

Indications of a Defunctioning Stoma in Colorectal Anastomosis - Our Experience and Review of the Literature

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Rezumat

Indicațiile stomiilor de protecție în anastomoza colorectală - experiența noastră și analiza literaturii de specialitate

Context: Stomiile de protecție pot preveni consecințele fistulelor anastomotice colorectale, dar sunt grevate la rândul lor de posibile complicații.

Obiective: Identificarea pacienții cu risc crescut, pentru a putea formula indicațiile absolute și relative ale efectuării stomiilor de protecție.

Metode: Două sute cincizeci de anastomozele colorectale consecutive au fost efectuate în perioada 2004-2015, dintre care 95.2% pentru cancer colorectal. În 130 cazuri s-a folosit anastomoza mecanică. Stomiile de protecție au fost realizate în doar 15 cazuri. Incidența fistulelor anastomotice a fost evaluată în conformitate cu mai mulți parametri, precum și complicațiile postoperatorii legate de stomii. Rezultatele au fost comparate cu cele raportate în literatura de specialitate. **Rezultate:** Fistule anastomotice au apărut la șase de pacienți (2,4%) și a dus la deces în patru cazuri. Nici unul dintre pacienții cu o stomă de protecție nu a dezvoltat complicații grave legate de anastomoza colorectală. Cu toate acestea, au existat două cazuri de complicații grave legate de stomia de protecție (15,38%).

Concluzii: Stomiile de protecție ar trebui efectuate pe baza unor criterii de risc a pacienților. Recomandări absolute sunt: imperfecțiunile anastomotice, anastomoza sub tensiune,

iradierea pelvisului preoperator, anastomoza ultrajoasă la pacienții cu vârsta peste 70 de ani, pacienți peste 80 ani și comorbidități semnificative.

Cuvinte cheie: anastomoza colorectală, fistula, stomie de protecție

Abstract

Background: Defunctioning stomas can prevent consequences of anastomotic leakage, but they are not free of complications. **Objectives:** The identification of high-risk patients to establish criteria for strong and relative indications for the formation of a defunctioning stoma.

Methods: Two hundred fifty consecutive colorectal anastomoses were performed between 2004 and 2015; 95.2% of these were for colorectal cancer. In 130 cases, mechanical anastomosis was used. A protective stoma was performed in only 15 cases. The incidence of anastomotic leakage was evaluated according to multiple parameters, as were the postoperative complications related to protective stomas. The outcomes were compared to those reported in the literature.

Results: Symptomatic anastomotic leakage occurred in six patients (2.4%) and resulted in four deaths. None of the patients with a protective stoma developed serious complications related to the colorectal anastomosis. However, serious ileostomy-related complications occurred in two cases (15.38%).

Conclusions: Protective stomas should be used only according to the risk criteria of the patients. Strong indications are: anastomotic imperfections, anastomosis under tension, previous pelvic irradiation, ultralow anastomosis in patients older than 70 years, patients over 80 years, and significant co-morbidities.

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Key words: colorectal, anastomosis, fistula, leak, defunctioning, stoma

Introduction

Colorectal resection followed by colorectal anastomosis is performed most often for cancer but is also used for other conditions, such as diverticulitis, polyps, volvulus and trauma. Regardless of the pathology, colorectal resection followed by anastomosis carries a risk of anastomosis dehiscence with severe consequences that can endanger the patient's life.

Colorectal anastomosis after resection for cancer has some particularities associated with the disease itself, which requires extensive resection associated with adjunctive oncologic treatment (radiochemotherapy), and with the anatomical specificities of the pelvic region (e.g., it is a narrow space that is difficult to access). In these cases, the surgeon has two main concerns: saving the anal sphincter and preventing anastomotic dehiscence.

Since the introduction of stapling devices into clinical practice, more cases with lower rectal cancer have been spared rectal amputation. Staplers have especially demonstrated their utility in cases of lower rectal cancer in obese male patients with a narrow basin; in these patients, a hand-sewn anastomosis is impossible or very difficult and carries a high risk of imperfection and anastomotic fistula. In addition, staplers have enabled a laparoscopic approach in these cases with clear benefits for both the patient and the hospital. As a result, the incidence of rectal amputation has decreased continuously in favor of ultralow colorectal anastomosis.

A safe anastomosis presumes compliance with two main principles: a good blood supply to the stumps being anastomized and a lack of tension in the anastomosis. In addition, good preoperative preparation of the colon has lost much of its importance since the introduction of Enhanced Recovery after Surgery (ERAS) principles.

The risk of anastomotic dehiscence and its possible fatal outcome is why many surgeons prefer to routinely incorporate a protective (defunctioning) upstream stoma. Unfortunately, these stomas are not without complications, and some can even endanger the patient's life.

Based on their experience with 250 consecutive cases of colorectal anastomosis and on published data related to this topic, the authors propose a classification of the indications for creating a defunctioning stoma.

Materials and Methods

This retrospective study involved 250 cases of colorectal anastomosis treated at the First Surgery Clinic of Mures Clinical County Hospital in Romania over more than 11 years, between 2004 and March 2015. Multiple parameters

were analyzed to establish the cases in which a defunctioning stoma would have been strongly recommended to prevent the consequences of anastomotic leakage. These parameters included the disease for which the colorectal resection was performed, the age and gender of the patient, co-morbidities, the distance of the anastomotic line from the anal verge, whether the patient underwent preoperative radiotherapy, the type of anastomosis (hand-sewn or mechanical), and post-operative complications.

The clinical study does not reflect the experience of a single surgeon, and being a retrospective one, including patients over a period of almost 12 years, there have been variations of therapeutic approach.

A systematic review of the literature on this topic was undertaken using the Medline and PubMed databases.

Results

Of the 250 colorectal anastomoses, 238 were performed for colorectal cancer, five for polyposis, five for diverticulitis and two for volvulus of the sigmoid colon. Among the colorectal cancer cases, the distances of the tumor from the anal verge were as follows: five cases less than 6 cm, 35 cases between 6 and 8 cm, 82 cases between 8 and 10 cm and 116 cases more than 10 cm.

Cases in which the anastomosis was performed but then converted to Hartmann's I type operation because of major imperfections were excluded from the clinical study.

The mean age of the patients was 63.7 years, ranging between 18 and 87 years. An equal sex ratio was found. The most frequent (50%) associated co-morbidity was cardiovascular disease (hypertension, chronic ischemic heart disease, arrhythmias, cardiac insufficiency, etc.), followed by diabetes mellitus and obesity.

All of the patients underwent preoperative mechanical bowel preparation (MBP).

Mechanical colorectal anastomosis was performed in 130 cases (52%), including 71 males and 59 females. This type of anastomosis was incorporated into our clinical practice in 2008 and is represented by the double stapling (Knight and Griffen) technique. The decision to use a mechanical anastomosis in open surgery rather than a hand-sewn one depended primarily on the tumor's location (i.e., mechanical anastomosis was usually applied to rectal tumors located less than 10 cm from the anal verge) and the narrowness of the basin. In 18 cases, the operation was performed using a laparoscopic approach. For financial reasons, a hand-sewn anastomosis was usually used when the tumor was more than 10 cm from the anal verge.

Ultralow rectal resection followed by mechanical anastomosis was performed in 41 cases of rectal cancer. In these cases, the suture line was located 3-4 cm from the anal orifice.

In all cases, the integrity of the anastomosis was assessed using pneumatic distension of the colorectum immersed in saline solution. Imperfections were found in five cases (3.84%) of mechanical anastomosis and were resolved with supplementary sutures and a defunctioning upstream ileostomy. None of

the hand-sewn anastomoses had imperfections.

Defunctioning stomas were performed in only 15 cases (6% of all anastomoses and 11.53% of the mechanical ones) consisting of 13 ileostomies and 2 colostomies. In addition to the 5 ileostomies performed for anastomotic imperfections, defunctioning stomas were performed in 7 other cases of ultralow anastomosis in patients with irradiated rectal cancer and in one case of ultralow anastomosis for a rectal cancer arising from ulcerative colitis.

The overall mortality rate was 3.6% (9 cases); in four cases, mortality resulted from anastomotic dehiscence with consecutive sepsis. These four patients were elderly males (aged 72, 78, 79 and 83 years) who underwent ultralow resections (representing 9.75% of the ultralow anastomoses) and mechanical anastomosis for rectal cancer and preoperative radiotherapy and who did not receive an ileostomy during the first operation. Although reintervention was performed as soon as signs of leakage occurred and a terminal colostomy was performed at reintervention, the patients died from associated cardiovascular diseases. Other causes of death included heart failure in one case, acute pancreatitis after pancreatic biopsy during surgery for a tumor of the head of the pancreas in one case, hemoperitoneum in another case, hepatorenal failure in a cirrhotic patient, and intense dehydration resulting from diarrhea through the ileostomy in a patient with cardiac insufficiency.

Symptomatic postoperative anastomotic leaks occurred in six patients (2.4% of all anastomoses). All of the leaks occurred after mechanical anastomosis (4.61% of all mechanical anastomoses). None of these cases had a defunctioning ileostomy, and four of them (66.66%) had a fatal outcome. Two patients with mechanical anastomosis between 6 and 8 cm from the anal verge had a favorable evolution of the leakage under conservative treatment in association with an efficient proximity drainage tube. We must recognize that none of the 15 patients with protective stomas (even those with anastomotic imperfections) developed a symptomatic anastomotic fistula. However, we encountered some important complications related to

ileostomy, represented in one case by peristomal cellulite (in a patient with ulcerative colitis) and in another case by intense dehydration with fatal outcome in a patient with cardiac insufficiency.

The overall mean duration of hospitalization was 12.4 days (5-35 days), and the duration was higher in patients with ileostomy. For patients whose operation used a laparoscopic approach, the mean duration of hospitalization was 8 days, including five postoperative days.

Discussions

Anastomotic leakage involves an imperfection at the site of the anastomotic line between two hollow organs (the colon and the rectum). This imperfection results in a communication between the intra-luminal and extra-luminal space through which the contents of the hollow organs can leak out and which can have clinical manifestations, such as general or localized peritonitis and abscesses.

In 2010, Rahbari NN et al (1) proposed the following classification of anastomotic fistulas:

- Grade A fistulas - those that do not require any change in patient management
- Grade B fistulas - those that require a change in patient management but do not require relaparotomy
- Grade C fistulas - those that require relaparotomy

The incidence of anastomotic fistulas reported by different authors varies widely, from 0% to 28%. (Table 1) Such large differences are difficult to explain.

The low incidence of anastomotic fistulas (only 2%) found in our study leads us to believe that defunctioning stoma formation is not necessary in cases without obvious risk factors and when the general principles of a good anastomosis are followed. In addition, defunctioning stomas can be accompanied by serious complications and increase hospitalization expenses.

Decision-making regarding defunctioning stoma formation should consider the risk factors associated with the high incidence of anastomotic fistula. These factors, identified by

Table 1. Anastomotic fistula incidence reported by different authors

Author - country	Number of cases of colorectal anastomosis	Year of publication	Leakage incidence
Gao F (2) - China	146	2014	0.00%
Hansen O (3) - Germany	615	1996	1.50%
Vignali A (4) - USA	1014	1997	2.90%
Zaharie F (5) - Romania	1743	2012	3.09%
Isbister WH (6) - Arabia S	3359	2001	3.60%
Wong NY (7) - Singapore	1078	2005	4.00%
Fujita S (8) - Japan	701	2012	6.00%
Smith JD (9) - USA	184	2013	6.50%
Brigand C (10) - France	301	2004	7.60%
Rullier E (11) - France	272	1998	12.00%
Morks AN (12) - Netherlands	141	2013	13.00%
Ruggiero R (13) - Italy	72	2011	16.60%
Chude GG (14) - Greece	234	2008	19.20%
Tuson JR (15) - UK	360	1990	24.40%
Matthiessen P (16) - Sweden	118	2007	28.00%

many authors, can be classified as follows:

- Host-related factors, which include diabetes, anemia, hypoproteinemia, bowel inflammation, smoking, chronic obstructive pulmonary disease, corticosteroid use, male gender and others (5,17,18).
- Disease-related factors, particularly the tumor's features and location and the level of the anastomosis (4,11,19,20).
- Surgery-related factors, such as anastomosis under tension and poor blood supply, prolonged operative time, a large volume of blood loss and blood transfusion, and contamination of the operative field (17,19,21).
- Pre-operative pelvic radiotherapy (17,22). The highest incidence of anastomotic leakage reported for a group of patients who underwent preoperative radiotherapy was reported by Oprescu C et al (23) (64.7% for mechanical anastomosis versus 35.3% for manual anastomosis).

A recent systematic review and meta-analysis of the literature concluded that the most important risk factors associated with colorectal anastomosis leaks are low-level anastomosis, male gender and preoperative radiotherapy (22). Another systematic review (24) concluded that low anastomoses, male gender, smoking and malnutrition are the most important factors in anastomotic leakage, whereas bowel preparation, drain use, tumor stage, type of anastomosis (hand or mechanical) and type of approach (open or laparoscopic) do not seem to affect the leakage rate.

Regarding the level of anastomosis, most authors agree that it is significantly correlated with anastomotic leakage, especially when the distance from the anal verge is within 5-7 cm (4,10,11,20). Our results support this view as all four cases of dehiscence in our study occurred in ultralow anastomoses unprotected by an upstream stoma.

Given these risk factors, surgeons should take all the necessary precautions to minimize the risk of an anastomotic fistula and its consequences. The primary safety measures are a tension-free anastomosis and a good blood supply to the stumps being anastomosed (2). Of course, other factors can interfere with the healing process and can also contribute to some degree; consequently, despite taking precautions, some patients will still develop an anastomotic leak that may have a devastating effect, especially in elderly patients with comorbidities. Cong ZJ et al, (20) in a retrospective study of 738 rectal cancer patients who underwent anterior resection, found that a major risk factor associated with anastomotic leakage was a non-specialist surgeon (3.9% versus 11.3%).

Good preoperative MBP has lost much of its importance since the introduction of ERAS principles into colorectal surgery, (25) but there are still debates on this topic in the literature regarding rectal surgery. Studies have demonstrated that many surgeons are still applying MBP based on a common-sense feeling that contamination of the surgical field favors infection-related complications and anastomotic leaks. (26) However, a recent study (27) of randomized controlled trials (RCTs) including elective colorectal surgery patients concluded that there is no statistically significant evidence that patients benefit from MBP or from the use of rectal

enemas in colonic surgery; nonetheless, MBP can be used selectively in rectal surgery, even though no significant effect was found. Another meta-analysis (28) that included 1592 patients concluded that MBP leads to a higher rate of anastomotic leakage and recommended reconsidering the dogma of preoperative MBP. The latest guidelines of the ERAS Society regarding perioperative care during elective rectal/pelvic surgery differ somewhat from the guidelines for colon surgery. (25) The recommendations are that "in general, MBP should not be used in pelvic surgery. However, when a diverting ileostomy is planned, MBP may be necessary (although this needs to be studied further)."

In our study, MBP was used in all patients, and no adverse effects such as dehydration or changes in the electrolyte balance were encountered. We also believe that MBP is useful in case endoscopic investigation becomes necessary during surgery, especially for finding small tumors.

It is well-known that a defunctioning stoma does not prevent anastomotic dehiscence, but it can prevent the serious consequences of consecutive peritonitis (29). The dilemma that many surgeons face is determining when cases should undergo these stomas. There are authors who propose that a defunctioning stoma be conducted routinely in all patients with colorectal anastomosis. These authors can be divided in two categories: those who rely on their own experience and those who rely on the experience of others. Examples in the first category include the authors of a Swedish multicenter randomized trial (16) published in 2007 with 234 patients; these authors found an anastomotic fistula rate of 28% for anastomosis without a protective stoma and 10.3% for anastomosis with a protective stoma. Considering the high incidence of fistulas, the authors justifiably recommend the use of stomas in all cases. The authors in the second group base their recommendations on meta-analyses of studies published by other authors (29,30).

Our belief that stomas should be performed only in selected cases (5,7) based on fact that ileostomy is not free of complications (31,32) supported as well by authors who have good experience with a low rate of anastomotic fistulas (3). Even more, if the surgeon feels that the anastomosis has major problems, conversion to terminal colostomy (Hartmann's operation) could be the best solution for the patient.

The complications of defunctioning stomas cannot be neglected, and they have been highlighted in several studies (31,32). A recent study by Sharma et al (33) of a large number of patients (5401) who underwent ileostomy closure found a significant incidence (9.3%) of major complications related to this surgery. Mengual-Ballester M et al (34) found a 45.9% incidence of ileostomy-related complications, including intestinal obstruction, diarrhea, surgical wound infection, enterocutaneous fistula, rectorrhagia and anastomotic leakage. Among our cases, two out of 13 ileostomies (15.38%) experienced important complications, represented by one case of peristomal cellulitis (in a patient with ulcerative colitis) and one case of intense dehydration with a fatal outcome in a patient with cardiac insufficiency.

The cost-effectiveness of defunctioning stomas represents

another issue. In 2003, T. Koperna (35) published a study on this topic conducted in a surgical department in Austria. He found that “a leakage rate of 16.5% in patients without a stoma would be necessary to balance the overall costs of patients with stomas”, and he recommends reducing the rate of defunctioning stomas because of their major effect on overall costs. His opinion is that higher leakage rates depend more on the skill of the surgeon than on the characteristics of the patient, and higher leakage rates should lead to a change in the surgical strategy.

Ileostomy or colostomy? On this matter, most authors (36,37) agree that ileostomy has certain advantages over colostomy; it is much more easily performed and repaired, with fewer complications and less hospitalization time. In most cases, colostomy can be performed only on the transverse colon given that a part of the sigmoid colon must be resected. When using the open approach, this will interfere with the abdominal wound and lead to infectious complications.

To avoid stoma-related physical complications and mental suffering, some authors (38,39) use a transanal drainage tube in lieu of ileostomy and have reported good results. It seems that transanal drainage associated with a defunctioning ileostomy is also useful for managing low anastomotic leaks; it allows the preservation of the anastomosis and provides sepsis control in patients (40). However, some authors (20) report a higher incidence of anastomotic leakage related to transanal drainage versus ileostomy (15.1% versus 4.9%).

Conclusions

In colorectal anastomotic surgery cases, a defunctioning stoma does not reduce the postoperative anastomotic leakage rate, but it is an excellent method for preventing the catastrophic effects of fecal peritonitis and septicemia. However, stomas can lead to certain complications that can sometimes be fatal. Consequently, it is very important to identify patients at high risk of developing an anastomotic fistula who are good candidates for a defunctioning stoma. The creation of a temporary stoma should be considered on the basis of risk factors.

Based on our experience and on the data published in the literature, we propose the following classification of recommendations for defunctioning stomas in cases of colorectal anastomosis:

Strong recommendations:

- Imperfections (leakage) of anastomosis found during operation, (conversion to Hartmann's type I operation is another choice);
- Anastomosis under tension (depending on the degree of tension the conversion to Hartmann's type I operation could be a better solution);
- Previous pelvic irradiation;
- Ultralow anastomosis (less than 5 cm from the anal verge), especially in patients over 70 years old;
- Advanced patient age (> 80 years);
- Patients with significant co-morbidities who cannot afford the complications of a leak.

Relative recommendations:

- Intense fecal contamination of the field
- Perforated tumor with abscess formation
- Poorly prepared bowel
- Diabetes mellitus
- Inexperienced surgeon
- Combinations of the abovementioned factors

Conflicts of interest and source of funding

None declared for all authors.

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