Enteral Feeding via Percutaneous Endoscopic Gastrojejunostomy(PEGJ) Tubes Decreases Risk of Aspiration and Tube Dislodgement Related Complications Compared to PEGs.

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Abstract:
Background: Protein-calorie malnutrition is a common problem that develops in patients requiring management in the surgical intensive care unit (SICU). The use of durable enteral feeding tubes to help meet their nutritional needs has grown dramatically over that past three decades. However, prepyloric enteral feeding has been associated with increased aspiration risks.
Hypothesis: We hypothesize that the percutaneous endoscopic gastrojejunostomy (PEGJ) tubes decrease the risk of aspiration compared to PEG in critically ill SICU patients.
Materials and Methods: We retrospectively reviewed the medical records of 106 ICU patients who underwent PEG/PEGJ tube placement at an urban teaching hospital between September 2009 and May 2013. We evaluated the records for aspiration events, aspiration pneumonia, tube dislodgement, intra-abdominal sepsis, reoperation, pre-albumin, hospital and ICU length of stay, and outcome, including mortality. This study was approved by the MSM Institutional Review Board.
Results: There were 54 PEG tubes (34.9% male 16% female) and 52 PEGJ tubes (34.9% male and 14.2%) placed. Aspiration occurred in 5 (9.3%) patients with PEG tubes and 2 (3.80%) with PEGJ tubes. Aspiration pneumonia occurred in 1 (1.90%) patient in both groups. Tube dislodgment occurred in 11 (20.4%) patients with PEG tubes versus 4 (7.7%) with PEGJ tubes. Preoperative prealbumin was 11.2mg/dL(PEG) and 12.2mg/dL(PEGJ). Discharge pre-albumin was 16.3mg/dL(PEG) versus 17.5mg/dL(PEG) (normal=15-35mg/dL).
Conclusion: In this study, there was no significant difference between the two feeding tubes in regards to nutrition, dislodgment and it's associated morbidity; however, ICU LOS significantly favored the PEG tube population. An increased power is needed to analyze the morbidity and mortality associated with these enteral feeding tubes.

I. INTRODUCTION

Protein-calorie malnutrition is a common problem that can develop in critically ill patients requiring prolonged management in the intensive care setting. Depending on the severity of the injury or extent of the operation, caloric and protein needs rise significantly. Although the best means to provide nutrition in these compromised patients is debatable, Percutaneous Endoscopic Gastrostomy (PEG) and Percutaneous Endoscopic Gastrojejunostomy (PEGJ) are two less

invasive, modern procedures that are able to deliver proper enteral nutrition to patients who have poor oral intake due either to neurological dysphagia, respiratory failure with ventilator dependence, or trauma induced altered mental status or oropharyngeal dysfunction, [1]. Jejunostomy tube feeding offer all of the benefits of PEG tubes but have been suggested to decrease the morbidity and mortality associated with feeding tube-related respiratory disease by significantly reducing the risk of pulmonary aspirations in patients as well as decreasing the time necessary to reach adequate nutritional status.

As opposed to some of the older, open and more invasive techniques, PEG and PEGJ procedures provide access to the proximal gastrointestinal tract for nutritional support without requiring significant violation of the abdominal wall or by passing a tube through the esophagus [2]. Initially, PEGs were used to meeting nutritional needs for children in 1980s. However, the use of both enteral feeding tubes has grown dramatically over that past three decades [1]. Many patients who undergo enteral feeding take on a few risks, including, aspirations and aspiration related pneumonia due to gastroesophageal reflux and intra-abdominal sepsis related to tube dislodgement. [3].

PEG and PEGJ tubes typically require endoscopic placement and positioning. PEG tubes empty their contents directly into the stomach. PEGJ tubes, which are PEG tubes with a 10 French silastic feeding tube passing through the gastrostomy port into the stomach, across the pylorus, through the duodenum, and past the ligament of Treitz into the proximal jejunum. The portion of the tube giving access and stopping in the stomach is used for decompressing the stomach and providing medication [1].

Overall, percutaneous endoscopic enteric feeding tubes have been shown to provide better health outcomes, increased quality of life for patients, decreased expenses, and less strain on the healthcare system [4]. PEGJs along with all of the benefits of PEG's, and similar to open jejunostomy tube feeding, may reduce the risk of pulmonary aspirations and decrease the time to reach sufficient nutritional intake [5, 6]. This study of percutaneous endoscopic enteral feeding tubes seeks to analyze which type of feeding tube reduces risk of unfavorable events, such as aspiration and tube dislodgement, in critically ill patients. The purpose of this study is to evaluate complication rates of PEGJ versus PEG and determine which tube is more favorable for the provision of nutritional support.

II. MATERIALS AND METHODS

We retrospectively reviewed the medical records of 106 ICU patients who underwent PEG/PEGJ tube placement at an urban teaching hospital between September 2009 and May 2013. We evaluated the records for aspiration events, aspiration pneumonia, tube dislodgement, intra-abdominal sepsis, reoperation, pre-albumin, hospital and ICU length of stay, and outcome, including mortality. This study was approved by the MSM Institutional Review Board. Prealbumin was used as a mark of nutritional status. Ranges were set to access adequate nutrition: 15-35=nutritionally adequate, 11-15=risk of malnutrition, 5-10.9=malnourished, <5mg/dL=severely malnourished. Pre-procedural morbid conditions such as sepsis and pneumonia were documented to identify confounding factors related to known complications associated with enteral feeding tubes. All data was compiled and underwent statistical analysis using Minitab.

III. RESULTS

Of 106 enteral tubes, there were 54 PEG tubes (68.5% male 31.5% female) and 52 PEGJ tubes (71.2% male and 28.8%) placed. In the PEG population, 28(51.9%) of the patients were African American, 22(40.7%) of the patients were Caucasian, and 4(7.41%) were Hispanic, Native

American, or Asian. In the PEGJ population, 27(51.9%) of patients were African American, 17(32.7%) of patients were Caucasian, and 8(15.4%) were Hispanic, Native American, or Asian.
Aspiration occurred in 5(9.26%) patients with PEG tubes and 2(3.85%) with PEGJ tubes. Aspiration pneumonia occurred in 1 patient in both PEG and PEGJ groups (1.85% and 1.92%, respectively).
11(20.4%) gastrostomy tube dislodgments were accounted for in the PEG population while 4(7.69%) dislodgments were accounted for in the PEGJ group. In addition, the PEGJ population required 2(3.85%) biliary tube repositionings after initial placement.
On admission, prealbumin was averaged at 14.4mg/dL in the PEG population and 14mg/dL in the PEGJ population (p=0.69). Pre-operative prealbumin was averaged at 11.2mg/dL in the PEG population and 12.2mg/dL in the PEGJ population (p=0.86). Discharge prealbumin was averaged at 16.3mg/dL in the PEG population and 17.5mg/dL in the PEGJ population (p=0.84). Time to nutritional goal was averaged at 23.5 days in the PEG population and 26.3 in the PEGJ population. 30(55.6%) of the PEG population did not reach the set nutritional goal by discharge. 30(57.7%) of patients in the PEGJ population did not reach their nutritional goal by discharge.
Pre-morbidity was accounted for in both groups: Sepsis was present in 14(25.9%) of PEG patients and 13(25.0%) of PEGJ patients. Pneumonia was present in 11(20.4%) of PEG patients and 20(38.5) of PEGJ patients. Mortality was 5(9.26%) in the PEG population and 5(9.62%) in the PEGJ population.
Patients who had a PEG tube placed stayed in the hospital for an average of 52 days while patients who had a PEGJ tube placed stayed in the hospital for an average of 41 days (p=0.69). Patient who had a PEG tube placed stayed in the ICU for 10.6 days while patients who had a PEGJ tube placed stayed in the ICU for 17.6 days (p=0.04).

n=106	PEG (n= 54)		PEGJ (n= 52)		P-value (0.05)
	Male	Female	Male	Female	
Gender	37 (68.5%)	17 (31.5%)	37 (71.2%)	15 (28.8%)	
	African American	Caucasian	African American	Caucasian	
Ethnicity	28 (51.9%)	22 (40.7%)	27 (51.9%)	17 (32.7%)	
Pre-Morbidity	25 (46.3%)		33 (63.5%)		
	Sepsis	Pneumonia	Sepsis	Pneumonia	
	14 (25.9%)	11 (20.4%)	13 (25.0%)	20 (38.5%)	
Aspirations	5 (9.26%)		2 (3.85%)		
Aspiration Pneumonia	1 (1.85%)		1 (1.92%)		
Trauma Related	28 (51.9%)		37 (71.5%)		
Mortality	5 (9.26%)		5 (9.62%)		
Hospital LOS	52 days*		41 days*		0.69
ICU LOS	10.6 days*		17.6 days*		0.04
Tube Repositions	0 (0.00%)		2 (3.85%)		
Tube Dislodgements	11 (20.4%)		4 (7.69%)		
Admission Prealbumin	14.4 mg/dL*		14 mg/dL*		0.69
Pre-operation Prealbumin	11.2 mg/dL*		12.2 mg/dL*		0.86

Discharge Prealbumin	16.3 mg/dL*	17.5 mg/dL*	0.84
Time to Nutritional Goal	23.5 days*	26.3 days*	0.60
Did Not Reach Goal	30 (55.6%)	30 (57.7%)	

Table 1: 106 Patients were evaluated and divided into two groups: Percutaneous Endoscopic Gastrostomy (n=54) Percutaneous Endoscopic Gastrojejunostomy (n=52). Prealbumin Ranges (Normal= 15-35, Increased Risk= 11-15, High Risk= 5-10.9, Poor Prognosis= <5.0[7]) *represent averaged values.

IV. DISCUSSION

Historically, in the presence of poor oral intake, percutaneous endoscopic procedures are preferential and highly effective at providing nutrition[5]. ICU patients who are compromised by their condition and require an enteral feeding tube need proper means of nutritional support with minimal risks associated with the selected feeding strategy.

Evidence shows that PEGJ tubes can be used to reduce the risk of aspiration[8]. PEGJ tubes do have tendency to migrate back towards the pylorus[9], but this is an easy adjustment compared to PEG dislodgement and dealing with aspiration related risks along with discontinued feeding. Evidence also suggests that jejunal extensions may provide a faster means of tolerably reaching adequate nutritional levels[5].

In our study, we found patients receiving PEG tubes had a lower pre-morbidity rate in comparison to patients with PEGJ's. No episodes of intra-abdominal sepsis occurred after tube placement. The risk of aspiration is noted to be higher in the PEG population but statistical analysis revealed no significant difference. Overall, two aspiration related pneumonia events were seen in the PEG populations and only one in the PEGJ population. Only one individual in each population had an aspiration event accompanied by an episode of pneumonia. These patients may be outliers, but a larger population will be needed to further assess the risk. Due to the nature of SICU patients with respiratory infections, it is plausible that aspiration events were higher than noted by the staff during each patient's stay.

The sum of tube complications favored PEGJ tubes with an overall rate of 10.4% to 3.77%. 11 complications were noted with PEG tubes while patients who received PEGJ tubes had only 6 complications. With more study, PEGJ's could prove to be more reliable in regards to stability. Stable continuous nutrition is of vital importance in SICU patients as noted repeatedly throughout the literature.

Both patient populations were found to be at risk for malnutrition at admission and pre-operatively. Approximately half of the patients reached adequate nutritional status by discharge. Due to prealbumin's sensitivity at detecting changes in recent diet, the small difference between both groups' discharge values may be quite significant. The percent of each population that did not reach their nutritional goal, as assessed and recommended by a dietician, showed no difference, but there was a three day span between the time it took to reach those goals in favor of gastric feeding via PEG tube, which is contrary to what evidence has shown [5]. Of note, there is significant difference between ICU LOS whereas no difference in LOS was evidenced in the literature [4],[5]. Patients with PEGJ tubes tended to remain in the ICU nearly a week longer than those with PEG tubes. The nature of the PEGJ patients' admission may factor heavily into this as 71.2% of these patients were admitted as trauma patients.

V. CONCLUSION

The data supports that PEGJs have an advantage over PEG tubes in regards to stability, aspiration risk, and sequelae due to dislodgement. Dislodgment of the gastric portion of the

PEGJ is not associated with as many or as significant local complications compared to the PEG tube after it has been inadvertently removed. This study shows that these two procedures are comparable in the delivery of nutrition to critically ill patients based on prealbumin, reaching caloric goals, and time to reach tube feeding goals. The stability of PEGJ's shows that jejunal feeding is more reliable because of the ability to provide continuous nutrition, reduced aspiration risk, and reduced dislodgement-related complications in critically ill and neurologically compromised patients. However, due to the low frequency of patients that reached their nutritional goal, supplemental feeding via parenteral routes may be beneficial. A major limitation of this investigation is that it a retrospective study. Therefore, it is difficult to draw definitive conclusions as the patients could not be prospectively followed. The power of this study may need to be increased to determine if significant differences do exist between these two types of feeding tubes. In the future, prospective clinical trials should be performed to analyze the benefits of adding a jejunal extension to PEGs as suggested by the above data.

REFERENCES

1.Hussain, A et. al. Percutaneous Endoscopic Gastrostomy. Postgrad Medical Journal 1996; 72: 581-585.

2.Rumalla, A and Baron, TH. Results of Direct Percutaneous Endoscopy, an Alternative Method for Providing Jejunal Feeding. Mayo Clinic Procedures 2000; 75:807-810.

3.Park, R H R et. al. Randomized Comparison of Percutaneous Endoscopic Gastrostomy and Nasogastric Feeding in Patients with Persisting Neurological Dysphagia. BMJ 1992; 304: 1406-9.

4.Poteet, S J et. al. Inpatient Mortality and Length of Stay Comparison of Percutaneous Endoscopic Gastrostomy and Percutaneous Endoscopic Gastrojejunostomy. Journal of Laparoendoscopic and Advanced Surgical Technology. 2010 Sep; 20(7): 587-90.

5.Adams, G F et al. Maximizing Tolerance of Enteral Nutrition in Severely Injured Trauma Patients: A Comparison of Enteral Feedings by Means of Percutaneous Endoscopic Gastrostomy Versus Percutaneous Endoscopic Gastrojejunostomy. The Journal of Trauma: Injury, Infection, and Critical Care 1999 Dec; 48(3): 459-65.

6.Varnier, A et. al. Percutaneous Endoscopic Gastrostomy: Complications in Short-Term and Long-Term Follow-Up and Efficacy on Nutritional Status. Europa Medicophysica 2005 Dec; 42(1): 23-6.

7.Beck, FK and Rosenthal, TC. Prealbumin: a marker for nutritional evaluation. American Family Physician 2002 Apr; 65(8):1575-1578.

8.Mathus-Vliegen,LM and Koning H. Percutaneous Endoscopic Gastrostomy and Gastrojejunostomy: a Critical Reappraisal of Patient Selection, Tube Function and Feasibility of Nutritional Support During Extended Follow-Up. Gastrointestinal Endoscopy. 1999 Dec; 50(6): 746-54.

9.Panagiotakis, PH et. al. Feeding Jejunostomy Tube Placement Prevents Aspiration Pneumonia in High-Risk Patients. Nutrition in Clinical Practice. 2008 Apr-May; 23(2): 172-5.