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Overuse of fluoroscopic gastrostomy studies in a children's hospital

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ABSTRACT

Background: Gastrostomy tubes are often dislodged or exchanged in children. Indications for fluoroscopic examination of gastrostomy location include concern for malposition, dislodgement, leak, or gastric outlet obstruction. We hypothesized that most of the studies obtained at our institution were not ordered for one of the aforementioned indications and do not ultimately affect patient management.

Methods: All fluoroscopic gastrostomy studies performed from January 2011 to December 2012 were reviewed. Transgastric jejunostomy studies were excluded. Patient demographics, indications for the study, elapsed time since placement, imaging findings, and short-term outcomes were recorded. Chi-square analysis was used to evaluate relationships between categorical variables.

Results: During the study period, 337 patients who underwent fluoroscopic gastrostomy studies were identified; median age was 2.5 y (0.05–23.8). Sixty-two percent (208/337) of the studies were ordered in asymptomatic patients to confirm tube placement location after routine exchange or replacement. Symptomatic patients accounted for 38% of the studies. Ordering physicians were primarily nonsurgeons (72%, 242/337). Abnormal findings were observed in 4.8% (16/337) of patients, six (1.7%) of whom required an operative intervention. The 2.9% (6/208) abnormal study rate for asymptomatic patients was significantly lower than the 7.9% (10/129) rate in the patients who were evaluated for symptomatic indications ($P = 0.03$).

Conclusions: Most of the fluoroscopic gastrostomy studies ordered at a tertiary care center did not appear to alter patient care. Development of a standardized management algorithm based on clinical indications is necessary to decrease the number of extraneous gastrostomy studies.

1. Introduction

Gastrostomy tube placement is one of the most common surgical procedures performed in the pediatric population [1]. The indications for insertion are broad, including failure to thrive, risk for aspiration, neurologic devastation, prolonged ventilation, swallowing impairment, and neuromuscular disease. However, the complication rates and emergency room

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visit rates after tube placement are not insignificant [2]. Serious complications are rare but can include perforated bowel with intra-abdominal leakage of gastric contents [3]. One study reported a 5% rate of major complications including peritonitis in 3% and one death related to the insertion of the gastrostomy tube [1]. The predominant issues after gastrostomy placement are related to tube dislodgement [1,4], hypergranulation tissue, and external leakage at the tube site.

When a patient presents to the emergency department or to clinic with concerns related to their gastrostomy tube, a contrast-enhanced fluoroscopic study of the tube is often ordered to visualize the anatomy and the positioning of the tube [2,5]. Recognized indications for this study include concern for dislodgement or intraperitoneal positioning in the immediate postoperative period or concern for gastric outlet obstruction [6]. However, these imaging studies are often performed to confirm placement, when the suspicion of improper placement is very low. There is no evidence that these confirmatory studies are medically indicated when easy gastrostomy replacement is performed outside of the immediate postoperative period and gastric contents are aspirated. One study by Showalter *et al.* [5] studied 237 children and found that 35% of the patients who underwent G-tube replacement after accidental tube dislodgement in a pediatric emergency department had confirmatory imaging performed.

Although at our institution fluoroscopy after routine g-tube exchange is not standard practice, we have empirically noticed that a number of providers use these studies for confirmatory, as opposed to diagnostic purposes, perhaps exposing the child to unnecessary testing and increasing the cost of treatment. We hypothesized that most of the studies obtained at our institution were not obtained for diagnostic purposes. The purpose of this study was to review the indications and results of gastrostomy tube contrast studies in children to determine if confirmatory compared with diagnostic studies affect patient management. This would allow for the development of a standardized treatment algorithm and institutional guidelines regarding the use of further testing.

2. Materials and methods

2.1. Study design and patient population

Permission to conduct this study was obtained from the Institutional Review Board (H-32735) of Baylor College of Medicine. This was a retrospective chart review of patient medical records and imaging studies conducted at a tertiary children's hospital. All fluoroscopic gastrostomy studies performed from January 2011 to December 2012 were reviewed through our hospital-wide imaging system (PACS). Transgastric jejunostomy studies were excluded. Data collected included patient demographics, indications for the study, elapsed time since placement, imaging findings, and short-term outcomes. Regarding operative technique, the standard at our institution is to secure the stomach to the anterior abdominal wall. However, there are provider differences in the type of tube inserted and operative approach (laparoscopic *versus* open).

2.2. Measured outcomes

The primary outcome of the study was the frequency of gastrostomy contrast studies with abnormal findings. Patients were stratified into symptomatic (diagnostic) or asymptomatic (confirmatory) groups according to their clinical presentation. Symptoms included leaking, vomiting, failure to tolerate feeds, pain, tube blockage, inability to aspirate gastric contents after replacement, wound infection, and bleeding. The asymptomatic category represented two patient groups. The dislodged category included all children presenting with a gastrostomy tube accidentally knocked out of the tract requiring replacement followed by confirmatory imaging. Routine gastrostomy studies were defined as those that were physician-directed tube exchanges, typically converting from tube to button and a fluoroscopic study to confirm placement. To differentiate between complications encountered in patients with immature compared with mature gastrostomy tube tracts, contrast studies were analyzed whether they occurred before or after 45 d following initial placement of the gastrostomy tube. Abnormal contrast studies were defined as those confirming malposition of the tube in the subcutaneous tract, extravasation into the peritoneum, or gastric outlet obstruction.

2.3. Statistical analyses

All statistical analyses were performed using SPSS version 21 statistical software (IBM Corporation, Armonk, NY). Bivariate analysis was performed using the χ^2 test for categorical variables and Student t-test for continuous variables. All results are presented as median with range unless otherwise specified. A P value of <0.05 was considered statistically significant.

3. Results

3.1. Patient demographics and outcomes

During the study period, a total of 337 patients who underwent fluoroscopic gastrostomy studies were identified at our institution. The median patient age at the time of the contrast study was 2.5 y (0.05–23.8), and mean time from g-tube placement to the contrast study was 249 d. The majority of physicians ordering the studies were nonsurgeons (72%, 242/337), which consisted mainly of emergency medicine providers. Of the 242 studies ordered by nonsurgeons, 4.1% (10/242) were abnormal whereas 6.3% (6/95) of studies ordered by surgeons, which may reflect a greater reliance on radiographic studies among nonsurgeon providers. Abnormal findings on contrast study were observed in 4.8% (16/337) of all patients, 6 (1.7%) of which required an operative intervention. Five of the 16 abnormal studies occurred in percutaneous endoscopic gastrostomy (PEG) tubes without abdominal wall fixation. The median age of patients with abnormal studies was 4.3 y and spanned the age range from 6 mo to 18 y.