Official Organ of the European Society of Gastrointestinal Endoscopy (E.S.G.E.) and Affiliated Societies

Official of:
Société Française d’Endoscopie Digestive (SFED)
Endoscopy Group of the Polish Association of Gastroenterology
Nederlands Genootschap van Artsen voor Maag-, Darm- en Leverziekten
Scandinavian Association of Digestive Endoscopy (SADE)
Hong Kong Society of Digestive Endoscopy (HKSE)
Argentine Federation of Digestive Endoscopy Associations (AAED)
Endoscopic Section of the Hungarian Society of Gastroenterology
Belgian Society of Digestive Endoscopy
Korean Society of Gastrointestinal Endoscopy
Deutsche Gesellschaft für Verdauungs- und Stoffwechselkrankheiten mit Sektion Endoskopie

Co-Editors-In-Chief:
M. Classen, Germany
J. Geenen, USA
C. A. Lehman, USA
N. Soehendra, Germany
H. Suzuki, Japan

Managing Editors:
B. Fischer, Germany
H. Hamilton, Germany

Editorial Assistants:
A. Knöbel, Germany
R. Loda, Germany

Chief Copy Editor:
T. Brady, UK

Statistical Advisor:
K. Ulm, Germany

Section Editors:
J.-F. Rey, France (Guidelines)
J. Baldey, USA (Clinical Case Conference)
R. Hawes, USA, C. Ell, Germany (Technology Assessment)
R. Lambert, France (The Expert Approach)
M. Stolte, Germany, R. H. Riddell, USA (GI Pathology)

Editors Emeriti:
K. Kawai, Japan
R. Ottenjann, Germany
H. W. Schreiber, Germany

Editorial Board:
L. Dikob, Norway
J. R. Armengol-Miro, Spain
A. T. R. Axon, UK
K. F. Binmoeller, USA
J. Boix Valverde, Spain
S. Boyacıoglu, Turkey

M. G. Bramble, UK
M. Butet, France
G. Calelli, Italy
D. L. Carr-Loecke, USA
W. S. Chao, Hong Kong
I. S. Chung, South Korea
S. C. S. Chung, Hong Kong
F. Cosentino, Italy
G. Costamagna, Italy
M. Cremer, Belgium
P. Dexpert, Belgium
J. Devière, Belgium
P. Dite, Czech Republic
C. Ell, Germany
J. Escourrou, France
D. Fleischer, USA
P. Folkens, The Netherlands
M. L. Freeman, USA
M. A. Fujino, Japan
R. Fujita, Japan
A. J. Ganc, Brazil
H. Gouveia, Portugal
M. Gréff, France
G. B. Haber, Canada
F. Hagenmüller, Germany
E. G. Hahn, Germany
M. D. Heller, UK
B. I. Hirschowitz, USA
K. Huibregtse, The Netherlands
J. H. Hyun, South Korea
N. Jajeh, Syria
D. M. Jensen, USA
S. Karayalcın, Turkey
Y. Kato, Japan
J. Knöflik, Czech Republic
R. Kozarek, USA
A. Kruse, Denmark
S. Kudo, Japan
S. D. Ladas, Greece
N. Landoni, Argentina
C. N. Leitao, Portugal
G. Liedberg, Sweden
C. Liquory, France
B. C. Manegold, Germany
M. P. Manns, Germany
N. E. Marcon, Canada
T. A. Marek, Poland
P. Matzen, Denmark
J. Montero Vásquez, Spain
A. Montori, Italy
A. I. Morris, UK
M. Muñoz-Navas, Spain
M. Nakajima, Japan
J. Nord, USA
A. Nowak, Poland
L. Palazzo, France
M. Polkowski, Poland
T. Ponchon, France
J. C. Prolla, Brazil
I. Rácz, Hungary
J. Regula, Poland
J. E. Richter, USA
J. F. Riemann, Germany
P. Rolny, Sweden
W. Rösch, Germany
Y. Sakai, Japan
T. Sauerbruch, Germany
R. Schöfl, Austria
J. Schömerich, Germany
F. Schreiber, Austria
E. G. Segal, Argentina
S. Sheir, Egypt
J. D. Sollano, Philippines
J.-C. Souquet, France
P. Spinelli, Italy
J. J. Y. Sung, Hong Kong
H. Tajiri, Japan
F. Tárkó, Hungary
V. Tejedo Graña, Spain
F. Thakor, Egypt
Z. Tulassay, Hungary
G. N. J. Tytgat, The Netherlands
C. B. Williams, UK
Z.-L. Yu, China

F. M. Zano, Philippines
M. Zavoral, Czech Republic
Q.-L. Zhang, China

European Society of Gastrointestinal Endoscopy (E.S.G.E.):
A. Axén, UK (President)
A. Nowak, Poland
A. Montori, Italy
A. Kruse, Denmark
M. Liberato, Portugal
J.-F. Rey, France
J. Devière, Belgium
J. B. Valverde, Spain
G. Costamagna, Italy
H. Neuhaus, Germany
J. Spilczak, Czech Republic
M. S. Zakaria, Egypt

Address:
J.-F. Rey MD, Secretary General
Institut Arnauld Tzanck
Avenue du Docteur Maurice Donat
06700 St. Laurent du Var, France
Fax: +33-493-975158
E-mail: jean-francois.rey@wanadoo.fr

Reprint Volume 34 - 2002
© Georg Thieme Verlag
Stuttgart - New York
Reprint with the permission of the publishers only

Georg Thieme Verlag
Rüdigerstraße 14
D-70469 Stuttgart
www.thieme-connect.com
www.thieme.de/endoscopy
Thieme New York
333 Seventh Avenue
New York, NY 10001, USA
www.thieme.com
Mechanism of the Development of Gastric Ulcer after Percutaneous Endoscopic Gastrostomy

Background and Study Aims: The present study was carried out in order to elucidate the mechanism of the development of gastric ulcer, one of the serious complications of PEG tube placement.

Patients and Methods: This retrospective study included 92 patients who underwent gastric endoscopy after PEG tube placement. Gastric ulcers detected at gastroscopy were examined in relation to the length of the protrusion from the PEG tubes intragastric bumper and the use of histamine H₂-receptor antagonists.

Results: Gastric ulcers were found in nine of the 92 patients, and in all nine the ulcer was found on the posterior wall of the gastric body, where the tip of the PEG tube was attached. Seven of the 21 patients (33.3%) who had a PEG tube with a long protrusion from the intragastric bumper developed gastric ulcer. By contrast, only two of the 71 patients (2.8%) who had a PEG tube with a short protrusion developed gastric ulcer. The use of H₂-blockers had no significant impact on the development of gastric ulcer.

Conclusions: The occurrence of gastric ulcer after PEG placement was attributable to the shape of the PEG tube within the intragastric space, and not to the use of H₂-blockers, suggesting that appropriate placement of the PEG tube is an important factor in preventing gastric ulcer.

Introduction

The value of tube feeding with percutaneous endoscopic gastrostomy (PEG) has been clearly recognized, and PEG tube feeding is now widely used in elderly patients with dysphagia due to cerebral apoplexy or senile dementia; nasogastric tube feeding is also still widely used, however [1-3]. With the widespread use of PEG feeding, there have been reports of several complications peculiar to PEG feeding [4-8], as well as reports on ways of preventing these [9-12]. However, these reports have been limited to complications during the acute postoperative phase, with the exception of buried bumper syndrome in the chronic postoperative phase [13-15]. There have been few reports of other complications during the chronic phase, particularly the development of gastric ulcer as a severe complication of PEG tube placement. The aims in the present study were to investigate the incidence of gastric ulcer detected at gastroscopy after PEG placement, and to examine the contribution to the development of gastric ulcer of two possible factors — the shape of the intragastric bumper and the use of histamine H₂-receptor antagonists (H₂-blockers).

Patients and Methods

Patients

The study included 92 patients (29 men, 63 women, mean age 78.3, range 39–97) who underwent gastric endoscopy after PEG tube placement. Gastroscopy was carried out when the tubes were being exchanged. The disease backgrounds for all the patients included are shown in Table 1. Gastric endoscopy was carried out a mean of 249 days (range 6–1833 days) after PEG tube placement during tube exchange, except in patients who pres-
Table 1 Characteristics of the patients who underwent gastroscopy after placement of a percutaneous endoscopic gastrostomy (PEG) tube

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Group 1* (n = 21)</th>
<th>Group 2** (n = 71)</th>
<th>Total (n = 92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral infarction</td>
<td>6</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>Dementia</td>
<td>8</td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>Cerebral hemorrhage</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Subarachnoid hemorrhage</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Brain contusion</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Brain anoxia</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Amyotrophic lateral sclerosis</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Parkinson's syndrome</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gastric cancer</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Progressive supranuclear palsy</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Brain tumor</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Sex

<table>
<thead>
<tr>
<th></th>
<th>Group 1*</th>
<th>Group 2**</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>6</td>
<td>23</td>
<td>29</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>48</td>
<td>63</td>
</tr>
</tbody>
</table>

Age (y; mean, range)

<table>
<thead>
<tr>
<th></th>
<th>Group 1*</th>
<th>Group 2**</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>79.24</td>
<td>(53-97)</td>
<td>78.04</td>
<td>(39-94)</td>
</tr>
</tbody>
</table>

Interval after PEG***

<table>
<thead>
<tr>
<th></th>
<th>Group 1*</th>
<th>Group 2**</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>237</td>
<td>(6-1833)</td>
<td>252</td>
<td>(13-801)</td>
</tr>
</tbody>
</table>

* Group 1: protrusion from intragastric bumper ≥ 5 mm.
** Group 2: protrusion from intragastric bumper < 5 mm.
*** Interval between the day of a percutaneous endoscopic gastrostomy and that of gastroscopy.

Figure 1 Categorization of the percutaneous endoscopic gastrostomy tubes relative to the length of the protrusion from the intragastric bumper as observed by gastroscopy. a Group 1: protrusion from intragastric bumper ≥ 5 mm. b Group 2: protrusion from intragastric bumper < 5 mm

Table 2 Relationship between the shape of the percutaneous endoscopic gastrostomy (PEG) tube and the development of gastric ulcer

<table>
<thead>
<tr>
<th></th>
<th>Group 1*</th>
<th>Group 2**</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric ulcer</td>
<td>7 (33.3%)</td>
<td>2 (2.8%)</td>
<td>9</td>
</tr>
<tr>
<td>No gastric ulcer</td>
<td>14 (66.7%)</td>
<td>69 (97.2%)</td>
<td>83</td>
</tr>
<tr>
<td>Total</td>
<td>21 (100%)</td>
<td>71 (100%)</td>
<td>92</td>
</tr>
</tbody>
</table>

* Group 1: protrusion from intragastric bumper ≥ 5 mm.
** Group 2: protrusion from intragastric bumper < 5 mm.
P < 0.05 (Fisher's exact test).

Results

Incidence of Gastric Ulcer after PEG Tube Placement

Of the 92 patients who underwent gastroscopy after PEG placement, nine (9.9%) were found to have gastric ulcers. Among the nine patients diagnosed with gastric ulcer at gastroscopy, three patients in group 1 showed clinical symptoms of gastrointestinal bleeding. The other four patients in group 1 and two patients in group 2 were asymptomatic. There were no differences between the groups with regard to complications or other confounding factors (e.g., age, types of medication, disorders such as respiratory, renal, or hepatic dysfunction) capable of increasing the risk of gastric ulcer. In all nine patients, the gastric ulcers were located on the posterior wall of the body of the stomach, where the tipp of the PEG tube was in contact with the mucosa. Seven (33.3%) of the 21 patients in group 1 (long protrusion), and two (2.8%) of the 71 patients in group 2 (short protrusion) developed gastric ulcer. The occurrence of gastric ulcer was significantly higher in group 1 patients compared with group 2 patients (P < 0.05, Fisher's exact test) (Table 2).

Effect of H2-Blocker Administration

An H2-blocker was administered to four of the 92 patients who underwent gastroscopy after PEG tube placement. Among the 21 patients in group 1, gastric ulcer was observed in one of the two patients who were receiving an H2-blocker, and in six of the 19 patients who were not receiving an H2-blocker. In group 2, none of the patients who were on an H2-blocker developed gas-
Table 3  H₂-blocker medication and the risk of gastric ulcer among patients in groups 1 and 2

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>No H₂-blockers</th>
<th>Total</th>
<th>Group 2</th>
<th>No H₂-blockers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric ulcer</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>No gastric ulcer</td>
<td>1</td>
<td>13</td>
<td>14</td>
<td>2</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>19</td>
<td>21</td>
<td>2</td>
<td>69</td>
<td>71</td>
</tr>
</tbody>
</table>

N.s. (Fisher’s exact test).

Discussion

PEG was first described by Gauderer et al. in 1980 [16], and PEG tube placement is highly regarded as a useful method for managing patients who require long-term transstomal feeding. We previously reported [17] that complications are more frequent after PEG than reported by Jain et al. [18]. In our experience in 441 patients who underwent PEG, there were 144 incidents of post-PEG complications, including gastric ulcer.

Some speculations have been published regarding the mechanism underlying the development of gastric ulcer after PEG tube placement. Several reports [19, 20] have suggested the possibility that contact between a nasogastric feeding tube and the gastric wall may be a cause of gastric ulcer. However, this mechanism has not previously been demonstrated for the onset of gastric ulcer in patients undergoing PEG placement. In the present study, in all nine patients who developed gastric ulcer after PEG tube placement, the gastric ulcer was observed on the posterior wall of the gastric body, where the tipp of the PEG tube came into contact with the mucosa. None of the 92 patients in the present study had any previous history of gastric ulcer. In addition, it was confirmed that the gastroscopy was aseptic for Helicobacter pylori before the gastroscopy procedure in each patient. It is therefore likely that mechanical stimulation by the PEG tube on the mucosa of the stomach led to the development of the gastric ulcers, and this view is supported by the finding that gastric ulcer occurred in a significantly higher percentage of group 1 patients, in whom the PEG tube was more likely to cause injury to the gastric mucosa due to the longer protrusion from the bumper.

Only four of the 92 patients studied had received H₂-blocker treatment before PEG tube placement. However, H₂-blocker administration did not significantly reduce the incidence of gastric ulcer. As detailed above, we would speculate from these results that the development of gastric ulcer after PEG tube placement may be due to mechanical injury caused by the PEG tube to the gastric mucosa, and that the administration of H₂-blockers may not prevent the development of gastric ulcer.

Conclusion

Use of a PEG tube with a long protruding tip was associated with a significantly higher frequency of post-PEG gastric ulcer due to contact injury to the gastric mucosa caused by the tip of the tube. Choosing the appropriate PEG tube may be crucial in preventing gastric ulcer after PEG placement.

References

5 Fox VL, Abel SD, Malas S et al. Complications following percutaneous endoscopic gastrostomy and subsequent catheter replacement in children and young adults. Gastrointest Endosc 1997; 45: 64–71