Percutaneous Endoscopic Gastrostomy

Procedure of Choice

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Operative gastrostomy (OG) for gastrointestinal decompression or feeding has stood the test of time. Nevertheless, this procedure is often associated with significant morbidity and occasional mortality. Furthermore, although it is often performed under local anesthesia, general anesthesia is frequently necessary. A recent alternative to OG is percutaneous endoscopic gastrostomy (PEG). The purpose of this study is to describe our experience with 100 consecutive PEGs in 98 patients. There were no complications, and no patient died as a result of PEG. Furthermore, PEG never required general anesthesia and was rapid and less costly than OG. Since PEG is so simple to perform, it may be employed earlier in the patient’s course, thus avoiding nasogastric feedings or parenteral alimentation. PEG is the procedure of choice should gastrostomy be needed.

Operative gastrostomy (OG) for gastrointestinal decompression or feeding is a time proven procedure. Described in 1837 by Egeberg and perfected by Sedillot, Verneuil, Stamm, and Witzel, OG, though effective, is often associated with significant morbidity and occasionally with mortality. In an attempt to simplify the procedure, in 1980, Gauderer et al. developed a percutaneous endoscopic gastrostomy technique (PEG) that did not require a celiotomy. In this innovative technique, which involves two passages of the gastroscope, a specially prepared mushroom catheter is pulled through the mouth and seated in the stomach. In 1984, Russell et al. introduced an even simpler PEG method. A single gastroscopy is performed, and a Foley catheter is inserted percutaneously directly into the stomach via a peel-away sheath introduced over a previously placed wire guide.

In 1985, we reviewed our own results with OG and noted a major complication rate of 7%. Included were wound infection, hematoma, and dehiscence, prolonged paralytic ileus, myocardial infarction, cardiac arrhythmia, and inability to extubate. As a result of this experience, PEG appeared to be an attractive alternative.

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Materials and Methods

From November 1, 1984 to January 31, 1986, 98 patients, 53 men and 45 women, have undergone PEG using the Russell method at St. Luke’s-Roosevelt Hospital Center. In two patients, PEG was repeated after tube displacement at 3 and 4 weeks, respectively. Thus, our experience with 100 consecutive PEGs forms the basis of this report.

The vast majority of the patients had neurological conditions that precluded swallowing. Other indications for PEG included severe debilitation from systemic disease, partial mechanical obstruction of pharynx or esophagus, intolerance to nasogastric feeding, recurrent intravenous line sepsis, and aspiration pneumonia.

PEG is absolutely contraindicated in complete pharyngeal or esophageal obstruction, uncorrectable coagulopathy, or inability to perform endoscopy. Relative contraindications include massive ascites, severe gastroesophageal reflux, portal hypertension with esophageal varices, gastric cancer, or ulcer and gastroenteric fistulae. Obesity and prior abdominal surgery are not contraindications.

Eighteen patients had undergone previous upper abdominal operations. This included partial or subtotal colectomy (7 patients), cholecystectomy (6 patients), exploratory celiotomy (3 patients), aortic aneurysmectomy (1 patient), and repair of perforated gastric ulcer (1 patient). PEG was performed in the Endoscopy Unit in all but five instances when it was done at the bedside.

The stepwise technique is thoroughly described by Russell (Figs. 1 and 2). Briefly, the patient does not eat or drink for at least 8 hours prior to the procedure. A broad spectrum antibiotic, usually a systemic cephalosporin, is given 1 hour before operation. Using intravenous meperidine and diazepam for sedation, a complete eso-
The surgeon anesthetizes the skin of the abdomen at the chosen site with 1% lidocaine. A 7 cm 18-gauge needle is inserted percutaneously perpendicularly into the stomach. A J-wire guide is threaded into the stomach via the needle. The needle is removed, and an incision is made along the wire in the skin and fascia. The width of the incision must accommodate the dilator and sheath (Cook®-Russell Gastrostomy Tray) (Cook, Inc., Bloomington, IN).

The inner dilator and outer sheath are threaded as a unit over the wire guide and, with a rotary clockwise–counterclockwise motion, thrust into the stomach. The dilator is removed and a #14 Foley catheter is inserted via the 16F peel-away sheath into the stomach. The fit of the Foley catheter through the sheath should be tested prior to the procedure. The Foley balloon is inflated with 5 ml of saline and positioned closely against the gastric wall. The sheath is peeled away and the Foley catheter sutured to the skin. The gastrostomy tube is placed on dependent drainage overnight, after which appropriate feedings are begun.

The keys to successful PEGs are a fully inflated stomach, clear visualization endoscopically of finger indentation of the gastric wall and not referred motion, perpendicular placement of the needle, wire guide, dilator, and sheath, and fairly snug traction on the Foley catheter to appose the stomach to the abdominal wall. Meticulous attention to detail and close cooperation between the endoscopist and surgeon are essential. A video monitor attached to the endoscope facilitates the procedure.

**Results**

Ninety-eight patients underwent PEG. The average age was 75, with a range of 18–93 years. The operating time, including the endoscopy, averaged 16.5 minutes, with a range of 10–45 minutes. The operative component averaged 5 minutes. PEG was unsuccessful in three additional patients. In two, the stomach could not be entered because of esophageal obstruction, while, in another patient, prior partial gastrectomy precluded safe insertion of the tube. OG was performed in these three patients. In no instance did lack of patient cooperation prevent successful PEG.

There were no complications of either the endoscopy or the gastrostomy tube placement. No patient died as a result of PEG.

**Discussion**

It is generally accepted that enteral nutrition is better than parenteral, with a normally functioning gastrointestinal tract. Torosian and Rombeau point out that the advantages include lower cost, increased safety, better patient tolerance, and maintenance of gastrointestinal structural integrity. Recent advances in nasogastric feeding tube design have permitted patients unable to consume a sufficient quantity of oral feedings to be fed more comfortably by this route. However, long-term enteral tube
feeding is better accomplished with gastrostomy, since nasogastric feeding tubes have a higher incidence of failure, inadvertent removal, and pulmonary aspiration.

For gastrostomy to be an acceptable alternative for enteral feeding, it must be both effective and safe. Candidates for gastrostomy tube usually are chronically ill, malnourished, and elderly, and tolerate complications poorly. In spite of substantial improvements in surgical care in general, recent reports describe considerable morbidity and occasional mortality with OG. Ruge and Vazquez\(^2\) reported 133 OGs with a complication rate of 13.5%. Five (3.1%) patients required further operative procedures to repair or revise the original OG. The operative mortality was 1.8%. Similarly, Shellito and Malt\(^6\) noted a major complication rate of 6.6% and a minor complication rate of 6.6% in a series of 428 OGs. Complications included wound infection, hemorrhage, internal and external leaks, and aspiration pneumonia. The operative mortality was 0.5%. A literature review revealed a morbidity rate ranging from less than 2% to 75%.

Most authors have found PEG to be a safe procedure. The complications of PEG occurred early in each reported series.\(^3\) With increasing experience, PEG has become safer. A collected review (see Table 1) of 369 PEGs reveals a complication rate of 7%. We have performed 100 consecutive PEGs without morbidity. Thus far, no mortality has been reported due to PEG.

At the present time, the Gauderer–Ponsky\(^1^2\) PEG technique seems to be used more commonly than the Russell procedure. Both appear to be equally effective, but we chose the Russell PEG because it requires a single endoscopy, avoids the need to pull the gastrostomy tube through the mouth and esophagus, and uses a Foley catheter that is inexpensive and easy to replace. Furthermore, with this technique, a sterile Foley catheter is inserted percutaneously, while, in the Gauderer–Ponsky method, a mushroom catheter, contaminated by passage through the mouth and esophagus, is used. Meticulous attention to the details of the procedure and close cooperation between the endoscopist and surgeon are essential to avoid complications.

There are many advantages to PEG, as compared to OG, other than reduced morbidity and mortality. Since PEG is so simple to perform, it may be employed earlier in the patient's course, thus avoiding nasogastric feedings or parenteral alimentation. PEG can be easily performed at the bedside or in an endoscopy unit. In so doing, the need to use a traditional operating room is eliminated. General anesthesia is not required for PEG but is necessary for 23\(^1^3\) to 66%\(^4\) of OGs. PEG can be performed quickly with a procedure time ranging from 11 minutes\(^3\) to 27.5 minutes.\(^8\) It is important to note that PEG costs less than OG. Russell\(^3\) reports a saving of $2000 per gastrostomy, which is almost the same as in our experience.\(^4\)

PEG is not useful for every situation. It is contraindicated in complete pharyngeal or esophageal obstruction, uncorrectable coagulopathy, or inability to perform endoscopy. We were unsuccessful in performing PEG in three patients. In two, endoscopy could not be performed because of esophageal obstruction, while in another patient prior gastrectomy with gastroduodenostomy precluded safe insertion of the tube. OG was performed in these three patients. We have performed PEG in one patient following dilatation of a recurrent benign esophageal stricture. In no instance did lack of patient cooperation prevent successful PEG. PEG was easily performed in two malnourished, morbidly obese patients and in 18 patients who had undergone a variety of prior upper abdominal operations.

In our experience, PEG is safer, faster, and much less expensive than operative gastrostomy. When possible, PEG should be the procedure of choice whenever gastrostomy is indicated.

### References


### Table 1. Results of PEG

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<th>Author</th>
<th>Cases (N)</th>
<th>Procedure Time (Minutes)</th>
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<td>0</td>
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<td>—</td>
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<td>Miller et al.</td>
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