

Body

Neck, Chest, Abdomen, Pelvis

Objectives

- Determine specific imaging plane used to acquire or reformat CT scan, i.e. sagittal, coronal, transverse, and off-axis or oblique.
- Assess and evaluate CT scans for use of contrast media.
- Differentiate between normal anatomy and pathological processes.
- Critique CT scan for proper positioning, acquisition methods, parameter selections, and any protocol modifications.
- Investigate methods to reduce radiation during CT procedures.



Procedures (continued)

TYPE OF STUDY

2. Neck and Chest

A. Neck

1. larynx
2. soft tissue neck

B. Chest

1. mediastinum
2. lung
3. heart
4. airway
5. low dose lung screening

3. Abdomen and Pelvis

A. Abdomen

1. liver
2. biliary
3. spleen
4. pancreas
5. adrenals
6. kidneys and/or ureters
7. GI tract

B. Pelvis

1. bladder
2. colorectal
3. reproductive organs

FOCUS OF QUESTIONS

Questions about each of the studies listed on the left may focus on any of the following relevant factors:

Anatomy

- imaging planes
- pathological considerations/recognition
- protocol considerations
- patient considerations (e.g., pediatric, geriatric, bariatric)
- post-processing presentations
- landmarks

Contrast Media

- indications
- scan/prep delay
- effect on images

Additional Procedures

- vascular (CTA, CTV) (e.g., PE, dissection, runoff, venogram)
- biopsies
- drainages
- aspirations

Preparing the Patient

- Obtain clinical history
- Check allergies/lab values
- Remove all metal objects from the chest down through pelvis

Neck

- Usually preformed with IV contrast
- Check for contraindications to IV contrast
- Head first and supine, arms at side
- Use cradle support for head
- Instructions

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Neck

- Scout: Table height EAM, zeroed at top of head
- Institutional protocol
- SFOV: 50cm
- DFOV: 18-25 cm
- Spiral: superior orbital rim to lung apex
- No angulation

Neck

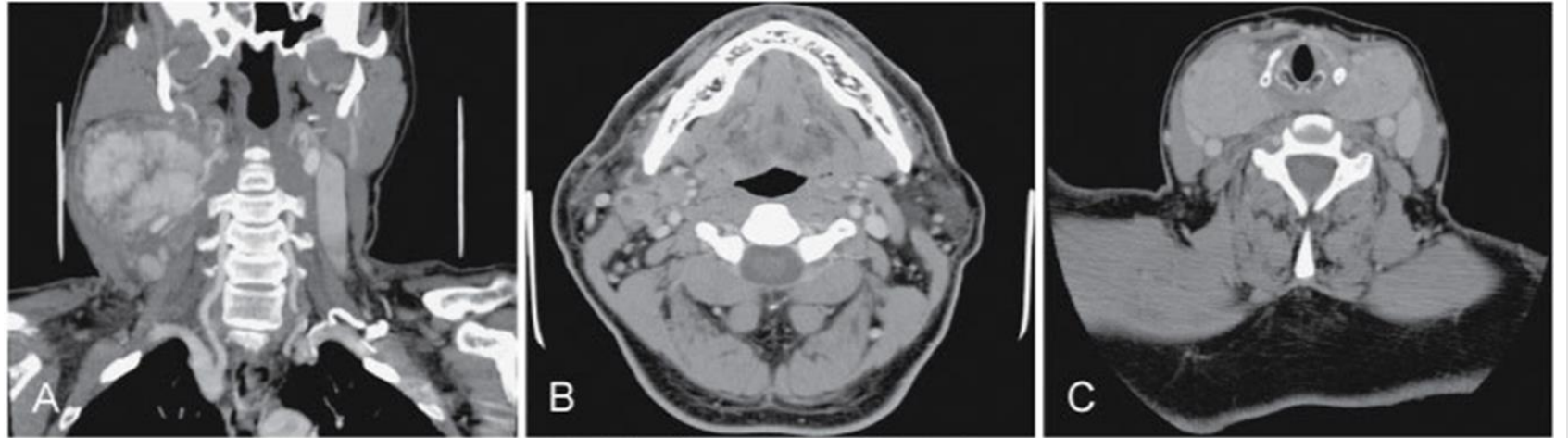
- kVp: 120
- mAs: 220-400
- Slice thickness: 3-5mm
- Pitch: .7-1.2

Neck

- 50-150 mL contrast
- 2-3 mL/sec
- 30-60 second delay
- Soft tissue: WL 50; WW 400
- Bone: WL 300; WW 2000

Vascular Mass

Figure 17-11 A, Large vascular mass (carotid body tumor) shown on CTA. B, Metastatic ring enhancing necrotic lymph nodes, abutting on the right submandibular gland. C, Large thyroid goiter encircling the trachea.



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Chest

Clinical Indications

- ▶ Interstitial lung disease
- ▶ Evaluation mediastinum
- ▶ Detection and differentiation of pulmonary nodules/masses
- ▶ CA staging
- ▶ CTA
- ▶ Cardiac

Chest Positioning

- Place the patient supine on the table
- Patient feet or head first will depend on the protocol of the facility
- Patient's arms need to be raised above the head

Routine

- Scout
- Breath hold
- Radiopaque objects removed
- Patient is straight

Chest

- Communicate importance of the breath hold throughout the scan
- Scan field of view (SFOV) vs. display field of view (DFOV)
- Scan range
- Gantry angle
- 80-120 kVp
- Ma: 40-300; time: .33-1.0 sec.
- Slice thickness: .5-2mm, reconstruct into 3-5 mm; 50% overlap

Chest

- Contrast:
 - Vascular structures: 2.5-4.0 mL/sec
 - Delay: specific to the vessel of interest
 - 50-150 mL

Chest

- Pitch
- Standard or soft tissue algorithm
 - Lung: WL -450; WW 1400
 - Mediastinum: WL 40; WW 350
 - Bone: WL 300; WW 2000
- Matrix 512 x 512

Chest

- High-Resolution (HRCT)
 - Demonstrate lung tissue
 - Indications:
 - Emphysema
 - Bronchiectasis
 - Sarcoidosis
 - Cystic fibrosis
 - COPD
 - Asbestosis
 - Asthma
 - Thin slices: .6-2mm
 - Reduced DFOV

CTA Pulmonary Angiography

- Indication: Pulmonary Embolism
- Helical scan
- Slice Thickness: .5-1.25 mm; overlapping .6 mm
- kVp: 80-120
- mA: 400; .8 sec
- Diaphragm-lung apex
- Contrast:
 - 4-5 mL/sec
 - 18-20 gauge catheter
 - 80-150 mL
 - Saline injection directly after contrast

CTA Pulmonary Angiography

- Prospective gating
- Retrospective gating

Cardiac CT

- Coronary artery calcium
- Coronary CTA
- Non-coronary cardiac imaging
- Indications:
 - Assessment of atherosclerotic disease
- Prospective gating

Cardiac CT

- Helical scan-dual energy
- Slice Thickness: .75; spacing at .5 mm
- kVp: 80-140
- mAs: 700
- Pitch: .2 or less
- DFOV:
- Carina-base of heart
- Contrast:
 - 4-5 mL/sec
 - 18-20 gauge catheter
 - 80-150 mL
 - Saline injection directly after contrast

Abdomen/Pelvis

Clinical Indications

- ▶ Abdominal pain
- ▶ Mass
- ▶ Diverticulitis
- ▶ Liver
- ▶ Spleen
- ▶ Bowel
- ▶ Retroperitoneum
- ▶ Pelvis
- ▶ Trauma
- ▶ Vascular system
- ▶ Interventional applications
- ▶ Musculoskeletal system

Abdomen and Pelvis Positioning

- Place the patient supine on the table
- Patient feet or head first will depend on the protocol of the facility
- Patient's arms need to be raised above the head

Routine

- Scout
- Breath hold
- Radiopaque objects removed
- Patient is straight

Abdomen/Pelvis

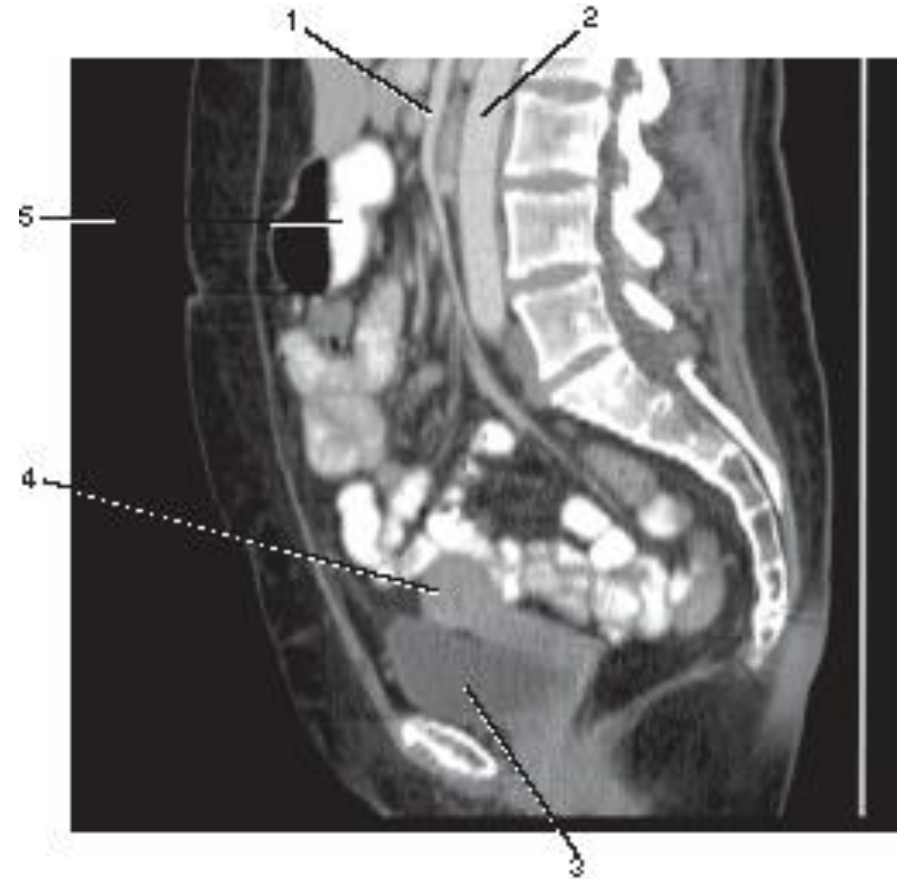
- Communicate importance of the breath hold throughout the scan
- Scan field of view (SFOV) vs. display field of view (DFOV)
- Scan range
- Gantry angle
- 120 kVp
- 200-250 mAs
- Slice thickness: 3-5 mm

Abdomen/Pelvis

- Pitch
- Standard or soft tissue algorithm
 - Soft tissue: WL 40; WW 350
 - Lung bases: WL -450; WW 1400
 - Bone: WL 300; WW 2000
- Matrix 512 x 512

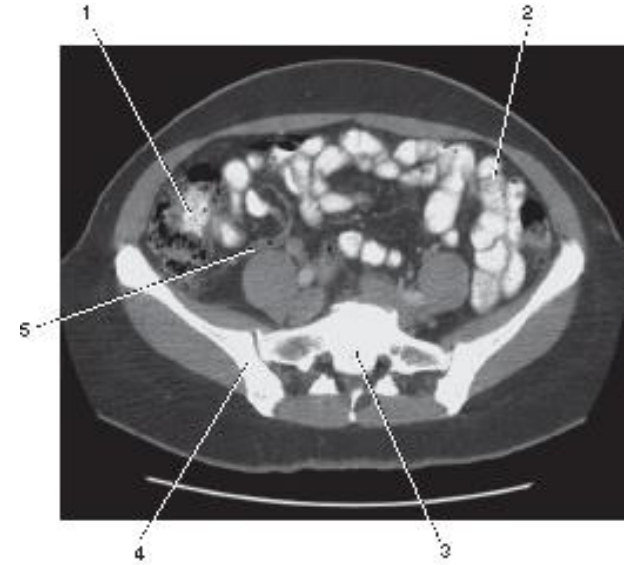
Abdomen/Pelvis

- Annotate
- Single vs. Multiphase
- Reconstruction



Abdomen/Pelvis

- Contrast
 - Oral
 - IV

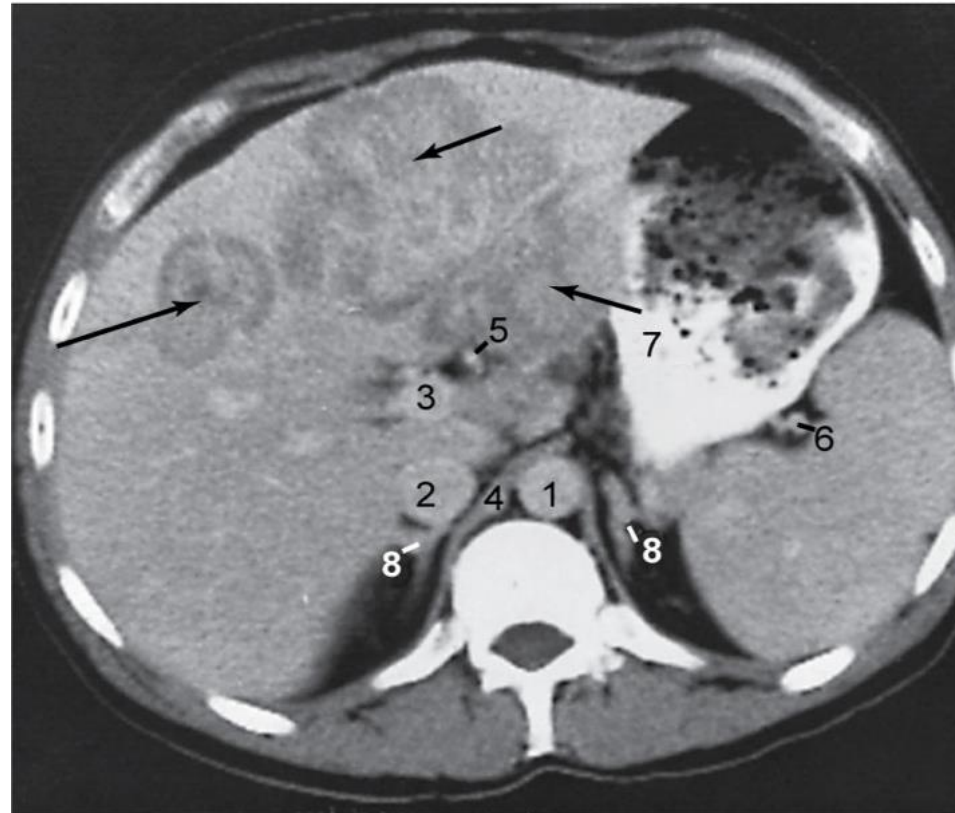


Post scan

- Check for motion
- Image quality

Liver

Figure 18-7 Hepatoma (arrows) involving the lateral and medial segments of the left lobe of the liver. 1, Aorta; 2, inferior vena cava; 3, portal vein; 4, crus; 5, hepatic artery; 6, splenic artery; 7, stomach; 8, adrenals.



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Splenic Rupture

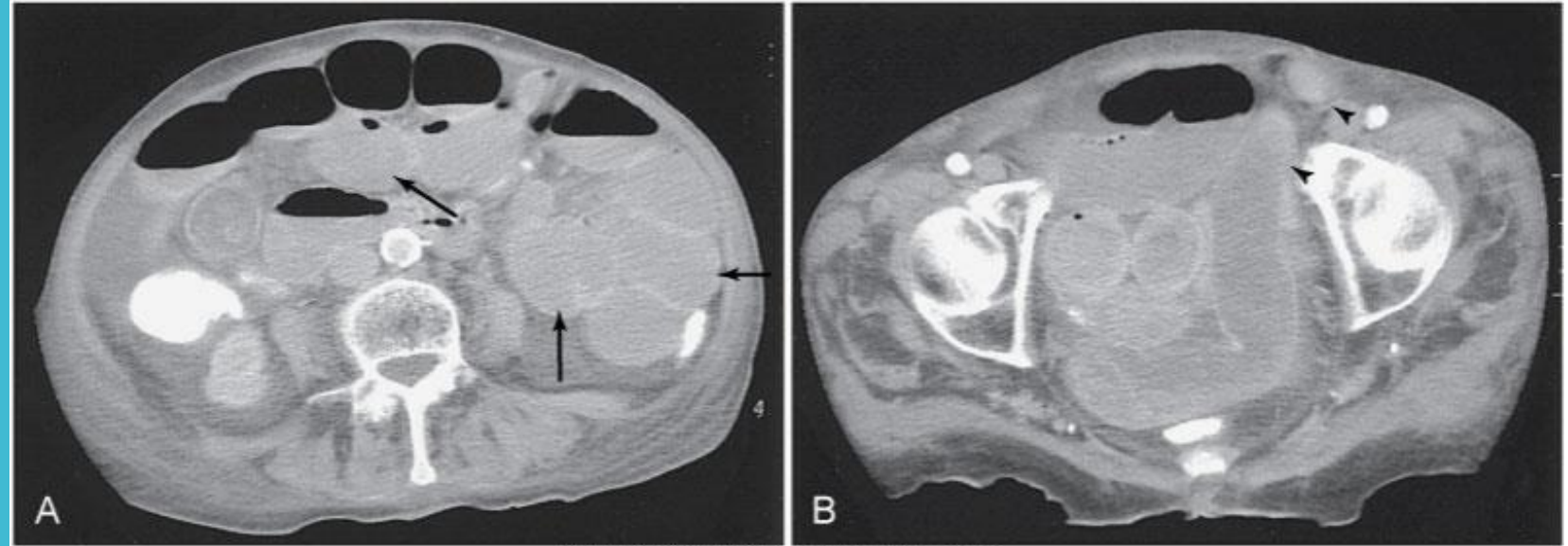
Figure 18-10
Splenic rupture with
pseudoaneurysms (*arrows*).
(Image courtesy Dr. Luck
Louis, Vancouver Hospital.)



(Image courtesy Dr. Luck Louis, Vancouver Hospital.)

Small Bowel Obstruction

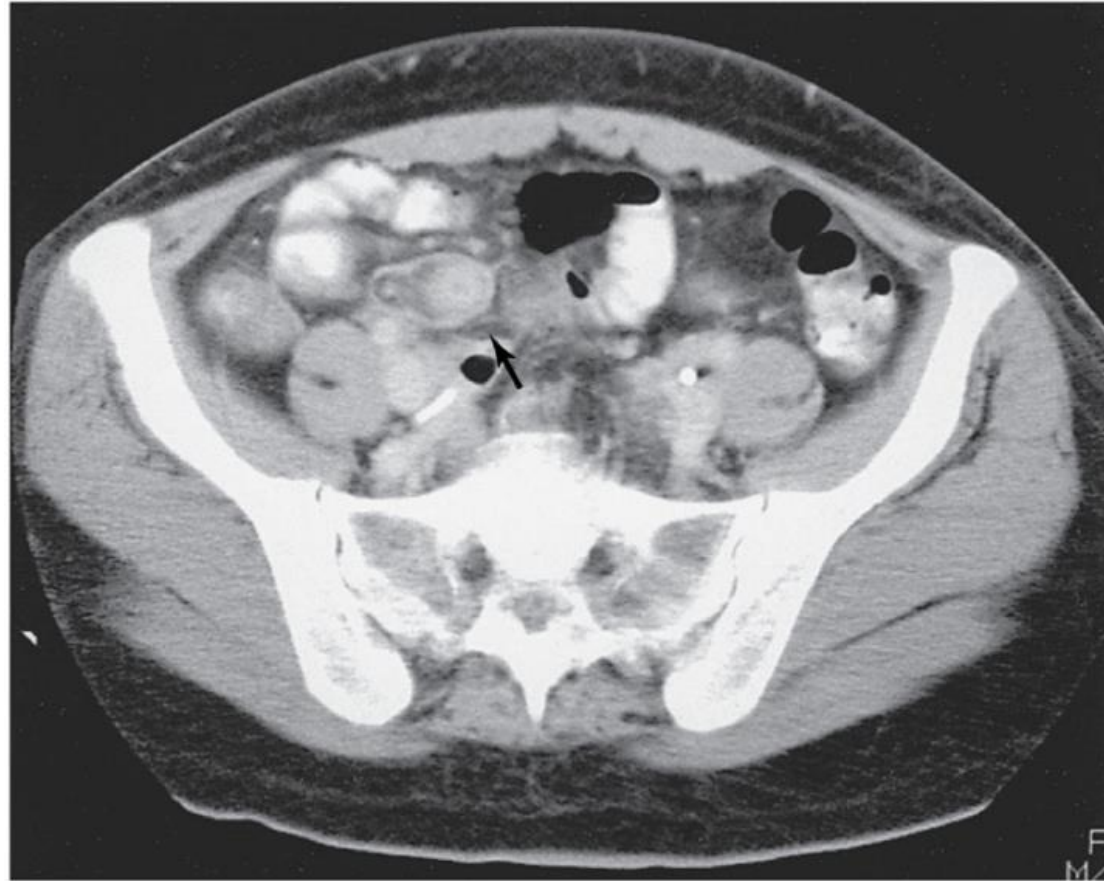
Figure 18-11 **A**, Small bowel obstruction as evidenced by the multiple dilated loops of proximal small bowel (*arrows*). **B**, A herniated loop in the left groin (*arrowheads*).



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Appendicitis

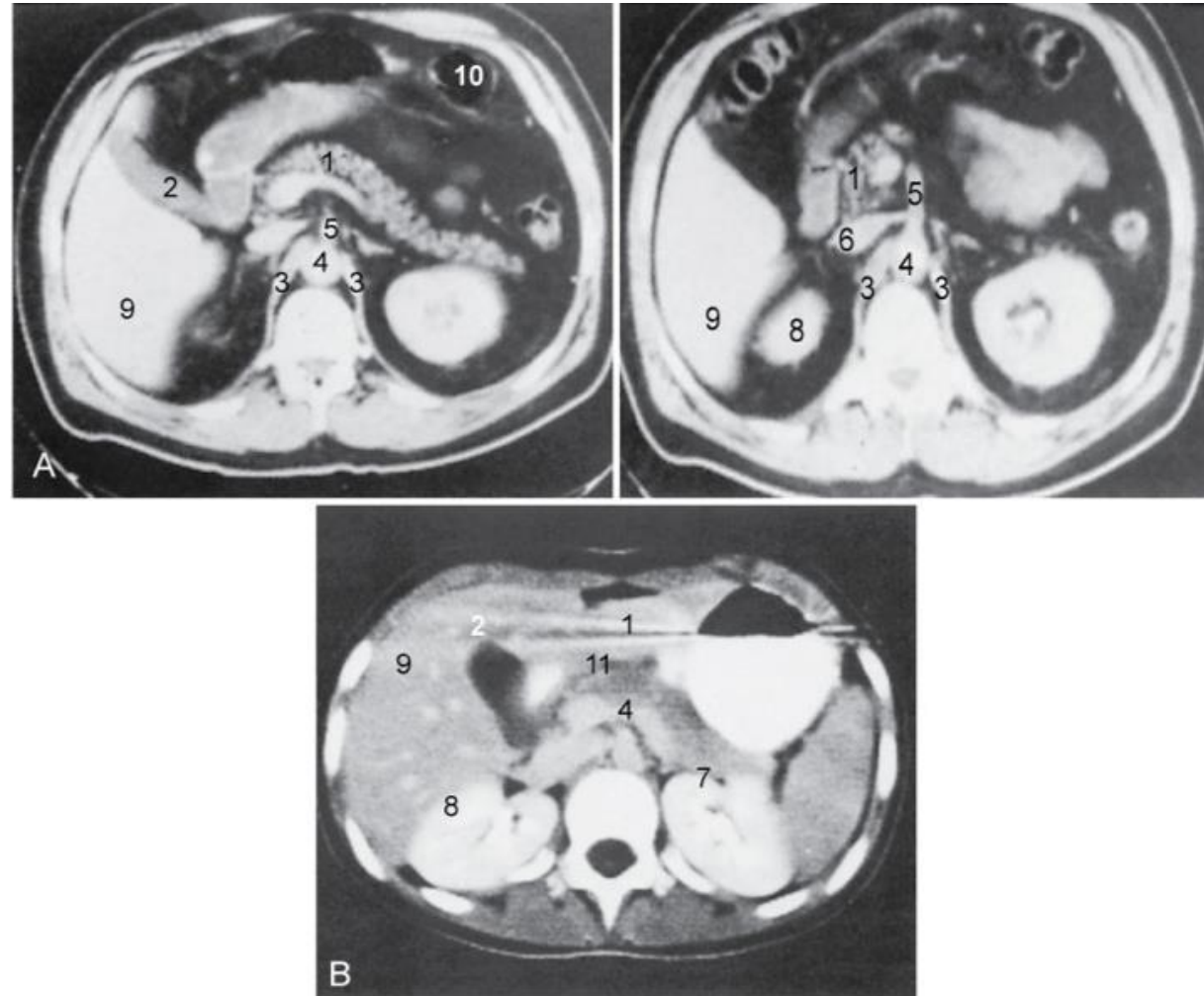
Figure 18-12 Thickened, inflamed appendix (*arrow*) in the right lower quadrant.



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Pancreas

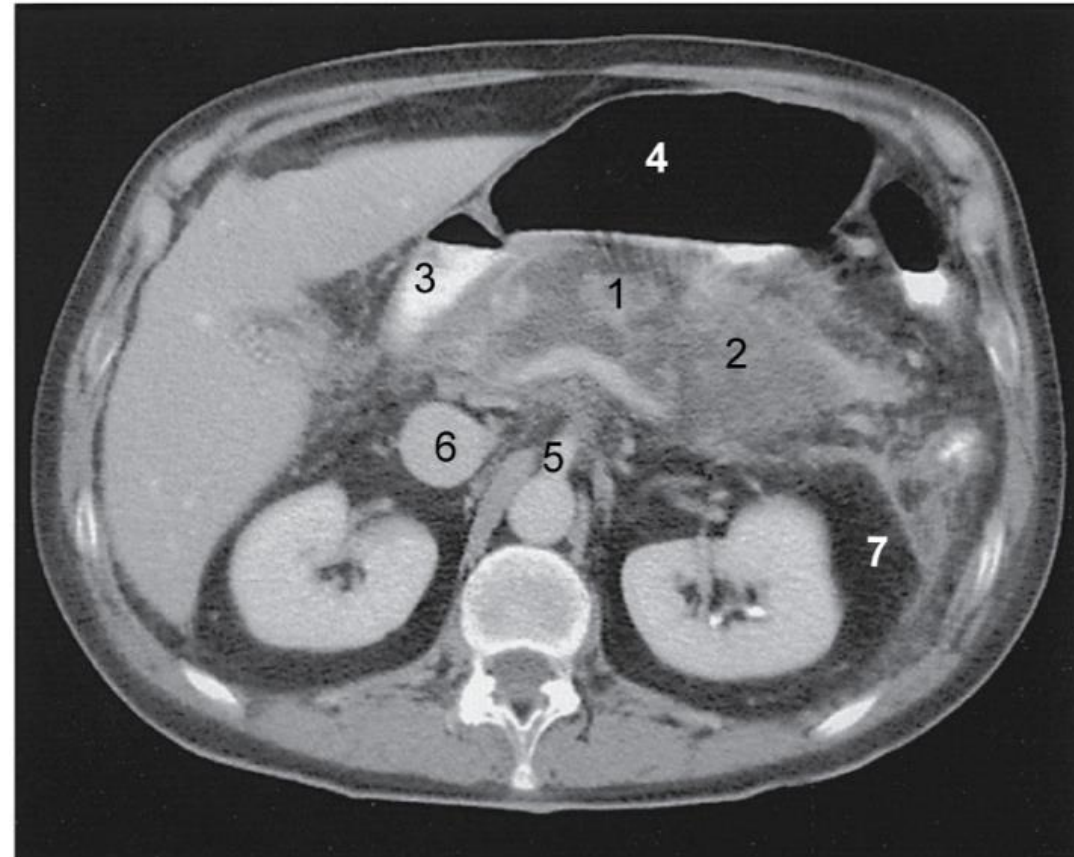
Figure 18-13 Normal pancreas in patient with abundant (A) and little (B) intra-abdominal fat. 1, Pancreas; 2, gallbladder; 3, crus of the diaphragm; 4, aorta; 5, superior mesenteric artery; 6, inferior vena cava with left renal vein; 7, left kidney; 8, right kidney; 9, liver; 10, bowel; 11, splenoportal confluence.



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Acute Pancreatitis

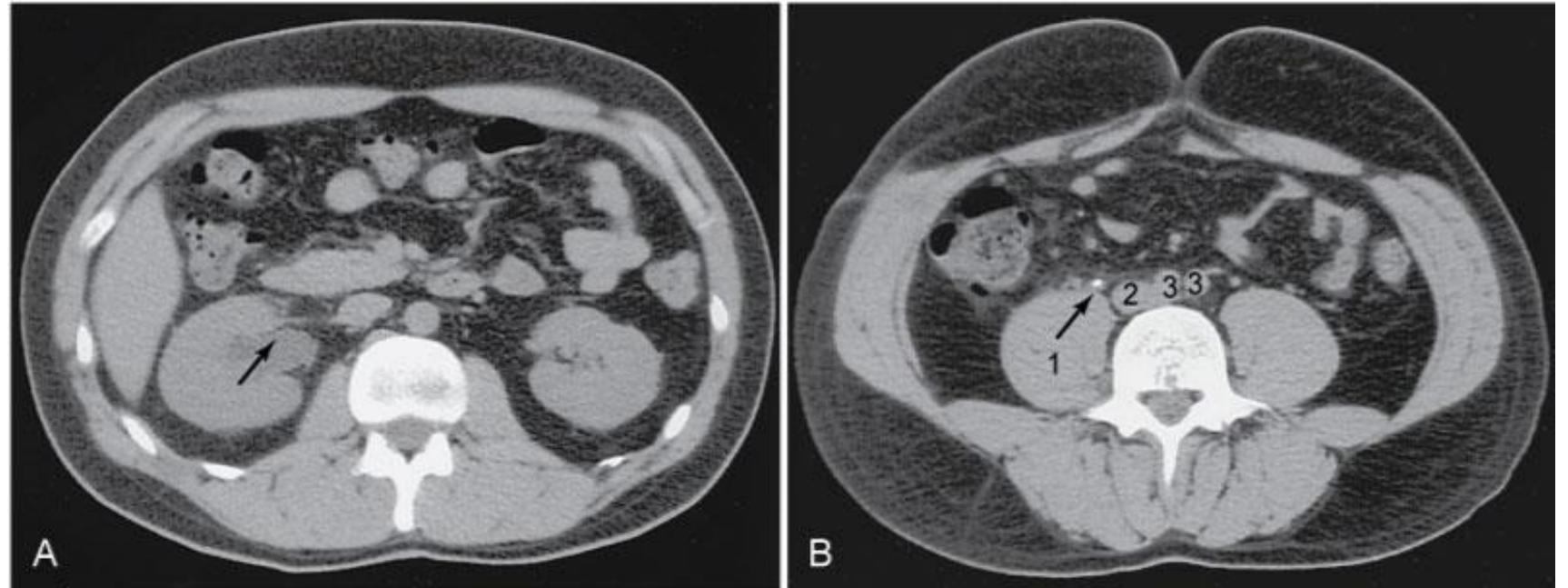
Figure 18-14 Acute pancreatitis. Necrotic pancreas (1) surrounded by fluid (2), duodenum (3), air-filled stomach (4), superior mesenteric artery (5), inferior vena cava (6), and perirenal fat (7).



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Renal Pelvis

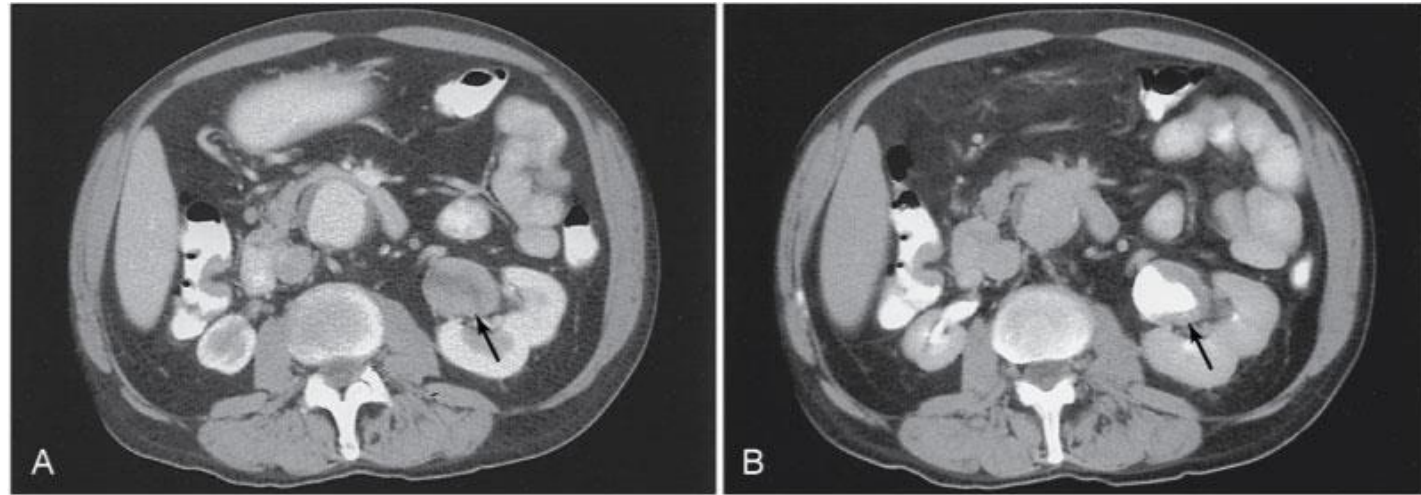
Figure 18-17 **A**, Dilated right renal pelvis (*arrow*). **B**, Calculus (*arrow*) in the right ureter. 1, Psoas muscle; 2, inferior vena cava; 3, iliac arteries.



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Renal Mass

Figure 18-18 Solid mass in the renal pelvis (*arrow*) before **(A)** and after **(B)** contrast opacification of the renal pelvis.



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Adrenal Mass

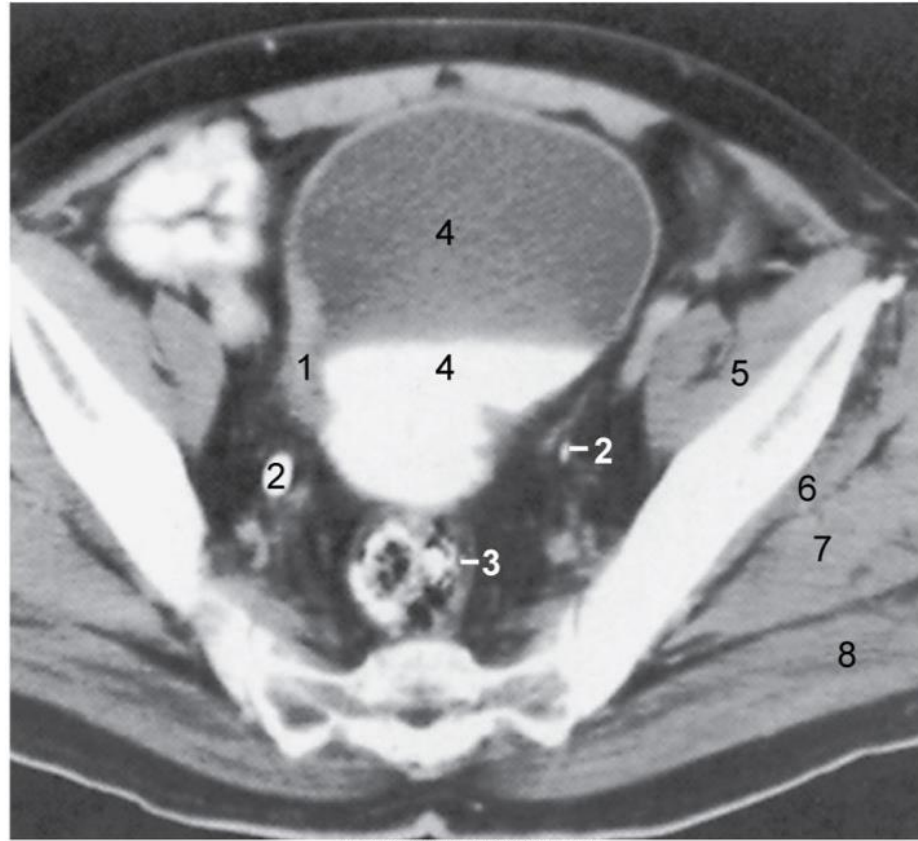
Figure 18-19 Region of interest within an adrenal mass (*arrow*) indicating a negative Hounsfield number, confirming the diagnosis of adenoma. 1, Left kidney; 2, aorta.



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Imaging of the Pelvis

Figure 18-22 Thickening of the bladder wall without evidence of extension into the perivesical fat (proven amyloidosis). 1, Thickened bladder wall; 2, ureters; 3, sigmoid colon; 4, urine and contrast medium in the bladder; 5, iliac muscle; 6, gluteus minimus; 7, gluteus medius; 8, gluteus maximus.



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CT Fluoroscopy

- Interventional guidance tool
- CT fluoroscopy fundamentals
- Equipment configuration and data flow
- X-ray technique parameters: increase radiation dose, ALARA
- Image quality and radiation dose considerations

Interventional CT

- Precise localization during interventional procedures
- Types of procedures:
 - Lungs
 - Mediastinum
 - Adrenals
 - Liver
 - Pancreas
 - Kidneys
 - Retroperitoneum
 - Pelvis
- Most common indication: biopsy

References

- Seeram, Euclid, 2016. Computed Tomography Physical Principles, Clinical Applications, and Quality Control. Elsevier, 4th Ed.
- Demaio, D. MEd. RT (R), CT 2018. Mosby's Exam Review for Computed Tomography. Elsevier. 3rd ed