Article published online: 2021-04-10

Original Article

Percutaneous Endoscopic Gastrostomy Large-Bore Tube Application without the Use of Endoscope: Single-Center Experience on 86 Neurologically Compromised Patients

Rana T. M. Khafagy, Karim A. Abd El Tawab

Department of Radiology, Interventional Radiology Unit, Ain Shams University Hospitals, Cairo, Egypt

Abstract

Context: Percutaneous placement of gastrostomy tube has replaced surgical placement as the most accepted method of gastrostomy tube insertion. It can be done by an alternative nonendoscopic fluoroscopy-guided technique that combines the advantages of fluoroscopic guidance and the pull technique. **Aims:** This study aimed to describe a percutaneous fluoroscopy-guided technique for applying mushroom-retained large-bore gastrostomy advanced through the nose without endoscopy. **Settings and Design:** This retrospective study was conducted at the Interventional Radiology Unit, Ain Shams University Hospitals, Cairo, Egypt. **Subjects and Methods:** Between January 2015 and November 2017, 86 neurologically compromised patients underwent placement of 24F mushroom gastrostomy tubes. There were 55 males and 31 females, with the mean age of 61 years (58–87 years). Technical success and procedural complications were assessed. Follow-up data were collected retrospectively by reviewing the medical records at the neurology clinic to evaluate tube function and monitor complications. **Results:** Technical success rate was 100%. Procedure time varied between 10 and 13 min. No major procedure-related complications occurred. Twenty-two patients (25.5%) died during the study period with no procedure-related deaths. Nearly 34.8% of the patients (30/86 patients) could not be followed up due to loss of contact. Follow-up time ranged between 200 and 230 days in the remaining 34 patients with no evidence of tube dysfunction. **Conclusions:** Fluoroscopy-guided percutaneous placement of large-bore pull gastrostomy tubes inserted via nasal route showed a high rate of technical success and long-term patency with low risk of complications.

Keywords: *Percutaneous, gastrostomy tubes, neurologically compromised*

Introduction

Percutaneous placement of gastrostomy tube has replaced surgical placement as the most accepted method of gastrostomy tube insertion.[1] Percutaneous procedures are performed with either a push technique (the gastrostomy tube is "pushed" directly through the abdominal wall after serial dilatation) or a pull technique (the tube is "pulled" from the mouth down the esophagus and out of the anterior abdominal wall).[2]

Despite being an established method of enteral feeding, percutaneous fluoroscopic-guided small-bore push gastrostomy tubes are more prone to tube occlusion and dislodgement.[3]

This study describes and evaluates an alternative nonendoscopic fluoroscopy-guided technique to insert large-bore mushroom-head gastrostomy tubes originally designed for endoscopic placement to be advanced via the nasal cavity. This technique combines the advantages of fluoroscopic guidance and the pull technique.

Subjects and Methods

After obtaining approval from our Institutional Review Board, we conducted a retrospective review of medical records of 86 neurologically compromised patients who had undergone percutaneous fluoroscopy-guided mushroom-retained gastrostomy from January 2015 to November 2017. All procedures were performed in the Interventional Radiology Unit at Ain Shams University Hospitals. There were 55 males (64%) and 31 females (36%), with a mean age of 61 years (58–87 years). All patients had neurological disorders as summarized in Table 1.

How to cite this article: Khafagy RT, Abd El Tawab KA. Percutaneous endoscopic gastrostomy large-bore tube application without the use of endoscope: Single-center experience on 86 neurologically compromised patients. Arab J Intervent Radiol 2018;2:82-6.

Address for correspondence:
Dr. Karim A. Abd El Tawab, 1 Ahmed Abd El Naby Street, El Nozha Eljadida, Helioplis, Cairo, Egypt.
E-mail: karimabdeltawab@gmail.com

Videos Available on: www.arabjir.com

Access this article online

Website: www.arabjir.com

DOI: 10.4103/AJIR.AJIR_13_18

Quick Response Code:

Table 1: The underlying conditions of 86 patients receiving gastrostomy tubes

The underlying conditions of patients receiving gastrostomy tubes	Number of patients	Mean age (years)	Men	Women
Stroke	68	71 (62-80)	44	24
Cerebral palsy	5	62 (59-65)	1	4
Degenerative neurological disorders	3	76 (65-87)	2	1
Myasthenia gravis	2	62.5 (60-65)	1	1
Muscular diseases	2	59.5 (59-60)	2	-
Other neurological causes	6	121 (58-63)	4	2

Inclusion criteria were patients with neurological disorders as those with poststroke, traumatic brain injury, cerebral palsy, Parkinson's disease; any other degenerative neurological disorders such as amyotrophic lateral sclerosis, multiple sclerosis, progressive supranuclear palsy, Huntington's disease, myasthenia gravis; and other patients with muscular dystrophy or myotonic dystrophy. The main indication in this group was dysphagia and aspiration.

We excluded patients with head-and-neck massive trauma and those with nonneurological causes of dysphagia such as esophageal or nasopharyngeal malignancy and esophageal strictures for which they underwent fluoroscopic-guided push balloon gastrostomy tube placement to avoid causing any injury to the upper gastrointestinal tract (GIT). Furthermore, patients with deranged coagulation profile required correction prior to procedure to avoid undesirable associated bleeding.

Prior to the procedure, all patients were kept NPO for 6 h, and a signed informed consent was obtained. Intravenous (IV) moderate sedation by the anesthesiology team was administered in noncooperative patients. Antibiotics were not prescribed consistently as prophylaxis for infection. The use of proper infection control practice at our institute during gastrostomy tube placement together with the postprocedure use of adequate local skin care of the stoma as taught to the caregiver had decreased the need for regular antibiotic prophylaxis. Furthermore, the included patients were those suffering from dysphagia due to neurological rather than malignant causes, so their immune status was usually not compromised. Antibiotic prophylaxis was considered in patients with known compromised immune status and poor general condition where 1 g IV cefoxitin was administered.

A review of patients' laboratory results was done. Usually, a platelet count of >50,000/μL and an international normalized ratio of <1.5 were acceptable.

Technical steps for tube insertion are illustrated in Figures 1-10 and online video 1. After gastric insufflation with air via a nasogastric tube, a closed dormia basket (1.9 Fx120 cm Bagley Helical Stone Retrieval Basket, Boston Scientific, Natick, USA) is advanced through the nasogastric tube to be placed in the body of the stomach and opened. The puncture site in the skin is prepped with betadine and

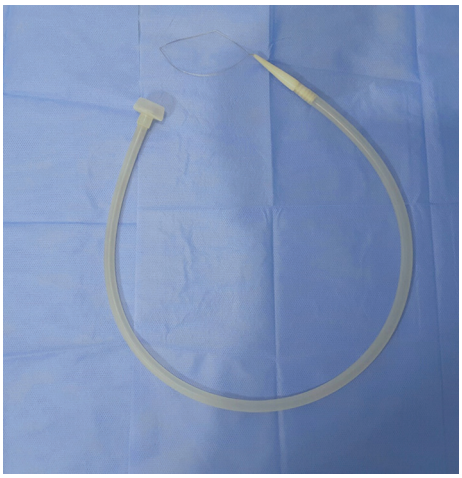

Figure 1: EndoVive ™ Standard Percutaneous Endoscopic Pull Gastrostomy tube, Boston Scientific

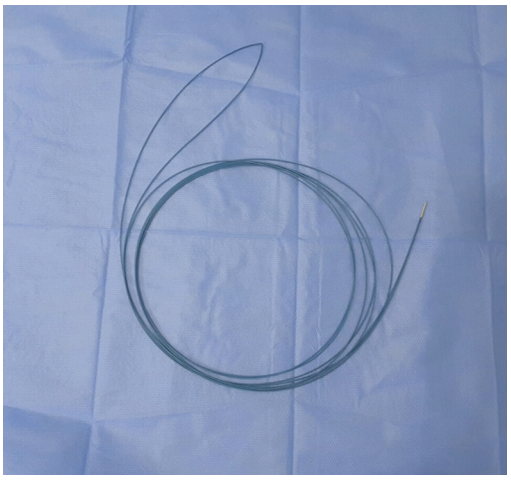

Figure 2: Insertion wire included in the kit (EndoVive ™ Standard Percutaneous Endoscopic Pull Gastrostomy Kit, 24 F, Boston Scientific)

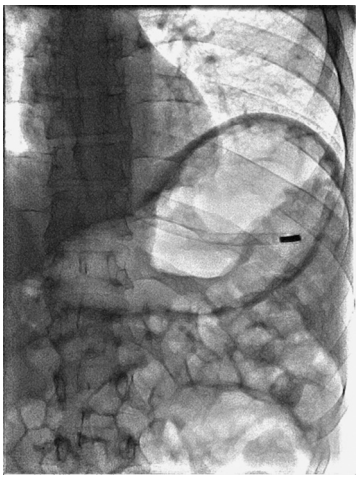

Figure 3: Insufflation of the stomach with air through the nasogastric tube

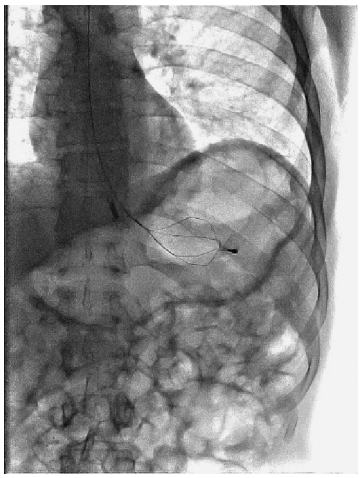

Figure 4: A Dormia basket opened in the gastric lumen for percutaneous gastric puncture

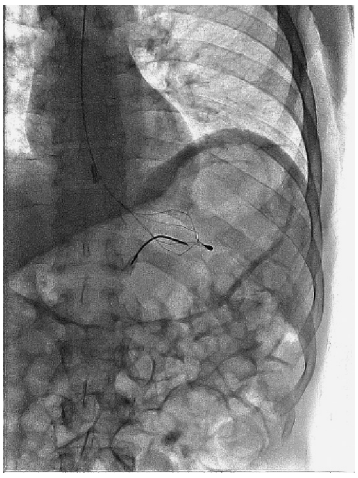

Figure 5: Insertion of trocar cannula (16G) through the anterior abdominal wall targeting the center of the 3-wire dormia basket. The liver outline was marked by ultrasound

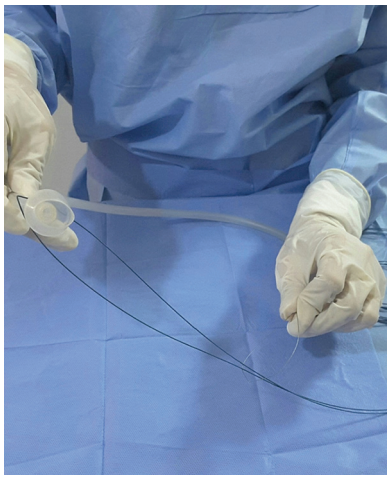

Figure 6: The insertion wire's looped end is passed through the wire loop attached to the end of the G-tube and over its mushroom headed end on the other side

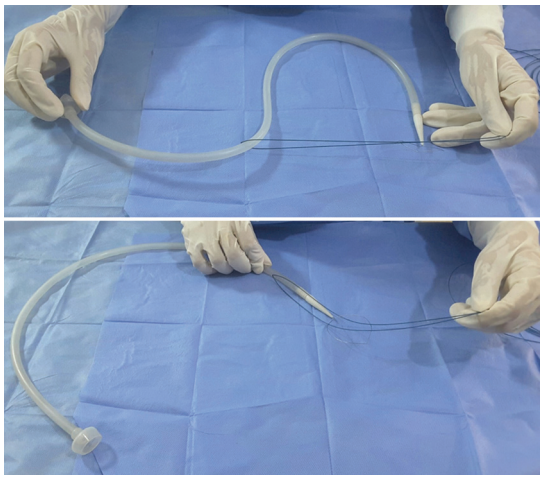

Figure 7: The mushroom headed end of the tube is pulled gently to knot the tube with the insertion wire

anesthetized with 1% lidocaine. The liver outline is marked by ultrasound. Under fluoroscopic guidance, a trocar cannula (16G), included in the gastrostomy kit (EndoVive™ Standard Percutaneous Endoscopic Pull Gastrostomy Kit, 24F; Boston Scientific, USA), is advanced through a skin incision of 10–15 mm, targeting the center of the dormia basket where a specially designed loop snare is advanced. After closing the basket over the snare under fluoroscopy, it is pulled together with the wire in a retrograde direction, out from the patient's nose. The snare end is passed through the wire loop attached to the end of the tube and over the mushroom head of the tube on the other side, and then the mushroom-headed end of the tube is pulled gently to knot the tube with bifid wire.

The tube is pulled, after being lubricated, through the patient's nose into the stomach toward the puncture site. The Gastrostomy tube's tip is pulled out the skin incision till its mushroom head is retained by the stomach wall. There is no need for serial dilatations of the track with the presence of the smooth tapered tip of the tube that allows gradual dilatation of the track with pulling the tube out; accordingly, no dilators are included in the kit. After connecting the Y-port feeding adapter to the gastrostomy tube, contrast medium is injected into the tube to confirm its proper position in the stomach. The tube is secured to the skin after applying the included round bolsters with no need of sutures.

Procedure time (from the placement of a dormia basket in the stomach to pulling the tube into the stomach and securing the tube to skin) varied between 10 and 13 min.

Technical success

Technical success was confirmed by aspiration of gastric fluid and documented fluoroscopically with contrast medium injected via the feeding port of the tube.

Complications of tube placement were classified as minor or major according to the Society of Interventional Radiology classification system for complications by outcome.[4]

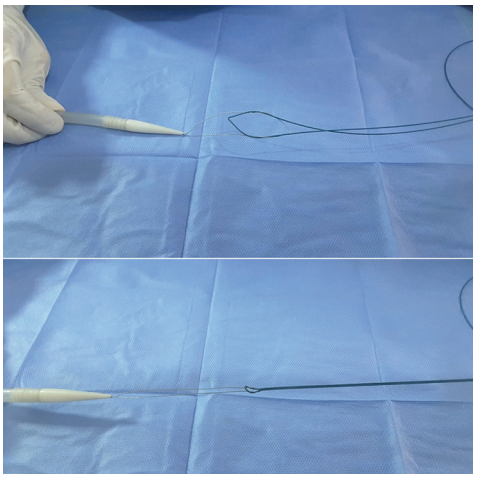

Figure 8: The G-Tube's looped wire end was knotted to the insertion wire's looped end

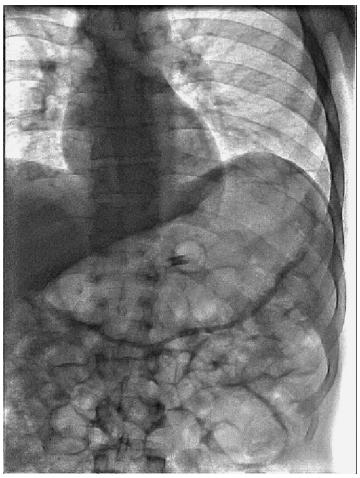

Figure 9: The gastrostomy tube retained by the stomach wall after being knotted to the wire's end and pulled down through the patient's nose out of the puncture site (EndoViveTM Standard Percutaneous Endoscopic Pull Gastrostomy Kit, 24 Fr, Boston Scientific). No need for serial dilatations of the track with the presence of tapered tip of the tube that allows gradual dilatation of the track while pulling the tube out

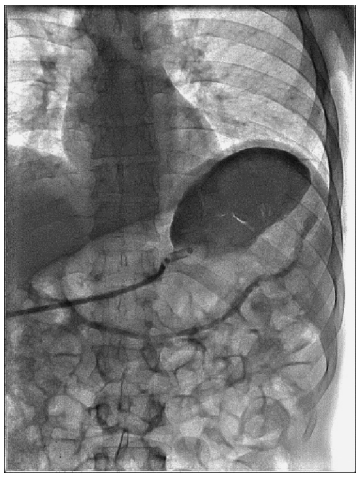

Figure 10: Contrast material injected into the tube ensuring its position within the stomach

Major complications were defined as procedural or tube complications that need long-term hospital accommodation and repeated hospitalizations of a patient or lead to patient's death such as peritonitis, deep abscess formation, and bowel perforation.[5] Minor complications were defined as self-limiting events. The latter involved tube complications that included dislodgment, obstruction refractory to flushing and guidewire recanalization, peri-tubal leakage, and fracture.[4]

Follow-up

An interventional radiology nurse practitioner examined all patients for the proper position of the gastrostomy tube 24 h after tube placement. Once the tube was confirmed to be in the stomach without any evidence of peritonitis, tube feeding was started by a dietician. Before discharge, the patients' caregiver was trained on the use and care of the tube. Topical antimicrobial cream with daily dressing change using clean gauze was done in the first 2 weeks as a part of the local skin care. A dietician instructed the caregiver on the amount of liquid feed and the technique and frequency of tube flushing. Flushing with saline was done after each attempt of liquid feeding through the tube.

Being patients with neurological causes of dysphagia, follow-up was done primarily using the patients' regular follow-up medical records at the neurology clinic in our hospital where the data were collected retrospectively. Living patients with available contacts are still under follow-up.

Results

Technical success rate was 100% (86/86 patients). There was no major complication (0%). Minor complication rate was 3.4% (3/86 patients) in the form of peristomal superficial wound infection, which was treated successfully with topical antimicrobial creams and oral antibiotics. Tube complications were observed in four patients (4.6%); two patients with peristomal leakage (2.3%), treated with a topical antimicrobial cream and regular daily dressing change till the stoma becomes dry, and two patients with refractory occlusion (2.3%) that occurred 1 month after gastrostomy tube insertion, which was thought to be secondary to inadequate tube care. The two occluded tubes were removed and exchanged with two replacement tubes having pancake-shaped 6-ml inflatable balloon tips (22–24 Fr Replacement G-Tube, Straight; Boston Scientific, 780 Brookside Dr. Spencer, IN 47460, USA). They were placed into the stomach through the gastrostomy opening, along the mature track of the tube, without the need of fluoroscopic or endoscopic guidance, and the same standard tube care was advised.

Nearly 25.5% of the patients (22/86) died during the study period with no procedure-related deaths. Almost 34.8% of the patients (30/86) could not be followed up due to loss of contact. Follow-up period for the remaining 34 patients ranged between 200 and 230 days.

No major nasopharyngeal injury was encountered during the insertion of the tube, and only self-limiting superficial minor trauma was detected in 74.4% of the patients (64/86 patients).

Discussion

Percutaneous fluoroscopic-guided gastrostomy tube insertion via the pull technique has the advantage of being done under fluoroscopic guidance, allowing the visualization of the air-filled stomach and colon unlike the endoscopic technique. This allows less incidence of colon perforation and ensures optimum positioning of the tube within the gastric body.[6]

Besides, visualization of the stomach allows tube insertion even in obese patients who usually fail to undergo gastrostomy tube placement using endoscopic approach.[6]

Percutaneous pull gastrostomy tubes showed low rates of tube occlusion being of large bore (24 Fr) and were unlikely to dislodge, as their mushroom retention device does not depend on lock type that can be unlocked or inflation device that can be deflated unlike the push gastrostomy balloon-tipped tubes.[7]

Another technique for nonendoscopic mushroom-head large-bore gastrostomy tube insertion through the oropharynx, using retrograde cannulation of the esophagus, was also described in different studies.[2,7]

Patients referred to our institute for pull gastrostomy tube (GT) insertion had nasogastric feeding tube in place, so nasopharyngeal route, rather than oropharyngeal route, was selected using the previously described modified technique for GT placement to avoid removal and re-insertion of the feeding tube through the oropharynx for less patient discomfort. Besides, the use of nonhard malleable silicone mushroom-head GT together with good lubrication allowed safe introduction of the tube through the nasal cavity without the fear of major injury, and only self-limiting minor superficial trauma was encountered.

Dormia basket, rather than the included snare device in the gastrostomy kit, was preferred to be used in our technique attributed to its three-dimensional shape which allowed easier capture of the bifid guidewire's end. It is worth mentioning that the snare device (Universal 1.9 mm O.D. × 240 cm Retrieval Snare;Boston Scientific, 780 Brookside Dr. Spencer, IN 47460, USA) can be used in our technique if the dormia basket is not available.

The pull gastrostomy tube, being inserted via the nasal cavity, requires patients to be free from any nasopharyngeal or esophageal obstructive tumors to avoid failure of the technique or injury to the GIT. However, in cases of low-grade nonobstructive cancers, pull gastrostomy tube insertion still can be done; however, seeding of the tumor cells into the stomach may occur.[8]

Conclusion

Percutaneous fluoroscopic-guided mushroom-retained gastrostomy advanced through the nasopharynx is a safe and effective method for long-term enteral feeding and eliminates the need for the aid of endoscopy.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Shin JH, Park AW. Updates on percutaneous radiologic gastrostomy/gastrojejunostomy and jejunostomy. Gut Liver 2010;4 Suppl 1:S25-31.
2. Russell TR, Brotman M, Norris F. Percutaneous gastrostomy. A new simplified and cost-effective technique. Am J Surg 1984;148:132-7.
3. Gauderer MW. Gastrostomy techniques and devices. Surg Clin North Am 1992;72:1285-98.
4. Cardella JF, Kundu S, Miller DL, Millward SF, Sacks D, Society of Interventional Radiology. *et al.* Society of interventional radiology clinical practice guidelines. J Vasc Interv Radiol 2009;20:S189-91.
5. Tam A, Wagner-Bartak NA, Wallace MJ, Murthy R. Liver abscess after inadvertent transhepatic transgression during percutaneous fluoroscopy-guided gastrostomy. Clin Radiol 2008;63:731-5.
6. Darcy MD. Radiologic percutaneous transgastric jejunostomy. Semin Interv Radiol 1996;13:299-307.
7. Simons ME, Yeung EY, Ho CS. Percutaneous fluoroscopic gastrostomy and transgastric jejunostomy. Semin Interv Radiol 1996;13:159-67.
8. Funaki B, Peirce R, Lorenz J, Menocci PB, Rosenblum JD, Straus C, *et al.* Comparison of balloon- and mushroom-retained large-bore gastrostomy catheters. AJR Am J Roentgenol 2001;177:359-62.