Original Research Article

Splenic flexure mobilization in low anterior resection

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ABSTRACT

Background: The use of splenic flexure mobilization (SFM) for rectal cancer surgery is still controversial. SFM includes division of the splenocolic, phrenocolic, gastrocolic and pancreaticomesocolic ligaments, which is time-consuming. The aim of present prospective study of low anterior resection in case of cancer rectum was to compare splenic flexure mobilization (SFM) carried out by an extended medial approach with that by a lateral approach.

Methods: A prospective study was carried out in General Surgery Department, Menoufia University, Egypt between October 2017 and December 2018. Patients were allocated randomly into two groups in which first group (group A) allocated to medial mobilization of splenic flexure and the second group was allocated into lateral approach of splenic flexure. The extended medial involved continuing the medial to lateral approach upwards to enter the lesser sac over the pancreas, thus permitting detachment of the splenic flexure. However, lateral approach involves dissection of retroperitoneal fascia.

Results: Thirty patients, including 20 undergoing a lateral SFM and 10 an extended medial SFM, were evaluated. Mean number of lymph nodes in lateral and medial approach are (17.7±5.6, 24.3±6 respectively) with significant (P-value=0.04). Interestingly, Intra-operative blood loss in lateral approach is more than medial approach (175±25.3, 160.1±30 respectively) with significant (p-value=0.02). The interval to oral intake (3±0.3 days extended medial, 4.1±0.7 lateral, P=0.14).

Conclusions: An extended medial approach for SFM during low anterior resection of rectal cancer appears to be an improvement over the previously used lateral approach because it may provide a shorter operation time and higher number of harvested lymph nodes with less intra-operative blood loss.

Keywords: Lateral approach, Low anterior resection, Splenic flexure mobilization

INTRODUCTION

In the recent 2 decades, improvements have been achieved in the outcomes of rectal cancer surgery with the advances in surgical techniques as well as adjuvant therapy. Abdominoperineal resection, the previous gold standard treatment of rectal cancer, has been regarded as unnecessary in most patients with rectal cancer and more patients can now be treated with sphincter-saving surgery.[1] The increased understanding of the spread of the disease has contributed significantly to this change. Distal mural spread of the disease was shown to be rarely more than 2 cm. The allowance of a close distal margin has led to an increased incidence of sphincter-saving operations.[2] Moreover, safe anastomoses at the distal rectum or the anal canal have been made possible by the advances of mechanical stapling devices and the development of the double stapling technique.[3] Local recurrence has always been a formidable problem following rectal cancer surgery.

Conventional rectal mobilization by blunt dissection has been associated with a high local recurrence rate.[4] The importance of the complete removal of the lymphovascular tissue surrounding the rectum and a free circumferential margin have been recognized in the

management of rectal cancer.[5] By sharp meticulous perimesorectal dissection and total mesorectal excision (TME), Enker et al, have reported low local recurrence rates in patients with rectal cancer.[6]

The use of splenic flexure mobilization (SFM) for colorectal cancer surgery remains controversial.[7] Some surgeons have argued that SFM is not required for every anterior resection because it may be technically demanding and may increase the operation time while providing no advantages with regard to short-term results.[8] Even when experienced surgeons perform SFM, the risk of major morbidity or mortality associated with splenic injury is considerable.[9] Other surgeons advocate the routine use of SFM to ensure a tension-free anastomosis and safe oncological resection.[10] SFM consists of division of the splenocolic, phrenocolic, gastrocolic and pancreaticomesocolic ligaments, which is time-consuming.[11] Two approaches of SFM has been recognized and involves two methods which are extended medial approach and lateral approach, medial approach involves medial to lateral approach upwards to enter the lesser sac over the pancreas, thus permitting detachment of the splenic flexure. However, lateral approach involves dissection of retroperitoneal fascia.[12]

The aim of this prospective study was to compare the perioperative results of an extended medial approach, designed to reduce the operative time of SFM performed during laparoscopic low anterior resection of colorectal cancer with those using a lateral approach.

METHODS

A prospective study was conducted on 30 cases diagnosed with rectal carcinoma. The enrolled participants in the study were all patients presented to Oncology Unit in General Surgery Department, Menoufia University Hospitals, Egypt, spanning the period between October 2017 to December 2018.

All low anterior resections for rectal cancer performed were allocated for involvement in two groups, the first group includes extended medial SFM (10 cases, 33%) and the second group involves lateral approach of SFM (20 cases, 67%). These included 30 patients, with 7 laparoscopic anterior resections and 23 cases performed by open technique.

After allocation of the groups by computer generated randomization, the parameters included age, sex, tumour stage was recorded, tumour size and history of previous abdominal surgery. Perioperative parameters included operation time, volume of blood loss, percentage of patients undergoing perioperative transfusion and open conversion, distal resection margin, number of excised lymph nodes, percentage of patients undergoing reoperation, perioperative complications, time to first flatus, oral intake and duration of hospital stay. The rectal

cancers were grouped into those in the middle (6-10 cm) and upper rectum (11-15 cm).

Endorectal ultrasound and/or pelvic magnetic resonance imaging were used to determine the extent of local tumour spread. Most patients with a locally advanced lower rectal cancer (T3/4 and/or N+), as assessed by preoperative endorectal ultrasound or magnetic resonance imaging received preoperative chemoradiation, with surgery performed 6-8 weeks later. Use of a diverting stoma was left to the surgeon's discretion.

Procedure

Patients were preoperatively prepared with anterograde intestinal cleansing (polyethylene glycol) and oral antibiotics (neomycin and vancomycin). Surgery was done under general anesthesia by staff members. Metronidazole was given intravenously at the time of anesthesia induction and 3 hours later. For laparoscopic colon excision, a pneumoperitoneum with intraabdominal pressure between 10-14 mmHg was maintained throughout the operation. The average length of the incision for colonic extraction was 45 mm for left-sided tumours and 65 mm for right-sided lesions. Manoeuvres to prevent port-site metastasis i.e., non-touch technique with initial vascular ligation, use of a wound edge protector, reduction of intra-abdominal pressure before tumour extraction and extensive cleansing with 5% iodopovidone solution were used routinely. The laparoscopic technique used for primary colorectal cancer has previously been described. Regarding the open technique, lateral approach for SFM was performed after high ligation of the inferior mesenteric vessels. The retroperitoneal dissection was continued over Gerota's fascia to Toldt's fascia and the lower border of the pancreas (Figure 1A).
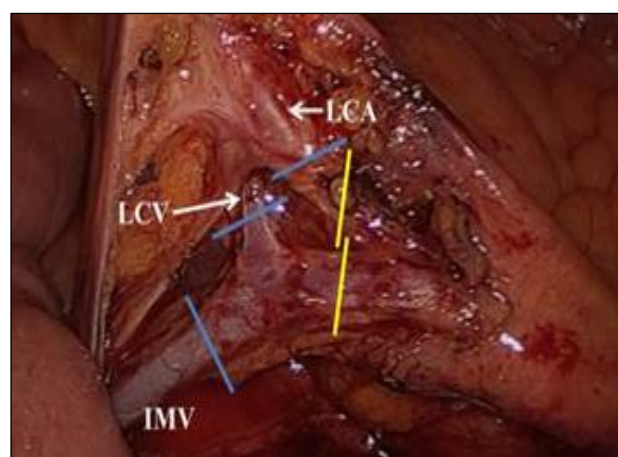

Figure 1A: Intraoperative anatomy during splenic flexure mobilization in low anterior resection.

The phrenicocolic and splenocolic ligaments are divided until the spleen was clearly seen. For the newly developed extended medial to lateral approach, this was

continued until the lesser sac was entered and dissected over the anterior surface of the pancreas to the splenic hilum. The splenic flexure of the colon was then easily mobilized (Figure 1B) and this was continued downwards to the descending and sigmoid colon and to the transverse colon on the right dividing the greater omentum.

Figure 1B: Excised rectum.

Statistical analysis

Quantitative variables were expressed as mean±standard deviation (SD). Categorical variables were expressed as percentages. Differences between the two groups were analysed using the chi-square test, Fisher exact test and student's t-test, as appropriate. A P value <0.05 was considered statistically significant. Regarding qualitative data, author used one-way ANOVA test. Statistical analysis was performed using the statistical package SPSS for Windows (version 21.0, SPSS Inc., Chicago, Illinois, USA).

RESULTS

Present study was carried out on 30 patients with rectal carcinoma and require anterior resection. The patients are divided into two groups group A and group B. Group A are those who undergo medial approach SFM, while group B who undergo lateral approach SFM.

Regarding perioperative complications of patients undergoing lateral and extended medial splenic flexure mobilization, author found more complication in lateral approach than medial approach with insignificant P-value=0.62. Interestingly, ileus and diarrhoea was significantly low in medial approach than lateral approach (zero cases versus 7 cases respectively) with significant p-value=0.02 (Figure 2).

In group A, there were 6 male patients (60%), age mean was 52.9±11.7, 3 patients (30%) had diabetes (Figure 3), 6 patients (60%) had hypertension, tumor size was 4±0.89, tumor site was in the upper site in 6 patients

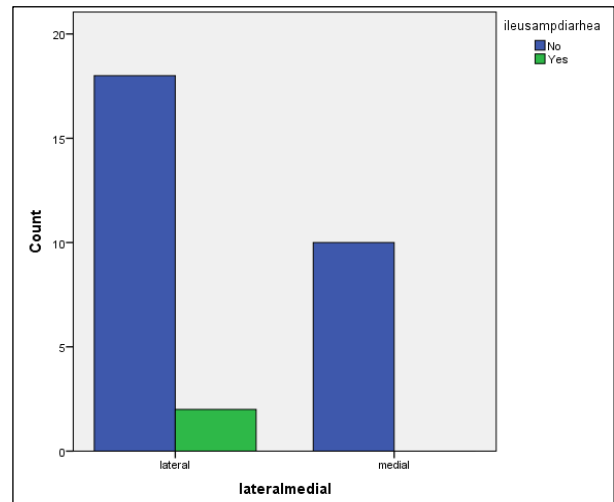(60%) and 6 patients (60%) received neoadjuvant chemotherapy.

Figure 2: Relation of medial/lateral SFM with incidence of ileus and diarhoea.
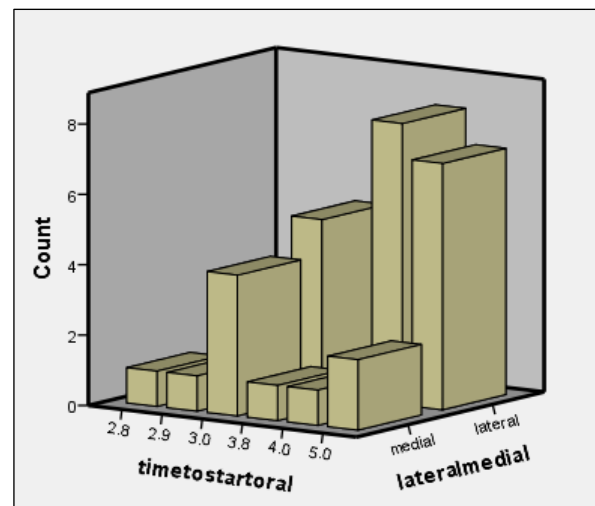

Figure 3: Relation between medial/ lateral SFM and diabetes.

While in group B, 14 patients (70%) were males with age mean 56.2±9.2, diabetes was detected in 5 patients (25%), while hypertension in 4 patients (20%), tumor size was 3.9±1, tumor site was in the upper site in 10 patients (50%) and 8 patients (40%) received neoadjuvant chemotherapy (Table 1).

Interestingly, intraoperative blood loss was significantly more in lateral approach (group B) than medial approach (group A) (175±25.3, 161±30, respectively) with P-value =0.02. Regarding operation time, lateral approach requires more time than medial approach (185±22.1, 175±19.3) with p-value=0.14 (Figure 4).

Regarding perioperative results for patients undergoing lateral and extended medial splenic flexure mobilization,

in group A mean number of harvested lymph nodes were 24.3±6, in comparison to group B mean number of harvested lymph nodes were 17.7±5.6 with significance (P-value=0.04). The time to start oral intake and pass flatus were (3±0.3, 4.1±0.7) for Group A and Group B respectively (Table 2, Figure 5).

Table 1: Patient characteristics between medial and lateral approach.

Characters	Lateral approach (Group B) (n=24)	Medial approach (Group A) (n=6)	P-value
Age	56.2±9.2	52.9±11.7	0.4
Sex			
Male (%)	14 (70%)	6 (60%)	0.44
Female (%)	6 (30%)	4 (40%)	
Tumor site of rectum			
Upper (%)	10 (50%)	4 (40%)	0.45
Middle (%)	10 (50%)	6 (60%)	
Tumor size (cm)	3.9±1	3.5±1	0.23
Diabetes			
Yes (%)	5 (25%)	3 (30%)	0.31
No (%)	15 (75%)	7 (70%)	
HTN			
Yes (%)	4 (20%)	6 (60%)	0.22
No (%)	16 (80%)	4 (40%)	
Neoadjuvant chemotherapy			
Yes (%)	8 (40%)	6 (60%)	0.25
No (%)	12 (60%)	4 (40%)	
T stage 1			0.25
Yes (%)	8 (40%)	2 (20%)	
T stage 2			0.56
Yes (%)	7 (35%)	3 (30%)	
T stage 3	7 (35%)	1 (10%)	0.15

Table 2: Perioperative results and complications for patients undergoing lateral and extended medial splenic flexure mobilization:

| Items	Lateral approach	Medial approach	P-value
No. of lymph nodes	17.7±5.6	24.3±6	0.04
Operation time	185±22.1	175.2±19.3	0.16
Intraoperative blood loss	175.7±25.3	161±30.3	0.02
Time to start oral	4.1±0.7	3.5±0.3	0.14
Safety margin above	10.3±1.5	10.3±1.3	0.53
Safety margin below	4.3±1.3	4.6±1.3	0.7
Complications			
Yes (%)	7 (35%)	4 (40%)	0.54
No (%)	13 (65%)	6 (60%)	
Surgical site infection			
Yes (%)	1 (0.5%)	2 (20%)	0.25
No (%)	19 (99.5%)	8 (80%)	
Ileus, diarrhoea			
Yes (%)	2 (1%)	0	0.04
No (%)	18 (99%)	10 (100%)	
Anastomis leak			
Yes (%)	2 (1%)	3 (30%)	0.19
No (%)	18 (99%)	7 (70%)	
Intraabdominal HGE			
Yes (%)	1 (0.5%)	0	0.67
No (%)	19 (99.5%)	10 (100%)	
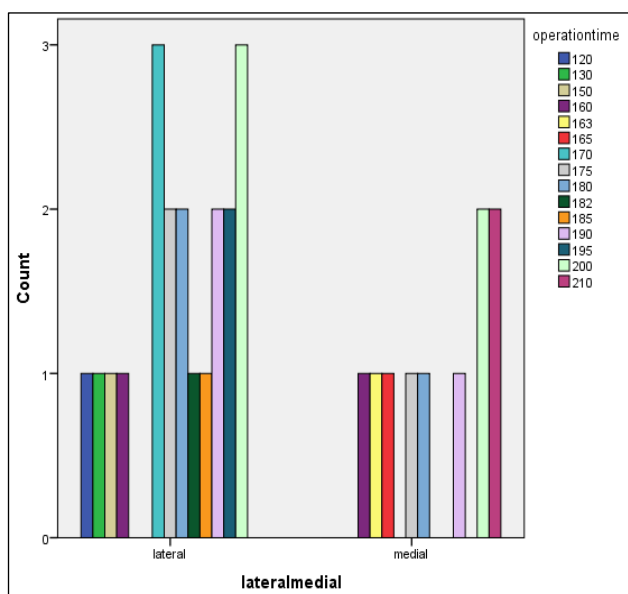
Figure 4: Relation of medial/lateral SFM and operation time.
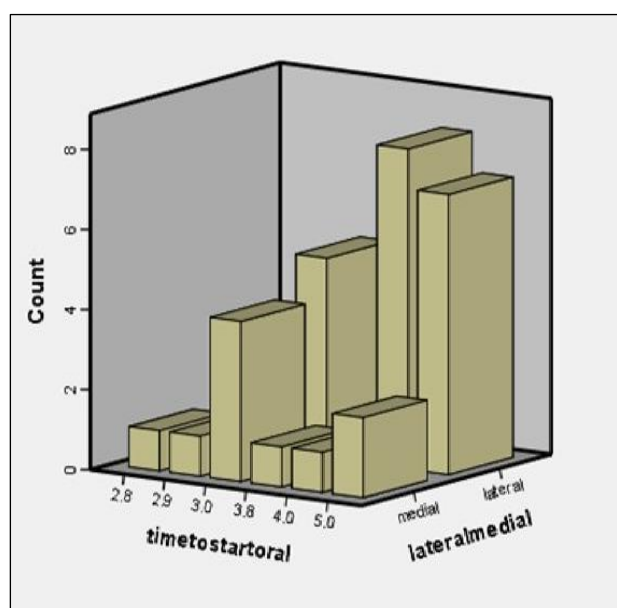

Figure 5: Relation between medial/lateral SFM and time to start oral intake.

DISCUSSION

The advantages of SFM include adequate oncological clearance and a tension-free colorectal anastomosis, especially for anterior resection.[13] It can be technically difficult, however, and may prolong operation time, require extension of the incision during open surgery or the insertion of additional laparoscopy ports and result in splenic injury. The right lateral approach for laparoscopic SFM was recently introduced to ensure a safe, rapid and complete mobilization of the splenic flexure.[14]

Some authors found that open approach takes less time and less intraoperative blood loss with less complication than laparoscopic technique.[15] Some surgeons recommend that SFM should be performed only when there is tension at the anastomosis.[16] While author agree with this recommendation, the policy is that SFM is a routine step during low anterior resection because it requires only 15-20 min more operation time than not performing it. Although a recent case-matched study found that SFM was an independent risk factor for splenic injury during colectomy, author have not observed this complication.[17] In this study, there were 4 patients who had a medial approach SFM-related complication, surgical site infection and anastomosis leak.

During the initial years of performing laparoscopic surgery, surgeons used a lateral SFM approach. However, since 2011 most oncology surgeons have preferred an extended medial to lateral approach.[18] The current study aimed to compare the outcomes of these two approaches with regard to operative factors and complications.

Some surgeons have recommended the lateral approach to SFM for beginners, because it is technically easy.[19] But others have suggested that a medial to lateral approach is preferable. This approach is used to approach the spleen via the pancreas at which point a lateral SFM is performed. To reduce the operative time of this procedure, a new technique of SFM was developed in which mobilization was achieved by continuing the medial approach.

After ligation of the inferior mesenteric vein at the lower border of the pancreas, author then open the lesser sac to separate the gastrocolic and pancreatico-mesocolic attachments from the tail of the pancreas until the splenic hilum is seen. In obese patients, author avoided the dissection until the splenic hilum is seen, to prevent injury to the marginal artery.

The characteristics of the patients, including the proportion having neoadjuvant chemotherapy, were similar and both groups were therefore sufficiently similar to allow comparison of the two approaches. A shorter operation time and low intraoperative blood loss were observed in the group having an extended medial to lateral approach. Author have recently tried to reduce further the hospital stay with a standardized clinical pathway including early oral feeding and ambulation.

Park et al, showed that for low anterior resection the operation time gradually decreased with increasing surgeon experience, even after 100 procedures.[20] However, the learning curve for laparoscopic colorectal surgery has been estimated to range from 30 to 100 cases.

This study has several limitations. Although not statistically significant, the perioperative complication

rate and reoperation rate were higher with the lateral approach group. It is possible that the tendency to decreased operative time and complications later in the study period might be attributed to the additional experience of the surgeon. However, there was no strong evidence to support this theory. Secondly, this was a prospective analysis of a relatively small number of cases.

CONCLUSION

The newly developed extended medial to lateral approach for mobilizing the splenic flexure during laparoscopic or open low anterior resection for rectal cancer appears to be an improvement over the previously used lateral approach because it shortens the operative time without increasing the rate of complications, a greater number of harvested lymph nodes and low rates of intra-operative blood loss.

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