International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Analytical Cross-Sectional Study to Assess the Effectiveness of Bowel Anastamosis using Stapler v/s Handsewn Techniques in a Tertiary Hospital

Dr. B. Santhi, MS., DGO.[1], Dr. Karthikmuthuram. S.[2], M.S, DR. Arulraj. C[3]

[1]Professor & Head of the Department, Department of General Surgery, Govt Kilpauk Medical College & Hospital Chennai 600010, India

[2]Assistant Professor of Surgery, GOVT Kilpauk Medical College & Hospital Chennai 600010, India

[3]Final Year Post Graduate, Department of General Surgery, GOVT Kilpauk Medical College & Hospital Chennai 600010, India

Abstract: ***Background: 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 one of the most commonly performed surgical procedures in the elective setting when resections are carried out for benign or malignant lesions of the gastrointestinal tract. Proper surgical technique and adherence to fundamental principles is imperative to ensure successful outcome after intestinal anastomosis. Intestinal anastomosis can be performed by a hand-sewn technique using absorbable or non-absorbable sutures, mechanical stapling devices or biological glues.To establish the better method of anastomosis among stapler and handsewn technique. To compare the results obtained from these two techniques and to assess the bowel's ability to regain the continuity after anastomosis using two different methods. Methods: Written informed consent will be obtained from the patients undergoing the procedure. The patients with laparotomy and bowel anastomoses using these two techniques are included in this study. During follow up, patients are divided into two groups. First group patients by staplers. Second group patients by hand sewn technique and the patients are followed. Observations are tabulated according to the predesigned proforma. Results: This randomized controlled trial compared the outcome of hand sewn anastomosis with stapled anastomosis in 40 patients who presented in Department of General Surgery at Government Kilpauk Medical College. The results were analyzed and compared with other studies published in literature. The results are same for both hands sewn and stapler anastomosis group in all 4 groups regarding appearance of bowel sounds, resumption of oral feeds and post-operative hospital stay. Regarding the total operation time it is shorter in stapler group of gastrojejunostomy, ileocolic and colorectal subgroups as compared to hand sewn technique. It is same for anastomosis inoesophogogastrostomy group. The results are the same as far as complications are concerned, that is 2 anastomotic leaks in each group of oesophagogastric anastomosis. (10% for each group). Regarding the mortality there are 3 deaths amounting to 7.5%. One death in colonic group which is due to unrelated cause.The other 2 in oesophoagogastric anastomosis, 1 in each of hands sewn and stapler anastomosis group. There are no other complications. With the added benefit of short operation time, stapled anastomosis scores over hands sewn anastomosis. Conclusion: 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.***

Keywords: GI anastomosis, Hand sewn, Stapler anastomosis, Complications

1. Introduction

Intestinal anastomosis is one of the most commonly performed surgical procedures in the elective setting when resections are carried out for benign or malignant lesions of the gastrointestinal tract.

Proper surgical technique and adherence to fundamental principles is imperative to ensure successful outcome after intestinal anastomosis.

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 option because of the availability and affordability of suture materials and familiarity with the procedure. The increased availability of stapling devices for intestinal anastomosis has provided an alternative option to perform rapid anastomosis. Higher cost, limited availability, and less familiarity are the main drawbacks of stapling devices.

However the most important factor in the decision to perform particular anastomosis depends on individual surgical 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 remain dehiscence and leakage. Indeed, 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.

Virtually all elective resections of gastrointestinal organs are followed by anastomosis to restore continuity. Bypass operations on the GI tract, once rarely performed, are the cornerstone of bariatric surgery. The widespread use of mechanical suturing devices (linear and circular staplers) changed the face of gastrointestinal surgery.

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.

Aim

To establish the better method of anastomosis among stapler and handsewn technique.

Objectives

To compare the results obtained from these two techniques and to assess the bowel's ability to regain the continuity after anastomosis using two different methods.

2. Materials and Methods

Written informed consent will be obtained from the patients undergoing the procedure. The patients with laparotomy and bowel anastomoses using these two techniques are included in this study. During follow up, patients are divided into two groups. First group patients by staplers. Second group patients by hand sewn technique and the patients are followed. Observations are tabulated according to the predesigned proforma.

Place of Study: Department of general surgery, Government Kilpauk medical college and hospital, Chennai

Duration: 5 months

Study Design: Prospective cross sectional study

Inclusion criteria:

- All patients undergoing elective gastrointestinal surgeries will be included in the study

Exclusion criteria:

- Patients with comorbidities like diabetes, Tuberculosis, steroid abuse.
- Patients who are not willing to participate in the study
- Patients who had received or receiving radiotherapy or chemotherapy
- Immunocompromised patients

Sample Size: 40

Methodology

After getting written informed consent from the patients undergoing elective laparotomy. Patient will be randomly alloted to Group 1 and 2 by lot method. Patient will undergo laparotomy and bowel anastamois by either procedure will be decided by operating surgeon. Patient ID and details of the procedure will be kept confidential from the primary investigator. Primary investigator will follow the patient post operatively till they are getting discharged. Operating time will be given by operating surgeon. Observations are tabulated according to the predesigned proforma.

3. Results

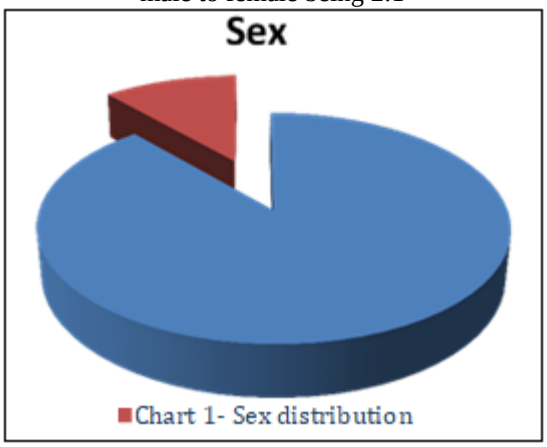
A Total number of 40 cases of resection and anastomosis studied, out of which 20 patients had hand sewn and 20 patients had stapler anastomosis.

Table 3: Comparison of age groups

Age in years	Group A Number of patients		Group B Number of patients	
18-20	0	-	0	-
21-30	1	5%	1	5%
31-40	4	20%	5	25%
41-50	7	35%	3	15%
51-60	4	20%	8	40%
61-70	4	20%	2	10%
71-80	0	-	1	5%

Age and sex incidence

Out of the 40 cases 25 male and 15 female with ratio of male to female being 2:1



Mean Age

Group A consists of 12 males and 8 females and group B consists of 13 males and 7 females. The mean age of patients in group A is 48.45 years and in group B is 49.25 years.

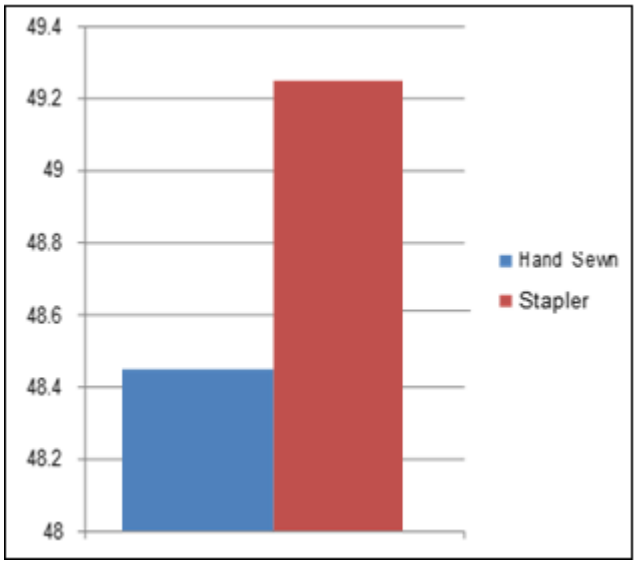


Chart 2- Mean Age

Types of anastomosis

1. **Oesophago-gastrostomy (Carcinoma Esophagus) - 6**
2. **Gastrojejunostomy -12**

a) Pyloric stenosis - 10
b) Carcinoma stomach - 2

Ileocolic -12

a) Ileostomy closure - 4
b) Carcinoma caecum - 4
c) Ileal stricture - 2
d) Ileal TB - 2

Colorectal -12

a) Colorectal carcinoma - 4
b) Rectosigmoid carcinoma - 4
c) Colostomy closure

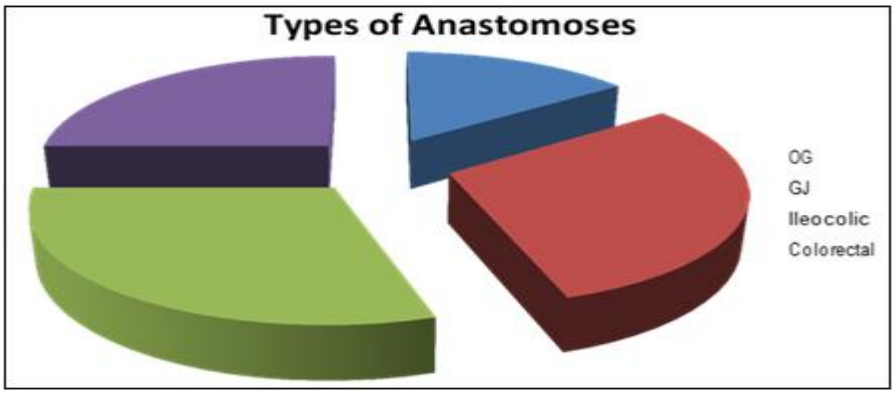


Chart 3: Types of anastomosis

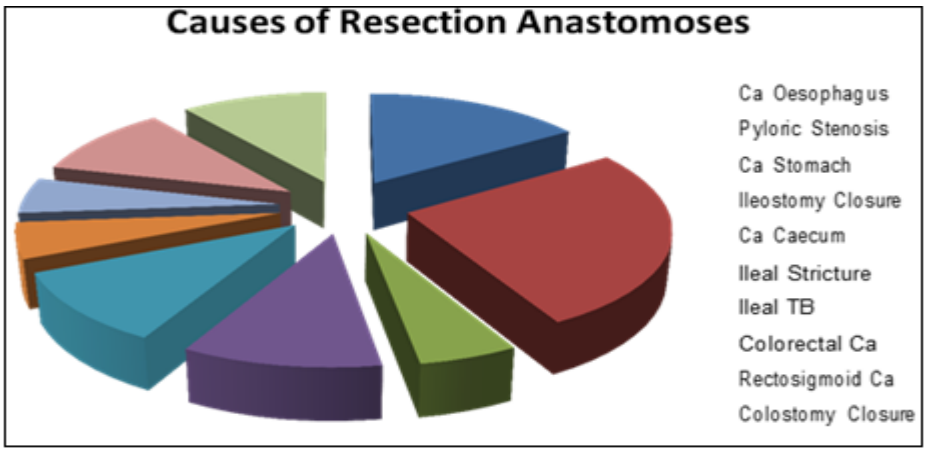


Chart 4- Causes of Resection Anastomosis

Operating time

The mean operating time taken for hand sewn was 143.75 minutes and for stapler anastomosis was 123 minutes.

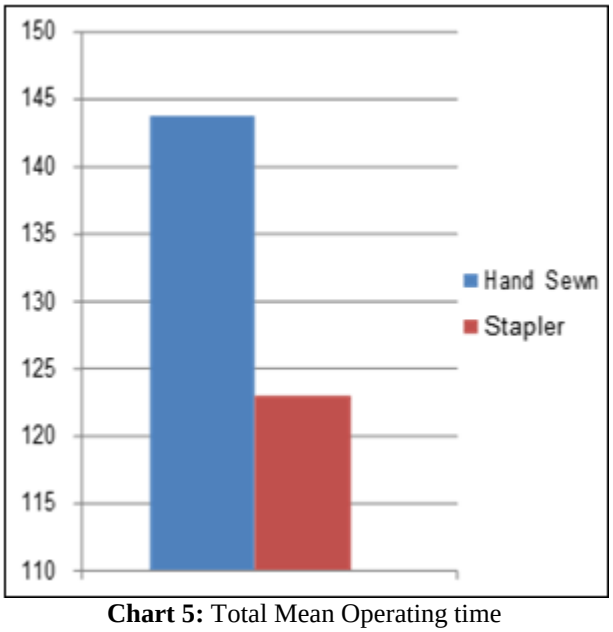


Chart 5: Total Mean Operating time

Return of bowel sounds
The mean time taken for return of bowel sounds was 3.2 days in hand sewn group and 3.2 days in stapler group.

Resumption of oral feeds
The mean time of resumption of oral feeds was 3.87 days in hand sewn group and 3.9 days in stapler group.

Post-operative Hospital stay
Mean duration of post-operative hospital stay was almost the same in both the groups 8.6 days for hand sewn and 8.4 days for stapler group.

Post-operative complications
Complications of anastomotic leak were found in 4 cases of oesophagogastricanastomosis, 2 in each hand sewn and stapler group, both on post-operative day 4. There were no complications of anastomotic bleeding in both the groups.

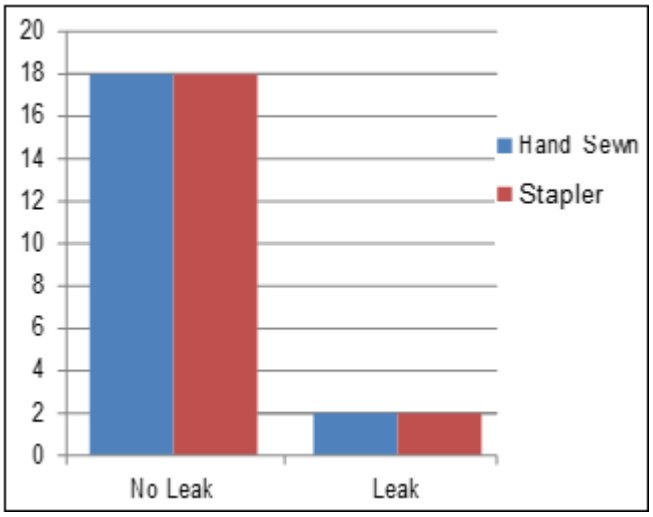


Chart 6: Correlation of technique used with anastomotic leak

Death
There were 2 deaths in oesophagogastric anastomotic groups 1 from both groups. One in colostomy closure of stapler anastomosis group who died due to pulmonary complications.

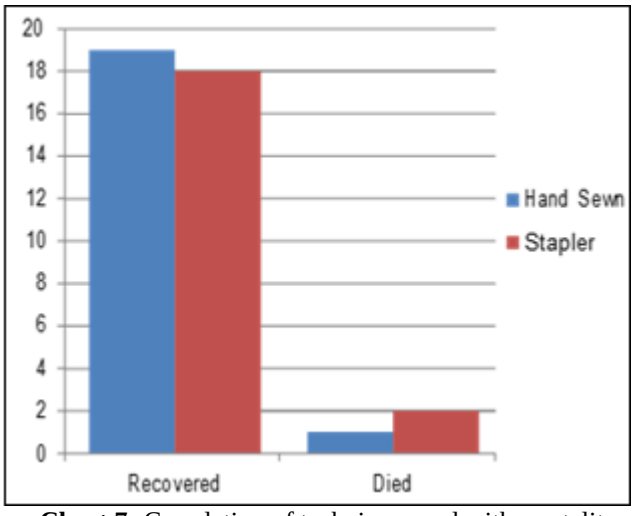


Chart 7: Correlation of technique used with mortality
Subgroup analysis

They are grouped as GJ group, ileocolic group, colorectal group and oesophagogastric group.

The **GJ group** consists of 12 patients with 6 in each hand sewn and 6 in stapler anastomotic group. Mean operating time was 109.16 minutes for hand sewn and 90 minutes for stapler group. Return of bowel sounds for hand sewn was 3.25 days for hand sewn and 3.16 days for stapler group.

Resumption of oral feeds 3.8 days and 4 days for hand sewn and stapler group respectively. Post-operative hospital stay were same in both the groups (7.8 days). There was no anastomotic leak or post-operative bleeding in both the groups.

In **ileocolic group** having 12 patients 6 in each group.

Mean operating time for hand sewn was 117.5 minutes and for stapler group was 87.5 minutes. Return of bowel sounds for hand sewn was 3.08 days and 3.16 days for stapler group. Resumption of oral feeds 3.75 days and 3.91 days for hand sewn and stapler group respectively. Post-operative hospital stays for hand sewn 7.8 days and 8 days for stapler group. No leak, bleeding or mortality in both the groups.

In 10 cases of **colorectal anastomosis** 5 in each group of hand sewn and stapler anastomosis.

Mean operating time for hand sewn was 160 minutes and for stapler group was 138 minutes. Return of bowel sounds for hand sewn was 3.2 days and 3.3 days for stapler group. Resumption of oral feeds 3.8 and 3.9 days for hand sewn and stapler group respectively. Post-operative hospital stays for hand sewn 10 days and 8.8 days for stapler group.

There was one mortality in stapler anastomosis group, a case of colostomy closure due to antecedent cause. Patient died of pulmonary causes (ARDS).

In 6 cases of **oesophagogastrectomy** 4 leaks in total with 2 in each group of hand sewn and stapler anastomosis. Mean operating time for hand sewn was 238.3 minutes and 235 minutes for stapler anastomosis group. Return of bowel sounds for hand sewn was 3.33 days and 3.16 days for stapler group. Resumption of oral feeds 4.3 days and 3.6 days for hand sewn and stapler group respectively. Mean post-operative hospital stay for hands sewn 14 days and stapler group was 14.5 days. Out of the 4 leaks, 1 from each group died as a result.

Other 2 leaks were managed conservatively and patients were discharged after recovery.

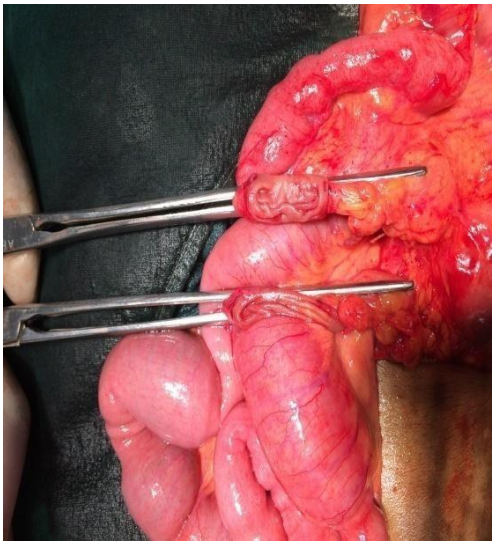


Figure 11: Ileal resection and Anastomosis for ileal stricture.

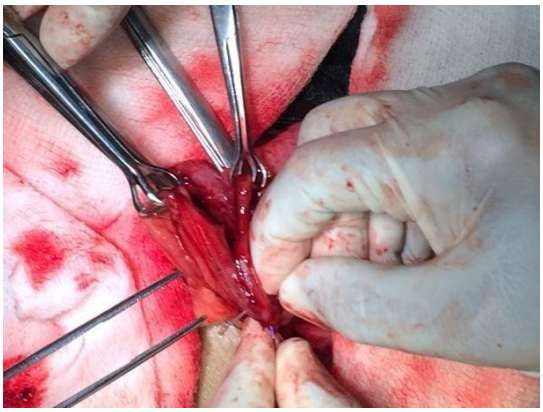


Figure 12: Hand sewn technique in ileal anastomosis

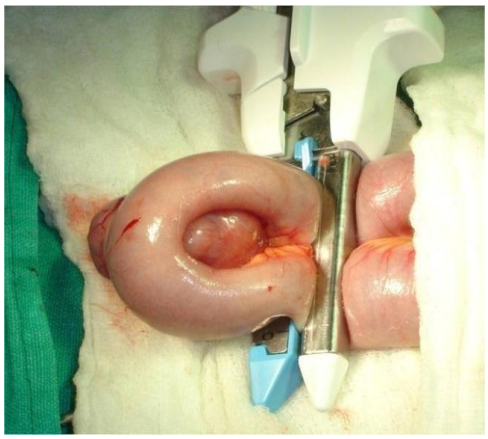


Figure 13: Stapler anastomosis with linear stapler for ilealanastamosis

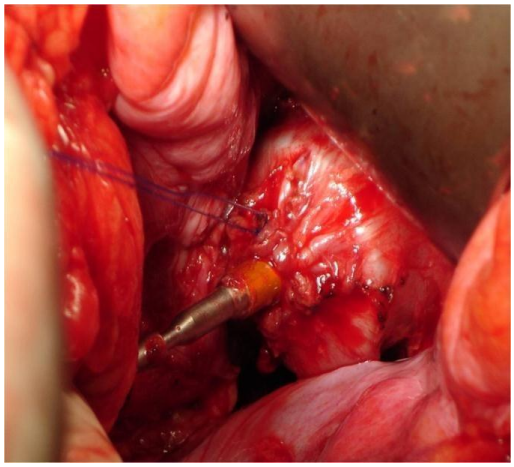


Figure 14: Circular stapler in use for low anterior resection

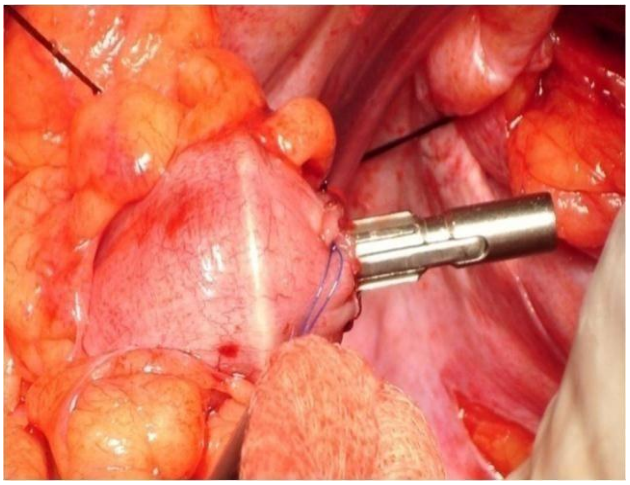


Figure 15: Circular stapler for low anterior resection

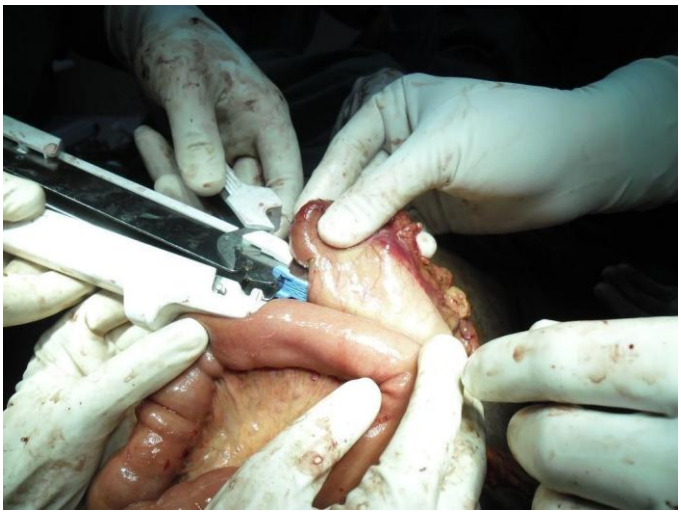


Figure 16: Linear staplers in Posterior GJ

4. Discussion

This randomized controlled trial compared the outcome of hand sewn anastomosis with stapled anastomosis in 40 patients who presented in Department of General Surgery at Government Kilpauk Medical College. The results were analyzed and compared with other studies published in literature.

The results are same for both hands sewn and stapler anastomosis group in all 4 groups regarding appearance of

bowel sounds, resumption of oral feeds and post-operative hospital stay. Regarding the total operation time it is shorter in stapler group of gastrojejunostomy, ileocolic and colorectal subgroups as compared to hand sewn technique.

It is same for anastomosis inoesophogogastrostomy group. The results are the same as far as complications are concerned, that is 2 anastomotic leaks in each group of oesophagogastric anastomosis. (10% for each group)

Regarding the mortality there are 3 deaths amounting to 7.5%. One death in colonic group which is due to unrelated cause.The other 2 in oesophoagogastric anastomosis, 1 in each of hands sewn and stapler anastomosis group. There are no other complications.

With the added benefit of short operation time, stapled anastomosis scores over hands sewn anastomosis.

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.

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[6].

In a study from the West of Scotland and Highland Anastomosis Study Group, there was no difference in the clinical leaks[7].

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[7]. 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[7].

Table 4: Comparison of anastomotic leak in both groups

Anastomotic Leak	Group A			Group B		
	Yes	No	Total	Yes	No	Total
Number	2	18	20	2	18	20
Percentage	10%	90%	100%	10%	90%	100%

Table 5: Comparison of mortality in both groups

Group	Number of patients	Percentage
Group A	1	5%
Group B	2	10%

Subgroup analysis Mean operating time

The mean of total operating time for GJ group in this study was 109.16 minutes for hand sewn group and 90 minutes for stapler group with a P-value of 0.001

In ileocolic group it was 117.5 minutes for hand sewn group and 87.5 minutes for stapler group with a P-value of 0.03

In colorectal group mean operating time was 160 minutes for hand sewn group and 138 minutes for stapled group with a P-value of 0.003

In all the 3 sub-groups of GJ, ileocolic and colorectal group mean operating time were significantly shorter in stapler group.

These results are similar to the study done by HimabinduBangaruet al[8] and similar to the study done by Damesha et al[9], George et al[10] and Hollender et al[11].

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[12] 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 group mean operating time was 238.3 minutes for hand sewn and 235 minutes for stapler group.

In Oesophagogastric anastomosis group total operating time taken for hand sewn and stapler anastomosis did not show any statistically significant difference (P-value 0.37)

In the study done by Quanet al[13] it was found that stapler anastomosis has a shortened operating time than the hand sewn anastomosis. That benefit was not reflected in this study, may be because the oesophageal resections are not routinely done in this institution.

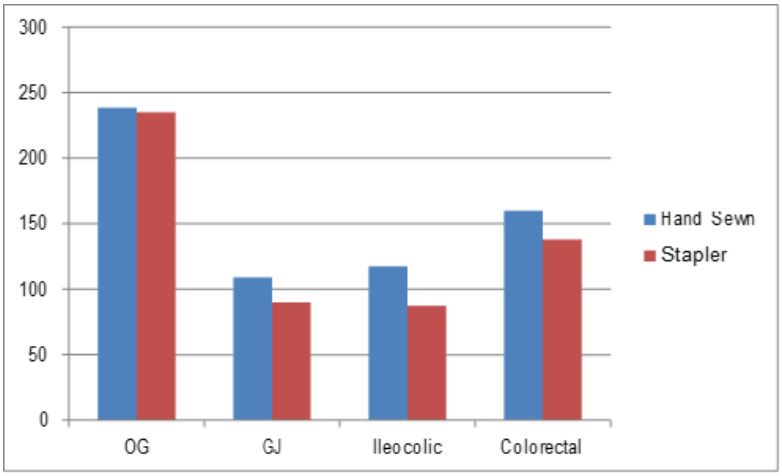


Chart 8: Subgroup analysis of total mean operating time

Return of bowel sounds and resumption of oral feeds

In GJ group there is no statistically significant difference with respect to these parameters in in hand sewn and stapler group with a P-value for return of bowel sounds 0.59 and P-value for resumption of oral feeds 0.34

Similar findings was found in HimabinduBangaru et al[50] and Damesha et al[51].

P-value for return of bowel sounds 0.72 and 0.68 for ileal and colorectal anastomosis respectively.

P-value for resumption of oral feeds 0.48 and 0.66 for ileal and colorectal anastomosis respectively.

The above parameters in ileocolic and colorectal anastomosis group in both hand sewn and stapler group shows no significant statistical difference which was in accordance with the study done by Scher etal[14,15], George et al[11] and HimabinduBangaru et al[10].

In Oesophagogastric anastomosis group shows similar results. P-value for return of bowel sounds 0.67

P-value for resumption of oral feeds 0.14. Both being statistically not significant.

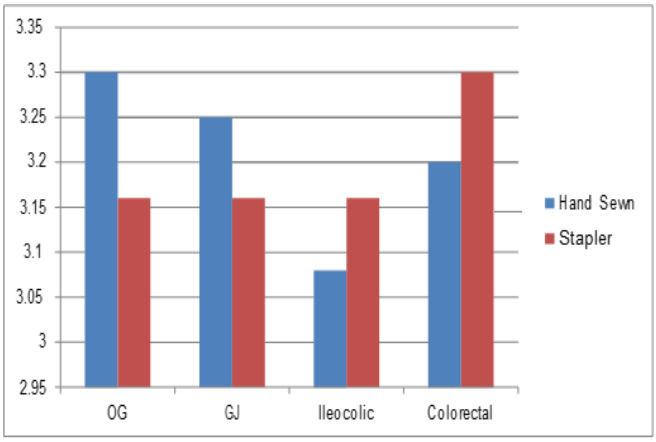


Chart 9: Subgroup analysis of return of bowel sounds

Post-operative hospital stay

This study shows, in all the 4 groups there was no statistically significant difference in post-operative hospital stay in hand sewn and stapler anastomosis with a P-value for GJ >0.99, P-value for ileocolic group 0.59, P-value for colorectal group 0.611 and P- value for oesophagogastric group 0.86.

This is in accordance with the studies done by Himabindu et al[10], Scher et al[14,15], Reiling et al[16] and George et al[12]

This study is unlike of Quan Wong et al[13] study in which they found shorter post- operative hospital stay in oesophagogastric stapler anastomosis group.

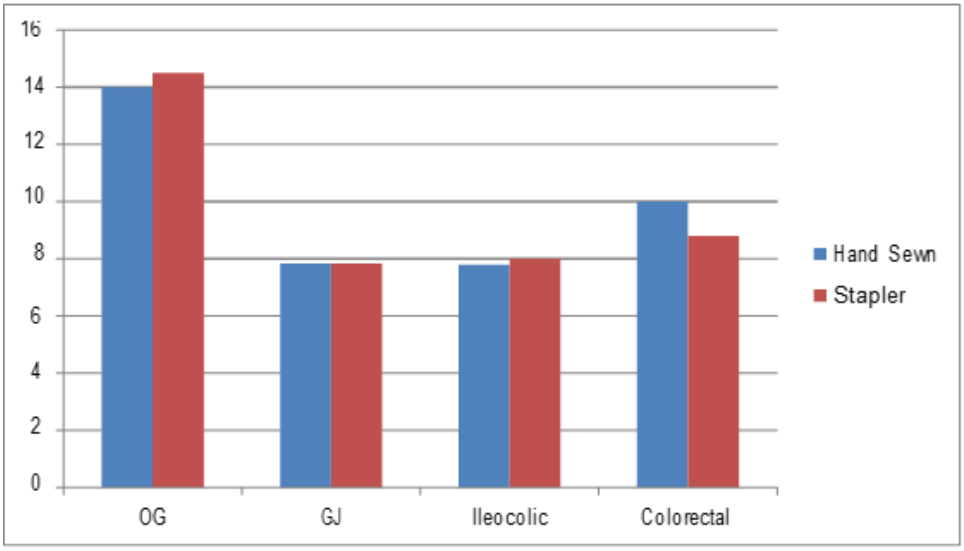


Chart 10: Subgroup analysis of post-operative hospital stay

Anastomotic leak

In this study there was 4 anastomotic leaks, 2 in each of hand sewn and stapler anastomosis in oesophagogastric group.

All cases managed conservatively. There was no difference in anastomosis leak in hand sewn and stapler group.

In other studies of Quan Wand et al[13] also found no significant difference in both hand sewn and stapler group in oesophagogastric anastomosis.

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 in oesophagogastric anastomosis.
There were no leaks in other groups of GJ, ileocolicand colorectal anastomosis in both hand sewn and stapler anastomosis.

This result does not correlate with other studies by Docherty et al[17], Lustosa et al[18] and Nasir Khan et al[19] and HimabinduBangaru et al[10] and Frances Goulder et al[20] 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 Suzana Angélicaet al[21] in 2008 which showed no difference in incidence of anastomotic leak between the two groups.

Bleeding
There was no bleeding from the anastomotic site which is similar to Himabinduet al[10] study. There was no other complication during the follow-up of 30 days in this study.

Mortality
There was 1 death of colostomy closure done by stapler anastomosis technique. The patient died of separate complication unrelated to surgery and 2 deaths in oesophagogastric group 1 each in hand sewn and stapler anastomosis group amounting to 7.5% mortality which is similar to other studies in the literature.

5. 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 oesophagogastric anastomosis 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.

References

[1] Brooks DC, Zinner MJ (2000) Surgery of the small and large bowel. In: Zinner MJ, Ellis H, editors, Maingot‘s abdominal operations, 10th ed., Applleton and Lange, Connecticut (USA), p 1321–1330.
[2] Leaper DJ (2008) Basic surgical skills and anastomosis. In: Williams NS, Bulstrode CJ, O‘Connell PR, (ed), Bailey and love‘s short practice of surgery, 25th ed., Edward Arnold Ltd: Great Britain, p 239, 242–245.
[3] Kirk RM. Basic surgical techniques. 5. Edinburgh: Churchill Livingstone; 2002. pp. 43–80.

[4] Ravitch MM, Steichen FM. Techniques of staple suturing in the gastrointestinal tract. Ann Surg. 1972;175:815-837.
[5] Feil W, Lippert H, Lozac'h P et al: Atlas of Surgical Stapling. Heidelberg, Germany, Johann Ambrosius Barth, 2000.
[6] Afsar Ali Bhatti et al: Comparison of Outcome between Stapled verses Hand Sewn Intestinal Anastomosis. PJMHS 7:921, 2013.
[7] Hassanen A, Darwish A, Bieh HA. Stapled versus hand-sewn anastomosis of the large bowel due to abdominal trauma: a prospective comparative study. Egyptian Journal of Surgery. 2008 Oct;27(4):208-212.
[8] Kracht M, Hay JM, Fagniez PL, Fingerhut A. Ileocolonic anastomosis after right hemicolectomy for carcinoma: stapled or hand-sewn? A prospective, multicenter, randomized trial. Int J Colorectal Dis 1993; 8: 29-33.
[9] Himabindu et al: Comparative Study between Staplers and Conventional(Hand-Sewn) Anastomosis in Gastrointestinal Surgery. Indian J Surg. 2012 Dec; 74(6): 462–467.
[10] Damesha N, Lubana PS, Jain DK, Mathur R (2008) A comparative study of sutured and stapled anastomosis in gastrointestinal operations. Internet J Surg 15(2).
[11] George WD, West of Scotland and Highland anastomosis study group Suturing or stapling in gastrointestinal surgery: a prospective randomized study. Br J Surg. 1991;78:337–341. doi: 10.1002/bjs.1800780322.
[12] Hollender LF, Blanchot P, Meyer C, da Silva e Costa JM. Mechanical suturing apparatus in gastrointestinal surgery. ZentralblChir. 1981;106(2):74–83.
[13] MacRae HM, McLeod RS. Handsewn vs. stapled anastomosis in colon and rectal surgery: a meta-analysis. Dis Colon Rectum 1998;41(2):180-9.
[14] Quan et al: Hand-sewn vs linearly stapled esophagogastric anastomosis for esophageal cancer: A meta-analysis, World J Gastroenterol. 2015 Apr 21; 21(15): 4757–4764.
[15] Scher KS, Scott-Conner C, Jones CW, Leach M. A comparison of stapled and sutured anastamoses in colonic operations. SurgGynecol Obstet. 1982;155:489–493.
[16] Scher KS, Scott-Conner C, Ong WT. A comparison of stapled and sutured anastamoses in gastric operations. SurgGynecol Obstet. 1982;154:548–552.
[17] Reiling RB, Reiling WA, Jr, Bernie WA, Huffer AB, Perkins NC, Elliott DW. Prospective controlled study of gastrointestinal stapled anastamoses. Am J Surg. 1980;139:147–152.
[18] Docherty JG, McGregor JR, Akyol AM, Murray GD, Galloway DJ. Comparison of manually constructed and stapled anastomosis in colorectal surgery. West of Scotland and Highland Anastomosis Study Group. Ann Surg. 1995;221:176–184.
[19] Lustosa SA, Matos D, Atallah AN, Castro AA. Stapled versus handsewn methods for colorectal anastomosis surgery: a systematic review of randomized controlled trials. Sao Paulo Med J/Rev Paul Med. 2002;120(5):132–136.
[20] Nasir Khan MU, Abir F, Longo W, Kozol R. Anastomotic disruption after large bowel resection. World J Gastroenterol. 2006;12(16):2497–2504.
[21] Frances Goulder: Bowel anastomosis: The theory, the practice and the evidence base. World J Gastrointest Surg. 2012 Sep 27; 4(9): 208–213.