

# The results of the surgical treatment of rectal cancer

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## SUMMARY

**Background:** Colorectal carcinoma is the most frequent malignant disease of the abdomen. Only radical surgical treatment of the patients provides cure and good prognosis. Our aim was to find out the frequency of certain surgical procedures in the therapy for rectal carcinoma and survival rate of the patients compared to the applied surgery and clinical stage of the disease.

**Methods:** From 2006 to 2008, we included 100 rectal cancer patients in the study, 46 women and 54 men aged from 29 to 80 years. They were all surgically treated at the Oncology Institute of Vojvodina, Clinic for surgical oncology and their medical reports served as our data source.

**Results:** We found locally advanced carcinoma T3 in 62% of patients and T2 in 24% of patients. Lymph nodes were positive in 74% of patients and distant metastases were found in 16% of diseased. Stage III was the most common (31%). The most frequently performed surgical treatment was low anterior resection of the rectum (52%) and Miles' operation. Palliative surgery was done in 13% of patients. Survival rate after radical operations was the highest in patients with stage I of the disease (100%) and the lowest in patients with stage IV of the disease (31.25%).

**Conclusion:** The type of surgery is of prognostic significance.

**Key words:** Rectal Neoplasms; Colorectal Surgery; Survival Rate

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## INTRODUCTION

Colorectal cancer is the most common malignant disease of the visceral organs in the abdomen (1). It is the second cause of death from malignancies in the USA after the lung cancer (2). At global level, this cancer is most common in Western Europe, North America, Australia, and New Zealand, i.e. in countries with western style of life and diet (1, 3).

According to the records of the Registry for malignant disease of the Oncology Institute of Vojvodina in Sremska Kamenica, incidence/100000 for carcinoma of the rectum in male population was 25.4, and in female population was 16.5. Male-female ratio was 1.17:1 (4, 5) and carcinoma of the rectum was mostly diagnosed among patients above 50 years of age.

As in the majority of malignant diseases, the specific cause of the carcinoma of the rectum is not possible to define. It has been assumed that several factors contribute to the development of this neoplasm, the most important being diet rich in red meat and animal fats and lean in fiber and obesity; the importance of alcohol and tobacco consumption varies from author to author (1-3). About one quarter of patients with colorectal carcinoma has a positive family anamnesis, which speaks in favor of genetic predisposition (2). Contrary to risk factors, a number of studies have pointed to certain factors that have a protective role in the development of colorectal carcinoma. Among these factors, the most important are diet rich in indigestible vegetable fibers (fruit and vegetables), reduced consumption of red meat and diet predominating with fish and poultry meat. It has also been observed that certain drugs (aspirin, sulindac) may have protective effect to the development of colorectal carcinoma (5, 6).

Stage of the disease at diagnosis, i.e. initiation of the treatment, is crucial for survival of the patients with the rectal carcinoma. About 75% of the patients diagnosed with rectal cancer in its asymptomatic stage have a 5-year survival and less than 50% of the patients survive five years when diagnosis is made in symptomatic stage of the disease (6).

Adequate treatment of the suspected carcinoma of the rectum should be preceded by the following diagnostic procedures: (1) anamnesis (diarrhea with traces of blood and mucus, tenesmus and/or pain in anal canal, pencil-shaped stool, etc.); (2) digital rectal examination followed by anoscopy if necessary; (3) irrigography; (4) rectoscopy and rectosigmoidoscopy; (5) histopathological examination of the samples obtained by rectoscopy, rectosigmoidoscopy, or during surgery; (6) endorectal ultrasound; and (7) MR or CT examination of small pelvis.

Prognosis in rectal cancer patient is based on the depth of tumor penetration into the bowel wall (T), the extent of regional node involvement (N), and absence or presence of distant metastases (M). These three factors are used to define cancer stages. In clinical practice, two staging systems are used for rectal cancer: the older Dukes system (modified by Astler-Coller) and TNM classification put forth by American Joint Committee on Cancer (AJCC) and Union Internationale Contre le Cancer (UICC) (7-11).

Rectal cancer presents 50% of all colorectal carcinomas. In two thirds of the cases, rectal cancer can be diagnosed by digital rectal examination (6). Although it is a relatively simple diagnostic procedure, our patients often come for checkup in advanced or inoperable stage of the disease when chance for complete healing is minimal. The optimal therapy is total resection, which provides long-term survival (6, 12).

Rectal cancer surgery implies the use of local excision of tumor or radical operation depending on the tumor stage according to TNM classification and clinical stage (CS) of the disease.

Local excision has many advantages compared to radical operation: lower morbidity, faster and easier recovery of the patients, and lower costs. However, this procedure is indicated only in case of T1 tumors with no lymph node involvement and for T2 tumors when radical surgery is contraindicative.

Radical operation is used to extirpate the tumor-involved portion of the bowel with perirectal fat and locoregional lymph node). Low anterior resection is most often used to remove complete mesocolon of the rectum with rectal tumor (TME). After dissection of mesorectum and rectum mobilization, rectum is resected and proximal part of the colon and remaining of the rectum are anastomosed. High anterior resection is slightly different from the low anterior resection and is rarely performed. Hartmann operation is mostly done in patients with ileus and poor general health condition. Miles operation (abdominoperineal resection of the rectum) is done in case when cancer develops in the lower third of the rectum and anal canal. After abdominal part of the operation, which is identical to low anterior resection and ends with the creation of sigmoidostomy, perineal part of the procedure is done which involves rectum excision with mesocolon and vascular bundle.

Invasion of the rectal carcinoma into the pelvic organs and/or the presence of distant diffuse metastases in liver, parietal peritoneum, and other organs prevent radical resection. Palliative operations are indicated in these cases (most frequently colostomy) (6, 12-18).

The application of preoperative (neoadjuvant) or postoperative (adjuvant) radiotherapy reduces the recurrence of the tumor in pelvis but as it seems it has no influence on patients' survival. Preoperative radiotherapy is indicated in patients with large and potentially unresectable carcinomas. Some retrospective studies report that 80% of patients with initially unresectable rectal carcinomas become candidates for surgical treatment after preoperative radiotherapy. In addition, radiotherapy can be applied intraoperatively in combination with chemotherapy. Palliative radiotherapy is indicated in patients with large, advanced carcinoma with expansion that excludes any radical operation and in patients with poor general health condition. The aim of radiotherapy application is to reduce bleeding and to alleviate pain and other symptoms (6, 19-24).

The aim of chemotherapy, both adjuvant and neoadjuvant, is to improve local controls of the tumor, to reduce development of metastases, and to improve survival. The purpose of adjuvant chemotherapy is to eliminate micrometastases existing at the time of operation and it is recommended for all patients with stage III or IV of the disease (4, 25, 26).

### Patients and methods

This retrospective-prospective study was conducted from December 2008 to February 2009 at the Oncology Institute of Vojvodina, Clinic for surgical oncology, Sremska Kamenica. We included 100 patients aged from 29 to 80 years treated from rectal carcinoma from January 01, 2006 to December 31, 2008. All patients were only treated with surgery without preoperative radiotherapy and/or chemotherapy.

Diagnosis of rectal carcinoma and its stage were established by anamnestic data, digital rectal examination (DRE), rectoscopy and/or rectosigmoidoscopy with biopsy, CT and/or MRI examination of the pelvis, and histopathological analysis of biopsied sample.

Case reports were used as data source. Evaluation of survival was done through telephone contacts with patients. Data obtained from case reports included general data about the patients (sex, age), diagnosis of rectal carcinoma, histopathological confirmation of the disease, TNM and clinical staging, type of surgical treatment (radical or palliative), and survival data. Statistical analysis was performed using SPSS v 13.0 software.

**Table 1. Clinical characteristics of patients with rectal cancer**

Gender	No of patients		/	%		
Male	54			54%		
Female	46			46%		
Age structure of the patients	No of patients		/	%		
	M	F				
< 39	1	1				
40-44	2	0				
45-49	2	3				
50-54	4	4				
55-59	7	3				
60-64	12	8				
65-69	6	14				
70-74	7	13				
75 >	5	8				
Types of surgery	Total		Women		Men	
	N	%	N	%	N	%
Miles operation	17	17	5	29,41	12	70,59
Low anterior resection	52	52	25	48,08	27	51,92
High anterior resection	9	9	4	44,4	5	55,56
Hartman's operation	9	9	5	55,56	4	44,44
Palliation/colostomy	13	13	7	53,85	6	46,15
TOTAL	100	100	46	46	54	54
TNM stage	No of patients		/	%		
T0	3			3		
T1	7			7		
T2	24			24		
T3	62			62		
T4	4			4		
N						
N0	53			53		
N1 (1-3 lymph nodes)	29			29		
N2 (4 and more lymph nodes)	18			18		
M						
M0 (absence of metastases)	84			84		
M1 (presence of metastases)	16			16		
Clinical stage of disease CS						
Stage 0	2			2		
Stage I						
Stage II	23			23		
Stage III	31			31		
Stage IV	16			16		

## RESULTS

### Age and sex structure of the patients

Mean age of the studied group of patients was 63.96 years (range, 29-80 years). The highest incidence of rectal carcinoma (41.3%) was in women between 55 and 64 years of age, and for men (50%) was in men between 65 and 74 years of age. Men:women ratio was 1.17:1 (Table 1).

### Types of performed surgeries

Radical operations were done in 85% of patients and palliative in 13% of patients.

Abdominoperineal resection of the rectum (Miles' operation) was done in 17% of patients (29.41% women and 70.59% men). Low anterior resection of the rectum was done in 52% of patients, i.e., 48.08% of women and 51.92% of men. Nine percent of patients (44.44% women and 55.56% men) underwent

**Table 2. Survival of the patients according to the applied type of surgery**

Group	Type of surgery	Deceased	%	Alive	%	Total	%
I	Miles' operation	4	23.53	13	76.47	17	100
II	Low anterior resection	4	7.69	48	92.31	52	100
III	High anterior resection	0	0	9	100	9	100
IV	Hartmann's operation	2	22.22	7	77.78	9	100
Radical operation		10	11.49	77	88.51	87	100
Palliative operation		9	69.23	4	30.77	13	100

high anterior resection. Hartman's operation was performed in 9% of all studied patients (in 55.56% of women and in 44.44% of men) (Figure 1, Table 2). Palliative treatment was applied in case of 13% of all patients (53.85% women and 46.15% men) (Figure 1, Table 2).

**Histopathological findings – TNM classification**

Histopathological analysis of surgical specimen showed that 3% of patients had T0 stage of the disease, T1 stage was found in 7% of patients, T2 stage in 24% of patients, T3 in 62%, and T4 in 4% of examined group of patients. Histopathological analysis of lymph node from perirectal fat and along the vascular mesentery of the excised portion of the bowel showed that the disease did not invade lymph node in case of 53% of patients. N1 stage was confirmed in 29% of patients and N2 stage in 18% of patients. Metastases were found in 16% of examined group of patients (Table 1).

**Clinical stage of the disease – CS**

Two percent of studied patients were in stage 0 of the disease. Stage I was found in 28% of patients, stage II in 23%, stage III in 31%, and stage IV (identified metastases) was found in 16% of the diseased (Figure 2).

**Survival**

**Survival of the patients according to the applied type of surgery**

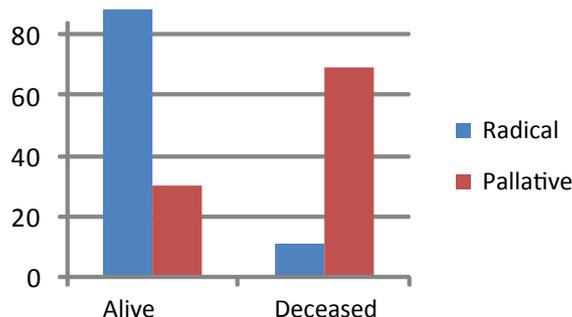
Patients who were treated with radical or palliative operation were divided into groups depending on the type of applied surgery. Group I consisted of patients who had Miles' operation and regarding the survival period 23.5% of these patients have died and 76.47% are alive. In the group II – patients treated with low anterior resection, 7.69% of patients have died, and 92.31% are alive. In the group III – patients treated with high anterior resection, all patients are alive (100%). In group IV with patients who had Hartmann's operation 22.22% of patients died and 77.78% are alive (Table 2).

The percent of deceased was significantly lower among the patients with radical operation (11.49%) compared to the patients with palliative operation (69.23%;  $p < 0.01$ ) as shown in Figure 1.

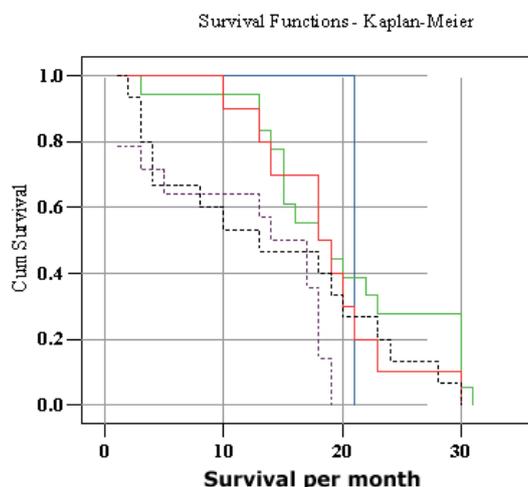
Overall survival according to the type of performed operation was better in case of radical than in case of palliative operations (Figure 3).

**Survival of the patients in relation to clinical stage of the disease**

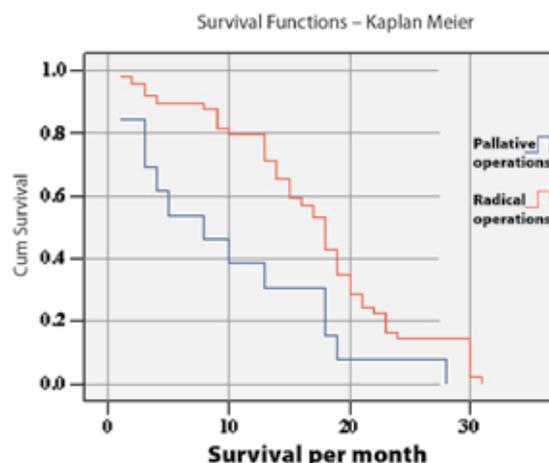
According to the stage of the disease, operated patients were classified into five groups. In groups I and II of patients (stage 0 and I) no lethal outcomes were recorded. Among patients from the group III (stage II) 8.75 of patients died and 91.3% are still alive. In the group IV (stage III) 19.35% of patients died and 80.65% are alive. In the group V (stage IV) 68.75% of patients died and 31.25% are alive (Figure 4).



**Figure 1. Comparison of alive and deceased patients in radical and palliative operations (%)**



**Figure 2. Clinical stage (CS) survival rate**  
CS 0 – blue, CS 1 – green, CS 2 – red, CS 3 – violet, CS 4 – black



**Figure 3. Survival of the patients according to the applied type of surgery**  
Red – radical operations, blue – palliative operations

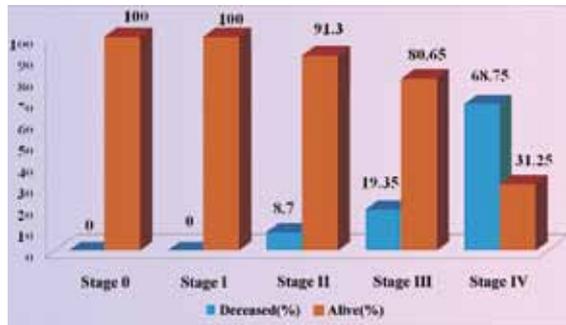


Figure 4. Status alive/died according to the stage of the disease of operated patients

## DISCUSSION

Carcinoma of the rectum is potentially curable disease and in two thirds of the cases it can be diagnosed by digital rectal examination. However, patients often come for checkup in advanced or inoperable stage of the disease when chance for complete cure is minimal. The later diagnosis is established the smaller probability for healing is and the prognosis is worse. As carcinoma of the rectum develops over a rather long time and associated symptoms and discomforts appear gradually, its early diagnosis can be easily established in individuals who take care of their health.

The highest incidence of rectal carcinoma among men was in men between 65 and 74 years of age and among women, in women between 55 and 64 years of age. The data show that carcinoma of the rectum is diagnosed in slightly older age of men compared to women, which may be explained with a greater concern of women for their health and earlier checkups with their physicians. Men:women ratio was 1.17:1, which is very similar to the data found by Miladinov-Mikov et al. (1.24:1) (6).

Treatment of the patients with rectal carcinoma depends on the stage of the disease, i.e. the involvement of rectum and other structures by the malignant process. TNM classification and clinical stage of the disease help surgeon in making the choice of the most appropriate operation for each patient.

Histopathological analysis confirmed absence of malignant cells (T0) in 3% of examined patients. Locally advanced carcinoma of the rectum (T3), was diagnosed in 62% of patients. Tumor tissue was found in adjacent lymph nodes in case of 47% of patients; involvement of single lymph node (not more than 3) was found in one third of patients and 4 or more lymph nodes in case of 18% of patients. Our findings comply with literature data (20,23). Distant metastases were present in 16% of patients and majority of studied patients had clinical stage III of the disease.

Radical operation is the only treatment procedure that, if applied in time, can provide cure and good prognosis. Which type of operation will be used entirely depends on TNM classification and the clinical stage of the disease. In case of our patients, the most frequent surgical treatment was low anterior resection of the rectum (52%) and Miles' operation (17%). Spreading of the rectal carcinoma into adjacent structures makes radical operation useless, i.e. patients with such an advanced stage of the disease are considered inoperable. These patients are treated with palliative operations to alleviate their discomforts. In our studied group of patients, palliative surgical treatment was chosen in 13% of patients and that corresponds to literature data (6,20,23).

The most important aim of treatment for cancer patients is to increase their survival time. The prognosis for these patients depends on a number

of factors, the major one being the invasiveness of a malignant process. Clinical stage of the disease that indicates the progression of the malignancy is in inverse proportion to the period of survival. In the observed period of our study, two thirds of patients with stage IV of the disease died while all patients with stage I and 91.3% of patients with stage II of the disease are alive (3 years follow up).

Kaplan-Meier curve was used to present survival in relation to the stage of the disease and it clearly shows that stage of the disease is in inverse proportion to the time of survival. One-year survival among patients with stage I of the disease is about 95% and it decreases in each subsequent stage reaching 55% in stage IV of the disease.

The highest percent of living patients who were treated with radical operation was in patients who had high anterior resection and low anterior resection. The death outcome was significantly higher ( $p < 0.01$ ), in the group of patients with palliative surgical treatment than in the group of patients who were radically operated, which directly correlates with the stage of the disease.

Kaplan-Meier curve was also used to present survival of the patients in relation to the type of operation. It shows significantly longer time of survival in patients treated with radical operation compared to patients treated with palliative operation. The above data indicate that, apart from clinical stage, type of operation is also a predictive factor. High incidence of advanced carcinoma of the rectum is an obvious sign for a more serious engagement in early disease detection and education of population. Otherwise, the results of the treatments for carcinoma of the rectum will be poor in a long-time perspective.

## Conflict of interest

We declare no conflicts of interest.

## REFERENCES

- Miladinov M, Dugandžija T, Petrović T. Epidemiological Characteristics of Colorectal Cancer in Vojvodina 1991-2000. 9<sup>th</sup> Central European Congress of Coloproctology. Oct 7-9, 2004, Belgrade, 2004
- Miladinov M, Lukić N, Petrović T. Epidemiology of colon cancer in Vojvodina. *Arch Oncol*. 1999;7(3):109-12.
- Miladinov M, Gudurić B. Epidemiologija raka debelog creva u Vojvodini. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p. 7-17.
- American Cancer Society. Cancer Facts and Figures. 2009.
- Gudurić B, Miladinov M. Faktori rizika nastanka raka debelog creva i rektuma. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p.18-25.
- Petrović T. Hirurško-onkološki parametri promene operabilnosti lokalno uznapredovalog karcinoma rektuma nakon preoperativne radioterapije. Doktorska disertacija. Novi Sad: Medicinski fakultet Univerziteta u Novom Sadu; 2004.
- Knežević-Ušaj S. Patološke i molekularno-biološke karakteristike raka debelog creva i rektuma. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p. 66-92.
- Gunderson LL, Sargent DJ, Tepper JE, O'Connell MJ, Allmer C, Smalley SR, et al. Impact of T and N substage on survival and disease relapse in adjuvant rectal cancer: A pooled analysis. *Int J Radiat Oncol Biol Phys*. 2002;54:386-96.
- Dukes CE. The classification of cancer of the rectum. *J Pathol Bacteriol*. 1932;35:323-32.
- Astler VB, Collier FA. The prognostic significance of direct extension of carcinoma of the colon and rectum. *Ann Surg*. 1954;139:846.
- International Union Against Cancer. TNM classification of malignant tumours. 4 ed. Berlin: Springer-Verlag; 1987.

- 12 Breberina M, Petrović T, Radovanović Z. Hirurški tretman operabilnog raka rektuma. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p. 181-208.
- 13 Miles WE. A method performing abdomino-perineal excision for carcinoma of the rectum and of the terminal portion of the pelvic colon. *Lancet*. 1908;II:1812-3.
- 14 Heald RJ, Husband EM, Ryall RD. The mesorectum in rectal cancer surgery; the clue to pelvic recurrence. *Br J Surg*. 1982;69:613-6.
- 15 Turnbull Jr RB, Kyle K, Watson FR, Spratt J. Cancer of the colon; the influence of the no-touch isolation technique on survival rates. *Ann Surg*. 1967;420-7.
- 16 Dixon CF. Anterior resection for malignant lesions of the upper part of the rectum and lower part of the sigmoid. *Ann Surg*. 1948;128:425-42.
- 17 Gerzić Z, Dragović B. Osnovi hirurgije. Beograd: Medicinska knjiga; 1994.
- 18 Breberina M. Kolostome i stome. In: Breberina M, Skrička T, editors. Stoma. Novi Sad; p. 25-46.
- 19 Pahlman L, Glimelius B. Pre-or postoperative radiotherapy in rectal and rectosigmoid carcinoma. Report from a randomized multicenter trial. *Ann Surg*. 1990;211:187-95.
- 20 Birgisson H, Pahlman L. In: Gunnarsson, et al. Adverse effects of preoperative radiation therapy for rectal cancer: long term follow up of Swedish Rectal Cancer Trial. *J Clin Oncol*. 2005;23:697-705.
- 21 Glimelius B. The role of radiotherapy in rectal cancer. *Eur J Cancer*. 2001;37:203-12.
- 22 Fisher B, Wolmark N, Rockette H. Postoperative adjuvant chemotherapy or radiation therapy for rectal cancer. Results from NSABP, Protocol R-01. *Natl J Cancer Inst*. 1988;80:21-9.
- 23 Papillon J. Rectal and anal cancer. Conservative treatment by irradiation - an alternative to radical surgery. Berlin: Springer-Verlag; 1982.
- 24 Erak M. Mesto radioterapije u tretmanu raka rektuma. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p. 221-34.
- 25 Jovanović D. Tretman metastaskog raka debelog creva i rektuma. In: Gudurić B, Breberina M, Jovanović D, editors. Rak debelog creva u Vojvodini. Novi Sad: VANU, Institut za onkologiju Vojvodine; 2009. p. 263-8.
- 26 Popov I. Novine u dijagnostici i terapiji kolorektalnog karcinoma. Optimizacija protokola lečenja. Beograd: Akademija medicinskih nauka Srpskog lekarskog društva; 2007. p. 211-9.