Endoscopic diagnosis and treatment for T1 early gastric cancer

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Disclosure of Conflicts of Interest

• There are no conflicts of interest to declare.

• There are no financial relationships with a commercial entity relevant to this presentation.
ESMO guideline for gastric cancer

Figure 1. Gastric cancer treatment algorithm.
Management of T1 early gastric cancer

- **Screening:** risk stratification and endoscopic diagnosis
- **Treatment:** endoscopic submucosal dissection (ESD)
- **Prevention:** *H. pylori* eradication after ESD
Management of T1 early gastric cancer

- **Screening:** risk stratification and endoscopic diagnosis
- **Treatment:** endoscopic submucosal dissection (ESD)
- **Prevention:** *H. pylori* eradication after ESD
Main course of gastric carcinogenesis

Normal mucosa

↓

Active gastritis

↓

Chronic atrophic gastritis

↓

Intestinal metaplasia

↓

Gastric cancer
**H. pylori antibody and serum pepsinogen**

<table>
<thead>
<tr>
<th>group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. pylori</em> antibody</td>
<td>−</td>
<td>+</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Serum PG</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

## Number of gastric cancer & Hazard ratio

<table>
<thead>
<tr>
<th>group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>967</td>
<td>2341</td>
<td>1316</td>
<td>31</td>
</tr>
<tr>
<td>Average age</td>
<td>48.3</td>
<td>49.5</td>
<td>50.4</td>
<td>49.3</td>
</tr>
<tr>
<td>Follow-up (year)</td>
<td>7.8</td>
<td>7.7</td>
<td>7.6</td>
<td>7.4</td>
</tr>
<tr>
<td>N of gastric cancer</td>
<td>0</td>
<td>19</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Hazard ratio</td>
<td>1</td>
<td>7.1</td>
<td>14.5</td>
<td>61.9</td>
</tr>
</tbody>
</table>

Endoscopic diagnosis for EGC
Endoscopic diagnosis for EGC
Endoscopic diagnosis for EGC

20x19mm, 0-IIb, pT1a(M), tub2, UL0, ly0, v0.
Endoscopic diagnosis need learning and experience
You know Wally. You can find him!
Image-enhanced endoscopy (IEE)

To augment the detection and diagnosis of lesions

• Dye-based : indigo carmine dye
  – no require special endoscopic equipment
  – cumbersome preparing dye

• Electronic-based : NBI, BLI, LCI
  – easy, time saving
  – using special endoscopic equipment
Endoscopic image of EGC using IEE

White light image

Indigo carmine dye
Endoscopic image of EGC using IEE

Linked color imaging (LCI), a novel image-enhanced endoscopy technology, emphasizes the color of early gastric cancer

Authors
Hiromitsu Kanzaki¹, Ryuta Takenaka², Yoshiro Kawahara³, Daisuke Kawai², Yuka Obayashi¹, Yuki Baba¹, Hiroyuki Sakae¹, Tatsuhiko Gotoda¹, Yoshiyasu Kono¹, Ko Miura¹, Masaya Iwamuro¹, Seiji Kawano¹, Takehiro Tanaka⁴, Hiroyuki Okada¹,³

Kanzaki H, et al. Endosc Int Open 2018
AI support to detect gastric cancer?

Application of artificial intelligence using a convolutional neural network for detecting gastric cancer in endoscopic images

Toshiaki Hirasawa¹,², Tetsuya Tanimoto⁴,⁵, Soichiro Ishihara²,⁶, Satoki Shichijo⁷, Tsuyoshi Ozawa²,⁶, Tatsuya Ohnishi⁸, Mitsuhiro Fujishiro⁹, Keigo Matsuo¹⁰, Junko Fujisaki¹, Tomohiro Tada²,³,¹¹

Hirasawa T, et al. Gastric Cancer 2018
Image recognition using AI


• Image recognition using AI with deep learning has dramatically progressed

Hirasawa T, et al. Gastric Cancer 2018
AI-based diagnostic system for gastric cancer

AI system automatically extracts features of gastric cancer and learns about gastric cancer.

Hirasawa T, et al. Gastric Cancer 2018
AI-based diagnostic system for gastric cancer

Output of AI system

☐ An endoscopist manually marked
☐ AI system marked

Hirasawa T, et al. Gastric Cancer 2018
### Accuracy of AI-based diagnostic system

- **Overall sensitivity of 92.2%**
- **PPV of 30.6%**

<table>
<thead>
<tr>
<th>Depth of tumor</th>
<th>Tumor size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 5</td>
</tr>
<tr>
<td>T1a (mucosa)</td>
<td>1/6 (16.7)</td>
</tr>
<tr>
<td>T1b (submucosa)</td>
<td>0/0</td>
</tr>
<tr>
<td>T2 (muscularis propria)</td>
<td>0/0</td>
</tr>
<tr>
<td>T3 (subserosa)</td>
<td>0/0</td>
</tr>
<tr>
<td>T4a (serosa)</td>
<td>0/0</td>
</tr>
</tbody>
</table>

Hirasawa T, et al. Gastric Cancer 2018
Management of T1 early gastric cancer

• **Screening:** risk stratification and endoscopic diagnosis

• **Treatment:** endoscopic submucosal dissection (ESD)

• **Prevention:** *H. pylori* eradication after ESD
Treatment options for T1 early gastric cancer

ESD • Curability • Feasibility

Surgery
Endoscopic Submucosal Dissection (ESD)

- Marking
- Injection
- Pre-incision
  Mucosal cutting
- Submucosal dissection
- Endoscopic managements for complications
Endoscopic Submucosal Dissection (ESD)
Indication of ESD for early gastric cancer
5-year survival rate after surgery for EGC

- **T1a mucosal**: 99%
- **T1b submucosal**: 97%

Hypothesis
If the rate of LN metastasis is,

- ≤1%
- ≤3%

The curability of ESD is equivalent to surgery.

EGC with low risk of lymph node metastasis

<table>
<thead>
<tr>
<th>Depth</th>
<th>Ulceration</th>
<th>Differentiated type</th>
<th>Undifferentiated type</th>
</tr>
</thead>
<tbody>
<tr>
<td>pT1a (ly0,v0)</td>
<td>UL 0</td>
<td>≤ 2 cm</td>
<td>&gt; 2 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0% (0/437)</td>
<td>0% (0/493)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 ~ 0.7%</td>
<td>0 ~ 0.6%</td>
</tr>
<tr>
<td>pT1b (SM1) (ly0,v0)</td>
<td>UL 1</td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0% (0/488)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 ~ 0.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0% (0/145)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 ~ 2.5%</td>
<td></td>
</tr>
</tbody>
</table>

Upper: % lymph node metastasis (%)
Lower: 95% confidence interval (CI)

Gotoda T, et al. Gastric Cancer 2000
Hirasawa T, et al. Gastric Cancer 2009
A non-randomized confirmatory trial of an expanded indication for endoscopic submucosal dissection for intestinal-type gastric cancer (cT1a): the Japan Clinical Oncology Group study (JCOG0607)

Noriaki Hasuike1 · Hiroyuki Ono2 · Narikazu Boku3 · Junki Mizusawa4 · Kohei Takizawa2 · Haruhiko Fukuda4 · Ichiro Oda5 · Hisashi Doyama6 · Kazuhiro Kaneko7 · Shinichiro Hori8 · Hiroyasu Iishi9 · Yukinori Kurokawa10 · Manabu Muto11 · Gastrointestinal Endoscopy Group of Japan Clinical Oncology Group (JCOG-GIESG)

Received: 8 December 2016 / Accepted: 7 February 2017
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<table>
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<th>Depth Ulceration</th>
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<tr>
<td>pT1a (cT1a) (lV0,v0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL - 0 cm</td>
<td>&lt; 2 cm</td>
<td>0% (0/437)</td>
</tr>
<tr>
<td>UL - 0 cm</td>
<td>≥ 2 cm</td>
<td>0% (0/493)</td>
</tr>
<tr>
<td>UL + &lt; 3 cm</td>
<td>0% (0/488)</td>
<td>0% (0/248)</td>
</tr>
<tr>
<td>pT1b (cT1b) (lV0,v0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 3 cm</td>
<td>0% (0/488)</td>
<td>0% (0/248)</td>
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Overall survival (OS)

5-year OS (n = 470) 97.0% (95%CI : 95.0-98.2%)
Median follow up 73.8 months (range:9.3–98.8)

- 5-year OS of enrolled patients exceeded the age and sex adjusted 5-year OS in the general Japanese population.
- Null hypothesis was rejected because lower 95%CI of 5-year OS exceeded the threshold value; 86.1% (general population).
## Definitions of curative resection

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</tr>
<tr>
<td></td>
<td>UL 1</td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td>pT1b</td>
<td>SM1</td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SM2</td>
<td></td>
<td></td>
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- **Curative resection (Absolute)**
  - 1. R0 resection
  - 2. No lymphovascular involvement

- **Curative resection (Expanded)**

- **Non-curative resection**

*Japanese Gastric Cancer Treatment Guidelines Ver5*
A Phase II Clinical Trial of Endoscopic Submucosal Dissection for Early Gastric Cancer of Undifferentiated Type: Japan Clinical Oncology Group Study JCOG1009/1010

Kohei Takizawa¹, Atsuo Takashima², Aya Kimura³, Junki Mizusawa², Noriaki Hasuike⁴, Hiroyuki Ono¹, Masanori Terashima⁴, Manabu Muto⁵, Narikazu Boku⁶, Mitsuru Sasaki⁷ and Haruhiko Fukuda² for the Gastrointestinal Endoscopy Study Group (GIESG) and Stomach Cancer Study Group (SCSG) of the Japan Clinical Oncology Group (JCOG)

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<td>&gt; 2 cm</td>
</tr>
<tr>
<td></td>
<td>UL +</td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td>pT1b</td>
<td>SM1</td>
<td>≤ 3 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SM2</td>
<td></td>
<td></td>
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Main course of gastric carcinogenesis

- Normal mucosa
  - Active gastritis
  - Chronic atrophic gastritis
  - Intestinal metaplasia
  - Gastric cancer
**H. pylori eradication after ESD**

Effect of eradication of *Helicobacter pylori* on incidence of metachronous gastric carcinoma after endoscopic resection of early gastric cancer: an open-label, randomised controlled trial

**Eradication of Helicobacter pylori After Endoscopic Resection of Gastric Tumors Does Not Reduce Incidence of Metachronous Gastric Carcinoma**


Helicobacter pylori Therapy for the Prevention of Metachronous Gastric Cancer

Il Ju Choi, M.D., Ph.D., Myeong-Cherl Kook, M.D., Ph.D., Young-Ill Kim, M.D., Soo-Jeong Cho, M.D., Ph.D., Jong Yeul Lee, M.D., Chan Gyoo Kim, M.D., Ph.D., Boram Park, M.S., and Byung-Ho Nam, Ph.D.

Figure 2. Kaplan–Meier Analysis of the Incidence of Metachronous Gastric Cancer.
Take home message

- Supportive equipment IEE and AI are being developed for endoscopic diagnosis of early gastric cancer.

- Indication of ESD is established based on the rate of LN metastasis and the 5-year survival of surgical treatment.

- *H. pylori* treatment can reduce risk of metachronous gastric cancer after ESD.
Nihon University Hospital

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