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SURGICAL ENDOSCOPY
and Other Interventional Techniques

Laparoscopic Witzel gastrostomy—a reappraised technique

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Abstract
Background: Laparoscopic gastrostomy is the best alternative for long-term enteral feeding when percutaneous endoscopic gastrostomy is not possible. The aim of the present study was to determine the feasibility, complications, adequacy of feeding support, and tolerability of laparoscopic Witzel gastrostomy (LWG) in head and neck cancer patients. The initial results and the results of extended follow-up were evaluated.
Methods: A consecutive series of 48 patients with stenotic head and neck or esophageal cancer were referred for laparoscopic gastrostomy. The patients consisted of 42 men and 6 women aged 36 to 82 years (mean, 54 years). After laparoscopic placement of a Foley catheter of 16 F into the stomach, a seromuscular tunnel 4 cm in length is created, embedding the catheter by interrupted sutures. Three stay sutures for gastropexy are fixed and tied on the abdominal skin at the end of the procedure. The mean duration of the procedure was 62.4 ± 11 min (52–124 min).
Results: Laparoscopic Witzel gastrostomy could be performed successfully in all patients with aerodigestive cancer. None of the laparoscopic gastrostomy tube placement procedures was converted to an open surgery, and none of the 48 patients in this series died as a result of the laparoscopic procedure. All LWG complications (11%) were minor, consisting of superficial wound infections, balloon rupture, and chronic granulation. No major complications were encountered. The mean usage time of gastrostomy was 6.3 ± 5.3 months.
Conclusions: Current techniques of LWG could be an alternative to percutaneous endoscopic gastrostomy (PEG) for long-term enteral access, because it has proved to be safe and reproducible with relatively few complications.

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Key words: Head and neck cancer — Laparoscopic Witzel gastrostomy — Enteral feeding

Esophageal or head and neck cancer patients with dysphagia are commonly nutritionally depleted and require aggressive nutritional support in an attempt to reduce morbidity and enhance quality of life [9, 17]. Treatment of nutritional problems in these dysphagic patients receiving therapy for aerodigestive cancer represents a significant challenge. Enteral access is the treatment of choice for malnourished patients with a normally functioning gastrointestinal tract, as the integrity of the gut mucosa is maintained and mucosal atrophy is thus prevented. For many years, surgery or nasogastric tube placement offered the only means of providing adequate nutritional assistance until percutaneous endoscopic gastrostomy (PEG) was developed in the early 1980s [1, 2, 4, 8, 10, 19]. This method has been found to be simple and safe for enteral nutrition and has become the standard procedure in the last few years [11, 13]. In most instances conventional surgical procedures have been increasingly replaced because of the high morbidity and mortality rates. However, gastroscopy, especially the performance of PEG, is impossible for patients with a tightly stenotic upper digestive tract, and this difficulty is sometimes exacerbated in cancer patients.

With the advent of minimally invasive surgery, new therapeutic options have become available. Great progress in laparoscopic techniques and instrumentation has led to the development of laparoscopic approaches for the placement of the gastrostomy tube. Although surgical Witzel gastrostomy has been widely used in patients requiring enteral access [2, 10], there is no report with regard to similar technique assisted with laparoscopy in the literature. The aim of the present study was to determine the feasibility, complications, adequacy of feeding support, and tolerability of laparoscopic Witzel gastrostomy (LWG) in aerodigestive cancer patients. The initial results and the results of extended follow-up were evaluated.

Table 1. Locations of primary lesion in esophageal or head and neck cancer patients

Primary site	No. of patients
Tongue cancer	6
Mouth floor cancer	2
Retromolar and fauces cancer	3
Alveolus cancer	4
Buccal mucosa cancer	4
Maxillary cancer	3
Hypopharyngeal cancer	6
Oropharynx cancer	1
Nasopharyngeal cancer	3
Laryngeal cancer	4
Esophageal cancer	10
Thyroid cancer	2
Total	48

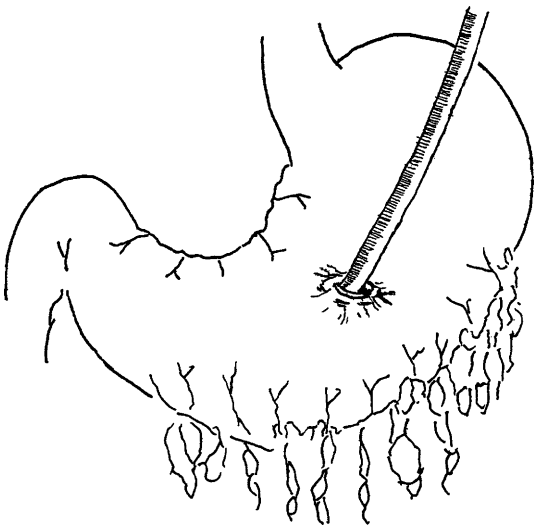

Fig. 1. The catheter is inserted into the lumen of the stomach and secured by a concentric purse string suture.

Materials and methods

Patients

From September 2002 to June 2005, a consecutive series of 48 patients with stenotic head and neck or esophageal cancer were referred for laparoscopic gastrostomy by the departments of otolaryngology and oncological surgery. Twenty patients were scheduled to undergo radiotherapy or combined radiochemotherapy. Twenty-five patients with local recurrent disease were undergoing intra-arterial regional chemotherapy. The patients included 42 men and 6 women aged 36–82 years (mean, 54 years). Among them, two patients had undergone previous Billroth II type gastric resection. In forty of the 48 patients, endoscopy was judged to be impossible and PEG was not attempted because of severe pharyngeal or esophageal occlusion by tumor invasion before the patients were referred for enteral access. The locations of the primary lesions are listed in Table 1.

The indications for feeding tube placement were malignant disease in all patients and an associated moderate to complete dysphagia. The mean body mass index (BMI) was 19.6 ± 4.5 (14.0–27.8), and the mean serum prealbumin level was 12.6 ± 5.88 mg/dl (6.40–29.9 mg/dl) before placement of the gastrostomy tube in all patients. Varying degrees of malnourished status were founded in all patients, and a feeding gastrostomy was urgently needed.

Follow-up study was performed at least monthly for evaluation of complications, tube disturbances, adequacy of feeding support, and fate of the tube.

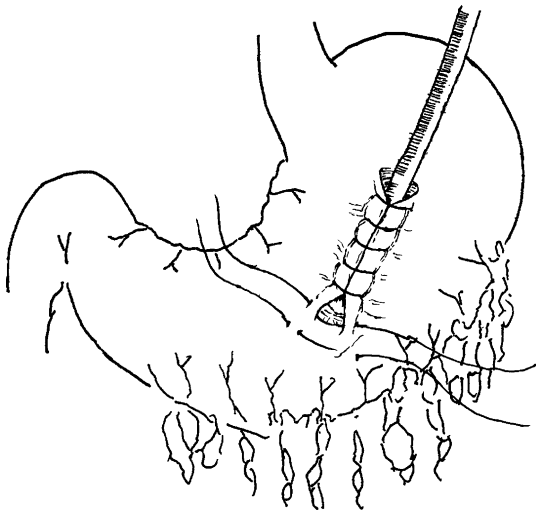

Fig. 2. A seromuscular tunnel is created embedding the catheter by continuous sutures.

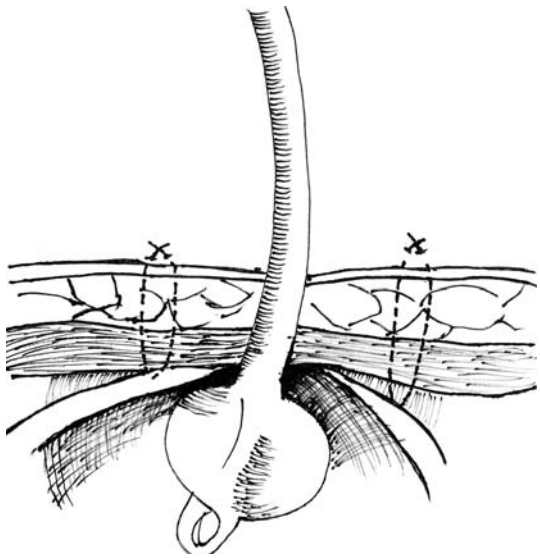

Fig. 3. Three stay stitches are placed for the gastropexy and the sutures are fixed and tied on the abdominal skin.

Operative technique

After creation of a pneumoperitoneum of 12 mmHg using a Veress needle under general anesthesia, three trocars are placed into the abdominal cavity. The first, a 10-mm trocar, is inserted in the umbilical region for optic equipment, and two 5-mm trocars are placed into the right and left lower quadrant, respectively, under laparoscopic control. The anterior wall of the stomach is identified at the region of the corpus and the proper site proposed for gastrostomy is selected. A 0.5-cm gastric stoma is made by means of a cauterization instrument, and a 16 F Foley catheter is then introduced into the stomach through the abdominal wall. Subsequently the catheter is secured by a concentric pursestring suture (Fig. 1), and a seromuscular tunnel 4 cm in length is created, embedding the catheter by interrupted or continuous sutures (Fig. 2). Three stay stitches are then placed, forming a triangle at the exit point of the catheter. Both ends of the sutures are pulled through the abdominal wall after the balloon is inflated, and the anterior wall of the stomach is then attached to the parietal peritoneum of the abdominal wall. The sutures are fixed and tied on the abdominal skin at the end of the procedures (Fig. 3).

All patients also had a fluoroscopic contrast examination on the first postoperative day to ensure that there was no leakage. One dose of prophylactic antibiotics was administered to all patients before or during the procedure.

Results

Success rate

Laparoscopic Witzel gastrostomy could be performed successfully in all patients with aerodigestive cancer. None of the laparoscopic gastrostomy tube placement procedures was converted to an open surgery, and none of the 45patients in this series died as a result of the laparoscopic procedure.

Time for procedure

The mean duration of the procedure was 62.4 ± 11 min (52–124 min). Operating time in 2 patients with previous surgery was much longer because it was necessary to lyse the adhesive bands laparoscopically and to identify an area suitable for placement of a gastrostomy tube.

Complications

All patients were closely followed for at least 30 days. All complications during that period were included in the assessment of morbidity. Major complications such as hemorrhage requiring blood transfusion or other intervention, peritonitis, aspiration, cardiac failure, anaphylaxis and collapse, or other states necessitating surgery or intensive care were not found in any of these patients. All LWG complications were minor, consisting of superficial wound infections, balloon rupture, and chronic granulation as summarized in Table 2. The rate of minor complications is 11%. The infection resolved completely with meticulous topical therapy. One tube displacement due to balloon rupture was encountered on the seventh postoperative day. The tube was removed and replaced with a new catheter through the original fistula without any difficulty. Two patients had chronic peristomal granulation, and this proved to be self-limiting with aggressive wound care.

Follow-up

In most patients gastrostomy tube feeding usually started with a clear liquid diet 24 h postoperatively. If the patient tolerated a clear liquid diet well for 2 days, commercial enteral nutrients were given as the main energy source. The gastrostomy tube was first replaced 10–14 days postoperatively. Further exchanges of the feeding tube depended on actual needs. In our series, 40 patients were discharged from the hospital with the gastrostomy tube in place, and all the tubes functioned satisfactorily during the period of outpatient follow-up. Four patients (8.3%) died within 30 days after the procedure. All of these deaths were disease-related. Twelve patients survived. The average duration of the gastrostomy was 6.3 ± 5.3 months (range, 1–20 months); termination of the gastrostomy was due either to death of the patient or removal of the tube.

Discussion

In recent decades surgical gastrostomy had been the mainstay for long-term enteral access until the percutaneous technique of gastrostomy placement was introduced. Two of the most popular surgical gastrostomies were the techniques described by Witzel and Stamm [1, 10]. These two techniques are comparable in ease of performance and complication rate [22]. However, surgical gastrostomy is created via laparotomy and carries a high risk of complications, with a rate between 3% and 60% [14, 22]. The use of percutaneous endoscopic gastrostomy has obviated the necessity for laparotomy and general anesthesia for enteral access in elderly, high-risk patients [11, 13]. Therefore, percutaneous techniques have become more frequently used than the open surgery technique. The laparoscopic technique was first introduced in 1991 and represented a promising alternative of minimally invasive procedures [7, 20]. Multiple studies have documented that laparoscopic gastrostomy is a safe and effective means of providing enteral nutritional support [15, 18].

One of the main advantages of the laparoscopic technique over PEG is its application in patients in whom endoscopy is impractical because of marked obstructions from tumors in the pharyngoesophageal region [6, 15]. In addition, it offers the benefits of direct intraperitoneal visualization, and therefore the chances of inadvertent injuries of visceral organs can be minimized during the procedure. Moreover, laparoscopic gastrostomy is still feasible with minor technical modifications in patients who have had previous gastric surgery.

We have been able to perform laparoscopic gastrostomies in two postgastrectomy patients with an excellent result. A serious but rare complication that has been reported in head and neck cancers is seeding of the tumor at the PEG site [5]. This is probably the result of implantation of cancer cells from the primary tumor into the abdominal wall by pulling the tumor through with the catheter. It seems likely that this complication can be completely eliminated by the laparoscopic approach, as none of the patients in this study had tumor metastasis at the abdominal stomal site.

Laparoscopic gastrostomy is clearly superior to traditional gastrostomy in terms of the advantages of minimally invasive surgery: postoperative pain is decreased, early enteral feeding is possible, and hospitalization is short [15, 18]. In our series, the rate of minor and major complications was 11%, comparing favorably with the literature. It is also well documented that laparoscopic gastrostomy enables advanced cancer patients to benefit from early enteral nutritional support [15, 18].

In this study, the results of 48 laparoscopic gastrostomies have proved that this technique allows a safe

and reliable means of ensuring nutritional supplements in patients with stenotic aerodigestive cancer. Laparoscopic Witzel gastrostomy has become our method of choice in patients with malignant, nonresectable subtotal stenosis of the hypopharynx or esophagus.

A number of technical variants of laparoscopic gastrostomy as alternatives to open gastrostomy and to PEG have been shown to be safe and effective by many studies [6, 15, 16, 18]. Most authors used modifications of the conventional Stamm gastrostomy by utilizing stay sutures [3], T-fasteners or anchors [6], or a combination of stay and pursestring sutures [12].

We have developed a laparoscopic variant adapted from the classic Witzel gastrostomy for use in patients with advanced aerodigestive cancer. The characteristic feature of our procedure is the creation of a seromuscular tunnel for the gastrostomy tube, assisted with a laparoscope, to prevent the risk of leakage. To our knowledge, there is no other description of laparoscopic gastrostomy with a Witzel tunnel in the literature. In this study, we found that these procedures can be performed as safely as PEG or other laparoscopic techniques. The method requires only three trocars and it is not time-consuming as compared with the methods adapted in other studies. Only 30 min is added to the procedure to accomplish a seromuscular tunnel. The tunnel is intended to function as an antireflux barrier that may prevent the peristomal skin from being eroded by the gastric contents; thus peristomal leakage can be avoided. A gastropexy is secured by three stay sutures tied on the abdominal skin to minimize peritoneal leakage. In this study no intraperitoneal drainage is needed.

Peristomal leak or stoma infection, which are traditionally attributed to excessive reflux of the gastric contents to the stomal site, are the most frequent and bothersome complications in patients with Stamm gastrostomy or PEG. In these patients the relatively short length of the gastrocutaneous tract makes it impossible to avoid excessive reflux of the gastric contents to the stomal site, and this may lead to subsequent erosive injury of the peristomal skin. Fluid leakage then ensues around the tube. The advantage of LWG over the common laparoscopic gastrostomy is the antireflux effect of the seromuscular tunnel. In this series none of our procedures were complicated by a peristomal leak. Our results also exhibited that a Witzel tunnel is effective in reducing the rate of stomal infection as well as peristomal leakage compared with other laparoscopic procedures or PEG in previous studies.

Improvements in laparoscopic technique make it possible to place the gastrostomy tube with ease, and the procedure now carries a low rate of minor complications (9%–15%) with rare serious complications [15, 18]. In our series, all complications were minor, and the complication rate of 11% is comparable to the incidence reported previously. In addition, none of the Witzel procedures were converted to surgical laparotomy. The procedure is easily learned, adds little operative time, and has no long-term morbidity. We prefer to use a 16 F Foley catheter with a 5-ml balloon as the gastrostomy tube, because the device is readily available and easy to use. However, to prevent early deflation of the balloon catheter we also recommend the use of a mushroom catheter of larger caliber instead of a Foley catheter as the gastrostomy tube. In addition, neither expensive commercial gastrostomy kits nor stapler devices as used in the Janeway procedure [16] are required, and the cost of the technique is low [3, 6, 15, 21].

In this retrospective study, we found that these procedures can be performed as safely under general anesthesia, and for similar cost, as conventional gastrostomy. In patients with advanced aerodigestive cancer placement of a gastrostomy tube usually becomes a permanent means of providing nutritional support. Our patients with LWG tolerated long-term enteral feeding well. Therefore, the LWG procedure could be an alternative to PEG, because it has been proven to be safe and reproducible with relatively few complications.

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