

Intestinal Anastomosis Single Layer versus Double Layer - A Prospective Study

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ABSTRACT

BACKGROUND

Anastomosis is a surgical procedure where in two hollow viscera are approximated together to establish the continuity. We wanted to compare the single layer and double layer gastrointestinal anastomosis in terms of their technical ease, duration of procedure, cost effectiveness, duration of hospital stay, anastomotic leak and other post-operative complications.

METHODS

This prospective study was conducted in the Postgraduate Department of General Surgery, M.K.C.G. Medical College and Hospital, Berhampur during the period July 2017 to June 2019. A total of 110 patients requiring small bowel and large bowel anastomosis both in elective and emergency cases were included in the study. Single layer anastomosis (SL) was done in 50 cases and double layer anastomosis (DL) in 60 cases. SL was done with extra mucosal interrupted suture with polyglactin curved round body 2-0 or Silk 2-0 curved round body or Prolene® 2-0 curved round body. In DL, first layer was continuous through and through with polyglactin round body 2-0 followed by outer Lembert suture with silk round body 2-0 or Polypropylene 2-0. The stitches were placed at an interval of 4-6 mm and mucosal eversion was strictly avoided. Drainage of anastomotic site is provided in all cases.

RESULTS

Mean time taken for single layer was 21.62 minutes and double layer was 31.22 minutes (p value 0.000), Mean Duration of hospital stay in SL was 5.74 days and DL was 7.70 days (p value 0.000). Mean expenditure in SL was 1140 rupees, DL was 1950 rupees (p value 0.000). Leakage rates in SL was 2% (1/50) and DL was 11.7% (7/60) (p value 0.06).

CONCLUSIONS

SL anastomosis is more cost effective, has shorter operating time, shows better patient compliance in terms of hospital stay with comparable leakage rates with DL, and is therefore the procedure of choice in routine surgical practice.

KEYWORDS

SL (Single Layer Anastomosis), DL (Double Layer Anastomosis)

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BACKGROUND

Anastomosis is a surgical procedure where in two hollow viscera are approximated together to establish the continuity. An anastomotic leak, faecal or biliary fistula, greatly increases the morbidity and mortality. Intestinal anastomosis and its success has been the subject of controversy with development of techniques over years. Czerny in 1880 advised two layer sutures. The first was an inner through and through stitch, usually a continuous catgut to secure rough apposition of cut ends of bowel and good hemostasis. The second was an outer neuromuscular stitch with interrupted silk to produce inversion and bring the peritoneal coats together.¹ Lambert in 1826 described a suturing technique in which serosa to serosa apposition was obtained while Senn advocated a two layer technique for closure.² Gambee in 1951 counseled against too much inversion by employing a special type of single layer suture designed to secure accurate end to end opposition of cut edges of bowel.³

Disadvantages of Double Layer Method

- Fails to oppose clean serosal surfaces.
- Results in large amount of ischemic tissue within the suture line, increasing chances of leakage.
- Excessive inversion leads to narrowing of lumen.⁴

Advantages of Single Layer Method

- Incorporates the toughest layer of gut and causes minimal damage to submucosal vascular plexus.
- It leads to accurate apposition with minimal tissue damage and luminal narrowing.⁵

To minimize all these perils of faulty surgery, resulting solely after defective and complicated gastrointestinal anastomosis using different suture materials and techniques, here is a trial of different techniques of gastrointestinal anastomosis using nonabsorbable or delayed absorbable sutures and comprising of either single layer or double layer anastomosis. A prospective study was done with the aim to compare the single layer and double layer gastrointestinal anastomosis in terms of their technical ease, duration of procedure, cost effectiveness, duration of hospital stay, anastomotic leak and other post-operative complications.

METHODS

The study was conducted in postgraduate Department of General Surgery, M.K.C.G. Medical College and Hospital, Berhampur within the period from July 2017 to June 2019. It covered a total of 110 patients requiring small bowel and large bowel anastomosis, either in elective or emergency procedure were included in the study.

Exclusion Criteria

Patients with Age <12 years and >80 years excluded from this study. Cases that required anastomosis to stomach,

duodenum and anal canal were excluded. Stapled anastomosis was also not taken in to consideration.

All patients are grouped into two categories. One group undergoing Single layer anastomosis (SL), other group undergoing Double layer anastomosis (DL). Single layer anastomosis was done by extramucosal interrupted suture with polyglactin curved round body 2-0 or Silk 2-0 curved round body or Prolene® 2-0 curved round body. The posterior layer was stitched first by passing the needle from serosa to submucosa without piercing the mucosa. Needle was then passed through the other end in the submucosa to come to the surface through the serosa and knots were tied over the serosal surface. In double layer intestinal anastomosis, first layer was continuous through and through with polyglactin round body 2-0 followed by outer Lembert suture with silk round body 2-0 or Polypropylene 2-0. The stitches were placed at interval of 4-6 mm and mucosal eversion was strictly avoided. Drainage of anastomotic site is provided in all cases.

a. Anastomotic leak was defined as-

- i. Established faecal fistula to the skin
- ii. Fever above 38°C or septicaemia in patients with radiological or endoscopic leak.
- iii. Presence of intraperitoneal abscess or symptoms and signs of peritonitis in the presence of an anastomotic leakage.

b. Time Taken- begins with placement of first stitch and ends when excess suture from last stitch was cut.

c. Wound Infection defined as discharge of serosanguinous or frank pus from the wound site within 30 days.

Cases are followed up weekly for first month, then monthly for next 5 months, both clinically and radiologically.

Statistical Analysis

Data were analyzed using the appropriate tests of significance in SPSS R Version 3.02. A p-value of less than 0.05 was considered as statistically significant.

RESULTS

Out of total 110 patients, Male patients were 61. 81% and female patients were 38.18%. Shah et al. and Kar et al. also had preponderance of males in their study.⁴ In this study age varied from 15 years to 78 years. 60% of the anastomosis were performed on the patients, those who were in their 4th to 6th decade of life. The mean time of operation for SL- 21.62 min. (range 18 to 30 min.) DL- 31.22 min (range 28 to 35 min) for double layer anastomosis with a p-value of 0.000.

2.73% (3 patients) of entire study population had wound infection, nil wound infections noted in the single layer group. 75.45% of the patients were operated in emergency where aseptic measures had not been taken properly. In emergency DL was done in 50.60% of cases. Emergency procedure had longer duration (6.82 days) of

hospital stay as compared to routine procedure (6.78 days). Anastomotic leakage was seen in 7 (11.7%) of Double layer group and 1(2.0%) of Single layer group, seen in 8 /110 patients (7.3%) with a p-Value of 0.06. Emergency operation showed a high anastomotic leak rate (8/83 i.e. 9.64%) while routine operation had no leakage. In present study 50% (3/6) of the patients who had faecal soiling developed leakage. In the Present study, the minimum number of cases had single layer operation with mean expenditure of Rs. 1140 in comparison to double layer with mean expenditure of Rs. 1950 with a p value of 0.000. Amongst the three suture materials used in single layer intestinal anastomosis, the silk is the most cost effective and cheap to the patients, followed by polypropylene, and Vicryl.



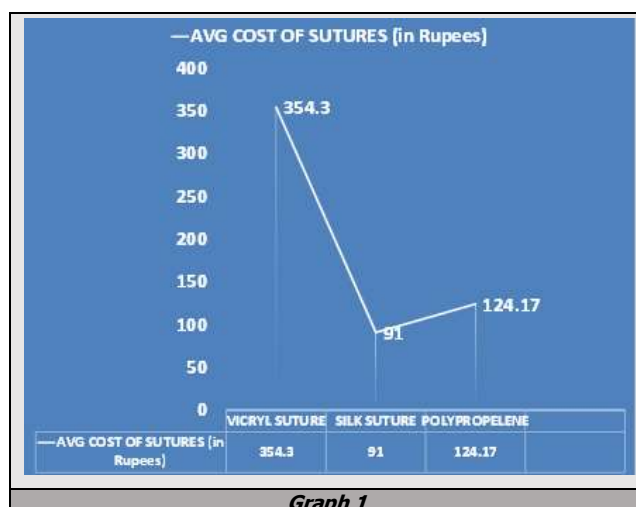
Image 1. Posterior Layer of Single Layer Anastomosis Interrupted in Ileo-ileal Anastomosis



Image 2. First Layer Continuous in Double Layer Anastomosis

Author	Time Taken (minutes)		Mean Hospital Stay (days)		Anastomotic Leakage (%)		Cost Effectiveness (Rs.)/ \$		Wound Infection (%)	
	SL	DL	SL	DL	SL	DL	SL	DL	SL	DL
Present Study	21.62	31.22	5.74	7.70	2	11.7	1140	1950	0	5
Burch John et al ⁷	20.8	30.7	7.9	9.9	3.1	1.5	\$4.61	\$35.58	3	3
Pathak et al ⁵	17.55	30.16	NR	NR	6.67	9.37	NR	NR	18.75	13.33
Kar et al ⁶	15.12	24.38	5.90	7.29	0	2.13	564	480	4	4.25
Ayub M Shah et al ³	NR	NR	8.2	10.5	4.7	8.3	NR	NR	7.1	10.4
	29.13	34.35	NR	NR	4.45	4.45	NR	NR	7.9	7.5

Table 1



Graph 1

DISCUSSION

The technique of double layer anastomosis has been used traditionally for more than 100 years which was originated by Travers, Lemert and Halsted. Historically, double layer method has been method of choice however many reports have advocated the use of single layer anastomosis method for anastomosis because of lower rate of leak, time and cost effectiveness. In the present study the mean time of operation for single layer and double layer were 21.62 minutes and 31.22 minutes respectively; with a range of 18 to 30 minutes for single layer and 28 to 35 minutes for double layer anastomosis with a p-value of 0.000 Pathak et al. in 2014 found that mean time taken in single layer was 17.59 min. and 30 min. for double layer, with a p-value of 0.001.⁶ Kar et al. in 2017 found that mean time for anastomosis in min for single layer was 15.12 and 24.38 for double layer, with a p-value of 0.001.⁷ In 2000 Burch et al. Found that, mean time taken for single layer anastomosis was 20.8 minutes and that of double layer was 30.7 minutes.⁸ Khan et al found in 2010 that time consumed in SL group was 20 minutes and in DL group was 35 minutes with a p value of <0.001.⁹ This study fairly tallies with the results of Pathak et al., Kar et al. and Bursch et al. Khan et al. ^{6,7,8,9}

- In DL anastomosis, more meticulous circumferential clearing of mesentery, appendices epiploicae and omentum is required before anastomosis, with SL method, less or no circumferential clearing is necessary.⁷
- Thus, time required to prepare bowel for anastomosis is less for SL, which might be of significance in patients with haemodynamic instability who are operated in emergency.⁷
- Emergency procedure had longer duration .In case of emergency setup preference was given to SL as it is less time consuming and use of silk made it less costly.
- As the amount of suture used in single layer anastomosis is less than double layer anastomosis, it is more cost effective and benefit for developing countries. Among SL anastomosis, silk was cheaper to the patient, followed by polypropylene and Polyglactin.
- Shorter hospital stay was seen in SL group. Kar et al., found that mean duration of hospital stay in single layer is 5.90 days and 7.29 days with a p-value of 0.001.⁷ Bruch et al. found that the hospital stay was 7.9 and 9.9 days in SL and DL respectively.⁸ Khan et al found that SL group average stay was 168 hrs and DL group 216 hrs with a p value of <0.001.⁹

The present study was quite similar to that of the observations of above authors.

- As most emergency cases were done with single layer, unprepared gut in emergency cases took longer time to resume the normal peristalsis and coexisting bacteraemia contributed for longer convalescence and post-operative return of bowel function was quicker in SL group as compared to DL group.
- In the present study wound infection rate in DL 5% SL – NIL and Total 2.73%. Rate of wound infection was more

because most of the patients operated in emergency procedure and post-operative aseptic measures had not been taken properly. In the study by Ayub et al. they found that SL group had wound infection in 7.1% of cases, and DL group had wound infection in 10.4% of cases.⁵ In the study by Kar et al. they found that SL group had wound infection in 4% of cases, and DL group had wound infection in 4.25% of cases.⁷ It was similar to the findings of Ayub et al. and Kar et al.^{5,7}

Anastomotic leakage rates were comparable in both the groups with a p value only slightly more than being significant. similar findings were noted in study conducted by Ayub et al and Burch et al.^{5,8} Although Gurung et al. conducted a comparative study in the year 2018, comprising of total 50 cases. 25 included in each of the single layer (Group A) and double layer (Group B) with leakage rates in Group A 0 and Group B 1(4%) found SL to be more efficacious.¹⁰

- In DL- submucosal vascular plexus may be compromised and there may be excessive inversion and inflammation of tissue leading to narrowing of lumen.
- SL - least damage to submucosal vascular plexus, least chances of luminal narrowing, incorporates strongest submucosal layer and accurate tissue apposition.
- In our study no mortality was encountered.

CONCLUSIONS

A single layer interrupted suture appears to give better results than standard two layer technique. Prompt attention, sustained enteral and parenteral nutritional support, improvement in general condition of the patients are important factors for better results. Keeping in view the shorter operative time, comparable complication rates, and lesser hospital stay duration for single layered anastomosis as compared to the conventional double layer method, it can be concluded from our study that former is equally safe and more cost effective than the latter. Thus, single layer technique may represent the optimal choice for routine surgical practice.

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