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Uptake of Laparoscopic Colorectal Cancer Surgery at Regional Cancer Centre, South India

Oncology

KEYWORDS: Colorectal cancer; surgery; laparoscopic

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ABSTRACT

Introduction

The uptake of laparoscopy in colorectal cancer (CRC) surgery has been gradual and incomplete. Over the last 10 years, the use of laparoscopic approach has been encouraged over open colorectal surgery by the results of various randomized trials which demonstrated equivalent outcomes in terms of disease free survival and overall survival. However, in spite of evidence favouring laparoscopic resection for colonic surgery the uptake of the approach has been slow.

Material and methods

This is a single institution based retrospective analysis of treatment records of patients registered at our institute between January 2004 and December 2013. There were 2357 patients of CRC registered at our institute in this period. Out of these 1116 patients underwent definite surgery. We compared the surgical details and pathology records of patient undergoing definitive surgery, and compared the outcomes of open and laparoscopic approaches.

Results

Elective surgery was performed for 1116 cases of CRC, 712 (64%) rectal cases and 404(36%) colon cancer cases. Mean age of male and female patients were 50.3 years (± 14.61) and 49.4 years (±13.76) respectively. Out of 712 rectal cases, 70 (10%) were treated laparoscopically while 642 underwent open surgery. The laparoscopic rectal cancer surgery rose from 3.6% in 2005 to 26.6% in 2013. The conversion rates declined from 57.1% in 2009 to 11.8% in 2013. Out of 404 patients of colonic cancer, 8 (1.98%) patients underwent laparoscopic surgery over these years. The performance of laparoscopic colon cancer surgery saw a rise from 2.17% in 2010 to 14.3% in 2013.

Conclusion: Lapaproscopic surgery is being gradually taken-up as an approach for CRC in the regional cancer centre. The reason for gradual increase could be due to predominance of rectal cancer over colonic cancers in India. The evidence in support of laparoscopic surgery for rectal cancer from recent randomised trials may boost the uptake of laparoscopy.

INTRODUCTION

Laparoscopic approach is an example of surgical innovation, which has revolutionized the surgery in the past few decades. Laparoscopic cholecystectomy was adopted quickly worldwide, in the early 1990s over a short 3-year period, to achieve significant advantages in recovery[1]. In contrast, the uptake of laparoscopy in colorectal cancer (CRC) surgery has been gradual and incomplete. The first laparoscopically- assisted colectomy was reported by Jacobs et al, in 1991.[2] The driver of laparoscopic colorectal surgery in the setting of cancer was clearly the possibility of gaining patient benefits. A large number of controlled studies and meta-analyses have shown that laparoscopic colorectal surgery is associated with lesser pain, earlier recovery of bowel transit and shorter hospital stay as compared to open surgery.[2] However, the initial concerns regarding the oncologic adequacy of tumor resection, local recurrence rate and long -term survival influenced its slow uptake in CRC surgery.[3] Over the last 10 years, the use of laparoscopic approach has been encouraged over open colorectal surgery by the results of various randomized trials which demonstrated equivalent patient outcomes in terms of recurrence and survival.[2] Following these publications, the Society of American gastrointestinal and endoscopic surgeons (SAGES) and the American society of colon and rectal surgeons (ASCRS) endorsed the laparoscopic surgery for both, colon and rectal cancers but NCCN still recommend laparoscopy for colon cases but in the trial only for rectal cancers. NICE updated its guidance on August 2006, to recommend laparoscopic (including laparoscopically assisted) resection as a potential alternative to open resection for individuals with colorectal cancer when performed by appropriately trained surgeons who are treating enough cases to maintain competence (8).[4]

Despite the proven benefits and revised guidelines, laparoscopic procedure in CRC treatment is still underutilized. The study from Schwab et al shows that only one quarter of all the procedures are being undertaken laparoscopically by consultant colorectal surgeons in Great Britain.[5] The reasons behind the slow progress of implementation of this technique are the steep learning curve and the lack of training.[5] Also the lack of availability of optimal equipment limited its early adoption.

Our institution is a tertiary centre for comprehensive cancer care located in south India. In 2003, we established dedicated laparoscopic operation theatre with standard equipment and hence started laparoscopic intervention in cancer treatment. First laparoscopic surgery for CRC done at our institute was abdominoperineal resection for rectal cancer in 2004. This study is initiated to assess the uptake of laparoscopic CRC surgery at our institute and to compare the short term outcomes of laparoscopic CRC surgery with open surgery.

MATERIAL AND METHODS

We searched the treatment records of patients registered at our institute between 2004 to 2013 in our hospital registry. The database is maintained by our department of statistics and epidemiology which uses international classification of diseases, tenth edition(ICD-10) codes. We looked for disease codes C18 which included C18.1(colon), C19.9(rectosigmoid) and C20.9(rectum), and found 2357 patients of CRC registered at our hospital during the

study period. Further, we restricted our data extraction to patients who had an elective surgical resection at our institute which included 1116 patients. The data had information about the date of admission and discharge, gender, age, site of disease, staging investigation reports, year of surgical treatment, type of surgical procedure and post-operative follow up notes documenting the recovery of the patient and any eventful incident if happened to daily basis. We searched the operation theatre records to know the approach for the procedure- open or laparoscopic and to access the details regarding duration of surgery and pathology records for histology. Any lesion which was within 15cm of anal verge by colonoscopy or sigmoidoscopy was considered as rectal and above that was taken as colonic mass. Since rectosigmoid lesions involve at least anterior resection as a surgical procedure, we included them under rectal cases for analysis. WHO classification was used to classify CRC into histological subtypes. The circumferential resection margin was taken as free if greater than 2 mm.

Statistical evaluation was done using epiinfo 7 software. The P value of < 0.05 was taken as significant.

RESULTS

There were 2357 cases of CRC registered in our institute between 2004 to 2013, out of which 1116 (47.3%) underwent elective definitive surgery. The male patients were 636 and females were 480 in the ratio of 3:2. Mean age of male and female patients were 50.3 years (± 14.61) and 49.4years (±13.76) respectively. The disease was more common in the 5th decade in males while it was in 4th decade in females (Figure 1).

Out of 1116, there were 712 (64%) rectal cases and 404(36%) colon cancer cases. Rectal cancers were consistently more common among study population and the trend remained the same throughout the study period (figure 2). The prevalence of rectal cancer is 1.76 times more compared to colonic cancer in our study population. The most common site among colon cancer cases were caecum 174(15%), ascending colon (9%) and sigmoid colon(6%).Out of 712 rectal cases, 70(9.8%) were treated laparoscopically while 642 underwent open surgery (Table 1). Only 8 (1.98%) were treated laparoscopically and remaining 396 underwent open approach out of total 404 cases of colon cancers (table 2). For the years 2004 to 2013, the annual rate of laparoscopic surgery rose from 0 to 26.6% for rectal cancer and from 0 to 14.3% for colon cancer (table 1). Laparoscopic procedures were converted to open surgery in 18(26%) of 70 patients with rectal cancer where as there was no conversion in colon cancer cases. The reasons for conversions were narrow pelvis(2),extensive adhesions(6),fixation of tumor(4),anatomical difficulties(2),bleeding(3) and ureter injury(1).The most common histology was adenocarcinoma(82%) followed by mucinous (14%) and signet cell carcinoma (4%). The conversion rate declined from 57.1% in 2009 to 11.8% in 2013 (table 1).

The mean duration of laparoscopic surgery was 213.4(120-360) minutes compared with 134.3(75-300) min for open surgery(p<0.001) (Table 3). The number of patients who required blood transfusion was 512(49.3%) in the open surgery group compared to 28(35.8%) of patients in the laparoscopic group(p<0.001). Median hospital stay after laparoscopic surgery was 8(6-10) days, 1 day shorter than after open surgery(p=0.02). The median hospital stay after the procedure got converted to open surgery, however, was more being 13(10-18) days. The proportion of patients who needed readmission within 30 days after surgery was similar in two groups, 4(5%) in laparoscopic group and 52(5%) in the open surgery group. The reasons for readmission in laparoscopic vs open surgery group were burst abdomen (0 vs 15), revision of ileostomies or colostomies(1 vs 5),anastomotic leak(2 vs 32) and pneumonia(1 vs 0).The CRM was positive in 64(11.7%) patients in open surgery group and 8(10.3%) patients in laparoscopy group(p=0.03). The difference in mean number of lymph node harvested was not statistically significant , 10.32(1-20) and 9.28(1-17) in open and laparoscopic surgery group respectively.

DISSCUSSION

CRC has the lower incidence in India compared to the western world and other countries in South East Asia. However, it has seen a steady increase in numbers with the increasing urbanization of India. The rates of laparoscopy surgery increased from zero to 26.6% in rectal cancer cases and from zero to 14.3% in colon cases during our study period, however, increase has been gradual when compared to other eastern countries. In a Korean nationwide study done by Park SJ, et al, the proportion of laparoscopy for rectal cancer increased from 42.6% in 2008 to 64.7% in 2013 and for colon cancer, this increase was from 41% to 65.3%.[6] In a similar study, Thompson BS, et al reported the increment in laparoscopic usage from 1.1% in 2000-01 to 21.5% in 2007-08 for rectal cancer and from 2.4% to 27.5% of colon cancer during the same period in Australia, which is comparable to our study.[7] The relatively high resource and training demands of providing colorectal cancer procedures laparoscopically might be a factor influencing its uptake. It is a very complex procedure requiring mobilisation of a bulky structure, access to more than one quadrant of the abdomen, control of multiple large blood vessels, extraction of a large specimen and successful creation of an anastomosis. Because of its long learning curve, one of the limiting factors for the implementation of this procedure is the number of surgeons capable of performing a laparoscopic colorectal surgery, rather than the characteristics of the tumor or the patient.[8] In Korea, the Korean Society of Coloproctology and the Korean Society of Endoscopic & Laparoscopic Surgeons started laparoscopic education among university and specialized hospitals in early 2000s, leading to increased laparoscopic rates in colorectal surgeries which is evident in their nationwide data showing that the number of laparoscopic procedures are more than the open ones in CRC cases.[6] Similar training courses were also started early in Europe and North America.[9] In India, the structured and recognised training courses started late by a few years and are limited only to few centres leading to less number of confident laparoscopic colorectal surgeons. Also the spread of laparoscopy is attributed to ease of access to infrastructure and standard equipment. The better dissecting instruments like Harmonic or Ligasure, high definition video-endoscopy cameras and endoscopic stapling devices has encouraged surgeons to perform laparoscopy procedure particularly for resections within the pelvis. The maximum number of patients are treated in government hospitals in our country and our institution is one among them where the government policies and funding often delays the required infrastructure set-up. Though we established our dedicated laparoscopic OT late by at least five years compared to others, proportion of our laparoscopic procedures have been rising steadily since then.

Also to note is that utilisation of laparoscopy is nearly equal in rectal and colon cases in both the Korean and Australian study, whereas our laparoscopy rate in rectal cancer(26.6%) is nearly double of that in colon cases(14.3%) in 2013. This could be due to the higher incidence of rectal cancer in the study population. Unlike the western countries where colonic cancer is more common compared to rectal, in India, rectal cancer incidence is nearly double that of colonic cancer.[8,9] This could be the reason for the comfort of surgeons to start their laparoscopic surgical career with rectal cancer.

The oncologic safety of the procedure and outcomes were certainly perceived as the main issue of concern in the early stage of laparoscopic CRC surgery. The port-site metastasis was another factor that influenced its uptake. The largest number of metastases in the abdominal wall, and in particular into laparoscopic ports, described in some of the first series of laparoscopic surgery published in the 1990s caused widespread concern regarding the indication of minimally invasive techniques in the treatment of gastrointestinal tumours.[10]The etiology of port site recurrence was investigated in several experimental studies, proposing the manoeuvres like avoiding of manipulation of the tumor, the use of povidone iodine solution, empty the CO2 through the trocars, using a device to protect wall incision and removal of specimen in a bag to reduce port-site implantation of tumor cells.[11,12] However,

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despite this initial concern regarding the oncological safety of the laparoscopic approach, well designed prospective randomised multicentre trials for colonic have demonstrated no differences in the incidence of metastasis in the surgical wound as well as in oncological outcomes when the laparoscopic approach was compared to open surgery.[13]

The median duration of our laparoscopic surgery was 213 min(120-360) and for open surgery was 134min (75-300) which was similar to 240min(184-300) and 188min(150-240) respectively in COLOR II trial.[14] It is possible that as surgeons become more experienced with laparoscopic techniques, operating time will reduce to that of open surgery. It was presumed that a shorter incision would result in a shorter hospital stay and early post-operative recovery, our post-laparoscopy stay was one day less compared to open procedure as it was in the CLASSIC, COLOR II and COREAN trial.[14-16] In the conversion cases, the median stay was 3 days more compared to open cases and in CLASSIC trial it was more by 3 days.[15] This emphasizes the need of careful selection of patients to avoid conversion which is associated with poor outcomes as reported by Law et al.[17] High unplanned intraoperative conversions from laparoscopic to open surgery rates of 30% and higher were reported in earlier studies which questioned the feasibility of the procedure in patients with rectal cancer. The CLASSIC study has reported the conversion rate of 30%, which is much higher than in COLOR II trial (16%) and COREAN trial (1.2%).[14-16] The CLASSIC study was one of the first trials comparing laparoscopic-assisted surgery with conventional open surgery and the lack of experience in laparoscopic anterior resection in the early years of the study had a significant influence on the reported conversion rate. This could explain the conversion rate of 26% in our study also which has decreased from 57% in our early days in 2009 to 11.8% in 2013.

The trials of laparoscopic rectal cancer surgery came much later than those of colonic cancer surgery. This delay also could be responsible for slow uptake of laparoscopy at our centre. The radicality of laparoscopic resection was assessed by pathology report on the basis of CRM status and the number lymph nodes retrieved. CLASSIC trial noted positive CRMs in 12% of patients after laparoscopic anterior resection for cancer whereas only 6% of patients after open surgery had positive margins. While in case of abdomino-perineal resection it was reversed, 26% CRM positivity in open but only in 20% of laparoscopic cases.[15] Again, it can be attributed to the inexperience of dissecting into narrow pelvis on the part of surgeons at that time. Recently published COREAN trial reported much improved rate of negative lateral margins in more than 95% of patients with cancer in the middle and lower portions of the rectum that had either open or laparoscopic surgery after preoperative chemo radiotherapy.[16] However, these studies have used a distance of less than 1 mm from the edge of the specimen in judging CRMs as positive. We used distance of 2mm or more as cut-off for differentiating clear CRM from positive one because Nagtegaal et al concluded that tumour growth between 1 mm and 2 mm from the CRM was as relevant as within 1 mm from the CRM based on a 16% risk of a local recurrence at 2 years after surgery in patients with margins smaller than 2 mm whereas patients with margins greater than 2 mm had a 5·8% risk.[14,15] COLOR II trial resulted in radial free margins in 90% of patients in both groups using same 2mm criteria. In our study also, clear CRM in laparoscopic and open group was 90% and 88% respectively(p=0.03). The number of lymph nodes retrieved might be considered as a surrogate marker of proper oncologic resection. The median number of lymph nodes harvested was 9.28(1-17) after laparoscopic surgery and was 10.38(1-20) in open surgery(p=0.87). It was not significantly different in the two groups in COLOR II trial also.[14]

The major strength of the study is that this is the first report from India on uptake of laparoscpic cancer surgery and that it is coming from a major training centre in the subcontinent. However, the study does not include a detailed long-term outcome analysis. This study would pave way for policy making and resolve training issues in the country.

Conclusion

This study shows that laparoscopic colo-rectal cancer surgery is gaining acceptance in the region and the numbers are steadily increasing. The feasibility and safety of laparoscopic colo rectal cancer surgery has been proven by trials. Presently there is a necessity for developing policies and guidelines to help in case selection and training in the country.

Figure 1: Age at presentation with CRC

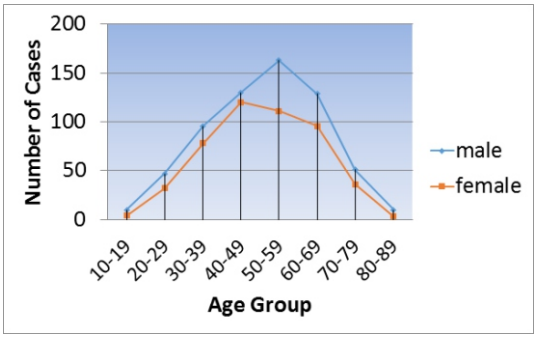

Figure 2: The trend of location of CRC

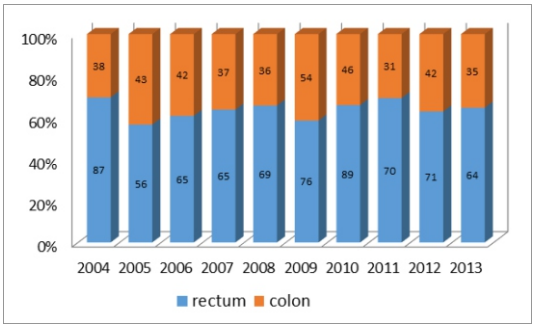

Table 1: Rectal Cancer Surgery

Year	No.	Rectum	Open	Lapro	%	Conversion	%
2004	125	87	87	0	**0.0**	NA	NA
2005	99	56	54	2	**3.6**	NA	NA
2006	107	65	61	4	**6.2**	NA	NA
2007	102	65	63	2	**3.1**	NA	NA
2008	105	69	68	1	**1.4**	NA	NA
2009	130	76	69	7	**9.2**	4	57.1
2010	135	89	75	14	**15.7**	6	42.9
2011	101	70	60	10	**14.3**	4	40.0
2012	113	71	58	13	**18.3**	2	15.4
2013	99	64	47	17	**26.6**	2	11.8
Total	**1116**	**712**	**642**	**70**	**9.8**	**18**	**25.7**

Table 2: Colonic cancer surgery.

YEAR	NO.	COLON	OPEN	LAPRO	%
2004	125	38	38	0	**0**
2005	99	43	43	0	**0**
2006	107	42	42	0	**0**
2007	102	37	37	0	**0**
2008	105	36	36	0	**0**
2009	130	54	54	0	**0**
2010	135	46	45	1	**2.17**
2011	101	31	31	0	**0**
2012	113	42	40	2	**4.76**
2013	99	35	30	5	**14.3**
Total	**1116**	**404**	**396**	**8**	**1.98**

Table 3: A comparison of outcomes of open and laparoscopic

surgery.

Variable		Open Surgery (n=1038)	Laparoscopic surgery (n=78)	p value
Duration of Surgery	Mean	134.3 min	213.4min	<0.001
	Range	75-300	120-360	
Postoperative Hospital Days	Median	9	8	0.02
	Range	7-12days	6-10days	
Blood Transfusion		512 (49.3%)	28 (35.8%)	<0.001
30 day Readmission		52 (5%)	4 (5%)	0.98
CRM (<2mm) (n=625)		64 (11.7%)	8 (10.3%)	0.03
Nodal yield	Mean	10.32	9.28	0.87
	Range	1-20	1-17	

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