Wired Enteroscopy: Which Technique Will Survive?

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Introduction

A wide variety of diseases may be associated with small-bowel lesions. However, the diagnosis of small-bowel disorders has long been a challenge to gastroenterologists because of the length and anatomy of the small intestine and the lack of adequate diagnostic tools. Traditionally, the diagnosis and assessment of small-bowel lesions have depended on radiologic tests such as small-bowel follow-through and computed tomography. In recent years, the advent of capsule endoscopy and deep enteroscopy (DE) has dramatically changed diagnostic and therapeutic approaches to small-bowel diseases. Although capsule endoscopy can be used to examine areas unreachable by enteroscopy, a main disadvantage of this technique is the inability to obtain biopsies or to treat the disease. In contrast, DE techniques have diagnostic and therapeutic capabilities. Three DE methods are currently available: double-balloon enteroscopy (DBE), single-balloon enteroscopy (SBE), and spiral enteroscopy (SE). In this review, we provide a detailed analysis of the current status of the different types of DE.

Types of Small Bowel Enteroscopy

Dr. Hironi Yamamoto developed DBE in 2001, and this method was introduced in Korea in 2004. The use of a balloon enables gripping of the intestinal wall and prevents subsequent loop formation. The two most commonly used DBE systems (EN-450P5 and EN450T5; Fujinon Inc., Saitama, Japan) have diameters of 8.5 and 9.3 mm and operating channels of 2.2 and 2.8 mm, respectively. Corresponding overtubes (TS-12140 and TS-13140; Fujinon, Inc.) are 12.2 and 13.3 mm wide, respectively, with a length of 140 cm. A DBE system consists of a balloon at the distal end of an enteroscope and an overtube; its use entails a series of steps employing a push-and-pull technique.

The SBE system is represented by the SIF-Q160 endoscope (Olympus Optical Company, Ltd., Tokyo, Japan), which has a working length of 200 cm, a diameter of 9.8 mm, and a working channel with a 2.8-mm diameter. Because SBE was introduced in 2007, few published studies have directly compared this method with DBE or SE. The SBE system is controlled by repeatedly inflating and deflating a single balloon attached to the distal end of a splinting tube.

SE, which was introduced in 2007, has the potential advantages of shorter examination time and ease of use.
Table 1. Comparison between the Three Enteroscopic Techniques

<table>
<thead>
<tr>
<th>Type</th>
<th>Single-balloon</th>
<th>Double-balloon</th>
<th>Spiral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning curve</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Depth of insertion</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Procedure time</td>
<td>Similar</td>
<td>Similar</td>
<td>Lower</td>
</tr>
<tr>
<td>Complete rate</td>
<td>Similar</td>
<td>Higher</td>
<td>Similar</td>
</tr>
<tr>
<td>Complication rate</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Diagnostic yield</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Therapeutic yield</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Advantage</td>
<td>Decreased preparation time</td>
<td>High success rate of total enteroscopy</td>
<td>Rapid &amp; convenience, controlled withdrawal</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>Time-consuming</td>
<td>Time-consuming</td>
<td>Uncertain effectiveness of anal approach</td>
</tr>
</tbody>
</table>

compared with balloon-assisted enteroscopy. The Endo-Ease Discovery SB system (Spirus Medical, Stoughton, MA, USA) is made of polyvinyl chloride and has a length of 118 cm, with external and internal diameters of 16 mm and 9.8 mm, respectively. The distal end of the overtube has a raised hollow spiral, 5.5 mm in height and 21 cm in length, and a soft tapered tip. It is used for enteroscopy via the oral route. Enteroscopes made by Fujinon and Olympus (overtube- or balloon-free) can be used for SE. This method enables the enteroscope to be advanced and withdrawn through the small bowel using rotatory clockwise and counter clockwise movements.

Comparison of DBE, SBE, and SE

The most common indication for DE is the evaluation of obscure gastrointestinal bleeding. Among other indications are the evaluations of inflammatory mucosal lesions (e.g., Crohn’s disease, nonsteroidal anti-inflammatory drug-induced enteropathy) and small-bowel malignancies. In a meta-analysis, Xin et al. showed that the distribution of positive findings appears to differ between Eastern and Western countries. In particular, inflammatory lesions (37.6%) were primarily found in the east, whereas vascular lesions (65.9%) were frequently diagnosed in the west. To date, six randomized controlled trials (RCTs) have compared the use of DBE, SBE, and SE. The results of these studies have differed slightly.

Two of the four RCTs showed that DBE was superior to SBE in terms of insertion depth, whereas the other two RCTs demonstrated no difference. Published data have indicated that the oral intubation depth is comparable among DBE (239 ± 24.3 cm), SBE (233 ± 31 cm), and SE (236 ± 23 cm). However, given the difficulty of estimating insertion depths, the rate of total enteroscopy has been considered to be the gold standard. Although the rate of complete enteroscopy is clearly superior for DBE compared with SE and SBE, these rates have not translated into increased diagnostic yields. Ultimately, diagnostic yield is the most important parameter in the assessment of a method’s clinical relevance, and the published diagnostic yields for all of these procedures are comparable, at about 60%. The methods have shown no significant difference in the rate of therapeutic yield. Two studies assessed preparation time, which was slightly shorter for SBE than for DBE. Procedure time appears to be shorter for SE than for DBE and SBE. The reported incidence rates of severe adverse effects have been very low for all enteroscopy techniques (DBE, 0.3 ± 0.2%; SBE, 0.3 ± 0.3%; SE, 0.0 ± 0.0%). According to the literature, DBE, SBE, and SE are all relatively safe methods. - 1 shows the main char-
acteristics of these three enteroscopic techniques.

**Conclusion**

Although the clinical impact of total enteroscopy rates remains controversial, the results of previous studies suggest that DBE, SBE, and SE have comparable diagnostic and therapeutic yields. Therefore, the selection of an enteroscopic technique should be based on availability and the endoscopist’s experience.

**References**