

Laparoscopic vs Open Total Mesorectal Excision for Rectal Cancer: A Clinical Comparative Study in a Government Sector Hospital

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ABSTRACT

Aims and objectives: To assess feasibility, advantages, oncological safety, cost-effectiveness and short-term results of laparoscopic vs open total mesorectal excision (TME) for rectal cancer in a government sector hospital.

Patients and methods: This comparative nonrandomized retrospective study analyzes the data of 70 patients with rectal cancer treated with low anterior resection (LAR) or abdominoperineal resection (APR) from May 2007 to June 2012. Of these 40 patients underwent laparoscopic TME and 30 underwent open TME. Both the groups were comparable.

Results: Laparoscopic surgery took longer to perform (200 vs 150 min), but was accompanied by less blood loss (200 vs 800 ml) and fewer postoperative complications. Enteric function recovered sooner after laparoscopy than open surgery. Hospital stay was shorter for patients who underwent a laparoscopic surgery (7 vs 10 days). The mean number of harvested lymph nodes was greater in the laparoscopic group than in the open group (12 ± 3 vs 9 ± 2). Mean follow-up time was 30 months (range: 28-32 months). No local recurrence was found.

Conclusion: This study shows that laparoscopic TME for rectal cancer is a safe and feasible technique with some short-term benefits over open TME.

Keywords: Total mesorectal excision, Low anterior resection, Abdominoperineal resection.

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INTRODUCTION

Since its introduction in 1982, the total mesorectal excision (TME) concept by Heald et al¹ has become the gold standard in surgical treatment of rectal cancer.^{2,3} It includes the standard excision of the total mesorectum, through the avascular 'holy plane', removing potential micrometastases enclosed in the mesorectum. At present, TME in combination with preoperative radiation therapy offers the lowest local recurrence rate (5%) and the highest 5-year survival rate (80%) in patients with mid- and low-rectal cancer.^{4,5}

There are however problems with open TME surgery, mainly pertaining to difficulties in pelvic dissection, often leading to functional urogenital problems—especially in male

patients— and possibly a less radical resection. Moreover, the increased use of coloanal anastomosis has also increased the need for better visualization during pelvic dissection. The laparoscopic approach to rectal cancer may be an attractive alternative for open TME because it offers better visualization, more delicate instrumentation and better tissue handling. This in turn, may lead to an adequate dissection up to the pelvic floor in combination with a better preservation of the hypogastric plexus and erigent nerves, possibly resulting in an improved functional and oncological outcome.

Several recently published randomized studies have shown short-term benefits of the laparoscopic approach to colon cancer over the open approach, without compromising oncological outcome.⁶⁻⁹ Hence, we performed a study to compare laparoscopic TME with open TME in terms of perioperative and short-term outcomes in patients with rectal cancer in government sector hospital SCB Medical College, Cuttack.

PATIENTS AND METHODS

Seventy patients undergoing low anterior resection and abdominoperineal resections for rectal carcinoma between May 2007 and June 2012 at SCB Medical College and Hospital (Cuttack, Orissa, India) were entered into a database. Of these 40 patients underwent laparoscopic resection and 30 conventional open resection.

Exclusion criteria were:

1. Presence of distant metastasis
2. Locally advanced disease with invasion into adjacent pelvic organs
3. Acute bowel obstruction or perforation from cancer
4. Severe medical illness.

All patients received the same pretreatment workup, including an ultrasound, colonoscopy with biopsies, chest X-ray and carcinoembryonic antigen (CEA) level for dissemination status. CECT abdomen was routinely done to rule out metastatic disease and to look for evidence of local infiltration, gauge the size of tumor and regional lymph node involvement.

All patients received mechanical bowel preparation day before the operation. Systematic prophylactic antibiotics were given intravenously at the time of induction.

OPERATIVE TECHNIQUE

Patient was placed in head down Lloyd-Davies Trendelenburg position with surgeon and camera assistant on patient's right side. Five ports were routinely used with subumbilical port used for 30° angled telescope. No deviation from basic principles of open oncologic colorectal surgery was permitted and performed as follows: laparoscopic abdominal exploration, preliminary identification, ligation and transection of IMA (Fig. 1) and IMV with clips, mobilization of left hemicolon and splenic flexure, identification of ureters and hypogastric nerves bilaterally, rectal mobilization (for higher lesion mesorectal tissue down to 5 cm below tumor routinely excised and TME in tumors of middle and distal third) and intracorporeal transection of rectum below growth with an endoluminal stapler (Fig. 2) in case of restorative resection. Abdomen opened by Pfannenstiel incision (maximum 5 cm length) and resection of tumor bearing bowel completed extracorporeally. Anvil of circular stapler inserted into proximal bowel, gut put back in peritoneal cavity, pneumoperitoneum re-established and intracorporeal anastomosis done with

circular stapler passed per anally (Figs 3 and 4). For LAR, temporary diverting covering loop ileostomy is used (Fig. 5).

In patients with APR, pelvic dissection done as far distally as possible abdomen opened by extension of port in left lower quadrant, descending colon transected extracorporeally and end colostomy created. Conventional perineal dissection and delivery of specimen through perineal wound. Perineal drains routinely used. Throughout the surgery meticulous hemostasis was maintained to prevent light absorption by hemoglobin which reduces picture quality.

RESULTS

The patients characteristics in laparoscopic or open resection group are summarized in Table 1. The two groups were comparable in terms of age, sex, American Society of Anesthesia score (ASA score), pathologic stage and type of resection.

The mean operating time was significantly longer in LAP resection group than in open resection group. The amount of operative blood loss was lower in LAP resection group

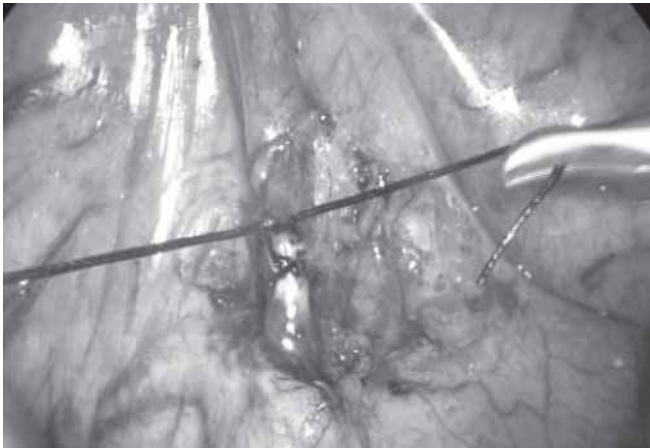


Fig. 1: Ligation of inferior mesenteric artery



Fig. 3: Introduction of circular stapler per anally



Fig. 2: Resection of rectum keeping tumor-free margin using Endo Gia stapler



Fig. 4: Completed coloanal anastomosis



Fig. 5: Covering loop ileostomy

than in conventional surgery group (Table 2). Five patients needed conversion to open surgery in laparoscopic resection group, two because of advanced disease and the other three because of dense adhesions.

Postoperative complications were more frequent in the open resection group than in LAP resection group. The passage of flatus occurred earlier in laparoscopic resection group, and oral intake could be started earlier in the LAP resection group. Mean postoperative stay was shorter in LAP resection group than in open resection group.

To assess the adequacy of oncological resection, several parameters were examined from pathology reports. Evaluation of the resected specimens is summarized in Table 3. The mean number of lymph nodes removed in LAP or open resection group was 12 ± 3 and 9 ± 2 , respectively. No significant difference was found between the 2 groups. The average lengths of removed specimens with the two surgical procedures were also comparable. Tumor distances from the closest margin were similar too for the two procedures, and were adequate from an oncological standpoint of view. Histological examination revealed that proximal and distal margins were free of tumor in all surgical specimens in both groups. The complications in the two groups are shown in Table 4.

DISCUSSION

Laparoscopic techniques have been attempted and applied to wide range of colorectal disease since, first published study of laparoscopic colectomy in 1991 by Jacobs et al.¹⁰ After almost 20 years of clinical application, use of laparoscopy for treatment of colorectal cancer is still controversial because long-term outcome in malignancy is of overwhelming importance compared with potential benefits obtained in the early postoperative course and advantages in cosmesis.¹¹ There were serious concerns about potential inadequacy of resection, possible staging

Table 1: Patients characteristics in laparoscopic or open resection group

	LAP resection group (40)	Open resection group (30)
1. Age (yrs)	52 ± 8	54 ± 7
2. Male:Female	17:23	14:16
3. ASA score	2	2
4. Preoperative CEA	3.4	4.2
5. Location of tumor		
• Lower rectum	8	6
• Upper rectum	14	10
• Mid rectum	18	14
6. Grade of differentiation		
• Well	14	10
• Moderately	20	12
• Poor	6	8

Table 2: Intra- and postoperative results

	LAP resection group (40)	Open resection group (30)
1. Mean operative time (mins)	200	150
2. Mean blood loss (ml)	200	800
3. Diverting ileostomy	30	15
4. Conversion	5	–
5. Mean length of hospital stay (days)	7	10
6. Mean oral intake (days)	3	5

Table 3: Histopathological evaluation of the resected specimens

	LAP resection group (40)	Open resection group (30)
1. Lymph nodes harvested	12 ± 3	9 ± 2
2. Resected bowel (cm)		
LAR	21	26
APR	27.5	32
3. Distal resection margin (cm)	3.7	3.5

Table 4: The complications of the two groups

	LAP resection group (40)	Open resection group (30)
1. Ureter injury	1	1
2. Rectum perforation	0	1
3. Wound infection	1	6
4. Perineum infection	1	6
5. Anastomotic leak	1	2
6. Paralytic ileus	0	5
7. Urinary retention	1	3
8. Recurrence		
– Port site	0	–
– Local	1	3
– Distant	2	3

inaccuracies or possibility that use of pneumoperitoneum altered the patterns of tumor dissemination.⁷ Many questions have arisen concerning the oncological safety of this approach, following reports on port site metastases.¹²⁻¹⁴ In nonrandomized comparative studies, laparoscopic and open

excision of rectal cancer was found to be equivalent in achieving distal and radial negative margins. Adequacy of radial resection can also be measured by ability to achieve high ligation, specimen characteristics and lymph node yield which in many recent studies have shown to be comparable in open and laparoscopic group.¹⁵ Port site recurrences were as infrequent as incisional metastases in these studies, making it very likely that port site metastases in earlier reports were due to technical failure rather than to inherent problems with laparoscopy.

Three factors have stimulated the development of laparoscopic surgery for rectal cancer. Firstly, the technical difficulty of rectal dissections in a narrow pelvis, especially in male patients. Secondly, the inherent benefit of improved fine instruments and the improved visualization provided by the laparoscopic camera during pelvic dissection. Thirdly, the possibility to better dissect the rectum up to the pelvic floor in order to perform a coloanal anastomosis, avoiding an abdominoperineal resection, in selected patients with very low rectal cancer.

Laparoscopic colorectal surgery invariably takes longer time than a corresponding open procedure. This was true at the beginning of the learning curve, but many surgeons would disagree with this with the current level of expertise. Our study also confirmed the low rate of postoperative complications after minimally invasive procedures. Postoperative ileus, urinary retention, and wound infections occurred less frequently than that in the open resection group. These advantages have also been confirmed by many authors.^{9,16} Comorbidity does not appear to be a major obstacle for laparoscopic technique and even elderly patients with comorbidities may be benefited with reduced postoperative morbidity. With magnified view and improved visualization of deep pelvic structures under laparoscope, postoperative genitourinary dysfunction after rectal cancer surgery, which is of paramount importance from patient's perspective, can be minimized.

Repeated evidences have indicated that a laparoscopic approach in colorectal cancer has several advantages including a shorter hospital stay, less pain, a better appearance and decreased postoperative analgesia requirements. In fact, laparoscopic surgery has been found to be associated with significantly decreased intraoperative blood loss and postoperative complications as well.^{6,17} Furthermore, theoretic advantages of less physiologic trauma and immunologic suppression have recently received more attention in the literatures.^{16,18} A less intensive inflammatory response has also been demonstrated after laparoscopic surgery compared with conventional open surgery.

For low rectal lesions laparoscopy-assisted abdominoperineal resection also allowed earlier postoperative

recovery, with an equivalent tumor clearance, morbidity, mortality, disease-free interval and duration of survival.²¹

One final consideration that has to be made regarding laparoscopic surgery is cost effectiveness. Indeed, laparoscopic procedure itself is more expensive than conventional techniques because of the use of single use trocars and endoluminal staplers. However, when one takes into account ICU stay and overall hospital stay laparoscopic procedure is significantly superior, bringing considerable savings to the budget.

The difficulty in operating, resecting, anastomosing in pelvic cavity has led nowadays robotic surgeries to overtake conventional laparoscopic surgery.

To date, all reported comparative nonrandomized studies and randomized studies have shown no difference in recurrence and survival rates with laparoscopic vs open colorectal resection, and a lower overall morbidity with laparoscopic procedure.¹⁹ Wise selection of appropriate cases should guide the novice in advanced laparoscopic surgery. With development of improved techniques and more experience, operating time can gradually be reduced with improved outcomes.

CONCLUSION

Our results suggest that laparoscopic resection for rectal cancer can be performed safely and without compromising oncological principles. There are definitely improved short-term outcomes with laparoscopic surgery.

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