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A comparative study between single vs double layered bowel anastomosis in a tertiary care hospital

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KEYWORDS

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A B S T R A C T

This comparative study is intended to determine the efficacy of single layer intestinal anastomosis in comparison with double layered intestinal anastomosis in terms of duration required to perform an anastomosis, complications like anastomotic leak, and the number of duration of hospital stay. This prospective comparative study was conducted at Victoria hospital and Bowring & Lady Curzon hospitals attached to BMC & RI, Bangalore. The study had two groups, group A (single layer)and group B (double layer) and cases were allotted to either groups alternatively requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel after fulfilling inclusion and exclusion criteria. Single layer continuous extra-mucosal anastomotic technique was done using 3-0 PDS and double layer continuous technique with 3-0 vicryl& 3-0 mersilk. The mean age in group A was 41.4 years and in group B was 41.72 years. Ileal stricture was diagnosed in maximum number of patients i.e. 17 (34%) cases and resection of ileum and ileoileal anastomosis was performed in maximum number of patients i.e. 19 (36%) cases. Single layer extra mucosal continuous intestinal anastomosis can be constructed in significantly shorter duration.

Introduction

Gastrointestinal anastomosis has been excited interest in our day to day surgical practice and aim of anastomosis is to make a sound alignment of bowel through which the contents will pass in as early as possible.

Patients undergoing resection anastomoses for various causes like bowel obstruction, incarcerated hernias, benign and malignant tumors of small and large bowel is not so

uncommon. Surgery stands major modality of treatment in such cases in diagnosis, treatment and even palliation in few situations¹. Bowel anastomoses after resection of bowel may be either end to end anastomoses, side to end or side to side depends on the surgery and operating surgeon. Different techniques of intestinal anastomosis are single, double layered closure, staples, glue, laser welding²

The basic principles of the intestinal suture were established more than 100 years ago by Travers, Lambert and Halsted. Controversy regarding single vs double layered closure of anastomoses goes as back as 1887 when Halsted proposed interrupted extra mucosal suturing³

Then Senn in 1893 advised double layer anastomosis. By 1931, more than 52 techniques for G.I anastomoses had been described². The single-layer continuous anastomosis is a contemporary innovation first described by Hautefeuille in 1976 . In the USA, the first mention of this technique was by Allen et al⁴

Satoru Shikata, Hisakazu Yamagishi et al at Kyoto, Japan, did a meta-analysis of all the articles related to single vs double layered anastomoses from 1966-2004 and no evidence was found that two-layer intestinal anastomosis leads to fewer postoperative leaks than single layer. Considering duration of the anastomosis procedure and medical expenses, single-layer intestinal anastomosis appears to represent the optimal choice for most surgical situations⁴

Muhammad Jawaid Rajput, Abdul Sattar Memon et al at Muhammed Medical College, Mirpurkhas did a prospective study on 72 patients with end to end single interrupted extramucosal anastomoses using polyglactin and found out that Single-layer extramucosal interrupted suture gut anastomosis is safe method of hand sewing technique. It is suitable for all anastomosis in the gastrointestinal tract⁵

Shahnam Askarpour, Mohammad Hossein Sarmast et al at University of Medical Sciences, Iran in 2005-06 did a study comparing single vs double layered anastomoses and its complications in 126 patients and they found out that

complications in single and double layered anastomoses is the same and single layer had an additional advantage of decreased operation time and cost of surgery⁶

Rullier E, Laurent C et al at University of Bordeaux, France did a study from 1980-95 on 272 anterior resections and anastomoses for rectal cancers and found out that male sex and level of anastomoses were independent risk factors for anastomotic leak and obesity contributed for leak and anastomotic leak contributed for 6-22% mortality⁷

Arnaud Alves, Yves Panis et al at Lariboisiere hospital in France did a Multivariate analysis of 707 patients to study the factors associated with clinically significant anastomotic leakage after large bowel resection and they found out that after colorectal resection and intraperitoneal anastomoses a temporary protective stoma is proposed for patients with high risk of anastomotic leak⁸

Currently single layer extra mucosal anastomoses is popular as advocated by Norman Matheson of Aberdeen as it probably causes the least tissue necrosis and luminal narrowing. Different trials and clinical studies have proven the superiority of single layer anastomosis, which besides being quicker to create, are apparently as strong as two-layered anastomoses⁴

Materials and Methods

The comparative study was done on patients presenting to Victoria, Bowring and Lady Curzon hospital attached to BMC & RI, either in emergency or elective undergoing resection anastomosis of bowel..

The patients selected for this study are those who were admitted with various clinical

conditions requiring resection and anastomosis of small and large bowel. Based on detailed history, thorough clinical examinations, radiological examinations and ultrasound of abdomen, the diagnosis was made. These patients were subjected to the required pre operative investigations; after bowel preparation, ensuring fitness elective surgery was done. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel. Intestinal anastomosis was carried out in single layer continuous extramucosal technique with 3-0 PDS and double layer continuous technique with 3-0 vicryl taking through all layers and seromucousular layer with 3-0 mersilk.

Inclusion criteria

- Patients giving written informed consent (Annexure 1)
- Patients undergoing resection and anastomoses of small bowel and large bowel at our hospital for causes like small bowel gangrene, strangulated hernia with bowel loop as content, small and large bowel tumours, intestinal ischaemia.
- Age more than 18 years.

Exclusion criteria

- Patients who are not willing to give written informed consent
- Resection anastomoses done for perforation with gross contamination of peritoneal cavity.
- Associated co-morbid diseases like sepsis, known cardiovascular disease, grossly deranged liver function.

A pretested proforma will be used to collect relevant information (patient data, clinical findings, lab investigations, follow up events etc.,) from all the selected patients.

Statistical analysis

Results are 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 and fisher exact test. A value of 0.05 or less was considered for statistical significance.

Results and Discussion

In our study we had two groups, Group A (single layer) and Group B (Double layer). Maximum number of patients in group A (single layer) were in the age group of 31-40 years i.e.08 (32%) and in group B (double layer) maximum number of patients were in the age group of 41-50 years i.e. 09 (36%). The mean age in group A (single layer) was 41.4 years and in group B (double layer) was 41.32 years.

The study included three different types of anastomosis all together in bothgroups depending up on the position of the viscera. In both the groups end to end type of anastomosis was done in maximum number of the cases, i.e. in group A (single layer) 25 (100%) patients and in group B(double layer) 25(100%) patients. No side to side type of anastomosis or end to side anastomosis was performed in either of groups.

The present study assessed the efficacy and safety of single layered anastomosis in comparison with double layer anastomosis after intestinal resection and anastomosis. The study included two groups single layer and double layer, each group had 25 cases altogether 50 cases. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel.

Table.1 Age distribution

| Age Groups (Years) | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
|--------------------|------------------------------|------------------------------|
| 20-30 | 5 (20%) | 5 (20%) |
| 31-40 | 8 (32%) | 6 (24%) |
| 41-50 | 6 (24%) | 9 (36%) |
| 51-60 | 6 (24%) | 5 (20%) |
| TOTAL | 25 (100%) | 25 (100%) |
| MEAN AGE | 41.4 | 41.32 |

Table.2 Disease group and patients

| Disease group | No. of cases | n(%) |
|------------------------------|--------------|------|
| Caecal mass (GIST) | 2 | 4% |
| Carcinoma ascending colon | 5 | 10% |
| Carcinoma caecum | 1 | 2% |
| Caecal perforation | 1 | 2% |
| Carcinoma transverse colon | 3 | 6% |
| Carcinoma descending colon | 3 | 6% |
| Carcinoma rectosigmoid | 1 | 2% |
| Ileocaecal tuberculosis | 7 | 14% |
| Jejunal stricture | 2 | 4% |
| Multiple ileal perforation | 2 | 4% |
| SMA syndrome | 2 | 4% |
| Terminal ileal stricture | 13 | 26% |
| Terminal ileal TB stricture | 4 | 8% |
| Strangulated inguinal hernia | 4 | 8% |

In our study of fifty cases in both groups terminal ileal stricture was diagnosed in maximum number of patients i.e. 13 (26%) cases.

Table.3 Type and number of procedures performed

| Procedure | No of cases | n % |
|---|-------------|-----|
| Anterior resection and colorectal anastomosis | 1 | 2% |
| Left hemicolectomy with colorectal anastomosis | 4 | 8% |
| Resection of terminal ileum with caecum with ileo-ascending anastomosis | 13 | 26% |
| Resection of ileum with ileo-ileal anastomosis | 21 | 42% |
| Right hemicolectomy with ileo-transverse anastomosis | 8 | 16% |
| Resection of jejunum with jejuno-jejunal anastomosis | 2 | 4% |
| Resection of jejunum and ileum with jejuno-jejunal anastomosis | 1 | 2% |

In our study of fifty cases in both groups resection of terminal ileum and ileoileal anastomosis was performed in maximum number of patients i.e. 21 (42%) cases.

Table.4 Type of anastomosis

| Type of anastomosis | Group A (Single Layer) n (%) | Group B (Double Layer) n (%) |
|---------------------|---------------------------------|---------------------------------|
| End to end | 25 (100) | 25 (100) |
| Side to side | - | - |
| End to side | - | - |
| Total | 25 (100) | 25 (100) |

Table.5 Comparison of mean duration of anastomosis between two groups

| Groups | Range | Mean±SD | Mean difference | t* value | P value |
|---------------------------|-----------------------|---------|-----------------|-------------|--------------|
| | (Duration in minutes) | | | | |
| Group A (Single Layer) | 14 – 22 | 19.04± | 10.16 | 19.6 | 0.000 |
| Group B (Double Layer) | 25 - 35 | 28.8± | | | |

*Unpaired t test

Mean difference of duration between the two groups is found to be 10.16 and p value is 0.000 which is < 0.005 and is highly significant.

Comparison of mean age in present series with Gangat S series⁹

| Groups | Present series | Gangat S series |
|---------------------------|---------------------|-----------------|
| | Mean age(in years) | |
| Group A (Single Layer) | 41.4 | 37.5 |
| Group B (Double Layer) | 41.32 | 40.2 |

Comparison of duration of anastomosis of Khan RAA and Burch ET series with present series¹⁰

| Groups | Present series | Khan RAA series | Burch ET series |
|---------------------------|--|-----------------|-----------------|
| | Mean duration of anastomosis (in minutes) | | |
| Group A (Single Layer) | 19.04 | 20 | 20.8 |
| Group B (Double Layer) | 28.80 | 35 | 30.7 |

Anastomosis was done at different levels of intestine and depending up on the position of the viscera. The efficacy of both groups were compared in terms of duration required to perform single and double layered intestinal anastomosis, study post operative complications like anastomotic leak in

single and double layered intestinal anastomosis, the outcome associated with single and double layered anastomosis and the duration of hospital stay in either of them.

In present series mean age in group A (single layer) was 41.4 years and in group B (double layer) 41.32 years. In Gangat series mean age in group A (single layer) was 37.5 years and in group B (double layer) 40.2 years.

In Khan RAA series, the arithmetical mean duration required to perform an anastomosis procedure was 20 minutes for single layer and 35 minutes for double layer. In Burch ET series duration required to perform a single layer anastomosis was 20.8 minutes and 30.7 minutes for double layer. In our study the mean duration required to construct a single layer anastomosis was 19.04 minutes and 28.80 minutes for double layered anastomosis. The difference in average time is statistically significant as p value <0.001HS in present series. Therefore in our series the time required to perform anastomosis is well within the average time.

Conclusion

Though a large number of patients need to be studied to do a dogmatic conclusion, duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer.

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