

Original Research Article

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Splenic flexure mobilization is an essential role in laparoscopic low anterior resection!

Mohamed Hamed Elmeligi*, Mohamed Sabry Amar, Mohammed Nazeeh Shaker Nassar

Department of Surgery, Menoufia Faculty of Medicine, Menoufia University Hospitals, Menoufia, Egypt

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***Correspondence:**

Dr. Mohamed Hamed Elmeligi,
E-mail: mhamedsurg@yahoo.com

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ABSTRACT

Background: Routine mobilization of splenic flexure whether partial or complete became an essential step in laparoscopic low anterior resections in order to perform an oncologic resection and to achieve a safe, tension-free anastomosis.

Methods: 60 patients with rectal cancer were operated by laparoscopic low anterior resection with high ligation of inferior mesenteric artery in general surgery department, Menoufia university hospital between February 2016 and January 2019. All patients were divided randomly into 2 equal groups based on the techniques used in splenic flexure mobilization whether partial (group A) or complete (group B).

Results: The majority of our patients were male 56.6% and 60% in both groups respectively with mean age (54.6±8.8) years in group A and mean age (58.5±9.2) years in group B. The operative time was highly significant lower in group A (269±17.6 minutes) than group B (304±22.4 minutes) while the conversion rate was significantly higher in group B (26.6%) than group A (6.6%). Regarding the postoperative data there was only significantly higher leak from the anastomosis in group A (20%) than group B (3.3%).

Conclusions: Complete splenic flexure offer better oncological outcome and low incidence of anastomotic leak but with higher conversion rate, prolonged operative time, more blood loss and more 30 day mortality rate. So it needs more time to gain more experience to overcome these disadvantages.

Keywords: Splenic flexure mobilization, Laparoscopic surgery, Low anterior resection

INTRODUCTION

In Europe, colorectal cancer considered the most common malignancy. Two thirds of all colorectal malignancies are left-sided colorectal cancer. Complete oncologic resection is the standard surgical treatment if possible, with a primary anastomosis.¹

In 1991, Jacobs et al was the first one who describes laparoscopic colonic resection after that Laparoscopic colonic surgery has been employed for the treatment of colon cancer.²

Several studies show that treatment of colorectal cancers can be performed by laparoscope with acceptable outcomes, while other studies show controversy for laparoscopic colorectal cancer surgeries.²

There is debate still exists regarding mobilization of splenic flexure during laparoscopic rectal cancer resection because mobilization of splenic flexure considered difficult step either during conventional or laparoscopic technique as it may require a more operative time, changing the position of the patient, increasing the length of the abdominal incision or insertion of additional ports.³

Low anterior resection for rectal cancer in patients having short sigmoid colon may require mobilization of the splenic flexure to avoid tension on colonic anastomosis.⁴

Routine mobilization of splenic flexure have been advised by some surgeon in order to obtain a anastomosis without tension which obtain a good blood supply from the middle colic vessels, in case of inferior mesenteric artery origin ligation for oncological purposes.^{5,6}

The aim of our study was to demonstrate the role of splenic flexure mobilization in low anterior resection for rectal cancer.

METHODS

This study was a prospective randomized controlled study included 60 patients of rectal cancer who were operated by laparoscopic low anterior resection with high ligation of inferior mesenteric artery in general surgery department, Menoufia university hospital between February 2016 and January 2019. Informed consent has been taken from all patients.

Patients were divided into two groups based on mobilization of splenic flexure (partial or complete): group A included 30 patients who underwent partial mobilization of splenic flexure while group B included 30 patients who underwent complete mobilization of splenic flexure.

Inclusion criteria:

All patients with early rectal cancer included.

Exclusion criteria

Advanced stage, recurrent colorectal cancer, synchronous malignancy in right sided colon, patients with intestinal obstruction, immuno-compromised patients and patients underwent abdominoperineal resection excluded.

All patients were subjected preoperatively to history taking, examinations (general and local) and investigations which include routine labs, CEA, colonoscope to exclude synchronous malignancies and take biopsy from colorectal malignancies for histopathology to confirm diagnosis.

Metastatic work up include chest X ray or CT chest if indicated, CT abdomen and pelvis with contrast (oral and IV).

All patients underwent colonic preparation 3 days before surgery and given low molecular weight heparin + elastic stocking for prophylaxis against DVT. Antibiotic was given at induction of anesthesia.

Surgical technique

A medial-to-lateral approach was followed, and high ligation of inferior mesenteric artery was routinely performed in our practice after ligation of inferior mesenteric artery we dissect cephalically to demonstrate inferior mesenteric vein to be our land mark for splenic mobilization.

The retroperitoneal dissection was continued over Gerota's fascia until Toldt's fascia and the pancreas were seen at the lateral and superior borders of the dissection, respectively. After the dissection of Toldt's fascia and mobilization of the sigmoid and descending colon, the phrenicocolic and splenocolic ligaments were sealed and divided until the body of the spleen was clearly demonstrated (partial mobilization)

The operation was completed via four trocars in the partial mobilization of splenic flexure group, but we preferred to insert an additional trocar between the umbilicus and xiphoid process and moved the camera to this port while performing a complete mobilization of splenic flexure, which was more commonly performed in recent years. In this technique, in addition to dissected ligaments during partial mobilization of splenic flexure, gastrocolic and pancreaticomesocolic attachments were also divided.

Operative time and amount of blood loss were recorded and compared between both groups. Postoperatively, all patients encourage for early mobilization, early feeding and proper pain control.

Follow up (end point)

All patients were followed up inpatient for hospital stay, post-operative complications in the form of surgical site infection, ileus, anastomotic leak, intra-abdominal hemorrhage and reoperation.

Histopathological findings as T stage, resection margin, lymph nodes (LN) removed, length of specimen were compared between both groups.

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 21, SPSS Inc. USA). Data were described using mean and standard deviation (SD) and frequencies according to the type of the data (quantitative or categorical respectively). Chi-square and fisher exact test were used for comparison of qualitative variables. We used one way ANOVA test to compare between means of categorical and numerical data. Significance level (p value) was adopted, i.e. p<0.05 for interpretation of results of tests of significance.

RESULTS

60 patients with early rectal cancer were operated by laparoscopic low anterior resection in general surgery department, Menoufia university hospital during February 2016 to January 2019. All patients were divided randomly to 2 groups based on splenic flexure mobilization where partial or complete.

The majority of our patients were male 56.6% and 60% in both groups respectively with mean age (54.6±8.8) years in group A and mean age (58.5±9.2) years in group

Table 1: Demographics and perioperative data.

Characteristics	Group A partial (n=30)		Group B complete (n=30)		χ^2 value	P value
	Number	Frequency (%)	Number	Frequency (%)		
Gender (male%)	17	56.60	18	60		0.6 NS
Neoadjuvant chemoradiotherapy	18	60	19	63.30	0.071	0.5 NS
Conversion rate	2	6.60	8	26.60	1.66	0.04 S
Age (years)	54.6±8.8		58.5±9.2			0.08 NS
Operative time (minutes)	269±17.6		304±22.4			0.001 HS
Blood loss (mL)	343.5±26.4		373.5±22.3			0.08 NS

HS: highly significant, S: significant, NS: not significant.

Table 2: Postoperative data.

Characteristics	Group A partial (n=30)		Group B complete (n=30)		χ^2 value	P value
	Number	Frequency (%)	Number	Frequency (%)		
Blood transfusion	6	20	8	26.60	0.371	0.3 NS
SSI	3	10.00	5	16.60	0.351	0.3 NS
Ileus	2	6.60	3	10	0.218	0.5 NS
Anastomosis leak	6	20	1	3.30	4.75	0.05 S
Non-surgical	1	3.30	3	10.00	0.351	0.4 NS
Intra-abdominal Hemorrhage	3	10.00	5	16.60	0.351	0.3 NS
Reoperation	1	3.30	3	10.00	0.351	0.4 NS
30 days mortality	1	3.30	3	10.00	0.351	0.4 NS
Length of hospital stay (days)	8.6±2.6		8.3±2.4			0.09 NS

HS: highly significant, S: significant, NS: not significant.

Table 3: Postoperative histopathology.

Characteristics	Group A partial (n=30)		Group B complete (n=30)		χ^2 value	P value
	Number	Frequency (%)	Number	Frequency (%)		
T stage					0.58	0.9 NS
0 (%)	0	0	0	0		
1 (%)	1	3.30	2	6.60		
2 (%)	7	23.30	6	20		
3 (%)	19	63.30	18	60		
4 (%)	3	10	4	13.30		
Positive radial margin	1	3.30	0	0	1.017	0.5 NS
Harvested lymph nodes	17.9±3.5		22.5±4.4			0.01 S
Distal margin (cm)	4.1±1.7		5.9±2.2			0.01 S
Length of the specimen (cm)	25±5.2		26.9±5.2			0.16 NS

HS: highly significant, S: significant, NS: not significant.

B. There was no significant difference regarding age and sex between both groups (Table 1).

The number of patients subjected to neoadjuvant were 18 (60%) and 19 (63.3%) in both groups respectively with no significant difference between both groups (Table 1).

The operative time was highly significant lower in group A (269±17.6 minutes) than group B (304±22.4 minutes) while the conversion rate was significantly higher in group B (26.6%) than group A (6.6%) (Table 1).

Regarding postoperative data there was only significantly higher leak from the anastomosis in group A (20%) than group B (3.3%) (Table 2).



Figure 1: Creation of the optimum avascular plane between the mesentery and tolds fascia.

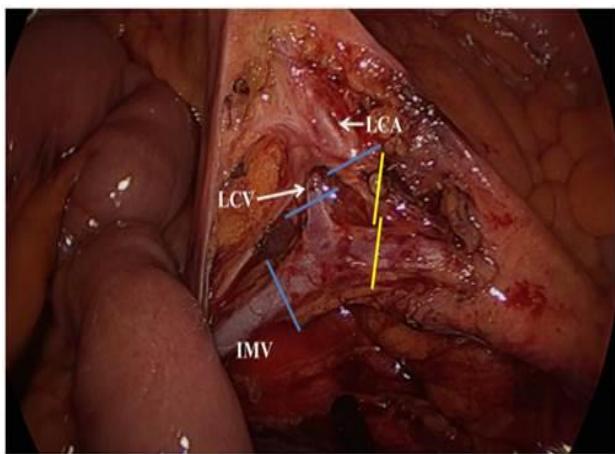


Figure 2: Inferior mesenteric vein is a very important land mark in laparoscopic low anterior resection (IMV).



Figure 3: Dissection of phrenocolic ligament by harmonic scalpel.

Histopathology reveals no significant difference between both groups in T stage and radial margin while there were a significantly higher number of harvested lymph nodes in group B (22.5 ± 4.4) than group A (17.9 ± 3.5). Although the distal margin was significantly longer in group B (5.9 ± 2.2 cm) than group A (4.1 ± 1.7 cm) (Table 3).

DISCUSSION

Routine mobilization of splenic flexure is considered to be an essential part of low anterior resections in order to perform an oncologic resection and to achieve a safe, tension free anastomosis especially with wide use of laparoscope in colonic surgery.⁶⁻¹⁰

A recent review has revealed that mobilization of splenic flexure decrease the anastomotic leak especially in patients underwent low anterior resection for rectal cancer which is agreed to our study as anastomotic leak is significantly higher in partial splenic flexure mobilization than in complete splenic flexure mobilization 20% of patients in partial mobilization but in complete mobilization 3.3% of patients.⁶⁻¹⁰

In contrast, mobilization of splenic flexure is a difficult step; especially complete splenic flexure mobilization may lengthen the operation time, and may be associated with some complications, including extended incision, or additional port insertion and injury of the spleen.^{8,10} This is agreed to our study in which operation time is prolonged in complete splenic flexure mobilization (304 minutes) and show highly significant difference than partial mobilization.

Thus, many advocate that mobilization of splenic flexure may be omitted in most of the patients without worsening the surgical and oncological outcome and not to be a rigid step in laparoscopic low anterior resection.^{4, 10-12}

In contrast to the previous studies, current data disproved an increase in operation time and intraoperative bleeding in patients receiving a complete mobilization of splenic flexure.¹³ This was disagreed with our study in intraoperative bleeding is more in complete mobilization about 373.5 ml than partial mobilization (343.5 ml) with no significant difference.

The major problem is the lack of a precise definition for splenic flexure mobilization, because most analyses did not determine the clear border of the mobilization. The splenic flexure and the transverse colon are fixed to the spleen with the phrenicocolic ligament, which does not always exist but lies as an extension of Toldt's fascia, and with the splenocolic ligament. Dissection of these fascias promotes partial splenic flexure mobilization; however, further dissection through the gastrocolic attachments is required, which are the actual connection between the omentum and transverse colon. In addition, the peritoneum located anterior to the pancreas connects the pancreas and mesocolon. So dissection of pancreatico-

mesocolic attachment through the inferior border of the pancreas result in complete mobilization of splenic flexure and sometimes inferior mesenteric vein ligation may be required at this level.³

Partial splenic flexure mobilization was preferred to be performed via during the initial years of our laparoscopic colorectal surgery practice by dissecting phrenicocolic and splenocolic ligaments; however, recently we have preferred to gastrocolic and pancreatico-mesocolic attachments dissection (complete mobilization of splenic flexure) via an extra port in addition to the previous attachments that have been dissected in partial splenic flexure mobilization.³

In a case-matched study, multivariate analysis reveals splenic injury as a result splenic flexure mobilization.¹⁴ This was disagreed with our study as there is no splenic injury.

The hospital stay length was similar between the groups. However, postoperative outcomes had the paramount significance, and previous studies have revealed that mobilization of splenic flexure does not decrease the rates of complications, or re-operations and 30-day mortality.^{10, 11} Correspondingly, these parameters were more in complete group than partial splenic flexure mobilization without significant difference in our study.

In addition, complete mobilization of splenic flexure does not produce an extended volume of the specimen because there was no difference between the groups regarding the number of harvested lymph nodes, the length of specimen, and distal margin.¹¹ This was disagreed to our study in which harvested lymph nodes were significantly more in complete mobilization (22.5 LN) than partial mobilization in which harvested lymph nodes about were 17.5 LN.

Also distal margin in complete group is 5.9 cm which is significantly longer than partial group which was about 4.1cm while the length of specimens were 25 cm and 26.9 cm in both groups respectively without significant difference.

Finally, our study showed significantly high conversion rate especially in complete mobilization of splenic flexure and this is explained by our early experience in laparoscopic low anterior resection which needs more and more experience to achieve the best results.

CONCLUSION

Splenic flexure mobilization is considered as an essential role in laparoscopic low anterior resection but we should know the difference between partial and complete mobilization to do the optimum technique.

In our study, blood loss and 30 day mortality rate were more in complete splenic flexure mobilization group

without significant difference while the anastomotic leak was significantly higher in partial splenic flexure mobilization group. On the other hand, the lymph node harvested and distal margin were significantly more in complete mobilization group which offers better oncological outcome while the operative time was prolonged in complete mobilization group with highly significant difference than partial mobilization group, also the conversion rate was significantly higher in complete mobilization group. So standardization of complete mobilization of splenic flexure is mandatory in low anterior resection to achieve better outcome but it needs more time to gain more experience to overcome these disadvantages regarding conversion rate, operative time, blood loss and 30 day mortality rate.

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