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A Prospective Comparative Study of Hand Sewn Versus Stapler Gastrointestinal Anastomosis

Dharmraj Meena[1]*, Rinkesh Meena[2]
1. Department of Surgery Govt. Medical College, Kota (Raj.)
2. Medical Officer, Govt. Hospital, Baran (Raj.)

ABSTRACT

Leak from Gastrointestinal anastomosis following resection is associated with morbidity. To address this issue, we conducted a randomized trial comparing "hand-sewn" with "stapled " anastomosis. The cases were randomly allocated depending on the affordability and availability of instrument for the procedure .A detailed history and the routine and specified investigations were carried out and the details about operation were recorded. Proper post operative care and careful observations done. Two group made (i) Stapled and (ii) Hand Sewan 25 patients in each group. The primary outcome measure was anastomotic leak rate. Secondary outcome were duration of surgery, hospital stay and wound infection. The overall anastomotic leak rate was 14%. The leak rate was higher in hand sewn group(hand-sewn: 5/25, stapled: 2/25; p=<0.005). The stapled anastomotic technique was faster (8.5 ±.5 min vs. 25.4 ± 1.8 min; p=<0.05). In stapled bowel surgery the mean return of G.I. function occurred on 4.32th day and in hand sewn it was 5.32th or 1 day (24 hours) earlier when stapling technique was used (p. Value 0.0217) There were significant differences in the leak rates and postoperative outcome between the two techniques. The only concern is the financial issues specifically in India.

*Corresponding Author Email: dr.dharm2000@gmail.com
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INTRODUCTION

Anastomosis is defined as the re-establishment of continuity of two tubular structures. It is required in order to short circuit some obstructive lesion or to reestablish continuity after resection has been carried out. Anastomoses commonly used surgical procedure and may be created between two segments of bowel in a multitude of ways. The submucosal layer of the intestine provides the strength to the bowel wall. The choice of anastomosis depends upon the operative anatomy and surgeon's preference.

Anastomosis configuration might be-

1. End to End
2. End to Side
3. Side to End
4. Side to Side

There are two different anastmotic techniques for reconstructing the small or large bowel.

1. Hand Sewn(Hand Sutured) Technique

2. Stapled Techniques

Aims and Objectives

1. To look and comprehensively access all aspects of anastomosis that include.
2. Accessibility, feasibility, expertise, cost effectiveness and compare in with hand sewn procedure.
3. To compare safety of the two procedure.
4. To compare duration of procedure in both methods in critical settings and average hospital stay.
5. To compare the leak rate of the two procedures.

MATERIALS AND METHOD

The cases are randomly allocated depending on the affordability and availability of instrument for the procedure. A detailed history All the routine and specified investigations were carried out and the details about operation were recorded. Proper post operative care and careful observations done. Two group made (i) Stapled and (ii) Hand Sewan 25 patients in each group.

Operative Procedure

A detailed analysis was presented for separate operative procedures:

Gastrectomies

Duodental stump closure

Gastro-enterostomies

Entero-enterostomies

Anterior resection

Various hand suturing techniques were used according to the preference of the surgeon. Those however individuals procedures were not analyzed separately.

Criteria For Complications

Wound Infection:- It was defined as a purulent discharge from the incision, irrespective of bacteriological assessment, which occurred before discharges from hospital.

Clinical Leak:- It was defined as anastomotic dehiscence confirmed by either reoperation or autopsy, development of an enterocutaneous fistula, appearance of bowel contents from drains or systemic sepsis in association with peritonitis.

Intra Abdominal Sepsis:- It was defined as discharges of purulent material from the drain site or the patient showed fever, persistent ileus etc.

Criteria For Time Taken In Operative Procedure & Total Duration Of Surgery:-

The time taken in operative procedure was calculated from the end of dissection until a complete anastomosis had been achieved & Total duration of surgery was defined as the time from the start of the skin incision to the completion of the skin closure.

Criteria For Return Of Gastrointestinal Functions:- By recording the day on which the patient first passed flatus or stool.

Review of literature:

The basic principles of intestinal suture were established more than 100 years ago by travers Lembert[4], Czerny and Halsled.

Steichen and Rivitch[38] reported 147 stapled gastrointestinal operations of their own in the year 1973 with 11 complications. Latimer[27] and associated studied 112 stapled operative procedure with stapled related complication rate of 1.9% Lawson[28] and associates reported 122 operations on alimentary canal done with stapling devices with a complication rate of 4%.

The study carried out by Weil and Scherz[53] et al conclude that the use of staples in the performance of gastrectomies is a safe method, and under equal circumstances considerably more expedient and time-saving. Their application can easily by learned and is probably safer in the hands of a less experienced surgeon than hand- suture methods. The leak rate of the duodenal stump when stapled was 2.5% compared with 4.7% with the hand suture. As far as the financial aspect is concerned, the disposable loading units are not cheap. But when one takes into consideration the price of sutures material, the need for numerous sutures in place of one loading

unit and the time factor, the cost difference is not significant and is far outweighed by the other advantages on the stapler technique (Arch Surg. 1981; 116:14-16).

Lowdon IM[22] et al studied a retrospective review of 362 upper G.I. operations. The complication rates were 21% with suturing techniques and 16% when stapling instruments, This difference is statistically significant (Br. 1982;69:333-335).

The similar study done by Chassin[22] et al (Ann. Surg. 1978; 182:689-696).

Beart and Kelly[7] trial a randomized prospective evaluation of the EEA stapler for colorectal anastomoses and suggest that approximately 8 minute can be saved by using the stapler. (Am. J. Surg. 1981; 141:143-146).

Similarly H.P. Redmond et al studies 111 patients who underwent elective anterior resection and concluded that, double-stapled end to end anastomosis has mace low anterior resection for rectal ca is the safer procedure with a low mortality rate, an acceptable local recurrence rate and minimal anastomotic leakage (Br. J. Surg. 1993; 80:924-7).

A similar study by B.Mann et al reviewed (Br. J. Surg. 1996;83:29-31)

Fingerhut et al – Study on 159 patients. No statiscally significant difference was found in the rate of early complication including anastomotic leakage (4 of 74 Vs 6 of 85) in the hand sewn & stapled anastomosis, (Surgery 1995; 118:479-85).

RESULTS AND OBSERVATION

Table 1: Total Duration In Surgery

S.N	Operative Procedure	Total No. of patients	Stapled		Hand Sewn		P. Value
			Range	Mean time (Min)	Range	Mean time (Min)	
1	Gastrostomies	5	90-130	108.00	90-200	171.00	0.0186(S)
2	Gastro-	10	30-120	55.20	80-180	136.60	>0.0001(S)
3	Duodenal Stump Closure	02	120-125	122.00	140-180	160.00	0.2039
4	Entero-enterostomies	05	60-110	95.00	90-180	140.00	0.0522
5	Anterior resection	3	90-110	100.00	180-220	203.00	0.0015(S)
	Total	25	30-130	96.04	80-220	162.12	0.0010

Total duration surgery measured from skin incision to the completion of skin closure overall mean time in total duration of surgery in hand sewn 162.12 min. and in stapled bowel surgery were 96.04.

Table 2: Return of gastrointestional function

S. No.	Operative Procedure	Stapled		Hand Sewn		P. Value
		Range	Mean time (Min)	Range	Mean time(Min)	
1	Gastrectomies	4-5	4.4	5-7	6.0	0.0138
2	Gastroenterostomies	2-5	3.4	5-6	5.0	0.0192
3	Duodenal Stump Closure	4-6	5.00	5-6	5.5	0.6985
4	Entero-enterostomies	4-6	4.20	5-7	4.6	0.86
5	Anterior resection	3-6	4.60	6-7	5.4	0.3686
	Mean		4.32		5.32	0.0217

Overall observations of our study were mean return of G.I. function on 4.32 days in stapled bowel surgery and in hand sewn surgery was 5.32 days.

Table 3: Time Taken In Operative Procedures

S.No.	Operative Procedure	Stapled		Hand Sewn		P. Value
		Range (Min)	Mean time (Min)	Range	Mean time (Min)	
1	Gastrectomies	8-12	9.8	24-30	26.6	0.001 (S)
2	Gastroenterostomies	4-5	4.3	20-30	24.8	<0.0001 (S)
3	Duodenal Stump Closure	5-9	7	22-25	23.5	0.015 (S)
4	Entero-enterostomies	3-15	9.4	18-30	22.8	0.0027
5	Anterior resection	10-15	12.3	28-30	29.3	0.0182
Mean			8.5		25.4	<0.0001

Overall observations time taken in stapled bowel operative procedure is less (8.5 min. mean time) then hand sewn bowel operative procedure.

Table 4: Post-Operative Hospital Stay

S.No.	Operative Procedure	Stapled		Hand Sewn		P. Value
		Range	Mean time (Days)	Range	Mean time (Days)	
1	Gastrectomies	15-21	16.6	8-40	21.2	0.4231
2	Gastroenterostomies	9-22	12.4	11-30	15.1	0.3580
3	Duodenal Stump Closure	8-13	10.5	17-21	19.0	0.1174
4	Entero-enterostomies	8-41	12.6	14-33	12.1	0.7297
5	Anterior resection	11-16	14.0	20-21	20.0	0.0155
Mean			13.22		17.48	0.0625

In our study mean post operative hospital stay in stapled bowel surgery was 13.22 days and hand sewn surgery was 17.48 days. Overall was patients discharged early in stapled bowel surgery then hand sewn surgery.

Table 5: Cost in Operative Procedure

S.No.	Operative Procedure	Stapled		Hand Sewn		P. Value
		Range	Mean (Rs.)	Range	Mean (Rs.)	
1	Gastrectomies	4000-8000	5900	1000-1200	1080	0.002 (S)
2	Gastroenterostomies	3000-3500	3180	800-1500	1105	<0.0001 (S)
3	Duodenal Stump Closure	3500-3800	3650	800-900	850	<0.0032 (S)
4	Entero-enterostomies	12500-14500	13400	810-1250	1072	<0.0001 (S)
5	Anterior resection	15000-16000	15500	800-1100	916.66	<0.0001 (S)
Mean			8326		1004.73	<0.0213 (S)

On compare hand stapled bowel surgery was costly.

Table 6: Post operative complication of individual procedures

S.No	Operative Procedure		Total No. of patients	Type of Complication with number of patient with that complication					
				Wound Infection	Clinical leak	Intra abdo. Sepsis	Obstruction	Stricture	Death
1	Gastrectomies	Stapled	5	0	0	0	0	0	0
		Hand Sewn	5	2	2	0	0	0	0
2	Gastroenterostomies	Stapled	10	1	0	0	0	0	1
		Hand Sewn	10	2	1	0	0	0	0
3	Duodenal Stump	Stapled	2	0	0	0	0	0	0
	Closure	Hand Sewn	2	0	0	0	0	0	0
4	Entero-enterostomies	Stapled	5	2	1	1	0	0	0
		Hand Sewn	5	2	1	0	0	0	1
5	Anterior resection	Stapled	3	0	1	0	0	0	0
		Hand Sewn	3	1	1	0	0	0	0

Stapled bowel surgery has low complication rate then hand sewn bowel surgery.

CONCLUSION

Out reasons for favoring stapled bowel surgery are:

1. It can easily be learned and is probably safer in the hands of a less experienced surgeon than hand suture methods.
2. It is particularly appropriate in critically patients in whom curtailment of operating & anaesthesia time may be important.
3. It considerably facilitates the performance of technically difficult surgical manoeuvere like duodenal stump closure, low ant. Resection etc.
4. It is associated with diminished handling of the delicate bowel wall which ultimately results in earlier entral feeding as well as reduces the post operative hospitalization.
5. It is associated with using a single loading unit in place of numerous sutures especially in ant. Resection surgery.
6. It is associated with relatively less complications, hence plays a effective part in reducing extra burden on patients & hospital staff, as well as attendants.
7. It enables the surgeon not only to extend the range of ant. Resection to lower tumors but also to extend the level of resection below the tumor as well as reduce the rate of APR, especially in men with a narrow pelvis.
8. It is related with convenient & easy construction of resection & anastomosis through the laparoscopic approach.

Thus our study clearly demonstrates that stapling technique provides a expedient way of performing resection and anastomosis that is safe if not safer than conventional hand suture but our country is developing country. So financial problem is main drawback in stapling technique otherwise it is safe and it is far out weighted by the other advantages of the stapler technique.

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