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Pediatric gastrostomy tubes and techniques: making safer and cleaner choices



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ABSTRACT

Background: Gastrostomy tube placement is a common procedure that can be accomplished with a variety of techniques, each with its attendant complications. In an effort to standardize practice at our institution, we retrospectively evaluated complications including early dislodgement requiring operative repair, leaks, and granulation tissue to determine the optimal technique.

Materials and methods: A retrospective cohort study (June 2008–July 2014) evaluating children (<18) receiving gastrostomy tubes was completed. We recorded demographic data, placement technique, and postoperative complications within 120 days. The seven techniques in use at our institution were categorized into three groups: standard pull-type techniques for percutaneous endoscopic gastrostomies (PEGs), “push” techniques using trans-abdominal sutures or T-fasteners for securement of the stomach, and “fascial” techniques using sutures directly from the stomach to the abdominal fascia at the stoma site. Descriptive statistics were analyzed using t test and Kruskal-Wallis tests as appropriate, and outcomes with $P < 0.05$ were considered significant.

Results: Of the 450 patients, 255 (56.7%) were male. Median age and weight at the time of operation were 19.3 months (interquartile range, 6.5–89.6 months) and 9.0 kg (interquartile range, 5.7–17.1 kg) respectively. By technique, 245 patients underwent fascial placement (54.4%), 112 underwent push (24.9%), and 93 underwent PEG (20.7%). Push and fascial techniques were less likely become dislodged than PEG, with odds ratios (ORs) of 0.14 (confidence interval CI 0.02–0.66) and 0.31 (CI 0.11–0.83), respectively. Fascial techniques had more granulation tissue than either push or PEG pull methods, OR 2.39 (CI 1.20–3.36), and more leakage, OR 2.22 (CI 1.19–4.15).

Conclusions: Dislodgement is most likely with PEG techniques. Granulation and leakage are most likely with fascial suture techniques. Push techniques are associated with the lowest complication rate.

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Introduction

Infants and children can require long-term enteral access for a variety of reasons, including nutritional deficiency, short gut syndrome, hypermetabolic state, neurologic disease, or other illness requiring enteral feedings. Traditionally, gastric access has been secured via either open surgical gastrostomy or percutaneous endoscopic gastrostomy (PEG), with both methods demonstrating good safety and efficacy profiles.¹⁻³ In recent years, many additional techniques for gastrostomy tube (G-tube) placement have emerged, including combinations of endoscopy, laparoscopy, fluoroscopy, and new methods for securing the stomach to the abdominal wall.⁴⁻¹³ Each method carries its own complications, and comparative studies are limited and low powered. Thus, it remains unclear which techniques are safest.

Several studies have compared open gastrostomy to PEG and demonstrated either no significant difference,^{3,5,13} or an increased complication rate with PEG.¹ Studies comparing PEG to laparoscopic placement generally show higher rates of both major and minor complications with PEG,^{5,12,14} though this is not always the case.¹³ No significant differences in complication rates have been observed between laparoscopic and open gastrostomy.^{5,13,15} Several other small series have evaluated newer alterations of technique, such as the use of T-fasteners or trocars in PEG,⁹ different methods of securing the stomach in laparoscopic cases,⁶ or comparing pull-style PEG tubes to push-style buttons.¹⁰

An early study at our institution compared laparoscopic gastrostomy to PEG and found a significantly increased risk of complications, including dislodgement requiring return to odds ratio (OR), with PEG technique. However, this study did not evaluate other techniques for gastrostomy placement.¹⁴

Overall, the literature is heterogeneous and composed mostly of low-powered studies comparing one technique directly against another. Based on the available data, we hypothesized that pull-style PEG techniques would be associated with higher complication rates compared with other methods. Our aim was to better inform our technique selection by determining which techniques were associated with the fewest complications.

Material and methods

Under a protocol approved by the institutional review board, we queried patients aged 0-18 years who underwent primary gastrostomy tube placement by 11 attending surgeons between June 2008 and July 2014 at Mott Children's Hospital in Ann Arbor, Michigan. The medical chart of each patient was reviewed, excluding patients with gastrostomy revisions, gastrojejunostomy placement, and duplicate records. Information collected included primary and secondary diagnoses, method of gastrostomy creation, operative time, and outcomes in the first 120 days after the surgery. Outcomes included complications, number of clinic visits, postoperative admissions, ER visits, and phone calls regarding common problems with G-tubes. Complications were defined as granulation tissue, leak, and dislodgements requiring operative

intervention. Granulation tissue and leak were considered present if a pediatric surgeon examined and diagnosed the child as having either in the clinic note. The follow-up interval was chosen a priori as 4 months to allow comparison to previous literature, and since this is the time frame we expect to see complete healing of the gastrostomy sites.

Seven gastrostomy techniques were analyzed: Open, PEG, PEG with fluoroscopy, PEG with T-fastener or full-thickness transabdominal suture, fluoroscopy only, laparoscopic with sutures securing the stomach to fascia at the stoma, and laparoscopic with T-fastener or full-thickness transabdominal suture.

We grouped the various techniques into three categories for analysis: those that used stomach-to-fascial sutures at the stoma, those that used push techniques with T-fasteners or transabdominal sutures, or pull-style PEG (Table 1). The categories were selected to best describe the common methods for placing gastrostomy at our institution.

The Stata/IC 12.1 statistical program was used to analyze data. Student t tests and Kruskal-Wallis tests were used to analyze the data where appropriate. P values less than or equal to 0.05 were considered significant.

Operative technique

Open

Open Stamm gastrostomies were created using a standard left upper quadrant incision and used fascial sutures of 2-0 Vicryl to secure the stomach to the anterior abdominal wall fascia. These cases were analyzed in the Fascial group.

PEG

PEG tubes were placed using the original technique described by Gauderer *et al.*,⁸ as this technique has been utilized by our group since its inception.² These cases were analyzed in the PEG group.

PEG with fluoroscopy

PEG with fluoroscopy included the use of real-time fluoroscopic guidance either with or without a retrograde contrast

Table 1 – Gastrostomy techniques by category.

Fascial suture techniques
Open
Laparoscopic with fascial sutures at the stoma
PEG techniques
PEG
PEG with fluoroscopy
Push techniques
Endoscopic with t-fastener or full-thickness transabdominal suture
Laparoscopic with t-fastener or full-thickness transabdominal suture
Fluoroscopy only

PEG = percutaneous endoscopic gastrostomy.

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