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Single Case

Hybrid Endoscopic/Fluoroscopic Gastrostomy Tube Placement: Case Report of a Novel Technique

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Keywords
Gastrostomy · Bowel obstruction · Endoscopy · Fistula

Abstract
Introduction: We report the case of a 60-year-old female with a history of perforated gastric ulcer, abdominal abscesses, enterocutaneous fistula, and small bowel obstruction requiring durable gastric decompression prior to delayed fistula takedown. The patient had contraindications to or failed attempts at traditional gastrostomy approaches (surgical, endoscopic, interventional radiology). ***Case Report:*** Gastrostomy was successfully performed via a novel technique combining interventional radiology and endoscopic placement. ***Discussion:*** In certain patients with complex presentations, a hybrid approach to gastrostomy tube placement using fluoroscopy and endoscopy may prove a viable alternative when traditional methods are contraindicated or unsuccessful.

Introduction

A chronic small bowel obstruction, as is seen in some oncologic disorders or complex general surgery presentations, is debilitating to patients. The goal of management for chronic small bowel obstructions includes gastrointestinal decompression, nutritional resuscitation, and reestablishment of gastrointestinal flow [1]. There is a variety of methods to achieve these goals including placement of either a nasogastric (NG) tube, an esophageal-gastric tube, or a gastrostomy tube. Patient specific characteristics typically dictate the treatment approach.

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When compared to other methods, gastrostomy tubes have improved patient comfort – allowing for small volume or recreational oral intake [2]. Perhaps most importantly, patients can manage gastrostomy tubes outside of the hospital setting. Historically, NG tubes were the most utilized method of management; however, with the innovation of percutaneous placed gastrostomy tubes, it has become a primary treatment option [2, 3].

Achieving gastrostomy tube access can be accomplished via endoscopy, fluoroscopic guided interventional radiology (IR) placement, or surgical techniques (open or laparoscopic). Percutaneous endoscopic gastrostomy (PEG) was first introduced in 1980 by the application of endoscopy to insert a feeding tube into the stomach [4]. Due to the comparably low cost, less invasive nature, and lack of need for general anesthesia in most cases, PEG tubes are generally preferred over surgical gastrostomy tube placement [5–7]. Although generally considered to be a safe procedure, there is always the potential for both minor and major complications. The major complications can generally be classified into three categories: endoscopic technical difficulties, PEG procedure-related complications, and late complications associated with PEG tube use and wound care [7]. A computed tomography (CT) scan may be performed prior to endoscopic gastrostomy tube placement to evaluate for a satisfactory anatomic window, which has been shown to be highly predictive of successful endoscopic gastrostomy tube placement [8].

An alternative option to gastrostomy placed via endoscopy is radiologic guided IR gastrostomy tube (PRG). This method was originally utilized for patients with an anatomic restraint of advancing the endoscope through the esophagus [9]; however, indications have expanded with innovations of the technique and novel technologies [10]. However, upon literature review, there is very little describing the use of a hybrid endoscopic-IR approach to placing a gastrostomy tube in a presentation with a troublesome anatomic window. This case report describes a technique for gastrostomy tube placement in a patient necessitating chronic decompression with surgical contraindications and inadequate anatomic window for approach via IR or endoscopy alone.

Case Description

This is a case of a 60-year-old female with a complex medical history who initially underwent an emergent Graham patch repair of a perforated peptic ulcer of the lesser curvature. Her postoperative course was complicated by large, percutaneously inaccessible, intra-abdominal abscesses for which she underwent a second exploratory laparotomy on postoperative day nine. She underwent multiple subsequent IR drainage of the abscesses on postoperative days 13, 31, and 52. Ultimately, the drainage from one of these percutaneous drains was appreciated to be large volume bilious, and sinogram confirmed enterocutaneous fistula (ECF). The patient had intermittent oral intolerance for the first month of her postoperative course, and ultimately developed complete dependence on gastric decompression, with mucus only from her anus. CT confirmed small bowel obstruction. Given data suggesting improved outcomes with delayed intervention [2], the treatment team elected to defer surgical correction of her ECF and SBO until 3–6 months after her last operation, and ideally after source control (her last additional drain placement). The patient was initially managed with nothing by the mouth (NPO) with total parenteral nutrition and NG tube decompression. Given the patient's long-term need for decompression, the treatment team elected to pursue gastrostomy tube placement.

CT scans consistently showed a very narrow (2 × 2cm) window in the left upper quadrant through which the stomach could potentially be accessed without traversing nearby intestines (Fig. 1). An endoscopic approach was thus perceived to be relatively contraindicated.

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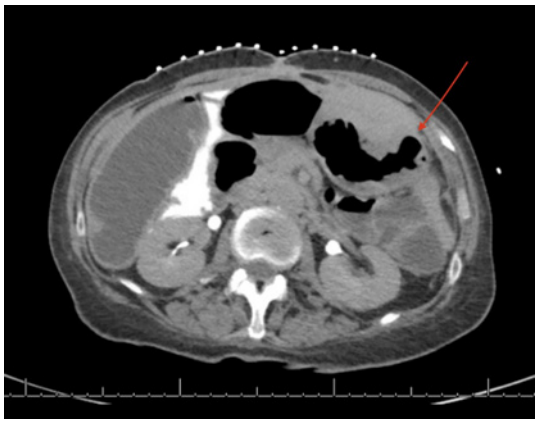

Fig. 1. Axial CT showing narrow window where stomach abuts the abdominal wall for traditional percutaneous endoscopic gastrostomy placement. The red arrow indicated where the stomach abuts the abdominal wall.

Thus, IR planned to place the gastrostomy tube via fluoroscopic guidance, 126 days after initial presentation. After standard initial procedural practices were performed, the stomach was insufflated via an NG tube to allow for gastric penetration. Then, fluoroscopic images were obtained to evaluate for a safe approach to the anterior stomach. While viewing ipsilateral, steep lateral, and true-lateral fluoroscopic images, it was determined that there was no window to approach the stomach. Despite the presence of a small window on CT, insufflation of the stomach resulted in it moving away from the abdominal wall, with small bowel completely obscuring access. The treatment team, therefore, decided to attempt the unique procedure of a hybrid IR-endoscopic gastrostomy with the general surgeon managing the endoscope.

First, an endoscopy was performed. Once the gastric mucosa was visualized, the endoscope was retroflexed to tent the stomach against the abdominal wall, as was visualized on oblique fluoroscopic views. The utilization of endoscopic tenting of the stomach provided the same function of the NG insufflation in the standard IR guided approach, however, with communication between the endoscopist and radiologist, this allowed for manipulation of the stomach to allow for a safe window to approach the stomach. This required pushing the stomach both anteriorly and inferiorly, with the needle access performed at a steep cephalad angle. Of note, after initial confirmation of being intragastric, the camera on the endoscope was not used for visualization. Rather, fluoroscopy guided the positioning of the endoscope as a buttress – with the camera itself obscured by being pressed against mucosa. Using real time steep oblique and true-lateral images, a needle was placed just anterior to the endoscope (Fig. 2). After IR gained gastric access and safely introduced a guidewire (Fig. 3), standard endoscopic placement of the gastrostomy tube was performed by the treatment team. Post-procedural CT scan confirmed appropriate positioning, and revealed only millimeters of space between the gastrostomy and the surrounding intestines after the stomach was desuflated (Fig. 4, 5). The patient tolerated the procedure well.

The patient's most recent follow-up was on post-gastrostomy tube placement day 24 (post-initial initial presentation day 160). The patient reported that she has been feeling well, including increasing exercise tolerance, as well as extreme gratitude for ability to return to her home – which had not been possible while she was dependent on NGT and suction. Follow-up CT demonstrated resolution of the abdominal abscesses. At this juncture, the plan of care was to wait six to 12 months following resolution of inflammatory insults to perform surgery with fistula resection and lysis of adhesions for the patient's SBO. Ethics approval was not required for this study in accordance with local and national guidelines. Written patient consent was

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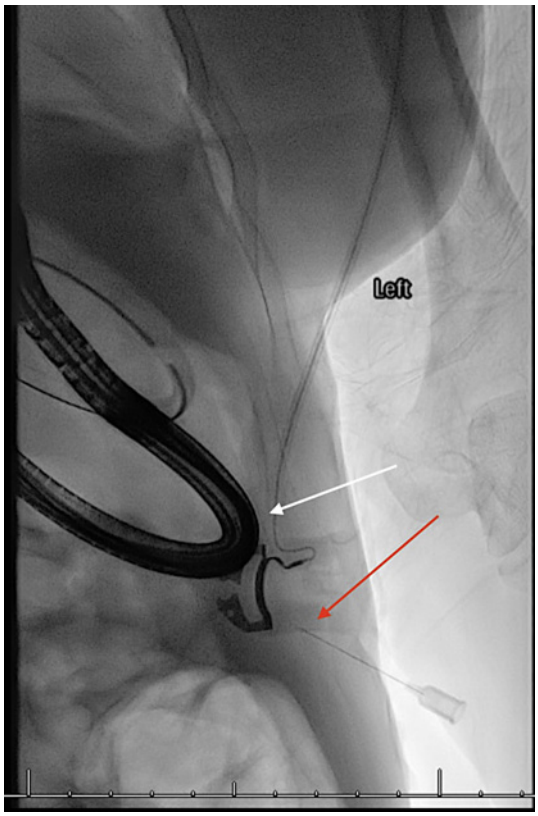

Fig. 2. Oblique fluoroscopic image showing endoscope used to push stomach against abdominal wall (white arrow), with percutaneous needle introduced to access stomach (red arrow).

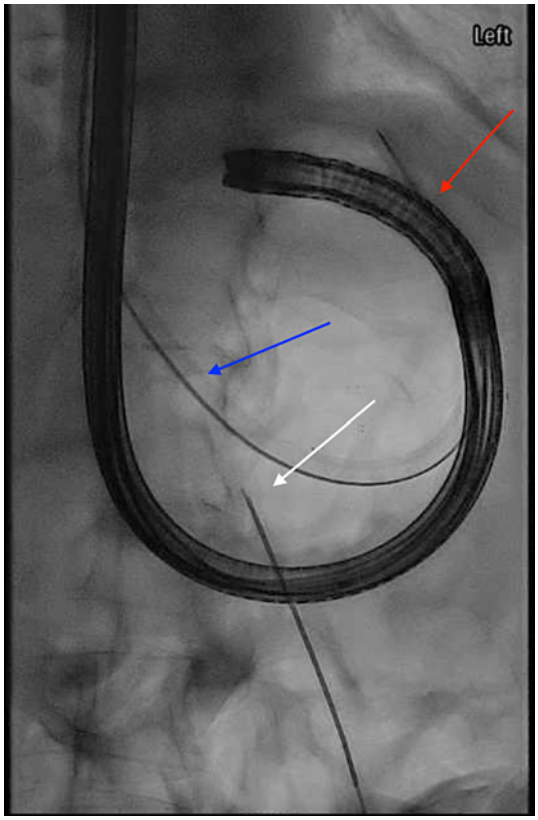

Fig. 3. Fluoroscopic image showing the introducer (white arrow) in the stomach, adjacent to the curled endoscope (red arrow). The blue arrow demonstrates the nasogastric tube within the stomach.

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Fig. 4. Post-hybrid gastrostomy placement axial CT showing successful placement (red arrow) in the previously identified narrow window.

obtained for this case report and the CARE Checklist was completed by the authors and was submitted as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000542809).

Discussion

With the anatomic barriers to traditional approaches to gastric decompression in this patient, unique approaches to gastrostomy tube placement were considered. A percutaneous endoscopic gastrostomy is the most successful method of placement, with a success rate of around 95% [11]. Our patient, however, had a very small window present on CT scan. Given the imprecise means of assessing for presence interposed bowel with 1:1 transillumination in the endoscopic approach, the small window on CT made the treatment team wary of using this approach. Considering this, a PRG was the initial plan for placement. This is a highly successful method of placement with a success rate of 94.9% [12], as reported in the literature. The main reason for failure of this technique is overlying bowel preventing a successful window to pass the gastrostomy tube [13]. In our patient, there was a small window of access on CT scan; however, NG insufflation resulted in movement of the stomach with loss of window for access via fluoroscopy.

Given the many reasonable techniques for gastrostomy tube placement, discussion on the best management approach was required. The patient had a relevant history of an ECF; therefore, surgical intervention remained relatively contraindicated due to concern for on-going intra-abdominal inflammation and thus risk for additional bowel injury during lysis of anticipated adhesions [14].

NG tube and esophageal gastrostomy decompression were also considered, but they have a higher incidence of treatment failure and poor patient tolerance compared to a gastrostomy tube [1]. For this patient in particular, any method which required suction would require ongoing stay in a rehabilitation facility, due to lack of access and insurance support for home suction systems [13].

Thus, a unique hybrid endoscopic-IR procedure to place the gastrostomy tube was successfully attempted. The treatment team hypothesized that the use of the endoscope to tent the stomach with fluoroscopic guidance, would allow for IR to safely access the stomach. After the IR team was able to access the stomach and safely introduce a guidewire, the remainder of the procedure continued as a traditional endoscopic approach with a lower risk of bowel perforation. Overall, the approach was preferable to a basic endoscopic approach due to the ability to confirm with fluoroscopy that the stomach and endoscope within were against

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Fig. 5. Sagittal CT showing the steep angle (red arrow) required to access the stomach for hybrid gastrostomy.

the abdominal wall without interposed intestines. Through this technique, we mitigated these risks via IR assisted placement of the wire – all within a single anesthesia event.

This unique case report illustrates the successful execution of a hybrid IR-endoscopic gastrostomy tube placement in a presentation that was contraindicated to, or failed, standard percutaneous techniques. Upon literature review, there were not any case reports identified describing this approach. However, the main limitation of this report is it is a single case with extenuating circumstances that may not be generalizable.

Conclusion

In patients necessitating a gastrostomy tube without a safe anatomic window for traditional percutaneous methods, a hybrid IR-endoscopic approach is an alternative, particularly in those with contraindications to surgical intervention.

Statement of Ethics

Ethics approval was not required for this study in accordance with local and national guidelines. Written informed consent was obtained from the patient for the publication of the details of their medical case and any accompanying medical images.

Conflict of Interest Statement

The authors do not have any conflicts of interest to declare.

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Author Contributions

Nicholas Girardi and Benjamin Wharton contributed equally to this paper as authors, including planning and coordination, interpretation of data, and drafting and finalization of the manuscript. Dr. Kenneth Cicuto was the radiologist for this case and contributed to data interpretation, critical manuscript review, and final approval. Alysia Wiley played a vital role in data acquisition and de-identification, critical review, and finalization of the manuscript. Dr. Lacey LaGrone was responsible for the conception of the case report, critical review of the manuscript, and final approval. All authors agree to be accountable for all aspects of the work and the ensure accuracy of the presented case.

Data Availability Statement

All relevant data analyzed during this case is included this article and its supplementary files. Further inquiries can be directed to the corresponding author.

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