Pancreas (non-endocrine) (see also: biliary/pancreatic folios => pancreas)

Physiology

ductal system produces bicarb, high carbonic anhydrase
secretin primary stimulus
duodenal enterokinase activates trypsin

Acute pancreatitis

etiologies
metabolic: ETOH, hyperlipidemia, hypercalcemia, genetic, drugs (steroids, thiazides, estrogen, azathioprine)
ETOH pancreatitis
increased ampulla resistance, high acid and secretin increase exocrine secretion causing enzyme extravasation
ETOH -> acetaldehyde, damages membranes and microtubules
ETOH increases triglycerides producing cytotoxic FFAs
impairs trypsin inhibition, impairs pancreatic blood flow
mechanical: gallstones, duct obstruction (divisum, tumor, duodenal obstruction), trauma, surgery (gastric, biliary)
ischemia: post bypass, periarteritis nodosa, atheroemboli
infectious: mumps, coxsackie B, CMV
other causes of hyperamylasemia: perforated ulcer, ischemic bowel, small bowel obstruction, renal failure, salivary gland inflammation, ectopic pregnancy, ovarian tumor/cyst, lung cancer, ketoacidosis, macroamylasemia (low urine amylase, too large to filter)
related to duct obstruction, premature enzyme activation: blocked extrusion of zymogen granules, altered intracellular transport
zymogen granules fuse with lysosomes (co-localization theory)
hydrolases (cathepsin B) activate enzymes (eg trypsinogen) in large cytoplasmic vacuoles which activates otherzymogens causing acinar cell injury,
intrapancreatic inflammatory response proportional to severity and extrapancreatic injury (lung, kidney)
gallstone pancreatitis
rising bilirubin and enzymes: 30% chance of CBD stones v 8% without chance increases with age and size of common duct
25-50% return within 30d without cholecystectomy at first episode
5% risk of severe pancreatitis with each episode
lap chole 1st admission 90% success, 10% morbidity
lap chole at recurrence 45% morbidity
in good risk patient amylase need not return to absolute normal before lap chole
MRCP 80-100% accurate for common duct stones > 2mm, but not therapeutic diagnostic accuracy = ERCP and IOC, screen hi risk
routine ERCP only 25% positive, 75% unnecessary risk of complications
pre-op ERCP 90% successful, 1-2% incidence of exacerbating pancreatitis, bleeding, perforation
routine intraop cholangiogram: clarifies anatomy, decreases injury in cholecystitis, jaundice, pancreatitis; hard to demonstrate benefit in uncomplicated lap chole
contrast CT @ 48-72h shows extent, viable tissue, abscess, pseudocyst
severe 20% mortality, multiple organ dysfunction
enteral alimentation beyond Treitz
80% of deaths from secondary infection

Assessment of severity

most acute pancreatitis due to gallstones, mild, resolves
Ranson criteria
on admission
age > 55
WBC > 16K
glucose > 200mg%
LDH > 350
AST > 250

at 48h
Hct 10mg/dl drop
BUN increase > 5
Ca++ < 8
pO2 < 60 (room air)
base deficit (acidosis) > 4
fluid sequestration > 6L
3 or more high risk for severe pancreatitis
APACHE II (acute physiology & health evaluation) score of 8 or more
amylase level is not prognostic

Severe pancreatitis

rapid fluid resuscitation (3-500cc/h), O2 supplementation
greater than 30% necrosis (contrast CT after 48h) associated with 30-40% infection rate
antibiotics when infection documented by CT-guided aspiration
no benefit for prophylactic antibiotics before proven infection
delay debridement 2-3wks if necessary to allow demarcation

Chronic pancreatitis

Puestow pancreatojejunostomy: 33% long term pain relief
Whipple: pain relief but significant morbidity and mortality, 60% endocrine insufficiency
thoracoscopic splanchnicectomy more effective than celiac block

6 April 2009
Pseudocyst

2% of acute pancreatitis develop, 85% single pain most common manifestation
observe 6-12wks, 40% resolve by 6w, unlikely after 6 smaller more likely to resolve, may take months jaundice from pressure of cyst on CBD

Cystic lesions

mucinous cystic lesions and IPMN may present with pancreatitis because of thick secretions blocking duct mucinous cystic lesions: women predominate, average age 50 malignant potential: Rx resection intraductile papillary mucinous neoplasm (IPMN)
younger (20s) women predominate pre-malignant (50% malignant @ Dx), thick mucin, 15% present with jaundice cysts, dilated ducts, in main duct more often invasive resection, even with microscopically positive margins beneficial predictors of malignancy: >70, symptoms, enlargement (not initial size or location) aspiration controversial risk hemorrhage, abscess, seeding information may guide Rx (incr CEA consistent with malignancy) aspiration is not therapeutic, 37% misdiagnosed as pseudocyst resection excellent long term survival, even with cancer solid/cystic lesions of young women asymptomatic, no jaundice incidental finding, ~10cm solid mural nodules (floating cloud sign) do not invade resect, no adjuvant Rx, excellent prognosis

Pancreatic cancer

80% > 55, black increased incidence, M > F genetics: HNPCC, BRCA2, Peutz-Jeghers (400X incidence), ataxia telangiectasia, familial atypical mole-melanoma syndrome, hereditary pancreatitis; tobacco, chronic pancreatitis, diabetes; primary relatives with hx pancreatic Ca 4-8X risk (increased screening to detect earlier?) smoking associated with pancreatic cancer & K-ras mutation 75% adenoCa 66% head, 20% body/tail, 15% diffuse cystic mucinous (columnar epithelium) premalignant serous: small cuboidal cells rarer, rarely progress to cancer do not predispose to pancreatitis head lesion: 2/3 painless jaundice
check LFTs, coags (bile necessary for vit K absorption)
body/tail: pain, weight loss, diabetes, non-specific
markers: CA19-9 only valuable marker; CEA may be elevated but not specific
CA19-9 may be proportional to tumor burden, useful to follow after adjuvant
also elevated in cholangitis and chronic pancreatitis
double duct sign

staging
contrast spiral CT best diagnostic test
10% of head lesions too small to be seen
ERCP
MRCP/heavily T2-weighted MRI
good for stones and stricture
shows stationary fluid, bile, pancreatic ducts
90% specific for tumor v stone, stricture
non-invasive, quick, no contrast
Endoscopic ultrasound (EUS)
good for biliary, poor for pancreas
laparoscopy
10-15% carcinomatosis, liver implants, changes operative management
body/tail: 50% mets not seen on CT
unresectable
medically unfit
back pain usually indicates growth into retroperitoneum
palliative resection for pain not indicated, celiac block
hepatic/distant mets
art/vein involvement (encase SMA, celiac contraindication)
SMV/portal V involvement relative contraindication
palliative
biliary obstruction best managed with endoscopic stent
7Fr lasts 1mo, 12 Fr 3mo, metallic wall stent may last until pt dies
duodenum: 10-20% develop gastric outlet problems before death; stent?
malignant ileus, gastro-jejunostomy may not help
biliary bypass
cholecystojejunostomy highest obstruction rate
choledochojejunostomy, choledochoduodenostomy rarely occlude
celiac block
open, percutaneous, endoscopic US guided
thoracoscopic splanchnicectomy may be equal or superior
chemo/rad palliation for locally extensive, not for widespread
5FU, gemcitobine some benefit, may increase survival 2-4mo
exploration
distal, retroperitoneal, vascular involvement
extensive Kocher maneuver

surgery
classic Whipple v pyloric-preserving
  no difference survival, outcome, no physiologic benefit
technically easier
pancreatic-enteric anastomosis
  jejunum, stomach; duct to mucosa v stuff/intussusception
Whipple v total
  no difference in cancer outcome if margin negative
brittle diabetes (no glucagon to overcome hypoglycemia)
no benefit extended nodal dissection
mort 2-3% (<5%) associated with experience of surgeon, high volume centers
complications: 20-40%
  delayed gastric emptying (more with pylorus sparing)
  prokinetic agents: reglan, erythromycin (action on modulin receptor)
abscess, wound, pulmonary
fistula
  historic 30-60%, mortality 15-30% (wound care, nutritional depletion)
current 10-30%, mort 1-2%
  detect abscess with CT, perQ drain
patients with head lesions, soft pancreas highest rates
treatment: TPN, tube feed, octreotide
prevention: octreotide (8 amino acid active residue of somatostatin)
  most potent inhibitor of pancreatic secretion
  most negative enteric hormone
  overall decrease in fistula with prophylactic
  start in recovery room
Hopkins pancreas survival 20%
  all eventually die of pancreatic cancer
predictors of 5y survival: negative margin (most common positive margin uncinate along
  SMA/SMV, portal V), smaller tumor
palliative
  do not use diseased Gb for bypass
adjuvant Rx
  diploid v aneuploid on flow cytometry, more differentiated, did better with adjuvant (5Fu
  & gemcitobine) (up to 40% 5y)
little data for locally unresectable; not indicated for widespread
trauma
  explore all central retroperitoneal hematomas r/o pancreas injury
References:

Katz M et al. Diagnosis and management of cystic neoplasms of the pancreas: an evidence-based approach. JACS, 207(1), July ’08: 106-120.