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The relationship between age and the development of major complications in patients who underwent laparascopic surgery due to colon cancers

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ABSTRACT

Introduction: The laparoscopic approach is preferred in colorectal cancer cases, yet concerns arise regarding the development of complications among the elderly patient population. This study aims to investigate the difference in the development of major complications between patients aged 65 and older undergoing laparoscopic procedures for colorectal cancer diagnoses and the younger patients.

Materials and Methods: Between 2013 and 2023, records of patients who underwent laparoscopic surgery due to colorectal cancers at our center were extracted. Demographic characteristics, pathology data, complications developed during hospitalization, and lengths of stay were gathered from hospital records.

Results: A total of 72 patients were included in the study, with 18 patients aged 65 and older and 54 patients aged younger than 65. When patients were evaluated based on the development of major and minor complications, all demographic and pathological characteristics were found to be similar. Only in the group of patients aged 65 and older, the length of hospital stay was found to be longer ($p<0.001$). In the multivariate analysis conducted, age was not found to be significant for the development of major complications (OR: 0.895 [0.246-3.264], $p=0.897$).

Conclusion: This study has shown that being aged 65 or older or younger is not associated with the development of major complications in patients undergoing surgery for colorectal cancer. It has also demonstrated that laparoscopic surgical procedures can be safely used in patients aged 65 and older. Further studies with larger patient cohorts could provide more clarity on this topic.

Keywords: Age, Colon cancer, Complication, Laparoscopy, Morbidity

Introduction

In our evolving and changing society, the average life expectancy has increased from an average of 49 years in the 1950s to 71 years today.[1] This increase has led to the development and updating of treatment protocols for the elderly population's illnesses. The World Health Organization (WHO) has defined the threshold for old age as 65.[2]

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The incidence rates of colorectal cancers, which are currently the fourth most common cancer, also increase with age.[3] With advancing age, the incidence of colorectal cancers increases due to various factors, leading to increased research in elderly patient populations today. By 2050, it is expected that 23% of the population in Western Europe will be aged 65 and older. This demographic shift underscores the need for different studies focusing on colorectal procedures for this age group in the future, particularly for general surgeons.[4]

Studies have yielded different results in the elderly patient population. Currently, there is no consensus on whether conventional or minimally invasive surgery provides superior survival outcomes in colorectal cancers. While conventional surgery was initially noted to be shorter, recent studies indicate similar durations for both procedures due to increased proficiency. Furthermore, contemporary studies demonstrate lower rates of surgical site infections in patients undergoing minimally invasive procedures. However, efforts to alleviate surgeons' apprehensions toward laparoscopy to minimize surgical duration in older patients continue.[5-8]

This study aims to evaluate the morbidity outcomes in patients aged 65 and older compared to younger patients following laparoscopic surgical procedures.

Materials and Methods

Study Design

Before data collection, ethical approval for the study was obtained with decision number 2024/05/795 from the Ethics Committee of the same institution. The study was conducted in accordance with ethical standards, and patient confidentiality and privacy were strictly maintained.

This retrospective cohort study focused on the examination of records of patients who underwent surgery for colorectal malignancies at the Gastroenterologic Surgery Department of Koşuyolu Training and Research Hospital between January 1, 2013, and December 31, 2021. Ethical approval was obtained before commencing data collection, ensuring adherence to the principles outlined in the Declaration of Helsinki and relevant ethical guidelines.

Inclusion Criteria

Patients were included in the study based on specific criteria to ensure homogeneity and relevance to the research objectives. The inclusion criteria comprised the following: Patients who underwent elective surgery for histologically confirmed colon and rectum adenocarcinoma with a laparoscopic approach, having comprehensive clinical and pathological data available for analysis, and only patients aged 18 years or older were considered.

Exclusion Criteria

To ensure the integrity and specificity of the study, the following exclusion criteria were applied: Patients who underwent conventional, palliative, or emergency surgery, patients who did not undergo R0 resection. Cases with inadequate dissection, positive surgical margins, or R2 resection were excluded to maintain the study's focus on complete and oncologically appropriate surgical resections, ensuring the findings' reliability and validity. Patients not operated on according to oncological principles, and patients with postoperative follow-up durations of less than 30 days, were also excluded from the study.

Data Collection

All data were obtained from the electronic database, ensuring accuracy and reliability in the analysis. Demographic information, preoperative tumor markers,[9] prior operation records, history of neoadjuvant therapy, pathology data, operation durations, postoperative follow-up complications,[10] length of hospital stays, and survival data were retrospectively reviewed for all patients. American Society of Anesthesiologists (ASA) and operation duration records were obtained from anesthesia records.[11]

Surgery and Follow-up

The study initiated by collecting data from 371 individuals who underwent surgery for colorectal cancer at our center between 2013 and 2021. Of this group, 197 were excluded for reasons such as missing pathology or diagnostic data (2 cases), conventional approach (195 cases). Two subjects were excluded due to a postoperative follow-up period of less than 3 months. Ultimately, 72 participants met the inclusion criteria.

Among these, tumor localizations were distributed as follows: cecum,[10] ascending colon, transverse colon,[1] descending colon,[5] sigmoid colon, and rectum. Neoadjuvant chemoradiotherapy was routinely administered to patients with mid and low rectal cancer before surgery.

Statistical Analysis

The software IBM® SPSS® (Statistical Package for the Social Sciences) version 25 (IBM Corp. Armonk, NY, USA) was used for statistical analysis. The distribution of numerical data was performed using the Kolmogorov-Smirnov test with the non-normal distribution results. Qualitative data were presented as frequency and percentage. Continuous measurements were presented as median (IQR). The chi-square test was utilized for comparisons involving categorical variables. The relationship between continuous parameters and mortality was examined through the application of the Mann-Whitney U test. Additionally, the Receiver Operating Characteristic (ROC) curve was examined to determine the cut-off value of age. For the analysis of factors influencing morbidity, univariate Cox regression tests were conducted. A significance level of 0.05 was considered for all tests.

Results

A total of 72 patients were evaluated for the study. Within these patients, morbidity rates were separated as 57 (79.1%) minor and 15 (20.8%) major complications. Patients' demographic and clinicopathologic features were evaluated according to major and minor complications. Hospitalization duration was longer in the major complication group (6.88±1.25 vs. 14±7.69, p<0.001). Other demographic and clinicopathologic features were similar (p>0.05). Demographic and clinicopathologic variables' evaluation based on complications is presented in Table 1.

Then, patients were divided as <65 years and ≥65 years into two groups with the cut-off point based on the WHO's elderly recommendation. Fifty-four patients were included in the younger group, whereas 18 patients were included in the older group. Male patients were more in the elderly group (34.1% vs. 12.9%, p=0.039). Tumor localizations showed differences too. The younger group consisted of 9 cecum, 15 ascending colon, 4 descending colon, 13 sigmoid, and rectum colon tumors. In the elder group, 11 patients had sigmoid colon tumors. The rest consisted of 3 rectum and 1 each of cecum, ascending colon, transverse colon, and descending colon (p=0.022). Other variables were similar between groups (p>0.05) (Table 2).

Since the only variable showing relation with major complication development was hospitalization duration, multivariate analysis was not proceeded. A univariate Cox regression analysis was performed for complication development based on patients' age below or above 65, and age was found irrelevant to morbidity in laparoscopic colorectal procedures (OR: 895 [0.246-3.246], p=0.867) (Table 3).

Discussion

This study was conducted to evaluate the relationship of elderly patients with morbidity incidence in laparoscopic colorectal procedures. We found similar major complication rates between elder and younger patients in our study. Only hospitalization duration was longer in the elder patients group. We believe this result is due to the late stabilization of other comorbidities in older groups and the late return to daily activity compared to the younger population. In our experience, we think the laparoscopic approach is feasible in the elder population too.

Minimally invasive surgery is considered to be more favorable in any indicated surgery possible. While providing advantages like smaller incision scars and faster adaptation to daily routine, it shows similar efficiency with conventional approaches in pathologic specimen quality, which makes laparoscopy more favorable for many surgeons. However, there are still some issues with the selection of the approach, and age is one of the main considerable topics regarding this. Even if recent studies reveal similar operative times between the two approaches, surgeons may tend to use conventional practices to avoid any complications in this fragile population and avoid laparoscopy.[4,5]

Frasson et al.[4] published the results of their randomized control trial in 2008 based on 535 colorectal cancer patients. In this study, the cutoff value was based on age 70. In the conventional group, elder patients suffered higher morbidity rates and longer hospitalization duration. But in the laparoscopic group, morbidity ratios and hospitalization length were recorded as similar between groups. Our study showed similar results. We didn't include conventional procedures in our study,

Table 1. Patient demographic and clinicopathologic variables according to Minor/Major complication

Variables	Minor n=57 (79.1%)	Major n=15 (20.8%)	p†
Age, years			
<65	43 (59.3%)	11 (40.7%)	0.897
≥65	14 (54.9%)	4 (45.1%)	
Gender			
Male	32 (60.3%)	9 (39.7%)	0.788
Female	25 (53.5%)	6 (46.5%)	
ASA score			
1	2	0	0.174
2	20	2	
3	35	13	
Localization			
Caecum	8	2	0.363
Ascending Colon	10	6	
Transvers Colon	1	0	
Descending Colon	5	0	
Sigmoid Colon	21	3	
Rectum	12	4	
T Stage			
T1	8	1	0.157
T2	9	0	
T3	34	10	
T4	6	4	
N Stage			
N0	33	11	0.507
N1	15	2	
N2	9	2	
M Stage			
M0	56	15	0.605
M1	1	0	
LVI			
No	33	11	0.275
Yes	24	4	
PNI			
No	42	12	0.615
Yes	15	3	
Tumor grade			
Well	15	3	0.890
Moderately	37	10	
Poorly	5	2	
Muscinous Component			
No	45	14	0.197
Yes	12	1	

Table 1. CONT.

Variables	Minor n=57 (79.1%)	Major n=15 (20.8%)	p†
Neoadjuvant Theraphy			
No	51	12	0.324
Yes	6	31	
Stage			
1	13	1	0.230
2	22	10	
3	21	4	
4	1	0	
	Median (IQR)		p‡
BMI	26.24±3.58	24.78±4.21	0.682
Total Lymph Node	22.10±12.53	24.20±9.00	0.372
CEA, ng/mL	7.76±14.68	13.09±20.51	0.494
CA 19,9 ng/mL	12.09±10.30	11.58±20.18	0.087
CA 125 ng/mL	12.11±8.38	19.74±39.38	0.847
Surgery Duration	270.18±74.40	298.33±116.78	0.483
LOS	6.88±1.25	14±7.69	<0.001*

BMI: Body Mass Index; ASA: American Society of Anesthesiology, LVI: Lymphovascular Invasion, PNI: Perineural Invasion. LOS: Length of Hospital Stay; IQR: Inter Quartile Range; p<0.05, p<0.01, *p<0.001 †: Chi-Square, ‡: Mann Whitney U.

but elder and young patients showed similar major complication rates. However, our elder group showed longer hospitalization in our study, even though our elder cut-off was lower than the study. We believe our patient population consisted of more comorbid patients. We couldn't calculate comorbidity indexes; however, our patient population consisted of more ASA 3 patients than the study mentioned.

A recent study evaluated the safety of laparoscopic procedures for octogenarians. 199 patients aged 80 and above were included in this study, and 116 laparotomy and 83 laparoscopy patients were divided as arms of the study. Intraoperative blood transfusion and bleeding were higher in the laparotomy group. The laparoscopic group had better general morbidity rates. Major complication rates were also similar, and the length of hospitalization was recorded as lower in the laparoscopy group. Our study, whereas compared age rather than procedures.[12]

Another recent study from 2016 evaluated laparoscopic right hemicolectomy outcomes for elder patients. Four groups consisted of age ranges below 64, 65-74, and 75-84. As expected, the last two groups had higher ASA scores. Also, advanced-staged patients were more consistent in the last two groups. However, major complication rates were similar between groups. Minor complication rates were higher in the last group. The only independent variable related to postoperative complications recorded was blood transfusion. Our study showed similar results, with major morbidity occurrence rates distributed similarly between groups.[13] This topic is mentioned also in a systematic review, and aging increases the incidence of more comorbidities these patients would have. So even if it isn't statistically relevant, these patients' tendency for complications should always be considered.[6]

Our study has some limiting factors. First of all, it's designed retrospective. Our patient population is small as only laparoscopic procedures were included. Also, we didn't include comorbidity indexes. But our patient group showed heterogeneous distribution based on pathologic stages and disease characteristics. Even though sigmoid and rectum cancer were dominant in the elder group, it didn't show any difference regarding complication rates.

Table 2. Demographic and clinicopathologic characteristics of patients sorted by age

Variables	<65 years n=57 (79.1%)	≥65 years n=15 (20.8%)	p†
Gender			
Male	27 (50)	14 (34.1)	0.039*
Female	27 (50)	4 (12.9)	
ASA Score			
1	2	0	0.174
2	20	2	
3	32	16	
Localization			
Caecum	9	1	0.022*
Ascending Colon	15	1	
Transverse Colon	0	1	
Descending Colon	4	1	
Sigmoid Colon	13	11	
Rectum	13	3	
T Stage			
T1	5	4	0.551
T2	7	2	
T3	34	10	
T4	8	2	
N Stage			
N0	31	13	0.349
N1	15	2	
N2	8	3	
M Stage			
M0	53	18	0.561
M1	1	0	
LVI			
No	34	10	0.577
Yes	20	8	
PNI			
No	39	15	0.346
Yes	15	3	
Tumor grade			
Well	13	5	0.388
Moderately	34	13	
Poorly	7	0	
Muscinous Component			
No	42	17	0.111
Yes	12	1	
Neoadjuvant Theraphy			
No	47	16	0.837
Yes	7	2	

Table 2. CONT.

Variables	<65 years n=57 (79.1%)	≥65 years n=15 (20.8%)	p†
Stage			
1	9	5	0.677
2	24	8	
3	20	5	
4	1	0	
	Median (IQR)		p‡
BMI	26.59±7.74	25.64±3.71	0.252
Total Lymph Node	23.26±7.74	20.50±9.29	0.108
CEA, ng/mL	9.67±16.87	6.41±13.36	0.666
CA 19,9 ng/mL	13.13±13.76	8.19±8.58	0.101
CA 125 ng/mL.	14.60±20.83	11.08±4.21	0.864
Surgery Duration	275.74±89.93	276.94±82.57	0.850
Hospitalization	8.30±4.89	8.56±3.82	0.713

BMI: Body Mass Index; ASA: American Society of Anesthesiology; LVI: Lymphovascular Invasion; PNI: Perineural Invasion. LOS: Length of Hospital Stay; IQR: Inter Quartile Range; * p<0.05, p<0.01, p<0.001 †: Chi-Square, ‡: Mann Whitney U..

We believe the elderly will become more tolerable for concerns within surgeons for the laparoscopic approach with increasing tendency and articles related within years. Laparoscopy is feasible and has similar complication ratios in all ages. Further studies focusing on cancer origin and specific complication differences between age groups will provide more certain verdicts within this matter.

Conclusion

Elderly age is not an issue for choosing operative approach criteria. Older patients showed similar morbidity incidence with younger patients in colorectal procedures. This fragile population should be approached with concern. Larger population-based studies will provide better knowledge for future aspects regarding patient evaluation.

Table 3. Prognostic factors for major complications, identified by univariate Cox regression analysis

Prognostic factors	OR	95% CI	p
Age, ≥65 years	0.895	0.246-3.264	0.867

CI: Confidence Interval; OR: Odds Ratio; PNI: Perineural Invasion; GLR: Glucose/Lymphocyte Ratio p<0.05, p<0.01.

Disclosures

Ethichs Committee Approval: Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Tarih 05.03.2024, Karar no 2024/05/795 This study was approved by the Kosuyolu Yuksek Ihtisas Training and Research Hospital Ethics committee on 05.03.2024 with 2024/05/795 number.

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