

## Comparative study between stapled versus hand sewn method for large bowel anastomosis surgery

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### Summary:

**Background:** intestinal anastomosis is one of the most commonly performed procedures it required to re-establish gastrointestinal continuity after surgical resection, traumatic disruption or bypass procedures. In last decade, advances in intestinal stapling devices have led to an increased frequency of stapled anastomosis. There are varieties of proposed benefit from a stapled technique: better blood supply, reduced tissue manipulation, less edema, uniformity of suture, adequate or perhaps wider lumen at the site of anastomosis, ease and rapidity.

**Patient and methods:** a prospective study was conducted on 103 patients who suffered from benign and malignant diseases in addition to trauma patients. They were divided in to two groups (SA)(stapled group) which involved 51 patients where the anastomosis were done by stapler and other group of 52 patients where the anastomosis were done by hand sewing named as HS group (hand sewing group). Both groups had the same preoperative characters such as age and gender, and the types of outcome analyzed were specific mortality, clinical anastomotic leak, stricture, anastomotic hemorrhage, reoperation, wound infection and hospital stay.

**Results:** A total of 9 patients (17.6%) in SA group developed complications compared to 20 patients (38.5%) in HS group (p-value 0.019). nine patients developed fistula in HS group (17.3%) compared to two patients (3.9%) in SA group (p- value 0.035). mean postoperative hospitalization time for SA group (6.5) days while for HS group (8.8) days (p-value 0.75) . there is a significant difference regarding fistula in favor of stapled anastomosis .

**Conclusion:** staples anastomosis is safe and effective and associated with fewer leaks than hand sewn anastomosis.

**Keywords:** stapled intestinal anastomosis, sewn intestinal anastomosis.

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### Introduction:

The interest in the results from comparisons between hand sewing and stapling has been progressively growing (1). Mechanical stapling devices are now widely used for gastrointestinal surgery. A better blood supply, reduced tissue manipulation, minimum edema, uniformity of sutures, adequate lumen and rapidity of operation are proposed benefits of this technique (2).

Consistently, safe method of anastomosis is still ideals, the achievement which would not only lower the incidence of dangerous complications but possibly avoid the need for defunctioning colostomy or ileostomy. Staplers have been used in many kind of anastomosis but most frequently in colorectal anastomosis (3).

### Patients and methods:

A prospective study was carried out from 1<sup>st</sup> of May 2007- 1<sup>st</sup> of December 2008, involving 103 patients (59 male and 44female) admitted to the first surgical unit in Baghdad teaching hospital. The study focused

on the comparison between stapling and hand sewing in large bowel anastomosis in elective and emergency cases. The stapler suturing was done using different types of staplers, mainly circular stapler, while hand sewn suturing was done by double layer interrupted sutures using 3/0 absorbable suture material. The patients subdivided in to two groups as stapled anastomosis group (SA group) and hand sewn anastomosis group (HS group). Both groups were subjected to hematological investigations including HB, PCV, and blood group, cross match, renal function test and liver function tests. ECG and chest x-ray was according to the age. Imaging study was started by non invasive studies including ultrasound and CT-scan of the abdomen. Colonoscopy was done to determine the size and site of the tumor and to take biopsy for histopathology. Some patients underwent contrast examination by barium enema. Stapled anastomosis group (SA group): This group includes 51 patients where the age ranged between 16-75 years with mean age (45.5 years). Twenty seven patients (52.2%) were male and 24 patients (47.1%) were female. Eighteen patients (35.2%) had tumors predominantly adenocarcinoma of left colon. Twenty two patients (43.9%) had Hartmann's colostomy. two

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patients (3.9%) with sigmoid volvulus were treated primarily by resection and Hartmann's colostomy then prepared for closure by stapler. five patients (9.8%) with emergency penetrating injuries to the bowel were anastomosed primarily by stapler after resection. Two patients (3.9%) with ulcerative colitis were treated primarily by Hartmann's colostomy then prepared for second closure by stapler. Two patients (3.9%) with multiple polyposis of colon were prepared for surgery as elective case.

Hand sewn anastomosis group (HS group): this group include 52 patients where the age ranged from 18-70 years with mean age of 44 years. Thirty tow patients (61.5%) were male 20 patients (38.5%) were female. Twenty five patients (48%) had tumors of colon predominantly adenocarcinoma and two of them had carcinoid tumor of the appendix. Eighteen patients (34.6%) had Hartmann's colostomy due to previous bullet injury to the abdomen. Five patients (9.6%) with emergency penetration, injury to the colon had full criteria for primary anastomosis, by hand sewing. Two patients (3.8%) with ulcerative colitis were prepared for surgery with resection and end to end anastomosis. One patient (1.9%) with sigmoid volvulus was treated in the same time with resection and anastomosis and one patient with tuberculosis of caecum (1.9%) presented with fistula after appendicectomy treated in the same time by resection and anastomosis.

Technique: All the patients in elective surgery whether stapled or hand sewn anastomosis received prophylactic antibiotics, fluids diet for 72 hours preoperatively with administration of laxative and enema 24 hours preoperatively. Operative technique of stapled anastomosis is done by end to end anastomosis (EEA) or by side to side anastomosis (SSA) by stapler devices liner or circular type. While hand sewn anastomosis was done between the two edges by double interrupted layers using 3\0 absorbable suture material. All patients received antibiotics for 5-7days, including metronidazole 500mg three times daily and ceftriaxone 1g once daily.

### Results:

A total of 103 patients were admitted to 1<sup>st</sup> surgical Baghdad teaching hospital during the period from May 2007 to December 2008. The mean age for SA group was 37.29 year with a range of 16-75 year and mean age for HS group was 41.71 year with a range of 18-70 year. Twenty seven patients in SA group were male (52.9%) and 24 were female (47.1%) patients, while the HS group include 32 patients male (61.5%) and 20 female (38.5%) patients. Patients with tumors, total number was 43 patients (47.1%), 25patients in HS group 48% and 18 patients in SA group (35.24%). The difference in distribution of the cases according to the site of tumors between two groups is not statically significant (P value 0.32). Fifty patients with the

trauma treated as emergency with resection and closure or diversion colostomy done for them then closure after 8-12 weeks by SA or HS groups ,27(52.9%) of them were SA group and 23 (44.2%)patients were HS group. No significance difference observed between the two groups of patients (P value 0.637).

**Table (1) Anastomoses according to the sites.**

| anastomosis    | SA group    | HS group   | total      |
|----------------|-------------|------------|------------|
| ileo-colic     | 6 (11.7%)   | 12 (23%)   | 18 (17.4%) |
| Colo-colic     | 10 (19.6%)  | 28 (53.8%) | 38 (36.9%) |
| colorectal     | 26 (50.9%)  | 12 (23%)   | 38 (36.9%) |
| Low colorectal | 8 (15.6%)   | 0 (0%)     | 8 (7.8%)   |
| ileo-rectal    | 1 (1.96%)   | 0 (0%)     | 1 (0.9%)   |
| total          | 51 (49.51%) | 52(50.49%) | 103 (100%) |

As shown in the table, the stapler was mainly used for colo-rectal and low colorectal anastomosis where the hand sewn is difficult to be done.

Out come and complications: comparing the post operative result. There are 4 mortalities in both groups, three of them (5.8%) in HS group and 1 (2%) inSA group. This difference between the two groups regarding mortality is not significantly difference (P value 0.89) as shown in table (2), (3).

**Table (2) postoperative general complications**

| complication    | Studied group |          | total | P-value | significance |
|-----------------|---------------|----------|-------|---------|--------------|
|                 | SA group      | HS group |       |         |              |
| Chest infection | N             | 1        | 4     | 5       | 0.635        |
|                 | %             | 2        | 7.7   | 4.9     |              |
| UTI             | N             | 2        | 5     | 7       | 0.772        |
|                 | %             | 3.9      | 9.6   | 6.8     |              |
| DVT             | N             | 1        | 2     | 3       | 0.654        |
|                 | %             | 2        | 3.8   | 1.9     |              |
| mortality       | N             | 1        | 3     | 4       | 0.891        |
|                 | %             | 2        | 5.8   | 3.9     |              |
| total           | N             | 5        | 14    | 19      | 0.134        |
|                 | %             | 7.9      | 26.92 | 17.48   |              |

S= significant

NS= not significant

The number of general complications in SA group was 3 complication (5.8%) compared to 11 complications (21.1%) in HS group with the overall morbidity was 13.5%. no statistical significant difference in general complications between two groups (p-n value 0.62) while the number of local complication in SA group was 11 complications(21.5%) compared to 25 complications in HS group (48.07%) with overall morbidity was 34.95%, it means there is no statistical significant difference (p-value 0.061).

**Table (3) Postoperative local complications**

| complication         |   | Studied group |      | total | P-value | significance |
|----------------------|---|---------------|------|-------|---------|--------------|
|                      |   | SA            | HS   |       |         |              |
| Wound infection      | N | 3             | 6    | 9     | 0.317   | NS           |
|                      | % | 5.9           | 11.5 | 8.7   |         |              |
| fistula              | N | 2             | 9    | 11    | 0.035   | S            |
|                      | % | 3.9           | 17.3 | 10.7  |         |              |
| dehiscence           | N | 0             | 2    | 2     |         | NS           |
|                      | % | 0             | 3.8  | 1.9   |         |              |
| Collection abdominal | N | 2             | 0    | 2     |         | NS           |
|                      | % | 3.9           | 0    | 1.9   |         |              |
| stricture            | N | 1             | 3    | 4     | 0.317   | NS           |
|                      | % | 2             | 5.8  | 3.9   |         |              |
| bleeding             | N | 2             | 3    | 5     | 0.997   | NS           |
|                      | % | 3.9           | 5.8  | 4.9   |         |              |
| reoperation          | N | 1             | 2    | 3     | 0.564   | NS           |
|                      | % | 2             | 3.8  | 2.9   |         |              |
| total                | N | 11            | 25   | 36    | 0.061   | NS           |

**Table (4) Duration of anastomotic technique (minute) and hospital stay (day)**

|                            | Studied group | N   | mean  | Standard deviation | range |      | P-value | Sig. |
|----------------------------|---------------|-----|-------|--------------------|-------|------|---------|------|
|                            |               |     |       |                    | Min.  | Max. |         |      |
| Anastomotic duration(min.) | SA            | 51  | 11.22 | 1.27               | 10    | 15   | 0.021   | S    |
|                            | HS            | 52  | 27.92 | 1.86               | 25    | 30   |         |      |
|                            | Total         | 103 |       |                    |       |      |         |      |
| Hospital stay(day)         | SA            | 51  | 6.2   | 1.23               | 4     | 9    | 0.751   | NS   |
|                            | HS            | 52  | 8.8   | 3.01               | 5     | 11   |         |      |
|                            | Total         | 10  |       |                    |       |      |         |      |

Total number of patients who developed complications in SA group was 9 patients (17.6%) compared to 20 patients (38.4%) in HS group P-value 0.019 which is a significant difference.

In local complications, nine patients (17.3%) from HS group developed fistula compared to 2 patients (3.9%) from SA group and overall fistula rate (10.7%), p-value 0.035, so there is significant statistical difference

between two groups while for the others local and general complications there is no statistical difference. Regarding the anastomotic duration in SA group was mean 11.22 minute compared to HS group was 27.092 minute, so there is statistical difference in duration of anastomosis p-value 0.01 while no statistical difference in postoperative hospital stay in both groups as shown in table (4) , (5).

**Table (5) Number of patients who developed complications:**

| Development of complication |   | Studied group |      | total | P-value | significance |
|-----------------------------|---|---------------|------|-------|---------|--------------|
|                             |   | SA            | HS   |       |         |              |
| positive                    | N | 9             | 20   | 29    | 0.019   | S            |
|                             | % | 17.6          | 38.5 | 28.2  |         |              |
| negative                    | N | 42            | 32   | 74    |         |              |
|                             | % | 82.4          | 61.5 | 71.8  |         |              |
| total                       | N | 51            | 52   | 103   |         |              |
|                             | % | 100           | 100  | 100   |         |              |

**Discussion:**

In our study the mean age of all patients with HS group is 41.71 years while for SA group is 37.29 years , these figures are similar to Scher et al in their study done(4)(5). Total numbers of deaths are 4, three in HS group and one in SA group p-value 0.89, no statistical difference. One from each group death occurred due to the co morbid disease (D.M, hypertension) and another two deaths occur in HS group due to anastomotic leak with wound dehiscence. The result is similar to Delcio 2002 show also no significant statistical difference in mortality but in this study the most common cause of deaths was due to anastomotic leak(1). Fistula rate after anastomosis in HS group was 9 patients (17.5%)

while in SA group was 2 patients (3.9%), p-value 0.035 so there is significant statistical difference and this is identical to other studies showed that stapled anastomosis had low leak rate (Kracht et al, Monro et al, Cubertafond et al and S.anwar et al)(2)(6)(7)(8). The stapled technique for ileo-transverse anastomosis differs from distal colonic anastomosis and leak rate is higher with left sided colon (Lipska)(9). In our study we took the ileo-transverse anastomosis with colonic anastomosis in same study while (Lipska) show that ileo-transverse anastomosis should be considered separately from colonic anastomosis. While Kracht considered colonic, small bowel and upper GI anastomosis individually. Fistula in our study occurs extraperitoneally, which means that the risk of complication is greater with distal colorectal anastomosis which is identical to Karanjia (10). The mean time taken to perform anastomosis in SA group is 11.22 minutes while in HS group is 27.9 minutes (p value 0.021) so it is significant statistical difference in favor SA group which is closely similar to Delcio and Puiyee Grace et al, Pakkastie TE et al. (11)(12) Colorectal anastomosis especially infraperitoneum using sewing technique relatively takes long time to be performed with difficulty while the use of stapler may make the colorectal anastomosis easier to be done and more secured (McGinn, Naresh, Docherty) (13)(14)(15).

#### Conclusion:

The cost of stapler devices is more expensive but in comparison with the other factors including the length of operative procedure, length of hospitalization, price of sutures used and cost of the complication related to the method employed, all those factors make staples more preferable.

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