Imaging techniques in the diagnosis and management of colorectal cancer

March 3, 2018
Dr. Ryan Buss
Disclosure

No financial relationships with manufacturers or commercial products discussed in this presentation
How is imaging involved with colorectal cancer diagnosis and management?
How is imaging involved with colorectal cancer diagnosis and management?

- Screening
How is imaging involved with colorectal cancer diagnosis and management?

• Screening

• Staging/Rer staging
How is imaging involved with colorectal cancer diagnosis and management?

• Screening

• Staging/Restaging

• Image guided interventions
Colon Cancer Screening Methods

• 2016 USPSTF updated their prior 2008 colon cancer screening recommendations for average risk individual ages 50-75

• Multiple different screening tests were assessed and given A recommendations

• No single method of screening was favored but acknowledged each has its pros and cons

• Per the Affordable Care Act, for non-grandfathered insurances plans, any USPSTF A recommendation must be covered by private insurers with no cost sharing to the patient
## USPSTF Recommendations

<table>
<thead>
<tr>
<th>Screening Method</th>
<th>Frequency(^a)</th>
<th>Evidence of Efficacy</th>
<th>Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stool-Based Tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gFOBT</td>
<td>Every year</td>
<td>RCTs with mortality end points: High-sensitivity versions (eg, Hemoccult SENSA) have superior test performance characteristics than older tests (eg, Hemoccult II)</td>
<td>Does not require bowel preparation, anesthesia, or transportation to and from the screening examination (test is performed at home)</td>
</tr>
<tr>
<td>FIT(^c)</td>
<td>Every year</td>
<td>Test characteristic studies: Improved accuracy compared with gFOBT Can be done with a single specimen</td>
<td>Does not require bowel preparation, anesthesia, or transportation to and from the screening examination (test is performed at home)</td>
</tr>
<tr>
<td>FIT-DNA</td>
<td>Every 1 or 3 y(^d)</td>
<td>Test characteristic studies: Specificity is lower than for FIT, resulting in more false-positive results, more diagnostic colonoscopies, and more associated adverse events per screening test Improved sensitivity compared with FIT per single screening test</td>
<td>There is insufficient evidence about appropriate longitudinal follow-up of abnormal findings after a negative diagnostic colonoscopy; may potentially lead to overly intensive surveillance due to provider and patient concerns over the genetic component of the test</td>
</tr>
</tbody>
</table>

| Direct Visualization Tests  |                 |                                                                                     |                                                                                      |
| Colonoscopy\(^e\)          | Every 10 y      | Prospective cohort study with mortality end point                                    | Requires less frequent screening Screening and diagnostic follow-up of positive findings can be performed during the same examination |
| CT colonography\(^f\)      | Every 5 y       | Test characteristic studies                                                         | There is insufficient evidence about the potential harms of associated extracolonic findings, which are common |
| Flexible sigmoidoscopy      | Every 5 y       | RCTs with mortality end points: Modeling suggests it provides less benefit than when combined with FIT or compared with other strategies | Test availability has declined in the United States |
| Flexible sigmoidoscopy with FIT\(^g\) | Flexible sigmoidoscopy every 10 y plus FIT every year | RCT with mortality end point (subgroup analysis)                                    | Test availability has declined in the United States Potentially attractive option for patients who want endoscopic screening but want to limit exposure to colonoscopy |

\(^a\) Recommended screening frequency can be adjusted based on patient factors and clinician judgment.

\(^b\) Evidence of efficacy includes both primary and secondary prevention studies.

\(^c\) FIT = fecal immunochemical test.

\(^d\) FIT-DNA = fecal immunochemical test with DNA.

\(^e\) Colonoscopy = flexible or rigid colonoscopy.

\(^f\) CT colonography = computed tomography colonography.

\(^g\) Flexible sigmoidoscopy with FIT = flexible sigmoidoscopy with fecal occult blood test.
### USPSTF Recommendations

#### Table. Characteristics of Colorectal Cancer Screening Strategies*

<table>
<thead>
<tr>
<th>Screening Method</th>
<th>Frequency</th>
<th>Evidence of Efficacy</th>
<th>Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stool-Based Tests</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gFOBT</td>
<td>Every year</td>
<td>RCTs with mortality end points: High-sensitivity versions (eg, Hemoccult SENSA) have superior test performance characteristics than older tests (eg, Hemoccult II)</td>
<td>Does not require bowel preparation, anesthesia, or transportation to and from the screening examination (test is performed at home)</td>
</tr>
<tr>
<td>FIT</td>
<td>Every year</td>
<td>Test characteristic studies: Improved accuracy compared with gFOBT Can be done with a single specimen</td>
<td>Does not require bowel preparation, anesthesia, or transportation to and from the screening examination (test is performed at home)</td>
</tr>
<tr>
<td>FIT-DNA</td>
<td>Every 1 or 3 y*</td>
<td>Test characteristic studies: Specificity is lower than for FIT, resulting in more false-positive results, more diagnostic colonoscopies, and more associated adverse events per screening test Improved sensitivity compared with FIT per single screening test</td>
<td>There is insufficient evidence about appropriate longitudinal follow-up of abnormal findings after a negative diagnostic colonoscopy; may potentially lead to overly intensive surveillance due to provider and patient concerns over the genetic component of the test</td>
</tr>
<tr>
<td><strong>Direct Visualization Tests</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>Every 10 y</td>
<td>Prospective cohort study with mortality end point</td>
<td>Requires less frequent screening Screening and diagnostic follow-up of positive findings can be performed during the same examination</td>
</tr>
<tr>
<td>CT colonography</td>
<td>Every 5 y</td>
<td>Test characteristic studies</td>
<td>There is insufficient evidence about the potential harms of associated extracolonic findings, which are common</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy</td>
<td>Every 5 y</td>
<td>RCTs with mortality end points: Modeling suggests it provides less benefit than when combined with FIT or compared with other strategies</td>
<td>Test availability has declined in the United States</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy with FIT</td>
<td>Flexible sigmoidoscopy every 10 y plus FIT every year</td>
<td>RCT with mortality end point (subgroup analysis)</td>
<td>Test availability has declined in the United States Potentially attractive option for patients who want endoscopic screening but want to limit exposure to colonoscopy</td>
</tr>
</tbody>
</table>
Why these new methods?
Why these new methods?
Why these new methods?

• It is estimated that ~ 40% of patients eligible for screening have not done so
Why these new methods?

• It is estimated that ~40% of patients eligible for screening have not done so

• Optical colonoscopy is an invasive test requiring sedation
Why these new methods?

• It is estimated that ~ 40% of patients eligible for screening have not done so

• Optical colonoscopy is an invasive test requiring sedation

• Optical colonoscopy can have rare but serious complications
  • Rate of perforation 4/10,000
  • Rate of hemorrhage 8/10,000
CT Colonography – How its done

• Low dose screening CT exam performed after bowel preparation
  • The bowel preparation includes barium for stool tagging and water soluble contrast for liquid tagging.

• Colon is distended with CO² from an automated insufflator via a flexible rectal tube

• Images are obtained in the supine and prone positions

• Interpreted from the source images as well as with specialized software

• Polyps > 6 mm are considered positive and are referred for optical colonoscopy. Polyps > 10 mm are most consequential
  • Patients with only 1-2 polyps < 10 mm can be offered surveillance at 3 years instead of 5.
CT Colonography
CT Colonography
CT Colonography versus Colonoscopy for the Detection of Advanced Neoplasia

David H. Kim, M.D., Perry J. Pickhardt, M.D., Andrew J. Taylor, M.D., Winifred K. Leung, M.D., Thomas C. Winter, M.D., J. Louis Hinshaw, M.D., Deepak V. Gopal, M.D., Mark Reichelderfer, M.D., Richard H. Hsu, M.D., and Patrick R. Pfau, M.D.

BACKGROUND

Advanced neoplasia represents the primary target for colorectal-cancer screening and prevention. We compared the diagnostic yield from parallel computed tomographic colonography (CTC) and optical colonoscopy (OC) screening programs.

METHODS

We compared primary CTC screening in 3120 consecutive adults (mean ±SD age, 57.0±7.2 years) with primary OC screening in 3163 consecutive adults (mean age, 58.1±7.8 years). The main outcome measures included the detection of advanced neoplasia (advanced adenomas and carcinomas) and the total number of harvested polyps. Referral for polypectomy during OC was offered for all CTC-detected polyps of at least 6 mm in size. Patients with one or two small polyps (6 to 9 mm) also were offered the option of CTC surveillance. During primary OC, nearly all detected polyps were removed, regardless of size, according to established practice guidelines.

From the Department of Radiology (D.H.K., P.J.P., A.J.T., W.K.L., T.C.W., J.L.H.) and the Section of Gastroenterology and Hepatology (D.V.G., M.R., R.H.H., P.R.P.), University of Wisconsin Medical School, Madison. Address reprint requests to Dr. Kim at the Department of Radiology, University of Wisconsin Medical School, E3/11 Clinical Science Center, 600 Highland Ave., Madison, WI 53792-3252, or at dkim@uwhealth.org.

**CT Colonography**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Primary CTC (N=3120)</th>
<th>Primary OC (N=3163)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of OC — no. of patients (%)</td>
<td>246 (7.9)</td>
<td>3163 (100)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total no. of polyps removed</td>
<td>561*</td>
<td>2434</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No. of advanced adenomas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥10 mm</td>
<td>103</td>
<td>103</td>
<td>0.92</td>
</tr>
<tr>
<td>6–9 mm</td>
<td>5*</td>
<td>11</td>
<td>0.14</td>
</tr>
<tr>
<td>≤5 mm</td>
<td>1†</td>
<td>3</td>
<td>0.32</td>
</tr>
<tr>
<td>Invasive carcinoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of carcinomas</td>
<td>14</td>
<td>4</td>
<td>0.02</td>
</tr>
<tr>
<td>No. of patients (%)</td>
<td>12 (0.4)</td>
<td>4 (0.1)</td>
<td>0.04</td>
</tr>
<tr>
<td>Total advanced neoplasia‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of neoplasms</td>
<td>123*</td>
<td>121</td>
<td>0.81</td>
</tr>
<tr>
<td>No. of patients (%)</td>
<td>100 (3.2)*</td>
<td>107 (3.4)</td>
<td>0.69</td>
</tr>
</tbody>
</table>
## Table 2. Diagnostic Yield of Primary CTC and Primary OC Screening.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Primary CTC (N=3120)</th>
<th>Primary OC (N=3163)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of OC — no. of patients (%)</td>
<td>246 (7.9)</td>
<td>3163 (100)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total no. of polyps removed</td>
<td>561*</td>
<td>2434</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No. of advanced adenomas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥10 mm</td>
<td>103</td>
<td>103</td>
<td>0.92</td>
</tr>
<tr>
<td>6–9 mm</td>
<td>5*</td>
<td>11</td>
<td>0.14</td>
</tr>
<tr>
<td>≤5 mm</td>
<td>1†</td>
<td>3</td>
<td>0.32</td>
</tr>
<tr>
<td>Invasive carcinoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of carcinomas</td>
<td>14</td>
<td>4</td>
<td>0.02</td>
</tr>
<tr>
<td>No. of patients (%)</td>
<td>12 (0.4)</td>
<td>4 (0.1)</td>
<td>0.04</td>
</tr>
<tr>
<td>Total advanced neoplasia‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of neoplasms</td>
<td>123*</td>
<td>121</td>
<td>0.81</td>
</tr>
<tr>
<td>No. of patients (%)</td>
<td>100 (3.2)*</td>
<td>107 (3.4)</td>
<td>0.69</td>
</tr>
</tbody>
</table>
CT Colonography

• Improved sensitivity and specificity compared to double contrast barium enema (DCBE) for polyps > 1.0 cm.
  • DCBE sensitivity 70%, specificity 85%
  • CT Colonography sensitivity 90-95%, specificity 96% \(^4,5\)

• Improved safety profile compared to optical colonoscopy

• No sedation required

• Around 90% of exams are negative, repeat screen in 5 years no optical colonoscopy required
CT Colonography - Downsides

• Coordination with gastroenterology/endoscopist is ideal, if same day colonoscopy can not be performed, patient may need to repeat bowel preparation

• Positive exams still require colonoscopy

• Payment issues
  • Medicare does not currently cover CT Colonography, only DCBE
  • Non-grandfathered private insurance plans should pay per ACA
  • VA system covers CT Colonography
CT Colonography - Downsides

• Extra-colonic findings (incidentalomas) which require workup and additional cost

• However, 2.5% will have potentially significant extra colonic findings
  • Vascular aneurysms, solid organ masses, and lymphadenopathy

• Series of 10286 patients found 36 extra-colonic malignancies (lymphoma, renal cell carcinoma, and pulmonary adenocarcinoma being most common)\(^6\)
  • Same series found 22 colorectal cancers (excludes adenomas)
CT Colonography - Summary

• Newer direct visualization screening test
  • Better sensitivity and specificity compared to DCBE
  • Reimbursement remains an issue

• Detection of advanced neoplasia comparable to colonoscopy

• Pros and cons have to weighed for each patient
Staging
Colon Cancer Staging – Principles of Imaging

• Staging CT chest, abdomen, and pelvis should be performed with IV and oral contrast

• Evaluate local extent of disease and involvement of adjacent structures

• Evaluate for distal metastatic disease (liver, lungs, peritoneum, lymph nodes etc.)
Colon Cancer Staging – Principles of Imaging

- What if the patient has a CT contrast allergy?
  - MRI of the abdomen and pelvis without and with contrast
  - Non-contrast CT of the chest.
Colon Cancer Staging – Principles of Imaging

• What if the patient has poor renal function (GFR <30)?

  • MRI of the abdomen and pelvis without and with contrast with Group II agent

  • Non-contrast CT of the chest.
Colon Cancer Staging – Principles of Imaging

• What if the patient has poor renal function (GFR < 30)?

  • What about Nephrogenic Systemic Fibrosis (NSF) risk?
Colon Cancer Staging – Principles of Imaging

• What if the patient has poor renal function (GFR <30)?
  • What about Nephrogenic Systemic Fibrosis (NSF) risk?
  • New ACR contrast guidelines released in 2017
Assessment of Risk (See Table 1 for the classification of GBCAs)

Group II agents

Based on the most recent scientific and clinical evidence [30-37] the ACR Committee on Drugs and Contrast Media considers the risk of NSF among patients exposed to standard or lower than standard doses of group II GBCAs is sufficiently low or possibly nonexistent such that assessment of renal function with a questionnaire or laboratory testing is optional prior to intravenous administration. As in all instances, group II GBCAs should only be administered if they are deemed necessary by the supervising radiologist, and the lowest dose needed for diagnosis should be used as deemed necessary by the supervising radiologist.1

Group I and III agents

The ACR Committee on Drugs and Contrast Media concludes that patients receiving group I GBCAs should be considered at risk of developing NSF if any of the following conditions apply to the patient:

- On dialysis (of any form)
- Severe or end-stage CKD (CKD 4 or 5, eGFR < 30 mL/min/1.73 m²) without dialysis
- AKI [38,39]
Assessment of Risk (See Table 1 for the classification of GBCAs)

Group II agents

Based on the most recent scientific and clinical evidence [30-37] the ACR Committee on Drugs and Contrast Media considers the risk of NSF among patients exposed to standard or lower than standard doses of group II GBCAs is sufficiently low or possibly nonexistent such that assessment of renal function with a questionnaire or laboratory testing is optional prior to intravenous administration. As in all instances, group II GBCAs should only be administered if they are deemed necessary by the supervising radiologist, and the lowest dose needed for diagnosis should be used as deemed necessary by the supervising radiologist.¹

Group I and III agents

The ACR Committee on Drugs and Contrast Media concludes that patients receiving group I GBCAs should be considered at risk of developing NSF if any of the following conditions apply to the patient:

- On dialysis (of any form)
- Severe or end-stage CKD (CKD 4 or 5, eGFR < 30 mL/ min/1.73 m²) without dialysis
- AKI [38,39]
New ACR MRI contrast guidelines

<table>
<thead>
<tr>
<th>Group I: Agents associated with the greatest number of NSF cases:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gadodiamide (Omniscan® – GE Healthcare)</td>
</tr>
<tr>
<td>Gadopentetate dimeglumine (Magnevist® – Bayer HealthCare Pharmaceuticals)</td>
</tr>
<tr>
<td>Gadoversetamide (OptiMARK® – Guerbet)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group II: Agents associated with few, if any, unconfounded cases of NSF:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gadobenate dimeglumine (MultiHance® – Bracco Diagnostics)</td>
</tr>
<tr>
<td>Gadobutrol (Gadavist® – Bayer HealthCare Pharmaceuticals; Gadovist in many countries)</td>
</tr>
<tr>
<td>Gadoterate acid (Dotarem® – Guerbet)</td>
</tr>
<tr>
<td>Gadoteridol (ProHance® – Bracco Diagnostics)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group III: Agents for which data remains limited regarding NSF risk, but for which few, if any unconfounded cases of NSF have been reported:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gadoxetate disodium (Eovist – Bayer HealthCare Pharmaceuticals; Primovist in many countries)</td>
</tr>
</tbody>
</table>
New ACR MRI contrast guidelines

<table>
<thead>
<tr>
<th>TABLE 1. ACR Manual Classification of Gadolinium-Based agents Relative to Nephrogenic Systemic Fibrosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group I: Agents associated with the greatest number of NSF cases:</strong></td>
</tr>
<tr>
<td>Gadodiamide (Omniscan™ – GE Healthcare)</td>
</tr>
<tr>
<td>Gadopentetate dimeglumine (Magnevist™ – Bayer HealthCare Pharmaceuticals)</td>
</tr>
<tr>
<td>Gadoversetamide (OptiMARK™ – Guerbet)</td>
</tr>
<tr>
<td><strong>Group II: Agents associated with few, if any, unconfounded cases of NSF:</strong></td>
</tr>
<tr>
<td>Gadobenate dimeglumine (MultiHance™ – Bracco Diagnostics)</td>
</tr>
<tr>
<td><strong>Gadobutrol (Gadavist™ – Bayer HealthCare Pharmaceuticals; Gadovist in many countries)</strong></td>
</tr>
<tr>
<td>Gadoterate acid (Dotarem™ – Guerbet)</td>
</tr>
<tr>
<td>Gadoteridol (ProHance™ – Bracco Diagnostics)</td>
</tr>
<tr>
<td><strong>Group III: Agents for which data remains limited regarding NSF risk, but for which few, if any unconfounded cases of NSF have been reported:</strong></td>
</tr>
<tr>
<td>Gadoxetate disodium (Eovist – Bayer HealthCare Pharmaceuticals; Primovist in many countries)</td>
</tr>
</tbody>
</table>
Colon Cancer Staging – Principles of Imaging

- PET CT is *not* routinely indicated
  - Does not supplant contrast enhanced CT or MRI

- Special circumstances
  - Patient with contra indications to both CT and MRI (allergy or non compatible MRI device)
  - Can be considered in potentially curable M1 liver disease to evaluate for occult extrahepatic metastasis
  - Can be used for problem solving for equivocal findings on CT or MRI
Colon Cancer Staging – Principles of Imaging

• If patient is being considered for liver directed therapy or surgery for metastatic disease MRI preferred over CT and PET\(^8\)

  • Increased sensitivity for small metastasis
  • CT sensitivity 85%
    • Difficulty with fatty liver and <1 cm lesions
  • MR sensitivity up to 95%
Rectal Cancer Staging – Principles of Imaging

• Staging for distal metastatic disease is the same as colon cancer

• Pelvic MRI has a unique usage for local disease staging
Rectal Cancer Staging – Principles of Imaging

• Define tumor relationship to the muscularis propria and important anatomic structures.

  • T1-T2 disease → Surgical resection

  • T3-T4 disease → Neoadjuvant chemotherapy and radiation prior to surgical resection
Rectal Cancer Staging – Principles of Imaging
Rectal Cancer Staging – Principles of Imaging
Rectal Cancer Staging – Principles of Imaging
Colon Cancer Staging – Summary

• Goal is to evaluate extent of disease to most accurately guide therapy

• Methods depend on patient circumstances (GFR, MRI compatible devices, allergies etc.)

• MRI staging likely to have increased usage with new contrast guidelines
Image Guided Interventions
Colon Cancer Treatment – Metastatic disease

• Patients often will have hepatic metastatic disease found during initial staging (synchronous 15-25%) or after colonic resection (metachronous 15-20%)
  • Resectable/potentially resectable
  • Non resectable

• Hepatic metastasis resection (in conjunction with chemotherapy) is the treatment of choice if the lesions are resectable
  • Increases 5 year survival rate to 28-58%\textsuperscript{11}
  • However, only 10-20% of metastasis are resectable at presentation
  • Some tumors can be “downsized” with neoadjuvant chemotherapy and become resectable

• Surgically clear margins are required and patient must have a large enough future liver remnant for normal hepatic function
Colon Cancer Treatment – Metastatic disease

• What if the patients future liver remnant (FLR) will be too small?
  • Patients undergoing hepatotoxic chemotherapy need a FLR > 30% of liver volume
  • Patients with underlying chronic liver disease need a FLR > 40%
Colon Cancer Treatment – Metastatic disease

• Pre-operative portal vein embolization
  • Used in patients with predicted insufficient liver remnant
  • Induces hypertrophy of the contralateral hepatic lobe
  • Can increase liver volume ~ 15% in 3-9 weeks time
Colon Cancer Treatment – Metastatic disease

• What if the patient the metastasis are not resectable?
Colon Cancer Treatment – Metastatic disease

• Several intervention ablation and embolization techniques are available
Colon Cancer Treatment – Metastatic disease

• Percutaneous ablation can be considered in several cases when hepatic resection is not an option
  • Treatment of resectable disease in patients with comorbidities who are unfit for surgery
  • Insufficient liver remnant
  • In conjunction with surgery to obtain a tumor free status
  • Salvage therapy for recurrent disease after hepatectomy
Colon Cancer Treatment – Metastatic disease

• Several methods are available
  • Radiofrequency ablation (heat)
  • Cryoablation (cold)
  • Microwave ablation (heat)

• Higher local recurrence rates compared to resection (4-16% vs 1-5%)\(^{10}\)

• 5 year survival 21-48%\(^{11}\) in conjunction with chemotherapy
Colon Cancer Treatment – Metastatic disease

- Lesion size and number impacts ability to ablate
  - Ideally lesions should be less than < 3 cm for best results
  - Should have ≤ 3 lesions
- Adjacent structures can be limiting
  - Large vessels for “heat sink” effect
  - Gallbladder and biliary radicles can be injured
Colon Cancer Treatment – Metastatic disease

• If a patient is not a surgical or ablative candidate current NCCN guidelines recommend systemic chemotherapy regimens
Colon Cancer Treatment – Metastatic disease

• If a patient is not a surgical or ablative candidate current NCCN guidelines recommend systemic chemotherapy regimens.
• What are our options for hepatic predominant chemotherapy resistance/refractory disease?
Colon Cancer Treatment – Metastatic disease
Colon Cancer Treatment – Metastatic disease

• Arterial embolization techniques
• Liver receives 80% of blood from portal vein and 20% from hepatic artery
• Colorectal metastasis receive ~ 80% of their blood flow from recruited hepatic artery branches
• Agents infused into the hepatic artery selectively go towards metastases
Colon Cancer Treatment – Metastatic disease

- Transarterial chemoembolization (TACE)
- Drug eluding beads transarterial chemoembolization (DEB TACE)
- Yttrium 90 radioembolization
Colon Cancer Treatment – Metastatic disease

• Yttrium 90 radioembolization
  • Allows a high dose of localized radiation to the metastases (200-300 Gy)
  • Has the most acquired data of the embolization techniques
  • Better tolerated than other embolization techniques
  • Median survival after radioembolization ranges depending on series from 9-14.5 months\textsuperscript{12}
  • Lung shunt has to be evaluated to prevent radiation pneumonitis.
Colon Cancer Treatment – Metastatic disease

*Baseline CT scan pre-SIRT*

*CT scan 6 months post-SIRT*
Colon Cancer Treatment – Metastatic disease

- Transarterial chemoembolization (TACE)
  - Chemotherapeutic drugs (mitomycin C, gemcitabine, irinotecan) blended with lipiodol and embolic agents
  - 2009 study of 463 patients had a median survival from chemoembolization 14 months\textsuperscript{13}
  - Often performed several times
  - Main side effect is tumor embolization syndrome
    - Fever, N/V, and abdominal pain
Colon Cancer Treatment – Metastatic disease

• Drug eluding beads transarterial chemoembolization (DEB TACE)
  • Beads are made to release drug over a longer period of time
  • Usually doxorubicin or irinotecan
  • 2012 study of 74 patients compared DEBIRI vs systemic FOLFIRI
    • DEBIRI median survival 22 months
    • Systemic FOLFIRI median survival 15 months
The End
Questions?
References


References

