INTRODUCTION TO ABDOMINAL IMAGING: RIGHT IMAGE FOR THE RIGHT PATIENT

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Abdominal Imaging

QUIZ PRE

QUESTION:

T/F: Background radiation in the US is typically ~3 mSev/yr

QUESTION:

Which is the correct order for least expensive to most expensive imaging?

I: CT
II: MRI
III: US
IV: Radiographs

A: I, II, III, IV
B: IV, III, II, I
C: IV, III, I, II
D: IV, II, III, I

QUESTION:

Which of the following modalities is first line imaging for the reproductive system (ovaries, uterus, testicles)?

A: CT
B: MRI
C: US
D: Radiographs

QUESTION:

For which indication would a noncontrast CT be appropriate?

A: Diverticulitis
B: Renal calculus
C: Aortic dissection
D: Concern for metastatic disease

QUESTION:

T/F: NSF (nephrogenic systemic fibrosis) is associated with iodinated CT contrast.

OVERVIEW

- Overutilization
- Review of general scan limitations
- Review of each modality, pros and cons, common indications

GROWTH OF IMAGING

- In the past decade, imaging services and their cost have grown at twice the rate of other technologies in the health care industry
  - Radiation dose!
  - $$$

Hendee, W. et al. Addressing Overutilization in Medical Imaging. Radiology. August 2010.

GROWTH OF IMAGING: DOSE CONCERNS

- Dose to the public
  - 1980: Medical radiation made up <25% of average total radiation dose to US residents[1]
  - 2010: Medical radiation made up >50% of average total radiation dose to US residents[1]
- "...we must ensure that patients undergoing CT receive the minimum radiation dose possible *to produce a medical benefit*"
- *LOWEST* dose for any given patient

1. Smith-Bindman, Rebecca. Is Computed Tomography Safe? N Engl J Med; 363:1-4

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- "…we must ensure that patients undergoing CT receive the minimum radiation dose possible *to produce a medical benefit*"[2]
- ~~*LOWEST* dose for any given patient~~
- *APPROPRIATE* dose for any given patient

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GROWTH OF IMAGING: DOSE CONCERNS

- Radiology is measured in effective dose (millisieverts: mSv)
  - Refers to radiation risk averaged over the entire body
- Background radiation (cosmic radiation, radon): 3 mSv/year
- Effective dose may be used to estimated risk of cancer/cancer related death
- Risk levels: Additional risk of fatal cancer from an examination
  - Negligible: less than 1 in 1,000,000
  - Minimal: 1 in 1,000,000 to 1 in 100,000
  - Very low: 1 in 100,000 to 1 in 10,000
  - Low: 1 in 10,000 to 1 in 1,000
  - Moderate: 1 in 1,000 to 1 in 500
  - These risk levels represent a very small addition to the 1 in 5 chance we all have of dying from cancer

Radiologyinfo.org American college of radiology and Radiologic Society of North America

GROWTH OF IMAGING: DOSE CONCERNS

Procedure	Effective dose	Comparable for natural background radiation for:	Additional life risk of fatal cancer
Intra-oral XR	0.005 mSv	1 day	Negligible
Extremity XR	0.001 mSv	3 hours	Negligible
Chest XR	0.1 mSv	10 days	Minimal
Spine XR	1.5 mSv	6 months	Very low
Head CT	2-4 mSv	8-16 months	Low
Chest CT	1.5-7 mSv	6 months-2years	Very low to low
Abdominopelvic CT	10-20 mSv	3-7 years	Low to moderate
PET-CT	25 mSv	8 years	Moderate

- New software and dose reduction protocols are continually evolving
- Doses vary with scan technique and patient size

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GROWTH OF IMAGING: COST OF EXAMS

- Conventional Radiography (X-ray): $149-$388
  - Two view chest x ray: $207
  - 4 views of the knee: $266
- Ultrasound: $386-1360
  - Breast ultrasound: $386
  - Abdominal ultrasound: $783
  - Carotid Doppler: $1360
- CT: $1072- $1832 per body part!
  - CT CAP w/wo contrast: $5322!
- MR: $1555 - $4547
  - Brain MR: $2189
  - Abdominal MRI w/wo contrast: $4547

GROWTH OF IMAGING: OVERUTILIZATION

- **Overutilization**: applications of imaging procedures where circumstances indicate that they are unlikely to improve patient outcome
- Why does it happen?
  - Self referral
  - Defensive medicine
  - Lack of comprehensive/accessible practice guidelines
  - Referring physicians
  - Radiologists
  - Patients

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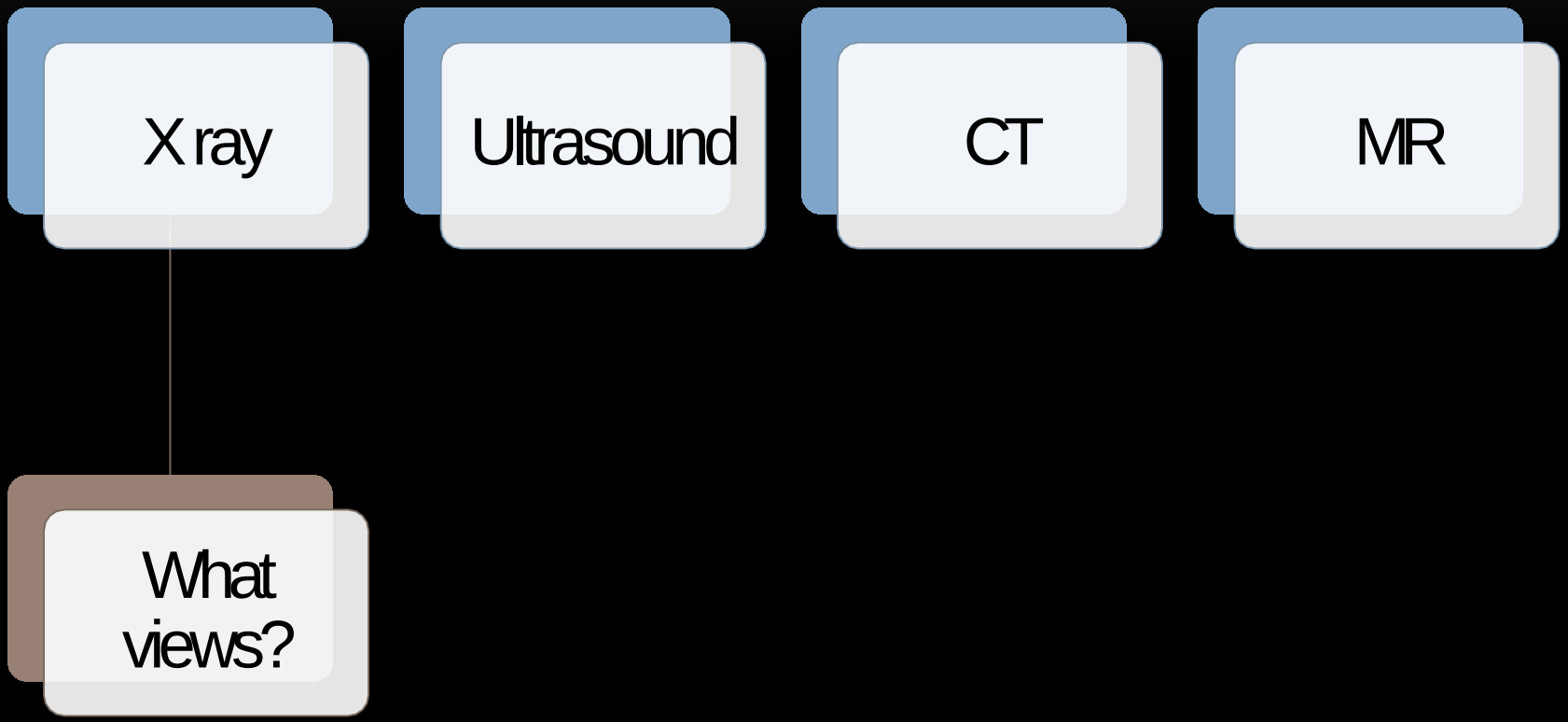
YOUR OPTIONS…

- X ray
- Ultrasound
- CT
- MR

YOUR OPTIONS…



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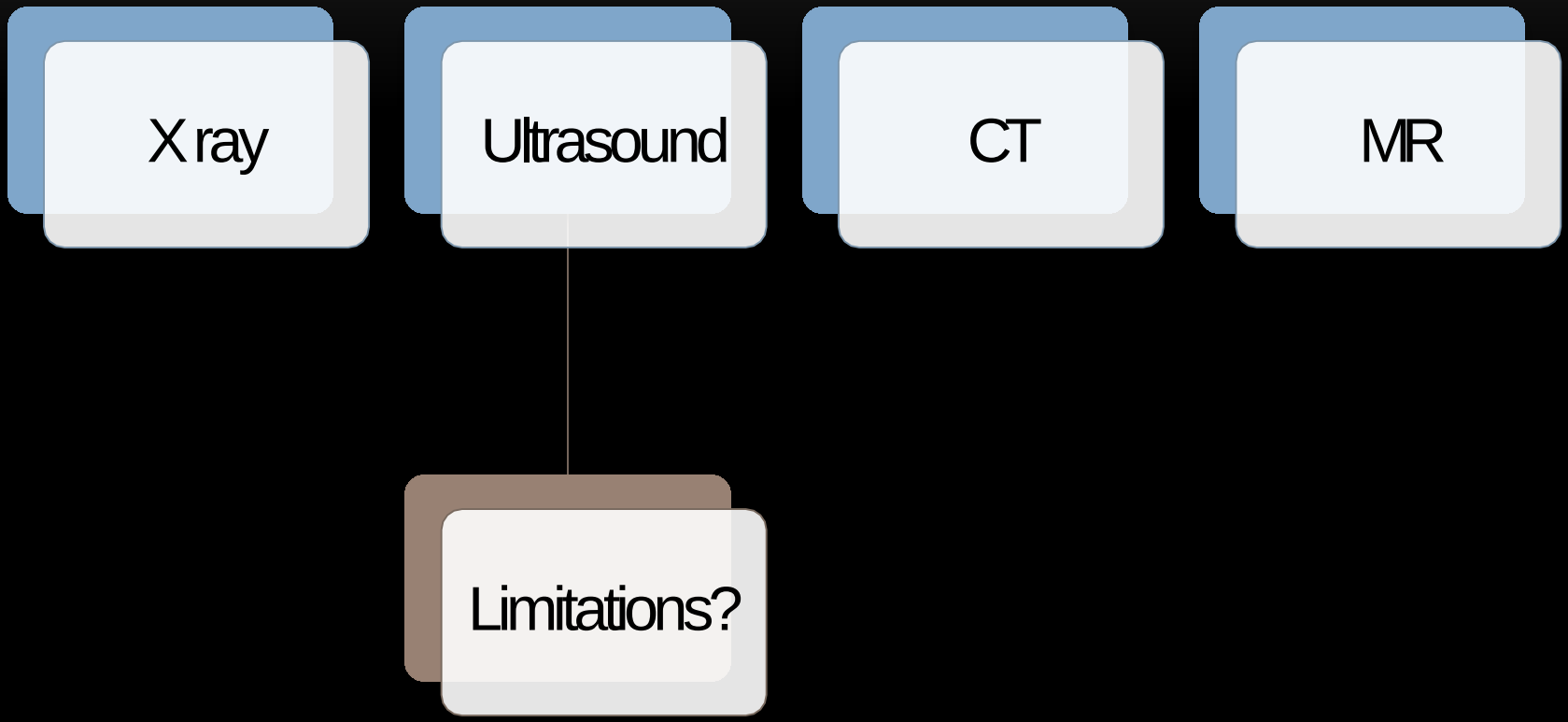

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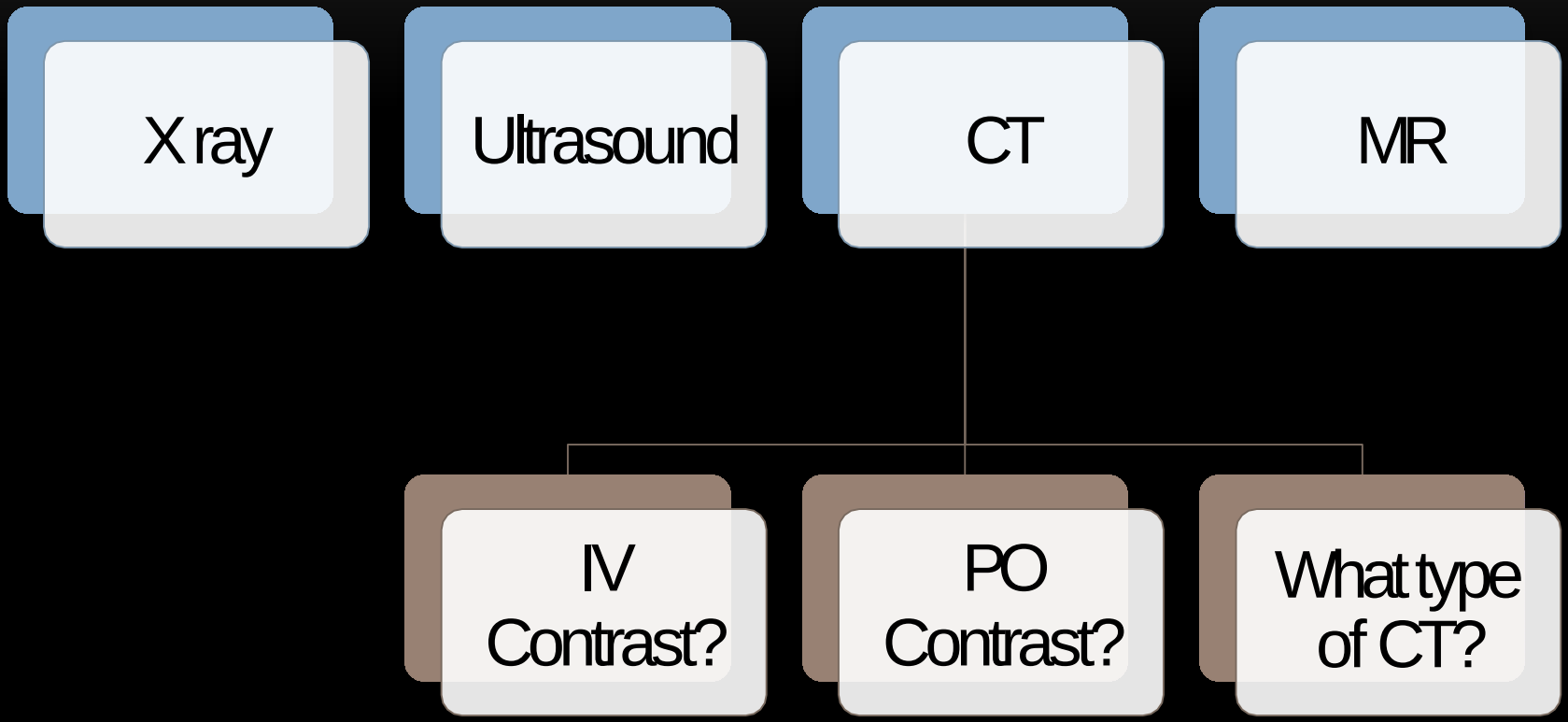
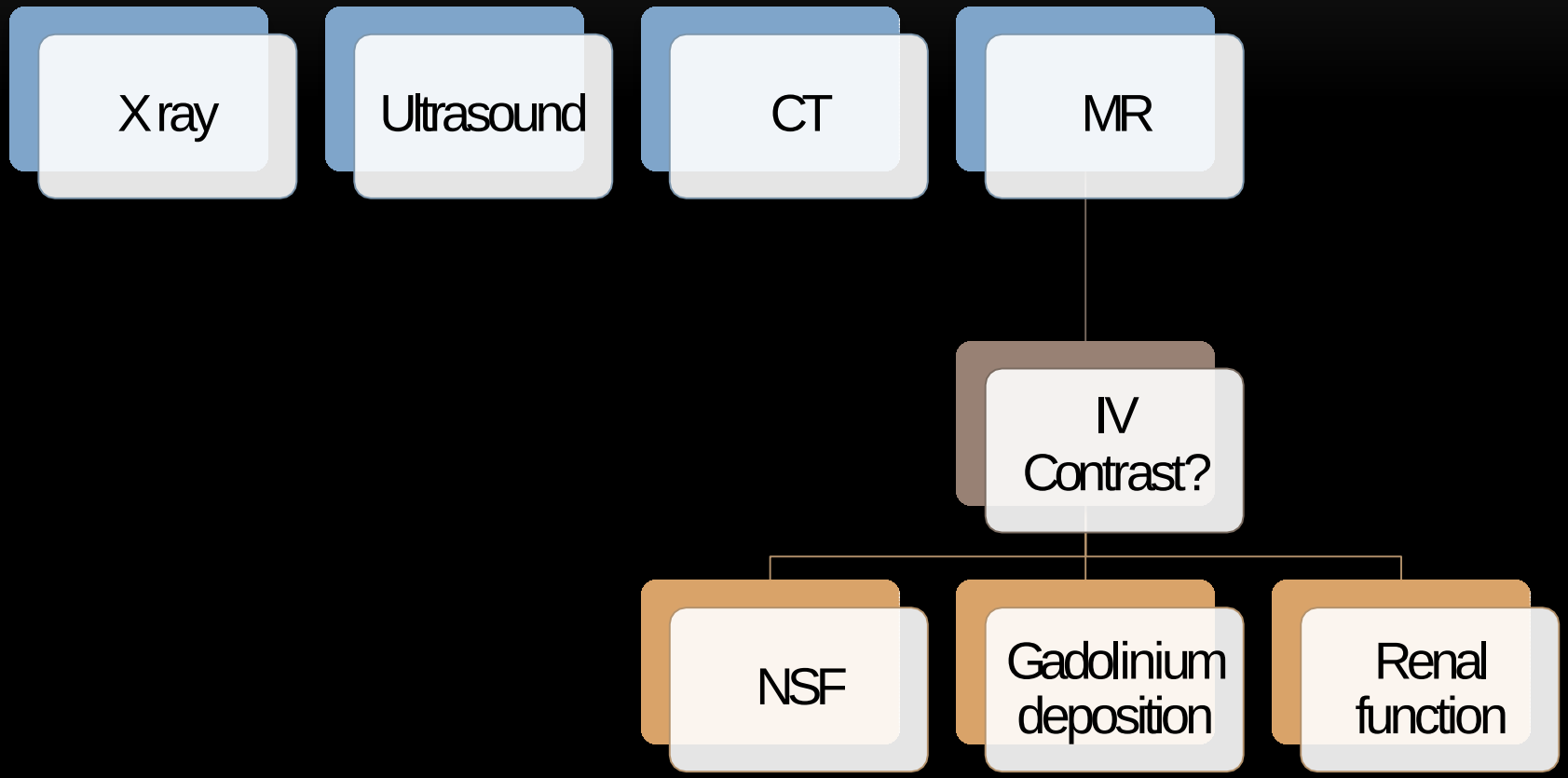


YOUR OPTIONS…

- X ray
- Ultrasound
- CT
- MR
  - IV Contrast?

YOUR OPTIONS…



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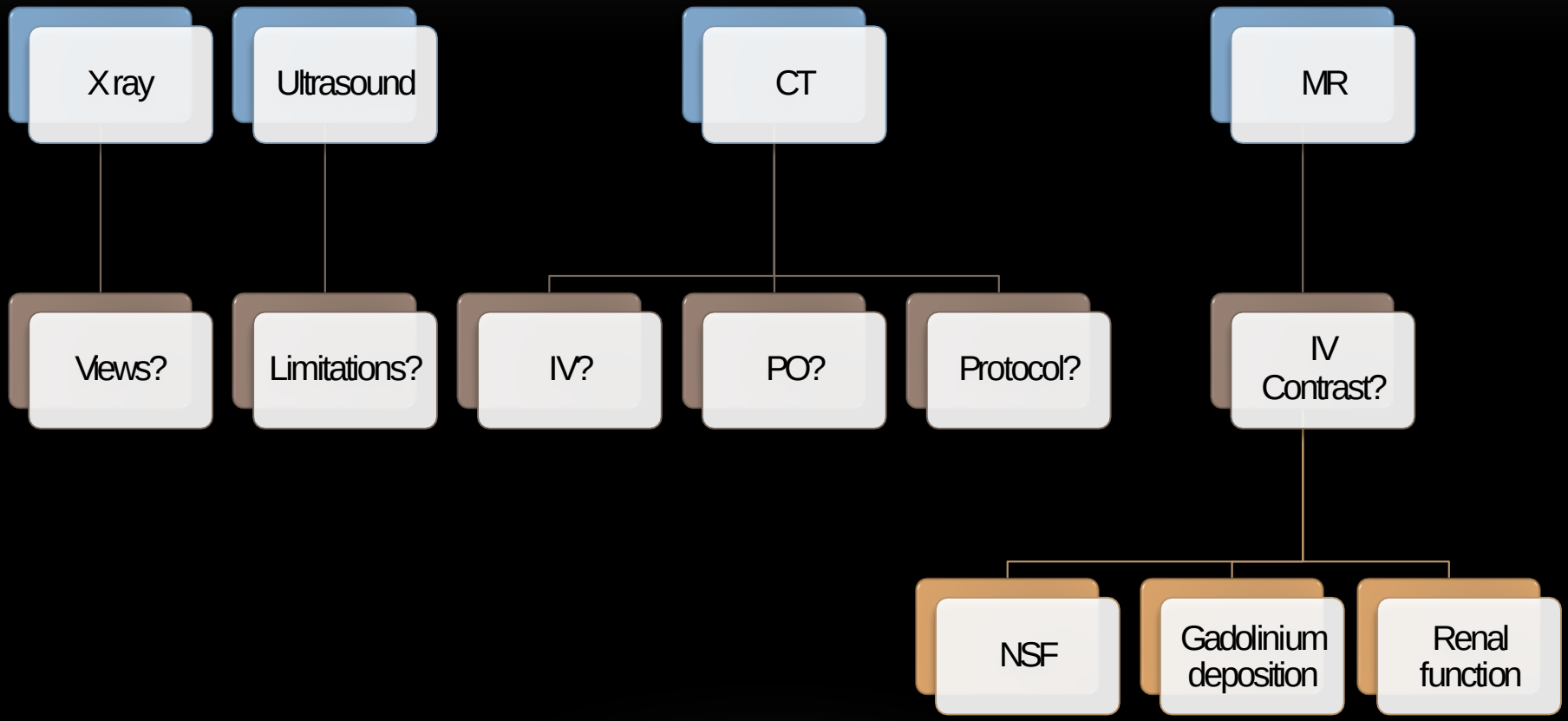


RESOURCES AT YOUR DISPOSAL

- ACR Appropriate Criteria
  - https://www.acr.org/Quality-Safety/Appropriateness-Criteria

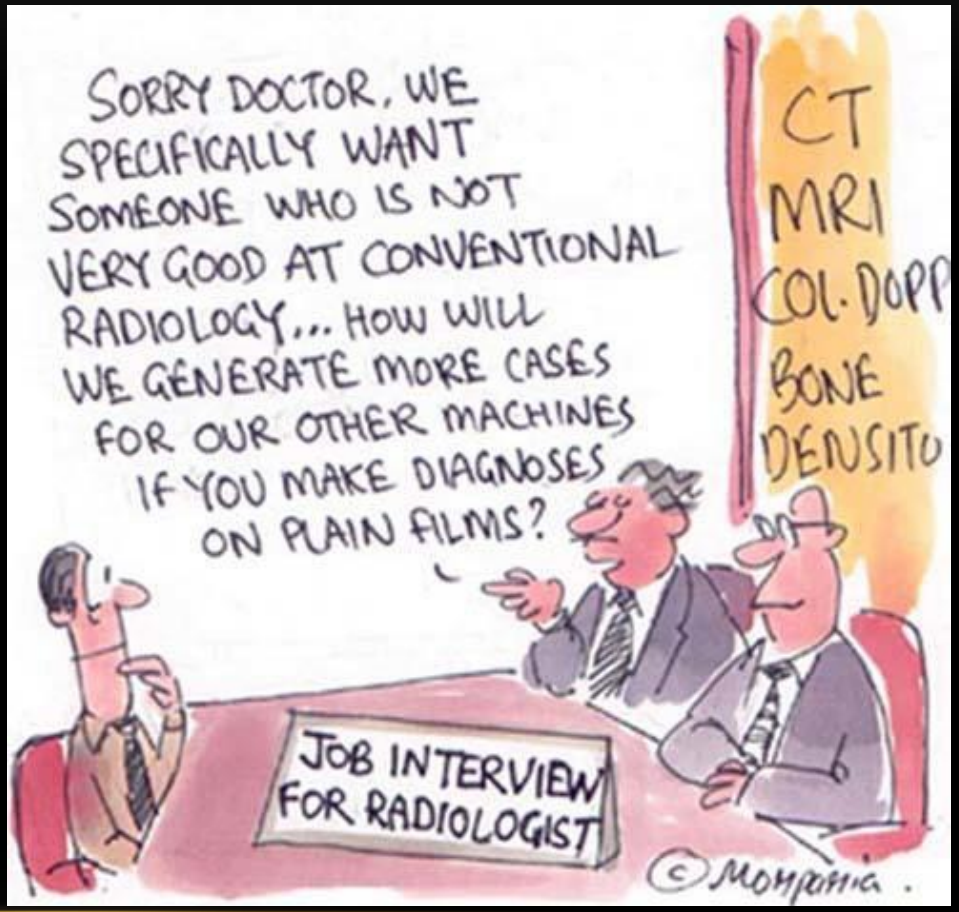
RESOURCES AT YOUR DISPOSAL

- Your radiologist!!!!

CONVENTIONAL RADIOGRAPH (X-RAY)

CONVENTIONAL RADIOGRAPHS

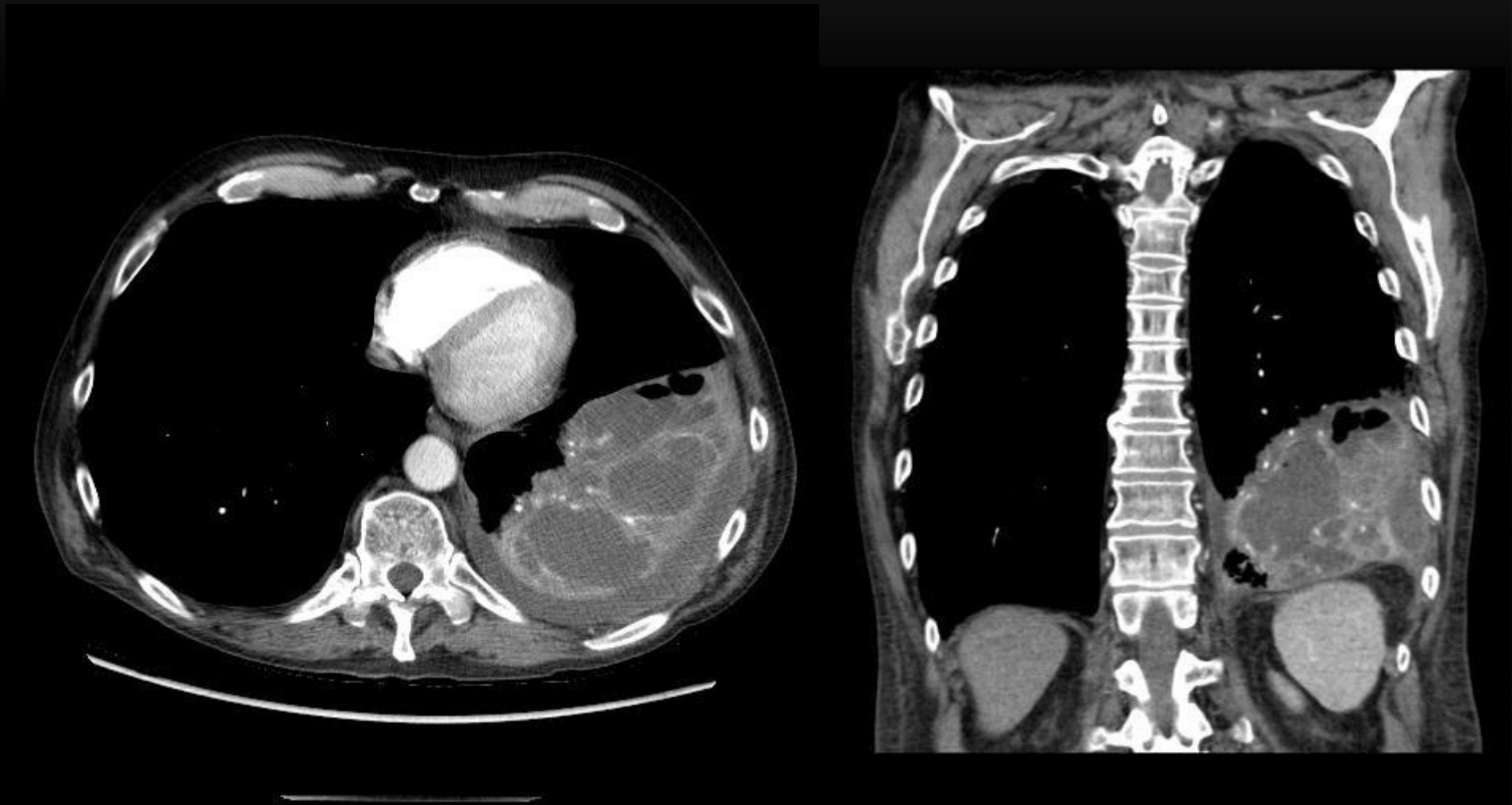
- Unsatisfying reports
  - "Thin lucency in the proximal tibia, possibly non displaced fracture. Correlate for point tenderness"
  - "Left lower lobe consolidation may represent atelectasis, pneumonia or edema; cannot exclude underlying mass lesion"
  - "Further evaluation with CT of the _____ is recommended"
  - "Non specific finding. Clinical correlation recommended…."



CONVENTIONAL RADIOGRAPH

Non specific lobulated left lower lobe mass, possibly loculated fluid, pleural based mass, neoplasm, infection. . ... Recommend correlation with CT of the chest.

CONVENTIONAL RADIOGRAPH



Multiloculated collection in the pleural space consistent with empyema

CONVENTIONAL RADIOGRAPH

- Specific views and patient positioning may be helpful
  - Upright chest x ray: Pneumoperitoneum
  - Expiratory upright film: Pneumothorax
  - Decubitus films: Layering effusion, pneumoperitoneum
  - Upright abdominal x ray: Small bowel obstruction

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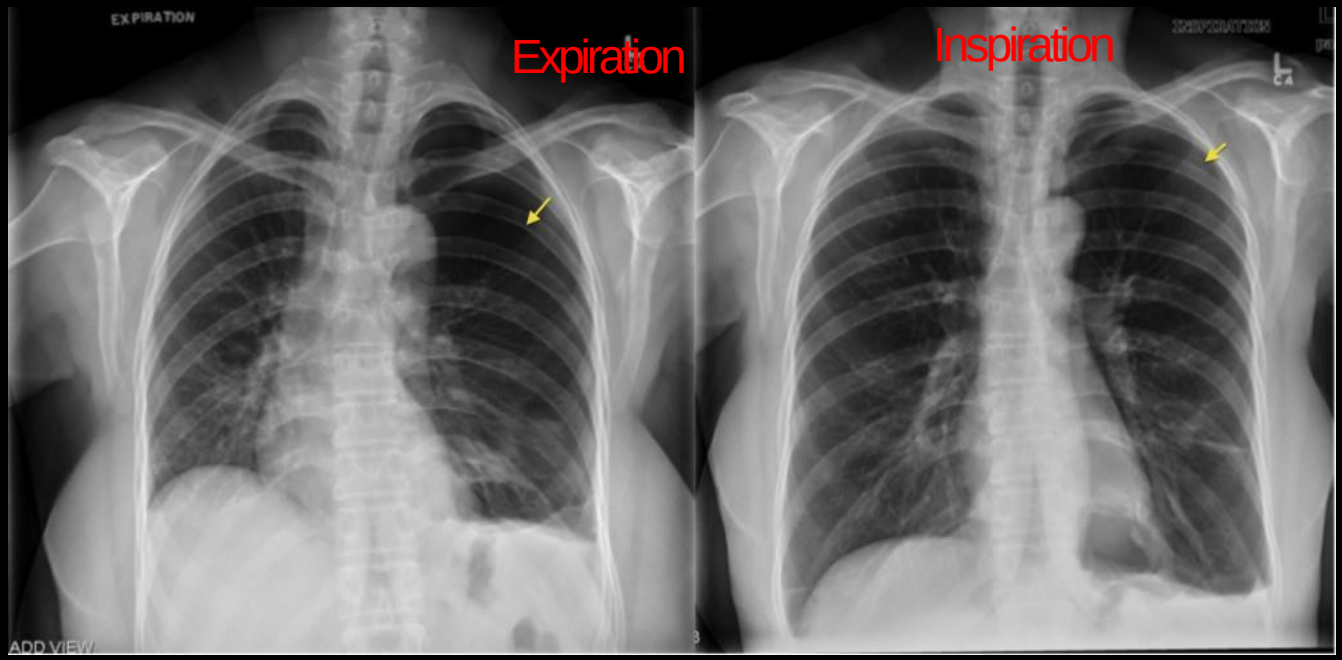

Image courtesy of Saint Vincent's University Hospital

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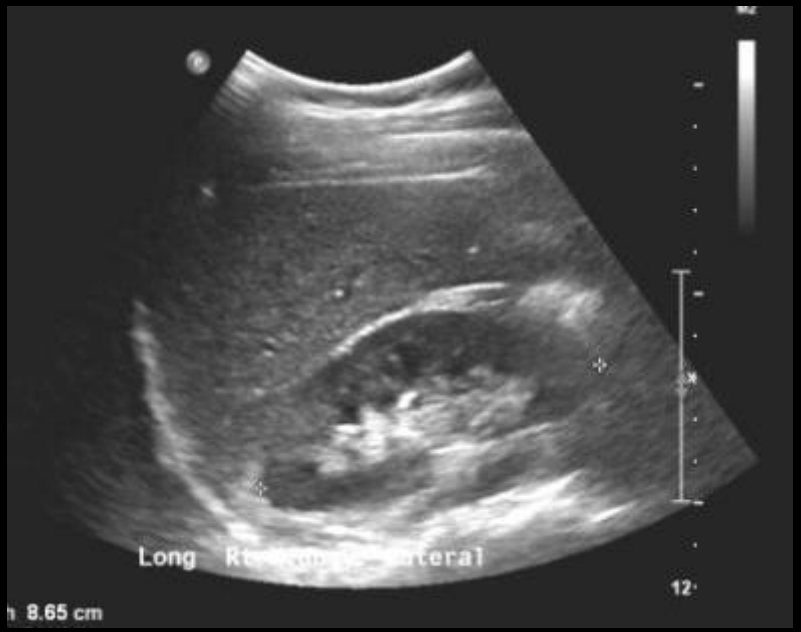
CONVENTIONAL RADIOGRAPH

- Easily accessible
- Not always sensitive or specific
- Specific views may answer specific clinical questions
- You get what you pay for!

ULTRASOUND


Pros
No radiation
"Real time" imaging- blood flow, peristalsis, etc
Cheap (relatively speaking
Operator dependent
Patient dependent
• Body habitus
• Positioning
• Breath hold
Cons

ULTRASOUND LIMITATIONS: BODY HABITUS



BMI 24

BMI 49

ULTRASOUND LIMITATIONS: BOWEL GAS

ULTRASOUND: LIMITATIONS

High Frequency ultrasound

- Good spatial resolution
- Superficial penetration

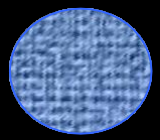
Superficial structures

- Thyroid
- Subcutaneous
- Breast
- Lymph nodes
- Superficial vessels

Low Frequency ultrasound

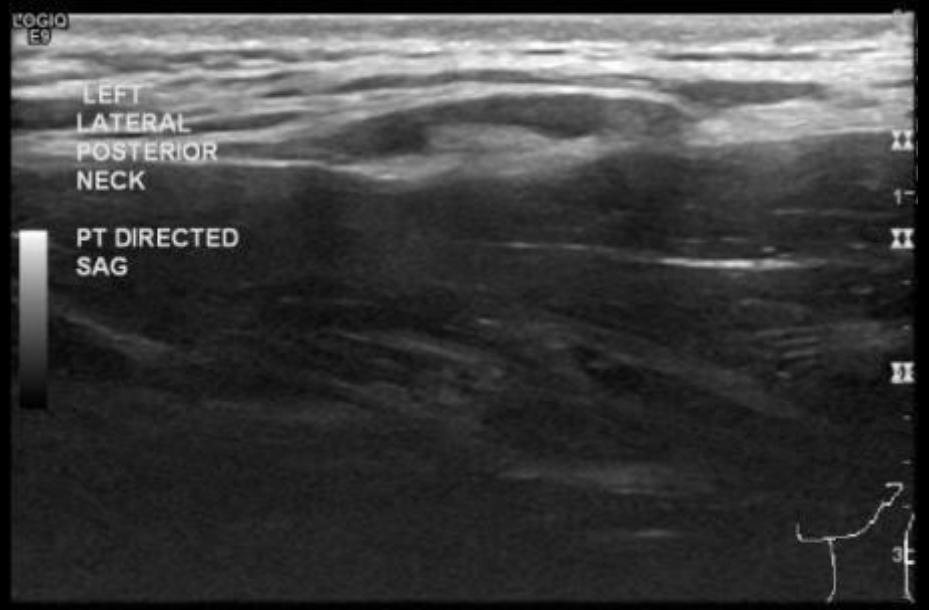
- Worse spatial resolution
- Deep penetration

- Deeper structures
  - Abdominal organs



ULTRASOUND: SUPERFICIAL STRUCTURES

THYROID NODULE



Cervical lymph nodes

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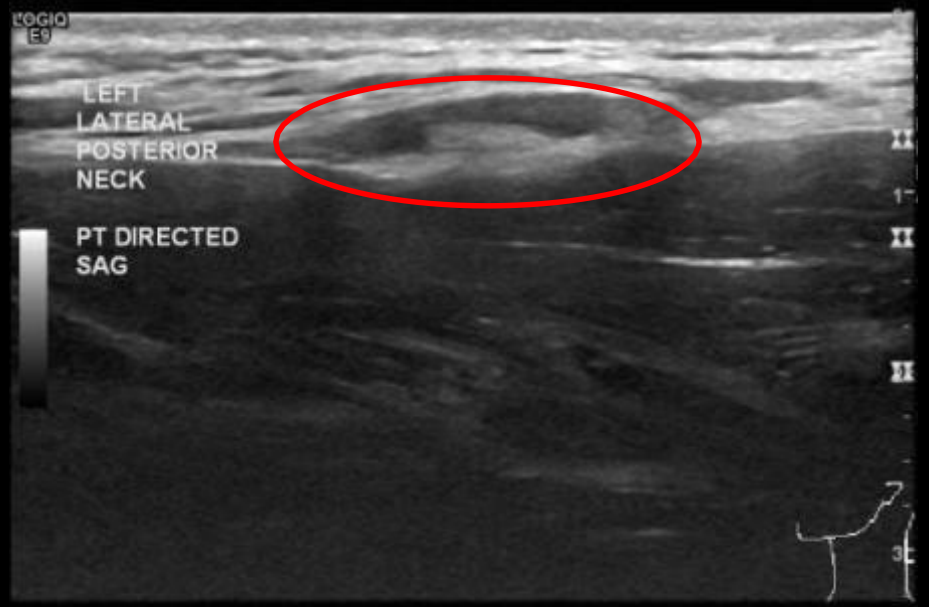

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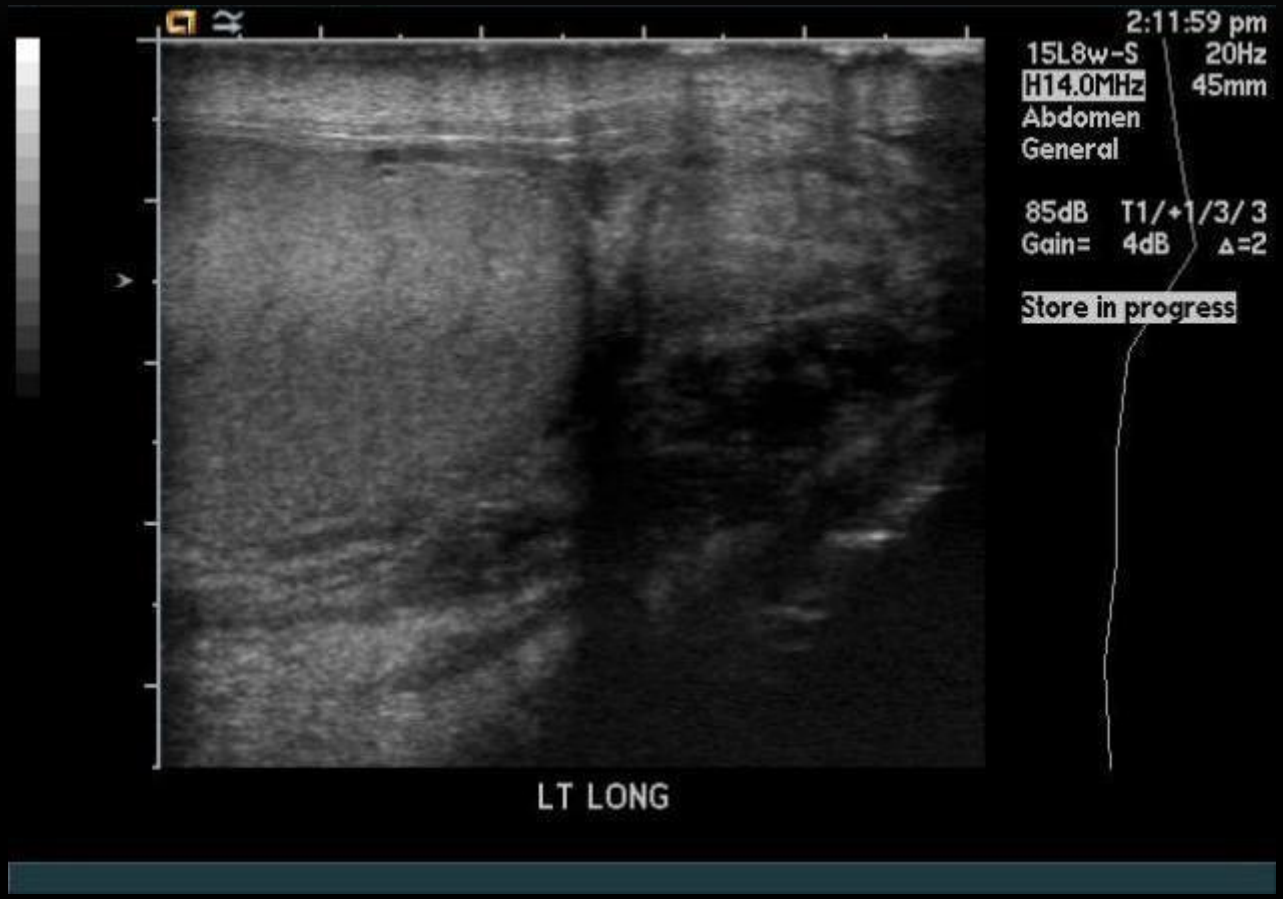
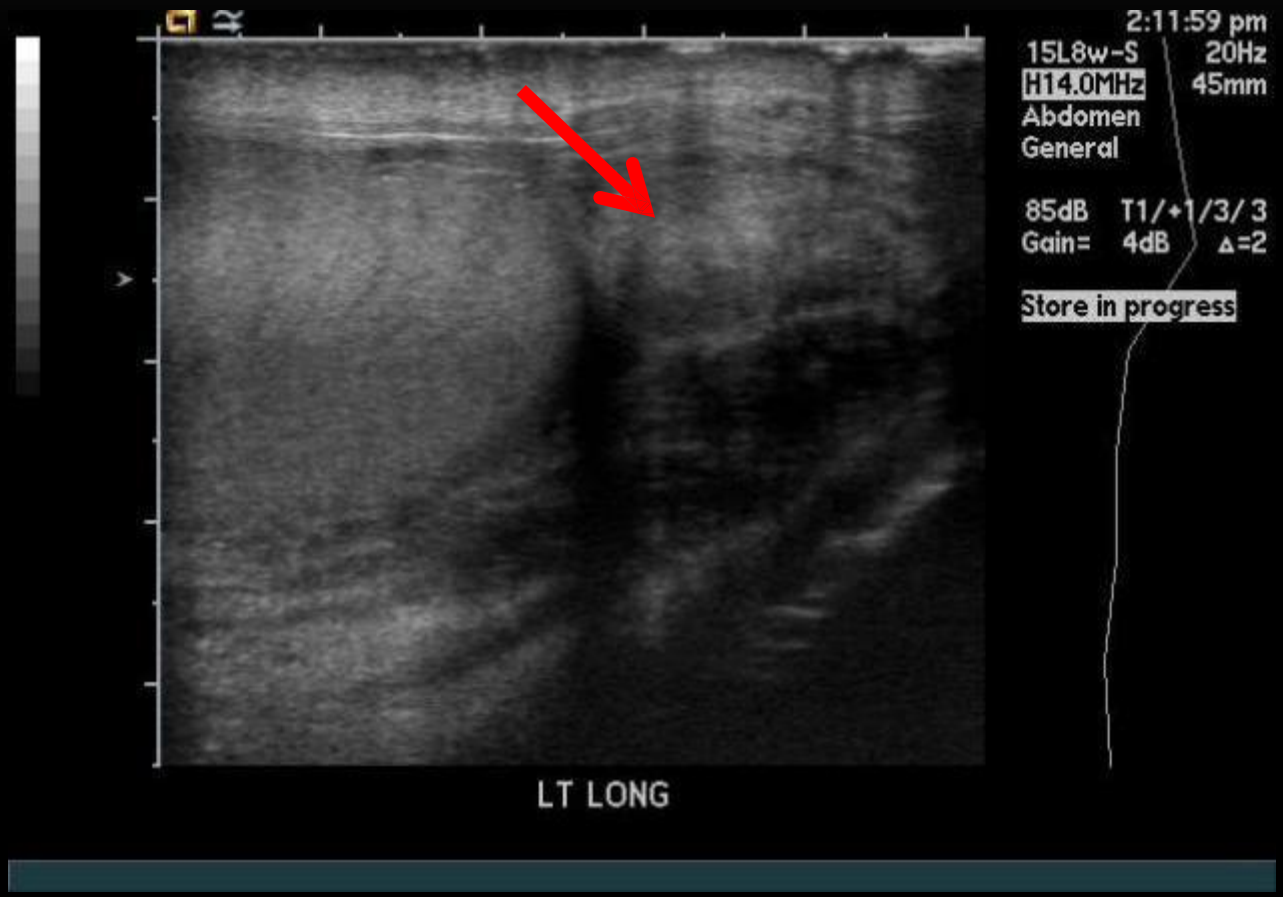
ULTRASOUND: DYNAMIC IMAGING



Left inguinal hernia with Valsalva

ULTRASOUND: DYNAMIC IMAGING



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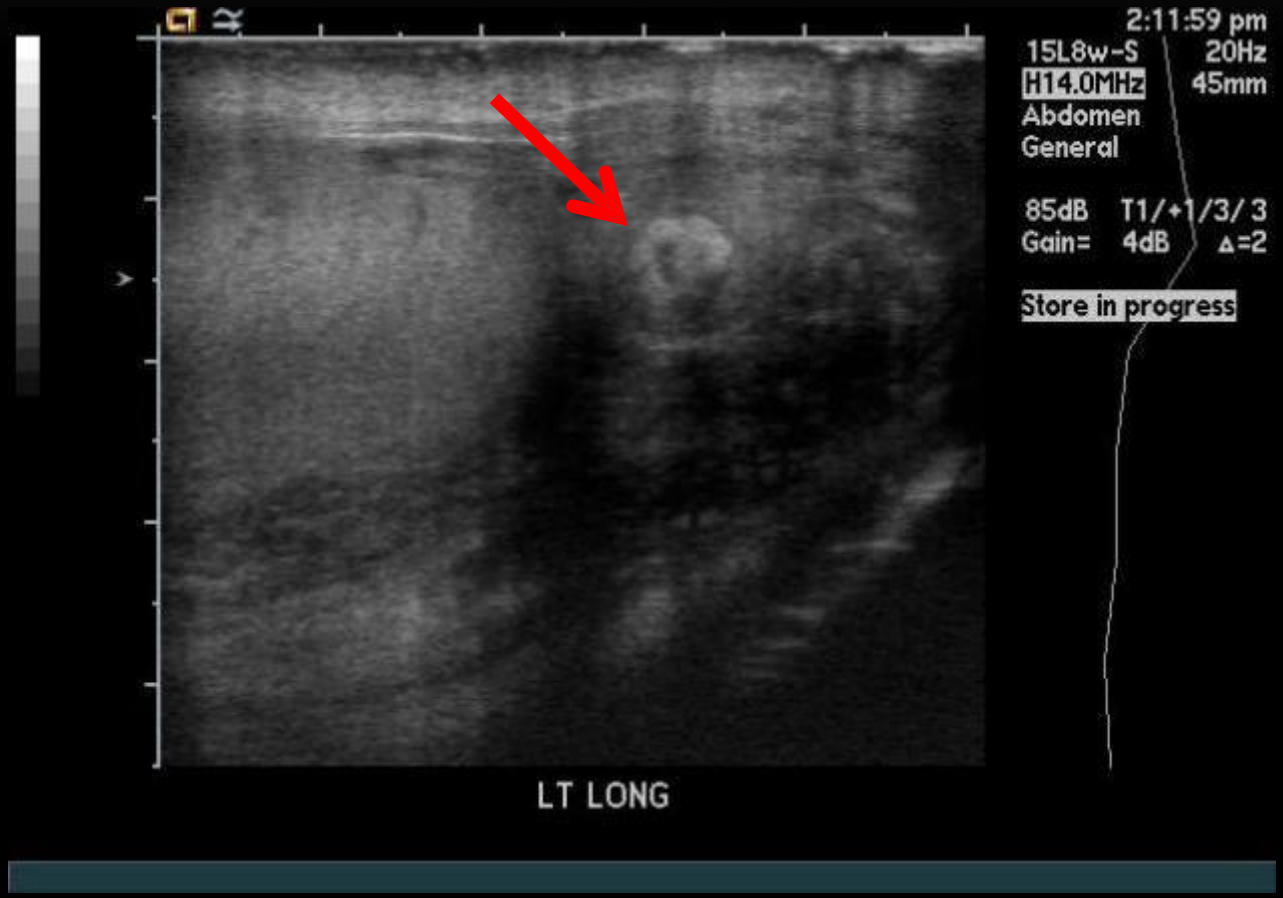

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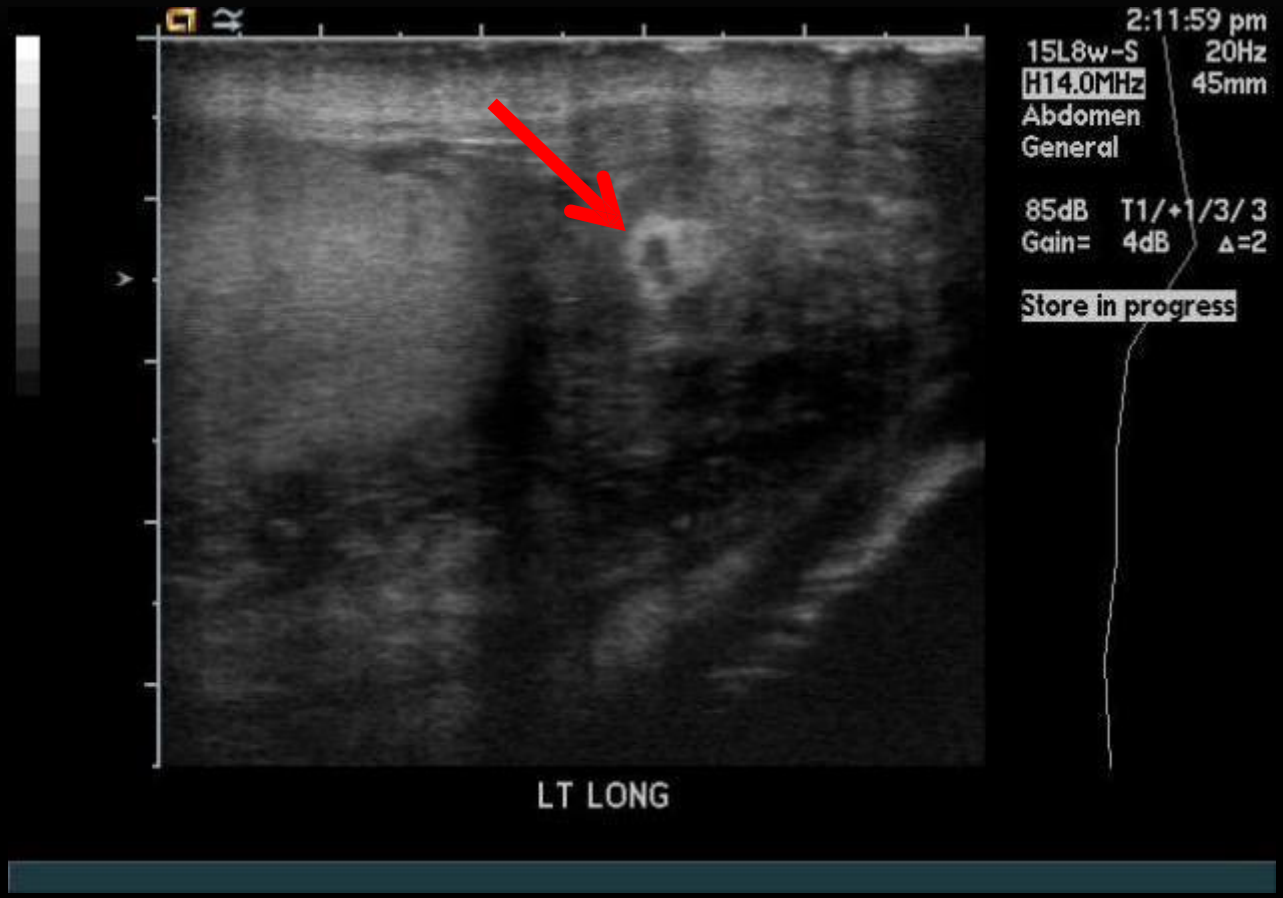

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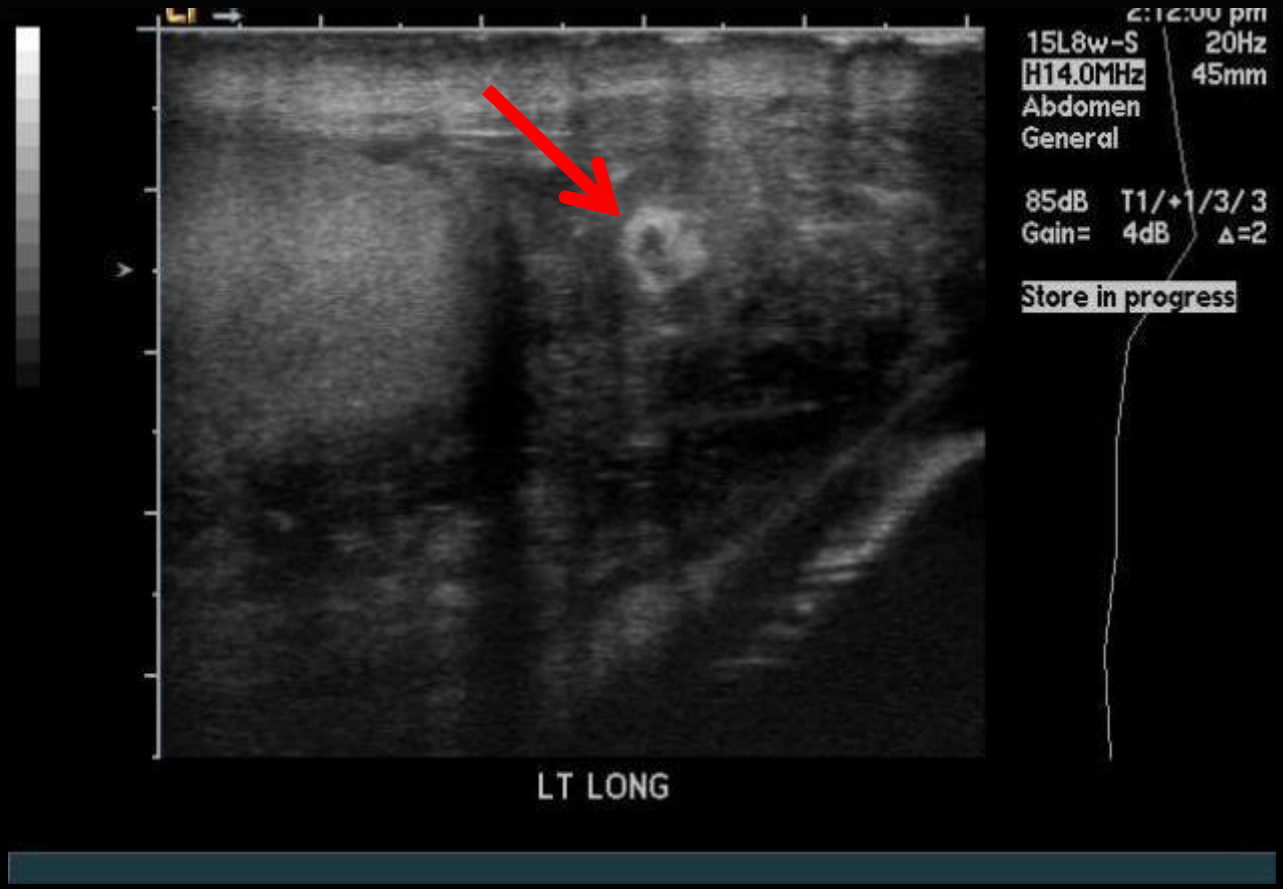

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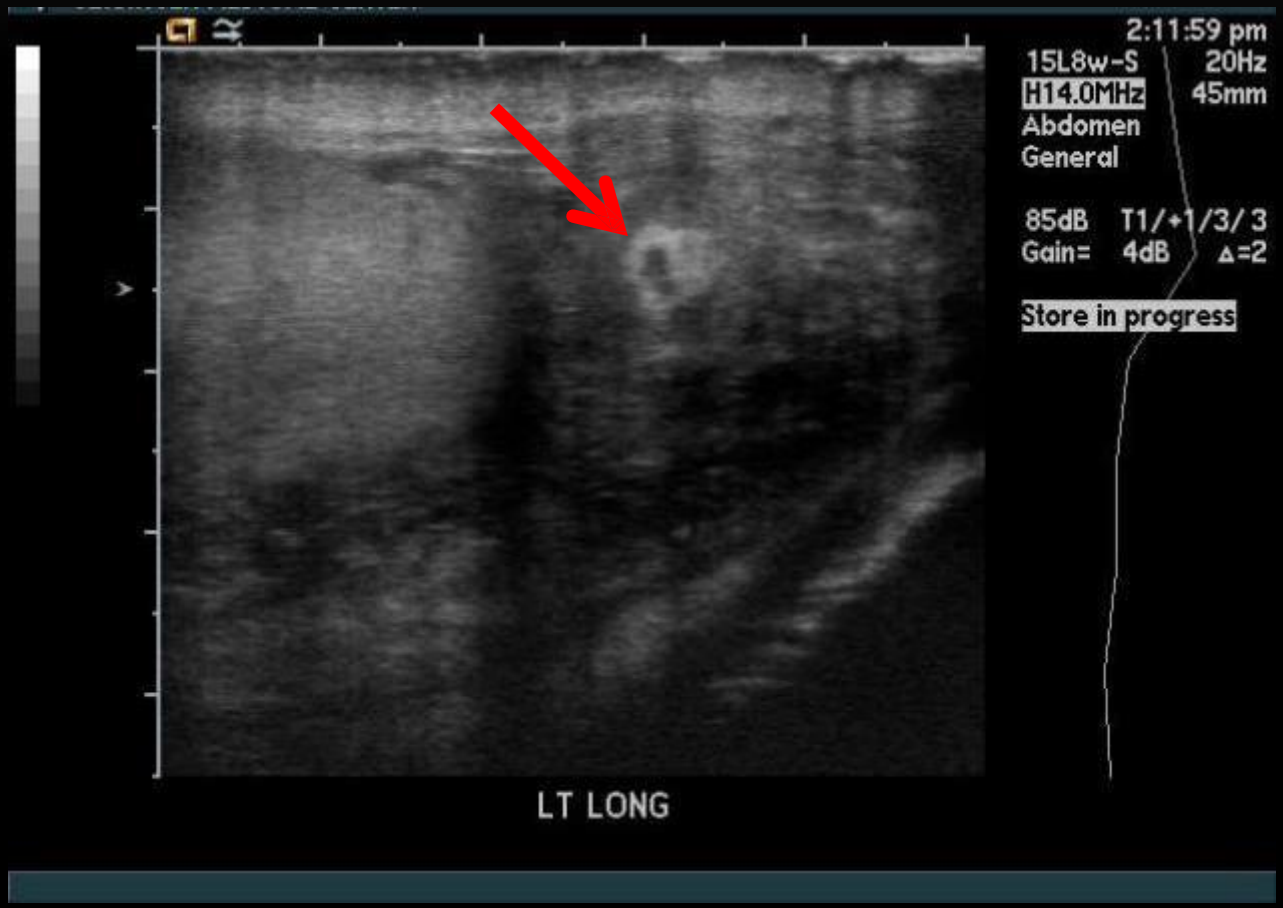

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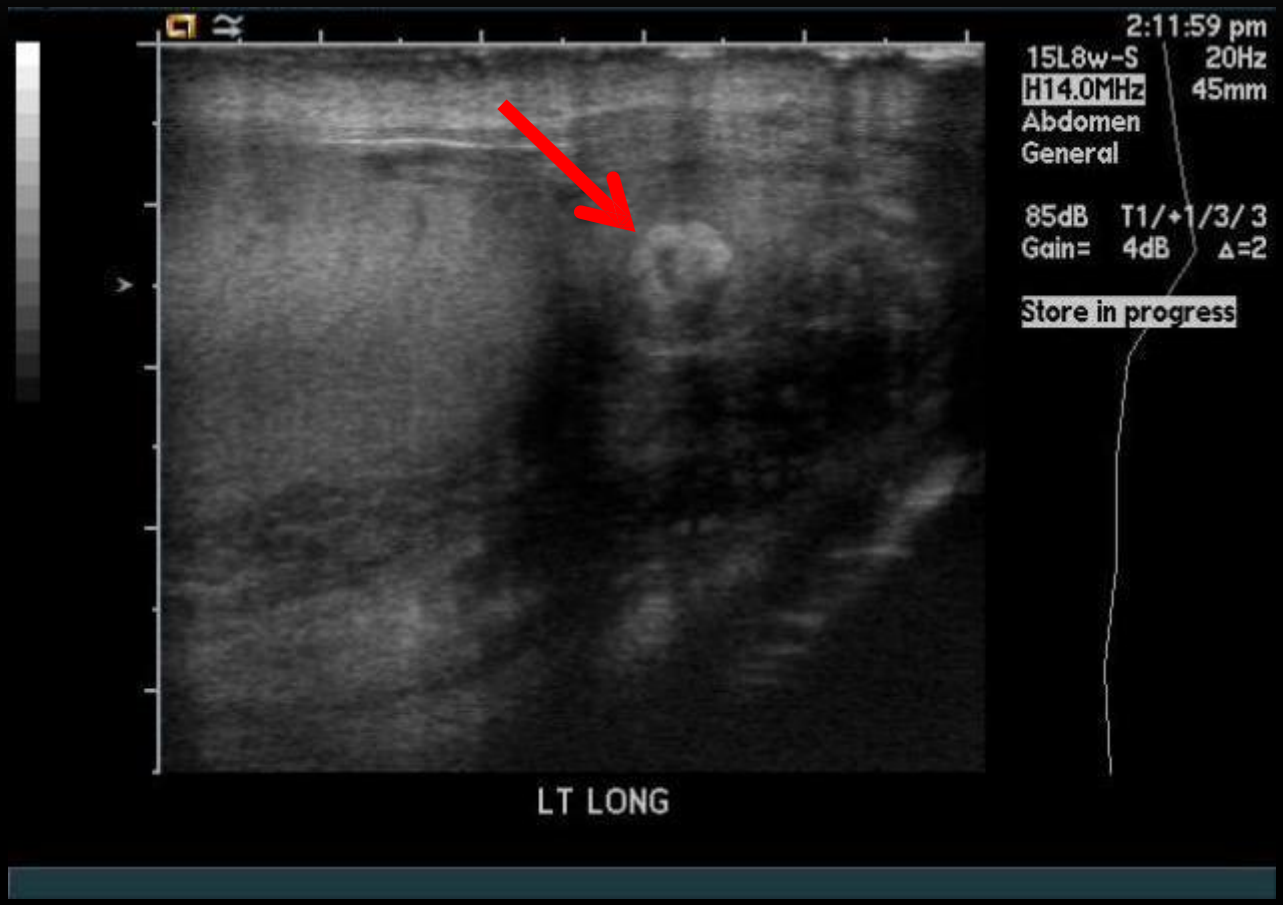

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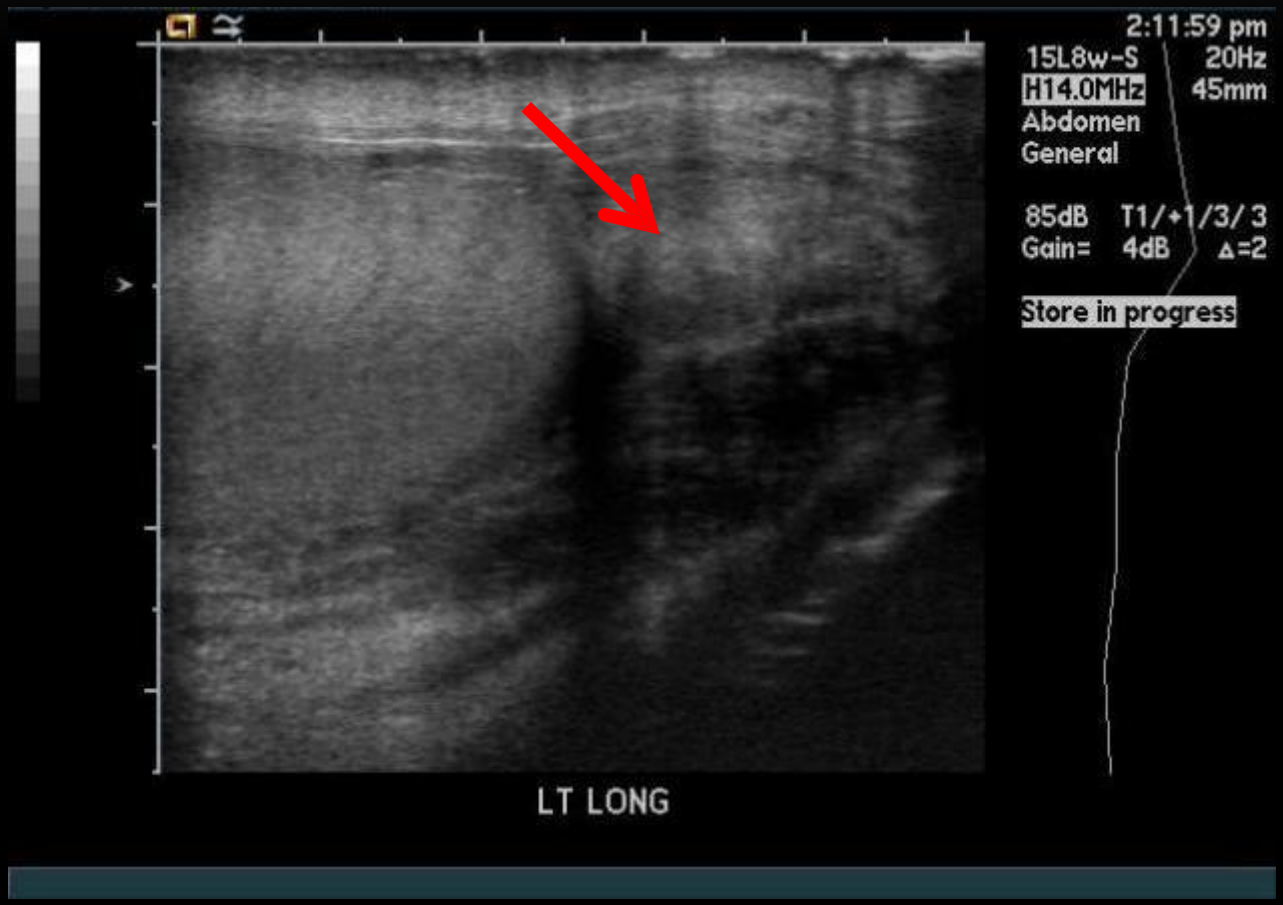

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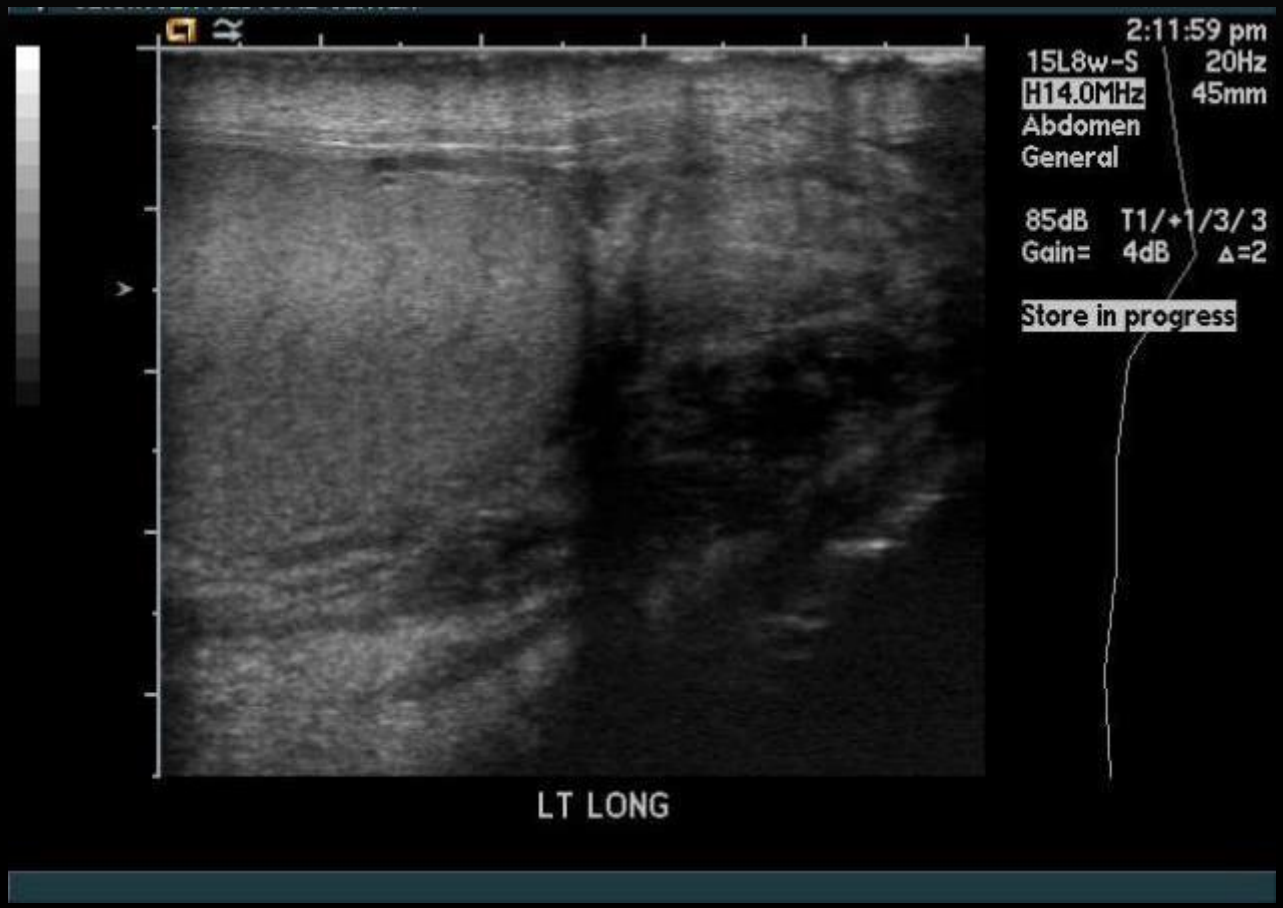
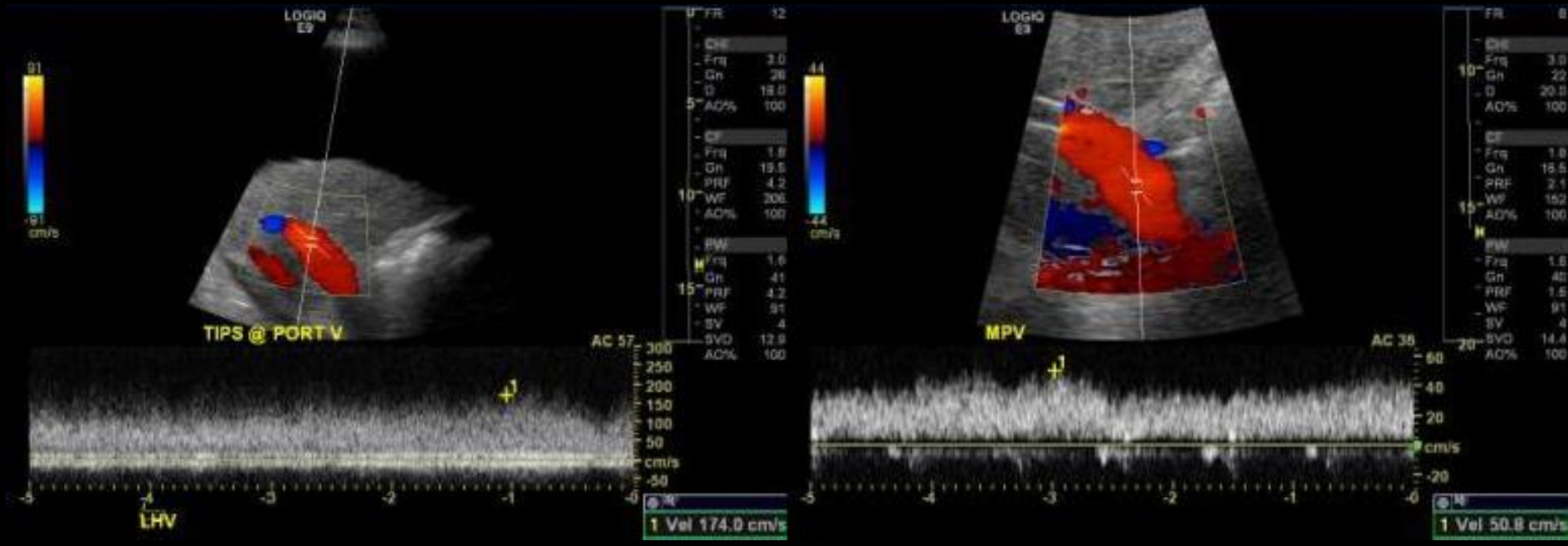


Left inguinal hernia with Valsalva

ULTRASOUND: VASCULAR EVALUATION

- Cirrhotic patient: TIPS evaluation

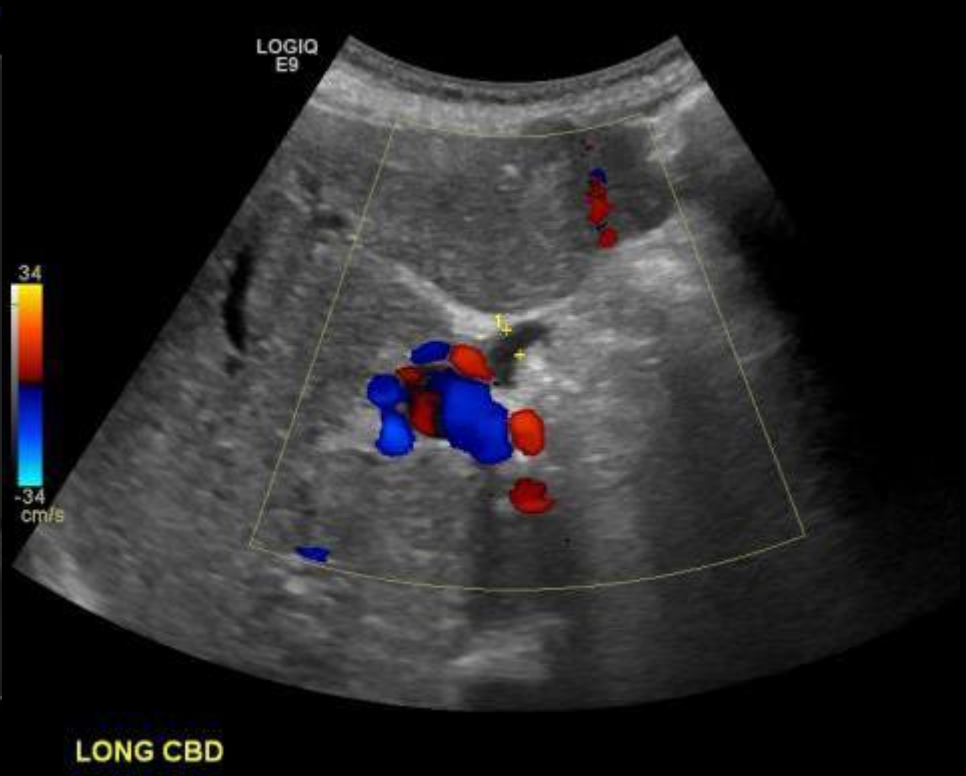


Elevated velocities through TIPS indicative of stent malfunction

ULTRASOUND: BILIARY TREE

Intrahepatic biliary ductal dilatation

Normal caliber common bile duct



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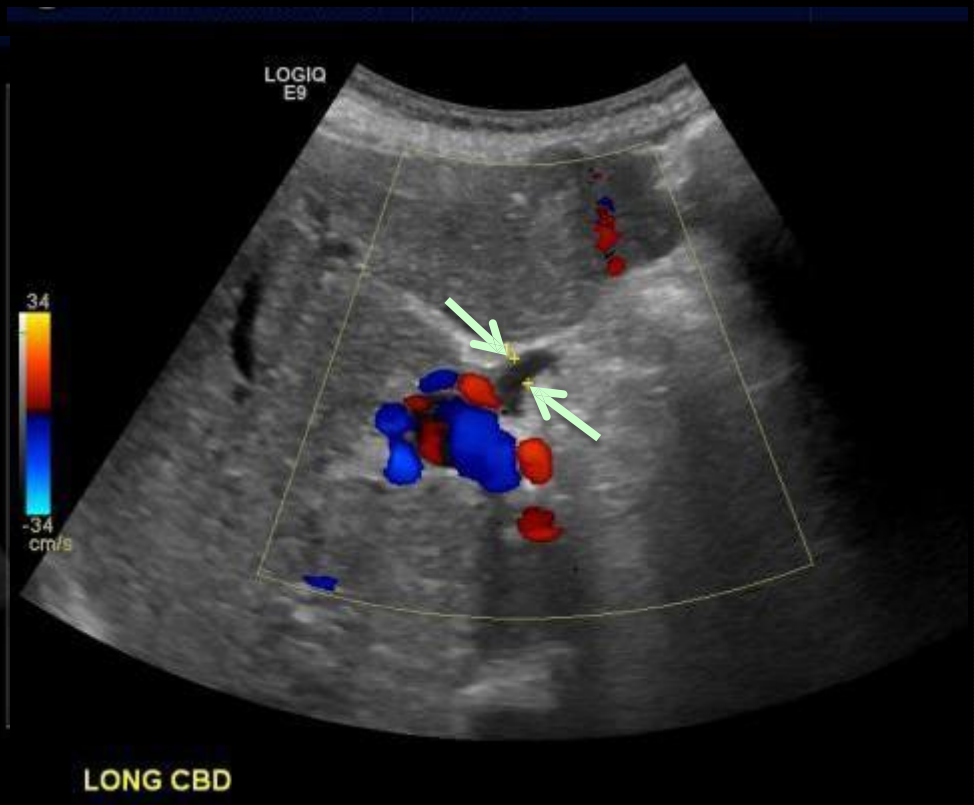
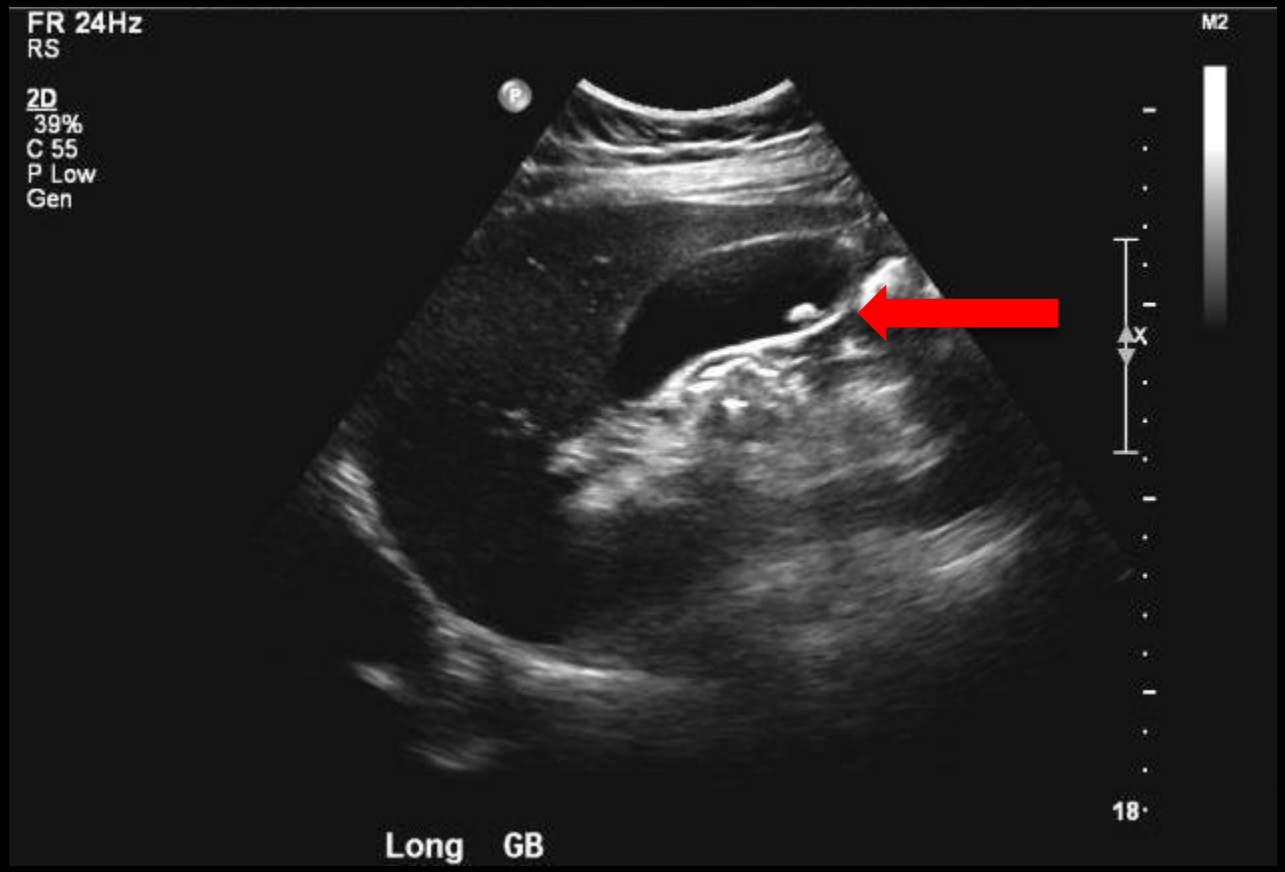


ULTRASOUND: GALLBLADDER/BILIARY TREE

- Incidental gallstone



ULTRASOUND: GU IMAGING

- First line modality:
  - Uterus
  - Ovaries
  - Testicles
  - Superficial structures
- Why?
  - Good soft tissue contrast
  - No radiation

ULTRASOUND: GU EVALUATION: UTERUS

- Post menopausal bleeding

Ill defined uterine mass, possibly leiyomyoma although neoplasm cannot be excluded: Recommend ultrasound for further evaluation…

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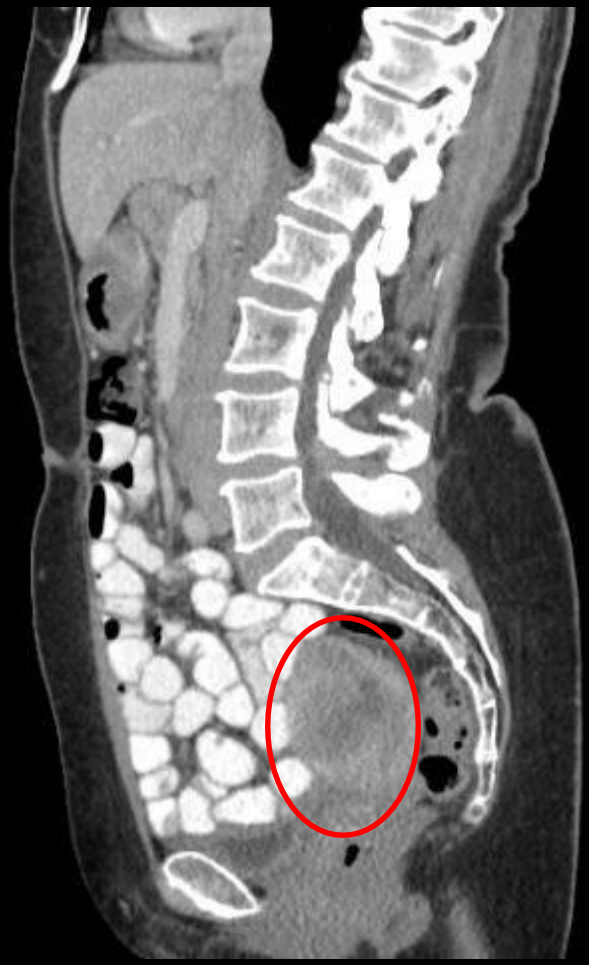

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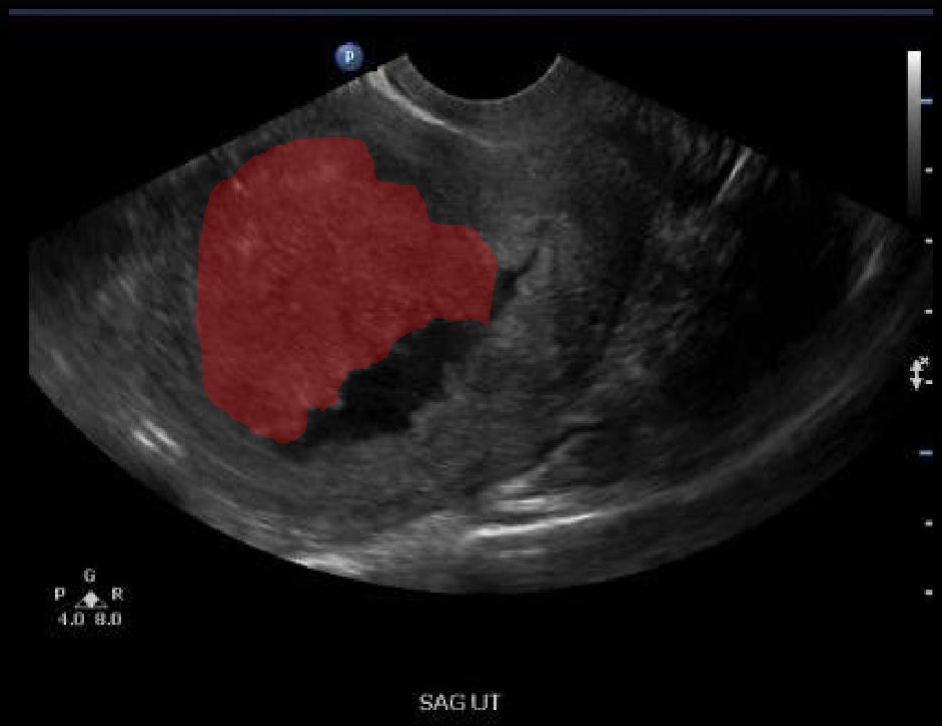
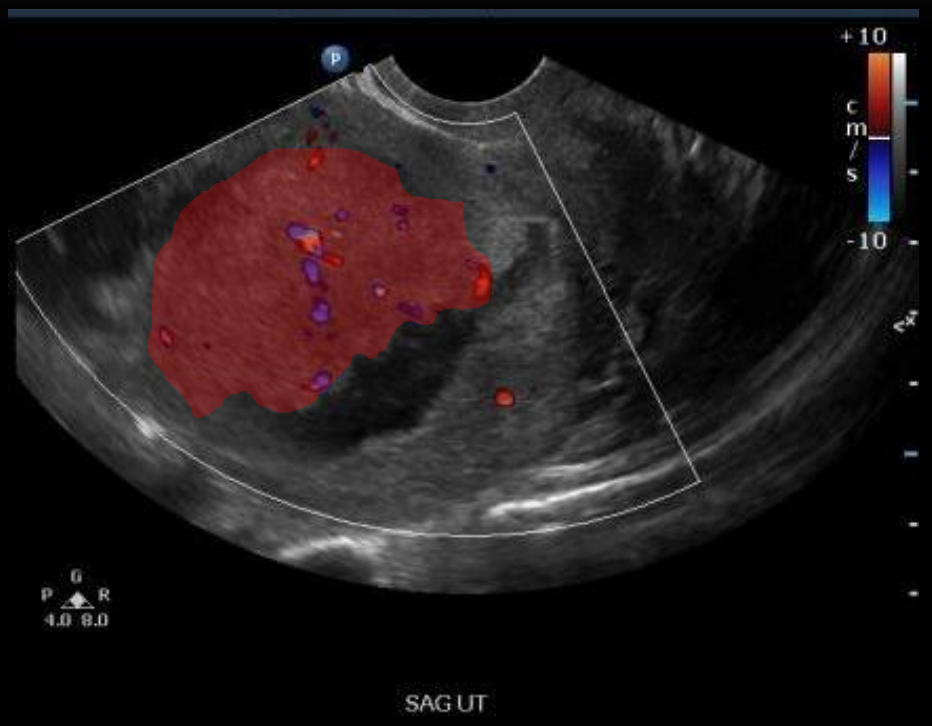
ULTRASOUND: GU EVALUATION: UTERUS

FIGO grade II endometrial adenocarcinoma involving 81% of the myometrium

ULTRASOUND: GU EVALUATION: UTERUS

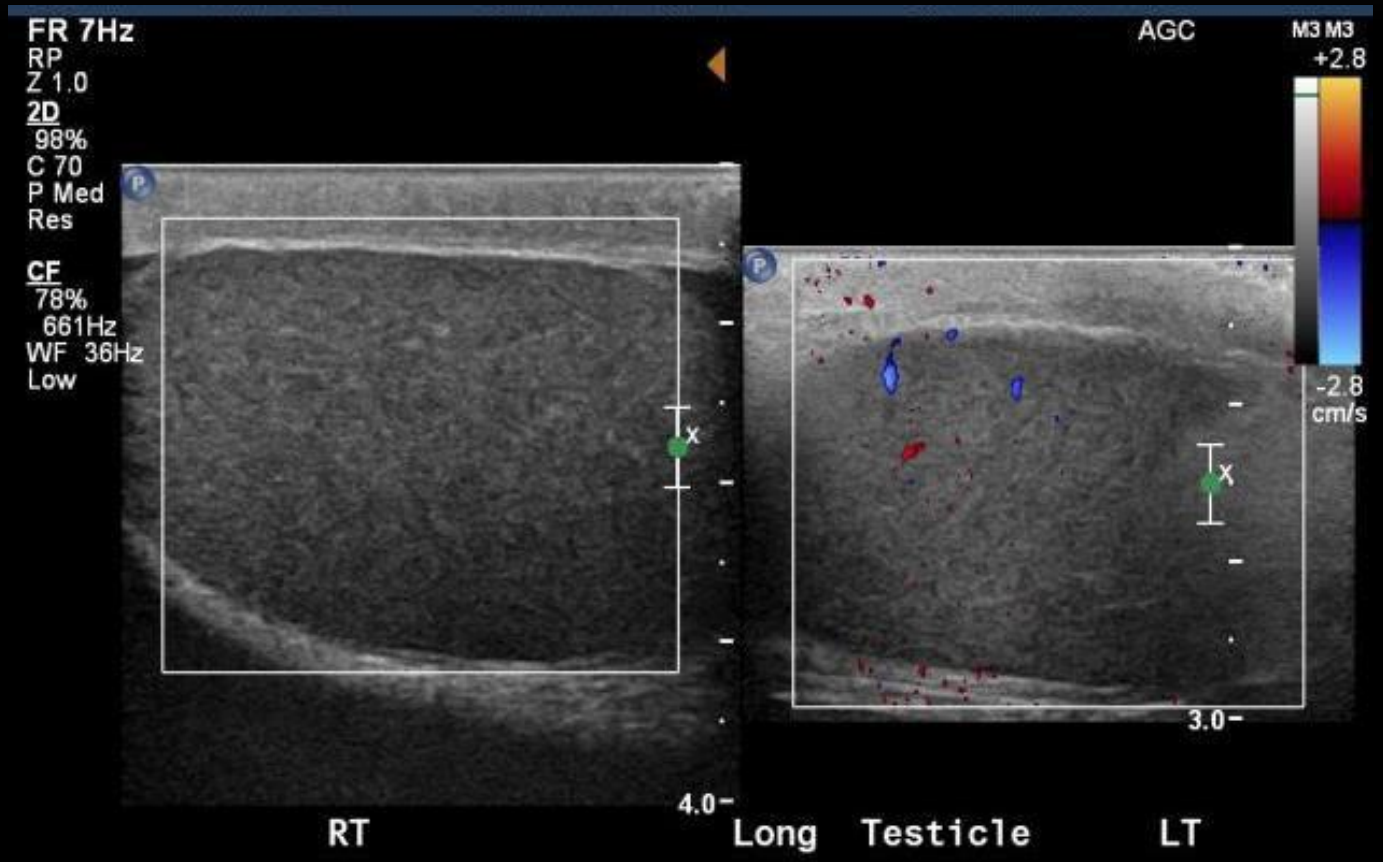




FIGO grade II endometrial adenocarcinoma involving 81% of the myometrium

ULTRASOUND: GU EVALUATION: TESTICLES

- 13 year old male with testicular pain



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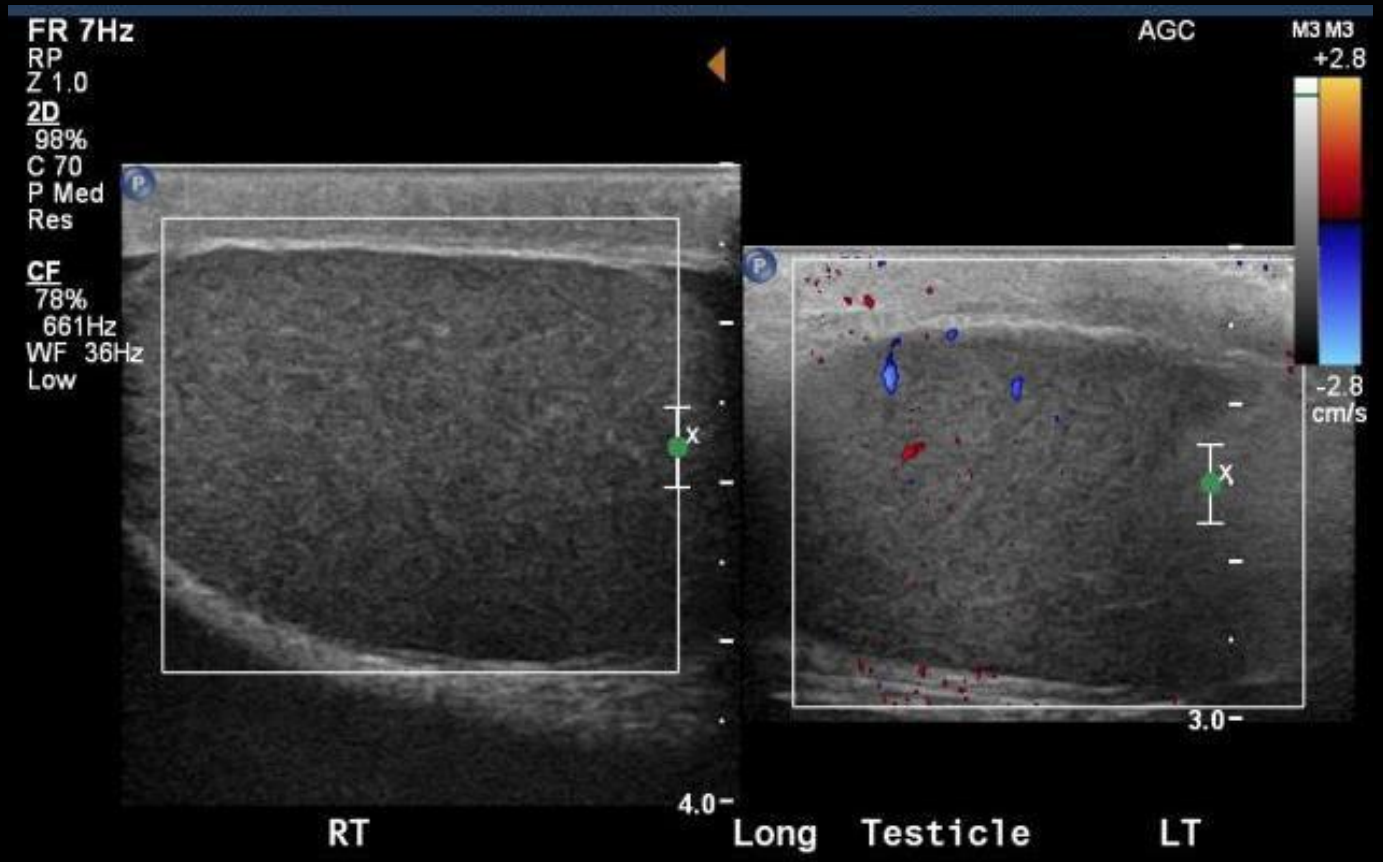
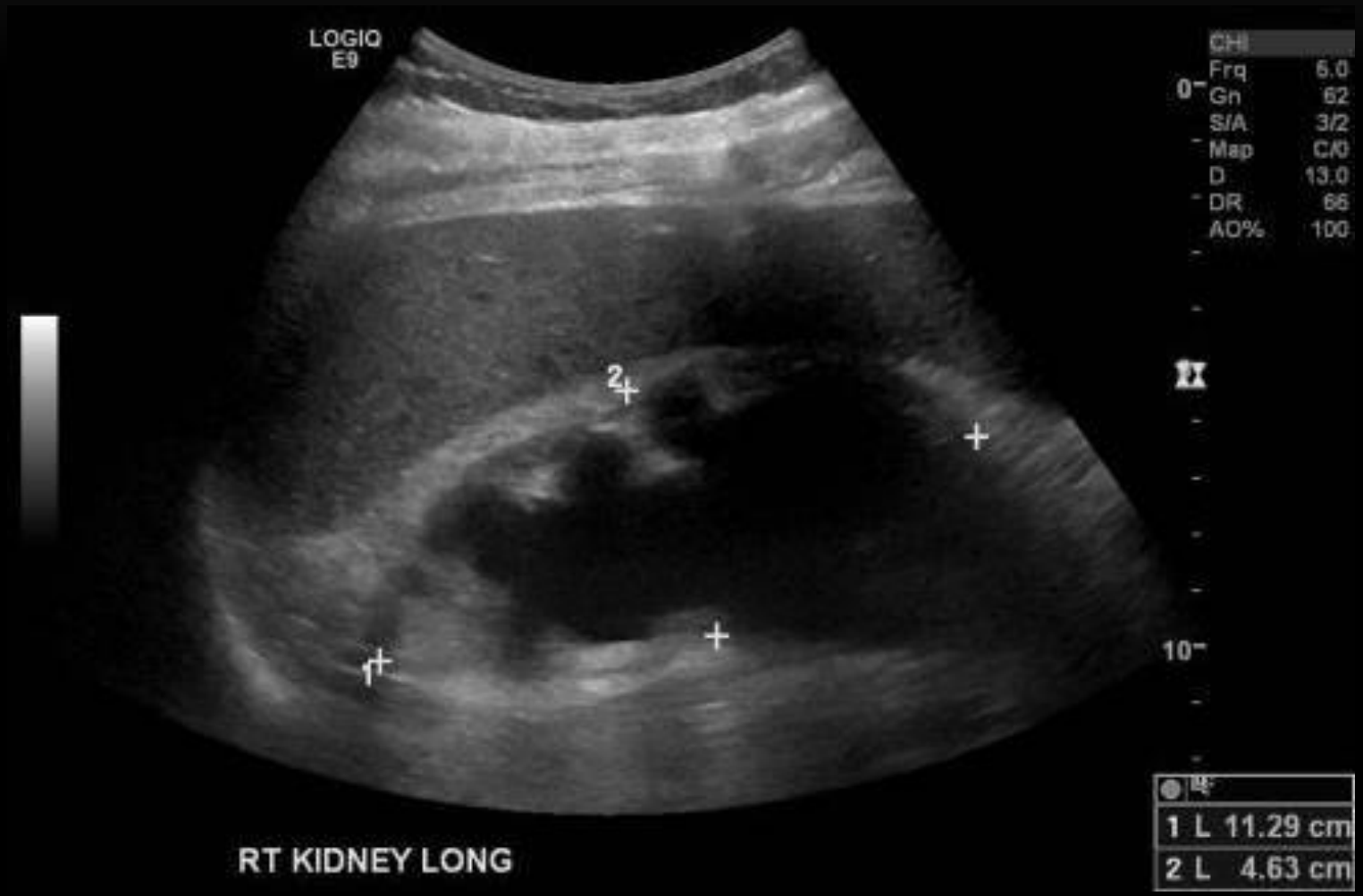


Right sided testicular torsion

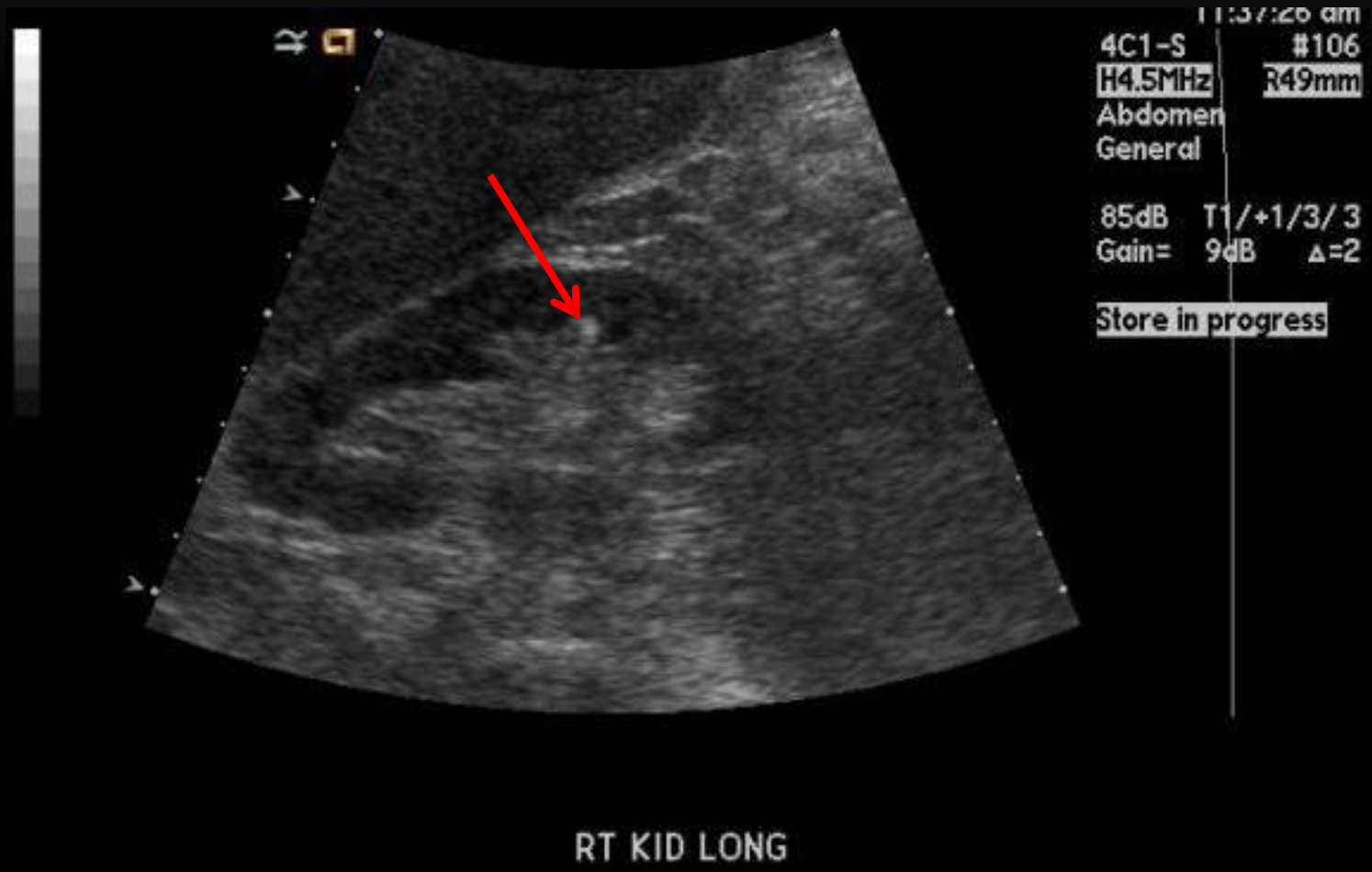
ULTRASOUND: GU EVALUATION: KIDNEYS

- Useful:
  - Stones (sometimes)
  - Hydronephrosis
  - Cysts (sometimes)
- Not useful:
  - Characterizing solid renal masses (except CEUS)
  - Ureteral stones (sometimes)

ULTRASOUND: HYDRONEPHROSIS



ULTRASOUND: NEPHROLITHIASIS

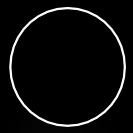


ULTRASOUND: SOLID VERSUS CYSTIC

Multiple simple renal cysts

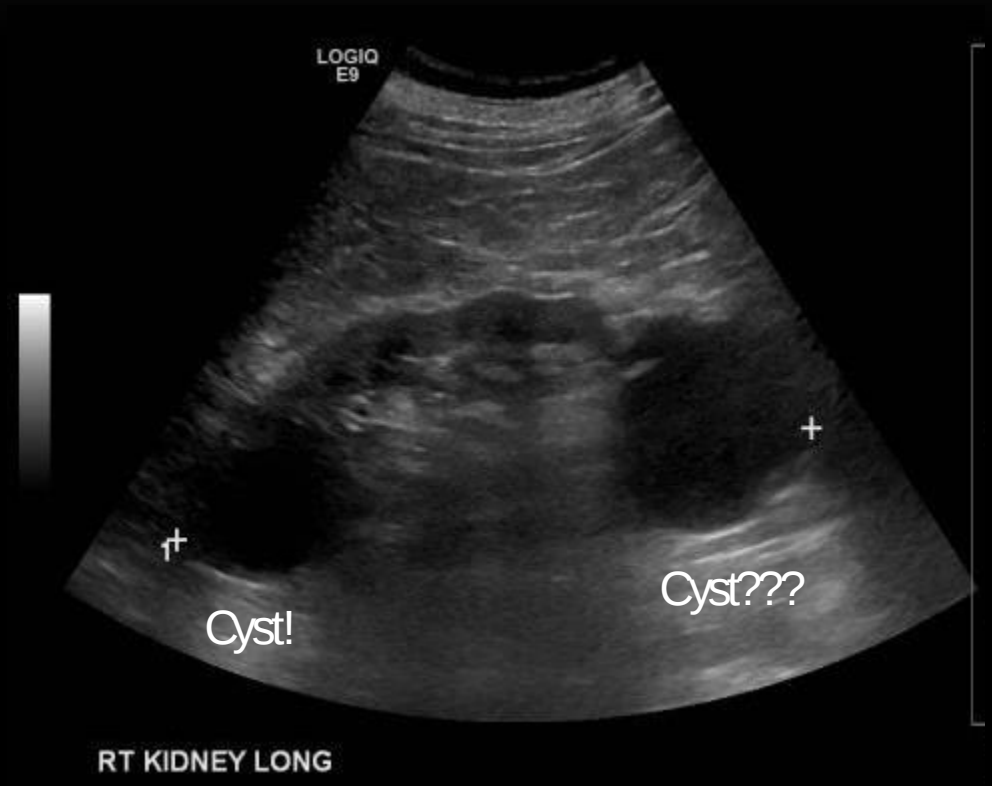
Characteristics of a cyst

1. Anechoic = "black"
2. Posterior acoustic enhancement = "bright shadow"
3. No blood flow
4. Nothing in it



Simple cyst

ULTRASOUND: SOLID VERSUS CYSTIC



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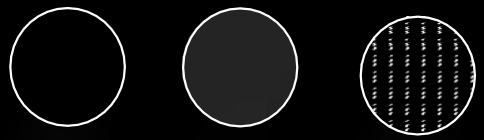
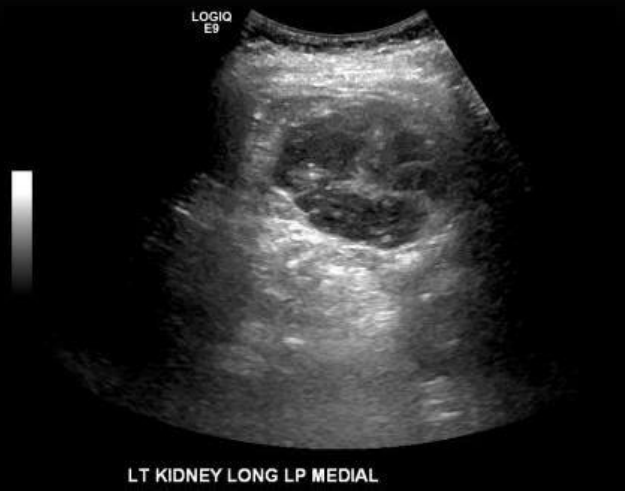


Simple cyst Mildly complex cysts

ULTRASOUND: GU: KIDNEYS

- 79 year old female with acute kidney injury



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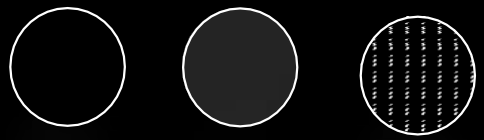

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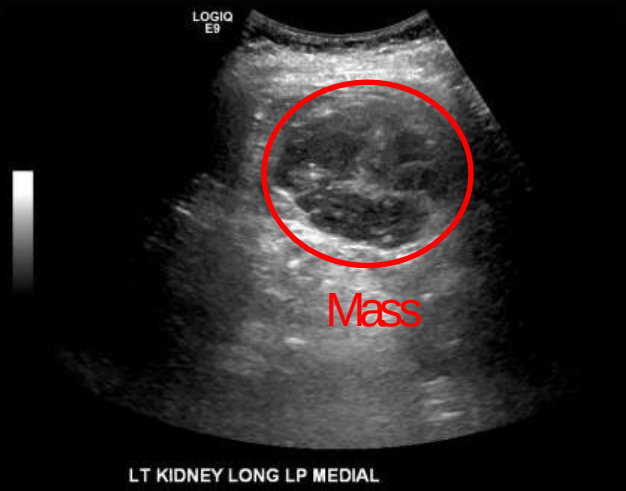
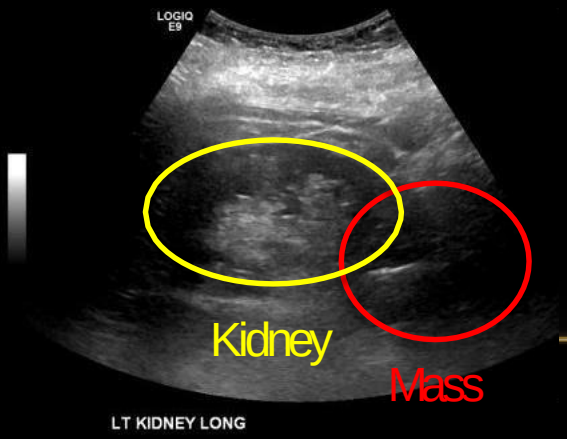
ULTRASOUND: GU: KIDNEYS

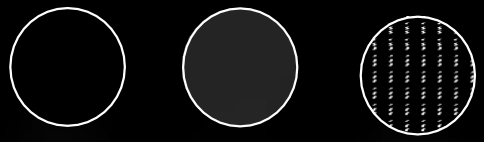
- 79 year old female with acute kidney injury





Characteristics of a cyst

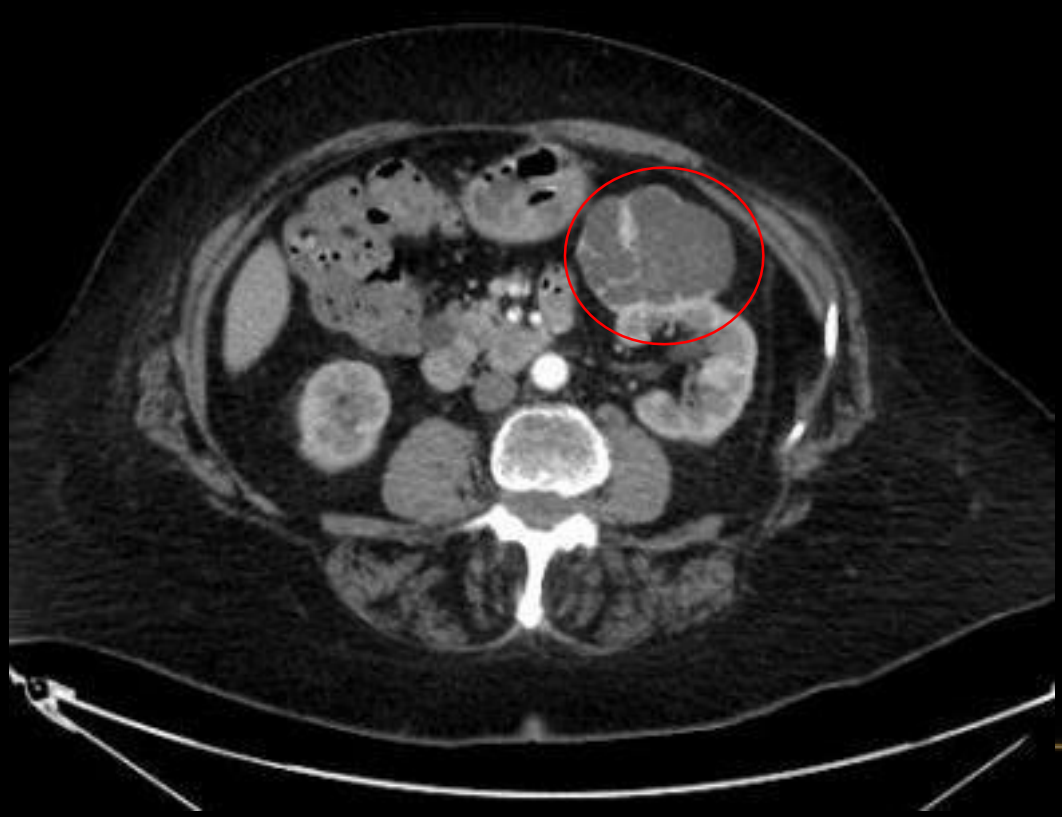
1. Anechoic = "black"
2. Posterior acoustic enhancement = "bright shadow"
3. No blood flow
4. Nothing in it



Simple cyst Mildly complex cysts

ULTRASOUND: GU: KIDNEYS

- 79 year old female with AKI



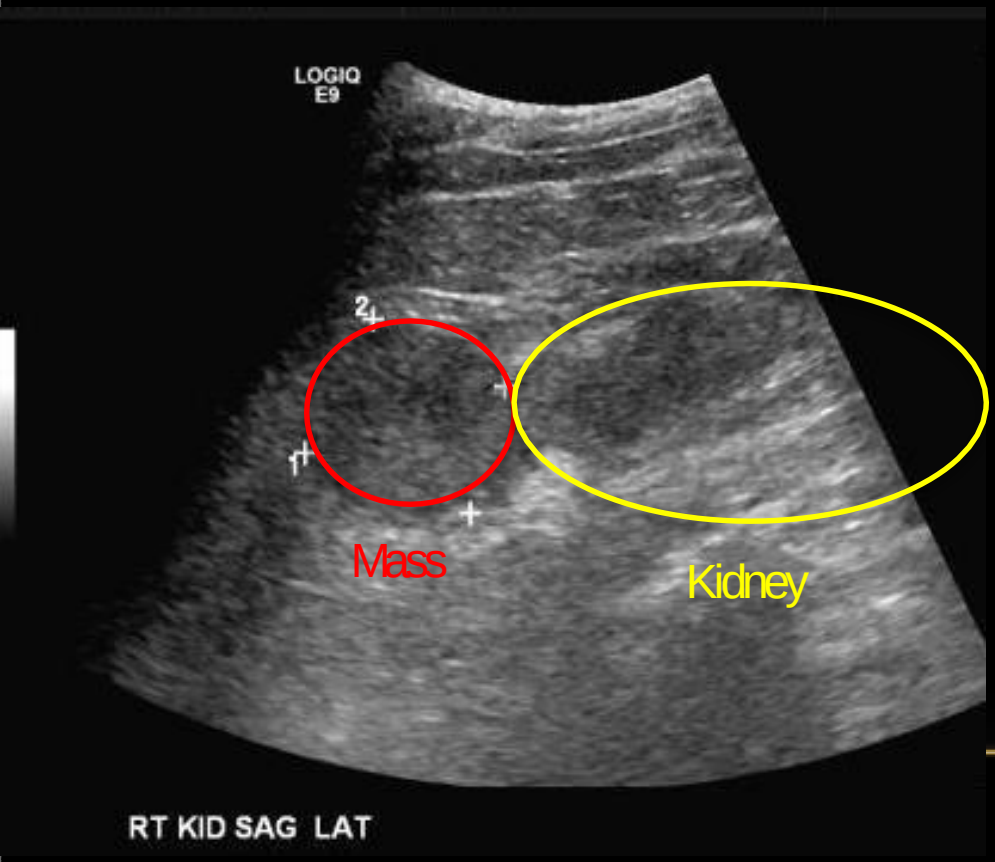
Renal cell carcinoma

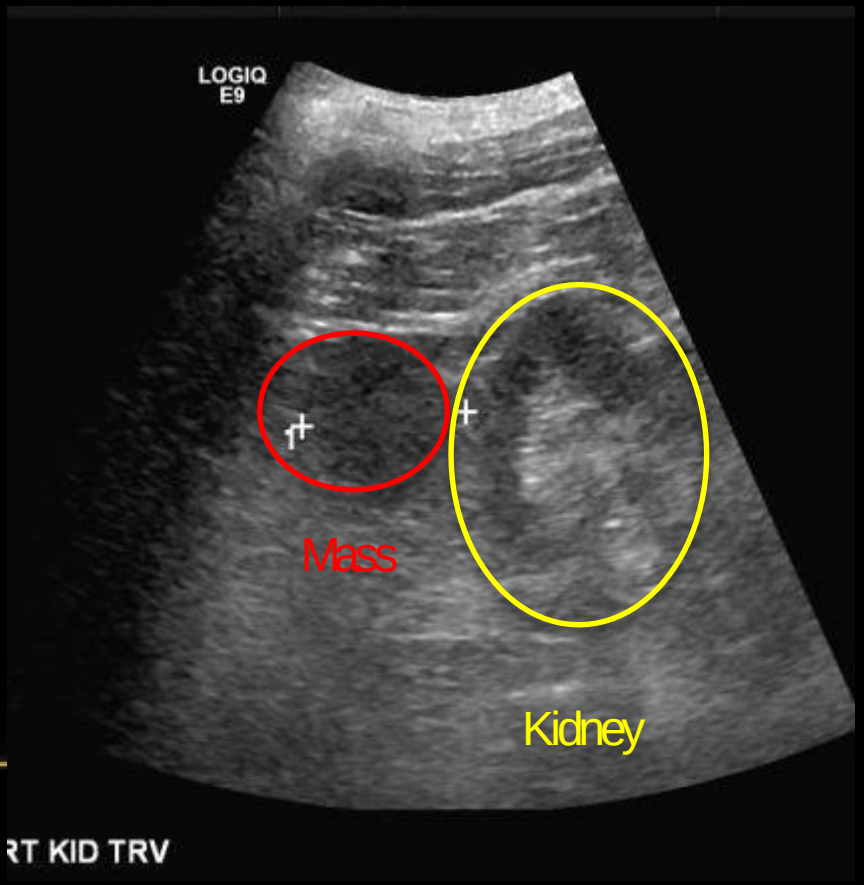
ULTRASOUND: GU: EVALUATION OF KIDNEY

- 71 year old male with right upper quadrant pain

ULTRASOUND: GU: EVALUATION OF KIDNEY

- 71 year old male with right upper quadrant pain





ULTRASOUND: GU: EVALUATION OF KIDNEY

- 71 year old male with right upper quadrant pain

Clear cell renal cell carcinoma: 5 cm

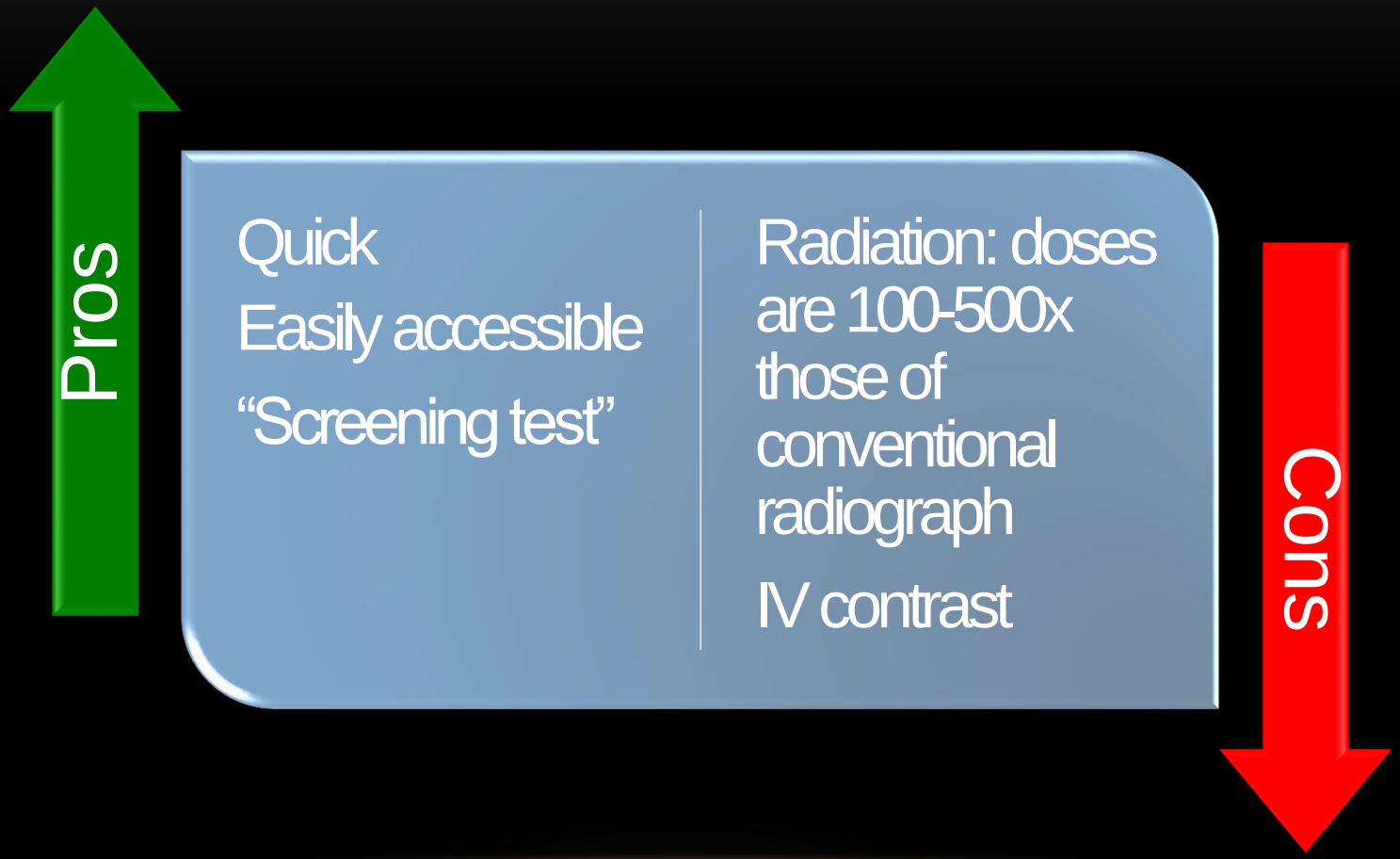
ULTRASOUND: GU EVALUATION: KIDNEYS

- Uses
  - Hydronephrosis: Very good
  - Calculi: Good (renal caluli, not necessarily ureteral calculi)
  - Cysts: Okay (simple cysts, non obese patient)
  - Masses (detection and characterization): Poor

ULTRASOUND

- First line imaging modality
  - Vascular pathology
  - Dynamic ”real time” imaging
  - Biliary pathology
  - Uterus, ovaries, testicle
  - Kidneys (sometimes)
- NOT useful for
  - Characterizing solid lesions
  - Detection of occult pathology outside of the probe’s range
  - Penetrating extensive fat/gas

COMPUTED TOMOGRAPHY



CT CONTRAST AGENTS

- At risk patients: BUN/Creatinine recommended within *30 days* of the exam IF…
  - > 60 year old
  - History of renal disease
    - Dialysis
    - Renal transplant
    - Single kidney
    - Renal cancer
    - Renal surgery
  - Hypertension requiring medical therapy
  - History of diabetes
  - Metformin use
- No universal cutoff- will vary with institution
  - Range of serum creatinine 1.5-2.0 , we go by GFR

We use GFR cutoff of 30 at UNC

ACR Manual on Contrast Media, Version 10.2, 2016

CT CONTRAST AGENTS: WHEN TO AVOID IT

- Risk factors for contrast induced nephropathy…
  - Repeated doses (20 hours to clear contrast from system)
  - Acute renal injury
  - Dehydration
  - Radiologist is consulted to determine if contrast is needed or if situation can be optimized
- DIALYSIS
  - If the patient is on hemodialysis AND anuiric, IV contrast can be given
  - If the patient is still making urine, proceed cautiously
- PREVENTION
  - Hydration: oral or IV, no ideal rate
  - Sodium bicarbonate and N acetylecysteine (mucomyst) not validated
- *Acute renal failure is a contraindication to IV contrast*

ACR Manual on Contrast Media, Version 10.2, 2016

CT CONTRAST AGENTS: PREMEDICATION

- Reactions to contrast agents
  - Mild (no treatment): 5-8% of patients (flushing, nausea, vomiting)
  - Moderate (require treatment): 1% of patients (severe nausea/vomiting, hives, swelling)
  - Severe (require treatment): 0.1% of patients (anaphylaxis)
    - Expected death rate of 1 in 75,000[1]
- "Pseudo-allergy": No allergic antibody- IV contrast causes histamine release from mast cells

ACR Manual on Contrast Media, Version 10.2, 2016

M. Saijoughlan. Intravenous Radiocontrast Media: A review of Allergic Reactions. US Pharm. 2012;37 (5): HS-14-HS-16

CT CONTRAST AGENTS: PREMEDICATION

- Contrast reaction: At risk patients
  - Prior reaction
  - Shellfish allergy does not necessitate premedication[1]
- Premedication:
  - 13 hours prior: Prednisone 50 mg (IV or po)
  - 7 hours prior: Prednisone 50 mg (IV or po)
  - 1 hour prior: Prednisone 50 mg (IV or po) and Diphenhydramine (Benadryl) 50 mg po[2]
- "Emergency" premedication
  - Q4 hours until injection: 40 mg Methylprednisonedosium succinate (Solu-medrol) or 200 mg hydrocortison sodium succinate (Solu-Cortef)
  - 1 hour prior: 50 mg diphenhydramine (Benadryl)
  - **Steroid less effective when given less than 4-6 hours prior to exam**

1. M. Saijoughlan. Intravenous Radiocontrast Media: A review of Allergic Reactions. US Pharm. 2012;37 (5): HS-14-HS-16

2. ACR Manual on Contrast Media, Version 10.2, 2016

CT CONTRAST: METFORMIN, BREASTFEEDING

- Metformin
  - Acute renal failure caused by IV contrast can lead to an accumulation of metformin, resulting in lactate accumulation/lactic acidosis
  - Hold metformin for 48 hours post injection

- Breastfeeding
  - >1% of the dose is excreted in breast milk
  - >1% of the contrast in breast milk is absorbed from the GI tract
  - 0.01% of dose ingested by infant
  - If the mother is concerned, she may abstain from breast feeding for 24 hours

ACR Manual on contrast media. Version 10.2, 2016

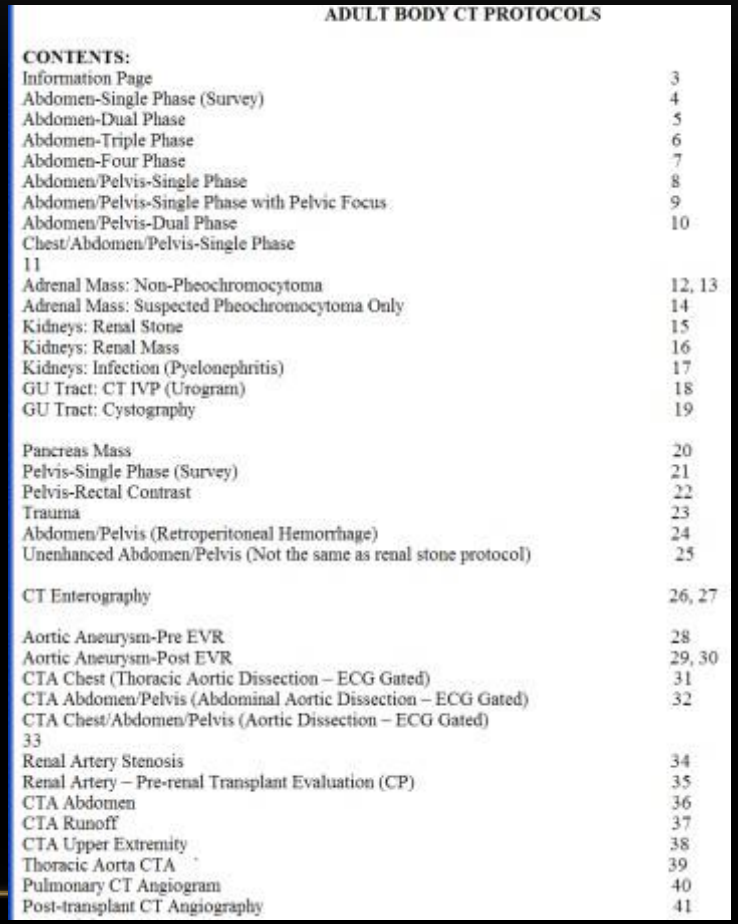
CT: WHEN AND WHY OF CONTRAST AGENTS

- Principle: Increased attenuation (brightness) from the iodine atom in contrast = "enhancement"
  - Magnitude of enhancement is related to amount of contrast deposited in a target organ or in the intravascular blood pool
- Variables in enhancement
  - Rate of injection
  - Cardiac output of the patient
  - Organ perfusion (i.e. single versus dual blood supply)
  - Timing of imaging
- When do we use it?
  - Vascular imaging
  - Infectious/inflammatory processes
  - Neoplasm

Herman, S. Computed Tomorgraphy Contrast Enhancement Principles and the Use of High Concentration Contrast Media. J Comput Assist Tomogr 2004; 28: S7-S11

CT: WHEN AND WHY OF CONTRAST AGENTS

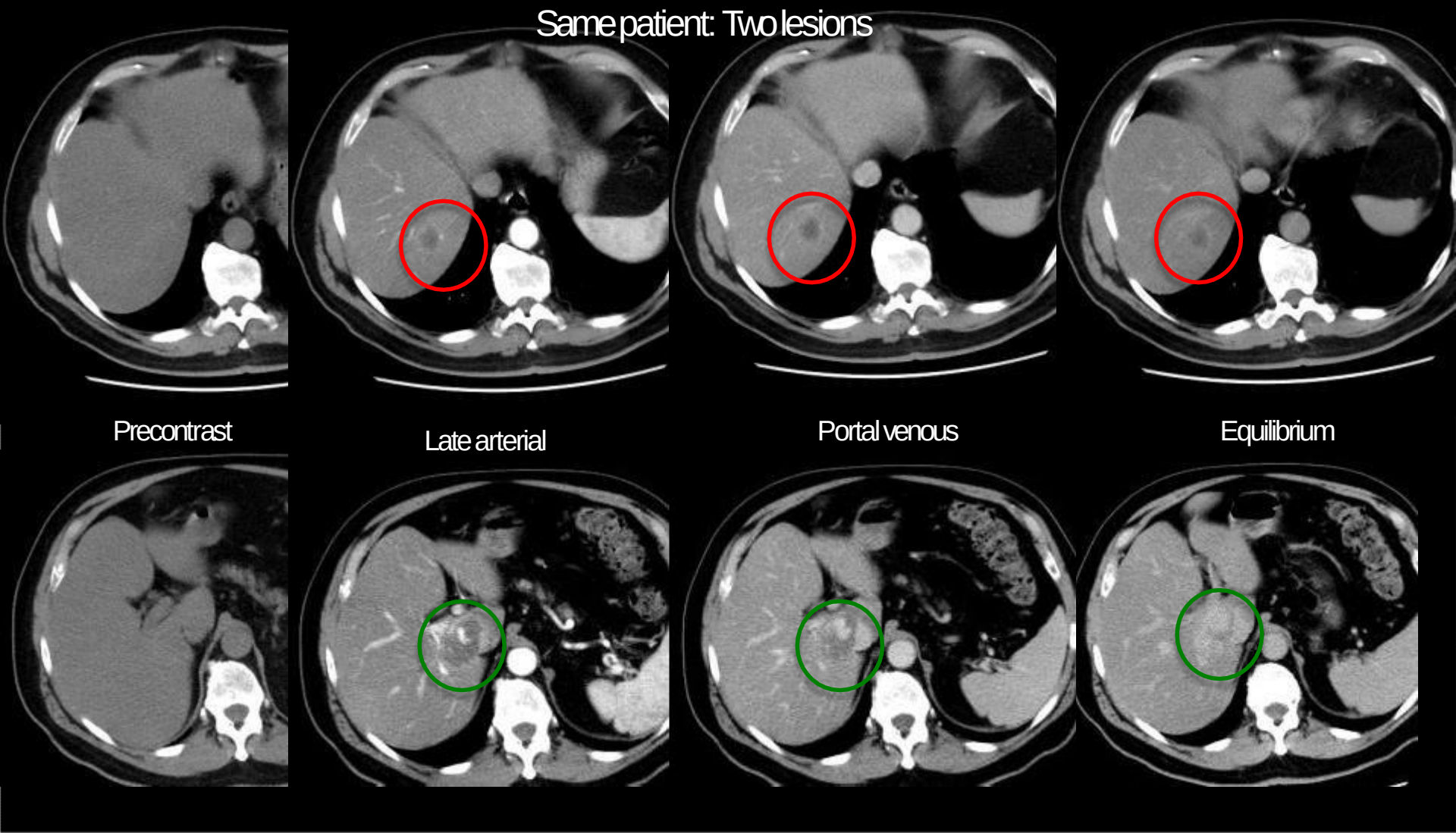
- Getting a diagnostic scan…
  - Appropriate *use* of IV contrast
  - Appropriate *timing* of IV contrast
- Based on clinical history, a scan protocol is chosen to optimize the diagnostic yield
  - Precontrast imaging?
  - Multiple phases of imaging?



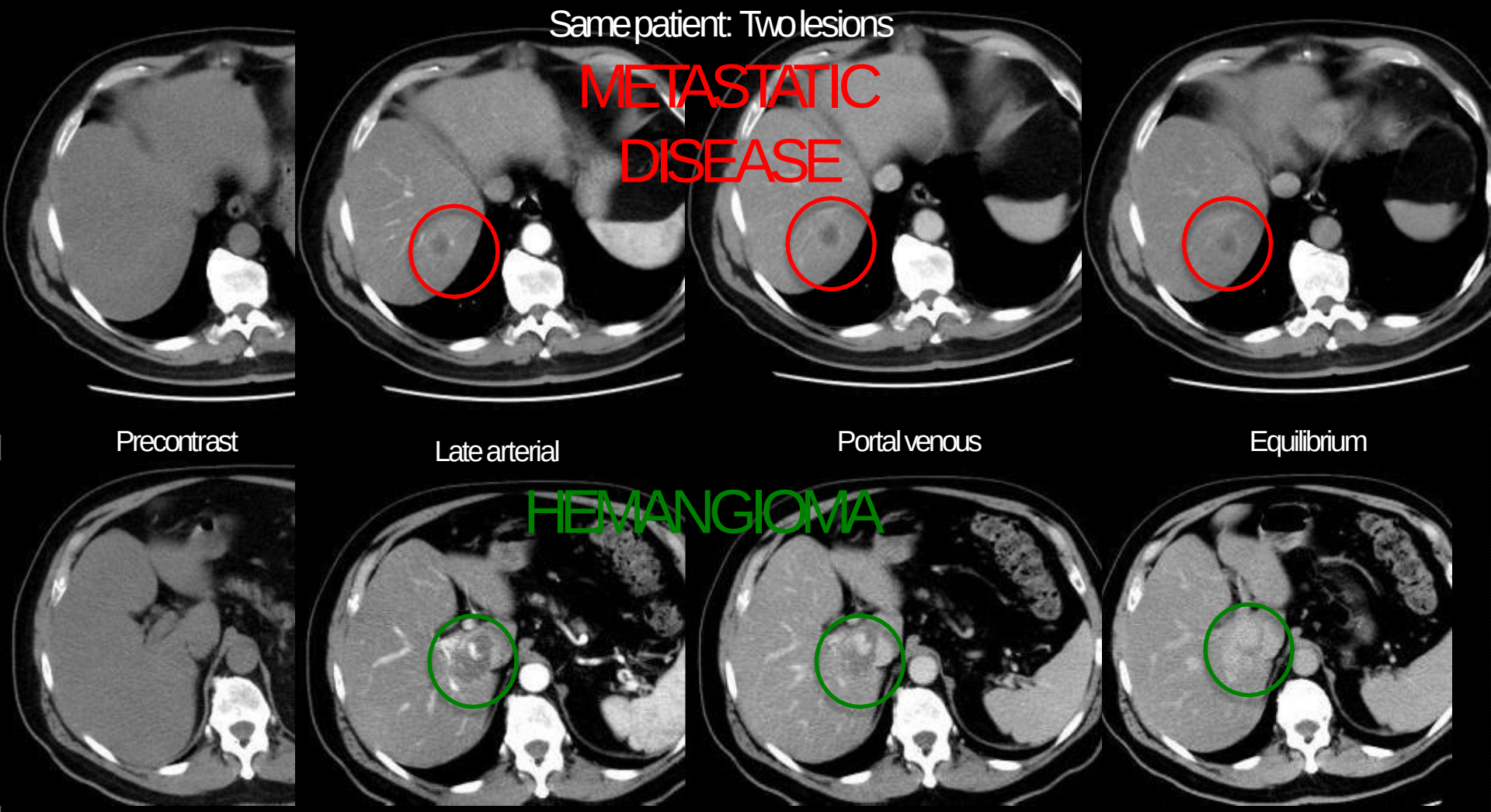
ADULT BODY CT PROTOCOLS

CONTENTS:

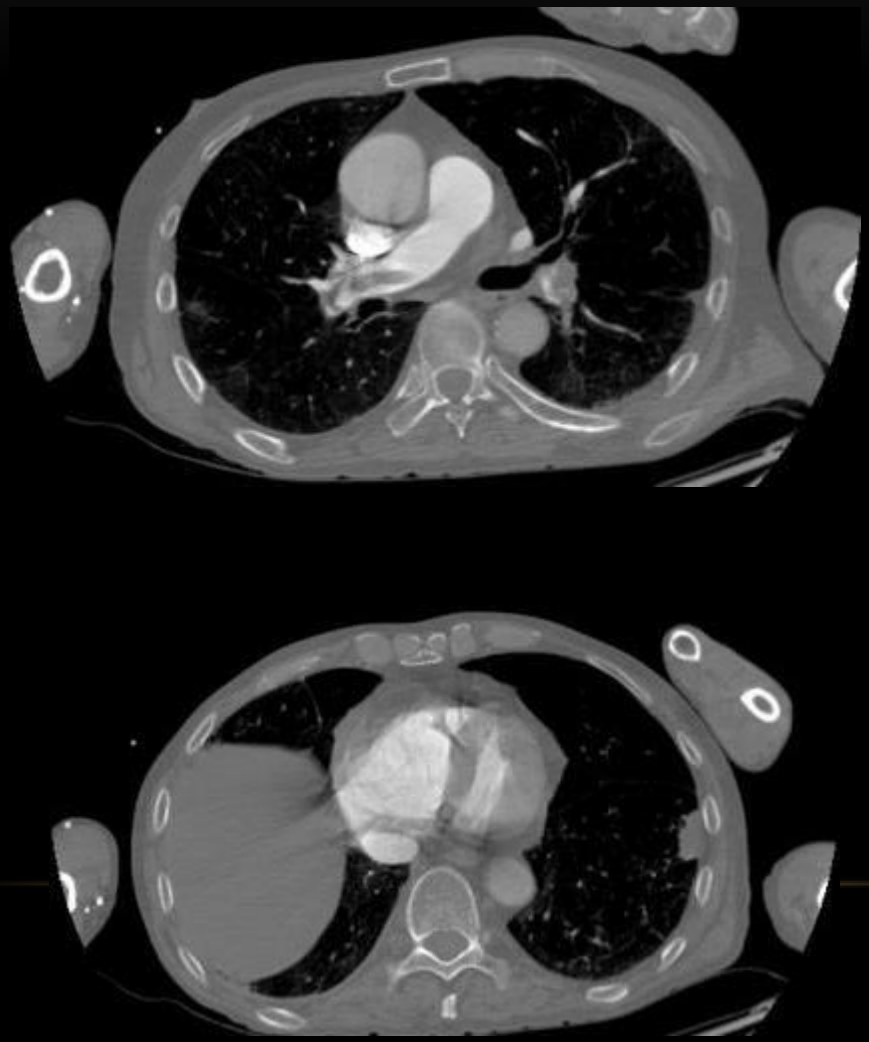
CT CONTRAST AGENTS: TIMING IS EVERYTHING



CT CONTRAST AGENTS: TIMING IS EVERYTHING

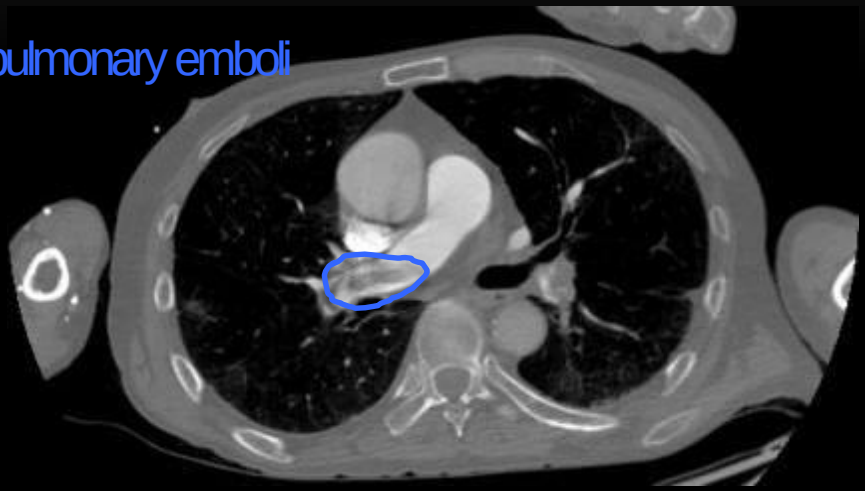


CT CONTRAST: VASCULAR IMAGING



CT CONTRAST: VASCULAR IMAGING

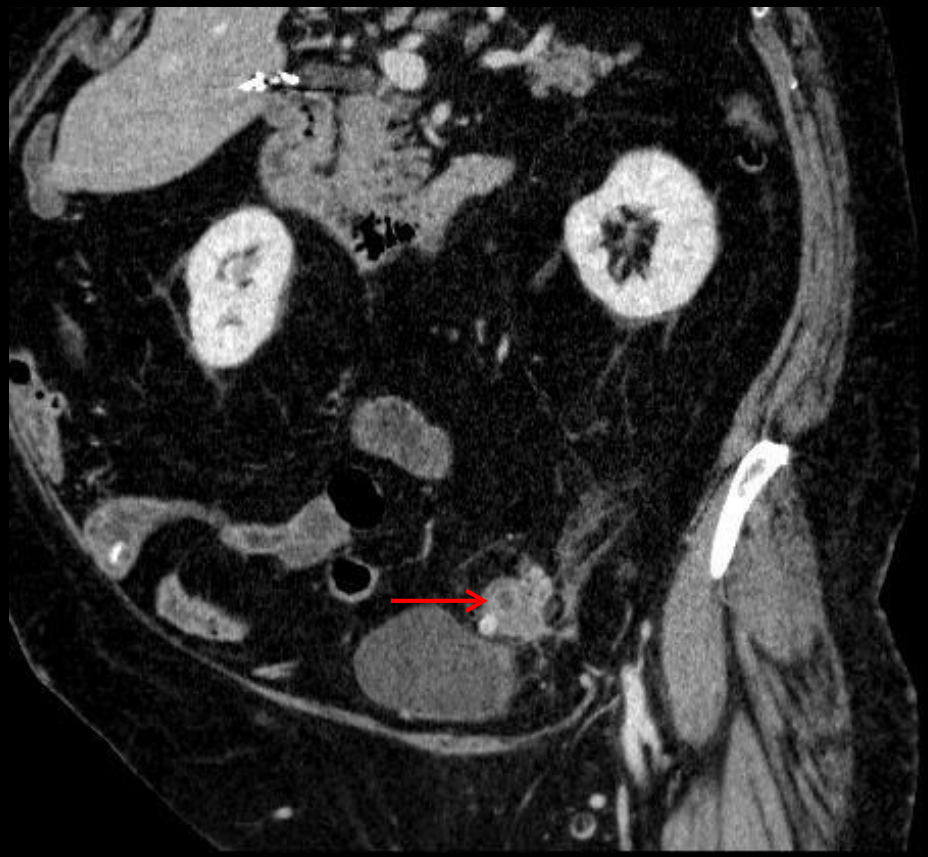
Filling defect = pulmonary emboli



Bowed interventricular septum = Right heart strain

CT CONTRAST: INFECTION/INFLAMMATION

- With contrast: Diverticulitis with intramural abscess



CT CONTRAST: NEOPLASM

- Pancreatic neuroendocrine tumor: Without and with contrast

No contrast: No tumor!

Pancreatic protocol CT: TUMOR

CT: IV CONTRAST: WHEN DON'T WE WANT IT?

- What is bright on CT?
  - Blood
  - Calcium
  - Iron
  - Foreign bodies

CT: IV CONTRAST: WHEN DON'T WE WANT IT?

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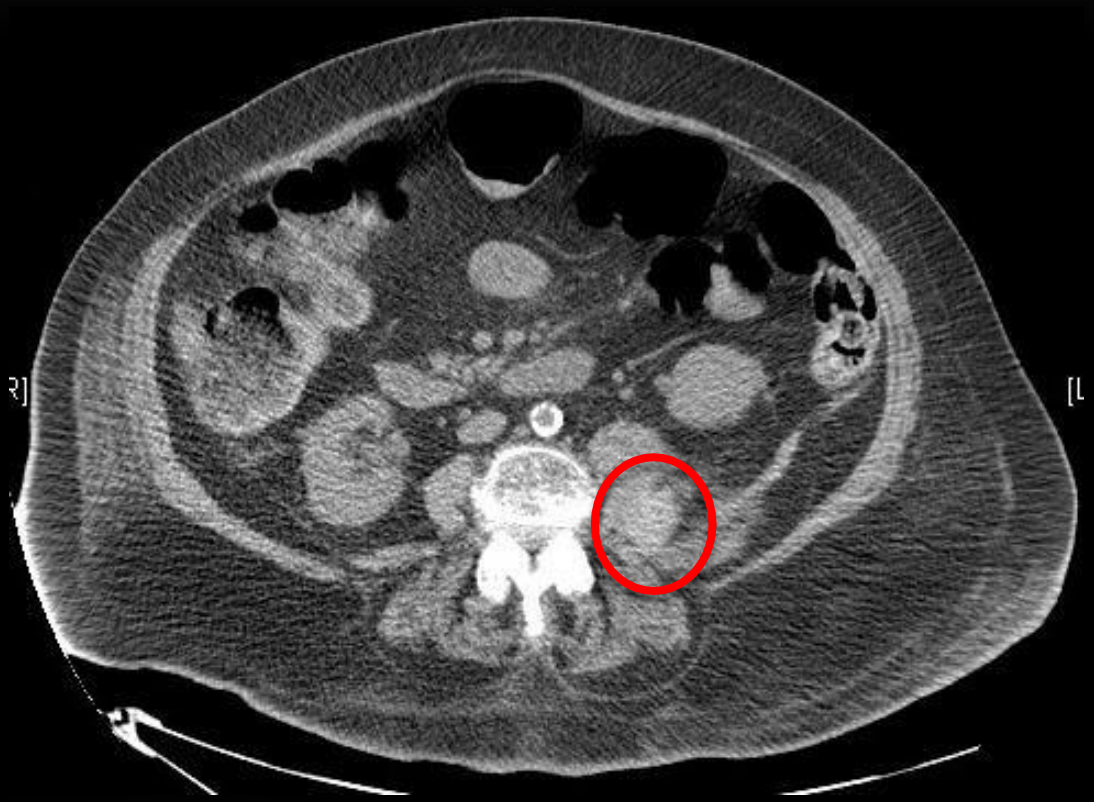
  - Foreign bodies



Retroperitoneal hematoma

CT: IV CONTRAST: WHEN DON'T WE WANT IT?

- What is bright on CT?
  - Blood
  - Calcium
  - Iron
  - Foreign bodies

CT: IV CONTRAST: WHEN DON'T WE WANT IT?

- What is bright on CT?
  - Blood
  - Calcium
  - Iron
  - Foreign bodies

Left UVJ stone

CT: IV CONTRAST: WHEN DON'T WE WANT IT?

- What is bright on CT?
  - Blood
  - Calcium
  - Iron
  - Foreign bodies

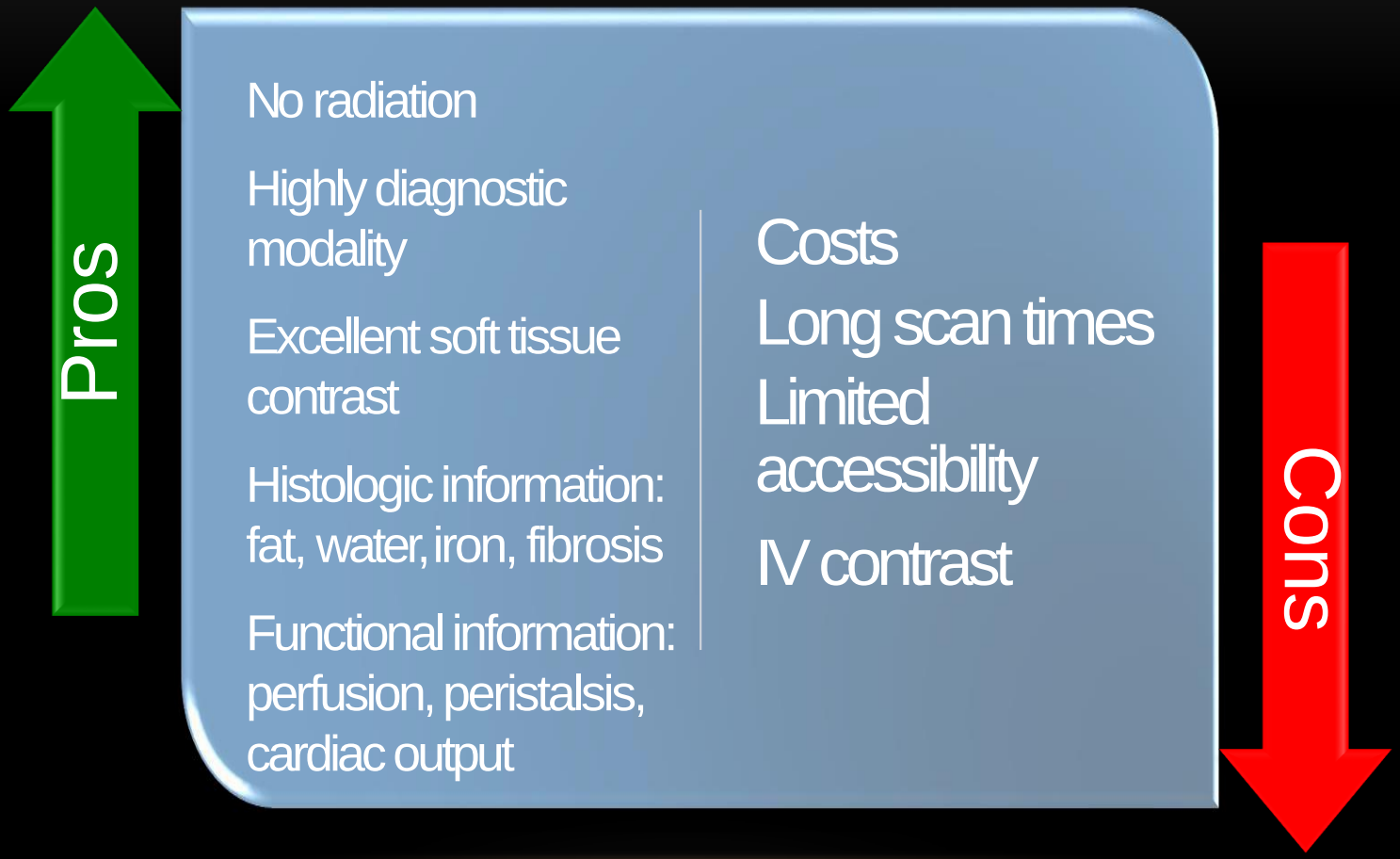
CT: IV CONTRAST: WHEN DON'T WE WANT IT?

- What is bright on CT?
  - Blood
  - Calcium
  - Iron
  - Foreign bodies

CT: SUMMARY

- IV contrast useful…
  - Vascular imaging
  - Infection/inflammation
  - Neoplasm
- IV contrast not useful…
  - Calcium (renal stones)
  - Blood (RP hematoma)
  - Iron/Foreign body
- A specific clinical history aids with scan protocolling

MAGNETIC RESONANCE IMAGING



MRI: PROS AND CONS

- Limitations: Patient
  - Enclosed space for up to one hour?
  - Lying on their back
  - Loud noises
- Limitations: Radiologist and system
  - Subspecialized reading
  - Longer scan times
  - Limited availability/varying magnets
- Solutions
  - Stereovision
  - Gentle use of anxiolytics
  - More MR trained radiologist/subspecialized reads

"OK, Mrs. Dunn. We'll slide you in there, scan your brain, and see if we can find out why you've been having these spells of claustrophobia."

MRI: CATEGORIES AND CONTRAST AGENTS

- Multiple types of MRI
  - Neurologic: Brain, neck and spine
  - Abdominopelvic
  - Musculoskeletal
  - Vascular imaging
  - Cardiac imaging
  - And more!
- Pelvic MRI: Be specific!
  - Prostate MRI?
  - Rectal MRI?
  - MSK MRI?

All three are ordered as a pelvic MRI

MRI CONTRAST AGENTS: NEPHROGENIC SYSTEMIC FIBROSIS

- "Fibrosing disease, predominantly of the skin and subcutaneous tissue, but also other organs, which may develop and progress rapidly, possibly causing death"
- Occurs with ESRD in association with gadolinium based IV contrast materials
  - *Amount of gadolinium* given (per scan and accumulated dose)
  - eGFR <30 have a 1-7% chance of developing NSF
- Has developed in patients with AKI even if renal function returned to normal
- Declining incidence with use of macrocyclic contrast agents
- Controversial topic! Be alert for changing literature

ACR Manual on Contrast Media. Version 10.2, 2016

MRI CONTRAST AGENTS: NSF

- When can we give contrast?
  - ESRD on chronic HD:
    - Is CT possible instead of MR?
    - If MR must be performed, we choose least offensive contrast agent and lower dose
    - Consider hemodialysis ASAP
  - ESRD (GFR <15), not on HD
    - Avoid both MR and CT contrast agents if at all possible
    - If must be given, lower dose, etc

ACR Manual on Contrast Media. Version 9, 2013

MRI CONTRAST AGENTS: NSF

- Screening requirements: require BUN/Creatinine within 30 days of exam[1]
  - Age >60 years
  - Hypertension
  - Renal disease

- GFR Guidelines
  - GFR <15: No IV contrast
  - GFR 15-30: Use a lower risk contrast agent (Doderone, Multihance)
  - GFR >30: No problem!

- Certain contrast agents have few, if any reported cases of NSF
  - Multihance
  - Dotarem
  - Gadavist
  - Prohance

MRI CONTRAST AGENTS: NSF

- Screening requirements: require BUN/Creatinine within 30 days of exam[1]
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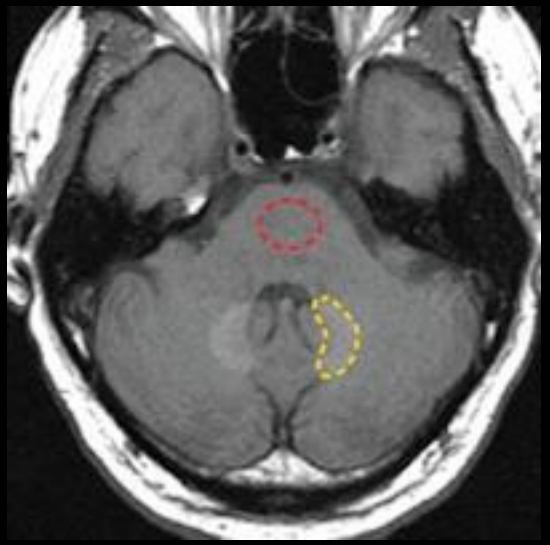
- Certain contrast agents have few, if any reported cases of NSF
  - Multihance
  - Dotarem
  - Gadavist
  - Prohance

Used at UNC

GADOLINIUM DEPOSITIONAL DISORDER

- High signal in brain tissue in patients with normal renal function
  - Associated wrepeated doses of gadolinium
  - No known adverse effects
- Certain contrast agents not associated with this
  - Dotarem (used at UNC)
  - Prohance
- However, as led to a more cautious use of gadolinium contrast agents



Deposition
- Dentate nucleus
- Globus pallidus

Semelka R et al. Gadolinium in Humans: A Family of Disorders. AJR 207, August 2016 229-233

MRI CONTRAST AGENTS: PREGNANCY AND BREASTFEEDING

- Pregnancy:
  - "Present data has not conclusively document any deleterious effects of MR imaging on the developing fetus"[1]
  - Avoid in first trimester (not evidence based)
  - IV contrast DOES cross the placenta and is not given at our institution in pregnancy
- Breastfeeding:
  - > 0.04% of the IV dose in breast milk [2]
  - > 1% of the contrast in breast milk is absorbed across the GI tract[2]
  - Expected dose to infant <0.0004% of IV dose[2]
  - If the mother is concerned, she may abstain from breastfeeding for 24 hours

1. Kanal et al. ACR Guidance Document on MR Safe Practices: 2013. JMRI 37: 501-530 (2013)
2. ACR Manual on Contrast Media. Version 10.2, 2016

MRI CONTRAST AGENTS: WHEN AND WHICH ONE

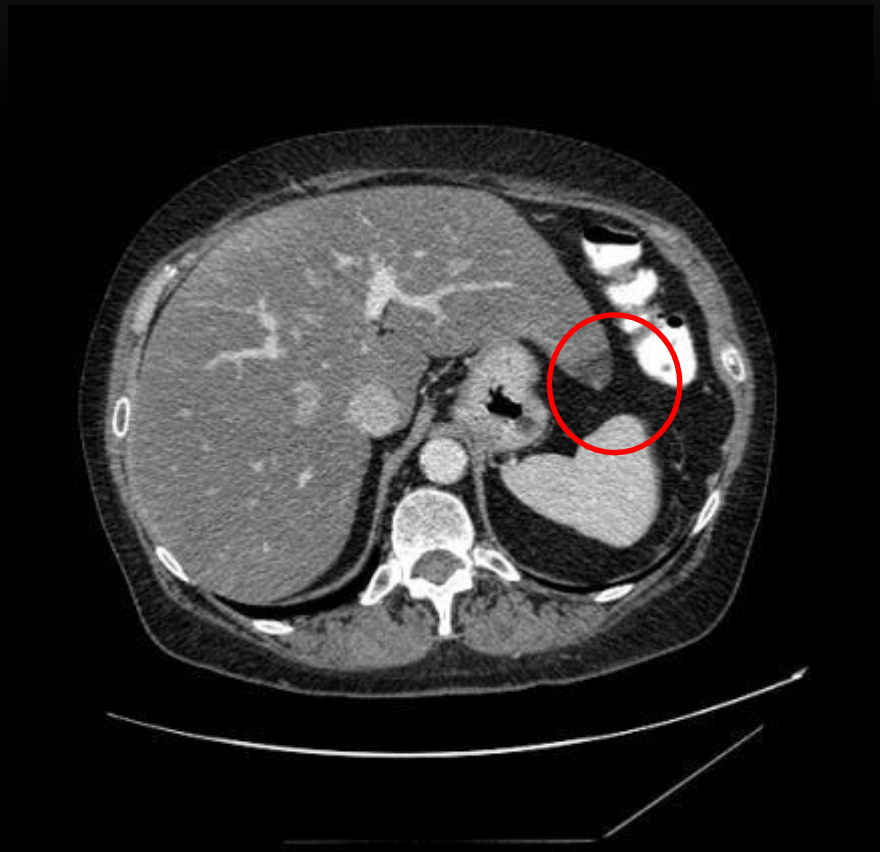
- Varying contrast agents available
  - Dotarem
  - Multihance
  - Eovist

- Indications: similar to CT
  - Vascular imaging
  - Infection
  - Inflammation
  - Neoplasm

MR- BODY IMAGING

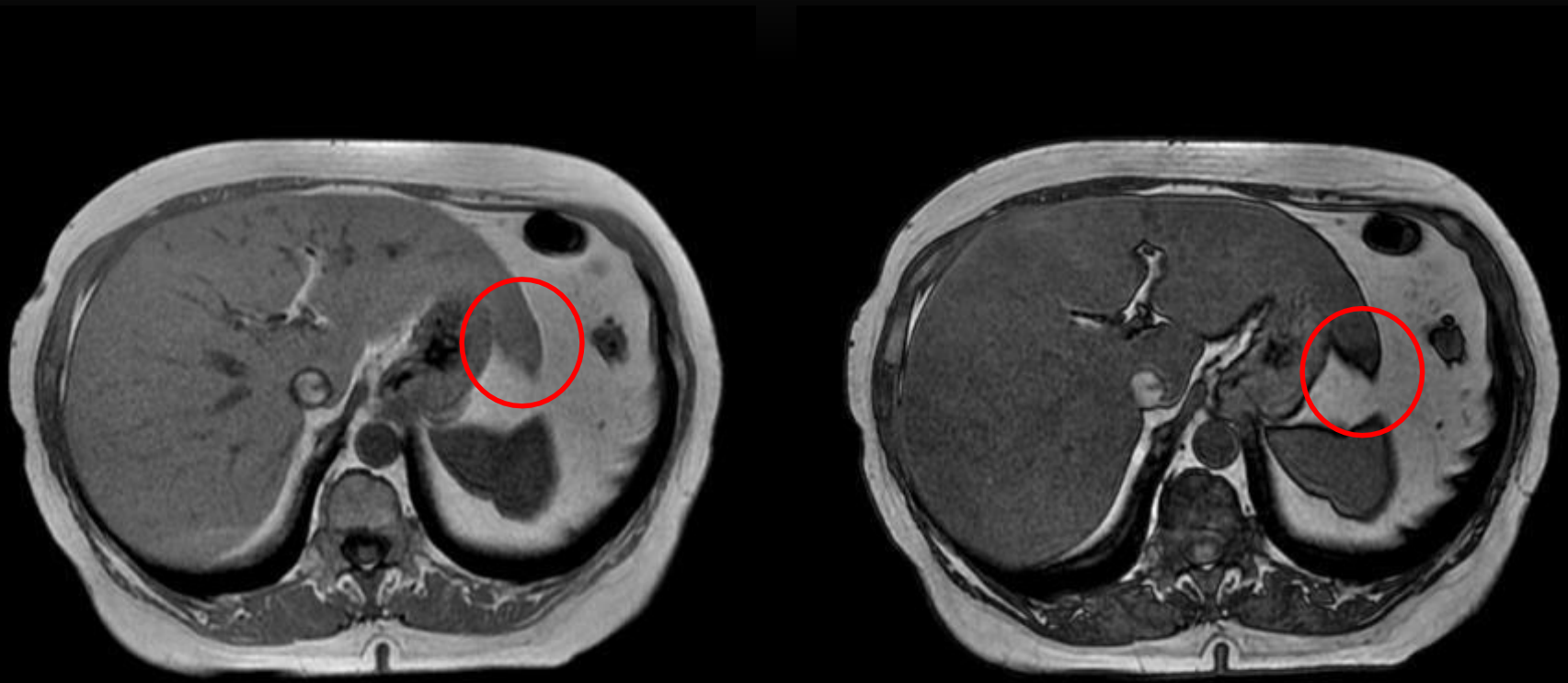
- Please keep in mind that this is *problem solving* modality, not a screening modality
- The more specific the clinical history, the better the exam will be!
- Common indications
  - *Because the radiologist told you needed one*
  - Characterization of a lesion
  - Evaluation of the biliary tree
  - Follow up of treated disease
  - GU: Female pelvis, prostate (NOT CT!)
  - Imaging the bowel (small bowel, rectum)
- Emerging indications
  - Tissue composition (iron, fat, fibrosis)

MRI: LESION CHARACTERIZATION



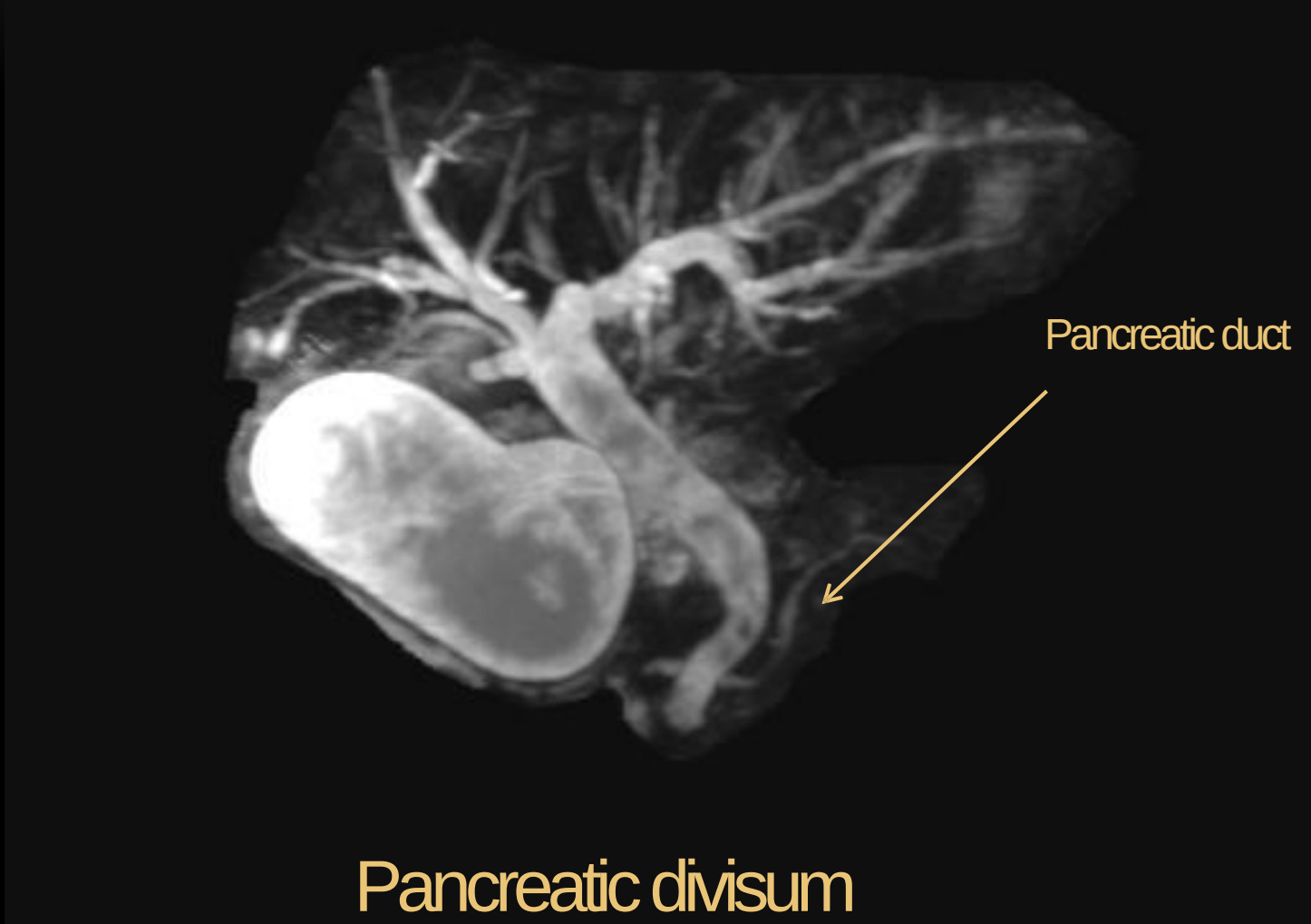
Indeterminate hepatic lesion

MRI: LESION CHARACTERIZATION



Focal steatosis

MRI: IMAGING THE BILIARY TREE

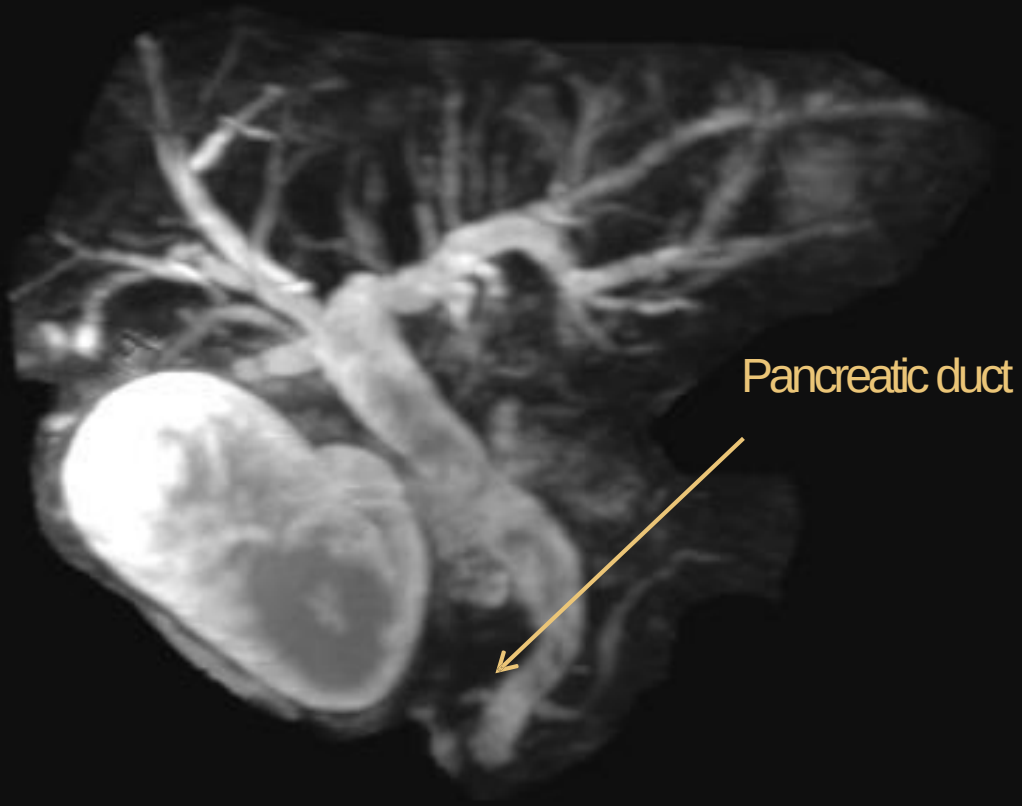


Pancreatic divisum

MRI: IMAGING THE BILIARY TREE

Pancreatic divisum

MRI: IMAGING THE BILIARY TREE

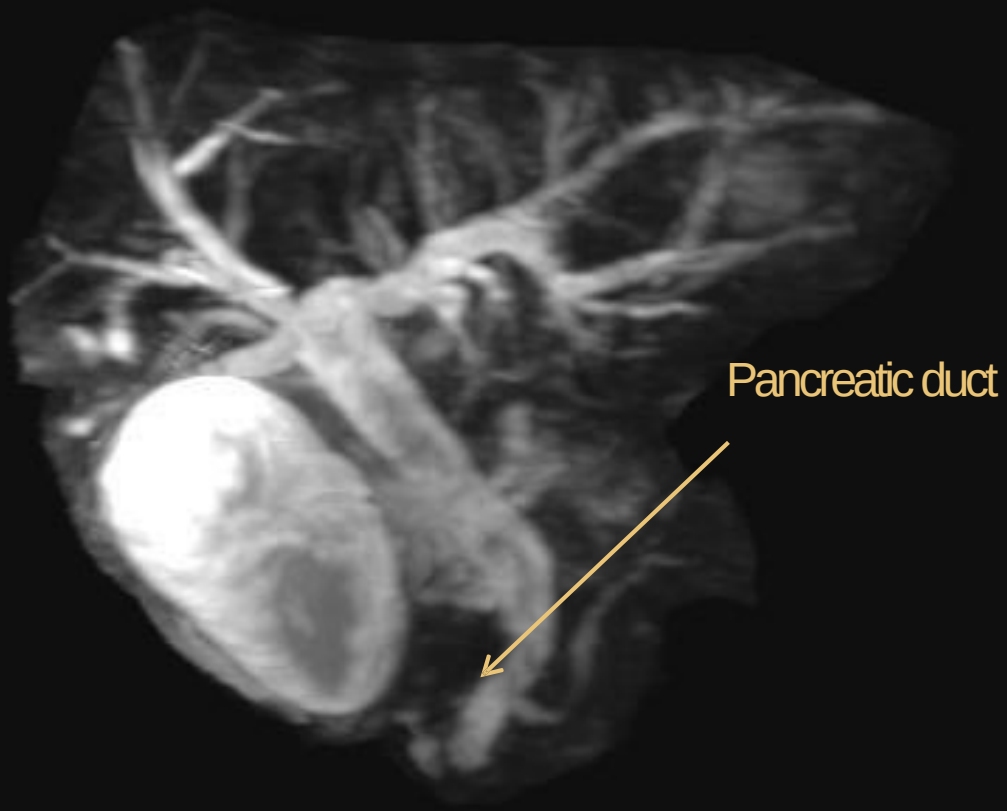


Pancreatic divisum

MRI: IMAGING THE BILIARY TREE

Pancreatic divisum

MRI: IMAGING THE BILIARY TREE



Pancreatic divisum

MRI: IMAGING THE BILIARY TREE

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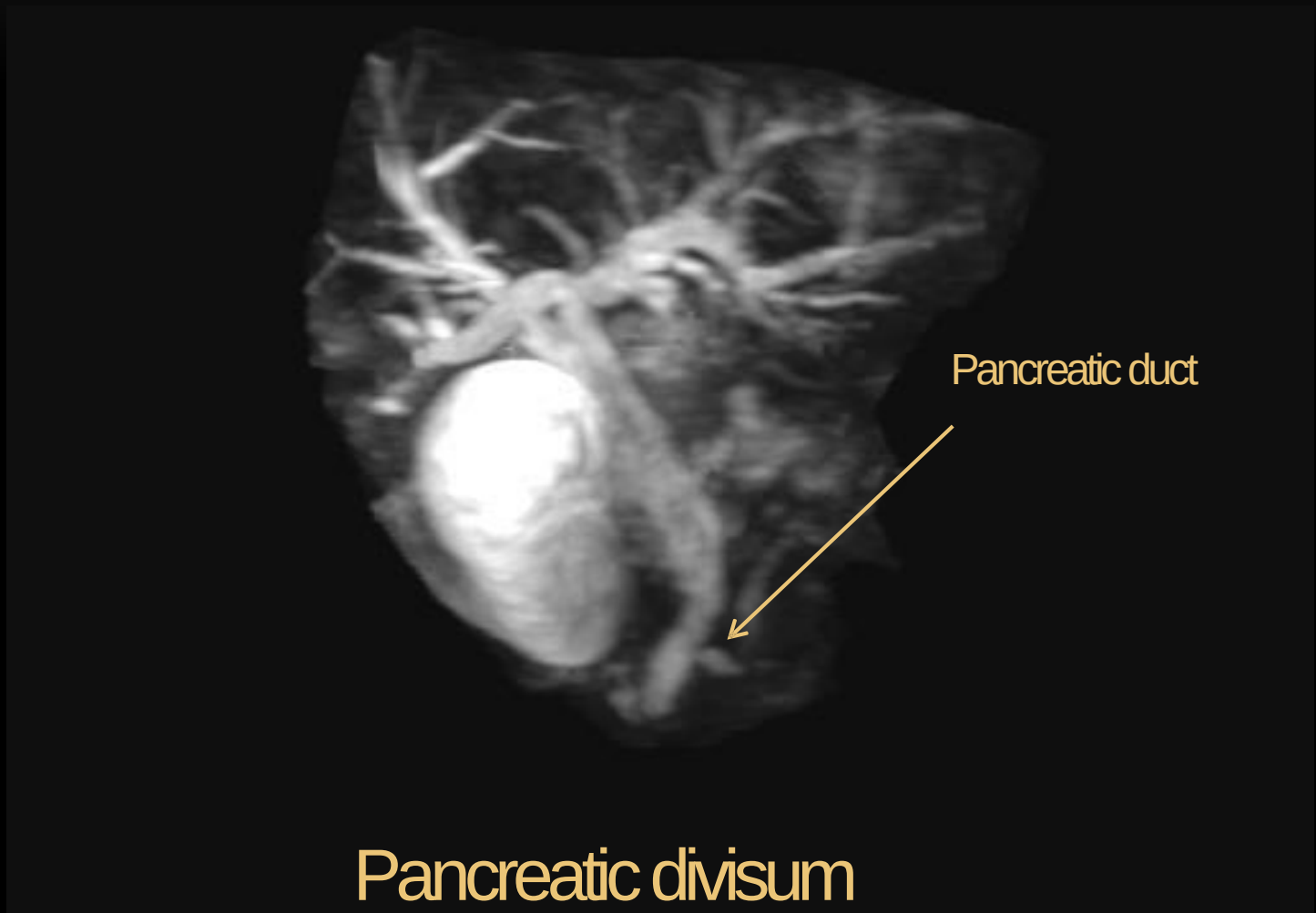
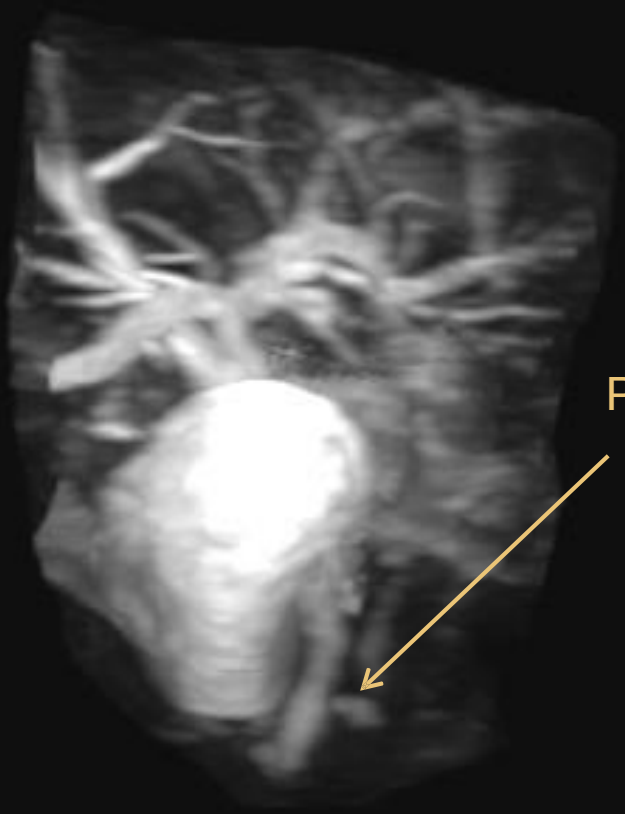


MRI: IMAGING THE BILIARY TREE

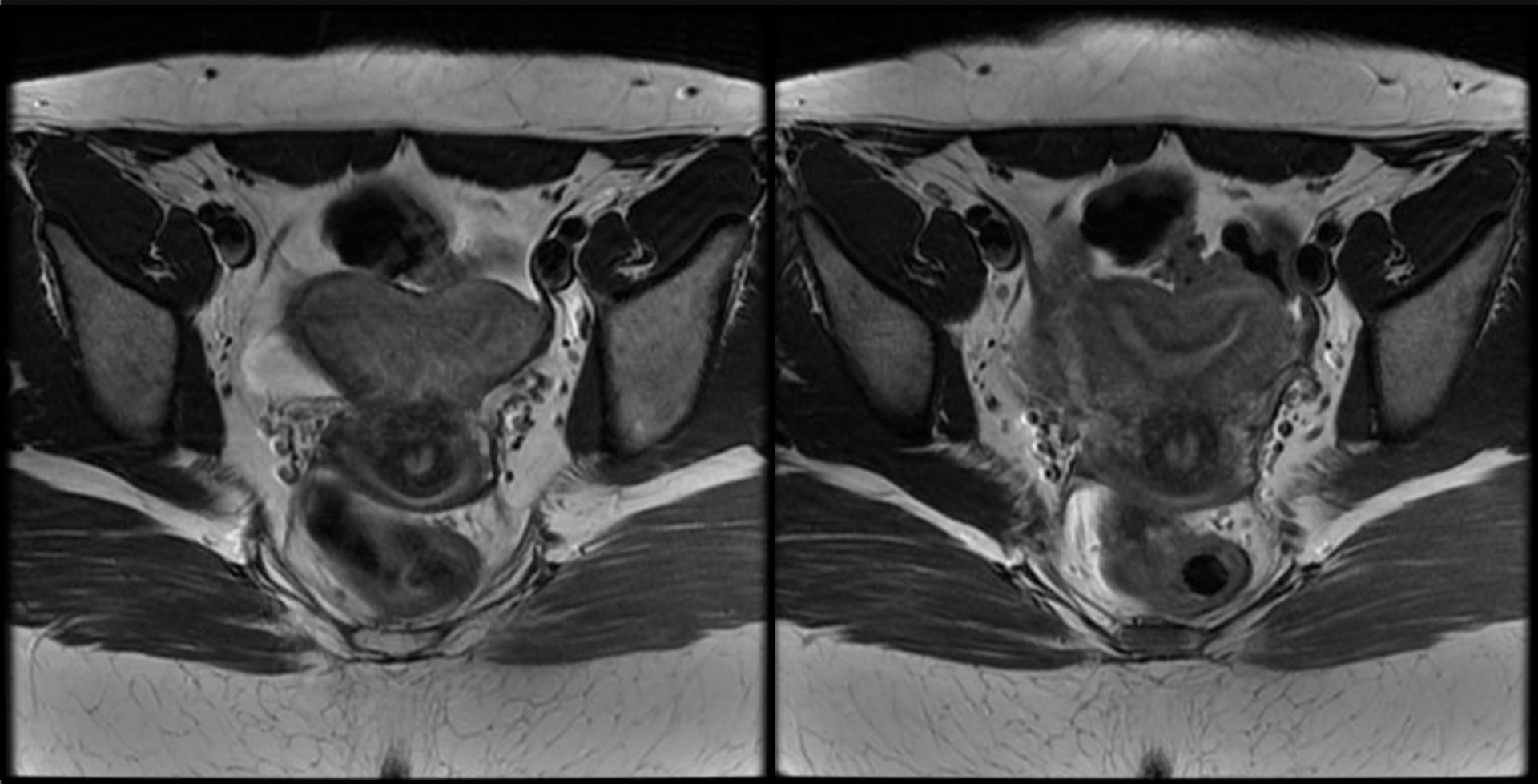
Pancreatic divisum

MRI: IMAGING THE BILIARY TREE



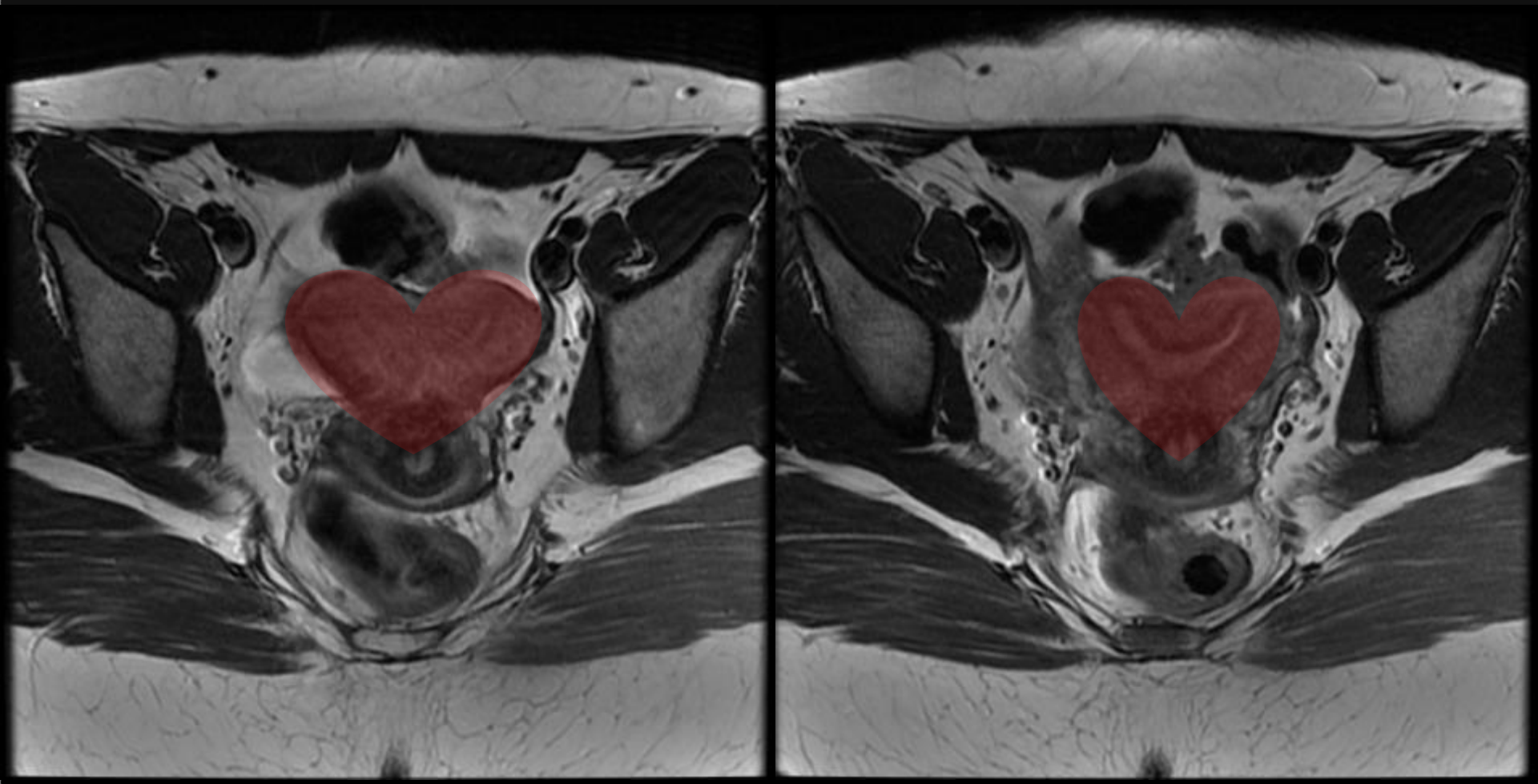
Pancreatic divisum

MRI: IMAGING THE FEMALE PELVIS



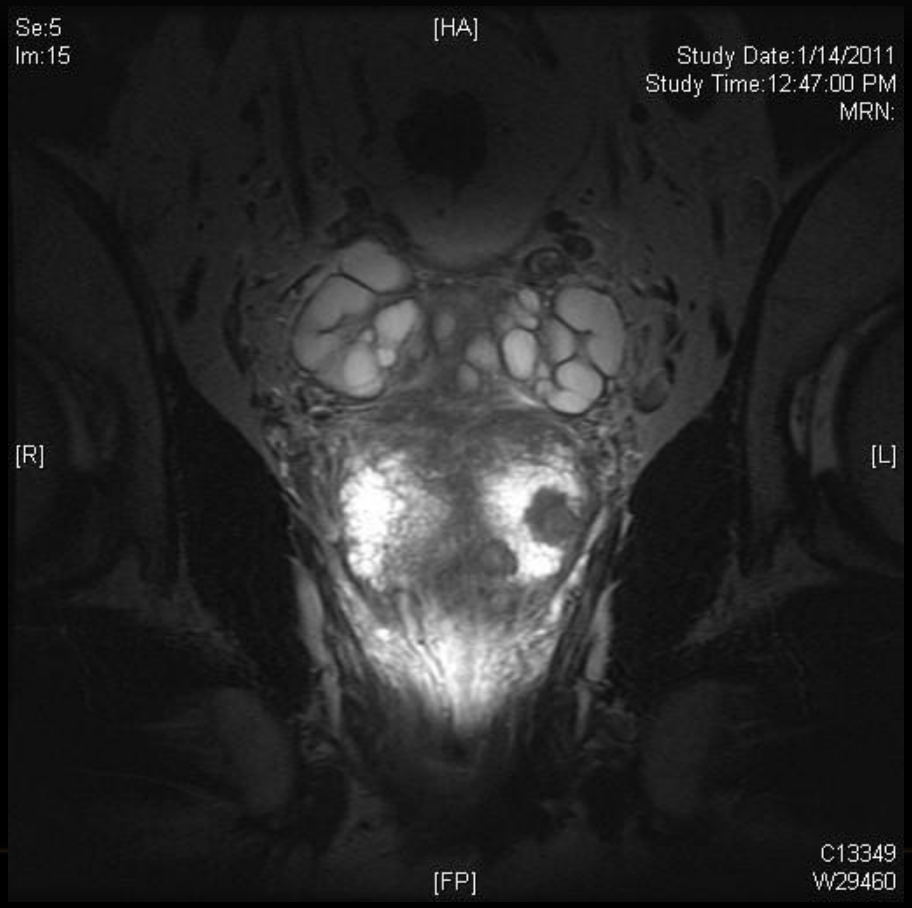
Bicornuate uterus

MRI: IMAGING THE FEMALE PELVIS



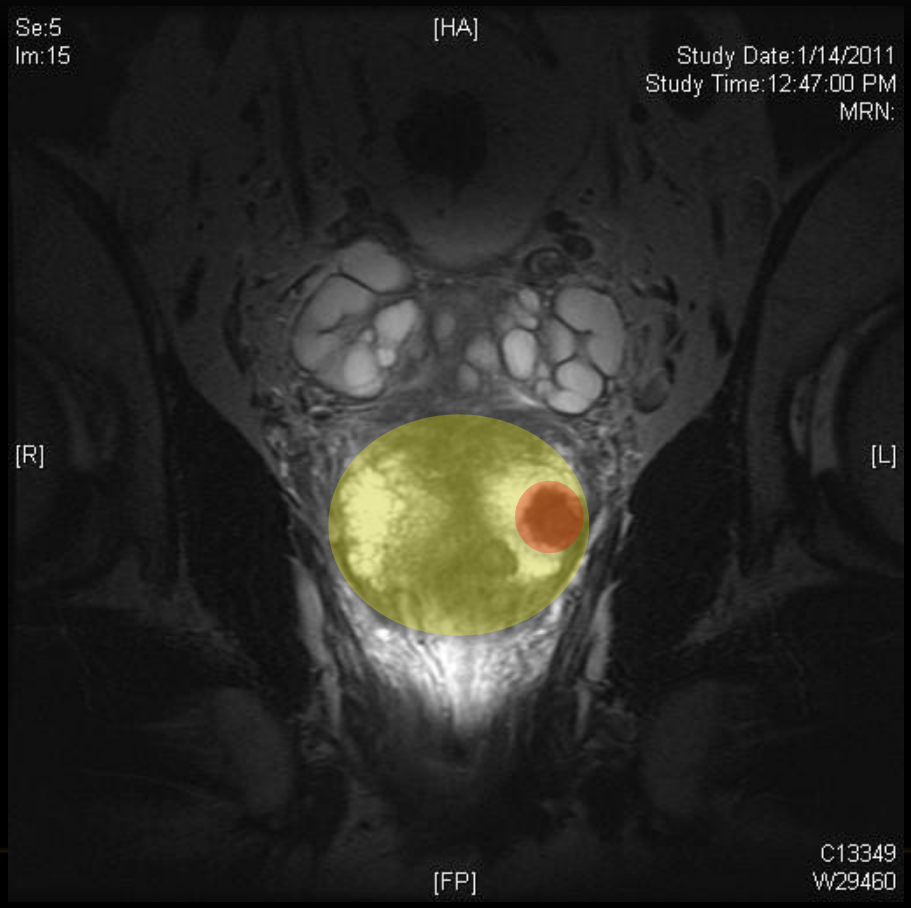
Bicornuate uterus

MRI: IMAGING THE MALE PELVIS



PROSTATE CANCER

MRI: IMAGING THE MALE PELVIS



PROSTATE CANCER

MRI IMAGING: TISSUE COMPOSITION

- Liver
  - Fat content
  - Iron content
  - Fibrosis
- Bowel
  - MR enterography
  - Rectal MR
- MRI is a rapidly expanding and changing field. If you want to know if we can do it- *just ask!!!*

QUICK NOTE ABOUT FLUOROSCOPY

- Contrast agents:
  - Concern for intraperitoneal leak? → Use water soluble contrast
  - Routine, outpatient? → Barium "double contrast" with air
- Bowel:
    - Esophagram
    - UGI
    - UGI + SBFT
    - Barium enema
    - Defecogram
- Urinary tract:
    - VCUG
    - RUG
    - Loopograms

YOUR RADIOLOGIST

- Clinician feedback
  - Reports
    - Relevant? Unclear?
  - Imaging problems
    - Patient complaints?
    - Didn't give you an answer
  - Pathology and/or clinical follow up
    - Were we right or wrong?
- You are our target population with our imaging and reports- let us know how we can improve and make your life easier!

TAKE HOME POINTS

- Overutilization is a real but solvable problem if a partnership exists between the clinician and radiologist
- There are many different imaging modalities at your disposal with varied resources to help advise you
  - ACR appropriateness criteria
  - Radiologist
- When considering appropriate scan for each patient
  - Appropriate radiation dose
  - Scan limitations
  - Patient limitations
- Clinician feedback is critical for imaging and service improvement.

QUIZ POST

QUESTION:

T/F: Background radiation in the US is typically ~3 mSev/yr

TRUE!

QUESTION:

Which is the correct order for least expensive to most expensive imaging?

I: CT
II: MRI
III: US
IV: Radiographs

A: I, II, III, IV
B: IV, III, II, I
C: IV, III, I, II
D: IV, II, III, I

QUESTION:

Which of the following modalities is first line imaging for the reproductive system (ovaries, uterus, testicles)?

A: CT
B: MRI
C: US
D: Radiographs

QUESTION:

For which indication would a noncontrast CT be appropriate?

A: Diverticulitis
B: Renal calculus
C: Aortic dissection
D: Concern for metastatic disease

QUESTION:

FALSE! MRI agents

T/F: NSF (nephrogenic systemic fibrosis) is associated with iodinated CT contrast.

THANK YOU!

WORKS CITED

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