A Prospective Study on Single Layer versus Double Layer Anastomosis in Emergency Colonic Surgery in a Tertiary Care Hospital.

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ABSTRACT

Background: Colonic anastomosis is mostly due to to primary colonic diseases like volvulus, carcinoma, strangulation, injuries and stricture. As a result intestinal ischaemia and gangrene develops and finally the affected bowel is resected and end to end anastomosis is done. The aim of the study is to evaluate the effectiveness and outcome of colonic anastomosis by single layer or double layer. Methods: 134 cases were selected for this study. 69 patients were taken up for single layer and 65 for double layer anastomosis. Single layer anastomosis has a better outcome in terms of healing, less time consuming and minimal complications. Results: Single layer takes less time, post. Operative complications are minimal, duration of hospital stay is less and mortality and morbidity is reduced. Conclusion: Single layer anastomosis should be a preferred technique and a procedure of choice for colonic anastomosis.

Keywords: Colonic volvulus, Single layer anastomosis, Double layer anastomosis.

INTRODUCTION

An anastomosis is approximation of two hollow viscer. It is a routinely performed procedure in a surgical emergency. Intestinal anastomosis dates back to 1000 B.C. Sushruta has described the use of red ants for intestinal anastomosis.¹ Different techniques have evolved during the last few decades. Laparoscopic stapled anastomosis is the preferred technique now in many advanced centers. In the 19th century, Travers and Lambert first performed double layer intestinal anastomosis.² In 1976 single layer interrupted anastomosis was described by Hautefeuille.³ Anastomosis may be everted, inverted, side to side, end to end, end to side, single layer, double layer, interrupted or continuous. The sutures used may be absorbable, non-absorbable, mono filament or braided. Hand sewn anastomosis is a commonly preferred technique as it is easy to perform with available suture materials. Early complications like anastomotic leak, peritonitis, faecal or biliary fistula, abscess, necrosis, stricture and late complications like intestinal obstruction increases the morbidity and mortality in patients. The frequency of anastomotic leakage ranges from 1-24%.⁴⁻⁶ Single layer anastomosis results in less tissue damage. Double layer increases the inflammatory response in the nearly stage of wound healing owing to extra suture material and due to the inverted tissue.⁷⁻⁹ The ideal suture material should cause minimal tissue injury and should provide easy handling and knotting.¹⁰⁻¹¹ An ideal anastomosis should achieve adequate blood supply, water tight, leak proof, no tension on suture line with healthy tissue edges and absence of distal obstruction.

MATERIALS AND METHODS

This study was conducted in the Department of Surgery, S.C.B. Medical College and hospital, Cuttack from JUNE 2017 to MAY 2019 to compare the safety and cost effectiveness of single layer interrupted colonic intestinal anastomosis versus double layer technique, duration of anastomosis, hospital stay and morbidity in patients undergoing emergency surgery.

A Total of 134 cases were selected for the study with the following inclusion and exclusion criteria in this hospital based prospective study. Patients who required resection of the intestine and anastomosis were assessed for eligibility following admission to...
the ward after clinical and radiological investigations. The patients were subjected to physical examination, routine blood investigations, X-ray and ultrasonography. Patients aged between 18-65 years of both sex were considered eligible. In emergency only colo-colic and colo-rectal anastomosis were taken up for the study after due consent and explaining about the prognosis to the patients.

Inclusion Criteria
1. After due consent. Patients above 18 years and less than 65 years of age admitted to Surgery ward with clinical and radiological feature suggestive of large bowel obstruction or injury undergoing resection and anastomosis.
2. Only haemo dynamically patients with HB% level more than 8 gm/dl were included in the study

Exclusion Criteria
2. Patients requiring gastric, duodenal, small intestinal or low rectal anastomosis were not included.
3. Patients who underwent stapler anastomosis were excluded.
4. Patients with hypo-volaemic shock, septicaemia and severe cachectic patients needing TPN and ICU care were excluded from this study.

Ryle’s tube was given pre-operatively in all cases. Intra operative findings, haemodynamics and complications, quantity and cost of suture material was noted. All patients were given inj. Tazobactum piperacillin and inj. Metronidazole and standard post-operative care. All anastomosis were end to end type. The affected segment of bowel was resected and bowel ends cleaned with povidone iodine swab and approximated.

In double layered anastomosis, the inner transmural layer is constructed in an interrupted manner using silk 2-0 suture. Lembert sutures were taken in an interrupted manner using 2-0 silk sutures inverting the inner layer.

In single layer anastomosis it is performed using a single layered anastomosis using an interrupted 2-0 silk starting from the mesenteric border, incorporating all layers except the mucosa. Both the anastomosis were water tight and care was taken to prevent ischaemia.

Post-operative leak was assessed clinically. Any faecal discharge in the drain or from the wound or a disruption of the suture line was seen. A Straight X-ray abdomen and USG were done in doubtful cases. 134 cases had undergone resection and anastomosis of the large bowel during the period of study from JUNE 2017 to MAY 2019 at S.C.B. Medical College, Cuttack for different colonic pathologies during emergency surgery.

RESULTS

The results and observation are shown in different graphs and Tables.

Table 1: Relation of Primary Disease of Large Bowel Anastomosis

<table>
<thead>
<tr>
<th>Primary Disease</th>
<th>No. Of Anastomosis</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonic Volvulus</td>
<td>113</td>
<td>84.33</td>
</tr>
<tr>
<td>Ca.Colon</td>
<td>06</td>
<td>4.88</td>
</tr>
<tr>
<td>Strangulated Hernia</td>
<td>04</td>
<td>2.98</td>
</tr>
<tr>
<td>Colo-Colic Intussusception</td>
<td>03</td>
<td>2.24</td>
</tr>
<tr>
<td>Traumatic Injury</td>
<td>03</td>
<td>2.24</td>
</tr>
<tr>
<td>Stricture</td>
<td>02</td>
<td>1.49</td>
</tr>
<tr>
<td>Introgenic Injury After Cs</td>
<td>02</td>
<td>1.49</td>
</tr>
<tr>
<td>Sigmoid Diverticulitis</td>
<td>01</td>
<td>0.75</td>
</tr>
</tbody>
</table>

The present observation is on advantages and disadvantages of single layer and double layer intestinal anastomosis. An attempt has been made to document the risk factors for anastomotic dehiscence and other complications. The results were compared to with those studies done previously by different surgeons.

In the present series, the total of 134 cases of single layer and double layer anastomosis were performed over a period of of 2 years, out of which 69 cases were done as single layer and 65 cases as double layer anastomosis.

Table 3: Sex Incidence of Patients Undergoing Large Bowel Anastomosis

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. Of. Anastomosis</th>
<th>Percentage</th>
<th>Sex Ratio</th>
<th>Age In Years (Mean + Sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>89</td>
<td>66.42</td>
<td>1.9:1</td>
<td>47.79+13.39</td>
</tr>
<tr>
<td>Female</td>
<td>45</td>
<td>33.58</td>
<td></td>
<td>47.78+11.85</td>
</tr>
</tbody>
</table>

Out of 285 patients operated in emergency surgery between age group of 18 to 65 years for colonic pathology, 134 undergone resection and anastomosis, 151 underwent diversion procedure. Majority of patients undergone diversion procedure are large bowel (Ca.colon) and extensive gangrenous volvulus with feature of peritonitis.

In this study, majority of patients undergoing resection and anastomosis are colonic volvulus (84.33%) followed by Ca.left sided coilon (4.88%) presented as acute abdomen.

Male patients have a higher rate of large bowel anastomosis (66.42) as compared to females (33.85)
in emergency surgery. The ratio between male: female was 1:1.

Out of the 134 patients with large bowel anastomosis, 89 were males and 45 were females with mean age of 47.79 & 47.78 respectively. In this series male patients have a predominance over females.

Table 4: Type of Anastomosis

<table>
<thead>
<tr>
<th>Layer of Anastomosis</th>
<th>No. of Patients</th>
<th>Complications</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>65</td>
<td>18</td>
<td>26.09</td>
</tr>
<tr>
<td>Double</td>
<td>65</td>
<td>18</td>
<td>27.69</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>36</td>
<td>26.87</td>
</tr>
</tbody>
</table>

P-value 0.834

Table 9: Leakage in Single Layer and Double Layer Large Bowel Anastomosis

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Leakage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Layer Anastomosis</td>
<td>05</td>
<td>7.25</td>
</tr>
<tr>
<td>Double Layer Anastomosis</td>
<td>06</td>
<td>9.23</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>8.20</td>
</tr>
</tbody>
</table>

In this present study, single layer anastomosis was done in 69 patients and souble layer in 65 patients. Mean duration of intestinal anastomosis for single layer is 20.79 minutes and for double layer is 32.77 minutes with range of 18 to 27 minutes for single layer and 29 to 39 minutes for double layer anastomosis. (MEAN+S.D)

Burch et al,[12] study 2000 found that mean time taken for a single layer anastomosis was 20.8 minutes and double layer, 30.7 minutes. Khan et.al,[13] study:2010 found that mean time for single layer and double layer anastomosis was 20 minutes and 35 minutes respectively .Pravin P.Dandi[14] et.al: 2015 found that mean duration for single layer anastomosis was 19.6 minutes and for double layer was 29.5 minutes.

Table 5: Distribution of Post-Operative Complications in Relation to the Type of Anastomosis

<table>
<thead>
<tr>
<th>Post-Operative Complication</th>
<th>Single Layered</th>
<th>Double Layered</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anastomotic leak</td>
<td>05 (7.25%)</td>
<td>06 (9.23%)</td>
<td>0.676</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>07 (10.15%)</td>
<td>08 (12.31%)</td>
<td>0.691</td>
</tr>
<tr>
<td>Abdominal collection</td>
<td>07 (10.2%)</td>
<td>06 (9.2%)</td>
<td>0.691</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>11 (15.9%)</td>
<td>12 (18.5%)</td>
<td>0.699</td>
</tr>
<tr>
<td>Obstruction</td>
<td>00</td>
<td>01 (1.54%)</td>
<td>0.301</td>
</tr>
<tr>
<td>Prolonged ileus</td>
<td>08 (11.6)</td>
<td>12 (18.5%)</td>
<td>0.265</td>
</tr>
<tr>
<td>Sepsis</td>
<td>13 (17.5%)</td>
<td>15 (23.08%)</td>
<td>0.547</td>
</tr>
</tbody>
</table>

In this present study, maximum number of cases had single layer anastomosis with median expenditure of Rs.426 in comparision to double layer with mean expenditure of Rs.568.

In the post-operative period the double layered anastomosis had slightly higher leak rate (9.23%) than single layer anastomosis (7.25%) with total leak of 8.20% noted in emergency large bowel anastomosis.
The present study states the advantages and disadvantages of single layer and double layer intestinal anastomosis. An attempt has been made to document the risk factors for anastomotic dehiscence and post-operative complications. The results were compared to the studies done before.\(^\text{[15]}\)

**DISCUSSION**

134 patients of intestinal anastomosis of large bowel were studied from June 2017 to May 2019 at S.C.B. Medical College, Cuttack which included 69 cases of single layer and 65 cases of double layer anastomosis (Youngest in this study was 18 years and oldest was 65 years).

All the patients were operated in emergency. Intestinal anastomosis was performed more in male patients (66.42%) as compared to females with the ratio of 1.9:1.

Colonic volvulus (84.33%) were more in number compared to Ca. left colon (4.48%). Early return of bowel sounds was early in the single layer anastomosis group (2.67 vs 3.52 days).

Post-operative hospital stay was shorter in single layer group as compared to double layer group (8.85 vs 10.26 days). There is a significant difference in anastomotic leak rate between two groups. Single layer anastomosis was found to have better leak tolerance than double layer technique in emergency operations. The main wound infection reported was less in single layer than in double layer anastomosis (10.15% to 12.31%).

Tension during anastomosis and faecal soiling predisposes to anastomotic dehiscence and leak inspite of a prophylactic drain which can identify an early leak. Majority of the anastomotic leakage was encountered from 5th to 9th post-operative days (mean 7.09 days). In all cases of anastomotic leak, faecal matter was seen in the drain and the main wound with history of fever and was managed conservatively. Double layer anastomosis had higher post-operative complications compared to single layer anastomosis except intra-abdominal collection which is higher in single layer. Mortality in single layer and double layer was 4.35% and 7.69% respectively. Out of 8 patients, 3 patients had anastomotic leak, other 5 patients died due to sepsis, shock, multi organ failure and pulmonary complications.

In this present study, all cases of large bowel anastomosis were done with non-absorbable 2-0 silk suture which is cheap and readily available.

Though statistically there is no significant difference in the risk of leakage and other post-operative complications, but there is a significant difference in terms of time taken for the anastomosis, duration of hospital stay and cost of the suture material used between the two study groups which is also evident in our study.\(^\text{[16]}\)

The single layer anastomosis promised better patient compliance and consume less operative time, thus reduced prolong anaesthetic hazards and further pulmonary complications. Single layer hand sewn anastomosis proved best for emergency large gut anastomosis where vascular jeopardisation with infection would have given more leak in double layer anastomosis.

The post-operative hospital stay was seen to be more in double layer anastomosis, which explained for either minor leak or delayed anastomotic vascularisation for this prolongation.

**CONCLUSION**

Ideally an anastomosis should be well vascularised, free of tension, free of faecal loading and faecal soiling. A single layer interrupted extra mucosal large bowel anastomosis has better results than the double layer technique and thus it has become our preference of choice. Prompt attention, early ambulation, sustained enteral and parenteral nutritional support and improvement of general condition of patients are important factors for better results.

Hence single layer anastomosis has a better outcome in terms of healing, less time consuming, less number of complications, duration of hospital stay is less and reduced morbidity and mortality rates as compared to double layer anastomosis.

**REFERENCES**


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