Objectives

- Anatomy of the pancreas
- Overview of pancreatitis
- Role of imaging in pancreatitis
- Illustrative cases with complications
Pancreas anatomy

- Liver
- Gall Bladder
- Stomach
- Pancreas
- Spleen
- Duodenum
- Right and Left gastroepiploic arteries
- Left gastric artery
- Common hepatic artery
- Celiac trunk
- Splenic artery
- Superior Mesenteric Artery
- Aorta

From Virtual Hospital: http://www.vh.org/adult/provider/anatomy/atlasofanatomy/
Anatomy cont’d: posterior view

From Virtual Hospital: http://www.vh.org/adult/provider/anatomy/atlasofanatomy/
Acute Pancreatitis

- Approx. 185,000 cases/yr in US
- 75% caused by EtOH and gallstones
- Other causes:
  - Drugs (ddI, metronidazole, furosemide, valproic acid...) (2-5%)
  - Hypertriglyceridemia (>1000 mg/dL) (1-4%)
  - Hypercalcemia
  - Infection (Mumps, viral hep, coxsackievirus, ascariasis)
  - Pancreas divisum
  - (Scorpion venom)
Patient 1: Patient SD
Patient SD

- 58 y/o F presents w/ 1 week of acute epigastric pain, worse w/ fatty foods
- PMHx: HTN, hypothyroidism, depression
- SHx: 30+ years EtOH abuse
- U/S: Gallstones, no dilatation of CBD.
Diagnosis

- Hx: EtOH and/or cholelithiasis, previous episodes
- Abdominal/epigastric pain +/- radiation to back
- Elevated serum lipase (amylase), leukocytosis, hypocalcemia, hyperglycemia
Role of Imaging

Abdominal Plain Film

- Usually to r/o other causes of abdominal pain – esp. perforated viscus
- May show nonspecific focal ileus due to irritation: “sentinel loop.”
Coned-down Abdominal X-Ray

Shows dilated colon with abrupt cutoff: Colon cutoff sign, indicative of inflammation

From Pickhardt, Radiology: 2000
Role of Imaging II

Ultrasound

- Can show cholelithiasis, dilated bile ducts
  - Absence of findings does not rule out gallstone-induced pancreatitis
  - Findings do not clinch diagnosis
  - Pancreatitis associated with cholelithiasis usually warrants cholecystectomy
  - Limited by bowel gas, depth of pancreas
- Endoscopic US can show pseudocyst
Abdominal Ultrasound: Cholelithiasis

Findings: Multiple echogenic gallstones, no CBD dilatation. Pancreas poorly visualized

Images from BIDMC PACS
Endoscopic US: Pancreatic Pseudocyst

Looking posteriorly from the fundus of the stomach

Shows homogenously anechoic region with through-transmission, with poorly defined walls, consistent with a pseudocyst.

From: Digestive Disease Center, Medical University of South Carolina
http://www.ddc.musc.edu/
Role of Imaging III: CT

- Most commonly used modality to image pancreas
- Can accurately visualize pancreatitis-induced changes:
  - Minimal edema
  - Pseudocysts
  - Hemorrhage
  - Necrosis
  - Erosion into adjacent structures
Role of Imaging III: CT cont’d

- Diagnostic changes can sometimes be visualized when serological tests are negative.
- Major use: When diagnosis is uncertain or when complications are known or suspected.
Patient SD’s CT:
Patient SD’s CT: Cont’d

Findings:

- Distended GB (white arrows)
- Extensive peripancreatic stranding and free fluid (yellow arrows)
- Pancreas enhances homogeneously: no evidence of necrosis, hemorrhage, or pseudocyst

CT Diagnosis: Mild pancreatitis
A more severe case...
Patient NA

- 55 y/o F presents with 2 days of 7/10 epigastric and RUQ pain, nausea, vomiting
- SHx: Occasional EtOH
- Labs included elevated bilirubin, elevated amylase and elevated lipase, WBC count of 19.
- CT:
Patient NA’s CT

BIDMC PACS
Findings

- Ill-defined non-enhancing low-attenuation area in body of pancreas w/o defined wall (blue circles)
- Marked peripancreatic stranding (yellow arrows)
- Dilated pancreatic duct (red arrow)
- CT Diagnosis: Necrotizing pancreatitis
6 weeks later…

Large pseudocyst
Role of Imaging IV: MRI

- Better soft-tissue contrast than CT
- Gadolinium contrast safer than iodine, safe in renal failure
- Some evidence iodine contrast can exacerbate pancreatitis
- Better differentiation of subtle lesions
- Better evaluation of residual tissue when extensive necrosis has occurred
Peripancreatic edema (bright on T2 – yellow arrows)
Filling defect in bile duct (blue arrows)

Images courtesy of Dr. Pedrosa
Minimal edema around Gerota’s fascia (yellow arrow)

Courtesy of Dr. Pedrosa
Pancreatic duct dilatation (yellow arrow)
Heterogeneous tail enhancement (green arrow)
Late and heterogeneous tail enhancement (blue arrows)
CT vs. MRI cont’d – 6 weeks later

Peripancreatic edema (yellow arrows)

Less tail enhancement (green circle)

Heterogeneous area between body and tail (blue arrow)

**Diagnosis:** Necrotic pancreatitis, not seen on CT.
CT: Large fluid collection displacing stomach anteriorly (blue arrows)
Small area of parenchymal enhancement (red arrow)
MR: Gallstones clearly visible (green arrow)
Diffusely necrotic pancreatic parenchyma visible (yellow arrows) – not visible on CT
MRCP: Patent pancreatic duct (orange arrow) – ERCP not necessary! – not visible on CT

Courtesy of Dr. Pedrosa
MRI cont’d – evaluation of residual pancreatic parenchyma

Left image: some pancreatic parenchyma (green arrows), no change with contrast – likely necrotic. Is any functional tissue left?...

Courtesy of Dr. Pedrosa
MRI cont’d – subtraction of contrast and non-contrast images

Most of pancreatic parenchyma is lost in subtraction (green arrows) – it has no blood supply and is necrotic.

One small area remains (red arrow) that enhanced with contrast but not without – it has blood supply and is likely functional.

Courtesy of Dr. Pedrosa
Conclusions

- Imaging is useful if diagnosis is unclear.
- Ultrasound is used to evaluate for cholelithiasis, begin w/u for cholecystectomy if indicated.
- CT with and without contrast if complications are suspected (severe or prolonged course), or to f/u known complications.
- MR used if patient has iodine allergy or renal failure, or for subtle findings not ascertainable on CT.
References

Virtual Hospital:

http://www.vh.org/adult/provider/anatomy/atlasofanatomy/


Digestive Disease Atlas, Medical University of South Carolina:

http://www.ddc.musc.edu/ddc_pro/pro_development/atlases/EUS/benign.htm
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