

# The effect of increased case volume on percutaneous endoscopic gastrostomy outcomes: A single endoscopist experience

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## Abstract

### Background

The technique of percutaneous endoscopic gastrostomy (PEG) is performed at low volumes in many developing countries in the Caribbean. The PEG technique has been in use for eight years at a service hospital in Jamaica and over this time we have noted a progressive increase in case volume. We studied the effect of the increase in case volume on PEG outcomes.

### Methods

We carried out a retrospective audit of all PEG procedures performed by a single endoscopist at this institution from January 1999 to December 2006. The data were divided into two groups for analysis. Group A consisted of patients who had PEG placement within the first four years of its utility. The patients who had PEG placement between January 2003 and December 2006 were placed into group B. Data were compared using Fisher's exact test and Chi square statistics.

### Results

There were 161 PEG tubes placed in 155 patients during the study period with procedure-specific complications in 8.7% of cases. The yearly case volume has doubled for group B (13.8 vs 26.5) and this has been accompanied by a significant fall in PEG-specific morbidity (17.7% vs 4.1%;  $P = 0.01$ ). There has also been a trend toward increased mortality within group B at seven days (0 vs 4.1%;  $P = 1.0$ ) and at thirty days (9.8% vs 18.4%;  $P = 0.465$ ).

### Conclusions

The increase in case volume has contributed to the endoscopist's proficiency with this technique, leading to significant reduction in PEG-related morbidity. We must ensure that endoscopists are provided with adequate supplies, sufficient operating time and dedicated space in order to maintain good outcomes.

## INTRODUCTION

Although the endoscopic technique of gastrostomy creation has been in clinical use for over two decades, it is still performed at low volumes in many developing countries in the Caribbean. In 2003, a publication from Trinidad reported that only ten percutaneous endoscopic gastrostomy (PEG) tubes were placed over a period of four years. We expect that in this type of low volume setting the incidence of complications would be higher than that from larger centers.

The technique is still relatively novel at our institution in Jamaica, where the first PEG tube was sited in 1999. Since this time, we have seen a progressive increase in our case volume. We performed a retrospective audit of all

consecutive procedures performed by a single endoscopist in this setting to document the relationship between increasing case volume and complications.

## METHODS

A single endoscopist performed all the procedures in this study in a minor operating theatre. The patients were routinely starved for 12 hours prior to the procedure. Antibiotic prophylaxis was routinely employed using one gram of a third generation cephalosporin approximately 30 minutes prior to the procedure. Commercially available PEG kits were used for these procedures (Ponsky® PEG Kit: Bard Endoscopic Technologies, Massachusetts, USA; Cook® PEG Kit: Wilson-Cook Medical Inc, North Carolina,

USA).

After informed consent, a complete gastroscopy was performed under intravenous sedation with Midazolam and Pethidine hydrochloride when necessary. The PEG entry site was chosen by abdominal wall palpation during the gastroscopy. An assistant infiltrated the area with local anesthetic (1% Lidocaine) prior to insertion of the PEG trocar. A guidewire was passed across the sheath into the stomach. It was grasped with an endoscopic snare and pulled retrograde into the mouth. The tapered end of the gastrostomy tube was attached and pulled into place by traction on the guidewire across the abdominal wall. The PEG tube was secured with the provided bumpers. Gastroscopy was routinely repeated to confirm proper tube position and detect complications.

A wound infection was considered present when there was a purulent discharge or positive wound culture that was associated with tenderness, localized swelling and/or erythema and was identified within 30 days of operation. Hemorrhage was considered significant when there was clinical evidence of bleeding, such as melena or haematemesis, with an associated fall in the hemoglobin concentration by at least 2gm/dl. Perforation included retroperitoneal or bowel wall leaks documented by any radiographic technique or at operation. Gastric fistulae were defined as an abnormal communication between the gastric lumen and internal viscera and/or skin demonstrated radiographically or at operation. Aspiration was considered present when there was clinical or radiographic evidence that oral or gastric contents entered the broncho-pulmonary tree. We included patients who did not have obvious evidence of vomiting, but developed signs of respiratory compromise or pneumonia (dyspnoea, cyanosis, tachycardia, hypotension and radiographic changes) in the post-operative period.

The hospital records of all patients who had PEG placement between January 1999 and December 2006 were retrieved. The patients were divided into two groups. Group A consisted of patients who had PEG placement between January 1, 1999 and December 30, 2002. Patients who had PEG placement between January 1, 2003 and December 30, 2006 were placed into group B.

The data extracted from the hospital records included patient demographics, success rates, PEG-related complications and mortality. The data were input into a Microsoft Excel<sup>®</sup> worksheet and analyzed using SPSS version 12.0.

Comparisons between both groups were made using chi-square statistics and Fisher's exact test. Significance was considered present with a two-tailed P value < 0.05.

## RESULTS

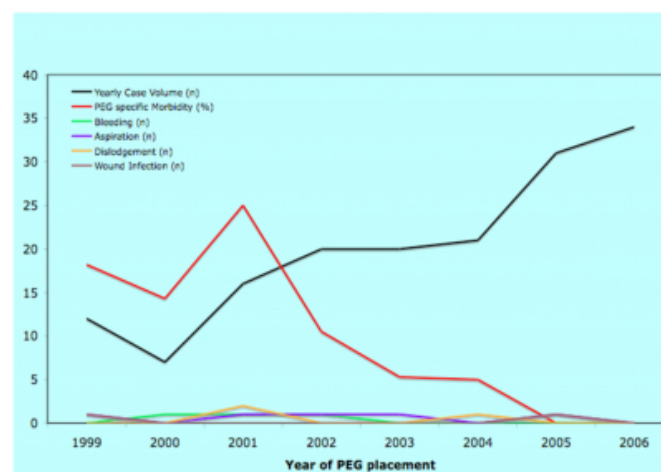
The single endoscopist placed 161 PEG tubes in 155 patients during the study periods. There were 63 males and 98 females, with ages ranging from 17 to 97 years (Mean  $\pm$  SD: 73 $\pm$ 16.7). The commoner indications were dysphagia due to acute cerebro-vascular accidents (51.4%), chronic neurologic disorders (13.8%), head and neck neoplasms (8.6%), blocked indwelling PEG tubes (8.6%) and traumatic brain injuries (5.8%).

The hospital records for 10 patients could not be retrieved for analysis. Of the remaining 151 patients, two procedures were unsuccessful. These patients were excluded from further analysis. A total of 149 patient records were included in the final analysis.

The yearly case volume doubled for group B and there was a concomitant decrease in overall complications during this period (Fig. 1). There was PEG-related morbidity in 8.7% of patients.

### Figure 1

Figure 1: Chronologic Analysis of Morbidity in PEG Placement



There was 2.7% mortality within one week and 15.4% mortality within 30 days of PEG placement. There were no reports of stomach perforation, gastro-enteric fistulae or peritonitis in this series. Table 1 compares the outcomes between the study groups.

**Figure 2**

Table 1: Comparison of Outcomes of PEG Tube Placement by a Single Endoscopist

Parameter	Total Study Period	Group A	Group B	P Value
Total Number of Cases	161	55	106	-
Yearly Case Volume	20.13	13.75	26.5	-
Successful PEG Placement	149/151	51/52 (98.1%)	98/99 (99%)	-
Overall Morbidity	15/149 (10.1%)	10/51 (19.6%)	5/98 (5.1%)	0.005
PEG-specific Morbidity	13/149 (8.7%)	9/51 (17.7%)	4/98 (4.1%)	0.011
• Aspiration	5 (3.4%)	3 (5.9%)	2 (2.0%)	1.000
• PEG Dislodgement	3 (2.0%)	2 (3.9%)	1 (1.0%)	
• Wound Infection	2 (1.3%)	1 (2.0%)	1 (1.0%)	
• Bleeding	3 (2.0%)	3 (5.9%)	0	
• Perforation / Peritonitis	0	0	0	
• Gastro-Enteric Fistula	0	0	0	
Pulmonary Embolism	2 (1.3%)	0	2 (2.0%)	
Mortality at 7 days	4 (2.7%)	0	4 (4.1%)	1.000
Mortality at 30 days	23 (15.4%)	5 (9.8%)	18 (18.4%)	0.465

## DISCUSSION

The PEG technique has now surpassed the traditional open surgical approach for gastrostomy creation because it is a technically simple operation that can be performed without general anesthesia or a laparotomy. <sup>1,2</sup>

Many centers in developed countries place PEG tubes at high volumes. <sup>2,3</sup> Although the technique is becoming increasingly popular in Caribbean countries, most centres still perform these procedures at low case volumes. <sup>1</sup>

During the first year after the introduction of PEG at our institution, a single endoscopist began offering this service at a low volume of only 12 cases per year. This was partly due to the limited availability of operating lists and the long duration of individual cases.

Although there has been no change in the length or number of available operating lists over the ensuing seven years, we have recorded a two-fold increase in case volume between the two study periods from 13.75 to 26.5 cases yearly. This is most likely due to increased proficiency of the endoscopist, now requiring less time to perform individual procedures.

As expected, there has been a four-fold reduction in the incidence of PEG-specific complications from 17.7% for group A to 4.1% for group B. Although the morbidity in

both groups lies within the 4-30% range that is reported from high volume centres, <sup>2,3,4,5,6,7</sup> the reduction is important because these patients are usually debilitated and unable to tolerate any adverse events.

There has been a downward trend in the incidence of aspiration from 5.9% to 2%, but it has not achieved statistical significance. However, the incidence of aspiration has only now come down to acceptable levels that are reported to range from 0.5-2% in large volume centers. <sup>8,9</sup> We believe that this is clinically significant because these patients are unable to protect their airway, and this leads to mortality exceeding 50% when patients aspirate gastric contents during PEG placement. <sup>9,10,11,12</sup>

There has not been any significant change in the incidence of the remaining individual PEG-specific complications, but this is probably due to the small number of occurrences. The remaining individual complications are all comparable to the incidence reported from large volume centres. <sup>8,10,11,12</sup>

There has been no significant difference in failure rates across the study periods. But failure rates were already remarkably low in both patient groups and compare well to large volume centers. <sup>2,9,13</sup>

The patients who require PEG tubes are usually in poor general condition and this is reflected by high mortality rates within one month of PEG placement. <sup>14</sup> We believe that the seven-day mortality is a closer reflection of procedure-related complications. There was an increase in the seven-day mortality between the study periods from 0 to 4.1%. The trend did not achieve statistical significance, but the absolute figures are slightly higher than PEG-related mortality from larger reports that range from 0-2%. <sup>2,8,15</sup> One possible explanation is that the now skilled endoscopist may be attempting increasingly difficult cases. With increased experience, this is likely to fall once more, but assessment of this part of the learning curve will require reassessment of future data.

## CONCLUSIONS

An increase in PEG case volume enhances the experience of endoscopists, and so facilitates reduction in procedure-related morbidity. In order to maintain good outcomes, we need to ensure that we provide endoscopists who offer this service with adequate supplies and sufficient operating time and space to perform PEG.

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