5

Defining the Indications for Prophylactic Percutaneous Endoscopic Gastrostomy Tubes in Surgically Treated Head and Neck Cancer Patients

Jason Foster[1], Peter Filocamo[1], William Brady[2], Thom Loree[1] and John F. Gibbs[1]
[1]*Department of Surgery, Roswell Park Cancer Institute, State University of New York at Buffalo, Elm & Carlton Streets, Buffalo, NY*
[2]*Department of Biostatics, Roswell Park Cancer Institute, State University of New York at Buffalo, Elm & Carlton Streets, Buffalo, NY*
U.S.A.

1. Introduction

Malnutrition is a common problem in head and neck cancer with up to 50% of the patients developing some degree of nutritional deficiency.[1] The etiologies of this problem can be divided into two categories: tumor related or treatment related. Patient with tumor related malnutrition typically present with obvious clinical signs and symptoms of undernourishment. Tumor cachexia can contribute but this is primarily caused by physical impediments to oral consumption such as pain, oropharygeal obstruction, or nerve compression , all resulting in discordant degluttination.[2] Prior to definitive cancer therapy, this group of patients requires nutritional resuscitation.

Additionally many patients who present nutritionally sound and who undergo surgical resection experience some degree of postoperative nutritional difficulties. In many cases it a short lived and inconsequential. However, a subset of patients will experience a more severe prolonged course requiring enteral supplementation. Prior studies have shown that if these patients are not supplemented, they will likely experience severe dehydration, treatment intolerance, or severe treatment related complications that require hospitalization.[3,4] Inherently, the surgical treatment of head and neck malignancies can be quite debilitating and result in significant mastication and deglutination dysfunction.[5-7] At times this involves radical resections that require complex reconstructions to maintain oropharyngeal continuity; and adjuvant radiation and/or chemotherapy may be required to maximize local control. Indiscriminately placing PEG tubes in all patients would put many patients at risk for PEG related complications.[8-13] Therefore, the difficulty has been trying to preoperatively identify which patients likely to experience prolonged treatment induced malnutrition and benefit from early nutritional supplementation.

Groups have identified some factors that are predictive of a need for enteral support.[3,4,14-17] One factor that has been clearly established is radiation therapy, particular when given

postoperatively.[3,4,17] Other factors such as Stage IV disease, base of tongue tumor location, and heavy alcohol ingestion are less clearly defined.[14-16] Some criticisms have been that the studies conducted to identify these variables were small, used a mixed population of surgical and non-surgical patients, and often used durations of enteral support that were short (< 4 weeks) or undefined.

At Roswell Park Cancer Institute (RPCI) prophylactic PEG are routinely placed in surgically treated patients who require a composite resection, flap reconstruction, radiation therapy, chemotherapy, and at the discretion of the attending surgical staff. We found that many patients required their PEG tube for 4 weeks or less; while some patients required their PEG for a year or longer. In order to more accurately define which patients benefited from prophylactic PEG placement we reviewed our experience. We used a homogenous population of surgically treated head and neck cancer patients to identified patient, tumor, and treatment factors that were predictive of a short-term (≤ 3 months) and long-term (≥1 year) PEG tube dependency.

2. Methods

One hundred forty one cases of surgically treated head and neck cancers treated at RPCI from January 1, 1999 to December 31, 2003 who underwent pretreatment placement of PEG tubes were reviewed. Only patients with squamous cell carcinoma (SCC) of the oral cavity, oropharynx, larynx, and pharynx were included in this study eliminating 14 patients. Seven patients had PEG tube placed a second time for the treatment of a new primary or recurrent disease, and six patients did not have complete records, leaving 114 patients for evaluation.

The variables analyzed were divided into patient factors (age and sex), tumor factors (primary site, T stage and nodal status), and treatment factors (flap reconstruction, radiation, and chemotherapy). A short-term dependency required that the PEG tube be in place for 3 months or less, while a long-term dependency require usage for a year or longer.

2.1 Statistical method

The duration of PEG tube dependency was calculated from the date of placement until the time of removal. Patients who had their PEG tube removed and not replaced were considered to be no longer dependent on it. Patients who died while still dependent on their PEG tube, or who were still dependent at last documented follow-up were considered to have censored durations. Because of this censoring, time to event analyses was used. The distribution of PEG duration was compared across age, sex, tumor sites, T stage, N stage, flap reconstruction, radiation, and chemotherapy. Kaplan-Meier estimates of the proportions (and 95% confidence intervals {CIs}) of patients with PEG tubes in place at 3 and 12 months after placement were determined for each variable and log-rank tests were used to compare durations.

Proportional hazards regression models were used to compare durations while accounting for other factors. Variables were selected for inclusion in the model in a stepwise selection process. Variables were entered in the model if $p<0.05$ and were retained if $p<0.05$. Because a number of patients had unknown T stage (8 patients) and unknown N stage (20 patients), in the proportional hazards regression models, these factors included separate levels for

'unknown' T and 'unknown' N stage, respectively. In the log-rank analyses of T stages and N stages, patients with unknown stages were not included.
These analyses are post hoc so no adjustments for multiplicity are made. All tests were done two-sided with a significance level of 0.05. All analyses were done using SAS version 8.2.

3. Results

The mean age of patients in this study was 65 and 65% of patients were male. Sixty-four percent of the patients had advanced T stage or recurrent disease and node positive disease was present in 49% of the patients. Flap reconstructions were performed in 39% of patients, while the rate of adjuvant therapy was 40% for radiation and 11% for chemotherapy. The percentage of patients in each of the four major tumor sites were 42% oral cavity, 23% oropharynx, 26% larynx, and 9% pharynx. In Table 1 the patient characteristics (age, sex), tumor characteristics (T stage, N stage), and treatment (flap reconstruction, radiation, chemotherapy) characteristic, along with PEG status at the end of the study is presented for each major tumor site. Overall 64% (73/114) of patients in the study had their PEG tubes removed.
Sixty-nine percent of patients had short-term PEG usage. When the group receiving adjuvant radiation was compared to the group that did not receive radiation treatment a significant difference was observed 91% (83, 99) vs. 53% (41, 65). Eighty-nine percent of pharyngeal tumor site patient and 92% of chemotherapy patients had a short term dependency but this was not statistically different from the other tumors site or the no chemotherapy group respectively. The short-term dependency was not influenced by patient age, sex, T stage, N stage, or flap reconstruction (Table 2).
The long-term dependency for this group of patients was 36%. Table 2 presents Kaplan-Meier estimates of the proportions of patients with PEG tubes in place at 12 months for each variable. PEG tube duration was statistically significantly different across surgical sites: 78% of pharynx patients still had their tubes in place after 12 months, while only 45% of oral cavity patients, 34% of oropharynx patients, and 11% or larynx patients had tubes in place. Patients who underwent flap reconstruction also had statistically significantly ($p=0.004$) longer PEG tube durations than those who did not, 52% vs. 25%, respectively. When a multivariate analysis was performed, adjusting for other factors, site and flap reconstruction remained as statistically significantly long-term risk factors. Chemotherapy was also found to be significant factor in long-term PEG dependency.

4. Discussion

The prevention of malnutrition and early nutritional support in the management of cancer patients is well documented. Specifically in head and neck cancer, suboptimal nutrition during definitive treatment results in a significant increase in surgical complications, dehydration, therapy breaks and hospitalizations. (3). Because malnutrition can result in reduced immunosurvelliance, it may contribute to early local and distant cancer recurrence. (18, 19) Avoidance of treatment induced malnutrition may prevent these complications, and prophylactic placement of PEG tube provides access for the delivery of nutrition. Identification of the risk factors which contribute to prolonged enteral support ensures PEG placement in the appropriate patients. Of equal importance is that accurate risk

factors can avoids subjecting low risk patients to PEG related complications, and costs. In this study we found that radiation was the only predictor of a short-term dependency; while pharyngeal tumor site, flap reconstruction, and chemotherapy were predictive a long-term need.

	Site									
	Oral cavity		Oropharynx		Larynx		Pharynx			
	n	%	n	%	n	%	n	%	n	%
All	49		26		30		9		114	
Removal Category										
Died	10	20	5	19	2	7	6	67	23	20
In Use at End of Follow-up	11	22	4	15	1	3	1	11	17	15
Removed	28	57	17	65	26	87	2	22	73	64
Unknown/Loss to Follow-up	0	0	0	0	1	3	0	0	1	1
Age, PEG Placed (y)										
<55	10	20	9	35	7	23	2	22	28	25
55-64	10	20	8	31	12	40	3	33	33	29
65-74	16	33	6	23	7	23	3	33	32	28
>=75	13	27	3	12	4	13	1	11	21	18
Sex										
F	24	49	5	19	8	27	3	33	40	35
M	25	51	21	81	22	73	6	67	74	65
Chemotherapy										
Unknown	1	2	0	0	0	0	0	0	1	1
No	46	94	22	85	24	80	9	100	101	89
Yes	2	4	4	15	6	20	0	0	12	11
Radiation										
Unknown	1	2	0	0	0	0	0	0	1	1
No	32	65	11	42	19	63	5	56	67	59
Yes	16	33	15	58	11	37	4	44	46	40
Flap Reconstruction										
No	34	69	7	27	25	83	3	33	69	61
Yes	15	31	19	73	5	17	6	67	45	39
T Stage										
Unknown	3	6	3	12	2	7	0	0	8	7
Recurrence	14	29	7	27	9	30	0	0	30	26
T1	2	4	1	4	2	0	2	22	5	4
T2	16	33	6	23	5	17	1	11	28	25
T3	5	10	7	27	11	37	4	44	27	24
T4	9	18	2	8	3	10	2	22	16	14
Node Involvement										
Unknown	6	12	6	23	6	20	0	0	18	16
No	21	43	2	8	13	43	4	44	40	35
Yes	22	45	18	59	11	37	5	56	56	49

Table 1. Characteristics of Patients by Surgical Site

	N ¶	Median Duration (95% CI)	Percent† (95% CI) of Patients With PEG at		p (log-rank)	p for selected covariates ‡
			3 months	12 months		
Site						
Oral cavity	49	11.2 (4.1, NE)	64% (51%, 78%)	45% (31%, 60%)	0.007	0.004
Oropharynx	26	6.6 (4.0, 18.2)	80% (64%, 96%)	34% (15%, 53%)		
Larynx	30	3.5 (2.6, 5.9)	62% (45%, 80%)	11% (0%, 23%)		
Pharynx	9	NE	89% (68%, 100%)	78% (51%, 100%)		
Age, PEG Placed (y)						
<55	28	7.1 (4.7, 11.3)	78% (63%, 94%)	29% (11%, 47%)	0.157	NA
55-64	33	3.1 (2.3, 6.6)	52% (34%, 69%)	26% (10%, 41%)		
65-74	32	11.2 (5.0, NE)	87% (75%, 99%)	50% (31%, 68%)		
≥75	21	4.4 (2.6, 19.1)	60% (38%, 81%)	41% (18%, 64%)		
Sex						
F	40	5.0 (4.0, 11.2)	68% (54%, 83%)	32% (16%, 48%)	0.583	NA
M	74	6.6 (4.9, 11.3)	70% (59%, 80%)	37% (25%, 49%)		
Radiation						
No	67	3.2 (2.3, 8.7)	53% (41%, 65%)	34% (22%, 46%)	0.102	NA
Yes	46	8.2 (6.6, 13.8)	91% (83%, 99%)	38% (23%, 53%)		
Chemotherapy						
No	101	5.9 (4.1, 8.7)	66% (57%, 76%)	35% (25%, 44%)	0.141	<0.001
Yes	12	10.6 (4.9, NE)	92% (76%, 100%)	46% (17%, 76%)		
Flap Reconstruction						
No	69	4.9 (2.7, 6.6)	62% (50%, 73%)	24% (13%, 35%)	0.002	0.011
Yes	45	18.2 (5.6, NE)	82% (70%, 93%)	54% (38%, 69%)		
T Stage						
Recurrence	30	5.9 (2.7, 18.2)	66% (49%, 83%)	42% (22%, 61%)	0.151	NA
T1	5	NE	80% (45%, 100%)	53% (5%, 100%)		
T2	28	6.3 (3.8, 11.3)	71% (55%, 88%)	27% (9%, 45%)		
T3	27	5.0 (2.6, 9.9)	66% (48%, 84%)	24% (7%, 41%)		
T4	16	NE	80% (60%, 100%)	60% (35%, 85%)		
Node Involvement						
No	40	5.4 (2.6, 8.7)	62% (47%, 77%)	33% (18%, 49%)	0.663	NA
Yes	56	6.6 (4.7, 11.2)	74% (63%, 86%)	30% (18%, 43%)		

¶ At PEG placement.
† Percents and medians are Kaplan-Meier estimates.
‡ From likelihood ratio tests for selected covariates from proportional hazards regression models using stepwise selection.
NA = not applicable (term not selected for inclusion in proportional hazards regression model).
NE = not estimable

Table 2. Time-to-Event Analyses of PEG Duration

Other groups have documented that radiation treatment results in significant malnutrition.(3,4,20) Radiation treatment often results in xerostomia, loss of taste, mucositis, and tumor edema which all contribute to poor oral intake and nutritional deficits. When patients receive primary radiation without nutritional support 40% of patient loose more than 10% of their baseline weights, 40% of patients require hospitalization during the treatment with 20% of patients requiring therapy break, and 40% of these patients will require a gastrostomy placement to complete therapy. (3,4,20) As expected 91% of patients who received radiation in addition to surgical resection required short term enteral support. However, this dependency was self-limited, and did not impact long term oral nutrition, evident by no difference at 1 year between the radiated or unirradiated (Table 2).

A pharyngeal site was significant on univariate analysis, while flap reconstruction was significant on both univariate and multivariate analysis. Given the significant amount of dysfunction associated with these surgical procedures, this data validates our clinical expectation that these subsets benefit from prophylactic PEGs. Importantly, given the propensity of oral pharyngeal bacterial overgrowth in this patient subset and significant intra-oral tumor burden, we believe that the T-fastener technique should be used to prevent/reduce PEG site abscess and local cancer recurrence. We previously published that the T-fastener technique has a low rate of local infection and cancer recurrence in head and neck carcinoma population. (21)

Chemotherapy was the only other significant factor on multivariate analysis. Although our series was small, the increasing use of chemotherapy in the management of the head and neck SCC population will dramatically increase this patient fraction requiring nutritional support. In our study almost half of chemotherapy patients required long-term support. We believe that prophylactic PEG placement should be part of the management discussion in patients receiving adjuvant or neoadjuvant chemotherapy.

Importantly when PEG tubes are placed in this patient population, the usage of the T-fastener technique is critical. Most of these patients are at high risk for PEG site infection and tumor implantation when the pull through technique is used in this patient population. We recently published that the rate of these complications can be significantly reduced by direct PEG placement with T-fastener strategy.

This review confirmed the favorable current approach to prophylactic PEG tube in the head and neck cancer population. Aside from patients who present malnourished, prophylactic PEG tubes should be placed in all SCC head and neck cancer patients who have a pharyngeal primary tumor site, require flap reconstruction, undergo radiation therapy, and/or chemotherapy.

5. References

[1] Bassett MR, Dobie RA: Patterns of nutritional deficiency in head and neck cancer. *Otolaryngol Head Neck Surg* 91:119-25, 1983

[2] Logemann JA, Bytell DE: Swallowing disorders in three types of head and neck surgical patients. *Cancer* 44:1095-105, 1979

[3] Fietkau R, Iro H, Sailer D, et al: Percutaneous endoscopically guided gastrostomy in patients with head and neck cancer. *Recent Results Cancer Re*s 121:269-82, 1991

[4] Lee JH, Machtay M, Unger LD, et al: Prophylactic gastrostomy tubes in patients undergoing intensive irradiation for cancer of the head and neck. *Arch Otolaryngol Head Neck Surg* 124:871-5, 1998

[5] Martini DV, Har-El G, Lucente FE, et al: Swallowing and pharyngeal function in postoperative pharyngeal cancer patients. *Ear Nose Throat J* 76:450-3, 456, 1997

[6] Vokes EE, Kies MS, Haraf DJ, et al: Concomitant chemoradiotherapy as primary therapy for locoregionally advanced head and neck cancer. *J Clin Oncol* 18:1652-61, 2000

[7] Murry T, Madasu R, Martin A, et al: Acute and chronic changes in swallowing and quality of life following intraarterial chemoradiation for organ preservation in patients with advanced head and neck cancer. *Head Neck* 20:31-7, 1998

[8] Baredes S, Behin D, Deitch E: Percutaneous endoscopic gastrostomy tube feeding in patients with head and neck cancer. *Ear Nose Throat* J 83:417-9, 2004

[9] Ehrsson YT, Langius-Eklof A, Bark T, et al: Percutaneous endoscopic gastrostomy (PEG) - a long-term follow-up study in head and neck cancer patients. *Clin Otolaryngol Allied Sci* 29:740-6, 2004

[10] Hunter JG: Tumor implantation at PEG exit sites in head and neck cancer patients: how much evidence is enough? *J Clin Gastroenterol* 37:280, 2003

[11] Sharma P, Berry SM, Wilson K, et al: Metastatic implantation of an oral squamous-cell carcinoma at a percutaneous endoscopic gastrostomy site. *Surg Endosc* 8:1232-5, 1994

[12] van Erpecum KJ, Akkersdijk WL, Warlam-Rodenhuis CC, et al: Metastasis of hypopharyngeal carcinoma into the gastrostomy tract after placement of a percutaneous endoscopic gastrostomy catheter. *Endoscopy* 27:124-7, 1995

[13] Tucker AT, Gourin CG, Ghegan MD, et al: 'Push' versus 'pull' percutaneous endoscopic gastrostomy tube placement in patients with advanced head and neck cancer. *Laryngoscope* 113:1898-902, 2003

[14] Gardine RL, Kokal WA, Beatty JD, et al: Predicting the need for prolonged enteral supplementation in the patient with head and neck cancer. *Am J Surg* 156:63-5, 1988

[15] Anwander T, Berge S, Appel T, et al: Percutaneous endoscopic gastrostomy for long-term feeding of patients with oropharyngeal tumors. *Nutr Cancer* 50:40-5, 2004

[16] Schweinfurth JM, Boger GN, Feustel PJ: Preoperative risk assessment for gastrostomy tube placement in head and neck cancer patients. *Head Neck* 23:376-82, 2001

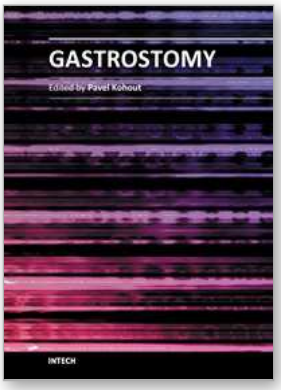
[17] Scolapio JS, Spangler PR, Romano MM, et al: Prophylactic placement of gastrostomy feeding tubes before radiotherapy in patients with head and neck cancer: is it worthwhile? *J Clin Gastroenterol* 33:215-7, 2001

[18] van Bokhoust-de van der Schuer, von Blomberg-van der Flier BM, Kuik DJ, Klop, Scholten PE, Siroen MP, Snow GB, Quak, JJ, van Leeuwen PA . Survival of malnourished head and neck cancer patients can be predicted by human leukocyte antigen-DR expression and interleukin-6/tumor necreosis factor-alpha response of the monocyte. *J Parenter Enteral Nutr*. 24(6):, 329-36, 2000

[19] van Bokhoust-de van der Schuer, van Leeuwen PA, Kuik DJ, Klop WM, Sauerwein HP, Snow GB, Quak, JJ. The impact of nutritional status on the prognoses of patients with advanced head and neck cancer. *Cancer* 86(3): 519-27, 1999

[20] Jensen K, Lambertsen K, Grau C. Late swallowing dysfunction and dysphagia after radiotherapy for pharynx cancer: frequency, intensity and correlation with dose and volume parameters. *Radiother Oncol* 85(1): 74-82, 2007.

[21] Foster J, Filacoma P, Brady W, Nava H, Hicks W, Loree T, Rigual N, Smith J, Gibbs JF. The introducer technique is a safe method for placing percutaneous endoscopic gastrostomy tubes in head and neck cancer patients. *Surg Endos* 21: 897-01, 2006



Gastrostomy

Edited by Dr. Pavel Kohout

ISBN 978-953-307-365-1
Hard cover, 152 pages
Publisher InTech
Published online 02, December, 2011
Published in print edition December, 2011

The gastrostomy placement is a method of providing nutrition to the patients who are unable to eat. In this book you can find chapters focused on the use of gastrostomy in children, patients with neurological impairment and patients with head and neck tumours. Home enteral nutrition is suitable for all of these groups of patients and is far easier with gastrostomy. The new indications (especially in very young children) required new techniques such as: laparoscopic gastrostomy, laparoscopy assisted endoscopic gastrostomy with/without fundoplication, ultrasonography assisted gastronomy. All information about these techniques can be found in this book. This book does not serve as a basic textbook, but as an interesting reading material and as an aid for physicians who are already familiar with the indication for gastrostomy and want to know more.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Jason Foster, Peter Filocamo, William Brady, Thom Loree and John F. Gibbs (2011). Defining the Indications for Prophylactic Percutaneous Endoscopic Gastrostomy Tubes in Surgically Treated Head and Neck Cancer Patients, Gastrostomy, Dr. Pavel Kohout (Ed.), ISBN: 978-953-307-365-1, InTech, Available from: http://www.intechopen.com/books/gastrostomy/defining-the-indications-for-prophylactic-percutaneous-endoscopic-gastrostomy-tubes-in-surgically-tr

INTECH
open science | open minds

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821