Objectives

• Review background demographics and pathways for colon cancer
• Review colorectal cancer screening and post-polypectomy surveillance guidelines
• Review endoscopic technique for removal of large colon polyps
• Review colonic stenting

Background

• 4th most common cancer in men and women in the US
  • 10% of all newly diagnosed cancers
  • Estimated 134,000 new cases in 2016
• 2nd leading cause of cancer death in men and women in the US
  • Estimated 49,000 deaths in 2016
• M>F incidence and mortality
• African Americans ↑ incidence and mortality
• Multifactorial etiology
  • Age, genetics and environment
Background

• CRC etiology

  • Age – ↑ incidence with age
  • Most frequently diagnosed age 65 to 74
  • Median age of diagnosis 68 y/o

Environmental – numerous causative and protective factors

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Possible causes</th>
<th>Probably protective</th>
<th>Possibly protective</th>
</tr>
</thead>
<tbody>
<tr>
<td>High fat and low fiber diet</td>
<td>Alcohol consumption,</td>
<td>ASA, NSAIDs, Cox-2 inhibitors</td>
<td>Carotenoid-rich foods</td>
</tr>
<tr>
<td>Red meat consumption</td>
<td>Cigarette smoking</td>
<td>Calcium</td>
<td>High fiber diet</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Hormone replacement</td>
<td>Therapy</td>
<td>Vitamins C, D, E</td>
</tr>
<tr>
<td>Environmental carcinogens</td>
<td>Low BMI</td>
<td>Yellow-green cruciferous vegetables</td>
<td></td>
</tr>
<tr>
<td>Nitrates</td>
<td>Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low dietary selenium</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Genetics - Numerous genes involved

<table>
<thead>
<tr>
<th>Gene</th>
<th>Chromosome</th>
<th>Frequency of CRC with gene alteration (%)</th>
<th>Gene class</th>
<th>Function of gene product</th>
</tr>
</thead>
<tbody>
<tr>
<td>APC</td>
<td>5</td>
<td>70</td>
<td>Tumor suppressor</td>
<td>Regulates β-catenin which activates Wnt signaling pathway</td>
</tr>
<tr>
<td>DCC</td>
<td>18</td>
<td>70</td>
<td>Tumor suppressor</td>
<td>Caspase substrate in apoptosis</td>
</tr>
<tr>
<td>BM44</td>
<td>16</td>
<td>7</td>
<td>Tumor suppressor</td>
<td>Transcription factor in TGF-B signaling, regulation of androgen's promoter</td>
</tr>
<tr>
<td>TRKA</td>
<td>17</td>
<td>75</td>
<td>Tumor suppressor</td>
<td>Transcription factor, regulates apoptosis, gene expression, and DNA repair</td>
</tr>
<tr>
<td>MSH2, MSH6, MLH1</td>
<td>2,3</td>
<td>15</td>
<td>DNA mismatch repair</td>
<td>Maintains fidelity of DNA replication</td>
</tr>
<tr>
<td>TGF-RE</td>
<td>3</td>
<td>10</td>
<td>Tumor suppressor</td>
<td>Receptor for TGF-B signaling pathway</td>
</tr>
</tbody>
</table>
Background

- Pathways to CRC
  - Classic pathway - adenoma/carcinoma sequence
    - Multi-hit hypothesis
  
  ![Diagram of Pathways to CRC]

Colon cancer screening

- Target population
  - Asymptomatic adults aged 50 and older at average risk for developing colorectal cancer
  - No known family history of known genetic disorders that predispose to a high-lifetime risk of CRC (i.e., Lynch syndrome, FAP etc.)
  - No personal history of IBD
  - No previous adenomatous polyp(s)
  - No previous CRC
Colon cancer screening

• Approximately 1/3 of eligible adults in the US have never been screened for CRC
  • Continued emphasis on increasing the overall number of patients screened

• US Preventative Services Task Force
  • Updated screening guidelines released June 2016 (JAMA)

• Updated guidelines provide a menu of options – they are no longer presented in any ranked or preferred order
  • If patients given more choices for screening (and allowed to choose themselves), utilization of CRC screening across the board may improve

Colon cancer screening

• US Preventative Services Task Force June 2016
  • Conclusions
    • Convincing evidence that screening for CRC with several different methods can accurately detect early stage colorectal cancer and adenomatous polyps
    • High certainty that the net benefit of screening for CRC in adults 50 to 75 y/o is substantial
    • Moderate certainty that the net benefit of screening for CRC in adults 76 to 85 y/o who have been previously screened is small
    • Adults in this age group who have never been screened are more likely to benefit
    • No benefit of CRC screening in adults 86 y/o or older

Colon cancer screening

• Recommend CRC screening options in updated USPSTF guidelines
  • Stool based testing
    • Guaiac FOB
    • Fecal immunochemistry (FIT)
    • FIT-DNA
  • Direct visualization tests
    • Colonoscopy
    • CT colonography
    • Flexible sigmoidoscopy
    • Flexible sigmoidoscopy + FIT
Colon cancer screening

• Stool based testing

  • Guaiac-based fecal occult blood tests (gFOBT)
    • Identifies heme in stool
    • Need to avoid certain foods prior to testing for 3 days
    • Red meat, vegetables such as cucumber, cauliflower, horseradish, vitamin C, citrus fruits
    • Reduces colorectal cancer deaths in multiple RCTs
    • Sensitivity from 62-79%, specificity 87-96% depending on product used
    • Frequency: every year

  • Fecal immunochemical tests (FIT)
    • Identify intact human hemoglobin in stool
    • No dietary restrictions prior to testing
    • Increased sensitivity compared with gFOBT of 73-88%, specificity 91-95%
    • Frequency: every year

  • Stool DNA testing (FIT-DNA) – Cologuard
    • Combines FIT with testing for altered DNA biomarkers in stool
    • Includes 2 DNA methylation markers (NDRG1 and BMP3) and 7 DNA mutation markers (all KRAS)
    • Increased sensitivity compared with FIT but somewhat decreased specificity
    • For CRC: sensitivity 92%, specificity 84%
    • For precancerous lesions (advanced adenomas and sessile serrated polyps measuring ≥ 1 cm): sensitivity 42%
    • Frequency: every 1 to 3 years
Colon cancer screening

- Direct visualization tests
  - Flexible sigmoidoscopy
    - Multiple RCTs with reduction in CRC mortality
    - Pooled meta-analysis showed reduction of CRC-related mortality of 27% after 11-12 years
    - 3-4 fewer CRC deaths per 100,000 person-years
  - Frequency: every 5 years

- Flexible sigmoidoscopy + FIT
  - Further reduction in CRC mortality rate with addition of FIT to flex sig
  - Hazard ratio 0.62 compared to 0.84 for flex sig only
  - Frequency: flex sig every 10 years with FIT yearly

- CT colonography
  - Evidence for effectiveness limited; data from studies evaluating the lack of effectiveness
  - Estimated sensitivity of detecting adenomas ≥ 1 cm is 63-74%, specificity 85-98%
  - High burden of incidental extra-colonic findings:
    - 40-70% of exams, of which 5-27% require further follow-up, and about 1% require definitive treatment
  - Frequency: every 5 years
Colon cancer screening

• Direct visualization tests
  • Colonoscopy
    • Indirect evidence from flex sig studies on mortality
    • Prospective cohort study showing lower CRC mortality (Nurses Health Study)
    • Reduced distal and proximal CRC mortality with HR 0.18 and 0.47 respectively
    • Large case-control study from Germany of colonoscopy vs no colonoscopy
      • Incidence odds ratio at 5-9 years 0.26 and at 10-19 years 0.28
    • Multiple RCTs are in progress (US CONFIRM, Spanish COLONPREV, Swedish SCREENCO trials)
    • Frequency: every 10 years
  
• Serology tests
  • Single approved test by the FDA - Epi proColon
    • Detects circulating methylated Septin 9 DNA in serum
    • Low sensitivity of 48% for detecting CRC
    • Not included in screening guidelines

**Summary of USPSTF recommendations**

<table>
<thead>
<tr>
<th>Screening test</th>
<th>Recommended screening interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stool-based tests</td>
<td></td>
</tr>
<tr>
<td>GFOBT</td>
<td>Every year</td>
</tr>
<tr>
<td>FIT</td>
<td>Every year</td>
</tr>
<tr>
<td>FIT-DNA</td>
<td>Every 1-3 years</td>
</tr>
<tr>
<td>Direct visual tests</td>
<td></td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>Every 10 years</td>
</tr>
<tr>
<td>CT colonography</td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy</td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy with FIT</td>
<td>Flex sig every 5 years plus FIT every year</td>
</tr>
</tbody>
</table>
Post polypectomy surveillance

- Numerous societies have put forth surveillance guidelines
- US Multi-Society Task Force on Colorectal Cancer guidelines (2012)
  - Includes individuals from the American Gastroenterological Association, American College of Gastroenterology, and the American Society for Gastrointestinal Endoscopy
- Surveillance intervals are based on baseline colonoscopy findings and subsequent colonoscopy findings — presence of low and high risk findings
  - Low risk findings
    - Hyperplastic polyps
    - 1-2 tubular adenomas < 10 mm in diameter
  - High risk findings
    - Tubular adenoma ≥ 10 mm
    - ≥ 3 tubular adenomas
    - Adenoma with villos histology
    - Adenomas with high grade dysplasia

<table>
<thead>
<tr>
<th>Baseline Colonoscopy: most advanced finding(s)</th>
<th>Recommended surveillance interval (years)</th>
<th>Quality of evidence supporting the recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No polyps</td>
<td>10</td>
<td>Moderate</td>
</tr>
<tr>
<td>Small (&lt;10 mm) hyperplastic polyps in rectum or sigmoid</td>
<td>10</td>
<td>Moderate</td>
</tr>
<tr>
<td>Low risk adenomas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 small (&lt;10 mm) tubular adenomas</td>
<td>5-10</td>
<td>Moderate</td>
</tr>
<tr>
<td>High risk adenomas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-10 tubular adenomas</td>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;30 adenomas</td>
<td>&lt;3</td>
<td>Moderate</td>
</tr>
<tr>
<td>≥3 tubular adenoma ≥ 10 mm without dysplasia</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>≥3 villous adenomas</td>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>Adenoma with high grade dysplasia</td>
<td>3</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Colon cancer surveillance

- Serrated lesions
  - Includes hyperplastic polyps, sessile serrated adenomas/polyps and traditional serrated adenomas
  - Thought to be precursors of CPG island methylator pathway (CIMP) of CRC
  - Have high frequency of BRAF mutation, up to 50% microsatellite unstable

<table>
<thead>
<tr>
<th>WHO classification</th>
<th>Prevalence</th>
<th>Shape</th>
<th>Distribution</th>
<th>Malignant Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperplastic polyp</td>
<td>Very common</td>
<td>Sessile/Flat</td>
<td>Mostly distal</td>
<td>Very low</td>
</tr>
<tr>
<td>Sessile serrated polyp/adenoma</td>
<td>Common</td>
<td>Sessile/Flat</td>
<td>80% proximal</td>
<td>Low</td>
</tr>
<tr>
<td>No dysplasia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dysplastic</td>
<td></td>
<td></td>
<td></td>
<td>Significant</td>
</tr>
<tr>
<td>Traditional serrated adenoma</td>
<td>Uncommon</td>
<td>Sessile or pedunculated</td>
<td>Mostly distal</td>
<td>Significant</td>
</tr>
</tbody>
</table>
Colon cancer surveillance

- Serrated lesions
  - Difficult to detect at colonoscopy
    - Similar color as surrounding mucosa
    - Indiscrete edges
    - Often flat
    - Often adherent mucous layer/cap

- 2012 Multi-Society Task Force Guidelines – serrated lesions
  - Generally treated as adenoma equivalents
  - Many experts suggest that all proximal serrated lesions (including HP) ≥ 10 mm be considered SSPs due to high rate of inter-observer variation

<table>
<thead>
<tr>
<th>Baseline Colonoscopy (most advanced finding)</th>
<th>Recommended surveillance interval (years)</th>
<th>Quality of evidence supporting the recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessile serrated polyp(s) &lt;10 mm without dysplasia</td>
<td>5</td>
<td>Low</td>
</tr>
<tr>
<td>Sessile serrated polyp(s) ≥ 10 mm</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Sessile serrated polyp with dysplasia</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Traditional serrated adenoma</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Serrated polyposis syndrome</td>
<td>1</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

- When are the surveillance intervals for subsequent colonoscopies after the initial follow up exam?

<table>
<thead>
<tr>
<th>Baseline colonoscopy</th>
<th>1st surveillance colonoscopy</th>
<th>Interval for 2nd surveillance (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk adenoma</td>
<td>High risk adenoma</td>
<td>3</td>
</tr>
<tr>
<td>Low risk adenoma</td>
<td>Low risk adenoma</td>
<td>5</td>
</tr>
<tr>
<td>No adenoma</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>High risk adenoma</td>
<td>High risk adenoma</td>
<td>3</td>
</tr>
<tr>
<td>Low risk adenoma</td>
<td>Low risk adenoma</td>
<td>5</td>
</tr>
<tr>
<td>No adenoma</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Colon cancer screening/surveillance

• Familial CRC
  • 25-30% of CRC patients have a family history of CRC with at least relative with CRC
  • 2-3 fold ↑ above baseline
  • Higher risk if young relatives with CRC: 3-6 fold ↑ risk of CRC if
    • One 1st degree relative < 45 y/o with CRC
    • Two 2nd degree relatives <45 y/o with CRC
  • However, increased risk of CRC not limited only to those with relatives with young onset CRC
  • Meta-analysis – 2 fold ↑ risk of CRC if relative diagnosed with CRC after age 50-60
  • → Need to start screening/surveillance sooner and more frequently

Colon cancer screening/surveillance

• When to screen in patients with family history of CRC?
  • CRC or HRA < 60 y/o in 1st degree relative or CRC any age in multiple 1st/2nd
    degree relatives
    • Start at age 40 or 10 years before youngest affected relative
    • Repeat every 5 years or sooner based on findings
  • CRC or HRA ≥ 60 y/o in 1st degree or multiple 1st/2nd degree relatives
    • Start at age 40
    • Use appropriate average risk guidelines for surveillance

Colon cancer screening/surveillance

• When should screening/surveillance stop?
  • USPSTF conclusion on screening
    • No benefit of CRC screening in adults 86 y/o or older
    • Moderate certainty that the net benefit of screening for CRC in adults 76 to 85 y/o who
      have been previously screened is small
    • Adults in this age group who have never been screened are more likely to benefit
  • Multi-Society Task Force on surveillance
    • Decision to continue surveillance past age 75 should be individualized
    • Based on assessment of benefit, risk and patient comorbidities
Colon cancer screening/surveillance

- When should colonoscopy be repeated if initial prep is poor?
  - Poor prep defined as inability to adequately detect lesions >5 mm
  - Generally should repeat within 1 year

- When should colonoscopy be repeated if initial prep is fair?
  - Fair prep defined as adequate to detect lesions > 5 mm
  - If any small adenomas (<10 mm) detected, should repeat in no more than 5 years

Colon cancer surveillance

- When should patients have surveillance after colon cancer?
  - Perioperative clearing colonoscopy - prior to surgical resection or within 3-6 post-op if obstructive CRC
  - First surveillance colonoscopy 1 year post-op or 1 year after clearing exam
  - Next surveillance colonoscopies 3 later and then every 5 years thereafter
  - Can be modified based on exam findings, i.e. high risk adenomas or lesions

- When should patients have surveillance after rectal cancer?
  - Increased risk of local recurrence in patients who had surgery without total mesorectal excision, trans-anal local excision, endoscopic submucosal dissection and those with locally advanced rectal cancer who didn’t receive neoadjuvant chemotherapy
  - Flex sig or EUS every 3-6 months for first 2-3 years after surgery

Screening/surveillance in special populations

- Hereditary genetic syndromes can lead to increased risk of colon cancer
  - 3-6% of all CRC is associated with highly penetrant GI cancer syndromes
  - GI cancer syndromes have 40-100% lifetime CRC risk
    - Includes Lynch, FAP, attenuated FAP, MAP, Peutz-Jeghers, Juvenile Polyposis

  - Start screening early and more frequently
Screening/surveillance in special populations

• Lynch syndrome
  • Also called HNPCC – hereditary non-polyposis colorectal cancer
  • Most common hereditary CRC
  • 2-4% of all CRC and endometrial cancer
  • Autosomal dominant inheritance
  • Germline mutation in mismatch repair (MMR) genes
    • These correct single base mismatches and insertion/deletion loops that occur during replication
    • MSH2, MLH1, MSH6, PMS2, EpCAM genes

Screening/surveillance in special populations

• Mismatch repair system
  • If defective → mutations at simple repetitive sequences (microsatellites) found in DNA

<table>
<thead>
<tr>
<th>Nucleotide Mismatch</th>
<th>Normal MMR</th>
<th>Microsatellite stable (MSS)</th>
<th>Microsatellite Instability (MSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCAGTC</td>
<td>TCAGTC</td>
<td>TCAGTC</td>
<td>TCAGTC</td>
</tr>
<tr>
<td>Defective MMR</td>
<td>TCAGTC</td>
<td>TCAGTC</td>
<td>TCAGTC</td>
</tr>
</tbody>
</table>

Screening/surveillance in special populations

• Lynch syndrome
  • Lifetime CRC risk 50-80%
  • Avg age of 44-61 yrs
  • Adenocarcinoma sequence fast in Lynch syndrome
    • Polypl to cancer time approx. 35 months
    • 10-15 yrs in sporadic CRC
  • Majority cases related to MSH2 and MLH1 mutations – 380% of cases
    • MSH6 mutations – 12%
    • PMS2 mutations – 6%
    • Epithelial cell adhesion molecule (EPCAM) – 1-3% of cases
  • Commercial testing available for all 5 genes
  • CRC is usually right sided
Screening/surveillance in special populations

• Lynch syndrome
  • Various mutations confer different lifetime colon cancer risks

<table>
<thead>
<tr>
<th>Mutation</th>
<th>Risk of colon cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td></td>
<td>Women</td>
</tr>
<tr>
<td>MLH1</td>
<td>58-65%</td>
</tr>
<tr>
<td></td>
<td>50-53%</td>
</tr>
<tr>
<td>MSH2</td>
<td>54-63%</td>
</tr>
<tr>
<td></td>
<td>39-68%</td>
</tr>
<tr>
<td>MSH6</td>
<td>16-49%</td>
</tr>
<tr>
<td></td>
<td>18-50%</td>
</tr>
<tr>
<td>PMS2</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>15%</td>
</tr>
</tbody>
</table>

Screening/surveillance in special populations

• Lynch syndrome
  • High rate of extra-colonic cancers

<table>
<thead>
<tr>
<th>Site of cancer</th>
<th>Rate of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endometrial</td>
<td>40-60%</td>
</tr>
<tr>
<td>Gastric</td>
<td>11-19%</td>
</tr>
<tr>
<td>Urinary tract</td>
<td>1-25%</td>
</tr>
<tr>
<td>Duct</td>
<td>4-20%</td>
</tr>
<tr>
<td>Hepatobiliary</td>
<td>2-7%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3-4%</td>
</tr>
<tr>
<td>CNS (glioblastoma)</td>
<td>1-5%</td>
</tr>
<tr>
<td>Sebaceous neoplasms</td>
<td>1-9%</td>
</tr>
<tr>
<td>Small bowel</td>
<td>1-4%</td>
</tr>
</tbody>
</table>

Screening/surveillance in special populations

• Lynch syndrome
  • Adenomas are the precursor lesion for CRC in Lynch syndrome
  • Adenoma-carcinoma sequence is accelerated
    • Therefore colonoscopy is the basis of screening/surveillance
    • Start early and screen frequently
  • Goal is to detect polyps/CRC at an earlier stage in those undergoing screening
Screening/surveillance in special populations

- Lynch syndrome
  - CRC screening/surveillance
    - Colonoscopy at age 20-25 y/o
    - Repeat every 1-2 years
    - If family member diagnosed with CRC <25 y/o -> colonoscopy 2-5 years earlier than age of diagnosis

- Extra-colonic screening
  - Uterine/ovarian
    - Pelvic exam with endometrial sampling and transvaginal US age 30-35 then annually
    - Prophylactic total abdominal hysterectomy age 40-45, consider sooner if child bearing completed
    - Gastric cancer
      - EGD age 30-35 then every 2-3 years

- Uterus tract
  - Bilateral oophorectomy age 50-55 then annually

- Screening/surveillance in special populations

- Familial adenomatous polyposis (FAP)
  - 2nd most common CRC syndrome
  - 1/20,000-13,000 births
  - 1% of all CRC related to FAP
  - Usually presents in early adolescence
  - Avg age <15, range 8-34
  - Inevitable CRC if left untreated
  - Avg age of CRC diagnosis 39 y/o, 95% with CRC by 50 y/o

- Screening/surveillance in special populations

- FAP
  - Develop hundreds to thousands of adenomas in the colon
Screening/surveillance in special populations

- Attenuated FAP
  - Less severe form
  - Lower polyp burden – avg 30 adenomas (range 0-100)
  - 70% lifetime risk of CRC
    - Usually develops later than in classic FAP – avg age diagnosis CRC 55 y/o

- FAP/AFAP
  - Autosomal dominant with 80-100% penetrance
  - Germline mutations in the APC gene
    - Encodes tumor suppressor gene and results in faulty protein
    - Mutations identified in 80-90% of FAP, 10-30% of AFAP
  - Genotype-phenotype correlation for colonic polyposis
    - Central APC gene mutations -> FAP
    - Proximal or distal APC gene mutations -> AFAP

Screening/surveillance in special populations

<table>
<thead>
<tr>
<th>FAP</th>
<th>AFAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of cancer</td>
<td>Incidence</td>
</tr>
<tr>
<td>Colorectal</td>
<td>100%</td>
</tr>
<tr>
<td>Duodenal/Periampullary</td>
<td>4-12%</td>
</tr>
<tr>
<td>Desmoid</td>
<td>10%</td>
</tr>
<tr>
<td>Pancreatic</td>
<td>2%</td>
</tr>
<tr>
<td>Thyroid</td>
<td>1-2%</td>
</tr>
<tr>
<td>Liver (hepatoblastoma)</td>
<td>1-2%</td>
</tr>
<tr>
<td>Gastric</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>CNS (medulloblastoma)</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

- High rate of extra-colonic malignancies
Screening/surveillance in special populations

• FAP/AFAP
  - Early diagnosis/screening essential
  - Again start early and often
  - Screening with colonoscopy can decrease CRC incidence from 35-65% → 3-5% and delay CRC development by 15 years
  - 1/3 of patients with AFAP can be managed long term with colonoscopy and polypectomy

<table>
<thead>
<tr>
<th></th>
<th>Starting age</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAP</td>
<td>10-12 y/o</td>
<td>Every 1-2 years, yearly once adenomas detected</td>
</tr>
<tr>
<td>AFAP</td>
<td>18 y/o</td>
<td>Every 1-2 years</td>
</tr>
</tbody>
</table>

• CRC screening recommendations

Screening/surveillance in special populations

• FAP/AFAP
  - Extra-colonic screening
    - Duodenal/gastric cancer
      - EGD and side-viewing scope at age 18-25 or onset of colonic polyposis
      - Repeat every 1-2 years based on endoscopic findings
    - Thyroid cancer
      - Thyroid US and clinical thyroid exam starting late teens
      - Repeat annually

Screening/surveillance in special populations

• Other genetic syndrome
  - MUTYH associated polyposis (MAP)
    - Colonoscopy in mid 20’s, repeat every 1-2 years

  - Peutz-Jeghers
    - Colonoscopy in late teens, repeat every 2-3 years

  - Juvenile polyposis
    - Colonoscopy at age 15, repeat every 1-3 years
Screening/surveillance in special populations

- Serrated polyposis syndrome (SPS)
  - WHO criteria – need 1 criterion to diagnose
    - 5 or more serrated polyps proximal to the sigmoid colon, with at least 2 polyps ≥ 1 cm in size
    - At least 1 serrated polyp proximal to the sigmoid colon in a patient with a 1st degree relative with serrated polyposis
    - 20 or more cumulative serrated polyps (includes hyperplastic polyps) of any size throughout the colon

- When to screen in SPS?
  - No standardized guidelines yet, but most experts recommend
    - Start earlier (unclear how early) and repeat every 1-2 years
    - Consider NBI or chromoendoscopy

Large colon polyps

- Generally defined as polyps ≥ 2 cm in size
- Appropriate patient selection required
  - Low risk of invasive cancer
  - Size and location of the polyp amenable to endoscopic removal
- Features suggestive of invasive cancer in large polyp
  - Friability, induration, ulceration
  - Central depression
  - Firm consistency, poor lifting
  - Smooth, velvety surface vs those with a nodular/granular appearance

- 2 main techniques generally used
  - Snare polypectomy
  - Endoscopic mucosal resection (EMR)
Large colon polyps

• Snare polypectomy
  • Most pedunculated polyps can be easily removed with snare cautery resection
  • Can use submucosal injection to lift depending on the size, i.e. > 2 cm

Large colon polyps

• Endoscopic mucosal resection
  • Used for large flat and sessile polyps
  • Clearly define the borders – both white light and NBI evaluation

Large colon polyps

• Endoscopic mucosal resection
  • Initially raise/lift the polyp with submucosal injection
    • Saline – gets rapidly absorbed
    • Tissue expander such as hydroxyethyl starch (Voluven), hyaluronic acid, dextrose solutions
    • Can add dilute epinephrine to decrease the risk of bleeding
    • Add methylene blue to help highlight resection margins
Large colon polyps

• Endoscopic mucosal resection
  • Snare cautery removal of the polyp
    • Depending on size can be done en bloc (usually <1.5 cm) but piecemeal resection usually required for larger polyps
    • Start at one margin and work to the other side
    • Avoid leaving polyp tissue between the removed pieces → increases the rate of recurrence
    • If small amount of residual polyp left, APC can be used to ablate
    • Place tattoo adjacent to the site to facilitate future identification

Large colon polyps

• Endoscopic mucosal resection

Complications

• Bleeding, can be both intra or post-procedural – 2 to 10% depending on the study
  • Risk factors
    • Intra-procedural
      • Polyp size (>2 cm), villous or tubulovillous histology, procedure performed at low volume center (>75 large polyp resections)
    • Post-procedural
      • Right sided polyp, cautery current not controlled by a microprocessor, presence of intra-procedural bleeding
  • Perforation – 0 to 5%
    • Generally requires surgery, sometimes can be closed with clips
**Large colon polyps**

- **Endoscopic mucosal resection**
  - Preventing risk of bleeding after resection
  - Epinephrine injection at polypectomy site
  - Placement of hemoclips across stalk if pedunculated or across the resection site if flat/sessile
  - Need to be careful not to deploy clip within the mucosal defect

**Colonic stenting**

- **Colonic self expandable metal stents (SEMS)**
  - 2 main indications
  - Palliation of advanced disease – i.e non-operative patients
  - 75% patients can achieve adequate palliation of symptoms
  - Preoperative decompression
    - Can convert a surgery from emergency two step procedure requiring a colostomy into an elective single procedure
    - Studies have shown this approach to be more effective and less costly overall
  - Can also be used to allow completion colonoscopy to examine the remainder of the colon prior to surgical resection
  - Can be performed in patients with partial or complete obstruction (without signs of toxicity)

**Technique**

- Patients generally prepped with enemas
- Mass attempted to be passed with the scope
  - If successful the length of the lesion is measured
- If unable to traverse the mass
  - Guidewire is advanced across the stricture under fluoroscopic guidance
  - Length can then be measured using contrast injection and/or a balloon
Colonic stenting

• **Technique**
  - Stent deployed over through the scope over the wire under both endoscopic and fluoroscopic guidance
  - Try to place stent so that at least 2 cm of the stent is proximal and distal to the mass
  - After stent deployed a “waist” in the stent will be seen and usually a gush of stool comes through the stent
  - Occasionally if long mass/stricture, multiple stents are required

• **Complications**
  - Perforation - <5%, can be immediate or delayed
    - Tends to occur more commonly in the distal colon due to sharp angulations and redundant loops
    - Rates higher if patient on bevacizumab - about 15%
  - Stent migration – about 10%
    - Risk factors include benign strictures, extrinsic compression from other abdominal/pelvic masses, dilation of the stricture, smaller caliber stent, use of covered stents, post-stenting radiation therapy
  - Bleeding – usually minor and related to friability and irritation of the tumor from the stent
  - Abdominal pain – usually transient and mild lasting a few days

• Overall about 5% of patients will not achieve adequate decompression from colonic stenting

• **Diet recommendations after stent placement**
  - Need to maintain soft stool consistency to avoid fecal/stool impaction in the stent
  - Low residue diet
  - Avoid high fiber diet
  - Use of regular laxatives such as miralax
Objectives

• Review background demographics and pathways for colon cancer
• Review colorectal cancer screening and post-polypectomy surveillance guidelines
• Review endoscopic technique for removal of large colon polyps
• Review colonic stenting

Thank you