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Brief communication (Original)

Outcome of colostomy closure and influencing factors in patients with anorectal malformation

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Background: Colostomy formation and closure procedures are common operations, frequently be performed in patients with anorectal malformation. Collected information is lacking concerning the outcome of colostomy closure operations and the major factors influencing the outcome.

Objective: The authors examined the outcome and complications of colostomy closure in patients with anorectal malformation, and the major factors influencing the outcome.

Materials and methods: The study period was January 1997 through December 2007. A review of medical records from this period showed 259 cases of anorectal malformations (ARM). The records of one hundred and one patients from Songklanagarind Hospital were examined. The variables considered were first feeding time following the procedure, length of hospital stay and presence of complications. Influencing factors that might be related with these outcomes were identified.

Results: The data showed 107 colostomy closures. The median first feeding time was two days and median post operative hospital stay was five days. There were 13 cases (12.2%) of acute complications, of which the most common was wound infection (four cases, 3.7%) and 16 cases of late complication, most of which were fecal impaction (eight cases, 7.5%). Acute post-operative complications were more likely in patients with co-morbidity prior to surgery (*p*-value 0.088) and in transverse-end colostomies (*p*-value 0.004), and with an interval between colostomy formation and closure less than four months or more than eight months (*p*-value 0.010). Hospital stay was longer in patients with transverse-end colostomy (*p*-value 0.051), Down syndrome (*p*-value 0.009) and acute complications (*p*-value <0.001).

Conclusion: Many variables influenced the outcome of colostomy closure, most commonly co-morbidity prior to surgery, transverse-end colostomy, Down syndrome, and longer or shorter than normal interval between colostomy formation and closure.

Keywords: Anorectal malformation, colostomy closure, complication

Anorectal malformations are a wide group of malformations characterized by an abnormal anal opening. Most often detected at birth, this abnormality can range from stenosis of the normally sited opening, to an abnormal position of the anus, to complete absence of the anus. Associated with the apparent problem with the anus, are a range of local abnormalities affecting the rectum and the adjacent genitourinary system. The reported incidence of ARM ranges from 1:5000 to 1:3300 live births [1]. Even through in recent years a growing number of pediatric surgeons have begun advocating the repair of ARM in a primary fashion without a colostomy, most pediatric patients with an ARM still receive a protective colostomy before the main repair to avoid contamination.

Many surgeons pay attention and often reveal the outcome and complication of colostomy formation. There have been only a few studies that have examined the outcome and complications of colostomy closure and the major factors influencing the outcome. Major complications of colostomy closure include bleeding, anastomosis leakage, intraabdominal abscess, and abdominal wall mucocele [2, 3].

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Some factors have been found to be prognostic or influencing the colostomy closure results such as co-morbidity before stromal closure (in adults), type, and location of colostomy (children), or the interval between stromal formation and closure [4-9]. In this study, we provide more information about the outcome of colostomy closure and influencing factors in patients with anorectal malformation in our institute.

Materials and methods

A retrospective analytic study was performed of all patients with anorectal malformation who were admitted between January 1997 and December 2007 and received a closure colostomy at Songklanagarind Hospital, Hatyai, Thailand. Patient demographics, type of ARM, operative findings and results after the colostomy closure were collected. The histopathology of their colostomy ends before the closure colostomies were reviewed for ganglion cell counts that were used to analyze correlations with outcomes after the closure.

Parametric data are presented as median range unless otherwise stated. Non-parametric variables are compared using Mann Whitney U test and Fisher's exact tests. Statistical significance is considered achieved with a p-value of less than 0.05.

Results

The review of the medical records showed 259 cases of anorectal malformations (ARM) were admitted during the study period. One hundred and one patients underwent 107 colostomy closures in this group (six patients had a second closure for various reasons i.e. gut obstruction requiring second colostomy (**Table 1)**. Median first feeding time was two days (range 1-11 days) and median postoperative hospital stay was five days (range 3-24 days) as shown in **Table 2**.

There were 13 cases (12.15%) of acute complications (deemed to be a complication that was detected within one month after the operation) as can be seen in **Table 3**. Wound infection was the most common complications (4 cases, 3.7%) followed by acute gastroenteritis (3 cases, 2.8%) and urinary tract infection (2 cases, 1.9%), and there were 16 record of late complications (a complication detected one month or longer after the operation), fecal impaction (8 cases, 7.5%) gut obstruction (4 cases, 3.7%), rectal prolapsed (2 cases, 1.9%) and entero-urinary tract fistula (2 cases, 1.87%).

Table 1. Demographic data (n = 101)

Characteristics	Number
Sex	
Male	75
Female	26
Type of ARM	
Low	26
Intermediate	35
High	40
VACTERL* association	9
Down syndrome	12

* VACTERL = vertebra, anus, cardiac, T-E fistula, renal, and limb abnormally

Table 2. Outcome of Colostomy Closure

Outcome	Result
Mean first feeding time	2.04 (1-11) days
Mean hospital stay	5.85 (3-24) days
Complications	
Acute	13 (12.2%)
Late	16 (15%)

Nine variables (intra-operative adhesion, co-morbidity before surgery, type of colostomy, number of ganglion cells at colostomy site, bowel preparation quality, intra-operative fecal contamination, type of ARM, Down syndrome and interval of stomal formation to closure) were analyzed for correlations with outcome after the colostomy was closed. All variables were reviewed from the inpatient data folder. We calculated the association of each variable factor with the outcome of colostomy closure (time to first feeding, length of hospital stay and presence of complications) as shown in **Tables 4-6**. Acute post-operative complications were more likely in patients with co-morbidity prior to surgery (p-value 0.088), in transverse end colostomies (p-value 0.004), and in patients where the interval between colostomy formation and closure was less than four months or more than eight months (p-value 0.010). No factor related to time of first post-closure feeding was identified. Hospital stay was longer in patients with transverse end colostomy (p-value 0.051), Down syndrome (p-value 0.009) and acute complications (p-value <0.001). Many variables such as adhesion, ganglion cell number, quality of bowel preparation, intra-operative fecal contamination, and type of ARM showed no evidence of influence on outcome.

Table 3. Acute and late complications after colostomy closure in 107 patients

Type of complication	Number
Acute complications	
Wound infection	4
Acute gastroenteritis	3
Urinary tract infection	2
Gut obstruction	2
Pneumonia	1
Sepsis	1
Bleeding per rectum	1
Late complications	
Fecal impaction	8
Gut obstruction	4
Entero-urinary tract fistula	2
Prolapsed rectum	2

Table 4. Univariate association analysis of clinicopathological factors with acute complication after colostomy closure

Variable	Number of complications/total		*p*-value
Adhesion: No adhesion	4/37	9/70	0.758
Co- morbidity: No Co- morbidity	4/16	9/91	0.088
Transverse end: Loop sigmoid	4/10	8/89	0.004
Ganglion cell number (<6 cells/HPF: ≥6cells/HPF)	6/49	4/31	0.931
Bowel preparation quality (Fair or Poor: Good)	0/3	1/13	0.620
Fecal contamination: No contamination	0/2	3/23	0.586
Type of ARM (Low : Intermediate and High)	3/26	10/70	0.965
Down syndrome (Present: None)	12/89	1/12	0.668
Interval from stomal formation to closure (<122d to122-243d: 244-365d to >365d)	3/57	10/41	0.010

Table 5. Univariate association analysis of clinicopathological factors with the first feeding time after colostomy closure

Variable	Mean first feeding time + standard deviation (days)		*p*-value
Adhesion: No adhesion	2.05±0.80	2.03±1.47	0.270
Co- morbidity: No Co- morbidity	2.44±2.61	1.97±0.86	0.498
Transverse end: Loop sigmoid	2.30±1.16	2.03±1.33	0.362
Ganglion cell number (<6 cells/HPF: ≥6cells/HPF)	1.98±1.09	2.23±1.78	0.646
Bowel preparation quality (Fair or Poor: Good)	2.33±0.58	2.00±0.82	0.351
Fecal contamination: No contamination	2.5±0.71	1.91±0.79	0.250
Type of ARM (Low: Intermediate: High)	1.67±0.88 : 2.08±0.75 : 2.25±1.71		0.136
Down syndrome (Present: None)	1.67±0.99	2.08±1.30	0.291
Interval of stomal formation to closure (<122d to 243d: 244d to >365d)	2.25±2.44 : 1.88±0.75 : 1.89±1.27 : 2.18□1.14		0.586
Acute complication (Yes: No)	3.31±2.69	1.86±0.81	0.093

Table 6. Univariate association analysis of clinicopathological factors with length of hospital stay

Variable	Mean length of hospital stay + standard deviation (days)		*p*-value
Adhesion: No adhesion	5.38±1.64	6.10±3.92	0.749
Co- morbidity: No Co- morbidity	7.63±6.20	5.54±2.44	0.396
Transverse end: Loop sigmoid	6.50±2.27	3.80±3.50	0.051
Ganglion cell number (<6 cells/HPF: ≥6cells/HPF)	5.53±2.78	6.52±4.70	0.438
Bowel preparation quality (Fair or Poor: Good)	4.67±0.58	5.15±1.82	0.889
Fecal contamination: No contamination	4.50±0.71	5.17±1.70	0.604
Type of ARM (Low: Intermediate: High)	5.30±1.60 : 6.05±3.24 : 6.02±4.11		0.783
Down syndrome (Present: None)	7.67±6.11	5.62±2.76	0.474
Interval of stomal formation to closure (<122d: 122-243d: 244-365d: >365d)	7.31±6.32 4.80±1.03	6.78±3.27 6.12±3.20	0.225
Acute complication (Yes: No)	10.50±5.83	5.21±2.19	<0.001

Discussion

Prior to their colostomy closure, all patients had pre- operative bowel preparation consisting of a low-residue diet for two to three days followed by mechanical bowel washes and perioperative antibiotics. In the majority of loop colostomies, the loop was divided completely before anastomosis. In the remaining patients, only a wedge of the loop was resected. Tissue from both ends was sent for further pathological evaluation. A hand-sewn extramucosal single-layered technique with 3-0/4-0 PDS was used for all anastomoses.

In the study, there were many factors to compare and analyze to see if there was any association between these and the outcome. However, the judgment of factors such as adhesion and fecal contamination is subjective. Furthermore, in this institute, we have no strict criteria for documenting and classifying the severity of adhesion and fecal contamination intra-operatively.

Strong evidence of some relationship between ARM and Hirschsprung's disease has been reported [10] and literature about ganglion cell numbers in the colon [11]. We wonder prior to doing the study about the effect of the amount of ganglion cells on colonic function. The normal practice in our institute is to collect the tissue from all colostomy sites before closure of the colostomy for further pathological evaluation. We used six cells per high power field for evaluation because this was the mean value of ganglion cells from each patient in our study. However, we found no significant correlation between the number of ganglion cells and outcomes. We found little data on bowel preparation (only 16 patients) as this information is not normally recorded in our institution because there is not a necessary data that must be recorded before each operation was performed.

Most of the pediatric surgeons in our institute prefer to perform a sigmoid loop colostomy first because it is easier to create the opening and closing ostomies, and the end function is usually better[12]. Therefore, in the group of transverse colostomy patients may have some problems that we could not find during reviewing data.

We compared our results with previous studies as shown in **Table 7** and found comparable results in terms of the complication rate that in these studies range from 6.5-39.3%. Our study found the most common complication is wound infection (3.74%) and the most common gastrointestinal complication was gut obstruction.

Even through this study had a large number of patients, because some factors were not recorded completely so there were too little data to determine if some variables had an influence on the outcomes or long-term complications. Further studies are required.

Conclusion

A colostomy is a necessary operation to help ARM patients defecate, while they are waiting for total correction. Complications of colostomy closures have infrequently been examined. In this study, we

Table 7. Comparing our results with previous studies

	Year	N	Acute complication rate	GI related complication rate	Wound infection rate	Gut obstruction
Current study	2009	107	12.15%	8.41%	3.74%	2.8%
A. Pena	2006	50	8%	-	4%	2%
B. Chandramouli	2004	56	39.3%	-	12.6%	3.68%
S. Nour	1996	136	6.5%	-	3.33%	N/A

present the incidence and details of colostomy results in our institution. The first feeding time and length of hospital stay were on average two days and five days after the operation, respectively. The acute complication rate was 12.15% and the major complication was wound infection. Acute complications post operation were more likely in patients with a co-morbidity prior to surgery, those who had a transverse end colostomy procedure or those whose interval between colostomy formation and closure was less than four months or more than eight months. Hospital stay was longer in patients with a transverse-end colostomy, Down syndrome, and acute complications. However, no factor that had an impact on first feeding time postoperative closure colostomy was identified.

The authors have no conflict of interest to report.

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