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A Comparative Study between Stapler and Hand Sewn Anastomosis in Elective Gastrointestinal Surgery in a Tertiary Care Centre

Amarendra Nath Sarkar[1], Partha Pratim Deb[2*], Satyajit Naskar[3]

[1]Associate Professor, Department of General Surgery, North Bengal Medical College, Darjeeling, India
[2]Assistant Professor, Department of Urology, North Bengal Medical College, Darjeeling, India
[3]Ex-postgraduate Trainee, Department of General Surgery, North Bengal medical college, Darjeeling, India

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***Corresponding author:** Partha Pratim Deb
Assistant Professor, Department of Urology, North Bengal Medical College, Darjeeling, India

Abstract **Original Research Article**

An intestinal anastomosis becomes necessary when a segment of the gastrointestinal tract is resected for benign or malignant indications and gastrointestinal continuity needs to be restored. The oldest method to close intestinal wound was described by the Indian physician Sushruta, 800 years before Christ, who used the jaws of ants to hold the wound margins together. The introduction of staplers in recent decades have enabled to construct a safe anastomosis in places difficult to reach for conventional suture techniques. There are several studies which showed that there are no such differences in conventional handsewn and stapler anastomosis technique in elective gastrointestinal surgeries except the duration of operation is less in stapler anastomosis technique. In the present study, three types of gastrointestinal anastomosis (gastrectomy & gastrojejunostomy, right hemicolectomy & ileocolic anastomosis and anterior resection & rectocolic anastomosis) were taken and all 68 patients after these operative procedures were divided into two groups (gr A handsewn and gr B stapler). They were compared by the parameters like duration of procedure, appearance of bowel sounds in postoperative period, anastomotic leak and duration of hospital stay. Regarding duration of operative procedure, the mean duration of gastrectomy and gastrojejunostomy for gr A was 166 mins and for gr B was 144 mins, the mean duration of right hemicolectomy and ileocolic anastomosis for gr A was 143 mins and for gr B was 125 mins, the mean duration of anterior resection and rectocolic anastomosis for gr A was 149 mins and for gr B was 131 mins. It signifies that gr B or stapler anastomosis required less time and this value was statistically significant ($p < 0.0001$). There was no statistically significant difference regarding the appearance of bowel sounds, starting of oral feeding and hospital stay in the postoperative periods. We conclude that there was reduction in operative time in patients with stapler anastomosis compared to handsewn technique but there was no difference in appearance of bowel sounds, incidence of anastomotic leak and duration of hospital stay when both the procedures were compared with each other.

Keywords: Anastomosis, gastrointestinal, stapler, handsewn, technique, gastrojejunostomy, ileocolic, rectocolic.

INTRODUCTION

An intestinal anastomosis becomes necessary when a segment of the gastrointestinal tract is resected for benign or malignant indications and gastrointestinal continuity needs to be restored. The first accounts of the bowel surgery were often in response to trauma, specifically that of penetrating injuries. One of the earliest descriptions of treating an intestinal wound was attributed to Sushruta, a prolific contributor to medicine in India in the 6th century BC. In the 8th century AD, Rhazer used sheep gut to suture wounds instead of relying on black ants [1]. The advent of anaesthesia in 1843 allowed for larger, more complex surgeries while the patient was in a insensate state [2]. Listerism, Joseph lister's antiseptic principles which involved washing hands and instruments with carbolic acid was responsible for reducing surgical morbidity to less than 50% after his paper published in 1867 [3, 4]. And yet abdominal surgery was avoided since entering the abdomen was considered to be noli me tangere –do not touch—and usually fatal [5].

The first foray into colon surgery was because of bowel obstruction, often due to an advanced tumor. Paracelsus, in the 15th century was thought to be the first to propose the opening of intestine to the abdominal wall to relieve obstruction [1]. In 1776, Pillore of Rouen suggested the creation of an artificial anus or ostomy diverting the intestinal tract away from the obstruction caused by a large rectal tumor. In 1823, Reybard was credited with performing the first sigmoid colon resection with an end-to-end anastomosis. Billroth resected a portion of the colon and brought the proximal

end out as a colostomy [6]. With the advent of the concept of exteriorization colon resection met greater success with less morbidity. One other method of adjoining bowel was mentioned in Lowson's delightful paper in the lancet, published in March 25, 1893, the earliest mention of a right colectomy with a primary anastomosis [7]. For the anastomosis, the bowel was divided with clamps and over sewing the stumps, first with a six continuous suture and a second layer with Lambert's suture. With time, modern advancement in bowel anastomosis included the advent of stapling device. Although the murphy button described in 1892 was the first popular stapling prototype, further progress was not remarkable until the early 1960's when the institute of experimental apparatus and instruments in Moscow developed a group of instruments capable of performing gastrointestinal tract anastomosis [8].

The purpose of this study is to compare the feasibility, safety and efficacy of the outcome of handsewn and stapler anastomosis in elective gastrointestinal surgeries.

MATERIAL AND METHODS

A prospective study was conducted in the department of General Surgery, North Bengal Medical College, Darjeeling for a period of one and half years. All the patients attending general surgery department and subsequently undergoing elective gastrointestinal anastomosis during this period were included in the study. Patients undergoing hepatobiliary, oesophageal, duodenal anastomosis and patients with comorbidity like diabetes, moderate to severe anaemia, morbid obesity and immunocompromised status were excluded from the study. After admission, patients were subjected to detailed history, clinical examination and routine investigations as par the hospital protocol. The patients were divided into groups depending on the anastomosis site such as distal gastrectomy and gastrojejunostomy, right hemicolectomy and ileocolic anastomosis and colorectal anastomosis for anterior resection (AR). Each group were further divided into two, one group was for stapler anastomosis and another was for handsewn anastomosis. Surgery was done in elective setting in all the patients and all anastomosis were done by same operative team. For gastrectomy and gastrojejunostomy, handsewn anastomosis were done using continuous two-layer technique and handsewn ileocolic and colorectal anastomosis were done using single layer interrupted suture. Linear stapler was used for gastrectomy & gastrojejunostomy and ileocolic anastomosis whereas circular stapler was used for colorectal anastomosis. Standard preoperative bowel preparation was done for every patient and prophylactic antibiotic was given. All the patients were studied for the parameters such as total operative time, time of return of bowel sounds, day of resumption of oral feeds, postoperative hospital stay and postoperative complication like anastomotic leak. Statistical analysis was performed with the help of Microsoft excel, Medcalc^{R} 19.0.7 software and manually using statistical formula. Chi square test was used to test the association of different study variables, Z test was used to test the significant difference between two proportions, t-test was used to compare the means. $P<0.05$ was taken to be statistically significant and confidence interval was set at 95%.

RESULTS

In our study, a total of 68 patients admitted in the department of general surgery during the time period were selected. Out of the 68 patients, 29 (42.7%) were treated with gastrectomy and gastrojejunostomy. Among them, 15 (22.1%) patients were treated by handsewn methods and 14 (20.6%) were treated by stapler method of anastomosis. Out of the total patients, 21 (30.9%) had undergone right hemicolectomy and ileocolic anastomosis. Among them, 11 (16.2%) were treated by handsewn method and 10 (14.7%) were treated by stapler technique. Out of the total patients, 18 (26.4%) patients had undergone anterior resection and retrocolic anastomosis. Among them 9 (13.2%) were treated by handsewn methods and 9 (13.2%) were treated by stapler technique.

In both groups of study population, female participants were less in number compared to male and the male female distribution in both groups was statistically insignificant (p=1.0000). for group A, the mean age was 55.78 and standard deviation was 7.46. For group B, mean age was 56.40 and standard deviation was 6.78 but it was statistically insignificant (p=0.7215).

For group A, mean duration with standard deviation was 166.2±7.03 min, and for group B, mean duration with standard deviation was 144.8±7.30 min with 95% confidence interval, p value was <0.0001 which was statistically significant. So it suggested that stapler anastomosis required less time than that required for handsewn type.

Table 1: Appearance of bowel sounds following different anastomosis

Time in hours	gastrojejunostomy		Ileocolic		Retrocolic	
	Gr A	Gr B	Gr A	Gr B	Gr A	Gr B
49-60	2	1	1	1	1	2
61-72	8	9	7	6	6	5
73-84	5	4	3	3	2	2
Mean ±SD	68.9±8.11	69.07±6.94	68.68±7.23	68.9±7.58	67.83±7.21	66.5±8.4
P value	0.9523		0.9464		0.7179	

In gastrojejunostomy group, for gr A, mean duration with standard deviation was 68.9±8.11 hrs. For gr B mean duration with standard deviation was 69.07±6.94 hrs. With 95% confidence interval, p value was 0.9523, which was statistically insignificant. In right hemicolectomy and ileocolic anastomosis group, for gr A, mean duration with standard deviation was 68.68±7.23 hrs. For gr B mean duration with standard deviation was 68.9±7.58 hrs. With 95% confidence interval, p value was 0.9464 which was statistically insignificant. In anterior resection and rectocolic group, for gr A, mean duration with standard deviation was 67.83±7.21 hrs. for gr B mean duration with standard deviation was 66.5±8.4 hrs. With 95% confidence interval, p value was 0.7179 which was statistically insignificant. It signifies that the differences in the appearance of bowel sounds in all these groups were statistically insignificant.

Table 2: Starting of oral feeding following different anastomosis

Time in hrs	Gastrojejunostomy		Ileocolic		Rectocolic	
	Gr A	Gr B	Gr A	Gr B	Gr A	Gr B
73-84	1	0	2	2	3	4
85-96	8	9	8	7	6	5
97-108	6	5	1	1	0	0
Mean ±SD	94.5±7.4	94.78±5.97	89.4±6.5	89.3±6.8	86.5±6	85.2±6.3
P value	0.9057		0.9729		0.660	

In the gastrojejunostomy group, for gr A, mean time of starting oral feeding in postoperative period was 94.5 hrs and standard deviation was 7.4. For gr B mean time with standard deviation was 94.78±5.97 hrs. With 95% confidence interval, p value was 0.9057, which was statistically insignificant. In right hemicolectomy and ileocolic anastomosis group, for gr A, mean time of starting oral feeding in postoperative period was 89.4 hrs and standard deviation was 6.5. For gr B mean time with standard deviation was 89.3±6.8 hrs. With 95% confidence interval, p value was 0.9727 which was statistically insignificant. In anterior resection and rectocolic group, for gr A, mean time of starting oral feeding in postoperative period was 86.5 hrs and standard deviation was 6. for gr B mean time with standard deviation was 85.2±6.3 hrs. With 95% confidence interval, p value was 0.660 which was statistically insignificant. It signifies that the differences in time of starting oral feeding in all these groups were statistically insignificant.

Table 3: Postoperative hospital stay following different anastomosis

Duration in days	Gastrojejunostomy		Ileocolic		rectocolic	
	Gr A	Gr B	Gr A	Gr B	GrA	Gr B
6-7	6	5	5	5	4	2
8-9	8	9	5	4	3	6
10-11	1		0	0	2	1
12-13			1	1		
Mean & SD	7.84±1.2	7.78±0.99	7.95±1.8	7.9±1.89	8.05±1.67	8.27±1.2

In gastrojejunostomy group, for gr A, mean duration with standard deviation was 7.84±1.2 days. For gr B mean duration with standard deviation was 7.78±0.99 days. With 95% confidence interval, p value was 0.8848, which was statistically insignificant. In right hemicolectomy and ileocolic anastomosis group, for gr A, mean duration with standard deviation was 7.95±1.8 days. For gr B mean duration with standard deviation was 7.9±1.89 days. With 95% confidence interval, p value was 0.9513 which was statistically insignificant. In anterior resection and rectocolic group, for gr A, mean duration with standard deviation was 8.05±1.67 days. For gr B mean duration with standard deviation was 8.27±1.2 hrs. With 95% confidence interval, p value was 0.7524 which was statistically insignificant. It signifies that the differences in the duration of hospital stay in all these groups were statistically insignificant.

Table 4: Anastomotic leak in different types

Anastomotic leakage	Gastrojejunostomy		Ileocolic		Rectocolic	
	Gr A	Gr B	Gr A	Gr B	Gr A	Gr B
present	0	0	1	1	0	0
absent	15	14	10	9	9	9
Total	15	14	11	10	9	9

Out of the total 68 patients of our study one (1.47%) patient in handsewn group (Gr A) and one (1.47%) patient in stapler group (Gr B) had anastomotic leak. For this value chi square test was done and p value was 1 and it suggested that these differences in these groups were statistically insignificant.

DISCUSSION

An intestinal anastomosis is required when gastrointestinal continuity needs to be restored while a segment of bowel is resected for benign or malignant conditions. For making a good and reliable tension free anastomosis meticulous technique and maintenance of good tissue vascularity is required. The most common complication of gastrointestinal anastomosis is anastomotic leak and wound dehiscence.

In the present study, the duration of gastrectomy and gastrojejunostomy for group A, mean duration was 166.2 mins and for group B the mean duration was 144.8 mins. It was significant statistically ($p<0.0001$), so it was clearly seen that the group B or stapler technique required less time for gastrectomy and gastrojejunostomy. The study also shows the duration of right hemicolectomy and ileocolic anastomosis where the mean duration of gr A was 143.7 mins and for gr B was 125.5 mins. This was statistically significant as p value was < 0.00001. So, stapler technique required less time for right hemicolectomy and ileocolic anastomosis.

Table 1 shows the appearance of bowel sounds in the postoperative period. Most of the time it was more or less same for all the groups. In gr A of gastrojejunostomy gr the mean duration of appearance of bowel sounds was 68.9 hrs and for gr B it was 69.07 hrs. The mean duration of appearance of bowel sounds for gr A of ileocolic anastomosis group was 68.68 hrs and for gr B it was 68.9 hrs. The mean duration of appearance of bowel sounds for gr A of AR group was 67.83 hrs and for gr B it was 66.5 hrs after statistical evaluation it shows that there was no significant difference in appearance of bowel sounds in postoperative periods in both the groups.

Table 2 expresses the time in hours of starting oral feeding in postoperative period. For gastrojejunostomy, the mean time of starting oral feeding in gr A was 95.4 hrs and for gr B it was 9.78 hrs. But it was statistically insignificant ($p=0.9057$). For ileocolic anastomosis, the mean time of starting oral feeding in gr A was 89.4 hrs and for gr B it was 89.3 hrs but the p value was 0.9729 which was statistically insignificant. For rectocolic anastomosis group, the mean time of starting oral feeding for gr A was 86.2 hrs and for gr B was 85.2 hrs. but p value for both the groups was 0.660 so it was also statistically insignificant. So in the present study there was no difference in starting oral feeding in both the groups.

Out of the total 68 patients 2 patients one in each group (both gr A and gr B) undergoing right hemicolectomy and ileocolic anastomosis had anastomotic leakage. Other 66 patients were absolutely fine in postoperative period and percentagewise it was 2.94%. For this chi square analysis was done and the p value was 1, so the occurrence of anastomotic leakage in both the study groups was not significant.

Postoperative hospital stay in days was depicted in table 3. Regarding gastrojejunostomy the mean duration for gr A was 7.84 days and for gr B 7.78 days. No significant difference in both the groups ($p=0.8848$). Regarding ileocolic anastomosis the mean duration of hospital stay for gr A was 7.95 days and gr B it was 7.9 days. No significant difference in both the groups ($p=0.9513$). Regarding the LAR, the mean duration of hospital stay for gr A was 8.05 days and gr B it was 8.27 days. No significant difference in both groups ($p=0.7524$).

CONCLUSION

After comparing the two surgical techniques of gastrointestinal anastomosis in the parameters mentioned above, it was concluded that there was reduction in the operating time with stapler anastomosis compared to the handsewn type and this difference was significant in prolonged surgeries involving multiple anastomoses only. There was no difference in the appearance of bowel sounds in postoperative period and incidence of anastomotic leakage in both the groups. The total duration of hospital stay remained the same in both the groups.

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