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Comparison of Oncological Outcomes After Colorectal Cancer Surgery in Patients Undergoing Laparoscopic Versus an Open Procedure

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ABSTRACT

Objective: To compare the oncological outcomes after colorectal cancer surgery in patients undergoing laparoscopic versus open procedures for colorectal carcinoma.

Study Design: Comparative Cross-sectional Study.

Place and Duration of Study: Surgical Department Combined Military Hospital, Rawalpindi and Histopathology Department Armed Forces Institute of Pathology Rawalpindi Pakistan, from June 2021 to March 2022.

Methodology: This study was conducted on 60 patients who underwent oncological surgery for colorectal cancer via the open or laparoscopic method. Data were collected for all the patients from the Histopathology Department regarding proximal margin involvement, circumferential margin involvement, distal margin involvement, tumour perforation and lymph nodes resected. These parameters were compared in patients undergoing open or laparoscopic methods.

Results: Out of 60 patients included in the final analysis, 41(68.3%) were males, and 19(31.7%) were females. The mean age of patients who underwent open or laparoscopic surgery for colorectal cancer in our study was 44.67±7.537 years. 32(53.3%) patients underwent laparoscopic surgery, while 28(46.7%) underwent an open surgical procedure. Statistical tests revealed that both Groups found that proximal margin involvement, circumferential margin involvement, distal margin involvement, tumour perforation, and the number of lymph nodes resected were not statistically significant (p-value>0.05).

Conclusion: Oncological outcomes on histopathology were not different in patients undergoing the open or laparoscopic procedure. Therefore, laparoscopic colonic resection is oncologically equivalent to open resection.

Keywords: Carcinoma colon, Lymph nodes yield, Margins involved, Tumour perforation.

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INTRODUCTION

Colorectal cancer is the second most common cancer in females and the third most common cancer seen in males.[1] Surgery for colorectal cancer is one of the most commonly performed cancer operations worldwide. Traditionally colorectal cancer operations were performed by an open technique using midline laparotomy. There was a belief that adequate oncological clearance would be difficult to achieve with laparoscopic surgery. Due to this, there was hesitance on the part of surgeons to adopt laparoscopic resections even though their benefits in early recovery are validated worldwide. Surgical oncology and abdominal surgery have constantly been evolving in all parts of the world.[2] Researchers and surgeons have been constantly in search of methods which would produce the best oncological results with minimum trauma.[3] Abdominal, and hepatobiliary region is complex and becomes more complicated if the disease process is neoplastic. Different approaches could deal with these challenges from treating surgical teams.[4]

The role of the open surgical method remains relevant. These methods are practised in routine for various abdominal diseases across the globe.[5] Oncological surgeries sometimes are different from routine abdominal surgeries and need an entirely different approach from the treating team.[6] Multidisciplinary team involvement is usually the key in the treatment of cancers and histopathologic outcomes after surgical resection hold a vital position in determining long term outcomes of neoplastic illness.[7]

Laparoscopic and open methods have been compared for oncological outcomes in various surgical centres worldwide. Chiu *et al*. conducted a single-centre study regarding oncologic outcomes in laparoscopic versus open surgery for non-metastatic colorectal cancer. They found that immediate oncological parameters and long-term survival were similar in both Groups, but adverse effects were seen more in patients undergoing open methods. They, therefore, recommended the laparoscopic method for surgical resection of colorectal cancers.[8] Bizzoca *et al*. in 2021 targeted only obese patients suffering from colorectal

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cancer and tried to look for short-term post-operative outcomes of open and video-laparoscopic approaches for cancer surgery.[9] They came up with the findings that the laparoscopic method was better regarding post-operative parameters related to surgery, but they did not look for oncological outcomes. A literature review published in 2013 concluded that laparoscopy was not inferior to the open method in terms of oncological outcomes and superior in terms of other complications.[10] They recommended the laparoscopic method after considering individual factors in each patient suffering from colorectal malignancy.

Laparoscopic surgeries for gallbladder disease are a routine practice in Pakistan, but this minimally invasive method is still in the evolving phase for colorectal surgeries. This is due to the limited availability of trained professionals and equipment across the country. Limited data from Pakistan is available regarding this minimally invasive method for colorectal surgeries. Therefore, we planned this study to compare the oncological outcomes after colorectal cancer surgery in patients undergoing laparoscopic versus open procedures for colorectal carcinoma.

METHODOLOGY

This comparative cross-sectional study was conducted at the Surgical Department of Combined Military Hospital Rawalpindi and Histopathology Department, Armed Forces Institute of Pathology Pakistan, from June 2021 to March 2022. The sample size was calculated by WHO sample size calculator using the population proportion of oncological adequateness in laparoscopic surgery as 88%,[11] and the margin of error as 10%. A consecutive non-probability sampling technique was used to gather the sample.

Inclusion Criteria: All patients above 18 years who underwent open or laparoscopic management for colorectal cancer were included in the study.

Exclusion Criteria: Patients with metastatic disease or any neoplastic lesion (solid or hematopoietic) were excluded. Those undergoing redo surgeries were part of the exclusion criteria in this study. Palliative resections were also excluded from the study. Those who refused to become part of the study and chose any method on their own were also not included.

Patients were placed in two Groups after obtaining ethical approval from IERB (Via letter no 210), application of set criteria and informed consent. Group-A underwent laparoscopic resection, whereas open surgery was performed for patients in Group-B. The same surgical team performed both types of surgeries per set protocol. The extent of surgery via open and laparoscopic surgery was determined in a team meeting before the surgery depending upon the site and extent of the tumour. After resection, the specimen was sent to the histopathology department to look for the parameters of the oncological outcome. A consultant histopathologist analyzed the sample and reported after the team meeting.

All statistical analysis was performed using the Statistics Package for Social Sciences version24.0 (SPSS-24.0). Frequency and percentages were calculated for quantitative parameters. Mean and standard deviation for age were also calculated for the study participants. Pearson chi-square test and Fischer exact test, by keeping the p-value<0.05 as significant, were used to looking for a comparison of oncological outcome parameters in both the Groups.

RESULTS

Out of 60 patients included in the final analysis, 41(68.3%) were male, and 19(31.7%) were female. The mean age of patients who underwent open or laparoscopic surgery for colorectal cancer in our study was 44.67 ±7.537 years. The general characteristics of study participants were summarized in Table-I.

Table-I: Characteristics of Patients Managed For Colorectal Cancer (n=60)

Study Parameters	n(%)
Age (years)	
Mean±SD	44.67±7.537 years
Range (min-max)	21 years-65 years
Gender	
Male	41(68.3)
Female	19(31.7)
Oncological Outcome	
Proximal margin involvement	1(1.6)
Circumferential margin involvement	5(8.3)
Distal margin involvement	1(1.6)
Tumor perforation	1(1.6)
<12 lymph nodes resected	12(20.0)
Type of surgery	
Open procedure	
Abdomino-perineal resection	6(10.0)
Anterior resection	11(18.3)
Left hemicolectomy	4(6.7)
Right hemicolectomy	3(5.0)
Total colectomy	4(6.6)
Laparoscopic Procedures	
Abdomino-perineal resection	8(13.3)
Anterior resection	18(30.0)
Right hemicolectomy	4(6.7)
Left hemicolectomy	1(1.6)
Total colectomy	1(1.6)

Thirtytwo (53.3%) patients underwent laparoscopic surgery, while 28(46.7%) underwent open surgical procedures for resectioning colorectal carcinoma.

The results of the statistical test were shown in Table-II. It was revealed that all the oncological outcome parameters included in the study (proximal margin involvement, circumferential margin involve-ment, distal margin involvement, tumour perforation and the number of lymph nodes removed) were not statistically significant in both the Groups (*p*-value>0.05).

Table-II: Comparison of Various Oncological Outcome Parameter in Patients Undergoing Open and Laparoscopic Surgery(n=60)

Oncological Outcome Parameters	Laparoscopic Surgery (n=32)	Open Surgery (n=28)	*p*-value
Proximal Margin Involvement			
No	32(100.0)	27(96.4)	0.214
Yes	00(0%)	01(3.6)	
Circumferential Margin Involvement			
No	30(93.7)	25(89.3)	0.532
Yes	02(6.3)	03(10.7)	
Distal Margin Involvement			
No	31(96.8)	28(100.0)	0.259
Yes	01(3.2)	00(0.0)	
Tumor Perforation			
No	32(100.0)	27(96.4)	0.214
Yes	00(0%)	01(3.6)	
<12 Lymph Nodes Resected			
No	26(81.3)	22(78.5)	0.796
Yes	06(18.7)	06(21.5)	

DISCUSSION

The immediate oncological outcome in this study turned out to be similar for both laparoscopic and open colorectal cancer resection Groups. There was no difference in the involvement of resection margins, whether surgery was performed laparoscopically or by the open method. The lymph node yield in both Groups was also comparable. Colorectal malignancies have been commonly dealt with by laparoscopic methods in most parts of the world as more and more surgeons have been trained to perform minimally invasive surgery.[12,13] Several factors could be incorporated into the plan to determine the best method for surgery.[14] However, in the case of malignancies, the better immediate histopathological outcome remains the most important factor.[15] Therefore, our study tried to obtain data comparing the oncological outcome after colorectal cancer surgery in patients undergoing laparoscopic vs open procedure for colorectal carcinoma.

Ringressi *et al*. in 2018 studied patients with Stage I- III colorectal carcinoma regarding long-term surgical outcomes comparing the laparoscopic and open methods of surgery.[16] They came up with the conclusion that long-term disease-free survival and overall survival were better in patients who underwent laparoscopic surgery as compared to those who underwent open surgery. Our study was not about the long-term outcome but immediate oncological outcome parameters and both methods were equally effective for these parameters.

Oncological outcomes of laparoscopic versus open surgery in pT4 colon cancers were studied in a meta-analysis by Liu *et al*.[17] They came up with the conclusion that oncological outcomes were similar in patients undergoing either open or laparoscopic surgery. However, post-operative complications were significantly less in patients undergoing laparoscopic surgery. Our study strengthened the results of Liu *et al*. regarding oncological parameters outcome. Post-operative complications were not part of our analysis.

A nationwide study was conducted in Taiwan by Huang *et al*. in 2020. Left-side colon cancer patients undergoing open and laparoscopic surgeries were assessed for clinical outcomes.[18] It was concluded that immediate oncological outcome and long-term survival were comparable in both methods, but post-operative complications were less in patients undergoing laparoscopic surgeries. Other than post-operative complications, which were not part of our study, other results were similar to our study. A long-term randomized controlled trial was conducted in 28 European hospitals on survival rates after laparoscopic versus open surgery for colon can-cer. This study concluded that patients who under-went laparoscopic surgery for colon cancer did not differ from those treated by open surgery in terms of overall and disease-free survival. The stage-specific treatment outcome was also not significant among both Groups.[19]

Volkel *et al*. conducted a study from Germany regarding the long-term outcome in colon cancer patients undergoing open and laparoscopic surgery for tumour resection.[20] They concluded that patients with non-metastatic disease had a better outcome with the laparoscopic procedure, but overall, both procedures were equally effective, and laparoscopy was safer. Unfortunately, assessing safety was not part of our study; otherwise, immediate oncological outcome parameters were the same in both Groups.

LIMITATIONS OF STUDY

As various services and teams were involved in the study, multiple factors could affect the results. All of these

factors could not be controlled or incorporated into one study. Long-term oncological outcome parameters must also be studied to generalize results and devise local guidelines. For future research, we recommend a randomized control trial that would conclusively prove the fact.

CONCLUSION

Oncological outcomes on histopathology were not different in patients undergoing the open or laparoscopic method. Therefore, laparoscopic colonic resection is oncologic and superior to open resection.

Conflict of Intrest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

QTH: Conception, Study design, drafting the manuscript, approval of the final version to be published.

MAA: Data acquisition, data analysis, critical review, drafting the manuscript, critical review, approval of the final version to be published.

UA & UG: Drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

HR & SS: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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