

Outcome of loop versus divided colostomy in the management of anorectal malformations

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BACKGROUND: Colostomy is a common part of the management of high anorectal malformation (ARM) in the pediatric population.

OBJECTIVE: To evaluate whether the type of colostomy (loop vs divided) has an impact on outcome in patients with ARM.

DESIGN: A retrospective study.

SETTING: King Faisal Specialist Hospital and Research Center, a tertiary care center.

PATIENTS AND METHODS: All patients who were managed with colostomy for ARM and had definitive repair during the period of January 2000 to December 2014. Outcomes relative to the type of the colostomy were compared.

MAIN OUTCOME MEASURES: Morbidities associated with each type of colostomy.

RESULTS: There were 104 patients managed for ARM with colostomy as staged procedures, 63 males and 41 females. Patients had a colostomy at a median age of 6 days and were closed at a median of 11 months. Definitive repair was at a median age of 17 months. Type of fistula was 8 perineal, 21 rectovestibular, 35 rectourethral, 11 rectovesical and there were 16 without fistula and 13 cloaca anomalies. There were 55 loop and 49 divided colostomies. There were 91 descending/sigmoid and 13 transverse colostomies. Operative time for loop colostomy closure was shorter than with divided colostomy (76 minutes vs 94 minutes, $P=.002$). Three patients among the divided group had reversed orientation of the colostomy that had affected bowel preparations negatively prior to its repair. There was no differences in complications of creation and closure of loop and divided colostomies except in occurrence of skin excoriation. There was more skin excoriation with divided colostomy compared to loop colostomy (17 vs 10, $P=.04$).

CONCLUSIONS: Loop colostomy has a shorter closure operative time and relatively fewer complications compared to the divided colostomy. Our data suggests that loop colostomy may be more favorable than divided colostomy for ARM patients.

LIMITATIONS: Retrospective nature of the study and some colostomies performed at other hospitals.

Anorectal malformations (ARM) comprise a wide spectrum of diseases that involve the distal rectum and anus as well as the urinary and genital tracts. Colostomy is traditionally performed as part of staged management in children with high-type anorectal malformations.¹ However, some pediatric surgeons have recently advocated for the repair of ARM primarily without a colostomy for several rea-

sons, one being the significant morbidity associated with colostomy itself.²⁻⁴

The level and the type of the colostomy in ARM have been a major topic for discussion among pediatric surgeons. The type of colostomy chosen depends on healthcare resources and surgeon preference.⁵ Our study compared the outcome of loop and divided colostomy in the management of patients with ARM.

PATIENTS AND METHODS

A retrospective chart review was performed for patients managed with high ARM at King Faisal Specialist Hospital and Research Center (KFSHRC) who had colostomy as part of their management during the period of January 2000 to December 2014. Eight patients were excluded since the type of colostomy was not documented in all patients.

Demographic data along with type of malformation, age at colostomy formation and closure, age at definitive surgery, level of colostomy, type of colostomy, duration of stoma, stoma-related complications including prolapse, retraction, bleeding, parastomal hernia, stenosis, urinary tract infection, megarectum, skin excoriation, obstruction, stoma necrosis, stoma mislocation and stoma closure-related complications including wound infection, leak, bowel obstruction, incisional hernia, urinary tract infection and fistula were collected and descriptive data were generated. Outcome measures relative to the type of the colostomy were compared using the t test for continuous variables and the chi-square or Fisher exact tests for proportions. A *P* value of <.05 was considered statistically significant. Microsoft Excel 2010 software was used for analysis.

RESULTS

Over the 15-year period, 104 patients were managed for ARM with colostomy as staged procedures. There were 63 males and 41 females. There were 55 loop and 49 divided colostomies (**Table 1**). The colostomy was constructed at KFSHRC in 10 patients while the remaining 94 patients had their colostomy constructed at another hospital and were then referred to KFSHRC. Types of ARM included 8 perineal, 21 rectovestibular, 35 rectourethral, 11 rectobladder neck fistulae and 16 without fistula and 13 cloaca anomalies. The colostomy was created at a median of 6 days and were closed at a median of 11 months. Definitive repair was at a median age of 17 months. Loop colostomies had a shorter closure operative time compared to divided colostomies, the mean operative time was 76 and 94 minutes for loop and divided colostomies respectively, (*P*= .002, **Table 2**). There were 3 patients with reversed colostomy orientation among the divided group (proximal end was placed distally) performed outside our institution. The latter had created confusion and affected the bowel prep before definitive repair of the anomaly (2nd stage) and caused stool spillage during the procedure. None developed any negative sequelae. There was more skin excoriation in divided stomas compared to loop stomas (17 vs 10, *P*=.04). Other outcome mea-

asures were comparable between the two groups (**Table 3 and 4**).

DISCUSSION

High-type ARM is managed in a staged fashion, and colostomy is usually the initial procedure. Complications from colostomies have been one of the factors prompting some pediatric surgeons to advocate primary repair of ARM.

It has been suggested that divided sigmoid colostomy with enough skin bridge between proximal stoma and distal mucous fistula allows the stoma bag to be fitted on the proximal stoma, which prevents the development of urinary tract infection, megarectum, and wound infection. Divided sigmoid colostomy may result in better radiological studies and a lower incidence of prolapse.⁶ On the other hand, a loop colostomy has better cosmetic results owing to a smaller incision and is easier to create and close.

The duration of the stoma has been considered by many surgeons to be a more important factor than the type of the stoma with regard to complications, and hence a short-lived well-constructed stoma is less likely to cause any troubles regardless of its type. One study showed no difference between loop and divided stomas when the loop stoma was closed early (2-4 months).⁷ Our results showed no significant differences between the two groups in duration of stoma. This finding does not support the notion of duration-related complication differences.

In a recent study, loop colostomy was associated with a greater incidence of prolapse than divided colostomy, but there was no difference between the two

Table 1. Demographic and clinical data (N=104).

Variable	Loop colostomy	Divided colostomy	Total
Number	55	49	104
Gender			
Male	29	34	63
Female	26	15	41
Type of malformation			
Perineal fistula	6	2	8
Rectovestibular fistula	12	9	21
Rectourethral fistula	16	19	35
Rectobladder neck fistula	4	7	11
Atresia without fistula	10	6	16
cloaca	7	6	13
Level of colostomy			
Transverse	12	1	13
Descending/sigmoid	43	48	91

Table 2. Comparison by type of colostomy (N=104).

Variable	Loop colostomy n=55	Divided colostomy n=49	P value
Mean age (days) at colostomy	5.0	5.2	.2
Mean age (months) at definitive surgery	8	11	.042*
Median duration of stoma (months)	11	9	.28
Mean operative duration (min)	54	70	.3
Mean operative time (min)	76	94	.002*

t test was used to compare means (1 degree of freedom).

Table 3. Formation-related complications.

Complication	Loop colostomy n=55	Divided colostomy n=49	P value
Prolapse	5	1	.2
Retraction	0	1	.4
Bleeding	1	1	-
Peristomal hernia	1	1	-
Stenosis	1	1	-
UTI	2	4	.4
Megarectum (fecaloma)	5	1	.2
Skin excoriation	10	17	.045*
Obstruction	0	1	.4
Stoma necrosis	1	0	.4
Mislocation (reversed stoma)	0	3	-

Chi-square Fishers exact tests were used to compare proportions (1 degree of freedom).

Table 4. Closure-related complications.

Complication	Loop colostomy n=55	Divided colostomy n=49	P value
Wound infection	5	2	.45
Leak	0	0	-
Bowel obstruction	2	2	-
Incisional hernia	0	0	-
Urinary tract infection	2	3	.66
Fistula	0	2	.44

Chi-square Fishers exact tests were used to compare proportions (1 degree of freedom).

groups in other complications such as urinary tract infection or megarectum.⁸ However, prolapse depends more on the level rather than the type of colostomy. A stoma in a mobile portion of the colon is more likely to prolapse than one in a fixed portion of the colon.

Other studies that compared loop and divided (split) colostomy in children showed no difference in complications between the two groups (23% and 16%, respectively, $P=.389$) and the most common complication reported was prolapse, however all prolapses occurred in the transverse colon group.⁹

Our results showed no differences between the loop and divided colostomies except in the occurrence of skin excoriation, which might be attributed to either the difficulty in applying the stoma appliance firmly around the stoma to prevent leakage or lack of an accurate definition for peristomal skin excoriation. Another study showed that the incidence of skin excoriation as well as prolapse was higher in the loop compared to the divided colostomy group, and the majority of loop colostomy cases were at the transverse colon.¹⁰

The risk for fecal impaction in the distal loop (fecaloma or megarectum) and potential contamination of the urinary tract are considered among the main reasons why surgeons elected to do divided colostomies in ARM patients. However, in our studies as well as other published series, there were no differences between the two types of stomas in terms of fecaloma or urinary tract infection. One study performed in a subgroup analysis of patients with a rectourinary fistula controlled for other risk factors, yet found no difference in urinary tract infection.¹¹

Table 5. Comparison of our results with other similar studies.

	Almosallam et al n=104	Oda et al⁸ n=144	Billur et al¹¹ n=155	Liechty et al¹² n=171
Loop/divided	55/49	73/71	77/65	78/93
Level of colostomy				
Transverse	13	18	83	Majority were in the proximal sigmoid colon
Sigmoid/descending	91	126	59	
Complications	Skin excoriations was higher in divided colostomy group	Prolapse was higher in loop colostomy group	No difference in complications between loop and divided colostomy groups	No difference in complications between loop and divided colostomy groups

In our study, the majority of colostomies were constructed at another hospital (another limitation in addition to being a retrospective review), and some of these cases were performed by general surgeons. Nonetheless, our data are comparable to other data reported in the literature (Table 5).^{8,12}

Three of our patients who had their divided colostomies constructed outside our institution had reversed orientation of the colostomy ends with the proximal end placed distally in the wound. This caused confusion in bowel preparations since we only wash the distal loop prior to the definitive anomaly repair (2nd stage). The reversed orientation caused stool spillage during

the procedure but no infective complications afterwards. The latter may suggest a superiority for the loop colostomy over the divided type.

In conclusion, the loop colostomy has a shorter operative time and relatively fewer complications compared to the divided colostomy. Our data suggests that loop colostomy may be more favorable than divided colostomy for ARM patients. Although considered simple, colostomy remains a delicate procedure that requires good surgical skills and postoperative care to prevent complications. Moreover, early definitive repair and thus early closure of the colostomy may minimize morbidity.

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