Medical University " Prof. Dr. Paraskev Stoyanov " Varna

Faculty of Medicine

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EFFICACY AND SAFETY OF LAPAROSCOPIC COLORECTAL RESECTIONS. COMPARATIVE ANALYSIS OF RESULTS WITH OPEN SURGERY. RISK ASSESSMENT AND METHODS FOR IMPROVEMENT OF PERIOPERATIVE COMPLICATIONS

ABSTRACT

on

Dissertation work

for the acquisition of a scientific degree "Doctor of Sciences"

Varna. 2024

The dissertation work of Assoc. Dr. Veselin Marinov Marinov PhD is presented in 205 pages. Contains 34 tables and 77 figures. The bibliography includes 280 literary sources, of which 30 in Cyrillic and 250 in Latin. In the bibliographic reference, the same are arranged in alphabetical order.

The dissertation work is scheduled for public presentation by the extended collegium of the Department of General and Operative Surgery at the Medical University " Prof Dr. Paraskev Stoyanov" Varna

The public presentation will take place on 21.06.2024.

INTRODUCTION

Colorectal pathology requiring surgical resections of colon and rectum in different volumes is a daily occurrence nowadays and has a tendency to increase. The main indications for surgery are colorectal cancer and complicated diverticulosis . Both diseases are age-related and their frequency increases steadily, parallel to the increase in average life expectancy.

From the first reports of performed laparoscopic colon resections in the early 1990s, there is a stable trend of displacement of open surgery by minimally invasive techniques. The surgical approach has proven benefits – minimal surgical tissue trauma, less pain and rapid patient recovery. Laparoscopic equipment itself , surgical robotic consoles, energy sources are constantly improving, offering a rich arsenal in the hands of the modern surgeon to perform minimally invasive operations in all areas of surgery. Minimally invasive colorectal surgery is perhaps the fastest growing field of visceral surgery. Today, it is the "gold standard" and the method of first choice in many surgical centers. However, there are many controversial points regarding the specific surgical complications in the postoperative period, the indications for locally advanced CRC, the risks associated with comorbid , obese, elderly patients, the ways to optimize the results during the training of the surgeon. It is extremely important to assess the risk factors for the occurrence of intra- and postoperative complications and the need for conversion in the course of a complicated minimaly invasive surgery. It is necessary to assess the benefits and risks for the patient in the Bulgarian surgical practice and to define evidence-based recommendations.

METHODOLOGY AND DESIGN OF THE DISSERTATION RESEARCH

To perform a comparative analysis of perioperative indicators between groups of patients with planned laparoscopic colorectal resections , open colorectal resections , converted patients, evaluating the effectiveness and safety of the laparoscopic approach, defining personal criteria for the surgical approach, creating a model for the prediction of the risk of complications and conversion, and defining methods for the reduction of perioperative complications.

To achieve the goal, the following **TASKS are defined:**

Study design – retrospective analysis over 12 years period – January 2010 – December 2021. Clinic for Hepato-Billiary, Pancreatic and General Surgery. Acibadem City Clinic UMBAL Tokuda" EAD

Basis of the study – entirely own experience in colorectal resections - all patients in the study were operated by one lead surgeon.

Inclusion criteria – All colorectal resections for the specified period with the exception of:

bypass

Responding to the criteria for inclusion in the specified period, I operated on 285 patients, divided into the following groups:

- Open resections group – 102 patients
- Laparoscopic resections group – 152 patients
- Conversions – 31 patients
- A subset of palliative colorectal resections – 17 patients

During the course of diagnosis, operative treatment and postoperative monitoring, the following methods were used

- Abdomen x-ray
  ultrasound

- MRI
- PET-CT

Материал и методология

Data were entered and processed with the statistical packages IBM SPSS Statistics 25.0. and MedCalc Version 19.6.3., as well as Office Excell 2021. The level of significance at which the null hypothesis is rejected was $p<0.05$.

The following methods were applied:

1. ***Descriptive analysis*** – the frequency distribution of the considered signs is presented in tabular form.
2. ***Graphical analysis*** – for visualization of the obtained results.
3. ***Analysis of Variance –*** calculating estimates of central tendency and dispersion.
4. ***Comparing Relative Shares*** .
5. ***Fisher-Freeman-Halton exact test, Fisher's exact test and χ^2 -*** to test hypotheses about the presence of dependence between categorical variables.
6. ***Kolmogorov -Smirnov and Shapiro- Wilk test*** – to check the distribution for normality.
7. ***One-factor analysis of variance (One way ANOVA)*** – to test hypotheses about a difference between the arithmetic means of several independent samples.
8. ***Student 's t-test*** - for testing hypotheses about the difference between the arithmetic means of two independent samples.
9. ***Kruskal -Wallis test*** – for testing hypotheses of difference between several independent samples.
10. ***Non-parametric Mann-Whitney test*** - for testing hypotheses about a difference between two independent samples.

11. ***ROC curve*** – for determining threshold values for quantitative variables.

12. ***Binary logistic regression analysis*** – for quantitative assessment of the influence of the studied factors.

13. *Criteria for validation of screening tests .*

to assess ***the validity*** of the screening (diagnostic) test [1]:

- Sensitivity;
- Specificity;
- Positive predictive value;
- Negative predictive value;
- Accuracy (% of correct answers).

Possible test results

Test results	**With an illness**	**No disease**	**Total**
Positive	a true positives	b false positives	a+b
Negative	c false negatives	d true negatives	c+d
Total	a+c	b+d	a+b+c+d

Sensitivity represents the ability of the test to detect individuals with a disease . It is measured by the probability of a *positive* test among those screened *sick* persons:

$$Se = \frac{a}{a+c}$$

Specificity characterizes the test 's ability to detect healthy individuals. It is measured by the probability of a *negative* test in those screened *healthy* individuals:

$$Sp = \frac{d}{b+d}$$

The positive predictive value (Positive predictive value) of the test is measured by the probability of *the presence of a disease* in persons with *a positive test* :

1. E. Shipkovenska, L. Georgieva, G. Genchev Prevention of diseases, in "Applied epidemiology and evidence-based medicine". Sofia, Delphi 2002, 121-138. (29) .

$$PV = \frac{a}{a+b}$$

The negative predictive value (Negative predictive value) of the test is measured by the probability of *absence of disease* in persons with *a negative test* :

$$NV = \frac{d}{c+d}$$

Accuracy – relative share of correct answers:

$$Ac = \frac{a+d}{a+b+c+d}$$

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To achieve the set goal and fulfill the set tasks, we performed a comparative analysis of the main groups of laparoscopic colorectal resections , open colorectal resections and converted patients. The patient groups were analyzed according to the following parameters:

- G

- B
- **M** Weight categorization – underweight /normal, overweight, obesity

  I

  ASA

- Perioperative morbidity – specific, non-specific

On the reliability of contrast-enhanced computed tomography in terms of assessing the local status of colorectal disease and, in particular, the preoperative assessment of the local T status in oncological cases, we analyzed the sensitivity and specificity of the methodology. Only the results of the pre-operative examinations carried out at ACK UMBAL "Tokuda" EAD were analyzed to avoid differences in the technical options of computer tomography equipment and the qualification of imaging specialists.

Perioperative parameters of laparoscopic resections were analyzed over time until reaching a plateau – a “learning curve”.

The perioperative results in a subgroup of patients who underwent palliative laparoscopic surgery were analyzed.

A study of 285 patients with colorectal resections was carried out in the period 2010-2021 . The studied clinical contingent had an average age of 66.59 ±11.38 years in the range of 31 – 93 years. Of the study participants, 163 (57.2 %) were male and 122 (42.8%) were female (Fig. 1).

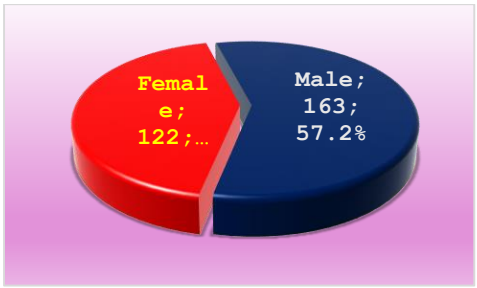

Figure 1 : Frequency distribution of the studied contingent by gender

The age group with the largest number for men is 60-69 years , followed by 70-79 years old , and with the smallest one – 30-39 years . For women, the largest number is the age group 60-69 years, followed by 70-79 years old, and the smallest one – 30-39 years (fig. 2).

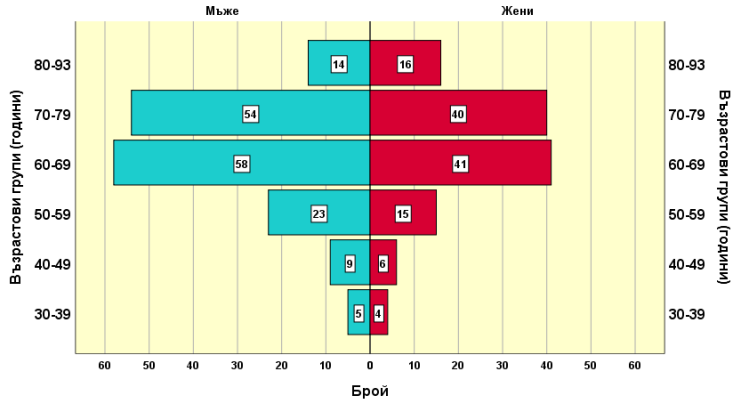

Figure 2 : Distribution of study participants by gender and age group

The comparative analysis of the studied groups by sex, weight, ASA, main diagnosis, age, BMI and number of comorbidities found that the difference between them according to these indicators is statistically insignificant (tables 3 and 4).

Statistical equality according to the known confounding factors of gender and age is a good prerequisite for the correctness of subsequent comparisons.

Indicators	Type of operation								
	Open			Laparoscopic			Conversion		
	n	$\overline{X}$	SD	n	$\overline{X}$	SD	n	$\overline{X}$	SD
Age (years)	112	66.92 [a]	11.51	152	65.76 [a]	11.59	31	69.58 [a]	9.55
BMI (kg/m ^{2})	92	26.78 [a]	4.78	141	26.64 [a]	5.07	25	26.56 [a]	4.68
Number comorbidities	97	1.81 [a]	1.36	152	1.51 [a]	1.28	31	2.00 [a]	1.41

Table 1 : Comparative analysis on the researched groups by age , BMI and number accompanying diseases .

** the same letters on the horizontal lines mean the absence of a significant difference, and the different ones - the presence of one (p < 0.05)*

Indicator	**Type of operation**					
	Open		**Laparoscopic**		**Conversion**	
	n	**%**	**n**	**%**	**n**	**%**
Gender (p=0.141)						
Men	61	59.8	80	52.6	22	71.0

Women	41	40.2	72	47.4	9	29.0
Weight (p=0.320)						
Subnormal / normal	39	42.4	55	39.0	13	50.0
Excessive	29	31.5	58	41.1	6	23.1
Obesity	24	26.1	28	19.9	7	26.9
ASA (p=0.228)						
Completely healthy	6	6.1	17	11.6	4	14.3
Easy expressed systemically disease	30	30.6	54	37.0	8	28.6
Heavy expressed systemically disease	46	46.9	64	43.8	14	50.0
Heavy expressed systemically disease and disordered lively capacity	16	16.3	11	7.5	2	7.1
Basic diagnosis (p=0.491)						
CRC (colorectal cancer) or anal carcinoma	95	93.1	128	84.2	27	87.1
Diverticulitis / complicated diverticulosis	3	2.9	12	7.9	2	6.5
Polyp	3	2.9	7	4.6	1	3.2
Malignancy of the appendix	0	0.0	3	2.0	0	0.0
Other benign disease	1	1.0	2	1.3	1	3.2

Table 2: Comparative analysis of the studied groups by sex, weight, ASA and main diagnosis

Indicator	**Type of operation**					
	Open		Laparoscopic		Conversion	
	n	%	n	%	n	%
Localization						

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Cecum , appendix	9	8.8 [a]	18	11.8 [a]	3	9.7 [a]
Ascendent colon	9	8.8 [a]	22	14.5 [a]	2	6.5 [a]
Right flexure	5	4.9 [a]	12	7.9 [a]	1	3.2 [a]
Transverse colon	4	3.9 [a]	7	4.6 [a]	4	12.9 [a]
Left flexure	6	5.9 [a]	3	2.0 [a]	1	3.2 [a]
Descendent colon	3	2.9 [a]	8	5.3 [a]	1	3.2 [a]
Sigma	22	21.6 [a]	46	30.3 [a]	7	22.6 [a]
Rectum	39	38.2 [a]	32	21.1 [BC]	11	35.5 [ac]
Anus	1	1.0 [a]	1	0.7 [a]	0	0.0 [a]
Synchronous tumor	4	3.9 [a]	3	2.0 [a]	1	3.2 [a]
Type operation						
Right hemicolectomy	26	25.5 [a]	53	34.9 [a]	8	25.8 [a]
Sigmoid resection	19	18.6 [a]	44	28.9 [a]	4	12.9 [a]
RRA+TSME	20	19.6 [a]	18	11.8 [a]	6	19.4 [a]
RRA+TME	10	9.8 [a]	11	7.2 [a]	3	9.7 [a]
Miles	8	7.8 [a]	4	2.6 [a]	2	6.5 [a]
Left hemicolectomy	11	10.8 [a]	14	9.2 [a]	3	9.7 [a]
Hartmann	3	2.9 [a]	0	0.0 [a]	2	6.5 [a]
Proctocolectomy	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]
Synchronous resection	4	3.9 [a]	2	1.3 [a]	2	6.5 [a]
Partial resection , suture	0	0.0 [a]	2	1.3 [a]	1	3.2 [a]
Resection of transversum	0	0.0 [a]	2	1.3 [a]	0	0.0 [a]
Abdomino-transanal resection	0	0.0 [a]	2	1.3 [a]	0	0.0 [a]

Table 3: Comparative analysis of the studied groups by location and type of operation

The analysis of the frequency distribution of the preoperative indicators by patient groups shows a lack of significant differences, which is a good indicator of the lack of preoperative selection of patients and a prerequisite for the adequacy of the obtained results.

Right hemicolectomy is one of the most frequently performed laparoscopically resections in the present study. The indications are shown on table. 4.

Diagnosis	Number

CRC	45
Adenoma of the colon	4
Hemorrhagic diverticulosis	1
Perforative diverticulitis	1
NET of the appendix	1
Carcinoma of the appendix	1
Mucocele of the appendix	1
Total	54

Table 4 Pathology in laparoscopic right hemicolectomies

The position of the trocars is situated in 2 different ways depending on anatomical features and the localization of the pathological process.

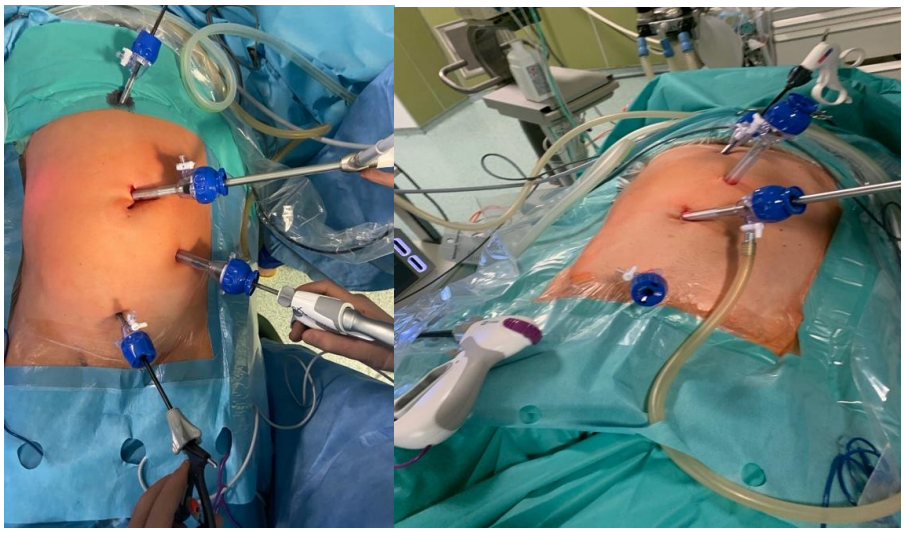

Fig. 3. Different positions of the working trocars in right hemicolectomy

We support a stepwise medial-to-lateral dissection approach that includes identification of the superior mesenteric vein, paramesenteric dissection cranially with identification of the ileo-colic vessels, which we ligate at the confluence separately. Retroperitoneal dissection followed with identification of the duodenum and the right ureter. Subsequent lateral mobilization of the right hemicolon. The last step in the dissection practice is the ligation of the right colic vessels and completion of the lymphadenectomy in regions 222 r,i . At this piont, dissection practice I describe differs from some recommendations in the literature for completion of the lymphadenectomy. The described hybrid technique is associated with minimizing the risk of damage to the right gastro-epiploic vessels and pancreas.

Fig.4. Lymphadenectomy in region 222 r .

This is one of the less frequently performed surgical interventions, which has its own specificities. The total number of laparoscopic left hemicolectomies in the study is 14.
We recomend lateral dissection approach, which is motivated by the fact that in locally advanced tumors in the area of distal transversum and left flexure of the colon, there may be infiltration to the splenic hilus , the posterior gastric wall, or the pancreas. In these cases, with a medial approach, this fact may be recognized late in the course of the dissection and leads to increased risk of intraoperative complications or conversion.

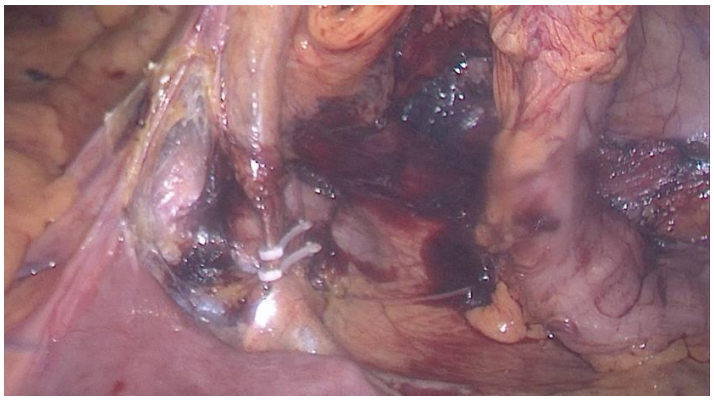

Fig. 5. Lymphadenectomy D2 in left colectomy . Ligated left colic vessels

Laparoscopic resections of the sigmoid and proximal 1/3 of the rectum are the most frequently performed in the study. This is related to the prevalence of the frequency of left-sided localization of CRC.
The position of the patient on the operating table for sigmoid and rectal resections with inserted trocars is shown in Fig. 5

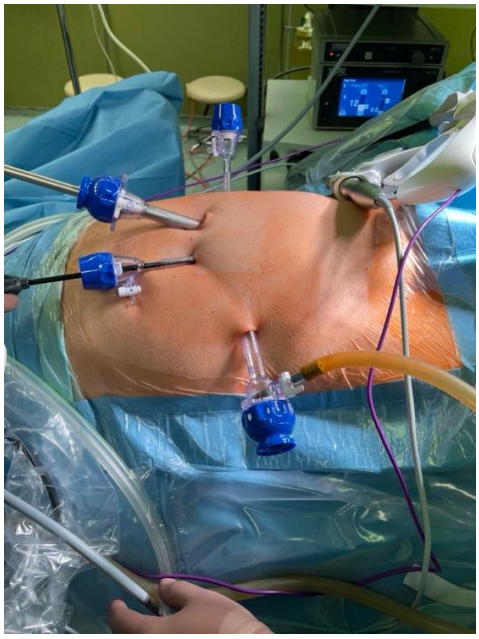

Fig. 5. Position of the patient and trocars during laparoscopic surgery sigmoid and rectal resection

When performing sigmoid and rectal resections , a medial-to-lateral dissection approach is used. It starts with peritoneal incision over the left common iliac artery and cranial parailiac and paraaortic dissection to identify the inferior mesenteric artery. Depending on the localization of CRC, we use **a selective approach** to the artery. When the tumor is localized in the sigmoid area , we ligate the DMA in the area of confluence by performing a lymphadenectomy D3 excision of lymph nodes in region 253. Fig. 6

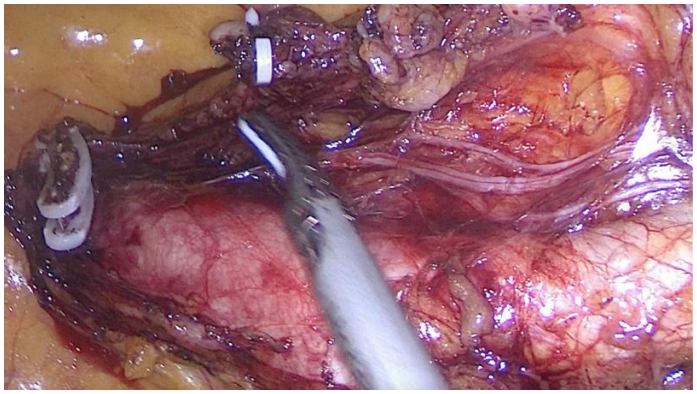

Fig. 6. Ligated DMA with lymgadenectomy D3.

For rectal localizations, we perform lymphadenectomy D2 with preservation of the left colic vessels. This is extremely important for preservation of large bowel wall vitality and decreasing of risk for anastomotic leakage. Fig. 7.

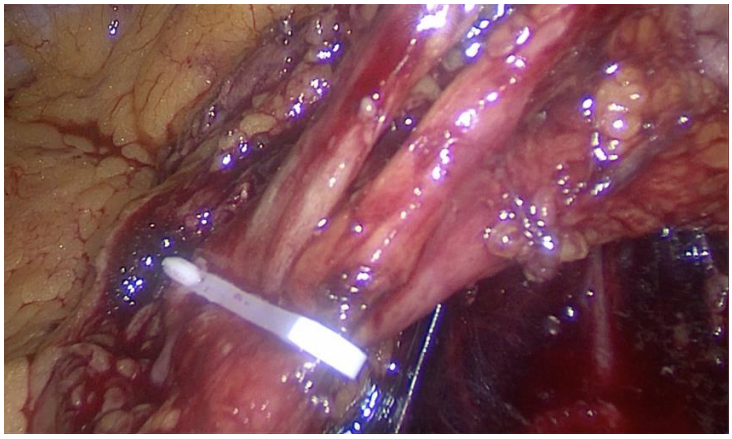

Fig. 7. High ligation with preservation of the left colic vessels

In the stepwise approach, identification of the left ureter follows. Distal identification of the presacral dissection plan (holly plane) follows. Then we perform a lateral dissection of the left colon .
We support **a selective approach in the mobilization of the left** colic **flexure .** Usually, with a good length of the sigmoid colon, an adequately performed retroperitoneal and lymphatic dissection does not require additional mobilization.

At high rectal resections we prefer to perform a tumor-specific mesorectal TSME excision . It is associated with achieving negative distal and circumferential resection line while preserving the blood supply to the residual rectum, which is extremely important when constructing the colo-rectal anastomosis Fig. 8

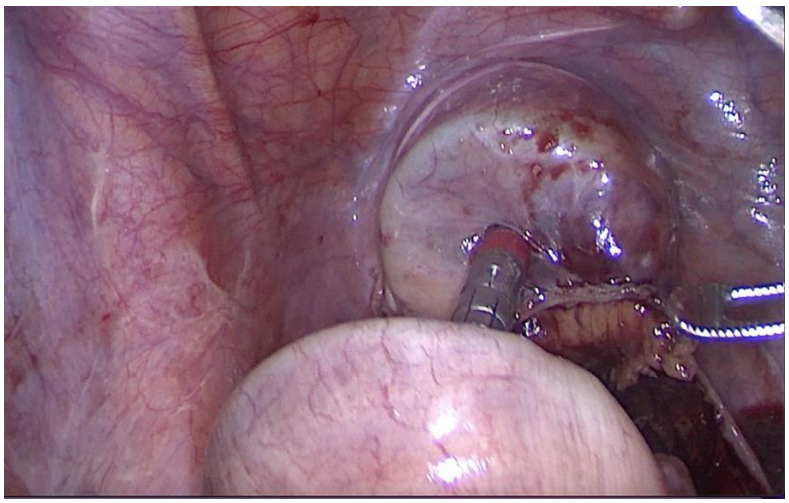

Fig. 8. Construction of a high colo-rectal anastomosis transanally with a circular stapler .

It is extremely important, when constructing the anastomosis, to ensure sufficient length of the colon, the proximal end of which should fit freely to the rectal stump before anastomosis . To reduce insufficiency in high colo-rectal anastomoses, as a routine measure we perform **a strengthening suture of the anastomosis** with a continuous thread type V-Lock 3/0 V20 fig. 9.

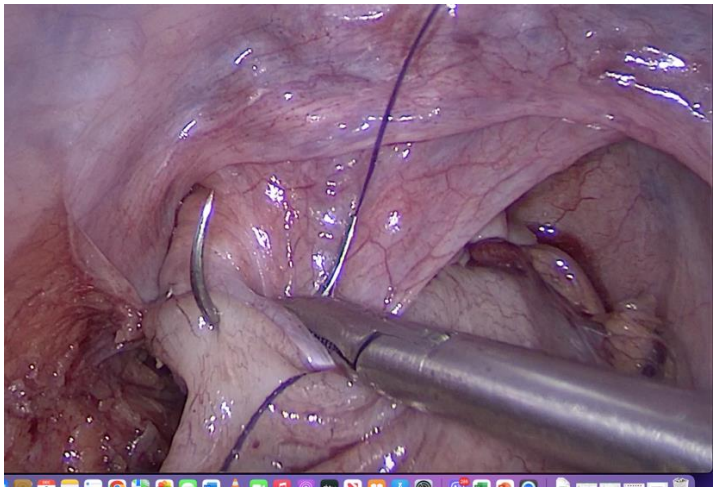

Fig. 9. Applying a strengthening suture to the high colo-rectal anastomosis .

In all cases of carcinoma in the region of the middle and distal third of the rectum, we prefer to perform a volume resection with a total mesorectal excision from requirements to achieve negative resection lines. In these cases, as a routine practice, we derive **a protective one ileostomy** for a period of 3 months. Restitution of the passage is performed after a mandatory lower endoscopy and verification of the tightness and patency of the anastomosis .

By the end of the study period, 12 robotic colorectal surgeries were performed resections . The same are described in table. 5.

Type of robotic surgery	Number
RRA+TME+ protective stoma	4
Synchronous right colectomy + sigmoid resection	1
Abdomino -transanal + protective stoma	2
RRA+TSME and primary anastomosis	1
Miles	1
Conversions	3
Total	12

Table 5. Types of robotic operations.

In robotic operations, we observe the following rules: The position of the patient on the operating table is gynecological. Deep Trendelenburg and moderate left lithotomy position. Docking of the robotic system depends on the model and can be lateral or between the patient's legs. We routinely use 4 robotic arms and one 12mm assist port through which a linear endoscope can be inserted . From the set of energy sources, we prefer a dissection hook and bipolar forceps, which ensure reliable dissection and hemostasis . The approach is medial-to-lateral and follows the steps of a routine laparoscopic approach resection . The robotic system, however, gives extremely good 3D visualization in the operative field. Good depth is achieved with the robotic instruments and the possibility of surgical dissection in several directions, which gives the system an advantage over conventional laparoscopy . The real advantage of the robotic system is in surgical dissection low in the pelvis. In practice, the

internal anal sphincter can be reached , making it possible to perform ultra-low and abdomino -transanal resections of the rectum. Fig. 9.

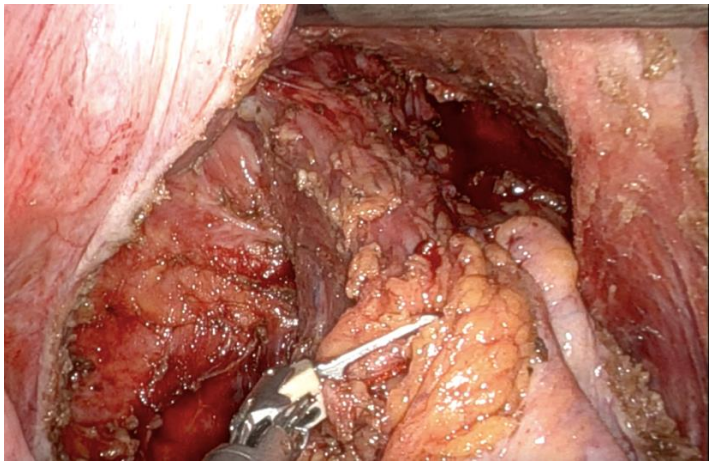

Fig. 9. Complete mobilization of the rectum with TME to the level of the pelvic floor

In the present study, there was a distinct subgroup of 17 patients who underwent palliative colon resections . Technically, the resection technique does not differ significantly from that of radical resections . Adherence to dissection plans is of utmost importance , which is associated with a lower risk of iatrogenic damage and bleeding. Extended lymphadenectomies are not indicated . For local stage T4a, we follow the same resection rules. Resections were mainly performed on the occasion of a symptomatic primary tumor. The type of resections performed is indicated on the table. 6.

Type of palliative surgery	Number
Resection of the sigmoid	9
Left hemicolectomy	5
Right hemicolectomy	2
RRA + TSME	1
Total	17

Table 6. Type of performed palliative colorectal resections .

No patients died in the perioperative period. No perioperative complications were registrated. There were no recorded complications related to excisional liver biopsies during colorectal resections . The perioperative data for presented in the table. 7.

Indicator	Result
Mortality	0%
Morbidity	0%
Stay in Intensive Care	0.05 days
Hemotransfusions	0.17E
Median hospital stay	5.35 days

Table 7. Perioperative data in the palliative resection group .

As can be seen, perioperative outcomes in this group were associated with a short hospital stay and no complications.
On the one hand, palliative resections are associated with prevention of complications related to the primary tumor. On the other hand, the quick recovery and short hospital stay do not delay the initiation of chemotherapy, which is extremely important for these patients. Based on the results, palliative resections may be recommended as a routine procedure.

Complicated diverticulosis is the second most common reason for colorectal surgery resections in the study group. The laparoscopic ones have the largest relative share resections – 12. In 2 patients, it was necessary to perform a conversion during the operation. Conversion was performed in the first patient with laparoscopic surgery in 2013, who has sigmoid diverticulitis . On the occasion of the same diagnosis and with evidence of massive inflammatory adhesions in the small pelvis, another conversion was performed. The conversion rate in patients with complicated diverticulosis was 14.2%.
Perioperative indicators in laparoscopic resections due to complicated diverticulosis are shown in table. 8

Indicator		Quantitative	
gender	Men	7	
	Women	5	
Age		31 – 78, average 55.5 years	
BMI index average		27.55kg/m2	
Median operative time		139.5 min	
Average blood loss		44.5 ml	
Median hospital stay		5.66 days	
Complications		2	Suppuration
		14.2%	Drainage hemorrhage treated conservatively

Table 8. Perioperative indicators in the laparoscopic group resections

The technical aspects of operations for complicated diverticulosis differ from those for interventions for CRC. The leading complications associated with diverticulosis are spurs of diverticulitis affecting most often the sigmoid . This is associated with the development of severe inflammatory adhesions of the large intestine to the parietal peritoneum, the retroperitoneal space and adjacent organs. In these cases, we prefer a lateral-to-medial

dissection approach, with lateral colonic mobilization being most essential. There are no indications for extended lymphatic dissections.

Evidence-based methods

Evidence-based methods relevant to faster recovery address all three stages of the perioperative period – pre-, intra- and postoperative. The main methods underlying our practice are:

Decreased

nasogastric tubes

The comparative analysis of the studied groups by complications showed that (table 9):

- T
- h A statistically significantly higher relative proportion of patients without complications
  w was observed in the laparoscopic surgery group compared to the other two, whose rates
  r were not statistically different from each other;
  h had a statistically significantly lower percentage in the laparoscopic surgery group
  compared to the other two, whose relative proportions were not statistically different from
  i each other;
- F For the remaining complications, the difference between the three study groups was
  statistically insignificant.

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Complications	Type operation

	Open		Laparoscopic		Conversion	
	n	%	n	%	n	%
Without complications	68	66.7 [a]	131	86.2 [b]	20	64.5 [a]
Wound infection	12	11.8 [a]	5	3.3 [b]	4	12.9 [a]
Postoperative subileus treated conservatively	4	3.9 [a]	5	3.3 [a]	1	3.2 [a]
Insufficiency on the anastomosis without reoperation	3	2.9 [a]	1	0.7 [a]	3	9.7 [a]
Insufficiency on the anastomosis with peritonitis and reoperation	2	2.0 [a]	2	1.3 [a]	1	3.2 [a]
Bleeding from GIT treated conservatively	3	2.9 [a]	1	0.7 [a]	0	0.0 [a]
Kidney insufficiency	2	2.0 [a]	0	0.0 [a]	0	0.0 [a]
Lymphorrhea	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]
Respiratory insufficiency, pulmonary edema	3	2.9 [a]	0	0.0 [a]	0	0.0 [a]
Heart rhythm disorders	2	2.0 [a]	0	0.0 [a]	0	0.0 [a]
Syncope	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]
Postoperative ileus treated with reoperation	0	0.0 [a]	4	2.6 [a]	1	3.2 [a]
Depression	2	2.0 [a]	0	0.0 [a]	0	0.0 [a]
Pleural effusion	2	2.0 [a]	0	0.0 [a]	0	0.0 [a]
Hypertensive crisis	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]
Retention on the urine	1	1.0 [a]	1	0.7 [a]	0	0.0 [a]
DVT	1	1.0 [a]	0	0.0 [a]	1	3.2 [a]
Pulmonary embolism	0	0.0 [a]	1	0.7 [a]	0	0.0 [a]
Wound dehiscence	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]
Perforation of small intestine - reoperation	0	0.0 [a]	1	0.7 [a]	0	0.0 [a]
Stomach dilatation treated conservatively	0	0.0 [a]	2	1.3 [a]	0	0.0 [a]
Postoperative bleeding - reoperation	0	0.0 [a]	1	0.7 [a]	0	0.0 [a]
A lesion of the ureter – reoperation	0	0.0 [a]	0	0.0 [a]	1	3.2 [a]
A lesion of urethra	0	0.0 [a]	0	0.0 [a]	1	3.2 [a]
Bleeding from GIT - reoperation	0	0.0 [a]	0	0.0 [a]	1	3.2 [a]
Acute heart insufficiency	2	2.0 [a]	0	0.0 [a]	0	0.0 [a]
Pneumonia	1	1.0 [a]	0	0.0 [a]	0	0.0 [a]

Table 9 : Comparative analysis on the researched groups by complications

Table 10 shows that the highest frequency of complications was registered in the group of converted patients. In this group, the perioperative morbidity is up to 35.5%. In the group of

open colorectal resections, a total of 44 complications were registered, such as the perioperative one morbidity rate is 33.3%. There was no statistically significant difference between the two study groups. In the laparoscopic group colorectal resections , however, the perioperative morbidity rate is 13.8%. It is statistically less than the morbidity in the other two studied groups. Regarding the structure of perioperative complications, as expected, wound infection is statistically less frequent in laparoscopic operations.

Analyzing the mortality rate and severity of complications by patient groups, it is clear from the table. 10 that the three study groups did not differ statistically in terms of mortality and severity of complications.

Indicator	**Kind operation**					
	Open		Laparoscopic		Conversion	
	n	%	n	%	n	%
Lethality (p=1,000)						
No	100	98.0	150	98.7	31	100.0
Yes	2	2.0	2	1.3	0	0.0
Weight on the complications (Clavien-Dindo) (p =0.330)						
I – degree	10	30.3	5	23.8	2	18.2
II - degree	14	42.4	9	42.9	4	36.4
Grade 3a	2	6.1	0	0.0	1	9.1
Degree 3b	2	6.1	5	23.8	4	36.4
Grade 4a	3	9.1	0	0.0	0	0.0
5th degree	2	6.1	2	9.5	0	0.0

Table 10: Comparative analysis of the studied groups by mortality and severity of complications

It is noteworthy that in patients with grade IIIb , more complications are observed in the group of converted ones, having a statistically significant difference with the others.

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Indicators	Kind operation								
	Open			Laparoscopic			Conversion		
	n	$\overline{X}$	SD	n	$\overline{X}$	SD	n	$\overline{X}$	SD
Flatulence (days)	71	3.59a	0.84	130	2.65b	0.75	28	3.75a	0.89
Defecation (days)	76	4.16a	0.82	130	3.05b	0.83	28	4.29a	1.18
ICU stay (days)	98	0.63a	0.99	149	0.08b	0.39	17	0.41a	0.62
Median Hospital stay (days)	101	7.61a	1.90	152	5.99b	3.30	31	8.58c	2.79
Duration of operation(minutes)	102	158,40a	54.88	152	139.05b	46.06	31	174,19a	47,21
Blood loss (perioperative blood loss in milliliters)	53	150.57a	99.87	152	41.71b	42.79	30	205.00c	88.42
Hemotransfusions (erythrocytes units)	97	1.08a	1.72	152	0.38b	0.95	31	0.94a	1.36
General number lymphonodes with index “ yp ”	12	8.00a	2.41	12	4.83bc	3.30	3	6.00ac	3.61
General number on the complications	102	0.43a	0.68	152	0.16b	0.42	31	0.45a	0.68
Ratio between preoperative / postoperative value on hemoglobin	95	1.06a	0.12	131	1.11bc	0.09	30	1.09ac	0.10
Ratio between preoperative / postoperative value on leukocytes	92	0.68a	0.24	130	0.74bc	0.22	28	0.70ac	0.23
Number lymphatic nodes (extracted in the pathoanatomical preparation)	83	11,11a	5.81	98	13.34b	6.31	24	15.88b	8.44
Number metastatic lymphatic nodes	95	1.56ac	2.25	109	1.08a	1.99	26	3.62bc	6.73
Percent ratio between the general number extracted lymphatic nodes and metastatic ones	89	13.44ac	21.40	105	10,21a	20.06	26	22.78BC	28.60

Table 11: Comparative analysis of the studied groups according to perioperative indicators

** the same letters on the horizontal lines mean the absence of a significant difference, and the different ones - the presence of one ($p < 0.05$)*

The comparative analysis according to the specified criteria is important for evaluating the effectiveness and the safety of the laparoscopic approach compared to the open and conversions.

The results of the table 11 show that in the group of laparoscopic operations there are significantly better results according to the following criteria:

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Sensitivity and specificity in benign diseases and tumors T1-T3	Number	%	Sp
(-) sensitivity; (-) specificity	29	21.5	3.5
(+) sensitivity; (-) specificity	21	15.6	3.1
(+) sensitivity; (+) specificity	85	63.0	4.2
Total	135	100.0	

Table 12: Frequency distribution of patients by percentage of sensitivity and specificity in benign diseases and tumors T1-T3

The table shows that the specificity of the methodology in terms of benign diseases and local status of colon cancer amounts to 63%. The sensitivity, however, is higher and amounts to 78.6% according to the data of the single-center study.

In a different way, however, the possibilities of the methodology for evaluating the local T status of colon cancer appear. Table 24 shows the results regarding the sensitivity of the contrast-enhanced CT to assess the local T4 status .

Sensitivity and specificity at T4	**Number**	**%**	**Sp**
(-) sensitivity; (-) specificity	2	5.3	3.6
(+) sensitivity; (-) specificity	17	44.7	8.1
(+) sensitivity; cT 4, CT T 3, pT 3	10	26.3	7.1
(+) sensitivity; cT4 , CT T4, pT3	6	15.8	5.9
(+) sensitivity; cT4, CT T4, pT4	3	7.9	4.4
Total	38	100.0	0.0

Table 24: Frequency distribution of patients by percentage of sensitivity and specificity at T4 local stage

The overall sensitivity of the method in relation to locally advanced colon carcinoma is 44.7%.

Only in 7.9% of cases there is a coincidence between the pathological diagnosis and the computed tomographic diagnosis . In 15.8% there is a coincidence between the macroscopic finding during the operation cT4 status and the computed tomography . There is a significant dissociation between the intraoperative macroscopic finding, cT4 status, pathologic diagnosis, and contrast-enhanced CT description. Peritumoral inflammation involving adjacent organs and anatomical elements from malignant infiltration is difficult to distinguish both with CT and macroscopically during the operation itself.

In order to identify preoperative factors that may be associated with a greater risk of developing complications in the perioperative period and conversions, we set out to search for a statistical relationship between the following indicators:

- Between age, complications, conversions
- Between comorbidities, complications, conversions
- BMI index, complications, conversions
- Between cT4 and complications, conversions
- Type of operation, complications, conversions
- Multivisceral resections , complications, conversions
- Associated factors complications and conversions

- Time to conversion (early, late) and complications

Table 13: Comparative analysis of patients with and without complications according to gender, PZ, cT4, type of operation, multivisceral resections , associated factors, time to and presence of conversion

Indicators	**Without complications**		**With complications**		**P**
	n	%	n	%	
gender					**0.047**
Men	118	53.9	45	68.2	
Women	101	46.1	21	31.8	
Companions a disease .					**0.013**
No	52	23.9	6	9.7	
Yes	166	76.1	56	90.3	
cT4					0.356
cT4a	52	23.9	6	9.7	
cT4b	166	76.1	56	90.3	
Type operation					0.165
Right hemicolectomy	63	28.8	24	36.4	
Resection on the sigma	57	26.0	10	15.2	
RRA+TSME	33	15.1	11	16.7	
RRA+TME	14	6.4	10	15.2	
Miles	11	5.0	3	4.5	
Left hemicolectomy	24	11.0	4	6.1	
Hartmann	4	1.8	1	1.5	
Proctocolectomy	0	0.0	1	1.5	
Synchronous resection	7	3.2	1	1.5	
Partial resection , suture	3	1.4	0	0.0	
Resection of transversum	1	0.5	1	1.5	
Abdomino-transanal resection	2	0.9	0	0.0	
Multiviscral resections					0.275
Abdominal wall , parietal peritoneum	15	34.1	4	26.7	
Resection on one adjacent organ	16	36.4	5	33.3	
Resection on more from one adjacent organ	3	6.8	1	6,7	
Synchronous resection of the liver	10	22.7	3	20.0	
Resection on adjacent organ + synchronous of the liver	0	0.0	2	13.3	
Associates factors					
Big tumor	9	18.0	19	70.4	**<0.001**
Peritoneal adhesions	24	48.0	10	37.0	0.357
Visceral adiposis	20	40.0	9	33.3	0.565
Time for conversion					0.273
Early	12	60.0	4	36.4	
Late	8	40.0	7	63.6	

Conversion					**0.008**
No	131	86.8	21	65.6	
Yes	20	13.2	11	34.4	

On the table 13 it can be seen that:

- Patients with and without complications differed significantly in the categories of indicators gender, presence of accompanying diseases, associated factors and conversion;
- Those with complications have a significantly higher relative share men, the presence of accompanying diseases, a large tumor and conversion;
- The difference in other indicators is statistically insignificant.

Indicators	**Without complications**			**With complications**			**R**
	n	$\overline{X}$	SD	n	$\overline{X}$	SD	
Age (years)	219	65.88	11.44	66	68.94	10.93	**0.038**
BMI (kg/m ^{2})	199	26,30	4.85	59	27.97	4.94	**0.008**

Table 14: Comparative analysis of patients with and without complications according to age and BMI

- Patients with and without complications differed significantly in age and BMI;
- The higher averages are for those with complications.

In an individual plan n a table. 15 it can be seen that:

- significantly related to the risk of complications;
- The highest risk (about 3.4 times) for the occurrence of complications was the presence of conversion, followed by the presence of comorbidities (about 2.9 times), and the lowest (about 1.8 times) belonging to the male sex

Indicator	**Comparison**	**Individually**				**Group**			
		OR	95% CI		r	OR	95% CI		r
			Lower border	Upper border			Lower border	Upper	

								bord er	
gender	Men - women	1,834	1,025	3,283	**0.041**	2,637	1,010	6,882	**0.048**
Age (years)	≥78 / <78	2,784	1,412	5,489	**0.003**	2,544	0.823	7,866	0.105
BMI (kg/m ^{2})	≥27.17 / <27.17	2,480	1,367	4,500	**0.003**				
Comorbidities	Yes / No	2,924	1,191	7,175	**0.019**				
Conversion	Yes / No	3,431	1,440	8,174	**0.005**	2,396	0.870	6,597	***0.091***

Table 15: Risk ratio and 95% CI of the studied indicators as factors related to the occurrence of postoperative complications

In a group plan

To account for the combined influence of the investigated indicators and eliminate confounding factors, they were entered jointly into the regression equation. After applying the " Backward " procedure conditional ” in the final version of the equation, gender, age and conversion remained. The risk influence of gender increases to about 2.6 times in men compared to women. The highest hazard ratio (about 2.5) was age greater than or equal to 78 years compared to younger, and the lowest hazard ratio for the presence of conversion versus its absence was about 2.4. The percentage of correct answers in this model is 83.7. Age and presence of conversion retain their risk direction but lose statistical significance, most likely due to increased study group size requirements in combined impact assessment. It should also be noted that when the conversion is included in the regression equation, patients with open operations are excluded from the analysis.

In the group of converted patients, 17 patients required intervention on more than one organ/anatomical element due to locally advanced CRC.

Types multivisceral resections are presented in table. 16.

Interventions on more than one organ/anatomical element	Number
En bloc resection + small bowel	4
En bloc resection + small intestine + abdominal wall excision	2
En bloc resection + urinary bladder	2

Synchronous resection of sigmoid + retroperitoneal tumor - histiocytoma	1
Synchronous resection transversum / sigma	1
Right hemicolectomy + excision of kidney fat capsule	2
Abdominal wall resection + excision	2
En bloc resection + small intestine + uterus	1
En bloc resection + small intestine + partial gastrectomy	1
En bloc resection + vaginal excision + adnexectomy	1

Table 16. Types of operations in the group of converted patients .

The performed comparative analysis of patients with and without conversion according to age, BMI, sex, accompanying diseases, cT4, type of operation, multivisceral resections and associated factors (tables 31-32) found that:

- The two studied groups differ statistically reliably only in some of the categories of indicators of type of operation, multivisceral resections and associated factors;
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Indicators	**Without conversion**			**With conversion**			**R**
	n	$\overline{X}$	SD	n	$\overline{X}$	SD	
Age (years)	152	65,76	11.59	31	69.58	9.55	***0.087***
BMI (kg/m ^{2})	141	26.64	5.07	25	26.56	4.68	0.977

Table 17: Comparative analysis of patients with and without conversion according to age and BMI

Indicators	**Without conversion**		**With conversion**		**P**
	n	%	n	%	

gender					***0.075***
Men	80	52.6	22	71.0	
Women	72	47.4	9	29.0	
Companions diseases					***0.094***
No	37	24.3	3	9.7	
Yes	115	75.7	28	90.3	
cT4					***0.071***
cT4a	16	80.0	7	46.7	
cT4b	4	20.0	8	53.3	
Type operation					**0.034**
Right hemicolectomy	53	34.9	8	25.8	0.329
Resection on the sigma	44	28.9	4	12.9	***0.066***
RRA+TSME	18	11.8	6	19.4	0.254
RRA+TME	11	7.2	3	9.7	0.634
Miles	4	2.6	2	6.5	0.266
Left hemicolectomy	14	9.2	3	9.7	0.936
Hartmann	0	0.0	2	6.5	**0.002**
Proctocolectomy	0	0.0	0	0.0	-
Synchronous resection	2	1.3	2	6.5	***0.072***
Partial resection , suture	2	1.3	1	3.2	0.447
Resection on transversum	2	1.3	0	0.0	0.524
Abdomino-transanal resection	2	1.3	0	0.0	0.524
Multivisceral resections					**0.002**
Abdominal wall , parietal peritoneum	7	38.9	2	13.3	0.105
Resection on one adjacent organ	5	27.8	10	66.7	**0.028**
Resection on more from one adjacent organ	0	0.0	3	20.0	***0.050***
Synchronous resection of the liver	6	33.3	0	0.0	**0.015**
Resection on adjacent organ + synchronous of the liver	0	0.0	0	0.0	-
Associates factors					
Big tumor	9	18.0	19	70.4	**<0.001**
Peritoneal adhesions	24	48.0	10	37.0	0.357
Visceral adiposis	20	40.0	9	33.3	0.565

Table 18: Comparative analysis of patients with and without conversion according to gender, comorbidities, cT4, type of operation, multivisceral resections and associated factors

Quantification of potential conversion factors

So far, it has been found that gender, co-morbidities and cT4 could be potential factors for the occurrence of conversion. The raised hypothesis was tested using binary logistic regression analysis.

In an individual plan n a table. 33 it can be seen that:

- significantly related to the risk of conversion. Gender and accompanying diseases have borderline significance (p< 0.1);
- With the highest risk (about 4.6 times) for the occurrence of conversion is the presence of cT4c compared to cT4a, followed by the presence of accompanying diseases (about 3 times), and with the lowest (about 2.2 times) the male gender ;

Indicator	**Comparison**	**Individually**				**Group**			
		OR	95% CI		r	OR	95% CI		r
			Lower border	Upper border			Lower border	Upper border	
gender	Men - women	2,200	0.951	5,088	***0.065***	3,403	0.689	16,796	***0.133***
Comorbidities	Yes / No	3,003	0.863	10,449	***0.084***				
cT4	cT4c/cT4a	4,571	1,027	20,347	**0.046**	5,380	1,088	26,616	**0.039**

Table 19: Risk ratio and 95% CI of the investigated indicators as factors related to the occurrence of conversion

In a group plan

To account for the combined influence of the investigated indicators and eliminate confounding factors, they were entered jointly into the regression equation. After applying the " Backward " procedure conditional ” in the final version of the equation, only gender and cT4 remained. The percentage of correct answers in this model is 68.6. Both factors increase the magnitude of their risk impact. Gender lost the statistical significance of the odds ratio, but this was most likely due to the higher group size requirements when considering the combined effect, and 102 open surgery patients were excluded from the analysis of factors associated with the occurrence of conversion .

One of the tasks of the present study is related to the assessment of the risk associated with the surgeon's experience in laparoscopic surgery colorectal surgery. Therefore, we performed

an analysis of the perioperative results over time from the first colorectal resection . We set the following parameters for research over time:

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The aim of this study is to estimate the number performed laparoscopically colorectal resections until reaching a plateau in the results obtained and to integrate this into a model for preoperative risk assessment and recommendations for the surgical approach.

In fig. 10 and 11 show the dynamics in the ratio of open and laparoscopic operations for the period 2010-2021. The more characteristic moments are the following:

- At the beginning of the period, the operations are only open, and at the end, laparoscopic ones dominate;
- The first laparoscopic operation was performed in 2013, followed by 4 more in 2015;
- The total number of operations until 2014 was 10-11, in 2015 it increased to 20, and then marked an almost permanent increase reaching 53;
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Figure 1 0: Ratio open / laparoscopic operations (number)

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Fig 11: Ratio of open/ laparoscopic operations in percentage

From fig. 12 it is clear that the decline in the relative share of complications compared to the number of operations began already when the open type predominated (2013), and its stabilization within significantly narrower limits (19-35%) when laparoscopic operations predominated (after 2015).

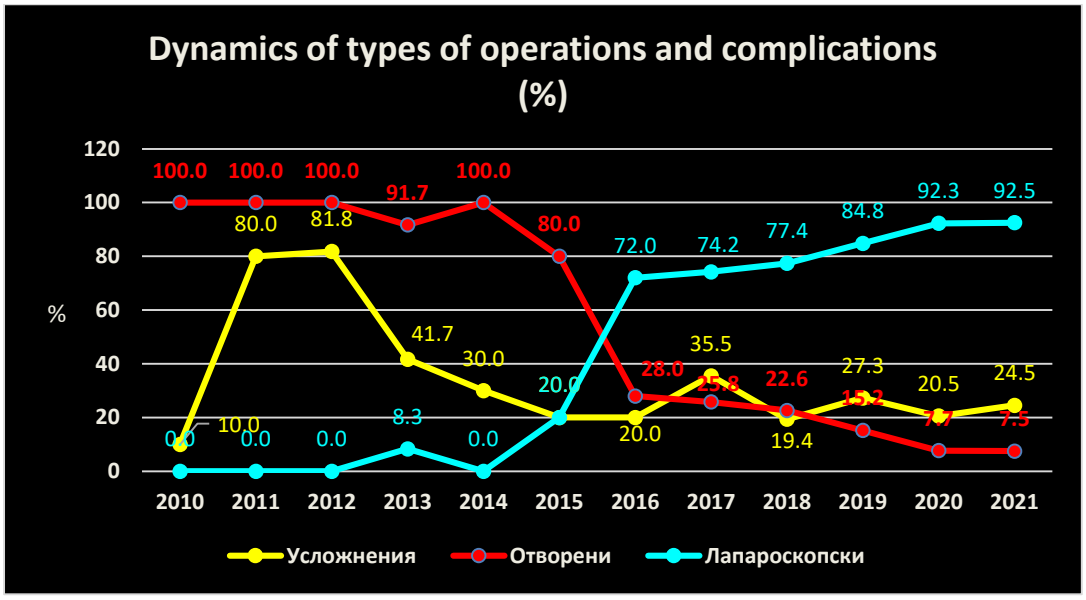

Figure 12 : Dynamics on the species operations and complications (%)

The dynamics of the average hospital stay has a slightly regressive character (Fig. 13). Starting in 2010 with values close to 8 (when open operations prevailed) after the predominance of laparoscopic ones , it settled at a level of about 6.5 days.

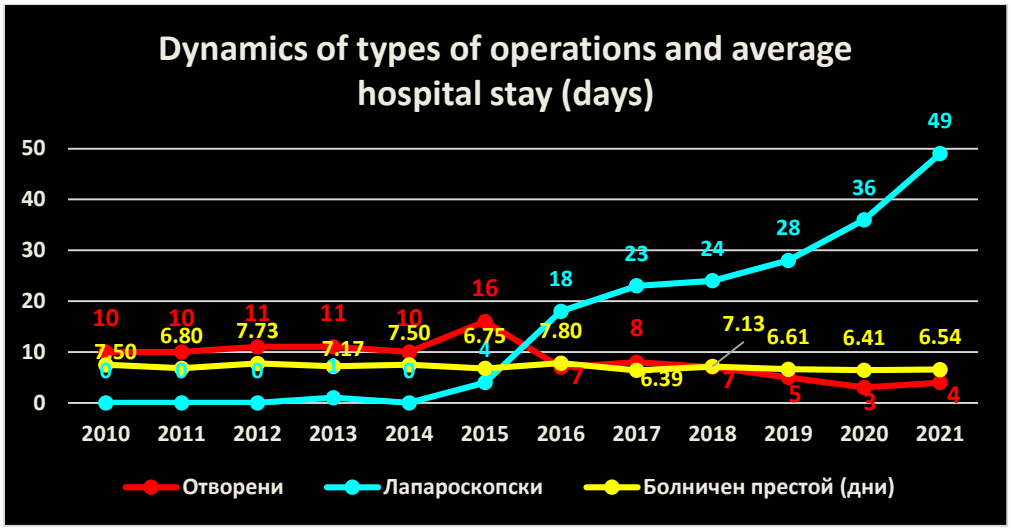

Figure 13: Dynamics of types of operations and average hospital stay (days)

Regarding the dynamics of the average blood loss, we have little data for the beginning of the research period 2010-2015, when the open type of surgery predominates (value 100 ml. for 2012, 167 ml. for 2014 and 135 ml. for 2015), but during mainly the " laparoscopic " period (2016-2021) saw a significant drop to 71 ml. in 2018 and establishing a relatively constant average level of around 71 mln. in the next three years (Fig. 76).

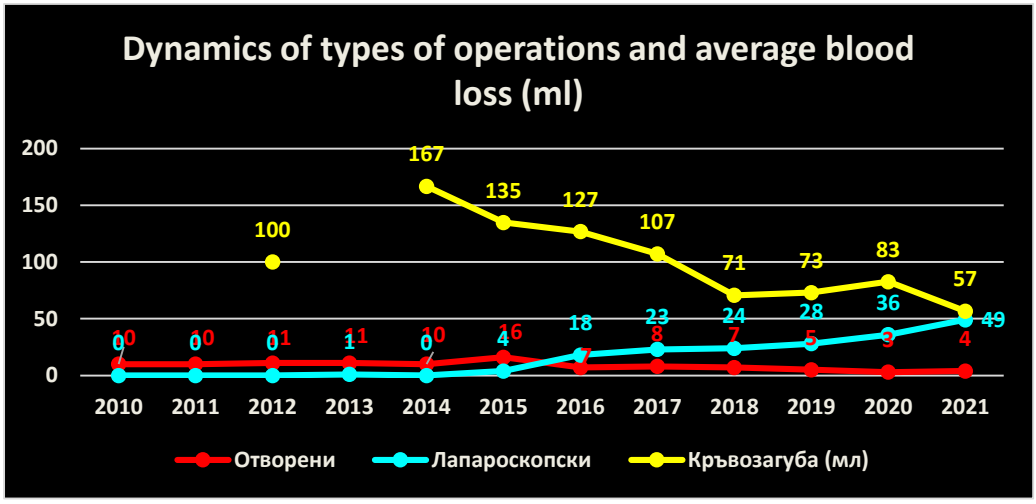

Figure.14: Dynamics of types of operations and average blood loss (ml)

The average number of extracted LVs during the year is characterized as a stationary process at levels mainly 9-10 during the period in which open operations prevail and passing into a smooth progressive (in the interval 11-18) in the following years, when laparoscopic operations take a serious advantage (Fig. 77).

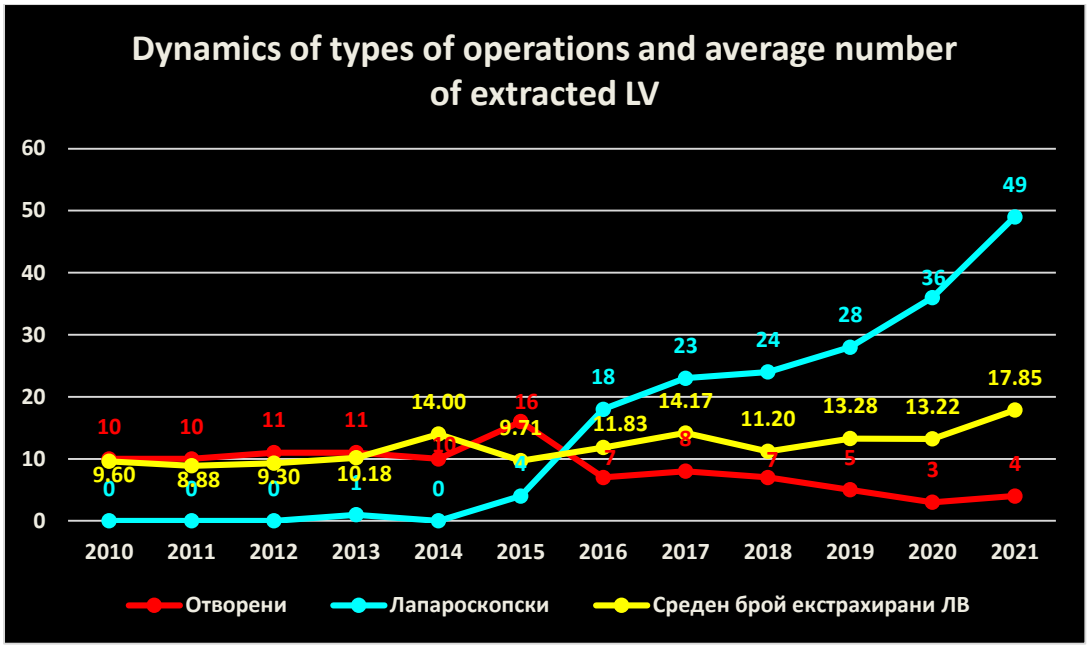

Figure 15: Dynamics of types of operations and average number of extracted LV

The first parameter studied was perioperative complications.

With relatively low levels of perioperative complications in 2015-2016, there was an increase, reaching 35% in 2017. In this year, a marked preponderance of laparoscopic over open operations was also observed . After 2017, the results regarding perioperative complications stabilized over time, reaching a plateau.

Another parameter studied was the average hospital stay. At the beginning of the study period, at the time of open surgery, the average hospital stay was around 7.5 days. In 2016, with the sharp increase in the number of laparoscopic resections and some recorded complications, the hospital stay showed a slight increase to 7.8 days, and subsequently this parameter again marked a "plateau", which in the last 3 years of the study was almost without variation and with a value of 6.5 days.

Examining the number of extracted lymph nodes as a criterion of oncological radicality of the performed operation over time, a permanent tendency to increase was observed. From an average of 9.6 lymph nodes extracted at the beginning of the observed period, to 17.8 in the last year. Between 2016 and 2020, there was some stabilization in the average number of lymph nodes extracted between 11.8 and 13.22, followed by an increase to 17.85 in 2021.

Analyzing the obtained results over time, with perioperative complications as the main criterion, it appears that until the month of July 2017 is the time range in which relatively more frequent complications are observed in the group of laparoscopic resections . If we

add up all laparoscopic colorectal resections until then, including palliative and converted patients, the number is 38. This is also the amount of performed independent colorectal resections until a “plateau” is reached. It should be noted that the surgeon's experience exceeds 100 open colorectal operations resections before the first laparoscopic , which would have an impact on the results in the control group of patients with open surgery, as well as in the group of conversions. Possibly, this fact would also be reflected in the laparoscopic group resections , but such a statement in the present study can hardly be proven.

Based on this, with an increased risk of developing complications and/or conversion, the following preoperative criteria can be adopted:

1st Group	Male gender
	Comorbidities ≥ 3
	Age ≥ 78 years.
II Group	BMI ≥ 30 kg/m2 , visceral type
	Palpable tumor CT scan T4 (colon); MRI T4 (rectum)
	Experience of the surgeon < 38 (independent KR resections)
	Major, previous, open surgery

Table 20 Preoperative criteria for risk of complications and/or conversion

With an association of 2+2 or more factors from a risk group, it can be assumed that there is an increased risk of postoperative complications and/or conversion during the operative intervention. In this case, all concomitant factors such as the severity of co-morbidities, pre-anesthesiology evaluation, performance status should be discussed , and participation in the operative team of a surgeon with more experience in minimally invasive CR surgery or initiation of the operative intervention via the open route should be recommended. .

DISCUSSION

Today, elective minimally invasive colorectal surgery is routine, being the "gold standard" in many centers. The advantages over open surgery in terms of minimal tissue trauma, pain, faster recovery have been mentioned in many authoritative literature sources and have been proven. The present study is no exception. The results indicate faster recovery of intestinal motility , lower rates of infectious complications, lower perioperative blood loss, shorter hospital stay compared to patients operated on by the open route. On the other hand, oncological safety can be discussed in the light of extracted lymph nodes and achieved negative resection lines. The results of the present study demonstrate such oncological safety, even superiority in terms of the quality of lymph dissections performed. Relatively surprising is the fact that the average duration of laparoscopic interventions is significantly shorter. This is in contrast to some reports in the literature. Regarding surgical dissection techniques, there are many publications. The medial dissection approach in right laparoscopic colectomies has been recommended as being associated with the best outcomes. However, there are some details that are associated with a higher risk of intraoperative complications. This is the reason for my preferred hybrid dissection approach for lymphatic dissection in the region of the middle and right colic arteries.

The author's categorically preferred dissection approach when performing left laparoscopic surgery hemicolectomy is lateral. The reasons are related to locally advanced CRC and the risks of late tumor infiltration to the posterior wall of the stomach, pancreas or hilus of the spleen, which is associated with risks of intraoperative complications. Some authors recommend the medial approach in these CRC locations. There are moments of discussion in the world literature regarding the left colorectal resections . Controversial points regarding the approach to the lower mesenteric vessels, the volume of lymphatic dissection, mobilization of the left flexure of the colon, performing a total mesorectal excision in the different localizations of rectal cancer, the removal of a protective ileostomy . The experience of the present study shows that the rate of anastomotic insufficiency after left resections is less than 3% and is comparable to some of the best results indicated in authoritative publications, which gives reason for the routine application of the methods of insufficiency reduction detailed in dissertations. labor.

One of the tasks of the present work is to identify risk factors associated with perioperative complications and conversion. The results subjected to statistical analysis show that age, co-morbidities, male sex, locally advanced CRC, obesity are related to the

occurrence of complications and the risk of conversions. Similar data are found in the literature, but there is still no current risk prediction model. The comparative analysis between the results in the group of open operations and converted patients is interesting. In the present study, conversions were associated with nonsignificantly worse perioperative outcomes, at the expense of better mortality outcomes. Reviewing meta-analyses of large databases from North America reporting superior perioperative outcomes in converted patients compared with open surgery, led the authors to recommend the minimally invasive approach as the "gold standard" in elective colorectal surgery. Here we should mention that in Bulgaria, patients with colorectal pathology have specific characteristics. The study shows that the main contingent of patients have locally advanced CRC - stages III, IV. This is naturally accompanied by the need to perform extended resections , a higher risk of conversion and worse perioperative results.

Of interest are the results in the small series of patients with palliative colorectal resections . No perioperative complications were recorded , with a mean hospital stay of 5.35 days. Unfortunately, the study group is small, but these results would encourage us to recommend palliative resections as a standard approach. There are conflicting data in the literature on this issue, and the timing of the approach in asymptomatic patients is particularly controversial.

There is particularly conflicting data in the current literature regarding the influence of the surgeon's experience on perioperative outcomes. The number of performed independent laparoscopic colorectal resections to reach expertise ranges from 5 to 300 in some publications. Analysis of the perioperative outcomes in the present study indicated that at least 38 solo colorectal were required resections until reaching results comparable to literature data and stable results over time - expertise. It turns out that the learning curve is long, based on experience in open colorectal surgery over 100 independent operations.

CONCLUSIONS

CONTRIBUTIONS

r, i.

List of publications related to the topic of this dissertation after holding the academic position "Docent".

V. Conversions In Minimally Invasive Colorectal Resections . Risk Assessment And Analysis Of Perioperative Results . Scripta Scientifica Medica . 2023 Oct 12;55(Suppl 2):9–13.
Colorectal Surgery . Scripta Scientifica Medica . 2023 Oct 16;55(Suppl 2):14–7.
V. Laparoscopic Versus Robotic Rectal Resections . Comparative Analysis of Perioperative Results . Scripta Scientifica Medica . 2023 Oct 16;55(Suppl 2):18–21.
V. Learning Curve in Laparoscopic Colorectal Surgery . Results of a Retrospective Personal Study . Scripta Scientifica Medica . 2023 Oct 19;55(Suppl 2):22–5
P, Dimitrov T. Intestinal endometriosis of the ileum and appendix - report of two cases. Diagnostic and therapeutic ultrasound. 2021;29(1):25–34.

, 2019;51, suppl . 1:47-47 XVI International Congress of Colorectal Surgery , October 3-5 , 2019 – Golden Sands , Bulgaria
2019;51, suppl . 1:48-48 XVI International Congress of Colorectal Surgery , October 3-5 , 2019 – Golden Sands , Bulgaria
t approaches that colorectal cancer liver metastases : are evidence-based protocols still missing ? Scripta Scientifica Medica , 2019;51, suppl . 1:73-73 XVI International Congress of Colorectal Surgery , October 3-5 , 2019 – Golden Sands , Bulgaria
I International Congress of Colorectal Surgery , October 3-5 , 2019 – Golden Sands ,

ABBREVIATIONS

CRC – Colorectal carcinoma

DNA – Deoxyribonucleic acid

NSAIDs – Nonsteroidal anti-inflammatory drugs

CT - Computed Tomography

MCP – Mechanical bowel preparation

OA – Oral antibiotics

FGS - Fibrogastroscopy

FCS - Fibrocolonoscopy

CHD - Ischemic heart disease

PME – Complete mesocolic excision

LCA – Left colic artery

DMA – Inferior mesenteric artery

TME – Total mesorectal excision

LAR – Anorectal line

NPR – Low Anterior Resection

APR – Abdomino-perineal resection

TSME – Tumor-specific mesorectal excision

CRC - Colorectal liver metastases

NO – Neuroendocrine tumor

COPD – Chronic Obstructive Pulmonary Disease

PEEP – Positive end expiratory pressure

IBD - Inflammatory bowel disease

APC – Adenomatous Polyposis Coli

FOBT – Fecal Occult Blood Test

FIT – Fecal Immunochemical Test

CT - Computer Tomography

MDCT - Multidetector Computer Tomography

MRI - Magnetic Resonance Imaging

iv – intravenous

SAGES - Society of American Gastrointestinal and Endoscopic Surgeons

ASER - American Society for Enhanced Recovery

POQI – Perioperative Quality Initiative

ASA - American Society of Anesthesiologists

BMI - Body Mass Index

EAES – European Association of Endoscopic Surgeons

TNM - Tumor, Nodes, Metastases classification

ISREC – International Study Group of Rectal Cancer

CEA – Carcinoembryonic Antigen

PET-CT – Positron Emission Computer Tomography

NYHA - New York Heart Association