Obscure GI Bleeding

Jerrod Keith MD
University of Colorado Health Sciences
General Surgery Grand Rounds
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Outline

- Defining the problem
- Diagnostic approach
- Radiographic modalities
- Endoscopic modalities
- Surgical modalities
- Capsule endoscopy outcomes
- CT scan
- Conclusions
Obscure GI Bleeding

- Gastrointestinal bleeding of unknown origin that persists or recurs after negative endoscopy of the upper and lower GI tract

- Overt
  - Hematemesis
  - Hematochezia
  - Melena

- Occult
  - Drifting hematocrit
  - Iron-deficiency anemia
  - Blood in stools not grossly apparent
Gastrointestinal Bleeding

- GI bleeding – 300,000 hospitalizations/year
- 10-20% no identifiable source (obscure)
- 5% recurrent bleeding
Sources of Obscure Bleeding

- **Vascular**
  - Angiodysplasia (30 - 40%)
  - Dieulafoy lesion

- **Mass lesions**
  - Carcinoma
  - Adenoma
  - Small bowel tumors (4%)

- **Inflammation**
  - Ulcers
  - Cameron lesions

- **Other**
  - Meckel’s diverticulum
  - Diverticula
Missed Diagnosis

- Stopped bleeding
- Slow or intermittent bleeding
- Anemia and volume contraction
  - Lesions look less obvious
- Lesions located in the small bowel
  - 27% of obscure bleeds have small bowel lesions
Small Bowel Bleeding

- Difficult to examine
- 6.7m in length
- Endoscopic visualization
  - Free intraperitoneal location
  - Active contractility
- Contrast studies
  - Multiple overlying loops
Approach to GI Bleed

- Localize the site
  - Hematemesis typically proximal to ligament of Treitz
  - Hematochezia typically left colon and distally
  - Melena typically right colon and proximal

- Upper endoscopy
- Lower endoscopy
Work-up for Obscure Bleeding

- Repeat upper endoscopy
  - Diagnostic yield 25% to 64%
- Repeat colonoscopy
  - Diagnostic yield 6%
- Etiology still unclear
  - Focus on small bowel
  - Look for obscure bleeding
    - Radiographic
    - Endoscopic
    - Surgical
Radiographic Modalities

- **Small bowel follow-through (SBFT)**
  - Diagnostic yield – 8%
    - Small bowel tumors – 83%
    - Crohn’s disease – >90%

- **Enteroclysis**
  - Double-contrast infused under pressure into distal duodenum or proximal jejunum
  - Diagnostic yield – 10% to 21%
    - Small bowel tumors – 93%
    - Crohn’s disease – 93% to 100%
Radiographic Modalities

- Technitium-labeled nuclear scan
  - Tagged RBC scan
  - Active bleeding, rate of 0.1 mL/min
  - Diagnostic yield – 15% to 70%
    - Higher in overt bleeding
  - Poor localization

- Angiography
  - Active bleeding, rate of 0.5 mL/min
  - Diagnostic yield – 40% to 53%
  - Identify vascular patterns as well
  - Provocative angiography
  - Treatment options
    - Vasopressin, embolization
  - Mesenteric angiography yield – 53% to 60%
Radiographic Modalities

- **Meckel’s scan**
  - Technetium pertechnetate
  - Identifies heterotopic gastric mucosa
    - 50% of GI bleeding in patients <3 years of age
    - Sensitivity in pediatric patients – 81% to 90%

- **Helical CT angiogram**
  - Bleeding rates of 0.5 to 6 mL/min
  - Diagnostic yield – 72%

- **MRI**
  - Visualize changes in the bowel
    - Mucosal thickening, strictures, ulcerations
Endoscopic Modalities

- **Routine endoscopy**
  - Repeat upper endoscopy yield – 25% to 64%
  - Repeat colonoscopy yield – 6%
Endoscopic Modalities

- **Enteroscopy**
  - **Push enteroscopy**
    - 120cm past ligament of Treitz
    - Diagnostic yield – 28%
  - **Sonde enteroscopy**
    - Rarely used
  - **Double balloon enteroscopy**
    - Invasive
    - Newer technology
    - Diagnostic yield – 76%
Endoscopic Modalities

- Capsule endoscopy
  - FDA approval in 2001
  - Diagnostic yield – 40% to 70%
  - Clinical impact unclear
    - Abnormalities seen in 23% of healthy patients
  - Poor localization
  - Poor visualization
    - Bowel prep
    - Rapid or delayed bowel transit
    - Orientation of camera
  - Inability to treat lesions
**Inside the M2A™ Capsule**

1. Optical dome
2. Lens holder
3. Lens
4. Illuminating LEDs (Light Emitting Diode)
5. CMOS (Complementary Metal Oxide Semiconductor) imager
6. Battery
7. ASIC (Application Specific Integrated Circuit) transmitter
8. Antenna
Surgical Modalities

- **Exploratory laparotomy**
  - Alone
    - Diagnostic yield – 31% to 65%
  - Combined with intraoperative enteroscopy
    - Diagnostic yield increased – 50% to 100%
# Modality Overview

<table>
<thead>
<tr>
<th>Modality</th>
<th>Invasive</th>
<th>Diagnostic Yield</th>
<th>Therapeutic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBFT</td>
<td>-</td>
<td>8%</td>
<td>-</td>
</tr>
<tr>
<td>Enteroclysis</td>
<td>+</td>
<td>21%</td>
<td>-</td>
</tr>
<tr>
<td>Angiography</td>
<td>+</td>
<td>53%</td>
<td>+</td>
</tr>
<tr>
<td>Tagged RBC scan</td>
<td>-</td>
<td>70%</td>
<td>-</td>
</tr>
<tr>
<td>CT angiogram</td>
<td>+</td>
<td>72%</td>
<td>-</td>
</tr>
<tr>
<td>Repeat upper endoscopy</td>
<td>+</td>
<td>64%</td>
<td>+</td>
</tr>
<tr>
<td>Push enteroscopy</td>
<td>+</td>
<td>28%</td>
<td>+</td>
</tr>
<tr>
<td>Double Balloon enteroscopy</td>
<td>+</td>
<td>76%</td>
<td>+</td>
</tr>
<tr>
<td>Capsule endoscopy</td>
<td>-</td>
<td>70%</td>
<td>-</td>
</tr>
<tr>
<td>Intraoperative endoscopy</td>
<td>++</td>
<td>Near 100%</td>
<td>+</td>
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</tbody>
</table>
Double Balloon Enteroscopy

- Invasive
- Diagnostic yield near that of capsule endoscopy
- 2 prospective trials compared DBE with CE
  - Slightly higher diagnostic yield in capsule endoscopy
Capsule Endoscopy

- **Absolute contraindications**
  - Known small bowel stricture or obstruction
  - Ileus

- **Relative contraindications**
  - GI motility disorder
  - Prior abdominal surgeries or radiation
  - Dysphagia or swallowing disorder
  - Diverticuli
  - Patients requiring MR imaging
  - Cardiac pacemaker or defibrillator
  - Pregnancy
Meta-Analysis

- 14 studies comparing CE with push enteroscopy
  - Yield for CE – 63%
  - Yield for push enteroscopy – 28%

- 3 studies compared CE to barium radiography
  - Yield for CE – 67%
  - Yield for small bowel barium radiography – 8%

- 1 prospective study compared CE to mesenteric angiography
  - CE yield – 47%
  - Angiography yield – 53%
  - No significant difference

Clinical Outcomes

- Retrospective review
- Follow-up 6.7 months
- 44 consecutive capsule endoscopies
  - Negative EGD, colonoscopy, barium study
  - Overt bleeding – 51%
  - Occult bleeding – 42%
- Diagnostic yield – 42% (18 of 43)
  - Angiodysplasias most common
  - 12 (28%) patients underwent intervention or change in management
  - 7 (16%) positive clinical outcome

Variability in Diagnostic Yield

- Multicenter, prospective study
- 100 consecutive patients with obscure GI bleed and previous negative workup
- Capsule retention in 5 patients, 4 requiring surgery
- Overall diagnostic yield – 47%
  - Overt bleeding
    - 92.3%
  - Previous overt bleeding
    - 12.9%
    - The shorter the interval, the higher the yield
  - Occult bleeding
    - 44.2%
<table>
<thead>
<tr>
<th>Type of bleeding</th>
<th>Type of finding (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Overt-ongoing (n = 26)</td>
<td>24 (92.3)</td>
</tr>
<tr>
<td>Overt-previous, overall (n = 31)</td>
<td>4 (12.9)</td>
</tr>
<tr>
<td>10–14 days (n = 3)</td>
<td>2 (66.6)</td>
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<tr>
<td>3–4 weeks (n = 3)</td>
<td>1 (33.3)</td>
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<tr>
<td>2–3 months (n = 9)</td>
<td>0 (0.0)</td>
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<tr>
<td>4–6 months (n = 11)</td>
<td>1 (9.1)</td>
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<tr>
<td>7–12 months (n = 5)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Occult (n = 43)</td>
<td>19 (44.2)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>N</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Positive findings</td>
<td></td>
</tr>
<tr>
<td>Small intestine</td>
<td></td>
</tr>
<tr>
<td>Angiodysplasias (multiple or bleeding)</td>
<td>21</td>
</tr>
<tr>
<td>Aphthoid ulcerations with serpiginous ulcers</td>
<td>5</td>
</tr>
<tr>
<td>Active bleeding</td>
<td>5</td>
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<tr>
<td>Ulcers</td>
<td>4</td>
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<tr>
<td>Varices</td>
<td>3</td>
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<tr>
<td>Stenosis with ulcers</td>
<td>3</td>
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<tr>
<td>Bleeding ileal polyp</td>
<td>2</td>
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<tr>
<td>Tumor</td>
<td>1</td>
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<tr>
<td>Anastomosis with ulcers</td>
<td>1</td>
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<tr>
<td>Stomach</td>
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<tr>
<td>Gastric ulcers</td>
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<tr>
<td>Gastric antral vascular ectasia (GAVE)</td>
<td>1</td>
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<tr>
<td>Suspicious findings</td>
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<tr>
<td>Isolated, non bleeding angiodysplasias</td>
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<tr>
<td>Venous ectasias</td>
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<tr>
<td>Isolated clots</td>
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<tr>
<td>Isolated erosions</td>
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<tr>
<td>Erythematous folds</td>
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<tr>
<td>Small nonbleeding polyp</td>
<td>1</td>
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<tr>
<td>Negative findings</td>
<td></td>
</tr>
<tr>
<td>No lesion</td>
<td>38</td>
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</table>
Clinical Outcomes: Classified by Bleeding

- Subsequent management dictated by capsule endoscopy findings
- Resolution of bleeding
  - Mean follow-up 18 months
  - Overt bleeding
    - 86.9%
  - Previous overt bleeding
    - 41.4%
  - Occult bleeding
    - 69.2%

Clinical Outcomes: Classified by Findings

- 96 patients, prospective
- Median follow-up 14 months
- Prior endoscopy, barium studies and push enteroscopy
- Capsule endoscopy findings classification
  - Positive – 41.7%
    - Explained symptoms, helped management, confirmed findings
  - Uncertain significance – 20.8%
    - Failed to completely explain symptoms
  - Negative – 37.5%

<table>
<thead>
<tr>
<th>Capsule findings</th>
<th>Treatment, no. patients</th>
<th>Resolution of bleeding, no. patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive findings</td>
<td></td>
<td></td>
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<tr>
<td>Multiple or bleeding angiodysplasias</td>
<td>13</td>
<td>8</td>
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<tr>
<td>Multiple aphthoid ulcerations</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Mucosal ulcers</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Bleeding polyps</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Small-bowel tumor</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Findings of uncertain significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated, nonbleeding angiodysplasias</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Mucosal erosions</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Resolution of Bleeding

Based upon positive findings  \( (p = 0.009) \)
- Positive CE – 68.4%
- Uncertain or negative CE – 40.8%

Based upon any CE finding
- Positive and uncertain CE vs. negative CE
- No significant difference \( (p = 0.198) \)

Helical CT

- Prospective study
  - 18 patients with obscure GI bleeding

- CT bleeding protocol
  - 1 liter H₂O PO
  - Unenhanced images
  - Enhanced images, IV contrast
    - Arterial and venous phases

- Control population of 20 patients
  - No known history of GI bleeding
Results

- 11 of 18 patients
  - 12 causes of bleeding confirmed
  - CT correctly diagnosed 10/12
- 5 of remaining 7
  - + findings on CT
  - Bleeding unconfirmed
Angiodysplasia
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Site</th>
<th>Method of final diagnosis</th>
<th>Helical CT findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. angiodysplasia</td>
<td>cecum</td>
<td>surgery</td>
<td>suspected bleeding site — cecum</td>
</tr>
<tr>
<td>2. angiodysplasia</td>
<td>proximal ileum</td>
<td>surgery</td>
<td>suspected bleeding site — ileum</td>
</tr>
<tr>
<td>3. aortoduodenal fistula</td>
<td>retroperitoneum</td>
<td>surgery</td>
<td>suspected pseudoaneurysm</td>
</tr>
<tr>
<td>4. cholesterol crystal emboli</td>
<td>small bowel</td>
<td>surgery</td>
<td>bleeding site — jejunum</td>
</tr>
<tr>
<td>5. radiation enteritis</td>
<td>ileum</td>
<td>surgery</td>
<td>radiation enteritis</td>
</tr>
<tr>
<td>6. small bowel lipoma</td>
<td>jejunum</td>
<td>surgery</td>
<td>lipoma</td>
</tr>
<tr>
<td>7. pancreatic cancer w/ metastases</td>
<td>? bowel location</td>
<td>ERCP</td>
<td>pancreatic cancer w/ metastases</td>
</tr>
<tr>
<td>8. stromal cell tumor</td>
<td>jejunum</td>
<td>surgery</td>
<td>stromal cell tumor</td>
</tr>
<tr>
<td>9. hemorrhagic gastritis</td>
<td>stomach</td>
<td>endoscopy, clinical follow-up</td>
<td>antral wall thickening</td>
</tr>
<tr>
<td>10. angiodysplasia</td>
<td>hepatic flexure</td>
<td>colonoscopy</td>
<td>no abnormalities</td>
</tr>
<tr>
<td>11. Osler–Weber–Rendu</td>
<td>proximal bowel</td>
<td>endoscopy</td>
<td>no abnormalities</td>
</tr>
<tr>
<td>12. hemorrhagic gastritis</td>
<td>stomach</td>
<td>endoscopy, clinical follow-up</td>
<td>suspected bleeding site — cecum</td>
</tr>
<tr>
<td>13. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>suspected bleeding site — transverse colon</td>
</tr>
<tr>
<td>14. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>suspected bleeding site — ileum</td>
</tr>
<tr>
<td>15. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>suspected bleeding site — small bowel</td>
</tr>
<tr>
<td>16. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>suspected bleeding site — small bowel</td>
</tr>
<tr>
<td>17. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>suspected bleeding site — jejunum</td>
</tr>
<tr>
<td>18. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>no abnormalities</td>
</tr>
<tr>
<td>19. obscure GI bleeding</td>
<td>none</td>
<td>none</td>
<td>no abnormalities</td>
</tr>
</tbody>
</table>
Results

- All cases
  - 14/18, + findings on CT
  - Diagnostic yield – 78%

- Confirmed bleeding
  - 10/12 diagnosed by CT
  - Diagnostic yield – 83%

Conclusions

- 1st – begin with repeat upper endoscopy
- 2nd – use minimally-invasive tests with high diagnostic yields
  - Capsule endoscopy
  - CT scan
    - GI bleeding protocol
Conclusions

- Capsule endoscopy
  - Not appropriate for all patients
  - Time-consuming
  - High diagnostic yield
  - Clinical relevance is unclear
    - Limited to overt bleeding and strictly positive findings
  - Not therapeutic
Conclusions

- **CT scan**
  - Rapid, non-invasive evaluation
  - High diagnostic yield
  - Clinically relevant findings

- **Double balloon enteroscopy**
  - Invasive
  - High diagnostic yield
  - Therapeutic options
  - Impact remains to be seen
Angiodysplasia

Angiodysplasia
Angiodysplasia
References