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ORIGINAL ARTICLE

SINGLE LAYER OR DOUBLE LAYER FOR PEDIATRIC COLOSTOMY CLOSURE: WHICH IS BETTER? A COMPARATIVE STUDY

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Abstract

Background/Purpose: Colostomy formation and colostomy closure (CC) procedures are common operations frequently be performed in pediatric patients. Despite its benefits, it can produce significant morbidity and mortality. Few reports examined the outcome, complications and factors influencing the outcome of CC in pediatric age group. The aim of this study is to compare the outcome of two different technical details; single layer interrupted extramucosal closure and double layer interrupted closure; for pediatric CC.

Patients and Methods: In this prospective randomized comparative study all infants and children admitted for colostomy closure from January 2008 to December 2011 were included and were allocated prospectively into 2 groups according to technique used in CC. Group A consisted of 40 patients in whom CC was done with single layer interrupted extramucosal closure. Group B consisted of 40 patients in whom their colostomies were closed by double layer; the inner layer full thickness interrupted and the outer interrupted sero-muscular. Patients' details and data for CC for each technique all were collected, recorded and compared. Statistical analysis was carried out using SPSS.

Results: The statistical analysis showed that there was statistically very highly significant difference between the two groups concerning mean operative time (P=0.00) and significant difference regarding mean time for passing first bowel motion postoperatively (P=0.04). Postoperative CC related complications (wound infection, anastomotic leak, gastroenteritis and incisional hernia) were reported in12 (15%) patients. There was statistically significant difference between both groups regarding the incidence of overall postoperative complications.

Conclusion: We advise single layer interrupted extramucosal closure technique as it carries shorter mean operative time and less complications rates.

Keywords: Colostomy, single layer, extramucosal.

INTRODUCTION

Colostomy formation and closure procedures are common operations frequently be performed in pediatric patients.[1] Despite its benefits, it can produce significant morbidity and mortality.[2] Collected information is lacking concerning the outcome of colostomy closure (CC) operations and the major influencing the outcome.[1]

According to the literature anastomotic dehiscence, wound infection[3-8] and other complications such as intraabdominal abscess, bleeding, anastomotic stricture[9-12] and death[13-15] have been reported consecutive to CC in the pediatric population with variable frequency.[2] Some factors have been found to be prognostic or influencing CC results such as co-morbidity, type and location of colostomy, or the interval between stoma formation and closure.[16-20]

There are reports which document considerable incidence of CC complications in adult population.

Although stomas are commonly used in infants and children, there are comparatively fewer reports that have examined the outcome, complications and factors influencing the outcome of CC in this age group.[1,21]

The aim of this study is to compare the outcome of CC procedure in patients who operated upon for CC by two different technical details that might have contributed to affect the outcome in terms of incidence of complications and morbidity related to CC. The two techniques are single layer interrupted extramucosal closure and double layer interrupted closure.

PATIENTS AND METHODS

This prospective randomized study was conducted at pediatric surgery unit-Sohag university hospitals, local health insurance hospital and private sector-Sohag-Egypt.

All infants and children who were admitted for colostomy closure from January 2008 to December 2011 and operated by the author were included in our study after signing an informed consent by the parents. Infants with systemic diseases were excluded from the study.

In a randomized fashion, before surgery at the time of hospital admission, patients were allocated prospectively into 2 groups according to technique used in CC.

Ethical committee approval was obtained and counseling of the parents was performed. Medical checkup, routine laboratory studies and contrast study were performed. Preoperative preparation for CC was consisted of admission one day before surgery, oral metronidazole, clear fluids and repeated proximal stoma irrigations with saline solution (20cc/Kg warm saline) 24 h prior to the operation.

Surgical-technique: All patients were operated under general anesthesia with prophylactic IV antibiotic (Ceftriaxone and Metronidazole) at the time of induction were used routinely. Our surgical technique included packing of the proximal stoma with gauze soaked in povidone-iodine 10%. , multiple silk sutures at the mucocutaneous junction of the stomas, remaining close to the bowel wall during mobilization, hemostasis, try to avoid contamination, prepare the edge of the stomas for closure and according to CC technique patients were divided into two groups. Group A consisted of 40 patients in whom CC was done with single layer interrupted extramucosal closure using 3/0 or 4/0 silk suture. Group B consisted of 40 patients in whom their colostomies were closed by double layer; the inner layer full thickness interrupted using 4/0 absorbable sutures and the outer interrupted sero-muscular layer using non-absorbable 3/0 or 4/0 silk suture.

Lastly, irrigation of the peritoneal cavity, wound closure in layers, intra-peritoneal tube drain and anal dilatation was done at the end of the operation.

In the postoperative period; nasogastric tube for 24 hours was not regularly used. Patients were kept on IV fluids for 3days with nothing per oral, then patients received clear fluids if they were not distended. Postoperative pain control and appropriate antibiotics cover continued for 5-7 days. Most of the patients were discharged home in the seventh or eighth postoperative day.

Demographic information and patients' details included age, sex, initial diagnosis; type and site of colostomy were collected and analyzed. Also, data for CC included operative time, need for blood transfusion, time to regain bowel motion, total hospital stay, and post-operative complications rates and type for each technique all were recorded and compared. Statistical analysis was carried out using SPSS and data were summarized and expressed with percentages, means ± SD and $P < 0.05$ was considered to be significant.

RESULTS

Demographic data and patients' details were documented (Table 1). Out of 80 colostomies that we closed, only 62 (77.5%) were created by the author, the remaining 18 (22.5%) patients had their colostomies opened elsewhere by other surgeon. Indications for colostomy creation, type, site, and colostomy complication are shown in (Table 2). Patients' details and colostomy characteristics all showed statistically insignificant difference between the two groups.

Intra operative blood transfusion required in 3 (3.75%) patients; one patient in group A and 2 patients in group B; with statistically insignificant difference (P=0.5) between the two groups. Operative and postoperative data are shown in (Table 3). The statistical analysis showed that there was statistically very highly significant difference between the two groups concerning mean operative time (P=0.00) and significant difference regarding mean time for passing first bowel motion postoperatively (P=0.04).

Postoperative CC related complications were reported (Table 4). Wound infection occurred in 4/80 (5%) cases; all of them managed successfully by local wound care and antibiotic coverage. Anastomotic leak reported in 2/80 (2.5%) cases; both were related to group B,

presented on 5th postoperative day and both were respond well to conservative management. Gastroenteritis was documented in 4/80 (5%) patients; all managed medically. Incisional hernias were experienced in 2/80 (2.5%) patients both were related to group B and experienced anastomotic leakage. Postoperative cosmetic outcome was satisfactory to the parents of all uncomplicated patients.

The difference between both groups concerning the incidence of overall postoperative complications were found to be statistically significant by Chi square test (P = 0.013). However, on statistical analysis for the incidence of individual complication type, we found no significant difference between the two groups (Table 4).

Table 1. Demographic data and other patients' details; P < 0.05 was considered to be significant.

		Group A (no=40)	Group B (no=40)	P value	Total (no=80)
Sex	Male	21 (52.5%)	24 (60%)	0.32	45 (56.3%)
	Female	19 (47.5%)	16 (40%)		35 (43.7%)
Age/Month	Range	5-28	6-24	0.98	5-28
	Mean ± SD	11.6±4.9	11.5±4.2		11.5±4.6
Body Weight/Kg	Range	7.1-14.5	7.5-14	0.5	7.1-14.5
	Mean ± SD	10.1±2.2	9.8±1.7		9.95±1.94
Duration of colostomy/Week	Range	10-42	16-40	0.81	10-42
	Mean ± SD	27.5±8.9	27.9±7.3		27.7±8.1

Table 2. Colostomy characters using Chi square test for comparison between the two groups; P < 0.05 was considered to be significant.

		Group A (no=40)		Group B (no=40)		P value	Total (no=80)	
		No.	%	No.	%		No.	%
Original diagnosis	ARM	32	80%	28	70%	0.58	60	75%
	HSD	6	15%	9	22.5%		15	18.8%
	Others	2	5%	3	7.5%		5	6.2%
Type	Loop	38	95%	37	92.5%	0.5	75	93.8%
	Separated	2	5%	3	7.5%		5	6.2%
Site	Sigmoid	37	92.5%	34	85%	0.2	71	88.8%
	Transverse	3	7.5%	6	15%		9	11.2%
	Prolapsed	3	7.5%	2	5%		5	6.3%
Colostomy complication	Excoriation	10	25%	7	17.5%	0.23	17	21.3%
	Stenosis	1	2.5%	1	2.5%		2	2.5%

Table 3. Operative and postoperative data using independent t test for comparing the means values between the two groups; P < 0.05 was considered to be significant.

		Group A No=40	Group B No=40	P value
Operative time/min	Range	45-60	50-80	***0.00***
	Mean ± SD	52.1±4.8	69.95±7.9	
Time for 1st bowel motion/Hours	Range	18-36	20-60	***0.04***
	Mean ± SD	31.8±4.6	35.3±9.6	
Hospital stay/day	Range	8-10	8-18	0.13
	Mean ± SD	8.95±0.8	9.53±2.2	

Table 4. Postoperative complications using Chi square test for comparison between the two groups as regard complication; P < 0.05 was considered to be significant.

	Group A (no=40)		Group B (no=40)		P value	Total (no=80)	
	No.	%	No.	%		No.	%
Wound infection	1	2.5%	3	7.5%	0.308	4	5%
Leakage	-	-	2	5%	0.247	2	2.5%
Gastroenteritis	1	2.5%	3	7.5%	0.308	4	5%
Incisional hernia	-	-	2	5%	0.247	2	2.5%
Total	2	5%	10	25%	***0.013***	12	15%

DISCUSSION

Colostomy closure is a routine procedure performed frequently by pediatric surgeons all over the world. It is an elective procedure that is assumed to be easy and with minimal or no morbidity. Yet, the literature indicates that this procedure still may be the source of significant complications, including death.[2,22]

Many literatures documented that anorectal malformation (ARM) was the commonest indication for colostomy creation in pediatric patients followed by Hirschsprung's disease (HSD) and lastly, other different indications.[2,23] Loop colostomy was the commonest type[24] and sigmoid colon was the commonest site[23]; which may be due to it is easier to create the opening and closing ostomies.[25] Common complications after colostomy creation, in order of frequency, were pericolostomy skin excoriations followed by prolapsed stoma and lastly stomal stenosis.[23,24] These data were agreement with our patients' colostomy characteristics.

In 2010 Andrea et al recommend abdominal wall closure in layers with obliterating all spaces to decrease the tension between the skin edges, decrease pain, allowing a safer closure and to achieve a better cosmetic scar than mass single-layer abdominal wall closure.[2]

There are several articles signifying that a one-layer bowel anastomosis is as good as a two-layer one.[26-28] In 2011 Pawan et al used hand-sewn extramucosal single-layered technique for all CC in his cases.[1]

In our study there was very highly significant difference between the two techniques regarding the mean operative time which may due to simpler technique in group A than group B.

Also; we documented significant difference between the two techniques concerning the means of time interval for first bowel motion postoperatively which may be explained by early partial mechanical obstruction due to larger tissue mass and edema in addition to longer period of post-operative ileus owing to prolonged operative time and more intestinal manipulation in group B than group A.

Overall complication rate after CC procedure varied from 1.5% to 27%[1,2,22] with mortality ranging from 0 to 8%.[3]

In 2011 Pawan et al used hand-sewn extramucosal single-layered technique for all CC in his cases with overall complications rate was 12.1% and wound infection rate was 3.7%.[1] In another study, the mean fistula rate was 5%, mean wound infection rate was 17%, a mean mortality rate was 0.5% and a mean complication rate was 27%.[3] Incisional hernia represent a lack of closure of one of the layers of the wound.[2] This is nearly consistent with our results which run in parallel with many literatures.

In conclusion colostomy closure is a common procedure in pediatric surgical practice. Though it is said that complication seldom occurs after closure of colostomy, this has not been a uniform experience. Several factors decide complications rates; surgical technique of bowel anastomosis is one of these factors. We advise single layer interrupted extramucosal closure technique as it carries shorter mean operative time and less complications rates. However; we Promote CC procedure by an experienced hand with adequate preoperative bowel preparation and meticulous technique to decrease morbidity of these operations.

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