

Laparoscopic Colectomy in the Elderly: When Is Too Old?

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ABSTRACT

To date, there is little literature regarding the impact of laparoscopic colectomy in the elderly population (i.e., patients older than 70 years) as the vast majority of studies regarding laparoscopic colectomy have evaluated younger patients (younger than 65 years). It is unknown whether elderly patients garner the same benefits from laparoscopic colectomy that younger patients have been shown to receive. As a result, there may be a reluctance to offer laparoscopy to elderly patients. The majority of the reports suggest that laparoscopic colectomy in the elderly is safe and provides the same benefits as laparoscopic colectomy in a younger population. Although an elderly population does not return to the work force, the benefits in the elderly population are related to a return to independence more often than after conventional surgery without an increase in hospital costs. Based on the current literature, one may never be too old to have a laparoscopic colectomy.

KEYWORDS: Laparoscopy, age, elderly, physiology

Objectives: On completion of this article, the reader should understand that age by itself is not a contraindication to laparoscopic surgery.

Colorectal pathology requiring surgical management increases with age. Improvements in medical technology have lengthened the average life expectancy, which has led to a substantial increase in the incidence of colorectal diseases in the elderly population. As a result, the proportion of patients older than 70 years requiring major abdominal surgery is climbing. In the early 1960s, abdominal surgery was considered hazardous for elderly patients. It is clear that as patients age, there is an associated increase in comorbid conditions. These age-associated comorbidities often complicate the perioperative management of elderly patients after major abdominal surgery. Fortunately, our ability to monitor and manage these comorbid conditions has greatly improved.

Today, age is rarely considered a contraindication for the surgical management of disease of the colon and rectum, and the criteria used to determine the need for surgical therapy are the same for surgical patients of all ages.¹

Although laparoscopic-assisted colectomy (LAC) is associated with short-term benefits compared with open colectomy,²⁻⁶ the majority of studies examining the benefits of LAC have centered on patients younger than 65 years. The role of LAC in the elderly patient is controversial and may not be widely accepted. There are several issues that contribute to the reluctance to offer LAC routinely to this older population of patients requiring colectomy. First, with the age-associated increase in comorbidities, some question whether LAC

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can be performed as safely and without an increase in morbidity or mortality compared with a conventional laparotomy. Second, LAC is associated with significantly longer operative times, and the physiologic effects that prolonged time under anesthesia and CO₂ pneumoperitoneum have upon the multiple comorbid conditions of these patients are unknown. Third, there is relatively little literature addressing the risks and benefits of LAC in the elderly. Finally, how old is an elderly patient—70...75...80 years? There are certainly patients older than age 80 who are physiologically much healthier than some 60-year-old patients. Difficulty in defining physiologic and functional age makes this an arduous task to tackle. For most studies, an age greater than 70 years has been used to define “elderly.” As a result, it has been difficult to determine whether older patients enjoy the same benefits as younger patients. Conversely, laparoscopic surgery has been shown to be less stressful and lead to quicker recuperation than open surgery. Therefore, proponents of LAC argue that elderly patients, because of their comorbid conditions and decreased functional reserve, would benefit most from a laparoscopic approach. This article highlights the current literature on laparoscopic colonic resection in the elderly and elucidates which subset of the population does benefit from a minimally invasive approach to colorectal diseases.

Through a search of PubMed and subsequent examination of the study references, a total of 18 studies on LAC in the elderly were identified (Tables 1 and 2). Initial reports regarding laparoscopy in the treatment of colorectal diseases indicated that LAC could be performed in the elderly population safely and without significant increase in morbidity and mortality. The first report of LAC in elderly patients was a case series by Vara-Thorbeck et al from Spain.⁷ Eighteen patients underwent LAC for cancer, 11 of whom were older than 70 years. All patients had an American Society of Anesthesiologists (ASA) score of III or IV.

None of the cases were converted to open laparotomy, and there were no mortalities. Three of the 11 patients older than 70 years had complications, and 3 of 8 patients younger than 70 years had complications. The elderly patients required analgesics for an average of 3.3 days versus 3.1 days for patients younger than 70 years. Average length of postoperative ileus was 4.7 and 4.1 days with an average hospital stay of 7.5 and 7.8 days for patients older than 70 years and younger than 70 years, respectively. The authors also measured the length of specimen harvested along with the length of proximal and distal margins and number of lymph nodes identified. All parameters were within accepted limits. This study demonstrated that LAC could be done safely on both older and younger patients while maintaining the same principles of surgical technique as open colectomy.

Peters and Fleshman followed this report with their experience specifically with LAC in patients older than 65 years.⁸ In a prospective study, 103 patients who underwent elective LAC were enrolled. Eighty-four of the patients were older than 70 years. Indications for surgery included cancer or polyp (90), diverticulitis (6), ulcerative colitis (2), arteriovenous malformation, lipoma, lymphoma, radiation colitis, and sigmoid volvulus (1 each). Fourteen (14%) patients were converted to open laparotomy. The most common reasons for conversion were more extensive carcinoma than expected and adhesions. Morbidity and mortality were reported as 24% and 2.9%, respectively, which are comparable to the rates reported in the literature for open colectomy in elderly patients. Length of stay was significantly shorter for the patients who had a laparoscopic resection (5.3 days) than the patients who were converted to an open procedure (8.1 days). The authors concluded that LAC in patients older than 65 years is safe and feasible.

This study was followed by an age comparative study from Cleveland Clinic in Florida of LAC for 36 patients with a mean age of 73 years versus 36 patients

Table 1 Case Series for Laparoscopic-Assisted Colectomy in the Elderly

Author (year)	Age	No. of Patients	RBF (days)	LOS (days)	Morbidity (%)	Mortality (%)	Conversion Rate (%)
Vara-Thorbeck et al (1994) ⁷	> 70	18	3.3	7.5	28	0	
Peters and Fleshman (1995) ⁸	> 65	103		5.9	24	3	26
Reissman et al (1996) ⁹	> 60	36	4.2	6.5	11		
	< 60	36	2.8	5.2	14		
Schwandner et al (1999) ¹⁰	< 50	95		11.5	4.6		3.1
	51–70	138		13.3	10.1		9.4
	> 70	65		17.2	9.5		7.4
Iroatulam et al (1999) ¹⁸	< 65	48	3.3	6.3	21	0	0
	> 65	38	3.3	5.7	18	0	0
Bardram et al (2000) ²³	> 75	50		2.5	32	4	22
Seshadri et al (2001) ¹³	> 80	62		10	31	5	11

LOS, length of stay; RBF, return of bowel function.

Table 2 Comparative Studies of Laparoscopic-Assisted Colectomy versus Open Colectomy in the Elderly

Author (year)	Operation	Age	No. of Patients	RBF (days)	LOS (days)	Morbidity (%)	Mortality (%)	Conversion (%)	Analgesia (days)	Activity/ Costs
Stewart et al (1999) ¹⁷	LAC	> 80	42		9	16.7	7	12		84%*
	Open	> 80	35		17	43	11			64%*
Tuech et al (2000) ¹⁹	LAC	> 75	22		13.1	18			5.4	27%†
	Open	> 75	24		20.2	50			8.2	63%†
Stocchi et al (2000) ²⁰	LAC	> 75	42	3.9	6.5	14	0	14.3	2.7	95%‡
	Open	> 75	42	5.7	10.2	33	0		4.8	76%‡
Sklow et al (2003) ²²	LAC	> 75	39	3.9	6.1	31	2.5	8		
	Open	< 75	38	4.2	6.1	29	0	16		
		> 75	39	4.9	7.8	31	0			
		< 75	38	5.5	7.7	37	0			
Delgado et al (2000) ¹¹	LAC	> 70	59	3.1	6	10	1.7			
	Open	< 70	70	2.9	5	11	0			
		> 70	67	4.7	7	31	0			
		< 70	59	4.4	7	20	0			
Mutch et al (2002) ²¹	LAC	> 70	37	3	5	32	0	0		62%§
	Open	> 70	37	4	6	38	0			65%§
Law et al (2002) ¹²	LAC	> 70	65	3	3	27.7	1.5	12		
	Open	> 70	89	4	5	37	5.6			
Senagore et al (2003) ²⁴	LAC	> 70	50		4.2	16	0			\$3920¶
	Open	< 70	181		3.9	10.5	0			\$3216¶
		> 70	123		9.3	37	1			\$6448¶
		< 70	122		6.1	13.1	0			\$3804¶
Vignali et al (2005) ²⁷	LAC	> 80	61	3	9.8	21	1.6	6		98%‡
	Open	> 80	61	4	12.9	31	3.2			82%‡

*Independent at time of discharge.

†Discharged to inpatient rehabilitation.

‡Remained independent at time of discharge.

§Discharged without assistance.

¶Direct cost related to surgery.

LAC, laparoscopic-assisted colectomy; LOS, length of stay; Open, open colectomy; RBF, return of bowel function.

with a mean age of 44 years.⁹ There was no difference in the rates of complications or conversion to open laparotomy between the two age groups. The older patients had longer postoperative ileus (4.2 versus 2.8 days) and longer hospital stay (6.5 days versus 5.2 days), but neither parameter reached statistical significance. Laparoscopy-assisted colectomy in the elderly can be performed with no difference in morbidity or length of hospital stay compared with LAC in younger patients.

Drawing from a German study, Schwandner and colleagues compared the results of LAC for three different age groups (< 50 years versus 51–70 years versus > 70 years).¹⁰ There were 65, 138, and 95 patients in the respective age groups. Preoperative testing, based on blood pressure measurements, electrocardiogram, and pulmonary spirometry, showed a significantly higher incidence of cardiopulmonary disease in the age group older than 70 years. The patients' ASA score was not determined. Overall, 22 (7.4%) patients were converted to an open procedure, with no difference between age groups. All age groups had similar rates of morbidity

and mortality. However, the older patients had a significantly longer hospital stay at 17.2 days versus 11.5 and 13.3 days in the younger age groups, respectively. The age group older than 70 years also had a significantly longer mean stay in the intensive care unit than the younger groups (0.9 days versus 0.1 days and 0.5 days, respectively). The authors concluded that despite the increased comorbid conditions and longer hospital and intensive care unit stays, this did not translate into increased complications or death. As a result, age should not be a contraindication for laparoscopic approach to colectomy.

In a similar study by Delgado et al, a significantly lower complication rate was shown in patients older than 70 years who underwent a LAC versus an open procedure.¹¹ The study was a randomized controlled study comprising 129 patients younger than 70 years randomly assigned to LAC or open colectomy (70 LAC, 59 open) and 126 patients older than 70 years randomly assigned to LAC or open colectomy (59 LAC, 67 open). Colorectal cancer was the indication for surgery in all patients. The four different groups of patients were compared for

postoperative ileus, hospital stay, and complications. The LAC groups had shorter postoperative ileus and hospital stays than the open groups. As previously mentioned, patients older than 70 years had fewer complications and a shorter hospital stay in the LAC group than those in the open group. Also, the older than 70 year, LAC group had fewer complications and a shorter length of stay than the younger than 70 year, open group, but there were no differences between the two different LAC age groups. This study demonstrated that for patients older than 70 years LAC can be performed with significant benefit over open laparotomy. Therefore, it was recommended that LAC be offered to appropriate elderly patients rather than a conventional laparotomy.

Law et al from Hong Kong prospectively compared 65 patients who underwent LAC and 89 patients who underwent open colectomy.¹² Patients underwent LAC based on the surgeon's preference and were then matched to elective open cases. All patients were older than 70 years and had various indications for surgery. They found a significant reduction in postoperative ileus (3 days versus 4 days), earlier resumption of solid food (3 days versus 5 days), and shorter hospital stay (7 days versus 9 days) in the LAC group. Regarding the overall complication rate there was no difference, but the laparoscopic group did have a significantly lower rate of cardiopulmonary complications than the open group (5 complications versus 20 complications). Complications included arrhythmia (2 versus 5), myocardial ischemia (1 versus 2), heart failure (0 versus 3), pneumonia (7 versus 2), and respiratory failure (0 vs 2), respectively. They concluded that LAC is a safe option for elderly patients and may lead to a quicker return to baseline functional status.

Seshadri et al from Canada published their case series of 62 patients who were older than 80 years who underwent LAC.¹³ The majority of patients were treated for cancer (77%), diverticulitis (10%), and polyps (8%). The average length of stay was 10 days, and the patients requiring conversion to laparotomy spent an average of 15.7 days in the hospital. The overall complication rate was 31%, but the cardiopulmonary and urinary complications were lower than those reported in the literature for open colectomy. It was concluded that LAC was technically feasible and safe in patients older than 80 years.

In a contrasting study, Schlachta et al performed a multiple regression analysis of 416 laparoscopic colorectal resections between 1991 and 1998.¹⁴ These cases included benign and malignant pathology but were not stratified for the patients' preoperative medical status. They found that increased age was one preoperative predictor of the risk of postoperative complications after laparoscopy, with 70% of the complications occurring in patients older than 60 years. The other predictors included abdominoperineal resection and presence of a

fistula. The authors concluded that age should be taken into account when selecting patients for LAC.

Despite evidence for the benefits of laparoscopic colorectal surgery in multiple studies, enthusiasm for applying this technology to the population of elderly patients was still marginal. Fortunately, as surgeons have gained experience with LAC, its use has become more widespread. It is clear that open colorectal procedures in patients older than 70 years are associated with significant morbidity resulting in prolonged hospital stays, increased need for intensive monitoring, and less independence at time of discharge.^{15,16} The next series of studies began to examine how LAC affected length of stay and discharge disposition. A group from Australia performed a prospective, comparative study for patients older than 80 years who underwent either laparoscopic or open colectomy.¹⁷ There were 42 patients in the laparoscopic group and 35 patients in the open group. Patients were assigned to their procedure based on the surgeon's preference. Seven patients (17%) required conversion to open laparotomy. Length of stay was shorter at 9 days versus 17 days and the number of patients admitted to the intensive care unit was less (7 patients versus 14 patients) in the laparoscopic group than in the open group. Overall morbidity and mortality were similar in both groups, but the laparoscopic group did have a significantly lower number of wound and cardiovascular complications. However, the numbers in this study were fairly small. The significance of this study was the major benefit of LAC with regard to discharge disposition and time to return to preoperative activity levels. For the laparoscopic group, 80% were discharged to home with only 11% requiring transfer to a rehabilitation facility. This was significantly improved over the open group, in which only 43% were discharged to home and 46% were discharged to a rehabilitation facility. Finally, 87% of patients in the laparoscopic group had returned to their preoperative energy level by 4 weeks compared with 57% of patients in the open group. However, the authors did not report the methods used to determine return of activity level. This study demonstrates not only that age is not a contraindication to LAC but also that elderly patients have a significant benefit and advantage with LAC versus open colectomy.

Iroatulam and colleagues from the Cleveland Clinic of Florida retrospectively examined the rate of return of activity level for two cohorts of patients (age < 65 years versus age > 65 years) who underwent LAC.¹⁸ Thirty-eight patients were younger than 65 years and 48 patients were older than 65 years. The length of postoperative ileus (3 days versus 3 days), length of stay (5.7 days versus 6.3 days), and complication rate (18% versus 21%) were similar for patients younger than 65 years and those older than 65 years, respectively. Determination of return of activity was by questionnaire regarding ability to perform activities of

daily living and performance of routine activities (i.e., driving, working, sexual activity, exercise). Weeks to return of partial and full activity were no different for the two age groups. As a result, the authors concluded that elderly patients experience the same degree of benefit with regard to length of hospital stay and return of activity level as younger patients for laparoscopic colon surgery.

In France, Tuech et al reported a significantly lower complication rate and less need for postoperative inpatient rehabilitation following LAC for sigmoid diverticulitis in patients older than 75 years.¹⁹ Twenty-two patients who underwent LAC were prospectively compared with 26 patients who underwent open sigmoid resection. This population consisted of consecutive patients surgically treated for diverticulitis and assigned to laparoscopic or open colectomy based on the surgeon's preference. The ASA status was similar for both groups. The laparoscopic group had an 18% complication rate versus 50% in the open group. The major difference was that there were fewer cardiac, pulmonary, and wound complications in the laparoscopic group. Next, independent patients were more likely to maintain their independence after discharge in the LAC group than in the open group. Fifteen patients who were independent required inpatient rehabilitation after laparotomy compared with six in the laparoscopic group. The authors concluded, "In general terms, laparoscopy decreases the negative impact of colorectal surgery in elderly patients." It is the reduction in surgical stimulation, which allows earlier ambulation and decreased complications, that gives LAC a definite advantage in selected older patients.

Two studies from the United States examined discharge disposition in patients older than 70 years after LAC. The first study from Mayo Clinic retrospectively performed a case-matched comparison of 42 LAC cases with 42 open cases.²⁰ The laparoscopic group had significantly fewer complications, less narcotic use, faster return of bowel function, and shorter length of hospitalization and were more independent at time of discharge. Independence was defined as being at home and performing activities of daily living without assistance. In the laparoscopic group, 35 of the 37 patients who were independent before surgery maintained their independence upon discharge. In the open group only 29 of 38 patients maintained independence at discharge. These results highlight an advantage of LAC and demonstrate for the first time in the United States a posthospital benefit for LAC in the elderly population. The second U.S. study came from Lahey Clinic and examined the same endpoints.²¹ Thirty-seven patients who underwent LAC were retrospectively matched with 37 patients who underwent an open colectomy. Once again, the laparoscopic group had a quicker return of bowel function. However, in contrast to the other study,

the length of stay (5 days and 6 days, respectively) and discharge disposition were similar in each group. The LAC group had 23 of 37 patients discharged to home without assistance versus 24 of 37 in the open group. The explanation for this is unclear, and it may represent regional variations in discharge patterns.

Fleshman and his group from Washington University found that patients 75 years and older enjoyed the same benefits as younger patients from LAC and suggested that elderly patients may have a selective advantage with regard to laparoscopic-assisted left colectomy.²² Two groups of 39 patients each more than 75 years of age (LAC versus open) were matched with regard to procedure performed and compared with two matched groups of 38 patients younger than 75 years (LAC versus open). The patients were involved in the COST trial of LAC for colon cancer. They were evaluated with regard to anesthesia time, postoperative ileus, length of stay, and requirement for discharge assistance. Operative times were longer and ileus and hospital stay were shorter for the entire LAC group. There was no overall difference in the need for discharge assistance between the two groups. However, they did show that for left colectomy and not right colon resection, patients older than 75 years who underwent LAC had a significantly faster recovery compared with age- and procedure-matched patients having open colectomy and a lower utilization of discharge assistance. Therefore, they concluded that age and type of procedure should influence the decision to use a laparoscopic approach to colectomy. This may make some sense. If a thin elderly female requires a right colectomy, one may be able to perform the procedure with either a 6-cm open incision or a 3-cm laparoscopic extraction site. For the thin patient requiring right colectomy, the benefit of laparoscopy may be lost if the conventional incision can be kept small. By contrast, most patients requiring left colectomy with full mobilization of the splenic flexure cannot typically be treated through a 6-cm incision, and a laparoscopic approach would be more beneficial. The goal is minimally invasive surgery by whatever means.

A group in Denmark took advantage of the decrease in hospital stay associated with LAC to alter their perioperative protocol to assist the postoperative rehabilitation of elderly patients.²³ Fifty-five patients older than 70 years were included in the study. The perioperative protocol consisted of preoperative epidural catheters, initiation of a liquid-protein diet the day of surgery, solid food on postoperative day 1, and mobilization for 2 hours on day 1, 6 hours on day 2, and 8 hours on day 3. There was a 22% conversion rate, 29% complication rate, and mortality was 4%. Thirty-six of the 43 patients who had a completed LAC had a bowel movement within 3 days of surgery, average length of stay was 2.5 days, and only five patients required narcotic pain medicine after discharge. There was a reduction in

hospital stay by 1 to 2 days, and this translated into a significant decrease in overall cost. A multimodality effort at rehabilitation combined with LAC can lead to more rapid recovery of bowel function and activity level for patients older than 70 years.

Senagore and colleagues from the Cleveland Clinic evaluated the effects of a rapid recovery program for four different groups of patients (group 1, patients > 70 years old undergoing LAC; group 2, > 70 years old undergoing open colectomy; group 3, < 60 years old undergoing LAC; group 4, < 60 years old undergoing open colectomy).²⁴ The perioperative care plan used in this study was controlled rehabilitation with early ambulation and diet (CREAD), which consisted of pain control with either intravenous patient-controlled analgesia or epidural analgesia, clear liquids when postoperative nausea had subsided, advancement to regular food as tolerated, and ambulation five times a day beginning the evening of surgery. Length of stay was reduced by 55% in the elderly patients who had laparoscopic versus open colectomy. The complication rate was highest in the open colectomy group older than 70 years, but there was no difference in complications for the laparoscopic group older than 70 years compared with both younger groups. Using the Physiologic and Operative Severity Score for the Enumeration of Morbidity and Mortality (POSSUM) system to calculate the ratio of the observed to expected morbidity and mortality, it was determined that the LAC group older than 70 years had a complication rate well below the predicted rate and significantly lower than that of the open colectomy group older than 70 years. Finally, they performed a direct cost analysis of the use of CREAD in combination with laparoscopic and open colorectal surgery. The direct costs were similar between the LAC group older than 70 years (\$3920) and both groups younger than 60 years (\$3616 LAC, \$3804 open). The cost associated with open colectomy for patients >70 years old (\$6448) was significantly higher than the other three groups. The authors concluded that elderly patients who undergo LAC benefit as much as younger patients after LAC from an aggressive multimodal diet and ambulation perioperative care plan. This can lead, on average, to an approximately 40% reduction in direct hospital costs for this selected group of patients. Other current studies have shown similar results.^{25,26}

For patients who are 80 years of age or older, the literature has until recently been more sparse. In a study by Vignali et al published in 2005,²⁷ a population of octogenarians undergoing open colectomy and LAC were compared. Sixty-one patients who underwent a laparoscopic resection were matched to a comparable open group. As in the Senagore study,²⁴ the patients undergoing LAC had a shorter hospital stay (LAC 9.8 days versus open 12.9 days), reduced morbidity (LAC 21% versus open 31%), and higher rate of independence at

discharge (LAC 98% versus open 82%). This timely study provides confirmation that the benefits of LAC are maintained with advancing age.

CONCLUSION

Laparoscopic-assisted colectomy in elderly patients is safe, feasible, and has many benefits over open colectomy. Major abdominal surgery in the either chronologically or physiologically older patient no doubt carries a higher risk of morbidity and mortality. The risk of an operation is directly related to the number of identified comorbid illnesses and the physiologic reserve of a patient. Fortunately, advances in medicine have allowed us to perform many of the operations with a much higher degree of safety. As a result, today age is not a contraindication for major surgery. Laparoscopic-assisted colectomy in the elderly is another medical advancement that allows us to deliver better care to a frail, higher risk group of patients. It offers significant benefit because it appears to be less physiologically stressful than conventional open laparotomy. Laparoscopy results in a significant advantage for remaining independent after surgery, quicker return of activity level, and a decrease in direct costs when compared with similar patients after open resections. In conclusion, LAC should be strongly considered as the preferred surgical approach in the management of many colorectal diseases for appropriately selected elderly patients. One may never be too old to have a laparoscopic colectomy.

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