ORIGINAL RESEARCH PAPER

Volume-8 | Issue-7 | July - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A COMPARATIVE STUDY BETWEEN SINGLE LAYER VERSUS DOUBLE LAYER INTESTINAL ANASTOMOSIS

General Surgery

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ABSTRACT

Background: With the rising incidence of blunt trauma abdomen, gastro-intestinal malignancies, mesenteric thrombosis, bowel strangulation etc., there is an ever-increasing need for resection anastomosis to correct these surgical conditions. This prospective comparative study is performed to evaluate the safety and effectiveness of single layer interrupted extramucosal technique as compared to conventional double layer technique in term of anastomotic leak and other complications.

Methods: The patients selected for this study are those who were admitted with various clinical conditions requiring resection and anastomosis of small or large bowel presented to Krishna Hospital and Medical Research Centre, Karad during June 2018 to May 2019. A total of 50 patients were included in the study. A total of 50 patients were included in this study. Subjects over 18 years and below 60 years were included in this study and effectiveness of single layer bowel anastomosis was compared to traditional two layer anastomosis.

Results: Though a large number of patients need be to studied to do a dogmatic conclusion, based on the results obtained in the present study following conclusions can be drawn. Duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer. There is no significant difference in anastomotic leak between two groups. There is no significant difference in duration of hospital stay in single vs double layered bowel anastomosis.

Conclusions: Single layer interrupted extra-mucosal technique required significantly less duration for anastomosis, is cost effective with no significant difference in anastomotic leak rate and as safe as conventional double layer technique.

KEYWORDS

Single layer anastomosis, double layer anastomosis

INTRODUCTION

Gastrointestinal anastomosis has been excited interest in our day to day surgical practice and aim of anastomosis is to make a sound alignment of bowel through which the contents will pass in as early as possible.

Patients undergoing resection anastomoses for various causes like bowel obstruction, incarcerated hernias, benign and malignant tumors of small and large bowel is not so uncommon. Surgery stands major modality of treatment in such cases in diagnosis, treatment and even palliation in few situations.

Bowel anastomoses after resection of bowel may be either end to end anastomoses and side to side or side to end anastomoses depending on surgery and the operating surgeon. Different techniques of intestinal anastomosis are single, double layered closure, staples, glue, laser welding[1]

Various complications following bowel anastomoses are anastomotic leak resulting into peritonitis, abscess, fistula, necrosis, stricture. Various factors contribute to these complications like suturing technique, suture material, presence of concurrent sepsis, vascular compromise and so on. Leakage from the bowel anastomoses in the gastrointestinal tract is major complication and accounts for about 1.3 to 7.7%, that is often associated with increased morbidity and mortality and prolonged stay[2,3].In double layered closure where mucosa and seromuscular layers are sutured separately though haemostatic there is more chance of strangulation of mucosa due because of damage of submucosal vascular plexus[4].

In single layer technique, only seromuscular layer of gut wall is approximated. This technique incorporates the strongest layer (submucosa) of gut and causes minimal damage to the submucosal vascular plexus, anatomy is maintained and hence less chances of necrosis and superior to double layered closure[5,6].

This comparative study endeavours 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 complications like anastomotic leak, duration of hospital stay in each group.

AIM AND OBJECTIVES

AIM

To compare the safety effectiveness of single layer versus double layer hand sewn intestinal abnastomosis

OBJECTIVES

- To compare duration required to perform single and double layered intestinal anastomosis.
- To compare the duration of hospital stay in single vs double layered bowel anastomosis.
- To study post operative complications like anastomotic leak in single and double layered intestinal anastomosis.

MATERIAL AND METHODS

The comparative study was done on patients presenting to Krishna Institue of Medical Sciences, Karad, either in emergency or elective undergoing resection anastomosis of bowel from June 2018 to May 2019.

The patients selected for this study are those who were admitted with various clinical conditions requiring resection and anastomosis of small and large bowel. Based on detailed history, thorough clinical examinations, radiological examinations and ultrasound of abdomen, the diagnosis was made. These patients were subjected to the required pre operative investigations; after bowel preparation, ensuring fitness elective surgery was done. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel. Intestinal anastomosis was carried out in single layer continuous extramucosal technique with 3-0 mersilk and double layer continuous technique with 2-0 vicryl taking through all layers and seromucusular layer with 3-0 mersilk.

Each case was analyzed with respect to duration required to perform intestinal anastomosis, post operative complications like anastomotic leak and the duration of hospital stay The duration of anastomosis begin with placement of first stitch on the bowel and ended when the last stitch was cut . All single layer anastomosis was done with mersilk 3-0 pack which had a suture material of 90 cm length. For double layer, 2-0 vicryl was used taking through all layers andseromucusular layer with 3-0 mersilk pack which had suture material measuring

90 cm. Cost effectiveness is not studied here in our study. All cases were followed up to discharge and subsequently for a follow up period of 2 weeks. A minimum of 50 cases with the following inclusions and exclusion criteria were selected for the study and were allocated alternatively to each of the comparative study group.

Inclusion criteria:

1. Patients undergoing resection and anastomoses of small bowel and large bowel at our hospital for causes like intestinal obstructions due to bowel ischemia, strangulated hernia, traumatic bowel injury, bowel tumours etc.
2. Age more than 18 years and less 60 years.

Exclusion criteria:

1. Esophageal, gastric and duodenal anastomosis.
2. Age less than 18 years and more than 60 years.

RESULTS

Table -1: AGE DISTRIBUTION

Age Groups (Years)	Group A (Single Layer) n (%)	Group B (Double Layer) n(%)
20-30	5 (20%)	5 (20%)
31-40	8 (32%)	6 (24%)
41-50	6 (24%)	9 (36%)
51-60	6 (24%)	5 (20%)
TOTAL	25 (100%)	25 (100%)
MEAN AGE	**41.4**	**41.32**

In our study we had two groups, Group A (single layer) and Group B (Double layer). Maximum number of patients in group A (single layer) were in the age group of 31-40 years i.e. 08 (32%) and in group B (double layer) maximum number of patients were in the age group of 41-50 years i.e. 09 (36%). The mean age in group A (single layer) was 41.4 years and in group B (double layer) was 41.32 years.

Graph 1 - Age Distribution

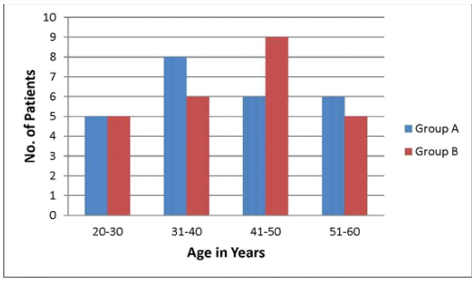


Table -2: SEX DISTRIBUTION

Gender	Group A (Single Layer) n (%)	Group B (Double Layer) n (%)
Male	17 (68%)	15 (60%)
Female	08 (32%)	10 (40%)

In our study, In Group A (single layer) there were 17 (68%) males and 08 (32%) females. In group B (Double layer) there were 15 (60%) males and 10 (40%) females.

Graph 2- SEX DISRIBUTION

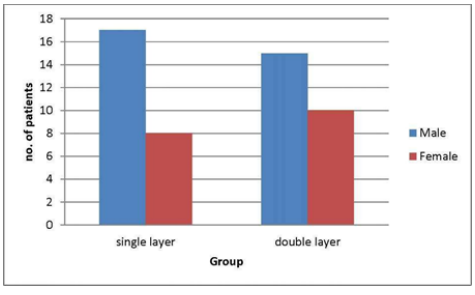


Table-3: DISEASE GROUP AND PATIENTS

Disease group	No. of cases	N (%)
Caecal mass (GIST)	2	4%
Carcinoma ascending colon	5	10%
Carcinoma caecum	1	2%
Caecal perforation	1	2%
Carcinoma transverse colon	3	6%
Carcinoma descending colon	3	6%
Carcinoma rectosigmoid	1	2%
Ileocaecal tuberculosis	7	14%
Jejunal stricture	2	4%
Multiple ileal perforation	2	4%
SMA syndrome	2	4%
Terminal ileal stricture	13	26%
Terminal ileal TB stricture	4	8%
Strangulated inguinal hernia	4	8%

In our study of fifty cases in both groups terminal ileal stricture was diagnosed in maximum number of patients i.e. 13 (26%) cases.

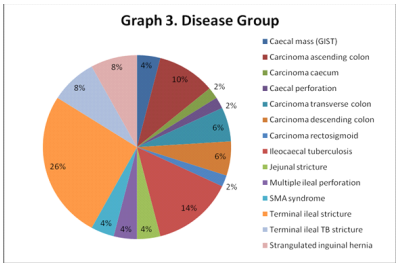


Table-4: Type And Number Of Procedures Performed

Procedure	No of cases	n %
Anterior resection and colorectal anastomosis	1	2%
Left hemicolectomy with colorectal anastomosis	4	8%
Resection of terminal ileum, caecum with ileo-ascending anastomosis	13	26%
Resection of ileum with ileo-ileal anastomosis	21	42%
Right hemicolectomy with ileo- transverse anastomosis	8	16%
Resection of jejunum with jejuno-jejunal anastomosis	2	4%
Resection of jejunum and ileum with jejuno-jejunal anastomosis	1	2%

In our study of fifty cases in both groups resection of terminal ileum and ileoileal anastomosis was performed in maximum number of patients i.e. 21 (42%) cases.

Graph - 4 Type And Number Of Procedures Performed

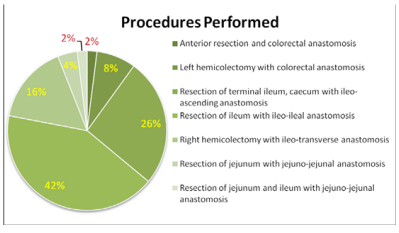


Table -5: ANASTOMOTIC SITE

Anastomotic site	Group A (Single Layer) n (%)	Group B (Double Layer) n (%)
Entero enteric	11 (44)	13 (52)
Entero colic	12 (48)	9 (36)
Colo Colic	2 (8)	3 (12)
Total	25 (100)	25 (100)

This study included a total of fifty anastomosis at different levels of small intestine and large intestine. The maximum number of anastomosis in group A (single Layer) were performed at entero colic level in 12 (48%) patients, next at entero enteric site in 11 (44%) patients and least at colo colic site in 2 (8%) patients. In group B (double layer),out of 25 anastomosis maximum number ofanastomosis were performed at entero enteric level in 13 (52%) patients, next common site for anastomosis was at entero colic site in 9 (36%) patients and followed by colo colic site in 3 (12%) patients.

Graph - 5: ANASTOMOTIC SITE

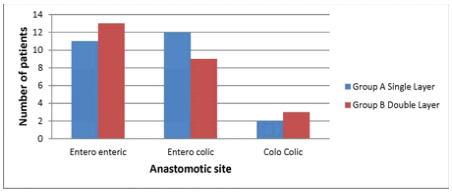


Table -6: TYPE OF ANASTOMOSIS

Type of anastomosis	Group A (Single Layer) n (%)	Group B (Double Layer) n (%)
End to end	25 (100)	25 (100)
Side to side	-	-
End to side	-	-
Total	25 (100)	25 (100)

The study included three different types of anastomosis all together in both groups depending up on the position of the viscera. In both the groups endto end type of anastomosis was done in all of the cases, i.e. in group A (single layer) 25 (100%) patients and in group B(double layer) 25(100%) patients. No side to side type of anastomosis or end to side anastomosis was performed in either of groups.

Graph - 6: TYPE OF ANASTOMOSIS

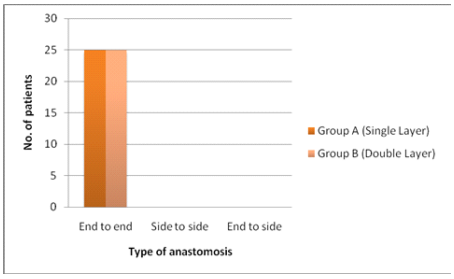


Table -7: DURATION OF ANASTOMOSIS

Duration of anastomosis (in minutes)	Group A (Single Layer) n (%)	Group B (Double Layer) n (%)
10-15	1 (4)	-
16-20	22 (88)	-
21-25	2 (8)	1 (4)
26-30	-	19 (76)
31-35	-	5 (20)
Total	25 (100)	25 (100)

P < 0.001 HS

In this comparative study, In group A(single layer) the minimum time required to perform anastomosis was between 10 to 15 minutes in 1 (4%) patient and maximum time was between 21 to 25 minutes in 2 (8)% patients, followed by 22(88%) 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 1 (4%) patients and maximum time was between 31 to 35 minutes in 5 (20%) patients and no anastomosis required beyond 35 minutes. Maximum were done in between 26 to 30 minutes 19(76%). P value was <0.001 HS.

Graph – 7 : DURATION OF ANASTOMOSIS

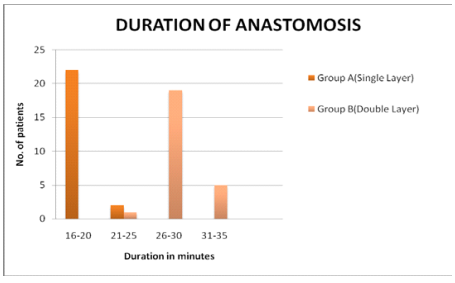


Table-8: Comparison Of Mean Duration Of Anastomosis Between Two Groups

Groups	Range (Duration in minutes)	Mean±SD (Duration in minutes)	Mean difference	t* value	P value
Group A (Single Layer)	14 - 22	19.04±1.60	10.16	19.6	0.000
Group B (Double Layer)	25 - 35	28.8±2.02			

***Unpaired t test**

Mean difference of duration between the two groups is found to be 10.16 and p value is 0.000 which is < 0.005 and is highly significant.

Table -9: COMPLICATION- ANASTOMOSTIC LEAK

Complication	Group A (Single Layer) n(%)	Group B(Double Layer) n(%)
Anastomotic Leak	1 (2)	2 (4)

p = 0.5 , not significant (chi-square test)

In our comparative study, overall complication in the form of anastomotic leak was noted in 3(6%) patients. Anastomotic was observered in group A (single layer) in 1 (4%) patient and occurred in group B (double layer) in 2(4%) patients. The p value was 0.5 (chi-square test)

Graph 8. Complication - Anastomotic leak

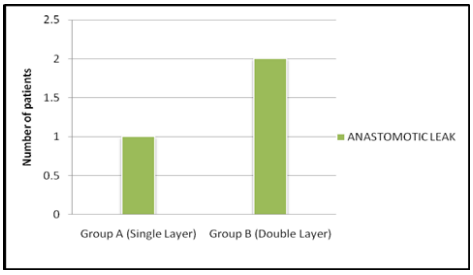


Table -10: FINAL OUTCOME

Out come	Group A (Single Layer) n(%)	Group B (Double Layer) n(%)
DEATH	0 (0)	1 (4)
RECOVERED	1 (4)	1 (4)
ASYMPTOMATIC	24 (96)	23 (92)

p = 0.14 ns (fisher's exact test)

In this study two patients who had developed anastomotic leak in group B(double layer),among them 1(4%) patient responded well to conservative management and recovered. one more patient (4%) who had anastomotic leak in group B (double layer) died due to septicaemia and rest 23 patients (92%) were asymptomatic. In group A (single layer) one patient (4%) developed anastomoticleak and recovered with conservative management. p value if found out to be 0.14 and is not significant.

GRAPH.9. FINAL OUTCOME

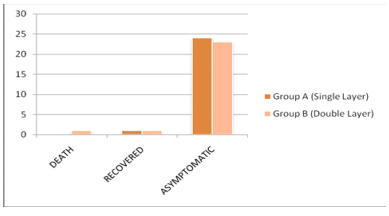


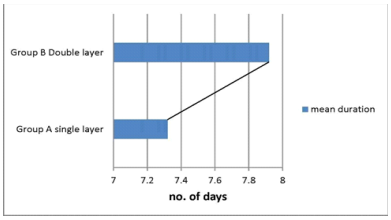
Table -11: Comparision Of Mean Duration Of Hospital Stay

Groups	Range (Duration in minutes)	Mean±SD (Duration in minutes)	Mean difference	t* value	P value
Group A (Single Layer)	5 - 14	7.32±1.72	0.6	1.002	0.322
Group B (Double Layer)	5 - 15	7.92±2.44			

**Unpaired t test*

In our comparative study the mean duration of hospital stay in Group A was 7.32days an in Group B it is 7.92days. Mean difference being 0.6. Unpaired t test and p value shows that the comparison is insignificant.

Graph.10. MEAN DURATION OF HOSPITAL STAY



CONCLUSION

This prospective comparative study included fifty cases of various clinical conditions of small and large bowel requiring resection and anastomosis. The study had two groups, single layer and double layer comprising twenty five cases in each group. Each group was evaluated and compared with respect to duration required, anastomotic leak in single and double layered intestinal anastomosis, outcome associated and the duration of hospital stay in single vs double layered bowel anastomosis.

Though a large number of patients need be to studied to do a dogmatic conclusion, based on the results obtained in the present study following conclusions can be drawn:

- Duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer.
- There is no significant difference in anastomotic leak between two groups.
- There is no significant difference in duration of hospital stay in single vs double layered bowel anastomosis.

This comparative study included fifty cases, comprising of two groups twenty five cases in each group and was conducted Krishna Hospital and Medical Research Centre, Karad during June 2018 to May 2019.

Institute either in emergency or elective undergoing bowel resection and anastomosis were included in the study. All patients were subjected to thorough clinical examinations and radiological examinations. After confirming the diagnosis ensuring fitness emergency or elective surgery were performed after full filling exclusion and inclusion criteria.

Patients data, operative findings, duration of anastomosis and length of hospital stay of all patients were followed till discharge to asses any complications in the form of anastomotic leak. All these data was collected in pretested proforma and were entered in the master chart in both groups. Each case was analysed with respect to duration required, length of hospital stay and to study post operative complications like anastomotic leak in single and double layered intestinal anastomosis. After drawing the results from the statistical test, results were analysed and compared with other comparative studies. In our present series following results were drawn.

- With respect to duration of intestinal anastomosis, In group A (single layer) the range was between 7.67 minutes to 18.00 minutes and mean duration was 14.35 minutes to perform a anastomosis, in group B (double layer) the range was between 16.83 minutes to 24.83 minutes and mean duration was 21.43 minutes to perform a double layered anastomosis per operatively. The mean difference between two groups was 7.08minutes, t value was 11.9 minutes and P value was <0.001 and was highly significant. Considering duration of the
- anastomosis extra mucosal single layer continuous intestinal anastomosis appears to represent the optimal choice for most surgical situations and in shorter duration.
- In comparative study of ours complication rate in the form of anastomtic leak, overall complication in the form of anastomotic leak was noted in 3 patients (6%). Anastomotic leak was observed in one patient who underwent single layered bowel anastomosis whereas two patients in the group of double layered bowel anastomosis had leak. The p value was 0.5 which was not significant. To conclude complication of intestinal anastomosis in our study no evidence was found that single layered intestinal anastomosis leads to fewer postoperative leaks than double layer and either single layer or double layer is superior.
- In our comparative study the duration of hospital stay in the Group A consisting of single layered bowel anastomosis and Group B consisting of double layered bowel anastomosis were compared. The mean duration of hospital stay in Group A is 7.32days and in Group B is 7.92 days. The p value obtained is insignificant. To conclude the duration of hospital stay is the same and one is not superior over the other in this regard.

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