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Treatment of Stercoral Peritonitis Caused by Colorectal Carcinoma

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SUMMARY

Stercoral peritonitis (SP) caused by perforation of the colon due to colorectal carcinoma (CRC) represents one of the most difficult types of peritoneal inflammation with complex clinical presentation. The aim of the study was to establish the frequency of CRC as a cause of stercoral peritonitis, type of treatment, postoperative complications, length of hospital stay and mortality among our patients.

Retrospectively, two groups of patients were analyzed. Group A - the patients treated in the period from January 1, 2001 to December 31, 2006, and group B - the patients treated from January 1, 1995 to December 31, 2001. Surgical approach was different in those groups since we have accepted new strategies in the treatment of colonic perforations caused by CRC from 2000.

Group A included 56 operated patients, median age 62.9, and in most of the cases (35.71%) SP was caused by carcinoma of the left colon. Group B involved 65 operated patients, median age 60.5, where most of SP cases were also caused by the cancer of the left colon (38.46%).

In both groups, there was a similar number of minor complications (wound infection, peristomal abscess, personal irritation of the skin, stomal necrosis) - 34 in group A and 39 in group B. Thirty different major complications were recorded in group A (wound dehiscence, anastomotic leakage, intraabdominal abscess, fistula formation, and stomal retraction) opposed to 63 in group B. The higher percentage of complications in group B affected higher mortality rate (60%), opposed to mortality rate of 30% in group A.

By applying new strategies in the treatment of stercoral peritonitis caused by CRC in the recent years, we have managed to reduce the rate of postoperative complications and mortality as well as hospital stay among these patients.

Key words: stercoral peritonitis (SP), colorectal carcinoma (CRC)

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INTRODUCTION

Stercoral peritonitis (SP) represents the inflammation of visceral and parietal peritoneum caused by various bacterial species. This is a secondary peritonitis and it represents severe type of intraabdominal infection and abdominal - related sepsis. Due to surgery and effective modalities of medical treatment, extremely high mortality rate of 90% from the beginning of the century has been reduced to 15-40%.

The aim of our study was to establish the colorectal carcinoma (CRC) as a cause of SP, type of surgery, postoperative complications, hospital stay and mortality during two time periods. We will analyze weather the following new strategies in the treatment of stercoral peritonitis caused by CRC in the recent years have managed to reduce the rate of postoperative complications and mortality as well as hospital stay among these patients.

MATERIAL AND METHODS

This is a retrospective - prospective study involving the patients treated for stercoral peritonitis caused by CRC at the Surgery Clinic, Clinical Center Niš. Two groups of patients were analyzed. Group A - the patients treated in period from January 1, 2001 to December 31, 2006, and group B - the patients treated from January 1, 1995 to December 12, 2001. We analyzed the type of treatment, hospital stay, postoperative complications and mortality. Surgical approach was

different in those groups since we have accepted new strategies in the treatment of colonic perforations caused by CRC from 2000.

RESULTS

In group A, 435 patients were operated for peritonitis, 56 of which had SP (12.87%) caused by CRC. Male gender predominated: 38 (67.87%) men opposed to 18 (32.14%) women, mean age 62.9 years (51-76). In the group B, there were 326 patients with peritonitis, 65 (19.23%) of which had SP caused by CRC. There were 37 (56.92%) men and 28 (43.07%) women, mean age 60.5 years (37-84 years). In both groups, most of patients had the left - sided CRC: group A 20 patients (35.71%) and in group B 25 (38.46%) patients (Table 1).

With further analysis of our results, a significant difference in type of surgery among those groups was established (Tables 2a, 2b and 2c).

There was a difference in rates of postoperative complications among the groups. We recorded minor complications as: wound infection, peristomal abscess, stomal necrosis, parastomal skin irritation, and major complications as: wound dehiscence, anastomotic leakage, postoperative abscesses of abdomen, stercoral fistula formation and retraction of stoma (Table 3).

Average hospital stay in group A was 16 days (10-22 days), and in group B 21 days (11-31 days). Mortality in group A and group B according to type of surgery is described in Table 4.

Table 1. Localization of CRC among our patients

	Group A		Group B		p
	n	%	n	%	
Right colon	17	30,35	24	36,92	0,57
Left colon	20	35,71	25	38,46	0,902
Rectum	19	33,92	16	24,61	0,355
Total	56	100	65	100	0,304

Table 2a. Type of surgery in group A (according to tumor localization)

	Total	TYPE OF SURGERY	N	%
Right colon	17	RH with anastomosis	5	29,41
		RH with unipolar ileostomy sec Brooke	8	47,05
		RH with ileostomy and transversecolostomy	2	11,76
		Cecostomy	2	11,76
Left colon	20	LH with unipolar colostomy	4	20
		LH with bipolar colostomy	5	25
		Cecostomy	2	10
		Resection with unipolar colostomy	9	45
Rectum	19	Hartmann' procedure	19	100

RH-right hemicolectomy; LH-left hemicolectomy

Table 2b. Type of surgery in group B (according to tumor localization)

	Total	TYPE OF SURGERY	N	%
Right colon	24	RH with anastomosis	13	54,16
		RH with unipolar ileostomy sec Brooke	2	8,33
		RH with ileostomy and transversecolostomy	4	16,66
		Colostomy	2	8,33
		Cecostomy	3	12,5
Left colon	25	LH with anastomosis	6	9,23
		Cecostomy	2	8
		Colostomy	9	13,84
		Resection with unipolar colostomy	8	12,3
Rectum	16	Exteorisation of transverse colon	2	12,5
		Colostomy	7	43,75
		Hartmann' procedure	7	43,75

RH-right hemicolectomy; LH-left hemicolectomy

Table 2c. Comparative analysis

TYPE OF SURGERY		Group A	Group B	p
Right colon	RH with anastomosis	5	13	0,147
	RH with unipolar ileostomy sec Brooke	8	2	0,043
	RH with ileostomy and transversecolostomy	2	4	0,685
	Colostomy	0	2	0,499
	Cecostomy	2	3	0,999
Left colon	LH with anastomosis	0	6	0,03
	LH with unipolar colostomy	4	0	0,043
	LH with bipolar colostomy	5	0	0,019
	Cecostomy	2	2	0,999
	Resection with unipolar colostomy	9	8	0,74
	Colostomy	0	9	0,004
Rectum	Exteorization of transverse colon	0	2	0,499
	Colostomy	0	7	0,015
	Hartmann' procedure	19	7	0,004

RH-right hemicolectomy; LH-left hemicolectomy

Table 3. Postoperative complications

Complication	Group A	Group B	Total group A	Total group B	p
Wound infection	10 (17,85%)	11 (16,92%)			
Peristomal abscess	3 (5,35%)	3 (4,61%)	34 (60,71%)	39 (60%)	0,085
Stomal necrosis	5 (8,92%)	6 (9,23%)			
Parastomal skin irritation	16 (28,57%)	19 (33,92%)			
Wound dehiscence	8 (14,28%)	13 (20%)			
Anastomotic leakage	3 (5,35%)	10 (15,38%)			
Postoperative abscess	8 (14,28%)	14 (21,53%)	30 (53,57%)	63 (96,92%)	0,085
Stercoral fistula	6 (10,71%)	15 (23,07%)			
Retraction of stoma	5 (8,92%)	11 (16,92%)			
Total	64	102			

Table 4. Mortality in group A and group B according to type of surgery

TYPE OF SURGERY	Group A - 56 patients		Group B - 65 patients		p
	n	Mortality	n	Mortality	
RH and LH with anastomosis	5	4 (80%)	19	15 (78,94%)	0,01
RH with unipolar ileostomy	8	3 (37,5%)	2	1 (50%)	0,043
RH with ileostomy and transversocolostomy	2	0	4	3 (75%)	0,685
Cecostomy	4	1 (25%)	5	3 (60%)	0,999
Resection with unipolar colostomy	9	0	8	4 (50%)	0,144
LH with unipolar colostomy	4	1 (25%)	0	0	0,043
LH with bitubular colostomy	5	1 (20%)	0	0	0,019
Colostomy	0	0	18	6 (54,54%)	0,00006
Exteorization of transverse colon	0	0	2	2 (100%)	0,499
Hartmann' procedure	19	8 (42,1%)	7	5 (71,42%)	0,004
Total	56	18 (32,14%)	65	39 (60%)	0,304

RH-right hemicolectomy; LH-left hemicolectomy

DISCUSSION

Stercoral Peritonitis (SP) is a severe disease with uncertain prognosis. Due to high concentration of aerobic bacteria, endotoxins of Gram-negative and especially egzotoxins of anaerobic bacteria, a quick penetration of these components occurs resolving in diffuse peritonitis, systemic infection and sepsis. Toxins primarily affect the heart cells, endothelium, hepatocytes, kidney cells, and cells of immune system. Because of the ischemic, toxic and metabolic damage, cell necrosis occurs leading to septic shock and multiple organ failure in the end.

Acute Physiology Score (APS) is commonly used to describe the intensity of pathophysiological disorder, while **APACHE II** score helps in describing the incidence, morbidity and mortality rate. Patients with SP are classified in the third group with mortality rate of over 40% according to this score (1).

Treatment of SP caused by colonic carcinoma considers:

A. Permanent and successful elimination of septic source (respecting oncology principles);

B. Evacuation of necrotic and purulent content out of abdominal cavity.

Removing the cause of infection is basically the most important step in surgical treatment of SP. CRC is the third most common form of cancer, equally distributed in both genders. Etiology of origin is unknown and risk factors are various (2). This cancer is followed by a high rate of mortality, and a 5-year survival rate corre-

lates to the stage of carcinoma (Dukes A-about 90%; Dukes C-less then 60%) in case of elective surgery (3).

The very first principles of diagnosis and treatment of SP were noted during Hippocrates's era, while the first principles of surgical treatment were set by Martin Kirschner in 1926. SP is an acute condition, demanding an urgent surgical treatment. Reanimation and preoperative treatment involve, besides the correction of hypovolemic and acidobase balance, a prophylactic use of antibiotics (4). The presence of CRC is often discovered during operation; therefore, the surgeon is forced to decide about the type of operation according to the intraoperative finding and patient's condition.

The first colostomy used as a procedure to resolve an intestine perforation caused by CRC was created in the 18th century. The basic principles of this treatment were set by Mikulicz (Vorlagerungs methods). This way of treatment was performed for decades until two stage procedures and the immediate anastomosis were introduced. If SP is caused by perforation of the right colon affected by carcinoma, right hemicolectomy with Brook's unipolar ileostoma is the common treatment. Immediate anastomosis is acceptable only if protective ileostoma has been made. Right hemicolectomy without anastomosis is performed far more often. Performing immediate anastomosis is related to a high risk of postoperative complications.

Carcinoma of the left colon and rectum resulting in SP is a special problem. It is not recommended to perform coloanoanastomosis during the first stage of procedure but to create a colostomy. Nowadays, reco-

nstructive surgeons support immediate anastomosis of the left colon even with the presence of diffuse peritonitis and perforation in strictly selected cases, explaining that this maneuver does not effect mortality and morbidity in patients (5).

It is considered that the risk of immediate anastomosis of the right and left colon is the same if the patients are hemodynamically stable. Immediate anastomosis should not be considered only in hemodynamically unstable patients, whether obstruction or perforation of colon is involved (6).

Localization of carcinoma do not affect postoperative mortality and a 5-year survival rate (7, 8), but patient's general condition, severity of SP, promptness of performed procedure, surgeon's skill (9), and whether oncological principles are applied (total lymphadenectomy) (10). Regardless of the procedure extensiveness, a 5-year rate of survival is 20-30%.

According to many colorectal surgeons of GBA (Grate Britain Association), it is possible to determine the risky patients (RIX- risk-stratification index) which would help in survival prognosis (11-13).

The methods of treatment of SP caused by colorectal origin are still a subject of discussion: one or two stage operation. High rate of mortality in these patients (over 40%) poses the question related to:

- Primary colostomy in patients in poor general condition. Postoperative occlusions of intestine after Loop ileostomy or Loop transversocolostomy are quite often. Loop transversocolostomy is recommended only as protective colostomy (14).
- Intestine resection (along with tumor removal and lymphadenectomy) with immediate anastomosis and protective ileo- or colostomy and finishing anastomosis during the second stage. Postoperative mortality in these patients is 86%, while in those treated palliatively is 39% (15).
- Subtotal colostomy, if radical operation is needed, in patients in good condition (16, 17).

After removing the source of infection, the treatment is continued with evacuation of necrotic and purulent content out of abdominal cavity: mechanical cleaning, debridment, intraoperative lavage with ceftriaxon, and drainage of abdominal cavity. Some recent studies show that intraoperative lavage with ceftriaxon or metronidasol completely exclude the possibility of postoperative abscess development. According to some other authors, performing lavage with 20l of saline solution decreases the development of postoperative complications, abscesses and the need for reintervention.

Special attention should be paid to severe forms of SP when it is recommendable to proceed with closed postoperative lavage, which actually represents the continuum of intraoperative lavage. Using this method, the risk of developing adhesive ileus decreases. The method of choice in the treatment of highly severe forms of SP is staging lavage with temporary abdomen closure, which avoids the negative effect of increased

abdominal pressure and the risk of intestine perforation.

According to many authors, there is no difference in postoperative mortality between planned and relaparotomy on demand (18, 19). Second - look operations can be quite useful in case of severe SP followed by marked organ necrosis, and in patients that developed septic shock with consecutive coagulopathy.

Knowing and respecting the principles of medical approach in stercoral peritonitis caused by colonic cancer perforation, patients in group A were treated with the following surgical procedures:

- Solving SP, which was presented as a late diffuse peritonitis in the majority of patients.
- Removal of tumor, which was often perforated (regarding the oncological principles)
- Performing immediate anastomosis only in selected cases. The majority of patients underwent ileo- and colostoma creation as well as the Hartmann's procedure.

In group A patients suffering from the right colon carcinoma, right hemicolectomy with Brook's unipolar ileostoma was preformed in 47.05%, while only 29.41% of patients underwent right hemicolectomy with immediate anastomosis. In patients with the left colon carcinoma, the most performed procedure was colon resection with unipolar colostoma (45%) and left hemicolectomy with bitubular colostoma (25%), while immediate anastomosis was not created. All patients suffering from rectal carcinoma underwent Hartmann's procedure (100%) (Table 2a).

More various procedures were preformed in the B group patients. In patients with the right colon carcinoma, right hemicolectomy with immediate anastomosis was used more often (54,16%), while right hemicolectomy with Brook's ileostoma was rarely preformed (8,33%). In patients with the left colon carcinoma, colostomas were the most frequent (13,8%), while left hemicolectomy with immediate anastomosis was preformed rather often (9,23%). Rectal carcinoma was solved equally by colostoma creation and Hartmann's procedure (43,75%) (Table 2b).

During this study, special attention was paid to the number and type of complications after the first stage of procedure. The study showed that patients were in terminal phase of disease, with poor preoperative condition and signs of systemic infection. Very often, surgical procedures had to be preformed without adequate colon preparation, after brief and urgent preoperative reanimation. Postoperative complications (such as accretion of laparotomy "per secundam", laparotomy and anastomosis dehiscence, stercoral fistula) were rather the result of poor general condition in patients then inadequate operative technique (stoma complications, postoperative abscess, or other liquid collections in abdominal cavity, etc).

According to results, about 60% of patients in group A suffered from minor complications which were

treated using conservative procedures, while about 53% of patients suffered from serious complications treated both conservatively and operatively. The percentage of patients with minor complications were rather similar in group B, while harder complications occurred far more often - in 96,92% of patients (Table 3).

Patients in group A with more severe complications underwent reintervention in about 37% of cases and 70% of patients in group B. In group A patients, wound dehiscence were minimal and they did not demand reintervention as in the cases with postoperative abscesses. In those patients, conservative treatment was successful. Postoperative abscesses were minimal and treated with antibiotics (ceftriaxon and metronidazol or stronger with whider spectar of treatment). Only three patients with severe abscesses underwent reintervention. Three patients with stercoral fistula were treated conseratively and other three underwent reintervention. All B group patients with these complications underwent reinterventions because these complications were more serious or did not give answer to conservative treatment.

Anastomotic leakage and retraction of stoma in both groups of patients demanded reinterventions because of developed SP meanwhile. SP in B group patients was solved by treatment of primary cause of peritonitis and lavage of abdomen with a few liters of saline solution. The results were satisfactory.

In case of group A patients, we were not able to use any kind of CT scan for diagnosing SP, as described in literature (20).

SP was diagnosed only by clinical examination and in several cases by EHO examinations. Treatment of SP in those patients was serious and demanded a reoperation and treatment of SP. The operative technique was more successful than the prior one owing to the introduction of modern operative methods. For treatment of SP, table colonic lavage and intraoperative peritoneal lavage were performed, along with metronidazol in saline solution. Postoperative closed lavage performed in patients with severe forms of SP involved the use of saline solutions or Peristeril. The results were much better. Nowadays, researches are very different. Some authors are not for peritoneal lavage and they are only for operative treatment of primary causes of SP (21- 23).

Cause of death was closely related to general condition of patients (azothemia, cardiovascular, renal or multiple organ dysfunction) and severity of primary disease. SP and CRC occurring separately are related to high mortality rate, therefore this rate increases when they need to be treated at the same time. Mortality rate in group A was 32.14%, and 60% in group B. There is a significant difference between mortality rate in relation to the type of performed surgical procedure: in right hemicolectomy with unipolar ileostoma it was 37,5% in patients within group A, and 50% in group B patients; Hartmann' procedure, as the most frequently used pro-

cedure in rectal carcinoma, was related to a mortality rate of 42,1% in group A, and 71,42% in B group patients.

Prognosis, frequency of complications and mortality rate depend on various factors: Hinchey classification (Stage II-IV), APACHE II (>19), SOFA (score 8), MOF (score 7), Mannheimer Peritonitis Index (MPI score 30), age of patients (over 65years) - 26.9% (24). According to results from 1994, mortality rate was 19.6 % (25), while in 2002 it was 16.9 %, although that is closely related to the type of procedure. When primary resection with anastomosis was performed, mortality rate was 11.1%, though it was 22,2% when anastomosis was not included. None of the patients with MPI less than 25 passed away, while in patients with MPI from 26-36, mortality rate was 38.5 % (26). Localization of carcinoma also affects mortality rate. In the left colon carcinoma it was 22.4 %, and if it had been associated to a high Peritonitis Severity Score (PSS) it was increased by 15.4% (27). Mortality rate during the first 30 postoperative days, according to the results from 2001, was 14%, while one-year survival was 55% and a five-year - 14%. Intestine perforation proximal to carcinoma was related to a higher morbidity and mortality rate than perforation located on the tumor itself (28). Intrahospital mortality during 30 days was 40.5% in 2006, while during two years it was 64.3% (29). Further studies were performed trying to determine the difference between mortality and survival rate with perforative and non - perforative CRC. Mortality rate as well as metastasing in the first 30 days was extremely high, while according to the results from 2008, two-year survival was 47% in perforative and 54% in non - perforative carcinoma, and five-year survival was 28% versus 33% (30).

Comparing our results with those obtained from literature, we ascertained that mortality rate of the group A patients corresponded to the literature data, while mortality rate of the B group patients was high above the average values.

CONCLUSION

SP caused by CRC is one of the most severe secondary peritonitis forms, and still poses a great surgical issue. During examination period (group A), it was noticed in 12% of all peritonitis cases, while during the control period (group B) it was rather often - 19%.

Surgical procedures used during the treatment of patients in group A considered immediate anastomosis in 8.92%, while creation of unipolar ileostomy and colostomy were present in about 53%. In group B, immediate anastomoses were created in 30% of patients, and unipolar ileostomy and colostomy in nearly 60%. Total amount of minor complications in both groups was around 60%, while serious complications were presented with 53% in group A and 96% in group B. This significant difference between results referring

to serious complications in our groups affected mortality rate, which was much higher in group B.

Considering that these were the patients with late stage of malignant disease, complicated with se-

vere systemic disorders, the obtained results point to a solid success in the treatment of these patients as well as the improvement of surgical and reanimation procedures compared to prior results.

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LEČENJE STERKORALNOG PERITONITISA UZROKOVANOG KOLOREKTALNIM KARCINOMOM

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Sažetak

Sterkoralni peritonitis (SP) uzrokovan perforacijom debelog creva zbog kolorektalnog karcinoma (CRC) jedan je od najtežih oblika zapaljenja peritoneuma, kompleksne kliničke slike. Cilj ispitivanja bio je da retrospektivno-prospektivnom studijom naših bolesnika utvrdimo učestalost CRC kao uzroka SP, način lečenja, postoperativne komplikacije, dužinu hospitalizacije i mortalitet bolesnika. Bolesnici su podeljeni u dve grupe: grupu A (od 01.01.2001-31.12.2006. godine) i grupu B (od 01.01.1995 do 31.12.2000 godine). Podela je urađena na osnovu uvođenja i poštovanja novih stavova u lečenju CRC i SP (grupa A). U grupi A operisano je 56 bolesnika prosečne starosti 62,9 godine: najviše sa karcinomom levog kolona - 20 (35,71%). U B grupi operisano je 65 bolesnika prosečne starosti 60,5 godine, najviše sa karcinomom levog kolona -25 (38,46%).

Hirurški postupci kod ovih bolesnika razlikovali su se, što je rezultovalo većom stopom komplikacija i smrtnosti. U A i B grupi bilo je lakših komplikacija, oko 60%, dok je težih komplikacija u A grupi bilo oko 53%, a u B grupi oko 96%. Visok procenat težih komplikacija u B grupi odrazio se i na stopu smrtnosti, koja je u B grupi iznosila 60%, dok je u A grupi bila dvostruko niža. Poštovanjem algoritama lečenja CRC i SP skraćuje se dužina hospitalizacije bolesnika, smanjuje nastanak komplikacija i mortalitet.

Ključne reči: sterkoralni peritonitis, kolorektalni karcinom