Percutaneous endoscopic gastrojejunostomy: a retrospective analysis on its utility in maintaining enteral nutrition

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Abstract

Background

Percutaneous endoscopic gastrostomy (PEG) is a safe and minimally invasive procedure for long-term enteral nutrition in patients with inadequate oral intake. However, feeding-related complications such as aspiration and peristomal leakage can impede the use of PEG. Percutaneous endoscopic gastrojejunostomy (PEG-J) can help by circumventing gastric passage during enteral nutrition and improving drainage of gastric secretions.

Methods

19 patients (11 males and 8 females) who received PEG-J after unsuccessful PEG feeding during a five year period in our institution were analysed retrospectively to evaluate the efficacy of jejunal feeding.

Results

Average age was 85.8 ± 2.9 (95% CI) years. Average period from PEG to PEG-J was 53.2 ± 28.4 days. Aspiration due to feed reflux occurred in 17 patients (89.5%) and severe leakage in 2 patients (10.5%). Tube placement was successful in all patients. The average post-procedural length of stay was 49.9 ± 29.2 days. In 2 patients, feeding-related complications persisted and resulted in transition to parenteral nutrition. There were 6 (31.6%) in-hospital mortality, with 3 (15.8%) occurring within 30 days after procedure.
Conclusions
PEG-J can be performed safely in most patients. It does not resolve PEG feeding-related complications in all patients but may facilitate the continuity of enteral nutrition in many patients.

KEYWORDS: Percutaneous endoscopic gastrostomy, Gastrojejunostomy, Enteral nutrition

Background
The introduction of percutaneous endoscopic gastrostomy (PEG) provided a safe and minimally invasive procedure for long-term enteral nutrition in patients with dysphagia or inadequate oral intake [1, 2]. However, feeding-related complications such as aspiration from the regurgitation of gastric feed and increased peristomal leakage can impede the use of PEG. Although jejunal (or post-pyloric) feeding has not been proven to be generally superior to gastric feeding [3-5], it may help to overcome gastric feeding-related complications by circumventing gastric passage during enteral nutrition and improving the drainage of gastric secretions [6-8]. Jejunal feeding can be achieved by direct percutaneous endoscopic jejunostomy (D-PEJ) [9] or more commonly by placing a jejunal tube through an existing gastrostomy site, also called a gastrojejunostomy (PEG-J or JET-PEG) [10]. Jejunal extension tubes placed through PEG tubes are usually smaller than direct placement and are therefore prone to tube dysfunction such as blockage or migration into the stomach [11, 12]. Recently, larger-bore jejunal tubes can also be placed transgastrically with the aid of an ultrathin endoscope after removal of the PEG tube [13]. The present study retrospectively reviews our experience using transgastrically placed large-bore jejunal tubes with gastric decompression function in patients with unsuccessful PEG feeding.
Methods

Study design and patients

Medical records of 19 patients with in-dwelling PEG tubes who underwent PEG-J procedures for placement of jejunal tubes between January 2007 and December 2011 in our hospital were reviewed retrospectively. Indications for PEG-J were aspiration from gastric feed reflux in 17 patients and severe peristomal leakage in 2 patients. Written informed consent was obtained before each procedure. 20Fr size all-silicone jejunal tubes (length 60cm, effective length 40cm) with gastric decompression function (Figure 1) were used and all procedures were performed in an interventional radiology suite with the use of fluoroscopy. Conscious sedation and local anesthesia were not required.

PEG-J tube insertion technique (Figure 2)

The existing PEG tube is removed and an ultrathin endoscope (5.4mm outer diameter) is inserted into the gastric lumen through the mature gastrostomy puncture site (Figure 2A). Once the endoscope is fluoroscopically confirmed to have passed the ligament of Treitz, a guide wire is inserted and the scope is removed (Figure 2B). With the aid of the guide wire, the PEG-J tube is then inserted so that the tip of the tube is placed in the jejunum (Figure 2C). After tube placement, the guide wire is removed and procedural success is confirmed using contrast medium. Tube feeding usually resumes the following day.

Statistical analysis

Continuous variables are expressed as mean ± 95% confidence interval, and categorical variables are expressed as numbers (percentage). Comparisons for continuous variables in the same group
were made using paired t-tests for normally distributed data or Wilcoxon signed-rank tests for ordinal data. Tests for proportionality between groups were made using the Fisher exact test. Statistical significance was defined as p<0.05 and analysis was performed using XLSTAT2014 for Windows (Addinsoft Ltd., Paris, France).

Results

Tube placement was successful in all patients. Table 1 shows the clinical characteristics of patient who underwent the procedure. All patients received their earlier PEG tube placements in our hospital but were not discharged due to feeding related complications. Average period from initial PEG tube placement to PEG-J procedure was 53.2 ± 28.4 days. Aspiration due to feed reflux occurred in 17 patients (89.5%) and severe peristomal leakage in 2 patients (10.5%). Semi-solid feeds, which have been shown to improve or prevent PEG related complications [14], were attempted in 13 patients (68%) before undergoing the procedure. Nutritional status of patients undergoing the procedure was generally poor with the average body mass index of 17.7±1.1 kg/m² and 4 patients (21%) being classified as Grade B (moderately malnourished) or Grade C (severely malnourished) using subjective global assessment (SGA). Pre-procedural serum albumin levels were also significantly lower compared to levels before PEG tube placement.

[Table 1]

Table 2 shows the post-procedural outcomes of PEG-J tube placements. The average post-procedural length of stay was 49.9 ± 29.2 days. In 2 patients, feeding-related complications persisted, resulting in transition to total parenteral nutrition (TPN). There were 6 (31.6%) in-
hospital mortality, with 3 (15.8%) occurring within 30 days after the procedure. In surviving patients, regular tube replacement is performed every 4 to 6 months to ensure proper tube function [Table 2].

An analysis of the in-hospital mortality rates of patients who received percutaneous feeding tubes in our hospital was performed (Figure 3). Between January 2007 and December 2011, there were 324 cases of PEG tube placements, with an overall in-hospital mortality rate of 15.7%. For patients with feeding-related complications who had their liquid feed changed to semi-solid feed but did not undergo any further procedure, the in-hospital mortality rate was 19%. Patients who transitioned from PEG feeding (enteral nutrition) to TPN had an in-hospital mortality rate of 70%, which was significantly higher than those who received PEG-J tube placements and those that needed only a change in feeding regimen (liquid to semi-solid). Patient baseline did not significantly differ between those transitioning from PEG to TPN and those transitioning from PEG to PEG-J.

Discussion

For patients with impaired oral intake, tube feeding is the alternative choice for enteral nutrition. Tube feeding can be initiated using nasogastric tubes (or nasojejunal tubes) but for the long term, percutaneous routes are preferable. Although the most common percutaneous route is through PEG, feeding-related complications such as aspiration of feed and peristomal leakage can impede enteral feeding. In Japan, tube feeding usually begins with liquid feeds, but semi-solid
feeds or blended food can be helpful in patients with regurgitation (aspiration), peristomal leakage or feeding-related diarrhea [14]. Recently, elemental feeds have also been shown to be useful in preventing PEG feeding-related complications [15].

Because jejunal or post-pyloric feeding has not been established as being superior to gastric feeding [3-5], it is not usually used as the first choice to initiate percutaneous tube feeding even in patients with high risk of aspiration. Not only is the procedure more complicated than PEG but long term jejunal feeding has been associated with deficiency in micronutrients such as copper [16]. Jejunal access by D-PEJ has also been associated with high peristomal leakage rates [17]. However, by circumventing gastric passage during enteral nutrition and improving the drainage of gastric secretions, jejunal feeding through PEG-J may help to overcome feeding-related complications when PEG feeding with semi-solid feeds or other regimens fails. This positive effect may be more pronounced in severely ill patients [18, 19].

Although percutaneous jejunal feeding can be achieved by either D-PEJ or PEG-J, previous studies have shown that PEG-J using jejunal extension tubes placed through PEG tubes are more prone to tube dysfunction such as tube blockage or migration because of their smaller size (up to 9Fr) [11,12]. Gastric decompression is also limited due to the almost-total occlusion of the existing PEG tube’s lumen. Nevertheless, for the patient with an existing gastrostomy site, accessing the jejunum through a new puncture site by D-PEJ is not usually considered an attractive option. Not to mention that the D-PEJ procedure may be technically unfeasible in up to 38% of patients [20].

Currently, PEG-J can also be performed using larger-bore jejunal tubes up to 24Fr size that is placed directly through the PEG site with or without the aid of endoscopy [13, 21]. This should
theoretically reduce the incidence of tube dysfunction without the need for a new puncture site. Tubes with gastric decompression ports also provide an outlet for excessive gastric secretions even during jejunal feeding. Since there are no studies at hand comparing D-PEJ and PEG-J using jejunal tubes more than 20Fr size, tube dysfunction with PEG-J using larger-bore tubes may not be as high as previously reported. In addition, tube dysfunction can be reduced by regular replacement as in Japan. In this study, we retrospectively reviewed our experience using large-bore 20Fr size jejunal tubes with gastric decompression function. Successful tube placement in all attempts showed agreement with previous studies citing higher technical success with PEG-J compared to D-PEJ [11, 12]. Despite declining nutritional status as indicated by lower serum albumin levels compared to before PEG tube placements, 13 out of 19 patients were successfully discharged without further intervention, indicating discontinuance of feeding-related complications. When the option of jejunal feeding (whether through PEG-J or not) is not taken into consideration, patients with similar PEG feeding-related complications often undergo transition from enteral to parenteral nutrition. As shown in Figure 3, the outcome of this pattern is not always positive and may even increase the cost of nutritional therapy [22].

Conclusions

PEG-J is a simple procedure that can be performed safely with minimal invasion in most patients with existing gastrostomy site. Although it may not resolve PEG feeding-related complications in all patients, it does facilitate the continuity of enteral feeding in many patients who would otherwise be indicated for total parenteral nutrition. Since enteral nutrition is the route of choice as long as gut integrity is intact, patients with unsuccessful PEG feeding should be offered the
option of jejunal feeding through this procedure. It would even be reasonable to recommend that jejunal feeding through PEG-J be attempted if possible before termination of enteral nutrition.

**Abbreviations**

PEG: Percutaneous endoscopic gastrostomy

PEG-J: Percutaneous endoscopic gastrojejunostomy

D-PEJ: Direct percutaneous endoscopic jejunostomy

SGA: Subjective global assessment

CI: Confidence interval

TPN: Total parenteral nutrition

**Competing interests**

The authors declare that they have no competing interest.

**Authors' contributions**

EWTY designed and performed the study, analyzed the data, and drafted the manuscript. EWTY, SN and KN participated in the procedures described in the study. KY assisted in the clinical data management. All authors read and approved the final manuscript.

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References


Figures

Figure 1 - PEG-J tube used in our hospital. (CREATE MEDIC Cliny PEG-J Catheter)

Figure 2 - PEG-J tube placement in an 87-year-old male

Figure 3 - In-hospital mortality of different patient groups

The in-hospital mortality for patients transitioning from PEG feeding to total parenteral nutrition (n=10) was significantly higher than for patients in the PEG-J group (n=19) and patients whose feeding regimen were changed from liquid to semi-solid feed (n=84).
Table 1 - Clinical characteristics of patients.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>(n =19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>85.8 ± 2.9</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>11/8</td>
</tr>
<tr>
<td>Underlying condition (overlapping):</td>
<td></td>
</tr>
<tr>
<td>• Stroke</td>
<td>14 (74)</td>
</tr>
<tr>
<td>• Dementia</td>
<td>8 (42)</td>
</tr>
<tr>
<td>• Respiratory disorders</td>
<td>11 (58)</td>
</tr>
<tr>
<td>• Cardiovascular disorders</td>
<td>7 (37)</td>
</tr>
<tr>
<td>• Diabetes mellitus</td>
<td>2 (11)</td>
</tr>
<tr>
<td>• Pressure ulcers</td>
<td>4 (21)</td>
</tr>
<tr>
<td>Preoperative nutritional parameters:</td>
<td></td>
</tr>
<tr>
<td>• Body mass index (kg/m²)</td>
<td>17.7 ± 1.1</td>
</tr>
<tr>
<td>• Serum albumin (g/L)</td>
<td>28.5 ± 1.8 [30.5 ± 2.3]*</td>
</tr>
<tr>
<td>• Total lymphocyte count (/µL)</td>
<td>1416 ± 280 [1345 ± 253]</td>
</tr>
<tr>
<td>• C-reactive protein (mg/dL)</td>
<td>3.3 ± 1.3 [2.6 ± 1.7]</td>
</tr>
<tr>
<td>• Blood urea nitrogen (mg/dL)</td>
<td>23.2 ± 5.6 [23.7 ± 6.6]</td>
</tr>
<tr>
<td>• Classified as Grade B or C by SGA</td>
<td>4 (21)</td>
</tr>
<tr>
<td>Other preoperative observations:</td>
<td></td>
</tr>
<tr>
<td>• Period from PEG to PEG-J (days)</td>
<td>53.2 ± 28.4</td>
</tr>
<tr>
<td>• Use of semi-solid feed before PEG-J</td>
<td>13 (68)</td>
</tr>
</tbody>
</table>

Values expressed as mean±95%CI. Values in parentheses ( ) are percentages.

Values in parentheses [ ] are pre-PEG values.

*: p<0.05 vs pre-PEG value using Wilcoxon signed-rank test.
Table 2 - Post-procedural outcomes after PEG-J tube placement.

<table>
<thead>
<tr>
<th>Clinical outcomes</th>
<th>(n =19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-procedural length of stay (days)</td>
<td>49.9 ± 29.2</td>
</tr>
<tr>
<td>Transition to total parenteral nutrition</td>
<td>2 (11)</td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>6 (32)</td>
</tr>
<tr>
<td>30-day mortality</td>
<td>3 (16)</td>
</tr>
</tbody>
</table>

Values expressed as mean±95%CI. Values in parentheses ( ) are percentages.
Figure 1 - PEG-J tube used in our hospital. (CREATE MEDIC Chiny PEG-J Catheter, China)
Figure 3 - In-hospital mortality of different patient groups

- PEG overall: 15.7%
- Change from liquid to semi-solid feed (no procedural transition): 19.0%
- Transition from PEG to jejunal feeding (PEG-J): 31.6%
- Transition from PEG to total parenteral nutrition (TPN): 70.0%

*: p<0.005 between groups using Fisher’s exact test (Freeman-Halton extension)