

# Colon & Rectal Surgery Oral Boards Study Guide

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## INTRODUCTION

The year following fellowship can be exhausting. For many, we are relocating to what will hopefully be a permanent location. We are transitioning into our new practices, and soon operating on patients where we are the ones responsible if any complications were to occur. At the same time, we are building a network of practitioners whom we rely on and hope that they reflexively will rely on us as well. The written board exam quickly approaches and soon thereafter the oral board examination.

It is incredibly difficult to set time aside to study. In fact, I would say the most difficult time I ever had preparing for examinations was once I was within my own practice. You are juggling numerous responsibilities and the very last thing you want to deal with is yet another exam. I spent time during my fellowship, as well as during my first year of practice, re-reading both the ASCRS textbook and the textbook "Improved Outcomes in Surgery."

The latter of the textbooks, "Improved Outcomes" to me proved to be an invaluable read for preparation for this exam, and I would urge anybody who is considering what to read to consider this text. It is by no means voluminous and instead focuses on exactly these questions.

As prior, the notes below are my own notes. And thus, they are chalk full of typos and errors. Some may be ridiculous. I haven't spent time proofreading these notes – in this regards, they are a "first draft" of notes. Nevertheless, I compiled below all the topics and notes I thought necessary to prepare for my oral boards for CRS. Other than having read the texts to make these notes, these notes constituted my preparation for the orals examinations.

I provide them because I do believe there is little to guide the residents/fellows in this regard. I do not think that by themselves, these notes will suffice for a well rounded understanding of the topics in hand. These notes absolutely will not suffice for the written exam, as they lack the detail and many of the topics necessary to pass that specific exam.

As always, I cannot thank enough my wife Dalia, who has supported me through all of this. Especially on the days and nights I was absolutely fed up with sitting and reading, she pushed me forward. And my 2 daughters, for the time with me they have unknowingly given up. I will be repaying you both, in interest, from here on forward.

If you have any thoughts or concerns, please let me know.

I wish you all the best.

Allen Kamrava, M.D.

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## ANAL CANCER

### ANATOMIC CONSIDERATIONS

Intraanal: lesions that cannot be visualized at all or incompletely w/ gentle traction on buttocks

Perianal: completely visible, w/in 5-cm radius of anal opening

Skin: outside of 5-cm radius of anal opening

Transition Zone: 0-12 mm in length from dentate line to proximal.

Transitional urothelium. May have squamous metaplasia overlying normal rectal mucosa. Can extend up to 10 cm proximal.

### TERMINOLOGY

Pathologists use varying terms for same meaning – CIS, AIN, Anal dysplasia, SIL & Bowen's all may mean the same thing

Recommendation – just use one of four terms:

1. normal
2. low-grade squamous intraepithelial lesions (LSIL)
3. high-grade squamous intraepithelial lesions (HSIL)
4. Invasive Cancer

### LYMPHATIC DRAINAGE

- Above Dentate: S. Rectals to Inf Mes LNs & Int. Iliac LN
- Below Dentate: inguinal nodes, may also be above nodes

### ETIOLOGY AND PATHOGENESIS OF ANAL CA

- HPV necessary but insufficient
  - DNA papovavirus
  - CA Serotypes: 16, 18, 31, 33, 35
  - MC serotypes: 6, 11 – low malignant potential
  - transmission not prevented by condoms – virus pools at base of penis and scrotum (only abstinence works)
  - women: pools vagina to anus
  - anal condyloma does not require anal intercourse
  - requires disruption in mucosal barrier of skin to enter or transitional epithelium very susceptible
  - Cell mediate immunity important block to virus
- HIV+ patients:
  - more likely to have HSIL
  - More likely to go from LSIL to HSIL w/in 2 years
  - increased risk w/ CD4 count <200
- Acetic acid and Lugol's solution with colposcope or Loupe's will help visualize the lesions

### BOWEN'S DISEASE

Bowen's Disease: both SCCA in situ and HSIL – depends on pathologist's training, no reliable term - t/c HSIL

- often times incidental finding in a hemorrhoidectomy
- in immunocompetent, <10% will progress
  - higher rate of progression if immunocompromised
- unknown predictors of progression – so recommendation for now is treat Bowen's (unless advanced age and asymptomatic or severe other health risks)

### Treatment:

- (1) Incidental finding: 1-cm random biopsies starting at dentate line, send for frozen. Positive areas undergo wide excision w/ 1 cm margins
  - risks of incontinence, stricture/stenosis, recurrence
- (2) Acetic Acid/Lugol's: diathermy on the visualized lesions
  - in immunocompetent – zero progression and recurrence
  - HIV+ - higher recurrence but little progression
  - can resect with minimal margins this technique as well
- (3) Other options, less data – 5-FU cream, Imiquimod, PDT, XRT, Laser, combos – try in complicated case

### Follow-Up:

- HIV+: yearly pap-smear

- HIV-: pap-smear every 3 years

### SCC of Anal Margin

Skin from dentate to 5 cm radius externally

- different expressions of cadherin, cytokeratins, & p53 than normal anal CA – different cancer

### Clinical Characteristics

Similar to skin SCC, staged likewise

- 70s, M=F

### Staging

- based on size and nodal status of tumor
- Lymphatics: femoral & Ing. LNs, ext & com iliac LNs
- Venous: inferior rectal vein

### Treatment Options

- Tis, T1 lesion: local excision w/ 1 cm margin
- T2 lesion: XRT 1<sup>st</sup>, in select local excision w/ 1 cm margin
- T3/T4: XRT including pelvic and groin nodes
  - 5-FU and mitomycin
  - Persistent/recurrence – may need re-excision/APR

Local Recurrence rates:

T1: 50-100%, T2: 60-100%, T3: 37-100%

### SCC OF THE ANAL CANAL

- Includes: epidermoid, cloacogenic, mucoepidermoid CAs

### Clinical Characteristics:

- bleeding MC symptom
- others: tenesmus, d/c, incontinence, inguinal LAD
- most diagnosed late

### Evaluation:

- DRE, procto, ERUS
- if nodes enlarged, consider FNA
- CT A/P, CXR

### Staging:

- based on tumor size and nodes
- T stage T1 <2 T2 <5 T3, T4 invades deep structures
- N stage: N1 perirectal v. N2 unilateral v. N3 bilateral

### Treatment:

ChemoRadiation: Nigro Protocol – 1<sup>st</sup> line

- 5-FU and mitomycin C
- external or brachy ok – 30 – 60 Gy
- decreased cure rate (50%) if over 5 cm
- late complications: anal necrosis, stenosis, ulcers, diarrhea, urgency, FI, SBO, urethral stricture
- Cisplatin: gaining favor over mitomycin C
  - radiation sensitizer
  - less myelosuppressive

### Follow up:

DRE and Procto: Q2mo 1<sup>st</sup> yr; Q3mo 2<sup>nd</sup> year; Q6 mo →

### Treatment of Residual Disease:

- re-stage the patient
- salvage therapy can be given
- Surgery: APR
  - use plastics for flaps to improve wound healing
- Poor prognosis:
  - nodal disease
  - positive margins
  - persistent disease after neoadjuvant
- Isolated liver and lung mets: t/c resection

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## UNCOMMON ANAL CANAL NEOPLASMS

### ADENOCARCINOMA

3 types – based on source:

- (1) mucosa of transitional zone – same as rectal CA

- (2) Base of anal glands
  - (3) from a chronic anorectal fistula
- More aggressive than SCCs; 60's, M=F
- Rectal type is only one that *may* be amenable to local resection
    - all others must have an APR
  - Chemoradiation – little data, but prelim data supports it

#### MELANOMA

- < 500 reported cases; Usually Caucasian Women in 60s
  - late presentation for most
- Anorectal bleeding MC symptom
- Arise from: transitional zone, anoderm or mucocutan jxn
- most pigmented, some polypoid – may look like a thrombosed hemorrhoid
- Surgery only chance for cure
  - if > 10 mm thickness – no treatment will cure
  - 35% present with nodes
  - local excision vs. APR – does not seem to affect survival – all have dismal prognosis
    - for now advocate APR for all lesions > 4mm thick
    - if < 4mm thickness – discretion
  - if signs of metastatic disease – APR not advised
  - do APR if: lesion > 1-2 cm, sphincters involved
- Adjuvant Chemoradiation being evaluated – no standard

#### GASTROINTESTINAL STROMAL TUMORS (GIST)

- only 17 reported cases; Men 50s -70s
- *mesenchymal* origin; *CD34* & *CD117* antigens
- most asymptomatic; symptomatic worse prognosis
- Prognosis: worse with
  - size > 5cm,
  - high mitotic counts,
  - pleomorphisms,
  - infiltration of fascia propria,
  - coagulative necrosis
- Treatment:
  - local excision: if < 2 cm
  - APR: if > 2cm, or one of findings above

#### SMALL CELL CARCINOMA/NEUROENDOCRINE TUMORS:

- < 1% of all colorectal CAs
- hyperchromatic nuclei, pale nucleoli, high mitotic count
- not disseminated → radical resection w/ ChemoXRT
- disseminated(~75%) → chemo-XRT(cisplatin & etoposide)

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#### UNCOMMON ANAL MARGIN/PERIANAL NEOPLASMS

##### BASAL CELL CA

- 70 yo Men
- sun not etiology, synchronous lesions common
- most <2 cm at presentation
- little invasive and metastatic potential
- must differentiate from Basaloid CA which is different
- Treatment: WLE, may require Moh's or flaps/grafts
  - survival ~100%

##### PAGET'S DISEASE

- Paget's Cells: intraepithelial adenoCA w/ a prolonged preinvasive phase that eventually develops into an adenoCA of underlying apocrine gland
- 70's; M=F
- Sx: *itching* MC, bleeding, mass, LAD – median 3 yrs
- Mimics many other disease – *Biopsy* essential for diag
- Histology: large round eccentric hyperchromic nuclei
  - vacuolated cytoplasm
  - Positive on Acid Schiff stain ← mucin

- positive stain: mucoproteins
- Treatment: based on invasion
  - *NonInvasive*: WLE to grossly negative margins
    - must also do mapping with random circumferential biopsies sent for frozen section – to include 1 cm border, dentate line and anal verge. *Toluidine Blue* & *Acetic Acid* staining help identify biopsy sites
  - *Invasive*: Radical Resection
  - *Positive Nodes*: also do lymph node dissection
  - *Adjuvant Therapy*: efficacy unknown at this time

#### VERRUCOUS CARCINOMA

- AKA giant condyloma or Buschke-Lowenstein Tumors
- measure from 1.5 – to 30 cm
- invade locally – cause fistulas, necrosis, tissue loss
- Treatment: radical local excision
  - APR if: deep tissue invasion, multiple fistula, sphincters
  - Neoadjuvant: may help downstage

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#### HIV-RELATED ANAL CANCER

##### KAPOSI'S SARCOMA

- rare, look like hemorrhoids
- treatment: chemotherapy

##### LYMPHOMA

- NHL, in anal mucosa is a MALT
- Sx: pain, pruritis, drainage, mass
- Treatment: Chemo-XRT
- No role for surgery

## ANAL STRICTURE

### **Surgery for anal stenosis**

Anal stenosis: after 10% radical hemorrhoidectomies,  
fissurectomies, XRT, Moh's chemosurgery

Due to excessive anodermal lining removal

- Flaps used successfully
  - key points: maintain vascularity & no hematoma postop
  - liquid diet first day or two post op, konsyl thereafter
  - limit activity for a few weeks post op to allow healing

*Anal S-Plasty:*

- full-thickness skin flaps with a base-to-length ratio of  $>1.0$   
(base 7 – 10 cm)

*Y-V Anoplasty:*

- length-to-base ratio  $<3.0$
- well suited for lower anal canal but not for use above dentate line

*House and/or Diamond Advancement Flap:*

- can cover 25% of anal circumference
- multiple: 2, 3, or 4 can be done

Anal Stenosis w/ Unilateral Ectropian:

## ANASTOMATIC LEAK

### GENERAL CONSIDERATIONS

- Leak rate if w/in 7 cm from anal verge: 10%
- overzealous stripping of bowel can lead to ischemia – only strip mesentery and epipoic appendages enough for mosis
- Taking IMA vs. sigmoidal (i.e. preserving left colic artery): has not been shown to decrease anastomotic failure rate
- diverticulum should not be in staple line – options:
  - suture it closer onto the anvil so its resected
  - resect more bowel
- if doughnuts are not whole but leak test is ok: NO increased risk of leak
- if have a leak on leak test, you fix it and no longer air leak: NO increased risk of leak
- Factors that increase leak rate: TME, distance from anal verge, male gender, prolonged OR time

### PROXIMAL DIVERSION

Large Prospective trial in Sweden – 234 patients

- diverted (DI) vs. Not Diverted (ND) in < 7 cm Rsn's
- Clinical Leak Rates: 10.3% (DI) vs. 28% (ND)
- Urgent reop: 8.6% vs. 25.4%

### MECHANICAL BOWEL PREPARATION

- Cochrane review of 1,592 patients found no difference in leak rate between two for colonic or for low rectal
  - when combined two populations together: mech bowel prep significantly higher rate of leak
  - leak rates: Colonic 1.6-2.9%; LAR 7.5-9.8%

### ANASTOMOTIC TECHNIQUE

- Cochrane review of 9 randomized controlled trials of 1,233 patients stapled vs. handsewn: no difference for clinical (~7%) or radiologic leaks (~7%)
- side-to-side, Baker's, colonic J: no difference in leak
- anvil size: no difference in leak rate
- Omental Pedicle: no difference, surgeon preference

### RADIATION

- Dutch TME Trial: 1,414 rectal cancer patients – neoadjuvant XRT vs. straight to OR: no difference in leak rate (11% vs. 12%)
- Swedish Rectal Cancer Trial: 1,168 patients – preopXRT vs. straight to OR: no difference
- “the notion that neoXRT increases risk of leak is not supported by the majority of the literature ... likely due to high risk of TME dissection, not XRT itself.”

### PELVIC DRAINS

- Dutch TME trial retrospectively reviewed with regression analysis – selection bias by the surgeons when to use drains: drained vs. nondrained leaks: 9.6% vs. 23.5%
  - reop 97% if not drained vs. 74% if drained
- Cochrane review of 1,140 patients: no difference in leak rate and complications drained vs. not drained

### MANAGEMENT OF LEAKS

#### Asymptomatic:

- usually low pelvic anastomoses, short, simple sinus tracts originating from the anastomosis
- no intervention, no clinical consequence, should heal spontaneously

#### Leak without Abscess:

- stable, mild symptoms, focal ttp: bowel rest, IVF, Abx
- Consider TPN

#### Leak with Associated Abscess:

- 1<sup>st</sup> – drain & antibiotics
- re-op if fail or inaccessible abscess

#### Peritonitis:

- reop, antibiotics, fluids
- peritoneal fluid cultures will by polymicrobial – likely not a benefit in treatment

#### Colocutaneous Fistula:

- CT to eval for undrained collection

- Rule out: distal obstruction, anastomotic stricture, radiation strictures
- most close, may need bowel rest

### OPERATIVE INTERVENTION

#### Resection of leaking anastomosis & colostomy creation:

- Standard: Rsn of leak, end colostomy & Hartmann's
- if rectum very difficult to control – exteriorize as mucous fistula
- wash out and drain
- high rate of permanent ostomy – no closure

#### Leaving the leaking anastomosis in place:

- abdominal washout, loop stoma diversion and drainage of the leak
- higher rate of stoma reversal
- literature supports this plan

#### Repeat Anastomosis after resection of leak:

- certain situations, redo w/ or w/o diversion
- most often only ok with ileocolic anastomoses
- less likely to work with colorectal anastomoses

#### Exteriorization of leaking anastomosis:

- bring out leak as a stoma
- most won't be able to reach to do this
- stoma could be very difficult to manage

### SHORT AND LONG TERM IMPLICATIONS OF LEAK

- 30-day mortality w/ leak: 10-15% (some report 36%)
- MC cause of death after colectomy: leak
- rectal compliance shown to decrease after leak
- leak increases risk of not receiving or significantly delaying adjuvant chemo
- Multicenter Scottish study of 2,235 pts: decreased 5 year overall survival (42% v. 55%) if leak
  - 5-year cancer-specific survival rate (50% vs. 68%)

### ANASTOMOTIC STRICTURE

- estimated in 10% in general
- majority short segment, less than 1 cm in length
- Risks: leak, post op pelvic infxn, proximal diversion
- 2 meta-analysis: stapled higher stricture rate than hand-sewn
- Late strictures: recurrent CA, IBD, or XRT injury – investigate late strictures to ensure not CA

#### Treatment:

- asymptomatic: no treatment, leave alone
- endoluminal dilating techniques, usually at least 4-6 weeks post op
- very low, can be with finger, or sequential dilators
- TTS (through the scope) hydrostatic balloon dilators
  - dilate to > 20 mm
  - triamcinolone injxn (long acting steroid) or cautery/laser release of scar – no increased risk of complication but decreased recurrence
- for low refractory stricture – consider mucosectomy and pull through type procedure rather than abdominal

## **APPENDICEAL TUMORS**

### **Carcinoid:**

- 1.5 cm:
- 2.5 cm
- Staging workup

### **Mucinous Cystadenoma:**

- 1 cm: Right Hemi
- 2 cm: Right Hemi
- Staging Workup: Normal Staging

### **Adenocarcinoma:**

- 1 cm: Right Hemi
- 2 cm: Right Hemi
- Staging Work up: PET CT in 6 months

## **APPENDICITIS - PERFORATED**

### **BOWEN'S DISEASE**

- Bowen's Disease: both SCCA in situ, AIN II&III, & HSIL –  
depends on pathologist's training, no reliable term - t/c HSIL
- often times incidental finding in a hemorrhoidectomy
  - in immunocompetent, <10% will progress
    - higher rate of progression if immunocompromised
  - unknown predictors of progression – so recommendation for now is treat Bowen's (unless advanced age and asymptomatic or severe other health risks)

## CARCINOID

### At Base of <1 cm polyp:

- Mgmt:
- LNs:
- w/u for mets:
- Likelihood of Stage IV if LN+: 17%

### CARCINOIDS

- from Kulchitsky cells in the crypts of Lieberkuhn a type of enterochromaffin cells – endocrine system

### Pathology:

- small round cells with uniform nuclei & cytoplasm
- electron-dense neurosecretory granules w/ small clear vesicles – same as synaptic vesicles in neurons
- Argentaffin positive & argyrophilic → able to take up & reduce silver stains due to serotonin
- *Chromogranin*: immunohistochemical stain to identify

### Carcinoid Tumor Growth Patterh

	Pattern	Pearls	Freq	Prognosis
A/I	Insular	Solid nests; peripheral palisading	1	Favorable
B/II	Trabecular	Ribbon-like	2	Favorable
C/III	Glandular	Tubular, acinar, rosette	4	Poor
D/IV	UnDiff'd	No recognizable pattern	3	Poor
Mix	Mixed	Any combo of above		Favorable

### Pathophysiology

- Amine Precursor Uptake & Decarboxylation (APUD) system
- produce >30 bioactive compounds – amines, proteins, prostaglandins – serotonin MC
- Serotonin: 2 stage metabolism – Tryptophan → 5-HTP – decarboxylation → 5-HT (serotonin)

### Systemic Symptoms – “Carcinoid Syndrome”

- 3 main symptoms
  1. Vasomotor Sx – flushing & BP changes
  2. Diarrhea
  3. Bronchospasm
- Liver metabolizes & inactivates compounds – so syndrome only occurs if there are liver mets or primary is outside of portal venous system
- Right sided heart disease common (tricuspid valve)
- 4 types of flushing:
  - Type 1: diffuse eryth. Rash < 5 min - early stage mets
  - Type 2: violaceous rash, telengectasias < 5min – late
  - Type 3: bronchial tumors
  - Type 4: Gastric Tumors
- Cardiac: serotonin acts on myofibroblasts → fibroplasia → increased vasc tone → bronchoconstriction & Plt Aggregation
  - Left side of heart protected by lung which inactivates
- Carcinoid Crisis: by anesthesia, manipulation, stress – profound flushing & hypoT, arrhythmias, bronchoconstriction.
  - can avoid by pretreatment with somatostatin and histamine blockade

### Diagnostic Studies:

- 24-h urine 5-HIAA –
  - avoid foods rich in serotonin – banana, pineapple, Kiwi, plums, walnuts, avocados, pecans, tomatoes
  - avoid meds: Guaifenesin, Tylenol, Salicylates, L-Dopa

### Imaging Studies:

- Somatostatin Receptor Scintigraphy (SRS): to evaluate for metastatic dz b/4 curative resection done & determine if will respond to octreotide (90% sensitive)
- 18F-Dopa-PET: Also sensitive for identifying primary & Nodes
- EGD & Scope all w/ unknown primary
- Echo and ECG on all to eval for right sided valvular disease

### Prognosis

- staging same as adenoCA
- Stage I: 82%; II: 95%; III: 83%; IV: 38%
- 50% risk of another CA (likely due to hormonal effects)

### Treatment

- Surgical resection
  - Appendix: appy if <1 cm, R Hemi if >2, in b/t choice
  - SB: Local – resection of primary, extensive – debulk
    - resect mesentery due to high risk of fibrosis & SBO
  - Col/Rect: < 1cm local, >2 segment – in b/t choice
  - Liver Mets: Rsnx improves survival from 20 → 70%
- Systemic Therapy:
  - Palliative: by symptoms or octreotide 400 µg/day
    - Octreotide LAR: 20 mg IM Qmonth
    - Lanreotid PR 30 mg IM Q10days
    - both 50% rate of cholelithiasis
  - Chemo: poor overall results;

## COLON CANCER

### COLORECTAL CANCER: SCREENING

Colon & Rectal CA 2<sup>nd</sup> leading CA death in US

Gatekeeper of colorectal Neoplasia: Adenomatous polyposis coli gene

#### Average Risk (75%)

Do not fit any of higher risk categories

- do not do *routine* screening >75 years of age

Screening Recs begin at age 50: (1 of these 3)

- (1) yearly FOBT
- (2) Flex sig Q5yrs + FOBT Q3 yrs
- (3) Colonoscopy Q10yrs

FOBT – low sensitivity, so really shouldn't be used alone

- has poor compliance
- sample three bowel movements while not eating red meat, ASA, NSAIDS, turnips, melons, salmon, sardines, horseradish or Vitamin C for 2 days.

Flex Sig: if find a polyp, do full colonoscopy - ~30% will have another proximal lesion

- recommended to combine with FOBT (still 15-30% false negative rate)

Air Contrast BE:

- < 1cm: 50-80% sensitivity
- > 1 cm: 70-90% sens
- Stage I and II: 50-80%

CT Colonography:

- Needs good oral prep
- rectal catheter with air insufflation used
- any positive findings need scope
- Initial studies show not as sensitive, but evolving

Fecal DNA testing

- cells are shed, tests for tumor markers
- ~20% sensitivity (FOBT ~11%)
- at this point, not enough evidence to support it for screening in general

#### Personal History of Adenomatous Polyps or AdenoCA

All recommend colonoscopy

Initial post-resection scope: 1 year, followed every 3-5 years thereafter

- looking for metachronous disease

#### Family History of ColoCA or Adenomatous Polyps

If 1<sup>st</sup> degree relative – begin at age 40, or 10 years before the age at diagnosis of relative

- if diagnosis was before age 60, Colonoscopy Q5 yrs (!?)

If 2<sup>nd</sup> degree relative w/ CA or relative with polyps over age 60 – consider them average risk

#### Hereditary Nonpolyposis Colorectal Cancer

75% will have disease by age 65

Autosomal Dominant – mutations in mismatch repair genes; microsatellite instability common

Most tumors proximal to splenic flexure by age 40-50

- still get adenomatous polyps, despite the name
- tendency for multiple cancers
- at risk for other cancers, ovary and uterus highest

Amsterdam Criteria:

- colorectal CA in 3 or more Family members, 2 generations affected, at least one a 1<sup>st</sup> degree relative, at least 1 before age 50

- Bethesda criteria increases sensitivity –
  - if meet Bethesda, do genetic testing too look for *proband*, which can be used to test family members

Screening: start age 21, repeat Q2 years

- Referral for genetic counseling w/ genetic testing
- Regardless of testing (only 30-50% sensitive) needs scoping if meets criteria

#### Familial Adenomatous Polyposis

Autosomal dominant defect in adenomatous polyposis coli gene 100% cancer by age 40

Extracolonic tumors: duodenal adenomas, desmoids

Start colonoscopy at puberty

- flex sig or Colonoscopy then repeated Q1-2 years
- screening EGD for duodenal adenomas

Genetic testing: if shows proband with a positive truncated protein assay, relative that test negative can be screened as average risk individuals

#### Inflammatory Bowel Disease

UC and Crohn's patients with increased CA risk

- 7-8 yrs if pancolitis
- 12-15 yrs if left sided only

- Crohn's risk now considered equivalent to UC

Screening: Q1-2 years scope with multiple biopsies every 10 cm starting:

- 7-8 yrs after diagnosis – if pancolitis
- 12 – 15 years after diagnosis – if left sided

#### Clinical presentation:

- MC: abdominal pain
- 2<sup>nd</sup>: Change in bowel habit
- rectal bleeding in 25% - all patients with rectal bleeding should have an endoscopy
- even if young – series of 570 patients under 50 w/ BRBPR – 17.5% had colorectal cancer

#### Staging: TNM

#### Clinical Prognostic Factors:

*Age:* incidence increases w/ age (mean 60)

*Symptoms:* obstruction/perforation – 5 yr survival 33%

*Blood Transfusion:* can cause immunosuppression in the post-op period – decreases ability to combat tumor cells shed at the time of surgery

*Adjacent Organ Involvement:* T4 worse, enbloc resection improves survival (up to 75% 5-yr in some series)

#### Histologic/Biochemical/Genetic Factors

*Histologic Grade:* 3 grades, most grade 2 – preserved gland architecture

*Tumor Budding:* represents undifferentiated portion of tumors at the leading invasive edge

- <5 cells of single infiltration cancer cells at the invasive edge
- higher rate of local recurrence
- independent risk factor for local spread, +LNs and Mets

*Mucin Production and MSI:* hnpcc related, better prognosis

*Signet-Ring:* younger, worse prognosis, > rate +LN/Mets

*Venous Invasion*: poor prognosis

*Perineural Invasion*: poorer prognosis

*Lymph Node Involvement*: most important prognostic indicator – need at least 13 lymph nodes for adequate staging

*CEA*: glycoprotein absent in normal mucosa, present in 97% of CA; good for surveillance, not screening

- if elevated, preop, if resected and no mets, should decrease

- if > 15 mg/mL, high likelihood of mets

*Sentinel Node*: being studied, marginal utility since lymph node removal adds little risk to the operation

*DNA Ploidy*: nondiploid cells worse prognosis

#### Spreading Patterns:

*Intramural*: maximum 2 cm → transect at 5 cm for colon proximally and distally for margins

*Transmural*: T stage, try for R0 resection

*Margins*: colon margins 5 cm, rectal distal 2 cm

*Radial Margins*: more important in rectal, but in T4's matters in colon as well

*Transperitoneal/Implantation*: ovaries, omentum, serosal or peritoneal surfaces at risk – carcinomatosis

- if localized, remove that structure

*Lymphatic*: risk by T stage

- T1: 9%, T2: 25%, T3: 45%

*Hematogenous*: less common than lymphatic; thought to be source for pulmonary mets ← bypasses liver

Detection of Synchronous Lesions: 6% or fewer patients

- if obstructing distal lesion, t/c barium enema, virtual CT, or colonoscopy, or recently PET/CT

- if a synchronous lesion, consider likely HNPCC and should consider doing a Subtotal w/ IRA

#### Distant Metastatic Disease:

Almost always Liver or Lungs, others rare, so check those by symptoms

*Liver Mets*: CT standard, 64% sensitivity for lesion >1 cm

*Lung Mets*: in 3.4%, author advocates CT over CXR

*PET Scans*: IV <sup>18</sup>F-fluorodeoxyglucose (FDG)

- poor spatial resolution

- 94.6% sensitivity

#### Response to Chemotherapy:

Monoclonal Antibodies to EGFR: cetuximab, panitumumab, and bevacizumab

- does not work with Kras mutation at codon 12 or 13

- other markers to predict response: BRAF, PIK3CA, PTEN

5-FU treatment: elevated Thymidylate Synthase (TS) markers shows resistance to 5-FU

#### Screening Guidelines:

Low Risk: start at age 50

Moderate Risk:

- FamHx: 40yo or 10 yrs before FamHx Q5yrs

- Hx of > 1cm polyp: 1 yr after polyp'd then in 5yrs

- Hx of Colon CA: 1 yr, 3yr, 5yr, then at 10 yrs

High Risk:

- FamHx FAP: 12-14yo, then Q1-2yrs

- FamHx HNPCC: 21yo then q2yrs

- Hx Crohn's: 15 years after onset, Q1-2yrs

- Hx UC: 8 years after onset, Q1-2 yrs

#### PreOperative Preparation

Must know:

1. tumor location in bowel

2. stage of the CA

3. patient's physiologic status

- ASA score, POSSUM and p-POSSUM scores

- CR-POSSUM: CRS specific, most accurate prediction of mortality for colorectal.

- p-POSSUM overpredicts

Mechanical Bowel Prep: all but one study have showed a higher anastomotic leak rate in prepped patients, with an odds ratio of 1.8

#### Right Colectomy – Technique

- no touch technique

- ligation at origin of ICA off SMA

- terminal ileum 5-15 cm from ICV to ensure vascular supply

#### Extended Right Colectomy:

- for any lesion involving the transverse colon including hepatic or splenic flexures

- must ligate the middle colic vessels

#### Left Colectomy

- take omentum with transverse colon

- option for anastomosis is retroileal right colon to rectum anastomosis to maintain orientation of the right colon

- ligation at base of IMA or to preserve left colic artery?

- St. Marks, 1,370 patients, no difference in outcome if LCA preserved

- high ligations actually fared worse

- French Association for Surgical Research: no difference if Left Colic preserved.

#### Sigmoid Colectomy

- high ligation of the IMA

- release the splenic flexure

- always do in lithotomy

- always do a leak test in the pelvis

#### Total Abdominal Colectomy and Ileorectal Anastomosis

- HNPCC, attenuated FAP, metachronous cancers

- end-to-end ok, can also do side to side

#### Special Circumstances

##### Prophylactic Oophorectomy:

- 3.2% metastatic seeding but studies do not show a survival benefit

- not recommended at this point

*Concurrent AAA*: >6 cm AAA either first or synchronous.

- EVAR mitigates this problem

*Sentinel Node Assessment*: not recommended right now.

*Palliative Colectomy*: should rarely be performed and only in patients with life-threatening comorbidities or advanced incurable disease

*Acute Obstruction*: on table lavage has been shown to be safe way to avoid colostomy w/o increased leak rate

- *Stenting*: emergency, viable option as bridge

- decreased hospital stay, mortality, SSI

##### Known Liver Mets:

- if unresectable liver mets, upfront chemo before colectomy may be advisable

- 16% can be downstaged and become resectable, w/ 40% 5 year survival
- 7% will ultimately need palliative surgery (e.g. obstruction)

#### Outcomes of Colectomy for colon CA:

Stage I: 90%

Stage II: 65-90%

Stage III: 45-75%

Risk of locoregional recurrence after colectomy: 5%

#### Margins - Mural

- 5 cm proximal and distal for sure adequate
- more recent data suggests 2 cm from palpable tumor edge
- mural spread to ileum is very rare – so don't need to resect for margin, only vascularity

#### COLORECTAL CA: METASTATIC (PALLIATION)

Vast majority of Stage IV not curable.

- 5 year survival rate in 2000: 8%
- median Survival 21 months (now)

#### DIAGNOSIS & STAGING

Initial:

- colonoscopy, bx
- ERUS or MRI if Rectal
- CT C/A/P
- PET detects 20% of CT false negatives (indicated if will change mgmt)

Three Important decisions:

1. Patient fit for aggressive treatment?
2. Does tumor present sig. risk of bowel obstruction?
3. Can Mets be resected?

#### PALLIATIVE MGMT

Majority of obstructing CAs Stage III or IV

- Risk of cecal perforation w/ competent IC valve

Non-Resective Palliative Options:

- (1) *laser therapy*: for rectal CA (or distal sigmoid) – 85% success, however needs multiple therapy sessions, risks of bleeding, perforation and severe pain.
- (2) *fulguration*: removes bulk of tumor but requires admission and anesthesia
- (3) *colonic stents*: can potentially dilate lumen to near-normal diameter; minimal sedation necessary, can be placed in long lesions by overlapping stents
- (4) *diversion*

#### SURGICAL MGMT – RESECTION

No randomized data demonstrating a survival benefit for bowel Rxn in stage IV dz

Complication rates of ops in stage IV disease:

- Mortality rate: 15 – 34%
- Morbidity rate: 32 – 64%

MetaAnalysis of 1,062 patients: prolonged survival

- w/ palliative Rxn: 14 – 22 months survival
- systemic therapy alone: 6 – 15 months

Standard Mgmt: systemic chemotherapy

- author's advocate considering palliative resection

#### LIVER METASTASIS

60% of colon CA will have liver Mets

- 1/3 of those will be isolated liver mets

- 10% candidates for resection
- 30% of those candidates will get long-term survival

Prognostic Indicators of Hepatic Resection:

- size > 5 cm, disease free interval < 1 yr, > 1 tumor, Lymph node positive primary, CEA > 200 ng/ml

Margins: Goal > 1 cm

#### LUNG METS

Rule of 10s

- 10% will have lung mets, of those –
- 10% will have isolated lung mets, of those –
- 10% will be considered resectable

5 year survival after Rxn: 30-40%

- poor data on actual outcomes

#### PERITONEAL METS

In 10-15% of patients

Second most common met site after liver

Two classification systems:

- (1) Gilly's: by dimension of the implants
- (2) Peritoneal Cancer Index of Sugarbaker: tumor size in 13 regions of the abdomen

Historical survival data with peritoneal mets: 6-8 months

Newer evidence demonstrates that aggressive surgical cytoreduction and IP chemotherapy for those with limited peritoneal burden

#### OVARIAN METS

Metastatic Colon vs. Ovarian Primary:

Determine by staining:

Ovarian: CK20<sup>-</sup>/CEA<sup>+</sup>/CK7<sup>-</sup>

Colon: CK20<sup>+</sup>/CEA<sup>+</sup>/CK7<sup>+</sup>

No good studies to establish resection benefit

Needs to be discussed with patients and families

Premenopausal, consider prophylactic oophorectomy in:

- known family hx, does not want any more children, known peritoneal metastases,

#### BONE AND BRAIN

Surgery only for isolated single brain mets – can result in survival beyond 1-2 years

Bone Mets: consider radiation and medical therapy for symptomatic relief.

- gamman knife and cyber knife being evaluated for use in these mets

#### TYPES OF SURVEILLANCE

NCCN, ASCRS and ASCO Guideline:

- Q3-6 month follow up for 2st 2-3 years, then Q1 yr until yr 5
- do NOT use LFTs, hemmoccult, or serum hemoglobin tests for surveillance, only use CEA
- NCCN & ASCO: Annual CT C/A/P 1<sup>st</sup> 3 years post Rxn
- Colonoscopy: Q1 year for 5 years (ASCRS suggests Q3 years)

CEA:

- main use is surveillance

- if > 5 ng/ml preop – bad prognostic indicator (37% rate of recurrence)
- if fails to lower after resection → likely occult disease
- Check CEA levels Q3 months for 3 years, then Q6month to year 5.
- Don't check CEA while on 5-FU → falsely elevated

Metachronous Colorectal Neoplasms

- Risk of Metachronous polyps: 30-56%
- Risk of Metachronous CA: 2-8%

Recurrent Cancer

Only 2% of local recurrences can be visualized on colonoscopy  
 - more likely with rectal CA than colon

If had transanal excision, Q3 months ERUS to eval

- CEA: Q3 months first 2 years, then Q6 months next 3 years
- CXR: Q6-12 months

No evidence for routine screening with CT, MRI or PET

Hereditary Cancer:

- Thought to play a role in 10-25% of colorectal CAs
- consider if <50 years of age, or 1<sup>st</sup> degree relative with it
- cancers to consider: endometrial, ovarian, ureteral, gastric

Risk & Pattern of Recurrence

- 60-80% of recurrences w/in 2 years of surgery
- 90% by 5 years
- So follow up most intense during first 2 years, taper over next 3
- 10% of recurrences will be able to have R0 resection

Algorithm of work up in setting of Abnormal Results:

- CEA abnormal
- Next Step: Physical, Colonoscopy, CT C/A/P
- if that is all negative → PET CT
- if PET negative → Rescan Q3 months until either:
  - recurrent disease identified, or
  - CEA stabilizes or declines

SIGMOID

Perforated Stage II Colon Cancer:

- Remember, is not stage IV so adjuvant therapy is appropriate

COLON CANCER – SPLENIC FLEXURE MASS

COLON CANCER - RECURRENT

DUODENAL INJURY DURING RIGHT COLECTOMY

TABLE 48-1. Summary of recommended surveillance protocols

Test/procedure	ASCRS <sup>23</sup>	ASCO <sup>22</sup>	NCCN <sup>24</sup>
History and physical	Minimum of 3 times per year for the first 2 years	Every 3–6 months for 3 years, then every 6 months during years 4 and 5, then per physician discretion	Every 3–6 months for 2 years, then every 6 months for 5 years
CEA	Minimum of 3 times per year for the first 2 years	Every 3 months for 3 years or longer, for patients with Stage II or III disease	Every 3–6 months for 2 years, then every 6 months for 5 years for T2 or greater
Flexible sigmoidoscopy or proctoscopy for rectal cancer patients	Periodic anastomotic evaluation is recommended for patients who have undergone resection/ anastomosis or local excision of rectal cancer	Every 6 months for 5 years for patients who have not received pelvic irradiation	Consider proctoscopy every 6 months for 5 years
Colonoscopy	Every 3 years	At 3 years then every 5 years if normal	At 1 year, if advanced adenoma repeat in 1 year, if none repeat in 3 years, then every 5 years
Computed tomography of the chest–abdomen–pelvis	Not recommended	CT chest/abdomen every 1 year for 3 years, consider CT pelvis for rectal cancer patients especially if they have not received radiation therapy	Annually for 3 years, for patients at high risk for recurrence
Fecal occult blood test	Not recommended	Not addressed	Not addressed
Complete blood count	Not recommended	Not recommended	Not addressed
Liver function tests	Not recommended	Not recommended	Not addressed
Chest radiography	Not recommended	Not recommended	Not recommended
Abdominal ultrasound	Not recommended	Not addressed	Not addressed

These are the recommended surveillance protocols for those patients who are candidates for further intervention.

## ONCOLOGIC OUTCOMES IN COLORECTAL CANCER

General survival ranges by stage:

- Stage I: >90%
- Stage II: 65-90%
- Stage III: 45-75%

### Preoperative Evaluation:

- Thorough eval of Chest, Abd, Pelvis
- full colonoscopy in all
  - synchronous CA: 5%
  - synchronous polyp: 25-75%

### Surgical Technique:

- Margins:
    - Colon: 5 cm proximal & distal
      - mural spread rarely beyond 2 cm
    - Rectum: Distal 1 – 2 cm
      - worse survival if < 0.8 cm
  - High Ligation:
    - evidence does not show improved outcome
    - increases lymph node sampling
    - Goal: ≥12 nodes
- 12 nodes

---

## SURGICAL OUTCOMES IN COLORECTAL CANCER

### Anastomotic Leak: 3-6% of all colorectal cases

- up to 15.3% of low pelvic anastomoses
- adequate blood supply, tension free
- albumin <3 associated with leak
- risk factors: peritonitis, steroids, COPD, Obesity, weight loss >5 kg, alcohol use
- usually evident on PODs 5-8

### Anastomotic Stricture:

- up to 30% of cases, most asymptomatic
- highest rate with end-to-end stapled
- proximal dilation increases risk
- all strictures should be verified not to be cancer recurrence
- Most can be dilated endoscopically – usually several treatments before resolves

### Anastomotic Bleeding:

- with stapled: 1.8-5% rate
- if bleeding on staple line, control w/ sutures rather than cautery
- Initial post op treatment – non op
  - 80% will stop spontaneously, 50% will need prbc
  - stop SQ heparin, correct coags
  - endoscopy to check staple line
  - Angio w/ vaso or embo
  - surgery if these fail

### Pelvic Hemorrhage:

- results from inadvertent violation of the avascular presacral plane
- put direct pressure, let anesthesia know
- microfibrillar collagen and absorbable gelatin
- sterile titanium thumbtacks
- 4 cm flap of rectus muscle and then bovie it into place
- bone wax
- pack, close and 2<sup>nd</sup> look if all failing

### Splenic Injury:

- 1-8% of cases

### Ureteral Injuries:

- Most likely injured during:
  - while ligating the IMA
  - dissecting at the sacral promontory
  - division of lateral stalks of rectum
- best if fixed intraop
- consider ureteral catheters

### Autonomic Nerve Injury:

- Dissection in Denonvillier's: nervi erigentes at risk
- 

## FUNCTIONAL OUTCOMES

- 4 factors for Poor function after sphincter salvage:

1. damage to sphincter complex
  2. loss of anorectal sensation
  3. reduced rectal capacity and compliance
  4. reduced colon length → less water absorption
- Better outcomes found with colonic J-pouch & coloplasty
    - colonic J-pouch seems to have better outcomes
    - multi-center study shows sustained results > 2 years
    - Baker anastomoses: side to end (another option)
      - recent evidence shows long term not as good
    - author recommend Col J Pouch if w/in 6 cm from verge

### COLONIC VOLVULUS

- 10 – 15% of colonic obstruction in U.S.
- Mobile portion of colon has narrow mesentery
- Incidence: Sigmoid 60%, Cecal 35%, Tcolon: 3.6%

### CECAL VOLVULUS

Incidence: most common in young females (53 yo)

#### Pathogenesis:

- Cecal Volvulus:* axial torsion of ileum and colon
  - forms closed loop and SBO together
- Cecal Bascule:* cecum folds anterocephalad, not twist
- Association with prior surgery; considered risk factor
- congenital lack of fixation also postulated

#### Symptoms:

- small bowel obstruction
- difficult to diagnose

#### Diagnosis:

- Coffee bean deformity towards LUQ
- contrast: bird's beak

#### Treatment: celiotomy

*Cecopexy:* elevate lateral peritoneal flap along entire length of ascending colon, suture flap to anterior surface of the serosa of colonic wall – places it partially retroperitoneal (12-14% recur)

*Cecostomy:* after removal of the tube, spontaneous closure is common (12-14% recurrence)

- can combine the above 2

*Resection:* likely 0% recurrence

### TRANSVERSE COLON VOLVULUS

Incidence: very rare – 1-4% of all volvuli

Path/Et: constipation, laxative use; congenital disease

Clinical Presentation: large bowel obstruction; chronic subacute process or fulminant course

- Chilaiditi Sign: hepato-diaphragmatic interposition of bowel on plain film – in less than 1% of cases on review – more historical term
- plain film rarely diagnostic
- contrast enema: bird's beak distal T-Colon

Treatment: segmental transverse colectomy or extended right hemi

### SPLENIC FLEXURE VOLVULUS

Incidence: rarest form, <50 case reports (young women)

Path/Et: 3 ligaments important in normal flexure: gastrocolic, splenocolic, phrenocolic; congenital lack of or disruption in these leads to it; 2/3 had prior surgery

Clinical Presentation: large bowel obstruction; chronic subacute process or fulminant course

- plain film: significant air in colon up to splenic flexure; two air fluid levels in cecum & T-Colon; empty descending colon; crescentic gas shadow in LUQ
- contrast enema: bird's beak at Splenic Flexure

Treatment: segmental colectomy or extended left hemi

- many will have very dilated colon, so may have to do ileosigmoid or ileorectal anastomosis

### SIGMOID VOLVULUS

Incidence: MC volvulus, but only 10% of all LBOs (men)

Path/Et: elongated colon, redundancy;

- in US: elderly, institutionalized male, psychotropic med
- *Shrinking MesoSigmoiditis:* scarring patches and bands from previous volvulus that resolved

- Counterclockwise twist around mesocolic axis
  - need at least 180° to be clinically significant
- once 360 degrees – closed loop obstruction
- 3 patterns of necrosis:
  1. at neck of volvulus
  2. any location in closed loop
  3. proximal descending colon due to retrograde mesenteric thrombosis

Clinical Presentation: male, constipated, nursing home, on psychotropic meds

- 40-60% will have had symptoms in past
- significant distention usually
- plain film (diagnostic in 70%): *bent inner tube sign* or *omega loop*
- Water contrast enema: bird's beak
- CT: Whirl Sign, however not pathognomic

#### Treatment:

- emergent sigmoid detorsion – rigid proctosig, flex sig, colonoscopy, blind rectal tube, barium contrast – successful in 70-80%
- 50% will already have gangrene, some recommend just go straight to laparotomy; others recommend if detorsing, can do so if not a blind technique
- detorsing nonviable bowel leads to higher rate of perf
- rectal tube should be placed during detorsion and fixed in place
- patient resuscitated, can do full colonoscopy to eval for no malignancy or other disease
- 25% will recur without surgery (some report upto 80%)
- can then do *sigmoid resection* – standard of care

*Mesosigmoidolasty:* incising the elongated sigmoid mesentery vertically, relosed transversely; shortens and broadens the mesentery. Most report recurrence <2% (one 28%)

Other non Rxsxn options: sigmoidopexy, parallel colopexy to T-Colon, fixation to abdominal wall, perc colon deflation – all high rates of failure & mortality

- if go emergently to OR and dead bowel found – DO NOT detorse first. First step is *Vascular control*. Prevent spread of inflammatory toxins
- if megacolon: consider Subtotal Colectomy (high recurrence if only take sigmoid – 82% recurrence)

Mortality rates higher without pre-op detorsion and resuscitation: 45% vs. 10%

### ILEOSIGMOID KNOTTING – COMPOUND VOLVULUS

Incidence: rare form, men almost all less than 50 yo

Path/Et: associated with single large meal with lots of fluid

- ileum around sigmoid or vice-versa

Clinical Presentation: usually first attack

- fulminant course common, present in shock and intra-abdominal catastrophe
- intestinal gangrene on exploration in 70-100%

Treatment: if nonviable, vascular control before detorsion

- sigmoid segmental to prevent retrograde mesenteric thrombosis
- mortality: 40-50% if dead bowel, 10-30% if viable

### SPECIAL CONSIDERATIONS:

Children: most have comorbidities (Cerebral Palsy)

Pregnancy: obstruction rare in Pregos. 45% of Obstructions in prego due to volvulus –

- have a high index of suspicion in prego w/ "SBO"
- always rule out volvulus in obstructed Prego
- 1<sup>st</sup> trimester – attempt to delay till 2<sup>nd</sup> trimester
- 3<sup>rd</sup> Trimester – avoid op if possible before fetal maturity – if forced to operated, Hartmann's procedure of choice.

## CONSTIPATION

Rome Criteria: for diagnosis, need 2 for at least 3 mo's

1. Straining > 25% of the time
2. Hard stool >25% of time
3. Incomplete Evacuation >25% of time
4. Two or fewer BM's per week

Mean colonic Transit times:

- Males: 31 hours
- Female: 39 hours
- small bowel transit: 90 – 120 minutes

Ex:

- Prevalence 15%
- F > M, increases with age
- Non-whites more often

Px:

- Medical conditions – hypothyroid, lupus, DM, Scleroderma, neurologic, immobilization, psych

Subtypes of Constipation:

- (1) Colonic Inertia: long term, < 3 BMs/wk, laxative dependence
- (2) Irritable Bowel Synd: abd pain, irregular, pain relief w/ BM
- (3) Obstructed Defecation: need for digital manipulation, prolonged straining w/ BMs, incomplete evacuation

Evaluation:

HPI:

- Details: stool size, frequency, consistency, ease & efficacy of evacuation
- age of onset, diet & exercise, meds, PSHx, PMHx
- hx of sexual abuse, psych illness
- urinary incontinence or related
- Patient diary: dietary intake, defecation frequency, stool consistency, associated symptoms

PE: usually unremarkable

Dx:

- 1<sup>st</sup> step always scope (or BE) to rule out obstruction
- If normal, then proceed:

Colonic Transit Time:

- estimated w/ marker study or scintigraphy
- *Marker Study:* refrain from all laxatives/enemas 2 days before study. Injest 24 radioopaque markers. Must injest 30 g of fiber daily during the test, no lax/enemas. AXR on day 5.
- 80% of normal patients will pass all markers by day 5
- markers accumulated in rectum – outlet obstruction
- distributed throughout – colonic inertia
- more than 20% of markers remain – colonic inertia
- *More precise marker study:* ingest radiopaque marker for 3 days, then imaging on days 4 & 7.
- <65 hours colonic transit time in 95% men
- <75 hours colonic transit time in 95% women

Defecography:

- visualization of mechanism of defecation
- identify non-relaxing puborectalis or a rectocele

Anal Manometry:

- shows lack of rectoanal inhibitory reflex – suggests Hirschsprung's Dz
- Balloon expulsion testing can show outlet obstruction and add to reliability of defecography

Anal Electromyography:

- used w/ manometry – the recruitment of Puborectalis fibers during defecation simulation indicates a nonrelaxing puborectalis as cause of outlet obstruction

Lactulose Hydrogen Breath Test:

- evaluation of small bowel transit
- lactulose fermentation only occurs in colon.
- Record the time of ingestion of lactulose to time of production of Hydrogen to infer transit time

STARR: Stapled Transanal Rectal Resection

- Indication: rectocele, mucosal prolapse, rectal intussusception
- double stapled circumferential full-thickness resection of the lower rectum
- long term improvement of obstructed defecation w/ STARR\

Rectocele: defect in rectal vaginal septum & protrusion of anterior rectum into posterior vaginal wall

- repair w/ transvaginal, transperineal, or transrectal

Enterocele: descent of small bowel into pelvis → mechanical obstruction of rectum

- repair: transabdominal or transvaginal

Sigmoidocele: descent of sigmoid colon causing obstruction

- Rx: sigmoid rsxn or -pexy w/ a post compartment repair

Medical Treatment of Constipation

- does not have to be one daily
- ensure no malignancy or other mechanical blockage
- increase physical activity and fluid intake

Bulking Agents: fiber, hydrophilic, facilitate absorption and retention of fluid.

- Synthetic methylcellulose derivatives
- SE: bloating, flatulence
- 20-30 g daily recommended

Osmotic Laxative: promote fluid mov't into colon

- derived from sugars/salts
- eg: Sorbitol/Lactulose – yield hydrogen, CO<sub>2</sub>
- Caution w/ these gases can cause explosion
- Milk of mag, Fleets, PEG

Colonic Irritants: stimulate colonic motility

- senna, cascara, bisacodyl,
- **Pseudomelanosis Coli:** from long term use, brown discoloration to mucosa of colon

Mineral Oil & Colace: manipulation of the composition of stool.

- Mineral oil coats stool, prevents absorption. Colace decreases stool surface tension allowing more water into it.

Lubiprostone: C1C-2 chloride channel activator → induces intestinal secretion w/o elevating serum electrolyte levels

- Rx: functional constipation and/or IBS-C patients
- S.E.: nausea, diarrhea, headaches

COLONIC INERTIA:

- small % of constipated have this
- Subtotal colectomy only if colonic transit only. Full work up before TAC
- Options: IRA, ileosigmoid or cecal-rectal anastomosis
- if also have pelvic floor problem, 50% dissatisfaction with operative intervention
- relative contraindication: gastric or SB component as well

ANTEGRADE COLONIC ENEMA:

- option for patients to avoid stoma

IRRITABLE BOWEL SYNDROME

- abd pain & bad BMs w/o identifiable path
- can also have diarrhea
- 3 categories: constipative (IBS-C), diarrhea (IBS-D), Mixed (IBS-M)
- R.F. for psych illness – MC depression & anxiety disorder

- but only for those seeking help, if self-managed, odds ratio for psych disorder same as general population
  - myoelectric studies – suggest problem – shorter intervals b/n mmc's → generalized hyperresponsiveness of smooth muscles in patients with IBS
  - Diarrhea: irregular short spikes
  - Constipation: irregular long spike bursts
  - *Visceral Hyperalgesia*: increased sense of gut distention
- Rome Criteria for IBS:**
- Abd pain that is: improved after pooping, and associated with both a change in frequency and in stool quality
  - At least 2 of below >25% of time:
    - altered stool frequency
    - altered stool form
    - altered stool passage
    - Mucorrhea
    - Abdominal bloating/distention
- Treatment of Diarrhea Predominant IBS:**
- Anticholinergics: dicyclomine hydrochloride (Bentyl) and Hyocycamine sulfate (Levsin)
  - Nonabsorbable synthetic opioids: Lomotil/Immodium
  - Tricyclic antidepressants: amitriptyline (Elavil) & imipramine (Tofranil)
  - Serotonin Agonist: alosetron (lotronex)
- Treatment of Constipation Predominant IBS:**
- fiber, osmotic laxatives
  - serotonic agonist – Tegaserod
  - Fedotazine (kappa opioid agonist)
- Small Intestine Bacterial Overgrowth (SIBO) – may be linked with IBS – antibiotics considered in these situations**
- Neomycin: x10 days
  - levo or cipro or falgyl: x7 days
  - Rifaximin 1,200 mg/day x 10 days (expensive)

TABLE 32-1. Factors associated with constipation

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<i>Lifestyle</i>
Inadequate fluid intake
Inadequate fiber intake
Inactivity
Laxative abuse
<i>Medications</i>
Opiates
Anticholinergics
Iron
<i>Medical illness</i>
<b>Neurologic</b>
Spinal cord dysfunction/damage
Parkinson's disease
Multiple sclerosis
<b>Endocrine/metabolic dysfunction</b>
Diabetes mellitus
Hypothyroidism
Electrolyte abnormalities
Uremia
Hypercalcemia
Porphyria
<i>Psychological</i>
Depression
Anorexia
Psychiatric illness
Sexual abuse
<i>Colonic structure/function</i>
Cancer
Crohn's disease
Irradiation
Endometriosis
Hirschsprung's disease
Chagas' disease
<i>Pelvic floor abnormality</i>
Nonrelaxing puborectalis
Anal stenosis
Rectocele/enterocele

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## MEDICAL MGMT OF INFLAMMATORY BOWEL DISEASE

### Medical Mgmt of Crohn's Disease

Diagnosis usually in 2<sup>nd</sup> or 3<sup>rd</sup> decade

### Induction Therapy for Crohn's Disease

#### Mild-Moderate Crohn's Disease

Sx: tolerate diet, ambulating, no signs of systemic toxicity

Rx: Aminosalicylates & antibiotics

- Topical Steroid: Budesonide

*Sulfasalazine*: a compound of sulfapyridine

- Azo- bonded: cleaved into active form by a colonic bacteria → so not effective in small bowel Crohn's
- SSZ 6 g/day: 40-50% of pt's achieved clinical remission
- Dose Independent S.E.: pneumonitis, hepatitis, pancreatitis, anemia, bone marrow suppression, reversible sperm abnormalities, impaired folate absorption
- Depletes folate: All should receive daily folate (1 mg/day)
- Reversible infertility in men – 3 months to go away

5-aminosalicylic acid (5-ASA AKA mesalamine)

- like SSZ but w/o Sulfa component – increased tolerance
- New formulations to minimize side effects:
  - Pentasa: controlled release throughout SB & colon
  - Asacol: release in terminal ileum & cecum at pH 7
  - Dipentum & Colazal: release in Colon
  - Lialda: delayed release, once daily dosing, in TI @ pH 7

#### Antibiotics:

- alternative 1<sup>st</sup> line therapy in mild-moderate disease
- work better in colonic than small bowel disease
- metronidazole shown to efficacious, better effect to crossover to flagyl than from
  - Side effects: metallic taste, peripheral neuropathy (irreversible) – risked at >1 g/day for long term
- Cipro 500 mg BID – 50% remission shown
  - S.E.: tendonitis, Achilles tendon rupture (both rare)
- Initial treatments show combo Cipro/flagyl best Rx
- Rifaximin: 200 – 400 mg tid – negligible intestinal absorption
  - S.E. gas, headache, fecal urgency, tenesmus

#### Budesonide:

- only FDA approved agent for ileum/right colon
- potent glucocorticoid, 1<sup>st</sup> pass metabolism – 90% in liver, so only 10% reaches system as a whole
- Rx: 8-12 wks 9 mg/day – high remission rate than mesalamine
  - delays relapse up to 6 months, not longer → not recommended to be used over 1 year time

### Moderate-Severe Crohn's Disease

Sx: abdominal pain, >10% weight loss, n/v, anemia

Rx: steroids, infliximab, immunomodulator therapy

*Corticosteroids*: mainstay for mod-sev disease

- Prednisone 40-60 mg x2-6 wks – remission in 50-70%
- not safe, nor effective for maintenance
- consider Budesonide and then switch to prednisone if fails
- 50% of pt's eventually become steroid dependent/resistant

*Immunomodulators – Thiopurines:*

- maintain steroid induced remission
- Azathioprine (AZA) 2-2.5 mg/kg qd
- 6-mercaptopurine (6-MP) 1-1.5 mg/kg qd
- need 3-4 months to achieve affect
- allow for better remission and steroid sparing
- S.E.: LFT changes, pancreatitis, leukopenia
  - monitor for *leukopenia* Q1-2 weeks and then Q3 months

- safe during pregnancy
- no risk for lymphoproliferative disorders (an old concern)
- Check thipurine methyltransferase (TPMT) in patients
  - do not give AZA or 6-MP to pts deficient in TPMT enzyme
  - heterozygous deficiency get reduced dosages

*Methotrexate (MTX)*: IM or SQ – 25mg Qweeks

- steroid sparing agent – for patients refractory to steroids
- also give Folate 1 mg daily if on MTX
- S.E.: stomatitis, nausea vomiting, leukopenias
  - hepatic fibrosis: mild increased LFTs
  - hypersensitivity pneumonitis possible but rare
- contraindicated in pregnancy; no alcohol while on this

*Infliximab*: chimeric monoclonal antibody to TNF

- induction and maintenance of Crohn's for those refractory to steroids and thiopurines
- reduces perianal fistula
- 5 mg/kg given at 0, 2 and 6 weeks as induction; then redoes every 8 weeks to maintain response in most and decrease rate of antibody formation to infliximab
- 30% have no response & of 70% responders, some only partial
  - Predictors or response: CRP, nonstricturing Dz, pure colonic CD, concomitant use of immunomodulator (AZA & 6-MP)
- Other agents: Adalimumab & Certolizumab pegol
- S.E.: hematologic – leukopenia, neutropenia, thrombocytopenia, pancytopenia, infusion reaction (allergy)
  - rare: T-cell lymphoma (non-hodgkin) - pts also on AZA/6-MP

*Natalizumab*: monoclonal antibody targets  $\alpha_4$  Integrin → interferes

- w/ trafficking of leukocytes into the mucosa
- for patients refractory for all else w/ documented inflammation
- patient not suitable for surgery
- risk of Progressive Multifocal Leukoencephalopathy (PML):
  - last resort med – all others failed, surgery not option
  - can NOT be on immunomodulators or anti-TNF at same time

#### Loss of Response to Anti-TNF agents

- Human anti-chimeric antibody (HACA) made by body in response to infliximab → 40% of pt's reduced response by 6 months
- Loss or response: test HACA and infliximab levels in serum
  - if HACA elevated: change to alternate agent
  - if infliximab not detectable: increase dosing
- Concomitant AZA/6-MP/MTX reduces HACA (38% vs. 16%)

#### Contraindications to Biologic Therapies:

- Allergy, active infection, TB, demyelinating disorder, CHF, cancer, (for natalizumab, also PML and liver disease)

*Tarolimus*: limited data on its use

- seems to benefit fistulizing disease
- need to monitor multiple blood levels if using

#### Severe-Fulminant Crohn's

Start with high dose IV steroids equivalent to 40-60 mg prednisone

If fail after 5-7 days, consider Infliximab, Cyclosporine, Tacrolimus

#### Mgmt of Perianal Crohn's Disease

1<sup>st</sup> line: drainage and antibiotics

2<sup>nd</sup> line: AZA, 6-MP, CSA, Tacrolimus

- steroids no role in perianal Crohn's

3<sup>rd</sup> line: Infliximab

- 68% improved, 55% fistulae ceased – avg time 12 weeks

#### Maintenance Therapy for Crohn's

1<sup>st</sup> line: Thiopurines prove to work (5-ASA no role here)

2<sup>nd</sup> line: infliximab – being researched, initial studies show works well

#### Indications for Surgery in Crohn's

Up to 2/3 need it at some point, though not curative for them

Disease predictably recurs at anastomosis

Any patient that fails intense inpatient care for 7-10 days should be considered a surgical candidate

#### Postop Prophylaxis for Crohn's Disease:

60-80% e/o recurrence on scope, 10-20% clinically

- smoking strongest predictive factor for recurrence

Diversion prevents recurrence

---

### Medical Mgmt of Ulcerative Colitis

#### Induction Therapy for UC

Sx: bloody diarrhea, rectal urgency, tenesmus

Histologic sign of remission: absence of neutrophils in the epithelial crypts

Treat only proctitis/distal disease differently than proximal/total colonic disease

- for total colonic disease, see Crohn's treatments

Mild: <4 BM per day

Mod: mixed b/n mild and severe

Severe: >6 BM per day

Fulminant: >10 BM /day

#### Mild-Moderate Proctitis

- Suppositories should suffice

- Mesalamine 1-1.5 g/day (Canasa) good up to 20 cm disease

- respond by 2-3 weeks for most (some 4-6 wks)

- if not responding, combo with topical corticosteroids should be added, usually will induce remission

- Systemic therapy rarely needed

#### Mild-Moderate Distal Colitis

1<sup>st</sup> line: Topical 5-ASA – nightly enema 4g/60 mL (Rowasa)

- if no response by 2-4 weeks, add a morning enema

- add steroid enema in morning – Budesonide (Entocort)

#### Mild-Moderate Extensive UC

- need oral (systemic) therapy

- combining with topical rectal therapy has shown to be additive

1<sup>st</sup> line – 5-ASA or newer – follow same algorithm as in Crohn's

- PO budesonide not as effective in UC since released in TI

#### Severe UC

Admit, IV solucortef 300 mg daily (or solumedrol 48 mg)

Empiric antibiotics have no established role in treatment but most still give

*Cyclosporine*: (CSA) rescue therapy to force remission: side effects risks of seizures, hypomagnesemia. If fail after 7 days, operate on them. Discontinue after 3-4 months if was effective.

- contraindicated in patients with multi-organ dysfunction

- While on CSA – place on Bactrim DS for PCP prophylaxis

Role of infliximab not defined in severe UC

#### Maintenance Therapy for UC

1<sup>st</sup> line: aminosalicylates

2<sup>nd</sup> line: AZA & 6-MP to keep people off steroids

- steroids not good for maintenance

5-ASA topical (enema) to maintain – then reduce frequency overtime from every night to every 3<sup>rd</sup> night

3<sup>rd</sup> line: infliximab on biologic approved in UC, maintains up to 54 weeks of remission

#### Steroid-Induced Remission in UC

Steroids not good for maintenance, however some patient become steroid dependent, and can not come off steroids or will immediately relapse – these patients should be considered for AZA or 6 MP treatment

- thiopurines slow to onset, so corticosteroids until at therapeutic levels

#### CSA-induced remission in UC

- transition to CSA PO

- transition to thiopurines

- PCP prophylaxis with Bactrim DS three times a week

- goal CSA at 150-300 ng/mL

TABLE 28-1. Sulfasalazine and 5-aminosalicylates

Generic	Brand	Daily dose	Site of action
Sulfasalazine	Azulfidine	4–6 g daily in divided doses	Colon
	Azulfidine EN-Tabs	4–6 g daily in divided doses	Colon
Mesalamine	Canasa (suppositories)	500–1,000 mg daily QHS	Rectum
	Rowasa (enemas)	1–4 g daily QHS	Rectum/distal colon
	Asacol	2.4–4.8 g daily in divided doses	Terminal ileum/colon
	Pentasa	2–4 g daily in divided doses	Distal small bowel/colon
	Lialda	2.4–4.8 g daily in a single dose	Colon
	Apriso	1.5 g daily in a single dose QAM	Colon
Olsalazine	Dipentum	1.5–3 g daily	Colon
Balsalazide	Colazal	6.75 g daily	Colon

TABLE 28-2. Indications for biologic therapies

Indication	Crohn's disease				Ulcerative colitis
	Infliximab	Adalimumab	Certolizumab	Natalizumab	Infliximab
Induction of response and remission	X	X	X	X <sup>1</sup>	X
Maintenance of response and remission	X	X	X	X	X
Mucosal healing	X	X	X		X
Induction of response in adults with draining perianal fistulas	X	X			
Induction of response in adults with draining abdominal or rectovaginal fistulas	X				
Steroid sparing agent	X	X		X	X
Treatment of spondyloarthritis, arthritis/arthritis, pyoderma gangrenosum and erythema nodosum, uveitis and other ocular manifestations of Crohn's disease	X	X			X
Loss of response or intolerance to infliximab		X	X	X	

X<sup>1</sup> Must have also failed anti-TNF therapy and have evidence of inflammation.

TABLE 28-3. Dosing guidelines for biologic therapy

Biologic agent	Induction regimen	Maintenance dose	Attenuated response	Discontinue therapy
Infliximab	5 mg/kg IV at weeks 0, 2, and 6	5 mg/kg IV every 8 weeks beginning at week 14	10 mg/kg at 8-week intervals, or 5 mg/kg every 4 weeks	No response after 2 doses or infusions are required more frequently than every 4 weeks
Adalimumab	160 mg SC on day 1 of week 0, then 80 mg SC on day 1 of week 2	40 mg SC every other week	40 mg SC weekly or 80 mg every other week	No response to induction therapy or duration of response decreases to less than 1 week
Certolizumab	400 mg SC at weeks 0, 2, and 4	400 mg SC every 4 weeks	Extra dose of 400 mg SC 2 weeks after last dose	No response to induction therapy or when the duration of response decreases to 2 weeks
Natalizumab	300 mg IV at weeks 0, 4, and 8	300 mg IV every 4 weeks	Other dosing regimens have not been adequately evaluated	Lack of response or inability to discontinue steroids by week 12

## CROHN'S

### SURGERY FOR CROHN'S DISEASE

#### ETIOLOGY AND INCIDENCE

- considered environmental & genetic factors
  - 50-60% concordance with twins
- Bimodal Age: 15-30 & 60-80

#### DISEASE CLASSIFICATION

Vienna Classification: age, location, behavior

- (1) Age at diagnosis: <40 or >40
- (2) Location: TI, Colon, ileocolon, Upper GI
- (3) Behavior: Inflammatory, Strictureing, penetrating
  - >80% change class, so not too useful; clinicians subjectively disagree on a patient class as well

#### DIAGNOSIS

##### ESR & CRP:

- CRP: more accurate
  - half-life of 19 hours
- ESR: less accurate
  - reflects changes in plasma protein concentrations and packed cell volume
  - correlates with colonic more than ileal disease

##### Operative Risks:

- cumulative w/in 10 years of diagnosis: 40-55%
- Risk of second op by year: 5(16%), 10(28%), 15(35%)

#### OPERATIVE INDICATIONS

##### Severe Colitis:

- Disease Flare: 6 or more BMs w/ systemic toxicity:
  - anemia (<10.5 g/dL)
  - elevated ESR (>30 mm/h)
  - Tachy (>90)
  - temp (>37.8)
- first resusc patient unless abdominal catastrophe
- medical therapy first line: steroids, biologics, immunomodulators, empiric antibiotics
- if no improvement after 5-7 days, t/c surgery vs new medical therapy
- Surgical options:
  - Subtotal with end ileostomy – standard of care
  - TPC w/ end ileostomy
  - loop ileostomy w/ blowhole colostomy

##### Hemorrhage:

- endoscopy if can
- if not mesenteric angiography to identify site and treat
  - in CD – may be small bowel source\
  - if can localize but not embolize – leave catheter in place and do intraop or inject dye, to target resection margins for OR
- after 6 units transfused, consider bowel resection

##### Perforation:

- typically at or just proximal to a stricture
- Rx: resection of involved bowel – anastomosis based on patient status – diversion safer

##### Neoplasia:

- RR 4-5x of small bowel & hepatobiliary cancers
- RR 2.6% colon CA (similar as UC)
- RR of rectal cancer not increased
- If have PSC, start endoscopic surveillance
- Plan: as in UC – start colonoscopy 8-10 yrs after onset
  - four quad biopsies every 10 cm
  - directed biopsies of strictures and lesions
  - repeat every 1-2 years

- any dysplasia, even if low → colectomy

##### Growth Retardation:

- abnormal linear growth secondary to delayed skeletal maturation – improves after resection

##### Extraintestinal Manifestations:

- 30% of CR pts. Skin, mouth, eye, joints
- musculotcutaneous ones more likely to improve w/ op

##### OPERATIVE CONSIDERATIONS

- CD is incurable
- GI complications MC indication to operate
- many factors influence operative decisions
- ignore asymptomatic disease
- non-diseased bowel may be involved by fistulas/adhesions
- Mesenteric division can be difficult
- Resection margins should be conservative (2 cm) – to grossly normal bowel (NOT microscopically)

##### OPERATIVE OPTIONS

Internal Bypass: not used as often anymore, but certain choice situations where it would still be efficacious

##### Fecal Diversion:

- deep ulcerations & high complex fistulas MC to fail diversion
- some times needs a secondary procedure to work – advancement flap, resection, ...

##### Strictureplasty:

Indications:

- multiple strictures diffusely in SB
- stricture in pts w/ previous >100 cm SB resection
- rapid recurrence of CD w/ obstructive disease
- stricture in patient already with short bowel
- Nonphlegmonous fibrous stricture

Contraindications:

- perforation of bowel
- phlegmonous inflammation, any fistula involving site
- multiple strictures in short segment
- stricture close to resection margin
- albumin <2

Types:

- Heineki-Mikulicz: <10 cm
- Finney: 10-20 cm
- Jaboulay: > 20 cm – side to side internal bypass

##### Resection:

- secondarily involved bowel in internal fistulas that are otherwise normal – do wedge resection of fistula
- not recommended to attempt to remove enlarged LNs

#### SPECIFIC ANATOMIC LOCATIONS

Terminal Ileum: avoid too much resection (R Hemi) – increases chance for internal fistula to duodenum

Colon: segmental resections as per disease

- IRA: those w/ max tolerated rectal volume <150 ml do poorly with IRA

Upper GI: poor form of Crohn's – avoid resection and internal bypass, try to do strictureplasties

Anoperineum: ignore asymptomatic disease, control sepsis

- infliximab at 0, 2 and 6 wks – 50% fistulas close
- more effective w/ cipro, and redoses Q8weeks

#### SPECIAL CIRCUMSTANCES

Intramesenteric Abscess: exclude the bowel – proximal and distal bypasses, drain abscess into the bowel and through the mucous fistulas; resect it in 6 months

Psoas Abscess: Resect bowel & externally drain abscess

## **DIVERTICULITIS**

### **INCIDENCE**

- 5% by 40, 80% by 80
- 10-20% symptoms → 10-20% of those inpatient
- 10-50% of inpatient → surgery (<1% of all need surg)
- Perfs more likely in men < 50 , Women > 50

### **PATHOPHYSIOLOGY**

- High intraluminal pressures – 90 mmHg at peak (9x wnl)
- Herniation at *vasa recta brevia* – where blood vessels penetrate muscle to reach mucosa
  - most b/n mesenteric & anti-mesent tinea
  - muscular layer does not herniated
  - acquired or *pulsion* diverticula for most
- patients with diffuse diverticulosis, may be due to connective tissue abnormality

### **ETIOLOGY**

- possible disturbance in cholinergic activity
  - diverticular disease more cholinergic innervation than normal colon

### **EPIDEMIOLOGY**

Diet: high red meat & low fruit/veggies increase diverticulosis. Veggies & brown bread protective.

- fermentation of fibers – provides butyrate for colon
- seeds/nuts no correlation

Age/Sex: Pts <50 yo more often with chronic/recurrent diverticulitis

- men bleed more often, women bladder fistula more

NSAIDS: increased rates of complications from diverticula via inhibition of COX → decreased Prostaglandin

Immunocompromised: associated w/ increased risk – more likely from inability to prevent containment

Opiates: increase intracolonic pressure, slow intestinal transit – both increase risk of complications

Smoking: relative risk of complication: 3x, but new study refutes this

Alcohol: may also have risk, but data refuted because alcoholics have worse diet habits, which may be cause

### **CLINICAL MANIFESTATION**

#### **Non-Inflammatory Diverticular Disease**

- symptoms without associated inflammation

#### **Acute Diverticulitis:**

*Hinchey* – for complicated acute diverticulitis:

- Stage I: localized abscess
- Stage II: confined pelvic abscess
- Stage III: purulent peritonitis
- Stage IV: fecal peritonitis

#### **Chronic Diverticulitis:**

- remain symptomatic despite standard treatment.
- *Atypical*: if never develop systemic signs
- usually associated with a phlegmon

#### **Complex Diverticular Disease:**

- chronic + fistula/stricture/obstruction

### **NATURAL HISTORY**

- increasing risk w/ age & no diet modifications
- progression from one segment of bowel to next does not typically occur – unusual for complications to develop in the proximal colon after Rsnx of diseased sigmoid.
- est. 10% will recur after first outpatient episode
- est. 70% will recur after 2 inpatient treatments
- 75 – 96% of pt's w/ peritonitis present w/ it with no prior history of diverticulitis (first presentation)

- est. 20% overall recurrence rate, <5% will be complicated, <1% will eventually need surgery

### **PRESENTING SYMPTOMS**

- LLQ abd pain
- no prodromal epigastric pain, rare n/v
- bleeding atypical, if so ensure no other diagnosis (CA)

### **COMPLICATIONS:**

Bleeding: not a feature of diverticulitis (is of –osis)

Perforation: focal to diffuse

Abscess: consider perc drainage

Fistula: bladder MC; if clinical hx c/w it, imaging w/u not a must

Stricture/Obstruction: caution w/ use of stents; may need diversion due to size mismatch

Ureteral Obstruction: most often will resolve with treatment of diverticulosis, usually left sided

Phlegmon: better to treat to resolution before surgery

Saint's Triad: diverticulosis, cholelithiasis, hiatal hernia – unknown clinical significant

### **DIAGNOSTIC TESTS**

Endoscopy: caution in acute phase; unless really indicated, delay until inflammation resolved

- if acute phase discovered during elective scope, antibiotics are not necessary

AXR: to rule out pneumoperitoneum

Contrast Studies: to eval stricture/obstruction, fistulas

CT Scan: documents –itis phase.

U/S: not really used, some research into its use

MRI: correlates with CT findings, no radiation

### **DIFFERENTIAL DIAGNOSIS**

IBS: know Rome II criteria to distinguish:

Rome II: pain that is at least 2 of 3 below in last 12 months

1. relieved with defecation
2. onset associated with frequency of BMs
3. Onset associate with form of stool

Red Flags not associated with IBS: disturbed sleep from the pain, blood, weight loss, fever, abnormal exam

Colon Neoplasia: scope the patient

IBD: Crohn's may mimic; recurrent diverticulitis after previous resection should make you consider Crohn's

Polycystic Kidney Disease: very high association with sigmoid diverticulosis – some transplant centers request prophylactic sigmoid colectomies before transplant

### **UNCOMMON PRESENTATIONS**

Young Patient: more likely to have complicated recurrence if initial CT demonstrates significant disease

Rectal Diverticula: rare, typically true, usually solitary; most can be managed conservatively

Cecal/Right Sided: more common in far east; present younger w/ R sided; cecal diverticula are *true* ticks;

- Four Grades: I – inflamed tick; II – inflamed cecum; III – localized abscess; IV – rupture/perforation

- often confused as appy, and taken to OR; always take out appendix, even if only thing you do, to prevent confusion in the future.

- procedure of choice is appy and close, or appy + diverticulectomy vs. right hemi (if not identifiable disease or concerned for cancer)

Giant Colonic Diverticulum:

- sigmoid; pseudo-tic w/ inflammatory (not mucosal) wall
- unknown mech; as large as 30-40 cm
- large gas filled cavity on plain film
- Rx: Resection of involved colon

#### Transverse Colon Diverticular Disease:

- very rare
- females, younger age
- more often resected because difficult diagnosis

#### **TREATMENT**

- Diet: 20-30 g of fiber daily
- no data to restrict eating seeds

#### Acute Diverticulitis: outpatient, antibiotics, low residue/clear diet

- gram negative and anaerobes; E. Coli & Streptococcus, Bacteroides, Peptostrepto, Clostridium, Fusobacterium
- Inpatient: make NPO initially, then advance PO

#### **SURGICAL MANAGEMENT**

- *Hartmann's*: oversewing rectal remnant
- *Mikulicz*: mucous fistula of rectum
- most argue b/n 1 vs. 2 stage op; 3 stage historical

#### Abscess: that can't be drained – consider Hartmann's

- 35-45% of people will never have second stage

#### Complications: low pelvic anastomotic leak rate: 2-5%

#### Indications: current ASCRS guidelines:

- elective Rsn after 2-3 well-documented episodes
- after 1 if it was a severe attack (abscess, air); >50% rate of recurrence

#### Mgmt of Fistula:

- Bladder: drain for 5-7 days alone
- Vagina: no closure,
- Cutaneous: will close spontaneously
- Enteric: Resection/closure
- Ureteral: ureteral drainage
- Uterine: observation vs. hysterectomy
- Appendix: appy
- Tubes: Salpingo-oophorectomy

#### Recurrence after resection:

- 3 – 13% rate with elective cases
- Risks: distal sigmoid left in-situ (not resected to level of true rectum) – Thaler et al: level of anastomosis only significant indicator or recurrence

#### Technique:

- remove all thickened bowel, NOT all bowel with tics
- no hypertrophied colon should remain
- ALL sigmoid should be taken out
  - MC reason for recurrence: Retained distal sigmoid – anastomosis NOT to rectum

#### Op: Mass stuck to bladder/ureter:

Scenario: Can't mobilize, you try everything from multiple approaches – try proximal to distal, distal to proximal, medial to lateral, lateral to medial ----- In none are SAFE the divert proximally and come back later

## ENDOMETRIOSIS

- presence of endometrial glands & stroma outside uterus
- cyclical pain/bleeding from any location that coincides with menses

### Clinical Manifestations:

#### Sites and incidence:

Common	Less Common	Rare
Ovaries 60-70%	Appendix 2%	Diaphragm
Uterosacral Ligs 30-65%	Ureter 1-2%	Inguinal Canal
Cul-de-sac 25%	TI 1%	Liver
Uterus 4-20%	Bladder <1%	Spleen
Rectosig Colon 3-10%	Scars <1%	Kidney

Symptoms: MC – menstrual irregularities, pelvic pain, infertility, or may be asymptomatic – spectrum between this

- pain most intense just before menstruation and lasts for the duration of menstruation

### Pelvic Pain and Dysmenorrhea

- pain MC symptom (80%): dysmenorrheal, dyspareunia, or chronic noncyclic pelvic pain
  - associated: back pain, dyschezia, levator M. spasm
- total lesion volume correlates with pain
- *Dyspareunia*: deep pelvic pain w/ vaginal penetration
  - usually in advanced endometriosis
  - indicative of degree of fixation of the pelvic organs
- *Chronic Non-Cyclical Pain*: pain > 6 mo, intermittent or continuous;

### Infertility:

- unclear relationship/cause (30 – 50% rate?)
- may be to adhesion formation in the pelvis
- may benefit from surgical treatment

### Intestinal Symptoms:

- bowel involved in 12-37% - symptomatic variable
  - 1<sup>st</sup> MC Rectosigmoid (70%), Small Int. 2<sup>nd</sup>, Appy 3rd
- *Rectosigmoid Dz*: change in BM, diarrhea, decreased caliber, tenesmus, rare bleeding around menses
- can cause perforation
- if asymptomatic – benign natural history- *don't resect asymptomatic patient*

### Malignant Transformation

- not common, younger age (40s), good prognosis
- Signs of CA: > 10cm, cyst rupture, or change in pain
- rectosigmoid most common area of CA origin ones
- Most common symptom: rectal bleeding
- risk factor: prolonged unopposed estrogen exposure
- Endometrial CA MC type; 60% survival at 5 years
- Histologically: arise from the colon, not invading it

## DIAGNOSIS

### Physical Exam:

- may be normal; possible ovarian mass
- bimanual exam: nodularity/induration in the uterosacral ligaments or cul-de-sac of Douglas
- cyclical pain/bleeding from any location that coincides with menses should be worked up for endometriosis

### Laboratory Evaluation:

- CA-125: low sensitivity, low specificity
- better for surveillance than diagnosis

### Endoscopy:

- usually normal since lesions are on outside of bowel
- biopsy in area may resemble solitary rectal ulcer
- Proctoscope may show fixed mucosa

### Imaging Techniques:

- TransVag U/S: good to detect ovarian implants only
- TranRectal U/S: may have use for pouch of douglas
- BE: extracolonic mass
- CT: higher sensitivity, lower specificity
- MRI: more sensitive than CT

### Laparoscopy:

- only definitive way, can be used to diagnose those when other tests have failed
- Only time to menses in pts w/ infertility – luteal phase
- Examine all small bowel, appendix, pouch of douglas, uterosacral ligaments, both ovaries, sigmoid colon, ureters

### TREATMENT:

#### Medical Management:

- treat symptoms – pelvic pain
- neoadjuvant treatment 3-6 mo → decrease burden
- 3 month trial of danazol or GnRH-a to determine cause
  - if endometriosis, most no pain w/in a month
  - can be used as bridge, can still get pregnant
  - will not cure disease, will relapse once stopped
- *OCPs*: work, but can't get pregnant. Good if no desire.
- *Danazol*: older drug, lowers peripheral estrogen & prog levels; 5% get side effects of menopause type symptoms, hirsutism, acne, weight gain; do not use in patients with liver disease or atherosclerosis
- *GnRH-a*: suppresses release of FSH & LH; same efficacy as danazol, but less SEs. Menopause like symptoms, bone loss.

#### Surgical Management:

- Goal: completely excise/ablate endometrial implants, preserve ovarian function, optimize fertility
- implants can be deeper in tissue than can always tell – be careful of iatrogenic injury to other organs
- ureteral stents advised in all of these

#### Rectovaginal Endometriosis:

- most lesions can be removed w/o entering mucosa
- may need anterior resection vs. wedge (if < 3cm lesion)
- margins: grossly normal bowel

#### Appendix: appendectomy

#### Small Bowel: wedge or resection

## FAMILIAL ADENOMATOUS POLYPOSIS

### FAMILIAL ADENOMATOUS POLYPOSIS

Autosomal Dominant – mutation in APC gene

#### Polyposis Registries

- provide counseling, support for FAP families
- pedigree analysis & identifying of at risk relatives
- assist with post op and surveillance

#### Features of FAP

*Large Bowel:* >100 adenomatous polyps; usually by teens, cancer by age 40; 25% due to new mutation

*Extracolonic Manifestations:* duodenal CA and desmoids as new major source of morbidity, others:

- Congenital Hypertrophy of retinal pigment epithelium (CHRPE): hyper/hypo pigmented spots on retinal examination – no effect on vision but seen in 66% of families w/ FAP

#### Genetics

*The APC Gene:* large gene on 5q21

- mutation of APC one of initial events, truncating APC product

*The APC Protein:* APC mRNA in higher levels in normal colonic mucosa; highest when cell replication done

*Genotyp-phenotype Correlation in FAP:* different codons associated with differing prognosis and age of onset

*MYH Polyposis:* autosomal recessive FAP

- oligopolyposis (<100 polyps)
- mutation along MutY homolog (MYH) gene
- duodenal adenomas also, but not desmoids
- consider genetic testing for this if: no APC mutation found, mode of inheritance is not Autosomal Dominant, or polyp numbers are low.

#### Clinical Variants of FAP

*Attenuated FAP:* <100 polyps at 34-44 yrs

- still have APC mutation, and get extracolonic manifestations
- most polyps right colon
- clinical picture similar to HNPCC

*Gardner's Syndrome:* FAP, epidermoid cysts, osteomas, fibromas

- Syndrome is considered obsolete now, since the extracolonic manifestations part of normal FAP

*Turcot's Syndrome:* polyposis with CNS tumors

- ~ 70%: cerebellar medulloblastoma w/ APC mutation
- ~ 30%: glioblastomas w/ HNPCC mutations

#### Diagnosis:

*Genetic Testing:* 80% sensitivity, if positive, at risk family checked, between ages 12-15

- should be done in patients with 10 or more adenomas

*Clinical Surveillance:* scopes starting at 12-14 yrs of age

- if start with flex sigs, COYs by age 20

#### Mgmt of Large Bowel

*Timing of Prophylactic Surgery:*

- invasive CA rare under 18 yrs of age
- plan surgery b/n ages 16-20 for most

*Choice of Operation:*

- Proctocolectomy with End Ileostomy
- Colectomy with IRA
  - 12-29% risk of CA in rectum w/in 20-25 yrs
  - do NOT do if:
    - 1309 mutation
    - severe polyposis
    - Rectal Polyps w/ high grade dysplasia
    - > 20 rectal adenomas present

- Proctocolectomy with IPAA
  - mucosectomy really only indicated in those with severe low rectal polyposis
  - 53% develop polyps in pouches – unknown significance at this point
- author recommends IRA if no 1309 or severe polyposis

#### *Post-Operative Surveillance*

- IRA: rescope Q6-12 months; remove all polyps >5mm
  - if severe dysplasia – completion proctectomy
- IPAA: annual scope, w/ good DRE
  - remove polyps over 5 mm in size
  - multiple small polyps responds to sulindac

#### *Anal Transition Zone Adenomas*

- more common in stapled vs. hand-sewn
- adenomas can be individually removed or do stripping of the whole area. Mucosal stripping may have to be staged to prevent stenosis (2 stages)

#### *Chemoprevention:*

- Sulindac, Celecoxib: reduced the # & size of adenomas
- not a treatment to avoid cancer

#### Upper Gastrointestinal Polyposis

- Increase in Gastric CA polyps in Asia but not West
- 95% of FAP have duodenal adenomas
  - occur about 15 yrs later than large bowel polyps
- Everywhere but most just distal to ampulla of Vater
- 5% develop into CA at average age of 50

#### *Surveillance of Duo:*

- prognosis very poor for the few that progress
- *Spigelman Staging:* stratifies severity of duo polyposis
  - Stage II or III: 2% risk CA at 10 years; Stage IV: 36%
- upper EGD scopes starting at age 25

#### *Management:*

- very high recurrence rate, Whipple only curative treatment available

#### Desmoid Disease

- locally invasive, non-metastasizing clonal proliferations of myofibroblasts; 10-50% mortality
- develop in 10-15% FAP patients, ~30 yrs of age, or 2-3 yrs after surgery

#### *Clinical Features:*

- may encase small bowel vessel if in mesentery → ischemia/perforation
- 10% resolve spontaneously; 10% rapid growth, the rest cyclic
- causal link from estrogen & trauma

#### *Management:*

- known desmoids, avoid operation as long as possible, and when finally do, do Lap IRA
- when vessels involved, high periop mortality rate
- ureteric obstruction: best mgmt is stents
- Sulindac + Tamoxifen/Toremifene

#### *Algorithm by stage:*

- 1 (<10 cm, static): Sulindac 150-200 mg Bid
- 2 (<10 cm, slow growth) add Tamoxifen 80-120 mg Qd 3 &
- 4: consider chemo – Liposomal doxorubicin
  - alternatives: vinblastine and methorexate

#### SERRATED POLYPOSIS (SPP)

#### *Defined by WHO:*

1. 30 or more serrated polyps, or
2. >10 serrate polyps proximal to splenic flexure, at least 2 are > 1 cm in size, or
3. Serrate polyps with family history of SPP

No germ line mutation identified, but 50% risk of CR CA  
Close COYs, until can't control endoscopically then IRA -  
screen all family members 10 years prior to neoplasia

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16yo M w/ multiple polyps

- Surveillance paradigm: Yearly
- When to do proctectomy: 18 years old or earlier if dysplasia
- Rectal Sparing: 1309, multiple, severe, >20
- Scoping above: Age 25
- Screening of Family members: 1<sup>st</sup> degree all scoped and tested
- Post op Surveillance: IRA 6 m – 1 yr, IPAA Q1 yr

## FECAL INCONTINENCE

Fecal Incontinence: inability to control feces and to expel it at a proper time, for at least *one month*

Mechanism:

- Rectosigmoid: antiperistaltic motion
- rectal capacity – acts as a reservoir
- CNS input necessary
- pelvic floor to keep sphincters tight

*Soilage*: continuous or intermitten liquid anal discharge

*Pseudoincontinence*: not true, due to prolapse, incomplete evac, poor hygiene, fistulas, STDs, ...

*Encopresis*: involuntary loss of formed, semifformed or liquid stool associated with functional constipation as a child

*Urgency*: need to defecate immediately at the risk of incontinence when facilities are absent

- seen with impaired rectal compliance

Incontinence scores: Most widely used – Vaisey and Wexner

*FIQOL* – severity index and quality indicator by ASCRS

- best was to get info on incontinence

## CAUSES OF INCONTINENCE

Congenital:

- hx of high anorectal malformation – severely defective fecal continence and poor quality of life
- 75% get voluntary control, 40% occasional soiling
- constipation frequent

Pelvic Floor Denervation:

- Pudendal nerves and S3/4 branches of pelvic plexus
- irreversible injury w/ as low as 12% stretch

Obstetric:

- 0.6 – 9%
- occult injuries seen on ERUS in 20-35%
- Risk Factors: forceps, mediolateral episiotomy, primiparity
- 60% will have concomitant pudendal nerve injury
- due Compression & Traction injury to nerves

Iatrogenic:

- Park's anal retractor MC – damage to internal sphincter from excessive dilatation
- sphincter division, rectal resection, neo-adjuvant therapy

Traumatic:

- uncommon cause of fecal incontinence
- immediate recognition is vital to a successful outcome and may prevent need for stoma
- anal intercourse associated with reduced resting pressure in the anal canal and an increased risk of anal incontinence

Radiation:

- 75% will have acute phase reactions
- 20% late-phase radiation proctitis

## DIAGNOSIS

History:

- Ob Hx, PSHx, Change in BM, time course
- Active (urge) or Passive?
- Active: tries to stop but can't → has intact sensory mechanism w/ dysfxnl EAS
- Passive (unaware): IAS vs neurologic source
- Procidencia? Urinary Incontinence?

Physical Exam:

- Purborectalis: can be palpated bilaterally and posteriorly as a prominent sling passing around the rectum thus creating the anorectal angle that is normally 90 degrees
- Perineal Body: in females, see if thinned
- Patulous Anus? Consider prolapse
- Perianal Sensation & wink reflex to pinprick: test neuro

Anal Manometry:

- Checks: anal pressure, anal squeeze pressure, recto anal inhibitory reflex, compliance of the rectum, sensory thresholds in response to balloon dilatation
- resting pressure: internal sphincter fxn
- Squeeze Pressure: external sphincter pressure
- no absolute numbers – can have normal numbers and have problems, or vice versa
- *Resting Pressure*: (40 – 70 mmHg) – majority by IAS, provides 55-60% of resting tone. Hemorrhoids provide the remainder, less EAS. If low, consider IAS dysfxn
- *Squeeze Pressure*: (2 – 3x baseline rest pressure) – majority by EAS. If low, consider EAS dysfxn
- *High-Pressure Zone*: (2-3 cm in women, 2.5 – 3.5 cm in men) – the length of the IAS w/ pressures greater than 50% of maximal resting pressure
- *Rectoanal Inhibitory Reflex*: (10 – 30 mL) – plays a role in fine adjustments, rectal distention causes a contraction of the EAS followed by IAS relaxation, allowing anal mucosa to sample the rectal contents
- *Rectal Sensation*: (40 mL of air) – measured with intrarectal balloon and incremental installation of known volumes of air; high volumes abnormal
- *Rectal Compliance*: Subtracting volume of first sensation from maximum tolerable volume and divide by the change in pressure b/n the two – decreased in proctitis

Defecography:

- radiologic visualization of the act of defecation.
- demonstrates presence of internal rectal intussusception in patients with perineal symptoms or the solitary rectal ulcer syndrome or if overflow FI

Endosonography:

- 7 to 10 MHz
- 3D improves ability for novice, but does not add anything to work-up
- Perineal body < 10 cm abnormal. If > 12 cm unlikely sphincter defect

MRI:

- endo-coil in the anus with surface phased array coil
- coil is 2 cm so causes stretching of the sphincter
- MRI without the endocoil but with a phased array coil gives a view of that natural contracted sphincter.

Pudendal Nerve Latency Time: (2.0 ± 0.2 ms)

- measures the time form an electrical stimulus of the pudendal nerve to the onset of the electrical response in the muscles of the pelvic floor.
- use finger electrode – place on ischial spine
- prolonged latency is taken as evidence of neuropathy
- if prolonged, sphincteroplasty less likely to work, however does not exclude it from possible treatment

Electromyography:

- Anal EMG – concentric needle electrode records electrical activity of sphincter muscles
- gives sphincter info, helps if EUS limited b/c of scarring

Endoscopy: ensure no lesions, IBD, proctitis, etc.

## TREATMENT – NONOPERATIVE MANAGEMENT

### Conservative:

- meds to achieve 1-2 well-formed stools per day
- pads only appropriate for minor symptoms
- *Enopresis*: evacuate rectum and then proper habits
- Enemas to keep the rectum empty
- Bulking agents

### Medical Therapies:

1. bulking agents: psyllium
  - psyllium 50% reduction in FI one study
  - Psyllium = calcium polycarbophil
  - synthetic insoluble fiber absorbs 70x weight in H<sub>2</sub>O
2. constipating agents: Loperamide, codeine, dephenoxylate plus atropine, difenoxin plus atropine, amitriptyline
  - Loperamide: inhibits UGI & LGI peristalsis via Mu receptor
  - □ resting pressure, improves rectal sensation, □ RAIR
3. laxative regimens w/ scheduled disimpactions – for chronic constipation w/ encopresis:
  - 30 g lactulose daily w/ daily glycerin sup and weekly tapwater enema

### Biofeedback:

- improves the threshold of rectal sensation and coordinates pelvic floor contraction with rectal distention
- must have: rectal sensation, ability to contract pelvic floor, motivation
- Mechanism of action not fully understood
- allows patient to better understand Nervous system of pelvic floor, do at least 6 sessions
- 75% with improvement, only 50% cure

### Secca:

- radiofrequency used to generate heat → collagen contracting
- shortens and tightens muscles
- patients w/ mild complaints & no sphincter defect
- 90 s delivery to each quadrant at 5 mm intervals

### Injectables:

- For minor FI to IAS dysfxn
- inject into anal submucosa or Intersphincteric space
- Silicone biomaterial versus carbon-coated microbeeds
- Maximal improvement at 1-6 mo postinjn, durable up to 1-2 years

Balloon Training: to increase sensibility of rectum

Electrostimulation: not clinically effective for anal incont.

## TREATMENT – OPERATIVE MANAGEMENT

Anal Encirclement: Same as Thiersch procedure for prolapse.

High complication rate. No longer considered a viable option. Colostomy better than this

Anterior Overlapping Sphincteroplasty: for anterior defects

- rectovaginal fistula is not a contra-indication
- may need temporary diversion
- Prone Jack knife, full bowel prep; injxn adrenaline solution
- Transverse Incision on thin/absent perineal body
- Lateral dissection allows identification of normal EAS
- Scar tissue dissected to level of anorectal ring, scar preserved to place sutures in, muscles overlapped with mattress sutures.
- Should not go over 180 degrees lateral to prevent nerve damage
- No packing, central portion left open to drain
- 50-80% fxnl outcome good

### Parks Posterior Anal Repair:

- indication: denervation damage to pelvic floor w/p sphincter defect
- Purpose: restore anorectal angle & length anal canal
  - Curved posterior incision, dissection in intersphincteric space
  - Dissect up to Waldeyer's Fascia
  - Plicate: pubococcygeus & puborectalis
- low success rate (30-40%), but low morbidity and zero mortality

### Sacral Nerve Stimulation:

- stimulate S3 – test for three weeks prior with diary
- implant lasts about 8 years, lower abdominal wall or buttocks
- recruits more nerve fibers, improves Rectal Sensory Threshold and balloon expulsion time
- best indication: intact sphincters, or prior failed repair
- good for neurogenic incontinence

### Dynamic Graciloplasty:

- for long gap defects or complete destruction
- gracilis is auxiliary muscle for adductor muscles
- Minority of type one fibers (long acting, slow twitch) and a majority of type II (short acting, fast twitch) make it a poor substitute
  - with long term training, can be converted to type I
- implantable stimulator to stimulate it.

### Artificial Bowel Sphincter:

- implantable fluid-filled, silicone elastomer cuff.
- pump fluid out to deflate, passively refills to allow for continence
- erosion of material is common complication – ensure have adequate tissue

### Gluteal Muscle Transposition:

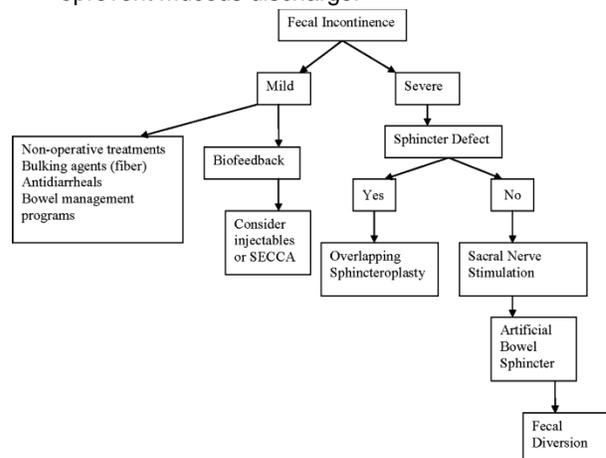
- difficult with climbing stairs and standing
- suggested to use unilateral muscle

### Gracilis Muscle Transposition:

- best for Trauma or congenital anomaly (kids)
- contraindications: diarrhea, severe constipation, obstetric injury, advanced age
- encircle with gracilis muscle and transfix to contralateral ischial tuberosity – acts as a living Thiersch
- functionally, only helps with solid stool

### Colostomy:

- last alternative, after counseling
- because of mucous discharge, should also perform rectosigmoid resection with 3-4 cm cuff remaining to prevent mucous discharge.



## **FISSURE**

Anal Fissure: tear/ulcer in anal canal from dentate line to anal verge

- M:F 1:1
- Et: mc cause is trauma, 75% post midline
  - Females also 13% ant. Midline
- If not midline, consider other cause and treat primary diagnosis to cure (e.g. CD, UC, HIV, STD, Cancer)

Chronic Fissure: > 4 weeks; base can see int. sphincter, sentinel pile (cranial) & hypertrophied papilla (distal)

Pathophys: considered ischemia + ulceration

- 85% of people w/ decreased blood to post midline

## **ACUTE ANAL FISSURE**

>50% of acute will heal w/in several weeks

- Rx: Fiber, Sitz, Topical anesthetic
- Fiber only thing shown to help cure *acute* fissure
- others supportive, topical may be harmful (?)

*Calcium Channel Blockers*: improves rate of healing from >50% to ~98%

- Rx: Nifedipine 0.2% ointment BID for 14 days
- New drug, injected: Gonyautoxin, 1 study, 100% efficacy (like botox)

## **CHRONIC ANAL FISSURE:**

**Nitrates**: relax IAS

- via enteric inhibitory neurons in muscles
- decreases resting pressure & increases blood flow
- 10 RCTs comparing it vs. Placebo: 5 worth noting
  - Headache major side effect (~33%)
  - recurrence ~33%
  - increased dose does not improve healing but increases risk of headache
  - 50% rate of healing (slightly better than placebo)

## **Calcium Channel Antagonists**

*Nifedipine/Diltiazem*

- decrease resting pressure by ~30%, increase blood flow
- 80 – 90% healing rate
- depends on study, 30-40%
- fewer side effects

## **Botulinum Toxin**

- decreases mean resting pressure
- recommend 30-40 units, inject around anterior midline, NOT posterior – better results
- recommend to use before LIS if pt. is high risk for FI (50 yrs, previous anal surgery, multiparous females, known IBD diagnosis)

## **Anal Dilation**

3 methods: Balloon only one that works

1. gradual, with dilators
  - not more effective than placebo
2. balloon to 1.4 atmospheres x 6 minutes
  - 95% heal rate, 0-6% FI rate, 3% recurrence
3. 4-6 finger dilation: high rate FI (20-30%)

## **Sphincterotomy**

- posterior midline IS → keyhole deformity → abandoned

LIS

- open and closed compared in 4 RCTs: equivalent
- Cure: 90-100%
- recurrent: 0-10%
- FI: 4.1 – 7.5%, improves over 2 years

Limited LIS vs. Full (too fissure apex vs. dentate line)

- decreased rate of FI (2% vs. 10%)
- no change in cure rate
- may have higher rate of recurrence (?)

## **Refractory Fissure**

*Anterior Fissures*: more common in women

- associated with OB trauma
- resting pressure is lower in ant. Fissure
- treatments based on LIS can cause FI

*Posterior Midline Fissures s/p LIS*:

- Island advancement Flaps
- V-Y plasty
- consider flaps in low pressure fissures

## **Surgery for anal stenosis**

Anal stenosis: after 10% radical hemorrhoidectomies, fissurectomies, XRT, Moh's chemosurgery

Due to excessive anodermal lining removal

- Flaps used successfully
  - key points: maintain vascularity & no hematoma postop
  - liquid diet first day or two post op, konsyl thereafter
  - limit activity for a few weeks post op to allow healing

*Anal S-Plasty*:

- full-thickness skin flaps with a base-to-length ratio of >1.0 (base 7 – 10 cm)

*Y-V Anoplasty*:

- length-to-base ratio <3.0
- well suited for lower anal canal but not for use above dentate line

*House and/or Diamond Advancement Flap*:

- can cover 25% of anal circumference
- multiple: 2, 3, or 4 can be done

## FISTULA-IN-ANO

### ETIOLOGY AND DIAGNOSIS

Majority are *cryptoglandular* – from obstruction of anal duct

Abscesses classified by locations:

- Perianal, Submucosal, Ischioanal, Intersphincteric, Supralelevator, Deep Postanal, Retrorectal
- Pus can spread circumferentially in the: intersphincteric, supralevator, ischioanal spaces
- Circumferential spread that can become horseshoe: deep postanal space

Fistulas classified by sphincters: Intersphincteric, transsphincteric, suprasphincteric, extrasphincteric

*Goodsall's Rule*: Anterior radial, posterior to midline

- May only be correct in 30% of patients in reality

Imaging of difficult tracts: EUS, CT, MRI, Fistulography

- CT: better for abscesses, not fistulas
- Fistulography: very limited modality
- EUS: sensitive (81%), cheap test, concerns of sensitivity.
  - H<sub>2</sub>O<sub>2</sub> increases sensitivity to 95%
  - 3D EUS increases sensitivity even more
  - 3D EUS w/ H<sub>2</sub>O<sub>2</sub> – sensitivity ≥ MRI
- MRI most sensitivity (97%): expensive
  - phased array vs. coil – PA may be superior
  - MR fistulography: emerging technique

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### SURGICAL MANAGEMENT

Incision and Drainage: primary treatment for Abscess

- most can be done in office or ED
- cruciate/elliptical incision as close to anal verge
- mushroom catheter (10-16 Fr) can be used – removed usually 5-10 days later (once no further drainage, and cavity smaller)
- Larger ischioanal may require GETA
- Intersphincteric Abscess: division of internal sphincter along length of the abscess with marsupialization of the wound
- Supralelevator abscess: drainage based on etiology:
  - Intersphincteric: transrectally via division of IS
  - Ischioanal source: external drainage
  - Retrorectal: IR drainage of source
- Horseshoe Abscess:
  1. Drain deep postanal space via midline incision between coccyx and anus → spread fibers of superficial external sphincter M.
  2. Open internal sphincterotomy of Internal sphincter in the post-midline
  3. counter incisions over each ischioanal fossa for drainage (mushroom catheter/penroses option)
- Antibiotics: consider in any one with prosthetic valves, valvular heart disease, cellulitis, diabetes, immunocompromised, joint prosthesis

Fistulotomy:

- Ways to define internal opening: probe, injxn H<sub>2</sub>O<sub>2</sub>, methylene blue, milk, look for puckering at internal opening with traction on tract, preop imaging
- Primary fistulotomy at time of abscess – controversial has been shown to have significantly higher rate of clinical disturbance

Seton Placement:

- use when substantial sphincter involved
- cutting vs. non-cutting
- Suprasphincteric fistula: consider laying open internal sphincter and placing cutting around superficial external sphincter

Advancement Flap:

- A full thickness flap incorporating portion of the internal sphincter advanced at least 1 cm beyond opening
- 75% rate of success (25-30% rate of failure)
- 50% rate of success if failed a 1<sup>st</sup> attempt
- V-Y an option as well – same basic rates of success

Fibrin Glue:

- Pros: easy, sphincter safe, can repeat easily
- autologous fibrin from patient blood – good short term result, worse long term (54% success)
- Fibrin glue: best reports 69%
- Fibrin glue + Flap: worse results – NOT recommended

Anal Fistula Plug:

- Surgisis Anal Fistula Plug (AFP)
- cone shaped bioprosthetic fashioned from surgisis – bioabsorbable xenograft from porcine intestinal mucosa
  - resistant to Infxn, no foreign body reaction, host cells populates it w/in 3-6 months
- Technique*: inserted in tract and secured at level on internal opening – must make sure all perianal sepsis treated first
  - preop Abx before procedure
  - clean tract with H<sub>2</sub>O<sub>2</sub> before placing AFP
  - mechanical debridement with curette not advised
  - Fixation: figure of 8 absorbable through mucosa, submucosa and IAS that inverts the proximal end of the fistula plug beneath the mucosa, anchoring and closing the tract opening over the plug.
    - do not fixate external opening, trim at level of the skin
- advantages – sphincters safe, less pain, can repeat
- Success in 80-90% of patients, 80% in Crohn's patients
- Utility shown in rectovaginal fistulas
- however some studies: 41- 60% - a prospective trial showed poor long term results (55%)
- reasons for AFP failure: plug extrusion, untreated sepsis, post op infectious complications

Ligation of Intersphincteric Fistula Tract (LIFT)

- initial paper – 94% success rate, 4 weeks healing, sphincters spared

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### Additional Issues

Recurrence: in about 50% after I&D abscess

- 7.6% reop w/in 10 days (inadequate drainage)
- Fistula recurrent up to 20% - risks: complex, horseshoe, previous fistula surgery, surgeon
- Cigarette smoking – higher rate of recurrence – worse blood flow objectively shown

Incontinence: iatrogenic cause

- key hole deformities – seepage
- incontinence rates wide range of reports
- 0 - 35% decreased continence s/p adv. Flaps
- Fistulotomy decreases maximum pressure & length of high pressure zone but does not affect voluntary contraction pressure

Crohn's Disease:

- 20 – 25% rate of peri-anal disease
  - in 60% of patients with proctitis
- risks: poor/delayed wound healing, sphincter injury
- *Low Lying Post Fistula*: if no rectal disease → fistulotomy
- Consider Endorectal Advancement Flaps
- AFP 25-30% rate of success in CD
- may need to consider diversion

- long term use of non-cutting setons can be done
  - low risk of carcinoma development

#### Non Surgical Management

- Flagyl – if used as maintenance, must be continued or else will relapse
- Cipro: a few trials, can be used in combo
- Azathioprine and 6-MP: cure ~30-40% of patients – but recurrence when stopped taking them
- Infliximab: in combo with seton drainage – Poritz reports 44% cure if seton removed between 2<sup>nd</sup> & 3<sup>rd</sup> dose
  - does not affect ability to do other surgical procedures into the future

#### HIV-Positive Patients

- drain promptly
- antibiotics recommended
- minimize the size of the wound
- higher rate of perineal sepsis

#### Carcinoma Associated with Fistula-in-Ano:

- 0.7% rate of carcinoma development – SCCA & Adeno
  - persistent fistula or ulcer
  - CD increases risk (after 14 years of disease)
  - SCCA can be treated with Nigro
  - AdenoCA treat with APR
  - Biopsy long standing disease with strictures/ulcers, especially in the setting of Crohn's Disease

## GI BLEED

### Epidemiology:

MC Causes: Diverticulosis, IBD, Anorectal, Cancer, Ischemic Colitis

### ETIOLOGY

- Diverticular Disease: Approximately 50% of the population by age 60 years has evidence of diverticulosis
- pseudo-diverticula in areas of weakness in colonic wall where vasa recta course through – no significant mucosa covering the vessels there
  - 75% will stop spontaneously:
    - Rebleeding: 25% rate after 1<sup>st</sup>, 50% after 2<sup>nd</sup> episode

### Angiodysplasia: (3% of all LGIBs)

- thin-walled arteriovenous communications located within the submucosa and mucosa of the intestine
- loss of vascular integrity related to loss of TGF  $\beta$  signaling cascade or from deficiency in mucosal type IV collagen
- uncommon before age 60, increase with age, associated w/ Aortic stenosis, CRF, von Willebrand's Dz
- Angiography gold standard to diagnose
  - early venous filling and *tufts*\*
- On scope: cherry red lesion, flat, "fern-like", > 2mm
- originally thought to be only on right side, now known to be bilateral

Occult Hemorrhage: may need capsule endoscopy

Colorectal Anastomosis: first resusc, transfuse, correct coagulopathy – if continues, endoscopy next step: cautery, endoclips or epinephrine injection

Radiation Proctitis: 95% will be w/in 1 yr of XRT

- most will resolve spontaneously w/o intervention
- Thermal Coagulation w/ Nd:Yag laser
- Topical formalin 3 or 4% solution
  - instill in 50 ml aliquots for 500 ml total
  - needs anesthesia
  - after each 50, washout with saline, do 10 times total
- Dab Method: 10% formalin on cotton swab through anoscope/proctoscope – can be done in office without anesthesia
- 75-90% success w/ formalin (both methods)
- surgical mgmt. last resort – diversion

### ASSESSMENT, RESUSC, AND STABILIZATION

1. gastric lavage
2. anorectal exam, proctoscopy
3. then either: scope, angio or bleeding scan
  - Major/Ongoing:* angiography/surgery
  - Minor, self-limited:* colonoscopy
  - Major, self-limited:* unclear, up for debate

### Radionuclide Scanning:

- detects rates 0.1 mL/min
- > 2 u of PRBC in 24 predictive of + scan
- can rescan w/in 24 h if 1<sup>st</sup> scan (-) & rebleeds
- cannot reliably localize site of hemorrhage – do not make a resection choice based on this scan
- sulfur colloid or 99mTc pertechnetate-tagged rbc
- if demonstrates:
  - *Immediately Pos. Blush (1<sup>st</sup> 2 minutes):* highly predictive (60%) of positive angio, 24% need surgery
  - *No blush:* predicts negative angio (93%), 7% surgery

Angio: needs bleeding rate 0.5 mL/min

- Correlate w/ positive angio: BP <90, > 5 units PRBC transfusion, blush w/in 2 min scintigraphy

- Treatment: Superselective embolization
  - success: 60-90%, rebleed: 0-33%, ischemia: 7%
  - superselective – at level of vasa recta or marginal artery
    - w/ microcoils, polyvinyl, gelfoam
  - can give vasopressin 0.2 – 0.4 U/min to site
  - if not bleeding can do *provocative* angio – inject urokinase or the like to induce bleeding while doing angio
  - if bleeding site found but can't embolize, inject methylene blue so that area becomes tattooed for surgeon

### Colonoscopy:

- Sensitivity: 45-95% for finding LGIB
- Timing: usually within 24 hours
- Options: Heater Probes, argon Plasm, Bipolar coag, epinephrine, endoclips
- complication rate: 1.3%
- consideration: Tattoo area of bleed so if Rxn needed going forward, can be identified

### Multidetector Row CT:

- rates at 0.3 ml/min
- still little data supporting this
- easy to perform, readily available in all ERs
- accurate localization
- identification of other pathologies

### Operation:

- Consider if > 6-7 units of blood
- < 10 units of blood: 7% mortality rate
  - > 10 units of blood: 27% mortality rate
  - Make sure to palpate entire intestinal system (small, stomach) to ensure no masses
  - if no source found, subtotal/total colectomy
    - anastomosis pending how stable patient is

## HEMORRHOIDS

Only 5-10% will need operative hemorrhoidectomy

### **ANATOMY**

- *Treitz Muscle*: anal submucosal muscle
- *Vascular Cushions*: anal continence, protect sphincters (15% contribution), are part of normal physiologic function
- 3 *main cushions*: L. Lateral, R. Ant, R. Post. (in 19%)
  - most will have additional small accessory cushions
- *Vascular Supply*:
  1. Superior Rectal A. (IMA)
  2. Middle Rectal A. (internal Iliac A.)
  3. Inferior Rectal A. (pudendal A.)
  4. Venous – Portal venous above dentate, systemic below
- *Histology*:
  - External: modified Squamous epithelium
  - Internal: columnar/transitional epithelium

**ETIOLOGY**: Constipation, straining, irregular habits, diarrhea, pregnancy, erect posture, increased abdominal pressure, IAS abnormalities

### **EXAMINATION**

- prone jack knife – if can't tolerate do sims position (left lateral)
- Side viewing Anoscopy best for hemorrhoidal disease

### **TREATMENT**

3 categories

- dietary and lifestyle: 20-30 g/day fiber, Calcium Dobesilate,
- non-op, office procedures
- operative hemorrhoidectomy

### Office Treatments

*Rubber Band Ligation*:

- aim at least 2 cm above dentate line
- sloughs in 5-7 days
- 1<sup>st</sup> and 2<sup>nd</sup> degree, sometimes 3<sup>rd</sup>
- can do multiple in a single session
- avoid ASA or others 7-10 days

*Infrared Photocoagulation*:

- infrared radiation via a tungsten-halogen lamp
- coagulates tissue – apply 1-1.5 sec 3-4x per

*Bipolar Diathermy*:

- cautery, bipolar – in 1 sec pulses

*Direct-Current Electrotherapy*

- probe placed at apex of hemorrhoid
- 110-volt direct current for about 10 minutes
- requires multiple treatments

*Sclerotherapy*

- chemical agents injected – fibrosis and scarring
- 5% phenol in oil or 5% quinine and urea
- hypertonic saline
- 2-3 ml into submucosa of each >1 cm from dentate
- avoid repetitive injection – risk stricture formation

*Anal Dilatation or Stretch*:

- manual dilatation, risks sphincter injury, and high failure rate.
- Not advocated in the US

*Cryotherapy*

- freezing the Internals – special probe with NO at -60-80 degrees C. Very poor results. Not recommended.

### External Hemorrhoids

*Acute Thrombosis*: peaks at 48 hours, subsides usually by 4<sup>th</sup>

- if pain intense, can consider resection
- if improving, then excise
- excision can be done in office (does NOT need OR)
  - can be in OR, but NOT mandatory

- excise entire thrombosed hemorrhoid
- can leave wound to close secondarily

### Operative Hemorrhoidectomy

- only 5-10% need excisional treatment
- Milligan-Morgan Technique (Open)*: UK – excision of the external & internal components, preserve anoderm and leave skin to close secondarily over 4-8 weeks
- Ferguson (Closed)*: excision of both, closure of the skin defects primarily
- Whitehead Procedure*: circumferential excision of veins and mucosa proximal to dentate line. Concern for ectropian and stricture (largely abandoned)
- Stapled Hemorrhoidectomy*: more of a pexy, Expensive, so not practical for grades 1&2. Circumferential grade III is best candidate for this.
  - circumferential purse string 4-6 cm above dentate
  - stapler head introduced proximal to purse-string
  - close for 20 seconds after firing
  - does not excise – pexies

### Strangulated Hemorrhoids

- rosette of thrombosed external and/or prolapsed internal
- urgent/emergent treatment
- excise all necrotic tissue – if there is necrosis, use open techniques

### Hemorrhoids in setting of Portal Hypertension

- in these patients, serve as a collateral pathway
- rarely bleed, implicated in 1% of massive bleeding in these patients
- Rx: medical mgmt, suture ligation, stapled anopexy, TIPS< Shunts, IMV ligation, Sigmoid Venous to Ovarian Vein Shunt, IMV Shunt

### Hemorrhoids in Pregnancy

- most will resolve
- so only do operation for acutely thrombosed/prolapsed
- try to do under local, in Sims position

### Hemorrhoids and Crohn's Disease

- can do operation, just exercise caution
- high rate of sig. complication (30%)
- avoid in patients with active Crohn's anal Dz or proctitis

### Hemorrhoids and Immunocompromised

- poor wound healing and infectious complications
- perform as a last resort to relieve pain and sepsis

### PostHemorrhoidectomy Hemorrhage

- 2% rate
- most respond to packing or tamponade with a foley catheter balloon
- 15-20% will need suture ligation

### Post Hemorrhoidectomy Anal Stenosis

- Usually need flap repair
- House Flap(s) useful for repair

### Post Hemorrhoidectomy Pain

- pain associated with reflex spasm of the urethral and anal sphincter muscles – leads to urinary retention and constipation
- Consider Toradol as pain adjunct on top of narcotic

### Post Hemorrhoidectomy Urinary Retention

- incidence up to 52%
- limit periop fluids to 250 ml
- avoid spinal
- avoid anal packing
- aggressive pain medications

Variation of this theme that can be asked:

Thrombosed Internal & Externals:

- Surgical Options:
- Medical Options:
- Returns one year later, options:

**HEMORRHOIDS – CIRCUMFERENTIAL PROLAPSE**

**HEMORRHOIDS – BANDING COMPLICATIONS**

Post Banding Sepsis:

Non healing wound s/p Hemorrhoidectomy:

- Work up & mgmt
- Crohn's mgmt.

**HEMORRHOIDS - GANGRENOUS**

## HNPCC - HEREDITARY NONPOLYPOSIS COLON CANCER

5-6% of colorectal CA have germline mutation

HNPCC accounts for 3% of colorectal CA annually

### HNPCC Traits:

- mean age 45 (earlier diagnosis)
- multiple generations affected
- proximal to splenic flexure
- poorly differentiated
- increased frequency synchronous/metachronous Dz
- Endometrial, ovarian, gastric, small Bowel, HB, transitional cell CA
- autosomal dominant inheritance
- mismatch repair (MMR) gene mutation

### History

- unique genetic abnormality – replication error phenotype (RER+)
- Microsatellites instability areas of errors
- E.Coli research found MMR genes

### Genetics – Microsatellite

- short tandem repeating base sequences
- usually mononucleotide or dinucleotide base repeats
- repeats found in noncoding or *intronic* portion of gene
- MC: repeats of adenine/thymine or CA or GT
- if sequence in cancer cell different than surrounding tissue – termed *microsatellite instability*

### Genetics – Different type of DNA Repair

- *Base Excision Repair*: repairs based damaged by oxygen radicals.
- *Nucleotide Excision Repair*: repairs damage caused by exogenous agents (rads, chemo, UV)
- *MMR*: repair single base mismatches as well as insertion/deletion loops of up to 10 nucleotides
  - dysfunction is characterized by MSI → HNPCC
- *Loss of Heterozygosity*: Loss of whole portions of chromosome alleles → sporadic Colon CA

### Genetics – MMR Function in Single Cells

3 main parts of the repair system: MutS, MutL, MutH

- *MutS*: finds mismatched DNA and forms it into a loop
- *MutL*: locates the the looped DNA
- *MutH*: excises the looped DNA
- DNA polymerase resynthesize new DNA strand

### Genetics – MMR function in Humans:

- *MutS*: 5 identified MSH2 – 6
  - MSH3 & MSH6 have to both be abnormal to have loss of MMR
- *MutL*: 4 identified MLH1, PMS1, PMS2, MLH3
- *MutH*: equivalent for humans not identified yet
  - maybe S&L act without H?

### Pathologic Features of HNPCC Tumors

- mucinous or poorly differentiated signet ring cells
- lymph node incidence is 35% (sporadic 65%)
- diploid tumors, large chromosomes not lost

### Clinical Features of HNPCC Tumors

- Colon CA in 80% (median age 42),
- endometrial in 50-60% (median age 49)
  - 75% chance of developing other CA
- Proximal to splenic flexure in 68% (49% sporadic)
- Synchronous Lesion 7% (1% sporadic)
- Metachronous CA at 10 yrs 29% (5% sporadic)
- 1 of 2.8 polyps removed has CA (1:41-119 in sporadic)
- Adenoma precursor lesion in 70% - larger, HGD, villous

- one cancer prevented for every 2.8 polyps removed in HNPCC patients
- malignancy transformation 3 yrs (10 yrs sporadic)

### Genotype-Phenotype Relationships

*Muir-Torre Syndrome*: sebaceous adenomas, sebaceous carcinomas, & keratoacanthomas associated w/ multiple visceral tumors. 25% develop polyps, 90% of which will become CA.

### Diagnosis

Original Amsterdam Criteria modified because it didn't:

- account for extracolonic malignancies
  - decrease in average family sizes
  - late onset variants of HNPCC
  - problems with incomplete data recovery
- HNPCC is a *clinical* diagnosis and genetic testing cannot prove a family does not have HNPCC.

### Genetic Testing

- gene sequencing of MSH2 and MLH1
- 90% of mutations in MSH2 and MLH1
- *InSiGHT*: databank of all known mutations of these genes
- MSH6: left sided cancers
- MSH2 & MLH1: higher risk of endometrial

### Surveillance

- Colonoscopy Q2yrs starting at age 21, then Q1yr at 40yrs of age
- Annual Transvaginal ultrasound of endometrium with endometrial aspiration starting b/n 25-35 yrs

### Treatment

- Colectomy with Ileorectal Anastomosis
  - then annual flex sig of rectum
  - 12% rectal CA at 12 yrs
- if patient very young or poor compliance with follow up then do TPC w/ IPAA
- if finished childbearing, strongly consider concurrent TAHBSO

### Prognosis

- survival rate better than sporadic
- chemotherapy in MSI patients equivocal if helps

### Modified Amsterdam Guidelines

- Two 1<sup>st</sup> degree relatives w/ colorectal CA involving 2 generations
- At least one before age 55 or a 3<sup>rd</sup> relative w/ endometrial or other extracolonic HNPCC tumor

## ILEOSTOMY COMPLICATIONS - ISCHEMIA

### Psychological Impact of Living with a Stoma

Improve over time:

- overall quality of life, return to prior activities, pain and fatigue

May not improve with time:

- self impression and body image

### Stoma Site Marking:

- pre-op marking for all elective stomas
- account for sitting, lying, standing, previous incisions, waist and belt lines, abdominal habitus, and hernias

### Stomal Types

End Stoma, Continent Stoma (Kock), Loop-End, Diverting/Loop

### To Divert or not to Divert:

Two studies cited:

1. Wong and Eu: not to divert, no difference in leak rate
2. Swedish trial: no difference in rate, but difference in outcomes

Conclusion:

- stoma does not mitigate risk of leak, but decreases the negative outcomes from a leak
- recommend to divert IPAA, w/in 5 cm from verge, XRT, shock, malnourished, steroids

### Ileal v. Transverse Loop?

- Willaims et al: all complications 2x as common with T-loop
- Edwards et al: increased rate hernia s/p takedown w/ T
- Conclusion: ileal loops preferred

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## COMPLICATIONS WITH OSTOMIES

### Skin Complications

Common causes: fungal/bacterial infections, irritation from effluent, folliculitis, contact dermatitis, pyoderma gangrenosum

Retraction: ~15% - technical error

Ischemia/Stenosis: arterial insuff/venous engorgement

- identify the proximal extent of necrosis
- test-tube test
- must re-explore if necrosis below fascia
- risk of stoma stenosis 2-9%

Parastomal Hernias: 5-10%

- most non-op mgmt, 30% will require operation
- Options; relocation, primary fascial repair, mesh
- Rubin et al: 60-70% recurrence

Prolapse:

Causes: large fascial opening, redundancy, not through rectus, increased abdominal pressure

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## SPECIAL CONSIDERATIONS

### Morbidly Obese Patients:

- make liberal trephine to support mesentery
- conservative mesenteric mobilization, will elongate overtime and can refashion
- consider loop ostomy or end-loop
- Consider options for modified Abdominoplasty:
  - a. *Medical Approach:*
  - b. *Transverse Approach*
  - c. *Mercedes Technique:* for revision

### INCIDENCE:

Complications:

- loop ileostomy with most complications (75%)

- Descending end colostomy next most common (65%)

- Obesity associated with stoma necrosis

Risk Factors for complications:

- IBD, Obesity, Emergency Surgery, Diabetes
- Preop visit with ET nurse: Decreased morbidity rate

SKIN PROBLEMS:

Skin Irritation: more with ileostomy due to liquid, high alkaline, active enzymatic effluent

- upper abdominal stomas has less skin problems

After immediate post-operative period – edema and abdominal distention decrease, needing downsizing of appliance

Too frequent of changing can irritate the skin

Too infrequent of changing: erosion of protective barrier

*Fungal Overgrowth:* bright red rash around the stoma with associated satellite lesions. Rx: antifungal dusting powder

*Allergic Reaction:* dermatitis conforms precisely to the outline of the stoma appliance

Crohn's disease: no correlation with remote portion of the bowel and occurrence of pyoderma around the stoma

### High-output Stoma:

Most often with ileostomy

- 5-20% of ileostomies in early post-op period

Ileostomy function by 3<sup>rd</sup> to 4<sup>th</sup> day, usually peaks on 4<sup>th</sup>

- rehydrate with sports drinks
- ileal resection removes "Ileal brake" – slows gastric emptying and small bowel transit

### Nephrolithiasis:

- loss of sodium, water and bicarb → decreased urinary pH
- 4% gen pop incidences, 8% in ileostomy subgroup
- 60% will be uric acid (10% in gen pop)
- also increased rate of calcium oxalate stones
- avoid foods high in oxalate (eg spinach)

### Bowel Obstruction

- 23% rate in ostomy patients
- red rubber irrigation of ostomy may clear food content bolus

### Ischemia

- can evaluate with glass test tube or endoscope
- if viable at fascial level, then observe
- if not viable at fascia – emergency reop

### Late Hemorrhage

- heavy bleeding (MC ileostomy) by portal HTN and stoma varicies development.
- ostomy revision does not prevent recurrence
- Treatment of portal HTN is key
- no standard algorithm as of yet

### Stoma Closure:

- two randomized trials comparing stapled vs. handsewn
- risk of post op obstruction significantly high in the handsewn group
- LOS equal between both
- time to return of first flatus sooner with stapled
- stapled lower risk of infection

### Parastomal Hernia:

1. Site of stoma related to rectus: 6 studies found that no difference if through or lateral to rectus M.
2. Size of Abdominal Aperature:
3. Mesh Sublay: Have been found to preven hernation, however increased risk of stomal stenosis, erosion and infection with the mesh
4. Trans- vs. Estra-peritoneal tunneling:
5. fixation of stoma to abdominal fascia:
6. Repair of stoma: can resite, fix fascia to ostomy or apply mesh. Mesh higher infection, fixation high rate of recurrence.

## IPAA COMPLICATIONS

### INDICATIONS FOR SURGERY

- Acute Flare refractory to medical therapy
- life-threatening complications
- medical intractability
- risk of malignancy: increase 1-2% after 8-10 yrs
  - 20% risk at 20 years
- disabling extracolonic disease
- growth retardation in children
  - rapid growth spurt often after surgery

### Emergency Versus Elective Procedures

#### *Elective Options:*

1. TPC and Brooke Ileostomy: optimal surgical approach
2. TPC and continent ileostomy:
3. TAC and IRA: 25% will require proctectomy eventually
4. TPC and IPAA: standard practice now

#### *Emergent Options:*

1. TAC with Brooke Ileostomy
2. Turnbull blow-hole – historical option
3. Proctectomy – not advised in emergency situation

#### *Technical Aspects of subtotal colectomy:*

1. mesenteric dissection at ICV should be flush with colon – preserves ileal branches of ileocolic vasc.
2. avoid mobilizing rectum in pelvis - go to promontory

### BROOKE ILEOSTOMY

#### If does not reach:

1. may select more proximal portion of ileum
2. loop-end ileostomy may be better

#### Current indications:

- elderly patients
- distal rectal CA
- severely compromised anal function
- patient choice after proper education

### CONTINENT ILEOSTOMY

- contraindicated in Crohn's Disease
- consider in patients that have failed Brooke
- relative contraindications: obesity, > 40 y.o.
- only for highly motivated, stable patients

#### Operative Technique

- run bowel to ensure no e/o CD
- terminal 45-60 cm of ileum
- aperistaltic reservoir via S-pouch
- 2 15-cm limbs of ileum sutured to form pouch
- distal mesentery taken of 15 cm distal limb
- intussusceptions secured with sutures and staples
- sutured flush with skin, can be lower than ostomy
- tube placed in early post op period, occluded for longer periods up to 10 hours when can be removed
- pouch intubated three times a day

#### Post op Complications

- nipple valve slippage (30% - MC), pouchitis (25%), obstruction (5%), fistula (10%)

#### Variant procedures: Barnett modification & T-Pouch

- no studies to prove they work better

### ILEORECTAL ANASTOMOSIS

Indications: indeterminate colitis, High-risk, elder patients, mild rectal disease

Contraindications: disease rectum, dysplasia, perianal disease, compromised anal sphincter

#### Post op Course:

- 2-4 BM's per day (vs 6-8 for IPAA)

#### - IRA in UC:

- Risk rectal CA: 6% - most between 15-20 yrs post
  - will need Q6 months flex sig w/ biopsies to survey
- recurrent inflammation in 20-45%
  - 25% will require proctectomy

### ILEAL POUCH-ANAL ANASTOMOSIS

- must have good sphincter function
- topical 5-ASA/Steroid enemas may help mucosectomy

#### Operative Technique - Technical Points:

- explore to rule out CD
- evidence to avoid ementectomy
- staple ileum flush with cecum
- preserve ileocolic artery and vein
- pouch limbs 15-25 cm each – decision based on reach
- if mucosectomy – 4 cm rectal cuff above dentate
- If pouch needs more length:
  - superficial incision on anterior and posterior aspects of small bowel mesentery along SMA
  - mobilize small bowel mesentery up to and anterior to the duodenum
  - selective division of mesenteric vessels to the apex of the pouch
  - S-Pouch: provides extra length, but ↑ morbidity
- Post op:
  - check pouch for leaks, fistulas, sinus tracts, strictures
  - check anal sphincter tone
  - kegel exercises to increase tone prior to reversal
  - contrast and endoscopy
  - close ostomy at 6-8 weeks post

#### Post op Complications:

- SBO: 20%
- Pelvic Sepsis: 5%
- IPAA Stricture: 5-38%
- Anastomotic dehiscence: 10%
- Pouch Vaginal Fistula: 3-16%
- Pouchitis 25%:
- Infertility: 26%

#### Pouchitis:

Sx: abdominal pain, fever, sudden increase in stool frequency;  
Chronic Pouchitis: suspect CD  
Rx: Cipro and Flagyl

### CONTROVERSIES

- 10% indeterminate colitis – work up & counsel
  - Age should not be sole contraindication – elderly with LARs do well, so IPAA should be considered as well
  - If stage IV CA avoid IPAA to not delay chemo-XRT
  - Cecal CA in UC may prevent pouch due to oncologic Rsnx
- 23-45% of patients w/ UC will need surgery

#### Acute Colitis:

In setting of acute colitis, rule out infectious source:

- C. Diff, Bacteria, Ova
- Flex sig/COY w/ bx to test for CMV
  - CMV treated with foscarnet or ganciclovir
- if hemorrhage, can be UC (10%), but consider CD
- 5-7 days of IV steroids, & then cyclosporine/Infliximab
- if refractory or no improvement over 48-72 hours – TAC

#### Toxic Colitis:

- Standard: TAC w/ End Ileostomy
- mucous fistula vs. Harmann's
- avoid pelvic dissection, transect at sacral promontory

#### Screening for Cancer:

**Risk:**

- 10 years: 2%
- 20 years: 8%
- 30 year: 18%

Surveillance: annual, 33 biopsies minimum (90% sensitivity), four quadrant every 10 cm

Proctocolectomy: carcinoma, nonadenoma-like dysplasia associated lesion or mass (DALM), high grade dysplasia

Dysplasia risk to CA:

- High grade: 42%
- Low Grade: 19%

Strictures: ~25% malignant

- chronic, obstructing & right sided MC malignant

TAC w/ End Ostomy

- 26% v. 52% rate of complication compared to IPAA

Kock Pouch:

- 16.6% pouch failure rate
- 30% nipple valve slippage
- 25% rate of pouchitis

Restorative TPC w/ IPAA:

*More difficult to reach in:*

1. male patient, narrow pelvis
2. long anal canal
3. obese patients
4. mucosectomy with handsewn anastomosis

*Difficult to reach – options:*

1. if obese, do TAC w/ EI and complete s/p weight loss
2. S-Pouch: 2 cm extra length (efferent limb problems)

*Technical Maneuvers to gain length:*

1. mobilization of posterior small bowel mesentery
2. expose inferior portion of the head of pancreas
3. score mesentery serially on posterior and anterior
4. Ligation of vessels b/n primary & secondary arcades
5. ligation of terminal branches of SMA (clamp for 10-15 minutes to determine if essential or not first)
6. if still inadequate, leave pouch in-situ in pelvis and return after several weeks

*Functional Outcomes of TPC w/ IPAA:*

- Fecal Incontinence: Mild 17%, Severe 3.7%
- Urge Incontinence: 7.3%
  - incontinence worsens over time (>12 years)
- Sexual Dysfunction: 26%
- SBO: 15-44%

*Pouch hemorrhage:* 3.8% - local irrigation w/ saline and adrenaline or transanal suture ligation

*Pelvic Sepsis:* 9.8%

*Anastomotic leak:* 7.1% from the pouch

- leak from tip of J MC and most difficult to treat, most need operative intervention

*Stricture:* 10%, more common w/ hand sewn – want at least DIP of index finger to be able to pass

- soft strictures: dilate serially
- hard strictures need pouch advancement/new pouch

*Pouch Vaginal Fistula:* 3-16%

*Pouchitis:* nonspecific inflammation of pouch mucosa

- overgrowth of anaerobic bacteria suspected
- Sx: abdominal cramps, tenderness, fever, increase stool, sometimes blood/mucus
- Dx: clinical or by scope
- Rx: Flagyl or Cipro
  - probiotics for chronic refractory types

- consider CD if does not improve

*Dysplasia/Malignancy:*

- rare – ASCRS does not currently recommend routine screening of pouches

*Pouch Failure:*

- occurs within 12 months for 5-15%

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CONTROVERSIES

Pouch Design:

*S-Pouch:* efferent limb – overtime may elongate and cause obstruction

*H-Pouch:* long outlet tract associated w/ stasis, pouch distention, and pouchitis

Mucosectomy vs. Double Stapled Techniques:

Stapled patients improved nocturnal continence and higher resting & squeeze pressures

Stapled leaves 1-2 cm diseased rectal mucosa – some recommend scoping to survey every 2 years

Absolutely Must know:

Multiple Fistulas:

- Mgmt:
  - what do you do w/ Fistulas?

Pouch Won't Reach:

- Options

## POLYPECTOMY

### 36 POLYPS

Polyp: macroscopically visible lesion or mass projecting from an epithelial surface

4 Principle types of polyps: adenoma, serrate, hamartomas, inflammatory

### ADENOMA

- a benign neoplasm of epithelium
- dysplastic and pre-malignant

### Clinical Presentation

- most clinically silent, found during screening
- if large, may cause bleeding
- colonoscopy most accurate test for adenoma
  - BE FN rate to 52%, FP rate 14%
- CT colonoscopy 90% sensitive if >1 cm

### Pathology

- rate of synchronous if one adenoma found: 31 – 40%

3 *histologic subtypes: All 3 treated in same fashion*

1. Tubular: >80% tubules dysplastic
2. Villous: >80% of villous fronds
3. Tubulovillous: 20-80% of each

Adenoma vs. Hyperplastic Polyp:

- Adenoma w/ more cellular atypia, less differentiation
- Adenoma w/ more mitoses, not restricted to only lower half of tubule

Dominant risk factor for invasive CA: polyp size and villous histology

*Pseudoinvasion*: dysplastic epithelium becomes misplaced within the submucosa of a polyp & mimics invasive CA

- retains lamina propria, lacks other morphologic malignant features, presence of hemosiderin (sign of ischemia – thought to be cause)

Differing levels of dysplasia:

- *Mild*: tubules lined from top to bottom by epithelium similar to normal; nuclei enlarged, hyperchromatic; architecture normal
- *Moderate*: cellular polarity less preserved; nuclear stratification; glands more crowded
- *Severe*: large vesicular nuclei; irregular nucleoli; scalloped nuclear membranes; increased nuclear to cytoplasmic ratios; nuclear polarity disrupted; structural abnormalities

### Epidemiology

- Age 50: 24-50% rate of adenoma, increases with age
- family history increases risk of adenoma, M > F

Miss rates: >1 cm 5%; 6-9mm: 10%; <6 mm 30%

### Adenoma-carcinoma Sequence

Lifetime risk of colorectal CA 6% by age 85

2-3 yrs for <5 mm adenoma to become 1 cm

2-5 yrs for 1 cm adenoma to become CA

> 1 cm lesion – 3%, 8%, 24% risk CA at 5,10,20 yrs

- all based off of model projections

Risk of CA conversion by type and size – (yearly)

- > 1 cm: 3%
- Villous: 17%
- high-grade dysplasia: 37%
- no invasive CA found in polyps <6 mm

Molecular sequence: mutated genes

1. tumor suppressor APC gene deactivated chromosome 5q
2. also mutations in K-ras oncogene (APC + kras → adenoma)
3. DCC: regulates apoptosis via adhesion molecule
4. p53: regulates cell cycle to repair DNA (in 75% of CAs)

Risk Factors for advanced features: Villous, Left Side, >60 y.o.

### Management

- If see a polyp, important to see all the way to cecum
- majority, snare polypectomy
- colonoscopy reduces risk of cancer 76 – 90%
- if polyp too large for safe polypectomy – do oncologic Rsnx

### Rectal Adenomas

Consider TEM for excision

- if too proximal, consider anterior resection
- if not cancer and too distal, may need mucosectomy and hand-sewn coloanal anastomosis

### Surveillance

After polypectomy of large (> 1 cm) or multiple adenoma – cancer risk increased 3-5 fold

- (1) 1 – 2 < 1 cm tubular adenoma: repeat 5 – 10 years
- (2) Advanced adenoma, Complete Rsnx of CA, or 3 – 10 adenomas: repeat in 3 years
- (3) > 10 polyps, or incomplete Rsnx: repeat < 3 years
- (4) if first follow up for above negative, second at 5 years
- (5) large sessile > 3cm, or piecemeal ones: 3-6 month for one year, and then at 6-12 months in second year, and then yearly up to year 5
- (6) Specific hereditary/inflammatory disorders different recs
- (7) Small distal hyperplastic polyps: 10 year follow up

### Adenoma Prevention

Research being done on COX-2 inhibitors for long term effect

### The Malignant Polyp

*Haggitt's Classification*: Levels:

- 0: non-invasive (severe dysplasia)
- 1: cancer through muscularis mucosa
- 2: CA into neck of pedunculated
- 3: CA into stalk of pedunculated
- 4: cancer into submucosa – all sessile w/ invasive CA are considered 4
- Level 4 pedunculated treated as if a sessile lesion

*Kudo Classification*: better stratify Level 4 sessile malignant polyps

- SM<sub>1</sub>: Invasion into upper 1/3 of submucosa
- SM<sub>2</sub>: Invasion into middle 1/3 of submucosa
- SM<sub>3</sub>: Invasion into lower 1/3 of submucosa
- Haggitts levels 1-3 are all SM<sub>1</sub>, Haggitts level 4 can be any 3
- SM<sub>3</sub> is independent risk factor for lymph node involvement

Risk of Cancer by Adenoma Size:

- < 1 cm: 1.3%
- 1 – 2 cm: 9.6%
- >2 cm: 46%
- > 3 cm: 76%

Risk of lymph node mets:

- Levels 1-3: 1%
- Level 4: 12-25%
- LVI, poor differentiation, microacinar structure, SM3 invasion into lower third of submucosa

### Clear Margin for polypectomy: 2 mm

- piecemeal resections should be treated as positive margins even if “complete”
- anything high risk, do full oncologic resection
- High Risk: SM<sub>3</sub>, Rsnx margin <2 mm, LVI, poorly diff'd

Transanal Excision: appropriate for lesions well/mod diff, < 3 cm in size, <30% circumference, mobile, nonfixed, w/in 8 cm from anal very, no LVI, no perineural invasion, no e/o N or M dz,

- do full thickness transanal excision
- Transanal w/ XRT is being done but for now NOT considered standard of care

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#### SPECIAL ADENOMAS

##### Flat and depressed adenomas - neoplastic

- Not elevated above the mucosa, not "true polyps" – best identified with chromoendoscopy w/ indigo carmine or other spray techs
- can be classified as flat or depressed (2.5 mm from surface)
  - greater tendency to grow laterally or into wall of colon
  - high rate of associated cancer, depressed even higher
    - 14% overall risk of CA w/ flat lesion
    - 29% of flat lesions > 1cm
  - if detected, all should be removed
  - different sequence of Cancer formation, higher level p53, lower level k-ras & APC, greater prevalence of MSI
    - more frequently *de novo* (bypassing adenoma sequence)
  - if can do endoscopically do full removal, otherwise operative Rsnx

##### Sessile Serrated Adenomas - neoplastic

- Has serrated crypts that are longer and broader than in hyperplastic polyps.
- Different than hyperplastic.
  - Endoscopically may resemble villous adenoma or hyperplastic polyp or combo of both
  - more common in proximal colon
  - seem to form in combo with hyperplastic polyp (but not clear)
  - same risks as regular adenoma, but different pathway
  - correlation with MLH1 and MSI cancers
    - most often female, older patients, proximal cancer
  - still not much conclusive data – so for now recommended to manage as per adenoma protocols

##### Rectal Adenomas

Approach and options depends on location:

- Lower Half: Transanal, TEM, Kraske, York-Mason
- Upper Half: anterior resection

ERUS only reliable BEFORE polypectomy, after post polypectomy inflammation makes unreliable

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#### NONNEOPLASTIC POLYPS

##### Hyperplastic Polyps:

- failure of programmed cell death. Normal maturation, but more; most 3-5 mm in size
  - epithelial cells mature normally, but accumulate on mucosal surface, leading to crowding
  - saw tooth appearance histologically w/o dysplasia
- endoscopic diagnosis: 80% sensitive, 71% specific
- Histo: Mature goblet cells (adenoma reduced goblets)
- metaplastic, non-neoplastic epithelial variant
- ratio of 1:1 in incidence of <6 mm lesions
- not associated with increased risk of CA adenomas
  - does not necessitate more frequent surveillance
- *starlike pit pattern* when stained w/ indigo carmine & Chromoendoscopy: sens & specificity: 93%, 95%
- Hyperplastic Polyposis:
  - >29 hyperplastic polyps or 5 > 1cm proximal ones or hyperplastic polyps w/ known FHx of hyperplastic polyposis
  - linked with MSI, so if have many (>30) than at risk for CA
  - studies show ~50% will have a CA somewhere
  - Mgmt: remove all polyps > 5mm and consider TAC w/ Ileorectal Anastomosis w/ annual surveillance for life

- consider chromoendoscopy on these patients

Hamartomas: round, pink, smooth; dilated mucus-filled cystic spaces; polypectomy is snare. Non familial forms should be less than 3

2 categories: neither premalignant

(1) *Juvenile Type:* round, smooth, pedunculated (usually)

(2) *Peutz Jegher Type:* grossly more red, lobulated, arborizing smooth muscle on histology

Malignant degeneration of hamartoma very rare – may just be coincidence – Take Home Message: NOT premalignant at all

Inflammatory Polyps: associated with colitis (UC)

- a remnant or island of normal or minimally inflamed mucosa;
- not associated with CA
- treat underlying disease

Lymphoid Polyps:

- benign enlargements of lymphoid follicles
- usually multiple;
- Criteria to define:
  - lymphoid tissue w/in mucosa/submucosa
  - no invasion of fascia propria
  - at least 2 germinal centers identified
  - if can't see muscle coat & <2 germinal centers – can't call it lymphoid polyp

## PEDIATRIC ANORECTAL CONDITIONS

### HIRSCHSPRUNG'S DISEASE

- fxnl colonic obstruction via absence of ganglion cells
  - deletion in long arm chromosome 10
  - absence of ganglion cells in:
    - (1) Auerbach's Plexus: b/n circular & longitudinal layer
    - (2) Henle's Plexus: in submucosa,
    - (3) Meissner's plexus: in superficial submucosa
- length variable, MC rectum and sigmoid
- *Enterocolitis*: from poorly understood immunologic mucosal defect
- Sx: usually w/in 48 of life – delayed meconium, distention, vomiting – DRE may cause explosive passage of stool and gas and ameliorate symptoms
  - if not treated promptly → sepsis, shock, perforation ...
  - *Encopresis*: overflow pseudo-incontinence – from being overly constipated
- Contrast Enema: Dilated colon to point of aganglionosis
  - may not be evident in early neonatal period
- Manometry: absent anorectal inhibitory reflex (not reliable in neonatal period, more for adolescent disease)
- Histopathologic diagnosis – gold standard – absence of ganglion cells and present of hypertrophic nerves in rectal biopsy. Specimen must include *mucosa and submucosa*.
  - can also determine the *activity of acetylcholinesterase*

### Medical Mgmt:

- until definitive surgery – colonic *irrigation* – to pass stool --- enemas is wrong answer, will not pass

### Surgical Mgmt:

- one or two stage method based on training & patient
- different methods described:
  - *Swenson*: normal bowel to rectum above dentate
  - *Duhamel*: divide colon at peritoneal reflection, normal colon anastomosed to posterior rectal wall (in order to reduce risk of injury to pelvic nerves)
  - *Soave*: normal colon through muscular cuff of rectum. Anorectal dissection was submucosal above dentate.
- recommended to go 4 cm above the transition zone
  - biopsies and frozen section to experienced pathologist
  - if no experienced pathologist in acute setting, do right sided colostomy or ileostomy to be safe

### Surgical Mgmt of Total Colonic Aganglionosis

- No good mgmt plan has been found
  - Author advocates: TAC w/ IRA
  - Others: TPC w/ IPAA, TPC w/ Duhamel, leave right colon as neorectum, ...
- poor quality of life with all options
  - patient develop secretory diarrheas – difficult to mgmt

### Surgical Mgmt of Ultrashort Disease

- controversial diagnosis, since aganglionosis is normal above dentate, just distance has not been defined
- posterior midline internal sphincterotomy up to 15 cm above the dentate line (start 1 cm proximal to it) – use a posterior sagittal approach (Kraske)

### Neuronal Intestinal Dysplasia

- diagnosis of exclusion – for patients that have failed operations for Hirschsprung's disease – essentially grab back of abnormalities
- pathologists don't agree on this diagnosis
- no treatment strategies

- bowel mgmt program to keep colon clean of stool and make them socially acceptable
- daily enema or colon irrigation
- trial an error, every mgmt plan different
- *Malone Procedure*: continent appendicostomy – appendix attached to umbilicus for antegrade enemas. Allows independence

### Relevant Aspects when these patient become adults:

- Group 1*: poor sacrum, flat perineum, poor muscles, no sensation, incontinent of urine and feces; unlikely you can help them. Do bowel mgmt program or permanent stoma.
- Group 2*: mislocated rectum – good sacrum and good muscles; do redo PSARP w/ Pena stimulator
- Group 3*: severe constipation w/ severely dilated mega rectosigmoid; Do sigmoid resection.
- Group 4*: patients w/ good muscles, rectum in right place, good sacrum. Benefit from biofeedback training.

### OTHER PEDIATRIC COLORECTAL DISORDERS

#### Idiopathic Constipation

- vicious cycle of colon enlarging, less functional
- chronic fecal impaction → encopresis
- unknown cause, laxative important for relief
- Surgery: rectosigmoid rxn (remove all dilated)
  - does not cure, but improves

#### Rectal Prolapse:

- due to myelomeningocele, spina bifida, ...
- altemeir's or rectopexy +/- sigmoid rxn

#### Perianal Fistula:

- fistula common but different condition than seen in adults
- almost all spontaneously heal by a year
- Rx of abscess – most drain spontaneously, if not simple I&D, antibiotics not necessary
- may recur, but eventually, almost all heal
- THM: do NOT do fistulotomy in kids

#### Juvenile Polyps:

- at ~ 4yrs benign polyps in rectum and colon
- self amputate and disappear
- most in posterior rectal wall, long pedicle
- Sx: blood surrounding stool in toiled
- biopsy one to ensure benign

#### Anal Fissure

- consequence of constipation
- laxatives to make soft stools pass until fissure heals, or else child holds in stool, making it harder and makes vicious cycle
- 2% NTG (glyceryl trinitrate) ointment efficacious in kids

### ANORECTAL MALFORMATIONS

- *Cloacal Malformation*: rectum, vagina, urethra fused
- associated urologic malformations in most (>50%)
  - Unilateral Renal Agenesis MC malformation
  - Vesicoureteral Reflex 2<sup>nd</sup> most common
  - sacral and spinal abnormalities are common – worse sacral & spine correlate with poor fxnl outcomes
- *Tethered Cord*: in 25% - cord is abnormally tethered to spine – predicts poor outcome – poor sphincter fxn
- *Currarino Triad*: anorectal malform, hemisacrum & pre-sacral mass – have very poor fxnl prognosis
  - MC masses: teratoma, dermoid, lipoma, meningocele, or combo of them
- *Esophageal Atresia*: in 8% - usually very high defect
- *Cardiovascular Anomaly*: in 30% - PDA, ASD, VSD, TF

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## MEDICAL MGMT OF FECAL INCONTINENCE

- The higher the malformation, the worse the functional prognosis will be
- higher: more have FI, less constipation, flat perineum
- Lower: more likely constipated, less FI

#### DESCRIPTION OF SPECIFIC ANORECTAL DEFECTS:

Perineal Fistula: simplest; rectum opens into anterior perineum; most have normal sacrum, <10% associated defect; fxnl prognosis good. Move orifice back to center of sphincter

Rectourethral Fistula (males): rectum → urethra; Bulbar (low) vs. Prostatic (High)

- Bulbar: most good fxn, 30% associated anomaly
- Prostatic: poor fxn, 60% associated anomaly
  - bifid scrotum more likely
- most will be diverted shortly after birth, repair 1 mo

Vestibular Fistula (Females):

- MC in defect in females; 30% associated anomaly
- rectum → vestibule just outside hymen
- good fxn in most postop, sacrum usually normal
- PSARP

Rectobladder Neck Fistula:

- highest defect; 90% associated anomaly; flat perineum
- laparotomy and PSARP
- only 15% achieve bowel function

Imperforate Anus Without Fistula:

- 50% have Down's, 90% of Down's that have anorectal problem have this
- have good sphincters and sacrum – good fxn p repair

Rectal Atresia

- failure for canalization – sphincter and sacrum fully normal
- 100% of babies regain normal fxn post op

Cloaca (Female)

- rectum, vagina and urinary tract fused
- open in normal place of urethra
- length of channel related to prognosis – *longer: worse*
  - 3 cm is critical length
  - <3 cm – can repair via posterior sagittal approach
  - >3 cm – difficult, needs abdominal approach, need GU specialist, 90% w/ associated anomaly
- *Hydrocolpos*: in 40% - dilated, fluid filled vagina
- *Vaginal & Uterine Septations*: 40% - impacts menstrual flow, fertility

Rectovaginal Fistula: extremely rare – usually vestibular – fix with PSARP

#### INITIAL MANAGEMENT – ANORECTAL MALFORMATIONS:

- Most imaging should be done at 24-36 hours to allow rectum to descend and see if meconium passes
  - While waiting 24 hours – ensure safe to wait
- Get Echo, Spinal Images, PXR, Ultrasound of abdomen (kidneys), NPO, NGT
- If can't do repair, do diverting colostomy
- in females, if cloaca you MUST rule out hydrocolpos – it can cause renal obstruction. If so, drain it.

Colostomy:

- should be totally diverting – not loop
- double barrel left colon
- mucous fistula should have enough length to allow for pull through when definitive surgery performed so stoma not in the way

- Hydrocolpos can be drained transabdominally via vaginotomy to abdominal wall if big enough or drain
- *high pressure distal colostogram*: 2 weeks post ostomy
  - most important to figure out anatomy

#### MAIN REPAIR

Perineal Fistulas:

- relocate the anus back in b/n sphincters
- Must have foley – DO NOT injure urethra
- *Cutback*: posterior cut of fistula to make wider and allow drainage
- Emergency: can simply dilate to allow stool to pass

Rectourethral Fistulas:

- posterior sagittal anorectoplasty
  - posterior sagittal incision midline to base of scrotum
  - leave sphincter equal amount on both sides
  - posterior rectal wall identified and dissected circumferentially
  - sutures placed in rectum to assist with traction
  - dissect 1 cm proximal to allow mobilization

Rectobladder Neck Fistula:

- Laparotomy in addition to PSARP

Vestibular Fistula

- key technical challenge is separation from vagina – usually have one fused wall that must be evenly divided into two

Cloaca < 3 cm:

- PSARP + Total Urogenital Mobilization

Cloaca > 3cm: refer to specialized center – will need combined approach with specialized urologist

## PELVIC FLOOR DISORDERS

### RECTOCELE

Abnormal rectovaginal anatomy allows rectum direct contact to vaginal serosa

- Almost exclusive to women, mostly vaginally parous

Normal anatomy: distal- most posterior vaginal wall 3 cm from the hymen. In rectocele this is decreased/lost

Physical exam may give different measurements

- prone will show most
- standing straining technique makes most pronounced

Gyn surgeons: focus on fixing vaginal apex – secondarily fixes rectocele

Isolated rectoceles rare – usually associated pathology

Sx: stool trapping, difficulty stooling, vaginal protrusion from posterior wall, should be painless

- if with pain, entertain other diagnosis
- if no major life issues, fix stool quality & biofeedback

Surgery benefits some symptoms, not all

- will fix abnormal anatomy, less successful at having to use hand to help

Preop testing before surgery:

- Colonoscopy
- Pudendal nerve testing has NO role
- Defecography to eval PRM

Rx: Transanal vs. Transvaginal approach

- (1) Transanal: Delorme (50% recurrence), STAPL, STARR
- (2) Transvaginal: reapproximate, xenograft, rectovaginal

- symptom complex manifest by chronic pelvic/perineal pain in distribution of one or both pudendal nerves

Px: compression or entrapment of the pudendal nerve, positional in nature; usually in setting of prior trauma or cyclist or rowers

- sites of entrapment:

1. b/n sacrotuberous and sacrospinous ligaments
2. in pudendal canal (Alcock's Canal)

- may be due to hypertrophy of muscles during sports

Dx: reproduction of the pain with pressure on ischial spine; not very sensitive test

- PNLT: often delayed

- can perform nerve block to eval if nerve lysis would work – if nerve block works, consider neurolysis

Path of the pudendal Nerve:

- Arises from S2,3,4 – leaves pelvis beneath the piriformis muscle via greater sciatic foramen – then passes to sacrospinous ligament medial to the ischial spine and re-enters pelvic cavity

- runs ventrally to Alcock's Canal

- gives off 2 branches: inferior rectal & perineal

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## PELVIC PAIN SYNDROMES

### Levator Syndrome

Pain/pressure/discomfort in region of the rectum, sacrum & coccyx that may be associated with pain in the gluteal region & thighs

Diagnosis of exclusion

Rx:

- Digital Massage: daily 5-6d or once a week for 2-3 wks
- combine w/ heat and diazepam
- 68% reported improvement
- Transanal Injxn Triaimecinolone: 37% success
- Biofeedback: 37% success
- treat anxiety and depression

### Coccygodynia

distinct pain evoked w/ pressure or manipulation of coccyx

- associated with sacral tumors, trauma, avascular necrosis or lumbar disc referred pain

*Steroid Injection*: methylprednisone w/ manipulation under EUA

If fails, then coccygectomy

### Proctalgia Fugax

- fleeting pain in the area of the rectum lasting for a few minutes
- assumed from spasm of the rectum or pelvic floor
- once per year to 6 times per year

Rx: reassure patient not a serious disorder, can treat like a fissure (eg nifedipine)

### Pudendal Neuralgia

## PILONIDAL DISEASE

SubQ infxn in upper ½ of gluteal cleft

M:F = 3.5:1

- During WWII: 79,000 soldiers, avg stay in hospital: 55d
  - Risks: FamHx, Obesity, sitting, hair dresser, sheep shearers
- Develops as recurring abscess and drainage – chronic before many seek help

### **Pathogenesis**

- Acquired condition
- No published experiments exist that directly prove or refute the current theories of how the disease occurs

### **Initial Presentation: Pilonidal Abscess**

*Acute Pilonidal Abscess*: an acute abscess, needs I&D

- place incision parallel to midline, 1 cm lateral

*Chronic Abscess*: an established pilonidal sinus cavity; chronically drains; fails to heal due to retained hair/foreign body

*Recurrent Abscess*: recurs after apparent complete healing previously

Treatment: I&D w/ incision parallel to the midline and at least 1 cm lateral to it (facilitates healing)

- not advised to excise during active inflammation
- antibiotics only if significant cellulitis
- any hair within 2 inches should be shaved

### **Initial Presentation: Draining Chronic Abscess**

Shaving/Laser Hair Removal:

- one study by Armstrong et al, however flawed
- showed shaving works
- 23% recurrence w/ laser hair removal
- current recs: shaving until complete healing

Midline Excision:

- remove only diseased tissue
- does not have to go to presacral fascia
- Kronborg et al: closure vs. open similar final outcomes, but closure groups healed in 15 days (vs 64 for open)
- antibiotic ointment to wound had no effect
- Primary closure: higher rate of wound complications

Unroofing and Secondary Healing:

- decreases healing time from excision and leave open technique
- recurrence rate less than 13% reported

Bascom I: curettage and Pit excision:

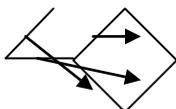
- Generous vertical incision off midline (> 1cm)
- curette out without excising chronic fibrous wall
- undermine skin to chronic draining tracts/pits
- diamond excision of pits
- flap of skin sutured down
- shaving until healed
- No trial comparing this vs. other technique

Bascom II (Cleft Lift):

- detaches the skin of the gluteal cleft from the underlying subQ tissue as a flap
- has not been duplicated to eval results

Rhomboid (Limberg) Flap:

- works well for flap coverage of chronic wounds in the gluteal cleft that have failed to heal over a prolonged time.



Karydakis Flap:

- goal: remove tissue, and place wound out of midline
- Off center (> 1 cm) elliptical incision, drain placed
  - studied 7,471 patients
  - 1% recurrence rates
  - 8.5% rate of infection
- Study in Turkey w/ 200 patients comparing it vs. midline – found to be superior
- Text recommends it as a good strategy for treatment

V-Y Plasty:

- Schoeller et al: 24 pts with advancement flaps
  - report no recurrences
  - 2 wound dehiscences

Z Plasty: another option

Myocutaneous Flaps: for most severe cases

Skin Grafting: no study published since 1983

- Guyuron ('83): 1.7% recurrence, 3.4% graft failure

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## HIDRADENITIS SUPPURATIVA

**Incidence:**

- AA > Caucasians
- M>F in perianal region
- Almost all after puberty and before age 40
- Smoking

**Microbiology:**

Staph epi (MC), E. Coli, Klebsiella, Proteus, Alpha Strep, anaerobes, diphtheroids.

**Pathogenesis:**

involves apocrine sweat glands in perineum, axilla, groin  
Obstruction of apocrine glands with keratin → sweat gland destruction consequential (secondary)

**Differential:**

- Does not affect rectum (apocrine glands only in lower third of anal canal)
  - should not see sinus/fistula tracks to or from rectum
  - should not penetrate the sphincter
- Possible to have concomitant disease
- 50% increased cancer risk – can develop SCC

**Treatment: Initial:**

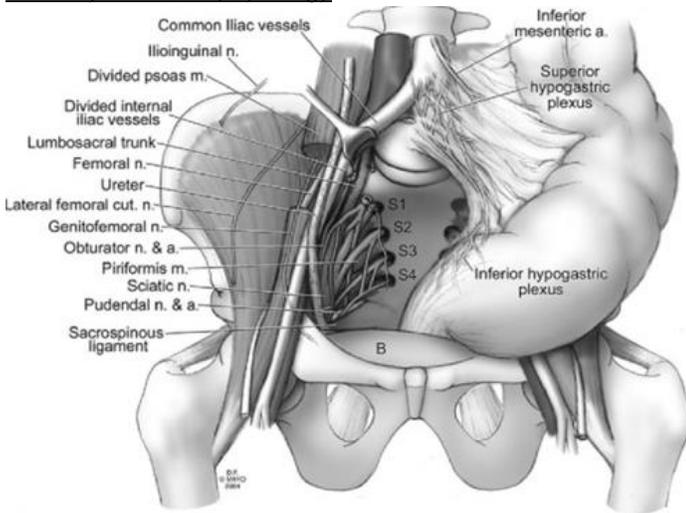
- I&D if abscess
- Cellulitis w/o abscess: abx; topical clinda & systemic tetracycline; no evidence to support prophylactic abx

**Treatment: Chronic:**

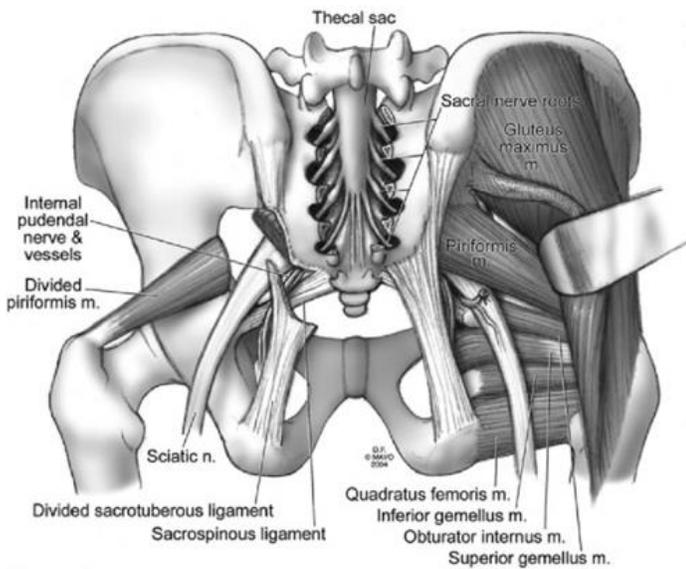
- unless the skin is excised, at risk for recurrence
- excision w/ healing by secondary intention most widely used treatment
- can be staged excision if widespread disease
- if near anal canal, stage it to prevent stricture

## PREsACRAL TUMORS

### Anatomy and Neurophysiology



A



Nerves:

- If upper three sacral nerve roots left intact on either side – anorectal function preserved
- if both S-3 roots taken: EAS will not contract → FI

Sacrum:

- majority can be resected – if >50% of S1 remains, pelvic stability will be maintained
- but if preop radiation, S1 alone will get stress fx

Classifications: Congenital, Neurogenic, Osseous, Misc, Liposarcomas – all into benign vs/ malignant

### GROSS AND HISTOLOGIC APPEARANCE

Epidermoid Cyst: results from closure defect of the ectodermal tube. Stratified squamous cells, no skin appendages, typically benign.

Dermoid Cysts: arise from ectoderm, have skin appendages. Benign. May communicate with skin as a skin dimple.

Enterogenous Cyst: originate from sequestration from developing hindgut. Endodermal – so can be lined w/ squamous, cuboidal or columnar. Multilobular w/ one dominant lesion and small satellite ones. Most benign.

Tailgut Cysts: cystic hamartomas, multilocular cysts. *Glandular vs. transitional* epithelium. Most Benign.

Teratomas: include all three germ layers; Benign but can become SCCs or Rhabdomyosarcomas. Associated *vertebral, GU or anorectal* abnormalities. MC female pediatrics. Malignant transformation MC in adults.

Sacroccocygeal Chordoma: MC malignancy in presacral space – originate from *primitive notochord*; Men >30yo may invade, distend or destroy surrounding tissue

Anterior Sacral meningoceles: result from defect in thecal sac & may be with a presacral cyst or lipoma; *headache* worse with straining or coughing. Other associated anomalies (Spina bifida, vaginal duplication) – Rx: *ligation of Dural Defect*

Neurogenic Tumors: different ones, MC neurilemoma; grow slowly; need to determine if benign or malignant

Osseous Tumors: arise from bone, cartilage, marrow, fibrous tissues; rapid growth; *lungs* MC site of mets; all associated with *sacral destruction*;

Currarino Syndrome: combo presacral mass, anorectal malform & sacral anomalies; meningocele MC, teratoma 2<sup>nd</sup> MC

### HISTORY AND PE

- DRE: extrarectal mass displacing rectum anteriorly
- ill-defined symptoms, may see psych
- recurrent fistulas
- posanal dimple

### DIAGNOSTIC WORKUP

- CT & MRI – eval neurovascular and bony involvement

### PREOPERATIVE BIOPSY? YES – determines neo & margins

- Recommended for – solid & *heterogeneously* cystic
- never do transvaginal or tranrectal – will infect lesion
- transperineally or transacrally
- biopsy tract has to be removed with specimen
- NOT for purely cystic lesion

### NEOADJUVANT THERAPY:

- preop allows smaller area of radiation
- decreased tumor size, pretreatment of systemic dz
- decreased wound allows for sooner systemic therapy

### Multi-disciplinary Team: include all necessary specialists

### SURGICAL APPROACH:

Below S3 – transperineal alone may be enough, if above S3, will likely need combined approach

### Preop:

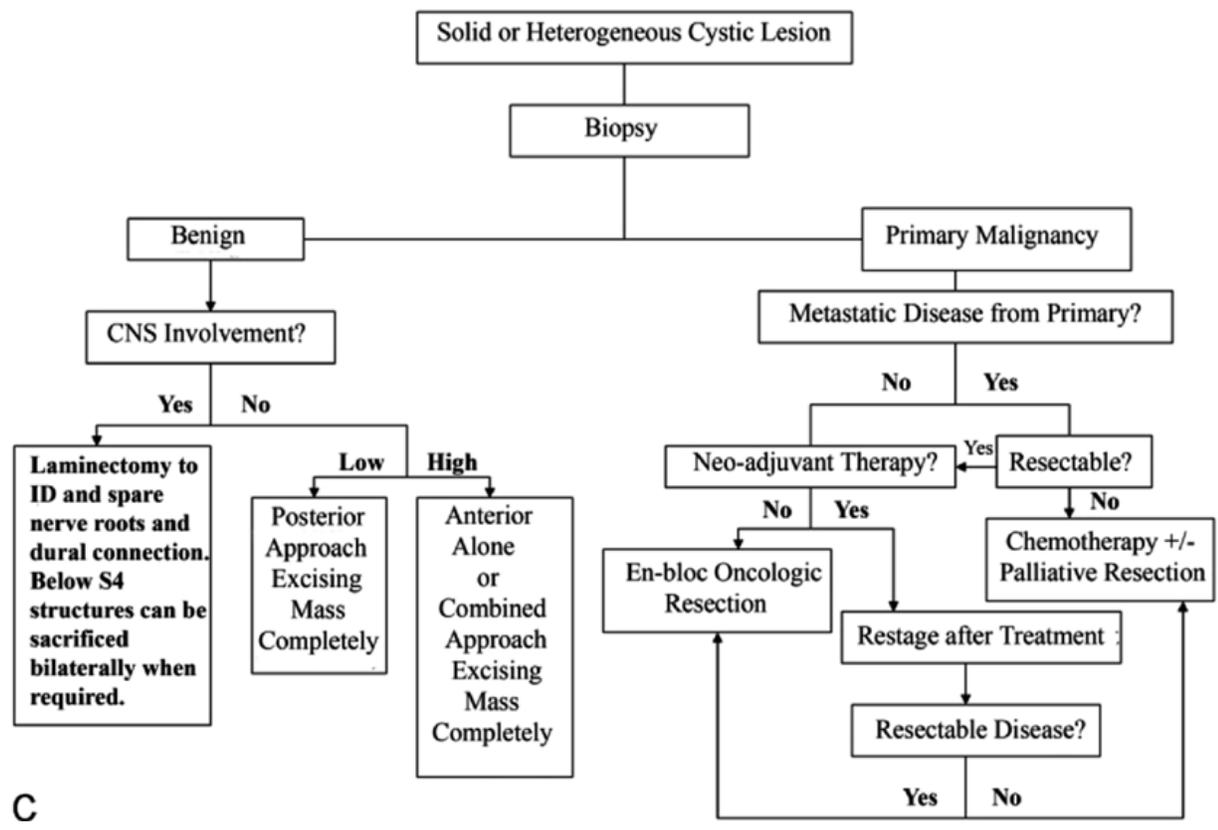
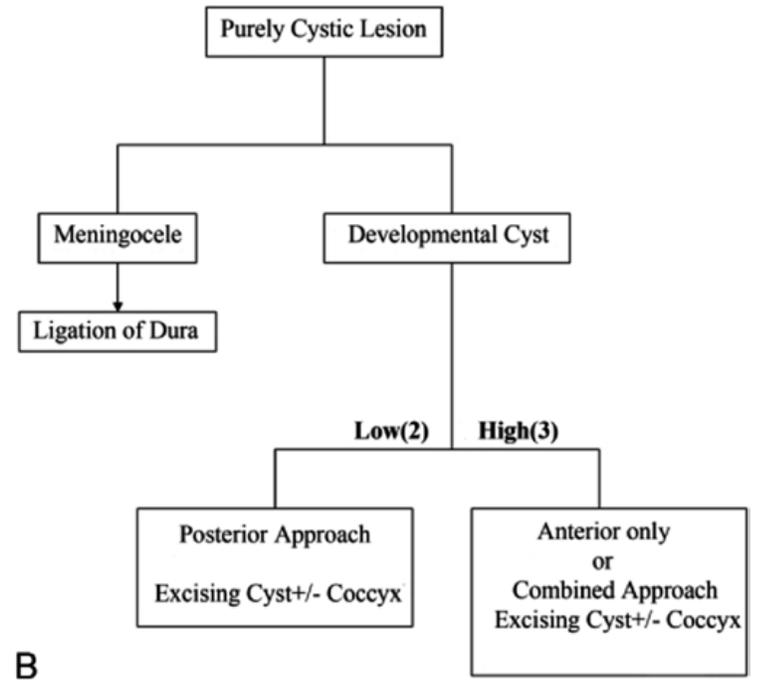
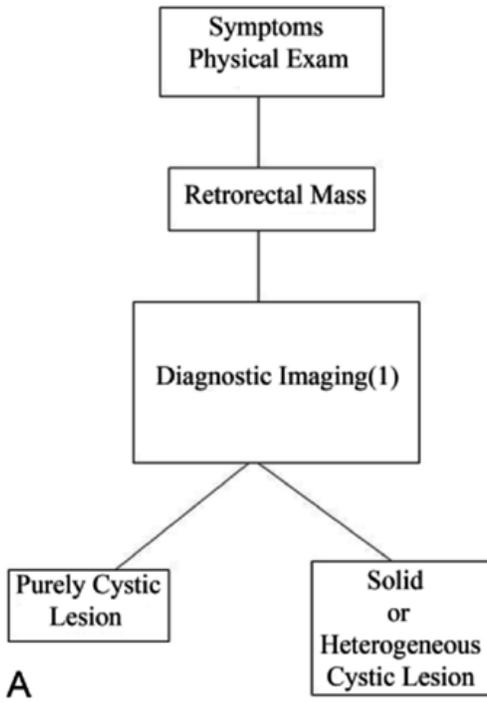
- consider temp IVC Filter if long op – high risk of DVT
- massive transfusion may be necessary

### Posterior Approach (Kraske):

- Prone Position
- incision over lower portion of sacrum (avoid EAS)
- lower sacrum or coccyx can be excised en-masse

### Combined Abdominal & Posterior Approach

- if extends above S3
- can ligate internal iliac A - try to preserve Ant. Division
- may need TRAM Flap



## PRURITIS ANI

DEFINITION:

Pruritis Ani: itchy anus

Primary: idiopathic pruritis ani

Secondary: identifiable cause or a specific diagnosis

Macules: flat spots

Papules: elevated circumscribed solid lesions, raised spots

Vesicles: separations of the epidermis & dermis filled w/ fluid

Bulla: larger vesicles/blisters > 1 cm

Ulcers: surface lesions w/ loss of continuity of the skin

Pustules: contain pus

Intertrigo: inflammation seen b/n 2 opposing skin surfaces (e.g. in obesity)

PHYSIOLOGIC CONSIDERATIONS:

Substances that produce itching: histamine, kallikrein, bradykinin, papain, trypsin

- topical anti-histamines only work for histamine
- so not always effective to stop itch

ETIOLOGY OF PRURITIS:

### Fecal Contamination

Study by Caplan on 27 men –

- fecal sample to arm skin vs control
- symptoms w/in 6 hours, relieved by washing skin
- suggests an irritant effect

Other findings (in other studies):

- coffee decreases anal resting pressure (leakage)
- anal inhibitory reflex more pronounced in many pruritis ani
- ~50% have poorly formed stool & multiple BMs

### Viral Infection

No evidence of viral etiology, lesions easy to distinguish:

Herpes: pain rather than itching, macules → vesicles

Molluscum Conagiosum: popular lesions 2-5 mm, central umbilication, clustered

### Fungal Infection:

Candida rare, but in those with immunocopromise, DM, ...

Dermatophytes: Trichophyton Rubrum

- again rare (<5%)

### Bacterial Infection – Erythrasma:

β-hemolytic strep, staph A, Corynebacterium minutissimum all implicated

C. Minutissimum probably in normal skin, but in moisture, diabetes and obesity may become infected with it

All patients with Erythrasma should have cure with erythromycin treatment

Psoriasis: in about 1 – 3% --

- treatment with fluocinolone acetonide 0.025% (Synalar)
- Biopsy rarely diagnostic
- check the rest of the body for similar lesions
- may need to add steroid agent as well for cure
  - Calcipotriene for 6 – 8 weeks

### Atopic Dermatitis – Eczema

- non-specific or diffuse erythema, usually w/ excoriation
- inherited disease, Fillagrin integral part of development
  - Have absent Fillagrin Gene (FLG) – absence cause permeable epidermal barrier, allow overgrowth
- look for the following signs:
  - (1) Keratosis Pilaris: rough texture over posterior biceps and/or thighs
  - (2) Morgan's Folds or Morgan-Dennie Lines – redundant creases beneath the eyes
  - (3) Sniffer (or Snuffer) Lines: subtle crease at mid nose
  - (4) Urticaria

(5) White Dermatographism

- Rx: providing barriers: Vaseline, aggressive moisturization techniques, antipruritic agents, inflammatory agents (topical steroids)

Lichen Sclerosis: chronic disease of unknown cause, almost always occurring in women

- white, atrophic, wrinkled lesions
- often involves the labia
- Biopsy is characteristic
- 300x higher risk of CA, so biopsy to rule out (4-5% risk)
- Rx: Clobetasol Propionate 0.05% (Temovate) for 6-8 weeks
  - alternative: Tacrolimus
- 4-5% risk of Squamous Cell CA formation → surveillance

Food: six common foods – coffee, tea, cola, beer, chocolate, ketchup. Total elimination will result in remission by two weeks. After 2-week period, foods can be re-introduced to thresholds that will cause symptoms.

Steroid Addiction: rebound phenomenon after withdrawal of steroids leading to their reinstatement and chronic use because symptoms always exacerbate after withdrawal.

- Potency and dosing should be tapered down

Contact Dermatitis: from trauma of wiping –

- Rx: Dilute white vinegar (15 ml in 8 ounces of water) and Burow's Solution (Domeboro) good for cleansing agents

### Anal Tattooing:

Few numbers, last resort treatment

- 10 ml 1% methylene blue + 5 mL NS + 7.5 mL 0.25% bupivacaine w/ epi (1/200,000) + 7.5 mL 0.5% lidocaine
- perianal skin up to the dentate line injected

TREATMENT OF PRURITIS ANI

1. Specific directed treatment for diagnosis
2. Eliminate offending agent
3. Eliminate Scratching
4. Control Symptoms
5. Hygienic Measures (Dove soap, detachable shower head, hair dryer)
6. Withdraw inappropriate steroids
7. Treat infection (silver sulfadiazine cream, clinda/gent topical, antifungal)
8. Protect skin (Zeasorb)
9. Correct any anal disease
10. Judicious use of appropriate steroids
11. Emphasize control of chronic condition
12. Reassess
13. Anal Tattooing in extreme cases

### Meds to consider:

1. Doxepin (anti-histamine, H1 and H2), orally 1,000x stronger than Benadryl
2. Cimetidine
3. Betamethasone: Diprolene 1,000x > Valisone Cream (Valisone Ointment inbetween the two)
4. Topical 1% hydrocortisone cream + Menthol 0.5% + Clinda/Gent/Bacitracin ointment +/- antifungal ointment

### In Setting of HIV:

-

## RECTAL CANCER

### Clinical Examination

Things to look for on Digital Exam:

- Location, morphology, number of quadrants involved, degree of fixation, mobility, extrarectal growths, direct continuity, separate

### Clinical Staging System:

- CS1: Freely mobile – likely submucosa penetration
- CS2: Mobile w/ Rectal wall – muscularis propria pen'd
- CS3: Tethered Mobility – Perirectal Fat
- CS4: Fixed – adjacent tissues

### CT Scan:

- unable to differentiate layers of rectal wall – can't do T stage
- unable to visualize lymph nodes < 1 cm
- unable to differentiate between inflamed vs. malignant nodes
- multidetector CT may improve the sensitivity of CT
- T-stage accuracy: 70%
- N-stage accuracy: 45%

### MRI:

- accuracy depends on technique
- fascia propria well visualized when done phased-array coil or endorectal coil
- "MRI with a surgace coil provides useful information in patients with locally advanced rectal cancer."

### Endorectal Ultrasound:

- learning curve, sensitivity improves with experience
- overstaging due to overreading of inflammation
- neoadjuvant therapy decreases EUS accuracy, so should be done prior to radiotherapy
- can't diff. between inflamed vs. malignant nodes
  - biopsy not recommended for now
  - ERUS findings of nodes suggesting malignancy:
    - hyperechoic
    - Round Shape
    - Peritumoral location
    - > 5 mm
- T-stage accuracy: 95%
- N-stage accuracy: 80-85%

### EUS vs. MRI:

- ERUS highest sensitivity & specificity for T stage
- MRI w/ endorectal coil: higher accuracy for N Stage

### Distant Mets:

- CT of Liver limited to 1 cm or greater lesions
- MRI liver more sensitive
- PET w/ CT/MRI improved sensitivity
  - indications now post resection or for rectal CA w/u

## LOCAL EXCISION OF RECTAL CANCER

### Colonoscopy:

- before all to detect synchronous lesions
- rate of synchronous polyps: 13-62%
- rate of synchronous CA: 2-8%

### TREATMENT ALGORITHM

- (1) T<sub>1</sub>N<sub>0</sub> Lesion (-) LV (-) poor diff: (+) Local (-) Adjuvant
- (2) T<sub>1</sub>N<sub>0</sub> Lesion (+) LV &or poor diff: (+) Local (+) Adjuvant
- (3) T<sub>2</sub>N<sub>0</sub> Lesion: (+) Local (+) Adjuvant
- (4) T<sub>3</sub>N<sub>0</sub> Lesion: local only if major comorbidities making radical not possible or patient refuses radical surgery
- (5) T<sub>x</sub>N<sub>1/2</sub>: any node positivity, must do radical

## Local Excision

- should be < 4 cm and <40% bowel circumference
- newer techniques make these criteria obsolete
- transanal if < 5cm from anal verge, or then TEM

### Transanal Excision(TAE):

- prone position,
- pudendal nerve block assists with visualization
- traction sutures 1-2 cm distal to tumor
  - if initially poor visualization, serial traction sutures ay help prolapsed it into view better
- line of dissection marked 1-2 cm border
- full thickness dissection – should see peri-rectal fat on base of lesion
- closure with 3-0 interrupted vicryls

### TransCoccygeal Excision (Kraske)

- mid-distal rectal lesions, usually posterior
- prone-jackknife position
- midline incision over sacrum to posterior border of EAS
- coccyx and sacral coccygeal joint removed
- levator ani next, incised midline
- palpation and 1 cm margins
- allows for removal of lymph nodes
- air test, and then close all layers (except bone)
- 5-20% rate of fecal fistula, most heal w/ diversion

### Transphincteric Excision (York-Mason)

- start like Kraske, but divide EAS and levators in midline posteriorly
- remain in midline to avoid nerve supply laterally
- higher risk of incontinence, so Kraske preferred

### TransAnal Endoscopic Microsurgery (TEM)

- scope 4 cm in diameter, 12-20 cm length
- allows for more proximal lesions
- low adoption rate due to expense and training

### Major Risk Factors for Local Recurrence

- depth of invasion
- positive surgical margins
- histologic grade
- Node positivity

### Rate of Nodal involvement by Depth - & Rx Recs:

- T1: 12% - Surgery Alone –
  - pos. margin/node pos → chemorads or radical R<sub>sx</sub>
- T2: 22% - Op + chemoradiation
  - pos. margin/node pos → radical R<sub>sx</sub>
- T3: 58%
- T4: 58%

### Post Operative Surveillance

- CEA Q3 mo x 2 yrs, & then Q6 mo x 3 yrs
- Flex sig at 3 and 9 months post op, and then yearly
- COY: at 1 year and then Q3 years
- CT at 1 yr, and then annually
- Author recommends 10 years of follow up (not 5)

### Outcomes after Local Excision

- (1) Morbidity, mortality & fxnl outcomes better
- (2) Local recurrence higher than radical
- (3) Salvage surgery possible in 30-50%
- (4) Disease free survival & overall survival similar for local and radical for T<sub>1</sub> & T<sub>2</sub> lesions

### Survival After Rectal Cancer Excision

- Stage I: 85-100%
- Stage II: 60-80%
- Stage III: 30-50%

- *Synchronous*: 3.5%

#### T4 Lesions – Exenterations

- 5 year survival >50% with extended resections, if margins are tumor free
- inflammatory ingrowth fair better than infiltration

#### TEM vs. TAE

- (1) Morbidity: TEM 0% vs. TAE 3.9%
- (2) Negative Margins: 98% vs. 84%
- (3) DFS @ yr5: 84% vs. 76%

#### Rate of Lymph Node Involvement by T Stage

On initial exam:

- T1: 5 – 10%
- T2: 10 – 20%
- T3: 30 – 50%

If after Neoadjuvant ChemoXRT:

- T0: 2%
- T1: 4%
- T2: 23%
- T3: 47%

#### SURGICAL TREATMENT OF RECTAL CANCER

##### Colonoscopy:

- before all to detect synchronous lesions
- rate of synchronous polyps: 13-62%
- rate of synchronous CA: 2-8%

##### Total Mesorectal Excision:

- rectal mesentery removed sharply under direct visualization
- emphasize: nerve preservation, hemostasis, and avoidance of violation of the mesorectal envelope
- reduces positive radial margins from 25% to 7%
- decreases the rate of local recurrence
- however has higher leak rate (up to 17%)
- decreased rate of impotence
- adjuvant therapy improves outcome of TME
- advised for stage II and III rectal CAs

##### *Points during dissection that nerves can be injured:*

- sympathetic plexus around aorta
- results in retrograde ejaculation
- lateral pelvic sidewall: both para- and symp- chains:
- results in impotence & bladder dysfunction
- anterolateral midrectum: hypogastric plexus & nervi erigentes

##### Distal and Radial Margins:

- radial margin sig. for local recurrence
- proximal margin of 5 cm
- distal margin of 2 cm

#### Techniques of Rectal Excision

##### **Abdominoperineal Resection**

Position: lithotomy, elevate coccyx off of bed

Incision: surgeon preference

Mobilization: mobilize sigmoid and left colon.

- often begin at the pelvic brim
- splenic flexure rarely needs to be mobilized

Resection and Ligation: divide bowel at descending & sigmoid junction.

- SHA (and if IMA) should be ligated flush

TME: after vessel ligation, dissect down towards the promontory.

- Anterior dissection should include the two layers of Denonvillier's Fascia

Perineal Dissection: sew anus closed. Elliptical incision around the anus. Start anteriorly at the perineal body, laterally to ischioanal spines, posteriorly tip of the coccyx.

#### **LAR w/ Sphincter Preservation**

- need at least 2 cm margins

#### **Coloanal Anastomosis**

- for rectal cancer not invading the sphincters but LAR not technically possible
- level of transection is "stripped"
- start at dentate line and do a tubular mobilization of the rectum from intersphincteric groove
- *Colonic J-Pouch*: Fold rectum 5-8 cm on itself
- *Coloplasty*: 4-6 cm from distal end, longitudinal incision of 5-8 cm and then closed transversely
- higher rate of leaks

#### **LOCALLY ADVANCED/RECURRENT RECTAL CA**

Locally advanced Dz: in 5-12%

- goal of surgery: wide en bloc Rxsx & involved organs

Local regional recurrence: in 7-33%

- 20% can be cured by curative resection
- Most important factor: stage of disease at presentation
- other factors: perforation, obstruction, T4, mucin production, LVI
- 90% of recurrences occur in the central or posterior pelvis
- 19% occur at the anastomosis

T4 Tumors:

- fixed on physical exam/invasion adjacent organs
- R2 resections – mean survival time less than a year

#### PREOPERATIVE EVALUATION & PATIENT SELECTION

If patient overall condition restrictive, may choose palliative surgery with chemoradiation (even if can do full resection)

- ASA IV or V not candidates for surgery

If patient is acceptable for surgery:

- all need scope to rule out synchronous lesion
- CT A/P w/ con: r/o extrapelvic spread, extent of disease and adjacent organ involvement
- Hepatic lesions: need ultrasound, and if suspicious bx
- CXR or Chest CT: lesions biopsied
- PET: higher sensitivity for recurrence than CT for colorectal CAs (90 v. 71%)

3 ways to differentiate postop changes from tumor:

1. change in the lesion (e.g. interval size increase)
2. invasion of adjacent organs
3. histologic evidence via endoscopy/CT/US

CEA rising but no evidence of disease:

- histologic proof should be sought
- exploratory pelvic surgery not recommended to eval

#### DETERMINING RESECTABILITY

Classification of Tumor Resectability:

- F0: not fixed to any pelvic organ or structure
- FR: fixed by resectable
- divided into anterior, posterior and lateral
- FNR: fixed and NOT resectable

#### Symptoms or findings suggestive on unresectable for cure:

Sciatic pain, Bilateral Ureteral Obstruction, Multiple points of tumor fixation in the pelvic sidewall, Circumferential

involvement of pelvic sidewall, S1/S2 bony or neural involvement, Extrapelvic disease

#### MULTIMODALITY RX - ADV/LOCALLY RECURRENT RECTAL CA

Radiotherapy: for local control

- alone does not offer significant chance of cure

Chemotherapy: for system disease

- Initial: Full course of EBRT (5040 cGy) w/ 5-FU chemo
- Recurrent: 2000 cGy EBRT w/ 5-FU before surgery
  - most synergy with IORT at 8 weeks
  - reimage at 4 weeks, if no progression can do surgery

#### SURGERY

FR lesions:

- Posterior: needs posterior sacrectomy (Not for S1&S2)
  - One S3 root usually sufficient to preserve bladder function
  - will need bilateral ligation of internal Iliac A&V (for S3&4)
- Anterior:
  - may need posterior vaginectomy up to en bloc hysterectomy
  - men: may need cystectomy or cystoprostatectomy

#### USE OF IORT

For R1/2 resections, or close margins

1000 – 2000 cGy delivered

- 1000: minimal residual disease
- 1500: gross residual disease <2cm
- 2000: unresectable or gross disease >2 cm

#### RESULTS OF MULTIMODALITY TREATMENT

Reports up to:

94% for stage II, 85% for stage III

Recurrent disease with curative intent surgery vs. palliative:

- 5-year survival: 35% vs. 7%

Local control rates w/ multimodality: 25 – 78%

Long-term survival: 25 – 40%

304 patients followed at Mayo prospectively for recurrent CA

- 138 (45%) had R0 resections
- 1-, 3-, & 5- yr survival rates: 84%, 43%, 25%
  - 5-year R0 vs. R1/2 Rxn: 37 vs. 16%
- R2 resection decreased survival with surgery
- best survivors: asymptomatic or nonfixed tumors (41%)

#### PALLIATIVE CARE FOR ADVANCED OR RECURRENT RECTAL CA

Radiation:

- full dose Rx (if no prior) effective for bleeding, pelvic pain, near obstruction
- effective for pain 50-90%, however most will recur w/ progression
- 2year survival: 25%

Minimally Invasive means:

- ureteral stents: for urinary obstruction
- expandable metal colonic stents (effective in 90%)
- Endoscopic Lasers: remove the tissue intraluminally by coagulative necrosis, tissue vaporization; becomes less effective with disease progression

#### RECTAL CANCER – ABSOLUTELY KNOW TO ANSWER:

Steps of a TME – describe:

- Details

Leak Rates of Repair:

-

Young patient, low T2 Cancer, doesn't want bag:

- options

Complications of EEA:

-

#### RECTAL CANCER RECURRENCE

## ABDOMINOPERINEAL RESECTION

### APPROACHES

*Gabriel*: supine, flip to lateral

*Lloyd-Davies*: synchronous approach in lithotomy

### Patient Preparation and Positioning

- ET Nurse consult and Preop stoma marking
- bowel prep
- abx, SCDs, foley

### *Allen Stirrups*:

- weight on feet & ankle,
- knee in line with opposite shoulder,
- angle not greater than 60 degrees
- no pressure over fibular head
- no hyperextension of the hip
- no forced abduction or adduction of the foot
- no stretching of the adductor muscle

### Operative Technique

1. midline incision extends to right of umbilicus
2. explore abdomen for stage IV disease
3. self-retaining retractor for exposure
4. mobilize sigmoid and left colon
5. Identify ureters
6. Sigmoid colon divided and mobilized
  - ligating IMA at base does not prolong survival in APR
7. TME dissection performed
8. dissect down to pelvic floor circumferentially
9. Fashion colostomy
10. Close abdomen, finish colostomy
11. Perineal portion – Elliptical incision to include both sphincters in entirety if doing for CA
12. Posterior dissection to go anterior to Coccyx
13. Dissect to the levator ani muscles

### Preservation of Sexual Urinary Function

Neuroanatomy: in order of sequence cranial to caudal

1. Sympathetic Trunk
  - 1a. travel through lumbosacral plexus
2. divide into two hypogastric nerves
  - 2a. parasympathetics come from S2-4 of lumbosacral plexus and join here
  - 2b. Both systems merge into Inferior hypogastric plexus

Rates of urinary dysfunction and impotence:

Urinary: 33 – 70%

Impotence: 20 – 46% - sympathetic plexus

Retrograde Ejac: 20 – 60% - hypogastric plexus

### Methods of Closure

Recommend multiple layer closure that will obliterate dead space

– rate of SSI at least 10%

- T/C myocutaneous flaps/omental flaps/drainage/abx

Intraoperative Hemorrhage: Key word: *basivertebral vein*

- consider thumbtack compression

### Nonhealing Wound and Perineal Sinus:

*Perineal Sinus*: perineal wound that remains unhealed for a minimum of 6 months

20-40% rate of non-healing wound/chronic sinus

Risk Factors: XRT, Fecal Contamination, IBD(?)

Treatment options: flaps

### Perineal Hernias:

Very rare, bulging of contents

Treatment indications:

- bowel obstruction
- incarceration
- impending skin loss

Do not repair for cosmesis

Imaging: MRI best modality to visualize

Closure: biologic mesh best results, one study 0% recurrence.

Other methods ~20% recurrence

## ADJUVANT THERAPY FOR COLORECTAL CA

### COLON CANCER

Stage at Presentation: most sig. prognostic factor

Stage I: 95% 5 year w/ surgery alone

Stage III & IV: adjuvant

Stage II: unclear if adjuvant necessary

Adjuvant Therapy for Stage III Disease:

Stage III 5 year: 30-60%

- Adjuvant therapy improves survival 10-15%

Standard Systemic Chemo in US: 5-FU & Leucovorin

Important Trials:

- *NSABP CO-1*: 8% improved 5 year survival Stage II and Stage III disease with MOF (semustine, vincristine, 5-FU)
- *NCCTG*: 5-FU + Levamisole significantly decreased recurrence rates in stage III (Duke's C)
- *Intergroup 0035 Study*: confirmed efficacy of 5-FU + Levamisole
- *NIH*: consensus statement for 5-FU + Levamisole

Leucovorin (LV) emerged as better agent than Levamisole

- *IMPACT Trial*: 3-year NED from 62% - 71%
- *NCCTG/NCIC*: 6 month therapy superior
- *NSABP CO-4 Study*
- *QUASAR Collaborative Group*

**New Standard: 6 months 5-FU/LV for Stage III disease**

Oxaliplatin as additional modulator (FOLFOX)

- *MOSAIC trial*: 23% decrease in recurrence 3-year
- *PETACC*

Adjuvant Therapy for Stage II Disease (node negative)

Still controversial

- *SEER-Medicare Cohort*: no advantage (72 vs 74%)
- Meta-analysis of NASBP trials CO-1,2,3&4: adjuvant therapy beneficial for stage II
  - noted to have major methodological flaws

For a good answer: need 5000-800 patients

Targeted Biologic Therapy

- Cetuximab: Antibodies to epidermal GF Receptor
- Bevacizumab: antibodies to vascular endothelial GF
- active trials, no data available to date

Radiotherapy

Most important risk factors for recurrence:

1. pathologic staging
2. tumor fixed in retroperitoneal part of colon
3. perforation or obstruction by cancer

Role in colon cancer still undefined.

- wide variations in radiation techniques, doses and concurrent use of chemo, make difficult to define

Treatment should be individualized to patients at high risk of local recurrence

Immunotherapy, Tumor Vaccines and Gene Therapy

Still under study. No definitive therapy as of yet.

### RECTAL CANCER

Clinical benefits of Radiotherapy in rectal CA:

1. lowers local failure rates & improve survival
2. allows surgery in nonresectable rectal CA
3. facilitates sphincter-preserving procedures
4. may offer totally curative approach w/o surgery

Recurrence rates after Local excision:

T1: 4 – 18%; T2: 27 – 67%

Benefit 1: lowers local failure rates & improves survival

- *Uppsala trial*

- *NSABP R-03 Trial*: 44% vs 34% NED at 1-year
- *German CAO/ARO/AIO Trial*: 6 vs 13% at 5 years

Neoadjuvant Therapy: Radiation alone vs. Chemorads

- preop: decreased small bowel toxicity, decreased overall radiation associated complications, decreased risk of tumor seeding during surgery; Risk: overtreating
- ERUS & Pelvic MRI decrease risk of overtreating
- *Dutch Trial*: 1861 patients TME wo/w radiation
  - 2 year recurrence: 8.2% to 2.4%
  - 5-year recurrence: 11.4% vs. 5.6%
  - 5-year survival equivalent between the two
- *EORTC 229121 Trial*: evaluating chemoradiation preop
  - beneficial in ypT0-2 but not ypT3-4
  - however can't tell yp status until post, so all are doing

Postoperative Radiation vs. Chemoradiation:

NIH 1990 consensus statement: combined modality for Stage II and III disease; chemo alone NOT acceptable

Benefit 2: Radiotherapy allows Surgery in nonresectable Rectal CA

Tumor that cannot be resected without a very high risk of local recurrence

Preop Radiation Does: Europe vs. USA

- Europe: preop 20-25 Gy (1 wk), surgery 1-2 wks later
- US: 45-55 Gy over 5-6 weeks, surgery 6 weeks later

No good evidence to support either, so follow standards

Benefit 3: Radiotherapy facilitates sphincter-preserving procedures in low-lying rectal CA

5-10 mm distal margin now being accepted as curative

- *French R9001 Trial*: local recurrence rate 12% among the patients in whom the surgeon had originally planned APR but changed intraop due to "downsize"

- At this time, there is no evidence that prolonged-course radiotherapy combined with chemotherapy with delayed surgery impacts sphincter preservation

- up to 20% of LAR patients incontinent to solid stool. On surveys, lower quality of life than those with stoma

Adjuvant Chemo alone in Rectal CA

Combo 5-FU/LV found to improve survival in pt's w/ colon CA, but not w/ Rectal CA.

## INDICATIONS AND OUTCOMES FOR TREATMENT OF RECURRENT RECTAL CA AND COLORECTAL LIVER AND LUNG METASTASIS

### **RECURRENT RECTAL CANCER**

#### Assessing Resectability:

- standard preop and cardiac clearance
  - involve any subspecialist that may be needed
  - pulmonary and cardiac preop critical due to extensive exents
- **DRE:** very important – determine location relative sphincters, pelvic sidewall, GU structures, sacrum
  - should also tell: bulk, mobility, fixation
  - if its extramucosal – DRE will find, procto won't
  - sphincters involved on recurrence → APR
- **Full colonoscopy:** rule out synchronous
- **PET CT:** eval for metastatic disease (37% rate of change in surgical planning based on PET CT – Watson et al)
  - radiation induced changes will be positive on PET CT
- **CT C/A/P:** eval lesion and for any other lesions
- **Pelvic MRI:** for recurrent disease – best for evaluation of involvement of adjacent organs and structures
- Recurrence adjacent to GU structures: en bloc resection
- Metastatic disease as well: most unresectable, but select patients with isolated lung/liver – possible exent

#### Adjuvant Therapies:

- Consider additional radiation boost
  - usually: 40-40 Gy boost w/ plan surgery in ~8 weeks
  - assumes >6 months b/n XRT treatments & small bowel can be excluded from pelvis – if Small bowel not excluded consider op just to exclude with a spacer to allow for XRT. Consider diverting now.
    - Spacers: Breast Prosthesis, uterus, tissue expander
- concomitant 5-FU based chemo
- **Intraoperative Radiation Therapy (IORT):** via dedicated fixed intraop unit via after-loading catheters placed intraop
  - indications: involvement of sidewall, sacrum, or major vascular structures – essentially when R0 resection likely will be impossible or extremely difficult
  - no studies on IORT and likely won't be because will have to randomize patients to non-treatment vs. IORT with low risk profile – makes sense, so do despite lack of evidence. Retrospective reviews support it.
  - if concerned about margins (if even thinking to due frozen sections) then highly consider doing IORT, even if your frozen comes back negative
  - author advocates IORT to sacrum rather than sacral resection and other like structures. And clinical suspicion given IORT. Sacrectomy only if clear cortical discussion or marrow involvement. Fibrosis and scar only → IORT.

#### Operative Approach:

- lithotomy, ureteral catheters in most
- mobilize left colon, isolate IMA root, eval for respectability
- rectal mobilization: start posterior if can
  - mobilize all the areas that can be done easily first to be used as guides
- Anterior Structures involved: Taken en bloc
- any suspicious area of involvement – IORT
  - posterior structures easier to treat; anterior better treated in setting of APR and patient in prone position
- gross tumor left behind – usually do not do anastomoses
  - if think its R1 disease left, IORT + anastomoses ok
  - ALL anastomoses should be diverted
- consider plastics involvement for flaps

#### Expected Outcomes:

- local recurrence after proctectomy: 2.6-32%
  - 50% will not have e/o of mets
- 5 year survival after re-resection: 14-44%
  - dependent on R0 Rsnx & no metastatic disease
  - studies support IORT in R1 resection & its efficacy; not as effective w/ R2 resections

- Re-resection is really only way for cure; ChemoXRT only palliates and prolongs; so consider even if think is morbid procedure – extended radical en bloc resection of all involved or potentially involved structures in the pelvis
  - include common/external iliac vessels w/ reconstruction, wide resection of the pelvic sidewall, sacrectomy.
- Anterior recurrence easier to resect and better long term survival than lateral recurrences:
- Likelihood of R0 resection by site of recurrence:
  - anastomotic or perineal wound: 90%
  - & Anterior: 72%
  - & Lateral and/or posterior component: 43%
  - & Iliac Vessels: 17%

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### **TREATMENT OF CR LIVER METASTASIS**

#### Assessing Resectability:

Based on: (1) general health of pt. (2) anatomic extent of disease in liver (3) extrahepatic mets

If considering patient is not resectable, options to downstage and make resectable:

- systemic or hepatic artery infusional chemotherapy
- RFA combined w/ resection
- staged resection
- portal vein embolization of segment/lobe

#### NCCN Guidelines to determine if can do Rsnx:

1. must leave adequate liver reserve post Rsnx
2. debulking NOT recommended
3. No extrahepatic disease should be left (no R2/R1)
4. if downstaging – all original sites must be resectable
5. Resection should be treatment of choice
6. ablations considered only if all disease is treatable
7. solitary lesions have better prognosis than multiple
8. arterial embolization only to be done on clinical trials
9. primary tumor must have been resected for cure
10. reresections possible in select patients

#### Resectability determination:

- prior was 3 or less lesions – however, overall tumor burden, vascular involvement and extrahepatic spread are better parameters
- **FDG-PET** to evaluate for occult mets
  - find 12% that actually not resectable
  - changes planning in 23%
  - increased 5-year survival in 58% of patients in study
  - recent chemo w/in 3 months: **False Negatives**
    - in reported 37% of patients
    - in lesions up to 3.2 cm in size
    - lesions < 1 cm in size: 92% rate of False Negative
  - **Take Home:** Do PET before chemo and treat all prechemo disease because PET has high rate of false negative post chemo

#### Combined vs. staged approach:

- studies show higher recurrence & worse 5 year survival in combined colon and liver resections
- many suggest 3 month waiting period after primary resection before liver resection to allow for better selection of patients for surgery & downstaging

#### Chemo Affects on Liver:

- Irintotecan: hepatic steatosis
- Oxaliplatin: sinusoidal dilatation

#### Adjuvant Therapies:

- RFA, Cryotherapy, Microwave Ablation, ChemoEmbo, yttrium-90, stereotatic high dose XRT

#### Operative Approach:

- GIA stapler for portal vein and hepatic Vein
- ligasure OK
- do not need formal resection, just clear margins – liver conservation has been shown better long-term outcomes
- get vascular control

- can use laparoscopy to do ultrasound first and determine if resectable and prevent unneeded large wound if not resectable

#### Expected Outcomes:

- 5 year survival after liver resection: 25-37%
- screening w/ PET → increased to 60% (selection bias)
- 50% will have solitary liver recurrence – can re-resect
- adjuvant chemo w/ FOLFOX type Rx rec'd by NCCN

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### **COLORECTAL LUNG METASTASIS**

#### Assessing Resectability:

Primary Lung CA (vs. a colon Met): irregular, speculated borders, should have PET activity (if >8mm)

- Mets: smooth bordered nodules, varying in size, PET + if > 10 mm
- Review old CTs to compare/contrast

Lung resection or not based on:

- exclusion of other sites of mets
- adequate lung function post resection
- ability to control intra-abdominal disease

PFTs – postop values you want:

- FEV1: >0.8 L
- DLCO: > 40%
- can patient climb 3 flights of stairs w/o stopping due to SOB? Then should be able to tolerate up to a pneumonectomy (general rule)
- V/Q scan can help in questionable cases

#### Operative Approach:

- Lung preservation is the gold standard – chance of future mets high and thus re-resection
- large anatomic resections provide no survival advantage
- Try to do wedge as much as possible

#### Expected Outcomes:

Overall:

- 5 year survival: 30.5%
  - Solitary met vs. 2 mets: 36.9% vs. 19.3%
- 20 year survival: 16.2%
- 5year after re-resection: 30%
- CEA >5 before resection vs. <5: 16% vs. 49%
- pneumonectomy: being researched if worth it

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### **CHEMOTHERAPY FOR COLON AND RECTAL CANCER**

SURVIVAL RATES BY STAGE – 5-YEAR:

- Stage I: 93% (T<sub>1-2</sub>N<sub>0</sub>M<sub>0</sub>)
- Stage IIA: 85% (T<sub>3</sub>N<sub>0</sub>M<sub>0</sub>)
- Stage IIB: 72% (T<sub>4</sub>N<sub>0</sub>M<sub>0</sub>)
- Stage IIIA: 83% (T<sub>1-2</sub>N<sub>1</sub>M<sub>0</sub>)
- Stage IIIB: 64% (T<sub>3-4</sub>N<sub>1</sub>M<sub>0</sub>)
- Stage IIIC: 44% (T<sub>any</sub>N<sub>2</sub>M<sub>0</sub>)
- Stage IV: 8% (T<sub>any</sub>N<sub>any</sub>M<sub>1</sub>)

CHEMOTHERAPY AGENTS COMMONLY USED IN CR CAS

#### 5-FU with either Leucovorin or Levamisole:

- 5-FU: inhibits DNA synthesis via blockage of thymidylate synthase
- Leucovorin: a 5-FU biomodulator – together form a stable ternary complex permitting prolonged inhibition of thymidylate synthetase
  - IMPACT trial: increased 3year DFS Stage III 62 → 71% and overall survival from 78 → 83%
- National Cancer Institute and Intergroup trial 0089: 6 months of 5-FU/Leucovorin as effective as one year
  - NSABP CO-4 trial confirmed these results
- QUASAR Collaborative Group: confirmed leucovorin superior to Levamisole
- Take home: standard 5-FU + Leucovorin for 6 months for stage III disease

#### Oxaliplatin-Containing Regimens: (FOLFOX/XELOX)

- Oxaliplatin: inhibits DNA replication by making bulky DNA adducts.

- MOSAIC Trial: FOLFOX superior to 5-FU/Leuco (76.4 vs. 69.8% 3 year DFS)

- FOLFOX now standard therapy – IV infusions
- if wish to avoid IV: XELOX: Capecitabine & Oxaliplatin
  - Capecitabine: prodrug to 5-FU

#### Irinotecan-Containing Regimens: (FOLFIRI, IFL, IROX)

- Irinotecan: inhibits DNA replication & transcription via topoisomerase blockade.
  - works but less effective than Oxaliplatin, however still better than 5-FU/Leuc alone
- IFL: Irinotecan, 5-FU, Leucovorin
- mostly used as second line therapy
- Bevacizumab: (AVASTIN)
  - Bevacizumab: a monoclonal antibody that binds to vascular endothelial growth factor ligand (VEGF), a biologic – blocks angiogenesis
  - TREE-2 trial: Avastin + FOLFOX – better long term result
- Cetuximab: (ERBITUX)
  - Cetuximab: monoclonal antibody blocking epidermal growth factor (EGFR)
  - approved as single agent or w/ irinotecan for recurrent advanced colorectal Cancer

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INDICATIONS & TIMING OF CHEMOTHERAPY FOR CR CANCER

#### Adjuvant Chemo for Stage III & IV Colon CA:

- chemotherapy to eradicate micrometastases
- double median survival time from 10-12 → 20 months

#### Adjuvant Chemo for Stage II Colon CA:

- Unclear, no clear data to support it
- American Society of Clinical Oncology: no data to support routine adjuvant chemo in medically fit patient
  - they did say, however, that select patients should still get adjuvant even if Stage II: T4 lesions, <12 nodes sampled, perforation, or poorly differentiated lesions

#### Neoadjuvant ChemoXRT for T3/ Node-positive rectal CA:

- Swedish rectal CA trial: XRT improved local control (89 v 73%) and overall survival (58 v 48%)
- German Rectal CA trial: XRT preop improves local control (6 v 13%), not overall survival
- EORTC 22921 and a European trial: preop chemoradiation better than preop XRT alone
  - All rectal CAs need ERUS vs. Pelvic MRI

#### Adjuvant Chemo alone for T<sub>3</sub> or N+ Rectal CA:

- CHRONICLE trial evaluating this
- CHRONICLE trial evaluating this

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SIDE EFFECTS OF CHEMOTHERAPY

5-FU: stomatitis, esophagitis, diarrhea, myelosuppression, cardiac Toxicity

Oxaliplatin: peripheral neuropathy, anemia, thrombocytopenia, neutropenia, abdominal pain

Irinotecan: alopecia, diarrhea, myelosuppression, colitis, GI ulcers, GI bleeding, ileus

Avastin: alopecia, thrombosis, bleeding, hyperkalemia, HTN, anorexia, neutropenia, delayed wound healing, bowel perforation

Erbix: confusion, pruritis, insomnia, lung disease, dyspepsia

## RADIATION PROCTITIS

### Radiation Treatment Paradigms

#### Short Course:

- usual: 25 Gy total
- 5 Gy fractions over 5 – 7 days
- surgery one week after completion
- really only used for preop treatment

#### Long Course:

- 45 – 54 Gy in 1.8 – 2 Gy fractions over 5-6 weeks
- surgery 6 weeks after completion

#### Radiation Effect:

- cell death after one or more mitotic events occur
- therefore, effect can be delayed for long periods

#### Radiation Targets:

- Superior border: L5S1 interspace
- Inferior border: 3-5 cm distal to CA (obturator foramen)
- Other organs: intestine in post pelvis, post bladder and prostate, soft tissue in ischioanal and presacral areas, sacrum, lymph nodes of internal iliac and distal common iliac chains

#### Dutch TME Trial:

Demonstrated a few important findings;

- TME reduced local recurrence from 27 – 10.4%
- TME + XRT further reduced to 5.6% recurrence
- w/p TME, XRT reduced to 11-12% recurrence (Stockholm and Swedish trials)
- XRT decreased recurrence, but only significantly different in stage III disease

#### Local resection with adjuvant therapy:

- T<sub>2</sub> local rx w/ adjuvant: 16% recurrence
- T<sub>3</sub> local rx w/ adjuvant: 23% recurrence
- 50% rate of salvage if local recurrence

#### (3) *Short Chain Fatty Acids (SCFAs):*

- 2 small RCTs – improved symptoms & endoscopy

#### (4) *Endoscopic Ablation Treatments:*

- laser or ABC
- used to control bleeding from telangiectasias
- rare complications: ulcer, stricture, mucous discharge

#### (5) *Formalin: 4% or 10%*

- (a) 4% - rectal formalin irrigation
  - 50 cc aliquots, to total of 400-500 cc
  - 75% success, will repeat
- (b) 10% - dab technique (w/ swab or soaked gauze)
  - significant rate of structuring w/ soaked gauze
  - 75% success rate

#### (6) *Re-operative surgery – two options:*

- (a) diversion
- (b) resection w/ coloanal and diversion
- 30 – 65% morbidity

---

## ACUTE ADVERSE EFFECTS

*Diarrhea:* most common acute effect

- 4 Grades:
  1. symptomatic treatment
  2. lomotil/immodium
  3. wearing pads, needs TPN, and support
  4. obstruction/fistula – needs inpatient treatment
- 31% rate of Diarrhea s/p LAR + adjuvant

*Cardiovascular Complications:*

- increased rate of CV mortality after adjuvant Rx
- increases age 75 and above

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## CHRONIC ADVERSE EFFECTS (w/ XRT) [w/0 XRT]

- Fecal incontinence (62%) [38%]
- Nocturnal incontinence (32%) [17%]
- Mean Number of bowel movements (3.69) [3.02]
- Pad usage (56%) [33%]

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## CHRONIC RECTAL EFFECTS

XRT causes progressive obliterative arteritis and submucosal fibrosis

- directly proportional to cumulative dose of XRT

75% of pelvic XRT will have some level of proctitis

- 20% will cont with chronic proctitis
- Sx: loos stools, urgency, bleeding, pain, tenesmus
- Endoscopy: friability, telangiectasias, granularity, pallor
- Histology: platelet thrombi formation, narrow arterioles, crypt distortion, telangiectasias

BRBPR w/ hx of XRT: 12% will be a new disease proximal – scope all or else will miss if assume its proctitis

#### Treatment – Chronic Proctitis:

##### (1) *Anti-inflammatory Agents:*

- oral or enema steroid or 5-ASA

##### (2) *Sucralfate:*

- provides protective barrier
- has been shown effective over placebo

## **RECTAL PROLAPSE (RECTAL PROCIDENTIA)**

Rectal Prolapse: circumferential full-thickness intussusceptions

### Etiology:

- W > M; men affected younger and due to other dz
- elderly women, psych dz, neurological disorders

### Patient Evaluation:

Sx: constipation, straining, incontinence, erratic BMs

- need to know if hx of constipation/obstructed defecation
- incontinence improves in ~40% of pts over 6 – 12 mo post-op

- Squatting or sitting may elicit prolapsed

*Mucosal Prolapse:* radially oriented grooves

- prior hx of trauma/anal procedures; asymmetrical

*Full thickness prolapsed:* concentric rings

*Solitary Rectal Ulcer/Colitis Cystica Profunda:* from an internal prolapsed; more often the source of bleeding; may co-exist

Digital Exam – look for:

- concomitant anal pathology
- assess resting tone
- assess squeeze pressure
- assess function of puborectalis muscle
- Colonoscopy/FlexSig: to eval for mucosal abnormality
- Defecography: indicated to evaluate internal procidentia
  - not necessary in the evaluation of full thickness
  - use if cannot reproduce it in the office, o/w not required

Anal Manometry: to assess sphincter function

- non-relaxing puborectalis: biofeedback therapy first

Colonic Transit Studies: if have hx suggesting problem

### Surgical Procedures

Perineal vs. abdominal

- Men at risk sex dysfxn with abdominal approach
- High risk patients with perineal approaches
- Perineal: can do w/ spinal or even local

Most commons:

- Abdominal: rectopexy w/ or w/o resection
- Perineal: Delorme or Altemeier

Indications by symptoms:

- Constipated: resection and rectopexy
- Incontinent: abdominal rectopexy or Altemeier + levatorplasty

### PERINEAL PROCEDURES

#### **Perineal Rectosigmoidectomy – Altemeier**

- under general, spinal or MAC, in Prone/lithotomy
- rectal wall injected w/ epi compound for hemostasis
- circumferential incision into rectal wall 1-2 from dentate line
- deepened through full thickness of rectal wall
- once full thickness through, ligate mesorectum
- post. Mesorectum will limit your dissection – use anterior to dictate how much to resect
- Anteriorly: hernia sac & enter pouch of Douglas
- dissect until no further redundancy
- hand sutured coloanal anastomosis
- if poor continence, levator placcation (works in 2/3)
- Morbidity: 5 – 24%, leak rate 1-2%, bleed 1-2%
- Recurrence: 6 - 16%
- Mortality: 0 – 6%

#### **Mucosal Proctectomy – Delorme**

- ideal for full thickness limited to partial circumference or less extensive prolapsed; 2<sup>nd</sup> line therapy after Altemeier
- only mucosa and submucosa excised
- general, spinal or local (MAC)
- 1 cm from dentate, incise through mucosa only
- Recurrence: 13-37%

## **Anal Encirclement - Thiersch Procedure**

- Silver wire around the anus under local
- prone position
- local applied
- tunneling around anus, above anoperineal ligament
  - above anococcygeal ligament, as well
  - around external sphincter
  - tighten around 18F Hegar Dilator
- does not fix prolapsed, just traps it above
- only used if very six patients
- morbidity up to 60%
- recurrence up to 44%

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### ABDOMINAL PROCEDURES

Theory: Fibrosis from rectal mobilization → long term fixation

- rectopexy worsens constipation, so ensure no constipation prior, or also need sigmoid colectomy

### **Abdominal Rectopexy & Sigmoid Colectomy**

Four Essential Steps:

1. complete mobilization of rectum down to levator
  - MUST leave lateral stalks intact (up for debate in actuality [Mollen et al], but by text book, leave them in tact)
  - textbook: anterior mobilization as well, but most only do posterior now
2. Elevation of rectum cephalad with suture fixation of lateral rectal stalks to presacral fascia just below sacral promontory
3. Suture of the endopelvic fascia anteriorly to obliterate the cul-de-sac
  - modern days, many omit this
4. Sigmoid colectomy with anastomosis

Recurrence: 0 – 9%, Mortality: 0 – 7%, Morbidity: 0 – 23%

*Abdominal Rectopexy (R,M: 3.6,1.4%)*

- if don't also have constipation, can do this alone
- suture with prolene or other non-absorbable
- if take lateral stalks, suture them to promontory
- *Frykman-Goldberg Procedure:* includes sigmoidectomy

*Ripstein Procedure (R,M: 8,28%)*

- currently seldom used
- 5 cm prosthetic mesh used to make a sling and anchor the rectum in place 5 cm below the sacral promontory
- concerns of mesh erosion into rectum & vagina

*Ivalon Sponge (Posterior Wrap/Wells Operation)*

- most popular procedure in UK
- Polyvinyl alcohol sponge wrap around ¾ of rectum
  - anterior rectum not covered
- peritoneum closed over the sponge

*Laparoscopic Rectopexy*

- depending on skill, equivalent results
- hospital stay shorter in lap group

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### RECURRENT PROLAPSE

- must figure out prior procedure so you can determine the blood supply to the rectum, success in 85-100%
- no specific algorithm for treatment
- determine if they have anismus 1<sup>st</sup> – if so, biofeedback 1<sup>st</sup>
- key is – if prior anastomoses, must be resected to prevent ischemic bowel segment

Prior procedure and options for Redo:

1. Altemeier: Redo Altemeier, Abd Recto w/o Rsnx
2. Abd. Rect: Redo w/ poss Rsnx or Perineal
3. Abd Rect w/ Rsnx: Redo abd Rect – *avoid* perineals – if must do perineal because of poor medical state, consider delorme

## RECTOVAGINAL FISTULA

### **Etiology:**

- 7 – 10 days after delivery (for OB related ones)
  - most often after 3<sup>rd</sup> or 4<sup>th</sup> degree lacs
  - inadequate repair, breakdown, or infection
  - 0.06% - 0.1% of vaginal deliveries in US
  - in developing nations higher prevalence due to prolonged labor → necrosis rectovaginal septum
- LAR – 2.9%
  - posterior vag wall included in anastomosis

### **Evaluation:**

Two primary goals: identification & then assessment

### Identification:

- may see dark red rectal mucosa vs. pink vag mucosa
- may see dimple anterior midline of rectum
- **Methylene Blue Test:** vaginal tampon, and then methylene blue enema (20 – 30 ml) while in prone position → See if tampon gets blue
- **Vaginography:** contrast into vagina through a Foley catheter w/ balloon up to occlude the vag orifice
  - 79 – 100 % sensitive
  - more useful for colovaginal and enterovaginal fistula
- MRI & Ultrasound:
  - hydrogen peroxide may help
  - will also allow you to assess the sphincters

### **Assessment:**

- Symptoms of incontinence
  - 48% w/ these symptoms
  - 100% of post obstetric patients
- Always assess if sphincter damage – may be able to address during same operation

### **Classification:**

- size, location, etiology
- **Fistula Height:** by Daniels:
  - low, middle or high, on rectvag septum
    - low & middle: perineal approach
    - high: abdominal approach
  - low: vaginal fourchette & Dentate line
  - high: cervix
  - middle: everything in between
- **Simple vs. Complex system**
  - reflects status of local tissue:
    - Simple: local repairs
    - Complex: resection &/or interposition &/or diversion
  - simple: < 2.5 cm, low, 2<sup>nd</sup> to trauma/infection
  - complex: large, IBD / radiation / malignancy

## Surgical Techniques

### **Local Repairs:**

- for 1<sup>st</sup> or 2<sup>nd</sup> repair w/ intact sphincter muscles
- prone jack knife, head light, lone star
- **Fistulotomy:** very select cases, no sphincters involved
- **Fibrin Sealant:** curette and then place
  - discouraging results (31 – 61%) of success
  - risk is minimal and success rate greater than zero
- **Fistulectomy w/ Layered Closure:** elliptical incision w/ 2 -3 cm mucosal flaps. Close each layer in succession.
  - 88 – 100% success in very small series
- **Advancement Flaps:** trans – rectal, -vag or -perineal
  - 21 – 40% FI after repair
  - U-shaped flap of mucosa, submucosa, & circular muscle
  - includes the fistula within it.

- Base 2-3 times larger than apex. Raise proximal to 4-5 cm.
  - Debride tract, leave open to drain through vag.
- Advance and close, debride off distal end with fistula
- avoid intercourse & tampons for 6 weeks
- **Rectal Sleeve Advancement:** mobilization of distal rectum and advancement to cover the fistula
  - circumferential incision made at dentate line through submuc and continued cephalad
  - Full thickness at anorectal ring and above
  - mobilize until at fully healthy tissue
  - advance healthy tissue and do coloanal anasto
- **Noble-Mengert-Fish Technique:** Full thickness of anterior wall mobilized 180°, continue until at rectovaginal septum. Flap secured to external sphincter muscle.
- **Excision of Fistula with Layered Closure:** 88-100% works
  - excise the tract, and then do a layer by layer closure
- **Perineo-Proctotomy:** conversion to 4<sup>th</sup> degree lac.
  - tract is excised and both rectal and vag wall dissected aware from the muscle
  - Repair of both rectal and vaginal defects
  - External sphincter muscle reapproximated
  - Perineal body reconstructed and skin closed
  - 87 – 100% success rates
- **Inversion of Fistula:** vaginal mucosa mobilized circumferentially around the fistula. Tract is excised and a pursestring suture used to invert the fistula into the rectum. Vaginal wall closed over this inversion.
  - One small series report (n=47) 100% successful

### **Complex Repairs:**

- **Tissue Interposition:**
  - MC sphincteroplasty
  - incision closed with drain in place
  - muscle mobilized and inserted b/n rectum & vag
- **Labial Fat Pad – Martius Graft:**
  - Bulbocavernous Muscle
  - longitudinal incision over labial majora
  - tunneled to final position
  - small series (14) 100% successful. Others ~80%
- **Tissue Interposition: Bioprosthetics:**
  - plugs or biologic mesh
  - 35% procedural success rate, with repeat 58% overall
- **Tissue Interposition: Muscle:**
  - Gracillis is a good option
- **Tissue Interposition: Bowel**
  - LAR, Omental buttress
  - *Bricker and Johnston:* Sigmoid colon divided and hartmann's. Distal end anastomosed to rectum at level of fistula. After healing, colo-colo side to side anastomosis.
- **Resection:** 78 – 100% reported success; hand sewn colon anal anastomosis.
  - 64% continent at 6 mo, 75% at one year

### **Choice of Treatment:**

- **Secondary to Obstetric Injury:**
  - high rate of spontaneous closure at 6-9 months
  - ~100% w/ sphincter defect
  - goal: close fistula and restore continence
  - choice of repair based on surgeon experience
    - author's: sphincteroplasty & perineoproctotomy
    - Advancement Flap, Martius good options.
  - may consider fibrin glue while waiting out 6-9 months
  - if want to have children after repair → C-section

- Secondary to Cryptoglandular Disease:
  - EUS to exclude occult disease
  - advancement flap if no other etiology
  - otherwise, dealer's choice for what makes sense
- Secondary to Crohn's Disease:
  - medical mgmt. a primary
  - Non-cutting seton + infliximab. Remove seton before last dosing of infliximab. 3 infusions usually necessary
  - radiologic healing rate lower than clinical
  - may need infliximab longer
  - never due until proctitis first treated
  - If flaps, always divert
- Secondary to Malignancy:
  - depends on cancer
- Secondary to Radiation:
  - diversion for at least 6 months
  - if low – muscle interposition
  - if high – abdominal tissue interposition or rsxn
- Iatrogenic Fistulas:
  - High: repeat rsxn
  - Low: advancement flaps
- Persistent Fistulas:
  - many successful on 2<sup>nd</sup> go around
    - 3<sup>rd</sup> attempt usually not successful
  - 3 month minimum between attempts
  - interposition grafts and sphincteroplasty

### SOLITARY RECTAL ULCER SYNDROME

*Solitary Rectal Ulcer Syndrome (SRUS)*: rectal bleeding, copious mucous discharge, anorectal pain, difficult evacuation

- can have single, multiple or no ulcers
- ulcers usually on anterior rectal wall just above anorectal ring
  - can occur just above to 15 cm from dentate (less frequent)
- ulcers usually "punched out" gray-white base surrounded by hyperemia

*Cystica Profunda (CCF)*: benign; mucin-filled cysts located deep to muscularis mucosae.

- more frequent in colon and rectum (can be anywhere)
  - if in colon rectum Colitis cystica profunda
- usually on anterior wall
- asymptomatic or rectal bleeding, mucous discharge, anorectal pain
- must differentiate from CA since is benign

In both: 45-80% have intussusceptions

Differential: polyps, endometriosis, inflammatory, infectious, drug induced colitis, adenoCA

Endoscopic biopsies to differentiate

- In CCF: mucous cysts lined by normal columnar epithelium located deep to the muscularis mucosae

If no prolapsed, can do biofeedback

- not too many medical therapies that work
- surgical therapy for good candidates
- if no prolapsed, transanal excision may be possible

Notes on this:

Begin with thorough H& P with focused bowel history, asking to elicit symptoms of straining or other evacuation difficulty.

According to Corman, there is a role of chronic constipation/fecal impaction with the "preprolapse" condition.

The suggested mechanisms for SRUS are failure of puborectalis relaxation and/or an internal prolapse/intussusception leading to ischemia of the anterior rectal wall. Inquire regarding symptoms of constipation, diarrhea, passage of mucus, tenesmus, rectal bleeding, and proctalgia.

Then perform a focused exam to include DRE, proctoscopy/sigmoidoscopy with biopsy.

Full colonoscopy to evaluate for other lesions may be warranted, and based on findings, some (not all) patients may need anorectal physiology testing to include defecography.

Gross findings of SRUS include either an anterior polypoid mass or ulcerated lesion with hyperemia and induration, typically 6-8 cm from the dentate.

Histology from biopsy will show inflammatory changes and FIBROMUSCULAR OBLITERATION OF THE LAMINA PROPRIA (thanks Ken Batts) as well as thickening of the muscularis mucosae. It is important to rule out malignancy.

Initial management of SRUS involves increasing dietary fiber and improved bowel management.

A trial of hydrocortisone enemas, sucralfate enemas, or oral sulfasalazine have all proven some success in treatment.

Biofeedback referral is indicated to help improve with evacuation difficulties and paradoxical puborectalis contraction.

Surgery (rectopexy +/- resection) is reserved for those patients that are found to have an underlying internal prolapse.

Source: Fazio 24: 135

The differential diagnosis for colitis cystica profunda includes:

- Rectal neoplasm
- Crohn's disease
- Suppository-induced rectal ulcer
- HIV-associated rectal ulcer
- Solitary rectal ulcer

## SEXUALLY TRANSMITTED DISEASES

### ETIOLOGIES:

- Anal Intercourse MC
- 2% of males (2-10% lifetime)
- 5-10% of females, more often unprotected

### ANORECTAL IMMUNOLOGY:

- With anal intercourse - breakdown of the mucous complex protecting the rectum
- abrades the mucous lining and delivers pathogens directly to the crypt and columnar cells -- allows easy entry
  - Mucosa of rectum sheds IgA
  - may burrow into cell
  - may proliferate on the cells
  - may incorporate into cell DNA

### NEISSERIA GONORRHEA:

- Gram negative diplococcus -- urethritis & cervicitis
- MC bacterial infxn of anorectum
  - infect columnar cuboidal or noncolumnar epithelial lined cells - urethra, endocervix, rectum, pharynx
  - frequently asymptomatic, 3 -14 day incubation
  - 50% males, 95% females
  - asymptomatic is main reservoir for persistent infections
- Sx: non-specific proctitis, erythema, edema, friability, pus
- Dx: culture on specific media (Thayer-Martin) incubated in CO<sub>2</sub> rich environment and gram stain
- Anoscopy: may have purulent discharge from anal crypts
- Rx: Ceftriaxone or Cipro/Levo (Any, single dose)
- 14% quinolone resistance in California/Hawaii
- No follow up required, 100% efficacious treatment
- only follow if still symptomatic

### Treat all for Chlamydia at same time

- no sex until treated, all partners within 60 days treat

### CHLAMYDIA/LYMPHGRANULOMA VENEREUM

- Px: obligate intracellular bacterium
- Different Serovars produce different infection
  - Serovar D - K: proctitis & genital infxn's - less invasive and mild proctitis
  - Serovar L1-L3: *lymphogranuloma venereum* - more invasive, cause ulcerations, abscess, strictures
  - incubation 5d - 2wks
- Lymphgranuloma V.: ulcerations/abscess and Lymphadenopathy of iliac, perirectal, inguinal & femoral
- large indurated matted nodes, similar to syphilis
- Dx: cotton/Dacron swab w/ inert shaft
- rectal Gram stain showing PMN w/o visible gonococci is presumptive chlamydia if clinical picture fits
  - tissue cultures low sensitivity, hard to transport
- Rx:
- Non- LGV: Azithromycin 1g x1 or Doxy 100mg bid x 7d
  - LGV: 21 days of treatment with either
  - no sex until 7 days post treatment

### SYPHILIS

- Spirochete Treponema Pallidum - several stages:
- Primary - Chancre/Proctitis
  - 2-10 wks s/p exposure
  - small papules that eventually ulcerate, usually painful without exudates, single or multiple
  - painless LAD
  - lesions will usually heal
  - Secondary - condyloma lata
  - 4-10 weeks p primary if untreated, hematogenous spread
  - non-specific symptoms -- fever, malaise, arthralgias,
  - maculopapular rash on trunk and extremities
  - Condyloma Lata: gray/whitish wart-like lesions that appear adjacent to the primary chancre; filled with spirochetes
  - untreated will resolve w/in 3-12 weeks
  - Tertiary
- Dx:
- 1st or 2nd stage w/ Dark-field microscopic scrapings from chancres;

- direct fluorescent antibody test for T. Pallidum
  - VDRL, RPR, serologic tests, but False Negative to 25%
- Rx: Pen G 2.4 mil U IM x1 (1st and 2nd stage)
- recheck in 6 months w/ serolog to ensure treated
  - if HIV+ 3 months and repeat
  - check partners within:
  - stage 1: 3 months
  - stage 2: 6 months
  - stage 3: 1 year

### CHANCROID

- ulcerating STD, G(-) facultative anaerobic bacillus H. Ducreyi
- Px: contact through breaks of skin -- causes ulcers
- Sx: infected tender papules - then pustules - then ulcerated and eroded, multiple and painful
- can drain from genitals to anal area
  - unilateral painful inguinal LAD (M>F)
  - facilitates HIV transmission and vice versa
- Dx: gram stain & cx from base of ulcers
- Rx: Azithromycin 1g x1 or Ceftriaxone 250 mg IM
- ### GRANULOMA INGUINALE (DONOVANOSIS)
- ulcerating infection by Calymmatobacterium Granulomatis
- AKA Donovanias Granulomatis
- very rare in US
- does not require sexual contact

- Sx: nontender, fleshy, beefy red ulcers - genitalia MC
- Dx: routine cultures low sensitivity
- smear: Donovan bodies (small inclusions) in macrophage
- Rx: Doxy 100 BID x1wk or Bactrim bid for 3 wks

### HERPES SIMPLEX VIRUS

- HSV-1&2, EBV, Varicella, CMV
- asymptomatic HSV-1 common
- Sx: Vesicles and ulceration, heal usually after 3wks
- HSV-2 proctitis via anal intercourse
  - limited to distal 10 cm - diffuse friability
  - tender inguinal LAD (50%)
  - sacral radiculopathy - paresthesias/neuralgias, urinary retention, constipation, impotence
- Dx: multinucleated giant cells w/ intranuclear inclusion bodies on Pap Smear/Tsank prep
- Rx: supportive, sitz; Acyclovir x 10d decreases symptoms
- ### HUMAN PAPILLOMA VIRUS
- DNA papovirus
- 6 & 11: MC, low risk
  - 16 & 18: greatest risk of dysplasia and anal CA
- Sx: perianal involvement w/o receptive intercourse can happen
- Dx: physical exam alone
- anoscopy, rarely above the dentate line
- Rx: destruction of all gross disease w/ minimal morbidity
- HIV+, recurrent lesions, flat lesions or suspicious should all be sent to path
  - recurrence rate 20-30%
  - Podofilox or Imiquimod topical - however not approved for anal canal
- Buschke-Loewenstein Lesion*: WLE w/ 1 cm margin

### ANAL CANCER DEVELOPMENT

HIV males at 38x risk v. general pop

### MOLLUSCUM CONTAGIOSUM

poxvirus family benign papular condition of skin

- sexual and nonsexual contact

Px: incubation 1-6 months

Sx: flesh colored umbilicated papules

Dx: clinical grounds

Rx: curettage, bovie, cryotherapy

- Podophyllotoxin and imiquimod (not FDA approved)

### HIV AND AIDS

- May have worse healing if low CD4 counts
- Impairs cell-mediated immunity by depletion of T-cells & Langerhan's
- allows propagation of oncogenic cells, like HPV to cancer

- Treat well compensated HIV+ patient as normal patient when making decisions for surgery

#### *Anal Ulcers in HIV+*

- often considered to be a fissure
  - Distinguished from fissure:
    - more proximal in anal canal (may be above dentate)
    - broader base
    - deeply ulcerating with destruction of sphincter planes
    - may demonstrate mucosal bridging
    - debilitating pain
  - cultures won't affect treatment
    - Acyclovir 800 tid & flagyl 500 tid x 2 weeks
    - intralesional steroid injxn – symptomatic relief
      - methylprednisolone 80-160 mg, in 1 cc in 0.25% bupivacaine
  - Treat Fistula patients if AIDS like in Crohn's
- Thrombosed hemorrhoids, treat like HIV- patients
- elective hemorrhoidectomy, up to debate
  - if significant symptoms, can consider
  - if well compensated, treat as HIV-

- thick purulent discharge from anal crypts highly suspicious for gonococcal proctitis
- Thayer-Martin plates for culture
- Rx: ceftriaxone, cefixime, quinolones, azithrom
- treat Chlamydia at same time (assume)

#### *Syphilis*

- Chancre first stage, pain, inguinal adenopathy
- resolves at 2-4 wks → secondary syphilis
  - maculopapular rash on torso and limbs
- test with VRDL and RPR
- Treat: penicillin G and/or doxy

### **CONDYLOMA ACUMINATUM**

- surgical excision recurrence rate: 9-46%
- send tissue for path to eval

#### Topical Therapies:

- *Trichloroacetic Acid*: caustic, burns wart. Place only on wart, blot to prevent burning adjacent skin or anal mucosa. Can cause skin necrosis, fistula in ano, and anal stenosis. Re-apply Q7-10 days. Recurs 25%.
- *Podophyllin*: apply to wart only; necroses treated tissue; similar complications as above. Can cause systemic problems if large dose used. Recurs up to 90%
- *Imiquimod*: stimulates cell mediated immunity to attack infected cells; apply and leave for 8 hours, then wash off. Apply 3 times a week for up to 16 weeks. Does not have risk of skin necrosis and breakdown as other two.

Langley et al: most effective therapy, first line with imiquimod, 2<sup>nd</sup> with fulguration for residual disease

### **HUMAN IMMUNODEFICIENCY VIRUS**

#### *Anal ulcer*

- etiologies: herpes, syphilis, CMV, Cryptococcus
- surgery for only refractory, non-healing ulcers – debridement, unroofing of ulcerative cavities, steroid injection

#### *Kaposi's Sarcoma:*

- lead to abd pain, GI bleed, malabsorption, obstruction
- treat with chemo
- surgery for complications

### **COMMON STDs**

#### *Herpes Simplex Virus (HSV):*

- small painful vesicles on perianal skin
- last 2 weeks, contagious when asymptomatic
- swabs from ulcers sent for viral cx and PCR
- Elsberg Syndrome: sacral radiculitis, constipation, urinary retention, parasthesias, and lower extremity weakness

#### *Chlamydia:*

- proctitis – rectal urgency, bleeding, pain; may lead to bloody diarrhea; PCR and Cultures
- Rx: doxy and azithro both work

#### *Gonorrhea:*

- proctitis, urethritis, cervicitis, pharyngitis
- incubation period 3 days to 2 weeks

## TRAUMA

### COLON INJURIES

Intraoperative Paracolic Hematoma:

- penetrating trauma: explored & colon evaluated
- blunt trauma: no routine exploration

### AAST Colon Injury Score

- Grade I: contusion/hematoma w/o devasc or partial thickness lac
- Grade II: Lac <50% circumference
- Grade III: Lac >50% circumference
- Grade IV: transection
- Grade V: Transection w/ segmental tissue loss
- Class I evidence for primary repair in all Grade I & II
  - Rates of complications:
    - Diversion: 21.7%
    - Primary Repair: 13.1%
  - THM –primary anastomosis in most instances.
    - even in “high risk groups” (shock, delay in op)
    - exceptions: severe colon edema & questionable blood supply

### Risk Factors for Abdominal Complications:

- overall rate in colon injury: 20%
- Left vs. Right Colon:* old theory left > right, but there is no evidence to support this. All evidence shows they heal equally
- Associated Abdominal Injuries:* current class I & II evidence supports primary repair or resection and anastomosis in patients with severe or multiple associated abdominal injuries
- Shock:* class I & II evidence that is not a risk factor nor a contraindication to primary repair
- Massive Blood Transfusion:* method of colon repair not associated with abdominal sepsis – can do primary
- Injury Severity Score:* ISS > 15 not associated as RF
- Fecal Contamination:* high risk for abdominal sepsis but should not affect the anastomosis – still recommend primary repair
- Specific Organ Injuries:* not a single organ associated with higher rate of leak – no organ should influence decision to do primary repair
- Time from Injury to Operation:* not identified as risk factor
- Retained Missile:* can be left in place, not a risk factor for problems later.
- Temporary Abdominal Wall Closure:* would advocate no ostomy since makes wound mgmt harder

### Anastomotic Leaks:

- overall 2-3% leak rate
- colocolostomies 9 (13%) > ileocolostomies (4%)
- enterocutaneous fecal fistulas most can be managed non-op and will heal spontaneously after perc drainage
- re-exploration should only be reserved for those with generalized peritonitis or failed perc drainage

### Technique of Colon Repair:

- GSW: debride edges first, primary repair
- destructive injury: resect to normal colon
- identical complication rate b/n stapled & hand-sewn
- rec fibrin glue and omental wrap but no evidence

### RECTAL INJURIES

- Eval with DRE and Rigid Procto

### AAST Rectal Injury Score

- Grade I: contusion/hematoma w/o devasc or partial thickness lac
- Grade II: Lac <50% circumference

- Grade III: Lac >50% circumference
- Grade IV: full thickness into perineum
- Grade V: devascularized

Intraperitoneal Injury: no evidence to say what to do – for now treat like left colon – repair it.

### Extraperitoneal Injury:

- 1) Fecal Diversion
- 2) ~~presacral diversion~~ – no evidence to support it
- 3) ~~distal rectal washout~~ – no evidence to support
- 4) repair of injury when possible

Associated Injuries: 77% of rectal injuries will have

- 30-40% bladder involved
- try to interpose omentum – 24% of patients develop rectovesicle fistula

### WOUND MANAGEMENT

- 11% wound infection rate
- recommend delayed closure at 3-5 days

### Antibiotic Coverage:

- no evidence for use over 24 hours
- recommended unasyn or zosyn

### Ostomy Complications:

- ~15% complication rate during takedown
- can close sooner than 3 months, some do same admission

### Rectal Foreign Bodies:

- operative intervention most likely if in sigmoid
- *Blow as Well as Pull:* Technique for foreign body removal – place a few foley catheters to go proximal, put in air (remove the suction), insufflate the balloons, and pull out the foleys (should release suction and pull the object out)

## ULCERATIVE COLITIS & PROCTITIS

### INDICATIONS FOR SURGERY

- Acute Flare refractory to medical therapy
- life-threatening complications
- medical intractability
- risk of malignancy: increase 1-2% after 8-10 yrs
  - 20% risk at 20 years
- disabling extracolonic disease
- growth retardation in children
  - rapid growth spurt often after surgery

### Emergency Versus Elective Procedures

#### *Elective Options:*

1. TPC and Brooke Ileostomy: optimal surgical approach
2. TPC and continent ileostomy:
3. TAC and IRA: 25% will require proctectomy eventually
4. TPC and IPAA: standard practice now

#### *Emergent Options:*

1. TAC with Brooke Ileostomy
2. Turnbull blow-hole – historical option
3. Proctectomy – not advised in emergency situation

#### *Technical Aspects of subtotal colectomy:*

1. mesenteric dissection at ICV should be flush with colon – preserves ileal branches of ileocolic vasc.
2. avoid mobilizing rectum in pelvis - go to promontory

### BROOKE ILEOSTOMY

#### If does not reach:

1. may select more proximal portion of ileum
2. loop-end ileostomy may be better

#### Current indications:

- elderly patients
- distal rectal CA
- severely compromised anal function
- patient choice after proper education

### CONTINENT ILEOSTOMY

- contraindicated in Crohn's Disease
- consider in patients that have failed Brooke
- relative contraindications: obesity, > 40 y.o.
- only for highly motivated, stable patients

#### Operative Technique

- run bowel to ensure no e/o CD
- terminal 45-60 cm of ileum
- aperistaltic reservoir via S-pouch
- 2 15-cm limbs of ileum sutured to form pouch
- distal mesentery taken of 15 cm distal limb
- intussusceptions secured with sutures and staples
- sutured flush with skin, can be lower than ostomy
- tube placed in early post op period, occluded for longer periods up to 10 hours when can be removed
- pouch intubated three times a day

#### Post op Complications

- nipple valve slippage (30% - MC), pouchitis (25%), obstruction (5%), fistula (10%)

#### Variant procedures: Barnett modification & T-Pouch

- no studies to prove they work better

### ILEORECTAL ANASTOMOSIS

Indications: indeterminate colitis, High-risk, elder patients, mild rectal disease

Contraindications: disease rectum, dysplasia, perianal disease, compromised anal sphincter

#### Post op Course:

- 2-4 BM's per day (vs 6-8 for IPAA)

#### - IRA in UC:

- Risk rectal CA: 6% - most between 15-20 yrs post
  - will need Q6 months flex sig w/ biopsies to survey
- recurrent inflammation in 20-45%
  - 25% will require proctectomy

### ILEAL POUCH-ANAL ANASTOMOSIS

- must have good sphincter function
- topical 5-ASA/Steroid enemas may help mucosectomy

#### Operative Technique - Technical Points:

- explore to rule out CD
- evidence to avoid ementectomy
- staple ileum flush with cecum
- preserve ileocolic artery and vein
- pouch limbs 15-25 cm each – decision based on reach
- if mucosectomy – 4 cm rectal cuff above dentate
- If pouch needs more length:
  - superficial incision on anterior and posterior aspects of small bowel mesentery along SMA
  - mobilize small bowel mesentery up to and anterior to the duodenum
  - selective division of mesenteric vessels to the apex of the pouch
  - S-Pouch: provides extra length, but ↑ morbidity
- Post op:
  - check pouch for leaks, fistulas, sinus tracts, strictures
  - check anal sphincter tone
  - kegel exercises to increase tone prior to reversal
  - contrast and endoscopy
  - close ostomy at 6-8 weeks post

#### Post op Complications:

- SBO: 20%
- Pelvic Sepsis: 5%
- IPAA Stricture: 5-38%
- Anastomotic dehiscence: 10%
- Pouch Vaginal Fistula: 3-16%
- Pouchitis 25%:
- Infertility: 26%

#### Pouchitis:

Sx: abdominal pain, fever, sudden increase in stool frequency;  
Chronic Pouchitis: suspect CD  
Rx: Cipro and Flagyl

### CONTROVERSIES

- 10% indeterminate colitis – work up & counsel
- Age should not be sole contraindication – elderly with LARs do well, so IPAA should be considered as well
- If stage IV CA avoid IPAA to not delay chemo-XRT
- Cecal CA in UC may prevent pouch due to oncologic Rsn

23-45% of patients w/ UC will need surgery

#### Acute Colitis:

In setting of acute colitis, rule out infectious source:

- C. Diff, Bacteria, Ova
- Flex sig/COY w/ bx to test for CMV
  - CMV treated with foscarnet or ganciclovir
- if hemorrhage, can be UC (10%), but consider CD
- 5-7 days of IV steroids, & then cyclosporine/Infliximab
- if refractory or no improvement over 48-72 hours – TAC

#### Toxic Colitis:

- Standard: TAC w/ End Ileostomy
- mucous fistula vs. Harmann's
- avoid pelvic dissection, transect at sacral promontory

## Screening for Cancer:

### Risk:

- 10 years: 2%
- 20 years: 8%
- 30 year: 18%

Surveillance: annual, 33 biopsies minimum (90% sensitivity), four quadrant every 10 cm

Proctocolectomy: carcinoma, nonadenoma-like dysplasia associated lesion or mass (DALM), high grade dysplasia

### Dysplasia risk to CA:

- High grade: 42%
- Low Grade: 19%

Strictures: ~25% malignant

- chronic, obstructing & right sided MC malignant

### TAC w/ End Ostomy

- 26% v. 52% rate of complication compared to IPAA

### Kock Pouch:

- 16.6% pouch failure rate
- 30% nipple valve slippage
- 25% rate of pouchitis

### Restorative TPC w/ IPAA:

*More difficult to reach in:*

1. male patient, narrow pelvis
2. long anal canal
3. obese patients
4. mucosectomy with handsewn anastomosis

*Difficult to reach – options:*

1. if obese, do TAC w/ EI and complete s/p weight loss
2. S-Pouch: 2 cm extra length (efferent limb problems)

*Technical Maneuvers to gain length:*

1. mobilization of posterior small bowel mesentery
2. expose inferior portion of the head of pancreas
3. score mesentery serially on posterior and anterior
4. Ligation of vessels b/n primary & secondary arcades
5. ligation of terminal branches of SMA (clamp for 10-15 minutes to determine if essential or not first)
6. if still inadequate, leave pouch in-situ in pelvis and return after several weeks

*Functional Outcomes of TPC w/ IPAA:*

- Fecal Incontinence: Mild 17%, Severe 3.7%
- Urge Incontinence: 7.3%
  - incontinence worsens over time (>12 years)
- Sexual Dysfunction: 26%
- SBO: 15-44%

*Pouch hemorrhage:* 3.8% - local irrigation w/ saline and adrenaline or transanal suture ligation

*Pelvic Sepsis:* 9.8%

*Anastomotic leak:* 7.1% from the pouch

- leak from tip of J MC and most difficult to treat, most need operative intervention

*Stricture:* 10%, more common w/ hand sewn – want at least DIP of index finger to be able to pass

- soft strictures: dilate serially
- hard strictures need pouch advancement/new pouch

*Pouch Vaginal Fistula:* 3-16%

*Pouchitis:* nonspecific inflammation of pouch mucosa

- overgrowth of anaerobic bacteria suspected
- Sx: abdominal cramps, tenderness, fever, increase stool, sometimes blood/mucus
- Dx: clinical or by scope
- Rx: Flagyl or Cipro

- probiotics for chronic refractory types

- consider CD if does not improve

### *Dysplasia/Malignancy:*

- rare – ASCRS does not currently recommend routine screening of pouches

### *Pouch Failure:*

- occurs within 12 months for 5-15%

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## CONTROVERSIES

### Pouch Design:

*S-Pouch:* efferent limb – overtime may elongate and cause obstruction

*H-Pouch:* long outlet tract associated w/ stasis, pouch distention, and pouchitis

### Mucosectomy vs. Double Stapled Techniques:

Stapled patients improved nocturnal continence and higher resting & squeeze pressures

Stapled leaves 1-2 cm diseased rectal mucosa – some recommend scoping to survey every 2 years

## URETERAL INJURIES

### URETHRAL INJURIES:

*Small injury:* repair with 3-0 or 4-0 synthetic absorbable on tapered needle; if prior XRT, consider tissue flap

#### *Post op urethral leaks:*

- identify w/ a RUG (water soluble contrast)
- if small and distal, can try conservative therapy (low rate of success) – foley for 4-6 weeks

#### *Stages of Urinary Fistulas:*

- Stage 1: low (< 4cm from verge, no XRT)
- Stage 2: High (> 4 cm from verge, no XRT)
- Stage 3: small (< 2 cm + XRT)
- Stage 4: Large (> 2 cm + XRT)
- Stage 5: Large – ischial decubitus fistula

Options for repair: place supra-pubic catheter in most

- Transanal-transphincteric approach
- York Mason with rectal advancement flap
- Perineal approach
- Gracillus or Rectus abdominus Flap

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## BLADDER INJURIES

### *Grades*

- Grade 1: contusion or partial thickness
- Grade 2: Extraperitoneal < 2 cm
- Grade 3: Extra > 2 cm or Intra < 2 cm
- Grade 4: Intra > 2 cm
- Grade 5: involving bladder neck or trigone

*Intraop Identification:* 2 layer closure, both running synthetic absorbables (can do 1 layer if lap)

- *posterior injury:* need to ensure ureteral orifices are not sacrificed, make anterior sagittal approach, give indigo carmine and verify. Close posterior under direct visualization and then anteriorly

*Poppy Seed Test:* a 1.25 ounce container of poppy seed is mixed into a 12-ounce beverage/6-ounce of yogurt and ingested by patient. Urine inspected for next 48 hours for poppy seeds. Sensitivity and specificity is 100%.

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## URETERAL INJURY

### Iatrogenic Injury MC locations:

- takeoff of the IMA
- pelvic brim
- b/w lateral rectal ligaments

### Anatomy:

- abdominal ureter has medial arterial supply
- pelvic ureter has lateral arterial supply
- “Kelly Sign” – peristalsis after gentle pressure

### Types of Injury:

*Laceration:* most repair with primary ureteroureterostomy w/ spatulated ends, ureteral stent and closed suction drainage at area of repair

*Ligation:* clamp or tie remove and then ureteral stent for up to one month. Repeat IVP at 3 months to ensure no stricture. If identified post op, may need percutaneous nephrostomy tube

*Devascularization:* decreased peristalsis, more common s/p XRT.

*Thermal:* present early with fistula/stricture; Repair depending on location.

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## LOCATION DPNDT REPAIR OF IATROGENIC URETERAL INJURY

### Basic Principles or ureteral repair:

- tension free
- well vascularized spatulated ends over a stent
- use 4-0 or 5-0 absorbable material
- place a closed drain near area of repair

### Proximal One Third:

- boundaries: ureteropelvic jxn (kidney) to pelvic brim

### Options:

1. primary repair if tension not an issue
  - consider nephropexy by mobilizing kidney caudad
2. if long segment – bowel/appendiceal interposition
3. autotransplantation at specialized centers

Middle One Third: ureteroureterostomy for repair

Distal One Third: ureteroneocystostomy

### Options:

1. primarily: for very distal injury
2. Psoas Hitch:
  - i. bladder mobilized by ligating contralateral superior vesicle pedicle (ensure contralateral ureter ok first).
  - ii. Anterior cystotomy – sew bladder to ipsilateral psoas muscle w/ several 0 vicryls
  - iii. avoid genitofemoral nerve with step 2
  - iv. tunnel ureter through the bladder with a clamp
  - v. spatulate the ends & sew circumferential w/ 4-0 vicryl
  - vi. place stent, drain and foley
3. Boari Flap: similar to above but with flap of anterior bladder
4. Transureteroureterostomy: tunnel in posterior peritoneum over lying the great vessels

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## RENAL INJURIES

90% can be salvaged

On table IVP: 2 ml of contrast per kg up to 150 ml IV max. Shoot KUB at 10 minutes. Should always confirm no function before removing

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## BLADDER DYSFUNCTION

Difficulties with Micturation:

- 15-25% s/p LAR, 50% s/p APR

MC GU complication: detrusor denervation & areflexia

*Detrusor Fxn:* parasympathetic, S2-S4,

*Relaxation of Bladder:* Sympathetic, L2-L4

## IDIOPATHIC PROCTITIS

### ISCHEMIC COLITIS

Younger patients – risk factors:

- collagen vascular diseases
- hematologic disorders
- long distance running\*
- cocaine abuse
- Many instances are self-limited
- Pain worse prognostic factor than melena

### COLLAGEN VASCULAR-ASSOCIATED COLITIS

- immune complex deposition in vascular walls → ischemia/thrombosis

### Polyarteritis Nodosa:

- systemic, necrotizing, small & medium arteries
- tends towards bifurcations & vessel branches
- Men, 40-60s
- many organs, non-specific abdominal pain
- mortality rate, when untreated – 50% in 1<sup>st</sup> 3 mo
- Rx: immunosuppression w/ corticosteroids
- *Churg-Strauss*: variant of PNA – eosinophilic infiltrate
- operate for abdominal catastrophes – diversion is key
- Arteriogram: sacular & fusiform aneurysms

### Cryoglobulinemia:

- *cryoglobulin*: immunoglobulin that undergo reversible precipitation at low temps
- associated w/ other disease, or idiopathic
- usually complicates other diseases
- GI problems rare but are ischemia & infarction

### Henoch-Schönlein Purpura

- tissue deposits of immunoglobulin A containing immune complexes
- GI pains, arthralgias/it is, purpura, glomerulonephritis
- GI bleeding in 40%
- Intramural hematomas, intussusceptions, infarction & perforation are possible sequelae

### Behçet's Syndrome

- chronic relapsing inflammatory, multisystem – widespread vasculitis small & large arteries & veins
- young Mediterranean & Japanese men; aggressive
- unknown path – genetic predisposition w/ environmental trigger
- GI involvement → poor prognosis; ileocecal MC
- ulceration from mouth to anus
- Similar to CD and UC, but no granuloma formation (as in CD)
- early surgery advocated to avoid catastrophe – divert

### Systemic Lupus Erythematosus

- systemic, autoimmune, microvascular inflammation & autoantibodies; antinuclear antibodies
- GI involvement – 50% mortality: ulcer/infarct, hem, perf
- arteriography & CT not sensitive tests
- diagnosis often only after pathology
- Rx: corticosteroids and cyclophosphamides

### Scleroderma

- multisystem, multistage, small arteries & conn. Tissue
- Women 20-40s
- GI symptoms may precede diagnosis by several years
- overproduction of collagen, increased humoral immunity, abnormal cellular immunity
- GI: Esophagus in 50%, SB/colon – chronic pseudoSBO

- Rx: prokinetics and antibiotics for bacterial overgrowth
- Somatostatin for severe diarrhea, when seen
- Fecal incontinence & severe constipation common

### Polymyositis:

- inflammatory muscle disease
- weakness, high levels of striated muscle enzymes, and e/p inflammatory myopathy
- symmetric muscle pain and weakness
- serum CK 5-50x normal – sensitive test
- Rx: steroids and immunosuppression
- GI symptoms – treat conservatively unless catastrophe

### MICROSCOPIC COLITIS

- 50:50 collagenous vs. lymphocytic cause
- lymphocytic diffuse
  - 10 lymphocytes per 100 epithelial cells
- collagenous patchy
  - collagen deposits in *subepithelial layer*
- Most women in their 60's
- all chronic diarrhea patients should have biopsies – random & multiple
- Rx: diet modifications; stop NSAIDs, and then in order:
  - loperamid & diphenoxylate/atropine symptomatic
  - bismuth 524 QID x8wks
  - Cholestyramine induces remission
  - Steroids
  - Immunosuppression
  - fecal diversion

### Eosinophilic Colitis:

- eosinophilic infiltration of tissues
- steroids for treatment
- surgery for complications

### Fungal Colitis

- HIV, immunocompromised, steroids
- Candida, Histoplasma, Cryptococcus
- Fever, abd pain, diarrhea
- scope diagnostic
- nystatin 500,000 – 1,000,000 QID or, if sicker
  - ketoconazole 200-400 mg daily (or amphotericin B IV)
- surgery for complications

### Histoplasmosis

- endemic in US Midwest
- in immunocompromised → ileocolitis → bleeding, ulcer stricture and perforation
- biopsy: intracellular budding yeast
- Ketoconazole (amphotericin B if fulminant)

### Cryptococcus

- affects CNS – via inhalation of contaminated soil
- GI in immunocompromised – colitis w/ perf
- biopsy: encapsulated budding yeasts (or stool cx)
- ketoconazole (amphotericin B in critically ill)

### BACTERIAL COLITIDES

- Watery diarrhea: supportive treatment
- *Dysentery*: bloody diarrhea, fever, abdominal pain – identify organism to give antibiotic

### Escherichia Coli

- five classes of E. Coli infection
  - (1) *Enteropathic*: severe diarrhea outbreaks in nurseries. Self-limited, supportive therapy. Cytotoxin in small bowel causes mucosal damage. Bactrim
  - (2) *Enterotoxigenic*: developing nations – *Traveler's diarrhea* – toxin produced does not damage mucosa but causes

secretory diarrhea; Supportive treatment only. Prophylaxis with Bismuth 2 tabs QID, but avoid this in kids.

- (3) *Enteroinvasive*: shigella-like; mucosal invasion; self-limited. Supportive, but if dysentery Rx w/ Bactrim
- (4) *Enterohemorrhagic*: cytotoxin produces serious dysentery; undercooked meat; supportive treatment, no antibiotic for this. May lead to Hemolytic Uremic syndrome – EHEC H7-0157
- (5) *Enteroggregative*: antibiotics may help

#### Shigella:

- *S. Sonnei* & *S. Flexneri* MC in US (2 others less common)
  - produce dysentery – resistant to low pH, replicate, & GNR toxin penetrates colonic epithelium
  - fecal-oral transmission
  - *S. Dysenteriae*: in developing nations, worse course
  - 10-100 BMs daily, last 4-7 days in most
  - elevated fecal WBCs & (+) stool cultures
  - COY: nonspecific friable, erythema, ulcerations, bleeding
  - rectosigmoid most affected, but severe can be total
  - Supportive if dysentery/immunocomp: Bactrim, Cipro, Ampicillin until stool cultures negative
  - complications: proctiditis, SBO, toxic megaC, perf

#### Salmonella

- GNR, two clinical conditions: GNB, facultative anaerobe
  - (1) *Typhoid Fever*: *S. Typhi* & *S. Paratyphi* – 3<sup>rd</sup> world
    - progressive, dysentery can lead to obstruction and perforation
  - (2) *S. Enteritidis*: in US – self-limited gastroenteritis during warm months; contaminated food products; watery diarrhea to dysentery – usually SB infxn; Stool cultures & rectal swabs. Supportive care alone good, but if severe, pregnant or other – Cipro/bactrim also.

#### Campylobacter

- GNR – MC cause of acute diarrhea in US
  - *C. Jejuni* MC
  - poor handling of chicken products;
  - TI & Cecum MC – watery diarrhea to dysentery
  - if mesenteric LAD may mimic Appy
  - lasts 1 week to 3 weeks (usually less)
  - Surgery rarely – supportive for most
  - if antibiotics: Erythromycin or Cipro

#### Yersinia

- GN coccobacillus – gastroenteritis
- 3 species: *Y. Pestis (plague)*, *Y. PseudoTB (rare in US)*, *Y. Enterocolitica*
  - poor food handling (pork), contaminated water
  - invades peyer's patches in TI
  - Symptoms 4-7 days p infection
  - can mimic Appy
  - Supportive therapy; critical Bactrim, cipro, tetras, amino

#### Tuberculosis

- immunocompromised
- via swallowing infected sputum or unpasteurized milk
- can cause ulcers, fistulas, stenosis, & masses – mimics Crohn's Dz (e.g. severe anal stenosis, fistulas ...)
- RLQ abdominal mass
- serology tests for intestinal disease 80% sensitive; stool culture less sensitive
- medical treatment for most – Isoniazid & Rifampin
  - some obstructions/fistulas resolve with medical Rx

#### Neisseria Gonorrhoea

- anal intercourse – oroanal spread
- often asymptomatic (50%) or may have anal discharge
  - purulent penile d/c & dysuria
  - rectal 5-7d s/p infxn → mucopurulent d/c
- stool-free culture swab on *Thayer Martin media*
  - smear shows GN diplococci (cx w/ cotton swab)
- Ceftriaxone IM x1 or PO cefexime, cipro, ofloxacin
- Treat Chlamydia at same time: doxy

#### Lymphogranuloma Venerum

- *C. Trachomatis* serovars L1, L2 & L3
- invades lymphatics – so lymphangitis w/ necrosis and abscess formation
- Primary: pustule/ulceration/erosion 3-30d s/p infxn
- Secondary: proctitis & inguinal LAD 3-6m later
  - resembles severe Crohn's proctitis
  - excruciating pain (worse than the rest)
  - if untreated, chronic problems from proctitis (stricture, fistulas)
  - Doxycycline 100 mg BID x 3 weeks

#### Syphilis

- *Treponema Pallidum* – anal receptive sex
- painless ulcer (chancr)
- darkfield examination, immunofluorescent stains
- Penicillin G 2.4 mill IM x1

#### Aeromonas

- related to host immunity status, age <2
- drinking untreated water
- watery stool, dysentery
- Quinolones, Bactrim, Tetras, Chloramphenicol
- endoscopy non-specific

#### Brucellosis

- *B. melitensis* – unpasteurized goat milk/cheese
- rare in US
- endoscopy: *protean* inflammation
- Doxycycline 100mg BID 3-6 weeks + Streptomycin 1 gm IM Q12-24h for 2 weeks

#### Actinomycosis

- *A. Israelii* – anaerobic GP
- fistula tracts with *sulfur granules*
- ileocolic infection MC, but can be anywhere
  - Rx: resection of ileocolic infection
  - high dose Pen G 2-6 weeks

#### MISCELLANEOUS COLITIDES

##### Diversion Colitis

- nonspecific inflammation of excluded colon
- deficiency of short chain fatty acids
- asymptomatic disease – no treatment
- sympstomatic: irrigation w/ SCFA x 2-4 wks
  - steroid or 5-ASA enemas can also work

##### Neutropenic Enterocolitis

- predilection for TI & cecum;
- bowel rest, IV fluids, antibiotics, TPN
- surgery for perforation/peritonitis

##### Disinfectant Colitis

- from the disinfecting solutions to clean endoscopes
- *pseudolipomatosis* - lesions on bowel
- 24-48 hours later – abd pain, bloody diarrhea
- self-limited
- diligent rinsing of scope w/ forced air drying

##### Corrosive Colitis

- glutaraldehyd & formalin
- formalin enema to treat radiation proctitis

- pain, mucous diarrhea, rectal bleeding 48h post
- supportive treatment

#### NSAID and Salicylate-Induced Colitis

- discontinue 5-ASA and steroid medications

#### Toxic Epidermal Necrolysis

- AKA *Steven Johnson Syndrome*
- severe mucocutaneous exfoliative diseases; high mortality rate
- immune complex mediated
- Diffuse ulceration anywhere w/in the mucosal surface of the GI tract
- operate for perfs etc only

#### VIRAL COLITIS

##### CMV Colitis

- MC Viral cause of diarrhea, in culture (-) stool
- HIV w/ low CD4 counts
- abd pain to diarrhea to dysentery
- can lead to Toxic megacolon or perforation
- supportive treatment w/ retrovirals
- Dx: biopsy shows viral cytopathic effect in tissue\*
- if you operate: Subtotal w/ end ileostomy (not segmental resections)

##### Herpes Simplex Colitis

- proctitis MC
- virus isolated in culture
- oral acyclovir
- rare perforations

#### PARASITIC COLITIS

##### Amebiasis

- *Entameba Histolytica*
- ingestion of cysts in food or water → invades intestinal mucosa
- many are asymptomatic
- symptomatic: abd pain, diarrhea, dysentery
- Dx: ELISA
- Rx: Flagyl + iodoquinol/paramomycin

##### Balantidiasis

- *Balantidium Coli* - tropical & subtropical regions
- pig is carriage organism – cysts in water & food
- dysentery
- Dx: trophozoites excreted in stool
- Rx: Tetracycline 500 mg QID x10days

##### Cryptosporidiosis

- HIV and immunocompromised patients
- voluminous watery diarrhea
- Dx: oocytes on fecal smears or colon biopsies
- Rx: Spiramycin & paramomycin

##### Giardiasis

- *Giardia Lamblia*; hikers and bikers – mountain lakes; adults caring for babies in diapers
- malabsorption
- Dx: trophozoites in stool or Giardia ELISA
  - negative stool exam not confirmatory
- Rx: Flagyl

##### Trypanosomiasis

- *Trypanosoma Cruzi* – Chagas' Disease
- Central America; Reduviid bug bite
- GI motility disorders and CHF
- Nifurtimox and benznidazole for acute phase
- Surgery for chronic: megacolon, constipation (severe)
  - Duhamel retrorectal abdominotransanal pull through
  - left hemi w/ colorectal anastomosis

##### Ascariasis

- large round worm *Ascaris Lumbricoides*
- ingest eggs – migrate from GI to portal to lungs, then coughed up and swallowed
- crampy abdominal pain, large worm load → SBO
- Dx: eggs in stool
- Rx: mebendazole/levamisole
  - surgery for perforation or unrelenting obstruction

##### Schistosomiasis

- fresh water, snail host
- *S. Japonicum*: SMV
  - associated with cancer
- *S. Mansoni*: IMV
- *S. Hematobium*: bladder, rectum, pelvic organs

##### Strongyloidiasis

- *S. Stercoralis* – nematode, soil-dwelling, rural southeast US; infects upper small intestine
- Sx: diarrhea, microcytic anemia
- Dx: stool aspirate *Stercoralis* larvae on wet mount
- Rx: Oral Thiabendazole 25 mg/kg Bid x 3 months

##### Trichuriasis

- Whipworm
- dysentery, TI and cecum MC infected
- barrel shaped eggs of *T. Trichiura* during stool exam
- Mebendazole 100 mg BID x3 days

##### Anisakiasis

- murine nematode in raw fish
- found in herin, mackerel, salmon, cod, halibut, sardine, squid
- invasion 1-5 days into stomach – abdominal pain
- mostly supportive therapy
- endoscopic removal provides cure

##### Tapeworm

- finding of ova in feces, undercooked meat
- *Diphyllobothrium Latum*: fish, B<sub>12</sub> deficiency
- *Taenia Solium*: pork, neurologic symptoms
- *T. Saginata*: beef,
- Rx for all: Niclosamid or praziquantel

##### AIDS Diarrhea

- Tests: 3 stool samples & Colonoscopy w/ random bx's
- send stool for: fecal leukocytes, ova, parasites, acid fast bacteria, C. Diff, bacteria and fat stains

##### RADIATION-INDUCATED BOWEL INJURY

- Biphasic injury – acute and delayed
  - (1) Acute Injury: mucosal injury – mucositis, cramps, diarrhea; supportive treatment mostly
  - (2) Delayed injury: progressive obliterative arteritis & submucosal fibrosis → chronic ischemia of bowel
    - Proctitis: 4% formalin, ABG, Nd:YAG, Hyperbaric O<sub>2</sub>
    - fistulizing: conservative measures
- Radiation tolerances:
  - 4500 cGy: 1-5% rate 5-year complications
  - 6500 cGy: 25-50%: rate 5-year
  - Rectum: 5500, 8000 for same rates

##### C. DIFFICILE COLITIS

Dx: stool culture, ELISA

Rx: vanco, flagyl, bacitracin

Surgery:

1. subtotal colectomy w/ end ileostomy
2. end ileostomy w/ mucous fistula

##### ISCHEMIC COLITIS

## MESENTERIC ISCHEMIA

### HISTORY:

Risk Factors: Valvular Disease, CAD, Hypercoag, Arrythmias  
Classic: Abrupt onset abd pain, diarrhea, hematochezia  
Recent Surgery (AAA, bypass)  
Recent MI (embolus)  
Classic Triad: Faver, abd pain, heme+ stools  
Abrupt onset: pain, diarrhea, hematochezia

### Physical Exam:

Toxic Appearance, Shock, Acidosis, Leukocytosis  
Pain out of proportion to physical exam: Acute thrombus  
Feed Fear in hx: Thrombus more likely  
Heme + stools, gross blood  
A. Fib

### Diagnostic Tests

Full labs, EKG, Abd X ray  
CT Angio  
Colonoscopy: mucosal edema, submucosal hemorrhage,  
mucosal ulcerations, bluish-black discoloration, nonviable  
black mucosa, skip areas

### Surgical Treatment:

- (1) Decide if this is acute small bowel or colonic
- (2) Initially:
  - volume support, ICU, O2, bowel rest, NGT, foley
  - serial labs/exams
  - heparinize (if appropriate)
  - possible abx, if appropriate
- (3) If improves – colonoscopy in 6 – 8 weeks to evaluate, may have stricture
- (4) If becomes toxic or peritoneal signs prepare for OR

#### In OR:

Control Contamination

Palpation of Celiac, SMA, IMA Pulses

#### *Intra-op Assessment of Viability of Bowel:*

1. wrap with warm towel see if pinks up
2. Doppler mesenteric border
3. Fluorescein Dye Injxn (1 gm) & Wood's Lamp – bowel would light up

#### *Bowel Resection?*

- Dusky: leave and wait for 2<sup>nd</sup> look
- Black → Rsn
- No anastomosis
  - Left Colon: Colostomy w/ mucous/Hart's
  - Right Colon: Ileostomy and Mucous Fistula

Do 2<sup>nd</sup> look op on most

- (5) Small Bowel Ischemia

Expose SMA: Pull up T-Colon Mesocolon → Look for Lig of Treitz, cut medially and follow MCA → SMA

*SMA Embolus:* 3 – 8 from SMA origin, embolectomy through transverse arteriotomy

- send embolus to path – eval for myxoma
- Fogarty catheter proximal & distal until good flow x2
- echo post op
- 2<sup>nd</sup> look within 24 hours

#### *SMA Thrombosis*

- MCC atherosclerosis → needs endarterectomy
- Thrombus @ origin of SMA
- if stable, no peritoneal signs, PTA &/or stents w/ selective tPA, if worsens OR
- If poor, SVG b/n infrarenal aorta and SMA
- Heparin post op

### *NOMI:*

- stabilize patient
- optimize C.O

### *Mesenteric Venous Thrombosis:*

- optimize, heparin gtt, OR only for dead bowel

## LARGE BOWEL OBSTRUCTION

### Differential:

- Obstructing Cancer
- Diverticular stricture
- Ischemic Stricture
- Volvulus
- Ogilvie's
- Prior Surgical Hx

### Physical:

- Abdominal and Rectal Exams
- Heme Occult
- Procto (unless peritoneal signs)

### Management Plan:

#### *No Peritoneal Signs, Stable*

- Gastrografin Enema or CT Scan
- NGT/Foley/IVF/NPO/Serial Exams

#### *Signs of Peritonitis*

- (1) Right Heme if T-colon or proximal obstructing lesion
- (2) Left Hemi with Colostomy & Hartmann's/Mucous
- (3) Subtotal if: Left Sided Lesion with Right sided Perforation and patient is sick
- (4) Defunctioning Stoma if obstructing mass on left that can't remove

### Common Algorithm

- (1) Acute Abdominal Series – Free Air? Dist?
- (2) Proctoscopy: Rectal mass vs. Volvulus
- (3) If think:
  - Diverticulitis: CT A/P
  - Cancer/Volv/Ogilvie's: Colonoscopy 1<sup>st</sup>, then CT if needed

### Ogilvie's Pseudo-obstruction

#### *Treatment:*

- (1) rule out mechanical obstruction – no rectal mass
  - air in rectum?
- (2) IVF, Replace all lytes to normal
- (3) Stop Narcotic Meds
- (4) NGT & Rectal Tube
- (5) Neostigmine 2.5 mg IV – have atropine available, and monitor
- (6) Colonoscopic Decompression
- (7) OR – Cecostomy vs. Right Hemi with Hartmann's

## RIGHT LOWER QUADRANT PAIN

### History:

Character of Pain  
GI/GU Symptoms  
Previous Surgery  
Appetite  
Menstrual History  
FHx IBD  
STD Hx

### Physical Exam:

Abdominal Exam  
Rectal Exam  
Pelvic Exam – CMT? Adnexal mass?  
Look for Hernia

### Data

Full Panel Labs, U/A  
Abdominal Films  
CT Scan  
Transvag u/s (?)

### Surgical Treatment:

#### (1) Appendicitis

- if base necrotic: partial cecectomy
- if abscess: perc drain, interval appy
- Carcinoid: right hemi if:
  - > 1.5 cm, at base, serosal involvement, or LN+

#### (2) Ectopic Pregnancy:

- unruptured → salpingotomy, evacuate contents, repair tube w/ vicryls
- Ruptures: salpingectomy (preserve ovary) if not stable; o/w do as above

#### (3) TuboOvarian Abscess (TOA)

- Sx: Fevers, chills, + risk factors
- Appendectomy
- Lavage, Drain, Abx (doxy + ceftriaxone)
- Salpingo-oophorectomy if necrotic
- Can treat with abx only if is just PID

#### (4) Meckel's – persistent vitelline Duct

- if negative appy, be sure to evaluate 2 feet of terminal ileum
- Wedge resection of diverticulum, if inflamed, segmental
- always do appy, before closing
- Incidental remove if: suspect gastric mucosa, or narrow neck, or base involved. Wedge only if normal, o/w segmental always

#### (5) Terminal Ileitis:

- Yersinia, campylobacter, Salmonella
- LN's enlarged
- Do appy if base free of disease
- Treat medically with Azulfidine, Prednisone, Falgyl
- Surgery only for complications

#### (6) Solid Ovarian Mass

- PostMeno: resect with full staging of ovarian CA – washing, biopsies, omentectomy, para-aortic LN sampling, TAH/BSO – consent
- PreMeno: washing, biopsies, *frozen section*,
- do not remove the ovary

#### (7) Cystic Ovarian Mass

- Post Meno: ovarian cancer staging procedure
- Pre Meno: treat as “6b” above if > 5cm, otherwise u/s follow up with gyn

## **SIRS – SYSTEMIC INFLAMMATORY RESPONSE SYNDROME**

2 or more of the following:

1. tachycardia
2. tachypnea
3. fever
4. leukocytosis

### **Wound infections:**

Risks for wound infection:

1. lowest risk: <1%
2. High Risk: 27% risk

### ***Nichol's Antibiotic Bowel Prep:***

- VA study demonstrated 43 – 9% improvement in SSI
- however w/ new antibiotics, difference not as clear
- Recent RCT found no benefit w/ good IV abx

### **Mechanical Bowel Preparation:**

- 2004 meta: 5 RCTS – did not improve rate of SSIs
- Cochrane review concordant studies
- however concern that higher rate of abscesses
- for now, recommend selective use

### **Wound Protector:**

- RCT by Nystrom – no difference in SSI w/ or w/o

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## INTRA-ABDOMINAL INFECTIONS

Kumar et al: 55% of abscesses can be treated with abx alone

- abscess likely to need perc drainage:
  - if > 6.5 cm
  - TMAX > 101.2
- failed patients drained w/in 49-72 hours

### **Perc drainage outcomes:**

- more likely to fail if abscess < 5 cm or abx started post drainage
- 70% success first time, 12% more on second attempt
- 16% failure rate overall

## **Pelvic Sepsis**

Factors related to increased risk of pelvic leak:

1. anastomosis < 6 cm from anal verge
2. Hx of XRT
3. adverse intraoperative events
4. male sex

Overall reported leak rate: 12%

### EEA INSERTION – DISTAL LINEAR STAPLE LINE DISRUPTED:

1. get visualization of distal staple line w/ retractors
2. Pathways:
  - A: Can visualize and can regrasp w/ clamps & traction sutures –
    1. if adequate length for it – reclose w/ linear stapler
    2. if inadequate length: reclose w/ sutures transabdominal or transanal
  - B: Distal segment impossible to visualize and reclose:
    1. Mucosectomy with hand sewn ileo-/colo-anal anastomosis
3. For Most – consider diverting loop ileostomy

### **PREOPERATIVE DISCUSSION AND PLANNING:**

- consider diversion if: chemo/XRT, malnourished, infection, comorbidities
- stoma siting

### **OPERATIVE PRINCIPLES:**

#### Principles of intestinal anastomosis:

1. appropriate access & exposure of two ends of bowel
2. healthy bowel to be joined
3. good blood supply
4. gentle handling of the bowel
5. good apposition with no tension

### **BOWEL PREPARATION**

- Cochrane review of 5 randomized trials showed equal or better morbidity or mortality in 576 patients with prep and 583 patients without prep
- regardless, prevent spillage with traction sutures, umbilical tapes or non-crushing clamps

### **BOWEL STATUS**

- only *absolute* contraindication is ischemia
- *Relative*: obstructed, irradiated, inflamed, no prep
- Signs of good blood supply: pink, parastalsis, pulsatile bleeding from the cut edge

### **EXPOSURE**

- don't compromise case by limited exposure
- lithotomy: protect peroneal nerves and hips
- bookwalter: protect femoral vessels/nerves and iliac crests

### **OBTAINING ADEQUATE LENGTH**

- difficult length most common in left sided colon – additional left colon length with following maneuvers:
  1. Division of lateral colonic attachments (White Line)
  2. Division of splenic flexure
  3. Division of IMA at its aortic takeoff
  4. Division of IMV at inferior border of pancreas
  5. Division of distal branches of middle colic artery & veins – may compromise blood supply
  6. if fails, may need to use Transverse Colon or hepatic flexure:
    - a. open a window in the ileal mesentery medial to the ileocolic artery and vein. Proximal T-colon through this window to reach the pelvis, or
    - b. completely mobilize the right colon and derotate it to the right – cecal tip towards liver, reverses direction of the colon and allows hepatic flexure to reach pelvis
      - remove the appendix!

### **ANASTOMOTIC TECHNIQUE**

#### Reducing rectovaginal fistula:

1. adequate dissection of rectum of vagina
2. careful visualization during mosis creation
3. intravaginal palpation of posterior wall before mosis

#### Can't pass stapler past the anus:

- Faensler or Chelsey-Eaton anoscope for gradual controlled dilatation and pass stapler shaft through scope

#### Misfire & can't remove anvil:

- redo anastomosis

#### Side-to-side vs. End-to-End

- meta-analysis b/n 1992 – 2005 comparing the two in Crohn's disease: side-to-side led to fewer leaks, less complications, shorter hospital stays and lower recurrence rates at mosis

### Doughnuts

- complete dough-nuts do not mean good anastomosis
- incomplete dough-nuts do not mean bad anastomosis

### **CHALLENGES**

#### Inadequate anastomotic lumen:

- side-to-side reduces this
- if anvil comes out, or proctoscope passes should be ok

#### Leakage:

- can fix small gaps with sutures
- resect and redo
- redo pursestring around defective lumen, pass the anvil, close the pursestring sutures and then repass the anvil and re-fire
- repair transanally if very low

#### Anastomotic Hemorrhage:

- cautery of the bleeding vessels
- placement of sutures at the site of bleeding
- digital compression
- intraluminal instillation of an epinephrine solution (1:100,000 or 1:200,000 u/mL)
- submucosal injection of epinephrine solution

#### Proximal Protection:

- will not prevent leak but prevents septic morbidity
- if need complete diversion, consider Prasad type of end loop stoma
- Colostomy vs ileostomy: colostomy larger stoma, output odorous, more difficult to achieve length for diversion

#### Adjuvants and Drains:

- wrap anastomosis with omentum (no evidence)
- foreign material shown to be harmful
- lambert sutures
- Drain: no proof in studies, however many still do

## **OTHER INTRAOPERATIVE CHALLENGES**

### **HERBALS THAT INCREASE BLEEDING TIME:**

- garlic, ginkgo, ginseng, capsaicin, fish oil, ginger & VitE
- stop all 1 week before surgery

### **PELVIC BLEEDING:**

1. Alert Anesthesia
2. Pack it off and get ready: long instruments, exposure, anesthesia ready, suction...
3. Suture ligation is best option
4. clip appliers sometimes helpful
  - A. Pelvic Sidewall: vein branches of internal iliacs – suture ligation is best option.
  - B. Presacral: avascular veins that communicate with the internal vertebral venous system through the basivertebral vein – veins will retract and be unreachable
    - packing more likely to work, can pack and wait over ten minutes – should be effective
    - put cautery on 60-80 watts
    - clips/suture ligation
    - titanium thumb tacks, some times multiple tacks
    - topical agents
    - if all else fails – tightly pack pelvis and go to ICU – and return in 24-36 hours – most will have stopped at this point
    - anastomosis obviously will be delayed

### **INTRAOPERATIVE BLEEDING:**

- Lap Case: have surgical clips and Endoloops available
  - always keep proximal control
- Spleen: electrocautery first line,
  - if brisk and cautery fails then pack it off
    - alert anesthesia
    - topical hemostatic agents
    - Argon Beam coagulator
    - still fails, mobilize spleen into abdomen
    - splenectomy: 5% life time risk of OPSI
    - preservation: partial splenectomy, mattress suture repair, mesh wrap

## **DAMAGE CONTROL**

Goals: stop hemorrhage, curtail contamination, remove debris and necrotic tissue

- reconstruction deferred to after correction of metabolic derangements, hypothermia, & coagulopathy

### **Selection Criteria:**

1. inability to achieve hemostasis due to coagulopathy
2. inaccessible major venous injury
3. associated life-threatening injury in 2<sup>nd</sup> location
4. planned reassessment in 24-72 hours
5. inability to close or concern of compartment syndrome

Abdominal Compartment syndrome: intrabdominal, gastric or IVC measurements; concern when >20 mmHg

## **ADHESIVE DISEASE**

### **4 Grades of Adhesions:**

1. thin filmy adhesions
2. can be divided by blunt dissection
3. dense, require sharp division
4. dense, division very high risk/resultant in bowel injury

### **Dense adhesions:**

- extraperitoneal dissection
- small piece of bowel wall may be left behind; desiccate mucosa with cautery. It's ok to leave it in-situ if protecting another structure (e.g. ureter)
- contiguous with cancer – remove with the cancer: treat it like an extension of the cancer.

## **LESION LOCALIZATION**

- preop tattoo 3-4 quadrants adjacent and distal to tumor
- other options:
  - endoscopic clips and plain film on OR table
  - Barium Enema or CT colography
  - rigid proctoscope all patients preop

What to do when localization attempts have failed:

1. blind resection not advised unless confidently guided by preop imaging
2. mobilize flexures, remove omentum off T-colon: Tattoo may be hidden and now revealed
3. If Lap, consider adding hand assist to palpate
4. Intraop colonoscopy (CO<sub>2</sub> insufflation helps)
5. Open ALL specimens after resection to confirm

## **ABDOMINAL WALL CLOSURE**

- Acute wound failure in 1.2%, most between days 6-9 post op. Tearing through fascia sited as MC cause
- Incisional hernia rate: 9-19%

### **Technique:**

- well studied: mass closure better than layered closure: decreases risk of tearing through fascia
- Peritoneum heals by regeneration of the layer over the entire defect, and not in incremental advancement from the wound edge
- Randomized studies: no difference between peritoneal closure and not closure – authors do not advocate it
- Meta-analysis, and experimental controls: continuous suture line superior to interrupted: less knots to slip, distributes the tension better.
- Fascia: has a zone of collagenolysis & matrix degradation that extends 0.75 cm from each wound edge; & fascia strength decreases 50% during 1<sup>st</sup> 48 hours after closure: so 1 cm deep minimum w/ 1 cm intervals

## **SUTURE MATERIAL**

- PDS & Maxon (slowly resorbed) stronger than ethilon and prolene (nonresorbable)
- a continuous, mass closure using slowly-resorbable monofilament suture with a 1 cm bite and 1 cm interval is best technique

### **Retention Sutures:**

- many risk factors: EC fistula, wound necrosis, ...
- use in very high risk wounds
- do not use for those at risk for Abd. Comp. Synd.

## **MESHES**

Synthetic: risk of EC fistula and erosion 23%

- try not to use these

### **Biologic Meshes:**

- Alloderm: acellular dermal matrix
- Permacol: intact porcine dermal collagen
- Collamend: cross-linked acellular porcine dermal collagen and its elastin fibers
- Allomax: human dermal collagen
- Stratattice: acellular dermal matrix derived from porcine skin

## POSTOPERATIVE ANASTOMOTIC COMPLICATIONS

### GENERAL CONSIDERATIONS

- Leak rate if w/in 7 cm from anal verge: 10%
- overzealous stripping of bowel can lead to ischemia – only strip mesentery and epipoic appendages enough for anastomosis
- Taking IMA vs. sigmoidal (i.e. preserving left colic artery): has not been shown to decrease anastomotic failure rate
- diverticulum should not be in staple line – options:
  - suture it closer onto the anvil so its resected
  - resect more bowel
- if doughnuts are not whole but leak test is ok: NO increased risk of leak
- if have a leak on leak test, you fix it and no longer air leak: NO increased risk of leak
- Factors that increase leak rate: TME, distance from anal verge, male gender, prolonged OR time

### PROXIMAL DIVERSION

- Large Prospective trial in Sweden – 234 patients
- diverted (DI) vs. Not Diverted (ND) in < 7 cm Rsnx's
  - Clinical Leak Rates: 10.3% (DI) vs. 28% (ND)
  - Urgent reop: 8.6% vs. 25.4%

### MECHANICAL BOWEL PREPARATION

- Cochrane review of 1,592 patients found no difference in leak rate between two for colonic or for low rectal
  - when combined two populations together: mech bowel prep significantly higher rate of leak
- leak rates: Colonic 1.6-2.9%; LAR 7.5-9.8%

### ANASTOMOTIC TECHNIQUE

- Cochrane review of 9 randomized controlled trials of 1,233 patients stapled vs. handsewn: no difference for clinical (~7%) or radiologic leaks (~7%)
- side-to-side, Baker's, colonic J: no difference in leak
- anvil size: no difference in leak rate
- Omental Pedicle: no difference, surgeon preference

### RADIATION

- Dutch TME Trial: 1,414 rectal cancer patients – neoadjuvant XRT vs. straight to OR: no difference in leak rate (11% vs. 12%)
- Swedish Rectal Cancer Trial: 1,168 patients – preopXRT vs. straight to OR: no difference
- “the notion that neoXRT increases risk of leak is not supported by the majority of the literature ... likely due to high risk of TME dissection, not XRT itself.”

### PELVIC DRAINS

- Dutch TME trial retrospectively reviewed with regression analysis – selection bias by the surgeons when to use drains: drained vs. nondrained leaks: 9.6% vs. 23.5%
  - reop 97% if not drained vs. 74% if drained
- Cochrane review of 1,140 patients: no difference in leak rate and complications drained vs. not drained

### MANAGEMENT OF LEAKS

#### Asymptomatic:

- usually low pelvic anastomoses, short, simple sinus tracts originating from the anastomosis
- no intervention, no clinical consequence, should heal spontaneously

#### Leak without Abscess:

- stable, mild symptoms, focal ttp: bowel rest, IVF, Abx
- Consider TPN

#### Leak with Associated Abscess:

- 1<sup>st</sup> – drain & antibiotics
- re-op if fail or inaccessible abscess

#### Peritonitis:

- reop, antibiotics, fluids
- peritoneal fluid cultures will be polymicrobial – likely not a benefit in treatment

#### Colocutaneous Fistula:

- CT to eval for undrained collection

- Rule out: distal obstruction, anastomotic stricture, radiation strictures
- most close, may need bowel rest

### OPERATIVE INTERVENTION

#### Resection of leaking anastomosis & colostomy creation:

- Standard: Rsnx of leak, end colostomy & Hartmann's
- if rectum very difficult to control – exteriorize as mucous fistula
- wash out and drain
- high rate of permanent ostomy – no closure

#### Leaving the leaking anastomosis in place:

- abdominal washout, loop stoma diversion and drainage of the leak
- higher rate of stoma reversal
- literature supports this plan

#### Repeat Anastomosis after resection of leak:

- certain situations, redo w/ or w/o diversion
- most often only ok with ileocolic anastomoses
- less likely to work with colorectal anastomoses

#### Exteriorization of leaking anastomosis:

- bring out leak as a stoma
- most won't be able to reach to do this
- stoma could be very difficult to manage

### SHORT AND LONG TERM IMPLICATIONS OF LEAK

- 30-day mortality w/ leak: 10-15% (some report 36%)
- MC cause of death after colectomy: leak
- rectal compliance shown to decrease after leak
- leak increases risk of not receiving or significantly delaying adjuvant chemo
- Multicenter Scottish study of 2,235 pts: decreased 5 year overall survival (42% v. 55%) if leak
  - 5-year cancer-specific survival rate (50% vs. 68%)

### ANASTOMOTIC STRICTURE

- estimated in 10% in general
- majority short segment, less than 1 cm in length
- Risks: leak, post op pelvic infxn, proximal diversion
- 2 meta-analysis: stapled higher stricture rate than hand-sewn
- Late strictures: recurrent CA, IBD, or XRT injury – investigate late strictures to ensure not CA

#### Treatment:

- asymptomatic: no treatment, leave alone
- endoluminal dilating techniques, usually at least 4-6 weeks post op
- very low, can be with finger, or sequential dilators
- TTS (through the scope) hydrostatic balloon dilators
  - dilate to > 20 mm
  - triamcinolone injxn (long acting steroid) or cautery/laser release of scar – no increased risk of complication but decreased recurrence
- for low refractory stricture – consider mucosectomy and pull through type procedure rather than abdominal

## UROLOGIC COMPLICATIONS OF COLORECTAL SURGERY

### URETHRAL INJURIES:

*Small injury:* repair with 3-0 or 4-0 synthetic absorbable on tapered needle; if prior XRT, consider tissue flap

### *Post op urethral leaks:*

- identify w/ a RUG (water soluble contrast)
- if small and distal, can try conservative therapy (low rate of success) – foley for 4-6 weeks

### *Stages of Urinary Fistulas:*

- Stage 1: low (< 4cm from verge, no XRT)
- Stage 2: High (> 4 cm from verge, no XRT)
- Stage 3: small (< 2 cm + XRT)
- Stage 4: Large (> 2 cm + XRT)
- Stage 5: Large – ischial decubitus fistula

Options for repair: place supra-pubic catheter in most

- Transanal-transphincteric approach
- York Mason with rectal advancement flap
- Perineal approach
- Gracillus or Rectus abdominus Flap

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## BLADDER INJURIES

### *Grades*

- Grade 1: contusion or partial thickness
- Grade 2: Extraperitoneal < 2 cm
- Grade 3: Extra > 2 cm or Intra < 2 cm
- Grade 4: Intra > 2 cm
- Grade 5: involving bladder neck or trigone

*Intraop Identification:* 2 layer closure, both running synthetic absorbables (can do 1 layer if lap)

- *posterior injury:* need to ensure ureteral orifices are not sacrificed, make anterior sagittal approach, give indigo carmine and verify. Close posterior under direct visualization and then anteriorly

*Poppy Seed Test:* a 1.25 ounce container of poppy seed is mixed into a 12-ounce beverage/6-ounce of yogurt and ingested by patient. Urine inspected for next 48 hours for poppy seeds. Sensitivity and specificity is 100%.

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## URETERAL INJURY

### Iatrogenic Injury MC locations:

- takeoff of the IMA
- pelvic brim
- b/w lateral rectal ligaments

### Anatomy:

- abdominal ureter has medial arterial supply
- pelvic ureter has lateral arterial supply
- “Kelly Sign” – peristalsis after gentle pressure

### Types of Injury:

*Laceration:* most repair with primary ureteroureterostomy w/ spatulated ends, ureteral stent and closed suction drainage at area of repair

*Ligation:* clamp or tie remove and then ureteral stent for up to one month. Repeat IVP at 3 months to ensure no stricture. If identified post op, may need percutaneous nephrostomy tube

*Devascularization:* decreased peristalsis, more common s/p XRT.

*Thermal:* present early with fistula/stricture; Repair depending on location.

### Basic Principles or ureteral repair:

- tension free
- well vascularized spatulated ends over a stent
- use 4-0 or 5-0 absorbable material
- place a closed drain near area of repair

### Proximal One Third:

- boundaries: ureteropelvic jxn (kidney) to pelvic brim

### *Options:*

1. primary repair if tension not an issue
  - consider nephropexy by mobilizing kidney caudad
2. if long segment – bowel/appendiceal interposition
3. autotransplantation at specialized centers

Middle One Third: ureteroureterostomy for repair

Distal One Third: ureteroneocystostomy

### *Options:*

1. primarily: for very distal injury
2. Psoas Hitch:
  - i. bladder mobilized by ligating contralateral superior vesicle pedicle (ensure contralateral ureter ok first).
  - ii. Anterior cystotomy – sew bladder to ipsilateral psoas muscle w/ several 0 vicryls
  - iii. avoid genitofemoral nerve with step 2
  - iv. tunnel ureter through the bladder with a clamp
  - v. spatulate the ends & sew circumferential w/ 4-0 vicryl
  - vi. place stent, drain and foley
3. Boari Flap: similar to above but with flap of anterior bladder
4. Transureteroureterostomy: tunnel in posterior peritoneum over lying the great vessels

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## RENAL INJURIES

90% can be salvaged

On table IVP: 2 ml of contrast per kg up to 150 ml IV max. Shoot KUB at 10 minutes. Should always confirm no function before removing

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## BLADDER DYSFUNCTION

### Difficulties with Micturation:

- 15-25% s/p LAR, 50% s/p APR

MC GU complication: detrusor denervation & areflexia

*Detrusor Fxn:* parasympathetic, S2-S4,

*Relaxation of Bladder:* Sympathetic, L2-L4