So, You Want Contrast With That?

Choosing among the multitude of available imaging options
and
Truths and myths in imaging

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Disclaimers

NONE

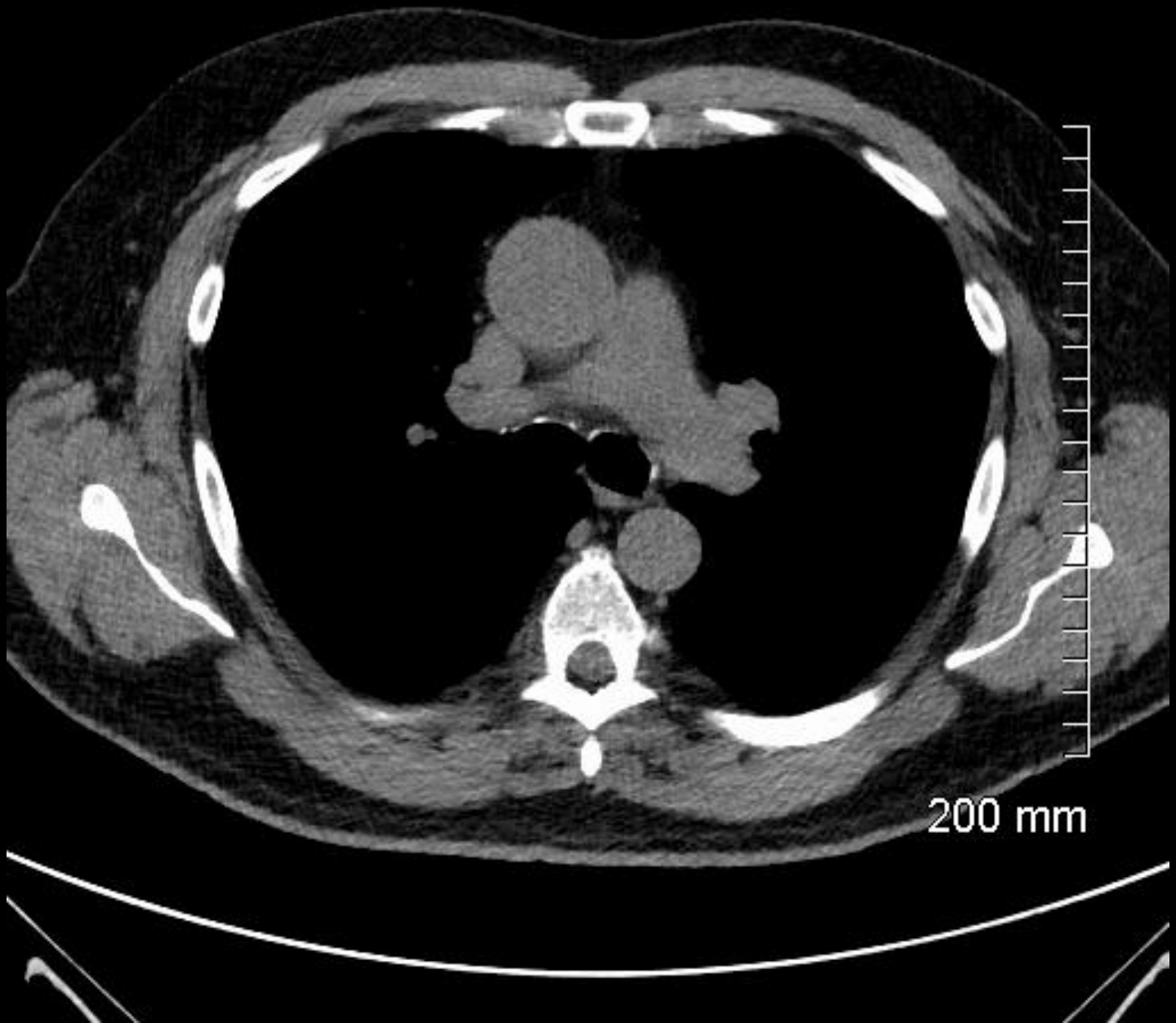
Contrast for CT Scanning

- None
- IV
- Oral

CT Natural Contrast

- **Generally**:

- AIR/GAS – Black
- FAT/OIL – Dark gray
- WATER/BILE/URINE/CSF – Intermediate gray
- SOFT TISSUE/BLOOD – Light gray - varied
- BONE/CALCIFICATION - White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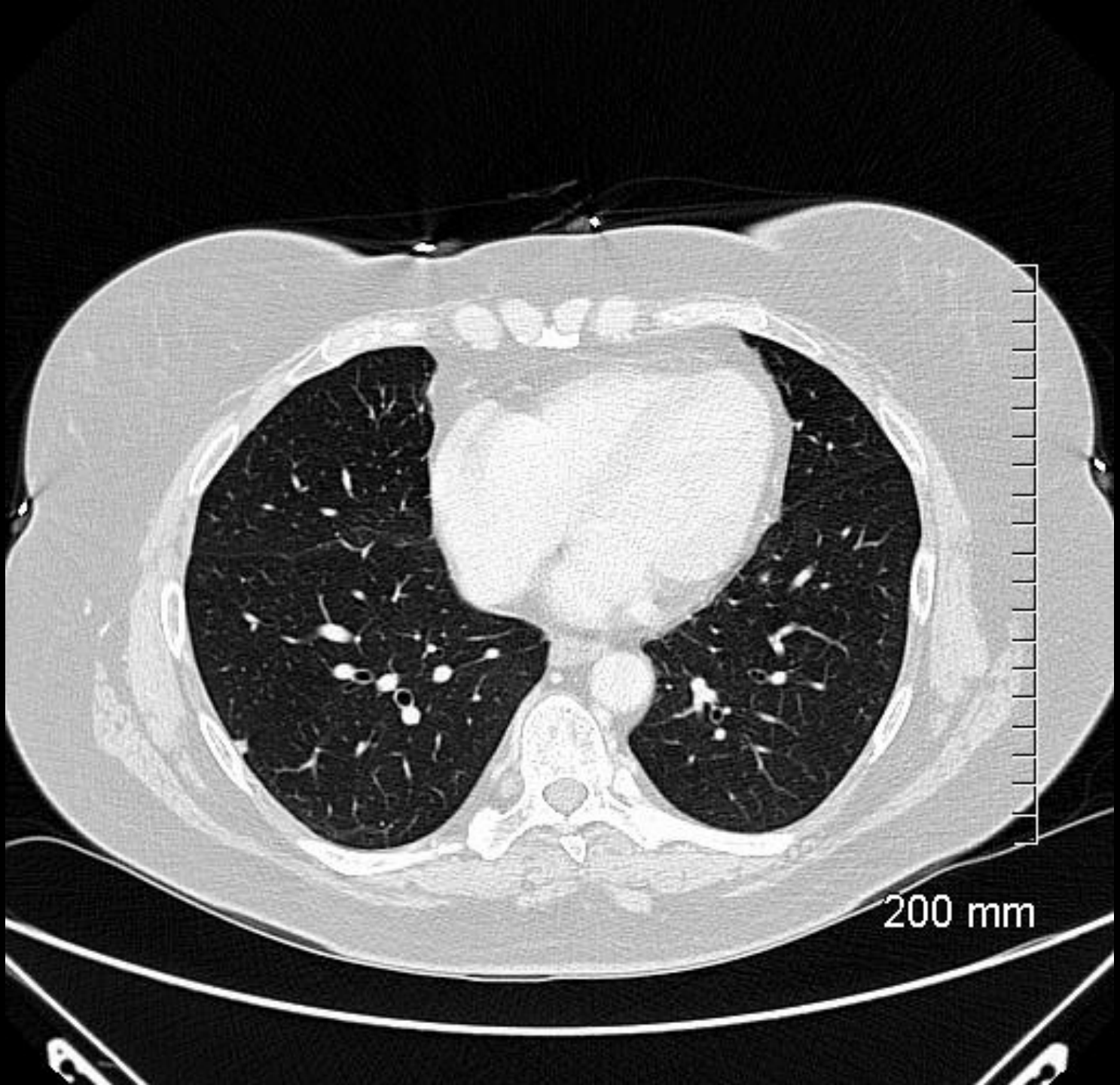
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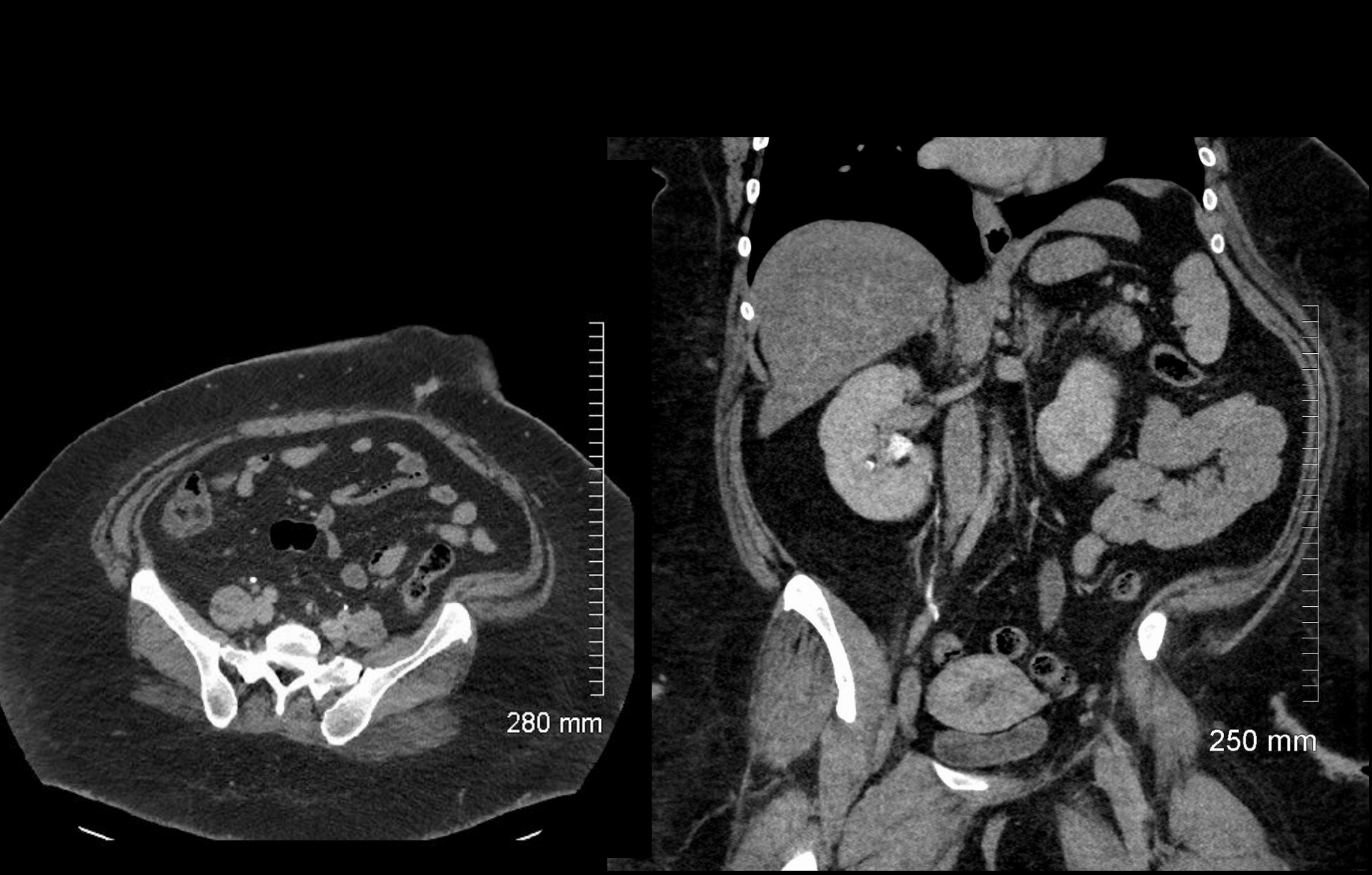
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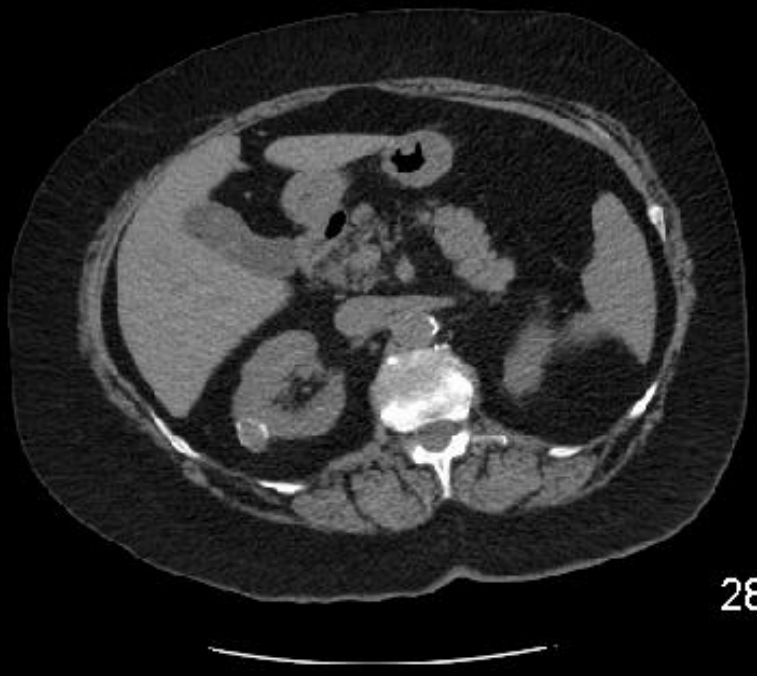
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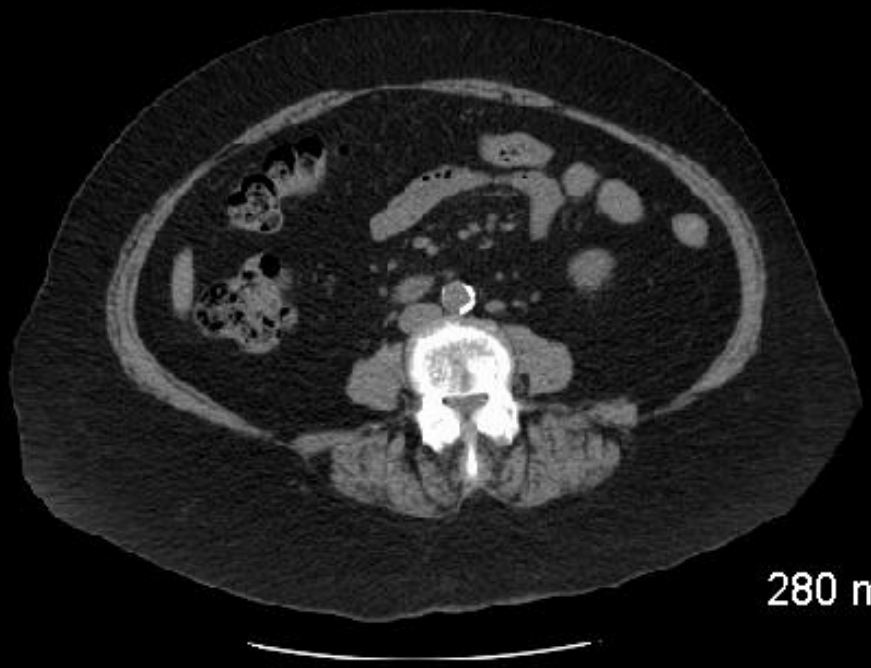
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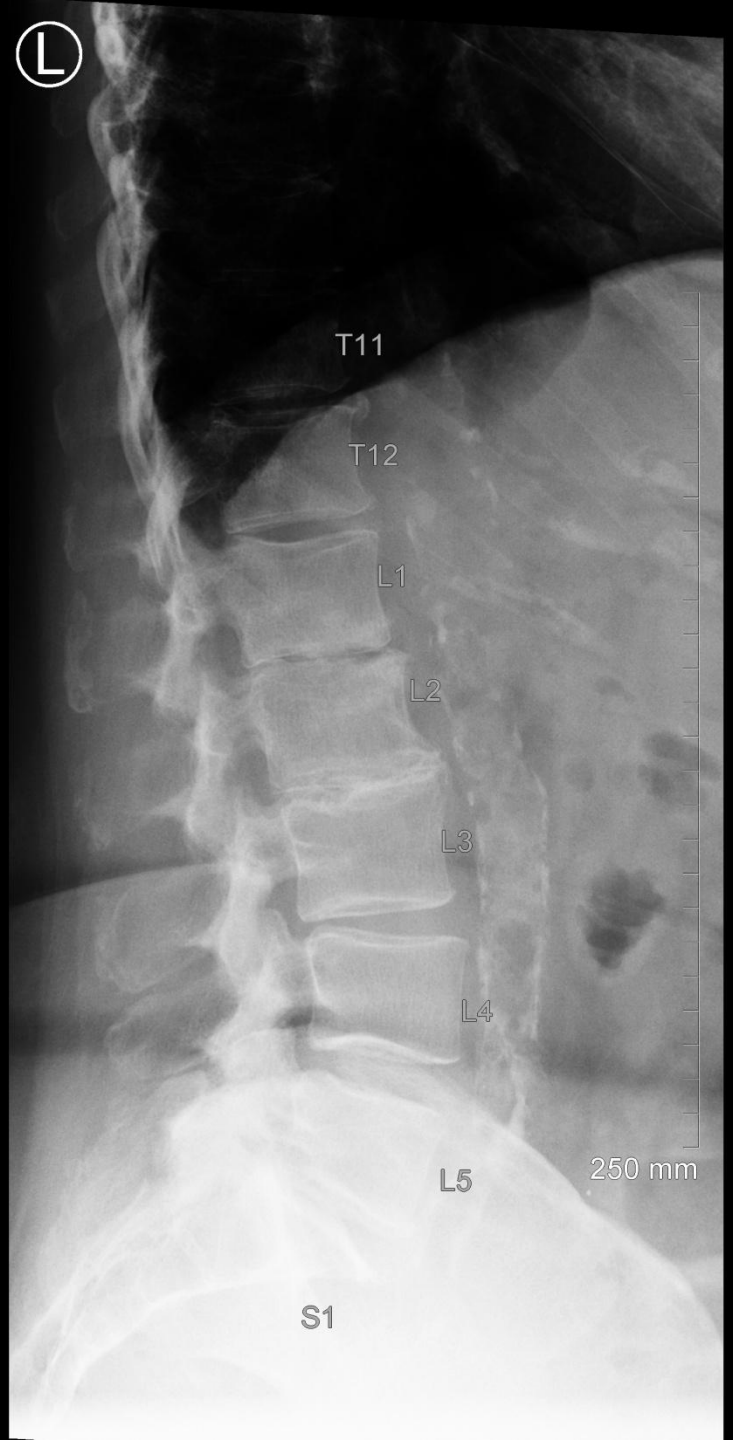
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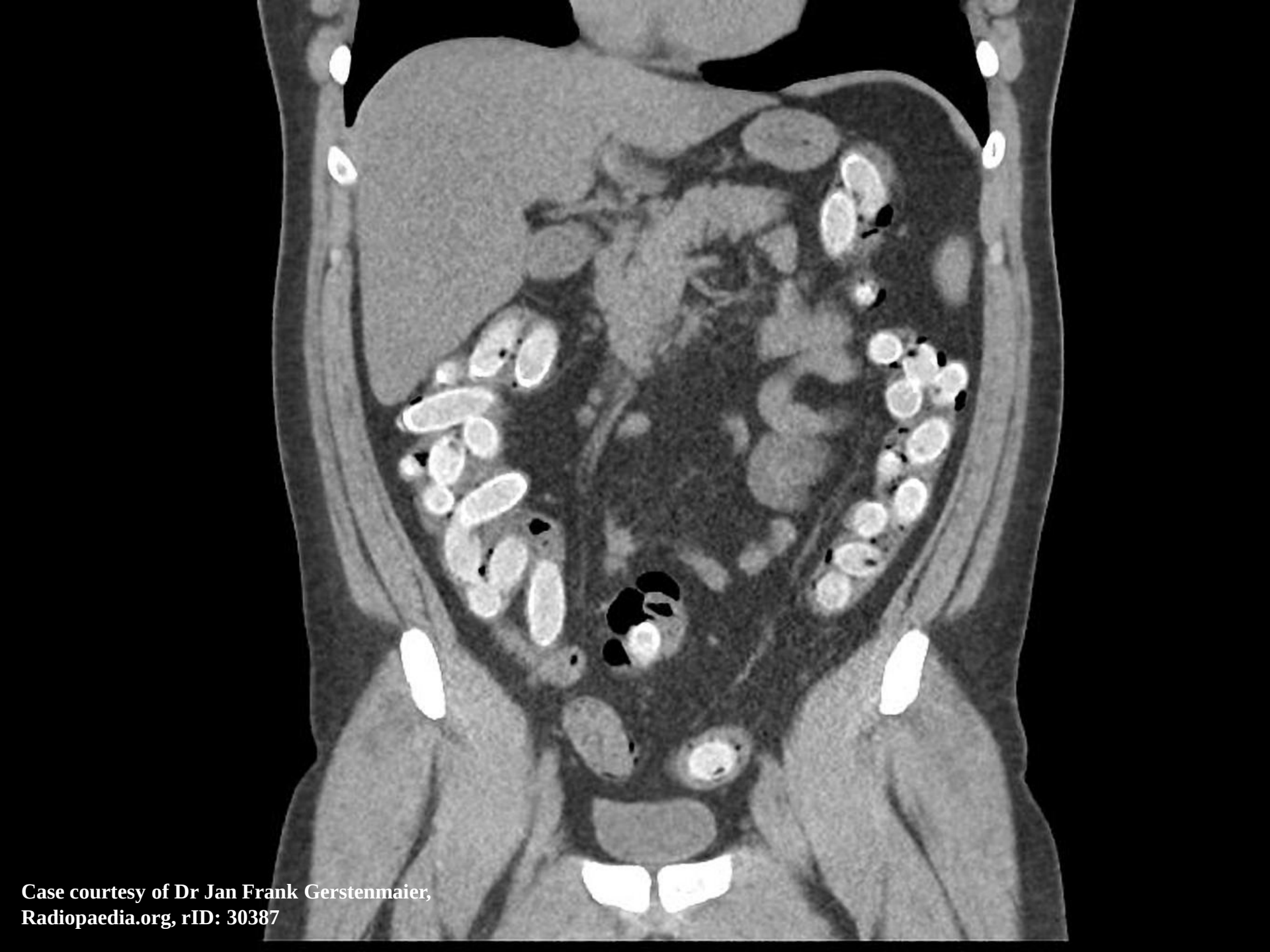
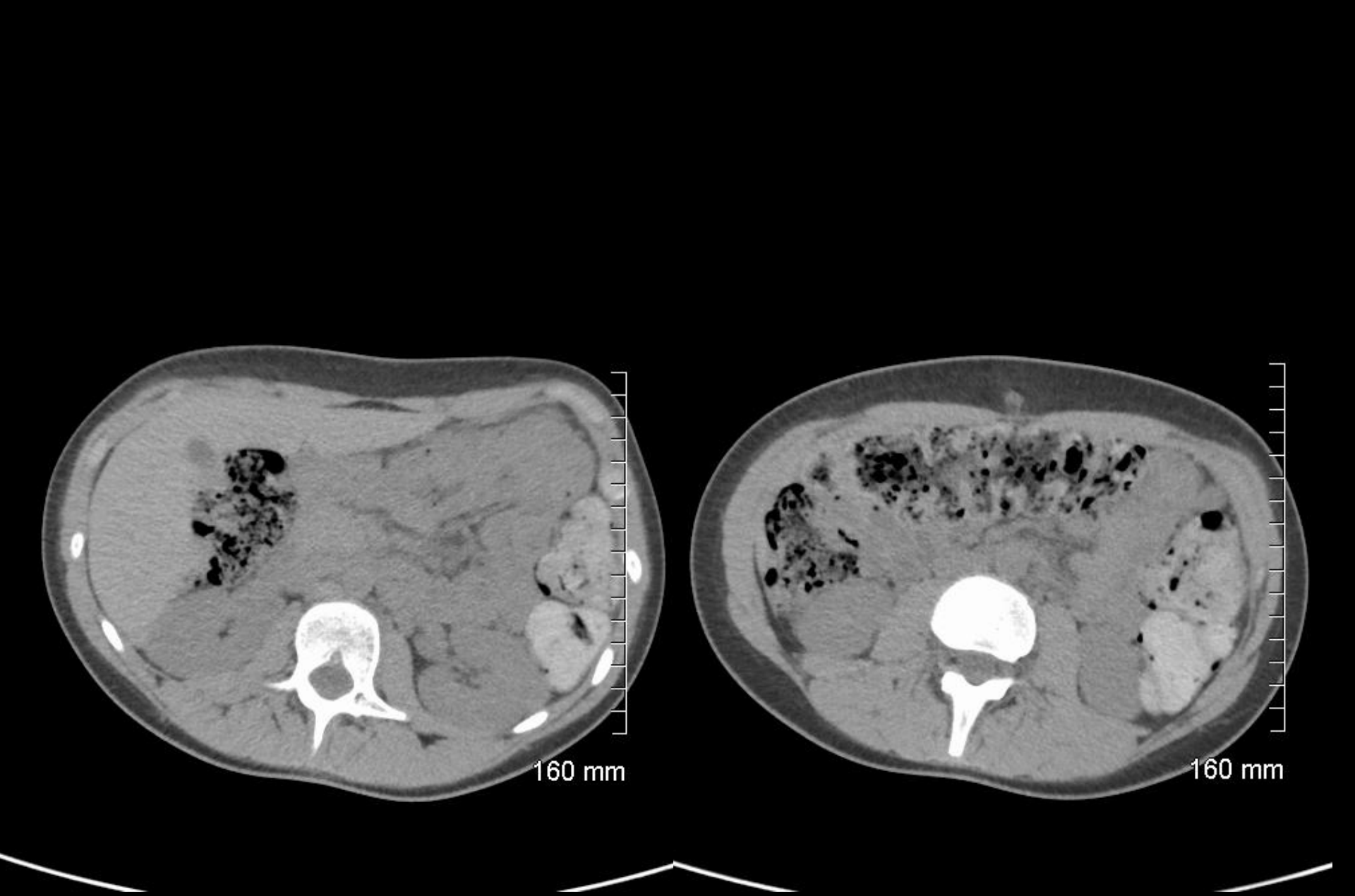


Case courtesy of Dr Jan Frank Gerstenmaier,
Radiopaedia.org, rID: 30387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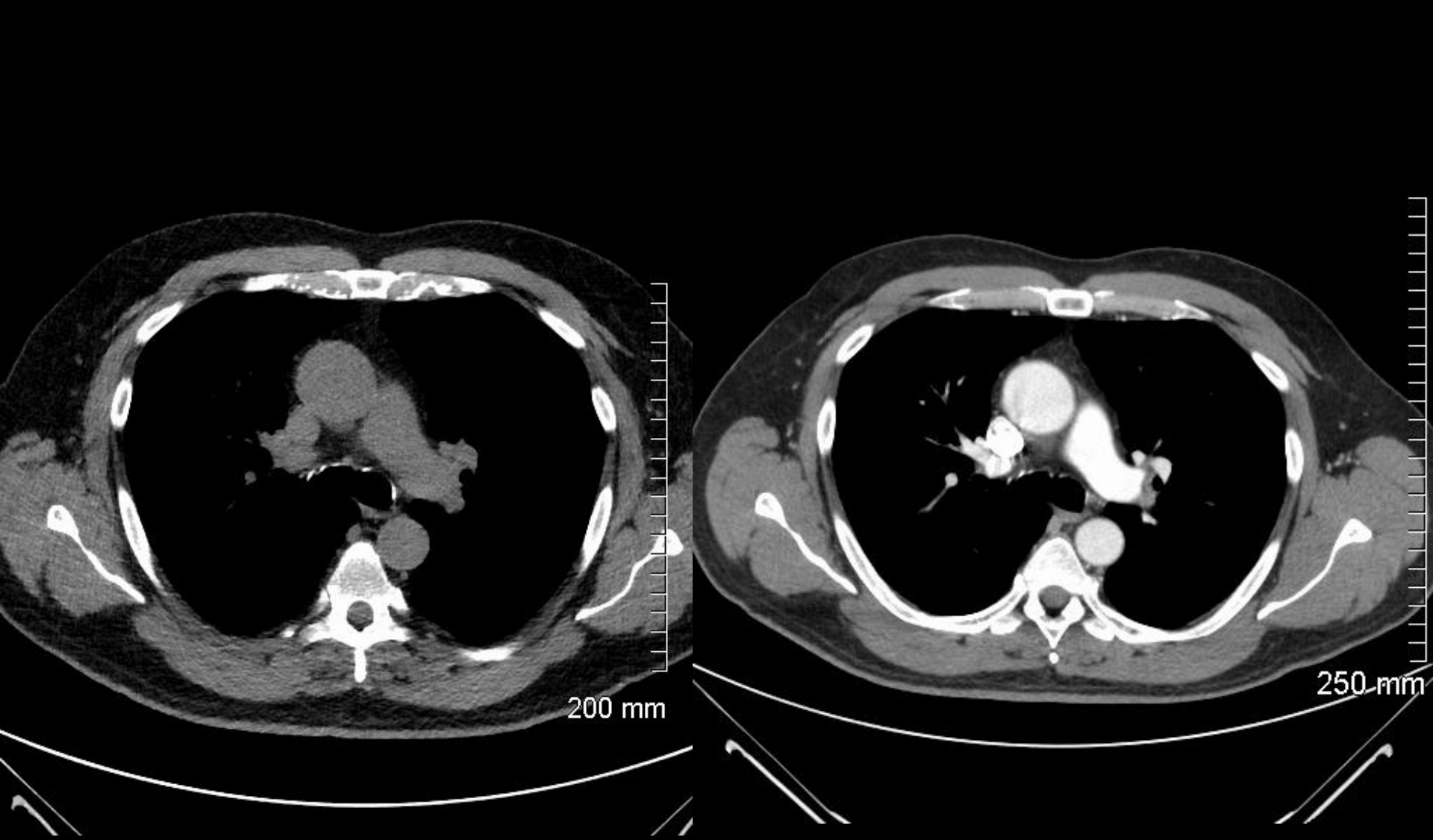
160 mm

CT
Add IV Contrast to:

- Improve contrast between normal soft tissue structures
- Differentiate blood vessels from adjacent structures
- Evaluate function
  - Renal excretion
  - Vascular flow
  - Parenchymal perfusion
- Identify/differentiate pathology
  - Tumor
  - Inflamation/infection
  - Abscess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CT IV Contrast

Low osmolarity, non-ionic, water soluble Iodinated contrast media (LOCM)

Two or three Iodine atoms, bound in a complex molecule

Either hypotonic or isotonic to serum

Versus older high osmolar and ionicformulations:

a complex molecule containing 2 or 3 Iodine atoms, loosely bound to Na+ or meglumine

CT
Add GI Contrast to:

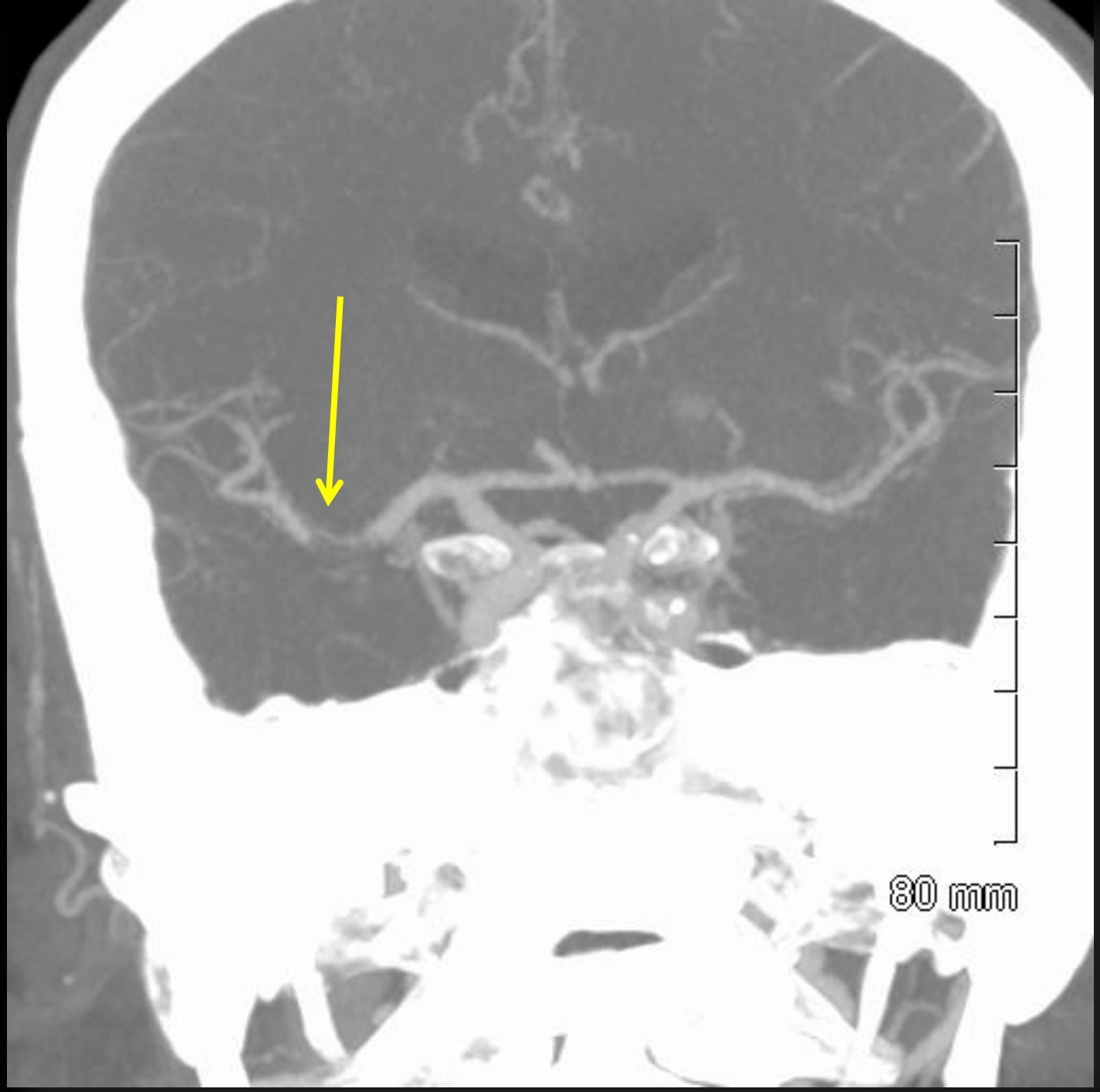
- Differentiate normal GI tract from adjacent structures
- Evaluate bowel obstruction
- **May** aide in detecting intraluminal or mural masses
- Identifying sites of perforation
- Evaluating anastamotic leaks

GI Contrast:

- Low, low density (dilute) Barium
- Water soluble iodinated contrast
- Milk
- Water (negative contrast)

When do we want IV contrast in CT?

- Head/Orbits/Spine
  - Follow up an abnormal C minus study
  - Clinical suspicion of tumor/infection
  - Need a C minus first, unless follow-up known pathology
- CTA (CT angiogram)
  - Differs from routine C plus exam
  - Higher injection rate (5mL/sec)
  - Thinner slices/volume acquisition
  - Allows for 2D and 3D volume rendering


80 mm

When do we want IV contrast in CT?

- Neck: most of the time
- Chest
  - Initial evaluation of abnormal CXR
  - Clinical suspicion of tumor/infection/inflammatory process
  - Trauma
- CTA
  - Pulmonary embolism
  - Aneurysm/dissection/stenosis/occlusion

When do we want IV contrast in CT?

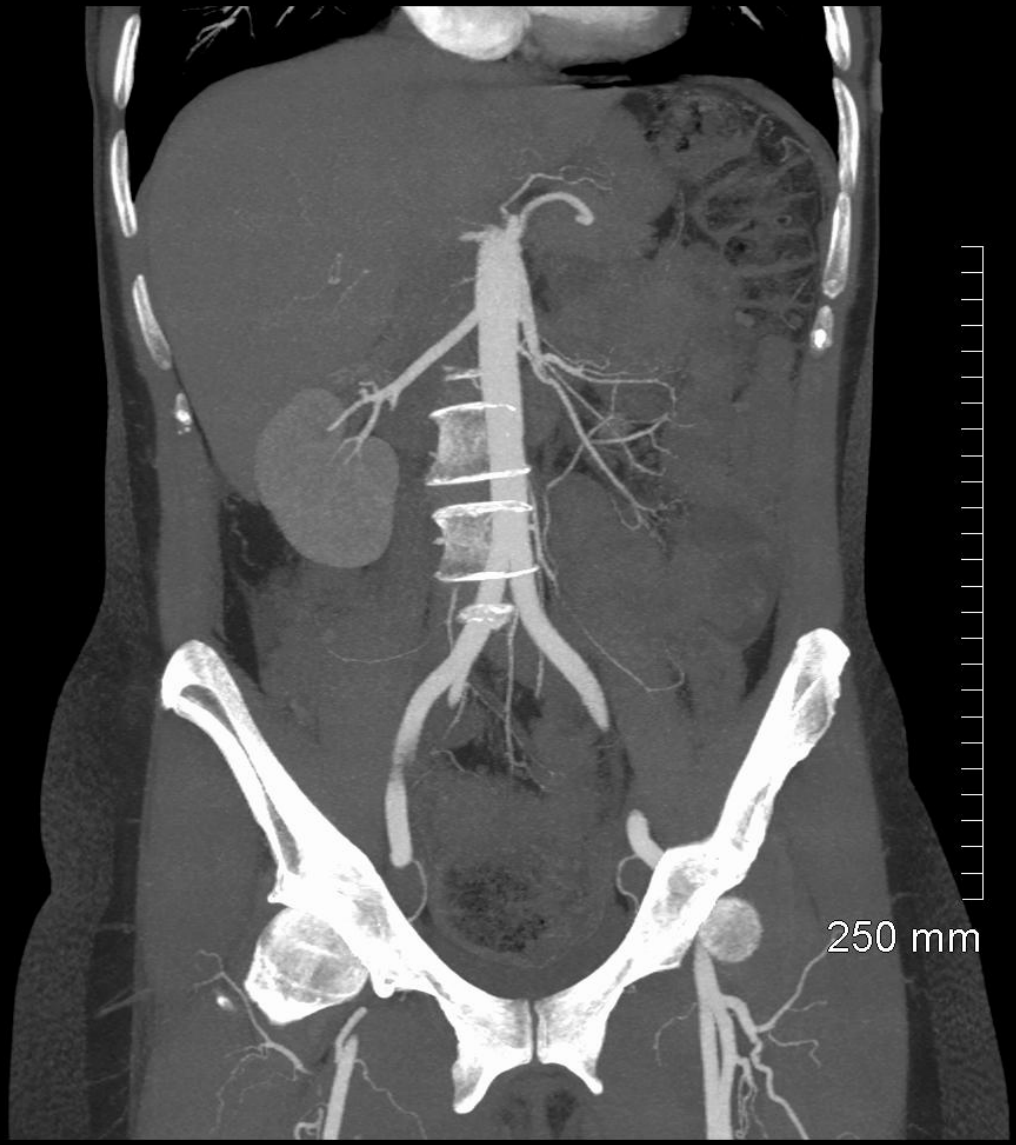
- Abdomen/Pelvis
  - Generalized or localized pain*
  - Trauma
  - FUO or suspicion of infection/inflammation (any “itis”)
  - GI/GU Bleeding*
  - Tumor
  - Cirrhosis/ascites
  - Suspected bowel obstruction/ischemia
  - Renal function/excretion/obstruction
  - Aneurysm/dissection/leak/rupture - stenosis/occlusion (CTA+/-)

* May want C minus first or instead

When do we want IV contrast in CT?

- Other:
  - Soft tissue tumor anywhere
  - Peripheral inflammation/infection/abscess
  - Bone tumor - sometimes

Timing of contrast administration can be important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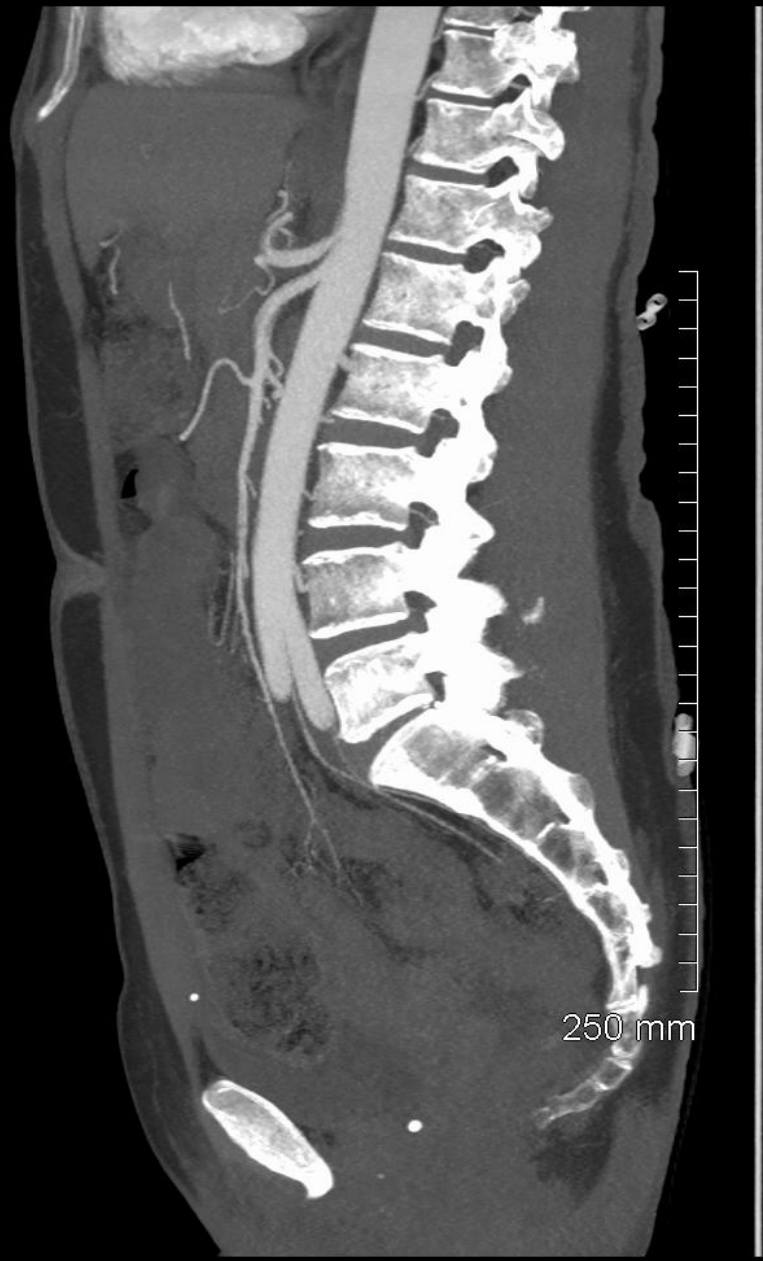
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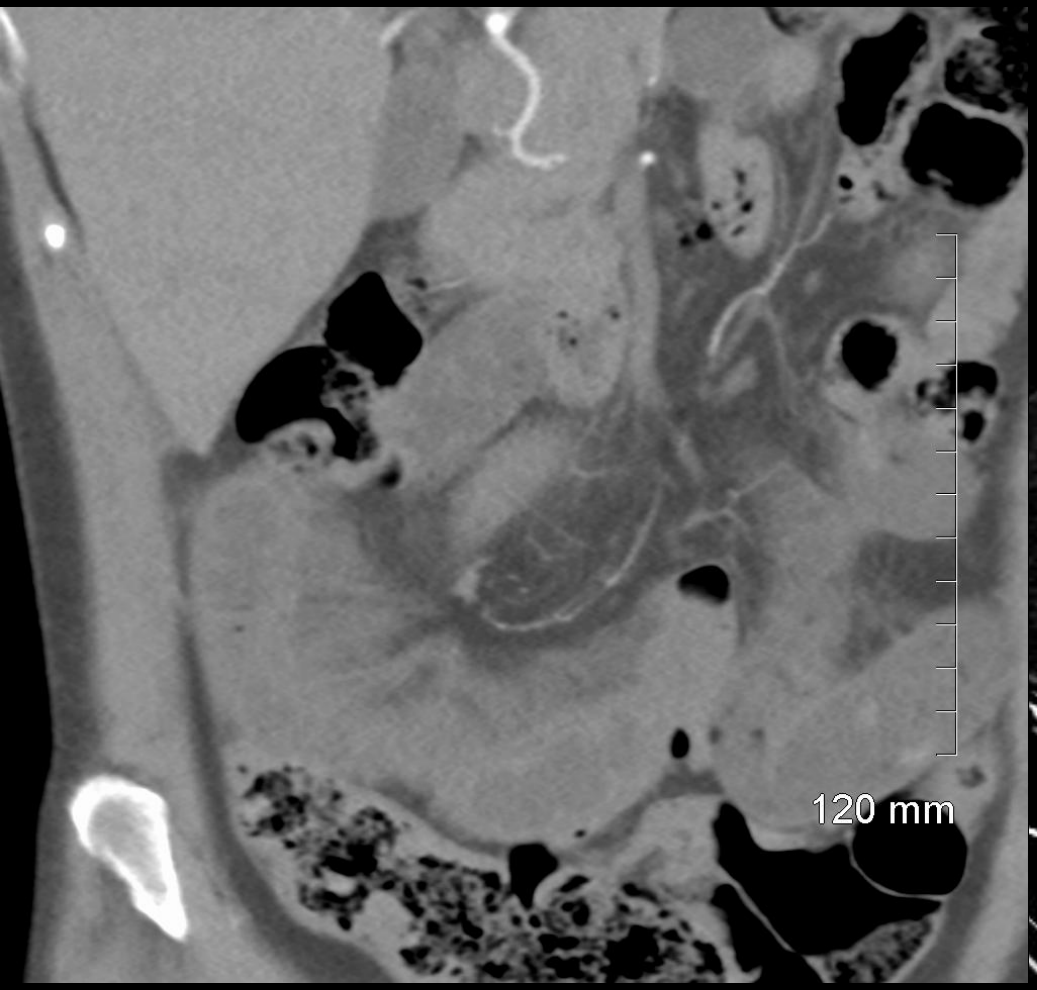
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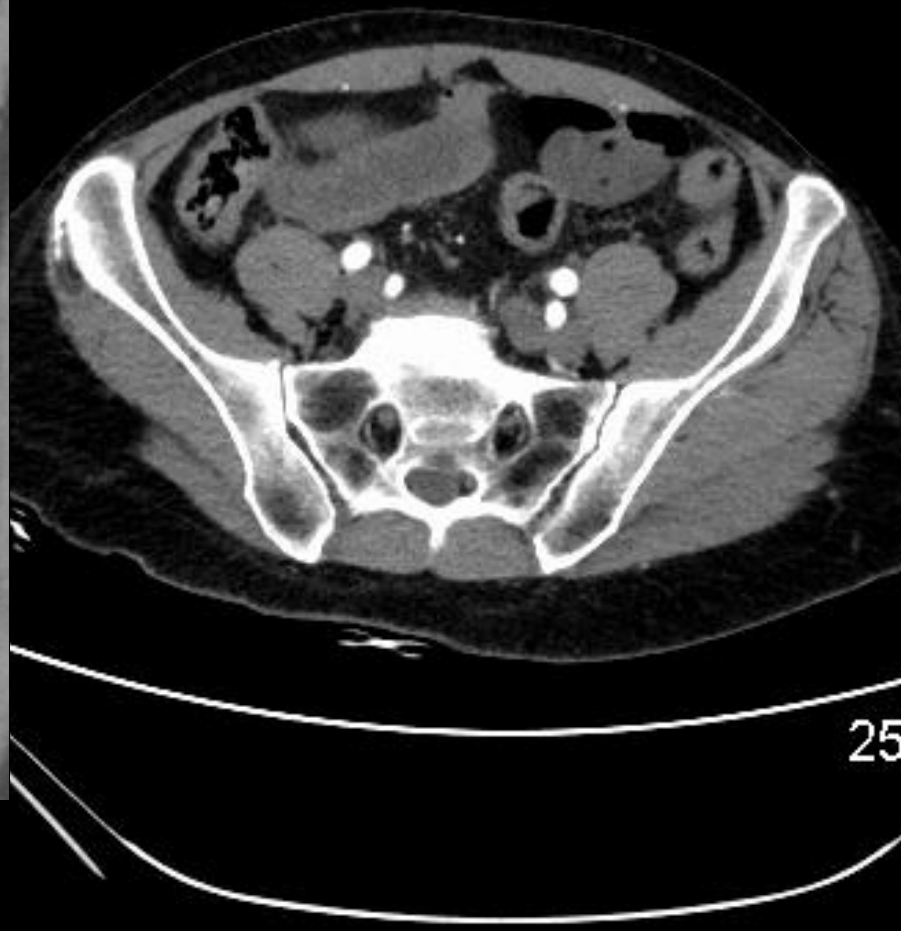
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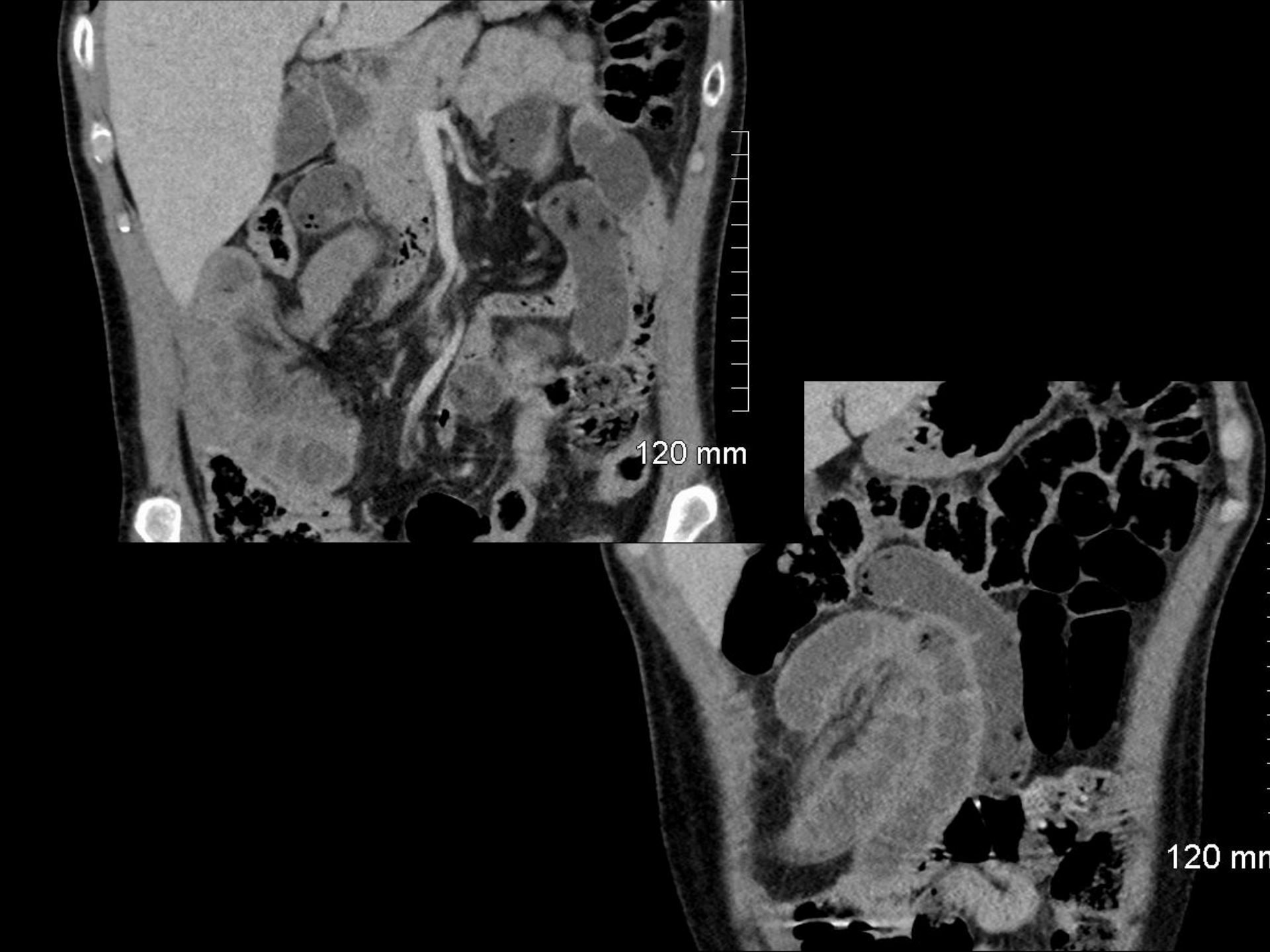
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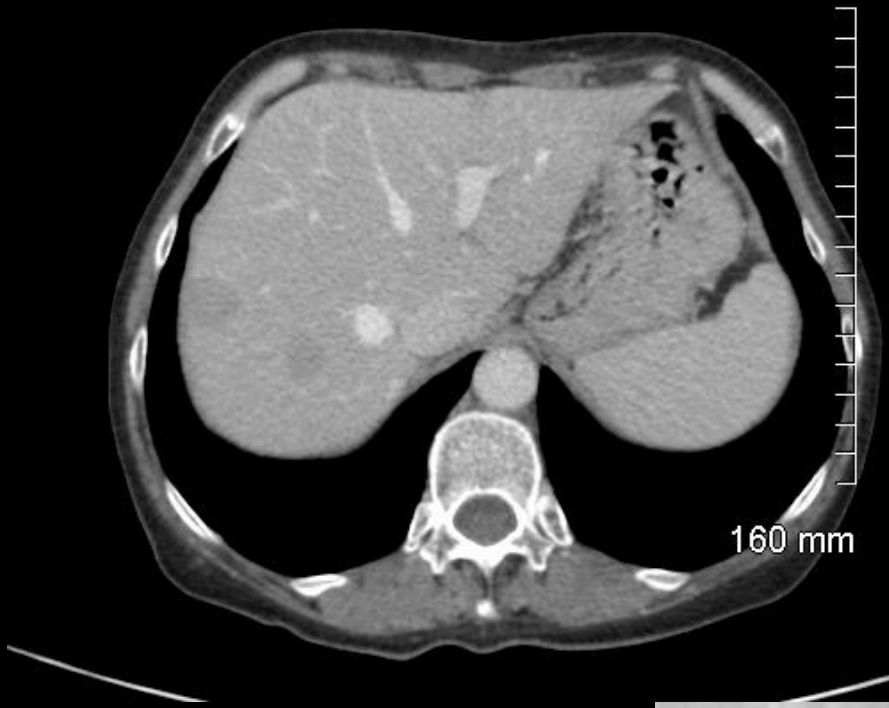
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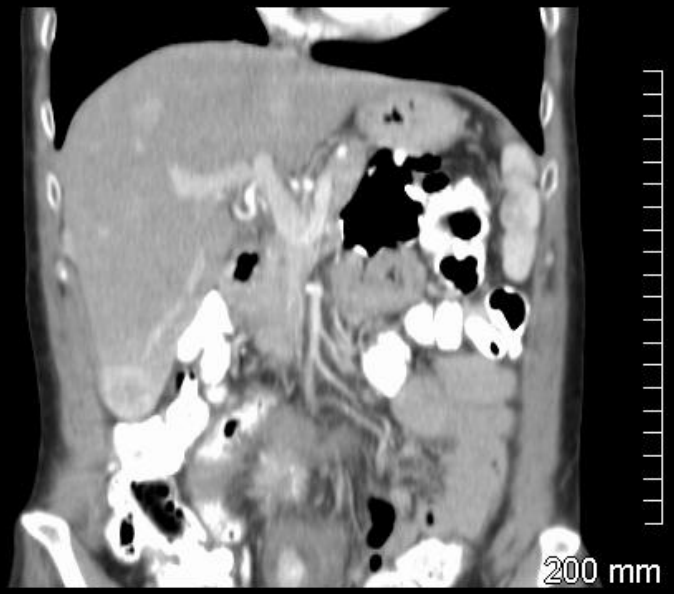
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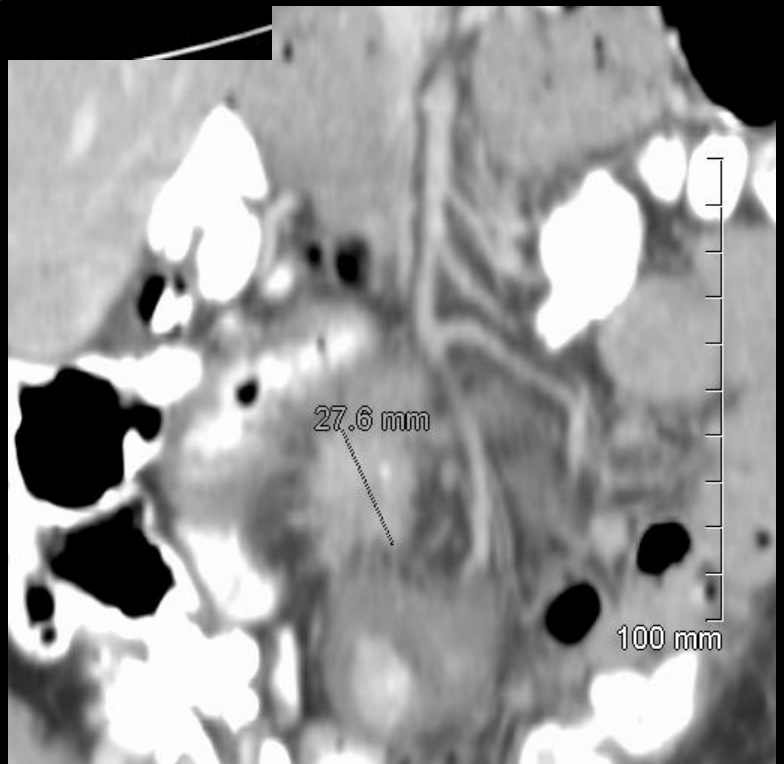
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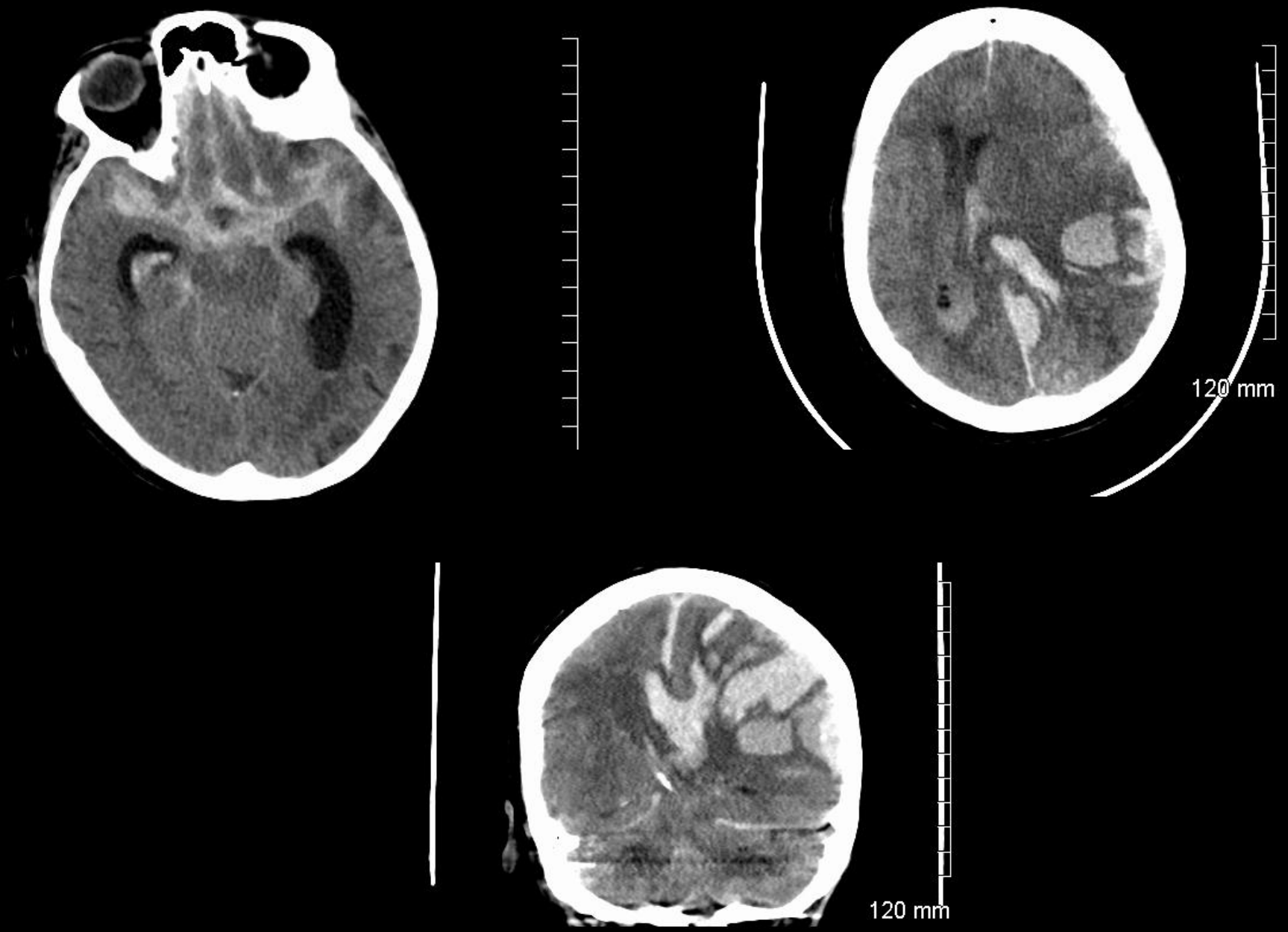
When do we NOT want IV contrast in CT?

- Head
  - Acute stroke
  - Most headache (especially acute/worsening)
  - Trauma
  - Initial work-up for most CNS pathology
    - tumor/infection/inflammation

- Abdomen and pelvis
  - Suspected renal/ureter/bladder stone
  - No GI contrast either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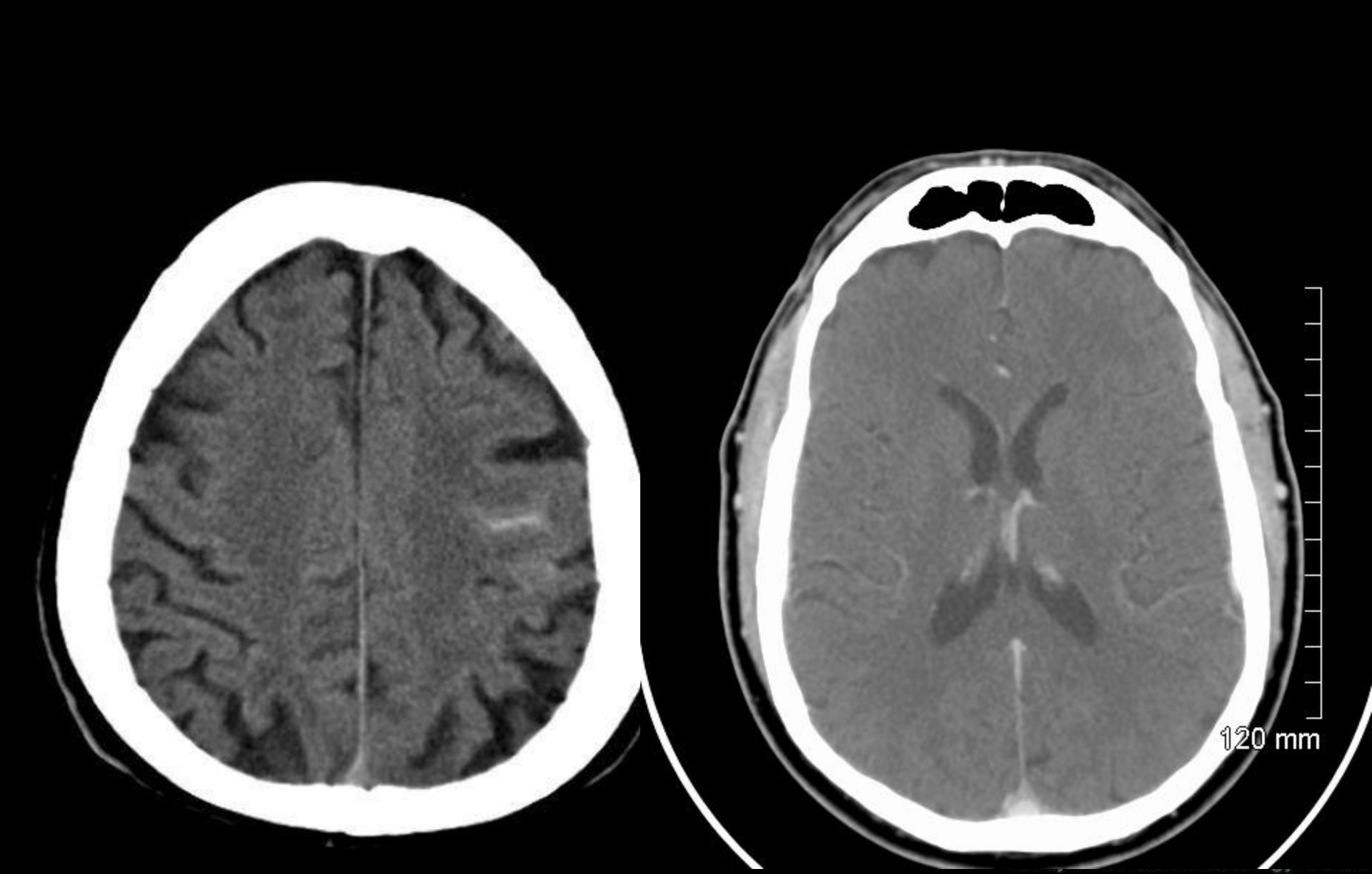
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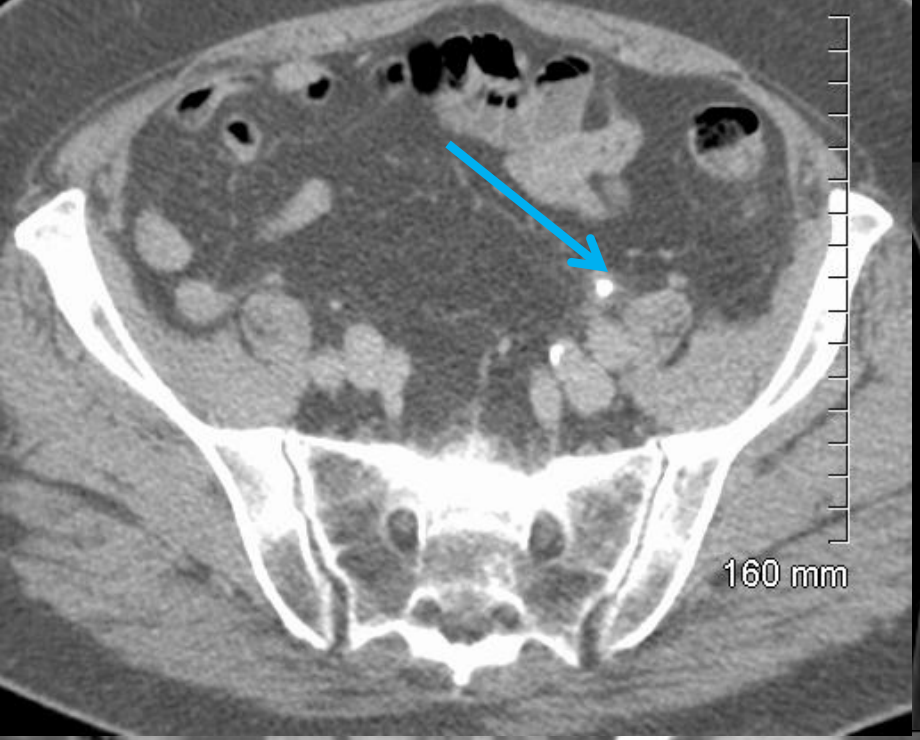
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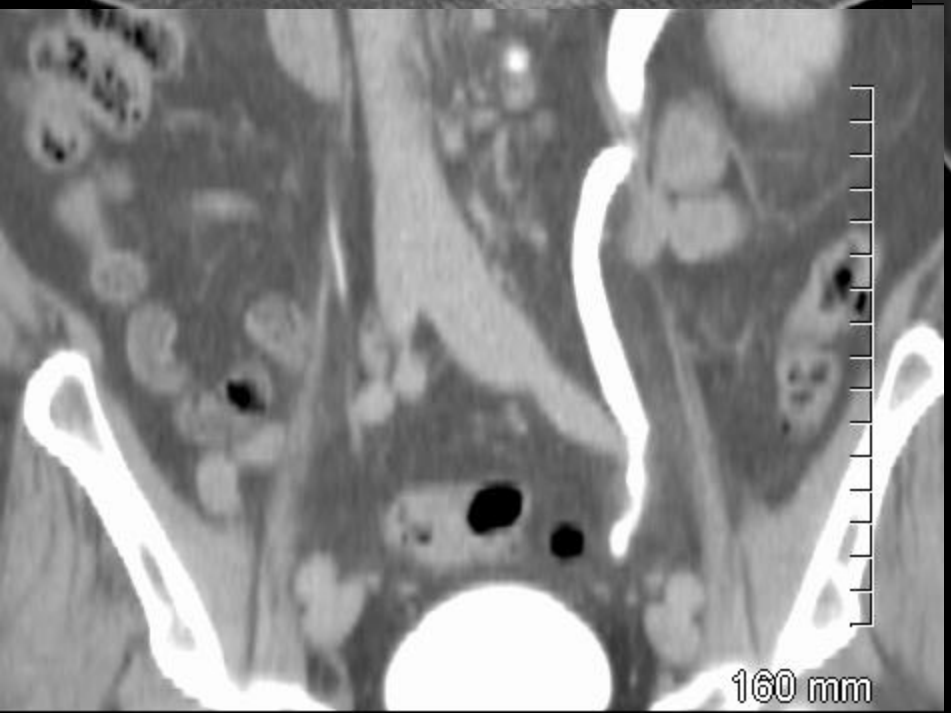
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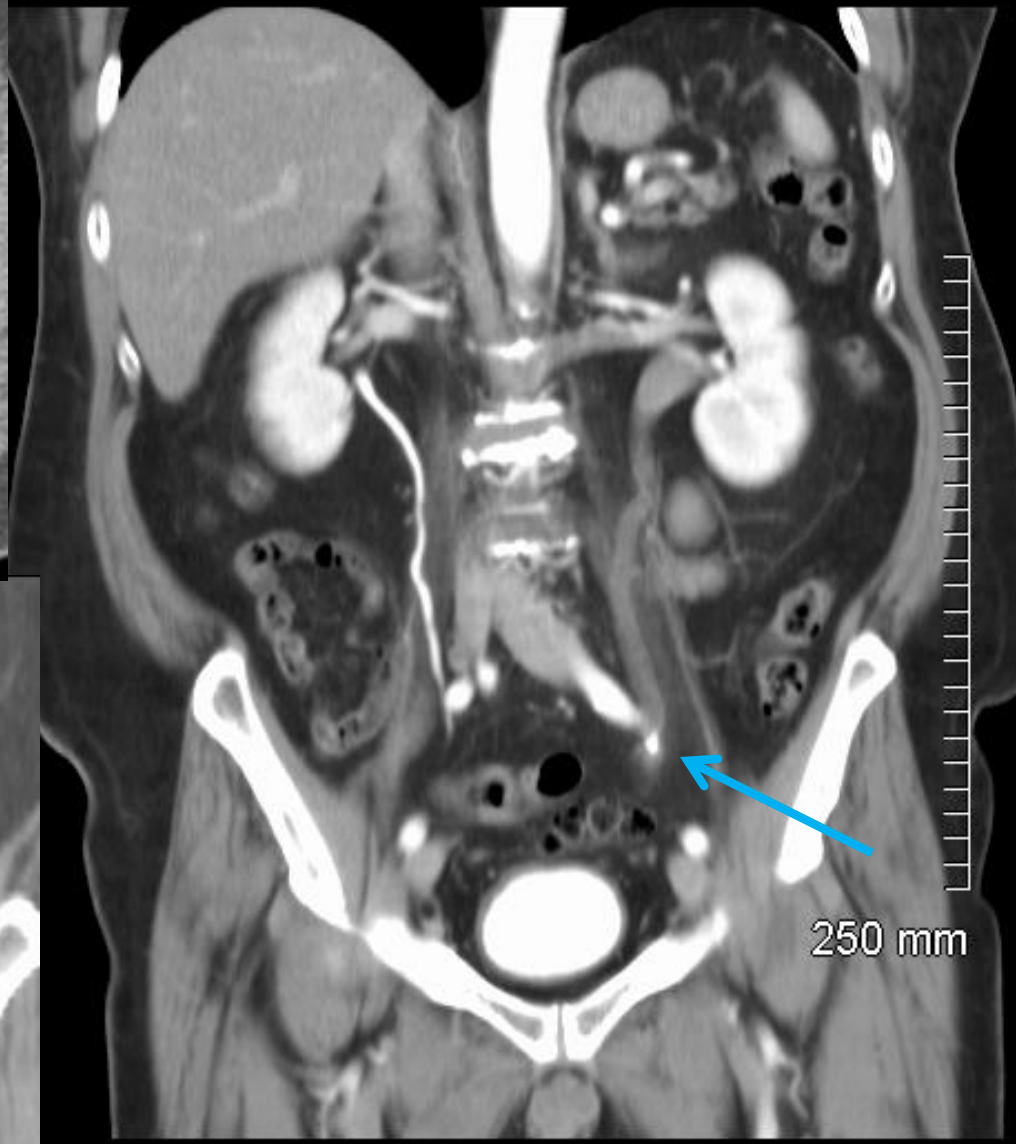
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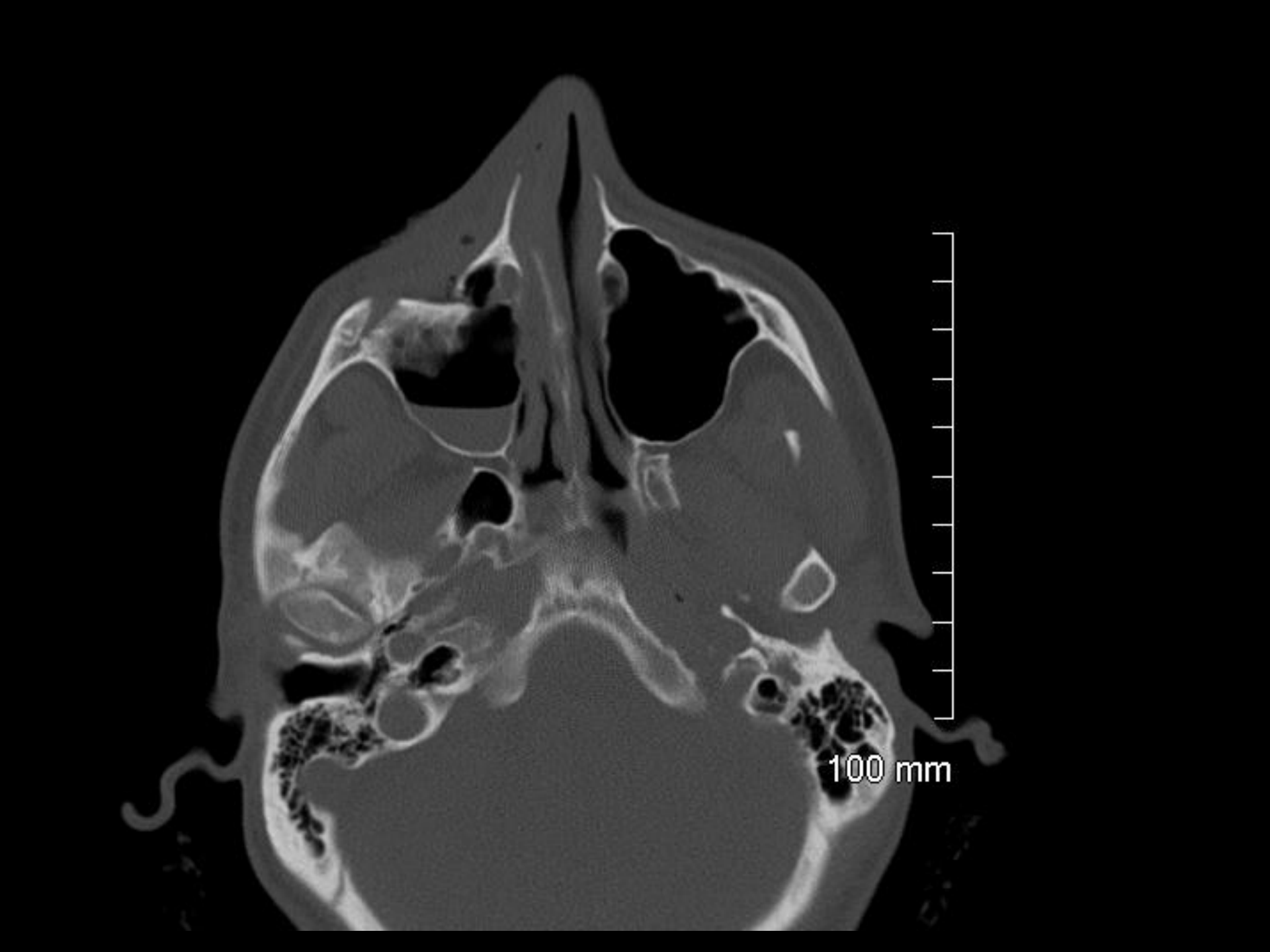
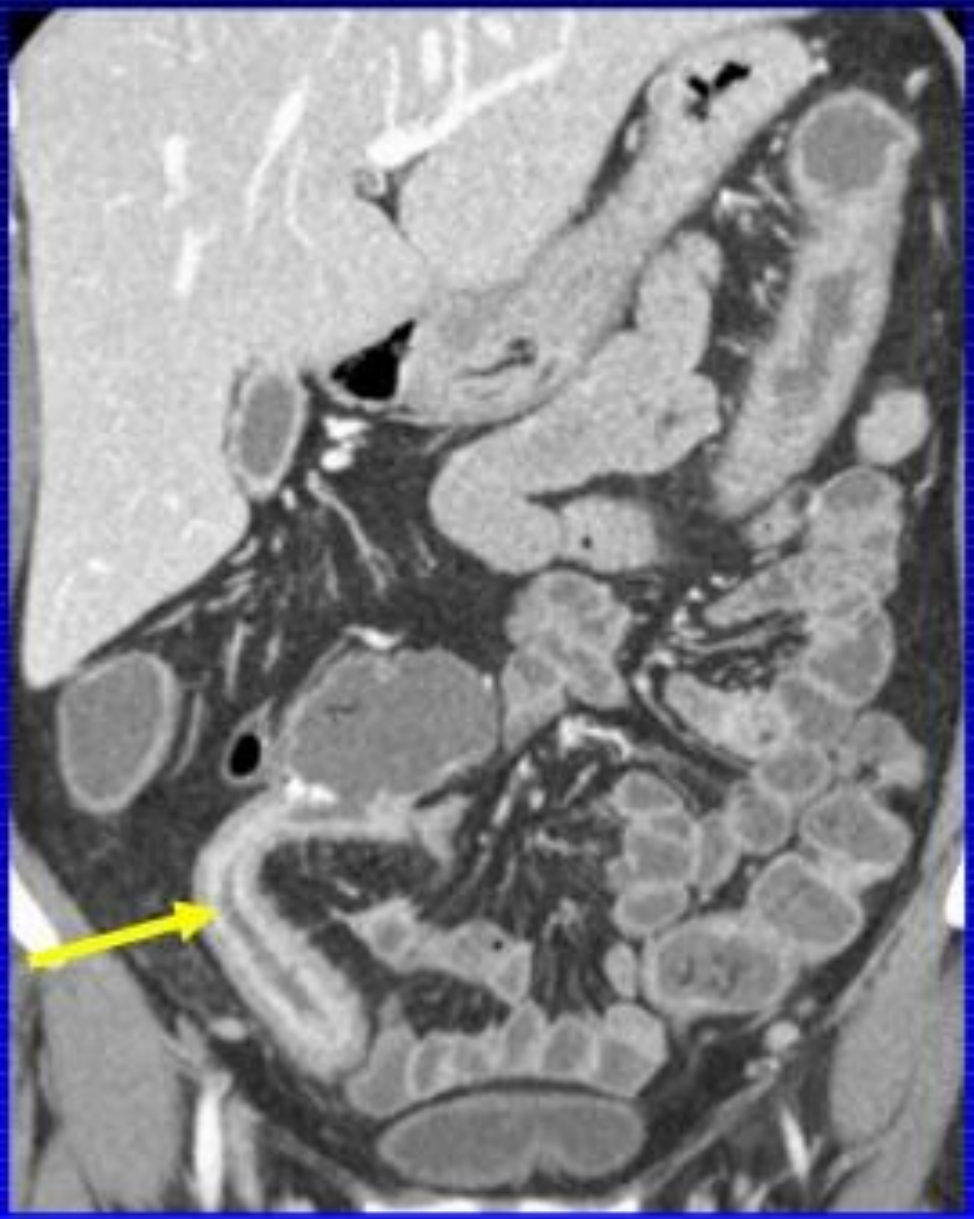
When do we not NEED IV contrast in CT?

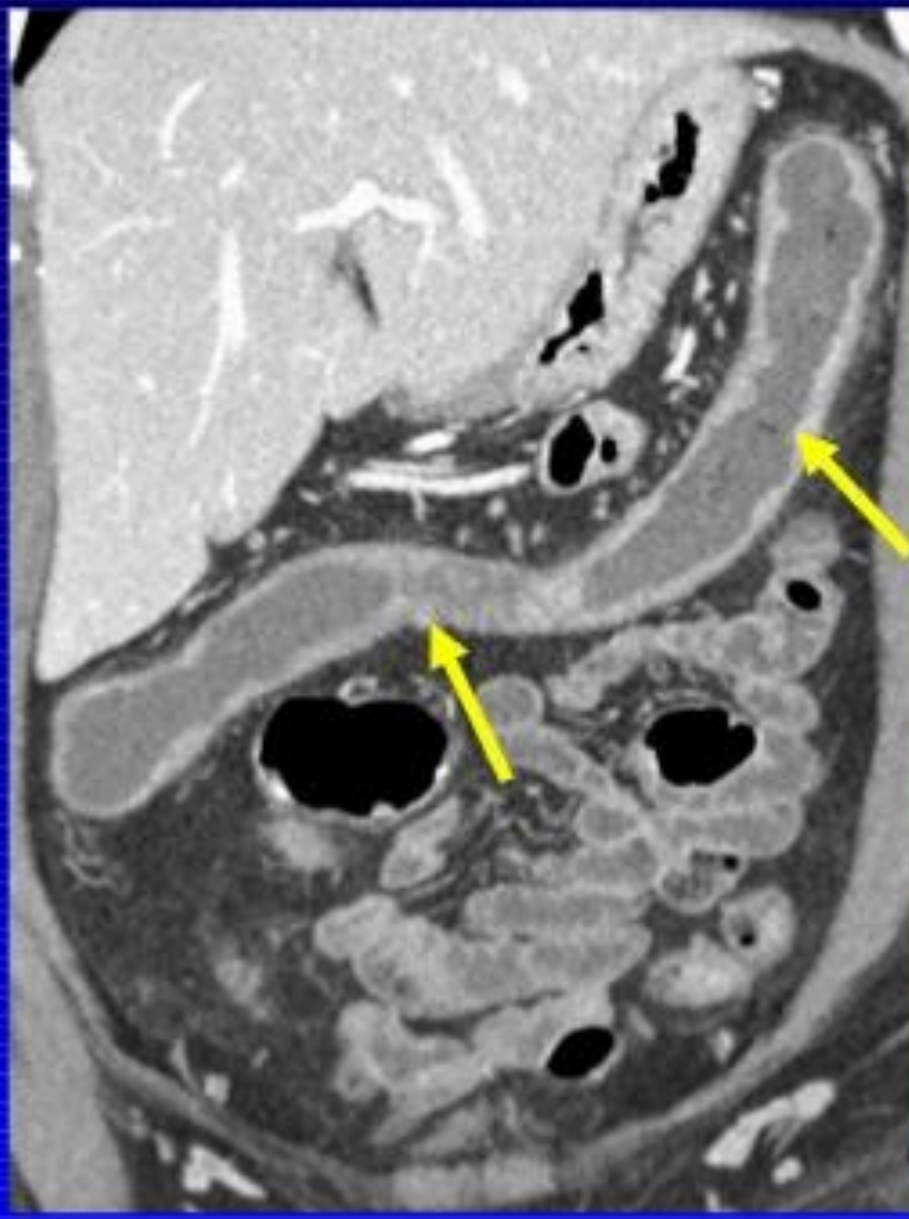
- Head/Face/Orbits
  - Trauma
  - Routine sinus disease
  - Temporal bone study
- Spine
  - Trauma
  - Stenosis/disc disease/radiculopathy
- Chest
  - Following nodules
  - High resolution for interstistial lung disease
- Extremity trauma
- Abdomen
  - Follow up bowel obstruction
  - Hernia/dehiscence/mesh graft integrity


100 mm

When do we NOT want GI contrast in CT?

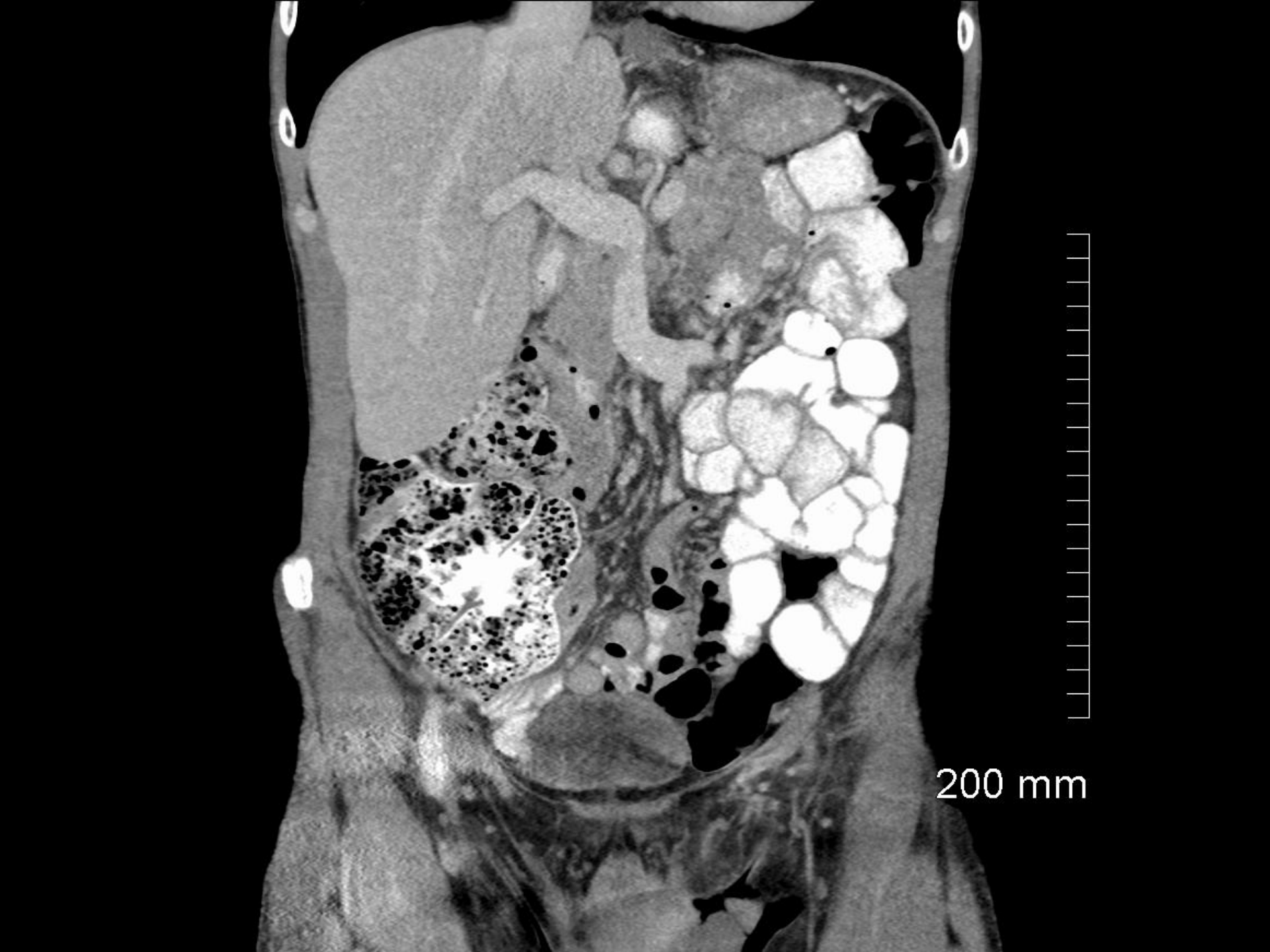
- “Stone Study”
- CT Urogram
- CTA
- CT Enterography
  - Inflammatory bowel disease
  - Acute GI bleed
- Clinically high grade bowel obstruction





When do we not *need* to give GI contrast in CT?

- ER
  - BMI > 25
  - Trauma
  - Vomiting or otherwise intolerant*
- Routine
  - Hernia evaluation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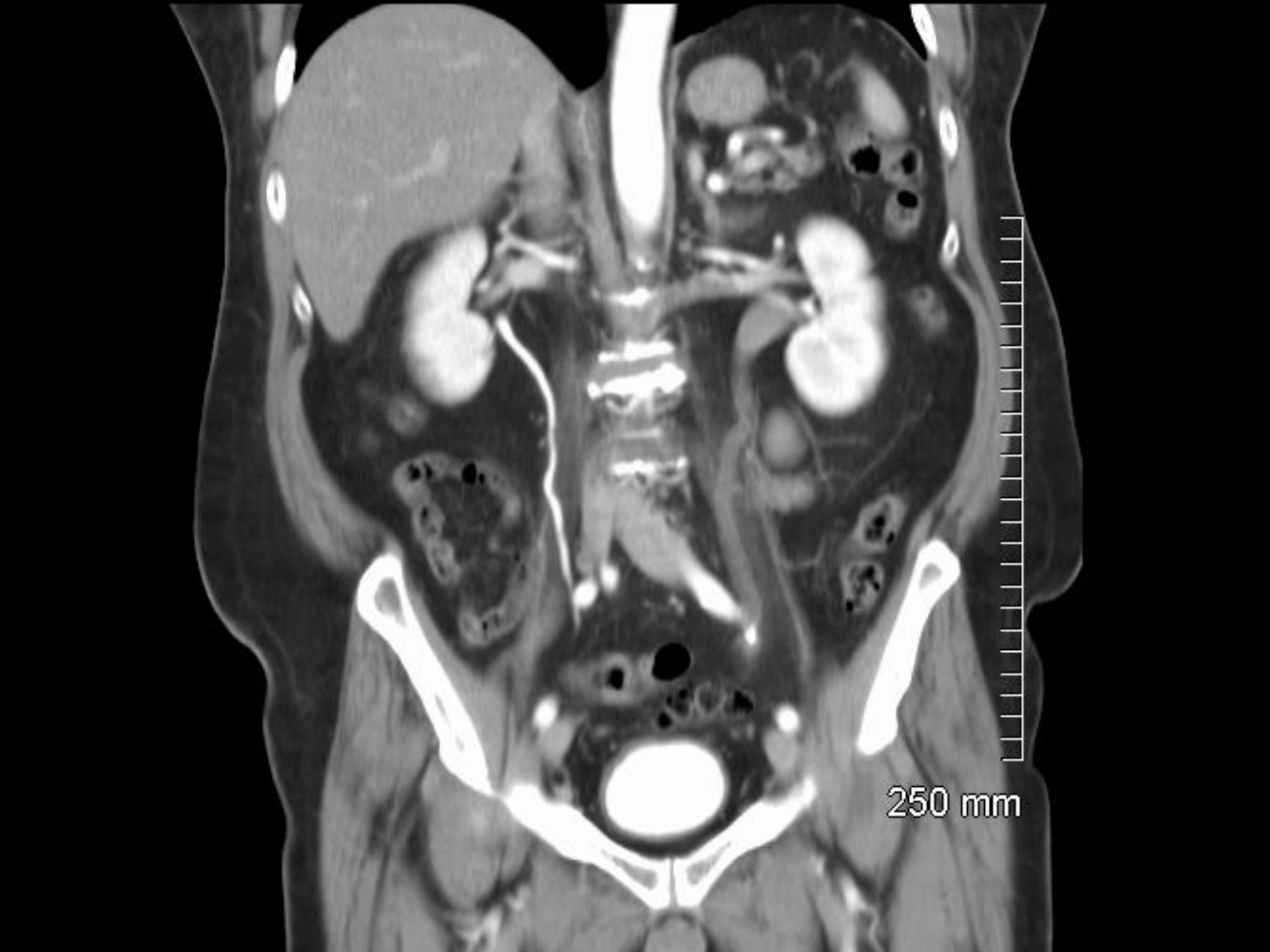
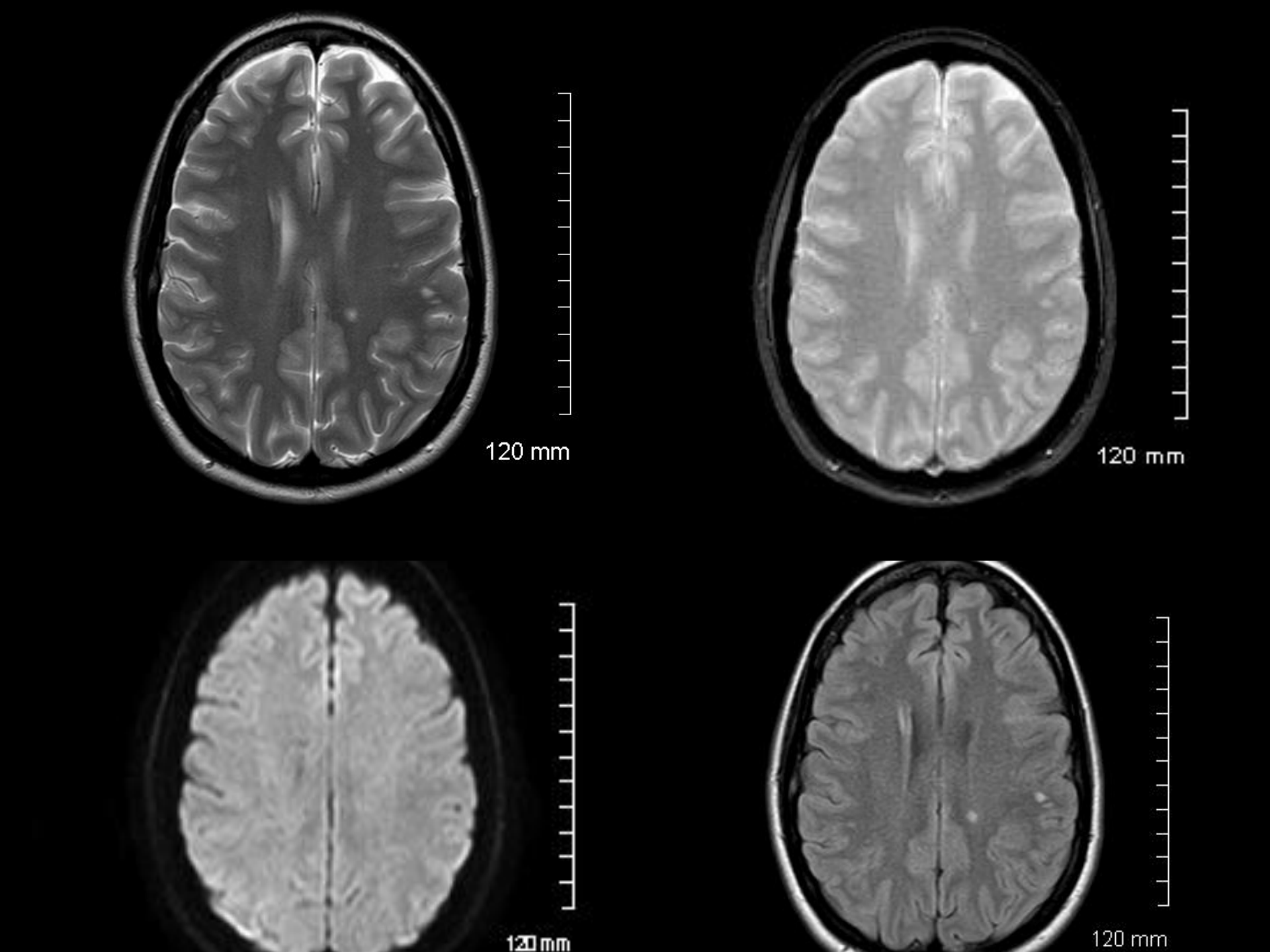

250 mm

MRI
Add Gadolinium Contrast to:

- Assess perfusion
- Identify/differentiate pathology
- Tumor
- Infection/inflammation
- Abscess
- Vascular flow – less often than CT
- Differentiate scar from disc herniation
- NOT needed for differentiation of normal structures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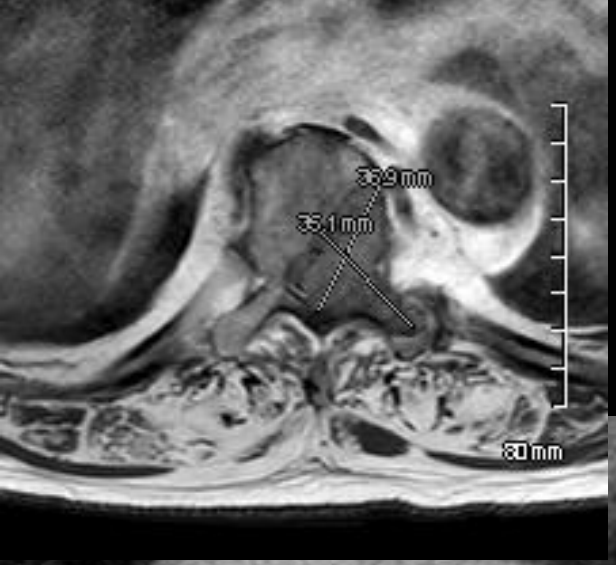

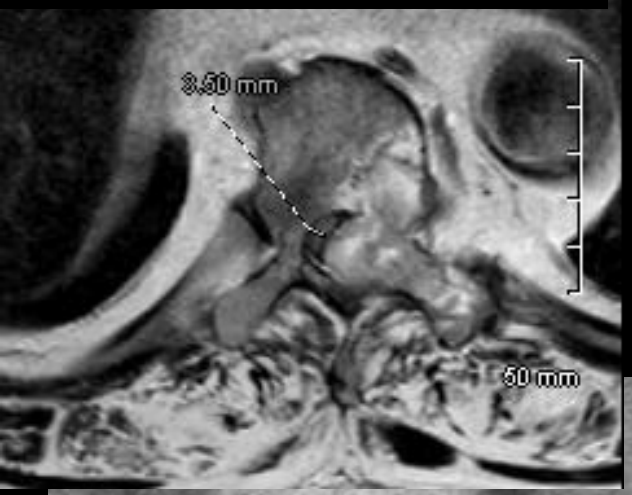

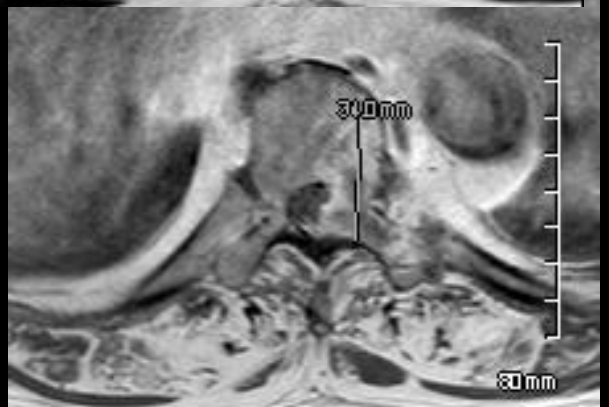

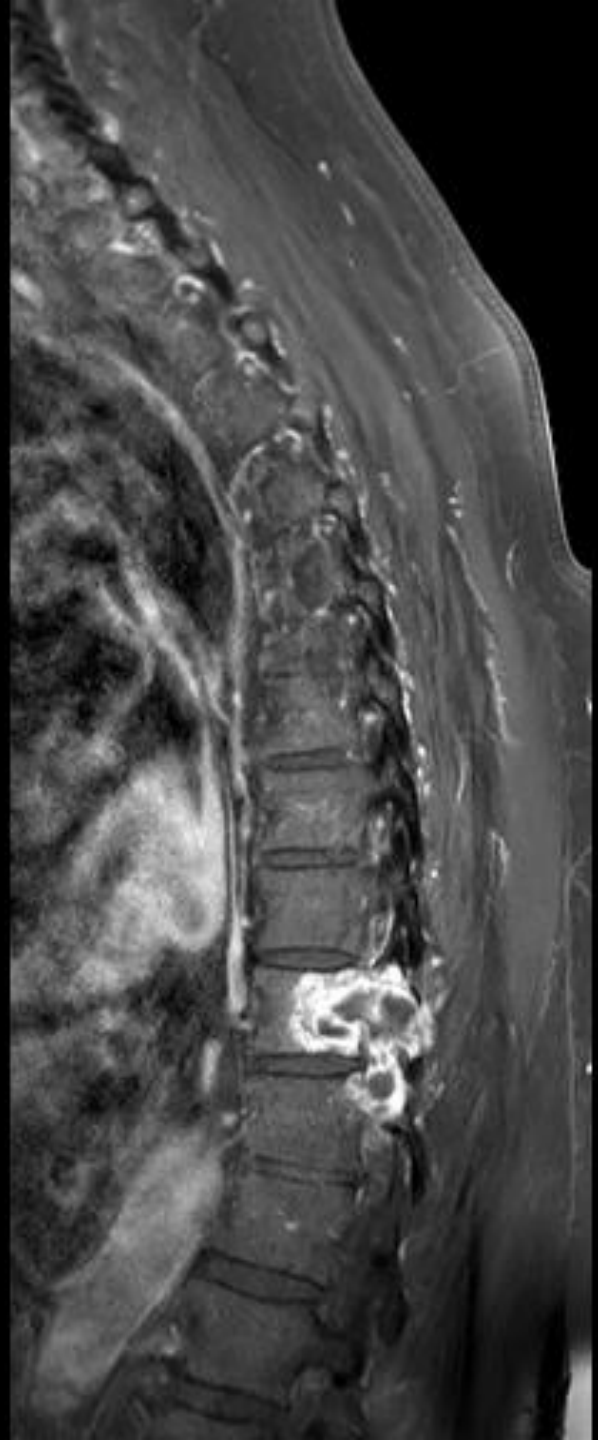

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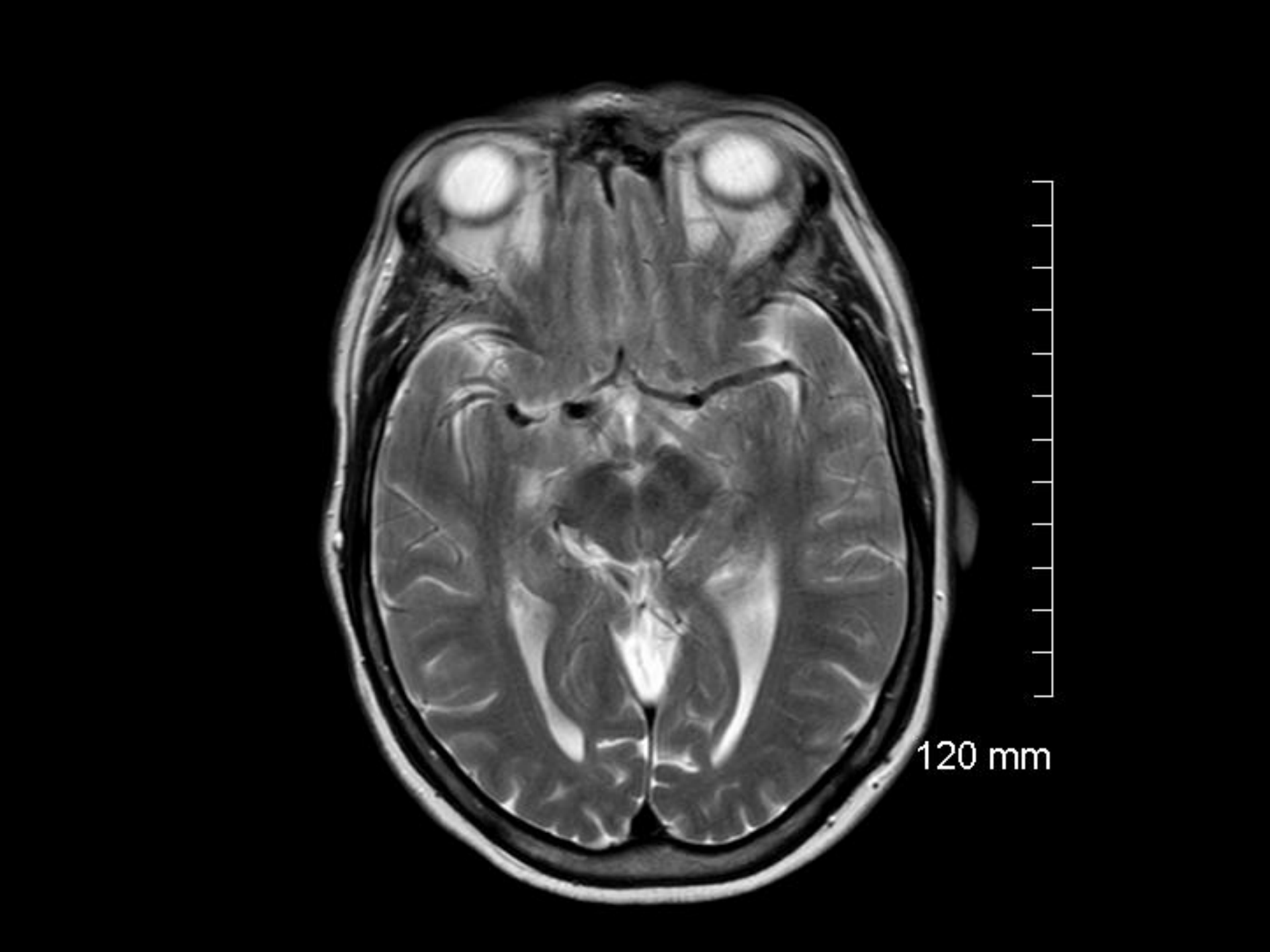
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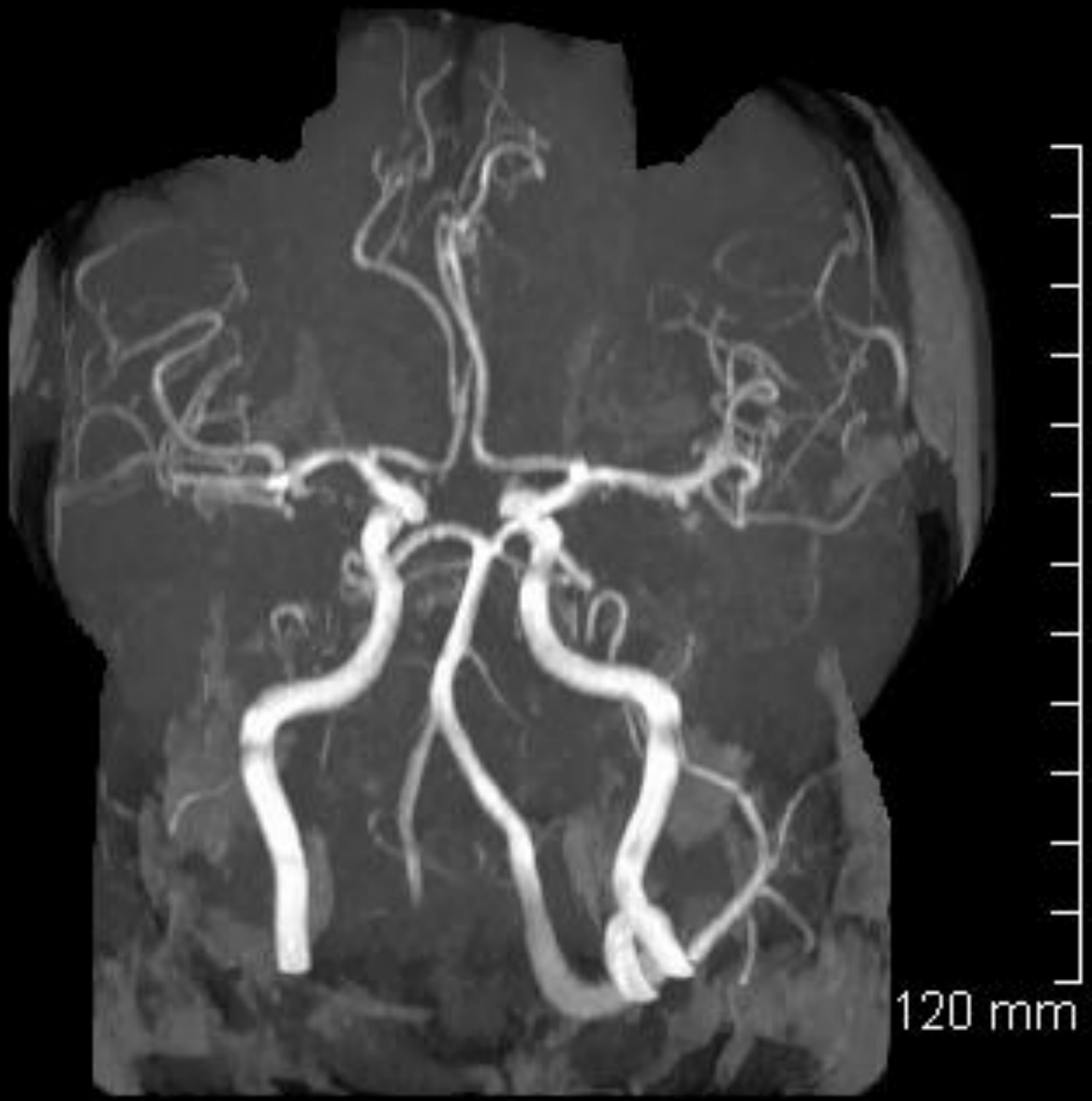
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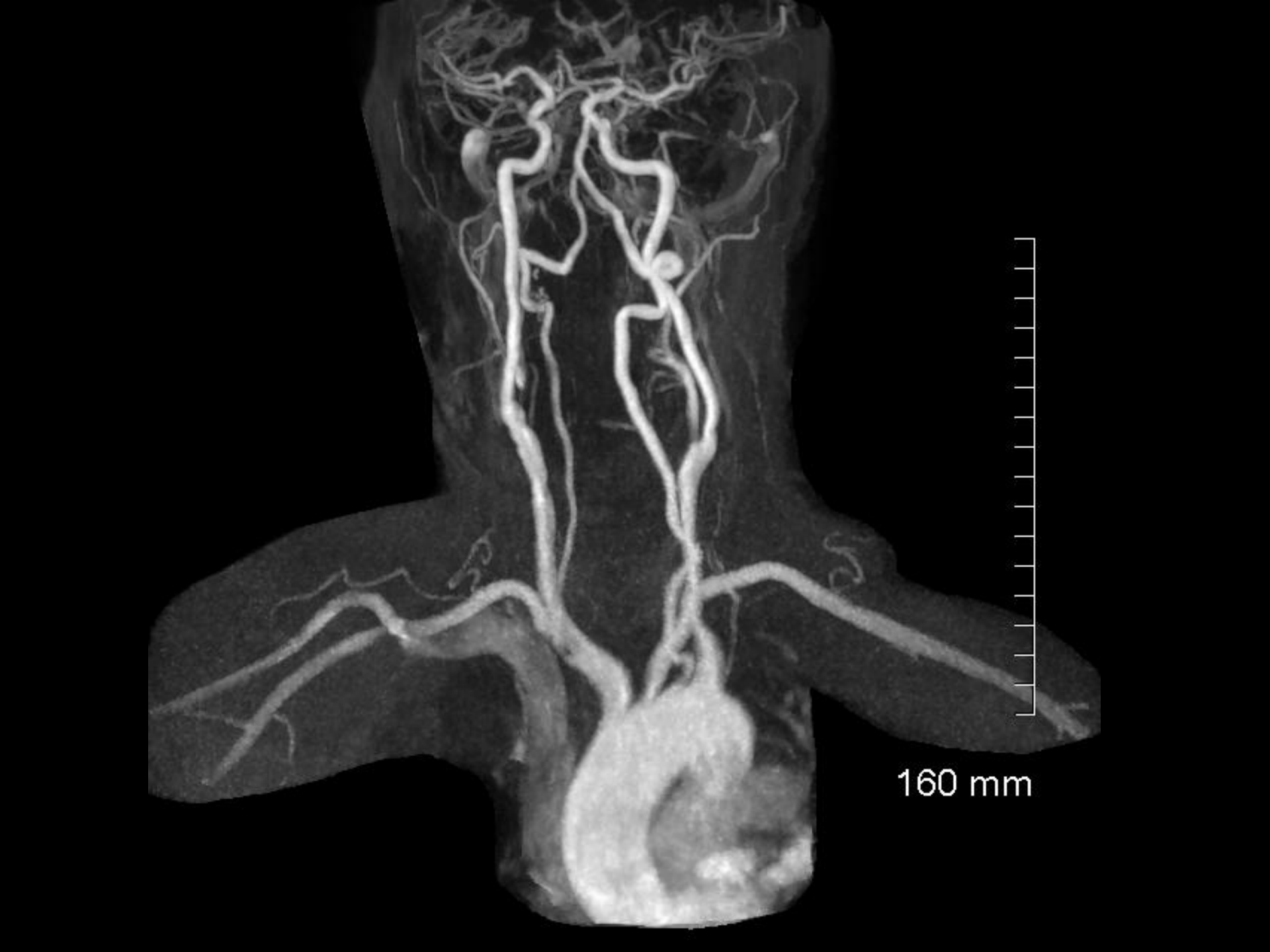

160 mm

MRI
GI Contrast

- Not so much

When do we not need Gadolinium contrast in MRI?

- Brain
  - Acute or follow up infarct/ischemia
  - Dementia workup
  - Headache
  - Structural evaluation
  - Hydrocephalus
  - Agenesis/dysgenesis syndromes
  - Chiari malformation
  - Demyelination/dysmeyination*

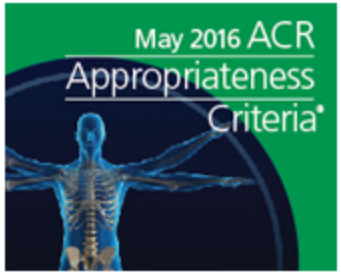
When do we not need Gadolinium contrast in MRI?

- Spine
  - Disc disease/radiculopathy
  - Stenosis
  - Structural issues
    - Tethered cord
    - Meningomyelocele/spina bifida
  - Fracture detection or acuity assessment
  - Myelopathy*
- MSK
  - Most joint exams

QUALITY & SAFETY

- Accreditation
- Appropriateness Criteria®
  - New & Revised
  - Topics in Development
  - Topics to Be Developed
- Practice Parameters
- Quality Measurement
- NRDR Data Registries
- Radiology Safety
- RADPEER™
- Reporting and Data Systems

ACR Appropriateness Criteria®



The ACR Appropriateness Criteria® (AC) are evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. Employing these guidelines helps providers enhance quality of care and contribute to the most efficacious use of radiology. Learn More »

NEW! ACR Named a Qualified Provider-Led Entity by CMS

The Centers for Medicare & Medicaid Services (CMS) has named ACR a "qualified Provider-Led Entity" (qPLE) approved to provide appropriate use criteria (AUC) under the Medicare Appropriate Use Criteria program for advanced diagnostic imaging. This means that ACR Appropriateness Criteria fulfill the Protecting Access to Medicare Act (PAMA) requirements to consult AUC prior to ordering advanced diagnostic imaging for Medicare patients. ACR qPLE status is valid through June 2021. Read more »

May 2016 Updates

Quality Measurement
NRDR Data Registries
Radiology Safety
RADPEER™
Reporting and Data Systems
Additional Resources
eNews
Contact Q&S

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May 2016 Updates

The latest release of the ACR Appropriateness Criteria covering a total of 215 clinical conditions includes **eight new and 15 revised topics**.

NEW & REVISED TOPICS

To access existing AC ratings tables and narratives use the buttons below.

BASIC ACCESS » Browse for a complete list of topics and ratings tables organized by panel (login not required)

ADVANCED SEARCH » Search and filter topics and ratings tables (login required)

Future Topics

- Topics Currently in Development
- Topics to Be Developed

Methodology Documents

Suspected Infective Endocarditis	Narrative & Rating Table	

Gastrointestinal		
Topic Name	**Narrative & Rating Table**	
Acute (Nonlocalized) Abdominal Pain and Fever or Suspected Abdominal Abscess	Narrative & Rating Table	
Acute Pancreatitis	Narrative & Rating Table	
Blunt Abdominal Trauma	Narrative & Rating Table	
Colorectal Cancer Screening	Narrative & Rating Table	
Crohn Disease	Narrative & Rating Table	
Dysphagia	Narrative & Rating Table	
Imaging of Mesenteric Ischemia	Narrative & Rating Table	
Jaundice	Narrative & Rating Table	
Left Lower Quadrant Pain — Suspected Diverticulitis	Narrative & Rating Table	
Liver Lesion — Initial Characterization	Narrative & Rating Table	
Palpable Abdominal Mass	Narrative & Rating Table	
Pretreatment Staging of Colorectal Cancer	Narrative & Rating Table	
Right Lower Quadrant Pain — Suspected Appendicitis	Narrative & Rating Table	
Right Upper Quadrant Pain	Narrative & Rating Table	

Date of origin: 1996
Last review date: 2014

American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Left Lower Quadrant Pain — Suspected Diverticulitis**

Variant 1: **Typical clinical presentation for diverticulitis, suspected complications or atypical presentations.**

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with IV contrast	9	For this procedure oral and/or colonic contrast may be helpful for bowel luminal visualization.	☢☢☢☢
CT abdomen and pelvis without IV contrast	6		☢☢☢☢
CT abdomen and pelvis without and with IV contrast	5		☢☢☢☢
MRI abdomen and pelvis without IV contrast	5		O
MRI abdomen and pelvis without and with IV contrast	5		O
X-ray contrast enema	4		☢☢☢
US abdomen transabdominal graded compression	4		O
X-ray abdomen and pelvis	4		☢☢☢
US pelvis transvaginal	2		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Date of origin: 1996
Last review date: 2015

American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Head Trauma**

Variant 1: **Minor or mild acute closed head injury (GCS ≥13), imaging not indicated by NOC or CCHR or NEXUS-II clinical criteria (see Appendix 1). Initial study.**

Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	2		☢☢☢
MRI head without IV contrast	1		O
MRA head and neck without IV contrast	1		O
MRA head and neck without and with IV contrast	1		O
CT head without and with IV contrast	1		☢☢☢
CTA head and neck with IV contrast	1		☢☢☢
MRI head without and with IV contrast	1		O
MRI head without IV contrast with DTI	1		O
CT head with IV contrast	1		☢☢☢
X-ray skull	1		☢
FDG-PET/CT head	1		☢☢☢☢
Arteriography cervicocerebral	1		☢☢☢
Tc-99m HMPAO SPECT head	1		☢☢☢☢

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level

Clinical Condition: **Head Trauma**

Variant 2: **Minor or mild acute closed head injury (GCS ≥13), imaging indicated by NOC or CCHR or NEXUS-II clinical criteria (see Appendix 1). Initial study.**

Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	9		☢☢☢
MRI head without IV contrast	5	This procedure may be appropriate in the outpatient setting, but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	O
MRA head and neck without IV contrast	2		O
MRA head and neck without and with IV contrast	2		O
CTA head and neck with IV contrast	1		☢☢☢
MRI head without and with IV contrast	1		O
MRI head without IV contrast with DTI	1		O
CT head without and with IV contrast	1		☢☢☢
CT head with IV contrast	1		☢☢☢
Tc-99m HMPAO SPECT head	1		☢☢☢☢
FDG-PET/CT head	1		☢☢☢☢
X-ray skull	1		☢
Arteriography cervicocerebral	1		☢☢☢

Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**

***Relative Radiation Level**

When do we NOT want IV contrast in CT?

- When the patient can't have it
  - Risk Factors
  - Lack of IV access

ACR Manual on Contrast Media
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ACR Committee on Drugs and Contrast Media

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Risk Factors for Adverse Intravenous Contrast Material Reactions

Allergy

Renal Insufficiency

Asthma

Cardiac Status

Anxiety

Allergy: “Iodine allergy” is not uncommonly reported by patients who have either a seafood intolerance/allergy or who have had a contrast reaction in the past.

Contrast materials are triiodinated benzoic acid derivatives that, in solution, contain a small amount of free iodide.

Adverse reactions to these substances may be classified as idiosyncratic, and are best termed "anaphylactoid," "allergy-like," or "pseudoallergic," rather than "allergic.”

There is no reason to believe that iodine allergy based on skin reactions to topical antiseptics is of any specific relevance to the administration of IV contrast material.

The frequency of allergic-like and physiologic adverse events related to the intravascular administration of iodinated contrast media (ICM) is low (0.2 – 0.7%) and has decreased considerably with changes in usage from ionic high-osmolality contrast media (HOCM) to nonionic low-osmolality contrast media (LOCM).

The majority of adverse side effects to LOCM are mild non-life-threatening events that usually require only observation, reassurance, and/or supportive measures.

Severe and potentially life-threatening adverse events continue to occur rarely and unpredictably (0.04%).

Nearly all life-threatening contrast reactions occur within the first 20 minutes after contrast medium injection.

Allergy: With regard to specific risk factors, a history of a prior allergy-like reaction to **contrast media** is associated with an up to five fold increased likelihood of the patient experiencing a subsequent reaction.

Any allergic diathesis predisposes individuals to reactions. This relationship is a difficult one to define, since many individuals have at least a minor allergy, such as seasonal rhinitis, and do not experience reactions.

True concern should be focused on patients with significant allergies, such as a prior major anaphylactic response to one or more allergens.

Allergy: The predictive value of specific allergies, such as those to shellfish or dairy products, previously thought to be helpful, is now recognized to be unreliable.

A significant number of health care providers continue to inquire specifically into a patient's history of "allergy" to seafood, especially shellfish.

There is no evidence to support the continuation of this practice.

As would be appropriate with any diagnostic procedure, preliminary considerations for the referring physician and the radiologist include:

1. Assessment of patient risk versus potential benefit of the contrast assisted examination.

2. Imaging alternatives that would provide the same or better diagnostic information.

3. Assurance of a valid clinical indication for each contrast medium administration.

Mild

Signs and symptoms are self-limited without evidence of progression. Mild reactions include:

Allergic-like

- Limited urticaria / pruritis
- Limited cutaneous edema
- Limited “itchy” / “scratchy” throat
- Nasal congestion
- Sneezing / conjunctivitis / rhinorrhea

Physiologic

- Limited nausea / vomiting
- Transient flushing / warmth / chills
- Headache / dizziness / anxiety / altered taste
- Mild hypertension
- Vasovagal reaction that resolves spontaneously

Moderate

Signs and symptoms are more pronounced and commonly require medical management. Some of these reactions have the potential to become severe if not treated. Moderate reactions include:

Allergic-like

- Diffuse urticaria / pruritis
- Diffuse erythema, stable vital signs
- Facial edema without dyspnea
- Throat tightness or hoarseness without dyspnea
- Wheezing / bronchospasm, mild or no hypoxia

Physiologic

- Protracted nausea / vomiting
- Hypertensive urgency
- Isolated chest pain
- Vasovagal reaction that requires and is responsive to treatment

Severe

Signs and symptoms are often life-threatening and can result in permanent morbidity or death if not managed appropriately. Severe reactions include:

Allergic-like

- Diffuse edema, or facial edema with dyspnea
- Diffuse erythema with hypotension
- Laryngeal edema with stridor and/or hypoxia
- Wheezing / bronchospasm, significant hypoxia
- Anaphylactic shock (hypotension + tachycardia)

Physiologic

- Vasovagal reaction resistant to treatment
- Arrhythmia
- Convulsions, seizures
- Hypertensive emergency

Allergy: Any patient who describes an “allergy” to a food or contrast media should be questioned further to clarify the type and severity of the “allergy” or reaction, as these patients could be atopic and at increased risk for reactions.

Most forms of atopy result in a 2 to 3 times likelihood of contrast reaction compared with non-atopic patients.

However, considering the rarity of severe life-threatening anaphylaxis, this level of incremental risk remains low and should be considered in the context of risk versus benefit.

Prophylaxsis?

Before deciding to premedicate an “at risk” patient, some consideration should be given to the goals of such premedication.

Ideally, one would like to prevent all contrast reactions; however, it is most important to target premedication to those who, in the past, have had moderately severe or severe reactions requiring treatment.

Prophylaxsis?

- Unfortunately, studies have thus far indicated that the main contrast reactions that benefit from premedication are minor ones, usaually requiring no or minimal medical intervention.
- No randomized controlled clinical trials have demonstrated premedication protection against severe life-threatening adverse reactions.
- But this may be attributed to the rarity of life threatening reactions to contrast and the prohibitive numbers of subjects necessary for enough statistical power to demonstrate any beneficial effect of premedication in preventing the most severe contrast reactions.

Typical Premedication Schema

- Elective:
  - Prednisone – 50 mg by mouth at 13 hours, 7 hours, and 1 hour before contrast media injection, plus Diphenhydramine– 50 mg by mouth 1 hour before contrast medium administration.
- Emergent:
  - Methylprednisolone sodium succinate (Solu-Medrol®) 40 intravenously every 4 hours (q4h) until contrast study plus diphenhydramine 50 mg IV 1 hour prior to contrast injection.
  - Omit steroids entirely and give diphenhydramine 50 mg IV.
  - **Note:** IV steroids have not been shown to be effective when administered less than 4 to 6 hours prior to contrast injection.

Anxiety: There is anecdotal evidence that severe adverse effects to contrast media or to procedures can be mitigated at least in part by reducing anxiety.

This issue was studied with reference to anxiety thought to be generated by informed consent of risks associated with intravenous (IV) contrast procedures. Using a standardized anxiety index, it was concluded that the majority of patients who were and were not informed had equally elevated anxiety, and there was no increase in adverse reactions in the informed group.

Renal Insufficiency

- Post-contrast acute kidney injury (PC-AKI) is a general term used to describe a sudden deterioration in renal function that occurs within 48 hours following the intravascular administration of iodinated contrast medium. PC-AKI may occur regardless of whether the contrast medium was the cause of the deterioration. *PC-AKI is a correlative diagnosis.*

- Contrast-induced nephropathy (CIN) is a specific term used to describe a sudden deterioration in renal function that is caused by the intravascular administration of iodinated contrast medium; therefore, CIN is a subgroup of PC-AKI. *CIN is a causative diagnosis.*

Renal Insufficiency

- Unfortunately, very few published studies have a suitable control group to permit the separation of CIN from PC-AKI .

- Therefore, the incidence of PC-AKI reported in clinical studies and the incidence of PC-AKI observed in clinical practice likely includes a combination of CIN (i.e., AKI caused by contrast medium administration) and AKI unrelated to contrast medium administration (i.e., AKI coincident to but not caused by contrast medium administration).

Renal Insufficiency

- **At the current time, it is the position of ACR Committee on Drugs and Contrast Media that CIN is a real, albeit rare, entity.**
- Published studies on CIN have been heavily contaminated by bias and conflation.
- Future investigations building on recent methodological advancements are necessary to clarify the incidence and significance of this disease.

AKIN Definition of Acute Kidney Injury (Acute Kidney Injury Network)

- The diagnosis of AKI is made according to the AKIN criteria if one of the following occurs within 48 hours after a nephrotoxic event:
  - 1) Absolute serum creatinine increase ≥0.3 mg/dL (>26.4 μmol/L).
  - 2) A percentage increase in serum creatinine ≥50% (≥1.5-fold above baseline).
  - 3) Urine output reduced to ≤0.5 mL/kg/hour for at least 6 hours.

Renal Insufficiency

- Elevations in serum creatinine are neither sensitive nor specific for individual types of AKI.
- Any serum creatinine-based criteria, used in isolation, will be unable to separate CIN from generic PC-AKI.
- This applies to scientific studies lacking appropriate control groups and to clinical evaluations of individual patients.

Renal Insufficiency

- Numerous studies have attempted to isolate risk factors for CIN. There is consensus that the most important risk factor is pre-existing severe renal insufficiency.

- Multiple other risk factors have been proposed, including diabetes mellitus, dehydration, cardiovascular disease, diuretic use, advanced age, multiple myeloma, hypertension, hyperuricemia, and multiple iodinated contrast medium doses in a short time interval (<24 hours), but these have not been rigorously confirmed.

Risk Thresholds

- There is no agreed-upon threshold of serum creatinine elevation or eGFR beyond which the risk of CIN is considered so great that intravascular iodinated contrast medium should never be administered.

- In fact, since each contrast medium administration always implies a risk-benefit analysis for the patient, contrast medium administration for all patients should always be taken in the clinical context, considering all risks, benefits and alternatives.

Risk Thresholds

- At the current time, there is very little evidence that **IV** iodinated contrast material is an independent risk factor for AKI in patients with eGFR ≥30 mL / min/1.73m2.

- Therefore, if a threshold for CIN risk is used at all, 30 mL / min/1.73m2 seems to be the one with the greatest level of evidence.

Whom to Screen
(Serum Creatinine/eGFR)

- Age > 60
- History of renal disease, including:
  - Dialysis
  - Kidney transplant
  - Single kidney
  - Renal cancer
  - Renal surgery
- History of hypertension requiring medical therapy
- History of diabetes mellitus
- Metformin or metformin-containing drug combinations*

Creatinine Screen
When?

- ???

- Outpatients: up to 30 days prior to exam, if no recent change in patient condition.

- Inpatients: If > 2 days since last sCr, check with Radiologist

Prevention

- *Avoidance of Iodinated Contrast Medium*
- *Volume Expansion*
- *"Renoprotective" measures*
  - *Sodium bicarbonate*
  - *N-acetylcysteine*
  - *Diuretics: Mannitol and Furosemide*

Volume Expansion

- The major preventive action to mitigate the risk of CIN is to provide intravenous volume expansion prior to contrast medium administration.
- The ideal infusion rate and volume is unknown, but isotonic fluids are preferred (Lactated Ringer's or 0.9% normal saline).
- One possible protocol would be 0.9% saline at 100 mL/hr, beginning 6 to 12 hours before and continuing 4 to 12 hours after, but this is only practical in the inpatient setting.
- Oral hydration has also been utilized, but with less demonstrated effectiveness.

September 29, 2016 -- The use of contrast media in x-ray and CT exams is probably less harmful to the kidneys than previously thought, and clinicians should reconsider the wisdom of withholding important imaging exams based on their use of contrast, even in individuals at risk, concludes a just-published study in the *Journal of the American Society of Nephrology*.

"We show data suggesting that the risk of acute kidney injury related to radiocontrast administration has been overestimated, and we would like for physicians, including cardiologists, radiologists, and surgeons who frequently are faced with decisions regarding the use or nonuse of radiocontrast-enhanced imagining studies, to take this information into account in their clinical decision-making," said Dr. Glenn Chertow from Stanford University School of Medicine in a statement accompanying the study (*JASN*, September 29, 2016).

Miscellaneous Risk Factors:

Paraproteinemias, particularly **multiple myeloma**, are known to predispose patients to irreversible renal failure after high-osmolality contrast media (HOCM) administration, due to tubular protein precipitation and aggregation; however, there is no data predicting risk with the use of low-osmolality or iso-osmolality agents.

Some patients with **pheochromocytoma** develop an increase in serum catecholamine levels after the IV injection of HOCM. A subsequent study showed no elevation of catecholamine levels after the IV injection of nonionic contrast media. Direct injection of either type of contrast medium into the adrenal or renal artery is to be avoided, however, as this may cause a hypertensive crisis.

What's up with Metformin?

- Metformin is excreted unchanged by the kidneys, probably by both glomerular filtration and tubular excretion.
- Metformin seems to cause increased lactic acid production by the intestines. Any factors that decrease metformin excretion or increase blood lactate levels are important risk factors for lactic acidosis.
- Renal insufficiency, and possible worsening of renal function by IV contrast, are major considerations for radiologists.

ACR Recommended Management

- *Category I*
  - In patients with no evidence of AKI and with eGFR ≥30 mL / min/1.73m2, there is no need to discontinue metformin either prior to or following the intravenous administration of iodinated contrast media, nor is there an obligatory need to reassess the patient's renal function following the test or procedure.*
- *Category II*
  - In patients taking metformin who are known to have acute kidney injury or severe chronic kidney disease (stage IV or stage V; i.e., eGFR< 30), metformin should be temporarily discontinued at the time of or prior to the procedure, and withheld for 48 hours subsequent to the procedure and reinstituted only after renal function has been re-evaluated and found to be normal.

ADVERSE REACTIONS TO GADOLINIUM-BASED CONTRAST MEDIA

- Allergic-like reactions are uncommon and vary in frequency from 0.004% to 0.7%.
- The manifestations of an allergic-like reaction to a GBCM are similar to those of an allergic-like reaction to an iodinated contrast medium.
- Severe life-threatening anaphylactic reactions occur but are exceedingly rare (0.001% to 0.01%)

Nephrogenic Systemic Fibrosis

- Nephrogenic systemic fibrosis (NSF) is a fibrosing disease, primarily involving the skin and subcutaneous tissues but also known to involve other organs, such as the lungs, esophagus, heart, and skeletal muscles.

- Initial symptoms typically include skin thickening and/or pruritis.

- Symptoms and signs may develop and progress rapidly, with some affected patients developing contractures and joint immobility. In some patients, the disease may be fatal.

Nephrogenic Systemic Fibrosis

- ***Associations:***
  - *Gadolinium-based contrast agents (GBCA)*
  - *Chronic kidney disease*
  - *Acute kidney injury (AKI)*
  - *High-dose and multiple exposures of GBCA*
  - *Hepatic insufficiency/hepatorenal syndrome*

Patients at Risk for NSF

- The ACR Committee on Drugs and Contrast Media believes that patients receiving any GBCA should be considered at risk of developing NSF if any of the following conditions applies:

  - on dialysis (of any form)
  - severe or end-stage CKD (CKD 4 or 5, eGFR < 30 mL / min/1.73 m2) without dialysis
  - eGFR 30 to 40 mL / min/1.73 m2 without dialysis*
  - AKI

Contrast ‘Myth’conception

My patient only has one kidney, I don’t want to risk “knocking it off” by giving her contrast

Quick Review of Contraindications for MRI

MRI ‘Myth’conception

Oh, my patient can’t have an MRI because he has a prosthetic hip (..shoulder..Harrington rods…etc)

Absolute Contraindications (at this time)

- Implanted electric and electronic devices are a strict contraindication to the magnetic resonance imaging, and in particular:
  - heart pacemakers (especially older types)
  - insulin pumps.
  - implanted hearing aids.
  - neurostimulators.
- intracranial metal clips*.
- metallic bodies in the eye.

Possible Contraindications

- Cardiac valves
- Vascular stents
- Old epicardial lead wires
- Ventricular shunts
- Body piercing jewelry
- Tattoos
- Metallic FB’s elsewhere

Relative Contraindications

- Recent surgeries (~6 weeks)
  - Ortho hardware/prostheses
  - Vascular clips
  - IVC filters
- Claustraphobia
- Unable to cooperate
- Need for monitoring

Drugs

Drug Safety and Availability
Drug Alerts and Statements
Medication Guides
Drug Safety Communications
Drug Shortages
Postmarket Drug Safety Information for Patients and Providers
Information by Drug Class

FDA Drug Safety Communication: FDA evaluating the risk of brain deposits with repeated use of gadolinium-based contrast agents for magnetic resonance imaging (MRI)

[7-27-2015]

Safety Announcement

The U.S. Food and Drug Administration (FDA) is investigating the risk of brain deposits following repeated

LaCoppola Meier/Get

MEDICAL MYSTERY 04.29.134:45 AM ET

Are Ultrasounds Causing Autism in Unborn Babies?

THE DAILY BEAST
Jennifer Margulis

Looking solely at the 111 boys with identified CNVs, first-trimester ultrasound was found to have a statistically significant effect on nonverbal IQ as well as on observed repetitive behaviors.

Significant variables for boys with CNVs

	No 1st-trimester ultrasound	1st-trimester ultrasound	p-value
Nonverbal IQ	92.6	78.6	0.02
ADOS repetitive domain score	3.4	4.2	0.02

As there were only 22 girls with ASD and identified CNVs, the researchers weren't able to apply their multiple linear regression model on such a small sample.

The team acknowledged a number of limitations to their study, including its reliance on parent reports for ultrasound exposure and its use of propensity scores to adjust for confounding factors.

Seattle Children's Research Institute
online September 1, 2016 in *Autism Research*.