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INTERVENTIONAL RADIOLOGY

TECHNICAL NOTE

Effect of post-pyloric Dobhoff tube retention during gastrojejunostomy for reduction of fluoroscopic time and radiation dose

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ABSTRACT

The purpose of this study was to determine whether retention of a post-pyloric Dobhoff tube (DHT) in position to serve as a visual guide through the pylorus during gastrojejunostomy (GJ) tube placement results in a reduction in fluoroscopy time, procedure time, and estimated radiation dose. A retrospective study evaluated patients who underwent GJ tube placement or gastric to GJ conversion from January 1, 2017, to April 1, 2021. Demographic and procedural data were collected, and results were evaluated using descriptive statistics and hypothesis testing through an unpaired Student's t-test. Of the 71 GJ tube placements included for analysis, 12 patients underwent placement with a post-pyloric DHT in position, and 59 patients underwent placement without a post-pyloric DHT in position. The mean fluoroscopy time and estimated radiation dose were significantly reduced in patients who underwent GJ tube placement with a post-pyloric DHT in position compared with those without (7.08 min vs. 11.02 min, $P = 0.004$; 123.12 mGy vs. 255.19 mGy, $P = 0.015$, respectively). The mean total procedure time was also reduced in patients who underwent GJ tube placement with a post-pyloric DHT in position compared with those who had no post-pyloric DHT, but this finding lacked statistical significance (18.55 min vs. 23.15 min; $P = 0.09$). Post-pyloric DHT retention can be utilized during GJ tube placement to reduce radiation exposure to both the patient and interventionalist.

KEYWORDS

Dobhoff tube, flouroscopy, gastrojejunostomy, radiation, time

Enteral tube feeding via gastric or jejunal routes is an effective method for patients unable to tolerate oral alimentation. When indicated, gastrostomy (G) tube placement is typically the initial intervention at our institution due to physiologic benefits, ease of placement, and low cost. Patients unable to tolerate gastric feeding require post-pyloric enteral feeding via a gastrojejunostomy (GJ) tube. Additionally, patients initially fed via a G tube may require radiographic conversion to a GJ tube when determined to be at high risk for aspiration, as feeding from the jejunal position has been shown to reduce the risk of reflux.[1-3] At our institution, interventional radiologists perform GJ tube placement and G to GJ conversion using fluoroscopic guidance. The principal technical challenge of these procedures lies in the navigation of the guidewire and catheter past the pylorus, accounting for approximately half the total fluoroscopy time in previous studies.[4] Many patients needing GJ tube placement present with a post-pyloric Dobhoff tube (DHT) in place, but this tube is often removed or retracted before GJ tube placement. Occasionally, the DHT is retained in its post-pyloric position, where it functions as a direct visual guide for pyloric access intra-procedurally. The purpose of this study is to investigate if post-pyloric DHT retention during GJ tube placement results in a reduction of fluoroscopy time, procedure time, and radiation exposure.

Technique

The medical records of patients who underwent GJ tube placement or G to GJ conversion from January 1, 2017, to April 1, 2021, were reviewed. The inclusion criteria of this study

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were procedures performed by one of seven fellowship-trained, board-certified interventional radiology attending physicians alone or with the assistance of an experienced radiology physician assistant. Exclusion criteria were patients who underwent GJ tube exchanges, patients with abnormal gastrointestinal anatomy, insufficient imaging, or procedures performed by medical residents or fellows under the supervision of the attending physician. Demographic and procedural data were collected from the patients' charts, Picture Archiving and Communication System, and procedural flowsheets. Procedural data extracted included procedure type, the presence or absence of a post-pyloric DHT during GJ tube placement, total fluoroscopy time, total procedural time, and estimated radiation dose measured in mean air kerma. Results were evaluated using descriptive statistics and hypothesis testing through an unpaired Student's t-test.

Procedural Technique

Various techniques for GJ tube placement exist; however, the primary technical points remain uniform for each. The indwelling DHT was retained in its post-pyloric position, and a nasogastric tube was placed for gastric insufflation (Figure 1). Two T-fasteners were inserted into the stomach after administering a local anesthetic, and the position of each T-fastener was confirmed with contrast injection. An 18-gauge needle was inserted into the stomach between the two T-fasteners, and the position was confirmed with contrast. A stiff angled glide wire (Terumno Medical Inc., Somerset, New Jersey) was then inserted into the needle and manipulated into the distal duodenum/proximal jejunum using intermittent fluoroscopy and the indwelling post-pyloric DHT for visual guidance through the pylorus. The tract was then serially dilated to the appropriate diameter, and a peel-away sheath was placed. Subsequently, a balloon GJ catheter was inserted into the distal duodenum/proximal jejunum (Figure 2). Post-placement imaging was performed with contrast injection through the port to confirm satisfactory positioning.

Main points

- A significant percentage of fluoroscopic usage during gastrojejunostomy (GJ) tube placement is for obtaining pyloric access.
- Many patients presenting for GJ tube placement have a post-pyloric Dobhoff tube (DHT) already in position; however, this tube is typically retracted into the gastric lumen or removed entirely pre-procedure.
- Retention of a post-pyloric DHT as a visual guide through the pylorus during GJ tube placement can be safely implemented to reduce procedural fluoroscopy time and radiation exposure.

Results

Between 2017 and 2021, 237 GJ tube placements were examined for study eligibility. Of these placements, 133 were excluded from analysis for being performed by resident physicians or fellows under attending physician supervision, as procedural inexperience could confound the analysis of time variables. An additional 22 procedures were identified as GJ tube exchanges and excluded from analysis, as exchanges performed over a guidewire do not require increased fluoroscopic usage. Seven procedures were excluded from analysis due to abnormal patient gastrointestinal anatomy that would confound the analysis of time variables. Four procedures were excluded due to insufficient imaging. The remaining 71 procedures were included in the study analysis (Table 1). The mean air kerma levels were unavailable for 15 patients in the non-DHT group.

The mean fluoroscopy time was significantly reduced in patients who underwent GJ tube placement with a post-pyloric DHT in position compared with those without (Table 2). The mean estimated radiation dose measured in air kerma was significantly reduced in patients who underwent GJ tube placement with a post-pyloric DHT in position compared with those without (Table 2). The mean total procedure time was also reduced in patients who underwent GJ tube placement with a post-pyloric DHT in position compared with no post-pyloric DHT. However, this finding lacked statistical significance (Table 2).

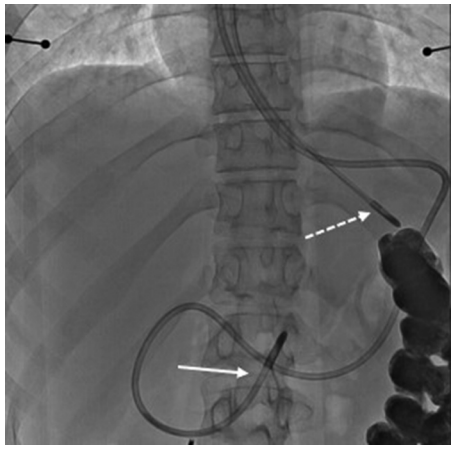

Figure 1. Initial procedural fluoroscopic imaging confirming the presence of a nasogastric tube in the stomach (dashed arrow), and a Dobhoff tube retained in the distal duodenum (solid arrow).

Discussion

There was a greater than 35% reduction in average fluoroscopy time during GJ tube placement when a DHT was retained intra-procedurally for pyloric visualization, which corresponded to significantly reduced radiation exposure to both patient and interventionalist. Although there was an observed decrease in total procedure time in the group with a post-pyloric DHT in position during GJ tube placement, this was not statistically significant, primarily due to statistical underpowering. Further, a component of human error exists in procedural time-keeping; however, this is not a factor for fluoroscopy time, which is strictly tracked by the fluoroscopic equipment during each procedure. Therefore, the total procedure time is subject to slight variation and is not a strict reflection of the actual time the operator spent in the procedure room.

The most common reason for DHT retraction during primary GJ tube placement is gastric insufflation use. The tube may also be removed entirely due to operator preference, with the concern that an additional tube across the duodenum may impede the larger caliber feeding tube following the same course. However, this described technique allows for gastric insufflation without necessitating DHT retraction, and post-procedurally the DHT may be removed to alleviate any concern about GJ tube impediment.

Previously, the use of metoclopramide (Reglan) and domperidone (Motilium) have been studied as potential adjunctive techniques during GJ tube placement to facilitate

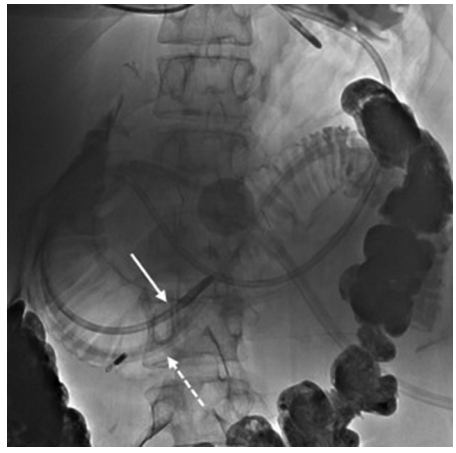

Figure 2. Procedural fluoroscopic imaging demonstrating successful gastrojejunostomy tube placement (dashed arrow) along a tract parallel to the retained post-pyloric Dobhoff tube (solid arrow).

Table 1. Patient characteristics

Cohort	Size	Mean age (years)	Gender distribution
Post-pyloric DHT	n = 12	43.6	4 male, 8 female
No post-pyloric DHT	n = 59	50.7	29 male, 30 female

DHT, Dobhoff tube.

Table 2. Procedural characteristics

Mean	Post-pyloric DHT, n = 12 (SD)	No post-pyloric DHT, n = 59 (SD)	*P*
Fluoroscopy time (min)	7.08 (2.34)	11.02 (9.73)	0.004
Procedure time (min)	18.92 (7.19)	23.25 (18.32)	0.094
Air kerma (mGy)	123.11 (88.42)	255.19 (358.08)	0.015

DHT, Dobhoff tube; SD, standard deviation.

post-pyloric access due to their motility-enhancing pharmacologic properties.[4-7] Our approach does not require medication administration, as these medications contribute to an increased risk of drug–drug interactions and other adverse events, such as neurologic dysfunction.[6-8] This novel technique employs the post-pyloric DHT as a direct visual guide to the pylorus and for dilatation of the pyloric lumen, enabling faster and easier guidewire advancement.

Limitations of this study include a small sample size in the group with a post-pyloric DHT in position during GJ tube placement since this review was performed at a high-volume academic institution, where training residents and fellows place most GJ tubes under attending physician supervision. Some patients in the non-DHT group may have had previous failures at post-pyloric tube placement due to anatomic or physiologic factors, which could confound the observed prolonged fluoroscopy time in the non-DHT group. Additionally, mean air kerma levels were unavailable for 15 patients in the non-DHT group. Therefore, the group's true mean air kerma may be subject to slight variation. Finally, this was a single-institution study, and there is a risk of sampling bias.

In conclusion, this method can be safely implemented as an adjunctive technique to reduce fluoroscopic usage and radiation dose during GJ tube placement. Because many patients presenting for GJ tube placement already have a post-pyloric DHT, this method provides benefits without requiring a significant change in procedural steps. This method can be applied to a broad patient population but shows particular promise for its use in populations where radiation exposure has to be strictly limited.

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Conflict of interest disclosure

The authors declared no conflicts of interest.

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