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The Safety and Efficacy of Selective Splenic Flexure Mobilization in Rectal Cancer Surgery-Experience from a Tertiary Hospital

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Abstract

Introduction: Splenic Flexure Mobilization (SFM) is widely considered to be an essential component of anterior resection of rectal cancer to achieve a tension-free anastomosis. No local studies have compared outcomes with and without SFM in laparoscopic and open colorectal cancer surgery.

Objectives: This study aimed to determine whether routine or selective SFM should be advised.

Method: From a prospective database, all patients who had undergone elective anterior resection for colorectal cancer between 2011-2016 were identified Demographics, operative details, morbidity, mortality and pathology for patients with and without SFM were analysed.

Results: Of the 249 resections, there were no clinicopathologic difference between those who had SFM (n=56) and those who did not (n=193). Mean operative time in SFM group was longer (279 min) *vs*. (230 min) (p=0.034). There was no difference in age, gender, ASA score, length of stay, lymph node yield and conversion rate. No statistical significant difference was found for lymph node harvest (p=0.544), postoperative morbidity (p=0.107), reoperation (p=0.384) and 30-day mortality (p=0.610).

Conclusion: Our results show no morbidity and oncological disadvantage when SFM was avoided. SFM takes longer. A selective approach to SFM is safe during anterior resection.

Keywords: Splenic flexure mobilization; Laparoscopic anterior resection; Open anterior resection; Rectal cancer

Introduction

Colorectal Cancer (CRC) is one of the most common malignancies in the world. According to the GLOBOCAN (Global Cancer Incidence, Mortality and Prevalence) Index, colorectal cancer ranks 3rd and is also the 4th leading cause of cancer-related mortality. There will be 60% increase in cancer burden to more than 2.2 million new cases resulting in 1.1 million mortality by 2030 [1]. Left-sided CRC comprises 50%-60% of all colorectal malignancies. The standard surgical treatment is a complete oncological resection with primary anastomosis [1].

Splenic Flexure Mobilization (SFM) is an essential component of anterior resection or low anterior resection for rectal cancer so as to ensure a safe, well-perfused and tension free anastomosis since sigmoid colon is well-known to be thick-walled, occasionally with diverticulae, poorer blood supply than more proximal colon [2,3]. SFM helps freeing the descending and distal transverse colon from their respective attachments so that the descending or sigmoid colon will reach into the pelvis for a tenson free anastomosis [4]. SFM also permits a longer proximal margin to be taken. Since the bowel end is closer to the feeding bowel vessels, it provides better vascularized proximal bowel for the anastomosis. SFM is believed to lower anastomotic leak rate [4].

However, there exist some controversies regarding the need and indication for SFM, such as the selective criteria, the best moment to perform, the need for additional ports and technical aspects. It is the most demanding part of colorectal surgery with complex technical details. Furthermore, there is a concern that an additional procedure could affect postoperative morbidity [3]. SFM can be technically challenging due to its location high in the left upper quadrant adjacent to spleen and cephalad to the costal margin. SFM can also be challenging especially in obese or tall patients. 0.46%-1.4% patients may even need splenectomy due to traction resulting in splenic capsular tears or bleeding. SFM has also been shown to increase operative time by 10% [5] and associated with longer wound if the operation is done in open manner. Evidence in literature showed no advantage with regard to morbidity, oncological outcomes or survival [2-6]. Establishing a learning curve cannot be easily overcome too [1]. Because of the above reasons, incidence of SFM varies between 25%-60% [4].

Aim

The aim of this study is to determine the early clinical outcome in laparoscopic and open anterior resection and low anterior resection with and without splenic flexure mobilization. Also to determine whether routine or selective splenic flexure mobilization should be advised. There is no local data available in Hong Kong so far.

Patients and Methods

Patient enrollment

It is a retrospective study on a prospectively collected database from Jan 2011-Jan 2016 in United Christian Hospital, Hong Kong. Consecutive patients underwent elective anterior resection and low anterior resection for rectosigmoid and rectal cancer with tumor located within 15 cm from anal verge based on preoperative staging MRI in curative intent were included. Emergency surgery, palliative resection and those with missing data were excluded.

Patients underwent standardized preoperative workup and staging including colonoscopy, chest X-ray, contrast CT and MRI pelvis. Neoadjuvant chemoradiotherapy was given to preoperative clinical or radiological T3/4, N1/2 or tumor with mesorectal fascia involvement. We underwent laparoscopic surgery unless contraindicated. All operations were done by 3 specialist colorectal surgeons.

Data were collected *via* patient registries, hospital records, surgical notes and final pathological reports. Demographics, preoperative morbidity, operative details, postoperative 30-day morbidity and mortality, histopathologic findings with surgical margin, length of hospital stay were included.

Postoperative complications were classified based on Clavien-Dindo classification. Anastomotic leakage was defined clinically as gas or fecal discharge from wound, drain or reoperation. Radiologically by contrast extravasation, air bubbles or anastomotic defect around the anastomosis verified by CT scan with rectal contrast. Tumor staging was performed according to the Union for International Cancer Control-American Joint Committee on Cancer (UICC-AJCC) TNM classification system 7th edition. Length of hospital stay was defined as the time from the day of surgery to hospital discharge. Demographics, operative details, morbidity, mortality and pathology for patients with and without SFM were analysed.

Outcome measures are as follows:

- Operative time
- Conversion rate
- Number of lymph nodes harvested
- Overall morbidity, mortality
- Leakage rate
- Reoperation rate
- Length of stay

Procedure

Anterior resection/low anterior resection were done by 3 colorectal specialists who were accredidated trainers. Operations were done laparoscopically at the start, conversion to open when indicated. Decision for SFM mobilization were made intraoperation depending on the length of bowel for tension-free and well-vascularised anastomosis.

Surgical approach

- The aim is to ensure tension-free anastomosis with good perfusion. In order to lengthen the bowel, we will perform lateral mobilization up to spleen tip, divide the inferior mesenteric vein twice, 1st time near the inferior mesenteric artery, 2nd time at the inferior border pancreas. Left colic artery will also be divided.
- A careful LN dissection was performed up to the level of the origin of IMA. The IMA was ligated distal to the origin of left colic artery. IMV was ligated close to IMA. Lateral mobilization along white line of Toldt up to spleen tip. The sigmoid colon and rectum were mobilised. Left colic artery will be divided to further lengthen the bowel. The rectum was divided 5 cm below the lower margin of tumor (tumor of upper 1/3 only) or at pelvic floor at least 1 cm macroscopic distal tumor clearance (low anterior resection). The proximal colon was divided at mid sigmoid colon with the marginal artery tested. A tension-free anastomosis was performed with circular staplers.
- If mobilization of splenic flexure is required, 3 point mobilization technique will be used. Lateral mobilization along white line of Toldt with splenocolic ligament divided. Medial mobilization with dissection of mesocolon from pancreas and division of gastrocolic ligament and entering of lesser sac will be performed in order to completely mobilise the splenic flexure.

Postoperation management

All patients were taken care of by specialist colorectal nurses according to Enhanced Recovery After Surgery (ERAS) protocol.

Statistics

We use *chi squared* test and student's test for statistical analysis. P<0.05 was defined as statistically significant. Descriptive data were expressed as mean ± Standard Deviation (SD) or Median (minimum-maximum) based on the distribution pattern of the variables. SPSS version 27.0 was used for statistical analysis.

Results

A total of 249 patients were included. 193 with no splenic flexure mobilization whereas 56 with splenic flexure mobilized. Age, Sex, ASA, no of comorbidity, tumor level and neoadjuvant therapy were comparable between the 2 groups. Splenic flexure mobilization group had lower level of tumor from anal verge which was statistically significant **(Table 1)**.

Table 1: Clinical and pathologic characteristics (n=249 (%)).

	No SFM	SFM	P-value
Patient no	193	56	-
Age (yr.)	70	69	0.827
Sex (M/F)	127/66	34/22	0.527
ASA	2	2	0.527
No. of co-morbidity	2	2	0.526
Tumor level (RS/rectum)	90/103	27/29	0.88
Tumor level from AV (cm)	7	4	NS
Neoadjuvant therapy	8/193 (4.1%)	2/56 (3.6%)	1
Note: SF: Splenic Flexure; SFM: Splenic Flexure Mobilisation; ASA: American Society of Anesthesiologists; AV: Anal Verge; RS: Rectosigmoid; NS: No Statistical Difference.			

Both groups had more anterior resection than low anterior resection, low anterior resection with total mesorectal excision and Hartmann’s operation. Splenic flexure mobilization group had 46.4% low anterior resection plus total mesorectal excision **(Table 2).**

Table 2: Type of operation: Ultralow anterior resection+TME (n=249 (%)).

	No SFM (n=193)	SFM (n=56)	P-value
Anterior resection	131/193 (67.9%)	27/56 (48.2%)	NS
Low anterior resection	16/193 (8.3%)	0/56 (0%)	-
Low anterior resection+TME	36/193 (18.7%)	26/56 (46.4%)	-
Hartman's operation	10/193 (5.2%)	3/56 (5.4%)	-
Note: TME: Total Mesorectal Excision.			

Over 80% had laparoscopic surgery. Splenic flexure mobilization group had significantly longer operation time by 49 mins and more stoma formation. This is due to higher percentage of the surgery with LAR and TME and covering ileostomy done in this group. Splenic flexure mobilization group had insignificantly more blood loss, longer hospital stay and conversion rate. There was no intraoperative complication including splenic injury or bleeding, bowel injury in both SFM and non SFM group **(Table 3).**

Table 3: Operation details (n=249 (%)).

	No SFM (n=193)	SFM (n=56)	P-value
Approach (lap/open)	167/26 (86.5%/13.5%)	46/10 (82.1%/17.9%)	0.396
OT time (mins)	230	279	0.034
Blood loss (ml)	90	138	0.222
Conversion	14/193 (7.3%)	5/56 (8.9%)	0.775
Hospital stay (days)	13	17	0.074
Stoma	57/193 (29.5%)	30/56 (53.6%)	0.001
Stoma type (Ileostomy/ colostomy)	39/18	27/3	0.001

Both groups had comparable pathology in terms of differentiation, lymph node mets, lymph node number, dukes staging, T and N staging. Only 1 patient with positive margin in no splenic flexure mobilization group. Splenic flexure mobilization group had an insignificantly longer tumor size, proximal and distal margin **(Table 4).**

Table 4: Pathology details (n=249 (%)).

	No SFM (n=193)	SFM (n=56)	P-value
Differentiation (well/poor)	171/3	50/0	0.681
Lymph node mets	69/193 (35.8%)	22/56 (39.3%)	0.87
Lymph node number	15	17	0.172
T stage (T1/2/3/4)	31/29/106/27	5/8/32/11	0.73
N (N1/2)	47/22	13/8	0.842
Dukes (A/B/C)	34/83/76	6/27/23	0.635
Margin clear	192/193	56/56	0.775
Tumor size (cm)	3.68	3.73	0.521
Proximal margin (cm)	5.76	8.3	0.062
Distal margin (cm)	4	4.68	0.361

In terms of postop morbidity and mortality, 5 from both groups had major complication. In no splenic flexure mobilization group, 2 with anastomotic leakage, 1 with anastomotic bleeding and 2 with stoma complication. All of them required reoperation. In splenic flexure mobilization group, 1 with anastomotic leakage, 2 with anastomotic bleeding, 2 with stoma complication. 3 of them required reoperation. There was no readmission. One 30-day mortality in splenic flexure mobilization group with anastomotic leakage.

There were no clinicopathologic differences between those who had splenic flexure mobilization (n=56) and those who did not (n=193). Mean operative time in the splenic flexure mobilization group was longer, 279 mins *vs.* 230 mins in the non-mobilised group (p=0.034). Lymph node yiels, conversion rate, perioperative complication, postoperative 30-day morbidity (anastomotic leakage) and mortality did not differ significantly between the two groups **(Table 5)**.

Table 5: Post-operation complication and mortality (n=249 (%)).

	No SFM (n=193)	SFM (n=56)	P-value
Post-operation major complication	5/193 (2.6%)	5/56 (8.9%)	0.107
Type of complication	Anastomotic leakage 2/5	Anastomotic leakage 1/5	-
	Anastomotic bleeding 1/5	Anastomotic bleeding 2/5	-
	Stoma complication 2/5	Stoma complication 2/5	-
Reoperation	5/193 (2.6%)	3/56 (5.4%)	0.384
Readmission	0/193	0/56	-
30-D mortality	0/193	1/56 (1.8%)	0.61

Discussion

Routine or selective SFM has always been controversial amongst colorectal surgeons [3]. In an international survey of 368 surgeons who performed laparoscopic rectal resection, 71.2% routinely performed SFM [7].

SFM separates mesocolon from the posterior pancreatic attachment and the Gerota's fascia [8,9]. It allows assessing retroperitoneal structures and medialising the colon for lengthening of colonic conduit to ensure a tension-free anastomosis [10]. Cadaveric study showed that SFM with ligation of IMV at the inferior border of the pancreas provided an additional 18 ± 6.8 cm of colonic conduit whereas only 5 ± 5.5 cm were obtained after high ligation of inferior mesenteric artery without SFM [10]. Two cadaveric studies [11,12] demonstrated the degree to which the use of SFM could lengthen the colon. A study with 20 cadaveric models demonstrated that a mean 28.3 cm mobilized colonic segment was achieved after full mobilization of the distal transverse colon [13]. Another study with 13 cadavers demonstrated that the length of colon gained after high ligation of IMA and IMV and SFM (28.75 ± 5.72 cm) altogether was greater than that after any of the procedures (low IMA ligation with high ligation of IMV and SFM, or low IMV ligation with SFM and high IMV ligation and *etc*.) [12]. From another study, the obtained redundancy of colon by SFM from the sacral promontory, which is a control point in cadaveric studies, was 27.81 ± 7.29 cm [13].

The objective of SFM is to obtain a well-vascularised, tension-free bowel for safe anastomosis. It was found to be an independent risk factor for anastomotic dehiscence in previous study. High ligation of inferior mesenteric artery in order to achieve radical lymph node resection was found to potentially increase the risk of distal colon ischemia [14,15]. SFM can help increase the length of left colon for a better vascularized and tension-free anastomosis [16]. SFM may even become mandatory in patients requiring a colonic pouch.

Surgeons advocate routine SFM based on the reason that there is only small increase of around 10% of the total time and also a relatively low risk of complications like splenic injury. They also advocate that SFM can reduce the incidence of anastomotic leakage for patients undergoing anterior resection or low anterior resection for rectal cancer in previous study. Although there are some risks associated with SFM, the frequency and magnitude of morbidity (postoperative bowel function, permanent stoma rate and oncologic outcome) and mortality from anastomotic complications far outweigh the risks associated with SFM. Mouw et al. reported that SFM enabled adequate lymph node dissection and an adequate distal resection margin [17]. Not only open approach, literature also advised SFM should be performed routinely even in laparoscopic colorectal surgery. Kim et al. [14] reported that SFM is an important factor in the reduction of morbidity associated with anastomotic leakage and suggested that SFM should be used in laparoscopic resection of rectal cancer.

However, the need to SFM during anterior resection of the rectum is still under debate. While most surgeons believe that the SFM is required to obtain a tension-free anastomosis, others believe that this is a time-consuming maneuver, which should only be performed when a well vascularized and tension-free anastomosis cannot be readily obtained [18]. They believe that SFM is a complex part of lap or open colorectal procedures and it has learning curve [3]. They also insist that selective SFM does not increase the risk of anastomotic leak or oncological compromise.

Although performing selective SFM during anterior resection has become standard practice in some centers, there is no objective criteria or scoring system to determine what patients may or may not benefit from SFM [10]. The incidence of SFM reported in the literature also varies widely with some centres reporting performing SFM in only 4% of patients who underwent laparoscopic anterior resection [5]. There are lack of standardisation definition of SFM as well. Some surgeons are doing partial instead of complete SFM [19].

Apart from variation in practice, SFM is also a complex surgical technique with a learning curve. A mail-in survey of 35 experienced laparoscopic colorectal surgeons showed that SFM is one of the hardest procedures to perform [20]. In a systematic review and meta-analysis by Gachabayov et al. laparoscopic SFM was associated with increased rate of surgical site infection and operative time without a clear decrease in anastomotic leakage rate. Literature demonstrated that inferior mesenteric artery ligation decrease blood flow to the anastomosis and thus some surgeons advise SFM. However SFM is also technically challenging with additional 2.5% risk of splenic injury. Incidental splenectomy during colorectal resections was associated with poorer short-term surgical outcomes and also the reduction of survival rates after sigmoid or rectal cancer resection [16,21-24]. Jamali et al. surveyed the surgical approach of 28 experienced laparoscopic colorectal surgeons from USA and Europe. SFM was considered the most difficult step ahead of rectal mobilisation after the degree of complexity of each surgical step was analysed [20]. The main difficulty is the need for protecting the mesenteric artery, retroperitoneal structures and spleen while a need for extensive posterior dissection is required.

A recent meta-analysis showed that SFM had a significantly higher risk of anastomotic dehiscence when compared with those without SFM. Therefore, the decision not to conduct a SFM or avoid this surgical step during laparoscopic or open rectal cancer surgery can be considered a protective factor for anastomotic leak [18].

Another advantage of selective SFM is shorter operative times with no increase in morbidity, anastomotic leakage or local recurrence [25]. Ferrara et al. reported that SFM increased the operative time, the incidence of conversion to open surgery and the complexity of the operation. The authors also noted that SFM had no superiority in terms of postoperative complications and oncological outcomes [26,27]. In a recent systematic review, Nowakowski et al. reported that SFM led to 3.2-fold increase in the operative time and a 3-fold increase in the incidence of anastomotic leakage compared to the patients who did not undergo SFM. A recent meta-analysis [20] also showed no significant differences between the groups in terms of surgical infection and general surgical complications, bleeding and mortality.

In our study, of the 249 resections, there were no clinicopathologic difference between those who had SFM (n=56) and those who did not (n=193). Our study demonstrated that the mean operative time in SFM group was longer (279 min) *vs*. (230 min) (p=0.034). There was no difference in age, gender, ASA score, length of stay, lymph node yield and conversion rate. No statistical significant difference was found for lymph node harvest (p=0.544), postoperative morbidity (p=0.107), reoperation (p=0.384) and 30-day mortality (p=0.610). Therefore selective SFM for rectal cancer surgery is feasible and safe with shorter operative time.

Limitations

For the limitation of this study, since it is a retrospective review, some outcome parameters might not have been properly defined or available for all patients with risk of information bias during extraction of the data. CDARDS is based on the diagnosis and procedural coding, there was risk of unidentified procedures if they were incorrectly coded. In this study we tried to limit the selection bias by only including patients with available data.

It is a non randomized study with a relatively small patient population and thus the external validity of this study is limited. It is difficult to propose generalizable results. A randomized controlled trial with larger sample size is required.

Even though the operations were performed by 3 accreditated colorectal specialist surgeons, performance bias is inevitable due to personal operative techniques and preference.

Conclusion

In conclusion, there was no morbidity and oncological disadvantage in terms of age, gender, ASA score, length of stay, lymph node yield, conversion rate, 30-D morbidity and 30-D mortality when splenic flexure mobilization is avoided. Splenic flexure mobilization takes longer OT time (49 mins longer). A selective approach is safe and careful case selection is important. A randomised controlled trial with larger sample size is warranted.

Conflict of Interest

The author declares no conflict of interest.

References

1. Ke TW, Geniales CR, Chen WTL (2018) The role of splenic flexure mobilisation in laparoscopic rectal surgery for rectal cancer. Mini-invasive Surg 2: 35.
2. Marsden MR, Conti JA, Zeidan S, Flashman KG, Khan JS, et al. (2011) The selective use of splenic flexure mobilisation is safe in both laparoscopic and open anterior resection. Colorectal Dis 14: 1255-1261.
3. Campos FG, Bustamante-Lopez LA, Martinez CA (2021) Laparoscopic splenic flexure mobilisation: Technical aspects, indication criteria and outcomes. Arq Bras Cir Dig 34: e1575.
4. Hsu YJ, Chern YJ, Jhuang JR, Tsai WY, Chiang JM, et al. (2021) Efficient and safe method for splenic flexure mobilization in laparoscopic left hemicolectomy: A propensity score-weighted cohort study. Surg Laparosc Endosc Percutan Tech 31: 196-202.
5. Boyuk A, Aday U, Gültürk B, Bozdağ A, Aksu A, et al. (2019) Effect of splenic flexure mobilisation performed *via* medial-to-lateral and superior-to-inferior approach on early clinical outcomes in elective laparoscopic resection of rectal cancer. Wideochir Inne Tech Maloinwazyjne 14: 509-515.
6. Katory M, Tang CL, Koh WL, Fook-Chong SMC, Loi TT, et al. (2007) A 6-year review of surgical morbidity and oncological outcome after high anterior resection for colorectal malignancy with and without splenic flexure mobilisation. Colorectal Dis 10: 165-169.
7. Cheung YM, Lange MM, Buunen M, Lange JF (2009) Currently technique of laparoscopic Total Mesorectal Excision (TME): An international questionnaire among 368 surgeons. Surg Endosc 23: 2769-2801.
8. Crolla RMPH, Coffey JC, Consten EJC (2022) The mesentery in robot-assisted total mesenteric excision. Clin Colon Rectal Surg 35: 298-305.
9. Dapri G, Bascombe NA, Cadiere GB, Marks JH (2017) The three approaches to the colonic splenic flexure mobilisation-a video vignette. Colorectal Dis 19: 948-949.
10. Meyer J, van der Schelling G, Wijsman J, Ris F, Crolla R (2023) Predictors for selective flexure mobilisation during roboic anterior resection for rectal cancer: A prospective cohort analysis. Surg Endosc 37: 5388-5396.
11. Araujo SEA, Seid VE, Kim NJ, Bertoncini AB, Nahas SC, et al. (2012) Assessing the extent of colon lengthening due to splenic flexure mobilisation techniques: A cadaver study. Arq Gastroenterol 49: 219-222.
12. Thum-Umnuaysuk S, Boonyapibal A, Geng YY, Pattana-Arun J (2012) Lengthening of colon for low rectal anastomosis in a cadaveric study: How much can we gain? Tech Coloproctol 17: 377-381.
13. Kye BH, Kim HJ, Kim HS, Kim JG, Cho HM (2014) How much colonic redundancy could be obtained by splenic flexure mobilisation in laparoscopic anterior or low anterior resection? Int J Med Sci 11: 857-862.
14. Kim CH, Lee SY, Kim HR, Kim YJ (2017) Nomogram prediction of anastomotic leakage and determination of an effective surgical strategy for reducing anastomotic leakage after laparoscopic rectal cancer surgery. Gastroenterol Res Pract 2017: 4510561.

15. Kennedy R, Jenkins I, Finan PJ (2008) Splenic flexure mobilisation for anterior resection performed for sigmoid and rectal cancer. Ann R Coll Surg Engl 90: 638-642.

16. Pettke E, Leigh N, Shah A, Cekic V, Yan X, et al. (2020) Splenic flexure mobilization for sigmoid and low anterior resections in the minimally invasive era: How often and at what cost? Am J Surg 220: 191-196.

17. Mouw TJ, King C, Ashcraft JH, Valentino JD, DiPasco PJ, et al. (2019) Routine splenic flexure mobilisation may increase compliance with pathological quality metrics in patients undergoing low anterior resection. Colorectal Dis 21: 23-29.

18. Damin DC, Betanzo LN, Ziegelmann PK (2019) Splenic flexure mobilisation in sigmoid and rectal cancer resections: A meta-analysis of surgical outcomes. Rev Col Bras Cir 46: e20192171.

19. Gachaboyov M, Bergamaschi R, Boni L, Uranues S, Fingerhut A (2019) Splenic flexure mobilisation in sigmoid and rectal resections: A systematic review and meta-analysis of observational studies. Surg Technol Int 34: 169-182.

20. Jamali FR, Soweid AM, Dimassi H, Bailey C, Leroy J, et al. (2008) Evaluating the degree of difficulty of laparoscopic colorectal surgery. Arch Surg 143: 762-767.

21. Carlson RM, Roberts PL, Hall JF, Marcellio PW, Schoetz DJ, et al. (2014) What are 30-day postoperative outcomes following splenic flexure mobilisation during anterior resection? Tech Coloproctol 18: 257-264.

22. Langevin JM, Rothenberger DA, Goldberg SM (1984) Accidental splenic injury during surgical treatment of the the colon and rectum. Surg Gynaecol Obstet 159: 139-144.

23. Holubar SD, Wang JK, Wolff BG, Nagorney DM, Dozois EJ, et al. (2009) Splenic salvage after intraoperative splenic injury during colectomy. Arch Surg 144: 1040-1050.

24. Tsarkov P, Garmanova T, Zhurkovskiy V, Markaryan D, Sidorova L, et al. (2020) Selective splenic flexure mobilisation for low colorectal anastomosis after D3 lymph node dissection (Speedy) trial: A study protocol. Chin Med J (Engl) 133: 1884-1885.

25. Brennan DJ, Moynagh M, Brannigan AE, Gleeson F, Rowland M, et al. (2007) Routine mobilisation of the splenic flexure is not necessary during anterior resection for rectal cancer. Dis Colon Rectum 50: 302-307.

26. Ferrara F, Di Gioia G, Gentile D, Carrara G, Gobatti D, et al. (2019) Splenic flexure mobilisation in rectal cancer surgery: Do we always need it? Updates Surg 71: 505-513.

27. Nowakowski M, Malczak P, Mizera M, Rubinkiewicz M, Lasek A, et al. (2018) The safety of selective use of splenic flexure mobilisation in sigmoid and rectal resections-systematic review and meta-analysis. J Clin Med 7: 392.