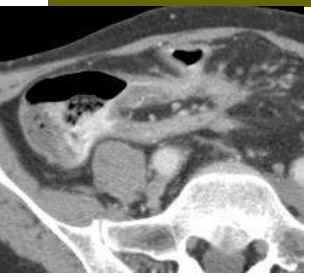
# The "-itis" Disorders: Acute Inflammatory Conditions of the GI Tract



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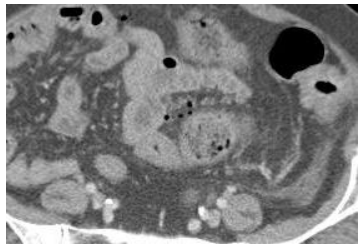

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# Objectives

- To overview the "-itis" disorders of the luminal and solid organs of the GI tract ("an 'itis' a minute… rowing down the alimentary canal")
- To review the CT findings of these common acute inflammatory conditions, using representative case material from my hybrid university/community hospital radiology practice (and a few cases from my colleagues)
- To briefly review the CT protocol options for imaging the acute abdomen

# General "-itis" CT protocol

- We still use positive oral contrast in *selected patients* (barium preparations, occasionally water-soluble contrast), although this is falling out of favor & we are eliminating in a variety of circumstances:
- - questionable yield, adds time, adds minor expense, may increase radiation exposure (if use with automated dose modulation), doesn't reach the RLQ in a substantial minority of patients, & may obscure subtle bowel wall pathology
- Decreased LOS by 97 min and time from order to CT by 66 minutes, in 2012 series; decreased LOS by 43 min in 2014 series, with no other negative effects
- Eliminate oral for SBO, and for suspected solid organ pathology and biliary pathology; increasingly eliminating at ED's discretion; use in peds./thin pts.

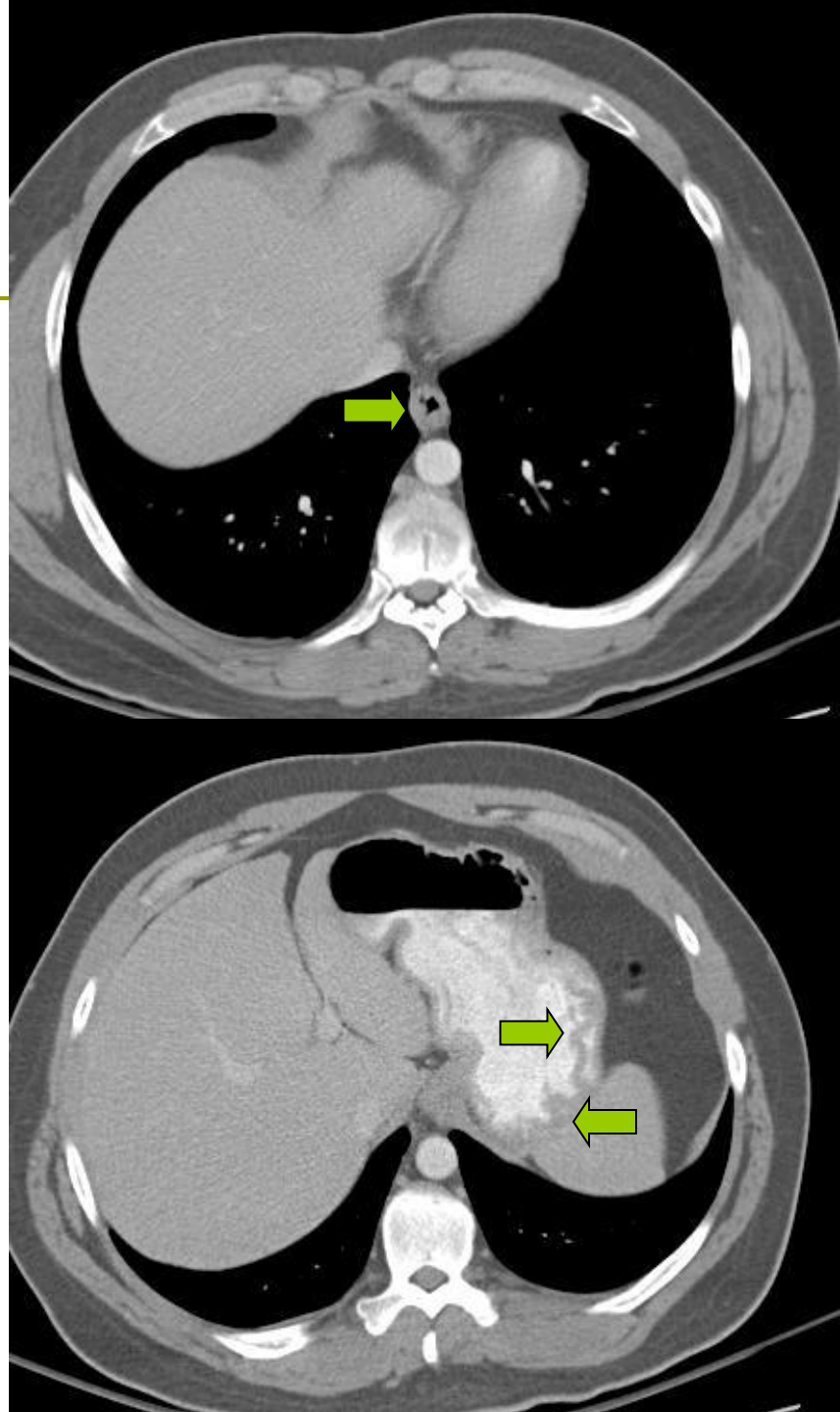
Levenson R et al. Emerg Radiol 2012; Wang et al. Eur J Radiol 2011; Schur et el. Emerg Radiol 2010; Winter T AJR 2010; Laituri et al. J Surg Res 2011; Anderson S et al. RCNA 2012; Razavi SA et al. Emerg Radiol 2014; Alabousi A et al. Can Rad Assoc J 2015; Kielar AZ et al. Emerg Radiol 2016; Hanna TN et al. Can Rad Assoc J

# General "-itis" CT protocol

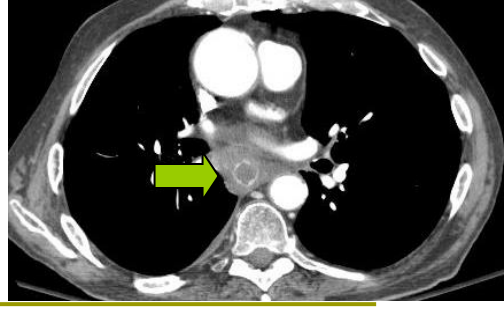
- IV contrast if possible (although a substantial minority of our population cannot receive it)
- Approximately 95- 100 cc of iohexol 300 (or iodixanol 320), usually at 2 to 2.5 cc/sec
- Acquire routine portal venous phase images
- Use routine radiation dose reduction strategies (iterative reconstruction, dose modulation, etc.)
- Protocols are modified for specific patient situations/clinical histories, in selected cases
- Reconstruct 3 mm images routinely; thinner images if needed
- Technologists routinely perform coronal & often sagittal reconstructions on 64+ MDCT scanners & send to PACS

# Esophagitis (& Gastritis)

- 27-year-old man with history of erosive esophagitis, now with nausea, vomiting, chills, & epigastric pain
- Mild non-specific distal esophageal wall thickening & mild thickening of rugal folds
- No periesophageal or perigastric inflammatory changes



# Esophagitis

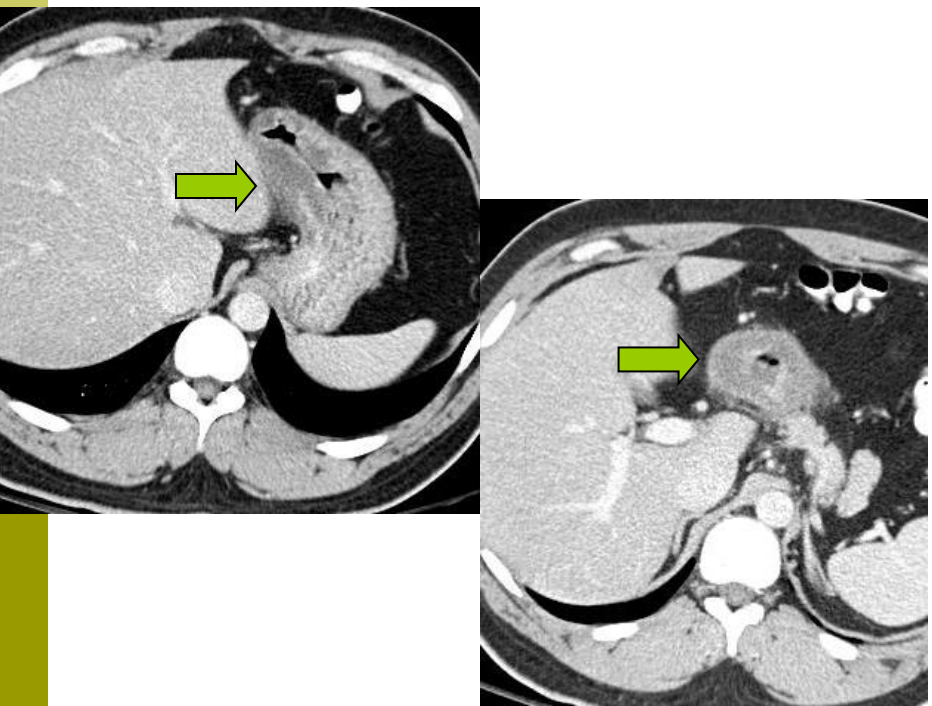


- CT - not the primary test for esophagitis
- Long segment of circumferential thickening +/- submucosal edema (target sign) relatively specific
- Ddx. includes reflux, medication-induced, radiation therapy, & infection (esp. in immunocompromised patients)
- Still very little in the imaging literature on CT – optimal protocol when a consideration? (IV; barium paste/effervescent crystals?)
- 29 pts. with dx.– 16 had CT findings (>5mm wall)
- May encounter unexpectedly on C/A CT in pt. with chest pain (e.g., 81-y.o. man on chemotherapy, rule out P.E.; has *Candida* esophagitis)

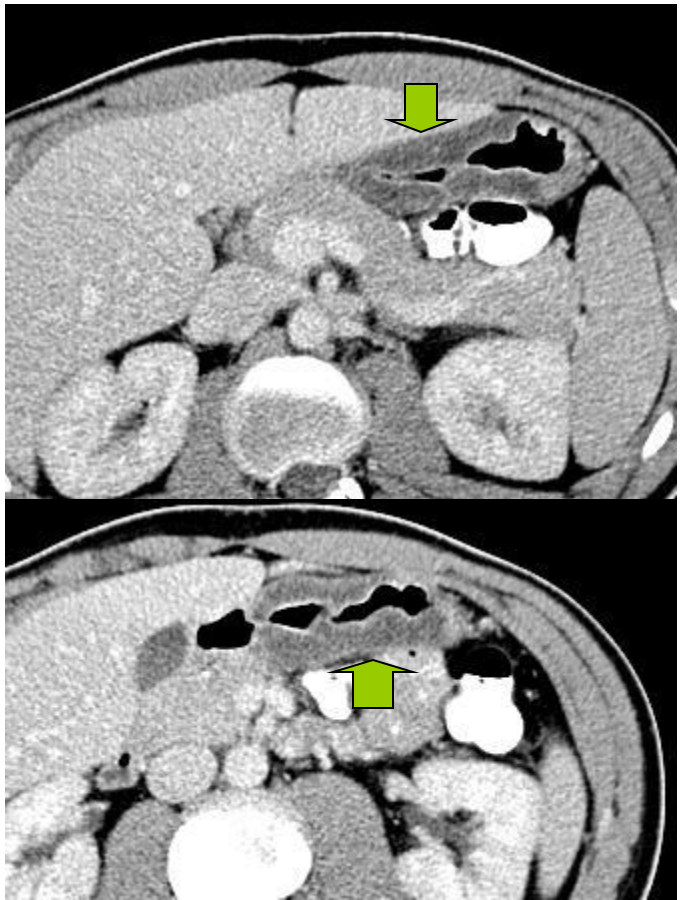
Berkovich et al. AJR 2000; Young et al. RadioGraphics 2008; Swenson Ultrasound Q 2012

# Gastritis

- 28-year-old man with upper abdominal pain
- Mid to distal gastritis evident, even without distension

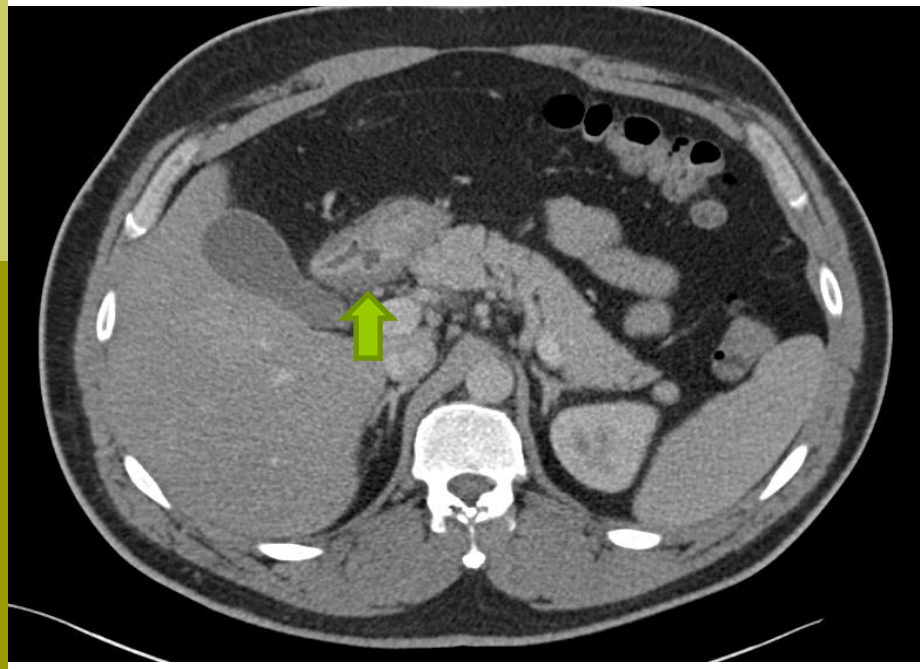


- 19-year-old male with left upper quadrant pain & mid to distal gastritis

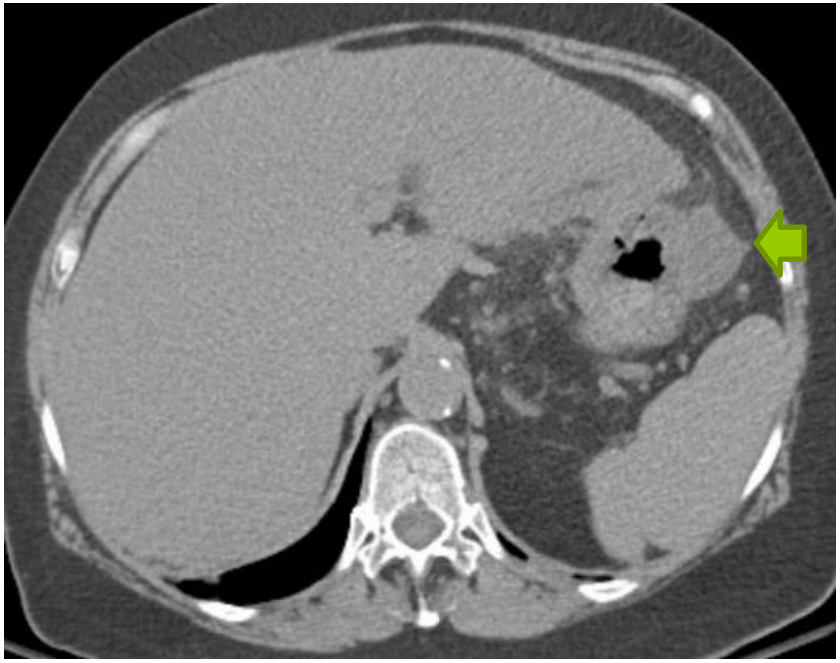


# Gastritis – Gastric ulcer

- 35-year-old man with abdominal pain, "r/o constipation" or obstruction (CT with IV contrast only) - unanticipated distal gastritis and ulcer



- 62-year-old woman on aspirin therapy & acute abdominal pain; non-contrast CT shows gastric ulcer with contained perforation



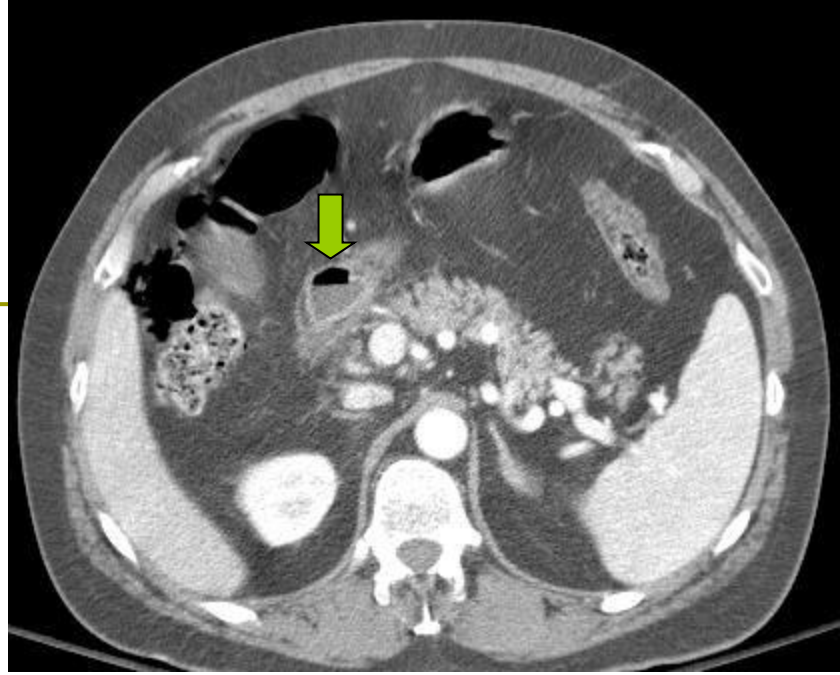
# Gastritis

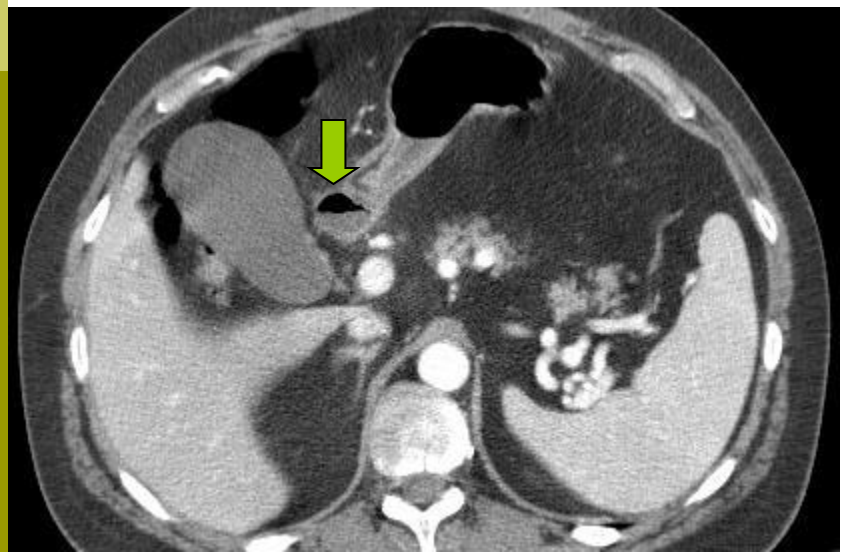
- Etiologies: *H. pylori*, aspirin/NSAIDs, EtOH, other medication, caustic ingestion, eosinophilic, granulomatous disease; can be focal or diffuse
- CT should not be used as the primary test, but may show gastritis in patients with non-specific complaints
- However, optimal CT evaluation would include good IV bolus + water or other neutral contrast agent +/- effervescent crystals, & prone/decubitus images as needed
- Wall thickening, increased mucosal enhancement, submucosal edema, & perigastric inflammation
- Wall thickening > 1 cm, esp. if eccentric/loss of architecture & in the appropriate patient – consider malignancy in the ddx.

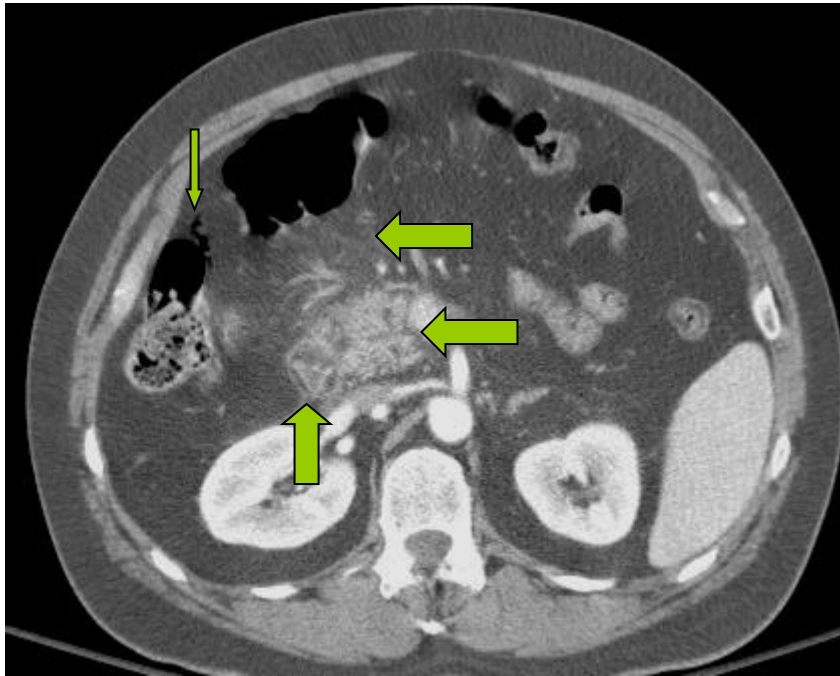
Horton et al. RG 2003; Ba-Ssalamah et al. RG 2003; Insko et al. Radiology 2003

# Duodenitis

- 51-year-old man with abdominal pain & pancreatitis on labs
- Proximal duodenal ulcer with duodenitis, small amount of free air, & secondary pancreatitis

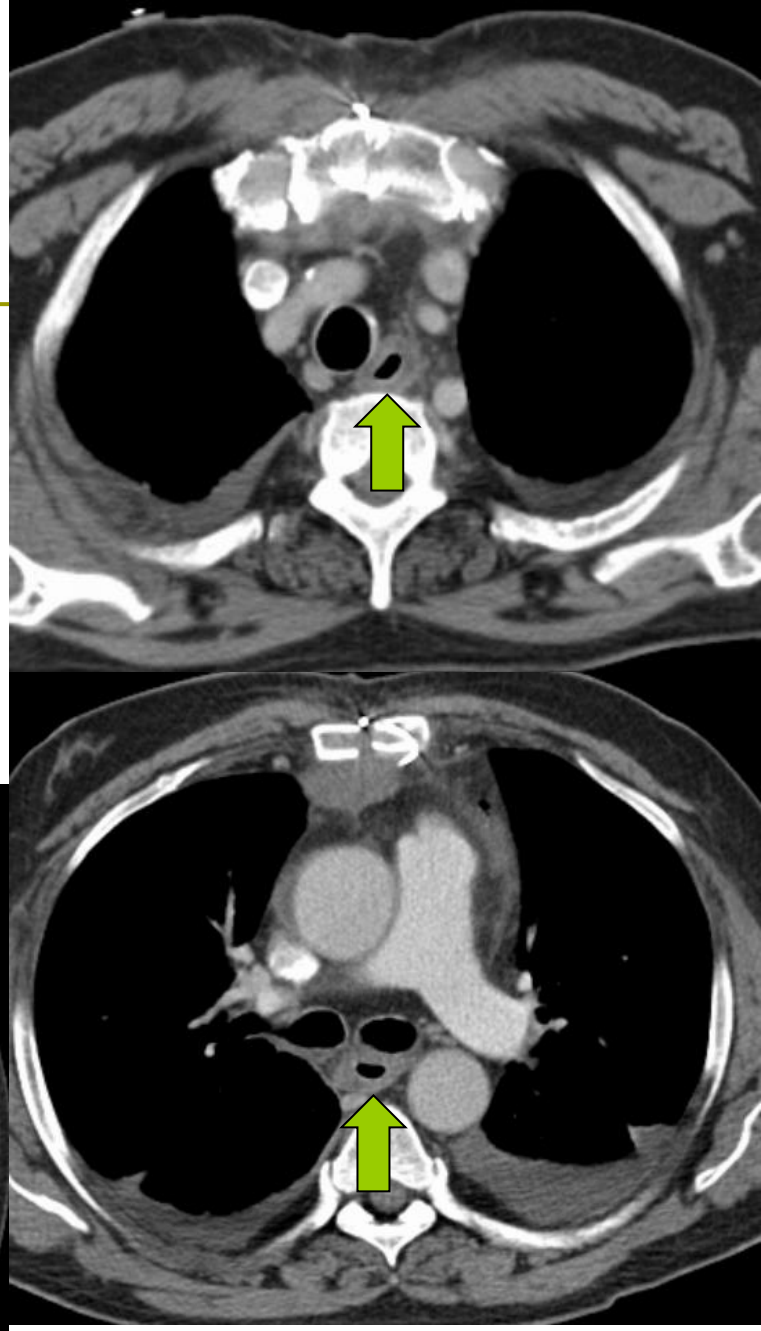


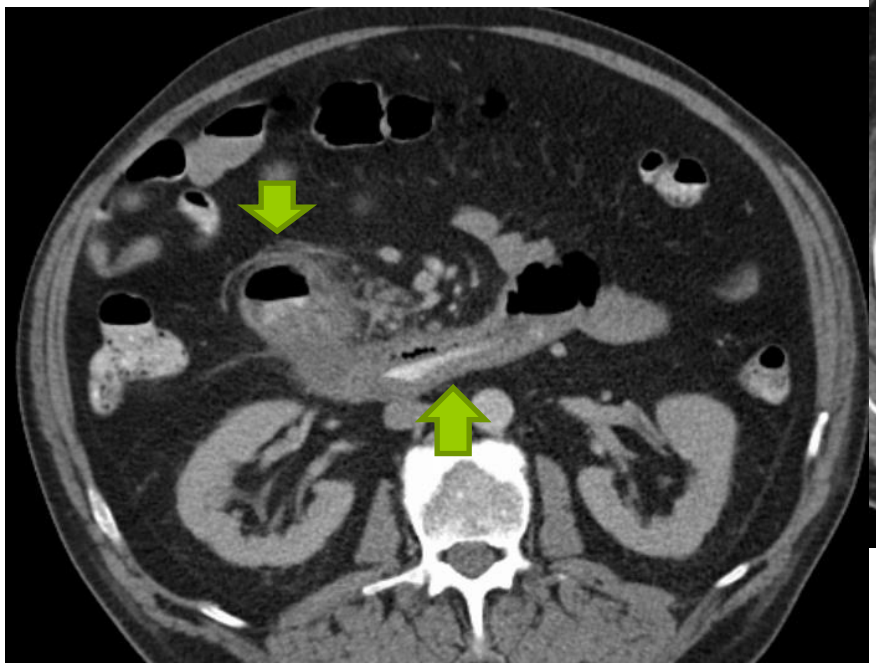




# Duodenitis and Esophagitis

- 68-year-old man with abdominal pain following recent mitral valve annuloplasty/sternotomy
- CT shows esophagitis and duodenitis; a specific etiology was not established





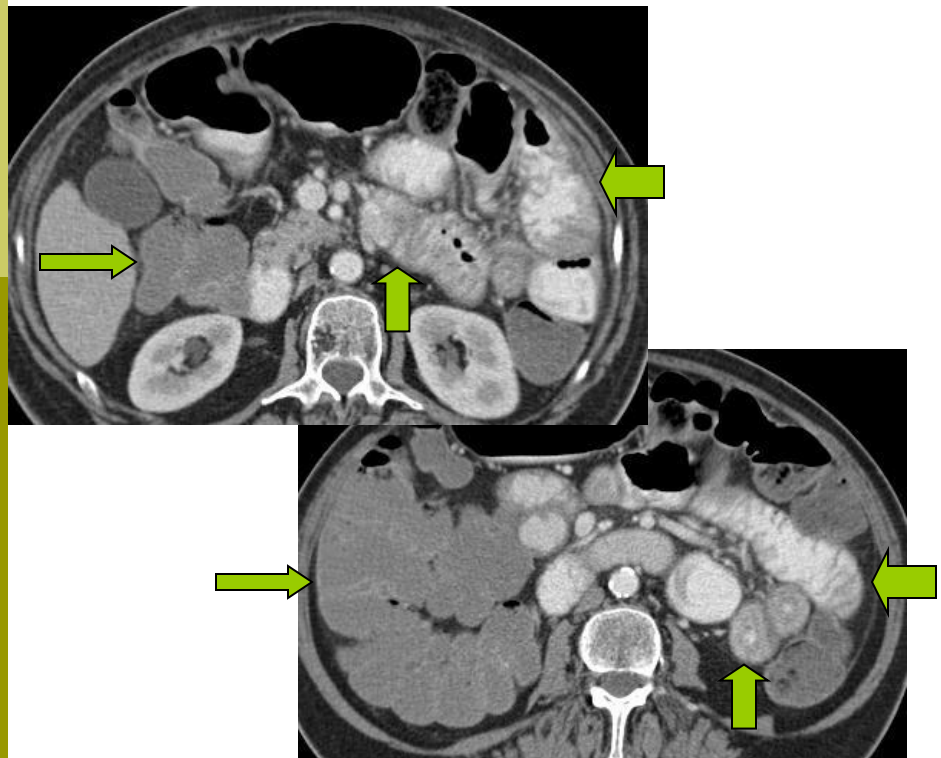
# Duodenitis/perforated duodenal ulcer

- Duodenitis: *H. pylori* infection, other infections, caustic ingestion, drugs, pancreatitis, Crohn disease, & radiation therapy (similar to gastritis)
- Usually non-specific duodenal wall edema; may also be part of a diffuse enteritis
- Duodenal ulcer – vast majority are bulbar; almost always benign
- Still occasionally see (unexpected) perforated duodenal ulcer on CT: ulcer itself when deep; fluid & inflammatory changes between duodenum & pancreatic head, wall thickening, increased wall enhancement; free air & oral contrast – intraperitoneal or retroperitoneal (with post-bulbar ulcer – typically into right anterior pararenal space)

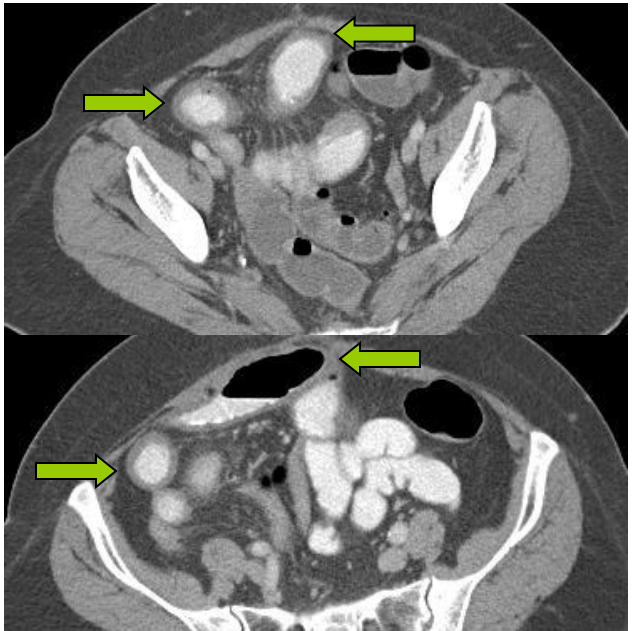
Ghekiere et al. JCAT 2007

# Jejunitis

- 76-year-old woman with abdominal pain; non-specific jejunitis
- Jejunal fold thickening & dilatation, & liquefied contents



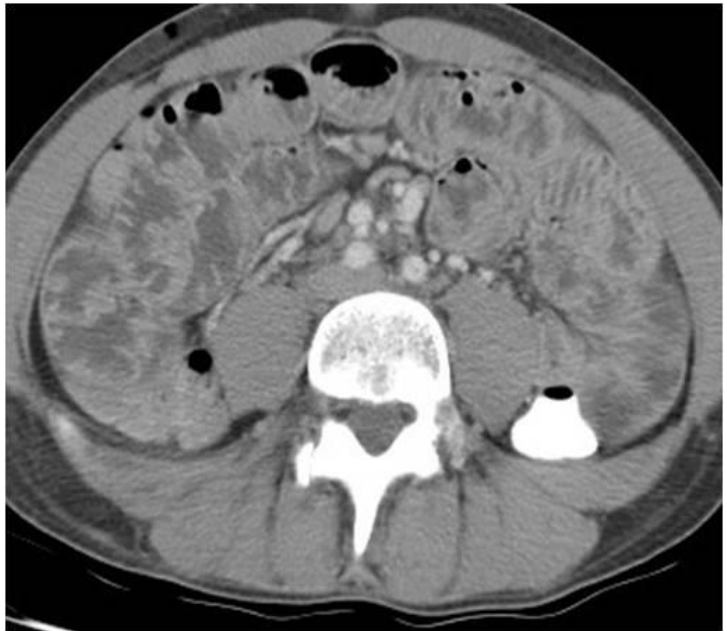
- 65-year-old woman with subacute abdominal pain & metastatic colon cancer
- CT shows distal jejunal & proximal ileal enteritis (chemotherapy vs. Crohn disease)



# Jejunitis

- Campylobacter enteritis: 49-year-old woman with abdominal pain and diarrhea; CT demonstrates extensive, diffuse jejunal thickening (case courtesy Dr. Christopher Schierey)

- Young adult man with endoscopically-proven eosinophilic gastroenteritis, and subacute abdominal pain
- There is diffuse SB fold thickening



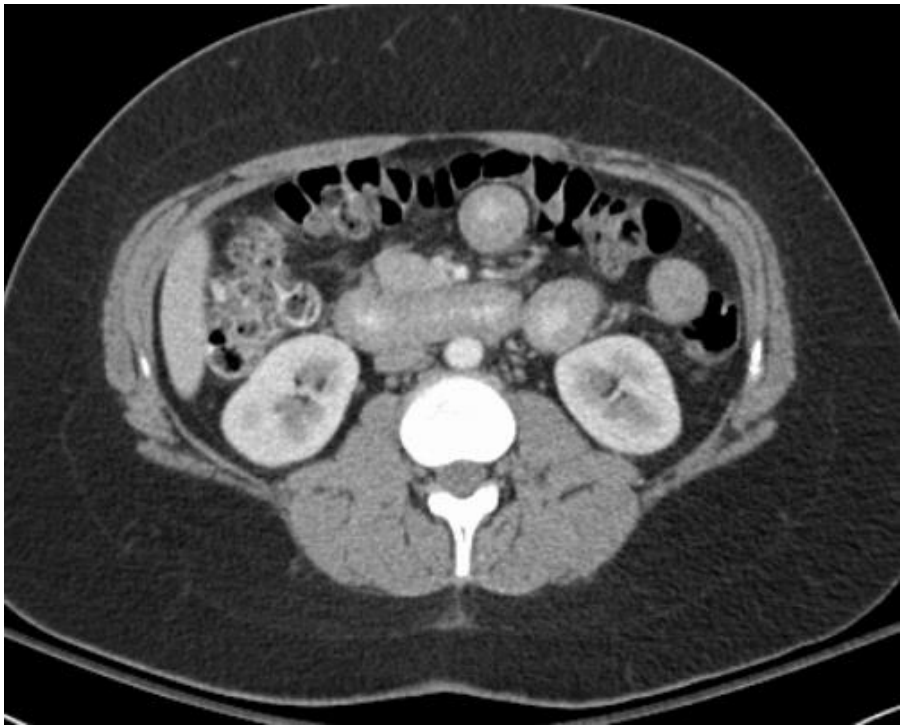
# Jejunitis

- Broad ddx. for jejunitis (& diffuse enteritis) – often non-specific CT findings (dilatation, increased fluid, increased wall enhancement, & wall edema); **correlate with history & labs**
- Typically routine protocol unless known enteritis/regional or diffuse SB process is the main concern (then role for CT/MR enterography?)
- *Do not overdiagnose jejunitis – mildly prominent folds, with mild dilatation may be WNL*
- Ddx.: various infections (giardiasis, strongyloidiasis; if immunocomp., CMV, MAI, cryptosporidium, GVHD, etc.), long list of immunologic/malabsorption conditions, & radiation, + other more chronic causes of diffuse SB thickening (e.g. amyloid, mastocytosis, & Whipple's dx.)

Horton et al. JCAT 1999; Katz et al. Rad Clin North Am 2013

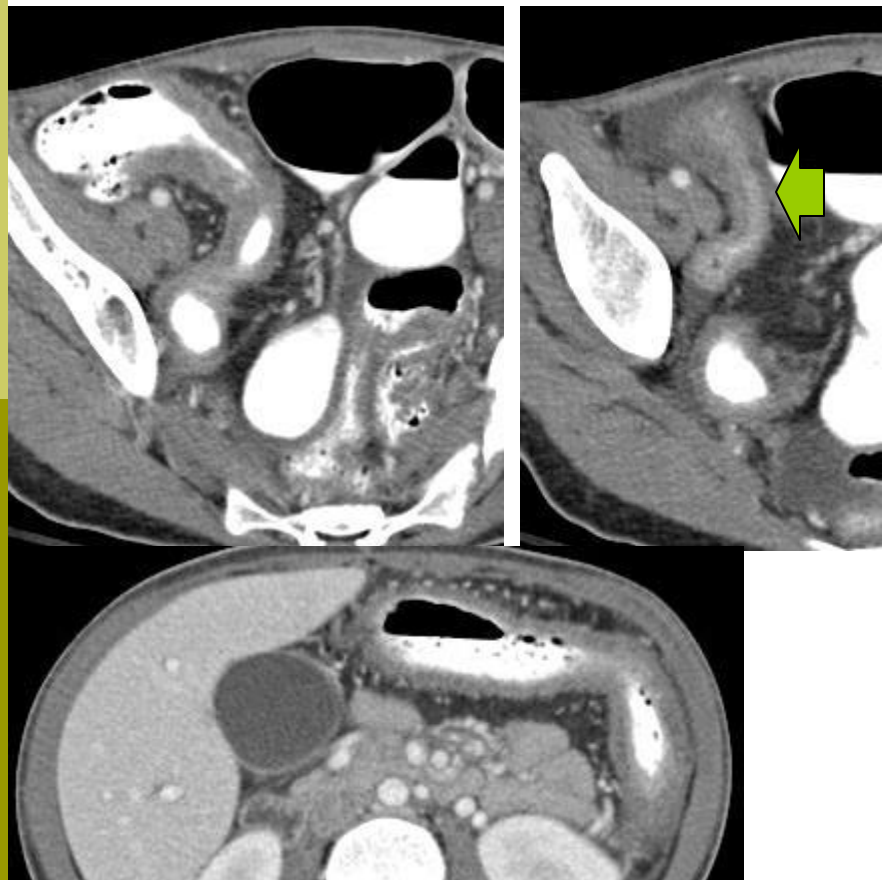
# Proximal jejunum – normal prominent folds

- 26-year-old with epiploic appendagitis (not shown) and presumably normal but prominent proximal jejunal folds on CT

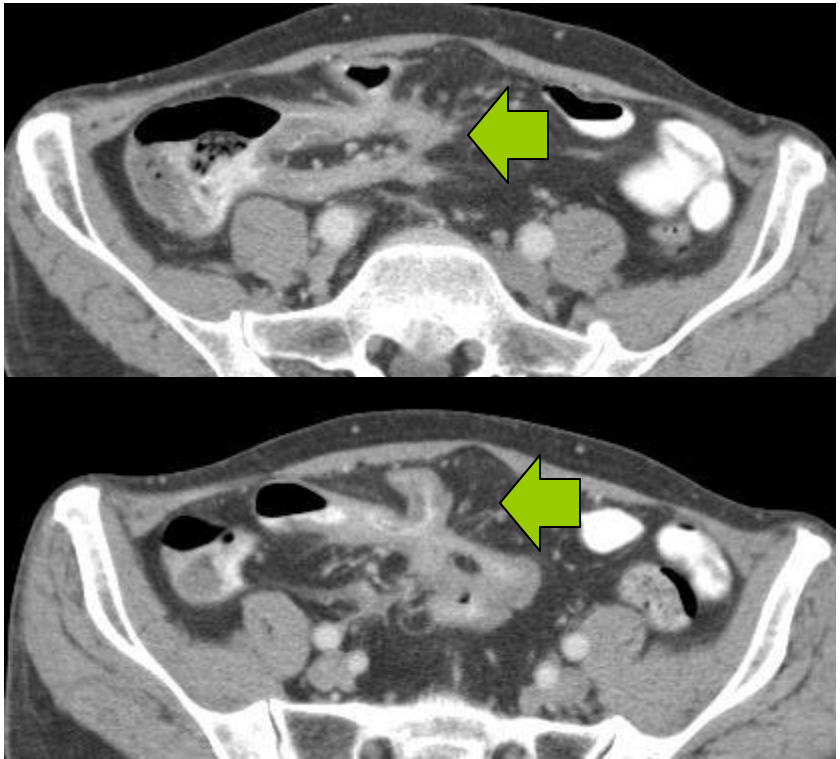


# Ileitis – Crohn disease

- 22-year-old woman
- Note appendiceal (rt), ileal (lt), and colonic involvement

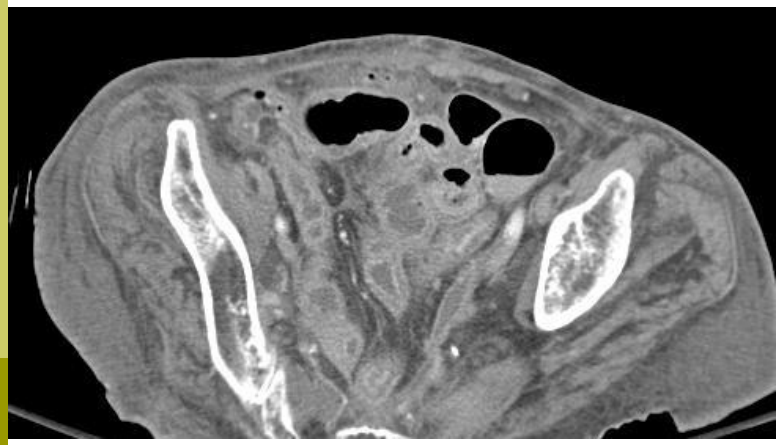


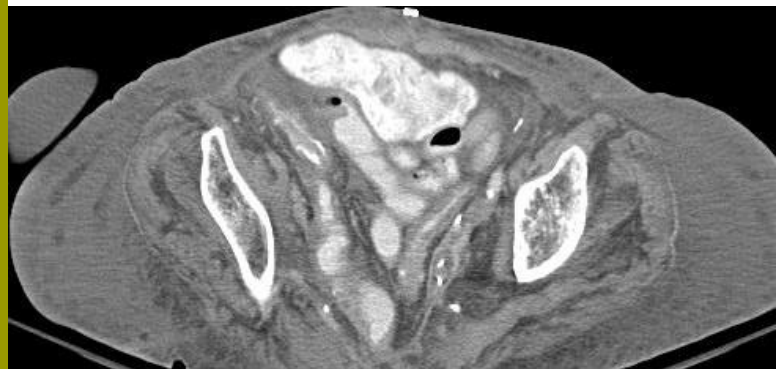
- 61-year-old man undergoing treatment for nasopharyngeal CA – new diagnosis of Crohn disease with fistulas, not related specifically to tumor



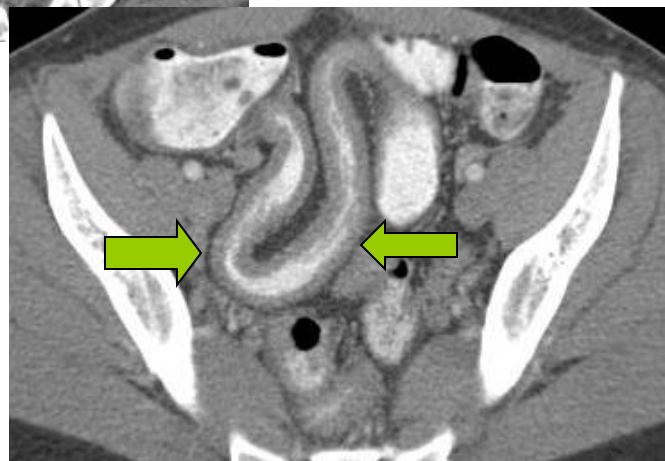
# Ileitis

- 65-year-old woman with radiation enteritis & colitis (current CT - top; 3 weeks earlier – bottom, IV + oral)





- 23-year-old woman with RLQ pain; CT shows ileitis with "creeping fat" – new diagnosis of Crohn disease



# Ileitis

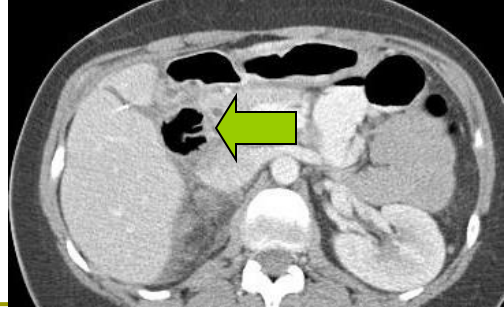
- Overlap in differential diagnosis with jejunitis, although the spectrum of infection is somewhat different (e.g., tuberculosis, *Yersinia*)
- Crohn disease – long history of use of CT for patient evaluation & follow-up
- Options for imaging in Crohn include routine CT, CT enterography (with various protocols), 'routine' MR, MR enterography, & others; *reduce radiation dose, & strongly consider MR for follow-up exams*
- Some controversy as to what extent imaging findings correlate with disease activity in IBD
- Evaluate for: wall thickening, enhancement, mural stratification; fistula, phlegmon, abscess, vascular/fatty proliferation, stricture, obstruction, adenopathy, pseudosacculations, etc.

Al-Hawary et al. RCNA 2013; Grand et al. Eur J Radiol 2012; Kambadakone et al. AJR 2010 & 2011

# Ileal diverticulitis

- 65-year-old man with recurrent abdominal pain

# Small bowel diverticulitis

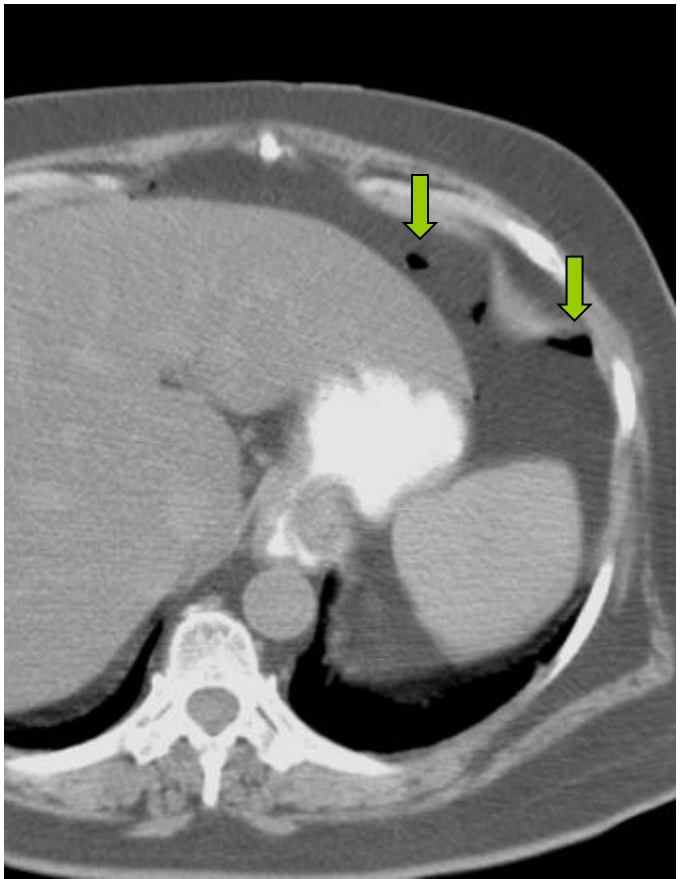


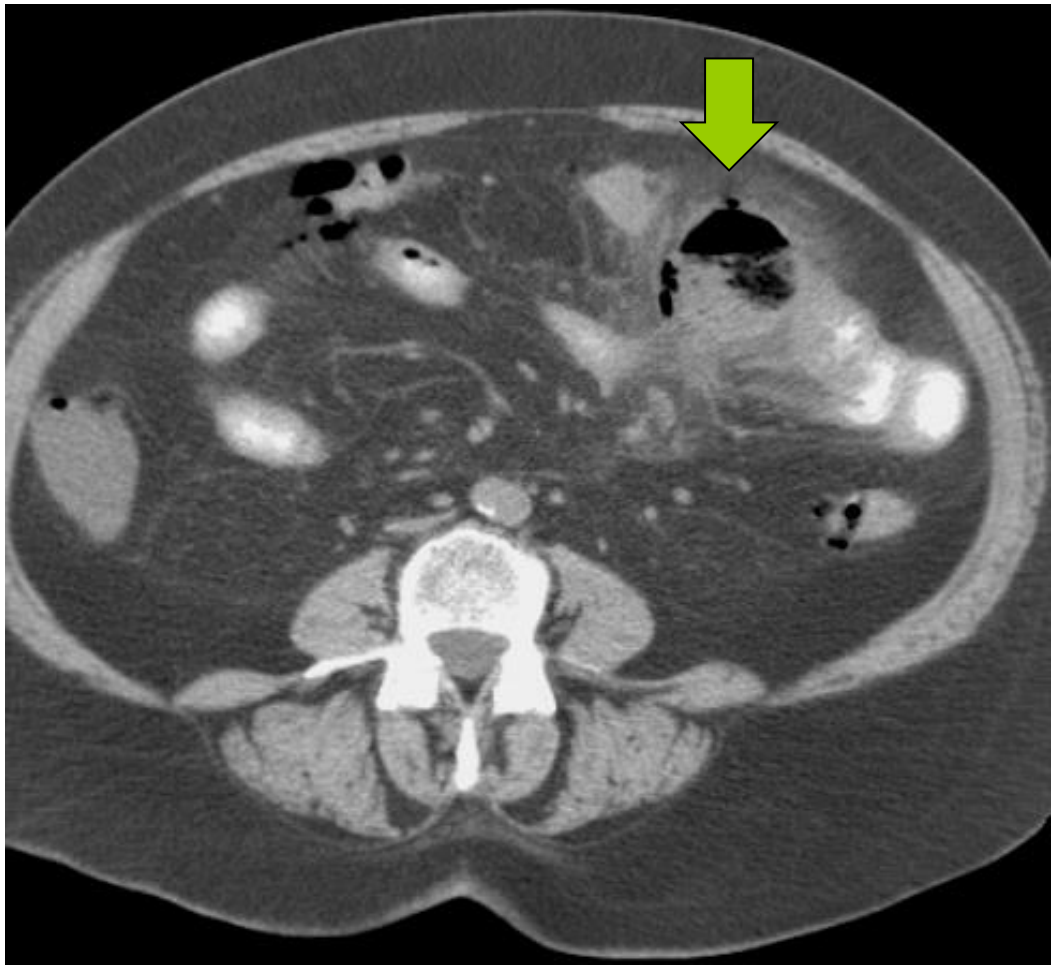
- Excluding Meckel's diverticula, these are acquired pseudodiverticula, probably secondary to intestinal dyskinesis, usually in older patients
- SB diverticulitis – almost never clinically suspected, but can establish the diagnosis on CT
- Duodenal – solitary collection of fluid/gas/food/oral contrast; when inflamed, distinguish from a duodenal ulcer/perforation
- Jejunum – usually several with one inflamed;
- Ileum – least frequent site; multiple, small; usually concurrent colonic diverticula
- CT findings: wall thickening, increased enhancement, & inflammatory changes
- Cxs.: abscess, free air, enterolith/SBO

Katz et al. Semin US CT MRI 2008; Hines et al. Emerg Radiol 2013; Garnet et al. Br J Radiol 2011

# Small bowel diverticulitis

- 67-year-old woman with free air due to perforated jejunal diverticulitis





# Meckel's diverticulitis

- Meckel's diverticulum – congenital (from incomplete closure of omphalomesenteric duct), contains all 3 intestinal layers, and is found along antimesenteric side of ileum
- Diverticulitis: from obstruction, peptic ulceration of ectopic gastric mucosa, or torsion
- May simulate appendicitis clinically and on CT – but separate from the appendix and not contiguous with the cecal base
- Needs surgical resection

# Meckel's diverticulitis

- - calcified lith is relatively rare - 10% of 84 cases of Meckel's diverticuli in AFIP series
- CT findings in 11 patients: blind-ending pouch of variable size (short axis 1.5 to 6 cm, long axis 2 to 7 cm) and mural thickness
- - contained air, fluid, or particulate material, but not oral contrast; mural enhancement with IV contrast; inflammation of adjacent fat
- - usually located near the midline but may be in RLQ and variable location relative to the terminal ileum (below or above)
- - normal appendix found in 7; SBO in 5 patients

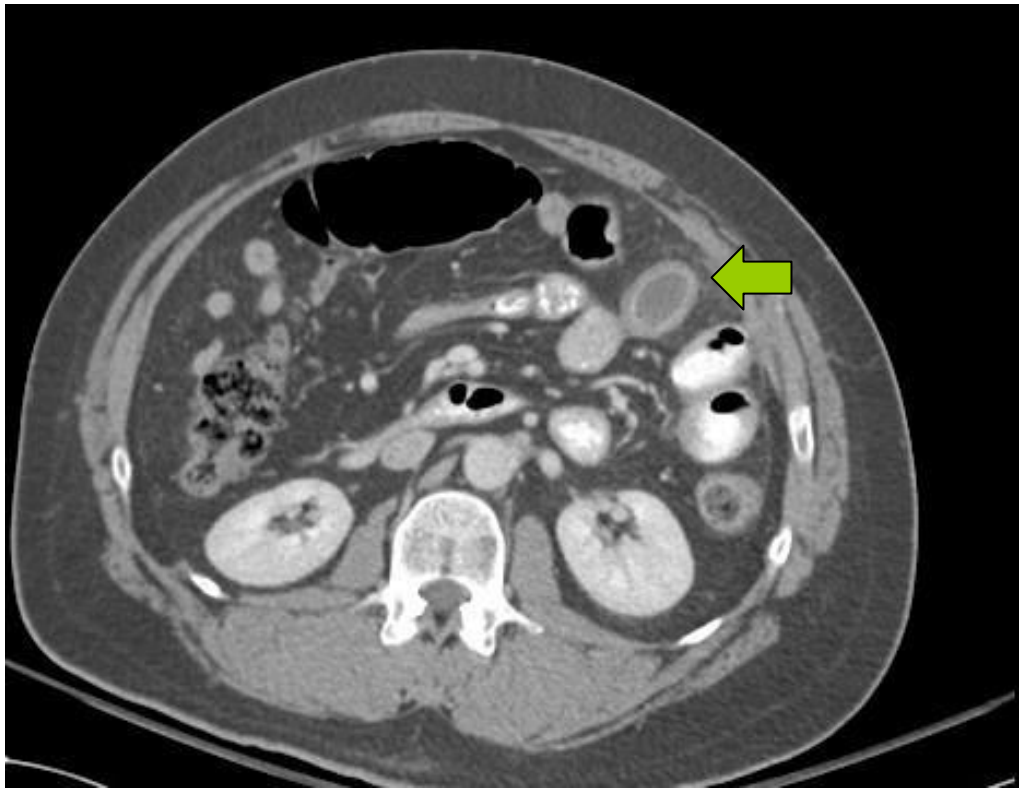
Pantograg-Brown et al. AJR 1996;
Bennett GL et al. AJR 2004

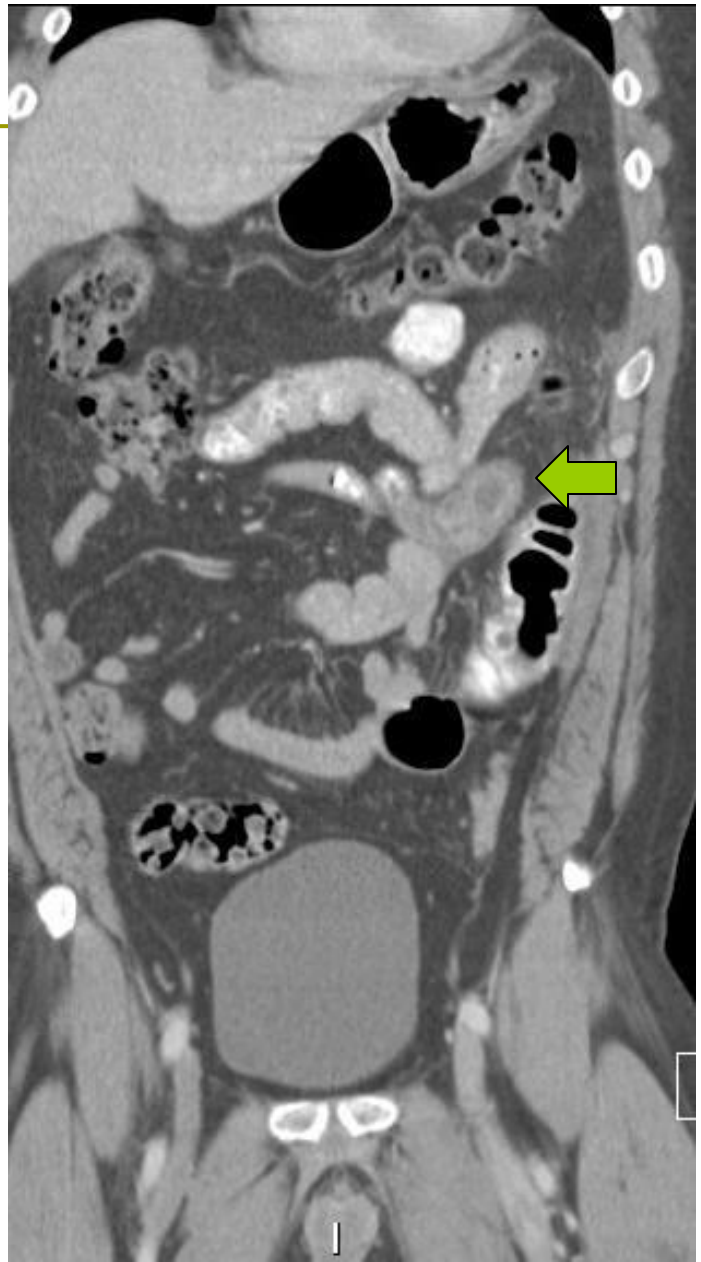
# Meckel's diverticulitis

- 14 patients with symptomatic Meckel's diverticulitis (of a subset of 40 patients total, the rest asymptomatic; 85 CT scans identified & reviewed retrospectively based on pathological/surgically-proven diagnosis)(Kawamoto S et al. AJR 2015):
- - Meckel's diverticulum correctly identified prospectively in 8 of 14 patients (57%)
- - correctly identified in 2/4 causing hemorrhage, 2/6 causing SBO, 2/2 with Meckel's diverticulitis, 1/1 with incisional hernia with a Meckel's diverticulum, & 1/1 with inverted Meckel's diverticulum

# Meckel's diverticulitis

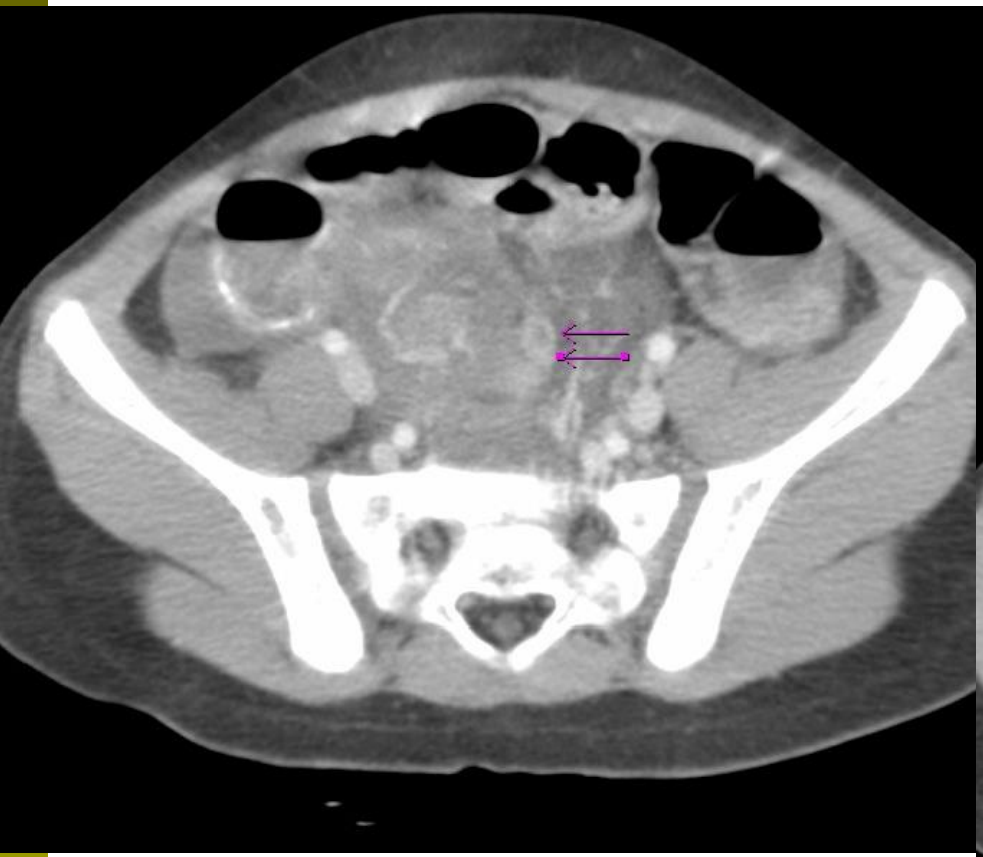
- Adult with acute left abdominal pain

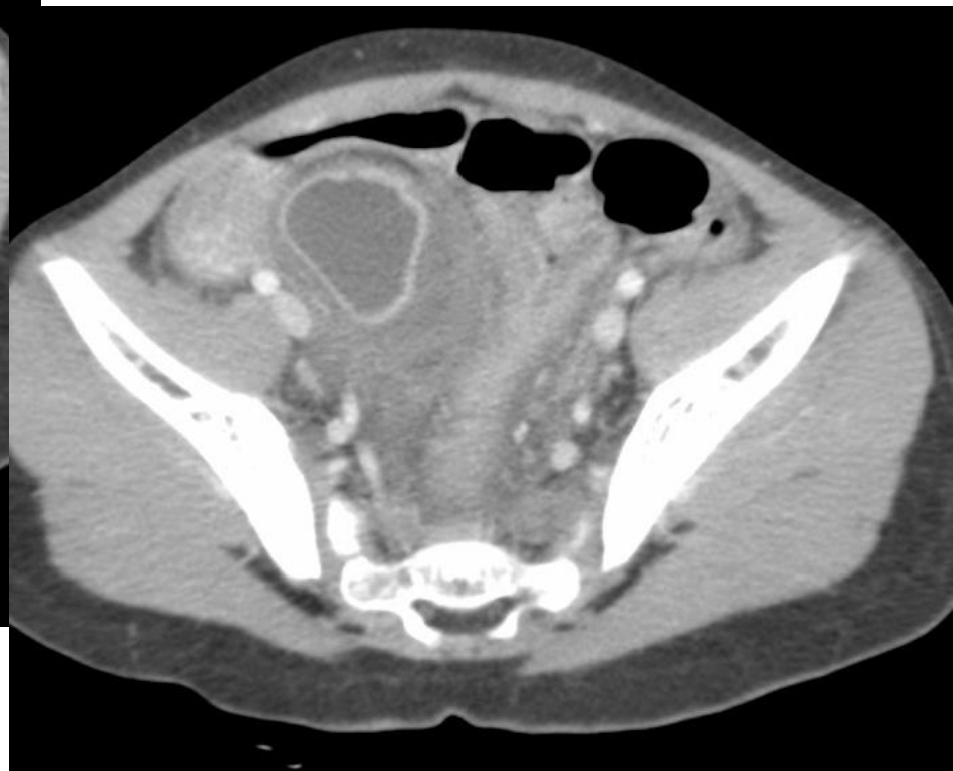




# Meckel's diverticulitis

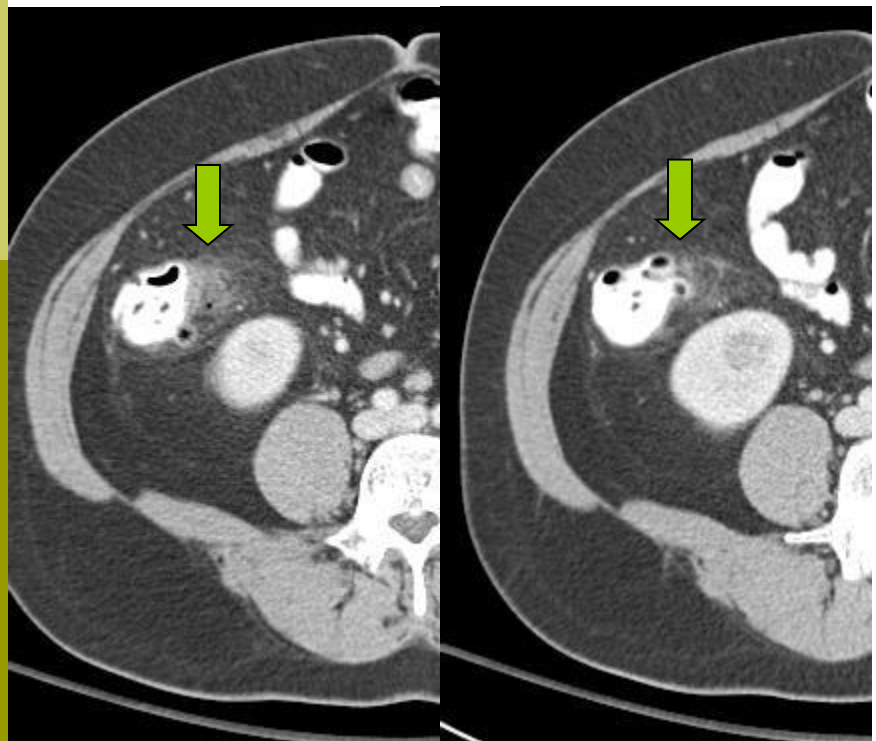
- 4-y.o. boy with severe abdominal pain



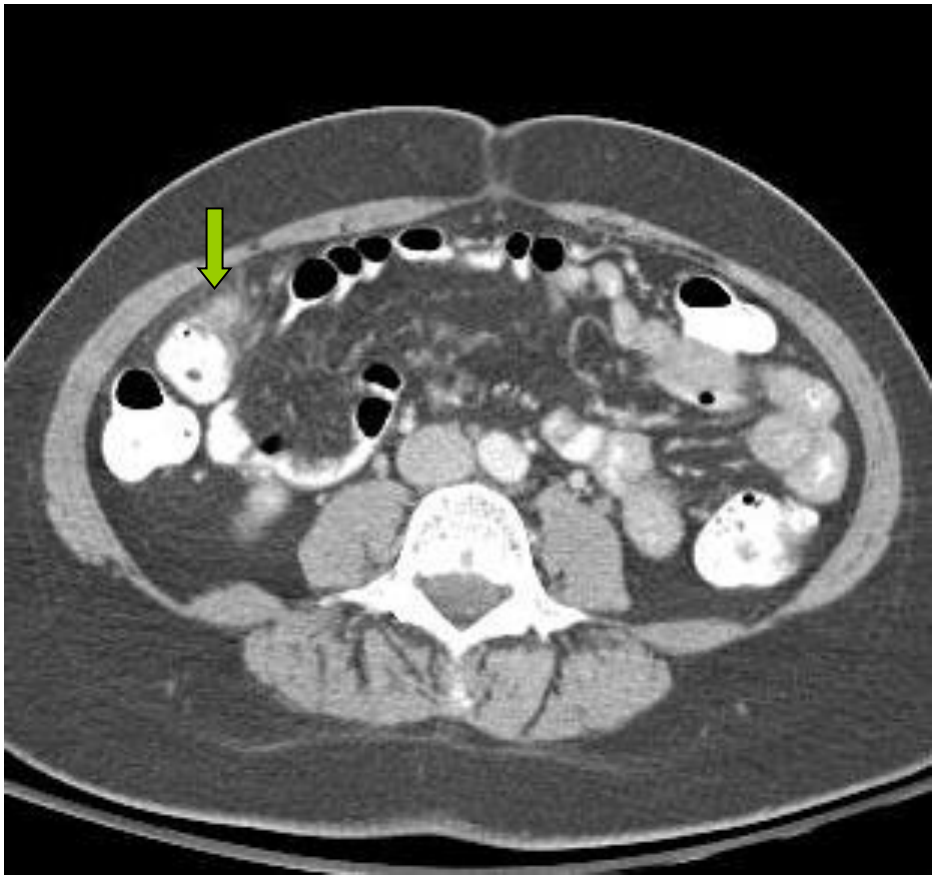


# Right-sided/transverse colonic diverticulitis

- 56-year-old woman with abdominal pain, fever, & elevated WBC count due to mild right colonic diverticulitis

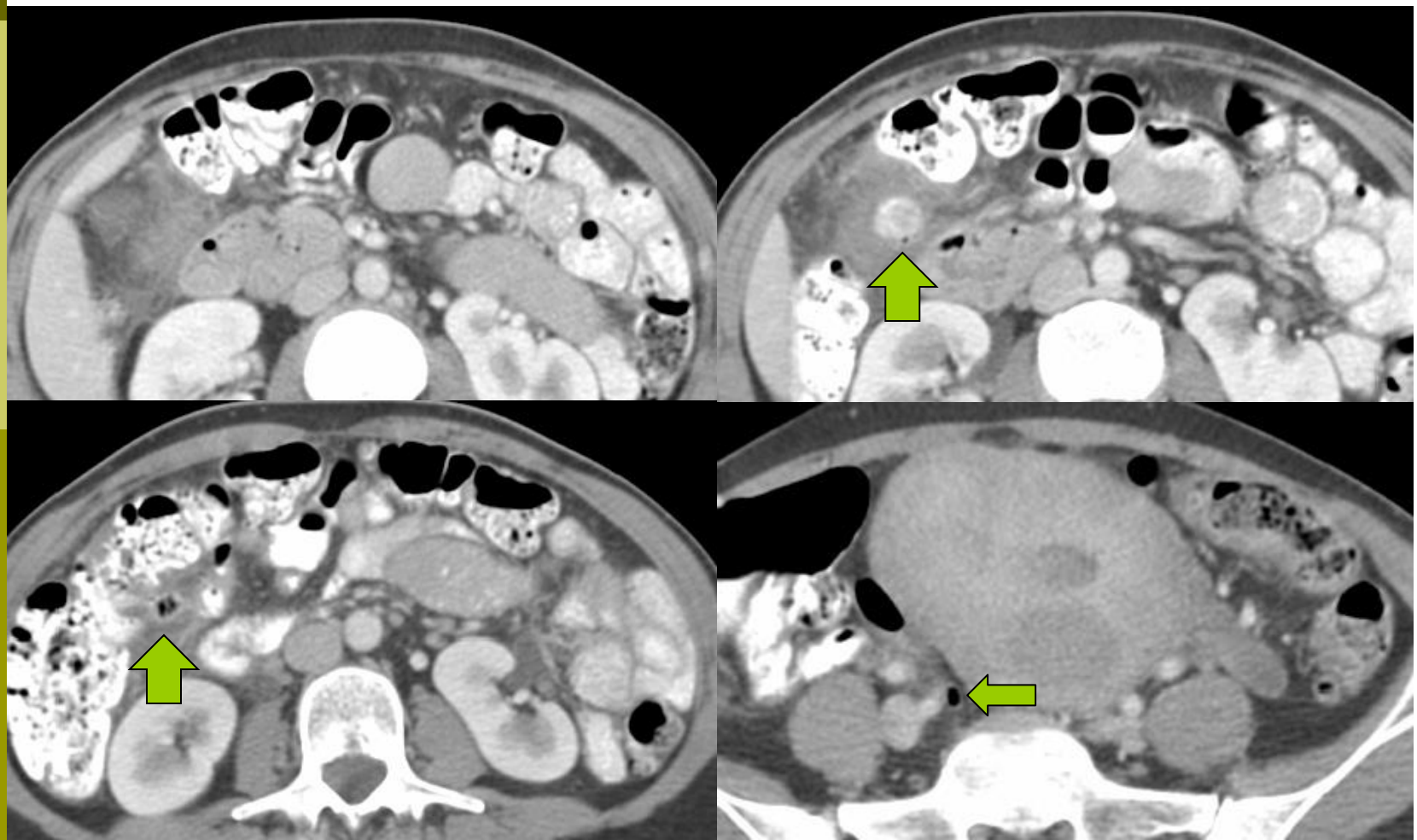


- 50-year-old woman with RLQ pain secondary to proximal transverse diverticulitis



# Right-sided/transverse colonic diverticulitis

- 52-year-old woman with right upper quadrant pain – right colonic diverticulitis; note normal appendix



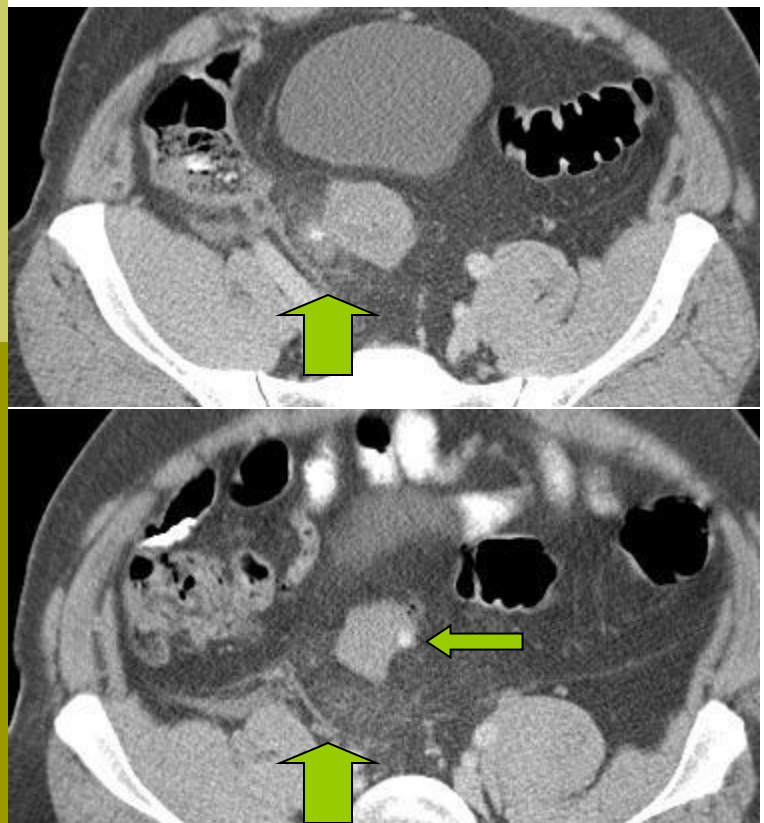
# Right-sided/transverse colonic diverticulitis

- Uncommon but increasingly diagnosed on CT; manage conservatively for initial episode
- In Western patients, usually acquired diverticula rather than congenital; non-specific presentation
- Inflamed diverticulum, colonic wall thickening & increased enhancement, preservation of wall (vs. CA), additional diverticula in region, & pericolonic inflammation; occasionally microperforation
- Abscess, substantial free gas, & obstruction: unusual c/w in left-sided diverticulitis
- **Attempt to identify a normal appendix on CT**
- Ddx. if complicated: IBD, perforated appendicitis, & perforated tumor

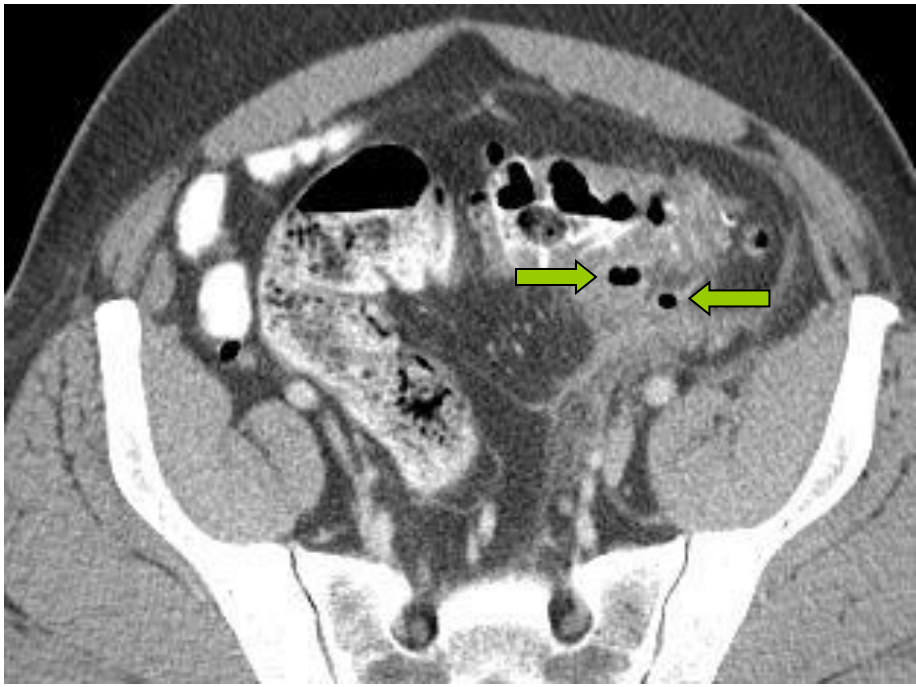
Katz et al. AJR 1998; Jhaveri et al. JCAT 2002; Park et al. Colorectal Dis 2010; Issa et al. Eur J Gastro Hepatol 2012

# Left-sided colonic diverticulitis

- 36-year-old man with mid to lower right abdominal pain due to sigmoid diverticulitis



- 44-year-old man with lower abdominal pain & bloating; proximal sigmoid diverticulitis with localized perforation



# Left-sided colonic diverticulitis

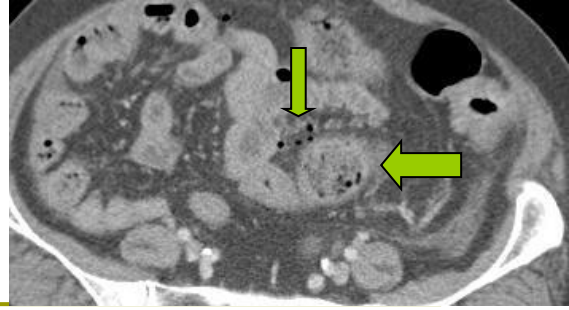
- 73-year-old woman with left psoas abscess from complicated proximal sigmoid diverticulitis

# Left-sided colonic diverticulitis

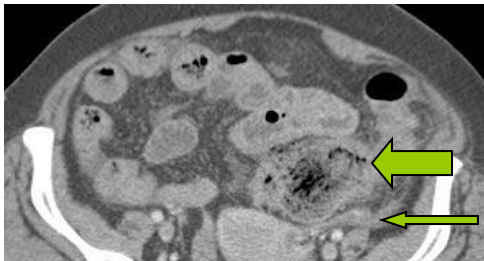
- Very common disorder; sigmoid, descending, & junction of sigmoid/descending colon
- Subset of younger patients with more severe disease
- Traditionally give oral & IV contrast, but equal high accuracy is achieved with rectal only, or without any contrast; now usually IV contrast only
- CT findings: diverticula, increased enhancement, wall thickening, pericolonic inflammation & fluid, fascial thickening, microperf., & mild adenopathy
- **Watch for redundant sigmoid & RLQ pain**
- Use CT to identify complications: free gas beyond immediate area, abscess, obstruction, fistula, & 2$^{o}$GU tract
- Limited data to support routine colonoscopy if 'routine' CT findings, although some surgeons/clinicians recommend this

Tack et al. Radiology 2005; Hall et al. Dis Colon Rectum 2010; Sai et al. Radiology 2012; Lau et al. Dis Colon Rectum 2011; Flor N et al. AJR 2016

# Left colonic diverticulitis

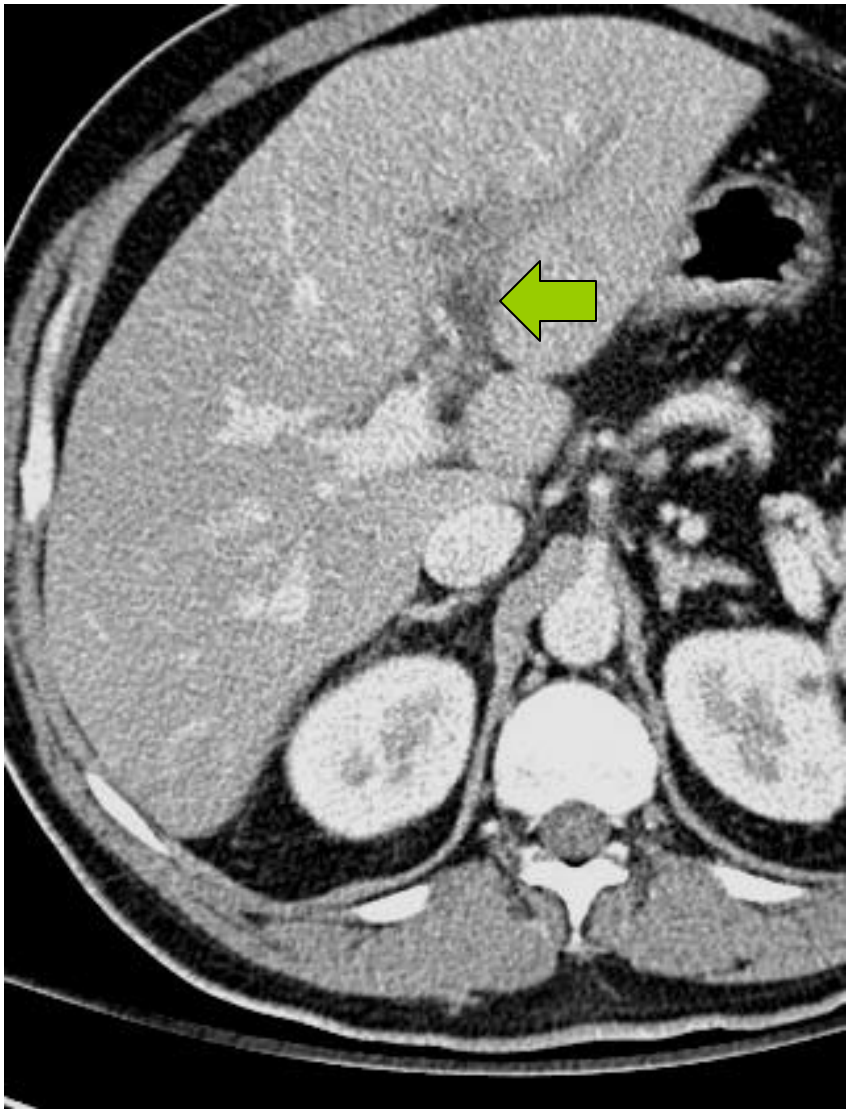


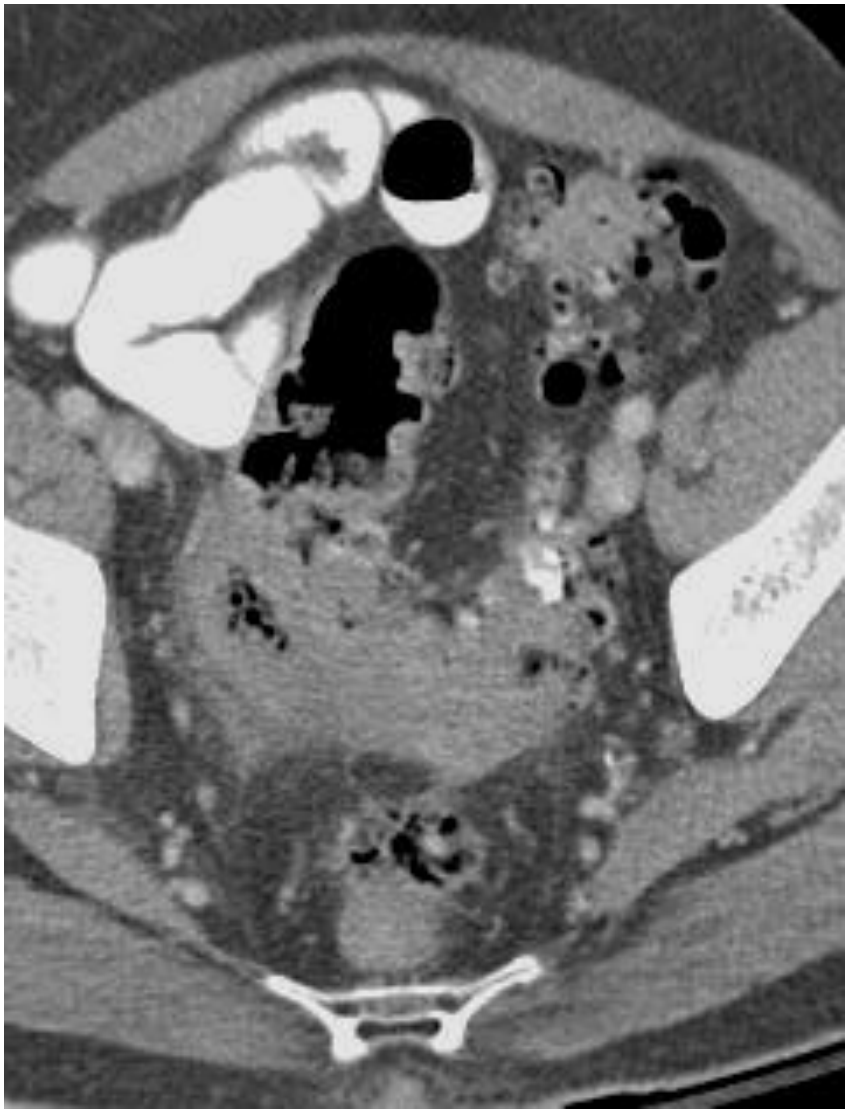
- "Giant" (> 4 cm) sigmoid diverticula – relatively rare, in older patients; other smaller colonic diverticula are usually present
- Enlarges over time due to increased intracolonic pressure & ball-valve effect
- High complication rate: diverticulitis & perforation
- Septic thrombophlebitis (pylephlebitis) of portal vein – still is associated with diverticulitis
- *Easily missed*, especially if focal/segmental within liver; also *look for associated IMV thrombosis*



Singh et al. JCAT 2008; Thomas et al. RG 2006; Balthazar et al. JCAT 2000

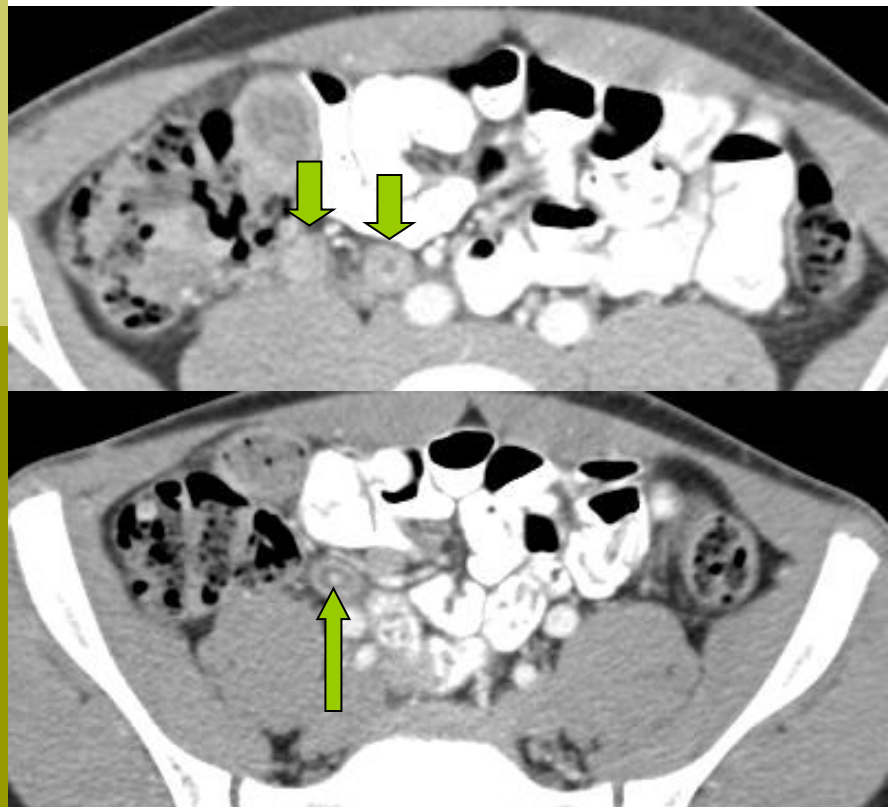
# Diverticulitis with pylephlebitis



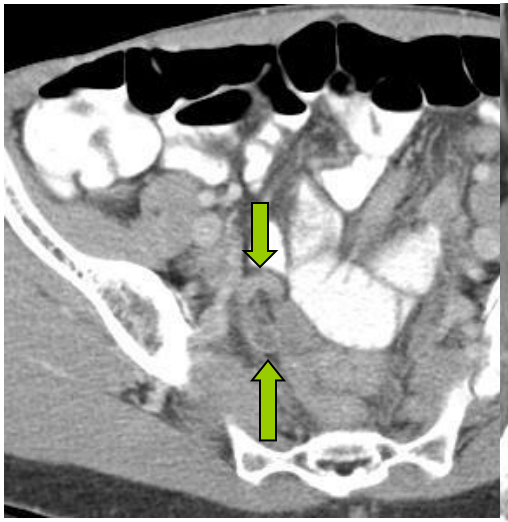


# Appendicitis

- 13-year-old male with RLQ pain from appendicitis; note target sign – submucosal edema, & lith



- 60-year-old woman with right abdominal pain due to appendicitis; cecum is low-lying, & the appendix abuts the right ovary



# Appendicitis

- Routine oral + IV protocol may still be used by some practices, although the debate continues; not one "best" approach; ***best results most dependent on experience of radiologist rather than CT protocol – high accuracy with most protocols, especially with IV contrast***
- Can use IV only, for increased E.R. turnaround; or initial non-contrast, then check
- No difference in radiologist interpretation in a 2009 moderately-sized randomized trial of oral + IV versus IV only; same results with similar 2012 trial
- Our practice now variably usually uses oral contrast (the ED decides in each pt.) in adults, and routinely in children; increase confidence level if all bowel in RLQ fills except for appendix - an appendix completely filled with non-opacified fluid is usually abnormal

Anderson et al. AJR 2009; Kepner et al. Am J Emerg Med 2012; Webb et al. Emerg Radiol 2010; Stengel et al Radiology 2010; Keyzer et al. AJR 2009; Poortman et al. Eur J Radiol 2010; Pickhardt P et al. Ann Intern Med 2011; Chun et al. Acad Radiol 2013

# Appendicitis

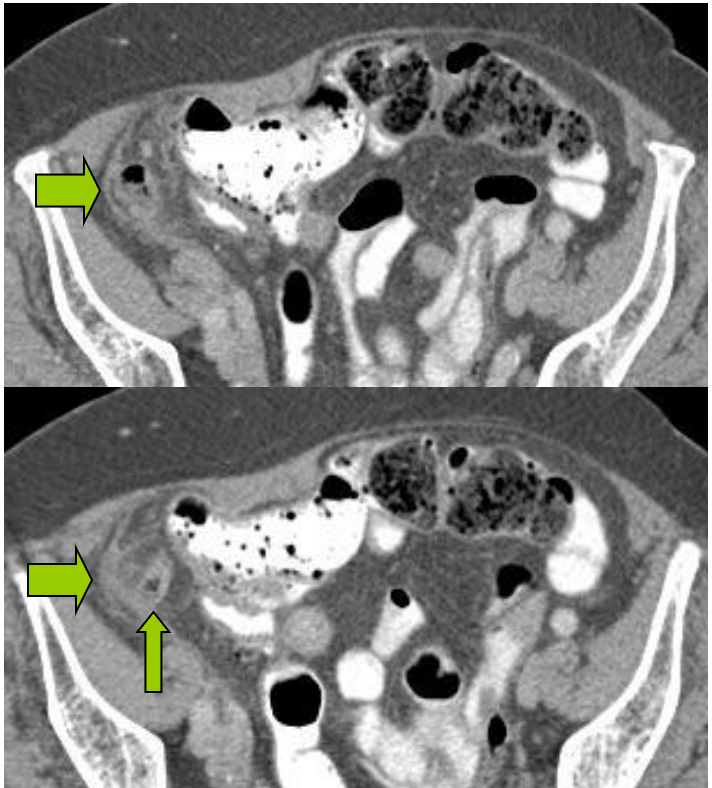
- **Also watch for > 6 mm diameter appendix, which in the absence of other findings can be normal** - especially if filled with gas or oral contrast (but almost always <10 mm)
- **CT findings may be surprisingly subtle in a minority of patients – especially in early & chronic/recurrent appendicitis**
- Other CT findings: increased wall enhancement, lith(s), wall edema/mural stratification, & periappendiceal fluid/inflammation
- *CT as surgical road map*
- Alternate diagnosis on CT in up to 1/3

Webb et al. Emerg Radiol 2010; Stengel et al. Radiology 2010; Pooler et al. Radiology 2012

# Appendicitis

- 40-year-old woman with RLQ pain secondary to perforated appendicitis; early abscess & lith in wall

- 78-year-old woman with RLQ pain related to perforated appendicitis; tip abscess forming



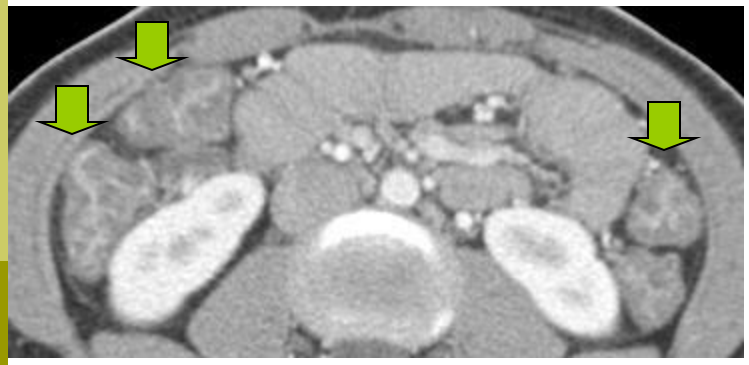
# Appendicitis

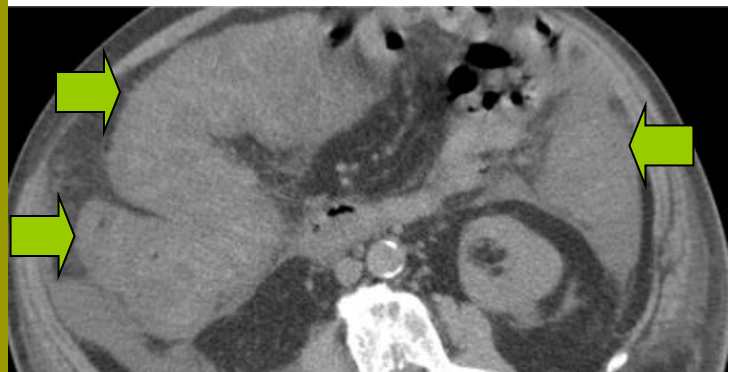
- Watch for distal appendicitis – follow appendix to its tip; multiplanar reformations may be helpful (in this & other situations), as location of tip is variable
- Perforation is still a common complication
- *Extraluminal gas &/or extraluminal lith(s) are diagnostic, but are uncommon findings in perforation*
- Secondary inflammatory changes of cecal base & ileum are much more common in perforation
- Intraluminal gas + other appendicitis findings may be a marker of perforation
- Two series on MDCT findings for perforation: overall had poor sensitivity in the first, unless extraluminal gas or abscess; yet in the other, a defect in the appendiceal wall enhancement was highly sensitive & specific

Rao et al. Radiology 1997; Kim et al. RG 2008; Bixby et al. Radiology 2006; Tsuboi et al. Radiology 2008; Azok et al. Acad Radiol 2012; Cabarrus et al. Emerg Radiol 2013

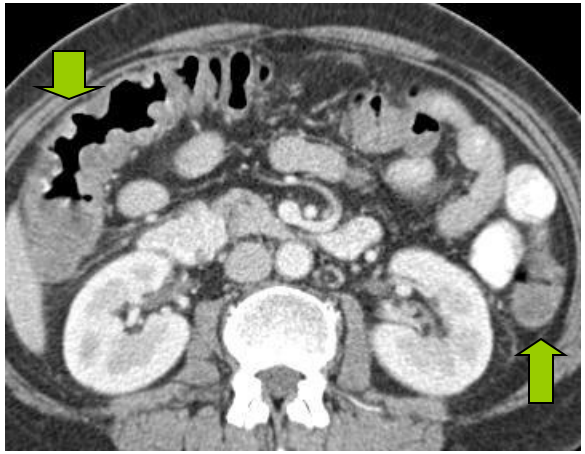
# Colitis

- 23-year-old woman with acute viral colitis (top)
- 90-year-old man with *C. difficile* colitis on non-enhanced CT (bottom)





- 64-year-old man with abdominal pain; moderate non-specific pancolitis, worse at right/transverse (left)
- 70-year-old woman, non-specific pancolitis, most substantial at sigmoid (right)



# Colitis

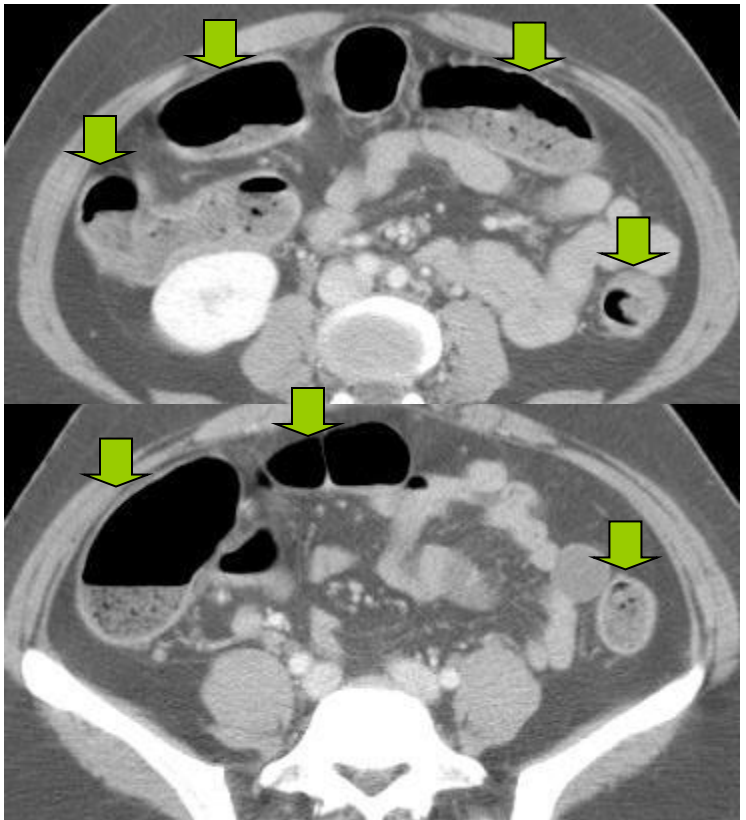
- Infectious colitis - CT findings are usually non-specific (wall thickening, increased enhancement, stranding/fluid around colon), *so again correlate with history, labs, etc.*
- Consider salmonella, shigella, campylobacter, TB, amebiasis, CMV, etc.
- *C. difficile* infection: more recent strain with increased virulence, now somewhat variable; may become relatively chronic or have more severe acute effects
- Varying extent of wall thickening, can be marked; diffuse or regional; distal small bowel is occasionally involved
- More recent data suggests initial CT findings do correlate with outcome

Thoeni et al. Radiology 2006; Ash et al. AJR 2006; Kirkpatrick et al. AJR 2001; Lin et al. RSNA 2008

# Colitis

- 29-year-old woman with Crohn dx., previous right colon resection, ileitis, colitis & small perirectal abscess

- 40-year-old woman with rectal pain & ulcerative colitis; note ahaustral colon

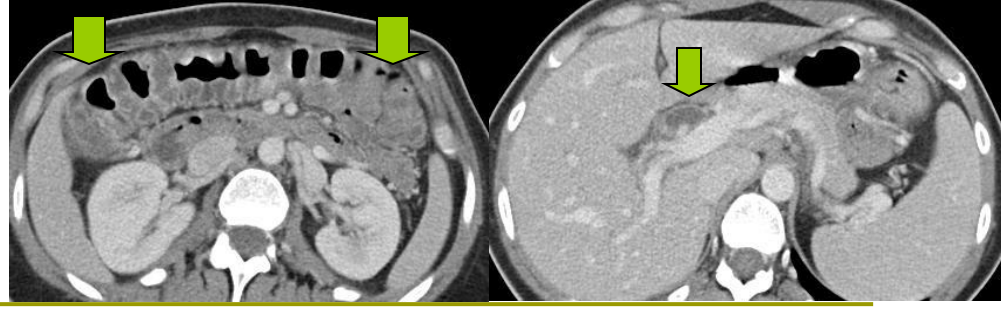


# Colitis

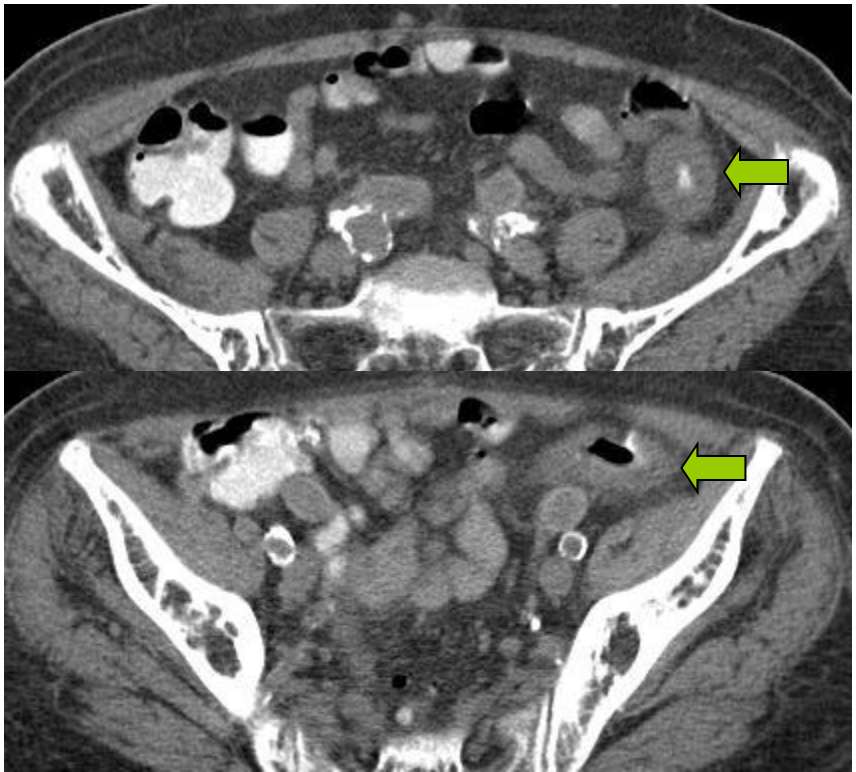
- Ulcerative colitis: diffuse or left-sided, continuous; rectum often involved; wall thickness on CT correlates with disease activity
- Ileum is usually not involved, unless backwash ileitis; generally use routine protocol/IV contrast only
- Wall thickening generally less substantial than in Crohn disease
- Complications: toxic megacolon - although now more commonly seen with *C. difficile* colitis, & carcinoma (also occurs less commonly in Crohn disease, both in large & small bowel)

Thoeni et al. Radiology 2006; Patel et al. Abd Imaging 2012

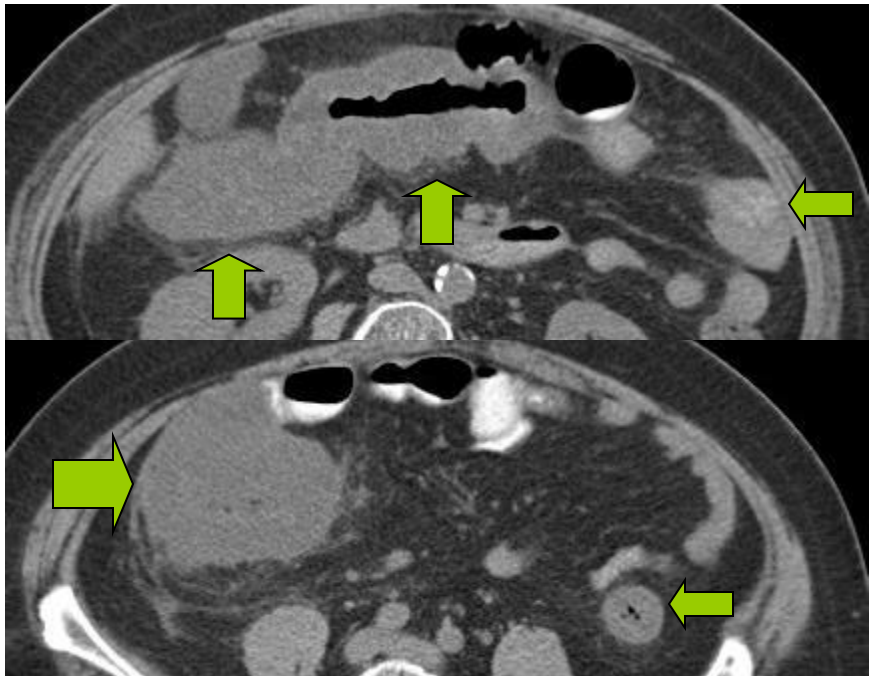
# Colitis



- 89-year-old man with AICD, aortoiliac bypass grafts, hypotension, & diarrhea; CT is highly c/w ischemic descending/sigmoid colitis



- 37-year-old woman with ulcerative colitis & sclerosing cholangitis (above)
- 64-year-old woman with lymphoma & typhlitis on non-enhanced CT (below)



# Colitis

- Ischemic colitis: usually small vessel disease + episode of hypoperfusion in older patient
- Watershed areas (splenic flexure & distal descending/sigmoid), but can affect any colonic segment; typically manage conservatively (c/w SB ischemia)
- Cannot use CT findings to reliably diagnose infarction, other than free air/venous gas
- Typhlitis (a.k.a. neutropenic enterocolitis): right colon, but can affect other parts of large & small bowel; likely multifactorial, see in immunosuppressed patients
- Colonic thickening is often relatively substantial
- Cxs.: necrosis, perforation, & abscess

Balthazar et al. Radiology 1999; Kirkpatrick et al. Radiology 2003; Thoeni et al. Radiology 2006

# Epiploic appendagitis

- 66-year-old woman with left flank pain

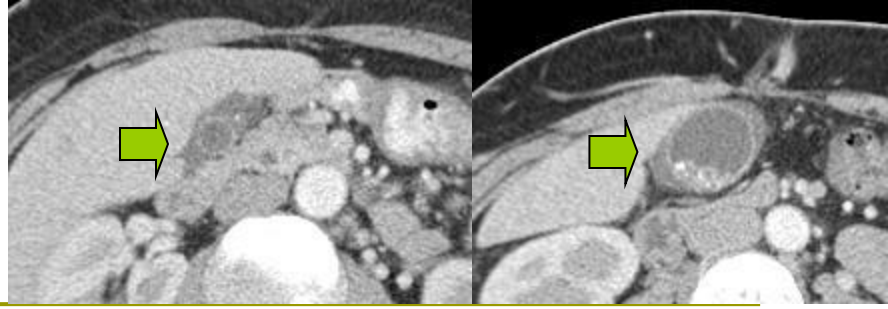
- 33-year-old man with lower abdominal pain

# Epiploic appendagitis

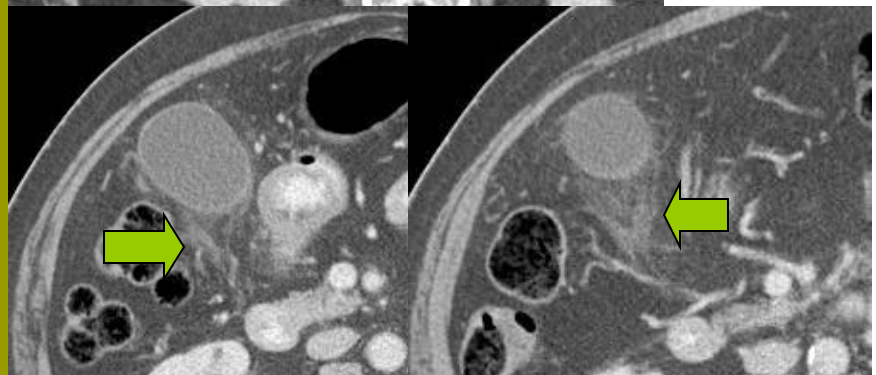
- Common condition, readily identified with CT; simulates other conditions clinically, so see on enhanced or non-enhanced CT exams
- LLQ > RLQ (where the appendages are most numerous, along external colonic surface)
- Related to torsion & then venous thrombosis
- Also see secondary to diverticulitis/colitis
- 1.5 – 3.5 cm fat-containing oval lesion with hyperattenuating rim & surrounding edema; central hyperattenuating dot from venous thrombosis/hemorrhage; can calcify over time
- The adjacent colon is normal, or mildly & focally edematous; manage conservatively

Singh et al. RadioGraphics 2005; Garg et al. Seminars US CT MRI 2008; Chen et al. J Dis Sci 2011; Jalaguier et al. Emerg Radiol 2010

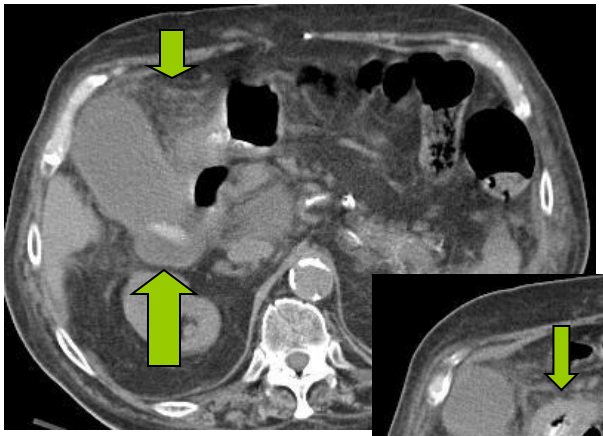
# Cholecystitis

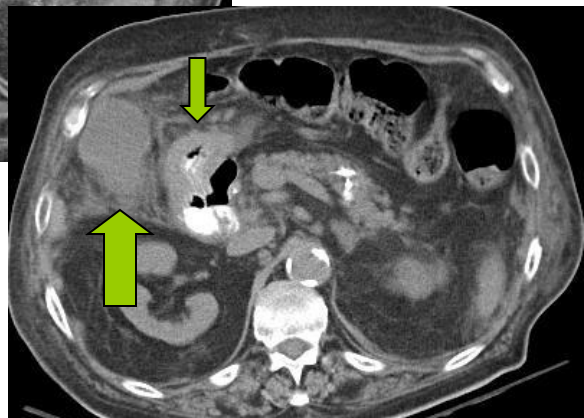


- 80-year-old man with RUQ pain & vomiting; CT done at 3 am - acute cholecystitis, although no stones identified



- 50-year-old woman with epigastric pain
- 80-year-old man with elevated WBC; CT (oral only) shows cholecystitis with possible gangrene/perforation





# Cholecystitis

- 75-year-old woman with RUQ pain – gangrenous cholecystitis

# Cholecystitis

- US remains the procedure of choice, but in patients with non-specific pain, or when US is unavailable, CT is frequently performed first (although can't assess for a sonographic Murphy's sign)
- Ideally perform with IV contrast
- CT findings: gallstones (although US is more sensitive, esp. for cholesterol stones; window CT carefully for), distension, wall thickening & increased enhancement, pericholecystic fluid/inflammation, & hyperemia of adjacent liver
- If unsure of diagnosis (e.g. if only wall thickening), go on to US or HIDA – complementary in a subset of patients
- CT very useful for cxs.: abscess/perforation, gangrene, hemorrhage, emphysematous, etc.

Bennett et al. Radiol Clin North Am 2015; Patel NB et al. RG 2013; Shakespear et al. AJR 2010; McGillicuddy et al. Am J Surg 2011

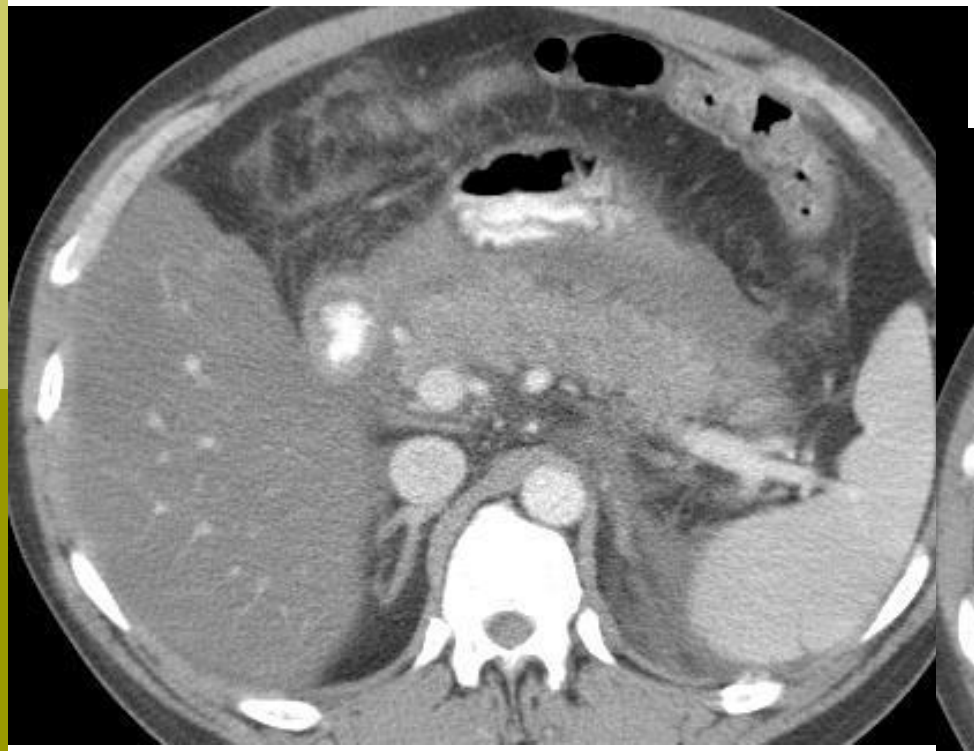
# Cholecystitis

- ***Gallbladder wall edema/pericholecystic fluid & inflammation can be subtle on CT & easily missed prospectively***
- CT signs of gangrene/perforation include: perfusion defects, wall irregularity, hyperemia of adjacent liver, & significant pericholecystic edema/fluid
- CT signs specific but not very sensitive for gangrene/perforation include: hemorrhage, abscess, mucosal sloughing, gas formation, & portal venous thrombosis
- Absence of wall enhancement & stone lodged in neck correlate with need for open cholecystectomy

Fuks et al. Radiology 2012; Brook et al. AJR 2011; Wu et al. Abd Imaging 2011

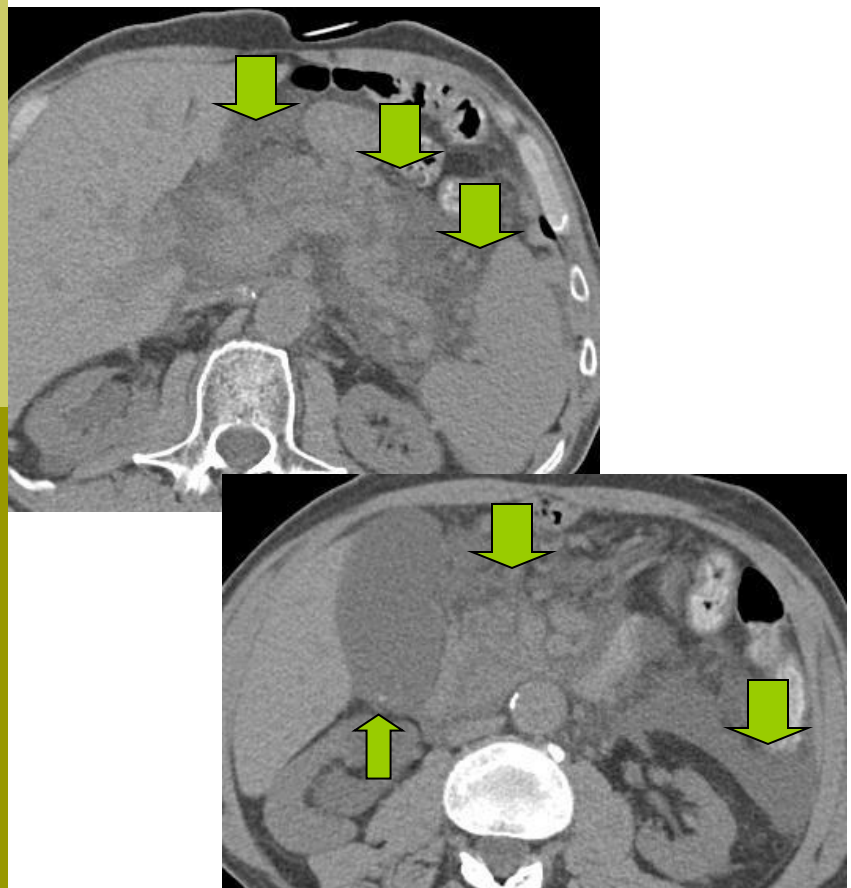
# Acute on chronic pancreatitis

- 44-year-old man with acute abdominal pain

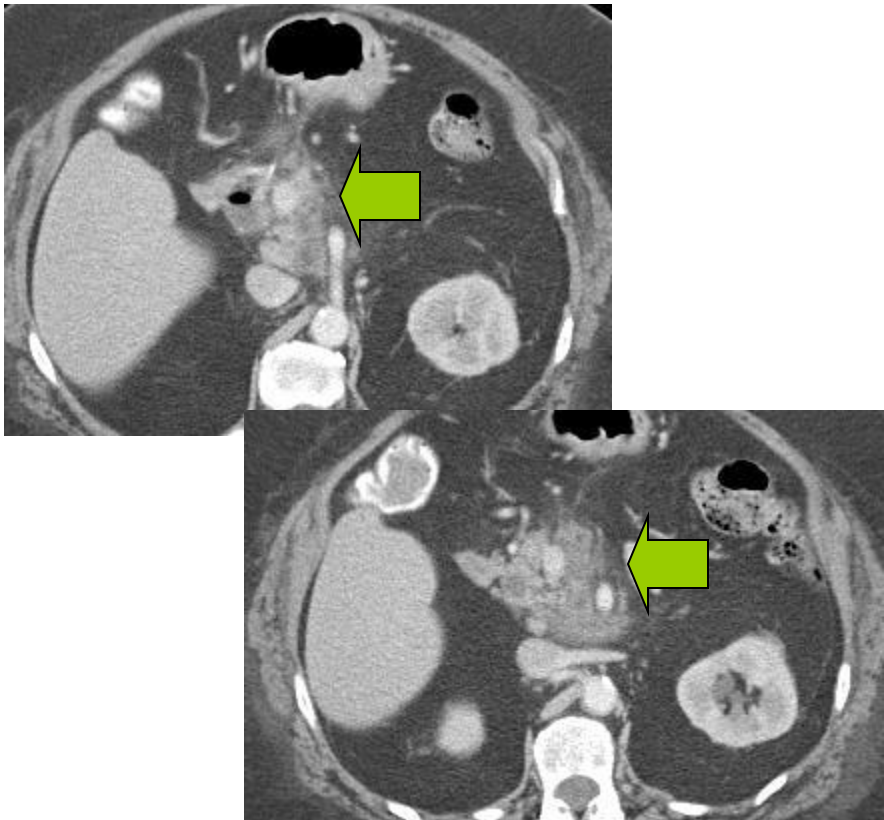


# Pancreatitis

- 78-year-old man with gallstone pancreatitis on CT with oral contrast only

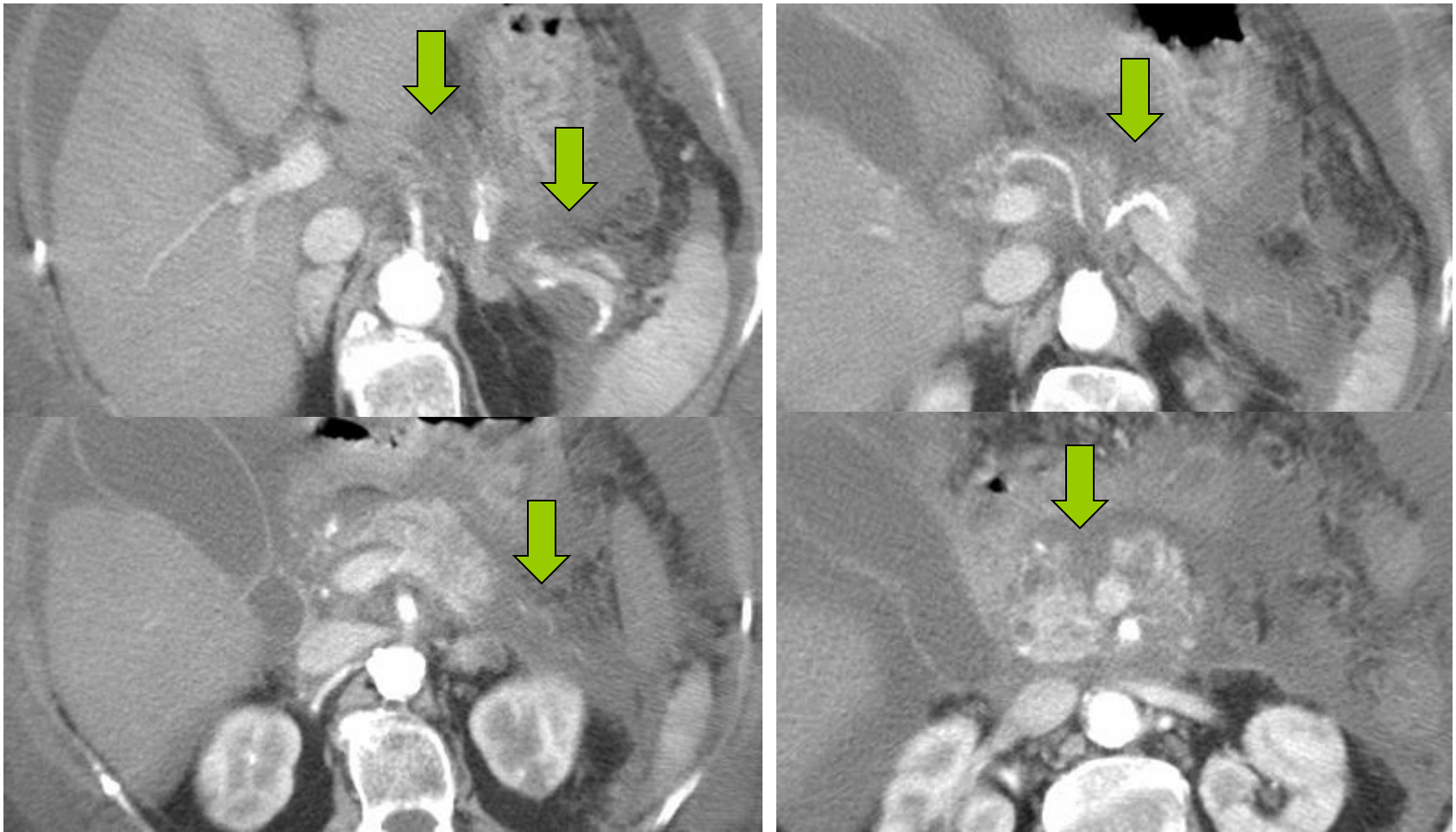


- 72-year-old woman with pancreatitis following ERCP; prior distal pancreatectomy & splenectomy



# Pancreatitis

- 85-year-old man with necrotic pancreatitis – discontinuity of pancreas/pancreatic duct



# Pancreatitis

- 32-year-old man with elevated triglycerides and pancreatitis

# Pancreatitis

- Pancreatitis is common, with a broad spectrum of presentations & outcomes
- Frequently is confused clinically with other pathologies (& serum amylase/lipase levels may be pending or not obtained)
- Etiologies: gallstones, EtOH abuse, iatrogenic (ERCP, post-biopsy), trauma, hypertriglycerides, medications, anomalies (divisum), & tumor
- Routine protocol used when not specifically suspected, but use tailored protocol if it is (e.g. no oral +/- $H_2O$, pancreatic phase imaging; some advocate multiple phases); IV very important if possible, to assess for necrosis, fluid collections, & vascular complications

Scaglione et al. Seminars US CT MRI 2008

# Pancreatitis

- CT findings range from a normal pancreas with mild focal or diffuse peripancreatic inflammation, to marked pancreatic swelling & necrosis
- Severity/extent of initial CT findings (first 72 hrs.) may not correlate with outcome & true extent of necrosis may be difficult to define; better correlation later on
- Revised Atlanta Classification system: attempt to better characterize processes, standardize terms, & correlate with prognosis; other scoring systems in use
- Other cxs.: pseudocyst, abscess, pseudoaneurysm, splenic vein thrombosis, & hemorrhage
- CT-guided aspiration is very useful to distinguish sterile from infected necrosis & fluid collections
- *Strongly consider MR as follow-up to reduce radiation*

Thoeni Radiology 2012; Bollen et al. AJR 2011; Ball et al. J Gastro Surg 2010; Forster BR et al. RadioGraphics 2016

# Pancreatitis – 2007 Atlanta Classification revision

- Two main types of pancreatitis: *interstitial versus necrotizing*
- Under 4 weeks: acute peripancreatic fluid collection (APFC) in interstitial, versus acute necrotic collection (ANC) - pancreatic &/or peripancreatic (sterile or infected) – in necrotizing
- 4 weeks or longer: pseudocyst (sterile or infected) resulting from APFC in interstitial, versus walled-off necrosis (WON) (sterile or infected) – in necrotizing
- The term 'abscess' is no longer used
- A 'pseudocyst' is now only peripancreatic

Thoeni Radiology 2012; Sheu Y et al. Emerg Radiol 2012

# Conclusion




- There are other "itises" which time does not permit discussion of: "splenitis" (splenic infarctions), hepatitis, & mesenteric adenitis/panniculitis, amongst others
- Radiologists should be familiar with the common and less common types of "itises" as they appear on CT, and their differential diagnoses
- There are a variety of protocol options for imaging the acute abdomen using CT, without a necessarily "correct" or "best" way for imaging