ABSTRACT

OBJECTIVES: To compare management outcome of single layer interrupted extramucosal intestinal anastomosis with double layer conventional method of intestinal anastomosis.

DESIGN: Comparative study.

MATERIAL AND METHODS: This prospective comparative study was conducted in Surgical Unit-II of Benazir Bhutto Hospital, Rawalpindi over a period of two years from Jan 2007 to Dec 2008. Adult patients undergoing elective or emergency small and large gut anastomosis were included. Esophageal, gastric and biliary anastomosis were excluded. Sixty patients were divided in two groups of 30 patients each. In Group-A single layer interrupted extra-mucosal anastomosis was done and in Group-B double layer anastomosis. Main outcome measures were to compare duration of procedure, post-operative leakage and post-operative duration of hospital stay.

RESULTS: Anastomotic leakage occurred in two (6.6%) patients of group A and in one (3.3%) patient of group B \( (p=0.55) \). Mean of time taken for anastomosis was 18.30 min in group A and 25.87 min in group B \( (p=0.001) \). Mean of duration of post operative hospital stay was 6 days in group A and 5.87 days in group B \( (p=0.8) \).

CONCLUSION: Single layer extramucosal intestinal anastomosis is equally safe and can be performed in shorter time than the double layer intestinal anastomosis.


INTRODUCTION

The basic principles of intestinal anastomosis were established more than 100 year ago by Travers, Lembert and Halsted, and have since undergone little modification. An insecure intestinal anastomosis is an unacceptable iatrogenic hazard. The breakdown of suture line or inappropriate anastomosis may result into hemorrhage, leakage, stenosis, diverticulum formation and ultimately faecal fistula with serious septic complication leading to death. The prevalence of intra peritoneal anastomotic leak varies in the literature between 0.5% and 30%, but is generally between 2% and 5%. The sound healing of process of anastomosis depends mainly on anastomosis technique, which is most important determinant.

Historically two-layer anastomosis using interrupted silk sutures for an outer inverted seromuscular layer and a running absorbable suture for a transmural inner layer has been standard for most surgical situations. The only appreciable shortcoming of the two layer technique is that it is somewhat tedious and time consuming to perform. Recently single layer interrupted extramucosal anastomosis using synthetic absorbable suture material has gained popularity as it requires less time and cost without incurring any added risk of leakage. The rationale for extramucosal technique is that the suture include the strongest part of the bowel wall (submucosa) while not incorporating the mucosa with the risk of inducing ischemia. Clinical studies have fairly consistently demonstrated that single layer anastomosis are associated with improved post operative return to normal bowel function (as measured by bowel sounds, passage of flatus and return to oral intake). Studies of anastomosis leakage rate have not shown any difference between single and double layer anastomosis in this regard. Keeping these two views in mind this study was conducted to evaluate the safety of single layer technique.

MATERIAL AND METHODS

This prospective study was conducted in Surgical Unit-II of Benazir Bhutto Hospital, Rawalpindi over a period of two years from Jan 2007 to Dec 2008. Adult patients undergoing elective or emergency small and large gut anastomosis were included. Esophageal, gastric and biliary Anastomosis and children below the age of 13 were excluded.

Correspondence to:
Dr. Yasir Mehmood
Assistant Professor of Surgery
Al-Nafees Medical College
Isra University, Islamabad Campus, Pakistan
E-mail: dr.yasir@live.co.uk
Sixty patients were divided in two groups of 30 patients each. There was no preference for single or double layer anastomosis and both techniques were used alternatively. In Group-A single layer interrupted extra-mucosal anastomosis was done and in Group-B double layer anastomosis. All patients were operated by same group of surgeons and Suture material was same for both type of anastomosis i.e. (2/0 Vicryl on round body needle) (Fig I). All patients received postoperative ceftriaxone and metronidazole. Postoperative leakage was assessed clinically. Ultrasound abdomen and pelvis and X-ray abdomen erect view were done in doubtful cases only. In case of leak, emergency exploration and temporary ileostomy was done. Patients were discharged after their first bowel activity, once they started tolerating semisolid food.

Data was entered and analyzed using Statistical Package for Social Sciences (SPSS software version 10). Descriptive statistics i.e. Means with standard deviations were calculated for continuous variables like patient's age, duration of hospital stay and time taken for procedure. Frequencies along with percentages were computed for presence or absence of leakage. Risk ratios were calculated along with their 95% Confidence Interval for risk of leakage in both the study groups. t- test was applied for comparison of means of duration of the procedure and duration of hospital stay between group A and group B. p value was calculated and a value of less than 0.05 was considered as statistically significant.

RESULTS

There were total of 60 Patients who were included in study. Out of these 60 patients, 37 (61.7%) were males and 23(38.3%) were females. Patients were between the ages of 16- 74 years with mean age of 34.30 and standard deviation of ±14.622. Elective surgery was performed on 17 (28.3 %) patients and emergency surgery on 43 (71.66 %). Maximum number of cases were operated for traumatic injuries, and minimum number of cases for Meckel’s diverticulitis. (Table I)

Anastomosis healed satisfactorily in 57 patients while leakage was seen in 3 (5 %) patients out of total 60 patients. (Table II) Out of 30 patients in each group, leakage was seen in 2 patients (6.6 %) in group A (single layer interrupted extra-mucosal Anastomosis) and in 1 patient (3.3 %) in group B (double layer Anastomosis), difference being statistically insignificant (p=0.55). (Fig II)

Mean of time taken to complete anastomosis was 18.30 min (S.D ± 1.368) in group A (single layer interrupted extra-mucosal Anastomosis) and 25.87 min (S.D ± 1.525) in group B (double layer Anastomosis), which is statistically significant difference (p=0.001). (Table III)

Mean of duration of post operative hospital stay was 6 days (S.D ± 2.017) in group A (single layer interrupted extra-mucosal Anastomosis) and 5.87 days (S.D ± 2.224) in group B (double layer Anastomosis), which is statistically insignificant difference (p=0.8). (Table IV)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traumatic intestinal perforation</td>
<td>19</td>
<td>31.7</td>
</tr>
<tr>
<td>Intestinal tuberculosis</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td>Enteric perforation</td>
<td>11</td>
<td>18.3</td>
</tr>
<tr>
<td>Strangulated hernia</td>
<td>6</td>
<td>10.0</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>10</td>
<td>16.7</td>
</tr>
<tr>
<td>Meckel’s diverticulitis</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients</th>
<th>Leakage of Anastomosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>group of</td>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Patients</td>
<td>double layer Anastomosis</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>single layer Anastomosis</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>3</td>
</tr>
</tbody>
</table>
Figure II: Frequency of leakage in two groups undergoing intestinal anastomosis

Table III: Mean of time taken for intestinal anastomosis procedure in two groups of pt's

<table>
<thead>
<tr>
<th>group of anastomosis</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>single layer anastomosis</td>
<td>18.30</td>
<td>30</td>
<td>1.37</td>
</tr>
<tr>
<td>double layer anastomosis</td>
<td>25.87</td>
<td>30</td>
<td>1.53</td>
</tr>
<tr>
<td>Total</td>
<td>22.08</td>
<td>60</td>
<td>4.08</td>
</tr>
</tbody>
</table>

Table IV: Mean of duration of postoperative hospital stay in two groups of pt's

<table>
<thead>
<tr>
<th>group of anastomosis</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>single layer anastomosis</td>
<td>6.00</td>
<td>30</td>
<td>2.02</td>
</tr>
<tr>
<td>double layer anastomosis</td>
<td>5.87</td>
<td>30</td>
<td>2.22</td>
</tr>
<tr>
<td>Total</td>
<td>5.93</td>
<td>60</td>
<td>2.11</td>
</tr>
</tbody>
</table>

DISCUSSION

Intestinal obstruction, peritonitis from a perforated bowel, abdominal trauma and diseases of bowel are common surgical indications that must be treated operatively hence it is frequently necessary to perform resection and anastomosis of the intestine. Accurate approximation of the bowel ends without tension and with a good blood supply to both of the ends are obviously fundamental for anastomosis healing. The process of intestinal anastomatic healing mimics that of wound healing elsewhere in the body in that it can be arbitrarily divided into an acute inflammatory (lag) phase, a proliferative phase, and, finally, a remodeling or maturation phase. The strongest component of the bowel wall, the submucosa, owes most of its strength to the collagenous connective tissue it contains. Collagen is thus the single most important molecule for determining intestinal strength. A number of factors both local and systemic significantly influence the healing of anastomosis in the gastrointestinal tract. These factors can be classified into preoperative, operative and postoperative. The operative factors which include technique of intestinal anastomosis, play a significant role in the healing of the process of intestinal anastomosis.

Numerous techniques have been used to fashion anastomosis. These techniques can be divided into 2 categories, hand sewn and stapled anastomosis. Hand sewn techniques include single layer interrupted or various double layer techniques. One aspect of intestinal suturing technique that has remained controversial is the use of either one or two layers of sutures for anastomosis. Historically two-layer anastomosis using interrupted silk sutures for an outer inverted seromuscular layer and a running absorbable suture for a transmural inner layer has been standard for most surgical situations. The concept of using the submucosal layer of the bowel to hold stitches for a sound anastomosis was first introduced by William Halsted in his publication of 1887, but this described work in dogs, and there is no evidence that Halsted ever applied his findings to man. It fell to Matheson in Aberdeen, working from the 1960s to the 1990s, to develop the technique for clinical use, and the extramucosal, appositional, interrupted serosubmucosal anastomosis has become widely used, with reported leakage rates in the region of 2%.

Both techniques have potential weaknesses that could threaten the anastomosis. Though the two layers might provide adequate strength initially, they increase the inflammatory response in the early stages of healing owing to the extrasuture material and the ischaemia of the inverted tissues as it incorporates large amount of tissue in the suture line leading to tension and increases the chance of leakage and lumen narrowing. The inflammatory reactions result in weaker anastomosis as more collagen is broken during the inflammatory phase of healing. Recently single layer interrupted extramucosal anastomosis using synthetic absorbable suture material has gained popularity.
Single-layer Anastomosis take less time to create, causes least damage to the sub-mucosal vascular plexus, minimally disturbs the gut lumen, foster more rapid vascularization and mucosal healing, increase the strength of the anastomosis (as measured by the bursting pressure) in the first few postoperative days and are associated with improved postoperative return to normal bowel function (as measured by bowel sounds, passage of flatus, and return to oral intake). 19, 20

The present study assessed the safety of single and double layer intestinal anastomosis. In this study, Anastomotic leakage occurred in 2 patients of group A, and in 1 patient of group B (P=0.55). Mean of duration of post operative hospital stay was 6 days in group A and 5.87 days in group B (p=0.8). Mean of time taken for anastomosis was 18.30 min in group A and 25.87 min in group B (p=0.001). There is no statistically significant difference in terms of anastomotic leakage and duration of post operative hospital stay between these two treatment options but there is significant difference in terms of time taken for anastomosis.

One study was conducted by Muhammad Ayub et al, at Department of Surgery, Unit 2 Dow University of Health Sciences and Civil Hospital, Karachi from 2005 to 2008, to evaluate the safety of single layer interrupted extramucosal intestinal anastomosis. 42 single-layer (Group A) and 48 double-layer (Group B) anastomosis were performed. Two leaks (4.7%) occurred in the single-layer group and four (8.3%) in the two-layer group with overall mortality 0% in single layer group and 4.1% in double layer group. Length of hospital stay was 8.2 days for single layer group while it was 10.5 days for double layer group.

Leslie A, Steele RJ, conducted a study at Department of Surgery and Molecular Oncology, University of Dundee, Dundee, UK. 21 The results of 553 single-layer appositional serosubmucosal anastomosis were compared with the results of 131 stapled anastomosis carried out during the same period using a circular anastomosing stapler. One anastomotic leakage occurred in the group of patients whose anastomosis was fashioned using the interrupted serosubmucosal technique (0.2%) and 11 leaks occurred in those who had a stapled anastomosis (8.4%). The mortality rate in each group was similar (2% and 2.3%, respectively).

Rana Asrar et al, conducted a study in Surgical Unit 4 of District Headquarter Hospital, Faisalabad, to evaluate the safety and cost effectiveness of single layer interrupted intestinal anastomosis (Group 1) in comparison with double layer conventional method of intestinal anastomosis (Group 2). 22 Average time for construction of the single layer anastomosis was 20 minutes and in double layer was 35 minutes (p<.001) while average duration of stay was 168hrs and 216hrs in group 1 and 2 respectively. Leakage rate was 12% (double) in group 2 while 6% in group 1. Suture material consumption was more in two layer technique and longer stay added to that lead to more hospital expenses on two layer technique. They concluded that anastomosis using a single layer interrupted extramucosal technique is faster to perform, cost effective, less likely to leak and as strong as two layer anastomosis.

Our study, like the studies of Muhammad Ayub, Leslie A and Rana Asrar favors single layer interrupted extra-mucosal intestinal anastomosis. This shows single-layer anastomosis can be constructed in significantly less time and with a similar rate of complications compared with the two-layer technique and can be incorporated into a surgical training program without a significant increase in complications.

CONCLUSION

Statistically there is no significant difference in the risk of leakage and post operative hospital stay but there is significant difference in terms of time taken for the intestinal anastomosis procedure between two study groups. Single layer extramucosal intestinal anastomosis is equally safe and can be performed in shorter time than the double layer intestinal anastomosis.

REFERENCES