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Abstract

Purpose: Monocentric retrospective 5-years study evaluation of indications and morbi-mortality rates of surgical gastrostomies.

Methods: 293 patients under went surgical gastrostomy according to the Witzel technique. Age, gender, indication, type of anesthesia, complications and 30-days mortality were analyzed. Complications were detailed according to type minor (tube site infection, gastric tube removal, obstruction, breakage or leakage, intra-abdominal displacement, parietal hematoma) or major (gastric bleeding, aspiration pneumonia, gastroesophageal reflux, peristomal hernia, peritonitis, digestive perforation, incisional hernia), time of occurrence early (≤ 30 days) or late (> 30 days) and Dindo-Clavien's classification.

Results: Mean age was 63-years-old. Gastrostomies were performed for enteral nutrition or gastric decompression in 85% and 15% of cases respectively. The main indications were neurological pathologies (48%), and tumors (oto-rhino-laryngeal tumors (17%), lung tumors (8%), peritoneal carcinomatosis (8%), other digestive cancers (5%), urological cancers (2%), and various abdominal diseases (12%)). Overall mortality at 30-days was 16.3%. Sixty-nine (23.5%) complications occurred, with 13.6% minor and 9.8% major complications. According to Dindo-Clavien's classification, complication were graded respectively in 1-2 (66%), 3(22%) and 4-5 (12%). Patients with the highest mortality rates at 30 days were patients with a complication or procedural failure after endoscopic or radiological gastrostomy (20%), patients with lung tumor (50%), patients with airway pathology (18.9%) and patients with peritoneal carcinomatosis requiring a gastric decompression (16.7%).

Conclusion: This single-center experience gives an overview of the results after surgical gastrostomies in delayed emergency. The high morbi-mortality in some groups must challenge the surgical choice versus other endoscopic and radiological procedures, by evaluating the risk to benefit ratio for critically ill patients, taking into account short-term outcome and quality of life.

Keywords

Surgical gastrostomy, Enteral nutrition, Gastric decompression, Feeding tube

Introduction

The first surgical gastrostomy was performed by Verneuil in 1876. The technique evolved over time, and was eventually performed by laparoscopy [1-4]. In 1980, Gauderer published on the endoscopic percutaneous technique [5], and later still, the radiological percutaneous technique was described [6]. These different procedures have evolved rapidly and have been the subject of several publications to evaluate their success and morbi-mortality rates [7-13]. Currently, indication criteria for surgical gastrostomies vary greatly, even from one center to another, as the procedure is feasible under local anesthesia, without intubation. The most common indications are: (1) enteral nutrition or gastric decompression during an emergency laparotomy to complement another surgical procedure, (2) when endoscopic access is no longer possible (oto-rhino laryngeal tumors or esophageal pathologies), (3) when general anesthesia is contraindicated (spinal or neurological pathologies), (4) when gastric parietal trans-illumination is not possible (extra abdominal surgical history mesocolic, peritoneal carcinomatosis etc.), and (5) when the radiological or gastroenterological teams are not available to perform gastrostomies in emergency, or delayed emergency. The aim of this study was to analyze the indications and rates of morbidity and mortality at 30 days after surgery, in all patients undergoing a surgical gastrostomy in the University Clinic of Digestive Surgery and Emergency of Grenoble, France, over a 5-year-period.

Methods

This retrospective study included 293 patients that underwent a surgical gastrostomy at the University Clinic of Digestive Surgery and Emergency Hospital Michallon in Grenoble, France, between September 2009 and October 2014. Sixteen patients were excluded because they did not receive surgical management following intra-abdominal findings during the procedure. Data were collected using the Cristal-Net v.01.03.03 software Company Alma, France. Age, gender, indication for gastrostomy, type of surgical technique, duration of intervention, type of anesthesia (general or local), complications, when they occurred, and date of death were investigated. It was also noted whether the gastrostomy was referred for enteral nutrition or gastric decompression.

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Table 1: Indications, 30 days mortality rate and morbidity rate for minor. major and early complications. according to gastrostomy indications.

Indications	Effective (%)	Complications Minor	Major	30-days Mortality
Gastrostomy for Enteral Nutrition				
Neurological diseases	143 (48.8%)	20 (8%)	15 (6%)	9 (6.3%)
Oto-rhino-laryngeal tumors	50 (17%)	0 (0%)	0 (0%)	14 (18.9%)
Lung tumors	24 (8%)	8 (3.2%)	8 (3.2%)	12 (50%)
Various abdominal diseases	21 (7%)	3 (1.2%)	2 (0.8%)	3 (14.3%)
Other general diseases	10 (3%)	2 (0.8%)	1 (0.4%)	2 (20%)
TOTAL	248 (85%)	33 (11%)	26 (8.8%)	40 (16.1%)
Gastrostomy for Gastric Decompression				
Peritoneal carcinomatosis	24 (8%)	5 (10.9%)	1 (2.2%)	4 (16.7%)
Abdominal diseases	19 (6%)	2 (4.4%)	1 (2.2%)	3 (15.8%)
Airways diseases*	1 (0.3%)	0 (0%)	1 (2.2%)	0 (0%)
Other general diseases	1 (0.3%)	0 (0%)	0 (0%)	1 (100%)
TOTAL	45 (15%)	7 (15.5%)	3 (6%)	8 (17.7%)
TOTAL**	293 (100%)			

*Airways pathologies concern both oto-rhino-laryngeal tumors and lung tumors.

**Cohort of 293 surgical gastrostomies, 248 (85%) gastrostomy for enteral nutrition and 45 (15%) for gastric decompression.

All patients were operated in delayed emergency, using the gastrostomy technique described by Witzel [1,14] under local anesthesia. Induction began with the progressive injection of a NAROPEINE® solution of 7.5% at a dose of 3-5 mg/kg on a case by case basis, as the intervention was carried out under local, exclusive, or general anesthesia. First, a median and superior laparotomy were realized. Second, a stock was made, using resorbable suture thread 4.0 in the superior and anterior sides of the stomach, and third, we introduced the probe. An overlock, made with the same suture thread used for the stock, hid the probe over an area of 10 cm (using only the serosa or the sero-muscular part of the gastric wall). This overlock was attached to the anterior abdominal peritoneal side with 4 knots of resorbable suture thread 4.0. Finally, the probe exited through a contra incision made towards the parietal side. Technical difficulties most commonly occured themselves in obese patients or previously operated patients, two situations that require general anesthesia. The Foley® catheter (Péters Medical, France) was replaced by a Mic-Key® button (Cobra Medical, Netherlands) at the 3rd month consultation. Mortality was considered if the death occurred within 30 days after surgery.

Complications were categorized as minor or major, and early (≤ 30 days) or late (> 30 days) according to their time of post-operative occurrence, and according to their classification on the Dindo-Clavien scale [15]. The indications, morbidity, and mortality rates for patients who benefited from a second-line surgical gastrostomy were also analyzed. These second-line gastrostomies included those performed by laparotomy after failure of an endoscopic, radiologic or laparoscopic procedure.

The methodology of this study did not require formal patient consent, was in accordance with the ethical standards of the institutional and /or national research committee, and with the 1964 Helsinki declaration, its later amendments or comparable ethical standards. Qualitative variables are presented in the form of average numbers and percentages. Continuous variables are presented as mean (± standard deviation) or median (range).

Results

General characteristics of study population

The study included 293 patients (194 (66%) males). Mean age was 63 ± 15 years-old. All patients went through surgical gastrostomy by laparotomy according to the Witzel technique. Surgical procedures were performed under general anesthesia in 158 patients (54%) and local anesthesia in 135 patients (46%) with a duration/length of 67 ± 27 and 79 ± 38 minutes respectively.

Indications for surgical gastrostomies

Surgical gastrostomies were performed for enteral nutrition in 248 cases (85%), and for gastric decompression in 45 cases (15%). Indications are summarized in table 1. One hundred and forty-three (48.5%) feeding gastrostomies were performed for neurological pathologies, 58 (19.4%) for stroke, 38 (13%) for head injuries and autonomic comas, and 47 (16.1%) for other neurological diseases (amyotrophic lateral sclerosis, Parkinson's, dementia, etc.). Seventy-five (25.6%) gastrostomies were conducted for pathologies affecting the airways: 51 (17.4%) for oto-rhino-laryngical tumors, 24 (8.2%) for lung tumors, and in most cases, for enteral nutrition (74 cases out of 75). Sixty-five gastrostomies were performed because of abdominal disease (22.2%): including 24 (8.2%) for peritoneal carcinomatosis (exclusively for decompression), 40 (13%) for various abdominal diseases (postoperative pancreatic surgery, perforated peptic ulcer, urologic surgery complicated by extensive mesenteric ischemia) with 21 feeding gastrostomies and 19 gastrostomies for gastric decompression. Finally, 11 (3.7%) gastrostomies for enteral nutrition were needed because of general diseases (lymphoma, myeloma, and sarcoidosis).

Fifteen second-line surgical gastrostomies followed 8 (53.3%) failed percutaneous endoscopic procedures, 6 (40%) failed percutaneous radiological procedures and 1 (6.7%) failed laparoscopic procedure (leading to peritonitis by default of attachment to the abdominal wall). Endoscopic and radiological failures caused 4 peritonitis and 1 colo-cutaneous fistula respectively and there was a lack of data on the reason for failure in the remaining 9 patients recorded.

Mortality at 30 days after surgery, depending on the etiology (Table 1) and morbidity

Forty-eight patients (16.3%) died within 30 postoperative days, including 7 patients, immediately after the surgery (3%). According to the etiology, the highest mortality rates at 30 days were for patients with a lung tumor (50%), patients with a pathology of the airways (18.9%), and patients with peritoneal carcinomatosis (16.7%) requiring a gastric decompression. The lowest mortality rate at 30 days was for neurological pathologies (6.3%). The 30-day mortality rates for feeding and decompressive gastrostomies were comparable, at 16.1% and 17.7% respectively. Sixty-nine complications (23.5%) occurred within an average of 177 ± 306 postoperative days, with 13.6% minor and 9.8% major complications.

Results, in term of minor or major type, were comparable between the gastrostomy group for enteral nutrition (11% and 8.8% respectively) and the gastric decompression group (15.5% and 6% respectively) (Table 1). There were 40 minor complications (13.6%), mainly because of the parietal alterations caused by tube site infection (23 cases), chronic purulent flow, local inflammation, skin irritations (simple erythma or extensive burns). There were 29 major complications (9.9%), essentially gastric bleeding (9 cases), and to a lesser degree, aspiration pneumoniae and gastro-oesophageal reflux

Table 2: Late complication rate and type of complication.

	Total Effective (%)	Late Complications* (%)
Minor Complications	40 (100%)	26 (10.2%)
Tube site infection	23 (57.5%)	14 (5.5%)
Gastric tube removal	6 (15%)	4 (1.5%)
Gastric tube obstruction	6 (15%)	3 (1.2%)
Gastric tube breakage or leakage	1 (2.5%)	1 (0.4%)
Intra abdominal secondary displacement	3 (7.5%)	3 (1.2%)
Parietal hematoma	1 (2.5%)	1 (0.4%)
Major Complications	29 (100%)	14 (5.5%)
Gastric bleeding	9 (31%)	3 (1.2%)
Aspiration pneumonia	5 (17.3%)	2 (0.8%)
Gastro-oesophagal reflux	5 (17.3%)	4 (1.5%)
Peristomal hernia	3 (10.3%)	2 (0.8%)
Peritonitis	5 (17.3%)	1 (0.4%)
Digestive perforation	1 (3.4%)	1 (0.4%)
Incisionnal hernia	1 (3.4%)	1 (0.4%)

*Percentage excluding patients who died within the 30 days after surgery.

Table 3: Complication rate according to Dindo-Clavien's classification.

Grade	Effective (%)
1	35 (50.7%)
2	11 (15.9%)
3	15 (21.7%)
4	1 (1.5%)
5	7 (10.2%)

(Table 2). One case (3.4%) of secondary displacement of the feeding tube in the duodenum with perforation required further surgery.

The rate of early and late complications was 9.9% (n = 29) and 15.6% (n = 40) respectively (late complications have been reported in the effective population, excluding patients who died within 30 days after surgery, n = 257). Gastric bleeding was more frequent in the early post-operative period, while the parietal alterations were diagnosed later, usually at the 3-months post-surgical control consultation, when the Foley catheter is changed by Mickey button (Table 2).

According to the Dindo-Clavien classification (Table 3), out of a total of 69 complications, 35 required standard management without pharmacological or surgical treatment, requiring endoscopic and radiological interventions (Grade 1: 50.7%). The use of antibiotics was necessary in 11 patients (Grade 2: 15.9%). Among the 21.7% of Grade 3, 13 patients underwent re-intervention (4 gastric hemorrhages, 3 peritonitis, 1 parietal infected hematoma, 1 duodenal perforation by migration of the tube, 2 cases of chronic flow and 2 cases of accidental gastric tube removal). Two cases of severe gastro-oesophageal reflux necessitated endoscopy. Seven patients died in the aftermath of the intervention (Grade 5: 10.2%): 3 from gastric bleeding, 3 from aspiration pneumoniae and 1 from peritonitis.

The 30-day mortality and overall morbidity rates in the second-line surgical gastrostomy group were 20% (n = 3) and 26.6% (n = 4) respectively.

Discussion

Surgical gastrostomies are indicated in numerous cases and are generally done in delayed emergency, when vital prognostic is not compromised, but a race against denutrition in critically ill patients remain. The Witzel technique is a fast and reproducible procedure, and allows for easy replacement of the feeding tube remotely.

The 30-day mortality rate mostly depends on the type of indication. It is high for patients with lung tumors, often in an advanced stage of the illness when the gastrostomy is needed (48% in our series), also for patients with peritoneal carcinomatosis presenting with an occlusion resistant to medical treatment (16.7% in our series), and finally in patients managed for abdominal pathology in an emergency context (septic shock, hemodynamic instability, trauma) (15% in this series). Taking into account patients with lung tumors, surgical gastrostomy may worsen chronic underlying respiratory failure. The time lapse between the decision, at preoperative consultation, and the surgical procedure can also be brought to question because the patient weakens and worsens. Other series report lower morbi-mortality rates (0% to 29%) [10-13,16,17], but they included patients undergoing surgical gastrostomy for enteral nutrition from all emergency context. In terms of morbidity, rates highlighted in our series are similar to those described in the literature, as well as for overall complications [7,12,13,17] (9 to 74.3%), both minor (18.6 to 54%) [9,13,16] and major (14% -19.9%) [9,10,16,17].

Between 1990 and today, many series have aimed to compare results for different surgical, endoscopic and radiological gastrostomy techniques. Results are generally comparable, as each specialty defends its favored procedure. Overall complication rates vary from 7.3 to 43% [7,11-13] for the endoscopic series, and from 4.9 to 16% [8,11] for the radiological ones. The 30-day mortality rates for both techniques were 0.53 to 17% [10-13,18,19], and 0.3 to 15% [10,11], respectively. Only one prospective randomized study compared morbidity and 30 day-mortality rates after surgical and endoscopic percutaneous gastrostomy procedures [13], which showed a significantly higher rate of overall complications in the surgical gastrostomies group (15% versus 74.3% p = 0.007). However, these results should be interpreted carefully, as the methodology and study populations were not comparable. Indeed, some excluded patients managed in an emergency context [13,17,19], while others included them [16], and others included patients with severe comorbidities [17] while others included only neurological [13] disease cases.

The strength of the present study lies in its cohort of surgical gastrostomy patients, all taken from a single center, within a 5 years period, and all performed according to the Witzel technique. However, the following limitations remain:

- This was a retrospective, nonrandomized study on a single surgical technique; there is no data about indications, morbidity and mortality rates for other endoscopic and radiological techniques performed in the same center. Similarly, patients with complications from an endoscopic or radiological procedure who did not require surgical treatment, and were not managed in the surgery department (essentially tube site infection of the parietal wall, difficulties with extensive equipment, sepsis, malnutrition and electrolyte disturbances) were not included either.

- Due to the retrospective nature of the study, it was not possible to assess the quality of life of patients operated.

- In most cases, enteral nutrition is an indispensable part of management for patients needing gastrostomies. Oftentimes, these cases are added to the delayed emergency programs in endoscopy, radiology, or open surgery, which are already overbooked, with the logistical difficulties this generates. In some cases, a gastrostomy might not be the most appropriate procedure, i.e. in cases where a surgical approach is not required, but patients will beoperated nonetheless. A common approach should be to promote the use of radiological and endoscopic percutaneous gastrostomy for all pathologies not related to obstruction of the upper aero-digestive tract [14, 20].

Conclusion

The surgical gastrostomy according to Witzel is applicable to a large number of patients with various diseases. Morbidity and 30-day mortality rates remain acceptable considering that patients suffer from heavy comorbidities and are in a state of nutritional insecurity.

The main limit of this study is its retrospective and descriptive characteristic. In this center, it was not possible to have access to the same morbi-mortality data for endoscopic and radiological gastrostomies in order to compare and orientate on which technique is superior. A common approach should be to promote the use of

radiological and endoscopic percutaneous gastrostomy for all pathologies not related to obstruction of the upper aero-digestive tract. Future studies could focus on randomized trials for the most appropriate technique (surgical, endoscopic or radiologic) in patients requiring a gastrostomy in delayed emergency, depending on indications and life expectancy.

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