ORIGINAL ARTICLE

THE MARK OF THE DURATION OF SURGERY ON THE POSTOPERATIVE COMPLICATIONS IN PATIENTS WITH COMPLICATED COLON CANCER

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Abstract

Postoperative complications are common in patients with colon cancers operated in emergency. Most complications are those of the wound (suppuration, hematoma, dehiscence), postoperative ileus, anastomotic fistula. The aim of this study is to evaluate what influence has the duration of the surgery on the postoperative complications in patients with colon tumors, operated in emergency. We made a retrospective study on 451 patients treated for complicated colon cancers in the surgery clinics I and II of the Clinical Emergency County Hospital Galati between 2008 and 2017. In this study, we found all the 3 types of complications of colon tumors, but the most common was the intestinal obstruction. The operations varied from colostomies to subtotal and total colectomies. Most complications occurred on the postoperative days 4-8. The statistical analysis that we made revealed important statistical significance in the correlation of the postoperative complications and the duration of the surgical intervention ($p < 0,001$). The emergency colon cancer surgery has a high rate of postoperative complications, of which the most common are cardio-respiratory, parietal and fistulous. Their occurrence is directly influenced by the duration of the surgery.

Keywords: colon cancer, duration of surgery, complications

Introduction

Up to one third of the patients undergoing colorectal surgery have postoperative complications [1]. Longo and others [2] have found a complication rate of up to 28% in patients undergoing colectomies for colon cancer, according to the National Veterans Surgery Quality Improvement Database. The most frequent complications that occur after colorectal resection are the infectious ones, followed by gastrointestinal motility problems, including ileus and intestinal obstruction. The

complications of the wound (suppuration, hematoma, dehiscence) are very common after colorectal surgery (especially after operations made in emergency) and they take place in up to 13 % of the patients [1, 3]. According to an analysis of the SEER program (Surveillance, Epidemiology and Final Results) Medicare, in patients with colorectal cancer who needed reinterventions after the initial resection, complications were recorded in 21% of reoperated cases [1]. The anastomotic fistulas and the local abscesses have a rate of 3 to 10% and they are responsible for 32% of the

reinterventions in patients with colorectal cancers [1, 6-13].

Even if the definitions for ileus and partial obstruction vary a lot in the literature, these disorders are considered as a significant source of postoperative morbidity in patients undergoing colorectal surgery. The prolonged ileus following colorectal surgery is reported in 5.3 up to 24% of cases [1, 2, 14-16].

In other 7 observational studies, the risk of postoperative complications after colorectal surgery ranged from 2.4 % to 16.3 %. The common complications included wound infection, sepsis, intestinal obstruction, hemorrhage and intra-abdominal abscesses. Four of these seven studies reported a mean operative time ranging from 2.4 to 4.6 hours, and a statistically significant association between the duration of surgery and the complications [3]. In a series of 541 colorectal anastomoses performed between 1999-2004, in a single colorectal surgery medical unit, the univariate analysis showed that a prolonged operative time reported a rate of 2.8% for the development of a fistula anastomosis [19].

In this study, we wanted to investigate the influence of the duration of surgery on the postoperative complications in patients with complicated colon cancers.

Materials and Methods

This retrospective study involved 451 patients treated for complicated colon cancers in the surgery clinics I and II of the Clinical Emergency County Hospital Galati between 2008 and 2017. The including criteria were: patients admitted in emergency, with complicated colon cancer. The exclusion criteria were uncomplicated colon cancer, as well as other causes of acute abdomen and complicated rectal cancer.

The database stores information in the form of nominal or scalar variables. The relationships between the variables were established by calculating the values of the correlation coefficients at nominal level C and V, as well as the probabilities associated with them. If the associated probability has the value $p < 0.05$, we can say that the variables are correlated. Another method for determining the degree of association

between two categorical variables is the Pearson Chi-square test. For the numerical variables we calculated the correlation coefficient r , Pearson's and the probability associated with it. If $p < \alpha = 0.05$ we admit that the two variables are correlated, the value of r indicating the level of correlation. The software package used for statistical analysis was IBM SPSS Statistics version 23.

Results

The complications of colon cancer in the study were occlusion, perforation and bleeding; in some cases, patients presented associations between them. By far, the most common complication was the intestinal obstruction (Table 1).

Complication	Frequency	%
Hemorrhage	15	3,3
Hemorrhage, obstruction	12	2,7
Intestinal obstruction	366	81,2
Obstruction, perforation	16	3,5
Perforation	42	9,3
Total	451	100

Table 1 – Types of complications

The operations varied from colostomies to subtotal and total colectomies (Table 2).

The postoperative complications varied a lot, on top being the cardiac complications, the parietal complications (especially suppurations) and fistulas (Table 3).

The complications found in this study occurred between the postoperative days 4th and 8th (Figure 1).

Figure 1 – The postoperative days when complications occurred

Operation	Frequency	%	Valid %	Cumulative %
Colostomy	41	9.1	9.1	9.1
Cecostomy	27	6.0	6.0	15.1
Segmental colectomy with colostomy	168	37.3	37.3	52.3
Segmental colectomy with anastomosis	73	16.2	16.2	68.5
Subtotal and total colectomies	4	0.9	0.9	69.4
Colostomies in continuity	4	0.9	0.9	70.3
Internal derivations	37	8.2	8.2	78.5
Hemicolectomies	95	21.1	21.1	99.6
Laparotomies, biopsies	2	0.4	0.4	100.0
Total	451	100.0	100.0	

Table 2 – Types of operations

Complications	Frequency	%	Valid %	Cumulative %
Peritoneal abscesses	2	0.4	0.4	0.4
Peritoneal abscesses, colostomy necrosis, cardiac complications	1	0.2	0.2	0.7
Clostridium difficile inf.	3	0.7	0.7	1.3
Cardiac complications	22	4.9	4.9	6.2
Parietal complications	22	4.9	4.9	11.1
Respiratory complications, cardiac complications	3	0.7	0.7	11.8
Yes	1	0.2	0.2	12.0
Fistulas	14	3.1	3.1	15.1
Fistulas, cardiac complic.	2	0.4	0.4	15.5
Fistulas, parietal complic.	2	0.4	0.4	16.0
Fistulas, wound hematoma	1	0.2	0.2	16.2
Fistulas, pulmonary thromboembolism	1	0.2	0.2	16.4
Acute renal insufficiency	1	0.2	0.2	16.6
No	369	81.8	81.8	98.4
Intestinal postoperative obstruction	7	1.6	1.6	100.0
Total	451	100.0	100.0	

Table 3 – Postoperative complications

Post-op complications	The duration of surgery									Total
	1 h	1.5 h	2 h	2.5 h	3 h	3.5 h	4 h	4.5 h	5 h	
Peritoneal abscesses	1	0	1	0	0	0	0	0	0	2
Peritoneal abscesses, colostomy necrosis, cardiac complications	0	0	0	0	1	0	0	0	0	1
Clostridium difficile	0	0	3	0	0	0	0	0	0	3
Cardiac complications	2	3	8	5	3	0	1	0	0	22
Parietal complications	1	2	8	7	3	1	0	0	0	22
Respiratory complications, cardiac complications	0	0	1	0	0	1	0	1	0	3
Fistulas	0	0	1	3	8	0	1	0	1	14
Fistulas, cardiac complications	0	0	1	0	1	0	0	0	0	2
Fistulas, parietal complications	0	0	0	0	2	0	0	0	0	2
Fistulas, wound hematoma	0	0	0	1	0	0	0	0	0	1
Fistulas, pulmonary thromboembolism	0	0	0	0	1	0	0	0	0	1
Acute renal insufficiency	0	0	0	0	1	0	0	0	0	1
No complications	17	61	214	41	29	1	2	1	3	369
Total	21	66	242	60	49	3	4	2	4	451

Table 4 – The correlation postoperative complications-duration of surgery

The correlation between the postoperative complications and the duration of surgery is written in Table 4.

The χ^2 test revealed a significant correlation between the complications and the duration of surgery ($\chi^2 = 655.385$ and p value <0.001).

The values of the correlation coefficients at the nominal level C and V as well as the probabilities associated with these values lead to the same conclusion ($p <0.001$ $<\alpha = 0.05$, $C = 0.772$ and $V = 0.405$).

The χ^2 test also shows that there is a link between deaths and the duration of surgery ($\chi^2 = 87.128$ and $p <0.001$ $<\alpha = 0.05$).

The values of the correlation coefficients at the nominal level C and V as well as the probabilities associated with these values lead to the same conclusion ($p <0.001$ $<\alpha = 0.05$, $C = 0.402$ and $V = 0.220$) (Figure 2).

Figure 2 – The correlation between deaths and the duration of surgery

Discussions

We found many studies that have evaluated the predictive factors of morbidity following colorectal surgery. The patient-related factors predicting postoperative complications are: the older age, the comorbidities (especially the neurological and cardiorespiratory ones) and low preoperative albumin value [1,5]. The variables that can predict morbidity include: emergency surgery, intraoperative time longer than 120 minutes and peritoneal contamination [1, 5]. In some other studies, there have been identified similar risk factors for the development of the anastomotic fistula after colorectal resection. In addition to the risk factors mentioned above,

intraoperative blood loss (> 200 or > 300 ml), the need for intraoperative transfusion and the classification of "dirty" cases, seem to predispose to the appearance of anastomotic fistulas [8-10]. The patient characteristics considered to be significant for the appearance of the anastomotic fistulas include: male gender, American Society of Anesthesiologists classification, preoperative radiation and postoperative hyperglycemia [1,6]. Furthermore, the patients undergoing colectomies for colon cancers also have an increased risk of readmission if they have multiple comorbidities (Charlson >3), male sex and emergency admission. Moreover, for these patients, there are some predictive factors for hospital readmission, such as: perioperative transfusion, osteoporosis and prolonged stay [17,18].

Conclusion

The emergency colon cancer surgery is accompanied by numerous postoperative complications. The most common are the cardio-respiratory, fistulous and parietal complications. Their occurrence is directly influenced by the duration of surgery, which is why a correct analysis is needed, on a case-by-case basis, considering the opportunity of a large intervention. Although the duration of the operation is one of the significant factors considered to be responsible for the occurrence of the postoperative complications, it influences less the appearance of the postoperative deaths.

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