

ORIGINAL ARTICLE

Comparison of the laparoscopic versus open surgery in patients aged over 75 years old with colorectal cancer. Short- and Mid-term outcomes

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Summary

Purpose: The benefit of minimally invasive surgery in colorectal cancer patients has been established, however it is not clear whether these advantages apply to older patients as well. The aim of this study was to review short- and mid-term outcomes in elderly patients, over the age of 75 years, with colorectal cancer.

Methods: This was a retrospective study of selected patients over the age of 75 who underwent laparoscopic and open surgery for colorectal cancer between February 2013 and January 2018 in a tertiary referral center. All patients were categorized in two groups: Group 1 included patients who had open procedure (OP) and Group 2 those who underwent laparoscopic procedure (LP). Demographic, clinical, short- and midterm postoperative data were collected and analyzed between the two study groups.

Results: A total of 78 patients were included in our cohort; 39 (50%) were operated with LP. The LP was equally safe in comparison with the OP, considering the similar postopera-

tive complications [9 patients (34.6%) in LP and 5 patients (18.5%) in OP ($p=0.224$)], including anastomotic leakage in 2 patients (7.7%) in LP and 1 patient (3.7%) in OP group ($p=0.61$). The median postoperative hospital stay favored the laparoscopic approach (6 days in LP group and 8 days in OP group; $p=0.001$). The number of harvested lymph nodes were without statistically significant differences [LP group retrieved 20.0 nodes in comparison with 20.5 nodes in OP group ($p=0.816$)]. The overall survival analysis showed no difference between the two approaches in 12 and 24 postoperative months ($p=0.098$ and 0.387 , respectively).

Conclusion: Our data suggest that LP in elderly patients is comparable with OP in terms of postoperative complications, removal of lymph nodes and mid-term survival. LP was correlated with a significantly shorter postoperative hospital stay.

Key words: colorectal cancer, elderly patients, laparoscopic colectomy, open colectomy

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer in men and the second in women. In terms of mortality, CRC is the fourth and third cause of cancer-related deaths in males and females, respectively [1]. Over the past two decades, it has been established that laparoscopic procedure (LP) is a safe and equally efficient to open procedure (OP) regarding the achievement of negative

resection margins, port-site and wound-site recurrence, local recurrence, overall survival, and blood loss during surgery [2].

Because of the remarkable aging of the population, the number of operations which are performed on elderly patients has dramatically increased [3]. Age by itself is an independent risk factor associated with increased perioperative morbidity and

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mortality [4]. Comorbidities in elderly patients increase the perioperative risks and therefore the choice of the best surgical approach is crucial for this group of patients.

The aim of this study was to review the short- and mid-term results of laparoscopic versus open surgery in the elderly patients (>75 years old) with CRC that were treated in a tertiary University hospital.

Methods

Study selection

This was a single-center cohort study, comparing laparoscopic versus open surgery in patients over 75 years with CRC. All patients were operated between February 2013 and January 2018 and were divided into two groups; Group 1 included those who underwent OP and Group 2 those with LP. Patient data were retrieved from the hospital's archives and a prospectively maintained database. Written informed consent was obtained from each patient who participated in this study. This study was approved by the hospital Research Scientific Committee. Finally, 78 patients were included for further analysis (Figure 1).

Preoperative data included Charlson Comorbidity Index [5], while functional status was quantified using a metabolic equivalent score (METs) [6]. In addition, the body mass index (BMI) was evaluated. Postoperative data included short- and mid-term postoperative complications. Moreover, intensive care unit (ICU) stay, overall hospital stay and early postoperative mortality (within 30 days after surgery) were reviewed. Histopathological data were also retrieved as a measure of surgery quality. Overall survival was calculated and analyzed.

Preoperative workup

On admission, all patients had physical examination, complete blood count and serum biochemistry, liver and renal function tests and measurement of carcinoembryonic antigen levels (CEA). Preoperative colonoscopy and lesion biopsy were reviewed, whereas multidetec-

tor computed tomography (CT) of the chest, abdomen and pelvis was performed for cancer staging. In rectal cancer cases, locoregional staging was completed with dedicated rectal magnetic resonance imaging (MRI). Positron emission tomography (PET) scan was utilized selectively, in cases with equivocal CT findings suggesting possible metastatic disease that could change treatment plan.

All CRC cases were discussed pre- and postoperatively in the hospital's oncological multidisciplinary meeting (MDT), consisting of colorectal surgeons, histopathologists, medical oncologists, radiologists and radiation oncologists.

Preoperative care

All patients were subjected to mechanical bowel preparation (polyethylene glycol or sodium phosphate) except for those with partial obstruction, where enema was used. Antibiotic prophylaxis was given intravenously one hour before induction of general anesthesia (2nd generation cephalosporin and metronidazole). Low molecular weight heparin (such as enoxaparin or bemiparin) was subcutaneously administered 12 h before surgery as prophylaxis for deep-vein thrombosis. The same regimen was continued postoperatively in combination with the use of graded compression stockings [7]. All patients had meticulous preoperative cardiovascular evaluation including echocardiography as well as pulmonary function tests [8].

Surgical approach

All operations were performed by the same colorectal surgical team. The decision for laparoscopic or open surgery was based upon surgeon's preference and experience for each individual case. For right-sided cancer cases, a laparoscopic colectomy with medial-to-lateral approach was performed. Specimen extraction was carried out through a mini upper midline laparotomy. Anastomosis was performed extracorporeally using a hand-sewn or stapling technique. For left-sided cancer, the distal bowel was divided intracorporeally with laparoscopic staplers, specimen was extracted via a small Pfannenstiel incision and anastomosis was performed by a transanally inserted circular stapler (with diameter of 29 or 31 mm). The concepts of total mesorectal excision for rectal cancers and total mesocolic excision for colonic cancers were followed in all cases, either laparoscopic or open.

Follow-up

A dedicated oncological follow-up was recommended in all cases; 3-month interval visits for the first year, 6-month interval visits for the second year, and yearly thereafter until the 5th postoperative year. Follow-up data were retrieved using the hospital's medical database. Missing data were obtained with either a direct or via telephone interview.

Statistics

Categorical variables are presented as absolute and relative frequencies (%). Normality of distribution for

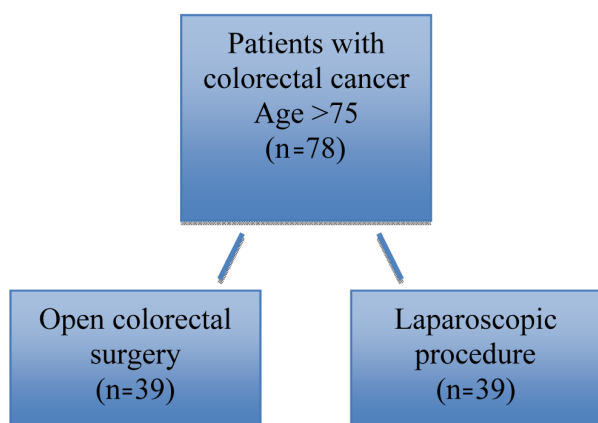


Figure 1. Flowchart of patient selection.

quantitative variables was evaluated with the Kolmogorov-Smirnov test. Normally distributed quantitative variables are presented as means \pm standard deviation, whereas non-normally ones as medians and 25th-75th interquartiles (IQR). Pearson's chi-square test was used for the comparison of categorical variables. Student's t-test and Mann-Whitney U test were performed for parametrical and non-parametrical variables, respectively. Survival was evaluated with the Kaplan-Meier method and the log-rank test was used for comparison between laparoscopic and open procedure. All p values were two-sided, whereas p values <0.05 were considered statistically significant.

All tests were performed with SPSS version 22 (SPSS, Chicago, IL).

Results

Demographic and preoperative data are presented in Table 1. From the 78 patients included in the study, 39 (50%) were operated with LP. Median age was comparable in both groups: 79 years

(IQR: 76-84) in the LP group and 79 years in the OP group (IQR:77-83) (p=0.549). Sex distribution in both groups was not significantly different: 56.4% of patients in LP and 48.7% in OP group were male (p=0.496). Preoperative evaluation showed no differences between the two study groups in Charlson score (p=0.113), BMI (p=0.544) as well as in METs score measurements (p=0.511). Similarly, there was not statistically significant difference in the type of colectomy: right colectomy was the most common operation performed either by LP (40%) or by OP (41%) (p=0.990, Table 2).

Postoperative data

The postoperative data are presented in Table 3. The two groups did not have significant differences in staging according to the TNM classification (p=0.208). Moreover, the mean number of extracted lymph nodes was insignificantly different: LP group retrieved 20.0 nodes in comparison with 20.5 nodes in OP group (p=0.816).

Table 1. Demographic and perioperative data

Data	Laparoscopic surgery (n=39)	Open surgery (n=39)	P value
Median age, years (Q1-Q3)	79 (76 - 84)	79 (77 - 83)	0.549
Male sex, n (%)	22 (56.4)	19 (48.7)	0.496
BMI, (kg/m ²), n (%)			0.544
<18	3 (7.9)	1 (2.8)	
18-25	9 (23.7)	13 (36.1)	
25-30	14 (36.8)	13 (36.1)	
30-35	12 (31.6)	9 (25)	
>35	0 (0)	0 (0)	
METs score >4, n (%)	15(39.5)	12(32.4)	0.511
Charlson score, median (Q1-Q3)	6 (6 - 7)	7 (6 - 8)	0.113
TNM staging, n (%)			0.208
0	3 (7.9)	2 (5.1)	
I	7 (18.4)	7 (17.9)	
II	18 (47.4)	10 (25.6)	
III	8 (21.1)	15 (38.5)	
IV	2 (5.3)	5 (12.8)	
Median Follow-up, years (Q1-Q3)	16 (1 - 30)	34 (6.5 - 36)	0.137

BMI: Body Mass Index; METs: Metabolic Equivalent of Task score

Table 2. Types of surgical procedures

Variables	Laparoscopic surgery (n=39) n (%)	Open surgery (n=39) n (%)	P value
Procedures			0.999
Right colectomy	16 (41)	16(41)	
Left colectomy	2 (5.1)	2 (5.1)	
Sigmoidectomy	11 (28.2)	10 (25.6)	
Low anterior resection	8 (20.5)	9 (23.1)	
Abdominoperineal resection	2 (5.1)	2(5.1)	

Examining the postoperative course no difference in patients' mobilization between the two study groups was noted; mobilization was achieved in the first postoperative day in both groups ($p=0.693$). Similarly, the need for ICU admission did not differ significantly between the two groups [8 patients (22.2%) in OP group compared to 7 patients in LP group (18.4%), $p=0.776$].

The median postoperative hospital stay was significantly longer in the OP group [8 days (IQR:7–12) versus 6 days in LP group (IQR:4–8.5), $p=0.001$]. An additional finding of this study was that the number of either total ($p=0.224$) or specific complications such as ileus ($p=0.236$), urinary retention ($p=0.111$), anastomotic leakage ($p=0.610$) and postoperative hernia ($p=0.669$) between the two groups did not present statistically significant differences (Table 3).

Overall survival (Figure 2)

Kaplan-Meier survival analysis and log-rank test demonstrated that overall survival in 12 and 24 months was comparable between the LP and OP

groups ($p=0.755$ and $p=0.387$ for 12 and 24 months, respectively).

Discussion

Surgery is the cornerstone of CRC treatment. Nowadays, two main standards of surgical treatment are followed worldwide, the classic open procedure and the so-called minimally invasive techniques, represented mainly by laparoscopic surgery.

After the first description of laparoscopically performed colectomy in 1991 by Jacobs et al [9], the interest for minimally invasive surgery was constantly growing worldwide, especially after the publication of the COLOR, COST and CLASICC trials that showed oncological equality in the short- and long-term outcomes of CRC [10–12]. Since then, many variations of this minimally invasive technique have been adopted; from classical laparoscopy to other procedures for colorectal surgery like transanal total mesorectal incision (ta-TME) and single incision laparoscopic surgery (SILS) [13,14].

Table 3. Comparison of postoperative short-term outcomes

Outcomes	Laparoscopic surgery (n=39)	Open surgery (n=39)	P value
Lymph nodes harvested, mean \pm SD	20.0 \pm 9.26	20.5 \pm 10.6	0.816
ICU need, n (%)	7 (18.4)	8 (22.2)	0.684
Mobilization (days), median (Q1-Q3)	1 (1 – 2)	1 (1 – 2)	0.693
Post-operative hospital stay (days), median (Q1-Q3)	6 (4 – 8.5)	8 (7 – 12)	0.001
Complications, n (%)			
Total	9 (34.6)	5 (18.5)	0.224
Ileus	2 (7.7)	0 (0.0)	0.236
Urinary retention	3 (11.5)	0 (0.0)	0.111
Anastomotic leak	2 (7.7)	1 (3.7)	0.610
Postoperative hernia	2 (7.7)	4 (14.8)	0.669

ICU: Intensive Care Unit, SD: standard deviation

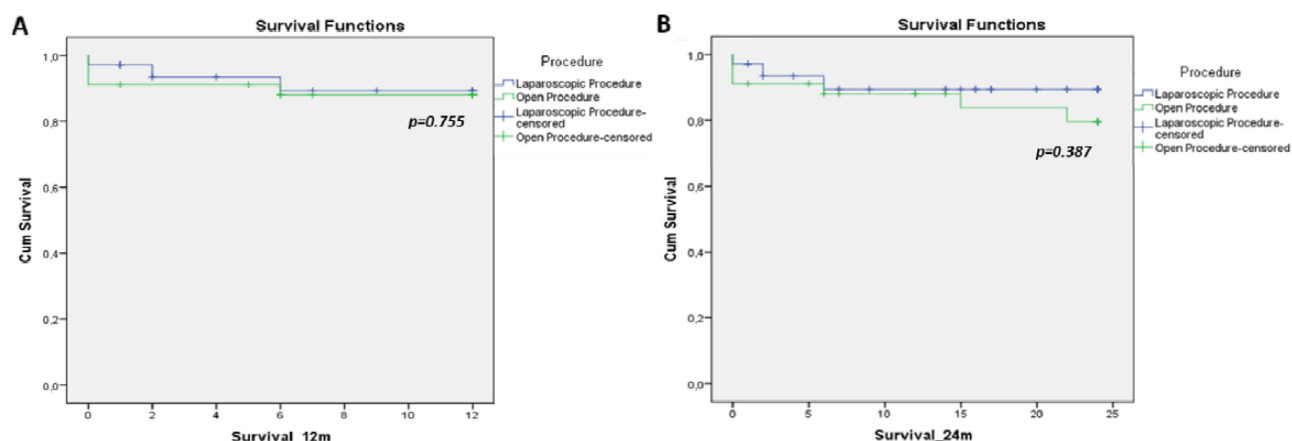


Figure 2. Kaplan-Meier curve for 12 (A) and 24 (B) months survival.

Devoto et al demonstrated in their systematic review that the age is not a contraindication for colorectal surgery by itself; moreover, the morbidity in the elderly patients who underwent laparoscopic resection for CRC was reduced [15]. During the last two decades a number of studies were published, confirming an equality regarding the oncological outcomes between laparoscopic and open surgery for CRC in short- mid- and long-term follow-up periods [16-18].

The aim of this study was to evaluate whether laparoscopic surgery for CRC in the elderly is as safe and effective as open procedure, taking into account the frequent presence of comorbidities in this group of patients. Our analysis revealed that laparoscopic resection is associated with equal short-term and mid-term outcomes in comparison to open procedure. It has also shown that there is a trend for better survival in the mid-term follow-up period, although without statistical significance.

Another finding of this study was that, in comparison to OP group, LP group had similar number of harvested lymph nodes (20.0 vs 20.5, $p=0.816$). Shiha et al described in their propensity score matching study that there is less aggressive laparoscopic surgical resection ($p=0.01$) in the elderly group when compared to younger patients [19]. It is still unclear whether it is necessary to harvest as high number of lymph node as possible, especially if we take under consideration the likelihood for postoperative complications after D3 lymph node dissection according to the Japanese staging system. Furthermore, the question whether extended lymphadenectomy in CRC has a positive implication on overall survival remains unanswered [20,21]. The long-term outcome of radical treatment is mainly correlated with the tumor stage, as it was shown in the study of Sheridan et al [22]. Moreover, a strong correlation of oncological outcome with ASA score and patient's preoperative performance status was also shown in the same study [22].

Last, neither the total complication rate nor the specific complication rate in this study have shown statistically significant differences between the two groups. This finding is in accordance with results

published in similar studies in the literature [4,23]. We found that the overall postoperative hospital stay was significantly higher in the OP group. A 2016 meta-analysis by Li et al showed that LP is associated with shorter postoperative hospital stay in elderly patients [24].

The present study has several limitations. First, this observational cohort is amenable to selection bias due to its retrospective design; factors that could possibly affect surgeon's choice for LP or OP, such as BMI, the presence of cardiovascular or pulmonary comorbidities or the tumor size (according to preoperative CT) were not adjusted between the two groups. Second, the sample size is relatively small. Last, the follow up period for both groups was short. Thus, long-term overall survival in 3 and 5 years could not be analyzed.

Conclusion

This is the first study comparing LP and OP in the elderly patients in Greece. Our findings are in agreement with those of earlier studies conducted in other countries regarding the shorter postoperative hospital stay in patients who undergo laparoscopic colectomy. Furthermore, in this study we confirmed that the oncological outcomes are comparable in both groups. Thus, it could be concluded that laparoscopic surgery seems to be a safe and applicable procedure for elderly patients with CRC.

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Conflict of interests

The authors have no conflict of interest to disclose and received no financial support for this study.

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