

Disclosures

- None

Objectives

- Modalities
- Sequences
- Orientation
- Lingo

Modalities

Fluoroscopy

Radiography

Ultrasound

CT (computed tomography)

MRI (magnetic resonance imaging)

Nuclear medicine

X-rays

X-rays

Sound waves

X-rays

Magnetic waves

Radiopharmaceuticals, X-rays

Radiation



Natural background
radiation
3 mSv/yr
(range 1-10 mSv)



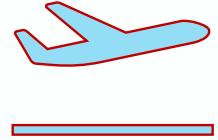
Living in a brick house
0.0002 mSv/yr

Table 1

Adult Effective Doses for Various Diagnostic Radiology Procedures

Examination	Average Effective Dose (mSv)	Values Reported in Literature (mSv)
Skull	0.1	0.03–0.22
Cervical spine	0.2	0.07–0.3
Thoracic spine	1.0	0.6–1.4
Lumbar spine	1.5	0.5–1.8
Posteroanterior and lateral study of chest	0.1	0.05–0.24
Posteroanterior study of chest	0.02	0.007–0.050
Mammography	0.4	0.10–0.60
Abdomen	0.7	0.04–1.1
Pelvis	0.6	0.2–1.2
Hip	0.7	0.18–2.71
Shoulder	0.01	...
Knee	0.005	...
Other extremities	0.001	0.0002–0.1
Dual x-ray absorptiometry (without CT)	0.001	0.001–0.035
Dual x-ray absorptiometry (with CT)	0.04	0.003–0.06
Intravenous urography	3	0.7–3.7
Upper gastrointestinal series	6*	1.5–12
Small-bowel series	5	3.0–7.8
Barium enema	8*	2.0–18.0
Endoscopic retrograde cholangiopancreatography	4.0	...

* Includes fluoroscopy.



6 hr commercial flight
0.03 mSv

Effective Doses in Radiology and Diagnostic Nuclear Medicine: A Catalog. FA Mettler, W Huda, et al, **Radiology**: Volume 248 Number 1 – July 2008

Sound energy: Frequency

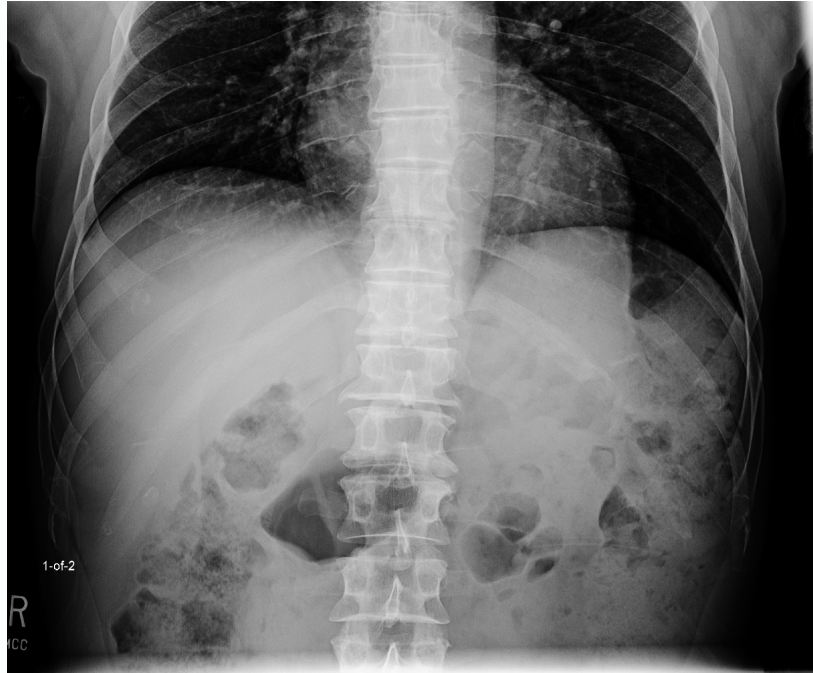
Sound source	Frequency (cycles/s, Hz)
Sounds audible to human	0.00002-0.020 MHz (20-20,000 Hz)
Sounds audible to dog	0.00007-0.045 MHz (67-45,000 Hz)
US transducer deep abdomen, OB/gyne	2.5 MHz (2,500,000 Hz)
US transducer general abdomen, OB/gyne	3.5 MHz
US transducer vascular, breast, pelvic	5.0 MHz
US transducer thyroid	10.0 MHz
US transducer superficial	15.0 MHz

https://en.wikipedia.org/wiki/Hearing_range

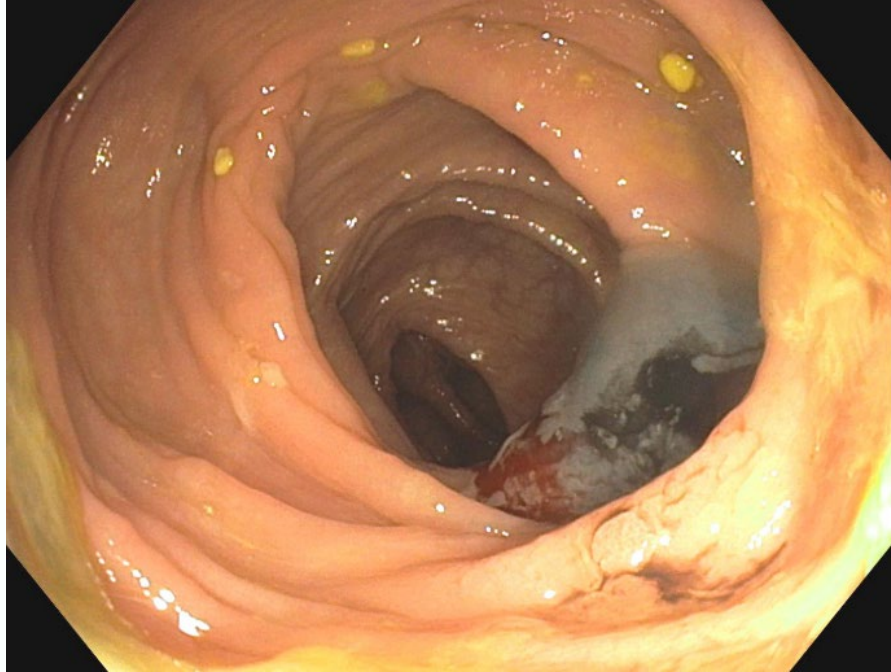
52 y/o man with abdominal pain

- Abdominal discomfort has been present for the last 4 days
- Described as a dull ache localized to the suprapubic region
- Intermittent pain 1 to 2 out of 10, occasionally brief sharp shooting pain
- Bowel habits have changed since illness 5 months ago
- Weight loss of 10 to 15 pounds over the past 6 to 8 months, attributed to improved diet and exercise
- Father either had prostate or colon cancer (can't remember which one) and brain tumor.

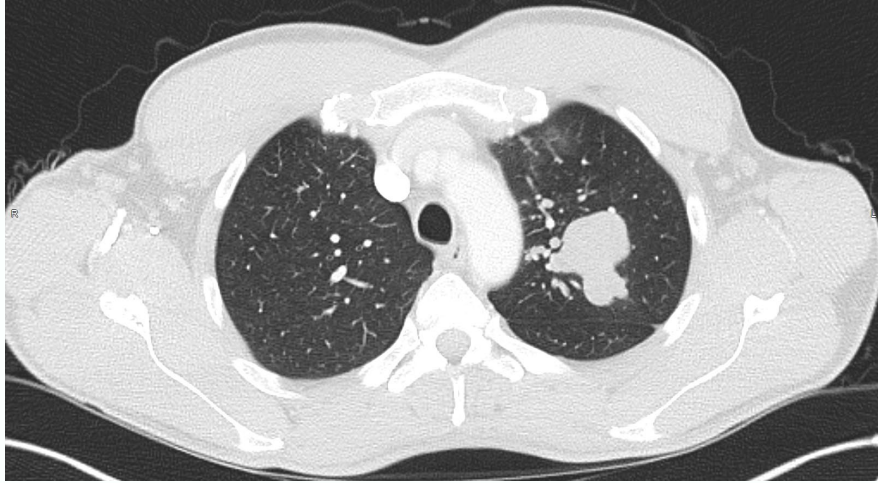
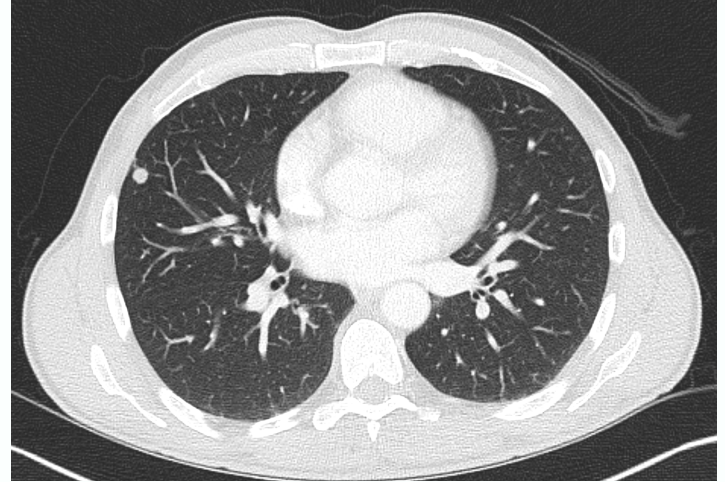
Abdominal radiographs



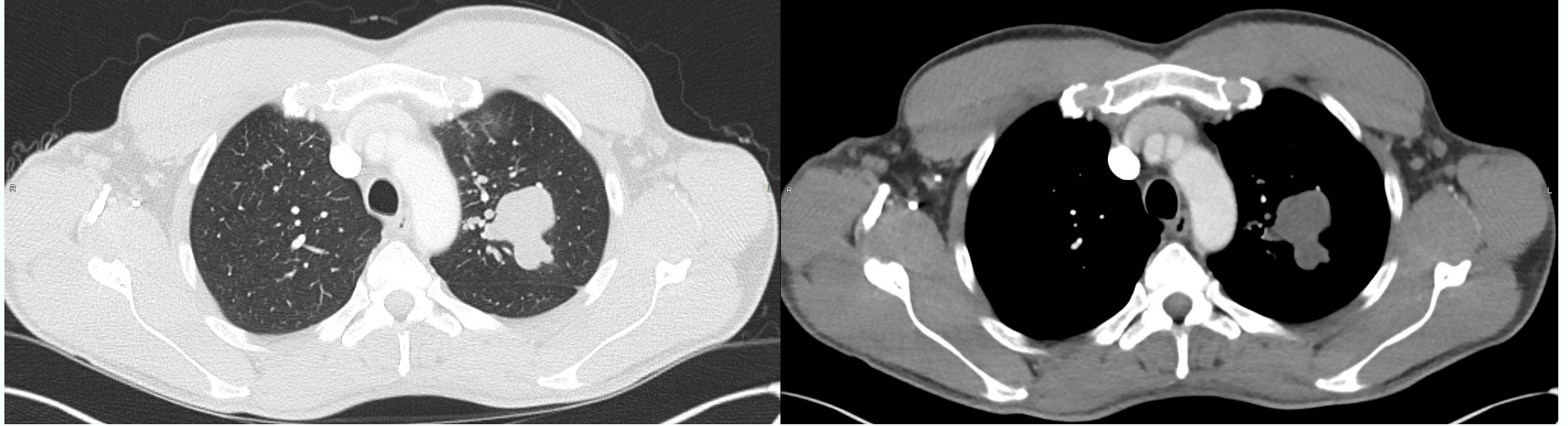
Colonoscopy



CT chest abdomen pelvis with contrast



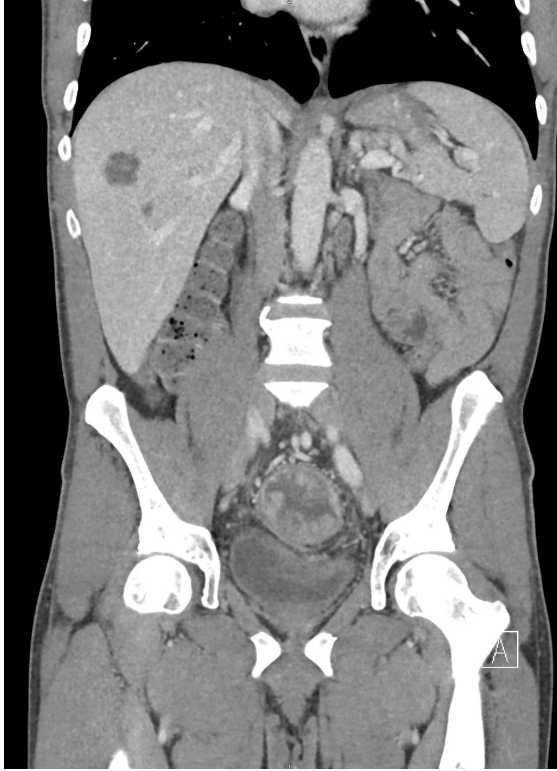
CT CAP w/ contrast



CT CAP w/ contrast



CT CAP w/ contrast

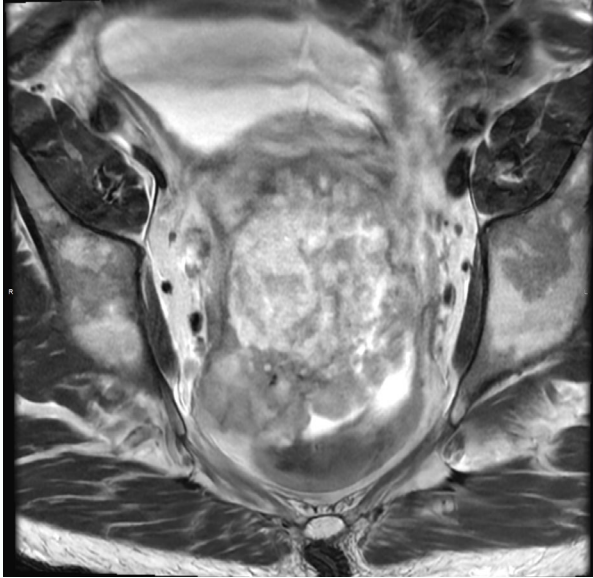


CT vs MRI



MRI pelvis

Axial T2

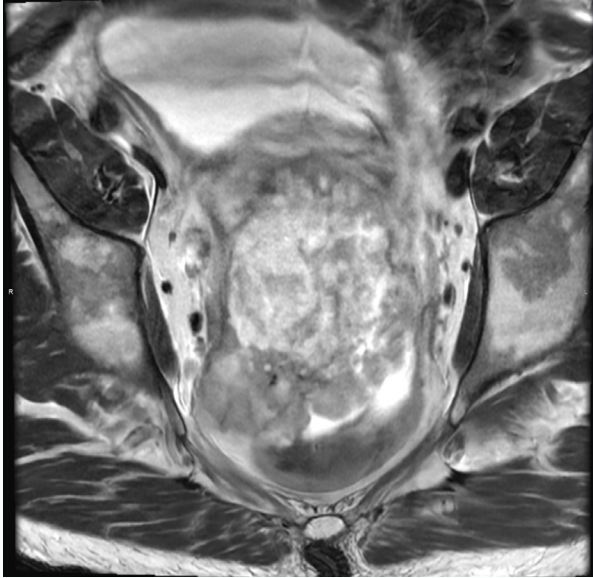


Sagittal T2

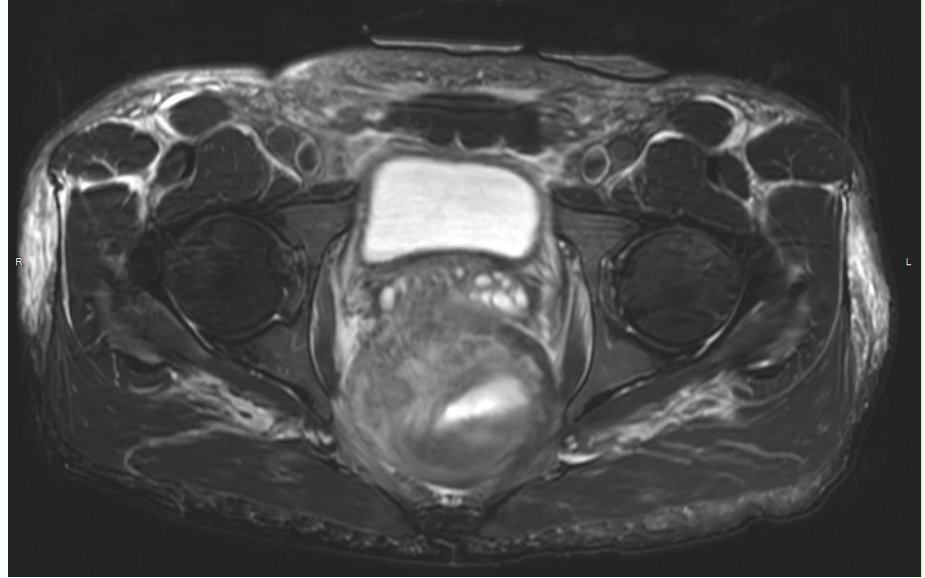


MRI: No fat sat vs With fat sat

Axial T2

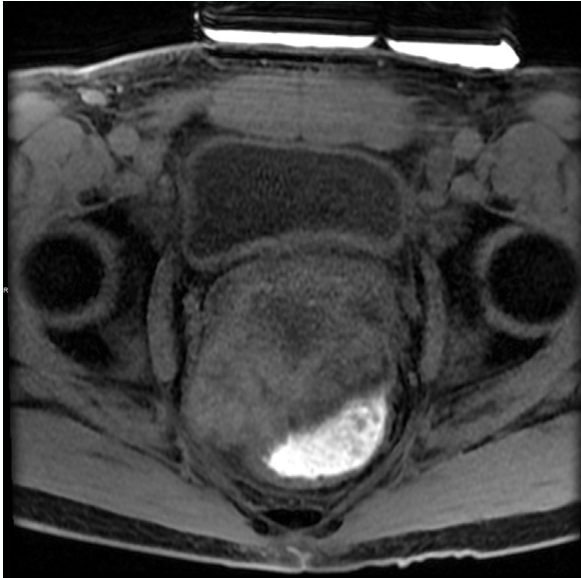


Axial T2 fat sat

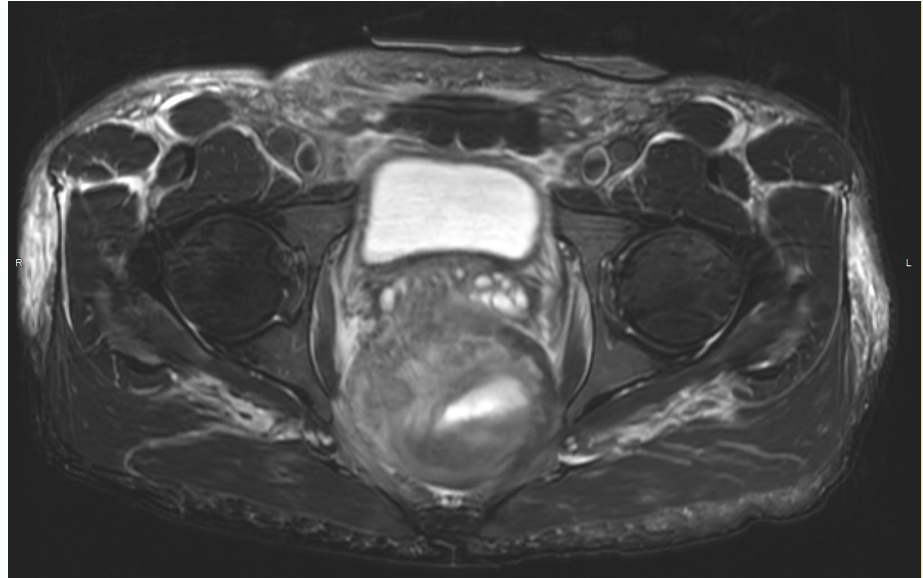


MRI: T1 vs T2

Axial pre T1 fat sat

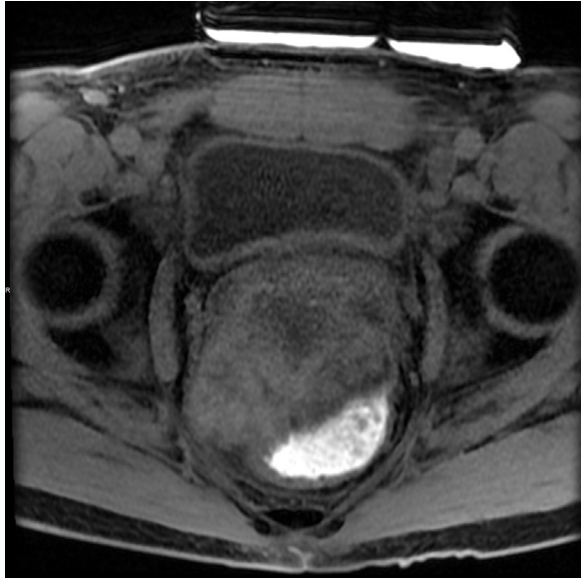


Axial T2 fat sat MRI scan of the pelvis.

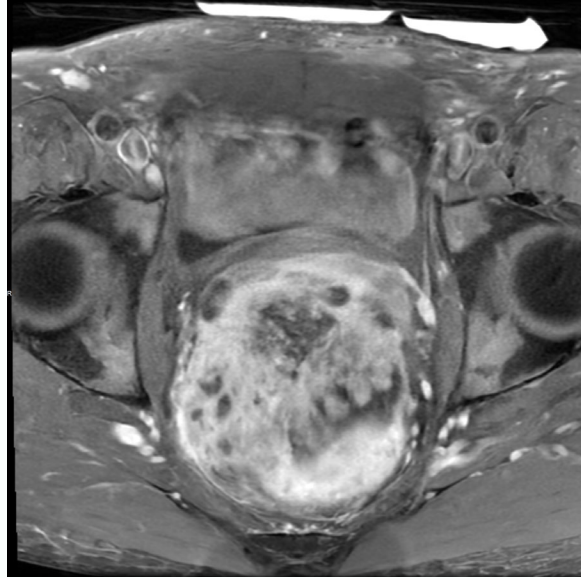


MRI: Without vs With contrast

Axial pre T1 fat sat



Axial post T1 fat sat

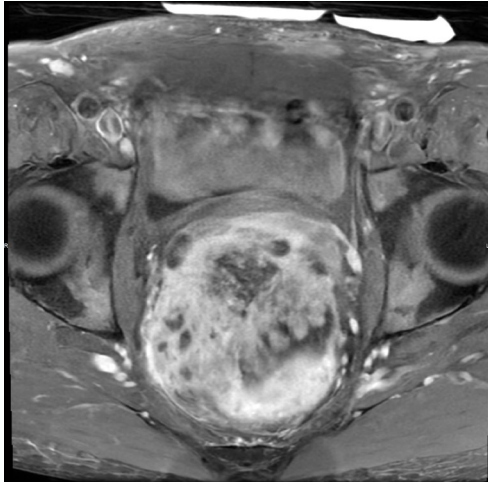


Without contrast
= No contrast
= Precontrast

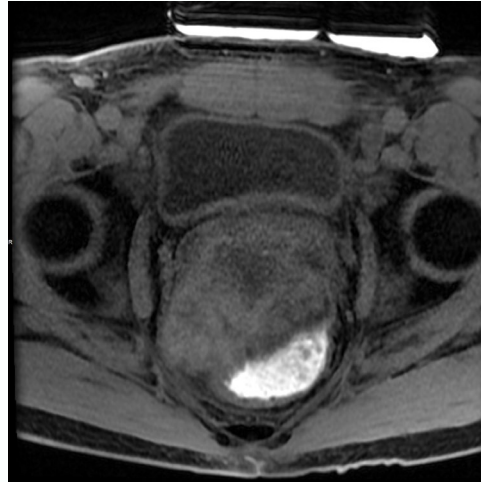
With contrast
= Postcontrast

MRI: Subtraction

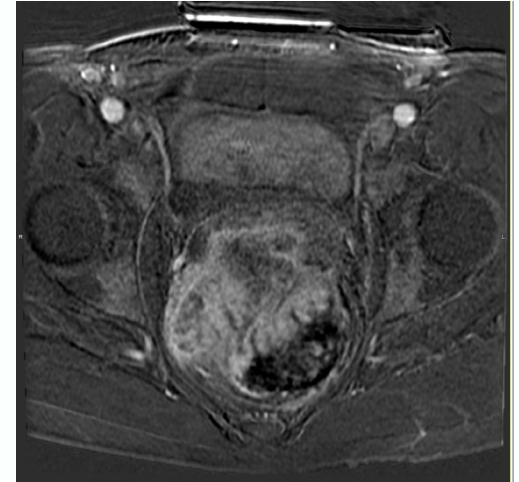
Axial post T1 fat sat



Axial pre T1 fat sat

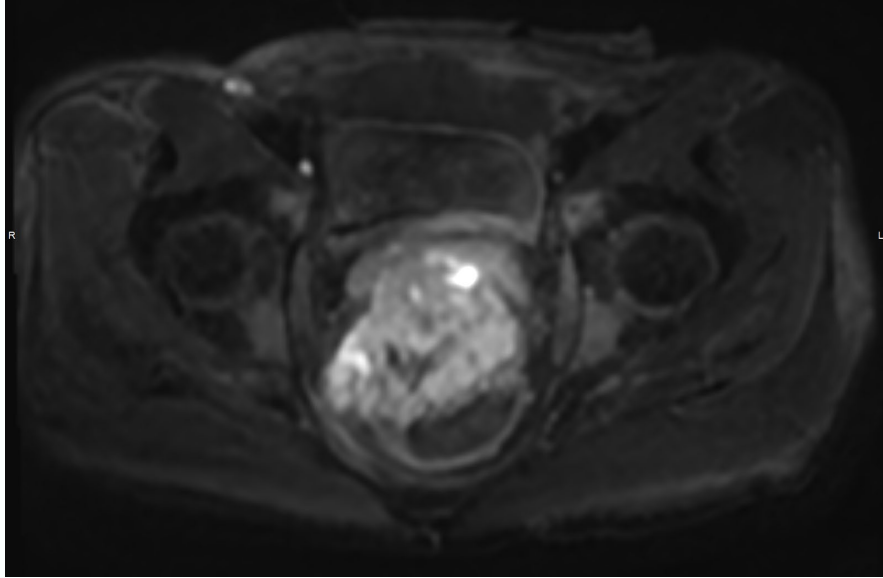


Subtraction T1 fat sat

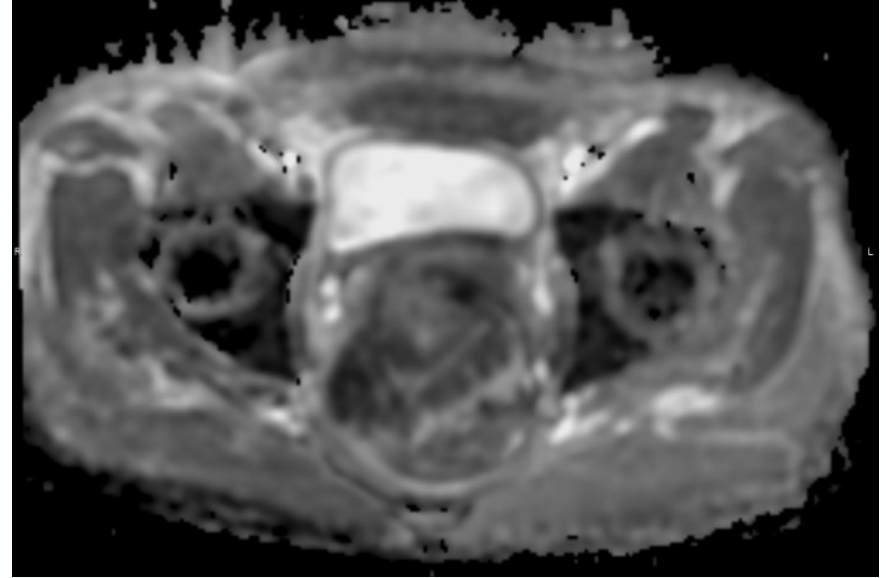


MRI: Restricted diffusion

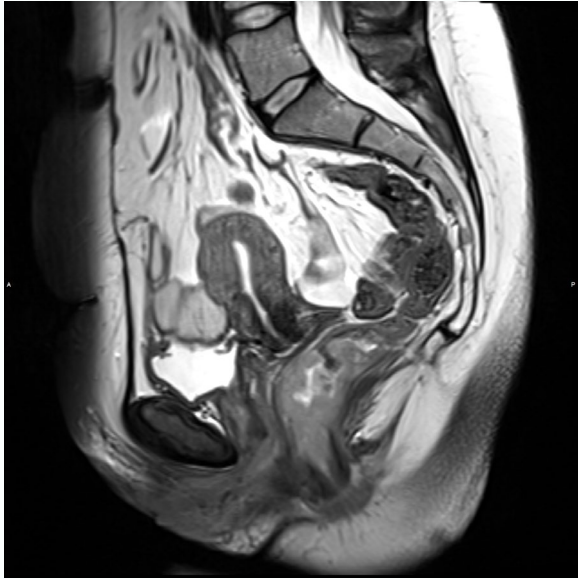
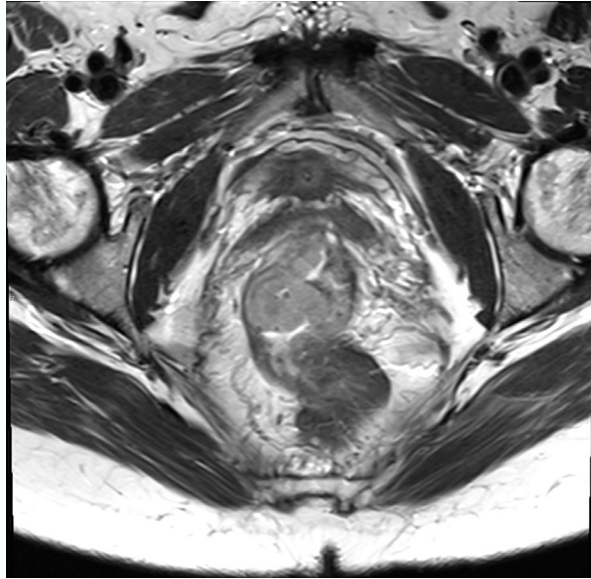
Diffusion



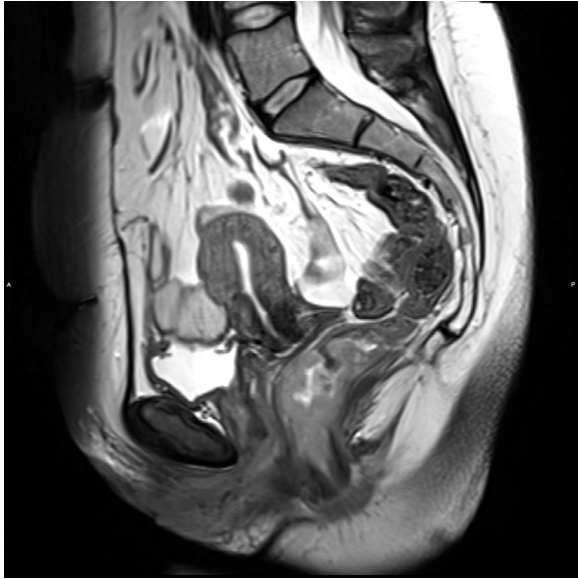
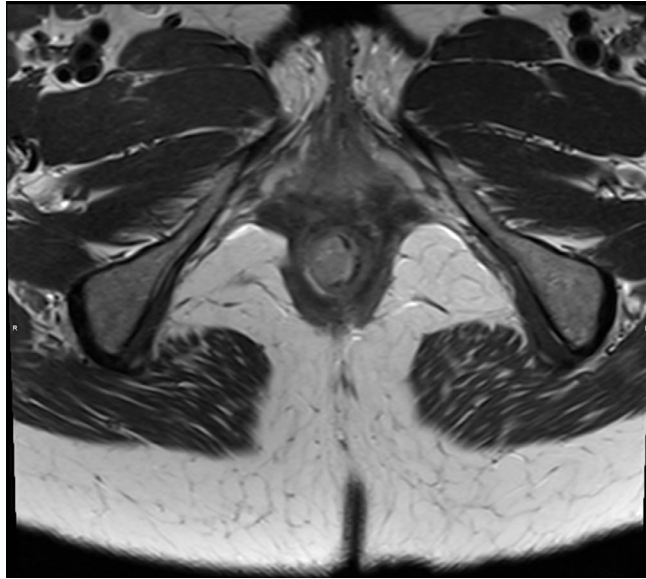
ADC



38 y/o woman with T4b rectal tumor and sphincter complex involvement



38 y/o woman with T4b rectal tumor and sphincter complex involvement



ED: 34 y/o woman with abdominal pain

- 1 month of generalized abdominal pain, decreased appetite, vomiting after eating
- Constipated, uses laxatives
- Intermittent coughing. Intermittent sharp chest pain worse with movements, lasts about 10 seconds.
- 1 week of vaginal spotting, lighter than her periods.

CT w/o contrast



CT: Current vs Prior

Current



2 years ago



US: Transabdominal vs Transvaginal

TA



TV

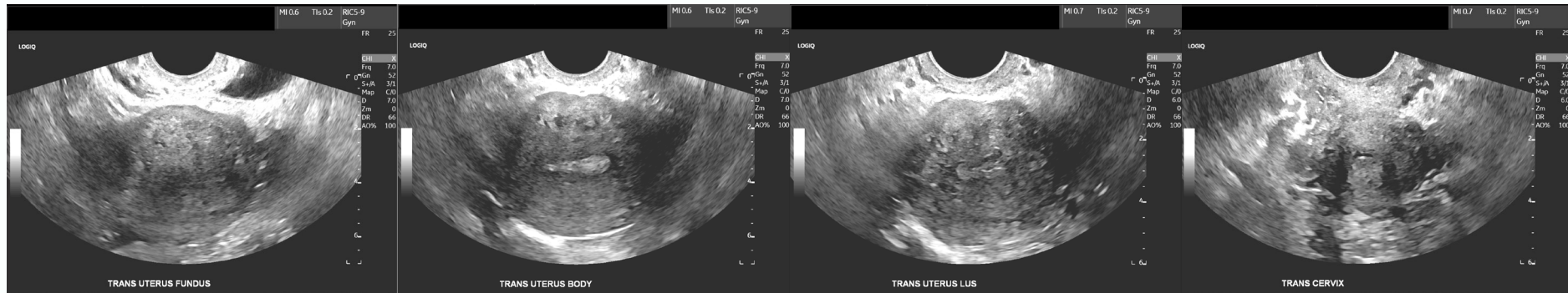


US: Sagittal vs Transverse



Sagittal (Sag) $\approx$ Longitudinal (Long) $\approx$ Long axis

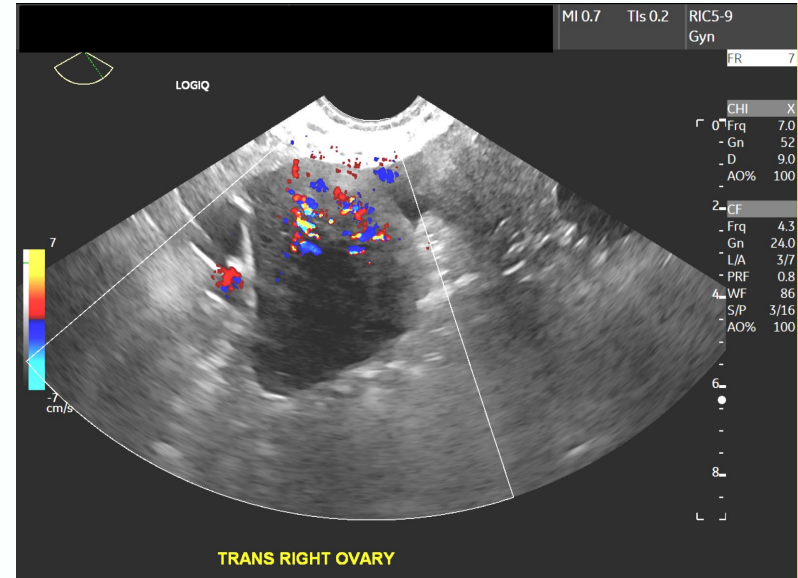
Transverse (Trans) $\approx$ Transaxial $\approx$ Short axis



US: Right vs Left

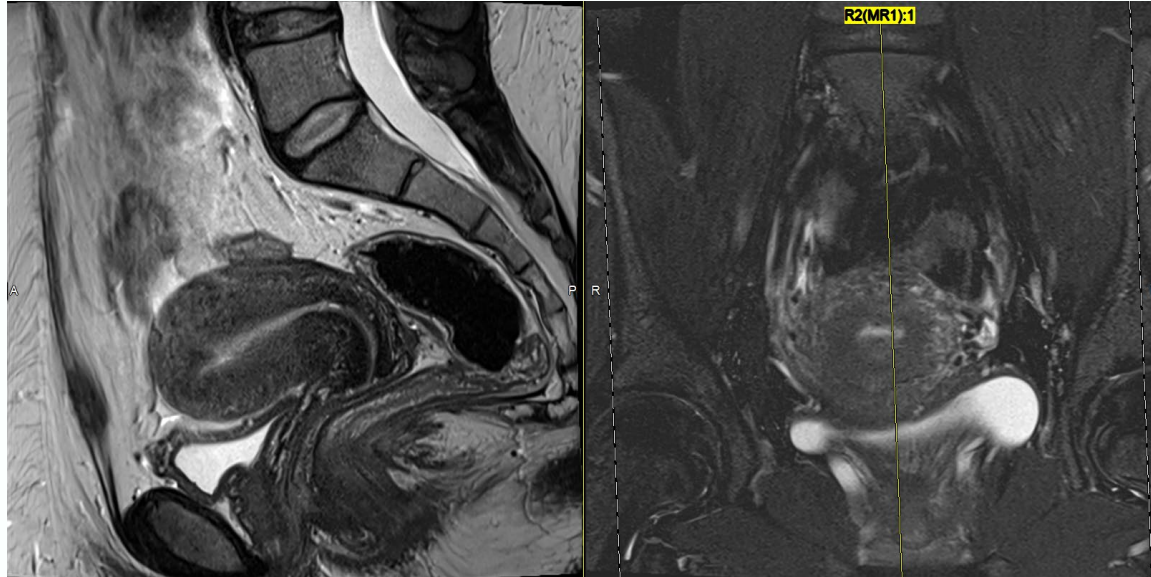


US: Greyscale vs Color Doppler



MRI: Sagittal vs Coronal

Long axis vs Short axis



MRI: Sagittal vs Coronal

Long axis vs Short axis



MRI: Sagittal vs Coronal

Long axis vs Short axis



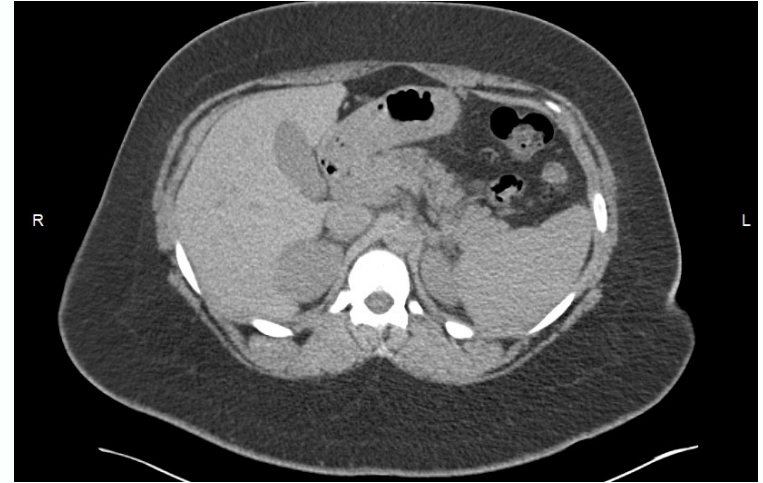
CT: With contrast vs Without contrast

Current vs Prior

Current



3 years ago



CT: Hounsfield Units (HU)

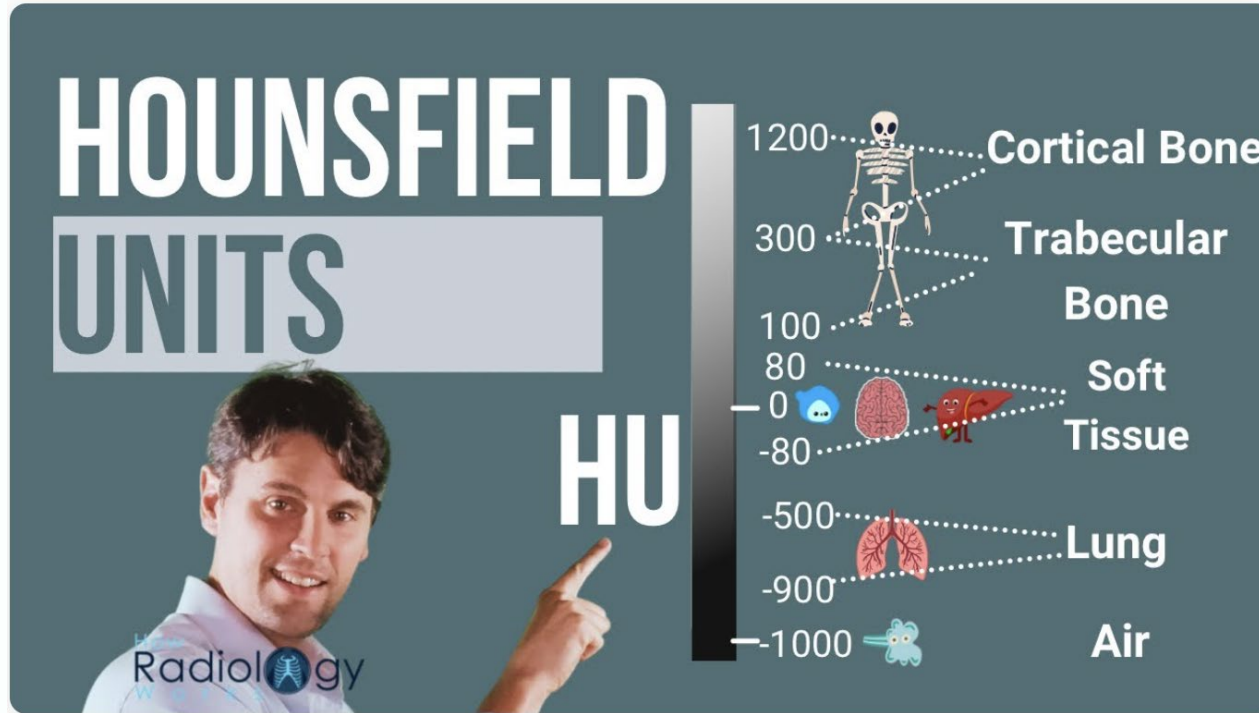
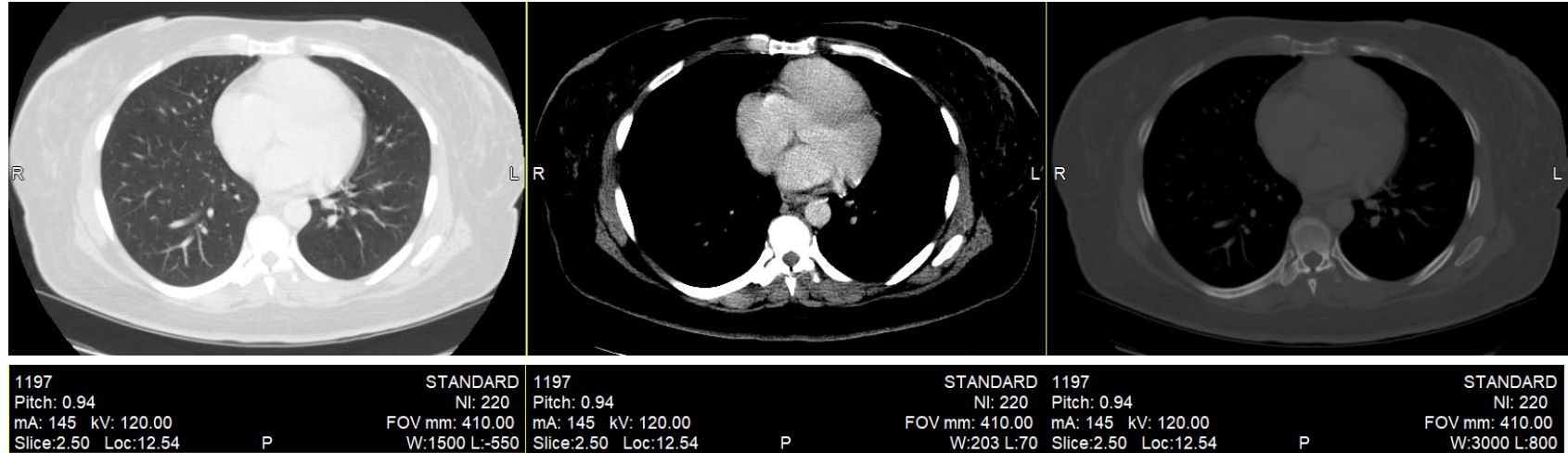


Image taken from the YouTube channel *How Radiology Works*, from the video titled *Hounsfield Units (Where do CT numbers come from?)*.

CT: Windowing



W = Window

L = Level

C = Center

CT: Windowing



W: 400
L: 50



W: 139
L: 96

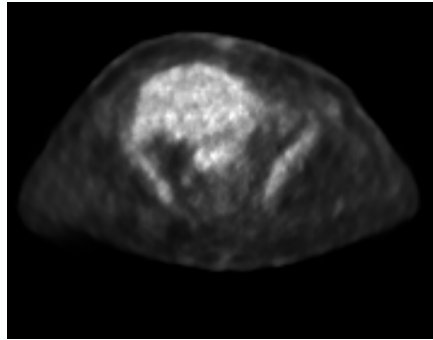
PET/CT

Noncontrast CT



+

PET

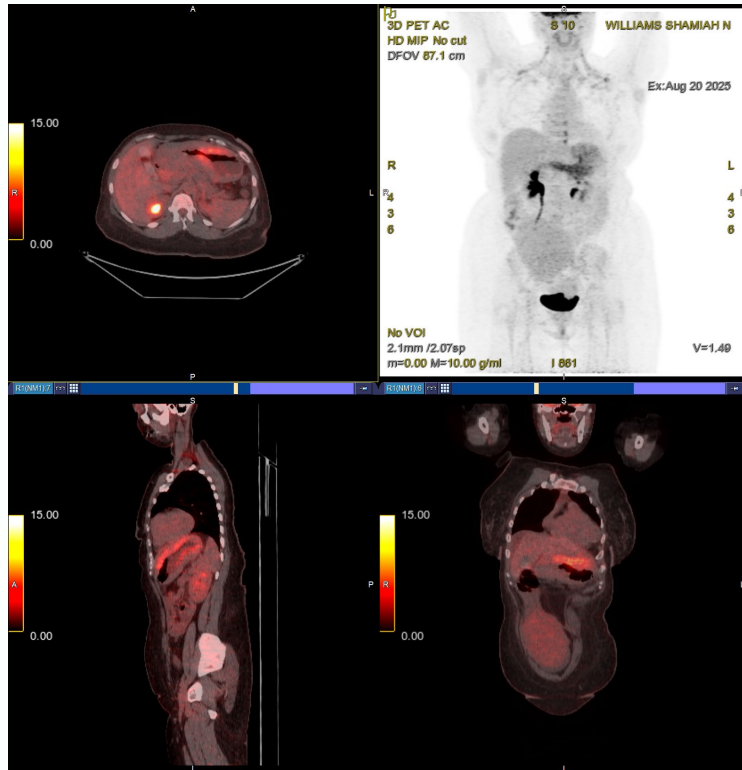
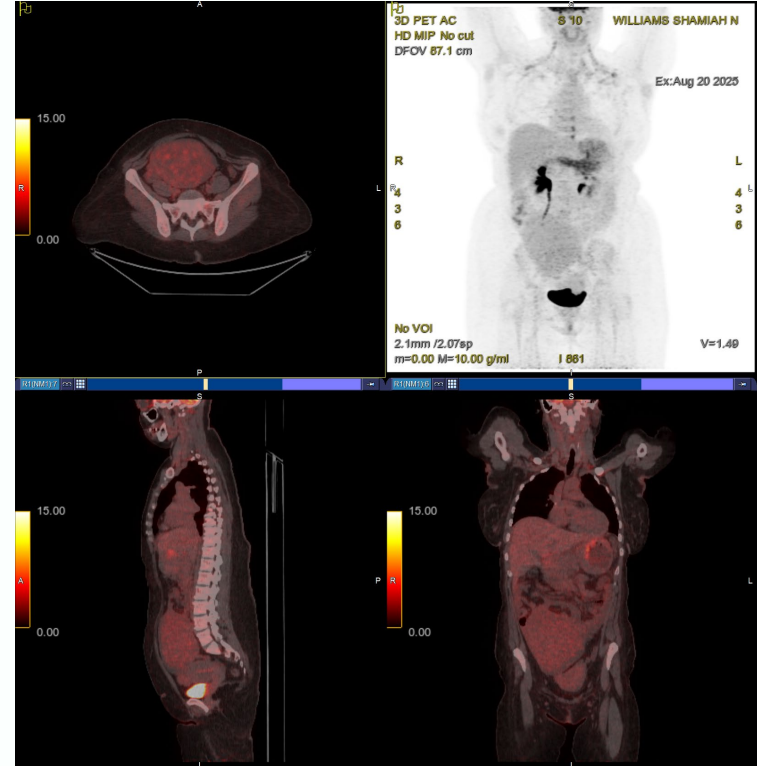


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Fusion



FDG PET/CT



Quick Questions

- What is the difference between T1 and T2?
- What does trans mean?
- Does PET/CT use radiation?

Q and A

