Colon Cancer Screening

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Objectives

- Background on incidence and death rates from colon cancer
- Present recent patient cases of colon cancer, and the radiographic findings
- Discuss current recommendations for colon cancer screening
- Present modalities for colon cancer screening, focusing on modalities that involve the radiology department
# 2005 Estimated US Cancer Cases*

<table>
<thead>
<tr>
<th>Cancer Site</th>
<th>Percentage</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>33%</td>
<td>710,040</td>
<td>662,870</td>
</tr>
<tr>
<td>Lung and bronchus</td>
<td>13%</td>
<td></td>
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<tr>
<td>Colon and rectum</td>
<td>10%</td>
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<tr>
<td>Urinary bladder</td>
<td>7%</td>
<td></td>
<td></td>
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<tr>
<td>Melanoma of skin</td>
<td>5%</td>
<td></td>
<td></td>
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<tr>
<td>Non-Hodgkin lymphoma</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leukemia</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Cavity</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Other Sites</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung and bronchus</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colon and rectum</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterine corpus</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ovary</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroid</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Other Sites</td>
<td>21%</td>
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</tbody>
</table>

*Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.

Source: American Cancer Society, Cancer Statistics 2005 Presentation.
2005 Estimated US Cancer Deaths*

Lung and bronchus 31%  
Prostate 10%  
**Colon and rectum** 10%  
Pancreas 5%  
Leukemia 4%  
Esophagus 4%  
Liver and intra-hepatic bile duct 3%  
Non-Hodgkin Lymphoma 3%  
Urinary bladder 3%  
Kidney 3%  
All other sites 24%  

**Men** 295,280  
**Women** 275,000  

27% Lung and bronchus  
15% Breast  
**10% Colon and rectum**  
6% Ovary  
6% Pancreas  
4% Leukemia  
3% Non-Hodgkin lymphoma  
3% Uterine corpus  
2% Multiple myeloma  
2% Brain/ONS  
22% All other sites  

ONS=Other nervous system.  
Source: American Cancer Society, Cancer Statistics 2005 Presentation.
Patient 1: EJ

- 80 yo woman with PMH significant for htn, GERD, CVA

- March 2005: Presents to ER with bilateral lower quadrant, crampy abdominal pain x 2-3 months
  - initially infrequent, now occurring at least 5-10 times per day for the past week
  - not related to eating
  - + flatus, nausea, vomiting (white foamy vomiting)
  - last bowel movement was approximately 4 days ago
Patient 1: EJ

- **PSH:** C-section, hysterectomy
- **PE:** afebrile, HR 110, BP 196/95
  - hypoactive bowel sounds, abd mildly distended and diffusely tender, worse in RLQ and suprapubic region.
  - no rebound or guarding, guaiac negative.
- Abdominal CT scan ordered in ED
Patient 1: EJ

- Thickened bowel wall
- Mural calcifications on aorta
- 4.28 mm
- Multiple small retroperitoneal lymph nodes, do not meet criteria for pathologic enlargement
- Small bowel loops normal in caliber
- No bowel wall pneumatosis
- No free air in abdomen

Courtesy of Jimmy Kang, MD
Patient 1: EJ

Transition point
Wall thickening

Courtesy of Jimmy Kang, MD
Patient 1: EJ

Diffuse dilation of colon, most prominent in ascending, transverse, and segments of descending colon and sigmoid colon

Courtesy of Jimmy Kang, MD
Patient 1: EJ

Diffuse dilation of colon, most prominent in ascending, transverse, and segments of descending colon and sigmoid colon
Differential Diagnosis of Focal Sigmoid Colitis/narrowing

- Ischemic colitis (24% sigmoid)
- Inflammatory bowel disease
- Diverticulitis
- Infectious colitis
- NSAID-induced colitis
- Colonic carcinoma
- Radiation-induced colitis

...at this point the differential is quite broad, direct visualization was recommended
Patient 1: EJ

Portable abdominal plain film taken the next day confirmed dilated loops of large bowel, cecum measures approximately 10 cm.

No evidence of megacolon
Patient 1: EJ

Single-contrast gastrograffin enema conducted on the following day showed complete obstruction in the mid-sigmoid colon. Filling defect in the lumen suggests a mass.
Patient 1: Hospital Course

- Based on the mid-sigmoid obstruction seen on the enema study, surgeons deemed that EJ would require a sigmoid resection.

- Intra-Op: The ascending, transverse, and descending colon were all dilated and thickened. A mass lesion was palpated in the distal sigmoid. There was no evidence of extra colonic spread within the abdominal cavity.

- Pathology: 4cm x 3.6cm high-grade adenocarcinoma, invades through the muscularis propria into the subserosa, with no lymph node involvement. Margins clear.
Patient 2: MM

- 67 y.o. woman p/w a 3-month history of abdominal pain, weight loss, and rectal bleeding
- Never been screened for colon cancer
- The patient was referred for computed tomography (CT) of the abdomen with integrated CT colonography.
Patient 2: MM

Low-attenuation, peripherally enhancing lesion in liver, consistent with metastasis (black arrow)

Constricting lesion in distal transverse colon (white arrow)

3-D reconstruction (virtual air-contrast enema) shows apple-core-like constriction

Courtesy of Vassilios Raptopoulos, MD
Panel A: endoluminal 3-D CT colonoscopy shows the overlapping distal edge of a lesion consistent with colon cancer. Panel B: photograph of the lesion from colonoscopy.

 Courtesy of Vassilios Raptopoulos, MD
Patient 2: MM

- MM was admitted for transverse colectomy and excision of liver metastasis.
- Pathology showed Stage IV adenocarcinoma of the colon.
- The patient received chemotherapy after surgery, and has been doing well.
For both of these patients, screening might have picked up the lesions earlier....

Unfortunately, compliance with screening is poor.

In 2/3 of patients, the initial diagnosis of colorectal cancer (CRC) is made after the onset of symptoms.
Screening Statistics

- The percentage of people aged 50 or older who reported receiving fecal occult blood testing within 12 months was
  - 19.4 percent in 1997
  - 23.5 percent in 2001

- The percentages who reported lower endoscopy within five years were
  - 29.9 percent in 1997
  - 38.7 percent in 2001

Source: CDC Behavioral Risk Factor Surveillance System
Screen men and women aged 50 and older who are at average risk for CRC

Higher risk patients (first-degree relative dx with CRC before age 60) should begin screening at a younger age.
Increasing incidence of colorectal cancer with age The age-specific incidence of colorectal cancer in the general population was measured between 1986 and 1992 in men and women of all races. (Data from Surveillance, Epidemiology, and End Results (SEER) Program, 1973-1992.)
Screening options include:

- Fecal occult blood test (FOBT)
- Flexible sigmoidoscopy
- Colonoscopy
- Double-contrast barium enema.

There is insufficient data to determine which screening strategy is best.

Regardless of which screening method is used, CRC screening is cost effective
costing less than $30,000 per additional year of life gained

Choice of screening method should be based upon patient preferences, medical contraindications, patient adherence, and available resources for testing and follow-up.
Menu of Tests

- Fecal Occult Blood Test (FOBT)
- Flexible Sigmoidoscopy
- Double-Contrast Barium Enema
- Colonoscopy
- Virtual Colonoscopy (CT)
Fecal Occult Blood Test (FOBT)

- Guaiac-based test cards are prepared at home by patients from three consecutive stool samples and forwarded to clinicians.
- RCTs show mortality reductions from 15% to 33% from periodic FOBT screening.
- Intended to pick up early malignancy: large adenomas rarely bleed.
- American Cancer Society (ACS) recommends screening annually.

Flexible Sigmoidoscopy

- Can only visualize the lower half of the colon
  - 75-80% only visualize up to sigmoid, identifying only 30-40% of lesions
  - If visualize up to splenic flexure, identify only 40-50% of lesions
- Small risk of perforation
- Screening with fecal occult blood testing and flexible sigmoidoscopy has been shown to reduce mortality from colorectal cancer
- ACS recommends screening every 5 years

Double Contrast Barium Enema

- The radiologic means of total colonic examination
- Liquid barium and air is insufflated in colon via rectum
- Can pick up
  - Ulcers
  - Strictures
  - Polyps
  - Diverticula
  - Cancer
  - Other abnormalities
- ACS recommends screening every 5 years
Barium Enema

**Pros**
- No sedation is needed.
- Complications, such as perforation of the colorectal wall, are slight.
- Less costly than colonoscopy.

**Cons**
- The test may miss small polyps or sometimes even small cancers.
- Biopsy and polyp removal cannot be done during testing → colonoscopy.
- Bowel prep can be uncomfortable.
Lesions found on barium enema

Pedunculated polyp

Sessile polyp (white arrows)
Lesions found on barium enema

3.5 cm flat discoid filling defect (white arrows)


Apple-core lesion in sigmoid colon

Colonoscopy is the most sensitive (90%) and specific test for detecting cancer and large polyps, but is associated with higher risks.

- Bleeding
- Perforation

Diagnostic and therapeutic benefits

- ACS recommends screening every 10 years
- Preferred screening strategy by American College of Gastroenterology

Virtual Colonoscopy

- Non-invasive procedure for producing images of the colonic lumen
- Requires bowel prep similar to colonoscopy, followed by installation of air or carbon dioxide through a rectal tube
- No need for sedation
- Multidetector helical CT scanner used to construct high-resolution 2- and 3-dimension images
- Exam can be performed in 10-15 minutes
- Small and flat polyps less well visualized than cancers and large polyps

Patient 2: MM

Endoluminal 3-D CT colonoscopy shows the overlapping distal edge of a lesion consistent with colon cancer.

Courtesy of Vassilios Raptopoulos, MD
Virtual Colonoscopy: Evidence

- In research studies, sensitivity for CT colonography varied from 21% to 96%.
- Overall, specificity was more consistent ~ 86%.
- Sensitivity and specificity increased with polyp size (94% & 96% for polyps > 1cm).
  - But based on ideal conditions of bowel prep, software, method of interpretation, and training.
  - In community practice, sensitivity drops to 55%.

Virtual Colonoscopy: Unanswered Questions

- If a lesion <1cm is found, does it need to be removed immediately, or can it be followed over time?
- If lesion should be removed, can radiologists and gastroenterologists coordinate to perform colonoscopy immediately while bowel prepped?
- Is virtual colonoscopy cost-effective? Absolute cost of virtual colonoscopy ($478) is less than colonoscopy ($728), but cost per year-of-life-saved is less for colonoscopy (factors in sensitivity, specificity, patient adherence, etc.).
- No consensus yet on role of virtual colonoscopy in colon cancer screening

Patient 3: DG

- 70 y.o. man w/CAD s/p CABG, htn, hypercholesterolemia, and CVA
  - friable fungating 4 cm mass in the right colon in the opposing wall of the ileo-cecal valve. The mass was biopsied, but not removed.
- Biopsy of the mass demonstrated adenoma of the ascending colon, with hyperplasia of regional lymph nodes.
- Patient was admitted to BIDMC for laparoscopic right colectomy, 4/2004.
Patient 3: DG

Pedunculated polyp
Patient 3: DG

Pedunculated polyp
References


References (3)


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