

Original Article

Short-term and Long-term Outcomes of Laparoscopic Colorectal Cancer Resections in the Octogenarian Patients

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Key Words

Laparoscopic surgery;

Colorectal cancer;

Octogenarian

Purpose. To investigate the feasibility and the outcomes of the octogenarian colorectal cancer patients underwent laparoscopic resection with curative intent.

Methods and Materials. From January 2007 to December 2017, 309 consecutive patients who had colorectal cancers undergoing laparoscopic resection in Taipei Wan Fang Hospital were enrolled into our study. There were 51 patients who were older than 80 years old. Their medical records were review and analyzed.

Results. In those patients, five patients were converted to open surgery (conversion rate: 10%). Overall 46 patients were enrolled into our study. The 30-day mortality rate was 2% (one patient died of heart disease). The average operative times were 249 ± 85 minutes. The average hospital stays were 13.5 ± 6.4 days. The 30-day morbidity rate was 26% (twelve patients). But only one patient must need surgical interventions due to left ureter injury. During the periods of follow up, 16 patients died. 5-year overall survival rate was 66% and 5-year disease-free survival rates was 81%.

Conclusion. Laparoscopic colorectal cancer resection may be a safe and feasible procedure with acceptable morbidity and mortality rates in the octogenarian patients. Laparoscopic colorectal cancer resection might be recommended for the octogenarian patients.

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Laparoscopic colon resection is considered as an alternative procedure to open colon resection with short-term advantages and similar long-term survival after a series of randomized controlled trials (RCTs) in 2004-2005.¹⁻³ But, the octogenarian patients (age > 80 years old) were usually excluded in the RCTs. The safety and feasibility of the laparoscopic colorectal cancer resections is uncertain in the octogenarian patients. Some retrospective observational studies showed laparoscopic surgery group had a lower morbidity rate

than open surgery in the elderly patients (age > 75 years old).^{4,5} A RCT confirmed that no difference between open surgery group and laparoscopic group in the 3-year overall survival rate in the elderly patients.⁶ However, there were limited data on the long-term results of octogenarian colorectal cancer patients underwent laparoscopic resections.

This study aimed to evaluate the feasibility, the short-term and long-term outcomes of the octogenarian colorectal cancer patients underwent laparoscopic

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resection with curative intent.

Materials and Methods

Patients

We retrospectively reviewed a database containing the information about patients who underwent laparoscopic resections with curative intent for stage I-III colorectal cancer from January 2007 to December 2017 at our hospital. The inclusion criterion is the patients with biopsy-proved adenocarcinoma of colon or rectum who undergoing laparoscopic resection with curative intent. The exclusion criteria included emergent operations for bowel perforation or obstruction, and the patients had synchronous colorectal cancers or other malignancy. At our hospital, adjuvant chemotherapy was recommended for high risks group of stage II patients and all stage III patients.

The formula of the adjuvant chemotherapy is mFOLFOX (oxaplatin 85 mg/meter square + leucovorin 400 mg/meter square + bolus IV drip of fluorouracil 400 mg/meter square + continuous drip of fluorouracil 2400 mg/meter square for 46 hours) for stage III patients and fluorouracil (Cabecitabine 850-1250 mg per meter square per day) for high risks group of stage II patients. The adjuvant radiotherapy was suggested for T4 colon cancer and stage II-III rectal cancer. We constructed a combined committee which included colorectal surgeon, gastroenterologist, radiologist, pathologist, medical oncologist and radiation oncologist to discuss whether rectal cancer patients underwent neoadjuvant concurrent chemo-radiotherapy (CCRT) or not. The inclusion criteria of neoadjuvant CCRT are stage II/III lower third rectal cancers or large (> 5 cm in diameter or > 1/2 circumference) rectal cancers. Standard neo-adjuvant CCRT consisted of a total dosage of 50.4 Gy in 28 fractions (radiotherapy) and a dosage of 100 mg fluorouracil per square meter per day during the first and fifth weeks of radiotherapy.

Preoperative characteristics were collected including age, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) score. Periopera-

tive and pathological data included tumor locations, type of operation, operative time, blood loss, sample length, proximal safe margins, and distal safe margin, tumor sizes, number of retrieved lymph nodes and the pathological stage. Postoperative data were obtained including duration of hospital stay and time until first liquid diet. The postoperative complications were also collected.

Surgical techniques

If the tumor is located at sigmoid colon or rectum, the patient was placed in a lithotomy position. Four trocars were inserted into peritoneal cavity at para-umbilical, right lower quadrant (RLQ) of abdomen, right upper quadrant (RUQ) of abdomen, and left lower quadrant (LLQ) of abdomen. The pneumoperitoneum was created via umbilical trocar by CO₂ insufflation to keep the pressure of peritoneal cavity between 10 to 12 mmHg. A flexible laparoscope (Olympus®) was inserted into peritoneal cavity via the umbilical trocar. The operative table was rotated toward the right side of the patient. Under the guidance of the laparoscope, the sigmoid colon and rectum were mobilized using the medial-to-lateral approach. The isolation of the inferior mesentery pedicle was performed. The root of the inferior mesentery artery (IMA) and vein (IMV) were ligated with endo-clips. And then, they were divided. Extensive mobilization of the descending colon, splenic flexure colon, and distal transverse colon were performed in the selective patients. Then, transection of rectum was done with Covidien® endo-GIA stapler. Extended the umbilical wound to 4 cm in length and a wound protector (Alex®) was applied to the wound. The rectum and sigmoid colon were pulled out from the wound protector. Clamped and divided the sigmoid colon. Laparoscopic anterior resection was performed. End-to-end anastomosis between rectum and descending colon was done intracorporeally by the trans-anal insertion of a circular stapler. A pelvic drain was usually placed. And then, closed the wound layer by layer.

If the tumor is located at right side colon, the patient was placed in a supine position. Four trocars were inserted into peritoneal cavity at para-umbilical,

left lower quadrant (LLQ) of abdomen, left upper quadrant (LUQ) of abdomen, and right upper quadrant (RUQ) of abdomen. The pneumoperitoneum was created via umbilical trocar by CO₂ insufflation to keep the pressure of peritoneal cavity between 10 to 12 mmHg. A flexible laparoscope (Olympus®) was inserted into peritoneal cavity via the umbilical trocar. The operative table was rotated toward the left side of the patient. Under the guidance of the laparoscope, the cecum and ascending colon were mobilized using the medial-to-lateral approach. The isolations of the ileocolic and right colic pedicles were performed. The ileocolic and right colic vessels were ligated and divided. Then, identified the right branch of middle colic artery and vein. Ligated and divided them. Extensive mobilization of the proximal transverse colon to midline of the body was performed. Extended the umbilical wound to 4 cm in length and a wound protector (Alex®) was applied to the wound. The right colon was pulled out from the wound protector. Clamped and divided the terminal ileum and transverse colon. Laparoscopic right hemicolectomy was performed. End-to-end anastomosis between ileum and transverse colon was done extracorporeally. Put the terminal ileum and transverse colon into the peritoneal cavity. A JP drain was usually placed into Morison's pouch. Closed the wound layer by layer.

If the tumor is located at distal transverse colon, splenic flexure colon or descending colon, the patient was placed in a lithotomy position. Four trocars were inserted into peritoneal cavity at para-umbilical, RLQ of abdomen, RUQ of abdomen, and LUQ of abdomen. The pneumoperitoneum was created via umbilical trocar by CO₂ insufflation to keep the pressure of peritoneal cavity between 10 to 12 mmHg. A flexible laparoscope (Olympus®) was inserted into peritoneal cavity via the umbilical trocar. The operative table was rotated toward the right side of the patient. Under the guidance of the laparoscope, identified the location of the IMV, from Treitz ligament to the IMA root. Picked up the meso-descending colon, lateral to the IMV, with an endo-clamp, and then made an incision along the groove between the aorta and the IMV. Further dissections were performed in the incision and cut the meso-descending colon out from the retroperi-

toneum along the Gerota fascia to make a window to the Splenic fossa. So, the sigmoid colon, descending colon, splenic flexure colon and distal transverse colon were mobilized using the medial-to-lateral approach. The isolations of the left colic artery and IMV were performed. Then, they were ligated and divided. Then, identified the inferior mesentery vein, near Treitz ligament, and left branch of middle colic artery and vein. Ligated and divided them.

Extended the umbilical wound to 4 cm in length and a wound protector (Alex®) was applied to the wound. The left colon was pulled out from the wound protector. Clamped and divided the transverse colon and sigmoid colon. Laparoscopic left colectomy was performed. End-to-end anastomosis between transverse colon and sigmoid colon was done extracorporeally. Put the sigmoid colon and transverse colon into the peritoneal cavity. A JP drain was usually placed into Splenic Fossa. Closed the wound layer by layer.

Follow-up

After the surgery, all patients were enrolled in a surveillance program designed to detect disease status including local recurrence or distal metastasis. Clinic visits were scheduled every 3 months for the first 2 years and then every 6-months for the next 3 years. During each visit, pelvic examination was performed and the carcinoembryonic antigen (CEA) was measured. Abdominal computed tomography was performed every 6 months. Colonoscopy was performed after 1 and 3 years. If the patients missed the follow-up session at our outpatient department, we contacted them by telephone or mail. Any symptom potentially related to local tumor recurrence or distant metastasis was detected by digital examination, colonoscopy, computed tomography or magnetic resonance imaging. They must be confirmed by biopsy as we can.

Statistical analysis

The primary end-point of the study was the short-term results of the laparoscopic surgery including conversion rate, 30-day morbidity rate, 30-day mortality rate, operative time, blood loss, and the duration of

hospital stay. The secondary end-point of the study was confirmation of local recurrence, distant metastasis and patient's death. Frequency tables are used for patients' presentations and tumor characteristics. We used the two-tailed chi-square test for differences in proportions and the Student's t-test for continuous numerical variables. The cumulative proportions of survival rates were performed according to the Kaplan-Meier method. Statistical significance was defined as a value of $p < 0.05$. We compared all study data with Statistical Package for the Social Sciences (SPSS) version 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

Results

Five patients were converted to open surgery (4 patients had severe adhesions and 1 patient had T4 lesion) and conversion rate was 10%. A total of 46 patients were enrolled into our study. The demographic and tumor characteristics are presented in Table 1. Of the 46 patients, 21 were men, and 25 were women. The mean age of the patients were 85 years. (Standard deviation (SD), 3 years) The mean body mass index (BMI) was 23.9 kg/m² (SD, 3.4). 19 patients were American Society of Anesthesiologists (ASA) score II and 25 patients were ASA score III. Of the 46 patients, 39 patients had coloncancers (85%) and 7 patients had rectal cancers (15%). 12 patients had stage I cancers (26%), 22 patients had stage II cancers (48%) and 12 patients had stage III cancers (26%). About the comorbidity, there were 159 comorbidities in the 46 patients, including 28 patients had hypertension history, 19 patients had diabetes mellitus history, 15 patients had arrhythmia history, 10 patients had hypertensive cardiovascular disease, 7 patients had hyperlipidemia, 5 patients had a stroke history, 4 patients had chronic kidney disease, 4 patients had heart failure, 4 patients had history of pneumonia within one year, 3 patients had coronary artery disease, 3 patients had chronic obstructive pulmonary disease, 3 patients had head injury history with subdural hemorrhage, 3 patients had dementia, 3 patients had hydronephrosis, and 3 patients had peptic ulcer history. Only two patients had no any comorbidity. Of the 46 patients,

eleven patients (24%) underwent adjuvant chemotherapy and two patients (4%) underwent neoadjuvant CCRT for rectal cancers and anal sphincter preservations. No patient received adjuvant radiotherapy. The mean operation time was 249 minutes, and other outcomes are presented in Tables 2 and 3. No intra-operative complication occurred in our study. Twelve patients experienced complications (24%), and 11 patients had minor complications according to the classification of Clavien-Dindo: three patients had urinary tract infection, three patients had ileus, two patients had pneumonia, two patients had chylous ascites and one patient suffered from acute urine retention.⁷ Only one patient (Clavien-Dindo III, 2%) had left ureter in-

Table 1. Characteristics of octogenarian colorectal cancer patients underwent laparoscopic resection

	N (%)
Gender	
Male	21 (45)
Female	25 (55)
Age, median ± SD	85 ± 3
BMI (Kg/m ²), median ± SD	23.9 ± 3.4
ASA score	
Score 2	19 (41)
Score 3	25 (59)
Colon cancer	39 (85)
Rectal cancer	7 (15)
Previous abdominal surgery	
No	34 (74)
Yes	12 (26)
Comorbidity	
Hypertension history	28 (60)
DM history	19 (41)
Arrhythmia history	15 (33)
Hypertensive heart disease	10 (22)
Hyperlipidemia	7 (15)
Stroke history	5 (11)
Chronic kidney disease	4 (9)
Heart failure	4 (9)
Pneumonia within one year	4 (9)
Coronary heart disease	3 (6)
Chronic obstructive pulmonary disease	3 (6)
Head injury with subdural hematoma	3 (6)
Dementia	3 (6)
Hydro nephrosis	3 (6)
Peptic ulcer history	3 (6)

ASA: American Society of Anesthesiologists; BMI: Body mass index.

Table 2. Clinical outcomes octogenarian colorectal cancer patients underwent laparoscopic resection

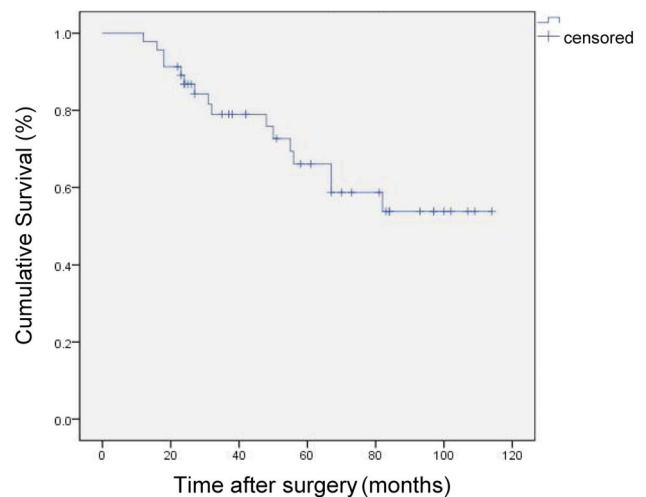
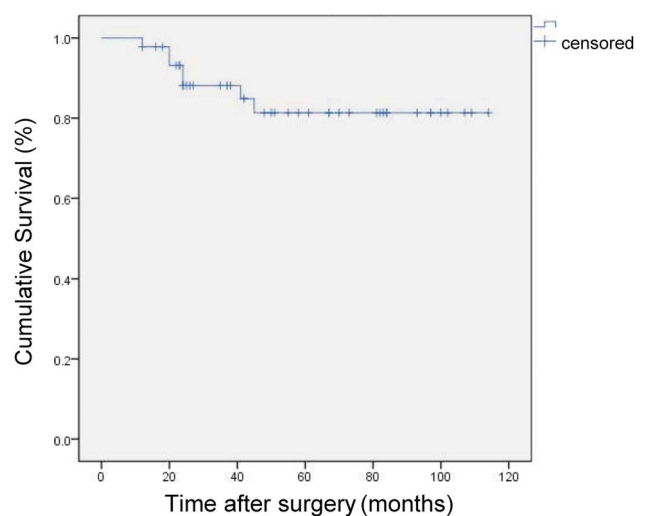
	N (%)
Stage I	12 (26)
Stage II	22 (48)
Stage III	12 (26)
T1	5 (11)
T2	9 (20)
T3	27 (59)
T4	4 (10)
N0	33 (72)
N1	7 (15)
N2	6 (13)
Lymph node harvested, mean \pm SD	21.0 \pm 10.6
Types of operations	
Right colectomy for colon cancer	21 (46)
Left colectomy for colon cancer	1 (2)
Anterior resection for colon cancer	17 (37)
Total meso-rectal excision (LAR) for rectal cancer	7 (15)
APR for rectal cancer	0 (0)
Operative time (minutes), mean \pm SD	249 \pm 85
Estimated blood loss (ml), mean \pm SD	172 \pm 286
Time to soft diet (days), mean \pm SD	6 \pm 3
Time to hospital stay (days), mean \pm SD	13 \pm 6
Neoadjuvant CCRT	2 (4)
Adjuvant chemotherapy	
Stage II	5
Stage III	6
Complication	
No	34 (76)
Yes	12 (24)
Alive (until December 2021)	50 (65)
Death (until December 2021)	16 (35)

jury and needed another surgical or radiological intervention to treat the complications. 30-day mortality rate was 2% in our study (one patient died of arrhythmia). The mean hospital stay was 13 days (range, 6-34 days).

The average duration of follow-up was 54 months (range, 3-114 months). During the periods of follow-up, 6 distant metastases occurred and one local recurrence developed. Seven patients died of colorectal cancer and nine patients died of other diseases including myocardial infarction, arrhythmia, pneumonia, liver cirrhosis with esophageal varices bleeding, and head injury. Five-year overall survival rate and five-year disease-free survival rate were 66% and 81% respectively (Figs. 1 & 2).

Table 3. Short-term and long-term results of the octogenarian colorectal cancer patients underwent laparoscopic resections

30-day morbidity rate (Clavian-Dindo I-II)	23.9% (11/46)
Urinary tract infection	6.5% (3/46)
Ileus	6.5% (3/46)
Pneumonia	4.3% (2/46)
Chylous ascites	4.3% (2/46)
Acute urine retention	2.1% (1/46)
30-day morbidity rate (Clavian-Dindo III-IV)	2.1% (1/46)
Left ureter injury	2.1% (1/46)
5-year overall survival rate	66%
5-year disease-free survival rate	81%

**Fig. 1.** Overall survival curve of octogenarian colorectal cancer patients underwent laparoscopic resection.**Fig. 2.** Disease-free survival curve of octogenarian colorectal cancer patients underwent laparoscopic resection.

Discussion

The definition of the elderly colorectal patients was not clear. Some authors thought that the ages of elderly patient are older than 75 years old.^{4,8} The others pointed that the oldest group is older than 85 years old.⁴ Some authors defined elderly patients as age are older than 80 years old, and 5-year survival rate was reported.⁹ We thought it be adequate that elderly patient is defined as octogenarian patient (older than 80 years old), and we could compare the 5-year survival rate of our study with the report (octogenarian patient's report). Of the 46 patients, 39 patients had colon cancers (85%) and 7 patients had rectal cancers (15%). In our previous study between 2013 and 2017 (unpublished data), laparoscopic colorectal cancer surgery consisted of 35% laparoscopic rectal cancer resection and 65% laparoscopic colon cancer resection in whole age population with curative intent. When the octogenarian patients had rectal cancer and they or their family faced the difficulties and complications about laparoscopic total meso-rectal excision (TME) or abdomino-perineal resection (APR), the possibility of favoring palliative treatment, such as palliative radiotherapy, or palliative chemotherapy, might increase. In addition, the percentage of adjuvant chemotherapy was just 24% (11/46) in our study, and it seemed to be low. So, we supposed that some patients underwent palliative chemotherapy or refused any adjuvant treatment because the patients or the patient's family thought the conditions of the patients were not suitable for the standard formula of the chemotherapy. They were afraid that the patients cannot tolerate the whole course of the chemotherapy well. That might make a negative impact on the long-term results including 5-year survival rates.

The octogenarian patients had high percentage of ASA score 3 (59%) which suggested that they had more co-morbidity that 60% of the patients had hypertension, 41% of the patients had diabetes mellitus, 32% of the patients had cardiac arrhythmia, 21% of the patients had cardiovascular disease, and 8% of the patients had renal disease. The average hospital stay was 13 days. It seemed to be too long. The possible explanations were that the elderly patients had more co-morbidity, and they needed more times to recovery than the younger group.

In our study, the 30-day morbidity rate was 24% and just one patient needed surgical intervention to resolve the complication. Compared with the previous studies, presented as Table 4, the result was acceptable. To date, there were limited data about long-term outcomes of octogenarian patient underwent laparoscopic resection. In a 2020 report, 5-year overall survival rate was 66.6%.⁹ The results were very close to our reports, presented in Table 4. So, the procedure had an acceptable survival rate for the octogenarian patients.

This study had some limitations. First, in this study, the sample size of the patient was small. Second, this is a retrospective observational study. Selection bias cannot be avoided. Third, so-called standard adjuvant chemotherapy or radiotherapy usually were rejected in the octogenarian patients. The results of treatments were not consistent.

Conclusion

Laparoscopic colorectal cancer resection may be a safe and feasible procedure with acceptable morbidity and mortality rates in the octogenarian patients. Lapa-

Table 4. Morbidity rate and survival rate in the elderly colorectal cancer patients underwent laparoscopic resection

Author	The year published	Case numbers	Definition of elderly patients	Morbidity rate	Survival rate	Reference
Valls FV, et al.	2014	143	> 75 Y/O	21.6%	-	4
Devoto L, et al.	2017	135	> 85 Y/O	23%	-	5
Bottino V, et al.	2012	40	> 75 Y/O	30%	-	8
Lee SM, et al.	2020	133	> 80 Y/O	-	66.6%	9
The present study	-	46	> 80 Y/O	26%	66%	-

roscopic colorectal cancer resection might be recommended for the octogenarian patients.

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原 著

80 歲以上大腸直腸癌患者接受腹腔鏡切除手術的短期及長期結果報告

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目的 研究及探討 80 歲以上大腸直腸癌患者在接受腹腔鏡大腸直腸癌根治手術的可行性及成果。

病人及方法 我們搜集及分析萬芳醫院從西元 2007 年一月至 2017 年 12 月期間，接受腹腔鏡切除手術的病人病歷。其中年紀超過 80 歲的共有 51 位。我們對這 51 位病人病歷做詳細分析及複閱。

結果 其中有 5 人因各種因素轉為開腹手術，轉為開腹手術比率為 10%。共計有 46 名進入我們的研究。平均手術時間為 249 ± 85 分鐘。平均住院天數為 13.5 天。30 天內併發症為 26%。5 年全存活率為 66%。5 年無復發存活率為 81%。

結論 腹腔鏡大腸直腸癌切除術，對於 80 歲以上之病人來說，是一個安全有效的手術。

關鍵詞 腹腔鏡手術、大腸直腸癌、老年、80 歲以上。