



A COMPARATIVE STUDY BETWEEN SINGLE LAYER VERSUS DOUBLE LAYER INTESTINAL ANASTOMOSES

General Surgery

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ABSTRACT

Background: This is a prospective single blinded randomized comparative study conducted at Mahatma Gandhi Medical college and institute to assess various aspects of safety, efficacy, duration of hospital stays and chances of perforation in single-and double-layer anastomotic surgery. **Methods:** Total 60 patients were included in the study. 30 patients each in single layer and double layer anastomosis group. Single layer intestinal anastomosis was carried using extramucosal technique with 2-0 vicryl suture (round body). Double layer anastomosis was carried out using interrupted 3-0 silk lembert sutures for the outer layer and a continuous 2-0 vicryl for the inner layer. Different types of anastomosis like End to end ileocolic, end to end colo-colic, end to side ileo-colic, side to side ileo-ileal, end to end ileo-ileal, end to end jejunio-ileal and end to end jejunio-jejunal were performed. Each group was compared for anastomotic leak, time required to construct the anastomosis, cost incurred, and length of hospital stay. **Results:** Findings of the study indicated that single layer is more economical as compared to double layer anastomosis and it took much less time to operate. There was no significant difference in duration of hospital stay of the patients in both the groups. There was no anastomotic leak in group-S (single layer) while one (3.8%) patient in group-D (double layer) suffered from anastomotic leak. **Conclusions:** It was concluded that the single layer anastomosis method is beneficial and safe as it required less operative time, suturing material and no leak took place after surgery.

KEYWORDS

Anastomosis, Anastomotic leak, Single layer, Double layer

INTRODUCTION

Intestinal anastomosis is required in the patients suffering with malignancy of intestine, bowel inflammation, tuberculosis with or without stricture, obstruction, congenital diseases like intestinal atresia, hirschsprung syndrome or trauma leading to malfunctioning of area affected. Most common purpose of anastomosis is to restore the continuity of affected intestinal portion. With the development of suturing materials and medications, anastomosis is becoming more effective and safer surgery with less incidences of associated complications. Intestinal anastomosis are common procedures in both elective and emergency general surgery and the technique selected is determined by the site of anastomosis, bowel thickness and size of perforation if any.

Based on technique used, anastomosis is categorized as hand sewn, stapled and laparoscopic anastomosis. Based on involvement of intestinal layer, anastomosis has been categorized into following two types-single layer anastomosis and double layer anastomosis. Various comparative studies have been performed to assess the efficacy and safety aspects of single layer and double layer anastomosis. Many studies have been conducted to test the efficacy of the two procedures considering the patient compliance, safety and operation time. In one such study comprising 553 anastomoses, Leslie and Steele concluded that single layer of interrupted sero submucosal sutures as the gold standard for anastomoses involving the large or small bowel. Burch et al conducted a prospective randomized trial on single-layer continuous versus two-layer interrupted intestinal anastomosis. On the basis of results, authors hypothesized that the single-layer continuous anastomosis could be safely introduced into a surgical training program and that it could be performed in less time and at a lower cost than the two-layer interrupted anastomosis. Shikata et al performed a meta-analysis of outcomes of anastomosis published from 1966-2004. There was no evidence found that two-layer intestinal anastomosis leads to fewer post-operative leaks than single layer. Also comparing the duration of the anastomosis procedure and medical expenses, the single-layer intestinal anastomosis appears to represent the optimal choice for most surgical situations. In order to achieve successful anastomosis pre-operative, trans-operative and post-operative considerations must be followed.

Use of mechanical bowel preparation and oral non absorbable antibiotics are highly effective in decreasing the microbial load and reducing the chances of infection post-surgery. Further it has been also observed that using oral non absorbable antibiotics with parenteral

antibiotics reduced the surgical site infection by 43%. Nutritional status of individual is another key factor for successful anastomosis. Many studies show that prolonged and short-term malnutrition decreases anastomotic healing. Poor nutrition affects anastomotic healing may be due to lack of essential amino acids for collagen synthesis or deterioration in the patient's immune competence.

Feeding is one of the foremost post-operative considerations. Late feeding is justified by the perception that the fasting would protect the anastomosis from any complication such as abdominal distention, vomiting, ileus, anastomotic dehiscence or leaks, wound infection and would allow a hermetic closure of the anastomosis before the beginning of enteral feeding.

Anastomosis like other surgeries, do have linked morbidity and sometime mortality. The morbidity and mortality in anastomosis are determined by variety of factors that may be controlled. Anastomotic leak, bleeding, wound infection and anastomotic stricture are important complications associated with intestinal anastomosis. Despite of availability of literature and research work on the single layer and double layer anastomosis, there are no definite concluding findings that determine the suitability of either technique. This research work aims to add further insight on the adoption of either single layer or double layer anastomosis by comparing various aspects associated with it.

METHODS

Study was conducted during November 2023 to October 2024, at Mahatma Gandhi Medical College and hospital, Jaipur. Prospective single blinded randomized study model was adopted to complete the study. 60 patients, 30 in each group-single layer anastomosis and double layer anastomosis, were taken.

Patients between 20 years and 60 years age, visiting OPD at MGMCH and suggested for resection and anastomosis of small bowel and large bowel for causes like intestinal obstruction due to bowel ischemia, strangulated hernia, traumatic bowel injury, bowel tumors etc., presenting to our institution and adjoining states were included in the study. Patients below 20 years and over 60 years age, were excluded from the study. Those patients requiring esophageal and gastric anastomosis were also excluded. The included patients were randomly divided in to two groups-single layer anastomosis and double layer anastomosis each group comprising 30 patients.

The affected segments of bowel were resected as per the standard

technique described as allocated for the patient. The bowel ends were cleaned with 5% povidone iodine swab and approximated. The time considered for anastomosis begun with the placement of the first stitch and ended with the cutting of the last stitch. Single layer intestinal anastomosis was carried out in extramucosal technique with 2-0 vicryl suture (round body). Double layer anastomosis was carried out using interrupted 3-0 silk Lambert sutures for the outer layer and a continuous 2-0 vicryl (round body) for the inner layer (Burch et al). End to end colocolic anastomosis, end to end ileocolic anastomosis, end to side ileocolic anastomosis, end to end ileoileal anastomosis, side to side ileoileal anastomosis, end to end jejunoleal anastomosis and end to end jejunojunal anastomosis were performed in different patients included for the study. Each group was compared for anastomotic leak, time required to construct the anastomosis, cost incurred, and length of hospital stay

The data was analyzed by paired t-test and chi square test accordingly with a p-value < 0.05 considered as significant.

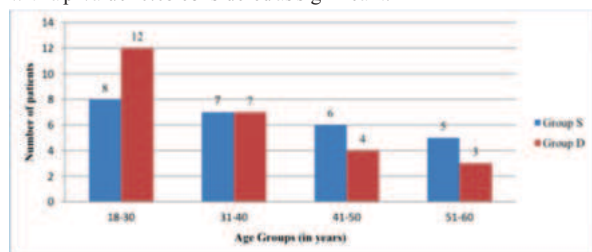
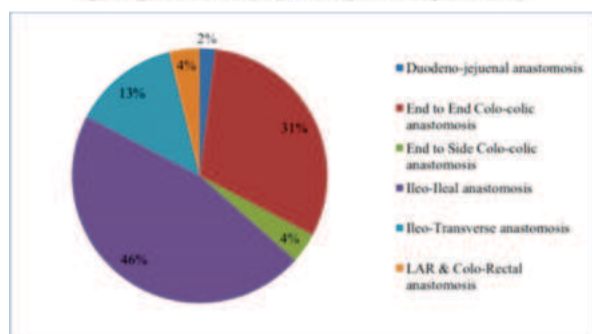


Figure 2: Age distribution of study subjects according to anastomotic procedure (n=52).



RESULTS

The mean $\pm$ SD of the participants in our study was 36.52 ± 12.665 years. Age range was 20 years to 60 years. Approximately half i.e. 30 participants were between the ages of 20-40 years

In our study, maximum number of patients in group S were in the age group of 18-30 years i.e. 08 (31%) followed by 31-40 years 07 (27%) while in group D also, maximum number of patients were in the age group of 18-30 years i.e. 12 (46%) followed by 31-40 years 07 (27%). The mean age in group S was 38.69 years and in group D was 34.35 years

Most of the study participants in our study were males 37 (71%). In group S there were 20 (76%) males and 06 (24%) females and in group D there were 17 (66%) males and 09 (34%) females

In our study, among the 60 cases, 40 traumatic intestinal perforation was diagnosed in maximum number of patients followed by sigmoid volvulus 12 cases

Maximum numbers of participants in group S were diagnosed traumatic intestinal perforation 8 (30.9%) whereas in group D also most of the participants were diagnosed to be traumatic intestinal perforation 9 (34.6%). The second most common diagnosis in group S was sigmoid volvulus 5 (19.2%) and intestinal perforation due to enteric fever 5 (19.2%) while in group D the second most common diagnosis was sigmoid volvulus 7 (26.9%) only

In our study, ileoileal anastomosis was performed in maximum number of patients i.e. 24 (46.2%) cases followed by end to end colocolic anastomosis 16 (30.8%)

This study included a total of 60 anastomosis, at different levels of small intestine and large intestine. The maximum number of

anastomosis in group S were performed at entero-enteric level in 14 (54%) patients, next at colo-colic site in 7 (27%) patients and followed by entero-colic 5 (19%). In group D, out of 26 anastomosis, equal number of anastomosis were performed at colo-colic level in 11 (42%) patients and at entero-enteric site in 11 (42%) patients.

The study included two different types of anastomosis in both groups depending up on the position of the viscera. In both the groups, end to end type of anastomosis was done more commonly with 21 (80.7%) and 22 (84.6%) in group S and group D respectively.

In this study, in group S number of anastomosis done in 15-20 minute range is 20 (77%). Rest 6 (23%) took time in between 21-25 minutes range. In group D no. of anastomosis done in 26-30 minutes range is 24 (92%). Rest 2 (8%) took time in between 31-35 minutes range. No anastomosis took time to complete beyond 35 minutes.

An independent sample t test reported a significant difference in time taken to complete anastomosis between Group S and Group D, $t(50) = 18.674$, $p < 0.001$, 95% C.I. [7.654 - 9.499]. Time taken to complete anastomosis was on average higher in group D ($M = 28.12$, $SD = 1.68$) as compared to group S ($M = 19.54$, $SD = 1.63$). Mean difference of duration between the two groups was found to be 8.57.

An independent sample t test reported no significant difference in duration of hospital stay between group S and group D, $t(50) = 1.373$, $p = 0.176$, 95% C.I. [-0.231 - 1.231]. Duration of stay was slightly higher in group D ($M = 11.58$, $SD = 1.528$) as compared to group S ($M = 11.08$, $SD = 1.055$). Mean difference of duration between the two groups was found to be 0.50. In our comparative study, overall complication in the form of anastomotic leak was noted in 1 (2%) patient. No anastomotic leak was observed in group S while 1 (3.8%) anastomotic leak was noted in group D. In this study one patient who had developed anastomotic leak in group B, responded well to conservative management and recovered while rest 25 patients (92%) were asymptomatic. In group A none of the patients developed anastomotic leak.

DISCUSSION

The basic principles of intestinal suture were established more than 100 years ago by Travers, Lembert and Halsted. Anastomotic integrity is an important determinant of immediate outcome in gastrointestinal surgery and anastomotic technique is an important factor in healing. The most important factors in the creation of a bowel anastomosis are meticulous technique, gentle tissue handling, and adequate apposition of bowel ends, good blood supply and absence of tension. Healing of anastomosis also depends on general factors like age, nutritional status, blood loss, steroids, other co-morbidities like malignancy, renal failure, diabetes, jaundice, radiation exposure, etc. This study assessed the efficacy and safety of single layered anastomosis in comparison with double layered anastomosis after intestinal resection. This study included two groups, group-S and group-D, comprising of 30 cases in each group. Both groups compared in terms of, duration required to perform single and double layer intestinal anastomosis, post-operative complications, and duration of hospital stay in either of them. Cases requiring anastomosis for various clinical conditions of small and large bowel were allotted to either group. In present study mean age in group-S was 38.69 years and in group-D was 34.35 years. In Bhargava study mean age in group-S was 32.7 years and in group-D was 32.4 years. In both studies patients were of middle age group and mean age of present study was more than Bhargava study.

In this study the number of male patients outnumbered female patients in both the groups, group-S and group-D, which may be because males are more prone to traumatic injury due to more outdoor activities. We found that single layered is economical in comparison to double layer anastomosis, as the total number of sutures pack required in double layer anastomosis was 2 or 3, whereas in single layer anastomosis only 1 pack was used. So, in comparison to single layer technique, double layer requires a greater number of suture packs. So single layer is comparatively cost-effective.

In many studies it has been observed that mean time required for anastomosis in double layer is more than that in single layer. In present study mean time required for anastomosis was nearly 8 minutes less in single layer anastomosis as compared to double layer which is statistically significant. In present comparative study the mean duration of hospital stay in group-S was 11.08 days and in group-D was 11.58

days. So, all the above studies show that duration of hospital stay in both type of anastomosis group-S and in group-D is almost same. There is no significant difference in terms of duration of hospital stay. In present study there was no anastomotic leak in group-S and 1 (3.8%) patient in group-D suffered from anastomotic leak. In a study by Khan et al, 1 (6%) anastomotic leak was present in group-S and 2 (12%) in group-D, while in a study by Ahmed et al, 1 (4%) anastomotic leak was present in group-S and 2 (8%) in group-D. Besides studying influence of single layer and double layer technique on leakage, attempts have been also made to correlate the leakage with gender. Lipska et al in a study having 541 consecutive operations involving anastomoses of the colon and rectum concluded that male gender, previous abdominal surgery and low rectal cancer are associated with increased anastomotic leak. Irvin and Goligher had studied the risk of leakage and dehiscence in aged patients. They observed that more than 50% of the patients were over 60 years of age and the incidence of anastomotic break down in such cases was significantly higher than that encountered in patients below the age of 60 years. Above studies shows that though anastomotic leak occurs more in double layer anastomosis but is not statistically significant. Finally, complication rates put all together shows; group-D anastomosis had more complication in terms of anastomotic leak. In the double layer technique sub-mucosal vascular plexus may be compromised and there may be more inflammation and inversion leading to narrowing of lumen. Single layer anastomosis causes least damage to sub-mucosal vascular plexus, least chance of luminal narrowing, incorporates strongest sub-mucosal layer and more accurate tissue apposition. In present study anastomotic leak rate was less compared to other studies as large numbers of procedures were performed on selective basis and also patient in present study were of younger age group. In hospitals like ours where emergency procedures were performed frequently and many patients belong to economically weaker sections, single layer anastomosis method is beneficial as it reduces operative time, anesthesia duration and less suture material needed and hence it is economical and equally safe.

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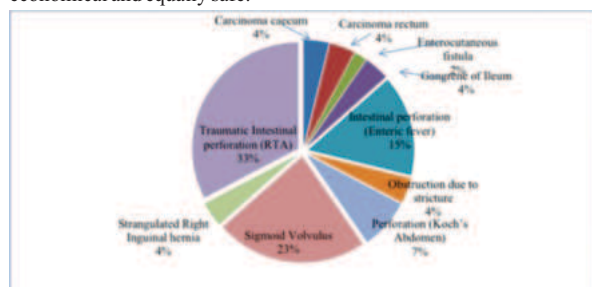


Figure 4: Disease distribution among study subjects (n=52).

CONCLUSION

On the basis of findings, it may be concluded that single layer anastomosis can be done insignificantly less time as compared to double layer anastomosis. Number of sutures pack required for single layer anastomosis is significantly less than double layer anastomosis, i.e., this shows single layer anastomosis is more cost-effective. There is no significant difference between two groups in terms of duration of hospital stay and anastomotic leak. Considering the different parameters associated with the set of surgical procedures, it may be concluded that the single layer extramucosal technique is equally safe and efficacious as classical double layer technique. Thus the findings of study affirm that single layer anastomosis can be trusted to be performed in the patients particularly economically poor one. Like other observational studies, certain limitations are associated with this study like limited number of patients, however more patients must be included in such study with some interventional approach to control incidences of leakage.

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