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Single layer extramucosal versus double layer anastomosis for colostomy closure in children with anorectal malformation

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Abstract

Background: Intestinal anastomosis is one of the commonly performed procedure in gastrointestinal surgeries. The purpose of this study is to Assess safety, efficacy, cost effectiveness of single layer anastomosis over double layer anastomosis for colostomy closure in children with Anorectal Malformation at tertiary care centre.

Materials and Methods: This prospective observational comparative study conducted between February 2016 to January 2021 consisting of 47 patients. All the children admitted for colostomy closure after definitive staged procedure for anorectal malformation were enrolled in the study.

All anastomoses were of end-to-end type. The single layered anastomoses were performed by using interrupted 3-0 polydioxanone suture beginning at the mesenteric border and taking all layers of bowel wall except the mucosa into the bite. The double layered anastomoses were performed using interrupted 3-0 polydioxanone suture for the transmural inner layer and interrupted 3-0 polydioxanone Lembert sutures for outer seromuscular layer.

Outcome parameters assessed were, quantity and cost of suture material used, time taken for anastomosis, time taken for surgery, postoperative return of peristalsis and passage of flatus, postoperative complications like paralytic ileus, bowel obstruction, anastomotic dehiscence diagnosed by presence of enteric contents like bile or faeces in drain or wound or diagnosed on radiological imaging like CT scans and hospital stay. Data were recorded in the case record form.

Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. All the data collected was analysed by using SPSS 24.0 version IBM USA.

Results: Out of total 47 children enrolled in study, 25 (53.19%) children were allocated to single layered extra mucosal intermittent anastomosis and 22 (46.81%) children to double layered anastomosis. All children admitted for colostomy closure had age ranges between 7 months to 36 months with mean age of 11.5 ± 3.8 months. Amongst all the children undergoing anastomosis 35(74.47%) were males and 12(25.53%) were females.

Observed outcome parameters like mean time taken for surgery in minutes (120.4 ± 15.3 Vs 135.7 ± 12.5), mean time taken for anastomosis in minutes (15.1 ± 2.3 Vs 24.4 ± 2.3), mean day of return of bowel sounds on postoperative day (2.40 Vs 3.74), mean day of first postoperative bowel movement (3.41 Vs 4.89) were significantly less in single layer anastomosis group than in double layer anastomosis. Suture material used in single layer anastomosis was lesser in quantity than used in double layer anastomosis.

Post-operative complications were seen in 3 (06.38%) children of in single layer anastomosis group and 5 (10.63%) children of double layer anastomosis group. One child who underwent double layer anastomosis had anastomosis leak while none of child in single layer anastomosis group had leak. Mean duration of hospital stay was 5.95 ± 1.40 days in single layer anastomosis group which is lesser than mean duration of hospital stay of 7.45 ± 1.95 days in double layer anastomosis group.

Conclusion: Single layer intestinal anastomosis resulted in significant reduction in operative time, hastens the postoperative recovery of bowel function, reduces suture material, hospital stay and cost; without any difference in complications.

Keywords: single layer anastomosis, double layer anastomosis, colostomy closure, anastomosis leak

Introduction

Bowel anastomosis dates back to 1000 B.C., the era of Sushruta where he described the use of black ants head for bowel anastomosis [1].

The basic principles of intestinal suturing were established more than 100 years ago by Travers, Lembert and Halsted and have undergone little modification since then [2].

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The meticulous technique, gentle tissue handling, adequate apposition of bowel ends, good blood supply and absence of tension or distal obstruction are the important factors in the bowel anastomosis [3].

The sutured anastomosis may be done either in a double layer or a single layer. The double layered intestinal anastomosis was performed in the early 19th century by Travers B in his experimental work [4]. The single-layered interrupted anastomosis was first described by Hautefeuille [5] in 1976.

End to end anastomosis or side to side or side to end bowel anastomosis is done after resection of bowel depending on the surgery and the operating surgeon. Different methods of intestinal anastomosis are single layered, double layered anastomosis, staples, glue, laser welding [6].

Interrupted absorbable or non-absorbable sutures are utilized for outer sero-muscular layer and continuous or interrupted absorbable sutures are used for the trans-mural inner layer in case of double layered anastomosis [7].

In the double layer anastomosis, submucosal vascular plexus may be damaged, excessive inversion and inflammation of tissue may lead to narrowing of lumen. Single layer anastomosis includes submucosal layer and accurate tissue apposition, which reduces injury to submucosal vascular plexus and there are less chances of luminal narrowing, [8].

In most surgical situations, the conventional method is two-layer anastomosis. But it is time-consuming and there is risk of anastomotic stricture formation. Recently, single layer anastomosis using monofilament suture is cost-effectiveness, less time consumption and no increase in leakage rates as compared to double-layer anastomosis, has been preferred by many surgeons [7].

Most common complication of bowel anastomosis is anastomotic leak, which leads to peritonitis, fistula, intraabdominal abscess and stricture. Suturing technique is one of the factor, which contributes to anastomotic leak. Anastomosis leak is a major complication and incidence may vary from 1.3% to 7.7%, and usually leads to increase morbidity, prolonged hospital stay, increases the economic burden and even may lead to mortality [9]. This study was done to know safety, efficacy, cost effectiveness of single layer anastomosis over double layer anastomosis for colostomy closure in children with Anorectal Malformation at tertiary care centre.

Materials and methods

This prospective observational comparative study conducted between February 2016 to January 2021 consisting of 47 patients. All the children admitted for colostomy closure after definitive staged procedure for anorectal malformation were enrolled in the study. All the children diagnosed with high anorectal malformation were subjected to divided sigmoid colostomy in neonatal period (stage 1) then underwent Definitive posterior sagittal Ano-rectoplasty (stage2) around 4 to 8 months and now admitted for colostomy closure after definitive staged procedure (stage 3). Children with Multiple malformation, cloaca were excluded from study.

The patients were included in the study after fulfilling the criteria and an informed written consent was taken from them. Investigations done as a routine standard of care were recorded in case record form and no additional investigations were done for the purpose of study alone.

All anastomoses were of end-to-end type. The single layered anastomoses were performed by using interrupted 3-0 polydioxanone suture beginning at the mesenteric border and

taking all layers of bowel wall except the mucosa into the bite. The double layered anastomoses were performed using interrupted 3-0 polydioxanone suture for the transmural inner layer and interrupted 3-0 polydioxanone Lembert sutures for outer seromuscular layer.

Each bite included 4–6 mm of the bowel wall from the edge and about 5 mm from each other. Adequate pressure was applied to the suture to make the anastomosis watertight.

All the anastomosis were done by single surgeon. The patency of the anastomosis was checked by palpating the anastomosis between the thumb and the index finger. Each case was analysed with respect to duration required to perform intestinal anastomosis & post-operative complications like anastomotic leak. The duration of anastomosis starts with first stitch placement on the intestine and ended with the last stitch finished. Abdominal drain was kept in all patients.

Outcome parameters assessed were, quantity and cost of suture material used, time taken for anastomosis, time taken for surgery, postoperative return of peristalsis and passage of flatus, postoperative complications like paralytic ileus, bowel obstruction, anastomotic dehiscence diagnosed by presence of enteric contents like bile or faeces in drain or wound or diagnosed on radiological imaging like CT scans and hospital stay. Data were recorded in the case record form. All the data thus collected was analysed statistically.

All patients received similar antibiotics (i.e. Injection Piperacillin+ Tazobactam and Metronidazole) and standard postoperative care. Removal of the drain was usually done on 4th to 5th postoperative day, depending on the post-operative recovery and amount of collection in the drain (Drain output <25ml in 24 hrs) Suture removal was done between the 10th to 15th postoperative days after wound healing. The total length of hospital stay (in days) was counted from the day of operation.

On discharge, the patients were followed up at 1st week, 3rd week and 3rd month. The patients were evaluated for gastrointestinal complaints and other complaints, if any. The data will be entered and analyzed in Epi Info version 7. Categorical variables will be summarized as percentages and quantitative variables will be summarized as mean with standard deviation (SD), or median with inter-quartile range (IQR) according to the distribution of the variable. Statistical analysis was performed using the Statistical Package for Social Sciences for Windows (SPSS, version 20.00).

Results

Out of total 47 children enrolled in study, 25 (53.19%) children were allocated to single layered extra mucosal intermittent anastomosis and 22 (46.81%) children to double layered anastomosis. All children admitted for colostomy closure had age ranges between 7 months to 36 months with mean age of 11.5 ±3.8 months, mean age in single layer group was 11.1±3.5 months and mean age in double layer group was 11.6±3.1 months which is comparable.

Amongst all the children undergoing anastomosis 35(74.47%) were males and 12(25.53%) were females.

Observed outcome parameters like mean time taken for surgery in minutes, mean time taken for anastomosis in minutes, mean day of return of bowel sounds on postoperative day, mean day of first postoperative bowel movement were significantly less in single Layer anastomosis group than in double layer anastomosis as shown in table 1(Table1). Suture material used in single layer anastomosis was lesser (two 3-0 polydioxanone suture) in quantity than used in double layer anastomosis (Four 3-0 polydioxanone suture).

Post-operative complications (Table 2) were seen in 3 (06.38%) children of in single layer anastomosis group and 5 (10.63%) children of double layer anastomosis group. One child in single layer anastomosis group and two children in double layer anastomosis group had post-operative abdominal distension due to paralytic ileus which responded to conservative management. One child each in single layer anastomosis group and double layer anastomosis group had post-operative vomiting which improves with conservative treatment. One child who underwent double layer anastomosis had feces/bile/pus in their drain s/o anastomosis leak while none of child in single layer anastomosis group had leak. The child with an anastomotic leak in double layer anastomosis group which was detected on day 7 post-operatively which was later reexplored and a stoma was created on postoperative day 11. One child each in single layer anastomosis group and double layer anastomosis group had post-operative wound infections which improves with regular dressing.

Mean duration of hospital stay was 5.95±1.40 days in single layer anastomosis group which is lesser than mean duration of hospital stay of 7.45 ± 1.95 days in double layer anastomosis group. After discharge, no major complaints or complication on follow at 1st week, 3rd week and 3rd month.

Discussion

Intestinal anastomosis is one of the commonly performed procedure in gastrointestinal surgeries in both elective and emergency settings. In Single layer anastomosis, single extra mucosal layer, which is the toughest layer, submucosa is adequate for a successful anastomosis [10]. Proposed benefit of single layer anastomosis is shorter surgery time and lower cost [11-13].

Most of the previous studies reported significantly shorter duration of anastomosis for single layered anastomosis [13, 14]. To perform a two-layer anastomosis, circumferential clearing of mesentery and appendices epiploica is required before the anastomosis. While to perform single-layer anastomosis, less circumferential clearing is required. Thus, time required to prepare the bowel for anastomosis is also less for single-layer anastomosis technique [15]. The time requirement for anastomosis may vary from surgeon to surgeon, from inexperienced to experience surgeon but overall single layer definitely required less time. In our study too, time required for single layer anastomosis was significantly less compared to double layer anastomosis which leads to significant reduction in overall time taken for surgery. And reduced overall time taken

for surgery indirectly leads to better postoperative recovery and improved outcomes.

Postoperative return of bowel function was earlier in the single layer anastomosis as compared to the double layer anastomosis in our study which was comparable with observations from previous studies [16, 17]. In contrast, some studies show no difference in the duration of return of bowel sounds between the two techniques [18].

Quantity of suture materials required for anastomosis was lesser in single layer anastomosis. It is especially important for cost reduction. other studies also reported lower cost for the single-layer anastomosis technique [8, 13, 15].

In our study we used 3-0 polydioxanone for anastomosis in both groups. The important feature of polydioxanone which is an absorbable monofilament suture, is its better tensile strength, lower rate of wound infection, and longer wound support due to its slow absorption [17]. But in other studies, different suture materials were used but comparing the anastomotic leak rate, no significant difference was noted in our and other studies by using different suture material [13, 15].

The safety and efficacy of a technique for intestinal anastomosis is depends on its rate of anastomotic leakage. An anastomotic leak increases the morbidity and mortality associated with the surgery, it can prolong the length of the hospital stay and increase the mortality by threefold [19]. They are diagnosed either clinically or radiographically by contrast enema or computed tomography scan [20]. In our study there was no anastomotic leak in the single layered anastomosis group while one patient developed leak in the double layered anastomosis group.

Burch JM *et al* [15], and Ceraldi CM *et al* [21], too observed no statistically significant difference in the rates of anastomotic leaks or abdominal abscess between the two techniques.

In our study, hospital stay was lesser in single layer anastomosis group compared to double layer anastomosis group it might be due to the earlier return of bowel function in the single layer anastomosis group. Maurya SD *et al*. [16], also observed shorter duration of stay in one-layer arm as compared to the two-layer arm (11.4 days versus 18.6 days, respectively) [16].

However, a Cochrane review inferred that both single and double-layer anastomosis methods were comparable in terms of perioperative complications, mortality and hospital stay [12].

Limitation of our study was smaller number of patients and however, long term follow up is required to evaluate the late complications of intestinal anastomosis which include bowel stenosis, stricture or obstruction.

Table 1: Observed outcome parameters in single layer extra mucosal versus double layer anastomosis.

Observations	Single Layer anastomosis	Double layer anastomosis	P- Value
Mean time taken for surgery in minutes	120.46± 15.35	135.77± 12.55	0.012
Mean time taken for anastomosis in minutes	15.12±2.27	24.38 ± 2.26	<0.001
Mean day of return of bowel sounds on postoperative day	2.40±1.18	3.74 ± 1.34	0.001
Mean day of first postoperative bowel movement	3.41 ±1.63	4.89± 1.45	0.001
Mean duration of hospital stay in days	5.95±1.40	7.45 ± 1.95	0.001
Complications recorded	3	5	0.148

Table 2: Postoperative complication in Single layer extra mucosal versus double layer anastomosis.

Postoperative complications	Single Layer anastomosis	Double layer anastomosis
Post-op abdominal distension	01	02
Post-op vomiting	01	01
Anastomotic leak	00	01
Wound infection	01	01

Conclusion

Single layer intestinal anastomosis resulted in significant reduction in operative time, hastens the postoperative recovery of bowel function, reduces suture material, hospital stay and cost; without any difference in complications.

References

1. Brunnicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB. editors. Wound healing. Schwartz

- principles of surgery. 9th edition. United States of America: The McGraw-Hill Companies (publishers) 2010, 216.
2. Egger M, Smith GD, Schneider M, Minder C, Noguchi Y, Gavaghan D *et al.* Bias in metaanalysis detected by a simple, graphical test. *BMJ* 1997;315(7109):629-34.
 3. Goulder F. Bowel anastomoses: The theory, the practice and the evidence base. *World J Gastrointest Surg* 2012;4(9):208-13.
 4. Travers B. Enquiry into the Process of Nature in Repairing Injuries of the Intestine. London: Longman, Rees, Orme, Brown, and Green 1812.
 5. Hautefeuille P. Reflexion's sur les sutures digestives: a propos de 570 sutures accomplies depuis 5 ans au surjet monoplan de monobrin. *Chirurgie* 1976;102:153-65.
 6. Zinner MJ, Ashley SW. Maingot's abdominal operations. 12th ed. New York: McGraw-Hill's 2013:585-795.
 7. Shikata S, Yamagishi H, Taji Y, Shimada T, Noguchi Y. Single-versus two-layer intestinal anastomosis: a meta-analysis of randomized controlled trials. *BMC Surgery* 2006;6:2.
 8. Askarpour S, Sarmast M, Peyvasteh M, Gholizadeh B. Comparison of single and double layer intestinal anastomosis in Ahwaz educational hospitals (2005-2006) *Int J of sur* 2010;23(2).
 9. Whang EE. Small intestine. In: Brunicaudi, Billian A, Dunn D, Hunter, Pollock RE. *Schwartz manual of surgery*. 8th ed. New York: McGraw-Hill 2005, 702-32.
 10. Kostić LL. Sutures in digestive surgery. *Acta Chir Iugosl* 1994;41(2):211-20.
 11. Pathak A, Rahaman MA, Mishra S. Single-layer versus double layer intestinal anastomosis of small bowel at Nepalgunj teaching hospital. *J Nepalgunj Med Coll* 2015;12(1):35.
 12. Sajid MS, Siddiqui MRS, Baig MK. Single layer versus double layer suture anastomosis of the gastrointestinal tract. *Cochrane Database System Rev* 2012;CD005477.
 13. Garude K, Tandel C, Rao S, Shah NJ. Single layered intestinal anastomosis: a safe and economic technique. *Indian J Surg* 2013;75(4):290-3.
 14. Khan RAA, Hameed F, Ahmed B, Dilawaiz M, Akram M. Intestinal anastomosis: comparative evaluation for safety, cost effectiveness, morbidity and complication of single versus double layer. *Professional Med J* 2010;17(2):232-34.)
 15. Burch JM, Franciose RJ, Moore EE, Biffl WL, Offner PJ. Single-layer continuous versus two-layer interrupted intestinal anastomosis: a prospective randomized trial. *Annals Surg* 2000;231(6):832-37.
 16. Maurya SD, Gupta HC, Tewari A, Khan SS, Sharma BD. Double layer versus single layer intestinal anastomosis: a clinical trial. *Int Surg* 1984;69(4):339-40.
 17. Chittmitrapap S, Kitisin P, Navichareern P. One layer continuous anastomosis of the alimentary tract with absorbable polydioxanone suture. *J Med Assoc Thai* 1993;76(5):264-70.
 18. Saboo R, Deshmukh SD, Sonarkar R, Agrawal VP, Shah P. A comparative study of single layer continuous sutures versus double layer interrupted sutures in intestinal anastomosis. *IJBAR* 2015;6(3):264-68.
 19. Chen C. The Art of Bowel Anastomosis. *Scandinavian J Surg* 2012;101:238-40.
 20. Hyman N, Manchester TL, Osler T, Burns B, Cataldo PA. Anastomotic leaks after intestinal anastomosis: it's later than you think. *Annals Surg* 2007;245(2):254-58.
 21. Ceraldi CM, Rypins EB, Monahan M, Chang B, Sarfeh II. Comparison of continuous single layer polypropylene anastomosis with double layer and stapled anastomoses in elective colon resections. *The American Surgeon* 1993;59(3):168-71.