Percutaneous Endoscopic Gastrostomy Before Multimodality Therapy in Patients With Esophageal Cancer

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Background. Percutaneous endoscopic gastrostomy (PEG) has not been widely used in esophageal cancer because of concerns about safety of dilatation, suitability of the stomach as an esophageal replacement, and potential for inoculation metastasis.

Methods. Experience with PEG in consecutive patients presenting with new esophageal cancer from March 1991 to March 2001 was reviewed retrospectively. PEG was planned in 119 of 179 (66%) of these patients excluding those presenting moribund and those for whom early resection was planned. The PEG was placed using an endoscopic method with wire-guided endoscopic bougienage or laser ablation or both as needed. Success of placement, requirement for dilatation and ablation, PEG-related complications, tolerance of enteral feeds, and impact on therapy were evaluated.

Results. PEG placement was possible in 87% of patients (103 of 119). Dilatation or laser ablation or both was required in 46% (47 of 103). There was no procedure-related mortality. Thirty-day mortality was 13.5%. Major PEG-related complications were observed in 4% (4 of 103) and minor PEG-related complications in 12% (12 of 103). PEG removal was required in 4 patients and interruption of enteral feeds required in 33 (32%). No instances of esophageal disruption or tumor inoculation metastasis were noted. PEG takedown and site closure at the time of operation was uncomplicated and use of the stomach as an esophageal substitute was possible in all 61 resected patients. Rates of anastomotic leak, stricture, and gastric emptying delay were similar to those for patients proceeding to resection without prior PEG (leak: PEG = 8% [5 of 61] versus non-PEG = 10.5% [2 of 19]), (stricture: PEG = 37% [22 of 61] versus non-PEG = 32.5% [6 of 19]), (delay: PEG = 9.8% [6 of 61] versus non-PEG = 10.5% [2 of 19]). Analysis of variables showed PEG to be significantly related to attainment of target doses of chemoradiotherapy (p = 0.034), and survival at 12 months (p = 0.02).

Conclusions. PEG in esophageal cancer is safe and useful and does not compromise the stomach or esophagogastric anastomosis. Further study is required to define the efficacy of PEG as a means of nutritional support and its impact on survival.
therapy including both neoadjuvant and primary chemoradiotherapy.

Patients and Methods

Patient Population

From 1991 to 2001, 179 patients with biopsy proven esophageal cancer were seen at a single center, the Washington DC VAMC. In 119 (66%) of these patients, antineoplastic therapy was planned, excluding patients presenting with short anticipated survival, poor performance status, those in whom early primary resection was planned, and those with prior upper abdominal operations. Dysphagia was present in all of these patients. Weight loss at presentation ranged from 4 to 31 kg (mean, 9.1 kg). PEG was planned as a means of supporting these patients through chemoradiation.

A retrospective review of this experience was conducted utilizing in and outpatient medical records including endoscopic and operative reports and tumor registry data. Recorded data included presentation, functional status, available nutritional indicators, procedural details, procedure-related complications, success of placement, tube function and dysfunction, tolerance of enteral feeds, and impact on therapy.

Technique

PEG placement was attempted as an isolated procedure in 74 of 119 patients (62%) and in conjunction with operative staging in 45 of 119 (38%). Percutaneous endoscopic gastrostomy was placed using an endoscopic guided “push” technique. Wire-guided endoscopic bougienage or laser ablation or both were performed before PEG placement to establish esophageal luminal patency as needed. As a primary procedure PEGs were placed using midazolam and fentanyl sedation. In conjunction with operative staging PEG was placed with general anesthesia after thoracoscopy or laparoscopy. Less operative impact on the stomach was anticipated with PEG placement to establish esophageal luminal patency. Surgical resection or laser ablation or both were performed before PEG placement. One patient with airway involvement developed a tracheoesophageal fistula temporally related to laser ablation before PEG placement [10,11].

Subsequent Course

Weight change data over the course of therapy were available in 101 patients. Tolerance and outcome of chemoradiotherapy was recorded as was survival. Records were carefully reviewed for the occurrence of tumor inoculation metastasis, a previously described phenomenon after PEG placement for head and neck and esophageal cancer patients [8,9]. In 61 patients progressing to resection, the gastric PEG site was oversewn with a purse string suture; 38 of 61 resected patients (62%) underwent transthiatal esophagectomy and 23 (38%) had a thoracotomy. The anastomosis was hand sewn and placed in the neck in all patients. Suitability of the stomach as an esophageal substitute was noted, including rates of anastomotic leak and stricture and gastric emptying delay. These were compared with patients proceeding to resection without prior PEG. Nutritional input was assessed in patients proceeding to operation as these patients provided a definable end point for analysis of nutritional status.

Statistical Methods

The $\chi^2$ test and Fisher’s exact test were used to test whether relationships existed between nominal variables. Survival was measured from the date of diagnosis to the date of death or October 1, 2001. Actuarial survival was calculated using the Kaplan-Meier method and comparisons made using the log rank test. Significant predictors from a univariable analysis of independent variables were subjected to multivariable analysis.

Results

PEG Placement

Percutaneous endoscopic gastrostomy placement was possible in 103 of 119 patients (87%). Prior dilatation or laser ablation or both was required in 47 of 103 (46%). In 12 of 16 patients (75%) in whom the PEG could not be placed, the obstructing cancer could not be traversed; and in the remaining 4 of 16 (25%), the stomach did not adequately rise to the abdominal wall. Characteristics of patients in whom PEG placement was and was not successful are summarized in Table 1. No instances of esophageal disruption or leakage occurred during placement. One patient with airway involvement developed a tracheoesophageal fistula temporally related to laser ablation before PEG placement [10,11].

Complications

Thirty-day mortality was 13.5% for all patients in whom PEG was planned. None of these deaths were PEG

| Table 1. Patient Characteristics Categorized by Success of PEG Placement |
|-----------------------------|-----------------------------|
|                             | PEG Successful | PEG Unsuccessful |
| Age                         | Mean 61.4 (38–81) | Mean 59.8 (51–79) |
| Cell type                   |                |                 |
| Squamous                    | 92/103 (89.3%)  | 15/16 (94%)     |
| Adeno                       | 11/103 (10.6%)  | 1/16 (6.25%)    |
| Tumor location              |                |                 |
| Mid                         | 89/103 (86.4%)  | 12/16 (81.3%)   |
| Distal                      | 14/103 (13.5%)  | 3/16 (18.7%)    |
| Stage                       |                |                 |
| T2N0                        | 7/103 (6.8%)    | 1/16 (6.2%)     |
| T2N1                        | 16/103 (15.5%)  | 2/16 (12.5%)    |
| T3N1                        | 52/103 (50.4%)  | 7/16 (43.7%)    |
| T4N0                        | 17/103 (16.5%)  | 4/16 (25%)      |
| T4N1                        | 11/103 (10.6%)  | 2/16 (12.5%)    |

PEG = percutaneous endoscopic gastrostomy.
related. Major PEG complications were observed in 4 of 103 patients (4%) including suppurative wound infection in 2 patients, protracted ileus in 1, and persistent leakage in 1. Minor PEG complications occurred in 12 of 103 (12%), principally soreness and erythema near the gastrostomy site diagnosed as cellulitis and treated with antibiotics. PEG removal was required in 4 patients (4%). Peritonitis, gastrocolic or gastrocolocutaneous fistula, and necrotizing fasciitis were not observed. Pneumoperitoneum occurred commonly after PEG as has been previously reported and typically resolved by the third day after placement [12].

**Tube Feeding**

Tube feedings were given through the PEG in 96 of the 103 patients (96%) in whom placement was possible. In the remaining 7 patients, feeds were avoided because of tolerance of oral feeds in 4 and critical illness in 3. Feeding were regularly adjusted to compensate for changes in oral intake as responses to therapy occurred including decreasing or increasing dysphagia, esophagitis, and mucositis. Diarrhea or abdominal distention was noted during the course of 42 patients (41%). Interruption of enteral feeds was required at some point in 33 patients (32%) during tube feeding.

Median duration of PEG placement was 15 weeks (range, 3 days to 10 months). There was at least one instance of tube dysfunction, typically clogging, in 23 of the 103 patients (22.3%).

**Nutritional Outcome**

Weight loss during chemoradiation generally declined and the mean percent weight loss for the 61 patients proceeding to surgery was 3.8% (range, 0% to 9%) from the time of PEG placement. Serum albumin data were available in 51 of the 61 patients. Mean serum albumin at PEG placement was 3.3 g/dL (range, 1.6 to 4.4 g/dL). Mean serum albumin immediately before surgery increased to 3.6 g/dL (range, 2.8 to 4.8 g/dL), an improvement that was statistically significant \( p = 0.001 \).

**Completion of Chemoradiotherapy**

Attainment of target doses of chemoradiotherapy was noted in 71 of the 103 patients (70%) in whom PEG placement was successful. This compared favorably with the 16 patients in whom PEG placement was not possible, in whom only 6 of 16 (37.5%) attained target doses. This difference was significant \( p = 0.03 \). Analysis of multiple variables potentially associated with completion of therapy including age, weight loss at presentation, T stage, N stage, concomitant laser therapy, and PEG placement showed PEG to be significantly related to attainment of target doses of chemoradiotherapy \( p = 0.034 \).

**Inoculation Metastasis**

No instance of inoculation metastasis was noted at the gastrostomy site, the abdominal wall, or the stomach.
was no evidence of tumor implantation or inoculation metastasis in the study cohort. Is “nutritional bridge” a meaningful concept in the management of esophageal cancer? Prior studies of parenteral nutrition in esophageal cancer suggest that it may be [13, 14]. A recent American Gastroenterological Association Medical position statement endorses the use of parenteral nutrition for this indication [15]. Enteral nutrition is thought to have numerous advantages over parenteral nutrition, though this is not universally accepted [16, 17]. A multitude of possible selection biases and confounding variables in a noncontrolled retrospective [16, 17]. A multitude of possible selection biases and confounding variables in a noncontrolled retrospective study such as this make the survival data difficult to interpret. Chief among these is that PEG placement may be systematically limited in more advanced lesions. Given the limitations of a retrospective review, the favorable impact of PEG on completion of chemoradiotherapy and survival in this cohort of patients should be further investigated.

References

DISCUSSION

DR DARRYL S. WEIMAN (Memphis, TN): You say the placement of a PEG may have some nutritional benefits. Did you measure any nutritional parameters pre-PEG and post-PEG?

DR MARGOLIS: We looked at the albumin patients at the time of diagnosis, at the time of inserting the PEG, and that was a mean of 3.3, and we rechecked that again at the time of surgery and that had increased to a mean of 3.6.

DR DANIEL L. MILLER (Rochester, MN): I have several questions especially in regard to your conclusions. You stated in your conclusion slide that a PEG had no effect on the stomach as a conduit but you failed to present any data in your talk to support this conclusion. I would appreciate your comment please. A significant percentage of our patients are undergoing neoadjuvant treatment prior to a planned esophagectomy. We usually place a feeding jejunostomy prior to initiation of the neoadjuvant treatment in those patients. You can do a minilaparotomy at the time of the jejunostomy placement and do an abdominal inspection to see if the patient has advanced disease or carcinoma. I have gotten burned a couple times when a PEG was placed elsewhere and when the patient came back for resection they had destruction of the right gastroepipolic artery, which prevented use of the stomach, and 1 patient died from sepsis secondary to an infection from the PEG skin site.

I would like to know if you could comment on the follow-up of your patients who went on to resection. Were there any complications related to the PEG such as wound infection or that you could not use the stomach and had to use the colon instead?

DR MARGOLIS: We were able to use the stomach as a conduit in all these 61 patients that had proceeded to surgery. I did present a slide where we assessed the suitability of the stomach as a conduit, looking at three factors. We looked at any anastomotic strictures, any anastomotic leaks, and any increased evidence of gastric emptying delay, comparing those patients who had a PEG placed with those patients who did not have a PEG placed. We showed that there was no difference between those two groups of patients. We had no problems taking down the PEG, we had no problems in using the stomach as a conduit. There was no increased incidence of wound infections either between the two groups.

DR JOE B. PUTNAM, JR (Houston, TX): I enjoyed your presentation and your enthusiasm for PEGs, but I believe that your two populations were two difficult groups to compare: both groups were at the “extremes” of care. One group was very poor...
prognosis and the PEG was placed for palliation to enhance end-of-life care and comfort. The other group was for preoperative nutritional preparation. At The University of Texas M. D. Anderson Cancer Center, the thoracic surgical faculty have not been very enthusiastic about PEG placement prior to esophagectomy simply because the need is not consistent—even for patients receiving preoperative chemotherapy and radiation therapy. As well, the location cannot always be predicted and involvement of the midline fascia has yielded significant wound complications with both skin and fascial dehiscence, and even evisceration on one occasion. Injury to the vascular supply of the gastric conduit occurred in 1 of our patients as a result of PEG placement, precluding the use of the stomach as a conduit.

Your institution may be unique in that your gastroenterologists and surgeons have jointly created a detailed and methodical process to prepare these preoperative patients with PEG placement. In many general communities, however, this process is not followed. Perhaps the process for routine PEG is just blow some air in the stomach and “slam a tube in there.” I believe that the gastroenterologist rarely if ever confers with the surgeon prior to PEG placement. This casual placement of a PEG (often not even warranted) may provide more morbidity than benefit.

DR MARGOLIS: Thank you. What you say is a hundred percent correct. We have a unique setup at the VA Hospital. We have a nutritional unit with an endoscopist who is particularly devoted to doing this in our patients with esophageal cancer. So these PEGs are placed with a lot of care, realizing that we do plan to absolutely use the stomach as a conduit.

**REVIEW OF RECENT BOOKS**

Evarts A. Graham: The Life, Lives and Times of the Surgical Spirit of St. Louis
C. Barber Mueller, MD, FACS
Hamilton, Ontario, BC Becker Inc, 2002
494 pp, illustrated, $48.00
Reviewed by W. Gerald Rainer, MD

This book about one of the true giants of thoracic surgery is arranged in an interesting fashion. The reader is introduced to the subject by the photograph of Dr Graham on the book’s cover and is immediately struck by one of the attributes ascribed to Graham—imposing (this adjective is used frequently and is aptly applied). The picture also provides an uncanny insight into other character traits of the subject—confidence, good taste, and thoughtfulness. Next, the foreword (written by another Graham trainee, Ben Eiseman) is masterfully constructed and paints an overview of the man in tracing the high points of his career, giving the reader a preview of what is ahead.

Mueller, in his own inimitable fashion, has painstakingly detailed the life story of Evarts Graham and documented his enormous contributions to surgery and medicine. These contributions are many: developing cholecystography; heading the Empyema Commission during 1918 and 1919; performing the first successful one-stage pneumonectomy for lung carcinoma; playing a leading role in the early days of the antismoking campaign; playing major roles in the development of the American Board of Surgery, the Joint Commission on Accreditation of Hospitals; and being actively involved in the American College of Surgeons, spearheading the fight against fee-splitting, which was a common practice in his day.

Over and above his carefully chronicled descriptions of the aforementioned accomplishments of Graham, Mueller gives a fascinating insight into all aspects of life during Graham’s career—social, political, family—and portrays Graham as being a willing entrant into any issue that might be extant and worthy of his efforts. One can almost imagine that his degree of involvement was directly proportional to the controversial nature of the topic, whether it be international, national, or local, social, political, or professional.

All surgeons will have a lot to take away from reading this well-written account of the life and times of one surgeon who not only had vision but was willing to approach challenges wholeheartedly and with conviction. Our specialty has been made vastly better because of his dedication and devotion to high principles and his uncompromising approach to the challenges that he faced.

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