Small bowel: standards and innovations
capsule endoscopy, push enteroscopy and
push and pull enteroscopy in single and
double balloon technique

Andrea May
Wiesbaden

5th Forum Gastroenterology, Falk Symposium 166
September 17th – 18th 2008, Wiesbaden
Small bowel endoscopy

- Capsule endoscopy
- Push enteroscopy
- Push and pull enteroscopy in double and single balloon technique
- Intraoperative enteroscopy
Small bowel endoscopy

Capsule endoscopy 2001

**PRO**
- easy to perform
- non invasive
- inspection of the entire small bowel in most cases

**„CONTRA“**
- costs
- limitation of view
- interpretation of (unspecific) lesions not easy
- no biopsy
- no therapy

→ Diagnostic tool → excellent for screening
Small bowel endoscopy

Push enteroscopy ~ 1980

**PRO**
- easy and fast to perform
- real time observation
- option for tissue sampling and endoscopic treatment

**„CONTRA“**
- limitation of insertion depths
- endoscopic treatment often difficult to perform due to excessive loop formation
Small bowel endoscopy


**PRO**
- checking of lesions that have been discovered using other imaging procedures
- biopsy
- endoscopic therapy
### Diagnostic yield:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push enteroscopy (PE)</td>
<td>44 %</td>
</tr>
<tr>
<td>DBE total</td>
<td>73 %</td>
</tr>
<tr>
<td>Oral DBE</td>
<td>63 %; (p &lt; 0.0001)</td>
</tr>
<tr>
<td>Additional lesions</td>
<td>78 %</td>
</tr>
</tbody>
</table>

### Complications:

- none

### Insertion depth:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>mean 80 cm</td>
</tr>
<tr>
<td>Oral DBE</td>
<td>mean 230 cm</td>
</tr>
</tbody>
</table>

PE: significant less sedation, investigation time, X-ray
### Diagnostic yield

Overall number of patients: 378

<table>
<thead>
<tr>
<th>Indication</th>
<th>n</th>
<th>Positive finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGI</td>
<td>191</td>
<td>154 80.6 %</td>
</tr>
<tr>
<td>Pain</td>
<td>69</td>
<td>26  37.7 %</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>63</td>
<td>23  36.5 %</td>
</tr>
<tr>
<td>Obstruction</td>
<td>48</td>
<td>39  81.3 %</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>5   71.4 %</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td>378</td>
<td>247 65.3 %</td>
</tr>
</tbody>
</table>

Zhong et al., Endoscopy 2007
**Diagnostic yield:** 275/353 pats. **78 %**
outside small bowel: 10 pats. → **75 %**

**Literature:** 43% – **70% - 80% – 90 %**

Results: 353 pats./ 635 DBEs

Diagnostic yield: 75 %

Therapeutic yield: 236/353 pats. 67 %

endoscopic
139/236 59%
medical
44/236 19%
surgical
53/236 22%

Zhong et al.: 84% overall specific treatment
Mulder et al.: 55% endoscopic therapy in MGI
Endoscopic therapy

- Argon Plasma Coagulation
- Injection, Clip
- Polypectomy
- Dilation
- Extraction of foreign bodies
- Implantation of metal stents
Small bowel endoscopy


**PRO**
- checking of lesions that have been discovered using other imaging procedures
- biopsy
- endoscopic therapy

**„CONTRA“**
- costs
- staff consuming procedure
- time consuming procedure
Small bowel endoscopy

Push-and-Pull-Enteroscopy
Balloon enteroscopy

Double balloon technique (DBE)

Single balloon technique (SBE)
## Balloon enteroscopy

### Details

<table>
<thead>
<tr>
<th></th>
<th>DBE</th>
<th>SBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scopes</td>
<td>EN450 - P5</td>
<td>XSIF Q260Y</td>
</tr>
<tr>
<td></td>
<td>EN450 - T5</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>200 cm</td>
<td>200 cm</td>
</tr>
<tr>
<td>Diameter</td>
<td>8.5 mm</td>
<td>9.2 mm</td>
</tr>
<tr>
<td></td>
<td>9.4 mm</td>
<td></td>
</tr>
<tr>
<td>Working channel</td>
<td>2.2 mm</td>
<td>2.8 mm</td>
</tr>
<tr>
<td></td>
<td>2.8 mm</td>
<td></td>
</tr>
</tbody>
</table>
Balloon enteroscopy

<table>
<thead>
<tr>
<th>Overtube</th>
<th>DBE</th>
<th>SBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>145 cm</td>
<td>140 cm</td>
</tr>
<tr>
<td>Diameter</td>
<td>12.2 mm, 13.2 mm</td>
<td>13.2 mm</td>
</tr>
<tr>
<td>Material Balloons</td>
<td>Polyurethane, Latex</td>
<td>Silicone, Silicone</td>
</tr>
</tbody>
</table>

In principle, the DBE system can also be used as a single-balloon enteroscopy, by dispensing with the balloon attached to the scope tip.
Small bowel endoscopy

Push-and-Pull-Enteroscopy
Balloon enteroscopy

DBE
SBE

?
Small bowel endoscopy

Balloon enteroscopy
Published data

DBE
252 published articles
(Fujinon)
(PubMed)

SBE
3 original papers for small bowel (Olympus)
5 Case series/case report on colonoscopy and ERCP (Fujinon)
Medical history:
67 – year-old man with iron deficiency anaemia and positive FOBT. Multiple abdominal surgeries.

Prior diagnostic work-up:
Lab test: anaemia, actual Hb 9.2 g/dl
Abdominal ultrasound: no pathological finding
EGD: no pathological finding
Colonoscopy (standard and pediatric): failed
Difficult Colonoscopy using SBE (Fujinon)
Balloon Endoscopy

<table>
<thead>
<tr>
<th></th>
<th>DBE</th>
<th>SBE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic yield</strong></td>
<td>60 – 80%</td>
<td>40 – 50%</td>
</tr>
<tr>
<td><strong>Endoscopic interventions</strong></td>
<td>35 – 65% (&gt; 50% MGI)</td>
<td>5 – 20%</td>
</tr>
<tr>
<td><strong>Complete enteroscopy</strong></td>
<td>40 – 80% (max. 86%)</td>
<td>12 – 25%</td>
</tr>
</tbody>
</table>

Yamamoto et al., Clin Gastroenterol Hepatol 2004; Ell et al., Endoscopy 2005; May et al., GIE 2005; Heine et al., Endoscopy 2006; Sun et al., Am J Gastroenterol 2006; May et al., Am J Gastroenterol 2007; Zhong et al., Endoscopy 2007; Gross et al., GIE 2008; Tsujikawa et al., Endoscopy 2008; Kawamura et al., GIE 2008
Complications

Double balloon enteroscopy

diagnostic DBE < 1%
therapeutic DBE 3 – 4%

Single balloon enteroscopy

perforation 1/37 SBE (2.7%)
deep mucosal tear (clips) 1/78 SBE (1.3%)
→ caused by the flexed endoscope tip during advancement of the overtube

Möschler et al., Z Gastroenterol 2008; Mensink et al., Endoscopy 2007
Tsujikawa et al., Endoscopy 2008; Kawamura et al., GIE 2008
DBE versus SBE: German prospective, randomised multicenter trial

Number of centers: 5
HSK Wiesbaden, Osnabrück, Remscheid, University of Erlangen-Nuremberg, University of Dresden

Experienced investigators: > 50 DBE; training in SBE technique for 2 months

Study end point:
complete enteroscopy

Hypothesis: DBE 40 % and SBE 15 %
1. Capsule endoscopy is a safe method, but only a diagnostic tool and is therefore excellent for screening

2. Flexible enteroscopy with push enteroscopy or balloon-assisted endoscopy is labour-intensive and more invasive but allows real time controlled observation with the option for tissue sampling and endoscopic treatment

3. Push enteroscopy allows only limited visualization of the small intestine; therefore only lesions in the proximal jejunum can be diagnosed and treated
Conclusion

4. Double Balloon enteroscopy has become established throughout the world for diagnostic and therapeutic examinations of the small bowel.

5. Single balloon enteroscopy represents a simplification of the method, but only preliminary data are available; the rate of complete enteroscopies appears to be markedly lower; it remains to be seen whether a significant reduction in the detection rate for relevant findings is associated with SBE; larger prospective and comparing studies have to be awaited.

6. On the basis of the currently available data, DBE must continue to be regarded as the gold standard for (therapeutic) deep small bowel endoscopy at present.