

Original Research Article

Study of clinical outcome of patients undergoing intestinal anastomoses with single layer extramucosal technique and double layer anastomoses

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ABSTRACT

Background: Intestinal anastomosis is one of the common surgeries for cases like bowel obstruction, incarcerated hernias, benign and malignant tumours of small and large bowel. The ideal intestinal anastomosis does not leak and allow normal function of the gastrointestinal tract. This study compared single layer versus double layer intestinal anastomosis in terms of duration, postoperative complications like anastomotic leak.

Methods: A total of 100 patients admitted in Hamidia hospital, based on history and clinical examinations and radiological examinations, placed in two groups, group A (single layer anastomosis) and group B (double layer anastomosis) and were operated by a qualified surgical specialist. Data analysis of anastomotic time, anastomotic leak was done and statistical tests of significance were applied. A p value less than 0.05 is considered as significant.

Results: In group A (single layer) the time required to perform in 30 (60%) patients is between 16-20 minutes. In double layer, maximum were done in between 26 to 30 minutes, 32 (64%). In our study of 100 patients, there were 6 anastomotic leaks, of which four of them were in group A (single layer) and 2 of them in group B (double layer).

Conclusions: In our study, the 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. Less time with no difference in complications, a move towards single layer anastomosis should be preferred.

Keywords: Intestinal anastomosis, Single layer, Double layer anastomoses, Anastomotic leak

INTRODUCTION

Anastomoses, the origin of the word is late Latin (by Galen) and Greek (anastomoun=to provide with a mouth; ana+stoma=mouth, orifice). The ideal intestinal anastomosis is the one which does not leak and allow normal function of the gastrointestinal tract within a few days of construction. It should be easy to construct, reproducible and easy to teach.¹

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 in his experimental work. Single layer continuous technique

was first described by Hautefeuille in 1976. He tried extramucosal single layer anastomotic techniques to overcome the shortcomings of double layer method.

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.⁴ Different techniques of intestinal anastomosis are single layered closure, double layered closure, staples, glue and laser welding.⁵

Historically, two-layer anastomosis using interrupted silk sutures for an outer inverted seromuscular layer and a running absorbable suture for a transmural inner layer has been standard for most surgical situations. Some recent

reports have described single-layer continuous anastomosis using monofilament sutures as requiring less time and cost than any other method, without incurring any added risk of leakage.^{6,7}

The factors which affect gastrointestinal anastomosis positively are tension free anastomosis, meticulous approximation of well vascularised bowel, gentle handling of the bowel and adequate hemostasis, while malnutrition, abdominal sepsis, generalized sepsis and immunosuppression can negatively affect anastomosis.⁸ So, anastomotic integrity is an important determinant of immediate outcome in gastrointestinal surgery. A major complication of gastrointestinal anastomosis is anastomotic leak and may lead to peritonitis, intra-abdominal abscess, fistula, necrosis and stricture.⁹

This study compared outcome of single layer versus double layer intestinal anastomosis in small and large bowel in terms of duration required to perform intestinal anastomosis, postoperative complications like anastomotic leak, duration of hospital stay in each group.

Aims and objectives

The aims and objectives were to compare time duration required to perform single and double layered intestinal anastomosis and to study postoperative complications like anastomotic leak in single and double layered intestinal anastomosis.

METHODS

This was an observational prospective study conducted at the department of general surgery, Gandhi medical college and associated Hamidia hospital in the city of Bhopal, Madhya Pradesh, India, over a period of 2 years beginning from October 2018 to October 2020.

Inclusion criteria

Patients who gave written informed consent were included in the study.

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 ischaemia were also included. Patients with age more than 16 years and less than 60 years were also included.

Exclusion criteria

Patients with age less than 16 years and more than 60 years, patients who were not willing to give written informed consent, patients with resection anastomosis done for perforation with gross contamination of peritoneal cavity and patients with associated co-morbid diseases like sepsis, known cardiovascular disease,

grossly deranged liver function were excluded from the study.

Based on detailed history, thorough clinical examinations, radiological examinations and ultrasound of abdomen, the diagnosis was made.

Patients were placed in either group A (single layer continuous extramucosal anastomosis) or group B (double layer anastomosis) as per surgeon's choice. All the patients were operated by a qualified surgical specialist. Different procedures were primary end to end anastomosis, ileo ileal and jejunal, ileo colic anastomosis. Informed consent was taken from all the patients before including them in the study.

Intestinal anastomosis was carried out in single layer continuous extramucosal technique with 3-0 vicryl and double layer continuous technique with 3-0 vicryl taking through all layers and seromuscular layer with 3-0 mersilk. All single layer anastomosis was done with vicryl 3-0 pack which had a suture material of 90 cm length. For double layer, 3-0 vicryl was used taking through all layers and seromuscular layer with 3-0 mersilk pack which had suture material measuring 90 cm. Each case was analyzed with respect to duration required to perform intestinal anastomosis, postoperative complications like anastomotic leak and the duration of hospital stay. The duration of anastomosis will be measured from the start of first stitch of anastomosis till the completion of last stitch of anastomosis.

All cases were followed up to discharge and subsequently for a follow up to period of 2 weeks. Patients were allowed to take orally after the resumption of bowel activity. Anastomotic dehiscence or leak was diagnosed on clinical grounds as for leakage gastrointestinal contents from the wound or through the drain and purulent discharge with or without systemic signs. They were diagnosed either clinically or radiographically by contrast enema or computed tomography scan. Postoperative hospital stay is defined as number of days from the day of operation to discharge.

The data were collected and recorded on a printed proforma including patients demographics, operative findings, anastomotic time, anastomotic leak and wound infection. Data analysis was done and statistical tests of significance were applied wherever required. A p value less than 0.05 is considered as significant.

RESULTS

Maximum number of patients in group A (single layer) were in the age group of 31-40 years, that is, 14 (28%) and in group B (double layer) maximum number of patients were in the age group of 41-50 years, that is, 14 (28%).

Table 1: Age distribution.

Age groups (in years)	Group A (single layer) N (%)	Group B (double layer) N (%)
16-20	2 (4)	4 (8)
21-30	10 (20)	10 (20)
31-40	14 (28)	12 (24)
41-50	12 (24)	14 (28)
51-60	12 (24)	10 (20)
Total	50	50
Mean age	38.86	40.40

Table 2: Sex distribution.

Gender	Group A (single layer) N (%)	Group B (double layer) N (%)
Male	32	34
Female	18	16

Table 3: Disease group and patients.

Disease group	Number of cases	Group A, N (%)	Group B, N (%)
Carcinoma ascending colon	10	6	4
Carcinoma caecum	10	5	5
Carcinoma transverse colon	2	1	1
Ileocaecal tuberculosis	22	12	10
Ileal stricture	23	9	14
Jejunal stricture	14	6	8
SMA syndrome	5	4	1
Strangulated inguinal hernia	9	3	6
Multiple ileal perforation	1	1	0
Carcinoma descending colon	4	3	1

Table 4: Type and number of procedures performed.

Procedure	Number of cases	Group A (single layer) N (%)	Group B (double layer) N (%)
Resection of ileum with ileoileal anastomosis	36	18	18
Resection of jejunum with jejunojejunal anastomosis	14	6	8
Right hemicolectomy	10	6	4
Resection of terminal ileum and caecum with ileoascending anastomosis	29	12	17
Resection with jejunoileal anastomosis	5	4	1
Left hemicolectomy	6	4	2

Table 5: Anastomotic site.

Anastomotic site	Group A (single layer) N (%)	Group B (double layer) N (%)
Enteroenteric	28	27
Enterocolic	18	21
Colocolic	4	2
Total	50	50

Table 6: Type of anastomosis.

Type of anastomosis	Group A (single layer) N (%)	Group B (double layer) N (%)
End to end	50	50
Side to side	-	-
End to side	-	-
Total	50	50

Table 7: Duration of anastomosis.

Duration of anastomosis (minutes)	Group A (single layer) N (%)	Group B (double layer) N (%)
10-15	1 (2)	-
16-20	30 (60)	-
21-25	18 (36)	4 (8)
26-30	1 (2)	32 (64)
31-35	-	13 (26)
36-40	-	1 (2)
Total	50 (100)	50 (100)

Table 8: Complication-anastomotic leak.

Complication	Group A (single layer) N (%)	Group B (double layer) N (%)
Anastomotic leak	2	4

In group A (single layer) there were 41 (82%) males and 9 (18%) females. In group B (double layer) there were 36 (72%) males and 14 (28%) females.

In our study of hundred cases in both groups, ileal stricture was diagnosed in maximum number of patients, that is, 23 (23%) cases followed by ileo caecal tuberculosis 22 (22%) cases and resection of terminal ileum and ileo ileal anastomosis was performed in a maximum number of patients, that is, 35 (35%) cases.

The maximum number of anastomosis in group A (single layer) were performed at entero enteric level in 29 (58%). In group B (double layer), out of 50 anastomosis maximum number of anastomosis were performed at entero colic level in 24 (48%) patients. In both the groups, end to end type of anastomosis was done in all of the cases.

In group A (single layer) the minimum time required to perform anastomosis was between 10 to 15 minutes in 1 (2%) patient and maximum time was between 26 to 30 minutes in 1 (2%) patients, followed by 30 (60%) patients between 16-20 minutes followed by 18 (36%) patients in 21-25 minutes and no anastomosis took more than 30 minutes. In group B (double layer) the minimum time required to perform anastomosis was between 21 to 25 minutes in 1 (2%) patients and maximum time was between 41 to 45 minutes in 1 (2%) patients and no anastomosis required beyond 45 minutes. Maximum were done in between 26 to 30 minutes, 32 (64%).

On doing unpaired t test between duration of anastomosis (mins) and the two techniques, the t value was obtained as 15.54, which was statistically significant given by the $p < 0.001$.

In our study of 100 patients, there were 6 anastomotic leaks, of which four of them were in group A (single layer) and 2 of them in group B (double layer). No significant association between anastomotic leak and different types of technique ($p > 0.05$).

DISCUSSION

Sibabrata et al conducted a study comparing single layer (group A) versus double layer (group B) intestinal anastomosis and 97 participants were randomized.¹⁰ The mean time taken for anastomosis (15.12 minutes in group A versus 24.3 minutes in group B). In the present study, mean time taken for anastomosis was 20.04 minutes in group A versus 29.66 minutes in group B.

Ordorica et al conducted a study comparing single layer anastomosis versus 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 ($p < 0.001$) which correlated with our study.

Sai et al conducted a study comparing single layer anastomosis versus double layer anastomosis.¹² 29 cases

were included in the study. Anastomotic leak was observed in group A (single layer) in 3 (10.3%) patients and in group B (double layer) in 2 (6.8%) patients. The p value was 0.5 (Chi-square test), which was not significant and it correlated with our study. In the present study, anastomotic leak in group A was 2 (4%) versus group B 4 (8%).

Relation of age with anastomotic complication

Three of them were of 60 years of age, one of 58 years, one of 49 years and one of 41 years of age. Hence elderly age was found to be a risk factor for anastomotic leak.

Male gender as an independent risk factor

In our study, in group A (single layer) there were 41 (82%) males and 9 (18%) females. In group B (double layer) there were 36 (72%) males and 14 (28%) females.

Longer duration of surgery

Longer duration of surgery in double layered anastomosis was considered as a risk factor for anastomotic leak.

Surgical technique

Though statistically not significant, it was found that double layer anastomosis have higher rate of anastomotic leaks. Male sex, elderly age, obesity, severe comorbidities (higher American society of anesthesiology ASA score), prolonged surgery time, perioperative blood transfusions, low anastomosis and neoadjuvant chemoradiotherapy were proposed risk factors for anastomotic leak.

Limitation

The limitation was that the number of patients in group were small from single centre.

CONCLUSION

Based on the results obtained in the present study, following conclusions were drawn. Duration required to perform a single layer intestinal anastomosis was significantly lesser when compared to double layer.

There was no significant difference in anastomotic leak between two groups.

The overall shorter operative time in case of single-layer method might be of significance in patients with haemodynamic instability who were operated in emergency. Moreover, this technique was easily learned, flexible in its application. Less time with no difference in complications, a move towards single layer anastomosis should be preferred.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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