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COMPARATIVE STUDY BETWEEN STAPLER AND HAND SEWING IN GASTROINTESTINAL ANASTOMOSIS

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Abstract
Gastrointestinal anastomosis is an important part of gastrointestinal operations and can be achieved by hand sewn anastomosis or by the newly developed staplers.
The study aims to compare between the two surgical methods of anastomosis in a prospective , randomized design, regarding: operation time, post operative hospital stay and the incidence of post operative anastomotic leak in both groups. The study was carried out in Department of Surgery at Alsader Teaching Hospital in Basrah, Iraq from October 2015 to December 2016, it included 40 patients of both gender and with a different age, they divided into 2 groups (hand sewn and stapler groups), each group included 20 patients, comparing the following parameters: time of anastomosis, duration of surgery, post operative leak and hospital stay.
There were no significant differences in the age, gender distribution, the indication for resection, post operative anastomotic leak (p=1) and hospital stay (P Value 0.15) in both group but there was significant differences in duration of anastomosis (P Value0 .00001) and operation time (P Value 0.00001). Our study concluded the superiority of stapler on hand sewing in gastrointestinal anastomosis in term of reducing operative time.

Introduction
Intestinal tumor, Intestinal obstruction and peritonitis from abdominal trauma or from perforated bowel are common surgical problems and these may be treated by resection and anastomosis which join two parts of bowel together by accurate approximations without tension and with a good blood supply to both parts[1].

Currently, the two most commonly used anastomotic methods are: hand sewn sutured anastomosis and stapled anastomosis. Although both are well confirmed, but they are not without any failings, they do not provide an immediately sealed anastomosis and both may be prone to serious complication such as infection & anastomotic leaks. However, conflict remains regarding which of the two methods of anastomosis gives better clinical results[2].

The evolvement of mechanical sutures by means of stapler use has become a realest technological advancement, as it has represented the concept of a new product with the combination of new functions that have resulted in improvements and effective gaining of quality or productivity in the handicraft suture process that has been done by surgeons for centuries[3].

Stapling instruments which is used in surgery were first presented in 1908 by Hültl, but they did not acquire popularity because they are expensive and untrusted. The evolvment of dependable, disposable staplers over the past 30 years has altered surgical practice sensationally. Technical failings in recent devices are rare and anastomosis in inapproachable sites are easier to be done[4]. Prospective, randomized trials in colorectal surgery have not showed any differences between both methods of anastomosis regarding rate of leakage, hospital stay length and morbidity[5].

Anastomotic leak: is clinical appearance of leakage of gastrointestinal contents from the wound or from drains or

development of peritonitis, entero-cutaneous fistula, anastomotic dehiscence proved by reoperation and or radiographic leakage which is demonstrate extra-vasation of contrast medium from the anastomosis in radiological image.

In a study on abdominoperineal resection and anal preserving operation for rectal cancer comparing local recurrence and 5 year survival rates demonstrated no statistically significant difference ($p>0.05$)[6], while in another study evaluating 1,125 patients for ileocolic resection and anastomosis demonstrated less anastomosis leaks in stapler group than hand-sewn group and demonstrated no any significant differences for intra-abdominal abscess, anastomosis time, reoperation rate and mortality rate[7].

The anastomosis time may Influence the total length of operative procedure or hospital stay and there is no any different advantages for other parameters in both group[8].

The aim of our study is to compare both surgical techniques of anastomosis: stapling and manual suturing in a prospective, randomized design, regarding: duration of gastrointestinal anastomosis, duration of operation, duration of post operative hospital stay in both groups & the incidence of post operative anastomotic leak.

Patients and Methods

This is a prospective, randomized study conducted in department of General Surgery at Al-Sadir Teaching Hospital in Basrah, Iraq from October 2015 to December 2016. The study included 40 patients of either gender and different age groups. Patients selected for this study included those who were admitted with various clinical problems requiring resection and anastomosis of gastro-intestinal tract. Those patients with serious medical condition, on chemo-radio-therapy, metastatic diseases and those requiring duodenal or rectal anastomosis were excluded from the study.

A predesigned proforma which included: Age, gender, operative findings , method of anastomsis, anastomotic time, operating time, postoperative anastomotic leak and duration of hospital stay was made for all patients.

Patients were randomized either to the hand sewn group or the stapler group by alternative method, the first patient by hand sewn anastomosis and the second patient by stapler anastomosis and so on for the rest of the patients. The procedures and their outcomes were explained to all the patients. Patients were enrolled in this study after their informed written consent.

A detailed history, clinical physical examination and investigations included complete blood count, blood urea, serum creatinine, serum electrolytes, blood glucose, liver function test, ECG, radiological examinations (chest and abdomen) and ultrasound of abdomen were done for all patients. Other investigations such as intravenous and oral contrast enhanced computed tomography scan of the abdomen were done as per case specification.

Preoperative preparation included bowel preparation, deep venous thrombosis prophylaxis &intravenous third generation cephalosporine with metronidazole at time of induction of anesthesia.

All cases of anastomosis were done by a senior surgeon as per standard procedures in both hand sewn and stapler group.

Hand sewn intestinal anastomosis was carried out in a single layer (extramucosal) with 3/0 polyglactin (vicryl), every bite of the suture was put about 5mm apart and at 5mm depth and averted excessive tension on the suture line. Stapler anastomosis was done by linear cutter GIA™ (GIATM Auto Suture TM stapler with DST Series TM Technology 60mm-4.8mm reloadable staplers) which place two double rows of titanium staples then cut and divide tissue between the two double rows simultaneously. In this technique, the two arms of the stapling device are placed

through open bowel ends or through an enterotomy at antimesenteric border if the bowel ends are stapled then stapler is fired to produce lumen between both segments. The enterotomy or the bowel ends was closed by hand suturing .

Anastomosis time (in minute) in hand sewn group: The time began with the placement of first stitch and ended when excess suture from last stitch was cut, while in stapler group anastomosis time start with firing and ends by removing stapler. Nasogastric tube and drains were inserted intraoperatively for every patient.

Duration of operation (in minute): time start from skin incision till finishing the skin closure. All patients were observed in general surgical ward until discharge to home and during this period, they were kept nil per oral and on intravenous fluids. Nasogastric tube was removed on 3rd-4th postoperative day and subsequently they were switched over to sips orally then on liquids and followed by soft diet within a span of 3 to 5 days and drains was removed on 5th-7th day.

Postoperative hospital stay: means number of days spent in the hospital from the day of operation till discharge of the patients to their home. Patients were discharged to home after they stayed stable for few days and skin stitches were removed on 7th -10th post operative day. Student T test for continuous variables and Chi-square test for categorical variables were used. A p-value of less than 0.05 was considered significant.

Results

A total of 40 patients were included in this study, 20 patients underwent hand sewn (group A) and 20 patients underwent stapler intestinal anastomosis (group B). There were no significant differences in the age and gender distribution between the two groups. Demographic data is presented in Table I.

There was no significant differences regarding the indication for resection in both group as shown in Table II. The mean anastomosis time was (36.5±10.65) minutes in group A and (16.5±5.40) minutes in group B with P-value (0.00001) shows highly significant difference while mean operative time was (176.25±32.07) minutes in group A and (136.5±16.86) minutes in group B with P-value=0.00001 which is also highly significant difference. Regarding post-operative complications we found that anastomotic leak developed in one patient in the group A and one patients in group B with p=1 which is not significant. The hospital stay was (8±2.36) days in group A and (8.95±3.31) days in group B with P value (0.15) which is also not significant as shown in Table III.

Table I: Demographic data of both groups.

Features	group A (Hand sewn) n=20	group B (Staplers) n=20	P value
Age (year) Mean±SD	46.6±11.6	44.3±10.4	0.25 T value 0.66
Gender Male Female	15(75%) 5(25%)	13(65%) 7(35%)	0.49 Chi square 0.47

Table II: Indications for resection and anastomosis.

Pathology	group A (Hand sewn) n=20	group B (Staplers) n=20	P value
Gastric outlet obstruction (mass or chronic ulcer)	1(5%)	2(10%)	0.55
small bowel obstruction due to adhesion	6(30%)	8(40%)	0.51
small bowel mass	3(15%)	2(10%)	0.63
large bowel mass	7(35%)	7(35%)	1
Closure of ileostomy	1(5%)	0(0%)	0.31
Closure of colostomy	2(10%)	1(5%)	0.55

Table III: Operative and post operative data.

Operative data	group A (Hand sewn) n=20	group B (Staplers) n=20	P value
Anastomotic time (minute) Mean±SD	36.5±10.65	16.5±5.40	0 .00001
Operative time (minute) Mean±SD	176.25±32.07	136.5±16.86	0.00001
Anastomotic leak	1(5%)	1(5%)	1
Hospital stay (day)	8±2.36	8.95±3.31	0.15

Discussion

In the present study, hand sewn and stapler groups were compared on the basis of anastomosis time, duration of operation, post operative hospital stay and anastomotic leak.

In our study there was Significant reduction in the mean anastomosis time which is (36.5±10.65 minutes) in group A in contrast to (16.5±5.40 minutes) in group B with P Value 0.00001 and this is similar to studies done recently in India that shown a significant reduction in the anastomotic times in the stapled group[9] and also Similar to Hori et al. study conducted in Japan which demonstrated that the anastomosis time is less in stapler group (14 mins) than in hand sewn group (25 mins)[10].

Because of decreasing anastomosis time, the total operative time also decreases. There was a reduction in the operating time for the stapler group (136.5±16.86 minutes) as compared with the hand-sewn group (176.25±32.07) minutes with p=0.00001 which is statistically significant. This result is harmonious to mean operating time of gastrointestinal anastomotic procedures done by Damesha et al. which was shorter in stapler group(140 min.) than in hand sewn group(154 min.)[9]. Long duration of hospitalization, morbidity, reoperation and mortality are a significant complications of postoperative anastomotic leaks [11–15].

In present study no significant difference in the anastomotic leak,none leak (5%) occurred in stapler group and one leak (5%)occurred in hand sewn group which is similar to Meta-analysis study done by Lustosa and review of Cochrane which demonstrated clinical leak of 7.1% in stapled group and 6.33% in hand-sewn group which was also not significant [16,17].

Postoperative hospital stay did not show any significant difference between the stapler group (8.95±3.31days) and the hand suture group (8±2.36days);(p 0.15) which is similar to previous studies of Damesha N et al. which was showed mean postoperative hospitalization (11.66 days) with the sutured method and (11 days with the stapled method in the gastro-jejunostomy group[9] and also similar to Seo SH et al. which comparing hand sewn and stapled gastro-jejunostomies appeared

no significant difference in postoperative hospital stay between both groups(8.0±3.8 days) for hand sewn group in contrast to (7.4± 1.9 days) for stapled group [18] , while other studies was showed significant differences in length of hospital stay e.g. in a study made by Anwar et al of Hope Hospital UK demonstrate the hospital stay in stapled anastomosis group was 14.5 days and in hand sutured anastomosis group was 11.5 days [19].

Our study also similar to meta-analysis study for the safety and effectuating of stapled versus hand-sewn in colorectal anastomosis comparing both group for anastomotic bleeding, wound infection, anastomotic leak, anastomotic time, hospital stay and mortality which was showed no significant statistical differences except long anastomosis time in hand sewn group($p<0.05$)[8].

In conclusion, for several decades, manual anastomosis has been the standard surgical procedure and other techniques such as staplers have been introduced later in the 20 century improved the field of surgery.

Our study demonstrated that stapled anastomosis is superior to the manual hand-sewn anastomosis in terms of operative time and no significant difference was found between stapler and hand-sewn groups with respect to other parameters like post-operative hospital stay and anastomosis leak.

This study was compatible with most studies in terms of similar complications of stapled and hand-sewn anastomosis .

Our results consider that stapler anastomosis is still a preferable choice than the hand-sewn anastomosis in reduction of operation time .

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