Objectives

- Review pertinent anatomy
- Review workup for suspected rectal cancer
- Discuss neo-adjuvant/adjuvant therapy
- Discuss operative therapy
- Discuss pertinent clinical questions
Oral Boards

• A 55 yo female is sent to your office for rectal bleeding

• A 65 yo male is found to have a mass in his rectum on CTA for AAA surveillance

• A 62 yo male has been found to have an obstructing rectal mass one month after cardiac stents placed
Epidemiology

• Colorectal carcinoma - 2nd leading cause of cancer related deaths
• 40,340 new cases of rectal cancer in 2013
• 50,830 deaths in 2013 (colon and rectal cancer)
Rectum and Anal Canal

- Sigmoid colon
- Superior rectal valve
- Middle rectal valve
- Inferior rectal valve
- Rectosigmoid junction
- Anal columns (of Morgagni)
- Muscularis mucosae
- Circular muscle layer
- Peritoneal reflection
- Longitudinal muscle layer
- Rectal fascia
- Levator ani muscle
- Anal sinus
- Anorectal (pectinate, or dentate) line
- Internal rectal venous plexus
- Plexus in submucous space
- Internal sphincter muscle
- Deep external sphincter muscle
- Conjoined longitudinal muscle
- Superficial external sphincter muscle
- Anal valve
- Anal crypt
- Anal glands
- Transverse fibrous septum
- Musculus submucosae ani
- Perianal space
- Intermuscular groove (white line of Hilton)
- External rectal venous plexus in perianal space
- Compressor cutis ani muscle
- Subcutaneous external sphincter muscle

Surgical anal canal
Anatomical anal canal
Anal verge
Sweat glands and hairs in perianal skin
Muscularis Propria

Orientation = Lateral view

Distal 1/3rd
NO peritoneal covering

Middle 1/3rd
Peritoneum on ant surface only

Prox 1/3rd
Peritoneum on ant & lat surfaces

"Rectosigmoid Junction"
• **Superior hypogastric plexus**
  – Sympathetic
  – T12 – L3 VNR’s
  – Bladder tone
  – Ejaculation

• **Nervi erigentes**
  – Parasympathetic
  – S2 – S4 VNR’s
  – Bladder tone
  – Erection
  – Vaginal lubrication

A 56 yo woman has rectal cancer found on colonoscopy. The patient’s primary concern is whether operation will be performed will result in permanent colostomy. Which of the following is the primary determinant of the feasibility of avoiding a permanent colostomy?

A) Distance of the tumor from the proximal anal canal
B) Presence of enlarged lymph nodes on CT scan
C) Distance of the tumor from dentate line
D) Distance of tumor from anal verge
E) Extension of tumor into posterior vaginal wall or bladder
• **Answer A**

• The distance of the tumor from the top of the sphincter mechanism or the proximal anal canal
Work Up

• History
  – Disease-specific symptoms
    • Pain with defecation?
  • Tenesmus?
  • History of incontinence?

http://crackberry.com/clarifying-4g-vs-fauxg
Work Up

- History of sexual dysfunction?
- History of previous surgery?
- Preoperative risk assessment
- Family history
Work Up

• Physical exam
  – LAD?
  – Rectal exam (DRE)
    • Fixed/Mobile?
    • Size/Circumference?
    • How far from anal verge?
    • Location relative to the upper part of the anorectal ring?
Work Up

• Labs
  – Pre-op CEA
    • A confirmed rise during surveillance should prompt further investigation

• Rigid proctosigmoidoscopy
  – Allows the most precise distance of tumor from the anal verge
Work Up

• Full colonic evaluation
  – Synchronous cancer 1 – 3%
  – Synchronous polyps is 30%

• Colonoscopy is the preferred option
  – Double contrast barium enema
  – CT colonography
Staging

- Should be routinely performed according to AJCC TNM system
  - Pre-treatment/Post-treatment

- MRI
- Endorectal U/S
- CT Chest/Abd/Pelvis
Phased-array MRI

- **T stage accuracy 75-85%**
- **N stage** *
  - Sensitivity 66%
  - Specificity 76%


• Circumferential margin
  – Considered positive $\leq 1$ mm
• Involvement of mesorectal fascia
  – 4-fold local recurrence after TME
• If MRI predicts clear circumferential resection margins $\rightarrow$ 94% will have a clear margin on histology*

Diagnostic accuracy of preoperative magnetic resonance imaging in predicting curative resection of rectal cancer: prospective observational study. BMJ 2006

**ERUS**

- **T stage accuracy 63-96%**
- **N stage sensitivity 67%, specificity 78%***


CT Chest/Abd/Pelvis

• ALL patients should have prior to elective resection

• Liver & lungs are most frequent site of metastatic disease

• CT Chest *
  – More sensitive than CXR for pulmonary mets
  – Enables indeterminate lesions to be characterized with more confidence on f/u
<table>
<thead>
<tr>
<th>TNM</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary tumor (T)</strong></td>
<td></td>
</tr>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
</tr>
<tr>
<td>Tis</td>
<td>Carcinoma in situ</td>
</tr>
<tr>
<td>T1</td>
<td>Tumor invades the submucosa</td>
</tr>
<tr>
<td>T2</td>
<td>Tumor invades the muscularis propria</td>
</tr>
<tr>
<td>T3</td>
<td>Tumor invades the subserosa or into nonperitonealized perirectal tissues</td>
</tr>
<tr>
<td>T4a</td>
<td>Tumor penetrates to the surface of the visceral peritoneum</td>
</tr>
<tr>
<td>T4b</td>
<td>Tumor directly invades or is adherent to other organs or structures</td>
</tr>
<tr>
<td><strong>Regional lymph nodes (N)</strong></td>
<td></td>
</tr>
<tr>
<td>NX</td>
<td>Regional lymph nodes cannot be assessed</td>
</tr>
<tr>
<td>N0</td>
<td>No regional nodal metastasis</td>
</tr>
<tr>
<td>N1</td>
<td>Metastasis in one to three regional lymph nodes</td>
</tr>
<tr>
<td>N1a</td>
<td>Metastasis in one regional lymph node</td>
</tr>
<tr>
<td>N1b</td>
<td>Metastasis in 2–3 regional lymph nodes</td>
</tr>
<tr>
<td>N1c</td>
<td>Tumor deposit(s) in the subserosa, mesentery, or nonperitonealized perirectal tissues without regional nodal metastasis</td>
</tr>
<tr>
<td>N2</td>
<td>Metastasis in 4 or more regional lymph nodes</td>
</tr>
<tr>
<td>N2a</td>
<td>Metastasis in 4–6 regional lymph nodes</td>
</tr>
<tr>
<td>N2b</td>
<td>Metastasis in 7 or more regional lymph nodes</td>
</tr>
<tr>
<td><strong>Distant metastasis (M)</strong></td>
<td></td>
</tr>
<tr>
<td>M0</td>
<td>No distant metastasis</td>
</tr>
<tr>
<td>M1</td>
<td>Distant metastasis</td>
</tr>
<tr>
<td>M1a</td>
<td>Metastasis confined to 1 organ or site</td>
</tr>
<tr>
<td>M1b</td>
<td>Metastasis in more than one organ/site or the peritoneum</td>
</tr>
</tbody>
</table>
Stage 0: Tis

http://www.cancer.gov/cancertopics/pdq/treatment/colon/HealthProfessional/page3
Stage 1: T1/2, N0, M0
Stage 2: T3/4, N0, M0

http://www.cancer.gov/cancertopics/pdq/treatment/colon/HealthProfessional/page3
Stage 3: Any T, N+, M0

http://www.cancer.gov/cancertopics/pdq/treatment/colon/HealthProfessional/page3
Stage IV

Colon cancer has spread to other parts of the body:

- Lymph nodes
- Lung
- Liver
- Abdominal wall
- Ovary

Cancer in the colon

Cancer

Blood

Lymph nodes

To other parts of the body

Stage 4: Any T/N, M+
<table>
<thead>
<tr>
<th>Stage</th>
<th>5 year survival</th>
<th>T</th>
<th>N</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td><strong>74%</strong></td>
<td>T1s</td>
<td>NO</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 1</td>
<td></td>
<td>T1, T2</td>
<td>NO</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIA</td>
<td></td>
<td>T3</td>
<td>NO</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIB</td>
<td></td>
<td>T4a</td>
<td>NO</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIC</td>
<td></td>
<td>T4b</td>
<td>NO</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td></td>
<td>T1, T2</td>
<td>N1/N1c/N2a</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td></td>
<td>T3, T4aT2, T3T1, T2</td>
<td>N1/N1cN2aN2b</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIC</td>
<td></td>
<td>T4aT3, T4aT4b</td>
<td>N2aN2bN1/N2</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IVA</td>
<td><strong>33-45-74%</strong></td>
<td>Any T</td>
<td>Any N</td>
<td>M1a</td>
</tr>
<tr>
<td>Stage IVB</td>
<td><strong>6%</strong></td>
<td>Any T</td>
<td>Any N</td>
<td>M1b</td>
</tr>
</tbody>
</table>

**Stage 0** is the earliest stage, where the cancer is localized to the primary site and has not spread. **Stage I** includes T1 and T2 tumors, with stage IIA and IIB tumors in the lymph nodes (N0). **Stage II** tumors extend beyond the primary site but are still contained within the body and can spread to lymph nodes (N0). **Stage III** tumors are more advanced, spreading to lymph nodes (N1-N2) and possibly to other parts of the body (M0). **Stage IV** tumors have spread to distant organs (M1).
Which of the following statements about locally advanced rectal cancer treated with chemoradiation therapy is TRUE?

- A) Complete clinical response occurs in 50% of cases
- B) Most complete clinical responses will have a complete pathologic response
- C) With complete pathologic response, recurrence rates are 25%
- D) Prognosis correlates better with pretreatment staging than postchemoradiation therapy clinical staging
- E) Final pathologic staging is more predictive of outcomes versus pretreatment clinical staging
• Answer E

• Outcome is more accurately predicted by final pathologic stage rather than the preoperative clinical stage
Neo-adjuvant Therapy

• Short-course radiotherapy
  • 5 Gray daily over 5 days w/o chemo
  • Surgery within 1 week

• Long-course chemoradiotherapy
  • 45 - 50 Gray
    – 1.8 - 2 Gy per fraction over 5-6 weeks
  • Concurrent 5-fluorouracil-based chemo
  • Surgery 8-12 weeks later
Who Gets Neo-adjuvant Tx?

- T3/T4 rectal cancer
- Any T, N1-2

- Appropriate option
  - Distal mobile rectal cancers not amendable to local excision
  - Presence of tumor within 2mm of mesorectum
A 56 yo woman has rectal cancer found on colonoscopy performed for evaluation of rectal bleeding. The optimal method for assessing whether preoperative combined modality therapy is indicated in this patient would be

- A) endorectal u/s (EUS)
- B) physical exam
- C) CT scan
- D) positron-emission tomography (PET)
- E) endoscopic biopsy
• **Answer A**

• In experienced hands, EUS is 90% accurate in determining T stage of rectal adenocarcinomas.

• Those with tumor invasion through muscularis propria as determined by preop EUS would be eligible for neoadjuvant therapy.
Operative Therapy

• Low anterior resection
• Abdominoperineal resection
• Local excision
Operative Therapy

- Laparoscopic vs. Open?

- Lap TME can be performed with equivalent oncological outcomes by experienced laparoscopic surgeons

- ACOSOG-Z6051 trial
How Much Margin?

• 2 cm margin
• Distal intramural spread is uncommon
  – Found beyond 1cm in 4–10% of rectal CA
• CA at or below mesorectal margin
  – 1cm distal mural margin is acceptable*
• Circumferential margin 2mm

Tumor-specific Mesorectal Excision

• Upper 1/3rd rectal CA’s
  – Above 10cm

• Mesorectum is divided at a right angle 5cm distal to the mucosal edge of the tumor
  – Distal mesorectal spread often greater than intramural spread
  – Deposits can be found 3-4 cm distal to 1° CA*

Total Mesorectal Excision

- Complete excision of visceral mesorectum with pelvic nerve preservation.
- Mesorectum: The fatty tissue that encompasses the rectum.
- Middle/Lower 1/3rd rectal CA's

Correct Dissection

Bladder & Tumor

- Low Anterior Resection
  - Lateral to medial
  - High ligation of IMA
  - Division of prox IMV
  - Mobilize splenic flexure
  - Doubled stapled anastomosis
    - 6 cm J pouch?
  - Leak test
Abdominoperineal Resection

• Involvement of sphincter complex?

• Cylindrical resection
  – Mesorectum disappears at the level of the sphincters
  – Levator ani should be resected widely en bloc to avoid + circumferential margin

http://www.surgwiki.com/wiki/Colorectal_cancer_and_adenoma
Vascular Ligation

• Up to the level of the superior rectal artery
  – aka Low tie – inferior to take off of left colic

• High ligation of IMA
  – LN yield may be increased
  – Provides superior mobilization for tension-free anastomosis

High tie of inferior mesenteric artery in curative surgery for left colonic and rectal cancers: a systematic review. Dig Surgery. 2008

http://home.comcast.net/~wnor/sup&infmesentericart.htm
Operative Therapy

- Local Excision
  - Carefully selected T1 cancers without high-risk features
  - Medically unfit for radical surgery
Local Excision Criteria

- Well to moderately differentiated T1N0 on pre-treatment staging
- Absence of lymphovascular or perineural invasion
- Tumors < 3cm in diameter
- Less than 1/3rd of circumference of lumen
- T1 lesion on final histological exam
Local Excision

- TEM – transanal endoscopic microsurgery
- TAMIS – transanal minimally invasive surgery
- Parks Excision – transanal excision

Local Recurrence
- T1: 7 to 21%
- T2: 26 to 47%
Diversion?

• Anastomotic leak rates range 3-32%

Meta-analysis of defunctioning stomas in low anterior resection for rectal cancer
W. S. Tan¹, C. L. Tang¹, L. Shi² and K. W. Eu¹

• 4 RCTs and 21 Nonrandomized studies
  – Lower clinical anastomotic leak rate
  – Lower re-operation rate
Who Gets Adjuvant Therapy?

- EASY version:
- All patients who receive preoperative therapy regardless of pathology results
  - 15-20% will have a complete path response
- Resected stage 2 or 3 on final path
- Radiation therapy only recommended for those at increased risk for pelvic recurrence

NCCN
Adjuvant Therapy

- 5-FU ± leucovorin
- F
- O
- L
- F - Fluorouracil (5-FU)
- O
- X
- Oxaliplatin (Eloxatin)
A 54 yo man has a 1.5 cm rectal mass in the posterior midline 11 cm from the anal verge. The mass is mobile on DRE. EUS suggests possible involvement of the submucosa but no nodal involvement. Bx shows adenocarcinoma. Transanal excision would be precluded by:

A) likelihood of recurrence
B) a moderately well-diff histology
C) location
D) mass size
E) submucosal involvement
• **Answer C**

• **Criteria for possible transanal excision**
  include lesions that are
  – T1 lesions
  – Mobile
  – Node negative on EUS
  – < 10cm from anal verge
  – Compromising <40% circumference
Oophorectomy?

- Krukenberg tumor
  - Colorectal metastasis ~15%

- Routine prophylactic oophorectomy is not necessary

- If 1 ovary is involved: Bil oophorectomy
• Malignant bowel obstruction 15 – 20%

• 4% treated with immediate nCRT progressed to complete obstruction and perforation

• Diverting loop ostomy
  – To allow for distal venting
Liver or Rectum First?

- Optimal timing is uncertain
- One-stage surgery – Probably a reasonable option for low-volume dx
  - Four or fewer mets, less than three segments, or all in the same lobe
  - Initial chemo and reassess
  - ≥ Five simultaneous potentially resectable hepatic metastases, bilobar involvement, or if disease is borderline resectable

www.uptodate.com  http://radiopaedia.org/articles/hepatic-metastases-1
Watch and Wait?

• Apparent complete clinical response on restaging
  – Should be offered definitive resection

• Complete pathological response without residual tumor cells $\rightarrow$ 8 to 16%
Rectal Carcinoid

- Smaller than 1 cm and confined to the mucosa or submucosa (T1) can be treated by local endoscopic excision
- 1-2cm - controversial
  - Risk of metastasis is 10 – 15%
- Larger than 2 cm and those that invade into or beyond the muscularis propria (T3/4 tumors) or have regional lymph node metastases → LAR or APR
When EUS shows a rectal cancer with invasion through the muscularis mucosae, with no involvement of the muscularis propria, the risk of lymph node metastasis is

- A) <1%
- B) 3 - 5%
- C) 10 - 20%
- D) 30 – 50%
- E) > 50%
• Answer C

• For all patients with T1 adenocarcinomas of the rectum (invading through muscularis mucosa that do not involve muscularis propria), the likelihood of LN mets is 10 – 20%
Follow Up

• **H/P, CEA**
  - q 3-6 months for 2 years then every 6 months for a total of 5 years

• **CT Chest/Abd/Pelvis q year x 5 years**

• **Colonoscopy in 1 year**
  - 3 mths after rsxn if not performed pre-op
  - Advanced adenoma – repeat in 1 year
  - Negative – repeat in 3 years then q 5 years
Guidelines for Perioperative Care in Elective Rectal/Pelvic Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations

- www.erassociety.org

Postoperative ERAS

- Mid-thoracic epidural anesthesia/analgesia
- No nasogastric tubes
- Prevention of nausea and vomiting
- Avoidance of salt and water overload
- Early removal of catheter
- Early oral nutrition
- Non-opioid oral analgesia/NSAIDs
- Early mobilization
- Stimulation of gut motility
- Audit of compliance and outcomes

Preoperative ERAS

- Preadmission counseling
- Fluid and carbohydrate loading
- No prolonged fasting
- No/selective bowel preparation
- Antibiotic prophylaxis
- Thromboprophylaxis
- No premedication

Intraoperative ERAS

- Short-acting anesthetic agents
- Mid-thoracic epidural anesthesia/analgesia
- No drains
- Avoidance of salt and water overload
- Maintenance of normothermia (body warmer/warm intravenous fluids)
Resources

PRACTICE PARAMETERS

Practice Parameters for the Management of Rectal Cancer (Revised)

www.ascrs.org

www.nccn.org