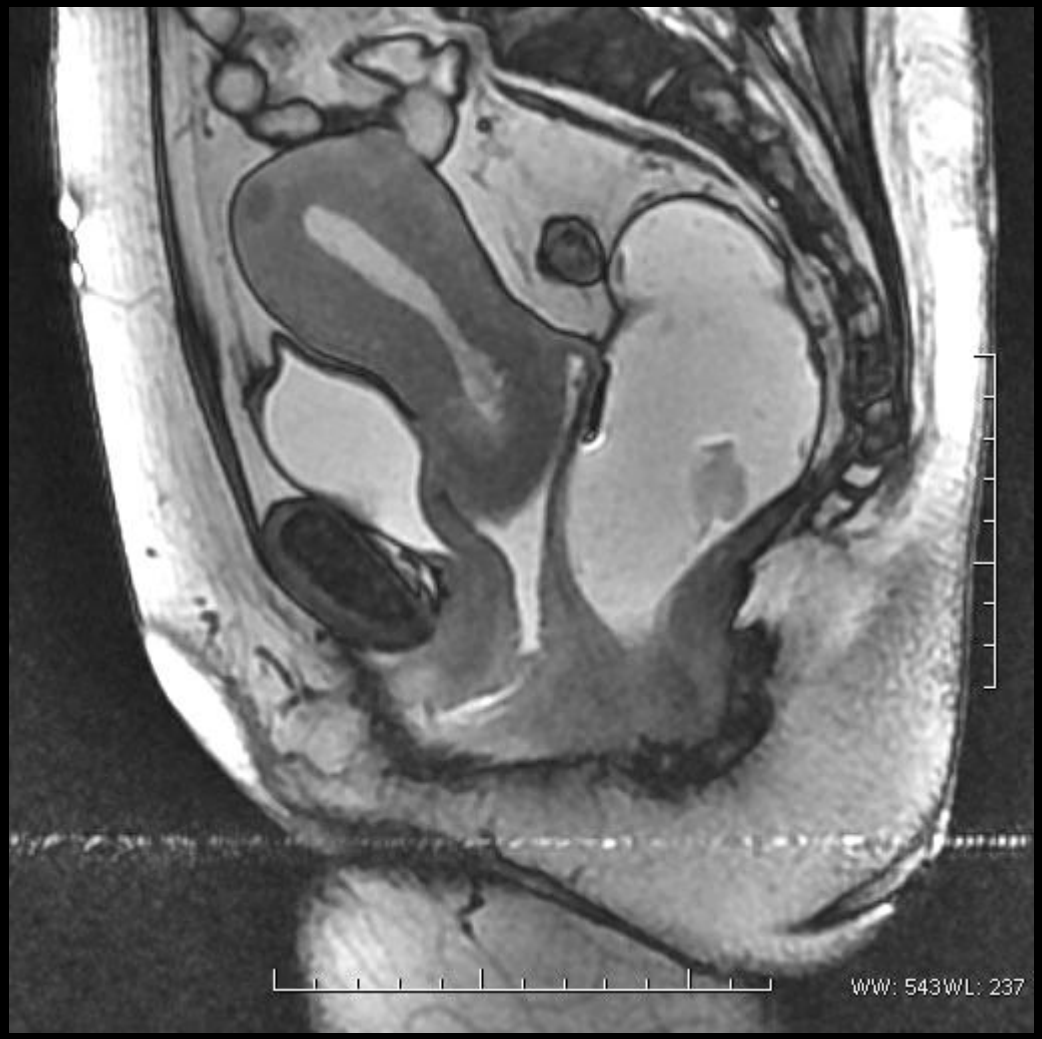
Basic Abdominal and Pelvic Imaging Concepts



David L. Smith, MD
Assistant Professor of Radiology

Basic Imaging Concepts

Contrast Resolution

vs

Spacial Resolution

Spacial Resolution …

…refers to the ability of the imaging modality to differentiate two closely-approximated objects.

Low spacial resolution techniques will be unable to differentiate between two objects that are relatively close together.

(The ability to see really small things)

X-ray > CT > US > MRI

Modality	Spacial resolution
X-ray	< 1 mm
CT	1-2 mm
US	2-3 mm
MRI	3-4 mm

Contrast Resolution

The ability to distinguish differences in image intensity of adjacent structures of the basis of their grayscale “color.”

CT

MRI

Contrast Resolution

MRI > CT> US > X-ray

Abdominal Imaging Modalities

- Radiography (aka KUB, plainfilm, x-ray)
- Fluoroscopy (Fluoro)
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Ultrasound (Sonography)

Different methods of looking at the same anatomy and the same pathology

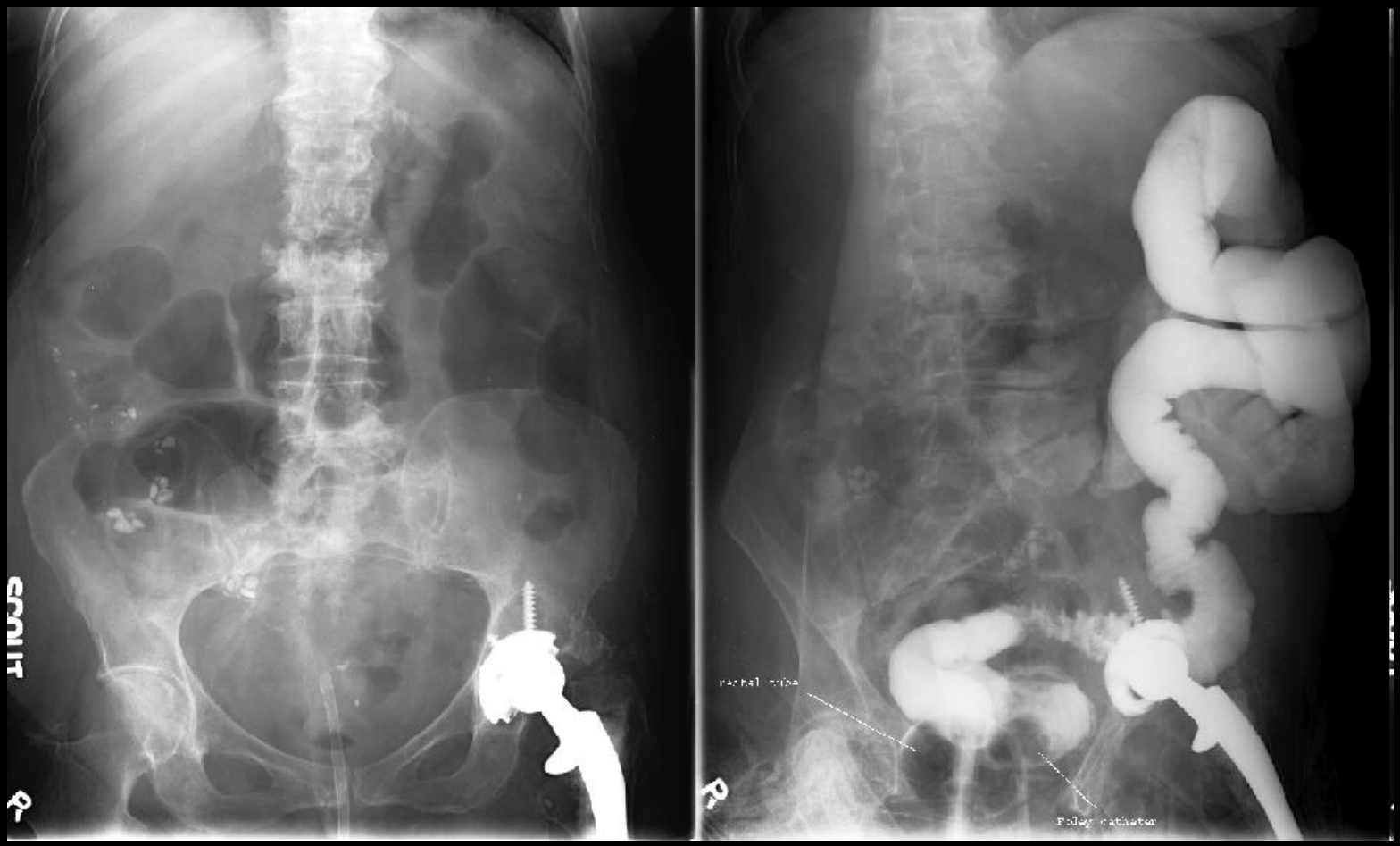
Abdominal Imaging Modalities

- Radiography (aka KUB, plainfilm, x-ray)
- Fluoroscopy (Fluoro)
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Ultrasound (Sonography)

REMEMBER: MRI $\not>$ CT $\not>$ x-ray!!!!!

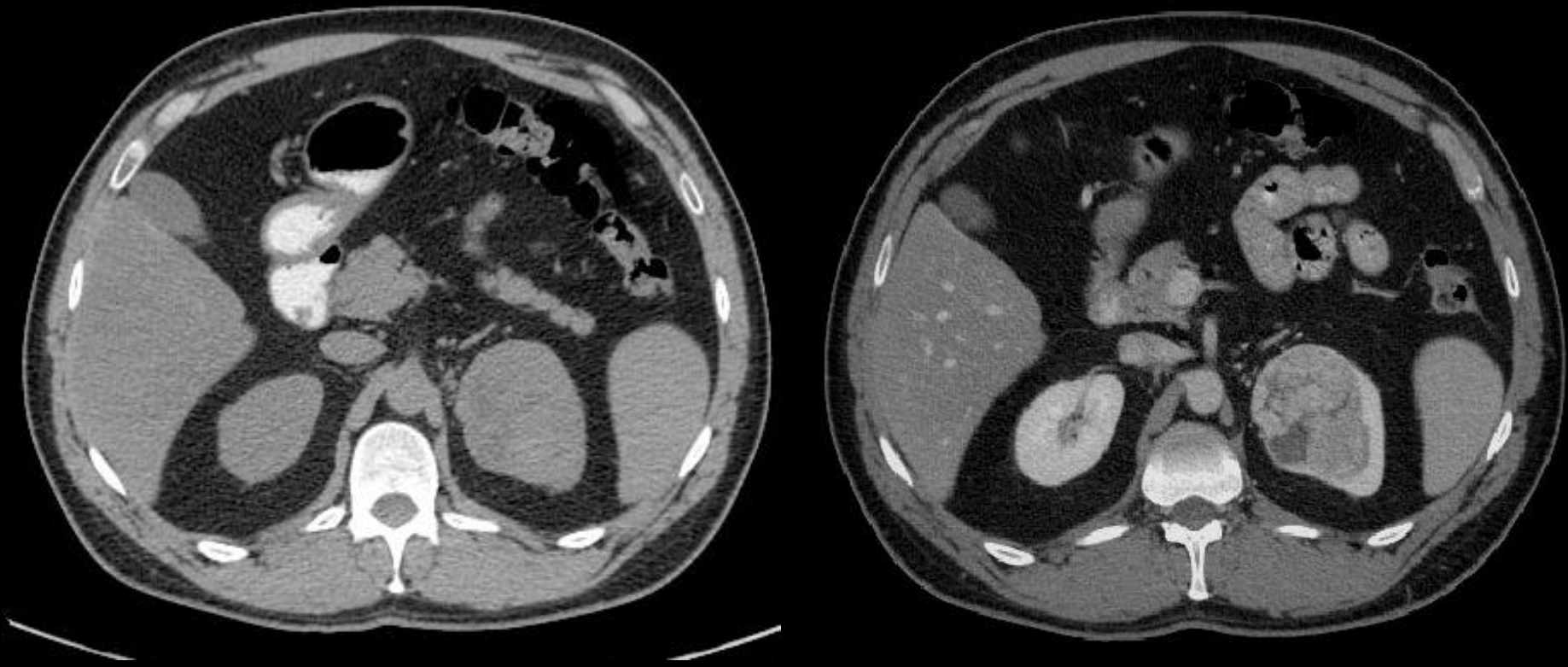
With or without contrast???

Contrast is a substance administered into a patient's blood stream, GI tract, or other space which increases that space's conspicuity on imaging.



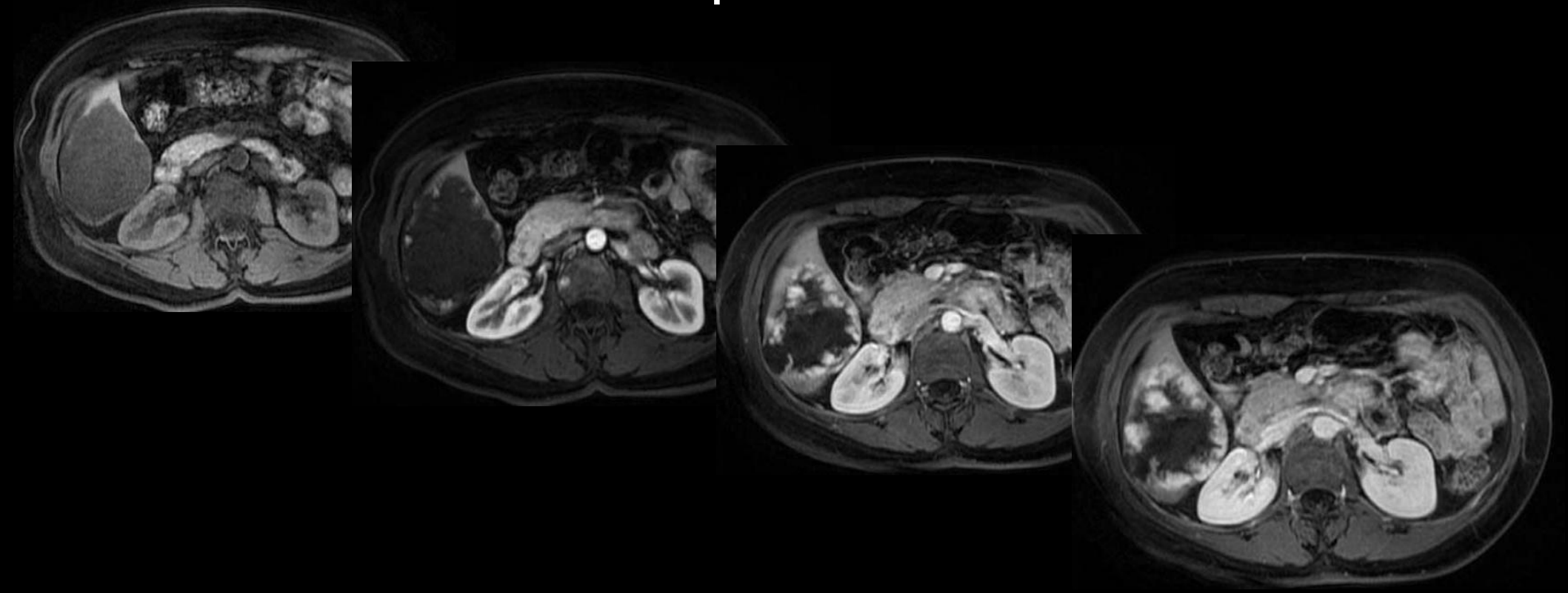
With or without contrast???

Contrast material improves contrast resolution and, therefore, sensitivity and specificity for disease.



With or without contrast???

Contrast administration provides information on physiology and vascularity of the organ or lesion in question.

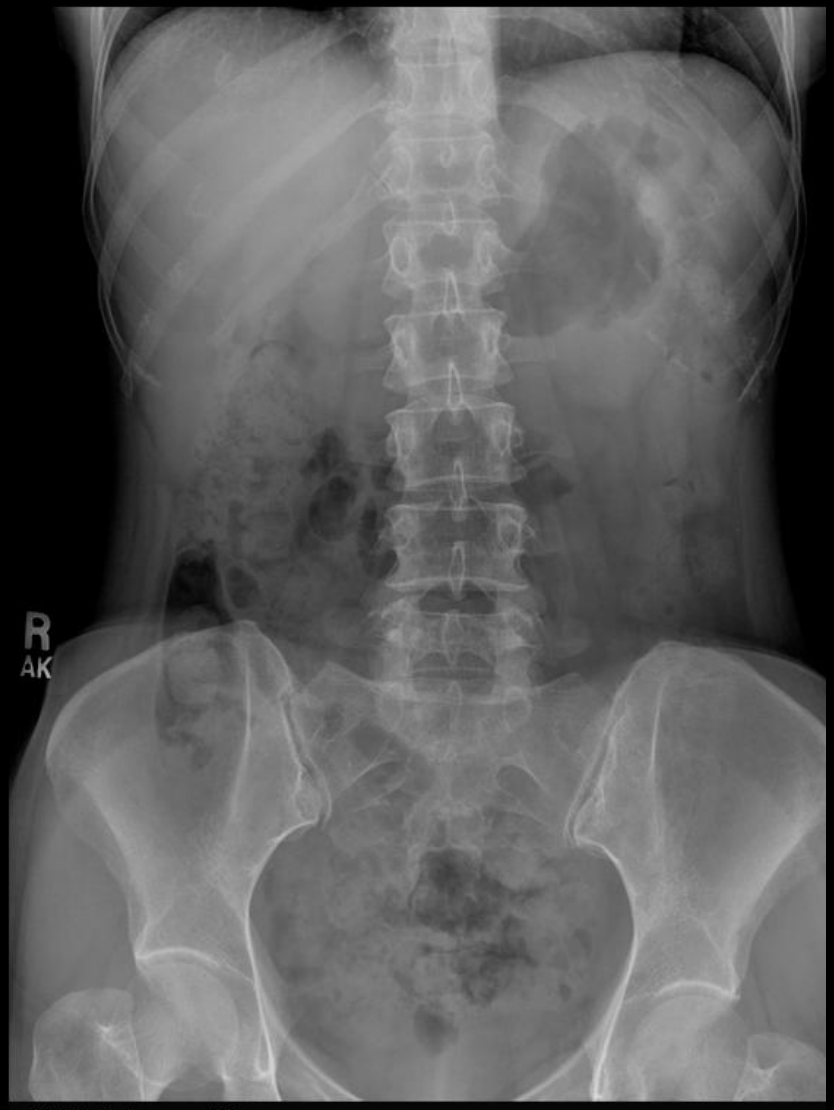


Radiography (plain old x-ray)

Things you can see:

- Bones and other calcified or metallic objects
- Gas in or outside of bowel
- Faint outline of some solid viscera

- Great spacial resolution
- Baaaaad contrast resolution



KUB abdomen film

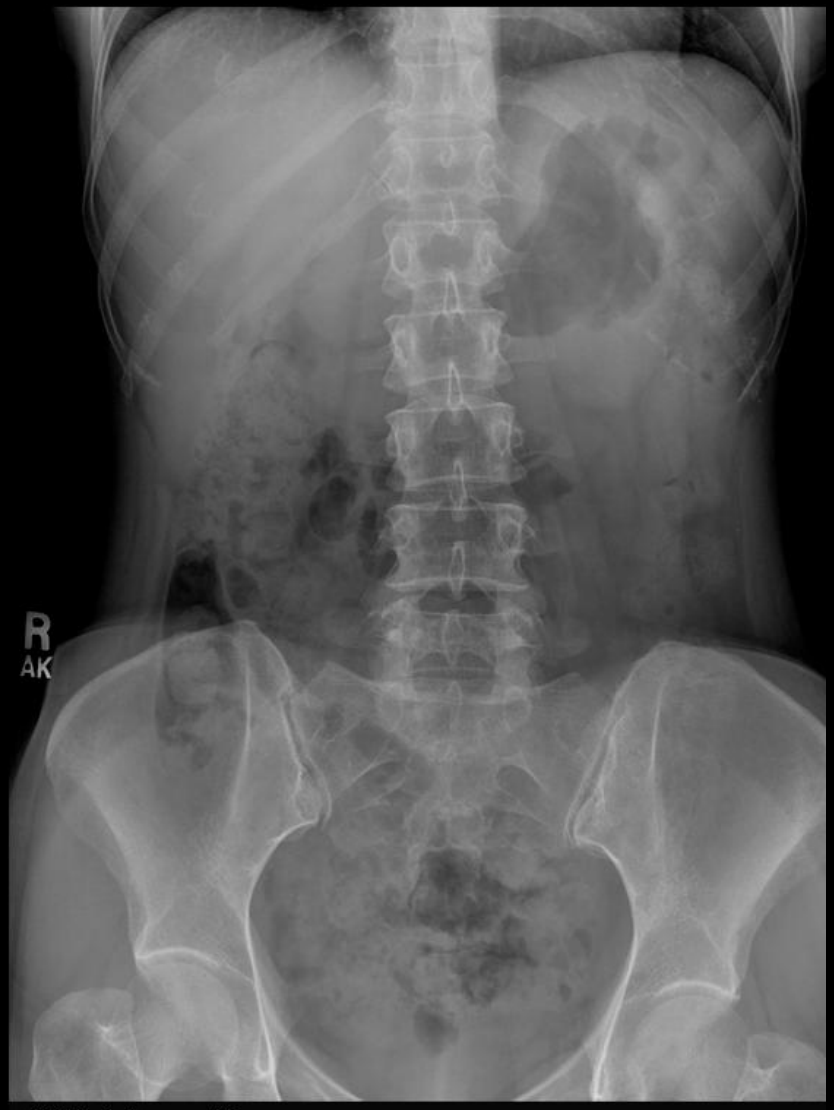
Radiography (plain old x-ray)

Good at:

- Screening for pneumoperitoneum
- Screening for bowel obstruction or ileus
- Evaluating tube / radio-opaque foreign body location

Crappy at:

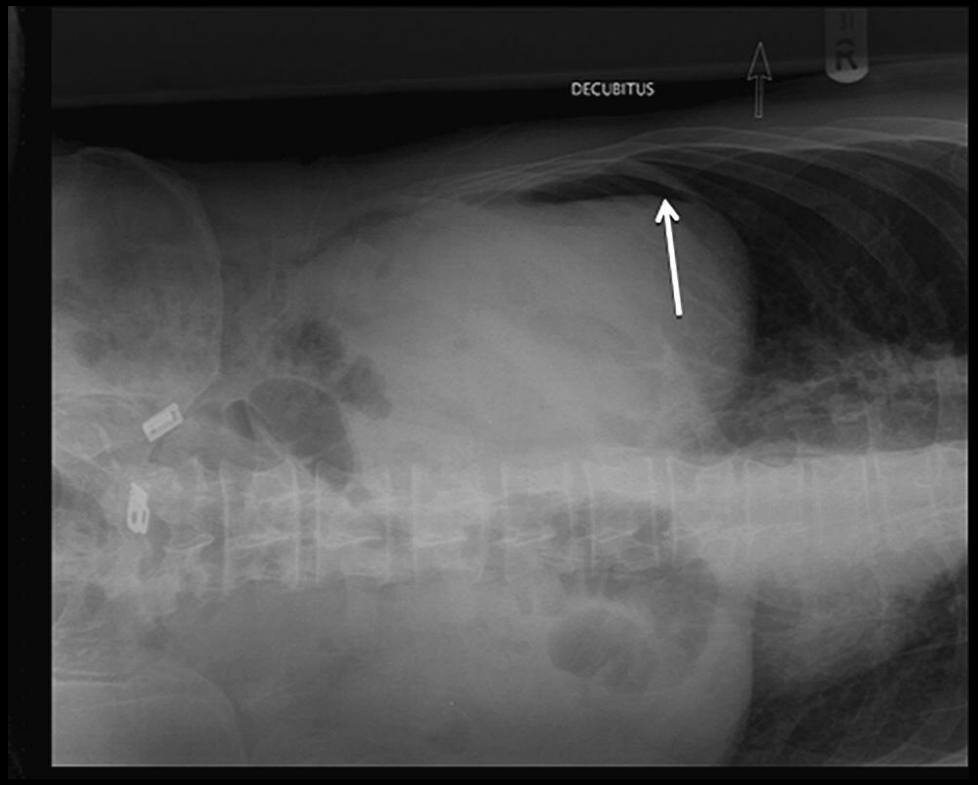
- Everything else (eg. appendicitis, cholelithiasis, gastroenteritis, cancer, etc.)



KUB abdomen film

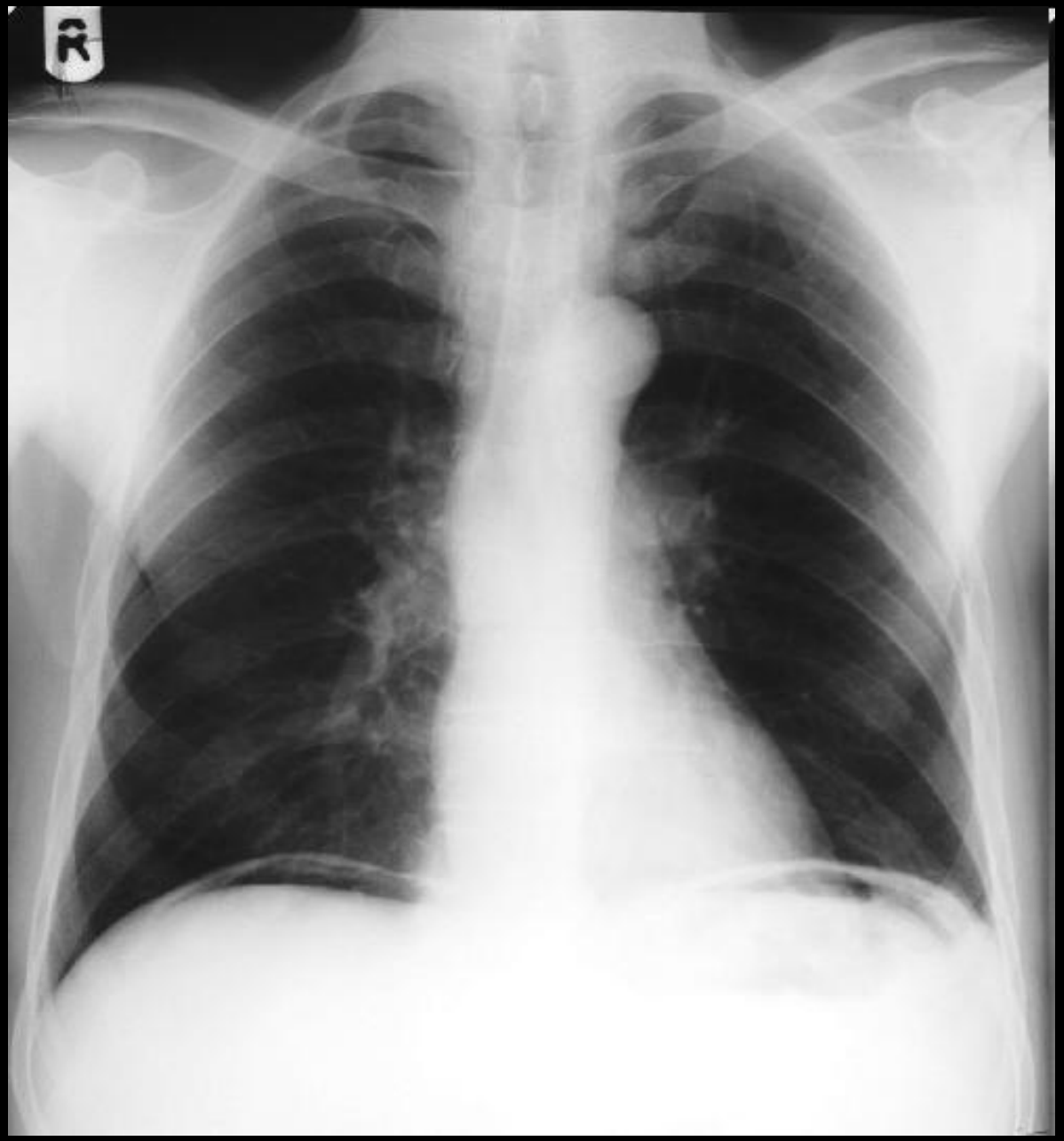
Radiograph variations

- Positional
  - Decubitus→
  - Supine
  - Upright

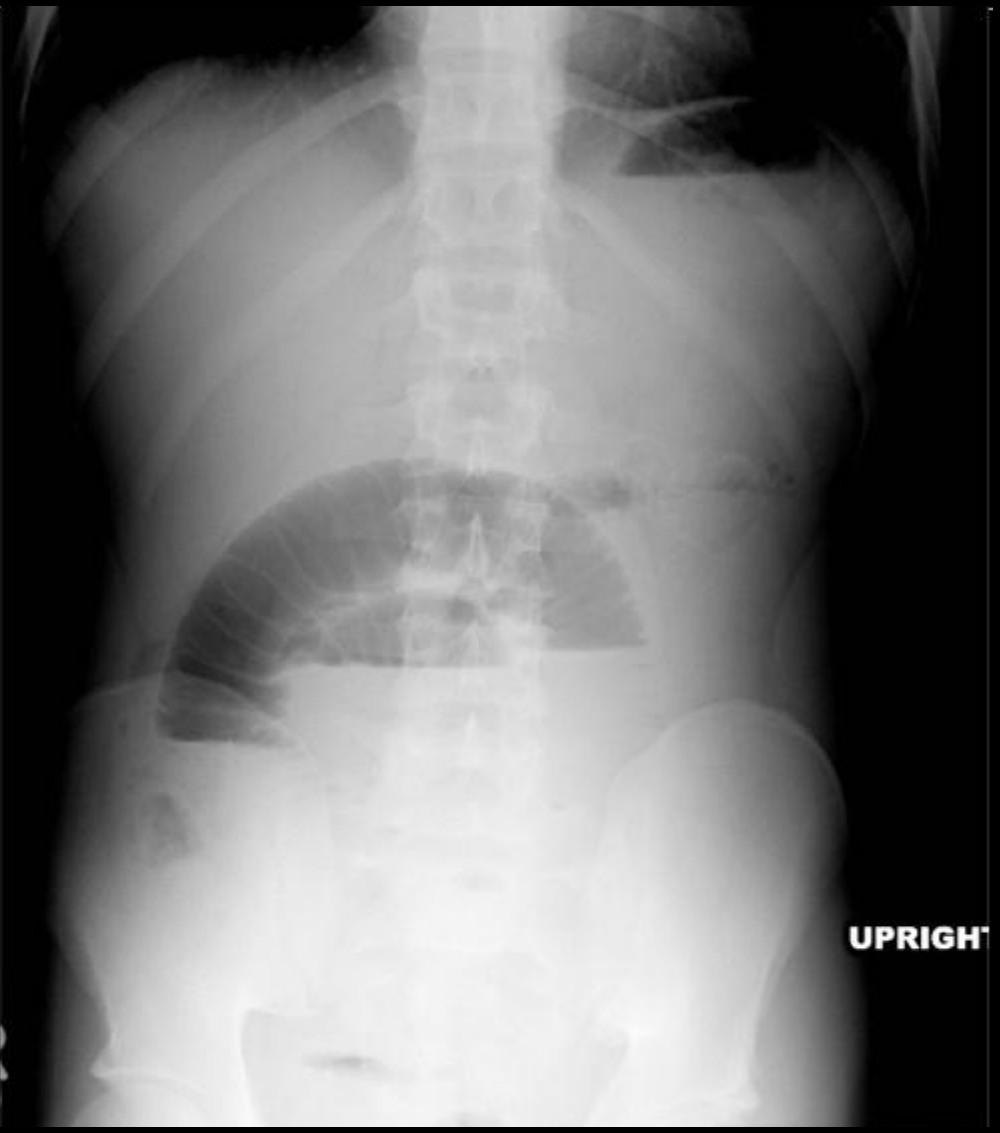


- After contrast administration
  - Intravenous pyelogram (IVP)
  - For tube placement verification

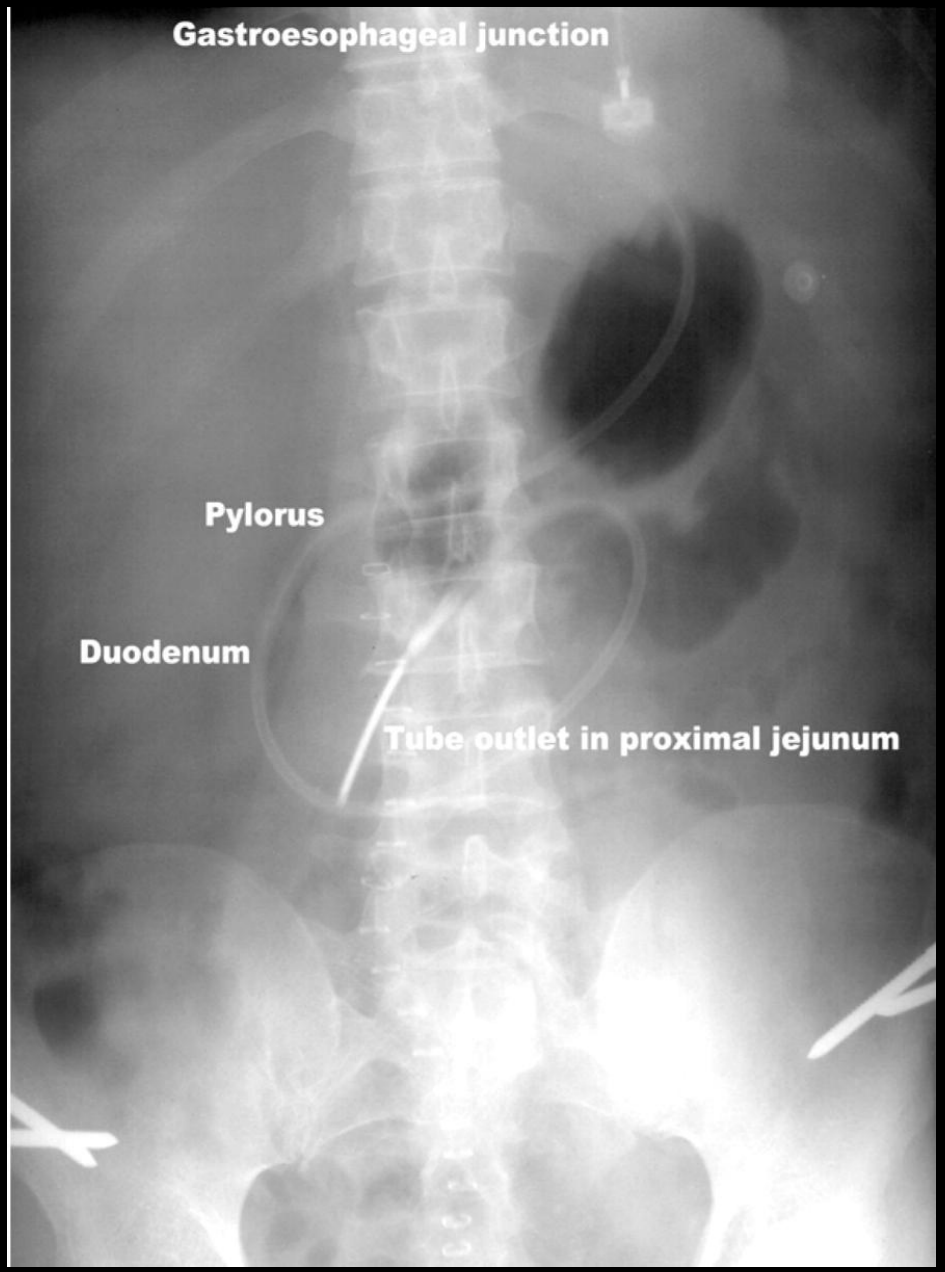
Radiography



Radiography



Radiography



Fluoroscopy

Like x-rays, but LIVE ON TV !!!!!

Contrast is administered to demonstrate the lumen (inside) of the space we're interested in.

Provides anatomic and functional information.

To wit:

Routine fluoroscopic studies

Esophagram

dysphagia, stricture

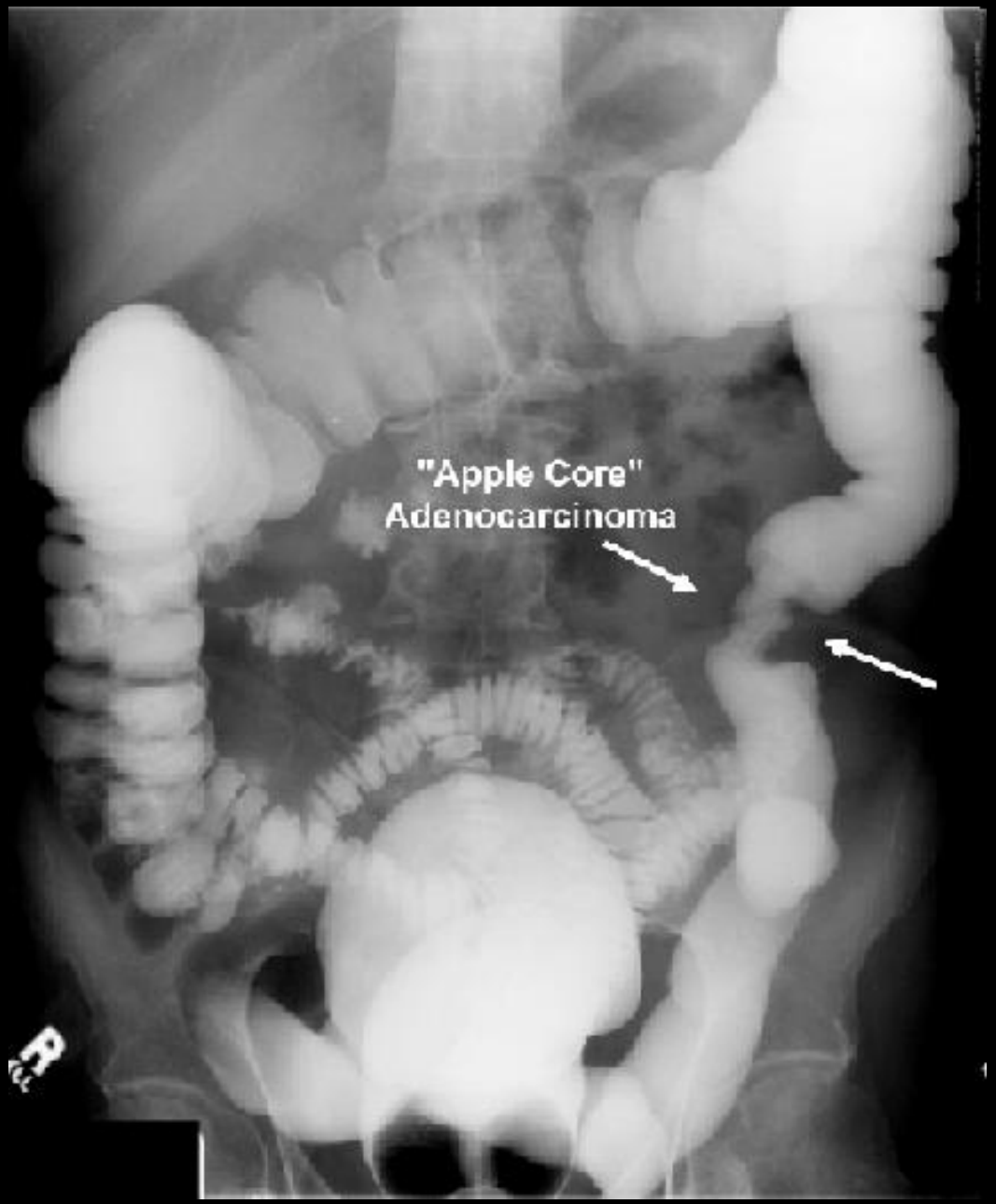
Upper GI

mass, ulcer, reflux

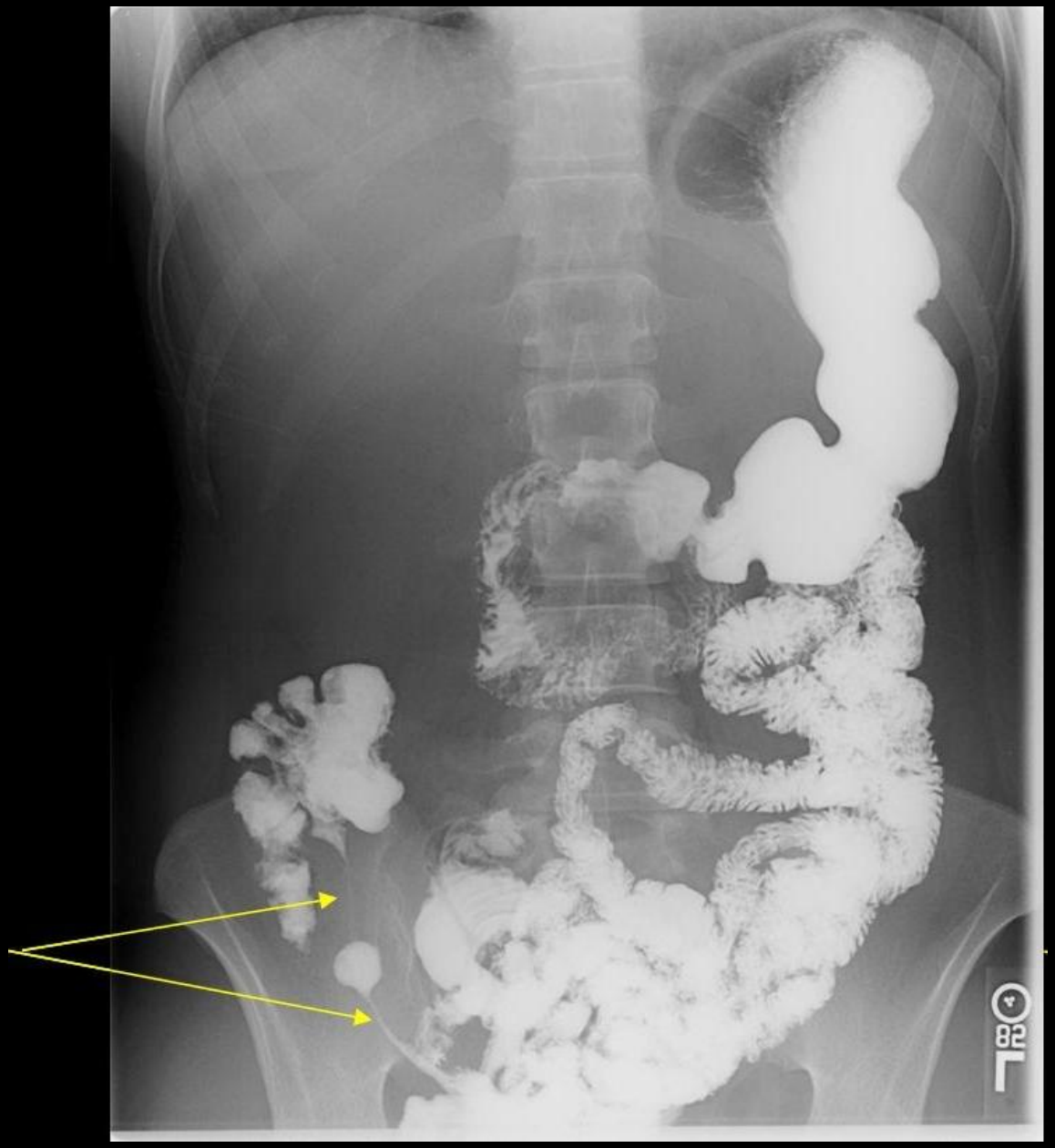
Barium enema

mass, polyp

Fluoroscopy



Fluoroscopy



Computed Tomography (CT)

- Very good spacial resolution
- Pretty good contrast resolution without contrast
- Very good contrast resolution with contrast

Pros:

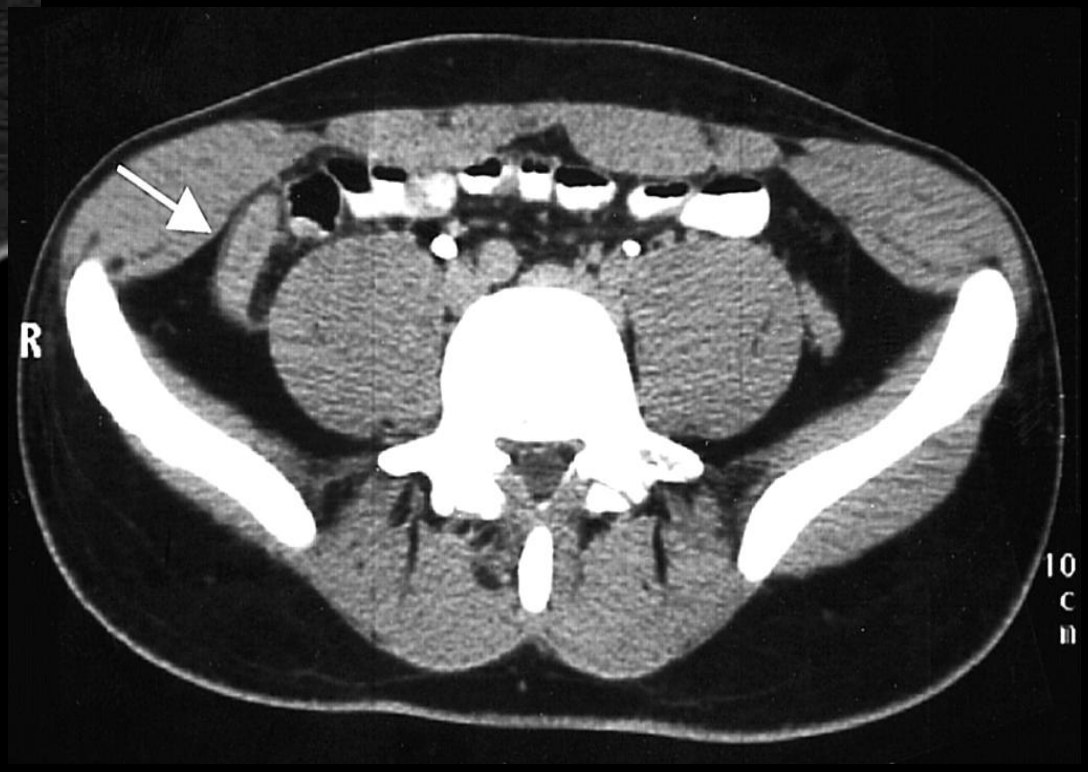
- Excellent anatomic detail
- Sensitive and specific for almost any abdominal disease which causes anatomic changes (inflammation, masses, obstruction, stones, etc.)
- Quick to acquire

Cons:

- Uses ionizing radiation
- Poor specificity for GYN pathology

Computed Tomography (CT)

Computed Tomography (CT)



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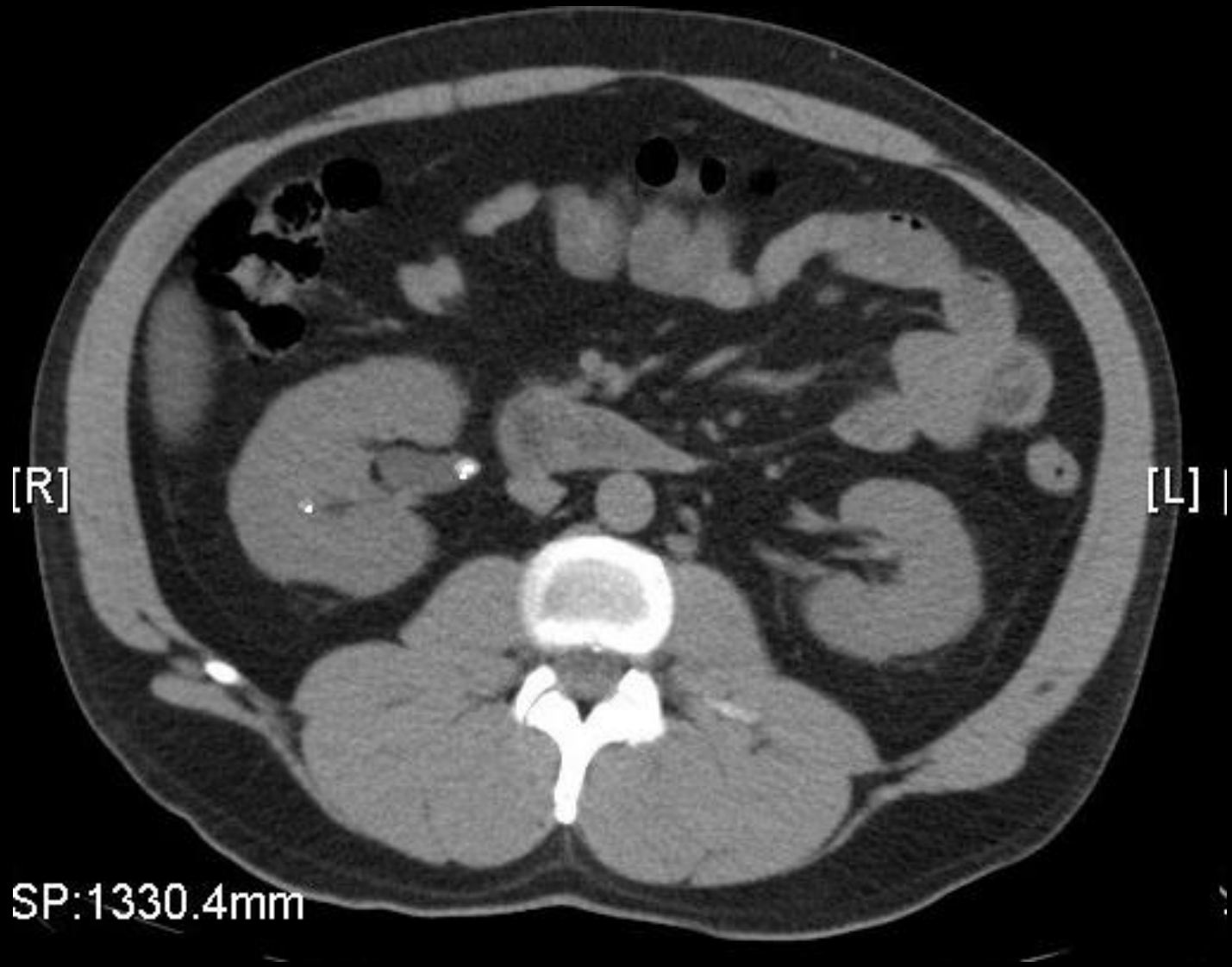

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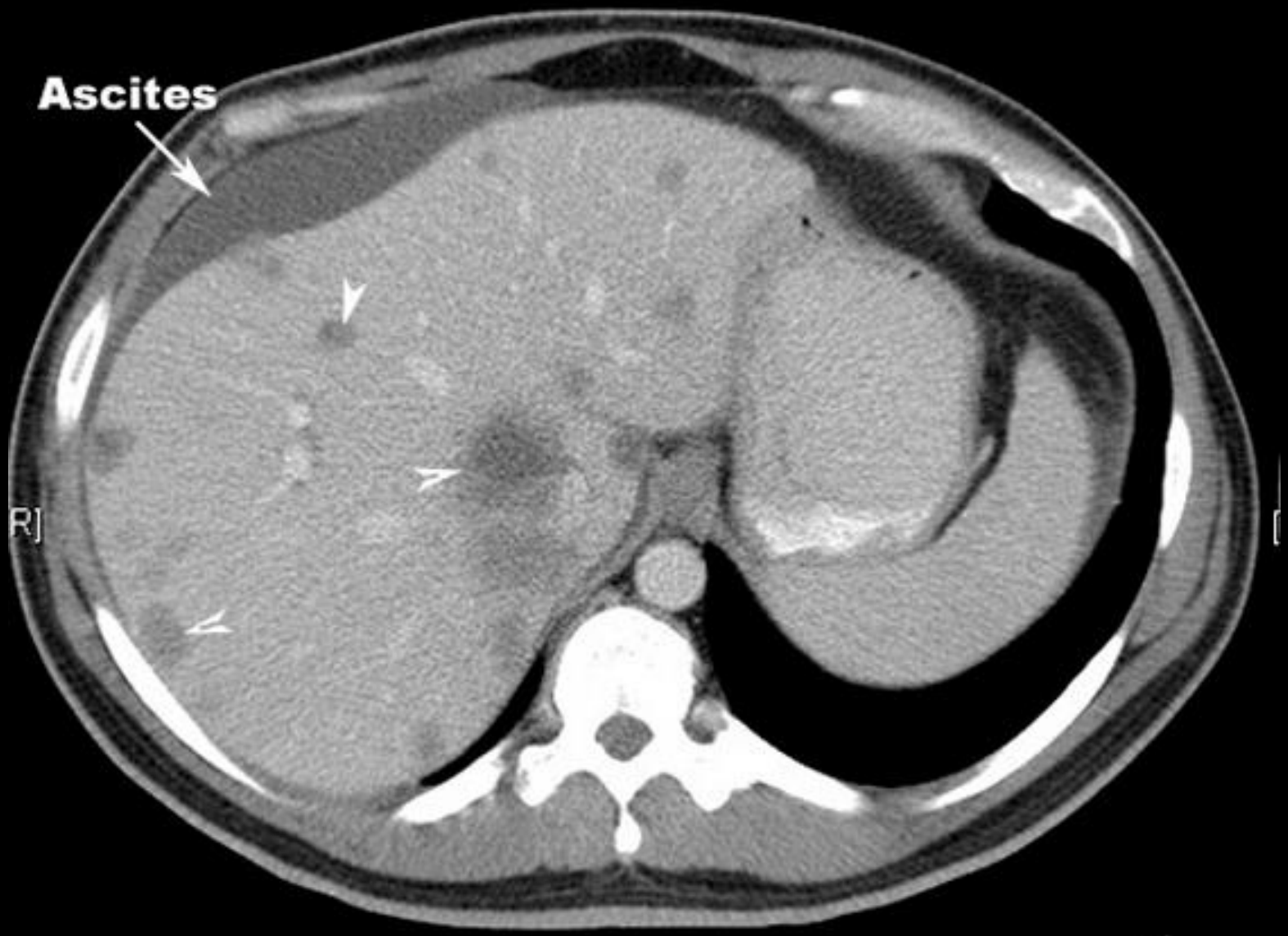


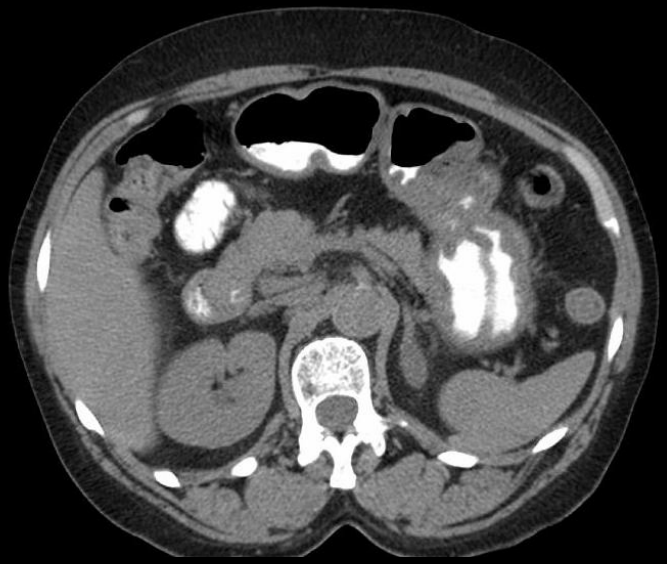
Magnetic Resonance Imaging (MRI)

- Freaking amazing contrast resolution
- Pretty good spacial resolution
- Problem-solving technology

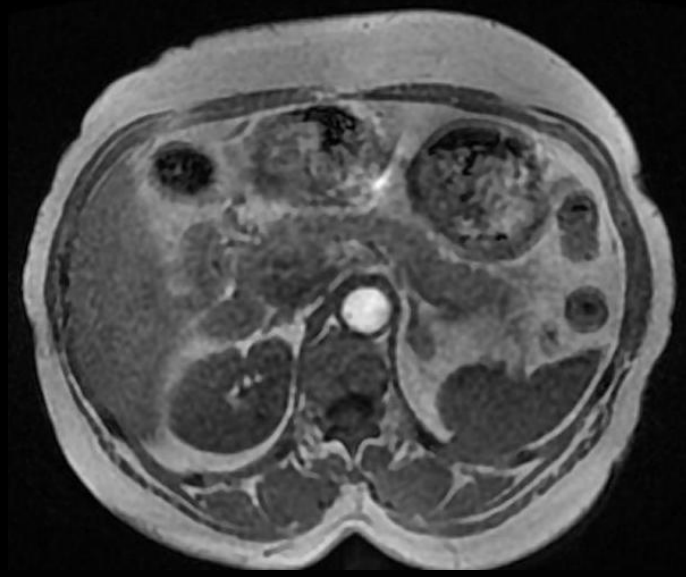
- Pros
  - Excellent tissue characterization
  - Very sensitive and specific for soft tissue lesions, especially in solid organs
  - Excellent characterization of GYN pathology
- Cons
  - Expensive
  - Long acquisition time
  - Quality depends on patient cooperation

Magnetic Resonance Imaging (MRI)

CT without

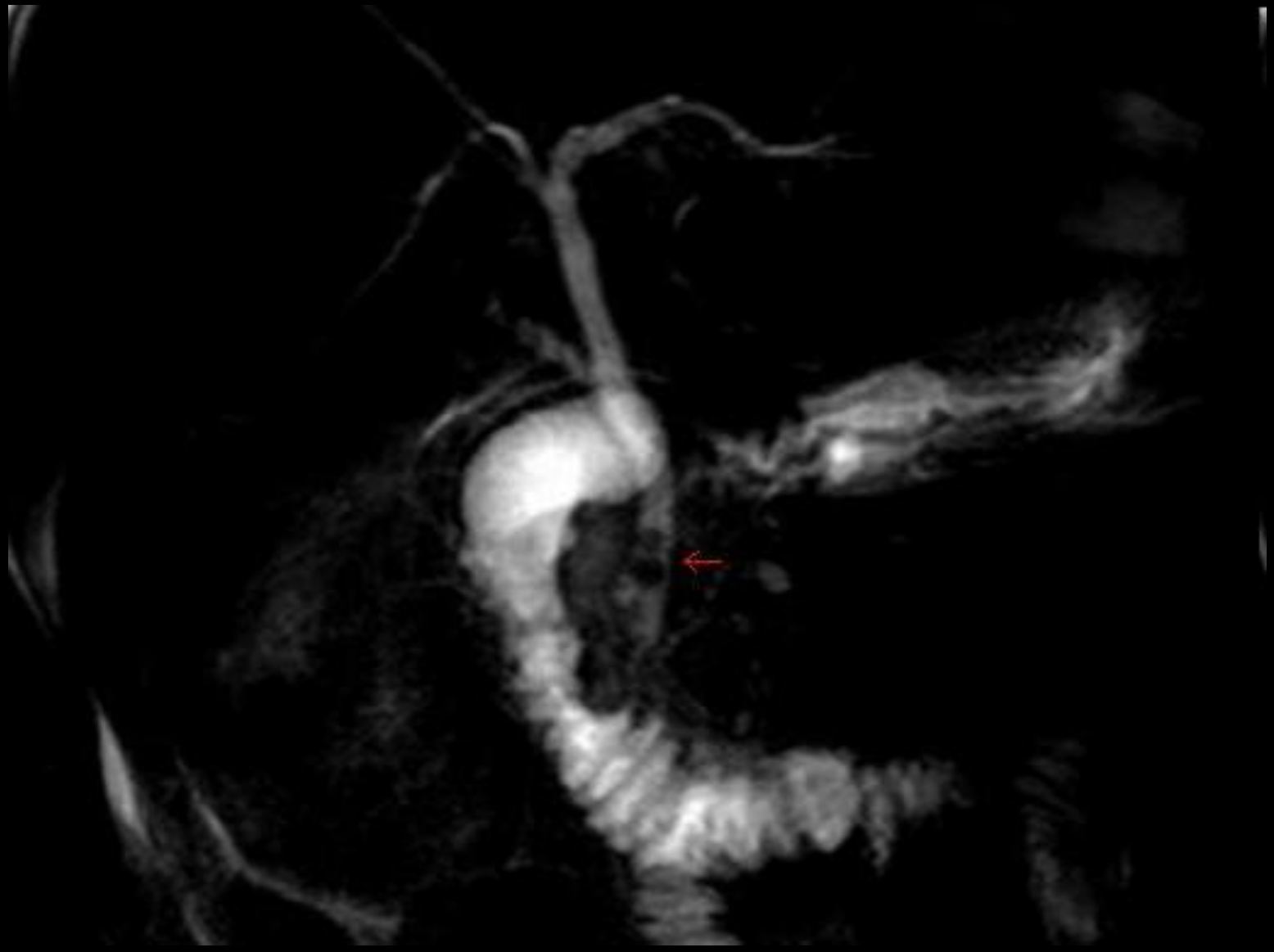


T1WI in-phase



T1WI out-of-phase

Magnetic Resonance Imaging (MRI)



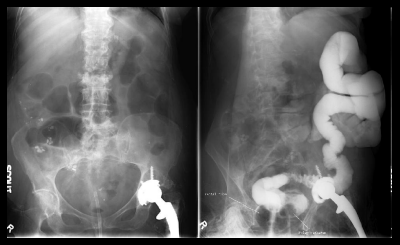
Magnetic Resonance Imagine (MRI)

Magnetic Resonance Imagine (MRI)

Basic Abdominal and Pelvic Imaging Concepts

Remember the basics:

- Resolution
- Modalities (x-ray, Fluoro, CT, MRI, US)
- With or without contrast?



If you don't know what to do,

ask a radiologist !!!