

Research Article

Impact of Early Enteral Feeding on Recovery after Paediatric Gastrointestinal Surgery

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ABSTRACT

Background: Traditional postoperative management after paediatric gastrointestinal surgery has frequently involved withholding oral or enteral nutrition until clinical evidence of bowel function appears. There is recent evidence that early enteral feeding can help to hasten gastrointestinal recovery without increasing major surgical complications.

Objective: To determine the impact of early enteral feeding on postoperative recovery, feeding tolerance, complications, and length of hospital stay in children undergoing gastrointestinal surgery.

Methods: This is a prospective comparative cohort study carried out at MTI Khyber Teaching Hospital Peshawar from July 2023 to June 2024. Total number of children included were 150 who were having gastrointestinal surgery. In 75 patients, enteral feeding was started early (within 24 hours after surgery), and in 75 patients, enteral feeding was delayed (48 hours or after clinical evidence of bowel recovery). Medical data including demographic, operative, feeding, recovery and postoperative complications were collected and analyzed on both groups.

Results: The mean time to initiation of feeding was 19.6 ± 4.8 hours in the early-feeding group compared with 62.4 ± 15.7 hours in the delayed-feeding group ($p < 0.001$). The early-feeding group demonstrated earlier bowel movement (38.2 ± 12.6 vs 55.8 ± 16.9 hours; $p < 0.001$), earlier achievement of full enteral nutrition (3.1 ± 1.0 vs 5.0 ± 1.3 days; $p < 0.001$), and a shorter hospital stay (5.8 ± 1.9 vs 8.2 ± 2.6 days; $p < 0.001$). Overall postoperative complications occurred in 13.3% of early-fed children compared with 28.0% of delayed-fed children ($p = 0.043$). There was no significant difference in vomiting, abdominal distension, anastomotic leakage, or 30-day readmission.

Conclusion: Early enteral feeding following paediatric gastrointestinal surgery was associated with faster return of bowel function, earlier attainment of full feeds, reduced intravenous fluid requirements, and shorter hospitalization without an apparent increase in major postoperative complications.

Keywords: Early Enteral Feeding, Paediatric Surgery, Gastrointestinal Surgery, Postoperative Recovery, Bowel Function, Enhanced Recovery.

INTRODUCTION

The gastrointestinal surgery in children is accompanied by significant physiological and nutritional stress. Traditionally, patients have been allowed to fast until they have resumed bowel movements, flatus or bowel sounds have returned to a normal state of recovery. But, extended periods of fasting may lead to insufficient nutrition, increased IV fluid or

parenteral nutrition dependence, and delayed recovery after surgery. The traditional practice of extended bowel rest after paediatric gastrointestinal surgery is now undermined by recent evidence (1, 2).

Early enteral nutrition provides nutrients directly to the gastrointestinal tract at a time when metabolic demand is increased because of surgical stress and tissue healing. Preservation of

luminal nutrition can help maintain the integrity of the intestinal mucosa, immune function, wound healing and gastrointestinal physiology. Thus, today's guidelines for peri-operative nutrition focus on not unnecessarily fasting and on starting oral or enteral nutrition as early as possible when clinically possible (3,4).

Furthermore, Enhanced Recovery After Surgery (ERAS) pathways have been successfully implemented in the clinic and have further changed postoperative care. These are multidisciplinary pathways consisting of optimized fluid management, reduced use of opioids, early mobilization, appropriate analgesia and early feeding. Studies of children with gastrointestinal surgery have shown to be successful in decreasing the time for children to begin oral feeding, gastrointestinal recovery, and hospital stays, with inconsistent results for increased postoperative complications (5,6).

Evidence specifically addressing early enteral nutrition in children has also expanded. Tian et al. documented that early feeding after intestinal anastomosis was correlated with earlier recovery of bowel function and return to full feeds, reduced hospital stays and surgical infections, and no significant difference in anastomotic leakage or feeding-related complications (7). Likewise, a systematic review by Behera et al. revealed that early enteral nutrition was linked to reduced total complications and early postoperative recovery than delayed enteral nutrition (8).

The safety of this approach has also been demonstrated in younger patients. In a multicentre randomized study of neonates after intestinal anastomosis, early enteral feeding was shown to be possible without a rise in the postoperative morbidity and feeding intolerance (9). Other more recent paediatric surgical studies involving stoma closure and intestinal surgery have also demonstrated good recovery with early feeding (10).

Despite these developments, postoperative feeding practices remain variable, particularly in centres where conventional fasting protocols continue to be used. Local evidence from Pakistan regarding the effect of early enteral feeding following paediatric gastrointestinal surgery remains limited. Therefore, the present study was conducted to compare early and delayed enteral feeding in children undergoing gastrointestinal surgery at MTI Khyber Teaching Hospital, Peshawar, with particular emphasis on return of bowel function, achievement of full feeds, postoperative complications, and length of hospital stay.

METHODOLOGY

This prospective comparative cohort study was conducted at MTI Khyber Teaching Hospital, Peshawar, over a period of 12 months from July 2023 to June 2024. The study included 150 paediatric patients undergoing gastrointestinal surgical procedures during the study period. Ethical approval was obtained from the relevant. Written informed consent was obtained from the parents or legal guardians of all participating children. Patient identity and clinical information were kept confidential throughout the study.

The children ranged from the neonate to 18 years of age, and had undergone gastrointestinal surgery, and were deemed clinically appropriate for enteral feeding following surgery. Patients were excluded if they had severe haemodynamic instability, uncontrolled sepsis, intestinal ischemia, persistent bowel obstruction, major anastomotic disruption, severe postoperative complications requiring prolonged ventilatory support or contraindications to enteral nutrition. Eligible patients were consecutively recruited until 150 patients were reached.

Patients were classified based on the feeding practice after surgery. The early enteral feeding group consisted of 75 children in which enteral feeding was started within 24 hours of the surgery, as long as the child was haemodynamically stable without any surgical contraindication. Breast milk, clear liquids, age-appropriate liquid nutrition or enteral formula based on age and clinical condition depending on the age and clinical condition was initiated and advanced as tolerated. The delayed-feeding group comprised 75 patients whose enteral feeding was commenced after 48 hours or after clinical recovery of their bowel was demonstrated in accordance with the standard postoperative practice.

The basic data collected were sex, age, body weight, nutritional status, diagnosis, type and urgency of operation, intestinal anastomosis and surgery time. Postoperative results included: time to first enteral feed, time to first bowel movement/stool, duration of intravenous fluids, time to full enteral feeding, vomiting, abdominal distention, feeding intolerance, surgical-site infection, wound complications, anastomotic leakage, overall postoperative complications, duration of postoperative hospital stay, and 30-day readmission. Feeding intolerance was considered the failure to progress or tolerate feeding due to repeated vomiting or clinically significant abdominal distention or other

gastrointestinal complaints which necessitated a temporary withholding of feeds.

IBM SPSS Statistics version 26.0 was used to enter and analyze data. The quantitative variables were presented as mean $\pm$ standard deviation and categorical variables as frequency and percentage. Independent-samples t-test was used to compare continuous variables between the early- and delayed-feeding groups, as appropriate. The chi-square test or Fisher's exact test was used for analysis of categorical variables. The two-tailed p-value <0.05 was regarded as statistically significant.

RESULTS

The total number of children involved was 150, 75 of which received early enteral feeding, and 75 received delayed feeding. No difference was found between the two groups with respect to mean age, which was 5.9 ± 4.2 years in early-feeding and 6.1 ± 4.0 years in delayed-feeding ($p=0.766$). The male proportion of the two groups were 58.7% and 56.0% respectively. Demographic and operative parameters were similar in general.

Table 1. Baseline Characteristics of Study Participants

Variable	Early feeding, n=75	Delayed feeding, n=75	p-value
Age, years, mean $\pm$ SD	5.9 ± 4.2	6.1 ± 4.0	0.766
Male sex	44 (58.7%)	42 (56.0%)	0.869
Female sex	31 (41.3%)	33 (44.0%)	
Mean body weight, kg	21.3 ± 12.7	20.8 ± 11.9	0.804
Elective surgery	49 (65.3%)	47 (62.7%)	0.735
Emergency surgery	26 (34.7%)	28 (37.3%)	
Intestinal anastomosis performed	59 (78.7%)	61 (81.3%)	0.684
Mean operative duration, min	94.7 ± 27.4	97.1 ± 29.2	0.604

Early feeding was started significantly earlier (19.6 ± 4.8 hours after surgery) than delayed feeding (62.4 ± 15.7 hours after surgery; $p<0.001$). The return of gastrointestinal function was also quicker in children receiving early feeds. The first bowel movement was at 38.2 ± 12.6 hours, while it was 55.8 ± 16.9 hours for the delayed-feeding group ($p<0.001$). Children who were fed early swallowed all their enteral feedings

after 3.1 ± 1.0 days versus 5.0 ± 1.3 days in the delayed-fed group ($p<0.001$). The early fed children were able to take all their enteral feedings after 3.1 ± 1.0 days, while the delayed fed children did so after 5.0 ± 1.3 days ($p<0.001$). Likewise, postoperative IV fluid requirement was more in the delayed group (4.8 ± 1.5 days) than in the early group (2.9 ± 1.1 days) ($p<0.001$).

Table 2. Postoperative Recovery Outcomes

Outcome	Early feeding	Delayed feeding	p-value
Time to first feed, hours	19.6 ± 4.8	62.4 ± 15.7	<0.001
Time to first bowel movement, hours	38.2 ± 12.6	55.8 ± 16.9	<0.001
Time to full enteral feeds, days	3.1 ± 1.0	5.0 ± 1.3	<0.001
Duration of IV fluids, days	2.9 ± 1.1	4.8 ± 1.5	<0.001
Postoperative hospital stay, days	5.8 ± 1.9	8.2 ± 2.6	<0.001

Early feeding was generally well tolerated. 8 (10.7%) children receiving early feeding experienced vomiting, while 6 (8.0%) children who received delayed feeding experienced vomiting ($p=0.780$). Abdominal distension occurred in 7 (9.3%) and 9 (12.0%) patients, respectively ($p=0.792$). Both differences were not significant. A total of 3 (4.0%) patients had a

surgical-site infection in the early-feeding group and 9 (12.0%) patients had a surgical-site infection in the delayed-feeding group, which was not statistically significant ($p=0.130$). The early-feeding group had one patient (1.3%) with anastomotic leakage, while the delayed group had two patients (2.7%) with anastomotic leakage ($p=1.000$).

Table 3. Postoperative Complications and Readmission

Complication	Early feeding, n=75	Delayed feeding, n=75	p-value
Vomiting	8 (10.7%)	6 (8.0%)	0.780
Abdominal distension	7 (9.3%)	9 (12.0%)	0.792
Surgical-site infection	3 (4.0%)	9 (12.0%)	0.130

Anastomotic leakage	1 (1.3%)	2 (2.7%)	1.000
Overall postoperative complications	10 (13.3%)	21 (28.0%)	0.043
30-day readmission	2 (2.7%)	4 (5.3%)	0.681

Overall postoperative complications were documented in 10 (13.3%) early-fed children compared with 21 (28.0%) patients in the delayed-feeding group ($p=0.043$). The mean

postoperative hospital stay was significantly shorter following early feeding, at 5.8 ± 1.9 days compared with 8.2 ± 2.6 days in the delayed-feeding group ($p<0.001$).

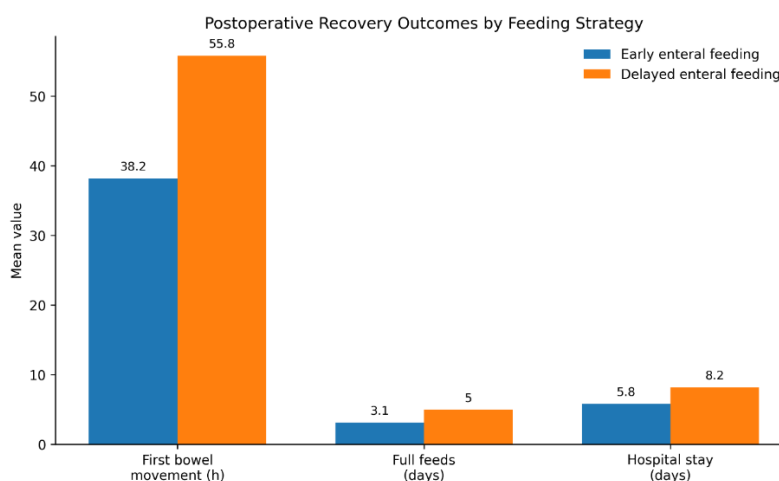


Figure 1. Comparison of Postoperative Recovery Outcomes between Early Enteral Feeding and Delayed Enteral Feeding Groups. Early Feeding Was Associated with Earlier Bowel Movement, Earlier Achievement of Full Enteral Nutrition, and a Shorter Postoperative Hospital Stay.

DISCUSSION

The present study demonstrated that initiation of enteral feeding within the first postoperative day was associated with faster gastrointestinal recovery and shorter hospitalization in children undergoing gastrointestinal surgery. Children in the early-feeding group passed their first bowel movement approximately 18 hours earlier and achieved full feeds almost two days sooner than those managed with delayed feeding. These observations are consistent with contemporary evidence supporting the physiological benefits of early stimulation of the gastrointestinal tract following paediatric abdominal surgery (11,12). This decrease in hospital stay is of clinical significance from 8.2 days in delayed feeding to 5.8 days in early feeding. In a systematic review, Loganathan et al. found that paediatric enhanced recovery protocols decreased time to full enteral nutrition and hospital stay (13). Likewise, Hidayah et al. showed that time to oral intake, passage of stools and hospital length of stay were shorter in children who underwent abdominal surgery using ERAS protocols (14). As these results show, restoring nutrition early could make a significant difference in overall improvement of recovery, not just nutrition alone. One of the most important issues to consider with early postoperative feeding is the risk of vomiting,

abdominal distention or disruption of a gastrointestinal anastomosis. The vomiting and abdominal distention were slightly different between the groups in the present study, and were not found to be significantly different. Importantly, only 1.3% of patients had anastomotic leakage in the early feeding group and 2.7% in the delayed feeding group. In another study, Behera et al. also did not observe any difference in leakage, abdominal distention, wound dehiscence, or vomiting between the two groups of children receiving enteral nutrition started early (15). Therefore, recent reviews have recommended that it is not necessary to fast for a prolonged period of time consistently to protect an otherwise clinically satisfactory intestinal anastomosis (16).

Another observation was that children who were fed early had a lower overall number of postoperative complications. The direction of the findings was positive in the present sample even though none of the individual events were significant in terms of statistical significance in this sample. Children receiving early enteral nutrition after gastrointestinal surgery had shorter hospitalization, earlier fecal movement and fewer wound infections, respectively, compared with children who do not receive early enteral nutrition (17). Other findings of the EPOC

study were the feasibility and safety of starting feeds within 24 hours after paediatric enterostomy closure (18). While the present study was not designed to directly study the biological mechanisms of early luminal nutrition, this is a theoretical concept that could help maintain the barrier function and nutritional status of the intestine.

Postoperative nutrition, however, should be tailored early on. It may not be suitable in children who are haemodynamically unstable, have bowel ischemia, uncontrolled sepsis, severe ileus, mechanical obstruction and/or suspected anastomotic complications. The current paediatric Perioperative Nutrition Guidelines are focused on nutritional assessment and the development of a feeding pathway and not on a uniform approach for all children (19). In addition, more recent paediatric surgical studies have demonstrated that early feeding is possible with early mobilization, fewer tubes and fewer drains and multimodal analgesia without an apparent increase in the surgical complications (20).

The research was limited in several respects. It was carried out at one tertiary care hospital, and may not be generalizable to other hospitals or paediatric settings. Residual selection bias and differences in surgical complexity may have played a role in the observed results, as the allocation was not randomized, but was dependent on the postoperative feeding plan. Different gastrointestinal procedures were also studied, and the number of patients might also have been too small to pick up on rare problems like anastomotic leakage. Future larger, multicentre randomized studies are needed to test procedure-specific feeding protocols, nutritional status, parent and patient satisfaction, hospital cost, and longer term postoperative status.

CONCLUSION

Early enteral feeding following paediatric gastrointestinal surgery was associated with earlier return of bowel function, faster achievement of full enteral nutrition, reduced intravenous fluid requirements, and a significantly shorter postoperative hospital stay. Early feeding did not appear to increase vomiting, abdominal distension, anastomotic leakage, or readmission. These findings support the use of carefully selected early postoperative enteral feeding protocols in clinically stable paediatric surgical patients while maintaining individualized assessment for children with contraindications.

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