Digestive Decompression to Prevent Digestive Fistulas After Gastric Neoplasm Resection

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Rezumat

Decompresia digestivă în prevenția fistulelor digestive după rezecția gastrică pentru neoplasm

Introducere: Riscul de fistulă digestivă la pacienții operați pentru neoplasm gastric este crescut datorită dezechilibrelor biologice generate de evoluția cancerului, de stadiile avansate la prezentare și de amploarea intervenției. În aceste condiții utilizarea unor metode tehnice care să protejeze suturile digestive la acești pacienți este utilă.

Scop: Analiza eficienței mijloacelor tehnice de protejare a suturilor digestive la pacienții operați în diferite stadii de evoluție a cancerului gastric.

Material și metodă: Am efectuat un studiu retrospectiv pentru un lot format din 130 pacienți operați pentru cancer gastric în Clinica de Chirurgie Generală și Oncologică I IOB, între 2010-2014.

Rezultate: În lotul studiat 38,46% dintre pacienți au fost în stadiul IV cu complicații și multiple dezechilibre biologice. S-au efectuat 52 de gastrectomii totale, 40 de rezecții gastrice, iar la 34 pacienți s-au efectuat “excizii tumorale” paliative sau alte tipuri de intervenții chirurgicale paliative. La 15 pacienți dintre cei cu rezecții gastrice s-a utilizat sondă de decompresie duodenală, iar la 13 pacienți dintre cei cu gastrectomie totală s-a utilizat sonda de aspirație Esojeunală alături de sonda de

alimentație jejunală ca măsuri tehnice suplimentare de prevenire a fistulei. Incidența fistulei de bont duodenal a fost de 7,69%, cea a fistulei de anastomoza esojeunală de 2,3%, cu o mortalitate generală de 3,07%, iar la anastomoza gastro-jejunală a fost de 0,76%.

Concluzie: Având în vedere riscul de fistulă la pacienții cu cancer gastric precum și creșterea acestui risc în stadiile avansate de evoluție, apreciem că utilizarea mijloacelor tehnice de protecție a suturilor digestive este benefică și oportună ducând la scăderea incidenței fistulelor, la scăderea debitului și a efectelor fiziopatologice ale acestora precum și la reducerea mortalității.

Cuvinte cheie: sondă decompresie duodenală, bont duodenal, anastomoze digestive, cancer gastric

Abstract

Introduction: The risk of digestive fistula in patients operated for gastric neoplasm is increased due to biological imbalances generated by the cancer's progression, by diagnosis in advanced stages, and by the scale of intervention. Under these circumstances the use of some technical means to protect digestive sutures in these patients is useful.

Aim: To analyse the efficiency of technical means to protect the digestive sutures in patients operated in various stages of development of gastric cancer.

Material and Methods: We conducted a retrospective study on a group of 130 patients operated for gastric cancer in the 1st

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Results: 38.46% of the patients in the study group presented stage IV cancer with multiple complications and biological imbalances. 52 total gastrectomies and 40 gastric resections were carried out, while in 34 patients palliative "tumour excisions" or other types of palliative surgery were performed. In 15 of the cases with gastric resection a duodenal decompression probe was used, while in 13 of the patients with total gastrectomy an oeso-jejunal aspiration probe together with an oeso-jejunal feeding probe were used as additional technical measures to prevent fistula formation. The incidence of duodenal stump fistula was 7.69%, that of oeso-jejunal anastomosis fistula was 2.3%, with an overall mortality of 3.07% and that of gastro-jejunal anastomosis fistula was 0.76%.

Conclusion: Given the risk of fistula development in patients with gastric cancer, as well as the increased risk in advanced stages of cancer development, we consider that the use of technical means of protection of digestive sutures is beneficial and opportune, lowering the incidence of fistulas, reducing their output, pathophysiological effects, and mortality.

Key words: duodenal decompression probe, duodenal stump, digestive anastomoses, gastric cancer

Introduction

Surgical treatment in gastric cancer consists in radical and palliative gastric resection. Radical gastric resections may apply in stages IB, II, IIIA, and sometimes IIIB, and they involve removing the section of the stomach containing the tumour and an area of the proximal gastric wall within 5 cm distally to the tumour for oncological safety, as well as performing D1 or D2 lymphadenectomy (1). Radical resections types are represented by subtotal gastrectomy, total gastrectomy and upper polar gastrectomy. In the latter's case there are however a series of controversies regarding its value, especially given postoperative gastroesophageal reflux. For stage IA tumours endoscopic local excision is recommended, as metastases occur in under 5% of cases (1). Palliative gastric resections, which involve removing the stomach segment in which the tumour is located, without loco-regional lymphadenectomy are indicated in stage IV patients with bleeding or perforation complications. Restoring digestive continuity after resections with radical intent in patients with gastric cancer is achieved by "y" or omega loop oeso-jejunal anastomosis, with Braun fistula at the base of the loop in total gastrectomy or "y" or omega loop gastro-jejunal anastomosis in subtotal gastrectomy. For palliative resections, Hoffmeister-Finsterer or Reichel-Polya type gastro-jejunal anastomoses are performed (1,2).

A number of local and general causes for anastomoses and digestive sutures disunion are known.

Local causes are represented by:

- suture under tension;
- incorrectly performed suture (too rare or too frequent suture points, ischemic, eversion of the mucosa);
- septic factor present;
- drain tube in close contact with the suture;
- stasis and reflux followed by organ distension.

General causes are represented by:

- neoplastic disease;
- malnutrition with protein deficiency;
- atherosclerosis;
- long-term preoperative anaemia;
- decompensated pyloric stenosis (3).

Specific causes in gastro-jejunal anastomosis are:

- gastro-jejunal anastomosis with excessive traction on the anastomosis;
- gastric stump distension through malfunction of the anastomosis mouth;
- haematoma of the anastomosis mouth;
- torsion of the anastomosis mouth;
- defective anisoperistaltic montage;
- Petersen hernia.

Specific causes in oeso-jejunal anastomosis are:

- relatively poor vascularization of the oesophagus;
- lack of serous coverage of the oesophagus;
- haemodynamic changes at the level of the ascended jejunal loop;
- oesophageal-jejunal reflux in the short jejunal loop.

Specific causes for disunion of the duodenal stump:

- excessive isolation with devascularisation;
- duodenal stump crushed by the forceps before performing the suture,
- absence of the serosa at the level of the posterior wall of the duodenum;
- obstacle at the level of the afferent loop due to a too long loop or to swelling of the anastomosis mouth;
- torsion of the gastro-jejunal montage;
- reflux in the afferent loop.

The risk of digestive sutures' disunion in gastroduodenal surgery is approximately 0.41% for gastro-jejunal anastomoses. For duodenal stumps the fistula risk is 1.5-3%, with a mortality of 24-38%. For oeso-jejunal anastomoses the risk of disunion used to be 31%, with a mortality of 50% in the 1980s (3). In another study published in 2011 and conducted on a sample of 300 patients with total gastrectomy for gastric cancer, fistulas of the duodenal stump are mentioned with an incidence of 2.3%, and oeso-jejunal fistulas with an incidence of 6% (4).

Aim of the Paper

The aim of the paper is to analyse the incidence of digestive suture disunion and the mortality rates in patients with gastric cancer in whom an oeso-jejunal aspiration probe in oeso-jejunal anastomoses and a duodenal decompression probe in gastro-jejunal anastomoses were used as a means of protecting the digestive sutures.

Material and Method

We performed a retrospective study on a sample consisting of 130 patients operated for gastric cancer at the First Surgical Clinic of the Bucharest Institute of Oncology, between January 2010 - December 2014, in which we analysed the incidence of anastomotic fistulae and how their development is influenced by a number of methods of protecting digestive sutures. Data were obtained by analysing the patients' hospital records, aiming to obtain information enabling staging of the disease and identifying biological imbalances that the patient presented upon admission. Starting with these primary evaluation data, we further analysed the preoperative preparation measures implemented to compensate for biological deficiencies, the type of surgery performed, and whether any methods were used to protect the digestive sutures and if so, what type of methods. A separate chapter of the analysis was the post-operative evolution of patients, where we recorded data on the occurrence of digestive fistulas, as well as their flow and their treatment outcome. We also observed whether the means of protecting digestive sutures used had any impact in preventing digestive fistulas or reducing their output and their pathophysiological effects in patients who, even with the methods of protecting the sutures, developed digestive fistulas.

Results

Patients in the study group showed significant biological imbalances such as: 69.23% anaemia, 26.15% showed low proteins level. These imbalances were observed in the context in which 43.07% of patients experienced weight loss, and in 15.38% the neoplastic disease was associated with pyloric stenosis. (Fig. 1 A,B) To correct said biological imbalances blood transfusion was performed in 15.4% of patients who had a Hb. level lower than 8 g/dL, hydroelectrolyte imbalance solutions were administered in 61.5%, and parenteral nutrition and amino acids were administered to 7.7% (Fig. 2). In terms of the location of the gastric cancer, in 35.5% of patients it was located at the level of the upper gastric pole (14% at the level of the cardia), in 31% at the level of the lower gastric pole, and in 34% in the midgastric region (Fig. 3). Many patients presented in advanced stages of disease progression. Thus, 38.46% presented with stage 4, 27.70% stage 3, 24.61% stage 2, and only 9.23% with stage 1 disease (Fig. 4). Disease stage and lesion location imposed performing total gastrectomy for upper pole gastric cancers and cancers of the midgastric region in 40% of patients, gastric resection (subtotal gastrectomy for lower pole gastric cancers, gastric resections with palliative intent) in 31% of patients. In 10 patients (8%) "tumour excision" was performed. Thus, in 4 patients this type of surgery was performed for tumours in stage IA (having radical intent), in 2 patients it was conducted with palliative intent, and in the other 4 patients this type of intervention was selected because the general condition and associated pathology did not allow another type of radical intent intervention (Fig. 6). Other types of limited intervention performed were: gastrostomy, jejunostomy, gastro-entero-anastomosis, staging laparoscopy and

Figure 1A. Group distribution by patients' degree of anaemia

Figure 1B. Group distribution by biological status

exploratory laparotomy in 21% of patients (Fig. 5). Of the patients submitted to total gastrectomy, surgery was performed with radical oncological intent in 83.33% and with palliative intent in 16.67% of cases. Subtotal and extended gastric resections were performed with radical oncological intent in 66.66%

Figure 2. Preoperative preparation measures

Figure 3. Cancer location at the level of the stomach

Figure 5. Group distribution by type of surgery performed

and with palliative intent in 33.33% of patients.

In patients with total gastrectomy we performed:

- „y” loop oeso-jejunal anastomosis (52 patients). In 13 of these (25%) an oeso-jejunal aspiration probe was also placed, in addition to the enteral nutrition probe.

In patients with subtotal gastrectomy we performed:

- „y” loop gastro-jejunal anastomosis in 24 patients;
- omega loop gastro-jejunal anastomosis in 4 patients.

In 16 patients with palliative gastric resection Hoffmeister-Finsterer type gastro-jejunal anastomosis was performed. In 15 of these patients, namely 93.75%, a duodenal decompression probe was used as a method to protect the duodenal stump suture. (Fig. 7, 8). The incidence of duodenal stump fistula was 10.87% of patients with duodenal stump suture and 7.9% of the total sample. Duodenal stump fistula incidence in patients with stage 1-3 disease was considerably lower than the incidence of fistula in patients with stage 4 disease (5.4% vs. 30%). We recorded only one patient with palliative gastric resection and Hoffmeister-Finsterer type gastro-jejunal anastomosis in whom a duodenal decompression probe was not used and who presented duodenal stump fistula.

The incidence of oesophageal-jejunal anastomosis fistula was 5.77% of patients with this type of anastomosis, representing 2.3% of the total group. We have not recorded any oeso-jejunal anastomosis fistula in patients in whom oesophageal aspiration was performed. (Fig. 9 A,B, 10).

Figure 4. TNM Staging

Total gastrectomy (40%)
Gastric resection (31%)
- subtotal gastrectomy
- gastric resection with palliative intent
Limited gastric resection (8%)
Other types of surgery (21%)
- gastrostomy
- jejunostomy
- gastro-entero-anastomosis
- laparoscopy
- laparotomy

Figure 6. Group distribution by type of surgery performed

In patients with duodenal stump fistula and duodenal stump decompression aspiration the fistula's output was 50 -100 ml / 24 h, and cases were solved through conservative methods, unlike the other patients in whom fistula outputs were higher (Fig. 11). Overall mortality was 3.07, and 3 of the 10 patients with duodenal stump fistula died (33.33%). Of these, two patients had been submitted to total gastrectomy with oeso-jejunal anastomosis and one patient to palliative gastric resection with Hoffmeister-Finsterer type anastomosis, but without duodenal decompression probe. Of the 3 patients with oeso-jejunal anastomosis fistula, one patient died (Fig. 12).

Figure 7. Postresection transit recovery procedures

Figure 8. Digestive decompression techniques

Figure 10. Duodenal stump fistula incidence according to disease stage.
(A) Stage IV patients – 20 patients (p) – 6 stump fistulas.
(B) Stages I, II, III patients – 74 patients (p) – 4 stump fistulas

Discussions

Gastric cancer surgery has recorded significant progress in recent years both in terms of anaesthesia and intensive care, as well as in terms of surgical technique through the introduction and increasingly frequent use of mechanical suture techniques. However, the incidence of digestive fistulas after gastric cancer surgery is maintained at a level that compels to research and find solutions to decrease the incidence and severity of their evolution. In such a study conducted in 2010 on a sample

Figure 9. (A) Incidence of duodenal stump fistulas depending on the method of decompression of the digestive lumen. (B) Incidence of oeso-jejunal anastomosis fistula depending on the method of decompression on the digestive lumen.

Figure 11. Duodenal stump fistula onset by type of anastomosis.
EJA - oeso-jejunal anastomosis, GJA - gastro-jejunal anastomosis, HF - Hoffmeister-Finsterer

consisting of 3,785 cases of gastric resection for cancer the incidence of duodenal stump fistula was 1.8%, with a mortality of 16% (5). In terms of surgical treatment, it is indicated in duodenal stump fistula cases when conservative treatment, percutaneous or endoscopic drainage (6) are not possible due to fistula output or presence of peritonitis. In these cases duodenostomy, duodeno-jejunostomy and defect coverage by a rectus abdominis muscle flap are recommended in the literature (7). These methods have a low success rate, which shows that there is no effective solution in treating these fistulas, hence the

Figure 12. Global mortality in the studied group.

importance of prevention. The occurrence of these complications leads on the one hand to prolonged and increased patient suffering, and on the other hand to the increase in average cost by 50% (8). In patients with gastric cancers, besides local etiopathogenic factors common to those of benign pathology, other general factors such as anaemia, hypoproteinaemia and advanced age may also intervene. In the group analysed in this study, 69.23% of patients experienced anaemia and 26.15% hypoproteinaemia, while 43.07% presented weight loss. Mortality in duodenal stump fistula cases correlates with serum albumin level and with age (5). Bearing these things in mind, preoperative correction of biological deficiencies is attempted to the extent that this is possible, given the fact that often the patient is a surgical emergency caused by the occurrence of bleeding, perforation or pyloric stenosis, which in our study represented 15.38% of cases. In our study group 15.4% of patients received preoperative blood transfusion as their haemoglobin levels were below 8 g / dL, and 7.5% received amino acid solutions and parenteral nutrition to compensate for protein deficits.

Many of the patients with gastric cancer are diagnosed and treated in advanced stages of the disease due to lack of effective screening measures. Thus, in our study, 38.46% of patients were diagnosed in stage 4, 27.7% in stage 3, and 24.61% in stage 2. This is why small-scale surgeries applicable to patients in stage IA, which would be easier to bear by elderly patients and determine fewer complications, could only be applied with radical oncological intent in 4 patients. Given the fact that our clinic does not benefit from endoscopic mucosal resection means, we performed "tumour excision" as an alternative. For the other 6 patients this type of intervention was chosen either as a palliative treatment option, or because the patient could not bear another more extensive surgery due to age and associated pathology.

The share of total gastrectomies was 40% similar to data reported in other studies (5), and that of gastric resections including subtotal gastrectomy and palliative gastric resections was 31%. A 21% percentage was represented by other types of interventions such as gastrostomy, jejunostomy, gastro- entero-anastomosis, diagnostic laparoscopy. As a consequence of the share of very advanced stages of the disease in the studied group only 83.33% of total gastrectomies and 66.66% of gastric resections were performed with radical intent, other

cases benefitting from palliative interventions.

Regarding the restoration of digestive continuity after total gastrectomy and subtotal gastrectomy, "y" loop oeso-jejunal or gastro-jejunal anastomosis were preferred, while omega loop anastomosis could be performed only in 4 patients. The reason for this approach is that "y" loop anastomosis, with a loop length between base and anastomotic mouth of up to 45-50 cm, avoids the occurrence of biliary-digestive reflux at the level of the oeso-jejunal or gastro-jejunal anastomosis. In terms of incidence of duodenal stump fistula there were no significant differences between "y" and omega loop anastomosis (5).

As shown by the studies published so far, in gastric cancer surgery the highest incidences of fistula are those of duodenal stump fistula and oeso-jejunal anastomosis fistula. This increased incidence of duodenal stump fistula contributes also to the fact that during the postoperative period, amid dynamic ileus, due to the movements of duodenal transit, great intraluminal pressures intermittently occur, which can reach up to 50 mmHg. Once a duodenal stump fistula develops, the patient loses on average 290 ml of duodenal liquid per 24 hours through the fistula, varying between 40 - 2,200 ml. 40% of patients require reintervention and mortality is 16%, in particular by MSOF (5). Therefore, the use of methods that help prevent duodenal stump fistula or prevent the negative effects of large fistula output is very useful. To this purpose, we used a duodenal decompression probe introduced intraoperatively in the duodenal stump and protruding through the afferent duodenal loop in the gastric stump, from where it continued through the oesophagus and nasal cavity to the outside. This probe is designed to prevent the increase in duodenal stump pressure and reduce the risk of fistula development (Fig. 13). This technique was used by Welch and resumed by Coopér and Herrington after gastric resection for peptic ulcer and restoring digestive continuity in the Billroth II manner. The decompression probe protrudes through the gastrostomy "a minimum" or via a nasogastric pathway (9, 10). To ensure that the probe does not move from the duodenum its end is fixed to the duodenal wall (to the mucosa and submucosa with a 2-0 absorbable wire). Although,

Figure 13. Duodenal decompression probe and gastric stump decompression probe.

as previously mentioned, the method was described to protect the duodenal stump in patients with ulcers in whom given the "delicate" condition of the duodenal stump suture safety was poor, in our opinion it is useful in selected cases of patients with gastric cancer as well, because even if these patients do not present "difficult" duodenum conditions, they do however present poor scarring conditions due to specific biological deficiencies, which often cannot be corrected. We used this decompression probe in 15 of the 16 patients with palliative gastric resection and Hoffmeister-Finsterer type anastomosis (93.75%). In patients from the study group with total and subtotal gastrectomy, digestive transit recovery was obtained through "y" oeso- or gastro-jejunal anastomosis, in which due to the summed up length of the loops in the anastomotic montage the installation of a decompression probe is very difficult, which is why we did not use it for this type of interventions. We kept the duodenal decompression probe in place for 10 days in patients who did not develop duodenal stump fistula, as this occurs on average seven days postoperatively (5). In patients with duodenal fistula we kept it in place until we considered the fistula output had stabilized. In the studied group the incidence of duodenal fistula was 7.69%, higher than other studies (4). This we believe is due to the fact that, as we have shown, many patients in the analysed group were in advanced stages of disease, with important biological imbalances. Thus, of the 20 patients with stage IV disease, 6 had postoperative duodenal stump fistula, while in of the 74 patients with stage I-III disease fistula occurred only in 4 patients. Of the 15 patients in whom a duodenal decompression probe was used and gastric resection was performed with palliative intent, duodenal stump fistula occurred in 3 patients, had an output of 50-100 ml./24 hours and closed after conservative treatment, not requiring reintervention.

Restoring digestive continuity in patients with total gastrectomy was performed by 'y' loop oeso-jejunal anastomosis, and in 13 of the 52 patients with this type of surgery an oesophageal aspiration probe was installed together with the jejunal feeding probe as well. The rationale of using an oesophageal aspiration probe is represented on the one hand by the fact that patients do not always comply with not swallowing saliva, and on the other hand that failure to efficiently recover bowel transit can lead to a degree of reflux even when a "y" loop with a length up to 45-50 cm between base and anastomosis is used. Both situations can lead to increased pressure in the anastomotic area and subsequently to fistula development, situation prevented by an aspiration probe. The incidence of oeso-jejunal anastomosis fistula was 2.3%. None of the patients in whom an oesophageal aspiration probe was used developed any fistula, which in our view demonstrates the effectiveness of the method.

Gastro-jejunal anastomosis and jejuno-jejunal anastomosis present lower incidences of fistula development (4). This is because of the anatomical peculiarities of the stomach that make this organ a very good partner for anastomosis. Also, routine use of gastric aspiration probe prevents the anastomosis from being placed under tension.

Jejuno-jejunal anastomosis is not subject to content tension if there are no postoperative intestinal obstructions

downstream from it, which is why fistula incidence at this level is low.

The mortality rate in the study group was 3.04%. Of the four deceased patients 3 patients presented duodenal stump fistula, and one patient presented oeso-jejunal anastomosis fistula. In none of these patients were the methods discussed to protect sutures used.

Conclusions

1. Patients with gastric cancer in advanced stages of evolution present multiple etiologic general factors of digestive suture disunion.
2. Preoperative correction of biological imbalances is often difficult, even impossible in emergencies.
3. Under these circumstances, fistulas can occur independently of the use of proper surgical techniques.
4. For these reasons we consider useful the methods of protecting digestive anastomoses and sutures (duodenal decompression probe, oesophageal aspiration probe) in patients with gastric cancer, even if their use slightly prolongs the operating time.

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