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Original Research Article

Single interrupted vs. continuous all layer closure in bowel anastomosis in emergency surgeries: a comparative study

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ABSTRACT

Background: Intestinal anastomosis dates to ancient eras and hand sewn intestinal anastomosis is the most used technique worldwide. Various complications following bowel anastomoses are anastomotic leak resulting into peritonitis, abscess, fistula, necrosis, stricture. Various factors contribute to these complications including suturing technique. Leakage from the bowel anastomoses complication and accounts for about 1.3 to 7.7%, that is often associated with increased morbidity and mortality and prolonged stay. This comparative study endeavours to compare outcome of extra-mucosal interrupted single layer versus continuous all layers 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 of the present study was to compare time required to perform anastomosis and to compare the rate of postoperative complications and hospital duration.
Methods: Based on detailed history, clinical examination and radiological investigations; patients were allotted in either group A or B. Group A: Bowel Anastomosis done by single layer (20 Patients) and Group B: Bowel anastomosis done by double layer (20 Patients). Time required to perform anastomosis and post op complications was assessed and compared.
Results: In this prospective study of 40 patients, it was found that Group A required an average of 17 minutes and Group B required 24 minutes for anastomosis. The rate of postoperative complications were found to be similar in both groups. The mean hospital stay was also found to be similar.
Conclusions: Thus, from this prospective comparative study, we conclude that both extra mucosal interrupted single layer and continuous all layer anastomosis have operative technical challenges and similar postoperative outcomes.

Keywords: Intestinal anastomosis, Single layer anastomosis, Double layer anastomosis

INTRODUCTION

Intestinal anastomosis has been successfully performed for more than 150 years using a variety of techniques, materials and devices. Hand sewn intestinal anastomosis is the most commonly used technique worldwide because of the availability and affordability of suture materials and familiarity with the procedure. Anastomosis may be performed by a double layered suturing technique or by a single layer technique. The essential fundamental principles of an intestinal anastomosis were laid down a hundred years ago by surgeons like Travers, Lembert, and Halsted.[1] Currently, the resected segments of the bowel are anastomosed using various techniques, such as the traditional hand sewn method, staples, or the suture less bio-fragmentable anastomotic ring etc.[2] The most common technique is the double layered anastomosis, using absorbable sutures for the inner layer and non-

absorbable (silk) sutures for the outer seromuscular layer.[3] The disadvantage of this technique is that it is time-consuming, challenging to perform, and runs the risk of formation of anastomotic strictures.[4]

The other technique which is the interest of our study is the single layered anastomosis, using an absorbable suture. Compared to double layered anastomosis, it is cost-effective, and requires less time to perform. If the surgeon should conduct single layer or double layer anastomosis, is most discussed issue. Several studies have noted that devascularisation, infection, and necrosis are more likely to occur after a double-layer anastomosis.[5] A single layer continuous suturing technique is less likely to cause focal strangulation and tissue damage since the tension is more evenly distributed around the intestinal wall. This comparative study endeavours to compare outcome of extra-mucosal interrupted single layer versus continuous all layers 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 and objectives of current study were to compare time required to perform anastomosis, to compare the rate of postoperative complications and to compare the mean hospital stay of patients in both groups.

METHODS

Study design, location and duration

Current study was a prospective, comparative, longitudinal study performed at MGM medical college and hospital, Kamothe, Navi Mumbai from June 2021 to June 2022.

Sampling type, sample size and sampling technique

Random sampling method was employed and total 40 patients were included in the study. For the study purpose two group of equal size (i.e., 20 patients each) were constituted to provide statistically most precise results; Group A: bowel anastomosis done by single layer-20 Patients and Group B bowel anastomosis done by double layer-20 patients. Simple random sampling (i.e., randomly picking up of Unnamed card by patients) were used to select study subject in each group. The data was obtained from the patients coming to surgical department of MGM Hospital, Navi Mumbai.

Inclusion criteria

Patient undergone resection and anastomosis in traumatic emergency conditions and either sex - male, female and age - above 18 years were included in the study.

Exclusion criteria

Patient undergone resection and anastomosis for other causes. Patients under 18 years of age, pregnant women and all patients above the age of 18 years with severe debilitating disease were excluded from the study.

Methodology

Based on detailed history, clinical examination and radiological investigations; patients were allotted in either group A or B. Group A: anastomosis by extramucosal interrupted single layer. The technique of single-layered intestinal anastomosis comprised anastomoses performed using a 2-0/3-0 Vicryl by interrupted extra mucosal approximation of the cut end of the intestine. All these sutures were performed beginning at the mesenteric border, incorporating all the layers except the mucosa. Group B: Double layer anastomosis. The technique of double-layer intestinal anastomosis comprised transmural continuous suture layer applied with Vicryl 2-0/3-0 thereafter followed by an interrupted, seromuscular suture layer with 3-0 silk suture. Time required to perform anastomosis and post op complications was assessed and compared.

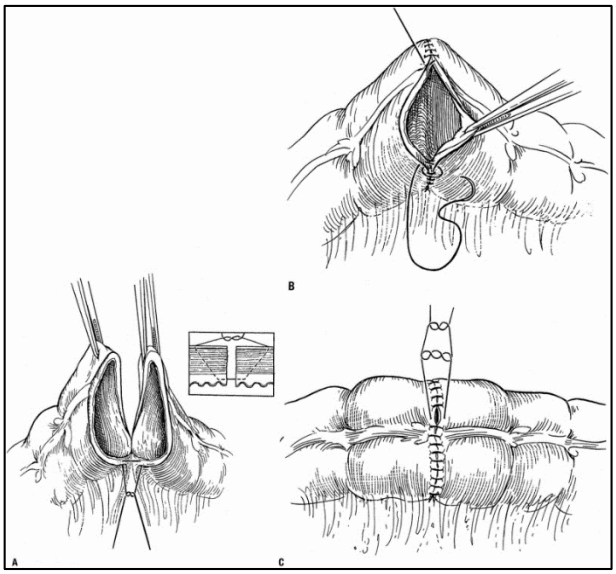

Figure 1: Method of single Layer anstomosis.[6]

Statistical analysis

Descriptive statistics was used the data was analyzed using statistical software (IBM SPSS, IBM Corporation, Armonk, NY, USA).

RESULTS

In this prospective study done from June 2021- June 2022, 40 patients of Traumatic Abdominal injuries were assessed in which resection and anastomosis was done. Patients were divided into two groups and were managed

and followed up accordingly. As shown in (Figure 1), In group A 14 patients underwent small bowel to small bowel anastomosis, 4 (small to large bowel), 2 (large to large). As shown in (Figure 2), In group B-17 patients underwent small bowel to small bowel anastomosis, 2 (small to large bowel), 1 (large to large). The percentages were compared between the groups and the difference was not statistically significant.

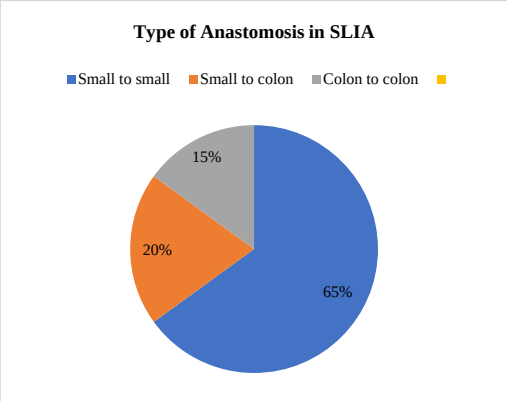

Figure 2: Pie diagram showing type of anastomosis in SLIA (Group A).

Table 1: Time required for anastomosis.

Duration of anastomosis (minutes)	Group A	Group B
10-15	3	-
16-20	13	2
21-25	4	14
26-30	-	4
31-35	-	-
Total	20	20

Table 2: Post operative complications.

Complications	Group A	Group B
Anastomotic Leak	1	1
SSI and Seroma	1	2

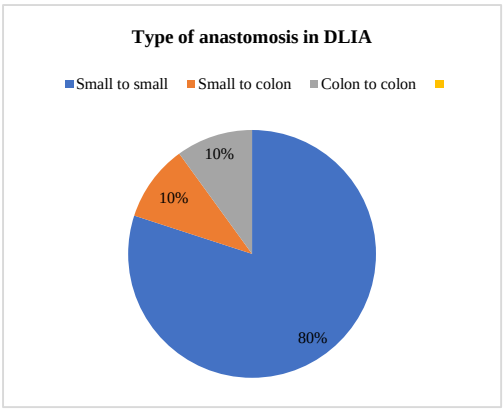

Figure 3: Pie diagram showing type of anastomosis in DLIA (Group B).

As shown in (Table 1), the mean time to complete anastomosis was 17 minutes in SLIA and 24 minutes in DLIA, which was significant. Above (Table 2) shows, there was 1 anastomotic leak identified in each group. The calculated anastomotic leak rate in the SLIA group is 5% and in the DLIA group was 5%, and the difference was not significant. The other complications that were recorded in the initial 3 months post-operative period were SSIs and seromas. There were 1 such complications in SLIA and 2 in DLIA, but the difference was not significant. The length of hospitalization (mean) in SLIA was 8 days and DLIA was 8.5 days, which was found to be similar.

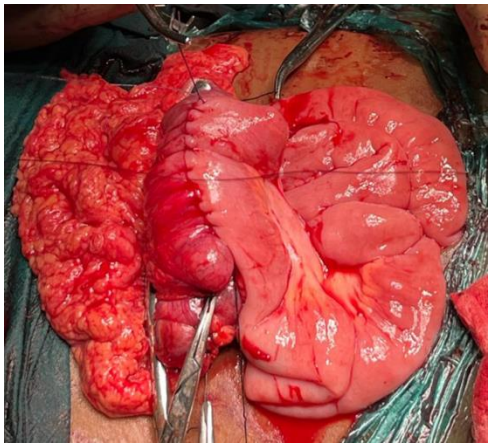

Figure 4: Continuous two layer side to side ileocolic anastomosis.

Figure 5: Single layer interrupted anastomosis technique.

DISCUSSION

The two-layer interrupted anastomosis has its origins in the early 19th century through the experimental work of Travers and of Lembert, who advocated careful approximation of the serosal surfaces of the bowel and devised a method of suturing to accomplish this.[7] In

1836, Dieffenbach performed the first successful anastomosis of the small intestine using Lembert's method.[8] In 1880, Czerny advocated the addition of an inner layer to reduce the risk of leakage and to achieve a precise mucosal approximation.[9]

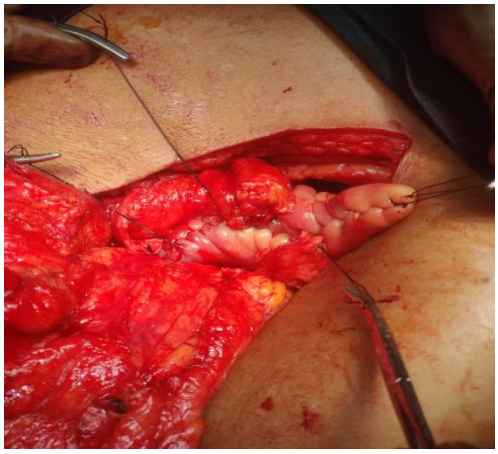

Figure 6: Continuous two-layer anastomosis.

Figure 7: Single layer anastomosis.

Since then, the technique has remained essentially unchanged except for the evolution of suture material for the inner layer. The single-layer interrupted anastomosis was never entirely abandoned and has periodically attracted renewed interest.[10] The single-layer continuous anastomosis is a contemporary innovation first described by Hautefeuille in 1976.[11] In the United States, the first mention of this technique was by Allen et al who presented their results with its use before the Texas surgical society in 1979.[12] It was then popularized by a colon and rectal surgical group based in Houston, Texas.[13-15] Numerous studies in the literature comparing techniques (e.g., one-layer vs. two-layer, hand-sewn vs. stapled, and end-to-end vs. end-to-side) have failed to demonstrate a clear superiority of one over another. The ultimate test of the suitability of a technique for intestinal anastomosis is its ability to heal without leakage. This complication has catastrophic consequences for the Patient. The present study demonstrates that a single-layer interrupted anastomosis is similar in terms of safety to the two-layer technique. The mean time saved by creating the single-layer anastomosis, 7 minutes, may seem relatively insignificant. However, to accomplish a two-layer anastomosis, at least 1 cm of the serosal surface must be circumferentially cleared of mesentery, appendices epiploica, and omentum before beginning the anastomosis. With the single-layer method, less circumferential clearing is required, and in many instances no clearance is necessary.[16] Between the two methods used the single-layer anastomosis always has a larger lumen thus it is possible that gastrointestinal function may return to normal in a shorter time with the single-layer method, although further studies would be required to confirm this speculation. It was also found that there is considerable difference in cost of materials used for both types of anastomoses. There is no significant difference noted in post operative complication and also mean hospital stay of the patient.

Limitations

The present single centre study was limited only traumatic emergencies presenting to emergency department. Also small to small bowel anastomosis, small to large bowel anastomosis and large to large bowel anastomosis are together included in same study. Therefore, the results may not be generalised.

CONCLUSION

The present study demonstrates that a single-layer anastomosis is similar in terms of safety to the two-layer technique, but that it can be constructed in a significantly shorter time and at a lower cost. These results also imply that the technique can be safely introduced into a surgical training program without a steep learning curve.

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

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