

Comparison of Laparoscopic Versus Open Resection in Management of Colorectal Carcinoma

Muhammad Aakif¹ and Saim Ather²

¹St Luk's Hospital, Kilkenny, Ireland.

²Ibn-e Sina Hospital, Multan, Pakistan.

Correspondence:

Farhan Ali: aakif_khan2001@yahoo.com

Article Link: <https://www.brainnetwork.org/index.php/jcihs/article/view/4>

DOI: <https://doi.org/10.69591/jcihs.v1i1.4>



Citation: Aakif, M., & Ather, S. (2023). Comparison of laparoscopic versus open resection in management of colorectal carcinoma, *Journal of Contemporary Insights in Health Sciences*, 1(1), 32-39.

Conflict of Interest: Authors declared no Conflict of Interest

Acknowledgment: No administrative and technical support was taken for this research

Article History

Submitted: Mar 11, 2023

Last Revised: Apr 20, 2023

Accepted: May 15, 2023

Volume 1, Issue 1, 2023

Funding
No

Copyright
The Authors

Licensing



licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).



An official Publication of
Beyond Research Advancement & Innovation Network, Islamabad, Pakistan

Comparison of Laparoscopic Versus Open Resection in Management of Colorectal Carcinoma

Muhammad Aakif
St Luk's hospital, Kilkenny, Ireland
Email: aakif_khan2001@yahoo.com

Saim Ather
Ibn-e Sina Hospital, Multan, Pakistan
Email: saimather333@yahoo.com

ABSTRACT

Objective: To compare the outcomes of laparoscopic and open colorectal surgery in terms of infection control, hospital stay and blood loss.

Study Design: Randomized controlled trial.

Place and duration: Study was conducted at the general surgery department of Nishtar hospital, Multan from January 2020 to January 2021.

Methodology: Three hundred and ten patients were enrolled in the study and divided into two groups. One group was treated with laparoscopic technique and the second group treated with open surgical technique. Main variables of study were infection rate, duration of hospital stay and mean blood loss. SPSS version 23 was used for data analysis. Mean and standard deviation were calculated for numerical data and frequency and percentages for categorical data. P value ≤ 0.05 was considered as significant.

Results: In the laparoscopic group, 16.8% of patients experienced infection, compared to 20.6% in the open group. However, this variance was not statistically significant ($p=0.382$). The average hospital stay for the laparoscopic group was 11.21 ± 2.53 days, whereas it was 14.78 ± 3.01 days for the open group. This disparity was statistically significant ($p=0.000$).

Conclusion: Laparoscopic technique is associated with reduced rate of infection; hospital stay, and blood loss as compared to open surgery of colorectal carcinoma. Laparoscopic surgical method is preferred over open method.

Keywords: Colorectal carcinoma. Laparoscopic surgery, Open surgery, Hospital stay, Infection, Blood Loss

1. INTRODUCTION

Colorectal carcinoma is a malignant tumor or cancer of the large intestine which may involve rectum or colon (1). Usually, the upper five feet of intestine are named colon and lower five inches named as rectum (2). Rectum is the upper portion of anal canal. Colorectal cancer usually starts from the colon and spreads to the rectum. These cancers are named according to their location like colon cancer or rectal cancer (3). In surgical terms both types are grouped under same classification because of some common symptoms and features (4).

Treatment options for colorectal cancer may include conservative or surgical treatment. In surgical mode of treatment laparoscopic colorectal resection after adequate training skills is better choice with reasonable safety measures (5). These safety measures are essential but not preferred over open surgery of colorectal carcinoma. Between both techniques many advantages like better cosmesis, post operative pain, surgical site infection, early mobilization and many other issues are still under debate (6).

In their review, Gupta et al. (7) determined that laparoscopic resection is superior in maintaining immune and metabolic responses compared to open surgery. However, it's worth noting that laparoscopic techniques may also lead to heightened intraperitoneal cell-mediated immunity, which could be a consideration in the management of conditions like sepsis and cancer (8). Clinically relevant advantages of laparoscopic surgery were shorter length of hospital stay, recurrence of disease, post operative morbidity, and mortality.

Before modern era of medical sciences resection of colorectal cancer has been done through open surgical procedure (9). But now after successful laparoscopic procedures for appendectomy, cholecystectomy, and incisional hernia this technique is introduced in management of colon cancer and after that for resection of rectal cancer (10). Preparation of laparoscopic surgery is also like open surgical management in colorectal carcinoma (11).

The endpoint of this trial is to compare the impact of open colorectal surgery and laparoscopic surgery regarding 30 days morbidity and mortality. Effectiveness of both techniques along with postoperative complications and hospital stay were the main outcomes (12).

1. METHODOLOGY

The study was conducted after taking ethical clearance and obtaining written informed consent from the patients. Participants were recruited from the hospital's outpatient department (13). Those aged 18 and above, of both genders, and scheduled for elective surgery were eligible for inclusion (14). However, patients with conditions such as cancer infiltrating other organs, cardiovascular dysfunction (assessed via magnetic resonance imaging), respiratory issues, ongoing infections, hepatic dysfunction, and plasma neutrophil levels below $2.0 \times 10^9/L$ were excluded from the study. Patients were randomly assigned to either the laparoscopic or open surgery group using a lottery method (15).

Demographics, primary diagnosis, nutritional status were recorded. Weight loss above 10% in six-month duration with respect to usual body weight was labeled as undernutrition (16). Obesity was labeled when body mass index is above 30 and ASA status was assessed by American Society of Anesthesiologist system. Intestinal washout was made a day before surgery with a 3-liter osmotic solution and enema was given in the morning before surgical procedure. Antibiotic prophylaxis was given with Ceftriaxone 2g intravenously and a 2nd dose was given during surgery (17). Low molecular weight heparin with dose of 50 IU/kg/d was administered as prophylaxis for deep vein thrombosis. Standard anesthesia was given to all patients. Patients in the open group were treated with open surgical technique and the second group were treated with laparoscopic surgical technique (18).

Demographics, blood loss and outcomes (infection, hospital) were recorded in all patients. Blood loss was calculated by measuring blood in suction container and number of gauze. Strict protocol about analgesia, postoperative care and nutrition feed was followed. Continuous epidural infusion of 0.2% ropivacaine (4–6 mL/h) was given as postoperative analgesia along with intravenous morphine at dose of 4 mg maximum. Recovery from surgical procedure and anesthesia was made by monitoring reversal of sensorium and normal bowel function (19).

All collected data was entered in SPSS version 23 and frequency percentages were calculated for categorical variables like gender, type of surgery and mean standard deviation was calculated for numerical variables like age, blood loss

and hospital stay. Tests of significance were applied to see association among variables. P values less than or equal to 0.05 was taken as significant (20).

2. RESULTS

Three hundred and ten patients were included in this study, both genders. Of the 310 patients, n=155 (50.0%) treated in laparoscopic group and n=155 (50.0%) patients treated in open group. The mean age in both the groups was almost equal. Males were predominant in both the groups i.e. (66.5%) and (67.1%), respectively. Right hemicolectomy was the most common type of operation in laparoscopic and open groups, i.e. (47.1%) and (45.2%), respectively. No significant difference was found with respect to age, gender, ASA score, hemoglobin, and type of operation to be performed between the two study groups. (Table 1)

Table 1: Demographic Characteristics and Type of Operation of the Study Groups

Variable	Laparoscopic Group n=155 (50.0%)	Open Group n=155 (50.0%)	P-value
Age (years)	58.35±3.59	58.41±3.53	0.861
Gender			
Male	n=103 (66.5%)	n=104 (67.1%)	0.904
Female	n=52 (33.5%)	n=51 (32.9%)	
ASA score	2.21±0.62	2.10±0.71	0.855
Hemoglobin (g/L)	12.44±1.28	12.74±1.38	0.442
Type of operation			
Right hemicolectomy	n=73 (47.1%)	n=70 (45.2%)	0.965
Left hemicolectomy	n=35 (22.6%)	n=32 (20.6%)	
Sigmoid resection	n=19 (12.3%)	n=22 (14.2%)	
Rectal resection	n=15 (9.7%)	n=17 (11.0%)	
Other	n=13 (8.4%)	n=14 (9.0%)	

In (16.8%) patients of laparoscopic group, infection occurred. While (20.6%) patients in open group, infection occurred. But the difference was statistically insignificant, (p=0.382). The mean hospital stay in laparoscopic group was 11.21±2.53-day and 14.78±3.01 days in open group. The difference was statistically significant. (p=0.000). (Table 2)

Table 2: Infection Distribution and Hospital Stay of the Study Groups

Variable	Laparoscopic Group n=155 (50.0%)	Open Group n=155 (50.0%)	P-value
Infection	n=26 (16.8%)	n=32 (20.6%)	0.382
Hospital stays (days)	11.21±2.53	14.78±3.01	0.000
Blood loss	166.9±17.7	233.8±35.5	0.001

3. DISCUSSION

Many studies have been conducted on the safety and feasibility of laparoscopic surgery of colorectal carcinoma. Complications and rate of conversion into open surgery is much lower when eligibility criteria and standard protocol is followed¹². In our study it was observed that open surgery is associated with higher rate of infection and hospital stay is also prolonged. A study was conducted by Braga M et al¹³ in 2002 and reported 11% infection in laparoscopic group and 23% infection in open surgery group.

In our study hospital stay in laparoscopic group was 11.21±2.53 and in open surgery group it was 14.78±3.01, results were statistically significant. A study was conducted by Molenaar et al¹⁴ and reported mean hospital stay 12 days in laparoscopic group. Another study was conducted by Franklin et al¹⁵ on comparison of both techniques in colorectal carcinoma and reported longer hospitalization in open surgery as compared to laparoscopic surgery 5.7 days in laparoscopic vs 9.7 days in open surgery group.

In our study it was also observed that laparoscopic surgery is associated with less blood loss as compared to open surgery. Open surgery of colorectal carcinoma is associated with greater fall of hemoglobin level and blood transfusion. A study was conducted by Psaila et al¹⁶ also reported similar findings that laparoscopic surgery is associated with low blood loss. Another study was conducted by Goh et al¹⁷ and reported there was no difference regarding blood loss between the two techniques.

Laparoscopic surgery is a preferred technique in the treatment of colorectal carcinoma management. Ribeiro et al¹⁸ conducted a study on comparison of both techniques and reported that laparoscopic surgery is 17% less in hospital stay of patients. Hospital stay in laparoscopic and open surgery is 6.02 ± 3.86 vs 9.86 ± 16.27 days respectively, (P < .001). In a study by Fujii et al¹⁹ also reported that laparoscopic surgery is a more effective and safe technique

for management of colorectal carcinoma. Hospital stays and postoperative infection is better in laparoscopic technique.

A study by Zhou et al²⁰ also reported similar findings about hospital stay of patients. Study reported that hospital stay of open surgery technique is much higher as compared to laparoscopic surgery group. Hemoglobin level is also much better in laparoscopic group after surgical procedure and blood transfusion is not required.

4. CONCLUSION

The laparoscopic approach is linked to lower rates of infection, shorter hospital stays, and reduced blood loss compared to open surgery for colorectal carcinoma. Consequently, the laparoscopic surgical technique is favored over the open approach.

REFERENCES

1. Song XJ, Liu ZL, Zeng R, Ye W, Liu CW. A meta-analysis of laparoscopic surgery versus conventional open surgery in the treatment of colorectal cancer. *Medicine (Baltimore)*. 2019;98(17):e15347.
2. Tong G, Zhang G, Liu J, Zheng Z, Chen Y, Cui E. A meta-analysis of short-term outcome of laparoscopic surgery versus conventional open surgery on colorectal carcinoma. *Medicine (Baltimore)*. 2017;96(48):e8957.
3. Reibetanz J, Germer CT. Pathologisches Outcome nach laparoskopischer und offener Rektumkarzinomchirurgie. *Chir.* 2016;1(87):72–72.
4. Devoto L, Celentano V, Cohen R, Khan J, Chand M. Colorectal cancer surgery in the very elderly patient: a systematic review of laparoscopic versus open colorectal resection. *Int J Colorectal Dis.* 2017 Sep;32(9):1237–42.
5. Ishibe A, Ota M, Fujii S, Suwa Y, Suzuki S, Suwa H, et al. Midterm follow-up of a randomized trial of open surgery

- versus laparoscopic surgery in elderly patients with colorectal cancer. *Surg Endosc.* 2017 Oct;31(10):3890–7.
6. Sheng S, Zhao T, Wang X. Comparison of robot-assisted surgery, laparoscopic-assisted surgery, and open surgery for the treatment of colorectal cancer: a network meta-analysis. *Medicine (Baltimore).* 2018;97(34):e11817.
7. Gupta A, Watson DI. Effect of laparoscopy on immune function. *Br J Surg.* 2002 Nov 29;88(10):1296–306.
8. Kitano S, Inomata M, Mizusawa J, Katayama H, Watanabe M, Yamamoto S, et al. Survival outcomes following laparoscopic versus open D3 dissection for stage II or III colon cancer (JCOG0404): a phase 3, randomised controlled trial. *Lancet Gastroenterol Hepatol.* 2017;2(4):261–8.
9. Kim MJ, Park SC, Park JW, Chang HJ, Kim DY, Nam BH, et al. Robot-assisted versus laparoscopic surgery for rectal cancer: a phase II open label prospective randomized controlled trial [Internet]. *LWW*; 2018 [cited 2024 May 7]. Available from: <https://journals.lww.com/annalsofsurgery/fulltext/2018/02000/robot-assisted-versus-laparoscopic-surgery-for.11.aspx>
10. Yang ZF, Wu DQ, Wang JJ, Lv ZJ, Li Y. Short-and long-term outcomes following laparoscopic vs open surgery for pathological T4 colorectal cancer: 10 years of experience in a single center. *World J Gastroenterol.* 2018;24(1):76.
11. Fugang W, Zhaopeng Y, Meng Z, Maomin S. Long-term outcomes of laparoscopy vs. open surgery for colorectal cancer in elderly patients: A meta-analysis. *Mol Clin Oncol.* 2017;7(5):771–6.
12. Stommel MW, Ten Broek RP, Strik C, Slooter GD, Verhoef C, Grünhagen DJ, et al. Multicenter observational study of adhesion formation after open-and laparoscopic surgery for colorectal cancer. *Ann Surg.* 2018;267(4):743–8.
13. Braga M, Vignali A, Gianotti L, Zuliani W, Radaelli G, Gruarin P, et al. Laparoscopic versus open colorectal surgery: a randomized trial on short-term outcome. *Ann Surg.* 2002;236(6):759–67.
14. Molenaar ChBH, Bijnen AB, De Ruiter P. Indications for laparoscopic colorectal surgery: Results from the Medical

- Centre Alkmaar, The Netherlands. *Surg Endosc.* 1998 Jan;12(1):42–5.
15. Franklin Jr ME, Rosenthal D, Abrego-Medina D, Dorman JP, Glass JL, Norem R, et al. Prospective comparison of open vs. laparoscopic colon surgery for carcinoma: five-year results. *Dis Colon Rectum.* 1996;39(10):S35–46.
 16. Psaila J, Bulley SH, Ewings P, Sheffield JP, Kennedy RH. Outcome following laparoscopic resection for colorectal cancer. *Br J Surg.* 2003 Jan 13;85(5):662–4.
 17. Goh YC, Eu KW, Seow-Choen F. Early postoperative results of a prospective series of laparoscopic vs. open anterior resections for rectosigmoid cancers. *Dis Colon Rectum.* 1997;40(7):776–80.
 18. Ribeiro Jr U, Tayar DO, Ribeiro RA, Andrade P, Junqueira Jr SM. Laparoscopic vs open colorectal surgery: economic and clinical outcomes in the Brazilian healthcare. *Medicine (Baltimore).* 2020;99(42):e22718.
 19. Fujii S, Ishibe A, Ota M, Yamagishi S, Watanabe K, Watanabe J, et al. Short-term results of a randomized study between laparoscopic and open surgery in elderly colorectal cancer patients. *Surg Endosc.* 2014 Feb;28(2):466–76.
 20. Zhou S, Wang X, Zhao C, Liu Q, Zhou H, Zheng Z, et al. Laparoscopic vs open colorectal cancer surgery in elderly patients: short- and long-term outcomes and predictors for overall and disease-free survival. *BMC Surg.* 2019 Dec;19(1):137.