Colon ESD: Indications and Advances

Sergey V. Kantsevoy, MD, PhD
Professor of Medicine
University of Maryland School of Medicine
Director of Therapeutic Endoscopy
Mercy Medical Center, Baltimore, MD
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What Are The Indications For Endoscopic Lesion Removal?

- Lesion causes clinical problems (bleeding, obstruction, etc)
- Lesion of uncertain etiology (need specimen for diagnosis)
- Lesion is thought to be premalignant or malignant
  - Limited to mucosa or submucosa
  - No lymph node metastases
  - Well differentiated

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When Endoscopic Removal Should Not Be Attempted?

- Ulcerated lesions
- Aggressive, undifferentiated malignant lesion
- Enlarged regional lymph nodes
- Non-lifting after submucosal injection
  - Lifting sign as predictor of invasive colorectal cancer (Uno Y, Munakata A, GI Endoscopy 1994):
    - Sensitivity 100%
    - Specificity 99% PPV 83%
Why ESD Is Not Widely Used in Western Countries?

- **Advantages:**
  - En block removal of the lesion
  - Ro margins
  - Even very flat lesions can be removed

- **Disadvantages:**
  - Technically difficult procedure
  - Labor intensive
  - Time consuming
Current ESD Procedures

- No control of operating field
  - Collapsed lumen
  - Peristalsis
  - Fluid, stool, blood
- No traction, counter-traction, triangulation
- Use of electrical current in ESD knives
- Large defect after lesion removal

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LumenR: Expandable Portable Intraluminal Operating Room
Current ESD Procedures

- No control of operating field
- **No traction, counter-traction, triangulation**
- Use of electrical current in ESD knives
- Large defect after lesion removal

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Triangulation, traction, counter-traction
Problems With The Use of “NOTES” Endoscopes for ESD

- No control of operating field
- Flexible endoscopes cannot provide adequate traction
- Working channels are coupled with optics: “in-line” movements instead of real triangulation
Current ESD Procedures

- No control of operating field
- No traction, counter-traction, triangulation
- Use of electrical current in ESD knives
  - Lateral or longitudinal moves of the endoscope to cut
  - Unpredictable depth of thermal injury
  - Immediate and delayed complications
- Large defect after lesion removal
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Main Problems With Current ESD Procedures

- No control of operating field
- Need for traction, counter-traction, triangulation
- Use of electrical current in ESD knives
- Large defect after lesion removal
Prophylactic clip closure reduced the risk of delayed postpolypectomy hemorrhage: experience in 277 clipped large sessile or flat colorectal lesions and 247 control lesions

Hammad Liaquat, MD, Elizabeth Rohn, BA, Douglas K. Rex, MD
Indianapolis, Indiana, USA

Background: Endoscopic resection of large colorectal lesions is associated with high complication rates.

Objective: To evaluate the effect of prophylactic clip closure of polypectomy sites after resection of large (≥2 cm) sessile and flat colorectal lesions.

Design: Retrospective study.

Setting: Tertiary referral center.

Patients and Interventions: Patients with lesions 2 cm or larger who underwent EMR performed by using low-power coagulation current between January 2000 and February 2012. Beginning in June 2006, polypectomy sites were prophylactically closed with clips when possible. Patients had telephone follow-up at 30 days or later to track complications.

Main Outcome Measurements: Delayed hemorrhage, postpolypectomy syndrome, and perforation.

Results: There were 524 lesions 2 cm or larger in 463 patients, of which 247 (47.1%) were not clipped, 52 (9.9%) were partially clipped, and 225 (42.9%) were fully clipped. There were 31 delayed hemorrhages, 2 perforations, and 6 cases of postpolypectomy syndrome. The delayed hemorrhage rate was 9.7% in the not clipped group versus 1.8% in the fully clipped group. Multivariate analysis showed that not clipping (odds ratio [OR] 6.0; 95% CI, 2.0-18.5), location proximal to the splenic flexure (OR 2.9; 95% CI, 1.05-8.1), and polyp size (OR 1.3; 95% CI, 1.1-1.7 for each 10-mm increase in size) were associated with delayed bleeding.

Limitation: Retrospective design.

Conclusions: Prophylactic clipping of resection sites after endoscopic removal of large (≥2 cm) colorectal lesions using low-power coagulation current reduced the risk of delayed postpolypectomy hemorrhage. A randomized, prospective trial of clipping large polypectomy sites is warranted. (Gastrointest Endosc 2013;xx:xxx.)
Endoscopic suturing closure of large mucosal defects after endoscopic submucosal dissection is technically feasible, fast, and eliminates the need for hospitalization (with videos)

Sergey V. Kantsevoy, MD, PhD, 1 Marianne Bitner, CRNA, 1 Aleksandr A. Mitrakov, MD, 2
Paul J. Thuluvath, MD 1
Baltimore, Maryland, USA; Nizhniy Novgorod, Russia

**Background:** Endoscopic submucosal dissection (ESD) is less invasive than surgical resection, but the large mucosal defects after ESD may lead to adverse events necessitating hospitalizations.

**Objective:** To evaluate the use of an endoscopic suturing device for closure of large mucosal defects after ESD.

**Design and Setting:** Retrospective, single-center study.

**Patients:** Twelve consecutive patients underwent ESD.

**Interventions:** All lesions were removed by using a previously described ESD technique. The large mucosal defects post-ESD were completely closed with the endoscopic suturing device, and all patients were discharged home with subsequent clinical and endoscopic follow-up.

**Main Outcome Measurements:** Bleeding and perforation rates after ESD with mucosal defect closure.

**Results:** ESD followed by endoscopic suturing of the mucosal defects was performed in 12 patients (mean age, 64.7 ± 11.2 years, 4 lesions in the stomach, 8 lesions in the colon; mean lesion size, 42.5 ± 14.8 mm) over a period of 8 months. All lesions (100%) were removed en bloc. Closure of post-ESD defects with an endoscopic suturing device was technically feasible and fast (mean closure time, 10.0 ± 5.8 minutes per patient). Only 1 stitch (continuous suturing line) was required for complete closure in 8 patients. In the other 4 patients, the mucosal defect was closed with 2 to 4 separate stitches (mean number of sutures per patient, 1.6 ± 1.0). There were no immediate or delayed adverse events in any of the study patients.

**Limitations:** Retrospective study.

**Conclusions:** Closure of large post-ESD defects with the Overstitch endoscopic suturing device is technically feasible and fast and can significantly decrease treatment cost by eliminating the need for hospitalization.
### TABLE 1. Characteristics of the study patients

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age, y</th>
<th>Sex</th>
<th>Lesion location</th>
<th>Lesion pathology</th>
<th>Lesion size, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>78</td>
<td>F</td>
<td>Sigmoid colon</td>
<td>Tubulovillous adenoma</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>F</td>
<td>Body of the stomach</td>
<td>Gastric submucosal lipoma</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>52</td>
<td>F</td>
<td>Rectum</td>
<td>Traditional serrated adenoma</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>73</td>
<td>F</td>
<td>Antrum of the stomach</td>
<td>Heterotopic pancreas</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>M</td>
<td>Sigmoid colon</td>
<td>Tubulovillous adenoma</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>51</td>
<td>M</td>
<td>Rectum</td>
<td>Intramucosal adenocarcinoma</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>74</td>
<td>M</td>
<td>Rectum</td>
<td>Intramucosal adenocarcinoma</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>71</td>
<td>M</td>
<td>Antrum of the stomach</td>
<td>Intestinal metaplasia with low-grade dysplasia</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>63</td>
<td>M</td>
<td>Incisura of the stomach</td>
<td>Gastric submucosal lipoma</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>62</td>
<td>F</td>
<td>Descending colon</td>
<td>Tubular adenoma</td>
<td>40</td>
</tr>
<tr>
<td>11</td>
<td>56</td>
<td>F</td>
<td>Sigmoid colon</td>
<td>Tubulovillous adenoma with high-grade dysplasia</td>
<td>80</td>
</tr>
<tr>
<td>12</td>
<td>66</td>
<td>F</td>
<td>Rectum</td>
<td>Tubular adenoma</td>
<td>40</td>
</tr>
</tbody>
</table>

*F, Female; M, male.*
studies with clip closure after EMR and ESD.\textsuperscript{10,12,18} Despite such large defects, the endoscopic suturing was technically feasible and fast and only added approximately 10 additional minutes to the length of the procedure. Considering the price of the Overstitch suturing device ($599) and the cost of 1 suture with cinch ($138), the average cost of closure per patient (1.6 ± 1.0 sutures) in our study was only $875. In the study by Liaquat et al,\textsuperscript{12} the cost of closure of post-EMR defects (average polyp size was 31 mm, 3.7 clips per patient, $150 for each clip) was $555 per patient.

However, closure of larger defects after ESD will generally require more clips. In a study by Otake et al,\textsuperscript{10} closure of post-ESD mucosal defects required an average of 8.1 clips, which would cost $1215 per patient. In that respect, closure of large post-ESD tissue defects with the Overstitch endoscopic suturing device is not only technically feasible and efficient in terms of time and effort, it is also cost-effective compared with closure with endoscopic clips.
Traditionally, patients are admitted after ESD and observed for at least 5 days in the hospital.\textsuperscript{9,10} Closure of post-ESD defects with endoscopic clips allowed Otake et al.\textsuperscript{10} to hospitalize their patients for 4 days instead of the traditional 5 days. In contrast, closure of post-ESD defects with the Overstitch endoscopic suturing device allowed us to discharge our patients home on the same day after the procedure. Hospital admission was not needed, which resulted in significant cost savings of approximately $5000 per patient.

In our previously reported observations, we had 1 case of perforation (1.5%) and 2 cases of delayed bleeding (3.0%) after 66 ESD procedures in patients with large, flat colonic polyps performed in 2008 to 2011.\textsuperscript{25} During the current study period, we did not have any delayed perforations or delayed bleeding in 12 patients who had endoscopic suturing closure of the large mucosal defects after ESD by using the Overstitch suturing device.
ESD in 21st Century Will Closely Resemble Laparoscopic Surgery

- Full control of operating field
- Traction, counter-traction, triangulation
- Use of scissors to minimize collateral damage
- Endoscopic closure of defects post ESD
- Endoscopic suturing of all perforations
- Endoscopic submuscular and full-thickness resection

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