Laparoscopy for Rectal Cancer

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Abstract

It is evident that the use of laparoscopy in the management of rectal cancer has gained popularity in the last few years. It is still, however, not widely accepted as the standard of care. Multiple randomized trials have shown that short-term outcomes and perioperative morbidity and mortality of laparoscopic proctectomy are equivalent to open surgery. However, data regarding long-term oncologic outcomes are still scarce, with only a few randomized trials reporting similar outcomes in both laparoscopic and open group. A more recent trial failed to replicate those results in patients with locally advanced rectal cancer. In this article, we will look at the most recent evidence regarding the use of laparoscopy for patients with rectal cancer. We will also briefly discuss the different approaches and new minimally invasive techniques used in this field, and we will talk about the challenges facing the widespread adoption of laparoscopic surgery in the management of rectal cancer.

Keywords

- ▶ laparoscopy
- ▶ proctectomy
- ▶ techniques
- ▶ rectal cancer
- ▶ oncologic outcomes

Colorectal cancer is a major public health problem with a significant burden on health care in the United States. It is estimated that 132,700 new cases are diagnosed each year, of which 39,610 cases are rectal cancer.¹ Although mortality has declined in the last few decades to less than 3%, it is still the second leading cause of cancer-associated deaths. Surgery remains the cornerstone of the management of colon and rectal cancer, within a multidisciplinary approach that includes both chemotherapy and radiation. The use of laparoscopy in the management of colon cancer is now widely accepted as an acceptable approach based on the results of multiple, multicentered randomized control trials.^{2–7} These studies demonstrated similar rates of local recurrence, disease-free survival, and overall survival between the laparoscopic and open approaches, with reduced postoperative pain, decreased length of hospital stay (LOS), earlier return of bowel function, and improved cosmesis. Of these studies, the Clinical Outcomes of Surgical Therapy (COST) trial, the Colon Cancer Laparoscopic or Open Resection (COLOR) trial, and the Conventional versus Laparoscopic-Assisted Surgery in Colorectal Cancer (CLASICC) trial were three large, multicenter, randomized control trials that are considered landmark studies with substantive influence on the clinical practice of colorectal surgeons. They have demonstrated

similar short- and long-term cancer outcomes with the benefits of a minimally invasive approach for colon resection in those patients successfully resected with a laparoscopic technique.

However, the use of laparoscopy for the resection of rectal cancer has not been established as a standard of care. There are still questions about the long-term oncologic outcomes of laparoscopic surgery for rectal cancer being comparable to the open technique. The 2015 National Comprehensive Cancer Network (NCCN) practice guidelines in clinical oncology for rectal cancer recommend laparoscopy preferably in the setting of clinical trials until more decisive data are reported.⁸ On the other hand, the revised American Society of Colon and Rectal Surgeons (ASCRS) practice parameters for the management of rectal cancer advocate for the use of laparoscopy when experienced surgeons with the appropriate technical expertise are available (Grade of recommendation 1B).⁹ The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) has similar recommendations about laparoscopic resection of rectal cancer following standard oncologic principles, with a strong recommendation backed by high quality of evidence (using the GRADE recommendation system).¹⁰ SAGES specifies that surgeons need adequate knowledge, training, and experience in laparoscopy, citing multiple

studies recommending that at least 50 laparoscopic colorectal surgery cases are required to gain proficiency.^{11,12}

These variations in the guidelines and recommendations suggest that there is still no consensus among medical and surgical communities in the United States about the adoption of laparoscopy in the management of rectal cancer. We will review the current literature and data pertaining to laparoscopic resection of rectal cancer and identify that there is still divergent evidence pertaining to the short-term cancer outcomes and limited long-term survival data. Some studies have shown that laparoscopic proctectomy has been shown to have similar results to open proctectomy with respect to various oncologic parameters, including completeness of the total mesorectal excision (TME), involvement of the circumferential resection margin (CRM), and the number of harvested lymph nodes (HLN). However, when comparing laparoscopic to open technique, there is still not enough evidence to prove similar long-term outcomes, and indeed new data have emerged questioning short-term outcomes in laparoscopic rectal cancer surgery. This remains the most important barrier to the adoption of laparoscopic proctectomy as the “gold standard” in the management of rectal cancer.

Outcomes

As mentioned earlier, laparoscopy for colon resection compared with open resections is now believed to be safe and beneficial with regard to LOS, recovery time, cosmesis, and equivalent long-term oncologic outcomes.^{2-6,13,14} In contrast, the evidence behind the use of laparoscopy for rectal cancer remains controversial and inconclusive. This is partly due to the technical difficulty and complexity of this technique. It is also due to the challenges of measuring short- and long-term outcomes, as evidenced by some studies showing a significant variability in the outcomes of hospitals and surgeons across the United States.^{15,16}

Short-Term Outcome and Oncologic Parameters

Local recurrence is related to several oncologic parameters that can be objectively measured. These include completeness of the TME, involvement of the CRM, and number of HLN.¹⁷ In fact, in three large randomized controlled trials (COLOR II, CLASICC, and COREAN) and in a large-scale multicenter prospective review by Lujan et al, there were no statistical differences in those parameters when laparoscopic and open approaches were compared.^{4,14,18-21} However, different standards for pathological evaluation were applied to each study, and overall comparison was difficult to make.

In the COLOR II trial, Van der Pas et al prospectively randomized 1,103 patients with rectal cancer to either laparoscopic or open proctectomy.¹⁸ Although laparoscopic procedures took longer time (240 vs. 188 minutes), the patients in that group had significantly less blood loss (200 vs. 400 mL), earlier return of bowel (2 vs. 3 days), and shorter hospital LOS (8 vs. 9 days). The 28-day morbidity and mortality was similar in both groups. In the CLASICC trial, Guillaou et al randomized 794 patients with colorectal cancers in 27 centers in the

United Kingdom to receive laparoscopic or open resections.⁴ Out of these patients, 381 had rectal cancer and underwent a low anterior resection or an abdominoperineal resection. The open and laparoscopic groups had no statistically significant difference in perioperative morbidity. However, in patients undergoing laparoscopic anterior resection, a nonsignificant increase in CRM positivity was recorded when compared with open anterior resection, suggesting that the laparoscopic procedure may be associated with a slightly raised risk of local recurrence. Both groups in the CLASICC trial had a high rate of positive CRM (14% for open surgery, 16% for laparoscopic surgery). Subsequent publications of the 3- and 5-year follow-up of that same patient population did not show a significant difference in local recurrence.^{14,19} In the COREAN trial, Kang et al enrolled 340 patients with locally advanced (T3N0-2) rectal cancer from three centers in Korea.²⁰ All patients had undergone neoadjuvant chemoradiation therapy and were randomized to open versus laparoscopic resection. They concluded that the laparoscopic approach was able to achieve comparable short-term outcomes to open surgery, specifically in regard to perioperative morbidity and mortality, as well as equivalent oncologic resection parameters.

Likewise, Lujan et al included 4,970 patients with rectal cancer from 72 centers in Spain in a prospective nonrandomized study.²¹ They found that laparoscopic surgery resulted in decreased blood loss, lower 28-day morbidity, increased completeness of TME, and a 3-day decrease in the hospital LOS. In contrast to the CLASICC trial, the rate of CRM positivity was significantly lower, prompting the authors' conclusions that laparoscopic resection is the preferred approach for patients with rectal cancer.

On the other hand, the American ACOSOG Z6051 trial was a multicenter randomized phase III trial comparing laparoscopic to open resection of stage IIA, IIIA, or IIIB rectal cancer originating within 12 cm from the anal verge.²² This noninferiority trial randomized 486 patients who all underwent neoadjuvant therapy by protocol design. The endpoint comparing gross and pathologic evaluation of the resected specimen used clear distal and radial margins and completeness of the TME specimen as a combined assessment of optimal surgery. This has been shown in prior trials to be associated with long-term oncologic outcome.²³ The authors of ACOSOG Z6051 trial demonstrated that laparoscopic resection did not meet the criteria for noninferiority for pathologic outcomes compared with open surgery, despite the fact that all surgeons in this study were “highly motivated,” credentialed, expert laparoscopic rectal surgeons.

Stevenson et al randomized 475 patients with T1-T3 low rectal cancer (<15 cm from the anal verge) in 24 different sites throughout Australia and New Zealand to undergo laparoscopic or open resections.²⁴ The 26 surgeons participating in this ALaCaRT trial were all expert laparoscopic surgeons who met strict inclusion criteria. This study also failed to establish noninferiority of laparoscopic surgery compared with open surgery, especially in patients with larger T3 tumors. The authors concluded that there is not enough evidence supporting the routine use of laparoscopy in the management of rectal cancer. The results from these two

trials raise questions about the short-term cancer outcomes when performing a laparoscopic resection for rectal cancer and contradict those of the COREAN and COLOR II trial. It raises the question of whether laparoscopic proctectomy is indicated in the subgroup of patients with low rectal cancer and locally advanced disease.

Short-term advantages of the laparoscopic approach, however, were found to be significant in several other recent single-institution studies, similarly to the aforementioned large trials. Boutros et al retrospectively compared 234 patients undergoing open or laparoscopic TME for rectal cancer over a period of 57 months.²⁵ Laparoscopy was associated with longer operative time (245 vs. 213 minutes), but with less blood loss (284 vs. 388 mL), shorter LOS (7 vs. 8 days), and lower rates of 30-day morbidity (25 vs. 43%) and surgical site infections (9 vs. 20%). Similarly, Lee et al included 160 patients in their retrospective study; however, all these patients had stage I rectal cancer.²⁶ Overall morbidity and mortality were similar in both the laparoscopic and open groups. The laparoscopic group had longer operative time (221 vs. 184 minutes), but significantly less blood loss (150 vs. 200 mL), time to first bowel movement (2.44 vs. 3.54 days), rate of superficial surgical-site infection (0 vs. 7.5%), and LOS (8 vs. 11 days).

A meta-analysis of prospective trials was conducted by Arezzo et al and included 23 studies, 8 of which were randomized, representing a total of 4,539 patients.²⁷ A mortality incidence of 1.0% was observed in the laparoscopic group compared with 2.4% in the open group ($p = 0.048$). A significant difference was also seen in the morbidity rate between the two groups (31.8% in the laparoscopic group vs. 35.4% in the open group; $p < 0.001$).

Sexual and Urinary Complications, Quality of Life

Sexual and urinary dysfunction is an established risk after any type of pelvic surgery. This applies specifically to proctectomy for rectal cancer with TME, due to the proximity of the autonomic nerves innervating the urogenital system to the surgical field. Jayne et al reported the outcomes of 247 patients from the CLASICC trial who underwent laparoscopic or open rectal resection.²⁸ Bladder dysfunction was similar in both groups. There was a trend toward worse sexual dysfunction in the laparoscopic group, but the difference was not statistically significant. Furthermore, there were more TMEs performed in the laparoscopic group compared with the open group, which may explain the trend toward worse function. In a more recent study, McGlone et al compared the outcomes of 78 patients who underwent laparoscopic proctectomies to the outcomes of 65 who had an open resection.²⁹ Both groups were associated with deterioration in urinary and sexual function. However, the deterioration in sexual function in the laparoscopic group was not as severe with significantly higher incidence of successful penetration in men and significantly better outcomes in all aspects of sexual activity in women. A subgroup analysis of patients from the COLOR II trial by Andersson et al focused on overall quality of life.³⁰ Similar to Jayne et al, there was no difference between the open and laparoscopic groups. Sexual dysfunction was

included in the analysis as a part of general overall well-being in this study. Quality of life was similarly evaluated in participants of the COREAN trial. Urinary complications had a significantly lower rate in patients who had undergone laparoscopic surgery. Male and female sexual problems were not found to be statistically different between the open and laparoscopic groups. From these reported studies, we can conclude that there is probably no major difference between laparoscopic and open rectal surgery for cancer in regard to urinary and sexual dysfunction, and that these complications are more likely related to the rectal resection and TME than to the approach or technique.

Long-Term Oncologic Outcome

As was shown earlier, the advantages of laparoscopy in short-term outcomes have been well established by several large randomized studies. However, the evidence supporting long-term outcome is still controversial. The earliest randomized trial that compared survival in patients with rectal cancer undergoing laparoscopic versus open surgery was conducted by Ng et al.³¹ It included 51 patients undergoing laparoscopic resection and 48 patients undergoing open resections, and the median follow-up time was 90 months. The observed 5-year survival was comparable in both groups (75.2% in the laparoscopic group vs. 76.5% in the open group). However, any patient who had neoadjuvant chemoradiation therapy was not included in the study. Furthermore, the relatively small numbers of patients in both arms made any meaningful analysis of oncologic outcomes more difficult.

Other single-institution studies had similar results in long-term outcomes. In a retrospective study on 160 patients, Lee et al showed similar 5-year overall survival in open and laparoscopic resection (98.6 vs. 97.1%) of stage I rectal cancer.²⁶ Another study from Finland by Kellokumpu et al reviewed prospectively gathered data of 191 rectal cancer patients.³² They compared the 5-year disease-free survival as well as 5-year local recurrence rate, and found no statistically significant difference between laparoscopic and open resection. Recently, Laurent et al from France also retrospectively compared 110 patients who had laparoscopic surgery to 65 who had open surgery for low rectal cancer.³³ There was no significant difference in 5-year local recurrence (5 vs. 2%, $p = 0.349$) or in 5-year disease-free survival (70 vs. 71%, $p = 0.862$).

The limitation of these studies and many others was that they were single-institution, retrospective studies. Therefore, no conclusive evidence on the long-term effectiveness of laparoscopic proctectomy could be made. However, two large, multicenter randomized controlled trials reporting on long-term outcomes have been published, including the previously cited CLASICC trial and the COREAN trial. The results from the major multicenter randomized controlled trials for laparoscopy in rectal cancer are shown in **Table 1**.

In two separate publications, Jayne et al reported on the long-term outcomes of the patients who were originally included in the CLASSIC trial.^{14,19} The higher positivity of the CRM that was reported after laparoscopic anterior resection did not translate into an increased incidence of local

Table 1 Multicenter randomized control trials on laparoscopy for rectal cancer

RCT	T/N-stage included	Conversion rate (%)	Length of stay (d)	Mortality rate (%)	p Value	Morbidity rate (%)	p Value	Circumferential resection margin positivity (%)	p Value	Distal margin positivity (%)	p Value
CLASICC	All stages	34	Open 13 (9–18) Lap 11 (9–15)	5	0.57	14	–	14	0.8	–	–
COLOR II	Stage I–III; T4 excluded	16	Open 9 (7–14)	1	0.4	37	0.42	10	0.85	–	–
COREAN	T3N0–2	1.2	Lap 8 (6–13) Open 9 (8–12)	2	–	40	–	10	–	–	–
Lujan et al	All stages	17.37	Lap 8 (7–12) Open 11 (8–17)	0	<0.05	40	0.6	4.1	0.77	–	–
ACOSOG Z6051	Stage II, IIIA, IIIB; T4 excluded	11.3	Lap 8 (6–13) Open 7.3	3.6	–	36	<0.05	2.9	<0.05	1.2	<0.05
AlaCaRT	All stages; T4 excluded	9	Lap 7 Open 8 (6–12)	0.8	0.95	45.6	0.93	16.3	0.11	0.5	0.91
					–	38.3	–	9.5	–	1.7	–
				<1	–	57.1	0.06–0.98	12.1	0.06	1	0.67
			Lap 8 (6–12)	<1	–	19	–	7	–	1	–

Note: N-dash (–) indicates not reported or unavailable.

recurrence. Moreover, no difference was found between the laparoscopic and open group in regard to overall survival, disease-free survival, and quality of life. More recently, Green et al conducted a subgroup analysis of the patients with rectal cancer.⁵ Similarly, they found no difference in overall survival or disease-free survival when comparing the open and laparoscopic groups. A higher rate of distant recurrence was found in rectal cancer patients than in colon cancer patients, but no difference was found between the open and laparoscopic surgeries for rectal cancer.

On the other hand, the COREAN trial compared laparoscopic and open resection of patients with locally advanced low rectal cancer. Their recent 2014 report of long-term follow-up showed no difference in long-term outcome.³⁴ In fact, the 3-year disease-free survival was 72.5% for the open group and 79.2% for the laparoscopic group, with a difference that was lower than the prespecified noninferiority margin.

An even more recent report from the COLOR II trial has provided data comparing longer term outcomes between laparoscopic and open surgeries for rectal cancer.³⁵ In April 2015 in the *New England Journal of Medicine*, the authors reported 3-year follow-up data on 1,044 patients who underwent either laparoscopic or open rectal cancer resection. Locoregional recurrence rates were identical at 5% in both groups. Disease-free survival rates were 74.8% in the laparoscopic cohort and 70.8% in the open surgery group, and overall survival was 86.7% in the laparoscopic group and 83.6% in the open surgery group. These findings prompted the authors to conclude that laparoscopic surgery is as safe and effective as open surgery in patients with rectal cancers that do not invade adjacent tissues.

The surgical community awaits more long-term follow-up data regarding outcomes from other similar trials to more fully understand the application of laparoscopy for rectal cancer. Although the results of these previous studies showed effectiveness of laparoscopic proctectomies and similar survival rates compared with open surgery, more data will need to be published before firm conclusions can be drawn. To that matter, the true long-term outcomes from the ACOSOG Z6051 and the ALaCaRT trials should become available within the next few years to shed more light on that subject.

Different Techniques, Approaches, and Variations

Many variations to the standard totally laparoscopic surgery have been described and are routinely performed in many centers in the United States. Some of these techniques have been shown to have similar outcomes, with some advantages related to each technique. Below is a brief description of these variations, with the available evidence supporting their use.

Hand-assisted laparoscopic surgery (HALS) is a hybrid operation that was introduced as an alternative to totally laparoscopic surgery in the mid-1990s. It became increasingly popular in the last decade with the introduction of new vessel-sealing devices like the Harmonic Scalpel (Harmonic Ethicon EndoSurg, NJ) and Ligasure (Ligasure Covidien Surg, MN) as well as various laparoscopic stapling instruments. The

HALS technique allows the surgeon to introduce his/her hand through a special hand port into the abdominal cavity without losing pneumoperitoneum. It grants tactile feedback to the surgeon and allows the surgeon's hand to assist in retraction, dissection, and organ retrieval. Tjandra et al reported in a prospective study the outcomes of 63 patients undergoing ultralow anterior resection using either a laparoscopic-assisted technique or HALS.³⁶ Both techniques were shown to have similar blood loss, hospital LOS, and oncologic parameters including involvement of the CRM and the number of HLN. The standard laparoscopic approach, however, had significantly longer operative time. Other studies showed similar results regarding favorable outcomes with HALS in colorectal procedures, with low conversion rates and morbidity/mortality rates comparable to laparoscopic and open techniques.^{37,38} A review article published in December 2010 looking at available literature regarding HALS concluded that long-term outcomes and complications, as well as cost were similar to the totally laparoscopic technique.³⁹ The challenge of this technique, however, is the number of cases to achieve technical proficiency, which was found to be 105 cases in a retrospective study published by Pendlimari et al, implying that the learning curve would likely extend beyond fellowship training for many colorectal surgeons.⁴⁰

Robotic-assisted surgery (RAS) is the main technical innovation to colorectal surgery since laparoscopy was introduced. The robotic Da Vinci system was developed in the early 2000s, with the purpose of improving visibility with 3D imaging, increasing the range of motion with higher degrees of articulation and rotation, and reducing the need for a skilled surgical assistant. In theory, surgical dissection in narrow spaces such as the pelvis would be easier and safer. Many studies, however, failed to show that advantage, and there have been conflicting data published in the last few years. Baek et al analyzed 64 consecutive rectal cancer patients with stage I–III rectal cancer who underwent robotic-assisted TME.⁴¹ They were able to demonstrate local recurrence rate, disease-free survival, and overall survival similar to those of laparoscopic and open surgery. A review of the literature by Trastulli et al came to the conclusion that robotic surgery for rectal cancer had lower conversion rate, with similar operative time, oncologic outcome, and postoperative morbidity when compared with laparoscopic proctectomy.⁴² The limitation of that review is that the eight studies included were non-randomized. A more recent systematic review and meta-analysis by Lorenzon et al published in September 2015 included 22 studies, totaling 1,652 laparoscopic and 1,120 robotic-assisted colorectal resections.⁴³ The result of that analysis was that laparoscopic procedures were shorter in time, with less blood loss, while robotic assisted procedures had less perioperative complications. Those differences, however, were not evident when the analysis was focused exclusively on the available randomized trials. Furthermore, Fung and Aly concluded in their review that both operative time and cost were significantly higher with RAS, questioning whether the surgical community should embark on a new learning curve for this technique.⁴⁴

Single incision laparoscopic surgery (SILS) is a relatively new technique where a single umbilical incision is used to

place one port, which accommodates articulating instruments that allow “pseudotriangulation.” This technique has been widely described for appendectomies and cholecystectomies over the last few years, but only a few reports have been published about this technique being used for rectal surgery. Law et al were the first to report their series of eight cancer patients undergoing colon and rectal resections, suggesting this technique is safe and feasible.⁴⁵ The same results were found in other small case reports and series.^{46,47} Larger case series and more recent reports compared conventional laparoscopic rectal surgery to SILS. Kim et al showed SILS is associated with shorter hospital stay and less narcotic use, while Levic and Bulut reported less intraoperative blood loss but longer operative times with SILS.^{48,49} This approach remains a new technique performed only in some centers, and long-term oncological outcomes have not yet been reported.

Challenges and Barriers to Implementation

A few barriers have delayed the adoption of laparoscopic proctectomy as standard of care for the management of rectal cancer. Technical difficulty, steep learning curves, and questionable cost-effectiveness of laparoscopy are some of the challenges.

Operating in the pelvis can be technically difficult due to the osseous structures narrowing that anatomic space. For an adequate oncologic resection, a TME must be achieved while avoiding injuries to surrounding structures including pelvic nerves and ureters. Those difficulties are magnified when we add the challenges of laparoscopy. These include limitations of instrument and endoscopic stapler angulations as well as the inability to palpate and feel the extent of the tumor. These limitations inevitably raise the question of adequate surgeon training and learning curves. SAGES suggests that proficiency in laparoscopic rectal surgery requires 50 cases.¹⁰ On the other hand, Kim et al studied the performance of 317 consecutive laparoscopic proctectomies.⁵⁰ Using a risk-adjusted cumulative sum analysis, they demonstrated a learning curve of 110 cases to achieve short-term outcomes and a local recurrence rate similar to an experienced surgeon. Furthermore, Lujan et al demonstrated that it was possible to complete the learning process without compromising patient safety or oncologic outcomes.⁵¹ Interestingly, one study found that learning curves for robotic proctectomies were steeper than those of laparoscopic proctectomies after 41 cases, with acceptable perioperative outcomes.⁵² We therefore think that it is crucial for a surgeon performing laparoscopy for rectal cancer to have undergone adequate training during residency and fellowship before independently operating on these patients.

Another issue that might impede the adoption of minimally invasive proctectomies is the cost of such procedures. Despite popular beliefs that laparoscopy costs more than open surgery because of instrument requirements and longer operative time, data actually suggest there is no difference in cost or cost savings when comparing these different techniques. Ramji et al performed a 6-year retrospective review of rectal cancer operations in a tertiary care center in Toronto,

Canada.⁵³ They found no significant difference in cost between laparoscopic and open operations. Robotic cases, however, added around \$6,000 to the overall cost of the hospitalization. Furthermore, Keller et al performed a review of a prospective database for laparoscopic rectal cancer operations at a large tertiary referral center in the United States.⁵⁴ They found that laparoscopic rectal cancer resection reduces length of stay, operating time, and resource utilization, and thus found a significant reduction in overall hospital cost when compared with open procedures (\$17,200 vs. \$21,800). The limitations of that study are that it was a retrospective review performed at a single institution. On the other hand, Jensen et al created a model investigating the cost-effectiveness of laparoscopic surgery for colon and rectal cancer using data from previously published large randomized trials.⁵⁵ They found that the laparoscopic approach was significantly less costly than the open approach with savings of \$4,283, and no difference in quality of life.

In light of the available and sometimes conflicting literature on the topic, we think that the most important barrier to widespread adoption of laparoscopic proctectomy for rectal cancer remains the paucity of convincing evidence that it has similar long-term outcomes when compared with open surgery, especially in specific groups of patients. More randomized trials addressing the contradictory results found in previously published studies should be considered before laparoscopy becomes more widely accepted as the “standard of care” in the treatment of patients with rectal cancer.

Conclusion

In conclusion, the current evidence suggests that the laparoscopic approach is equivalent to an open approach for proctectomies in the management of rectal cancer, with similar short-term perioperative outcomes primarily in morbidity and mortality. The limited current evidence suggests long-term outcomes and survival are similar in both groups, especially in early stage tumors. There is, however, not enough convincing evidence but rather conflicting data regarding the use of laparoscopy in locally advanced and distal rectal cancers with respect to short-term cancer outcomes. Further studies and trials are required before more conclusive arguments can be made to support the universal use of laparoscopy in the surgical management of rectal cancer.

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