

Original Research Article

Transverse colorectal anastomosis in left-sided colorectal stapled anastomosis and risk of anastomotic leak: a single tertiary centre experience

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ABSTRACT

Background: Extensive left colorectal resection following a high IMA ligation can lead to an anastomosis with tension and a compromised perfusion. The aim of this study is to compare the safety and feasibility of transverse colorectal anastomosis in anastomotic leak (AL) following left-sided colorectal stapled anastomosis with a descending colon/ileo – rectal anastomosis.

Methods: This retrospective study was performed in a prospectively maintained database at a tertiary colorectal surgical institution in Malaysia to evaluate the impact of performing a transverse colon to rectal anastomosis in a group of patients who underwent left-sided colorectal resection followed by stapled anastomosis from 2019 until 2021. This was compared to another cohort comprising of patients who underwent descending colorectal/ileo-rectal anastomosis. Categorical and dichotomous variables were analysed using chi squared test. Results which were considered significant were if $p < 0.05$. The statistical analysis was performed with IBM Statistical package for social sciences (SPSS) statistics for Mac OS, version 25.

Results: In that 3 years, 170 patients were included. 77 (45.3%) underwent transverse colorectal anastomosis. The median age of these patients was 58.5. Both groups of patients who underwent transverse colorectal anastomosis and ileo/colorectal anastomosis was homogenous with no significant difference. Our anastomotic leak rate was 8.8% ($n=15$). 48.8% ($n=83$) successfully completed their resections laparoscopically. And from our analysis, transverse colorectal anastomosis does not significantly affect anastomotic leak rates ($p=0.22$)

Conclusions: In an experienced tertiary health centre, transverse colorectal anastomosis does not impact anastomotic leak rate and has comparable outcomes to descending colon/ ileo-rectal anastomosis.

Keywords: Colorectal surgery, Anastomotic leak, Transverse colon, Descending colon, Inferior mesenteric vessels

INTRODUCTION

Anastomotic leak is defined as a defective join between bowels causing a communication from the intraluminal to the extraluminal space at the anastomotic site. It is one of the most dreaded complication following a colorectal resection with an anastomosis formation. It is associated with a significant rate of morbidity and mortality including possibility of a permanent stoma formation,

prolonged hospitalization, increased financial burden, diminished quality of life and poor oncological outcomes with an increased disease recurrence and a reduced survival rates.¹⁻³ The risk of colorectal anastomotic leak ranges between 5 and 15% despite various improvement to the technique. Some of the causes of anastomotic leaks are due to a poorly vascularized bowel, an anastomosis with a high amount of tension, low rectal anastomosis, and many other causes as described.⁴

Left sided colorectal malignancies requires oncological resection which encompass enbloc removal of the diseased bowel, supplying vasculature as well as its accompanying lymphatics. To achieve this, majority of our cases require a high ligation of the inferior mesenteric vessels. As a result of this, the left colic vessels is sacrificed and the proximal bowel (descending colon or splenic flexure) for anastomosis has to rely on the marginal artery of Drummond, a collateral artery, may not be ideal to perfuse the anastomosis and because of this, it may result in an anastomotic leak.^{5,6} As we are aware, splenic flexure (Griffith's point) has a water-shed area and it is at risk of ischaemia as it depends on the Marginal artery of Drummond which has a very variable blood supply located between the blood supply of Superior Mesenteric Artery (SMA) and Inferior Mesenteric Artery (IMA).⁷ The Arc of Riolo is also at risk of ligature during Inferior Mesenteric vessel ligation as it is situated anterior to the IMV on the inferior border of the pancreas. This vessel is important as it supplies 10% individuals with collateral mesenteric circulation between the SMA and middle and left colic artery.⁸ Hence, damage to the perfusion may lead to a potentially disastrous anastomotic ischemia and leak if an ideal well perfused anastomosis is not sought for.

Apart from the traditional technique of assessing perfusion of the bowel by visualizing its color and bleeding edges; flowgraphy, and fluorescence based videography has been studied. One of the newer techniques is by intraoperative intravenous angiography via indocyanine green fluorescence imaging assessment has been performed lately to assess the perfusion of the bowel. Indocyanine green (ICG) is an anionic, water-soluble, relatively hydrophobic, tricarboxyanine molecule and upon injection intravenously, and when it binds to plasma proteins, it has the ability to enable the perfused bowel to fluoresce at near-infrared light.⁹⁻¹¹ This technique will enable the surgeon to visualise fluorescent green light of a well perfused bowel intra-operatively and perform revision of anastomosis when necessary.

Descending colon to rectal anastomosis has been frequently performed with satisfactory outcomes however the level of transection relies on the marginal vessels and perfusion of the distal portion is occasionally compromised as describe above. Often because of this, further transection of the bowel has to be done to obtain a well perfused bowel for anastomosis. According to the PILLAR 2 study, high ligation was performed in 69% of their cases and 8% of their patients that underwent fluorescence angiography required a surgical revision.¹²

Resources for intraoperative angiography via indocyanine green was not available in our hospital at the time of our study and this prompted a shift in our level of transection towards a distal transverse colon transection to anticipate a better outcome in terms of a lower anastomotic leak rate. The aim of this study is to demonstrate that transverse colorectal anastomosis is feasible, does not

result in undesirable outcomes and does not always require additional maneuvers described in previous studies.

METHODS

Study population and data collection

This is an observational study which was conducted in a single centre on 170 patients with a left sided colorectal carcinomas. These patients underwent colorectal resections requiring high ligation of inferior mesenteric vessel ligation were retrieved from 2019 until 2021 at our tertiary institution, Department of Colorectal Surgery, Hospital Selayang, Malaysia. Records were obtained from a prospectively maintained database of all patients who underwent colorectal resection.

Patient selection

Patients with left sided colorectal tumors such descending colon, sigmoid and up to low rectal tumors were subjected to anterior resection and the proximal resection margin was at the extent of distal transverse colon following a high ligation of the inferior mesenteric vessels were grouped in one cohort labelled as transverse-colorectal anastomosis group. Another cohort established were patients who underwent descending colorectal and ileorectal anastomosis.

Patients who were excluded were patients who did not undergo inferior mesenteric vessel ligation, ECOG of more than 2, >80 years, and incomplete data.

Operative technique

In our centre, we selectively performed transverse colorectal anastomosis whereby decision was made intraoperatively with the supervision of a single senior colorectal consultant surgeon and performed by colorectal fellows. The transected bowel edges of distal 2/3rd of the transverse colon will be assessed visually to ensure good blood flow and the left branch of the middle colic vessel has to be preserved. The transverse colon is transected at distal 2/3rd level, ensured to be sufficient in length and has been adequately mobilized to be able to reach for anastomosis without tension judged by the senior colorectal consultant surgeon.

By performing a transverse colonic anastomosis, mobilization of the splenic flexure and occasionally up to the hepatic flexure has to be performed. Transection is at the level just proximal to the splenic flexure and distal 2/3rd of the transverse colon. Hence, the kink at the splenic flexure is also removed which is not desirable for anastomosis and removal of the flexure would appear more physiological following the anastomosis.

Additional maneuvers such as retroileal/jejunal anastomosis and Deloyers maneuver were not performed

as we deemed the anastomosis tension -less. Anastomosis was performed via a circular stapling device and anastomotic leak test was performed in all cases to ensure that there were no perioperative anastomotic defects. If there was a positive test, whereby air bubbles were visualized, the identified defect would be secured with sutures and a repeat leak test would be conducted again to ensure that the anastomosis was secure. This is to ensure that anastomotic leak rates are minimized. In the event that a transverse colorectal anastomosis was not possible, either a descending colon anastomosis or ileorectal anastomosis would be performed instead without compromising on the tension of the anastomosis. Ileorectal anastomosis was performed on patients that had a total colectomy due to a closed loop obstruction with a precarious cecum. Laparoscopic colorectal resection was the choice of procedure for both groups however T4 tumors, patients unfit for prolonged surgery, dense adhesions, unclear planes, and conversion to open was grouped into the open colorectal resection group.

Study parameters

The study parameters were classified into demographics (i.e., age, gender, ethnicity), types of operation (i.e., open or laparoscopic) and anastomotic leaks comparing between transverse-colorectal anastomotic group and ileo/colorectal anastomotic group.

Table 1: Comparison of patients characteristics, type of surgery and anastomotic leak.

Characteristics	Total	Transverse colorectal anastomosis	Ileo/Colorectal anastomosis	P value
Number of cases (n)	170	77 (45.3%)	93 (4.7%)	
Age, mean (range)	58.5 (16-79)	58.4	58.5	
Gender, N (%)				
Female	82	39	43	0.59
Male	88	38	50	
Ethnicity, N (%)				
Malay	73	39	34	0.759
Chinese	80	29	51	
Indians	14	6	8	
Others	3	3	0	
Type of surgery				
Laparoscopic	83	36	47	0.759
Open	87	41	46	
Post-operative data				
Anastomotic leak, n	15	7	8	0.22

DISCUSSION

In our study, the patients were operated during the COVID pandemic era. These patients were subjected to a screening COVID swab and necessary precautions prior to the surgical intervention. Despite the reduction in operating hours, there were 170 cases in total which was included in this study. 39 patients were operated in 2021,

Statistical analyses

Categorical and dichotomous variables were analyzed using chi squared test. Results which were considered significant were if p value <0.05. The statistical analysis was performed with IBM Statistical package for social sciences (SPSS) statics for Mac OS, version25.

RESULTS

Patient treatment and characteristics

Between 2019 and 2021, 170 patients underwent left sided colorectal resection and from this cohort of patients, 77 (45.3%) underwent transverse colorectal anastomosis. The median age of these patients was 58.5.

Both groups of patients who underwent transverse colorectal anastomosis and ileo/colorectal anastomosis was homogenous with no significant difference. Our anastomotic leak rate was 8.8% (n=15), 48.8% (n=83) successfully completed their resections laparoscopically. The table below demonstrates the demographic distribution. And from our statistical analysis, transverse colorectal anastomosis does not significantly affect anastomotic leak rates (p=0.22).

77 in 2020 and 54 in 2019. The anastomotic leak rate was also unchanged and coincides with the current literature and standards. Nevertheless, we were keen to investigate if the transverse colorectal anastomosis has an impact on short term outcomes. The anastomosis performed were tailored individually and preference for a transverse colorectal anastomosis was performed in only suitable cases. And based on our results, up to 45.3% of our cases

were suitable for this anastomosis. To the best of our knowledge, this paper has the highest sample size on colorectal resection that report anastomotic leak rates done in a Malaysian hospital and reported during the covid pandemic era.

We conducted our study at a tertiary public hospital and at the time of data collection, the ICG equipment was not available, hence, anastomosis and perfusion assessment were performed the traditional way which was by visualisation of bleeding edges, colour of the bowel, palpation for pulsation and sigmoidoscopy. It is more cost effective and with no expense to the outcome of the patient. A routine splenic flexure mobilisation was also mandatory to achieve an adequate length for a tension free anastomosis. Complete splenic flexure mobilisation requires division of the splenicocolic, phrenicocolic, gastrocolic and pancreaticomesocolic attachments. This is necessary for transection at distal transverse colon which would provide a straight segment of a well vascularised bowel for anastomosis to the rectum.

There were concerns about tension during anastomosis in previous literature and therefore, those concerns were addressed by additional manoeuvres described by Rombeu et al and Deloyers technique. These manoeuvres were not necessary in our selected group of patients as the length and perfusion of the transverse colon was adequate. In the retroileal/retrojejunal technique, the proximally transected colon was brought out through an opening created at an avascular region of the ileal/jejunal mesentery for the purpose of reducing the tension of the anastomosis.^{14,15}

However, with this manoeuvre, there is a risk of obstruction due to the internal herniation as well. As for the Deloyers technique, the right colon has to be mobilised completely, middle colic vessels ligated and the remaining colon is then rotated while preserving the ileocolic vessels to achieve a tension free anastomosis. This would preserve the ileocecal valve which is crucial for a good functional outcome by preventing an ileorectal anastomosis.¹⁶ This technique however is only reserved for as a salvage procedure at our hospital. This is because it adds more dissection, mobilisation, bleeding and operative time as compared to our preferred technique.

There was a higher rate of cases done via open approach and cases converted from laparoscopic to open approach were included in this group of patients. The cases performed were technically more difficult as they were locally advanced, irradiated pelvis from neoadjuvant chemoradiotherapy, and obesity which resulted in a higher conversion rate to open surgery.

Admittedly, there are several limitations to our study. Selection bias could not be avoided due to the highly selected patient group and that this was a retrospective study which lacks a control group. Randomized control study would certainly improve the strength of the study.

We acknowledge long term outcomes and some short-term morbidity outcomes are lacking which we would address in time. The unavailability of some data from our newly established database has limited some aspects of our study. This is also a selected series of cases done in our tertiary hospital and may not be representative to the primary and secondary centres which may not have a senior colorectal surgeon or adequate equipment.

CONCLUSION

In conclusion, this study evaluates the anastomotic leak rates, which is similar in both groups, transverse colorectal anastomosis, can be performed safely with similar outcomes as compared to descending colorectal and ileorectal anastomosis in a selected group of patients. Hence, individually tailored anastomosis while minimising preoperative and other intraoperative risk factors should be performed for an ideal outcome. The type of anastomosis can be chosen based on the surgeons' experience and this anastomosis was found to be safe and feasible in our study. The colorectal surgeon should be familiar with the different anastomotic techniques to achieve the best outcome for the patient.

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