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Late accidental dislodgement of a percutaneous endoscopic gastrostomy tube: an underestimated burden on patients and the health care system

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Abstract

Background—Since its introduction in 1980, the percutaneous endoscopic gastrostomy (PEG) tube has become an efficient means of providing long-term enteral access. Conveniently, the soft inner bumper allows PEG removal with relatively minimal external traction. Consequently, a major complication is accidental dislodgement, from which significant morbidity may occur. Clinicians have perhaps underestimated and underappreciated this complication, not only in the acute setting but over the lifetime of the PEG tube.

Methods—A retrospective analysis of PEG placements conducted at the authors' institution identified all PEG tubes placed between July 1, 2007 and July 1, 2010 by one faculty surgeon. Patient charts were reviewed for 30-day mortality, complications, and subsequent management. Patients were reviewed until intentional removal of the PEG, cessation of records, or patient mortality.

Results—A total of 563 PEGs were identified. The 30-day mortality rate was 7.8% (44/563), and the 7-day early accidental dislodgement rate was 4.1% (23/563). The total lifetime accidental PEG dislodgement rate was 12.8% (72/563). Of the 72 dislodged PEGs, 49 occurred after discharge from rehabilitation or nursing facilities. The vast majority required an emergency department visit, a level 3 surgical consultation, a replacement gastrostomy tube, and a radiographic confirmation of tube positioning, resulting in charges totaling an average of $1,200.

Conclusion—Many large PEG reviews report an early accidental dislodgement rate of 0.6% to 4.0%. The most clinically significant accidental removals occur in the first 7 days after placement, and open gastrostomy may cause obvious morbidity. The early dislodgement rate in this study (4.1%) is consistent with those currently reported. However, if cases are followed longitudinally, a significantly higher rate of late dislodgement (12.8%) is seen. Frequently placed into neurologically impaired or elderly patients, the PEGs that dislodge months and years later require expensive management. The late removal complication and its associated costs are overlooked and underestimated.

Keywords

Complications; Costs; Intensive care

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Introduction

The innovative technique of the “sutureless” gastrostomy was developed initially by Gauderer, Ponsky, and Izant [1] as a safe and efficient means of providing long-term enteral access for children who could not swallow. This procedure, first presented at the American Pediatric Surgical Association annual meeting in 1980, was described as the technique of approximating the stomach with the abdominal wall that avoids the need for a laparotomy. Since its initial introduction, percutaneous endoscopic gastrostomy (PEG) has rapidly become a common procedure in the adult population, with more than 215,000 PEG placements annually, making it the second most common indication for upper endoscopy [2].

Although PEG placement is an extremely safe procedure, major and minor complications do occur and have been classified and outlined by Schapiro and Edmundowicz [3] (Table 1). Highlighted in Table 1 is the major complication of “premature removal” or accidental dislodgement, which is the focus of this report. Initially, the internal bumper of the PEG tube bolsters the stomach against the anterior abdominal wall for eventual adherence and maturation of the gastrostomy track.

If accidental dislodgement occurs before maturation of the gastrocutaneous fistula tract, significant morbidity and even mortality may occur. The stomach may separate from the anterior abdominal wall, and the open gastrostomy may leak gastric contents into the peritoneal cavity. Numerous secondary complications occur with premature removal. Most of these complications are peritonitis requiring laparotomy for gastrostomy closure and peritoneal cavity irrigation [4]. Other serious complications from premature removal in the literature have included abdominal wall necrotizing fasciitis, *Candida* peritonitis, and hemoperitoneum after gastrostomy tube reinsertion [5-7].

Conveniently, the soft inner bumper of the PEG tube collapses and slides out through the gastrostomy tract, allowing the PEG to be removed electively when indicated with relatively minimal external traction. This feature allows easy PEG removal in an outpatient clinic setting without the need for sedation, repeat endoscopy, or an operation. Unfortunately, it is due to this flexible inner bumper that early accidental dislodgement is a common major complication.

Many large institutional reviews report an accidental dislodgement rate of 0% to 5.3% [8-14]. The most clinically significant accidental removals occur during the first 7 to 10 days after placement, in which the open gastrostomy causes serious complications. In many reports, premature removal is defined as occurring less than 7 to 14 days after initial placement or is not defined at all. Because the most clinically significant dislodgements occur early, before a mature gastrocutaneous fistula, these reviews lack a thorough follow-up assessment beyond a few weeks after placement.

We hypothesized, that when cases are followed longitudinally, the actual accidental dislodgement rate is markedly higher than currently reported in the literature. As the gastrostomy track heals, the stomach adheres to the anterior abdominal wall, precluding the significant morbidity that follows early accidental removal. Late dislodgements, then, are less likely to be lethal and therefore may have been underreported in the past. The late dislodgement complication and its associated costs are overlooked and underestimated in our health care system. Our study intended to quantify more accurately the burden of late accidental dislodgements on patients and providers alike.

Methods

A retrospective analysis of patients who underwent PEG placement was conducted at our tertiary care center. We identified all PEG tubes placed between July 1, 2007 and July 1, 2010 by one faculty surgeon. Patient charts were individually reviewed from the time of PEG placement through intentional removal of the PEG, cessation of records within our system, or patient mortality. Data were collected for all major and minor complications consistent with the classification scheme provided by Schapiro and provided for by the management.

Additional data were collected for all the patients with the major complication of premature removal. Using inpatient charts, radiology, and emergency department documentation, data were collected regarding the days from placement until accidental dislodgement, the need for an operation, the type of operation, and the management provided to replace the gastrostomy tube.

Billing reports from our institution's Clinical Data Repository (CDR) were used to identify approximate hospital charges for various clinical encounters, procedures, and consultations for our patients after PEG dislodgements. An estimate of additional charges for these dislodgements was performed by matching the approximate hospital charges to each individual's management after PEG dislodgement.

Results

A total of 563 PEGs were placed during our 3-year period by one faculty surgeon. Our 30-day, all-cause mortality rate was 7.8% (44/563). The 7-day early accidental dislodgement rate was 4.1% (23/563), and the total lifetime accidental PEG dislodgement rate was 12.8% (72/563).

Three major life-threatening complications occurred (in addition to the 72 accidental dislodgements). Two patients experienced significant peritonitis and sepsis after accidental PEG dislodgements, both of whom required exploratory laparotomy, gastrostomy closure, peritoneal irrigation, and open gastrostomy placement. The third patient had the initial PEG tube placed through the superior aspect of the transverse colon and positioned anterior to the stomach. This gastrocolocutaneous fistula, as classified by Schapiro, went unrecognized for several days until leakage of feculent material from around the gastrostomy was noted. The patient became septic and peritoneal, ultimately requiring an exploratory laparotomy for colon repair, gastrostomy closure, irrigation, and open gastrostomy placement. All three patients ultimately survived. Three minor complications of abdominal wall abscesses were identified in the peristomal area, requiring local incision and drainage.

Early accidental dislodgement, defined as PEGs inadvertently removed within 7 days after placement, occurred a median of 3 days after placement. Of the early accidental dislodgements, 11 were managed by direct replacement of a gastrostomy tube through the gastrostomy track followed by a contrasted radiographic study to confirm placement. For six patients, immediate replacement was either not attempted or not possible. These patients were managed with 3 to 5 days of nasogastric decompression of the stomach, antimicrobials, and placement of a new endoscopic PEG. Five patients underwent an open gastrostomy (typically for PEGs pulled in before 3 days), and the final patient did not receive a replacement tube after dislodgement.

Of the 49 PEGs dislodged more than 7 days from placement, many dislodged after discharge from the hospital (18/49) while the patients were receiving care at rehabilitation facilities or nursing homes. Slightly more than half of these patients (11/18) required an emergency

department visit, surgical consultation, a replacement gastrostomy tube, and a contrasted-radiographic study to confirm PEG positioning. The majority of the remaining patients were managed in an outpatient clinic setting, either by a surgical or gastrointestinal physician.

The CDR billing reports identified various clinical encounters, procedures, consultations, and associated charges used in the management of the patients whose PEG dislodged. Table 2 outlines these procedures, the associated current procedural terminology (CPT) codes, and the institutional hospital charges. These data are intended to provide an estimate of the financial burden and do not represent a formal cost analysis because each patient is charged differently based on various factors including insurance coverage.

Using these data, we found that patients with the major complication of peritonitis accrue at least an extra $5,160 in hospital charges (for exploratory laparotomy, general anesthesia, gastrostomy closure, and open gastrostomy placement) in addition to the extra hospital days associated with such an operation. Patients in the outpatient setting with PEG dislodgements accumulate an average charge of $1,200 (for the emergency department visit, level 3 surgical consultation, replacement gastrostomy tube, and radiographic confirmation of PEG placement), not including costly transportation to and from the emergency department or associated physician charges.

A patient whose dislodgement is managed in a clinic setting has the least expensive management, at $500 (for the office visit and replacement gastrostomy tube). Typically, radiographic confirmation is not required for these patients because they have a well-matured gastrocutaneous fistula.

Grossly, the 72 patients with accidental PEG dislodgements in this study accumulated an additional $61,900 in hospital charges for management and replacement of their PEGs after dislodgement. For this single faculty surgeon at our institution, this equals an additional minimum of $20,633 per year for the management of this major complication.

Discussion

The PEG tube has become a common and efficient means for providing patients with long-term enteral access for nutrition. It has become the preferred method for gastrostomy placement in many patient populations including those with trauma [15]. Findings have shown that PEG involves fewer major and minor complications than open surgical gastrostomy, obviates the need for patient transfer to the operating room, avoids the risks of general anesthesia, is less costly, and allows earlier initiation of tube feeding after placement. A prospective, randomized clinical trial supports these findings of significantly fewer complications, shorter procedural time, and fewer resources used [16].

Our institution's 30-day, all-cause mortality rate of 7.8% (44/563) is consistent with current reports in the literature (7.8–19.1%) and expectedly high due to the major medical conditions necessitating PEG placement [9, 14, 17]. Our minor complication rate of 0.5% (3/563) is markedly lower than that currently reported in the literature (3.8–10.7%) [8-11, 13] and likely is due to our focus on premature removals and the limitations of a retrospective design. A higher minor complication rate almost certainly occurred because we did not identify any PEG tube leakages, obstructions, or cases of local cellulitis, of which there certainly were several cases.

Our major complication rate, excluding premature removal, was 0.5% (3/563). This rate increases to 13% (73/563) if we include premature removal consistent with Schapiro's complication classifications. This major complication rate is significantly higher than the currently reported rates of 1.9% to 8.0% [8-11, 13]. We believe there is significant under-

identification of accidental PEG dislodgements beyond 1 to 2 weeks. Inclusion of these PEG dislodgements would potentially have greatly increased the major complication rates in previous reports.

The reported early accidental dislodgement rate of 0% to 5.3% is likely derived from the most clinically significant dislodgments due to early complications [8-14]. Our early dislodgement rate (4.1%) is consistent with these current reports. However, if the cases are followed longitudinally, a significantly higher rate of late dislodgement is seen (12.8%). These late accidental dislodgements, occurring months to years later, do not typically require invasive operations or significant faculty involvement. However, they do require expensive transportation to and from patient facilities, costly and time-intensive emergency room visits, surgical consultations, and radiographic confirmation. This becomes a significant frustration to patients, long-term care facilities, and health care providers alike.

Our estimate of $20,633 per year for the management of this major complication can be applied to approximate the extent of this problem on a national scale. Assuming that 215,000 PEGs are placed annually and that our institutional 188 annual PEGs accrued an additional $20,633 in PEG dislodgement management charges, this equates nationally to a $23,596,250 problem. This estimate likely far underestimates the additional costs because these figures do not include the individual physician charges, hospital days, transportation, and additional time and administrative costs associated with these events.

A few reports describe specific approaches to minimize or decrease accidental PEG dislodgement. Other than changes in the consistency or shape of the inner bumper, few strategies have been documented. One possible approach would be the routine use of T-fastener/anchor systems to prevent disruption of the PEG tract if dislodgement does occur. This approach has been used in the pediatric population and in laparoscopic approaches to gastrostomy to stabilize the newly formed gastrocutaneous fistula and allow appropriate maturation of the tract [18, 19]. Routine use of these T-fasteners may decrease major complications such as pneumoperitoneum, intraabdominal leakage of tube feeds, and peritonitis secondary to PEG dislodgement and subsequent open gastrostomy in the peritoneal cavity. It also may facilitate a more efficient replacement of dislodged PEG tubes due to maintenance of the stomach against the anterior abdominal wall.

Despite the benefits that T-fasteners may provide, they do not protect against accidental dislodgement of the PEG tube itself. This is again dependent on PEG tube design and ease of removal. Cases of major complications due to retained T-fasteners have been reported, including patent sinus tract formation around the fixation sutures resulting in pneumoperitoneum [20]. Therefore, the use of this fixation method also does not entirely prevent major complications after PEG tube placement and again does not prevent the major complication of PEG dislodgement itself.

A second mechanism by which accidental dislodgement may be reduced is intentional replacement of the PEG tube with a balloon-tipped gastrostomy tube. This could occur only after complete maturation of the gastrocutaneous fistula tract (~4 weeks) and would require an additional clinic visit. Although we do not have data to support this, it is logical that a filled balloon would not as easily pass through the tube tract and become dislodged. The vast majority of initial gastrostomy tubes are placed percutaneously and therefore do not have an existing balloon as the internal component.

Conclusion

The major complication of accidental PEG dislodgement and its associated costs are greatly underestimated and overlooked. Having become the “Achilles heel” of PEG tube placement,

premature removal is typically accepted as a common, well-described, but poorly quantified complication. Little has been done to develop prevention plans for this complication. Soft wrist restraints, hand mitts, and abdominal binders have only minimally reduced the dislodgement rates and are applicable only to patients who are hospitalized or in an otherwise closely monitored care situation. Unfortunately, it is not only direct patient removal that leads to PEG dislodgement but also activities of physical therapy, patient transfers, and rolling.

Lifetime rates of accidental PEG dislodgement are underreported in the literature because this major complication is generally life-threatening only during the first week or two after placement, before maturation of the gastrocutaneous fistula. These data suggest that further research is needed to develop a novel mechanism to secure new PEGs or to improve the design of the soft inner bumper to prevent this significant burden to the health care system. Although no satisfactory answer currently exists, our institution is investigating the development of a novel PEG safety mechanism to improve patient safety and to reduce the burden of dislodgment to the health care system.

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Table 1

Minor and major percutaneous endoscopic gastrostomy (PEG) complications

Minor	Major
Peristomal wound infection	Aspiration
Tube obstruction	Peritonitis
Tube fragmentation	Premature removal
Tube migration into the small bowel	Tube migration through the gastric wall
Leakage around PEG tube	Perforation
	Gastrocolocutaneous fistula
	Hemorrhage
	Necrotizing fasciitis
	Tumor implantation at the stoma site

Consistent with the classification scheme from Schapiro and Edmundowicz [3]

Table 2

Approximate hospital charges per procedure

Procedure description	Current procedural terminology code	Hospital charge ($)
Percutaneous endoscopic gastrostomy (PEG), initial	43246	730
Replacement gastrostomy, percutaneous, no endoscopy	43760	330
Fluoroscopic PEG placement, no endoscopy	49440	2,410
Open gastrostomy tube, operating room	43830	1,320
General anesthesia, abdominal wall operation	00700	940
Laparotomy, closure of gastrostomy	43840	2,900
Two-view abdominal plain film, confirmation	74020	65
Level 3 surgical consultation	99253	265
Emergency department visit for PEG dislodgement	99284	540
Office visit, replacement gastrostomy tube	99232	170