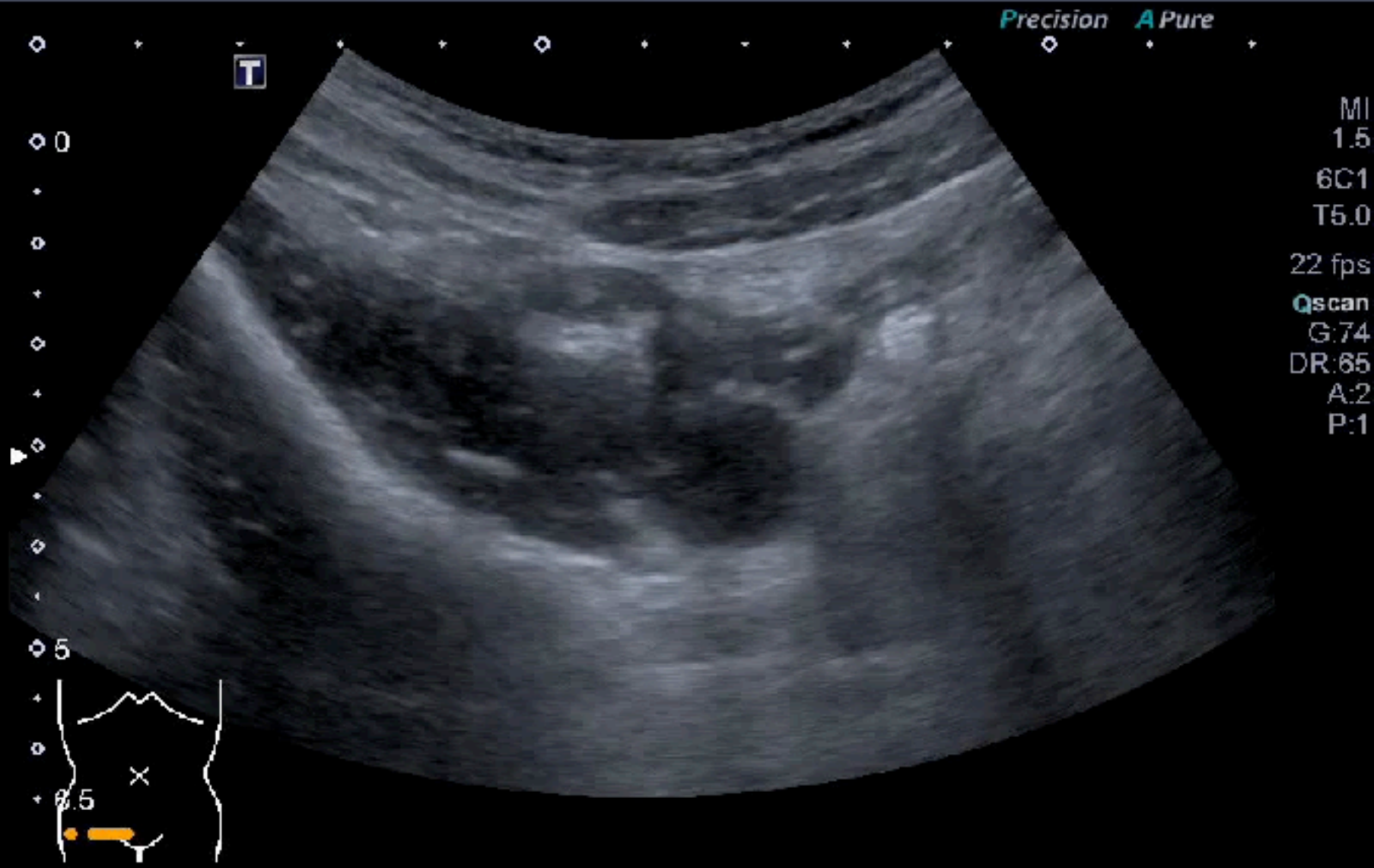
2

3.5cm

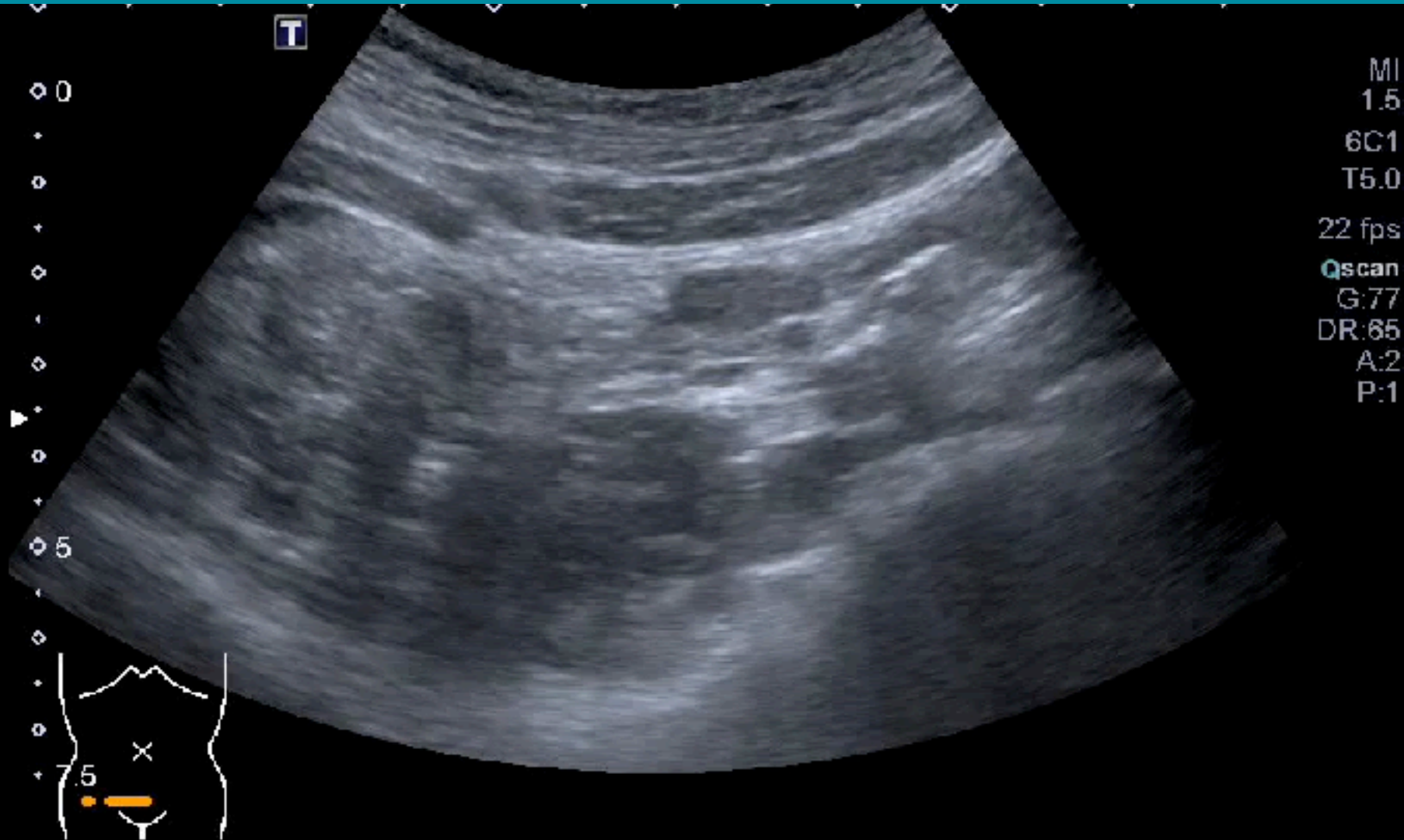
SMALL BOWEL



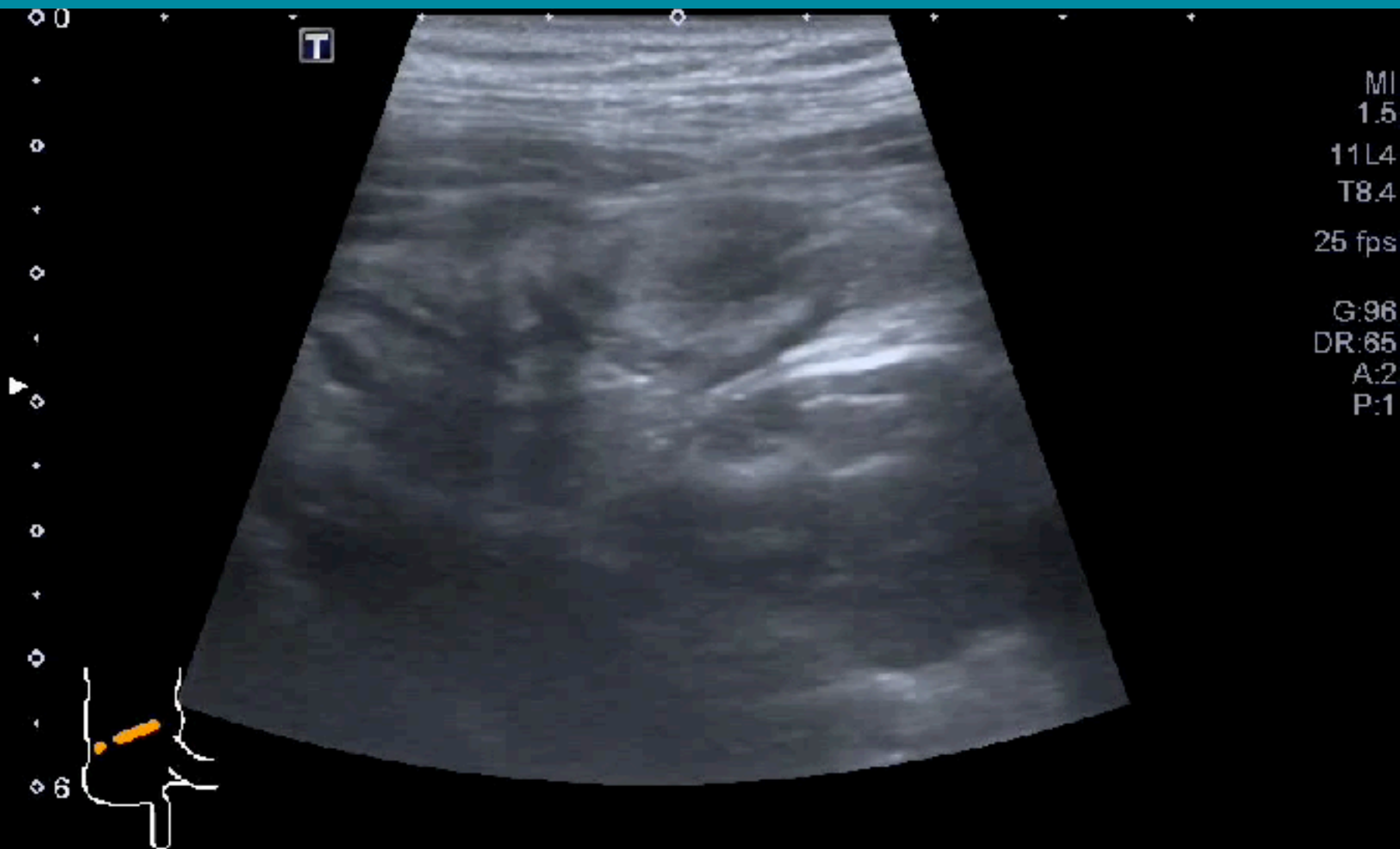
ILEOCECAL VALVE



APPENDIX



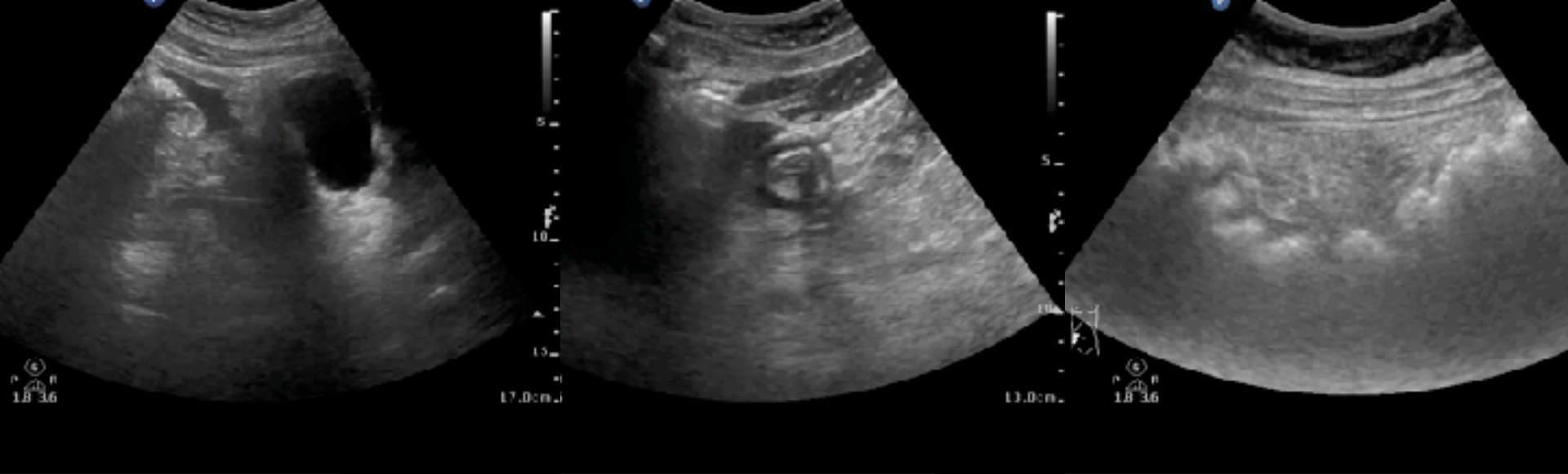
APPENDIX



GI ULTRASOUND: PATHOLOGIC PATTERNS



1. **Diameter** distended (3cm & 5cm)
2. **Unable to compress** during examination
3. **Wall** thickening (>5mm/1cm for stomach)
4. **Wall** stratification disappeared
5. **Luminal content** decreased at lesion sites
6. **Peristalsis** decreased
7. **Associated findings** (LN, Fat, ascites, abscess)



Ascites

Air

Fat

RECOGNIZE PATTERNS

ASCITES (DIRTY/ECHOGENIC)

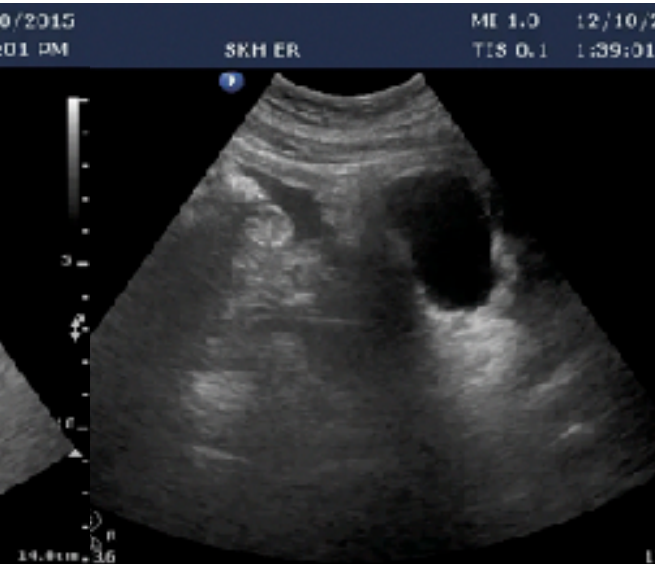
Around liver



Paracolic gutter



Pelvis

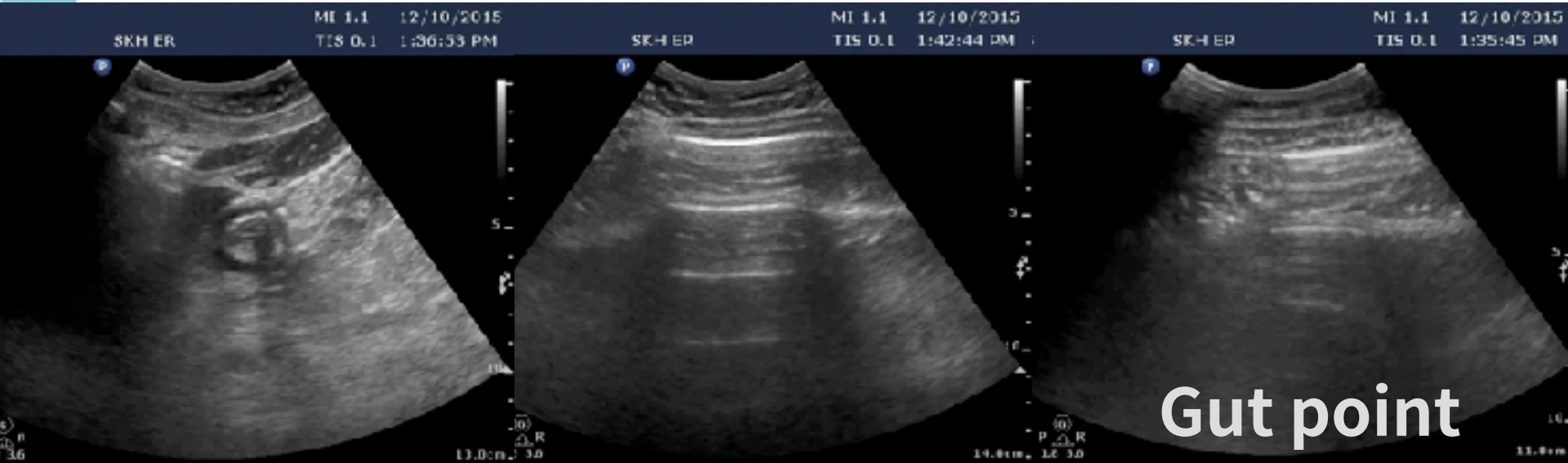


AIR (EXTRALUMINAL)

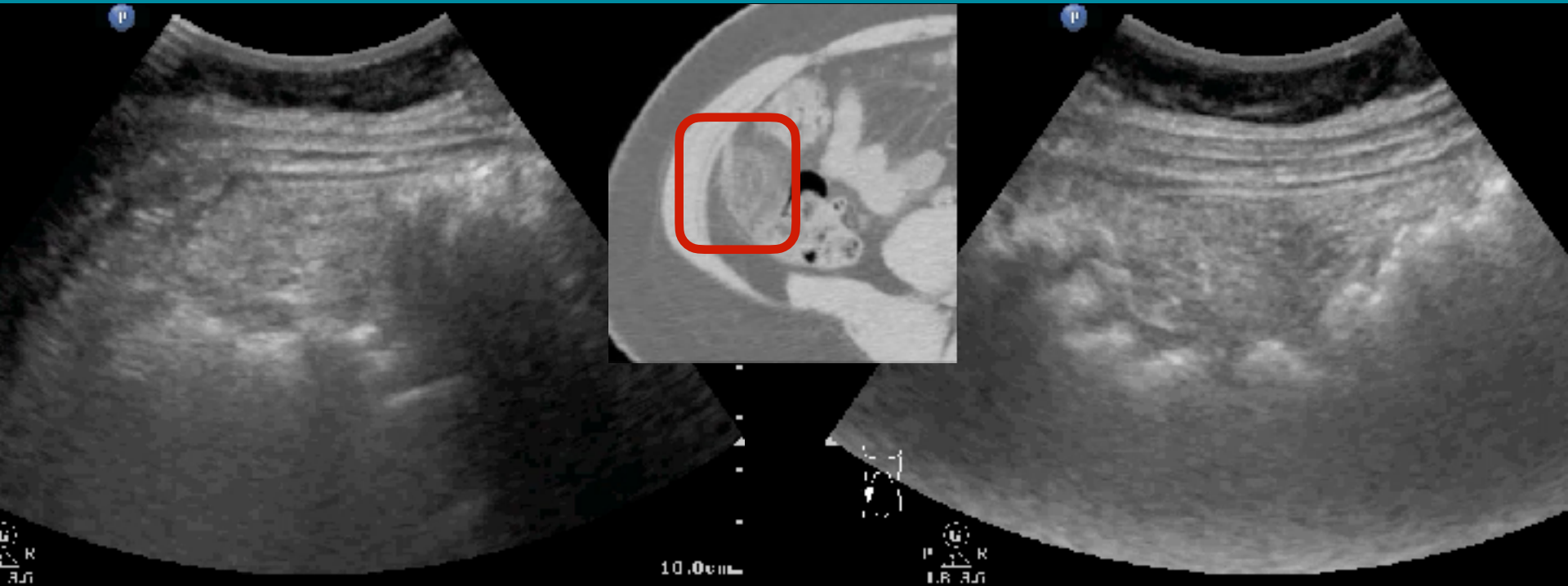
Liver surface

Curtain sign

EPSS

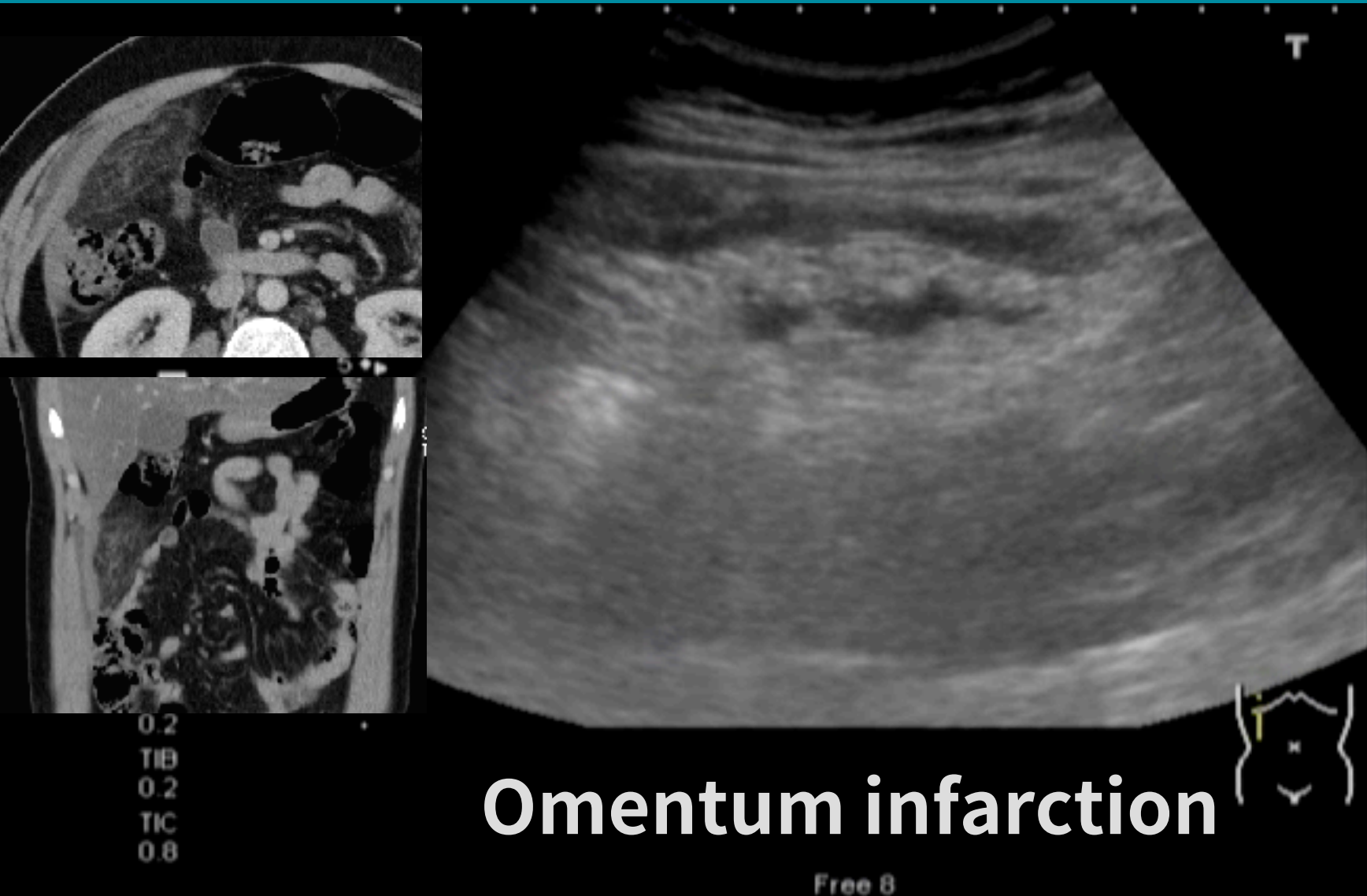


FAT (ECHOGENIC/INFLAMMATORY)



Epiploic appendagitis

FAT (ECHOGENIC/INFLAMMATORY)



FAT (ECHOGENIC/INFLAMMATORY)

d Gen2
-1
Hz
.0cm

Gen
n 62
56
/3 /3



Mesenteric Panniculitis

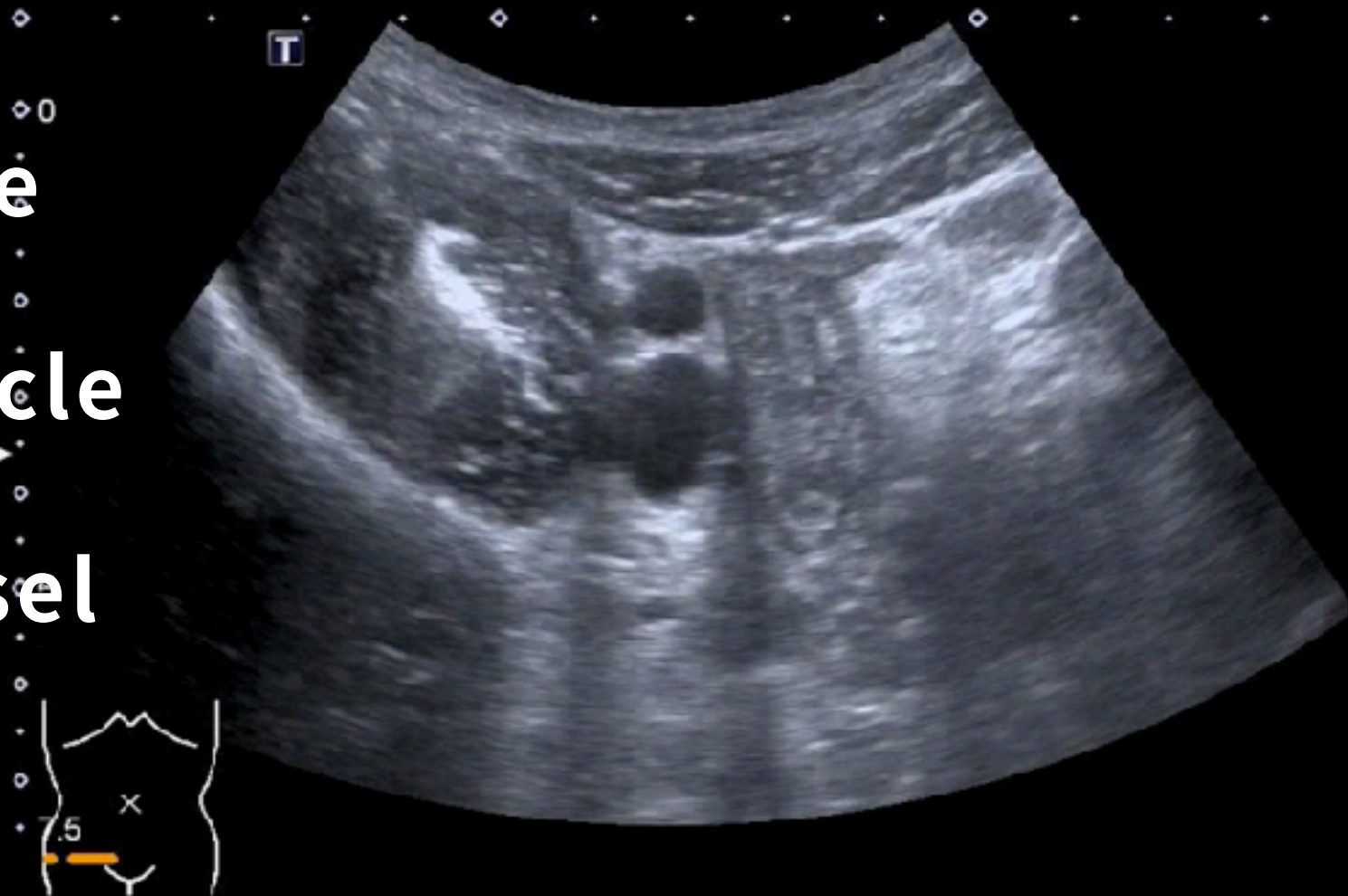
RLQ PAIN: ASIS (ANTERIOR SUPERIOR ILIAC SPINE)

POCUSAcademy©ChenKC

Bone

Muscle

Vessel

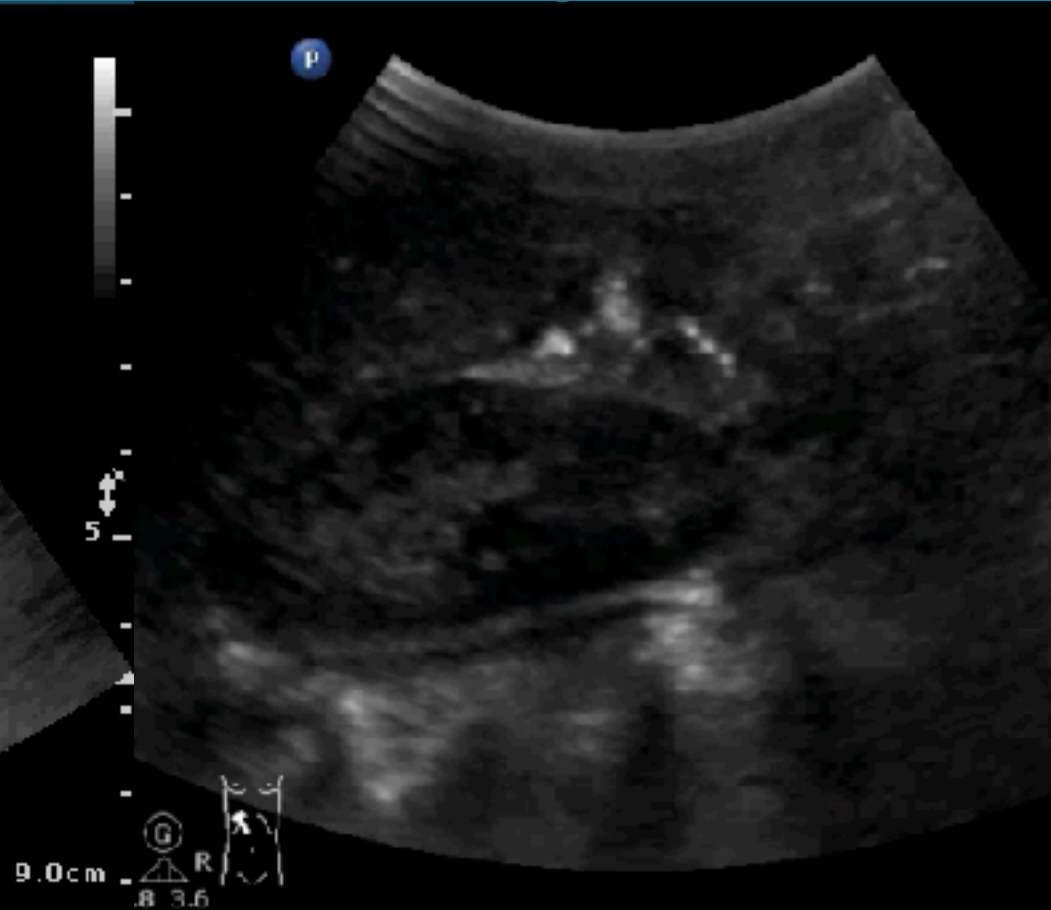


INTUSSUSCEPTION (PED)?

RUQ SCAN FIRST



Target sign



Pseudokidney sign

Superficial
L12-3
43 Hz
4.5cm

2D
Res
Gn 90
C 56
3/2/1

cranial

caudal

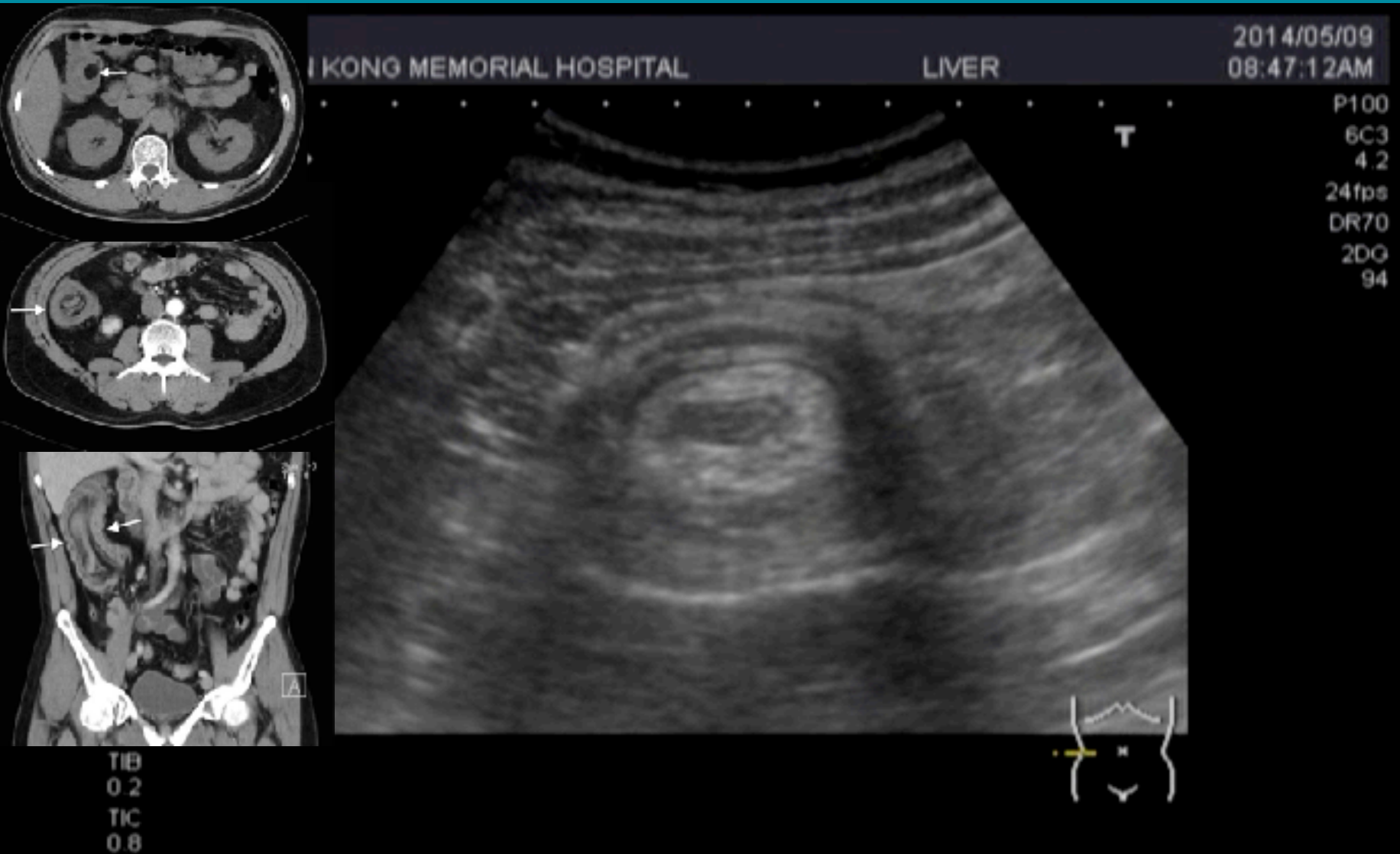


G
P R
3.0 12.0

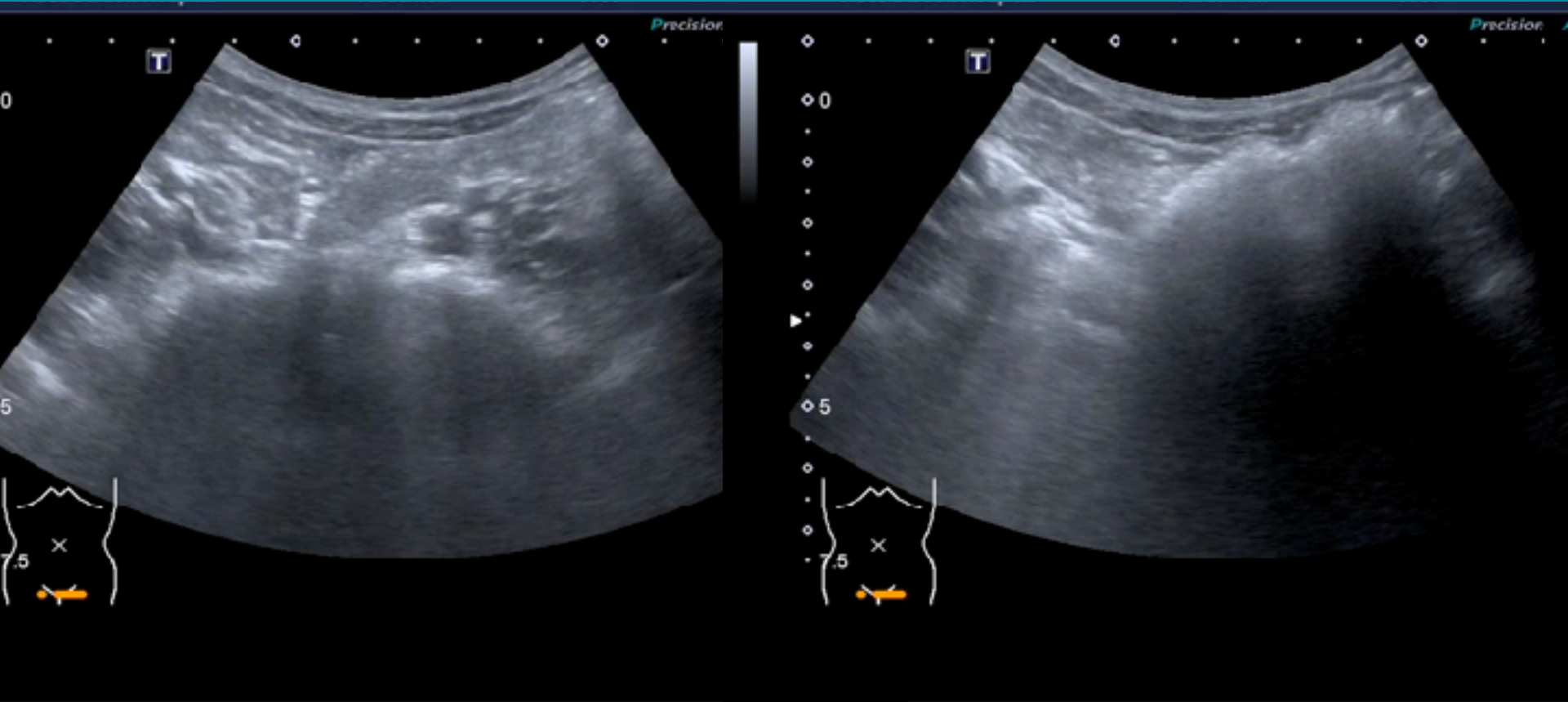
RUQ sagittal scan

4.5cm

51M, ABD PAIN AND TARRY STOOL

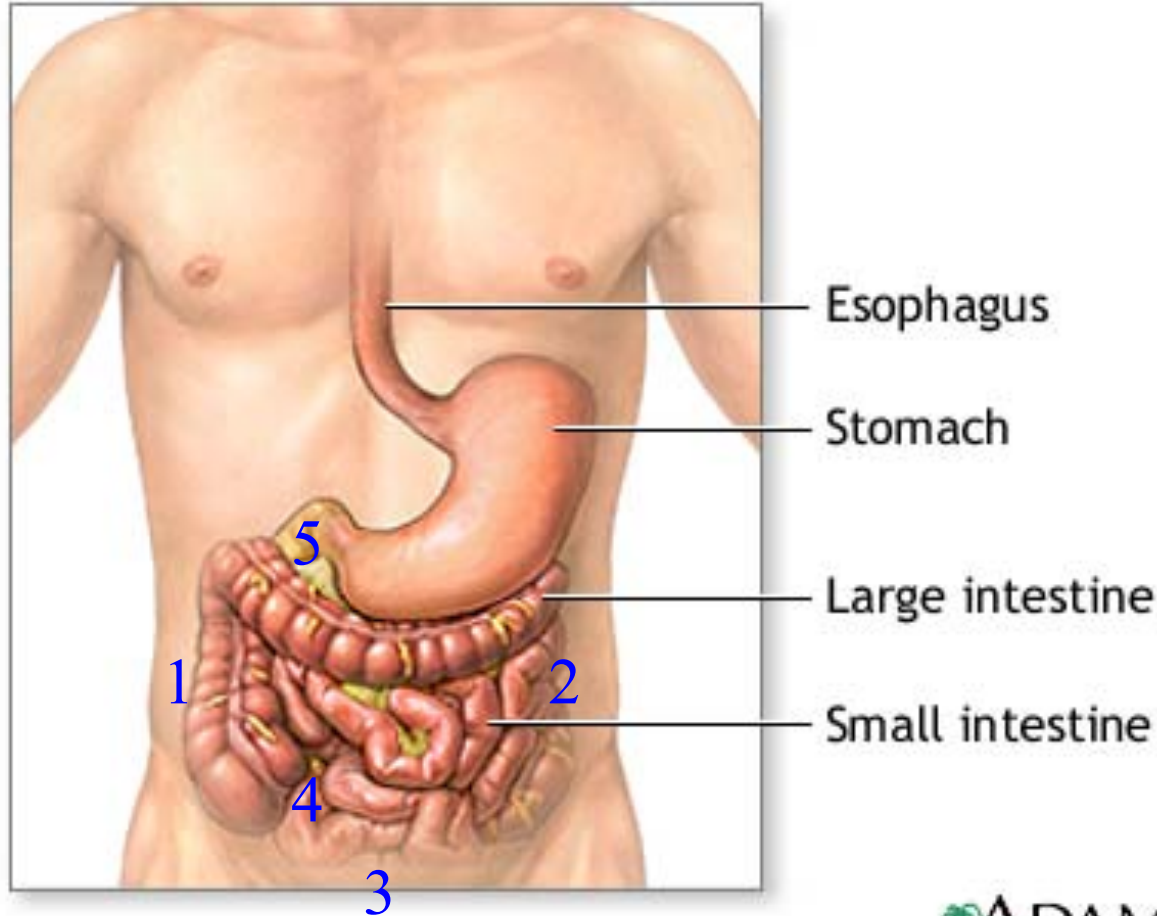


7F, INTERMITTENT ABDOMINAL PAIN



Transient intussusception

BISECTION APPROXIMATION METHOD FOR GI OBSTRUCTION



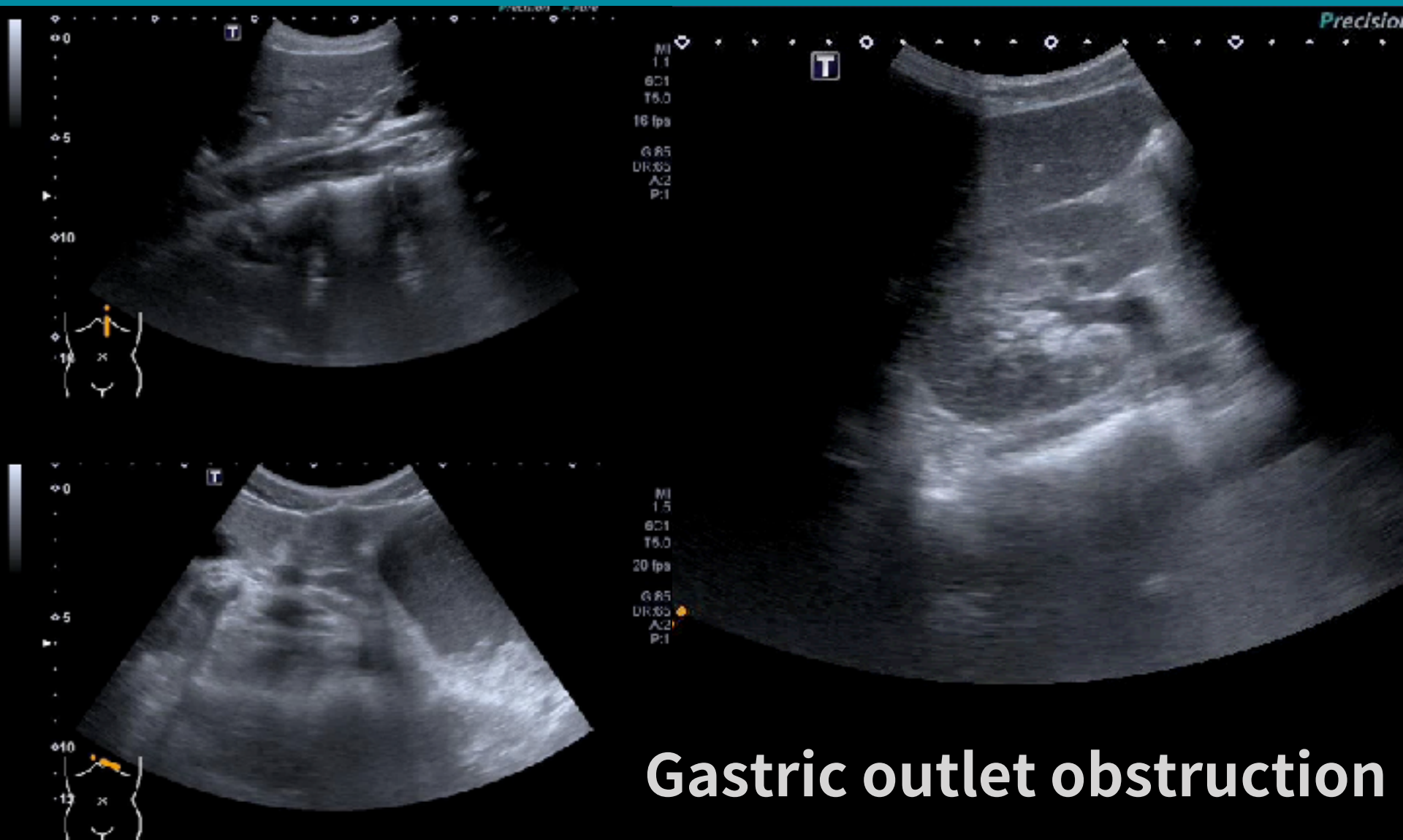
ADAM.

Hepatogastroenterology. 2006;53:547-51.

BISECTION APPROXIMATION METHOD FOR GI OBSTRUCTION

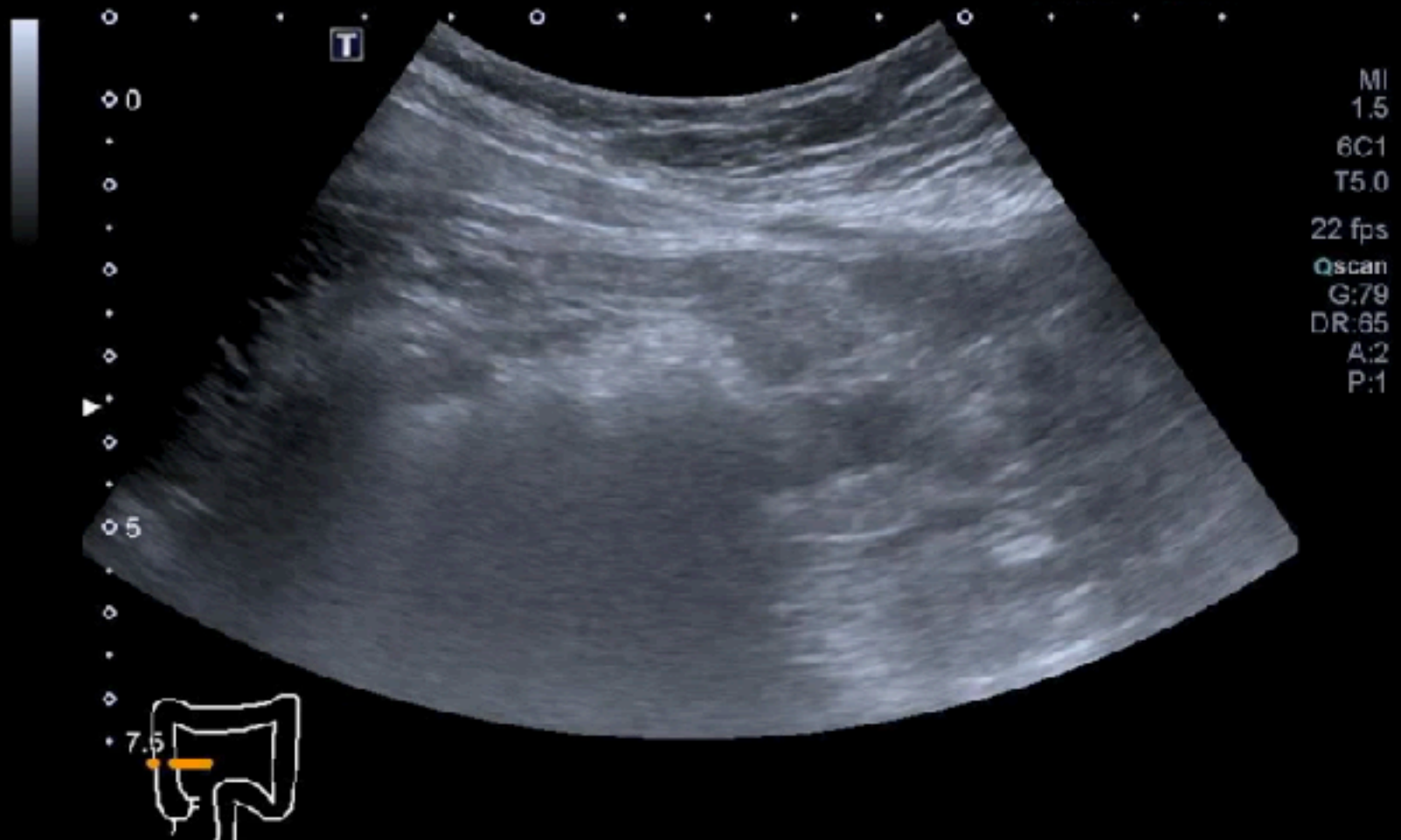
Location of US examination (From 1 – 5)					Possible lesion site
1. A-C	2. D-C	3. Rectum	4. IC region	5. Gastric outlet or duodenum	
Dilated	Collapsed				From 1-2
Dilated	Dilated	Collapsed			From 2-3
Collapsed	-	-	Dilated		From 1-4
Collapsed	-	-	Collapsed	Dilated	From 4-5
Collapsed	-	-	Collapsed	Collapsed	Above 5

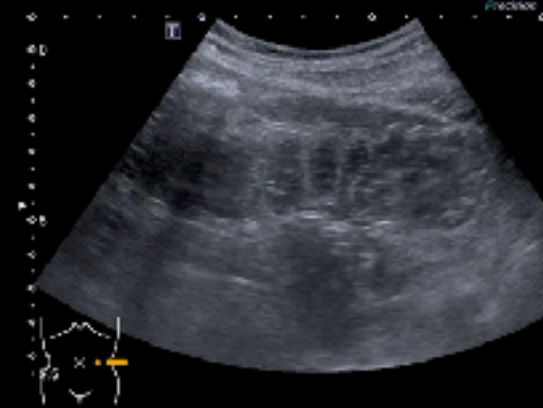
M/19, EPIGASTRIC PAIN & PERSISTENT VOMITING



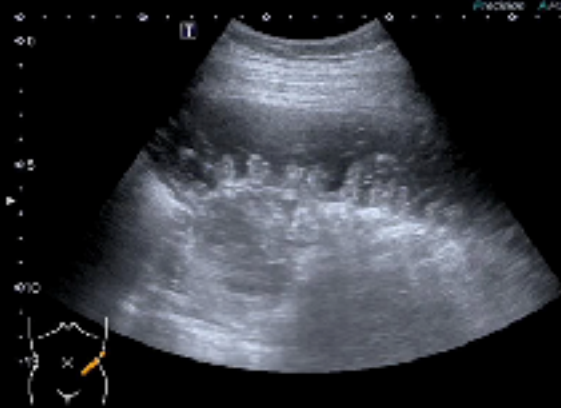
BOWEL OBSTRUCTION ? BAM METHOD FIRST

POCUSAcademy©ChenKC

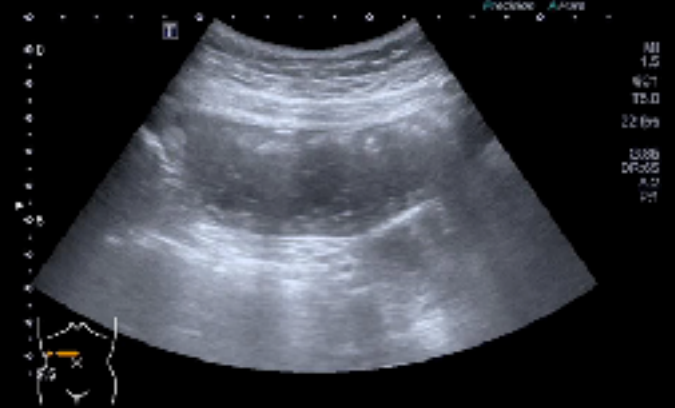




To & Fro



Keyboard

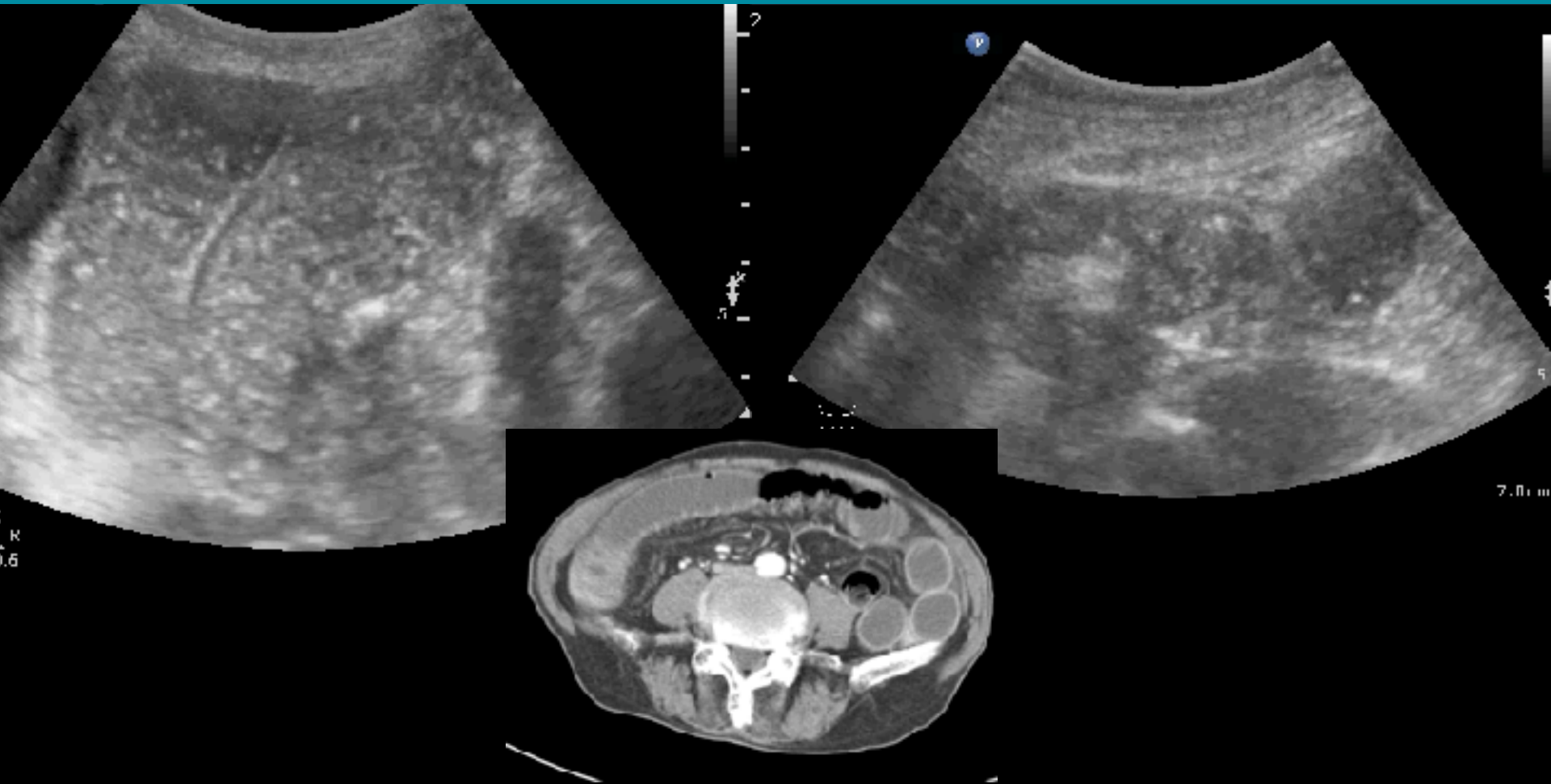


String-of-beads

Extremely helpful for gasless bowel obstruction



90M, RLQ PAIN 2D >> BAM METHOD



Cecal tumor

US FOR SBO DIAGNOSIS: LR + > 20

Cottlieb M, et al. AJEM 2017

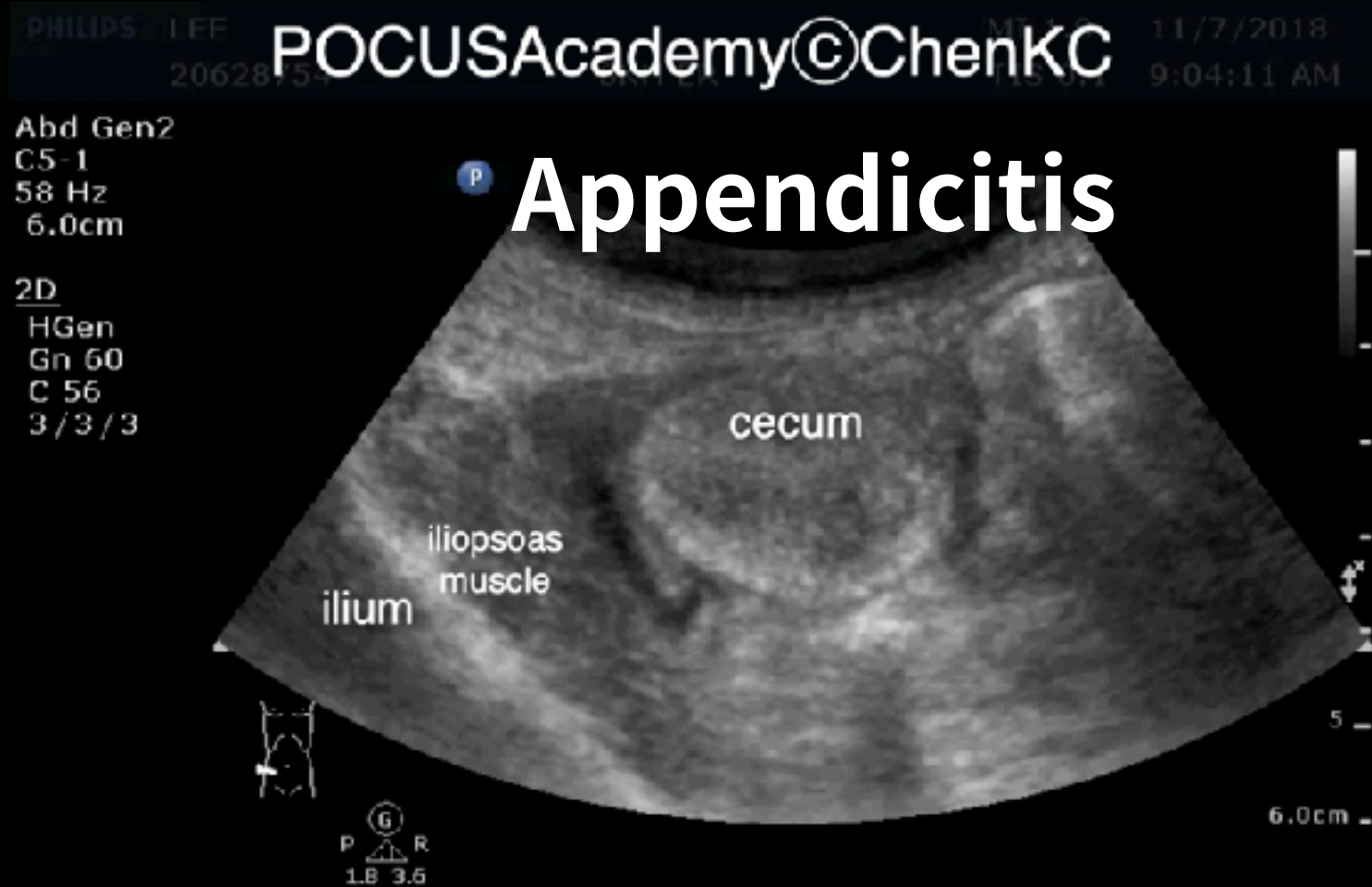
TAKE-HOME MESSAGE

For trained operators, ultrasonography possesses sensitivity and specificity comparable to that of abdominal computed tomography (CT) for the diagnosis of small bowel obstruction.

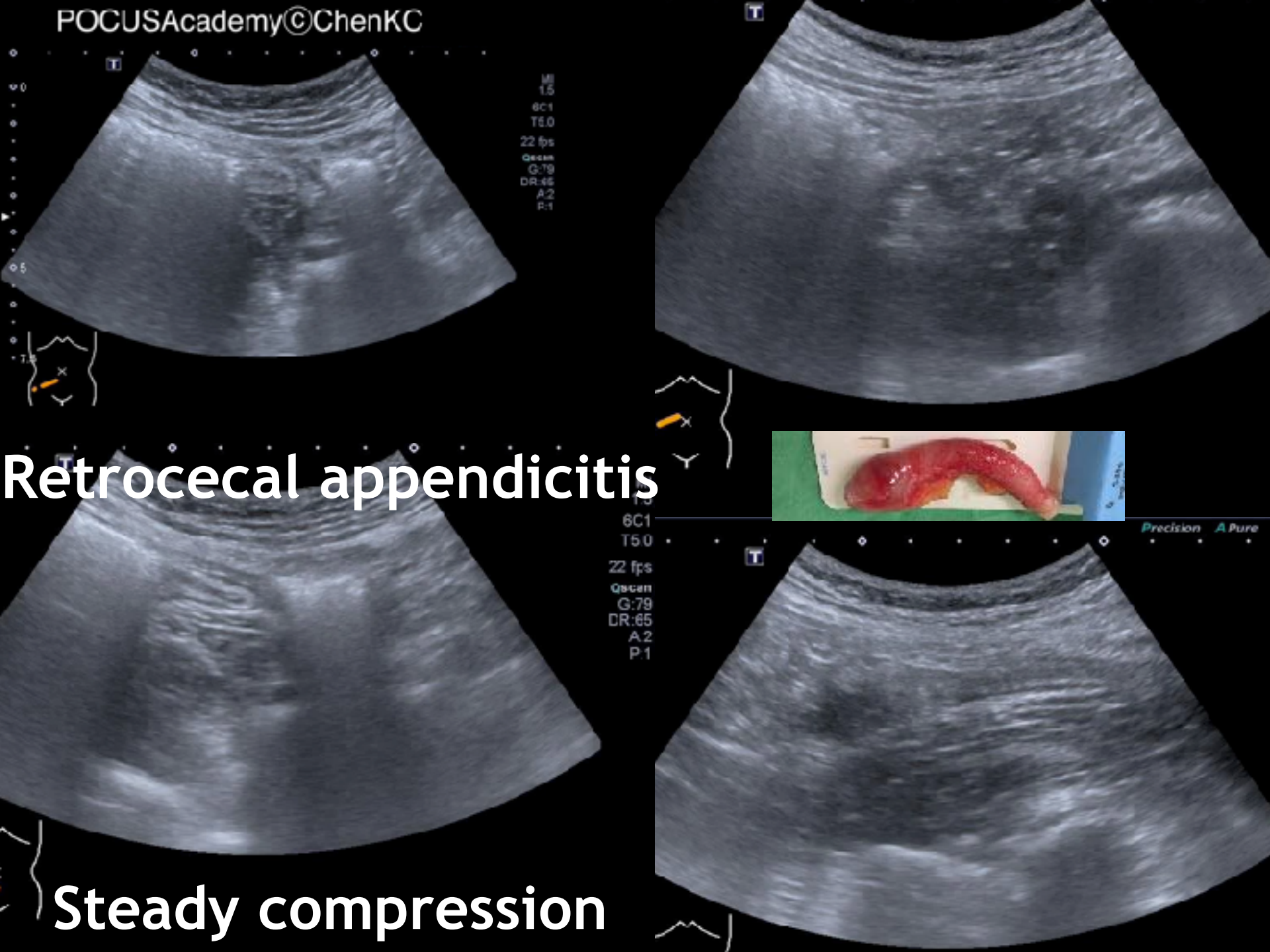
Ultrasonographic Diagnosis of SBO	Specificity (95% CI)	Sensitivity (95% CI)	+LR (95% CI)	–LR (95% CI)	SROC AUC (95% CI)
Overall	0.97 (0.88–0.99)	0.92 (0.89–0.95)	27.5 (7.7–98.4)	0.08 (0.06–0.11)	0.96 (0.94–0.97)
ED	0.96 (0.86–0.99)	0.93 (0.89–0.95)	21.1 (6.5–68.9)	0.08 (0.05–0.12)	0.96 (0.94–0.97)
Non-ED	0.99 (0.60–1.00)	0.92 (0.85–0.96)	70.8 (1.5–3279.7)	0.08 (0.05–0.15)	0.96 (0.94–0.98)

CI, Confidence interval; +LR, positive likelihood ratio; –LR, negative likelihood ratio; SBO, small bowel obstruction; SROC, summary receiver operating characteristic; AUC, area under the curve.

LANDMARK / TRANSVERSE / PAIN-ORIENTED



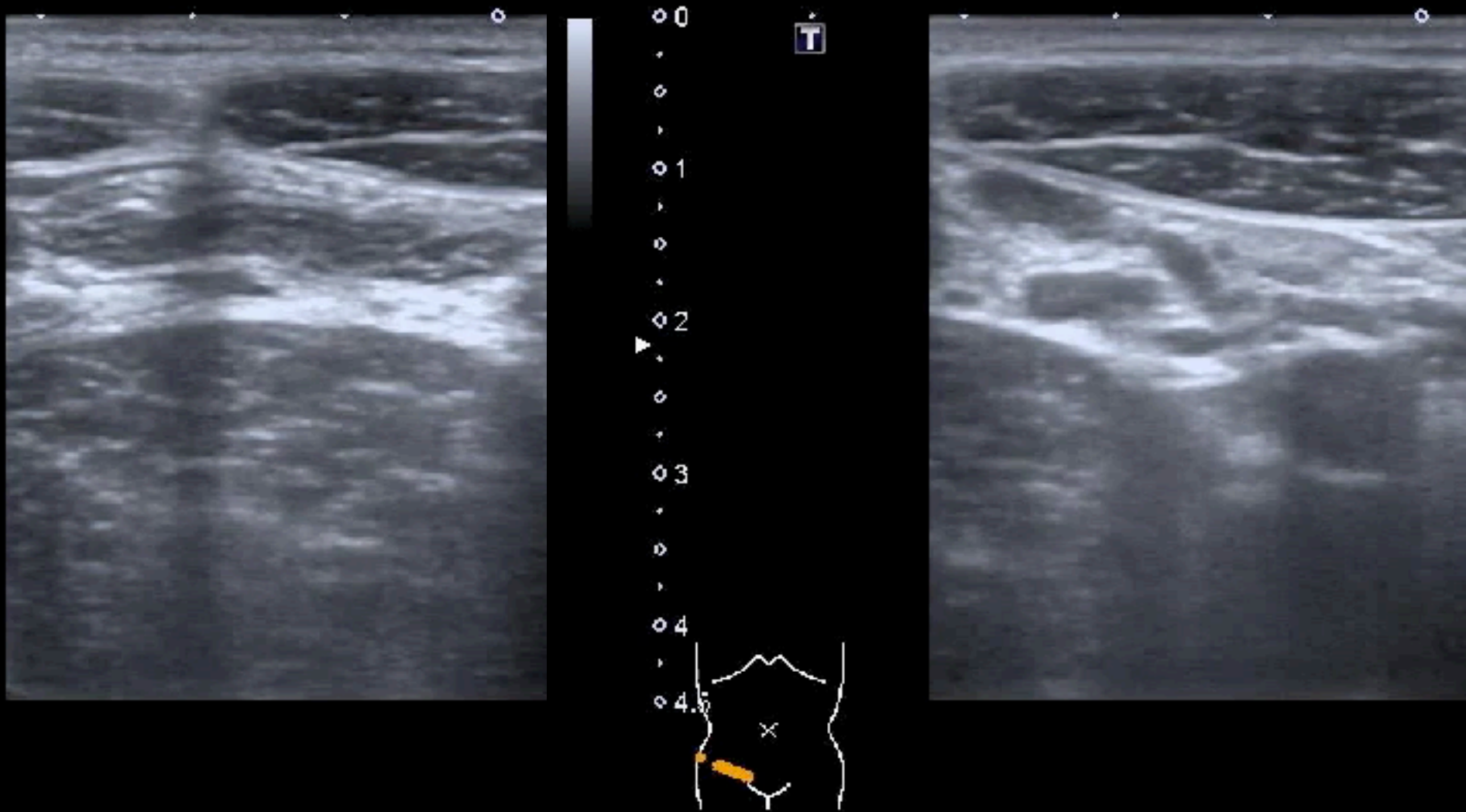
Transverse scan over RLQ area



Retrocecal appendicitis

Steady compression

15M, RLQ PAIN & TENDERNESS



Mesenteric adenitis



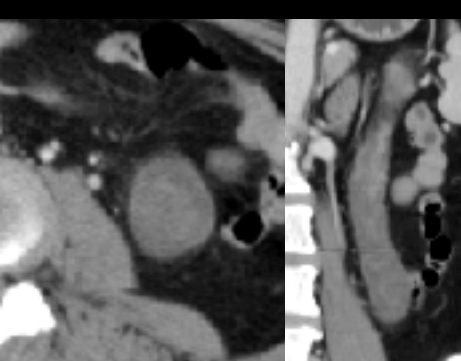
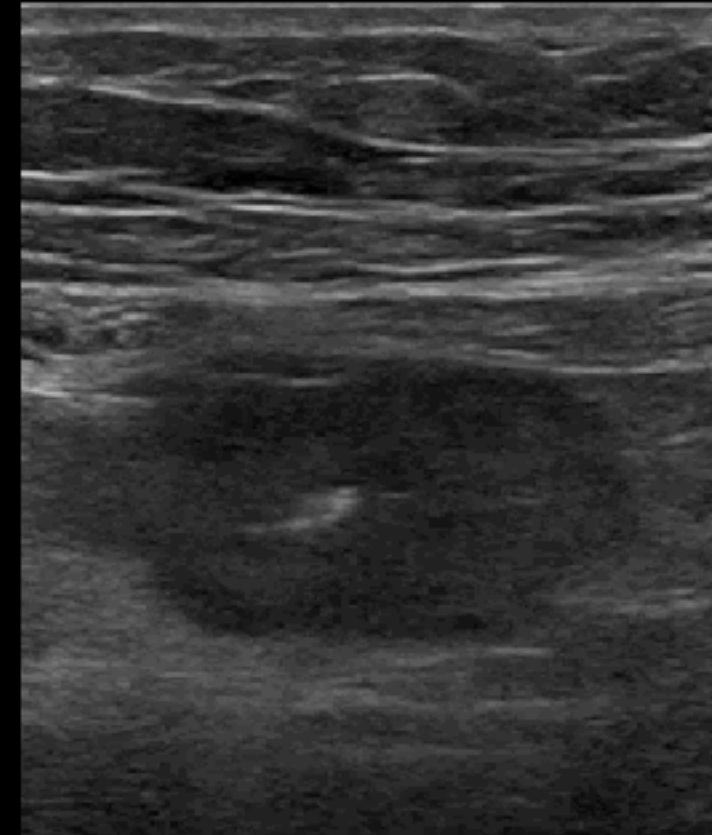
0+

5

Symmetric wall thickening
Stratification (+)
Decreased luminal content
Infectious colitis

Free 8

The image is a longitudinal B-mode ultrasound scan of a colon. The lumen is the dark, anechoic region on the left. The colonic wall is visible on the right and shows significant thickening and a loss of the normal layered structure (stratification), appearing more homogeneous and echogenic. A scale bar on the left indicates depth in centimeters, with markers at 0 and 5. A small diagram in the bottom right corner shows a cross-section of the colon with a yellow line indicating the measurement site. The text 'Free 8' is visible in the bottom right corner of the image area.

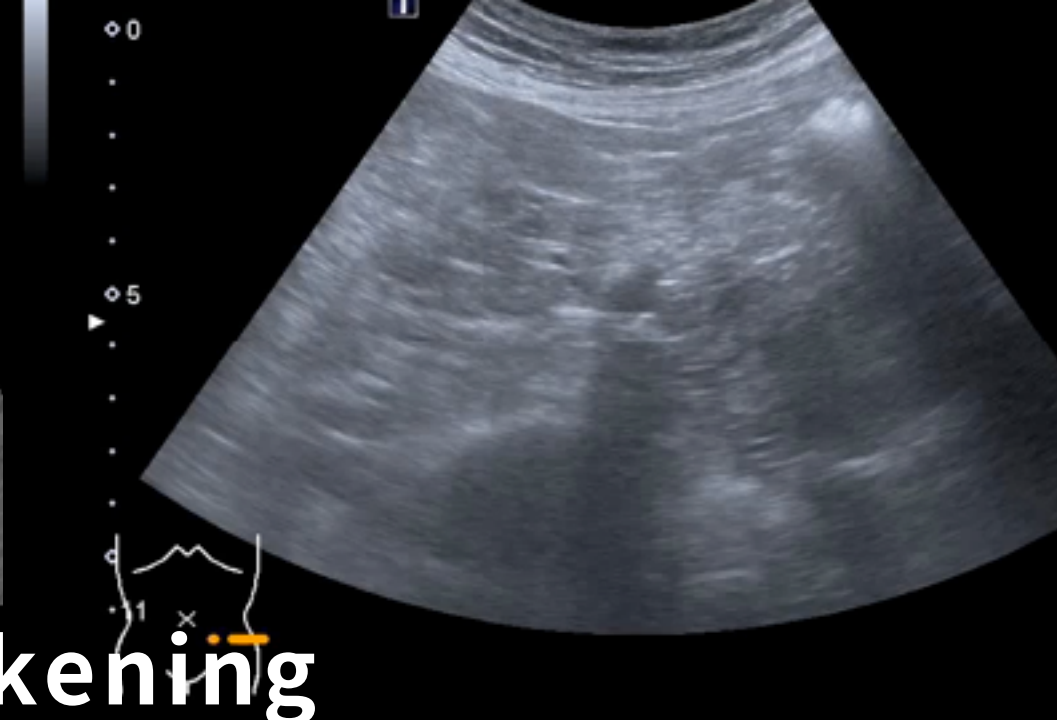


Symmetric wall thickening
Stratification (-)
Luminal content decreased
Ischemic colitis



**Wall
thickening**

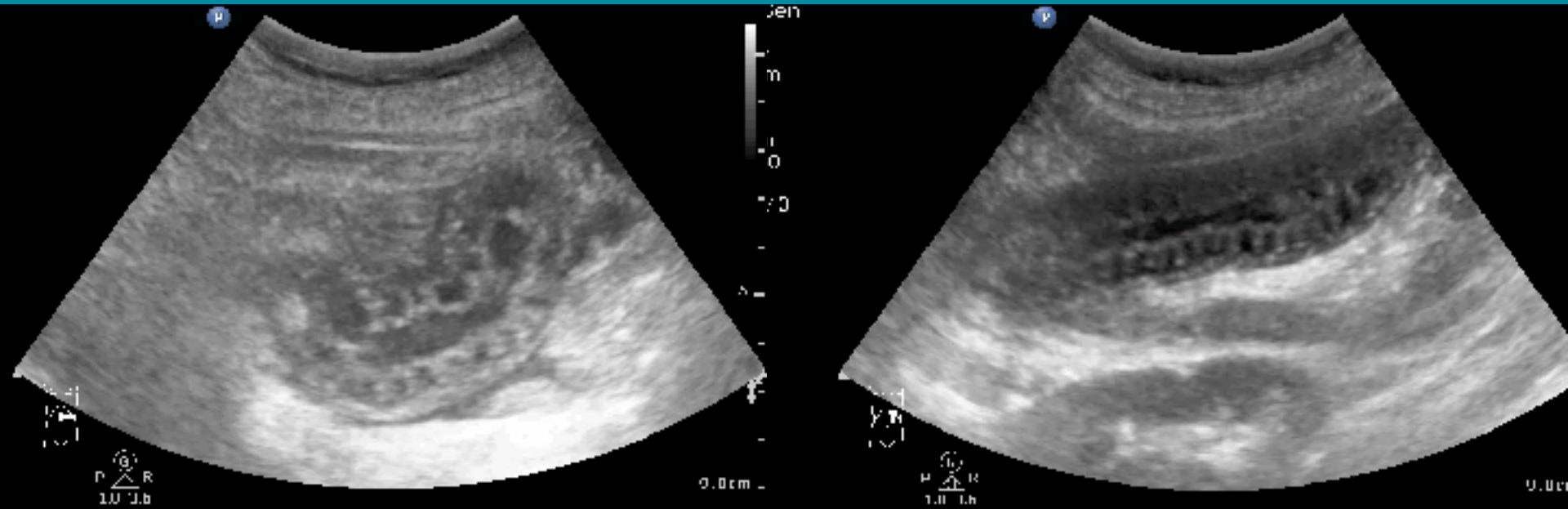
P (G)
1.0 1.5 R



**Symmetric
Stratification (+)
Infectious colitis**

**Asymmetric
Stratification (-)
Sigmoid colon cancer**

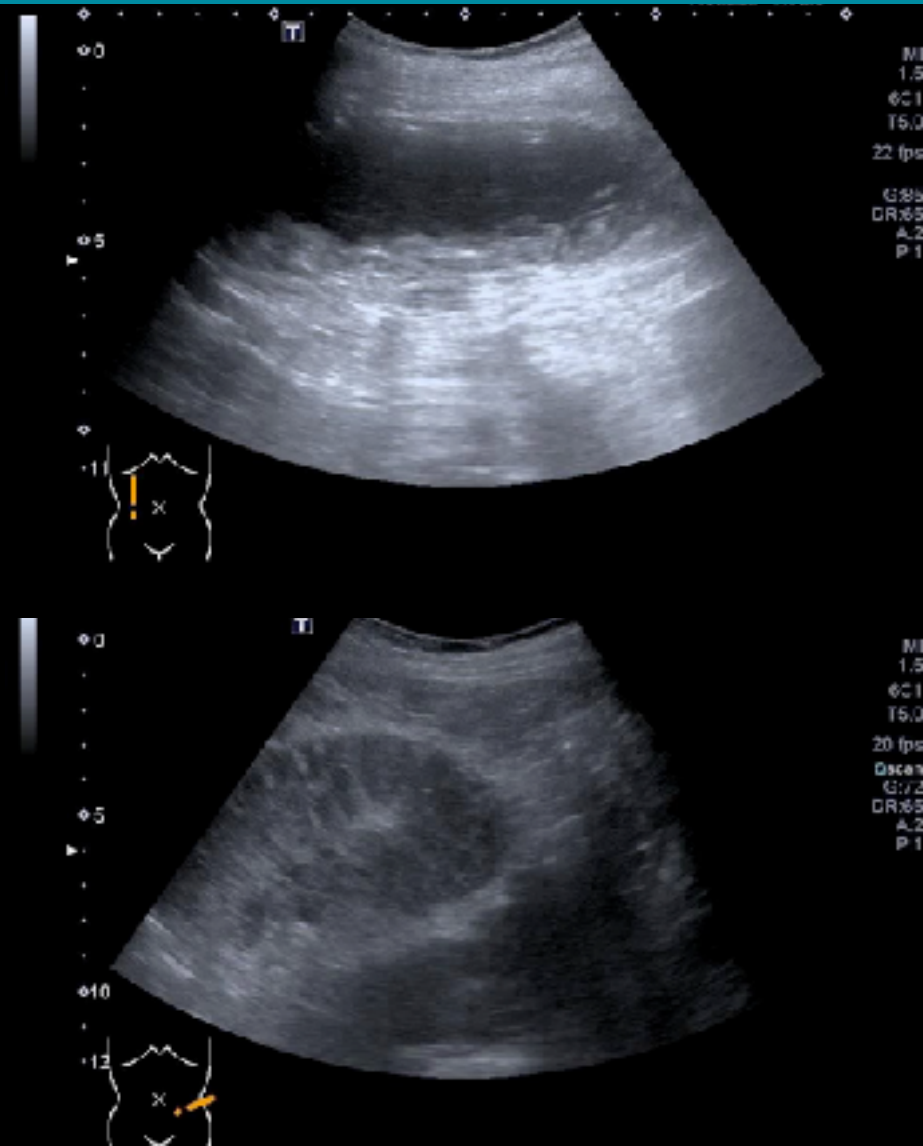
WALL THICKENING



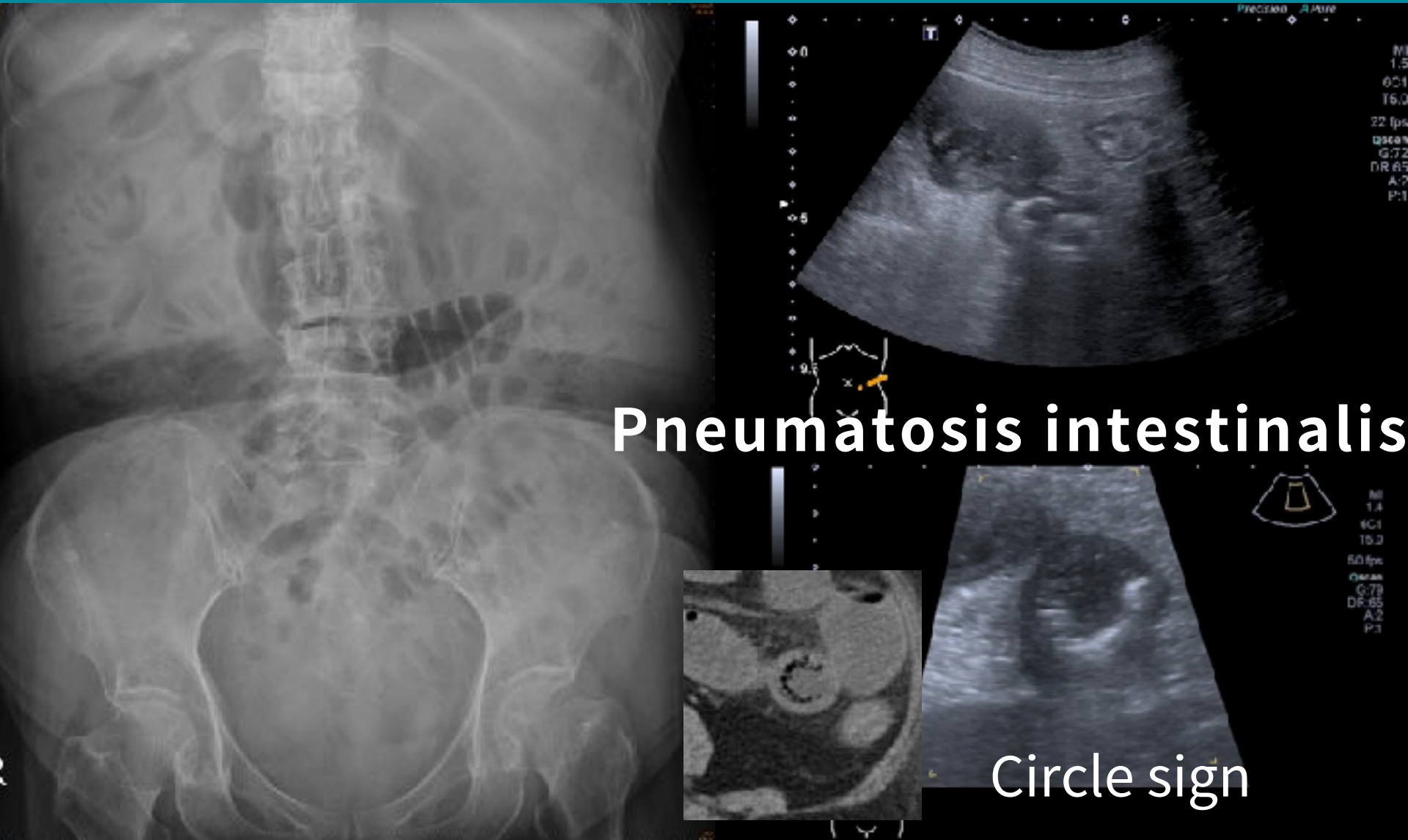
Lupus mesenteric vasculitis



WALL THICKENING ? ABNORMAL GAS ?

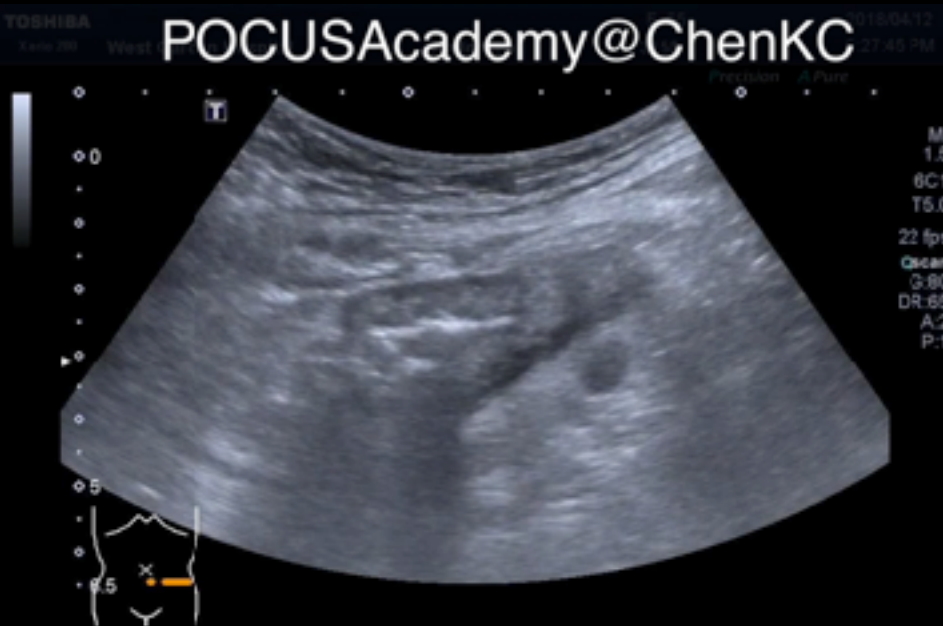


WALL THICKENING ? ABNORMAL GAS ?



LLQ PAIN. NOTICE WALL THICKENING & ASSOCIATED FINDINGS

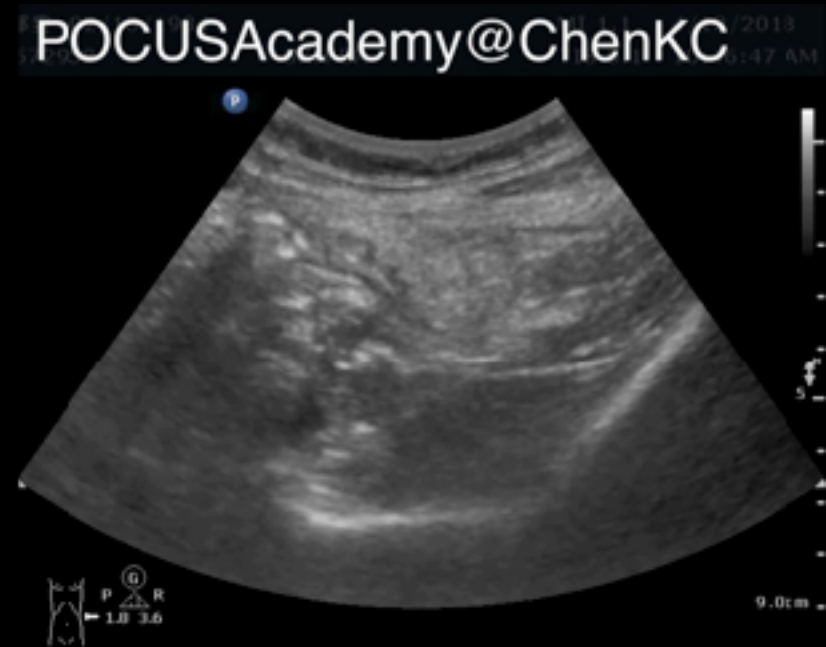
Asymmetric wall thickening
Echogenic fat
Dome sign



transverse scan on LLQ area

Diverticulitis

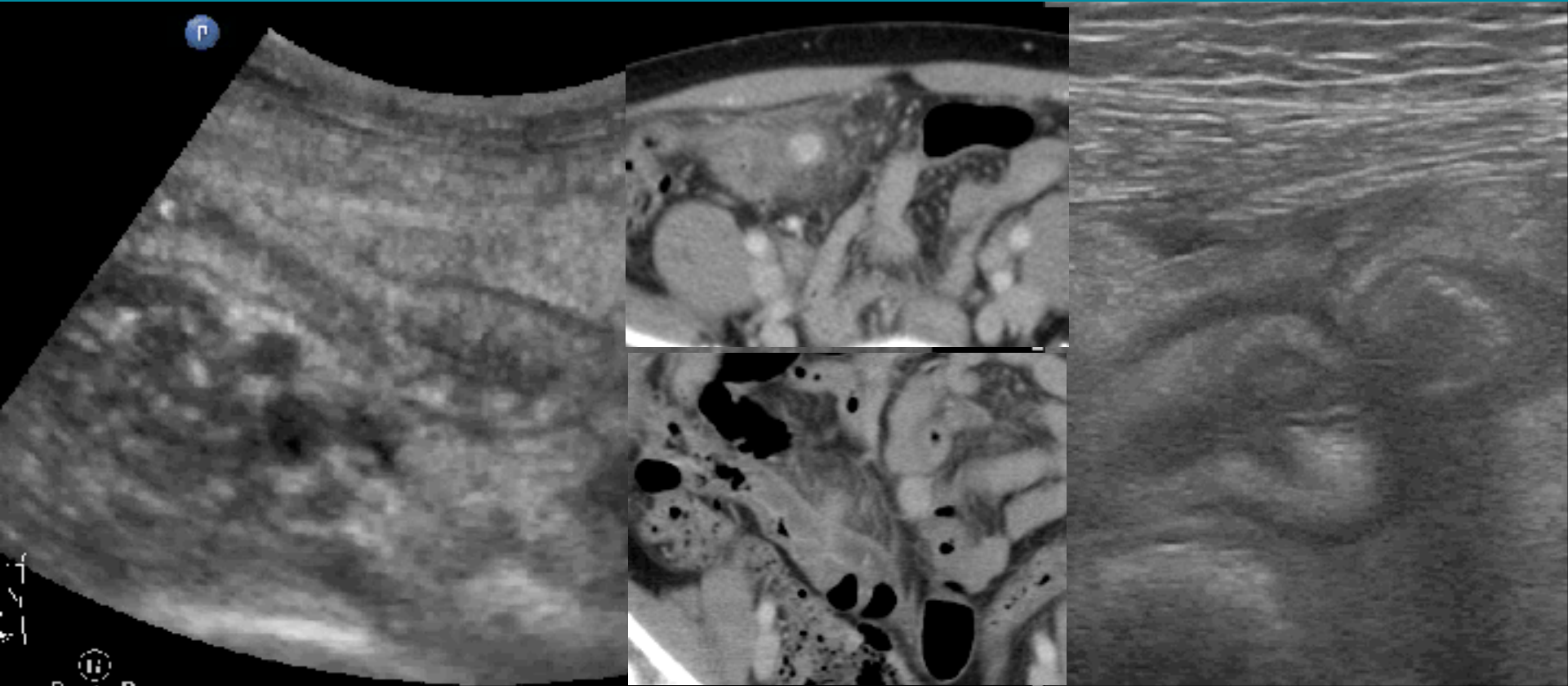
Normal bowel wall
Echogenic fat



transverse scan on LLQ area

Epiploic appendagitis

DIVERTICULITIS

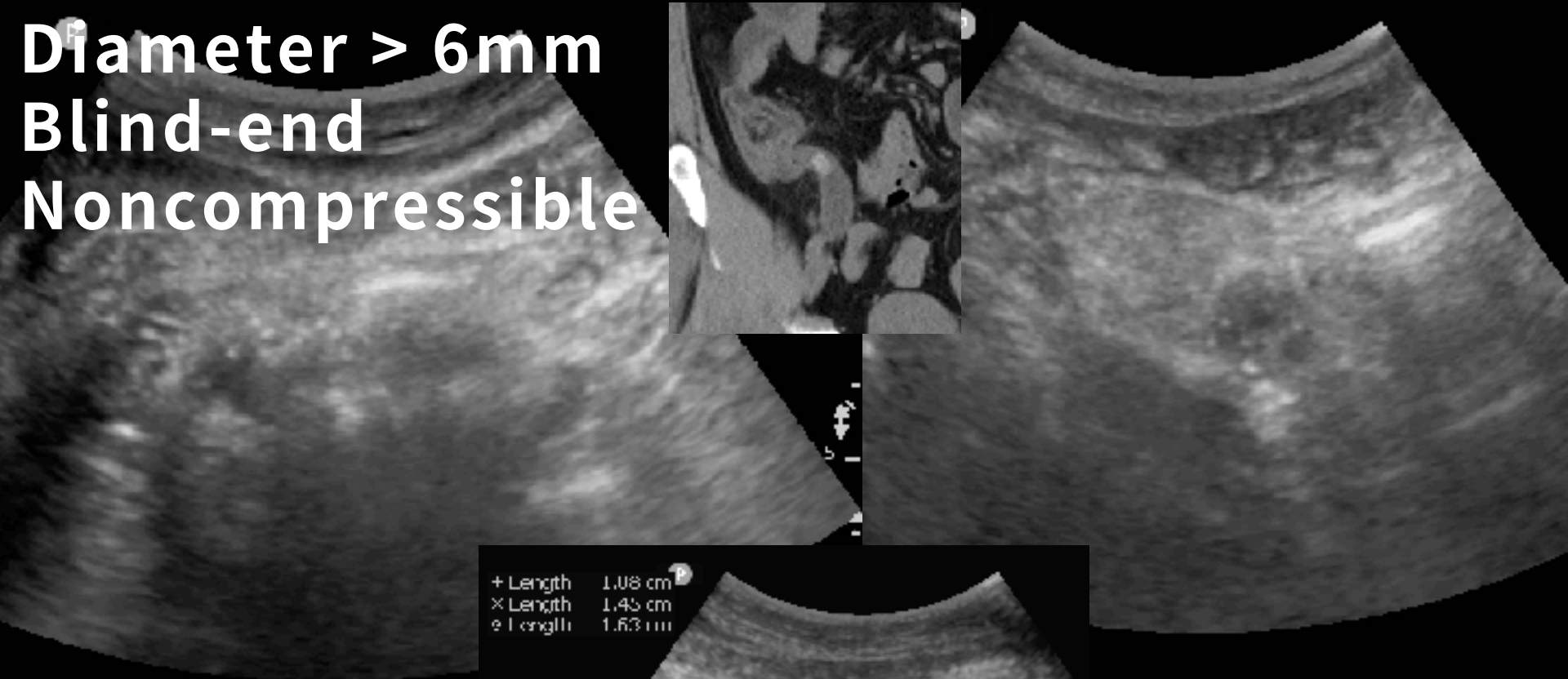
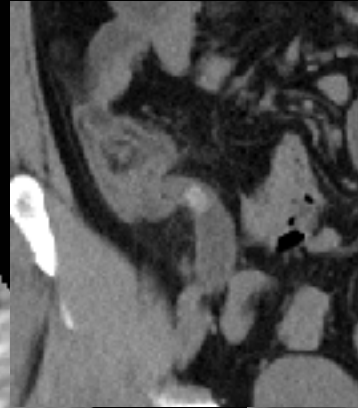


Asymmetric wall thickening
Echogenic fat
Dome sign

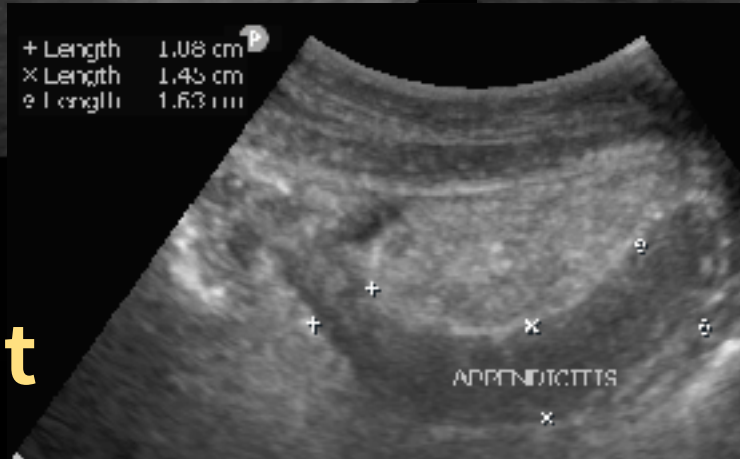
APPENDICITIS

(40M, EPIGASTRIC PAIN W/ RLQ TENDERNESS)

Diameter > 6mm
Blind-end
Noncompressible

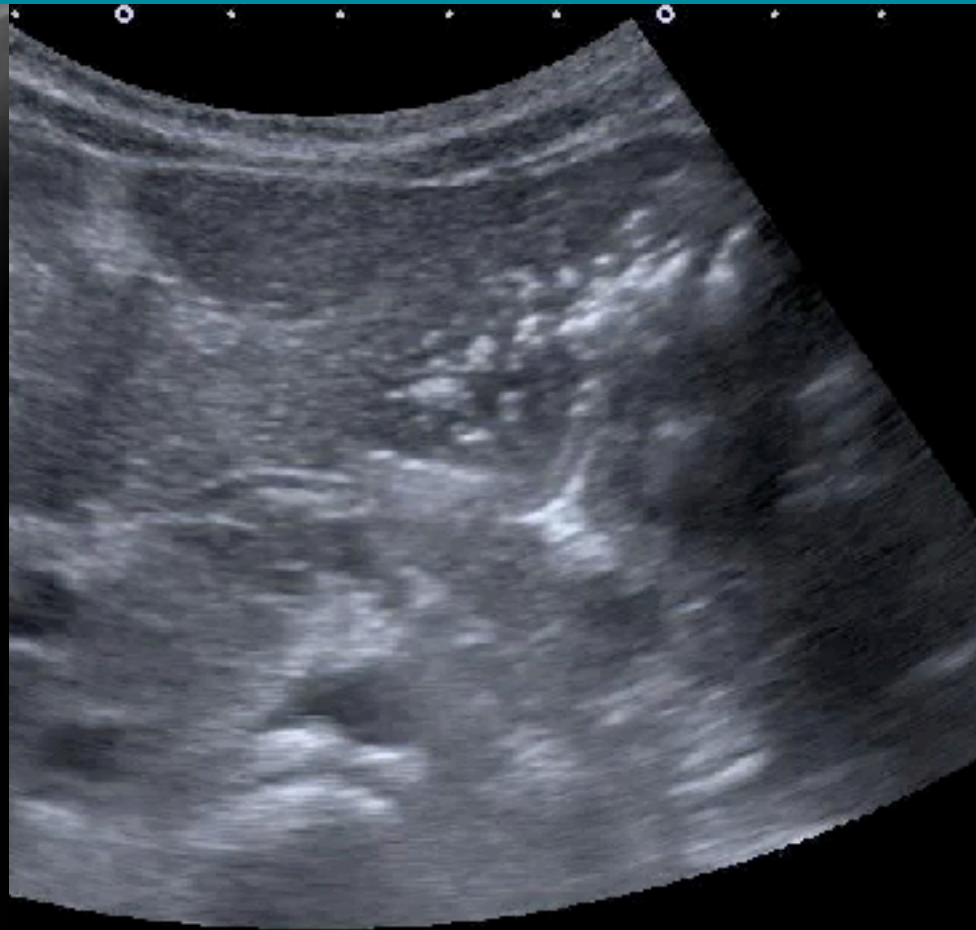
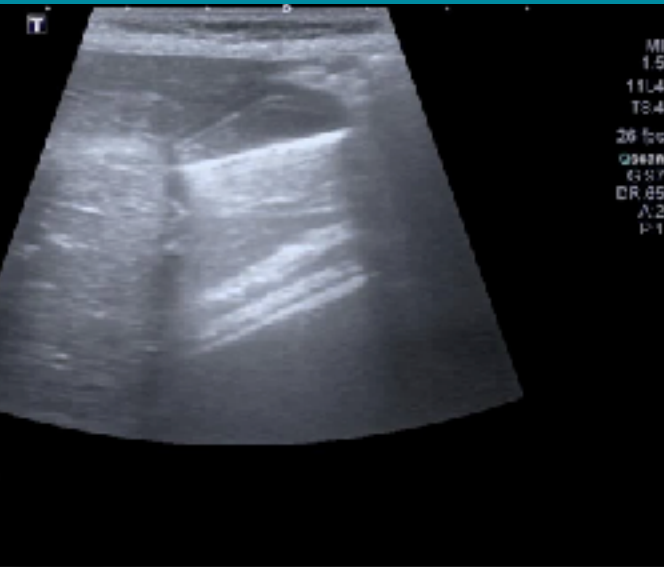


+ Length 1.08 cm
x Length 1.43 cm
o Length 1.63 cm



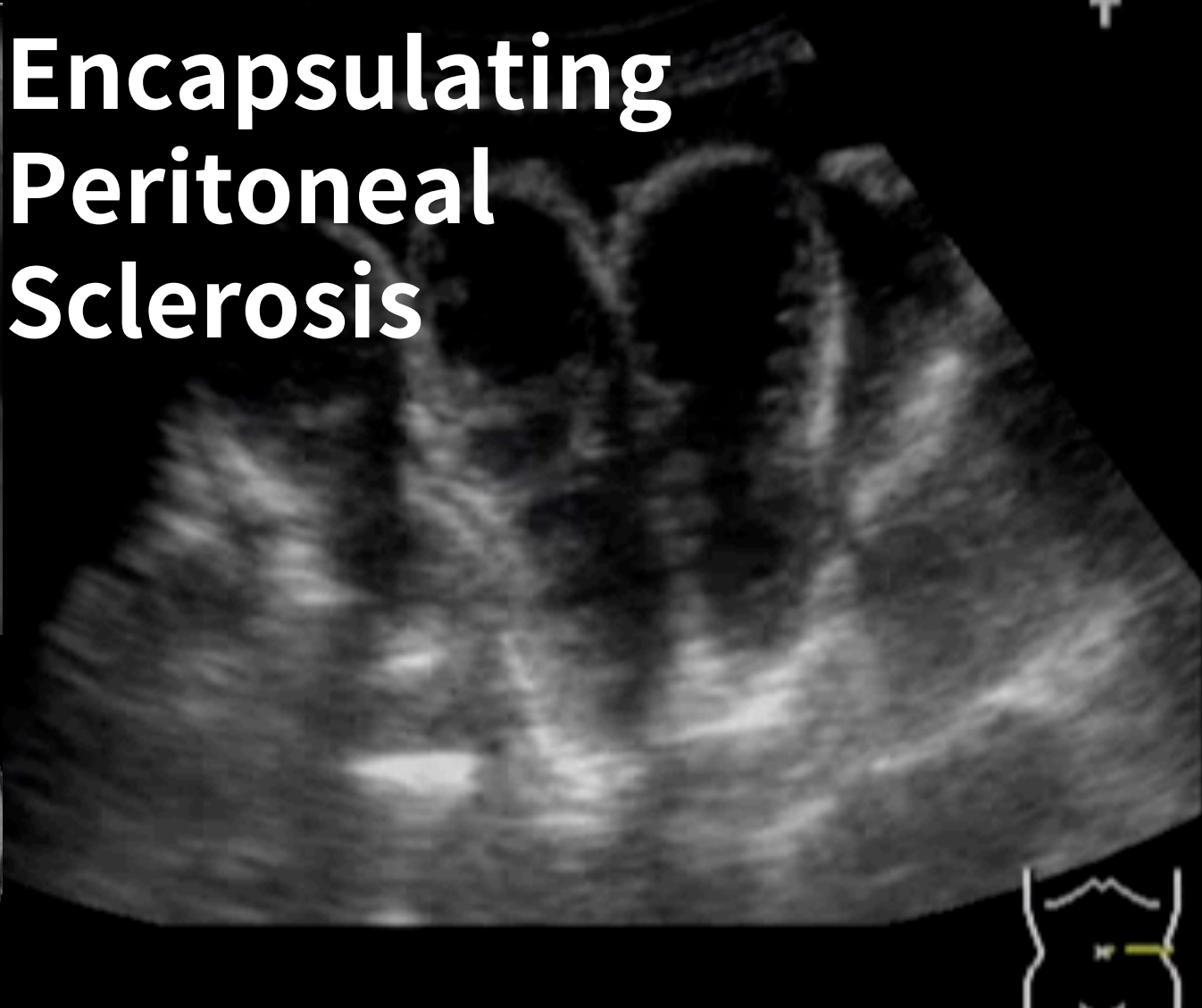
Echogenic fat

2F, COIN MIS-SWALLOWING

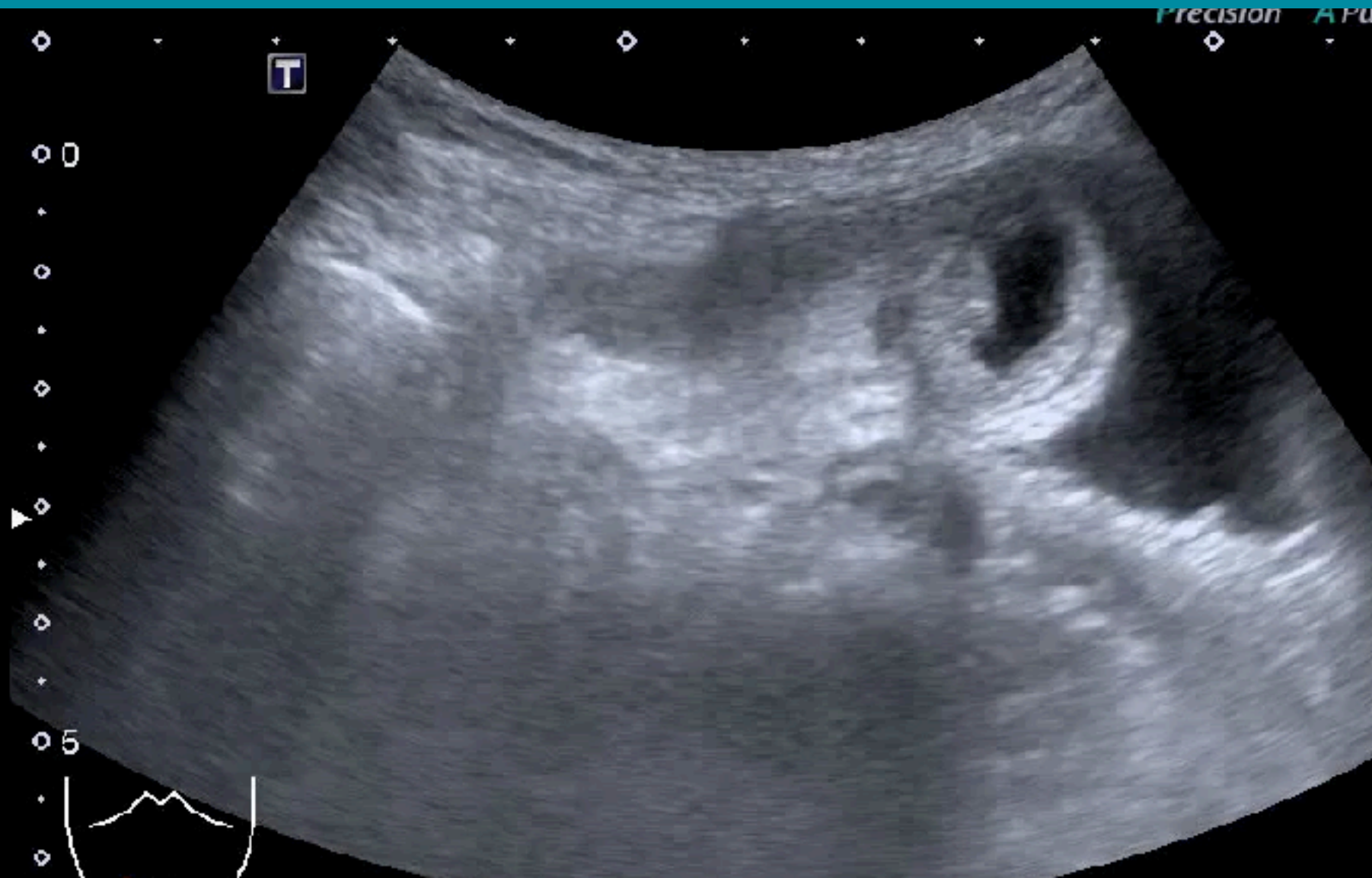


DIFFUSE ABDOMINAL PAIN

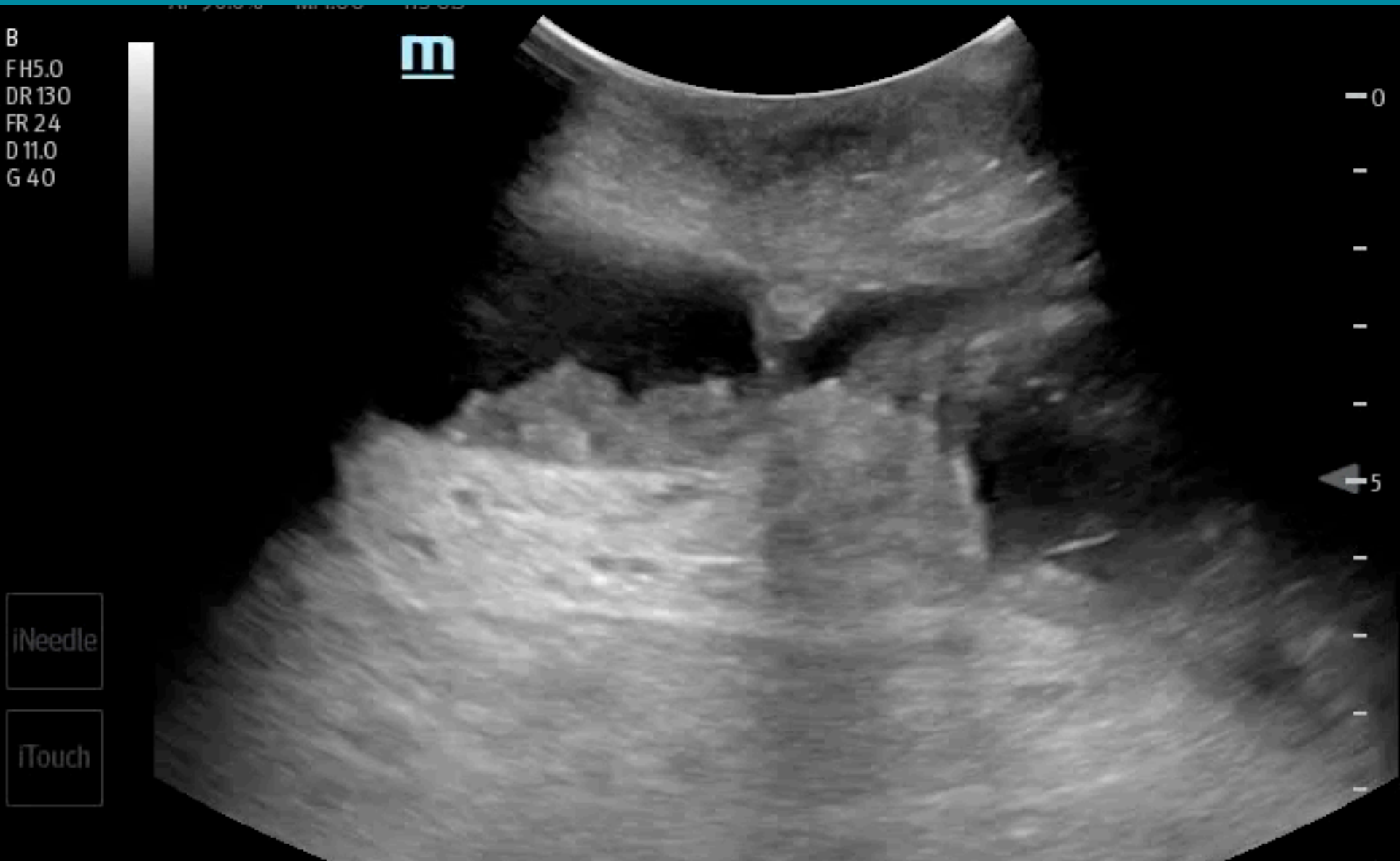
Encapsulating Peritoneal Sclerosis

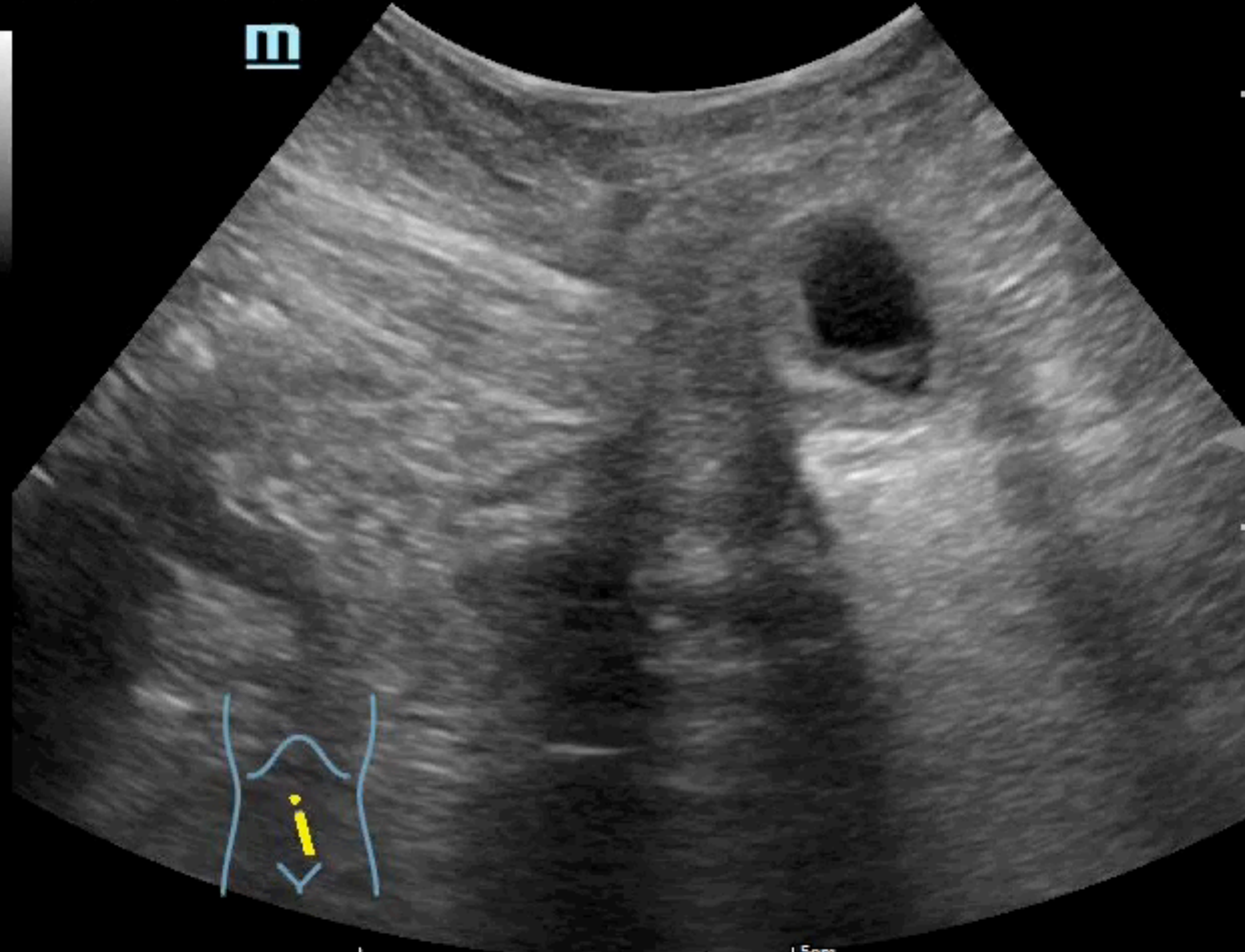


ULTRASOUND GUIDED HERNIA REDUCTION



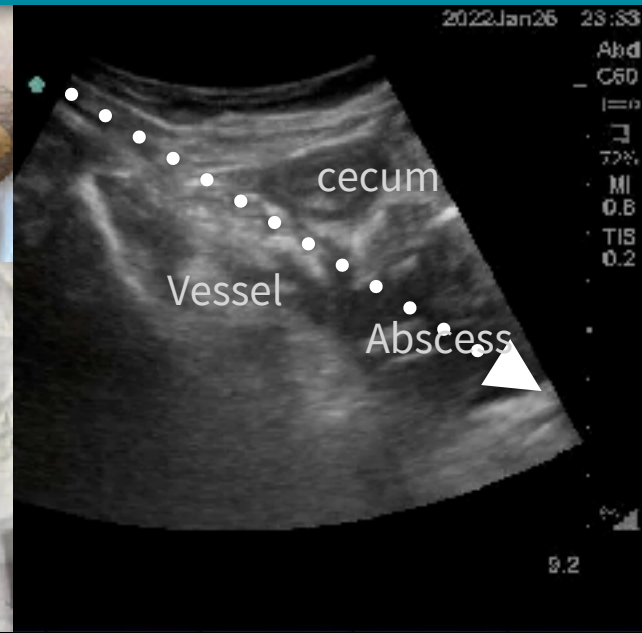
Ultrasound guided hernia reduction





50F, RLQ pain for one week

Ultrasound guided pigtail for abscess drainage



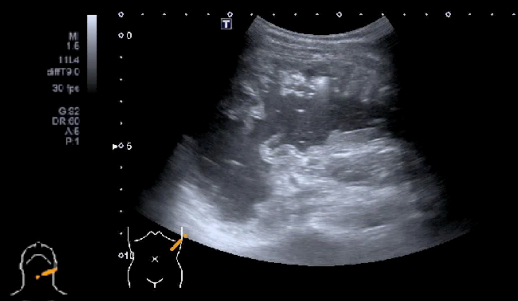
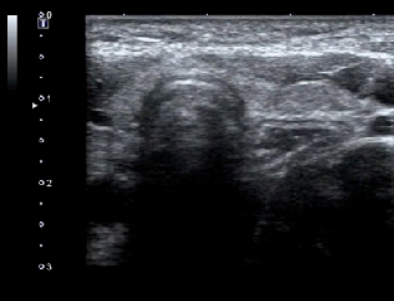


External landmarks

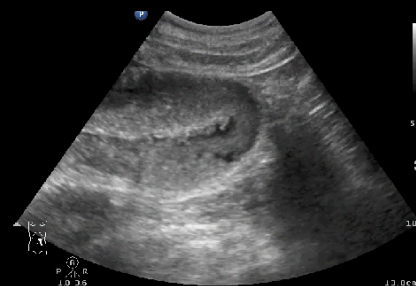
Find GI tracts

Recognize sonoanatomy

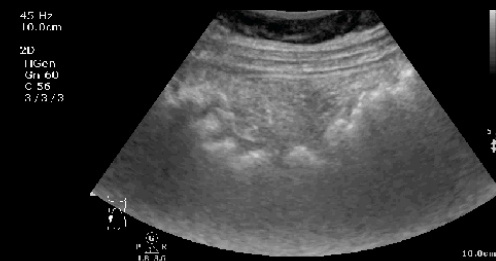
Fixed parts first



Abd Gen
CS-1
M38 Hz
1113.0cm
BC
TS/2D
22 fps
HGen
Gn 80
GBI C 56
DR: 3/3/3
A:
P:



Recognize GI tract Find patterns



Seeing your Gut feeling to facilitate diagnosis & management



1. Recognize GI sonoanatomy
2. Start your scanning on landmarks
3. Scan transversely on targets
4. **Compress steadily**
5. Identify pathologic patterns
6. **Size first then wall & layers**
7. Pay attention to direct & indirect findings

GI TRACT

Cervical esophagus	Duodenum 2/3 parts	Colon-A
EC junction	Small bowel	Colon-T
Stomach (subxypoid)	I-C valvie	Colon-D
Stomach (LUQ)	Cecum	Colon-S
Gastric CSA	Appendix landmark	Rectum