ORIGINAL ARTICLE

SURGICAL MANAGEMENT ANALYSIS OF EMERGENCY COLORECTAL CANCER SURGICAL CASES**G. Andrei^{1,2}, B. Dumitriu^{1,2}, M. Beuran^{1,2}**¹Department of Surgery, Clinical Emergency Hospital, Bucharest, Romania²University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

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Abstract

We present an observational retrospective study which takes into consideration and analyzes the surgical management of emergency colorectal cancer cases. This analysis would contribute to a better understanding and for identification of those characteristics that are essential for reducing emergency colorectal cancer incidence and for improving the management of such cases. A number of 159 patients that underwent surgery for obstructive, bleeding or perforated colorectal cancer between January 2015 and September 2017 were selected to be included in the study. The results obtained by analyzing available data collected from the observation charts, surgery protocols, histopathological protocols were then compared with those in the literature.

Keywords: *colorectal cancer, emergency, surgery*

Introduction

14% to 37% of colon cancer and about 15% of rectal cancers are presenting in a emergency setting [1-3]. Specialized studies have revealed that emergency surgery in colorectal cancer is correlated with poorer outcomes [4-6]. Emergency surgery can be considered among independent predictors of 30-day mortality [7]. Obstruction is in first place as an indication for emergency surgery (50-80% of cases), perforation occurs in 10-18%, while bleeding is in the last place (4-11% of patients) [8-10]. Metabolic, cardiovascular, infectious or respiratory disorders can be associated with this pathology facts that causes increased morbidity and mortality [11-12].

Materials and Methods

Our study includes 159 patients with colorectal cancer presented in an emergency setting between January 2015 and September 2017 in the General Surgery Clinic of the Emergency Hospital of Bucharest. The selection criteria of the patients which were included in the study were based on the type of emergency presentation to our clinic: occlusive, perforated or bleeding tumors, regardless of the time frame between admission and surgery time. Also, we included only patients in which the symptomatology had started a week prior to surgery at most.

Statistical analysis was performed using Microsoft EXCEL 2010 (Analysis ToolPak), Xlstat 2018, and SPSS 11.0 for Windows. Pearson correlation coefficient r and r^2 coefficient were calculated for assessing crude correlations and interdependencies between

variables. P value was determined by using ANOVA test – statistical significance was set at $p < 0.05$. For highlighting the results were used descriptive statistics using number and percentages.

Results

The most employed surgical procedures were: hemicolectomies (for 38.32%, $n=64$ of patients), segmental colectomies (31.14%, $n=52$) and Hartmann resections (19.76%, $n=33$).

Multivisceral resections were performed in 13.21% of the cases ($n=21$ patients). Out of these patients, 18 (85.71%) were aged 60 and above. Regarding the type of complications on presentation: 66.67% ($n=14$) were obstructive, 19.05% ($n=4$) were hemorrhagic and 14.29% ($n=2$) were perforated; in 57.14% of the cases there were complementary complications due to nearby visceral invasion of the tumor.

Synchronous tumors (hepatic flexure and transverse colon) were identified in a single female patient with personal history of hysterectomy and appendectomy which presented with obstruction and enteral invasion, both tumors having a G2 grading and IV B staging (peritoneal and hepatic metastases M1b), lymph node involvement (N1b – 2/14) and venous invasion.

Figure 1 – Types of procedures employed on patients in current study.

	Colectomy			Hemicolectomy	
	segmental	Hartmann	subtotal	right	right extended
Appendectomy		0,63%**			
Enterectomy	1,26%	0,63%	0,63%		0,63%
Splenectomy	0,63%	0,63%			
Distal pancreatectomy with splenectomy and gastric resection	0,63%				
Cystectomy		0,63%			
Metastasectomy	1,89%			1,26%	
Jejunectomy	0,63%				
Urethrotomy				0,63%	
Duodenorrhaphy					0,63%
	Left hemicolectomy		Resection	Complete proctocolectomy	
Appendectomy			0,63%		
Enterectomy	0,63%				
Total hysterectomy with bilateral adnexectomy				0,63%	

Table 1 – Surgical procedures with multivisceral resection.

The majority of the procedures ended with anastomosis (75.47%, $n=120$) and in 3 cases a ileostoma was employed (1.89%). Out of 120

anastomosis, 77 (64.17%) were manually performed and 43 (35.83%) were stapled.

Statistical analyses revealed a weak correlation between patient sex and the surgical procedure required ($r=0.1267$, $p<0.001$, $t_{calc}=1.664$, $t_{teor}=1.960$). However, in male patients the procedures ranked after frequency were Hartmann resections (27.85%, $n=22$), segmental resections (25.32%, $n=20$) and right

hemicolectomies (21.52%, $n=17$) while in female patients the order is slightly different with most frequent being segmental resections (36.36%, $n=32$), followed by right hemicolectomies (27.27%, $n=24$) and Hartmann resections (12.50%, $n=11$).

Figure 2 – Types of procedures performed according to sex.

The location of the tumor is the main factor determining the surgical procedure employed in cases of surgical emergency of colorectal cancer. The statistical analyses performed on this lot of patients has revealed a reasonable correlation ($r=0.4179$, $p<0.001$, $t_{calc}=6.543$, $t_{teor}=1.960$) between the location of the tumor and the type of surgery used. Hemicolectomies were performed especially for right colon cancer: right hemicolectomy for 65.08% ($n=41$) of cases while in 22.22 % ($n=14$) of patients (tumors of the cecal area) an extended right hemicolectomy was needed. For the left colon, in 45.19% ($n=47$) of cases a segmental colectomy was employed

while in 31.73% ($n=33$) a Hartmann procedure was required.

Figure 3 – Correlation between location of tumor and type of procedure performed.

Figure 4 – Types of surgical procedures performed according to tumor location.

There is a weak correlation, with high statistically significance ($r=0,1539$, $p<0,001$; $t_{calc}=1,987$, $t_{teor}=1,960$) between type of resection and the number of lymph nodes extracted. On average, most lymph nodes were resected in cases of total colectomies and colorectal resections. Taking in account the wide variations of the standard deviation and the large differences between the minimal and maximal lymph nodes resected during similar procedures, the statistical significance of mean values is small.

Figure 5 – Correlation between type of procedure and number of limps resected.

A weak correlation with high statistical significance was reported between the type of surgical procedure and the three main complications of colorectal cancer in the whole patient lot and as well in subcategories defined by sex and environment. As 61.68% of patients presented with obstructive tumors it's natural that most of each type of surgery was associated with this complication. In the case of right hemicolectomies, though, over 50% of patients

in this category presented with bleeding, for all types of patients.

Figure 6 – Correlation between types of complicated CRC and surgical procedures employed.

Mean operating time was 217 (± 78) minutes with the majority of operations between 180-240 minutes. A weak statistical correlation was found between operating time and demographics of patients. After comparing the duration of the procedures on consecutive years and sex of patients it can be observed that the mean operating time was reduced from 244 (± 88) minutes in 2015 to 179 (± 56) minutes in 2017 and also the lowest means were recorded on female patients.

Figure 7 – Mean operating time of surgical procedures by shares.

The location of the tumor and operating time were also found to have a weak correlation ($r < 0,0887$; $p < 0.001$; $t_{calc} = 1,127$, $t_{teor} = 1,960$). On average, the mean operating time for left colon cancer is relatively lower (212 ± 79 minutes, with a minimum of 72 and a maximum of 540 minutes) than right colon cancer (225 ± 77 , minimum 90, maximum 478 minute); the lowest mean operating time was recorded on the descending colon, especially the rectum. Patients

with synchronous tumors had the highest operating time (271 ± 144 minutes, minimum 114, maximum 498 minutes) compared to single site tumor (214 ± 73 minutes, minimum 72, maximum 540 minutes).

Location of tumor	Mean operating time	Min	Max
Appendix*	198	198	198
Cecum	194(± 57)	90	294
Ileo-cecal	181(± 61)	90	240
Ascending colon	251(± 86)	95	360
Hepatic flexure	223(± 69)	135	360
Transverse colon	231(± 62)	132	366
Splenic flexure	233(± 90)	120	540
Descending colon	178(± 61)	90	294
Sigmoid colon	200(± 65)	72	318
Rectum	255(± 82)	120	368

Table 2 – Mean operating time depending on tumor location; *single case.

Figure 8 – Correlation between operating time and the need for multivisceral resection.

There is a very weak correlation between types of major complications of colorectal cancer and the operating time ($r=0,06$, $p<0,001$; $t_{calc}=0,752$, $t_{teor}=1,960$) but multiple complications seem to influence the operating time to a higher degree ($r=0,1669$, $p<0,001$; $t_{calc}=2,164$, $t_{teor}=1,960$). This observation was derived from the fact that the operation for multicompliated colorectal cancer took longer (237 ± 80 minutes, minimum 105 and maximum 540 minutes) compared to standard ones (mean operating time of 209 ± 76 minutes, minimum

72 and maximum 498 minutes). Patients which required multivisceral resections had an average of 60 minutes added to the mean operating time (266 ± 99 minutes, between 130-540 minutes, compared with 209 ± 72 minutes, between 72-498) with a low statistical correlation between these two variables ($r=0,2466$, $p<0,001$; $t_{calc}=3,310$, $t_{teor}=1,960$).

Figure 9 – Correlation between type of procedure and operating time.

Figure 10 – Correlation between types of major complications and operating time.

Figure 11 – Correlation between operating time and occurrence of multiple complications.

A very weak correlation ($r=0,1786$, $p<0,001$; $t_{calc}=2,326$, $t_{teor}=1,960$) exists between the type of surgery employed and mean operating time (the highest mean being associated with the right extended hemicolectomy). A stronger correlation ($r=0,2533$, $p<0,001$, $t_{calc}=2,965$, $t_{teor}=1,980$) was observed between the type of anastomosis performed and the operating time – on average mechanical anastomosis had a lower mean operating time.

Figure 12 – Correlation between operating time and type of anastomosis.

The surgical procedure employed has been found to be a weak element of influence in the patients' length of stay ($r=0,1167$, $p<0,001$; $t_{calc}=1,492$, $t_{teor}=1,960$). The longest length of stay was found in patients who underwent rectosigmoid resections. Also, a weak correlation ($r=0,2052$, $p<0,001$; $t_{calc}=2,701$, $t_{teor}=1,960$) was found between the length of stay and type of anastomosis performed – mechanical anastomosis had a longer length of stay. Because of the high value of standard deviation as well as big differences between the minimum and maximum days of length of stay, caution should be utilized in making any statistically significant conclusions.

Figure 13 – Correlation between type of anastomosis and hospital stay of length.

Discussions

Even if the elective approach to colorectal cancer pathology has already been elaborated, about the treatment of emergency colorectal cancer as obstruction, perforation, or significant bleeding there is still more to say. Emergency colorectal cancer presentation is known to be more aggressive and have a worse prognosis than those treated electively [13]. In many western countries due to the subspecialization the approach of colorectal cancers in emergency is the appeal of some very specialized surgeons. In our country due to the lack of subspecialization cases are resolved by the general surgeon. This is why we support the approach of these cases in general surgery clinics with a large volume of colorectal resections. At the same time, we do not believe in the damage control approach for patients with this pathology for reasons of oncological safety. Unfortunately, emergency colorectal cancer patients have a poor prognosis, and after some studies up to 20% of them die within 1 month after surgery [14]. Although it is believed in the vast majority of cases that the bad evolution is due to the more advanced staging, there is evidence that the nonspecialist general surgeons management can be a factor worth considering [15].

Regarding obstructive colorectal cancers we believe that one stage operation is the best option for the reasons mentioned above, but we do not agree with the principle of subtotal colectomy in all cases for reasons of increased morbidity as a study published in 2016 states [16]. The most common sites of tumor obstruction are the left colon and perforation occurs most often at the level of the sigmoid or the cecum. The results are similar to other specialized studies [17] [18].

Histopathological examination of the resected specimen is an important step in determining node positivity and patient prognosis. A number of minimum 12 lymph nodes is required to accurately diagnose stage I to stage III disease [19]. It can be seen from the statistical analysis that the number of lymph nodes collected intraoperatively for the histopathological analysis does not differ compared with that of the cases of colorectal cancer operated in elective regime from other published studies on this aspect. As for performing the anastomoses, the mechanical one that uses devices like circular or

linear staplers, shortens the operative time and also the postoperative one. At the same time, the time until the gas transit resumption is shorter for mechanical anastomoses. These data do not differ from those in the specialized literature [20].

Conclusion

Many more studies are needed in order to try to standardize the management of colorectal cancer in emergency. It is preferable to treat these cases in general surgery clinics with large volumes of colorectal resections due to the lack of subspecialization in our country. Regarding the principle of damage control in colorectal surgery in emergency, we strongly believe that one stage procedure is more recommended due to the oncological arguments.

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