

## Colostomy closure in pediatric age group A comparative study between Single and double layer anastomosis

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### Summary:

*This prospective study involved one hundred patients with colostomies admitted at the Central Pediatric Teaching Hospital for colostomy closure over the period of two years (Jan.2000-Jan2002).*

*Patients were divided in to two groups according to the technique of colostomy closure. In the first group, the closure was done by single layer of interrupted non-absorbable suture material; in the second group closure was done by double layer suturing technique.*

*All patients were prepared by the same conventional method including fluid diet for three days followed by two days washing enemas before operation with antimicrobial prophylaxis agents. Of these one hundred patients;(48) presented as cases of Hirschsprung's disease, (50) were cases of ano-rectal malformations, and (2) were cases of traumatic colonic perforation. According to the type of the colostomy; there were (62) loop colostomy, and (38) double-barreled colostomy.*

*According to the site of the colostomy; there were (84) patients with right transverse colostomy, (2) with left descending colostomy, (12) with sigmoidostomy, and (2) with cecostomy. Sixteen patients developed complications following colostomy closure; these were (wound infection, fecal fistula, small bowel obstruction, and other systemic infections).*

*We advise single layer bowel anastomosis for the following reasons:*

*1-operative time (anesthetic time) theoretically shorter with single layer closure.*

*2-less tissue handling (less trauma) with single layer closure.*

*3-less narrowing effect (as less suture material) on the already small bowel lumen. Too many sutures and too many knots leading to compromise blood supply with double layer closure.*

*4-more cost benefit with single layer closure.*

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### Introduction:

A colostomy is an artificial opening made in to the large bowel in order to divert fecal stream to the exterior(1). Depending on the technique by which diversion is performed a colostomy may be loop, double barreled or end colostomy (2).

Colostomy formation and subsequent closure are important surgical steps in the management of Hirschsprung's disease, imperforated anus and neonatal necrotizing enterocolitis and other rarer conditions (3). Both procedures are associated with morbidity and mortality. Closure of colostomy is a major surgical procedure as it involves anastomosis of the large bowel and needs strict bowel preparation and prophylactic antibiotics (4).

Gastrointestinal surgery expanded rapidly and with various methods of suturing the bowel together. All were modifications of Lambert's basic principles and were reviewed by Senn in 1893. In 1893 Senn advised two-layer interrupted anastomosis. His suture was of fine aseptic silk applied with ordinary sewing needles. Halsted

favoured a one-layer anastomosis without penetration of the lumen. In contrast, Connell in 1903 strongly recommended a single layer of interrupted sutures, which passed through all coats of the bowel and with knots ligated intraluminally. Kocher also suggested all-coats suture technique in two layers using catgut and silk.

Anastomotic healing is influenced by many factors and it is difficult to assess the influence of any single factor especially in the clinical situation. Healing depends on fibroblastic response and on the formation of plentiful collagen in the submucosa round the anastomosis .

The preparation for closure is standardized, including mechanical preparation of the large bowel from both sides of the colostomy, and per rectum. This should be combined with the usual prophylactic measures, especially preoperative antibiotic cover as for any operation on the large bowel (5).

### **Material And Method:**

A prospective study was conducted at the Central Pediatric Teaching Hospital, Department of pediatric surgery , which included one hundred patients with colostomy closure over a period of two years between (2000-2002). Data were collected from their hospital admission including age, gender, initial diagnosis, type of colostomy,

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and the time of initial hospitalization. Data were extracted from follow-up after the initial procedure included time until readmission for closure and pre-operative contrast study. Data were also recorded from admission for colostomy closure included operative time, estimated intra-operative blood loss, anastomotic technique, antibiotic regimen, time to regular diet, total hospital stay, and post-operative complications.

The first group "single layer bowel anastomosis", included 50 patients whom their colostomies were closed by single interrupted layer using non-absorbable suture (3/0 or 4/0 silk).

The second group "double layer bowel anastomosis", also include 50 patients operated upon, their colostomies were closed by double layer; the inner layer using interrupted absorbable suture material (chromic catgut) and the outer layer "sero-muscular" by interrupted non-absorbable suture (3/0 or 4/0 silk).

Anal dilatation was done for all patients at the end of the operation.

Intra-peritoneal tube drain was used at the area of the anastomosis to detect any anastomotic leakage in some patients.

All patients reached operation with  $Hb \geq 10$  gm/dl.

During the postoperative period, patients were kept on:

Nothing per oral for 3-5 days with IVF supplement.

Nasogastric decompression for 24-48 hours.

3-Antibiotic cover for 5-7 days. Most patients pass their first bowel motion was on 3rd-5th postoperative day. The total hospital stay was from (7-15) days.

### Results:

Of (100) patients included in this study with age range (7m-7y), there were (73) male and (27) females. The ratio of male to female was (5.5:1) in cases of Hirschsprung's disease, while (1.5:1) in cases of imperforate anus. (Table-2)

Forty-eight patients were cases of Hirschsprung's disease, while (fifty patients) were presented with ano-rectal malformations and the remaining (two patients) were cases of traumatic perforation of the rectum (Table-1).

The site of the colostomy was as follows: (84 patients) with right transverse colostomy, (2 patients) with left-descending colostomy, (2 patients) with caecostomy and (12 patients) with sigmoid colostomy. (Table-3).

The overall incidence of complications was:(Table-4)

-Wound infection: 4% (in form of minor infection 2%, stitch abscess 1% or wound dehiscence 1%).

-Fecal fistula: 2%.

-Intestinal obstruction: 6%.

-Others (e.g. Chest infection): 4%.

The incidence of complications among the first group was: (Table-5)

1-wound infection: 2 patients (4%) (Minor wound infection).

2- Fecal fistula: one patient. (2%)

3-intestinal obstruction: 1 patient (2%)

Four-others: two patients with ( chest infection) (4%).

The incidence of complications among the second group was:(Table-5)

1-wound infection: two patients (4%) (One develop stitch abscess, the other develops wound dehiscence).

2- Fecal fistula: 1 patient (2%)

3-intestinal obstruction: 5 patients (10%)

4-others: 2 patients with (chest infection) (4%)

### Discussion:

Colostomy closure is a common operative procedure with wide variation in the reported morbidity and mortality.

The incidence of complications after closure of temporary stomas in our study was (16%). A comparison between these complication rates is difficult because of different definitions of complications. This makes compare of results with other studies conflicting. Furthermore, most of the studies performed were not restricted to pediatric age group. Another important point in making comparison is the change in modalities of operative and per-operative treatment in colorectal surgery over the last 22 years, thus the influence of per-operative antibiotic treatment and pre-operative bowel preparation can be easily documented. (Literature review of morbidity and mortality after colostomy closure in the last 20 years is shown in (table 7).

Several pre-operative factors may influence the outcome of the procedure. Of these:

1-The type of the colostomy: loop colostomies are closed with lower complications than divided colostomies (table-4). This is in accordance with the findings of Anderson et al and Beck and Conklin et al (7) (8). Perhaps this relates to the more limited dissection and minimal disruption of the mesentery that is required in the usual technique for closure of loop colostomies. The formation of loop colostomy would seem preferable when 100% diversion is not mandatory.

2-The precipitating disease: this also influences the number of complications after colostomy closure .We found a higher number of certain complications in specific primary pathology (for example higher rate of intestinal obstruction with Hirschsprung's disease). (Table-6).

3-Time interval between colostomy construction and closure:

Before closure a colostomy, radiographic

contrast study is required

To verify distal intestinal caliber and continuity. The amount of stoma output, rate of weight gain, and length since operation are important factors used in determining the timing of stoma closure. Early stoma closure is technically difficult owing to residual inflammation in the bowel and peritoneal cavity. During bowel mobilization, dense vascularized adhesions obliterate the peritoneal space and increase the risk of intestinal injury. The complication rate is influenced by the time between onset and closure of stoma. Time period below 4 weeks and more than 1 year shows a higher complication rate compared to patients operated between 2 months-1 year (as we found in our study), in particular the rate of post-operative bowel fistulae and anastomotic complications more higher in the group of patients with early closure.(5)

#### 4-Operative technique:

In our study we found a slight difference in complication rates (higher rate of intestinal obstruction with double layer bowel anastomosis) (table-5). This in accordance with M. Shahata study (6). In addition, operative time during single layer anastomosis was theoretically shorter than that during double layer bowel anastomosis in establishing mucosal realignment, and utilizing less suture material will decrease the incidence of complications.

#### Conclusion:

Colostomy closure is a common procedure in pediatric surgical practice. It still carries the risk of post-operative complication in term of morbidity and mortality. Several factors are involved to determine the rate of these complications. Some depends on the general health of the child, the primary disease, the preoperative bowel preparation and one of these important factors is still the surgical technique of bowel anastomosis.

#### Recommendations:

- 1-When performing a colostomy, one should put in mind that closure will follow, so a correctly performed stoma is a crucial point.
- 2- Choosing the appropriate suture material with regard to bowel lumen and durability.
- 3-Careful preoperative bowel preparation is an important point and it should be done under expert supervision.
- 4-Single layer bowel anastomosis is advised.
- 5-Good surgical judgment is important for the appropriate technique in each individual case, in order to minimize morbidity and mortality.

**Table-1 Colostomy Indication**

Diagnosis	No.
Hirschsprung`s Disease	48

Imperforated anus	50
Trauma	02

**Table-2 Sex distribution among 100 patients**

Diagnosis	Female	Male	Total
Hirschsprung`s Disease	07	41	48
Imperforated anus	20	30	50
Trauma	02	--	02

**Table-3 Colostomy site among 100 patients**

Colostomy Site	No.
Rt. Transverse	48
Lt. Transverse	02
Sigmoid	12
Cecum	02

**Table-4 Incidence of complications following closure colostomy**

Type of Complication	No.
Wound Infection	04
Fecal Fistula	02
Intestinal Obstruction	06
Others(chest infection)	04
Total	16

**Table-5 Incidence of complications in relation to different techniques of bowel anastomosis**

Type of Complication	Single Layer (50)	Double Layer(50)
Fecal Fistula	01 (2%)	01 (2%)
Wound Infection	02 (4%)	02 (4%)
Intestinal Obstruction	01 (2%)	05 (10)
Others	02 (4%)	02 (4%)

**Table-6 Incidence of complications of colostomy closure in relation to the type of colostomy**

Type of Complication	Loop Colostomy (62)	Double Barrell (38)	Kohler et al(25)	31	182	1994	0
			Recent study(27)	138	150	1999-2001	0
Wound Infection	01 (1.6%)	03 (7.9%)	Our study	16	100	2000-2002	0
Fecal Fistula	01 (1.6%)	01 (2.6%)					
Intestinal Obstruction	03 (4.8%)	03 (7.6%)					
Chest Infection	03 (4.8%)	01 (2.6%)					

**Table-7 literature survey of morbidity and mortality rates after colostomy closure**

Name of study	Morbidity%	Patients No.	year	Mortality %
Knox et al (18)	33	179	1971	2.2
Garnjobst et al(19)	56	125	1987	0
Rosen et al(20)	1.5	153	1980	1.4
Freund et al(21)	50	114	1982	0
Salley et al(22)	2.4	166	1983	0
Park&Hasting(23)	41	83	1985	0
Pittman et al(24)	33	126	1985	0.5

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