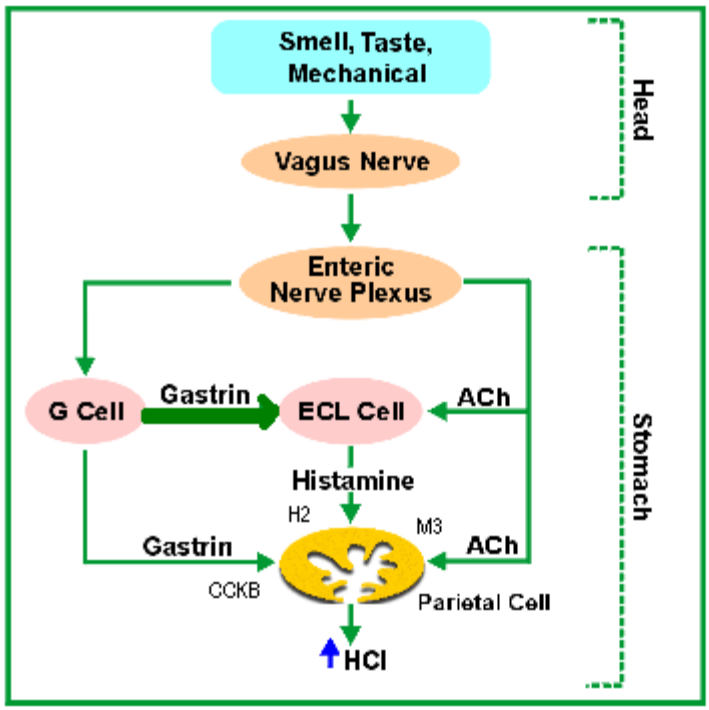
---STOMACH & DUODENUM---

Anatomy & Physiology

Stomach prepares food for digestion and absorption
Fundus: vagal stim czs relaxation to accommodate food
    Gastric pacemaker initiates motor activity
Corpus/Body: Parietal cells: HCl, IF production; Chief cells: pepsinogen; ECL: HCl regulation
    Storage of food and peristalsis
Antrum: G cells: gastrin (antrectomy + vagotomy for ulcer dz)
Sympathetic innervations parallels arterial supply
Vagus nerve: L trunk runs ant to esoph, R trunk runs post
Criminal N. of Grassi: branch or R trunk (must divide during truncal vagotomy to suppress acid)

H+/K+ ATPase pump on luminal surface of parietal cell
Parietal surface receptors: CCKB for gastrin, M3 for Ach, H2 for histamine (synergistic binding)
Cephalic phase: sight, smell, thought of food czs Ach release
Gastric phase: stretch receptors sense food entering stomach = Ach, gastrin release
EtOH, caffeine also increase HCl
~1L secreted after every meal

Secretin: secreted from duod S cells in response to acidic chyme in duod
    Inhibits gastrin release, HCl secretion, gastric motility
Somatostatin: secreted when gastric pH <1.5
    Inhibits gastrin release, histamine release, HCl secretion directly
CCK & GIP (gastic inhib polypep) also suppress HCl
Goblet cells (throughout entire stomach): produce mucus lining that traps HCO_3
    Keeps luminal surface pH at 7
IF: from parietal cells, binds B12 in duod after pancreatic enzymes activate it
Duod cell secrete 6x greater amt of HCO_3 than stomach, can neutralize all H^+ present



Gastric ulcer disease

H. pylori, NSAIDs (↓blood flow/mucus/HCO3), tobacco - all increase risk

Gastric ulcer classification types

I: lesser curve btw cardia/antrum (#1 type)
II: in combo w/ duod ulcers
III: prepyloric
IV: lesser curve, near GEJ

Type I/IV nl/low HCl secretion; II/III HCl hypersecretion (like duod ulcers)

HCl hypersecretion czs gastric metaplasia in duod

HCl hyposecretion allows H. pylori to spread proximally

NSAID ulcers occur anywhere

ALL gastric ulcers require bx to r/o malignancy

↑ risk if: >3cm, bunched up ulcer border, achlorydia

Rx: d/c NSAIDS, ASA, steroids, tobacco, EtOH
Sucralafate: forms polymer on gastric mucosa (↓pepsin, ↑HCO3/mucus/PG)
Misoprostol: PG E analogue
Clarithromycin + amox/metro +/- tetracycline
Repeat endoscopy 6 weeks after Rx; should see >50% healing (failure = poss malig)
Surgical Rx needed for: Intractability, hemorrhage, obstruction, perf

I,II, III: Antrectomy: >50% gastrect, = no gastrin, no pylorus (allows gastric emptying)
AND: Billroth I (gastroduod) or Billiroth II (gastrojej) or RNY gastroent
II, III: also reqs truncal vagotomy
IV: local ulcer excision or near total gastrect w/ RNY

--Stress gastritis
Curling's ulcer (burns)

Cushing's ulcer (CNS inj, critically ill pts, trauma pts): develops w/in 48 hours of inj
Hemorrhage = #1 cx
Rx: acid suppression, NGT aspiration, endoscopy w/ laser or vasoconstrictor injection
May oversew ulcer – controls bleed in 50%
--Mallory Weiss synd
Upper GI bleed d/t linear tear at GEJ
Rx: NGT, lavage, enodsocopy, fluids, acid suppression; most bleeding stops
Gastrotomy w/ oversewing if bleed continues; may rebleed, usu w/in 24 hours
--Gastric polyps: <0.5cm = low risk of malignancy; >2cm = high risk (10-20%)

GERD
Antireflux surgery (Nissen fundoplication) if:
Failure of medical management, stricture, esophagitis, Barrett's dz, aspirat'n/asthma sxs

Malignant gastric disease
95% = adenocarcinoma; overall incidence declining
More common in Japan, China (diet)
Risk factors: H pylori, pernicious anemia, achlorhydria, chronic gastritis, smoking, nitrates
Histologic types:
-Intestinal – well diff, hematogenous spread, older pts, precursor lesion, risk factors
-Diffuse – poorly diff, lymph spread, younger pts
Morphologies:
1. Ulcerating: deep penetration into all layers
2. Polypoid: large intraluminal tumor with late mets
3. Superficial spreading: "early" with late mets
4. Linitus plastica: complete infiltration, poor px

S/Sx: epigastric pain, wt loss, dysphagia, hematemesis, melena, n/v
LNs: Virchow's (supraclavic), Sister Mary Joseph (umbilical), Blumer's (rectal ridge)
Mets to lung, liver, ovary (Krukenburg's tumor); CXR, CT A/P needed
Dx: EGD; EUS helps w/ staging; CEA usu elevated w/ mets
Depth of tumor invasion important for staging
Rx: Cardia tumors: esophagogastrectomy
Prox / large distal lesion: total gastrectomy & B2
Most distal lesions: subtotal (85%) gastrectomy
Antral lesion: req distal gastectomy w/ 6cm prox margin, 3-4cm duod margin, en bloc resection of omentum, L gastric artery, subpyloric LN
Post op 5-FU + leucovorin + RT (not proven to increase survival)
Palliative surgery if tumor causing obstruction or bleeding (gastrojej)
Px: 5 yr surv: Japan <50%; Western countries <10%

--Gastric lymphoma
Stomach = source of 2/3 of GI lymphomas
Usu non-Hodgkin's, usu older pts
S/Sx: abd pain, wt loss, bleed
Rx: surgery + post op chemo vs chemo alone
Px: if confined to stomach, 75% 5 yr surv

--GI stromal tumor (GIST)
Stomach = #1 site for GIST
Submucosal growths (leiomyoma, leiomyosarc)
Tumors > 6cm = increased risk of malig
Bx usu non diagnostic
Rx: local excision w/ 2-3cm margins; imatinib for malignant GIST

Uncomplicated duodenal ulcer
Rarely malignant (unlike gastric lesions)
Poss h/o wt gain (duod ulcer = decrease pain w/ food)
Most pts have increased acid output (10x > nl in Zollinger-Ellison synd)
Dx: Urease test (urease from bact breaks urea into NH_3 + CO_2)
Fecal antigen test (must d/c PPIs weeks before these tests)
Rx: 1st line: acid suppression + 7 d ABX (clarithro + amox/metro)
2nd line: quad rx: acid supp + bismuth + metro + tetracycline

Complicated peptic ulcer
1. Perforation: acute onset pain, rigid abd, RLQ pain (d/t paracolic gutter), free air
Rx: Usu on ant duod; oversew w/ omentum (Graham patch)
If < 6 hours old perform acid-reducing procedure
2. Hemorrhage: hematemesis, melena, BRBPR; NGT + lavage + endoscopy
Rx: Endoscopic rx (electrocautery, injection rx)
Worrisome signs: active bleed, vessel at ulcer base, fresh clot on ulcer
Rebleeding in 25% of medically treated pts; usu w/in 48 hours
Rebleed pts usu benefit from surgery bc mortality as high as 30%
3. Gastric outlet obstruction: projectile vomiting after feeds, wt loss
Succussion splash on exam
Rx: NS for hypoCl, alkalosis; TPN, NGT (helps if obstruction d/t edema)
If conservative Rx fails after 1 week, may need truncal vagotomy + B1 or B2
4. Intractability: persistence after meds, recurrence; r/o Z-E synd
Rx: Truncal vagotomy - also disrupts gastric motility, req's gastric drain proced (pyloroplasty: longitudinal incision closed transversally) to prevent antral distension and gastrin release; adding antrectomy ↓s recurrence (from 10% down to 2%)
Prox gastric vagotomy preserves "crow's foot" nerves; thus gastric motility unchanged
Procedures w/ lowest recurrence have highest postgastrect cxs

Malignant duodenal disease
--Zollinger-Ellison synd (gastrinoma)
2/3 located in triangle btw jxn of cystic duct/CBD, 2nd/3rd part of duod, SMA
Associated w/ MEN I (#1 panc islet cell tumor in MEN I)
60% malignant w/ 50% 5 yr surv
S/Sx: ulcer like sxs w/ chronic/severe diarrhea (ulcers in duod/atypical locations)
Dx: Fasting gastrin level >1000pg/ml (d/c PPIs >1wk)
If <1000 but abnl, f/u w/ secretin stimulation test
Imaging studies to localize and stage dz
Liver = #1 site for mets

MEN I screening (look for hyperCa, if + check PTH level)
Rx: PPIs, somatostatin (octreotide)
If no mets: surgical excision + prox gastric vagotomy
If MEN I: parathyroidectomy, +/- surg excision
--Adenocarcinoma of duodenum
Rare, but duod is #1 site for small intestine adenocarc
2/3 in 2nd part of duod
Rx: pancreaticduodenectomy if in 1st/2nd part of duod; +/- post op RT
Px: If + LN, 5yr surv <15%
--Duodenal lymphoma: rare, usu in ileum; Rx: excision + post op chemo

Postgastrectomy complications
Often d/t to alterations in pyloric mechanism and gastric emptying
Upper GI series useful in pts w/ complicated post op course
1. Early dumping syndrome
d/t ingestion of high osmolarity food
Hypertonic fluid in SI czs rapid fluid shift into lumen
Several hormones also released
15min post meal, pts get anxious, weak, diaphoretic, tachycardic, palpitations, diarrhea
Have desire to lie down
Rx: avoid hypertonic liquids, ↓volume of meals, add fat to meals to slow emptying
2. Late dumping syndrome
d/t rapid fluctuations in blood glucose levels
Gluc absorbed more rapidly when pylorus not intact→↑insulin→hypoglycemia
Rx: eat small snack 2 hours post prandial; convert to Billroth I or RNY gastjej
3. Postvagotomy diarrhea
50% of pts w/ truncal vagotomy have change in bowel habits (↑freq, liquid stools)
Most sx resolve or improve; <1% have severe, unrelenting diarrhea (idiopathic)
Rx: loperamide, codeine, somatostatin; reversed 10cm seg of jejunum inserted
4. Afferent loop obstruction
Only after Billroth II; usu d/t kink in afferent limb at anastamosis
Panc/biliary secretions trapped in limb, causing distension
Sx: crushing pain 45min post meal; severe wt loss
Vomit dark brown, bitter, oil like material (no food), sxs resolve w/ vomiting
Rx: convert to Billroth I or RNYgastjej
5. Blind loop syndrome
More commonly after Billroth II than RNY
Bacterial overgrowth in blind limb, interfere w/ B12, folate absorption
Sxs: steatorrhea, diarrhea, wt loss, weakness, anemia
Rx: ABX for aerobes + anaerobes; regrowth often occurs: convert to Billroth I
6. Alkaline reflux gastritis
d/t reflux of duod/biliary/panc contents
Sxs: epigastric pain, wt loss, weakness, nausea
Dx: endoscopy shows bile stained gastric epithelium
Rx: long limb RNY gastjej; min dist btw gastjej & bile/panc entry is 40cm

7. Recurrent ulcer disease
    d/t incomplete vagotomy
    Dx: endoscopy w/ pentagastrin & congo red (to detect pH drop)
    If complete vagotomy confirmed, r/o MEN I (check Ca, PTH levels), gastrinoma
8. Metabolic disturbances
    Iron def anemia in up to 50%
    Vit B12 / folate def anemia in up to 20%
    Steatorrhea may cz Ca/Mg def by chelating these ions
9. Gastric atony
    In up to 50% of pts, but usu asx; usu resolve spont; metoclopramide/erythromycin

Surgical treatment of obesity

Restrictive operations: limit food intake; e.g. vertical banded gastroplasty
Malabsorptive operations: limit food absorption; e.g. biliopancreatic diversion
RNYGB = combined operation
Restrictive = less extensive, but less wt loss; Malabsorptive = better wt loss, but malnutrition
Laparoscopic procedures decrease wound infxn and incisional hernia

Complications of bariatric operations
1. Anastomotic leak
    In RNYGB, often at gastrojej site
    S/Sxs of peritonitis often masked d/t pt's size
    Post op persistent tachycardia or tachypnea may be only signs
    May test site for leak intraoperatively, or place drain
    Routine contrast swallow before feeding
2. Stricture
    In RNYGB, can form at gastrojej site
    Intolerance to solids or liquids 1-2 months post op
    Endoscopy for dx
3. Gallbladder disease
    1/3 of obese pts w/ rapid wt loss develop cholelithiasis
    Ursodeoxycholic acid decreases risk to 2%; use for 3-9 months post op
    CCY may also be performed w/ bariatric procedure
4. DVT/PE
    Adipose tissue causes increased thrombogenesis
5. Nutritional disturbances
    W/ RNYGB, vit B12 def common d/t ↓IF binding; Rx: IM, sublingual B12
6. Adjustable gastric band cxs
    Gastric prolapse: stomach herniates thru band; n/v, reflux; strangulation may occur
    Dx: contrast swallow study
    Rx: deflate band
    Band erosion: <1% pts