Comparison Outcomes of Divided End Loop Versus Separate Double Barrel Colostomy in Neonates with Imperforate Anus

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Abstract

Introduction: the aim of current is to compare clinical outcomes between the divided end loop and separate double barrel colostomy in neonates with imperforate anus.

Materials and Methods: This is a retrospective study to review 184 patients who presented with imperforate anus and were managed with a divided end loop or separate double barrel colostomy between 2017 and 2020. Complications were compared in the two groups.

Results: There was more skin excoriation in separate double barrel colostomy compared to divided end loop colostomy (p=0.001). The mean of scar size in patients of divided end loop colostomy group was lower than that of separate double barrel colostomy significantly (p<0.0001).

Conclusion: Our results suggest that divided end loop colostomy may be more acceptable than separate double barrel colostomy for neonates with imperforate anus.

Keywords

- Imperforate anus
- Divided end loop
- Separate double barrel
- Colostomy

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Introduction

Anorectal malformation appears in one out of every 4000 to 5000 infants and it is a little more common in males.[1-3]

This risk for second child with imperforate anus is approximately1%.[4] The most frequent defect in males is imperforate anus with a recto urethral fistula. In females, it is a rectovestibular fistula.[5]

Imperforate anus without fistula occurs in about 5% of the anorectal malformations, and is associated with Down syndrome.[6]

Imperforate anus has been known for many years.[1–3] For years, physicians have tried to help these patients with creating orifice in their perineum.[7]

This malformation is divided in two types: low and high. Historically, those with a 'high' defect did not survive. Most of the low-type patients survive despite this defect.[8]

Imperforate anus is a major indication for colostomy in anewborn.[9,10] Most of these patients need a major operation to correct this defect in addition to colostomy. Two types of colostomy are performed: divided end loop and separate double barrel.

A divided end loop colostomy includes an opened intestinal loop that is brought out through an incision in the abdominal wall without complete transection of the colon. As cutting or electrocautery of the colon is not painful, it is divided on the rod 10 days after colostomy formation out of the operating room without the need for anesthesia. The remaining tissue of the colon between two colostomy openings is cut off and the rod is removed and this creates a divided loop colostomy with two holes next to each other. On the other hand, a separate double barrel colostomy needs complete division of the colon which makes a proximal colostomy and a distal mucous fistula that are fixed to the abdominal wall via separateincisions.[11-17]

Since the first time that colostomy was performed to treat for imperforate anus, it has always been a challenge to surgeons; type, site, complications and its management.[18] Several studies have shown the high morbidity associated with colostomies. As so, the current study was designed to compare clinical outcomes between the divided end loop and separate double barrel colostomies in neonates with imperforate anus.

Materials and Methods

A retrospective study was performed at Imam Khomeini & Abuzar hospitals in Ahvaz. The data of all patients who presented with imperforate anus, who were managed by a diverting colostomy (divided end loop or separate double barrel) between 2017 and 2020 was collected.

Children with incomplete medical records and those who passed away, were excluded from the study.

Information was gathered through admission, pre-operative, operation, post-operative, and follow-up clinic notes.

Demographic data included gender, gestational age and weight of birth. Type

and duration of the colostomies were determined via the operation notes.

For statistical purpose operation time, the start of colostomy function and nutrition, duration of hospitalization, wound infection and the duration of colostomy till closure in months were collected.

Presence of megarectum was rouled out by a distal colostogram contrast study.

Then we collected complications after colostomies; these included retraction, prolapse, parastomal hernia, stricture, necrotizing enterocolitis(NEC), recurrent recto-urinary or recto-genital fistula and need for revision. A more comprehensive work-up of patients who developed urinary tract infection (UTI) was also performed. Diagnosis of UTI was based on the clinical symptoms accompanied with a positive urinary culture (colony count > 10^5).[19, 20]

For those who had their colostomies closed at our hospitals, the duration of follow-up was1 year. We registered cases of wound infection, skin excoriation, wound dehiscence and scar size after closure of the colostomy.

Collected data were analyzed using Student's t-test for continuous variables and qualitative variables were compared using Fischer's exact test.

The results were of statistical significance if the calculated p -value was less than 0.05.

Results

In the three-year duration of our study, 196 neonates with imperforate anus were identified.

The mortality rate was 3.7%(7 patients with congenital heart disease who were excluded) and 5 patients were omitted due to incomplete records.

One hundred and two patients (55.4%) underwent a divided end loop colostomy, while separate double barrel colostomy was performed in82patients (44.6%).

The demographic data is shown in **Table 1**, including gender, gestational age, birth duration of hospitalization and time to close colostomy. Only the mean of operative time was found to be statistically lower in patients with divided end loop colostomy ($p<0.0001$). No other complication was of statistical significance between two groups.

Complications after colostomy formation are summarized in **Table 2** including prolapse, need for colostomy revision, megarectum, urinary tract infection, colostomy stricture and necrotizing enterocolitis.

There were no statistically meaningful differences between two groups. Urinary tract infection was detected in 33 patients (18 %) and was due to either Escherichia coli or Pseudomonas. The incidence of urinary tract infection was 16.7 % in patients with divided end loop colostomy compared with 18.2 %in patients with separate double barrel colostomy ($p=0.413$).

The Complications after colostomy closure including wound infection, skin dehiscence, skin excoriation and scar size are compared in **Table 3.**

There was more skin excoriation in separate double barrel colostomy in

comparison with divided end loop colostomies (p=0.001). The mean of scar size in divided end loop colostomy group was significantly lower than that of separate double barrel colostomy (p<0.0001). Rate of other complications demonstrated no significant differences between two groups.

Table1. Demographic characteristics.

variable		loop	Double Barrel	P-value
Gender	**Male N (%)**	67 (65.7%)	51 (62.2%)	0.741
	Female N (%)	35 (34.3%)	31 (37.8%)	
Gestational Age Mean ± SD (weak)		36.1 ± 1.8	34.6 ± 2.3	0.435
Birth Weight Mean ± SD (gr)		2950 ± 54	2830 ± 75	0.511
Fistula	**Perineal Fistula N (%)**	6 (5.9%)	7 (8%)	0.625
	Vestibular Fistula N (%)	20 (19.6%)	14 (15.9%)	
	Recto-urinary Fistula N (%)	22 (21.6%)	21 (23.8%)	
	Recto-Genitalia Fistula N (%)	9 (8.8%)	6 (6.8%)	
Operative Time Mean ± SD (min)		17.8 ± 5.3	48.3 + 12.6	0.001
Hospitalization (day)		3.5 ± 1.2	4.3 ± 1.8	0.451
Duration Feeding Start Mean ± SD (day)		2.4 ± 1.3	3.2 ± 1.6	0.214
Duration of colostomy Mean ± SD (month)		11.6 ± 4.2	12.1 ± 3.4	

Table2. Complication after colostomy formation.

Complication	loop	Double Barrel	P-value
Megarectum n (%)	7 (6.8)	5 (6.7)	0.711
Retraction n (%)	3 (2.9)	3 (3.4)	0.465
Prolapse n (%)	12 (11.8)	9 (10.2)	0.331
Parastomal Hernia n (%)	4 (3.8)	2 (2.3)	0.125

Stricture n (%)	5 (4.9)	6 (6.8)	0.274
Colostomy revision n (%)	9 (9.8)	7 (7.9)	0.241
UTI n (%)	17 (16.7)	16 (18.2)	0.413
NEC n (%)	3 (2.9)	1 (1.2)	0.621

Table3. Complications after colostomy closure.

Complication	loop	Double Barrel	P-value
Wound Infection N (%)	7 (6.8)	8 (9.1)	0.112
Skin dehiscence N (%)	7 (6.8)	9 (10.2)	0.061
Skin excoriation N (%)	12 (11.8)	19 (21.6)	0.001
Scar size Mean + SD (mm^2)	32.3 ± 11.4	95.4 ± 3.7	< 0.001

Discussion

Usually the formation of a colostomy is the first stage of the surgical treatment of a patient with imperforate anus.The colostomy allows the patient to continue to grow while awaiting the definitive corrective surgery. While the creation of inappropriate colostomy can lead to various complications and even life-threatening infections.[21-23]With the right decision about the type of colostomy one can reduce these serious complications.

Complications of colostomies are important factors that have caused some pediatric surgeons to support the primary correction of imperforate anus.[24]

It appears that sufficient distance between proximal and distal openings of the double barrel colostomy prevents the complications such as urinary tract infection, megarectum and wound infection. Separate double barrel colostomy is accompanied with lower incidence of colon prolapse in these patients.[25] On the other hand, using small incisions for creation of divided end loop colostomies allows easier closure and better cosmetic results in child.

Our results showed operative time was shorter in patients with divided end loop colostomy.

The operation time is one of the most important factors which determines patient overall outcome specially in emergency situations. Therefore it seems that divided end loop colostomy in patient with imperforated anus has better outcome than separate double barrel colostomy.

One study showed no difference between divided end loop and separate double barrel colostomy when the loop colostomy

was closed early (2-4 months).[26] Our results demonstrated no meaningful differences between the two groups in terms of duration of colostomy.

In this study, there was no meaningful difference in common complications of colostomy. This is similar to the findings of Patwardhan et al survey,[27] but in contrast to others who have reported an overall incidence of complications as 31%–63% with divided end loop colostomy versus 15%–45% with separated double barrel colostomies.[11,12]

Incidence of colostomy prolapse in our patients (divided end loop 7% vs. separate double barrel 9%) was a little lower than other reports of 15%–18% with divided end loop colostomies and similar to the 3%–6% reported for separate double barrel colostomy.[28]The reason for this result is the fact that we perform most of our colostomies at the first mobile part of the sigmoid colon, immediately distal to the descending colon, whether or not it was to be separated.

Imperforate anus and other anorectal malformations are associated with renal anomalies and it may influence the patient's outcome.[11-14]

The presence of a recto-vesical and recto-urethral fistulae leads to a raised risk of UTI caused by urine absorption in through colon. Study of Singh et al reported a high incidence (86%) of UTI in patients with high imperforate anus with fistula (recto-vesicular).[29]

Our results showed a 23% incidence of UTI in our patients. It agrees with Wiener and Kieswetter the who demonstrated that incidence of associated renal anomalies in the patients who had UTI was particularity high (51%).[12]However the number of patients in group of separate double barrel colostomy is small, incidence of UTI was similar after divided end loop (16.7%) or separate double barrel colostomy(18.2%).

In a survey of complications after colostomy closure the risk of wound infection was increased in separate double barrel colostomy. Incidence of wound infection or peri-ostomal skin breakdown in our study was very small and there was not a significant difference between two groups. Pena et al. did not report any wound infections in all 50 patients with separate double barrel colostomy.[30]

Although according to our results the incidence of skin dehiscence was higher in double barrel colostomy group, but we did not detect significant difference between two groups. Also, a similar finding was reported in previous studies.[21-25]

In this survey we have found that the incidence of skin excoriation between the divided end loop and separate double barrel colostomies is significantly different(divided end loop 11.8% vs. Separate double barrel 21.6%). Another study reported that the rate of skin excoriation was higher in the separate double barrel group compared to the divided end loop colostomy group.[10]

Finally, the extent of wound scar has not been studied in any of the previous studies but in this study we compared scar size one year after colostomy closure and it turned out that size of wound scar is bigger in patients with separate double barrel colostomy than the other group significantly.

Conclusion

The divided end loop colostomy has a shorter operative time and partly fewer complications including skin excoriation and wound scar size compared to the separate double barrel colostomy. According to the shorter operative time and more acceptable appearance after colostomy closure, our data suggests that divided end loop colostomy may be more favorable than separate double barrel colostomy for neonates with imperforate anus.

Ethical Consideration

This study was approved by Ethical Committee of Ahvaz Jundishapur University of Medical Sciences with code number IR.AJUMS.REC.1398.368.

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Conflict of interests

There is no conflict of interest.

References

1. Pena A, Bischoff A: surgical treatment of colorectal problems in children, in Coran A, Krummel T(eds): Pediatric Surgery. Elsevir,2016, pp103-87.
2. Yesildag E, Muniz RM, Buyukunal R, et al: How did the surgeons treat neonates with imperforate anus in the eighteenth century? Pediatr Surg Int 2010;26:1149–58.
3. Chandramouli B, Srinivasan K, Jagdish S, et al: Morbidity and Mortality of colostomy and its closure in children. J Pediatr Surg 2004;49:596–9.
4. Levitt MA, Kant A, Pena A: The morbidity of constipation in patients with anorectal malformations. J Pediatr Surg 2010;45(6):1228–33.
5. Peduzzi P, Concato J, Kemper E, et al: A simulation study of the number of events per variable in logistic regression analysis. J Clin Epidemiol 1996;49:1373–9.
6. Vick LR, Gosche JR, Boulanger SC, et al: Primary laparascopic repair of high imperforate anus in neonatal males. J Pediatr Surg 2007;42:1877–81.
7. Iwai N, Fumino S: Surgical treatment of anorectal malformations. Surg Today 2012;33:241-9.
8. Patwardhan N, Kiely EM, Drake DP, et al: Colostomy for anorectal malformation: high incidence of complications. J Pediatr Surg 2001;36:795–8.
9. Pena A, Migatto-Krieger M, Levitt MA: Colostomy in anorectal malformations: a procedure with serious but preventable complications. J Pediatr Surg 2006;41(4): 748–55.

10. Oda O, Davis D, Ishiguro Y, et al: Loop versus divided colostomy for the management of anorectal malformations. J pediatric surg 2014;49:87-90.
11. Vick LR, Gosche JR, Boulanger SC, et al: Primary laparascopic repair of high imperforate anus in neonatal males. J Pediatr Surg 2007;42:1877–81.
12. Shawn T, Barnhart DC, Smith M, et al: the morbidity of a divided stoma compared to a loop colostomy in patients with anorectal malformation. J ped surg 2016;51:107-10.
13. Almosallam O, Aseeri A, Ayyad H, et al: Outcome of loop versus divided colostomy in the management of anorectal malformations. Ann sadudi 2016;36(5):352-5.
14. Youssef F, Arbash GH, Salem M, et al: Loop versus divided colostomy for the management of anorectal malformations: a systemic review and meta-analysis. J ped surg 2107;52:783-90.
15. Mollitt DL, Malangoni MA, Ballantine TV, et al: Colostomy complications in children: An analysis of 146 cases. Arch Surg 2016;115:455–8.
16. Levitt M, Pena A: Anorectal malformations, in Coran A, Adzick NS, Krummel TM (eds): Pediatric surgery. Philadelphia, Elsevier Saunders, 2012, pp1289–310.
17. Askarpour S, Peyvasteh M, Changai B, et al: Skin bridge versus rod colostomy in children- comparison between complications. Pol Przegl Chir 2012;84:485–7.
18. Wells GA, Shea B, O'Connell D, et al: The Newcastle-Ottawa scale (NOS) for assessing the quality of nonrandomized studies in meta analysis. Clin epidemiol 2015; 16:305-10.
19. Khan K, Younas M, Waheed T, et al: Management of colostomies in infancy. J Postgrad Med Inst 2011;17:242-8.
20. Dode LG, Luther C, Gianini N: Childhood colostomy and its complications in Lagos. JMA 2007;84: 85–7.
21. Chandramouli B, Srinivasan K, Jagdish S, et al: Morbidity and mortality of colostomy and its closure in children. J Pediatr Surg 2004;39:596–9.
22. Chirdan LB, Uba FA, Ameh EA, et al: Colostomy for high anorectal malformation: an evaluation of morbidity and mortality in a developing country. Pediatr Surg Int 2008;24:407–10.
23. Chowdhary SK, Chalapathi G, Narasimhan KL, et al: An audit of neonatal colostomy for high anorectal malformation: the developing world perspective. Pediatr Surg Int 2004;20:111–7.
24. Cigdem MK, Onen A, Duran H, et al: The mechanical complications of colostomy in infants and children: analysis of 473 cases of a single center. Pediatr Surg Int 2006;22:671–6.
25. Demirogullari B, Yilmaz Y, Yildiz GE, et al: Ostomy complications in patients with anorectal malformations. Pediatr Surg Int 2011;27:1075–8.
26. Vanden D, Sloots C, Meeussen C, et al: To split or not to split: colostomy complications for anorectal malformations or Hirschsprung disease: a single center

experience and a systematic review of the literature. Eur J Pediatr Surg 2014;24(1):61–9.
27. Patwardhan N, Kiely EM, Drake DP, et al: Colostomy for anorectal anomalies: high incidence of complications. J Pediatr Surg 2001;36(5):795–8.
28. singh Y, Takada K, Nakamura Y, et al: Temporary umbilical loop colostomy for anorectal malformations. Pediatr Surg Int 2012;28:1133–6.
29. Vick LR, Gosche JR, Boulanger SC, et al: Primary laparascopic repair of high imperforate anus in neonatal males. J Pediatr Surg 2007;42:1877–81.
30. Pena A, Migatto-Krieger M, Levitt MA: Colostomy in anorectal malformations: a procedure with serious but preventable complications. J Pediatr Surg 2006;41(4):748–55.