

Original Research Article

Laparoscopic resections in colorectal cancers-short term and medium-term outcome with 2 years follow up

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ABSTRACT

Background: After decades of debate and controversy, the short-term benefits and at least equivalent long-term outcomes of laparoscopic colon surgery compared to open surgery has now been well established.

Methods: In this article, short- and medium -term outcomes of patients undergoing laparoscopic colorectal surgery for cancer in a tertiary care hospital is analysed. A retrospective analysis of prospectively collected data of all patients who had laparoscopic management of colorectal cancer (CRC) for 3 years was done. Patients were followed up for 2 years after treatment. The prospectively collected data was analysed to find out the incidence of complications, local or distant metastases and the survival rates.

Results: There were 65 patients who underwent laparoscopic surgery among 120 patients who had treatment for colorectal carcinoma in the study period. The 26 patients underwent low anterior resection followed by 14 patients and 13 patients undergoing left colonic and right colonic resections respectively. While abdominoperineal resection was carried out in 6 patients, 3 each patients were treated by ultra-low anterior resection and subtotal colectomy. Morbidities of varying grade according to Clavien Dindo classification was less for laparoscopic surgery. Recurrence occurred in 14.8% at 2 years follow up. The 2-year survival rate was noted to be 87.7% among the study group who underwent laparoscopic surgery.

Conclusions: Judicious selection of patients and the appropriate selection of technique help to achieve good short-and long-term results without compromising on oncological outcome in laparoscopic surgeries for colorectal malignancies

Keywords: CRC, Laparoscopic surgery

INTRODUCTION

Worldwide, colorectal cancer (CRC) is the third most common cancer in men and second most common one in women.¹ It is also the fourth most common cause of cancer mortality.

Open surgery for colorectal disease has progressed significantly to be the mainstay of treatment for CRC and a number of benign conditions. However conventional

open surgery is reported with considerable morbidity and a long recovery period.

Minimally invasive surgery revolutionized the way operations were performed. However, minimally invasive surgical techniques for the colon have not enjoyed as rapid a rise in popularity as many other laparoscopic procedures have throughout the 1990s. Several factors account for this difference, including a steep learning curve for the surgeon, the need for laparoscopic intra-

abdominal vascular control, the time required to perform the procedure, the need for larger incisions to retrieve specimens, and concerns over the oncologic safety of the procedure in malignant disease.²

The incorporation of laparoscopic techniques in developing countries has been challenging, due in particular to the high costs of equipment and lack of expertise.³ However; many laparoscopic procedures, including appendectomy, cholecystectomy, hysterectomy and splenectomy have been successfully performed in developing countries.⁴⁻⁶ Demonstrating oncologic outcomes similar to those achieved in a developed setting will further support and encourage the continued growth of laparoscopy for cancer in developing countries.⁷⁻¹¹

In this study we aim at assessing the diversities of post-operative outcome of laparoscopic-assisted colorectal surgeries in Kerala, India.

Objectives

Assessment of post-operative recovery by assessing-Paralytic ileus recovery, resuming to normal diet, duration of post-operative ICU stays and number of days of hospital stay.

Assessment of surgical complications by estimating the rate of-anastomotic leak, prolonged ileus, secondary haemorrhage, wound infection, and mortality.

Assessment of intraoperative factors by estimation of blood loss during surgery, duration of surgery, rate of conversion to laparotomy

Follow up-LoCo-regional recurrence rate, distant recurrence rate and survival rate.

METHODS

The target population enrolled in the study are the patients undergoing Laparoscopic colorectal resections for CRCs. This was a retrospective analysis of a prospectively collected data. Study and analysis were done in medical trust hospital Kerala and Believers Church medical college, Kerala. The study period was from June 2014 to June 2018.

Inclusion criteria

All patients aged >18 years and <80 years who undergo elective laparoscopic colorectal resection for colorectal malignancies.

Exclusion criteria

Patients undergoing planned open colorectal resection, in acute bowel obstruction or perforation from cancer and pregnancy.

Standard operative techniques for laparoscopic surgery were used. Mechanical bowel preparation was used in left sided and rectal lesions. The cameral port was placed supraumbilically in all cases and rest of ports placed as per tumour location. Complete mesocolic excision and D2 resection were done for colonic lesions while Total mesorectal excision and high ligation done for rectal lesions. Ethical approval was obtained from the ethical committee before the study.

Data were collected prospectively using a computerized data base according to pre-study Power calculation. Quantitative data was given as a mean $\pm$ standard deviation. Laparoscopic surgery converted to the open procedure were taken as conversions but excluded from further analysis. Time to: (1) last follow-up evaluation, (2) treatment failure or (3) death was measured from the date of operation. All calculations were performed by using the SPSS software package version 12.0 (SPSS Inc., Chicago, IL)

Recurrence and overall survivals were evaluated using the Kaplan-Meier method. Survival analysis per stage was analysed by Chi-square test, Log rank (Mantel-Cox) method.

RESULTS

The results are illustrated in the following Tables. As shown in Table 1 majority of patients were with BMI less than 25.

Table 1: Demographics.

Variables	N	Percent (%)	Range
Age (years, Mean $\pm$ SD)	59.45 $\pm$ 12.04	63.08	30-79
Gender			
Male	41	36.92	
Female	24		
BMI (kg/m²)	24.12 $\pm$ 3.9		14.8-33.8

Almost 74% of patients had left sided colonic lesions with 29.5% in left colon or sigmoid and 47.69% having rectal lesion in this series as shown in Table 2.

Table 2: Site of tumour.

Site of tumour	N	Percent (%)	CEA ng/ml (mean $\pm$ SD)	Range
Right colon	15	23.08	30.46 $\pm$ 60.79	0.50-193.00
Left colon	1	1.5	1.8	
Sigmoid colon	18	27.7	22.04 $\pm$ 38.03	1.69-154.70
Rectum	31	47.6	18.38 $\pm$ 38.22	1.10-164.30

Low anterior resection with diversion stoma was the main surgery. Conversion occurred mainly due to poor vision in deep narrow pelvis when safe resection deemed unfeasible.

Table 3: Types of intervention, number, percentage, number of conversions to laparotomy and overall mean blood loss and duration of surgery.

Type of intervention	N	Percentage (%)
Right colonic resection	13	20
Left colonic resection	14	21.5
Low anterior resection	26	40
Ultra-low anterior resection	3	4.62
APR	6	9.23
Subtotal colectomy	3	4.62
Conversion to laparotomy	11	16.92
Blood loss (mean $\pm$ SD) (ml)	135.37 $\pm$ 104.022	Range (25-500)
Duration of surgery (mean $\pm$ SD) (Min)	253.33 $\pm$ 71.770	Range (130-480)

Patients were mobilised and started on incentive spirometry from day 1 and started on liquids which was gradually increased based on recovery in Table 4.

Table 4: Post-op recovery ICU and hospital stay.

Post op. recovery	Median	Mean $\pm$ SD	Range
Day of NG tube removal	1	0.98 $\pm$ 1.19	0-7
Day of first flatus	3	3.09 $\pm$ 1.39	0-9
Day of first stools	4	3.70 $\pm$ 4.00	0-10
Day of starting oral liquids	1	3.40 $\pm$ 1.77	1-9
Day of normal diet	4	5.89 $\pm$ 2.13	3-12
Post op. ICU stay	20	24.14 $\pm$ 14.06	9-71
Post op. hospital stay	7	7.87 $\pm$ 2.55	5-19

The complications are shown in Table 5. All the anastomotic leaks occurred in anterior resections. The leaks were diagnosed based on symptoms, CT abdomen and content of drain. Since they had a diversion stoma they were managed conservatively.

Patients followed up at 3 monthly interval during for first 2 years with CEA every 3 months and radiological investigations 3-6 monthly. Among 65 patients 4 patients lost to follow up and 4 patients died due to disease and 2 due to other reasons in Table 6 and 7.

Table 5: Complications.

Complication	Frequency	Percentage (%)
Surgical		
Anastomotic leak	6	11.1
Sepsis	1	1.85
Prolonged ileus	2	3.7
Intestinal obstruction	3	5.55
Wound infection	7	12.9
Others	1 (omental prolapse)	1.85
Pulmonary	1	1.8
Cardiac	0	0
Renal		
UTI	1	1.8
Urinary retention	5	9.2
Neurologic	0	0
Reoperation	4	7.4
Mortality (septic shock due to anastomotic leak)		
	1	1.8

Table 6: Follow up.

Follow up	N	Recurrence	Death
3 rd month	65	2 ^a	0
6 th month	62	0	2
9 th month	60	2	1
1 year		1	1
15 th month	57	1	2
18 th month	55	1	0
21 st month	55	1	0
2 years	55	0	0

Table 7: Kaplan-Meier survival curve.

Estimate	Std. error	95% confidence interval	
		Lower bound	Upper bound
22.569 months	0.641	21.313 months	23.824 months

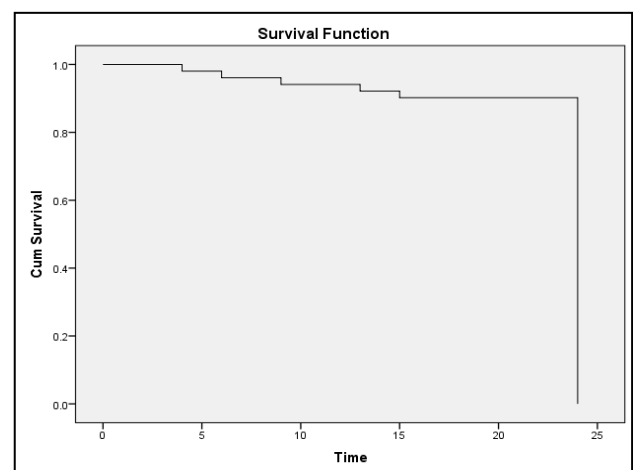


Figure 1: Kaplan-Meier survival curve.

Table 7 shown the Kaplan-Meier survival curve. Overall, 2 year follow up data is available for 55 patients. Mean follow up of each patient was 19.13 months. The follow up ranged from 3 months to 2 years.

There were 6 deaths in 2 years. 4 patients died of recurrence. One patient with chronic liver disease died of cirrhosis and another patient died due to bronchogenic carcinoma. The overall 19.13 months survival rate was found to be 87.7%. The survival rate was found decreasing with the stage of the disease ($p=0.971$). There were no deaths in stage 1, 1 death in stage 2, 4 in stage 3 and 1 in stage 4 seen. The 100% survival in stage 1 group, 94.5% survival in stage 2 group, 83.7% survival in stage 3 group and 50% survival in stage 4 group was seen.

There were 8 (16.3%) patients developed recurrence. Three (6.1%) patients developed local recurrence. Among them one patient following anterior resection developed local recurrence. Hence APR was done. One (2%) patient developed bone metastasis. Four (8.2%) other patients developed liver metastasis. Local recurrence rate is 6.1% and a distant recurrence rate is 10.2%.

DISCUSSION

We report here the experience of performing laparoscopic resection for CRC. Patients had acceptable rates of complications and conversion to open laparotomy, as well as reasonably short postoperative durations of stay, adequate lymph node retrieval, and finally, acceptable survival rates like open surgery.

CRC surgery, regardless of which technique is used, is technically demanding and requires sufficient training to be performed safely. With the development of laparoscopic techniques, along with the improvement of laparoscopic instruments, a standard laparoscopic procedure for CRC surgery has gradually become widely accepted, and a radical cure resection seems feasible for laparoscopic surgeries.

Recent published literature including multicentre trials have demonstrated comparable short- and long-term results with that of open surgery. But there are no published reports of large series of laparoscopic surgery for CRC from India. Many randomised clinical trials have been published and have demonstrated that laparoscopic resections are safe, feasible and a standard technique with effective short term and long-term outcome.

Short term outcome

Intraoperative blood loss, duration of surgery and conversion rate

The comparison of intraoperative variables between laparoscopic and open resections from other studies

(historical controls) showed a considerable difference. The mean operating time for the laparoscopic-assisted procedure was higher and the blood loss was considerably lower than open surgery in comparison with other studies. The mean operating time in our study was 257.54 min which was higher when compared to a few other studies. the COLOR trial had a mean operating time of 240 min for laparoscopic resections and 188 min for open surgery, the MRC-CLASICC had a very low operating time of 180 min and 135 min for LAC and open surgeries.¹² Prakash et al in their study of comparison between laparoscopic and open resections obtained a result of 296.7 min and 180 min respectively. Mean operating time for colon resection was 218.8 min and rectal resection was 273.6 min ($p=0.009$) as compared to 186.7 min and 200.5 min respectively from other studies.¹³

Mean blood loss in our study was 130.98 ml. This was lower than open resections from other trials. Other studies COLOR Prakash et al observed mean blood loss of 400 ml and 380 ml for open resections. However, there was no significant difference of blood loss between colonic and rectal resections in our study.

The conversion rate in this study was 16.9%, which is like that reported in other trials. The conversion rate from laparoscopic to open surgery was 17% in the COLOR trial, 29% in the MRC-CLASICC trial.¹⁵

Short term recovery

Those patients who underwent laparoscopic procedure had significantly faster recovery than the ones who underwent open surgery. Mean time for resuming normal diet in our study was 6 days. It was comparable with other major studies. MRC-CLASICC trial obtained a result of 5 days for laparoscopic group and 6 days for open surgery.¹⁶ In the study by Prakash et al the results obtained were 6.4 days and 8.9 days for laparoscopic and open resections respectively. Mean time for resuming normal diet was earlier in laparoscopic group. Postoperative hospital stay is an important evaluation criterion for fast-recovery surgery. The postoperative hospital stay for Laparoscopic colorectal surgery in our study was 7.87 days which is lower than the MRC-CLASICC trial of 10 days, Prakash et al-8.4 days.¹⁴ It is appreciably lower than the open surgery group in MRC-CLASSIC trial of 13 days, Prakash et al-13.4 days. Colonic cancer resection had significantly lower hospital stay of 7.09 days as compared to rectal resection of 8.54 days ($p=0.04$) which is similar to other studies (4.9 days versus 6.5 days, $p=0.046$).

Lymph node retrieval

The most important aspect of surgery for a tumour is the ability to remove the disease radically without compromising on oncologic principles. The number of lymph nodes harvested is an important parameter for

radical excision of the tumour along with tumour free bowel margin and radial margin. The number of lymph nodes harvested during the surgical procedure also influences clinical staging of the tumour. In our study an over all of 20.24 lymph nodes were harvested with a minimum being 13.5 in ultra-low anterior resection and maximum 30.08 in right colonic resection. The result obtained is acceptable as the minimum requirement is 12 lymph nodes. These results were like the open surgery group from other studies. The number of lymph nodes cleared the number of patients with positive resection margins were similar to other studies from both laparoscopic and open resection groups. The overall positive circumferential margin was 3.7% in our study. Prakash et al had a 4.7% positive margin in laparoscopic resection and 9.6% for open surgery group. The COLOR trial had 9.5% and 10% positive circumferential margin for laparoscopic and open resections respectively. We feel that laparoscopic approach is superior to laparotomy approach in rectal tumour surgeries due to better and magnified visualisation of mesorectum in total mesorectal excision.

Post-operative complications

Complications following surgery observed in this study were comparable to other studies. The Anastomotic leak rate (11.11%) was lower in our study as against 29% in other studies.¹⁷ It was comparable to other studies from laparoscopic and open surgery group of 3.2% and 11.2% respectively. Laparoscopic surgery did not increase the incidence of anastomotic leak when compared to open surgery from other studies. Clavien-Dindo classification is used to classify postoperative morbidity.¹⁸ Overall about 39% patients developed complications in our study, 30% belonging to Clavien grade 1 and 2, not causing significant morbidity. Rectal tumour resections had more complication rate when compared with colonic tumour resections. Total reoperation rate in our study were 7.4%. The reoperation rate was less in laparoscopic surgery (4.8%) than open surgery (12.9%) in comparison to other studies. There was one post-operative mortality (1.8%) in our study. Other studies showed a mortality rate of 1.6% for laparoscopic group and 6.4% for open surgery group.

Medium term outcome

Establishment of long-term benefits in laparoscopic colorectal resections is extremely important because long-term benefits are more important than the benefits obtained in the immediate postoperative period. If we can demonstrate that the long-term survival achieved by laparoscopic procedures is no less than that achieved by the conventional open technique, that result in itself should be sufficient to establish the advantage of laparoscopic and laparoscopic-assisted resections of colorectal malignancies. UK MRC CLASICC trial group in a 3 year result of randomized trial of laparoscopic-assisted resection of colorectal carcinoma observed 8.4% of 3 year local recurrence rate and 14.9%, 3 year distant

recurrence rate. The 3 year overall survival was 67.8%. In COLOR trial of comparison between laparoscopic and open colorectal resection, a 3 year follow up showed a local recurrence rate of 5% in each group and a distant recurrence rate of 22.1% and 19.1% respectively. In our study overall 8 cases out of 49 (16.3%) developed recurrence including 3 local recurrences were seen. A local recurrence rate of 6.1% and a distant recurrence rate of 10.2% were seen. The mean follow up in our study was 19.1 months and 2 year survival rate was 87.7%. Majority of the patients from our study belonged to stage 3. Overall survival of exclusive stage 3 cancer resection in our study was 83.6%. The recurrence rate and overall survival rate is comparable with other large, randomised trials. There was no significant difference in tumour recurrence between laparoscopic and open surgery for CRC seen.

This research establishes that laparoscopic colorectal resections have similar long term outcome as compared to open resections from other studies.

Port-site tumour implantations have been a matter of much concern with laparoscopic and laparoscopic-assisted colectomies. However, this may just represent an underestimation of wound implants in open techniques or an overestimation in laparoscopic surgery, wherein port-site “recurrences” just represent a part of widespread metastases. In study, there was no trocar-site or incisional implants. This correlates well with other studies that report port-site implants of approximately 1% or less, which is about the same as the wound tumour implantation rate of 0.6% to 1.5% reported for open procedures.¹⁸

Limitation

Limitation of this study is that is a retrospective analysis with the inherent issues of a retrospective analysis.

CONCLUSION

There is good short-term and medium-term outcome following laparoscopic surgery for CRCs which was better than open resections when compared to other studies. During the follow up period of 2 years there was a low locoregional and distant failure rate. Judicious selection of patients and the appropriate selection of the technique help to achieve good short-and long-term results without compromising on the oncological outcome of the procedure. Longer follow up period with larger numbers will be required to assess survival rates further. Laparoscopic resections should become the standard of care for surgery for CRC when the facilities are available.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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