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SURGICAL CONSIDERATIONS IN COLON CANCER MANAGEMENT

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Abstract: *The optimal management of surgical patients with colon cancer has been studied for a long time. However, as the population is evolving and this pathology affects a new range of patients every year, it becomes important to reassess the type of patients, their risk factors and to evaluate the most effective type of surgery in colon cancer patients. In this study, 54 patients have been analyzed in order to evaluate operative outcomes and future considerations for management of colon cancer patients. In this study most of stage III and IV patients had cancer localized on the sigmoid colon, and this site presented with a higher complications rate. However, further research is needed to better understand the colon cancer patient and to determine new technology methods for improving the surgical management of this pathology.*

Key words: *colon cancer, TNM staging, Hartmann.*

1. Introduction

In 2012, according to WHO statistics, there were 10,256 new cases of colorectal cancer in Romania [2], making it the second type of cancer diagnosed after lung cancer, and accounting for 13% of the total incidence of cancer of any type. In most cases, colon cancer's starting point is a benign pathology known as adenomatous polyposis, which consists of a protrusion in the lumen of the mucosa that normally has a flat aspect [11]. Polyps, usually, are small in size, and do not cause obvious symptoms. Therefore, annual screening is recommended for patients at risk. Approximately 10-30% of colorectal cancers occur within a familial context, but predisposing factors are non-specific and not fully elucidated [5].

Most cases require surgery, which is the most common procedure providing longer life expectancy or palliative treatment in some cases [10].

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Thus, considering that all reported cases will eventually be treated surgically; physicians are currently facing population diversity with patients ranging from 40 to 85 years, and older. Thus, it is essential to determine which are the main factors to consider in the surgical treatment of colon cancer for an appropriate approach.

Consequently, our aim was to describe the type of patients undergoing surgical treatment for colon cancer, to identify possible risk factors in this pathology as compared to data in literature, to make statistical correlations between the severity of the TNM stage and the risk factors, to evaluate the most effective type of surgery in terms of surgery duration, length of hospitalization and post-operative complications.

2. Materials and Methods

In order to carry out this retrospective study, 54 patients diagnosed with colorectal cancer hospitalized in the Surgery Departments of the Clinical Emergency County Hospital Brasov during January – December 2017 were selected.

Data processed in the study have been obtained from patient charts and compiled into a database using SPSS 24.

2.1. Inclusion Criteria

Inclusion criteria:

1. Diagnosis of colon cancer including:
   - Ascending colon neoplasm
   - Tumor of the hepatic angle of the colon
   - Transverse colon cancer
   - Descending colon tumor
   - Sigmoid colon tumor
   - Recto-sigmoid junction tumor
2. Patients under surgical treatment, aged between 40-90 years, evaluated with TNM stage.

3. Results

3.1. Descriptive Analysis of Population

The age of patients with colon cancer enrolled in the study ranged from 45 years (minimum) and 87 years (maximum), with an average of 68.03 ± 10.22 years.

The gender distribution of the group was: 37% women and 63% men. This report highlights the predominance of pathology in male patients. The male/female ratio was 1.70/1.

The study evaluated the relationship between age and staging. For this matter, a Fischer coefficient test has been used, the p-value being less than 0.05, indicating an association between the patient's age and the TNM stage.

In fact, over 70.3% of the patients aged 61-80 years were in the stage III or IV of the disease.

3.2. Tumor Markers and Relationship to Staging

Tumoral markers CEA (Carcinoembryonic Antigen) and CA 19-9 (Carbohydrate Antigen 9-19) are almost always expressed in colorectal cancer, especially in advanced stages. In this study, the values of these markers could be evaluated in only 68% of the patients, since only 37 patients of 54 had abnormal values (> 5 ng/mL for CEA, respectively, > 37 U/mL for CA 19-9). It is worth mentioning that 17 patients did not present values above the normal range, demonstrating that diagnosis cannot be based exclusively on the detection of these markers.

Maximum peak values observed in the study group were 486 ng/mL for CEA, respectively, 1,050 U/mL for CA 9-19.

Chi-square test and the Pearson coefficient have been used to evaluate the correlation with the TNM staging. There was a statistically significant correlation between CA 19-9 and the TNM stage ($p < 0.0001$, *Figure 1*). This statistical significant correlation was also valid for colon cancer: 29 patients out of 54 (53.70%), followed by stage IV (27.77%), stage II (12.96%) and stage I (5.55%).

The most common colon segment affected by cancer was the sigmoid colon (37 cases – 68.5%), followed by the transverse colon (8 cases – 14.8%), the ascending colon (7 cases – 13%), the right colon being the least affected (2 cases – 3.7%).

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	23.833[a]	3	.000	.000
Likelihood Ratio	25.985	3	.000	.000
Fisher's Exact Test	21.596			.000
N of Valid Cases	54			

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

Fig.1. *Chi-square test for CA 19-9 and TNM stage*

CAE and the TMN stage. Furthermore, patients had increased CAE or CA 19-9 in advanced stages of the disease.

3.3. Staging and Location

Within the analyzed group, most patients were diagnosed with stage III

Nonparametric methods have been used to evaluate the association of the disease stage with the portion of colon affected. Nonetheless, site and staging were related, as the sigmoid colon was affected mainly by stage III or IV *(Figure 2).*

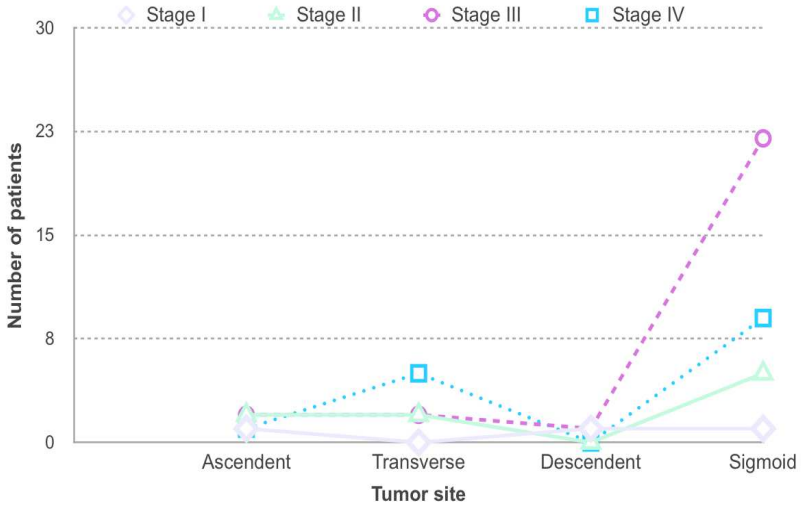

Fig. 2. *Tumor site and stage by the number of patients*

3.4. Preoperative Considerations

Preoperative evaluation was mandatory and rigorous for all patients enrolled in this study. The evaluation included complete blood count, and assessment of vital function parameters and blood glucose testing.

The most important biological investigations in a patient with surgical treatment of colon cancer were: hemoglobin (because of the significant risk of bleeding), erythrocyte sedimentation rate (ESR), serum C-reactive protein (CRP), blood pressure, and heart rate (HR).

Hemodynamic stability parameters were analyzed by measuring mean systolic blood pressure (MSBP), mean diastolic blood pressure (MDBP), mean heart rate (MHR) by age and gender.

It is worth mentioning that there were no patients in the 55-59-year group, male category, who results in a gap. All patients had oxygen saturation values above 98% (within normal range).

MSBP values were similar among both genders and all age ranges, except for the 65-69 age group, in which women had a MSBP of 120 mmHg and men of 144 mmHg. The age group of 45-49 years also showed a difference of 15 mmHg between women and men for MSBP and 18 bpm for MHR.

Haemoglobin (Hb) is one of the most important parameters in the preoperative assessment. For the purpose of statistical evaluation, because hemoglobin values vary with age and gender, the lower limit was defined as 12 g/dL.

Therefore, 26 patients (48.14%) required haemodynamic monitoring and stabilization. The age group in which most patients had Hb values under normal range was the 61-70 years old group.

3.5. Surgical Intervention Type, Duration, Length of Hospitalization and Postoperative Complications

In the study group, the therapeutic approach for all the 54 patients diagnosed with colorectal cancer was the surgical treatment, which was adapted depending on the localization and tumor stage: Hartmann operation, segmental resection, laparoscopic or classic haemicolectomy.

Thus, the most common type of surgery was Hartmann's procedure in 20 patients (37%), the rest of the interventions performed being segmental resections on the affected colon (59.2%), only 2 cases being not exclusively surgical *(Figure 3).*

The duration of the surgical procedure varied according to the location, type of operation and intraoperative complications. The longest duration was 240 minutes (2 cases – 3.7%), and the shortest 90 minutes (5 cases – 9.3%). The majority of the patients were treated within 120-180 minutes time-frame (46 cases – 85.18%).

The length of hospitalization also varied widely depending on the postoperative complications of each patient. Thus, 4 (7.4%) patients stayed less than 7 days and 4 patients over 31 days. Most patients remained in the hospital for 11-20 days (50%).

Postoperative complications were reported in 35.18% of patients (19 out of 54). The most common complications were haemorrhage (9 cases – 16.6%), followed by infection (7 cases – 12.96%), evisceration (2 cases – 12.96%) and anastomotic fistula (1 case – 1.85%).

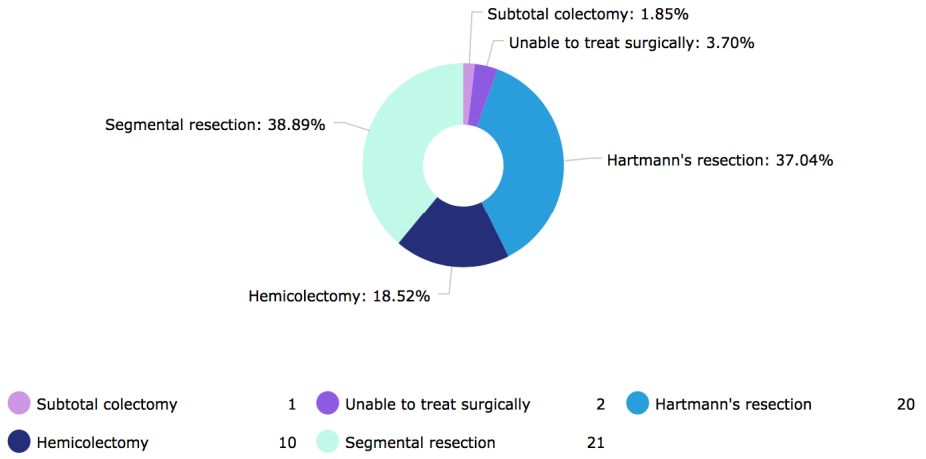

Fig.3. *Surgical intervention type*

Patients with sigmoid colon cancer had the majority of complications: 6 patients had haemorrhages, 2 had eviscerations, 3 had infections, 1 had an anastomotic fistula, thus representing 12 of 19 postoperative complications (63.15 %). So, in our study group, most of the complications were associated with the sigmoid location of colon cancer.

4. Discussions

The present study attempted to capture a number of factors that could contribute to an effective surgical approach for colon cancer. This study aimed to assess the correlation between the above-mentioned parameters, highlighting the risk factors, the operative parameters, and the proper surgical approach together with its complications.

From a demographic point of view, in recent studies, the incidence of colorectal cancer in patients younger than 54 years is increasing compared to a decline in patients over 55 years [9].

Demographic data for patients in our study group (54 subjects) indicated a prevalence of the disease in patients over 61 years of age, with an average age of 63 years old for men and 62 years old for women. The age range was quite wide, ranging from the minimum age of 45 years to the maximum of 87 years, but still respecting a Gaussian distribution with most of the values around the average.

The statistical analyses revealed the significant predominance of male patients (34 patients, 62.96%) compared to female patients (20 patients, 37.04%), gender ratio (1.7/1) being similar to that mentioned by Murphy & al. [8].

It would have been interesting to look at this distribution on a broader basis to understand the predisposing factors affecting a particular gender.

Carcinoembryonic antigen (CEA) and carbohydrate antigen (CA 19-9) are well-known tumoral markers used in the diagnosis of colorectal cancer (REF). This markers are also used in preoperative

staging and postoperative follow-up of patients, especially in patients treated with chemotherapy. The evidence of elevated levels of these markers in serum is, in most cases, a sign of recurrence or metastatic lesions near the tumor environment, as well as remotely [7].

In the studied group (54 cases), 37 (68%) of the patients had one of the tumoral markers in abnormal values (> 5 ng/mL for CEA and > 37 U/mL for CA 19-9). However, 17 patients showed normal values. Furthermore, these markers were evaluated as markers of an advanced TNM stage of colorectal cancer with statistical significance. Also, the highest CEA value was 486 ng/mL, while for CA 19-9, of 1,050 U/mL in a patient with TNM stage IV tumor localized in the sigmoid.

In this study, the presence of ischaemic heart disease (IHD) has been evaluated. Since colorectal cancer IHD have common risk factors [4], such as obesity, diabetes, smoking, high blood pressure (HBP), it might be interesting to assess a possible association between these pathologies. Out of 54 patients, 18 presented IHD, representing 33% of the group, which does not constitute a large enough sample to assess this association. According to a recent study published by Hee & al. [4], this association is significant, and particular attention should be paid to these patients for the screening and monitoring of colorectal cancer.

TNM staging of the analyzed cases showed the significant incidence of stage III (29 cases – 53.70%) and stage IV (15 cases – 27.77%) compared to stage II (7 cases – 12.96%) and stage I (3 cases – 5.55%).

In a recent study [6], stages II and III were reported as most common in hospitalized patients.

The most frequent site of the tumor localization was the sigmoid colon (37 cases – 68.5%), followed by the transverse colon (8 cases – 14.8%), ascending colon (7 cases – 13%), the right colon being the least affected (2 cases – 3.7%). This study noted an association of localization with an advanced stage of the disease, the sigmoid not only being the most affected, but also the portion where the highest frequency of stage IV or III was found.

Preoperative preparation consisted of an evaluation of biological parameters (complete blood count, blood pressure, temperature, HR, ESR, CRP) and stabilization of any patient prior to surgery.

Hemoglobin was one of the most important parameters because the patient was evaluated for haemorrhagic risk. Therefore, 26 patients (48.14%) required haemodynamic stabilization.

The most commonly used techniques were segmental resections and Hartmann resection, the latter being recommended in emergency situations or in high-risk patients [3].

This latter technique was performed in 20 patients (37%).

The duration of the surgical procedure averaged 139.8 ± 30 minutes, which was shorter than the usual time reported – 175 ± 58 minutes for classical resection, and 208 ± 55 minutes for laparoscopy [6]. To justify this difference, there is a likelihood that operation time might not have properly been recorded or strictly dependent on each hospital procedures.

Postoperative complications were noted in 35.18% of the patients. The most

common were haemorrhage (9 cases – 16.6%), followed by infection (7 cases – 12.96%), evisceration (2 cases – 3.7%) and anastomotic fistulas (1 case – 1.85%). Localization on the sigmoid was correlated to a more frequent rate of complications.

Finally, the duration of hospitalization was variable depending on complications, with an average of 16.13 ± 10.33 days, with a minimum of 4 days and a maximum of 59 days. Most patients (27 cases – 50%) were hospitalized for 11-20 days. In a recent study conducted in UK [1], the optimal duration of hospitalization is ≤ 5 days, over 21 days being considered as a prolonged period.

Therefore, patients in our study group experienced an optimal duration of hospitalization.

5. Conclusions

The results of our study is consisted with other previously published data. A potential drawback of this study could be the almost impossible patients' follow-up over time, in order to assess mortality or survival rates.

On the other hand, the study group was small as the exclusion criteria did not allow to assess a larger number of cases. Finally, limited technology did not allow for a more in-depth study by using new surgical approaches. For example, robotic surgery compared to laparoscopic or classical surgery.

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