DOUBLE BALLOON ENTEROSCOPY

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DOUBLE BALLOON ENTEROSCOPE

- Double balloon enteroscope was developed by Dr. Hironori Yamamoto in Japan. In 2001, he first reported the use of this scope in examining the entire small bowel.

ROPEWAY METHOD

- The world’s first successful total enteroscopy was performed by Dr. Hideo Hiratsuka in 1971.
- A long intestinal teflon string is inserted orally and discharged for the anus. This may require at least 24 hours. The ropeway enteroscope is pulled through the GI tract within 10 minutes. Observation and biopsy through the scope is possible.

SMALL BOWEL IMAGING
SONDE METHOD

- This method was developed by Tada et al. around the same time.
- It involves transnasal insertion of a thin and long endoscope which is advanced by peristalsis.
- The total procedure time is 3-6 hours.
- For the next 30 years, the standard was to examine the small bowel with push enteroscopy using a long enteroscope. With this scope, one can reach about 50 cm from the ligament of Treitz into the jejunum. The rest of the small bowel was examined by radiologic imaging such as SBFT, enterolysis, and CT scan.

DOUBLE BALLOON ENTEROSCOPY

SMALL BOWEL IMAGING

Recently, new methods have been developed to examine the entire small bowel:
- Capsule enteroscopy
- Double balloon enteroscopy
- Single balloon enteroscopy
- Spius enteroscopy

CAPSULE ENTEROSCOPY

- Examine the entire small intestine
- Outpatient procedure
- Better diagnostic yield than enterolysis and push enteroscopy
- No discomfort to the patient
- No sedation
Dr. Yamamoto developed DBE and first reported in 2001 completed examination of the small bowel by using this scope. He was able to advance the scope orally beyond the ileocecal valve.

Gastrointestinal Endoscopy - Volume 53, Issue 2 (February 2001)
DOUBLE BALLOON ENTEROSCOPY

INDICATIONS

COMMON
- Obscure GI bleeding
- Iron deficiency anemia
- Abnormal SBFT/CT scan
- Abnormal Capsule Endoscopy
- Peutz-Jeghers polyps
- Familial adenomatous polyposis
- Large SB mass needing resection
- Crohn's disease
- Celiac disease
- Refractory celiac disease
- Chronic diarrhea

UNUSUAL
- ERCP in Roux-en-Y situations
- Abdominal pain in gastric bypass patients
- PEG placement in gastric bypass anatomy
- Previously failed colonoscopy
- Protein-wasting enteropathy
- Mid-gut carcinoids
- Jejunal stenting

DOUBLE BALLOON ENTEROSCOPY

OBSCURE GI BLEEDING

- The most common indication for DBE (60-80% of patients)
- Overall yield: 60-80%
  - Angioectasias: 30-50%
  - Ulcerative disease: 3-35%
  - SB tumors: 8-20%
  - Diverticula: 2-20%
  - Radiation: 0-5%

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DIAGNOSTIC YIELD OF DBE IN OBSCURE GI BLEEDING

- GIE 2006
- GIE 2008
- CGH 2004
- AJC 2006
DOUBLE BALLOON ENTEROSCOPY

OBSCURE GI BLEEDING

Predictive factors for positive diagnosis

<table>
<thead>
<tr>
<th>OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of bleeding episodes &gt;1</td>
<td>5.67 (0.038)</td>
</tr>
<tr>
<td>Duration of bleeding &gt; 2years</td>
<td>3.35 (0.999)</td>
</tr>
<tr>
<td>Initial hemoglobin &lt;10 g/dl</td>
<td>0.34 (0.428)</td>
</tr>
<tr>
<td>Transfusion required</td>
<td>0.42 (0.386)</td>
</tr>
<tr>
<td>Interval between the last blood passage and DBE &lt; 10 days</td>
<td>0.46 (0.336)</td>
</tr>
</tbody>
</table>


Diagnostic yield (%)

<table>
<thead>
<tr>
<th>Bleeding type</th>
<th>No.</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overt ongoing</td>
<td>13</td>
<td>13 (100.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Overt previous</td>
<td>64</td>
<td>31 (48.4)</td>
<td>33 (51.6)</td>
</tr>
<tr>
<td>Occult</td>
<td>19</td>
<td>8 (42.1)</td>
<td>11 (57.9)</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>52 (54.2)</td>
<td>44 (45.8)</td>
</tr>
</tbody>
</table>

Diagnostic yield for DBE according to bleeding type

DOUBLE BALLOON ENTEROSCOPY

STUDIES COMPARING DIAGNOSTIC YIELDS OF CE AND DBE IN OBSCURE GI BLEEDING

<table>
<thead>
<tr>
<th>STUDY</th>
<th>PATIENTS</th>
<th>YEILD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matsumoto et al.</td>
<td>13</td>
<td>CE = DBE</td>
</tr>
<tr>
<td>May et al.</td>
<td>52</td>
<td>DBE &gt; CE</td>
</tr>
<tr>
<td>Hadithi et al.</td>
<td>35</td>
<td>CE &gt; DBE</td>
</tr>
<tr>
<td>Nakamura et al.</td>
<td>32</td>
<td>CE = DBE</td>
</tr>
<tr>
<td>Mehdizadeh et al.</td>
<td>115</td>
<td>CE = DBE</td>
</tr>
<tr>
<td>Ohmiya et al.</td>
<td>74</td>
<td>CE = DBE</td>
</tr>
<tr>
<td>Kamei et al.</td>
<td>32</td>
<td>CE = DBE</td>
</tr>
</tbody>
</table>

Gastrointestinal Endoscopy
October 2008 (Vol. 68, Issue 4, Pages 683-691)
**Double Balloon Enteroscopy**

**DBE in Surgically Modified GI Tract**

**ERCP**
- Surgery
- Percutaneous by interventional radiology
- Endoscopic by ERCP
  - Variables: stomach anatomy, length of Roux limb, adhesions, operator experience
  - Colonoscopes and Enteoscopes used
  - Native papilla interventions difficult
  - Variable success (30%-85%)

**DBE-ERCP**
- 12 patients, 10 post-liver transplant
- DBE-ERCP successful in 11/12 patients
- Stone removal, stent/relief
- No complications

BARIATIC DBE-ERCP

• Series included 6 patients
• Successful in 5/6 patients
• Sphincterotomy and PD stent reported


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POTENTIAL ADVERSE EVENTS IN DBE

- Aspiration
- Abdominal pain
- Complications common to all endoscopy
- Distention
- Intraperitoneal bleeding
- Perforation
- Submucosal tear

Cramping abdominal pain is the most common complication (2-20%).

It is usually temporary and has reported to be decreased if carbon dioxide rather than room air is used.

Potential reasons for abdominal pain include trapped gas, transient intussusception, and/or bowel wall herniation.
### Double Balloon Enteroscopy

#### Potential Adverse Events in DBE (Perforation)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonoscopy</td>
<td>1/1000 (0.1%)</td>
</tr>
<tr>
<td>Diagnostic EGD</td>
<td>1/10,000 (0.01%)</td>
</tr>
<tr>
<td>Stricture Dilation</td>
<td>No Benchmark</td>
</tr>
<tr>
<td>0.1-0.4%</td>
<td></td>
</tr>
<tr>
<td>Double Balloon Enteroscopy</td>
<td>No Benchmark</td>
</tr>
<tr>
<td>Mensink N=2367 (Perforation 0.3%)</td>
<td></td>
</tr>
<tr>
<td>May – Therapeutic DBE</td>
<td>2/178 (1.1%)</td>
</tr>
</tbody>
</table>

#### US DBE Data

- Total Number of DBE: 2255
  - Oral: 1573
  - Rectal: 682
  - Per-Stoma: 3
- Complications: 20 (0.9%)
  - Perforation: 11 (0.5%)
  - Oral: 3 (0.2%)
  - Rectal: 8 (1.2%)
  - Pancreatitis: 5 (0.2%)
  - Bleeding: 3 (0.2%)

Garson et al. ACG 2008

#### Pancreatitis After DBE

- 6 patients after diagnostic DBE
- 1 patient after therapeutic DBE (ERCP with papillotomy)
- 6/7 (86%) patients presented with persistent pain < 24 hr after DBE
- Location of pancreatitis:
  - 4 patients body and/or tail
  - 1 patient head of pancreas
  - 2 patients entire pancreas

Mensink, DDW 2007
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PANCREATITIS AFTER DBE

Possible mechanisms

- Pancreatic duct obstruction by direct oppression of the papilla with the inflated balloon.
- Increase in duodenal intraluminal pressure caused by overtube and gastroduodenal shortening technique.
- Reflux of duodenal contents into the pancreatic duct due to intraluminal hypertension caused by the inflated balloon.
- Injury or ischemia due to stretching and shortening of the proximal small bowel.

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GI BLEEDING

- Post-polypectomy
  - 10 (2%) therapeutic DBE (Mensink 2007)
  - Overall rate 19 (0.8%)
  - Literature summary 2400 cases: 2 (0.08%)
  - Large polyps > 3 cm prevalence of 1% (May 2007)
  - Not increased compared to standard endoscopic procedure.

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CONCLUSIONS

- DBE is safe for majority of patients
- Increased risk of perforation
  - Polypectomy of large lesions
  - Stricture dilation
- Patients with altered surgical anatomy
  - Patients with prior ileal anastomosis relative contraindication for retrograde DBE
  - Pancreatitis increased post-DBE
- Bleeding post-DBE associated with polypectomy. Prevalence not increased.
Recently created intestinal anastomosis
Severely ulcerated small intestine
Patients with small bowel lymphoma undergoing active chemotherapy
Ehlers-Danlos syndrome
Patients with significant anesthetic risks
High-grade intestinal obstruction
Recent bout of pancreatitis
Patients with coagulopathy
Large esophageal and gastric varices

DOUBLE BALLOON ENTEROSCOPY
CONTRAINDICATIONS

DOUBLE BALLOON ENTEROSCOPY
ANGIODYSPLASIA

DOUBLE BALLOON ENTEROSCOPY
ANGIODYSPLASIA

DOUBLE BALLOON ENTEROSCOPY
ANGIODYSPLASIA
Dilated aberrant submucosal artery that erodes the overlying epithelium in the absence of ulcer.

It is most commonly seen in the proximal stomach along the lesser curvature, near the GE junction.

It can be found in other areas of GI tract, including esophagus, duodenum, jejunum and ileum.

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DIEULAFOY’S LESION

DOUBLE BALLOON ENTEROSCOPY

BLUE RUBBER BLEB NEVUS SYNDROME

DOUBLE BALLOON ENTEROSCOPY

BLUE RUBBER BLEB NEVUS SYNDROME
DOUBLE BALLOON ENTEROSCOPY

CROHN’S DISEASE

DOUBLE BALLOON ENTEROSCOPY

LYMPHOMA

DOUBLE BALLOON ENTEROSCOPY

LYMPHOMA