Brant & Helms: Abdomen

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Thanks to Travis Caton, Shanna Matalon, and Asha Sarma, MD for previous drafts

Logistics

- Arrive early. Conference is 7:30am sharp. Your presence/absence is noted.
- Resources:
 - SharePoint Site
 - Protocol worksheets
 - Phone sheet
- Distribute calls/protocols as evenly as possible.
- Do not pick studies up that come in after 4:30 pm.
- Read out before 4:30 pm ideally.

Advice

- Learn what you can about protocolling but don't make it your life.
- Make attempt at distributing calls equitably.
- Leave as soon as you're read out. You need to study.
- Take as many CTs as possible. 10 by the end is not unreasonable, but don't beat yourself up if you don't reach this. You will eventually.

Outline

- CT abdomen basics (type of study/phase of contrast)
- Approach to taking a case
 - Learning a search pattern/approach
 - Organs
 - normal descriptions
 - summary of common pathology
- Cases!

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Approach to taking a Case

- 1. Modality and Protocol
 - CT? phase of contrast?
- 2. Abnormal organ
 - Consider "organ specific" diseases
 - Consider diffuse process
- 3. Consider absent organ (what should be there?)
- 4. Description
 - Shape, contour, attenuation (hyper/hypo/mixed), enhancement patterns, associated findings

Timing and Phase

Timing after administration of IV contrast depends on focus of study Multiple phases are possible Three most common in abdomen: Arterial (~40 seconds) Portal / Parenchymal (~70 seconds) Excretory (5-15 minutes)

How to Determine Phase













Wild cards when you're stuck: Lymphoma, Sarcoidosis, Tuberculosis, Melanoma

Approach to CT Abdomen

Approach to reading an Abdomen CT

- BWH standardized reporting:
 - Lower chest (lungs, pleura, pericardium, esophagus, heart)
 - Liver (size, contour, focal lesions)
 - Biliary System (intra- and extra-hepatic ducts)
 - Spleen
 - Pancreas (duct, parenchyma)
 - Adrenal glands (focal vs diffuse)
 - Bowel (diameter, wall)
 - Mesentery, omentum, and peritoneum (nodes, nodularity, free fluid/air)
 - Retroperitoneum (nodes, mass, free fluid/blood)
 - Lymph nodes
 - Vasculature (use your reformats!, don't forget portal system)
 - Pelvic organs (M vs F, free fluid)
 - Bones and soft tissues

Lets Run through the "Organs"

- Normal
- Examples of Focal/Multifocal Process
- Examples of Diffuse Processes

Disclaimer: By NO means a complete list, but should be a great start to what to put in your: "Oh, I've heard of that" bank

Lower chest

- Lungs (nodules, atelectasis)
- Pleura (effusion)
- Pericardium (effusion/hemopericardium)
- Esophagus (hernia, thickening, mass)
- Aorta (atherosclerosis, aneurysm)
- Heart (coronaries, size, clot)



Case 1





Case 1





Case 2



Liver



- Smooth margins
- Enhances homogenously on portal phase
- Equal or greater attenuation than spleen





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PORTAL VEIN

DDx: Focal versus diffuse

Focal

- Cyst
- Adenoma
- Hemangioma
- Focal nodular hyperplasia
- Focal fat / focal sparing
- Abscess
- Neoplasm
 - Met
 - Primary (HCC, cholangio)

Diffuse

- Cysts / biliary hamartomas
- Neoplasm
- Abscess / microabscess
- Neoplasm
 - Met
 - Primary
- Infiltrative
 - Steatosis
 - Iron overload
 - Wilson's disease









Gallbladder/Biliary tree

Size

Contents (fluid, stones, contrast excretion) Wall

Surrounding fluid/stranding

Biliary tree (extrahepatic, intrahepatic) is inconspicuous unless filled with fluid (dilated) or air (pneumobilia)





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Ddx: Gallbladder Processes

Focal

- Gallbladder carcinoma
- Mets (melanoma)
- Adenomyomatosis/polyps (US)

Diffuse

- Gallbladder wall thickening
 - Cholecystitis
 - Hepatitis
 - Anasarca / CHF / renal failure
 - Low protein states
- Porcelain gallbladder

Ddx: Biliary Processes

Extrahepatic

-choledocholithiasis -pancreatic head mass

Intrahepatic

-Pneumobilia

- -PSC (sclerosing cholangitis)' -PBC
- -Obstruction (ex: metastatic)

-Cystadenoma

**ddx periportal edema

Both/Either

-Pneumobilia-Distal obstruction-Choledochal cysts-Cholangitis



Case 6









Normal Pancreas

Homogenous Pancreatic duct not visible (<3 mm) Fatty replacement occurs with age – "feathery" No surrounding fat stranding or fluid



Uncinate \rightarrow Head \rightarrow Neck \rightarrow Body \rightarrow Tail

Ddx: Pancreatic

Focal/Multifocal

- Pancreatic adenocarcinoma
- Neuroendocrine tumor
- Mets
- Serous cystic neoplasm
- Mucinous cystic neoplasm
- SPEN
- IPMN
- Pancreatitis (focal form)
- pseudocyst

Diffuse

- Fatty atrophy (age, obesity, CF, steroids, lipomatous pseudohypertrophy)
- Pancreatitis (assess for cause!)
- Calficiations (chronic pancreatitis)

Case 8



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Normal Spleen

Heterogeneous enhancement on early arterial phase can mimic disease – "zebra stripe" pattern Homogenous on portal venous phase Assess size: normal is <14 cm in any dimension.





Ddx: Spleen

Focal/Multifocal

- Infectious (histoplasmosis, candida)
- Infarct
- Hemangioma
- Lymphangioma
- Cyst
- Mets
- Primary neoplasm (rare)

Diffuse

- Splenomegaly
 - Portal hypertension
 - Myeloproliferative disorder
 - Infection (mono, HIV)
- Shrunken
 - Sickle Cell (autosplenectomy)

Case 10



Normal Stomach Rugae Relatively thin wall Decompression causes thickening









Ddx: Stomach

Focal/Multifocal

- Hernia
- Diverticulum
- Mass
 - Adenocarcinoma
 - Leiomyoma
 - GIST
 - Lipoma

Diffuse

- Gastritis
- Linitis plastica
- Lymphoma

Normal Small Bowel

Thin walls with valvulae conniventes Jejunum (more freq) Ileum (less freq) Mild wall enhancement Less than 3 cm in diameter





Barium/Gastrografin/omnipaque

Ddx: Small bowel

Focal/Multifocal

- Diverticulum
- Duodenal ulcer
- Neoplasm
 - Carcinoid
 - GIST
 - Adenocarcinoma
- Lipoma

Diffuse

- Crohn's (stenosis, mucosal hyperenhancement)
- Obstruction
 - Adhesions
 - Hernia
 - Mass
 - Intusseception
 - **closed loop
- lleus
- Ischemia
- Graft-vs-Host disease (GVHD)
- enteritis

Case 11





Case 12



Normal Colon

Haustra

Don't go all the way across the bowel Thin walls (thicker if decompressed) Periphery MPR very useful for "running bowel" Diameter <6 cm, 9 cm cecum

Ddx: Colon

Focal/Multifocal

- Diverticulosis
- Diverticulitis
- Hamartomas
- Appendicitis
- Epiploic appendagitis
- Lipoma
- Increased submucosal fat
- Lymphoma

Diffuse

- Colitis
 - IBD
 - Ischemic
 - Infectious
 - Pseudomembranous
 - Typhlitis (neutropenic/R colon)

Case 13



Normal Appendix, lleocecal valve

Look at cecum to find appendix. Also look for nearby ileocecal valve to locate terminal ileum (Crohns, Meckel's Diverticulum)

- Thin-walled blind ending tube, <6 mm diameter Multiplanar reformats helful
- If not easily found, check past surg. hx

Ddx: Appendix

Acute appendicitis:

- Luminal obstruction \rightarrow superinfection
- Distended, thick-walled, mucosal hyperenhancement, adjacent stranding.
 - > 6 mm is considered distended
 - +/- Appendicoliths
 - Look for free gas/abscess signs of perforation/complication
- Mucocele
 - pseudomyxoma peritonei
- Carcinoid





Case 14



Normal Kidneys

Similar sizes

Smooth contour

Enhancement pattern

Corticomedullary/early arterial – 40s (harder to detect lesions)

Parenchymal/portal venous – 70 (best time to detect lesions)

Excretory – 10-15 min (look for filling defects, wall irregularity, etc)

**should enhance symmetrically Use MPR, especially coronal



Kidneys Focal/Multifocal

Cysts: simple vs. complex Bosniak Classification PKD

Masses

RCC (subtypes) Oncocytoma Angiomyolipoma Urothelial carcinoma Mets Stone disease Infarction









Kidneys Diffuse

Pyelonephritis – patchy enhancement, striated nephrogram Hydronephrosis Always evaluate cause. Coronal or curved MPR useful to evaluate ureters Atrophy "Delayed nephrogram" "Persistent nephrogram" Lymphoma

Nephrocalcinosis

Adrenals Normal

Uniformly thin, V or Y shaped Left/right limb, isthmus MPR useful





DDx: Adrenal



Focal:

Masses:

- Adenoma <10 HU nonenhanced
- Adrenal carcinoma
- Mets (lung)
- Myelolipoma Calcifications
- Prior hemorrhage Infection:
- TB, histo

<u>Diffuse</u>:

Hyperplasia Hemorrhage

Lymphoma

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Other

Mesentery, omentum, peritoneum: fat should be uniformly black without stranding or nodularity.

- Fat stranding that indicates other processes
- Mesenteric panniculitis, sclerosing mesenteritis
- Omental cake, peritoneal nodules: ovarian, GI cancer *** coronal view best!
- Mesenteric masses
 - Carcinoid, desmoid
 - Epiploic appendagitis

Retroperitoneum

- Liposarcoma
- Retroperitoneal fibrosis
- Hematoma

Lymph nodes: Portal, mesenteric, retroperitoneal

- Lymphoma, mets, infection, sarcoid

Vasculature

- Aneurysms, varices, atherosclerotic disease, vasculitis, thrombosis etc...

Bones and soft tissues

- Fractures, masses/mets, hematoma, abscess (really can be anywhere), etc.



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Bonus case 3 (cont.)









