

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

Dr. Hamid H. Sarhan, Assistant prof. , General Surgery, Tikrit Medical College

Abstract

Background: Controversy regarding single versus double layer intestinal anastomosis goes as back as 1887. Interrupted single layer is now widely considered to be the gold standard for intestinal anastomosis. **Objective:** To evaluate the safety, cost effectiveness, morbidity & mortality of single layer interrupted intestinal anastomosis in comparison with double layer. **Patient and methods:** A prospective comparative study was conducted from December 2009 to January 2012 at Surgical Department, Tikrit Teaching Hospital. All patients requiring both elective and emergency small bowel intestinal anastomosis including gastro-intestinal and ileo-colic anastomosis were included. Total of sixty- four 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 layer interrupted extra mucosal anastomosis was done with 2/0 vicryl. In group B 36 patients underwent conventional double layered anastomosis with 2/0 vicryl. **Results:** Anastomotic leakage in single layered group was 3.6%, while in double layered group was 4.7%. Average time for the construction of the single layer anastomosis is 20 min and in double layer was 35 min per operatively. Moreover, 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. **Conclusions:** Single-layer serosubmucosal (extramucosal) technique is safe, easy & faster to perform, simply to taught, cost effective and with less anastomosis related morbidity and mortality.

Key words: intestinal anastomosis, single, extramucosal, double.

Introduction

The basic principles of intestinal suture were established more than 100 years ago by Travers, Lembert and Halsted, and have since undergone little modification(1).

Anastomosis may be done with the help of stapling devices, by using double layered suturing technique or by a single layer technique. Stapling devices are expensive and not available in emergency situation in our set up (2).

Controversy regarding single versus double layer anastomosis goes as back as 1887 when Halsted proposed interrupted extra mucosal suturing. Then Senn in 1883 advised double layer anastomosis. By 1931, more than 52 techniques for G.I

anastomosis had been described (3). Currently single layer extra mucosal anastomosis is popular as advocated causes the least tissue necrosis and luminal narrowing (4).

Double layer anastomosis produces mucosal inversion and serosal apposition. The first inner layer is anastomosed but taking suture through all coats of gut wall and in second outer layer, serosa is approximated. The inner layer is believed to be haemostatic but there are chances of strangulation of mucosa due to damage to submucosal vascular plexus(5).

In single layer technique, only seromuscular layer of gut wall is approximated. This technique incorporates the strongest layer (submucosa) of gut and

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

causes minimal damage to the submucosal vascular plexus.

The objections against traditional double layer are that it ignores the basic principle to accurately opposing the clean cut edges and large amount of ischemic tissue within the suture line which may increase the incidence of leak and excessive inversion may lead to narrowing of lumen(6). In contrast, 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. (7,8)

Interrupted single layer is now widely considered to be the gold standard for intestinal anastomosis(9) .

So, the aim of present study is to conducted a comparison between single layer interrupted extramucosal and double layer techniques on the bases of rapidity to perform, cost effectiveness and chances of anastomotic failure.

Patients & method

This prospective comparative study was conducted from December 2009 to January 2012 at Surgical Department, Tikrit Teaching Hospital. All patients requiring both elective and emergency small bowel intestinal anastomosis including gastro-intestinal and ileo-colic anastomosis were included.

Total of sixty- four 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 layer interrupted extra mucosal anastomosis was done with 2/0 vicryl. In group B 36 patients underwent conventional double layered anastomosis with 2/0 vicryl. All patients were operated by same group of surgeons and senior residents assisted by an

attending surgeon. Post-operatively same group (Cefotaxime and Metronidazole) of antibiotics was used in both groups for 5 days.

Demographic details of each patient, indications for operation, operation performed and postoperative complications like clinical anastomotic leak, wound infection and mortality rate were recorded.

All data and results were presented in tables, and in all statistical procedures and tests , the level of significance was set at P value ≤ 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, Data of all cases were entered; descriptive and analytic statistics were performed using appropriate statistical tests.

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

Studied subjects were 64 case , divided into two group on the base of operative procedure that performed , single layer group which included 28 (43.8%) case , and double layer group which included 36 case(56.2%). The mean age was (41.8 \pm 17.4) year for the single layer group and (41.4 \pm 18.5) year for the double layer group . The overall mean age was (41.4 \pm 17.9) year and the range was (9 – 80) year.

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

There were, 15 male (53.6%) and 13 (46.4%) female within single layer group and 20 (55.6%) male and 16 (44.4%) within the double layer group. No significant difference in mean age or sex in between or within groups, the P value > 0.05 , in all comparisons, Table (1)

Bullet and shell injuries were the most prevalent diagnosis followed by Cancers at any part of GIT. There is no significant association between the diagnosis and the type of operation P value > 0.05 Table (2).

Regarding the Location of operations, the majority of operations were performed at ileum site 67.2 % of all cases (43 out of 64) and also within groups the ileum site was the more frequent, the overall comparison and in between groups shows no significant difference (P > 0.05), Table (3).

It had been found that wound infection is the more frequent complication in both groups 14 case out of 64 (21.9%), 8 of them among double layer group. Anastomotic leakage in single layered group was 3.6%, while in double layered group was 4.7%. Comparison of percentages and frequencies of complication in between or within groups there was no significant differences nor correlation had been found between the type of operation and the occurrence of complication, the P.value was > 0.05 in all comparisons. Table (4)

Average time for the construction of the single layer anastomosis is 20 min and in double layer was 35 min per operatively. The difference in average time is statistically significant as p value < 0.05 . Moreover, 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 .

Discussion

Following resections of the parts of the gut for any benign or malignant condition, anastomosis is necessary to restore the continuity of the gut. Intestinal anastomosis can be performed in a variety of ways. The type of anastomosis depends on personal experience but irrespective of Use of either one or two layer of suture for anastomosis has remained controversial. (10)

Single layered group and double layered group were evenly matched by age, sex, diagnosis and location of anastomosis, like other studies.(11,12)

Wound infection is the most common complication in both groups in our study. The overall wound infection rate 21.9% is higher than 2-11% reported in literature. (11,12,13,14,15)

In this study anastomotic leakage in single layered group was 3.6%. It is consistent with the other studies which shows leakage in the range of 1.3- 7.7%. (11,12,16) Among double layered group, this study shows anastomotic leakage around 4.7% which is go with the rate described in the literature. 11,12,16,17,18)

The objections against the traditional double layered anastomosis are that it incorporates large amount of ischemic tissue in the suture line leading to tension and increase the chances of leakage and luminal narrowing (6,19,20).

Mortality in single group is 0% while in double group it is 2.8%. again it is consistent with that described in the literature. (11,12,21)

single layer anastomosis can be constructed in shorter time at lower cost as in our study and other studies. (11,12,22,23)

Surprising finding was the two days difference in the mean length of hospital stay. Although it did not reach statistical significance, it may be related to an intrinsic difference between the two

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

methods: 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.

Comparison of morbidity and mortality for single layer serosubmucosal anastomosis procedures carried out by various researchers is shown in table (5) .

Though the general factor play an important role in the ultimate outcome they may not be correctable all the time. Surgeon my have to operate in a comprised or nearly optimized general condition.

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.(25,28,29)

Conclusion

Single-layer serosubmucosal (extramucosal) technique is safe, easy & faster to perform, simply to taught, cost effective and with less anastomosis related morbidity and mortality.

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Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

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Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

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Table 1.Distribution of Operative procedures and sex.

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	

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

Table(2): Frequencies of different diagnoses distributed by groups.

Diagnosis	Procedure			<i>P. value</i>
	single layer	double layer	Total	
Bullet and shell injury	2	8	10	0.253
Cancer (GIT)	6	2	8	
RTA	4	2	6	
Injury during C\S	4	1	5	
Ischemia due to band	2	4	6	
Meckels diverticulum	2	5	7	
Obstructed PUH	3	3	6	
Perforated viscus	1	2	3	
Mesenteric vascular occlusion	1	3	4	
Stab wound	0	3	3	
Closileostomy	2	2	4	
others(Explorative Laprotomy and Gallstone Ileus)	1	1	2	
Total	28	36	64	

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

Location		Procedure			<i>P. value</i>
		single layer	double layer	Total	
Ileum	Count	16	27	43	0.53
	% of Total	25.0%	42.2%	67.2%	
Jejunum	Count	12	7	19	
	% of Total	18.8%	10.9%	29.7%	
Ileum and Jejunum	Count		2	1	
	% of Total	3.5%	3.2%	1.6%	
Total	Count	28	36	64	
	% of Total	43.8%	56.2%	100.0%	

Comparative evaluation for safety, cost effectiveness, morbidity and mortality of single versus double layer intestinal anastomosis.

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

Complication		Procedure			P. value
		single layer	double layer	Total	
Wound infection	Count	6	8	14	0.82
	% within Procedure	21.4%	22.2%	21.9%	
Abscess	Count	3	4	7	0.73
	% within Procedure	10.7%	11.1%	10.9%	
Anastomotic Leake	Count	1	2	3	0.79
	% within Procedure	3.6%	5.6%	4.7%	
Mortality	Count	0	1	1	0.82
	% within Procedure	0%	2.8%	2.8%	

Table (5) :comparison of morbidity and mortality for single layer serosubmucosal anastomotic procedures carried out by various researchers.

Author& year	Total No. of patients	Anastomotic Failure (%)	Wound infection(%)	Mortality(%)
Matheson & Irving (1975) ⁽²⁴⁾	52	6.0	-	-
Matheson et al (1985) ⁽²⁵⁾	206	1.5	2.0	1.5
Kingsnorth et al (1989) ⁽²⁶⁾	52	7.7	3.8	5.8
Carty et al (1991) ⁽²⁷⁾	461	2.2	3.4	3.8
Nadeem et al (2006) ⁽¹²⁾	100	4.0	15.0	2.0
Present study	28	3.6	21.4	0.0