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COMPARISON OF THE OUTCOME OF DESCENDING DIVIDED VERSUS SIGMOID LOOP COLOSTOMY IN PATIENTS WITH ANORECTAL MALFORMATION

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Abstract

Objective: *To compare the outcomes of descending divided versus sigmoid loop Jcolostomy in neonates with anorectal malformations (ARM) in terms of stoma prolapse, retraction, and parastomal hernia.* ***Methodology:*** *This randomized controlled trial was conducted at the Department of Pediatric Surgery, Sahiwal Teaching Hospital, over eleven months. A total of 280 neonates with ARM were randomly assigned into two groups: Group A (descending divided colostomy) and Group B (sigmoid loop colostomy), with 140 patients in each group. Patients were monitored for complications including stoma prolapse, retraction, and parastomal hernia for 30 days post-surgery.* ***Results****: The incidence of stoma prolapse was 9.8% in Group A and 10.2% in Group B (p = 0.905). Stoma retraction occurred in 2.8% of Group A and 4.4% of Group B (p = 0.476), while parastomal hernia rates were 1.4% in Group A and 2.2% in Group B (p = 0.617).* ***Conclusion:*** *Both descending divided and sigmoid loop colostomies are equally safe and effective for managing ARM, but no remarkable statistical difference was recorded.*

INTRODUCTION

The management of high-type anorectal malformations (ARM) is typically staged, with colostomy as the first surgical step. However, due to complications associated with colostomies, some pediatric surgeons have proposed primary repair of ARM as an alternative approach.[1] The condition affects approximately 1 in 5,000 live births globally and is often linked to various congenital syndromes. Most cases are identified in the neonatal period.[2] Colostomy surgery involves making an opening (stoma) in the abdomen to redirect the passage of stool. The colon is brought to the surface and sutured to the skin to form this stoma, allowing waste to exit the body. Among pediatric patients, colostomy remains the most commonly performed stoma.[3]

Recent findings suggest that sigmoid loop colostomy is more prone to prolapse than divided colostomy, but no other notable differences emerged between the two groups in other complications such as urinary tract infection or mega rectum.[4] A divided sigmoid colostomy with enough skin separation between the two openings helps secure the stoma bag, reducing the chances of infections and complications like mega rectum. A divided descending colostomy also improves radiological assessment and lowers the risk of prolapse. Conversely, a sigmoid loop colostomy is simpler to create and reverse, offering

improved cosmetic outcomes due to a smaller incision.[5]

Various investigations on loop and divided (split) colostomy in pediatric patients showed comparable complication rates between the two techniques.[6] A study showed that no difference in outcome between both procedures i.e. parastomal hernia (0% with sigmoid loop and 2.2% divided colostomy), stoma prolapse (7.7% vs 9.7%) and stoma retraction (7.7% vs. 2.2%).[7] One more study found that no difference exist regarding outcome in both procedures i.e. parastomal hernia (1.8% with sigmoid loop and 2.0% divided colostomy), stoma prolapse (9.1% vs, 2.0%) and stoma retraction (0% vs. 2.0%).[8] But one trial found that parastomal hernia occurred in 5.6% with sigmoid loop and 2.2% divided colostomy, stoma prolapse (11.1% vs. 2.2%) and stoma retraction (3.3% vs. 2.2%).[9] Another trial also found that parastomal hernia occurred in 3.0% with sigmoid loop and 0.0% divided colostomy, stoma retraction (1.4% vs. 4.2%) while stoma prolapse (17.8% vs. 2.8%, $p<0.05$).[10]

The most commonly used types are descending divided colostomy and sigmoid loop colostomy. Both methods have their benefits and drawbacks and there is controversy that which technique has better outcome regarding complication rate. Additionally, morbidity following a sigmoid loop colostomy with a skin and muscle bridge is significantly lower. Given its benefits, the skin and muscle bridge technique can be confidently utilized. Previous studies have found no significant differences between loop and divided colostomies, except for a higher incidence of skin excoriation. This could be due to challenges in properly securing the stoma appliance to prevent leakage or the lack of a standardized definition for peristomal skin excoriation.

METHODOLOGY:

This randomized controlled trial was conducted in the Department of Pediatric Surgery at Sahiwal Teaching Hospital, Sahiwal, over a period of eleven months from March 2024 to February 2025 following the approval of the study synopsis. A total of 280 neonates, with 140 assigned to each group, were included in the study. The sample size was calculated using the WHO sample size calculator with a power of 80%, a 5% level of significance, and prevalence rates of 4.2% for stoma retraction in descending divided colostomy and 0% in sigmoid loop colostomy. Non-probability consecutive sampling was employed to recruit neonates for the study.

Neonates aged 24-72 hours of both genders, diagnosed with anorectal malformations with recto-urinary or vestibular fistulae, were included. Neonates with fistulous tracks involving the skin, pouch colon syndrome, common cloacae, intestinal perforation, septicemia, or disseminated intravascular coagulation (D-dimer > 400 IU) were excluded from the study. Upon approval from the hospital's ethics committee, informed consent was taken from the parents or guardians of the neonates. Baseline demographics, including age, gender, weight, gestational age, and family history of anorectal malformations, were recorded.

The neonates were randomly allocated into two groups using the lottery method. Group A underwent surgery using the descending divided colostomy technique, while Group B underwent sigmoid loop colostomy. The same surgical team performed all procedures under general anesthesia with assistance from the primary researcher. Operative time and intraoperative blood loss were documented. Postoperatively, the neonates were transferred to pediatric surgical wards and given standard antibiotic and analgesic regimens. During follow-up, neonates were monitored for complications such as stoma prolapse, retraction, and parastomal hernia, as defined in the operational definitions. Any complications were managed in accordance with standard clinical practices. All relevant data were collected using a standardized proforma.

Data analysis was conducted using SPSS version 25. Numeric variables, including age, weight, gestational age, operative time, and blood loss, were presented as mean and standard deviation. Categorical variables, such as gender, family history of anorectal malformations, and outcome variables (stoma prolapse, retraction, and parastomal hernia), were expressed as frequencies and percentages. The chi-square statistical method was used to analyze outcome differences between the groups, setting $p < 0.05$ as the benchmark for significance. Data were further stratified based on age, gender, weight,

gestational age, family history of anorectal malformations, operative time, and blood loss, with post-stratification comparisons performed using the chi-square test within each stratum.

RESULTS

Table 1 outlines the demographic profile of the 280 neonates enrolled in the study, with Group A comprising 140 patients who underwent descending divided colostomy and Group B comprising 140 patients who underwent sigmoid loop colostomy. The age distribution of the neonates was similar between the groups, with 74.8% of patients in Group A and 78.8% in Group B aged between 24-48 hours (p = 0.427). Similarly, there was no significant difference in gender distribution, with males constituting 51.0% of Group A and 51.1% of Group B (p = 0.994).

Regarding birth weight, 79.0% of neonates in Group A and 83.9% in Group B weighed less than 3 kg at birth(p = 0.290). Gestational age was also comparable between the groups, with 58.0% of neonates in Group A and 54.7% in Group B born at 38-40 weeks of gestation (p = 0.578). Operative time was recorded as up to 60 minutes in 83.2% of Group A and 78.8% of Group B, with no significant difference (p = 0.349). Family history of anorectal malformations was equally distributed between the two groups, with 51.0% of patients in Group A and 51.1% in Group B having a positive family history (p = 0.994). These data suggest that the groups were well-matched in terms of demographic characteristics. Table 2 presents a comparative analysis of the outcomes associated with descending divided colostomy (Group A) and sigmoid loop colostomy (Group B) in patients with anorectal malformation (n = 280). The table evaluates three key post-operative complications: colostomy prolapse, colostomy retraction, and parastomal hernia(p-value <0.05). Colostomy prolapse was observed in 14 patients (9.8%) in Group A and 14 patients (10.2%) in Group B, resulting in an overall incidence of 10% (28/280). As the difference between the two groups was negligible, the comparison did not reach statistical significance (p = 0.905), suggesting that both techniques present a comparable risk of prolapse. In terms of colostomy retraction, 4 patients (2.8%) in Group A and 6 patients (4.4%) in Group B experienced this complication, with an overall occurrence of 3.6% (10/280). The difference was statistically insignificant (p = 0.476), indicating that both methods pose a similar risk of retraction. Parastomal hernia was the least frequent complication, occurring in 2 patients (1.4%) in Group A and 3 patients (2.2%) in Group B, with a total incidence of 1.8% (5/280). The variation between the two groups was not statistically notable (p = 0.617), reinforcing the idea that both colostomy techniques have comparable complication rates.

Table 1:Demographics of the patients (n=280)

Variables		Group-A(n=140)	Group-B(n=140)	Total	P value [a]
Age(hours)	24-48	107	108	215	0.427
		74.8%	78.8%	76.8%	
	49-72	36	29	65	
		25.2%	21.2%	23.2%	
Gender	Male	73	70	143	0.994
		51.0%	51.1%	51.1%	
	Female	70	67	137	
		49.0%	48.9%	48.9%	
Weight(kgs)	<3kgs	113	115	228	0.290
		79.0%	83.9%	81.4%	
	>3kgs	30	22	52	
		21.0%	16.1%	18.6%	
Gestational age at the time of birth(weeks)	38-40	83	75	158	0.578
		58.0%	54.7%	56.4%	
	41-42	60	62	122	

		42.0%	45.3%	43.6%	
Operative time(minutes)	Upto 60	119	108	227	0.349
		83.2%	78.8%	81.1%	
	>60	24	29	53	
		16.8%	21.2%	18.9%	
Family history of anorectal malformations	Yes	73	70	143	0.994
		51.0%	51.1%	51.1%	
	No	70	67	137	
		49.0%	48.9%	48.9%	

[a]**chi square test**

Table 2:COMPARISON OF THE OUTCOME OF DESCENDING DIVIDED VERSUS SIGMOID LOOP COLOSTOMY IN PATIENTS WITH ANORECTAL MALFORMATION (n=280)

Outcome		Group-A(n=140)	Group-B(n=140)	Total	P value [a]
Prolapse of colostomy	Yes	14	14	28	0.905
		9.8%	10.2%	10.0%	
	No	129	123	252	
		90.2%	89.8%	90.0%	
Retraction of colostomy	Yes	4	6	10	0.476
		2.8%	4.4%	3.6%	
	No	139	131	270	
		97.2%	95.6%	96.4%	
Parastomal hernia	Yes	2	3	5	0.617
		1.4%	2.2%	1.8%	
	No	141	134	275	
		98.6%	97.8%	98.2%	

[a]**chi square test**

DISCUSSION:

In this randomized controlled trial, we aimed to compare the outcomes of descending divided colostomy and sigmoid loop colostomy in neonates with anorectal malformations (ARM). Our hypothesis was that there would be a difference in the outcomes between these two techniques, specifically in the incidence of complications such as stoma prolapse, retraction, and parastomal hernia. However, our findings revealed that both techniques are equally effective and safe in managing ARM.

Our results are consistent with several other studies on this topic. For example, Ibrahim Mohamed Hagras[12] conducted a randomized prospective study comparing loop and divided colostomies in patients with high and intermediate anorectal malformations. Hagras found that although loop colostomies had a significantly shorter operative time (P=0.04), they were associated with a higher incidence of stoma prolapse (P=0.033) and urinary tract infections in patients with cloaca. While our study reveal prolapse rates (9.8% in the descending divided group vs. 10.2% in the loop group, p = 0.905), the findings from Hagras highlight potential risks associated with loop colostomies, particularly in more complex cases. Omar Oda's retrospective cohort study[13] also found a higher incidence of stoma-related complications in patients with loop colostomies compared to those with divided colostomies. Specifically, the risk of stoma prolapse was significantly higher in the loop colostomy group (OR 8.75, 95% CI 1.74-44.16, p=0.009). Oda's findings support the notion that while loop colostomy may offer advantages like shorter operative times, it is more prone to complications, especially stoma prolapse. Our study, however, did not observe such a high rate of complications, suggesting that with careful surgical technique, the outcomes may be comparable between the two approaches.

Osama Ibrahim Almosallam[14] evaluated outcomes in patients with ARM undergoing loop and divided colostomies and found no significant difference in the overall complication rates, except for higher rates of skin excoriation in the divided colostomy group (P=0.04). This reinforces the idea that both colostomy types are generally safe, with minor differences in complication profiles. In our study, we did not observe significant differences in skin-related issues, although skin excoriation could be a factor worth considering in future analyses.

In contrast, Gonca Gerçel's systematic review and meta-analysis,[15] which included 2550 neonates, found no significant differences between loop and divided colostomies for ARM in terms of stoma prolapse, urinary tract infections, skin excoriation, stoma retraction, or parastomal hernia. The comprehensive nature of Gerçel's meta-analysis[15] supports the conclusion that both techniques present similar risks and benefits, which is consistent with our findings. This suggests that both loop and divided colostomies are viable options for fecal diversion, with the choice of technique depending on individual patient characteristics and surgeon preference.

In addition to the findings of our study, several other studies have compared the outcomes of loop and divided colostomies in children and reported both groups with not much differences in complication rates between the two techniques. One study[7] found no significant differences in outcomes such as parastomal hernia (0% in the sigmoid loop group vs. 2.2% in the divided colostomy group), stoma prolapse (7.7% vs. 9.7%), and stoma retraction (7.7% vs. 2.2%). Another study reported similar results, showing that parastomal hernia occurred in 1.8% of patients in the sigmoid loop group and 2.0% in the divided colostomy group, with stoma prolapse occurring in 9.1% and 2.0%, respectively, and stoma retraction rates of 0% and 2.0%, respectively.[8]

However, there are studies that reported variations in complication rates between the two techniques. One trial found a higher incidence of parastomal hernia in the sigmoid loop group (5.6%) compared to the divided colostomy group (2.2%), with a higher incidence of stoma prolapse (11.1% vs. 2.2%) and stoma retraction (3.3% vs. 2.2%).[9] Another trial[10] also reported that parastomal hernia occurred more frequently in the sigmoid loop group (3.0%) compared to the divided colostomy group (0.0%), with stoma retraction observed in 1.4% of patients in the loop group versus 4.2% in the divided group, and stoma prolapse being significantly more common in the sigmoid loop group (17.8% vs. 2.8%, $p<0.05$) .

Our hypothesis suggested that there would be a significant difference in the outcomes between descending divided and sigmoid loop colostomies in patients with ARM. However, the results of our study did not support this hypothesis, as the incidence of complications—stoma prolapse, retraction, and parastomal hernia—was similar between the two groups. This aligns with the findings of Gonca Gerçel[15] and Osama Ibrahim Almosallam,[14] who also observed no major differences in outcomes between the two techniques. However, Omar Oda[13] and Ibrahim Mohamed Hagras[12] did report higher rates of prolapse in the loop colostomy group, which suggests that specific factors, such as patient demographics and surgical expertise, may influence complication rates. Our study's results suggest that in general practice, both techniques can be safely used with no significant difference in outcomes.

CONCLUSION:

In conclusion, our findings, along with those from other studies, suggest that both descending divided and sigmoid loop colostomies are effective and safe for managing anorectal malformations in neonates. The choice between the two techniques should be based on individual patient needs, surgeon experience, and institutional protocols, rather than concerns about differences in complication rates. Further prospective studies with larger sample sizes are required to definitively conclude whether there are significant advantages to either technique in specific subgroups of patients.

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