

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 other zymogens 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

thoroscopic splanchnicectomy more effective than celiac block

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

thoroscopic splanchnicectomy may be equal or superior

chemo/rad palliation for locally extensive, not for widespread

5FU, gemcitabine 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 & gemcitabine) (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.