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RETROSPECTIVE OBSERVATIONAL STUDY ON THE DYNAMICS OF SURGICAL TREATMENT OF COLON CANCER BEFORE AND DURING THE COVID 19 PANDEMIC. THE EXPERIENCE OF A SMALL CENTER

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Abstract: *In March 2020, the World Health Organization declared COVID-19 a pandemic. The main purpose of this retrospective observational study is to highlight the diagnostic changes in the dynamics of surgical treatment of patients with colon cancer, hospitalized on Surgery I Department of Brasov County Emergency Clinical Hospital in the first year of the pandemic. A number of 129 patients diagnosed and surgically treated for colon cancer in the Surgery I Department of Brașov County Emergency Clinical Hospital between March 1, 2019 and February 29, 2021 were included in the study.*
Later, the patients were divided into two groups, the first group includes patients diagnosed and treated for colon cancer one year before the pandemic and the second group, patients treated surgically in the first year of the pandemic. Several characteristics of the two groups were analyzed. We report a decrease in the number of cases in the first year of the pandemic due to restrictions and a decrease in early diagnosis, as well as a decrease in the number of laparoscopic approaches, an increase in the length of hospital stays during the pandemic and an increase in the percentage of perioperative deaths in Group 2. The limitations of the study are represented by the small number of patients as well as by the evaluation of the experience of a single Section from a single Center that does not allow the generalization of the results.

Key words: *colon cancer, COVID 19 and colon cancer, screening during the pandemic.*

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1. Introduction

In December 2019, a new human coronavirus called SARS Cov-2 (severe acute respiratory syndrome coronavirus 2) was discovered in Wuhan, China which causes COVID 19 disease.

The spread of this virus was vertiginous and on March 11, 2020 the World Health Organization declared COVID 19 disease pandemic.

The first case of COVID 19 was identified in Romania on February 26, 2020 [1],[2].

Due to the recent onset of COVID-19 disease and, to a lesser extent, the limited information available on how the disease is transmitted and how severe forms of the disease can be managed, the decision-making process in the field of health, including in the Departments of Surgery, has encountered some difficulties and changes in normal functioning.

Medical systems around the world faced a particularly difficult situation, requiring the adoption of numerous measures aimed at the effective management of patients infected with SARS CoV 2.

Some measures such as stopping scheduled surgeries, stopping colonoscopy, stopping colorectal cancer screening, already modest in Romania, have led to changes in the dynamics of surgical treatment of colon cancer [3], [4], [5].

Even though the whole world has been swept away by successive waves of COVID 19 the other pathologies and especially the neoplastic ones have continued to evolve [6], [7].

In a permanent attempt to protect patients with oncological pathologies and also to protect and save medical and human resources, multiple measures were adopted within the Surgery Department I of the Braşov County Emergency Clinical Hospital, of which, the most important one was to continue to perform scheduled oncological surgeries after testing patients for COVID 19 disease with less than 48 hours before admission.

We conducted a retrospective observational study that aims to highlight the changes in the dynamics of surgical treatment of patients diagnosed with colon cancer, hospitalized in Surgery I Department of Braşov County Emergency Clinical Hospital in the first year of the pandemic.

We chose colon cancer due to the increased incidence of this pathology in Romania, of 10.1/100,000 inhabitants for men and 7.3/100,000 inhabitants, for women as well as due to the ranking of this pathology on the 2nd place in terms of cancer mortality, after broncho-pulmonary tumors, according to data provided by the National Institute of Public Health.

2. Patients and Methods

All patients hospitalized with the diagnosis of colorectal cancer in the Surgery I Department of Braşov County Emergency Clinical Hospital, between March 1, 2019 and February 28, 2021 were analyzed.

Written informed consent was obtained from the patients.

The inclusion criterion was the diagnosis of colon malign tumor regardless of whether the patient was hospitalized on a scheduled basis or after they arrived in the Emergency Room (ER), excluding from the study patients diagnosed with middle and lower rectal neoplasm who often required neoadjuvant therapy.

In the end, there were 129 cases that were divided into two groups.

The first group includes a number of 74 patients diagnosed with colon cancer and treated surgically in the of Surgery I Department, of the Brașov County Emergency Clinical Hospital between March 1, 2019 and February 29, 2020.

The second group includes 55 patients hospitalized and operated for colon cancer between March 1, 2020 and February 28, 2021.

Several characteristics of the two groups were analyzed and compared, namely: gender, the patients' distribution in age groups, the type of hospitalization, scheduled or admitted through the Emergency Room.

In the case of those hospitalized through the Emergency Room, the reason for the presentation was specified, namely occlusive/stenotic tumor, perforated or generating lower gastrointestinal bleeding.

The location of the tumor on the right or left colon as well as the classical or laparoscopic surgical approach were specified. Other criteria analyzed were the need for a colostomy, the number of days of hospitalization and deaths during hospitalization.

The collected data was processed using Microsoft Excel 2016. The chi-square test was used to evaluate the statistical significance, a value of $p<0.05$ being considered to have statistical significance.

3. Results

Analyzing the two groups in terms of age distribution, we see that it is similar, so in Group 1 a percentage of 71.62% of patients are over 65 years and in Group 2 the percentage of those over 65 years is 74.55%.

An important thing to note is the decrease in the number of cases by 25.68% in the second period of time studied, namely after the declaration of the SARS CoV 2 infection pandemic, compared to the number of cases registered between March 1, 2019 and February 29, 2021.

Regarding the gender distribution of the two groups, we see in Figure 1 and Figure 2 that it is similar, in both groups the men being in a higher percentage, of 59% in group 1, respectively 58% in group 2.

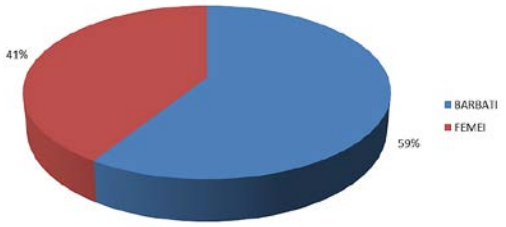

Fig. 1. *Gender distribution of Group 1*

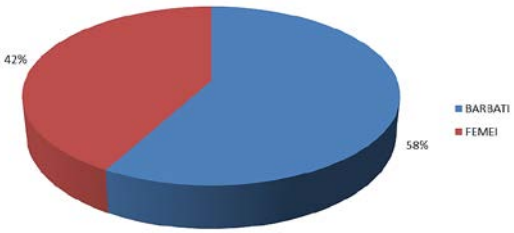

Fig. 2. *Gender distribution of Group 2*

In the first group, 59.46% (44 cases) of patients were admitted to the emergency room, a significant number that may be due to late detection of the disease, in complicated stages of the disease even before the pandemic, which may draw attention to the existing deficiencies in the screening of this neoplasm before the Pandemic. In the second group, the

percentage of those hospitalized through the ER was 70.91% (39 cases), so during the pandemic the emergency hospitalization of people diagnosed with malignant tumor of the colon increased by 11.45% compared to the same period of the previous year.

Another important aspect is the rate of complications, so in Group 1, among the patients scheduled for surgery we had 3 cases that had colonic stenosis; in the case of those hospitalized trough the ER, 34 were diagnosed with bowel obstruction, 3 with bowel obstruction and diastatic perforation and 5 with inferior gastrointestinal bleeding.

In Group 2 most cases, 74, 36%, were emergency hospitalized for bowel obstruction.

Table 1 and table 2 show the complications encountered in the two groups.

Complication rate in Group 1 Table 1

Hospitalization Type	Uncomplicated cases	Bowel Obstruction/ Colonic Stenosis	Tumoral Perforation	Diastatic Perforation	Inferior Gastrointestinal Bleeding	Bowel obstruction and Inferior Gastrointestinal Bleeding	Total cases
Scheduled	27 (90%)	3 (10%)	0	0	0	0	30
ER	0	34 (77,27%)	3 (6,82%)	3 (6,82%)	4 (9,09%)	1 (2,27%)	44
Total	27	37	3	3	4	1	74

Complication rate in Group 2 Table 2

Hospitalization Type	Uncomplicated cases	Bowel Obstruction/ Colonic Stenosis	Tumoral Perforation	Diastatic Perforation	Inferior Gastrointestinal Bleeding	Total cases
Scheduled	15 (93,34%)	1 (6,66%)	0	0	0	16
ER	0	29 (74,36%)	4 (10,26%)	1 (2,26%)	5 (12,82%)	39
Total	15	30	4	1	5	55

Analyzing the location of colon tumors either on the right colon (cecum, ascending colon and the right two thirds of the transverse colon) or on the left colon (the left third of the transverse colon, descending colon and sigmoid colon), it is observed that those located on the left colon are predominant, reaching a percentage of 63.51% in Group 1 and in Group 2 this percentage increases significantly to 81.82% (table 3). From the data analysis we deduce that most patients diagnosed with malignant colon tumor from March 1, 2020 to February 28, 2021 are emergency hospitalized in Surgery I Department for malignant tumor of the left colon complicated by bowel obstruction.

Comparison between the predominant location of tumors in both groups Table 3

	Left Colon Tumor	Right Colon Tumor	Row Totals
Group 1	47 (52.78) [0.63]	27 (21.22) [1.57]	74
Group 2	45 (39.22) [0.85]	10 (15.78) [2.11]	55
Column Totals	92	37	129 (Grand Total)

The chi-square statistic is 5.1679. The p-value is .023007. The result is significant at p < .05.

Regarding the surgical approach, it is observed that in both groups the classical approach is predominant. Between March 1, 2019 and February 29, 2020, 11 laparoscopic surgeries were performed, and in the second period their number decreased to only 4. This is due to the health restrictions originally imposed, the decrease in the number of scheduled hospitalized cases for the second period, as well as initial information that the SARS CoV 2 virus could be identified in the CO2 used for insufflation in the case of positive patients and so it would increase the risk of contamination of the medical staff, which was later refuted [8], [9].

Analyzing comparatively the number of cases in which it was necessary to perform a colostomy, it is observed that in group 1 this number was lower in the case of patients hospitalized for scheduled surgery, and in the case of those emergency hospitalized the percentage of those in need of colostomy reached 59.09%. In group 2, for 51.27% of the patients emergency hospitalized a colostomy was performed, while in the case of those hospitalized on a scheduled basis, in 87.50% of cases it was possible to perform an anastomosis.

It can be seen in Tables 4 and 5 that there is a statistically significant increase in the number of colostomies in the case of patients admitted to the Emergency Department in both groups.

Analysis of the statistical significance of the need of colostomy in group 1 Table 4

	Without Colostomy	With colostomy	Marginal Row Totals
Scheduled	30 (19.84) [5.2]	1 (11.16) [9.25]	31
ER	18 (28.16) [3.67]	26 (15.84) [6.52]	44
Marginal Column Totals	48	27	75 (Grand Total)

The chi-square statistic is 24.635. The p-value is < 0.00001. Significant at p < .05.

Analysis of the statistical significance of the need of colostomy in group 2 Table 5

	Without Colostomy	With colostomy	Row Totals
Scheduled	14 (9.60) [2.02]	2 (6.40) [3.03]	16
ER	19 (23.40) [0.83]	20 (15.60) [1.24]	39
Column Totals	33	22	55 (Grand Total)

The chi-square statistic is 7.11. The p-value is .007665. The result is significant at p < .05.

There was no statistically significant difference from this point of view between the two groups, so we cannot say that in our clinic the percentage of colostomies increased during the

Pandemic compared to the other period studied, as shown in Table 6.

Analysis of the statistical significance of colostomy needs between the two groups Table 6

	Without Colostomy	With colostomy	Row Totals
Group 1	48 (46.73) [0.03]	27 (28.27) [0.06]	75
Group 2	33 (34.27) [0.05]	22 (20.73) [0.08]	55
Column Totals	81	49	130 (Grand Total)

The chi-square statistic is 0.2162. The p-value is .64197. The result is not significant at p < .05.

Also, the average number of hospitalization days was higher in group 2, 11.92 days, compared to 10.48 days in group 1. We can thus say that the length of hospitalization increased between March 2020 and February 2021, for both scheduled and emergency hospitalized patients, compared to the same period of the previous year.

These changes can be attributed to the increasing complexity of cases during the pandemic and can be seen in Table 7.

Average number of hospitalization days in the two groups Table 7

	Average number of hospitalization days (Scheduled)	Average number of hospitalization days (ER admission)	Average number of hospitalization days
Group1	9,56	11,11	10,48
Group 2	11	12,3	11,92

If we evaluate the mortality rate during the hospitalization in the two groups, we observe a from 6.75% in Group 1 to 12.37% in Group 2; the situation is presented in Table 8.

Analysis of mortality during hospitalization in the two groups Table 8

	Scheduled admission	ER admission	Total
Group 1	2 (6,67%)	3 (6,82%)	5 (6,75)
Group 2	1 (6,25%)	6 (15,38%)	7 (12,37%)
Total	3 (6,57%)	9 (10,84%)	12 (9,30%)

The staging of the cases in the two groups is presented in figures 3 and 4, respectively. Thus, we can see that in both groups the cases detected in advanced stages predominate.

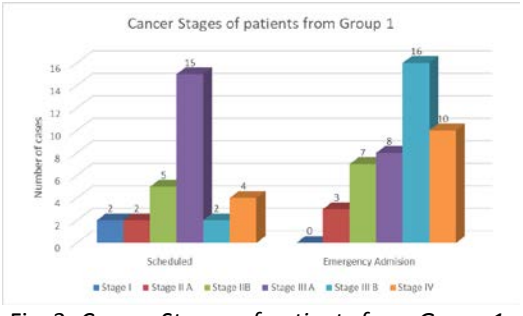

Fig. 3, *Cancer Stages of patients from Group 1*

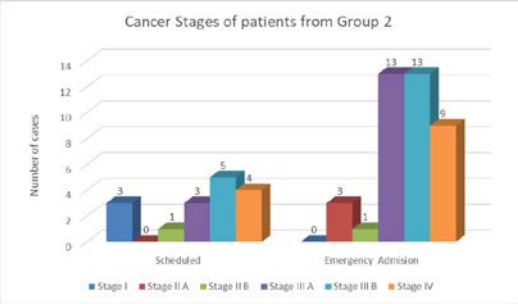

Fig. 4. *Cancer Stages of patients from Group 2*

Regarding the rate of SARS CoV 2 virus infections, it should be noted that patients admitted on a scheduled basis were tested less than 48 hours before admission and only patients tested negative were accepted for admission. Patients tested positive were rescheduled.

During the hospitalization, only 2 patients out of the 16 scheduled hospitalizations fell ill with COVID 19, both of which had a favorable evolution under treatment.

In the case of patients from Group 2, those who were emergency hospitalized, testing for SARS CoV 2 infection was performed at the time of admission. 7 patients out of 39 were tested positive, accounting for 17.94%.

Of the 6 deaths recorded among emergency hospitalized patients in Group 2, 2 were positive for SARS CoV 2 infection.

4. Discussions

The period between March 2020-February 2021 was a difficult period for the health system, which required taking specific organizational measures with a still insufficiently known impact on the morbidity and mortality of malignant neoplastic diseases [10], [11], [12].

In the first year of the pandemic, the number of known patients with malignant neoplastic pathology of the colon treated surgically in Surgery I Department of Brașov County Emergency Clinical Hospital decreased. This decrease can be attributed to the increased underdiagnosis of this disease in a pandemic context due to the limited number of lower gastrointestinal endoscopy examinations, as well to the reluctance of patients to see a doctor at the first symptoms due to the risk of SARS Cov 2 infection. We specify that in the Emergency County Clinical Hospital, the surgical interventions performed on a scheduled basis were initially stopped, except for those that had an oncological character.

It is observed that hospitalization through the ER exceeds the percentage of 50% in both periods, which draws attention to the shortcomings in the early diagnosis of this pathology. Also, in the second period the number of patients hospitalized for emergencies increased by 11.45%.

Most patients diagnosed with colon cancer, hospitalized in the first year of the pandemic, presented with a stenotic tumor located in the left colon, being necessary to perform a colostomy to the detriment of a colic anastomosis. It should be noted that there is no significant increase in the number of patients in need of a colostomy admitted through the ER during the pandemic, compared to those also admitted to the emergency room a year earlier.

We should also note the increase in the length of hospitalization in the second period studied compared to the first period, as well the almost doubling mortality during hospitalization in Group 2 compared to Group 1.

Out of the total number of deaths

registered in Group 2 among patients emergency hospitalized, a percentage of 33.33% is represented by patients tested positive for Sars Cov2. However, we cannot draw a statistically significant conclusion due to the very small number of cases, namely 6 deaths.

The change in the dynamics of treatment of cancer patients, due to the current pandemic situation, may have an impact in the coming years. Delays in the early detection of neoplastic malignancies and in the administration of appropriate treatment can lead to a direct change in the survival time of these patients as well as an increase in the costs required for complex stage therapy [13],[14].

Experts from several UE countries expect a significant increase in more advanced colon cancer cases as a result of the pandemic that affected the screening and therapeutic strategies of these patients [15], [16], [17].

We should consider the usefulness of conducting multicenter studies to address the changes in the dynamics of colon cancer during the pandemic, which would allow the establishment of urgent measures in the early diagnosis and management of these patients in order to recover therapeutic strategies and prevent, in the near future, the increase in the number of cases in advanced stages as well as the improvement of the life expectancy of these patients, thus aiming at the decrease of medical costs.

5. Conclusions

The study reveals notable changes in the dynamics of surgical treatment of colon cancer in Surgery I Department of Brașov County Emergency Clinical Hospital during the first year of the pandemic.

It can be concluded that during the pandemic period there was a decrease in the number of surgically treated colon cancer cases, the case complexity of the emergency hospitalized patients increased, without significantly increasing the number of patients who needed colostomy. There was also a halving of laparoscopic surgery for colon cancer, an increase in hospital stays and a doubling of mortality between March 2020 and February 2021 compared to the same period last year.

The limitations of the study are represented by the small number of enrolled patients as well as the analysis of the experience of a single center, which does not allow the generalization of the results.

Conflicts of Interest and Source of Funding

The authors have no conflict of interests to disclose.

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Ethics Approval

The study has been performed by following the ethical norms of scientific research.

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