

PROCEEDINGS

CONVERSIONS IN MINIMALLY INVASIVE COLORECTAL RESECTIONS. RISK ASSESSMENT AND ANALYSIS OF PERIOPERATIVE RESULTS

Vesselin Marinov^{1,2}

¹Medical University of Varna, Bulgaria

²HBP and General Surgery Clinic, Acibadem City Clinic Tokuda University Hospital, Sofia, Bulgaria

ABSTRACT

INTRODUCTION: Since the first announced laparoscopic colorectal resections in the 1990s, this approach has become widely accepted due to its advantages and better perioperative results with long-term ones being comparable to those of open surgery. Nowadays, the minimally invasive approach is accepted as a gold standard in many centers. Despite this, there are situations which require conversion to open surgery during surgery. Conversion is related to loss of the potential benefits of the minimally invasive approach and is accompanied by a higher risk of complications. According to some publications, the conversion risk is up to 30%. Factors related to higher conversion risk are disease, patient, level of competence of the surgeon, and others. The risk factors should be identified before the surgery. Comparison of the results from open surgery with those of conversions can give the answer whether it is appropriate to begin every elective colorectal resection as minimally invasive or conversion might have poorer results than the open approach.

AIM: The aim of this article is to conduct a comparative analysis of the perioperative results in a group of 31 conversions during 183 minimally invasive colorectal resections to 102 open resections. We aim to define and create a model of conversion risk factors based on preoperative data.

MATERIALS AND METHODS: Based on retrospective study of 285 patients with elective colorectal resections divided into 3 groups—102 patients with open approach, 152 minimally invasive, and 31 conversions, perioperative results were reviewed. All the methods for clinical assessment were applied. Statistical analysis was performed with IBM SPSS Statistics 25.0; MedCalc Version 19.6.3, Excel Office 2021. The sensitivity and specificity of contrast-enhanced CT were used for preoperative assessment of stage T4 colorectal cancer.

RESULTS: The conversion level in the group of minimally invasive resections was 16.93%. Perioperative mortality rate in converted patients was 0% compared to 1.96% in the open surgery group and 1.31% in the minimally invasive one. A higher morbidity rate was registered in conversion group—34.4%. The complications were more severe according to Clavien-Dindo scale. Conversions were related to a longer hospital stay—8.58 days, compared to open surgery—7.61 days; longer operative time, and higher blood loss. De-

spite this, the harvested lymph nodes were more—15.88 for converted patients, 13.34 for the minimally invasive group, and 11.11 for the open surgery patients. Factors with higher conversion rate were identified: male gender, comorbidity ≥ 3 , age ≥ 78 , BMI ≥ 30 kg/m², palpable formation, CT T4 for colon cancer, MRI T4 for rectum, personal experience of the surgeon <38 minimally invasive resections, previous open surgery.

Address for correspondence:

Vesselin Marinov
Acibadem City Clinic Tokuda University Hospital
51B Nikola Vaptsarov Blvd
1407 Sofia
Bulgaria
e-mail: doc.vesselinmarinov@gmail.com

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CONCLUSION: Cases of locally advanced colorectal cancer, obese patients, previous major open surgery, and surgeons without a completed learning curve are factors related to a higher risk of conversion. Converted patients had poor perioperative results than open surgery patients.

Keywords: *minimally invasive, colorectal, resection, conversion*

INTRODUCTION

Since the first reports in the literature of laparoscopic colorectal resections performed in the early 1990s, this approach has gained increasing popularity. The proven advantages of minimally invasive colorectal surgery are associated with better perioperative outcomes compared to open surgery and include less blood loss, less tissue trauma and pain, faster recovery of bowel physiology, shorter hospital stay, and fewer perioperative complications. Today, practically all surgical interventions on the colon and rectum can be performed as minimally invasive procedures. According to the literature, minimally invasive colorectal resections are associated with a conversion risk of up to 30%. On the one hand, the level of conversions is higher in the cases of more complicated and complex surgical interventions; on the other hand, the drive to standardize the minimally invasive approach in colorectal surgery inevitably leads to situations requiring conversion to open surgery in challenging cases. Converting a minimally invasive procedure to an open procedure results in the loss of the potential benefits of the minimally invasive approach and is associated with risks of complications. Conversions that can be seen as the Achilles heel in minimally invasive colorectal surgery. Today, there are still factors associated with the disease, patient, and level of competence of the surgeon that can come into consideration when planning the approach for a colorectal surgery and define the risk of a situation requiring conversion.

AIM

The aim of this article is to conduct a comparative analysis of perioperative outcomes in a group of 31 conversions during 183 minimally invasive colorectal resections and 102 open operations. We further aim to define conversion risk factors based on preoperative data.

MATERIALS AND METHODS

We have conducted our own study of 285 patients with colorectal resections who met the inclusion criteria over an 11-year period. Patients were divided into 3 study groups: open resections (n=102), minimally invasive resections (n=183), divided into minimally invasive resections with no conversion (n=152) and conversions (n=31). All research methods were used to evaluate the perioperative results in the studied groups, as well as statistical analysis methods included in IBM SPSS Statistics 25.0 software packages; MedCalc Version 19.6.3, Excel Office 2021. An evaluation of the sensitivity and specificity of contrast-enhanced computed tomography to assess local status in T4 colorectal cancer (CRC) was performed.

RESULTS

The conversion rate in the minimally invasive resection group was 16.93%. The statistical analysis of patients according to preoperative parameters showed a lack of preoperative selection of patients in the separate study groups—open, minimally invasive and conversions. Regarding the diagnosis, of all 31 converted patients, 27 had CRC (87%). Two had complicated diverticulitis, one patient with transversum adenoma, and one with complicated Crohn's disease. There were 13 patients with locally advanced CRC, intraoperatively assessed as stage cT4 (41.9%). There was a coincidence between the macroscopic and pathological diagnosis of pT4c in 3 patients. In the rest, it concerned peritumoral inflammation involving an adjacent organ or anatomical element, necessitating an extended resection to achieve surgical radicality. When reviewing the operational protocols, we systematized the indications for conversion in Table 1.

The number of indications for conversion was greater than the number of patients due to the fact that some patients had more than one. The most

Table 1. Indications for conversion.

Indication for Conversion	Number
Peritoneal adhesions	10
Visceral adiposis	7
Tumor bulking	14
Pericolic/pararectal abscess (CRC with perforation)	2
Surgical damage of small bowel	1
Huge diverticulum of urinary bladder	1
Intolerance of pneumoperitoneum	1

common causes were a large tumor, peritoneal adhesions, and visceral adiposis. In 17 patients, during conversion, it was necessary to perform an intervention on more than one organ or anatomical element. The same are shown in Table. 2.

Table 2. Types of performed operations in conversion group.

Interventions on More Than One Organ	Number
En bloc resection + small bowel	4
En bloc resection + small bowel + excision of the abdominal wall	2
En bloc resection + urinary bladder	2
Simultaneous sigmoid resection + retroperitoneal tumor (histiocytoma)	1
Simultaneous resection transverse colon/sigmoid colon	1
Right colectomy + excision of capsula adiposa of the right kidney	2
Colon resection + excision of the abdominal wall	2
En bloc resection + small bowel + hysterectomy	1
En bloc resection + small bowel + partial gastrectomy	1
En bloc resection + vaginal excision + adnexectomy	1

The perioperative results in the comparative analysis of patients by studied groups indicated the following: the perioperative mortality in the group of converted patients was 0%. No patients died in the perioperative period. In the other 2 studied groups, the perioperative mortality was 1.96% for open surgery and 1.31% for minimally invasive surgery. The highest frequency of perioperative complications was observed in the group of converted patients—34.4%. Complications were also significantly more severe on the Clavien-Dindo scale. Conversions were associated with the longest hospital stay—8.58 days, compared to 5.99 days in the minimally invasive group and 7.61 days in the open group. Conversions were associated with the longest operative time and high-

er blood loss. On the other hand, in the converted CRC patients, the number of extracted lymph nodes was higher—median 15.88, compared to 13.34 in the minimally invasive group and 11.11 in the open surgery group.

From the detailed statistical analysis, it was clear that the converted patients were at the highest risk of developing perioperative complications. There was also a correlation: with the increase in the number of minimally invasive resections and their prevalence in the last year by over 90%, the number of conversions also increased. Regarding the risk of complications, the following factors were important: male sex, age, BMI, comorbidity, large tumor, cT4 local status, low experience (<38 minimally invasive resections) of the surgeon. Based on the above, the following preoperative factors can be considered as

factors increasing the risk of 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 or conversion. In this case, all concomitant factors such as the severity of comorbidity, ASA status, performance status, participation of a more experienced surgeon in the operative team, initiation of the operative intervention via the open route should be discussed very carefully.

Table 3. Preoperative criteria for the risk of complications or/and conversion.

I group of factors	Sex: Male
	Comorbidity ≥ 3
	Age ≥ 78
II group of factors	BMI ≥ 30 kg/m ² , visceral type
	Palpable formation KT T4 (colon); MRI T4 (rectum)
	Experience of the surgeon <38 (personal minimally invasive resections)
	Major open surgery in the past

DISCUSSION

A conversion is defined as the transition from a minimally invasive surgical dissection to an open one during one operative intervention. According to various sources in literature data, in colorectal resection surgery, conversions occur in between 7 and 25% of the cases (1). In more recent, large studies, conversion rates ranged between 5.9 and 16.6% (2,3). In the current study, the rate of converted patients is 16.93% and is comparable to literature data. The indications for conversion to open surgery reported in the literature with the highest frequency are tumor-associated, anatomic, previous major surgery/peritoneal adhesions, visceral adiposis, surgeon-associated, and intraoperative ones (4,5). From the analysis of the data in our study, it can be seen that the most frequent reasons for conversion are anatomical (11 patients with tumor localization in the region of the rectum); tumor-associated (large and/or locally advanced tumor formation); postoperative adhesions; visceral adiposis. Similar main reasons for conversion are mentioned by Stafford C et al. (5). Data in the literature show a higher complication rate in converted patients in the perioperative period compared to those completed minimally invasively (6). Perioperative complication rates of 43.7% were reported by Yamamoto et al. (7). The overall perioperative morbidity in our group was 35.5%. Comparative analysis between converted patients and open colorectal resections showed worse perioperative outcomes in the conversion group, although these were not statistically significant. This is likely due to the relatively small group of patients with conversions. Similar

studies have been published in the literature, and the data are different. While some studies report better perioperative outcomes in the converted patient groups (2,3) and recommend the laparoscopic approach as the gold standard in colorectal resections, others indicate equivalent complication rates (8).

CONCLUSION

Cases of locally advanced CRC, obese patients, major prior open surgery, surgeons with an incomplete learning curve may be associated with an increased risk of conversion during a minimally invasive colorectal resection. A preoperative combination of several factors should be approached with caution and the need to start the surgical intervention via the open approach considered, because the risk of perioperative complications is slightly higher with conversion.

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