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Original Article

Safety and Efficacy of Early versus Conventional Enteral Feeding after Colostomy Closure in Children with High Anorectal Malformation

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ABSTRACT

Aim: The restoration of intestinal continuity after colostomy closure is a critical step and postoperative recovery is influenced by nutritional strategies. This study aimed to evaluate the safety and efficacy of early versus conventional feeding in children undergoing sigmoid colostomy closure on postoperative recovery parameters.

Materials and Methods: A prospective randomized observational study was carried out at a tertiary care hospital between January 2022 and October 2025. Fifty children (<16 years) undergoing stoma closure were randomized into two groups: Group A (early feeding within 48 hours postoperatively) and Group B (conventional feeding after return of bowel function or on postoperative day 5). Demographic data, perioperative parameters, and postoperative outcomes including time to initiation of feeding, time to full feeds, bowel function recovery, complications, and hospital stay were analyzed using SPSS v24.0.

Results: Of the 50 patients (39 males, 11 females; mean age 1.1 years), 25 were allocated to each group. Feeding was initiated significantly earlier in Group A (mean 18.7 hours) compared with Group B (52.6 hours; $p<0.001$). Time to achieve full feeds was shorter in Group A (median 42.5 hours) versus Group B (72.5 hours; $p<0.001$). First bowel movement occurred earlier in Group A (mean 4.1 days) than Group B (5.9 days; $p<0.01$). Median hospital stay was reduced in Group A (4.5 days) compared with Group B (6 days; $p<0.01$). No anastomotic leaks or wound dehiscence were observed. Minor complications included transient vomiting and urinary tract infections, with no significant differences between the groups.

Conclusion: Early enteral feeding after stoma closure in children with high anorectal malformation is safe, well tolerated, and associated with faster recovery and shorter hospital stays compared with conventional feeding.

Keywords: Early enteral feeding, colostomy closure, high anorectal malformation, ERAS, postoperative recovery

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Introduction

Anorectal malformation (ARM) is a spectrum of congenital anomalies which affect the distal anus and rectum, occurring in approximately 1 in 5,000 live births (1,2). Management of high ARM often requires staged surgical management, beginning with a high divided sigmoid diverting colostomy followed by definitive repair and later stoma closure. The creation of a temporary diverting colostomy allows for the safe passage of the stool while the definitive posterior sagittal anorectoplasty is performed and the area heals. The subsequent procedure, colostomy closure, marks the final stage of reconstruction and is a common operation in pediatric surgery (2,3). Restoration of intestinal continuity after colostomy closure is a critical step in the overall treatment pathway, and postoperative recovery is influenced by nutritional strategies.

Despite the routine nature of stoma closure, the postoperative period is often complicated by paralytic ileus, pain, and feeding intolerance, which can prolong hospital stay and impact recovery (4). Historically, conventional postoperative management has dictated a policy of delayed enteral feeding, often requiring patients to remain nil per oral (NPO) until there is clear evidence of returning bowel function (e.g., passage of flatus or stool), typically spanning four to five days. This approach is primarily rooted in the concern that early mechanical stimulation or increased intra-luminal pressure might compromise the integrity of the freshly created bowel anastomosis, potentially leading to a catastrophic anastomotic leak. However, this period of mandatory starvation, which is increasingly recognized as detrimental, leads to a catabolic state, malnutrition, weight loss, and reduced immunity (5-7).

However, modern pediatric surgical practices are increasingly challenging this traditional paradigm. Mounting evidence from adult and pediatric literature, particularly in non-gastrointestinal surgeries, supports the safety and significant benefits of initiating early enteral nutrition (EEN) (6,7). The concept of Enhanced Recovery After Surgery (ERAS) or "Fast-Track" protocols, initially established in adult surgery, advocates for a multimodal approach, with early enteral feeding (EEF) being a cornerstone (8,9). EEF, typically defined as the initiation of nutrition within 24 to 48 hours post-surgery, has a sound physiological basis. EEF is hypothesized to stimulate peristalsis, accelerate the resolution of postoperative ileus, maintain the integrity of the gut mucosal barrier, and prevent the catabolic state associated with prolonged starvation. Furthermore, rapid restoration of oral intake is a cornerstone of enhanced recovery protocols, aiming to reduce hospital morbidity and the overall duration of hospitalization (8,9).

Despite this mounting evidence, institutional protocols for pediatric colostomy closure often vary widely and so require standardization. The present prospective randomized observational study was designed to rigorously compare a protocol of EEF (Group A) initiated within 48 hours versus conventional feeding (Group B) (NPO until day 5 or the return of bowel function) in children undergoing sigmoid colostomy closure for high ARM. The primary objective was to definitively assess the impact of EEF on postoperative recovery parameters, including time to full feeding, first bowel movement, and the duration of hospital stay, while strictly monitoring for complications.

Materials and Methods

This prospective randomized observational study was carried out in a tertiary care hospital between January 2022 and October 2025. The study population consisted of children undergoing stoma closure following a high divided sigmoid colostomy for high ARM. Ethical approval was obtained from the Khaja Bandanawaz University Ethical Committee (no.: IEC/2021/178, date: 06.05.2021), and written informed consent was obtained from the parents/guardians, and assent from children older than 7 years, in accordance with institutional ethical committee guidelines. Children younger than 12 years scheduled for stoma closure after high divided sigmoid colostomy for high ARM were included in this study. Those patients with hemodynamic instability or those with multiple anomalies, syndromes or reanastomosis were excluded from this study.

Data regarding age, sex, weight, and duration of surgery were noted. None of our patients underwent preoperative proximal bowel preparation but, in all patients, distal stoma washes with normal saline (25 mL/kg) were performed the day before surgery. Preoperatively, antibiotics were administered before the induction of anesthesia. Preoperatively, complete blood count, kidney function tests, serum electrolytes, and the body mass index of the patients were recorded. Intestinal continuity was restored using a single-layer interrupted absorbable suture [Vicryl® (Polyglactin 910) 3-0/4-0]. All children were given adequate preoperative, intraoperative, and postoperative fluids and analgesia as per the standard protocol. Patients were randomized by using odd and even enrollment numbers, odd numbers were allotted to early feeding (Group A) and even were allotted to conventional feeding (Group B).

Group A (Early Feeding)

Enteral nutrition was initiated within 48 hours of surgery, either orally or via a nasogastric tube. Feeding began with clear fluids, followed by milk. The initial regimen was 1-2 mL/kg every 2 hours, with increments of 1 mL/kg after tolerance of two consecutive feeds. Oral feeding was introduced once nasogastric feeds were well tolerated. Full feeding was defined as tolerance of at least 80% of daily maintenance fluid requirements. If intolerance occurred (vomiting, abdominal distension, or high gastric aspirates), two feeds were withheld and the process was restarted after 4-6 hours.

Group B (Conventional Feeding)

The patients remained NPO until the fifth postoperative day or until bowel function returned, indicated by the passage of stool/flatus and a reduction in nasogastric aspirates.

All patients were given Ceftriaxone, Amikacin and Metronidazole postoperatively for 5 days as per the institutional protocol. In the postoperative period, the time until the initiation of feeding in hours, the time to achieve full feeding in hours, the requirement of nasogastric tube reinsertion and episodes of feeding intolerance, electrolyte imbalance, the time to the appearance of the first bowel sounds, the time to first bowel movement, the time to discharge, hospital stay, and complications such as surgical site infections (SSI), wound dehiscence, intraabdominal collection, anastomotic leak, vomiting, and abdominal distension were noted. Signs of anastomotic leak (tachycardia, fever, abdominal tenderness, clinical deterioration) were closely monitored. Suspected cases underwent blood investigations, ultrasound, and abdominal X-rays. Patients with confirmed leaks were excluded from this study and treated according to institutional treatment protocols. After discharge, the patients were followed up at 15 days and one month for any complications such as feed-intolerance or wound complications.

Statistical Analysis

Data were collected using a structured proforma, entered into an MS Excel sheet, and analyzed using SPSS 24.0 version IBM USA. Qualitative data are expressed in terms of proportions, while quantitative data are expressed in terms of mean and standard deviation. Associations between two qualitative variables were analyzed using chi-square/Fisher's exact test. A p value of <0.05 was considered statistically significant, while a p value of <0.001 was considered highly significant.

Results

A total of 50 patients were included in this study, 25 in each group were recruited, comprising 39 males (78%) and 11 females (22%) with a male to female ratio of 3.5:1. In the early feeding group (Group A), 20 patients were male, whereas in the conventional feeding group (Group B), 19 were male. The mean age was comparable between both groups (Table I), with an age range of between 6 months to 5 years. In this study, the mean body weight was comparable in both groups (Table I), the mean duration of surgery in Group A was 90 minutes and it was 92 minutes in Group B, which was comparable (Table I).

Postoperative recovery parameters demonstrated significant differences between the two groups. The median time to the initiation of oral feeding was 58 hours in Group A compared with 92 hours in Group B (p=0.001). On average, feeding was initiated at 18.7 (15 to 25) hours in Group A and 52.6 (19 to 95) hours in the Group B (p<0.001). Median full feeding hours were 42.5 and 72.5 hours in Group A and Group B, respectively (p<0.001). The median time to first bowel sound was 40 hours in Group A and 49 hours in Group B, but this difference was not statistically significant (p=0.208). First bowel movement in Group A was recorded at an average of 4.10 postoperative days, compared with 5.90 days in Group B (p<0.01). Reinsertion of the nasogastric tube was not required in either group (Table II).

The median duration of hospital stay was significantly reduced in Group A (4.5 days) compared with Group B (6 days; p<0.01). There were 2 cases of vomiting in the early feeding group (Group A), which were temporary and resolved spontaneously. Septic complications were noted in 5 patients in Group A and 4 patients in Group B (p=0.7).

Table I. Demographic and perioperative characteristics of the study groups

Parameter	Group A (early feeding, n=25)	Group B (conventional feeding, n=25)	p value
Male: female	20:5	19:6	0.74
Mean age (years)	1.18±0.9	1.05±0.8	0.853
Mean body weight (kg)	8.79±2.1	9.29±2.3	0.834
Mean duration of surgery (min)	90±12	92±14	0.62

Table II. Postoperative recovery parameters in the study groups

Parameter	Group A (early feeding, n=25)	Group B (conventional feeding, n=25)	p value
Median time to initiation of oral feeding (hours)	58	92	0.001
Median time to full feeds (hours)	42.5	72.5	0.001
Median time to first bowel sound (hours)	40	49	0.208
Median hospital stay (days)	4.5	6.0	0.01
Vomiting (n)	2 (transient, resolved)	0	0.15
Septic complications (n)	5 (mostly UTI)	4 (mostly UTI)	0.70

UTI: Urinary tract infection

The majority were urinary tract infections managed with antibiotics (Table II). There were no cases of wound infection, wound dehiscence, anastomotic leak, or requirement for relook surgery in either group. The follow-up periods were uneventful in both groups.

Discussion

The closure of a colostomy in the pediatric population, particularly following high ARM, has historically been associated with significant morbidity. Traditional surgical dogma dictated a conservative approach, prolonged nasogastric decompression and a strict NPO regimen to protect the tenuous anastomosis from mechanical stress and potential leakage. The results of this prospective randomized study challenge this paradigm, providing compelling evidence that EEF is not only feasible, but also offers superior postoperative recovery metrics compared to conventional management.

In this study, the early feeding group (Group A) initiated feeds at a mean of 18.7 hours compared to 52.6 hours in the conventional group ($p<0.001$). Despite this aggressive approach, there was no statistically significant increase in complications. We observed no anastomotic leaks or wound dehiscence in the early feeding group. This aligns with recent meta-analyses in pediatric gastrointestinal surgery suggesting that starvation does not protect anastomosis (10). In fact, physiologic evidence suggests that EEN promotes anastomotic healing by increasing collagen deposition and enhancing blood flow to the gut, whereas prolonged fasting may lead to mucosal atrophy and increased bacterial translocation (11-13).

A significant finding in our study was the accelerated return of bowel function in the early feeding group. While the time to the first bowel sound was comparable between the groups ($p=0.208$), the functional endpoint, the first bowel movement, occurred significantly earlier in Group A (4.10 days) compared to Group B (5.90 days) ($p<0.01$). This supports the concept of the gastrocolic reflex; the introduction of intraluminal nutrients triggers the release of gastrointestinal hormones (such as gastrin and cholecystokinin) and stimulates peristalsis (13-15). By withholding feeding in the conventional group, this physiological reboot is delayed, prolonging the duration of postoperative ileus, and may paradoxically increase the risk of bacterial translocation due to the breakdown of the mucosal barrier (13,14). The physiological rationale for early feeding lies in the stimulation of gut motility, maintenance of mucosal integrity, and prevention of bacterial translocation. EEN also supports immune function, reduces catabolism, and promotes faster wound healing (12-15).

A critical yet often overlooked advantage of early feeding is the reduction in intravenous fluid requirements. Patients in the conventional feeding group required intravenous (IV) fluids for nearly 5 days. Prolonged administration of crystalloids is known to cause interstitial edema, including edema of the bowel wall. Bowel wall edema can impair anastomotic healing and inhibit peristalsis, creating a vicious cycle which prolongs ileus (15). By transitioning to oral intake rapidly, the early feeding group relied less on IV hydration, potentially reducing intestinal edema and facilitating the quicker return of bowel sounds as observed in our data. In pediatric surgery, patient comfort is inextricably linked to surgical physiology. Children who are kept NPO for extended periods are prone to hunger, irritability, and prolonged crying. Crying induces significant aerophagia (swallowing of air), which exacerbates gastric dilation and abdominal distension, potentially putting more tension on the anastomosis than a small volume of liquid feed (16,17).

We observed that children in the early feeding group were generally more settled. The low incidence of

vomiting (only 2 cases), which were transient and resolved spontaneously, underscoring the safety of early feeding protocols, suggests that the small intestine recovers motility almost immediately after surgery, and the stomach is capable of handling clear fluids long before colonic function fully returns. The fear that early peristalsis will mechanically disrupt a fresh suture line is the primary barrier to adopting early feeding. However, our study utilized a single-layer interrupted suture technique with Vicryl 3-0/4-0, which provides immediate mechanical stability. Our results showed zero anastomotic leaks in the early feeding group. This aligns with findings from the ERAS Society (18), which suggests that the collagen deposition phase of healing is actually supported by the nutrients provided via enteral feeding (18). The absence of wound dehiscence or significant intra-abdominal collections in our study further corroborates that the metabolic state of the fed child supports better tissue repair than the catabolic state of the starved child. Furthermore, septic complications were comparable between the 2 groups (p=0.7), with the majority being urinary tract infections rather than SSI. This dispels the notion that early feeding increases the risk of abdominal distension leading to wound complications or aspiration pneumonia. From a healthcare systems perspective, the reduction in hospital stay is the most impactful finding. The early feeding group was discharged at a median of 1.5 days earlier than the conventional group (p<0.01). In a tertiary care setting with high patient volume, this accelerated turnover increases bed availability and reduces the direct costs associated with hospitalization (nursing care, IV fluids, and medication) (18). Our study corroborates these findings, specifically in the context of high ARM, where prolonged hospitalization and delayed recovery can impose significant burdens on families and healthcare systems (18).

Several studies in adults and a growing body of evidence in pediatrics have demonstrated the safety and efficacy of EEF after intestinal anastomosis, including stoma closure (19,20).

Study Limitations

This study had limitations such as its single-center design and relatively small sample size. Longer follow-up beyond one month would be valuable in order to assess late complications such as adhesive intestinal obstruction. Additionally, while randomization was performed using odd-even enrollment, more robust randomization methods could further strengthen internal validity. Multicenter trials with larger cohorts would further validate these findings.

Conclusion

EEF initiated within the first 24 hours is safe, well tolerated, and significantly reduces the duration of ileus and hospital stay. It does not increase the risk of anastomotic leakage or wound complications. Instead, it significantly reduces the time to full feeding, accelerates the return of bowel functions, and shortens hospital stay. Based on these findings, the traditional practice of keeping children NPO for 5 days is unnecessary, and an early feeding protocol should be considered as the standard of care for pediatric stoma closure.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Khaja Bandanawaz University Ethical Committee (no.: IEC/2021/178, date: 06.05.2021).

Informed Consent: Written informed consent was obtained from the parents/guardians, and assent from children older than 7 years, in accordance with institutional ethical committee guidelines.

Footnotes

Authorship Contributions

Concept: N.D.S., S.K., A.S., Design: N.D.S., S.K., Data Collection or Processing: N.D.S., S.K., A.S., Analysis or Interpretation: N.D.S., S.K., A.S., Literature Search: N.D.S., A.S., Writing: N.D.S., S.K.

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References

1. Wood RJ, Levitt MA. Anorectal malformations. Clin Colon Rectal Surg. 2018; 31:61-70.
2. Sangkhathat S, Patrapinyokul S, Tadyathikom K. Early enteral feeding after closure of colostomy in pediatric patients. J Pediatr Surg. 2003; 38:1516-9.
3. Ducey J, Kennedy AM, Linsell L, et al. Timing of neonatal stoma closure: a survey of health professional perspectives and current practice. Arch Dis Child Fetal Neonatal Ed. 2022; 107:448-50.
4. Uday Bhaskar MNS, Sundararajan L. Feasibility of enhanced recovery after surgery in pediatric colostomy reversal. J Indian Assoc Pediatr Surg. 2023; 28:319-24.
5. Greer D, Karunaratne YG, Karpelowsky J, Adams S. Early enteral feeding after pediatric abdominal surgery: a systematic review of the literature. J Pediatr Surg. 2020; 55:1180-7.

6. Zhang H, Wang Y, Sun S, et al. Early enteral nutrition versus delayed enteral nutrition in patients with gastrointestinal bleeding: A PRISMA-compliant meta-analysis. Medicine (Baltimore). 2019; 98:e14864.

7. Yadav P, Choudhury S, Grover J, et al. Early feeding in pediatric patients following stoma closure in a resource limited environment. J Pediatr Surg. 2013; 48:1748-51.

8. Shahrahmani F, Parvizi Mashhadi M, Khadembashi A, Abbasi Shaye Z, Bagheri E, Shojaeian R. Implementation of ERAS protocol in pediatric colostomy closure: a randomized clinical trial. Pediatr Surg Int.2025; 41:151.

9. Peng Y, Xiao D, Xiao S, et al. Early enteral feeding versus traditional feeding in neonatal congenital gastrointestinal malformation undergoing intestinal anastomosis: a randomized multicenter controlled trial of an enhanced recovery after surgery (ERAS) component. J Pediatr Surg. 2021; 56:1479-84.

10. Baik SM, Kim M, Lee JG. Comparison of early enteral nutrition versus early parenteral nutrition in critically ill patients: a systematic review and meta-analysis. Nutrients. 2025; 17:10.

11. Sholadoye TT, Suleiman AF, Mshelbwala PM, Ameh EA. Early oral feeding following intestinal anastomoses in children is safe. Afr J Paediatr Surg. 2014; 9:113-5.

12. Lewis SJ, Egger M, Sylvester PA, Thomas S. Early enteral feeding versus "Nil by Mouth" after gastrointestinal surgery: systematic review and meta-analysis of controlled trials. BMJ. 2001; 323:773-6.

13. Hidayah BA, Toh ZA, Cheng LJ, et al. Enhanced recovery after surgery in children undergoing abdominal surgery: meta-analysis. BJS Open. 2023; 7:zrac147.

14. Drossard S, Schuffert L. Early enteral nutrition (EEN) following intestinal anastomosis in pediatric patients - what's new? Innov Surg Sci. 2024; 9:167-73.

15. Boelens PG, Heesakkers FF, Luyer MD, et al. Reduction of postoperative ileus by early enteral nutrition in patients undergoing major rectal surgery: prospective, randomized, controlled trial. Ann Surg. 2014; 259:649-55.

16. Amanollahi O, Azizi B. The comparative study of the outcomes of early and late oral feeding in intestinal anastomosis surgeries in children. Afr J Paediatr Surg. 2013; 10:74-7.

17. Chusilp S, Yamoto M, Vejchapipat P, Ganji N, Pierro A. Nasogastric decompression after intestinal surgery in children: a systematic review and meta-analysis. Pediatr Surg Int. 2021; 37:377-88.

18. Gustafsson UO, Scott MJ, Schwenk W, et al. Enhanced Recovery After Surgery (ERAS) Society, for Perioperative Care; European Society for Clinical Nutrition and Metabolism (ESPEN); International Association for Surgical Metabolism and Nutrition (IASMEN). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS(®)) Society recommendations. World J Surg. 2013; 37:259-84.

19. Upreti S, Peters NJ, Samujh R. Early versus delayed enteral feeding in children after intestinal anastomosis: a randomized controlled study. Adv Pediatr Surg. 2025; 31:1622.

20. Tian Y, Zhu H, Gulack BC, et al. Early enteral feeding after intestinal anastomosis in children: a systematic review and meta-analysis of randomized controlled trials. Pediatr Surg Int. 2021; 37:403-10.