



ESSENTIALS OF RADIOLOGY STUDY GUIDE

The Essentials of Radiology Examination is designed to test the radiology knowledge and clinical skills across both the subspecialties and imaging modalities of diagnostic radiology for the imaging diagnosis of conditions that may be encountered in the practices of all radiologists. Many are acute conditions that may be met during off hours radiology coverage or imaging coverage of an emergency center. The guide is divided into the following imaging topics: Abdomen, Cardiovascular, Central Nervous System, Clinical Presentation, Gynecological/Genitourinary, Head and Neck, Multi-System Diseases, Musculoskeletal, Pediatric Radiology, Spine, Thorax, Nuclear and Breast. The examination will test knowledge and comprehension of radiological anatomy, pathophysiology, imaging indications and protocols as well as imaging diagnosis. In general, the Essentials Examination is based on the material in this study guide. However, not all the material in the guide is included on every form of the examination. Items that are not included in this study guide may appear on the examination.

If you are reviewing this in printed format, please be sure to check the ABR website, www.theabr.org, for updated study guide materials and questions.

- Abdomen
 - Abdominal Vascular
 - Abdominal vascular variance
 - Aortic aneurysm/inflammatory aneurysm
 - Aortic dissection / other dissection, e.g., renal artery
 - Aortic rupture
 - Inferior vena cava filter
 - Pseudoaneurysms
 - Renal artery stenosis
 - Vasculitis
- Adrenal
 - Adrenal Hemorrhage
 - Benign vs. Malignant Neoplasm
 - Gastrointestinal
 - Appendicitis
 - Blunt/penetrating trauma
 - Bowel-containing hernias

- Bowel ischemia/pneumatosis
 - Bowel obstruction
 - Diverticulitis
 - Epiploic appendagitis
 - Gallstone ileus
 - GI tumor
 - Infection – e.g., *C. difficile*
 - Inflammatory bowel disease
 - Intussusception
 - Malrotation
 - Shock bowel
 - Volvulus – gastric/colonic/small bowel
- Hepatobiliary
 - Benign disease as mimic of metastatic disease
 - Benign vs. malignant gallbladder disease
 - Cholangiocarcinoma
 - Cholelithiasis, cholecystitis, choledocholithiasis
 - Cirrhosis/portal hypertension/hepatocellular carcinoma
 - Hepatic abscess
 - Metastatic disease
 - Trauma – lacerations/contusion/rupture
 - Hepatitis
- Mesentery, Peritoneum, Retroperitoneum
 - Omental infarct
 - Peritoneal carcinomatosis
 - Retroperitoneal hemorrhage
 - Trauma – mesenteric hematoma
- Pancreas
 - Pancreatitis (abscess, pseudocyst)
 - Pancreatic neoplasm
 - Pancreatic trauma
- Spleen
 - Trauma/rupture
- Urinary Tract
 - Bladder trauma
 - Hydronephrosis
 - Pyelonephritis/emphysematous pyelonephritis/pyelitis
 - Renal abscess
 - Renal neoplasm
 - Renal transplant complications
 - Renal trauma
 - Stone disease
- Cardiovascular
 - Aorta
 - Aneurysm
 - Dissection

- Intramural hematoma
- Heart
 - Congestive heart failure
 - Pericardial effusion and tamponade
 - Valvular heart disease
- Technique-Related
 - Aortic and thoracic vascular imaging protocols
 - CT, MR, and nuclear radiology cardiac imaging protocols
 - Tubes and lines
- Central Nervous System
 - Brain and Its Coverings
 - Brain herniations
 - Epidural hematoma
 - Primary brain tumor including glioblastoma
 - Headache
 - Hydrocephalus
 - Infarction (arterial, venous)
 - Infection (cerebral abscess, subdural empyema, epidural abscess)
 - Intracranial tumors
 - Intraparenchymal hematoma (e.g., hypertensive)
 - Metastases
 - Nonaccidental trauma (especially child abuse)
 - Skull fracture
 - Subarachnoid hemorrhage
 - Subdural hematoma
 - Toxic/metabolic
 - Spinal Cord
 - Disk herniation
 - Spinal cord compression (especially acute)
 - Trauma (contusion, hemorrhage, epidural hematoma)
 - Technique-Related
 - CT physics – window & leveling, artifacts, diagnosis
 - MR sequencing (for diagnosis of stroke, etc.)
 - Protocol: when to add contrast to CT
 - Protocol: when to use unenhanced CT
 - Protocol: when to add contrast to MRI
 - Protocol: when to pick MRI over CT
 - Clinical Presentations
 - Abdominal pain
 - Back pain
 - Chest pain
 - GI bleeding
 - Headache
 - Hematuria
 - Hemoptysis
 - Trauma

- Gynecological, Genitourinary
 - Female Conditions
 - Benign vs. malignant ovarian masses/cysts
 - Ectopic pregnancy
 - Hydrosalpinx
 - Ovarian torsion
 - Pelvic inflammatory disease/tubo-ovarian abscess
 - Placental abnormalities
 - Retained products of conception
 - Uterine neoplasm
 - Male Conditions
 - Benign vs. malignant testicular lesions
 - Orchitis/epididymitis
 - Testicular trauma
- Head & Neck
 - Airway Compromise
 - Facial Fractures
 - Infections (abscess, cellulitis, epiglottitis)
 - Intraorbital Masses
 - Lymphadenopathy
 - Orbital Infections
 - Sinusitis (acute, chronic, complications)
 - Soft Tissue Injuries (hemorrhage, globe injuries)
 - CT Protocols for Face and Neck Trauma/Emergencies
 - Vascular Compromise, Vascular Injuries
- Multi-System Diseases
 - Atherosclerosis
 - Connective Tissue
 - Diabetes
 - HIV/AIDS
 - Iatrogenic Complications
 - Infection
 - Long-term & acute complications of chemotherapy/radiation therapy
 - Smoking
 - Substance Abuse
 - Tuberculosis
- Musculoskeletal (MSK)
 - General MSK Traumatic Conditions
 - Compartment syndrome
 - Insufficiency fractures
 - Patterns of sports injuries
- MSK Infections/Inflammations
 - Discitis
 - Diabetic Foot—Neuropathy vs. Infection
 - Necrotizing Fasciitis
 - Osteomyelitis—Acute, Chronic

- Tuberculosis
- MSK Neoplasms
 - Benign vs. Malignant
 - Indications for CT, MRI, PET, PET/CT
 - Indolent vs. Aggressive
 - Primary vs. Metastatic
- Technique-Related
 - CT and MRI protocols for suspected extremity/pelvic injuries
 - CT and MRI protocols for suspected spine injury
- Other MSK Conditions
 - Arthritis
 - Avascular Necrosis
 - Collagen Vascular Diseases
 - Developmental/Anatomic Variants
 - Iatrogenic/Postoperative
 - Arthroplasty (complications, loosening, motion)
 - Hardware failure
 - Low Back Pain
 - Indications for imaging
 - Imaging protocols (radiographs, CT, MRI)
 - Osteoporosis
 - Spondylolisthesis—Classification, Grading, Dynamic Studies
- Trauma
 - Cervical Spine
 - Cervical spine common fractures/dislocations
 - ❖ C1 burst
 - ❖ Compression
 - ❖ Facet subluxation/dislocation
 - ❖ Occipital condyle
 - ❖ Odontoid
 - Clinical criteria for cervical spine trauma imaging
 - ❖ Canadian Spine Rules
 - ❖ NEXUS criteria
 - Indications for CT, MRI, CT arteriography
 - Indications for radiographic examination
 - Mechanism: flexion vs. extension injuries
 - Lower Extremity
 - Ankle
 - ❖ Fracture types
 - Knee
 - ❖ Indications for CT and MRI
 - ❖ MRI of anterior cruciate ligament, meniscus injuries
 - ❖ Patellar subluxation, patellar fractures
 - ❖ Radiographic findings of trauma
 - ❖ Tibial plateau fractures/ intercondylar injuries
 - ❖ Role of CT and MRI

- Foot
 - ❖ Lisfranc fracture
- Hip
 - ❖ Indications for CT, MRI
 - ❖ Radiographic positioning for hip trauma
 - ❖ Risks for avascular necrosis
 - ❖ Trochanteric avulsions
 - ❖ Types of hip fractures
- Other Lower Extremity
 - ❖ Calcaneal fractures and associated injuries
 - ❖ Maisonneuve recognition
 - ❖ Talar dome and talar waist fractures, avascular necrosis risks
- Pelvis
 - ❖ Define anterior and posterior columns
 - ❖ Femoral head dislocation
 - ❖ Indications for CT and MRI
 - ❖ Mechanisms of injury
 - ❖ Patterns of injury
 - Vertical shear, compression, open book
 - ❖ Pelvic-ring trauma
 - ❖ Sacral fractures, sacroiliac joint disruption
- Thoracolumbar Spine
 - ❖ Acute vs. chronic
 - ❖ Burst fractures
 - ❖ Chance fractures
 - Facet subluxations/dislocations
 - Indications for thoracolumbar spine imaging
- Upper Extremity
 - Clavicle
 - ❖ Sternoclavicular dislocation
 - Elbow
 - ❖ Imaging protocols
 - Radial head-capitulum views
 - ❖ Location of fractures by age/mechanism of injury (Peds)
 - ❖ Olecranon fracture (Galeazzi & Monteggia)
 - ❖ Radial head fracture,
 - ❖ Supracondylar fracture
 - Shoulder
 - ❖ Dislocations
 - ❖ Fractures
 - ❖ Imaging protocols (radiographs, CT, MRI)
 - ❖ Indications for CT and MRI
 - Wrist
 - ❖ Carpal fractures - scaphoid
- Pediatric Radiology
 - Abdomen/Pelvis

- Appendicitis – ultrasound CT
 - Bowel obstruction
 - Hypoperfusion complex
 - Intussusception
 - Malrotation
 - Pregnancy
 - Wilms, Ewing, neuroblastoma
 - Testicular torsion/epididymitis
- Airway Emergencies
 - Epiglottitis & croup
 - Foreign body aspiration
 - Retropharyngeal abscess
- Central Nervous System
 - Hypoxic/ischemic injury
 - Increased intracranial pressure – hydrocephalus
 - Mastoiditis/meningitis
 - Skull fracture
- Chest
 - Pneumomediastinum
 - Pneumothorax
 - Round pneumonia
 - Thymus
- Child Abuse
 - CNS trauma
 - Skeletal trauma
 - Soft tissue trauma
- General Pediatric Considerations
 - Congenital disorders
 - Developmental dysplasia of hip
 - Informed consent
 - Radiation protection/dose reduction/ALARA
 - Sedation/monitoring
 - VACTERL association
- MSK
 - Developmental/anatomic variants
- Skeletal
 - Discitis
 - Elbow fracture/dislocation
 - Osteomyelitis
 - Salter-Harris injury
 - Septic joint
 - Slipped capital femoral epiphysis
- Spine (See also MSK section)
 - Cervical Spine Fractures/Dislocations
 - Congenital/developmental pathology:
 - Arnold-Chiari malformations, spina bifida

- Infections:
 - Discitis
 - Osteomyelitis
- Primary and Metastatic Neoplasms
- Technique-Related:
 - CT protocols for spine trauma/emergencies
 - MRI protocols for spine trauma/emergencies
- Thoracic and Lumbar Spine Fractures/Dislocations
- Thorax
 - Airway Conditions
 - Bronchiectasis
 - Foreign body
 - Small airway disease
 - Tracheal pathology
 - Anatomy and Normal Variants
 - Airways
 - Aorta
 - Chest Trauma
 - Aorta
 - Heart
 - Lungs
 - Skeleton (flail chest, thoracic spine fracture on portable chest film)
 - Intensive Care Chest Radiographs
 - Catheters, tubes, monitor
 - Interstitial Pulmonary Disease
 - Idiopathic interstitial pneumonias
 - Pneumoconiosis
 - Sarcoidosis
 - Signs & patterns – high-resolution CT
 - Smoking-related interstitial lung disease
 - Lobar Atelectasis
 - Lung Mass, Pulmonary Nodules
 - Benign tumors
 - Malignant tumors
 - Neoplasm management
 - Solitary & multiple pulmonary nodules
 - Mediastinum
 - Infection
 - Masses
 - Pneumomediastinum
 - Pulmonary Vasculature
 - Arterial venous malformations
 - Pulmonary embolism
 - Shunts
 - Pulmonary edema
 - Pleural Disease

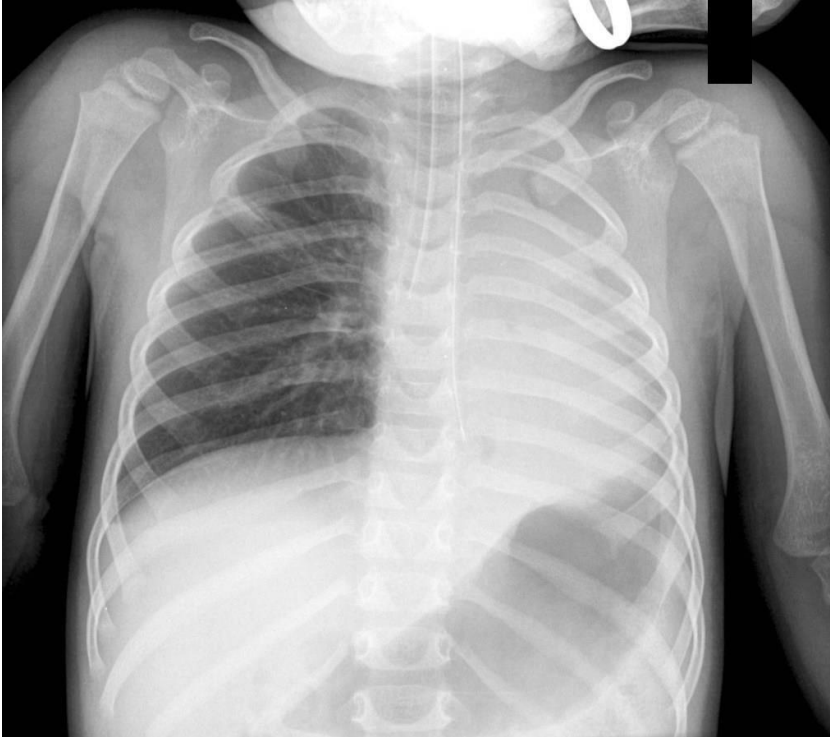
- Empyema
 - Hemothorax
 - Pneumothorax
 - Pleural effusion
 - Tumors
- Pulmonary Infections
 - Lung abscess
 - Pneumonia
 - Tuberculosis
- Technique-Related
 - Airway imaging
 - CT protocols for the thorax
 - Interstitial lung disease protocols
 - Pulmonary embolism protocols
- Nuclear
 - Interpretation
 - Bone scans
 - Renal scans
 - PET scans
 - Ventilation-perfusion scans
 - Hepatobiliary scans
 - Bleeding scans
 - Brain death
 - Thyroid
 - Cardiac
 - White cell scans
 - Sentinel nodes
 - Management & Methodology
 - Patient preparation
 - Radiopharmaceuticals
 - Protocols
 - Nonradioactive pharmaceuticals
 - Hardware and software
 - Risk
 - Radiation exposure to patients
 - Radiation exposure to public and staff
 - Quality Assurance
- Breast
 - Interpretation
 - Spiculated masses (mammography, MRI, ultrasound)
 - Architectural distortion (mammography)
 - Fibroadenomas (mammography, MRI, ultrasound)
 - Cysts (mammography, MRI, ultrasound)
 - Inflammatory breast cancer and other causes
 - Skin thickening, e.g., mastitis (mammography)
 - Malignant calcifications (mammography)

- Benign calcifications (e.g., fibroadenoma, skin, milk of calcium, fat necrosis, oil cysts) (mammography)
- Fat-containing masses (mammography)
- Nodes (mammography and ultrasound, benign and malignant)
- Postsurgical breast (mammography)
- Gynecomastia (mammography, ultrasound)
- Implants (mammography, ultrasound, MRI)
- Basic quality assurance of inadequate studies
- Management
 - High risk screening guidelines
 - Low risk screening guidelines
 - Image negative palpable mass
 - Palpable masses
 - Cat lesions
 - Significance of change and stability (high and low risk lesions)
 - Mastitis
 - Indications for core (stereotactic, ultrasound, MRI) versus surgical biopsy
 - Management of nonconcordant core biopsy results
- Risk
 - Radiation dose from mammography
 - Breast MRI risk (contrast, metal, etc.)
 - Procedural risk
- Terminology and methodology
 - Meaning of BI-RADS categories
 - Basic BI-RADS lexicon (mammography)
 - Views and positioning and screening and common diagnostic
 - MQSA – common regulations

SAMPLE QUESTIONS

Case 1

A 22-month-old girl with a seizure disorder is found unresponsive. She is intubated and a nasogastric tube is placed by emergency medical technicians in the field. She is taken to the emergency department, where a chest radiograph is obtained. What is the most likely diagnosis?



- A) Congenital absence of the left lung
- B) Massive left pleural effusion
- C) Collapse of the left lung *Key
- D) Large left thoracic neoplasm

BLOCK

What is the most likely cause of the left lung collapse?

- A) Intubation of the right bronchus *Key
- B) Aspirated foreign body
- C) Mucus plug
- D) Nasogastric tube in the left bronchus

Case 2

A 51-year-old man with no significant medical history presents with neck swelling. On physical examination, there appear to be many bilateral neck masses. According to the ACR Appropriateness Criteria, what is the most appropriate next step?

- A) CT scan of the neck with IV contrast *Key
- B) CT scan of the neck without IV contrast
- C) MRI of the neck with IV contrast
- D) MRI of the neck without IV contrast

BLOCK

ACT scan of the neck with IV contrast is performed. What is the most likely etiology of the bilateral neck masses?



- A) Arteries
- B) Lymph nodes *Key
- C) Muscles
- D) Nerves
- E) Veins

BLOCK

What is the most likely diagnosis?

BLOCK

- A) Lymphoma *Key
- B) Lung cancer metastases
- C) Tuberculosis
- D) Reactive adenopathy

After history, physical examination, and relevant bloods work, what is the most appropriate next step in management?

- A) MRI scan
- B) Follow-up CT scan in 3 months
- C) Lymph node biopsy *Key
- D) Clinical follow-up

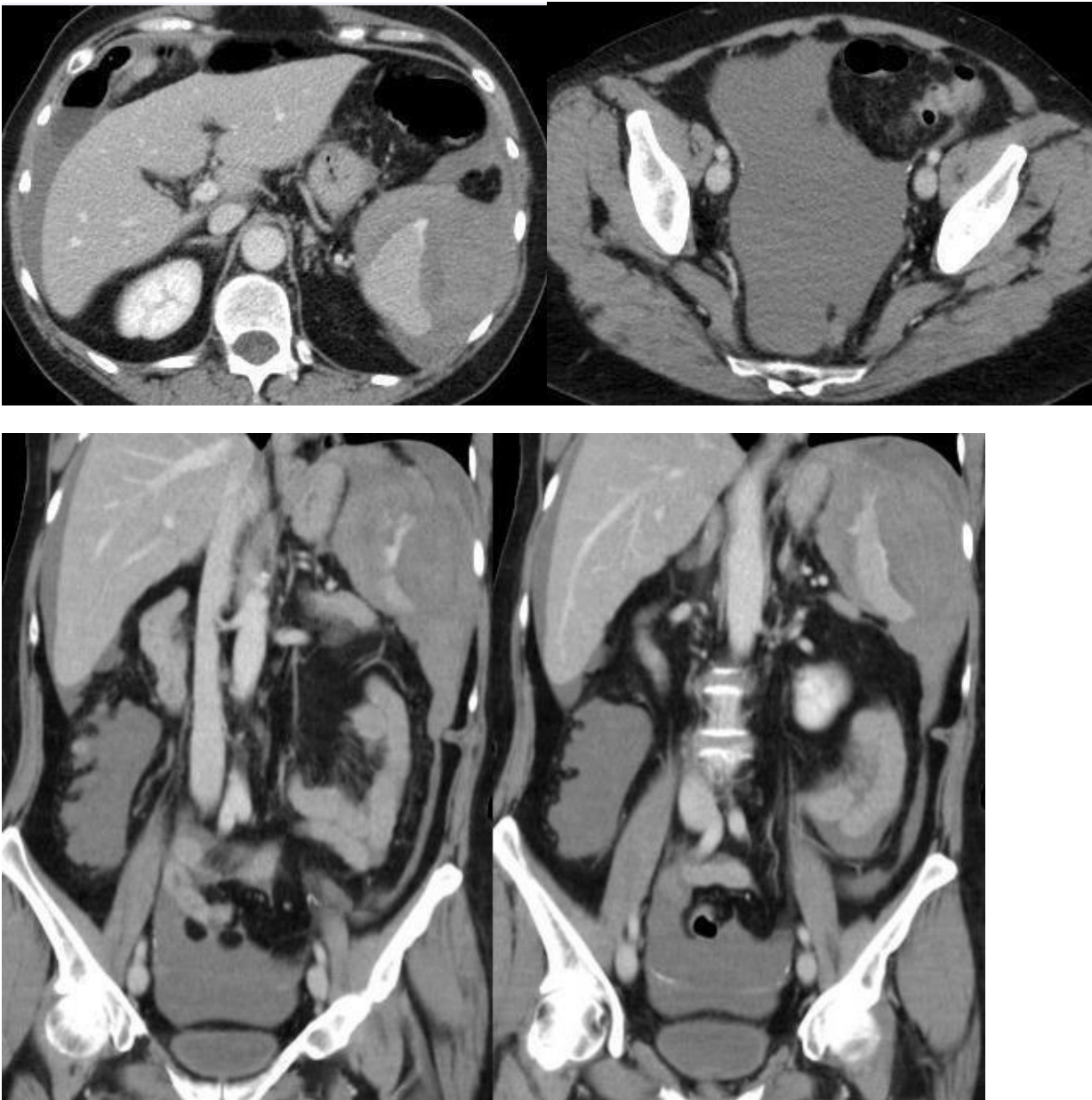
Case 3

A 73-year-old man presents to the emergency department with abdominal pain and nausea 1 day after a colonoscopy. A supine abdominal radiograph is obtained and appears to be normal. What is the most appropriate next imaging examination?

- A) CT scan *Key
- B) Left-side down lateral decubitus radiograph
- C) Ultrasound
- D) Water-soluble contrast enema

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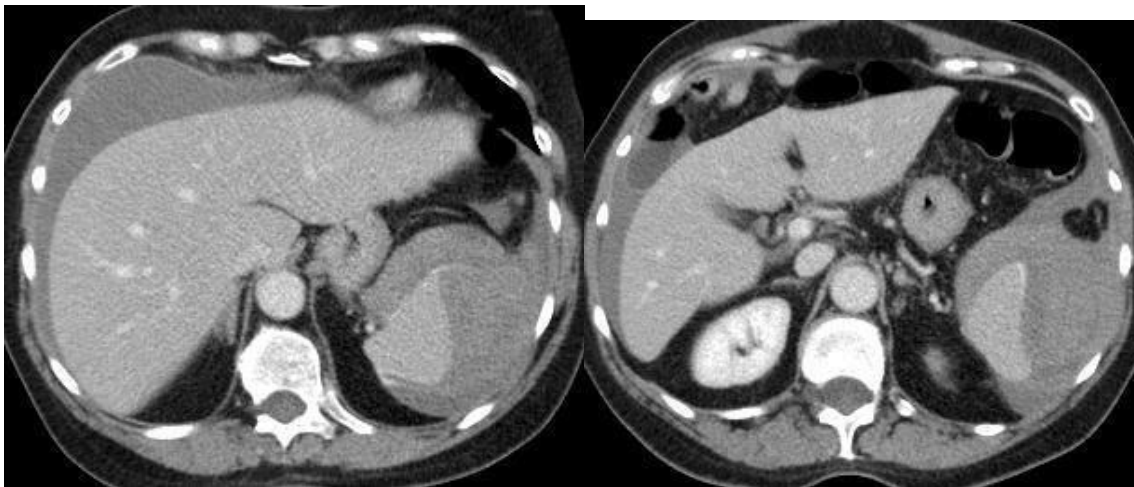
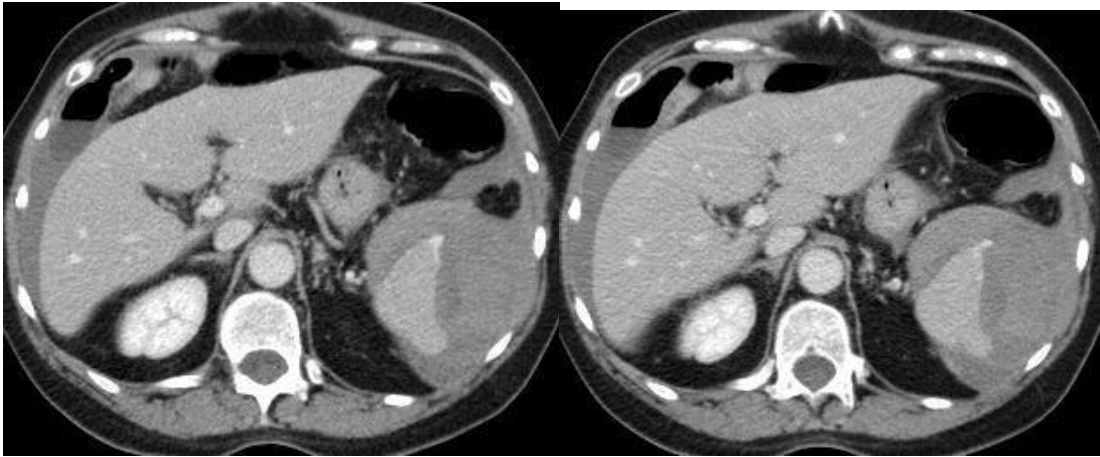
A contrast-enhanced CT scan is performed. What is the most likely diagnosis?



- A) Bowel perforation
- B) Hemorrhagic neoplasm
- C) Mesenteric tear
- D) Splenic injury *Key

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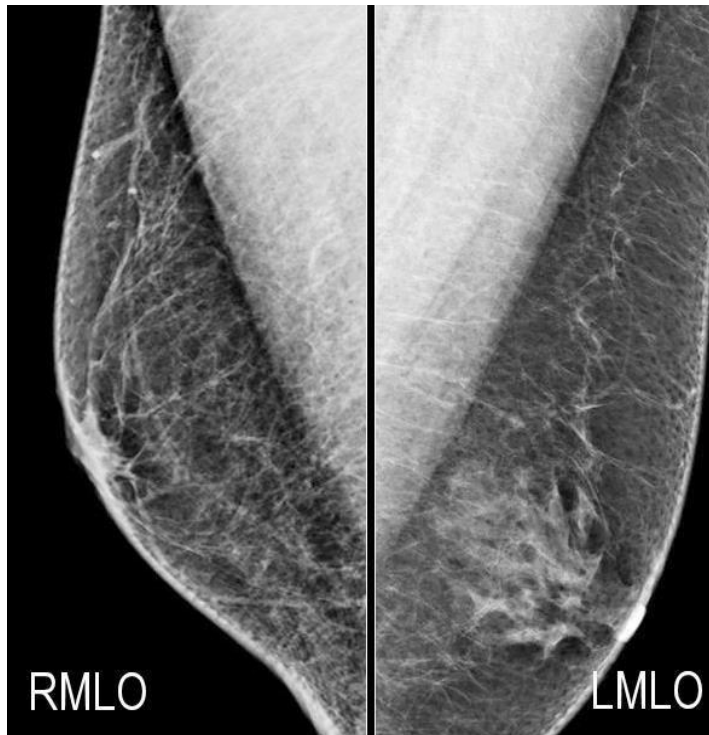
What does the high attenuation along the periphery of the spleen indicate?



- A) Active hemorrhage *key
- B) Arteriovenous fistula
- C) Capsular hyperemia
- D) Sentinel clot

Case 4

A 45-year-old man presents with a palpable left breast mass. He is referred for bilateral mammography. What is the most likely diagnosis?



- A) Cyst
- B) Breast cancer
- C) Fat necrosis
- D) Gynecomastia *key
- E) Hematoma