

## Original Research Article

# A comparative study of suturing technique of intestine between extra-mucosal single layer interrupted and continuous all layers: a single center experience

Manoranjan Kar, Somu Singhal, Bismoy Mondal\*, Arijit Roy

Department of General Surgery, Midnapore Medical College & Hospital, West Bengal, India

**Received:** 14 August 2021

**Revised:** 30 August 2021

**Accepted:** 31 August 2021

**\*Correspondence:**

Dr. Bismoy Mondal,

E-mail: [bismoymondal@gmail.com](mailto:bismoymondal@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Gastrointestinal anastomosis has been excited interest in our day to day surgical practice. We have compared efficacy, advantages, disadvantages, and complications following intestinal resection-anastomosis using extra-mucosal interrupted single layer suturing or continuous all layer suturing.

**Methods:** This comparative study included 50 cases (either in emergency or elective undergoing bowel resection and anastomosis), comprising of 2 Groups (25 cases in each Group) between January 2019 to June 2021 at Midnapore Medical College and Hospital. Patients data, operative findings, duration of anastomosis and length of hospital stay, post-operative complications of all patients were followed till discharge.

**Results:** Our comparative study have shown that- the mean duration for intestinal anastomosis in Group A (extra-mucosal interrupted single layer) and Group B (continuous all layers) were 21.43 minutes and 14.35 respectively. Considering duration of the anastomosis continuous all layers intestinal anastomosis appears to represent in shorter duration, anastomotic leak was noted in 3 patients (6%). Anastomotic leak was observed in 1 patient extra-mucosal interrupted single layer bowel anastomosis whereas two patients in the Group of continuous all layered bowel anastomosis had leak (p value 0.5-not significant) and the mean duration of hospital stay in the Group A and Group B were 7.32 days and 7.92 days respectively. (p value -insignificant).

**Conclusions:** Duration required to perform a continuous all layer bowl anastomosis is lesser when compared to an extra-mucosal interrupted single layer intestinal anastomosis. There is no significant difference in complications, final outcome and duration of hospital stay between two Groups.

**Keywords:** Intestinal anastomosis, Single layer extra-mucosal suturing, Continuous suturing, Anastomotic leak, Anastomotic duration

### INTRODUCTION

Intestinal anastomosis dates back to 1000 B.C., the era of Sushruta “The Great Indian Surgeon” where he described the use of black ants for intestinal anastomosis. 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. Patients undergoing resection anastomoses for various causes like bowel obstruction, incarcerated hernias, benign and malignant tumors of small and large bowel is not so uncommon. Various complications following bowel anastomoses are anastomotic leak resulting into peritonitis, abscess, fistula,

necrosis, stricture. Various factors contribute to these complications like suturing technique, suture material, presence of concurrent sepsis, vascular compromise, surgical expertise and so on. 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.<sup>1-3</sup>

In continuous all layered closure where mucosa and seromuscular layers are sutured together though haemostatic there is more chance of strangulation of mucosa due to because of damage of submucosal vascular plexus.<sup>5</sup>

In extra-mucosal interrupted single layer technique, only seromuscular layer of gut wall is approximated in interrupted manner. This technique incorporates the strongest layer (submucosa) of gut and causes minimal damage to the submucosal vascular plexus, anatomy is maintained and hence less chances of necrosis and superior to continuous all layered closure.<sup>6,7</sup>

This comparative study endeavors 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.

**Objectives**

Comparison of technical advantages and disadvantages between two techniques of intestinal anastomosis and comparison of complications between two techniques of intestinal anastomosis.

**METHODS**

The comparative study (prospective longitudinal interventional study) was done on patients presenting to Midnapore medical College and Hospital, Paschim Medinipur either in emergency or elective undergoing resection anastomosis of bowel from January 2019 to June 2020. A total of 50 patients undergoing intestinal resection and anastomosis have been taken up for the study.

Based on detailed history, thorough clinical examinations, radiological examinations and ultrasound of abdomen, the diagnosis was made. Cases were allotted to either Group alternatively, requiring extra-mucosal interrupted single layer (Group A) and continuous all layers anastomosis (Group B) for various clinical conditions of small and large bowel. The affected segment of bowel was resected as per the standard technique.

In case of continuous all layers anastomosis the transmural layer was constructed in a continuous manner using PDS 3-0 suture.

All the extra-mucosal single layered intestinal anastomoses were performed using an interrupted 3-0 PDS that began at the mesenteric border, incorporating all the layers except the mucosa. Each bite included 4-6 mm of the wall from the edge and about 5 mm from each other.

Each case was analyzed for post-operative complications like anastomotic leak, SSI, wound dehiscence, Intraabdominal collection. The duration of anastomosis begins with placement of first stitch on the bowel and ended when the last stitch was cut.

Patients who are not willing to give written informed consent, patients undergoing esophageal, gastric and duodenal anastomosis, resection-anastomoses done for perforation with gross contamination of peritoneal cavity, associated co-morbid diseases like sepsis, known cardiovascular disease, grossly deranged liver function (not fit for surgery) are excluded from the study.

**RESULTS**

Results are expressed as mean and standard deviation for continuous data and frequency as number and percentage. Unpaired t-test was used to compare mean levels between two groups. Categorical data was analysed by Chi square test and Fischer exact test. A value of 0.05 or less was considered for statistical significance.

**Table 1: Duration of anastomosis.**

Duration of anastomosis (in minutes)	Group A (extra-mucosal interrupted single layer)	Group B (continuous all layers)
	N (%)	N (%)
10-15	-	1 (4)
16-20	-	22 (88)
21-25	1 (4)	2 (8)
26-30	19 (76)	-
31-35	5 (20)	-
<b>Total</b>	<b>25 (100)</b>	<b>25 (100)</b>

P<0.001 HS

A pretested performa used to collect relevant information (patient data, clinical findings, laboratory investigations, follow up events etc.) from all the selected patients. Data collected and compared with percentage/rate of parameter as sample size is small. In our study we had two Groups, Group A (extra-mucosal interrupted single layer) and Group B (continuous all layers). Anastomosis has been performed in various type of pathologies.

**Types of anastomosis performed**

The maximum number of anastomosis in Group A (extra-mucosal interrupted single layer) were performed at entero-enteric level in 12 (48%) patients, next at entero-colic site in 11 (44%) patients and least at colo-colic site in 2 (8%) patients.

**Table 2: Comparison of mean duration of anastomosis between two groups.**

Groups	Range	Mean± SD	Mean difference	t* value	P value
	(Duration in minutes)				
<b>Group A (extramucosal interrupted single layer)</b>	25 - 35	28.8±2.02	10.16	19.6	0.000
<b>Group B (continuous all layers)</b>	14 - 22	19.04±1.60			

\*Unpaired t test

**Table 3: Comparison of complications.**

Complications	Group A (extra-mucosal interrupted single layer)	Group B (continues all layers)
	N (%)	N (%)
<b>Anastomotic leak</b>	1 (4)	2 (8)
<b>Surgical site infection (SSI)</b>	2 (8)	3 (12)
<b>Wound dehiscence</b>	1 (4)	1 (4)
<b>Intra abdominal collection</b>	0	1 (4)
<b>Reoperation</b>	0	0

p=0.5, not significant (chi-square test)

**Table 4: Comparison of mean duration of hospital stay.**

Group	Range	Mean±SD	Mean difference	t* value	P value
	(Duration in days)				
<b>Group A (extra mucosal interrupt single layer)</b>	5 – 14	7.32±1.72	0.6	1.002	0.322
<b>Group B (continuous all layers)</b>	5 – 15	7.92±2.44			

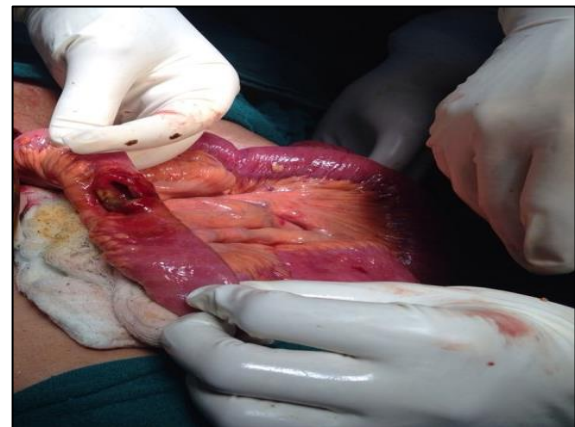
**Table 5: Comparison of duration of anastomosis of Khan RAA and Burch ET series with present series.<sup>7</sup>**

Groups	Present series	Khan RAA series	Burch ET series
	Mean duration of anastomosis (in minutes)		
<b>Group A (extra-mucosal interrupted single layer)</b>	28.80	35	30.7
<b>Group B (continuous all Layer)</b>	19.04	20	20.8

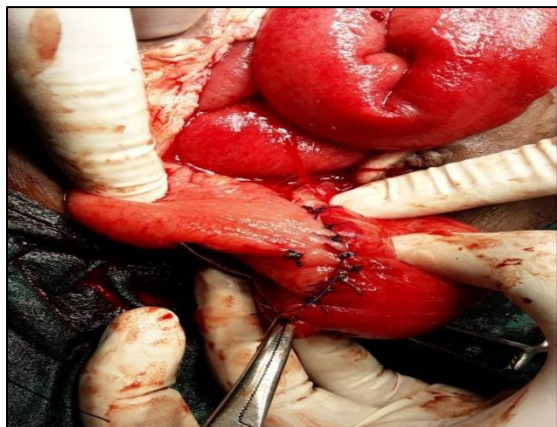
In Group B (continuous all layers), out of 25 anastomosis maximum number of anastomosis were performed at entero-enteric level in 13 (52%) patients, next common site for anastomosis was at entero-colic site in 10 (40%) patients and followed by colo-colic site in 2 (8%) patients. (Figure 4)

**Duration required for anastomosis**

In this comparative study, in Group B (continuous all layers) the minimum time required to perform anastomosis was between 10 to 15 minutes in 1 (4%) patient and maximum time was between 21 to 25 minutes in 2 (8)% patients, followed by 22(88%) patients between 16-20 minutes and no anastomosis took more than 25 minutes.(Figure 5)



**Figure 1: Isolated jejunal perforation in case of blunt trauma abdomen patient.**



**Figure 2: Extramucosal single layer jejunojenunal anastomosis.**



**Figure 3: Post-operative complication in case of jejunojenunal anastomosis: abdominal wound dehiscence.**

In Group A (extra-mucosal interrupted single layer) the minimum time required to perform anastomosis was between 21 to 25 minutes in 1 (4%) patients and maximum time was between 31 to 35 minutes in 5 (20%) patients and no anastomosis required beyond 35 minutes. Maximum were done in between 26 to 30 minutes 19 (76%). P value was <0.001 (Highly significant). (Table 1)

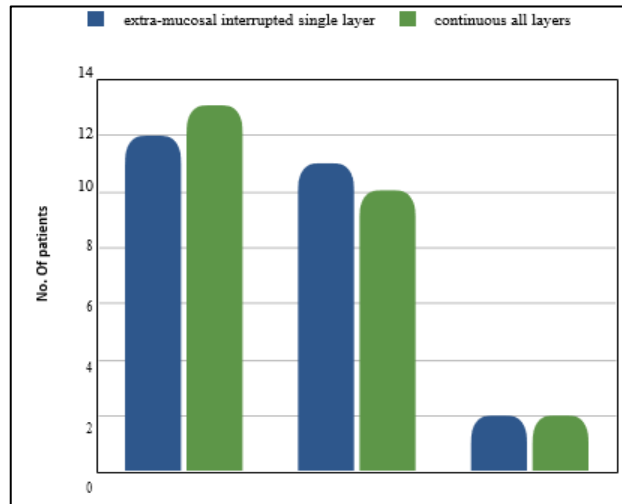
Mean difference of duration between the two Groups is found to be 10.16 and p value is 0.000 which is <0.005 and is highly significant. (Table 2)

**Complications**

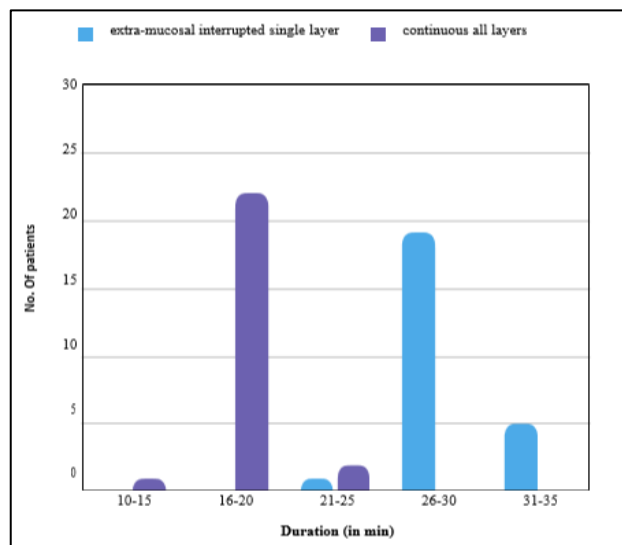
In our comparative study, SSI was most common complication in both Group A & B, followed by anastomotic leak. Anastomotic leak (most dreaded complication) was noted in 3 out of 50 patients. Anastomotic leak was observed in Group A (extra-mucosal interrupted single layer) in 1 (4%) patient and occurred in Group B (continuous all layers) in 2 (8%) patients. The p value was 0.5 (chi-square test). (Table 3)

**Duration of hospital stay**

In our comparative study the mean duration of hospital stay in Group A was 7.32 days and in Group B it is 7.92 days. Mean difference being 0.6. Unpaired t test and p value shows that the comparison is insignificant. (Table 4)



**Figure 4: Comparison of anastomotic sites.**



**Figure 5: Comparison of duration of anastomosis.**

**DISCUSSION**

As per the protocol of suturing technique, in case of single layer extra-mucosal interrupted suture, mucosal layer is not involved, so strangulation of mucosal layers are seen less often less often than in single layer continuous suture. Thus early epithelisation (within 24-48 hours) is seen in case of extramucosal single layer anastomosis. Extra-mucosal interrupted suture has been seen to cause less luminal disparity of bowels. The present study assessed the efficacy and safety of extra-mucosal interrupted single layer anastomosis in comparison with continuous all layers anastomosis after intestinal resection and anastomosis.



Cases were allotted to either Group alternatively, requiring extra-mucosal interrupted single layer and continuous all layers for various clinical conditions of small and large bowel. Anastomosis was done at different levels of intestine and depending up on the position of the viscera. The efficacy of both Groups was compared in terms of duration required to perform extra-mucosal interrupted single layer and continuous all layer intestinal anastomosis, study post-operative complications like anastomotic leak in extra-mucosal interrupted single layer and continuous all layers intestinal anastomosis, the outcome associated with extra-mucosal interrupted single layer and continuous all layers anastomosis and the duration of hospital stay in either of them.

**Comparison of mean age in present series with Gangat series<sup>8</sup>**

In present series mean age in Group A (extra-mucosal interrupted single layer) was 41.4 years and in Group B (continuous all layers) 41.32 years. In Gangat series mean age in Group A (extra-mucosal interrupted single layer) was 37.5 years and in Group B (continuous all layers) 40.2 years.<sup>8</sup>

**Comparison of duration of anastomosis of Khan and Brunch series with present series<sup>9</sup>**

In Khan series, the arithmetical mean duration required to perform an anastomosis procedure was 35 minutes for extra-mucosal interrupted single layer and 20 minutes for continuous all layers. In Burch series duration required to perform an extra-mucosal interrupted single layer anastomosis was 30.7 minutes and 20.8 minutes for continuous all layers. In our study the mean duration required to construct an extra-mucosal interrupted single layer anastomosis was 28.80 minutes and 19.04 minutes for continuous all layered anastomosis. The difference in average time is statistically significant as p value <0.001 (Highly significant) in present series. Therefore, in our series the time required to perform anastomosis is well within the average time (Table 5).

**Comparison of percentage of anastomotic leak in Khan series with present series<sup>9</sup>**

The anastomosis leak in our present series was 1 (4%) patient in extra-mucosal interrupted single layer and 2 (8%) in continuous all layers anastomosis. In Khan series one (6%) patient had anastomotic leak in extra-mucosal interrupted single layer and 2 (12%) of patients had anastomotic leak in continuous all layers.<sup>9</sup> Finally anastomosis leak rates put all together continuous all layers had more complication in terms of anastomotic leak in both series. A large number of patients need be to studied to do a dogmatic conclusion and techniques of performing a suturing procedure is partially subjective. These were the main limitations of our study.

**CONCLUSION**

Based on the results obtained in the present study following conclusions can be drawn: duration required to perform a continuous all layer bowl anastomosis is lesser when compared to an extra-mucosal interrupted single layer intestinal anastomosis, there is no significant difference in complications and final outcome between two Groups and there is no significant difference in duration of hospital stay in extra-mucosal interrupted single layer and continuous all layers bowel anastomosis.

**ACKNOWLEDGEMENTS**

We would like to thank the hospital authorities, nursing personnel, and other supportive staff for their continuous support in the patient care.

*Funding: No funding sources*

*Conflict of interest: None declared*

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

**REFERENCES**

1. Zinner MJ, Stanle W, Ashley-Maingot's. Abdominal operations, 19th edition, McGraw-Hill's; 1345-90.
2. Whang EE, Billian A, Hunter D, Pollock RE. small intestine. In: Manual of Surgery. 8th Ed. New York: McGraw-Hill; USA. 2005;27:702-32.
3. Rullier E, Laurent C, Garrelon J L, Michel P, Saric J, Parneix M. Risk factors for anastomotic leakage after resection of rectal cancer. *British Journal of Surgery.* 1998;85:355-8.
4. Murphy JB. History of the Intestinal Anastomosis: Cholecysto-intestinal, gastrointestinal, entero-intestinal anastomosis, and approximation without sutures. *Med Rec.* 1892;42:665-76.
5. Khan N, Rahman AU, Sadiq MU. Single layer interrupted sero-submucosal intestinal anastomosis: A prospective study of 100 patients. *Journal of medical sciences.* 2006;14.
6. Shikata S, Yamagishi H, Taji Y, Shimada T, Noguchi Y. Single- versus two- layer intestinal anastomosis: a meta- analysis. *BMC Surgery.* 2006;6:2.
7. Rajput MJ, Memon AS, Rani A, Khan AI. Use of Single Layer Extra Mucosal Interrupted Suture Intestinal Anastomosis: A prospective analytical study on 72 patients. *Jlums.* 2009;8:1.
8. Ayub M, Sheikh R, Gangat S, Rehman A. Single layer versus two layer intestinal anastomosis – a prospective study. *Pakistan J Surg.* 2009;25(3):141-3.
9. Rajput MJ, Memon AS, Rani M, Sattar A, Khan AI. Use of Single Layer Extra Mucosal Interrupted Suture Intestinal Anastomosis: A prospective analytical study on 72 patients. *Jlums.* 2009;8:1.

**Cite this article as:** Kar M, Singhal S, Mondal B, Roy A. A comparative study of suturing technique of intestine between extra-mucosal single layer interrupted and continuous all layers: a single centre experience. *Int Surg J* 2021;8:2916-20.