Selecting the Best Minimally Invasive Procedure for Proximal Gastric Cancer

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Gastric cancer in Iran
the most common cause of cancer death

Data source: GLOBOCAN 2018

Estimated number of incident cases and deaths in Iran, Islamic Republic of, both sexes, all ages.
Global incidence of gastric cancer in 2012 (GLOBOCAN 2012)

Estimated crude incidence rates in 2020, stomach, both sexes, all ages

Crude rate

≥ 15.9
9.7–15.9
5.0–9.7
2.4–5.0
< 2.4

Not applicable
No data

Data source: GLOBOCAN 2020
Graph production: IARC
(http://gco.iarc.fr/today)
World Health Organization

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Gastric cancer in Iran
the most common cause of cancer death

Data source: GLOBOCAN 2020
Cancer of the Gastric Cardia is Rising in Incidence in an Asian Population (Singapore)

(Data from Singapore Cancer Registry)

Number of surgery for Siewert type II AEG and proximal gastric cancer has been increasing in Japan

×2.4

Yamashita H, Seto Y et al. *Gastric Cancer* 2017; suppl1: 69-83
EGJ carcinoma

Siewert classification

Type I

Type II

Type III
Siewert type II

2cm from EGJ

5cm from EGJ

Upper

Middle

Lower
2cm from EGJ
5cm from EGJ

Siewert type II
Proximal GC
2 cm from EGJ

5 cm from EGJ

Upper

Middle

Lower

Siewert type II
Proximal GC

Siewert type III
Proximal GC
2cm from EGJ
5cm from EGJ

Upper
Middle
Lower

Siewert type II
Proximal GC
Siewert type III
Proximal GC
Proximal gastric cancer

my personal definition

• Location of tumor epicenter is identical with Siewert type II/III
• Gastric predominant tumor
• Confined to the upper portion of the stomach

What is the optimal surgical treatment?
Total gastrectomy
Distal gastrectomy
Pylorus preserving gastrectomy
Proximal gastrectomy

Japanese Gastric Cancer Association, Gastric Cancer 2021;24:1-21
Selection of gastrectomy The standard surgical procedure for clinically node-positive (cN+) or T2–T4a tumors is either total or distal gastrectomy. Distal gastrectomy is T2-T4a cN+

For cT1N0 tumors, the following types of gastric resection can be considered according to tumor location.

- Pylorus-preserving gastrectomy (PPG): for tumors in the middle portion of the stomach with the distal tumor border at least 4 cm proximal to the pylorus.
- Proximal gastrectomy: for proximal tumors where more than half of the distal stomach can be preserved.
- Local resection of the stomach and segmental gastrectomy should still be regarded as investigational treatments.

Japanese Gastric Cancer Association, Gastric Cancer 2021;24:1-21
Pattern of LN meta in proximal GC

T1a, T1b

Proximal gastrectomy with exclusion of no. 3b lesser curvature lymph node dissection could be indicated for patients with advanced upper-third gastric cancer.
Japanese nation-wide retrospective study
(Siewert type II and proximal gastric cancer, \(\leq 4\text{cm}, n=2384\))

<table>
<thead>
<tr>
<th>Tumor depth</th>
<th></th>
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<tbody>
<tr>
<td>pT1a</td>
<td>354</td>
</tr>
<tr>
<td>pT1b</td>
<td>1046</td>
</tr>
<tr>
<td>pT2</td>
<td>461</td>
</tr>
<tr>
<td>pT3/4</td>
<td>523</td>
</tr>
</tbody>
</table>

Yamashita H, Seto Y et al. *Gastric Cancer* 2017; suppl1: 69-83
Is total gastrectomy required for proximal gastric cancer?
Body weight trend

Preop 6w 9w 3m 4m 5m 7m

88kg 60kg

-32%

kg
Large-Scale Investigation into Dumping Syndrome after Gastrectomy for Gastric Cancer

Shinji Mine, MD, Takeshi Sano, MD, Kenji Tsutsumi, MD, Yoshitaka Murakami, PhD, Kazuhisa Ehara, MD, Makoto Saka, MD, Kazuo Hara, MD, Takeo Fukagawa, MD, Harushi Udagawa, MD, FACS, Hitoshi Katai, MD

TG

BW loss (\geq 10\%)
Specific Features of Dumping Syndrome after Various Types of Gastrectomy as Assessed by a Newly Developed Integrated Questionnaire, the PGSAS-45

Yutaka Tanizawa, Kazuaki Tanabe, Hiroshi Kawahira, Junya Fujita, Nobuhiro Takiguchi, Masazumi Takahashi, Yuichi Ito, Norio Mitsumori, Tsutomu Namikawa, Atsushi Oshio, Koji Nakada, the Japan Postgastrectomy Syndrome Working Party
BW loss is associated with poor tolerance of adjuvant chemotherapy

Continuation rate

Six months continuation rate was 71.8% in body weight loss < 15% group
Six months continuation rate was 40.0% in body weight loss ≥ 15% group

Number at risk

<table>
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<tr>
<th></th>
<th>0</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
<th>150</th>
<th>180</th>
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</thead>
<tbody>
<tr>
<td>Blue</td>
<td>85</td>
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<td>74</td>
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<tr>
<td>Orange</td>
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<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
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</tbody>
</table>

Total gastrectomy

• Body weight loss (malnutrition)
• Highly associated with post-gastrectomy syndrome (QOL impairment)
• Poor tolerance of postoperative chemotherapy

Preserving distal portion of the stomach
Beneficial???
TG vs PG (Jejunal Pouch Interposition), RCT

Locus U, <80 y.o., type 0/1/2, Jan 2000-May 2003

PG (n=25)
M/SM/MP/SS 9/10/4/2

celiac branch transected

TG (n=26)
M/SM/MP/SS 7/12/4/3

5 cm

10 cm

30 cm

45-50 cm

Post-gastrectomy syndrome at 12 months

<table>
<thead>
<tr>
<th>Condition</th>
<th>PG (n=25)</th>
<th>TG (n=26)</th>
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</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Early dumping</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Late Dumping</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Reflux esophagitis</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Gallbladder stone</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

Restoration of gastrointestinal motility ameliorates nutritional deficiencies and body weight loss of patients who undergo laparoscopy-assisted proximal gastrectomy.

Toyomasu Y et al. Surg Endosc 2017;31:1393
Multicenter prospective trial of total gastrectomy versus proximal gastrectomy for upper third cT1 gastric cancer

Makoto Yamasaki\textsuperscript{1} · S. Takiguchi\textsuperscript{2} · T. Omori\textsuperscript{3} · M. Hirao\textsuperscript{4} · H. Imamura\textsuperscript{5} · K. Fujitani\textsuperscript{6} · S. Tamura\textsuperscript{7} · Y. Akamaru\textsuperscript{8} · K. Kishi\textsuperscript{9} · J. Fujita\textsuperscript{10} · T. Hirao\textsuperscript{11} · K. Demura\textsuperscript{11} · J. Matsuyama\textsuperscript{12} · A.Takeno\textsuperscript{13} · C. Ebisui\textsuperscript{14} · K. Takachi\textsuperscript{15} · O. Takayama\textsuperscript{16} · H. Fukunaga\textsuperscript{17} · K. Okada\textsuperscript{18} · S. Adachi\textsuperscript{19} · S. Fukuda\textsuperscript{20} · N. Matsuura\textsuperscript{1} · T. Saito\textsuperscript{1} · T. Takahashi\textsuperscript{1} · Y. Kurokawa\textsuperscript{1} · M. Yano\textsuperscript{14} · H. Eguchi\textsuperscript{1} · Y. Doki\textsuperscript{1}

\begin{itemize}
  \item PG n=159
  \item TG n=93
\end{itemize}

**PG appears to be beneficial over TG in some respects**

Yamasaki M et al. Gastric Cancer 2020, in press
**Selection of gastrectomy** The standard surgical procedure for clinically node-positive (cN+) or T2–T4a tumors is either total or distal gastrectomy. Distal gastrectomy is

For cT1N0 tumors, the following types of gastric resection can be considered according to tumor location.

**Is PG contraindicated for advanced cancer?**

- Proximal gastrectomy: for proximal tumors where more than half of the distal stomach can be preserved.
- Local resection of the stomach and segmental gastrectomy should still be regarded as investigational treatments.

Japanese Gastric Cancer Association, Gastric Cancer 2021;24:1-21
Total gastrectomy is not necessary for proximal gastric cancer

Lawrence E. Harrison, MD, Martin S. Karpeh, MD, and Murray F. Brennan, MD, New York, N.Y.

Definitions. Proximal gastric cancer was defined as adenocarcinoma of the proximal one third of the stomach or gastroesophageal junction.

<table>
<thead>
<tr>
<th></th>
<th>PC (n = 65)</th>
<th>TG (n = 33)</th>
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<tbody>
<tr>
<td>T stage (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIS</td>
<td>1</td>
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</tr>
<tr>
<td>T1</td>
<td>17</td>
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<td>T4</td>
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<tr>
<td>N stage (n)</td>
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</tr>
<tr>
<td>N0</td>
<td>30</td>
<td>12</td>
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<tr>
<td>N1</td>
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<td>Stage (n)</td>
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<tr>
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<td>I</td>
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<tr>
<td>II</td>
<td>17</td>
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<td>III</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

60mm, T4bN2H0P0CY0 Stage IIIC
Pattern of lymph node metastases (Siewert type II n=225)

Japanese nation-wide prospective study
(Siewert type II and proximal gastric cancer, $\geq$T2, n=358)

Kurokawa Y. Ann Surg 2019, in press
Tentative standard in the extent of lymphadenectomy for junctional cancer

Junctional cancer $\leq 4$cm in diameter

E,EG,E=G

SCC

cT1

No.1,2,3,7 +19,20 +middle and lower mediastinal

No.1,2,3,7 +8a,9,11p +19,20 +upper,middle and lower mediastinal +cervical

Adenoca

cT1

No.1,2,3,7 +19,20 + lower mediastinal

No.1,2,3,7 +9 +19,20 +lower mediastinal

No.1,2,3,7 +8a,9,11p,11d +19,20 +lower mediastinal

GE,G

cT1

No.1,2,3,7 +8a,9,11p,11d +19,20

No.1,2,3,7 +19,20

Nos.4, 5, and 6 stations are not included!!!
cT2–T4 adenocarcinoma or SCC located within 2.0 cm of the EGJ

clinically node positive in the upper/middle mediastinal field

Esophageal involvement

> 4.0 cm
- Lymph node dissection of stations 1, 2, 3a, 7, 8a, 9, 11p, 19, 106recR, 107, 108, 109, 110, 111, 112

2.1 – 4.0 cm
- Lymph node dissection of stations 1, 2, 3a, 7, 8a, 9, 11p, 19, 110

≤ 2.0 cm
- Lymph node dissection of stations 1, 2, 3a, 7, 8a, 9, 11p, 19

Nos. 4, 5, and 6 stations are not included!!!

Kurokawa Y, Ann Surg in press
T3N2(5/43)

Recurrence-free ≥ 5 years

T4aN0

Recurrence-free ≥ 5 years
Proximal gastrectomy can be employed oncologically.
Proximal gastric cancer

**Standard**

Total gastrectomy

**Option**

Proximal gastrectomy

**Controversial**

Ex. proximal gastrectomy

Siewert type II (AEG)

Esophagectomy

Total gastrectomy
Reconstruction method after PG controversal issue !!!

Esophagogastrostomy

Jejunal interposition

Double tract

Simple

Reflux

anti-reflux procedure is required

Reflux ↓

Complicated

Reflux ↓

Ohyama S et al. Gastric Cancer 2009;12:88
Controversial !!!

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2010</th>
<th>2014</th>
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<tbody>
<tr>
<td>Remnant stomach</td>
<td></td>
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</tr>
<tr>
<td>2/3</td>
<td>69 (48%)</td>
<td>56 (69.1%)</td>
</tr>
<tr>
<td>1/2</td>
<td>41 (28%)</td>
<td>13 (21.3%)</td>
</tr>
<tr>
<td>Abdominal</td>
<td>19 (13%)</td>
<td>11 (13.6%)</td>
</tr>
</tbody>
</table>

Kumagai K et al. Surg Today 2012;42:411
Conclusion

- PG might have substantial benefits over TG.
- PG can be employed oncologically for advanced proximal gastric cancer confined to the upper portion of the stomach.

  Extent of stomach resection can be minimized

- Reconstruction method: **highly controversial**

- Laparoscopic/Robotic PG might be the best for minimally invasive approach for this tumor entity.