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CLINICOPATHOLOGICAL PROFILES OF EMERGENCY COLORECTAL CANCER SURGICAL CASES – PRELIMINARY REPORT OF A RETROSPECTIVE OBSERVATIONAL STUDY

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Abstract

We present a preliminary report of an observational retrospective study of clinical and pathological features of emergency colorectal cancer (CCR) aiming to identify specific profiles of patients according to gender, age and residence. This analysis would contribute to better understanding surgical emergency presentation and for identification of those characteristics that are essential for both reducing emergency CCR incidence and for improving the management of such cases. A number of 159 patients that underwent surgery for obstructive, bleeding and 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, clinicopathological profiles*

Introduction

Between 14% and 37% of colon cancer and around 15% of rectal cancers are diagnosed following the emergency presentation [1-3]. There is strong clinical evidence that late diagnostic and emergency surgery for complicated colorectal cancer are correlated with poorer outcomes and a higher risk of short and long-term mortality [4-6]. Some authors consider undergoing emergency surgery among independent predictors of 30-day mortality [7]. Obstruction is reported as the most frequent indication for emergency surgery (50-80% of cases), perforation occurs in 10-18%, while bleeding is less common (4-11% of patients) [8-10]. All these are often associated with metabolic, cardiovascular, infectious or respiratory disorders that significantly contribute to increased morbidity and mortality [11,12].

The main aim of our observational retrospective study is to identify specific profiles of CCR patients presented as surgical emergencies according to gender, age and residence. Better and in depth understanding of patients' characteristics would be a valuable ground for improving targeted strategies for identifying patients at risk and for reducing emergency CCR incidence.

Materials and method

Our study is comprised of 159 patients with colorectal cancer which were admitted and

operated in an emergency setting in the General Surgery Clinic of the Emergency Hospital of Bucharest during January 2015 and September 2017. Patient data which included clinical and paraclinical variables, pathology reports, operative protocols and outpatient data from the integrated data management system of the hospital were analyzed. This study was performed after acquiring the hospital's Ethics Committee approval. The multidisciplinary clinical, paraclinical and pathological evaluation was a joint effort amongst the General Surgery Clinic, Gastroenterology Clinic, Laboratory, Radiology and Pathology departments of our hospital. 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 operation. Also, we included only patients in which the symptomatology had started a week prior to surgery at most (Table 1).

Acute complication	Definitions
Obstruction	Complete or quasi-complete obstruction of the bowel due to a tumoral formation in the colorectal segment with physiopathological entities such as proximal bowel dilatation, fluid/electrolyte imbalance and infection.
Perforation	Local or diastatic/free or blocked-off perforation due to colorectal cancer
Bleeding	Ano-rectal bleeding (hematochezia /melena/rectal bleeding) in the first 24 hours after admission due to colorectal cancer causing a drop of hemoglobin levels above 2 g/dl and/or requiring blood transfusion of at least 2 units of red blood cell mass with surgical treatment indication

Table 1 - Acute colorectal cancer complications definitions used in the present study

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 present study included 159 patients – 53.46% (n=85) women and 46.54% (n=74) males – between 28-89 years of age. The mean age was 65.38(±10.72) years for males and 70.51(±9.11) years for women. 69.81% (n=111) of the total cohort live in the urban areas and 30.19% (n=48) in the rural areas. Most frequently, preliminary laboratory tests revealed different degrees of anemia, leukocytosis, hyperglycemia, and thrombocytosis; abnormal values for the rest of blood tests showed in less than 12% of the total study sample; 77.36% (n=123) of patients presented a history of co-morbid medical conditions and/or previous surgical interventions (38.35%, n=57) (Table 2). According to medical records, the indication for emergency surgery was because of obstruction in 62.89% (n=100) of cases, because of bleeding in 27.04% (n=43) of cases, while 10.06% (n=16) of patients presented perforation associated to colorectal cancer. In 47 patients (29.56%) multiple complications were identified – the most frequent associated complication was invasion to adjacent organs found in 17.61% (n=28) patients (Table 3).

Synchronous co-existing cancers were identified in 8 patients (5.03%) – one of them presenting bilateral tumors. Most tumors were on the left side (62.28% of the identified tumors), more specifically on sigmoid colon (34.73%); rectal cancer was present in 12 cases (7.19%).

96.41% (n=161) of the tumors were poorly and moderately differentiated, 91.02% (n=152) had T-stage 3 and 4, 53.89% (n=90) had N-stage 1 and 2, and only 10.18% (n=17) presented distant metastasis. The microscopic histopathologic examination revealed venous invasion for 40.12% (n=67) of the identified tumors, peri- and intraneural invasion for 32.93% (n=55) and angiolymphatic invasion for 19.16% (n=32) (Table 4).

| | Group; no (%)* | | | |
Characteristic	Total 159 (100)	Obstruction 100 (62.89)	Bleeding 43 (27.04)	Perforation 16 (10.06)
Gender				
Male	74 (46.54)	46 (46.00)	20 (46.51)	8 (50.00)
Female	85 (53.46)	54 (54.00)	23 (53.49)	8 (50.00)
Age, yr				
≤ 49	10 (6.29)	7 (7.00)	1 (2.33)	2 (12.50)
50-59	25 (15.72)	18 (18.00)	4 (9.30)	3 (18.75)
60-69	47 (29.56)	33 (33.00)	11 (25.58)	3 (18.75)
70-79	42 (26.42)	26 (26.00)	13 (30.23)	3 (18.75)
80-89	35 (22.01)	16 (16.00)	14 (32.56)	5 (31.25)
Residence				
Rural	48 (30.19)	31 (31.00)	10 (23.26)	7 (43.75)
Urban	111 (69.81)	69 (69.00)	33 (76.74)	9 (56.25)
Preliminary laboratory tests' results				
Anemia	87 (54.72)	34 (34.00)	43 (100.00)	10 (62.50)
Leukocytosis	83 (52.20)	58 (58.00)	11 (25.58)	14 (87.50)
Hyperglycemia	61 (38.36)	39 (39.00)	14 (32.56)	9 (56.25)
Thrombocytosis	53 (33.33)	27 (27.00)	19 (44.19)	7 (43.75)
Co-morbid medical conditions	123 (77.36)	78 (78.00)	32 (74.42)	13 (81.25)
Cardiac Pathology	68 (42,77)	42 (42,00)	21 (48,84)	5 (31,25)
Renal Pathology	24 (15,09)	16 (16,00)	7 (16,28)	1 (6,25)
Diabetes	23 (14,47)	14 (14,00)	7 (16,28)	2 (12,50)
Benign esogastric pathology	15 (9,53)	8 (8,00)	4 (9,30)	3 (18,75)
Cysts (hepatic, renal, ovarian)	16 (10,06)	11 (11,00)	3 (6,98)	4 (25,00)
Vesicular lithiasis	17 (10,69)	11 (11,00)	5 (11,63)	1 (6,25)
Pulmonary pathology	14 (8,81)	6 (6,00)	6 (13,95)	2 (12,50)
Sequel vascular stroke	12 (7,55)	6 (6,00)	4 (9.30)	2 (12.50)
Hepatic pathology	10 (6.29)	7 (7.00)	2 (4.65)	1 (6.25)
Colonic diverticulosis	8 (5.03)	5 (5.00)	3 (6.98)	
Abdominal parietal pathology	6 (3.77)	5 (5.00)	1 (2.33)	
Osteoporosis	6 (3.77)	2 (2.00)	2 (4.65)	2 (12.50)
Ophthalmologic pathology	5 (5.14)	4 (4.00)	1 (2.33)	
Hyperlipemia	4 (2.52)	3 (3.00)	1 (2.33)	
Adrenal adenoma	4 (2.52)	2 (2.00)	1 (2.33)	1 (6.25)
Uterine fibromatosis	4 (2.52)	2 (2.00)	1 (2.33)	1 (6.25)
Vascular pathology	4 (2.52)		3 (6.98)	1 (6.25)
Thyroid pathology	4 (2.52)		2 (4.65)	2 (12.50)
Others	27 (16.98)	18 (18.00)	5 (11.63)	4 (25.00)
Previous surgery	57 (38.35)	38 (38.00)	16 (37.21)	3 (18.75)
Appendectomy	16 (10.06)	10 (10.00)	4 (9.30)	2 (12.50)
Cholecystectomy	16 (10.06)	12 (12.00)	3 (6.98)	1 (6.25)
Hysterectomy	12 (7.55)	8 (8.00)	3 (6.98)	1 (6.25)
Colon tumor	4 (2.52)	3 (3.00)	1 (2.33)	
Breast cancer	4 (2.52)	2 (2.00)	2 (4.65)	
Other	18 (11.32)	11 (11.00)		
Tumor site (1)				
Left colon	99 (62.26)	79 (79.00)	14 (32.56)	6 (37.50)
Right colon	59 (37.11)	21 (21.00)	28 (65.12)	10 (62.50)
Bilateral	1 (0.63)		1 (2.33)	
Multiple tumors	8 (5.03%)	3 (3.00)	5 (11.63)	

Table 2 - Clinical and pathological features of the study group

Complications	Group; no (%)*					
	a. Total		b. Rural residents		c. Urban residents	
	M	F	M	F	M	F
Obstruction	46 (62.16)	54 (63.53)	14 (60.87)	17 (68.00)	32 (62.75)	37 (61.67)
Bleeding	20 (27.03)	23 (27.06)	4 (17.39)	6 (24.00)	16 (31.37)	17 (28.33)
Perforation	8 (10.81)	8 (9.41)	5 (21.74)	2 (8.00)	3 (5.88)	6 (10.00)
Single complication	53 (71.62)	59 (69.41)	17 (73.91)	18 (72.00)	36 (70.59)	41 (68.33)
Multiple complications	21 (28.38)	26 (30.59)	6 (26.09)	7 (28.00)	15 (29.41)	19 (31.67)
Bleeding obstruction	1 (1.35)	3 (3.53)			1 (1.96)	3 (6.67)
Obstruction and invasion to adjacent organs	5 (6.76)	11 (12.94)	2 (8.70)	5 (20.00)	3 (5.88)	6 (10.00)
Perforated obstruction	4 (5.41)	4 (4.71)	1 (4.35)		3 (5.88)	4 (6.67)
Bleeding and invasion to adjacent organs	4 (5.41)	3 (3.53)	1 (4.35)		3 (5.88)	3 (5.00)
Obstructive bleeding	2 (2.70)				2 (3.92)	
Perforated bleeding		2 (2.35)		1 (4.00)		1 (1.67)
Bleeding and rectosigmoidian invagination	1 (1.35)				1 (1.96)	
Bleeding perforation		1 (1.18)				1 (1.67)
Bleeding and invasion to adjacent organs	3 (4.05)	2 (2.35)	1 (4.35)	1 (4.00)	2 (3.92)	1 (1.67)
Obstructive perforation	1 (1.35)		1 (4.35)			

Table 3 - Colorectal cancer complications identified in the study group patients

Patients' specific features and profiles

The demographic profile of the study sample illustrates a higher incidence of emergency CCR among women (53.46%), among those living in urban areas (69.81%), and among older patients (77.99% of the patients were over 60 years of age) (Table 2). In men the complicated CCR appeared earlier (the youngest patient was 28 years of age and 12.16% of male patients were under 50 years of age), and the peak of incidence showed between 60-69 years taking a descending trend in the next two age groups. Only one woman under 50 presented as emergency and 83.53% (n=71) female patients were over 60 years of age (Figure 1). Discriminating the study sample according to patients' residence, we've found that even if in urban areas the incidence of emergency CCR is considerable higher, only 4.50% of urban patients were under 50 years of age while in rural areas the proportion of patients in this age category was more than twice bigger (10.42%) (Figure 2).
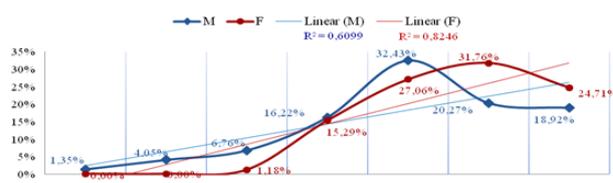

Figure 1 - The incidence of complicated colorectal cancer according to patients' gender and age (% of the male and, respectively, female patients)
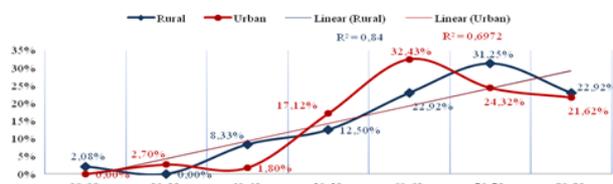

Figure 2 - The incidence of complicated colorectal cancer according to patients' residence (*% of the rural and, respectively, urban resident patients)

Characteristic	Group; no (%)*			
	Total	Obstruction	Bleeding	Perforation
	167 (100)	103 (61.68)	48 (28.74)	16 (9.58)
Tumor site (2)				
Right colon	63 (37.72)	22 (21.36)	31 (64.58)	10 (62.50)
Appendix	1 (0.60)			1 (6.25)
Cecum	11 (6.59)	1 (0.97)	9 (18.75)	1 (6.25)
Ileocecal valve	5 (2.99)	5 (4.85)		
Ascending colon	16 (9.58)	2 (1.94)	12 (25.00)	2 (12.50)
Hepatic flexure	17 (10.18)	6 (5.83)	6 (12.50)	5 (31.25)
Transverse colon	13 (7.78)	8 (7.77)	4 (8.33)	1 (6.25)
Left colon	104 (62.28)	81 (78.64)	17 (35.42)	6 (37.50)
Transverse colon	2 (1.20)	1 (0.97)	1 (2.08)	
Splenic flexure	19 (11.38)	19 (18.45)		
Descending colon	13 (7.78)	10 (9.71)	2 (4.17)	1 (6.25)
Sigmoid	58 (34.73)	44 (42.72)	10 (20.83)	4 (25.00)
Rectum	12 (7.19)	7 (6.80)	4 (8.33)	1 (6.25)
Tumor histopathologic differentiation				
G1	5 (2.99)	2 (1.94)	2 (4.17)	1 (6.25)
G2	113 (67.66)	79 (76.70)	26 (54.17)	8 (50.00)
G3	47 (28.14)	21 (20.39)	19 (39.58)	7 (43.75)
G2/G3	1 (0.60)		1 (2.08)	
GX	1 (0.60)	1 (0.97)		
T-stage				
T1	2 (1.20)	1 (0.97)	1 (2.08)	
T2	11 6.59)	2 (1.94)	8 (16.67)	1 (6.25)
T3	78 (46.71)	49 (47.57)	25 (52.08)	4 (25.00)
T4a	51 (30.54)	36 (34.95)	10 (20.83)	5 (31.25)
T4b	23 (13.77)	13 (12.62)	4 (8.33)	6 (37.50)
Tx	2 (1.20)	2 (1.94)		
TNM stage				
I	10 (5.99)	2 (1.94)	8 (16.67)	
IIA	37 (22.16)	23 (22.33)	11 (22.92)	3 (18.75)
IIB	16 (9.58)	8 (7.77)	5 (10.42)	3 (18.75)
IIC	11 (6.59)	6 (5.83)	4 (8.33)	1 (6.25)
IIIA	1 (0.60)		1 (2.08)	
IIIB	48 (28.74)	32 (31.07)	14 (29.17)	2 (12.50)
IIIC	27 (16.17)	22 (21.36)	2 (4.17)	3 (18.75)
IVA	13 (7.78)	9 (8.74)	1 (2.08)	3 (18.75)
IVB	4 (2.40)	3 (2.91)		1 (6.25)
N-stage				
N0	73 (43.71)	37 (35.92)	28 (58.33)	8 (50.00)
N1a	24 (14.37)	15 (14.56)	9 (18.75)	
N1b	27 (16.17)	19 (18.45)	4 (8.33)	4 (25.00)
N2a	18 (10.78)	13 (12.62)	4 (8.33)	1 (6.25)
N2b	21 (12.57)	16 (15.53)	2 (4.17))	3 (18.75)
NX	4 (2.40)	3 (2.91)	1 (2.08)	
Distant metastasis				
M1a	13 (7.78)	9 (8.74)	1 (2.08)	3 (18.75)
M1b	4 (2.40)	3 (2.91)		1 (6.25)
Venous invasion				
V1	66 (39.52)	44 (42.72)	16 (33.33)	7 (43.75)
V2	1 (0.60)	1 (0.97)		
Neural invasion				
Perineural	28 (16.77)	22 (21.36)	5 (10.42)	1 (6.25)
Intraneural	14 (8.38)	8 (7.77)	5 (10.42)	1 (6.25)
Peri- and intraneural	13 (7.78)	10 (9.71)	1 (2.08)	2 (12.50)
Angiolymphatic invasion	32 (19.16)	26 (25.24)	3 (6.25)	3 (18.75)

Table 4 - Tumor location and micromorphology parameters

Excepting 20-29 and 80-89 years, in all other age groups obstructions have the highest percentage weight in both men and women, rural and urban patients. In patients over 50 years of age increases the incidence of both bleedings and perforations while obstructions follow a significantly descending trend in urban resident patients. In rural resident patients, obstructions appear after 40 years of age in males and after 50 years of age in women and reach the peak between 70-79 years (20% of cancers), bleedings appear after 60 years of age in men and after 70 years in women and have the highest percentage weight in 80-89 years interval (10%), while perforations, with generally low percentages weight, are present in almost all age groups. In urban residents, obstructions and bleedings appear earlier while perforations occur much later (56 years of age in women and 61 years of age in men) and have lower percentage weights comparing to rural patients (Figure 3).
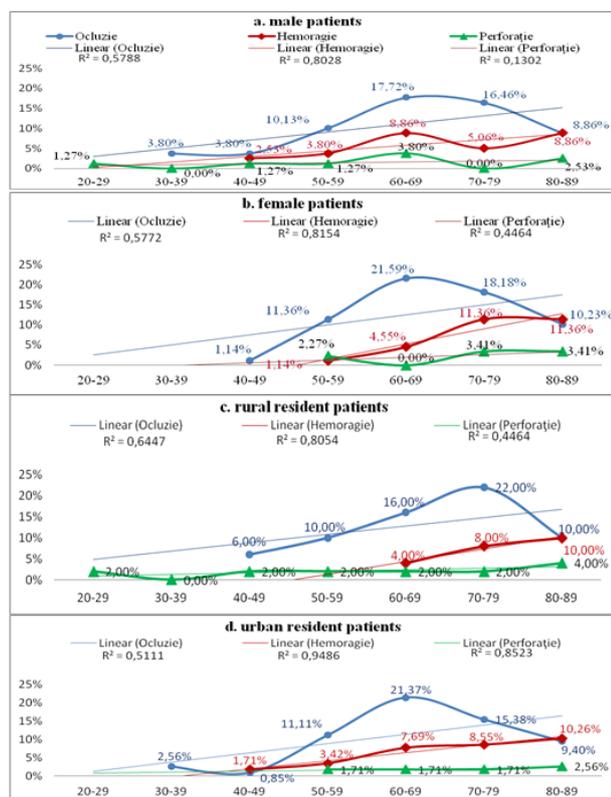
Figure 3 - Percentages weight of CCR complications in relation to patients' age, gender and residence(% of the male, female, rural and urban resident patients)

As a whole, there are no major differences between male and female patients in what concerns the percentage weights of the three major type of complications nor when looking at the ratio of single and multiple complications. But we could observe a higher incidence of bleedings in both males and females residing in urban areas, while, in rural patients, mainly in male, perforations were more frequent. 43.75% (n=7) of the patients with perforation as main CCR complication presented multiple complications (especially invasion of adjacent organs), comparing to 28% of the patients with obstruction and 27.91% of those with bleeding tumors. In males, multiple complications were found in 50% of the perforated cancers, 35% of the bleeding and 21.74% of the obstructive tumors; in females, 37.50% of perforated tumors, 33.33% of obstructing ones and 21.74% of the bleeding cancers developed multiple complications. Only 3 of the 8 patients with synchronous tumors developed multiple complications (Table 3).

In 62.26% of patients (n=99) tumors were located on the left side of the colon, in 37.11% (n=59) on the right side, and 1 patient presented two synchronous bilateral distinctive tumors. Left sided tumors prevail in all but the 80-89 female patients' age groups and is evident that in women over 50 years of age the right sided tumors became more and more frequent with age (Figure 4).
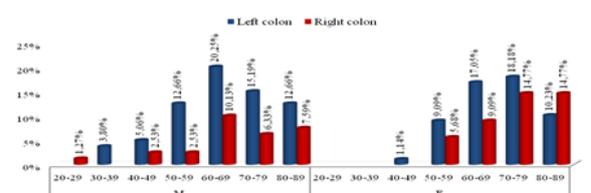

Figure 4 - Percentage weights of complicated left and right sided CCR in relation to patients' gender and age (% of the number of tumors identified in male and, respectively, female patients)

Most obstructive tumors were located on the left side of the colon (78.64% of obstructive cancers), mainly at the level of sigmoid colon, and over 60% of bleeding and perforated tumors were identified on the right side. All tumors on the ileocecal valve and on the splenic flexure were occlusive; 77.78% of the cancers on ascending colon in males and of the ones on the cecum in females were bleeding cancers; relatively higher percentages of perforated cancers were found on hepatic flexure and on

sigma in men and as well on hepatic flexure in women. The only colon segment without multiple complications was the descending colon. On the other hand, all cecum, ileum, hepatic and splenic flexure tumor in women and all those situated on appendix, cecum, splenic flexure and sigmoid colon in men proved to have multiple complications (Figure 5).
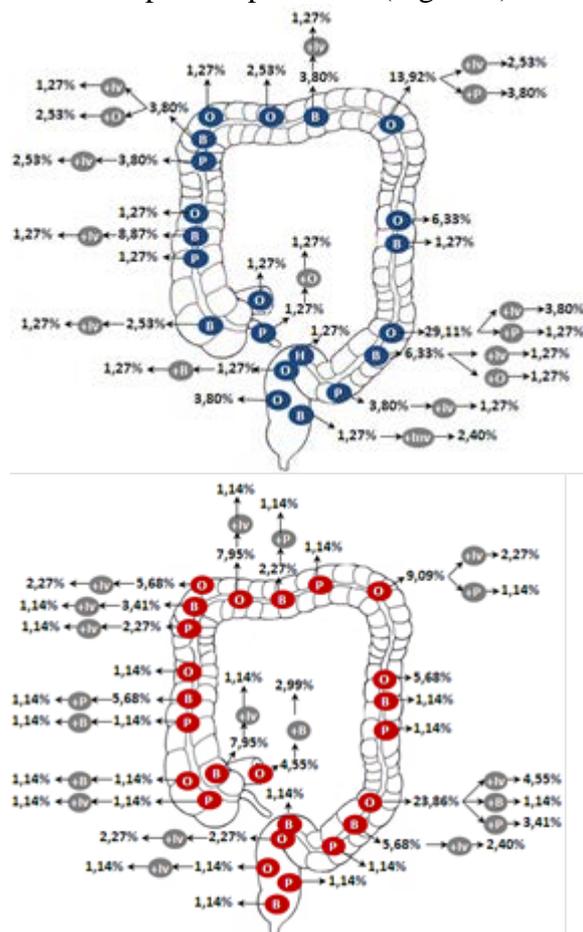

Figure 5 - Percentage weights of CCR complications on colon segments related to patient's gender (blue – male, red – female) (O – obstruction; B - bleeding; P – perforation; +Iv – associated invasion to adjacent organs; +Inv – associated rectosigmoidian invagination; +O – obstructive; +B – bleeding; +P – perforated. (% of the number of tumors identified in male and, respectively, female patients)

Since in-depth analysis of tumors' morphological parameters and their association with other clinical and pathological features is to be presented in a following report, here we will present only brief observations from the perspective of the three major CCR complications. G2 tumors prevail in all obstructing, bleeding, and perforated CCR subgroups. Yet, percent ratios demonstrate that bleeding and perforated tumors tend to be les

differentiated – G3 tumors were identified in 39.58% of bleeding cancers and in 43.75% of perforated cancers. 91.02% of the tumors had T-stage 3 and 4 but in patients with perforated cancer 68.75% were T4 (comparing with 47.57% in obstructive and 29.17% in bleeding CCR). 61.17% of obstructive tumors presented metastatic lymph nodes while the highest percentage ratio of distant metastasis was found in perforated tumors (25%). For venous, neural, and angiolymphatic there are smaller differences in percent ratios distributions but again the biggest values are associated with obstruction and perforation.

Discussion

The results of our analysis confirmed in a certain extent the generic profile of emergency CCR patient: age over 50, a significant co-morbid medical condition and/or previous surgical interventions, mostly left-sided obstructive T3-T4 stage colon tumor poorly or moderately differentiated. Yet, there are some quite significant gender, residence, age, and type of complication-related differences that should be further discussed.

Confirming finding in other published reports [13-15] but in contrast with other ones [16-18], in our group of study the incidence of emergency presented CCR is relatively higher among women, mainly in those over 50 years of age.

The higher ratio of urban residents among our patients might be due to the hospital localization in the capital city (meaning is more accessible for patients residing in Bucharest) but, as well, is in accordance to previous studies showing a higher incidence of emergency CCR in urban areas due to the lifestyle, occupation and environmental exposure [19]. On the other hand, is already a common knowledge that rural residents lack access to appropriate medical facilities.

Since, as showed in other reports [20], the most significant association of emergency CCR incidence and specific clinicopathological futures proved to be the one with patients' age, we will develop de discussion from this perspective.

Colorectal neoplasm is often presented as a disease of the old age [21] and some authors explain the higher rate of emergency CCR in older patients referring to their tendency of not paying attention to the symptoms [5]. In our study, 48.43% (n=77) of the patients were over 70 years of age. Among those, 62.34% (n=48) were female, 66.23% (n=51) live in urban areas, 84.12% (n=64) presented associated co-morbidities and 40.26% (n=31) had a medical history of previous surgical interventions (including cholecystectomy, appendectomy, and hysterectomy). In this group of patients, we have found the highest incidence of bleeding and perforated cancers (Table 2). 7 of the 8 identified synchronous tumors were in this group of patients (including a bilateral one) and 29.87% (n=23) of them had multiple complications. 50% of the tumors in female and 36.67% of the tumors in male patients from this age group were located on the right side of the colon. Most of the histopathologic features of the tumor in this particular group are quite similar with the rest of the patients but the rate of venous invasion is considerable higher in women (50.98%).

The other age groups that we consider should be further looked at are that of patients between 50-59 years of age and the one of 60-69 years of age. These age groups are the most gender balanced ones (48% males and 52% females and, respectively, 51.06% males and 48.94% females). As showed, emergency presentation increases considerably in these age intervals mainly due to the abrupt ascending of incidence in urban resident patients (Figure 2). This evolution confirms conclusions previously reported in the literature [22].

In both men and women of 50-59 years of age prevail obstructive left sided G2-G3, T-stage 3 and 4 cancers, with venous and/or neural invasion (52% of the total number of tumors found in these patients). It is to be noticed, as well, the high ratio of co morbidities (88% - 40% with hypertension, 16% with hepatic and/or ovarian cyst, and other 16% with diabetes mellitus) and, as well, the high ratio of previous surgical interventions in women (36.46% of them had hysterectomy, cholecystectomy, or cervix neoplasm).

The 60-69 years age group is the most numerous one including 29.56% (n=47) of total

patients included in the study representing the peak of emergency CCR incidence (Figure 2). 76.60% (n=36) of patients originated in urban areas. The percentage of patients presenting with co-morbidities is lower than in the previous group (72.34%) as the number of patients with previous surgical interventions. We could observe a slight increase in the ratio of right sided tumors from 28% in the previous interval to 34.04%. The shift of CCR toward the proximal colon mainly in female patients was previously reported in various countries [23-26] but the debate on the causes of this migration is still ongoing. 96.39% of the tumors in these patients were G2-3 with 3 and 4 T-stage; metastatic ganglia were found in 59.57% of, venous invasion in 42.55%, 30.04% presented neural invasion, 21.28% angiolymphatic invasion and 14.89% distant hepatic and/or pulmonary metastasis.

As already mentioned, a large proportion of patients included in the present study presented a rather complex and severe personal medical history. There is an on-going discussion in the literature concerning the association between the risk of CCR and certain features of patients' co-morbid medical conditions and/or previous surgical interventions. Yet, no significant references to complicated CCR we could find.

Recent meta-analysis and cohort studies reopened the issue of pre-existing type 2 diabetes mellitus and the risk of colon and rectal cancer, affirming a positive association between the two [27-30]. Still, when coming to patients' gender and age findings are contradictory: some authors conclude a significant association in men [31-35] while others have found a stronger association in women [36], mostly in postmenopausal ones [37]. In our study group 14.47% of patients had type 2 diabetes mellitus (18.92% of male and 10.59% of women patients). When correlating gender and residence we have come to the conclusion that in rural areas the percentage of type 2 diabetes mellitus male and women were almost similar (13.04% and, respectively, 12.00%), while in urban areas the gender differences proved to be more significant: 21.57% of males and only 10,00% of women.

The debates concerning the association of CCR risk and appendectomy [38-42] or cholecystectomy [43-45] are, as well, far from a

unanimous accepted conclusion. Our statistical analysis showed that 10.06% (n=16) of the patients underwent appendectomy, other 10.06% underwent cholecystectomy and, in contrast to the results of other studies, the associations are stronger in women than in males.

Hysterectomy is as well included among the CCR risk factors [46]; 14.12% (n=12) of our female patients underwent this surgery.

Conclusions

The main clinicopathological features of neoplasic patient presented as surgical emergency should be permanently reviewed and updated. Beyond gender, age and residence related particularities there are contextual, socioeconomic, cultural and educational factors to be further investigated. Therefore, a multidisciplinary approach is needed for identifying patients at risk and for developing effective and efficient strategies aimed to prevent and to improve emergency CCR management.

References

[1]H. Gunnarsson, K. Jennische, S. Forssell, J. Granstrom, P. Jestin and A. Ekholm, "Heterogenity of colon cancer patients reported as emergencies," World J Surg, 2014, vol. 38, pp. 1819-1826.

[2]G. Abel, J. Shelton, S. Johnson, L. Ellis-Brookes and G. Lyratzopoulos, "Cancer specific variation in emergency presentation by sex, age and deprivation across 27 common and rare cancers," Br J Cancer, 2015, vol. 112, no. Suppl 1, pp. S129-S136.

[3]K. Ortiz-Ortiz, R. Rıoss-Motta, H. Marın-Centeno, M. Cruz-Correa and A. Ortiz, "Emergency presentation and short-term survival among patients with colorectal cancer enrolled in the government health plan of Puerto Rico," Health Services Research and Managerial Epidemiology,2016, vol. 3, pp. 1-7.

[4]C. McArdle and D. Hole, "Emergency presentation of colorectal cancer is associated with poor 5-year survival," Br J Surg, 2004, vol. 91, pp. 605-609.

[5]S. Wong, B. Jalaludin, M. Morgan, A. Berthelsen, A. Morgan, A. Gatenby and S. Fulham, "Tumor pathology and long-term survival in emergency colorectal cancer," Dis Colon Rectum, 2008, vol. 51, no. 2, pp. 223-230.

[6]M. Tørring, M. Frydenberg, R. Hansen, F. Olesen and P. Vedsted, "Evidence of increasing mortality with longer diagnostic intervals for five common cancers: a cohort study in primary care," Eur J Cancer, 2013, vol. 49, no. 9, pp. 2187-2198.

[7]A. Askari, G. Malietzis, S. Nachiappan, A. Antoniou, J. Jenkins, R. Kennedy and O. Faiz, "Defining characteristics of patients with colorectal cancer requiring emergency surgery," Int J Colorectal Dis, 2015, vol. 30, no. 10, pp. 1329-1336.

[8]L. Rabeneck, L. Paszat and C. Li, "Risk factors for obstruction, perforation, or emergency admission at presentation in patients with colorectal cancer: a population-based study," Am J Gastroenterol, 2006, vol. 101, no. 5, pp. 1098-1103.

[9]S. Ghazi, E. Berg, A. Lindblom, U. Lindforss and L.-R. C. C. S. Group, "Clinicopathological analysis of colorectal cancer: a comparison between emergency and elective surgical cases," World Journal of Surgical Oncology, 2013, vol. 2013, no. 11, p. 133.

[10]R. Anantha, M. Brackstone, N. Parry and K. Leslie, "An acute care surgery service expedites the treatment of emergency colorectal cancer: a retrospective case–control study," World Journal of Emergency Surgery, 2014, vol. 9, p. 19.

[11]M. Lewis, A. Hendrickson and T. Moynihan, "Oncologic emergencies: pathophysiology, presentation, diagnosis, and treatment," CA Cancer J Clin, 2011, vol. 61, no. 5, pp. 287-314.

[12]D. Wallace, K. Walker, A. Kuryba, P. N. Finan and J. van der Meulen, "Identifying patients at risk of emergency admission for colorectal cancer," Br J Cancer, 2014, vol. 111, no. 3, pp. 577-580.

[13]R. Ramos, L. Santos dos-Reis, B. Esteves Borgeth Teixeira and I. Andrade, "Colon cancer surgery in patients operated on an emergency basis," Rev Col Bras Cir, 2017, vol. 44, no. 5, pp. 465-470.

[14]T. Chen, Y. Huang and G. Wang, "Outcome of colon cancer initially presenting as colon perforation and obstruction," World J Surg Oncol, 2017, vol. 15, no. 1, p. 164.

[15]A. Askari, S. Nachiappan, A. Currie, A. Bottle, J. Abercombie, T. Athanasiou and O. Faiz, "Who requires emergency surgery for colorectal cancer and can national screening programmes reduce this need?," Int J Surg, 2017, vol. 42, pp. 60-68.

[16]J. Littlechild, M. Junejo, A. Simons, F. Curran and D. Subar, "Emergency resection surgery for colorectal cancer: patterns of recurrent disease and survival," World J Gastrointest Pathophysiol, 2018, vol. 9, no. 1, pp. 8-17.

[17]B. Bayar, K. Yılmaz, M. Akıncı, A. Şahin and A. Kulaçoğlu, "An evaluation of treatment results of emergency versus elective surgery in colorectal

cancer patients," Ulus Cerrahi Derg, 2016, vol. 32, pp. 11-17.

[18]Ş. Kahramanca, T. Anuk, A. Yıldırım, G. Özgehan, I. Gökçe, H. Güzel and G. Çığşar, "The factors effecting mortality in emergency and elective colorectal cancer surgery," Turk J Colorectal Dis, 2016, vol. 26, pp. 77-82.

[19]P. Correa and W. Haesnzel, "The epidemiology of large bowel cancer," Adv Cancer Res, 1978, vol. 26, pp. 1-141.

[20]C. Renzi, G. Lyratzopoulos, T. Card, T. Chu, U. Macleod and B. Rachet, "Do colorectal cancer patients diagnosed as an emergency differ from non-emergency patients in their consultation patterns and symptoms? A longitudinal data-linkage study in England," B J Cancer, 2016, vol. 115, pp. 866-875.

[21]A. Wilmink, "Overview of the epidemiology of colorectal cancer," Dis Colon Rectum, 1997, vol. 40, no. 4, pp. 483-493.

[22]M. B. M. Lynch, "Preoperative evaluation of oncologic principles of colon cancer surgery," Clin Colon Rectal Surg, 2005, vol. 18, pp. 163-173.

[23]R. M. J. Beart, M. Maruta, M. Dockerty, H. Frydenberg and W. O'Fallon, "Trends in right and left-sided colon cancer," Dis Colon Rectum, 1983, vol. 26, pp. 393-398.

[24]J. Jass, "Subsite distribution and incidence of colorectal cancer in New Zeeland 1974-1983," Dis Colon Rectum, 1991, vol. 34, pp. 56-59.

[25]L. Rabeneck, J. Davila and H. El-Serag, "Is there a true "shift" to the right colon in the incidence of colorectal cancer?," Am J Gastroenterol, 2003, vol. 98, no. 6, pp. 1400-1409.

[26]S. Saltzstein and C. Behling, "Age and time as factors in the left-to-right shift of the subside of colorectal adenocarcinoma: a study of 213,383 cases from the California," J Clin Gastroenterol, 2007, vol. 41, pp. 173-177.

[27]S. Larsson, N. Orsini and A. Wolk, "Diabetes mellitus and risk of colorectal cancer: a meta-analysis," J Natl Cancer Inst, 2005, vol. 97, no. 22, pp. 1679-1687.

[28]H. Krämer, B. Schöttker, E. Raum and H. Brenner, "Type 2 diabetes mellitus and colorectal cancer: meta-analysis on sex-specific differences," Eur J Cancer, 2012, vol. 48, no. 9, pp. 1269-1382.

[29]S. Guraya, "Association of type 3 diabetes mellitus and the risk of colorectal cancer: a meta-analysis and systematic review," World J Gastroenterol, 2015, vol. 21, no. 19, pp. 6026-6031.

[30]S. Luo, J. Li, L. Zhao, T. Yu, W. Zhong, Z. Xia, T. Shan, H. Ouyang, H. Yang and Q. K. Chen, "Diabetes mellitus increases the risk of colorectal neoplasia: an updated meta-analyis," Crin Res Hepatol Gastroenterol, 2016, vol. 40, no. 1, pp. 110-123.

[31]P. Campbell, A. Deka, E. Jacobs, C. Newton, J. Hildebrand, M. McCullough, P. Limburg and S. Gapstur, "Prospective study reveals associations between colorectal cancer and type 2 diabetes mellitus or insuline use in men," Gastroenterology, 2010, vol. 139, no. 4, pp. 1138-1146.

[32]P. Limburg, R. Wierkant, Z. Fredericksen, C. Leibson, R. Rizza, A. Gupta, D. Ahlquist, L. Melton, T. Sellers and J. Cerhan, "Clinically confirmed type 2 diabetes mellitus and colorectal cancer risk: a population-based, retrospective cohort study," Am J Gastroenterol, 2006, vol. 101, no. 8, pp. 1872-1879.

[33]H. Yuhara, C. Steinmaus, S. Cohen, D. Corley, Y. Tei and P. Buffler, "Is diabetes mellitus an independent risk factor for colon cancer and rectal cancer?," Am J Gastroenterol, 2011, vol. 106, no. 11, pp. 1911-1933.

[34]W. Luo, Y. Cao, C. Liao and F. Gao, "Diabetes mellitus and the incidence and mortality of colorectal cancer: a meta-analysis of 24 cohort studies," Colorectal Dis, 2012, vol. 14, no. 11, pp. 1307-1312.

[35]X. Ren, X. Zhang, X. Zhang, W. Gu, K. Chen, Y. Le, M. Lai and Y. Zhu, "Type 2 diabetes mellitus associated with increased risk for colorectal cancer: evidence from an international ecological study and population-based risk analysis in China," Public Health, 2009 , vol. 123, no. 8, pp. 540-544.

[36]S. de Kort, C. Simons, P. van den Brandt, R. Goldbohm, I. d. B. A. J.-H. M. Arts, S. Sanduleanu, A. Masclee and M. Weijenberg, "Diabetes mellitus type 2 and subsite-specific colorectal cancer risk in men and women: results from the Netherlands Cohort Study on diet and cancer," Eur J Gastroeneterol Hepatol, 2016, vol. 28, no. 8, pp. 896-903.

[37]P. Limburg, K. Anderson, T. Johnson, D. Jacobs, D. Lazovich, C. Hong, K. Nicodemus and A. Folsom, "Diabetes mellitus and subsite-specific colorectal cancer risks in the Iowa women's health study," Cancer Epidemiol Biomarkers Prev, 2005, vol. 14, no. 1, pp. 133-137.

[38]G. Friedman and B. Fireman, "Appendectomy, appendicitis, and large bowel cancer," Cancer Res, 1990, vol. 50, no. 23, pp. 7549-7551.

[39]L. Mellemkjaer, C. Johansen, M. Linet, G. Gridley and J. Olsen, "Cancer risk following appndectomy for acute appndicitis (Denmark)," Cancer Causes Control, 1998, vol. 9, no. 2, pp. 183-187.

[40]H. Lai, C. Loong, L. Tai, C. Wu and W. Lui, "Incidence and odds ratio of appendicitis as first manifestation of colon cancer: a retrospective analysis of 1873 patients," J Gastroenterol Hepatol, 2006, vol. 21, no. 11, pp. 1693-1696.

[41]S. Wu, W. Chen, C. Muo, C. Fang and F. Sung, "Association between appendectomy and subsequent

colorectal cancer development: an asian population study," PLoS One, 2015, vol. 10, no. 3, p. e0118411.

[42]H. Song, C. Abnet, Å. Andrén-Sandberg, A. Chaturvedi and W. Ye, "Risc of gastrointestinal cancers among patients with appendectomy: a large-scale swedish register-based cohort study during 1970-2009," PLos One, 2016, vol. 11, no. 3, p. e0151262.

[43]P. Gordon, "Malignant neoplasms of the colon," in Principles and practice of surgery for colon, rectum, and anus, 3rd ed., P. Gordon and S. Nivatvongs, Eds., New York, Informa Healthcare USA, Inc., 2007, pp. 489-643.

[44]J. Goldacre, C. Wotton, J. Abisgoid, D. Yeates and J. Collins, "Association between cholecystectomy and intestinal cancer: a national record linkage study," Ann Surg, 2012, vol. 256, no. 6, pp. 1068-1072.

[45]Y. Chen, J. Yeh, C. Lin, C. Peng, F. Sung, I. Hwang and C. Kao, "Cancer risk in paients with cholelithiasis and after cholecystectomy: a nationwide cohort study," J Gastroenterol, 2014, vol. 49, no. 5, pp. 923-931.

[46]G. Luo, Y. Zhang, L. Wang, Y. Huag, Q. Yu, P. Guo and K. Li, "Risk of colorectal cancer with hysterectomy and oophorectomy: a systematic review and meta-analysis," Int J Surg, 2016, vol. 2016, no. 34, pp. 88-95