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Original Article

Percutaneous radiologic gastrostomy in patients with failed percutaneous endoscopic gastrostomy

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A B S T R A C T

Background: To determine the technical feasibility and success rate of percutaneous radiologic gastrostomy (PRG) after failure of percutaneous endoscopic gastrostomy (PEG).
Methods: Consecutive patients referred for PRG after failure of PEG between May 2011 and June 2016 were included in this study. The reasons for the failure of PEG, as well as the technical success and complications of PRG were noted.
Results: Fifteen patients (14 men, 1 woman; age, 27–93 years) were included. The most common reasons for PEG failure were esophageal stricture due to malignancies (n = 8), unfavorable abdominal wall conditions (n = 3), unstable patient condition during endoscopy (n = 2), and other miscellaneous conditions (n = 2). PRG placement was technically successful in all 15 cases. In one case, early slip-out of the gastrostomy tube occurred, which required removal and repositioning. No mortality was noted.
Conclusion: PRG is technically feasible in patients with failed PEG insertion, and has advantages over PEG and a high overall success rate.

Keywords: Gastrostomy; Percutaneous endoscopic gastrostomy; Percutaneous radiological gastrostomy

Introduction

Enteral nutrition is considered more advantageous than parenteral nutrition in patients requiring nutritional support.[1] Gastrostomy is one of the routes for administering enteral nutrition. The most common indications for gastrostomy include dysphagia secondary to neurological diseases, followed by dysphagia due to head and neck or esophageal malignancies.[2–4] Since the first description of gastrostomy creation through an open approach in 1876,[2] minimally invasive alternatives through endoscopic and radiologic approaches were described in 1980[5] and 1981,[6] respectively. Currently, percutaneous endoscopic gastrostomy (PEG) is the first-line approach for gastrostomy creation in many institutions. PEG and percutaneous radiologic gastrostomy (PRG) have similar indications. However, PRG is more advantageous than PEG because it avoids the insertion of a relatively large-bore endoscope orally. In this case series, we reviewed our spectrum of cases to determine the technical feasibility and success rate of PRG after failure of PEG.

Methods

All patients who were referred to the Department of Radiology, Asan Medical Center (Seoul, Korea) from May 2011 to June 2016 for insertion of a PRG tube after failure of PEG were included in this study. The medical records of the included patients were reviewed for primary diagnoses and reasons for PEG failure. Technical details and immediate complications were also reviewed. The study was approved by the Institutional Review Board of Asan Medical Center, and informed consent was obtained from all

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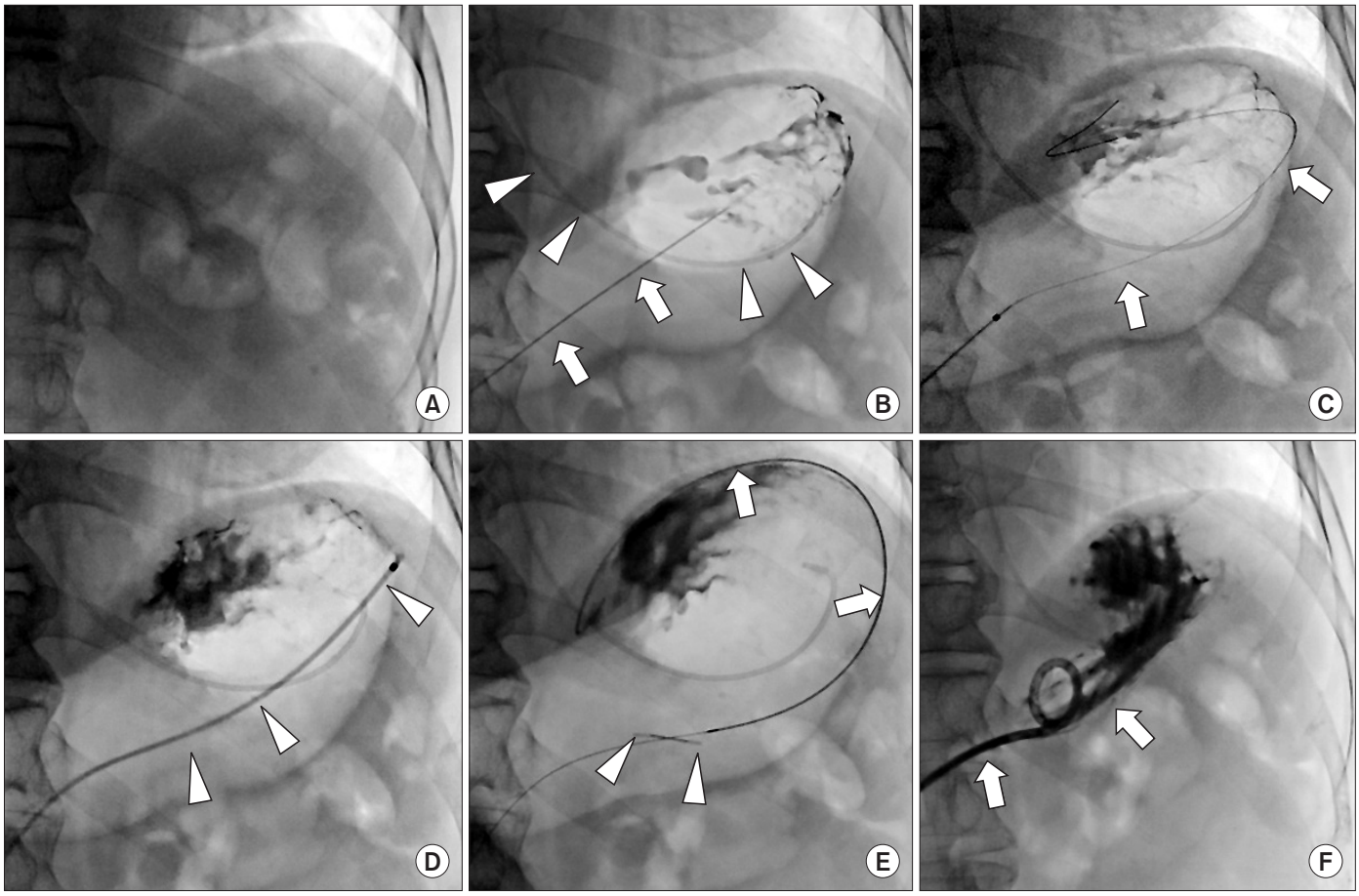

Fig. 1. Percutaneous radiologic gastrostomy in patient with esophageal stricture. (A, B) Stomach is insufflated by air via 5 Fr Kumpe catheter (arrowheads; Cook, USA). A 21 G Chiba needle (arrows; Cook) is used to puncture under fluoroscopic guidance. Small amount of contrasts are injected to verify the position of needle. (C, D) A Neff catheter (arrowheads; Cook) is advanced over the micro-guide wire (arrows). (E) The anchor (arrowheads) is deployed by the guide wire (arrows) and by traction of the anchor, the anterior stomach wall is opposed to abdominal wall. (F) The tract site is serially dilated and a 14 Fr gastrostomy tube is placed. Small amount of contrast is injected through the gastrostomy tube (arrows) to verify final intra-gastric position of the tube.

patients.

Intravenous sedation was initiated with 5 mg/5 mL midazolam under continuous monitoring including blood pressure and oxygen level. Antibiotics (cefotaxime 2 g) and gastroparetic agents (Bropium, cimetropium bromide, 5 mg/mL; Bukwang Pharm., Seoul, Korea) were used. Under fluoroscopic guidance, a Kumpe catheter (5 Fr, 65 cm; Cook, Bloomington, IN, USA) was inserted via the mouth through the esophagus and into the stomach over a hydrophilic guidewire (0.035", 150 cm, Radifocus; Terumo, Tokyo, Japan). Air was insufflated to distend the stomach until the inflated stomach extended below costal margins and displaced adjacent structures, thereby facilitating gastric puncture. Puncture of the gastric antrum was performed under fluoroscopic guidance using a Chiba needle (21 G, 15 cm; Cook) (Fig. 1). The puncture site was carefully determined and should be lateral to the rectus muscle or in the midline to avoid epigastric vessels. Ultrasound guidance was not routinely used in our series. Contrast was injected to verify the intragastric position of the needle tip. A Neff catheter (6 Fr, 20 cm; Cook) was used in place of a large-bore catheter. Gastropexy was then performed by using Cope anchor (Cook). The one anchor technique was used.[7] The tract was serially dilated, and ultimately a 14-Fr gastrostomy tube (Cook) was inserted into the stomach over the guidewire. Contrast was again injected to confirm the position of the gastrostomy tube (Fig. 1). The anchor was then sutured to the abdominal wall, and the gastrostomy tube was fixed to the skin. The tubogram was performed on the next day following the PRG insertion to verify the position and function of the gastrostomy tube. The anchoring sutures were cut one week after the procedure and the anchor was allowed sink into the stomach.

Results

A total of 15 patients were included in this study (14 men, 1 woman). Their ages ranged from 27 to 93 years (mean, 63.7 years). Nine patients had underlying malignancies. Five patients had underlying chronic neurologic conditions. In one case, postoperative infection occurred, leading to vocal cord palsy and necessitating gastrostomy creation.

PRG was successful in all patients (n = 15). In one case, complete obstruction of the esophagus made passing a guidewire through the esophagus impossible. To overcome this situation, direct puncture of the nondistended stomach under ultrasonographic guidance and subsequent air insufflation were performed. After the operator punctured the stomach successfully, contrast was injected to confirm the position of the needle. A micro-guide wire

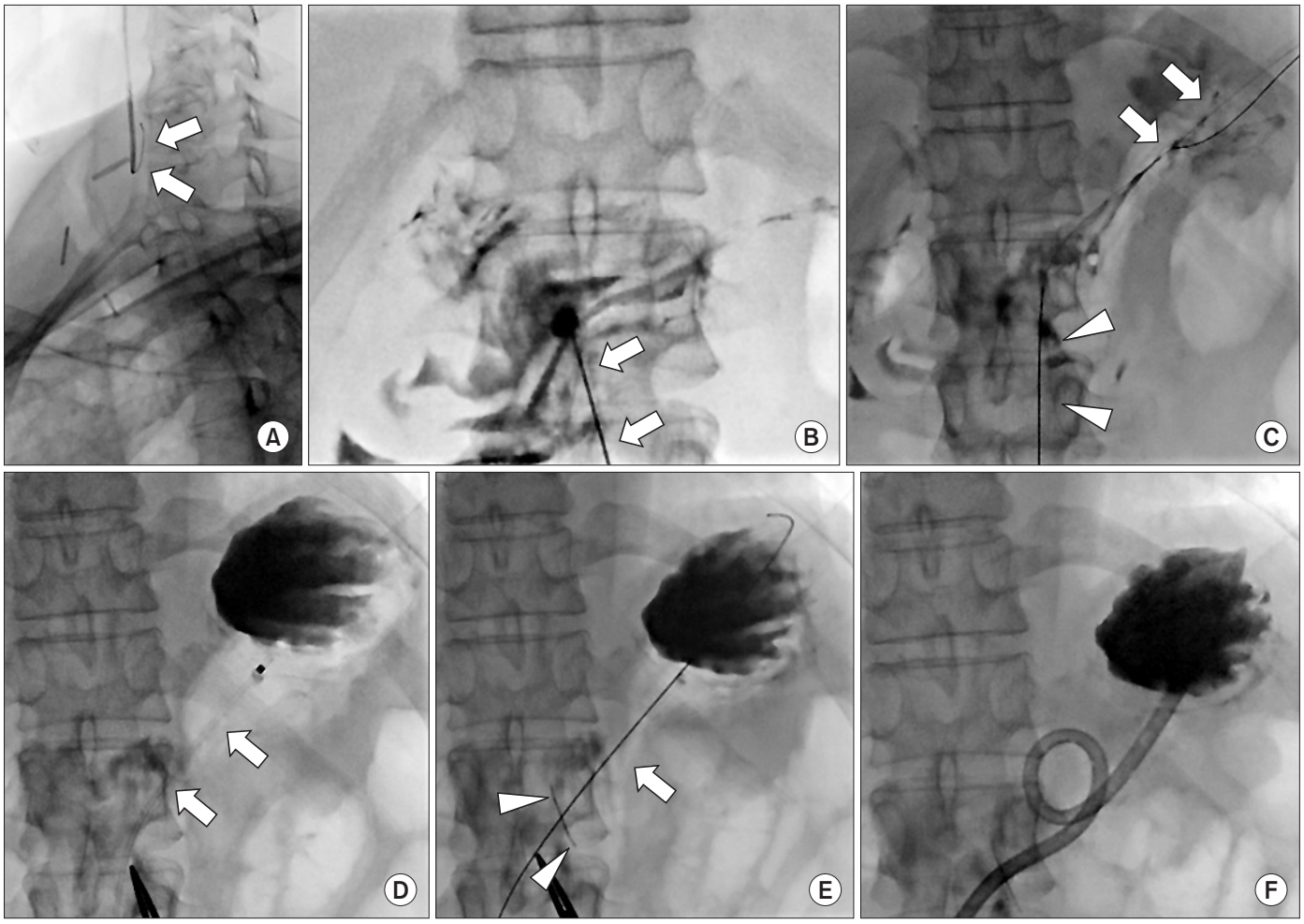

Fig. 2. Placing a gastrostomy tube in patient with nondistended stomach due to complete esophageal obstruction. (A) Passing a guidewire (arrows) through the stricture is impossible. (B) A Chiba needle (arrows; Cook, USA) is used to puncture the nondilated stomach under ultrasonographic guidance (not shown). Contrast is injected through the Chiba needle, and the image shows the spread of contrast medium in the nondistended stomach. (C) Insertion of a 0.018" microguidewire (arrows) via the Chiba needle (arrowheads) into the stomach. (D) Insertion of a 6-Fr Neff catheter (arrows) over the microguidewire. The stomach is air-inflated through the Neff catheter (Cook). (E) The anchor (arrowheads) is pushed with a 0.035" guidewire (arrow) through the Neff catheter. The Neff catheter is subsequently removed. (F) Gastrostomy catheter is successfully inserted after serial dilation of the tract.

was inserted to exchange for the Neff catheter. The procedure was then continued as in other cases (Fig. 2).

Reasons for failure of PEG

Esophageal stricture was the most common reason for PEG failure, and was observed in all cases of underlying malignancies (n = 8). The tight strictures prohibited the passage of an endoscope into the stomach. In seven of the eight cases, a 5-Fr Kumpe catheter was placed into the stomach with the help of guidewire under fluoroscopic guidance. In the remaining one case, complete occlusion of the upper esophagus was observed. Several attempts were made to puncture the stomach without inflation, finally resulting in a successful puncture.

In three cases, PEG failure was due to unfavorable abdominal wall conditions: failed transillumination due to obscuration by the xiphoid process in one case, thick abdominal wall in one case, and abdominal wall spasm related to spinal cord injury in one case.

In two cases, PEG failure was due to unstable patient condition (desaturation) during endoscopy. The patients in these cases had underlying neurological conditions.

In the remaining cases, PEG failure was due to other conditions, including esophageal erosion and bleeding in one case, and an ambiguous anatomy that the endoscopist deemed unsuitable for PEG in another case.

A summary of patient demographics and reasons for PEG failure is given in Table 1.

Complications

In one case, migration of the gastrostomy tube into the peritoneal cavity occurred, which was discovered on a routine tubogram performed on day 1 after the procedure (Fig. 3). The gastrostomy tube was removed, and PRG was performed again uneventfully. No other major complications were encountered.

Discussion

Our study showed that PRG is a feasible alternative for pa-

Table 1 Summary of Patient Demographics and Reasons for PEG Failure

Patient no.	Age (yr)/sex	Diagnosis	Reasons for PEG failure
1	46/F	Thyroid cancer	Esophageal stricture
2	27/M	Quadriplegia	Abdominal wall muscle spasm
3	56/M	Motor neuron disease	Unstable patient condition during endoscopy
4	65/M	Esophagus cancer	Esophageal stricture
5	70/M	Lung cancer	Esophageal stricture
6	74/M	Esophagus cancer	Esophageal stricture
7	93/M	Alzheimer's disease	Unstable patient condition during endoscopy
8	70/M	Parkinsonism	Esophageal erosion
9	80/M	Parkinsonism	Failed endoscopic puncture owing to a thick abdominal wall
10	62/M	Hypopharynx cancer	Esophageal stricture
11	74/M	Vocal cord palsy	Distorted gastric anatomy
12	72/M	Lung cancer	Failed transillumination
13	40/M	Thyroid cancer	Esophageal stricture
14	61/M	Esophagus cancer	Esophageal stricture
15	65/M	Esophagus cancer	Esophageal stricture

PEG, percutaneous endoscopic gastrostomy; F, female; M, male.

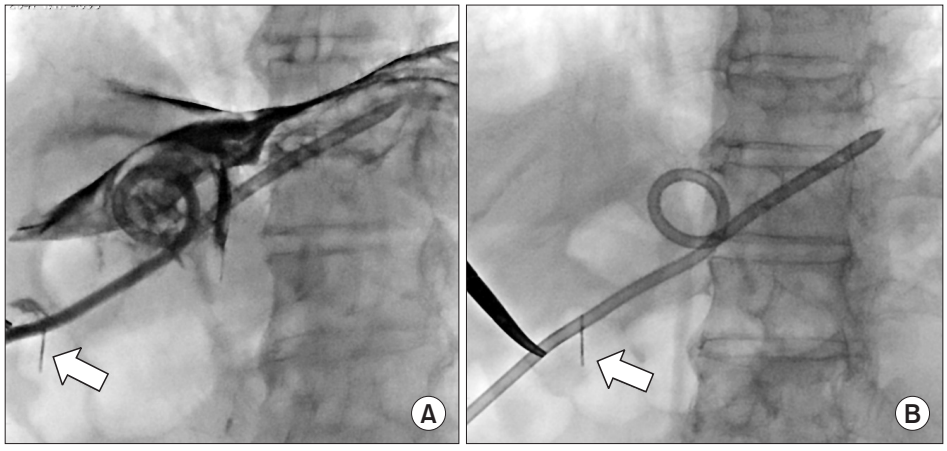

Fig. 3. (A) Post-procedural tubogram on day 1 showing contrast spillage into the peritoneal cavity, indicating peritoneal displacement of the gastrostomy tube. The anchor (arrow) seems to be displaced outside the stomach. (B) The shadow of the tip of scissors indicates the puncture site. The anchor (arrow) seems displaced from the puncture site. The tube was promptly removed and the gastrostomy tube was reinserted 1 week later without complications.

tients with failed endoscopic gastrostomy.

Previous studies have demonstrated a high technical success rate of PRG in patients with advanced esophageal cancer, which may preclude placement of an endoscopic gastrostomy tube.[8,9] PRG has the obvious advantage of being able to bypass any upper aerodigestive tract obstruction. In addition, the presence of an esophageal stricture may increase the risk of perforation and bleeding in patients with such obstructions.[10] Furthermore, although considered very rare, metastatic deposits from head and neck squamous cell carcinoma may occur at the gastrostomy site.[2,3,10,11]

Cardiorespiratory compromise is not uncommon in upper gastrointestinal endoscopy.[10] This can be related to sedation or the procedure itself, and this problem can be overcome with PRG. The insertion of a small-bore PRG tube seems much easier than large-bore PEG although tube clogging is more common in small-bore PRG. In our series, PRG was performed without sedation, therefore eliminating the risks of sedation.

One of the major concerns about PRG is the possibility of injuring adjacent organs. Distending the stomach by means of gas insufflation can effectively displace adjacent structures and guide fluoroscopic puncture. Ultrasound or computed tomography guidance has also been proposed.[12–15] Alternatively, inadvertent puncture of the colon can be avoided by asking the patient to ingest barium on the day before the procedure in order to opacify the colon. In some cases, the obstruction in the esophagus can be so severe that passing a guidewire or a small feeding tube through the obstruction is impossible. Without air insufflation, the stomach can be difficult to locate. However, PRG is still possible in such cases.[16] In our experience, even without distending the stomach, accurate puncture of the stomach is still possible under ultrasonography. By injecting small amount of contrast medium through the puncture needle, we also can confirm the needle position in fluoroscopic manner.

In our series, there was one case of PEG failure due to rigidity of the abdominal wall in a patient with quadriplegia due to spinal cord injury. A rigid abdominal wall is difficult to indent when identifying the puncture site for gastrostomy by using an endoscope, and we found that PRG can overcome this difficulty.

In one case, early slip-out of the gastrostomy tube occurred.

This was not an intraprocedural misplacement because we routinely inject contrast to confirm the tube position immediately after placement. The early slip-out of the gastrostomy tube may be related to a suboptimal opposition between the gastric wall and the anterior abdominal wall. The anchor stitch may loosen after the procedure, and operators should be aware of this possibility when handling the anchor. Although this complication may be prevented by placing more anchors, previous studies have shown that the one-anchor technique is adequate.[7,17–19]

In conclusion, our series shows that PRG can be successfully performed with a relatively low incidence of adverse events for patients with failed PEG. PRG should be actively considered for these patients. In fact, better patient selection may help avoid performing a relatively invasive but unsuccessful PEG procedure in some patients, with a probable added advantage of reduced medical costs.[20]

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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