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Colostomy for large bowel anomalies in children: A case controlled study

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KEYWORDS

Colostomy;
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Abstract *Background:* In children, colostomy may be required as a crucial part of treatment of some congenital anomalies of the large bowel. The procedure is associated with significant complications. This study reviews the morbidity and mortality of colostomy formation and closure for large bowel anomalies over a 10-year period in southeast Nigeria.

Methods: Evaluation of 182 colostomies and 146 colostomy closures performed in children at the University of Nigeria Teaching Hospital Enugu from January 1995 to December 2004.

Results: Hirschsprung's disease (106) and anorectal malformation (76) were the large bowel anomalies requiring colostomy. Of these, 133 (73.1%) were boys, while 49 (26.9%) were girls and their age ranged from 3 days to 15 years (mean 2.8 years). For anorectal malformation, the mean age at colostomy formation was 15.5 days (range 3–75 days), while in Hirschsprung's disease the mean age was 4.6 years (range 8 days–15 years). Ninety-two children (50.5%) had defunctioning colostomy and 90 (49.5%) had loop colostomy, with 177 (97.3%) of these sited in the transverse colon, while the remaining 5 (2.7%) were sited in the sigmoid colon. There were 123 complications that developed in 79 (43.4%) children. Skin excoriation (40 cases) and prolapse (37 cases) were the commonest complications. Other complications included wound infection (20 cases), superficial wound dehiscence (9 cases), stoma stenosis (5 cases), stoma retraction (5 cases), stoma bleeding (3 cases) and 2 cases each of stoma necrosis and burst abdomen. The complications were not dependent on the primary indication but prolapse occurred more frequently in children with Hirschsprung's disease who had colostomy after 5 years of age ($P < 0.001$). Loop colostomy had higher complication rate than defunctioning colostomy ($P < 0.001$). Colostomy revision was required in 15 patients. Death directly related to colostomy formation occurred in 3 (1.6%) patients from severe infection. Complications following colostomy closure (20 cases) occurred in 17 children and include wound infection (11 cases), stitch granuloma (5 cases), and 2 cases each of small bowel obstruction and incisional hernia. These were not related to the duration of the colostomy.

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Conclusions: A significant number of colostomies for large bowel anomalies are constructed late in our setting. This is largely due to delayed presentation in Hirschsprung's disease and may be associated with increased morbidity. Loop colostomy is associated with higher rate of complication and as much as possible should be performed less often.

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Introduction

Colostomy forms part of management of many children with congenital and acquired disorders of the large bowel. Overall, Hirschsprung's disease (HD) and Anorectal malformations are the commonest indications for colostomy in children.^{1,2} It is constructed to decompress an obstructed large bowel and to protect a future low bowel anastomosis. In anorectal malformations colostomy also prevents faecal contamination of the urinary tract. Many studies have indicated that colostomy formation and closure are associated with appreciable morbidity and mortality.²⁻⁴ As a result, some surgeons have called for modification of the operative technique while others advocate management of most cases of large bowel anomalies without preliminary colostomy.^{1,5}

In many reports from the West African sub-region,⁶⁻⁸ the data on colostomy in the paediatric age is often buried within the broad spectrum of colostomy in all ages. The net result is that the peculiar problems of children who had colostomy as part of management of large bowel anomalies in the sub-region have not been emphasized.

This study reviews our experience with colostomy formation and closure in children with large bowel anomalies over a 10-year period in southeast Nigeria.

Patients and methods

In southeastern Nigeria, most children with large bowel anomalies are managed at the paediatric surgical units of the University of Nigeria Teaching Hospital, Enugu. Over a period of 10 years (from January 1995 to December 2004), 182 colostomies were performed in 106 children with Hirschsprung's disease and 76 children with anorectal malformations. These excluded the children who were operated elsewhere and referred after having colostomy. These children were analysed. Data on age at colostomy formation, sex, and indication for colostomy, type of colostomy, complications of colostomy and mortality related to the colostomy were collected from the case records. Chi-square test of proportion was used to determine the *P* value.

During the same period, 146 children underwent colostomy closure including those whose colostomies were performed before referral to our centre. These cases were also analyzed with respect to complications following the closure of colostomy.

EPI Info version 6 was used to analyze the data.

Results

Colostomy formation

There were 133 (73.1%) boys and 49 (26.9%) girls with a male:female ratio of 2.7. The mean age at colostomy

formation was 2.8 years (range 3 days to 15 years). Fifty-nine of these children were neonates at the time of colostomy formation, 37, were aged 1–12 months while 50 were between 1 and 5 years. Of the rest, 26 were 6–10 years while 10 children were 11 years of age and above (Table 1).

Indications and types of colostomy

One hundred and six children with Hirschsprung's disease and 76 children with anorectal malformation had colostomy as part of their treatment protocol.

Colostomy site and type differed according to the preference of the surgeons. One hundred and seventy-seven colostomies (97.3%) were sited in the transverse colon, while 5 (2.7%) were sited in the sigmoid colon. Of these, defunctioning colostomy was the procedure in 92 (50.5%) children, while 90 (49.5%) children had loop colostomy.

Complications of colostomy

In all there were 123 complications that developed in 79 (43.4%) of the children. This is summarized in Table 2.

Skin excoriation (40 cases) was the commonest complication. Three (7.5%) of these were severe (Fig. 1), while the others were mild or moderate. Topical treatment with zinc oxide paste resulted in satisfactory recovery in all. Thirty-seven cases of prolapse (Fig. 2) were documented. Thirty-two of these followed transverse loop colostomy while 5 resulted from transverse defunctioning colostomy. Twenty-six (70.3%) of the prolapses occurred in children who were >5 years at colostomy formation compared to 11 (29.7%) in children who were 5 years old or less at colostomy formation (*P* < 0.001). In all, 33 cases of prolapse were managed conservatively while the remaining 4 cases required revision surgery.

There were 20 cases of wound infection. Of these, 19 cases recovered on local wound management with regular dressing. The remaining child developed overwhelming infection.

Four of the 9 cases of superficial wound dehiscence required secondary wound closure after conservative

Table 1 Age and sex distribution of 182 children at colostomy formation

Age	Male	Female	Total	Percentage
<1 month	42	17	59	32.4
1–12 months	29	8	37	20.3
1–5 years	37	13	50	27.5
6–10 years	18	8	26	14.3
11–15 years	7	3	10	5.5
Total	133	49	182	100

Table 2 Complications after colostomy formation

Complications	Transverse defunctioning colostomy	Transverse loop colostomy	Sigmoid loop colostomy
Skin excoriation (<i>n</i> = 40)	18	20	2
Prolapse (<i>n</i> = 37)	5	32	—
Wound infection (<i>n</i> = 20)	8	11	1
Superficial wound dehiscence (<i>n</i> = 9)	2	7	—
Stenosis (<i>n</i> = 5)	2	3	—
Retraction (<i>n</i> = 5)	1	4	—
Bleeding stoma (<i>n</i> = 3)	3	—	—
Burst abdomen (<i>n</i> = 2)	—	2	—
Stoma necrosis (<i>n</i> = 2)	2	—	—

treatment failed. The remaining 5 cases responded favourably to conservative treatment.

There were 5 cases of stoma stenosis with 4 of them involving only the proximal stoma and the remaining case involving both the proximal and distal stoma. Three of these were severe and required revision.

Of the 5 cases of stoma retraction, 4 were severe and required operative revision. The remaining child was managed conservatively.

Significant bleeding from the stoma occurred in 3 children. Pressure dressing controlled the bleeding in all.

The 2 cases each of burst abdomen and stoma necrosis were managed by surgical revision of the colostomy.



Figure 1 Extensive skin excoriation in a 6-month-old boy managed during the period of study. Topical zinc oxide treatment was successful.



Figure 2 Five-year-old boy with prolapse from distal stoma in a loop colostomy managed during the period of study. He was managed by operative revision.

Overall, the complication rate of 91.1% (82/90) in patients with loop colostomy was significantly more than the rate of 44.6% (41/92) in those with defunctioning colostomy ($P < 0.001$). The increased complication rate in loop colostomy was mostly due to the difference in the incidence of prolapse.

Mortality

There were 3 deaths directly related to colostomy formation. This represents a mortality rate of 1.6%. The cause of death was unrelenting sepsis in one patient each with stoma necrosis, burst abdomen and severe wound infection. Two of the deaths occurred with loop colostomy while the remaining involved a child with defunctioning colostomy.

Differences between colostomy in Hirschsprung's disease and anorectal malformations

All of the cases of anorectal malformation had colostomy before 3 months of age (mean age 15.5 days, range 3–75 days). In HD, the mean age at colostomy formation was 4.6 years (range 8 days–15 years). The overall complication rate of colostomy in anorectal malformation was 57.9% (44/76) while the rate in HD was 74.5% (79/106). This difference was largely due to higher incidence of prolapse in HD. Table 3 highlights the differences between colostomy in Hirschsprung's disease and anorectal malformation.

Colostomy closure

One hundred and forty-six colostomies were closed after a mean duration of 5.5 months (range 2–18 months). Seventeen of children (11.6%) developed 20 complications. Table 4 shows the complications.

Wound infection (11 cases) was the most common complication. The other complications included stitch granuloma (5 cases), adhesive small bowel obstruction (2 cases), and incisional hernia (2 cases). Apart from the 2 cases of incisional hernia that required operative

Table 3 Differences between colostomy in Hirschsprung's disease and anorectal malformations

	Hirschsprung's disease (n = 106)	Anorectal anomaly (n = 76)
Mean age at colostomy	4.6 years	15.5 days
Colostomy type		
Defunctioning	51	41
Loop	55	35
Overall complication rate	74.5%	57.9%
Mortality	2 (1.9%)	1 (1.3%)

treatment, all of the other children recovered with conservative treatment.

There was no death from colostomy closure.

Discussion

The mean age of 2.8 years at colostomy formation in this study indicate that most of our patients presented late for treatment. Though all the cases of anorectal malformation requiring colostomy had it performed before 3 months of age, most of our cases of HD had their colostomies late. The reason for this delay in HD may be the dearth of paediatric surgeons in our sub-region and lack of awareness of these anomalies among the majority of health care workers. The late presentation may also be related to the preference of parents for traditional methods of treatment and their recourse to hospitals when their expectations are not met.⁹ It follows therefore that a public health enlightenment programme may help to achieve early diagnosis.

In this study as in some other studies,^{1,4} Hirschsprung's disease (HD) is the commonest large bowel anomaly requiring colostomy. Recent reports from Europe¹⁰ and Asia,¹¹ however, indicate that anorectal malformation forms the main indication for colostomy formation in children. The reason for this disparity in our setting may have a bearing on the relative incidence of HD and anorectal malformation in our environment. Also, majority of HD presenting late constrains the surgeon to perform colostomy for many cases that would otherwise have been managed without colostomy if they presented early.

In our series, most of the colostomy for HD and anorectal malformation was sited in the right transverse colon. Similar findings have been reported in some studies.^{3,4,10} In our centre, lack of frozen section facilities may have been the reason for performing majority of the colostomies

in the transverse colon. In HD, this is probably to assure a point adequately proximal to the aganglionic bowel. Siting the colostomy in the transverse colon also has the advantage of providing an appreciable length of large bowel for definitive reconstruction, leaving the colostomy undisturbed to protect the distal anastomosis.

Defunctioning colostomy was the most frequently employed stoma technique in this study. In some older studies,^{4,12} loop colostomy was commonly performed, but more recent studies^{1,2,5,11} favour a more common use of defunctioning colostomy in managing large bowel anomalies. Defunctioning colostomy minimizes faecal overflow into the distal segment: in anorectal malformation, this prevents contamination of the urinary tract through the recto-urinary fistula while in HD faeces will not accumulate in the distal segment to form troublesome concretions.

The overall complication rate of 43.4% following colostomy formation in our series is similar to the 32–80.5% morbidity reported in other studies.^{4,5,10,11,13,14} Skin excoriation was the most common complication encountered in our patients. There is a tendency to underestimate this complication especially in a retrospective setting,¹ and as such, it might be overlooked and not documented. In our centre, stoma bags are not readily available. This leads to increased contact of colostomy effluents with the peristomal skin. Fortunately, salves are available and affordable as prophylactics to protect the skin. The high rate of stoma prolapse associated with transverse loop colostomy confirms findings of many previous reports.^{1,2,4,5} No consistent explanation has been given for this. In our environment, the predominantly high-fibre diet and the late presentation in cases of HD may also play a role. Cases of HD presenting late already have dilated and redundant colon and when this is combined with the marked mobility of the transverse colon, there is a higher tendency for prolapse. This may be the reason for the significant high incidence of prolapse in children who had their colostomy performed after the age of 5 years.

Some authors believe that performing defunctioning stoma technique rather than the loop technique can minimize complications from colostomy.^{5,11} The finding in this study that loop colostomy has a significantly higher incidence of complications agrees with this. Though some other studies^{14,15} observed no significant difference in morbidity between defunctioning and loop colostomy, a defunctioning stoma technique should be performed whenever possible.⁵

Mortality figures following colostomy formation range from 0% to 3.3%.^{1,5,10,11,14,15} The commonest cause of death as in this study is unremitting infection. Mortality can be minimized or avoided entirely by diligent management of the complications as they arise.

Table 4 Complications after 146 colostomy closures

Complications	Transverse defunctioning colostomy (n = 66)	Transverse loop colostomy (n = 73)	Sigmoid loop colostomy (n = 5)
Wound infection	8	3	—
Stitch granuloma	1	4	—
Adhesive small bowel obstruction	2	—	—
Incisional hernia	—	2	—

The morbidity of colostomy closure is reported to comprise mostly of general surgery complications.^{5,11,16} A similar observation was made in the current study. Wound infection and adhesive bowel obstruction are the commonest complications. Management of these complications is sometimes challenging but the overall mortality is low.^{5,16}

The high incidence of complications as well as the definite mortality associated with colostomy formation and closure is one of the factors compelling some surgeons to advocate primary definitive procedures for HD and anorectal malformation.^{5,17,18} Such advocacy has limitations in many developing and least developed countries where fundamental problems such as late presentation, poverty, ignorance and lack of facilities and qualified personnel are still common.

Conclusion

Colostomy formation and closure as part of management of large bowel anomalies is associated with appreciable morbidity and mortality. Loop colostomy technique has a significantly higher complication rate than defunctioning colostomy. This high incidence of complications indicates that defunctioning colostomy is the preferred stoma technique for these anomalies, especially in a setting of late presentation and lack of facilities. Despite this, careful attention to technical details and diligent post-operative and stoma care cannot be overemphasized.

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