GI Surgery
(Small Intestine & Appendix)

Small Intestine

- Obstruction
  - Historically, nonoperative management ruled
    - Reduction of hernias
    - Laxatives
    - Ingestion of heavy metals
    - Leeches
  - Late 1800s when antisepsis and aseptic surgical technique developed → surgical intervention became safer

Small Intestine - Obstruction

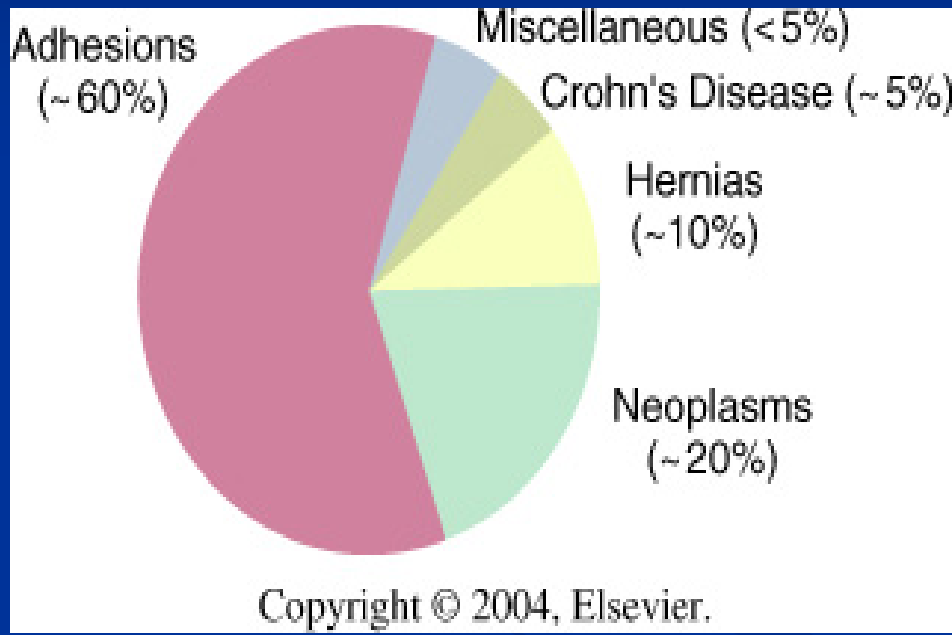
- Understanding the pathophysiology of SBO with the use of the following has greatly reduced mortality of pts with mechanical SBO
  - Isotonic fluid resuscitation
  - Intestinal tube decompression
  - Antibiotics

SBO

- **Etiology**
  - Obstruction arising from extraluminal causes (adhesions, hernias, carcinomas, and abscesses)
  - Obstruction intrinsic to the bowel wall (primary tumors)
  - Intraluminal obstruction (gallstones, enteroliths, FB, bezoars)

SBO

- At turn of 20th century, hernias accounted for >50% of mechanical SBO
- Now with elective hernia repairs, it is the 3rd most common cause of SBO
- **ADHESIONS** are by far the MCC of SBO!



SBO

- Adhesions
  - Mainly after pelvic operations (gynecologic procedures, appendectomy, and colorectal resection)
  - More than 60% of all causes of bowel obstruction in the U.S.
  - Likely due to the increased mobility of the bowel in the pelvis as compared to the more tethered state in the upper abdomen

SBO

- Malignant tumors
  - 20% of cases
  - Majority are metastatic lesions secondary to peritoneal implants that have spread from an intra-abdominal primary tumor such as ovarian, pancreatic, gastric, or colonic
  - Primary colonic cancers (cecal or ascending colon) may cause extrinsic compression
  - Primary SB tumors are extremely rare

SBO

- Hernias
  - 10% of cases (3rd MCC)
  - Ventral or inguinal
  - Internal hernias – usually related to prior abdominal surgery

SBO

- Crohn's disease
  - 4th MCC (approximately 5%)
  - Obstruction results from acute inflammation and edema that sometimes resolves with conservative management
  - Longstanding Crohn's disease can lead to strictures that may require resection and reanastomosis versus strictureplasty

SBO

- Pathophysiology
  - Early in an obstruction, intestinal motility and contractile activity increase to propel luminal contents past the obstructing point
  - Early on this increase in peristalsis is present both proximal and distal to the point of obstruction
  - Later in the course, the intestine becomes fatigued and dilates
  - With dilation, water and electrolytes accumulate both intraluminally and within the bowel wall

SBO

- Pathophysiology
  - Massive 3rd-space fluid loss → dehydration and hypovolemia
  - Can lead to hypotension, shock, IAP, ↓venous return, elevation of the diaphragm, ↓ ventilation
  - Proximal obstruction
    - Dehydration + hypochloremia + hypokalemia + metabolic alkalosis + vomiting
  - Distal obstruction
    - Less dramatic electrolyte abnormalities
    - Dehydration + oliguria + azotemia + hemoconcentration

SBO

- Pathophysiology
  - As the intraluminal pressure ↑, the mucosal blood flow ↓
  - Concern for bowel perforation and peritonitis
  - In absence of obstruction, jejunum & ileum virtually sterile; however, with obstruction, microflora changes
    - *E. coli, S. faecalis, Klebsiella* (up to 10^9-10^{10}/ml)

SBO – Clinical Manifestations

- Symptoms
  - Colicky abdominal pain
  - Nausea
  - Vomiting
    - Have patient describe bilious, nonbilious, or feculent
  - Failure to pass flatus/feces (obstipation)
    - Develops later
    - Pts may report diarrhea early on due to increased peristalsis
  - Abdominal distention

SBO – Clinical Manifestations

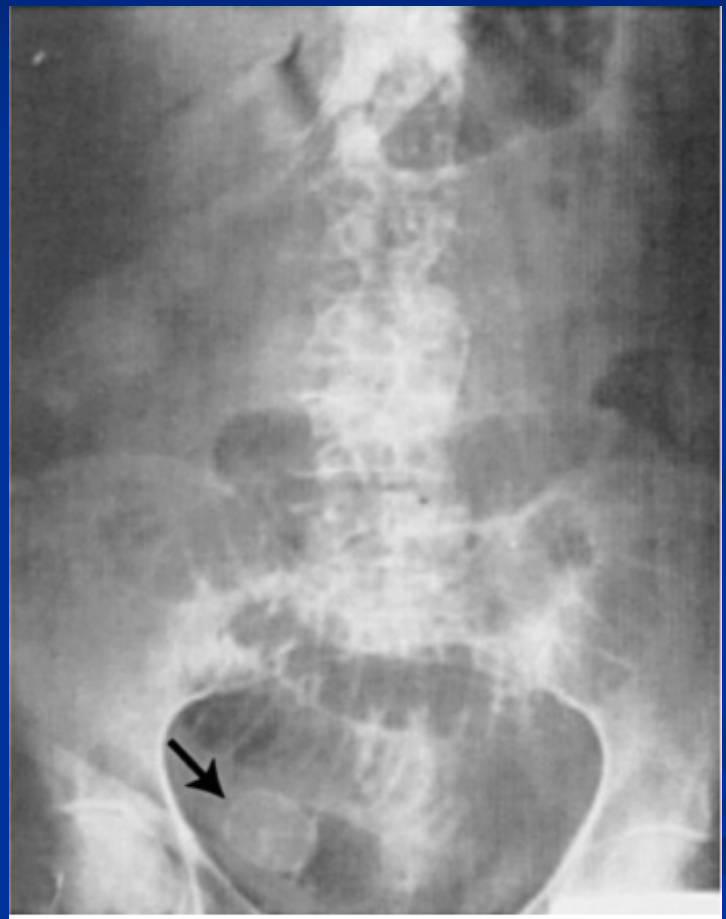
- Physical Exam
  - +/- tachycardia
  - +/- hypotension suggestive of severe dehydration
  - Fever (possible strangulation)
  - Distended abdomen
  - Rushes/tinkles
  - Localized tenderness, rebound, guarding → concern for peritonitis and strangulated bowel
  - ALWAYS check for incarcerated inguinal hernias!!!
  - Rectal exam – perform hemoccult

SBO – Clinical Manifestations

- X-Ray
  - AAS usually confirm H&P
  - 60% accurate
  - Upright → multiple AFL

SBO – Clinical Manifestations

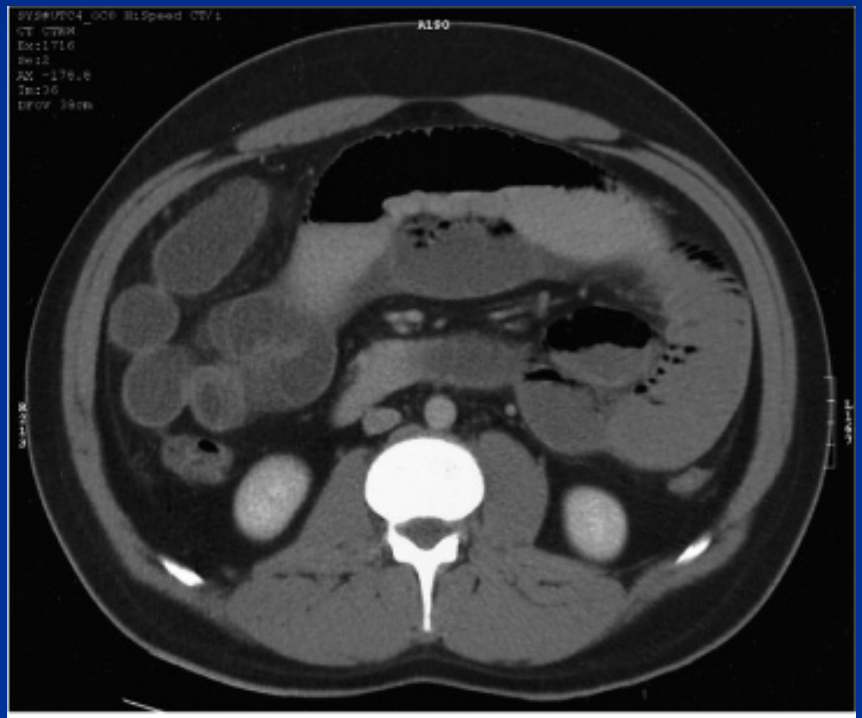
- Complete bowel obstruction secondary to large radiopaque gallstone



SBO – Clinical Manifestations

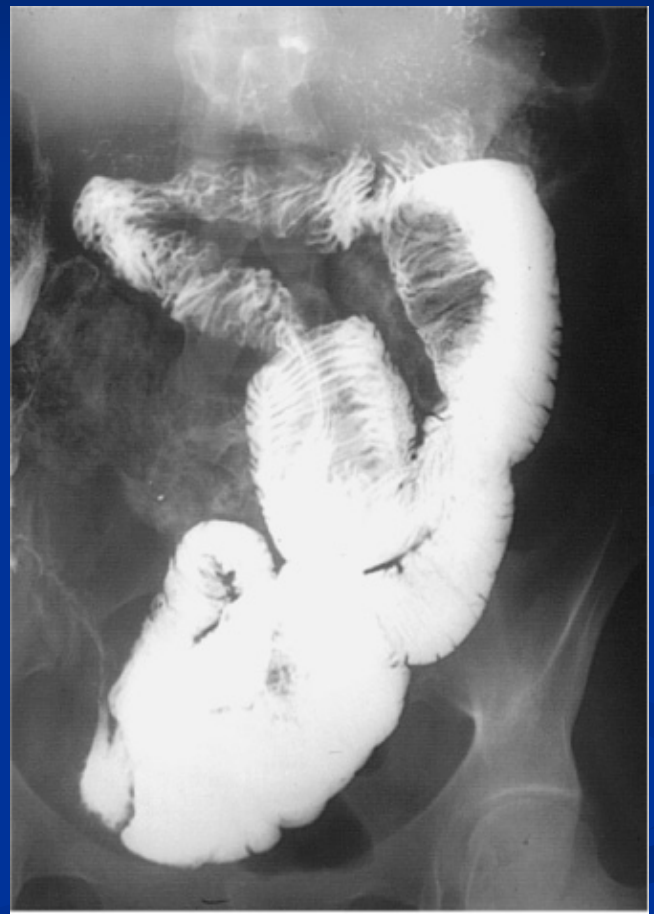
- CT scan
  - Beneficial when diagnosis uncertain
  - Sensitive for diagnosing complete or HG SBO and for determining location and etiology
  - Less sensitive in PSBO
  - Helpful for extrinsic causes

SBO – Clinical Manifestations



SBO – Clinical Manifestations

- Barium/Enteroclysis
  - Enteroclysis – oral insertion of tube into duodenum to instill air and barium directly into small intestine
    - Definitive study in pts in whom diagnosis of LG intermittent SBO is clinically uncertain
  - Disadvantages of enteroclysis
    - NGT
    - Slow transit of contrast in pts with SBO
    - Expertise required



SBO – Clinical Manifestations

- U/S
  - Pregnant pts
- MRI
  - No better than CT

SBO – Clinical Manifestations

- Lab work
  - Not helpful in diagnosis
  - Essential in assessing degree of dehydration
  - Pts with SBO need serial electrolyte checks to assess effectiveness of resuscitation
  - Follow Hct secondary to resuscitation on hemoconcentration associated with SBO
  - Leukocytosis may be associated with strangulation

Simple vs. Strangulating SBO

- Strangulating SBO usually involves closed-loop obstruction
  - Associated with increased morbidity/mortality
  - “Classic signs”
    - Tachycardia
    - Fever
    - Leukocytosis
    - Constant noncramping abdominal pain

Simple vs. Strangulating SBO

- CT useful only in late stages of irreversible ischemia
- LDH, amylase, alk phos, ammonia levels not beneficial
- Lactate and CPK limited success
- BOTTOMLINE:

Bowel ischemia and strangulation cannot be reliably diagnosed or excluded preoperatively in all cases by any known clinical parameter.

SBO – Treatment

- Fluid Resuscitation
  - LR – IVF of choice
  - UOP monitoring via foley
  - After potassium and chloride levels normalize and UOP adequate, IVF can be changed to maintenance with KCl replacement
  - Due to often large fluid requirements, central venous assessment may be necessary

SBO – Treatment

- Broad-spectrum antibiotics
  - Prophylactically given due to some reported data on bacterial translocation
  - Also given as prophylaxis for possible resection or inadvertent enterotomy at time of surgery

SBO – Treatment

- NGT
  - Empties stomach
  - No benefit given from longer intestinal tubes
  - PSBO can be managed conservatively (IVF & NGT) in 60-85% of patients

SBO – Operative Management

- Complete bowel obstruction → OR
  - 12-24hr delay of surgery is safe but incidence of strangulation and other complications increases significantly after this period
  - “sun should never set on a SBO”

SBO – Surgical Management

- LOA
- Manual reduction of herniated segment of bowel and defect repair
- Malignancy with metastasis - simple bypass of obstructing lesion appropriate
- Crohn's – resection or strictureplasty
- IAA – percutaneous drainage
- XRT – if chronic, may require resection versus bypass
- If ? intestinal viability, fluoriscein versus second look laparotomy

SBO – Surgical Management

- Laparoscopy – accepted in the following clinical scenarios
  1. Mild abdominal distention allowing adequate visualization
  2. Proximal obstruction
  3. Partial obstruction
  4. Anticipated single-band obstruction

Ileus

- Intestinal distention and slowing or absence of passage of luminal contents without demonstrable mechanical obstruction
- May continue to pass flatus and diarrhea
- Treatment is supportive with NGT, IVF, and correction of electrolytes

CAUSES OF ILEUS
Post laparotomy
Metabolic and electrolyte derangements
Drugs
Intra-abdominal inflammation
Retroperitoneal hemorrhage or inflammation
Intestinal ischemia
Systemic sepsis

Crohn's Disease – Buzz Words

- Transmural inflammatory disease
- Abdominal pain, diarrhea, weight loss
- Complicated by SBO or localized perforation with fistula formation
- Occurs in SI and colon
- Discontinuous and segmental
- Rectal sparing characteristic in pts with colonic disease
- Perianal involvement – multiple chronic perianal fistulas

Crohn's Disease – Buzz Words

- "skip areas"
- "fat wrapping"
- Aphthous ulcer
- Cobblestone appearance – linear ulcers that coalesce producing transverse sinuses with islands of normal mucosa in between

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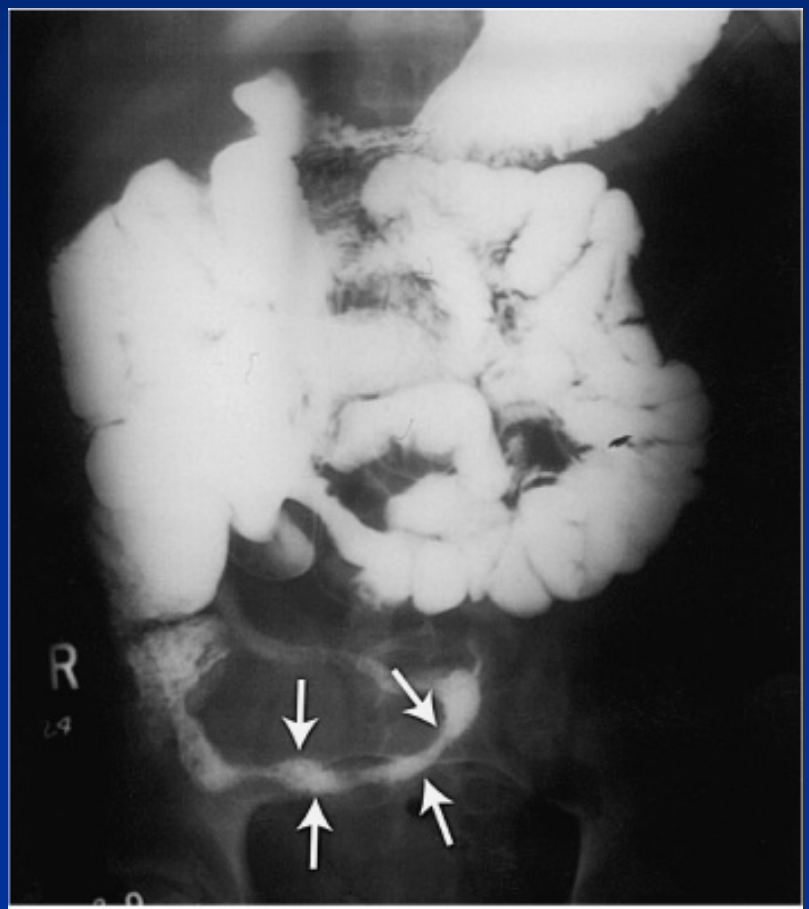
Crohn's Disease – Buzz Words

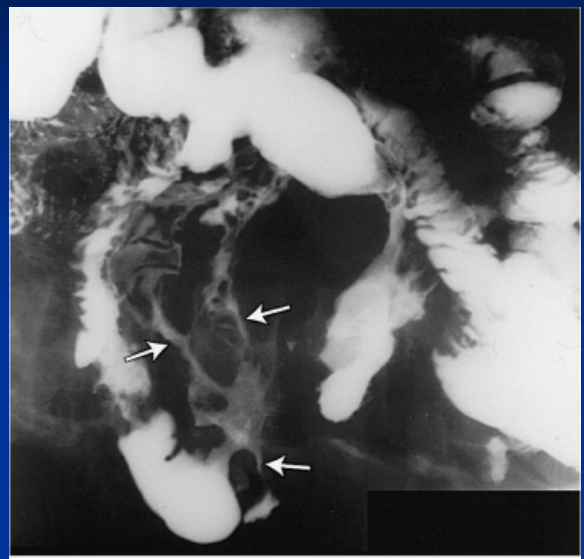
- Young adult (20-30s)
- MCC symptom = intermittent colicky lower abdominal pain
- Next MCC symptom = diarrhea (85% pts)
- Main intestinal complications = obstruction, fistulas, and perforation
- Cancer risk
  - Relative risk SB 100x greater (ileum)
  - Colorectal risk also great

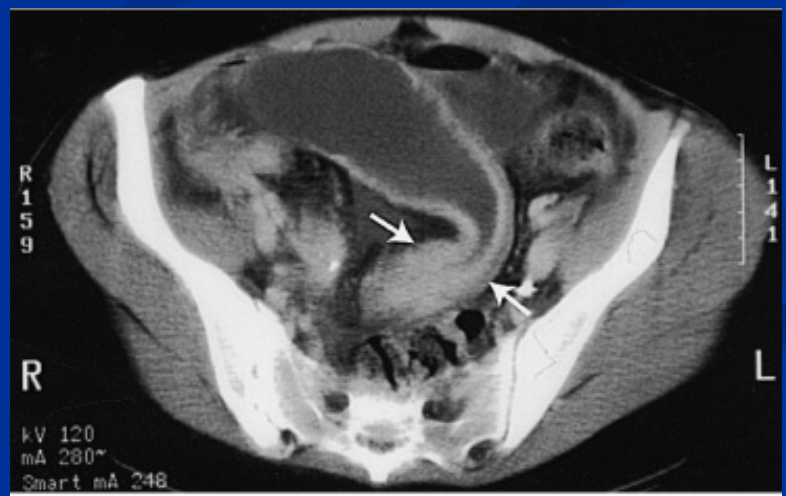
Crohn's Disease – Buzz Words

- Extraintestinal Manifestations
  - Skin lesions
    - Erythema nodosum
    - Pyoderma gangrenosum
  - Arthritis
  - Arthralgias
  - Uveitis
  - Iritis
  - Hepatitis
  - Pericholangitis
  - Aphthous stomatitis

Crohn's Disease



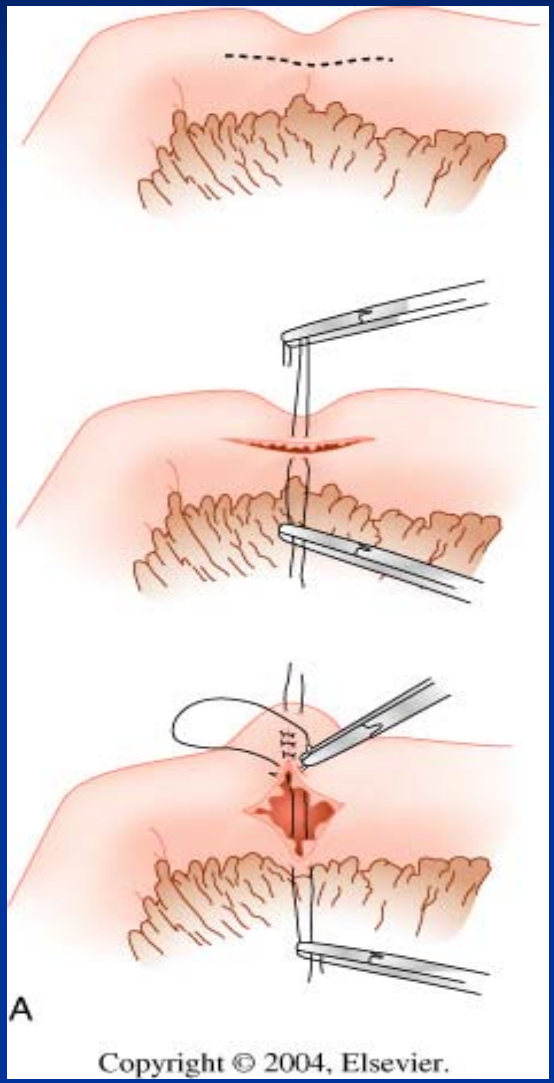


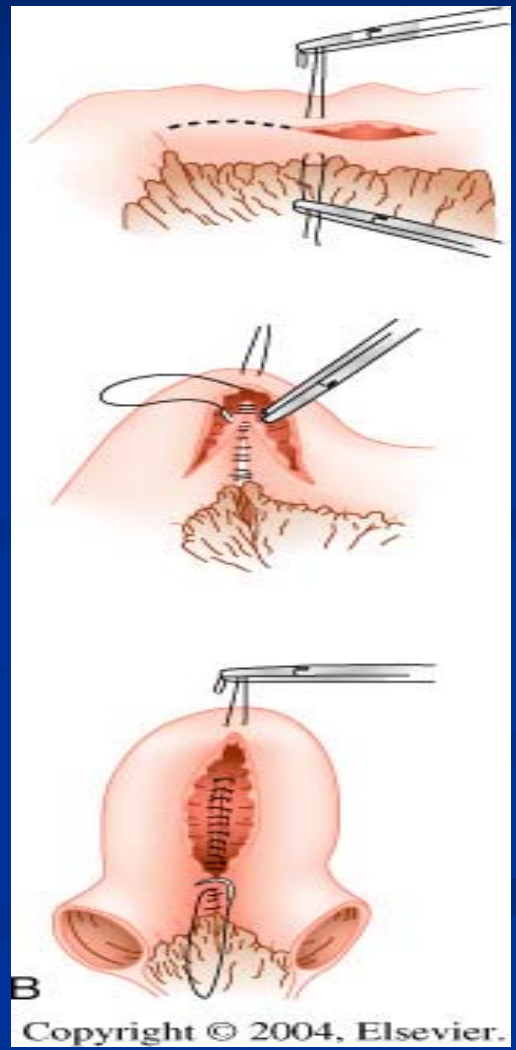


Crohn's Surgical Treatment

- Medical management for acute exacerbations
- Surgical treatment limited to
  - Intestinal obstruction
  - Intestinal perforation with fistula formation or abscess
  - Free perforation
  - GIB
  - Urologic complications
  - Cancer
  - Perianal disease
- Make no attempt to resect more bowel even though grossly evident disease may be apparent

Strictureplasty





SB Neoplasms

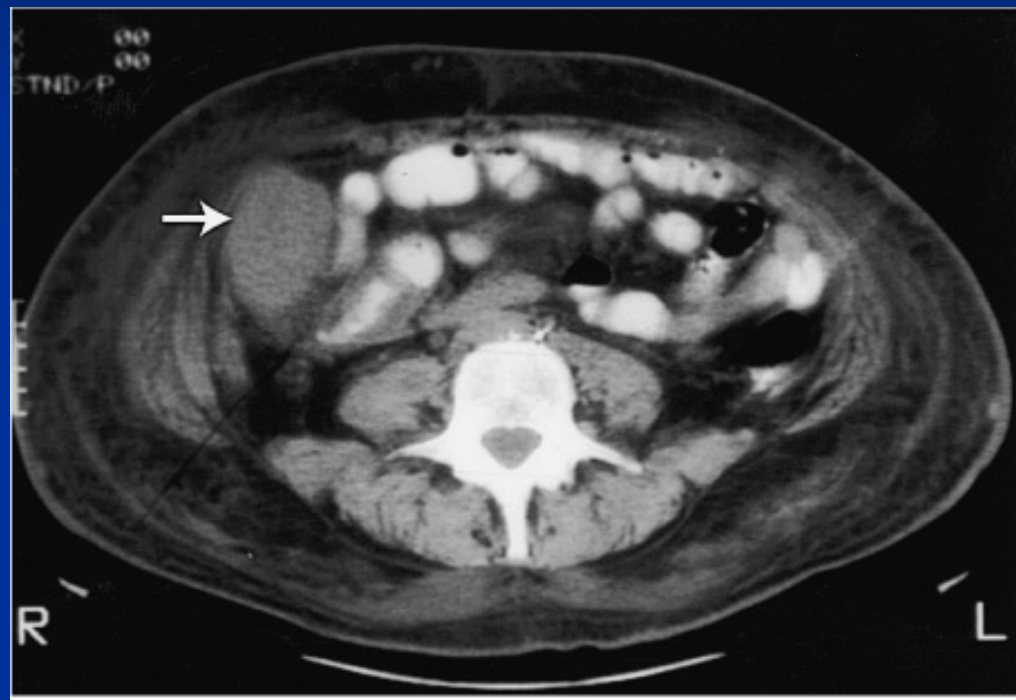
- Rare despite the fact that SB is 80% of the total length of the GI tract and 90% of mucosal surface area
- 5% of GI neoplasms, 1-2% of malignant tumors
- Possible reasons rate so low
  - Rapid transit of luminal contents
  - High turnover rate of SB epithelial cells minimizing carcinogenic exposure
  - Alkalinity of SI contents
  - High level IgA
  - Low bacterial count

SB Neoplasms

- Highest cancer rates – Maori of New Zealand and native Hawaiians
- Low in India, Romania, and Eastern Europe
- Increasing incidence likely due to spread of AIDS and lymphomas which occur in the immunocompromised host
- Benign – leiomyomas and adenomas; more common in distal SB
- Adenocarcinoma and carcinoid tumors are the most common malignant neoplasm
- Genetic mutations – *K-ras*

Work-up

- Upper GI series w/ SBFT
  - 50-70% accurate diagnosis
- Enteroclysis
  - Diagnostic accuracy 90%
- Flexible endoscopy
  - Duodenal lesions and ileal lesions
- CT A/P
  - Duodenal lesions and ileal lesions



Benign Neoplasms

- Adenomas most common in autopsy series
- GIST most common benign lesion producing symptoms
- Symptoms – vague and nonspecific
  - Most asymptomatic
  - Dyspepsia
  - Anorexia
  - Malaise
  - Dull abdominal pain
- SB tumors are the MCC of intussusception in adults!

Benign Neoplasms

- Treatment
  - Surgery – segmental resection and primary anastomosis
- Pathology
  - Leiomyomas (GIST) – MC symptomatic benign neoplasm of SB
  - Adenomas – 15%; most asymptomatic (20% duodenum, 30% jejunum, 50% ileum)
    - True
    - Villous – rare, mostly found in duodenum, may be associated with FAP, malignant potential 35-55%,
      - Segmental resection preferred, however, in duodenum polypectomy may be performed if histologically benign
    - Brunner gland – benign hyperplastic lesions from Brunner glands of proximal duodenum
      - Simple excision secondary to no malignant potential

Benign Neoplasms

- Pathology
  - Lipomas (GIST)
    - Mostly found in ileum
    - Elderly men
    - <1/3 symptomatic
    - Symptomatic lesions should be excised; no malignant potential
  - Hamartomas (Peutz-Jeghers syndrome)
    - Entire jejunum and ileum; 50% pts have colorectal involvement while 25% have gastric lesions
    - Adenomatous changes reported in 3-6% of hamartomas
    - Extra colonic cancers (50-90% patients)
      - SI, stomach, pancreas, ovary, lung, uterus, breast
      - SI most frequent site (RR 520)
    - Surgical resection – should be limited to segment of bowel producing complications
    - Cure not possible and extensive resection contraindicated

Benign Neoplasms

- Pathology
  - Hemangiomas
    - Jejunum most common
    - 3-4% benign SB tumors
    - Multiple in 60% of pts
    - May be part of Rendu-Osler-Weber disease, Turner's syndrome
    - Most common symptom = GIB
    - Angiography and ^{99m}Tc-RBC scan most useful
    - Surgical resection of involved segment only

Malignant Neoplasms

- Most common in order of frequency
  - Adenocarcinomas
  - Carcinoid tumors
  - Malignant GISTs
  - Lymphomas

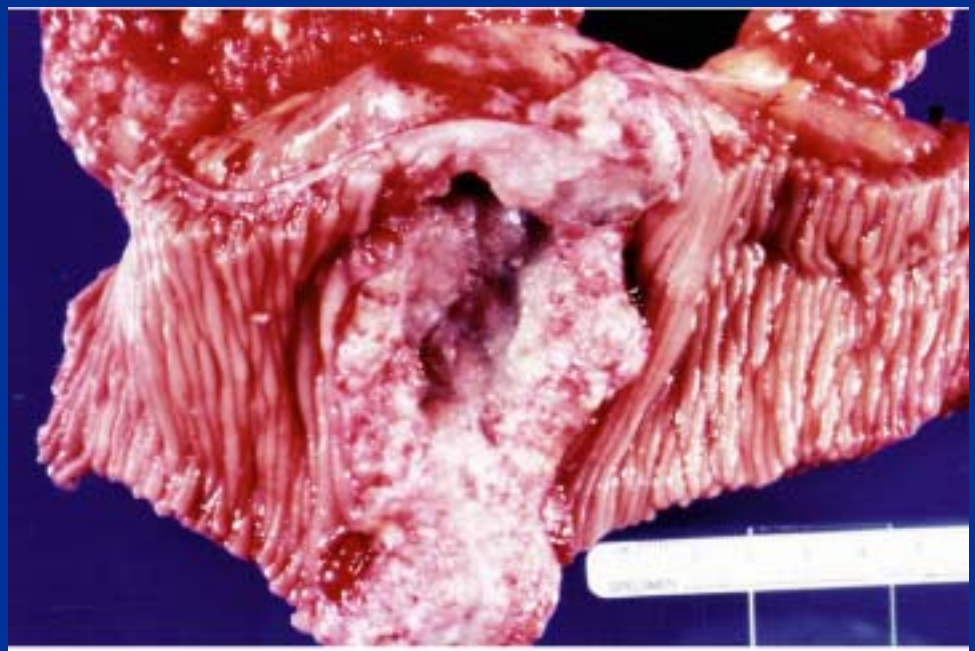
Malignant Neoplasms

- How do they present?
  - Pain
  - Weight loss
  - Obstruction (15-35% pts)
    - Due to infiltration and adhesions as opposed to intussusception caused by SB benign lesions
  - Diarrhea with tenesmus
    - Mucus
  - Palpable mass (10-20% pts)
  - Perforations (10% pts)
    - Lymphomas and sarcomas

Malignant Neoplasms

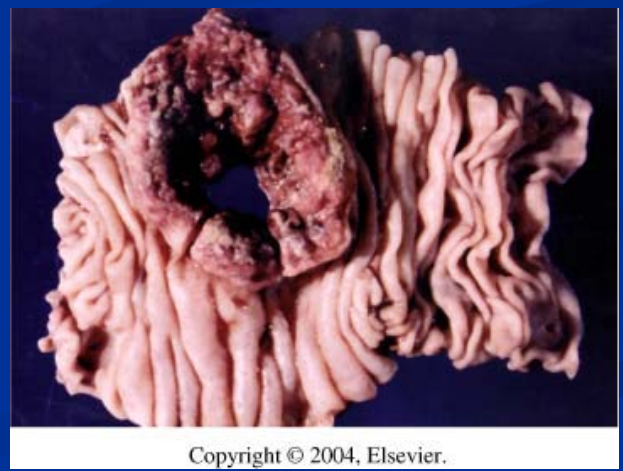
- Pathology
  - Adenocarcinomas
    - 50% malignant tumors of SB
    - Peak incidence 70s, slight male predominance
    - Duodenum and proximal jejunum
      - Crohn's pts younger age and in ileum
  - GISTs
    - 20% malignant tumors of SB
    - Peak incidence 50-60s, slight male predominance
    - Jejunum and ileum
    - Direct extension and hematogenous spread
      - >5cm at time of diagnosis in 80% pts
      - Arise in muscularis propria and grow extramurally

Malignant Neoplasms



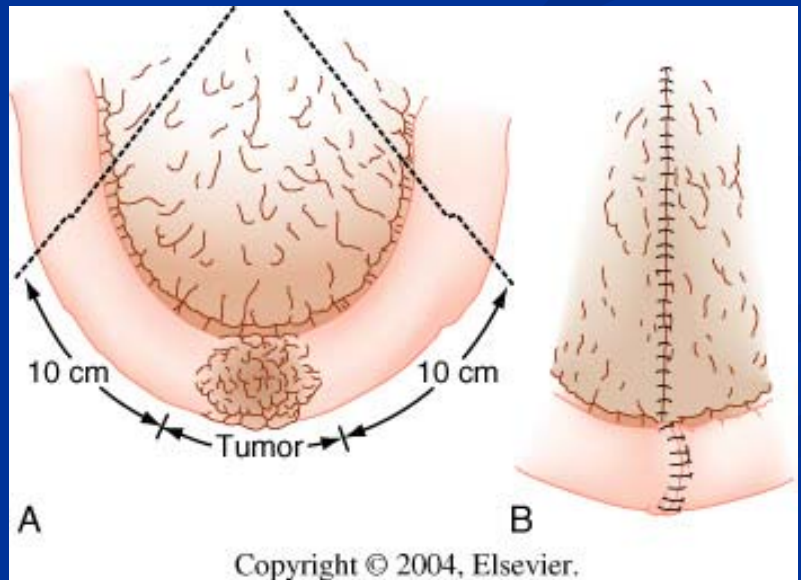
Malignant Neoplasms

- Pathology
  - Lymphomas
    - 5% all lymphomas
    - 7-25% malignant tumors of SB (most common intestinal neoplasm in children <10)
    - Ileum
    - Increased risk in those immunocompromised and with celiac disease
    - Usually large



Malignant Neoplasms

- Treatment
  - GISTs
    - Segmental bowel resections
    - If invasion into other organ segments present, resection may confer improved survival
  - Adenocarcinomas/Lymphomas
    - Wide resection + regional LN
    - May require Whipple for duodenal lesions
    - Surgery often not curative
    - Palliative procedures versus bypass are often performed



Malignant Neoplasms

- Prognosis
  - 5-yr survival after surgery only 25%
  - Adenocarcinoma has poorest prognosis, with overall survival rate 15-20%
  - GISTs
    - Overall survival 7-56%

Carcinoid Tumors

- Arise from enterochromaffin cells (Kulchitsky cells) found in the crypts of Lieberkühn (a.k.a. argentaffin cells)
- Lungs, bronchi, GI tract
  - GI tract most common site
- SB carcinoids – 5th decade
- Classified by embryologic site of origin and secretory product
  - Foregut (respiratory tract, thymus)
    - Low levels of serotonin
    - ACTH
  - Midgut (jejunum, ileum, R colon, stomach, and proximal duodenum)
    - serotonin
  - Hindgut (distal colon and rectum)
    - Rarely produce serotonin
    - Somatostatin and peptide YY

Carcinoid Tumors

- Can secrete corticotropin, histamine, dopamine, eurotensin, prostaglandins, kinins, gastrin, somatostatin, pancreatic polypeptide, calcitonin, neuron-specific enolase
- Within GI tract
  - Appendix most common site
  - SI 2nd most common
    - Occur within 2 ft of ileum

Carcinoid Tumors

- Primary importance of carcinoid tumors is malignant potential of tumors themselves
- Carcinoid syndrome
  - Episodic attacks of cutaneous flushing
  - Bronchospasm
  - Diarrhea
  - Vasomotor collapse

Carcinoid Tumors

- 70-80% asymptomatic
- 90% carcinoids = appendix 45%, ileum 28%, rectum 16%
- 3% appendiceal carcinoids metastasize
- 35% ileal carcinoids metastasize
- 75% GI carcinoids <1cm (2% metastasize)
- Tumors 1-2 cm (50% metastasize)
- Tumors >2cm (80-90% metastasize)

Carcinoid Tumors

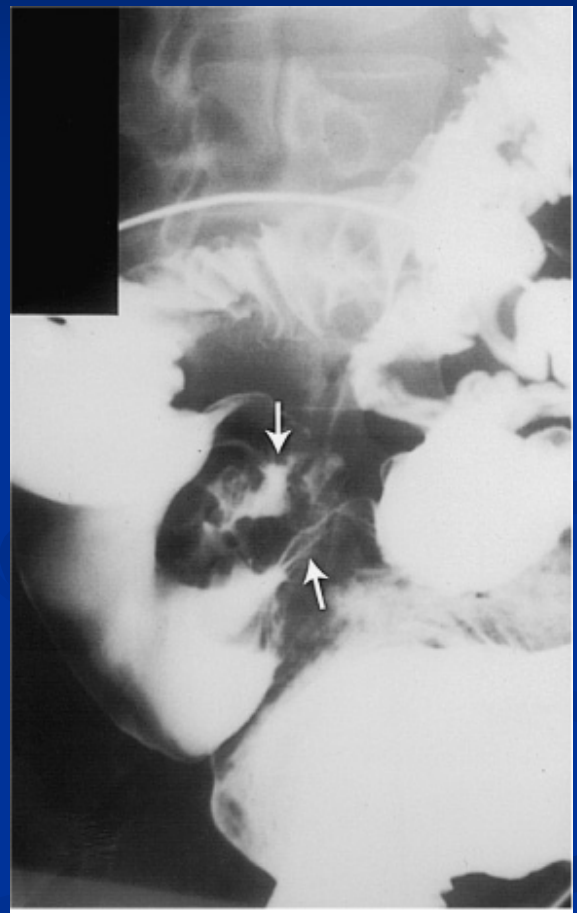
- Pathology
  - Yellow on cut surface
  - Slow growing
  - 20-30% multicentric
  - Synchronous adenocarcinoma (most commonly large intestine) in 10-20% patients with carcinoid tumors
  - Associated with MEN I in 10% cases

Carcinoid Tumors

- Diagnosis
  - Elevated urinary levels of 5-hydroxyindoleacetic acid
  - Plasma chromogranin A elevated in >80% pts with carcinoid tumors
  - Administration of pentagastrin safest and most reliable and most frequently used provocative test (not usually needed anymore)

Carcinoid Tumors

- XR
  - Barium may exhibit filling defects as result of kinking/fibrosis of SB
  - Angiography and U/S can reveal mesenteric and hepatic involvement
  - CT detects hepatic and LN metastasis and extent of bowel wall and mesenteric involvement
  - Somatostatin receptor scintigraphy using ^{111}In-labeled pentetreotide
    - Scintigraphic localization study shows higher reported sensitivity than conventional imaging techniques in delineating and localizing carcinoid tumors



SB Carcinoid Treatment

- Treatment based on tumor size and site and presence or absence of metastatic disease
- Primary tumors <1cm without evidence of regional LN involvement → segmental intestinal resection
- Primary tumors >1cm, multiple tumors, or + regional LN metastasis → wide excision of bowel and mesentery is required
- Primary tumors of TI → R hemicolectomy
- Small duodenal tumors → local excision (larger duodenal tumors may require Whipple)
- MUST ALWAYS EXPLORE ABDOMEN FOR MULTICENTRIC LESIONS!

SB Carcinoid Treatment

- Anesthesia alert
  - May precipitate carcinoid crisis (hypotension, bronchospasm, flushing, tachycardia)
  - Treatment IV octreotide bolus 50-100 µcg, continued with infusion of 50 µcg/hr

SB Carcinoid Treatment

- Surgery STILL indicated in pts with carcinoid tumors and widespread metastasis
- Definite role of surgical debulking in contrast to metastasis from other tumors
- May involve hepatic resection, hepatic artery ligation , or percutaneous embolization, hepatic artery occlusion with chemotherapy

Carcinoid Prognosis

- Best prognosis of all SB tumors
- Resection of carcinoid tumor localized approaches 100%
- 65% 5-yr survival in patients with regional disease
- 25-35% 5-yr survival in patients with distant metastasis

Metastatic Neoplasms

- Much more common than primary neoplasms
- Cutaneous melanoma is the most common extraabdominal source to involve SB
- Symptoms include anorexia, weight loss, anemia, bleeding, PSBO

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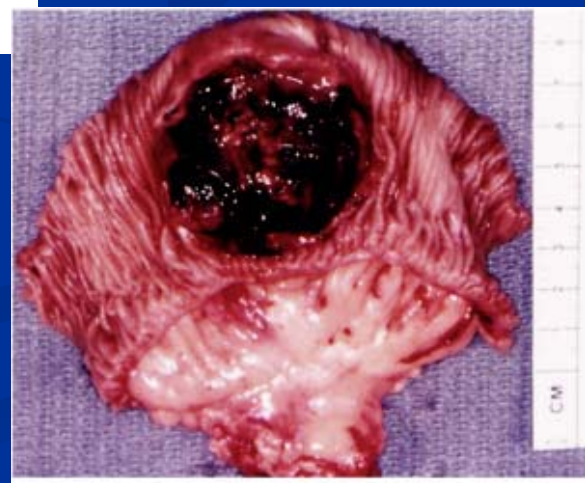

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SB Diverticular Disease

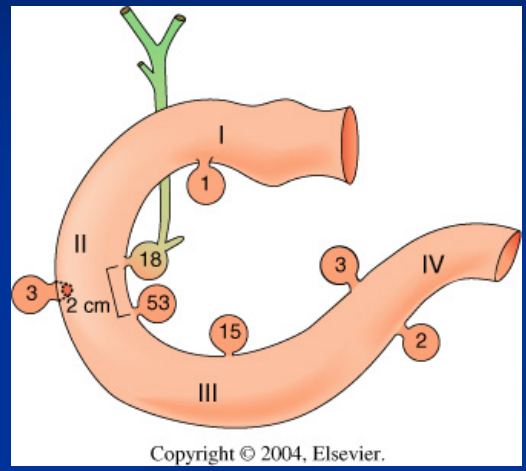
- True or false
  - True – usually congenital and contain all layers of intestinal wall
  - False – usually acquired and contain mucosa and submucosa protruding through defect in muscle coat
  - Duodenal location most common for acquired diverticula
  - Meckel's diverticulum most common true diverticulum of SB

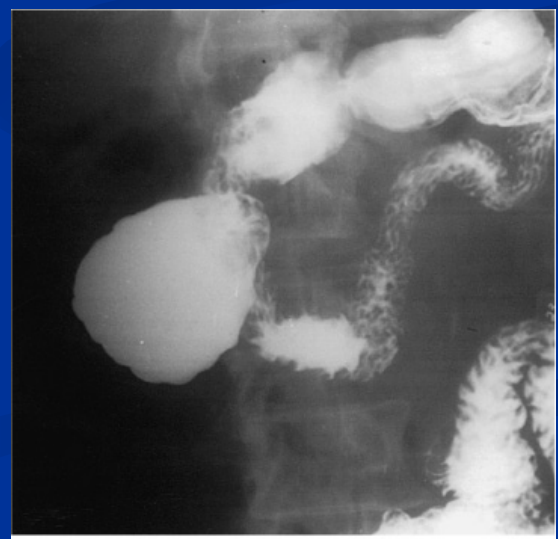
Duodenal Diverticula

- Duodenum second most common location after colon
- Found twice as often in women
- Rare in pts <40 yo
- ⅔ - ¾ duodenal diverticula found in periampullary region

Duodenal Diverticula

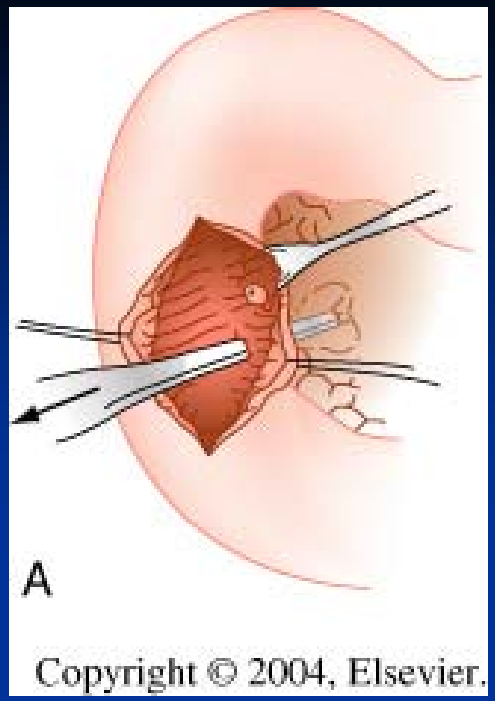
- Clinical Manifestations
  - Most asymptomatic
  - <5% require surgery
  - Major complications
    - Obstruction of biliary ducts → cholangitis
    - Obstruction of pancreatic ducts → pancreatitis
    - Hemorrhage
    - Perforation
    - “blind loop” syndrome – stasis of intestinal contents within distended diverticulum

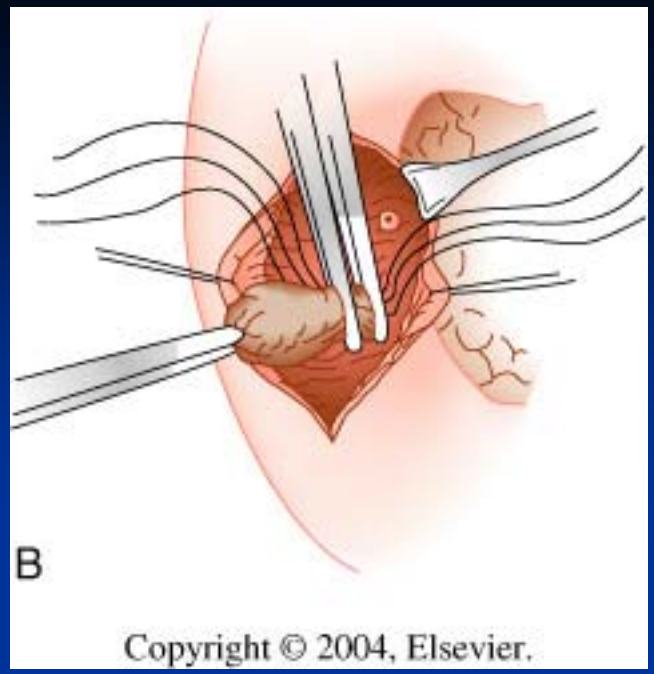


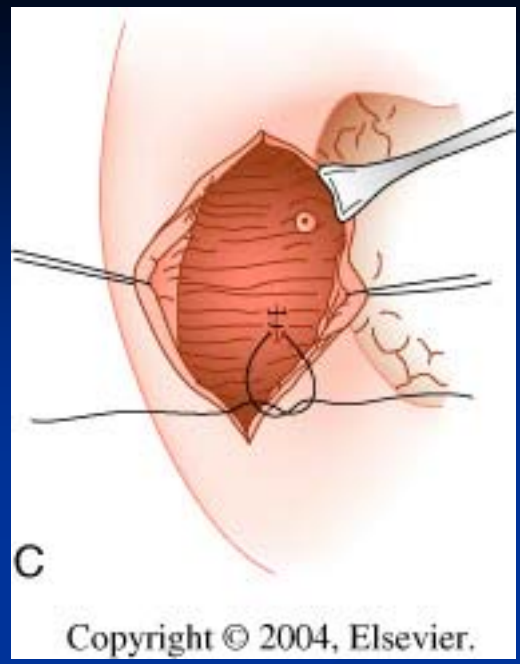


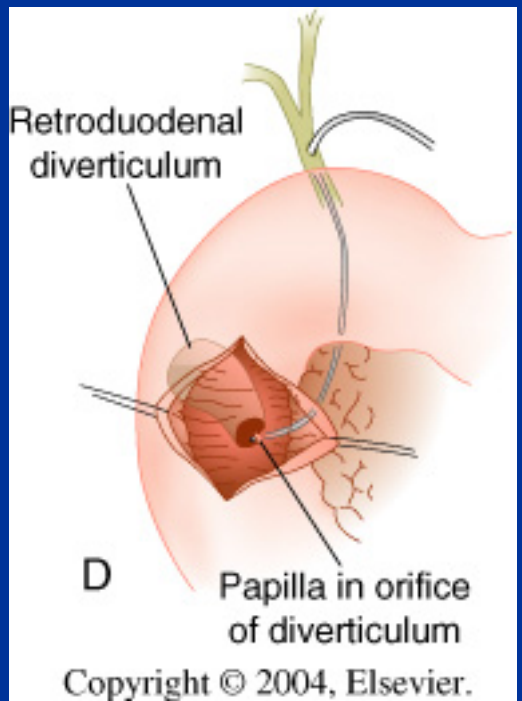
Duodenal Diverticula

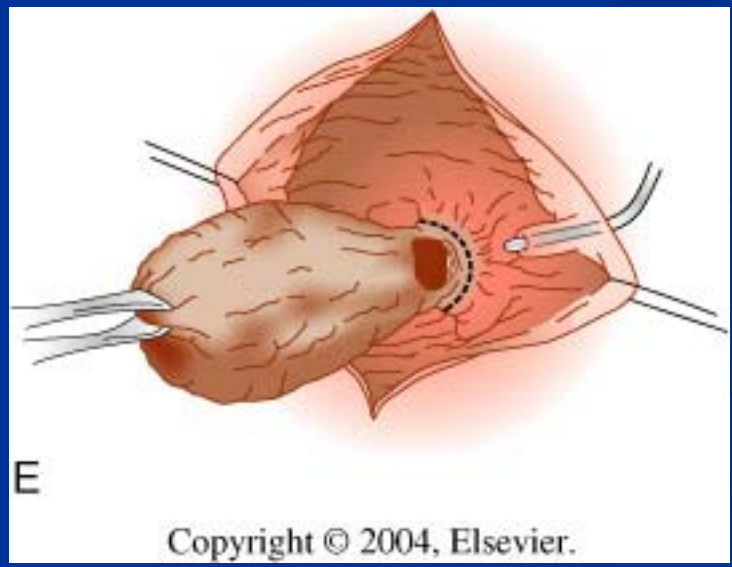
- Treatment
  - Symptomatic duodenal diverticulum
    - Diverticulectomy via Kocher maneuver exposing duodenum
    - Identification of the ampulla is essential
    - For diverticula embedded deep within the head of the pancreas, duodenotomy performed with invagination of the diverticulum into the lumen followed by excision and closure
    - Perforated diverticulum may require procedures similar to that of trauma to the duodenal wall

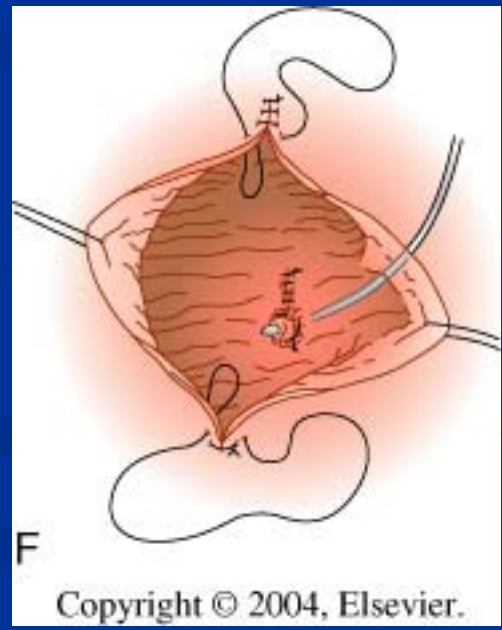












Jejunal and Ileal Diverticula

- 0.1-1.4% incidence
- Jejunal more common and larger
- False diverticula
- Older age
- Multiple
- Protrude from mesenteric border (often escapes surgical exploration)
- Cause possibly motor dysfunction of smooth muscle or myenteric plexus

Jejunal and Ileal Diverticula

- Clinical Manifestations
  - Majority asymptomatic
  - Acute complications are rare
    - Diverticulitis
    - GIB
    - Obstruction
    - Blind loop syndrome – may lead to deconjugation of bowel salts and uptake of B12 by bacteria leading to steatorrhea and megaloblastic anemia
- Treatment
  - Intestinal resection and end-to-end anastomosis for obstruction, bleeding, and perforation

Jejunal and Ileal Diverticula

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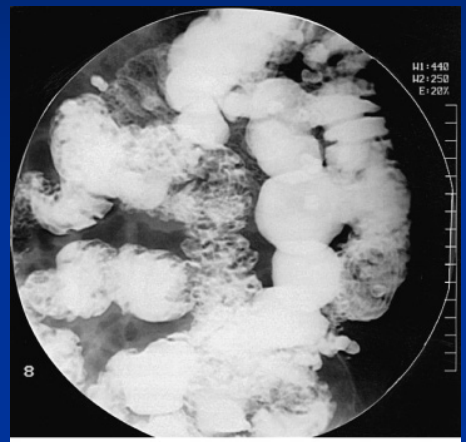

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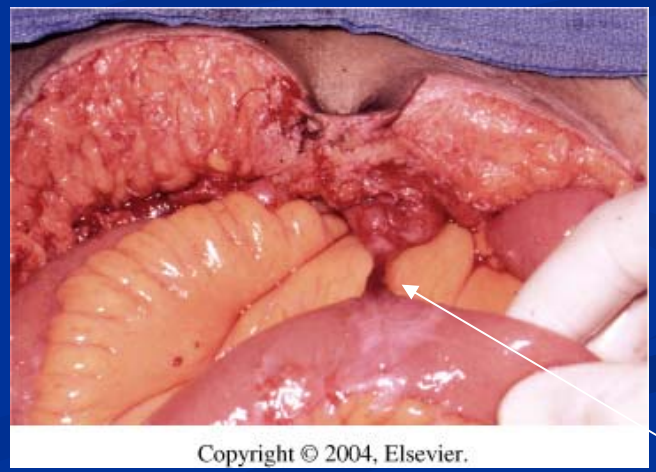

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Omphalomesenteric remnant persisting as fibrous cord from ileum to umbilicus

Meckel's Diverticulum

- Most common congenital anomaly of the SI (2% population)
- Antimesenteric border of the ileum 45-60cm proximal to the ileocecal valve
- Due to incomplete closure of the vitelline (omphalomesenteric) duct
- Male=Female
- Cells lining vitelline duct pluripotent; therefore, heterotopic tissue often within Meckel's (most common is gastric – 50%)

Meckel's Diverticulum

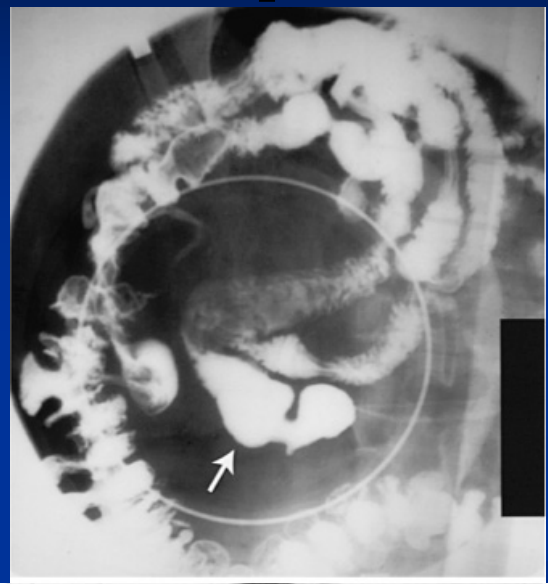
- Clinical Manifestations
  - Majority benign and incidentally discovered
  - GIB most common clinical presentation
  - Usual source of bleeding is chronic acid-induced ulcer in ileum adjacent to Meckel's that contains gastric mucosa
  - Intestinal obstruction is another common presenting symptom (volvulus, intussusception, Littre's hernia)

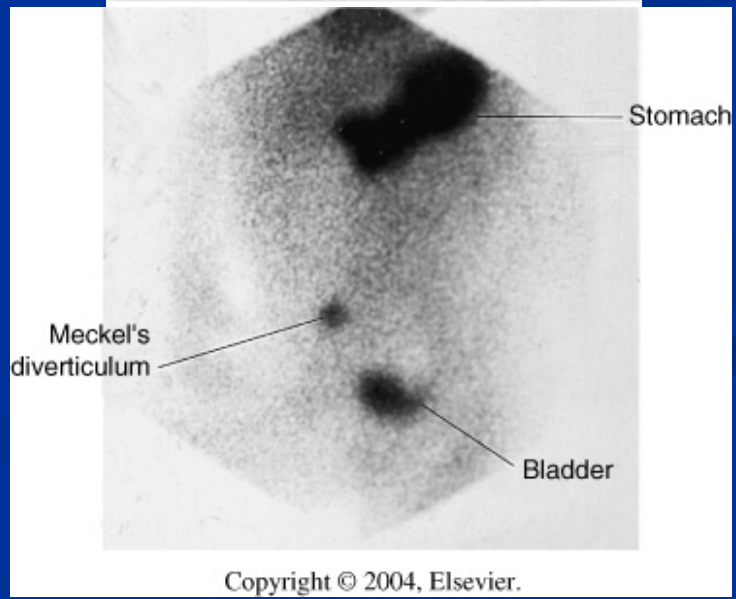
Meckel's Diverticulum

- Clinical Manifestations
  - Intussusception – diverticulum invaginates and then is propelled forward by peristalsis
    - Ileoileal or ileocolic
    - Possible palpable mass
  - Diverticulitis – 10-20% symptomatic presentations

Meckel's Work-up

- XR, CT, U/S rarely helpful
- Meckel's scan
  - 85% sensitive, 95% specific, 90% accurate in pediatric population
  - Not reliable for adults secondary to reduced ectopic gastric mucosa within diverticulum





Meckel's Diverticulum

- Treatment
  - Symptomatic → prompt surgical intervention with resection of diverticulum or segment of ileum with diverticulum
  - Segmental intestinal resection required for bleeding because bleeding site usually in ileum adjacent to diverticulum
  - Hand-sewn technique or stapling across base in diagonal or transverse line
  - Laparoscopy safe and feasible option
  - Incidental Meckel's found in children should be resected; however, in adults treatment controversial

Meckel's Diverticulum

Common presentation of a Meckel diverticulum projecting from the antimesenteric border of the ileum.

SB Ulcerations

- NSAID use and complications responsible for at least 4% of all SB resections
- Treatment of complications from SB ulcerations is segmental resection with reanastomosis

Foreign Body Ingestion

- Majority treated with observation
- Can follow radiopaque objects with serial XR
- Cathartics contraindicated!
- Development of abdominal pain, tenderness, fever, or leukocytosis → OR for laparotomy
- Also to OR for obstruction

SB Fistulas

- EC fistulas most commonly iatrogenic (surgical mishap)
  - Also secondary to erosion (suction catheters, adjacent abscesses, or trauma)
  - Contributing factors can be prior XRT, intestinal obstruction, IBD, mesenteric vascular disease, intra-abd sepsis
  - < 2% occur spontaneously and if so usually due to Crohn's disease

SB Fistulas

- EC fistula diagnosis usually obvious
  - Typically postop febrile pt with erythematous wound that once wound opened, purulent or bloody discharge found followed by leakage of enteric contents immediately or within 1-2 days
  - Classified according to their location and volume which dictate treatment

SB Fistulas

- More proximal the fistula, the more serious the problem with greater fluid & electrolyte loss
  - High output fistulas drain >500cc per 24h

FACTORS PREENTING SPONTANEOUS FISTULA CLOSURE
High output
Severe disruption of intestinal continuity (>50% bowel circumference)
Active IBD of bowel segment
Cancer
Radiation enteritis
Distal Obstruction
Undrained abscess cavity
FB in fistula tract
Fistula tract <2.5cm in length
Epithelialization of fistula tract

SB Fistula

- Treatment
  - Successful management dependent on establishing controlled drainage
    - Control of fistulous output most easily done by intubation of fistula tract with drain
    - Must protect skin around fistulous opening using stomahesive appliances with zinc oxide or similar products
    - TPN can be used to replace nutritional losses when necessary

SB Fistulas

- Treatment
  - Long-acting octreotide has been used with successful decrease in volume of output in proximal fistulas
    - whether it improves rate of closure remains in debate
  - Some advocate up to 3 months for spontaneous closure (however about 90% SB fistulas close within 1 month)
    - Therefore current recommendations suggest 4-6 weeks conservative management and optimization of nutritional status prior to surgical intervention if fistula fails to close

SB Fistulas

- Surgical Management
  - Most easily accomplished by entering prior abdominal wound
  - Preferred approach is fistula tract excision and segmental resection of involved segment of intestine with reanastomosis
  - Simple closure of the fistula after removing the tract almost ALWAYS results in recurrence
  - If unexpected abscess found and anastomosis unsafe, both ends should be exteriorized

SB Fistulas - BOTTOMLINE

- Most commonly results from previous surgical procedure
- Imaging must be performed to define location, possible abscess (usually by fistulogram)
- Must control sepsis, fluid & electrolytes, skin protection, and malnutrition
- After 6 weeks, if no closure → OR!

Pneumatosis Intestinalis

- Multiple gas-filled cysts of GI tract
- Most common in jejunum
- Males = Females
- In neonates, associated with NEC
- Most promising theories on etiology consist of mechanical, mucosal damage, bacterial, and pulmonary

Pneumatosis Intestinalis

- Cysts are thin-walled and when rupture → pneumoperitoneum
- Represents one of the few cases of sterile pneumoperitoneum
  - Should be considered in pt with free air but no evidence of peritonitis
- Symptoms nonspecific but when present
  - Diarrhea
  - Abdominal pain
  - Abdominal distention
  - N/V
  - Weight loss
  - Mucus in stool
  - Hematochezia
  - Constipation

Pneumatosis Intestinalis

- Pneumatosis intestinalis is benign cause of pneumoperitoneum!
- No treatment necessary unless rare complication intervenes
  - Rectal bleeding
  - Cyst-induced volvulus
  - Tension pneumoperitoneum
- Surgical intervention should be decided based on clinical course of the patient

SMA Syndrome

- Vascular compression of the duodenum or Wilkie's syndrome
  - Characterized by compression of 3rd portion of duodenum by SMA as it passes over this portion of the duodenum
- Symptoms
  - N/V
  - Abdominal distention
  - Weight loss
  - Post-prandial epigastric pain

SMA Syndrome

- Most common in young athletic women
- Predisposing factors
  - Significant weight loss
  - Supine immobilization
  - Scoliosis
  - Body cast placement
- Association with
  - Peptic ulcer
  - Anorexia nervosa
  - After proctocolectomy and J-pouch anastomosis
  - AVM resection of cervical cord
  - Orthopedic procedures (spinal)

SMA Syndrome

- Diagnosis made by barium UGI
  - Abrupt or near-total cessation of flow of barium from duodenum to jejunum

SMA Syndrome

- Treatment
  - Conservative measures tried initially
  - Operative treatment of choice is duodenojejunostomy

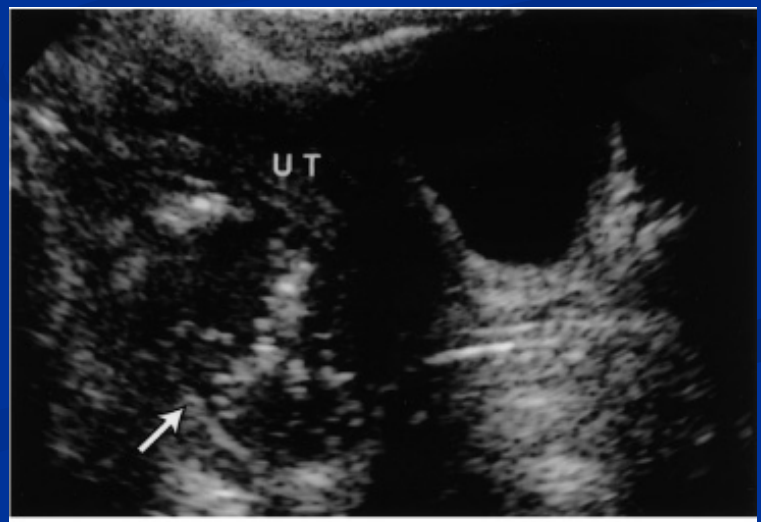
Appendix

- Diagnosis
  - Believe it or not should be primarily based on H&P! (CT scan not to be done BEFORE pt seen)
  - Lab and imaging are adjuncts to the H&P!
  - History
    - Onset of generalized abdominal pain followed by anorexia and nausea
    - Pain then intensifies in epigastrum migrating toward umbilicus and finally localized in RLQ
    - Emesis may occur during migration
- Physical
  - Diminished bowel sounds
  - Direct tenderness with muscle spasm in RLQ; spasm increases with development of rebound
  - Temperature mildly elevated (higher if perforation)
  - REMEMBER variable location of tip of the appendix from last week!
  - Rovsing's sign
  - Psoas sign
  - Obturator sign
  - Rectal to indicate presence of a mass

Appendix

- Imaging
  - AAS
    - Pneumoperitoneum usually = diagnosis other than appendicitis
    - Findings can include fecalith, localized ileus, loss of peritoneal fat stripe
  - U/S
    - Often used as initial study in pts with equivocal diagnosis
    - Sensitivity >85%, specificity >90%
    - Highly operator dependent
    - Sonographic criteria
      - Noncompressible appendix
      - 7mm or greater AP diameter
      - Presence of appendicolith
      - Interruption of continuity of echogenic submucosa
      - Periappendiceal fluid or mass

A



B

Appendix

- CT A/P
  - Reserved for pts with equivocal H&P and lab findings
  - Greatest when effort made to visualize appendix
  - PO & IV contrast

Appendix

- Diagnostic CT findings
  - Periappendiceal inflammation
  - Appendix distended or thickened to >5-7mm
  - Wall circumferentially thickened (“halo”)

A

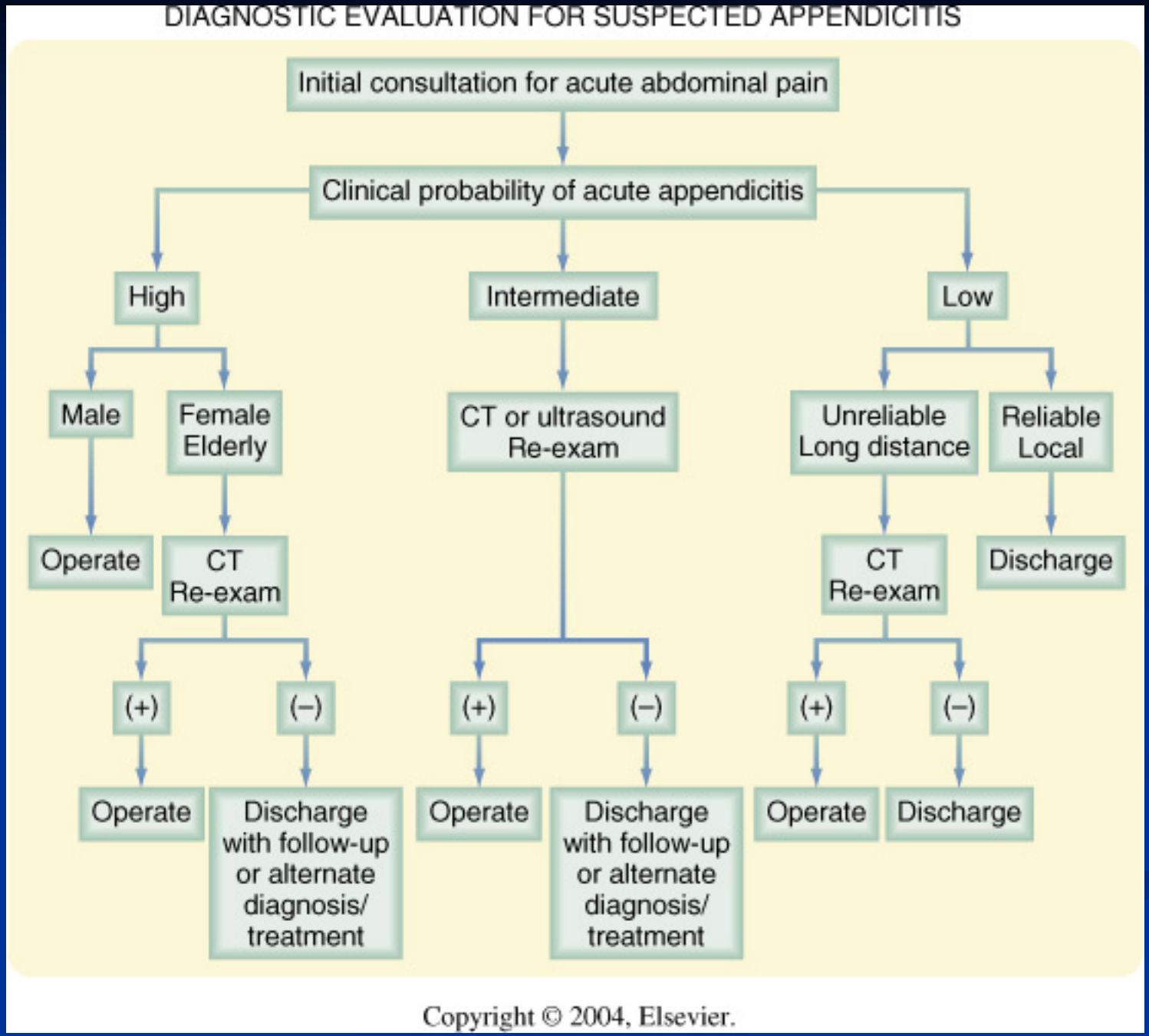
B

Appendicitis

- Lab work
  - WBC 12-18
  - Left shift
  - CRP nonspecific
  - UA – may show mild pyuria with appendicitis due to proximity of ureter to appendix

Diagnosing Appendicitis

- What conditions will fool you?
  - School-age children
    - Gastroenteritis (no lab findings, peritonitis)
    - Omental infarction (no pain migration)
  - Adolescent/young males
    - Crohn's disease/UC
    - Epididymitis (+ epididymis tenderness)
  - Adolescent/young females
    - PID (lower abdominal pain that is bilateral and worse with pelvic exam)
    - Ovarian cysts and torsion (no migration)
    - UTI (UA)
  - Elderly
    - Malignancies of GI and reproductive system
    - Diverticulitis
    - Perforated ulcers
    - cholecystitis


DIAGNOSTIC EVALUATION FOR SUSPECTED APPENDICITIS
Initial consultation for acute abdominal pain
Clinical probability of acute appendicitis
High
Intermediate
Low
Male
Female Elderly
CT or ultrasound Re-exam
Unreliable Long distance
Reliable Local
Operate
CT Re-exam
Discharge
CT Re-exam
(+)
(−)
(+)
(−)
(+)
(−)
Operate
Discharge with follow-up or alternate diagnosis/ treatment
Operate
Discharge with follow-up or alternate diagnosis/ treatment
Operate
Discharge
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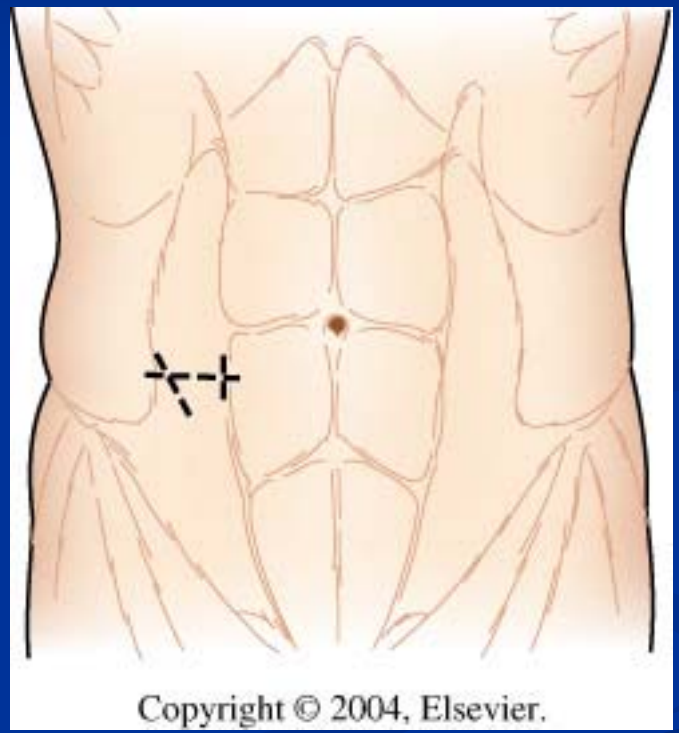
Appendicitis & the Surgeon

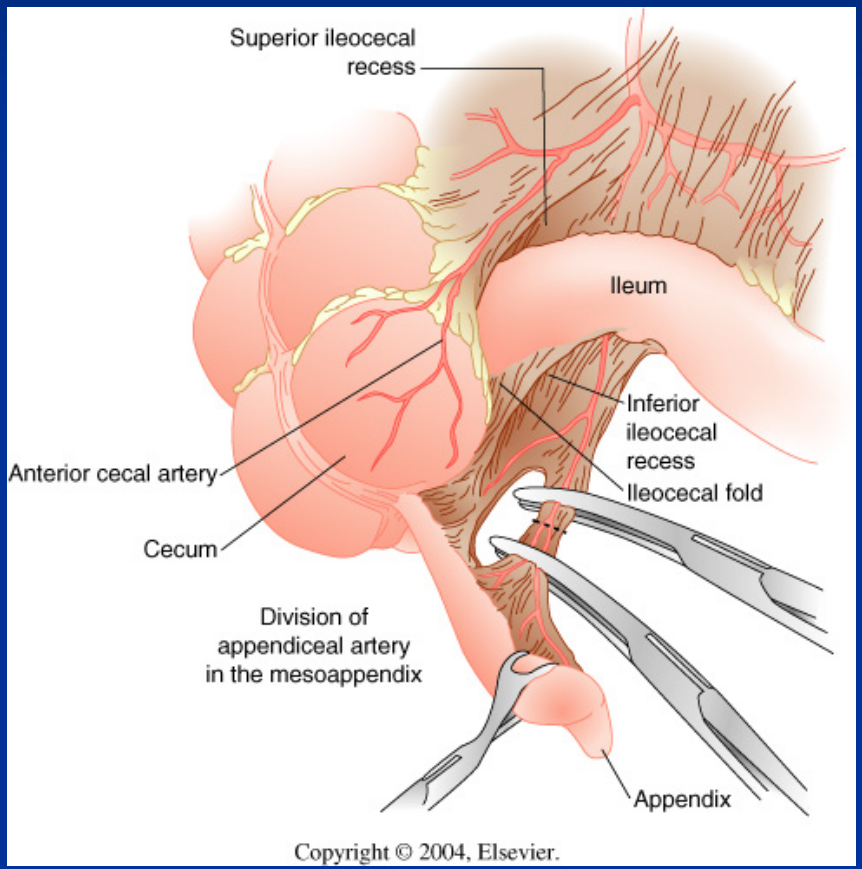
- IVF resuscitation prior to surgery
- Acute
  - Urgent appendectomy
  - Prophylactic antibiotics should be administered preop (single dose) – Cefoxitin or cefotetan
  - Negative appy rate historically has been acceptable at 20%, with diagnostic modalities available in 2005 should be lower ☺

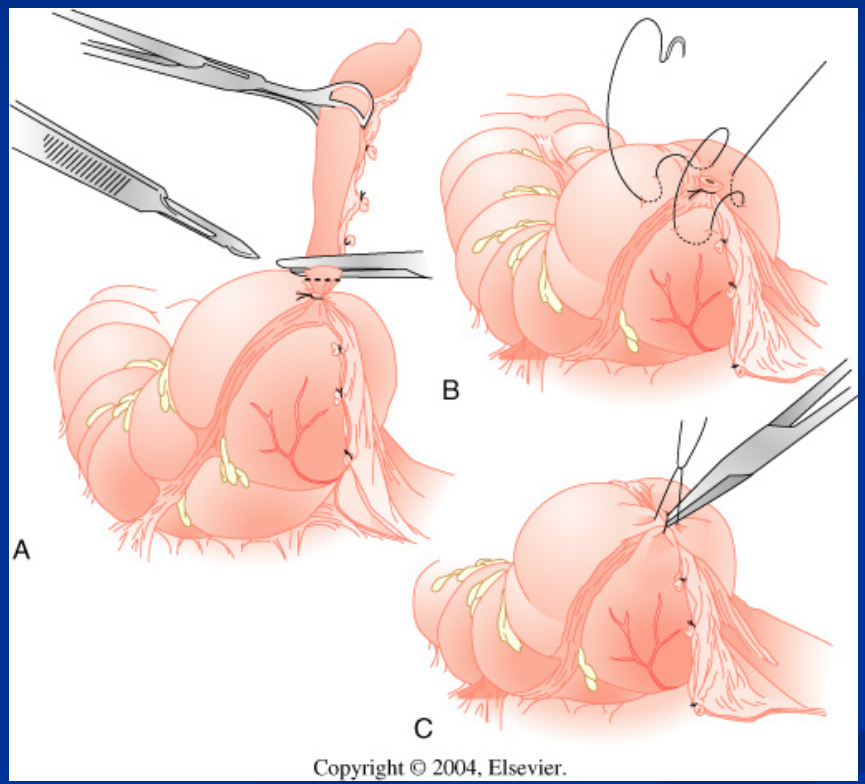
Appendicitis & the Surgeon

- Transverse incision (Davis-Rockey)
- Oblique incision (McArthur-McBurney)
- Paramedian incision



Open Appendectomy

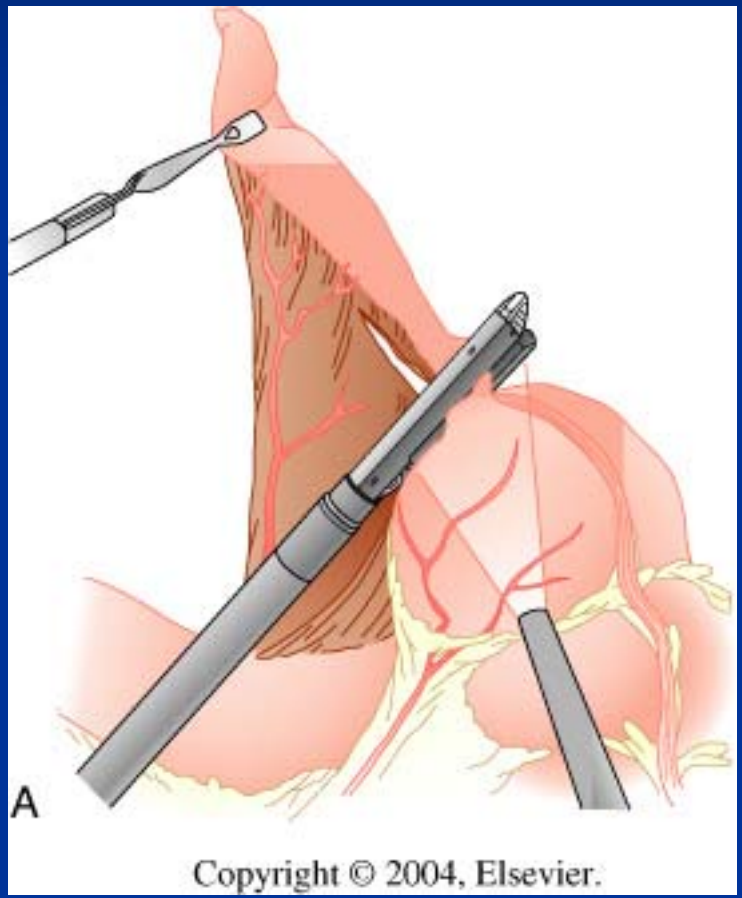


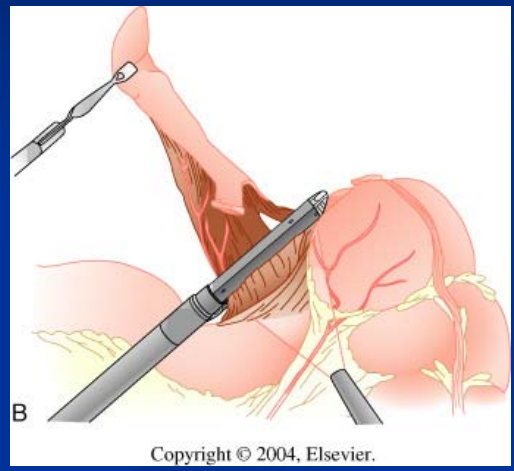


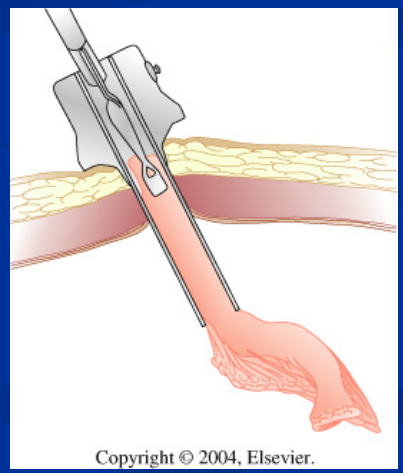
Laparoscopic Appendectomy

- Usually done with 3 ports (one umbilical and position of other 2 vary depending on the surgeon)
- Appendix can be removed using endoloops or an endoscopic stapler
- Appendiceal stump is not buried
- Fascia at 10mm port sites closed
- D/C home usually less than 24h postop

Laparoscopic Appendectomy

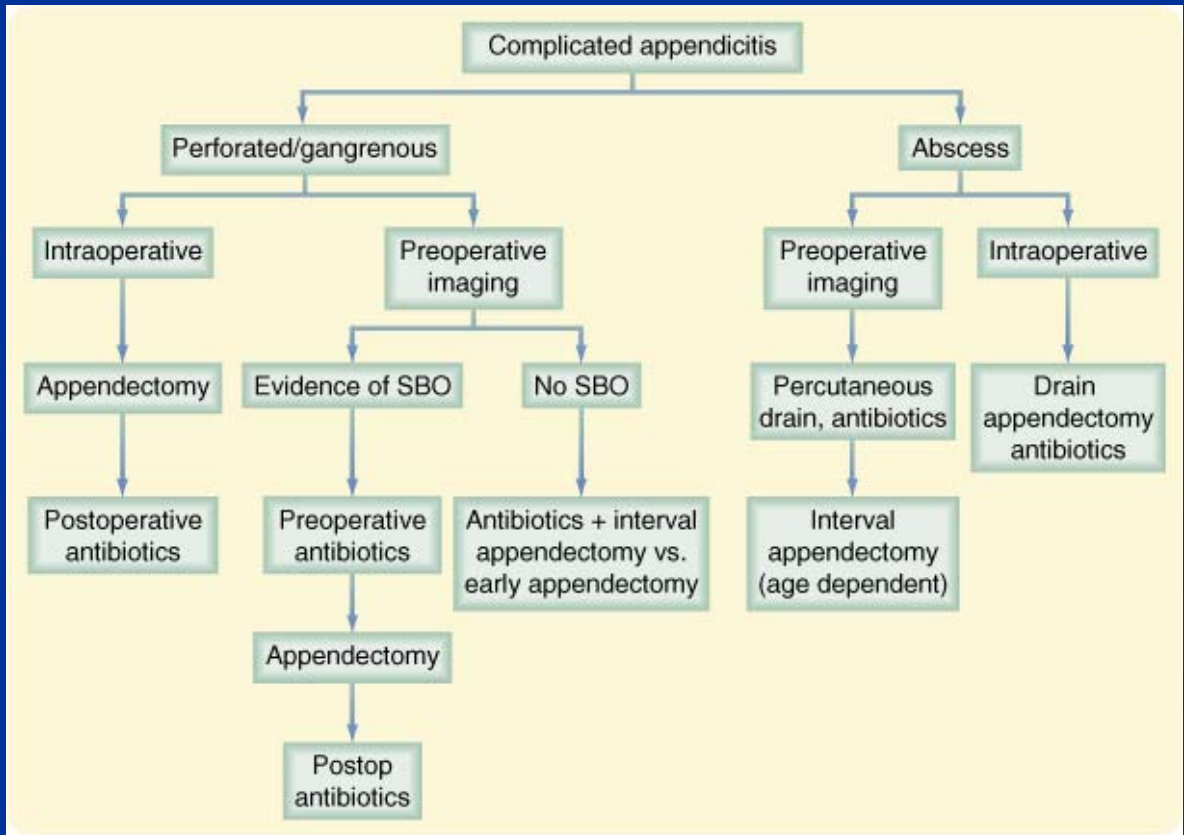






Perforated Appendicitis

- Antibiotic therapy duration controversial (7-10d versus until afebrile with normal WBC)



Intraoperative Appendix: What do you do?

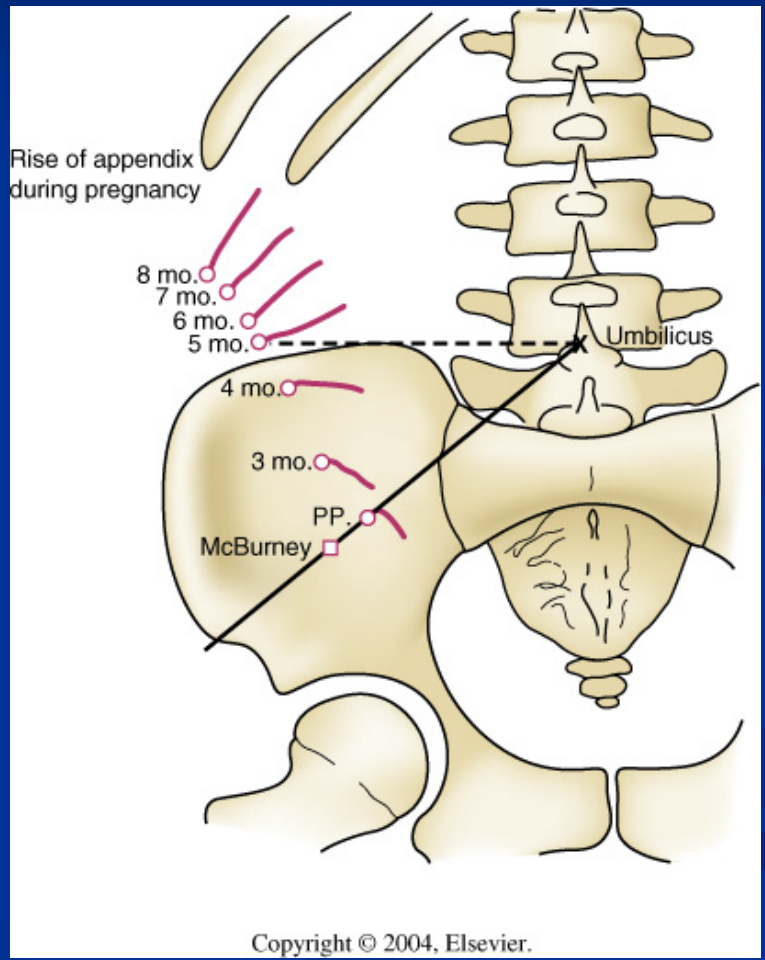
- Many surgeons advocate that the appendix should be removed since the complication rate is quite low in this setting (including authors of Sabiston)

Interval Appendectomy

- Controversial
- Risk of recurrent appendicitis must be balanced against risk of interval appendectomy
- Younger the patient, higher lifetime risk of recurrent appendicitis and lower operative risk

Appendicitis in Pregnancy

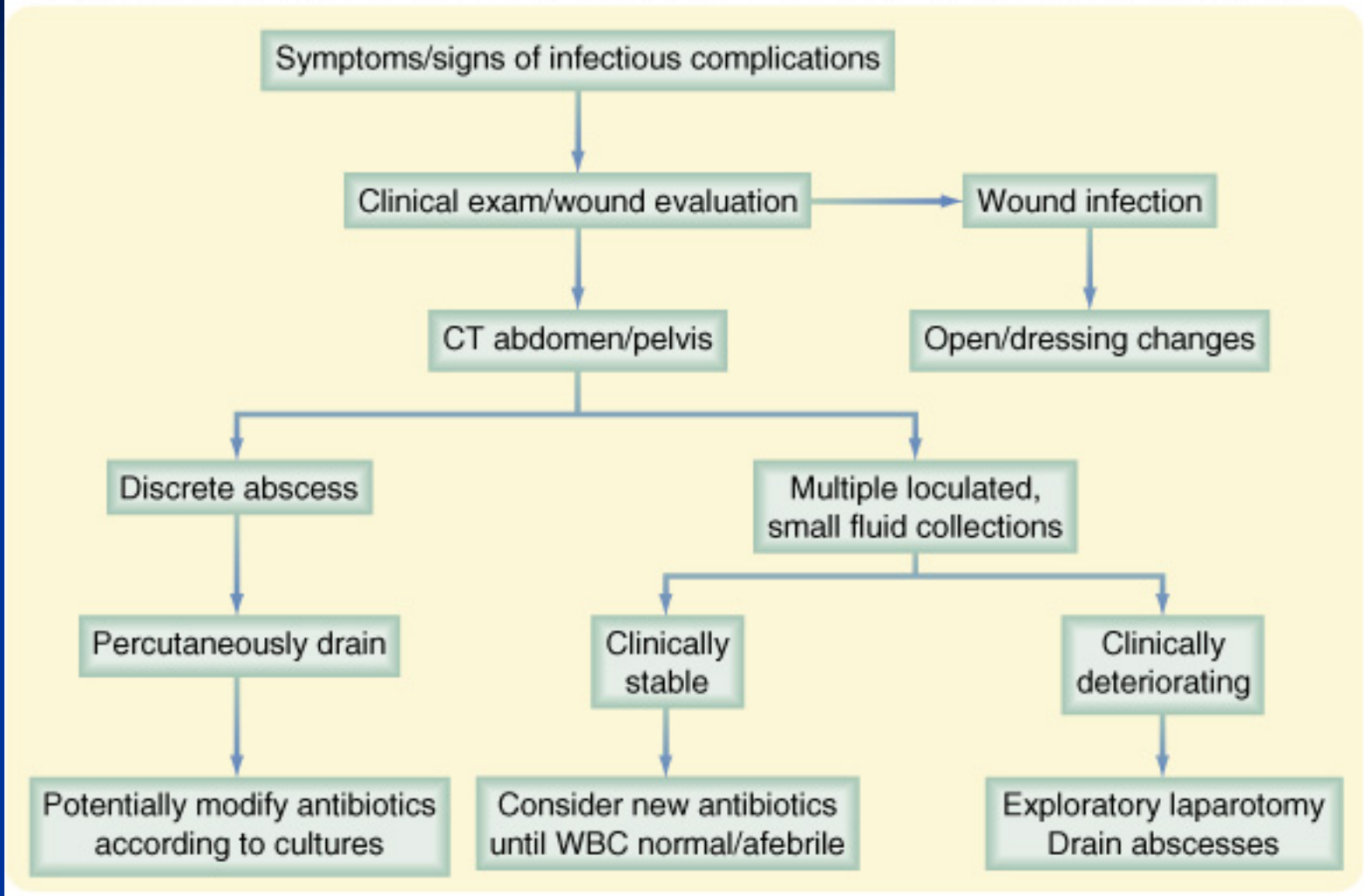
- Appendicitis and cholecystitis most common causes of abdominal pain during pregnancy
- After 5th month of gestation, appendiceal position shifted superiorly above iliac crest and appendix tip rotated medially by gravid uterus



Appendicitis in Pregnancy

- WBC usually not helpful as it is commonly elevated in pregnancy
- Symptoms usually not of diagnostic value secondary to pregnancy
- U/S can be helpful
- Suspicion should lead to EARLY surgical intervention in ALL trimesters
- Negative laparotomy results in minimal fetal loss whereas delay in diagnosis and perforation may lead to high incidence of fetal death and relatively high incidence of maternal death
- Laparoscopic approach may be used

MANAGEMENT OF POST-OPERATIVE INFECTIOUS COMPLICATIONS OF APPENDICITIS



Neoplasms

- Carcinoids most common appendiceal neoplasm
- Appendiceal neoplasms extremely rare
- Adenocarcinomas
  - <0.5% of all GI neoplasms
  - Mucinous (55%)
  - Most common presentation is that of acute appendicitis
  - Survival rate better with R hemicolectomy versus appendectomy alone
  - Second primary was located in 35% patients
  - R hemicolectomy indicated for
    - Invasive adenocarcinoma
    - Tumors close to cecum
    - Mucin-producing tumors
    - Invasion of lymphatics, serosa, or mesoappendix
    - Cellular pleomorphism with high mitotic rate
  - Appendectomy indicated in ALL patients with Krukenberg tumors when another primary site cannot be identified at time of surgery