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Early Initiation of Enteral Feeding in Oncology Patients after Outpatient Percutaneous Fluoroscopic-Guided Gastrostomy Catheter Placement

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Abstract

Purpose—To report the results of early enteral feeding in oncology patients following outpatient percutaneous fluoroscopic-guided gastrostomy (PFG) placement.

Materials and Methods—From January 2008 through December 2008, 121 consecutive outpatient oncology patients underwent PFG placement for nutrition. 113 patients met criteria and were fed early (after at least 3 hours). Of these patients, 5 had insufficient follow up for further analysis leaving 108 patients for outcomes analysis. After PFG placement, patients were put on

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low-wall suction via the PFG for one hour followed by feeding via PFG at least three hours after placement. Follow-up was obtained on the next business day. The medical records were reviewed for the outcomes of early feeding, technical aspects of the procedures, and complications.

Results—Following PFG placement, 93% (113/121) of patients met criteria for early feeding and 91% (103/113) of these patients were fed within 5 hours of PFG insertion. The median time between the end of procedure and initiation of feeding was 4 hours (range 3-6.5 hours). The 30-day minor complication rate was 14% (15/108) and major complication rate was 0.9% (1/108). No complications were directly attributable to early feeding.

Conclusion—Early initiation of tube feedings following outpatient PFG placement was well tolerated in oncology patients and carried no additional risk compared with previously reported results using traditional delayed feeding protocols. Early feeding provided our patients with prompt enteral nutrition and eliminated the need for post-procedural hospital admission.

Introduction

For many cancer patients, maintaining adequate nutrition by mouth can become a challenge. Whether the etiology is a neurologic condition that affects the swallowing mechanism, a neoplasm that obstructs the alimentary tract, or a therapy that irritates the mucous membranes, alternative feeding methods for nutritional support are often required. If the gastrointestinal tract is functionally normal distal to the site of disease, enteral feeding is generally preferable because it avoids the potential complications associated with parenteral nutrition (1). When prolonged tube feeding (>4-6 weeks) is expected, a gastrostomy tube is indicated (1). Percutaneous endoscopic gastrostomy (PEG) and percutaneous fluoroscopic gastrostomy (PFG) are the primary means of gastrostomy tube placement (2). The overall success and complication rates are comparable between the two percutaneous techniques and both are used routinely in oncology patients (3-4). While several studies have shown that feeding can safely be initiated in select patients < 3 hours following PEG tube placement (5-10), at many centers, patients are admitted to the hospital for observation and are not fed for 12 to 24 hours following PFG placement (11-13). This study was done to evaluate the feasibility and safety of early feeding following outpatient PFG placement in oncology patients.

Materials & Methods

The institutional review board approved this retrospective study and a waiver of informed consent was obtained. The electronic medical records of 121 consecutive oncology patients who were referred for placement of a PFG on an outpatient basis in 2008 were reviewed. Demographic information, technical aspects of the procedures, peri-procedural events, and tube feeding events, as well as 30 day overall complication rates were recorded and analyzed. Complications were graded according to the Society of Interventional Radiology classification system for complications by outcome. Descriptive statistics are presented. The mean age of included patients was 58 years (range 15 to 85 years). There were 96 men (79%) and 25 women (21%) included. The primary diagnoses of the patients are reported in Table 1.

Abdominal cross-sectional imaging was reviewed for all 121 patients prior to gastrostomy. Patients were considered candidates for outpatient PFG placement if there was no ascites, peritoneal carcinomatosis, or prior gastric surgery. Patients scheduled for outpatient feeding PFG placement met with a nutritionist before the procedure to receive teaching and to determine the appropriate feeding regimen.

Written, informed consent for the procedure was obtained from the patient. Laboratory coagulation parameters were routinely checked and if necessary were corrected to the following values: international normalized ratio (INR) <1.5, activated partial thromboplastin time (aPTT) < 35, and platelets > 50,000. All catheters were placed by an attending interventional radiologist or a trainee under attending physician supervision. Most procedures were performed with monitored moderate sedation provided by the interventional radiologist. For patients with trismus, airway obstruction, or sleep apnea associated with a body mass index >35, sedation was provided by the Anesthesia service. Pre-procedure prophylactic antibiotics were not administered and barium was not used to opacify the colon.

The technique we use for PFG placement has been previously described (11). In brief, a nasogastric catheter [5-French (Fr) TEGT, (Cook Inc., Bloomington, IN)] was placed under fluoroscopic guidance. After the intravenous administration of 1 mg glucagon, the stomach was insufflated with room air until a clear fluoroscopic window to the stomach was created. An 18-gauge Chiba needle [Cook Inc., Bloomington, IN] was used to gain percutaneous access to the gastric lumen under real-time fluoroscopic guidance. The tract was serially dilated to 12-Fr over a 0.035" Amplatz extra-stiff guidewire [Cook Inc., Bloomington, IN] and followed by placement of a 12-Fr locking pigtail catheter [Ultrathane multipurpose drainage catheter, Cook Inc., Bloomington, IN]. Contrast injection under fluoroscopy confirmed the location of the pigtail loop within the gastric fundus/body. The catheter was secured to the skin with non-absorbable suture and the nasogastric catheter was removed. Variations in the described technique were made at the discretion of the operating physician. A preliminary ultrasound in order to delineate the liver edge was performed in 25 % (30/121) of cases. A 21-gauge micropuncture needle and introducer system [Cook Inc., Bloomington, IN] were utilized prior to upsizing to the standard 0.035" guidewire in 7.4% (9/121) of cases. T-tacks [Cook Inc., Bloomington, IN] were deployed in 1.7% (2/121) of cases. Cone beam computed tomography was used in 0.8% (1/121) cases. Technical success was defined by the percutaneous placement of a 12-Fr locking pigtail catheter into the gastric lumen with the locked pigtail loop positioned in the fundus/body.

The patients were instructed to take nothing by mouth or tube for 3 hours after PFG placement. Immediately after the procedure, the gastrostomy catheters were connected to intermittent, low-wall suction in the recovery area while the patients remained under close nursing observation. Patients were discharged from the recovery area after one hour of observation if their pain score was <4 on the Visual Analog Scale (VAS), they were afebrile, and they were hemodynamically stable. Patients were instructed to remain in the hospital complex and return to the recovery area two hours after discharge. Upon their return, patients were evaluated by the nursing staff for appropriateness of tube feeding initiation. The following criteria had to be met in order for feeding to commence: pain score <4,

audible bowel sounds, and absence of peritoneal signs. The early feeding protocol consisted of 30cc sterile water flush followed by slow gravity delivery of formula as prescribed by a nutritionist. Patients were monitored by a dedicated nurse throughout the feeding and educated on the specifics of tube care and the signs and symptoms of possible tube complications. Feeding tolerance was defined by abdominal pain score remaining <4 on VAS, unchanged vital signs, absence of peritoneal signs, no nausea/vomiting, aspiration, and no diaphoresis. If the patients tolerated the feeding, they were discharged home with written instructions for the advancement of feeds. An overview of the early feeding protocol is provided in Table 2. Follow-up was generally obtained the next business-day by an interventional radiology physician assistant, a clinical nutritionist, or by the patient's treating physician either in a clinic visit or via telephone call. Figure 1 summarizes the enrollment and outcomes of the patients in this study.

Results

Technical success for placement of PFG was 100% (121/121). At the 1-hour post-procedure timepoint, 98% (118/121) of patients were met the criteria for continuing the early feeding protocol. Of these patients, five failed to return for feeding initiation, therefore, 93% (113/121,) of patients were successfully fed after at least 3 hours. Of the 8 patients who were not fed early, five patients did not return for early feeding, 2 patients experienced severe tube site pain, and 1 patient became syncopal precluding initiation of early feeding. Follow-up evaluation of these patients revealed no mechanical or infectious complications and each patient was subsequently fed uneventfully at >24 hours after tube placement.

Among the 113 patients fed early, the median time interval following PFG placement and the initiation of feeding was 4 hours (interquartile range 0.75 hours). The minimum time to initiation of feeding was 3 hours and the maximum time was 6.5 hours, 91% (103/113) of patients fed within 5 hours of PFG placement.. Five patients had insufficient follow-up documentation and were excluded from the outcomes analysis. Thus, 108 patients were included in the statistical analysis of outcomes with the early feeding protocol (Figure 1). Median time to post-procedural follow up assessment was 2 days (interquartile range 2 days). All 108 patients who were fed early tolerated the feeding. Overall, 85% (92/108) of the patients who completed the early feeding protocol experienced no complications within 30 days of the procedure. There were 15 (14%) patients with minor complications. Seven patients presented with pain during feeding and/or diarrhea after feeding that was related to pigtail migration into the duodenum, which required catheter repositioning; 2 patients had pericatheter leakage, which required upsizing to 14-Fr catheters; and, 3 patients had dislodgement of the catheter-to-skin retaining suture and retraction of the tube which required contrast injection and fluoroscopy to confirm tube position and re-suturing of the tube. One patient returned to the department for evaluation of tube site redness, which upon clinical evaluation was not thought to represent cellulitis, thus no further intervention was performed. One patient returned to the department complaining of tube site pain with oral intake. A limited, non-contrast enhanced CT revealed no abnormality and no further intervention was undertaken. Another patient returned to clinic reporting pericatheter leakage. No leakage was identified on exam and contrast injection of the PFG under fluoroscopy was normal. There was 1 (0.92%) patient with a major complication: the patient

returned to the emergency center with pain at the tube site three days after PFG placement. Contrast-enhanced CT revealed a hematoma of the rectus abdominis sheath. The patient was admitted to the hospital overnight for pain control and placed on a 10-day course of oral antibiotics. There was no interruption in tube feedings during the hospitalization and the pain resolved uneventfully. Overall, there were no complications attributable to early feeding (Table 3).

Discussion

Many centers delay feeding for 12-24 hours after PFG placement (11-13). Delayed feeding is a continuation of traditional surgical practice (14) and thought to be beneficial because the delay theoretically allows for resolution of procedure induced ileus before feeding, thus reducing gastric residuals and the associated risk of aspiration (14). Another proposed rationale for delayed feeding is to allow time for better sealing of the gastrostomy tract around the gastrostomy tube, thus reducing the chance of leakage of gastric contents and peritonitis (14). However, the practice of delayed feeding has been questioned in the PEG literature and multiple studies have demonstrated that early feeding, typically < 3 hours but even as soon as 1 hour after PEG, is safe (5-10). Endoscopists have argued that delayed feeding offers little benefit because bowel sounds, audible fairly soon if not immediately after PEG placement, indicate normal function (7). Furthermore, since the initial, inflammatory phase of wound healing lasts 5-7 days, delaying feeds for 12-24 hours is not enough time for any significant healing or tract formation (9). The results from our study suggest that early feeding protocols, similar to those used following PEG, can be used in oncology patients after PFG as 93% of our patients were fed early and there were no complications related to early feeding.

Specifically, our study group had no cases of aspiration pneumonia or peritonitis. Several large studies on PFG tube placement report 30-day major and minor complication rates of 1.3-6% and 2.9-12%, respectively. (2-3, 11-13). The patients receiving PFG in these studies were fed between 12-24 hours post-procedurally. In addition, a meta-analysis of randomized controlled trials comparing early (≤ 4 hours) versus delayed feeding after PEG placement showed that early feeding after PEG placement resulted in minor complication rate of 5.6% and a major complication rate of 5.2% compared to delayed feeding which resulted in minor complication rate of 7.2% and a major complication rate of 5.1% (5). Our observed rates of 14% minor complications and 0.92% major complications are similar to these previous reports and suggest that no increased risk is conferred with our early feeding protocol.

Defining the minimum safe observation period after PFG is important to expedite the delivery of nutrition; in addition, decreased observation times and follow-up periods should translate into more cost-effective delivery of care. The National Inpatient Sample database was queried for length of hospital stay and overall cost of care for patients whose primary diagnosis was cancer and whose primary procedure was listed as PFG in 2007. The median length of stay in hospital was 3 days with a median charge of \$18,317 (15). Though we did not perform a head to head cost comparison between inpatient and outpatient PFG, it makes intuitive sense that placing a PFG as an outpatient with same day feeding, thus eliminating the need for inpatient observation, would be less expensive.

Our study is limited because of its retrospective design and lack of a group of patients who underwent delayed feeding for comparison. Our practice is such that the majority of our PFGs placed for nutritional support are done in the outpatient setting and we would not have been able to accrue an adequate sample of patients who underwent delayed feeding after PFG for comparison during this time period. As a result, we can only provide descriptive statistics. Nevertheless, we feel this is valuable study as the early feeding concept has not been previously tested in patients following PFG. A prospective, randomized study comparing the 3-hour early feeding protocol with the traditional 24-hour feeding protocol in oncology patients undergoing PFG would be needed to confirm our findings. Lastly, our PFG tubes are 12-French in size which is relatively small and may minimize the risk of gastric leakage. The early feeding protocol would have to be verified for larger bore PFGs.

In summary, our study demonstrates the feasibility and safety of the early initiation of tube feedings after PFG placement in outpatient oncology patients. The results suggest that early feeding after PFG placement carries similar risk compared with previously reported results using traditional delayed feeding protocols. Given this similar risk profile, early feeding has the benefit of providing our patients with prompt enteral nutrition and eliminating the need for post-procedural hospital admission.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Seres DS, Valcarcel M, Guillaume A. Advantages of enteral nutrition over parenteral nutrition. *Therap Adv Gastroenterol*. 2013; 6:157–167.
2. Wollman B, D'Agostino HB, Walus-Wigle JR, et al. Radiologic, endoscopic and surgical gastrostomy: an institutional evaluation and meta-analysis of the literature. *Radiology*. 1995; 197:699–704. [PubMed: 7480742]
3. De Baere T, Chapot R, Kuoch V, et al. Percutaneous Gastrostomy with Fluoroscopic Guidance: Single-Center Experience in 500 consecutive Cancer patients. *Radiology*. 1999; 210:651–654. [PubMed: 10207463]
4. Keung EZ, Liu Q, Nuzhad A, et al. In-hospital and long-term outcomes after percutaneous endoscopic gastrostomy in patients with malignancy. *J Am Coll Surg*. 2012; 215:777–786. [PubMed: 22999329]
5. Bechtold ML, Matteson ML, Choudhary A, et al. Early Versus Delayed Feeding After Placement of Percutaneous Endoscopic Gastrostomy: A Meta-Analysis. *Am J Gastroenterol*. 2008; 103:2919–2924. [PubMed: 18721239]
6. Brown DN, Miedema BW, King PD, et al. Safety of early feeding after percutaneous endoscopic gastrostomy. *J Clin Gastroenterol*. 1995; 21:330–331. [PubMed: 8583114]
7. Choudhry U, Barde CJ, Markert R, Gopallswamy N. Percutaneous endoscopic gastrostomy: a randomized prospective comparison of early and delayed feeding. *Gastrointestinal Endoscopy*. 1996; 44:164–167.
8. Dubagunta S, Still CD, Kumar A, et al. Early initiation of enteral feeding after percutaneous endoscopic gastrostomy tube placement. *Nutrition in Clinical Practice*. 2002; 17:123–125.
9. McCarter TL, Condon SC, Aguilar RC, Gibson DJ, Chen YK. Randomized prospective trial of early versus delayed feeding after percutaneous endoscopic gastrostomy placement. *American Journal of Gastroenterology*. 1998; 93:419–421. [PubMed: 9517650]

10. Szary NM, Arif M, Matteson M, et al. Enteral feeding within three hours after percutaneous endoscopic gastrostomy placement: a meta-analysis. *J Clin Gastroenterol*. 2011; 45:e35–e38.
11. Bell S, Carmody EA, Yeung EY, et al. Percutaneous Gastrostomy and Gastrojejunostomy: Additional Experience in 519 Procedures. *Radiology*. 1995; 194:817–820. [PubMed: 7862985]
12. Hicks ME, Surratt RS, Picus D, Marx MV, Lang EV. Fluoroscopically guided percutaneous gastrostomy and gastroenterostomy: analysis of 158 consecutive cases. *Am J Roentgenol*. 1990; 154:725–728. [PubMed: 2107665]
13. Perona F, Castellazzi G, De Iuliis A, Rizza L. Percutaneous radiologic gastrostomy: a 12-year series. *Gut and Liver*. 2010; 4:S44–49. [PubMed: 21103294]
14. Itkin M, DeLegge MH, Fang JC, et al. Multidisciplinary practical guidelines for gastrointestinal access for enteral nutrition and decompression from the society of interventional radiology and American gastroenterological association (AGA) institute, with endorsement by Canadian interventional radiological association (CIRA) and cardiovascular and interventional radiological society of Europe (CIRSE). *J Vasc Interv Radiol*. 2011; 22:1089–1106. [PubMed: 21782465]
15. Nationwide Inpatient Sample [Internet]. Agency for Healthcare Research and Quality; Rockville (MD): Available from: www.hcupus.ahrq.gov/nisoverview.jsp [2013 Jun 7]

Figure 1.
Enrollment and outcomes.

Table 1

Primary diagnosis of patients receiving percutaneous fluoroscopic-guided gastrostomy.

Primary Diagnosis	N (%)
Head and Neck Cancer (excluding esophageal)	92 (76)
Gastrointestinal Cancer (including esophageal)	20 (15.7)
Thoracic/ Lung Cancer	5 (4)
Soft-Tissue Sarcoma	3 (2.5)
Amyloidosis	1 (0.8)
Total	121

Table 2

Early feeding protocol.

1) Keep NPO and nothing by tube for at least 3 hours after PFG placement.
2) PFG placed to intermittent low wall suction for 1 hour after placement.
3) If patients meet the following criteria, they are discharged to return for tube feed initiation: pain < 4 on scale of 10, afebrile, hemodynamically stable.
4) When patients return, they are evaluated with the following criteria to assess readiness to begin feeding: pain score <4, audible bowel sounds, and absence of peritoneal signs.
5) Tube patency is assessed with 30 cc sterile water flush. Aspiration of gastric content confirms intragastric position.
6) Slow (over 45-60 minutes) gravity delivery of formula (usually 125 cc) as prescribed by a nutritionist.
7) Vital signs are monitored every 10 minutes during feeding. If patient has significant change in vital signs, pain, nausea/vomiting, or diaphoresis, the infusion is stopped and patient is evaluated by physician.
8) Patients who tolerate initial feeding are discharged home with written instructions and formula as prescribed by the nutritionist for the advancement of feeds.
9) Follow up the next business day by phone or office visit.

Table 3

Complications of percutaneous fluoroscopic gastrostomy placement with early feeding protocol.

Complication	N (%)	95% CI
No Complication	92 (85.2%)	77%-91%
Major Complications	1 (0.9%)	0.02%-5%
Rectus sheath hematoma	1	
Minor Complications	15 (13.9%)	8%-22%
Tube malposition/migration	7	
Pericatheter leakage	2	
Broken sutures/tube retraction	3	
Problems requiring evaluation only	3	

Abbreviations: N = number of patients; CI- confidence interval.