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Original Research Article

Comparative Study between Single vs Double Layer Intestinal Anastomosis

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Abstract

Background: In gastrointestinal surgeries, intestinal anastomosis is a routine and important process. While double layer anastomosis was once thought to be secure, several surgeons now contend that single layer anastomosis with non-absorbable suture yields comparable outcomes.

Methods: A single-centre retrospective cohort comparative study was conducted in the Department of General Surgery, Govt. Medical College and Hospital, Kota, Rajasthan, India during April 2022 to June, 2023. A total of 50 patients were taken, out of which 35 underwent double layer anastomosis and 15 patients had single layer anastomosis.

Result: A total of fifty patients were enrolled; thirty-five underwent double layer anastomosis and fifteen underwent single layer anastomosis. Accordingly, the patients in each group were matched for diagnosis, sex, and age. Both the length of hospital stay and the mean time required for anastomosis were significantly shorter in Group-A. Compared to the double layer group, the single layer group experienced a faster postoperative return of bowel function. The double-layered group incurred a comparatively higher cost for the suture material used. However, there was no significant difference in the complication rates between the two groups.

Conclusions: There is not much difference in development of complications in both the methods. Both have same efficacy, mean time taken return of bowel movements. A single layer requires less operating time and is more economical.

Keywords: anastomosis, anastomotic leak, hand sewn, single layer anastomosis, double layer anastomosis

Introduction

Regardless of the technique used, the theory for achieving a safe, healthy bowel anastomosis is always the same. Regretfully, though, some anastomoses leak despite the "perfect patient," healthy bowel, and meticulous technique; this leads to significant morbidity and mortality (e.g., 22% mortality in patients with a leak vs 7.2% mortality in those without [1]. Roughly 4% of all anastomoses performed after resection of a colonic tumour (and a higher percentage of colorectal anastomoses) leak; lowering this rate would improve mortality [2]. "The precise union of two viable bowel ends with complete avoidance of tension" is said to be "the key to a successful anastomosis" [3]. Thus, the most important factors in the creation of a bowel anastomosis are: (1) meticulous technique; (2) good blood supply; and (3) no tension. Furthermore as shown in the table, various patient and technical factors can influence anastomotic healing

Table 1: Patient factors affecting anastomotic healing

Positive factors	Negative factors
Good nutritional status [4] - low pre-operative albumen and recent weight loss of over 5 kg are independent risk factors for anastomotic leakage [5,6] Haemodynamic stability [7]Healthy bowel ends and microvasculature [7]	High-dose steroids [4] Old age [4] Anaemia - haemoglobin < 11g/dL is an independent risk factor for anastomotic leakage [4,6] Uraemia [4] Diabetes mellitus [4] Smoking [5] Alcohol abuse [5] High risk site of anastomosis (e.g., low colorectal anastomoses) [5] Pre-operative radiotherapy - results vary, but some studies have shown an increased anastomotic leak rate following anterior resection after long course radiotherapy[5] Male sex in colorectal anastomoses - presumably as the narrow pelvis results in poor visualisation and a more challenging operation [5]

In the traditional approach of anastomosis i.e. inner layer with absorbable suture in continuous pattern and outer layer with non-absorbable suture in continuous or interrupted pattern has been the conventional method. But, it is tedious, time-consuming and there is potential risk of anastomotic stricture formation. Recently, many surgeons have embraced single layer continuous anastomosis using monofilament suture due to reports describing its cost-effectiveness, less time consumption and no increase in rates of leakage as compared to double-layer method [2].

Aims and Objectives:

1. Complications of Single layer technique and the Double layer technique in emergency and elective surgeries.
2. Time required for performing single layer anastomosis as well as double layer anastomosis.
3. The economical viability of monolayer anastomosis..

Materials and Method

A single-centre prospective cohort comparative study was conducted in the Department of General Surgery, Govt. Medical College and Hospital, Kota, Rajasthan, India during April 2022 to June, 2023.

Patients requiring intestinal resection and anastomosis, were assessed for eligibility following admission to the ward. Patients enrolled were subjected to physical examination, routine blood investigations and imaging (ultrasonography or computed tomography of abdomen) as appropriate.

Patients Included

1. Adult patients aged 18-65 years of either sex.
2. Patients who are hemodynamically stable patients with no peritoneal contamination.
3. The study included both elective and emergency procedures involving stoma closure, ileo-colic and colo-colic anastomoses, jejuno-jejunal, jejuno-ileal, and ilieo-ileal anastomoses..

Exclusion Criteria

1. Patients undergoing gastric, duodenal and rectal anastomosis, or proximal diversion were not included. 2. Cases where delayed recovery was anticipated i.e., septicemic or hypovolemic shock. 3. Profuse intraoperative or postoperative bleeding (>1 litre);

4. Severely cachectic patients who required simu taneous total parenteral nutrition;

5. re-exploration cases.

6. Severe systemic organ dysfunction (chronic liver, renal or heart diseases, diabetes mellitus).

7. Immunocompromised patients were excluded from the study.

After explaining the study protocol to each participant, prior written informed consent was obtained. Participants were randomised to undergo single layered extramucosal intestinal anastomosis (Group-A) or double layered intestinal anastomosis (Group-B).. The study participants and the care providers who followed up the patients in the postoperative ward were unaware of the type of anastomosis.

Primary outcome measures included average time taken for anastomosis in minutes, incidence of postoperative complications (such as anastomotic leak, intra-abdominal abscess, pelvic collection, persistent vomiting abdominal detention), mean duration of hospital stay, and cost of suture material used. Secondary outcome measures assessed the postoperative return of bowel function and included duration of nasogastric tube kept in situ (in days), duration for return of bowel sounds postoperatively (mean in days) and Patients who needed anastomosis and intestinal resection had their eligibility evaluated after being admitted to the ward.

The single layered anastomoses were performed by using continuous 3-0 polyglycolic acid suture starting at the mesenteric border and taking all layers of bowel wall except the mucosa into bite. The double layered anastomoses were performed using interrupted 3-0 silk Lembert sutures for outer layer and continuous 3-0 polyglycolic acid suture for the transmural inner layer.

To ensure water tight anastomosis and at the same time avoid ischemia optimum pressure was applied to the suture while approximating the bowel ends.

Notes were made regarding intraoperative findings, hemodynamics and complications if any, quantity and cost of suture material used, . Duration required for the anastomosis was recorded from the beginning with the placement of first stitch and ending with cutting of extra suture material from the last stitch of anastomosis. The nasogastric tube was inserted selectively postoperatively, contingent on the patient's clinical course, and was not used preoperatively in any of the patients undergoing stoma closure. All patients received similar antibiotics (i.e., Injection Ceftriaxone and Metronidazole) and standard postoperative care. Patients were followed up till two weeks post-surgery. The time taken for postoperative return of bowel function was assessed. Any immediate or delayed complications were recorded. Anastomotic leak was defined as radiographic demonstration of a fistula or non-absorbable material draining from a wound after oral administration, or visible disruption of the suture line during re-exploration. Intra-abdominal abscess without visible

discharge was seen in patients as fever, persistent abdominal pain, tachycardia, and raised leucocyte count and was confirmed on ultrasound of the abdomen. Commencing on the day of operation, the total length of hospital stay (in days) was calculated.

Results

A total of 50 patients were taken, out of which 35 underwent double layer anastomosis and 15 patients had single layer anastomosis.

Distribution on the basis of sex, diagnosis

Parameters	Group A [single layer]	Group B [double layer]
Sex		
Male	9	20
Female	6	15
Diagnosis		
Trauma	1	6
Cancer	5	9
Inflammatory/ others	6	11
Stoma closure	3	9
Anastomotic site	**Group A [single layer]**	**Group B [double layer]**
Jejuno-jejunal	0	1
Ileo-ileal	1	1
Ileo-ascending	1	5
Ileo-transverse	4	9
Colo-colic	5	9
Ileostomy closure	2	6
Colostomy closure	2	4
Total	15	35

Distribution on the basis of anastomotic site

Distribution on the basis of characteristics of the patients

Observed parameter	Single layer group	Double layer group
Duration taken for anastomosis[in min]	22.2	35.8
Duration of NG tube kept in situ [in days]	3	3
Return of bowel sounds in post op days [in days]	2	3
Complications recorded	3	5
Mean stay in hospital [in days]	8	8

Distribution of various post-operative complications

Complication	Single layer group	Double layer group
Anastomotic leak	0	2
Abdominal abscess	0	1
Pelvic collection	1	1
Persistent vomiting	1	1
Abdominal distention	1	0
Total	3	5

1 patient died from double layer anastomosis post re-exploration for anastomotic leak.

Discussion

Certain factors have to be taken care of while creating a bowel anastomosis; gentle tissue handling, adequate apposition of bowel ends, good blood supply and absence of tension or distal obstruction [6].

Interrupted absorbable or non-absorbable sutures are utilized for outer sero-muscular layer and continuous or interrupted absorbable sutures are used for the trans-mural inner layer in case of double layered anastomosis [2]. Hautefeuille P in 1976, first gave a detailed account of the single-layer continuous anastomosis [7]. However, either continuous or interrupted absorbable sutures can be used for single layer anastomosis. The present study compared the classical double layered method of intestinal anastomosis with the single layered extramucosal continuous method of anastomosis in terms of efficacy and safety.

To accomplish a two-layer anastomosis, more meticulous circumferential clearing of mesentery, appendices epiploica, and omentum is required before

beginning the anastomosis. While with the single-layer method, less or no circumferential clearing is necessary. Thus, time required to prepare the bowel for anastomosis is also less for one-layer technique [8] .The overall shorter operative time in case of single-layer method might be of significance in patients with haemodynamic instability who are operated in emergency. Moreover, this technique is easily learned, flexible in its application [9-12]. .

In the double layer technique, submucosal vascular plexus may be compromised and there may be excessive inversion and inflammation of tissue leading to narrowing of lumen. [13,14] Single layer anastomosis causes least damage to submucosal vascular plexus, least chances of luminal narrowing, incorporates strongest submucosal layer and accurate tissue apposition [15] .Although evidence is lacking, continuous sutures are speculated to have better serosal apposition and blood flow than interrupted sutures [16]. . In accords with observations from previous studies [17,18] postoperative return of bowel function was quicker in the single layer group as compared to the double layer group in our study . This may be related to the intrinsic difference between the two techniques as highlighted above. In contrast, some authors observed no difference in the duration of return of bowel sounds between the two methods [19] .The clinical parameters that can accurately demonstrate the return to normal function of the anastomosed bowel further needs to be defined.

Conclusion

As per our study it can be concluded that single layer has shorter operative time, almost equal complications of anastomotic leak, duration of return of bowel function and hospital stay as compared with convention double layer anastomosis. Thus, proving single layer continuous anastomosis is as effective as double layer perhaps optimal choice for bowel anastomosis.

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