Appx4H&R

Kylie Baker Ipswich Hospital, 2019

Ipswich

Emergency Medicine Foundation

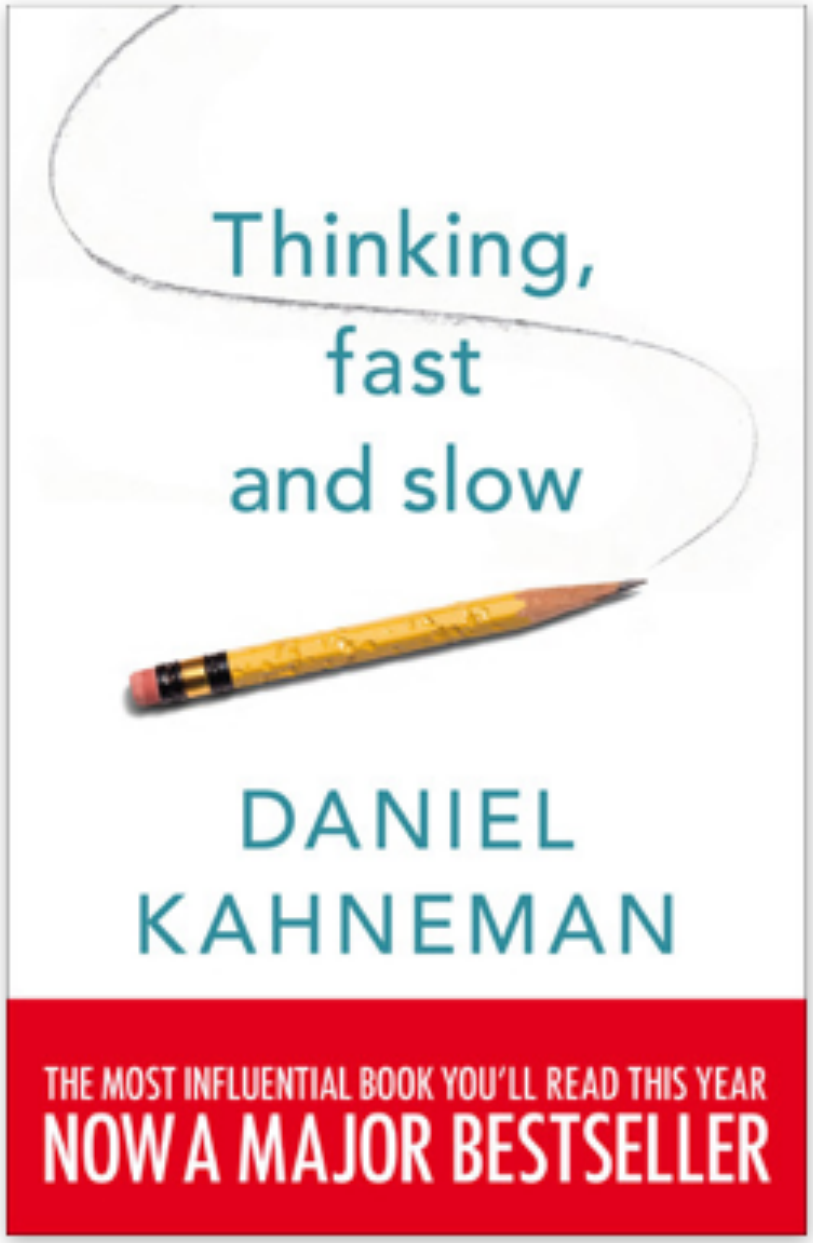
~~CONFLICTS~~ **CONFLUENCES OF INTEREST.**

Why learn ~~appendix~~?

POCUS

"Whether professionals have a chance to develop intuitive expertise depends essentially on the quality and speed of feedback.....radiologists obtain little information about the accuracy of the diagnoses they make and about the pathologies they fail to detect…"

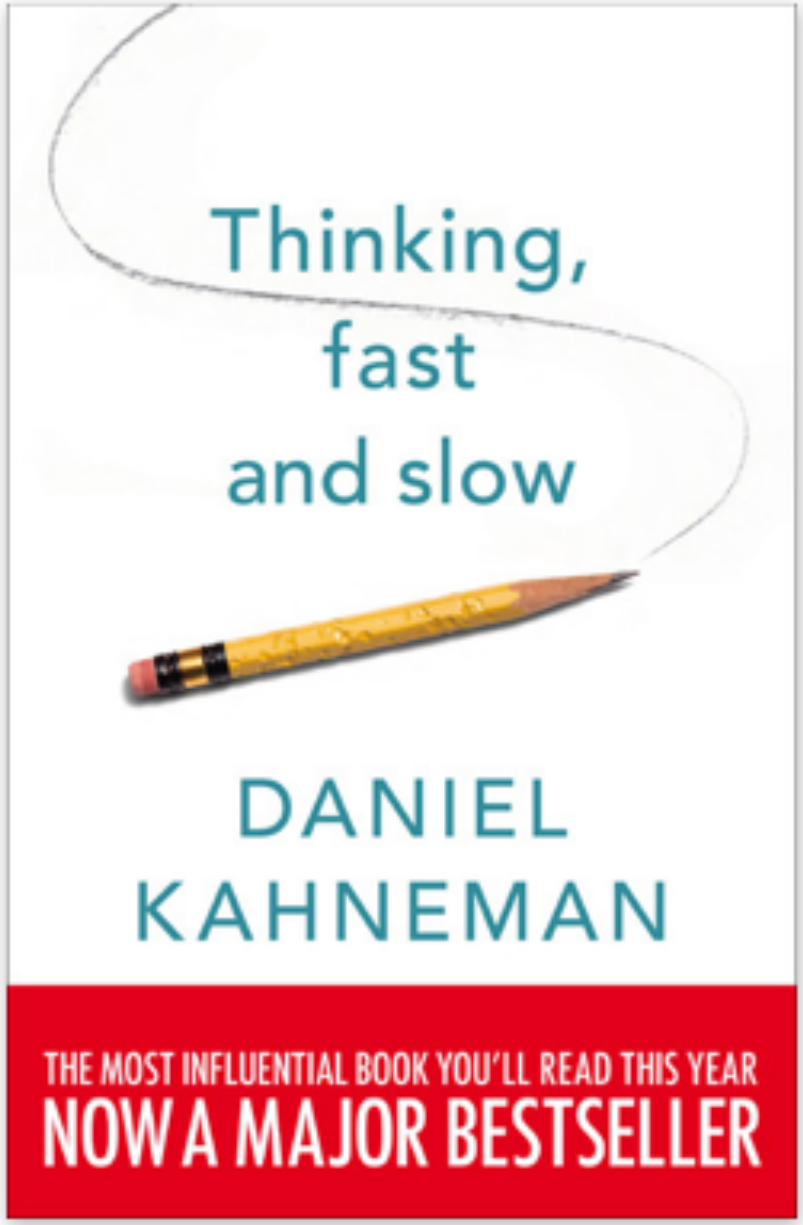
Daniel Kahneman,' Thinking Fast and Slow' Chpt 22, p 473



Requirements to develop expertise

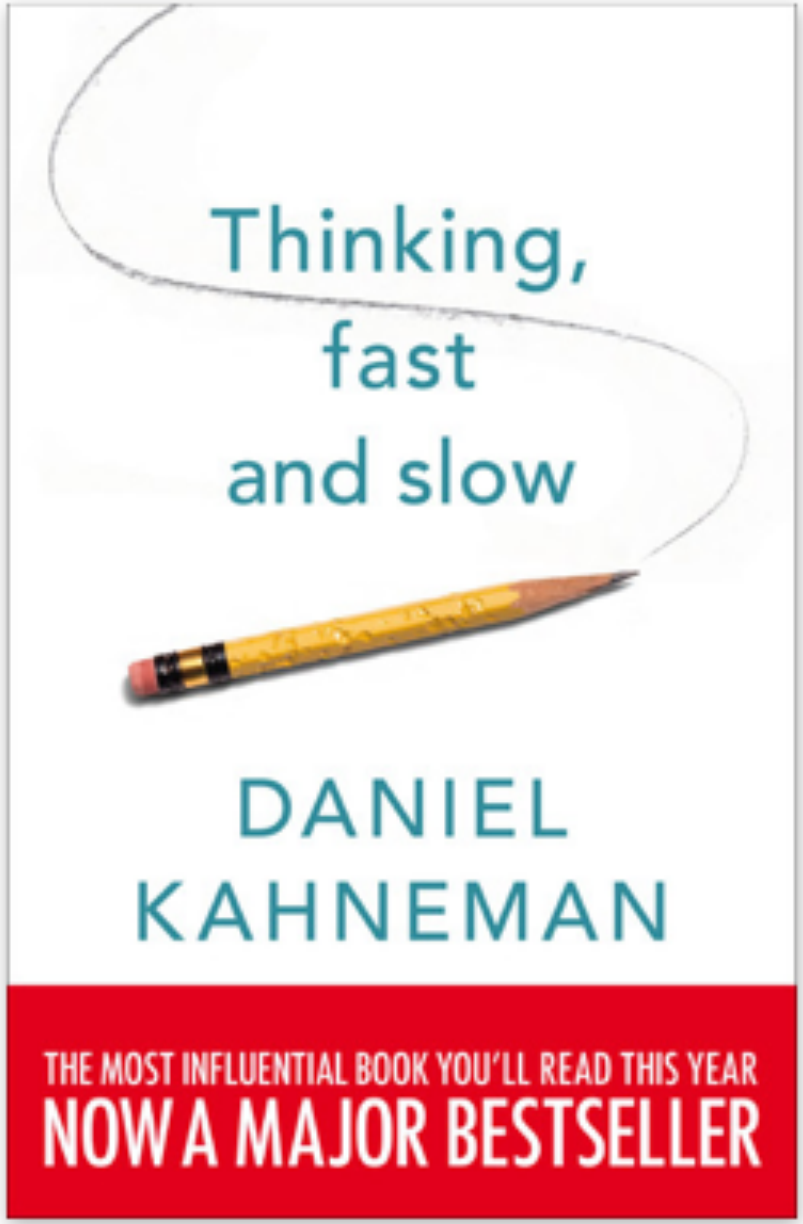
- Regular practice
- Stable environment
- ***Rapid feedback***

Daniel Kahneman, ***Thinking Fast and Slow ;*** Chpt 22:Expert intuition, when can we trust it?



"Among medical specialties, anaesthesiologists benefit from good feedback, because the effects of their actions are likely to be quickly evident……anaesthesiologists are therefore in a better position to develop useful intuitive skills…"

Daniel Kahneman, ***Thinking Fast and Slow ;*** Chpt 22:Expert intuition, when can we trust it?



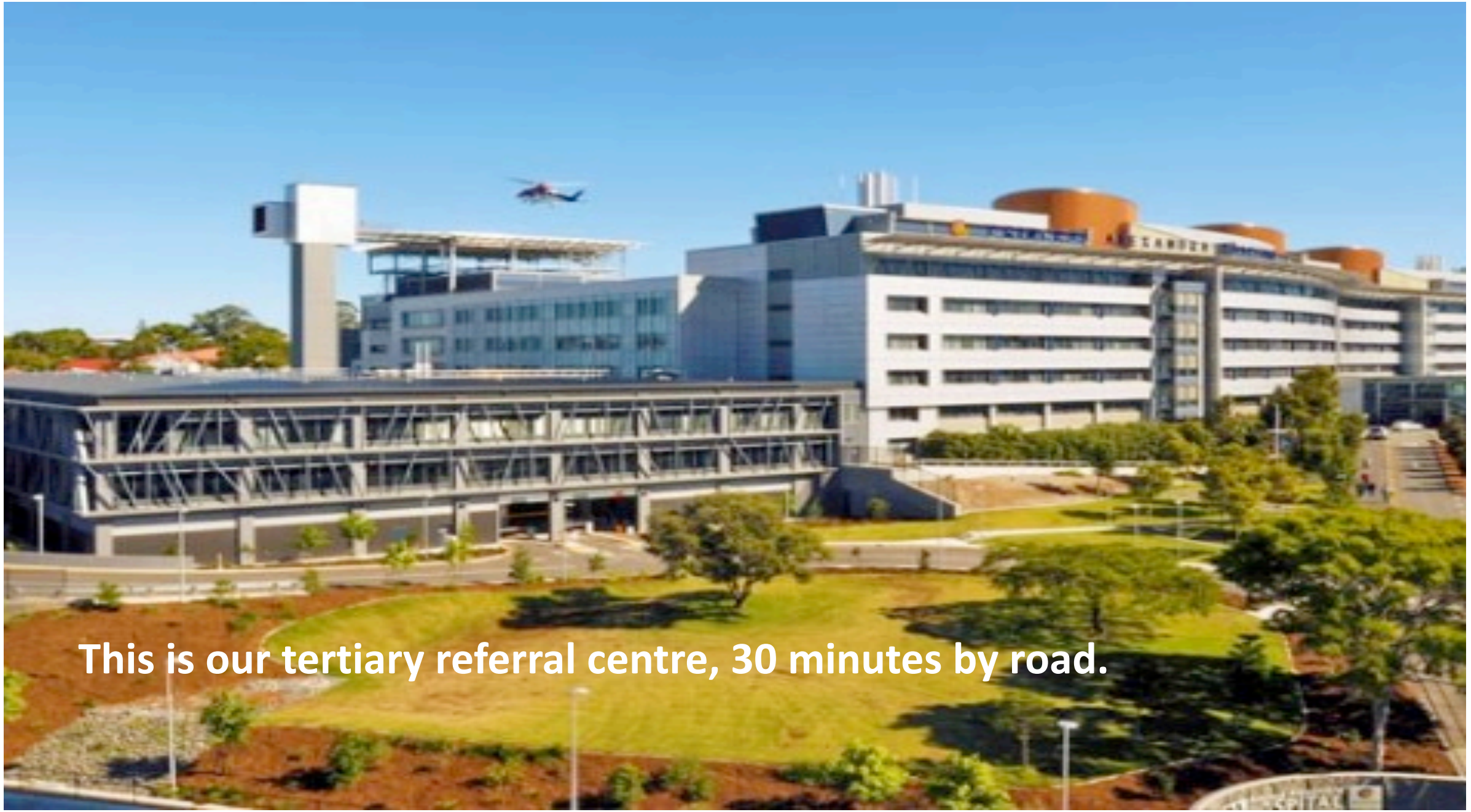
Good reference reviews

Puylaert JB, Acute appendicitis: US evaluation using graded compression. Radiology 1986; 158; 355-360

Trout A, Sanchez R, Ladino-Torres M. Re-evaluating the sonographic criteria for acute appendicitis in children. Acad Radiol 2012;19:1382-94

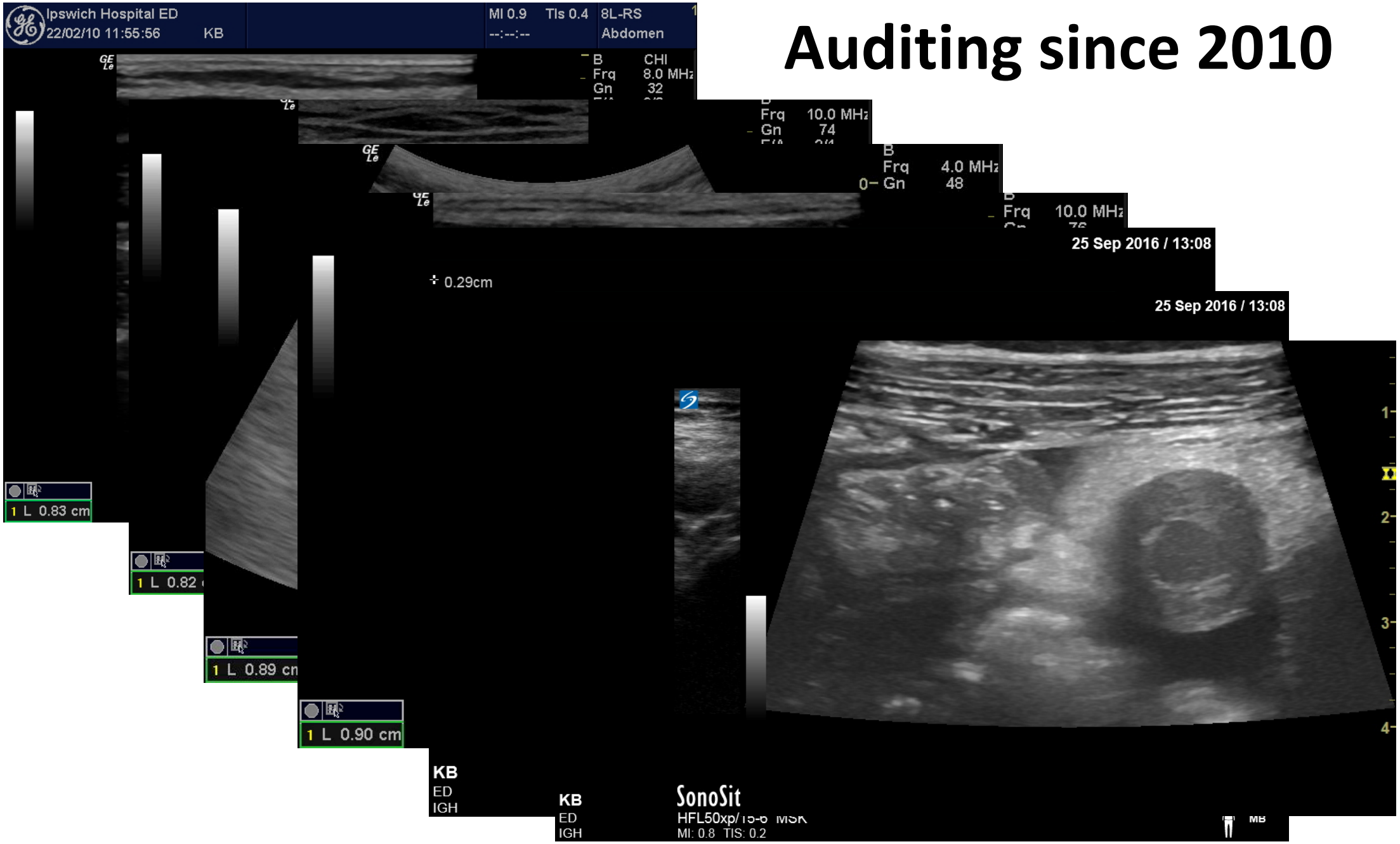
Gongidi P, Bellah R. Ultrasound of the pediatric appendix. Pediatr Radiol. 2017;47:1091-100.

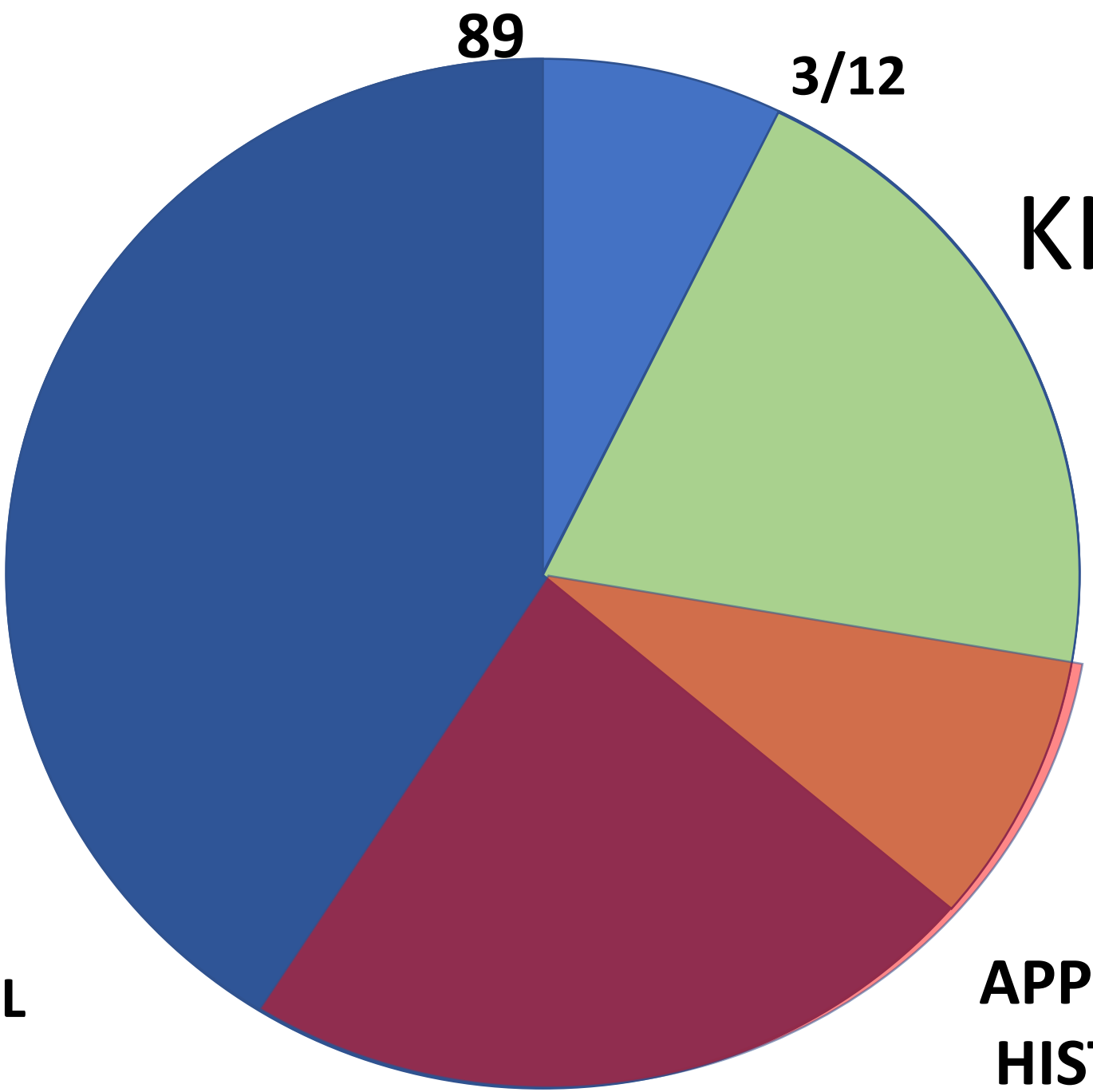

ED sees
~ 180/day
6 bed ICU


This is our tertiary referral centre, 30 minutes by road.


This is my neighbours goat yard

Auditing since 2010





KIDS = 85

NEGATIVE REFERENCE : PUBLIC HOSPITAL RECORD

APPENDICITIS AT HISTOLOGY = 85

QUICK AND DIRTY Stats

2010-2018	+ APPENDICITIS	NOT APPENDICITIS	Totals
I think Appendicitis	81	27* PURPOSELY OVERSENSITIVE	108
I think NOT appx	2	151	153
	83	178	261

.

+LR 6.4

-LR 0.028

SNs 98(95% CI 91-100)

SPc 85 (95% CI 79-90)

When appendix is positively identified….

Appx IDENTIFIED	YES APPENDICITIS	NOT APPENDICITS	Totals
I think HOT APPX	37	3	40
Nope, no, Nada….	1	84	85
	38	87	125

+LR 28 **(9-86)**

-LR 0.03 **(0.004-0.2)**

SNs 97 (95%CI 85 -100)

SPc 97 (95%CI 90-100)

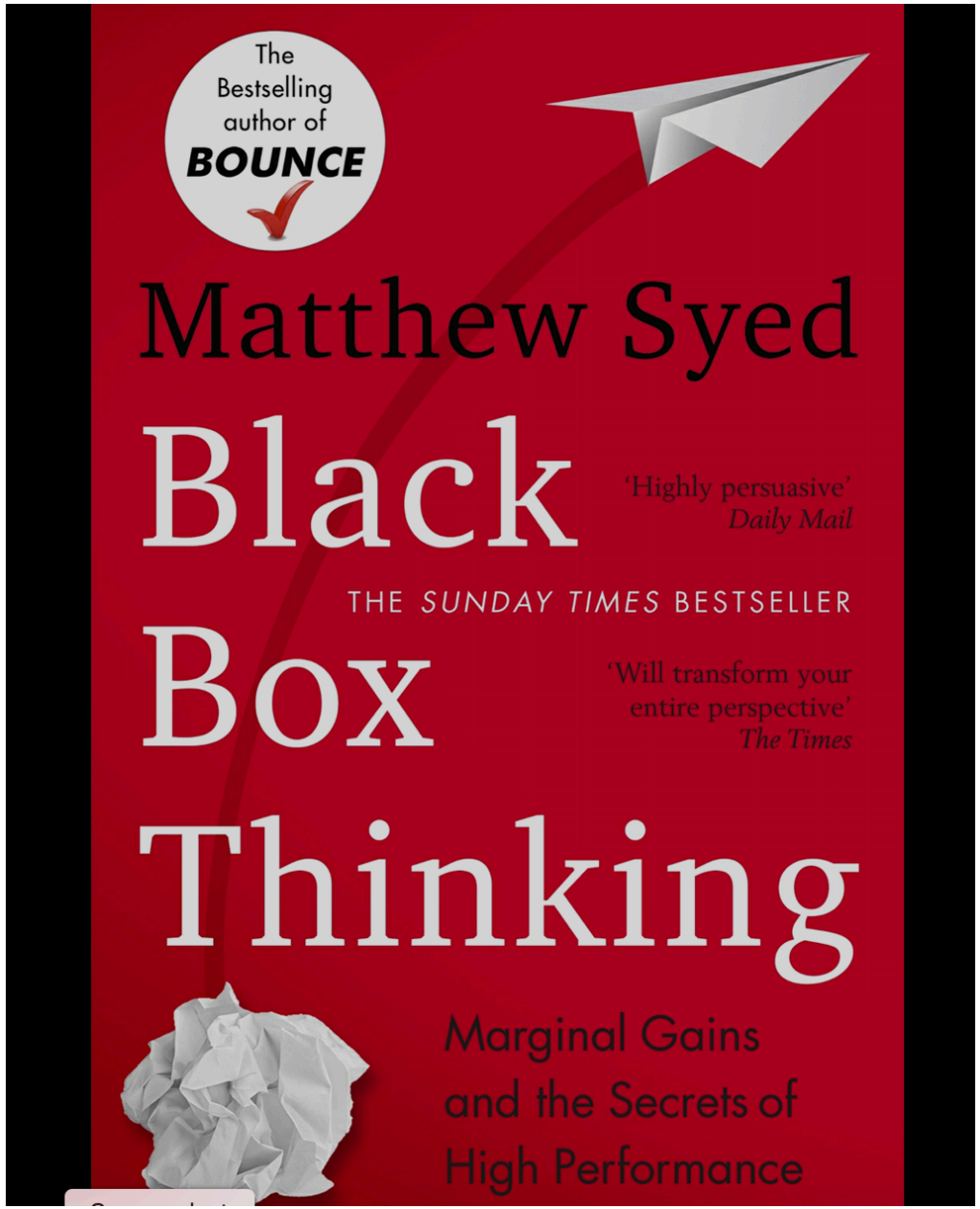
POCUS-Appx

- Radiologist: **SNs 74%,** (95% CI: 65%–81%) **SPc 97%** (95% CI: 93%–98%).
- EP-POCUS: **SNs 84%** (95% CI: 72%–92%) **SPc 91%** (95% CI: 85%–95%),
- Me: **SNs 98%** (95% CI: 91-100) **SPc 85%** (95%CI: 79-90)

Lee S, Yun S. Diagnostic performance of emergency physician-performed point-of-care ultrasonography for acute appendicitis: a meta-analysis. Am J Emerg Med. 2019;37:696-705.

Treasure your mistakes and near misses

"Success can only happen when we admit our mistake, learn from them, and create a climate where is a certain sense, it is 'safe' to fail. And if the failure is a tragedy, such as the death of Elaine Bromiley, ***learning from failure takes on a moral urgency.***



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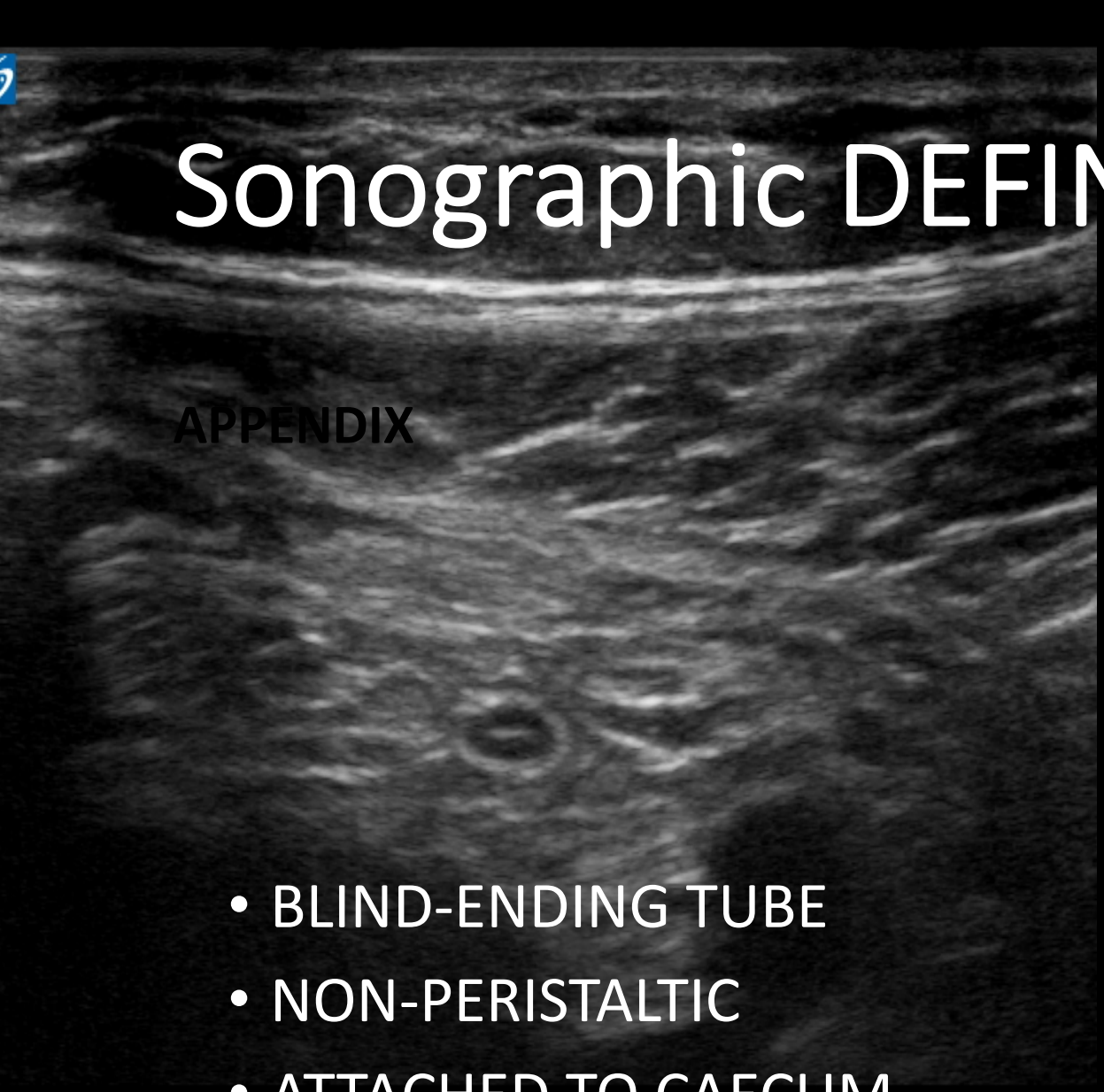
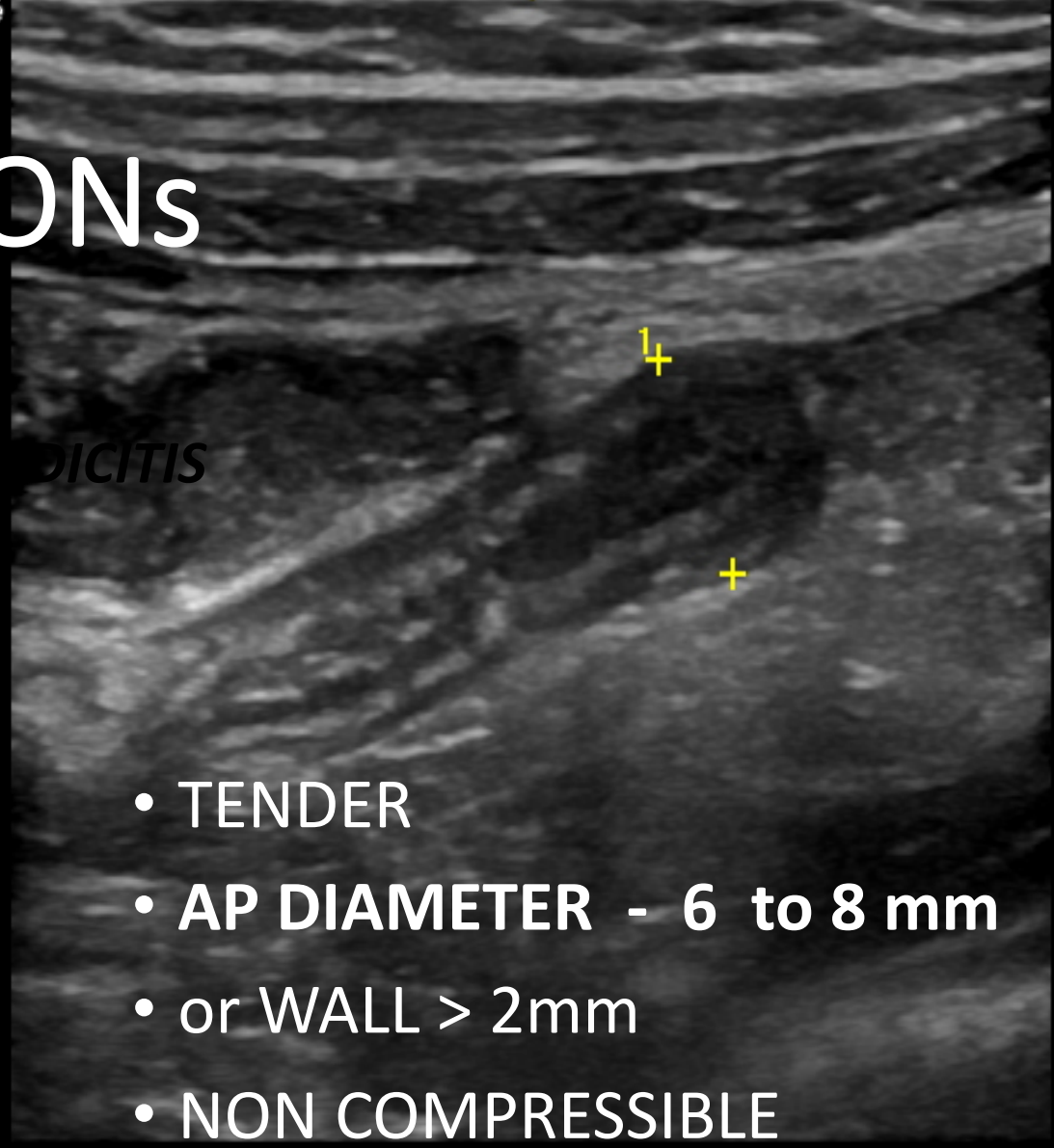
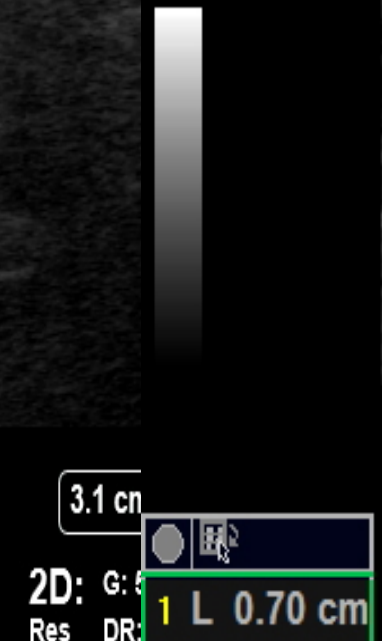
Sonographic DEFINITIONs

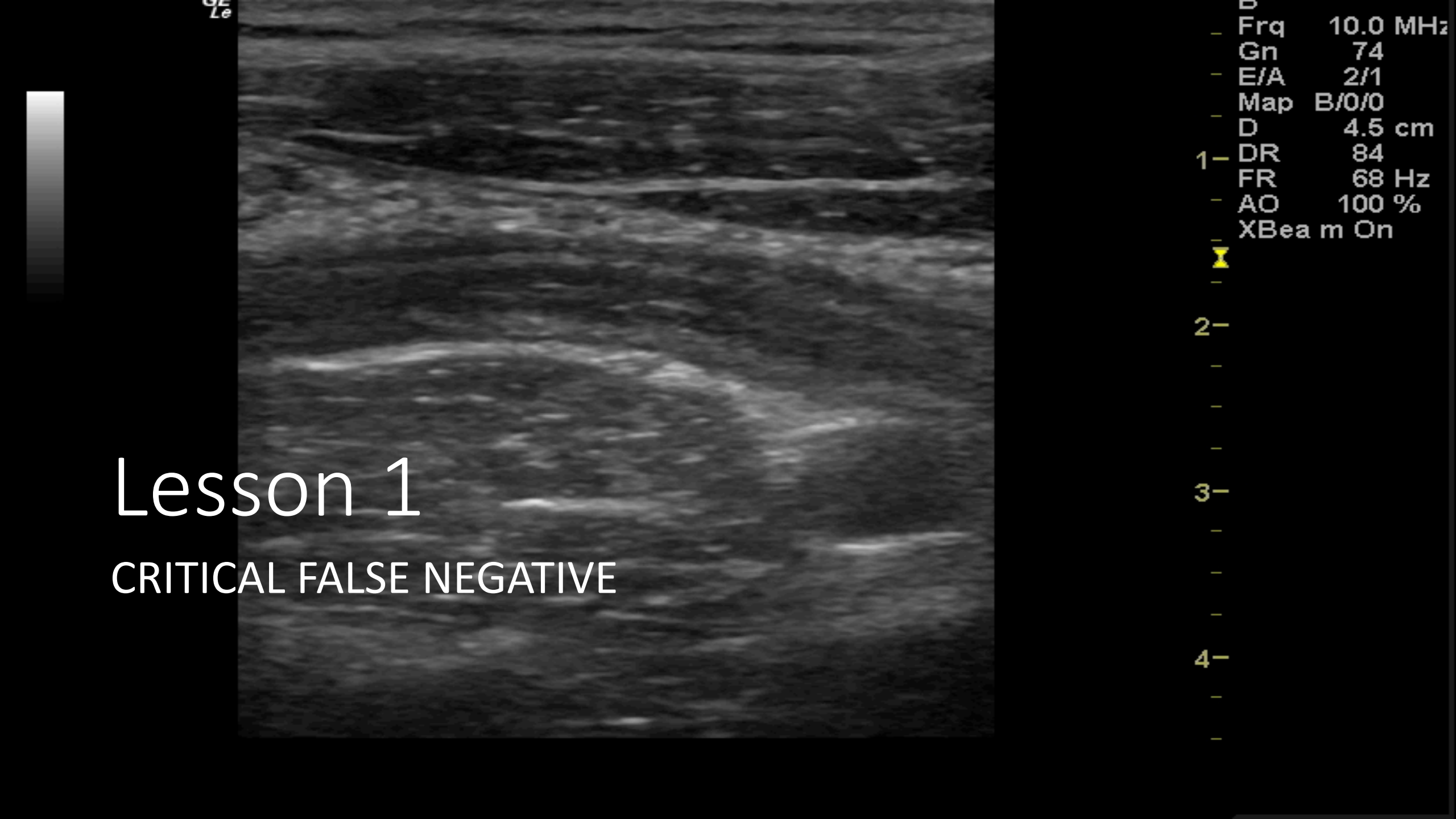


- BLIND-ENDING TUBE
- NON-PERISTALTIC
- ATTACHED TO CAECUM



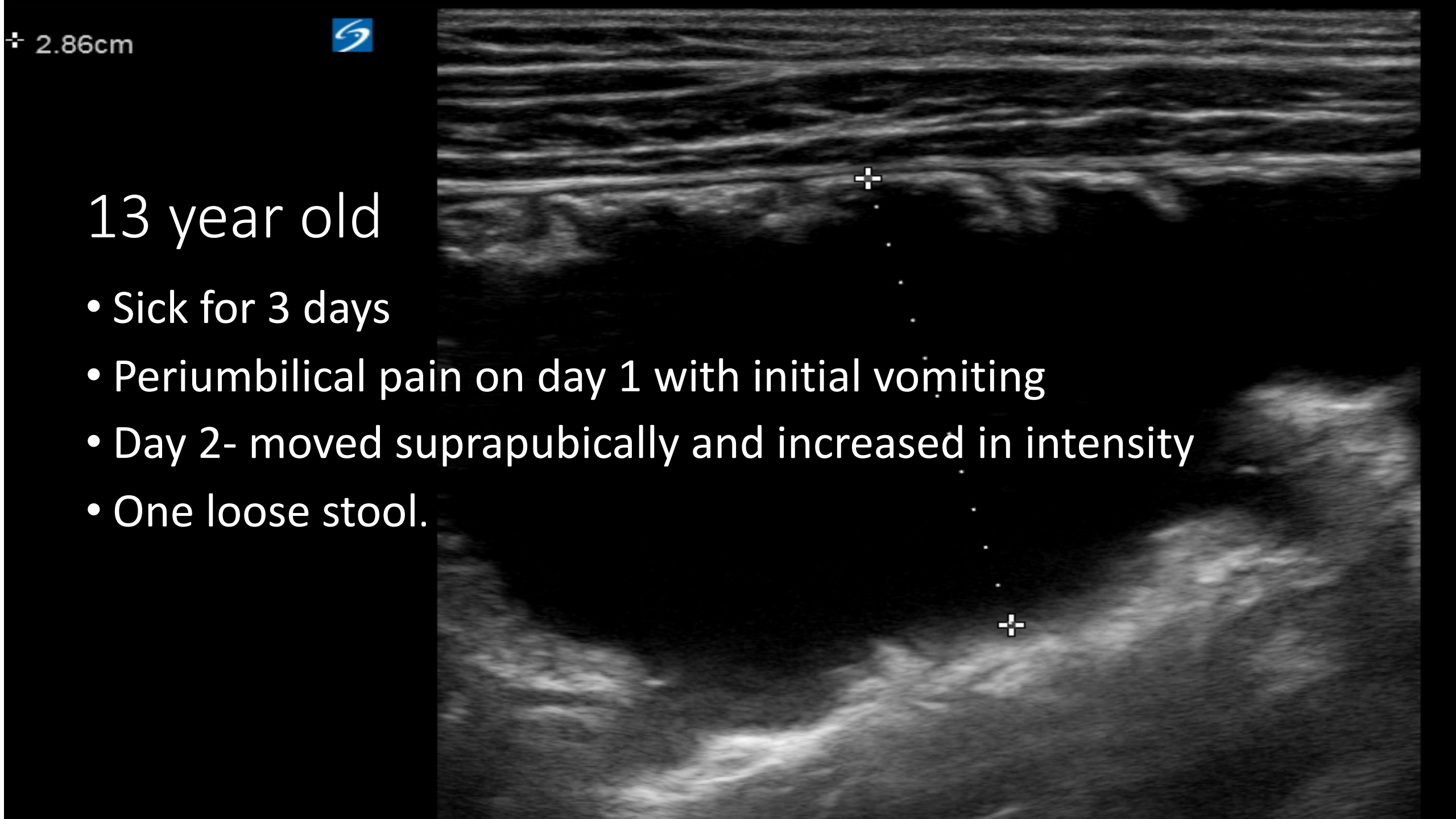
- TENDER
- **AP DIAMETER - 6 to 8 mm**
- or WALL > 2mm
- NON COMPRESSIBLE
- +/- SUPPORTING SIGNS





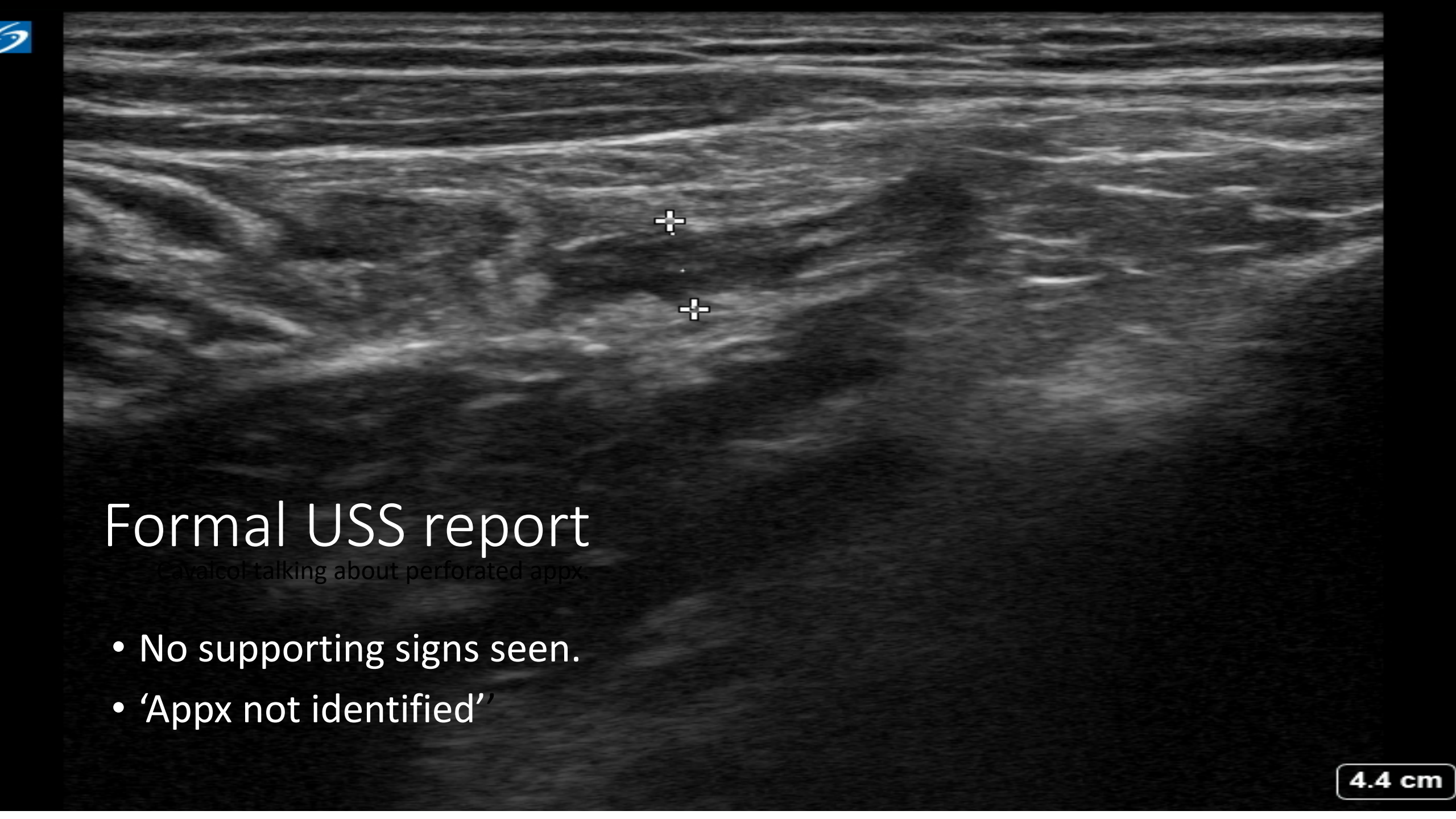
Lesson 1

CRITICAL FALSE NEGATIVE



13 year old

- Sick for 3 days
- Periumbilical pain on day 1 with initial vomiting
- Day 2- moved suprapubically and increased in intensity
- One loose stool.

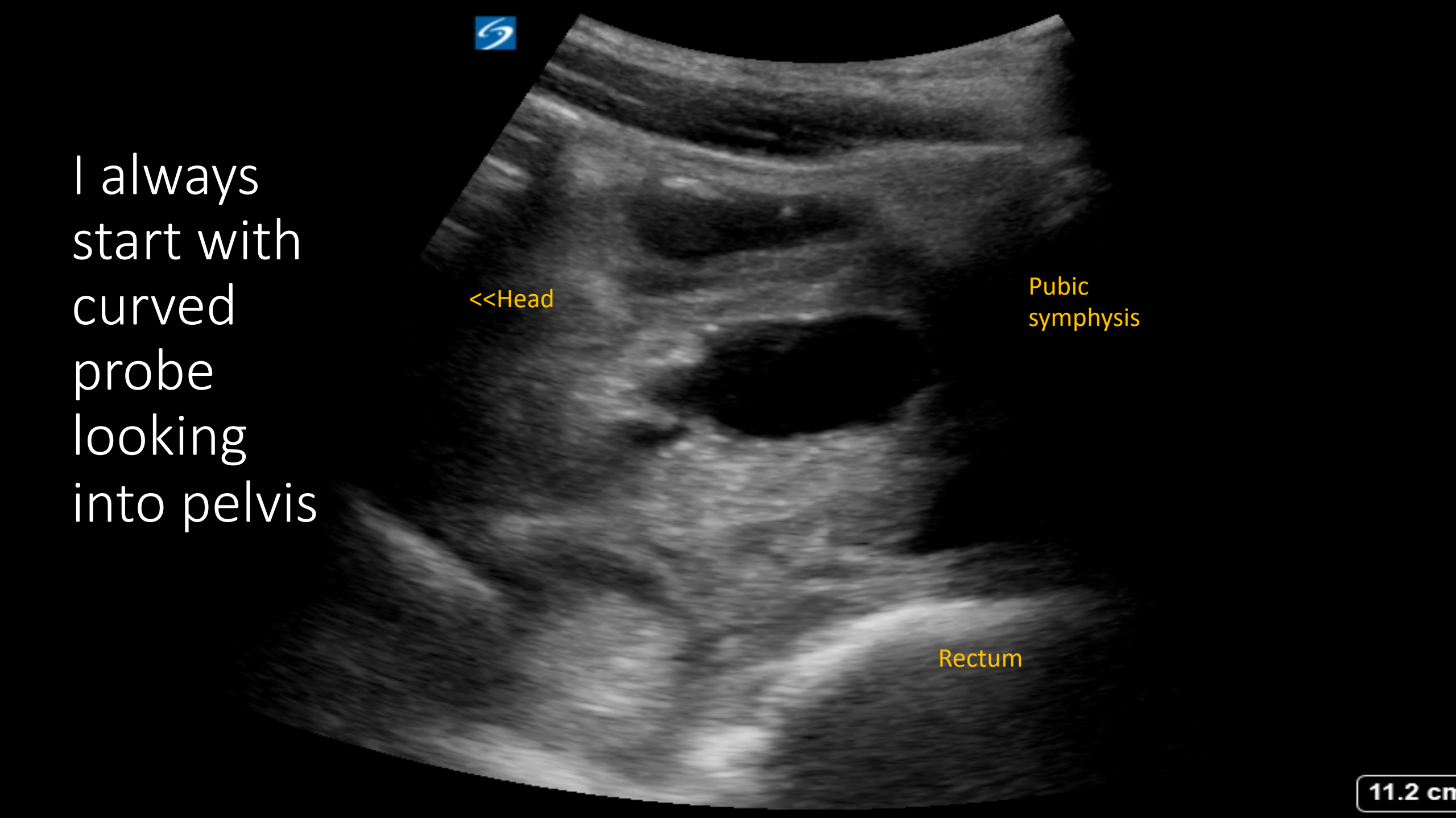


Formal USS report

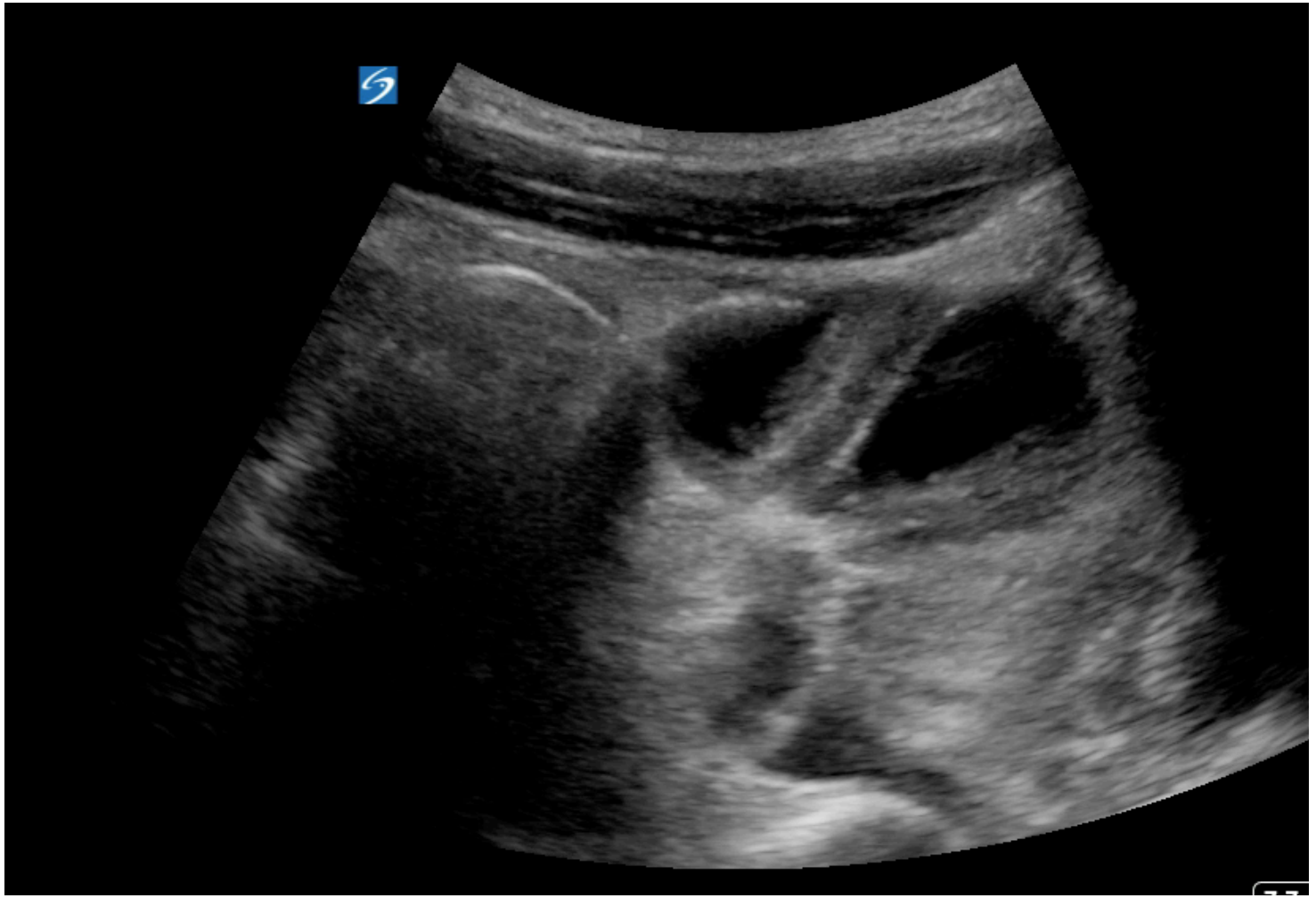
Cavalcol talking about perforated appx.

- No supporting signs seen.
- ‘Appx not identified’’

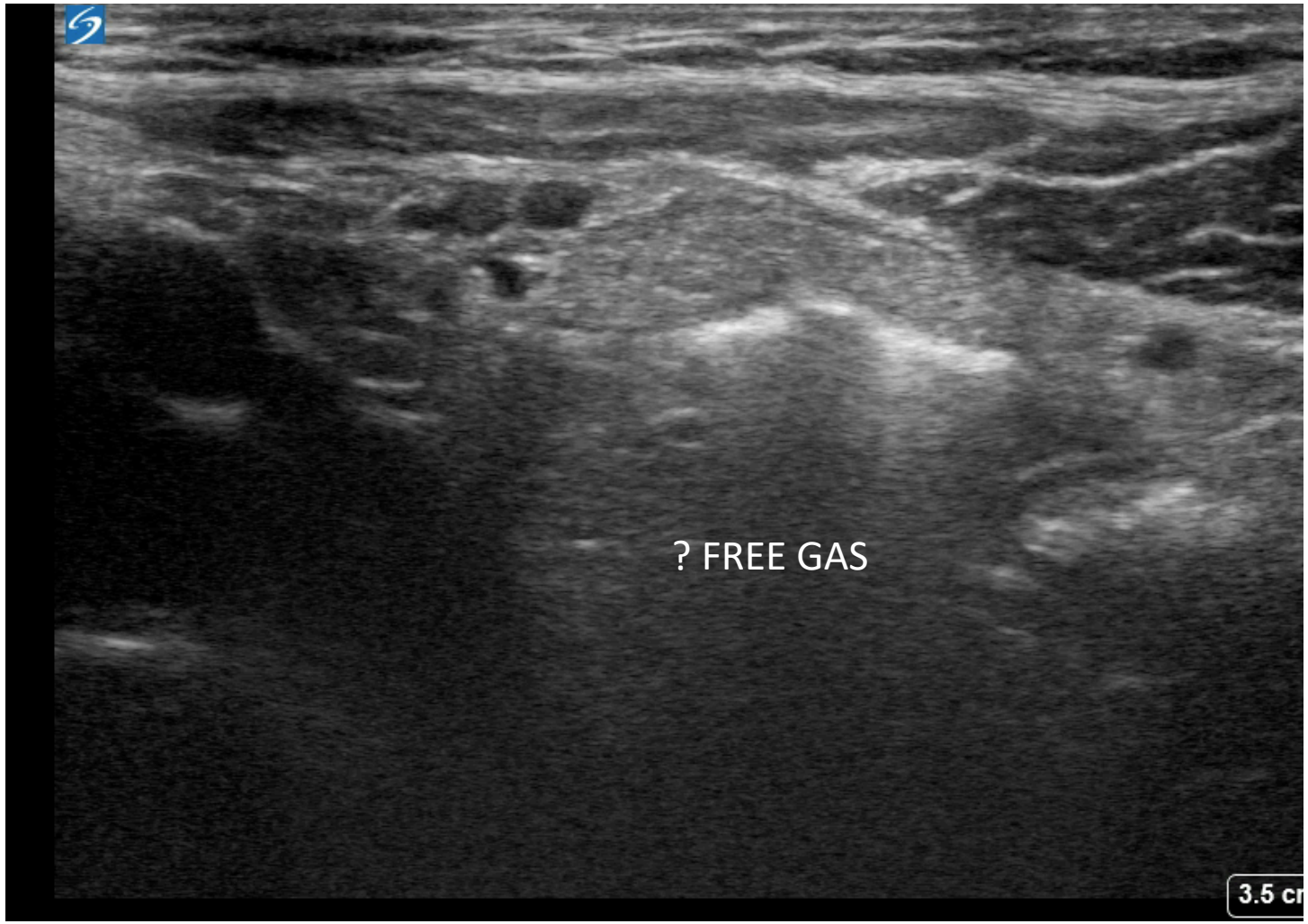
I always start with curved probe looking into pelvis

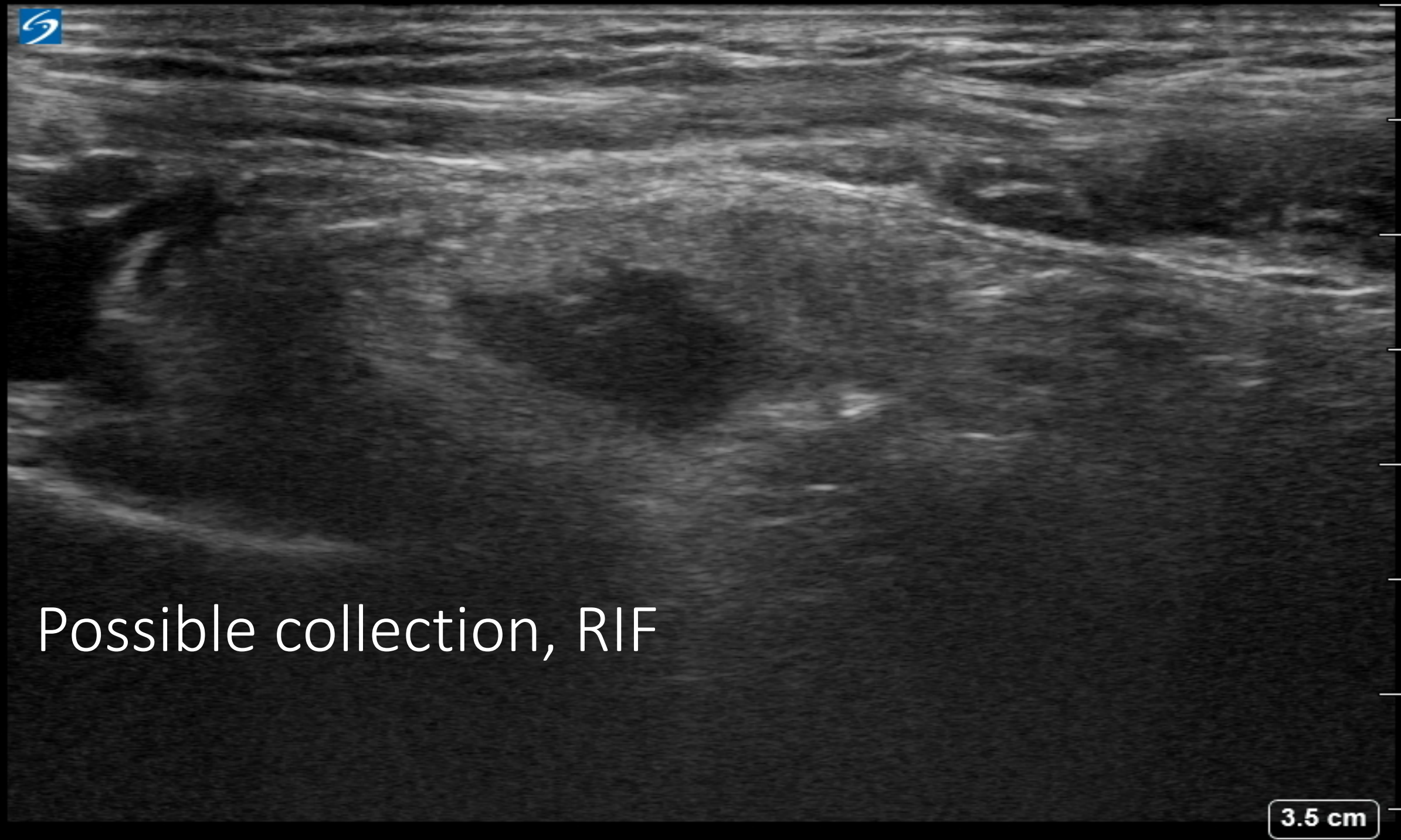


Dilated bowel, thick walls with poor movement.



Trans in RIF, terminal ileum – IMMOBILE

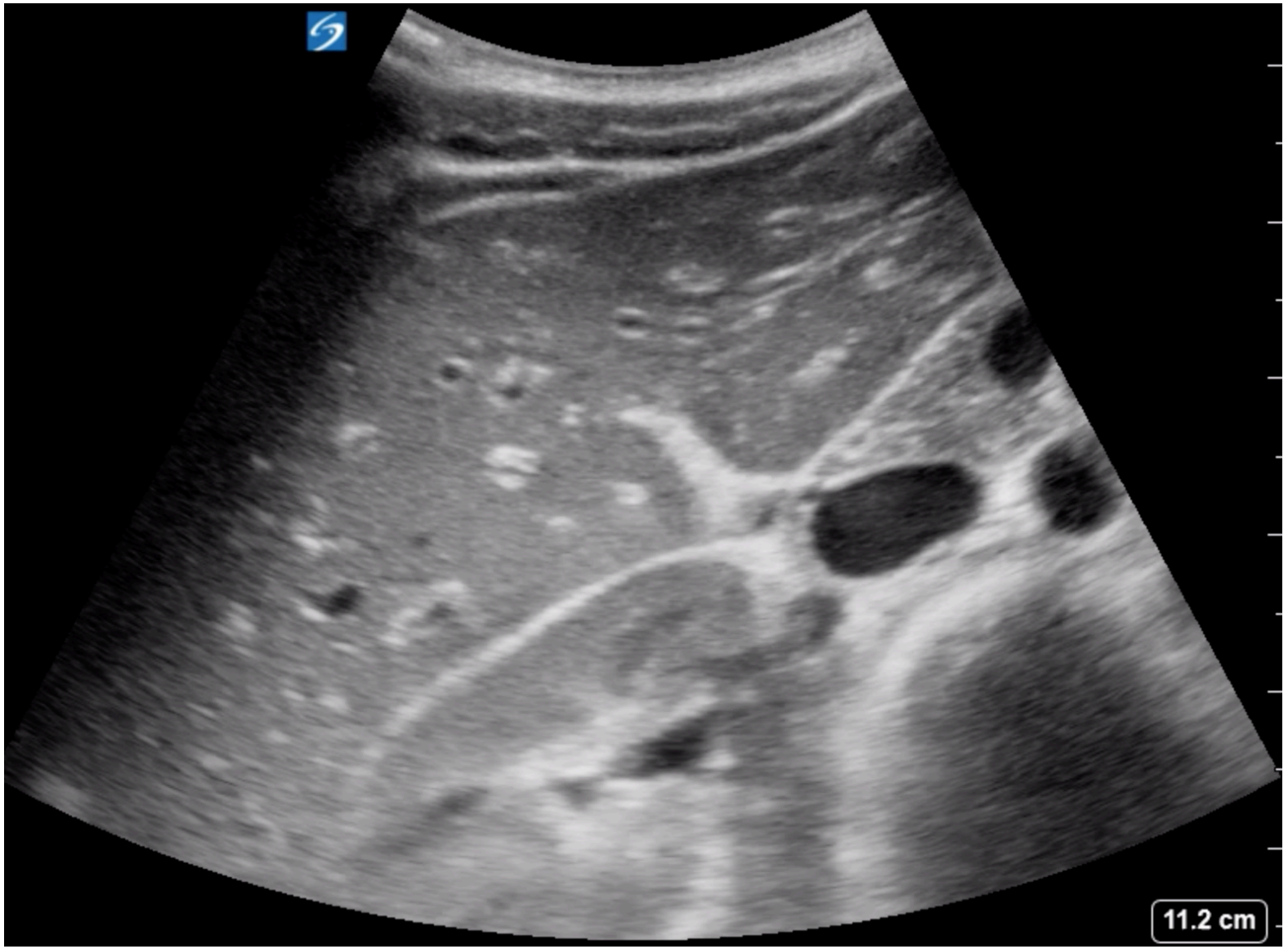


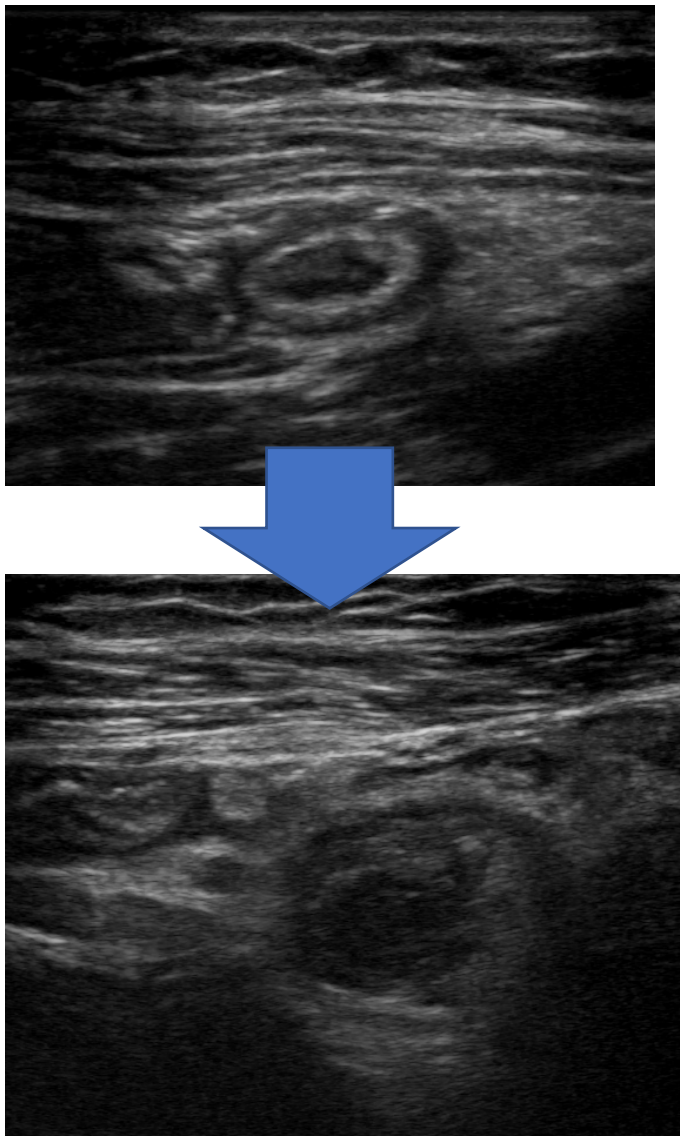


Possible collection, RIF

MISSED PERFORATION……

- Mirza W, Naveed M, Khandwala K. Utility and accuracy of primary and secondary ultrasonographic signs for diagnosing acute appendicitis in paediatric patients. Cureus. 2018`;10(12).***Retrospective chart review-*** M***irza states 5/36 perforations completely missed by USS.***
- Carpenter J, Orth R, Zhang W, Lopez M, Mangona K, Guillerman R. Diagnostic performance of US for differentiating perforated from nonperforated pediatric appendicitis. Radiology. 2017;282(3):835-41.***PROSPECTIVE, POOR SNs (80/182) but hi SPc. Good study, high volume, prospective, expert radiologists. Best sign = Complex peri-appendiceal fluid.***
- Tulin-Silver S, Babb J, Pinkney L, Strubel N, Lala S, Milla S, et al. The challenging ultrasound diagnosis of perforated appendicitis in children: constellations of sonographic findings improve specificity. Pediatr Radiol. 2015;45:820-30. ***Loss of hyperechoic submucosal stripe, increased periportal echogenicity, lots of free fluid and bright fat.***





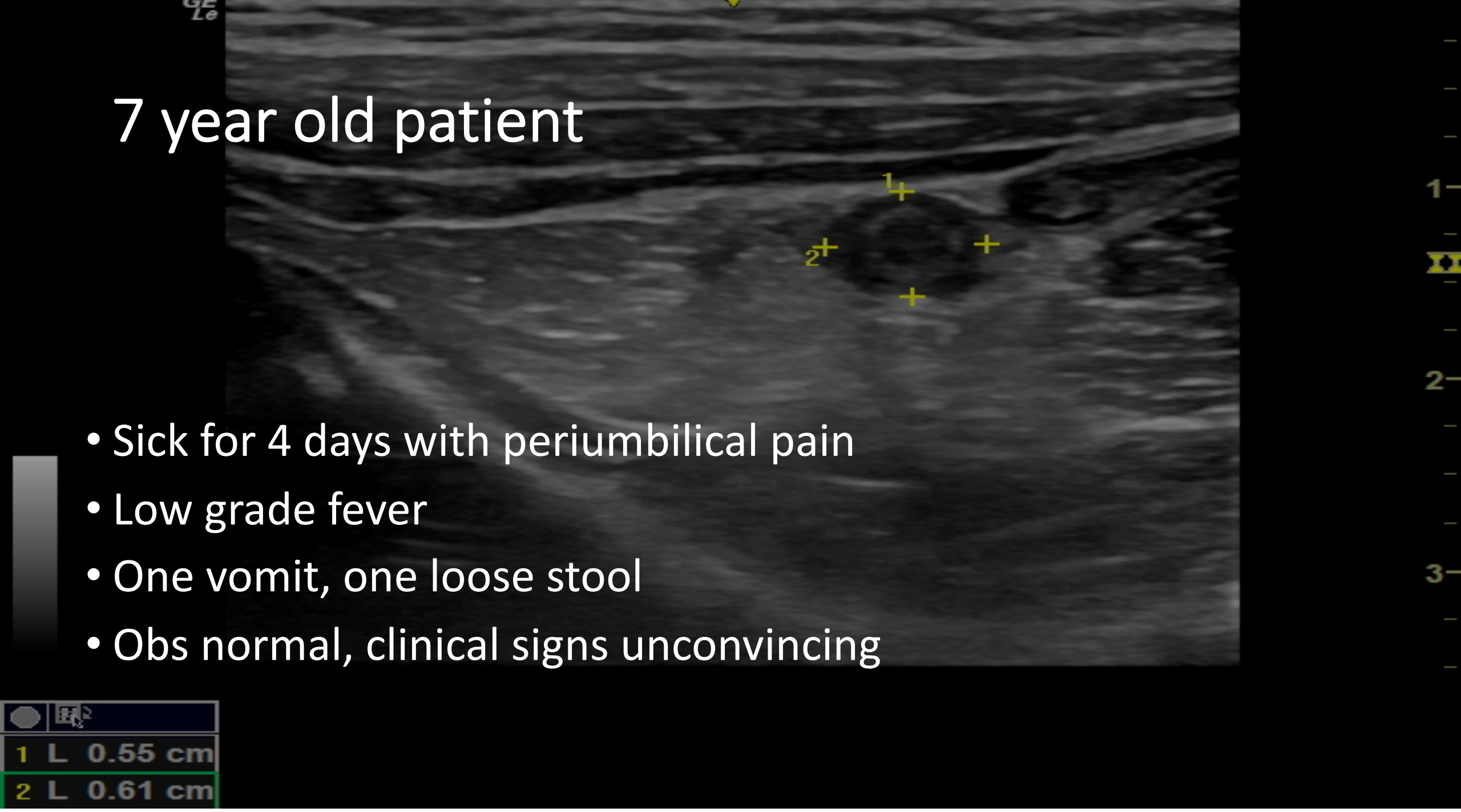
Perforated appx may decompress….


Learning point:
Even experts miss perforation
Start with an overview

Lesson 2

LESS IMPORTANT FALSE NEGATIVES….

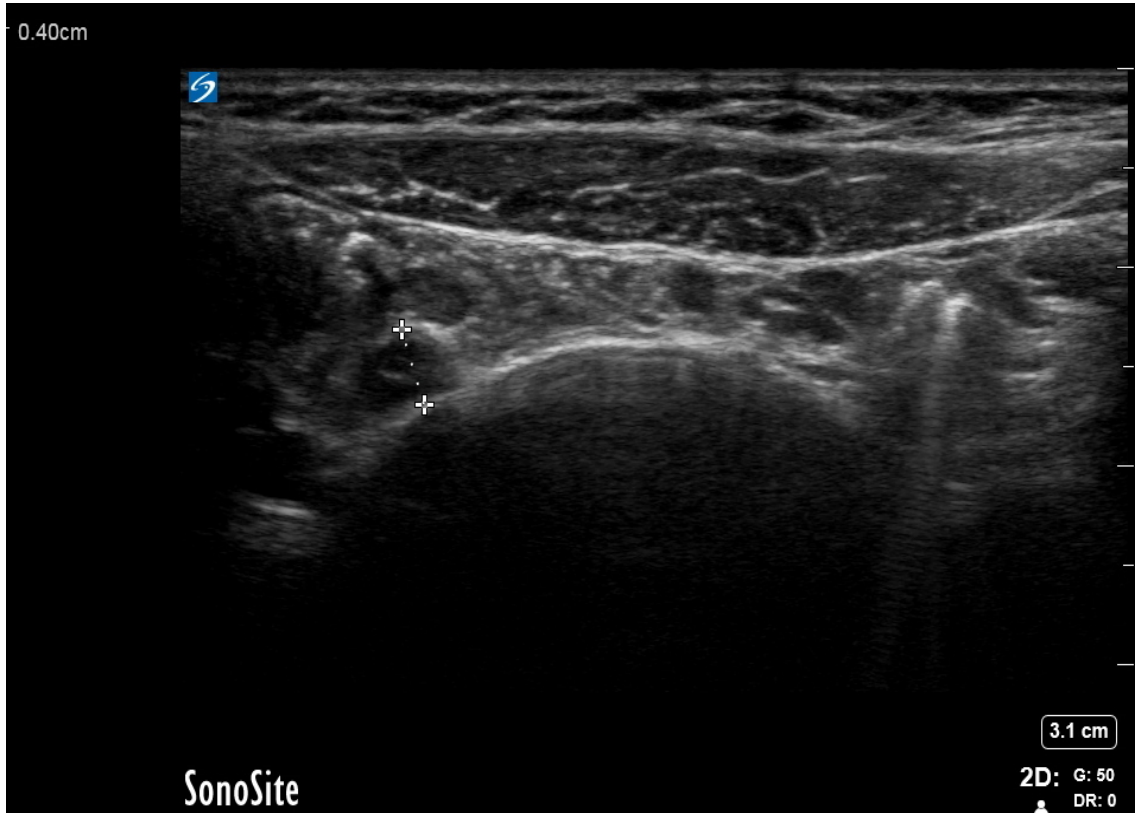
7 year old patient



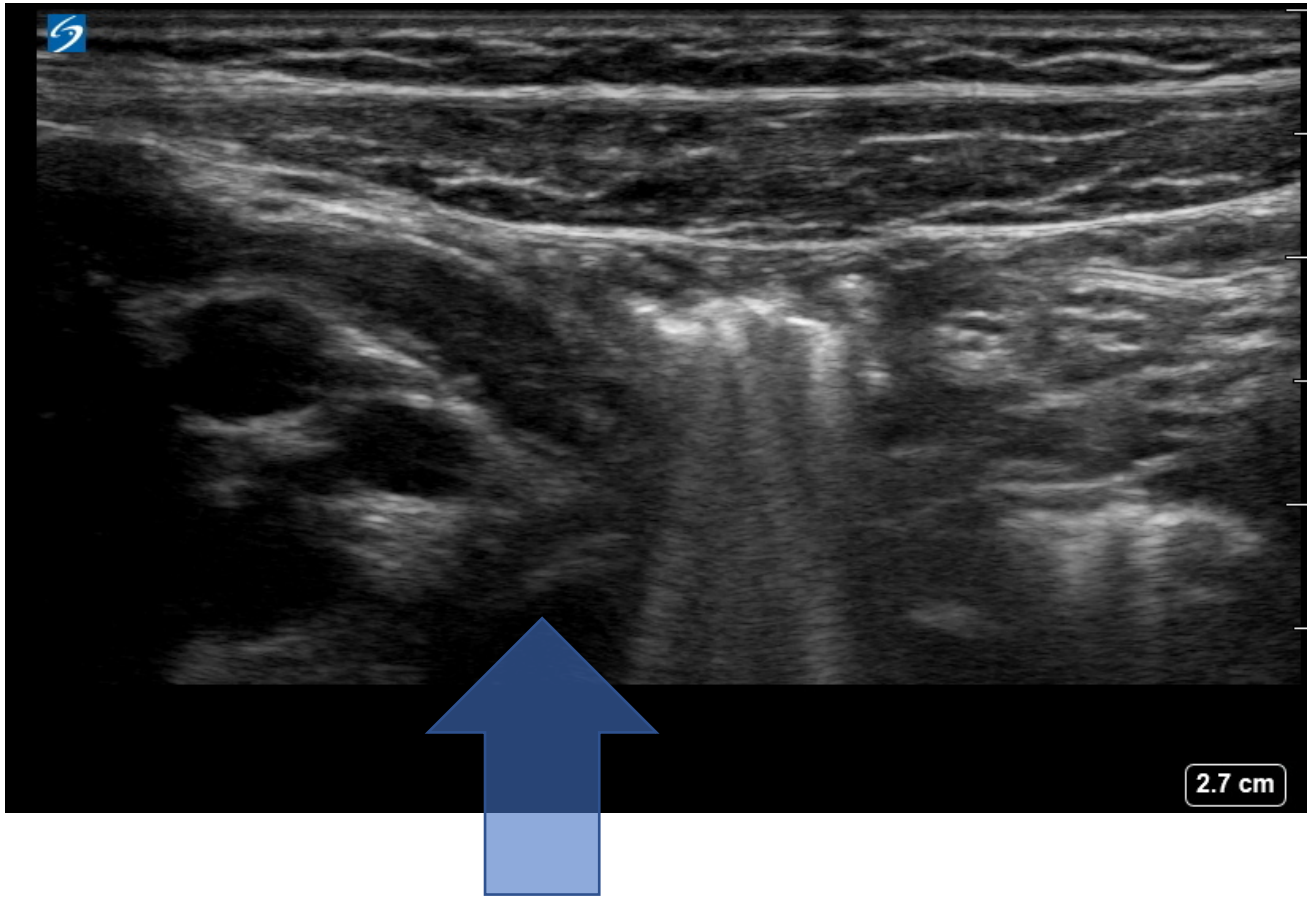
- Sick for 4 days with periumbilical pain
- Low grade fever
- One vomit, one loose stool
- Obs normal, clinical signs unconvincing

Appx DIVES…..

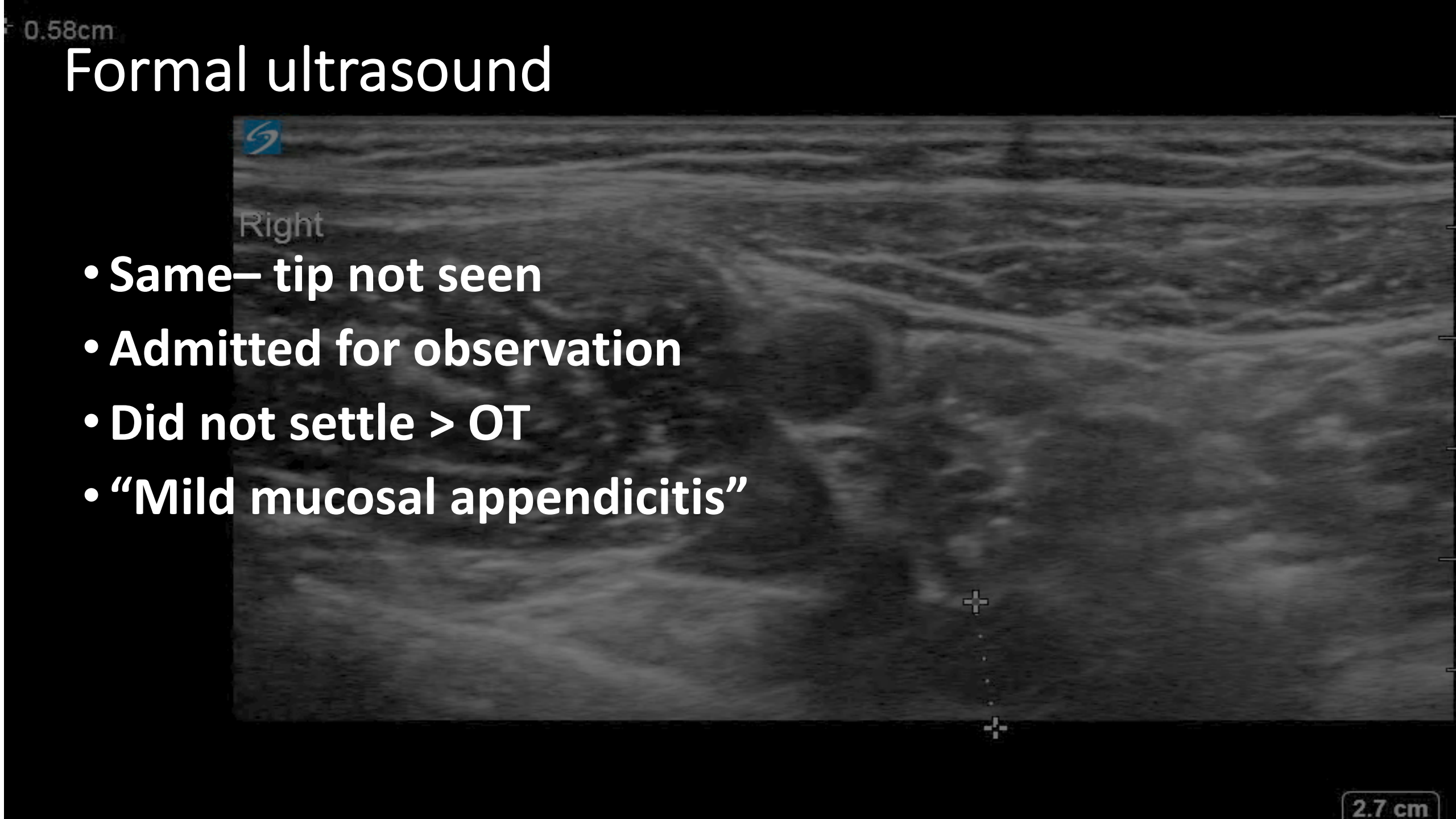
Appx easily FOUND



Seemed to get bigger near tip



Formal ultrasound



- **Same– tip not seen**
- **Admitted for observation**
- **Did not settle > OT**
- **“Mild mucosal appendicitis”**

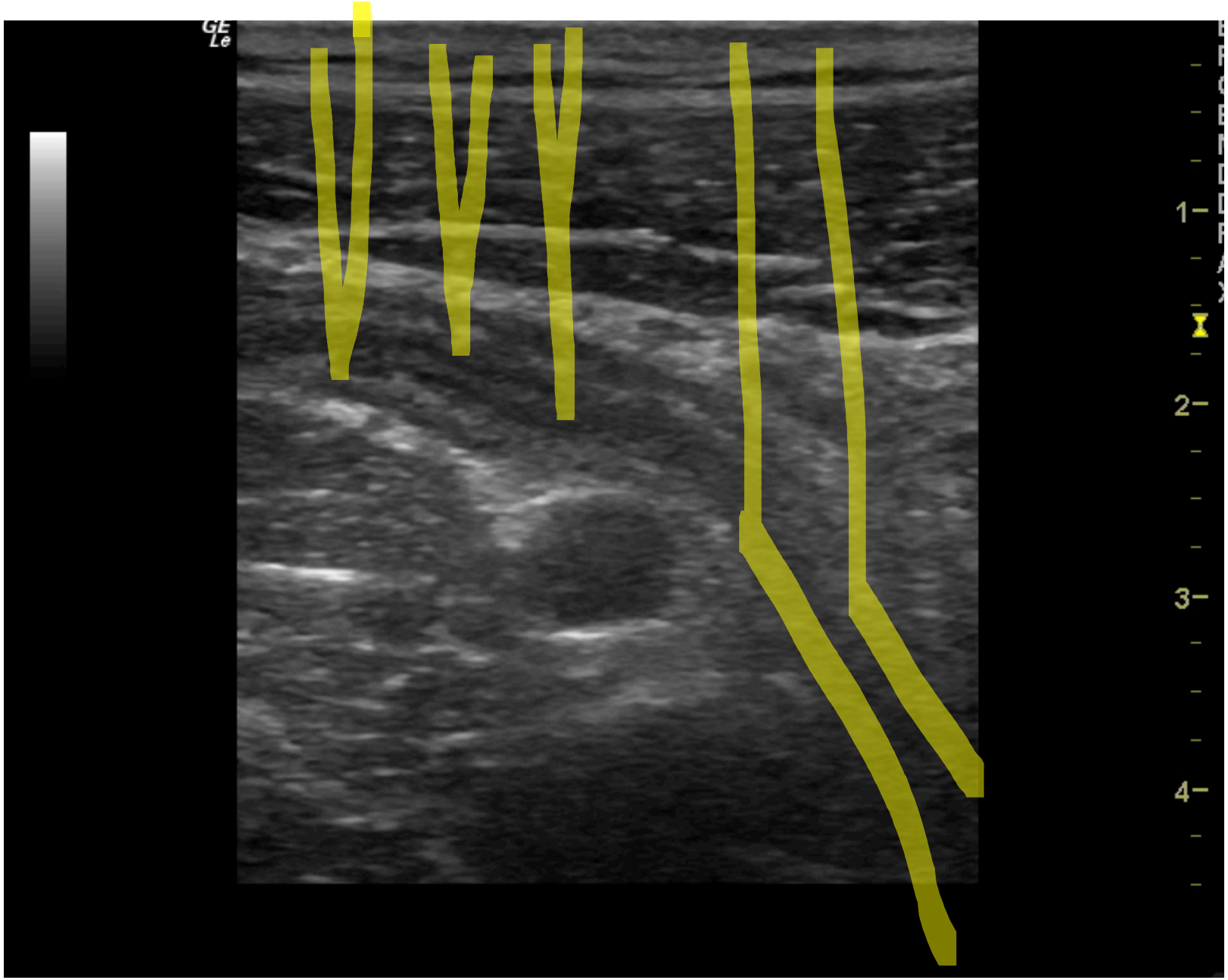
TIP APPENDICITIS – under and overcalled

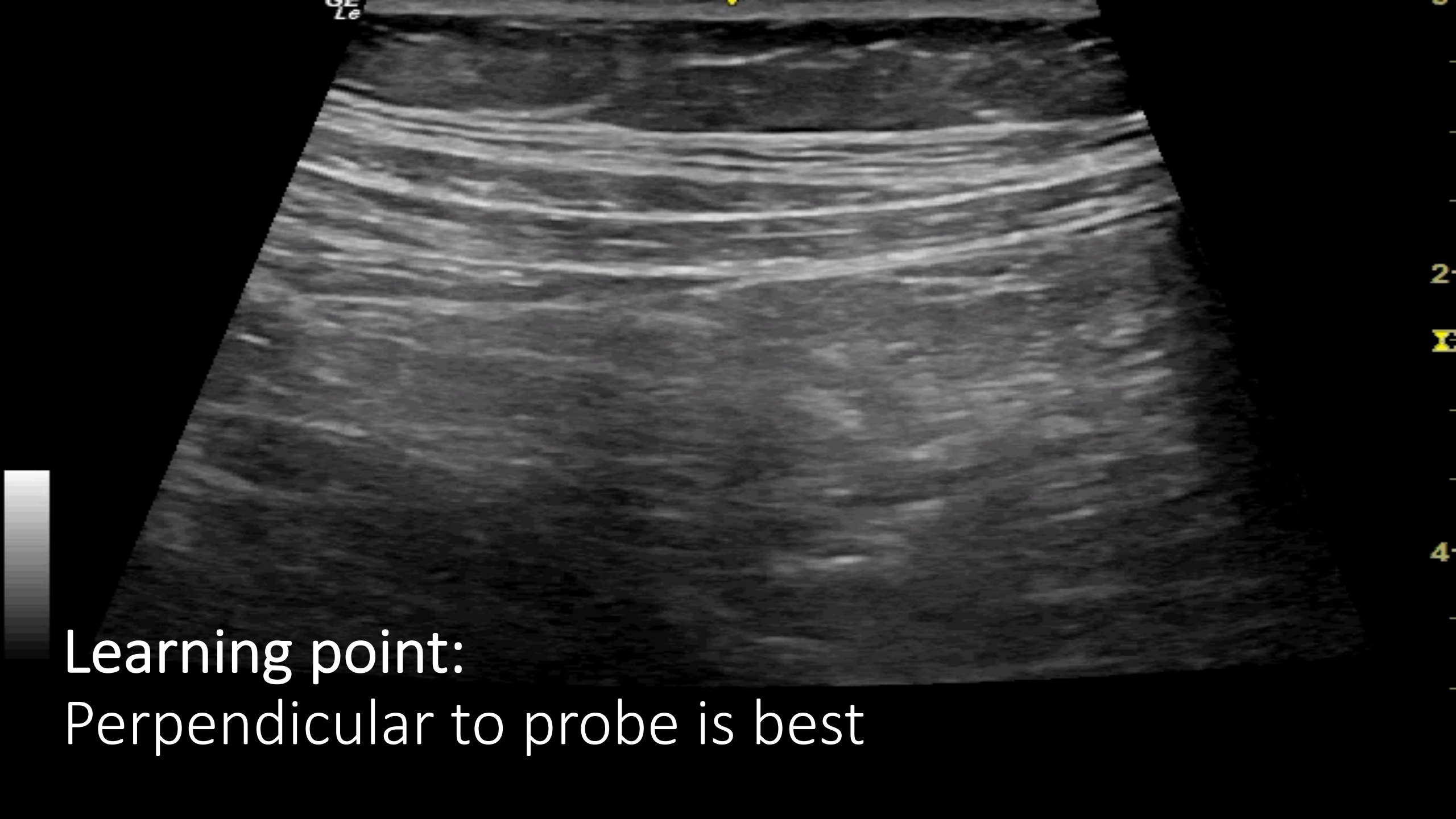
Leung B, Madhuripan N, Bittner K, Rastegar V, Banever G, Tashjian D, et al. Clinical outcomes following identification of tip appendicitis on ultrasonography and CT scan. Journal of Pediatric Surgery. 2019;54:108-11.

Of 32 "Tip appendicitis identified on USS" only 4 positive at OT.

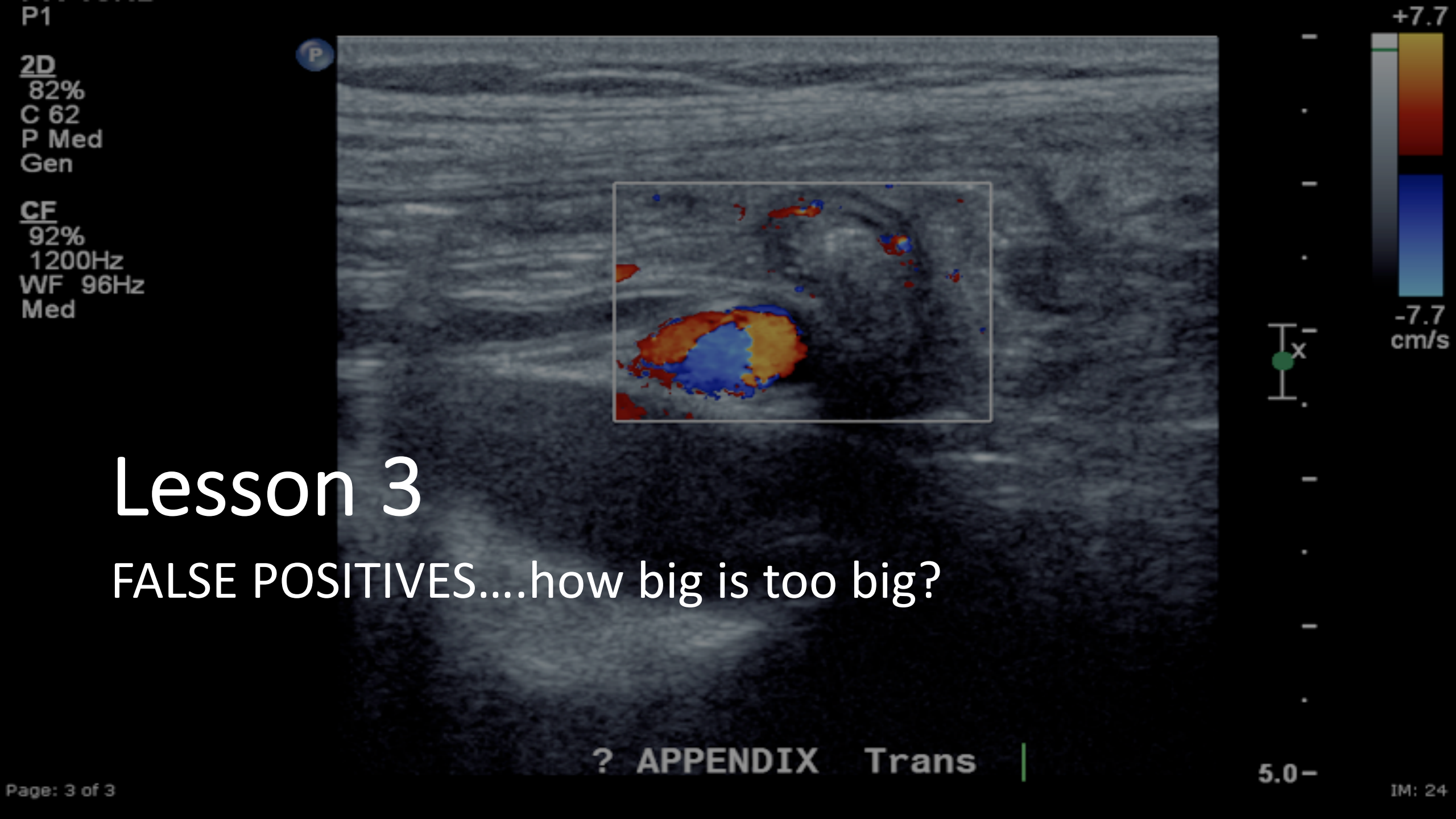
17 with tip appx on USS were managed non operatively.

Consider the physics…..



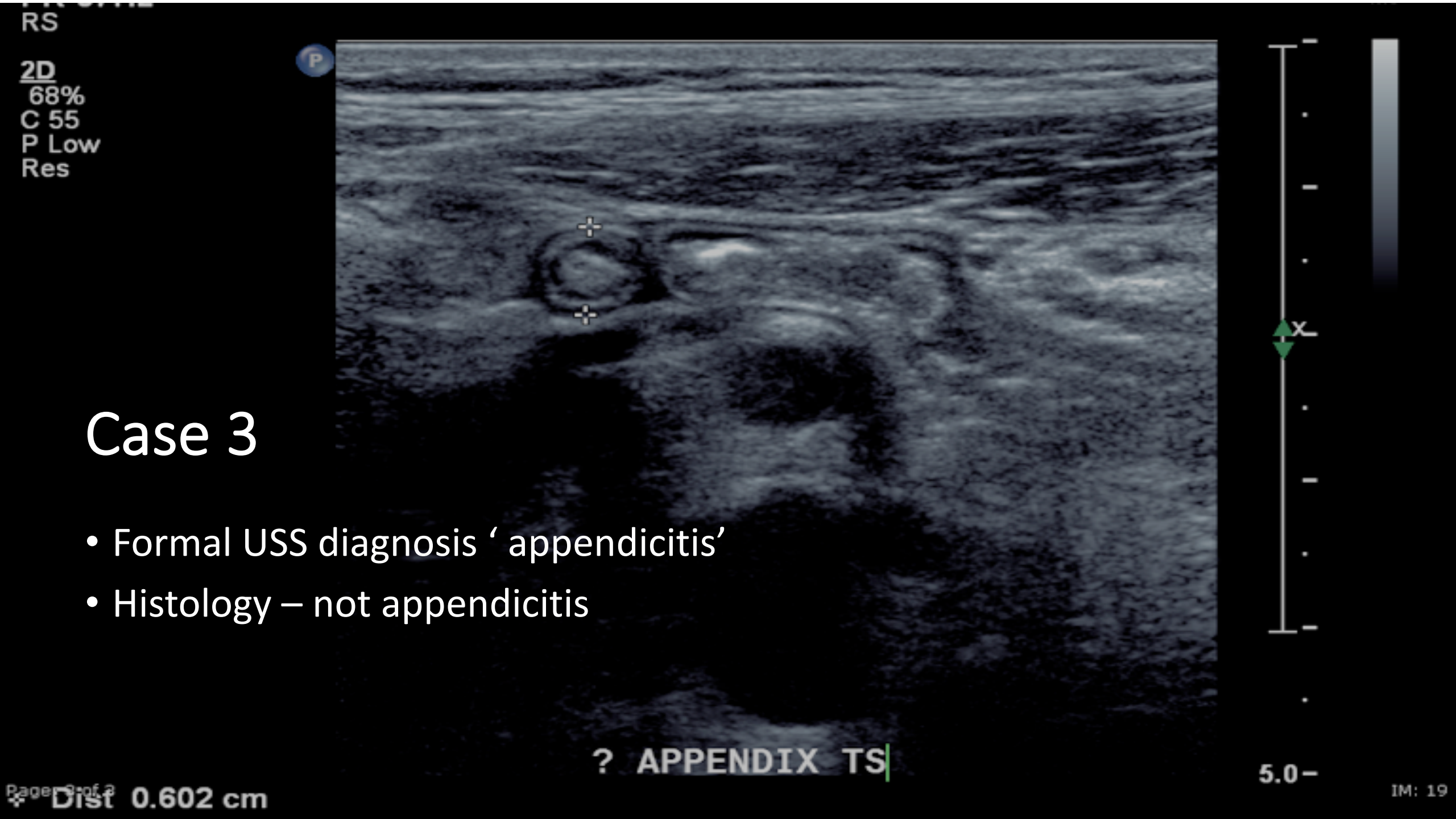


Learning point:
Perpendicular to probe is best



Lesson 3

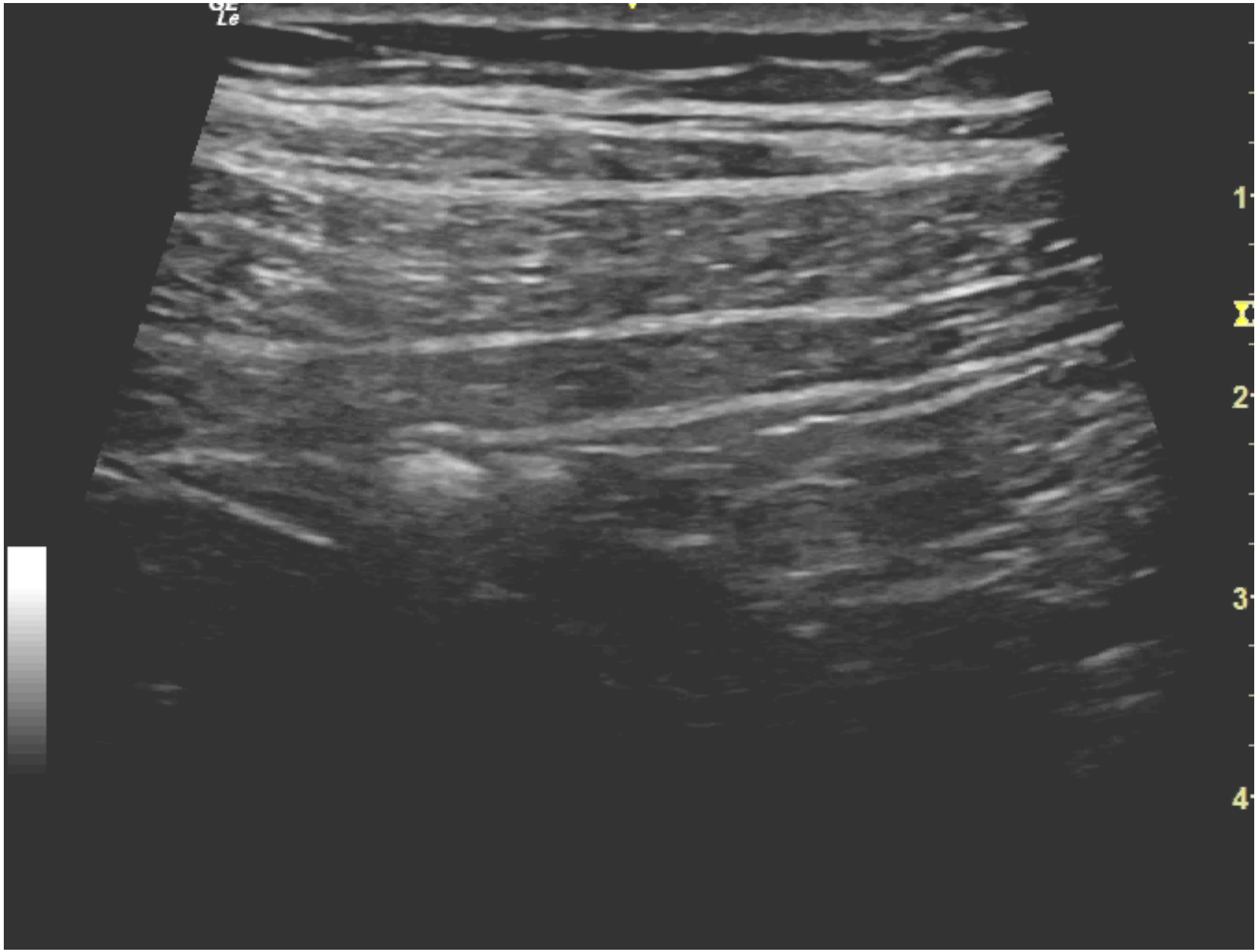
FALSE POSITIVES….how big is too big?



Case 3

- Formal USS diagnosis ‘ appendicitis’
- Histology – not appendicitis

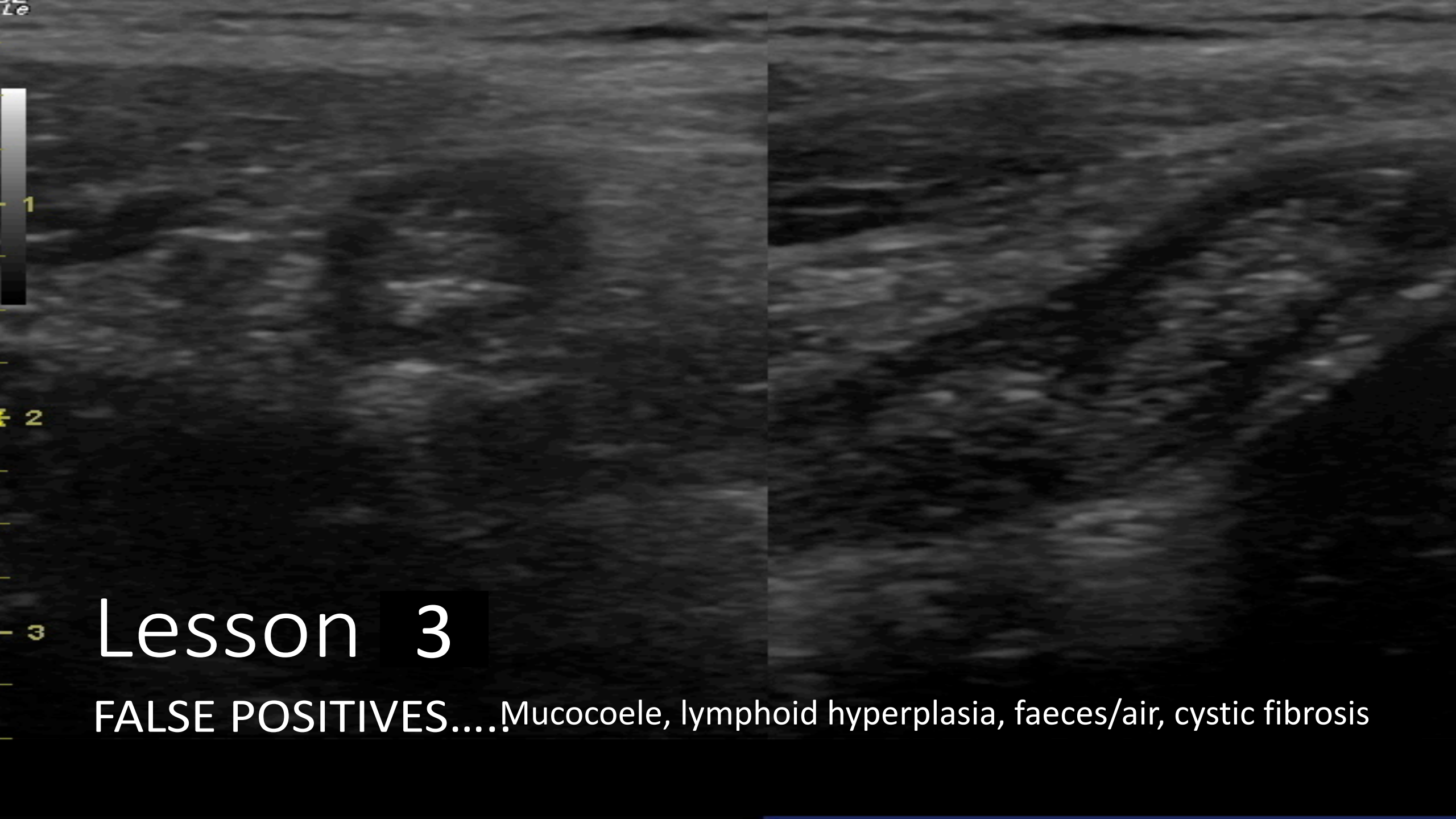
Increased diameter from contents



Does size matter?

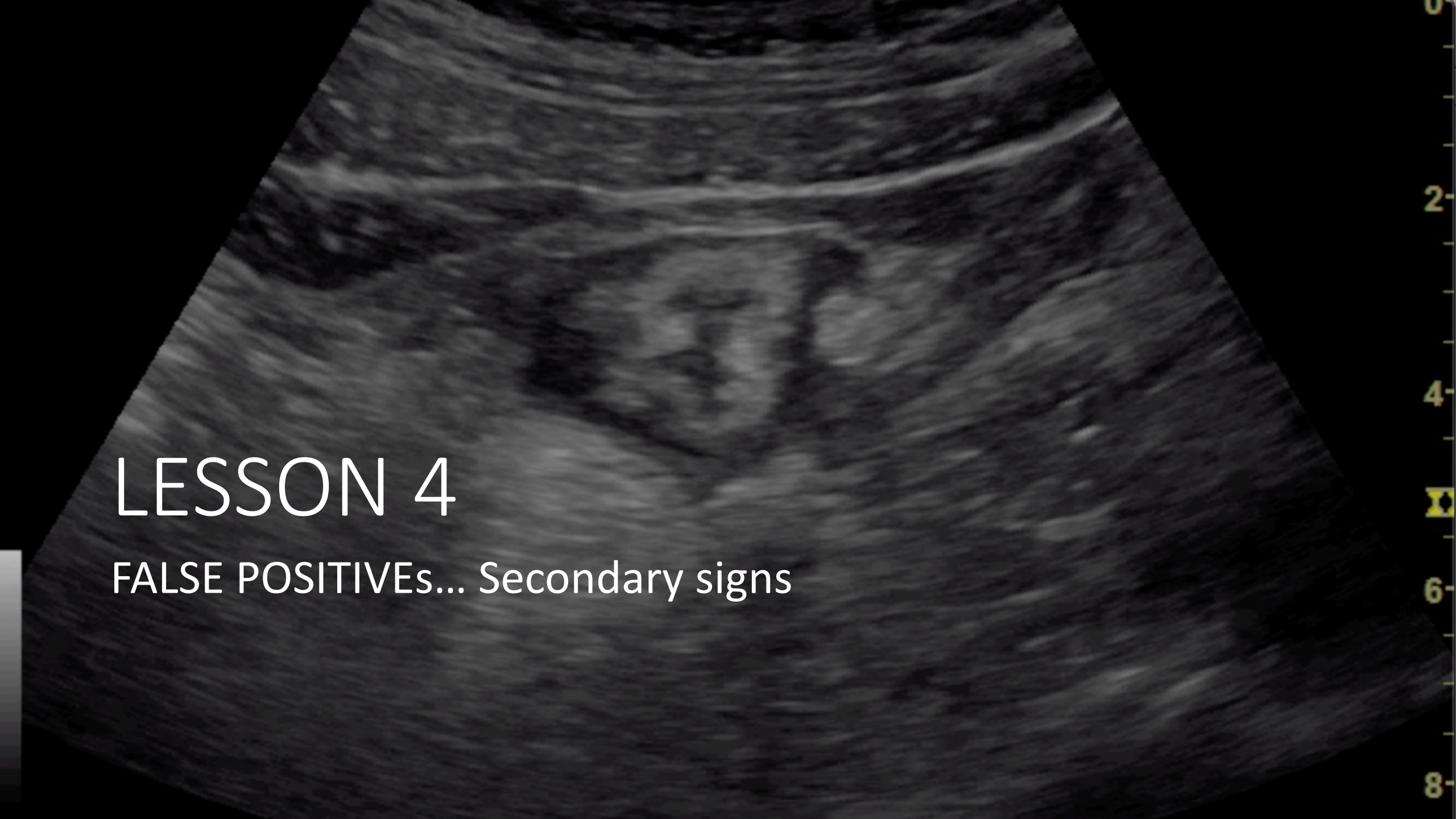
- Trout A, Sanchez R, Ladino-Torres M. Reevaluating the sonographic criteria for acute appendicitis in children. Acad Radiol. 2012;19:1382-94.

Size is not enough, it must be tender or inflamed



Lesson 3

FALSE POSITIVES....Mucocoele, lymphoid hyperplasia, faeces/air, cystic fibrosis

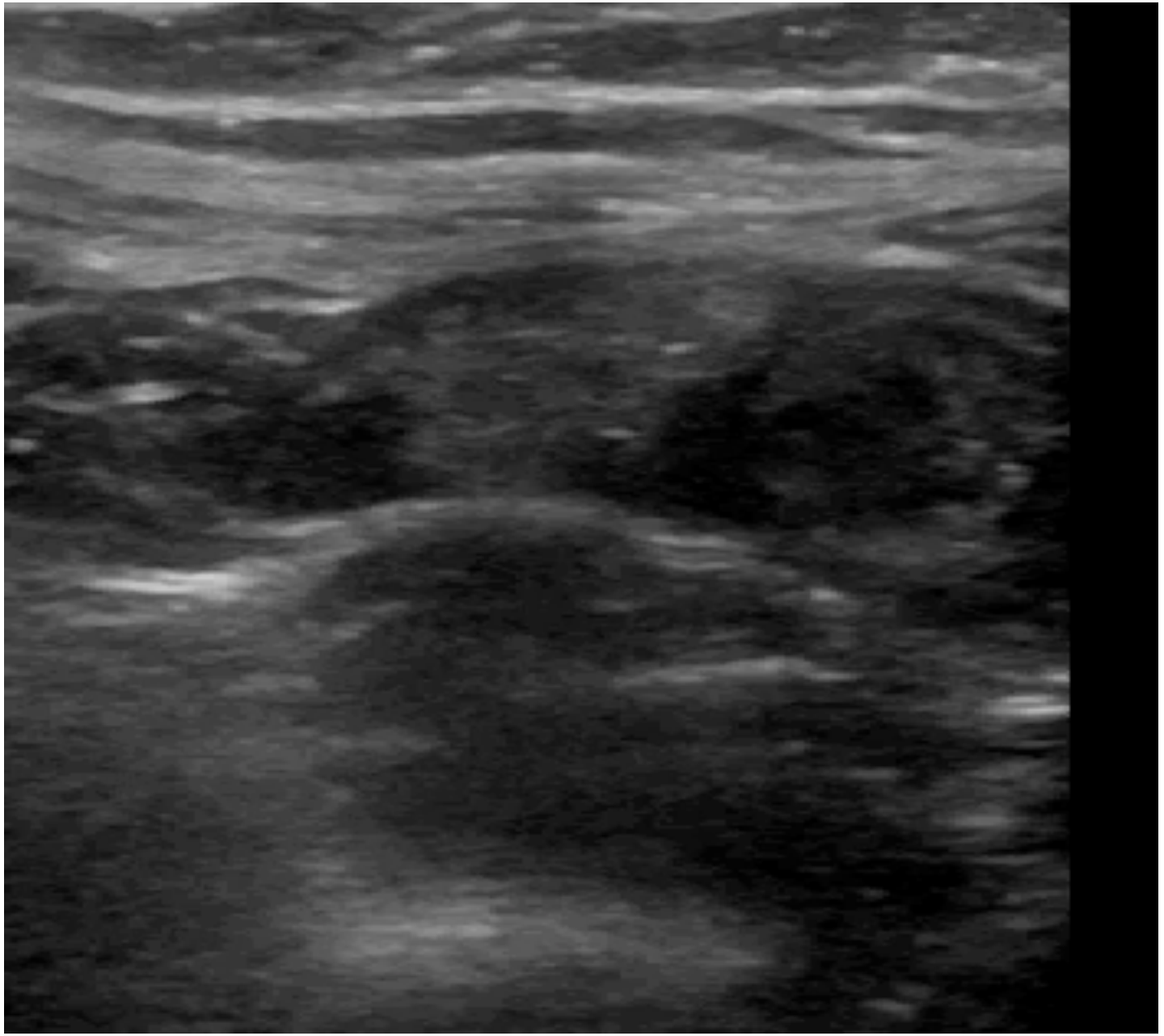


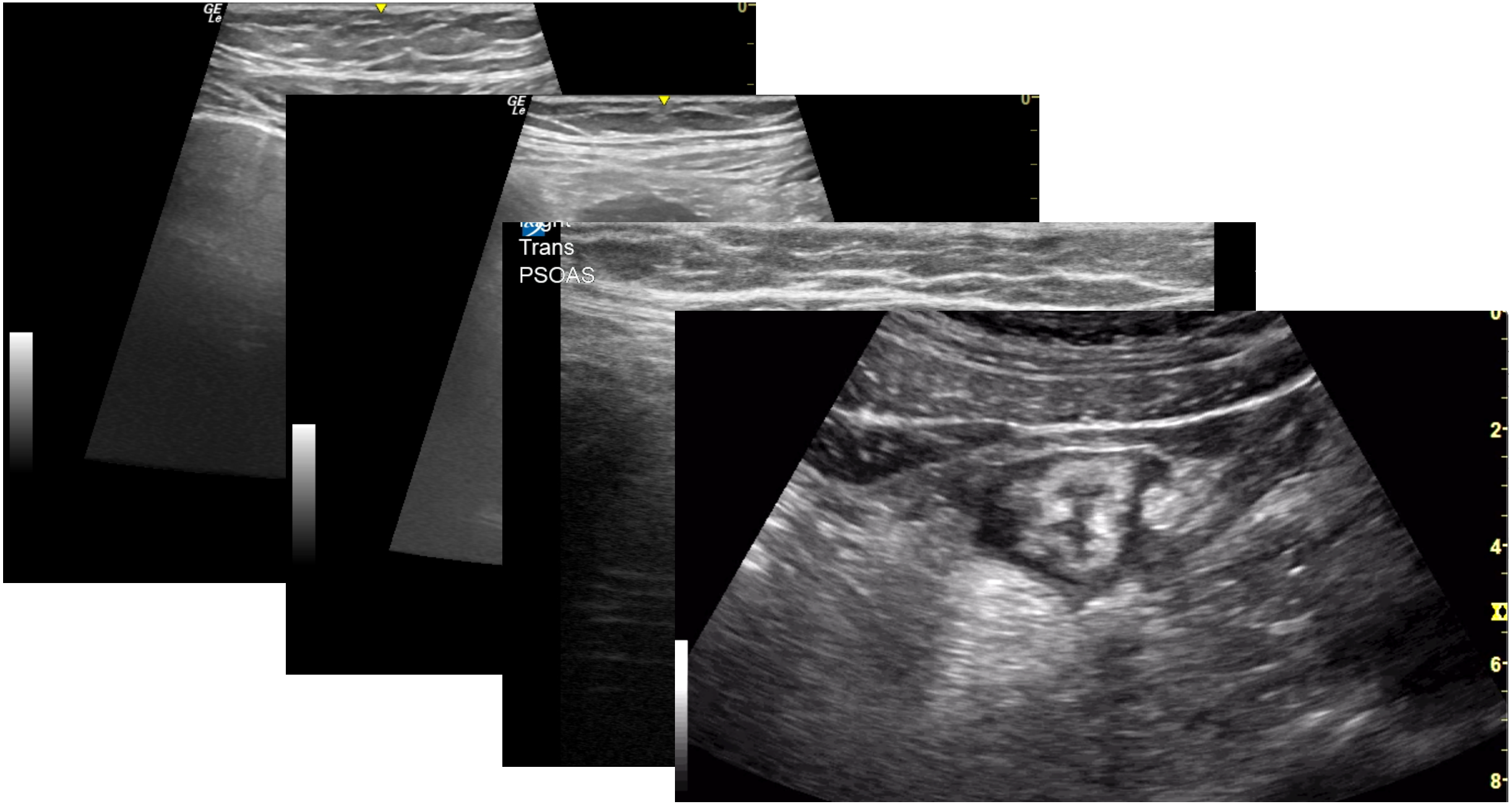
LESSON 4

FALSE POSITIVEs… Secondary signs

Young woman, sudden onset RIF pain.

Appx not seen but much free fluid with strange floaty bits, and exquisite pain…




Trans
PSOAS
2
4
6
8

‘Secondary signs’

- Reddan T, Corness J, Harden F, Mengersen K. Improving the value of ultrasound in children with suspected appendicitis: a prospective study integrating secondary sonographic signs. Ultrasonography. 2019;38(67-75).
  BRIGHT FAT - *Free fluid, nodes and ileus may have negative predictive value.*
- **.** Mirza W, Naveed M, Khandwala K. Utility and accuracy of primary and secondary ultrasonographic signs for diagnosing acute appendicitis in paediatric patients. Cureus. 2018`;10(12). NB Pakistan, retrospective RV.

  BRIGHT FAT - *decreased peristalsis, free fluid, inflamed caecum*

  (52 patients with ONLY supporting signs, 38 were positive for appx)

- Trout A, Sanchez R, Ladino-Torres M. Reevaluating the sonographic criteria for acute appendicitis in children. Acad Radiol. 2012;19:1382-94.

  BRIGHT FAT – *loss of submucosal echogenicity*

How useful are Secondary Signs?

SECONDARY SIGNS* 2017-2018	YES APPENDICITIS	NOT APPENDICITIS	Totals
SSx SEEN	17	11	28
SSx NOT seen	2	64	66
	19	75	94

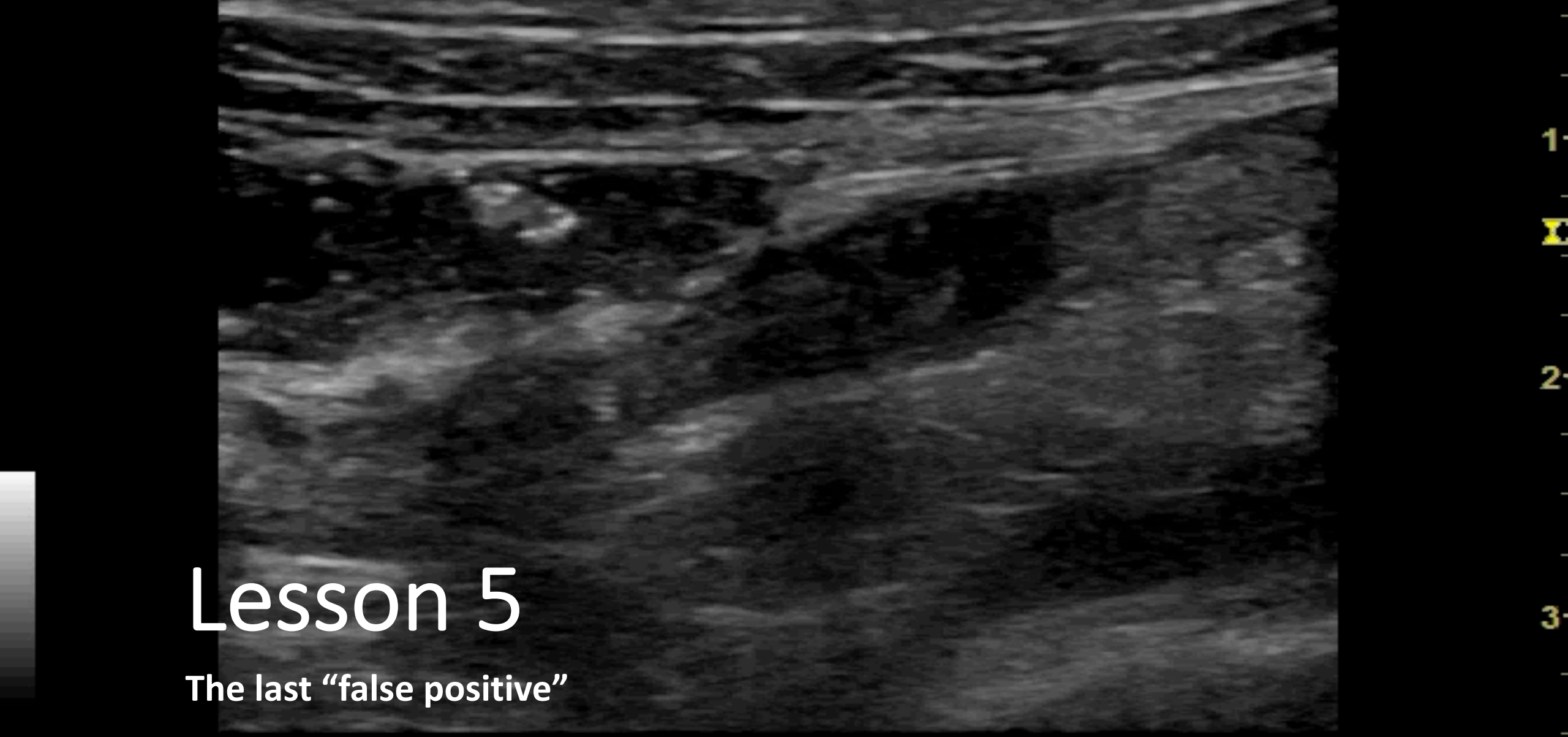
+LR 6.1 **(3.5-10)**

-LR 0.1 **(0.03-0.5)**

SNs 89 (95%CI 65 -98)
SPc 85 (95%CI 75-92)

*Bright fat, free fluid, ileus NOT including nodes, vascularity, periportal flare, faecolith


Learning point:
Secondary signs are sensitive but not specific
Secondary signs are culture and context specific
11.2 cm



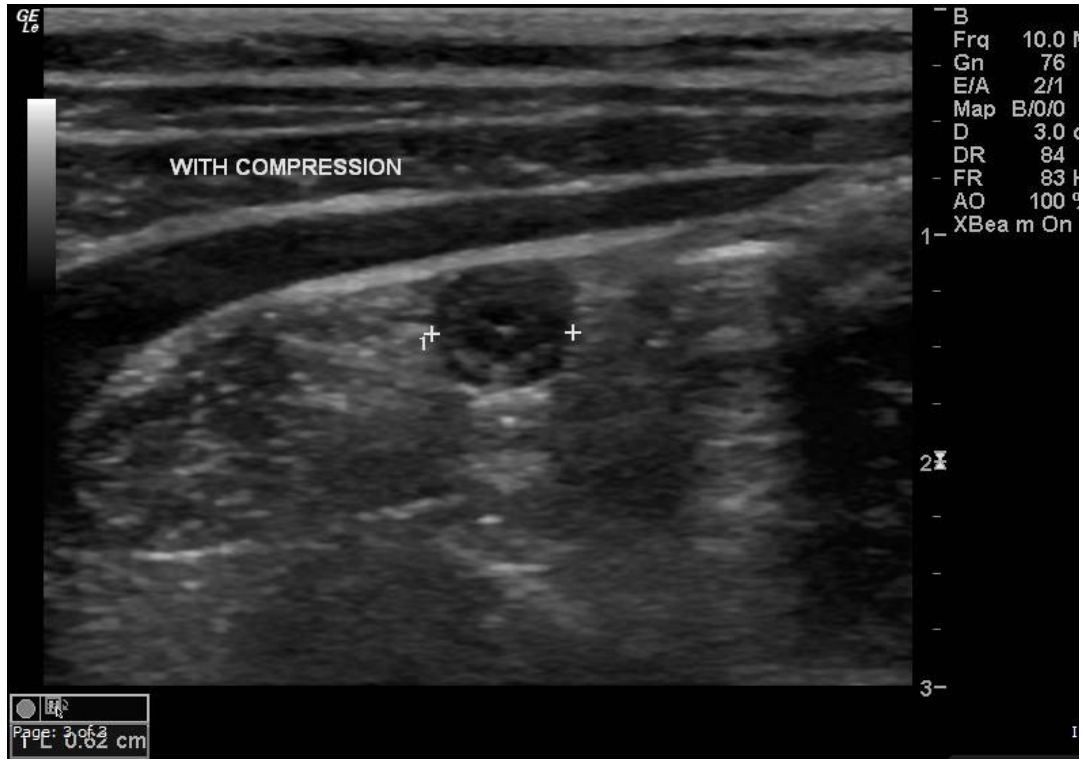
Lesson 5

The last “false positive”

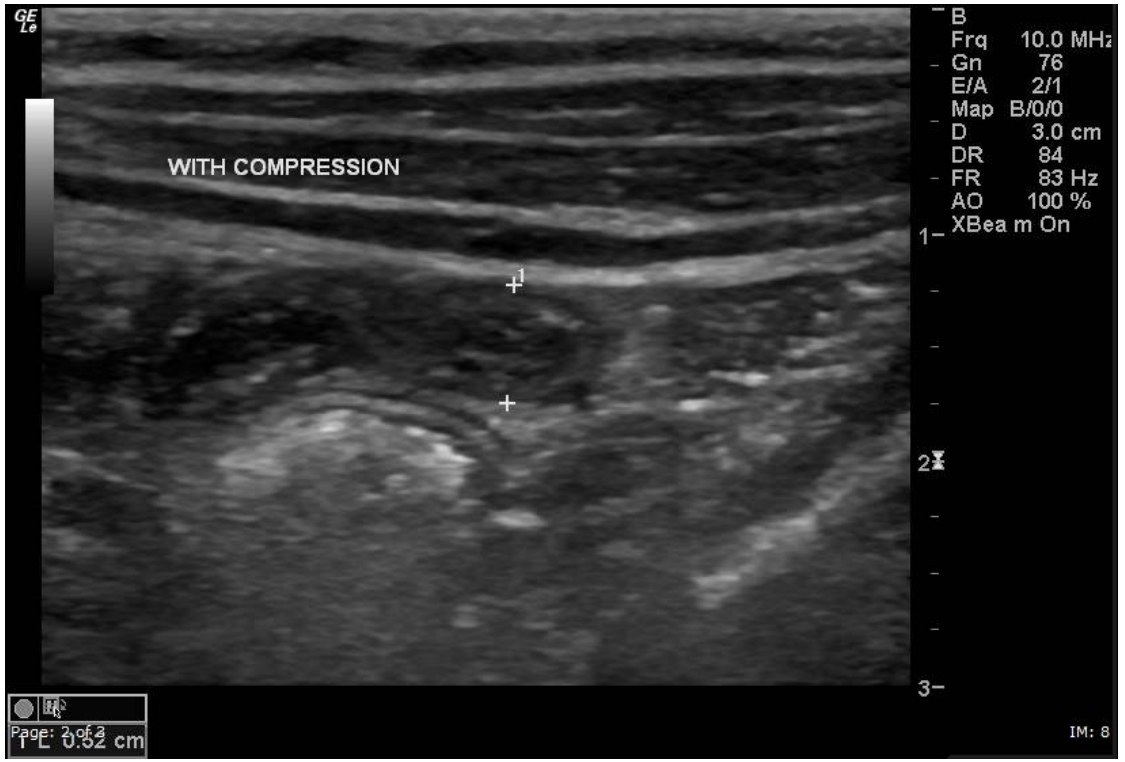
6 year old

- Intermittent RIF pain
- Sore 3 days
- Anorexic
- Now settling
- Obs normal, bloods normal

Appendix easily identified, borderline enlargement but not focally sore

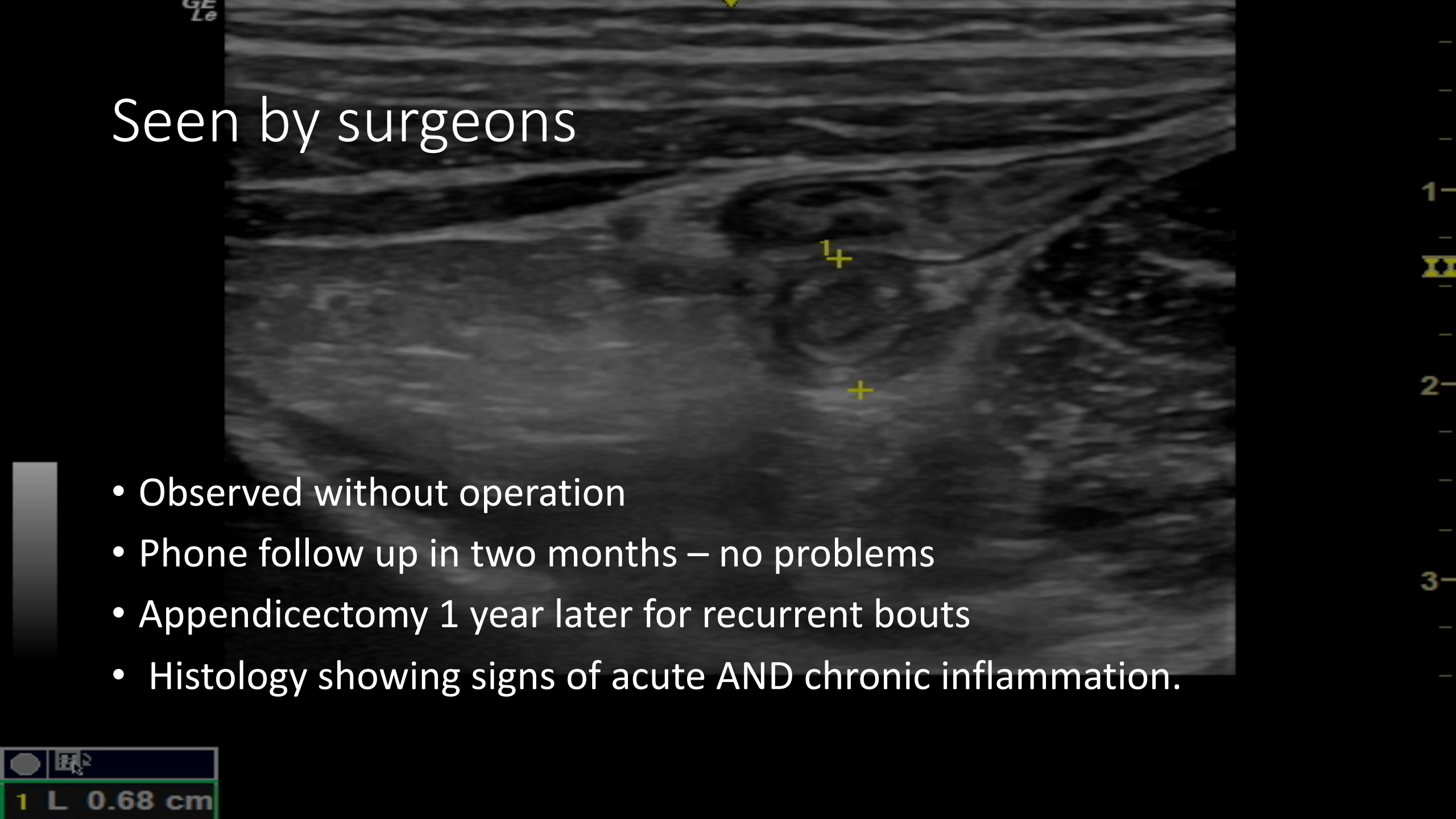


Transverse



Long

Seen by surgeons



- Observed without operation
- Phone follow up in two months – no problems
- Appendicectomy 1 year later for recurrent bouts
- Histology showing signs of acute AND chronic inflammation.

Expectant management of Appx

- Wijayanayaka T, Davidson J, Butter A. Does size matter? Correlation of ultrasound findings in children without clinical evidence of acute appendicitis. Journalof Pediatric Surgery. 2018;53:980-3.

Retrospective chart review- ***of 31 patients with US diagnosed appendicitis (size>6mm +/- bright fat) were managed without any Rx, and did well, only two required interval appendicectomy much later, no complications ensued.***

- Cobben et al of 60 patients over 10 years, with USS diagnosed appendicitis, 38% had recurrent attacks


Learning point:
Appendixes do grumble
If not tender - not urgent.
Consistent focal tenderness is a useful sign.
2.7 cm

Summary: HOW to scan the appendix

1. Start with the WIDE VIEW,
2. TARGET stillness and tenderness
3. Appx must be traced to TIP
4. Must be TENDER
5. WALL THICK not luminal contents
6. SECONDARY SIGNS should prompt further Ix.
7. Appendixes CAN grumble.

TIME TO RE-CALIBRATE ?

Summary Subplot:

“An unexamined life is not worth living”

PLATO.

And how many appendixes did you see??