ULTRASOUND
PROGRAM

急診醫師需要的
腸道超音波

陳國智　西園急診

ULTRASOUND
PROGRAM

前急診超音波委員會主委
急救加護重症超音波工作坊負責人

Faculty
-WINFOCUS, PERCUSS, WFPICC

JUICE BAR 格主
POCUS Academy 小編
YouTube: POCUS Academy
FB: Emergency Ultrasound Training Center

ULTRASOUND
PROGRAM

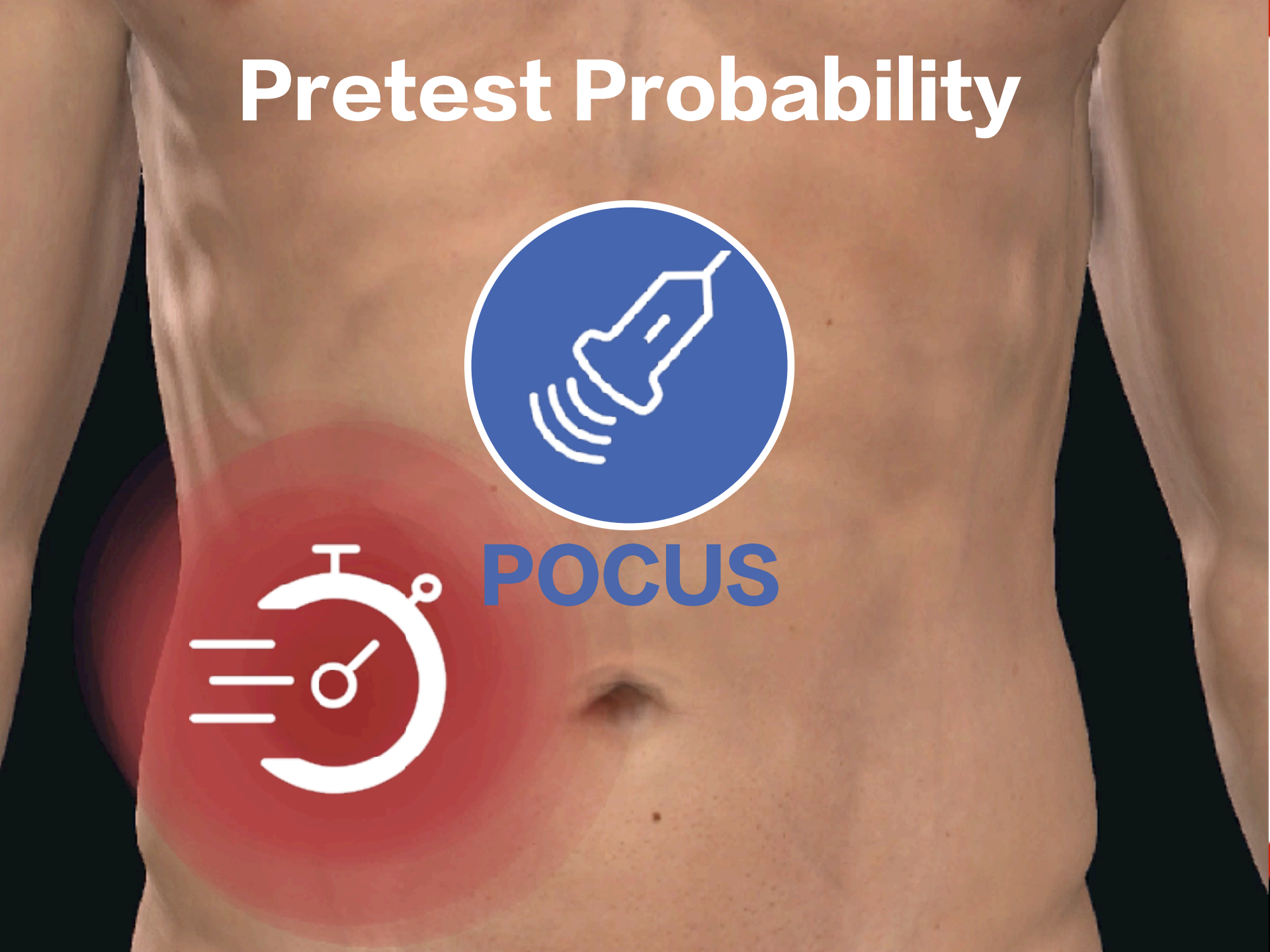
病史詢問

理學檢查

Y POCUS N

Taipei Medical University Center for Education in Medical Simulation

Pretest Probability



ULTRASOUND PROGRAM

POCUS for Acute ABDOMEN

A for aorta

B for biliary

D for diaphragm

O for obstruction

M for moving fluid or gas

E for ectopic pregnancy

N for nephropathy

ULTRASOUND
PROGRAM

ABDOMEN

O for obstruction
(SBO & Intussusception)

3 5

Essential Principles GIUS lesions on Sono

1. 腸胃道壁增厚 (>5mm)
2. 腸胃道壁分層消失
3. 蠕動減少
4. 用超音波探頭壓迫時不變形
5. 病灶通道內容物減少
6. 病灶附近之其他變化(LN, fat, ascites)

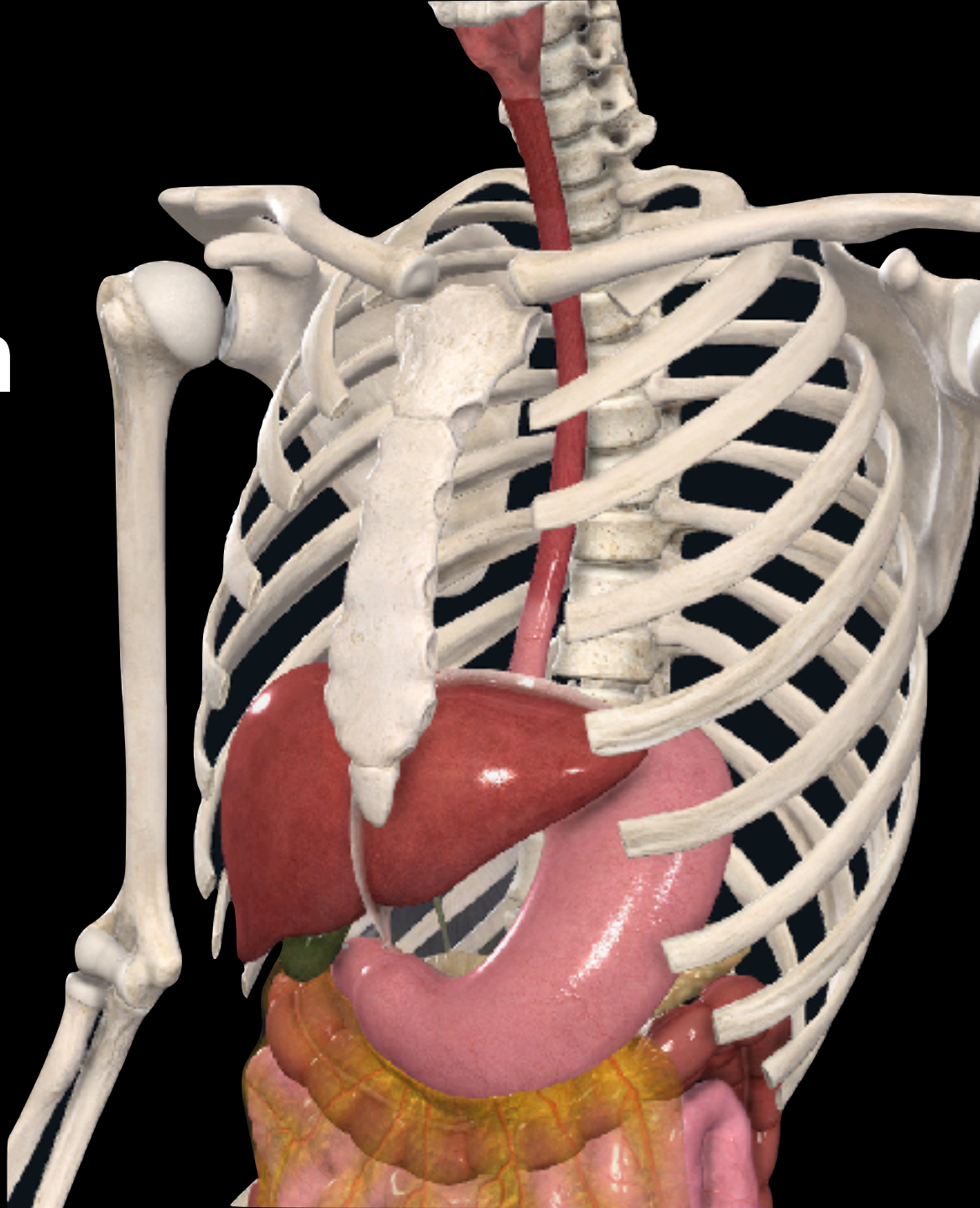
Esophagus

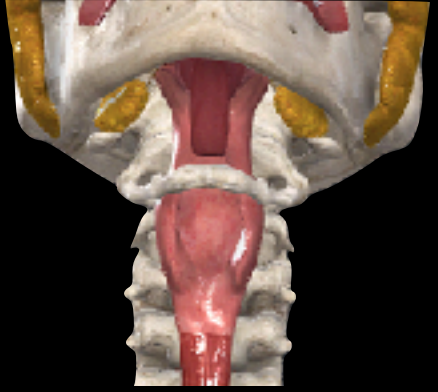
EC junction

Stomach

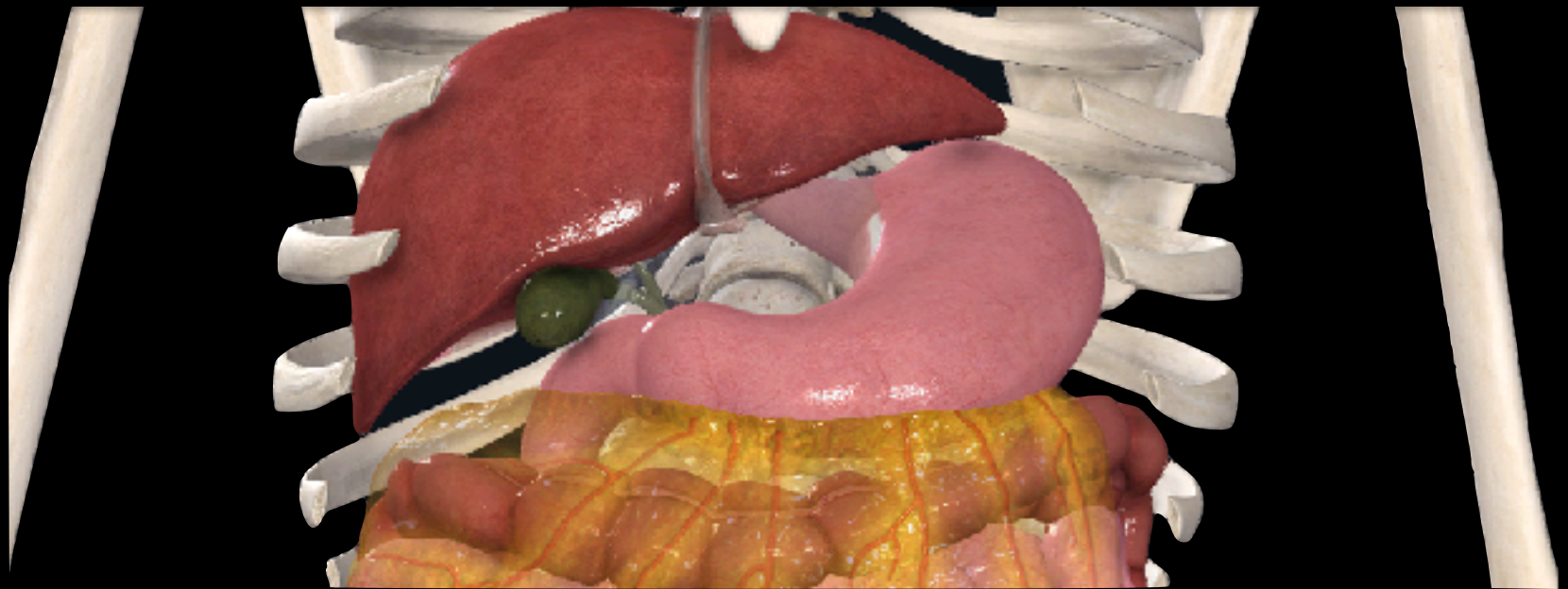
Antrum

Duodenum

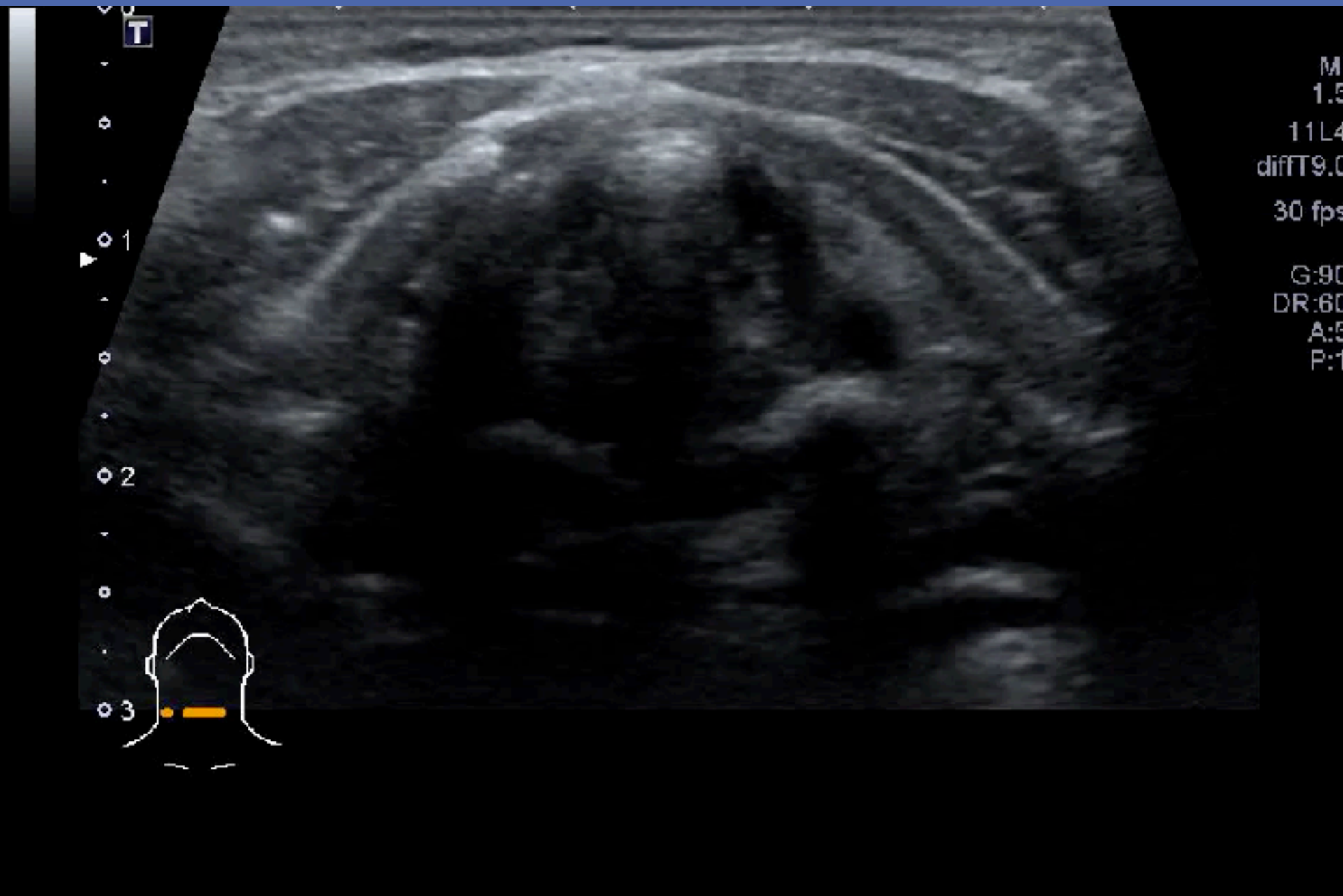




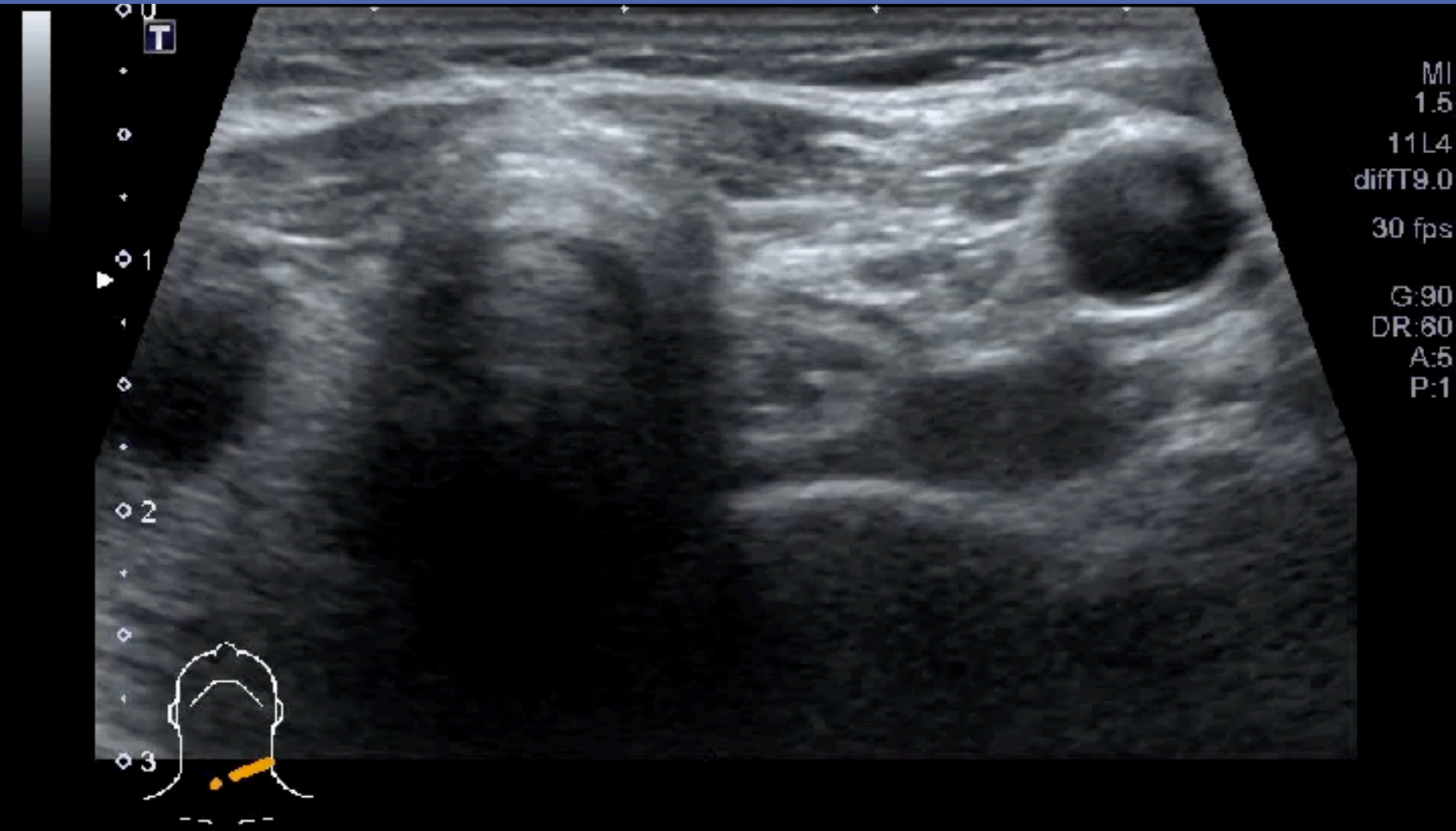
嘿嘿！你看不到我



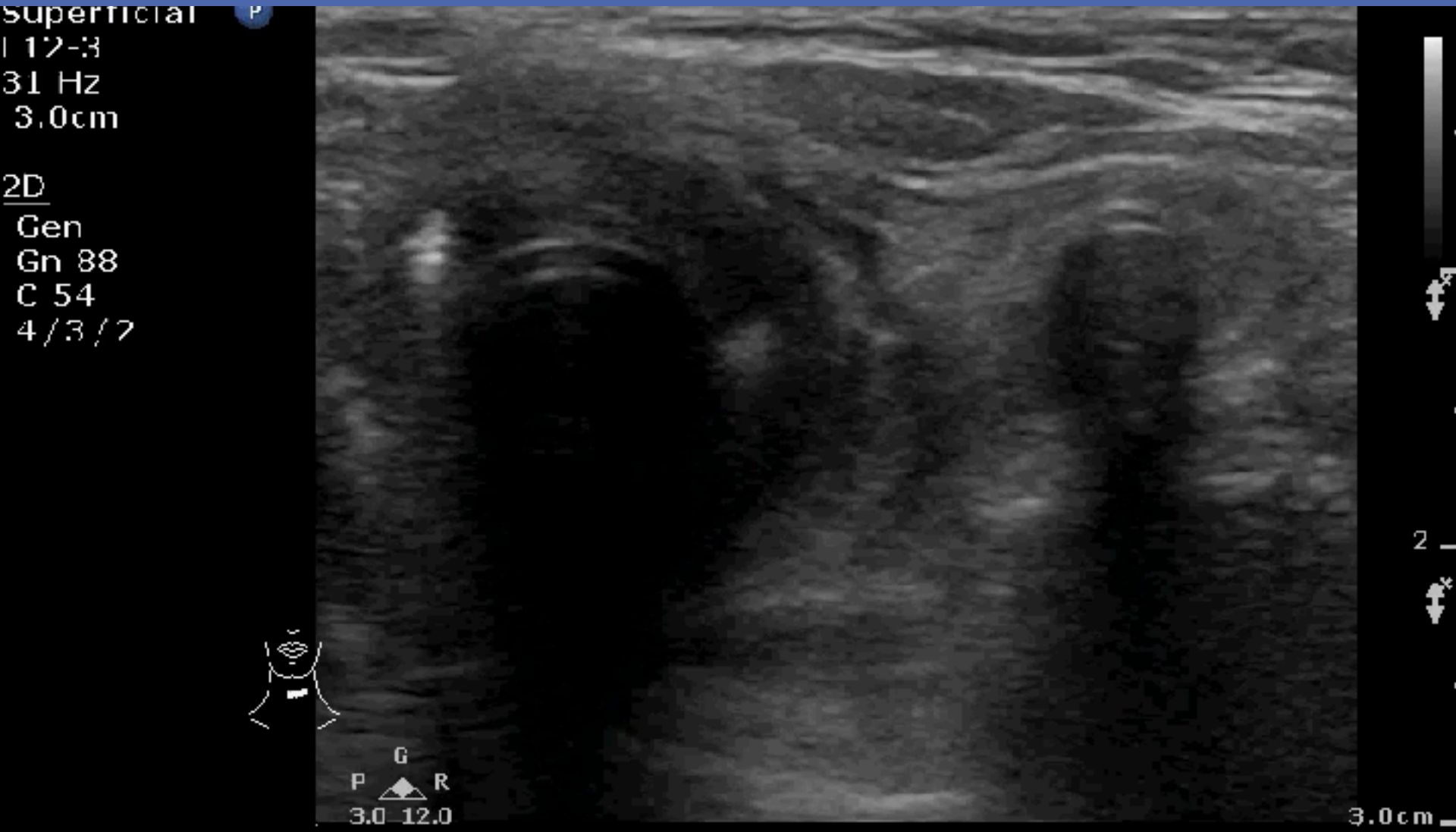
有看到食道請舉手



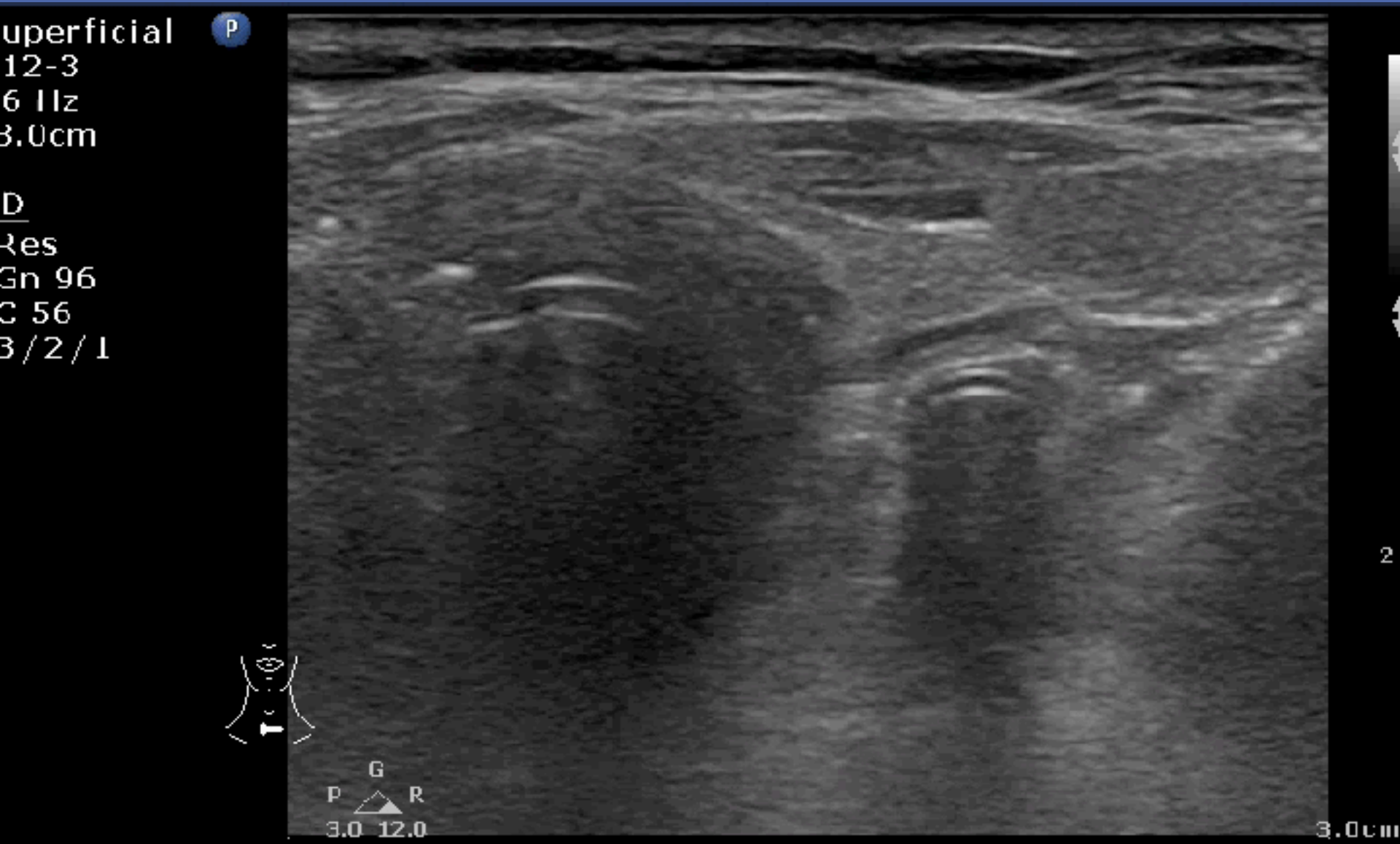
影片中做了什麼動作？



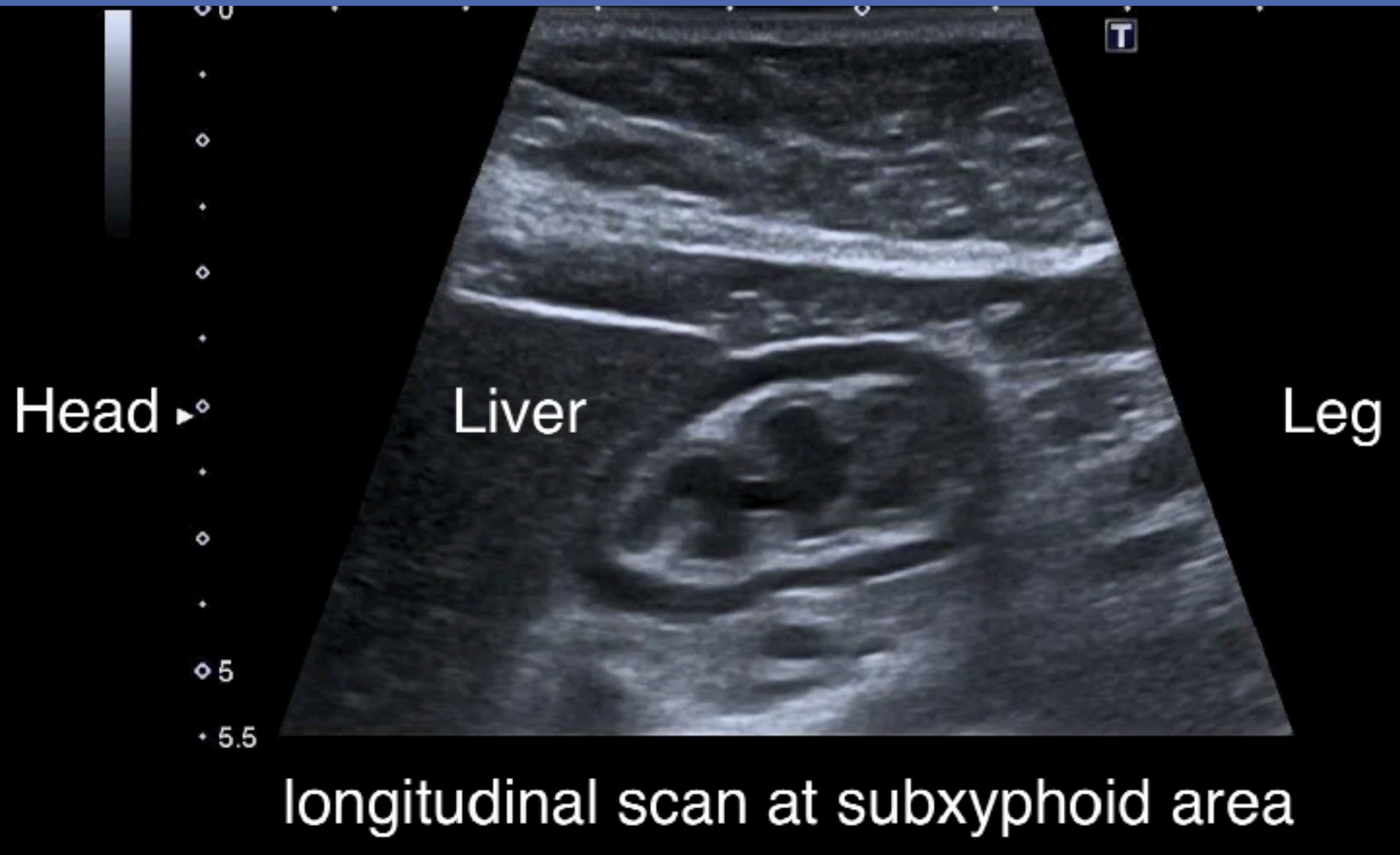
Corrosive injury

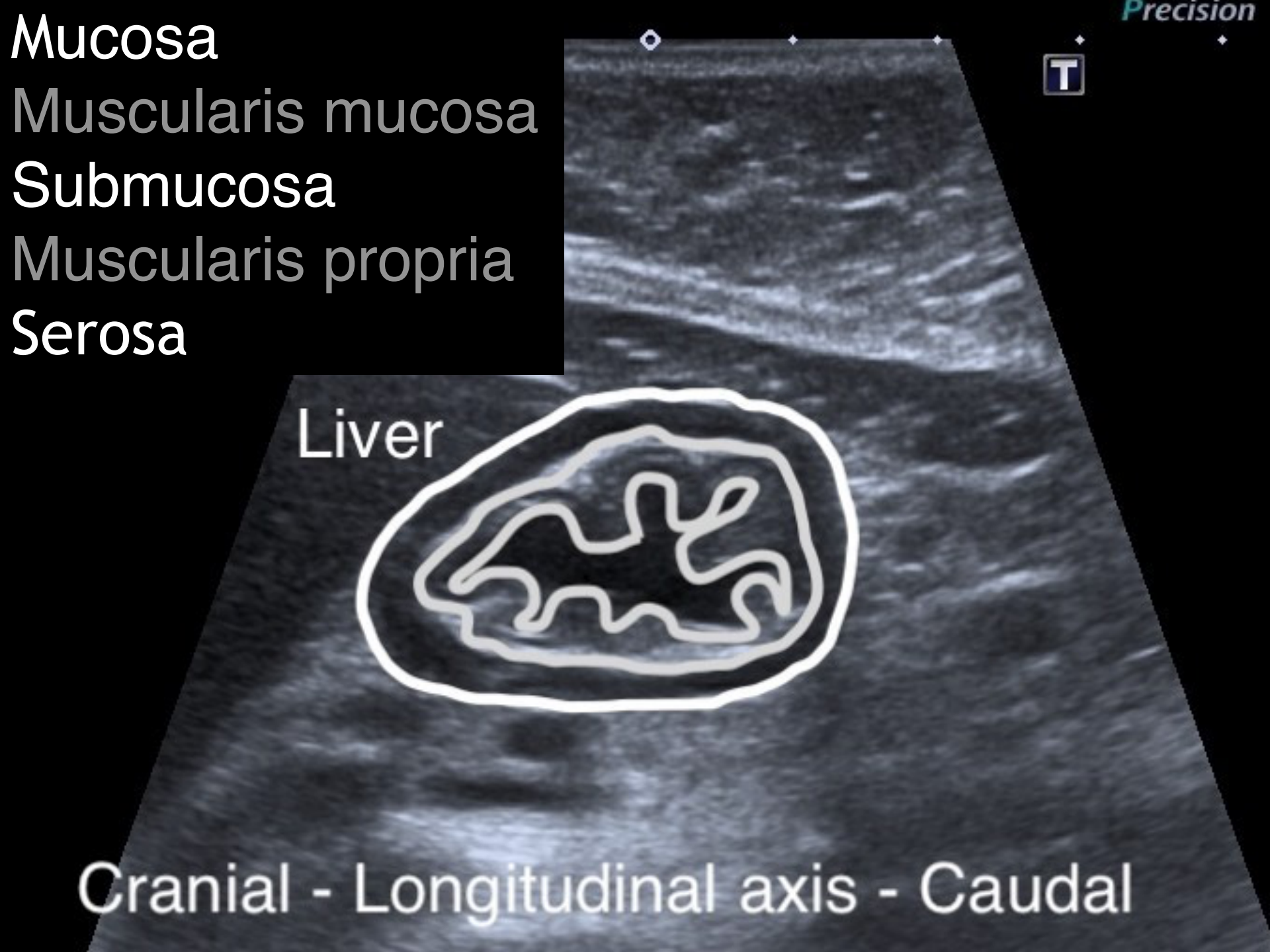


請問你看到1 or 2個Tube?

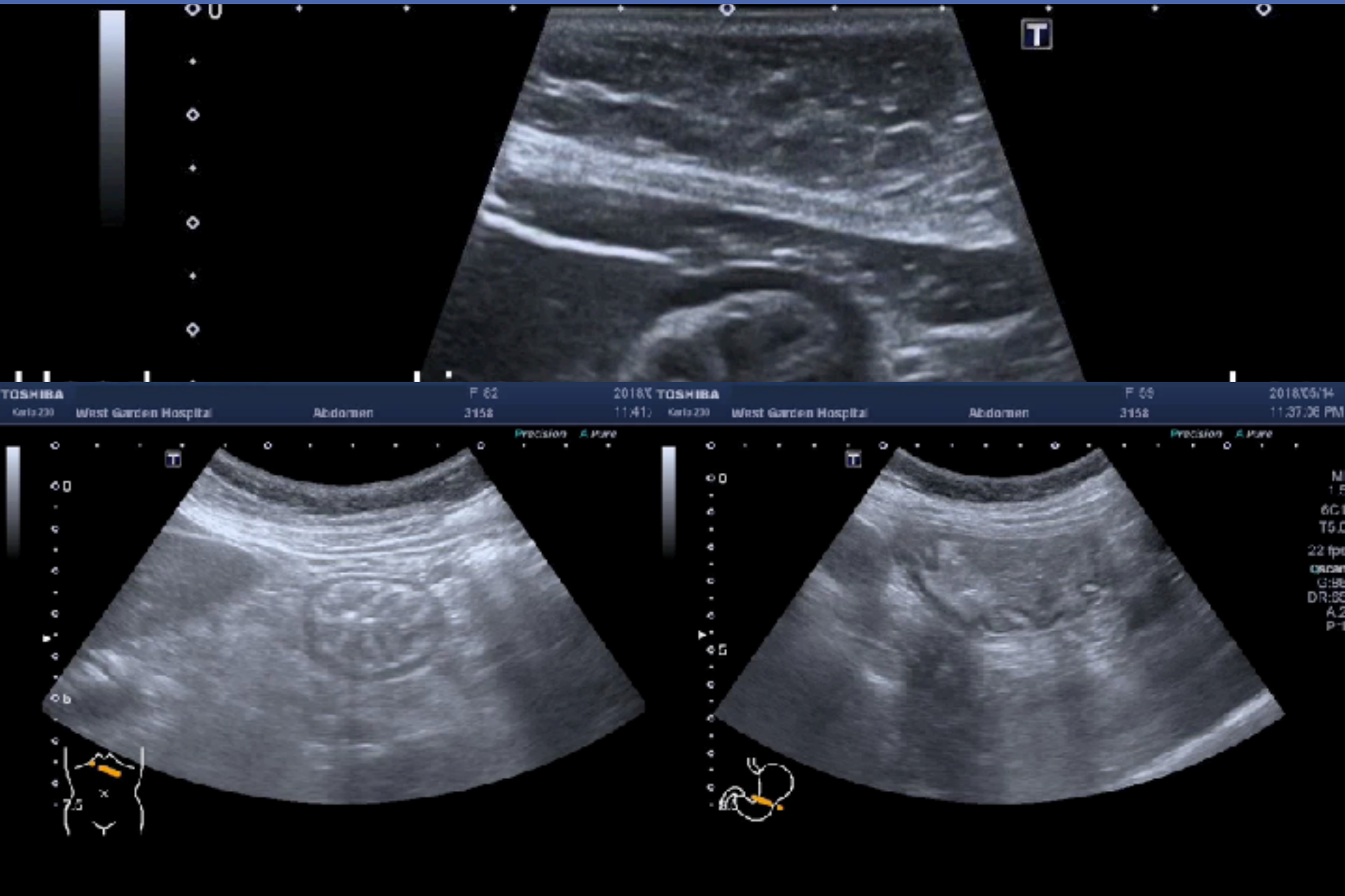


胃的結構你看到幾層？

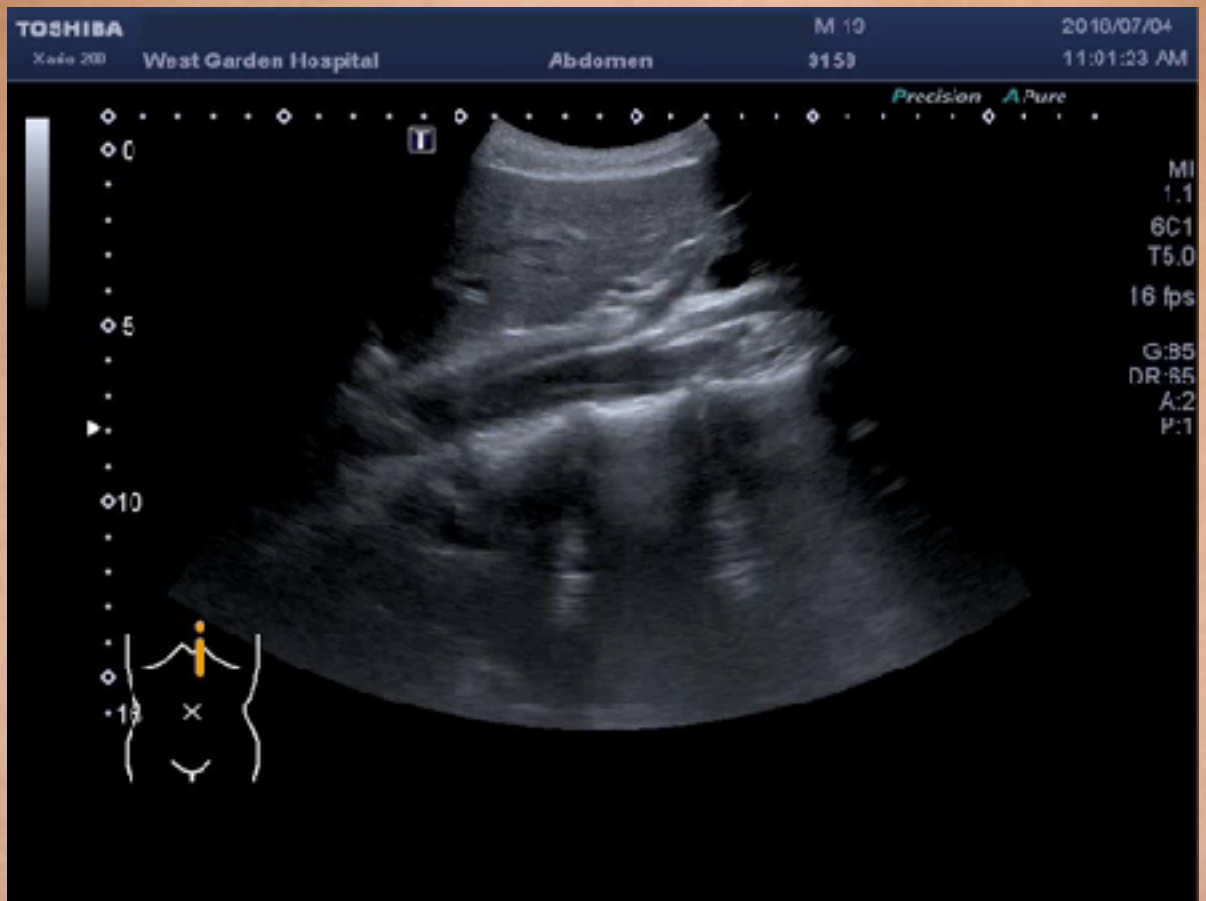



Mucosa
Muscularis mucosa
Submucosa
Muscularis propria
Serosa
Liver
Precision
Cranial - Longitudinal axis - Caudal

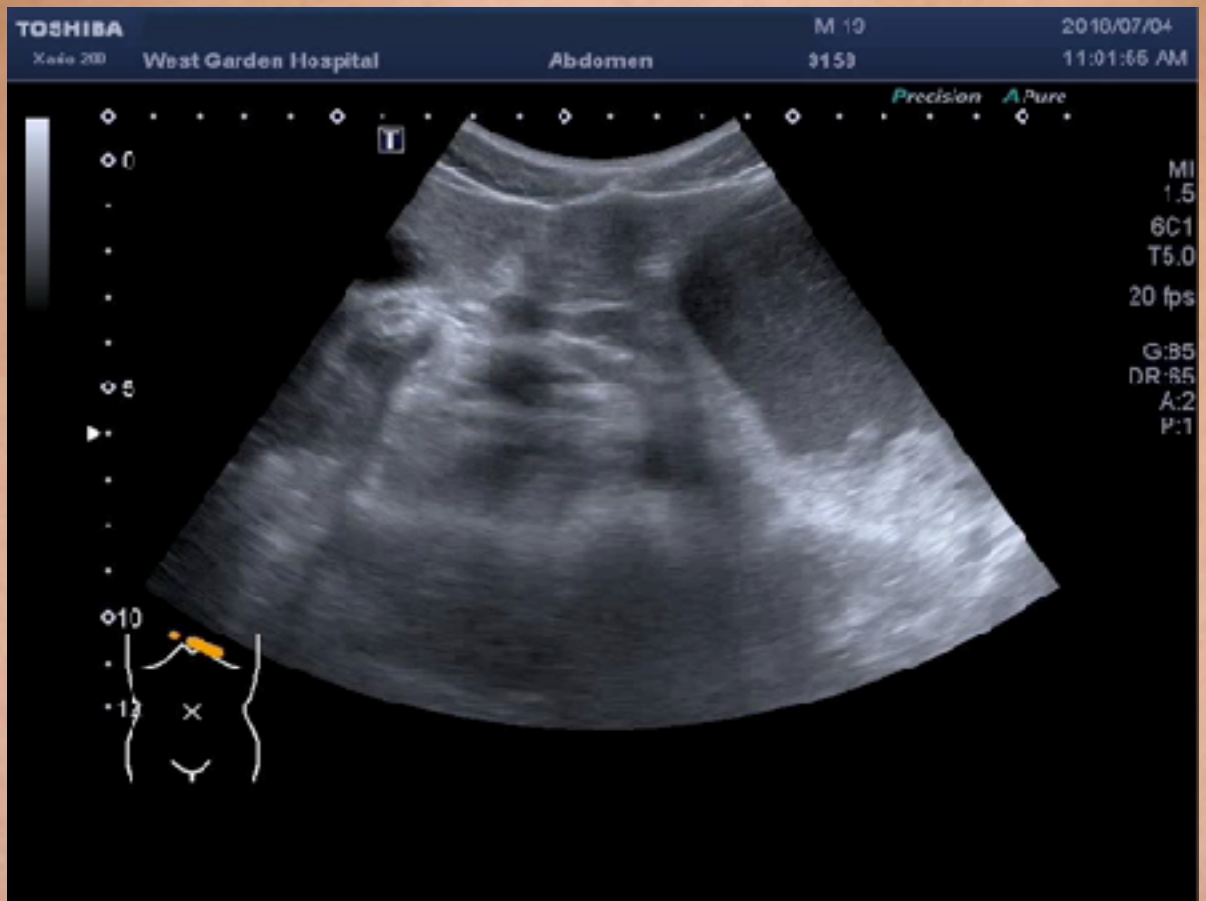
Rugae


TOSHIBA
West Garden Hospital
Abdomen
TOSHIBA
West Garden Hospital
Abdomen

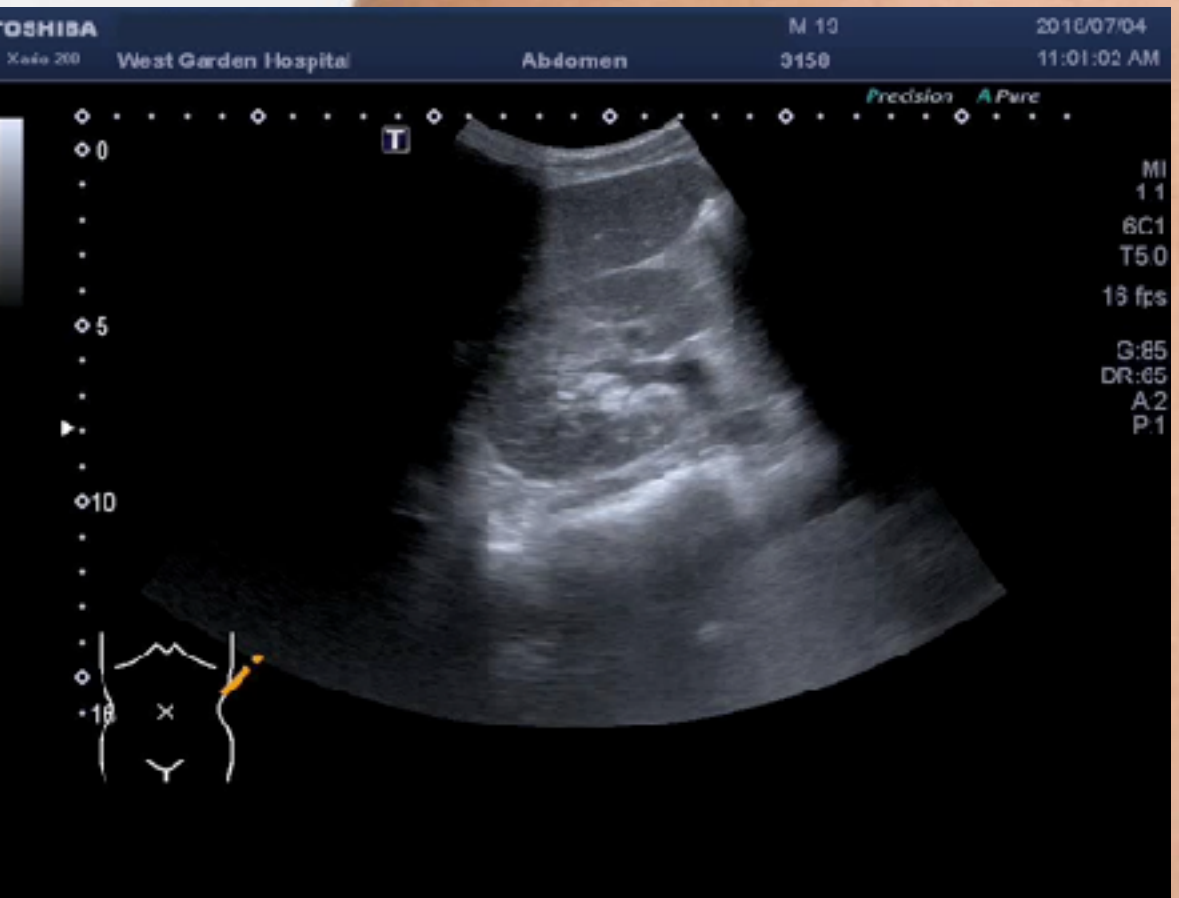
19M, 上腹痛 & 持續嘔吐


TOSHIBA
Xario 200
West Garden Hospital
Abdomen
M 19
3153
2010/07/04
11:01:23 AM
Precision
A Pure
MI
1.1
6C1
T5.0
16 fps
G:B5
DR:85
A:2
P:1
0
5
10

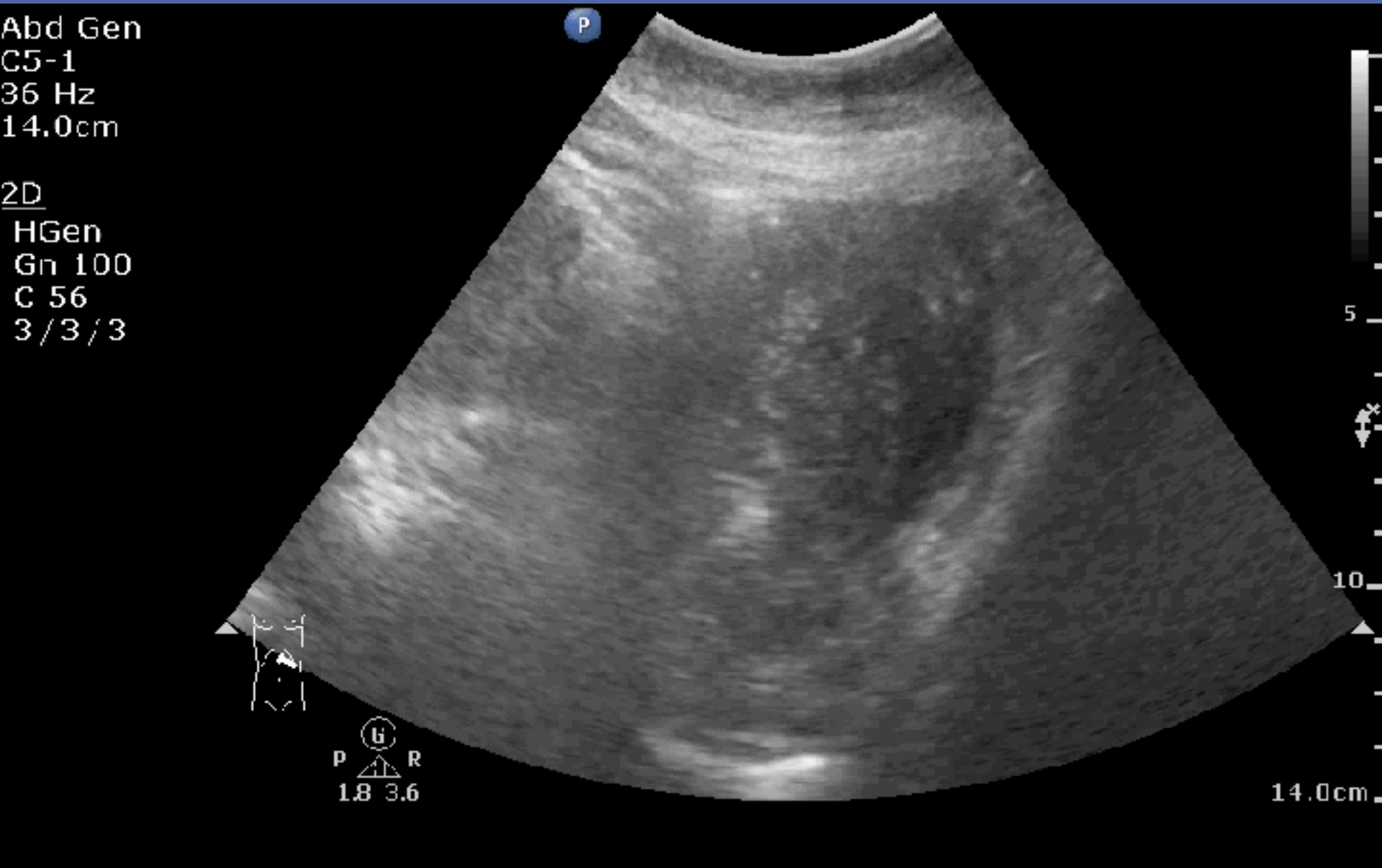
胃部掃描三部曲


TOSHIBA
Xario 200
West Garden Hospital
Abdomen
M 10
3153
2010/07/04
11:01:55 AM
Precision
APure
MI
1.5
6C1
T5.0
20 fps
G:B5
DR:55
A:2
P:1

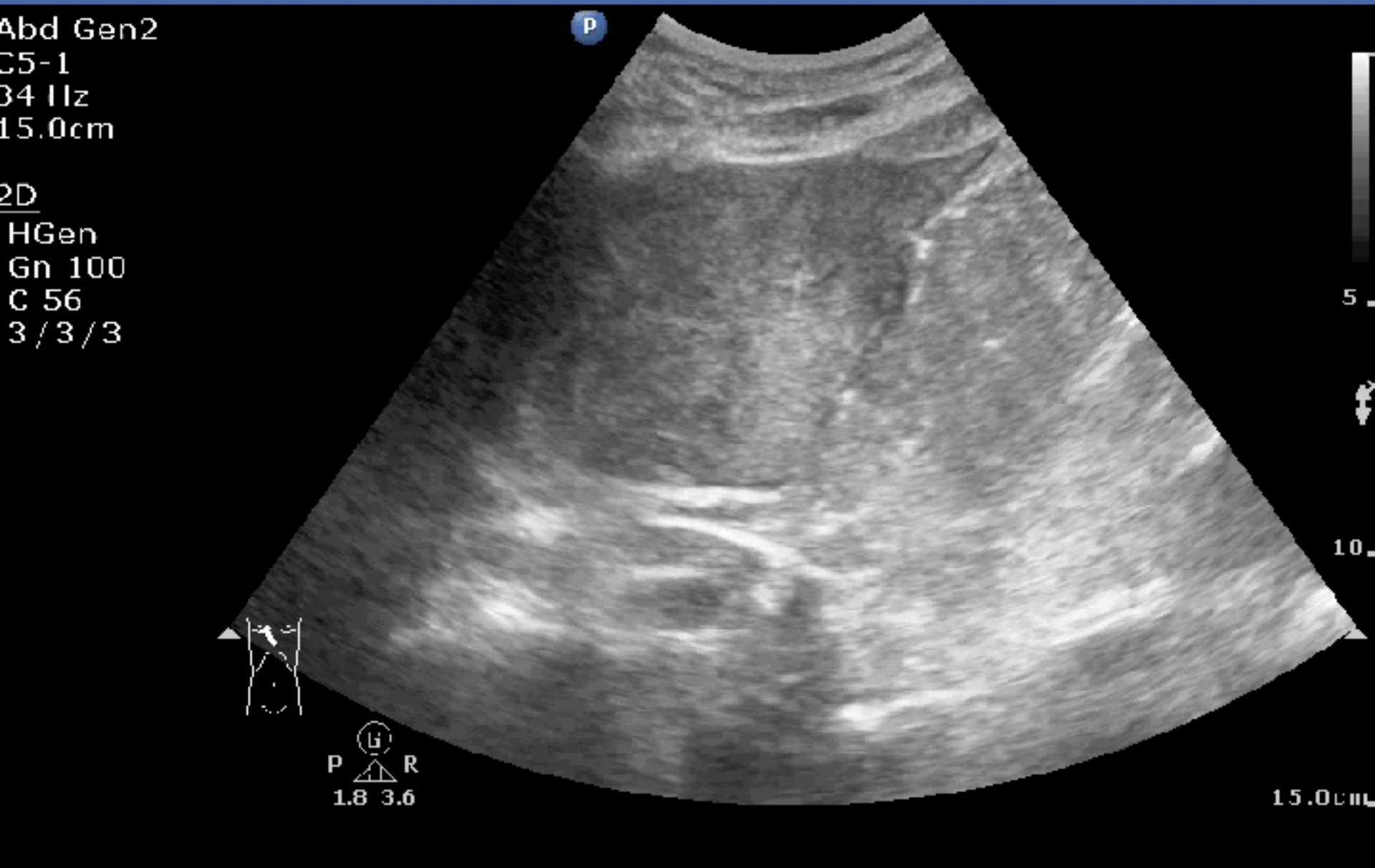
Gastric outlet obstruction



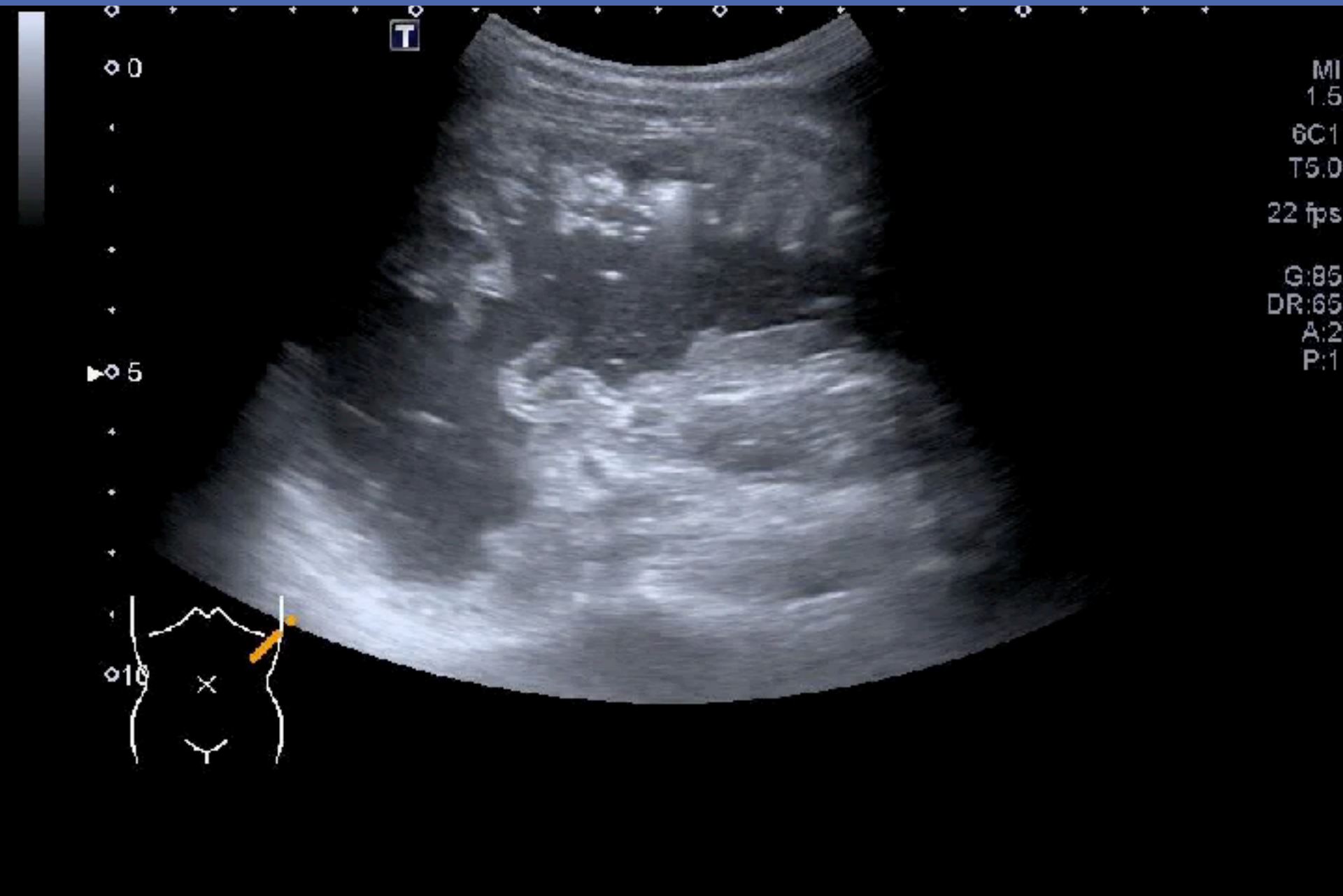
NG (Stomach)


Abd Gen
C5-1
36 Hz
14.0cm
2D
HGen
Gn 100
C 56
3/3/3
P
5
10
14.0cm
P
R
1.8 3.6

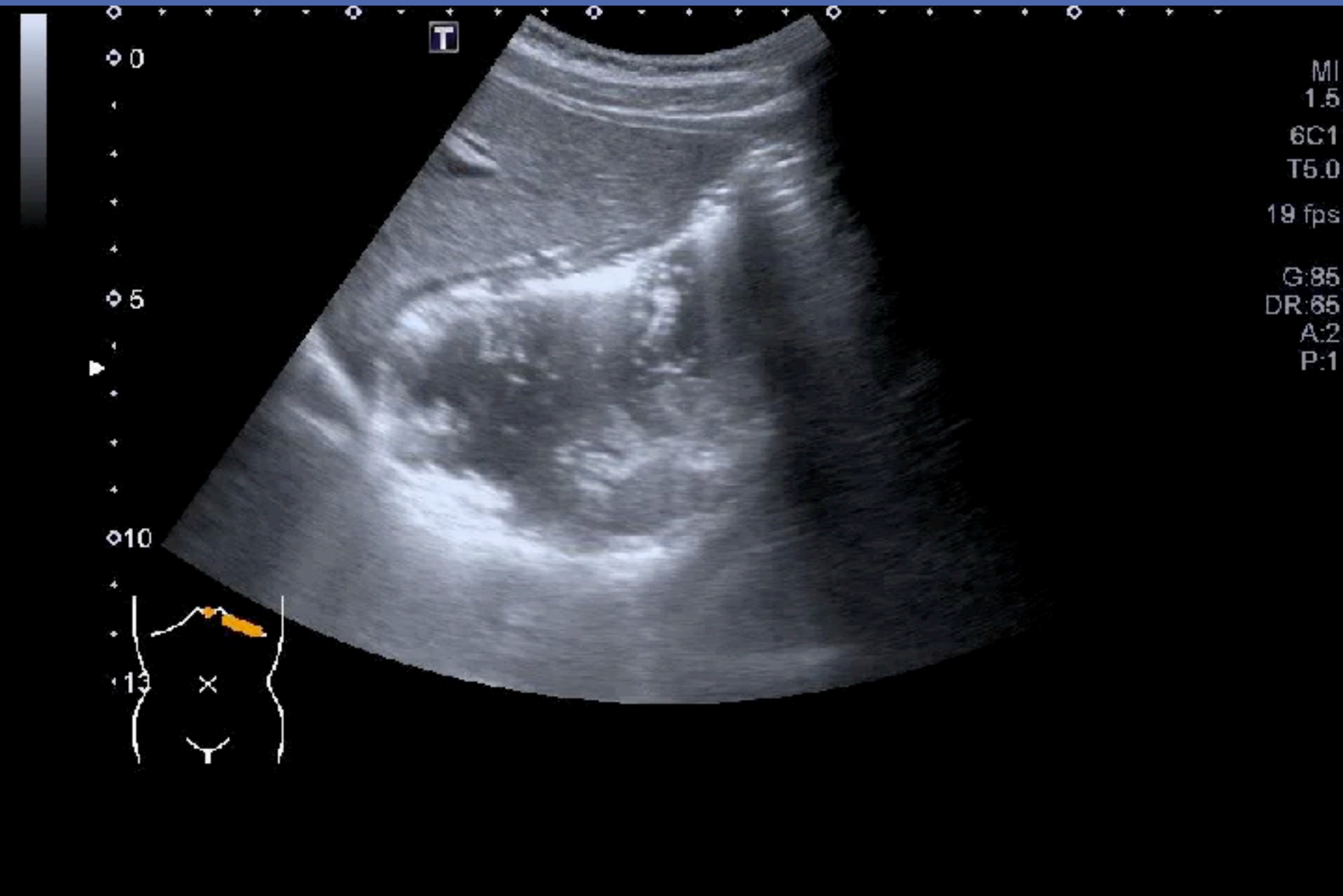
NG for stomach blood



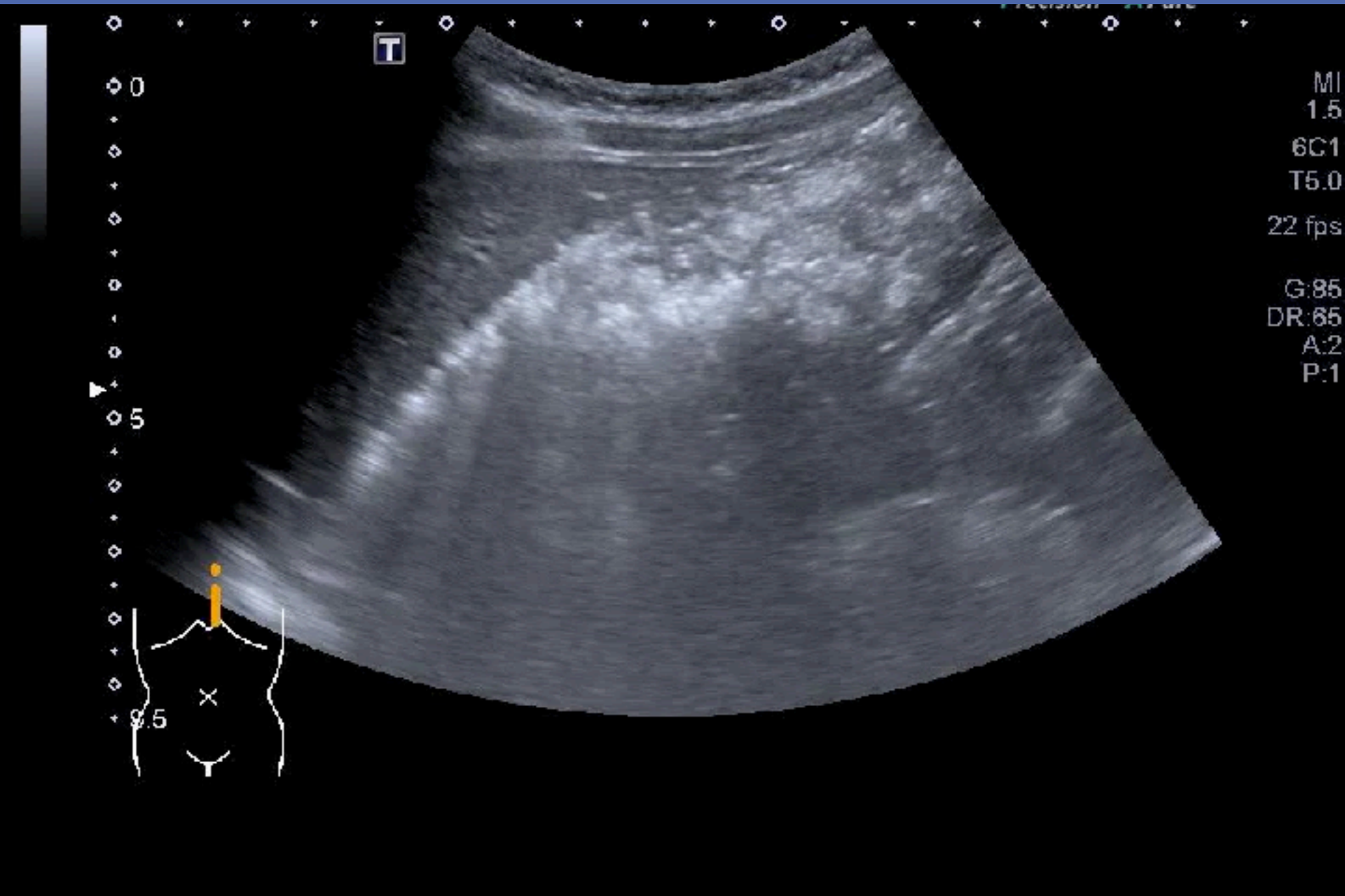
認為是胃的請舉手　！



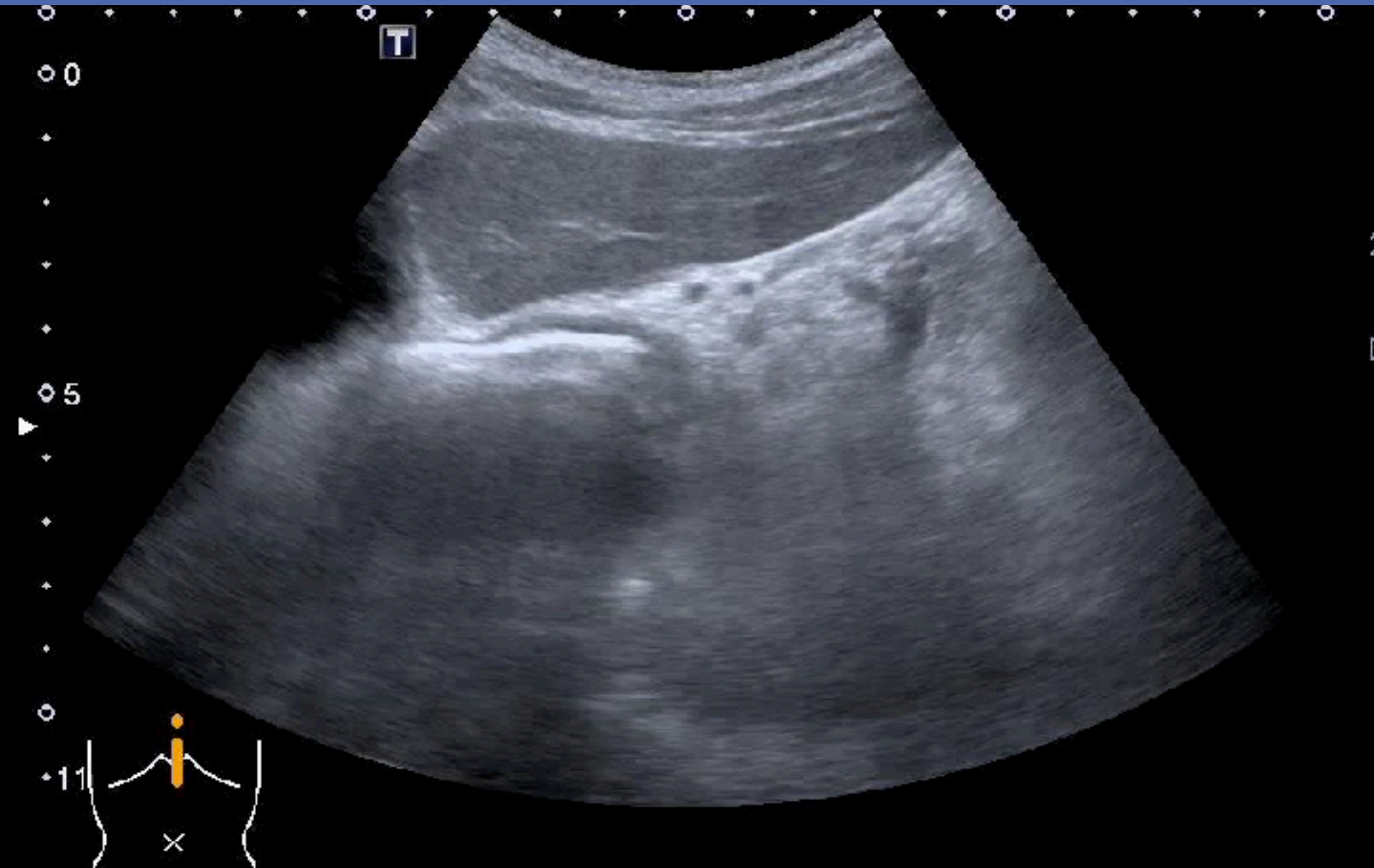
有看到EC junction請舉手 ！



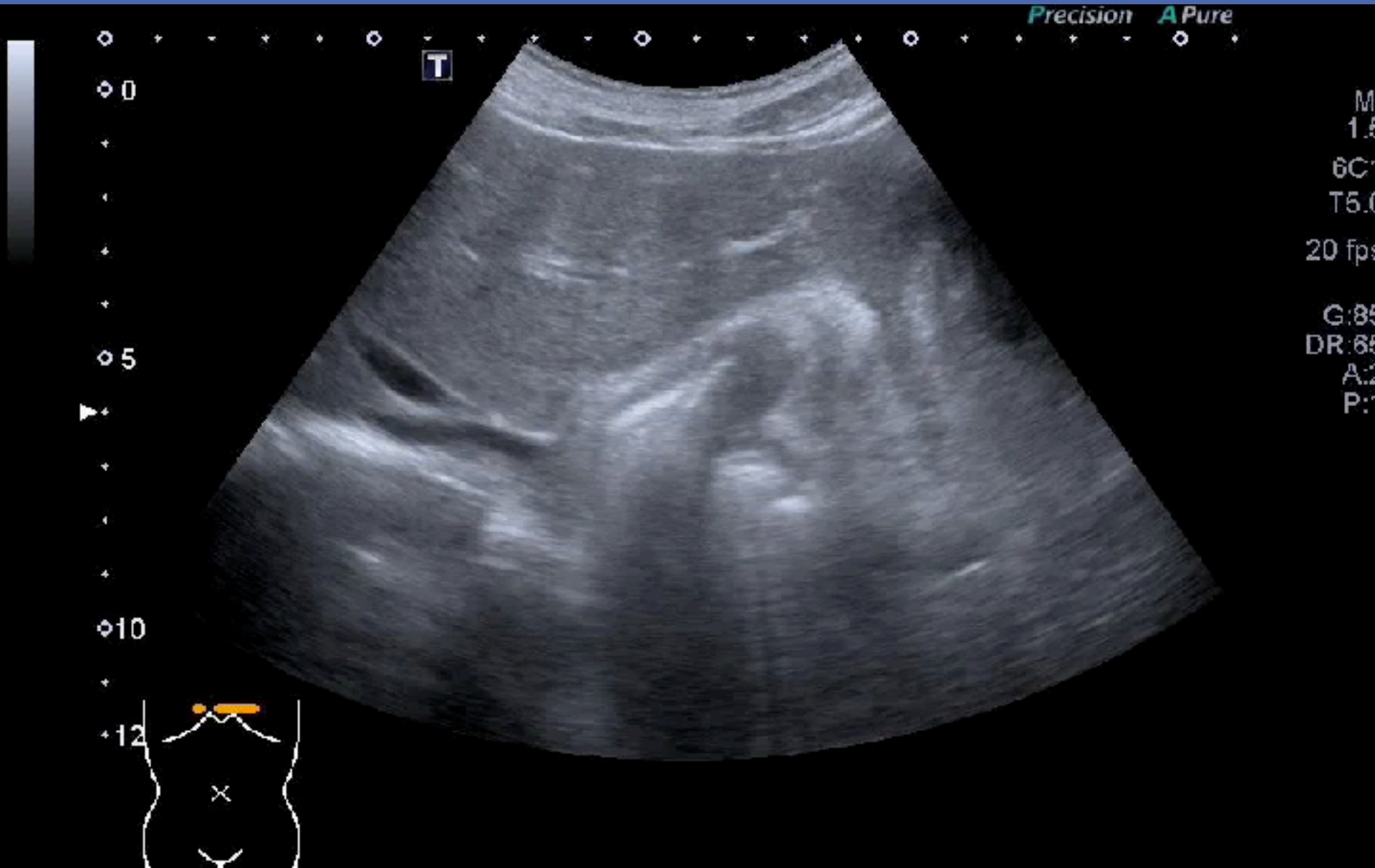
吸入性肺炎風險: 低、中、高？



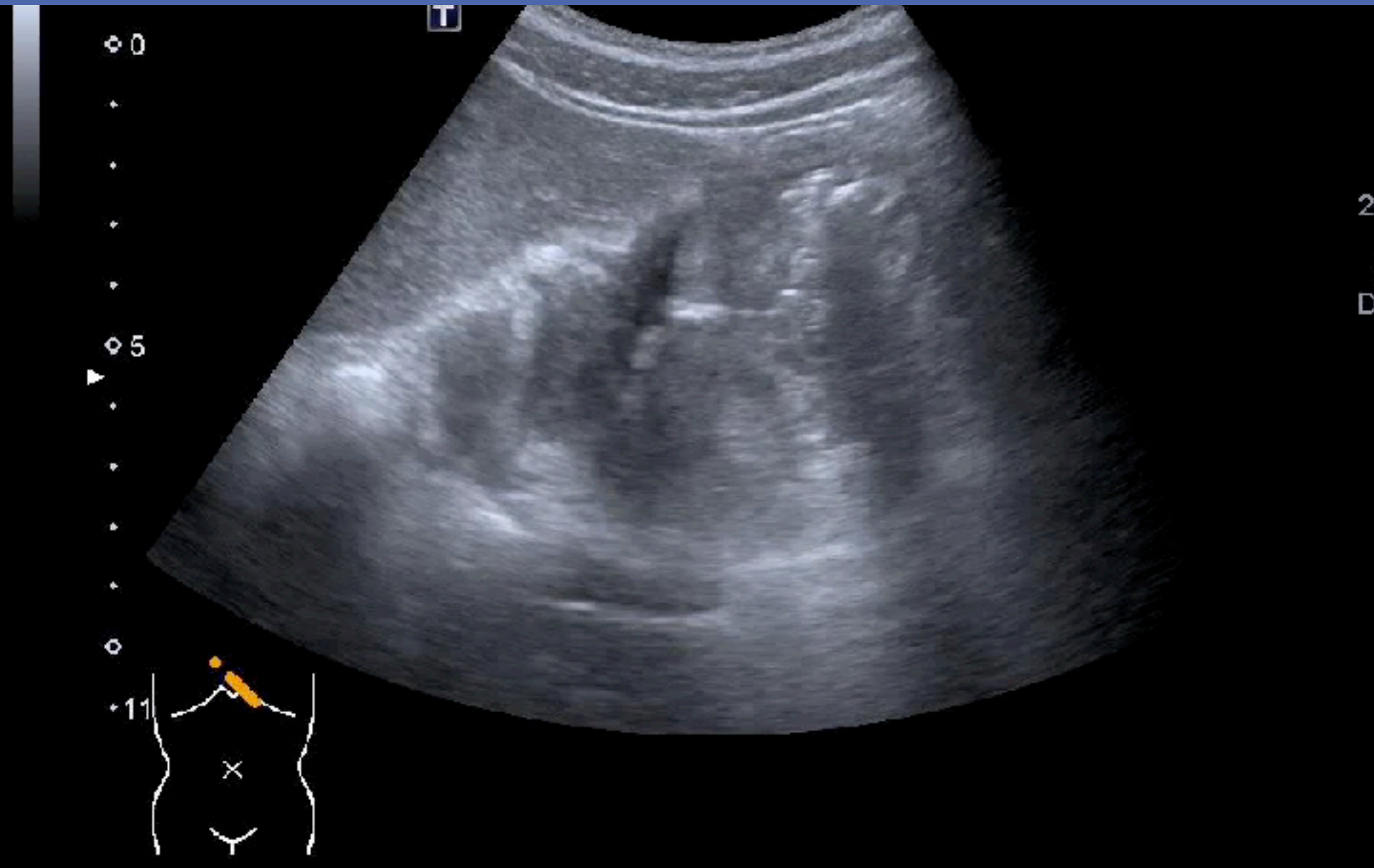
49M, 上腹脹好幾週

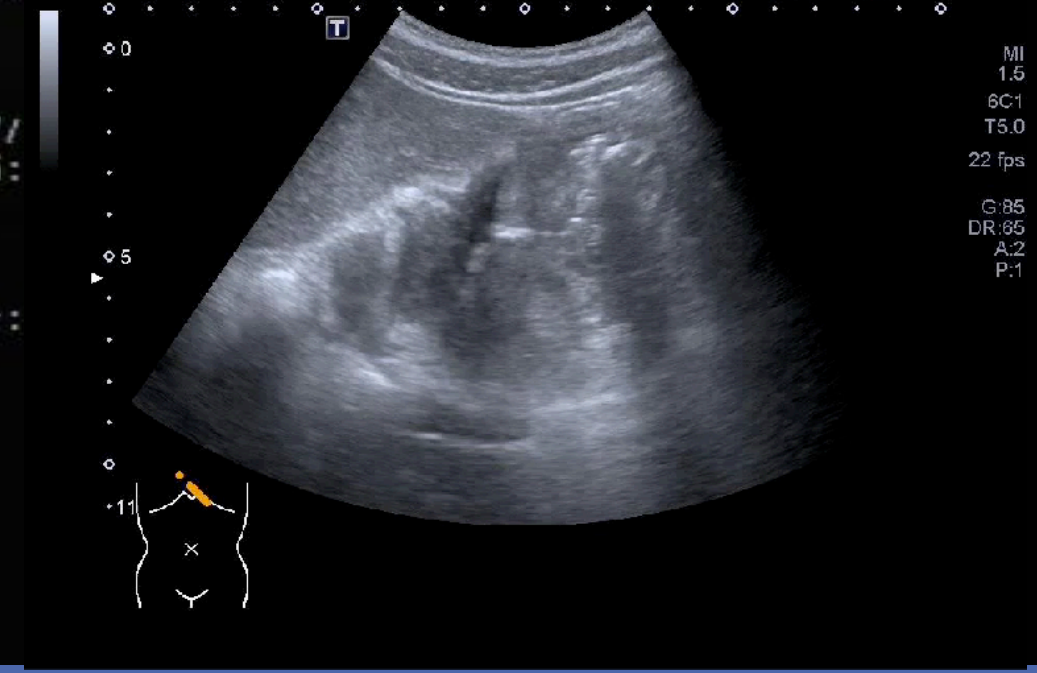


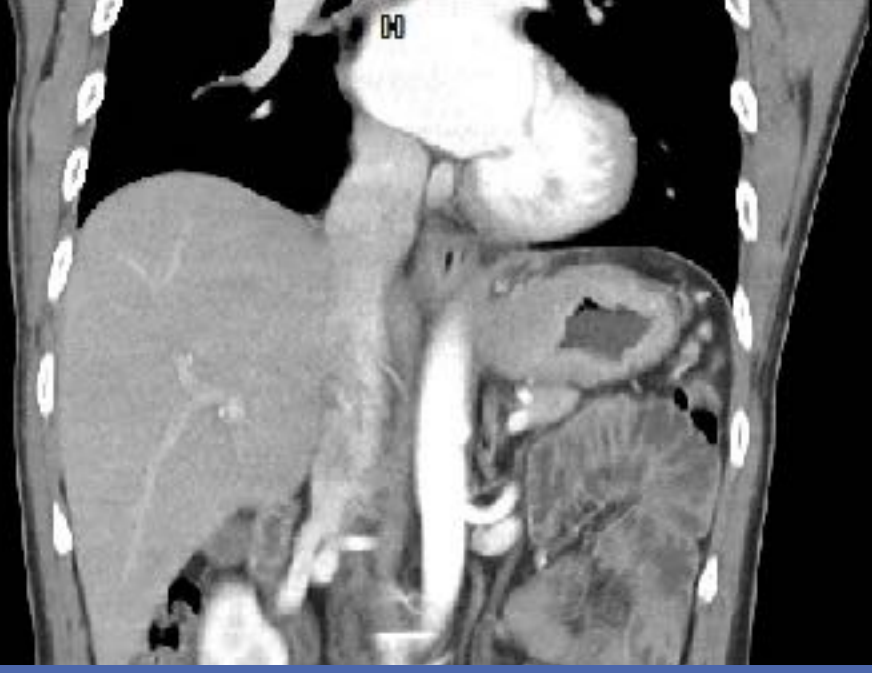
49M, 上腹脹好幾週



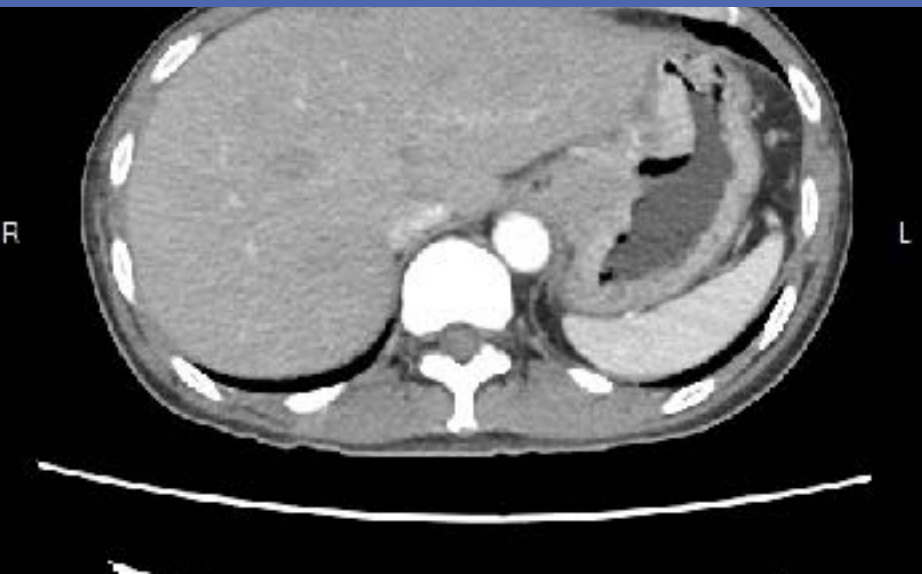
認為有問題的請舉手

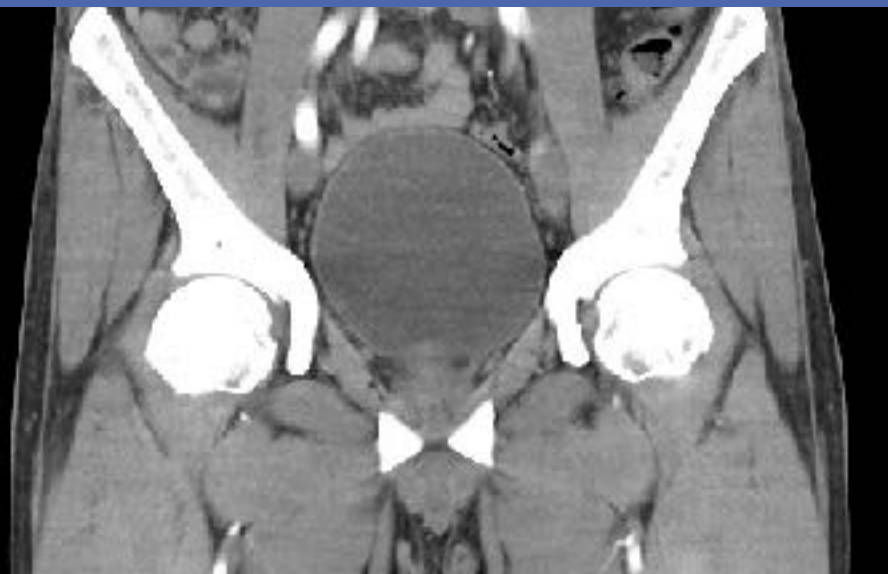




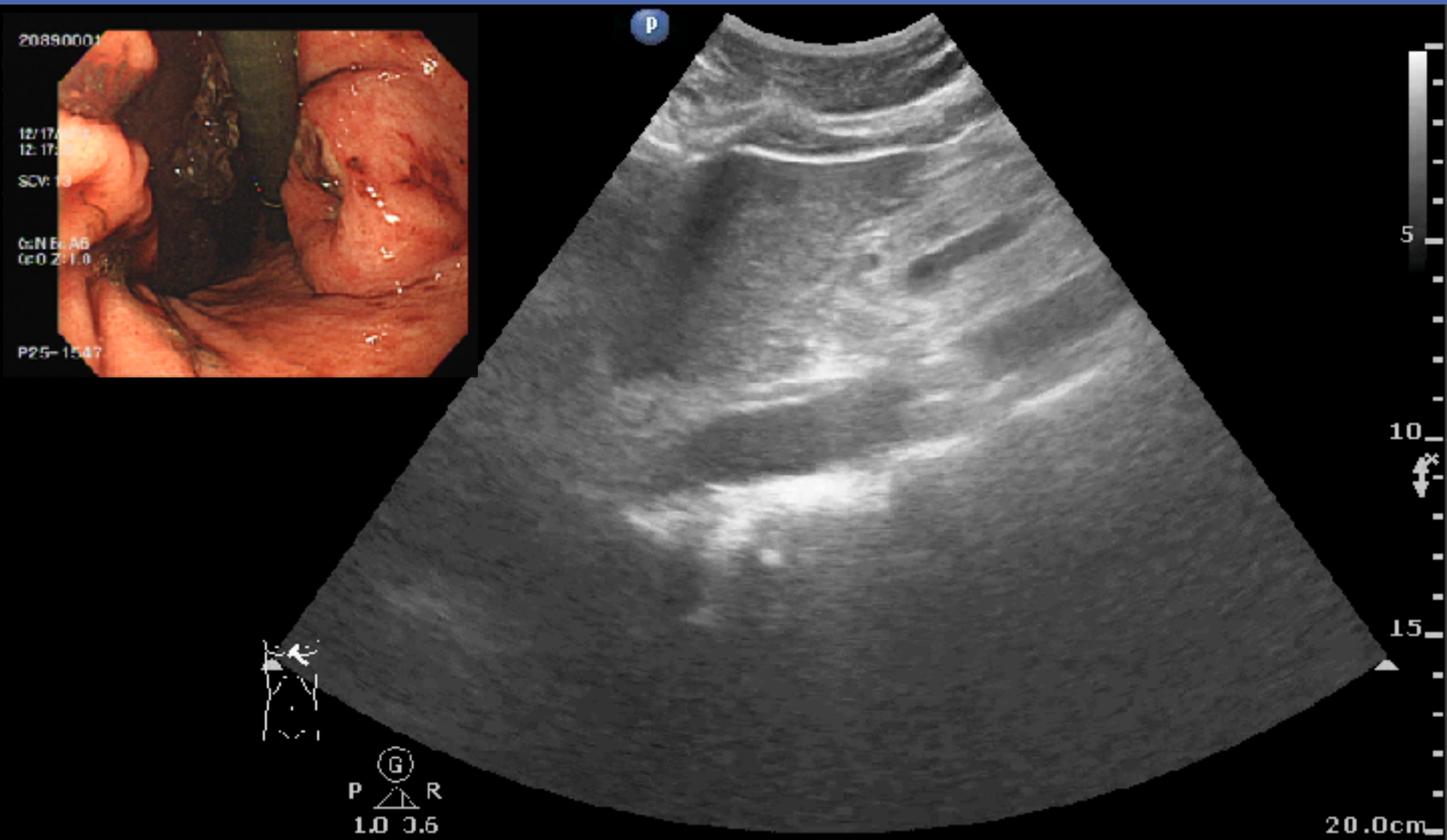


Gastric Cancer

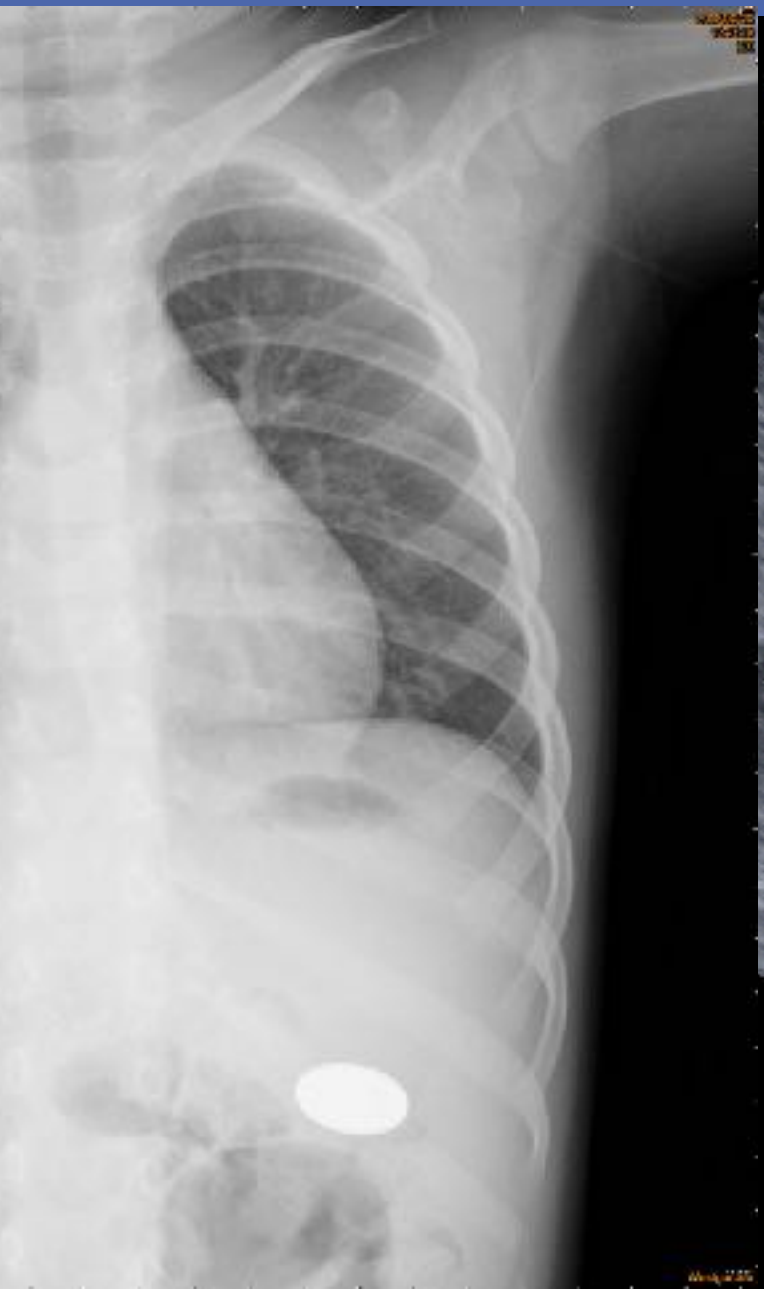


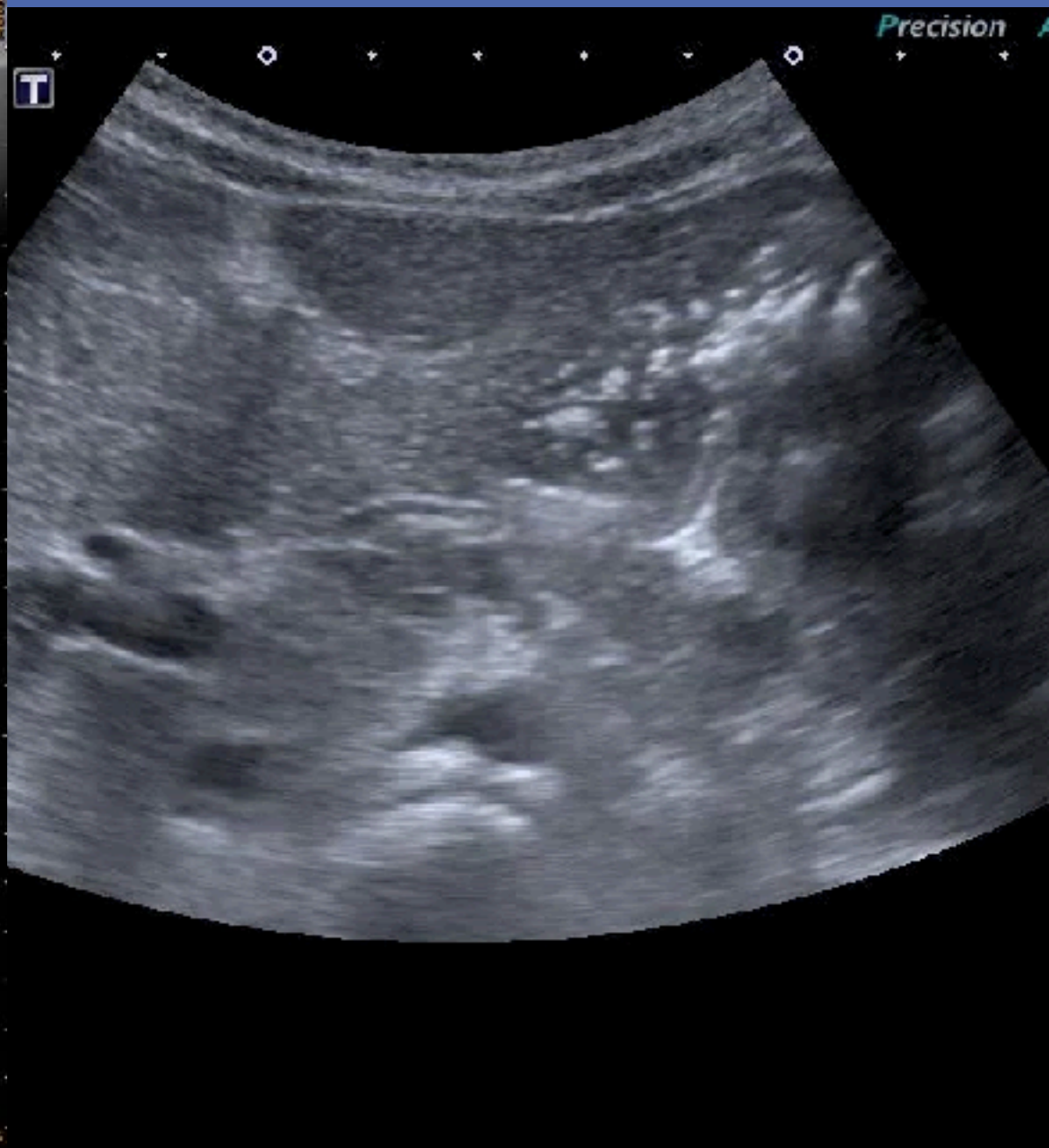


74F, vomit fresh blood

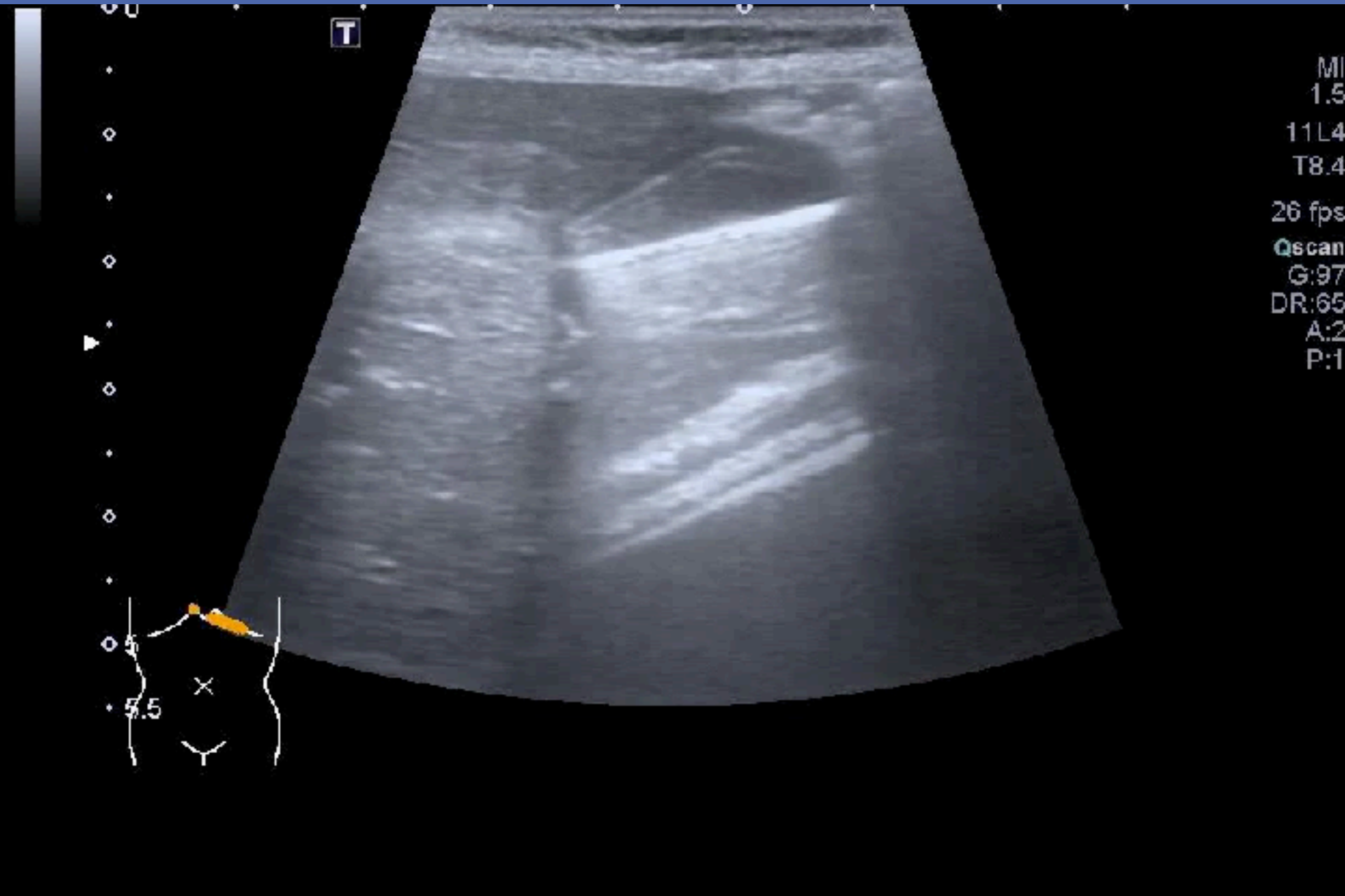


2F, 吞下硬幣

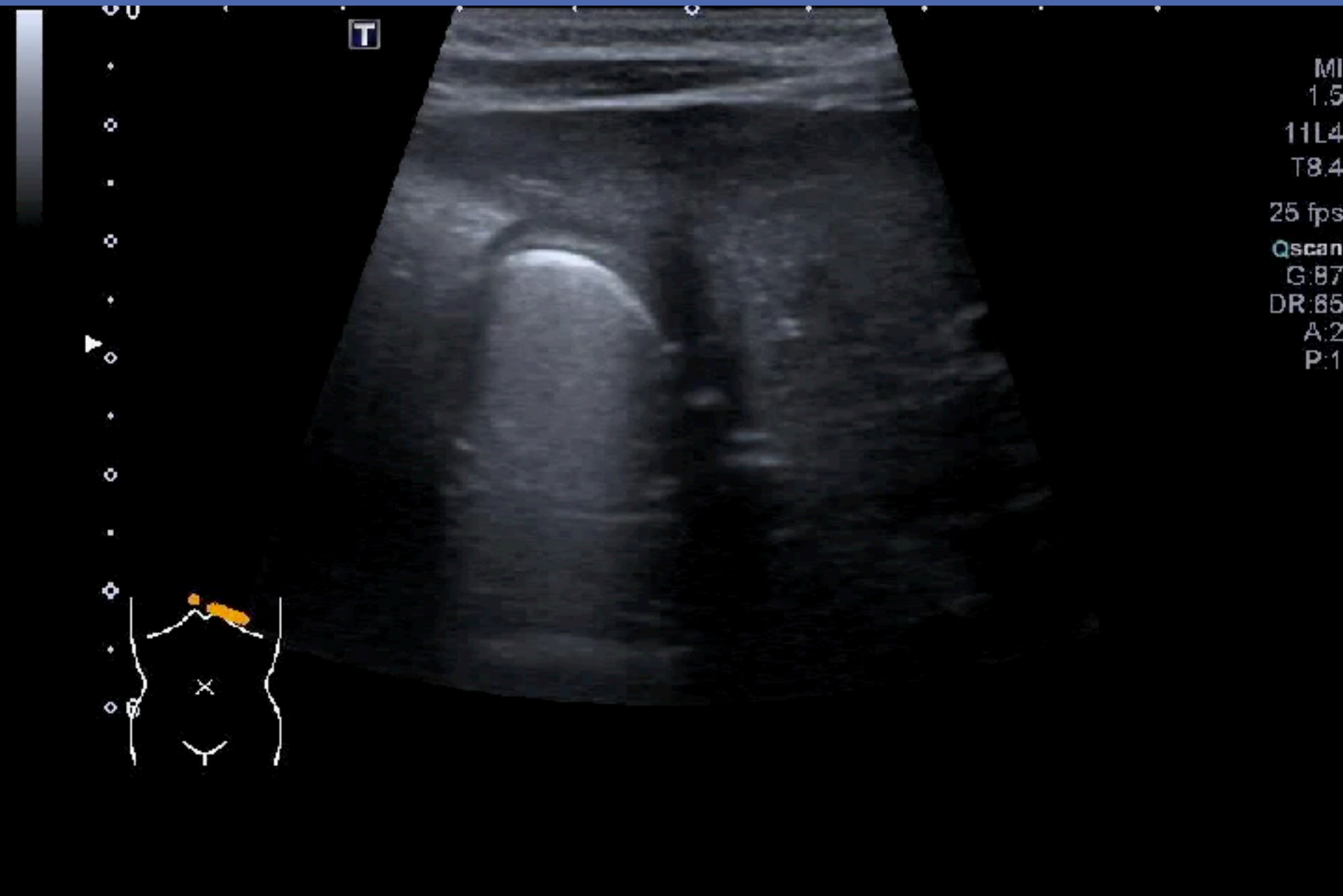




有看到硬幣的請舉手

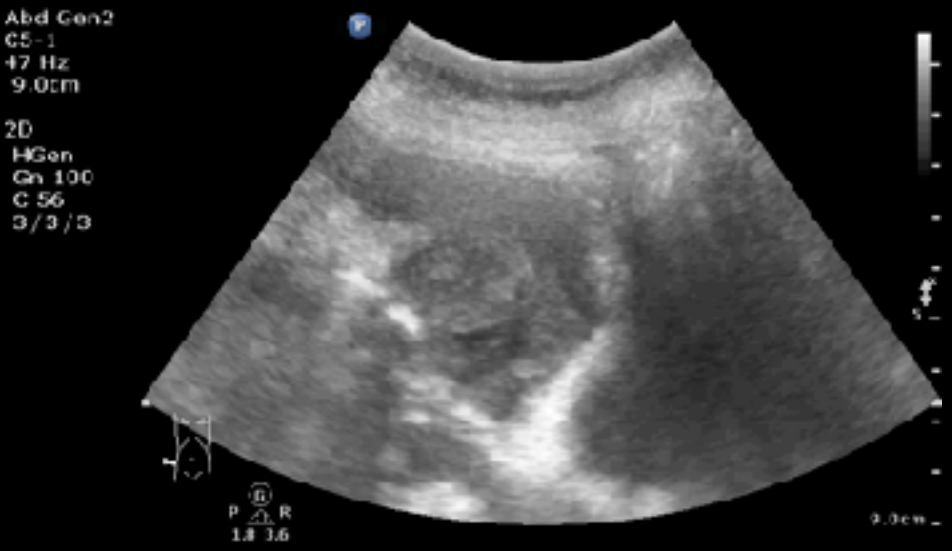


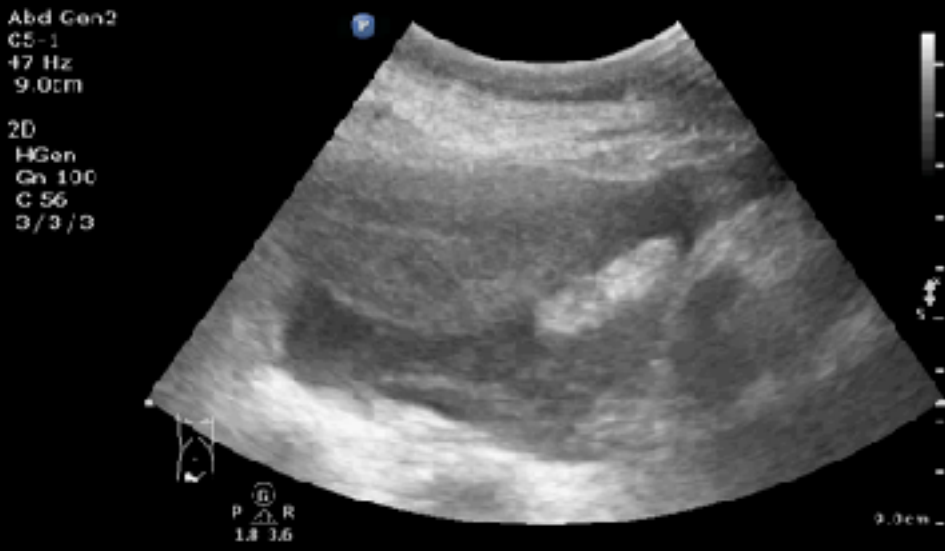
看出幣值的請舉手



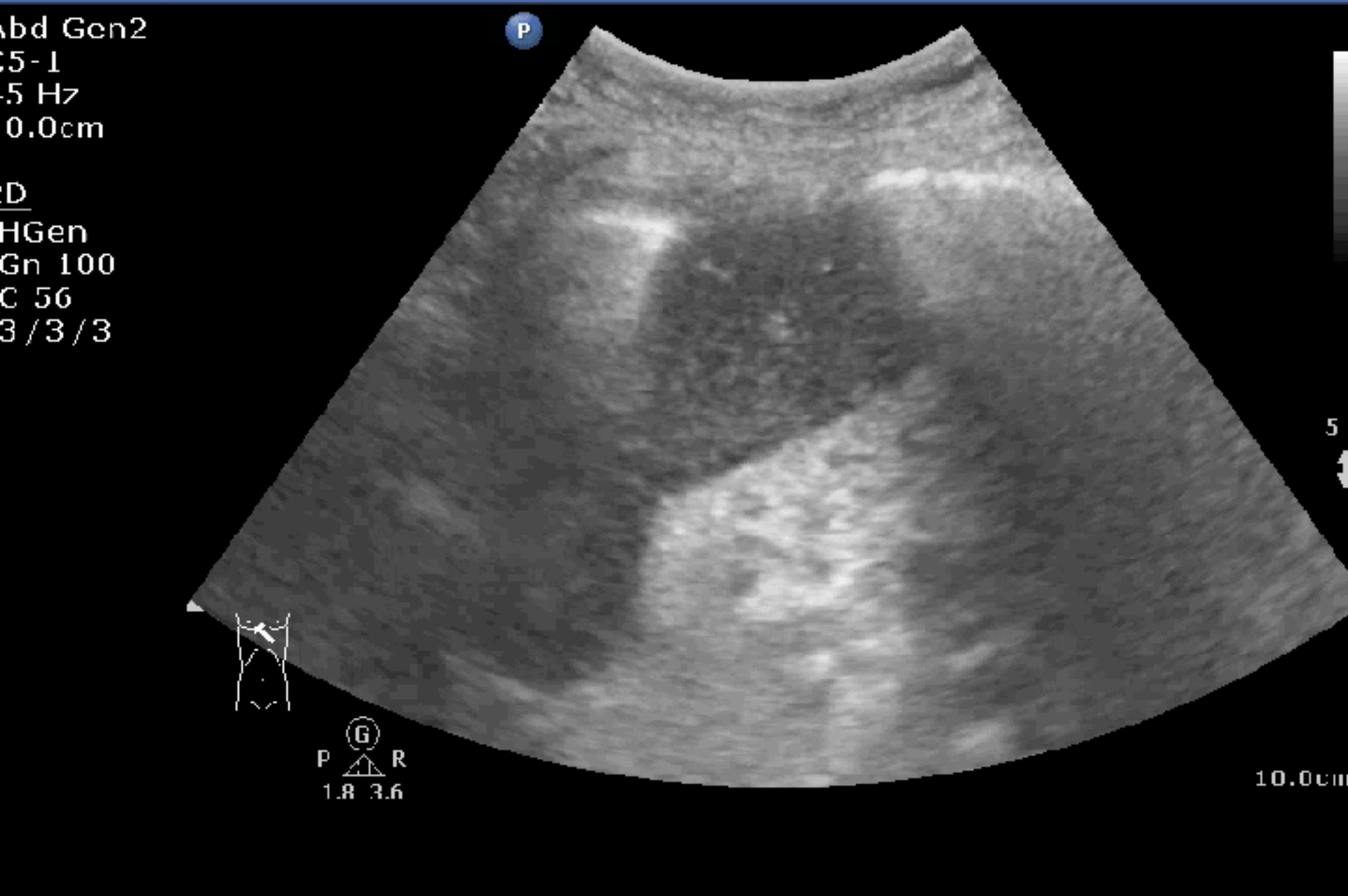
80F, diffuse abdominal pain

看到游離液體請舉手

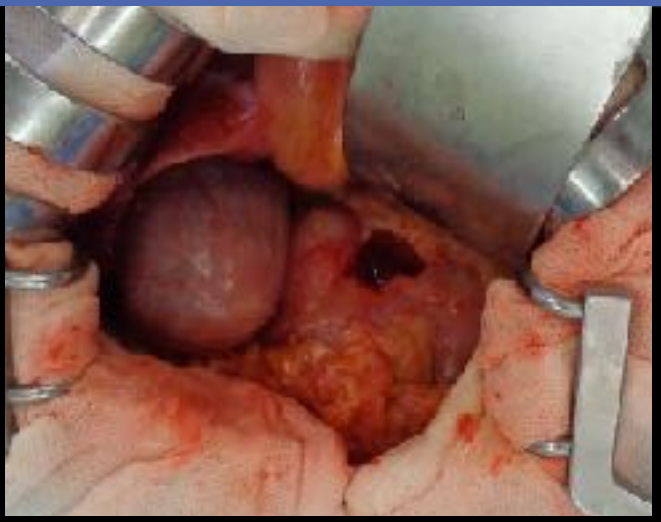


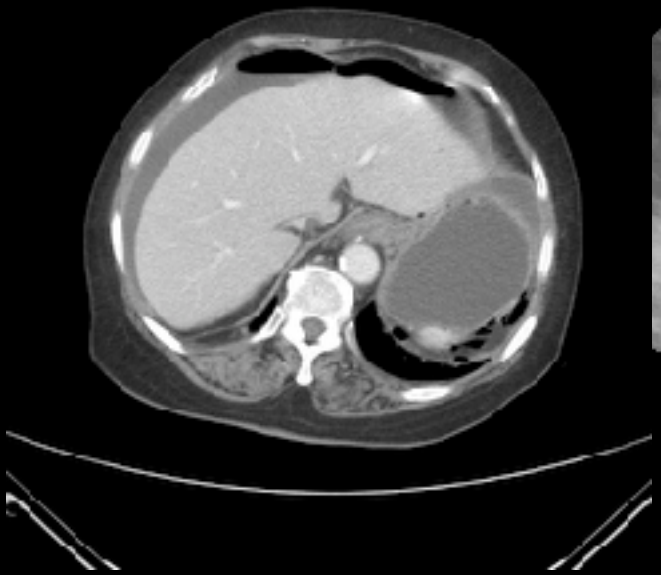


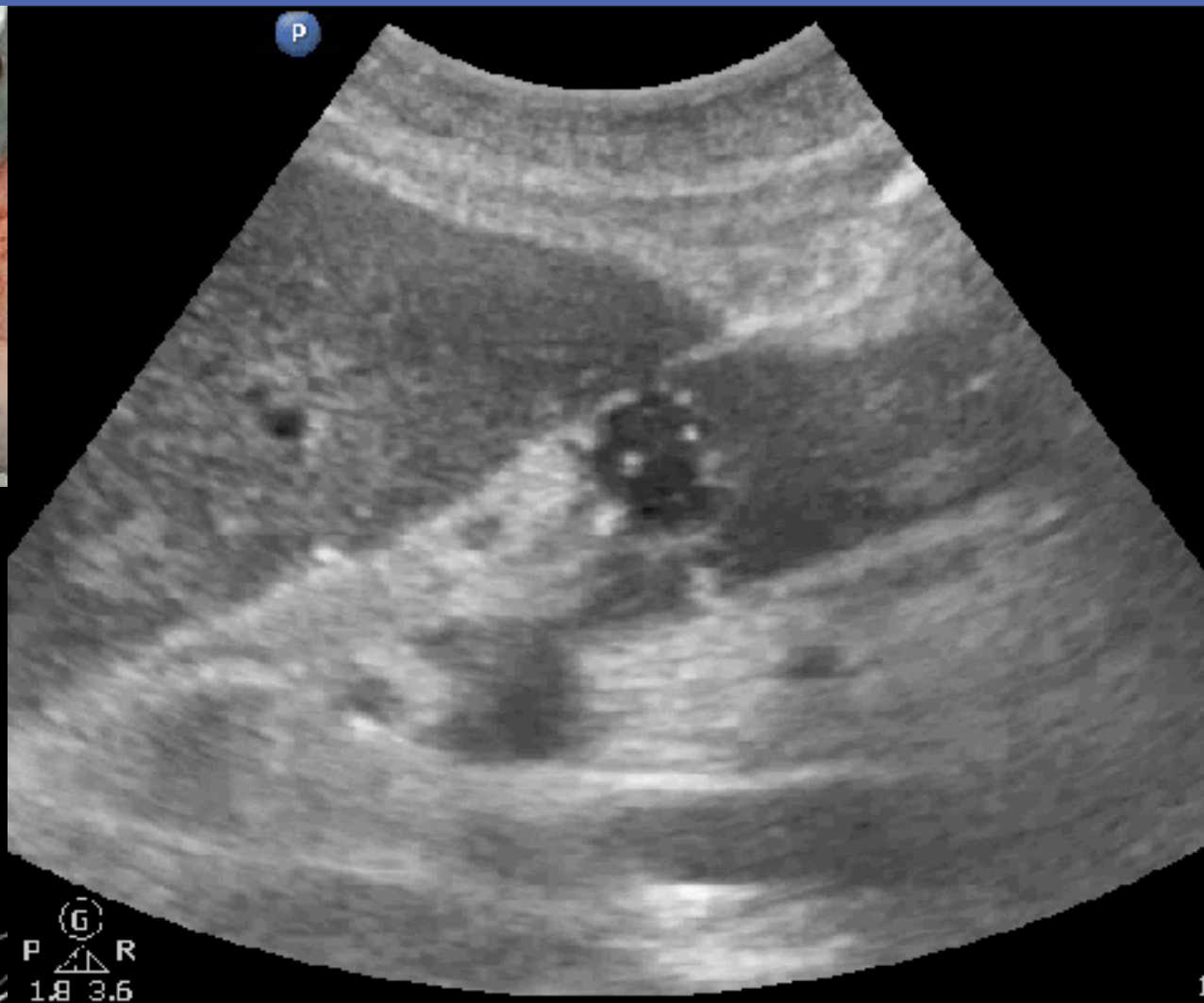
看到游離空氣請舉手



看到破洞請舉手

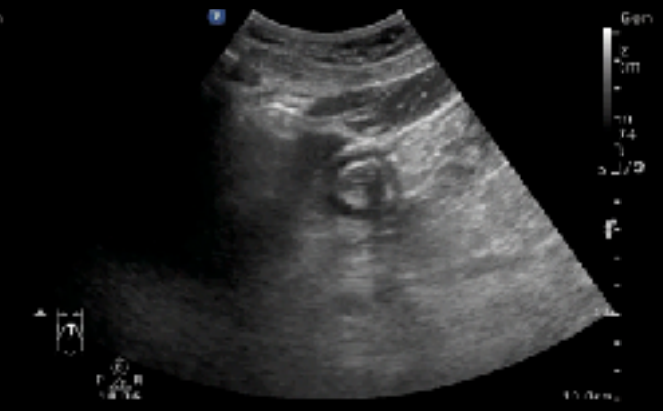




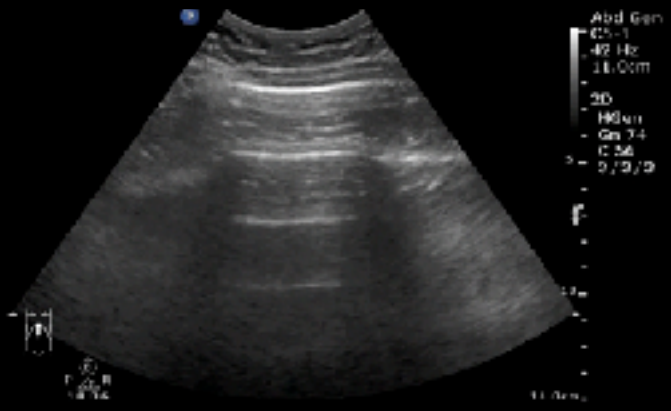


Free air: 往上找

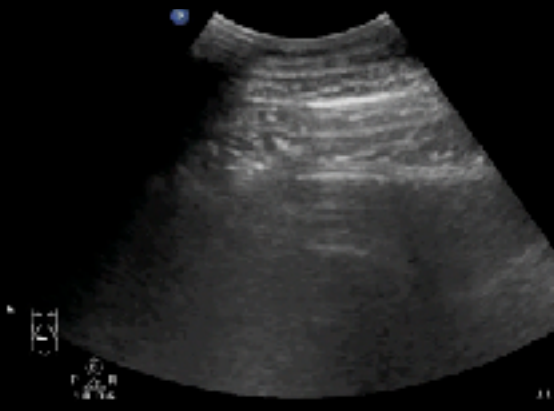
Liver surface



Curtain sign

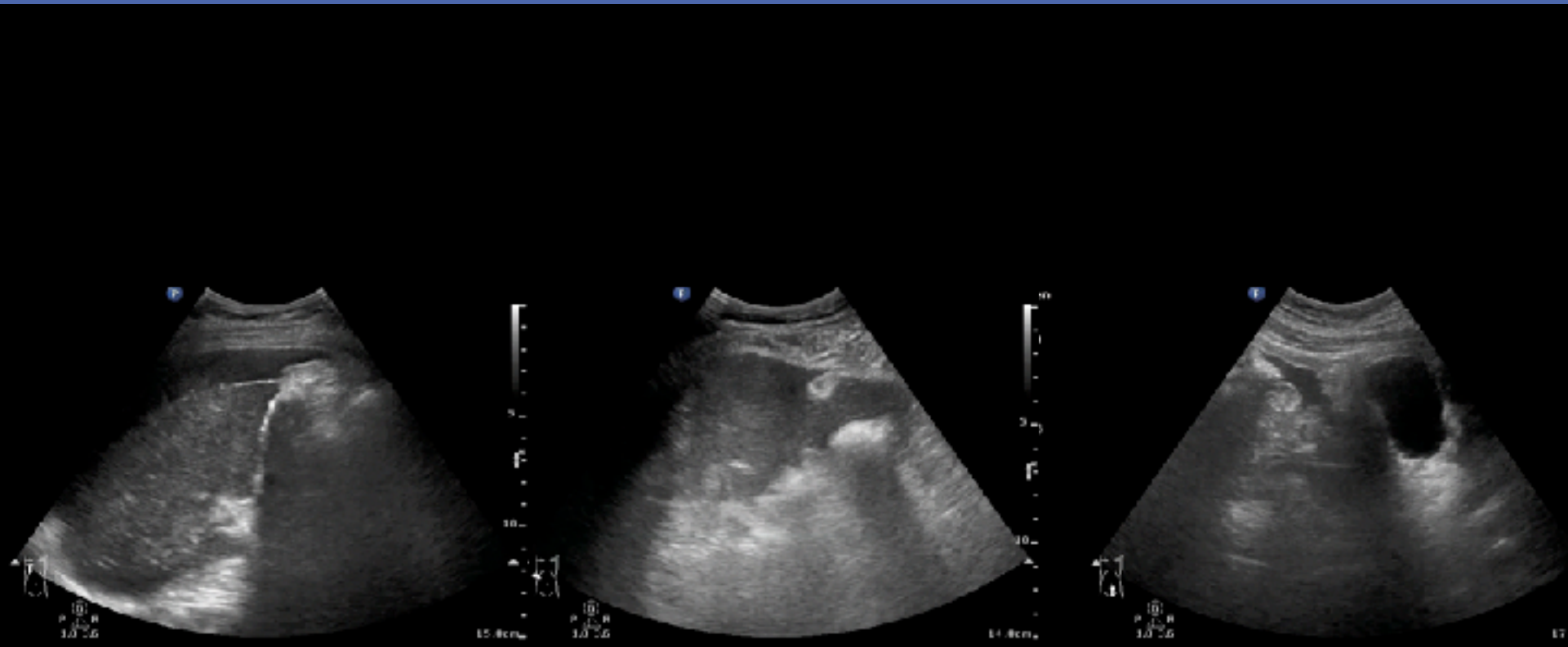


EPSS



EPSS: Enhanced peritoneal strip sign

Dirty ascites: 往下流



胃部掃描三部曲

阻塞、管路、異物

游離空氣

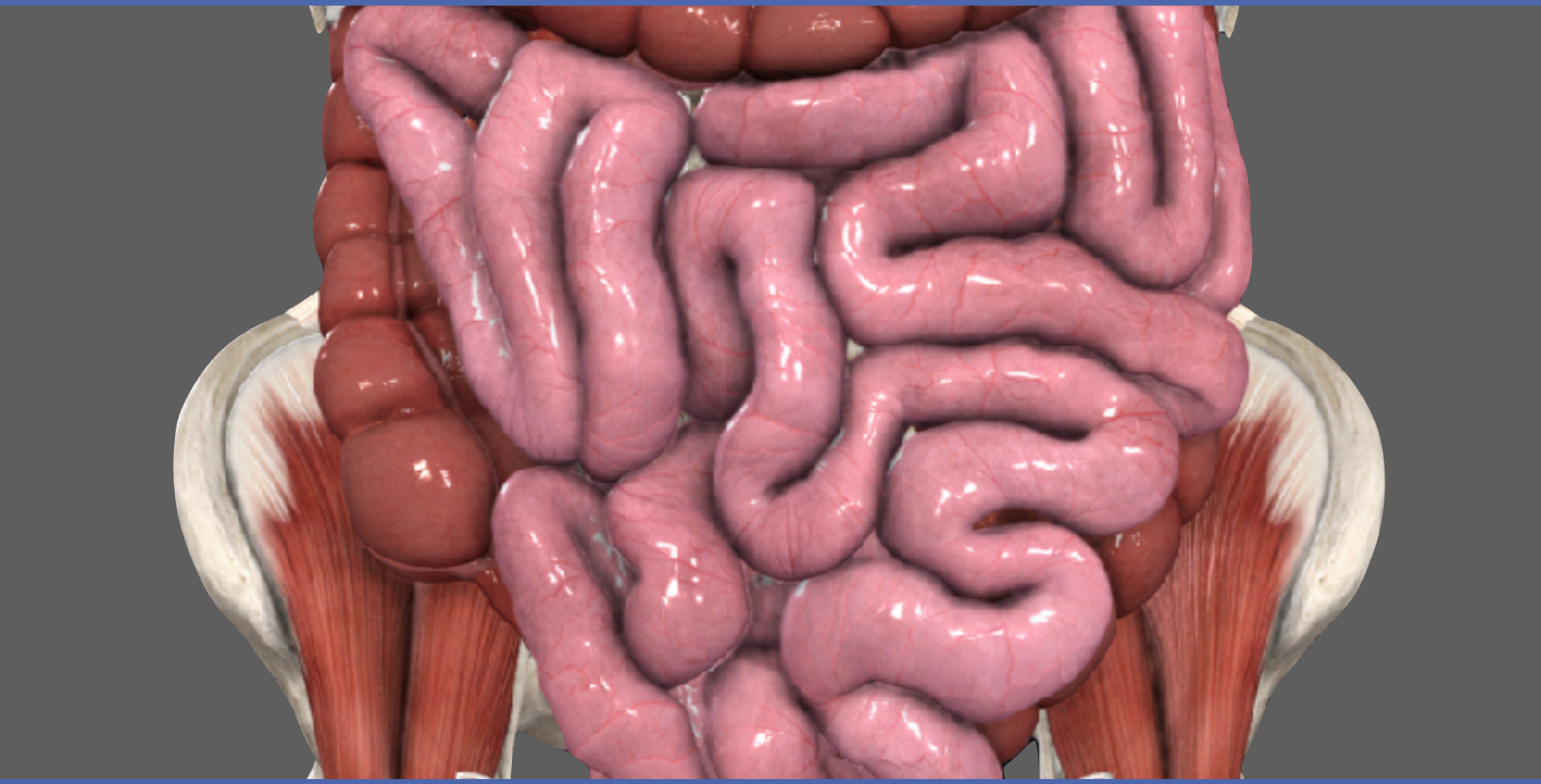
吸入風險

胃腸道掃描的敘述，下列何者正確？

1. 成人掃描以線形探頭為主要工具
2. 急診掃描得禁食6小時才能得到最佳影像
3. 正常胃腸壁的厚度小於5mm
4. 掃描時以肚臍為中心開始


Where to start ?

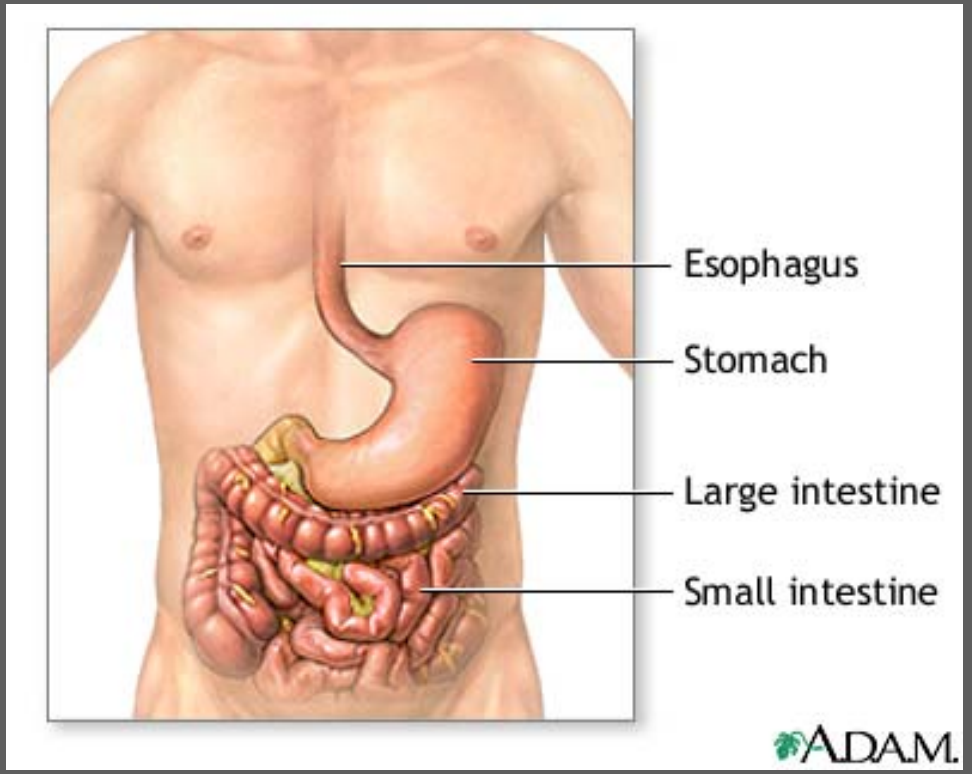
Small bowel first ?

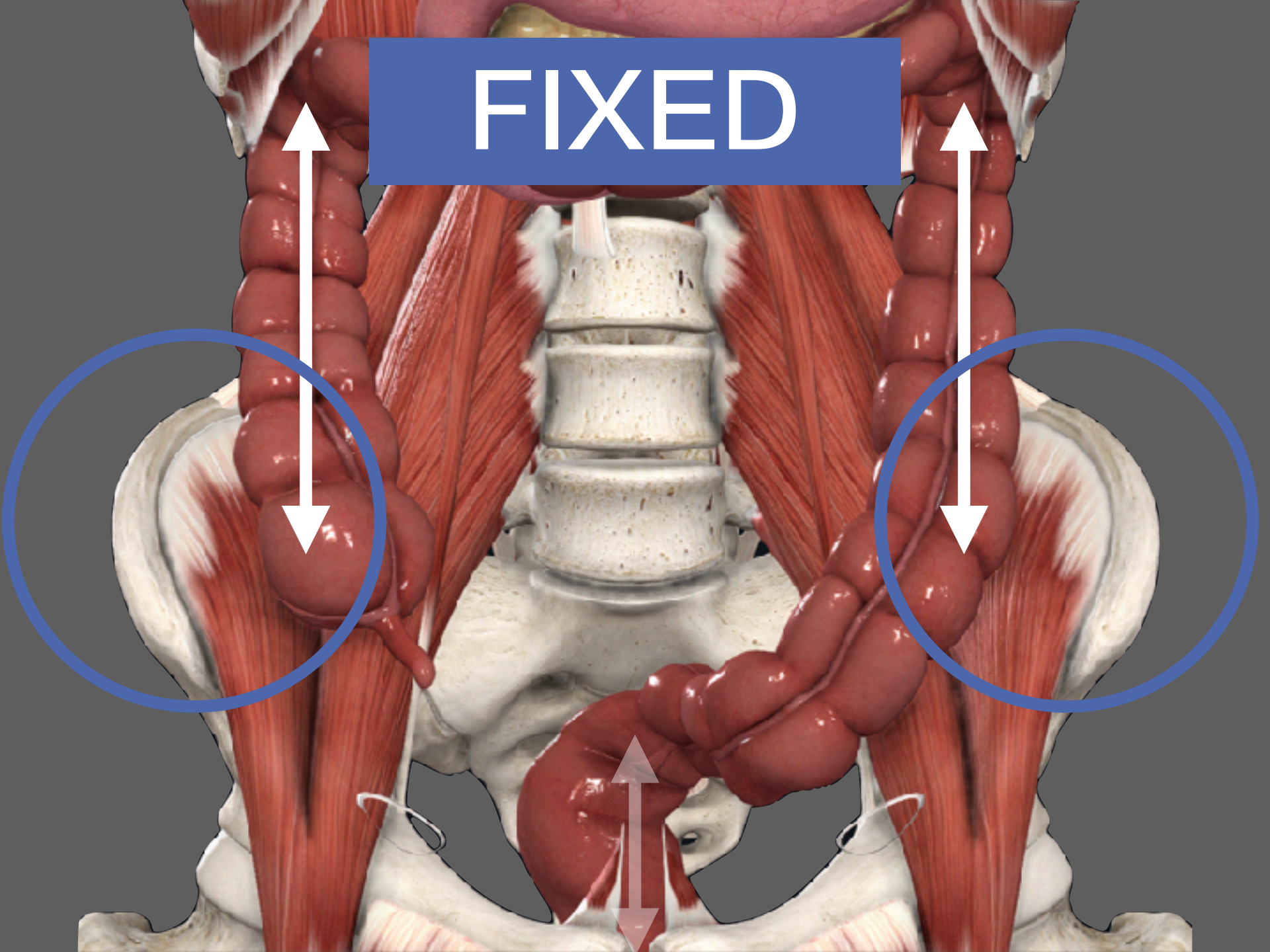


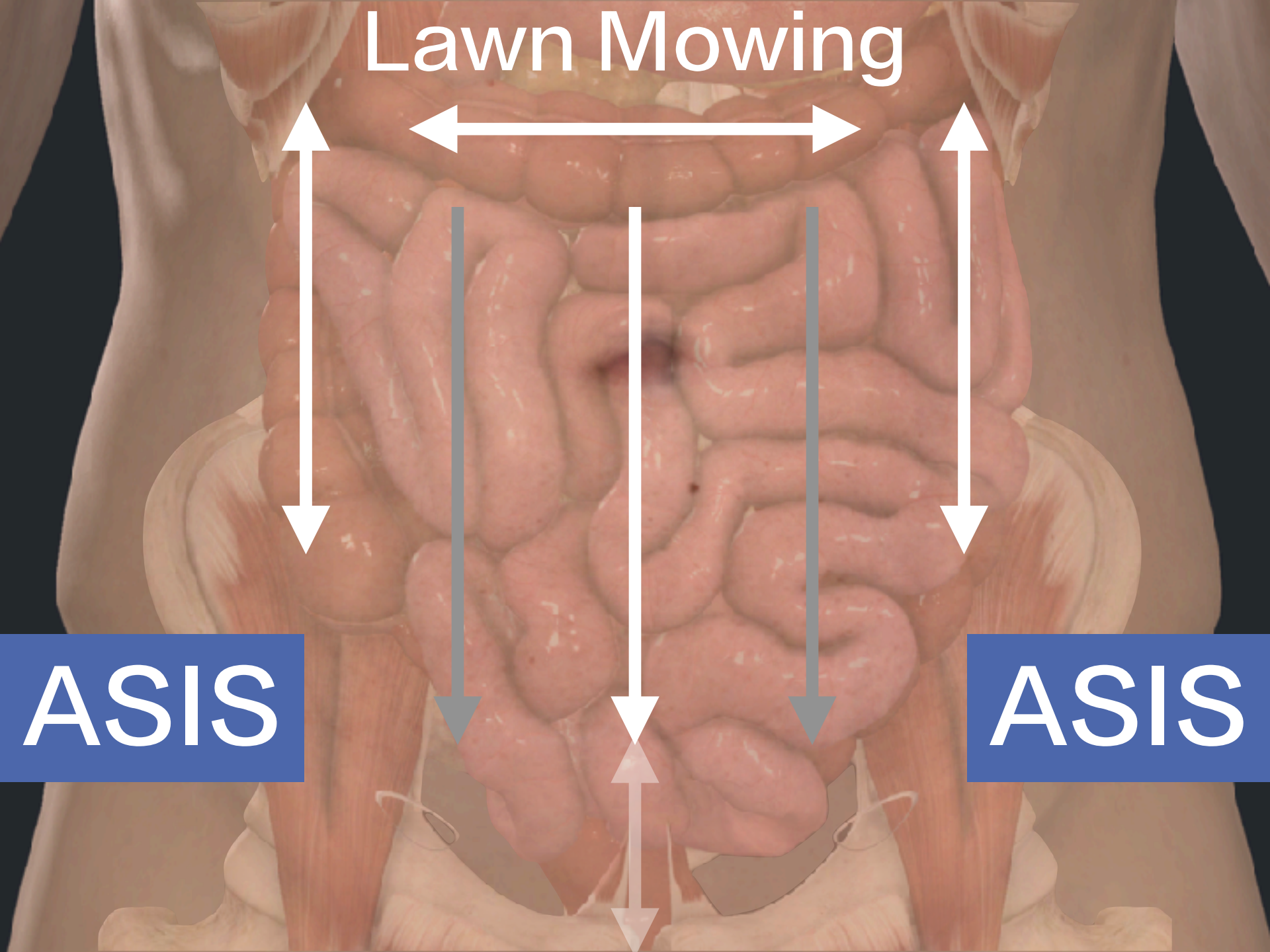
Colon first ?

請問解剖學上腸道的”固定”處不包含下列何處？

1. 食道胃交界
2. 升結腸
3. 橫結腸
4. 降結腸
5. 直腸




FIXED


Lawn Mowing
ASIS
ASIS

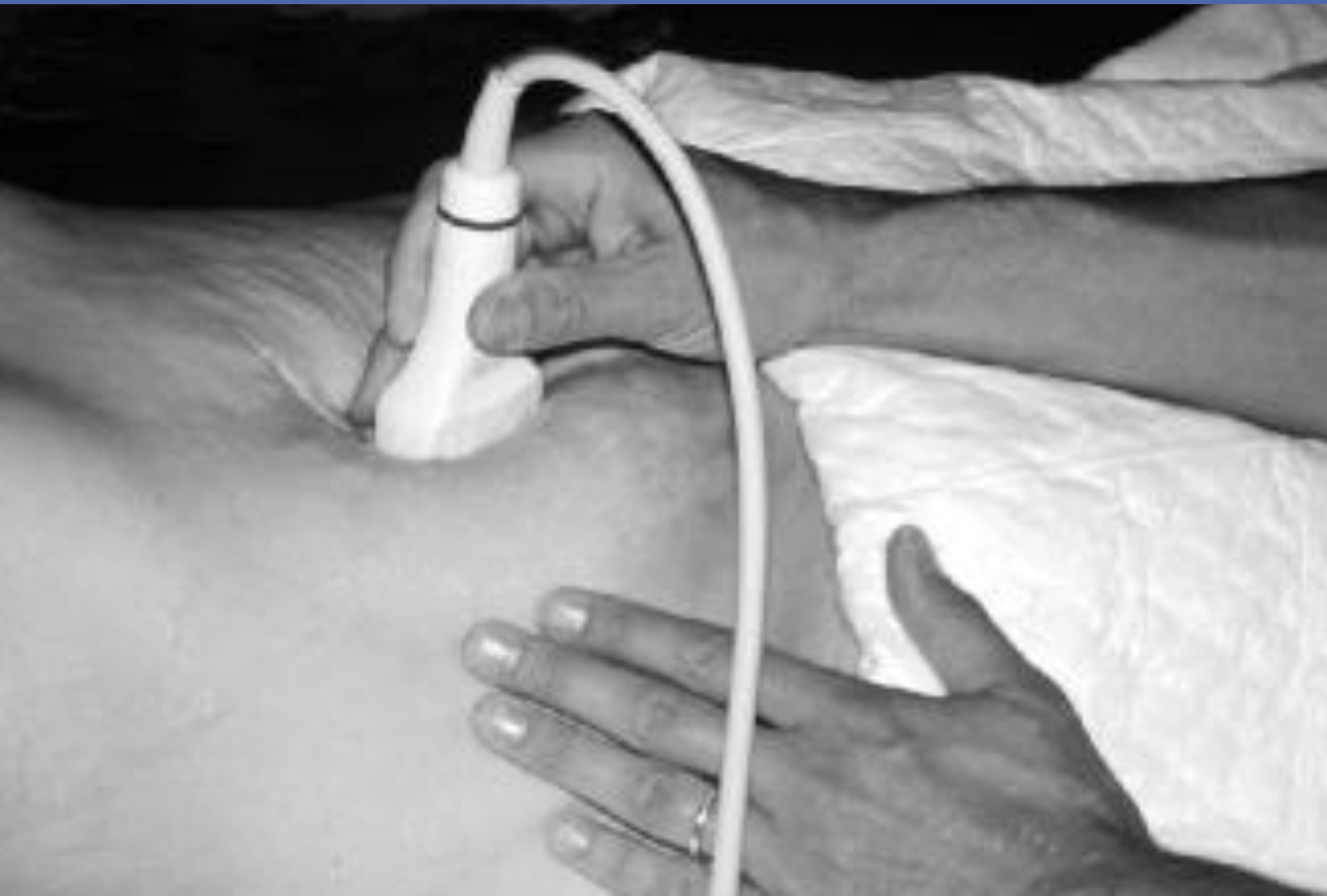
探頭操控 6 大技巧

X	Y	Z
Sweep	Slide	Rotate
Fan/ Tilt	Rock	Compress

探頭操控 6 大技巧

X	Y	Z
掃	滑	轉
傾	搖	壓

Graded Compression Technique



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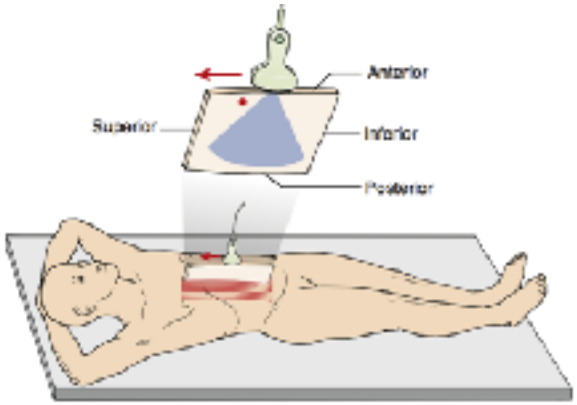
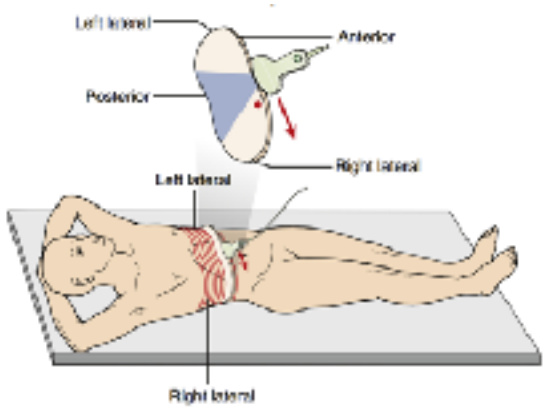
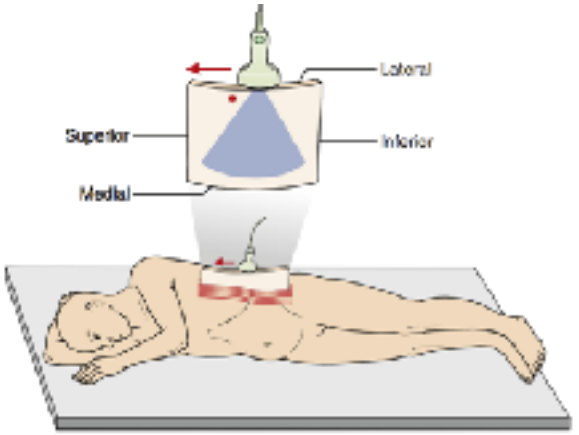


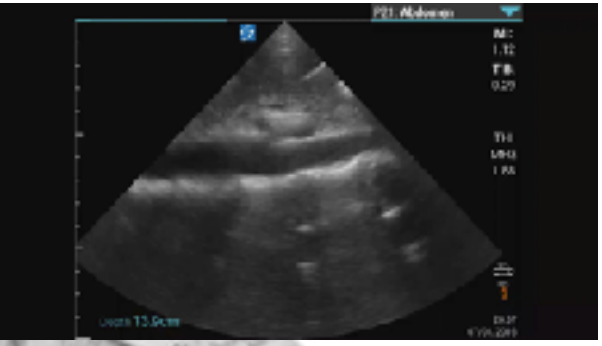


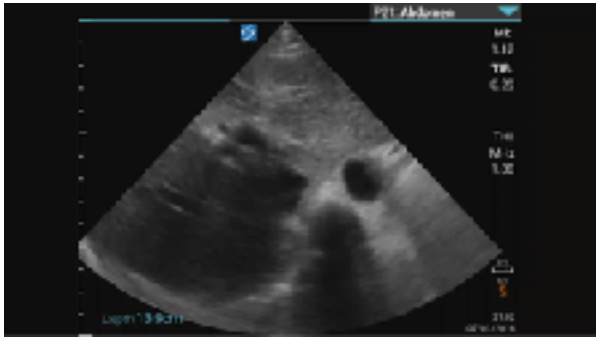


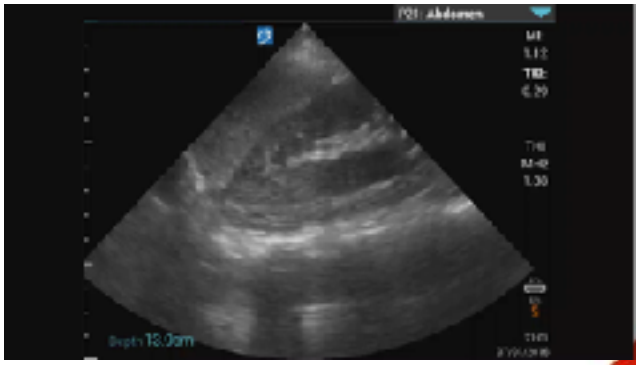
Sagittal

Transverse

Coronal







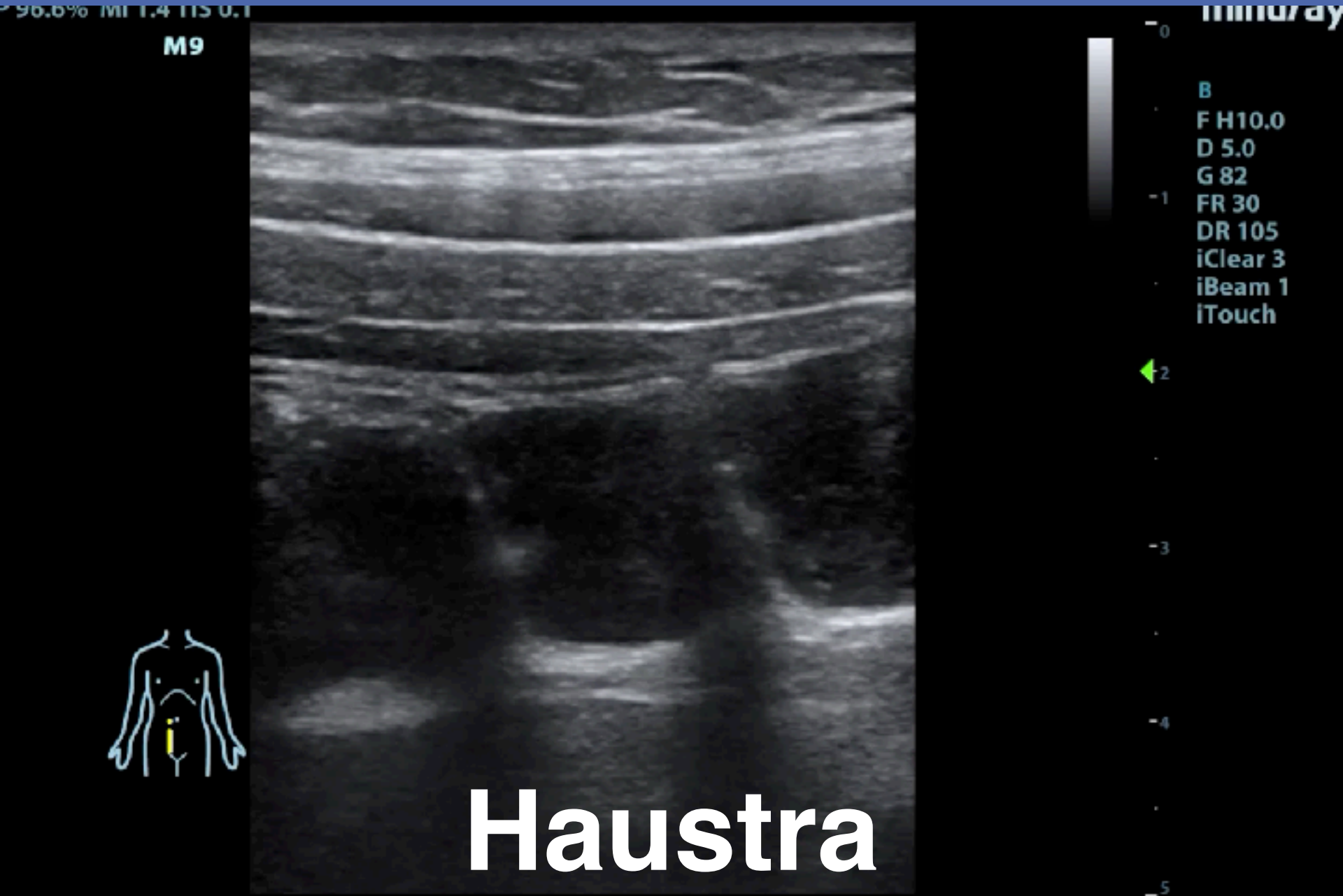
Transducers

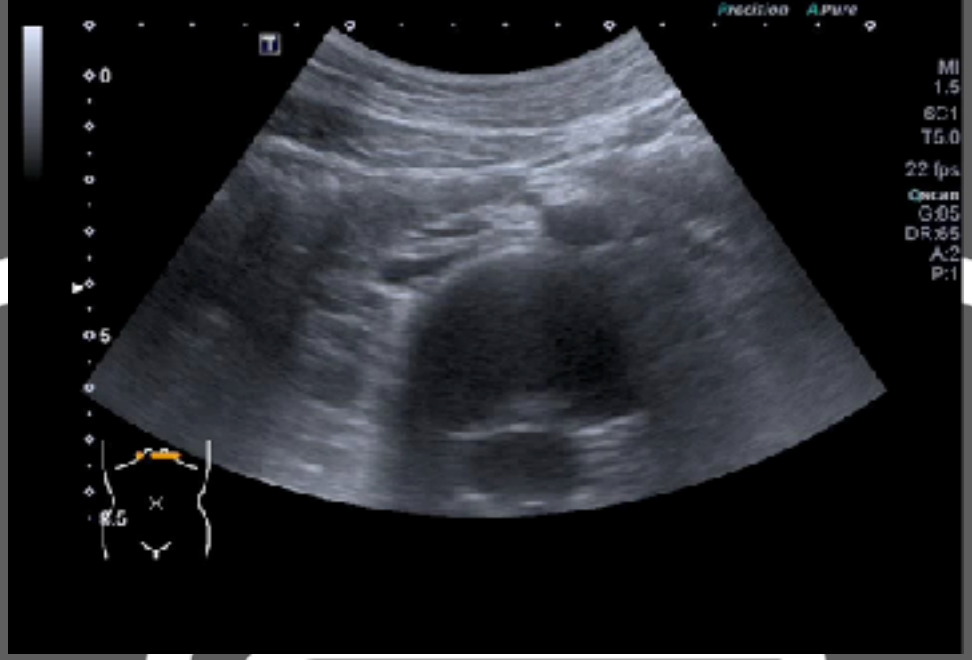
Doppler

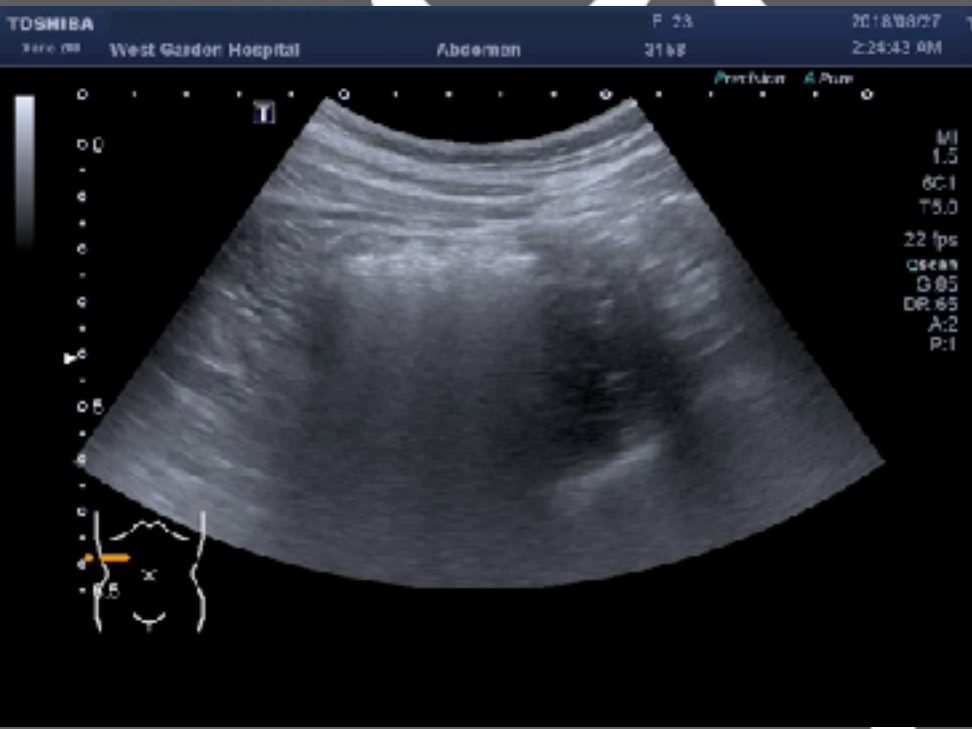
CEUS

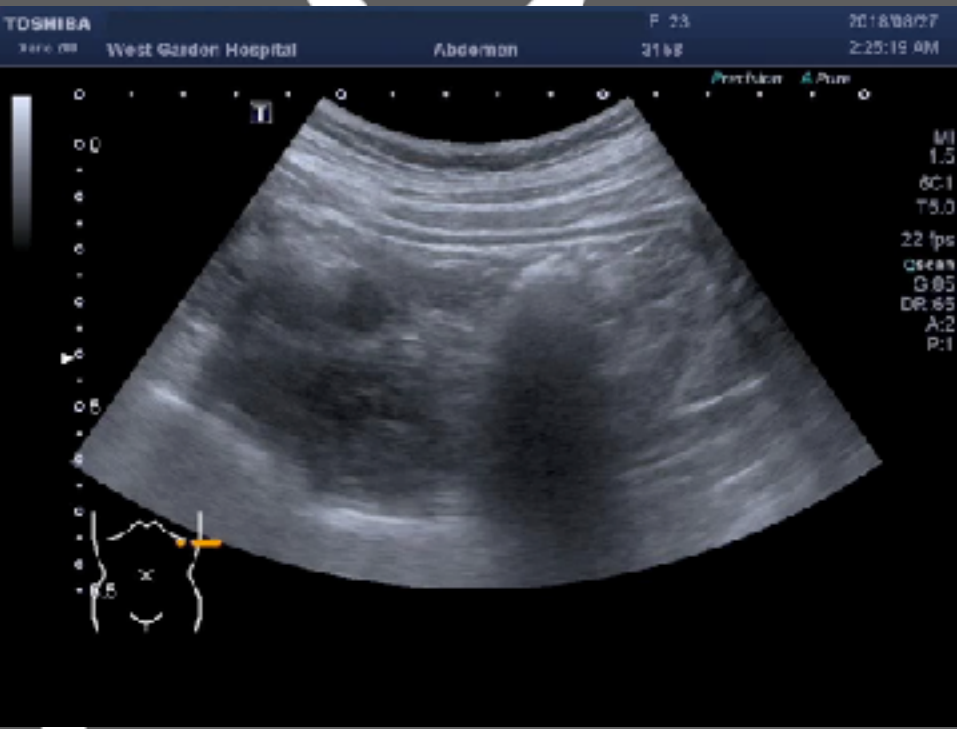
Elastography

認為是大腸的請舉手　！

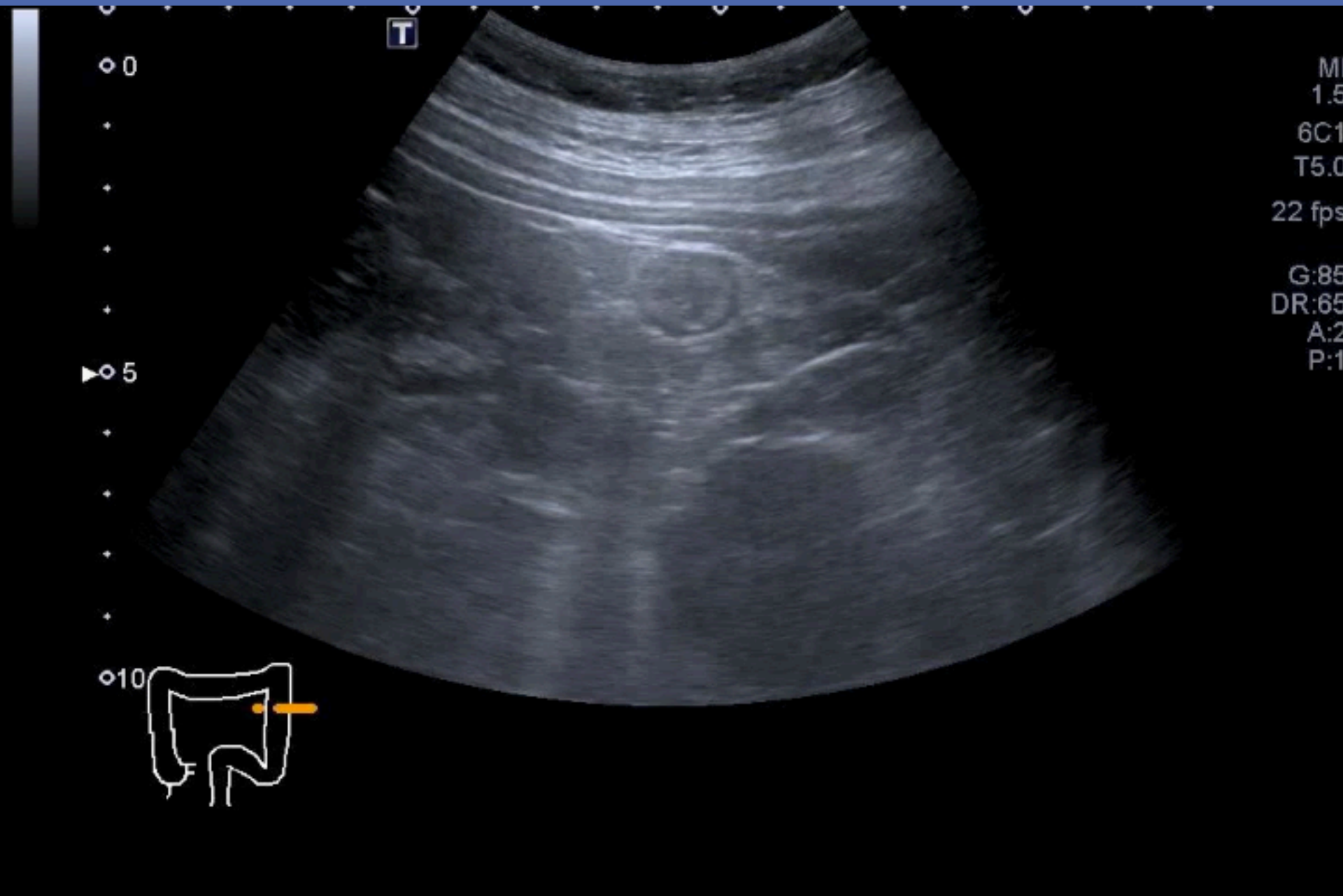




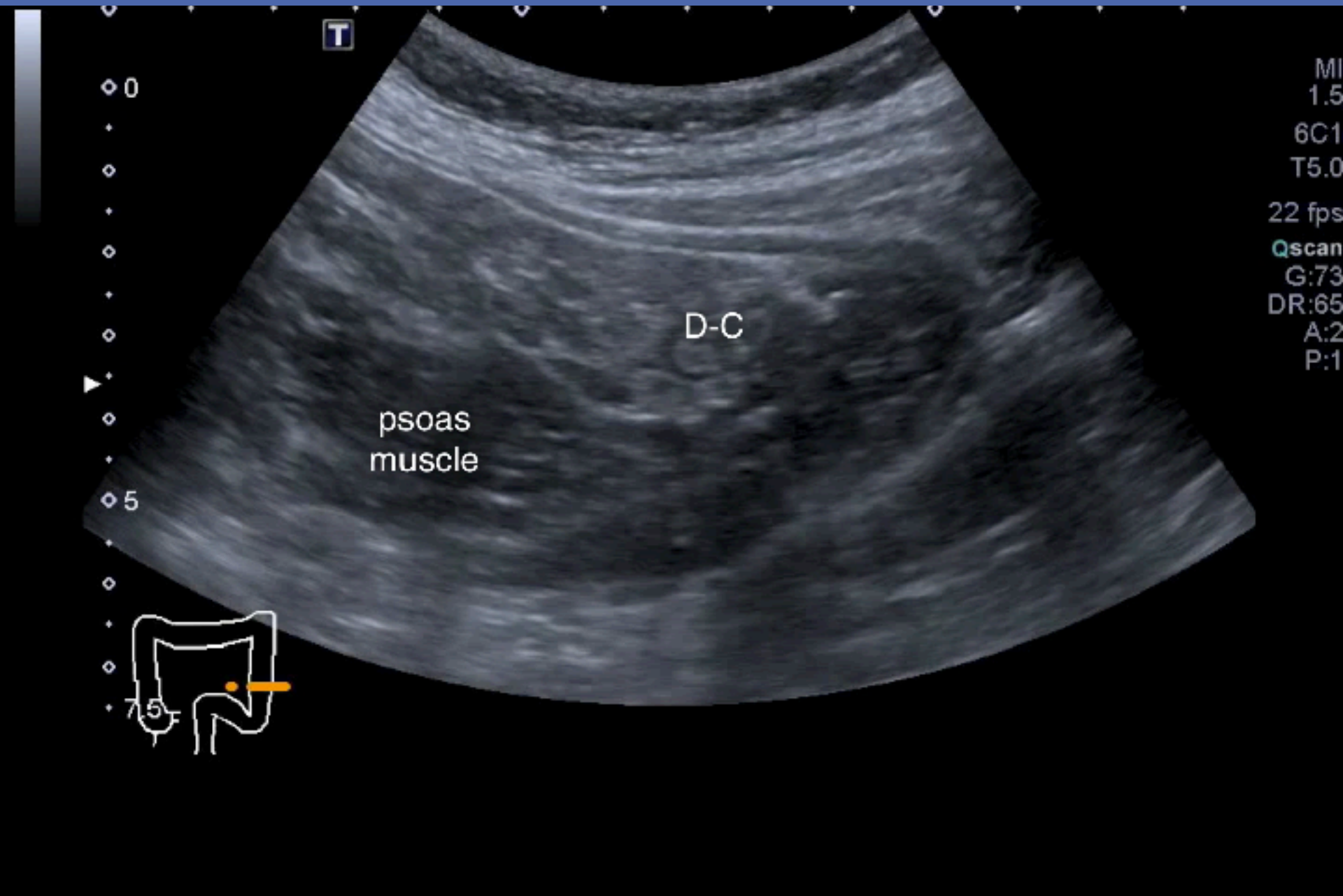

TOSHIBA
West Gardon Hospital
Abdomen
2:24:43 AM


TOSHIBA
West Gardon Hospital
Abdomen
2:25:19 AM

認為是大腸的請舉手　！



有看到憩室的請舉手

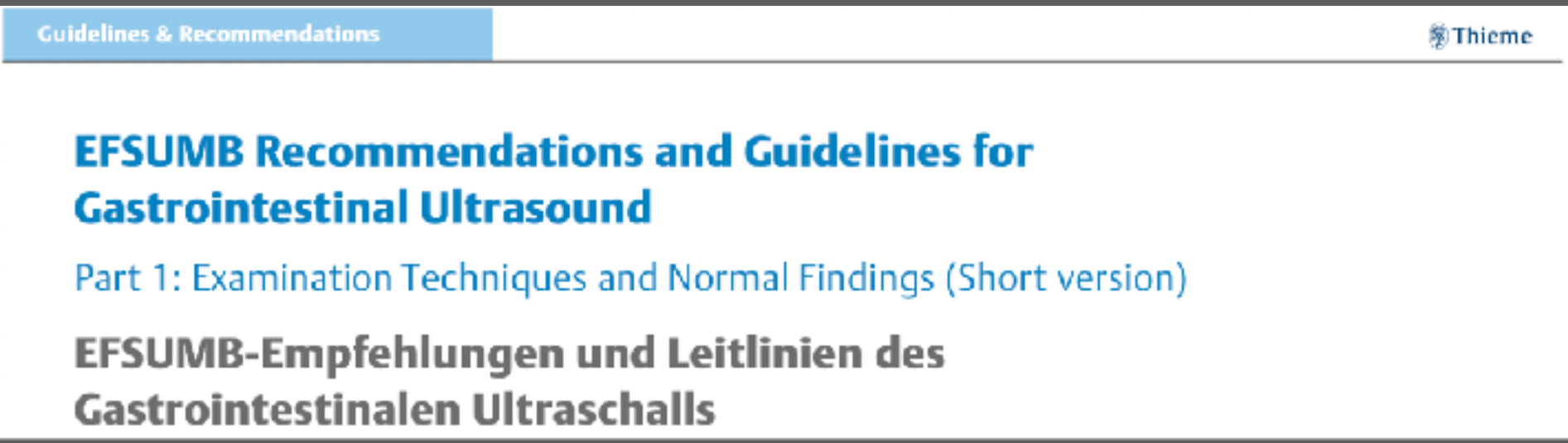


下列有關超音波在胃腸道病變掃描時的描述，何者正確？

1. 用超音波探頭壓迫時會變形
2. 腸胃道壁分層消失
3. 腸胃道壁一般不會增厚
4. 病灶附近不會有其他變化(如LN, fat, ascites)

GIUS lesions on Sono

1. 腸胃道壁增厚 (>5mm)
2. 腸胃道壁分層消失
3. 蠕動減少
4. 用超音波探頭壓迫時不變形
5. 病灶通道內容物減少
6. 病灶附近之其他變化(LN, fat, ascites, gas)



急診醫師要會的腸道超音波？

Nylund K et al. Ultraschall in Med 2017; 38: 273 – 284

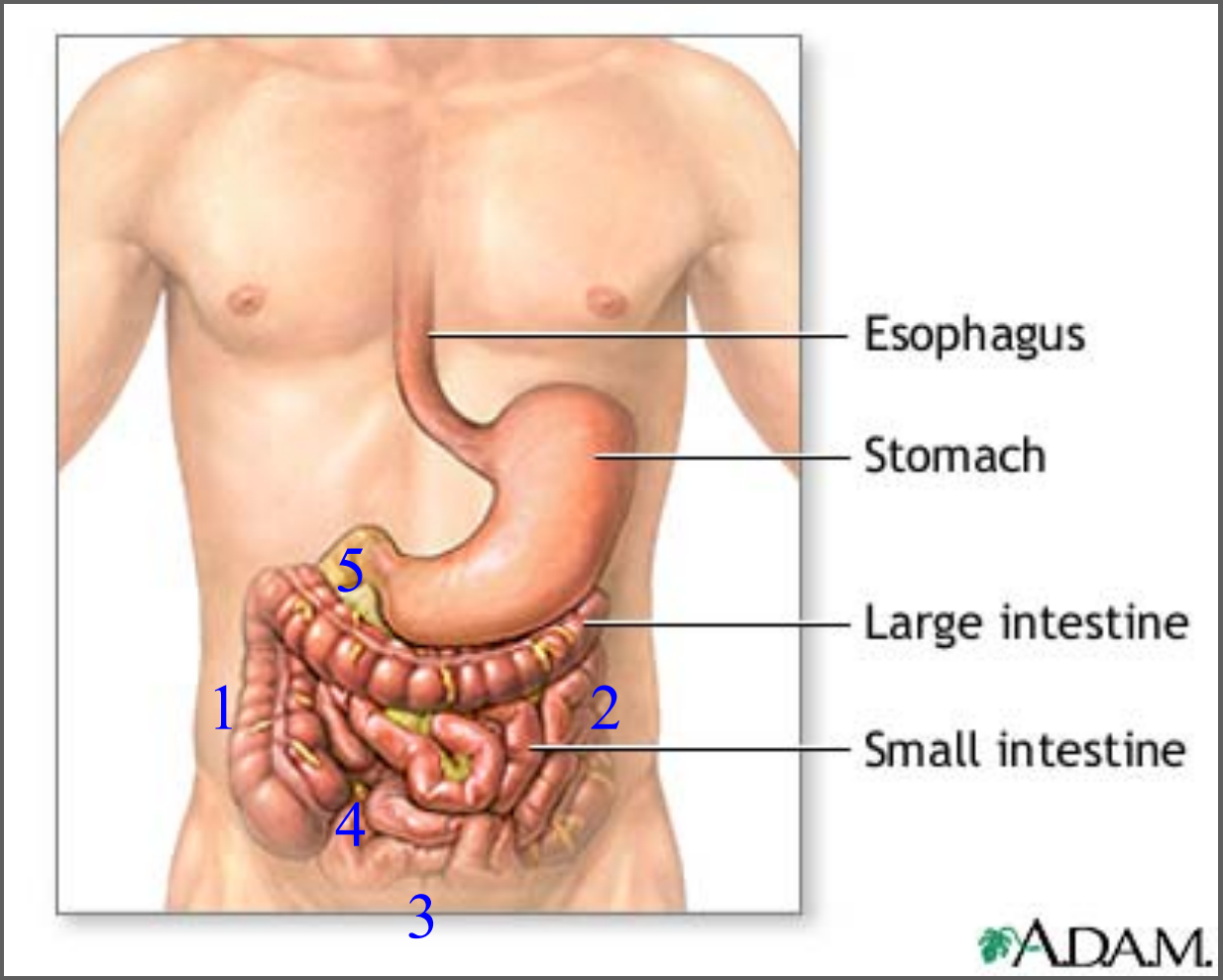
ULTRASOUND
PROGRAM

ABDOMEN

O for obstruction
(SBO & Intussusception)

3 5

Bisection Approximation Method for GI obstruction



Hepatogastroenterology. 2006;53:547-51.

Bisection Approximation Method

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

TAKE-HOME MESSAGE

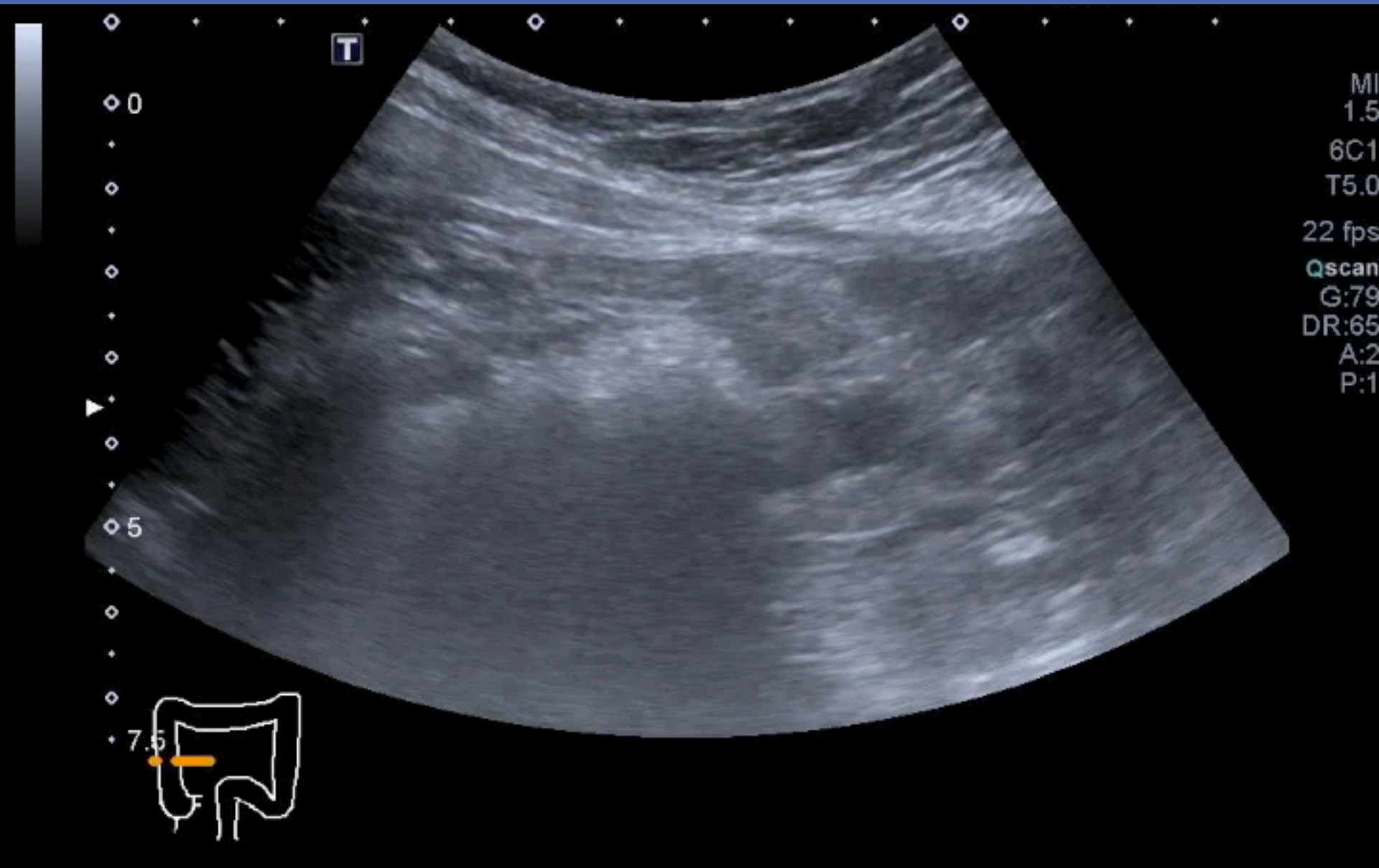
For trained operators, ultrasonography possesses sensitivity and specificity comparable to that of abdominal computed tomography (CT) for the diagnosis of small bowel obstruction.

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)

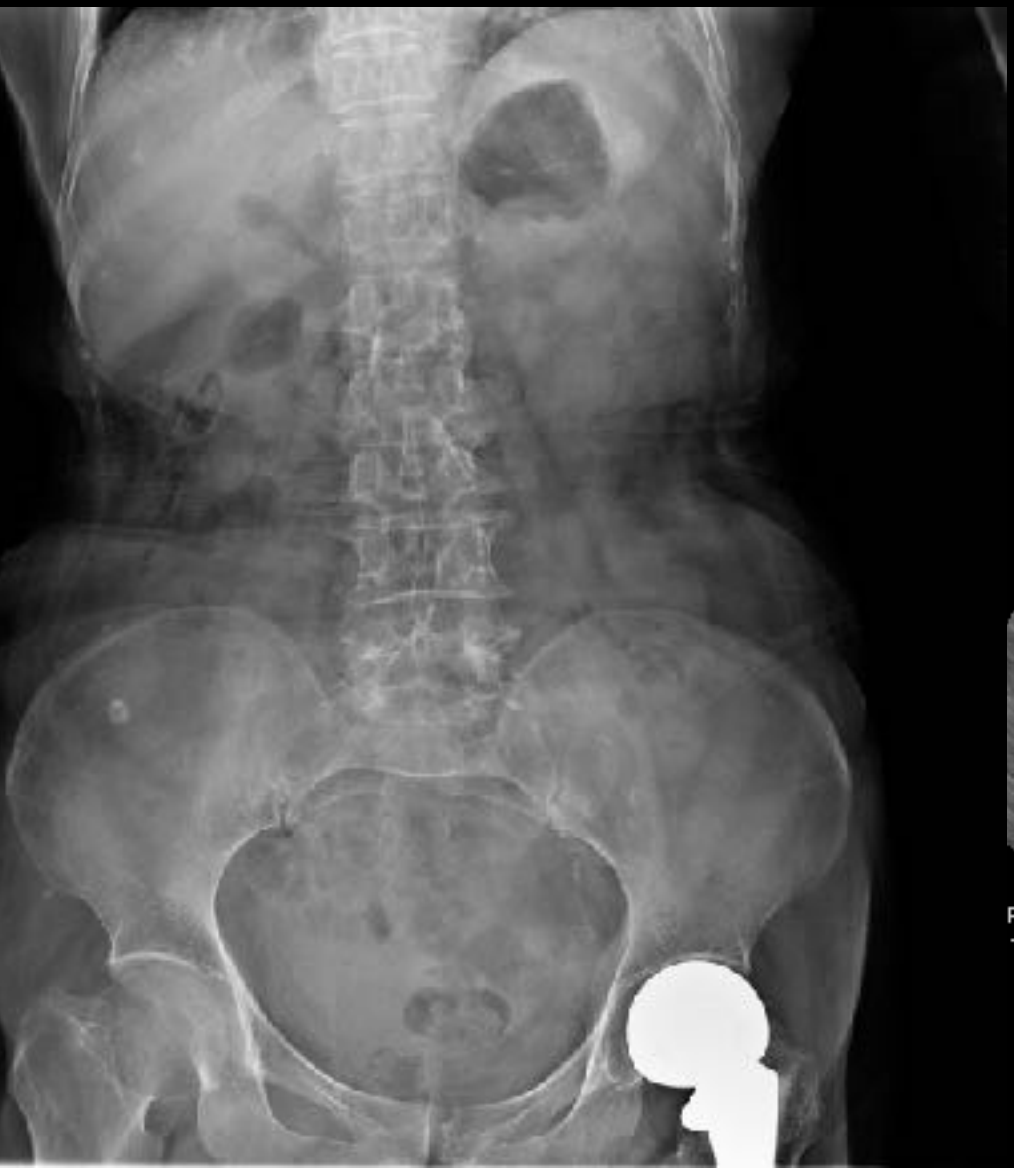
CI, Confidence interval; *+LR*, positive likelihood ratio; *–LR*, negative likelihood ratio; *SBO*, small bowel obstruction; *SROC*, summary receiver operating characteristic; *AUC*, area under the curve.

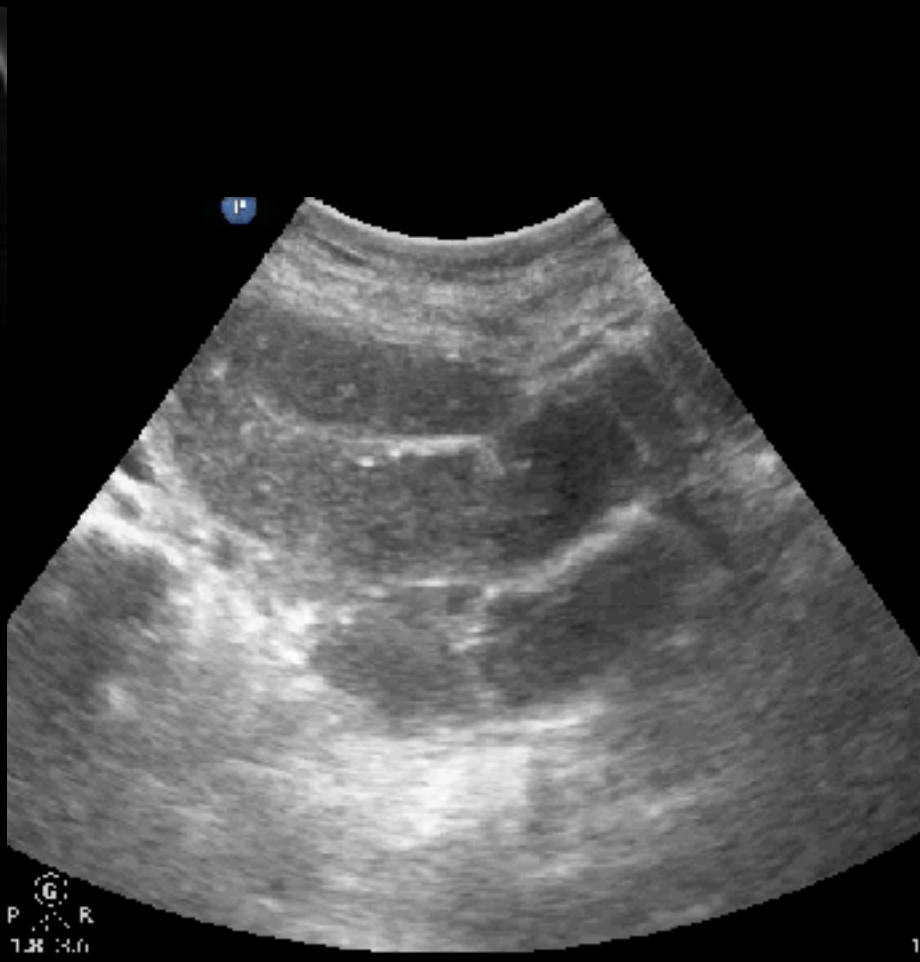
Cottlieb M, et al. AJEM 2017

阻塞處可能在那裡？

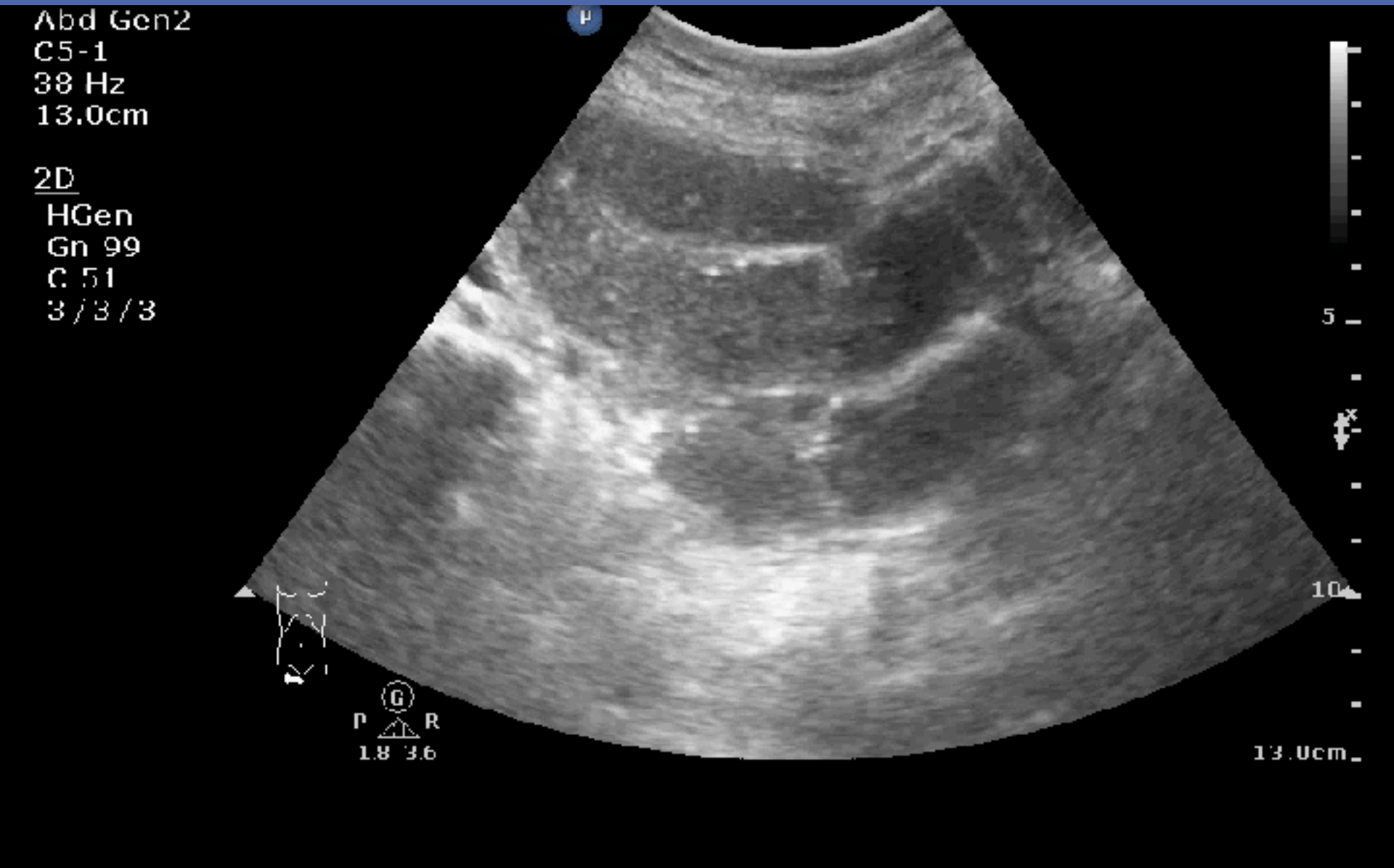


88F, diffuse abdominal pain

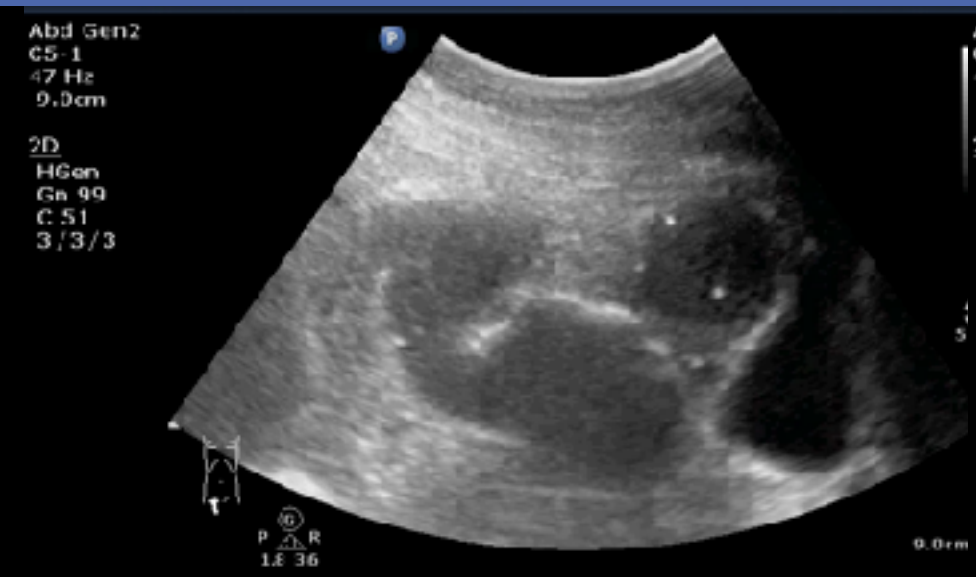


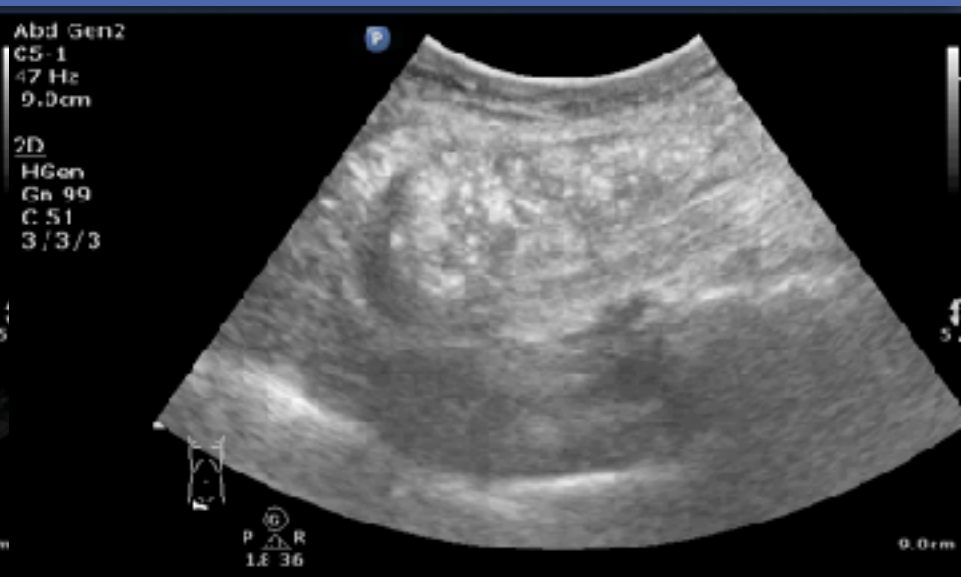


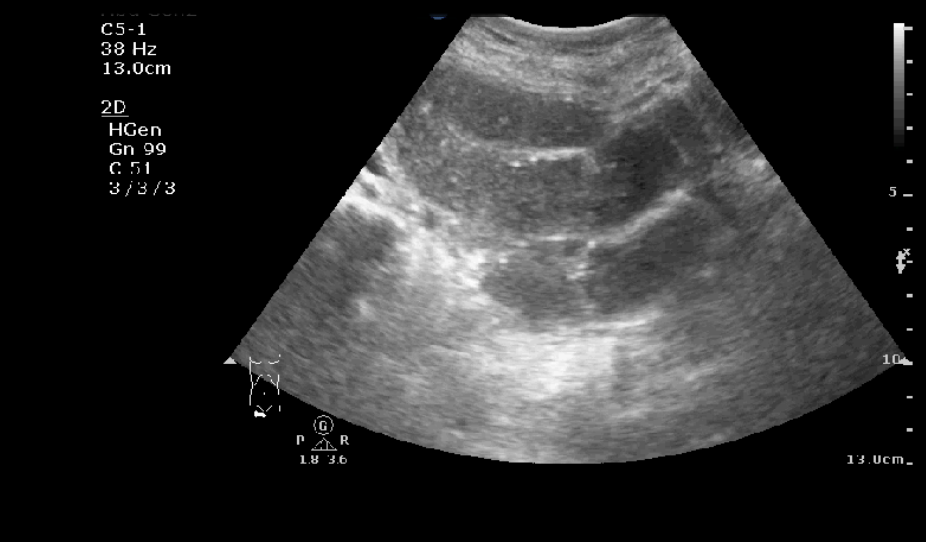
88F, diffuse abdominal pain

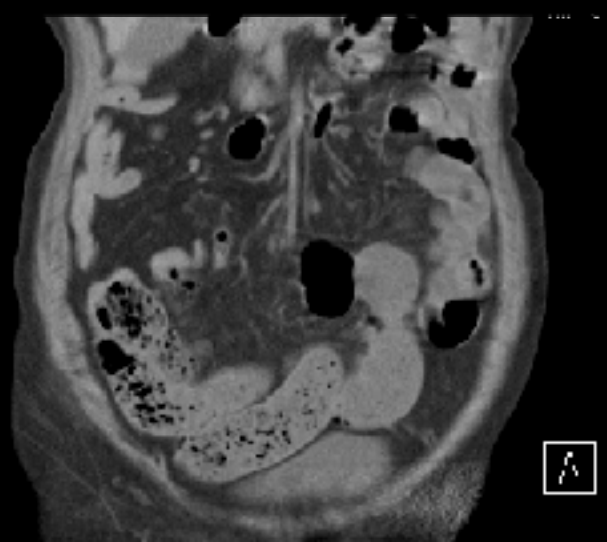


Small Bowel Obstruction

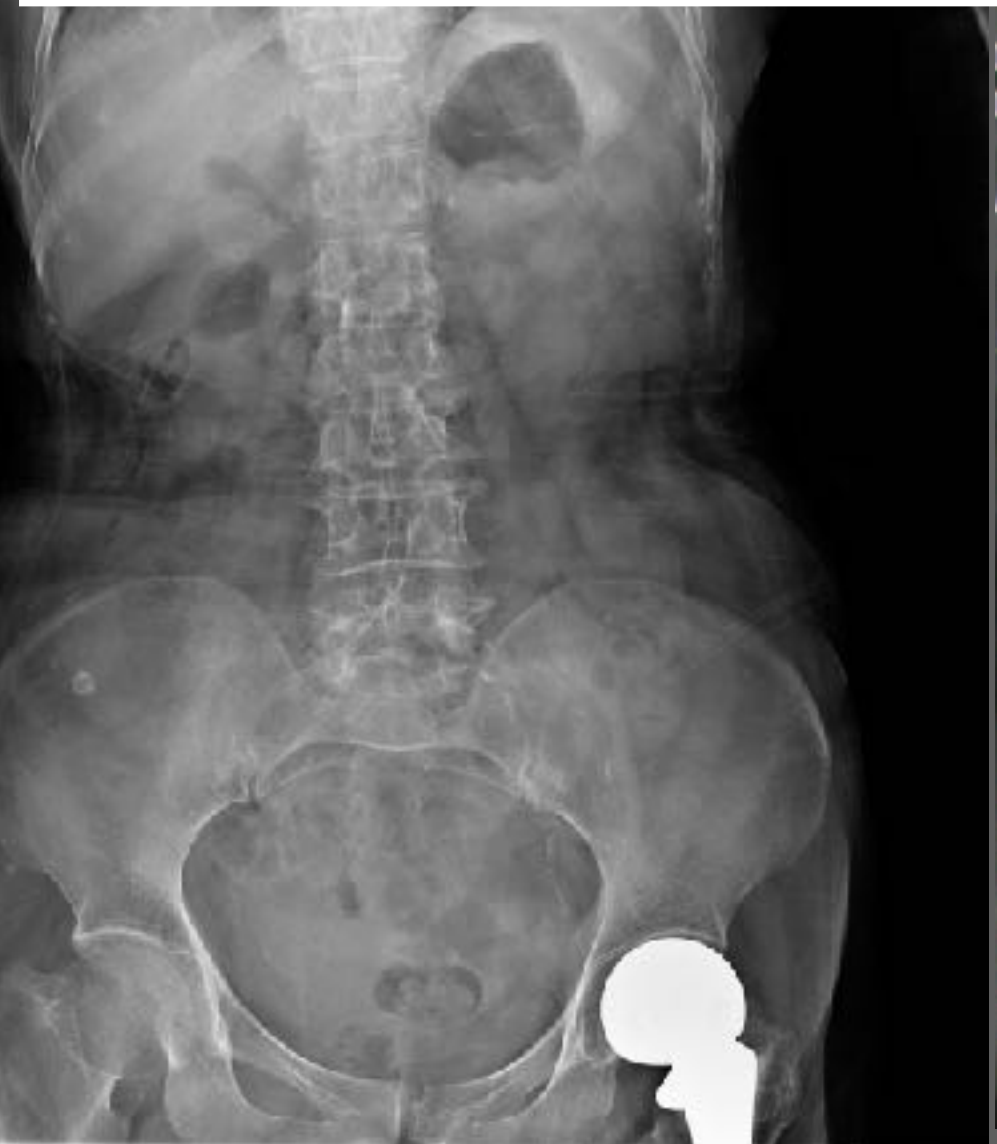


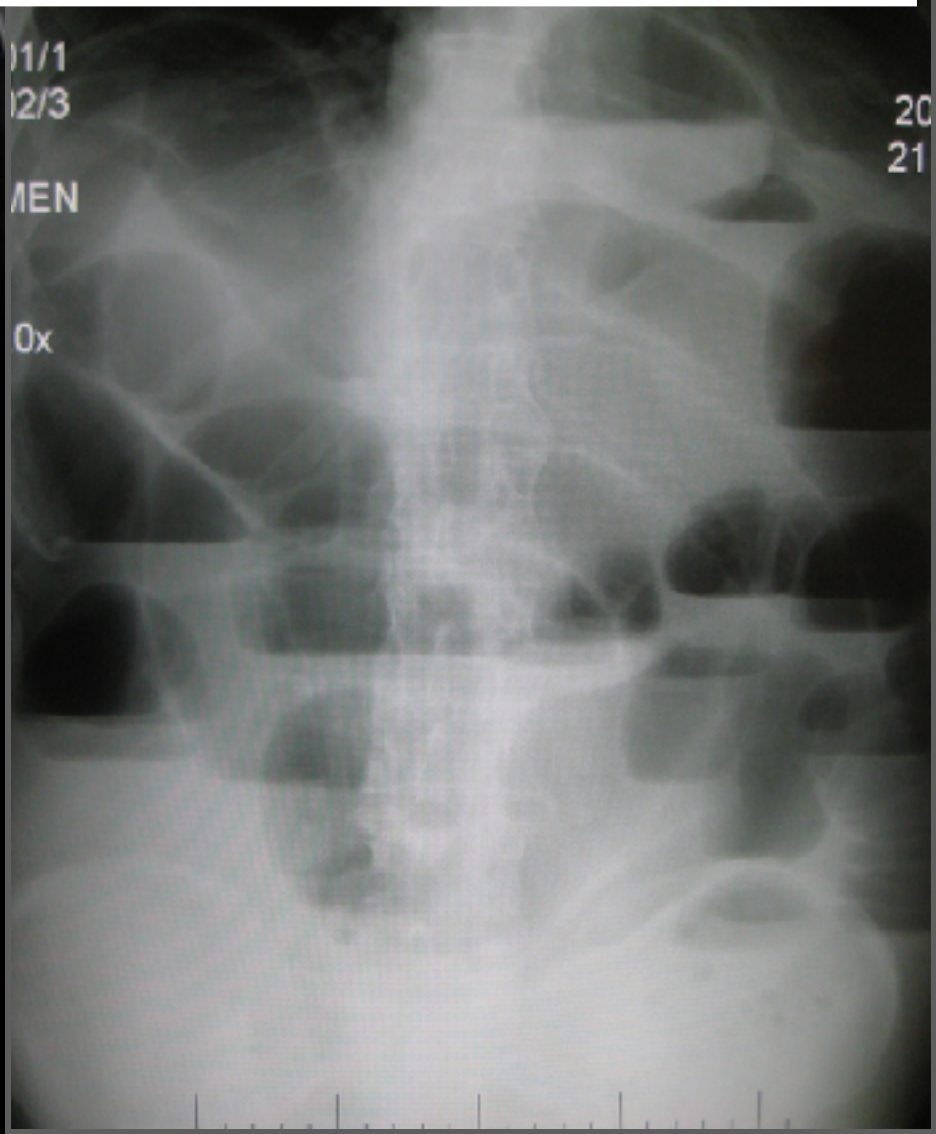




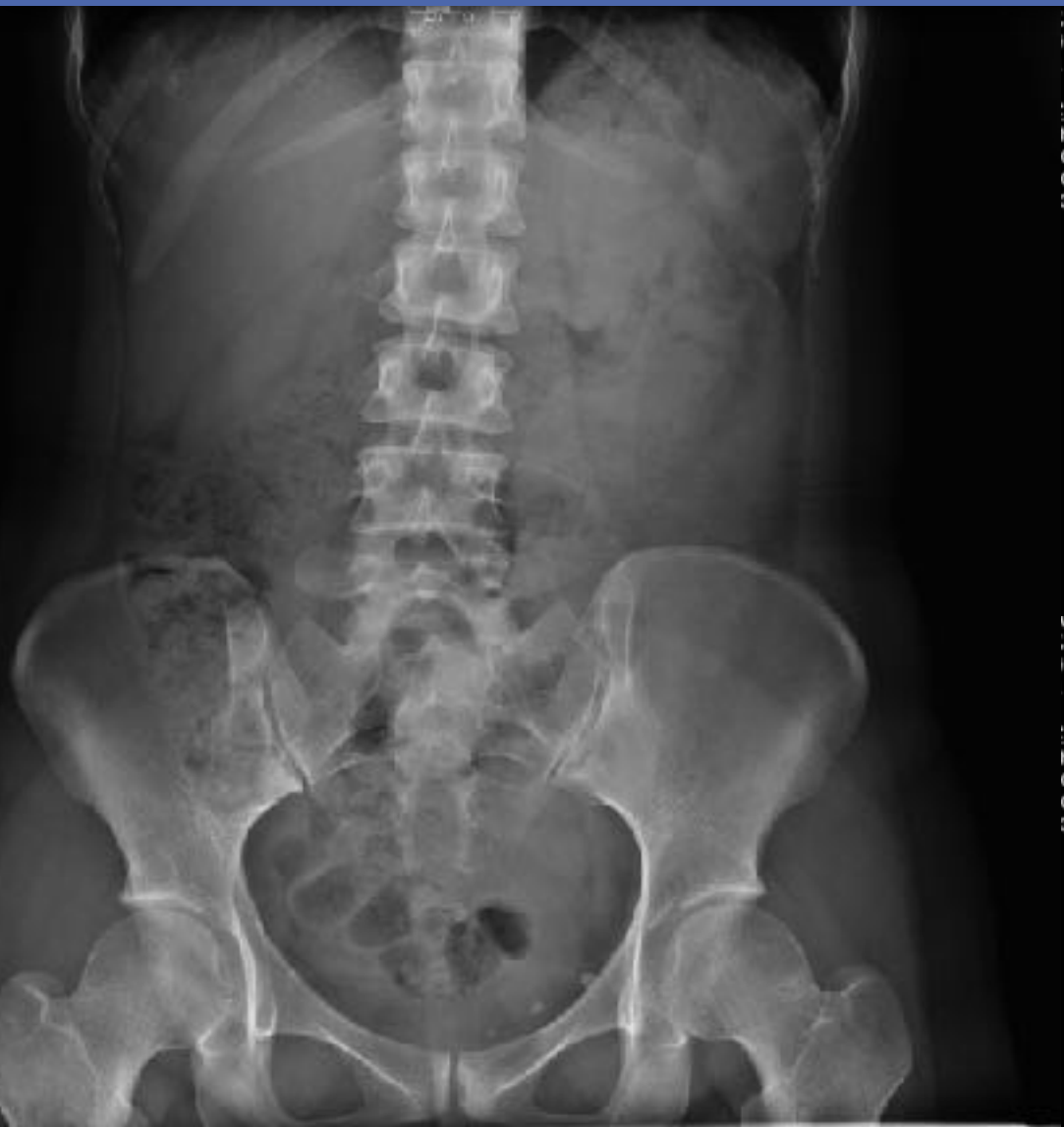


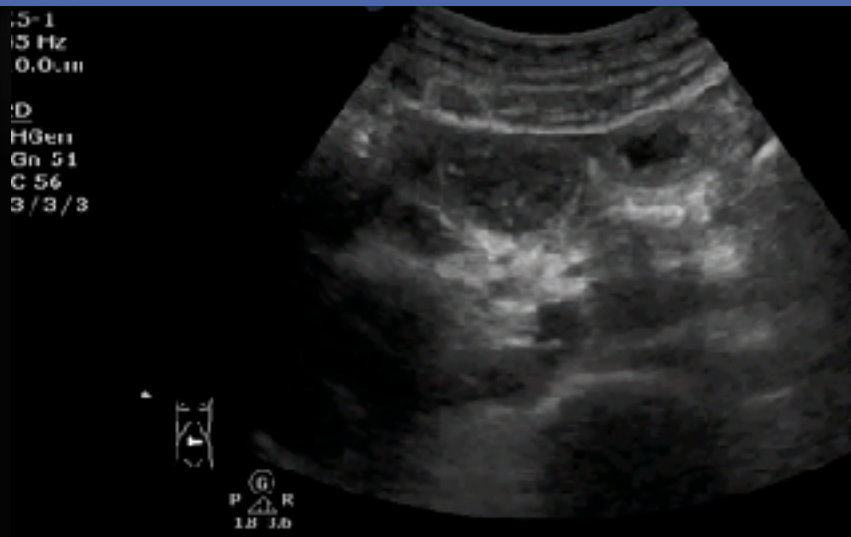
Bowel Obstruction

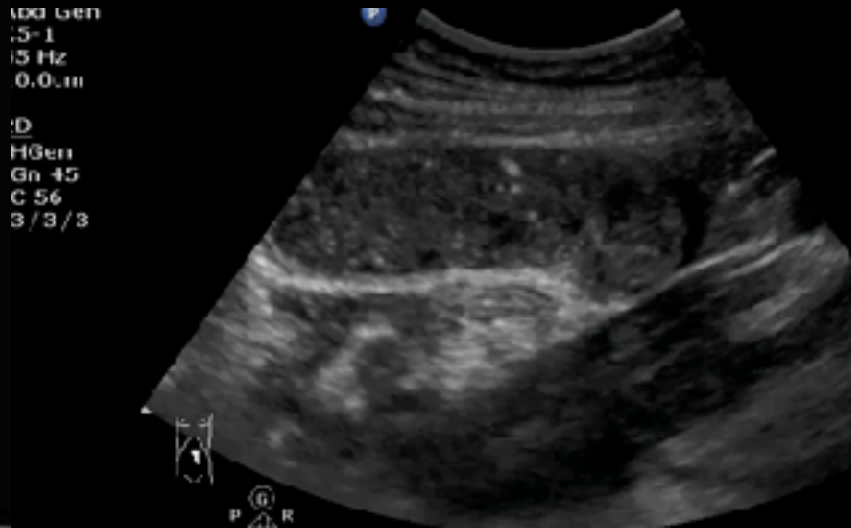


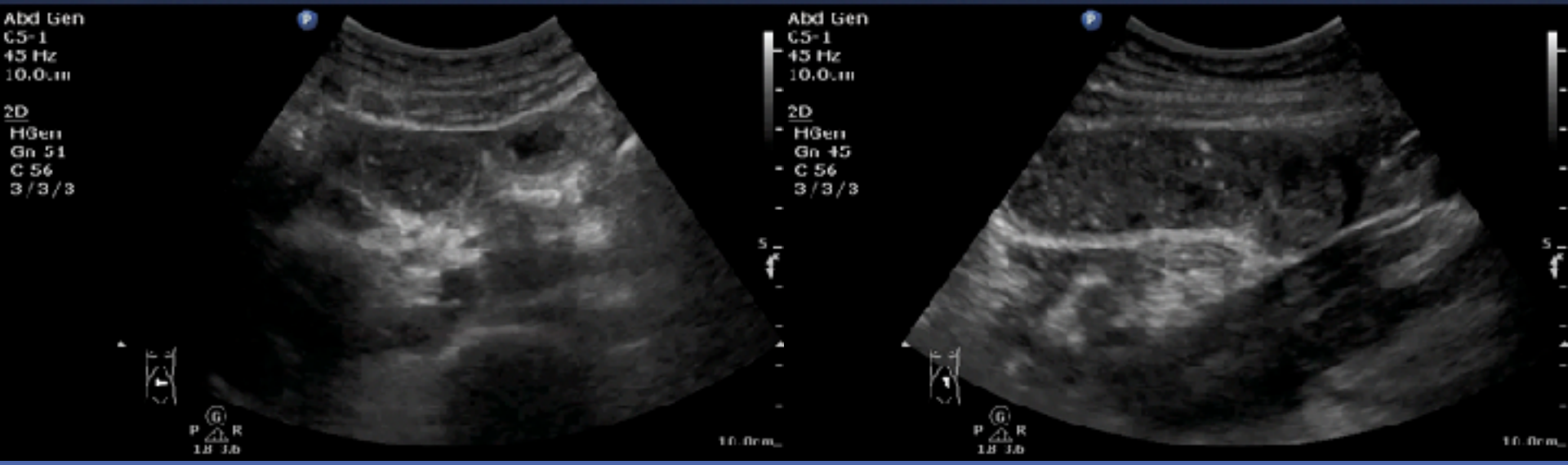


31F with abdominal pain & vomiting for 2 days

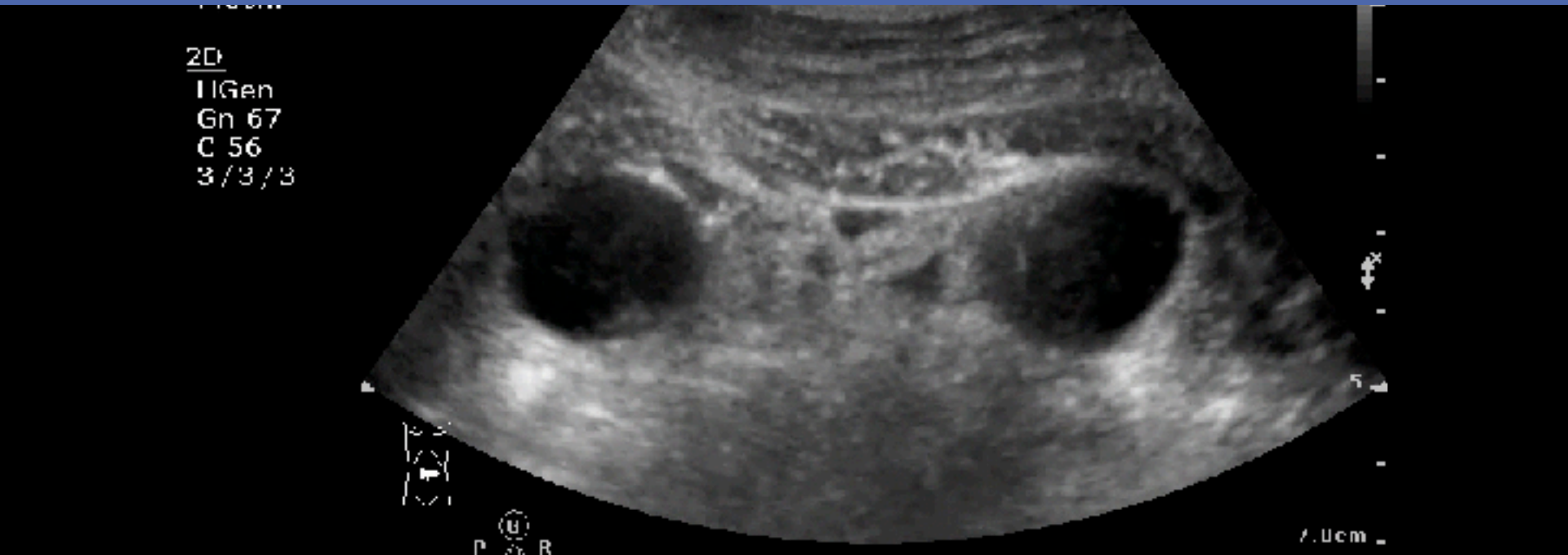




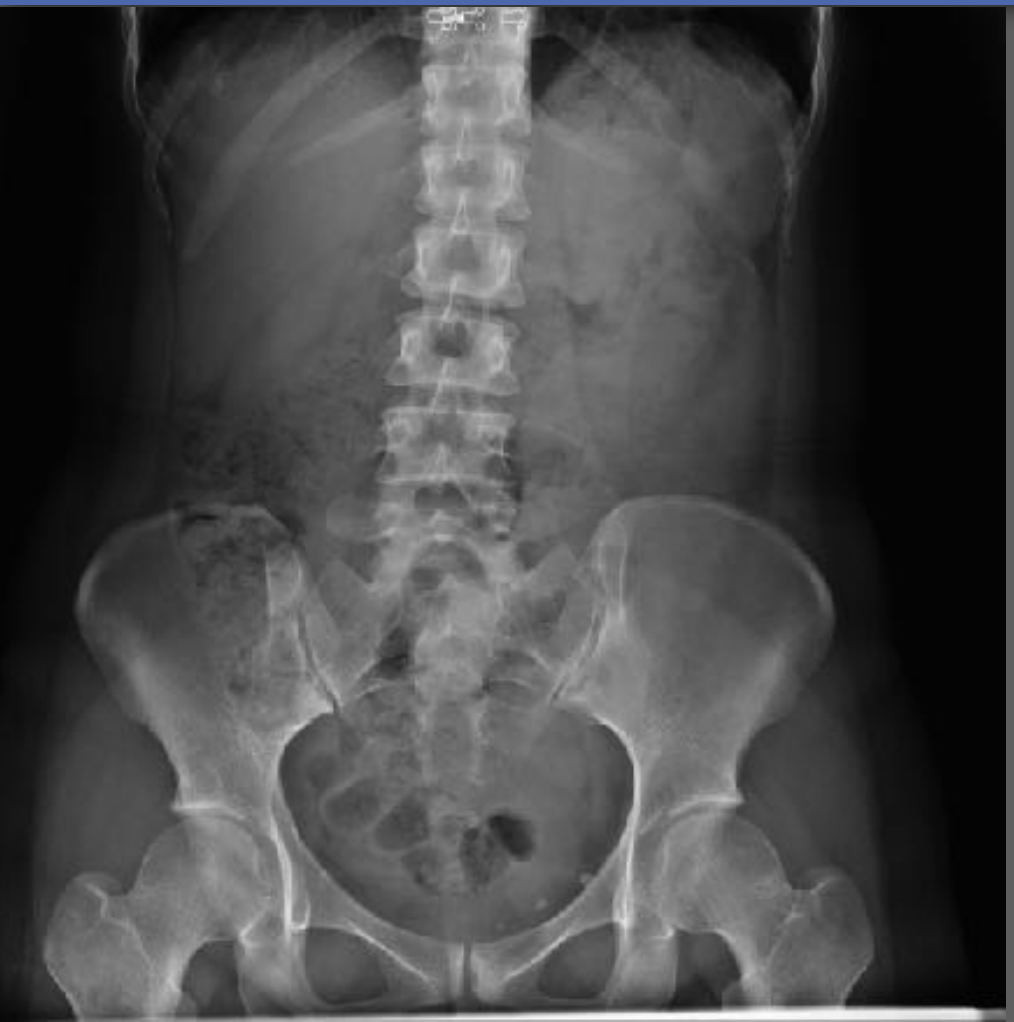




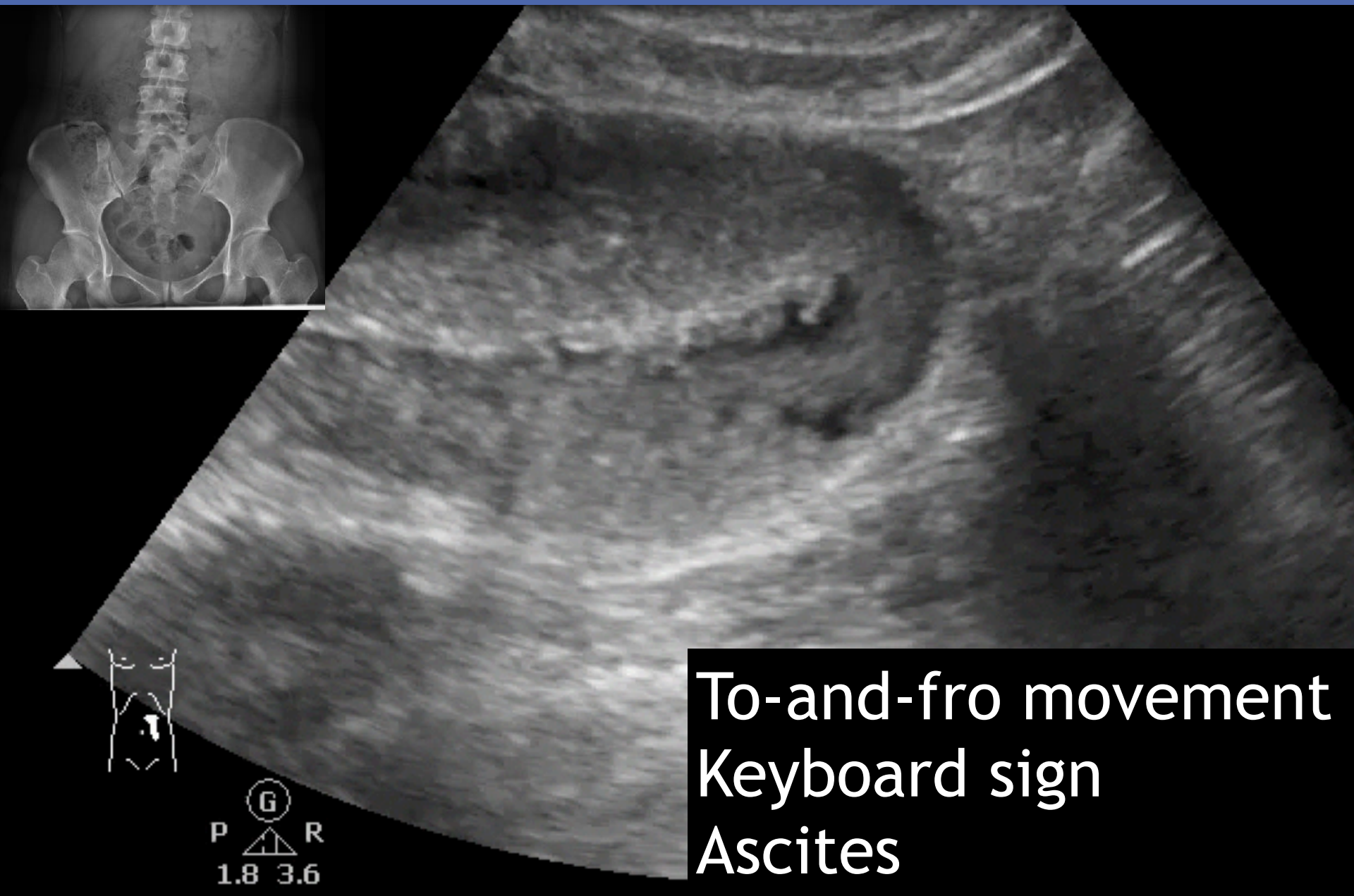
有看到Adhesion band請舉手



POCUS is useful for gasless ileus detection

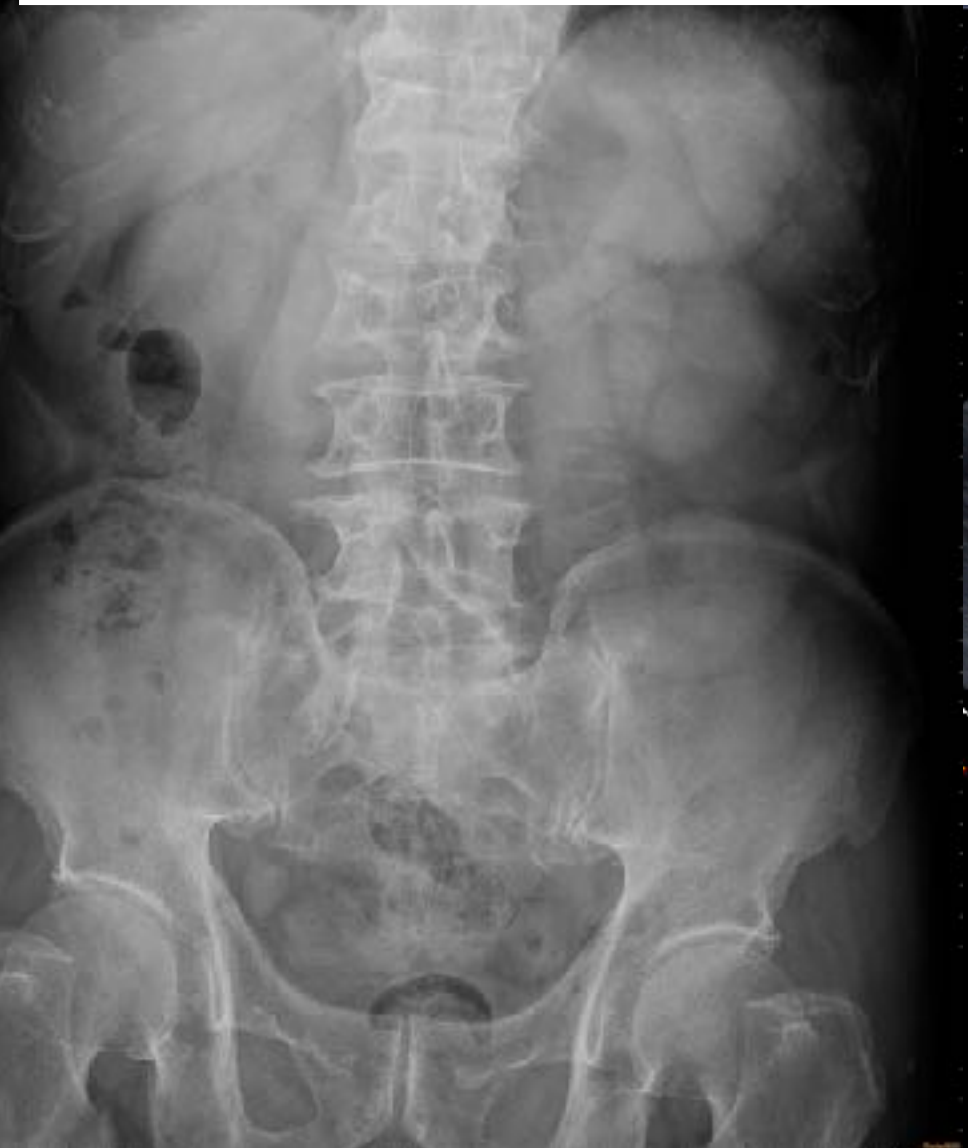


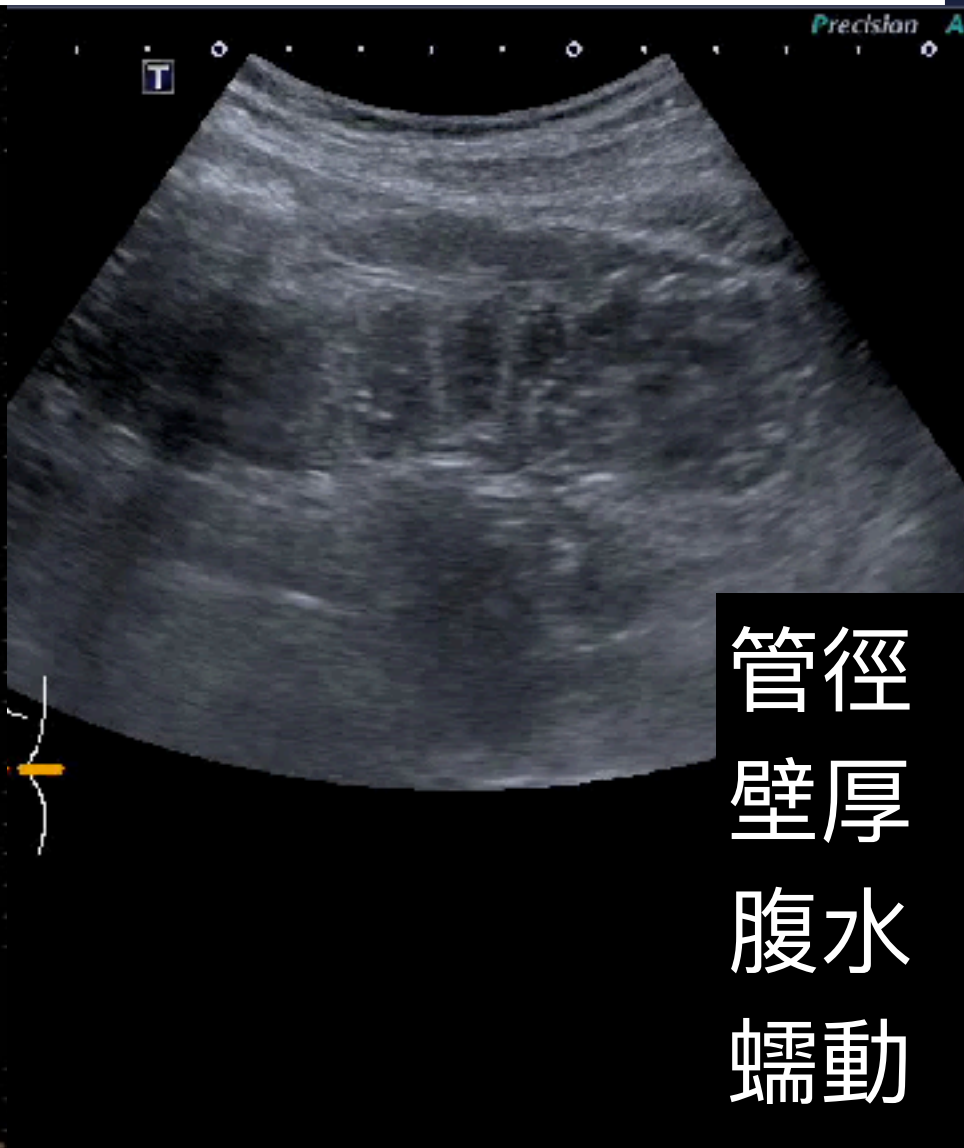
POCUS is useful for gasless ileus detection



To-and-fro movement
Keyboard sign
Ascites

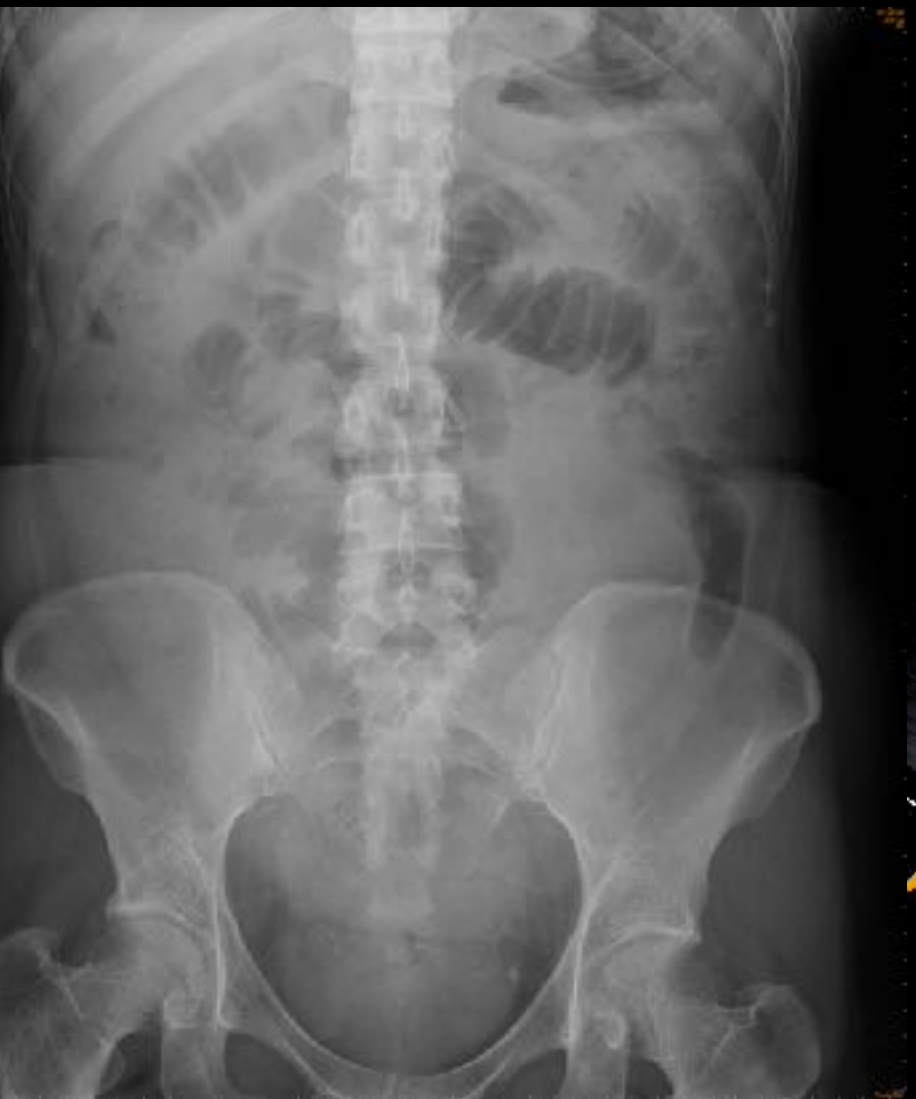
To-N-Fro movement

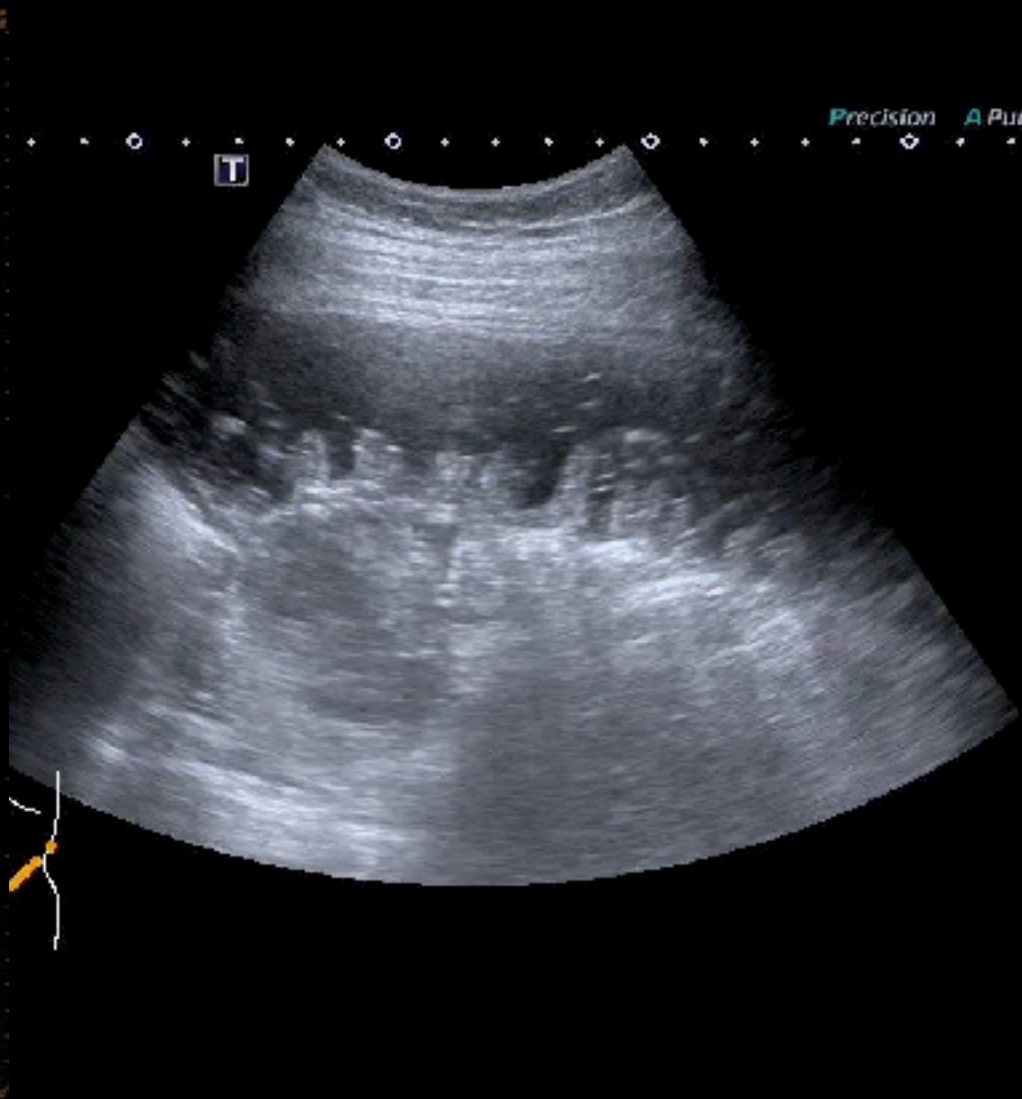




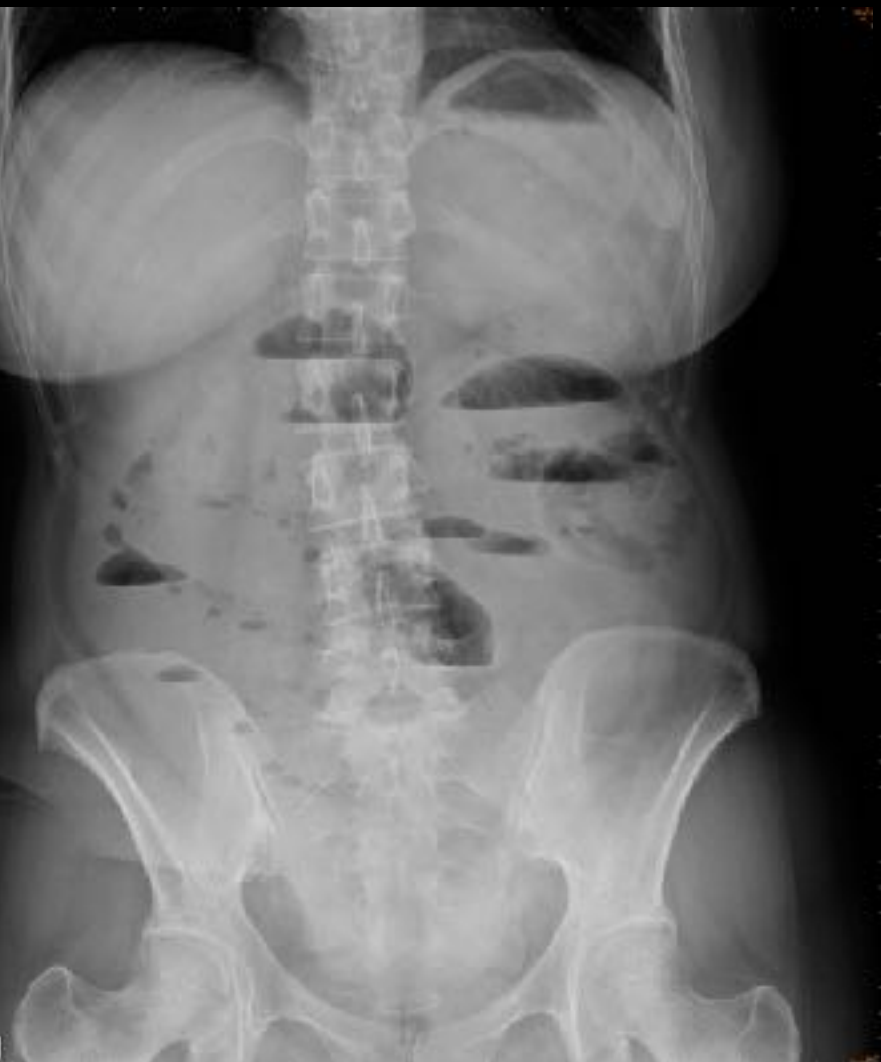
管徑
壁厚
腹水
蠕動

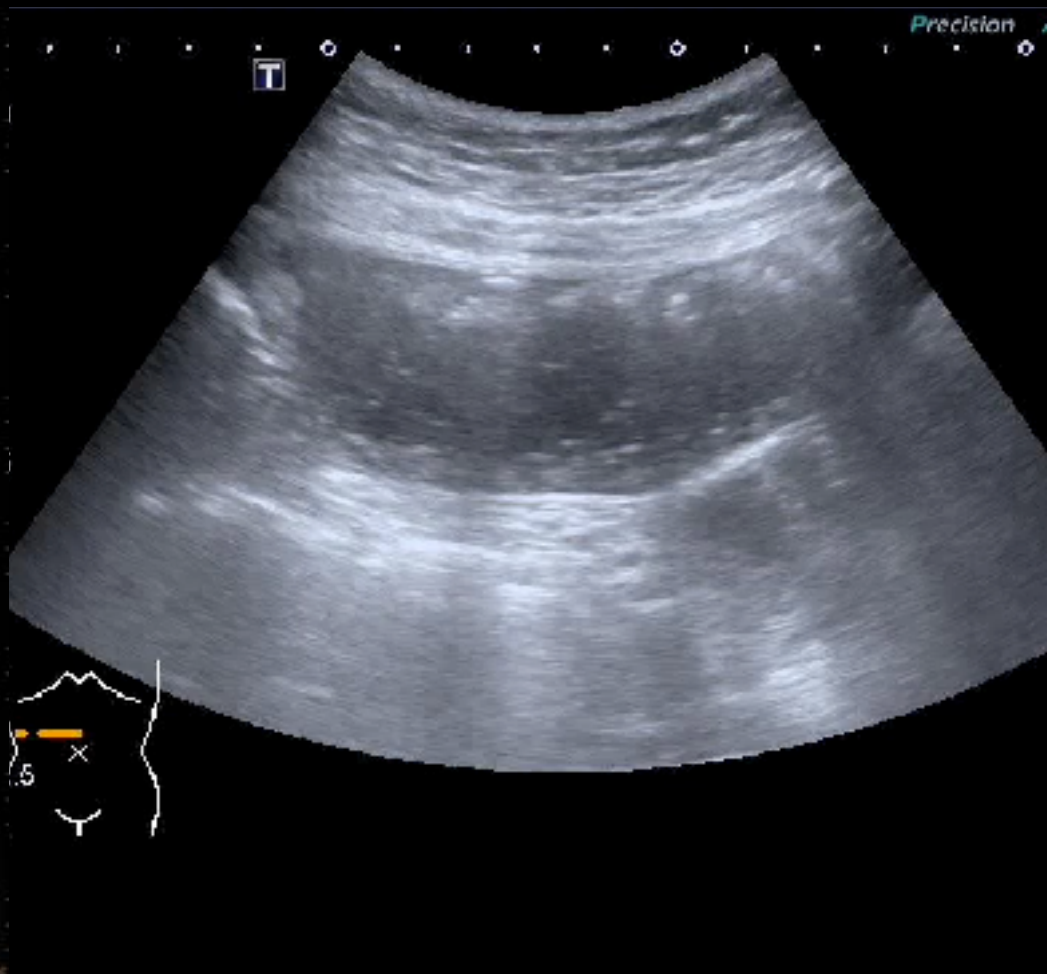
Jejunum or Ileum ?





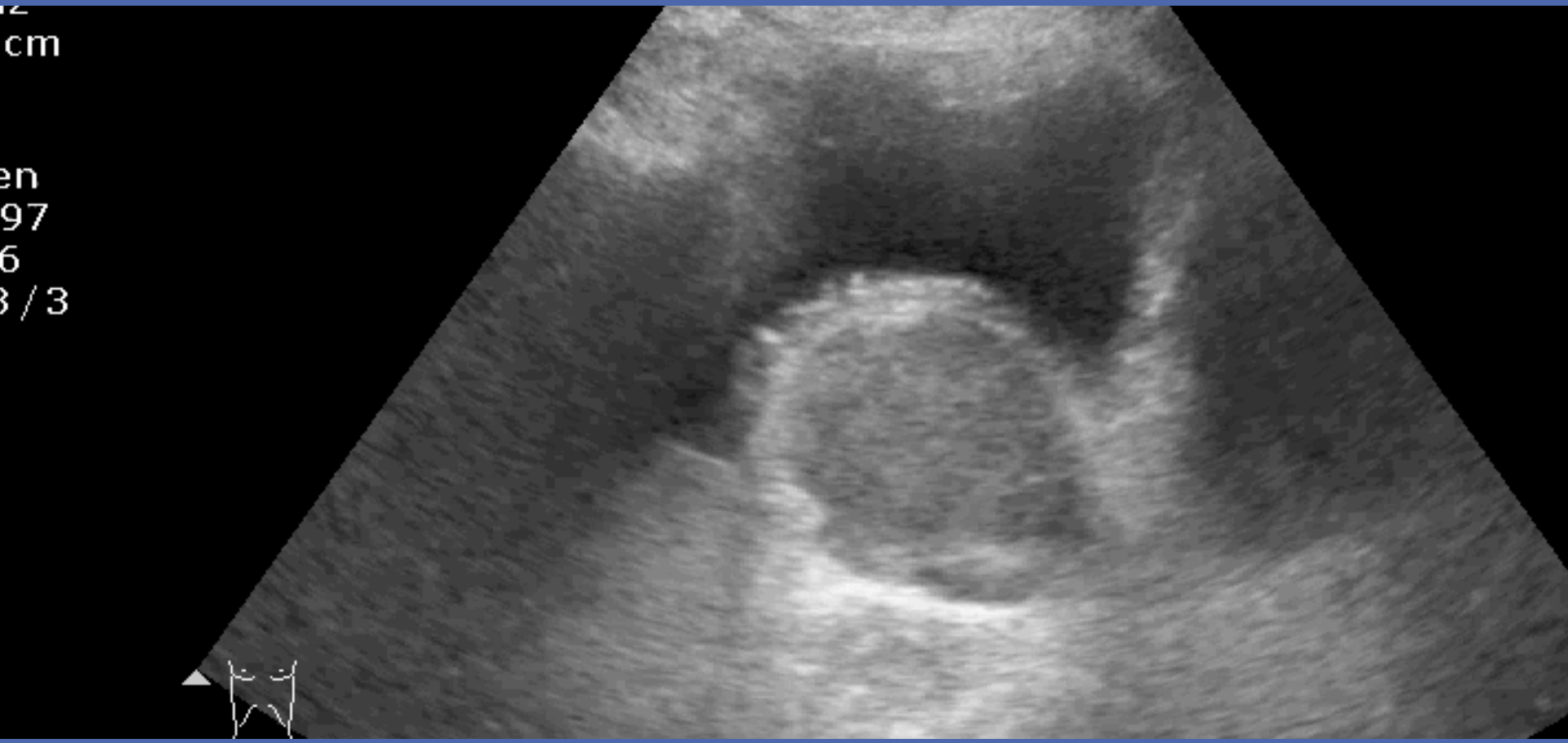
String-of-beads sign





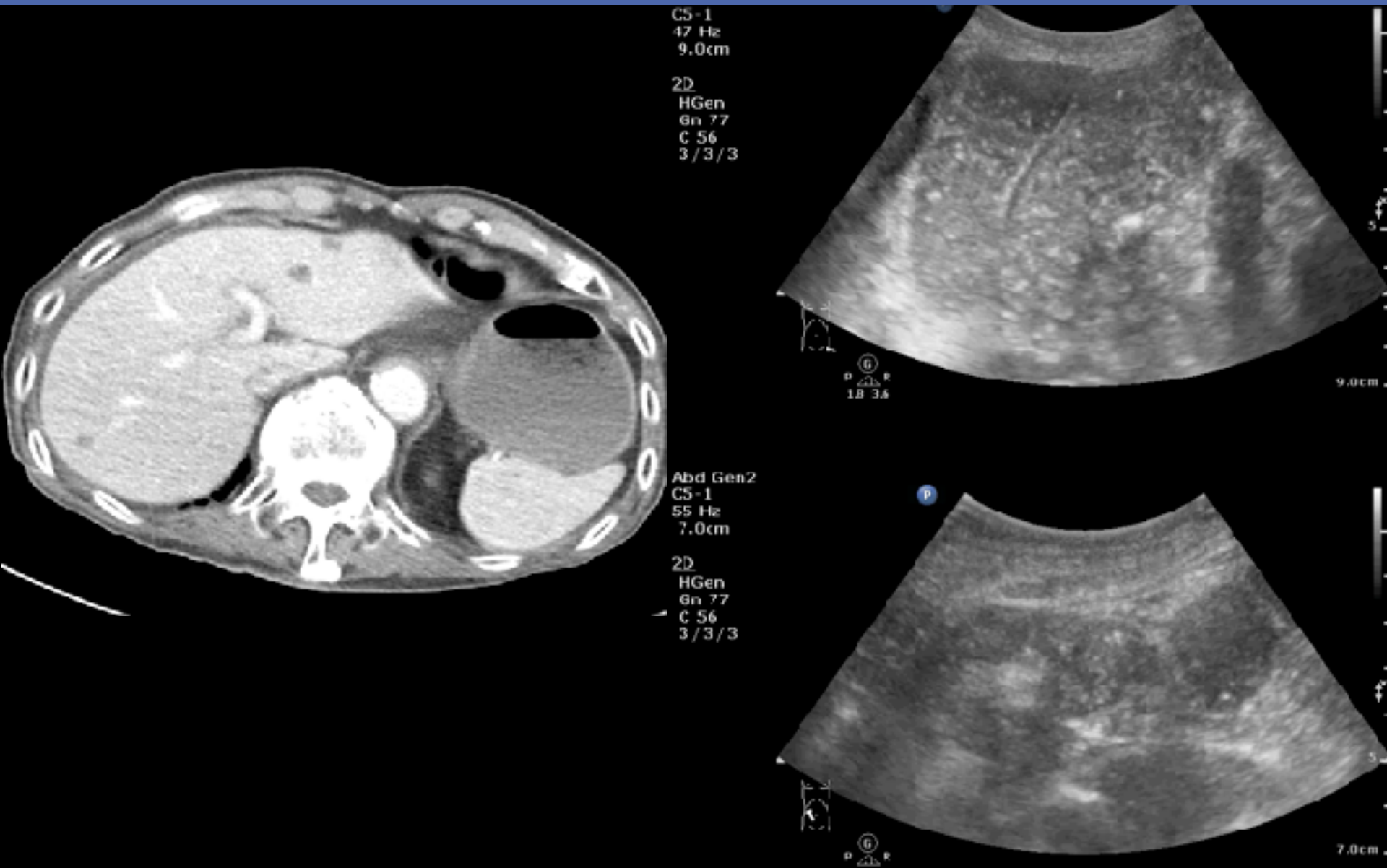
90M, RLQ pain * 2days

認為有腸阻塞請舉手

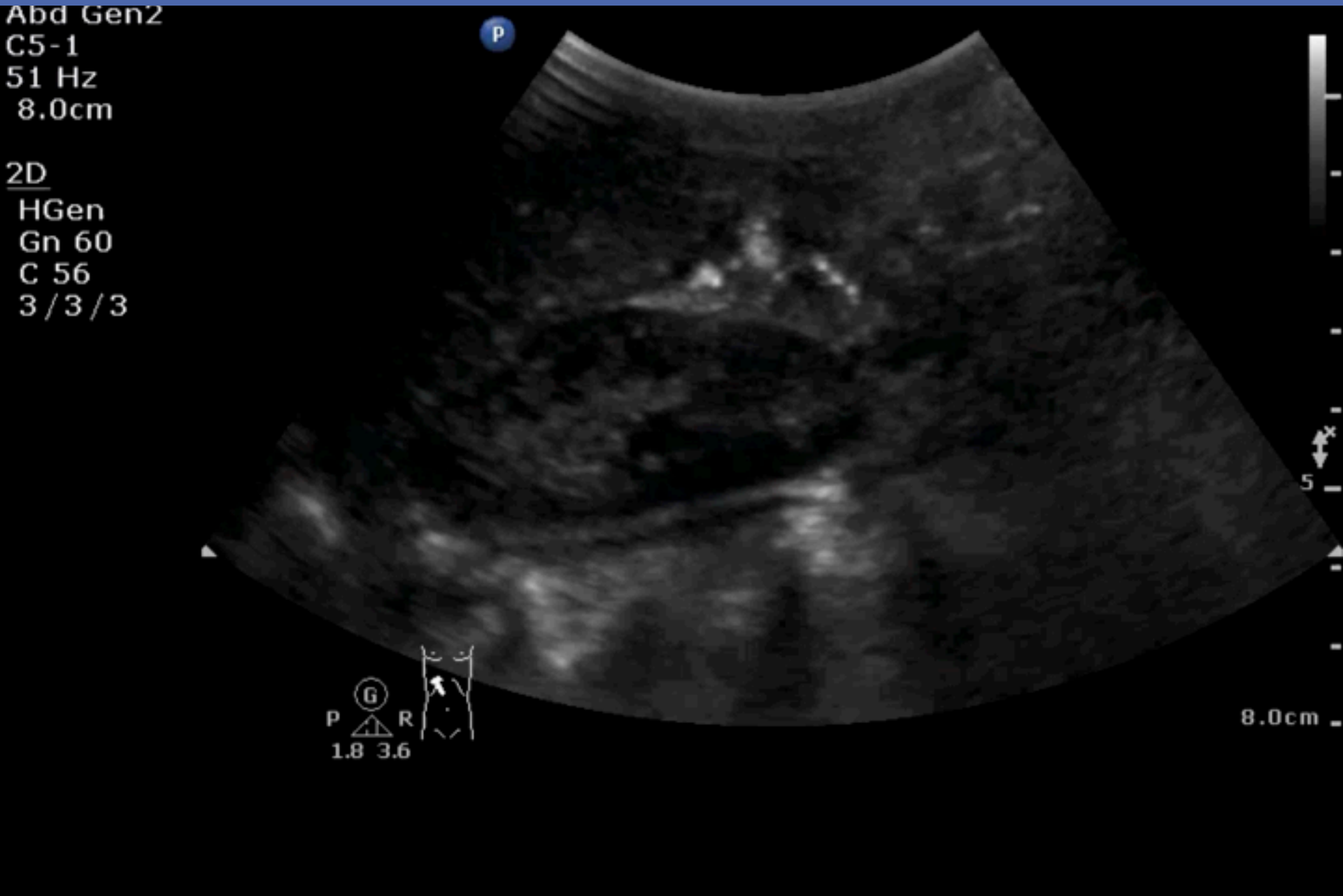


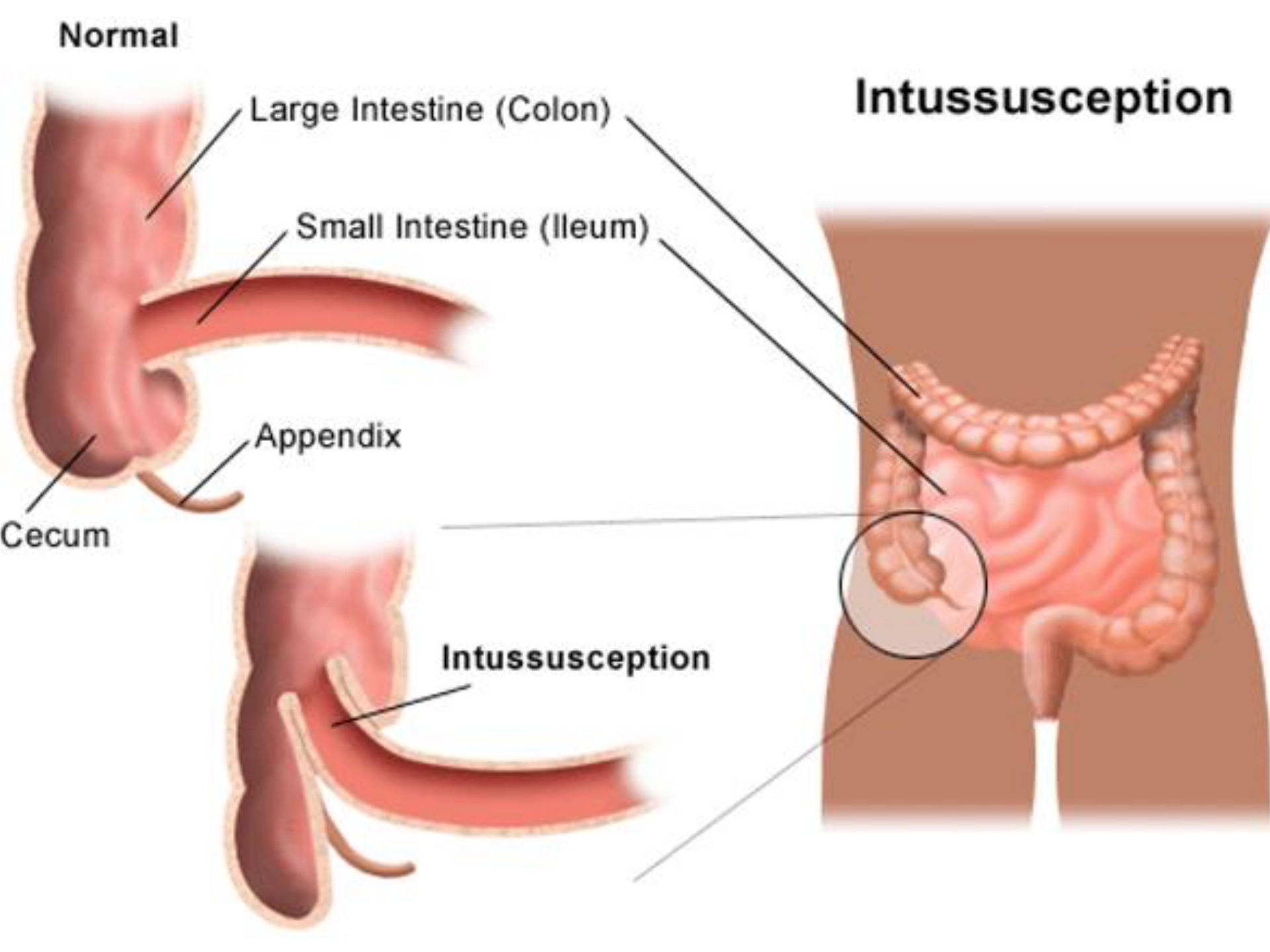
有看到腹水請舉手

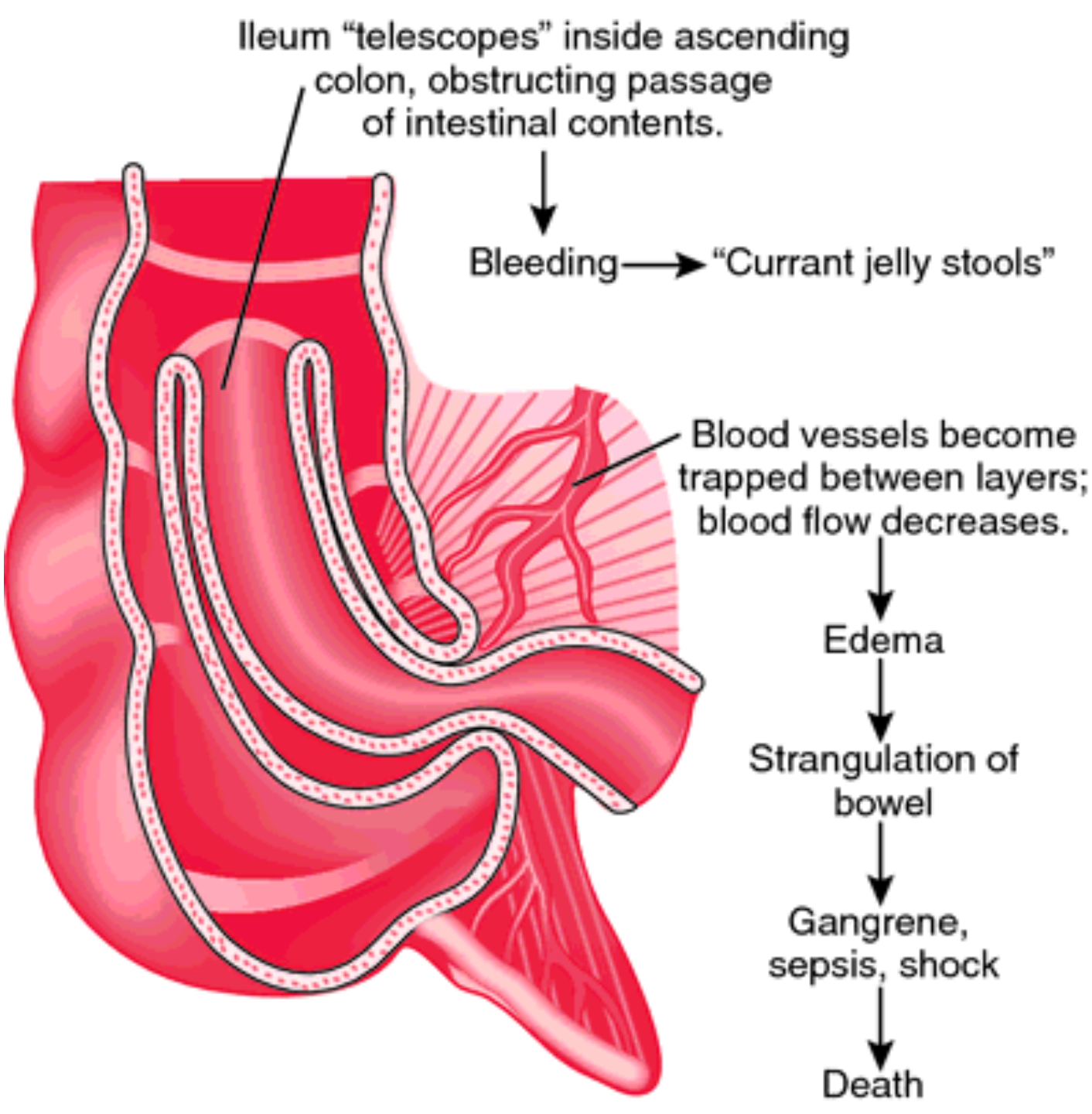
Mechanical obstruction



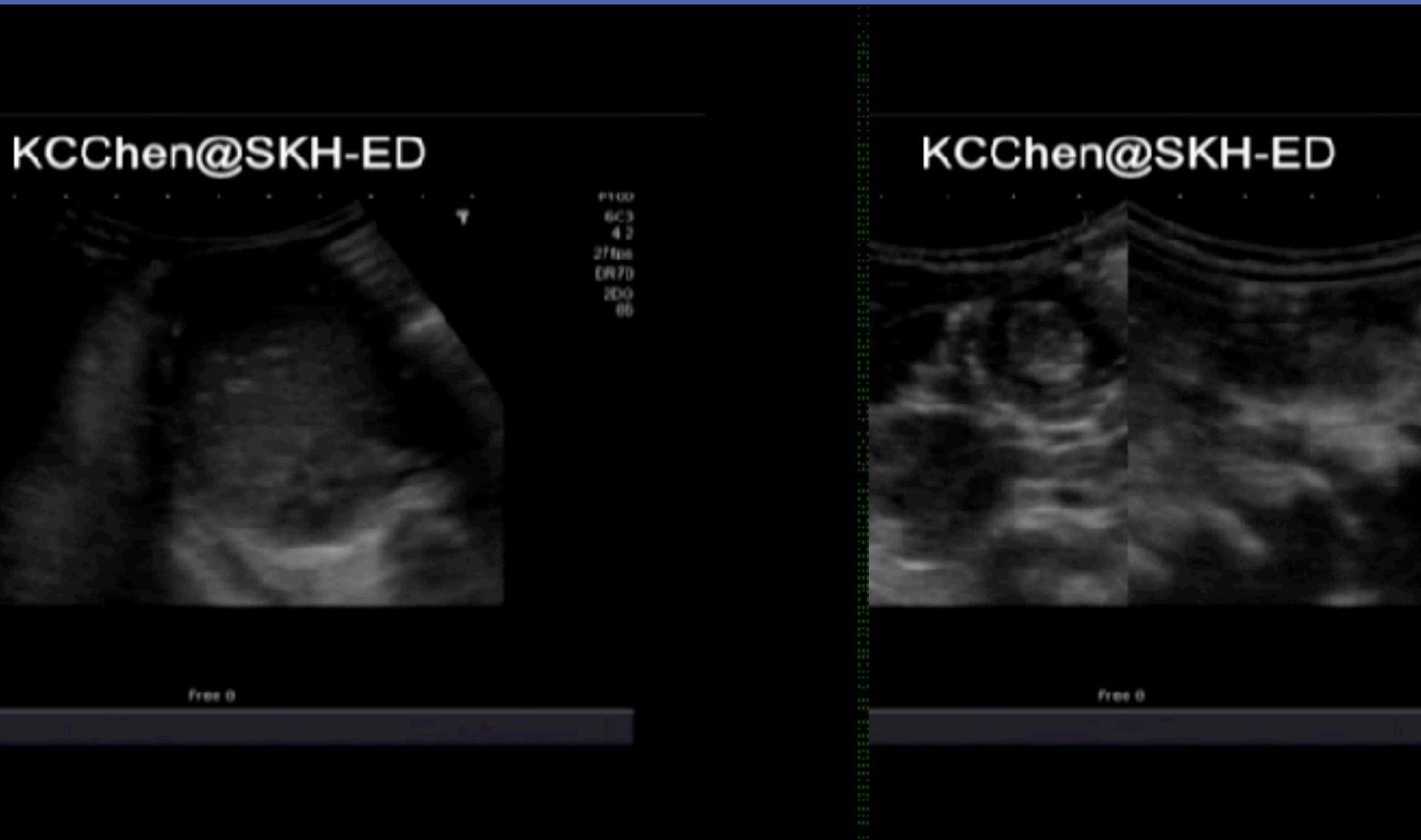
這個病人最特別的表現為何？



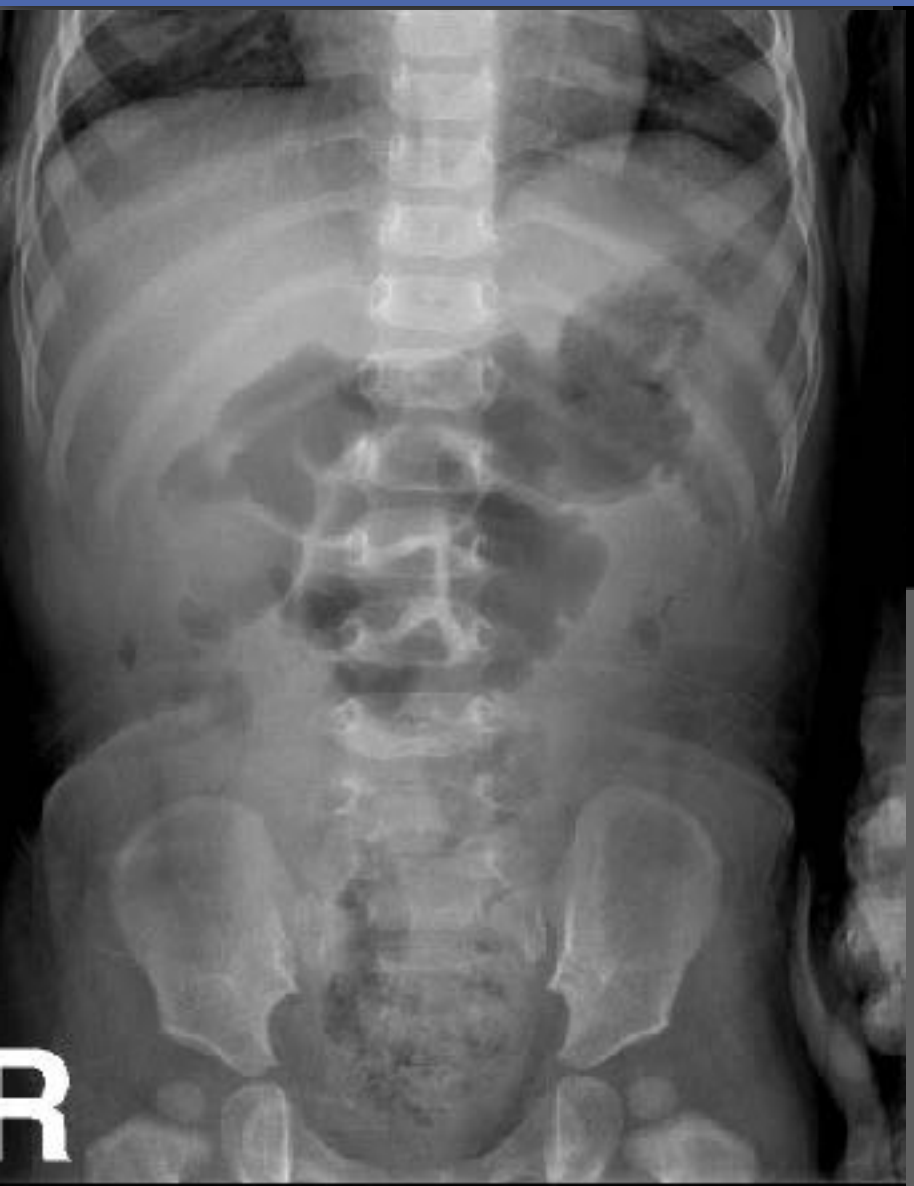

Normal
Large Intestine (Colon)
Small Intestine (Ileum)
Appendix
Cecum
Intussusception
Intussusception

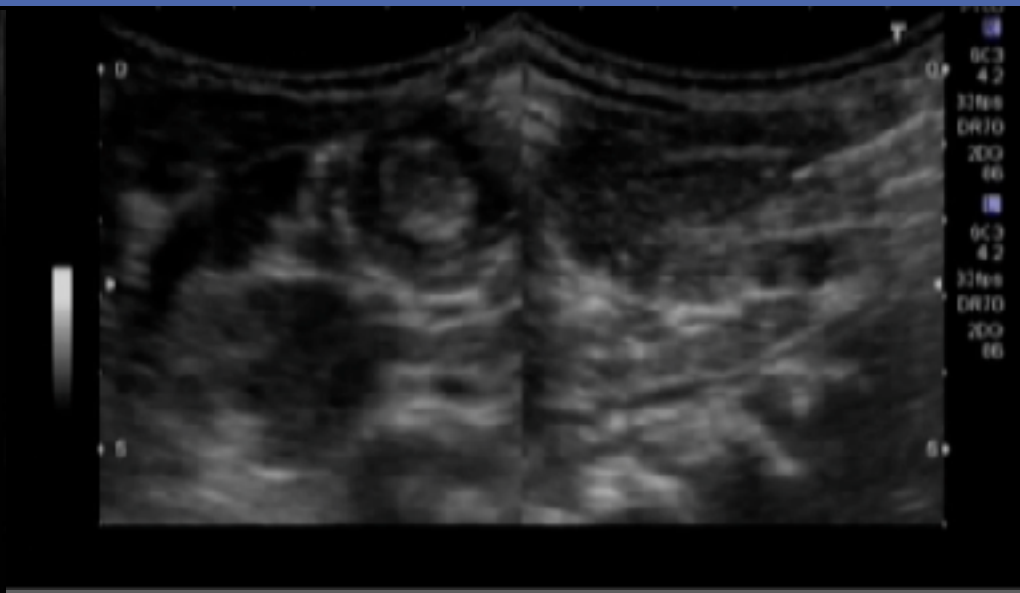

Ileum "telescopes" inside ascending colon, obstructing passage of intestinal contents.
Bleeding
"Currant jelly stools"
Blood vessels become trapped between layers; blood flow decreases.
Edema
Strangulation of bowel
Gangrene, sepsis, shock
Death

1F, irritable crying



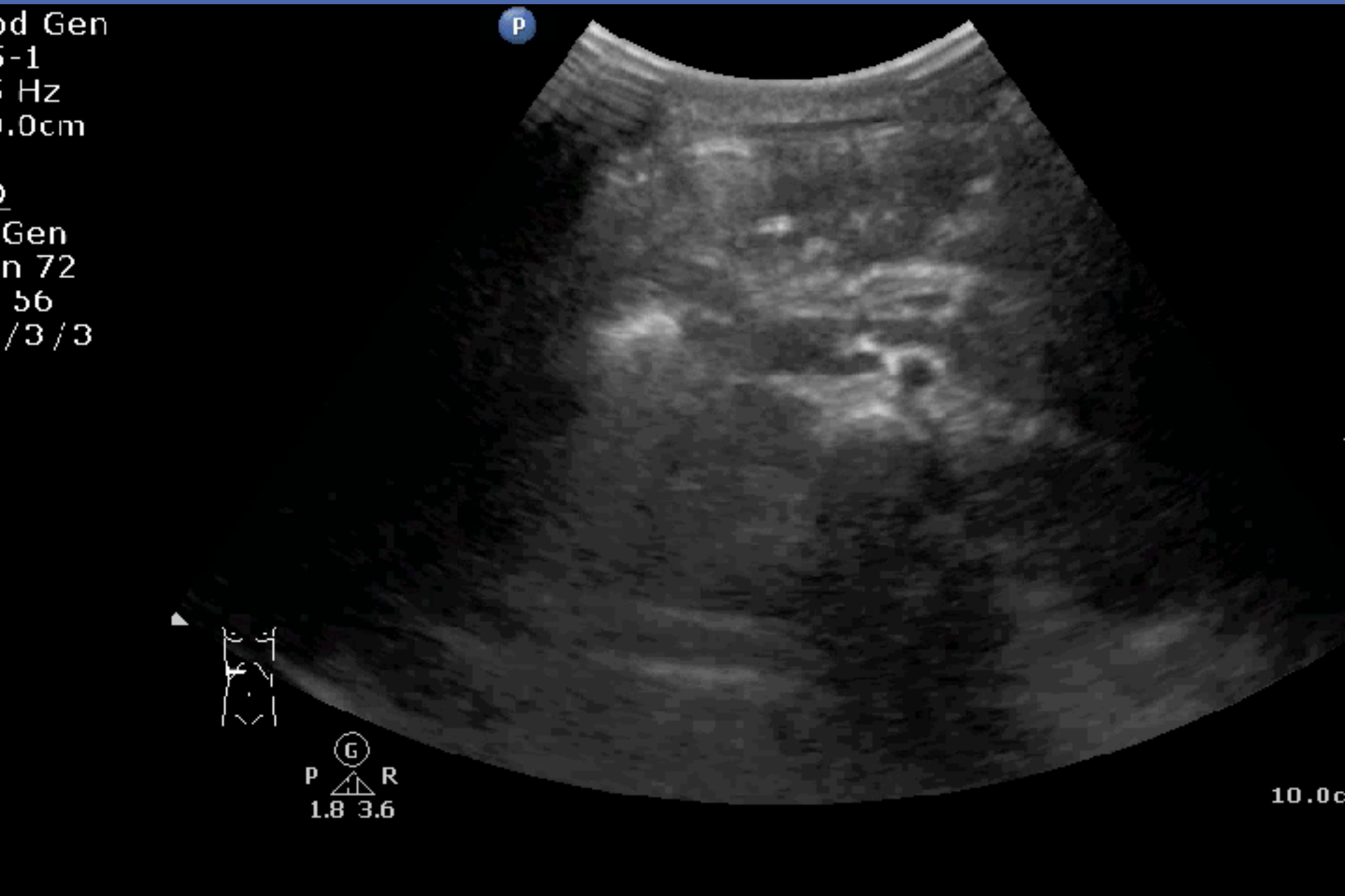
Intussusception



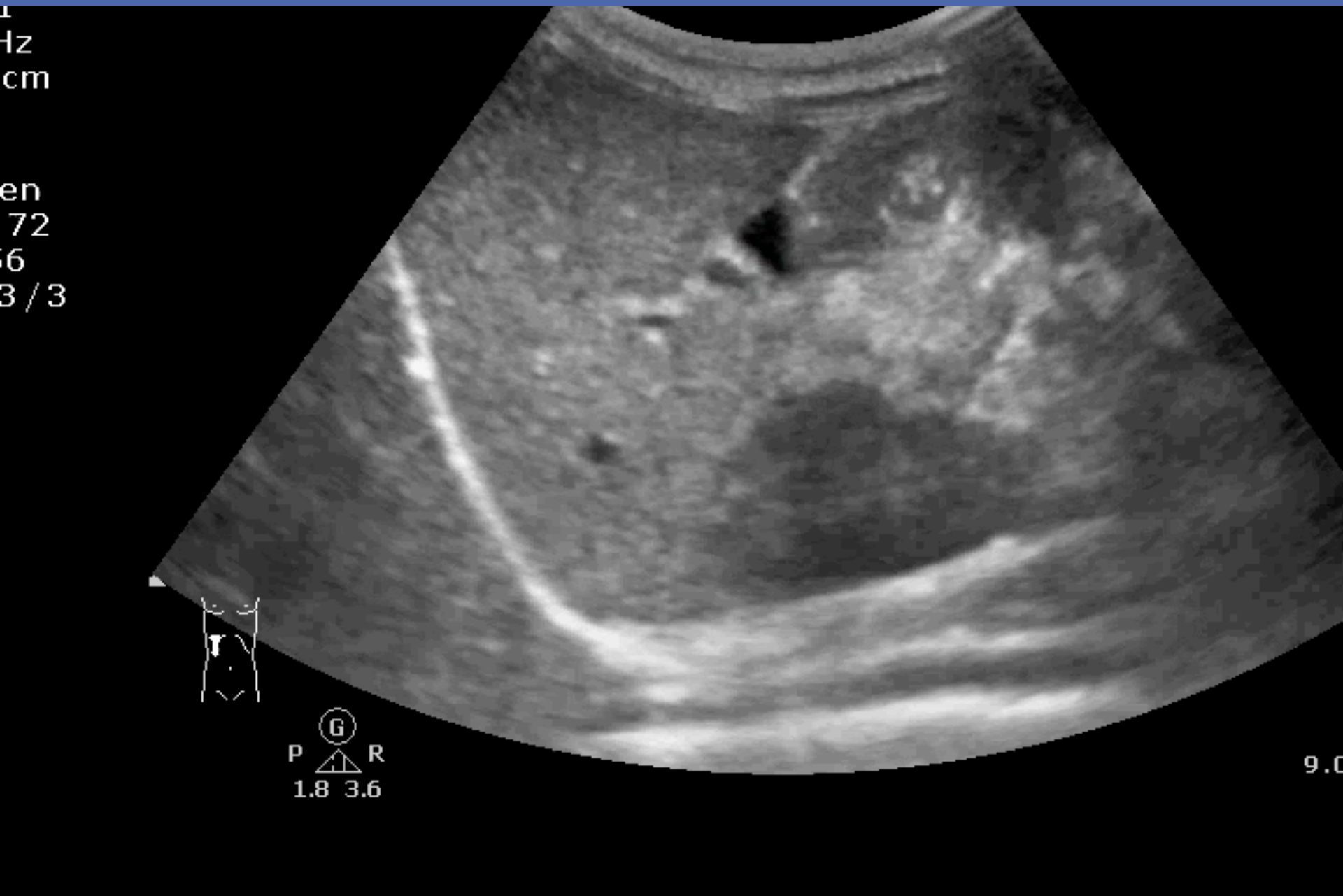


Target sign
Pseudokidney sign
Sandwich sign
Hayfork sign

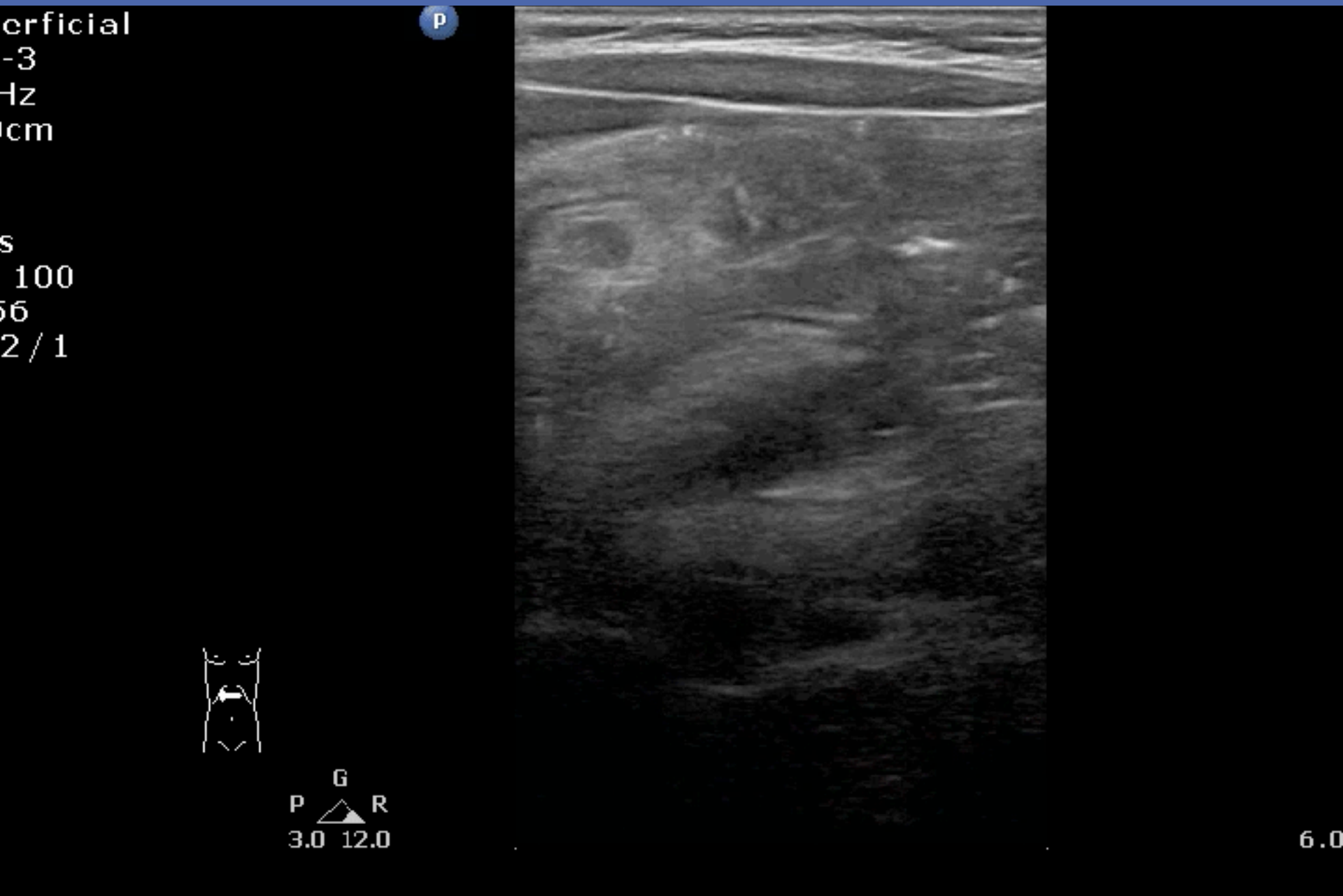
7個月大男童，間歇性溢奶



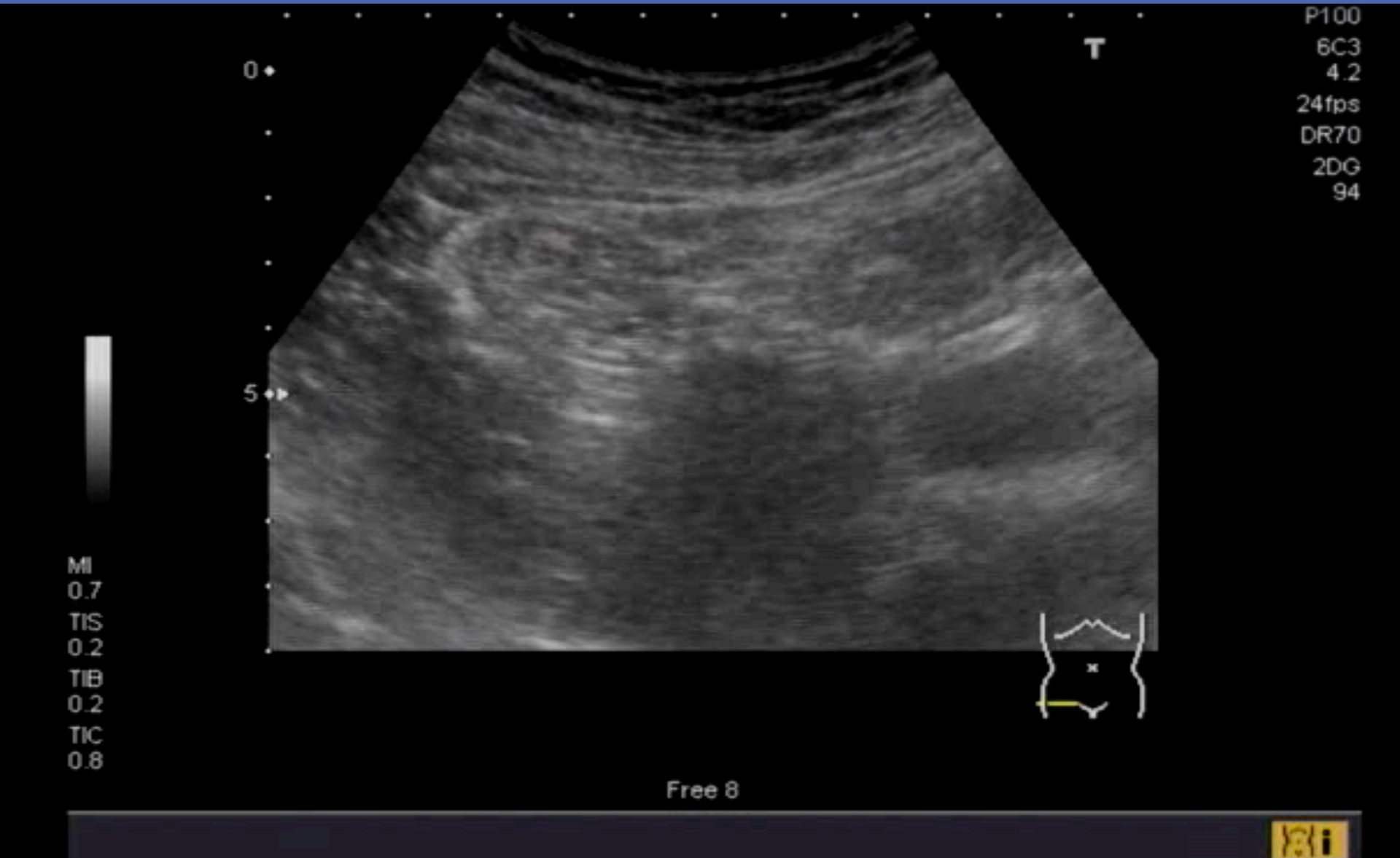
Intussusception



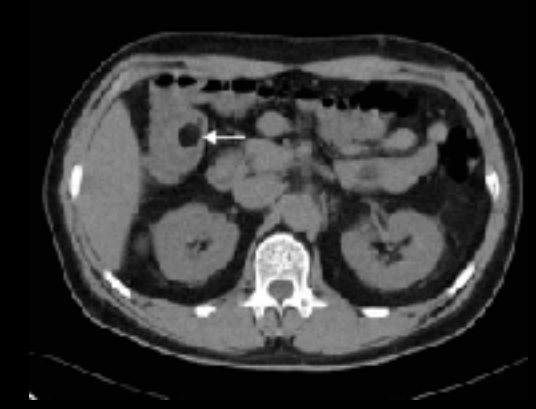
有看到leading point的請舉手！

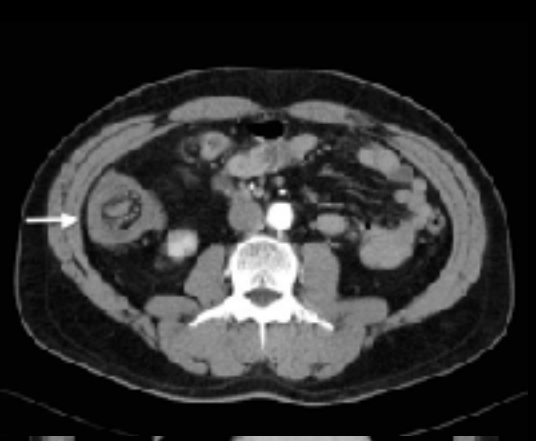


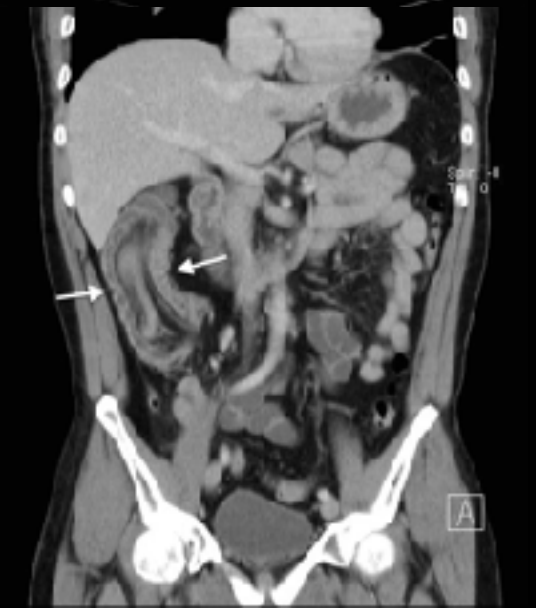
51M, abdominal pain and tarry stool

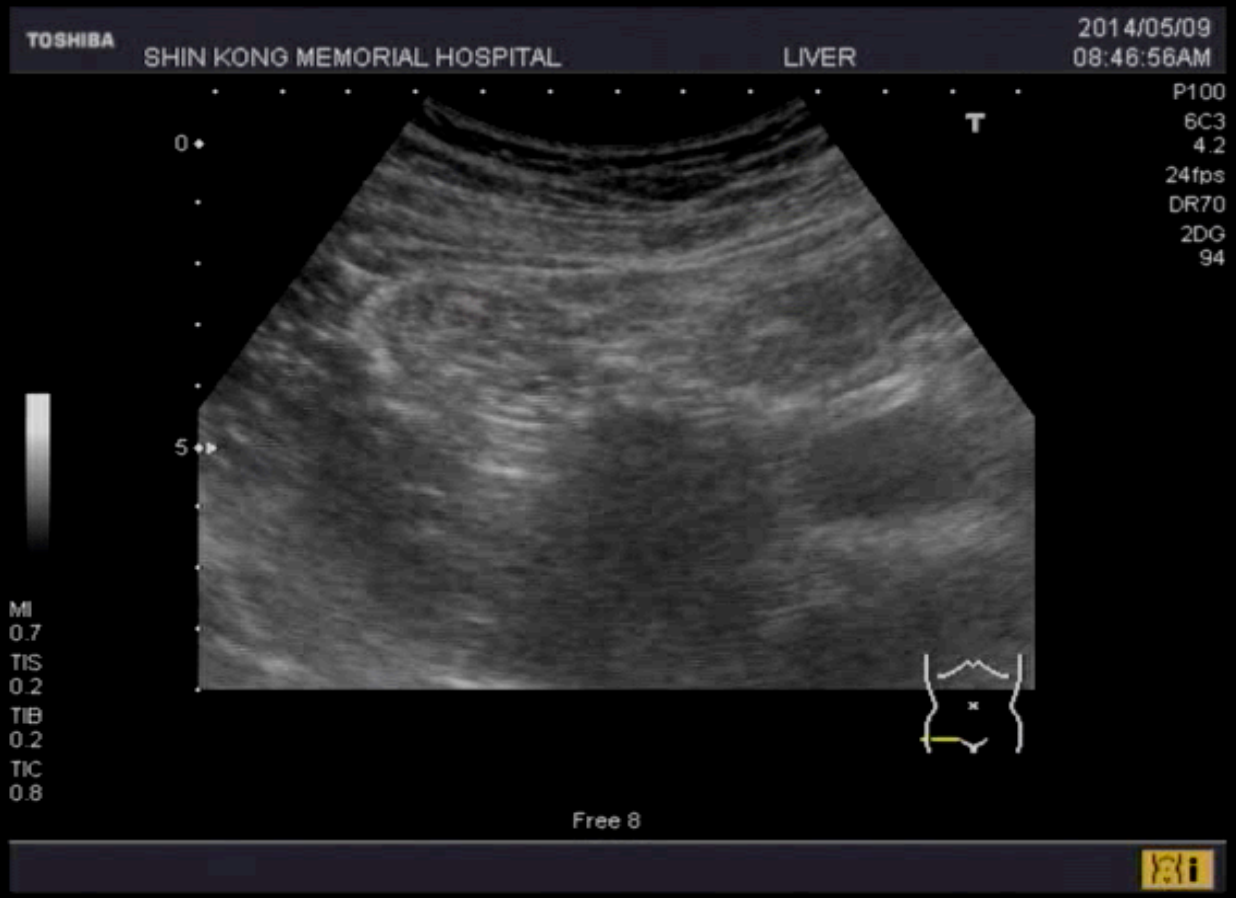


Intussusception



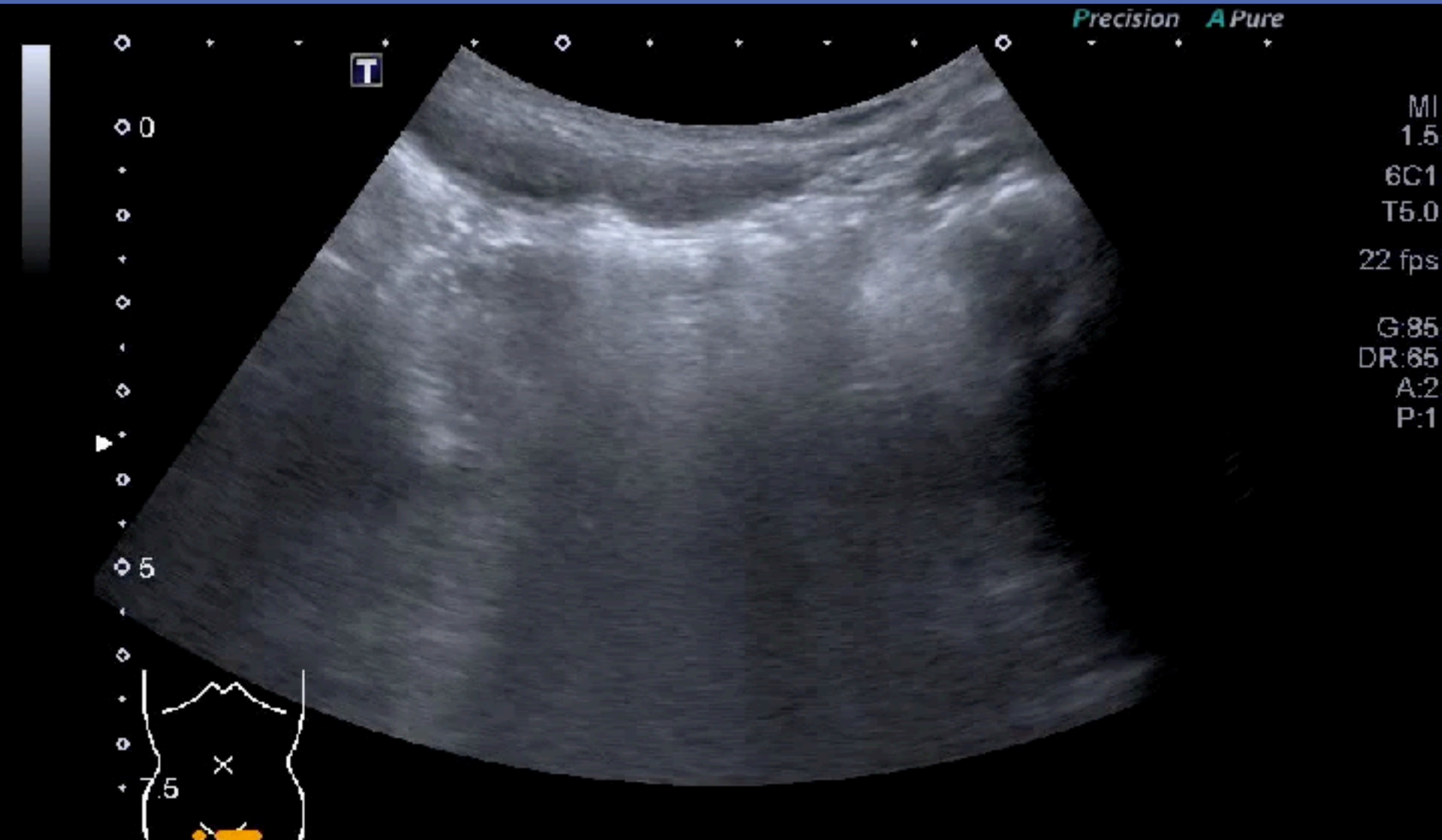


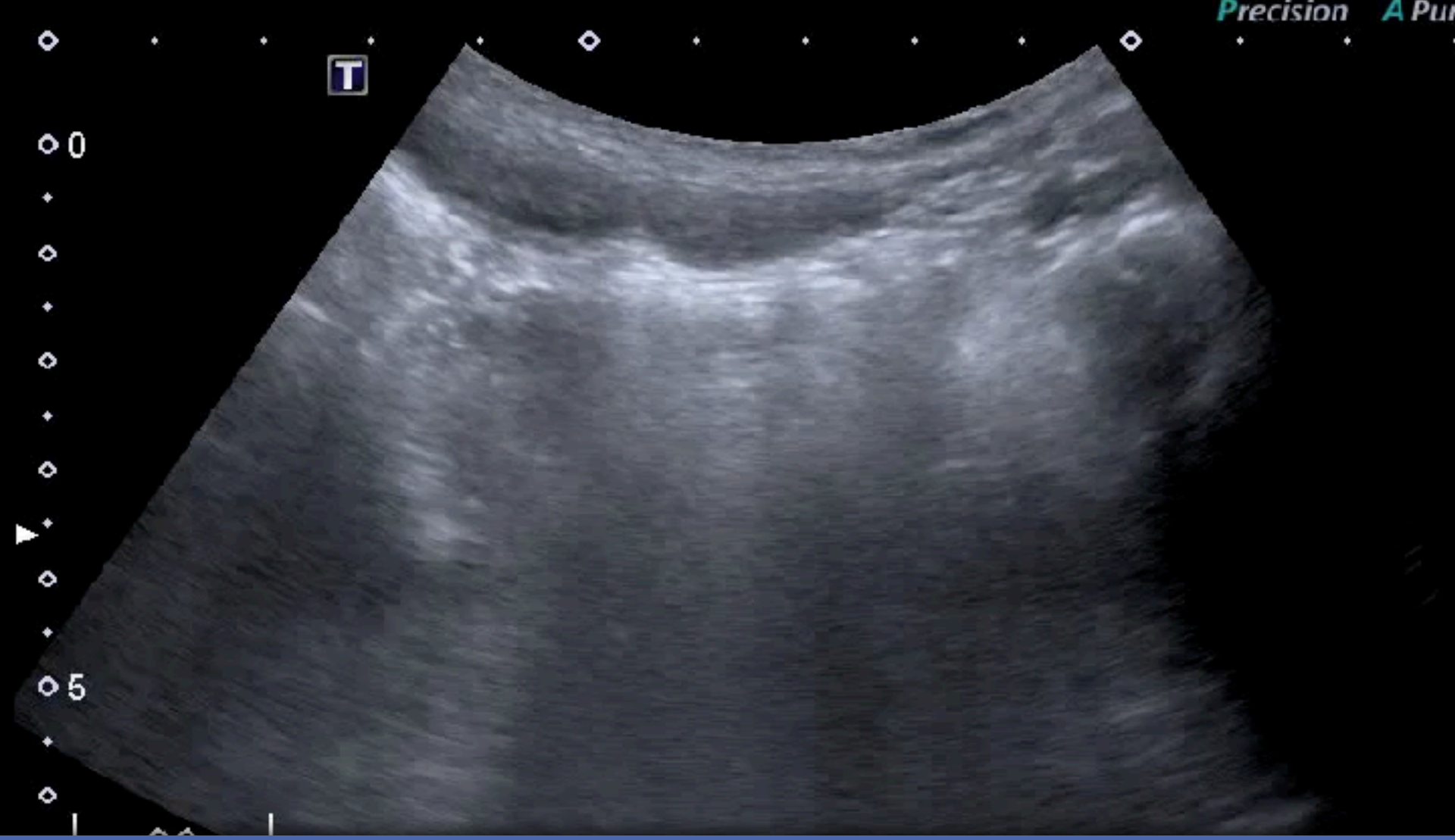




7F，一天未解便，

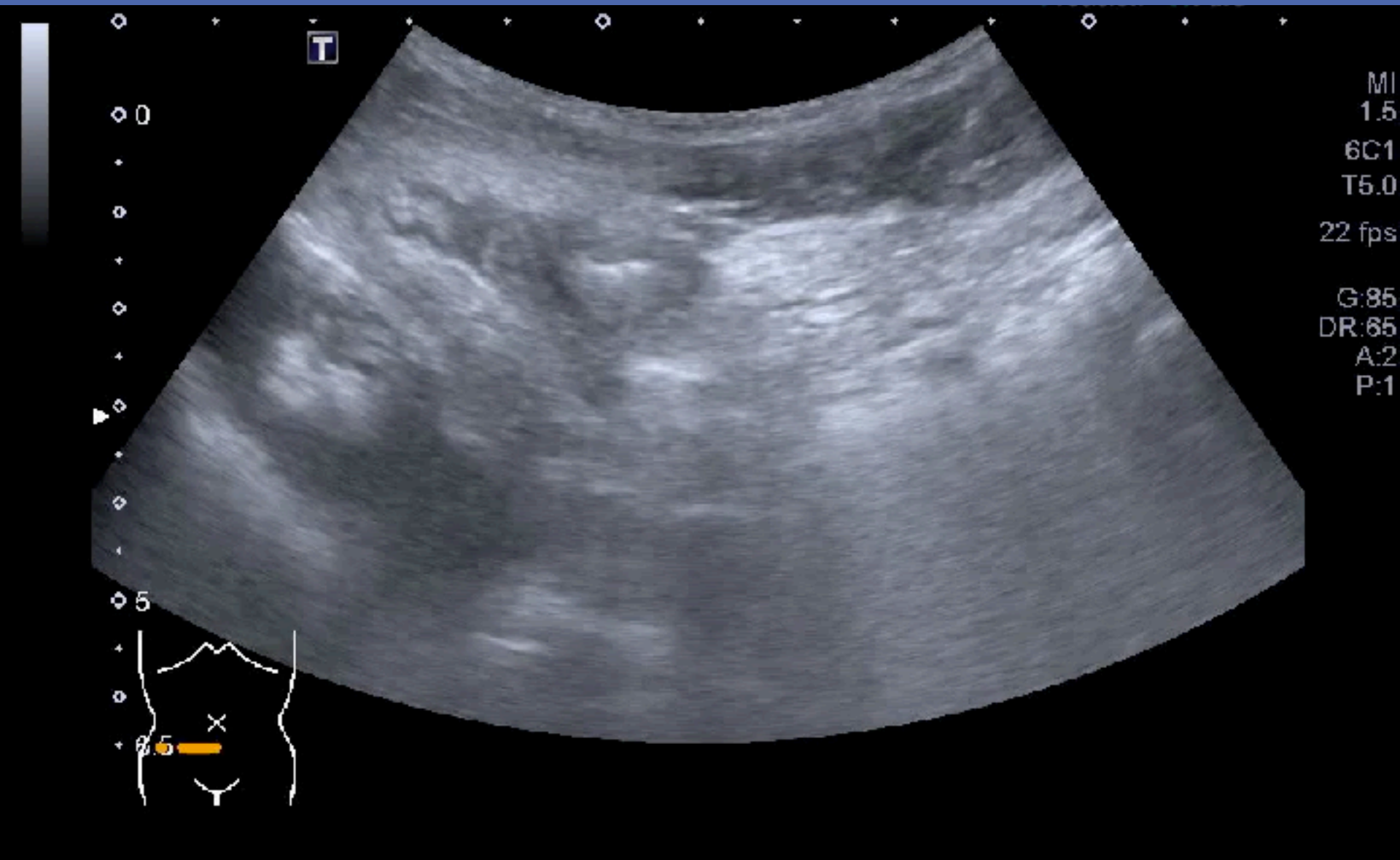
剛腹痛到在床上打滾、冒冷汗



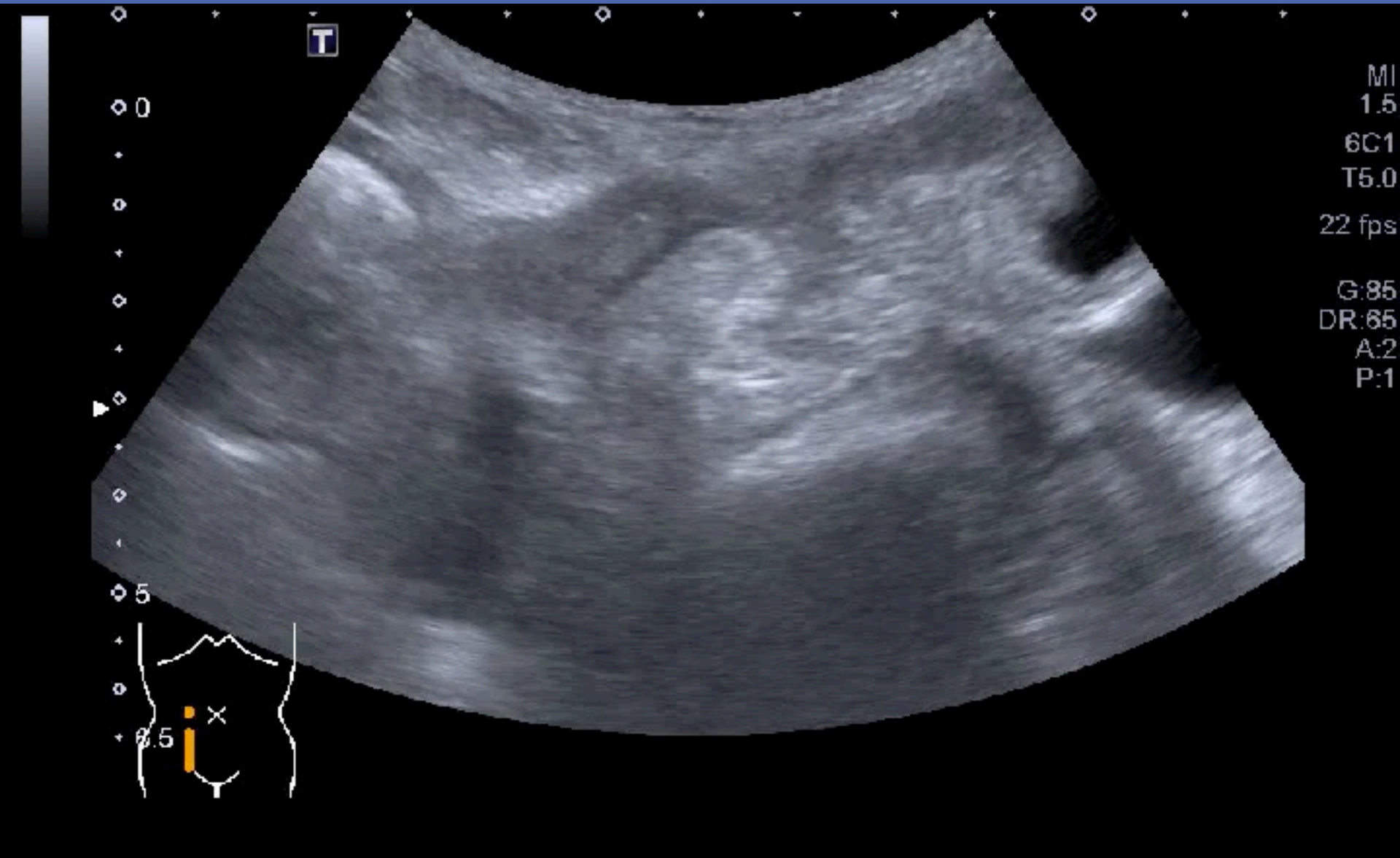


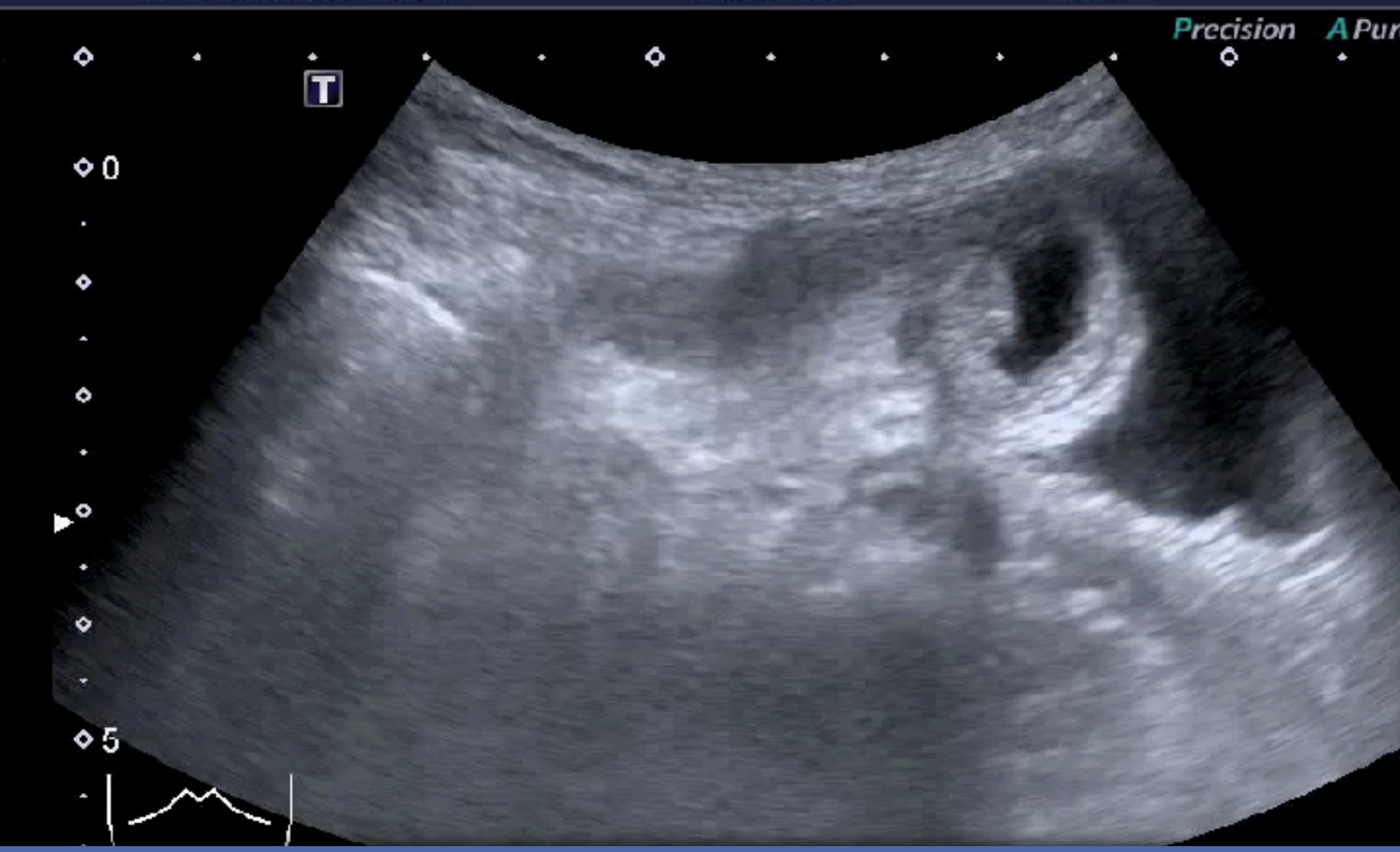
Spontaneous reduction

66M, right inguinal painful swelling



66M, right inguinal painful swelling





Successful reduction

Thieme

EFSUMB Position Paper: Recommendations for Gastrointestinal Ultrasound (GIUS) in Acute Appendicitis and Diverticulitis

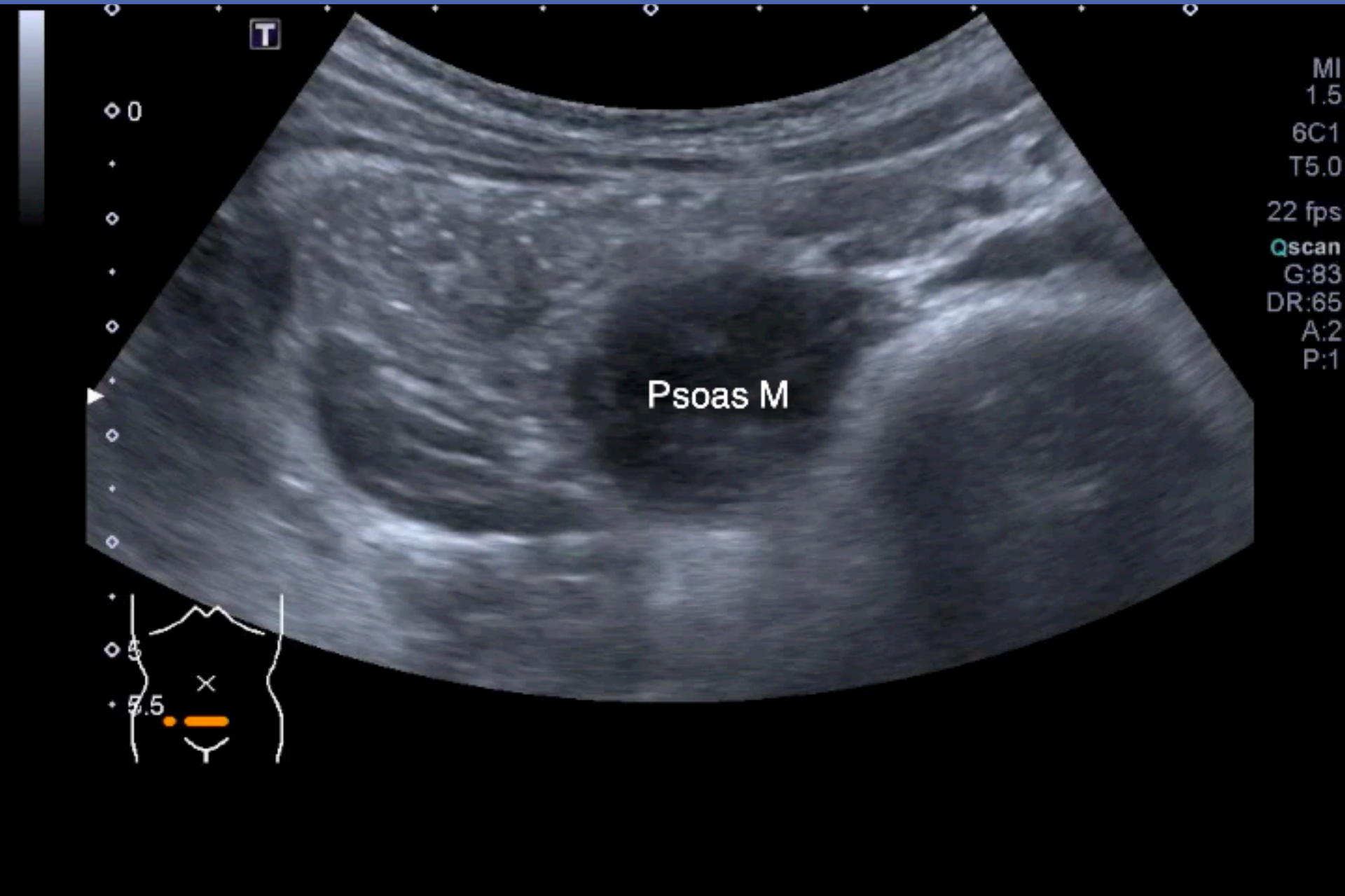
EFSUMB-Positionspapier: Empfehlungen für den gastrointestinalen Ultraschall (GIUS) bei akuter Appendizitis und Divertikulitis

Prevalence of appendicitis in Western country: 7-8%
Useful technique: **Graded Compression**

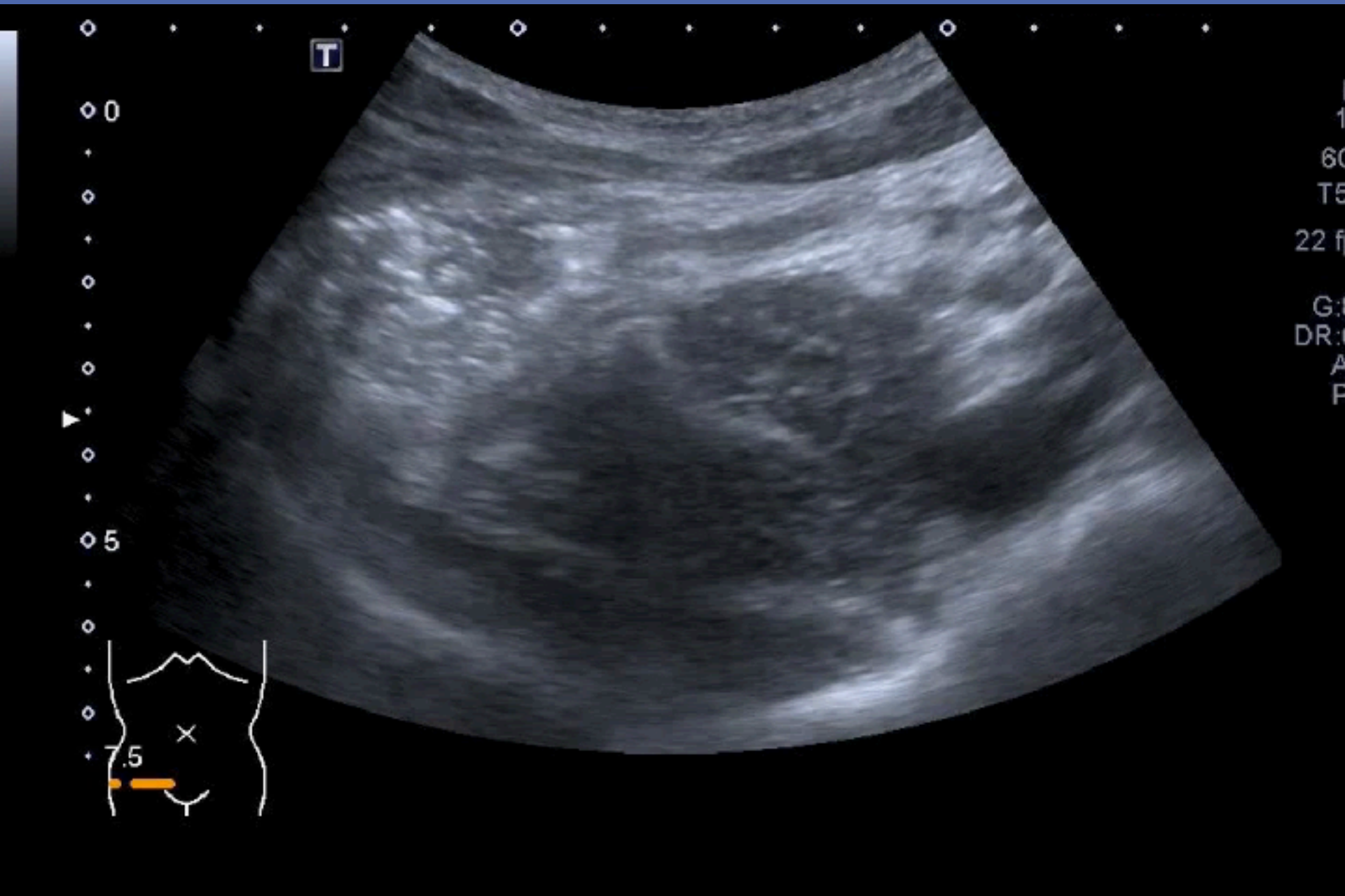
3 major goals of US

1. **Exclusion of alternative disease**
2. **Comfirmation of typical appendicitis**
3. **Ruling out by providing a normal appendix**

Appendix landmark



Landmark then Appendix



Thieme

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3 most important criteria in the conformation of acute appendicitis

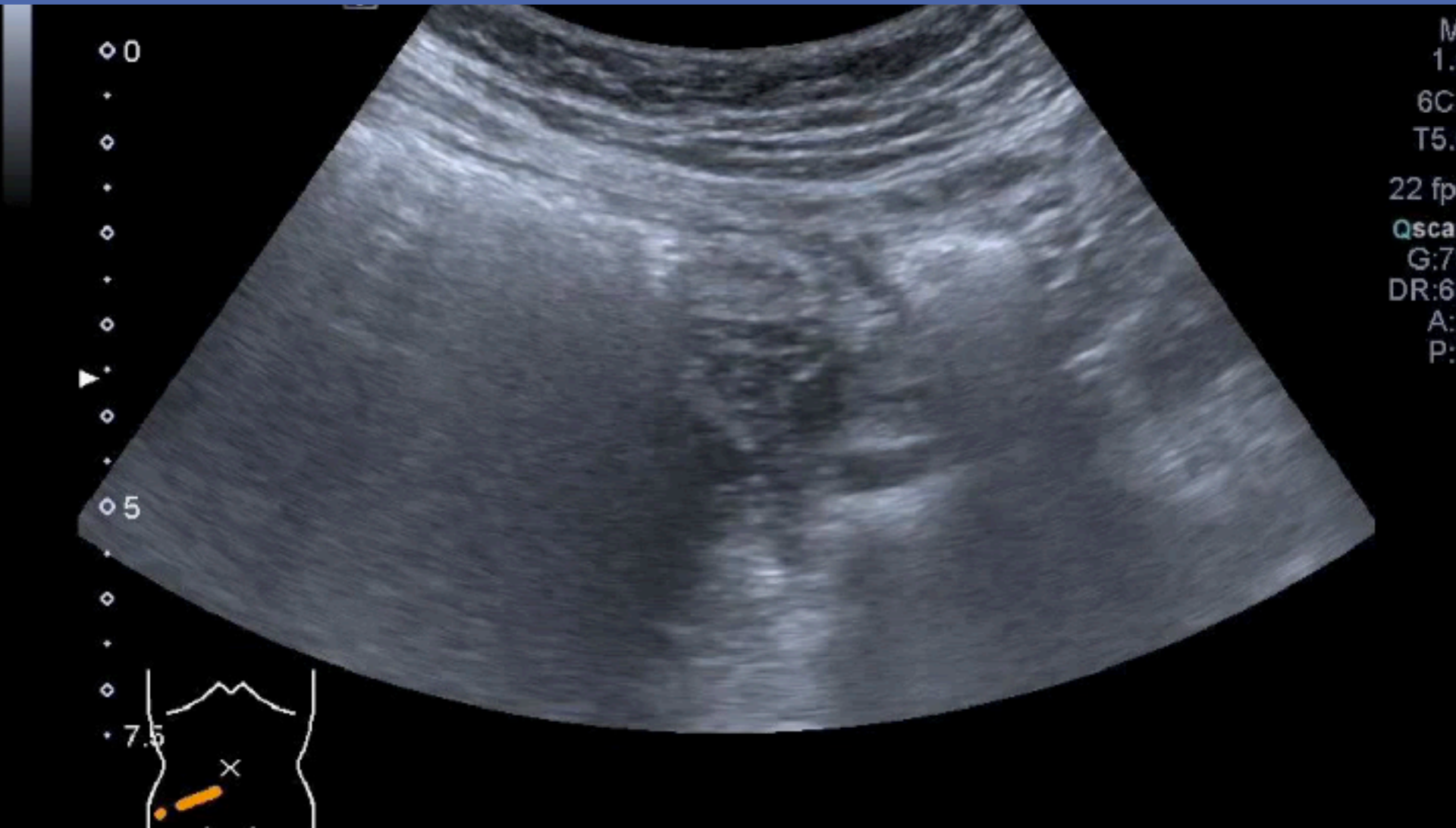
1. Max. diameter of appendix > 6 mm
2. Maximum pain over the appendix
3. Hyperechoic periappendiceal tissue

► **Table 1** Based on clinical assessment, laboratory results, and possibly scoring results, three scenarios are common in the daily routine.

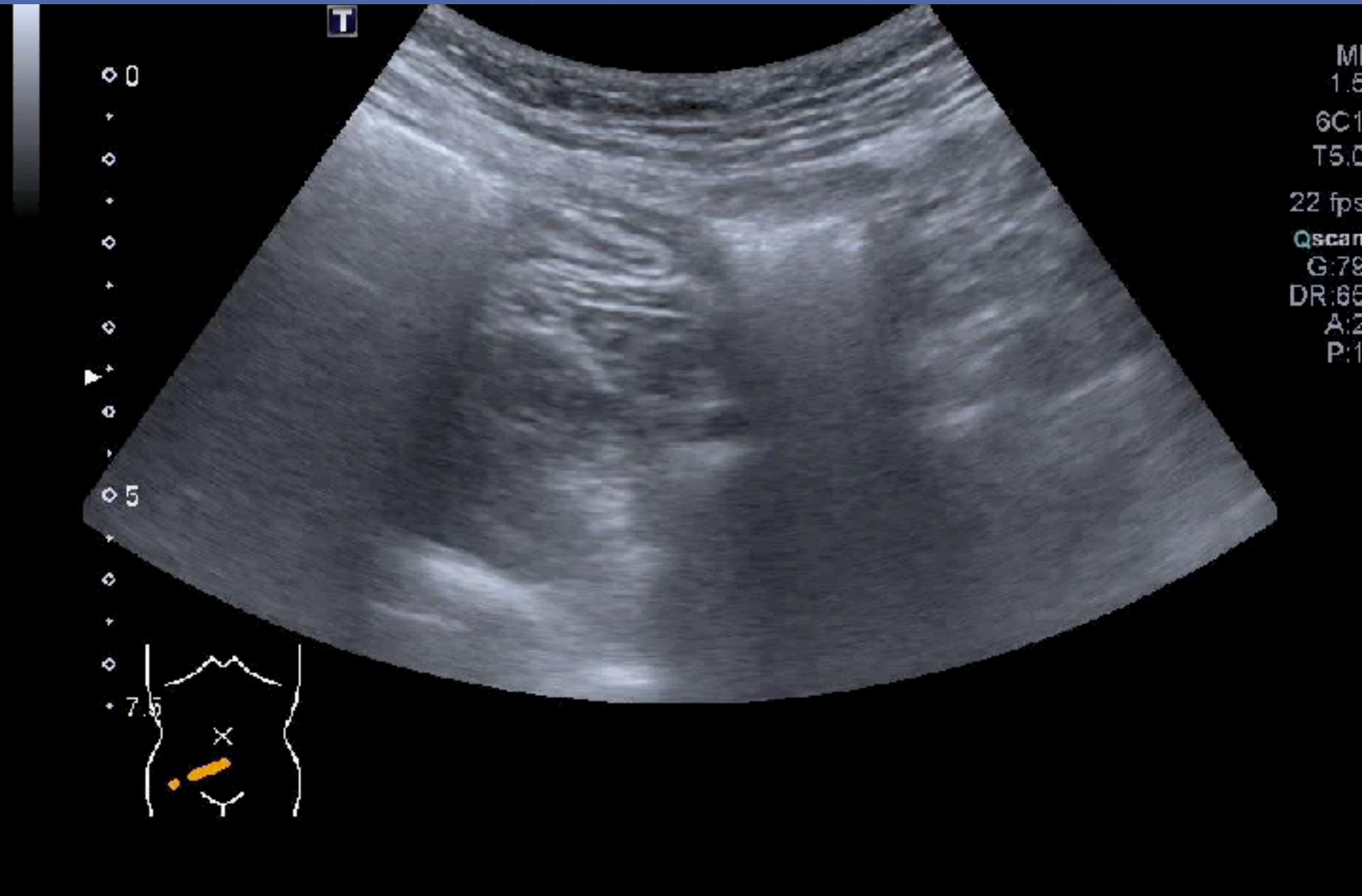
risk of appendicitis	Alvarado or AIR points	impact of sonography
low	0 – 4	visualization of the normal appendix in its full length definitively rules out appendicitis
		complete ultrasound is helpful in finding an alternative diagnosis
intermediate	5 – 8	validation of an inflamed appendix confirms the need for surgery
		if the diagnosis remains unclear, complementary CT, MRI or serial ultrasound performed by an experienced operator may be helpful
high	> 8	confirmation of acute appendicitis
		diagnosis of complications, e.g. abscess

46M, 上腹痛４小時

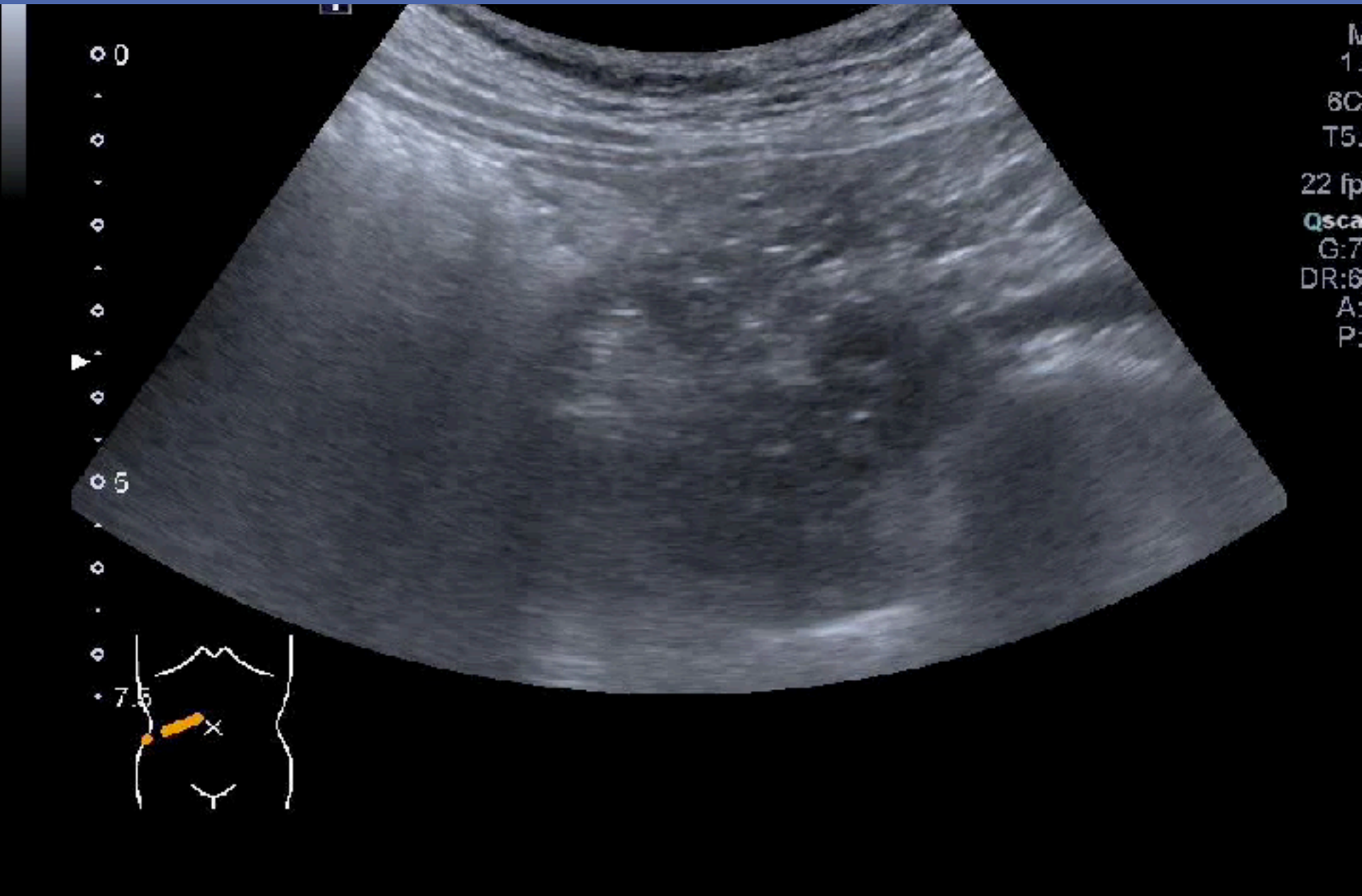
PE: Epigastric & RLQ tenderness



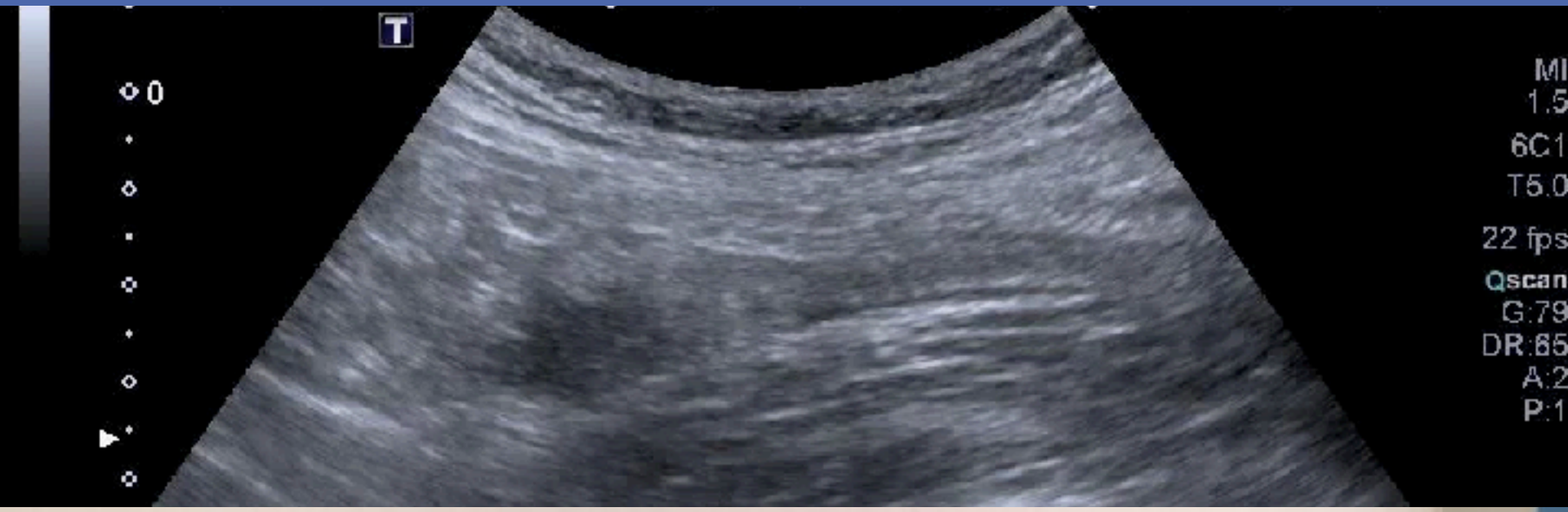
有看到Appendicitis請舉手

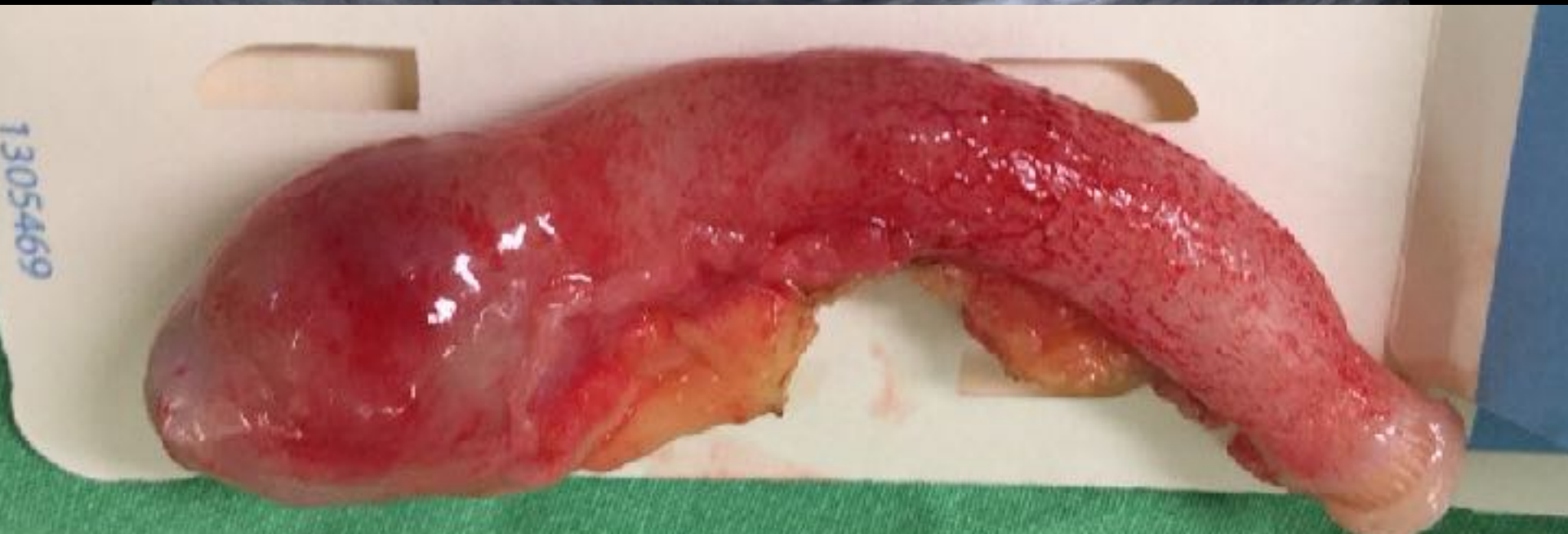


沒有看到Appendicitis請舉手



Retrocecal appendicitis

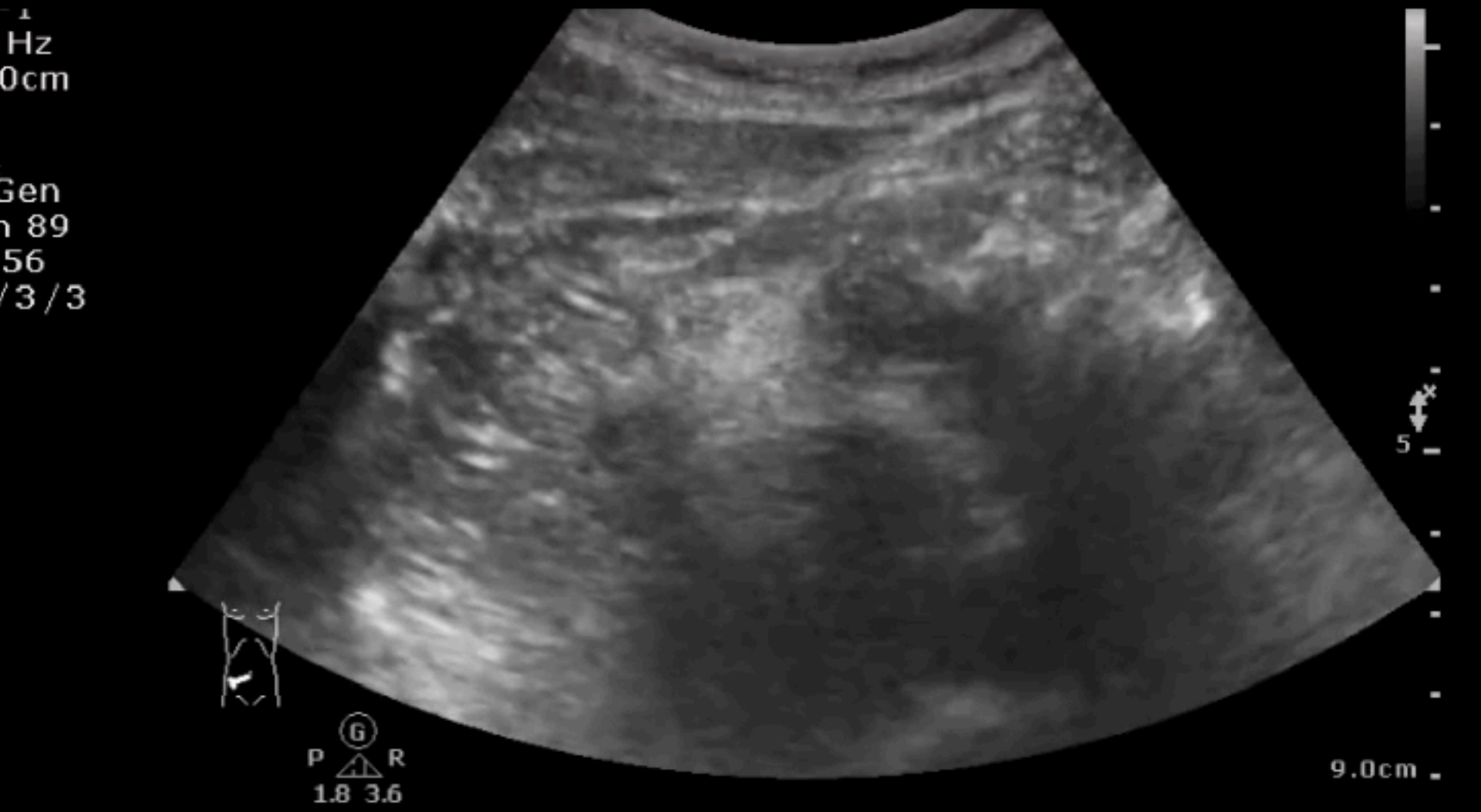




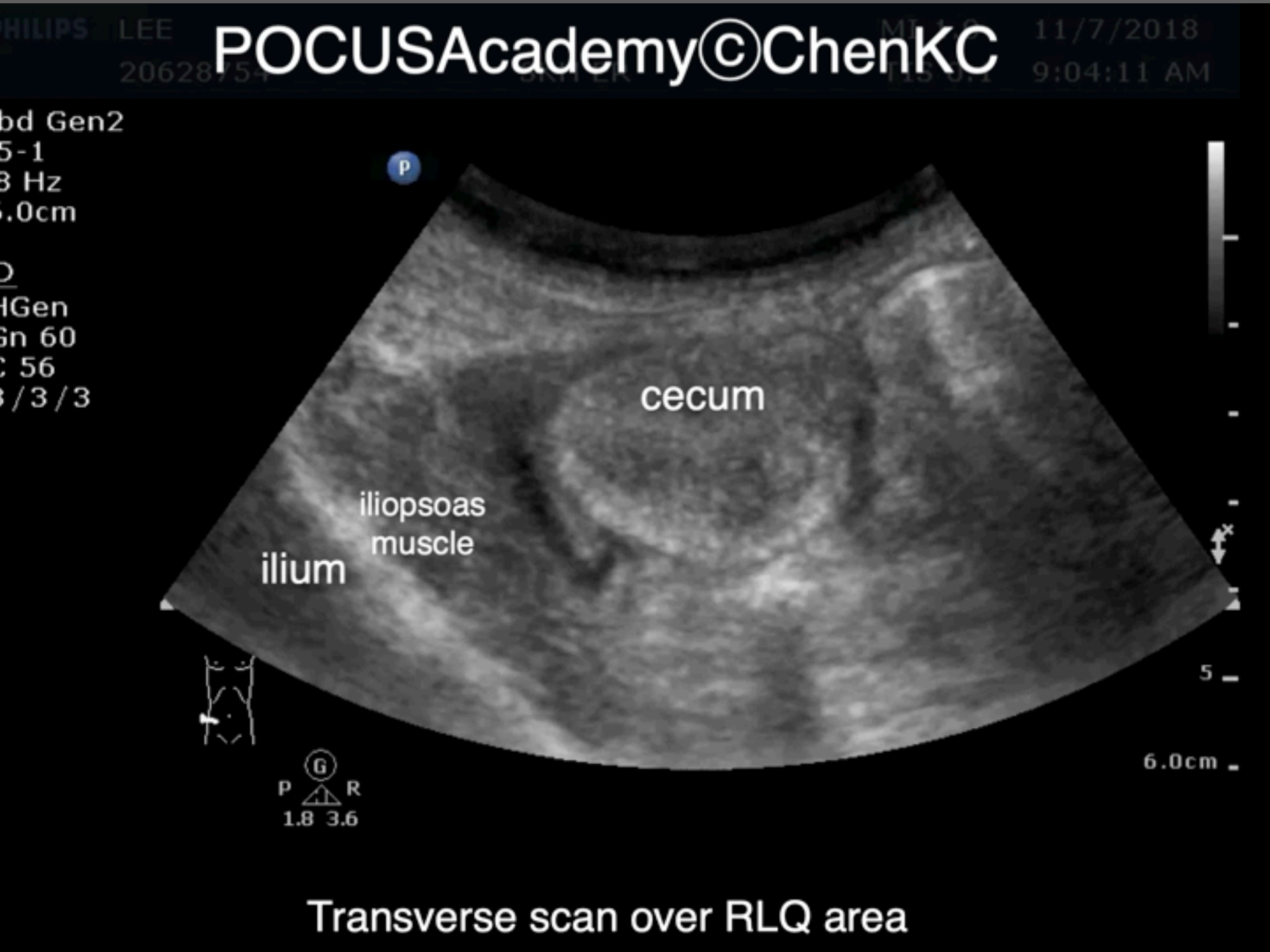
有看到Appendicitis請舉手

Right upper abdominal pain
w/ localized guarding

Chen KC M.D.
POCUS Academy

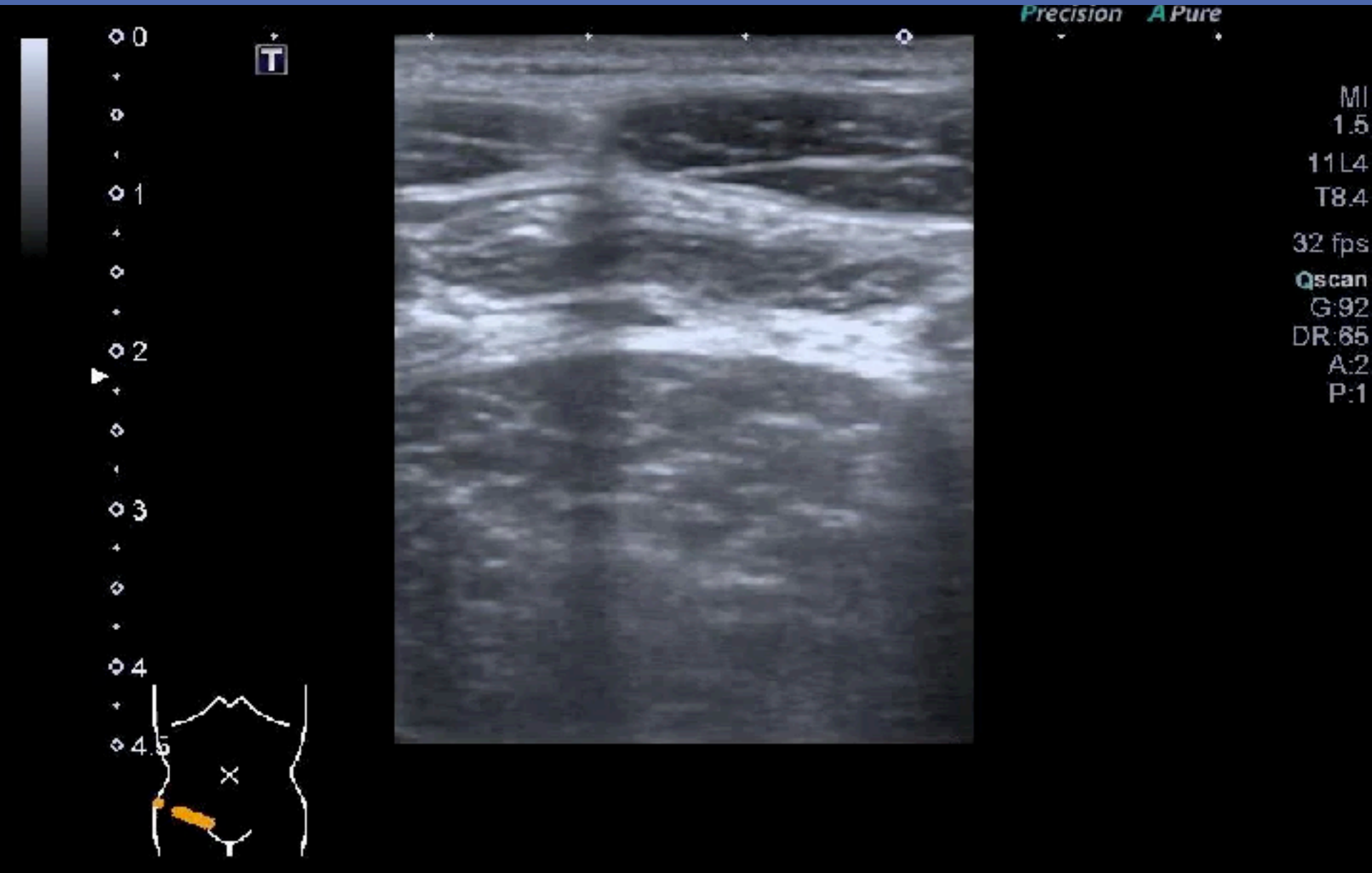


transverse scan
scanning from RLQ to RUQ

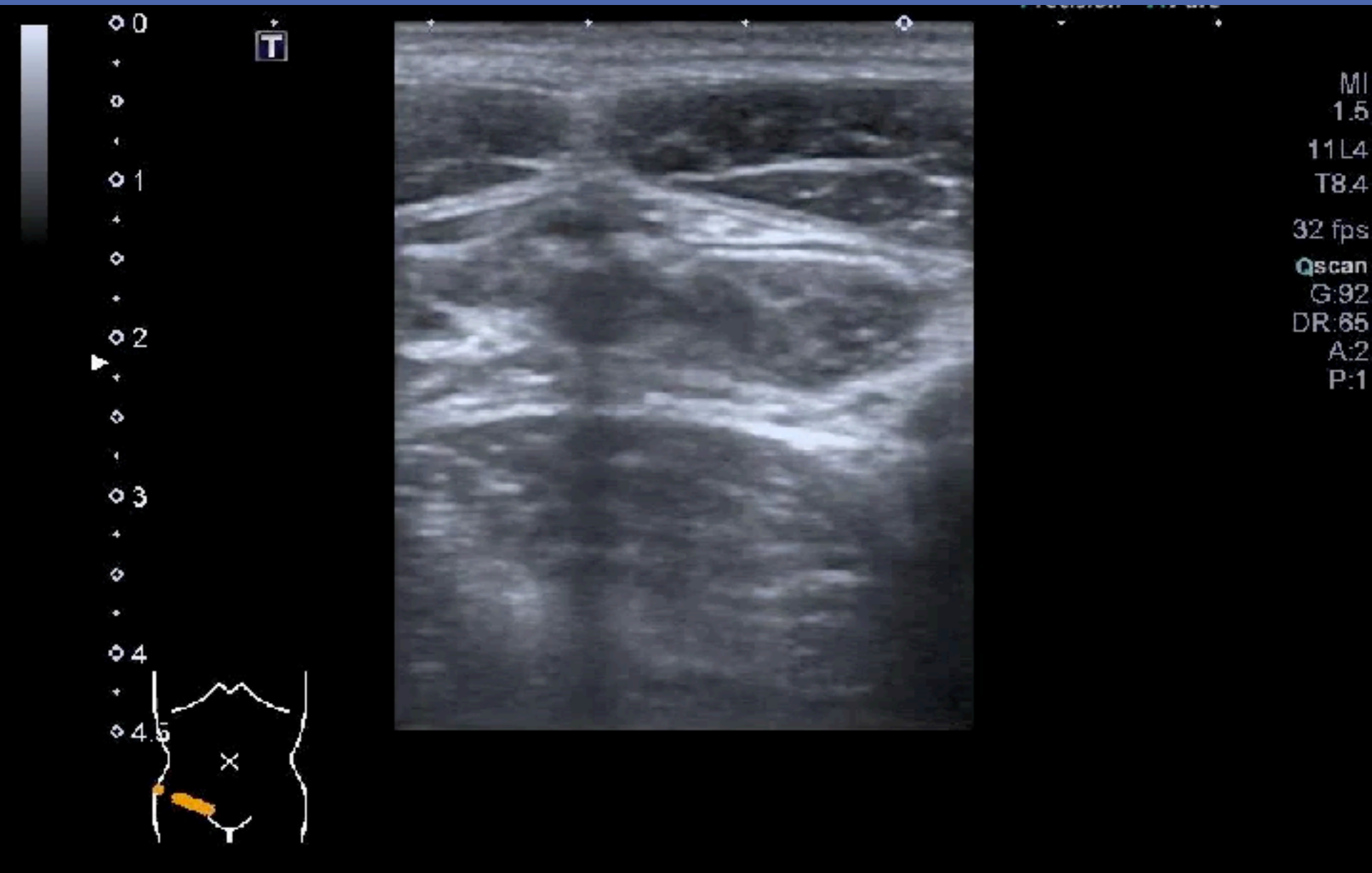


Transverse scan over RLQ area

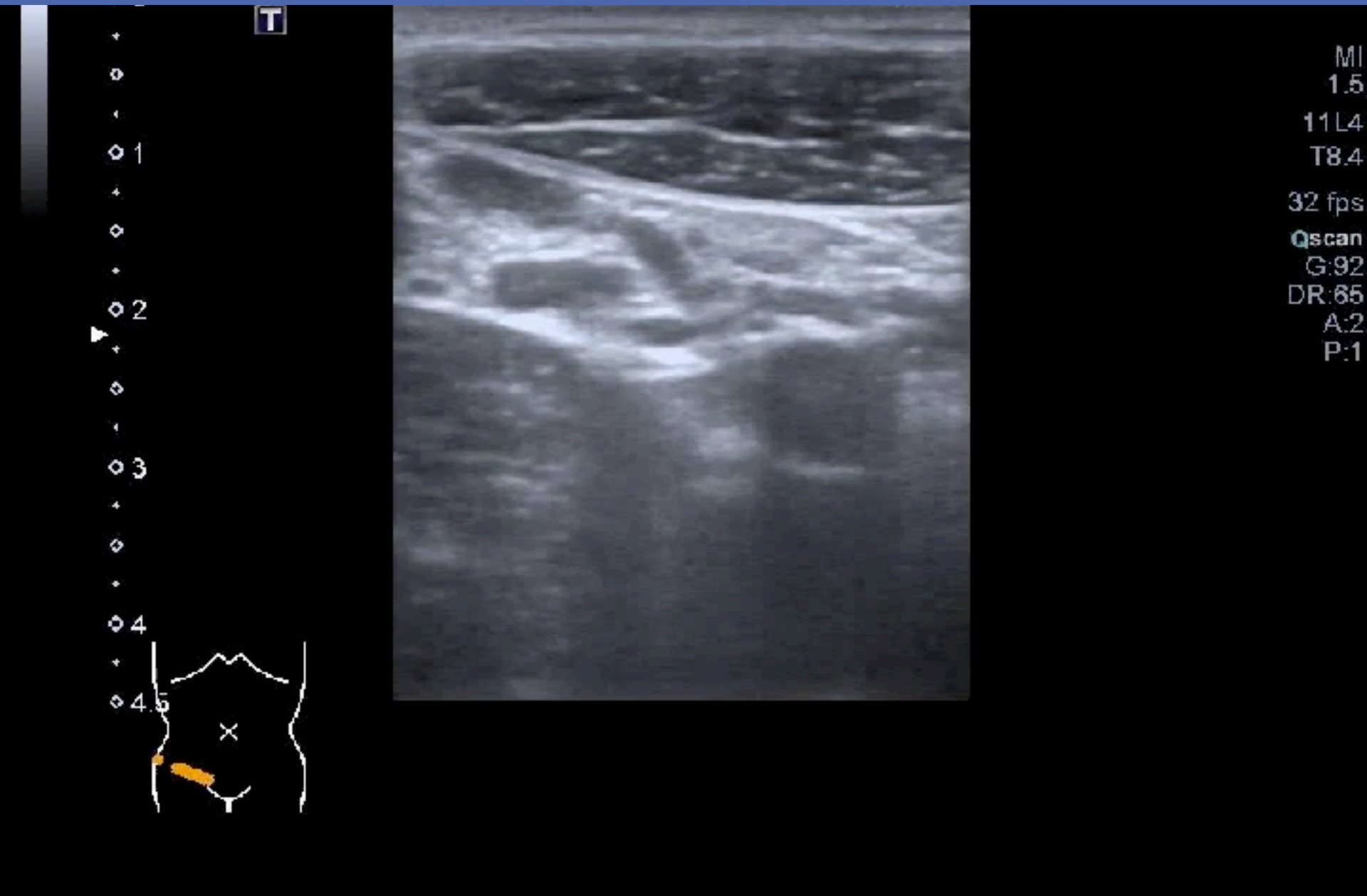
15M，RLQ tenderness



看到正常Appendix的請舉手



Mesenteric adenitis



Thieme

EFSUMB Position Paper: Recommendations for Gastrointestinal Ultrasound (GIUS) in Acute Appendicitis and Diverticulitis

EFSUMB-Positionspapier: Empfehlungen für den gastrointestinalen Ultraschall (GIUS) bei akuter Appendizitis und Divertikulitis

Graded compression at the point of maximum tenderness pointed out by the patient

3 diagnostic criteria of acute diverticulitis

1. Short segmental colonic wall thickening (>5mm)
2. Demostration of the inflamed diverticulum in the wall-thickened area (Dome sign)
3. Pericolic tissue changes (non-compressible, hyperechoic)

▶ **Table 2** Classification of Diverticular Disease (CDD) 2014.

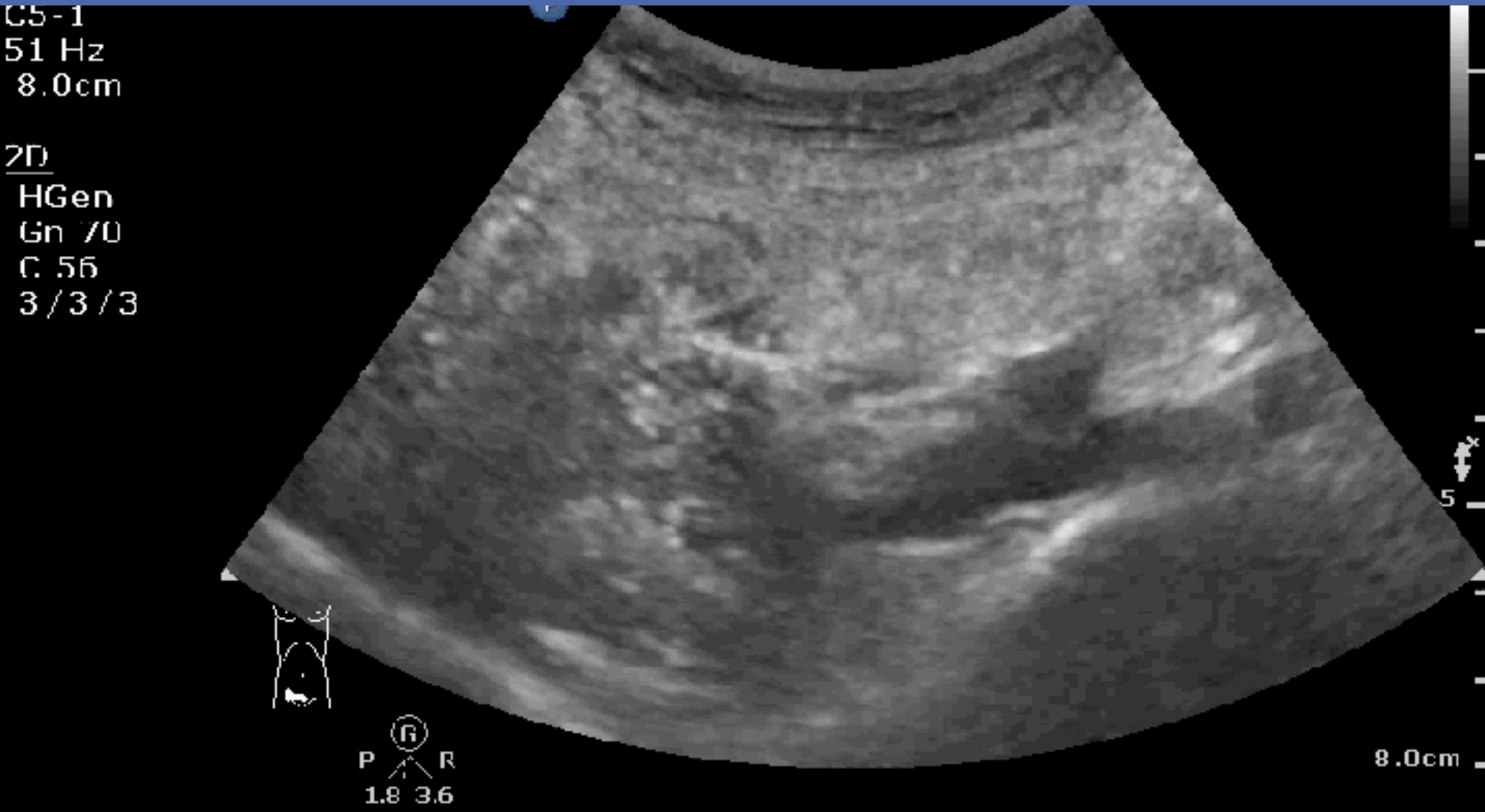
type 0	asymptomatic diverticulosis
type 1	acute uncomplicated diverticulitis ▪ 1a: without phlegmonous reaction ▪ 1b: phlegmonous reaction (colon/surroundings)
type 2	acute complicated diverticulitis ▪ 2a Microabscess (< 1 cm) ▪ 2b Macroabscess ▪ 2c Free perforation
type 3	chronic diverticular disease
type 4	diverticular bleeding

At least 500 GIUS experience

▶ **Table 3** Comparison between GIUS, CT and MRI in two metanalyses [142, 144].

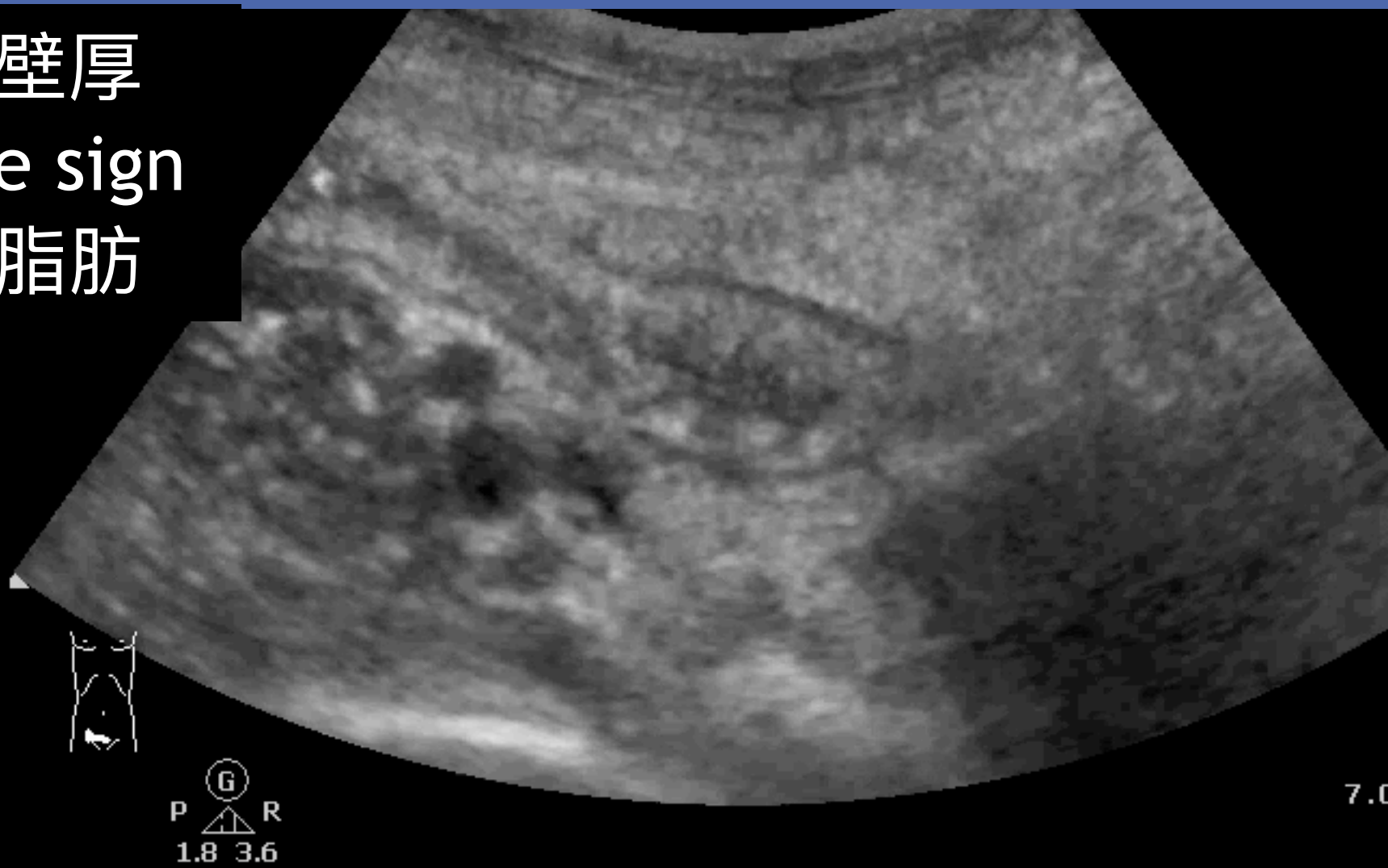
method	summary sensitivity	summary specificity	metanalysis
US	92 %	90 %	Lameris 2008
	90 %	90 %	Andeweg 2014
CT	94 %	99 %	Lameris 2008
	95 %	96 %	Andeweg 2014
MRI	–	–	Lameris 2008
	98 %	70 – 78 %	Andeweg 2014

50F, RLQ pain & guarding

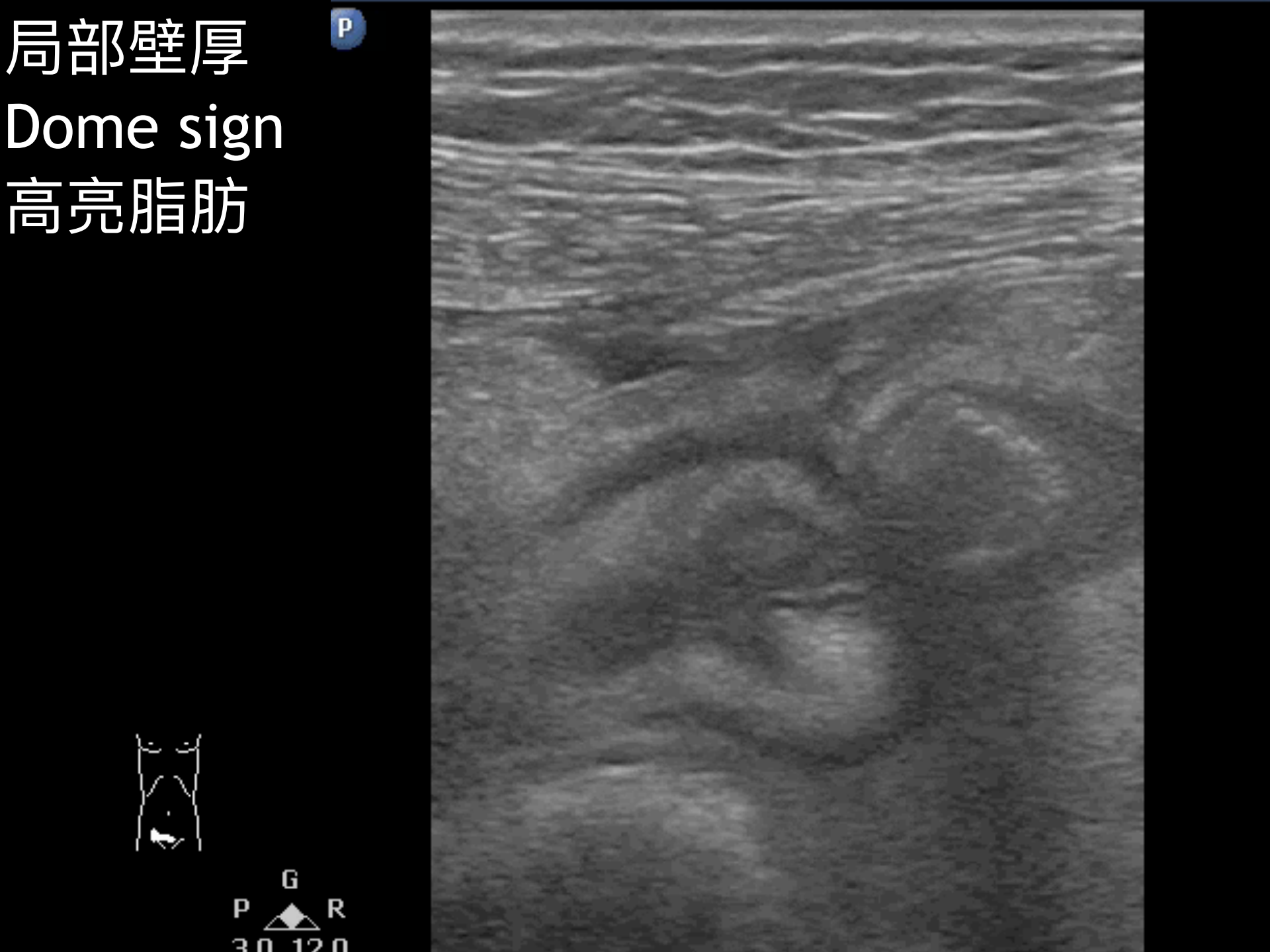


請問是闌尾炎或憩室炎?

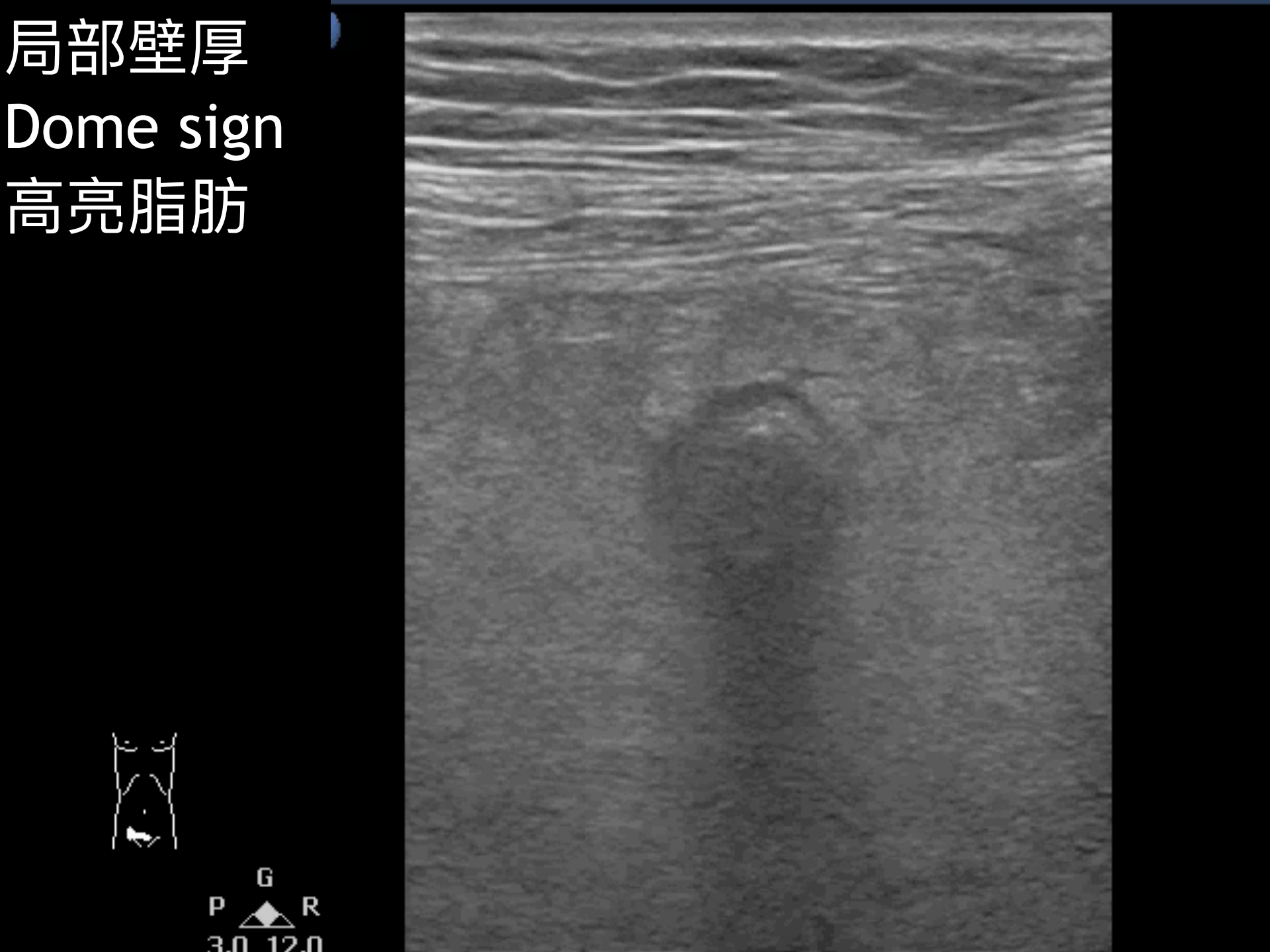
局部壁厚
Dome sign
高亮脂肪

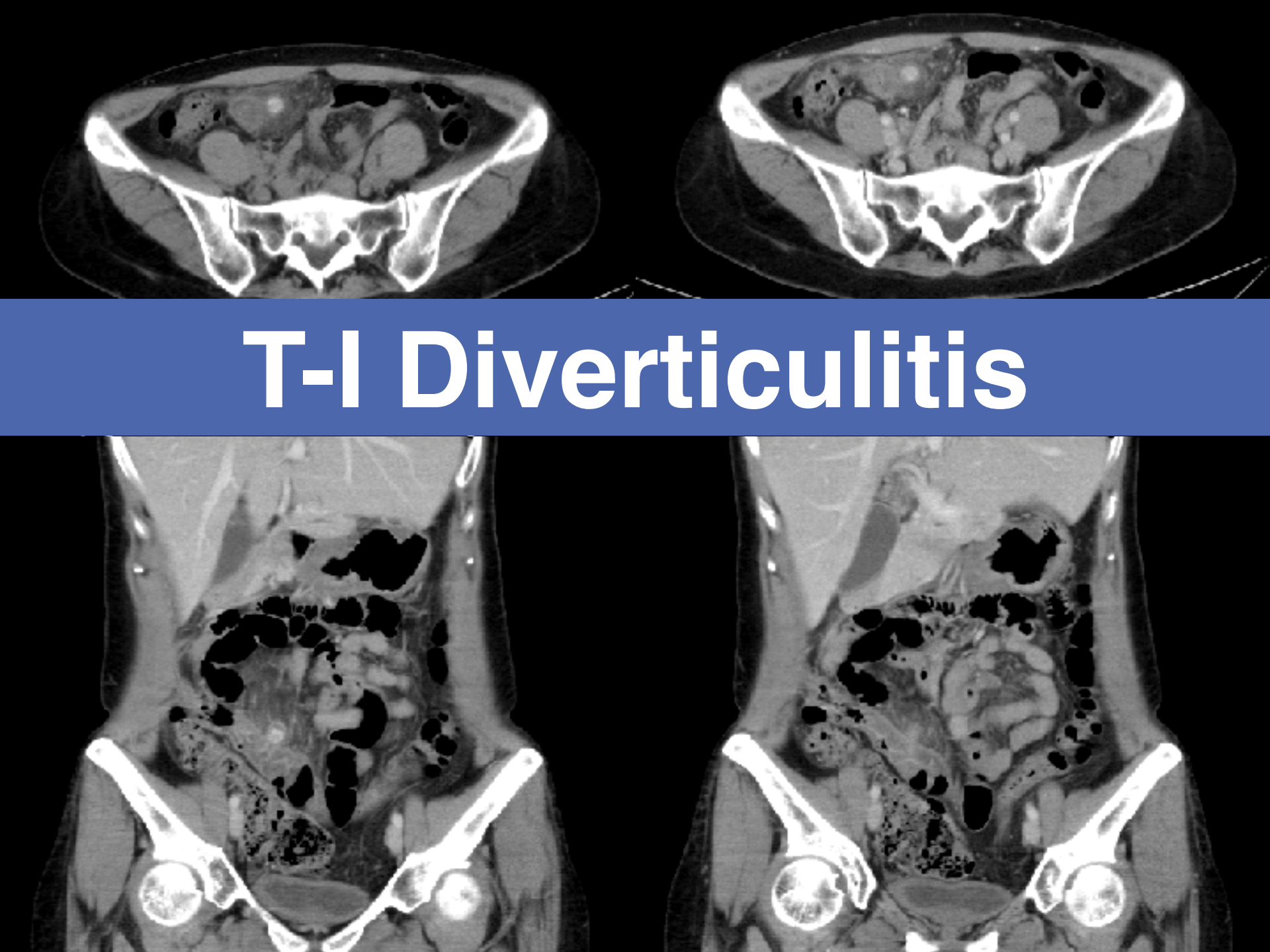


局部壁厚
Dome sign
高亮脂肪

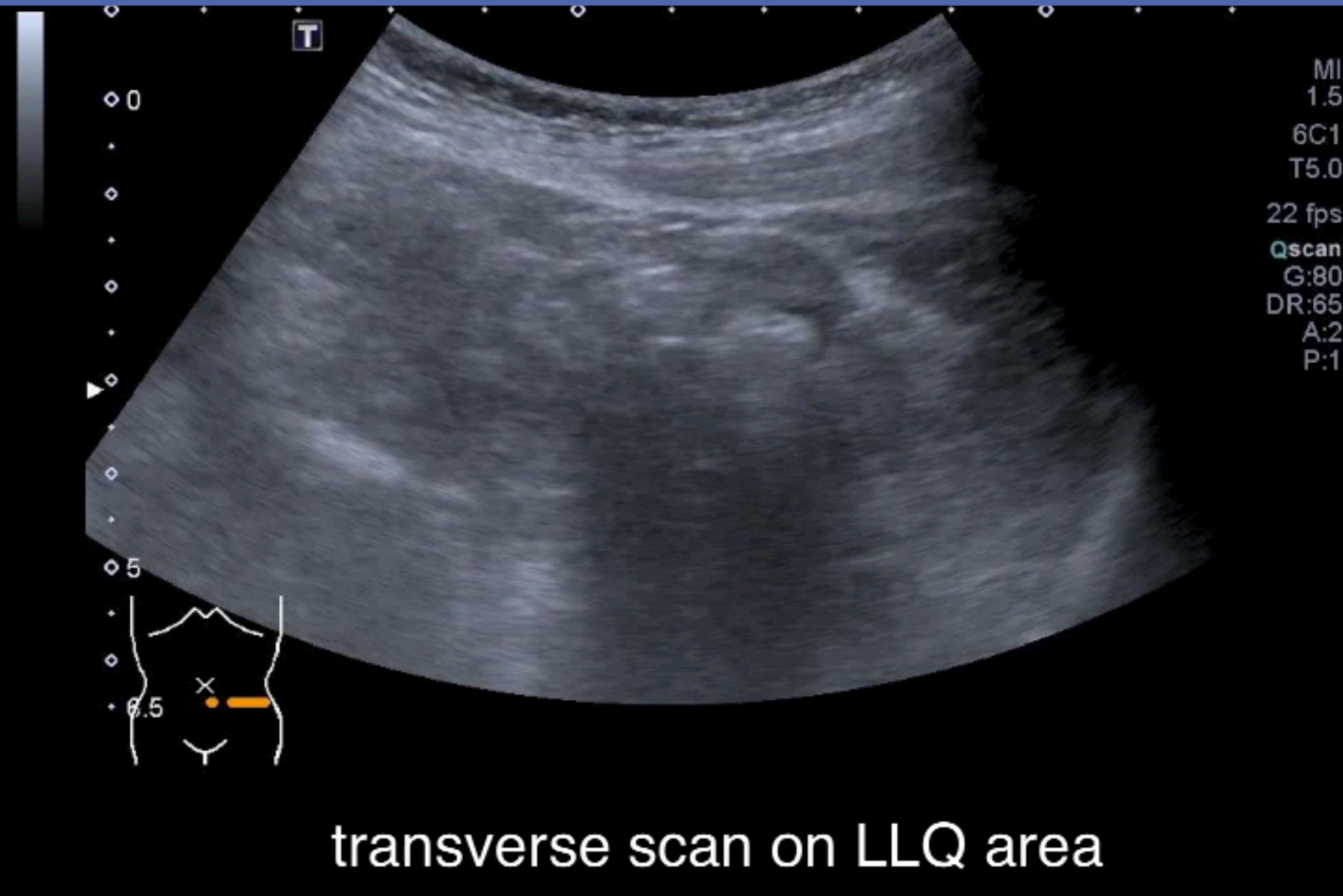


局部壁厚
Dome sign
高亮脂肪




T-I Diverticulitis

左下腹痛，認為是憩室炎請舉手



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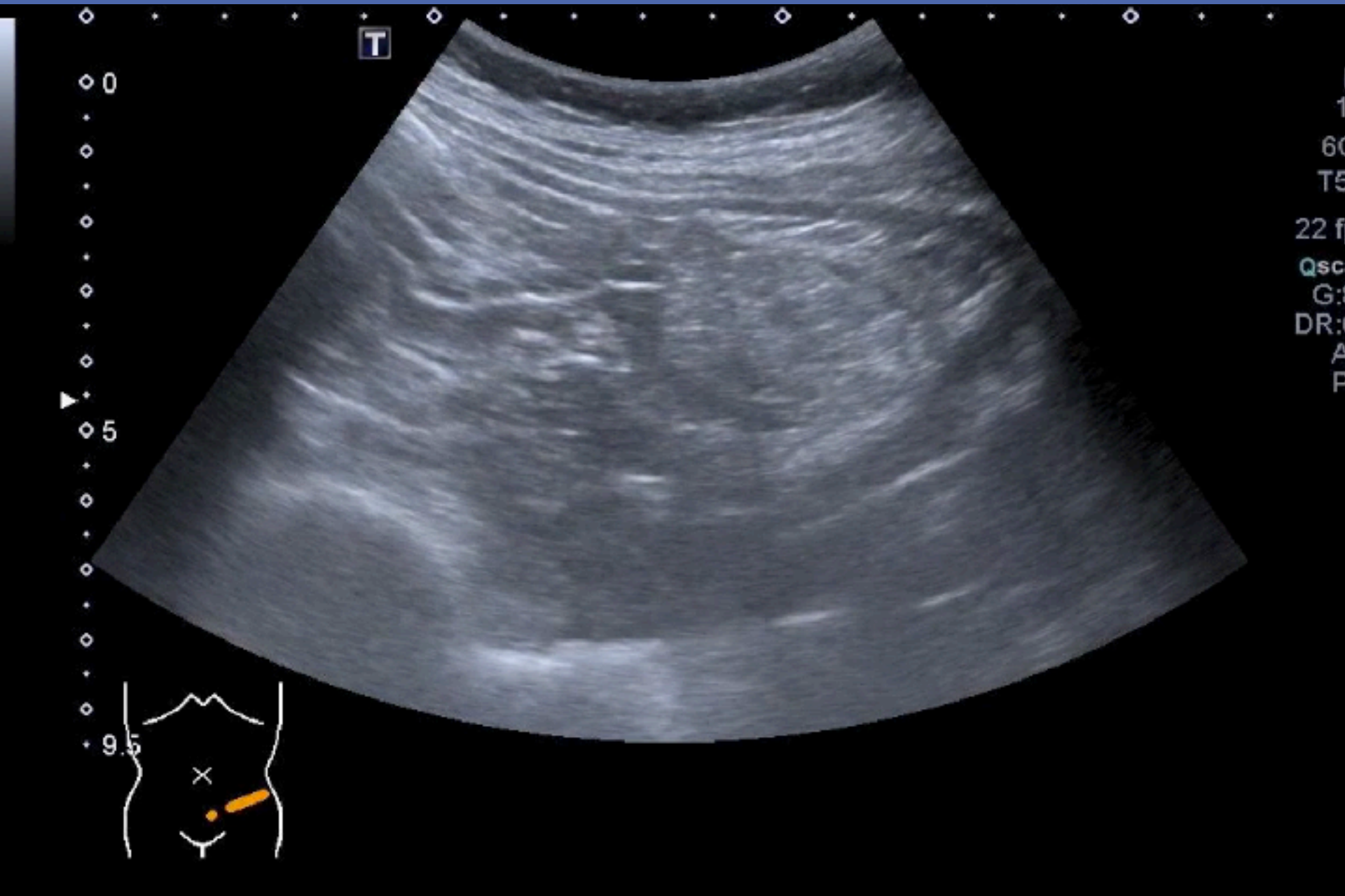
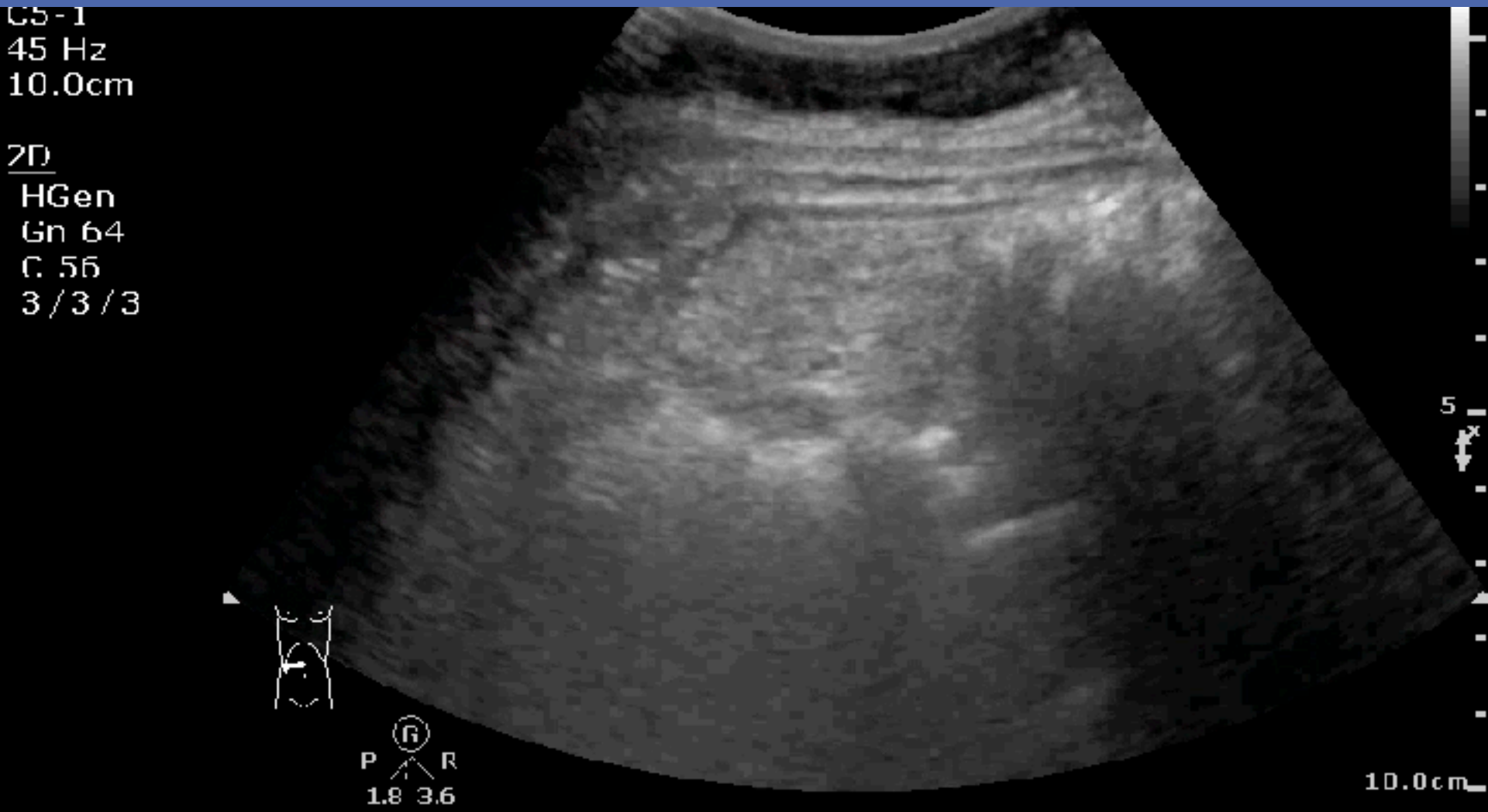
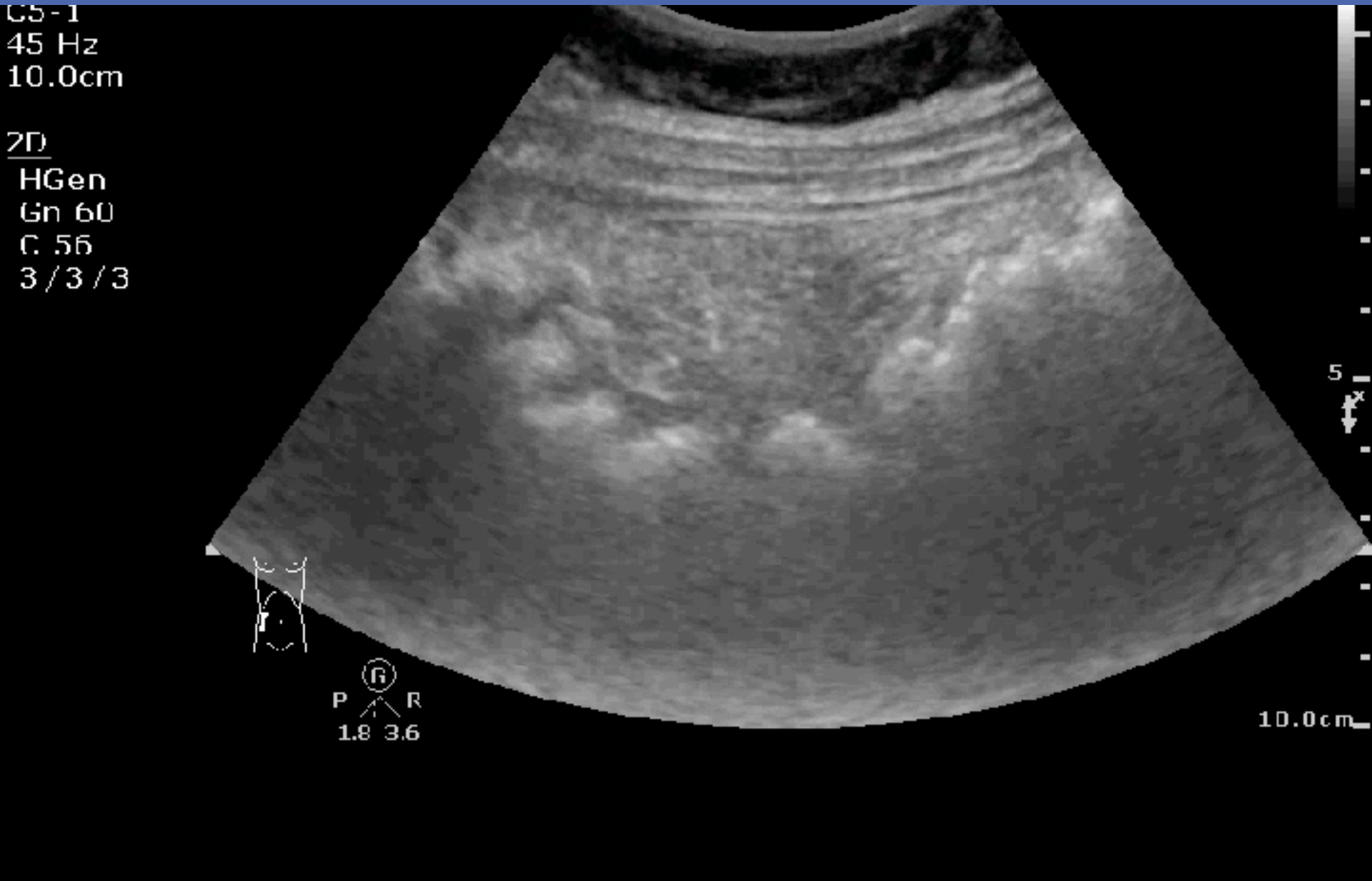


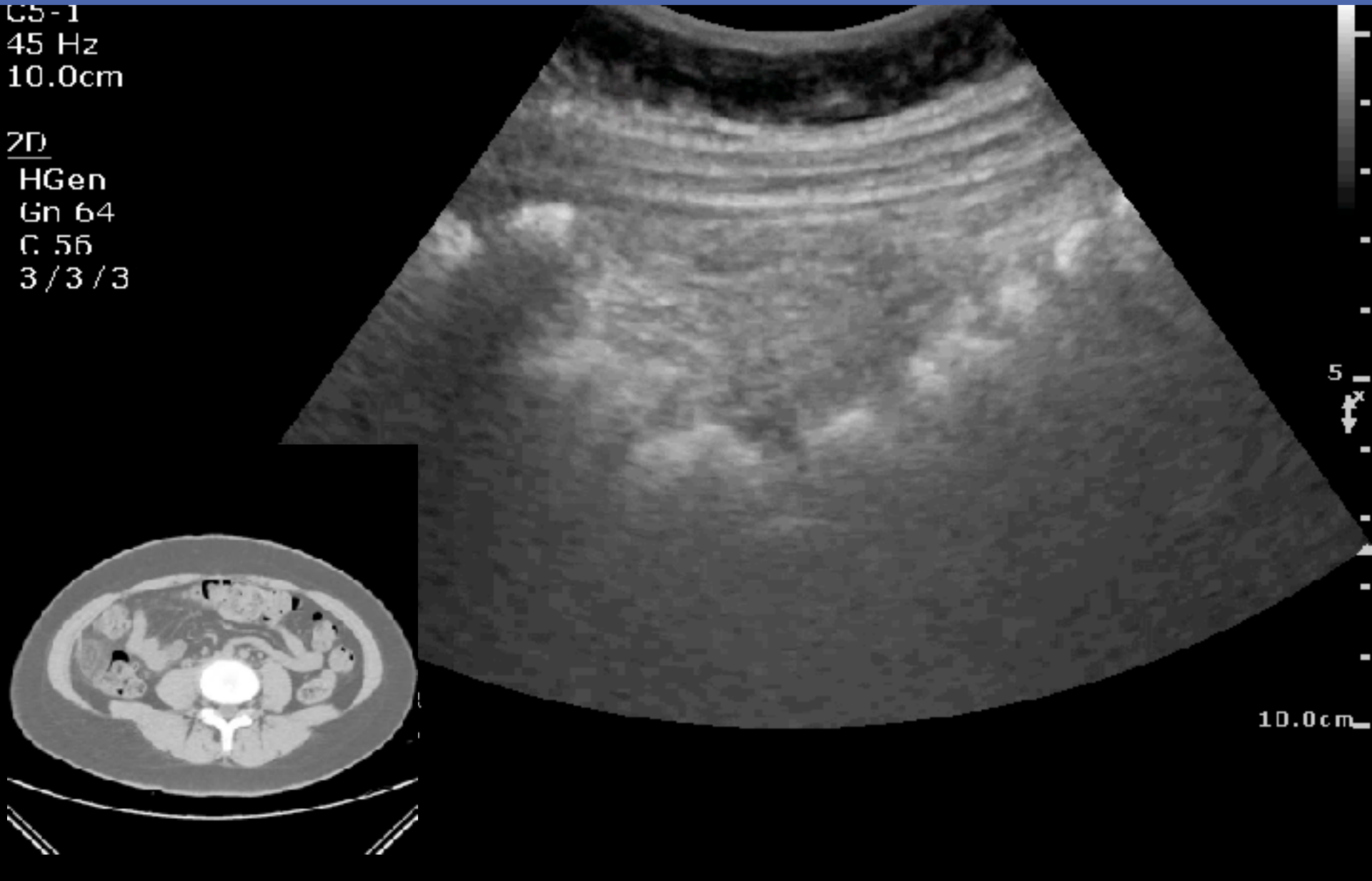
40M, RUQ pain 4 days



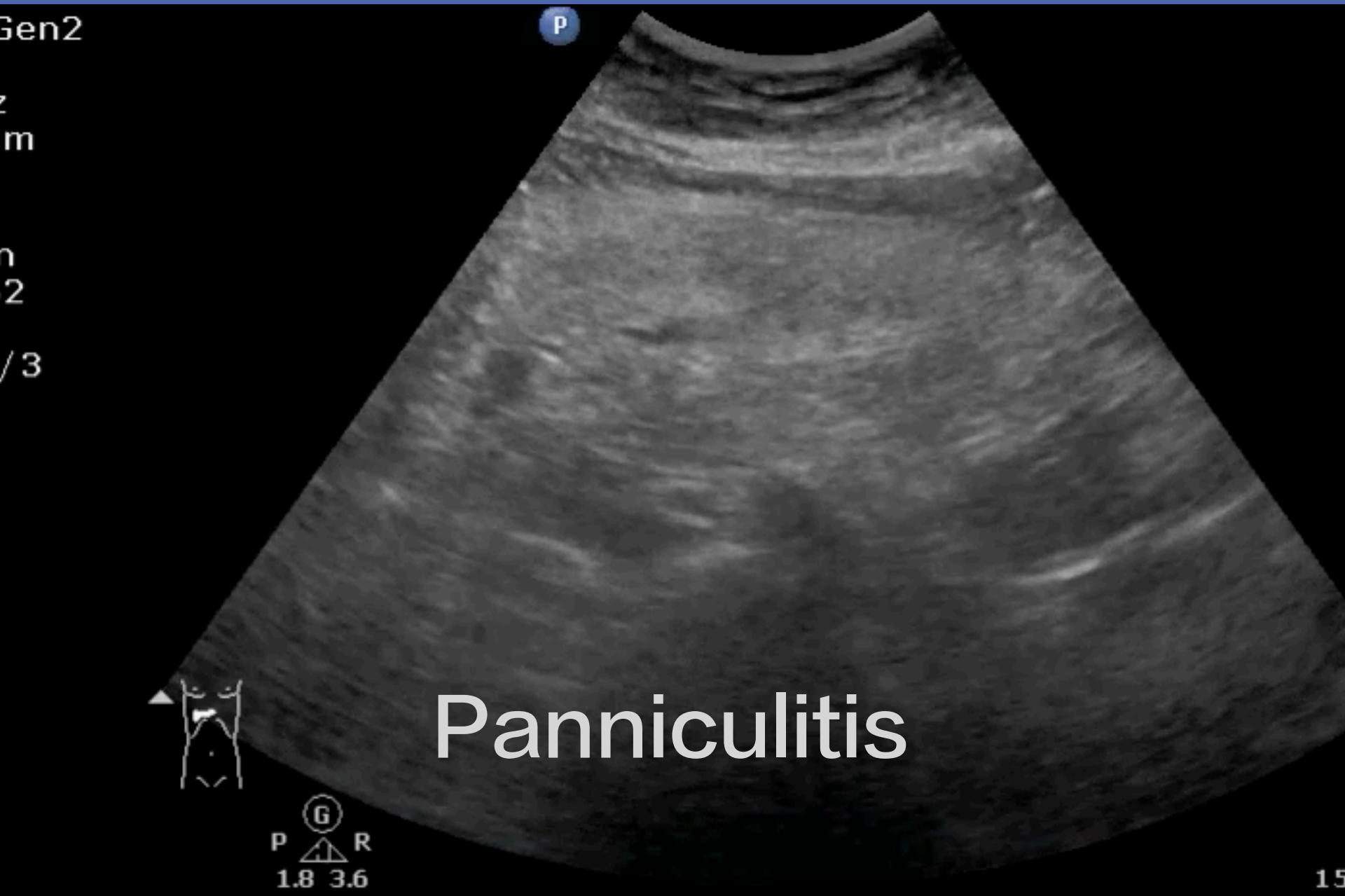
看不懂的請舉手



Epiploic appendagitis



肚臍附近疼痛，看不懂的請舉手



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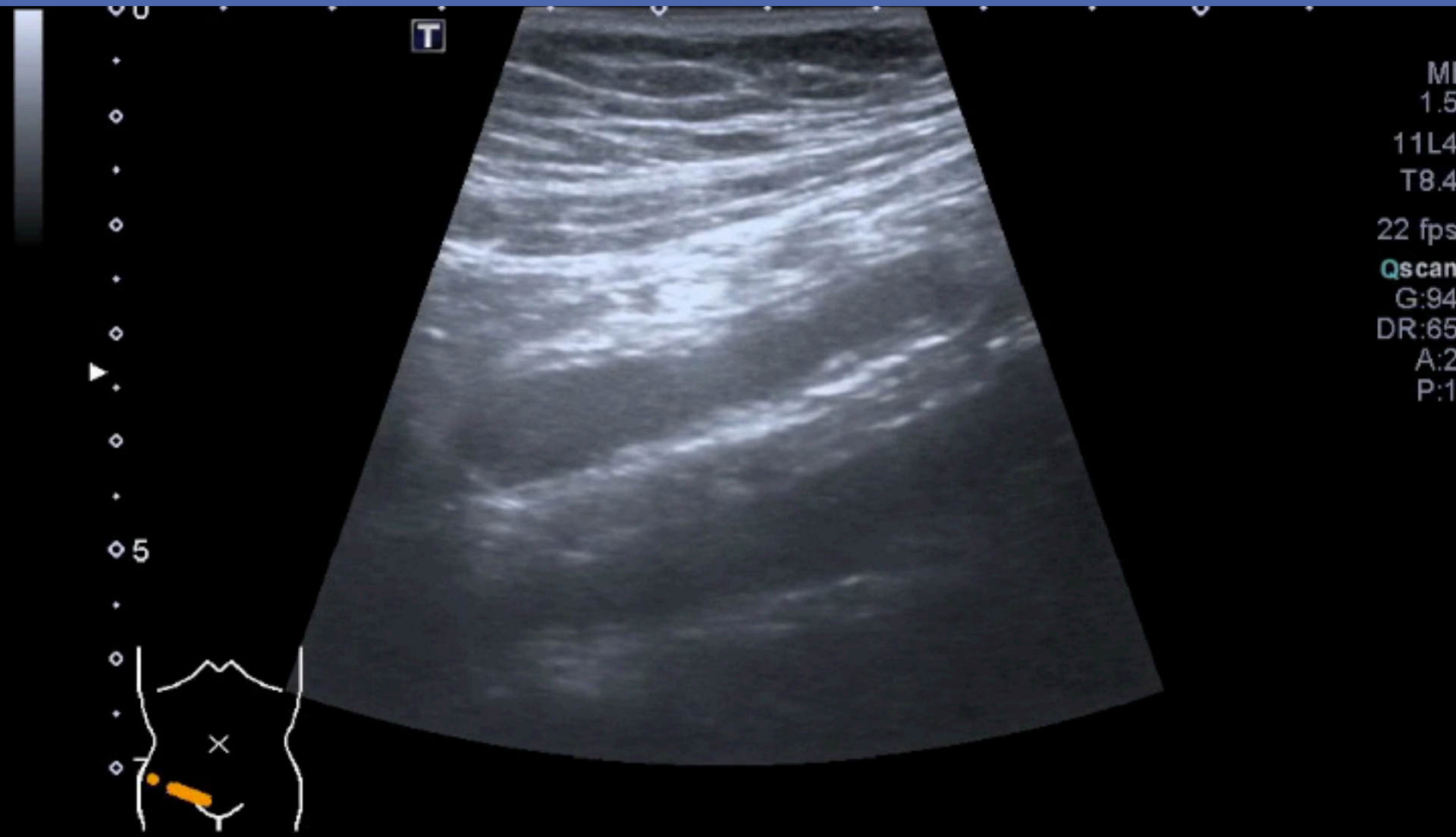
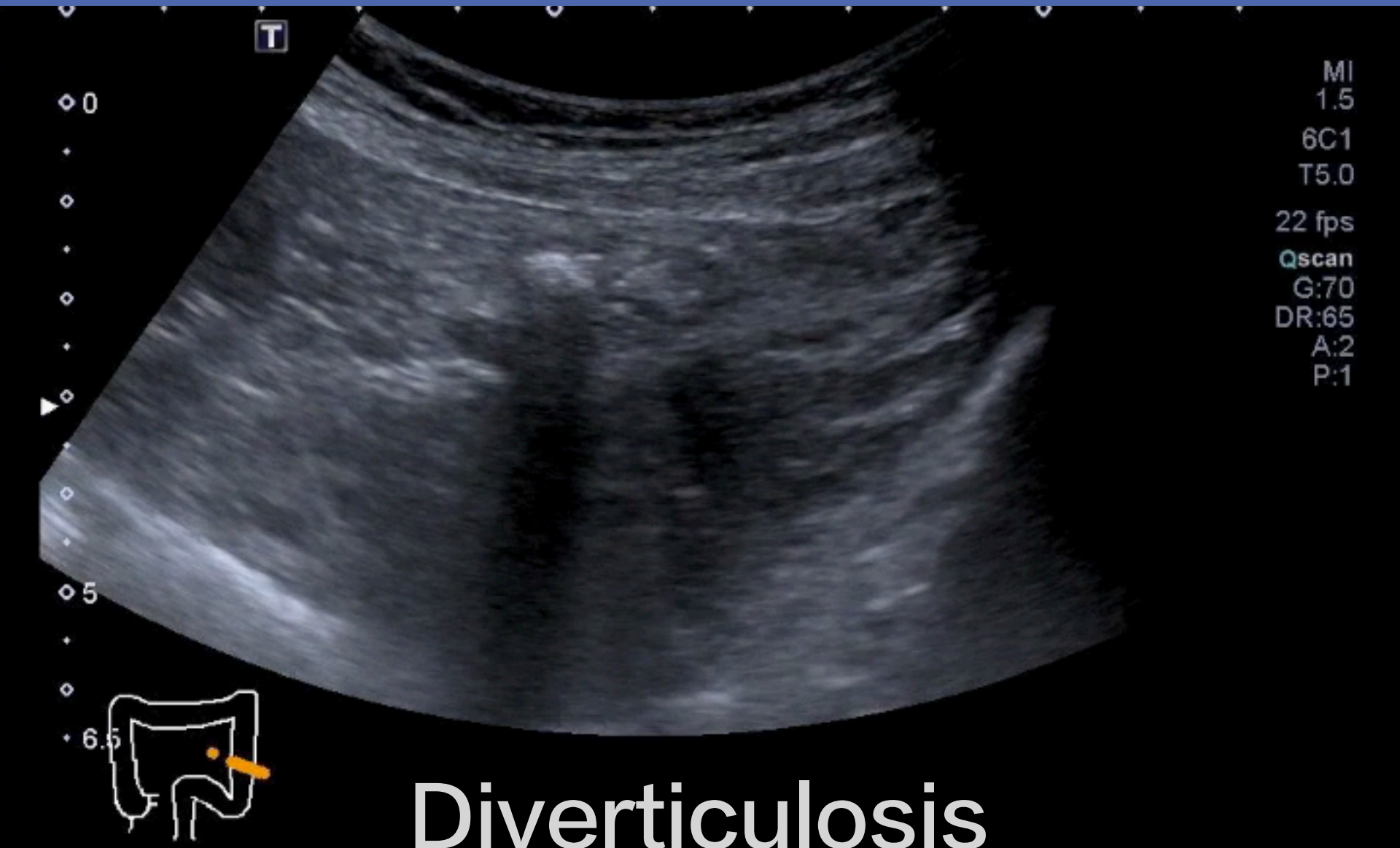


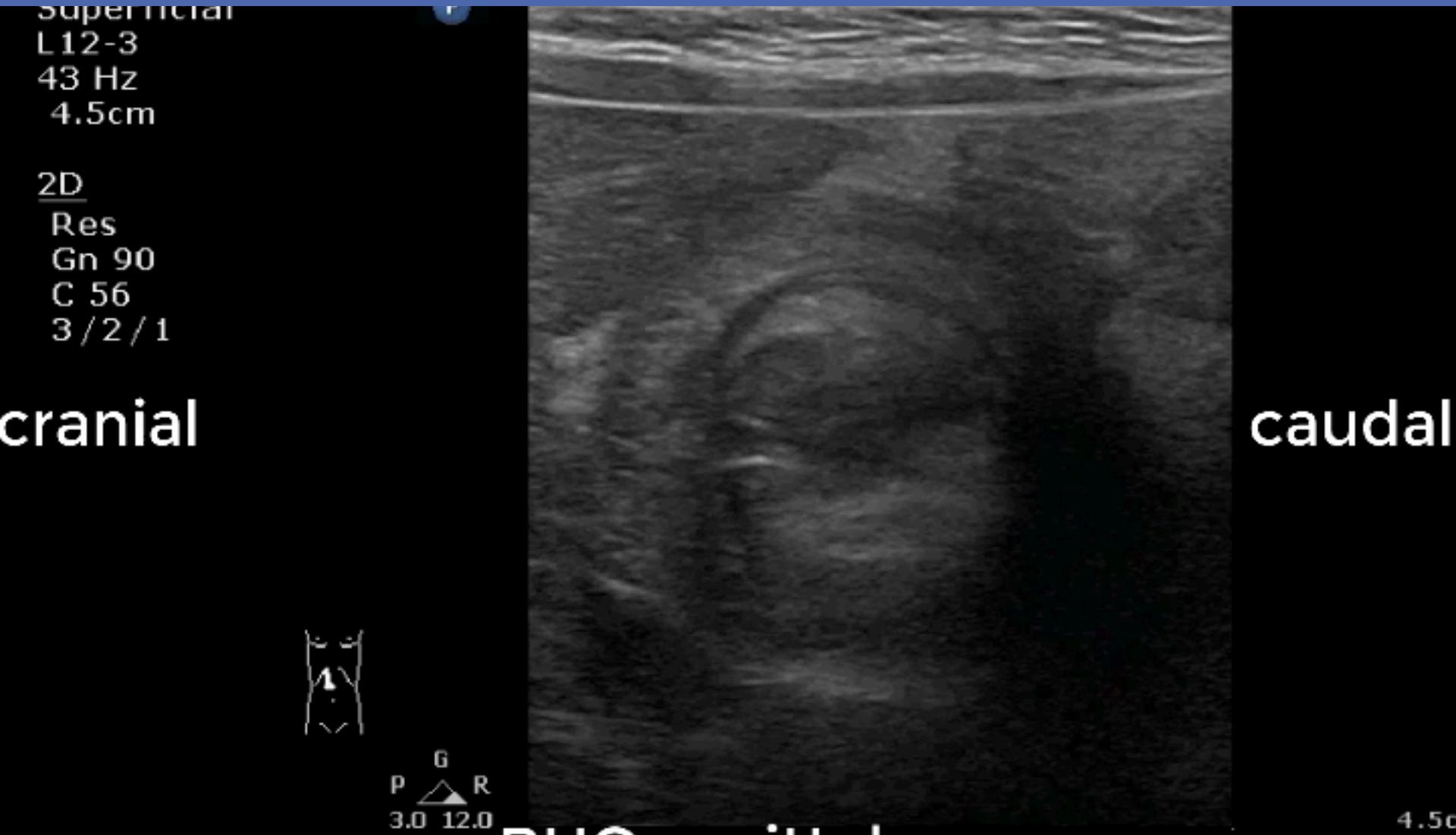
Appendicitis

看不懂的請舉手



Diverticulosis

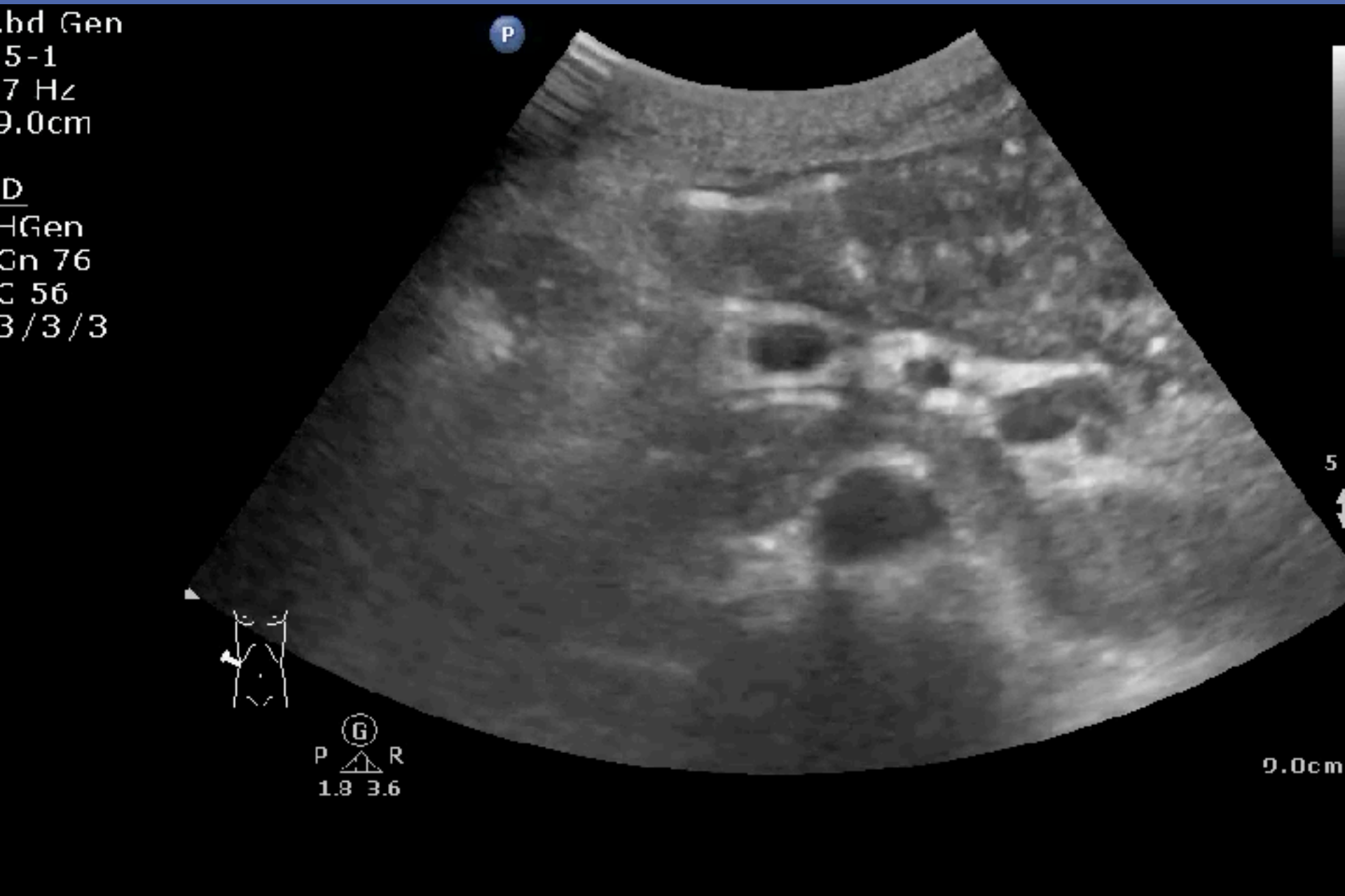
看不懂的請舉手



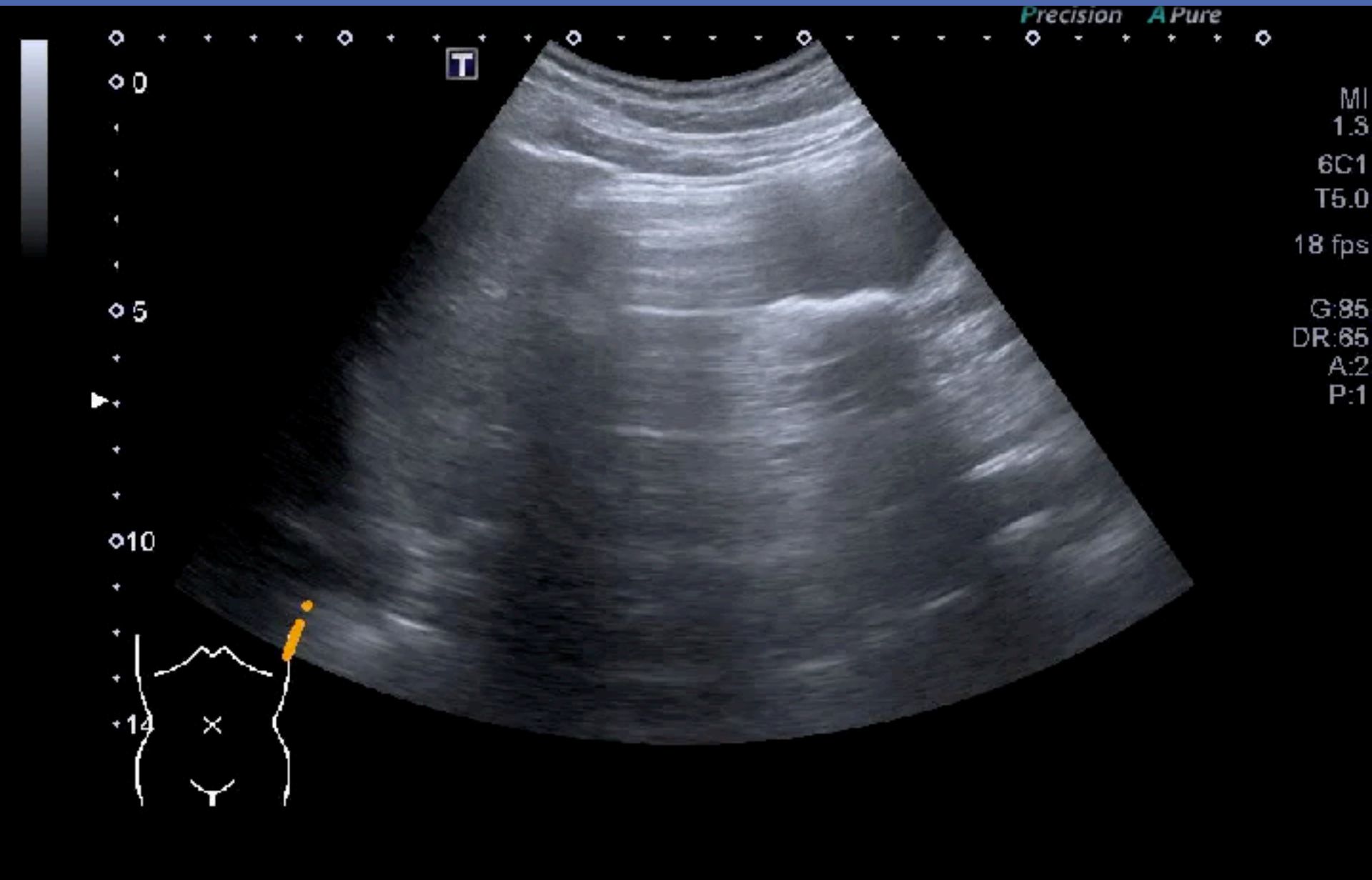
RUQ sagittal scan

Intussusception & LN

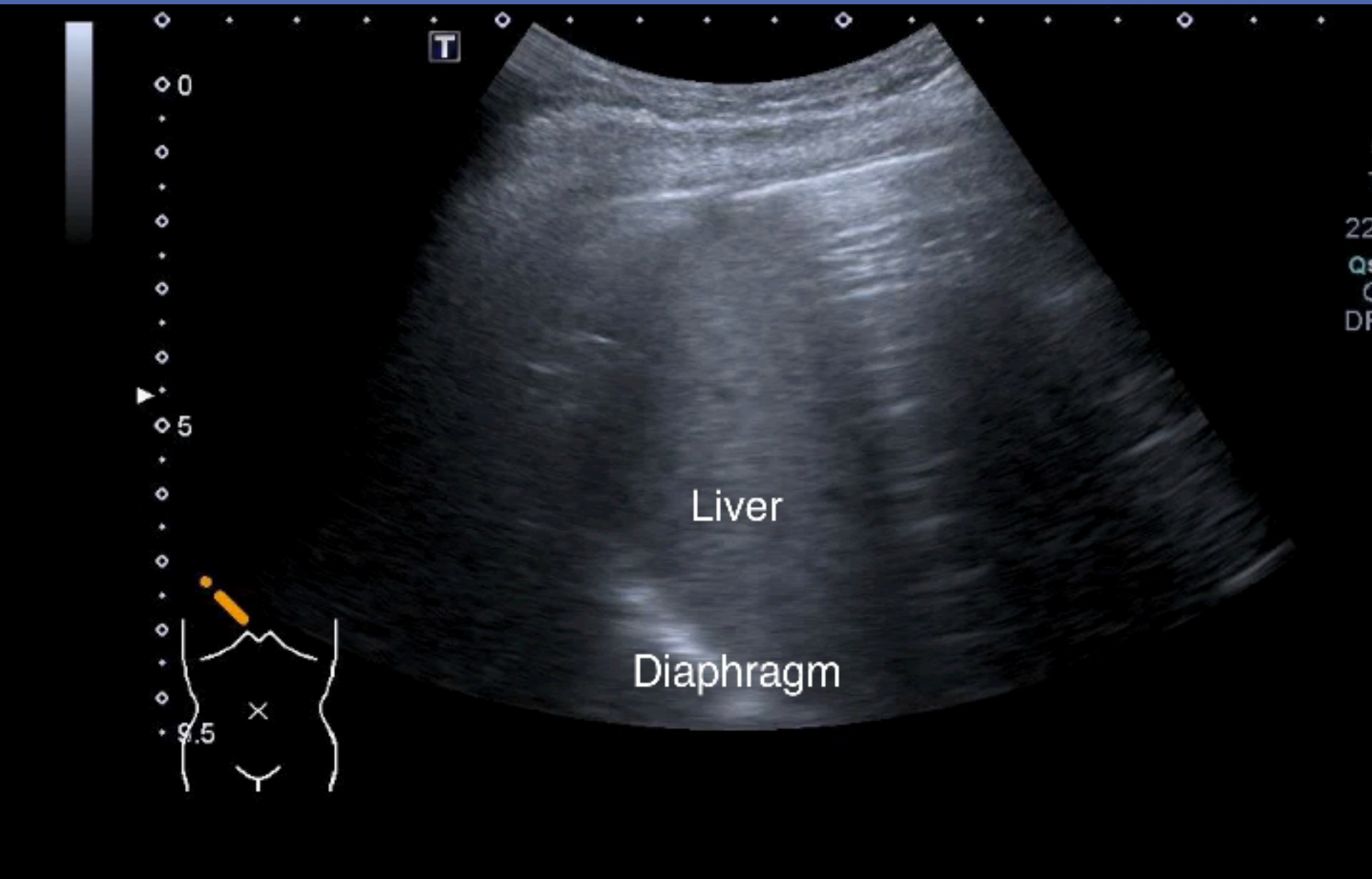
請描述這段影片的腸道結構！



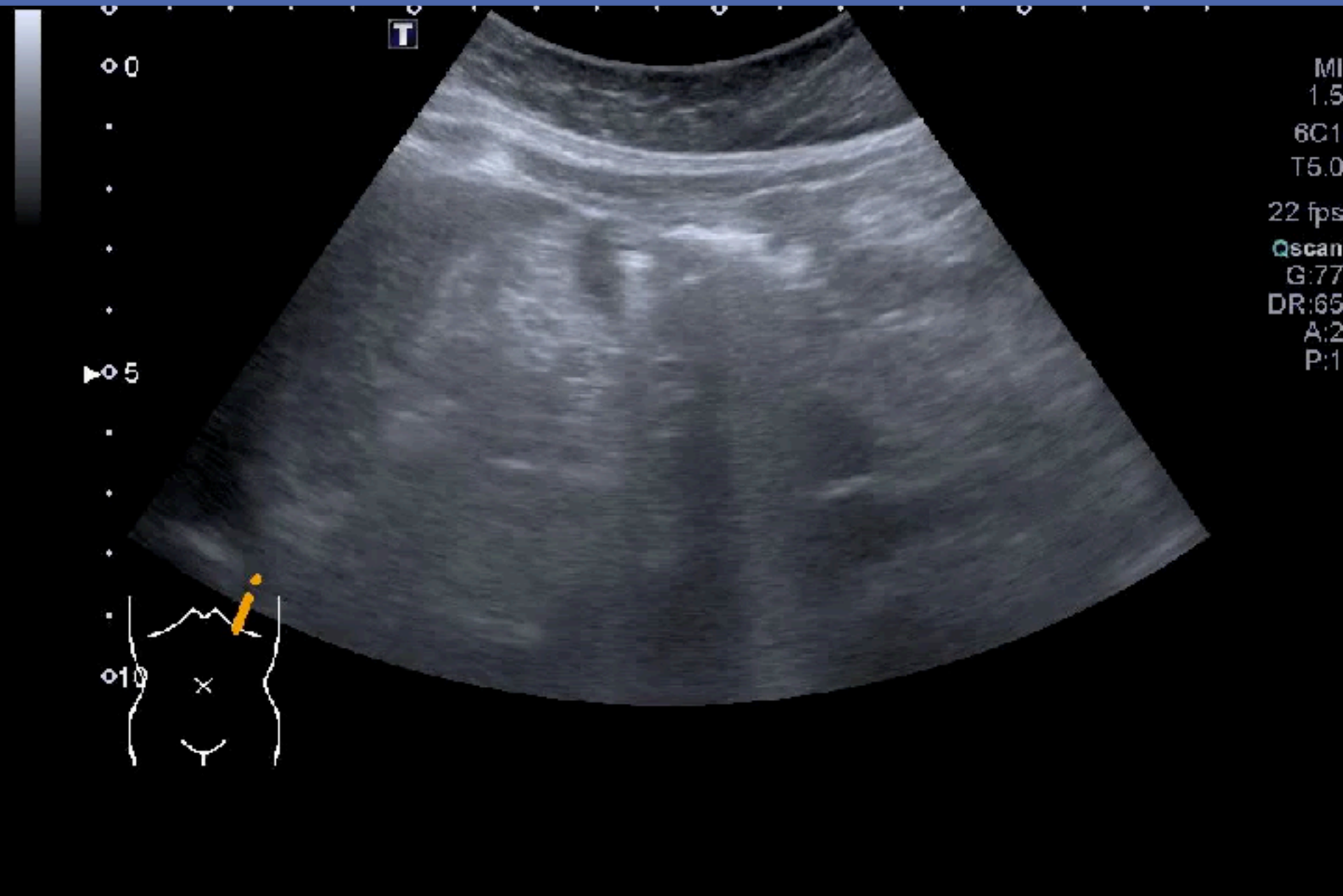
認為有游離空氣的請舉手



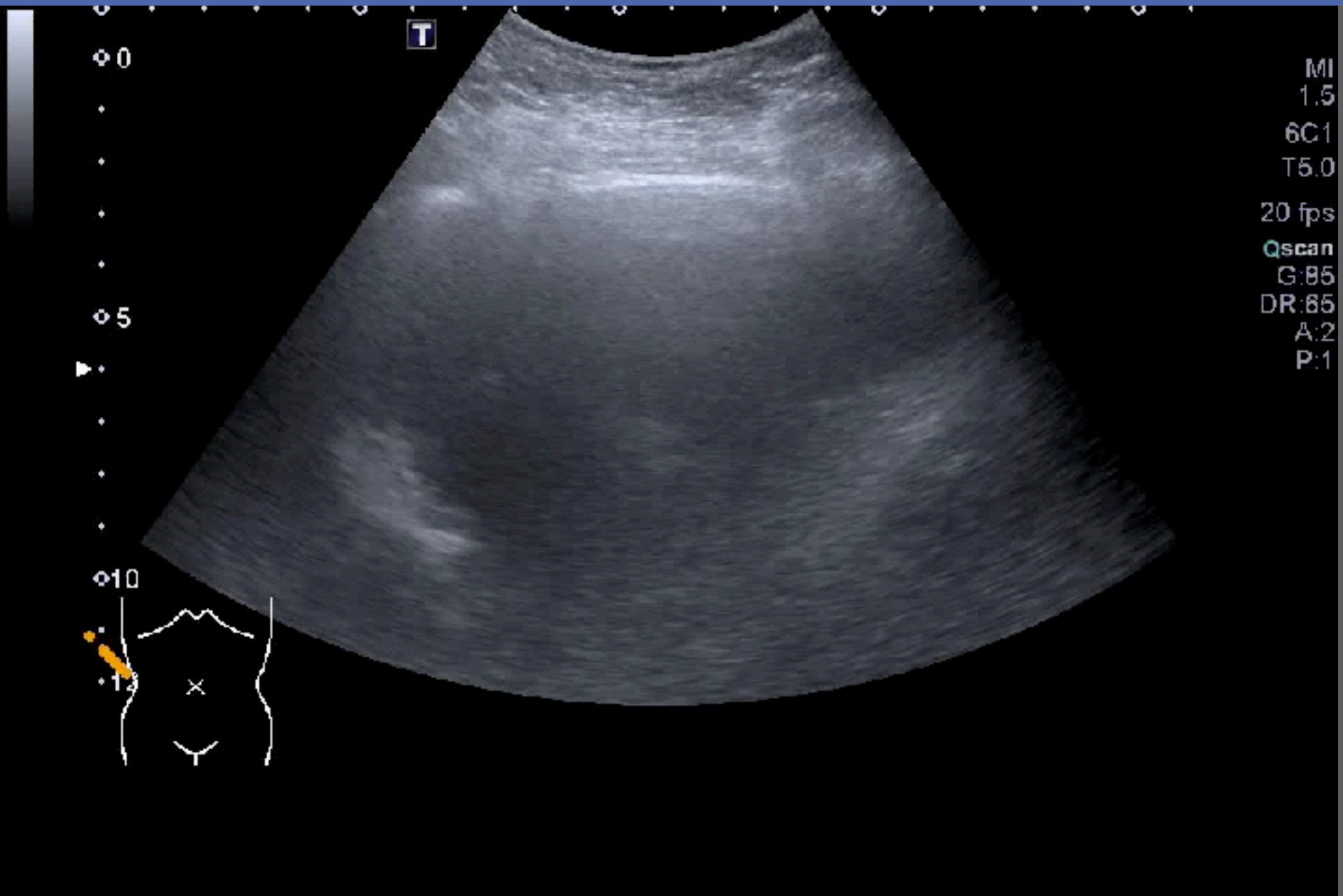
認為有游離空氣的請舉手



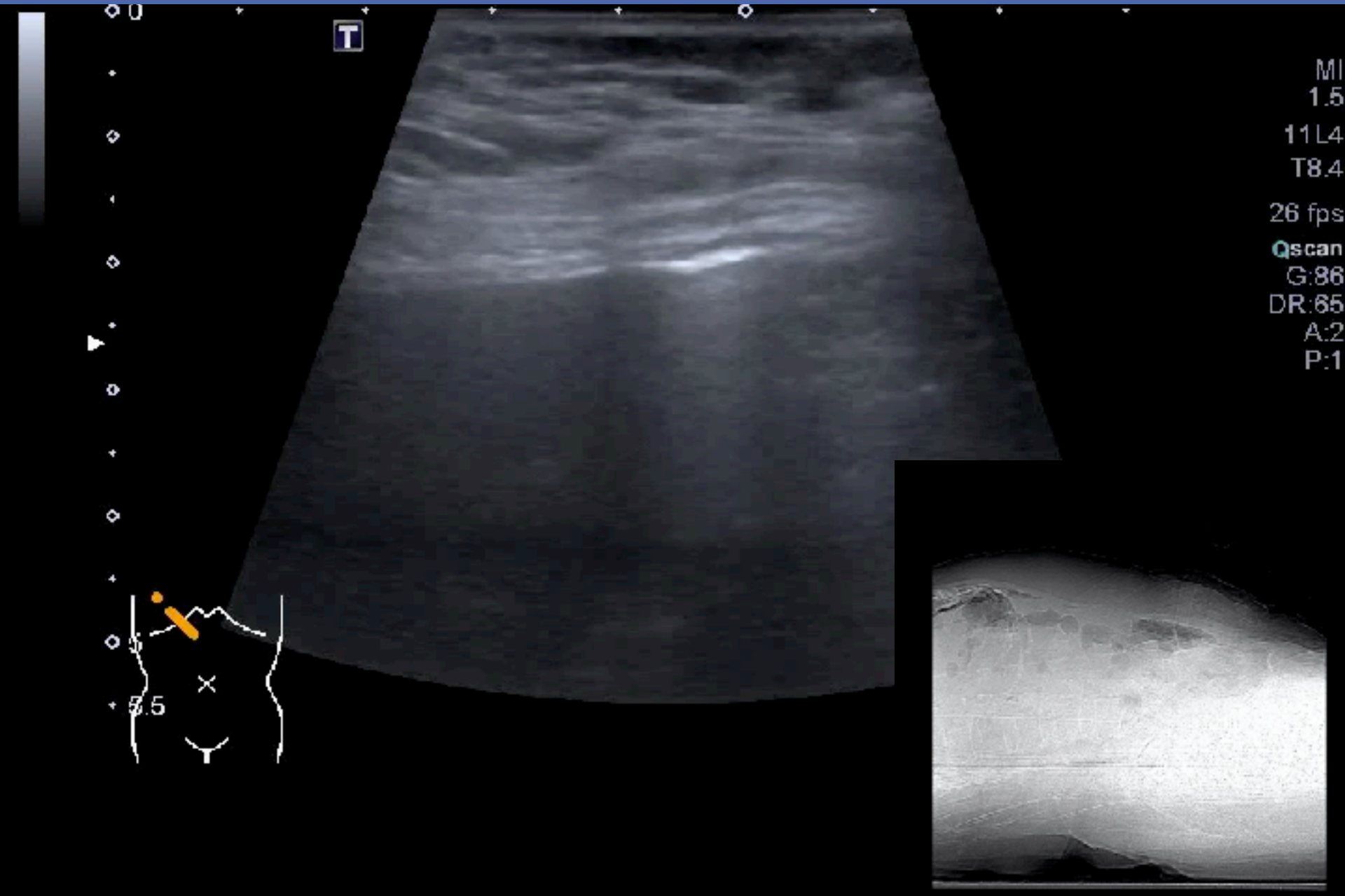
有看到游離空氣請舉手



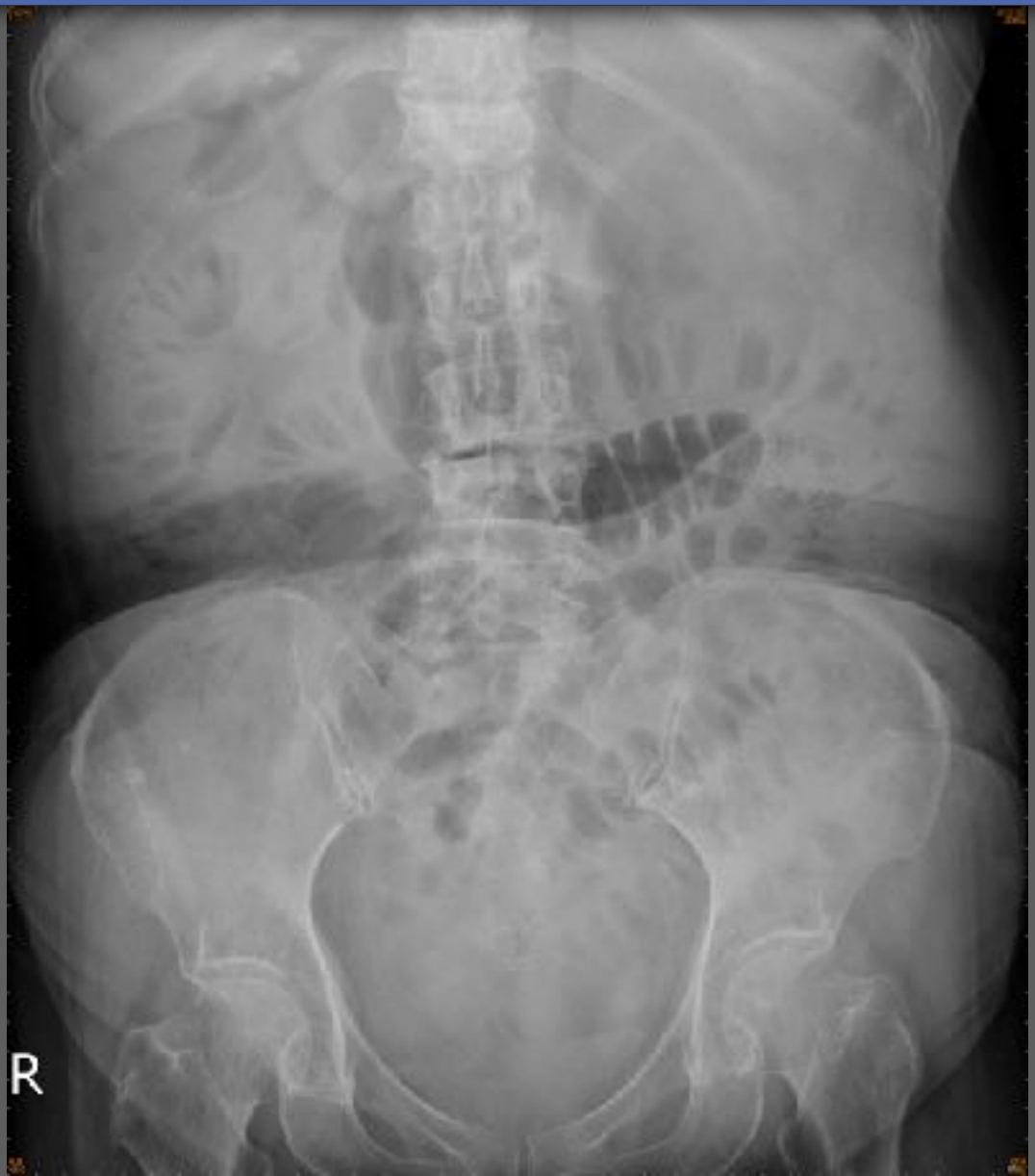
有看到游離空氣請舉手



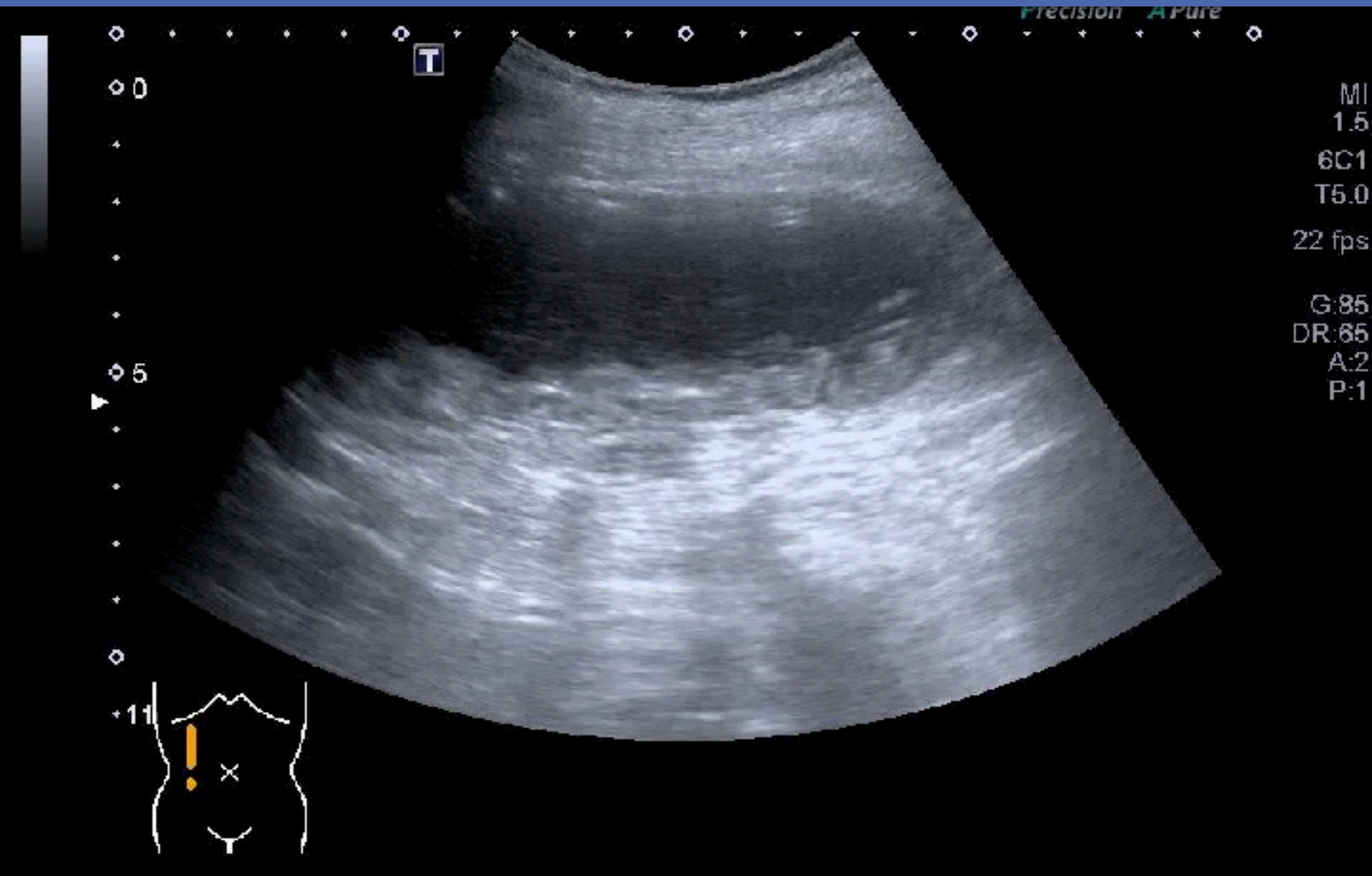
有看到游離空氣請舉手



73F, ABD pain



What do you see ?



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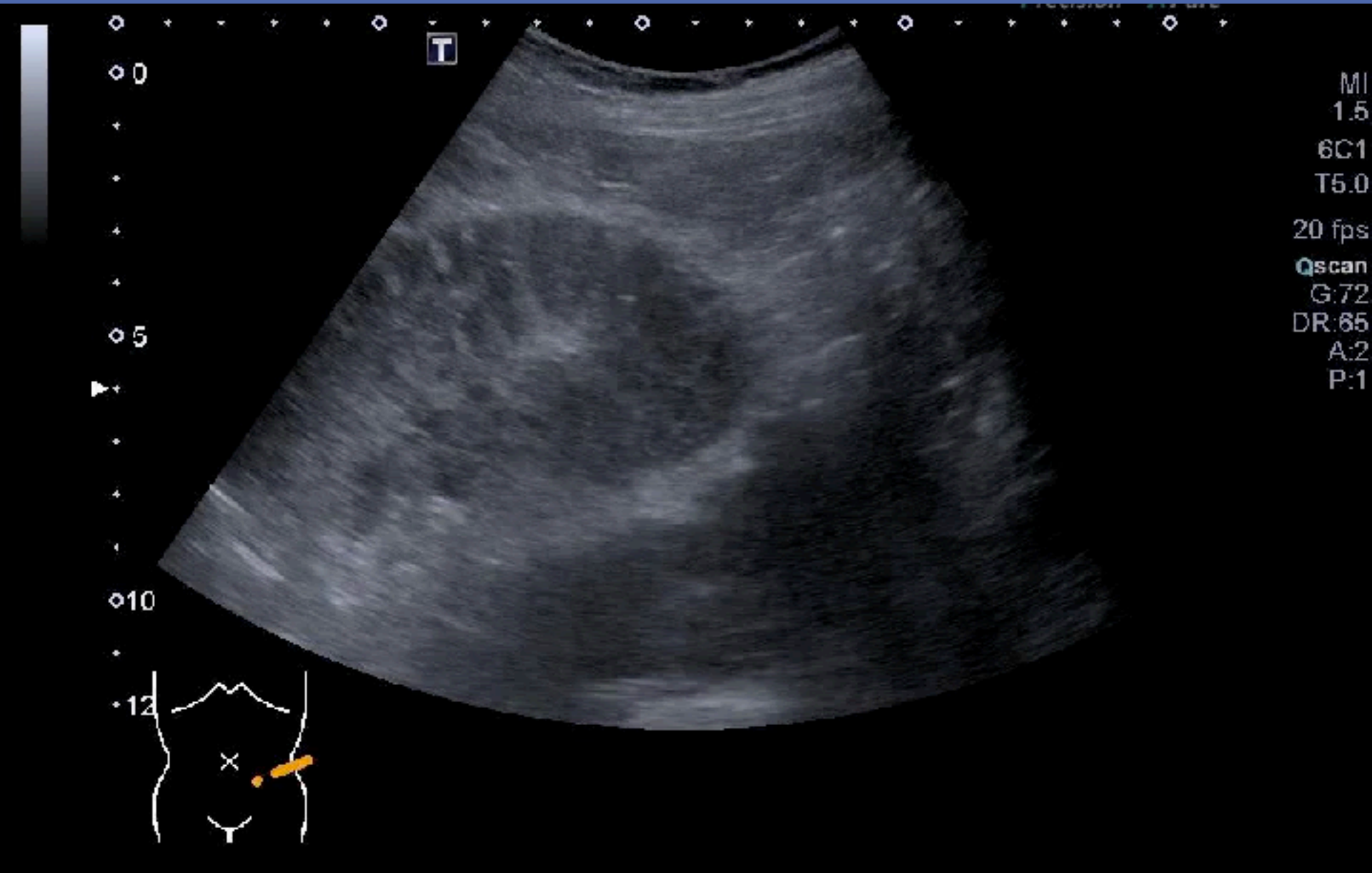

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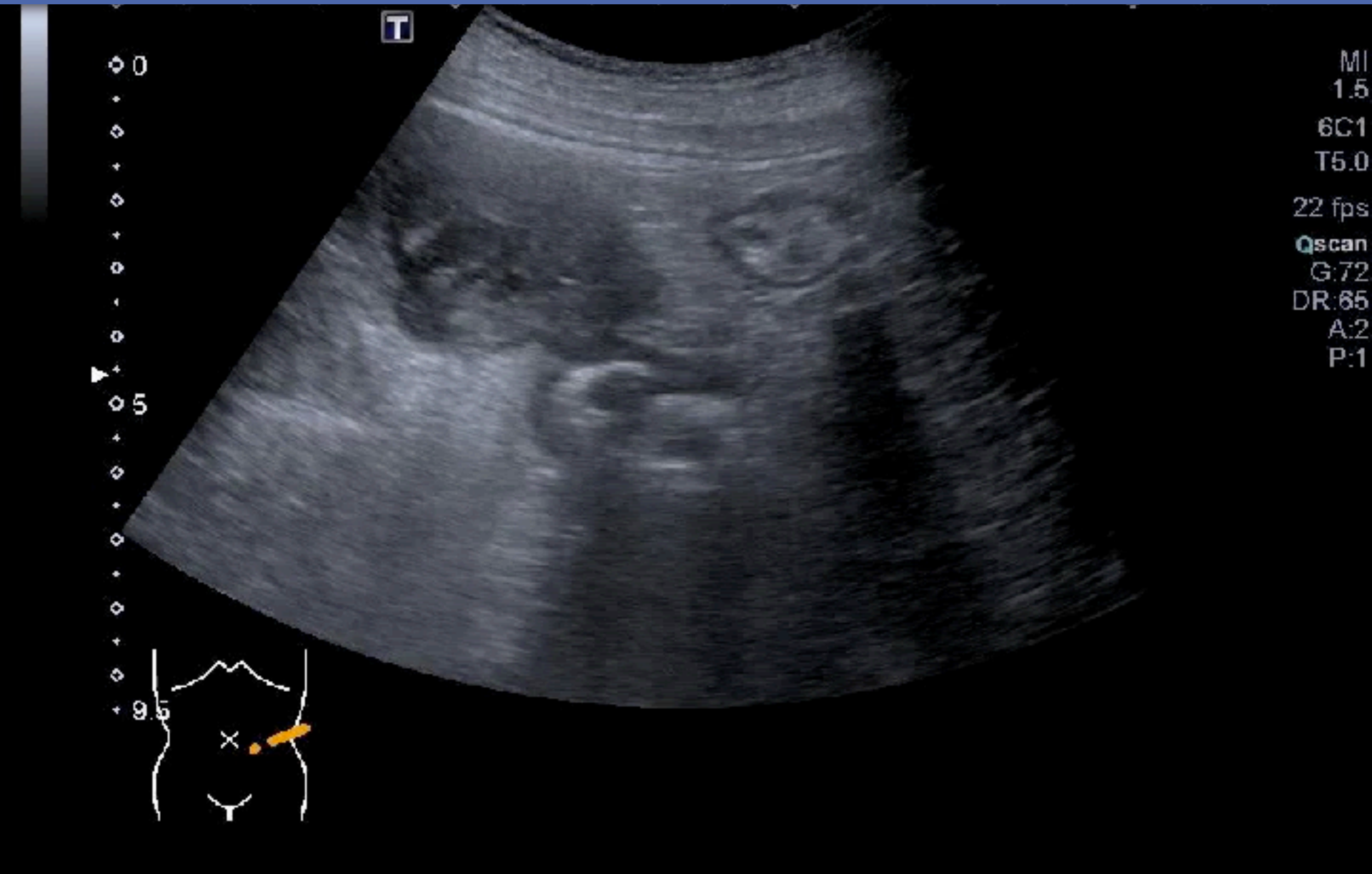
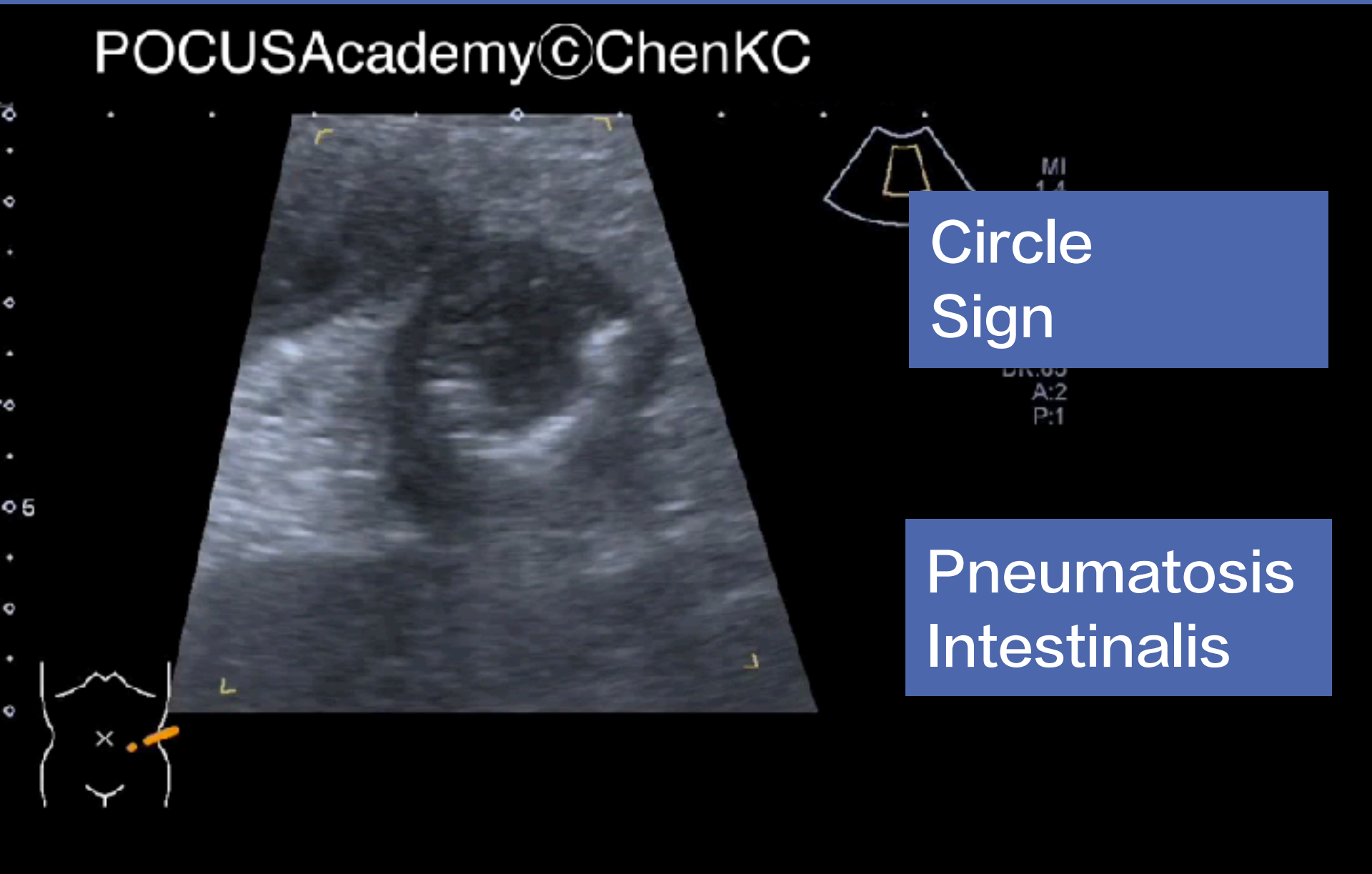
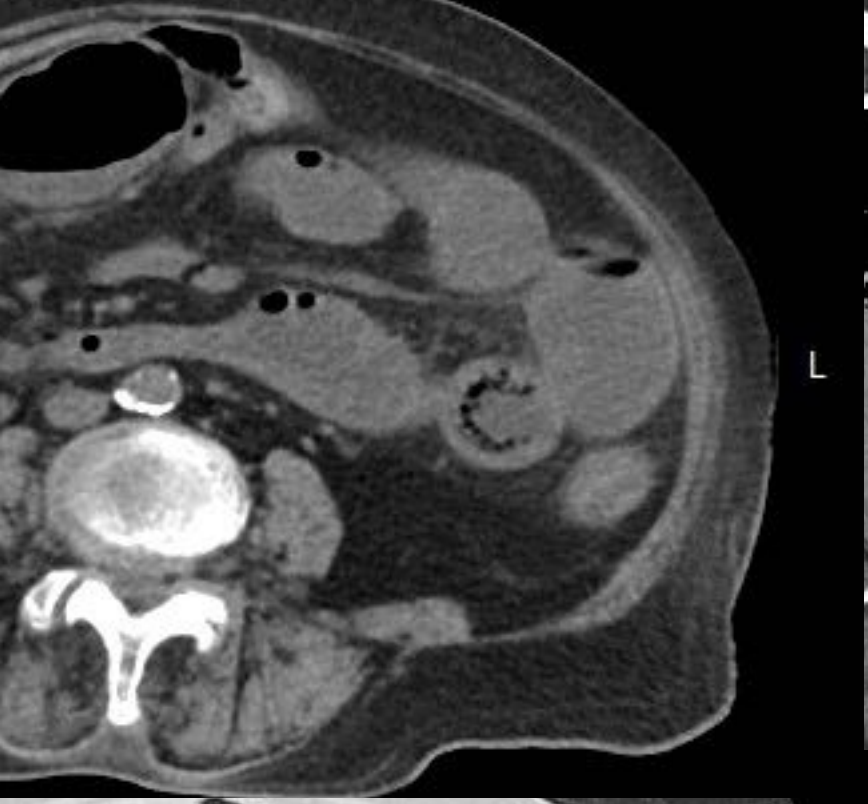


Sign & Diagnosis ?

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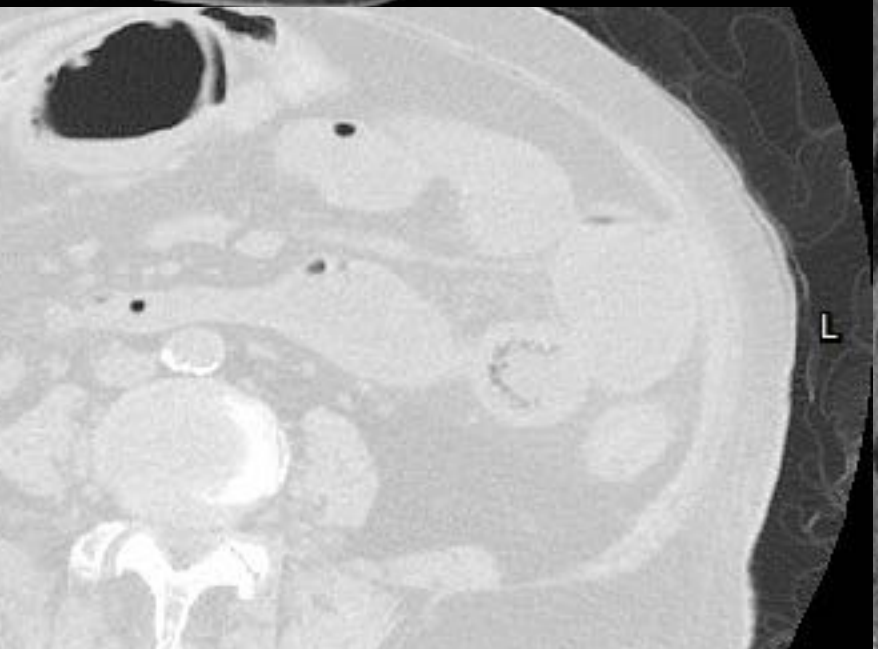
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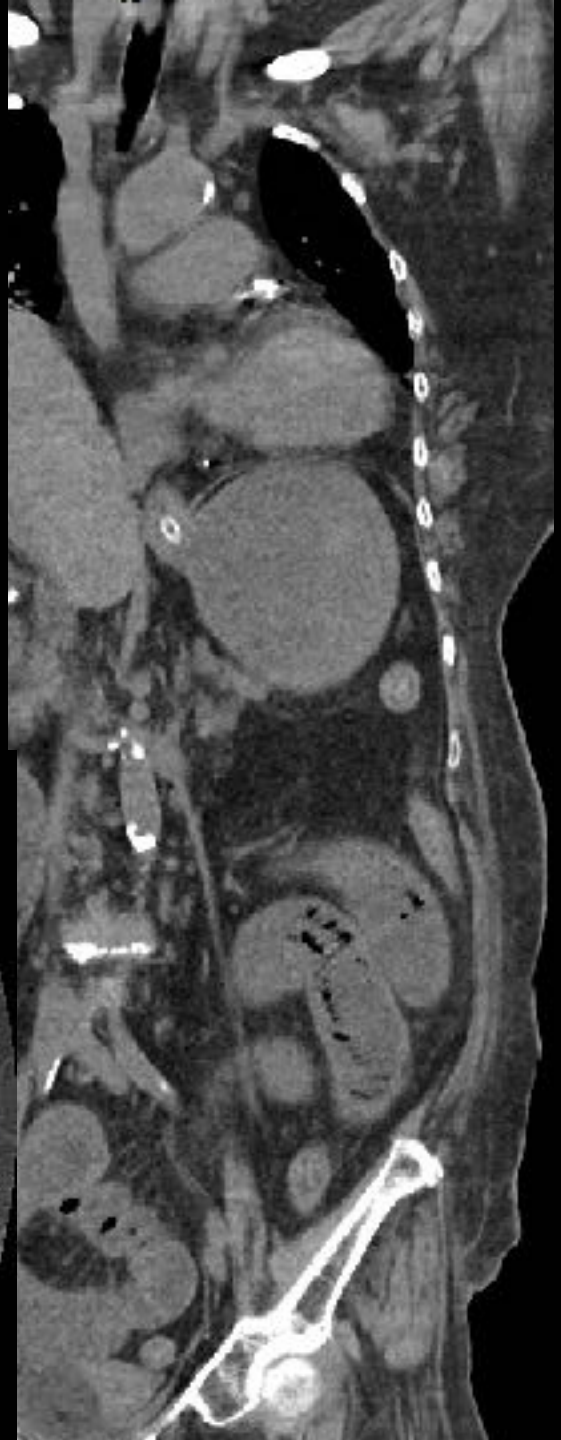

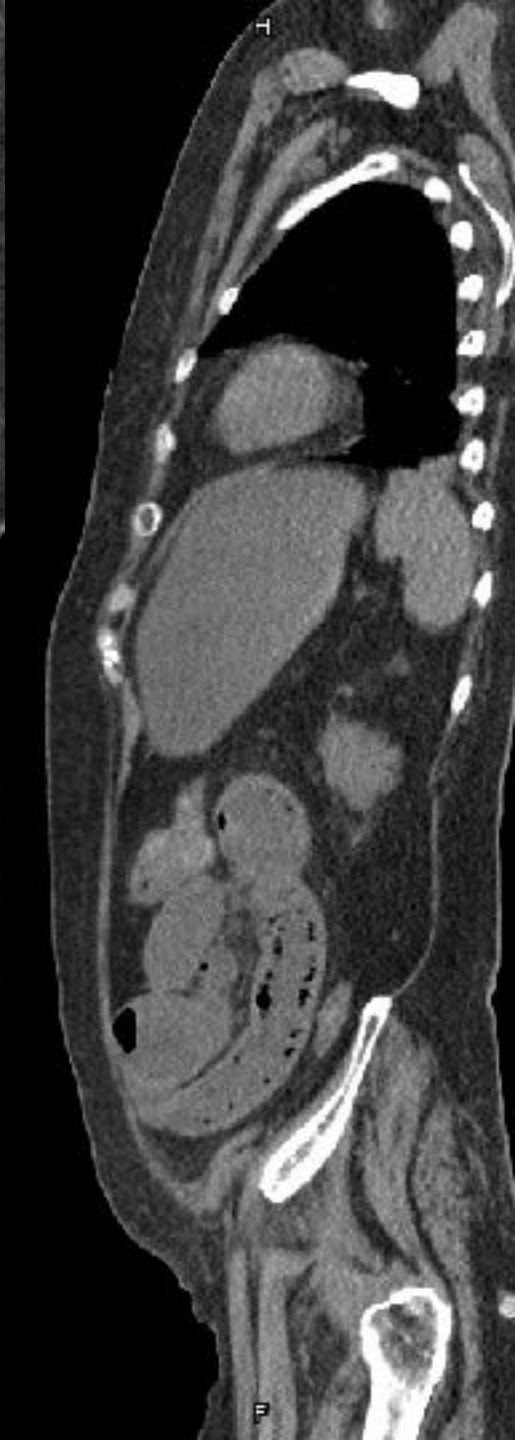
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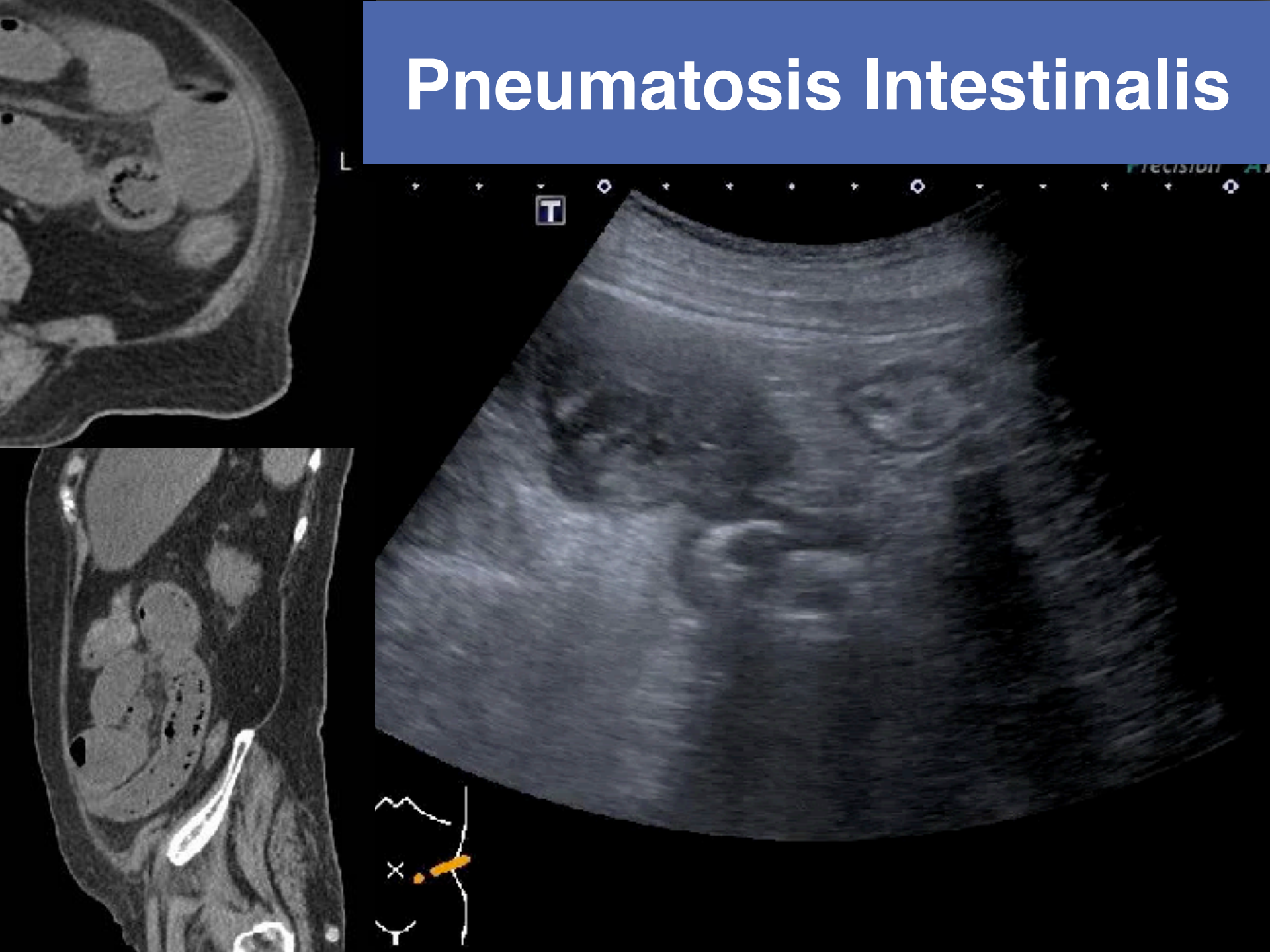
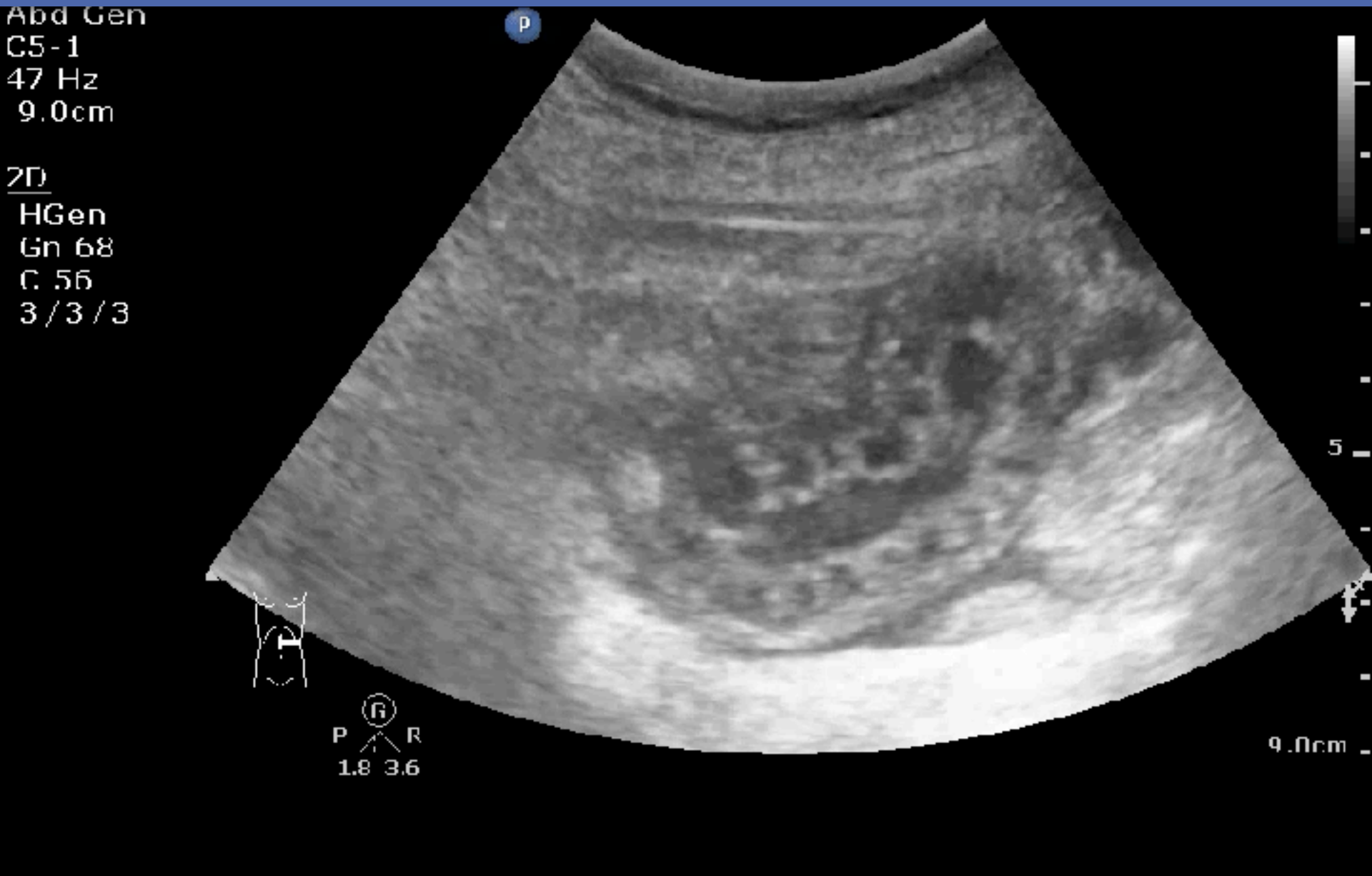
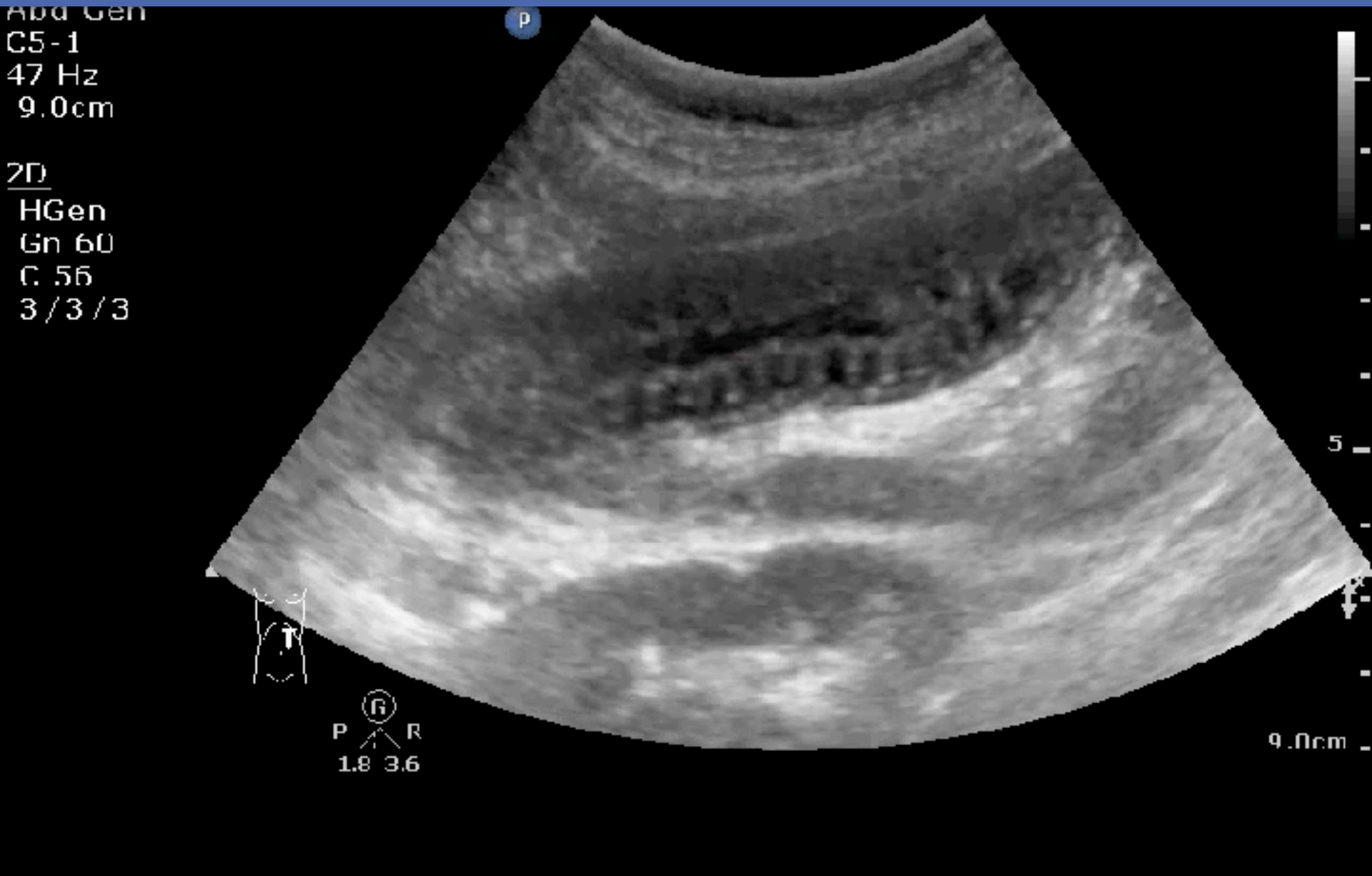
Pneumatosis Intestinalis

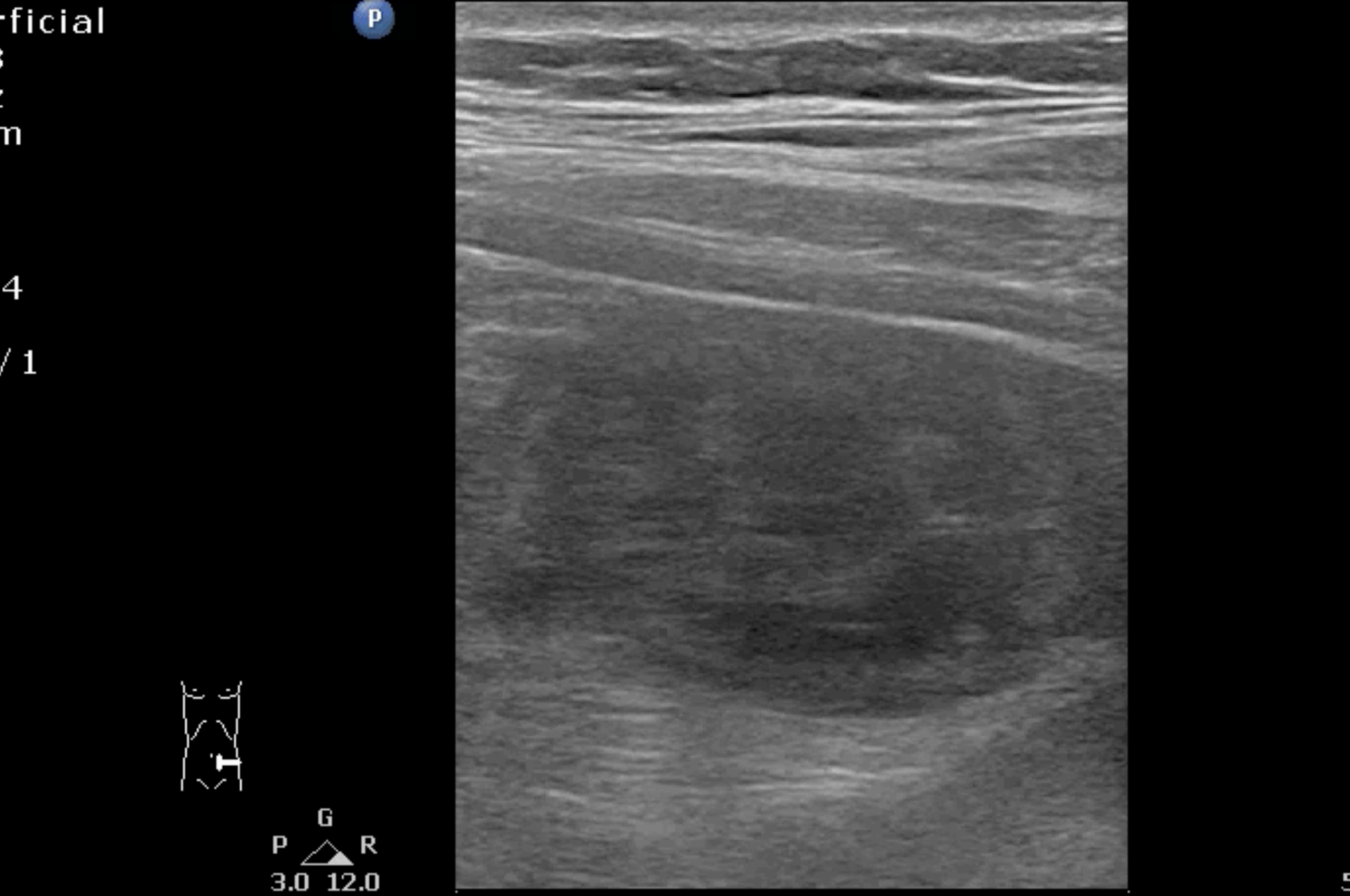


年輕女性，腹痛發燒



最可能合併什麼疾病?

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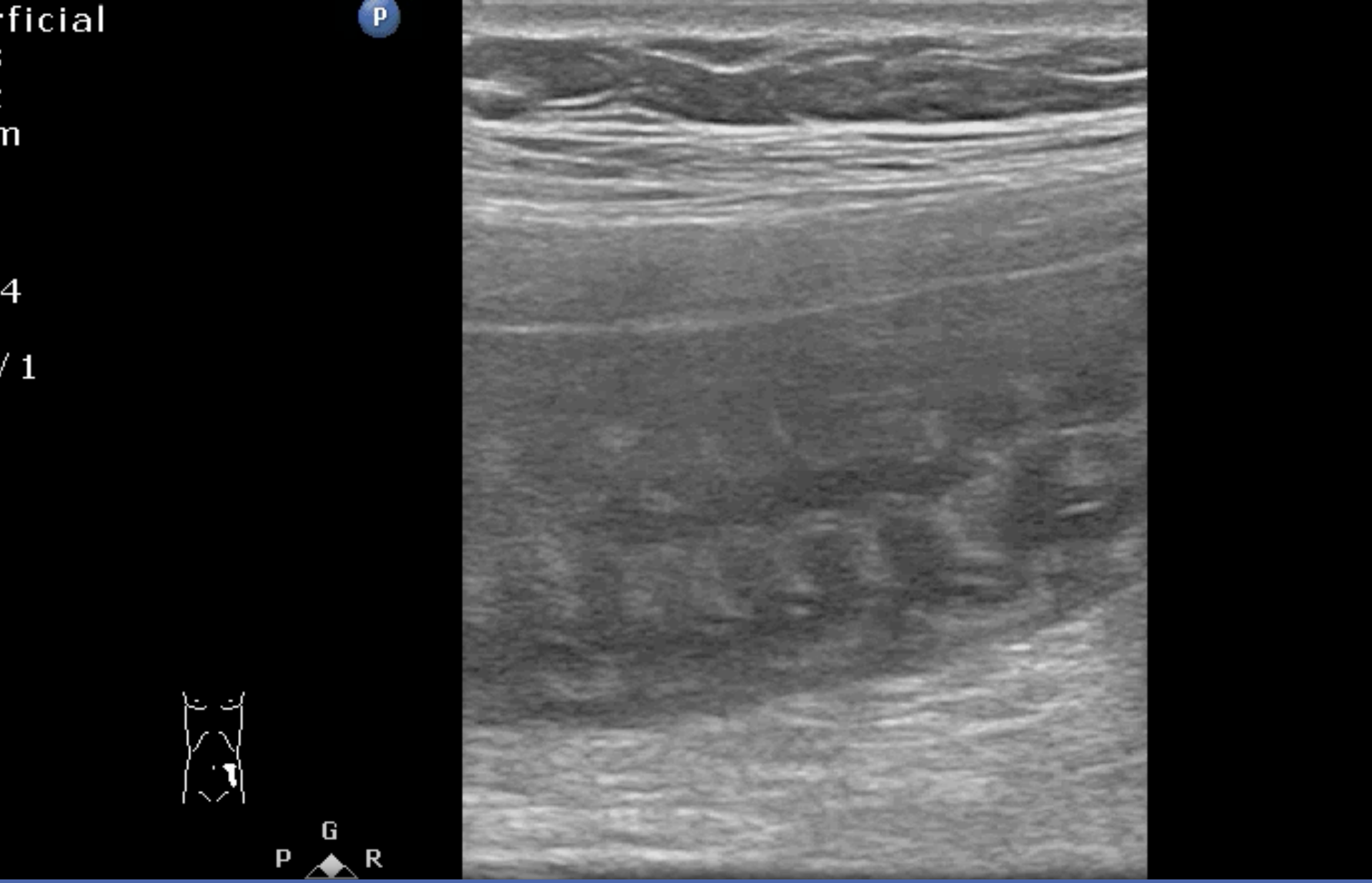
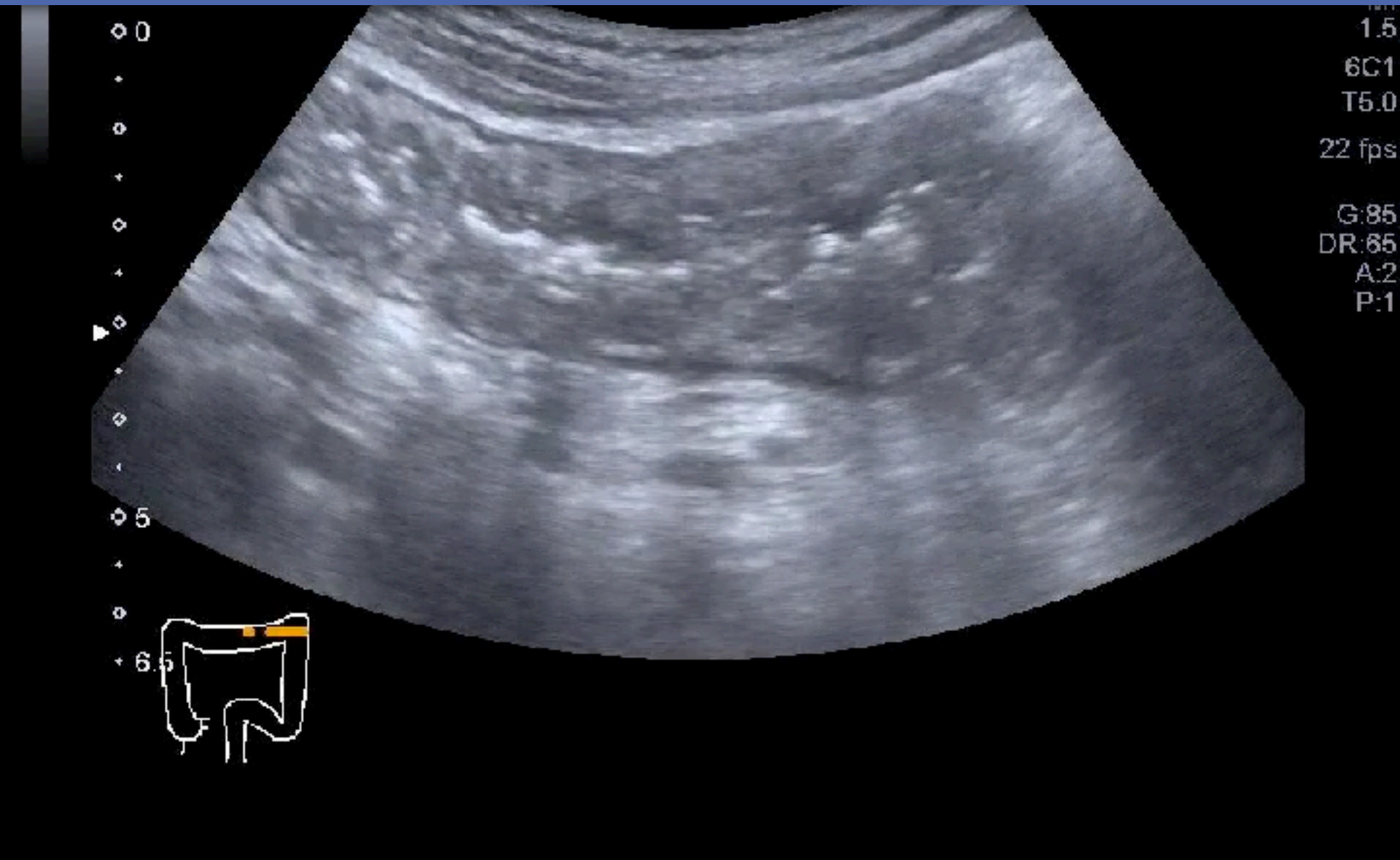
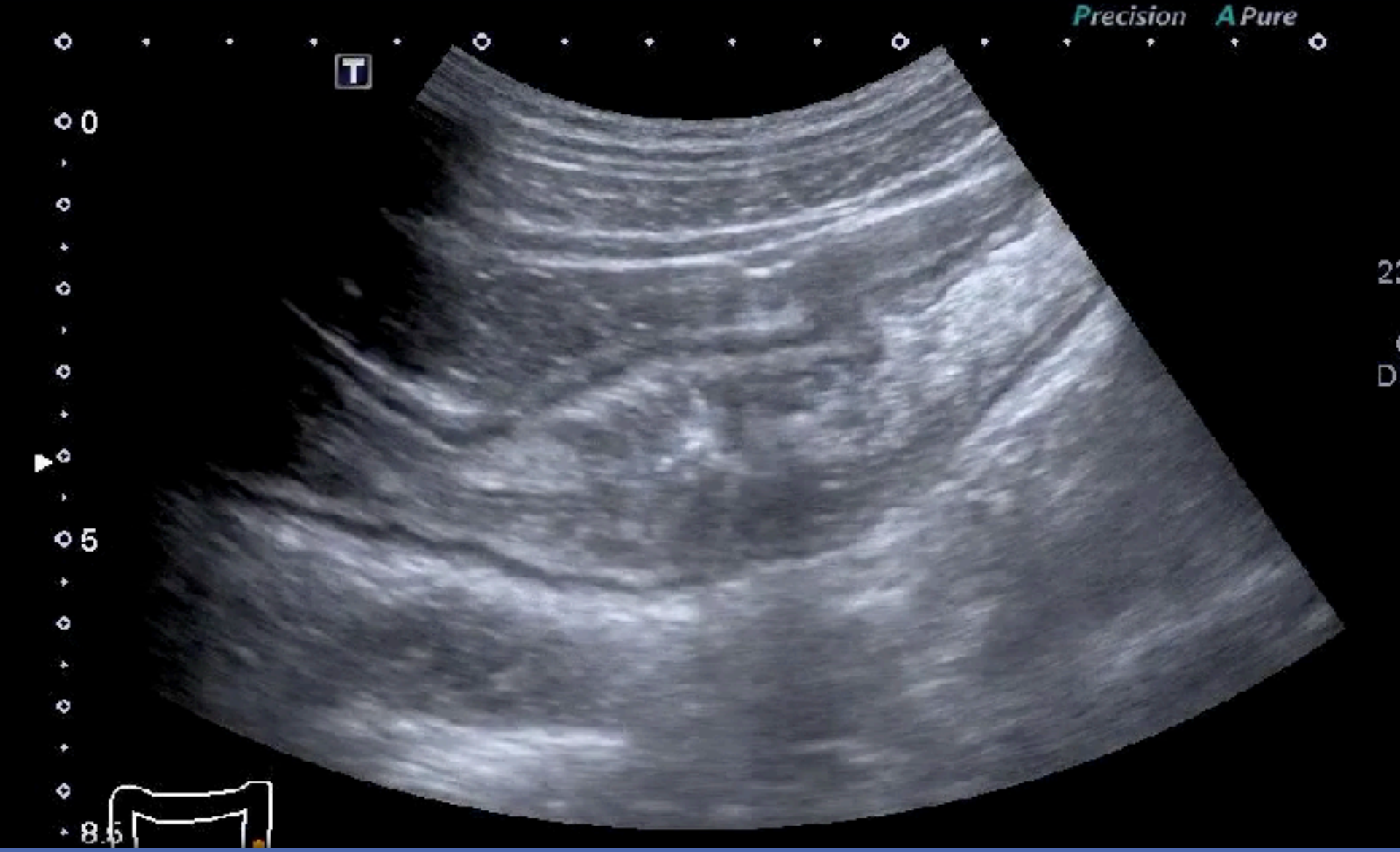


Lupus Vasculitis

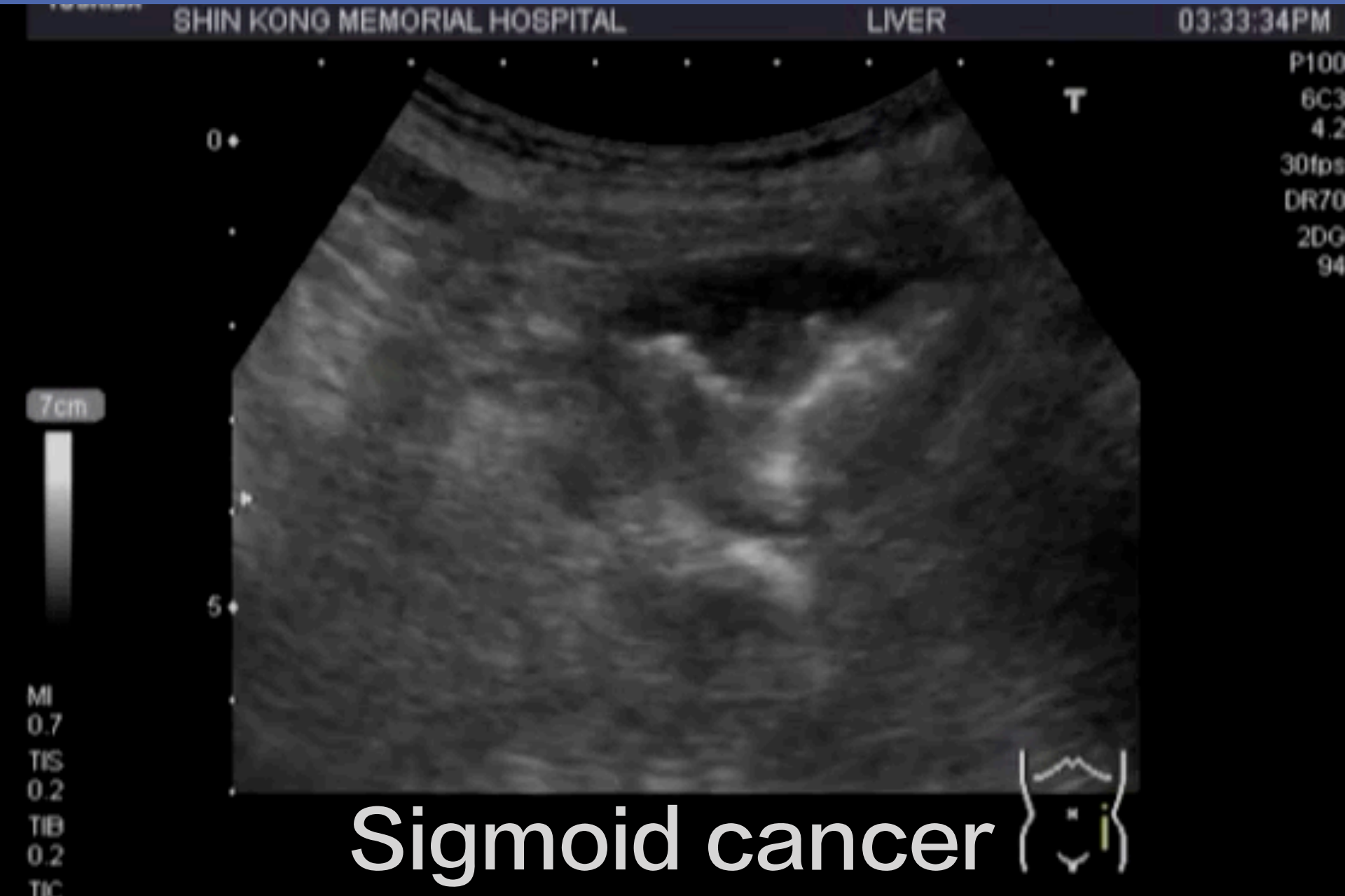
43M, fever & diarrhea





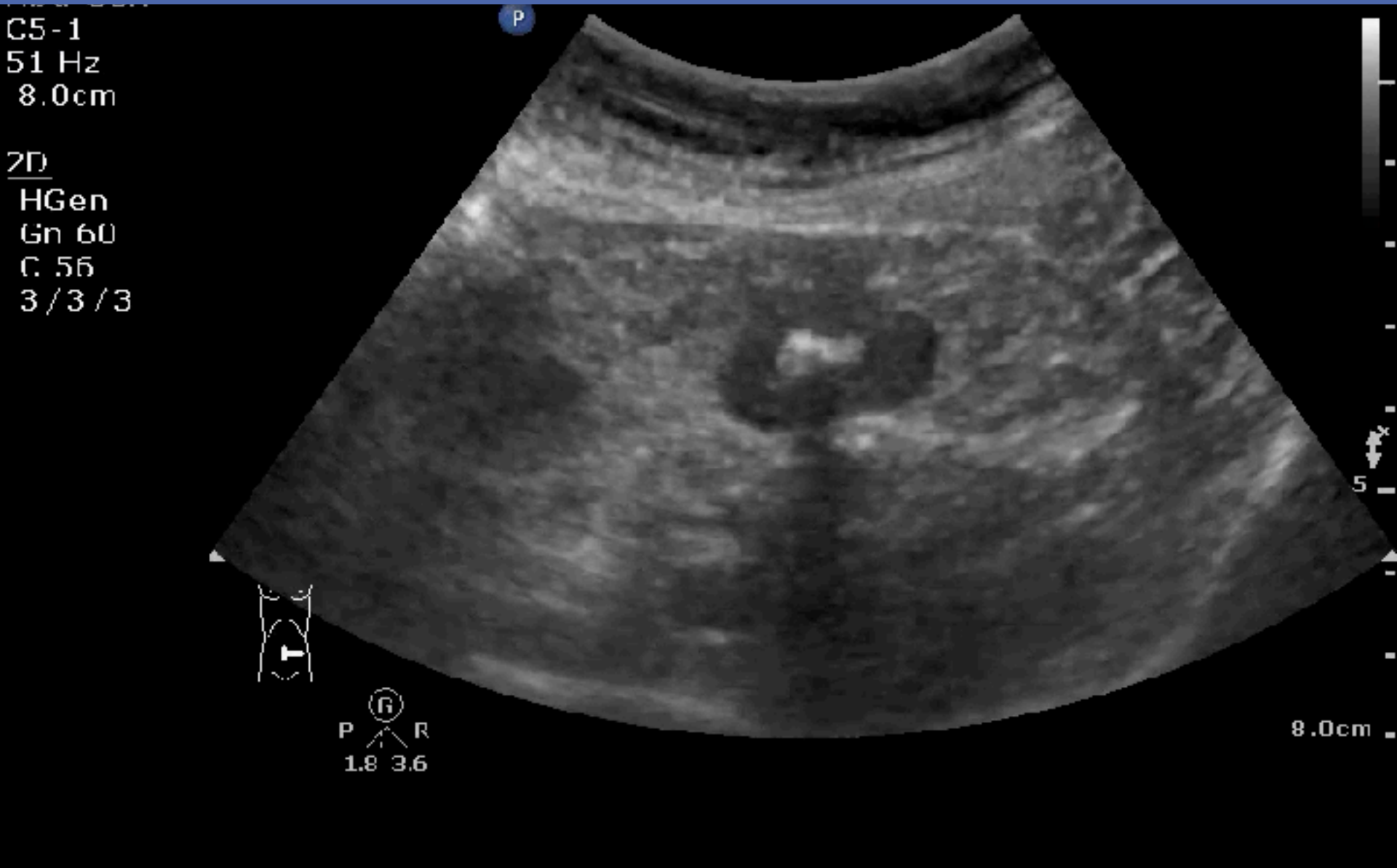
Infectious colitis

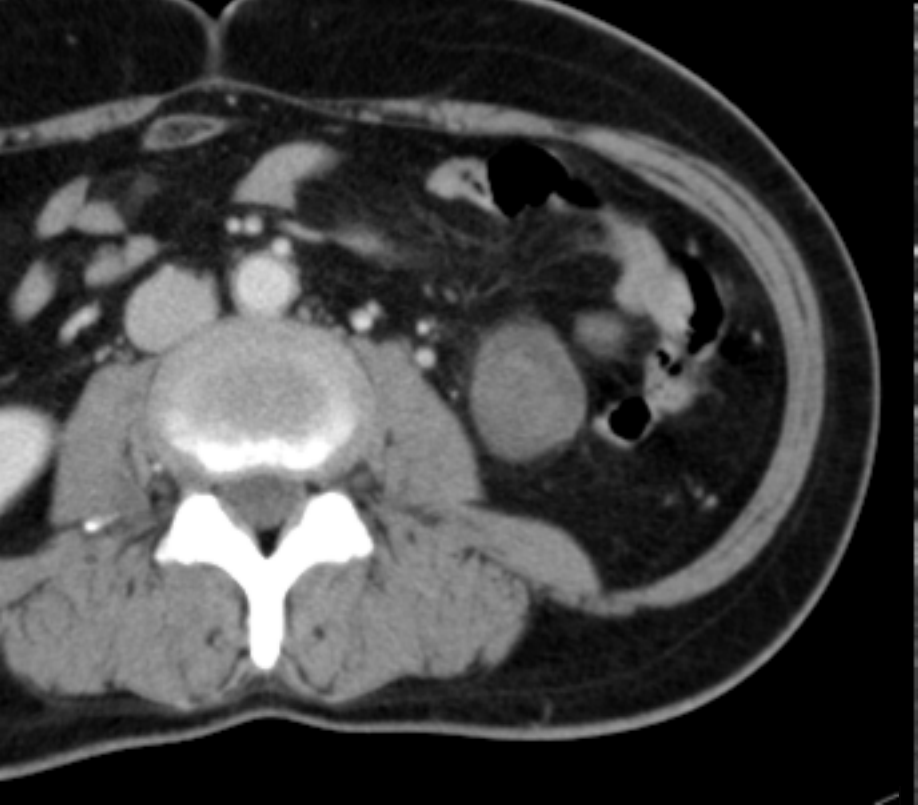
請判讀！

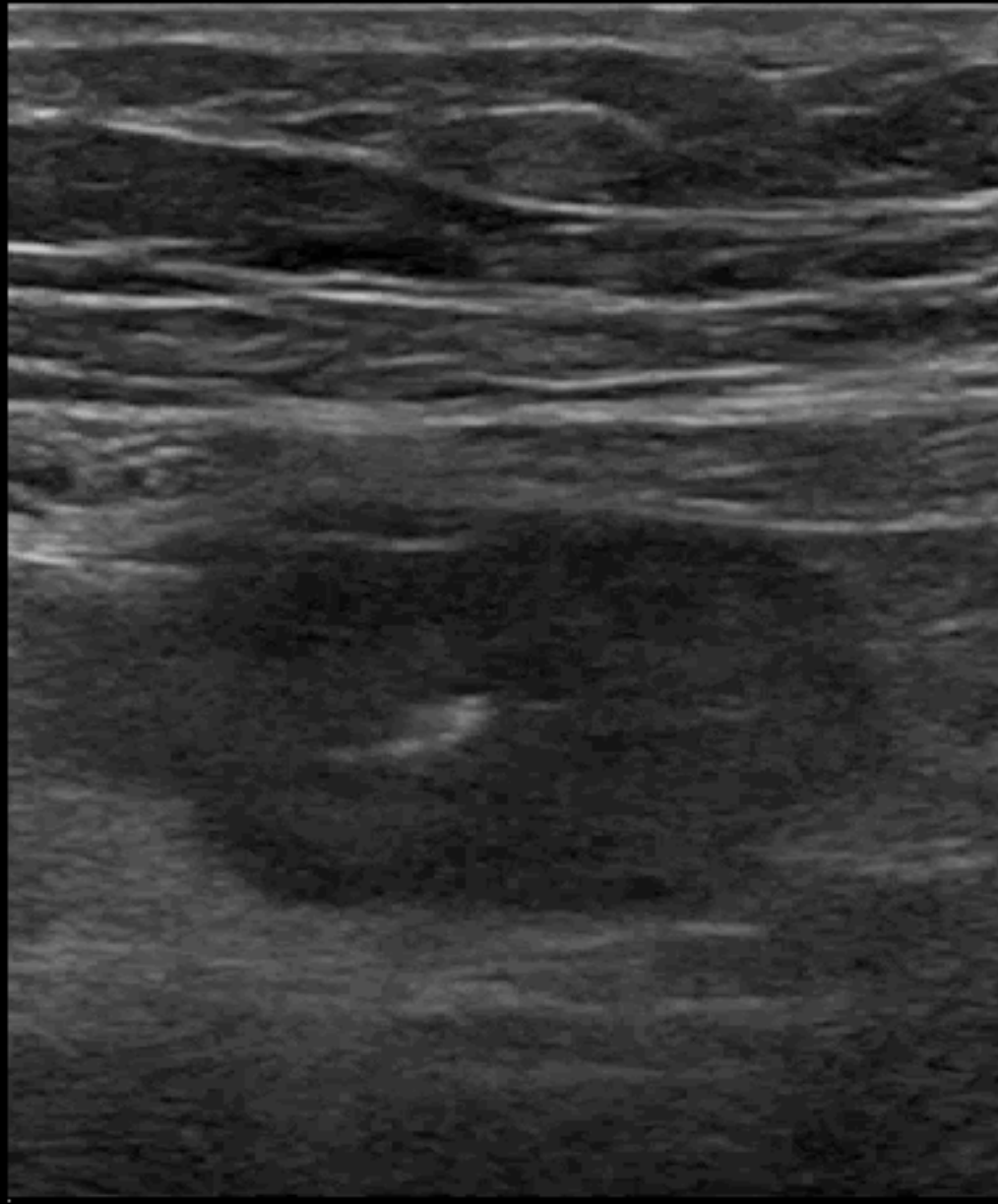


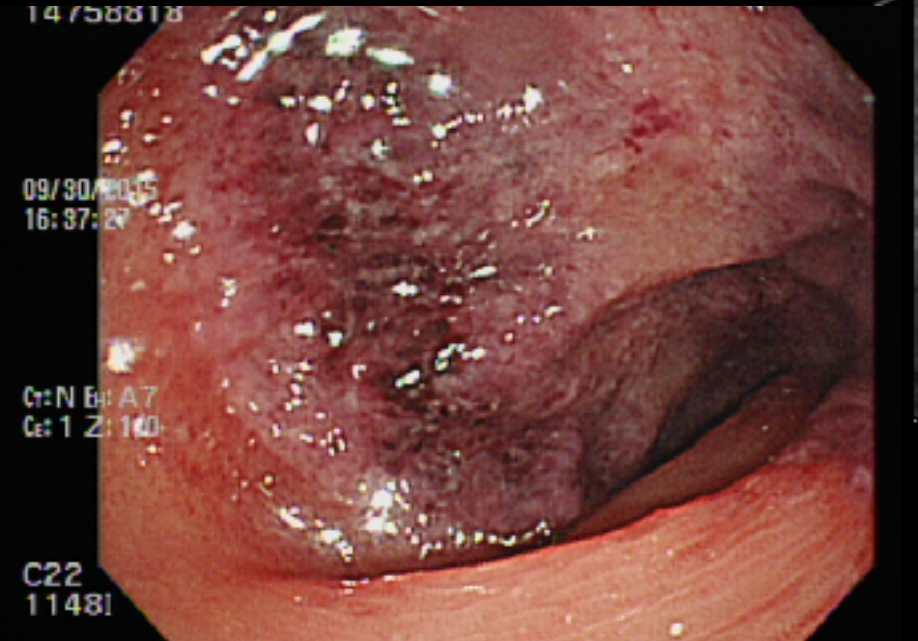
Sigmoid cancer

Old man with bloody stool








C22

Take Home Message
GIUS lesions on Sono

1. 腸胃道壁增厚 (>4mm) (2 - 4 - 6 mm)
2. 腸胃道壁分層消失
3. 蠕動減少
4. 用超音波探頭壓迫時不變形
5. 病灶通道內容物減少
6. 病灶附近之其他變化(LN, fat, ascites)