A comparative study of single layer extra mucosal versus conventional double layer anastomosis of intestines in elective and emergency laparotomy at a tertiary health center

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Abstract

Background: Intestinal anastomosis is one of the frequently performed surgical procedure in elective and emergency cases worldwide. Closure of anastomosis by single layer or double layer suture remains a controversy. In the present study, we compared the efficacy and safety of single layer extra mucosal versus conventional double layer anastomosis of intestines in elective and emergency laparotomy at a tertiary health center. Material and Methods: Present randomized control trial was conducted in patients 18-60 years age, undergoing elective or emergency resection and anastomosis of small bowel and large bowel at our hospital. Patients were allocated in either of two groups by non-probability consecutive sampling. Group 1 belonged to extra mucosal single layer continuous anastomosis while group 2 belonged to anastomosis by conventional double layer technique. Results: Total 60 patients were considered for present study, equally divided in two groups. Mean age, gender, ASA grade and diagnosis of patient were comparable in both groups and no statistically significant difference was noted. Duration required for anastomosis was less in single layer group (21.3 ± 4.17 mins) as compared to double layer group (34.22 ± 3.34 mins), difference was statistically significant. Anastomotic leak was noted in 2 patients from single layer group and 3 patients in double layer group. Conclusion: Single layer extra mucosal technique is simpler, safe, time conserving procedure with less hospital stay, than conventional double layer anastomosis of intestines in elective and emergency laparotomy surgeries.

Key Words: extra mucosal technique, single layer anastomosis, double layer anastomosis, anastomotic leakage

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INTRODUCTION

Intestinal anastomosis is one of the frequently performed surgical procedure in elective and emergency cases worldwide. Intestinal anastomosis is required in the patients suffering with intestinal malignancy, inflammation, infection like TB with stricture, obstruction, congenital conditions like intestinal atresia, Hirschsprung syndrome or injuries leading to malfunctioning of area affected.¹,² Bowel anastomoses after resection of bowel may be either end to end anastomoses, side to side or side to end anastomoses depending on the surgery and the operating surgeon. Different techniques of intestinal
anastomosis are single, double layered closure, staples, glue and laser welding. Most intestinal anastomoses heal uneventfully due to the relatively profuse blood supply of the bowel. The most important factors in the creation of a bowel anastomosis are meticulous technique, gentle tissue handling, adequate apposition of bowel ends, good blood supply, and absence of tension or distal obstruction. Closure of anastomosis by single layer or double layer suture remains a controversy. Cochrane database review compared effectiveness of single layer versus double layer gastrointestinal anastomosis and suggested further trials aimed to reduce the limitations of the review since the conclusion was derived from smaller number of patients recruited in relatively moderate quality trials. In the present study, we compared the efficacy and safety of single layer extra mucosal versus conventional double layer anastomosis of intestines in elective and emergency laparotomy at a tertiary health center.

MATERIAL AND METHODS
Present randomized control trial was conducted in department of General Surgery, Pondicherry Institute of Medical Sciences, Pondicherry. Ethical committee permission was taken for present study. Study duration was of 1 year (from October 2018 to September 2019). Written Informed consent was obtained from the patients participated for study.

Inclusion criteria
- Patients 18-60 years age, undergoing elective or emergency resection and anastomosis of small bowel and large bowel at our hospital for causes like intestinal obstructions due to bowel ischemia, strangulated hernia, traumatic bowel injury, bowel tumors etc.

Exclusion criteria
- Patients with other co morbid conditions like cardiac failure, hypertension, diabetes mellitus, chronic kidney disease, severe anemia (<6 gm/dl), coagulopathy, hypoalbuminemia
- Patients who has intestinal anastomosis with proximal defunctioning enterostomy
- Patients requiring oesophageal, gastric, biliary, rectal and anal anastomosis.
- Patients with contaminated peritoneal cavity, diffuse peritonitis, SMA thrombosis

Patients were allocated in either of two groups by non-probability consecutive sampling. Group 1 belonged to extra mucosal single layer continuous anastomosis while group 2 belonged to anastomosis by conventional double layer technique. Complete history was taken and clinical examination was performed. Routine lab investigations and required specific tests were done. For preoperative prophylaxis, antibiotics were given to patients. The anastomoses were made by "extra mucosal technique" either single layer continuous method or by double layer method with vicryl 3/0 75 mm sutures. All double layer intestinal anastomosis were done by inner transmural continuous with vicryl 3-0 and outer interrupted seromuscular with silk 3-0. All surgeries were done by senior surgeons with more than 10 years experience. After surgery patients were kept nil by mouth for next five days. The leakage or anastomotic dehiscence was diagnosed clinically. Patient's details such as demographics, anastomoses time, operative findings, duration of hospital stay, anastomotic leak and wound infection were documented in proforma. All cases were followed up to discharge and subsequently for a follow up period of 2 months. Results were expressed as mean and standard deviation for continuous data and frequency as number and percentage. Unpaired t test was used to compare mean levels between two groups. Categorical data was analysed by Chi square test. p value of less than 0.05 was considered as statistical significant.

RESULTS
Total 60 patients were considered for present study, equally divided in two groups. Mean age, gender, ASA grade and diagnosis of patient were comparable in both groups and no statistically significant difference was noted.

<table>
<thead>
<tr>
<th>Table 1: General Characteristics</th>
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<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>Age (in years) (Mean ± SD)</td>
</tr>
<tr>
<td>Gender (Male/ Female)</td>
</tr>
<tr>
<td>ASA grade (more than 2)</td>
</tr>
<tr>
<td>Diagnosis</td>
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<tr>
<td>Closure of Ileostomy</td>
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<tr>
<td>Intestinal Perforation</td>
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<tr>
<td>Bowel ischemia</td>
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<tr>
<td>Trauma</td>
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<tr>
<td>Others</td>
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</tbody>
</table>
Duration required for anastomosis was less in single layer group (21.3 ± 4.17 mins) as compared to double layer group (34.22 ± 3.34 mins), difference was statistically significant. Anastomotic leak was noted in 2 patients from single layer group and 3 patients in double layer group. Re-intervention were required in 1 patient from each group. Post operative hospital stay was less in group 1 (13.5 ± 6.02 days) as compared to group 2 (16 ± 3.45 days) and difference was statistically significant. Return of bowel sounds, drain removal, surgical site infection and mortality was comparable in both groups.

**Table 2: Characteristics of patients undergoing single-layered extramucosal anastomosis versus double-layered anastomosis**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group 1</th>
<th>Group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration required for anastomosis (mins)</td>
<td>21.3 ± 4.17</td>
<td>34.22 ± 3.34</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Anastomotic leak</td>
<td>2 (7 %)</td>
<td>3 (10%)</td>
<td>0.44</td>
</tr>
<tr>
<td>Re interventions</td>
<td>1 (3 %)</td>
<td>1 (3%)</td>
<td>0</td>
</tr>
<tr>
<td>Return of bowel sounds (days)</td>
<td>5.2 ± 1.2</td>
<td>5.4 ± 0.96</td>
<td>0.43</td>
</tr>
<tr>
<td>Drain removal (days)</td>
<td>5.9 ± 1.4</td>
<td>6.1 ± 1.3</td>
<td>0.37</td>
</tr>
<tr>
<td>Surgical site infection</td>
<td>2 (7 %)</td>
<td>2 (7 %)</td>
<td>0.52</td>
</tr>
<tr>
<td>Post operative hospital stay (days)</td>
<td>13.5 ± 6.02</td>
<td>16 ± 3.45</td>
<td>0.036 *</td>
</tr>
<tr>
<td>Mortality</td>
<td>1 (3 %)</td>
<td>1 (3%)</td>
<td>0</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The technique of anastomosis is dependent upon the site, situation of the bowel and the fundamental disease etiology, and the general complaint of the subject. There are various factors which influence the healing of anastomoses including blood supply, tension at suture line, surgical technique, and cleanliness of gut at the time of surgery. The principles of a good and reliable colonic or colorectal anastomosis are good exposure and access to large bowel, adequate blood supply to anastomosed stumps, prevention of sepsis or gross faecal contamination, sutures or staplers should be properly placed, assuring good approximation of all layers of bowel wall, no tension on the anastomosis, prevention of distal obstruction, the patient should be well nourished and the large bowel should be well prepared mechanically. The optimal method of intestinal anastomosis would: Promote primary healing by achieving accurate alignment of the divided bowel, cause minimal disruption of local vascularity, incorporate the minimum amount of foreign material, not implant malignant cells at the anastomosis, and not enhance the risk of metachronous cancers. Lipkina et al. in a study having 541 consecutive operations involving anastomoses of the colon and rectum concluded that male gender, previous abdominal surgery and low rectal cancer are associated with increased anastomatic leak. Khan RA et al., noted that mean duration required to perform an anastomosis procedure was 20 min for single layered and 35 min for double-layered. While Saravanan K noted the meantime taken for anastomosis construction in single-layered method was 16.56 min while it was 24.12 min in double-layered method which is a statistically significant difference. Similar findings were noted in present study. Mean hospital stay in single-layered group was 8.2 days as compared to 12.1 days in a double layered group in study by Saravanan K. We noted similar findings. Postoperative return of bowel function was quicker in the single layer group as compared to the double layer group in our study which accords with observations from previous studies. As an anastomotic leak is one of the most dreaded postoperative complications, it is obvious that meticulous postoperative clinical and laboratory observation is necessary after colectomy. Anastomotic leak is a major complication of gastrointestinal anastomosis and may lead to peritonitis, intraabdominal abscess, fistula, necrosis and stricture. Reported failure rate range from 1.5% to 2.2%, depending on what type of anastomosis was performed, where the operation was elective or an emergency procedure, general factors as age, nutritional status, comorbid conditions and local factors like vascularity, sepsis and suture technique. In the study conducted by Askarpour et al., intestinal leakage was found in 1.6% in single-layered and 6.3% in the double-layered anastomosis. In Garude et al., study 4 (5.4 %) patients had anastomotic leak in single layer and 3 (4.1%) had anastomotic leak in double layer was noted. When the evidence that is available for the hand-sewn anastomosis is evaluated, it can be concluded that an inverting single layer continuous suture technique with slowly absorbable monofilament material seems preferable because of increased inflammation and diminished circulation. Single layer anastomosis causes least damage to submucosal vascularplexus, least chance of luminal narrowing, incorporates strongest submucosal layer and more accurate tissue apposition. In double layered closure where mucosa and sero-muscular layers are sutured separately though there is more chance of stranulation of mucosa because of damage of sub mucosal vascularplexus. Also in double layer anastomosis in most of cases it fails to oppose clean serosal surfaces and it results in large amount of ischemic tissue within suture line which increases the chances of leakage. Further excessive inversion leads to narrowing of lumen. Operating time and intraoperative adverse events can be limited if the pre-
operative work up is optimal including the right diagnostics, to have experienced surgeons and operating team, to facilitate optimal surgical conditions, to limit blood loss and blood transfusions and to limit operations to high volume centers.\textsuperscript{20,21} The evolution of mechanical sutures by means of stapler, resulted in improvements and effective gains of quality or productivity in the handicraft suture process that has been favoured by many surgeons for centuries.\textsuperscript{22} With modern devices such as staplers, technical failures are rare, the staple lines are of more consistent quality, and anastomosis in difficult locations are easier to construct.\textsuperscript{23}

**CONCLUSION**

Single layer extra mucosal technique is simpler, safe, time conserving procedure with less hospital stay, than conventional double layer anastomosis of intestines in elective and emergency laparotomy surgeries.

**REFERENCES**


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