Endoscopic Resection: Esophageal EMR and ESD

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Endoscopic Mucosal Resection (EMR)
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- EMR has been widely applied in clinical practice for management of superficial esophageal neoplasia compared to esophagectomy
  - Less invasive
  - Less expensive
  - Better tolerated
  - Better QOL

- However
  - EMR has higher recurrence rates after piecemeal resection
  - Difficult to evaluate margins
  - Difficult to determine risk of lymph node metastasis
Endoscopic Mucosal Resection Kits
EMR Video
Randomized trial on endoscopic resection-cap versus multiband mucosectomy for piecemeal endoscopic resection of early Barrett's neoplasia.

**DESIGN**
- 84 patients (64 men; median age 70 years)
- ER-cap (n = 42) or MBM (n = 42)

**RESULTS**
- Procedure time (34 vs 50 minutes; P = 0.02) and costs (€240 vs €322; P < 0.01) were significantly less with MBM compared with ER-cap
- MBM resulted in smaller resection specimens than ER-cap (18 ×13 mm vs 20 × 15 mm; P < 0.01)
- Maximum thickness of specimens and resected submucosa were not significantly different

Pouw RE et al. GIE 2011
Randomized trial on endoscopic resection-cap versus multiband mucosectomy for piecemeal endoscopic resection of early Barrett's neoplasia.

• There were no clinically relevant bleeding episodes
• Four perforations: 3 with ER-cap, 1 with MBM (P = NS)

CONCLUSION

• Piecemeal ER with MBM is faster and cheaper than with ER-cap
• Despite the lack of submucosal lifting, MBM was not associated with more perforations
• Although MBM results in slightly smaller specimens, the clinical relevance of this may be limited because depth of resections does not differ between both techniques

Pouw RE et al. GIE 2011
Visual examination
Staging of Superficial GI Cancers

Figure 1 Subclassification of invasion depth by superficial carcinoma. m1 Intraepithelial non-invasive carcinoma, namely carcinoma in situ; m2, carcinoma invading the lamina propria; m3, carcinoma extending to or invading the muscularis mucosa; sm1, sm2, and sm3 carcinoma invading the upper, middle and lower one-third of the submucosa, respectively.
Depth of invasion and Risk of Lymph Node Metastasis

<table>
<thead>
<tr>
<th>Depth</th>
<th>Lymph node metastasis (%)</th>
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<tbody>
<tr>
<td></td>
<td>Gastric</td>
<td>Esophageal</td>
<td>Colorectal</td>
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<tr>
<td>Mucosal cancer</td>
<td>2-4%</td>
<td>2-3%</td>
<td>0%</td>
</tr>
<tr>
<td>Submucosal cancer</td>
<td>14-20%</td>
<td>37-53%</td>
<td>3-18%</td>
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Eleftheriadis N et al 2014
### Indications for Esophageal ESD

**Table 2. Japanese Esophageal Society Guidelines for esophageal endoscopic submucosal dissection (ESD)**

<table>
<thead>
<tr>
<th>Indications</th>
<th>Absolute indications</th>
<th>Relative indications</th>
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<td>T1a esophageal cancer involving the epithelium or lamina propria</td>
<td>Esophageal cancer involving the muscularis mucosa or &lt;200 μm invasion of the submucosa</td>
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<td>&lt;2/3 the circumference of the esophagus</td>
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Japanese Cancer Treatment Guidelines  
Japanese Esophageal Society Guidelines  
Bhat A / Saito Y. Am J Gastro 2015
Special considerations in the esophagus

- Lymphatics penetrate the muscularis mucosa
- Risk of LN metastasis in T1a lesions is 0 – 2.6%, which is lower than mortality from esophagectomy (1-6%)
- Esophagus is thin walled
- Risk of stricture formation is high after resection
ESD Video
Equipment

- Distal attachment / cap
- Electrosurgical unit
- Injection solution
  - saline
  - methylene blue / indigocarmine
  - carboxymethylcellulose / hypromellose / hyaluronic acid
- ESD knives
- Coagulation devices
  - Coagrasper
  - Clips
Technique

- Endoscopic examination
- Marking
- Circumferential mucosal incision
- Submucosal dissection
- Specimen preparation for pathology
Advantages of ESD

• En bloc resection of lesions > 2 cm with negative margins

• Avoids piecemeal resection that is associated with local recurrence

• Avoids invasive surgery and preserves native organ

• Allows detailed histopathologic assessment that is necessary to confirm curative resection

• Allows resection of superficial lesions regardless of tumor size, location, and fibrosis

Gotoda T et al. Gastrointest Clin N Amer 2011
Ono S et al. World J Gastrointest Endosc 2014
Cao Y et al. Endosc 2009
Disadvantages of ESD

• Requires technical expertise

• Increased complications
  – Bleeding
  – Perforation

• Longer procedure time

Oda I et al. Dig Endosc 2013
ESD vs EMR for Superficial Esophageal Cancer

METHODS

• 8 studies were included in the meta-analysis

• Primary end points included en bloc resection rate and the curative resection rate

• Secondary end points included operative time, rates of perforation, postoperative esophageal stricture, bleeding and local recurrence

Guo HM et al. World J Gastro 2014
ESD vs EMR for Superficial Esophageal Cancer

RESULTS

• ESD had significantly higher en bloc and curative resection rates than EMR
• Local recurrence rate in the ESD group was remarkably lower than that in the EMR group
• Operative time and perforation rate for ESD were significantly higher than those for EMR
• No difference in postoperative esophageal stricture and procedure-related bleeding with the two techniques

CONCLUSION

• ESD seems superior to EMR due to higher en bloc and curative resection rates and lower local recurrence rates

Guo HM et al. World J Gastro 2014
A randomised trial of endoscopic submucosal dissection versus endoscopic mucosal resection for early Barrett's neoplasia

**DESIGN**

- Patients with high-grade intraepithelial neoplasia (HGIN) or early adenocarcinoma (EAC) ≤3 cm were randomised to either ESD (n=20) or EMR (n=20)

- Primary outcome was R0 resection

- Secondary outcomes were complete remission from neoplasia, recurrences and adverse events (AEs)

A randomised trial of endoscopic submucosal dissection versus endoscopic mucosal resection for early Barrett's neoplasia

RESULTS

• R0 resection defined as margins free of HGIN/EAC was achieved more frequently with ESD (10/17 vs 2/17, p=0.01)

• No difference in complete remission at 3 months (ESD 15/16 vs EMR 16/17, p = 1.0)

• During mean f/u of 23.1 ± 6.4 months, recurrent EAC was observed in one case in the ESD group

A randomised trial of endoscopic submucosal dissection versus endoscopic mucosal resection for early Barrett's neoplasia

• Elective surgery in 4 after ESD and 3 after EMR (p=1.0)
• 2 severe AEs were recorded for ESD and none for EMR (p=0.49)

CONCLUSIONS
• ESD and EMR are both highly effective for endoscopic resection of early Barret’s neoplasia
• ESD achieves a higher R0 resection rate, but for most patients this bears little clinical relevance
• ESD is more time consuming and may cause severe AE

Take-home Message

• Both EMR and ESD are effective endoscopic options for resection of early esophageal neoplasia

• Appropriate case selection is important

• A multidisciplinary approach with gastroenterologists, surgeons, and oncologists is crucial

• Most appropriate treatment option (EMR, ESD, RFA/cryo, surgery) will need to be individualized based on
  – patient and lesion characteristics
  – available local expertise
Thank You

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