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Comparative Study of the Total Mesorectal Excision' Results (TME operated Through Laparoscopic and Open Surgery) in Malignant Tumors of Rectum

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ABSTRACT

The idea of laparoscopic or open execution of different localized colon cancer (TME)' operations are controversial around the world. In our present research, laparoscopic and open TMEs have been compared in selected patient groups under observation.

Material and Methods: 47 were included in the laparoscopic group and 56 in the open group off the 103 patients. Patients were operated on a standard basis, followed by the TME principles during the operation. Patients were analyzed for age, sex, stage, location, frequency of illness, scheme of radio chemoteraphy, surgical intervention structure, and depth of invasion, morphological characteristics, TME quality, CRB status and remote outcome analysis.

Result: *Based on our observations on selected patient groups, we did not find a significant difference between laparoscopic and open TME oncological point. The quality of TME, CRB status, proximal and distal boundaries of the resection, the number of removed lymph nodes, prolonged outcomes (local residual, remote metastasis and survival) were almost identical in both groups. So, as a result of our research, we come to the following conclusion. Laparoscopic TME can be successfully performed by a skilled surgeon in various localized colonic cancers.*

Keywords: *Laparoscopic TME, TME quality CRB (circular resection boundary) status, proximal and distal boundary of resection, local residual, remote metastasis.*

INTRODUCTION

Level of rectum cancer is around 9-14% in developed countries. Every year around 800 people worldwide are diagnosed with pancreatic cancer, which is 18 per 100,000 population [1, 3]. Although the surgical method (laparoscopic and open total mesorectal excision - TME) is the basis in order to treatrectum cancer, the multidisciplinary approach is the main line for the treatment of this type of cancer. There was no significant difference between laparoscopic TME and open TME in comparative study of oncological results in selected patient groups when investigating literature data [2, 8, 9,10]. Color II (2013 March) study which covered 30 hospitals in 8 countries was of particular importance for its scope and its honesty. Out of 1103 patients, 739 were operated on laparoscopic and 364 by open surgical method. Completeness of the resection were closely similar in both groups (88%and 92%), circular resection limits were positive in 10 % cases in laparoscopic and open group [8, 9]. In the GOREAN (2014) study, neoadjuvant chemotherapy and laparoscopic techniques were compared with the middle and lower edema of the rectum.

These studies have shown that the duration of operation was longer, so that amount of lost blood was higher in the laparoscopic group in comparison with open surgery group. CRB, TME quality, and lymph nodes were the same for both groups. This study has shown that radiochemical therapy performed prior to surgery in locally distributed derivatives does not have a significant effect on laparoscopic or open surgery [5, 9]. Ala Cart (2015) research has shown slightly different results. Successful resections in this study were found to be 82% in the laparoscopic group and 89% in the open group, CRB was 93% in the first case, and 97% in the second case. High quality TME was 87% in the laparoscopic group and 92% in the open group [8, 12]. Research has shown that laparoscopic surgery is not appropriate for daily use, despite of gotten high quality. AGOSOCH -

6051 (2015) study recommended not to use laparoscopic technology in every patient (especially when detected), and advised to be especially careful with rectum cancer at II and III stages. The results of laparoscopic and open-type TME patalogy were interpreted in methanalysis published on 19 April 2017 (JAMA) [2, 11]. In this study, incomplete TME laparoscopic group was found to be 13.2% and 10.9% in the open group. The findings show that the risk of incomplete TME is higher in the laparoscopic group. In the multidisciplinary study conducted in Japan in September 2017, laparoscopic TME was recommended to be used successfully in the II and III stage pancreatic cancer [3, 4, 6]. Thus, literature research shows that in the treatment rectum cancer the question of laparoscopic or open TME implementation is controversial [7, 8, 9]. In the present article we have tried to describe the results of laparoscopic and open TME in the treatment of rectum cancer.

Material and Methods of Research

The study involved 103 patients who had been diagnosed with colon cancer diagnosis in the ELMED private medical center. Patients are divided into 2 groups:

- Laparoscopic group - 47 patients; 2) open group - 56 patients. Patients were classified for age and sex, stage and place of disease, as well as the frequency of illness, radiochemical therapy schemes, the structure of surgical interventions, and the morphological properties of the derivative. Patients' age ranged from 20 to 70; 57 of them were female and 46 were men.

Table 1. *Distribution of patients according to age and sex*

Age	LTME n=47				ATME n=56				P
	male	female	male	female	male	female	male	female	
	M	M	%	%	M	M	%	%	
20-29	1	-	5	-	-	1	-	3.3	
30-39	2	1	10	3.7	1	2	7.7	20	
40-49	4	5	20	18.5	2	6	26.9	30	
50-59	5	7	25	25.9	7	9	50	33.3	
60-69	7	11	35	40.7	13	10	11.5	6.7	
70>	1	3	5	11.1	3	2			
Total	20	27			26	30			

The distribution of close illnesses is shown in Table 2. Most of the patients were diagnosed with 2 and more close diseases. There was no statistical difference between the groups on the frequency of the illnesses. It should be noted that the close illnesses also affected the choice of the surgical treatment method. Laparoscopic technology has not been used in patients with cardiovascular insufficiency.

Table 2. *Distribution of illnesses due to property of illnesses and its frequency*

Close illnesses	LTME n=47		ATME n=56		P
	M	%	M	%	
Atelosklerosis	13	27.6	16	28.5	
Ischemic heart disease	3	638	4	7.14	
Hypertensive disease	10	21.2	12	21.4	
Neurocircular distension	4	8.51	3	5.35	
Chronic disease of the lungs	9	19.1	11	19.6	
Stomach 12bb diseases	5	10.6	6	10.7	
Gallstone disease	1	2.12	1	1.78	
Kidney disease	3	6.38	2	3.57	
Fibromyoma of childhood	3	6.38	3	5.35	
Cyst of the ovary	7	14.8	6	10.7	
Diabetes	5	10.6	7	12.5	
1-2 degrees of obesity	3	6.38	2	3.57	
Chronic hepatic disease	4	8.51	3	5.35	

We divided the bowel into three part anatomically: bottom flat bowel (0-6m), middle flat bowel (7-12cm) top flat bowel (125m>).

Table 3. *Localization of malignant neoplasms of the flat bowel according to the distance from the anal canal*

Distance from anus	LTME	N=47	ATME	N=56
	M	%	M	%
0-6sm	13	27.7	16	28.6
7-12sm	18	38.3	22	39.3
>12sm	16	34.0	18	32.1
Total	47		56	

The distribution of patients in laparoscopic TME (LTME) and open TME (ATME) groups, depending on the invasion depth of flat gut tumors, was as follows. 5 patients with T1 stage, 21 patients with T2 stage, 65 patients with T3 stage, and 12 patients with T4 stage.

Table 4.*Distribution of patients according to the depth of invasion on both groups*

Depth of invasion	LTME n=47		ATME n=56	
	M	%	M	%
T_1	3	6.38	2	3.6
T_2	11	23.4	10	17.9
T_3	29	61.7	36	64.3
T_4	4	8.5	8	14.3
Total	47		56	

Distribution of patients by stages (both groups) is shown in Table 6.

Table 5. *Distribution of patients at LTME and ATME according to the stages*

Stages	LTME n=47		ATME n=56	
	M	%	M	%
I	7	14.8	5	8.9
II	12	25.5	16	28.5
III	28	59.5	35	62.5
Total	47	100	56	100

Note: *contrasting TNM classification by stages: Phase I - T1-2N0M0, II stage T3-4N0M0, III stage T1-4N1-2M0. Patients with remote metastases (M1) were not included in the study. In addition to the classical steps listed in Table 6, we considered it appropriate to classify patients at T3 and T4 levels in a separate subgroup.*

During the pathologic examination of extracted surgical materials, adenocarcinoma with various differentiation was found in most cases.

Table 6. *Morphological structure of flat bowel cancer in LTME and ATME groups*

Morphological features of the tumor	LTME n=47		ATME n=56	
	M	%	M	%
Adenocarcinoma				
High differentiation	13	27.6	16	28.5
Moderate differentiation	27	57.4	31	55.3
Low differentiation	5	10.6	7	12.5
Colloid cancer	1	2.12	1	1.78
Smell-similarcellular cancer	1	2.12	1	1.78
Total	47	100	56	100

Typically 4 troacar holes were used during laparoscopic surgery. 10-th troacar was pulled from the navel section, 5-th and 10 th troacar from the right side of the abdomen and 5 troacar in the left hip section.

In all cases, anastomoses, staplers, and intestinal fragment were removed by Pfanstill cut. In the open surgery, the abdominal cavity was opened with the middle cut and all of the anastomoses are laid with staplers.

RESULT AND DISCUSSION OF RESEARCH

In the study, TME quality, CRB (circular resection boundary) status, tumor regression rate, proximal and distal boundaries of the resection, number of removed lymph nodes, local residual, remote metastasis and survival were analyzed comparatively with laparoscopic and open group. The results of the treatment were studied comparatively in the laparoscopic group as well as in the open group because of the direct dependence of TME quality. High-

quality TME was 18.9 ± 7.3% and 46.4 ± 6.7% according to laparoscopic and open groups, however,31.9 ± 6.8%; 19.1 ± 5.7% and 32.1 ± 6.2%, 21.4 ± 5.5%respectively average and low-quality TME It is obvious from the analysis of figures that there was no significant difference between the laparoscopic and open groups in our patient groups in terms of TME's statistical significance.

Table 7.*Comparative analysis of some indicators among patients operated from rectum cancer with laparoscopic and open TME*

İndicator		Laparoscopic	Open	P
		n (P±mp%) / M (min – max)	n (P±mp%) / M (min – max)	
TME quality	High quality	23 (48,9±7,3%)	26 (46,4±6,7%)	0,952
	Average quality	15 (31,9±6,8%)	18 (32,1±6,2%)	
	Low quality	9 (19,1±5,7%)	12 (21,4±5,5%)	
CRB positiviness	High $^1/_3$	2/13 (15,4±10,0%)	2/16 (12,5±8,3%)	0,751
	Average $^1/_3$	3/18 (16,7±8,8%)	3/22 (13,6±7,3%)	0,859
	Low $^1/_3$	3/16 (18,8±9,8%)	3/18 (16,7±8,8%)	0,771
CRB median	High $^1/_3$	1,3 (0,7-2,0)	1,2 (0,6-1,8)	0,259
	Average $^1/_3$	1,4 (0,6-2,1)	1,2 (0,7-1,9)	0,126
	Low $^1/_3$	1,1 (0,5-1,6)	1,2 (0,4-1,8)	0,214
Regression degree of tumor	1	9 (19,1±5,7%)	13 (23,2±5,6%)	0,925
	2	24 (51,1±7,3%)	25 (44,6±6,6%)	
	3	8 (17,0±5,5%)	10 (17,9±5,1%)	
	4	6 (12,8±4,9%)	8 (14,3±4,7%)	
Resection boundary (proximal)	High $^1/_3$	12 (7,0-17,0)	14 (10,5-22,5)	0,529
	Average $^1/_3$	17,5 (11,5-22,7)	18,0 (13,5-25,7)	0,185
	Low $^1/_3$	22,2 (16,5-26,8)	24,2 (18,0-28,5)	0,221
Resection boundary (distal)	High $^1/_3$	5,5 (4,5-6,5)	5,6 (4,6-6,8)	0,852
	Average $^1/_3$	3,6 (2,8-4,7)	3,8 (3,0-5,5)	0,106
	Low $^1/_3$	1,9 (1,0-3,0)	2,0 (1,2-3,5)	0,174
Extracted lymph nodes		14,8 (10-19,0)	15,2 (12-22)	0,157
Local residual		6/47 (12,7%)	6/56 (10,7%)	
Distant metastasis		3/47 (6,3%)	4/56 (7,1 %)	
Survival		36/47 (76,5%0	44/56 (78,5%)	

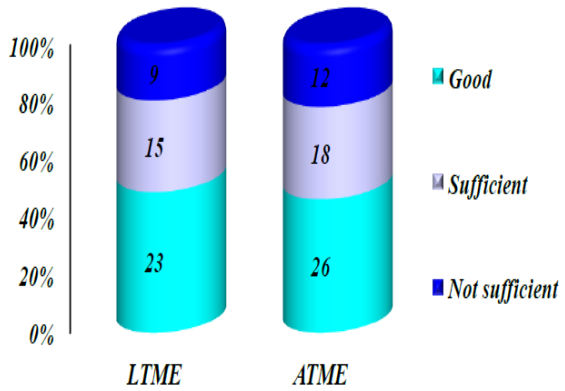

Diagram1. *Comparative study of TME quality, based on the dependence of rectum cancer's stage*

Diagram 3 shows that the quality of TME remains high in the laparoscopic group, as well as open group in I stage. II, especially in III stage, the TME quality also diminishes on both the disease because, illness gets more progressive and the depth of invasion becomes greater. The possibility of local recurrences may be increased in patients related to poor quality of TME.

CRB is less positive in open operations in terms of its status. However, this difference is not statistically straightforward. Thus, there is no significant difference between laparoscopic and open groups in the term of CRB status. As shown in diagram 4, among patients who included into laparoscopic group, 15 (31.9%) had CRB positive and 32 (68.1%) negative. In the open group, the relevant indicator was positive in 19 patients (33.9%) and negative in 37 patients (66.1%). The comparative analysis of figures shows that there is no significant difference between the laparoscopic and open group in terms of CRB status. Another important fact comes from the analysis of Diagram 4. 6 (40%) of 15 patients had SRS positive despite TME's high quality in the noted laparoscopic group. It is believed to be due to

the invasion depth of tumor, the tumor deposits and the closeness of metastatic nodes to the mesorectal fascia. This case was also found in open operated patients. CRB was positive in 9 (47.3%) of 19 patients. All of these patients have high quality TME. It turns out that no surgery operated with high-precision can be a major argument in the treatment of the disease.

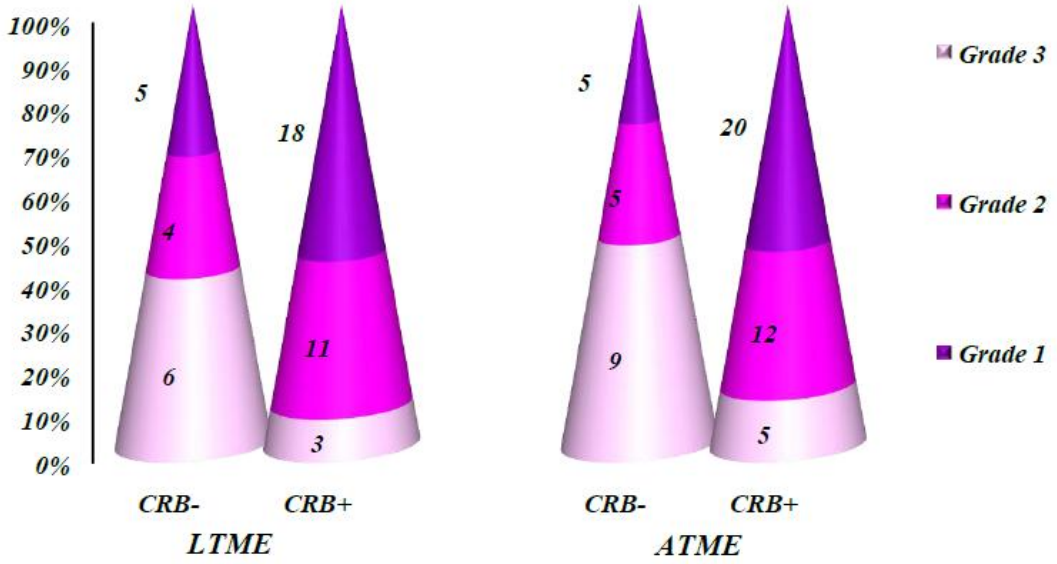

Diagram 4. *Comparative study of CRB status in laparoscopic and open group patients*

The multidisciplinary approach, the understanding of the biological nature of the disease, and the more accurate knowledge about involved mechanisms are of exceptional importance in the prognostic point of view. In this regard, it will be very important to investigate the effects of tumor spread, tumor deposits, tumor embols and dependence of metastatic lymph nodes on TME quality on both laparoscopic open surgery group.

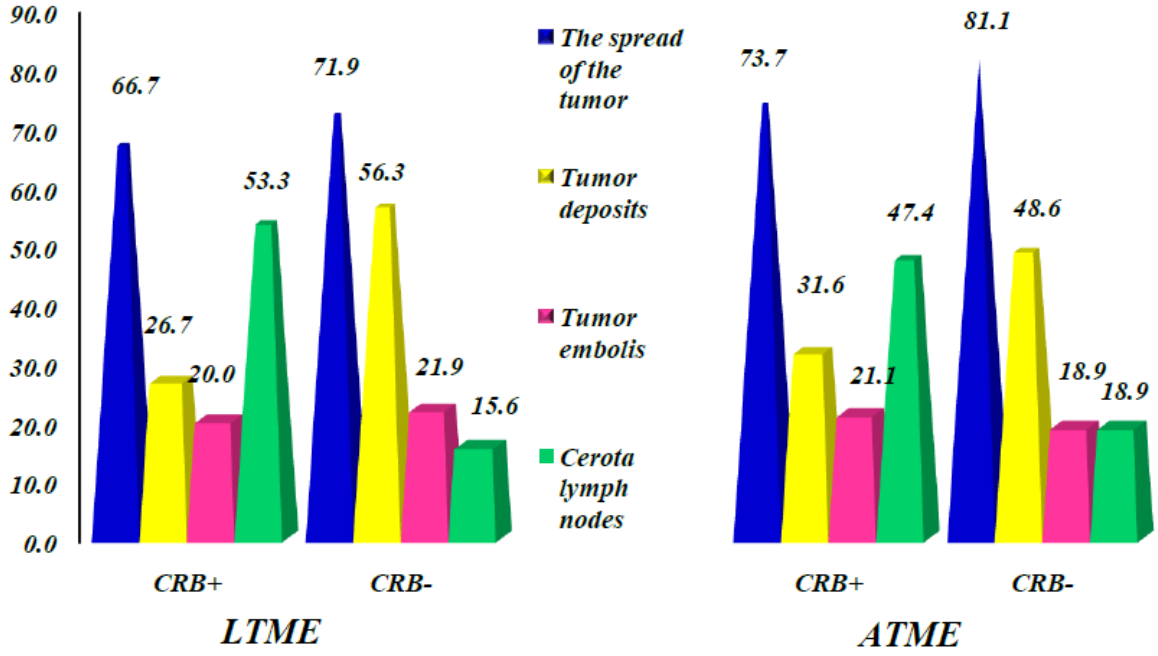

Diagram5. *Study of CRB status in laparoscopic and open group, depending on the biological characteristics of the tumor*

Observations show that the positivity of the CRB is affected commonly by tumor spread and metastatic lymph nodes, however, the tumor deposits and tumor embolisms' influence are rarely. This case was recorded both in the laparoscopic group and the open group. Patients

with CRB positive was 66.7% in laparoscopic group and 73.7% in open group, metastatic lesions accordingly, 53.3%, and 47.4%, tumor embols and deposits 26.7%, 20% and 31.6%,21.1%. Although, patients with negative CRB was 71.9% in the laparoscopic group and 81.1% in the open group. All of these patients belonged $T_1T_2T_3$ stage. Despite the spread of tumor in mechorectal tissue, the mesorectal fascia was not included in the tumor process (surgical clearance was 1mm). In the laparoscopic group, 56.3% had tumor deposits, 21.9% tumor embolies and 15.6% metastatic lymph nodes. In the open group, 48.6% tumor deposits, 18.9% tumor emboli and 18.9% metastatic lymph nodes were identified. Thus, in terms of CRB status, differences were found depending on the biological properties of the tumor, and another significant difference were not found between the groups.CRB median had been found to have originally changed in the laparoscopic and open group depending on location of tumor, but the difference was not significant. In the laparoscopic group, the CRB median was 1.3; 1.4; 1.1in the upper, middle and lower rectal cancers while in the open group this indicator was 1.2 for all types. The comparative study of the proximal and distal boundaries of the resection in both laparoscopic and open groups is particularly important for oncology. In the laparoscopic group, the proximal border of the resection was 12 cm in the upper derivatives of the rectum, 17.5 cm for middle derivatives and 22.2 cm in the lower derivatives.

The corresponding indicator was 14 cm for upper derivatives, 18 cm for middle derivatives and 24.2 cm for lower derivatives. In all cases, the observed difference between the groups was not statistically accurate (P = 0.529, P = 0.185, P = 0.221).

While some differences were observed within the group, in terms of the resection' proximal boundary no significant difference were not found.

The distal border of the resection was 5.5 cm in the laparoscopic group for the upper derivatives of therectum, 3.6 cm for the middle derivatives, and 1.9 cm for the lower derivatives. Relevant indicators were 5.6 cm for upper derivatives,3.8 cm for middle derivatives, and 2 cm for lower derivatives. In all three localizations,there were no statistically significant differences within the groups when between the groups some disparities were found. (P = 0.852; P = 0.106, P = 0.174).

It is of great importance to study the number of removed lymph nodes in both laparoscopic and open group. The number of lymph nodes in the laparoscopic group was 14.8 (10-19.0) and 15.2 (12-22) in the open group. The difference between groups is not statistically significant (P = 0.157). It was not possible to find a statistically significant difference between laparoscopic and open group during comparative study of remote results. Local residual was found in 6 (12.7%) patients included in laparoscopic group, 6 (10.7%) patients in the open group. As you can see, the difference between the groups is statistically insignificant. Long metastasis was observed in the laparoscopic group by 6.3% and in the open group by 7.1%. During the 36-month follow-up, survival were recorded for 76.5% laparoscopic group and 78.5% for open group.

RESULTS

- There is no statistically significant difference between laparoscopic and open group in the terms of TME quality (P = 0.952).
- During the laparoscopic and open surgery TME, CRB status does not differ depending on the location of derivation (P = 0.751, P = 0.859, P = 0.771).
- Although, CRB median differed from each other in upper and lower extremities, there was no statistically significant difference between laparoscopic and open groups (P = 0.259, P = 0.126, P = 0.214).
- The proximal and distal boundaries of the resection were the same in both groups (P = 0.529, P = 0.185, P = 0.221, P = 0.852, P = 0.106, P = 0.174).
- The number of removed lymph nodes in the two groups was expressed in close numbers. (14.8 and 15.2).
- Comparative analysis of long-term outcomes (local residual, remote metastatic survival) revealed that there were no statistically significant differences between open and laparoscopic groups.
- There was no significant difference between the laparoscopic and open groups (P = 0.925) according to the regression rate of the tumor (1, 2, 3, 4 degree).

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