

Egyetemi Doktori (PhD) értekezés tézisei

**Clinical applications and technical aspects of percutaneous endoscopic gastrostomy in head and neck malignancies.**

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## **INTRODUCTION**

Not until recently, the importance of nutrition in the critically ill patients was disregarded, as the focus was primarily directed towards curative therapy. Nutritional supplementation was thought to have a less significant impact on the final outcome of the diseases. Later, physicians started to realize the role nutrition plays in the recovery of patients. Malnutrition severely impairs the healing, the therapeutic outcome, the quality of life, the hospital stay, and thus the cost of care. Early postoperative nutrition benefits surgical patients by decreasing septic morbidity, maintaining immunocompetence, and improving wound healing.

Patients with head and neck cancers are at particular risk for malnutrition. Malnourishment is the result of several local and systemic factors. Alcoholism, smoking and poor diet have a high prevalence in patients with head and neck cancers leading to decreased protein, vitamins and minerals uptake. Local tumor growth can cause dysphagia, odynophagia, smell and taste distortion, and aspiration. On the other hand increased metabolic rate of cancer cells and accelerated protein catabolism require high calorie and protein diet to maintain nutritional balance. Surgery causes anatomical alterations, pain, dysmotility, and can predispose to aspiration further worsening the ability of proper alimentation. Mucositis, pain, edema, nausea and xerostomia as the result of radio-, and chemotherapy all have an adverse effect on feeding. All of these factors finally deplete the protein and fat stores of the body, leading to severe weight loss, impairing the immune function and resulting in progressive protein-calorie malnutrition. For these reasons, patients with head and neck cancer require continuous nutritional assessment and adequate calorie-protein supplementation.

## **ARTIFICIAL NUTRITION**

Proper diet of patients with head and neck cancer is essential. "When the gut works, use it" should be a common sense practice of physicians dealing with nutritional care. More and more data suggest in the literature that enteral feeding is not just more natural way of administering food but also has a positive influence on the recovery of patients. Not only the quantity and quality of food that matters, but also the route of alimentation. A normal well-fed intestine besides absorbing nutrients, also maintains a protective barrier against intraluminal toxins and bacteria. Peristalsis, secretory Immunoglobulin A, mucin and an intact mucosa have a protective and supportive role to achieve this function. Changes in the structure of

gastrointestinal mucosa, increases the permeability to bacteria and toxins, results in bacterial colonization and translocation, and alters the immunologic function of the gut. Enteral feeding leads to a reduced rate of surgical complications.

## **ENTERAL FEEDING**

The nasogastric tube feeding is the most common in head and neck cancer patients. However the introduction of percutaneous endoscopic gastrostomy (PEG) in clinical practice by Gauderer and Ponsky in 1980, has revolutionized our practice. This PhD focuses on percutaneous endoscopic gastrostomy and its aspects in head and neck cancer patients.

### **Historical background of PEG**

Dr. Jeffrey Ponsky, pediatric gastroenterologist and Dr. Michael Gauderer pediatric surgeon, both worked in Cleveland, USA note while performing upper gastrointestinal endoscopy in small children the ease and simplicity with which the anterior abdominal wall could be transilluminated, indicating the close contact between the abdominal and gastric walls. This gave them the idea to work out the details of a technique that would allow percutaneous puncture of the insufflated and transilluminated stomach under endoscopic control for gastrostomy tube placement. The original kit used was a home-made 16-F de Pezzer latex tube with a tapered intravenous cannula fitted to its distal end. The first five cases (all babies) of percutaneous endoscopic gastrostomy were presented at the annual meeting of The American Society of Gastrointestinal Endoscopy in May 1980. The method was welcomed and rapidly recognized by the gastroenterologist, but initially looked upon with skepticism by the surgeons. Soon PEG gained wide acceptance as a safe, simple and efficient method of providing nutritional support in patients with variety of pathologies. The general indication for percutaneous endoscopic gastrostomy is summarized in Table 1. The maintenance of nutrition and fluid balance during the treatment of head and neck tumors is one of the most important indications for PEG placement. More than 216,000 PEGs are performed annually in the United States and thus it is the second most common indication for upper gastrointestinal endoscopy.

## GENERAL INDICATIONS FOR PEG PLACEMENT

### I. LONG-TERM NUTRITION

- Head and neck tumors.
- After an acute stroke
- Extensive traumatic injury.
- Neurological disorder
- Growth failure in children.
- Other hyperkatabolic states

### II. DECOMPRESSION

- Diabetic gastroparesis
- Intestinal pseudo-obstruction
- Mechanical obstruction

### III. OTHERS

- gastric volvulus / gastric fixation
- formation of biliogastric shunt
- to deliver pharmacotherapy
- access “avenue” to stomach

Table 1.

## PEG IN HEAD AND NECK CANCERS

Percutaneous endoscopic gastrostomy is usually a straightforward procedure in cases of neurological indication, but certain technical aspects and clinical applications should be strongly considered when indicated for patients with head and neck malignancies. The insertion methods, the placement routes, and the timing of PEG insertion require certain adaptation and modification of the usual PEG procedure.

## INSERTION METHODS OF PEG

Mainly, “pull”, “push”, and “poke” methods are in use for PEG insertion. The “*pull method*” originally described by Gauderer and Ponsky in 1980, has changed little since its introduction and remained the most popular method of PEG tube placement. Percutaneous endoscopic gastrostomy procedures were started in the University of Pécs, Medical School, ENT Department with the collaboration of the Department of Internal Medicine on the 7<sup>th</sup> of January 1997. Most often the “pull method” is used in our department. The insertion is carried out “*lege artis*” according to the recommended procedure protocols. Initially antibiotic prophylaxis was not used, however later one dose of broad-spectrum antibiotic was given routinely to PEG patients prior to the procedure.

The “*push method*” is similar to the “pull method” except that the feeding tube is pushed over a guide wire. A flexible wire is passed via the needle-cannula instead of the suture used in the “pull-technique”, and retracted through the patient’s mouth by a snare. Specially designed PEG tube is pushed over the wire and eventually withdrawn. The advantage of this technique is that the operator has full control over the tube at all times.

The “*poke*” or “*introducer*” method is basically a Seldinger technique. Under direct gastroscopic visualization the stomach is punctured and the tract is serially dilated by a dilator peel-away sheath. To keep the stomach approximated to the abdominal wall during the introduction, T-fasteners are usually needed. The potential advantages and disadvantages of the different techniques are listed in Table 2.

<b>PEG TECHNIQUES</b>	<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
<b>“pull-back” or “push” PEG with second-look gastroscopy</b>	<ul style="list-style-type: none"> <li>• relatively easy procedure</li> <li>• quick</li> </ul>	<ul style="list-style-type: none"> <li>• double gastroscopy</li> <li>• increased procedure-related risks and complications</li> <li>• increased risk for bacterial translocation and tumor cell seeding</li> <li>• double discomfort</li> </ul>
<b>“introducer” PEG</b>	<ul style="list-style-type: none"> <li>• single gastroscopy</li> <li>• direct insertion of the feeding tube</li> </ul>	<ul style="list-style-type: none"> <li>• technically demanding</li> <li>• extra gastric punctures (T-fasteners)</li> <li>• higher complication rate</li> <li>• time consuming</li> </ul>
<b>“pull-back” or “push” PEG with single pass of gastroscopy without second-look</b>	<ul style="list-style-type: none"> <li>• easier</li> <li>• shorter procedure</li> <li>• no second per oral gastroscopy</li> </ul>	<ul style="list-style-type: none"> <li>• no second look, no chance to exclude disposition of tube or any complication</li> <li>• more experience needed for positioning the feeding tube</li> </ul>
<b>“pull-back” or “push” PEG with single pass of gastroscopy with “trans-tubal” fiberscopy for second-look</b>	<ul style="list-style-type: none"> <li>• option for second-look</li> <li>• less discomfort for patient</li> <li>• decreased gastroscopy-related risks and complications</li> </ul>	<ul style="list-style-type: none"> <li>• additional scope needed</li> <li>• additional experience needed</li> </ul>

**Advantages and disadvantages of various PEG methods in head and neck cancer patient**

Table 2.

The need for the second introduction of the gastroscope during PEG placement has a significance in patients with head and neck cancer. First, every procedure, so does the endoscopy has its own risks. A study reviewing the literature on endoscopic complications, lists 4 major and 45 minor complications related to gastroscopy. Although, the overall incidence of complications in routine cases is not high (0.1%), the chance of causing perforation or hemorrhage in patients with head and neck cancer is greater.

Second, there are additional risks when gastroscopy is done in cancer patients for creating a PEG. The repeated pass of the gastroscope increases the chance of tumor cell seeding to the stoma site and the risk of bacterial translocation causing peristomal infection. In addition, manipulation around the laryngeal or hypopharyngeal area with tumor growth can cause edema, further compromising the airway.

Third, the pass of the gastroscope can be very difficult in an area with extensive tumor mass or major postoperative anatomical changes. Technical details about how to avoid some of these problems will be discussed under the chapter “Placement routes of PEG”.

Last but not least, gastroscopy causes discomfort for the patient unless carried out in general anesthesia.

In sum, the second pass of the gastroscope during the “pull” or “push” method basically increases the risks of the above-mentioned problems. Though “introducer” method allows single gastroscopy, this technique is time consuming, technically more demanding, and increases the chance of some major procedure-related risks and complications. Thus, it is not in a routine clinical use.

In order to keep the advantages and to eliminate the disadvantages of the different PEG methods, the author has introduced a novel technical modification. In this method a “pull-back” or “push” type PEG is inserted in a traditional fashion but instead of the second per oral gastroscopy, a flexible laryngofiberscope is passed via the inserted feeding tube to provide the option for a “second-look”.

“Transtubal” fiberscopy can play a role in checking the correct position of the feeding tube and in excluding complications. It can be performed in most cases when otherwise a second per oral gastroscopy is planned.

## **ALTERNATIVE TECHNIQUES FOR CREATING GASTROSTOMIES**

There are several other options to create gastrostomy for patients with head and neck cancers, who are not fit for gastroscopy due to different reasons (e.g. extensive obstructing tumor mass). Percutaneous radiologic gastrostomy (PRG) is one of the most commonly used for creating gastrostomy for patients with head and neck cancer. Detailed discussion about PRG is beyond the scope of this PhD.

## **PLACEMENT ROUTES OF PEG**

The route of introducing the gastroscope into the stomach is one of the crucial points of PEG procedures in head and neck cancer patients. Mainly, percutaneous endoscopic gastrostomy is carried out by passing both the gastroscope, and the feeding tube through the oral cavity. However, one of the main hurdles for creating endoscopic gastrostomy in patients with head and neck cancers is the presence of the tumor mass that hinders the easy introduction of the gastroscope to the stomach. Tumors can block the way for gastroscopy either by narrowing the passage or by causing trismus, hemorrhage, edema or severe pain. To overcome such problems one can use pediatric or ultra-thin gastroscopes. In other cases it can be very challenging for the gastroenterologist to find the way down to the stomach by a flexible scope among massive tumor growth. Kleinsasser's rigid direct laryngoscopy and the experience of ENT surgeon, who is familiar with the location and extent of the cancer, usually proves to be a good help, maneuvering the gastroscope into the esophagus. When the tumor mass is located in the oral cavity and causes obstruction or trismus, transnasal pass of both the gastroscope and feeding tube provides a solution. One of the complications, which can occur after major head and neck surgery, is the formation of cervical pharyngo-cutaneous fistula. Beside others, this is the result of narrow pharynx caused by postoperative anatomical changes or irradiation-induced fibrosis. None of the conventional techniques would allow endoscopic placement of gastrostomy feeding tube due to the narrow alimentary tract. However, author described and carried out PEG via the cervical fistula for such cases, avoiding the need for open. In case, the tumor is so extensive that hinders any type of endoscopy and the patient is scheduled for surgical resection, an ideal option is intraoperative PEG. After resection of the cancer, PEG can be inserted directly into the pharynx or esophagus through the opened operative field. The author was among the first to detail the method of intraoperative PEG insertion in Hungary (Table 3).

## **PLACEMENT ROUTES OF PEG**

1. Per oral with standard-size gastroscope
2. Per oral with pediatric / ultra-thin gastroscopes
3. Per oral-with assistance of Kleinsasser`s rigid laryngoscope
4. Trans-nasal
5. Via cervical fistula
6. Trans-cervical during head and neck surgical procedure (intraoperative)

Table 3.

## **TIMING OF PEG**

Patients with head and neck malignancies are usually malnourished. Early nutritional support has a positive impact on the therapeutic outcome. Thus, timing of PEG is crucial in the nutritional and effective management of head and neck cancer patients. The use of percutaneous endoscopic gastrostomy and its timing should be considered individually based on the tumor's extension, localization, the therapeutic plan, the possible outcome, and the expected life span of the patient. The experience of the treating physician is needed to evaluate all these factors in order to make the correct decision regarding when and how to create gastrostomy. Generally, PEG can be inserted prior to the definitive surgery, during the surgery or after the surgery. PEG is also inserted in non-surgical cases, for those receiving either curative or palliative radio- and/or chemotherapy or any other form of palliation.

Preoperative insertion has the great advantage of early nutritional supplementation. As most of the head and neck cancer patients undergo staging panendoscopy and biopsy, it appears reasonable to insert PEG, if needed, at the same time in general anesthesia. It not only avoids an additional operative event for the patient, but also carries less procedure-related morbidity. There are reports suggesting higher incidence of acute cardio-vascular incidence during PEG insertion in local anesthesia for patients with head and neck cancers and also higher rate of perioperative PEG complication, if PEG is inserted before the tumor is resected. Beside the usual co-morbidities, the airways of these patients are often compromised by the tumor. General anesthesia with a secured airway by endotracheal intubation provides preferable protection during the PEG procedure in advanced malignancies. On the other hand preoperative PEGs have numerous disadvantages. Extensive tumors can block the passage of the gastroscope and the risk for tumor cell seeding

to the gastrostomy site is higher. Any arising complication due to PEG, can delay the time of definitive surgery. Last but not least, surgeon needs much more experience to decide at this early stage of management, whether patient really needs a gastrostomy. Intraoperative PEG is carried out via the opened pharynx immediately after the surgical resection of the tumor mass. Unimpeded passage of the gastroscope and feeding tube, no chance of tumor cell seeding and the lack of additional discomfort for the patient, are all in favor for intraoperative PEG. The risk for complications is reduced due to the protected airway by general anesthesia. Yet, drawbacks of intraoperative PEG are the extra time needed, and special preparation required for sterility (Table 5). Percutaneous endoscopic gastrostomy should not be indicated in the early postoperative period, as it is risky to pass the gastroscope and the feeding tube through a fresh surgical field with e.g. tenuous hypopharyngeal closure.

Nasogastric tube is inserted during the surgery in most of these cases, anticipating that, the patient will regain the ability of normal per oral feeding and swallowing after the healing takes place. If this fails for any reason, and the patient needs nutritional supplementation longer than 4 weeks, it is recommended to change nasogastric tube to gastrostomy. Indication for PEG is obvious in such cases. However postoperative PEG means an additional surgical intervention with extra discomfort for the patient. Certain complications after major head and neck surgery and the altered anatomy, caused by the ablative surgery can make PEG insertion difficult. It would be desirable to indicate preoperative or intraoperative PEG in the first place to patients, whose tumor location, -extension, and the type of operation, allow the surgeon to anticipate the need for long-term nutrition.

## **SPECIFIC INDICATIONS FOR PEG IN HEAD AND NECK CANCER**

The most important challenge for surgeons performing PEG placement is good patient selection. Patients undergoing resection of advanced-stage head and neck cancers often require weeks to months of rehabilitation before normal deglutition is achieved. This delay may be related to decreased oral competence due to resection of tissues needed for normal swallowing (e.g. tongue base), bulky reconstructive tissues, cranial nerve damage, or a combination of these factors. This delay of normal per oral feeding can be particularly prolonged by the side effects of postoperative radiotherapy. In order to set up a correct indication for PEG insertion in patients undergoing major head and neck surgeries, all the head and neck cancers treated in our ENT department in the last 7 years were worked up.

## PATIENTS AND METHODS

1325 malignant head and neck cancer patients were treated as inpatients in the University of Pécs, Medical School, ENT Department between 7<sup>th</sup> of January 1997 and 31<sup>st</sup> of December 2003. 1325 patients had 2125 hospital admissions over the 7-year-period. 177 (13%) patients were females and 1148 (87%) were males (Chart 1).

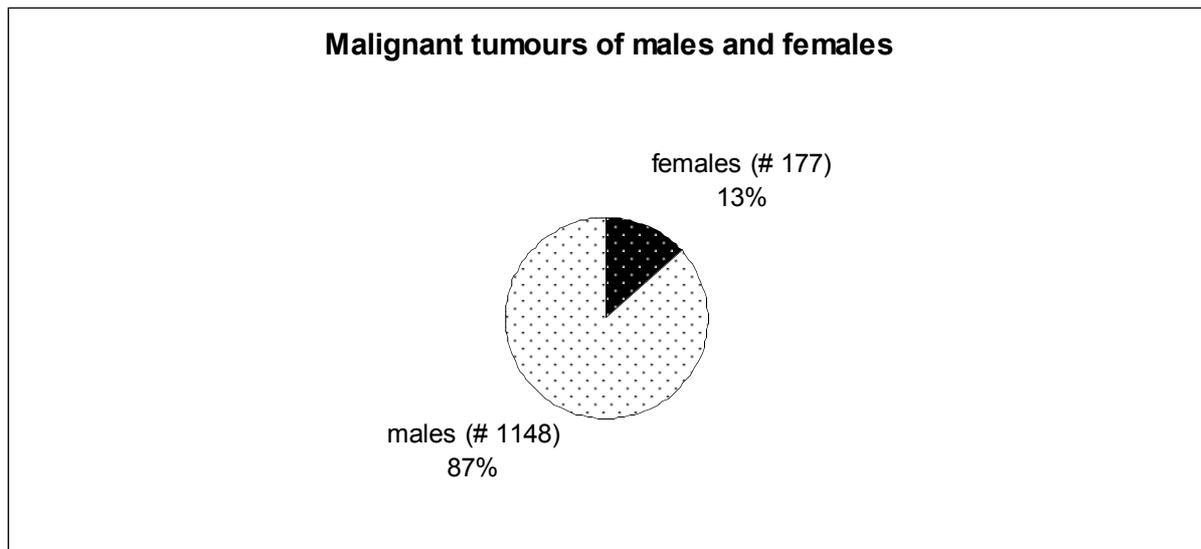


Chart 1

The average age for females was 53 years (range 21-90 years) while it was 45 years (range 17-93 years) for males. Of the 177 female patients 76 (43%) had laryngeal-, 14% had hypopharyngeal- and 7% had tonsillo-lingual cancers. 446 (39%) laryngeal-, 209 (18%) hypopharyngeal-, and 104 (9%) tonsillo-lingual cancers were diagnosed among the male patients with head and neck malignant tumors (Chart 2). The distribution of tumor sites was almost identical among the males and females (Chart 3). Overall, 41 % of the patients were treated with surgery, 10% with radiotherapy, and 10% with combination of surgery and radiotherapy. 30 % underwent diagnostic procedures only, and the remaining 9 % was admitted to the hospital for other reasons, such as e.g. palliation. Out of the 1325 patients with head and neck cancer, 676 patients had surgery (Chart 4). 23 different surgical procedures were performed on 834 occasions. The type and nature of the surgical procedures made it necessary in 559 cases, to insert a nasogastric tube or to create a gastrostomy for the recovery period. Unfortunately, missing and inaccurate data were only available regarding the exact number of nasogastric tube inserted and the time they were used, during the course of treatment in the different subgroups of oncology patients.

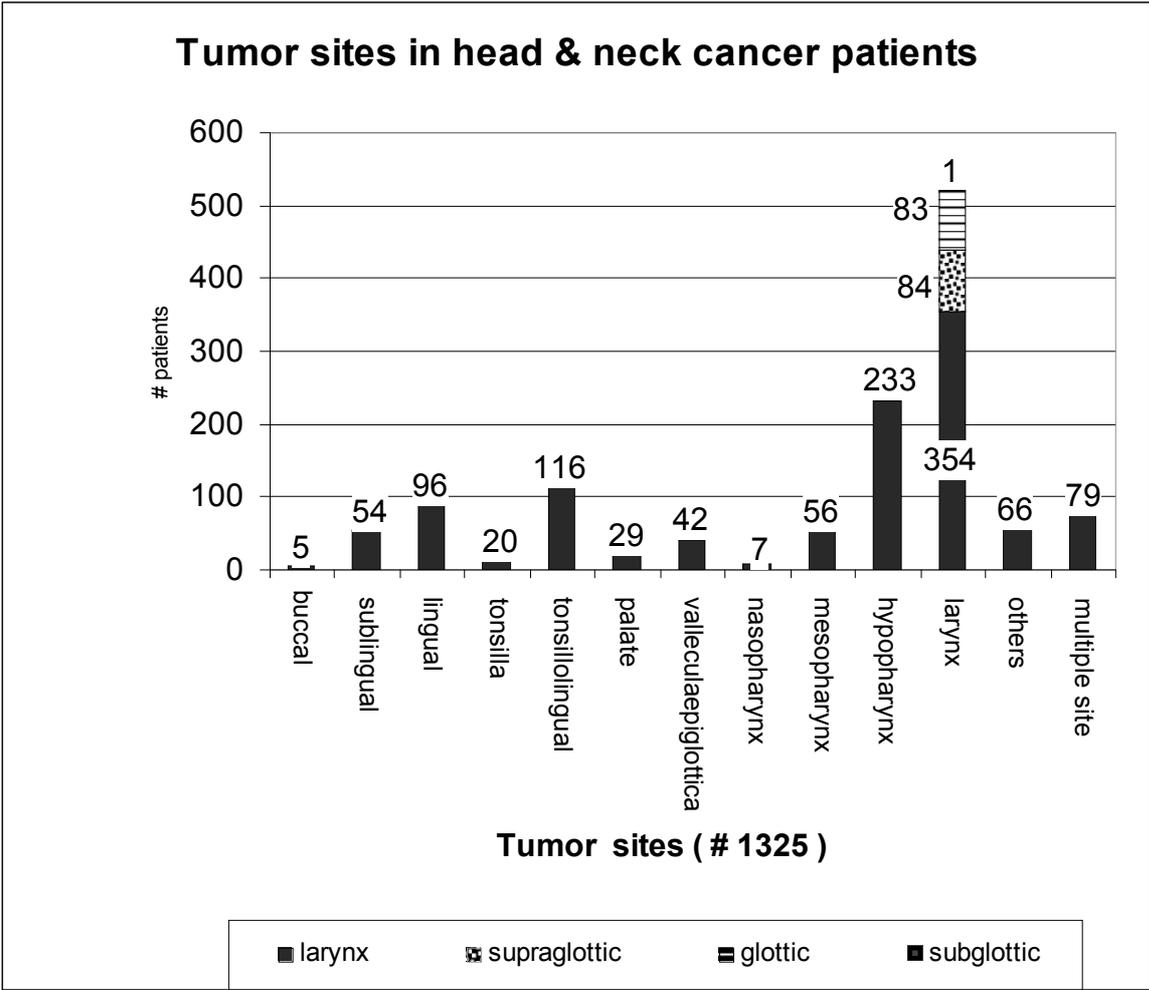


Chart 2

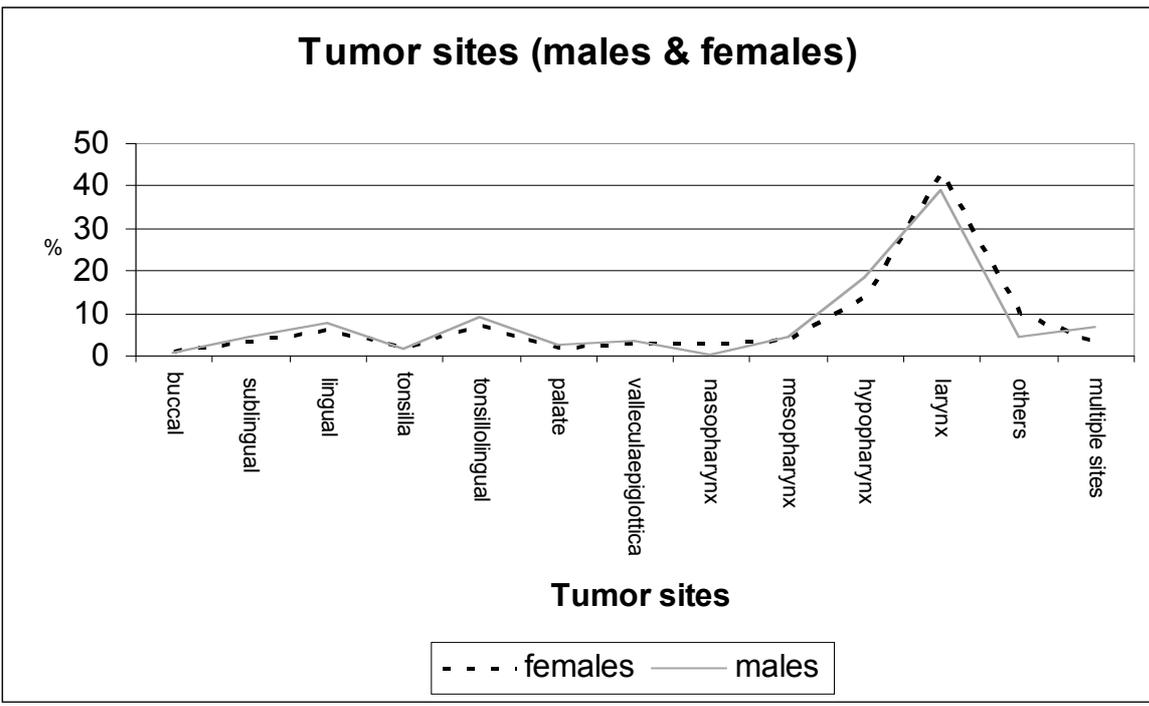


Chart 3

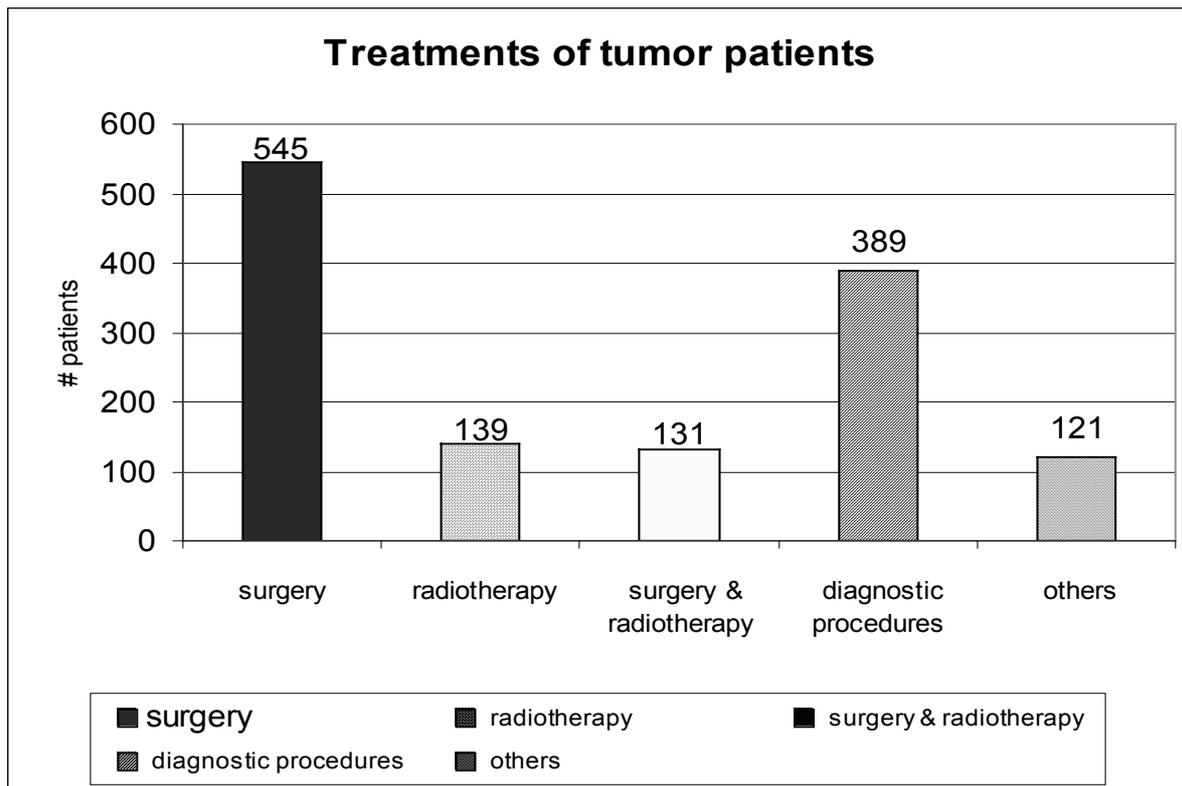


Chart 4

*Number of PEG procedures, timing of insertions, feeding days and replacements*

115 percutaneous endoscopic gastrostomies were carried out on 98 head and neck cancer patients in the University of Pécs, Medical School, ENT Department between 7<sup>th</sup> of January 1997 and 31<sup>st</sup> of December 2003. The average age was 62 years (range 48-76 years) for female and 54 years (range 31-78 years) for the male patients. 73 PEGs were performed in 59 patients in the postoperative period. 5 patients (6 PEGs) had preoperative, and 10 patients (11 PEGs) had intraoperative PEG insertions. One patient each had PEG inserted twice from the preoperative and intraoperative groups. The second PEG procedure took place postoperatively in both cases. 25 PEGs (24 patients) were carried out as part of palliative treatment to provide nutritional support (Table 4). “Pull back” technique was used for PEG insertion, except for two cases of “push” technique. The insertion was performed either in general anesthesia or in sedation. The assistance of a rigid laryngoscope was used, whenever difficulty was encountered during the introduction of the gastroscope. “Second-look” endoscopy was always performed, either per orally, or via the inserted PEG feeding tube. PEG feeding was started gradually 12-24 hours after insertion, if postoperative assessment showed no signs for bleeding or leakage at the PEG site.

## RESULTS

The average number of feeding days through PEG was 307 in the postoperative group. This value was calculated from results of 66 PEGs, as the data were missing in 7 cases. The shortest duration of PEG feeding was 6 days, while the longest was 2403 days. Postoperative PEG insertions took place 84 days in average (range 4-283 days) after the definitive surgical resection. The mean PEG feeding duration was 316 days (range 40-534 days) in the intraoperative group and it was 81 days (range 10-143 days) in the preoperative group. 24 patients had PEG as part of palliative therapy. The mean PEG feeding days in this group was 142 days (range 5-554 days).

In 10 postoperative patients the PEG had been permanently removed after 243 days in average (range 62-581 days), as adequate swallow function returned. In one preoperative case, PEG was removed on day 10 and in one palliative case on day 15, due to subsequent complication. 11 patients had PEG insertion more than 1 time. PEG was change 4 times respectively in two patients, 3 times in another two patients and twice in 7 patients. Complication was the reason for PEG replacement in 12 cases. 5 PEGs were removed as adequate per oral feeding returned, but later PEG had to be reinserted due to e.g. recurrence of tumor.

### *Tumor sites and types of surgical procedures*

20 tonsillo-lingual-, 7 tongue base-, 2 tongue-, 5 sublingual-, 10 supraglottic-, and 7 hypopharyngeal cancers were diagnosed in the surgical groups with PEG. 16 cancers involved multiple sites and 7 were localized elsewhere (Chart 5). 13 of the 16 multiple site cancers involved the tongue base along with other sites such as supraglottic area, mesopharynx or hypopharynx. The “others” group represented 3 mesopharyngeal, 2 trans-glottic, 1 parotid and 1 maxillary tumor. In total, 47 patients had cancers involving muscles responsible for tongue movement. Of the 74 patients in the surgical group, 36 had pectoralis major myocutaneous flap-, and 4 had radial forearm free flap reconstruction after radical resection of the tumors. 16 patients underwent horizontal supraglottic resection of the larynx. 6 of these cases also had tongue base involvement. In 18 cases, the tumors were resected radically without flap reconstruction. 8 surgical resections in this group also involved the muscle of the tongue and in 5 cases significant portion of the meso-hypopharynx were resected. Involvement of hypopharynx by cancer was found in 16 surgical cases. Percutaneous endoscopic gastrostomy insertions took place under general anesthesia in 33 cases. The rest was performed in local anesthesia. Antibiotic was given to all patients in the preoperative and intraoperative group.

	No. of patients	No. of PEG insertion	No. of patients with multiple PEG insertions	Duration of PEG feeding (days)	Missing data (cases)
Postoperative group	59	73	8	307 (6-2403)	7
Intraoperative group	10	11	1	316 (40-534)	4
Preoperative group	5	6	1	81 (10-143)	3
Palliative group	24	25	1	142 (5-554)	3

Table 4.

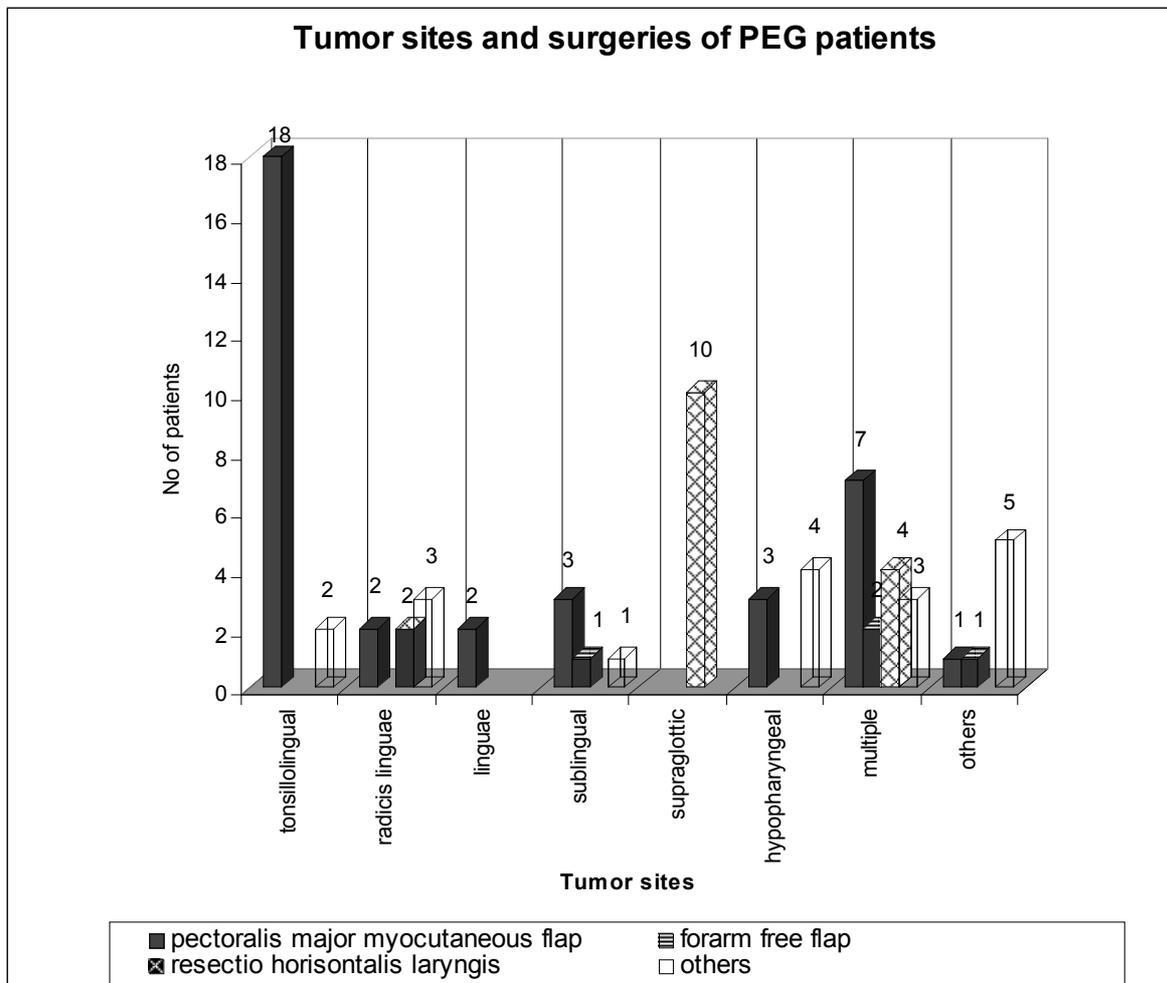


Chart 5.

*General anesthesia, antibiotic prophylaxis, complications*

Single dose antibiotic prophylaxis was used in 50 postoperative and in 14 palliative PEG procedures respectively. Most often, antibiotic was chosen from the cephalosporin group. Antibiotics were not routinely administered to patients needed PEG replacement.

	Laryngoscopy assistance	General anesthesia	Antibiotic prophylaxis	Complications	
				“in-use”	Procedure-related
Postoperative group (75 PEGs)	1	11	50	10	7 (2 AB)
Intraoperative group (10 PEGs)	0	10	10	0	0
Preoperative group (5 PEGs)	5	4	5	0	1
Palliative Group (25 PEGs)	4	8	14	0	2 (1AB)
Total	10	33	79	10 (8.77%)	10 (8.77%)

2 AB: Two patients with antibiotic prophylaxis; 1 AB: one patient with antibiotic prophylaxis.

Table 5.

We experienced complications in 20 instances. “In-use” complications were dislodgement, fracture, and blockage of the feeding tube. Displacement and deterioration of the tubes occurred in 10 cases after a mean of 351 days (range 6-594 days). All 10 tubes were replaced. Peritonitis, peritubal leakage and wound infection were noted, among the procedure-related complications. 2 PEGs had to be removed for good and 2 needed replacement. Each patient with complication was put on antibiotic therapy. The rate of procedure-related complication was 8.77%, while the overall complication rate was 17.54%. 36 PEG insertions were performed without antibiotic coverage while 79 were covered. Of the 36 PEGs, with no antibiotic prophylaxis 7 complications were noted versus the 3 among the 79 covered with antibiotics (19.44% vs. 3.79%). This was significant difference (CHI square test  $P < 0.006$ ). No complication was found in the intraoperative group. They all received antibiotics (Table 5). Four patients in the palliative group died within two weeks after PEG insertion. None of the deaths were related to the procedure.

### Technical notes

Always “pull” method was used to insert PEG, except for two cases with “push” technique. The introduction of the gastroscope into the stomach required the assistance of a Klensasser`s laryngoscope in 4 preoperative, 4 palliative and 1 postoperative case. PEG was inserted once via a cervical pharyngo-cutaneous fistula. “Second-look” endoscopy was performed by a laryngofiberscope via the feeding tube in 12 instances.

### Outcome and mortality

On 31 December 2003, 52 (53%) patients were dead and 30 (31%) were alive. No data were available in 16 cases. 26 patients were using PEG for feeding out of the 30 still alive. 4 patients had their PEGs removed permanently due to return of adequate per oral feeding. Death occurred within 2 weeks of PEG insertion in 4 palliative cases. None of the deaths were related to the PEG procedure. 48 patients died with their PEG still in place, while 4 had it removed earlier (Table 6).

## **DISCUSSION**

Majority of patients with head and neck malignancies need artificial nutrition during the course of their disease. Nasogastric tube is sufficient for short-term (less than 4 weeks) nutritional support, however for long-term, percutaneous endoscopic gastrostomy is favored. The type of surgery, the tumor site, the extension, and the therapy determines the possible need for long-term feeding. These factors were studied in our oncology patients in order to define indication for PEG in head and neck surgical cases. The focus of our attention was on tumor site and surgical procedures that hinder swallowing the most.

### *Indication for PEG in head and neck surgery*

The tumor registry and inpatient charts of patients hospitalized for treatment of head and neck cancers at Pécs University, Medical School, ENT Department were retrospectively examined. From January 1997 through December 2003, 1148 male and 177 female patients were admitted with head and neck malignancies. 23% of primary tumors involved the tongue and its muscles. Out of the 676 patients who underwent surgery, the resection involved the tongue, the tongue base or the tonsillo-lingual region on 187 (28 %) occasions.

	PEG removed			Died with PEG	Alive with PEG	No data
	Died	Alive	No data			
Postoperative group	4	4	2	23	21	5
Intraoperative group	0			6	1	3
Preoperative group	0	0	1	1	1	2
Palliative Group	1	0	0	17	3	3
Total	12			47	26	13

Table 6.

82 times pectoralis major myocutaneous flap and 19 times radial forearm free flaps were used for reconstructions. These flaps were utilized 87 times to reconstruct the excision site of the tongue-base, sublingual, or tonsillo-lingual regions. 69 (79%) of the patients who underwent such surgeries needed tube feeding more than 4 weeks in the postoperative period.

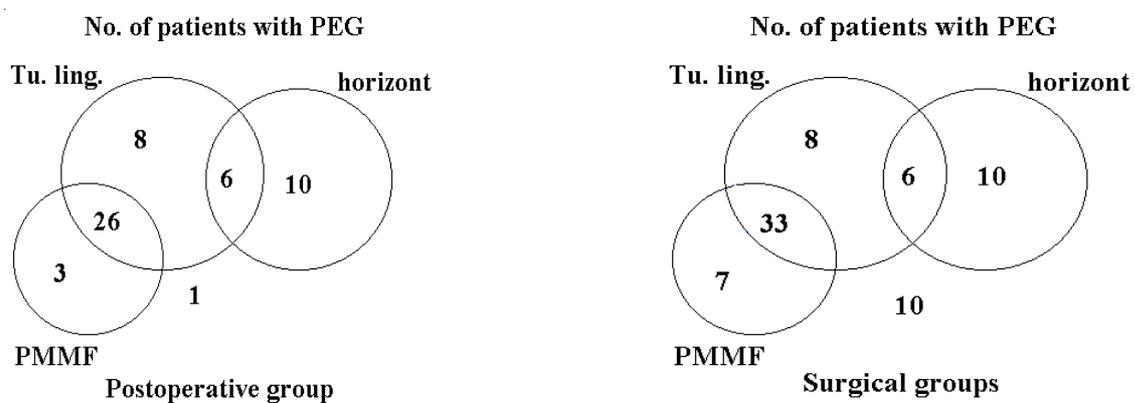
Among the 74 patients with percutaneous endoscopic gastrostomy in the surgical groups, 47 (64%) had tumors involving the muscular structure of the tongue and tongue base. The ratio was somewhat less in the non-surgical, palliative group (10 out of 24 patients, 42%).

40 (54%) patients underwent pectoralis major myocutaneous flap, or radial forearm flap reconstructions after radical excision of their malignancies (Table 6). Tongue involvements by the tumor or the need of musculo-cutaneous skin flaps for reconstruction seem to be important indicators for possible poor swallowing capability in the postoperative period. Either or both of these factors were present in 73% of all the surgical case and 80% in the postoperative group.

In our study, 6% of all head and neck oncology patients had supraglottic laryngeal malignancies. In the 7-year period, 47 horizontal supraglottic resections were performed, all requiring postoperative tube feeding. Out of the 47 supraglottic horizontal laryngectomies 16 (34%) had percutaneous endoscopic gastrostomy tube inserted for long-term nutritional support. The cancer was localized in the supraglottic region in 10 cases, and it also involved the base of tongue in the remaining 6. Among all the patients with PEG in our postoperative group, 16 (30%) underwent horizontal supraglottic laryngectomy previously.

16 patients in the surgical groups had tumors involving the hypopharynx. Due to the large extension of the tumor, 11 out of the 16 underwent radical surgical excision with skin flap reconstruction.

98 % of the patients who needed PEG feeding in the postoperative period had radical excision of cancers in the tongue region with or without skin flap reconstruction, or underwent supraglottic horizontal resection. The same figure was 86% among all the patients in the surgical groups receiving PEG (Chart 6). Excision of tumors in the lingual, sublingual, tonsillo-lingual or tongue base regions, all influence and hinder proper swallowing function. The need for different types of musculo-cutaneous skin flaps, also indicate that the resection was large and extensive. Besides, these musculo-cutaneous skin flaps cannot play an active role in the swallowing function, as do the tongue muscles, which they replace. They neither have muscle contracting capability nor innervations. The resection of the supraglottic region of the larynx also impairs proper deglutition and causes aspiration especially in elderly. Based on our findings, we indicate PEG, if extensive surgical resection of the extrinsic tongue muscles needed, with skin flap reconstruction. Besides, we also noticed that there is a high risk for prolonged swallowing difficulties and aspiration in patients with supraglottic horizontal resections, especially, if the tongue base also had to be resected due to tumor involvement.



Tu. Ling.: Tongue cancer; Horizont: horizontal supraglottic laryngectomy; PMMF: Pectoralis major myocutaneous flap or radial forearm free flap

Chart 6.

In sum, I suggest the use of percutaneous endoscopic gastrostomy at the time of the definitive surgery, if

- extensive resection of the extrinsic muscular structure of the tongue, with skin flap reconstruction is needed, or

- supraglottic horizontal laryngectomy, with partial resection of tongue- base is planned, or
- extensive resection of mesopharynx or hypopharynx with skin flap reconstruction is carried out.

*Procedure failures, complications, antibiotic prophylaxis, general anesthesia*

The literature cites approximately 5 % failure rate for inserting PEG. Unsuccessful gastroscopy and the inability to transilluminate the stomach are the causes of failure. We were unable to perform PEG twice in our practice. In one case, we failed to achieve transillumination of the abdomen, and in the other, we could not pass the gastroscope through the narrow pharynx, developed after surgery and radiotherapy. PEG complications are divided into two categories, major and minor. The mortality of PEG is around 1-2 %, and the morbidity rate is around 3-15 %. Peritonitis, hemorrhage, buried bumper syndrome, and gastrocolic fistula used to be cited as major (~3%), PEG, whereas wound infection, peristomal leak, hematoma as minor (5-15%) complications. Complications can also be divided into “in-use” or “procedure-related”. “In-use” complications include problems such as feeding tube blockage, fracture, dislodgement, and detachment of bumpers or deterioration of the tube. In our series we needed to change the PEG 10 times due to “in-use” reasons. 7 times the tube dislodged, 2 times it fractured, and once blocked. These events happened 351 days in average (range 6-594 days) after PEG insertion. “Procedure-related” complications were supposed peritonitis, peritubal leak, and wound infection. We noticed peritubal leakage on 4 occasions with clinical symptoms of infection. The onsets of symptoms were on day 3, 6, 37, and 149. All the patients were put on systemic antibiotic therapy along with H-2 blockers. Enteral feeding was suspended for few days. Zinc paste was applied locally, to prevent maceration of the skin. Three times drainage bag was necessary to collect the discharge. We noted severe abdominal pain, tenderness, distension and peritubal discharge on day 5 in two cases. Patients also developed fever, nausea and fatigue. The abdomen became firm, with board-like rigidity around the stoma site. In these two cases we supposed the presence of local peritonitis. Same treatment was used as for peritubal leakage, but we were also compelled to remove feeding tubes. Additionally, 4 times marked wound infections were noticed around the stoma site that developed 4, 4, 5, and 569 days after the PEG insertion. In all 4 cases local and systemic antibiotic treatment was started. PEG was also changed in one case.

To reduce the incidence of peristomal leak, “second-look” gastroscopy or “trans-tubal” fiberscopy are important for checking the tightness of the feeding tube at the time of insertion. The inner bumper of the feeding tube should be relatively tight in the first few days but later should be loosened. Too loose adjustment can lead to pneumoperitoneum or peritonitis, whereas too tight can cause cellulites or peristomal leak by pressure necrosis of the gastric wall. Four patients in the palliative group died within two weeks after PEG insertions (day 5, 5, 7, and 13), of causes unrelated to the gastrostomy tube insertion. The overall procedure-related complication rate was 8.77 % (Table 5). At the beginning, antibiotic prophylaxis was not routinely used for our PEG procedures, but later we found it useful to prevent wound infections. 36 PEG insertions were performed without antibiotic coverage, while 78 patients received antibiotics, either for prophylaxis or for treatment. Usually, antibiotics from the cephalosporin family were chosen. Of the 36 PEGs, with no antibiotic prophylaxis 7 complications were noted versus the 3 among the 79 done under antibiotic coverage (19.44% vs. 3.79%). This was significant difference (CHI square test  $P < 0.005$ ). No complication was found in the intraoperative group. They were all covered by antibiotics (Table 5). The use of perioperative antibiotics seemed to be an important factor in minimizing intra-abdominal infections, as well as preventing local exit site infections. We recommend the use of antibiotic prophylaxis as a general measure in percutaneous endoscopic gastrostomy. I recommend the insertion of PEG in the same anesthesia of the ablative surgery (e.g. intraoperative PEG), as no diagnosis, therapeutic plan, histology result or consent is yet available in the preoperative stage.

In 9 cases, maneuvering the gastroscope to the esophagus was only possible by using a Kleinsasser’s type rigid laryngoscope. Direct visual control enabled us to guide the gastroscope manually through the tumor mass into the esophagus.

In one postoperative case, both the gastroscope and the PEG tube was lead through cervical pharyngo-cutaneous fistula.

### *Outcome and mortality*

In most of our patients, the decision to place PEG proved to be correct, as the majority of patients both in the surgical and palliative groups required enteral feeding on a long-term basis (Table 4). In 10 postoperative patients, PEG was removed permanently, as they had regained their ability of per oral feeding after 243 days in average (range 62-581 days). At the end of the study, 26 patients still used PEG for nutritional support. 48 patients expired of causes unrelated to the gastrostomy tube, with their PEG *in situ* at the time of death (Table 6).

## THESES

1. Percutaneous endoscopic gastrostomy is advised for long-term enteral feeding in head and neck cancer patients.
2. The author recommends the use of percutaneous endoscopic gastrostomy in the first line, instead of nasogastric feeding tube for patients scheduled for the following surgeries:
  - Extensive resection of the extrinsic muscular structure of the tongue, with skin flap reconstruction.
  - Supraglottic horizontal laryngectomy, with partial resection of tongue- base.
  - Extensive resection of mesopharynx or hypopharynx with skin flap reconstruction.
3. PEG insertion is recommended at the time of the ablative tumor surgery in the same general anesthesia. If difficult gastroscopy is suspected due to massive tumor load, intraoperative PEG is advised.
4. “Second-look” gastroscopy should be performed for checking the correct position of the feeding tube and to exclude complications. The author recommends the use of his novel method (‘trans-tubal” endoscopy), instead of the second per oral gastroscopy. A laryngofiberscope can be passed through the inserted PEG tube for adequate visual control.
5. Antibiotic prophylaxis is essential, when performing percutaneous endoscopic gastrostomy in head and neck cancer patients. Antibiotic prophylaxis results in statistically significant reduction of the infectious complications.
6. PEG can be successfully performed via a cervical pharyngo-cutaneous fistula, if no other route is possible.

## NOVELTIES

1. The author introduced for the first time, the use of percutaneous endoscopic gastrostomy for the management of patients with head and neck cancers in Pécs University, Medical School, ENT Department.
2. The author set up specific indications of PEG in head and neck cancer surgery, by working up the data of head and neck oncology cases treated in his department.
3. He detailed the procedure of intraoperative PEG. Emphasized the importance of timing the PEG procedure and recommended intraoperative PEG placement after careful patient selection, based on the specific indications, set up by him.
4. The author worked out and introduced first in the international literature a novel technique for “second-look”. Instead of passing the gastroscope to the stomach second time when performing PEG procedure, a flexible laryngofiberscope is passed through the inserted feeding tube. Please refer to the text regarding the multiple advantages of this technique.
5. He published first in the international literature the possibility of performing PEG via a cervical pharyngo-cutaneous fistula formed after a major head and neck surgery.

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