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Original research article

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

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Abstract

Background: Intestinal anastomosis is one of the most common surgical procedure, required in the patients suffering with intestinal malignancy, inflammation, non-traumatic perforation, obstruction, etc. The present study assessed the efficacy and safety of the single layered anastomosis against the double-layered anastomosis after intestinal resection at a tertiary hospital.

Material and Methods: Present study was single-center, prospective, comparative study, conducted in patients of either gender, >18 years of age, required emergency resection and anastomosis of small intestine.

Results: In present study, 72 patients were divided as Group S (single layered anastomosis) and Group D (double layered anastomosis), 36 patients in each group. Both groups were comparable in terms of age, gender, co-morbidities & primary diagnosis, difference was not significant statistically (p> 0.05). Common procedures among both groups were Resection and ileo-ileal anastomosis (44.44% vs 47.22%) & Resection and jejuno-ileal anastomosis (22.22% vs 19.44%). Surgical procedures were comparable among both groups, difference was not significant statistically. Anastomosis time was comparatively lesser in single layer group as compared to double layer group (13.41 ± 4.14 minutes vs 21.37 ± 6.38 minutes) & difference was significant statistically (< 0.001).Postoperative complications were less in single layer group (1 cases of Dehiscence of anastomosis leak & 3 cases of Infection of surgical wound) as compared to double layer group (1 cases of Dehiscence of anastomosis leak & 3 cases of Infection of surgical wound), difference was not significant statistically (p> 0.05).

Conclusion: Single layer anastomosis is preferable, safe and economic technique in comparison to the conventional double layered anastomosis as single layer anastomosis required less time construct the anastomosis, less incidence of complication like anastomotic leak & overall less cost of surgery,

Keywords: Intestinal anastomosis, single layer anastomosis, double layered anastomosis, laparotomy

Introduction

Intestinal anastomosis is one of the most common surgical procedure[1], required in the patients suffering with intestinal malignancy, inflammation, non-traumatic perforation, traumatic perforation and ischemic necrosis, infection like TB with stricture, obstruction, congenital conditions like intestinal atresia, Hirschsprung syndrome or injuries leading to malfunctioning of area affected[2, 3].

Bowel anastomoses after resection of bowel may be either end to end anastomoses and side to side or side to end anastomoses depending upon the site of anastomosis, condition of the bowel and the underlying disease etiology, and also the general condition of the patient. Different techniques of intestinal anastomosis are single, double layered closure, staples, glue, laser welding[4].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[5].

The utility of any technique for intestinal anastomosis depends mainly on its ability to heal without a leakage. The present study assessed the efficacy and safety of the single layered anastomosis against the double-layered anastomosis after intestinal resection at a tertiary hospital.

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Material and Methods

Present study was single-center, prospective, comparative study, conducted in department of general surgery, at Srinivas medical college & hospital, Mukka,Surathkal, Mangalore, India. Study duration was of 2 years (July 2019 to June 2021). Ethical approval was taken from the institutional review committee.

Inclusion criteria

- Patients of either gender, >18 years of age, required emergency resection and anastomosis of small intestine (for conditions like intestinal obstruction due to bowel ischemia, strangulated hernia or traumatic bowel injury etc.), willing to participate in study.

Exclusion criteria

- Patients who required proximal diversion or stoma, multiple intestine anastomosis and colonic anastomosis
- Critically ill patients, polytrauma

Study was explained to patient & relatives, and an informed consent was taken for all the patients. Details such as name, age, gender, relevant history, physical status, clinical examination findings were noted in case record proforma. Haematological investigations (haemoglobin%, CBC, LFT's, RFT's, electrolytes, serum proteins, Blood grouping and Rh typing), ECG & radiological investigations (X ray chest & abdomen erect, USG) were done in all patients. CECT, MRI were done whenever required.

The enrolled patients were allocated into two groups by lottery method as Group S (single layered anastomosis) and Group D (double layered anastomosis). For double layered anastomoses, the inner transmural layer was approximated with 2-0 polyglactin suture in continuous manner, whereas the outer seromuscular layer was sutured with 2-0 silk sutures in interrupted manner. For single layer anastomoses, 2-0 polyglactin suture was used to approximate the bowel in continuous manner. Time taken for the surgical procedure was recorded, starting with the placement of first suture till the placement of last suture.

The patients were managed postoperatively in a standard way and were followed up for 30 days. During the hospital stay and follow up patients were observed for the evidence of anastomotic leak.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi- square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

Results

In present study, 72 patients were divided as Group S (single layered anastomosis) and Group D (double layered anastomosis), 36 patients in each group. Both groups were comparable in terms of age, gender, co-morbidities & primary diagnosis, difference was not significant statistically (p> 0.05).

Table 1: General characteristics

Variables	Group S [Mean ± SD / Value (%)]	Group D [Mean ± SD / Value (%)]	P value
Age (in years)	46.56± 13.38	48.27± 12.06	0.62
Sex, n (%)			0.73
Male	25 (69.44%)	28 (77.78%)	
Female	11 (30.56%)	8 (22.22%)	
BMI in kg/m2, mean (SD)	23.42± 3.06	23.02± 2.63	0.82
Co-morbidities			0.56
Alcoholism	12 (33.33%)	9 (25%)	
Hypertension	9 (25%)	8 (22.22%)	
Diabetes	5 (13.89%)	4 (11.11%)	
Smoking	5 (13.89%)	3 (8.33%)	
Asthma	2 (5.56%)	3 (8.33%)	
Tuberculosis	2 (5.56%)	2 (5.56%)	
Diagnosis.			0.72
Obstruction	9 (25%)	9 (25%)	
Perforation	9 (25%)	8 (22.22%)	
Strangulated hernia	8 (22.22%)	9 (25%)	
Malignancy	4 (11.11%)	6 (16.67%)	
Obstructed hernia	3 (8.33%)	2 (5.56%)	
Ileocecal TB	2 (5.56%)	1 (2.78%)	
Mesenteric cyst	1 (2.78%)	1 (2.78%)	

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Common procedures among both groups were Resection and ileo-ileal anastomosis (44.44% vs 47.22%) & Resection and jejuno-ileal anastomosis (22.22% vs 19.44%). Surgical procedures were comparable among both groups, difference was not significant statistically (p> 0.05).

Table 2: Procedure

Procedure	Group S [Value (%)]	Group D [Value (%)]	P value
Resection and ileo-ileal anastomosis	16 (44.44%)	17 (47.22%)	0.82
Resection and jejuno-ileal anastomosis	8 (22.22%)	7 (19.44%)	0.87
Right hemicolectomy and ileo-transverse anastomosis	5 (13.89%)	4 (11.11%)	0.78
Left hemicolectomy and colo-colic anastomosis	3 (8.33%)	3 (8.33%)	-
Limited resection and ileo-colic anastomosis	3 (8.33%)	4 (11.11%)	0.89
Distal gastrectomy and roux en y gastro- jejunostomy with jejuno-jejunostomy	1 (2.78%)	1 (2.78%)	-

Anastomosis time was comparatively lesser in single layer group as compared to double layer group (13.41 ± 4.14 minutes vs 21.37 ± 6.38 minutes) & difference was significant statistically (< 0.001).Postoperative complications were less in single layer group (1 cases of Dehiscence of anastomosis leak & 3 cases of Infection of surgical wound) as compared to double layer group (1 cases of Dehiscence of anastomosis leak & 3 cases of Infection of surgical wound), difference was not significant statistically (p> 0.05).

Table3: Operative & postoperative variables

Variables	Group S [Mean ± SD/Value (%)]	Group D [Mean ± SD/Value (%)]	p-value
Anastomosis time (minutes)	13.41 ± 4.14	21.37 ± 6.38	< 0.001
Duration of postoperative hospital stay (days)	6.01 ± 1.32	6.36 ± 0.66	0.69
Postoperative complications			
Dehiscence of anastomosis	1 (2.78%)	3 (8.33%)	0.39
Infection of surgical wound	3 (8.33%)	4 (11.11%)	0.89

Discussion

There are various factors which influence the healing of anastomoses including blood supply, tension at suture line, surgical technique, and cleanliness of gut at the time of surgery. These factors must be kept in mind along with proper apposition of submucosa of gut wall in order to get improved outcomes[6, 7].

In study by Sai KL[8], mean duration required to perform anastomosis in Group A (single layer anastomosis) was 21.64±1.60 minutes and in Group B (double layer anastomosis) was 29.6±2.02 minutes, difference was statistically significant. 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.

Rai A[9] noted that, in group A (single layer) the time required to perform in 60% patients was 16-20 minutes. In double layer, maximum (64%) were done in 26-30 minutes. Out of 100 patients, there were 6 anastomotic leaks, of which 4 were in group A (single layer) and 2 in group B (double layer). The duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer. There was no significant difference in anastomotic leak between two groups, thus single layer anastomosis should be preferred.

In study by Dhamnaskar SS *et al*.,[10] they noted that length of suture used for single layer (mean of 15.06 cm) was statistically significantly lesser than that for double layer (mean 19.90 cm) (p.0.001). Time taken for anastomosis and overall surgical time too was significantly less for single layer group (p.0.001 and 0.022 respectively). Complications including anastomotic dehiscence were not significantly different between two groups. Postoperative recovery of bowel function was earlier in single layer group with marginal statistical significance (p=0.048).

In study by Patil M[12], mean duration required to perform anastomosis in single-layer group was 18.23 ± 3.35 min and in double-layer group was 29.70 ± 2.74 min. The difference between the mean duration required for anastomosis between the two groups were statistically significant. Single layered intestinal anastomosis was found to be more economical compared to double layer as the total number of suture packs required in double-layered anastomosis (Vicryl and silk) was 2, whereas in single-layer anastomosis only one pack of vicryl was used. Cases in Group A and Group B developed anastomotic leak and the difference was statistically insignificant. There was statistically significant difference between the single layer anastomosis and double layer in terms of time taken to perform anastomosis; cost effectiveness of single layer anastomosis, however there is no difference in recovery of bowel function, postoperative anastomotic leak.

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Cochrane database review compared effectiveness of single layer versus double layer gastrointestinal anastomosis & suggested further trials aimed to reduce the limitations of the review since the conclusion was derived from smaller number of patients recruited in relatively moderate quality trials[12].
Many surgeons probably now use single-layer suturing due to reduction in ischemia, tissue necrosis, or narrowing of the lumen compared to the two-layer methods. In double layered closure where mucosa and sero-muscular layers are sutured separately though there is more chance of strangulation of mucosa because of damage of sub mucosal vascular plexus[13].
The shortcomings associated with double-layered technique include the risk of stricture formation, failure to oppose clean serosal surfaces, increased chances of leakage, excessive inversion causing narrowing of lumen[14].

Conclusion
Single layer anastomosis is preferable, safe and economic technique in comparison to the conventional double layered anastomosis as single layer anastomosis required less time construct the anastomosis, less incidence of complication like anastomotic leak & overall less cost of surgery, Thus single layer anastomosis should be procedure of choice for surgeons anastomosis of intestines in elective and emergency laparotomy.

Conflict of interest: None to declare.

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