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Comparative Study of Bowel Anastomosis - Hand Sewn Versus Stapler

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Abstract
Background:*Bowel anastomosis are common procedures in both elective as well as emergency GI surgeries.The anastomotic technique selected depends upon site of anastomosis, bowel calibre, bowel quality and underlying disease process. Important factor in the decision to perform anastomosis however remains individual surgical experience and preference. The theory behind creating a safe, healthy bowel anastomosis remains constant, irrespective of the technique chosen.*
Aims And Objective:*To compare hand suturing with surgical stapling in a comparative study in patients undergoing elective gastrointestinal surgeries*
Materials And Methods: *A minimum of 70 cases (35 in each group) which met the inclusion and exclusion criteria were included in this hospital based comparative study.*
Results: *There was no difference in appearance of bowel sounds or resumption of oral feeds, anastomotic leak rates and other complications in both hand sewn and stapler group. There was significant difference in total mean operating time and anastomosis time in the stapler group. There was no mortality in either group.*
Conclusion:*Stapling technique can significantly reduce the time for the anastomotic procedure. With reduced operating time there is less tissue trauma due to less tissue handling. Due to the shortened total operating time staplers may be advantageous in patients whose general condition is poor and who would not tolerate prolonged anesthesia There is no doubt, however, that stapling techniques are quicker to perform, particularly in situations where access is difficult such as in low colorectal anastomosis. The only drawback being the added cost for staplers.*
Keywords: *Bowel Anastomosis, GI Staplers, Gastro-Intestinal Surgeries, Hand Sewn Anastomosis*

I. Introduction

Intestinal anastomosis is a surgical procedure to establish communication between two formerly distant portions of the intestine. This procedure restores intestinal continuity after removal of a pathological condition affecting the bowel. Intestinal anastomosis is a very common procedure done in the elective surgical setting when resections are carried out for benign or malignant lesions of the gastrointestinal tract.

Intestinal anastomosis can be performed by a hand-sewn technique using absorbable or non-absorbable sutures, mechanical stapling devices or biological glues. Sutured anastomosis (hand-sewn technique) is the commonly used method. The newer stapling devices for intestinal anastomosis has provided an alternative option to perform rapid anastomosis. Increased cost and less familiarity with its usage are the main drawbacks of stapling devices. The choice of anastomotic technique is influenced by diameter of the bowel ends, accessibility, edema and site of anastomosis, available time and equipment, contamination and underlying pathology. However the most important factor in the decision to perform particular anastomosis depends on individual surgeons experience and personal preference.

It has been stated that the key to a successful anastomosis is the accurate union of two viable bowel ends with complete avoidance of tension[1]. Undoubtedly, two of the most significant complications related to intestinal anastomosis is dehiscence and anastomotic leak. Breakdown of anastomosis is associated with considerable perioperative morbidity and mortality. That being said, the odds of creating a safe and reliable anastomosis can be greatly increased if certain surgical tenets are respected. These include meticulous technique, tension free anastomosis, maintaining good tissue vascularity, perioperative nutritional optimization and effective management of systemic diseases, perioperative optimization of medical comorbidities, and avoidance of certain drugs such as steroids and vasopressors.

Virtually all elective resections of gastrointestinal organs are followed by anastomosis to restore continuity.

Surgical staples have been there since the early 20th century, but their use in routine surgery has not been widespread until 40 years ago when their design became much more convenient and efficient. Today, staplers are an integral part of most major abdominal operations.

This study has been taken up to know the advantages of staplers anastomosis over conventional hand sewn anastomosis in respect to time taken for procedure, appearance of bowel sounds resumption of oral feeds, post-operative hospital stay, incidence of leakage and anastomotic bleeding.

II. Materials And Methods

This study was conducted in the Department of General Surgery at KSHEMA, Nitte University, Mangalore. A minimum of 70 cases (35 in each group) which met the inclusion and exclusion criteria were included in this hospital based prospective comparative study conducted for duration of 18 months. The study population included all patients who underwent elective gastrointestinal surgeries.

The subjects were allotted into two groups according to the type of anastomosis, hand sewn and stapler. Group A were in hand sewn group and group B in stapler group. For the hand sewn group the suture material and type of anastomosis was done according to the individual surgeon's choice and preference. For the stapler group anastomosis was done using Linear cutting stapler, Linear anastomosing staplers or Circular anastomosing staplers, based on the need. The data was entered in the proforma prepared for the purpose and analyzed both as single group and subgroup analysis and compared with the other studies in the literature.

Inclusion criteria

1. All patients admitted to the surgery wards requiring elective gastro-intestinal surgeries who undergo bowel anastomosis for various benign and malignant conditions.
2. Male or female subjects (between the ages of 12 and 80 years) undergoing various gastrointestinal surgeries.
3. Subjects who gave written informed consent after reviewing the informed consent document.

Exclusion Criteria

1. Age less than 12 years of age.
2. Gastro-intestinal anastomosis done in emergency setting.
3. All pregnant patients
4. Patients undergoing radiotherapy.
5. Patients of coagulopathy and patients on anti-coagulation

III. 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 comorbid conditions. Details were recorded in the proforma prepared.

All patients had average body mass index. Pre-operatively anemia, diabetes and hypertension were controlled. They had standard preoperative bowel preparation and prophylactic antibiotic was given. Fitness for surgery by physician and cardiologist obtained. Preanesthetic clearance was obtained.

When planned for resection and anastomosis patients were randomly chosen for hand sewn and stapler anastomosis. The various observations made like the time taken for the procedure, time taken for bowel sounds to return, resumption of oral feeds, post- operative hospital stay and post-operative complications like bleeding, and anastomotic leak and mortality are recorded in the charts.

The patients were assessed till discharge from the hospital for development of complications by physical examination of wound and clinical examination. The reports were compared between the hand sewn and stapler anastomosis groups and also compared with other studies.

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

1. Independent samples T-Test to compare mean values between methods.
2. Chi-Square test to compare proportion of the two values.

The observation analyzed statistically and concluded. (P-value <0.05 – significant)

IV. Results

A total number of 70 cases of resection and anastomosis were studied, out of which 35 patients had hand sewn and 35 patients had stapler anastomosis. The total sample size of this study was 70 cases with 35 in hand sewn group and 35 in stapler group. There was no randomisation. It was a observational comparative study. The cases were operated by different surgeons. The decision to use hand sewn technique or staples was

left to the discretion of the operating surgeon. In the hand sewn group the techniques was based on the operating surgeon's preference.

In our study we included all cases which underwent elective GI anastomosis. Even benign cases were included unlike majority of other studies which included only malignant cases.

Majority of patients in both groups were between 40 to 80 years. The mean age in the hand sewn group was 54.63 years and in the stapler group it was 56.63 years.

Of the 70 cases 40 patients were males and 30 patients were females.

All patients underwent pre anaesthetic clearance with 38 patients classified under ASA I, 26 patientsunder ASA II and 6 patients classified under ASA III. There were 18 benign cases and 52 malignant cases. Majority of benign cases i.e. 15 cases underwent hand sewn anastomosis. Among 52 malignant cases 20 cases were hand sewn anastomosis and 32 cases underwent stapler anastomosis.

The mean total operating time was 269.14 mins in the hand sewn group and 253.43 mins in the stapler group. The mean anstomosis time was 33.9 mins in the hand sewn group and 12.92 mins in the stapler group.

Duration * Group Crosstabulation

			Group		
			HandSewn	Stapler	Total
Duration	150 - 200	Count	5	3	8
		% within Group	14.3%	8.6%	11.4%
	201 - 250	Count	18	24	42
		% within Group	51.4%	68.6%	60.0%
	251 - 300	Count	7	4	11
		% within Group	20.0%	11.4%	15.7%
	Above 300	Count	5	4	9
		% within Group	14.3%	11.4%	12.9%
Total		Count	35	35	70
		% within Group	100.0%	100.0%	100.0%

Table 1- Total Duration (in minutes)

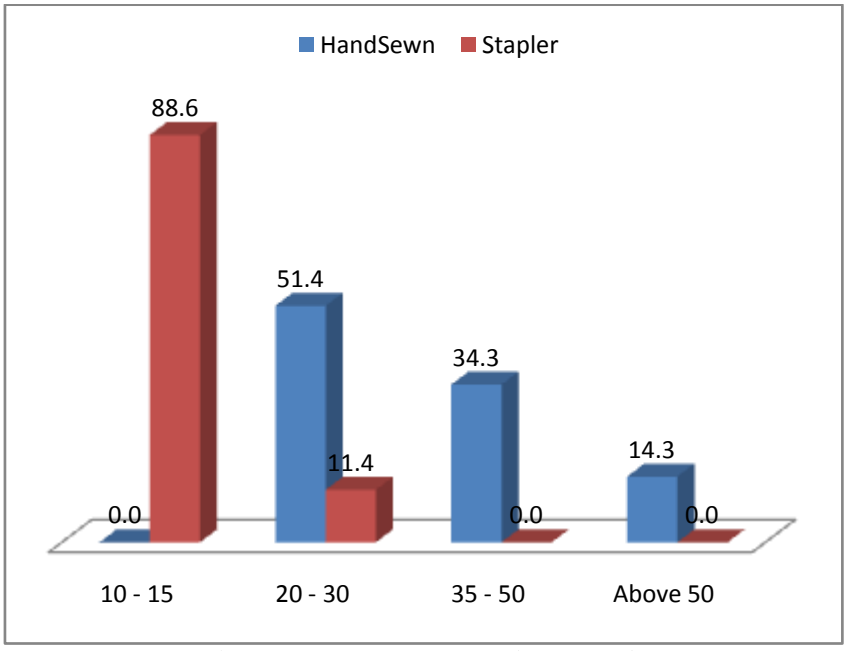

Figure 1- Anastomosis time (in minutes)

Appearance of bowel sounds was earlier in the stapler group (3.26 days) when compared to hand sewn group (3.89 days). Oral feeds starting day was earlier in the stapler group (4.89days) when compared to hand sewn group (5.37days).

In our study only one patient in the hand sewn group had an anasotmotic leak. It was a case of CA Pancreas. Patient underwent Whipples procedure. Intestinal contents were noticed in the drain. The leak was managed conservatively.

Leak * Group Crosstabulation

			Group		
			HandSewn	Stapler	Total
Leak	Absent	Count	34	35	69
		% within Group	97.1%	100.0%	98.6%
	Present	Count	1	0	1
		% within Group	2.9%	.0%	1.4%
Total		Count	35	35	70
		% within Group	100.0%	100.0%	100.0%

Table 2-Anastomosis leak

A total of 5 patients had other complications. Two patients in the hand sewn group and three patients in the stapler group. Complications include wound dehiscence, burst abdomen, pneumonia and myocardial infarction. All these patients were managed conservatively.
There was no mortality in both the groups.

Figure 2- Stapler anastomosis with linear stapler

V. Discussion

This comparative study between hand sewn anastomosis with stapled anastomosis in 70 patients was done and the results were analyzed and compared with other studies published in literature.

The results are same for both hands sewn and stapler anastomosis group regarding resumption of oral feeds. Appearance of bowel sounds was earlier in stapler group, which was statistically significant but clinically did not make much difference. Regarding the total operative time and anastomosis time it is shorter in stapler group when compared to hand sewn group.

Hand sewn group had one anastomotic leak when compared to stapler group but was statistically not significant. Regarding other complications hand sewn group had two complications, whereas stapler group had three complications.

Both the groups did not have any mortality.

As per the study done by Afsar Ali Bhatti et al, they have concluded that there is no statistical difference between hand sewn and stapler anastomosis regarding the leak. In their series they had a leak of 2.9% in stapler and 8.6% in hand sewn anastomosis[2].

Hassanen et al in their clinical trials of 39 patients found leak in 16.6% in stapler group and 38% in hand sewn favoring stapler anastomosis[3].

In a study from the West of Scotland and Highland Anastomosis Study Group, there was no difference in the clinical leaks[4].

As per the 1998 meta-analysis which addressed 13 trials published during 1980 to 1998 showed no difference in leak in colorectal anastomosis and significant reduction in leak in stapled group for ileocolic

anastomosis[4]. The high rate of anastomotic leak in OG group in this study is due to absence of adventitious layer.

As for mortality is concerned amounting to 7.5% and is the same for both the groups of hands sewn and stapler group.

This is observed in both the studies of West of Scotland and Highland groups and the meta-analysis of 1998, that there was no difference in mortality[4]

The mean of total operating time for hand sewn group was 269.14 mins whereas for the stapler group it was 253.43 mins with a p value of 0.500 which was statistically not significant.

The total mean operating time were significantly shorter in stapler group.

These results are similar to the study done by HimabinduBangaruet al[5] and similar to the study done by Dameshaet al[6], George et al[7] and Hollender et al[8].

A systematic review and meta-analysis of 17 studies comparing hand sewing and stapling in ileocolonic, colocolonic and colorectal anastomosis was done by MacRae& McLeod[9] 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.

The increased mean operating time in both the groups can be explained by cases of Carcinoma Pancreas, Periampullary Carcinoma and Carcinoma GE junction which require significantly longer operating time when compared to other malignancies.The mean anastomosis time in hand sewn group was 33.9 mins and in the stapler group it was 12.92 mins. In the stapler group 88 % of anastomosis was done within 10-15 mins which included loading the stapler gun, alignment of the tissues and firing of the gun.

In 11 % of the patients in stapler group the anastomosis time was slightly longer (between 20 – 30 mins) due to the added time required to set up the circular stapler.

In the hand sewn group, for 51% of patients the anatomosis time was between 20-30 mins and in the remaining 35 % of patients the anastomosis time was between 30-40 mins. This was mainly due to different surgeons and different suturing techniques employed by the surgeon. Whereas in the stapler group, alignment and firing of the stapler was uniform with different surgeons.

In this study using staplers reduces the anastomosis time and in turn the total operating time, which is in conjunction with other studies.

In our study we had a total of 18 benign cases (15 in the hand sewn group and 3 in the stapler group). Rest of the cases where malignant (52 cases). Most of the benign cases underwent hand sewn anstomosis. Most of the other studies have taken only malignant cases. In our study we took all the cases which underwent elective GI anastomosis irrespective of the type of pathology (Benign or Malignant).

With respect to return of bowel sounds, it was 3.89 in the hand sewn group and 3.26 in the stapler group with a p value of 0.0011. It was statistically signifinant but clinically the difference was negligible. For resumption of oral feeds the mean was 5.37 days for hand sewn group and 4.89 days for stapler group with a p value of 0.117, which was statiscally not significant. Similar findings was found in HimabinduBangaru et al[5] and Damesha et al[6].

In this study there was one anastomotic leak in the hand sewn group post Whipples procedure. It was managed conservatively. There was no statistical difference in anastomosis leak in hand sewn and stapler group.In other studies of Quan Wand et al[10] also found no significant difference in both hand sewn and stapler group.J.D Uschal et al in their meta-analysis of 50 articles found no significant difference in the leak in hand sewn and stapler anastomosis. This result does not correlate with other studies by Docherty et al[14], Lustosa et al[15] and Nasir Khan et al[16] and HimabinduBangaru et al[5] and Frances Goulder et al[17] in which there were anastomotic leaks in colorectal anastomosis, but similar in both hands sewn and stapler anastomosis. Frances et al in their review article quoted to have 8.3% of hand sewn and 2.8% of stapler anastomosis leaks. Our study is in accordance with study done by SuzanaAngélicaet al[18] in 2008 which showed no difference in incidence of anastomotic leak between the two groups. There was no bleeding from the anastomotic site which is similar to Himabinduet al[5] study.

VI. Conclusion

It is concluded by this study both hand sewn and stapler anastomosis can be performed safely with a small risk of anastomotic leak in oesophagogastricanastomosis in both these methods, otherwise there is no risk of leak in other anastomosis in both the technique.

There is no difference in the time of appearance of bowel sounds, resumption of oral feeds and in total post-operative hospital stay.

Due to the shortened total operating time in stapled anastomosis, staplers may be advantageous in patients whose general condition is poor and who would not tolerate prolonged anesthesia.

By this study it is concluded that neither hand sewn nor stapler anastomosis is favored for GI anastomosis. Surgeons therefore select the technique of their choice depending on the availability of facilities. The stapler can be beneficial in the armamentarium of the operating theatre.
One should not forget to master the art of conventional GI anastomosis technique.

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