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Original Research Article

A comparative study of single layer extra mucosal versus conventional double layer anastomosis of intestines in elective and emergency laparotomy

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ABSTRACT

Background: Gastrointestinal anastomosis has been a part of research since decades and is one of the key skills in surgeon's armamentarium. This study compared the outcome of single layer anastomosis with double layer anastomosis.
Methods: The study was designed as a prospective comparative study and 29 cases were included in the study during December 2016 to September 2017, who consented for being part of the study. Patients were alternatively allotted into the either group. Group A underwent single layer anastomosis and Group B underwent double layer anastomosis. Outcome parameters were analysed in the form of 'duration required to perform anastomoses, 'duration of hospital stay' and 'dnastomotic leak.
Results: Mean duration required to perform anastomosis in Group A is 21.64±1.60 minutes and in Group B is 29.6±2.02 minutes. The difference between the mean duration required for anastomosis between the two groups were statistically significant ($p<0.005$). Mean duration of hospital stay in Group A was 12.35±1.72 days and Group B was 12±2.44 days (difference was statistically insignificant), 3 (10%) cases in Group A and 2 (6.8 %) cases in Group B developed anastomotic leak and the difference was statistically insignificant.
Conclusions: Our study concluded that there is statistically significant difference between the single layer anastomosis and double layer anastomosis in terms of time taken to perform anastomosis, however there is no difference in postoperative anastomotic leak and duration of hospital stay.

Keywords: Double layer anastomosis, Extra mucosal technique, Single layer anastomosis

INTRODUCTION

Gastrointestinal anastomosis has been constant topic of discussion among the surgeons and lot of efforts and research had been done to improvise the technique and also to make learning curve easier for the future surgeons.

The aim of anastomosis is to make a sound alignment of bowel and also to make sure necessary precautions has been taken to avoid postoperative leak.

Surgery is the major modality of treatment in cases like bowel obstruction, incarcerated hernias, benign and malignant tumours of small and large bowel, and even palliation in many situations. Many of these patients undergo resection anastomoses and a sound anastomosis is one of the key features for uneventful postoperative period.

Bowel anastomoses after resection of bowel may be either end to end anastomoses, side to side or side to end anastomoses depending on the surgery and the operating

surgeon. Different techniques of intestinal anastomosis are single, double layered closure, staples, glue and laser welding.

In double layered closure technique, mucosa and seromuscular layers are sutured separately and it has been proposed that there are more chances of strangulation of mucosa because of damage of submucosal vascular plexus. However, in single layer technique, bowel approximated using single layer of sutures either continues or interrupted and incorporates the submucosa of gut (strongest layer of intestine). This technique causes less damage to submucosal vessel and it has been proposed that there are less chances of necrosis in single layer technique and some may consider this to be better option for anastomosis.[1,2]

Anastomotic leak is a major complication of gastrointestinal anastomosis and may lead to peritonitis, intra-abdominal abscess, fistula, necrosis and stricture. There are number of factors which may contribute to anastomotic leak and suturing technique is itself a strong independent factor. Anastomosis leak is a major complication and incidence may vary from 1.3 to 7.7%, and usually leads to increase morbidity, prolonged hospital stay, increases the economic burden and even may lead to mortality.[3]

This comparative study aims to compare outcome of single layer versus double layer intestinal anastomosis in small and large bowel in terms of duration required to perform intestinal anastomosis, post- operative anastomotic leak, and duration of hospital stay in each group.

METHODS

This study was designed as prospective comparative study, conducted during December 2016 to September 2017 in patients presenting to Govt. Kilpauk Medical college Hospital in emergency or elective condition and who consented to take part in the study.

Inclusion criteria

- Patients giving written informed consent.
- Patients undergoing resection and anastomoses of small bowel and large bowel at our hospital for causes like small bowel gangrene, strangulated hernia with bowel loop as content, small and large bowel tumours, intestinal ischemia, hollow viscus perforation, Intestinal obstruction.
- Age more than 18 years.

Exclusion criteria

- Severe anaemia (<6 gm/dl)
- Coagulopathy
- Hypoalbuminemia
- Chronic Kidney Disease
- Multiple organ dysfunction Syndrome (MODS).

Group allotment

Patients were alternatively allotted to group A consisted of single layer anastomosis and group B with double layer anastomosis.

Standardization

All single layer anastomosis were done with Vicryl 2-0 pack which had a suture material of 90 cm length. For double layer, 2-0 Vicryl was used taking through all layers and sero-muscular layer with 2-0 mersilk pack which had suture material measuring 90 cm.

Outcome parameters

- Duration required to perform anastomoses,
- Duration of hospital stay,
- Anastomotic leak,
- Return of bowel sounds.

Statistical analysis

All cases were followed up to discharge and subsequently for a follow up period of 2 weeks and results are expressed as mean and standard deviation for continuous data and frequency as number and percentage. Unpaired t test was used to compare mean levels between two groups. Categorical data was analysed by Chi square test. Confidence interval of 95 % and p value of 0.05 or less was considered for statistical significance.

RESULTS

Age distribution among groups

The mean age in group A (single layer) was 46.71 years and in group B (double layer) was 52 year (Figure 1).

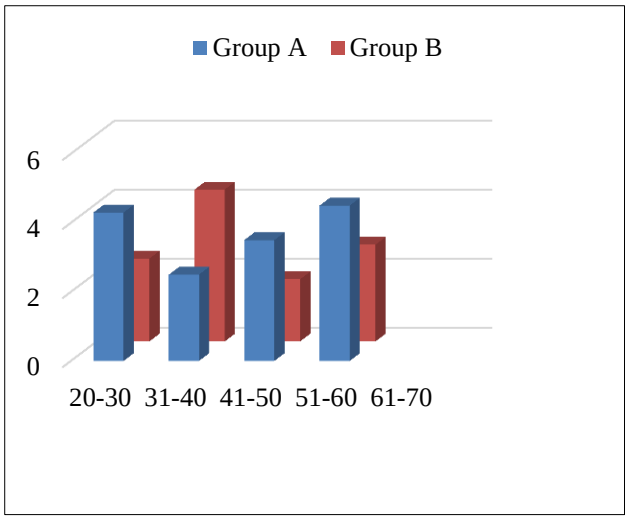

Figure 1: Age distribution.

Sex distribution

In group A (single layer) there were 10 (68%) males and 04 (32%) females. In group B (Double layer) there were 11 (60%) males and 04 (40%) females.

Diagnosis

Out of 29 cases, hollow viscus perforation was diagnosed in maximum number of patients i.e., 8 (28%) (Table 1).

Table 1: Diagnosis.

Diagnosis	No. of cases	N (%)
Ileocaecal TB	2	7
Ileostomy closure	2	7
Malignancy	2	7
Mesenteric cyst	1	3
Obstructed hernia	4	14
Obstruction	3	10
Perforation	8	28
Strangulated hernia	7	24

Procedure

In both groups resection of terminal ileum and ileo-ileal anastomosis were performed in maximum number of patients i.e. 13 (44.82%) cases.

Table 2: Procedure.

Procedure	No. of cases	N (%)
Distal gastrectomy and roux en y gastro-jejunostomy with jejuno-jejunostomy	1	3.44
Left hemicolectomy and colo-colic anastomosis	2	6.89
Limited resection and ileo-colic anastomosis	3	10.34
Resection and ileo-ileal anastomosis	13	44.82
Resection and jejuno-ileal anastomosis	7	24.13
Right hemicolectomy and ileo-transverse anastomosis	3	10.34

Anastomotic site

The maximum number of anastomosis in group A (single Layer) were performed at entero-enteric level in 12 (85.71%) patients, next at entero-colic site in 1 (7.14%) patient and at colo-colic site in 1 (7.14%) patient. In group B (double layer), out of 15 anastomosis maximum number of anastomosis were performed at entero-enteric level in 9 (60%) patients, next common site for anastomosis was at entero-colic site in 5 (33.33%) patients and followed by colo-colic site in 1 (6.66%) patient.

Type of anastomosis

End to end type of anastomosis was done in all of the cases in group A (single layer) 14 (100%) patients and in group B (double layer), in 14 (96.56%) patients end to end anastomosis was done and in 1 (3.44) patient end to side anastomosis was done.

Outcome parameters

Duration of anastomosis

In group A (single layer) the minimum time required to perform anastomosis was between 10 to 15 minutes in 1 (7.14%) patient and maximum time was between 21 to 25 minutes in 10 (71.42%) patients, followed by 3 (21.42%) patients between 16-20 minutes and no anastomosis took more than 25 minutes.

In group B (double layer) the minimum time required to perform anastomosis was between 21 to 25 minutes in 2 (13.33%) patients and maximum time was between 36 to 40 minutes in 2 (13.33%) patients and no anastomosis required beyond 40 minutes. Maximum were done in between 26 to 30 minutes, 8 (53.33%) patients. Difference is statistically significant. Mean difference of duration between the two groups is found to be statistically significant and p value is <0.001(Table 3).

Table 3: Duration of anastomosis.

Groups	Range (Duration in minutes)	Mean±SD (Duration in minutes)	t* value	P value
Group A	14 - 25	21.64±1.60	19.6	<0.001 (Unpaired t test)
Group B	24 - 36	29.6±2.02		

Table 4: Anastomotic leak.

Complication	Group A N (%)	Group B N (%)
Anastomotic leak	3 (10.3)	2 (6.8)

Anastomotic leak

Overall complication in the form of anastomotic leak was noted in 5 (5.8%) patients. Anastomotic leak was observed in group A (single layer) in 3 (10.3%) patients and occurred in group B (double layer) in 2(6.8%) patients. The p value was 0.5 (chi-square test), which is not significant (Table 4).

Return of bowel sounds

There were no statistically significant difference between the return of bowel sounds between the two groups. All

Patients were started on sips of oral fluids on third day depending on the tolerability and movement of bowel and general condition of the patients, further oral fluids were advanced.

Duration of hospital stay

In our comparative study the mean duration of hospital stay in Group A was 12.35 days and in Group B it is 12 days. Mean difference being 0.35. Unpaired t test and p value shows that the comparison is insignificant (Table 5).

Table 5: Duration of hospital stay.

Groups	Range	Mean±SD	t* value	p value
	Duration in minutes			
Group A	8 - 18	12.35±1.72	1.002x	0.322 (Unpaired t test)
Group B	9 - 18	12±2.44		

DISCUSSION

The basic principle of intestinal suture was established more than 100 years ago by Travers, Lambert and Halsted. The double layered intestinal anastomosis was formulated in the early 19th century by Travers B in his experimental work.

Double layer anastomosis was mostly preferable in last century, but opinion vary from surgeon to surgeon and different countries in the world. Hautefeuille in 1976, first gave a detailed account of the single-layer continuous anastomosis. Single layer anastomosis technique took over in early eighties in last century and reduces the potential risks, however some authors have suggested risk of dehiscence and narrow the intestinal lumen.[4-10]

Maurya et al conducted a trial recruiting 122 cases and there results concluding return of bowel movement is faster in the single-layer group was an unexpected outcome and made surgeons to think whether anastomotic techniques can affect bowel motility.[9] They also concluded single layer group have less chances of anastomosis leaks.

Ordorica et al conducted a study in paediatric age group comparing single layer anastomosis vs double layer anastomosis.[11] 86 cases were included in the study. They found surgical time for anastomosis with one layer was an average of 26 minutes versus 43 minutes with two layers (p<0.001).

Bursch et al recruited 132 patients and published a study in 2000.[12] They performed 65 single- layer and 67 two-layer anastomoses were performed. Their primary outcome was anastomotic leak and secondary outcome was intraabdominal abscess, operative time, perioperative complications and length of hospital stay. They concluded single-layer continuous anastomosis takes significantly less time than double layer anastomosis technique, however complication rates were similar.

Sibabrata et al conducted a randomized control trial comparing Single layer (Group A) vs double layer (Group B) intestinal anastomosis and 97 participants were randomized.[13] The mean time taken for anastomosis (15.12±2.27 minutes in Group A versus 24.38±2.26 minutes in Group B) and the length of hospital stay (5.90±1.43 days in Group A versus 7.29±1.89 days in Group B) were significantly shorter in Group A (p<0.001). The postoperative return of bowel function was quicker in the single layer group (2.42±1.11 days) as compared to the double layer group (3.1±1.34 days). The cost of suture material used was relatively more in the single layered group (564 INR vs. 480 INR) which might be the only factor favoring a double layered anastomosis in their study.

The present study assessed the efficacy and safety of single layered intestinal anastomosis in comparison with double layer intestinal anastomosis. The cases were divided into two groups' single layer and double layer, each group had 14 cases and 15 cases respectively, altogether 29 cases. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel. The outcomes were assessed in terms of duration required to perform anastomosis, anastomotic leak and duration of hospital stay.

Table 6: Mean duration of anastomosis.

Groups	Mean duration of anastomosis (in minutes)		
	Present series	Khan et al[14]	Bursch et al[12]
Group A (single layer)	21.64	20	20.8
Group B (double layer)	29.6	35	30.7

Table 7: Comparison of anastomotic leak with other study.

Groups	Present series	Khan et al[13]
	N (%)	N (%)
Group A (single layer)	3 (21)	1 (6)
Group B (double layer)	2 (13.33)	2 (12)

In the research of Khan et al, the mean duration required to perform single layer anastomosis procedure was 20 minutes and double layer anastomosis was 35 minutes.[14] In Khan RAA series one (6%) patient had anastomotic leak in single layer and 2 (12%) of patients had anastomotic leak in double layer. The complication rate

in our present series was 3 (21%) patients in single layer and 2 (13.33%) in double layered anastomosis.

Sajid et al published a review article in 2012 including seven randomised controlled trials encompassing 842 patients undergoing SGIA versus DGIA were retrieved from the electronic databases.[15] There were 408 patients in the SGIA group and 432 patients in the DGIA group. They concluded that SGIA can be performed quicker as compared to double layer GIA. SGIA is comparable to DGIA in terms of anastomotic leak, peri-operative complications, mortality and hospital stay.

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