

Single-layer seromuscular Continuous Versus Two-Layers Intestinal Anastomosis Of Small bowel in Baghdad Teaching Hospital (A prospective Study)

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Summary:

Background: Anastomosis may be done with the help of stapling devices, by using double layered suturing technique or by a single layer technique.

Objective: The aim of the study is to prove that a single layer continuous technique can be constructed in a significantly less time with similar rate of complications compared with two layers technique.

Patients and methods: A prospective study conducted in Baghdad Teaching Hospital, Iraq. A total of sixty-four patients were included in this study. They were divided into two groups; group A, 28 patients, single layer seromuscular continuous anastomosis was done and group B, 36 patients underwent conventional double layered anastomosis.

Results: There were, 15 male (53.6%) and 13 (46.4%) female within group A and 20 (55.6%) male and 16 (44.4%) female within the group B. There was no significant difference in gender distribution or mean age between or within groups. Bullet and sharp nail injuries to the abdomen were the most common causative agents followed by malignant disease of GIT. Wound infection was the most frequent complication in both groups as fourteen patient out of 64 (21.9%) developed wound infection; 8 of them were among group B. There was no significant difference in the incidence of anastomotic leakage; in group A was 3.6%, while in group B was 4.7%. The average time for the construction of the single layer anastomosis was 20 min and in double layer it was 35 min. The difference in average time is statistically significant

Conclusion: The single-layer continuous anastomosis requires less time to construct and has a similar risk of leakage compared with the two-layer technique. It also costs less than any other method and can be safely introduced into a surgical training program.

Key Words: Anastomosis, Single layer, Double layer, Seromuscular.

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Introduction:

Different techniques of intestinal anastomoses are used which include conventional methods (in the form of single layer suture, interrupted or continuous, two layer anastomosis or using a stapler), or the unconventional methods include compression ring, (bio degradable anastomosis ring- BAR, non-degradable using tissue glue or laser welding) (1, 2).

it is important to keep in mind that the serosa holds suture better than either the longitudinal or the circular muscle layer. Currently single layer extra mucosal anastomosis is popular as it probably causes the least tissue necrosis and luminal narrowing.

In single layer technique, only seromuscular layer of gut wall is approximated. This technique incorporates the strongest layer (submucosa) of gut and causes minimal damage to the submucosal vascular plexus. Single layer technique, employing extra mucosal sutures allows for accurate

opposition, incorporate the strongest layer (submucosa) of gut, causes minimal damage to submucosal vascular plexus and least disturbance to lumen. Interrupted single layer is now widely considered to be the gold standard for intestinal anastomosis (2).

The aim of the study is to prove that a single layer continuous technique can be constructed in significantly less time with similar rate of complications compared with two layer technique.

Patients and methods:

This prospective study was conducted during the period from the 1st of October 2010 to the end of December 2011 at Surgical Department, Baghdad Teaching Hospital, Medical City. All patients requiring both elective and emergency small bowel intestinal anastomosis, whether end-to-end or end to side including ileo-transverse anastomosis were included. Patients who required anastomosis to the stomach, duodenum and rectum were excluded.

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A total of 64 patients were included in this study. They were divided into two groups A and B. In-group A, 28 patients were included in whom single seromuscular continuous layer anastomosis was done using 3/0 vicryl. In-group B 36 patients underwent conventional double layered anastomosis with 3/0 vicryl.

In all cases good exposure of the injured segments, good hemostasis, closure of the mesenteric defect and drainage of the peritoneal cavity were done. All patients were operated by the same team of surgeons and senior residents supervised by consultant surgeon.

Postoperatively the same antibiotics (Cefotaxime and Metronidazole) were used in both groups for 5 days. Demographic details of each patient, indications for operation, operative details performed and postoperative complications like Anastomotic leak, wound infection and mortality were recorded.

Clinical anastomotic failure was considered when the patient developed postoperative peritonitis (local or generalized), established fecal fistula, or intra-abdominal abscess communicating with bowel (with contrast studies) or if leak was apparent at re-exploration. Contrast studies were not used routinely but were performed selectively to document clinical suspicion of anastomotic failure in various anastomosis or to localize the fistula in cases of failure of conservative management.

Intra-peritoneal abscess was diagnosed with ultrasonic evidence of intra-peritoneal collection of pus. Wound infection was defined as discharge of pus, with or without systemic features, yielding a positive culture.

Patients who developed leakage were treated successfully

with conservative measures.

One patient in group B died because of sepsis due to anastomotic failure following laparotomy for perforated viscous, while no mortality was recorded in group A.

All data and results were presented in tables and graphs and statistical analysis was done. The level of significance was set at $P \text{ value} \leq 0.05$ to be considered as significant. Statistical analysis was done by using SPSS (statistical package for social sciences) software for windows V.16.3.1US.

Descriptive statistics were expressed as (Mean \pm SD) or simple frequency tables. Chi square (X^2) test were used to find the associations among the categorical variables, while student (t) test was used to compare continues variables. Bivariate correlation with Pearson's coefficient correlation was used to find the correlations among different variables. Epi.calc 2000 package software from CDC,WHO V3.5 was used to compare percentages and proportions.

Results:

Sixty four patients were included in this study divided into two groups according to the operative procedure; group A include 28 (43.8%) patients and group B include 36 patients (56.2 %). The mean age was (41.8 \pm 17.4) year for the group A and (41.4 \pm 18.5) year for the group B. The overall mean age was (41.4 \pm 17.9) year and the range was (9 – 80) year. There were, 15 male (53.6%) and 13 (46.4%) female within group A and 20 (55.6%) male and 16 (44.4%)female within the group B. There is no significant difference in mean age or gender between or within groups, the $P \text{ .value} > 0.05$, table(1).

Table 1. Distribution of Operative procedures by the age and gender.

| Variable | Statistics | Procedure | | | P.value |
|----------|---------------|-----------------|-----------------|-----------------|---------|
| | | single layer | double layer | Total | |
| Number | N (%) | 28 (43.8%) | 36(56.2%) | 64 (100%) | |
| Gender | Male | 15 (53.6%) | 20 (55.6%) | 35 (54.7%) | 0.87 |
| | Female | 13 (46.4%) | 16 (44.4%) | 29 (45.3%) | 0.82 |
| Age | Mean \pm SD | 41.8 \pm 17.4 | 41.8 \pm 17.4 | 41.4 \pm 17.9 | 0.88 |
| | Range | 13 – 75 | 9 – 80 | 9 - 80 | |

Bullet and shrap nail injuries to the abdomen were the most common causative agent of pathology to the bowel followed by malignant disease of GIT. There was no significant differences between patient in group A& B. According to causative agents , $P \text{ .value} > 0.05$ Table (2).

Table(2). Frequency of different pathologies distributed by groups.

| Diagnosis | Procedure | | | P.value |
|---|-----------|-----------|-----------|---------|
| | Group A | Group B | Total | |
| Bullet and sharp nail injury | 2 | 8 | 10 | 0.253 |
| Cancer (GIT) | 6 | 2 | 8 | |
| RTA | 4 | 2 | 6 | |
| Injury during CAS | 4 | 1 | 5 | |
| Ischemia due to band | 2 | 4 | 6 | |
| Mackle's diverticulum | 2 | 5 | 7 | |
| Obstructed PUH | 3 | 3 | 6 | |
| Perforated viscous | 1 | 2 | 3 | |
| Mesenteric vascular occlusion | 1 | 3 | 4 | |
| Stab wound | 0 | 3 | 3 | |
| Closure ileostomy | 2 | 2 | 4 | |
| others (Explorative Laparotomy and Gallstone Ileus) | 1 | 1 | 2 | |
| Total | 28 | 36 | 64 | |

Regarding the site of anastomosis, the majority of operations were performed at the ileum (67.2% of all cases 43 out of 64) and the ileum was the most frequent site in both groups, the overall comparison and in between groups showed no significant difference ($P > 0.05$), table (3).

Table (3): Frequencies and percentages of Location of operations distributed by groups

| Location | Procedure | | | P.value | |
|-------------------|------------|---------|-------|---------|------|
| | Group A | Group B | Total | | |
| Ileum | No, | 16 | 27 | 43 | 0.53 |
| | % of Total | 25.0% | 42.2% | 67.2% | |
| Jejunum | No, | 12 | 7 | 19 | |
| | % of Total | 18.8% | 10.9% | 29.7% | |
| Ileum and Jejunum | No, | 0 | 2 | 2 | |
| | % of Total | 0% | 3.1% | 3.1% | |
| Total | No, | 28 | 36 | 64 | |
| | % of Total | 43.8% | 56.2% | 100.0% | |

Wound infection was the most frequent complication in both groups as fourteen patient out of 64 (21.9%) developed wound infection; 8 of them were among group B. Anastomotic leakage in group A was 1 patient, while in

group B was 2 patient.

Prevalence of complications between or within groups showed that there was no significant difference or correlation between the type of operation and the occurrence of complication; the P. value was > 0.05 in all comparisons Table (4).

Table (4) Frequencies and percentages of complications in both groups of patients

| Complication | Procedure | | | P. value | |
|-------------------------|--------------------|---------|-------|----------|------|
| | Group A | Group B | Total | | |
| Infection | No, | 6 | 8 | 14 | 0.82 |
| | % within Procedure | 21.4% | 22.2% | 21.9% | |
| Intra-abdominal abscess | No, | 3 | 4 | 7 | 0.73 |
| | % within Procedure | 10.7% | 11.1% | 10.9% | |
| Anastomosis leakage | No, | 1 | 2 | 3 | 0.79 |
| | % within Procedure | 3.6% | 5.6% | 4.7% | |
| Mortality | No, | 0 | 1 | 1 | 0.82 |
| | % within Procedure | 0% | 2.8% | 2.8% | |

The average time for the construction of the single layer anastomosis was 20 minutes and in double layer it was 35 minutes. The difference in average time is statistically significant as p value < 0.05 . Moreover, also suture material consumption was more in two layered technique. The mean of hospital stay was 5.2 ± 1.5 days in single layered group while it was 7.5 ± 1.8 days in double layered group. The difference in average stay is also statistically significant as $p < 0.05$.

Table (5): average time of construction and mean hospital stay in both groups of patients

| | Average Time | Mean Hospital stay |
|---------|--------------|--------------------|
| Group A | 20 minutes | 5.2 +/- 1 days |
| Group B | 35 minutes | 7.5 +/- 1.8 days |

Discussion:

The single-layer continuous anastomosis is a contemporary innovation first described by Hautefeuille in 1976(3). In the United States, the first mention of this technique was by Allen et al(4), who presented their results with its use before the Texas Surgical Society in 1979. It was then

popularized by a colon and rectal surgical group based in Houston, Texas (5,6,7). In this study Single layered group and double layered group were evenly matched by age, sex, diagnosis and location of anastomosis, like other studies (2,8). Wound infection was the most common complication in both groups in our study. The overall wound infection rate was 21.9% higher than 2-11% reported in previous literatures(9,10,11);and also higher than studies done by Asian workers like Nadeem Khan at 2006 in Lady Reading Hospital in Peshawar(15 patient out of 100), and Muhammad Ayub at 2009 in Civil Hospital in Karachi(3 patients out of 42) developed wound infection(2,8). In this study anastomotic leakage in single layered group occurred in 3.6% of patients, which was consistent with other studies that showed leakage in the range of 1.3- 7.7%. (2,8,12) Among double layer group , this study showed anastomotic leakage in around 4.7% of patients which was similar to the rate described in the literatures(12,13,14);and our result was also similar to the study of Muhammad Ayub in which 4.7% of single layer and 8.3% of double layer developed anastomotic leakage. Four percent of single layer developed leakage in Nadeem Khan study(2,8). Regarding the intra-abdominal abscess in our study we found that there was no significant differences between both groups (Group A it was 10.7% and in Group B was 11.1%) which goes with the rate described in the literatures, as 4.7% in group A & 6.2% in group B of Muhammad Ayub study developed intra-abdominal abscess(8). There was no mortality in our study in the single layer group while in the double layer group it was 2.8%. Again it was consistent with that described in the literatures. (2,8,15) Two percent mortality reported in single layer group of Nadeem Khan Study. Single layer anastomosis can be constructed in a shorter time and the average time for the construction of single layer was 20 min while in double layer it was 35 min and this will definitely affect the overall time of operation which is very significant especially in trauma patient or fragile elderly patient with malignant disease of the bowel. The overall perioperative morbidity will be much less when the time of surgery is short. (5,6,12) The cost of single layer anastomosis was less than any other method of construction as in our study and other studies(12) and this is crucial to the cost of surgery especially in a country like our country where there is a plenty of injuries due to military activities, frequent bombing and terrorist action.

There was a two day difference in the mean length of hospital stay that reached statistical significance, it may be related to an intrinsic difference between the two methods: on the single- layer anastomosis always has a larger lumen. It is possible that gastrointestinal function may return to normal in a shorter time with the single- layer method,

although further studies would be required to confirm this speculation. A comparison of morbidity and mortality for single layer seromuscular anastomosis procedures carried out by various researchers is shown in table (6) In conclusion, though the general factors play an important role in the ultimate outcome, they may not be correctable all the time. Surgeons may have to operate in comprised or nearly optimized general conditions.

This is where safety of technically controllable factor becomes a major determinant of ultimate outcome. The extra mucosal anastomosis, reappraised by Matheson and Irving, with acceptable morbidity and mortality, may be considered as having many of the attributes of an ideal and safe anastomosis.(12,16,17)

Table (6): comparison of morbidity and mortality for single layer serosubmucosal anastomotic procedures carried out by various researchers.(8)

| Author& year | Total No. of patients | Anastomotic Failure (%) | Wound infection (%) | Mortality(%) |
|-------------------------|-----------------------|-------------------------|---------------------|--------------|
| Matheson&Irving (1975) | 52 | 6.0 | - | - |
| Matheson et al (1985) | 206 | 1.5 | 2.0 | 1.5 |
| Kingsnorth et al (1989) | 52 | 7.7 | 3.8 | 5.8 |
| Carty et al (1991) | 461 | 2.2 | 3.4 | 3.8 |
| Nadeem et al (2006) | 100 | 4.0 | 15.0 | 2.0 |
| Present study | 28 | 3.6 | 21.4 | 0.0 |

Conclusion:

We conclude that the single-layer continuous anastomosis requires less time to construct and has a similar risk of leakage compared with the two-layer technique. It also costs less than any other method and can be safely introduced into a surgical training program with no apparent increase in complications. For these reasons, the single layer continuous anastomosis is superior to the two-layer interrupted technique.

Recommendation :It is safe to practice single layer continuous as a routine procedure instead of two layers technique in small bowel anastomosis whether emergency or elective operation. Also it is of low cost, safe, easy to perform and a less time consuming surgical procedure. So we recommend using the procedure for small bowel anastomosis in a large series in the future.

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