

End to End (Double stapled) Versus End to Side (Triple Stapled) Colorectal Anastomosis Following Anterior Resection for Rectal Cancer

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Abstract: End to End (Double stapled) Versus End to Side (Triple Stapled) Colorectal Anastomosis Following Anterior Resection for Rectal Cancer. **Introduction:** Sphincter saving procedures for mid and low rectal cancers is made possible with the use of Double stapling (DS) technique. Most important complication is anastomotic leak, which depends on the technique of anastomosis apart from other factors. Our aim is to compare early outcomes between End-to-End (Double Stapled) and End-to-Side (Triple stapled) anastomosis following Anterior resection (AR). **Methods:** All patients who underwent AR/LAR for rectal cancer during the period July 2014 to December 2016 were included. Following resection, patients were randomized to either End-to-End (EEA) or End-to-Side (ESA) anastomosis. Intra operative factors, and early postoperative outcomes were compared between two groups. P Value <0.05 was considered significant. **Results:** 73 patients were randomized. 32 underwent EEA and 41 ESA. Demographic characteristics, nutritional status, BMI, preoperative chemoradiation, operative time, level of anastomosis and incidence of ileostomy were comparable. Doughnut integrity was maintained better in ESA group (87.8% vs. 65.6%; p=0.0438). Air leak test was positive in 7(21.87%) in EEA group and 2 (4.87%) in ESA group (p =0.0335). Postoperative leak was seen in 2 (6.25%) in EEA group and 2 (4.87%) in ESA group (p=1.00). All leak patients underwent reexploration and loop ileostomy. **Conclusion:** End-to-side (triple stapled) anastomosis is easier to perform with better doughnut integrity with similar post operative leak rates.

Keywords: Anterior resection, Sphincter saving, Anastomotic leak, Doughnut

1. Introduction

The main aim of surgery in rectal cancers is to achieve oncological radicality with preservation of anal sphincters¹.² The sphincter sparing procedures are increasingly performed even in mid and low rectal cancers, as their oncological safety is proven³. Neoadjuvant chemoradiation and the circular staplers have increased the incidence of sphincter preserving resections further^{4, 5, 6}. Various anastomotic techniques have been described in literature to restore bowel continuity following rectal resections. But the major disadvantage of these resections is anastomotic leak and anterior resection syndrome.

The incidence of anastomotic leak after low anterior resection varies between 3 – 21%^{7,8}. Anstomotic leaks are associated with prolonged hospital stay, increased morbidity and mortality. The mortality associated with leaks range from 6-20%⁹. The incidence of anastomotic leak depend on the various factors such as distance of anastomosis from anal verge, preoperative long course radiation, nutritional status and technique of anastomosis^{10,11}.

The technical advantage of End to Side Anastomosis (ESA) over End to End Anastomosis (EEA) is it resolves the problem related to the difference of diameter between the intestinal and the rectal stump. And it also resolves the difficulty of the preparation of purse string on the colon.

Hence it is technically easier to perform ESA. The aim of our study is to compare the anastomotic complications between EEA and ESA following anterior resection (AR).

2. Methods

It is a prospective randomized study conducted after approval by Institutional Research and Ethics Committee. It included all patients who were planned for anterior resection or low anterior resection for rectal cancer during the period July 2014 to December 2016. Study excluded patients who underwent hand sewn anastomosis, those who underwent Hatmann's procedure with no primary anastomosis and those who underwent adjacent organ resections. Preoperative variables like demographic characteristics, nutritional status, neoadjuvant chemoradiation were recorded.

Procedure: Initially rectum and left colon were completely mobilised. All patients had ligation of inferior mesenteric artery and splenic flexure taken down to achieve maximal colonic mobilisation. Following complete mobilisation of rectum and left colon, lower end was transected using either curved contour stapler or linear stapler depending on the depth of transection into pelvis. Upper end was transected after applying intestinal clamp and specimen is removed. After resection and removal of specimen, patients were randomized by simple sealed envelope to either EEA

(double stapled) or ESA (Tri stapled). In the EEA group, purse string suture is taken on the proximal transected end and anvil of circular stapler is introduced and purse string tied around the anvil (Fig. 1). Whereas in the ESA group, the anvil of circular stapler is introduced into the proximal transected end and brought out by piercing through the side of the colon on tenia at 6 cms from the transected end. After introduction of anvil, the transected end is closed by using a linear stapler (Fig 2). Following this, circular stapler is introduced through the anal canal and trocar is pierced over the side of rectal stump anterior to the staple line and the anastomosis is completed. The doughnuts were checked for completeness. Doughnuts were considered complete only if all layers were intact. Level of anastomosis was checked in all patients by manual examination and measuring it on a measuring scale. All patients underwent airleak test intraoperatively. If positive, the exact site was identified and sutured if possible. All patients were drained by using 28Fr drain in pelvis. Covering loop stoma was added in selected cases such as elderly (>70 yrs), poor nutritional status and prior neoadjuvant chemoradiation. All patients undergo contrast study on postoperative day 7 to assess for leak.



Figure 1 (a) Figure 1 (b)

End to End anastomosis: 1a. Purse string on transected descending colon 1b. Anvil introduced and purse string tied



Figure 2 (a) Figure 2 (b)

End to Side anastomosis: 2a. Anvil introduced on side of transected descending colon 2b. Transected end is closed with linear stapler

Patients were followed in the postoperative period to assess primary outcomes such as anastomotic leak and anastomotic stricture. Anastomotic leaks were considered either clinical or radiological. Clinical leaks were those with obvious intestinal content in the drain tube. All clinical leaks without covering stoma underwent re exploration. Radiological leaks are those without any intestinal content in the drain but shows contrast leak on contrast radiographs. Anastomotic strictures were assessed based on clinical symptoms (sense of difficulty in passing stools and incomplete evacuation), clinical examination (not admitting a finger) and by colonoscopy. If strictured, they were dilated. The secondary outcomes measured were doughnut completeness, air leak test positivity. Data was collected and

statistically analysed. A p value of <0.05 was considered significant.

3. Results

102 patients were included during the study period. Of these, 29 patients were excluded. Reasons for exclusion were 22 patients underwent hand sewn anastomosis, 4 patients had adjacent organ resection such as uterus, small bowel and 3 patients had Hartmann's procedure without primary anastomosis. After exclusion, 73 patients were randomized. Of 73, 32 patients underwent EEA and 41 patients underwent ESA.

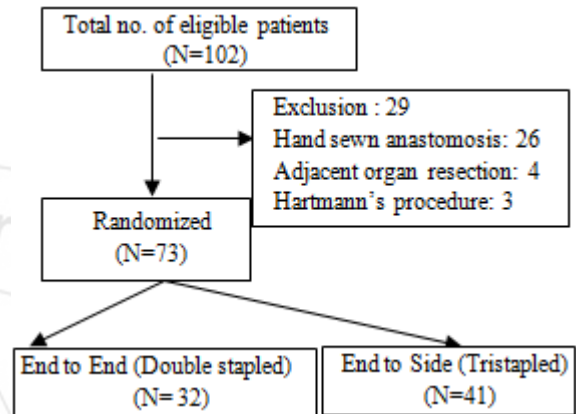


Figure 3: Consort diagram

Patient Characteristics

The characteristics of the patients treated in each group are shown in Table 1. There was no significant difference in demographic characteristics in 2 groups. Nutritional status assessed by haemoglobin levels, serum albumin and body mass index (BMI) was similar in both groups. Proportion of patients who had neoadjuvant chemoradiation in each group was not statistically significant.

Intraoperative parameters: Intra operative parameters in 2 groups are summarized in Table 2. Duration of surgery, level of anastomosis from anal verge and the incidence of defunctioning loop ileostomy were similar in 2 groups. Doughnut integrity was better maintained in ESA group than in EEA group (87.9% vs.

65.7%; p=0.043). Air leak test was positive in more patients of EEA group than ESA group (21.8% vs. 4.87%; p=0.034).

Complications

Postoperatively anastomotic complications were similar in 2 groups. The incidence of clinical or radiological leak was similar (6.25% vs. 4.87%; p=0.798). Anastomotic stricture rates were also similar in 2 groups (9.3% vs. 4.87%; p=0.267). All strictures were initially dilated endoscopically followed by self dilatations. None of the patients required redo surgery for strictures.

Table 1: Patient characteristics

	EEA Group (N=32)	ESA Group (N=41)	P Value
Patient Characteristics			
Age (Yrs) (Mean ± SD)	54.26 ± 12.01	53.71 ± 13.95	0.860
Sex (M:F)	18:14	24:17	0.844
Nutritional status			
Hemoglobin (g/dl) (Mean ±SD)	10.14 ± 2.47	10.23 ± 2.64	0.862
Albumin (g/dl) (Mean ±SD)	3.39 ± 0.48	3.43 ± 0.51	0.637
BMI	21.11 ± 3.5	20.27 ± 3.3	0.210
Neoadjuvant CRT	7/32 (21.8%)	11/41 (26.8%)	0.626

Table 2: Intraoperative parameters

	EEA Group (N=32)	ESA Group (N=41)	P Value
Duration of surgery (Min) Range (Mean ± SD)	120 - 300 123.47 ± 36.49	90 - 250 109 ± 34.04	0.096
Level of anastomosis (cms) (Mean ± SD)	3.82 ± 1.6	3.96 ± 1.53	0.871
Defunctioning stoma	27/32 (84.4%)	34/41 (82.9%)	0.868
Doughnut integrity	21/32 (65.7%)	36/41 (87.9%)	0.043
Airleak test	7/32 (21.87%)	2/41 (4.87%)	0.034

Table 3: Postoperative complications

	EEA Group (N=32)	ESA Group (N=41)	P Value
Clinical/Radiological leak	2 (6.25%)	2 (4.87%)	0.798
Anastomotic stricture	3 (9.3%)	2 (4.87%)	0.267

4. Discussion

Introduction of circular staplers and neoadjuvant chemoradiation have increased the rates of sphincter preserving rectal resections for malignancy

^{4, 5, 6}. The safety of staplers and the oncological radicality of these resections are proven. But as the anastomosis is getting closer to anal verge, the complications of surgery also increase. Most important are related to anastomosis and the loss of rectal reservoir. Anastomotic complications following anterior resection are anastomotic leaks and strictures. These increase the morbidity, mortality and hospital stay ^{7, 8, 9}. The incidence of these complications depends on the distance of anastomosis from anal verge, preoperative long course radiation, nutritional status and technique of anastomosis ¹⁰. The distance of anastomosis from anal verge depends on the location of tumor from anal verge. Definite guidelines are in place for selection of patients for neoadjuvant chemo radiation. Hence distance of anastomosis and neoadjuvant chemoradiation cannot be modified to reduce the leak rates. Nutritional status can be improved preoperatively to certain extent. Hence most of the studies have concentrated on the various anastomotic techniques which can decrease the anastomotic complications and also improve the rectal reservoir function.

There are many anastomotic techniques described in literature ¹². Traditionally it was done by end to end anastomosis. Later some surgeons used colonic J pouch for anastomosis. But these pouches were associated with problems of evacuation ^{13, 14}. Hence their usage has not gained much popularity. In 1950, Baker JW first described

an End to Side anastomosis ¹⁵. In an RCT by Brisinda et al, End to side anastomosis, when compared with end to end anastomosis was associated with a significantly lower anastomotic leak rate ¹⁶. In this study, rectal stump was closed using linear stapler and circular stapler is brought out from the side of rectal stump. The proximal bowel end had purse string and anvil introduced and purse string tied. The anastomosis thus done was end to side anastomosis (End of descending colon with side of rectal stump). The study also mentions that the end to side anastomosis had the advantage of resolving the difficulty of preparation of purse string on the rectal stump and also resolves the issue of discrepancy of luminal diameter between two anastomotic ends.

In our study, we have compared the results of end to end anastomosis with end to side anastomosis. The technique of end to end anastomosis in our study was similar to the end to side anastomotic technique described in the above study. We considered end to side anastomosis when the proximal bowel end also had its side anastomosed to side of rectal stump. Using this end to side anastomosis is technically easy as this avoids purse string preparation on proximal bowel also and it further reduces the luminal discrepancy ¹⁵. In our study, we have randomized patients into two groups only after undergoing Ro resection. The demographic characteristics, nutritional status was similar in two groups. Both groups had similar number of patients who underwent neoadjuvant chemoradiation. Duration of surgery in two groups was similar. As the distance of anastomosis from anal verge is an important predictor of anastomotic complications, we have measured the distance in all patients with great accuracy. Most of the patients in 2 groups had anastomosis situated between 3-4 cms from anal verge. Doughnut integrity and air leak test are two important indicators of safe anastomosis intraoperatively. Doughnut integrity was better maintained in ESA group than in EEA group (87.9% vs. 65.7%; p=0.043). Air leak test was positive in more patients of EEA group than ESA group (21.8% vs. 4.87%; p=0.034). The primary outcomes measured in the study were anastomotic leak and stricture rates. The overall incidence of anastomotic leak in our study was 5.5%. The incidence of clinical or radiological leak was similar in two groups (6.25% vs. 4.87%; p=0.798). From the study, we can assume that all patients with incomplete doughnuts need not have leaks. Of 4 patients with leak, only one patient had intraop doughnut incomplete. Rest 3 patients with leak had complete doughnut integrity. Over a follow up period of 3 months, anastomotic stricture rates were similar in 2 groups (9.3% vs. 4.87%; p=0.267). The data was not collected regarding the functional outcomes in two groups. But few studies in literature have shown that the functional outcomes with end to side anastomosis were similar to patients with colonic J pouch anastomosis ^{17,18,19}.

5. Conclusion

End-to-Side (triple stapled) anastomosis is a safe alternative reconstruction technique following anterior resections for rectal cancers. It is technically easier to perform with better doughnut integrity. Anastomotic complications are similar to end to end anastomosis. Functional outcomes need to be addressed further in this study, even though studies in

literature have shown outcomes comparable to colonic J pouch.

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