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Research Article

Open Gastrostomy by Mini-Laparotomy: A Complete Study

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Abstract: **Background**: Gastrostomy tube feeding is the best option for long lasting nutritional support in patients with dysphagia caused by obstructive tumours of the mouth, pharynx, larynx and oesophagus or neuromuscular diseases. However, these severely compromised patients often present severe respiratory risks, precluding the use of general anesthesia, sedation or even endoscopy. A simplified open gastrostomy (SOG) under local anesthesia has been in practice in our institution, especially for patients with severe neuromuscular diseases and continuous non-invasive ventilatory support. In this study, we try to compare the surgical outcomes of this technique, with the classical Stamm gastrostomy (SG). **Material and methods** This simplified technique uses a minimal vertical midline incision (3 cm), just below the xyphoid process, under local anesthesia. The gastrostomy tube is passed by a left lateral stab wound, inserted in a double purse-string in the gastric wall and pulled to the anterior abdominal wall. No sutures between the stomach and the peritoneum are placed. We retrospectively analyzed the clinical records of 63 consecutive gastrostomies performed upon a 3-year period, 23 of which were by SOG. **Results**: The SG was performed mainly in oncological patients, and SOG in patients with neuromuscular diseases ($p < 0.001$). In the SOG group, 95,4% (n = 22) of the patients were ASA IV, compared with 74,4% (n = 29) in SG ($p = 0,03$). The mean operative time was shorter in the simplified technique (37 vs 60 min; $p = 0,01$). All the surgeries in the SOG group were performed exclusively with local anesthesia and in the Stamm procedure, 47,5% required invasive ventilatory support ($p < 0.001$). There were no significant differences regarding in-hospital morbi-mortality ($p = 0,18$). The patients were able to receive adequate nutritional support, and the overall satisfaction of the patients and family/caregivers is very good. **Conclusion**: The simplified mini-laparotomy gastrostomy is a safe and effective alternative to other approaches. The association of local anesthesia with a minimal surgical offense and a short operative time render its effectiveness, even in high-risk patients.

Keywords: Gastrostomy, minimally invasive surgery, Neuromuscular disorders

INTRODUCTION

Gastrostomy tube feeding is the best option for long lasting nutritional support in patients with dysphagia caused by obstructive tumours of the mouth, pharynx, larynx and oesophagus or neuromuscular diseases. Due to the high complication rates associated with classical open approaches,[1] several minimal invasive techniques with endoscopic,[2] radiologic[3] or videolaparoscopic[4] assisted placement have been developed.

However, these severely compromised patients often present severe respiratory risks preventing the use of general anesthesia, sedation or even endoscopy.[5] The upper digestive cancers responsible for dysphagia may also preclude the use of endoscopy.

A simplified open gastrostomy (SOG) under local anesthesia has been proposed by Zickler et al[5] and has been in practice (with small modifications) at our institution, especially for patients with severe neuromuscular diseases under non-invasive ventilation.

In this study, we compare the surgical outcomes of this technique, with the well-established Stamm gastrostomy (SG).

MATERIAL AND METHODS

For this simplified technique, the patient is placed in a flat supine with the surgeon on its right side and first-assistant in the opposite side. We use a minimal vertical midline incision (3 cm), just below the xyphoid process, under local anesthesia. We routinely use 10 ml of 1% lidocaine and 10 ml of 7,5% ropivacaine to anesthetize the skin, aponevrosis and peritoneum, both in the midline incision and in the left lateral incision. The stomach is located and grasped with a Babcock clamp. We perform a double purse-string absorbable 3/0 suture in the eviscerated anterior greater curvature of the stomach, around the clamp. A left lateral 5–8 mm incision is then made and the tissue is dissected with a Kelly clamp upon entrance in the abdominal cavity. The gastrostomy tube balloon is tested for leakages, lubricated and inserted through the small lateral incision. The tube is then passed through the omental fat and a stab wound made inside the double purse-string to insert the tube inside the stomach. The purse-strings are knotted, the balloon is inflated and the tube is tightly pulled against the abdominal wall. No fixation sutures between the stomach and the parietal peritoneum are placed. The midline incision is then closed with running sutures of absorbable multifilament for the aponevrosis and absorbable monofilament for the skin. Enteral feeding is started on the morning after surgery, as tolerated, and the patient is safely discharged home.

We retrospectively analyzed the clinical records of 63 consecutive gastrostomies, completed upon a 3-year period (2007–2010), 23 of which were by this simplified technique. Demographic and clinical data was recorded for every patient and the statistical analysis was done with SPSS version 16.0.

RESULTS

Surgery was performed in 63 patients, predominantly male (n = 50), with a mean age of 58,4 years (21–89). Almost half of the patients had head and neck or esophageal cancers (n = 28–44.4%), 28.6% (n = 18) had CNS disorders (stroke or cerebral haemorrhage) and 27.0% (n = 17) had neuromuscular disorders (lateral amyotrophic sclerosis or Duchene muscular dystrophy). There was a male predominance in both groups of surgery (Table 1) and the mean age was similar.

Table 1. Demographic characteristics of the patients according to surgical technique.

Empty Cell	**SOG (n = 23)**	**SG (n = 40)**	***p***
Male – n(%)	16 (70)	34 (85)	.15
Age (mean)	61	57	.3
ASA IV – n(%)	22 (95.4)	30 (74.4)	.03

According to the diagnosis (Table 2), the SG were performed in oncological patients, while for SOG there was a predominance of patients with neuromuscular diseases (p < .001).

Table 2. Diagnostic group according to surgical technique.

***p* < 0.001**	**SOG-*n*(%)**	**Stamm-*n* (%)**	**Total**
Obstructive tumours	1 (4.3)	27 (67.5)	28
CNS disorders	6 (26.1)	12 (30.0)	18
Neuromuscular disease	16 (69.6)	1 (2.5)	17
Total	23 (100)	40 (100)	63

Overall, patients had major anaesthetic risks, with 82.3% of patients being ASA IV. This risk was even more significant for patients in the SOG group (Table 1), with 95.4% (n = 22) being ASA IV, as compared with 74.4% (n = 29) for patients that underwent the Stamm procedure (p = .03).

The mean operative time was shorter in the simplified technique (37 ± 11.6 min versus 60 ± 34.2 min for the Stamm procedure; p = .01). All the surgeries in the SOG group were performed exclusively with local anesthesia (a combination of lidocaine and ropivacaine) and in the Stamm procedure, 47.5% (n = 19) required invasive ventilatory support during surgery (p < .001) Table 3.

Table 3. Outcomes according to surgical technique.

Empty Cell	**SOG (n = 23)**	**SG (n = 40)**	***p***
Operative Time (minutes - mean ± SD)	37 ± 11,6	60 ± 34.2	.01
Exclusive local anesthesia – n(%)	23 (100)	19 (47.5)	<.001
In-hospital morbi-mortality – n(%)	3 (13)	8 (20)	.18

There were no significant differences regarding in-hospital morbi-mortality (Table 4), with 13% (n = 3) for patients in the simplified technique group and 20% (n = 8) for patients with Stamm gastrostomy (p = .18). No patients died in the 30 days following SOG and 5 patients died of pneumonia after SG (p = .15). One patient after SOG developed an abdominal abscess and required surgical drainage and 1 patient had surgical reintervention due to peritonitis. In th SG group, one patient developed an abdominal abscess, managed by percutaneous drainage.

Table 4. List of adverse events.

Surgical Technique	**Event**	**Treatment**	**Outcome**
SOG	Pneumonia	Antibiotic	Resolution

Surgical Technique	Event	Treatment	Outcome
SOG	Abdominal abscess	Surgical drainage	Resolution
SOG	Peritonitis(balloon inadvertently deflated)	Laparotomy and replacement	Resolution
Stamm	Abdominal abscess	Percutaneous drainage	Resolution
Stamm	Pneumonia	Antibiotic	Resolution
Stamm	Pneumonia	Antibiotic	Resolution
Stamm	Pneumonia	Antibiotic	Death
Stamm	Pneumonia	Antibiotic	Death
Stamm	Pneumonia	Antibiotic	Death
Stamm	Pneumonia	Antibiotic	Death
Stamm	Pneumonia	Antibiotic	Death

The patients were able to receive adequate nutritional support and the overall satisfaction of the patients and families/caregivers is very good.

DISCUSSION

The simplified open technique for gastrostomy under local anesthesia is a safe procedure, even for patients with neuromuscular diseases and a very limited breathing ability.[6]

From our perspective, this technique provides a minimal invasive surgery in a group of severely ill patients, combining the use of an isolated local anesthesia with minimal aggression, complexity and resources. It allows an early feeding of the patient through the artificial stoma and has proven as secure and effective as other described techniques.

One advantage of this open simplified technique is that it permits an exploration (although limited by the small size of the incision) of the peritoneal cavity (especially important in the presence of adhesions from previous surgeries), which is not the case with endoscopic or radiologic placement.[7]

Although the original proponents of the technique[8] systematically perform a contrast study, we do not find that to be necessary. As Sharma[8] reported, they have "never observed extravasation of contrast material" and as such, it seems an unnecessary procedure for a surgery that ought to be as simple as possible.

Some surgeons question the lack of fixation of the stomach to the parietal peritoneum. Although our series presents one case of peritonitis (due to removal of the tube before epithelization of the fistula occurred), if the tube is properly managed and the stomach tightly pulled to the anterior abdominal wall, this risk seems neglectible.[8] Confirming this theory is that the most widespread technique for gastrostomy (PEG) does not suture the stomach to the abdominal wall.[7]

However, the family and caregivers must be extensively warned about the imperative of keeping the tube in place with an inflated balloon for at least 10 days after surgery, in order to provide an adequate formation of the fistulous tract.[8] After this period, in case of tube dislodgement or malfunctioning, it can easily be replaced at bedside using the fistulous tract and gently inserting a lubricated tube. If the tube is no longer necessary and removed, the fistulous tract will promptly close and no further procedures would be required.

In this series, we present one patient in each group with abdominal abscesses, that required drainage. The patient with the classical Stamm procedure had an ultrasound guided percutaneous drainage, which was not timely available to treat the patient in the SOG group.

The operative time of the simplified technique is significantly shorter than for the classic Stamm gastrostomy, and seems to overlap with the times reported elsewhere for radiologic or endoscopic techniques.1, 9

Although some authors[1] suggest a superiority of the endoscopic techniques, the overall condition of the patients and the presence of complete obstruction of the upper digestive tract, might render the endoscopic approach unfeasible. Patients with neuromuscular diseases have enhanced risks, related with the muscular function depression,cardiac and respiratory compromises and increased risk of malignant hyperthermia and rhabdomyolysis.[5] These patients are almost always under positive-pressure non-invasive ventilation, do not tolerate endoscopic procedures and have an extremely high anesthetic risk.[8]

There are several reported complications arising from endoscopic gastrostomy, the most frequent of which are cardiopulmonary compromise, aspiration pneumonia, haemorrhage (luminal or peritoneal) and viscus perforation.[10] The alleged superiority of endoscopic technique,[1] has not been confirmed in some reports, especially if it is compared only with surgical techniques

performed under local anesthesia.[11, 12] The endoscopic placement is associated with a variable risk of complications (16–50%)[11, 13, 14] and death can occur in 1–12% of patients.[11, 14] In patients with neuromuscular diseases, the endoscopic technique has resulted in increased pain and more frequent respiratory problems.[15]

The percutaneous radiological guided technique, might overcome some of the difficulties associated with anesthesia and use of the endoscope and has been reported to have an overall morbidity of 22% with a mortality of 7%.[16] In patients with neuromuscular diseases, radiologically inserted gastrostomy has the advantage of being done under local anesthesia and allow non-invasive ventilation during the procedure,[17] avoiding respiratory decompensations.[15] These advantages are also true for the simplified mini-laparotomy placement.

A 1995 meta-analysis by Wollman et al,[9] concluded that surgical gastrostomy was more effective than endoscopic or radiological placement, but yielded a higher complication rate and mortality, thus suggesting the advantage of percutaneous methods. Of these, the radiological method had fewer major complications, although some authors report a higher morbi-mortality, specifically in head and neck cancer patients.[18, 19] These results might be explainable due to the association of surgical gastrostomy with the need for general anesthesia or deep sedation with invasive ventilation, as studies for surgical techniques using local anesthesia, tend to favour surgery over other non-operative techniques.[12] A 1995 report by Bergstrom[20] concluded that "surgically placed feeding tubes have outcomes similar to those reported for patients with PEG" and even in experienced referral centers, endoscopic placement fails in about 5% of patients.[14]

The Stamm gastrostomy, which has proven its efficacy for over 100 years, still remains the option to which other techniques are compared. Several authors report its success under local anesthesia for the majority of patients and a mortality of up to 18%, which is related to the severity of the underlying diseases.[21] In our results, the Stamm procedure was related with considerable mortality, which ocurred in the patients who had ventilatory support and later developed hospital-acquired pneumonias. So, the association of minimal aggression and local anesthesia, seems to relate to the safety of the procedure. Other groups have described similar minimal invasive open surgical techniques[22] with 100% success rates and low morbidity and mortality.

As stated by Grant,[19] "patient selection, co-morbidities and timing of tube insertion are all critical factors in preventing complications". Our results seem to translate the severity of the underlying diseases and the high-risk of adverse outcomes for any intervention in these patients. However, the simplified mini-laparotomy gastrostomy, despite the greater percentage of ASA IV patients, seems to be safer than the standard Stamm gastrostomy, due to its minimal surgical aggressiveness.

CONCLUSION

The simplified mini-laparotomy gastrostomy is a safe and effective alternative to other percutaneous or surgical approaches. The association of local anesthesia with a minimal surgical offense and a short operative time render its effectiveness, even in high-risk patients.

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