

# Comparative Study Of Hand Sutures Versus Staplers In Elective Gastric Surgeries In A South Indian Population

V Murthy, M V Pai, R Bhat, P Thejeswi

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## Abstract

### INTRODUCTION:

The development of reliable, disposable instruments over the past 25 years has improved surgical stapling. With modern devices technical failures are rarer and the stapler line is of more consistent quality.

### AIMS/OBJECTIVES:

To compare hand suturing with surgical stapling in a prospective cohort study in patients undergoing elective gastric surgery.

### METHODS:

All 30 patients were classified accordingly into 2 groups with 15 in each of them. The first group was the hand-sewn anastomosis group which included cases with at least one bowel anastomosis without the use of staplers. The second group is the stapler anastomosis group which includes cases with at least one bowel anastomosis done with a stapler. It also includes cases with multiple bowel anastomoses done with both hand sewing and stapler. Compared were the following parameters: duration of surgery, duration of anastomosis, early postoperative complications, and late postoperative complications. All the surgeries were done by the same group of experienced surgeons.

### RESULTS:

The most common diagnosis in our study was carcinoma of the stomach which underwent elective gastric surgery. On an average, oral feeding was started after 4.73 days in the stapler group and after 4.90 days in the hand-sewn group ( $p > 0.05$ ). The average times, by stapler versus hand-sewn, for subtotal gastrectomy, palliative gastrojejunostomy, and total gastrectomy were 129 versus 147 minutes ( $p < 0.05$ ), 85 versus 92 minutes and 147 versus 160 minutes, respectively. There were no major complications and anastomotic leaks in our study.

### CONCLUSION:

With use of staplers there was a significant decrease in duration of subtotal gastrectomy. Return of bowel sounds and hospital stay was not affected by stapler application in our study.

## INTRODUCTION:

The introduction and widespread application of stapling devices helped revolutionize the technical aspects of surgery that have allowed minimally invasive procedures to be developed. Thus, in recent years, mechanical stapling devices have improved and become more versatile so that many surgeons now consider the stapling technique as best alternate method of anastomosis to the suture technique, for speed, safety, efficiency and easy access.

A number of benefits conferred by the use of stapling instruments such as minimizing tissue manipulation and trauma, less bleeding and edema at the anastomosis, a

quicker return of gastrointestinal function and a more rapid patient recovery, have been claimed by the manufactures. Conversely, stapling techniques have been criticized on the grounds of expense, that no improvement in anastomotic security has been observed and that there is the possibility of stricture formation. Good clinical evidence upon which to base these claims and counterclaims remains hard to find.

Several retrospective reviews have reported variable results. Of the few prospective randomized trials comparing surgical stapling and manual suturing techniques, the majority have focused on large bowel surgery and use of circular stapling instruments.

During the first 3 to 5 days, termed the inflammatory phase of wound healing, the collagen matrix undergoes degradation by metalloproteinases. It is in this initial phase that the integrity of the anastomosis depends almost entirely on technical factors, suture materials, or the integrity of stapled margins of bowel.[1]

Around the fifth postoperative day there is a crucial switch from collagen degradation to collagen deposition, which corresponds to the transition from the inflammatory phase to the fibroplasia phase. The fibroplasia phase reaches its maximal level at day 7.[2] Any delay or impairment of the fibroplasia phase can result in the potentially catastrophic consequence of anastomotic dehiscence.[3] Indeed, it is at the end of the first postoperative week that anastomotic dehiscence usually occurs and becomes clinically evident.

Although it may seem that surgical stapling devices have completely supplanted hand suturing of bowel anastomoses, hand suturing remains a crucial skill in every surgeon's armamentarium. Hand suturing uniformly invokes an inflammatory response from dragging the suture material through the bowel. The choice of suture material used by surgeons is not based on a strong preponderance of scientific evidence. Everting and inverting anastomoses have come in and out of favor over the last 2 centuries, as have many anastomotic techniques.

Recommendations for best practices in creating a GI anastomosis

1. Ensure an adequate blood supply, eliminate tension, maintain hemostasis, and handle tissues gently. Level of evidence: 5 — Expert opinion without explicit critical appraisal, or based on physiology, bench research or “first principles.”[4]
2. Use an inverting (serosa-to-serosa), or an everting, with minimal exposed mucosa, technique. Level of evidence: 5
3. Close mesenteric defects to avoid internal hernia. Level of evidence: 5
4. Consider a stapled technique for ileocolic anastomoses; elsewhere in the GI tract either a hand-sutured or stapled anastomosis may be employed. Level of evidence: 1a — Systematic review (with homogeneity) of randomized clinical trials[4]
5. A single-layer anastomosis is an acceptable technique. Level of evidence: 1a

Many published studies have compared inverting and everting anastomoses through out the GI tract.[5-15] It is

clear that with everting[16-18] anastomoses, the role of the omentum and other peritoneal defense mechanisms is increased because of the need to seal the anastomosis and assist in healing. Although everting patterns do not initially impinge on intestinal lumen, stenosis of the anastomosis may result from extraluminal adhesions and increased fibroplasia.[19-20] Currently, inverted anastomosis is the most widely used technique worldwide. In this study, we compare hand suturing with surgical stapling in patients undergoing elective gastric surgery.

## **MATERIALS AND METHODS**

This study comprised 45 patients who have undergone elective gastric surgery with gastric anastomosis in our surgical unit. All of them have been diagnosed, treated, and followed up in the same hospital. All patients had good nutritional reserve pre-operatively with albumin above 3g and prophylactic antibiotics were given preoperatively.

Anastomosis techniques:

Hand sutures: one or two layered with 2/0 polyglactin continuous/interrupted sutures with silk second layer.

Surgical staplers: Linear cutting staplers, linear anastomosing staplers, circular anastomosing staplers

All 45 patients were classified accordingly into 2 groups. The first group was the hand sewn anastomosis group which included cases with at least one bowel anastomosis without the use of staplers. The second group was the stapler anastomosis group which included cases with at least one bowel anastomosis done with a stapler. It also includes cases with multiple bowel anastomoses which were done with both hand sewing and stapler. Though duodenal stump closure is literally not a bowel anastomosis by definition, it was included in our study because of its significance in bowel surgeries with anastomosis, and its resemblance in technique, meticulousness and duration with any other bowel anastomosis. Comparison of hand suturing with surgical stapling comprised the following parameters: duration of surgery, duration of anastomosis, start of oral feeding, intraoperative complications, postoperative complications, and duration of postoperative stay in hospital. All the statistical analysis was done by SPSS 15 statistical software and a value of less than 0.05 was considered significant.

Definition of some terms:

Anastomosis time: time taken from starting of anastomosis

until a complete anastomosis had been achieved.

Total operating time: time from the start of skin incision to completion of the skin closure

Failure of anastomotic integrity: a defined clinical leak, development of an enterocutaneous fistula, appearance of gastric or intestinal contents from drain or wound, or systemic sepsis in association with peritonitis

Wound infection: purulent discharge from the incision, irrespective of bacteriological assessment

Bleeding: excessive postoperative transfusion requirements or reoperation required

Intraabdominal sepsis: discharge of purulent material from the drain site after clinical evidence of intra-abdominal sepsis; reoperation for drainage of a collection of pus.

## RESULTS AND OBSERVATIONS

In our study we are comparing hand suturing with surgical stapling in elective gastric surgery.

### 1] Sex

**Table 1**

Sex of patients

	Male	female	Total
Hand sewn	22	8	30
Stapler	12	3	15
	34	11	45

### 2] Diagnosis

**Table 2**

Diagnosis

	Group		Total
	Stapler	Hand sewn	
CA stomach	13	30	43
GIST	2	0	2
TOTAL	15	30	45

The most common diagnosis in our study was carcinoma of the stomach which underwent elective gastric surgery.

### 3] Surgery performed

**Table 3**

Surgery performed

Surgery	Staplers	Hand sewn	Total
Palliative GJ	4	12	16
Subtotal gastrectomy	6	17	23
Total gastrectomy	5	1	6
Total	15	30	45

GJ = gastrojejunostomy

### 4] Oral feeding

On an average, oral feeding was started after 4.73 days in the stapler group and after 4.90 days in the hand sewn group.

5] Durations of surgery (in minutes) for hand sewn and stapler anastomoses were compared:

- o Subtotal gastrectomy - the average time by stapler was 129 minutes and for hand-sewn anastomoses it was 147 minutes.
- o Palliative gastrojejunostomy – the average time was 85 min in the stapler group and in the hand-sewn group it was 92 min.
- o Total gastrectomy: by staplers 147 minutes, hand-sewn 160 minutes.

**Table 4**

Duration of surgery in minutes

Duration of surgery in minutes		
	staplers	hand sewn
Palliative GJ	85	92.92
Subtotal gastrectomy	129.17	147.06
Total gastrectomy	147	160

GJ = gastrojejunostomy

### 6] Time taken for anastomosis in minutes (average):

**Table 5**

Time taken for anastomosis in minutes (average)

	Stapler	Hand sewn
GJ	16.80	21.90
EJ	20.00	30.00
Duodenal stump closure	10.00	15.00

EJ = esophagojejunostomy GJ = gastrojejunostomy

The time taken for each anastomosis (GJ, esophagojejunostomy) and duodenal stump closure was shorter in the stapler group ( $p < 0.05$ ).

### 7] Complications

Wound infection was seen in 2 cases in the hand-sewn group. There were no other complications noted in our study.

8] Duration of postoperative stay in hospital:

The duration of stay in hospital postoperatively was reduced in the stapler group as compared to the hand-sewn group.

**Table 6**

Duration of postoperative stay in hospital

	Hand sewn	Stapler
Palliative GJ	8.58	8.75
Subtotal gastrectomy	11.41	10.5
Total gastrectomy	13	11.8

## DISCUSSION

Operating time and anastomosis time

In our study comparing gastric surgery with stapler and hand-sewn anastomosis, there was a significant time reduction in the operating room time for the stapler group as compared with the hand-sewn group. The mean operating time for subtotal gastrectomy was 147 minutes in the hand-sewn group in contrast to 129 minutes in the stapler group, which is statistically significant.

In the study of Scher et al.[21], the mean duration of gastric resection with suture was 159.8 minutes while it was 163 minutes in stapled gastric resection. The difference was not statistically significant and the time used for staplers was longer than with sutured technique. Reiling et al.[22] reported no significant difference in mean operating times for the sutured and the stapled group.

The most common anastomosis done in our study was gastrojejunostomy. The mean duration of gastrojejunostomy in our study was 21 and 16 minutes with sutured and stapled technique, respectively, and the difference was statistically significant ( $p < 0.05$ ).

Duodenal stump closure took 10 and 15 minutes on an average in the stapler and suture group, respectively, which was statistically significant. Scher et al.[21] also compared sutured and stapled gastrojejunostomy. No statistically significant difference was found.

The stapling techniques and the staplers themselves have

evolved over the course of the last three decades, thus explaining the contradictory findings between our study and that mentioned above. Contemporary studies done in India recently have demonstrated a significant reduction in the anastomotic times in the stapled subset.[23]

Oral feeding

Following anastomosis with suture, the patients required an average of 4.9 days before resuming oral feeding compared with an average of 4.7 days after the stapled procedure. This was a statistically insignificant difference.

Reiling et al.[22] found no significant difference in restoration of intestinal function and resumption of oral feeding. The patients required an average of 4.8 days before resuming oral feeding after hand-sewn anastomosis compared with an average of 5.5 days after stapling ( $p > 0.05$ ). In the study of Scher et al.[21], the patients required a mean of 4.4 days after a sutured gastrojejunostomy before resumption of oral feeding compared with 6 days when staples were used, showing earlier oral feeding with suture technique. This may be explained by the fact that these studies were done at the time when stapled anastomosis was in its inception and confidence on the integrity of the same was not established. Therefore a bias towards delayed feeding in stapled patients might have been there.

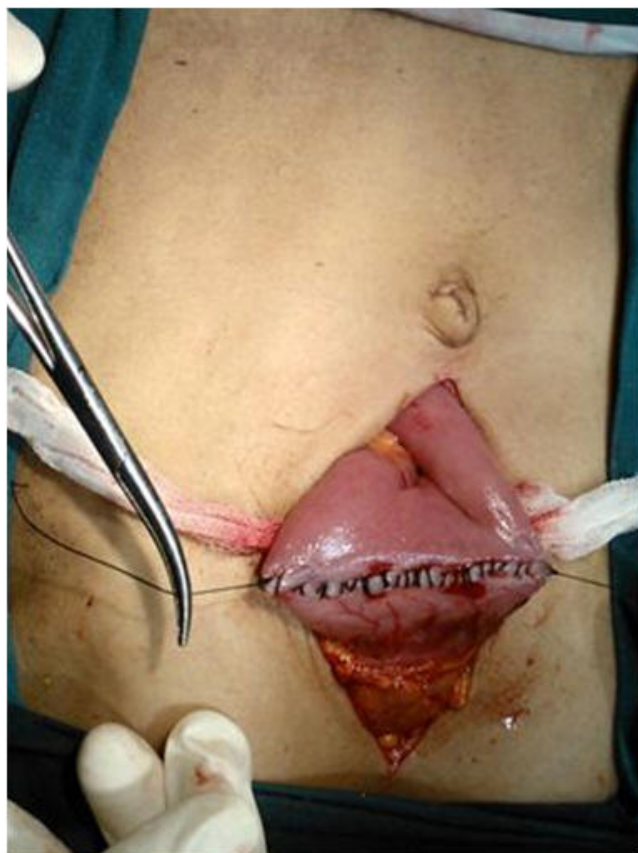
**Figure 1**

Stapler application in gastrojejunostomy



**Figure 2**

Hand-sewn anastomosis



Postoperative stay

In our study, postoperative hospital stay did not show a significant difference between the stapler (10.4 days) and the suture method (10.3 days;  $p>0.05$ ). Scher et al.[21] did not find any significant difference in postoperative hospitalization, either ( $p>0.05$ ). This was also confirmed by Reiling et al.[22]

In the gastrojejunostomy group, postoperative hospital stay did not show a significant difference between stapler and suture method in our study. The group with subtotal gastrectomy showed a statistically significant difference in postoperative stay when hand-sewn and stapler technique were compared, which was 10.5 days (SD 0.54 days) for the former as against 11.41 days (SD 1.06 days) for the latter group. The reason for this may be that the duration of hospital stay depends on the morbidity of the patient and is not dependant on the anastomotic technique.

Complications

In our study there were no anastomotic technique related

complications in both groups. However, there were 2 cases with superficial wound infection in the hand-sewn group. Evidence on this topic includes two randomized clinical trials. Izbicki et al[24], analysed the cost effectiveness of the stapled suture in visceral surgery. There were 200 anastomoses done, 20.5 % of these were performed after gastrectomies. Altogether, there was no significant difference in the anastomotic leaks, but the stapler technique took less time and was more costly. Distal gastrectomy with concomitant gastroduodenostomy was analyzed in a recent prospective clinical trial. Again, the authors did not find any significant difference except the time needed to perform an anastomosis, which was shorter in the stapler group[25]. Scher et al.[21] found that one leak occurred in the 36 patients who underwent stapled gastric resection, a leak rate of only 2.7%. Four of 36 patients had superficial wound infection developed after stapled gastric resection while wound infection was noted in only one of the 44 patients who underwent resection with the suture technique. In gastrojejunostomy, they found a statistically insignificant difference ( $p>0.05$ ); 4 of 24 patients had superficial wound infection in the stapled group as compared to 2 of 18 in the sutured group.

## CONCLUSION

Today there is a trend in gastric surgery from hand-sewn techniques towards the stapled anastomosis. This is fuelled by the promise of a better anastomosis that is faster and more convenient. This study was designed to compare the two anastomotic techniques and find out if any of them was better than the other. At the end of the study period, the following conclusions may be drawn:

- ▮ There was a reduction in operating time in those patients who underwent stapled anastomosis. This difference was significant in prolonged surgeries involving multiple anastomoses only (subtotal gastrectomy).
- ▮ If the time of individual anastomosis is considered, there is a reduction noted in those that undergo stapled anastomosis.
- ▮ The period of postoperative abstinence from oral feeding remained similar in the two groups compared.
- ▮ There was no difference in anastomotic complications noted between the two study groups.
- ▮ The total duration of hospital stay remained the same in both groups.

Thus, there is no significant difference in terms of anastomotic parameters considered in this study between the stapled and the hand-sewn group. The stapled anastomosis may be a convenient and rapid option for the surgeon, but it



comes at a higher cost to the patient.

There is scope for further studies comparing the two techniques in terms of surgeon learning curve and the application of stapled techniques in emergent surgical conditions.

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**Author Information**

**Vijay Murthy, Dr, Junior Resident**

Department of General Surgery, Kasturba Medical College Manipal University

Mangalore, INDIA

drvijaymurthy@gmail.com

**Manohar V Pai, Dr, Additional Professor**

Department of General Surgery, Kasturba Medical College Manipal University

Mangalore, INDIA

**Rahul Bhat, Dr, Assistant Professor**

Department of General Surgery, Kasturba Medical College Manipal University

Mangalore, INDIA

**Poornachandra Thejeswi, Dr, Associate Professor**

Department of General Surgery, Kasturba Medical College Manipal University

Mangalore, INDIA