

Original Article

# The Surgical Outcome of Tumor Resection Surgery for Octogenarian Patients with Colorectal Cancer

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## Key Words

Octogenarian patients;  
Colorectal cancer;  
Tumor resection

**Purpose.** Although surgical resection is the main treatment for colorectal cancer, the optimal protocol for octogenarian patients remains undetermined. Our study aimed to evaluate the effect of surgery in these patients.

**Methods.** This retrospective study was performed on patients aged > 65 years diagnosed with colorectal cancer and who underwent tumor resection surgery from 2005 to 2009 at the Taipei Veterans General Hospital. Normally distributed data were presented as mean and examined with the Student's *t* test.

**Results.** A total of 854 elderly patients were recruited with subgroups of elderly patients (< 80 years old, n = 388) and octogenarian patients (≥ 80 years old, n = 466). Longer lengths of hospital stay and higher rates of severe complications were noted in octogenarian patients. Postoperative cerebral vascular accident, myocardial infarction, arrhythmia, and respiratory failure were more common in the octogenarian sub cohort. For those diagnosed with stage III colorectal cancer, the rate of adjuvant chemotherapy in octogenarian patients was lower than that in younger patients.

**Conclusions.** In conclusion, tumor resection surgery for colorectal cancer in octogenarian patients was well tolerated. Age alone was not the only indication for less aggressive therapy, as surgery could still be recommended for select octogenarian patients.

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Colorectal cancer is one of the most commonly diagnosed malignancies in developed countries.<sup>1</sup> In Taiwan, colorectal cancer is the most common cancer in males and second most common cancer in females. In 2014, there were 15,764 newly diagnosed cases of colorectal cancer in Taiwan, and the number of cases has increased annually since 2002.<sup>2</sup> According to the National Cancer Intelligence Network in the UK, about 60% of colorectal cancer patients were older than 70 years of age.<sup>3</sup>

Recommending surgery for elderly patients is often a difficult decision when considering their shorter life expectancies, increased incidence of comorbidities, and poorer daily activity than for their younger counterparts. This decision is even more challenging for octogenarian patients, especially as both patients and their families often request, or opt for less aggressive treatments. However, opting for less aggressive treatments does not depend on the patients age alone,

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particularly as curative colonic resection is well tolerated in patients older than 75 years of age.<sup>4</sup> The aim of this study was to evaluate the surgical outcome of colorectal cancer in elderly patients who underwent tumor resection at our hospital, in an effort to develop optimal therapeutic strategy.

## Materials and Methods

This retrospective study examined 854 elderly patients aged > 65 years, who were treated at our hospital from January 2005 to December 2008. The study cohort consisted of patients with colorectal cancer (stage 0-IV) who had undergone tumor resection surgery at the Taipei Veterans General Hospital. The patient cohort was divided into two groups according to their age, i.e. the octogenarian group ( $\geq 80$  years old), and the elderly group (< 80 years old). The median age of 80 was chosen in consideration of the average life expectancy in Taiwan.<sup>5</sup> We also included 46 patients who aged from 90 to 99 into the octogenarian group, because these patients also had similar clinical challenge compared with octogenarian.

Data was collected for all patients, including, age, gender, comorbidities, ASA classification prior to surgery, tumor location, type of surgery, pathological TNM staging, 30-day and in-hospital mortality, length

of stay after surgery, and post-operative complications. Clavien-Dindo classification was used to define complications. The primary outcome was surgical outcome, including 30-day and in-hospital mortality. In-hospital mortality was defined as death occurring during the hospital stay after surgical resection of colorectal cancer. The death during re-admission was excluded from in-hospital mortality. The secondary outcomes were length of stay and complications. Complications that needed treatment with additional surgery were examined separately.

Statistical analysis was conducted with MedCalc Software (Maria Kerke, Belgium). Normally distributed data were presented as the mean and examined with the Student's *t*-test.

## Results

### Patients

The elderly group (aged > 65 but < 80) consisted of 388 patients with a mean age 69.89 years, while the octogenarian group consisted of 466 patients with a median age 83.97 years. The sex ratio (male/female) was 1.75 and 3.01 in the elderly and octogenarian groups, respectively ( $p = 0.028$ ). The octogenarian group demonstrated a higher rate of comorbidity then

**Table 1.** Comparison of clinical characteristics between elderly and octogenarian patients with colorectal cancer

Variables	Age $\geq 80$ n = 466 (54.6%)	80 > age $\geq 65$ n = 388 (45.4%)	<i>p</i> value
Mean age	83.97	69.89	-
Gender	M350 (75.1%)/F116 (24.9%)	M247 (63.7%)/F141 (36.3%)	0.028
ASA classification			
ASA 1+2/ASA 3+	232 (49.8%)/234 (50.2%)	272 (70.1%)/116 (29.9%)	0.072
Comorbidity	382 (82.0%)	267 (68.8%)	< 0.001
Diabetes mellitus	91 (19.5%)	78 (20.1%)	0.817
Hypertension	239 (51.3%)	171 (44.1%)	0.896
Heart disease	161 (34.5%)	73 (18.8%)	< 0.001
Liver disease	8 (1.7%)	7 (1.8%)	0.611
Renal insufficiency	16 (3.4%)	15 (3.9%)	0.237
COPD	43 (9.2%)	15 (3.9%)	< 0.001
Brain disease	55 (11.8%)	25 (6.4%)	< 0.001
Other malignancy	35 (7.5%)	27 (7.0%)	0.475
Inflammatory bowel disease	1 (0.2%)	1 (0.3%)	0.059

<sup>a</sup> American Society of Anesthesiologists.

the elderly group ( $p < 0.001$ ). Among the several of comorbidities, heart disease, chronic obstructive pulmonary disease (COPD), and brain disease (typically resulting from a previous cerebrovascular accident) were significantly higher in the octogenarian group than the elderly group. The sigmoid colon and rectum were the most common tumor sites for both groups. Higher rates in both palliative and emergent surgery were noted in the octogenarian group. No significant difference was noted for pathologic TNM staging between these two study groups.

### Surgical outcomes

Post-operative 30-day mortality was observed in 14 cases in the octogenarian group (3.00%) and one case in the elderly group (0.25%). In-hospital mortality was collected to facilitate the improvement of both the ICU and post-operative care centers. The incidence of in-hospital mortality was 20 patients in the octogenarian (4.29%) and two patients in the elderly group (0.52%;  $p < 0.001$ ). Longer lengths of hospital

stay were observed in the octogenarian group ( $16.48 \pm 2.76$  days) than in the elderly group ( $11.57 \pm 0.87$  days,  $p < 0.001$ ).

The rate of overall complication was higher in the octogenarian group than in the elderly group (27.25% vs. 18.81%,  $p = 0.04$ ). Complications such as post-operative cerebrovascular accident (CVA), myocardial infarction (MI), arrhythmia, and respiratory failure, respectively, required management with endotracheal intubation and mechanical ventilation ( $p < 0.001$ ). No significant difference was observed between the two groups for complications that required surgical treatment, regardless of whether the operation occurred during the in-hospital stay or during readmission to the hospital.

The most common in-hospital complication that required additional surgery was anastomotic leakage (in both groups), with a lower rate of this complication noted in the octogenarian group. Higher rates of fascial dehiscence, intestinal obstruction, and respiratory failure were also noted in this group. For both groups, intestinal obstruction was the most common complication resulting in readmission for additional surgery. In addition, higher rates of ventral hernia were noted in the elderly group. More severe complications (Clavien-Dindo classification grade IV) were noted in the octogenarian group than the elderly group. The grade IV or higher Clavien-Dindo classification of complications for all patients are shown in Table 6.

### Stage III colorectal cancer

For patients with stage III colon cancer, 55.13% of the octogenarian group had received adjuvant chemotherapy, while 85.07% received treatment in the el-

**Table 2.** Comparison of tumor location between elderly and octogenarian patients with colorectal cancer

Tumor location (n(%))	Age $\geq$ 80 n = 466 (54.6%)	80 > age $\geq$ 65 n = 388 (45.4%)
Appendix	1 (0.2%)	4 (1.0%)
Cecum	44 (9.4%)	32 (8.2%)
Ascending colon	62 (13.3%)	38 (9.8%)
Hepatic flexure	41 (8.8%)	24 (6.2%)
Transverse colon	23 (4.9%)	24 (6.2%)
Splenic flexure	10 (2.1%)	6 (1.5%)
Descending colon	30 (6.4%)	24 (6.2%)
Sigmoid colon	106 (22.7%)	91 (23.5%)
Recto-sigmoid junction	33 (7.1%)	12 (3.1%)
Rectum	123 (26.4%)	140 (36.1%)
Anal canal	2 (0.4%)	1 (0.3%)

**Table 3.** Comparison of surgical type between elderly and octogenarian patients with colorectal cancer

Type of surgery n (%)	Age $\geq$ 80 n = 466 (54.6%)	80 > age $\geq$ 65 n = 388 (45.4%)	p value
Elective	409 (87.8%)	370 (95.4%)	< 0.001
Emergent	57 (12.2%)	18 (4.6%)	
Minimal invasive surgery	27 (5.8%)	24 (6.2%)	-

**Table 4.** Comparison of pathologic TNM staging between elderly and octogenarian patients with colorectal cancer

TNM staging (n (%))	Age $\geq$ 80 n = 436 (53.7%)	80 > age $\geq$ 65 n = 376 (46.3%)	p value
0	15 (3.44%)	25 (6.65%)	0.082
I	80 (18.35%)	76 (20.21%)	
II	157 (36.01%)	107 (28.46%)	
III	119 (27.29%)	112 (29.79%)	
IV	65 (14.91%)	56 (14.89%)	

**Table 5.** Surgical outcome between elderly and octogenarian patients with colorectal cancer

	Age ≥ 80 n = 466 (54.6%)	80 > age ≥ 65 n = 388 (45.4%)	p value
<b>Complications (n (%))</b>			
Overall	127 (27.25%)	73 (18.81%)	0.040
Cerebral vascular accident	4 (0.86%)	1 (0.26%)	< 0.001
Myocardial infarction	7 (1.50%)	1 (0.26%)	< 0.001
Arrhythmia	7 (1.50%)	1 (0.26%)	< 0.001
Respiratory failure	13 (2.79%)	3 (0.77%)	< 0.001
Renal failure	4 (0.86%)	0	-
Leakage	16 (3.43%)	14 (3.60%)	0.618
<b>Return to OR because of complication (n (%))</b>			
In-hospital complication	40 (8.59%)	22 (5.67%)	0.1333
Anastomotic leakage (T-loop colostomy/ileostomy/Hartmann/exploratory laparotomy + drain)	12 (2.57%) {3/3/5/1}	13 (3.35%) {8/1/3/1}	0.008
Wound infection (debridement)	9 (1.93%)	5 (1.29%)	0.6414
Fascial dehiscence (suture)	9 (1.93%)	3 (0.77%)	< 0.001
Intestinal obstruction (enterolysis)	4 (0.86%)	1 (0.26%)	< 0.001
Respiratory failure (tracheostomy)	3 (0.64%)	0	-
Incarcerated hernia (segmental resection of small intestine and repair of fascia defect)	1 (0.21%)	0	-
Mucocutaneous fistula (enterolysis/debridement)	2 (0.43%)	0	-
Anastomotic leakage of transureterostomy (anastomosis)	1 (0.21%)	0	-
Ureter transection (anastomosis)	1 (0.21%)	0	-
Wound bleeding (check bleeding)	1 (0.21%)	0	-
<b>Return to OR because of complication n (%)</b>			
	Age ≥ 80 n = 466 (54.6%)	Age 65-79 n = 388 (45.4%)	p value
Re-admission	19 (4.07%)	23 (5.92%)	0.2773
Intestinal obstruction (resection + anastomosis/enterolysis/T-loop colostomy)	10 {3/6/1} (2.15%)	9 {3/6/0} (2.32%)	0.9508
Ventral hernia (hernioplasty)	7 (1.50%)	10 (2.58%)	< 0.001
Colon-vesical fistula (ileocecal resection)	1 (0.21%)	0	-
Uretero rectal fistula (colostomy)	0	1 (0.26%)	-
poor healing wound (debridement)	1 (0.21%)	1 (0.26%)	0.059
J pouch perforation (repair+ loop ileostomy)	0	1 (0.26%)	-

**Table 6.** Complications between elderly and octogenarian patients with colorectal cancer

	Age ≥ 80 n = 466 (54.6%)	80 > age ≥ 65 n = 388 (45.4%)	p value
<b>Clavien-Dindo classification n (%)</b>			
I	344 (73.82%)	312 (80.41%)	< 0.001
II	36 (7.73%)	28 (7.22%)	
III	56 (12.02%)	41 (10.57%)	
> IV	30 (6.44%)	7 (1.80%)	
<b>Clavien-Dindo classification ≥ IV n(%)</b>			
Total	30 (6.44%)	7 (1.80%)	
Respiratory failure	13 (2.79%)	3 (0.77%)	
Septic shock with multiple organ failure	7 (1.50%)	1 (0.26%)	
Acute myocardial infarction	6 (1.29%)	1 (0.26%)	
Congestive heart failure	2 (0.43%)	0	
Sudden cardiac death	1 (0.21%)	0	
Acute kidney injury	3 (0.64%)	0	
Stroke	1 (0.21%)	0	

derly group ( $p = 0.0002$ ). As for stage III rectal cancer, 56.10% of patients in the octogenarian group had received adjuvant chemotherapy, as compared to 86.67% in the elderly group ( $p = 0.0035$ ).

## Discussion

Tumor resection for colorectal cancer remains the standard of care for this disease. When considering the steady increase in the proportion of the elderly population in Taiwan, surgeons will soon be confronted with difficult clinical decisions for the treatment of these patients. In 2000, there was a previous systemic review published in the *Lancet* that found resection of colorectal tumors were performed less often in elderly patients than younger patients.<sup>6</sup> Another study claimed that age alone should not be the only consideration for choosing surgery.<sup>4</sup> Therefore, our study aimed to evaluate the surgical and oncological outcome in the elderly colorectal cancer patients.

In our study, the total postoperative morbidity rate was higher in the octogenarian group. Furthermore, among the complications, the rates of respiratory failure, cardiovascular event, and stroke were significantly higher in the octogenarian group. There may be some reasons for the observed trends of complications in this study. First, the octogenarian group had higher rates of comorbidities, especially in heart disease, COPD, and brain disease (mainly cerebrovascular accident). Second, higher rates of emergent surgery in this group were also noted (Table 3). The preparation for emergent operation can typically be less complete than elective surgery, such as colon preparation, the usage of anticoagulants, blood sugar levels, blood pressure, etc.

In addition, a longer duration of hospital stay was noted in the octogenarian group. Higher postoperative morbidity rates in this group may be one possible explanation. When considering cultural customs, many families prefer to keep elderly patients hospitalized and request longer hospital stays. This could be due to a concern over the quality of home care after discharge from the hospital. Moreover, this could be affected by a family's ability to afford extended hospitalization.

There was no significant difference in the anastomotic leak rate between the two study groups. However, the rate of re-operation for anastomotic leakage was lower in the group aged over 80 than the elderly group (2.57% vs. 3.35%,  $p = 0.008$ ). One explanation for optimal outcomes with conservative treatments for patients presenting with anastomotic leakage may be due to the protective stoma in the tumor resection surgery. In our analysis, there were four patients aged over 80 who did not need further operation after anastomotic leakage. Three of these patients had received protective stomas in previous operations.

In agreement with a previous systemic review study,<sup>6</sup> our study also showed that older patients had a higher risk of 30-day operative mortality. Modini et al.<sup>7</sup> reported that patients 80 years and older had a 6-fold higher 30-day postoperative mortality than their younger counterparts did. In our study, the rate of in-hospital mortality in the octogenarian group was 4.29%, as compared to 0.51% observed in the elderly group.

There is another possible cause of a higher postoperative mortality rate in the octogenarian patients. We found a higher rate of emergent surgery in the octogenarian group (Table 3). In previous study, postoperative mortality was related to emergency surgery,<sup>8</sup> but we observed the incidence of emergent surgery of 12.2% in the octogenarian group from our study. The in-hospital mortality rate could be reduced to 2.2% in the elective surgery in this group. This shows the importance of avoiding emergent operations in clinical practice.

Our study had some limitations. First, this was a retrospective study from a single medical center with limited cohort size. Second, we did not have the data for patients who had been diagnosed with colorectal cancer, but had not received tumor resection. In addition, the rate of adjuvant chemotherapy for stage III colorectal cancer patients was lower in the octogenarian group for both colon and rectal cancer than the elderly group. For patients aged over 80, the chemotherapy rate was 55.13% in colon and 56.10% in rectal cancers. In this study, the effects of chemotherapy, radiotherapy, and targeted therapy were not analyzed. There were three reasons for this: first, we aimed to focus on the influence of surgery; second, the number

of patients who received adjuvant therapy was limited for this analysis; third, the regimen of adjuvant therapy administered for these patients was different from current chemotherapy regimens.

## Conclusions

Tumor resection for colorectal cancer in octogenarian patients is well tolerated. However, longer lengths of stay after operations, and higher rates of complication were observed. Postoperative cerebral vascular accident, MI, arrhythmia, and respiratory failure were more common in octogenarian patients. For patients diagnosed with stage III colorectal cancer, the rate of adjuvant chemotherapy in their younger patients was higher than for their octogenarian counterparts. However, age alone should not be the only indication for choosing a less aggressive therapy. Surgery is still recommended for selected octogenarian patients.

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原 著

## 極老人接受大腸直腸腫瘤手術的預後

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結腸直腸癌的治療方法目前以腫瘤切除手術為主，但是對於年齡大於八十歲患者的最佳治療方法仍未確定。本研究旨在評估腫瘤切除手術對這些患者的療效。這項回顧性研究收錄 2005 年至 2009 年間在臺北榮民總醫院接受結腸直腸癌腫瘤切除手術的老年患者。正態分佈數據以平均值表示，並用 Student's t 檢驗進行檢驗。共收錄 854 名老年患者，其中小於 80 歲有 388 位，八十歲以上有 466 位。研究顯示八十歲以上患者的住院時間較長，嚴重併發症發生率較高，術後腦血管疾病、心肌梗塞、心律不整、呼吸衰竭較常見。對於診斷為第三期結腸直腸癌的患者，八十歲以上族群接受術後輔助化學治療的比率較低。雖然八十歲以上患者有較高術後併發症，但整體術後耐受性良好。年齡不應該作為拒絕手術的單一考量，手術對於篩選後的八十歲以上患者仍然可以為主要治療。

**關鍵詞** 老年人、結腸直腸癌、腫瘤切除術。