Diagnostic and Interventional Imaging (2017) **98**, 715—720

ORIGINAL ARTICLE /*Interventional imaging*

Fluoroscopy-guided placement of pull-type mushroom-retained gastrostomy tubes in 102 patients

G. Kahriman*, N. Ozcan, H. Donmez

Erciyes University, Medical Faculty, Gevher Nesibe Hospital, Department of Radiology, 38039, Kayseri, Turkey

KEYWORDS
Fluoroscopy;
Gastrostomy;
Enteral nutrition;
Neoplasms;
Upper gastrointestinal tract

Abstract
Purpose: The purpose of this study was to evaluate the technical and clinical results of fluoroscopy-guided placement of pull-type mushroom-retained gastrostomy tubes.
Materials and methods: This retrospective study included 102 patients (61 men, 41 women) with a mean age of 59 years ± 16.3 (SD) (range, 18—94 years) who had fluoroscopy-guided placement of pull-type mushroom-retained gastrostomy tubes. All procedures were performed after inflating the stomach with air via an orally inserted 5-Fr catheter by retrograde catheterization of the esophagogastric junction. Demographic data, results of the procedures and complications were evaluated.
Results: A technical success was observed in 101/102 patients, yielding a technical success rate of 99%. Complications due to the procedure were observed in 17/102 patients yielding a procedure-related complication rate of 16.7%. Procedure-related complications included peristomal superficial cellulitis (6/102; 5.9%), peristomal abscess (4/102; 3.9%), subcutaneous hematoma (3/102; 2.9%), peristomal leakage (2/102; 2%), inadvertent removal of the tube (1/102; 1%) and death due to procedure-related peritonitis (1/102; 1%).
Conclusion: Fluoroscopy-guided placement of pull-type mushroom-retained gastrostomy tubes is a feasible and effective method for enteral nutrition.

* Corresponding author.
E-mail addresses: guvenkahriman@hotmail.com (G. Kahriman), nevzatcan@yahoo.com (N. Ozcan), hdonmez68@yahoo.com (H. Donmez).

http://dx.doi.org/10.1016/j.diii.2017.03.009

Nutritional support is required in many patients with the inability to swallow due to head and neck cancers, upper gastrointestinal tract cancers, and neurological disorders [1—4]. The duration and procedure of this support differ from patient to patient. Although nasogastric (NG) and nasoenteric devices are convenient for short periods, they are not feasible and poorly tolerated for long-term feeding because of an increased risk of gastroesophageal reflux, and aspiration. Gastrostomy is more acceptable and tolerable option to maintain enteral nutrition in patients who need long-term nutritional support [2,3]. Varying approaches to the implementation of gastrostomy include surgical gastrostomy (SG), percutaneous endoscopic gastrostomy (PEG), and percutaneous radiologic gastrostomy (PRG) [1—19]. PRG and PEG have largely replaced SG, and PEG is widely used and the first choice when gastrostomy is required [4,6,16—19]. PRG is most commonly performed in a retrograde approach (push-type gastrostomy) and is accepted as a valuable non-operative alternative in patients who require nutritional support [7—15]. However, a limited number of papers have been published describing pull-type gastrostomy, which is an alternative to the PRG technique [20—26].

The purpose of this study was to evaluate the technical and clinical results of fluoroscopy-guided placement of pull-type mushroom-retained gastrostomy tubes.

Materials and methods

Patients

Approval for this retrospective study was granted by the Institutional Research Ethics Committee and informed consent was obtained from all patients or their relatives. A retrospective analysis of fluoroscopy-guided placement of mushroom-retained gastrostomy catheters performed in our department from January 2008 to January 2016 in a total of 102 patients was undertaken. There were 61 men and 41 women with a mean age of 59 years ± 16.3 (standard deviation [SD]) (range, 18—94 years). The patients had failed endoscopic procedure ($n = 82$) or co-morbidities ($n = 20$) preventing endoscopic procedures. Demographic data, indications for PRG, results and complications of the procedures were reviewed for each patient. Complications were defined as minor or major complications according to the guidelines for gastrointestinal access of the Society of Interventional Radiology and Gastroenterological Association [27]. Indications for placement of gastrostomies are listed in Table 1.

Procedure

Before the procedure, complete blood count including platelet count, prothrombin time, partial thromboplastin time and international normalized ratio were assessed and, when present any coagulopathy was corrected. A broad-spectrum prophylactic antibiotic (cephalosporin) was administered intravenously prior to the procedure in patients not under antibiotic treatment. All patients were monitored and vital parameters were checked during the procedure. The procedures were performed under local anesthesia using 1% lidocaine (Xylocaine® 10%, Astra, Westborough, MA, USA) in 95 patients, and intravenous sedation in 7 uncooperative patients provided by the anesthesia team using intravenous fentanyl and midazolam (Versed®; Hospira, Lake Forest, IL, USA). Lidocaine oral spray was used to suppress the pharyngeal reflex.

All procedures were performed under fluoroscopy guidance. Ultrasonography was performed to determine the demarcation of the left lobe of the liver and colon in all patients. The patients were placed in the supine position. Initially, a 5-French (Fr) angiographic catheter combined with a 0.035-inch hydrophilic guidewire (Cook, Bloomington, IN, USA) was advanced into the stomach under fluoroscopic guidance, per-orally, and the stomach was insufflated with air via the catheter. This catheter was also placed for air insufflations during the procedure. If an NG tube was in place, inflation of the stomach was performed via the NG tube. Under standard sterile conditions, an approximately 10 mm skin incision was made over the planned puncture site following administration of local anesthesia, the stomach was punctured to reach the gastric corpus with an 18-Gauge Chiba® needle or the entry needle included with the gastrostomy kit. A small amount of contrast material (Iopromide®, Ultravist 370®, Schering, Berlin, Germany) was administered into the stomach via the needle and visualized with fluoroscopy. Another hydrophilic guidewire was advanced into the stomach through the needle, then after removing the needle, the esophagogastric junction was passed by a guidewire supported by the 6-Fr angiographic catheter in a retrograde approach, and the guidewire was moved out of the patient's mouth through esophagus, and the guidewire was exchanged by the snare included with the gastrostomy kit. Then, a 20-Fr mushroom-retained gastrostomy tube (Cook Medical, Bloomington, IN, USA) was attached to the snare, and pulled into the stomach. Finally, the gastrostomy tube was fixed and the feeding port was attached. The position of the gastrostomy tube was checked by injecting contrast material (Fig. 1). The per-oral inserted angiographic catheter was removed after placement of the gastrostomy tube. When retrograde catheterization of the esophagogastric junction failed, the per-oral snare catheter was advanced into the stomach and after retrieval of the transabdominal guidewire by the snare (Fig. 2), the other steps of the process were completed as above. No tract dilatation was performed during the procedure to not increase the risk of peristomal leakage. The procedure was accepted as successful when the tube was correctly placed into the stomach and was functioning normally. If there was no acute complication, feeding of the patients was started 6 hours later in the referring clinic.

Results

A technical success was observed in 101/102 patients, yielding a technical success rate of 99%. The procedure failed in one patient because of colonic interposition. Repeated gastric punctures were needed in 3 patients (2.9%) due to loss of access during manipulation.

Complications due to the procedure were observed in 17/102 patients yielding a procedure-related complication rate of 16.7%. Minor complications were observed in 16/102 patients (15.7%), including peristomal superficial cellulitis (6/102; 5.9%), peristomal subcutaneous abscess (4/102;