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A Comparative Study of Stapled Anastomosis and Hand-sewn Anastomosis in Gastro-Intestinal Surgeries

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Abstract

Background: Bowel anastomosis remains the major part of both elective and emergency gastrointestinal surgeries. Currently, the two most common methods of anastomosis are stapled anastomosis and hand-sewn anastomosis.

Aims and Objectives: To compare the efficacy of stapled anastomosis over hand sewn anastomosis in gastrointestinal surgeries in terms of anastomosis time, total operative time, and anastomosis leak.

Methods: 54 patients of either gender were selected randomly and were equally divided between two groups. The study was done between January 2021 to July 2022. Anastomosis time, total operative time, and anastomosis leak was compared between both methods of anastomosis.

Results: The stapling method took shorter anastomosis time compared to hand-sewn anastomosis ($p<0.001$). Total operative time was significantly less in the stapler method compared to the hand-sewn anastomosis method ($p=0.007$). However, there was no significant difference in anastomosis leak between both methods of anastomosis ($p=1.000$).

Conclusion: Less anastomosis time and therefore less total operative time makes staplers a better option for frail patients. Stapler is also beneficial for inaccessible areas like colorectal surgeries and esophageal surgeries.

Keywords: Stapled Anastomosis, Hand Sewn Anastomosis, Gastrointestinal Surgeries.

Introduction

Intestinal Anastomosis was first done by Sushruta "The Great Indian Surgeon" in 1000 B.C. He described the use of black ants for the suturing of intestinal anastomosis. Currently the single layer extra mucosal anastomosis is popular, as advocated by Matheson of Aberdeen, as it probably causes the least tissue necrosis

or luminal narrowing. [1] The extra mucosal suture must include the submucosa, because it has a high collagen content and is the most stable layer in all sections of the gastrointestinal tract. [2] The evolution of mechanical sutures by stapler devices is a technological advancement which helps anastomosis of bowel loops with less tissue injury, decreased time duration of procedure and also decreases the anastomotic leak complication. [3] The effect of minimizing the operative trauma has been the main attribute in the use of staplers, especially in the application in difficult access operative fields like in the pelvis and the esophagogastric junction. Both are well confirmed methods of anastomosis but they do not provide an immediately sealed anastomosis and both are prone to serious complication such as infection and anastomotic leaks [4].

Studies have been conducted in the past to compare the efficacy of staplers and hand sewn anastomosis. However, dispute remains regarding which of the two methods of anastomosis gives better clinical results.

Aim of this study is to compare efficacy of stapled anastomosis over hand sewn anastomosis in gastrointestinal surgeries in terms of Anastomotic time, total Operative time, post-operative anastomotic leak.

Methodology

The present comparative observational study was conducted at tertiary care hospital to study efficacy of stapled anastomosis over hand sewn anastomosis in gastrointestinal surgeries. Study period was from January 2021 to July 2022. After ethical committee clearance, 54 patients of either gender not below the age of 12 years requiring gastrointestinal surgery (resection and anastomosis) was selected randomly. After informed written consent patients were enrolled under this study and were informed about procedure and their outcome. Patients were equally divided between two groups.

Both elective and emergency cases are included in the study. Elective patients were given bowel preparation using polyethylene glycol solution. No bowel preparation was given to emergency patients. The radiological investigation included X-rays, Ultrasound, CT scan. Preoperative blood tests were done for all patients.

Hand sewn anastomosis (end to end and side to side anastomosis) was done using Silk 2-0 or Silk 3-0 Round body with 4-layer technique. Stapler anastomosis was done using Circular (end to end anastomosis) stapler and Linear cutter (side to side anastomosis) stapler.

Data was analyzed using SPSS v23 (IBM Corp.) software. Descriptive statistics were elaborated in the form of means/standard deviations for continuous variables and percentages for categorical variables. For non-normally distributed data Wilcoxon Test were used. In case the expected frequency in the contingency tables was found to be <5 for >25% of the cells, Fisher's Exact test was used. Statistical significance was kept at $p < 0.05$.

Results

Parameters	Group		p value
	Stapler (n = 27)	Hand Sewn (n = 27)	
Age (Years)	51.78 ± 15.66	45.19 ± 14.02	0.105[1]
Gender			0.783[2]
Male	15 (55.6%)	16 (59.3%)	
Female	12 (44.4%)	11 (40.7%)	
Operative Procedure			1.000[3]
Ileo-Ileal Anastomosis	11 (40.7%)	10 (37.0%)	
Right Hemicolectomy	7 (25.9%)	8 (29.6%)	
Colo-Colic Anastomosis	2 (7.4%)	3 (11.1%)	
Colo-Rectal Anastomosis	3 (11.1%)	2 (7.4%)	
Whipple's Procedure	2 (7.4%)	3 (11.1%)	
Gastro-Jejunostomy	2 (7.4%)	1 (3.7%)	

***Significant at p<0.05, 1: Wilcoxon-Mann-Whitney U Test, 2: Chi-Squared Test, 3: Fisher's Exact Test

Figure 1: comparison of age, gender, operative procedure done between stapled and hand sewn anastomosis group. Values are shown as Mean ± SD for age, percentage (%) for gender and operative procedure.

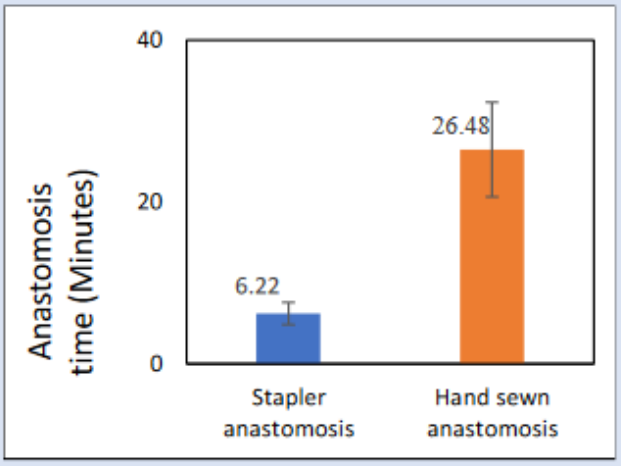

Figure 2: comparison of anastomosis time between stapled and hand sewn anastomosis. Values are presented as mean ± SD.

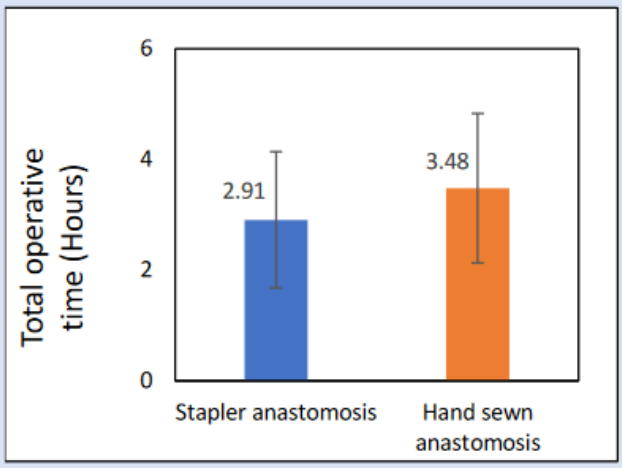

Figure 3: comparison of total operative time (hours) in stapled and hand sewn anastomosis group. Values are presented as mean ± SD.

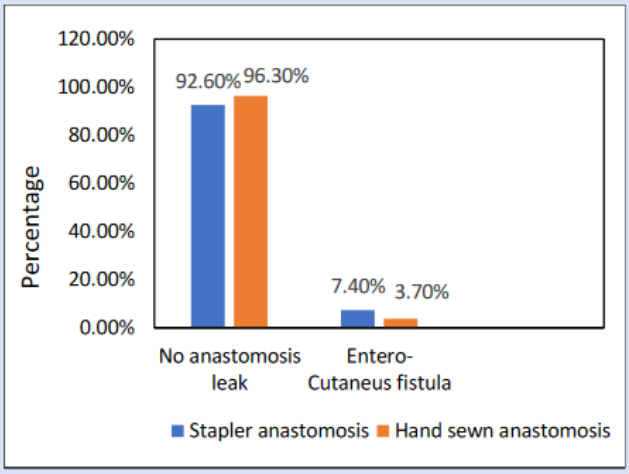

Figure 4: comparison of anastomosis leak rate between stapled and hand sewn anastomosis. Values are presented as percentage (%).

The stapled group consisted of 27 patients, including 15 males and 12 females. Mean age of participant was 51.78 ± 15.66. The hand sewn anastomosis group consisted of 27 patients, including 16 males and 11 females. Mean age of participant was 45.19 ± 14.02. There was no significant difference between the two groups in age, gender and operative procedure (Figure 1)

Firstly, we compared the anastomosis time of Stapled and Hand sewn anastomosis group and the results suggest stapled anastomosis significantly shortened the anastomosis time ($p < 0.001$) (Figure 2).

We further analyzed total operative time of both stapled and hand sewn anastomosis group and the results suggest stapled anastomosis significantly reduced total operative time ($p = 0.007$) (Figure 3).

We also compared the anastomosis leak rate in both stapled and hand sewn anastomosis group. The results suggest no statistical significance between both groups ($p=1.000$). (Figure 4)

Discussion

Ever since the beginning of stapler use in abdominal surgeries in mid-1908, with Victor Fischer and Hümér Hültl, and in 1924, with Petz Aladar the surgical procedure has become more practical and objective, despite higher costs. [5] Currently, using staplers during major surgical procedures is becoming a more common and important practice, especially during more complicated laparoscopic procedures that may involve

significant resections and digestive reconstructions. The surgical outcomes show a significant improvement as a result of shorter operating times and shorter hospital stays, as well as evidence of fewer problems, largely due to successful hemostasis and less tissue stress. However, the proper use of staplers and the surgeons' experience remain as crucial issues to succeed in the use of such devices, implying the necessity of combination of both clinic-surgical experience and technical training, providing regular systematization and standardization. [6]

Our results demonstrated that stapler use shortened the anastomosis time when compared to conventional hand sewn suturing for all types of anastomosis. The mean anastomosis time in stapler group was 6.22± 1.37 minutes and in hand sewn group was 26.48± 5.85 minutes which was statistically significant ($p< 0.001$). The results were comparable to the study done by Belbase et al, where the duration of anastomosis was significantly longer in the handsewn group. In his study the mean duration of anastomosis in the handsewn group was 32.04±4.51 minutes and in stapled group was 11.00±1.91minutes. [7]

When comparing the total operative time between both methods of anastomosis we found that the mean total operative time in stapled group was 2.91± 1.23 hours compared to hand sewn group which was 3.48± 1.35 hours which was statistically significantly ($p=0.007$). Short surgery time means reduced surgical trauma, intraoperative blood loss, reduced chance of local infection and surgical complications. [8] Similar to our study, Khan et al found that mean operating time was 161.5 ± 27.64 (110- 210) min in the handsewn group and 123.3 ± 21.1 (90-170) min in the stapler group which was statistically significant.[9]

We also demonstrated that 7.4% patients had anastomotic leak in stapled group compared to 3.7% in hand sewn group, which was not statistically significant ($p=1.000$). Our findings were consistent with study done by Belbase et al in which two (8%) patients in the handsewn group and one (4%) patient in stapled group had an anastomotic leak which was not statistically significant. [7] Despite substantial progress in surgical techniques and imaging methods, anastomotic leakage remains a major complication following bowel surgery and carries a high rate of morbidity and mortality. [10] Further studies are required to know the risk factors for anastomosis leakage in gastro intestinal surgeries.

Conclusion

From our study, we can say that the stapling technique can significantly reduce the time for the anastomotic procedure and total duration of the surgery. However, there was no significant difference in the rate of anastomotic leak between the handsewn and stapled anastomosis. As the duration of operation is less, staplers may be considered advantageous in patients whose general condition is poor and who would not tolerate prolonged anesthesia.

Limitations

Our study was limited by small size of study population and single center study. Further studies needed to corelate the findings.

Institutional ethics consent: Taken

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