

Comparative Study between Use of Single Layer Interrupted Extra Mucosal Technique versus Double Layer Continuous Technique in Intestinal Anastomoses

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Abstract

Introduction: The anastomotic approach chosen is based on the location of the anastomosis, the quality and caliber of the bowel, and the underlying medical process. However, personal surgical experience and inclination continue to play a significant role in the decision to conduct a specific anastomosis. The two-layer technique's sole noticeable drawback is that it takes considerable effort and time to complete. Recent papers have advocated for a monofilament plastic suture-based single-layer continuous anastomosis. This anastomosis can be created more quickly, for less money, and with a potentially lower risk of leaking than any other approach.

Aims and Objectives: To compare single layer interrupted extra mucosal technique versus double layer continuous technique in intestinal anastomoses.

Methods: This was prospective randomized control trial carried out on admitted patients and posted for resection and anastomosis surgery. Subjects was divided into two groups by alternative technique, namely, Group A. Patients, who received Single layered interrupted extra-mucosal anastomosis and Group B patients, who received double layered continuous intestinal anastomosis. In double layer anastomosis, anastomosis done using a 3-0 polygalactin continuous suturing for inner mucosal layer and a 3-0 silk interrupted for outer seromuscular layer. Each bite included 4 to 6mm of seromuscular wall. All single layer extramucosal interrupted anastomosis are constructed using a 3-0 Polygalactin round body needle suture beginning at the mesenteric border. Stitch advancement was approximately 5mm.

Results: In Group A (single layer) the range of time taken for closure was between 7.67 minutes to 18.00 minutes and mean duration was 14.35 minutes to perform an 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 7.08 minutes, t value was 11.9 minutes and $p < 0.001$, which is highly significant.

Conclusion: The study has concluded that single layer intestinal anastomosis requires much lesser duration than double layer intestinal anastomoses technique.

Keywords: Single Layer, Double Layer, Anastomosis, Mucosal Technique.

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Introduction

In both emergency and elective procedures, gastrointestinal anastomosis is used to restore gastrointestinal continuity following bowel resection for a variety of reasons. By surgeons like Travers, Lembert, and Halsted, the fundamental concepts of intestinal anastomosis were established more than a century ago [1,2]. Currently, the resected portions of the bowel are anastomosed utilizing a variety of methods, including staples, the suture less bio fragmentable anastomotic ring, and the conventional hand sewing method. As the supplies are readily accessible, and easily priced, and the majority of surgeons are familiar with the process, the hand-sewn suturing method has persisted in being widely used. Either one or two layers two layers of intestinal bowel wall can be used to perform it [3,4].

The incidence of postoperative problems, particularly the anastomotic leak rate, is used to gauge the effectiveness and safety of an anastomotic procedure. The success of the anastomosis is influenced by a number of technique-related parameters, including the opposition, adequate local blood supply, and tension-free sutures. The same is adversely affected by other abdominal variables as well as patient problems like inadequate nourishment, immunosuppression, and sepsis [5,6].

Both elective and urgent general surgery routinely perform bowel anastomoses. The anastomotic approach chosen is based on the location of the anastomosis, the quality and caliber of the bowel, and the underlying medical process. However, personal surgical experience and inclination continue to play a significant role in the decision to conduct a specific anastomosis [7,8].

The precise joining of two viable bowel ends with utter disregard for tension has been said to be "the key to a successful anastomosis". In order to successfully create bowel anastomosis, it is crucial to

use a careful approach should have a healthy blood supply, and be under no tension [9,10].

The width of the bowel ends, edema, accessibility and position of anastomosis, contamination, available time and equipment, and underlying pathology may all have an impact on the anastomotic approach selected [11].

The following is a description of anastomoses: (1) interrupted or continuous; (2) single or two layers; (3) end-to-end or side-to-side (or any combination); (4) different suture materials; (5) extra mucosal or full-thickness sutures; (6) size and spacing between each suture; and stapled: 1) side-to-side or end-to-end (or any combination); 2) staple lines oversewn, buried or not; and 3) using a variety of stapling machines [12-14].

For more than 150 years, intestinal anastomosis has been carried out effectively using a range of methods, supplies, and equipment. Of these, the two-layer anastomosis technique combining interrupted silk sutures for an outside inverted seromuscular layer and a running absorbable suture for a transmural inner layer has shown to be successful in the majority of circumstances and in the hands of most surgeons [15,16].

The two-layer technique's sole noticeable drawback is that it takes considerable effort and time to complete. Recent papers have advocated for a monofilament plastic suture-based single-layer continuous anastomosis. This anastomosis can be created more quickly, for less money, and with a potentially lower risk of leaking than any other approach [17,18].

Since the stress is distributed more evenly throughout the intestinal wall when using a single-layer continuous suturing approach rather than a double-layer interrupted technique, it is less likely to result in focal strangling and tissue damage [19,20]. But

the fundamental issue with the single-layer continuous approach made using a non-absorbable suture is that there exists a probability of stricture formation, at least theoretically, because of the potential for a purse-stringing effect on the anastomosis [21,22].

Methods and Materials

Study setting

This was prospective randomized control trial carried out in the dept. of general surgery, Medical College Baroda and Sir Sayajirao General Hospital Vadodara from April 2021 to October 2021. A total of 60 patients underwent resection and anastomosis (sample size decided as per formula for adjusted infinity sample size= {sample size for infinity population/1 + [(sample size for infinity population – 1)/target population]). Patients admitted in department of general surgery, medical college Baroda and Sir Sayajirao General Hospital Vadodara and posted for resection and anastomosis surgery between April 2021 to October 2021 were included in the study. Study was time bound study. Method of randomization was done by performing the operative techniques alternatively.

Subjects was divided into two groups by alternative technique, namely, Group A or patients who received Single layered interrupted extra-mucosal anastomosis and Group B patients, who received double layered continuous intestinal anastomosis.

In double layer anastomosis, anastomosis done using a 3-0 polygalactin continuous suturing for inner mucosal layer and a 3-0 silk interrupted for outer seromuscular layer. Each bite included 4 to 6mm of seromuscular wall. All single layer extramucosal interrupted anastomosis are constructed using a 3-0 Polygalactin round body needle suture beginning at the mesenteric border. Stitch advancement was approximately 5mm.

Inclusion criteria

1. Patients between ages 18 -65 undergoing intestinal resection and anastomosis either because of primary bowel pathology or as a part of another operative procedure.

2. Both emergency and elective procedures with jejunum-jejunal, jejunum-ileal and ileum-ileal anastomosis; ileocolic and colo-colic anastomoses; and stoma closure will be taken up for study.

3. Only hemodynamically stable patients and with a haemoglobin level of > 8 gm/dl.

Exclusion criteria

1. Patients undergoing gastric, duodenal, and rectal anastomosis, or proximal diversion will not be included.

2. Immunocompromised patients (i.e HIV pt's, pt's on chemo or radiotherapy or on steroid therapy)

3. Patients not giving consent for surgery.

Statistical Analysis

The study has conducted statistical analysis using Statistical Package for Social Sciences (SPSS software version 21). The continuous measurement was expressed as mean±standard deviation while the discrete measurement was expressed as count and its respective percentage. The level of significance was considered as $p < 0.05$.

Ethical Approval

Details of patients were collected including history and clinical examination on printed proforma attached herewith. Routine preoperative investigation was carried out. Approval letter for study was obtained from the Scientific and Ethical Review Committee of Medical College and Sir Sayajirao General Hospital, Baroda, IECBHR/62–2021. All the surgeries were performed by consultant doctors of Dept. of General Surgery, Medical College Baroda, and Sir Sayajirao General Hospital Vadodara.

Results

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 18-

30 years i.e. 10 (33.3%) and in Group B (double layer) maximum number of patients were in the age group of 51-65 years i.e. 12 (40.0%). Mean age in Group A (single layer) was 39.26 years and in Group B (double layer) 45.4years

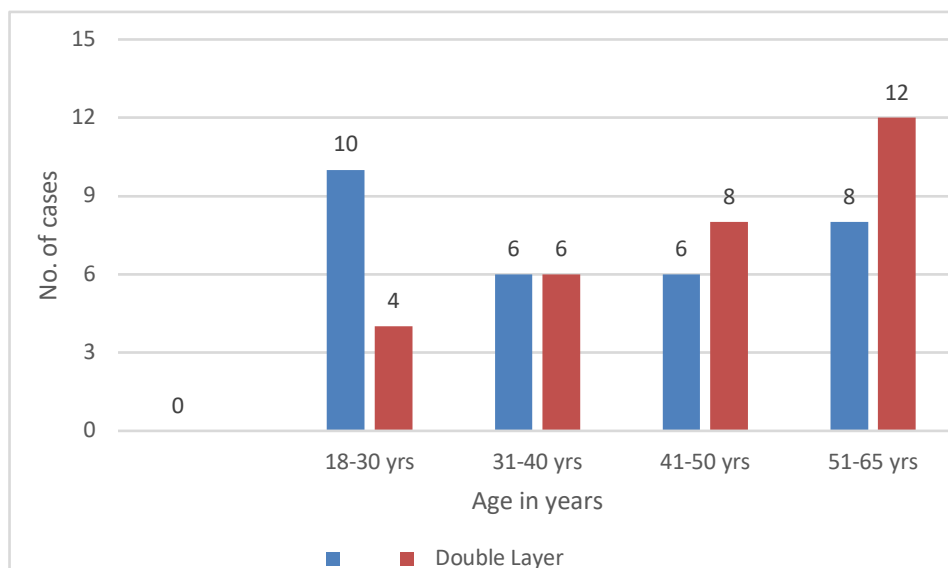


Figure 1: Distribution of age of the patients in this study

In our study of sixty cases in both groups terminal ileal stricture was diagnosed in maximum number of patients i.e. 14 (23.3%) cases.

Table 1: Type of bowel involved in different anastomosis

| Type of bowel involved in Anastomosis | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
|---------------------------------------|------------------------------|------------------------------|
| Small bowel | 23 (76.6) | 20 (66.6) |
| Small and Large bowel | 6 (20.0) | 6 (20.0) |
| Large bowel | 1 (3.33) | 4 (13.3) |
| Total | 30 (100) | 30 (100) |

The study has shown the types of procedures conducted and its respective number of patients.

Table 2: Type and number of procedures performed

| Procedure | No. of | n (%) |
|--|--------|-------|
| Resection of meckel's & ileo ileal anastomosis | 9 | 15.0 |
| Resection of terminal ileum & ileo ileal anastomosis | 14 | 23.3 |
| Right hemicolectomy & ileo transverse anastomosis | 7 | 11.6 |
| Segmental resection & ileoascending anastomosis | 4 | 6.7 |
| Segmental resection & ileo ileal anastomosis | 5 | 8.3 |
| Segmental resection & jejuno jejunal anastomosis | 9 | 15.0 |
| Stoma closure | 10 | 16.6 |
| Jejuno- jejunal anastomosis (in diff. procedures) | 2 | 3.0 |

In our study of sixty cases in both groups' resection of terminal ileum and ileo ileal anastomosis was performed in maximum number of patients i.e. 14(23.3%) cases (Figure 2).

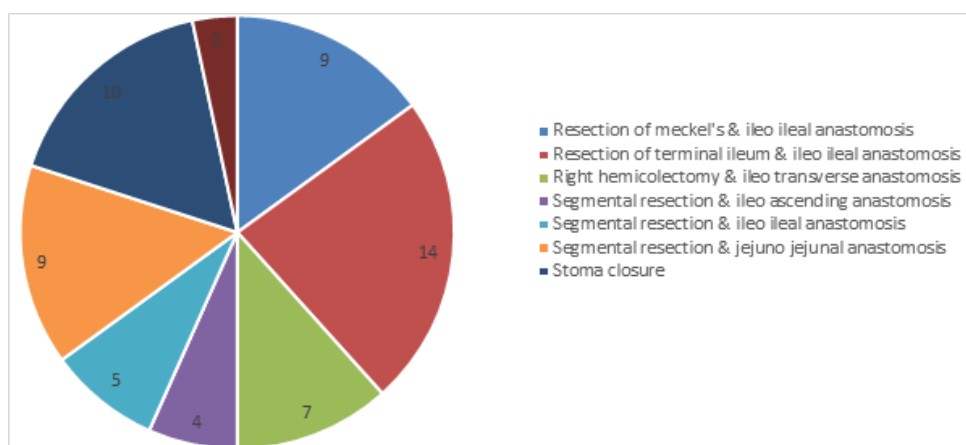


Figure 2: Total cases found in our study

This study included a total of sixty anastomosis at different levels of small intestine and large intestine. The maximum number of anastomosis in Group A (single Layer) were performed at entero enteric level in 23 (76.6%) patients, next at entero colic site in 6(20.0%) patients and least at colo colic site in 1(3.3%) patients. In Group

B (double layer), out of thirty anastomosis maximum number of anastomosis were performed at entero enteric level in 20 (66.6%) patients, next common site for anastomosis was at entero colic site in 6 (20.0%) patients and followed by colo colic site in 4 (13.3%) patients (Table 3).

Table 3: Anastomotic site, type and duration of this study

| Anastomotic site | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
|--------------------------------------|------------------------------|------------------------------|
| Entero-enteric | 23 (76.6) | 20 (66.6) |
| Entero-colic | 6 (20.0) | 6 (20.0) |
| Colo-colic | 1 (3.33) | 4 (13.3) |
| Total | 30 (100) | 30 (100) |
| Type of anastomosis | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
| End to end | 30 (100) | 28 (93.3) |
| Side to side | - | - |
| End to side | - | 2(6.6) |
| Total | 30 (100) | 30 (100) |
| Duration of anastomosis (in minutes) | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
| 5-10 | 1 (3.3) | - |
| 10-15 | 15 (50.0) | - |
| 15-20 | 14(46.7) | 8 (26.7) |
| 20-25 | - | 22 (73.3) |
| Total | 30 (100) | 30 (100) |

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 7.08 minutes, t value was 11.9 minutes and P value was <0.001 HS (Table 4).

Table 4: Statistical analysis between the groups and their significance

| Groups | (Duration in minutes) | | Mean Difference | t* value | p-value |
|------------------------|-----------------------|------------------|-----------------|----------|----------|
| | Range | Mean \pm SD | | | |
| Group A (Single Layer) | 7.67-18.00 | 14.35 \pm 2.55 | 7.08 | 11.9 | <0.001HS |
| Group B (Double Layer) | 16.83 – 24.83 | 21.43 \pm 1.99 | | | |

* Unpaired t test

In this study two patients who had developed anastomotic leak in Group B (double layer), among them 1(3.3%) patient responded well to conservative management and recovered. one more patient (3.3%), who had anastomotic leak in

Group B (double layer) died due to septicemia and rest 28 patients (93.3%) were asymptomatic. But in Group A (single layer) all patients were asymptomatic during their in the hospital and during follow up period (Table 5).

Table 5: Final outcome of the study groups

| Outcome | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
|--------------|------------------------------|------------------------------|
| Death | 0(0.0) | 1 (3.3) |
| Recovered | 0(0.0) | 1 (3.3) |
| Asymptomatic | 30(100) | 28 (93.3) |

Z = 1.47 P = 0.14ns (Fisher's Exact Test)

Discussion

The most popular bowel anastomosis technique is hand sewing, which is affordable, well-known, and has simple access to materials. Different surgeons favor one procedure over the other, and it can be done in single or multiple layers. In addition to taking time and effort to complete, double-layer intestinal anastomosis (DLIA) may also carry a higher risk of devascularization, infection, and necrosis [23,24]. There are no discernible differences between the two according to studies that have been done thus far, but additional research is needed to make a firm conclusion. The purpose of this study was to determine whether single-layer intestinal anastomosis (SLIA) is non-inferior to double-layer intestinal anastomosis (DLIA) in terms of anastomotic leak incidence. Additionally, it contrasted the two groups' rates of death, morbidity, and length of hospitalization (LOH). According to the study's findings, SLIA was comparable to DLIA in terms of anastomotic leak incidence, morbidity, mortality, and hospitalization duration and can be used as a safe and practical alternative in both elective and emergency situations [26].

Regarding the suitability of the single-layer and double-layer anastomotic techniques, there are currently opposing viewpoints. At Rajendra Institute of Medical Sciences, a prospective single-blinded randomized comparison study was carried out to evaluate several features of single- and double-layer anastomotic surgery, including safety, efficacy, length of hospital stays, and risk of perforation. According to study results, single-layer anastomosis was significantly quicker to perform and more cost-effective than double-layer anastomosis. The patients in the both groups' ' hospital stays did not differ significantly. One (3.9%) patient in group D (double layer) had an anastomotic leak, whereas there was none in group S (single layer). It was determined that the single-layer anastomosis technique is advantageous and safe because it required less surgical time, and suturing material, and there were no postoperative leaks [27].

Since anastomotic leakage is frequently linked to serious repercussions for affected individuals, intestinal anastomosis is an essential step in the majority of intestinal resections. The interrupted suture technique (IST) and the continuous suture technique are two distinct methods for hand-sewing intestinal anastomoses (CST) [25]. The

study looked into whether these two suture methods were linked to a lesser incidence of anastomotic leaking. The only independent risk factor for anastomotic leakage identified by multivariate analysis is the ASA score. In a multivariate analysis, the suture technique had no discernible effect on morbidity or the re- re-surgery rate. According to the statistics, the chosen suture method-interrupted vs. continuous has little bearing on the postoperative results, particularly on the anastomotic leakage rate [28].

The major goal was to evaluate the effectiveness of single-layer interrupted extra-mucosal sutures against double-layer sutures for colostomy closure. Anastomotic leak rates did not significantly differ between the two groups. When compared to the single-layer anastomosis, the mean cost of double-layer intestinal anastomosis was substantially higher. According to the study's findings, closing a colostomy with a single layer of extra-mucosal anastomosis of the intestine has the advantage of requiring less time, less morbidity, and being more cost-effective to execute [29,30].

Conclusion

The study has concluded that single layer intestinal anastomosis requires much lesser duration than double layer. The research was conducted on two different groups such as a single layer and a double layer, with a total of 30 participants in each group. In single and double-layered intestinal anastomosis, each group was evaluated and compared with regard to the duration required, the cost-effectiveness of suture material, anastomotic leak, the day of the post-op return of bowel sounds. Even the complications were lesser in Single layer than double layer group. Although further research on a large number of patients is required before reaching a definitive conclusion, the following inferences can be made based on the findings of the current study. When opposed to a double-layer anastomosis, a single-layer intestinal

anastomosis requires a far shorter amount of time to complete. When compared with a double layer, the cost of the suture material for a single layer is much lower. Anastomotic leak is identical in both groups, indicating that there is no substantial difference between them.

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