



Comparing open gastrostomy tube to percutaneous endoscopic gastrostomy tube in heart transplant patients



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H I G H L I G H T S

- OGT may result in less mortality than PEG in heart transplant patients.
- Complications occur more frequently when heart transplant recipients receive PEG.
- PEG in heart transplant recipients does not result in decreased LOS or total cost.

A R T I C L E I N F O

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Introduction: Impaired wound healing due to immunosuppression has led some surgeons to preferentially use open gastrostomy tube (OGT) over percutaneous gastrostomy tube (PEG) in heart transplant patients when long-term enteral access is deemed necessary.

Methods: The National Inpatient Sample (NIS) database (2005–2010) was queried for all heart transplant patients. Those receiving OGT were compared to those treated with PEG tube.

Results: There were 498 patients requiring long-term enteral access treated with a gastrostomy tube, with 424 (85.2%) receiving a PEG and 74 (14.8%) an OGT. The PEG cohort had higher Charlson comorbidity Index (4.1 vs. 2.0, $p = 0.002$) and a higher incidence of post-operative acute renal failure (31.5 vs. 12.7%, $p = 0.001$). Post-operative mortality was not different when comparing the two groups (13.8 vs. 6.1%, $p = 0.06$). On multivariate analysis, while both PEG (OR: 7.87, 95%CI: 5.88–10.52, $p < 0.001$) and OGT (OR 5.87, 95%CI: 2.19–15.75, $p < 0.001$) were independently associated with mortality, PEG conferred a higher mortality risk.

Conclusions: This is the largest reported study to date comparing outcomes between PEG and OGT in heart transplant patients. PEG does not confer any advantage over OGT in this patient population with respect to morbidity, mortality, and length of stay.

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1. Introduction

Heart transplantation is the gold standard treatment for patients with end stage heart failure (HF) refractory to medical management [1]. While many studies have focused on increasing the donor pool for heart transplant recipients [2–7], few studies

have focused on maximizing survival and quality of life in these patients. Occasionally, heart transplant recipients may require long term enteral access because they are not capable of eating and/or not meeting their nutritional demands. Percutaneous gastrostomy tube (PEG) has become the procedure of choice given its lower cost and postoperative complication rate compared to open surgical gastrostomy (OGT) [8,9]. Heart transplant patients present a unique obstacle as they require immunosuppressive medications to prevent rejection that have the unintended effect of impairing wound healing [10]. Open gastrostomy tube allows suturing of the stomach

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to the anterior abdominal wall which may decrease the risk of tube dislodgement and intra-peritoneal contamination as compared to PEG tube. To date, there have been no studies comparing outcomes between PEG and OGT in heart transplant patients. The goal of this study is to compare postoperative morbidity and mortality in open surgical gastrostomy versus percutaneous gastrostomy tube in heart transplant patients. We hypothesize that heart transplant patients undergoing OGT would have better outcomes as compared to PEG because of impaired wound healing secondary to immunosuppression.

2. Methods

2.1. Database

The National Inpatient Sample (NIS) Database developed by the Healthcare Cost and Utilization Project (HCUP) was used for this study. This database contains data from approximately 7 million hospital stays each year from a stratified sample of 20% of non-federal US hospitals. The NIS is the largest publicly available all payer inpatient health care database in the United States. Our analysis was based on a self-weighting design that reduces the margin of error for estimates and produces population based estimates. The NIS is a publically available de-identified database and was granted exempt status from our IRB committee.

2.2. Study population

Adult heart transplant patients that underwent PEG tube or OGT placement between 2005 and 2010 were identified by the International Classification of Disease, Ninth Revision (ICD-9) diagnosis and procedure code. Patients were selected based on diagnosis code for heart transplant (V42.1) and then separated into groups based on the procedure code for open gastrostomy tube (43.19) and percutaneous gastrostomy tube (43.11).

2.3. Data and statistical analysis

The primary outcome was inpatient mortality after gastrostomy tube placement. Secondary outcomes included in-hospital complications, length of stay, and cost. Common postoperative complications were identified by ICD-9 code as established in previous studies [11]. All continuous variables are presented as mean \pm standard deviation. Weighted frequencies and weighted multivariate logistic regression analysis using clinically relevant variables were used to examine post-operative complications and mortality. Covariates included in the model were age, female sex, race, hospital bed size, Charlson comorbidity index, PEG tube and OGT placement. Odds ratio (OR) with 95% confidence intervals were presented for each covariate. A *p*-value less than 0.05 was considered statistically significant. Data was analyzed using SAS 9.2 software (SAS Institute, Cary, NC).

3. Results

3.1. Baseline characteristics

A total of 498 heart transplant recipients required enteral access. Of these, 424 (85.1%) underwent PEG tube and 74 (14.9%) underwent OGT placement. As seen in Table 1, the patients in these two groups were not significantly different with respect to male gender (76.2% vs. 78.4%, *p* = 0.68) and age (56.3 vs. 42.7, *p* = 0.08). The PEG cohort had higher Charlson Comorbidity Index (4.1 vs. 2.0, *p* = 0.003), was more likely to be Caucasian (73.5% vs. 53.3%, *p* < 0.001), and more likely to have Medicare (56.5% vs. 30%,

Table 1
Baseline characteristics of patients undergoing gastrostomy tube placement.

	PEG (n = 424)	OGT (n = 74)	p Value
Age	56.3 \pm 48.9	42.7 \pm 59.5	0.08
Charlson Comorbidity Index	4.1 \pm 5.3	2.0 \pm 5.2	0.003
Male (%)	323 (76.2)	58 (78.4)	0.68
Caucasian (%)	312 (73.5)	39 (53.3)	<0.001
Hispanic (%)	13 (3.1)	13 (18.3)	<0.001
Other Race (%)	36 (8.4)	5 (7.5)	<0.001
Private Insurance (%)	111 (26.2)	31 (42)	<0.001
Medicare (%)	239 (56.5)	15 (20)	<0.001
Medicaid (%)	59 (13.8)	23 (31.6)	<0.001

p < 0.001). The PEG cohort was less likely to be Hispanic (3.1% vs. 18.3%, *p* < 0.001) and less likely to have private payer status (26.2% vs. 42%, *p* < 0.001).

3.2. Post-operative outcomes

As seen in Table 2, the PEG cohort had higher incidence of acute renal failure when compared to the OGT group (31.5% vs. 12.7%, *p* = 0.001). Post-operative pneumonia (3.4% vs. 0, *p* = 0.11), surgical site infection (4.8% vs. 6.4%, *p* = 0.56), DVT (3.5% vs. 0%, *p* = 0.10), and incidence of pulmonary embolus (PE) (2.6% vs. 0%, *p* = 0.16) were not different when comparing the two groups. Total hospital charges (\$224,000 vs. 183,000, *p* = 0.41) were also similar (Fig. 1). Patients receiving OGT had a shorter length of stay (20.0 vs. 15.0, *p* = 0.01).

3.3. Survival

Postoperative mortality in the PEG cohort was not significantly higher than the OGT cohort (13.8% vs 6.1%, *p* = 0.07). On multivariate analysis, as shown in Table 3, while both placement of PEG tube (OR: 7.87, 95%CI: 5.88–10.5, *p* < 0.001) and OGT (OR 5.87, 95% C.I: 2.19–15.75, *p* < 0.001) were associated with mortality, PEG tube added greater mortality risk. Charlson Comorbidity Index (OR 1.23, 95% C.I: 1.18–1.27, *p* < 0.001) and increasing age (OR 1.01, 95% C.I: 1.0–1.01, *p* < 0.005) were also associated with increased mortality. Variables associated with better survival included Caucasian race (OR: 0.87, 95%CI: 0.79–0.96, *p* < 0.005) and admission to a teaching hospital (OR: 0.83, 95%CI: 0.75–0.92, *p* < 0.001).

4. Discussion

Percutaneous gastrostomy tube (PEG) has become the method of choice for long term enteral access in the majority of patients given its cost effectiveness and ease of use compared to open surgical gastrostomy (OGT) [9]. While there is a consensus that PEG should be the procedure of choice in most patients [12], data on which procedure benefits heart transplant recipients is lacking. These patients present a unique obstacle as they require high doses

Table 2
Outcomes of patients undergoing gastrostomy tube placement.

	PEG (n = 424)	OGT (n = 74)	p Value
Mortality (%)	58 (13.8%)	4 (6.1%)	0.066
Acute Kidney Failure (%)	133 (31.5)	9 (12.7)	0.001
Pneumonia	14 (3.4%)	0 (0%)	0.11
DVT	15 (3.5%)	0 (0%)	0.102
Pulmonary Embolism	11 (2.6%)	0 (0%)	0.16
Surgical Site Infection	20.2 (4.8%)	5 (6.4%)	0.56
Length of Stay (mean, days)	20.0	14.0	0.01
Hospital Charges	224 k \pm 575 k	183 k \pm 353 k	0.414

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