

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

Rajesh Kumar Dora¹, Himansu Sekhar Kand², Sanat Kumar Patra², Manoj Kumar Barik², Nitya Nutan Misra²

¹Assistant Professor, Department of Surgery, S.C.B. Medical College, Cuttack.

²Junior Resident, Department of Surgery, S.C.B. Medical College, Cuttack.

Received: June 2019

Accepted: June 2019

Copyright: © the author(s), publisher. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Colonic anastomosis is mostly due 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 viscera. 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 centres. In the 19th century, Travers and Lambert first performed double layer intestinal anastomosis.^[2,3] In 1976 single layer interrupted anastomosis was described by Hautefeuille.^[5]

Anastomosis may be everted, inverted, side to side, end to side, end to end, 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 nearby 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

Name & Address of Corresponding Author

Dr. Rajesh Kumar Dora.
Assistant Professor,
Department of Surgery
S.C.B. Medical College,
Cuttack, Odisha.

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

1. Co-morbid conditions like DM, HTN, Immuno deficiency and bleeding disorders.
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. Tazobactam 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: ?

Total Number of Patients Under Gone Colonic Emergency Surgery	Total Number of Patients Undergone Large Bowel Anastomosis	Percentage
285	134	47.02

Table 2: Relation of Primary Disease of Large Bowel and Large Bowel Anastomosis

Primary Disease	No. Of Anastomosis	Percentage
Colonic Volvulus	113	84.33
Ca.Colon	06	4.48
Strangulated Hernia	04	2.98
Colo-Colic Intussusception	03	2.24
Traumatic Injury	03	2.24
Stricture	02	1.49
Iatrogenic Injury After Cs	02	1.49
Sigmoid Diverticulitis	01	0.75

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

Sex	No. Of. Anastomosis	Percentage	Sex Ratio	Age In Years (Mean + Sd)
Male	89	66.42	1.9:1	47.79+13.39
Female	45	33.58		47.78+11.85

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 (4.48%) 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: ?

Layer	Male	Female
Single	43	26
Double	46	19

Table 5: Age Distribution of Large Bowel Anastomosis

Age In Years	Number	Percentage
Below 20	4	2.98
20-29	13	9.7
30-39	12	8.96
40-49	37	27.61
50-59	28	20.89
60 and above	40	29.85

More number of patients were seen in age group 60 years and above – (29.85%) and between the age group of 40-49 years – (27.61%).

Table 6: Time Taken For Single Layer and Double Layer Anastomosis

Procedure	Total	Time Taken
Single Layer	69	20.87+2.07
Double Layer	65	32.77+2.08

In this present study, single layer anastomosis was done in 69 patients and double 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 7: Duration of Hospital Stay

Procedure	Total	Duration Of Hospital Stay
Single Layer Anastomosis	69	8.85+3.88
Double Layer Anastomosis	65	10.26+3.98

P-value-0.008

In this present study, mean duration of hospital stay for single layer anastomosis was 8.85+3.88 days and for double layer anastomosis it was 10.26+3.98 days.

Table 8: Type of Anastomosis (Post-Operative Complications)

Layer of Anastomosis	No. of Patients	Complications	Percentage
Single	69	18	26.09
Double	65	18	27.69
Total	134	36	26.87

P-value-0.834

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

Procedure	Leakage	Percentage
Single Layer Anastomosis	05	7.25
Double Layer Anastomosis	06	9.23
Total	11	8.20

Double layer 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.

Table 10: Expenditure in Single and Double Layer Anastomosis

Procedure	Total	Expenditure In Rs. (Mean+S.D)	Range
Single Layer Anastomosis	69	(426+91.59)	284.0
Double Layer Anastomosis	65	(568+75.82)	284.0

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

Table 11: Distribution of Post-Operative Complications in Relation to the Type of Anastomosis

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

In the post-operative period the double layered anastomosis had lower abdominal collection during post-operative period (9.2%) than single layer anastomosis (10.2%) with total abdominal collection (9.7%).

Double layer anastomosis had higher prolonged ileus during post-operative period (18.5%) than single layer anastomosis (11.6%) with total prolonged ileus (14.92%).

Double layer anastomosis had higher post-operative sepsis (23.08%) than single layer anastomosis (17.5%) with total post-operative sepsis (20.9%) noted in emergency large bowel anastomosis.

Table 12: Mortality in Single Layer and Double Layer Anastomotic Procedure

Anastomotic Procedure	No. Of Death	No. Of Death
Single Layer	03	4.35%
Double Layer	05	7.69%

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.^[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. Time needed to perform a single layer intestinal anastomosis was less when compared to double layer (20.87 vs 32.77). Anastomosis was done 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 in spite 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.^[16]

The single layer anastomosis promised better patient compliance and consume less operative time, thus reduced prolonged 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

1. Singh RK, Vyas Mk. Surgical procedures in sushruta samhita. International journal of Research in ayurveda and pharmacy 2011;2(5):1444-1450
2. Khan raa, Hameed F, Ahmed B, Dilawiz M. Intestinal anastomosis; comparative evaluation for safety, cost effectiveness, morbidity and complications of single versus double layer professional Med J Jun 2010;(2):232-234
3. Travers. B. Enquiry into the process of nature in repairing injuries of the intestine. London: Longman, Rees, Orme, Brown and Green; 1812
4. Lambert A. Memoire sur l'enterographic avec la description d'un procede nouveau pour cette operation chirurgicale. Rep Gen Anat Physiol path. 1826;2:100
5. Hautefeuille P. Reflexions sur les sutures digestives propos de 570 sutures accomplies depuis 5 ans au surjet monoplane de monorbin. chirurgie. 1976;102:153-165
6. Neal JM, Shazad A. Intestinal anastomosis. In ACS Surgery: principle and practice. 7th edition. Gastrointestinal Tract and abdomen. 2008. Deckers; Chapter 29
7. Greatorax G, WHITTAKER bl, Dixon RA. Anastomotic failure in relation to blood transfusion and blood loss. Proc R Soc Med 1970;63:751

8. Gottrup F,Anderson TT , Healing of incisional wounds in stomach and duodenum:The influence of experimental diabetes .J.Surg Res 1981;31:61
9. De Waard JW,Wobbes T,de Man BM.et.al.post operative levamisole may compromise early healing of experimental intestinal anastomosis.Br J cancer 1995;72:456
10. Foster MB,Stmberg BV,Blatchford GJ, et.al, Colonic anastomosis:Bursting strength after corticosteroid treatment.Dis Colon rectum 1994;37:12
11. Kripe SA,Fox AD et.al,stimulation of intestinal mucosal growth with colonic infusion of short chain fatty acids.JPEN J parenteral Nutr 1989;13:109
12. Burch A,Khourya GA.et.al,Large bowel anastomosis.I.The healing process and sutured anastomosis.A review.Br J Surg.2000;70:61-63
13. Khan AK ,Fielding LP et.al,suturing in G.I.surgery:A prospective randomized study Group .Br J Surg 2010;78:337-341
14. Pravin P.Dandi,Duthie HL et.al, Blood flow in colonic anastomosis.EWffect of suturing. Ann Surg 2015;1987;206:335
15. Berliner SD,Burson LC et.al,Mortality on colonic emergency .2016;50:546-54816.
16. K.Sibabrata et.al,Journal of clinical and diagnostic research.2017 Jun,VOL.11(6):PCO1-PCO4 .

How to cite this article: Dora RK, Kand HS, Patra SK, Barik MK, Misra NN. A Prospective Study on Single Layer versus Double Layer Anastomosis In Emergency Colonic Surgery In A Tertiary Care Hospital. Ann. Int. Med. Den. Res. 2019; 5(4):SG41-SG45.

Source of Support: Nil, **Conflict of Interest:** None declared