Colostomy Closure in Pediatric Age Group: Analysis Of Out Come in Single Center Experience.

Hassan K, Qatia* **FRCS, FICMS**

Abstract:

Background: Closure colostomy is a common procedure in the pediatric surgical practice, considered a major one because it involves anastomosis of the large bowel, and requires strict bowel preparation and prophylactic antibiotics. It's the last event in the management of some pediatric surgical conditions, as Hirschsprung's disease and anorectal malformations.

Objectives: To evaluate the complications of colostomy closure in pediatric patients.

Patients and methods: A total of 106 patients underwent colostomy closure were enrolled in this prospective study conducted in Welfare Teaching Hospital in Medical City Complex, from October 2015 to January 2017, were reviewed looking for complications following closure colostomy. Data was collected including age, gender, indication of colostomy, type and location of colostomy, presence of stoma complication, and presence of associated anomalies. Details of colostomy closure, including pre-operative, intra-operative and post-operative variables were recorded.

Results: Of 106 patients included**,** there were 38(35.8%) females and 68(64.2%) males, with an average age of 2.4 year. Indications for colostomy were Hirschsprung's disease 58(54.7%) and anorectal malformations 48(45.3%). Site of colostomy was transverse colon 54(50.9%), and sigmoid colon 52(49.1%). The type of colostomy was divided 8(7.5%) and loop 98(92.5%). Forty eight patients (45.3%) developed complications; the most common being wound infection 30 (28.3%), followed by fecal fistula 6 (5.7%), wound dehiscence 4 (3.8%), adhesive intestinal obstrution 4 (3.8%) and incisional hernia 4 (3.8%).

Conclusion: Closure colostomy is a high morbidity procedure. With morbidity rate of 45.3%, the highest complications were wound infection.

Keywords: Hirschsprung's disease (HD), Anorectal malformation (AM)

JFac Med Baghdad 2018; Vol.60, No .1
Received Dec. 2017
Accepted Jan. 2018

Introduction:

Colostomy is a common and a time honoured surgical procedure used to divert the fecal stream, to decompress obstructed bowel under emergency conditions, and to protect the lower colorectum after a reconstructive repair [1], [2].

Depending on the purpose for which diversion has been necessary, a colostomy may be temporary or permanent [3]. Most decompressing intestinal stomas in the pediatric age group are temporary and correction of the underlying problem often leads to closure of the diverting opening, a properly constructed temporary stoma is frequently unavoidable and lifesaving [4]. In several instances of non-correctable and crippling pathologic conditions of the lower intestinal tract, a permanent, well-functioning stoma contributes to an improved quality of life [5].

Among the more common serious complications of colostomies are prolapse, stricture, retraction, skin excoriation, parastomal herniation and stomal bleeding [6].

Colostomy closure, was a dangerous procedure with a high risk of leakage and fecal peritonitis, this led to the introduction of techniques to minimize the risk of peritoneal contamination, such as extraperitoneal closure. With the Mikulicz technique, were the common walls of a double-barrelled colostomy are crushed using an enterotome or forceps, and the resulting fecal fistula is closed later, leaving the suture line extraperitoneal if desired [7].

Timing of colostomy closure varies depending on the underlying condition,health status of the child, and presence or absence of stoma related complications[8]. Unnecessary delays in the reestablishment of bowel continuity tend to increase morbidity and should be avoided [9].

Patients and methods:

This is a prospective study conducted in Children Welfare Teaching Hospital in Medical City Complex, included all patients underwent colostomy closure from October 2015 to January 2017.

Data were collected from parent of the patients or their hospital admission file including age, gender, indication of colostomy, presence of associated anomalies, preoperative PCV, preoperative bowel preparation, preoperative antibiotics administration, site of colostomy, type of colostomy, time for colostomy closure, technique of closure (single vs.

* *Chairman of scientific council of pediatric surgery*
Email: Hasankq65@yahoo.com

double layers), presence of stoma complications and size discrepancy during closure of colostomy.

One hundred and six patients were reviewed, looking for complications following closure colostomy. The time interval between doing and colostomy closure was (two-seven) months.All patients admitted to hospital one to two days before surgery, the majority of patients 82 (77.4%) had adequate pre-operative bowel preparation including;

Fluid diet per oral for 2 days.

Mechanical bowel preparation (bowel enemas of both sides of the colon) for two days.

They also received preoperative antibiotics.

Surgical technique includes;

Preparing the abdominal skin with Povidone iodine, draping of towels, an elliptical incision made around the colostomy, an electrocautery used for maintaining the dissection as close as possible to the bowel wall and for careful hemostasis, the incision continued through the skin and abdominal wall layers down to the peritoneum, till the stomas are freed and separated from the abdominal wall, cleaning the edges of stoma to allow a precise anastomosis, avoidance of contamination, loop colostomy was divided completely before anastomosis, in some only a wedge of the loop was resected, one layer and double layers end to end anastomosis done with long term 3/0 or 4/0 absorbable sutures, irrigation of the peritoneal cavity and the subsequent layers with normal saline solution, abdominal wall closed in two layers with skin closed with interrupted silk sutures, drain inserted. In the postoperative period, no nasogastric tubes were used, the patients received intravenous fluid, as well as antibiotics for 5-7 days, most of the patients pass their first bowel motion on the 3rd to 4th postoperative day, they received fluid diet on the 5th postoperative day, and discharged home one to two days later. The total hospital stay was from (6-13) days. When there is size discrepancy during bowel anastomosis (especially with long time stoma) overcomes by: “Crowding” big bite, small bite,slitting the antimesentric border and cutting the smaller lumen obliquely; to maintain good blood supply, we cut on the antimesentric border.

Statistical analysis

Each case-sheet assigned a serial identification number. The data were analyzed using Statistical Package for Social Sciences (SPSS) version 23. The continuous data presented as mean and standard deviation. Student’s t-test (two tailed) was used comparing them between study groups. The categorical data represented by frequency and percentage tables. Pearson’s Chi–square test was used to assess statistical association between the categorical data and the study groups. A level of p – value less than 0.05 was significant.

Results:

Out of (106) patients included, with an average age of 2.4 year, theage range from 7 months to 9 years , there were 38(35.8%) females and 68(64.2%) males, the original diagnosis of the patients was: Hirschsprung’s disease 58(54.7%) and anorectal malformations 48(45.3%).

Table 1: Distribution of the studied group according to the indication of colostomy and the presence of associated anomalies

Variables	No. (%)
Indication of colostomy	
Hirschsprung's disease	58 (54.7)
Anorectal malformation	48 (45.3)
Associated anomalies	
Yes	16 (15.1)
No	90 (84.9)
Total	106 (100)

The site of colostomy was sigmoid colon in (52) patients, and transverse colon in (54) patients. The type of colostomy was; loop colostomy (98) [loop transverse colostomy (54) and loop sigmoid colostomy (44)], and eight double-barreled sigmoid colostomies. The mean time between colostomy establishment and colostomy closure was 4.5±1.3 months. Bowel anastomosis done with double layer in 66 patients (62.3%), and by single layer in 40 patients (37.7%).

Table 2: Main operative criteria for colostomy

Variables	No. (%)
Site of colostomy	
Sigmoid colon	52 (49.1)
Transverse colon	54 (50.9)
Type of colostomy	
Diverting stoma	8 (7.5)
Loop colostomy	98 (92.5)
Time for colostomy closure (months), Mean±SD	4.5±1.3
Technique of closure (Layers)	
Single layer	40 (37.7)
Double layers	66 (62.3)
Total	106 (100)

The mean preoperative PCV% for all cases was 37±4.3. The majority of patients had pre-operative bowel preparation 82 (77.4%), while 24 (22.6%) were without preparation.

Prophylaxis antibiotics were applied in 86 patients (81.1%), while twenty (18.7%) without.

Table: Pre-operative preparations preceding colostomy

Variables	No. (%)
Pre-op. Preparation.	
Yes	82 (77.4)
No	24 (22.6)
PCV%, Mean±SD	37±4.3
Prophylaxis Antibiotics	
Yes	86 (81.1)
No	20 (18.9)
Total	106(100)

Of the 106 cases, 10 cases (9.4%) founded with discrepancy, the size discrepancy during colostomy closure varies from no size to 5:1.

Table 4: Distribution of patients according to the presence of bowel discrepancy and stoma complications

Variables	No. (%)
Discrepancy	
Yes	10 (9.4)
No	96 (90.6)
Stoma complication	
Yes	40 (37.7)
No	66 (62.3)
Total	106 (100)

Forty eight patients (45.3%) developed complications; the overall incidence of complications were:

- Thirty patients developed wound infection 28.3%
- Six patients developed fecal fistula 5.7%
- Four patients developed wound dehiscence 3.8%
- Four patients developed adhesive small bowel obstruction 3.8%
- Four patients with incisional hernia 3.8%

There was no significant bleeding and no mortality.

Discussion:

Closure colostomy is a routine procedure performed frequently by pediatric surgeons all over the world, it is an elective procedure that is assumed to be easy, reproducible, and with minimal or no morbidity, yet, the literatures indicate that this procedure still may be the source of significant complications, including death[10]. A morbidity rate of (45.3%) in this study, founded higher than others as *Chandramouli et al* [2], *Mollitt DL. Malangoni MA. Ballantine TVN. et al* [11], *Freund HR. Raniel J. Muggia-Sulam M*[12] *and Das S*[13],with morbidity rate of (39.3%), (9%)and (15%) respectively. It might be related to the higher complications with wound infection. The highest recorded morbidity rate was wound infection, with a rate of (28.3%), it's founded higher than *Nasir,A.A. et al* with a rate of (6.5%) [14], *Chandramouli et al* (12.6%) [2], *Rickwood et al* with (16%) [15], and *Sowande et al* with (16.7%) [16]. Could be related to the absence of pre-operative preparation and prophylactic antibiotics in number of patients, and the poor preparation in others. According to literatures, anastomotic dehiscence with fecal fistula consecutive to closure of colostomy in the pediatric population occur with a frequency varies from 0 to (7.1%) as in *Nasir, A.A. et al* [14]who found (0%), also *Sowande et al* reported (0%) [16], while *Chandramouli et al* founded (7.1%) fecal fistula rate, he founded that the incidence of fecal fistula did not depend on the underlying pathology, type of colostomy, duration of closure after colostomy, use of drain, seniority of the operating surgeon and type of antibiotics[2]. While, a fecal fistula incidence of 5.7%, in our study founded increased in patients who complained from bowel size discrepancy during closure colostomy, six of ten patients with size discrepancy ranging from 3:1 to 5:1, developed fecal fistula, with the p value of 0.02 (one of the significant factor contributing to complication founded in the study). An incisional hernia of 3.8% founded, higher than others as *Chandramouli et al* [2], *Rickwood et al* [15]and *Todd GJ. Kutcher LM. Markowitz AM.* [17] who noticed (1.8%). It might be related to poor technique of fascial closure. Wound dehiscence developed with an incidence of 3.8%, its occurrence reported in patients with complications of fecal fistula and wound infections, four patients developed it, two of them with bowel size discrepancy of 5:1 during closure of colostomy and the other two with no remarkable preoperative risk factor. *S Nour et al* [18] reported 1.4% risk for wound dehiscence. The incidence of adhesive intestinal obstruction was (3.8%), (four patients developed obstruction due to small bowel adhesions), required lapratomy and adhesiolysis. Others reported (10%) as *Sowande et al* [16], *Chandramouli et al*[2] founded (5.2%), might be because of short duration follow-up, in contrast to other studies. while *Nasir,A.A. et al*[14] reported (0%), attributing that to the meticulous surgical technique of closure colostomy. Several factors may influence the development of complications after closure colostomy, of these:Age; of those who developed complications were with median age of (3.1 years), comparable to *Nasir,A.A. et al* with a median age of (3 years) with a closer complication rate of (41.9%)[14].While those who were free of complications were with median age of (2.3 years), It might be the delay in construction of colostomy and its closure contributed to the development of these complications in older patients. The incidence of morbidity founded higher in boys (52.9%), than girls (31.6%), it's because of the higher number of boys (68) than girls (38), and the higher incidence of HD and AM in boys. As *Chandramouli et al* who reported higher rate of complications (39.9%), with (101 boys) and (45 girls) [2]. It's founded with a P value of 0.034. Complications founded higher among patients with HD (48.3%), than patients with AM (41.7%), it's because of certain complications associated with the primary pathology, like higher rate of intestinal obstruction and malnutrition related to HD. Six of sixteen patients with associated anomalies developed complications of (37.5%). That affects the healing process and general health condition of the patients. Eighty two patients underwent bowel preparation prior to operation, 37 patients (45.1%) developed complications, might be related to inappropriate preparation. *Rickwood et al* also noticed a decrease in wound infection with mechanical preparation along with preoperative antibiotics; he had a wound infection rate of 16%, which is lower than the current study15]. Twenty four patients were without bowel preparation, 14 patients (58.3%) developed complications Thirty eight of 86 patients with use of prophylactic antibiotics developed complications of (44.2%). While twenty patients were without prophylactic antibiotics developed complications in 10

patients (50%). It's founded that use of prophylactic antibiotics still carry risk of complications. *Nasir,A.A. et al* reported morbidity rate closer to the current study with the application of preoperative antibiotics[14]. It's reported that transverse colon colostomy developed complication (48.1%) higher than sigmoid colostomy (42.3%), as *Chandramouli et al* founded in his study, and relate that to the increased malnutrition rate with the transverse colostomy than the sigmoid colostomy [2]. Also, *S Nour et al* reported the higher complication rates with the transverse colostomy [18]. Loop colostomy founded with higher complication rates (49.0%) post closure of colostomy, than divided colostomy (0%) according to the current study, might be caused by the small number of cases with divided stoma. Others as *Chandramouli et al* reported higher complications with loop colostomy especially the loop transverse colostomy (as malnutrition, prolapse and other stoma related complications) [2], *S Nour et al* also founded higher morbidity with loop colostomy and both recommended performing divided colostomy [18]. While others founded that loop colostomies are closed with lower complications than divided colostomies as with Anderson et al [19]. Founded with a P value of 0.007. It's founded that colostomies closed with double layer anastomosis were associated with increased risk of morbidity (51.5%), than those closed with single layer (35.0%), It might be caused by longer operative time and increase the narrowing of bowel lumen. Several articles indicating that a one-layer bowel anastomosis is as good as two-layers, as *Ordorica-Flores RM et al*20], and *Garcia-Osogobio SM et al* [21], *S Nour et al* also reported that low risk of anastomotic leakage may be related to single layer closure[18]. Eight of ten patients founded with discrepancy during anastomosis ranging from 3:1 to 5:1, developed complications (80%), we founded that it's one of the significant factors that contributed to morbidity after closure colostomy. Six of them developed fecal fistula. Forty colostomies were with complications prior to closure ranging from skin excoriation, prolapse and stenosis, 16 of them developed post closure complications including wound infection and fecal fistula, with morbidity rate of (40.0%). As *S Nour et al* who reported an increase in complications rate in colostomies with preoperative complications (mainly prolapse and adhesive obstruction), especially in transverse loop colostomies [18]. We did not find significant time interval strongly associated with morbidity, as those patients who developed complications underwent closure of their colostomies in an average time (4.9 months), close to those without complications (4.3 months). Others founded Colostomies closed after 6 to 15 months were found to have no fecal fistula, as *Mollit DL. et al*[11], whereas when closed within 3 months have a fistula rate of 5%, as *Rickwood AMK. Et al*[15], also *Rickwood AMK. Et al* noticed a higher infection rate in those colostomies closed later than 6 months. *Mollit DL.et al* did not find any difference [11].

Table 5: Factors affecting morbidity among patients subjected to colostomy closure, N=106.

Variables	Morbidity		Total (N=106)	p value
	Yes (N=48)	No (N=58)		
Age (years), Mean±SD	3.1±1.4	2.3±1.7		0.093 t
Sex, No. (%)				
Boys	36 (52.9)	32 (47.0)	68 (100.0)	0.034*
Girls	12 (31.6)	26 (68.4)	38 (100.0)	
Indication of colostomy, No. (%)				
hirschsprung's disease	28 (48.3)	30 (51.7)	58 (100.0)	0.496
Anorectal malformation	20 (41.7)	28 (58.3)	48 (100.0)	
Associated anomalies, No. (%)	6 (37.5)	10 (62.5)	16 (100.0)	0.057
Pre-op. preparation, No. (%)	37 (45.1)	45 (54.9)	82 (100.0)	0.144
Prophylaxis Antibiotics, No. (%)	38 (44.2)	48 (55.8)	86 (100.0)	0.638
Site of colostomy, No. (%)				
Sigmoid colon	22 (42.3)	30 (57.7)	52 (100.0)	0.546
Transverse colon	26 (48.1)	28 (51.9)	54 (100.0)	
Type of colostomy, No. (%)				
Diverting stoma	0 (0.0)	8 (100.0)	8 (100.0)	0.007*
Loop colostomy	48 (49.0)	50 (51.0)	98 (100.0)	
Technique of closure (Layers), No. (%)				
Single layer	14 (35.0)	26 (65.0)	40 (100.0)	0.098
Double layers	34 (51.5)	32 (48.5)	66 (100.0)	
Discrepancy, No. (%)	8 (80.0)	2 (20.0)	10 (100.0)	0.02*
Stoma complication, No. (%)	16 (40.0)	24 (60.0)	40 (100.0)	0.395

*. The Chi-square statistic is significant at the .05 level. t Student's t-test

Conclusion:

Wound infection was the highest complication at a rate of 28.3% in closure colostomy. HD was associated with higher complications than AM. Male patients were with higher morbidity than females. Double barrel colostomy carries lower risk than loop colostomy. Complications were high with

transverse colostomy. Pre-operative bowel preparation and prophylactic antibiotics decreased complications. Single layer bowel anastomosis carries low morbidity than double layer. Size discrepancy during bowel anastomosis was significant factor influenced morbidity post closure colostomy.

Recommendation:

Proper stoma care, the use of well fitted colostomy bags and early colostomy closure improves the outcome. Encouraging appropriate pre-operative mechanical bowel preparation and pre-operative antibiotic use. Advise for single layer bowel anastomosis as associated with shorter operative time, less tissue handling, and lessnarrowing on the already small bowel lumen. When there is size discrepancy during bowel anastomosis, must be overcomes with good surgical judgement.

References:

1. *Pena A, Migotto-Krieger M, Levitt MA. Colostomy in anorectal malformations: a procedure with serious but preventable complications. J Pediatr Surg 2006; 41:748-756.*
2. *Chandramouli B, Srinivasan K,Jagdish S, et al. Morbidity and mortality of colostomy and its closure in children. J Pediatr Surg 2004; 39:596-599.*
3. *Bailey and Love's. Short practice of surgery, 22nd edition: 807-809, 1995.*
4. *Teitelbaum DH, Cilley RF, Sherman NJ, et al: A decade of experience with the primary pull-through for Hirschsprung's disease in the newborn period: A multicenter analysis of outcomes. Ann Surg 2000; 232:372-380.*
5. *Woodward MN, Foley P, Cusick EL: Colostomy for treatment of functional constipation in children: A preliminary report. J pediatr Gastroenterol Nutr 2004; 38:75-78.*
6. *Wilkins S, Pena A. The role of colostomy in the management of anorectal malformations. Paediatric Surg. Int. 3:24, 2007.*
7. *Lewis Spitz and Arnold G Coran, Operative Pediatric Surgery seventh edition, Ch. 66 Colostomy: formation and closure, 2013; 615-616.*
8. *Weber TR, Tracy TF Jr, Silen ML, Powell MA: Enterostomy and its closure in newborns. Arch Surg 2015; 130:534-537.*
9. *Bakx R, Busch OR, Benelman WA, et al: Morbidity of temporary loop ileostomies. Dig Surg 2004; 21:277-281.*
10. *Andrea Bischoff, Marc A. Levitt, Taiwo A. Lawal, Alberto Pen˜a. Pediatr Surg Int (2010) 26:1087–1092.*
11. *Mollitt DL, Malangoni MA, Ballantive TVN, Grosfeld JL. Colostomy complications in children, an analysis of 146 cases. Arch Surg 2011; 115:455-8.*
12. *Freund HR. Raniel J. Muggia-Sulam M: Factors affecting the morbidity of colostomy closure. Dis Colon Rectum 25:712-71 5. 2013.*
13. *Das S: Extraperitoneal closure of colostomy in children. J Indian Mcd Assoc 89:253-255. 2010.*
14. *Nasir, A.A., African journal of paediatric surgery. Vol. 4(1); Jan-Jun 2007.*
15. *Rickwood AM, Hemalatha V, Brooman P. Closure of colostomy in infants and children. Br J Surg 2012; 66:273-274.*
16. *Sowande OA, Adejuyigbe O, Ogundoyin O, et al. Colostomy complication in infants and children. Nigerian journal of surgery 2009; 6:19-22.*
17. *Todd GJ. Kutcher LM. Markowitz AM: Factors inftuencing the complications of colostomy closure. Am J Surg 137:749-75 I. 2009.*
18. *Nour S, Beck J, Stringer MD (2016) Colostomy complications infants and children. Ann R Coll Surg Engl 78:526–530.*
19. *Anderson E,etal:colostomy closure: A simple procedure? Dis.Colon Rectum,22:446,2009*
20. *Ordorica-Flores RM, Bracho-Blanchet E, Nieto-Zermeno J et al (2008) Intestinal anastomosis in children: a comparative study between two different techniques. J Pediatr Surg 33:1757–1759.*
21. *Garcia-Osogobio SM, Takahashi-Monroy T, Velasco L et al (2006) Single-layer colonic anastomoses using polyglyconate (Maxon) vs. two-layer anastomoses using chromic catgut and silk. Rev Invest Clin 58:198–203.*