



## Editorial

# Current Paradigm in the Laparoscopic Management of Colorectal Cancers

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**Abstract:** The advent of minimally invasive surgery has transformed colorectal cancer management, yet early adoption of laparoscopic techniques faced scepticism. Initial concerns included the learning curve, risks of port-site metastasis, oncological clearance adequacy, and lack of advanced surgical tools. Key developments in the 1990s—like the work of Moises Jacobs and Dennis Fowler—established foundational techniques in laparoscopic colorectal surgery. Despite its complexity and steep learning curve, improvements in training and technology have refined laparoscopic methods. Surgeons now benefit from specialized programs and advanced tools like high-definition cameras and energy devices, which enhance safety and precision. Early fears of port-site metastasis were addressed through technique refinements, reducing risks associated with tumour spread. Oncological safety studies, including major trials like the COST, COLOR, and COREAN, found laparoscopic techniques non-inferior to open surgery for survival and recurrence rates, with advantages in recovery and postoperative morbidity. The accumulated evidence confirms laparoscopic surgery as an effective, ontologically safe approach for colorectal cancer in skilled hands, ensuring both short- and long-term benefits.

**Keywords:** Laparoscopic Surgery, Colorectal Cancer, Learning Curve, Port Site Metastasis, Oncological Safety.

While Minimal invasive surgery has really revolutionised the field of Surgery, historically the role of laparoscopy in colorectal cancers was not well established due to some concerns [1]. It is interesting to identify these concerns, how they were addressed over a period of time and also explore the latest evidence-based status of domain of laparoscopy in the management of colorectal cancers. The early concerns that prevented laparoscopic surgery from being incorporated into mainstream colorectal cancer surgery include: feasibility because of steep learning curve to get trained to this advanced procedure, fears of port site recurrences [2], adequacy of oncological tumor clearance and fears of tumor spread, safety vis-à-vis some specific complications with laparoscopic surgery and lack of advanced gadgets for resection, anastomosis and haemostasias.

In 1990, Moises Jacobs first employed video-laparoscopic techniques for colorectal surgery in Miami, performing a right hemicolectomy

[3]. That same year, Joseph Udo achieved the first laparoscopic colostomy closure, thanks to the creation of a circular stapling device for this procedure. Additionally, the introduction of a laparoscopic intestinal stapler allowed for the intra-peritoneal transection of the bowel, a technique successfully demonstrated by Dennis Fowler in his first laparoscopic sigmoid resection. Following these advancements, further innovations made laparoscopic surgeries on the colon and rectum increasingly viable.

## Learning Curve

Laparoscopic colorectal surgery is undeniably complex, as it involves operating in multiple abdominal quadrants, ligating large blood vessels, transecting the bowel, and re-establishing continuity (re-anastomosis). These tasks demand a high level of technical skill, and the surgeon must navigate a three-dimensional space while interpreting it on a two-dimensional screen, which can be quite challenging. Medial-to-lateral dissection, not

so commonly performed in open surgery, adds to the difficulty. A critical aspect of achieving optimal outcomes is the correct identification of anatomical planes, which is key to ensuring successful surgery with favorable oncologic results. As a result, laparoscopic procedures often take longer to perform than open surgeries. Addressing the complexities of these cases, Theodore Saclarides once remarked, "The patient looks better than the surgeon the next day."

Research has shown that the learning curve for mastering laparoscopic right colectomy involves approximately 55 procedures, while left colectomy requires around 62 procedures [4]. Specialized colorectal surgery training programs can help surgeons navigate this learning curve more quickly[5]. Over time, conversion rates, often considered a marker of surgical expertise, have decreased. Well-documented risk factors for conversion include surgeon experience, obesity, male gender, and a higher ASA score, as well as tumor-specific characteristics.

Technological advancements have also contributed to improvements in laparoscopic colorectal surgery. High-definition cameras, advanced energy devices like Harmonic, Ligasure, Enseal etc., Reticulating staplers and Barbed sutures have all played an instrumental role in facilitating the progress of these procedures.

### **Port site metastasis**

Port site metastasis can occur through several potential mechanisms [6], including direct contamination during tumor extraction through the wound, indirect contamination via the "chimney effect," and hematogenous spread during surgery. Early studies indicated a higher incidence of port site metastasis with laparoscopic surgery. However, as more data accumulated in favor of laparoscopic techniques, it became clear that these initial poor outcomes were likely due to suboptimal surgical methods [7]. To mitigate the risk of port site metastasis, certain precautions are recommended. These include minimizing

contact between laparoscopic instruments and the tumor by using specimen bags, employing the "no-touch" isolation technique proposed by RB Turnbull Jr.[8], thoroughly irrigating all wounds with a cytotoxic agent, enlarging the port for specimen extraction, and utilizing wound protectors [9].

### **Oncological safety and postoperative outcomes**

Potential short-term benefits of the laparoscopic approach were discovered in a Cochrane Review, where laparoscopic approach decreased blood loss, quicker oral intake, decreased narcotic use, and lower rates of surgical site infections [10]; this was particularly beneficial in elderly patients with comorbidity [11] and also contributed to the ERAS protocol in colorectal surgeries.

However Laparoscopic colorectal surgeries have constantly been under scrutiny with respect to the long-term outcomes - survival data and recurrence rates. To better investigate the issue of laparoscopic oncological safety, several large randomized trials were designed and carried out. Initial results with extended follow-up showed no difference in survival and local recurrence rates when comparing laparoscopic to open approaches. In fact, laparoscopic approaches showed some advantages over open surgery. The COST trial, COLOR I and II trials, CLASICC trial, and COREAN demonstrated non-inferior outcomes to open surgery vis-à-vis disease free survival, local recurrence and distant recurrence [12,13,14,15]. Besides, the studies have shown that the lymph node harvest, which is predictor of survival, is more in laparoscopic resections [16]. A meta-analysis conducted by Arezzo et al. in 2013, which included 23 studies (eight of which were randomized) and a total of 4,539 patients, further supported these findings. The analysis showed a reduction in mortality (2.4% compared to 1.0%) favoring the laparoscopic group ( $p = 0.048$ ), as well as reduced morbidity (35.4% vs. 31.8%,  $p < 0.001$ ) in patients undergoing laparoscopic rectal resection[17].

## CONCLUSION

To sum up, laparoscopic surgery for properly selected colorectal cancer patients has established its place in expert hands despite

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