

Ultrasound In The Emergency Department

The FAST Exam!

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ED Ultrasound

- A Special Use and Form of Ultrasound
- Goals and Philosophy are Different than “Formal” Ultrasound
- ED Ultrasound Tries To:
 - Improve patient care by decreasing time to disease diagnosis and definitive care (surgery)
 - Rapidly rule in/out diseases by asking specific questions that can be easily answered with simple yes/no answers

ED Ultrasound

- ◎ Common clinical scenarios/questions
 - Pericardial effusion?
 - Intra-abdominal fluid?
 - Ruptured AAA?
 - Ectopic Pregnancy?
 - Cardiac Motion?

ED Ultrasound

● Newer Cutting Edge Uses:

- Orbital ultrasound – retinal detachment
- Pneumothorax
- Hemothorax
- Detect esophageal intubation
- Central line insertion
- Rapid fracture detection
- Abscess evaluation
- Gall Bladder and DVT assessment

ED Ultrasound

- ⦿ Key to being safe ED sonographer is the ability to call scan **inconclusive**
 - Positive or negative scans are easy
 - Must avoid false negative scans
 - Must be able to disregard images and proceed as without scan
- ⦿ EDU is only an adjunct to clinical skills

Outline

- Overview with focus on “FAST” Exam
- Review Imaging techniques
- Review Sonographic Anatomy
- General Image Review

F.A.S.T.E.L.A.M.?

◎ Focused Assessment in Trauma

- One of the most extensively studied areas of emergency ultrasound
- Can predict need for laparotomy in trauma
- Can detect a minimum of 200cc of fluid
 - Has a sensitivity of 8-100% for detection
- BUT - never been shown to change outcome

FAST Exam

- In spite of the pro's and con's, ED ultrasound and "FAST" exam has really revolutionized care in the ED for patients with life threatening problems
 - Is essentially the standard of care for trauma patients across North America
 - Training in "FAST" and Emergency Ultrasound use is part of mandatory teaching in Emergency Medicine training programs

Fast Exam

- The Goal of The FAST Exam is:
 - Rapidly screen patients to determine who may need for urgent laparotomy
 - Rapidly assess for the etiology of hypotension in a trauma patient

FAST Exam

- ◎ FAST Examines the following:
 - Free Fluid in Abdomen
 - RUQ/LUQ/Pelvis
 - Pericardial Fluid
 - Using Subxiphoid view
 - Fluid in Thorax (FAST +)
 - RUQ/LUQ
- ◎ All this can be done in 90 seconds
 - (if you are lucky!)

Is FAST Better Than Current Practice?

● What about DPL and CT, or physical?

DPL is very sensitive - overly sensitive??

- Can detect 20 cc blood in 1 L saline
- Lots of contraindications

CT

- Not good for unstable patient
- 30 min time commitment
- Can detect 100-250 cc blood

Physical exam can be normal in 50% of positive laparotomy's

Clinical Application

● What does POSITIVE scan mean?

Free fluid in abdomen

- Does not mean blood
- Does not indicate need for laparotomy
- Does not necessarily explain hypotension

Clinical Application

● What does NEGATIVE scan mean?

There is less than 200 cc fluid in belly

- Does not mean that laparotomy is NOT needed
- Does not mean source of hypotension is not in abdomen
- You may have missed free fluid

Clinical Application

- ① How should the scan results influence management?
 - The message here is always use **CLINICAL JUDGEMENT**
Results must be correlated to clinical situation
Always ask if patient stable or unstable?

FAST Exam

Pericardial Effusion?

Yes

NO

Repeat if clinical
deterioration

Hemothorax?

Yes

NO or unsure
Chest x-ray

Free Fluid?

YES

Unstable : Laparotomy
Stable: CT or consider laparotomy
for large amt of fluid

NO

Unstable: look for other bleeding
Stable: observation or CT or serial
FAST

Indeterminate

Unstable: dpl or repeat
FASTq 10min
Stable: CT

FAST and Special Patients

● Altered Mental Status

Pts with negative FAST and “temporary” altered LOC can be observed with serial clinical/ultrasound exams (vs. urgent CT)

Patients with persistent LOC who will be getting General Anesthesia should get further imaging....ie: CT scan

F.A.S.T and Special Patients

◎ Pregnancy

Ideal tool

In later pregnancy, fluid collects in RUQ/LUQ

Uterine rupture can cause significant bleeding

Can quickly determine fetal viability:

- Fetal biparietal diameter >5cm (22weeks)
- Cardiac activity in fetus with moribund mother is viable – do “crash” cesarean section in ED

F.A.S.T and Special Patients

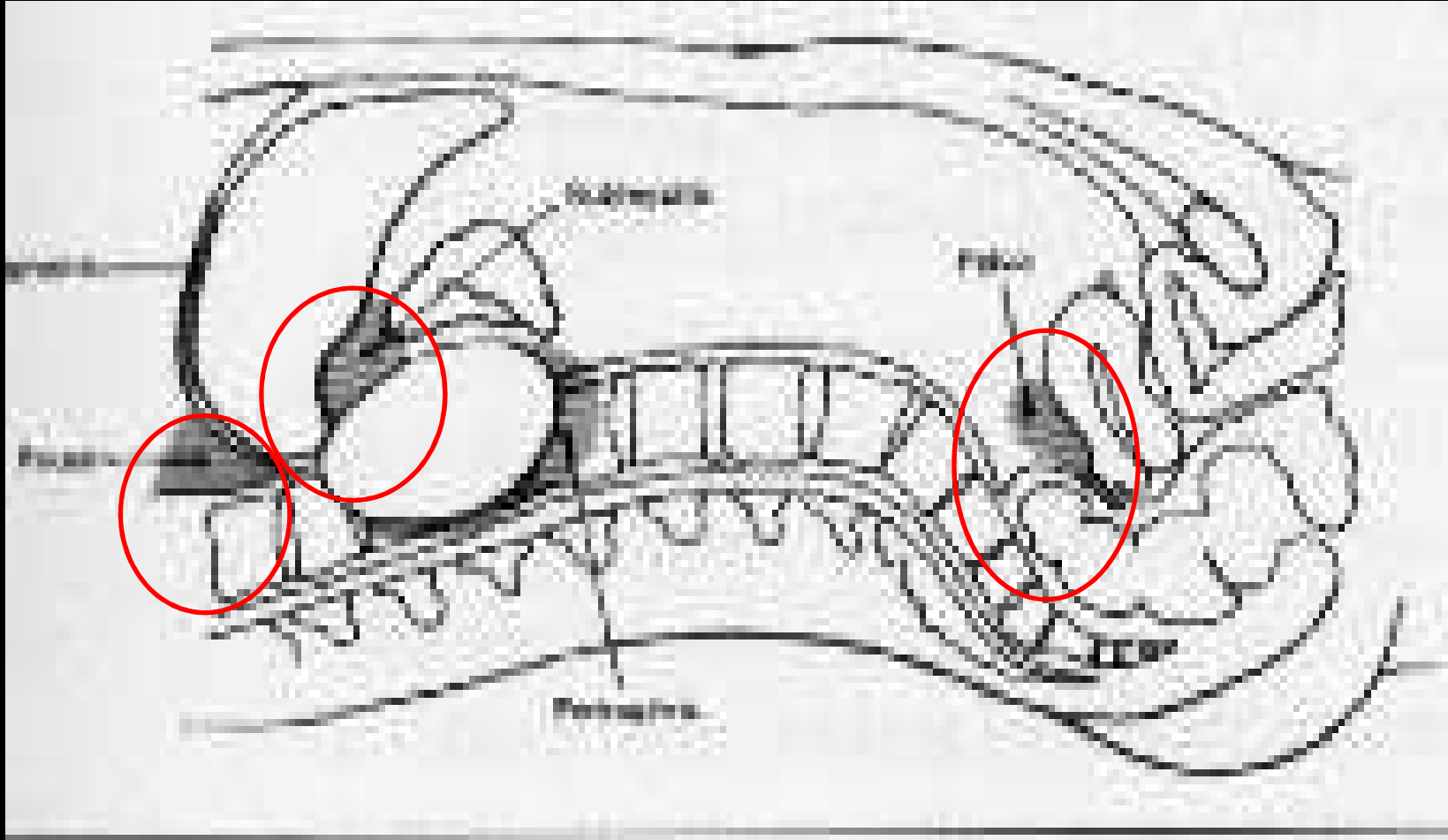
● Trauma Arrest

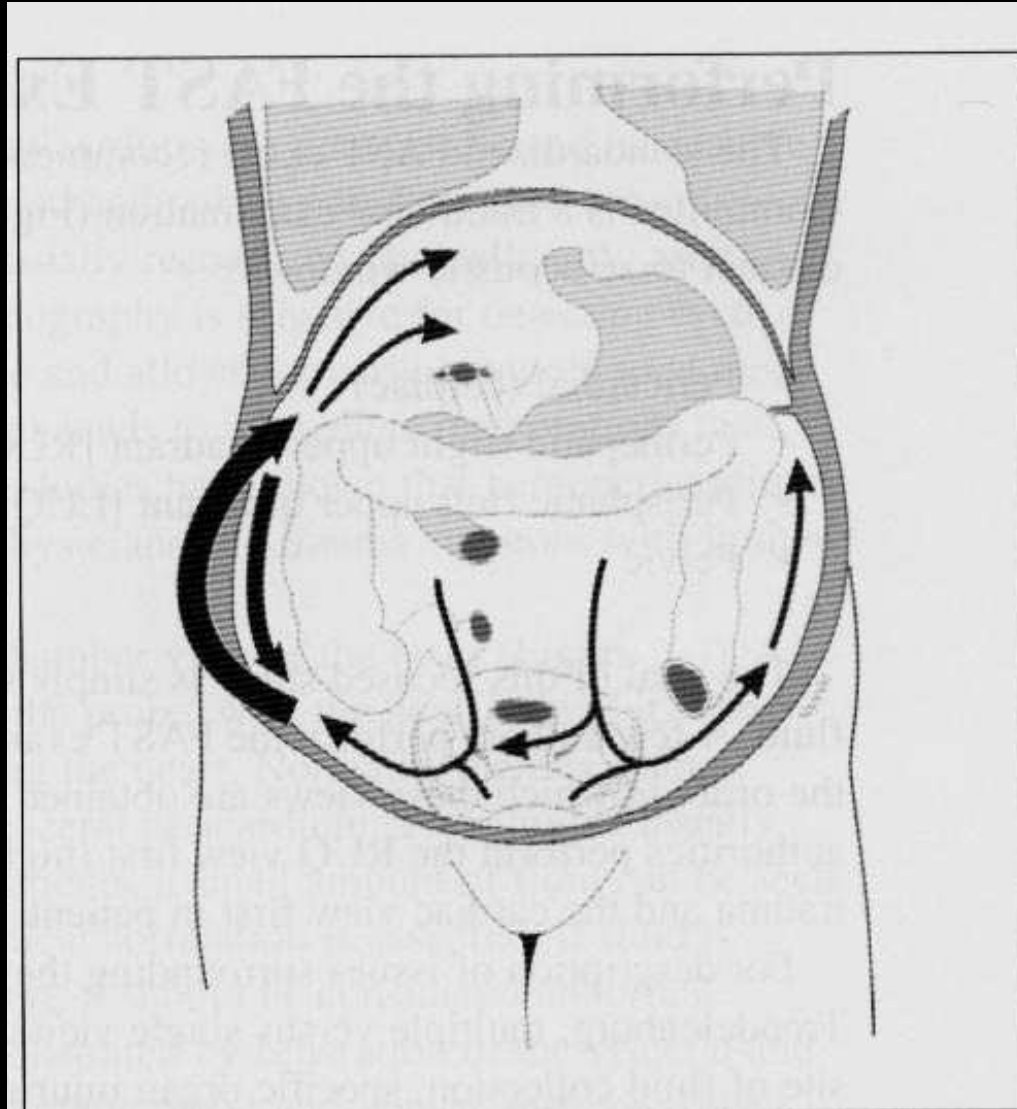
Rapidly search for reversible causes

- Vigorous cardiac activity = hypovolemia
- Pericardial fluid = tamponade
- No cardiac motion = Dead

FAST Exam - Physiology?

- FAST Exam is based on simple fluid physics in the abdomen
 - Blood collects in most dependent areas and when supine this is “Morrison's pouch” and the pelvis





Flow of Fluid in Peritoneal Cavity

Image Acquisition

Image Acquisition

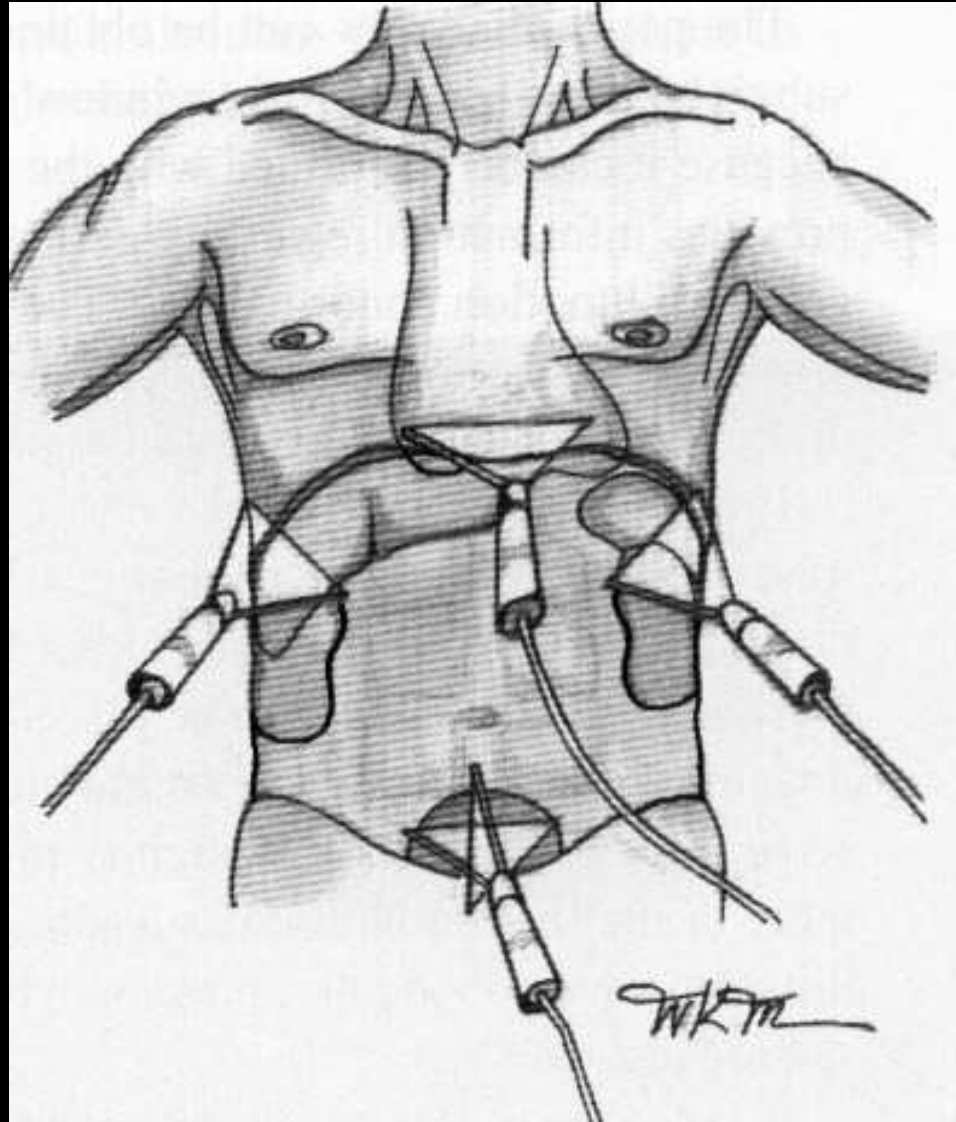
- 4 views

- RUQ – Morrison 's pouch –
hepatorenal space (*and hemithorax*)

- LUQ – spleenorenal space (*and
hemithorax*)

- Pelvis – bladder/uterus

- Sub-Xiphoid – pericardial space

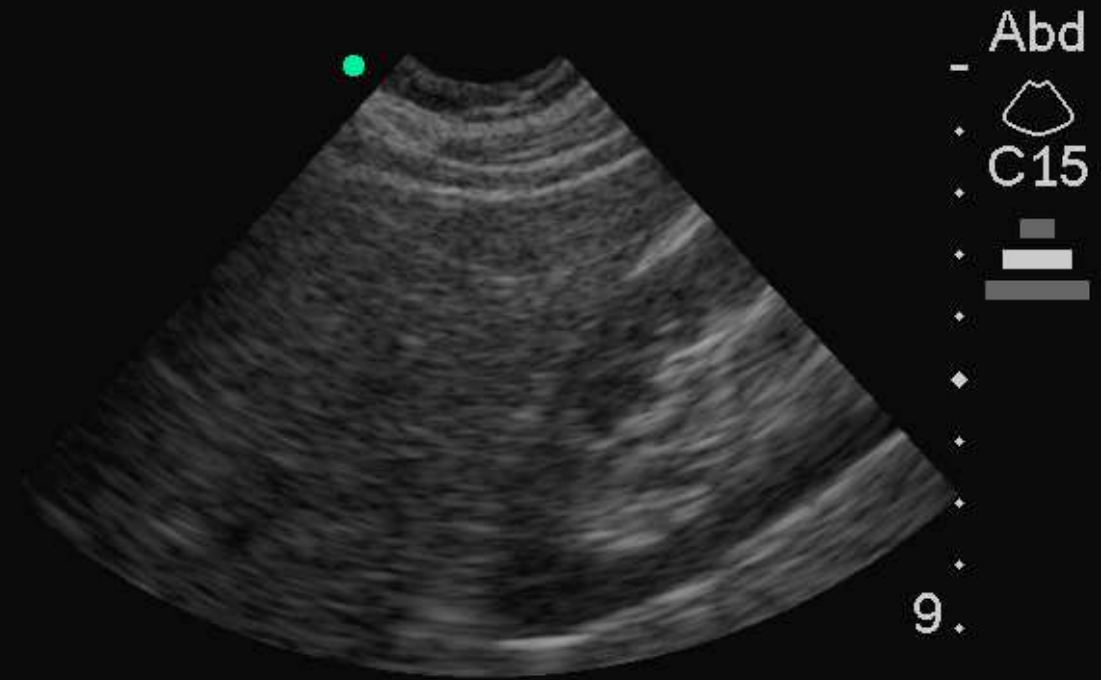


The 4 Positions of the FAST Exam...

j smith

master scanner

RUQ View



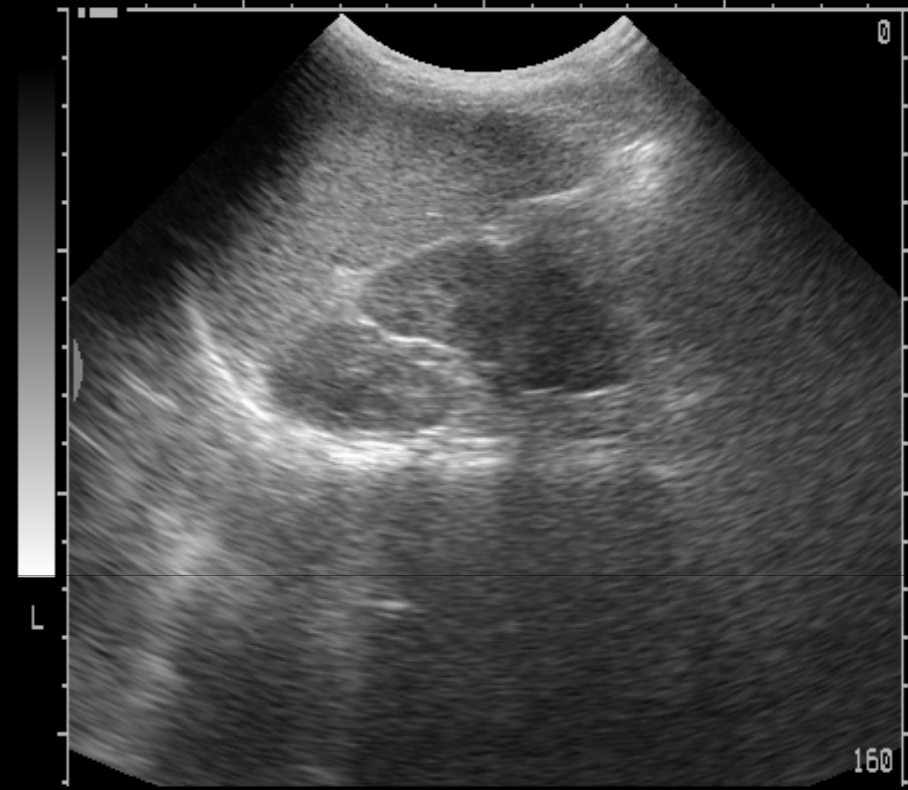
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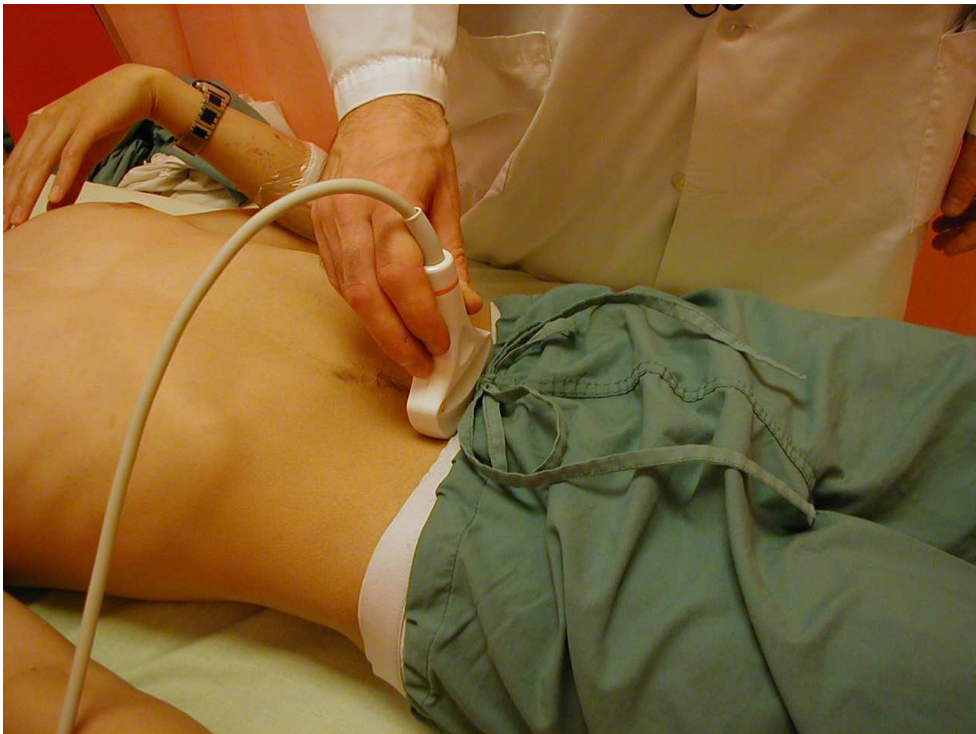
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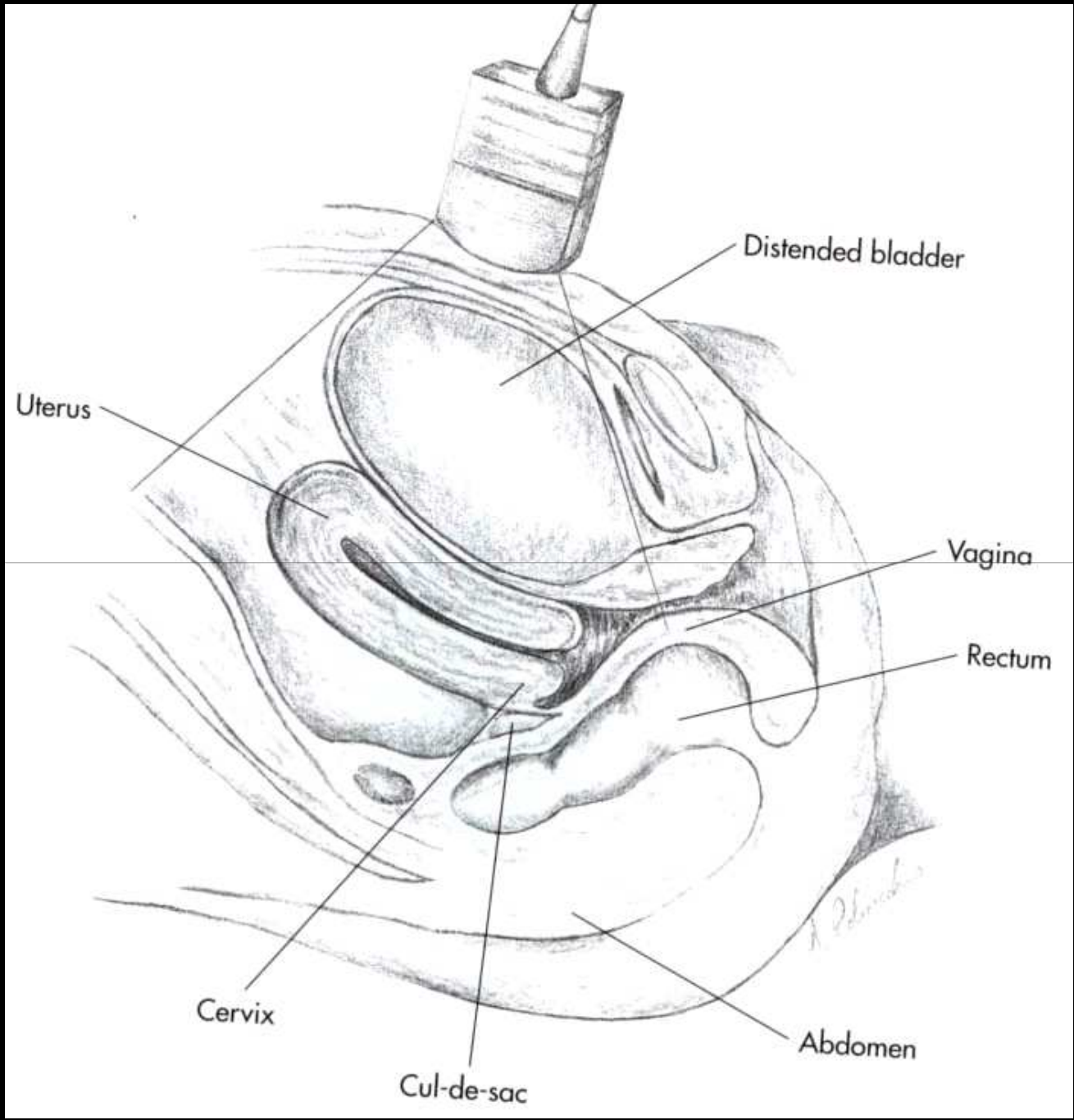
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LUQ View



Pelvis





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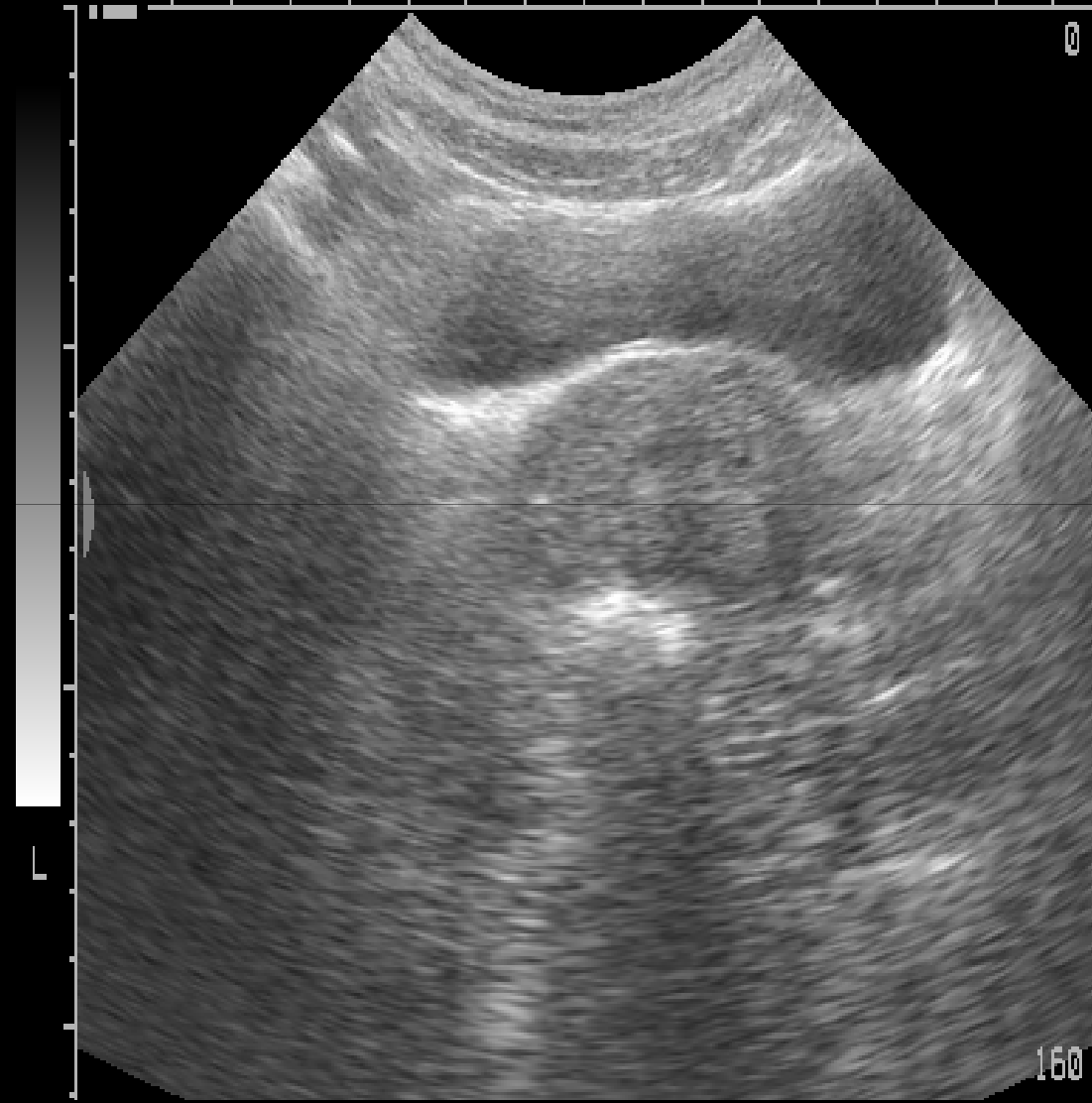
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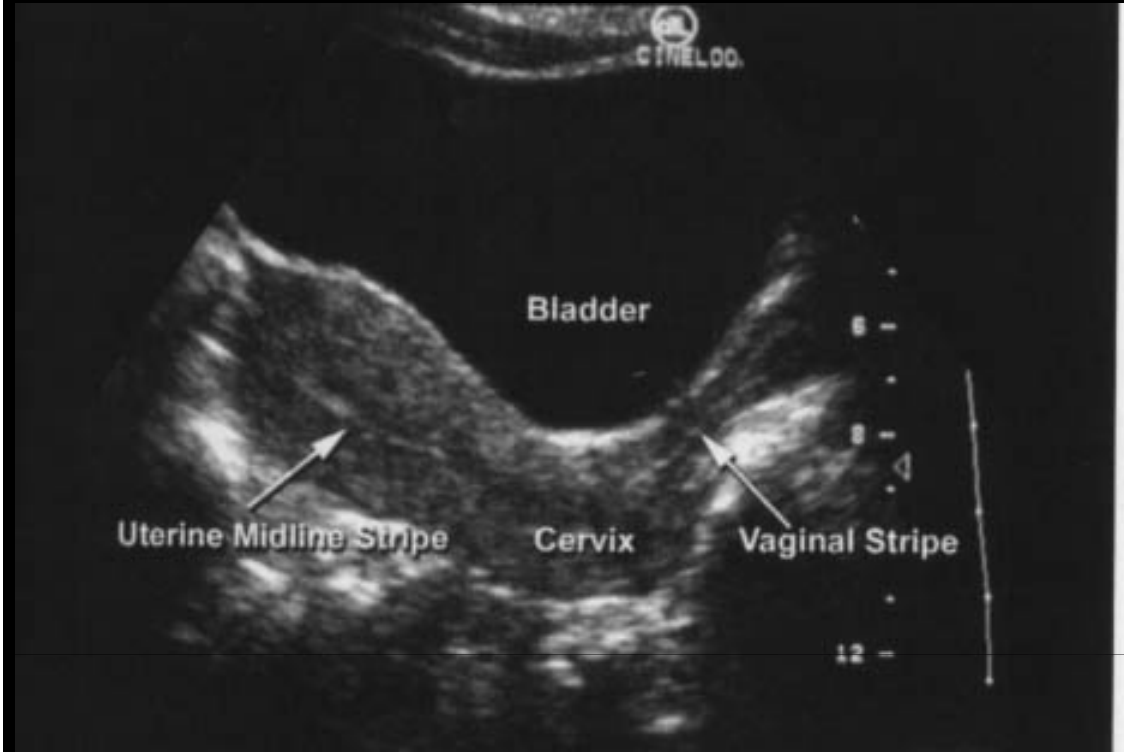


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Cardiac Exam

● Subxiphoid view

Uses liver as acoustic window

Stomach and bowel gas can block view

Pericardial fluid is black anechoic stripe

- Caution - clotted blood can be more echogenic

Epicardial fat can be mistaken as fluid

- This will be more anterior than posterior
- Fluid will collect in most dependent spaces....



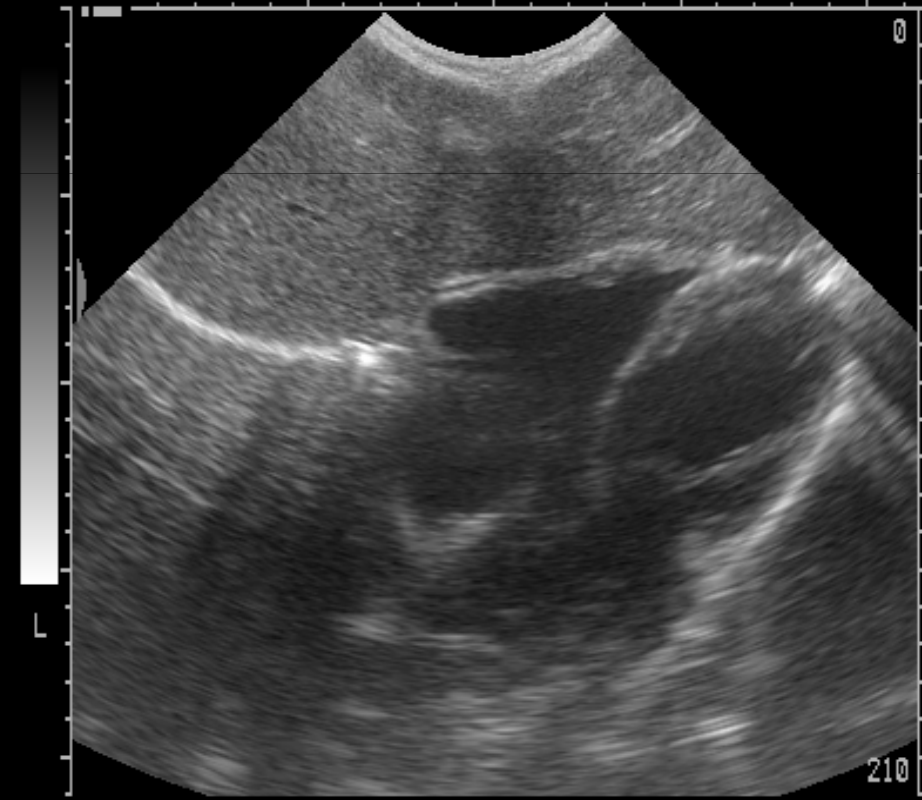
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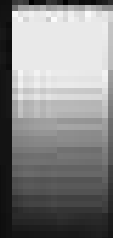
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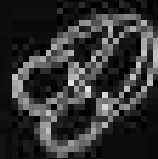
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DAVID BARNER
RCEP
BS

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P100 5MHz C358



CN18
15cm
DR55
G 26



MI 08. 4

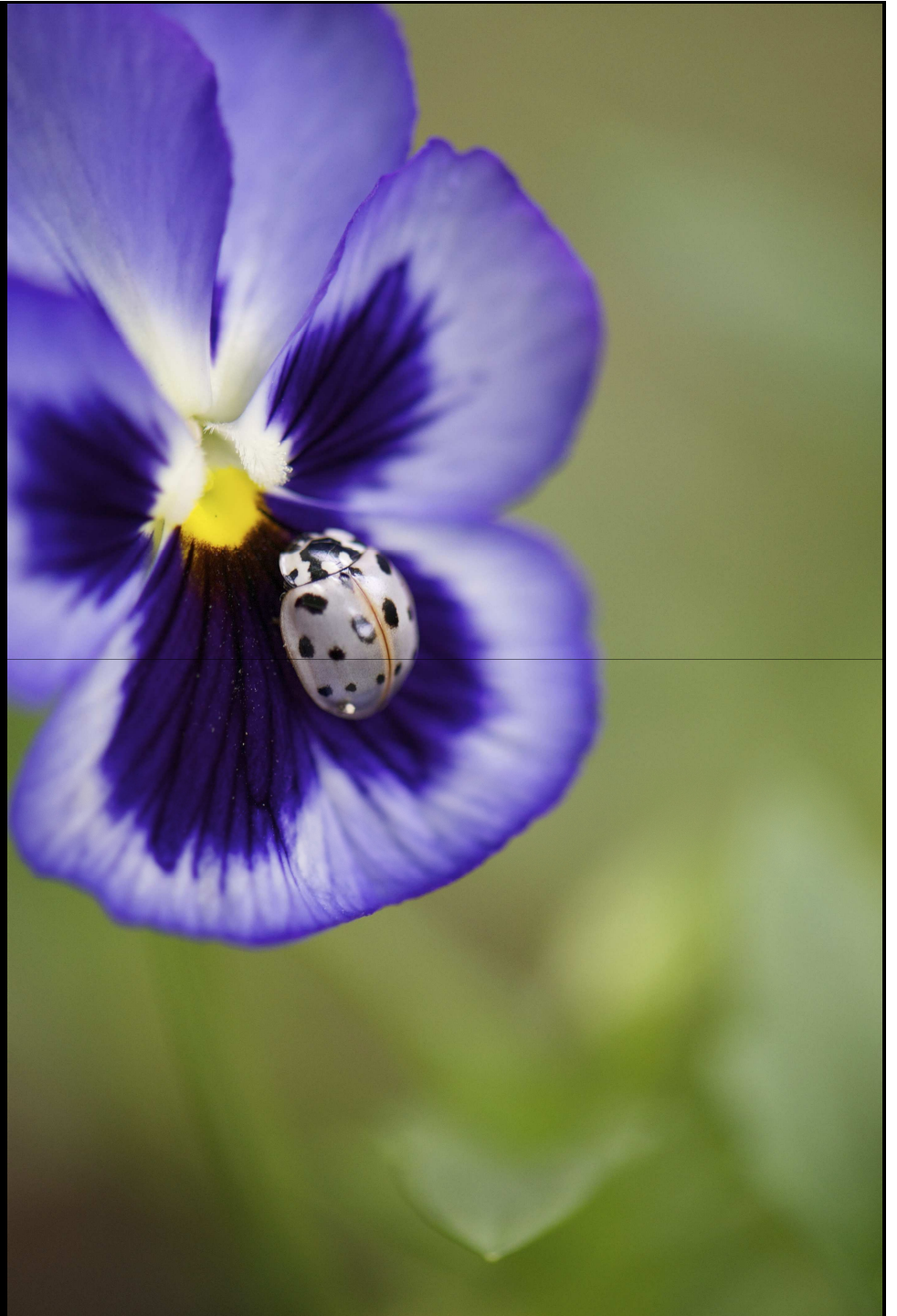
F.A.S.T Exam - Tips

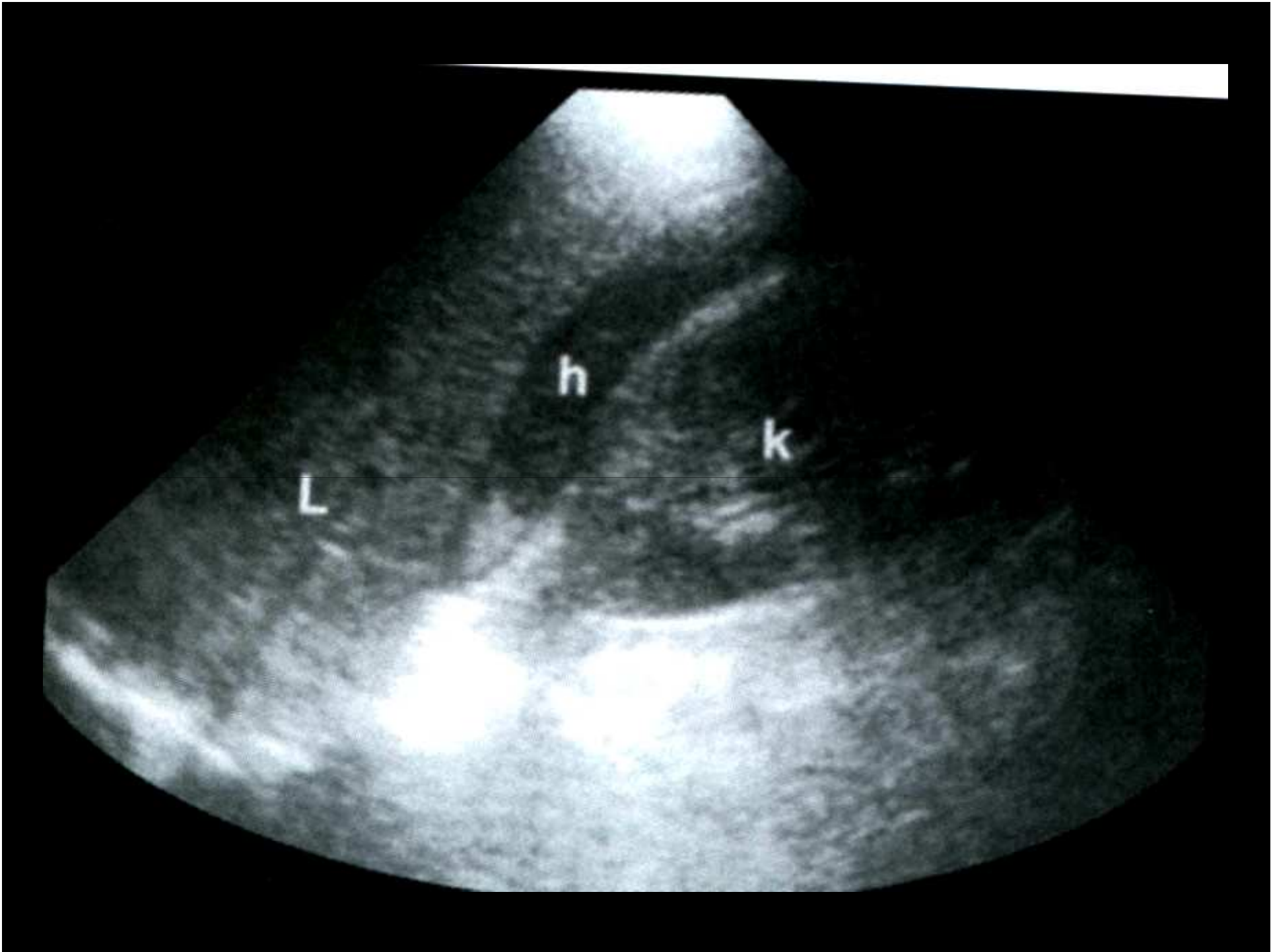
- Take your time to get adequate acoustic windows
- If negative, repeat in 15-20 mins
This will increase sensitivity
- Trendelenberg will give marginal increase in sensitivity
Do this when clinical suspicion is high and neg exam

Limitations of F.A.S.T

- ⦿ Operator dependent
- ⦿ Epicardial fat appears like fluid
- ⦿ Obtaining non-standard views
- ⦿ Pelvic scans with empty bladder are difficult to interpret
- ⦿ Poor views with obesity, subcutaneous air, and intraperitoneal air

The Pretty Pictures ●





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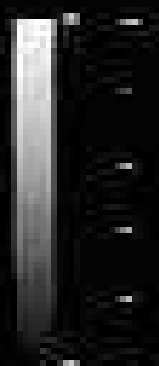


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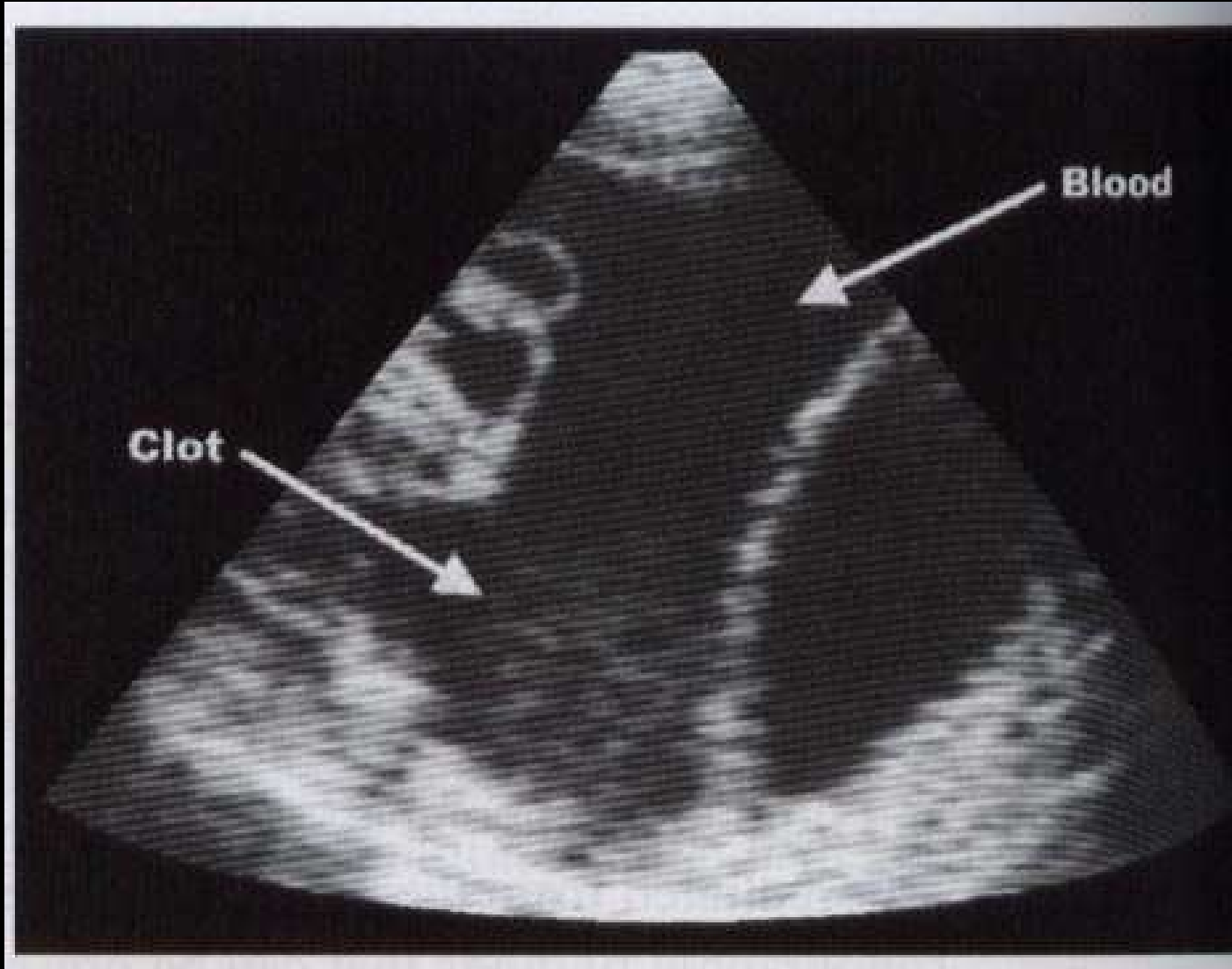
Y1 07.15.88
21.15.88
1PA 2.3M
DVA: 100%
48HZ MI C 0.4



R15
0805
0305

3: CARDIAC





II
[ML, MDR, FOX

V1 08.13.00
: 1 15:50:32
SCY 3.5M
DVR: 188M
29HZ MI = 0.4



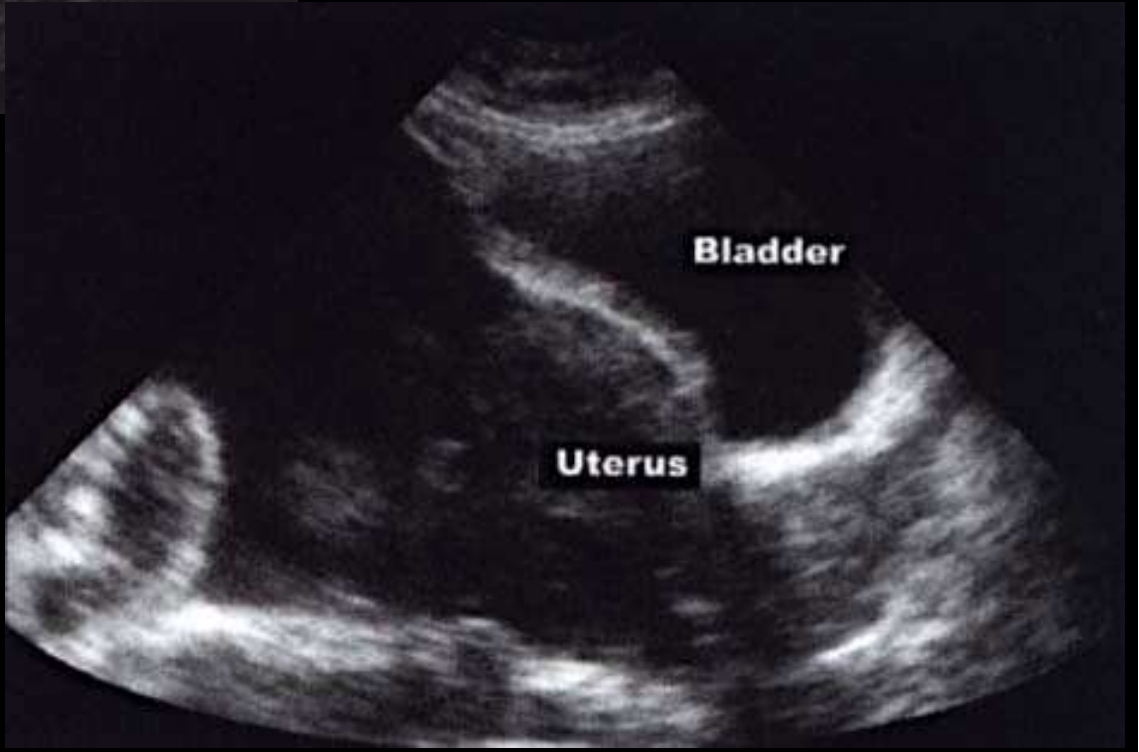
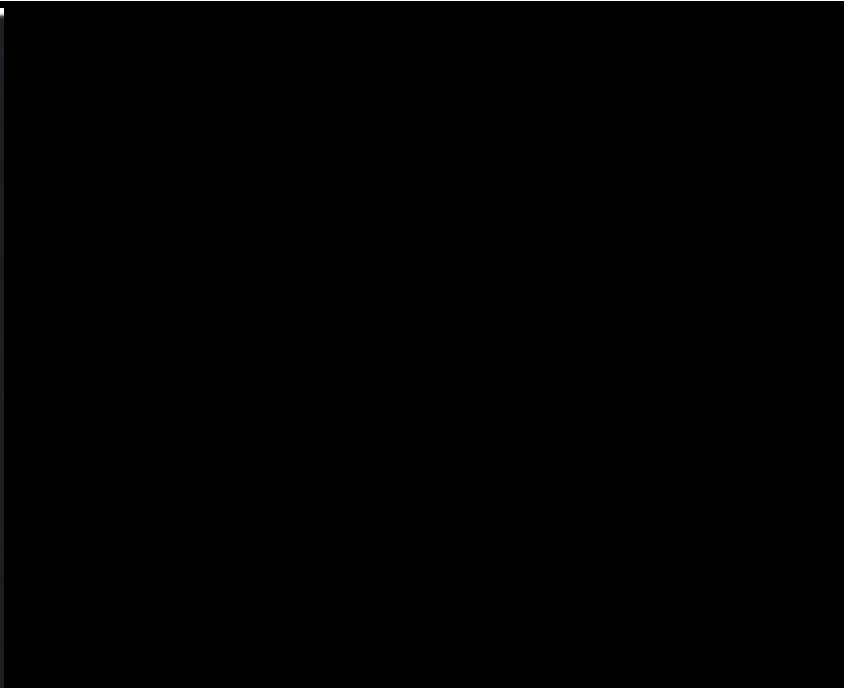
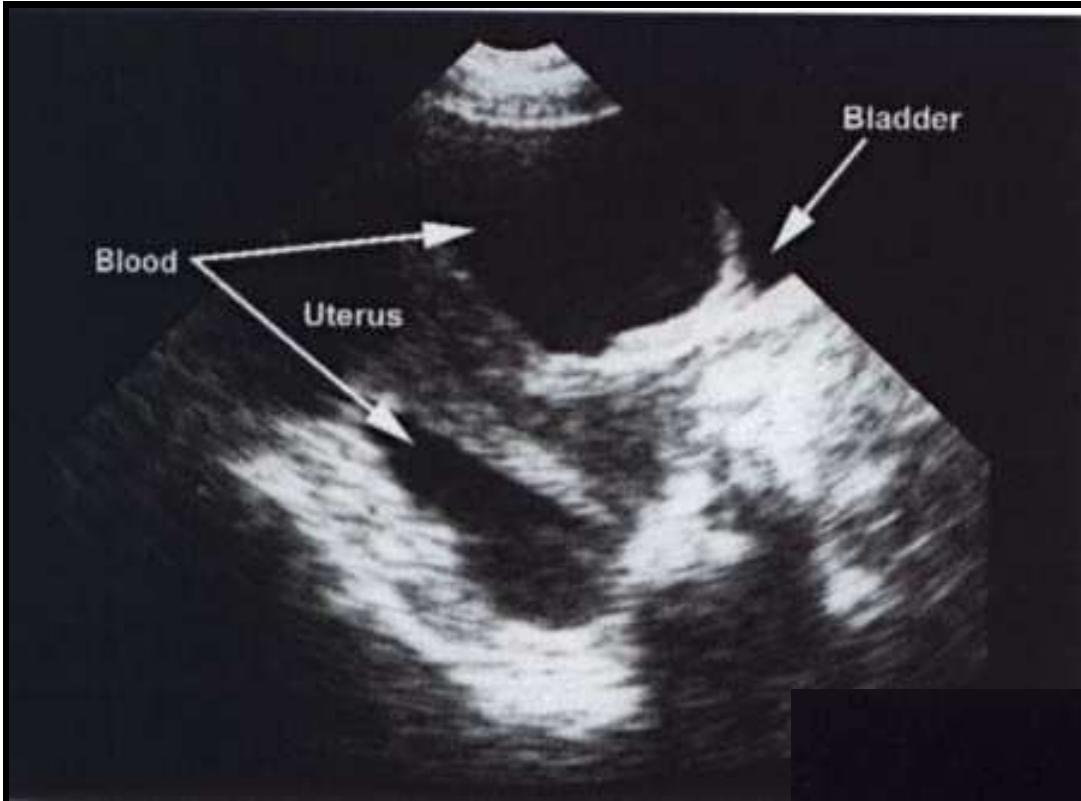
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R17
G70
C83

RUQ





LUQ





LUQ

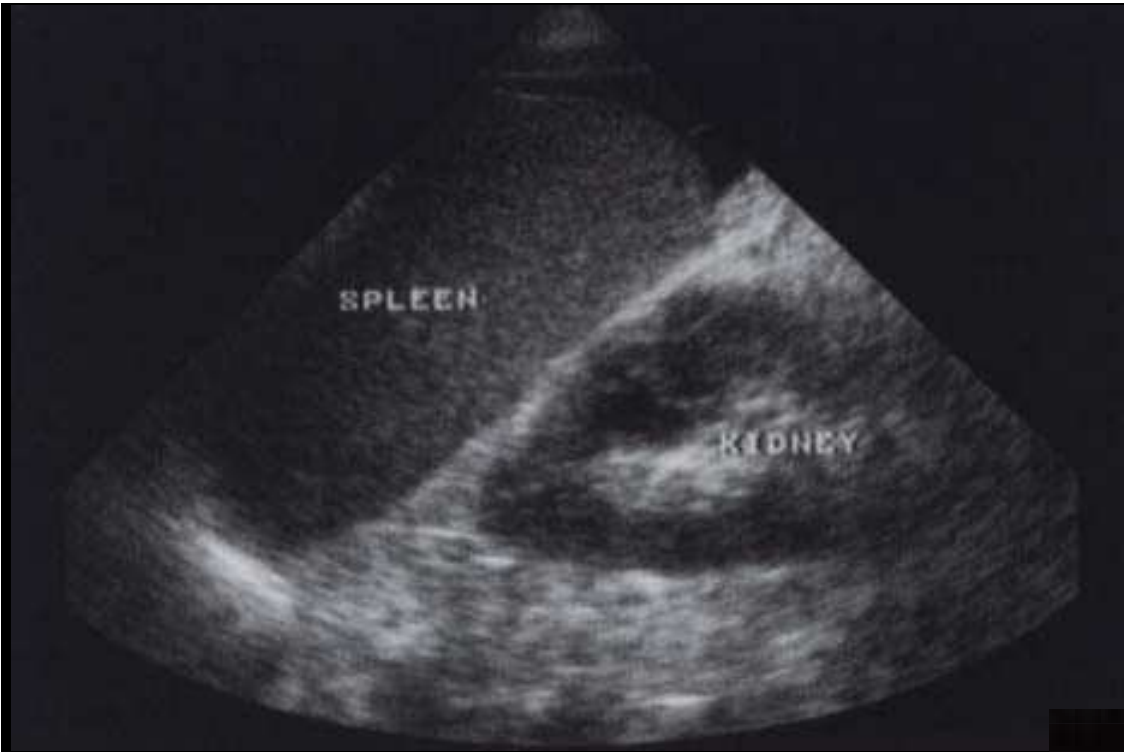


Fluid



Spleen

Diaphragm



LUQ

SubX

10E

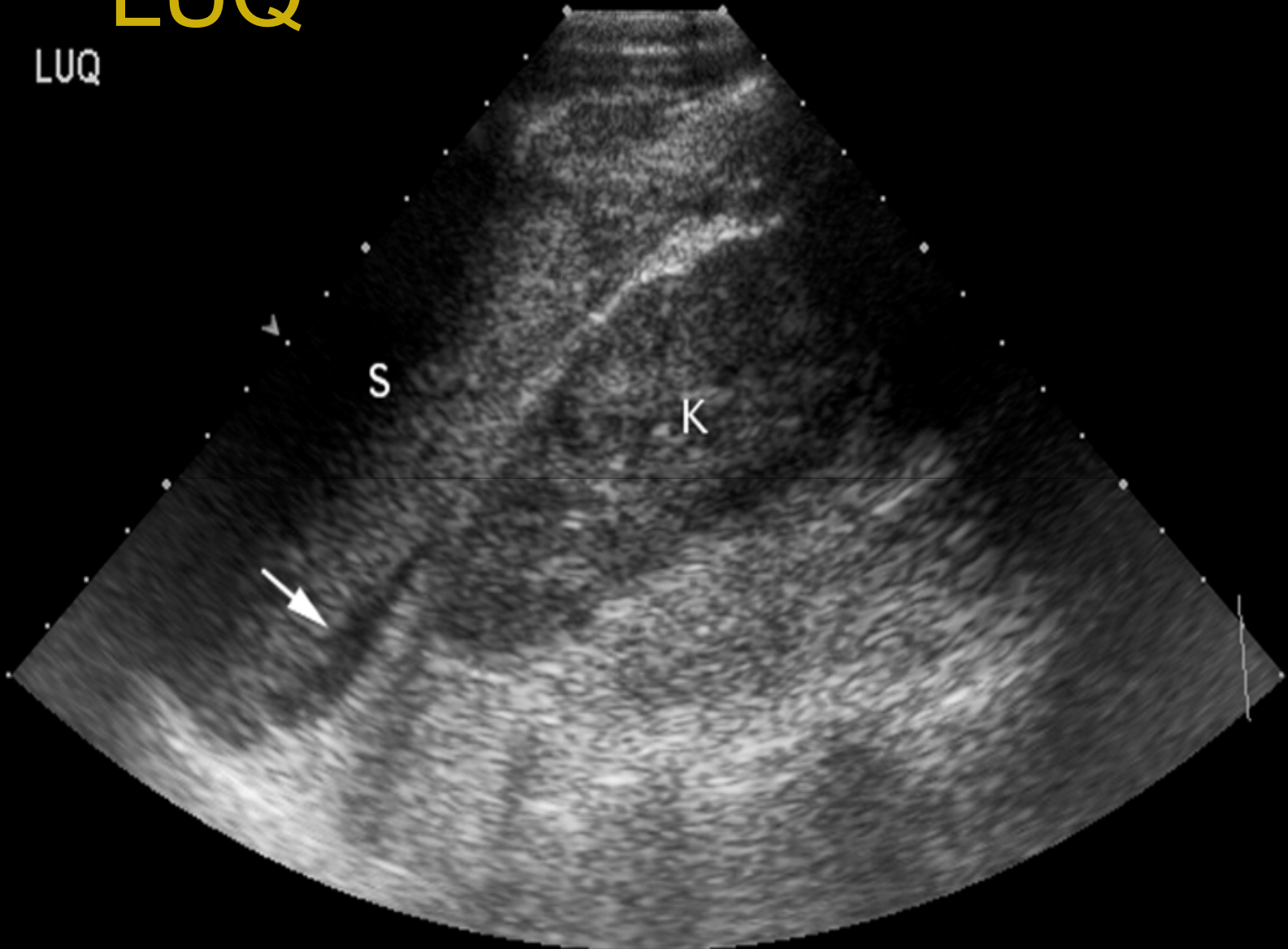


T2A



LUQ

LUQ



S

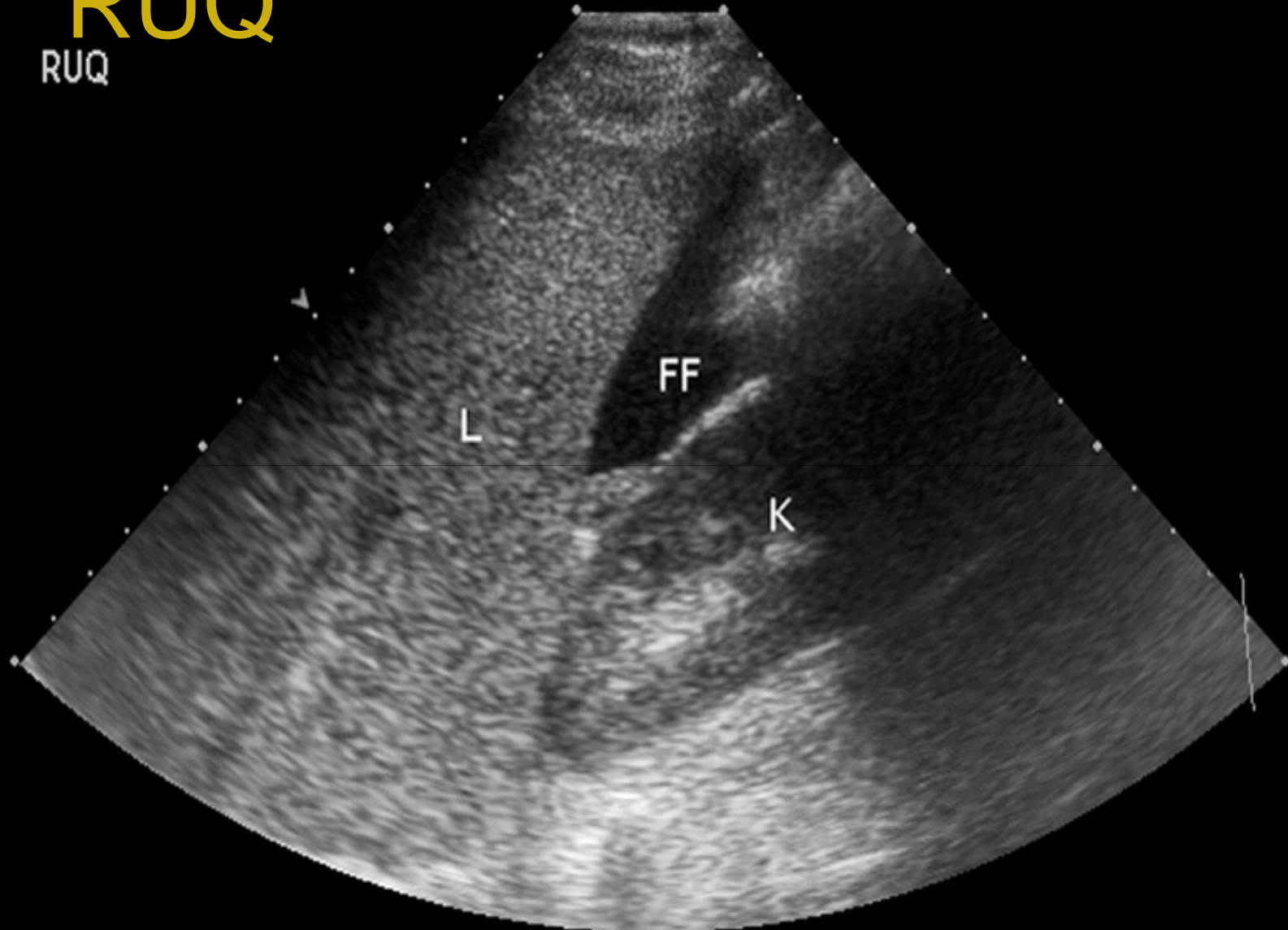
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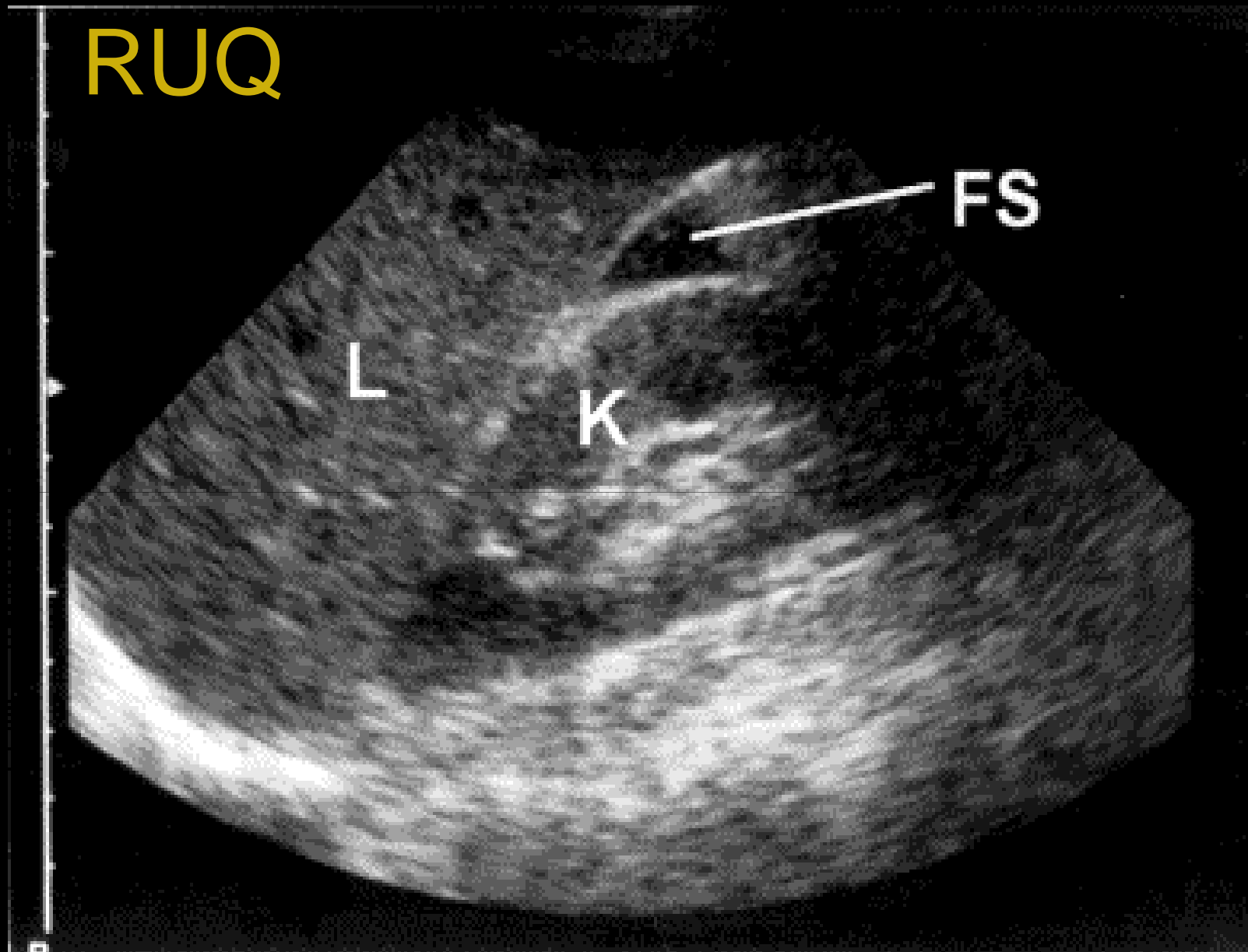
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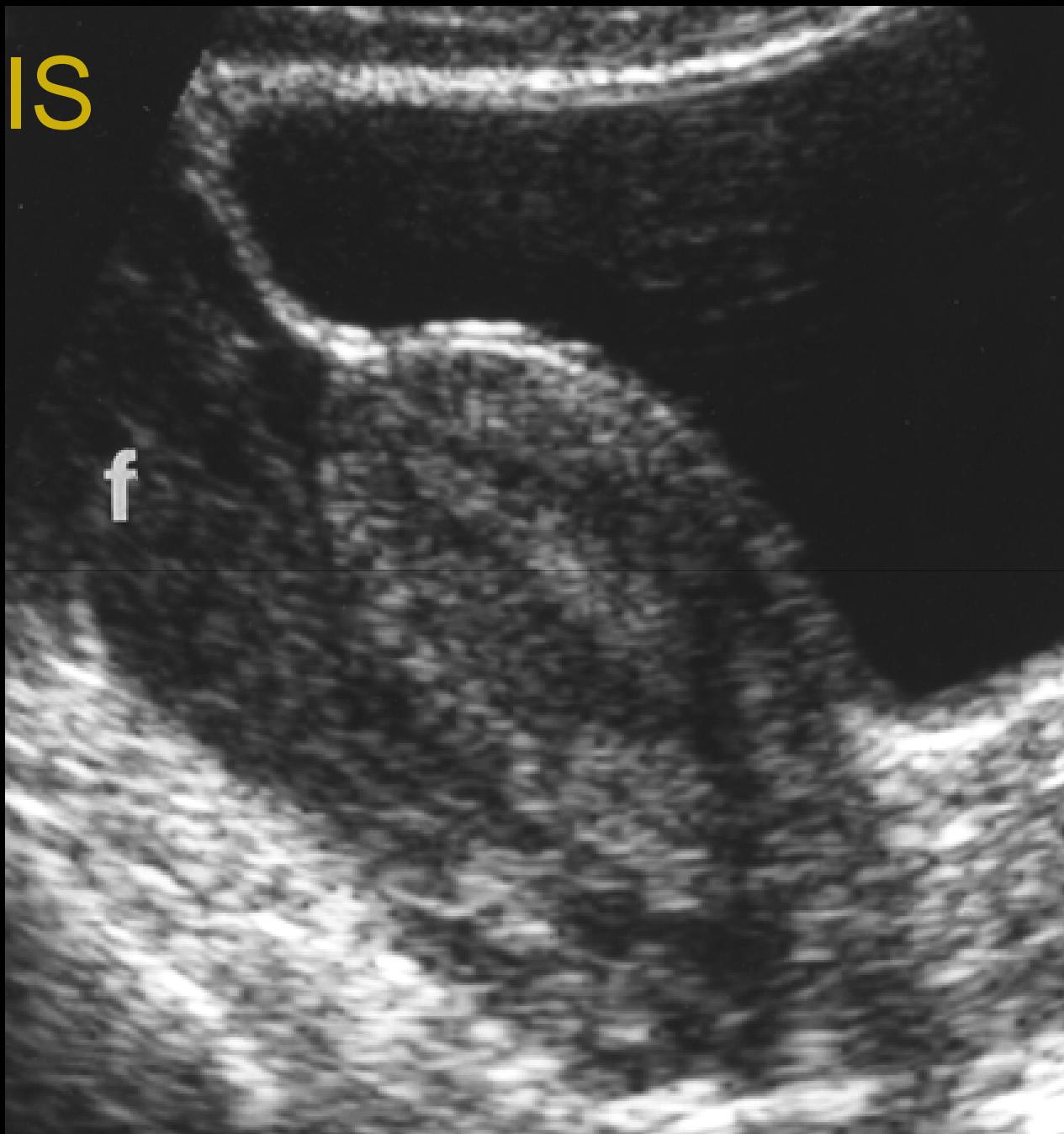


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RUQ

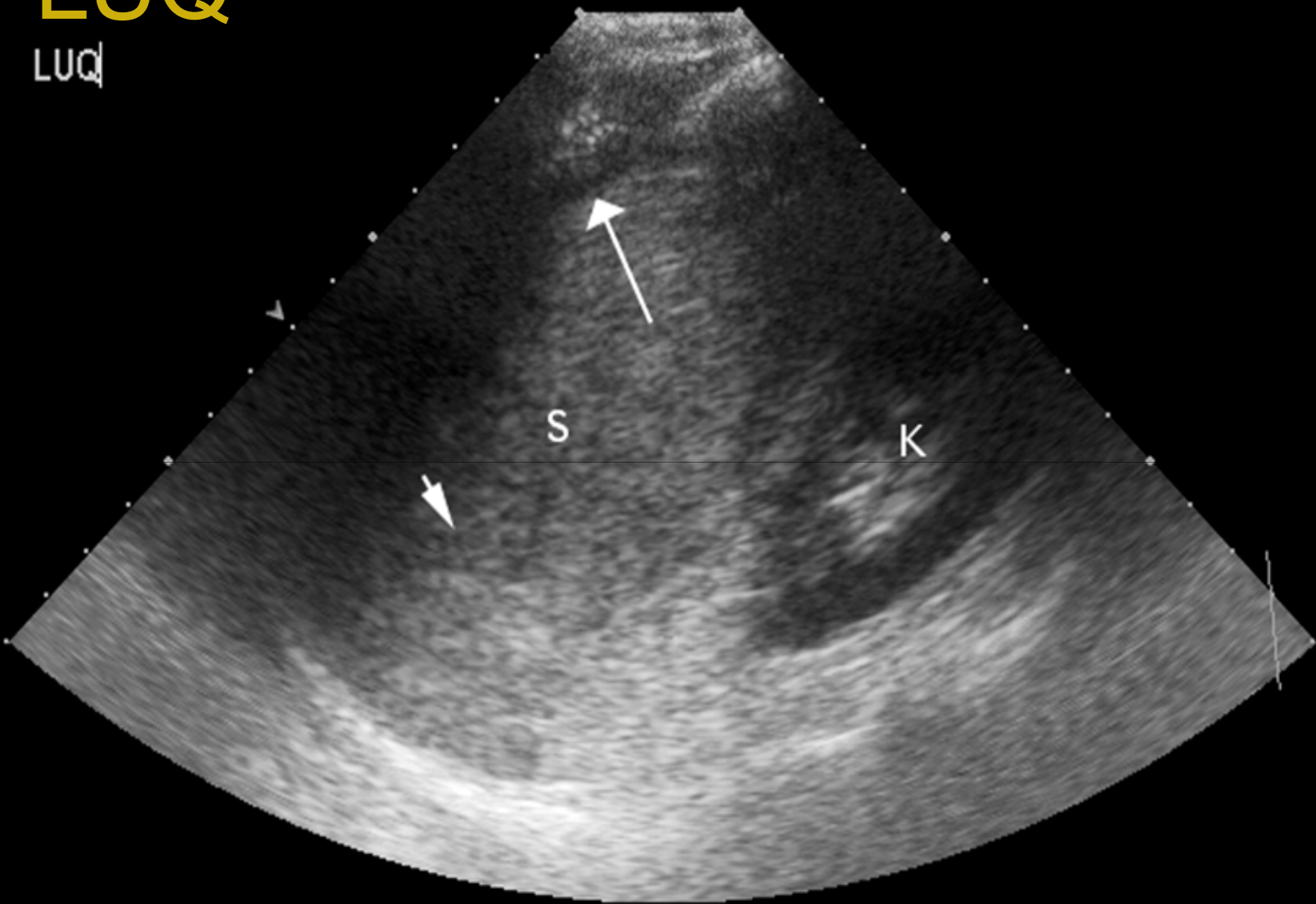


PELVIS

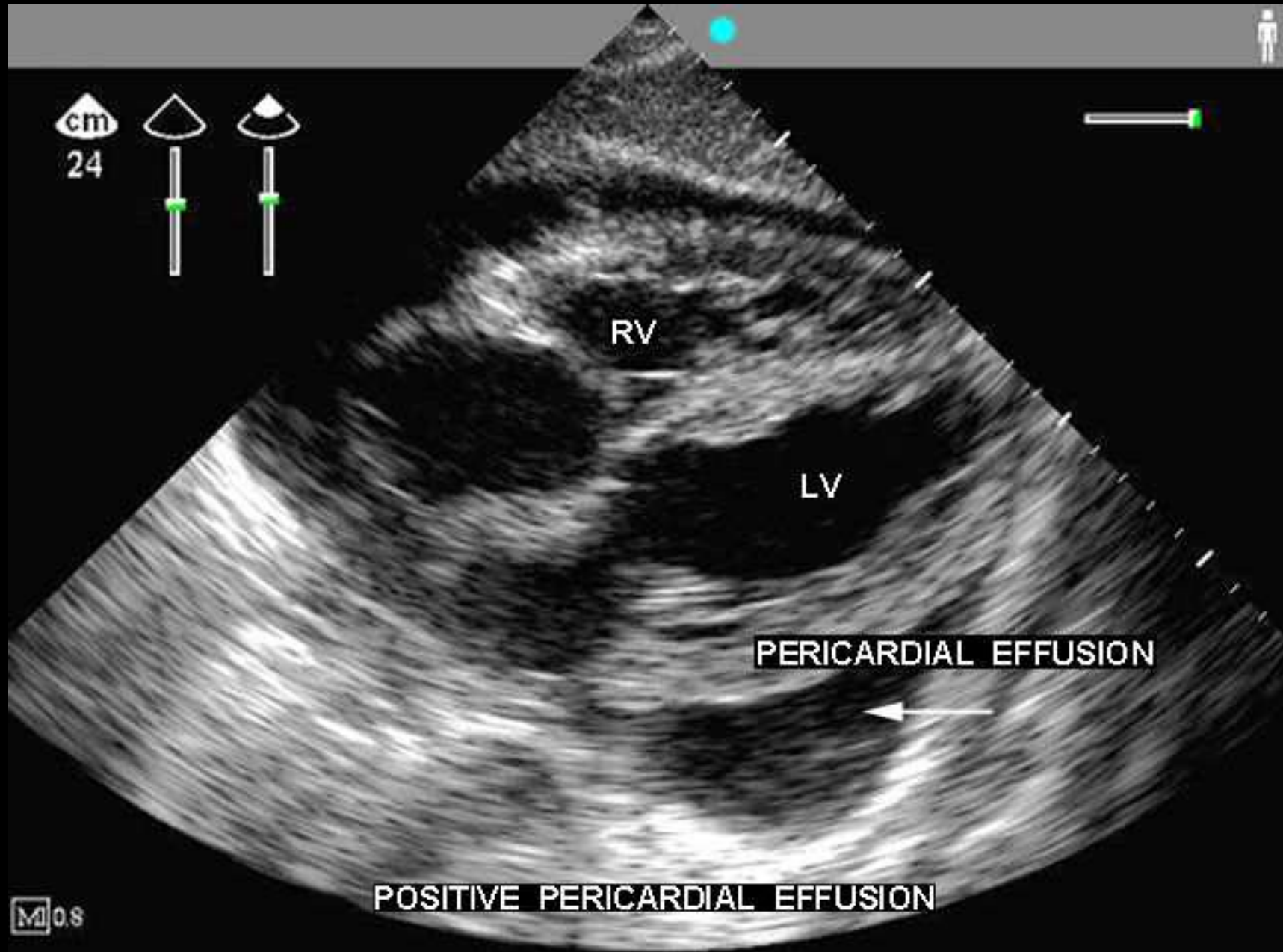


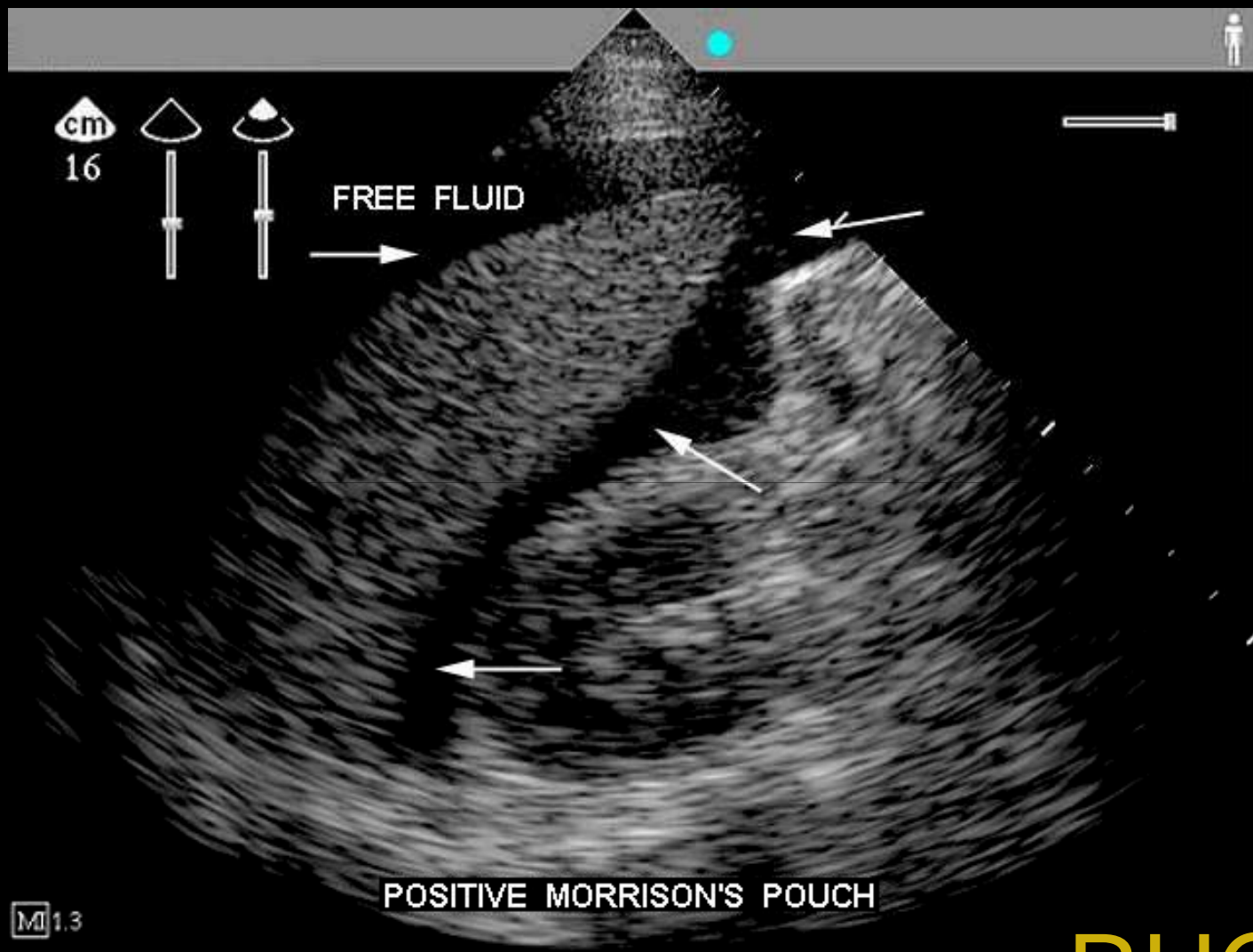
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LUQ



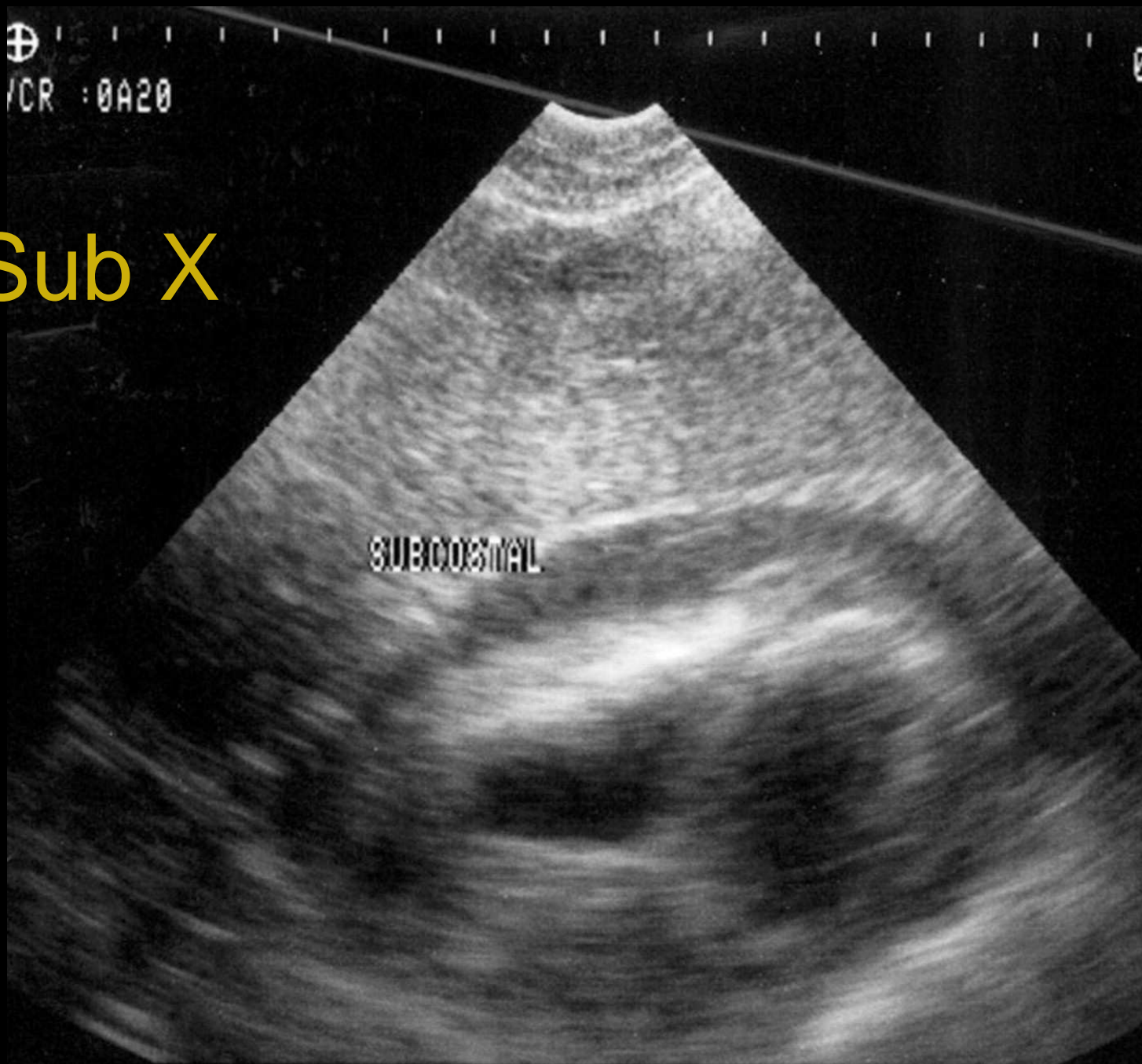
C





RUQ

Sub X



FINAL MESSAGES

- 1. FAST Exam can rapidly rule in or out the presence of free fluid in the abdomen/ chest/ pericardial space*
- 2. You must use clinical judgment and correlation to determine significance of your scan results*
- 3. When in doubt, look again in 15 minutes*
- 4. Don't forget your clinical skills!*



Lots of Free Fluid!

Caddy Lake, Manitoba Canada