USF EXPERIENCE WITH OBSCURE GI BLEEDING
(ROLE OF CAPSULE ENDOSCOPY AND ENTEROSCOPY)

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Disclosure

- The presenter has received support for research from the Olympus Corporation of America in the form of access to prototype endoscopic instruments.
Obscure Gastrointestinal Bleeding

- Bleeding from a source not identified by EGD, colonoscopy or radiographic studies.
- Can be subdivided into obscure overt and obscure occult bleeding.
- Accounts for approximately 5% of GI bleeding.
- May be increasing in frequency due to an increase in the prevalence of vascular disease, increased use of anti-platelet agents, and an aging population.
- Most is related to small bowel lesions, but gastric and colonic lesions are significant causes of obscure bleeding.
Capsule Endoscopy in OGB

Advantages
- Visualization of entire small bowel
- Noninvasive
- Minimal discomfort and high patient acceptance
- Safe
- Selects the route for deep enteroscopy

Disadvantages
- Inability to control capsule movement
- Inability to focus in on abnormalities
- No biopsy capability
- Not therapeutic
- Difficulty in localizing findings
- Contraindicated in strictures
Retrospective review of 203 consecutive CEs done for obscure GI bleeding.

Lesions were found within reach of a standard UGI endoscope in 86 patients (42%).

These included the following:

- GAVE: 7 patients (3.4%)
- Angioectasias: 15 patients (7.4%)
- Gastric ulcers: 7 patients (3.4%)
- Duodenal ulcers: 7 patients (3.4%)

Small Bowel Findings

- There are six general categories of findings seen on capsule endoscopy:
  - Vascular lesions
  - Ulceration/inflammation
  - Mass lesions
  - Villous atrophy
  - Active bleeding
  - Lymphatic obstruction
Lymphatic Obstruction
Endoscopic Methods to Assess the Small Bowel

- Capsule endoscopy
- Push Enteroscopy
- Deep Enteroscopy
  - Balloon Assisted Enteroscopy
  - Spiral Enteroscopy
Push Enteroscopy

- Done with a specifically designed push enteroscope or a pediatric colonoscope.
- Can reach the proximal jejunum.
- Not effective for deep enteroscopy (distal jejunum, ileum).
- Limited usefulness since amount of small bowel seen is limited.
Deep Enteroscopy

Advantages
- Therapy
  - Hemostasis
  - Polypectomy
  - Balloon dilation
  - FB removal
- Biopsy
- Tattoo

Disadvantages
- Complex and time consuming
- Entire SB not visualized in one procedure
- Invasive
- Deep sedation required
- Risk of pancreatitis
- Abdominal discomfort
Deep Enteroscopy Methods

- Double balloon enteroscopy
- Single balloon enteroscopy
- Spiral enteroscopy
Single Balloon Enteroscopy (SBE) Advantages

- Ease of setup, compatible with standard processors.
- Ability to use in cases of latex allergy (silicone balloon).
- Technically easier to perform than DBE.
- Learning curve is less steep.
- More cost effective than alternatives.
- Easier to clean than DBE.
DBE appears to have a favorable advantage over SBE for performing a complete enteroscopy of the small bowel.

When performing an anterograde approach SBE is performed in statistically significant less time than DBE, however, the two techniques appear to be similar in time requirement when performed retrograde.

DBE and SBE showed no statistical difference with respect to diagnostic yield, therapeutic yield, or adverse outcomes.

Four randomized control trials (RCTs) were included.

VAS for pain at 6 hours favored CO2 over room air (MD 0.13; 95% CI 0.01, 0.25; p=0.03).

Anterograde insertion depth was improved in the CO2 group (MD, 58.2 cm; 95% CI 17.17, 99.23; p=0.005),

Total enteroscopy rate was improved in the CO2 group (RR 1.91; 95% CI 1.20, 3.06; p=0.007).

Mean dose of propofol decreased in the CO2 compared to air (MD -70.53 mg; 95% CI -115.07, -25.98; p=0.002).

There were no differences in adverse events in either group.

Carbon Dioxide vs Air in SBE Depth of Insertion

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean SD</th>
<th>Total</th>
<th>Mean SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference</th>
<th>IV, Random, 95 % CI</th>
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<tbody>
<tr>
<td></td>
<td>CO2</td>
<td>Room air</td>
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<td>IV, Random, 95 % CI</td>
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<tr>
<td>Domagk, 2007</td>
<td>295 72.28 52</td>
<td>224 61.9 48</td>
<td>32.5 %</td>
<td>71.00</td>
<td>[44.69, 97.31]</td>
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<tr>
<td>Lenz, 2014</td>
<td>254 80.3 52</td>
<td>238 55.2 55</td>
<td>32.5 %</td>
<td>16.00</td>
<td>[-10.25, 42.25]</td>
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<tr>
<td>Li, 2014</td>
<td>323.8 64.2 106</td>
<td>238.3 68.6 108</td>
<td>35.0 %</td>
<td>85.50</td>
<td>[67.70, 103.30]</td>
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<tr>
<td>Total (95 % CI)</td>
<td>210 100.0 %</td>
<td>211 100.0 %</td>
<td>58.20</td>
<td>[17.17, 99.23]</td>
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<tr>
<td>Heterogeneity: Tau² = 1169.10; Chi² = 18.68, df = 2 (P = 0.0001); I² = 89 %</td>
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<td>Test for overall effect: Z = 2.78 (P = 0.005)</td>
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<td>Domagk, 2007</td>
<td>122 70.65 52</td>
<td>118 65.25 48</td>
<td>33.0 %</td>
<td>4.00</td>
<td>[-22.64, 30.64]</td>
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<tr>
<td>Lenz, 2014</td>
<td>85.6 67.1 52</td>
<td>110.3 68.4 55</td>
<td>33.1 %</td>
<td>-24.70</td>
<td>[-50.38, 0.98]</td>
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<tr>
<td>Li, 2014</td>
<td>261.6 74.2 106</td>
<td>174.7 62.1 108</td>
<td>33.8 %</td>
<td>86.90</td>
<td>[68.55, 105.25]</td>
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<tr>
<td>Total (95 % CI)</td>
<td>210 100.0 %</td>
<td>211 100.0 %</td>
<td>22.54</td>
<td>[-49.08, 94.16]</td>
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<td>Test for overall effect: Z = 0.62 (P = 0.54)</td>
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<tr>
<td>Domagk, 2007</td>
<td>230 139.85 48</td>
<td>177 119.3 52</td>
<td>28.9 %</td>
<td>53.00</td>
<td>[1.85, 104.15]</td>
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<tr>
<td>Hirai, 2014</td>
<td>216 199.4 20</td>
<td>255.3 183.4 20</td>
<td>6.7 %</td>
<td>-39.30</td>
<td>[-158.03, 79.43]</td>
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</tr>
<tr>
<td>Lenz, 2014</td>
<td>254 80.3 52</td>
<td>238 55.2 55</td>
<td>64.4 %</td>
<td>16.00</td>
<td>[-10.25, 42.25]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95 % CI)</td>
<td>120 100.0 %</td>
<td>127 100.0 %</td>
<td>22.96</td>
<td>[-8.82, 954.74]</td>
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<td>Heterogeneity: Tau² = 228.99; Chi² = 2.63, df = 2 (P = 0.27); I² = 24 %</td>
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<td>Test for overall effect: Z = 1.42 (P = 0.16)</td>
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Deep Enteroscopy at USF

- Done using the single balloon enteroscope (SIF-Q180).
- CO$_2$ is used in preference to room air.
- Patients receive deep sedation with Propofol.
- Endotracheal intubation is rarely used.
- Fluoroscopy is optional.
Single Balloon Enteroscope

Overtube with balloon
- 140 cm long
- 13.2 mm diameter

SIF Q180
- 200 cm long
- 2.8 mm instrument channel
- 9.2 mm distal diameter
Retrospective study of 141 patients undergoing both procedures between 2010 and 2014.

94 patients had capsule endoscopy (CE) done at an outside hospital or practice, and 47 had CE done at USF/TGH.

Concordance between CE and subsequent SBE was only fair for vascular lesions and ulcers in the outside group (Kappa 0.23 and 0.29 respectively).

Concordance was good for vascular lesions and moderate for ulcers in the USF group (Kappa 0.65 and 0.55 respectively).

Degree of concordance for vascular lesions and ulcers was significantly higher for USF CE compared to the community.

Agreement Between Capsule Endoscopy and SBE

- Most likely reason for poorer agreement between CE and SBE in the community group was over interpretation of capsule findings.
- Normal or insignificant findings frequently misinterpreted as pathology.
VCE and Balloon Assisted Enteroscopy Are Complementary

PillCam® SB 2
Small Bowel GIST
Capsule and SBE
## Complications of Balloon Assisted Enteroscopy

<table>
<thead>
<tr>
<th>Complication</th>
<th>Frequency (%)</th>
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<tbody>
<tr>
<td>Perforation</td>
<td>0.1-2.9</td>
</tr>
<tr>
<td>Bleeding</td>
<td>Diagnostic 0.2-0.3 Therapeutic 0.8-2.9</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>0.3 (Hyperamylasemia 30-50)</td>
</tr>
<tr>
<td>Sedation Related</td>
<td>0.5</td>
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</table>

### SBE Complications in Different Age Groups

<table>
<thead>
<tr>
<th>Age yrs (N)</th>
<th>&lt;55 (118)</th>
<th>55-64 (90)</th>
<th>65-74 (119)</th>
<th>75+ (101)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>3 (2.5%)</td>
<td>1 (1.1%)</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Major</td>
<td>0 (0%)</td>
<td>1 (1.1%)</td>
<td>3 (2.5%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Total</td>
<td>3 (2.5%)</td>
<td>2 (2.2%)</td>
<td>3 (2.5%)</td>
<td>2 (2%)</td>
</tr>
</tbody>
</table>

Diagnostic and Therapeutic Yields in SBE by Age
Deep Enteroscopy

Indications

- Obscure gastrointestinal bleeding
- Evaluation of lesions seen at time of capsule endoscopy or imaging procedures.
- Refractory celiac disease.
- Polyposis syndromes.
- Evaluation of the severity and extent of inflammatory conditions such as Crohn’s disease.
- Tattooing of small bowel lesions for surgical localization.
- Therapy including hemostasis, polypectomy, stricture dilation, foreign body removal, feeding jejunostomy.
All maneuvers pertinent to upper gastrointestinal endoscopy and colonoscopy are necessary for performance of deep enteroscopy.

Esophageal intubation is similar to standard upper endoscopy.

Balloon assisted enteroscopy utilizes a push-pull advancement in conjunction with inflation and deflation of the balloon ... and/or endoscope. Balloon inflation is controlled by an insufflator that is pressure regulated to avoid over inflation.

Flouroscopy may be helpful early on in an endoscopist's experience, but is much less helpful with increasing experience.
Small Bowel Dieulafoy
Peutz Jaegher
Peutz Jaeghers
Ileal Crohn’s
Retained Capsule
Small Bowel Carcinoma
Small Bowel Carcinoma-Tattoo
Mantle Cell Lymphoma
Bleeding Lymphangiectasia
Prototype SBE (SIF-Y005)

- Endoscope is stiffer
- Torque ability improved
- Channel size is larger at 3.2 mm (2.8 mm in standard SIF 180)
- Passive bending similar to H190 colonoscopes incorporated into design
- Force transmission improved
18 patients evaluated with antegrade SBE.

Average depth of small bowel insertion 310.8 +/- 70.2 cm. Range 200-425 cm).

Average procedure time 39.3 +/- 10.0 min. Range 28-120 min.

Therapeutic procedures done in eight patients including ablation of angioectasias in 5, polypectomies in 2, and Dieulafoy hemostasis in one patient.

7 patients had a normal exam and one each had Cameron lesions, GAVE, and a non-bleeding jejunal ulcer.
Retrograde Enteroscopy via Anal Route Prototype SBE

- Success in intubating ICV in 9 patients (100%).
- Average anal depth of insertion 167.2 +/- 55.7 cm. Range 50-250 cm.
- Average procedure time 60.6 +/- 23.3 min. Range 35-109 min.
- Therapy: Polypectomies in 4 patients (2 ileal and 2 colonic). Ablation of angioectasias in 4 patients. Large polyp site tattooed in one patient, polyp subsequently removed with combined SBE/laparoscopic approach.
Evaluation of Obscure GI Bleeding

- Consider repeating EGD and/or colonoscopy in selected patients.
- CE and deep enteroscopy are complementary procedures.
- Patients with a negative CE are less likely to rebleed and may not require deep enteroscopy.
- Positive capsule findings amenable to endoscopic therapy can be approached with deep enteroscopy.
- Capsule endoscopy is useful in determining the route of insertion of the enteroscope.
- In selected patients with recurrent bleeding and a negative CE, deep enteroscopy is needed.