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Original Article

Outcome Comparison of Stapled Versus Hand-Sewn Anastomosis in Elective Gastrointestinal Surgeries

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ABSTRACT

Bowel loop anastomosis is considered as major part of elective gastrointestinal surgeries. The anastomotic procedures being used now a days include hand sewn and stapled anastomosis. For appropriate gastrointestinal anastomosis, many factors should be considered such as intraoperative duration, restoration of blood supply, restoration of normal function of gastrointestinal tract and decrease tissue damage. **Objective:** The objective of the study was to compare the outcome of stapler and hand sewn anastomosis in elective gastrointestinal surgeries. **Methods**: Cross-sectional observational study conducted in department of surgery, Sheikh Zayed Hospital, Rahim Yar Khan from May 1, 2021 to August 31, 2022. Total 60 patients included in study and outcome variables such as anastomotic integrity, duration of procedure, post-operative hospital stay and return of bowel activity compared in hand sewn and stapled anastomosis. **Results**: The study included total 60 patients out of which 38 (63.33%) underwent stapled anastomosis and 22 (36.66%) underwent hand sewn anastomosis. Age (*P* value: 0.373), gender (*p* value: 0.372), anastomotic site (*p* value: 0.284) and return of bowel activity (*p* value: 0.331) did not show statistically significant difference between two groups. Anastomotic integrity (*p* value: 0.025), duration of procedure (*p* value: 0.002), post-operative hospital stay (*p* value: 0.037) show statistically significant difference between hand sewn and stapled anastomosis. **Conclusions**: Stapled anastomosis has better anastomotic integrity, reduced duration of procedure and decreased post-operative hospital stay as compared to hand sewn anastomosis with statistically significant difference between two groups.

INTRODUCTION

The primary method for management of gastrointestinal tumors was surgical excision previously. The major factor which determines the surgical outcome is anastomosis. The major anastomotic procedures being used in clinical practice for treatment of gastrointestinal surgeries include hand sewn and stapled sutures. Patency was major problem during anastomotic procedure which was addressed by development of sutures to provide the security against leakage of blood as well as bowel contents [1]. Major purpose of gastrointestinal anastomosis is excellent approximation of tissues without any tension and maintaining the blood supply of the tissue whether performed by hand-sewn technique or stapler anastomosis procedure [2]. There are many important factors which should be considered for appropriate gastrointestinal anastomosis such as intraoperative duration, restoration of normal function of gastrointestinal tract, restoration of blood supply, minimize blood loss, decrease tissue damage, and prevention of morbidity and mortality postoperatively. Anastomotic leak can lead to the sepsis, which increases the morbidity and mortality. Anastomotic leak can also result in increased hospital stay and result in re-exploration. Various sutures materials are being used for hand sewn and stapled gastrointestinal anastomosis including monofilament or multifilament, natural or synthetic, absorbable or non-absorbable. One of the most important characteristic of surgical suture is that it should cause minimal tissue necrosis and inflammation with provision of highest strength to the wound during lag phase of healing process [3]. The anastomotic technique

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should be selected by taking into consideration many factors such as ease of construction, speed, cost, personal preferences as well as training of staff. Stapling is considered as convenient and safe method to maintain the intestinal continuity by maintaining the principles of anastomosis [4]. Anastomosis of bowel loops is considered as major part of gastrointestinal surgeries. Mechanical suturing is improved by the use of stapling devices with minimum tissue injury and reduced duration of procedure[5]. Single layer extra mucosal anastomosis is familiar now a day due to its advantage of least luminal narrowing and minimum tissue necrosis. Significant reduction in duration of anastomotic procedure as well as less tissue trauma due to decreased tissue handling results in early restoration of gastrointestinal function in stapling technique [6]. Stapling anastomosis has advantage of cutting and stapling at the same time without any need of clamping. Staplers have an important impact to streamline the surgical procedures. Staplers have ability to access difficult areas. Circular staplers have good access in lower pelvic surgery thus preventing the patients from permanent colostomy. However, hemostasis should be maintained carefully in stapled line to prevent the risk of anastomotic bleeding [7]. Technical failure rate is decreased by the use of modern devices in stapler anastomosis. Stapler anastomosis is more consistent and comfortable in locations which are difficult to handle during procedure and challenging for the surgeons [8]. In the study, various outcome parameters such as anastomotic integrity, duration of procedure in minutes, post-operative hospital stay and return of bowel activity between hand sewn and stapled anastomosis are compared. Anastomotic integrity is assessed by the presence or absence of anastomotic leak while return of bowel activity is assessed by the day of appearance of bowel sounds after operation. The objective of the study is to compare the outcome between hand sewn and stapled anastomosis in elective gastrointestinal surgeries.

METHODS

The study was 'Cross-sectional observational study'. The study was conducted in the department of surgery, Sheikh Zayed hospital, Rahim Yar Khan. From May 1, 2021 to August 31,2022. Non probability consecutive sampling technique Sample size calculated using WHO software "sample size determination in health studies" using 95% confidence interval and 90% power of test. Inclusion criteria: Both genders (Between 12-80 years of age), Patients of elective gastrointestinal surgeries who underwent bowel anastomosis. Patients undergoing bowel anastomosis after curative resection due to colorectal tumor. Taken consent after adequate counselling including the cost of stapler. Exclusion criteria: Gastrointestinal anastomosis done in emergency setting, Patients undergoing esophageal anastomosis, Patients undergoing correction of colorectal malformations, Patients undergoing laparoscopic procedures, Patients with widespread loco-regional and distant metastasis, Patients undergoing radiotherapy, Patients of coagulopathy or on anti-coagulation therapy, Patients with complicated comorbidities, unwilling to give informed consent. Data collection was done during patient management in department of surgery, Sheikh Zayed Hospital Rahim Yar Khan. After taking informed consent, a total of 60 patients satisfying the inclusion criteria were included in the study and divided into two groups, the patients who underwent stapled anastomosis and the patients who underwent hand-sewn anastomosis. The data was collected for different variables such as age, gender, site of anastomosis, type of anastomosis, anastomotic integrity, duration of procedure (in Minutes), return of bowel activity, post-operative hospital stay. Data were recorded on predesigned proforma. The selected patients were treated accordingly and as per ward protocol. Data were analyzed thoroughly by using SPSS version 23.0. Quantitative variables such as Age (in years), duration of procedure (in minutes), post-operative hospital stay (days) and return of bowel activity (days) presented in term of mean and standard deviation. Qualitative variables such as gender, anastomosis site, anastomosis integrity presented in terms of frequency and percentages. All effect modifiers controlled through stratification. Post-stratification, independent sample t test and Chi square test applied for analysis of significance. P value <0.05 taken as significant.

RESULTS

Of the total 60 patients, hand sewn anastomosis was performed for 22 patients (36.7%) and stapled anastomosis for 38 patients (63.3%). In hand sewn anastomosis, 14 patients were male (63.6%) and 8 patients were females (36.3%) while in stapled anastomosis, 22 patients were male (57.8%) and 16 patients were females (42.1%). Mean age for hand sewn anastomosis 32.95±8.561 years and in stapled anastomosis 42.42±12.588 years. Age (P value: 0.373), gender (p value: 0.372) and anastomosis site (p value: 0.284) did not show significant difference between two groups Table 1.

Variable		Anastomotic Type		p- value
		Hand Sewn	Stapled	
		N(%)	N(%)	
Age 38.95±12.109 years	12-30	11(50%)	6(15.78%)	0.373
	31-50	10(45.45%)	16(42.10%)	
	51-80	1(4.54%)	16(42.10%)	
	Total	22(100%)	38(100%)	

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Gender	Male	14(63.63%)	22(57.89%)	0.372
	Female	8(36.36%)	16(42.10%)	
	Total	22(100%)	38(100%)	
Anastomosis site	Gastrojejunal	3(13.63%)	7(18.42%)	0.284
	Jejunojejunal	1(4.54%)	1(2.63%)	
	Colo-colicl	4(18.18%)	6(27.27%)	
	Ileo-ileal	10(45.45%)	12(2.63%)	
	Colorectal	1(4.54%)	1(2.63%)	
	Ileocolic	1(4.54%)	7(18.42%)	
	Ileoanal	2(9.09%)	2(5.26%)	
	Ileorectal	0(0%)	2(5.26%)	
	Total	22(100%)	38(100%)	

Table 1: Distribution of Age, Gender and Anastomosis site between hand-sewn and stapled anastomosis

Both techniques compared for anastomotic integrity, duration of procedure (minutes), post-operative hospital stay and return of bowel activity. Mean duration of procedure in hand sewn anastomosis 20.68±4.854 minutes and in stapled anastomosis 17.39±4.768 minutes. Mean post-operative hospital stay in hand sewn anastomosis 4.45±1.565 days and in stapled anastomosis 3.74±1.349 days. Mean time to return of bowel activity in hand sewn anastomosis 2.59±0.854 days and in stapled anastomosis 2.03±0.854 days. The difference was statistically significant between two procedures for anastomosis integrity (p value: 0.025), post-operative hospital stays in days (p value: 0.037), duration of procedure in minutes (p value: 0.002). There was no statistically significant difference between two procedures in terms of return of bowel activity in days (p value: 0.331) (Table 2). Of the 60 patients, gastrojejunal anastomosis was performed for 10 patients (16.7%), ileoileal anastomosis for 22 patients (36.7%), colo-colic for 10 patients (16.7%), ileocolic for 8 patients (13.3%), colorectal for 2 patients (3.3%), ileoanal for 4 patients (6.7%), ileorectal for 2 patients (3.3%), jejunojejunal for 2 patients (3.3%). Anastomotic site shows no statistically significant difference for age (p value: 0.889), gender (p value (0.930), anastomotic integrity (p value: 0.306), duration of procedure in minutes (p value: 0.259), post-operative hospital stay (p value: 0.491), return of bowel activity(p value: 0.306).

Parameters	Anastomotic technique		Frequency (%)	Chi-square value	p-value
Anastomotic Integrity	Stapled Hand-sewn	Yes	38(100%)	0.274	0.025
		No	0(0%)		
	Stapled (17.39±4.768) mins	Yes	20(90.90%)		
		No	2(9.09%)		
Duration of procedure (minutes)	Hand-sewn (20.68±4.854) mins	<20	31(81.57%)	0.058	0.002
		>20	7(18.42%)		
	Stapled (3.74±1.349) days	<20	13(59.09%)		
		>20	9(40.90%)		
Post-operative hospital stay (days)	Hand-sewn (4.45±1.565) days	≤4	27(71.05%)	0.103	0.037
		>4	11(28.94%)		
	Stapled (2.03±0.854) days	≤4	11(50%)		
		>4	11(50%)		
Return of bowel activity (days)	Hand-sewn	≤2days	28(73.68%)	0.180	0.331
		>2days	10(26.31%)		
	(2.59±0.854) days	≤2days	12(54.54%)		
		>2days	10(45.45%)		

Table 2: Comparison of Anastomosis integrity, duration of procedure, post-operative hospital stays and return of bowel activity between hand-sewn and stapled anastomosis

DISCUSSION

Stapling anastomotic technique was first introduced in 1908 by Hulti; but their use has been increased dramatically since last 35 years due to development of disposable and reliable instruments [9-10]. Various studies compared the outcome variables between conventional and hand sewn anastomosis and results for duration of procedure, anastomosis integrity and mortality are comparable [11]. In this study, total 60 patients included, out of which 38 (63.3%) underwent stapled anastomosis and 22(36.7%) underwent hand sewn anastomosis. Age, gender, anastomosis site and outcome variables such as anastomosis integrity, duration of procedure, post-operative hospital stay and return of bowel activity recorded. Of the total 60 patients, average age of the patients undergoing hand sewn anastomosis being 32.95±8.561 years and the patients undergoing stapled anastomosis being 42.42±12.588 years. The mean age in both groups did not show statistically significant difference (p value: 0.372). Kim Dh et al., demonstrated in their study that there was no statistically significant difference of the mean age between hand sewn and stapled anastomosis observed with mean age 10.9±4.8months in hand sewn and 7.5±2.1months in case of stapled anastomosis [12]. Of the total 60 patients, 36 patients were male (60%) and 24 patients were females (40%). Gender distribution between two groups did not show any statistically significant difference (p value: 0.372). Of the total 60 patients, 10 patients underwent gastro-jejunal anastomosis (16.7%), 10 patients underwent Colo-colic anastomosis (16.7%), 22 patients underwent ileo-ileal anastomosis (36.7%), 8 patients underwent ileocolic anastomosis (13.3%), 4 patients underwent ileoanal anastomosis (6.7%), 2 patients underwent ileocecal anastomosis (3.3%), 2 patients underwent colorectal anastomosis (3.3%) and 2 patients underwent jejuno-jejunal anastomosis (3.3%). Among 22 patients underwent hand-sewn anastomosis, 3 patients underwent gastrojejunal anastomosis (13.63%), 10 patients underwent ileoileal anastomosis (45.45%), 4 patients underwent colocolic anastomosis (18.18%), 1 patient colorectal (4.54%), 1 patient ileocolic (4.54%), 2 patients ileoanal (9.09%) and 1 patient underwent jejunojejunal anastomosis (4.54%). Among 38 patients underwent stapled anastomosis, 7 patients underwent gastrojejunal

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anastomosis (18.4%), 12 patients underwent ileo-ileal anastomosis (31.57%), 6 patients colo-colic (15.78%), 7 patients ileocolic (18.42%), 2 patients ileoanal (5.26%), 2 patients ileorectal (5.26%), 1 patient jejunojejunal (2.63%) and 1 patient underwent colorectal anastomosis (2.63%). Anastomotic site shows no statistically significant difference between two groups (p value: 0.284). Lustosa SA et al., demonstrated in their study that routine use of stapler anastomosis in colorectal anastomosis should not be recommended due to risk of strictures [13]. Anastomotic integrity evaluated on the basis of presence or absence of anastomotic leak. For 22 patients underwent hand sewn anastomosis; 2 patients underwent anastomotic leak (9.09%). Integrity was maintained for other 20 patients (90.90%). Of the total 38 patients underwent stapled anastomosis, none of the patient underwent anastomotic leak so integrity was maintained in 100% of patients in that group. The difference of anastomotic integrity between two groups was statistically significant (p value: 0.025). Hintz GC et al., have demonstrated in their retrospective cohort study that there is no statistically significant difference in primary outcome between hand sewn and stapled anastomosis [14]. Naumann DN et al., demonstrated that there is no statistically significant difference in anastomotic integrity between hand sewn and stapled anastomosis groups [15]. Choy PY et al., demonstrated in their study that there was statistically significant difference of anastomotic leaks between hand-sewn and stapled anastomosis. More anastomotic leaks in hand sewn anastomosis ac compared to stapled anastomosis (p value: 0.02) [16]. Harustiak T et al., demonstrated in their study that there is decreased rate of anastomotic leakage and stricture formation in stapled anastomosis as compared to hand sewn technique [17]. Mean duration of procedure in case of stapled anastomosis is 17.39±4.768 minutes while in case of hand sewn anastomosis, 20.68±4.854 minutes. The difference of duration of procedure between two groups is statistically significant (p value: 0.002). A systematic review demonstrated by Hemming K et al., that operating time between different types of anastomoses was not statistically different with p value less than 0.64. The stapler anastomosis result in decrease length of operating time for gastroesophageal anastomosis 1.5minutes while 14 minutes for ileocolic anastomosis [18]. Gonj J et al., provided in their meta-analysis that stapled anastomotic closure required shorter operating time with mean difference -11.21 with p value: 0.01 [19]. Mean hospital stay in case of stapled anastomosis was 3.74±1.349days, while in case of hand sewn anastomosis, mean hospital stay was 4.45±1.565days. The difference between the post-operative hospital stay in both groups was statistically significant (p value: 0.037). Hemming K. et al., demonstrated that length of hospital stay was statistically significant between different sites of anastomosis with p value <0.05 [18]. Gonj J et al., demonstrated in their meta-analysis that stapled anastomosis require shorter hospital stay with mean difference -1.22 and p value <0.001 [19]. The study conducted by Hussain T et al., showed that there is no statistically significant difference of the gender between hand sewn and stapled closure groups with 67% males in hand sewn and 50 % males in stapled anastomosis [20]. Mitra AS et al., demonstrated in their study that there is significant difference in surgery duration between two procedures with mean duration 95.7±14.7minutes in hand sewn anastomosis and 74.8±3.6minutes in stapled anastomosis with p value 0.019 [21]. Catena F et al., demonstrated in their study that no statistically significant difference in length of hospital stays between hand sewn and stapled closure groups. No significant difference of anastomotic leak has been demonstrated by Thakor RB et al., in their study [23]. Mean hospital stay in hand sewn group was 16.1±7.8days while in stapled group, mean stay was 11.8±2.4days. Epsin E et al., demonstrated no difference of hospital stay between hand sewn and stapled anastomosis (P value: 0.275) [24]. Of the total 38 patients underwent stapled anastomosis, mean time to return of bowel activity was 2.03±0.854 days while in case of hand sewn anastomosis, mean time was 2.59±0.854 days. Mean difference in return of bowel activity was not significant between two groups (p value: 0.331). Ji W et al., demonstrated in their study that mean duration to return of bowel activity in gastrojejunostomy and subtotal gastrectomy was 2.86 days in case of hand sewn anastomosis and 2.13 days in case of stapler anastomosis with p value 0.004 [25].

CONCLUSIONS

It was concluded that stapler anastomosis technique has significantly increased anastomosis integrity, less duration of procedure and less duration of post-operative hospital stay. No statistically significant difference observed in case of return of bowel activity in both techniques. So, keeping in view the outcome variables and post-operative complications, stapled anastomotic technique is better than hand-sewn anastomosis being quicker, safe and effective but the stapling instrument should not be used on friable, avascular and edematous bowel. Operating surgeons must be skilled enough to tackle the situations in which stapling anastomosis technique is contraindicated.

Conflicts of Interest

The authors declare no conflict of interest.

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