



A Randomised Controlled Study Comparing Staplers with Conventional Anastomosis in Gastrointestinal Surgery

KEYWORDS

Bowel anastomosis, staplers, gastrointestinal

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ABSTRACT

Bowel anastomosis is an important part of gastrointestinal surgeries and can be achieved by conventional anastomotic techniques using various sutures or by the recently developed staplers. Although, accurate approximation without tension and a good blood supply to both the segments of bowel being joined is the fundamental thing of good anastomosis, it is, however, essential to study the methodologies of bowel anastomosis and compare the factors during and after surgery. This study has been undertaken as prospective and comparative study of cases where hand sewn anastomosis done in one group and stapler anastomosis done in similar group of patients to estimate whether stapler anastomosis has any significant advantage over hand sewn anastomosis within the constraint of government setup and thus help in planning future ergonomics of surgical department in government hospitals.

INTRODUCTION

The word anastomosis comes from Greek 'ana' meaning without and "stoma" meaning mouth that is when a tubular viscous is joined after resection or bypass without exteriorization with a stoma¹.

There are various options for fashioning anastomosis in gastrointestinal surgery. Conventional anastomotic techniques, using various suture materials (absorbable or non-absorbable, natural or synthetic) have been in vogue for many decades. Staplers were introduced early in 20th century. Recently developed staplers are simpler, lighter and more reliable. Sophisticated staplers have been developed to simplify and expedite the surgical intervention.

Accurate approximation devoid of tension and a good blood perfusion to both the ends of bowel being joined is the fundamental requirement of good anastomosis and the principles of anastomosis are universal, irrespective of the anastomotic technique whether hand sutured or stapled. It is, however, necessary to study the methodologies of bowel anastomosis and compare the parameters during and after surgery.

AIMS AND OBJECTIVES

The aim of this study is to compare staplers versus conventional (hand-sewn) anastomosis in gastrointestinal surgeries with reference to the following parameters:

- . Total operating time
- . Return of bowel sounds.
- . Post-operative complications (leak)
- . Post-operative hospital stay
- . Cost implications

This study has been undertaken as prospective and comparative study of cases where hand sewn anastomosis done in one group and stapler anastomosis done in similar group of patients. And by comparison of above parameters it will be estimated whether stapler anastomosis

has any significant advantage over hand sewn anastomosis within the constraint of government setup. This will help to plan future ergonomics of surgical department in government hospitals.

REVIEW OF LITERATURE

Anastomosis by Suturing:

There are various techniques for performing an intestinal anastomosis. This can be done using suture materials, prosthesis, adhesives and staplers. Early in the 19th century, while describing intestinal injuries Travers emphasized the use of averting sutures². Antonie Lambert, a surgeon from Paris advocated inverting sutures by a seromuscular stitch apposing and sealing the serosal layers to prevent leakage. Senn advocated two layered technique for closure.

William Halsted, an American surgeon noted that the sub mucosal layer was the main tension bearing layer in intestinal anastomosis and favoured a one layer extramucosal closure. The method that is popular at present is an extramucosal or sero-sub mucosal technique. Kocher's method is a two layer anastomotic technique, first a continuous all layer suture using catgut, then an inverting continuous or interrupted seromuscular layer suture using silk.

Anastomosis by Stapling:

The first acclaimed mechanical device to fashion a non-sutured anastomosis was Murphy's button which contained two mushroom shaped pieces which were sutured with in the bowel ends by purse string sutures and then joined together creating an inverted anastomosis. Various types of sophisticated staplers have since been developed. Simpler, lighter, more reliable and disposable staple cartridges preloaded with staples are now available.

MATERIAL AND METHODS

This is a prospective study conducted in the following hospitals.

OSMANIA GENERAL HOSPITAL, HYDERABAD
MNJ CANCER HOSPITAL, HYDERABAD

Period of study: November 2012 to October 2014

A total number of 120 patients are included in this study. In this study, 120 patients were included and divided into 3 groups of 40 each, depending upon the type of surgeries they had undergone. One group underwent Truncal vagotomy, gastrojejunostomy and jejunojejunostomy for gastric outlet obstruction. The second group had undergone distal gastrectomy (Billroth II) with gastrojejunostomy and jejunojejunostomy for gastric carcinoma. The third group underwent colorectal anastomosis following low anterior resection for rectal cancer. In each group, staplers were used in 20 patients and in the other 20, hand suturing techniques were used.

Return of Bowel Sounds:

Return of Bowel sounds (days)	No. of patients					
	Gastro-jejunostomy		Billroth II gastrectomy with GJ & JJ		Colorectal Anastomosis (following low anterior resection)	
	Stapler	Hand-sewn	stapler	Hand-sewn	Stapler	Hand- Sewn
1	-	-	-	-	-	-
2	16	15	14	12	12	9
3	4	5	6	8	8	11

In Gastrojejunostomy group, the mean time taken for return of bowel peristalsis in stapler group and in hand sewn group is 2.2 days and 2.25 days respectively.

In Billroth II Gastrectomy with GJ & JJ group, in stapler it is 2.3 days and 2.4 days in hand-sewn group.

In Colorectal anastomosis group (following low anterior resection), it is 2.4 days in stapler group and 2.55 days in hand-sewn group.

Post-operative hospital stay:

Post-operative Hospital stay(days)	No. of patients					
	Gastrojejunostomy		Billroth II gastrectomy with GJ & JJ		Colorectal Anastomosis	
	Stapler	Hand- sewn	Stapler	Hand- Sewn	Stapler	Hand sewn
5-10	18	17	17	16	9	8
11-15	2	3	3	4	10	11
16-20	0	0	0	0	1	0
21-25	0	0	0	0	0	1
>25	0	0	0	0	0	0

In gastrojejunostomy group, the mean duration of post-operative hospitalization was 8.15 days in stapler group and 8.3 days in hand-sewn group.

In Billroth II gastrectomy group, the mean duration of post-operative hospitalization was 9.5 days in stapler group and 9.65 days in hand-sewn group. In Colorectal anastomosis group, the mean duration of post-operative hospitalization was 11.1 days in stapler group and 11.4 days in hand sewn group.

Post-Operative Complication – Anastomotic Leak:

Anastomotic leak, as a post-operative complication, occurred in one patient each in stapler group and in hand sewn group. No other complications were noticed.

DISCUSSION

In this study comparison of staplers versus conventional (hand-sewn) anastomotic techniques in gastrointestinal surgeries was done with reference to the parameters like total operating time, return of bowel sounds, resumption of oral intake, post-operative complications and the duration of hospital stay. The results obtained were then analysed

OBSERVATION & RESULTS

Total operating time:

1. Gastrojejunostomy

- Mean operating time in stapler group is 100.8 min
- Mean operating time in hand sewn group is 117.5 min

2. Billroth II Gastrectomy with GJ & JJ

- Mean operating time in stapler group is 119.85 min
- Mean operating time in hand sewn group is 142.45 min

3. Colorectal anastomosis (following low anterior resection)

- Mean operating time in stapler group is 164.2 min
- Mean operating time in hand-sewn group is 193.45 min

and compared with the previously documented literature. The probability index has been calculated and analysed for each individual parameter of this study and compared with similar studies done earlier.

Total Operating time:

In the gastrojejunostomy group of this study, the mean operating time was 100.8 min in the stapler group and 117.5 min in hand-sewn group. This difference was found to be statistically significant ($p < 0.05$).

This was found to be similar to the study done by Damesha et al³ where in gastrojejunostomy group, the mean operating time was 140 min in the stapler group and 154 min in sutured group with a statistically significant difference ($p < 0.05$).

In the gastric resection group, the mean operating time was 119.85 min and 142.45 min in the stapler group and in hand-sewn group respectively. Difference was statistically significant ($p < 0.05$) similar to the study done by Damesha et al.

In the anterior resection group, the mean operating time was 164.20 min in the stapler group and 193.45 min in hand-sewn group. Statistically significant difference was noted ($p < 0.05$). This result was also found to be similar to the study by Damesha et al.

Hence in this study, the overall mean operating time was significantly reduced in the stapler group when compared to that in the hand-sewn group.

Return of bowel sounds:

In this study, in all three groups, that is gastrojejunostomy, gastric resection and anterior resection, the difference in the post-operative return of bowel sounds in stapler and hand-sewn groups was statistically insignificant. Similarly in the study done by Damesha et al, the difference was not statistically significant with respect to these parameters.

Even in the study done by Reiling et al⁵ and Scher et al, the difference was not found to be statistically significant. In the study done by Prof. W. D. George et al⁴ also, it was found that the two groups were comparable in terms of recovery of gastrointestinal function.

Post-operative Hospital stay:

In this study, in all three groups, the difference in postoperative hospital stay in both the stapler group and hand-sewn groups was statistically insignificant. Even in the observations made by Scher et al, the difference was not statistically significant when postoperative hospital stay was compared in both groups.

Anastomotic leak:

In this study, complication of anastomotic leak was recorded only in the group of colorectal anastomosis. This was found in one patient in stapler group and one patient in hand-sewn group. Both the cases were managed conservatively. Thus, there was no difference with regard to anastomotic leak in both the stapler and hand-sewn groups

Cost:

Cost of the material when considered, staplers are relatively expensive. But the cost of an operative procedure must be analysed within a wider context involving not only the monetary value of materials but also the value resulting from the ease of execution, total time consumed, cost of managing the complications.

Though cost is high, the staplers can be preferred particularly in cases when the duration of surgery is to be reduced in patients who cannot tolerate prolonged anaesthesia.

SIGNIFICANCE OF THE STUDY:

In studies done by others it is concluded that there is reduction in operating time in stapler group compared to hand sewn group. As the studies done in private hospitals reduction in operating time will reduce the anaesthetist cost, operation theatre cost.

In our study done in Government Hospital, there is reduction in operating time like similar studies done earlier. The reduction in operating time particularly useful in patients with co morbid conditions who cannot tolerate prolong anaesthesia, especially in the background of high risk patients being operated in government hospitals .But however this advantage is nullified by extra cost of staplers in government set up where budget limitations are present. In this way though cost effectiveness doesn't make much

difference with the use of staplers in government hospital to the patient, still this reduction in operating time is beneficial to patients with co morbid conditions and it also helps to operate more number of patients in government hospitals indirectly helping the other patients who are waiting for surgery.

Thus this study helps to analysing and balancing the increased expenditure for purchase of staplers at government hospitals against their significant role in tackling surgical patients with co morbid conditions and excess number of poor patients on waiting list for surgeries.

RECOMMENDATIONS:

Recommendations for further studies in this regard is to plan and execute and arrange staplers to government hospitals which will help poor patients coming to government hospitals, so that their waiting period is reduced and post-operative morbidity and mortality reduced in those who are having co morbid conditions.

CONCLUSION & SUMMARY

Conventional anastomosis has been the standard surgical technique for several decades. Various novel techniques have been introduced later to bring about major improvement in the field of surgery. Staplers introduced early in the 20 century represent one such advancement in the surgical practice.

Traditionally, hand-sewn techniques have been employed for performing anastomosis in various gastrointestinal surgeries. To attain widespread approval, an innovative procedure must be efficient and rapid without compromising patient's safety.

In the present study, 120 patients were divided into 3 groups of 40 each depending up on the gastrointestinal surgery they had undergone, gastrojejunostomy and jejunojejunostomy, distal gastrectomy with gastrojejunostomy and jejunojejunostomy (Billroth II) and colorectal anastomosis following low anterior resection. Each group of 40 patients included 20 patients in stapler group and 20 patients in hand-sewn group.

In this study, apart from the advantage of consistent reduction in operating time by staplers, no significant difference was found between stapler and hand-sewn groups with respect to other parameters like restoration of intestinal function, post-operative hospital stay, and post-operative complications.

Staplers are relatively expensive. Nevertheless, the increased cost is offset by the reduction in operating time which may be advantageous in the patients whose anaesthetic fitness is poor and this study also helps to reduce excessive load of patients waiting to get operated in government hospitals. Anyhow like other similar studies, cost effectiveness is not there for staplers in government set up.

Hand-sewn anastomosis can sometimes be difficult to perform when access to the site is limited like in low anterior resection. Mechanical stapling can be advantageous in such situations.

Stapling devices may be considered valuable in certain situations. But, conventional suturing is an art that makes a surgeon feel like an artist and holds its own in today's times. It should not be forgotten.

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