International Journal of New Technology and Research (IJNTR)
ISSN:2454-4116, Volume-3, Issue-11, November 2017 Pages 71-77

The Outcome of Early Experience of Laparoscopic Colorectal Surgery at Armed Forces Hospital

Maj Gen C K Jakhmola, Wg Cdr V Trehan , Col S S Kumar , Wg Cdr Ameet Kumar

Abstract— **laparoscopic colorectal surgery for colorectal malignancy is still under-utilized among various surgeons. A steep learning curve is one of the most common cause of its restricted acceptance.**

Aim: To determine the probability of laparoscopic colorectal surgery in a single institution by implementing a well standardized protocol based operative technique.

Methods & Materials: 92 patients underwent laparoscopically colorectal surgery for colorectal malignancies between 2008 to 2016 were included. All the procedures were performed by trained gastrointestinal surgeons by following protocol based operative technique. Procedures were performed according to the principle of complete mesocolic or total mesorectal excision (TME). Postoperatively fast track recovery programme was followed and recovery parameters, morbidity and mortality have been assessed.

Results: Type of resections: 31 patients underwent right colonic resections, 17 low anterior resection with TME, 14 left colonic resections, 13 anterior resection, 11 underwent abdominoperineal resection (APR) , 6 patients underwent total panproctocolectomy with ileal pouch anal-anastomosis (IPAA). Mean operative time: 250 min; Mean number of lymph-nodes removed was 18.2. Eight cases were converted to open procedure. Overall morbidity and mortality was 31.5% and 2.17% respectively. The major morbidity, as defined by Clavien Dindoe grade III or higher was 9.78%.

Conclusion: Laparoscopic colorectal surgery is safe and leads to good results in terms of recovery parameters and immediate outcomes. Stringent criteria of patient selection, identical preoperative workup and protocol based surgical technique leads to shortening of learning curve and improved outcome.

Index Terms— **Laparoscopic colorectal surgery, Protocol based surgery, Colorectal cancer, Fast tract recovery.**

I. Introduction

Laparoscopic surgery is now a well accepted treatment option for many benign and malignant conditions of colorectal region. It has taken several years and many clinical trials to establish the role of laparoscopy surgery in colorectal diseases. This was the result of several clinical trials, which were designed to meticulously investigate the feasibility of laparoscopic colorectal surgery (LCS), recurrence rate, oncologic safety, morbidity and post operative recovery benefits. At least four large prospective, randomized controlled trials, from Europe, North America, and Canada have confirmed the feasibility and the oncological safety of colorectal laparoscopic surgery.[1-9]

However, LCS is still not considered as a gold standard procedure and remains underutilized. The long and steep learning curve might be considered the main cause of the limited acceptance of this procedure. Nevertheless a trend towards a larger acceptance of LCS has been observed in the last decade[10]. The study from Schwab et al [11] showed that the acceptance of this technique among various surgical departments is still quite low, as only one quarter of all the colorectal surgical procedures are being undertaken laparoscopically by colorectal surgeons in Great Britain. One of the main reason for consultants not doing laparoscopic colorectal resections, is the lack of proper protocols and inadequate training.

The aim of the present study, the first of its kind in the Armed forces, is to determine the feasibility of LCS in a tertiary care centre.

II. Methods & Materials

A prospective database has been maintained since the beginning of LCS in our centre. Data which included all laparoscopic colon and rectal resections, performed between 2008 to 2016 have been analyzed. Well standardized protocols have been followed with standard surgical principles. All the procedures were undertaken following meticulous oncological principles, as per criteria of complete mesocolic excision (CME) and total mesorectal excision (TME)[12,13] . Complications were also classified as per Clavien Dindoe Classification [14,15], which has been validated as a standardized tool for assessment of postoperative complications. Initially suitable patients were selected which were considered adequate for a learning curve setting.

Exclusion criteria were: T4 and bulky tumors, previous operations with a midline incision and BMI >30kg/m^2

Short term outcomes, including operative data, post operative recovery parameters and 30-days morbidity and mortality have been analyzed. Surgical data included operative time, number of lymph-nodes retrieved (considered a surrogate marker of proper oncologic resection), conversion rate and reasons for conversion were analysed. The following recovery endpoints have been considered: Mean time to flatus, Mean time to solid stool, Time to oral feeding, Mean time to quit intravenous analgesics

The overall morbidity and mortality were identified. Both surgical and medical complications were included and classified using Claviene & Dindo staging system. [14,15]. The overall morbidity was calculated considering the number of patients who had at least 1 complication. Major complications were considered as Claviene Dindo grade III or

Maj Gen C K Jakhmola, Ex Prof and HOD GI Surgery Base Hospital Delhi Cantt, India,
Wg Cdr V Trehan, Asst Prof, Dept of Surgery & GI surgery Base Hospital Delhi Cantt, India
Col S S Kumar, Associate Prof, Dept of Surgery & GI surgery Base Hospital Delhi Cantt, India
Wg Cdr Ameet Kumar , Asst Prof, Dept of Surgery & GI surgery Command Hospital Air Force Bangalore , India

higher.

III. Surgical Notes

All the operations were performed by trained gastrointestinal surgeons. A well structured surgical protocol was implemented irrespective of operating surgeon. Key factor was the protocol that was followed and enumerated below:

1. Proper preoperative patient preparation which includes high protein enteral feed in undernourished patients with low albumin- orally or nasogastric tube feed or supplemental Total parentral nutrition (if patient is not able to take adequate enteral feed) . Two days fluid diet prior to surgery as bowel preparation for left sided growth after excluding bowel obstruction.

2. Patient positioning, ports placement, the more complex parts of the procedure like, plane of dissection, vessels skeletonization, adequate mobilization of bowel, all are standardized as per our institutional protocol.

3. The role of operative assistant staff (operative room nurse and surgical assistants) were exactly defined in order to have smooth and co-ordinated function.

With regard to operative details, careful dissection was done trying not to violate mesocolic/ mesorectal fascia. All the procedures were undertaken following meticulous oncological principles, as per criteria of CME and TME and a medial to lateral dissection was done. For left sided colonic resection, ligation of inferior mesenteric vascular pedicle at the origin was done. For sigmoid and rectosigmoid junction tumors, the inferior mesenteric artery was divided just distal to origin of left colic artery. In case of carcinoma rectum with T3, N0/N1 without systemic spread, long course neo-adjuvant chemoradiotherapy (NACRT) was offered. Rectal cancer dissections were done according to the principle of TME. The ligation of both inferior mesenteric artery and vein just at origin was done followed by dissection in holy plane of heald. In case of upper and middle third rectal cancer at least a 5 cm clear distal margin was ensured and for lower third cancers, a minimum of 1 cm margin was considered necessary, failing which they underwent an abdominoperineal resection. We added a covering loop ileostomy in all cases.

For ulcerative colitis and Familial Adenomatous Polyposis (FAP), two staged procedure were done. Laparoscopic total proctocolectomy with ileal pouch anal anastomosis with covering loop ileostomy in first stage then closure of loop ileostomy in second stage. For easy handling of bowel we first do the right hemicolectomy, subsequently dividing the transverse colon then a dissection of left colon and rectum, followed by formation of pouch.

IV. Recovery Protocol

All the patients underwent a fast track recovery protocol. A visual analogue scale was used to measure pain. Patients were continued on epidural infusion for pain relief for 48 to 72 hours. This was supplemented with injectable paracetamol. Patients were mobilized on postoperative day one and encouraged to sit in a chair or walk few steps. Nasogastric tube was removed on first post operative day and urinary catheter was removed on second day, with the exception of low rectal resection in which the catheter was maintained for at least three days. Intravenous fluids were discontinued as soon as bowel was opened to flatus or stoma starts functioning. Patients were then encouraged to drink and eat soft diet. We also use a single abdominal drain in all cases which is left in place for around three days. Patients were usually discharged on 7th postoperative day.

V. Results

Ninety two patients, diagnosed with colon and rectal diseases, have been operated laparoscopically in the study period. Demographics profile as shown in Table 1. Male and Female population was 55.5 % and 45.5% respectively. Mean age was 57.2 years , mean BMI was 25.8kg/m^2 The following resections were performed: 31 right-side resections, 14 left-side resections, 13 anterior resection, 17 low anterior resection with TME,11 underwent APR, 6 patients underwent total panproctocolectomy with ileal pouch anal-anastomosis (IPAA).

All patients were staged as per TNM staging system as shown in Table 2. Operative data are shown in Table 3. Mean operative time depends up on kind of resection. Mean number of lymph nodes removed was 18.2. Eight cases were converted and details are shown in Table 3.

With regard to recovery data: mean time to flatus was 2.3 days (range 2-6), mean time to stool was 3.3 days (range 2-6), fluid diet was tolerated after 2.3 days on average. Mean time to quit injectable analgesics was 2.5 days; mean length of hospital stay was 7days (range 5 - 9). Short-term results in terms of 30-days morbidity and mortality according to Clavien Dindoe staging system definitions are shown in Table 4. Overall morbidity and mortality was 31.5% and 2.17% respectively. The major morbidity, as defined by Clavien Dindoe grade III or higher, was only 9.78% which includes two patients of carcinoma rectum who underwent APR, these two patients were re explored, because of bleed, two patients of carcinoma of right colon who underwent right hemicolectomy , had anastomotic leak for which they were re explored and end ileostomy was done ,one patient who underwent LAR was re explored because of post operative obstruction. We also recorded 16.3% grade I complication (15 wound infections) which were successfully managed conservatively by opening clips at bed side and local dressing. 7.6% cases had grade II complications (3 pulmonary infections, 2 prolong ileus required TPN, 1 port site bleeding, 1 required blood transfusion), where all required only medical treatment.

VI. Discussion

This study was done at a tertiary care centre which is a low volume centre as far as laparoscopic colorectal surgeries are concerned. The first author of this article who started the LCS programme at our centre had attended several hands on training capsule in colorectal surgeries before starting these surgeries. We believe that the key factors for cruising through the learning curve in LCS include: stringent criteria of patient selection, proper preoperative preparation of patient, implementation of a standardized and protocol based

technique.

When laparoscopic surgery was being extended to colorectal malignancies, it was believed the benefits that it had shown in other surgeries would be reflected in colorectal surgeries too. Data on recovery demonstrates the advantages of laparoscopic surgery for colorectal malignancies. Short-term complications, morbidity and mortality were calculated and found to be quite similar between the 2 groups in many trials [1-9]. Most multicentre RCTs showed no significant difference in the rates and severity of postoperative complications, rates of readmission or re-exploration. One trial, the Barcelona trial, did report a significant reduction in postoperative complication in the laparoscopic arm. Several other studies report lower complication rates after LCS, compared to open surgical procedures [16,17].

It has also been established that benefits from laparoscopic surgery still continue in selected high risk patients, with higher ASA grade, morbidly obese patients, and with more advanced age [18-24] . On the other hand, Law et al [25] also emphasize how conversion to open surgery was associated with poorer outcomes, probably suggesting that patient selection should be very stringent to avoid conversion which we strictly followed in our series also. We consciously did not offer laparoscopic surgery to patients with high BMI and patients with large midline scars in an attempt to avoid conversions, especially when we were on a learning curve. Published literature indicate that a fear of conversions, intra operative complications and a steep learning curve might be the main causes of the limited acceptance of lap colorectal surgeries.

Nevertheless, a larger acceptance of laparoscopy has been registered in the last decade. Bardakcioglu et al[10] analyzed data from the Nationwide In patient Sample (NIS) and showed how laparoscopic colorectal surgeries have increased from 5% in 2004 to 31.4% in 2009. Many surgeons admit that lack of structured training, standardized operative protocols and shortage of operating room time are still to be considered the main causes of reduced implementation of laparoscopic surgeries [26] . In a large multicenter analysis [27] the learning curve ranged from 87 to 152 surgeries. Acting as the camera man for a certain amount of time, may help in shortening the actual learning curve [28,29].

Our morbidity rates and rate of conversions are comparable to those reported in literature. This comes in the background of ours being a low volume centre and that we had a learning curve to overcome. There are no recognized universal tools to establish when a learning curve for laparoscopic colorectal surgeries can be considered completed; we believe that a subjective feeling of ease and confidence during the surgery and a progressive reduction in operative time are indicators of having overcome the learning curve. During this journey, we have maintained a focus on our set protocol based technique, irrespective of who the operative surgeon was, and an accurate oncological resection. The completion of the surgery laparoscopically is important but performing a correct oncological resection is even more imperative; an inappropriate oncological resection is not justifiable even in a learning curve setting and oncological outcomes should not be compromised [30].

A major contribution to our results has been the emphasis on good perioperative care of our patients. We laid emphasis on pre-operative built up of the patients including nutrition and chest physiotherapy during the time they were worked up for surgery and a fast track protocol postoperative period. Our results are comparable to those already demonstrated by previous studies. A strict patient selection, proper preoperative preparation and protocol based approach can be the key factor to overcome the learning curve and our experience of laparoscopic colorectal surgeries' outcome at armed forces hospital is almost same, both, in terms of patient safety as well as oncological safety.

CONCLUSION

LCS for colorectal malignancies is feasible and safe at a low volume centre and a reasonable outcome can be achieved even in a learning curve situation. The key to this is the implementation of stringent criteria of patient selection, standardized preoperative workup and set protocol based surgical technique.

REFERENCES

[1] Lacy AM, Garcia-Valdecasas JC, Delgado S, et al. Laparoscopy-assisted colectomy versus open colectomy for treatment of non-metastatic colon cancer: a randomised trial. Lancet 2002;359(9325):2224-9

[2] Lacy AM, Delgado S, Castells A, et al. The long-term results of a randomized clinical trial of laparoscopy-assisted versus open surgery for colon cancer. Ann Surg
2008;248(1):1- 7.

[3] A comparison of laparoscopically assisted and open colectomy for colon cancer. N Engl J Med 2004;350(20):2050-9.

[4] Fleshman J, Sargent DJ, Green E, et al. Laparoscopic colectomy for cancer is not inferior to open surgery based on 5-year data from the COST study group trial. Ann Surg 2007;246(4):654-5.

[5] Veldkamp R, Kuhry E, Hop WC, et al. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. Lancet Oncol 2005;6(7):477-84.

[6] Buunen M, Veldkamp R, Hop WC, et al. Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. Lancet Oncol 2009;10(1):44-52.

[7] Guillou PJ, Quirke P, Thorpe H, et al. Short-term endpoints of conventional versus laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLASICC trial): multicentre, randomised controlled trial. Lancet 2005;365(9472):1718e26.

[8] Jayne DG, Guillou PJ, Thorpe H, et al. Randomized trial of laparoscopic-assisted resection of colorectal carcinoma: 3-year results of the UK MRC CLASICC trial Group. J Clin Oncol 2007;25(21):3061-8.

[9] Luglio G, Nelson H. Laparoscopy for colon cancer: state of the art. Surg. Oncol.Clin N Am 2010;19(4):777-91.

[10] Bardakcioglu O, Khan A, Aldridge C, Chen J. Growth of laparoscopic colectomy in the United States: analysis of regional and socioeconomic factors over time. Ann Surg 2013;258(2):270-4.

[11] Schwab KE, Dowson HM, Van Dellen J, Marks CG, Rockall TA. The uptake of laparoscopic colorectal surgery in Great Britain and Ireland: a questionnaire survey of consultant members of the ACPGBI. Colorectal Dis 2009;11(3): 318-22.

[12] West NP, Hohenberger W, Weber K, Perrakis A, Finan PJ, Quirke P. Complete mesocolic excision with central vascular ligation produces an

oncologically superior specimen compared with standard surgery for carcinoma of the colon. J Clin Oncol 2010;28(2):272-8.

[13] West NP, Sutton KM, Ingeholm P, Hagemann-Madsen RH, Hohenberger W, Quirke P. Improving the quality of colon cancer surgery through a surgical education program. Dis Colon Rectum 2010;53(12):1594-603.

[14] Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a
new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240(2):205-13.

[15] Clavien PA, Barkun J, de Oliveira ML, et al. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg 2009;250(2):187-96.

[16] Bilimoria KY, Bentrem DJ, Merkow RP, et al. Laparoscopic-assisted vs. Open colectomy for cancer: comparison of short-term outcomes from 121 hospitals. J Gastrointest Surg 2008;12(11):2001-9.

[17] Tjandra JJ, Chan MK. Systematic review on the short-term outcome of laparoscopic
resection for colon and rectosigmoid cancer. Colorectal Dis 2006;8(5):375-88.

[18] Hemandas AK, Abdelrahman T, Flashman KG, et al. Laparoscopic colorectal surgery produces better outcomes for high risk cancer patients compared to open surgery. Ann Surg 2010;252(1):84-9.

[19] Da Luz Moreira A, Kiran RP, Kirat HT, et al. Laparoscopic versus open colectomy for patients with American Society of Anesthesiology (ASA) classifications 3 and 4: the minimally invasive approach is associated with significantly quicker recovery and reduced costs. Surg Endosc 2010;24(6): 1280-6.

[20] Stocchi L, Nelson H, Young-Fadok TM, Larson DR, Ilstrup DM. Safety and advantages
of laparoscopic vs. open colectomy in the elderly: matched-control study. Dis Colon Rectum 2000;43(3):326-32.

[21] Chautard J, Alves A, Zalinski S, Bretagnol F, Valleur P, Panis Y. Laparoscopic
colorectal surgery in elderly patients: a matched case-control study in 178 patients. J Am Coll Surg 2008;206(2):255-60.

[22] Frasson M, Braga M, Vignali A, Zuliani W, Di Carlo V. Benefits of laparoscopic
colorectal resection are more pronounced in elderly patients. Dis Colon Rectum 2008;51(3):296-300.

[23] Cheung HY, Chung CC, Fung JT, Wong JC, Yau KK, Li MK. Laparoscopic resection
for colorectal cancer in octogenarians: results in a decade. Dis Colon Rectum 2007;50(11):1905-10.

[24] Lian L, Kalady M, Geisler D, Kiran RP. Laparoscopic colectomy is safe and leads
to a significantly shorter hospital stay for octogenarians. Surg Endosc 2010;24(8):2039-43.

[25] Law WL, Lam CM, Lee YM. Evaluation of outcome of laparoscopic colorectal resection with POSSUM, Portsmouth POSSUM and colorectal POSSUM. Br J Surg 2006;93(1):94-9.

[26] Moloo H, Haggar F, Martel G, et al. The adoption of laparoscopic colorectal surgery: a national survey of general surgeons. Can J Surg 2009;52(6): 455-62.

[27] Miskovic D, Ni M, Wyles SM, Tekkis P, Hanna GB. Learning curve and case selection in laparoscopic colorectal surgery: systematic review and international multicenter analysis of 4852 cases. Dis Colon Rectum 2012;55(12): 1300-10.

[28] Mackenzie H, Miskovic D, Ni M, et al. Clinical and educational proficiency gain of supervised laparoscopic colorectal surgical trainees. Surg Endosc 2013;27(8):2704-11.

[29] Hemandas A, Flashman KG, Farrow J, O'Leary DP, Parvaiz A. Modular training
in laparoscopic colorectal surgery maximizes training opportunities without clinical compromise. World J Surg 2011;35(2):409-14.

[30] West NP, Kennedy RH, Magro T, et al. Morphometric analysis and lymph node yield in laparoscopic complete mesocolic excision performed by supervised trainees. Br J Surg 2014;101(11):1460-7.

Table-1- Demographic Profile

Procedures Performed	Number of Patients	Male (%)	Female (%)	Age(Yrs),mean	BMI(Kg/m^2), mean
Total Surgeries	92	51(55.5%)	41(44.5%)	57.2	25.8
Rt Hemicolectomy	31	18(58.06%)	13(41.9%)	61.1	26.2
Lt Hemicolectomy	5	3(60%)	2(40%)	58.2	26.1
Sigmoid Colectomy	09	4(44.5%)	5(55.5%)	57.6	24.2
Anterior Resection	13	8(61.5%)	5(38.4%)	61	26.2
LAR	17	7(41.1%)	10(58.8%)	62.9	24
APR	11	7(63.6%)	4(36.3%)	59	25.5
Total Proctocolectomy + IPAA	6	4(66.6%)	2(33.3%)	46	21.5

Table 2- Diagnosis/Surgery/HPE

Diagnosis	Patients Number (N)	Procedure Performed	Stage(N)
Rt Colon Cancer	31	Rt Hemicolectomy	pT4N2(9) pT4N1(7) pT3N1(7) pT3N0(5) pT2N0(3)
Lt Colon Cancer	5	Lt Hemicolectomy	pT4N1(2) pT3N1(1) pT3N0(1) pT2N0(1)
CA Sigmoid	09	Sigmoid Colectomy	pT4N2(2) pT4N1(3) pT3N1(2) pT3N0(1) pT2N0(1)
CA Rectum(Upper 1/3)+ Rectosigmoid Jn	13	Anterior Resection	pT4N2(3) pT4N1(1) pT3N1(5) pT2N0(4)
CA Rectum(Middle 1/3)	17	LAR	ypT4N2(5) ypT4N1(6) ypT3N1(2) ypT3N0(1) ypT0N0(3)
CA Rectum(Lower 1/3)	11	APR	ypT4N2(2) ypT4N1(3) ypT3N1(3) ypT3N0(1) ypT0N0(2)
Ulcerative Colitis	5	Total Proctocolectomy + IPAA	pT4N1(1) pT3N1(1) No CA (3)
FAP	1	Total Proctocolectomy + IPAA	-

Table 3- Operative Data

Procedure Performed	Operative Time(min),mean	Number of nodes,mean	Conversion	Reason of conversion	Mortality
Rt Hemicolectomy	165	18.5	3	**Bulky Tumor**	
Lt Hemicolectomy	250	15.5	-		
Sigmoid Colectomy	210	16.5	1	**Bleed from IMA Pedicle**	
Anterior Resection	220	17.5	-		
LAR	290	16.0	2	**Bulky Tumor**	**1**
APR	185	15.5	2	**Bleed**	**1**
Total Proctocolectomy + IPAA	420	31.5			
Over	250	18.2	8		**2**

Table 4 - 30-Days morbidity & mortality-ClavienDindoe scoring system.

ClavienDindoe classification **Definition**	**Number of patients (%)**
Grade I - Any variation from postoperative course without the need for change of pharmacologic treatment or endoscopic, radiologic or surgical interventions	**15 (16.3%)**
Grade II- Requiring pharmacologic treatment with drugs. Blood transfusions or requirement of total parenteral nutrition.	**7 (7.6%)**
Grade III - Requiring endoscopic or radiologic or surgical intervention	**5 (5.4%)**
Grade IV - Life-threatening complication (includes CNS complications) requiring ICU care	**2 (2.17%)**
Grade V - Death of the patient	**2 (2.17%)**
Overall	**31 (33.62%)**