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Research Article
Anastomosis

A prospective study of outcome of resection anastomosis in elective GI surgeries.

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Background: Bowel anastomosis is successful when there is accurate union with no tension. Previous literature has compared between hand suturing and stapling devices in retrospective and prospective designs with varying outcomes. In this study a comparison between hand suturing and surgical stapling in patients undergoing bowel surgery is done. **Methods:** A prospective study design over a period of 12 months was conducted in 40 patients undergoing elective resection and anastomosis. Different time parameters for anastomisis procedure, time taken for bowel sounds to return, resumption of oral feeds, postoperative hospital stay were collected. Follow up for 30 days post-operative was done. **Results:** In total forty patients were studied out of which twenty patients underwent hand sewn and twenty patients underwent stapler anastomosis. Main group analysis in mean time durations between hand sewn and stapler anastomosis were respectively; 35.25 minutes and 12 minutes for anastomosis, 3.4 days and 3.35 days for return of bowel sounds, 4.08 days and 4 days for resumotion of oral feeds, 9.35 days and 8.50 days for post-operative hospital stay. A sub-group analysis was also done.**Conclusion:** Stapler anastomosis had shorter anastomosis time and total duration of operation compared to hand sewn anastomosis. However no difference was seen in return of bowel activity, resumption of oral feeds and duration of hospital stay.

Keywords: Surgical anastomosis, Surgical staples, Operative time

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Introduction

A successful anastomosis aims at accurate union of two viable bowel ends with complete avoidance of tension [1]. Hand suturing with improved suture materials remains the method of choice by most of the surgeons, however stapling technique is emerged as an alternative method of anastomosis. The widespread application of stapling devices has helped revolutionize the technical aspects of surgery.

Several retrospective reviews have reported variable results. Of the few prospective randomized trials comparing surgical stapling and manual suturing techniques, majority have focused on large bowel surgery and use of circular stapling instruments. A meta-analysis comparing stapled and handsewn anastomosis in colorectal surgery included did not find any significant difference in the incidence of anastomotic leak between two techniques [2]. Whereas a high incidence of stricture rate and intraoperative problems in the stapled group in comparision to hand-sewn colorectal anastomosis was found [3].

In recent times, improved mechanical stapling are versatile so much so that many surgeons consider [4]. Another systematic review compared hand-sewn and stapled techniques of ileocolic anastomosis finding a significantly lower leak rate in stapled anastomosis [5]. In general benefits of stapling instruments include minimal tissue manipulation and trauma, lesser bleeding and edema at the anastomosis, quicker return of gastrointestinal function and a more rapid patient recovery. In this study, we compare hand suturing with surgical stapling in patients undergoing elective bowel surgery.

Objectives: To assess the duration of anastomosis, duration of total surgery, postop return of bowel activity, resumption of oral feeds and duration of hospital stay in hand sewn anastomosis versus stapled anastomosis in patients undergoing elective gastrointestinal surgeries.

Materials and Methods

Study design and Setting: All patients undergoing gastro-intestinal surgeries involving bowel anastomosis for various elective procedures during a period of 12 months in the Department of General Surgery at St Martha's Hospital, Bangalore, Karnataka.

It was a prospective study.A total of 40 cases who meet the inclusion and exclusion criteria are included in this study.

Sample Size: It was calculated using the formula

$$n = \frac{2s_p^2\left[Z_{1-\alpha/2} + Z_{1-\beta}\right]^2}{\mu_d^2}$$

$$s_p^2 = \frac{s_1^2 + s_2^2}{2}$$

S_{12} – Standard deviation in first group (bowel recovery time)

1-β - Power

S_{22}- Standard deviation in second group (bowel recovery time)

A – Significance level

M_{d2}-Mean difference between the samples.

Patients were grouped into either of the two groups based on the mode of closure implemented by the senior surgeon. Group A were in hand sewn group and group B in stapler group. Hand sewn anastomosis was done using suture materials like 3-0 vicryl 3-0 silk and 3-0 PDS. Staplers to be used in anastomosis are Linear cutting stapler, Linear anastomosing staplers, Circular anastomosing staplers. The data entered in the preformat prepared for the purpose and analyzed and compared with the other studies in the literature.

Inclusion criteria

- All patients admitted to the surgery wards requiring elective gastro-intestinal surgeries who undergo bowel anastomosis.
- Male or female subjects (between the ages of 18 and 70 years) undergoing elective surgery requiring a gastric, small, or large bowel anastomosis.

Exclusion Criteria

- Age group < 18 years.
- Patients with carcinomas.

- Gastro-intestinal anastomosis done in emergency setting, Biliary-enteric anastomosis.
- Patients refusing to join the study or left the hospital before final evaluation.
- All pregnant women are excluded from the study.
- Patients of coagulopathy and on anti-coagulant therapy.
- Patients with Hb<8 or Hypoalbuminemia

Method of data collection

The patients who were admitted for elective resection and anastomosis for various illnesses are selected after thorough clinical examination and investigations to confirm the diagnosis and co morbid conditions are corrected and details recorded in the proforma prepared. They had standard preoperative bowel preparation and prophylactic antibiotic was given. The various observations made like the time taken for the procedure, time taken for bowel sounds to return, resumption of oral feeds, postoperative hospital stay and post-operative complications like wound infection, and anastomotic leak are recorded in the charts. The patients were assessed periodically for 30 days after surgery for development of complications by physical examination of wound and clinical examination. Ethical clearance was taken. The reports compared between the hand sewn and stapler anastomosis and compared with other studies.

Statistical analysis: The following statistical tests are used to compare the results of hand sewn group and stapler group:

01. Patients were allotted to both the groups.
02. Independent samples T-Test to compare mean values between methods.
03. Chi-Square test to compare proportion of the two values.

The observation analyzed statistically and concluded. (P-value <0.05 – significant). The data so obtained was subjected to independent samples t-test statistics and chi-square tests using SPSSv.18.0 and R environment ver.3.2.2.

Results

This study was a prospective study done to compare the outcome of hand sewn versus stapled anastomosis in patients undergoing GI surgeries in

The Department of General Surgery from June 2017-May 2018 at St. Martha's hospital, Bangalore. In this study, out of 40 cases of resection and anastomosis studied, 20 patients underwent hand sewn and 20 patients underwent stapler anastomosis. Patient distribution are mentioned as per age (table 1), gender (table 2), types of anastomosis (table 3), etiology(table4). Hand sewn anastomosis was done in two layer using 3 -0 vicryl and 3-0 silk. Stapler anastomosis done using liner cutting, liner stapler. There were mainly 2 groups-hand sewn and stapled group with 20 patients in each. There were 22 in ileocolic group 14 cases in GJ group, 2 in JJ group and Oesophagogastric anastomosis.

The mean duration of anastomosis for hand sewn was 35.25 minutes and 12 minutes for stapled anastomosis. The mean total operating time taken for hand sewn was 125.75 minutes and for stapler anastomosis it was 97.75. The mean time taken for return of bowel sounds was 3.4 days in hand sewn group and 3.35 days in stapler group. (table5) The mean time of resumption of oral feeds was 4.08 days in hand sewn group and 4 days in stapler group. (table 6) Mean duration of post-operative hospital stay was 9.35 days for hand sewn and 8.50 days for stapler group. (table 7)

Sub-Group Analysis: There were 4 groups observed in our study namely Oesophagogastric group, Gastrojejunostomy group, Jejunojejunostomy group and ileocolic group.

01. The **Oesophago-gastrostomy group** consisted of 2 patients with 1 in each group i.e., hand sewn and stapled. The time taken for anastomosis was shorter in stapled group compared to hand sewn group. There was no significant difference in the return of bowel sounds,start of oral feeds and post operative stay
02. The **Gastrojejunostomy group** consists of 14 patients with 7 in hand sewn and 7 in stapler anastomosis group. Mean duration of anastomosis was 33.5 minutes for hand sewn group and 11.4 minutes for stapled group. Mean operating time was 121.4 minutes for hand sewn and 90 minutes for stapler group. Return of bowel sounds for hand sewn was 3.35 days and 3.14 days for stapler group. Resumption of oral feeds 4.14 days and 3.9 days for hand sewn and stapler group respectively. Post-operative hospital stay was 10.1 days for hand sewn group and 8.7 days for stapled group

03. The **Jejunojejunostomy group** consists of 2 patients with 1 in each group i.e. hand sewn and stapled. Time taken for anastomosis and total duration of operation was shorter in stapled group (10 minutes;80 minutes) than hand sewn group (30 minutes;110 minutes). Return of bowel sounds for hand sewn was 3.5 days and 3 days for stapler group. Resumption of oral feeds 4 days and 3.5 days for hand sewn and stapler group respectively. Post operative stay was almost same for both cases

04. The **ileocolic group** had 22 patients with 11 in each group. Mean duration of anastomosis was 35.9 minutes for hand sewn group and 12.2 minutes for stapled group. Mean operating time for hand sewn was 117.7 minutes and for stapler group was 89.5 minutes. . Return of bowel sounds for hand sewn was 3.36 days and 3.4 days for stapler group. Resumption of oral feeds was 3.95 days and 4 days for hand sewn and stapler group respectively. Post-operative hospital stays for hand sewn 8.7 days and 8.27 days for stapler group

Table 1: Age Distribution

Age in years	Hand Sewn Anastamosis	Stapler Anastamosis	Total
18-20	0(0%)	1(5%)	1(2.5%)
20-30	2(10%)	4(20%)	6(15%)
31-40	2(10%)	3(15%)	5(12.5%)
41-50	6(30%)	8(40%)	14(35%)
51-60	6(30%)	4(20%)	10(25%)
61-70	4(20%)	0(0%)	4(10%)
Total	20(100%)	20(100%)	40(100%)
Mean ± SD	48.30±11.27	41.95±11.51	45.13±11.69

Table 2: Gender Distribution

Gender	Hand Sewn Anastamosis	Stapler Anastamosis	Total
Female	8(40%)	5(25%)	13(32.5%)
Male	12(60%)	15(75%)	27(67.5%)
Total	20(100%)	20(100%)	40(100%)

Table 3: Types of Anastomosis

Types of anastomosis	Hand sewn	Stapled
Oesophago-gastrostomy	1(5%)	1(5%)
Gastrojejunostomy	7(35%)	7(35%)
Jejunojejunostomy	1(5%)	1(5%)
Ileocolic	11(55%)	11(55%)

Table 4: Etiology

Etiology	No of patients(%)
Cicatrizing duodenal ulcer	27
Ileal stricture	10
Ileal TB	10
Obstructed paraumbilical hernia	10
Adhesion bands	15
Gastric outlet obstruction	10
Jejunal stricture	7
Intussusception	5
Corrosive acid poisoning	3
Meckels diverticulum	3

Table 5 – Comparison of return of bowel sounds

Return Bowel sounds	Hand Sewn Anastamosis	Stapler Anastamosis	Total
3	7(35.0%)	7(35.0%)	14(35.0%)
3.5	10(50.0%)	12(60.0%)	22(55.0%)
4	3(15.0%)	1(5.0%)	4(10.0%)
Total	20(100.0%)	20(100.0%)	40(100.0%)

Table 6 Comparison of resumption of oral feeds

Return Oral feeds	Hand Sewn Anastamosis	Stapler Anastamosis	Total
3.5	2(10%)	2(10%)	4(10%)
4	15(75%)	17(85%)	32(80%)
4.5	1(5%)	0(0%)	1(2.5%)
5	2(10%)	1(5%)	3(7.5%)
Total	20(100%)	20(100%)	40(100%)

Table7 Comparison of return bowel sounds, resumptions of oral feeds & post-op Hospital stay

Variables	Hand Sewn Anastamosis	Stapler Anastamosis	Total	P value
Return bowel sounds	3.40±0.35	3.35±0.29	3.37±0.32	0.622
Resumption of oral feeds	4.08±0.37	4.00±0.28	4.04±0.33	0.477
Post operative hospital stay	9.35±2.16	8.50±1.88	8.93±2.04	0.192

Discussion

The conventional (hand sewn) technique of intestinal anastomosis has been in vogue for decades. Staplers which were developed to simplify surgery began to have significant impact. For fashioning anastomosis the factors considered are time required, restoration of function, effective hemostasis, reduction of tissue trauma and prevention of post-operative morbidity like sepsis.

Accurate approximation without tension and with good blood supply is fundamental whether suturing or stapling. Staplers have been developed to fulfill most of these criteria. It has become the integral part of surgical practice.

Staplers are capable of cutting and stapling at the same time avoiding the need for clamping [6]. The increased cost of staplers is offset by reduction in operating time [7]. Circular staplers have better access in low pelvic surgery, sparing many patients from permanent colostomy [8]. In this study we compared the outcome of hand sewn anastomosis with stapled anastomosis in 40 patients who presented in Department of General Surgery at St Martha's Hospital, Bangalore. The results were analyzed and compared with other studies published in literature. There was significant difference in the operating time in stapled anastomosis group compared to hand sewn group. The duration of anastomosis and the total duration of operation was shorter in stapled anastomosis group as compared to hand sewn technique. Stapled anastomosis has an advantage of shorter duration of surgery as compared to hand sewn anastomosis thereby reducing the duration of patient being under the effect of anaesthesia. There was no significant difference in both hands sewn and stapler anastomosis group with respect to appearance of bowel sounds, resumption of oral feeds and post-operative hospital stay.

Subgroup analysis

Mean operating time

In Oesophagogastric group operating time was 260 minutes for hand sewn and 250 minutes for stapler group. The mean of total operating time for GJ group in this study was 121.4 minutes for hand sewn group and 90 minutes for stapler group with significant p value <0.001. In ileocolic group it was 117.7 minutes for hand sewn group and 89.5 minutes for stapler group with significant p value 0.003. Hence it was observed that in the sub-groups of GJ, JJ and ileocolic group, mean operating time was significantly shorter in stapler group. These results are similar to the study done by HimabinduBangaruet al [9]. and similar to the study done by Damesha et al [10]. George et al [11]. and Hollender et al [12]. A systematic review and meta-analysis of 17 studies comparing hand sewing and stapling in ileocolic, colocolonic and colorectal anastomosis was done by MacRae& McLeod [13]. in 1998.

They concluded that although intraoperative technical problems were more common in those that were stapled, no evidence of differences between the two groups was found in the other variables, and they considered the two techniques to be equally effective. In Oesophagogastric anastomosis group total operating time taken for hand sewn and stapler anastomosis did not show any statistically significant difference. In the study done by Quan wang et al [14]. it was found that stapler anastomosis has a shortened operating time than the hand sewn anastomosis. But in our study we did not find any significance since Oesophagogastrostomy is not done regularly in this institution. In GJ group there is no statistically significant difference with respect to these parameters in in hand sewn and stapler group. Similar findings was found in HimabinduBangaru et al and Damesha et al. The above parameters in ileocolic and jejunojejunal anastomosis group in both hand sewn and stapler group shows no significant statistical difference which was in accordance with the study done by Scher et al. [15,16]. George et al and Himabindu Bangaru et al. In Oesophagogastric anastomosis group shows similar results, statistically not significant. This study shows, in all the groups there was no statistically significant difference in post-operative hospital stay in hand sewn and stapler anastomosis with a P-value of 0.695. This is in accordance with the studies done by Himabindu et al, Scher et al, Reiling et al [16]. and George et al This study is unlike of Quan Wang et al study in which they found shorter postoperative hospital stay in Oesophagogastric stapler anastomosis group.

Conclusion

This study suggested that stapled anastomosis has the advantage of shorter anastomosis time and also total duration of operation when compared to hand sewn anastomosis which in turn reduces duration of anaesthesia and its effects to the patients. However the type of anastomosis did not have any difference in the return of bowel activity, resumption of oral feeds and duration of hospital stay.

What does this study add to present knowledge ?

Hence this study suggests both handsewn and stapled anastomosis technique can be safely practiced with the advantage of shorter duration for stapled anastomosis.

The choice of technique depends upon surgeon and also availability of facility.

Author contribution

Dr. Abhilash N: conceptual framework, data collection. **Dr. Srikanth k Aithal , Dr. Venugopal K J:** review of literature, statistical help, methodology review. **Dr. Abhilash N:** manuscript writing and editing

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