

The Effect of Time-to-Surgery on Enteral Feeding Outcomes in Neonates with Uncomplicated Gastroschisis

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Abstract

Objectives: To evaluate the effect of time-to-surgery on enteral feeding outcomes in neonates with uncomplicated gastroschisis.

Materials and Methods: Retrospective review of NICU admissions for gastroschisis in Lampang Hospital, February 2014 – December 2024. The primary outcomes were the time to initiation of enteral feeding and the time to full enteral feeding (discontinuation of parenteral nutrition).

Results: Twenty-three patients with uncomplicated gastroschisis were analyzed in this study. Ten cases (43.5%) underwent surgery in less than 2 hours, 4 (17.4%) between 2–4 hours, 2 (8.7%) between 4–6 hours, 2 (8.7%) between 6–8 hours, and 5 (21.7%) between 8–10 hours. Primary fascial closure was performed in 5 cases (21.7%) and silo placement with staged closure in 18 cases (78.3%). The mean and median times to surgical intervention were 4.5 and 4 hours, respectively (range, 0.5–10 hours). The median time to start enteral feeding and achieve full enteral feeding was 15 days (IQR, 14.25–20.5) and 23.5 days (IQR, 21.0–28.0), respectively. One patient in the 8–10 hours group, managed with staged closure, died due to ventilator-associated pneumonia and sepsis. There were no statistically significant differences regarding the days to start enteral feeding, days to full enteral feeding, days to extubation, and length of stay. However, a clinical trend toward earlier enteral feeding and a shorter duration of total parenteral nutrition (TPN) was observed when surgery was performed earlier.

Conclusion: Although statistical significance was not reached, this study demonstrated that earlier surgical intervention may affect enteral feeding outcomes, specifically the time to start feeding and the duration of TPN in uncomplicated gastroschisis. Therefore, prenatal diagnosis and prompt in utero maternal transfer to a tertiary pediatric surgical center are advocated.

Keywords: Gastroschisis, Abdominal wall defects, Time-to-surgery, Abdominal wall closure method

INTRODUCTION

Gastroschisis is a congenital abdominal wall defect causing herniation of intra-abdominal organs into the amniotic cavity without a membrane covering.¹ The pathophysiology of bowel injury in gastroschisis is multifactorial. It is widely hypothesized that the degree of intestinal damage—often manifesting as bowel matting, peel formation, and atresia—is related to the duration of exposure to amniotic fluid and constriction at the abdominal ring defect.² The management of gastroschisis fundamentally revolves around two critical variables: the timing of intervention and the method of abdominal closure. Early surgical intervention soon after birth aims to restore gut circulation, reduce bowel edema, and cease heat and water

loss.³ Theoretically, minimizing the time between birth and surgical reduction should limit these inflammatory and ischemic processes, thereby preserving bowel function and reducing complications. In an effort to achieve earlier closure of the abdominal wall, delivery-room repair of gastroschisis has been reported.^{3,4} However, the clinical benefit of immediate "emergency" repair remains a subject of debate, with conflicting evidence regarding whether shorter intervals truly translate to improved outcomes.⁵

The management of gastroschisis generally involves two surgical methods: primary fascial closure and staged closure. The selection of the appropriate method often depends on the severity of bowel edema, the size of the abdominal defect, and the neonate's hemodynamic stability.

Received for publication 3 November 2025; Revised 27 January 2026; Accepted 26 March 2026

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<http://doi.org/10.64387/tjs.2026.278663>

Primary fascial closure involves the immediate reduction of herniated viscera and suturing of the abdominal defect in a single procedure shortly after birth. This method is best suited for neonates with minimal bowel edema and the abdominal cavity capable of accommodating the organs without excessive intra-abdominal pressure. Staged closure, also known as silo reduction or delayed closure, is an alternative strategy employed when immediate reduction is precluded by severe bowel edema, viscero-abdominal disproportion, or hemodynamic instability. This technique is the use of a 'silo'—a temporary, sterile silicone receptacle designed to encase the eviscerated bowel. This device facilitates gradual reintroduction into the abdominal cavity via daily manual reduction, typically over 3 to 7 days. Once full reduction is achieved, the silo is removed, and definitive fascial closure is performed.^{1,6,7} There are two primary types of silos utilized: the preformed spring-loaded silo and the surgically sutured silo. The preformed silo, widely considered the modern standard of care, features a flexible inner ring that secures the device within the abdominal wall without the need for sutures. In contrast, the surgically constructed silo involves suturing a silicone sheet directly to the fascia.⁷

A critical yet unresolved question is whether the time from delivery to surgery affects outcomes on an hour-by-hour basis. Identifying a specific 'optimal cutoff time' is essential for refining perinatal management protocols. If a distinct time-dependent correlation is established, it would scientifically justify the prioritization of prenatal maternal transfer to tertiary centers for fetuses with a prenatal diagnosis, ensuring immediate access to pediatric surgical care. Furthermore, for unexpected cases lacking prenatal detection, defining this timeframe would underscore the urgency of rapid referral, aiming to minimize the transport interval to achieve the best possible prognosis.

The main purpose of this study was to evaluate the effect of time from delivery to surgical repair on enteral feeding outcomes in neonates with uncomplicated gastroschisis. The primary outcomes were time to start enteral feeding and time to full enteral feeding (discontinuation of parenteral nutrition), while the secondary outcomes included ventilator days, postoperative complications, and length of stay.

MATERIALS AND METHODS

This study was a retrospective analysis approved by the Ethics Committee of Lampang Hospital. Our population comprised neonates with uncomplicated gastroschisis who were treated at Lampang Hospital from February 2014 to

December 2024. The electronic database reviews included characteristic data, time-to-surgery (time from birth to first surgery is in hours), surgical method (primary closure or secondary closure), ventilator days, feeding data and post-operative complications. Patients were categorized based on the condition of the herniated bowel. Uncomplicated gastroschisis was defined as patients with an isolated defect and uncompromised bowel, whereas complicated gastroschisis was defined as cases presenting with associated bowel atresia, perforation, or volvulus. Consequently, the exclusion criteria were patients with complicated gastroschisis.

Upon admission to the neonatal intensive care unit (NICU), all neonates were placed under a radiant warmer to maintain normothermia. The eviscerated bowel was covered with sterile saline-soaked gauze, followed by an outer layer of dry gauze, to minimize heat and fluid loss.

A nasogastric tube was inserted for gastric decompression, and broad-spectrum antibiotics were administered. Intravenous fluid resuscitation was initiated immediately. The preoperative resuscitation targets included achieving hemodynamic stability (mean arterial pressure and heart rate within normal ranges for gestational age), ensuring adequate tissue perfusion (urine output > 1 mL/kg/hr), and maintaining a core body temperature between 36.5°C and 37.5°C.

The surgical procedure, primary closure or silo sac placement, was determined intraoperatively based on abdomino-visceral proportion and intra-abdominal pressure. A preformed silo was adapted from a wound protector as in laparoscopic surgery (**Figure 1**). The device was adapted by inserting the inner ring into the abdominal cavity and extending the plastic sheath upward to encase the eviscerated bowel. The distal end was then ligated to construct a temporary silo.

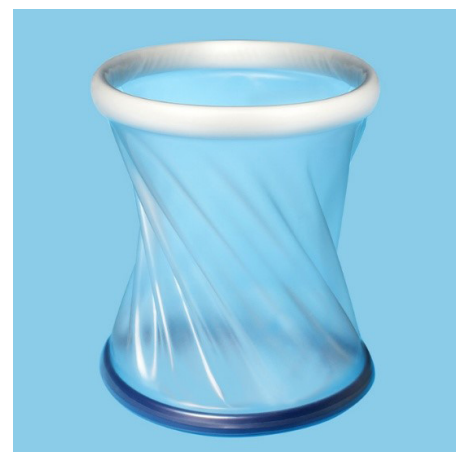


Figure 1 Silo

The reviewed feeding data were time to start enteral feeding (age at first enteral feeding) and time to full enteral feeding (age at full enteral feeding and discontinuation of parenteral nutrition). Enteral feeding was started once normal bowel function was established. The return of bowel function was assessed by the presence of normal bowel sounds, the resolution of bilious nasogastric drainage, and passage of stool. After enteral feeding was successful, parenteral nutrition was discontinued.

Statistical analyses included Student's t-test, Wilcoxon rank-sum test (Mann–Whitney U test), and Kruskal–Wallis test. A *p*-value less than 0.05 was considered statistically significant. A full parametric survival analysis with the Gompertz distribution was conducted and reported as a parametric failure curve.

RESULTS

Thirty-five cases of gastroschisis were treated at Lampang Hospital from February 2014 to December 2024. Twelve patients were excluded from the study: eight patients had incomplete data, and four patients had complicated gastroschisis. Twenty-three patients remained in the study (**Figure 2**). Among these, 6 patients (26.1%) were transferred from other hospitals. Fourteen cases (60.9%) were preterm neonates, and 9 (39.1%) were full-term. Nineteen cases (82.6%) had a low birth weight, 3 (13.0%) had a normal birth weight (> 2.5 kg), and 1 (4.3%)

had a very low birth weight. There were no statistically significant differences in outcomes between patients born preterm and those born term, or between those with low birth weight and those with normal birth weight (**Table 1**).

A prenatal ultrasound successfully diagnosed gastroschisis in 15 cases (65.2%). Among these prenatally diagnosed cases, the mothers either received complete antenatal care and delivered at the study institution, were referred to other hospitals for in utero transfer prior to delivery, or delivered at other hospitals followed by a postnatal transfer of the neonate. Regarding neonatal comorbidities, respiratory and airway problems were the most commonly observed. Specifically, 5 patients (21.7%) developed respiratory distress syndrome (RDS), 2 patients (8.7%) had meconium aspiration syndrome (MAS), and 1 patient (4.3%) presented with subglottic stenosis. Additional concurrent anomalies in this cohort included atrial septal defect in 2 patients (8.7%), patent ductus arteriosus in 1 patient (4.3%), and septo-optic dysplasia in 1 patient (4.3%).

All surgical interventions took place following initial postnatal resuscitation. Primary fascial closure was performed in 5 cases (21.7%), and silo placement with staged closure was performed in 18 cases (78.3%). The data showed no statistically significant differences in feeding outcomes, ventilation days, and hospital stays between the two surgical groups (**Table 1**). The 23 patients were categorized into five groups based on their time-to-

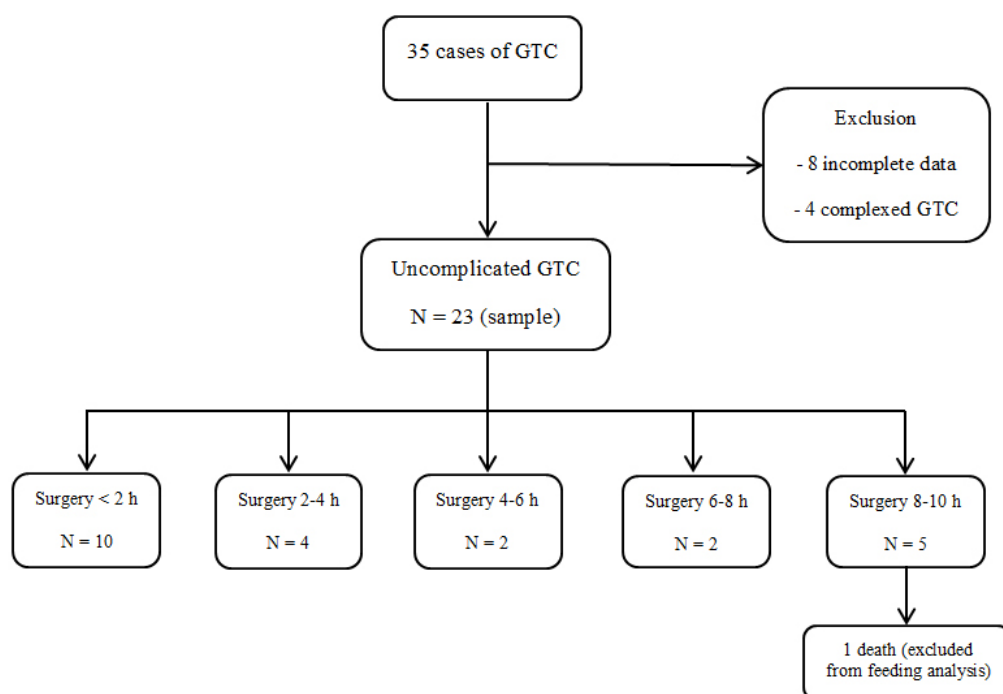


Figure 2 Classification of sample case according to time-to-surgery

Table 1 Outcome correlated to the gestational age, birth weight, abdominal wall closure method, and time-to-surgery

Characteristics	TTF (days)	TTFF (days)	Ven-Day	LOS (days)
GA	(mean $\pm$ sd)	(mean $\pm$ sd)	median (IQR)	median (IQR)
Term (n = 9)	16.1 $\pm$ 4.5	24.4 $\pm$ 6.0	3 (2-3)	24 (20-29)
Preterm (n = 13)	17.2 $\pm$ 3.9	25.8 $\pm$ 6.4	4 (3-7)	27 (25-29)
p value	0.570	0.631	0.060	0.226
Birth Weight	median (IQR)	median (IQR)	median (IQR)	median (IQR)
VLBW (n = 1)	16 (16-16)	23 (23-23)	10 (10-10)	27 (27-27)
LBW (n = 18)	15 (15-21)	24 (21-28)	3 (2-4)	26 (24-29)
NBW (n = 3)	13 (12-22)	19 (19-28)	2 (0-3)	20 (20-30)
p value	0.691	0.495	0.071	0.480
Sx method	(mean $\pm$ sd)	(mean $\pm$ sd)	median (IQR)	median (IQR)
Primary (n = 5)	17.4 $\pm$ 5.9	29.4 $\pm$ 7.1	3 (2-4)	32 (24-38)
Staged (n = 17)	16.5 $\pm$ 3.6	24.0 $\pm$ 5.5	3 (2-4)	25 (22-29)
p value	0.687	0.084	0.9034	0.237
Time-to-surgery	median (IQR)	median (IQR)	median (IQR)	median (IQR)
< 2 hr (n = 10)	15.5 (13-21)	22.5 (19-26)	2.5 (2-3)	25 (20-27)
2-4 hr (n = 4)	15 (12-17.5)	28 (26-32.5)	4 (2.5-6)	29 (27-33.5)
4-6 hr (n = 2)	19 (15-23)	26 (21-31)	5 (2-8)	27 (22-32)
6-8 hr (n = 2)	19.5 (15-24)	28 (21-35)	3.5 (3-4)	30.5 (22-39)
8-10 hr (n = 4)	15 (14.5-18.5)	22 (21-31.5)	3.5 (3-7)	26 (24.5-44.5)
p value	0.693	0.365	0.543	0.497

TTF: time to start enteral feeding (days) / TTFF: time to full enteral feeding (days) / Ven-Day: ventilation day / LOS: length of stay (days)

surgery: 10 cases (43.5%) underwent surgery in less than 2 hours, 4 (17.4%) between 2–4 hours, 2 (8.7%) between 4–6 hours, 2 (8.7%) between 6–8 hours, and 5 (21.7%) between 8–10 hours (**Figure 2**). The overall median time to surgery (n = 23) was 4 hours (range: 0.5–10 hours), with a mean of 4.5 hours. When stratified by surgical approach, the median time to surgery for the primary closure group was 6 hours (range: 4–9 hours). For the staged closure group, the median time to the first procedure was 2 hours (range: 0.5–10 hours), and the median time to the second procedure was 5 days (range: 3–7 days).

Post-operative complications included wound infection and wound dehiscence in 2 cases (8.7%), both of which were in the 2-4 hours time-to-surgery group and managed with staged closure. Necrotizing enterocolitis (NEC) developed in 2 cases (8.7%): one who had surgery within 4 hours with primary closure and the other at 10 hours with staged closure, which resulted in a prolonged time to full feeding period (37 and 40 days, respectively). The latter case also developed a catheter-related bloodstream infection (CRBSI). The neonate presented with respiratory distress syndrome (RDS) and, following initial surgery with a staged closure, subsequently died secondary to ventilator-associated pneumonia and sepsis at 6 days of life. Therefore, this patient was excluded from the statistical feeding analysis.

For the feeding analysis, the median time to start

enteral feeding and full enteral feeding was 15 days (IQR, 14.25–20.5) and 23.5 days (IQR, 21.0–28.0), respectively. The outcomes showed no statistically significant differences regarding the number of days to start enteral feeding, days to full enteral feeding, days to extubation, and length of stay across the time-to-surgery groups (**Table 1**). However, a trend was observed associating earlier surgery with earlier initiation of enteral feeding (**Figure 3**) and a shorter duration to achieve full feeding (**Figure 4**).

DISCUSSION

Uncomplicated gastroschisis is currently characterized by low morbidity and gradually decreasing mortality.⁸ However, clinical outcomes remain highly variable. To optimize patient care, various management strategies have been extensively evaluated in the literature, with particular attention paid to the interval between delivery and surgical intervention.^{9,10} Theoretically, early primary closure performed within a few hours of birth offers benefits over staged closure by rapidly returning the intestines to their anatomical position. This minimizes the risk of vascular compromise arising from mesenteric compression at the ring defect⁷ or mesenteric volvulus. Consequently, some studies advocate for immediate surgical repair following birth to maximize the likelihood of successful primary fascial closure.^{4,11}

A study from Chiang Mai University (CMU) reported that several factors associated with successful early enteral



Figure 3 The probability of starting enteral feeding related to time-to-surgery

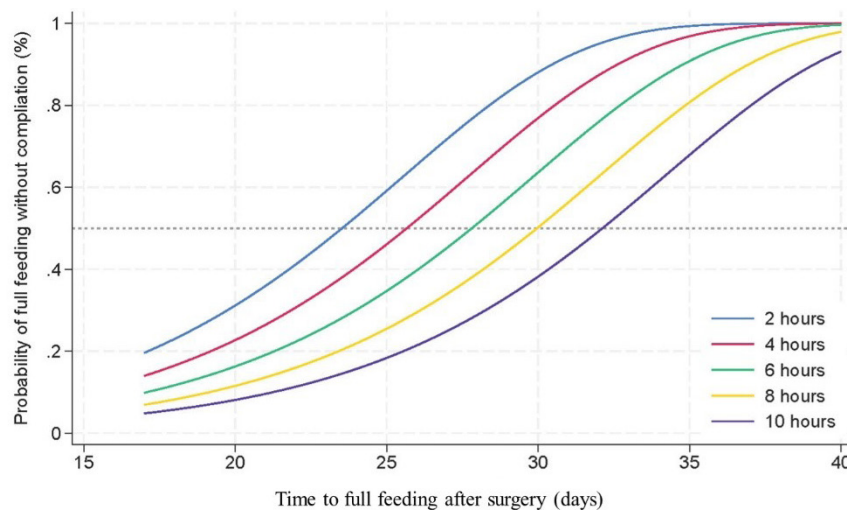


Figure 4 The probability of full feeding related to time-to-surgery

feeding were undergoing surgery within 10 hours, early postoperative extubation within 4 days, and initiating feeding before 10 days of life.¹² In the present study, all cases underwent the first surgical intervention within 10 hours after birth. Although there were no statistically significant differences regarding the effect of time-to-surgery on the days to start enteral feeding, days to full enteral feeding, and length of stay, a tendency was observed toward a higher probability of earlier enteral feeding and a shorter duration of TPN (full enteral feeding) when the surgery was performed earlier. A similar trend was reported by Tawil et al., where surgical intervention after 6 hours was associated with increased TPN duration and longer admission times, though their findings also did not reach statistical significance.¹³ Singh et al. demonstrated that commencing feeds within 10 days is associated with significantly lower inci-

dence of sepsis. This benefit is likely attributed to shorter TPN duration, reduced exposure to central venous catheters, and decreased length of stay.⁹ Furthermore, minimizing TPN duration reduces the risk of parenteral nutrition-associated liver disease (PNALD). Consistent with these risks, the present cohort showed that the patient who developed NEC and required prolonged TPN subsequently developed a catheter-related bloodstream infection (CRBSI).

Regarding time to surgery, the median time from delivery to first documented operative intervention in this study was 4 hours, whereas Bucher et al. reported a shorter interval of approximately 2 hours.¹⁴ However, these findings are consistent with a study from Chiang Mai University, which similarly reported prolonged time to surgery attributed to transportation time required for long-distance patient referrals.¹² While the median time

to start enteral feeding in the present cohort (15 days) was comparable to previous reports (18 days), the median time to full enteral feeding (23.5 days) was significantly shorter than the 44 days observed by Bucher et al.¹⁴

Most gastroschisis patients were preterm and had a low birth weight, which inherently predisposes them to respiratory distress syndrome (RDS). The presence of respiratory compromise significantly complicates initial stabilization. Consequently, the postnatal inter-hospital transport of these fragile, often intubated neonates carries a high risk of hypoxia due to suboptimal ventilatory support during transit. Therefore, early prenatal diagnosis, followed by in utero maternal transfer to a tertiary center, offers dual benefits: it significantly reduces time to surgery by eliminating postnatal transport delays and ensures immediate access to a specialized neonatal intensive care unit (NICU) for prompt ventilatory support. In this series, an overall prenatal diagnosis was achieved in 65.2% of the cases. Notably, over the last 7 years of the study period, the rate of prenatal diagnosis has improved to nearly 100%. However, it was noted that some prenatally diagnosed cases were still delivered at other hospitals, necessitating postnatal neonatal transfers.

The debate over the optimal location of delivery continues in the literature. Many studies have advocated for the benefits of maternal transfer during pregnancy to ensure delivery at a tertiary center. Quirk et al. reported that infants born at the surgical center benefited from earlier initiation of enteral feeds and a shorter length of stay compared with transferred neonates.¹⁵ Conversely, recent studies from the United Kingdom suggest no significant advantage regarding the proximity of delivery to a pediatric surgical center,^{10,16} and Singh et al. recommended that adequate preoperative stabilization be prioritized over rapid surgical closure.⁹ These latter findings align with the present study, which did not demonstrate a statistically significant effect of time-to-surgery on overall patient outcomes. Nevertheless, given the severe risks associated with transferring critically ill neonates and the widespread population distribution of Northern Thailand, the author advocates for the continuous improvement of the maternal referral system. Establishing a clear, standardized in utero transfer protocol for network hospitals is essential to facilitate prompt and standardized resuscitation, optimize preoperative conditions, and ultimately maximize patient safety.

The abdominal wall closure method appears to influence outcomes in uncomplicated gastroschisis, with primary closure generally superior to staged closure.^{17,18}

Specifically, staged closure is associated with prolonged durations of TPN, mechanical ventilation, and hospital stay compared to primary closure.⁹ This comparison is prone to selection bias because primary closure is typically successful in patients with favorable bowel conditions and sufficient abdominal capacity. In contrast, neonates with compromised bowel conditions—such as severe edema or a shortened mesentery—are generally not amenable to primary reduction and undergo silo placement-staged closure, which is associated with a high rate of sepsis, delayed feeding, and other complications.¹⁹ In this study, postoperative wound infection occurred in 2 cases (8.7%), both of which were in the staged closure group. This finding is consistent with the report by Sangkhathat et al., who observed a wound infection rate of 32.35% and similarly found a higher prevalence of infectious complications in patients undergoing staged reduction.²⁰ This predisposition may be attributed to the prolonged presence of the silo and the open nature of the abdominal defect during the reduction period. Despite this specific complication, there were no statistically significant differences in overall outcomes between primary closure and staged closure in this cohort. A possible explanation for this similarity could be the disparity in the number of cases between the two groups (5 primary vs. 17 staged closures). Nevertheless, primary closure remains the preferred surgical method when feasible.²¹ Regardless of these findings, clinical decision-making must be tailored to each patient to avoid the risks of abdominal compartment syndrome⁸ and respiratory distress.

Given the substantial proportion of patients requiring staged closure in this series, implementing routine bedside silo placement is a crucial future direction for our institution. Traditionally, silo construction at the center has been performed in the operating room, which inherently introduces delays related to surgical theater availability and transport. Conversely, the immediate bedside application of a preformed silo in the NICU offers profound physiological benefits. It significantly shortens the duration of bowel exposure, minimizes evaporative heat and fluid losses, and accelerates the initial resuscitation process. By completely bypassing the wait time for an operating room, bedside silo placement allows for earlier visceral protection and a more gradual reduction. This proactive approach may effectively mitigate bowel inflammation, thereby accelerating the recovery of physiological gut motility and ultimately improving enteral feeding out-

comes. Therefore, establishing a standardized bedside silo protocol is strongly recommended as a primary strategy to further optimize the management of gastroschisis in our regional network.

CONCLUSION

In conclusion, although statistical significance was not achieved due to sample size constraints, the present study demonstrated that earlier surgical intervention may affect enteral feeding outcomes in neonates with uncomplicated gastroschisis, specifically the probability of earlier feeding initiation and shorter TPN duration. To facilitate early and optimal surgical management, early prenatal diagnosis combined with prompt in utero maternal transfer to a tertiary pediatric surgical center is advocated. Furthermore, establishing standardized protocols for maternal transport and implementing routine bedside silo placement in the NICU are crucial next steps. These proactive strategies will minimize transport-related delays, accelerate initial resuscitation, and ultimately improve the overall quality of care for this vulnerable population.

REFERENCES

- Holland AJ, Walker K, Badawi N. Gastroschisis: an update. *Pediatr Surg Int.* 26(9):871-8. doi: 10.1007/s00383-010-2679-1.
- Langer JC, Longaker MT, Crombleholme TM, et al. Etiology of intestinal damage in gastroschisis. I: Effects of amniotic fluid exposure and bowel constriction in a fetal lamb model. *J Pediatr Surg.* 24(10):992-7. doi: 10.1016/s0022-3468(89)80200-3.
- Saranrittichai S. Gastroschisis: delivery and immediate repair in the operating room. *J Med Assoc Thai.* 91(5):686-92.
- Coughlin JP, Drucker DE, Jewell MR, et al. Delivery room repair of gastroschisis. *Surgery.* 114(4):822-6.
- O'Shea K, Harwood R, O'Donnell S, et al. Does the time to the theater matter in simple gastroschisis? *World J Pediatr Surg.* 6(4):e000575. doi: 10.1136/wjps-2023-000575.
- Klein MD. Congenital defects of the abdominal wall. In: Coran AG, editors. *Pediatric Surgery.* 7th ed. Philadelphia: Elsevier Saunders; 2012. p. 973-84. ISBN: 978-0323072557.
- Skarsgard ED. Management of gastroschisis. *Curr Opin Pediatr.* 28(3):363-9. doi: 10.1097/MOP.0000000000000336.
- Fraga MV, Laje P, Peranteau WH, et al. The influence of gestational age, mode of delivery, and abdominal wall closure method on the surgical outcome of neonates with uncomplicated gastroschisis. *Pediatr Surg Int.* 34(4):415-9. doi: 10.1007/s00383-018-4233-5.
- Singh SJ, Fraser A, Leditschke JF, et al. Gastroschisis: determinants of neonatal outcome. *Pediatr Surg Int.* 19(4):260-5. doi: 10.1007/s00383-002-0886-0.
- Nicholls G, Upadhyaya V, Gornall P, et al. Is specialist centre delivery of gastroschisis beneficial? *Arch Dis Child.* 69(1 Spec No):71-2. doi: 10.1136/adc.69.1_spec_no.71.
- Swift RI, Singh MP, Ziderman DA, et al. A new regime in the management of gastroschisis. *J Pediatr Surg.* 27(1):61-3. doi: 10.1016/0022-3468(92)90106-h.
- Pratheeppanyapat T, Tepmalai K, Singhavejsakul J, et al. The factors associated with successful early enteral feeding in gastroschisis. *Pediatr Surg Int.* 34(7):743-8. doi: 10.1007/s00383-018-4282-9.
- Tawil KA, Gillam GL. Gastroschisis: 13 years' experience at RCH Melbourne. *J Paediatr Child Health.* 31(6):553-6. doi: 10.1111/j.1440-1754.1995.tb00883.x.
- Bucher BT, Mazotas IG, Warner BW, et al. Effect of time to surgical evaluation on the outcomes of infants with gastroschisis. *J Pediatr Surg.* 47(6):1105-10. doi: 10.1016/j.jpedsurg.2012.03.016.
- Quirk JG Jr, Fortney J, Collins HB 2nd, et al. Outcomes of newborns with gastroschisis: the effects of mode of delivery, site of delivery, and interval from birth to surgery. *Am J Obstet Gynecol.* 174(4):1134-8. doi: 10.1016/s0002-9378(96)70655-5.
- Stoodley N, Sharma A, Noblett H, et al. Influence of place of delivery on outcome in babies with gastroschisis. *Arch Dis Child.* 68(3 Spec No):321-3. doi: 10.1136/adc.68.3_spec_no.321.
- Luck SR, Sherman JO, Raffensperger JG, et al. Gastroschisis in 106 consecutive newborn infants. *Surgery.* 98(4):677-83.
- Dore Reyes M, Triana Junco P, Barrena Delfa S, et al. Primary versus secondary closure: ventilatory and nutritional differences in patients with gastroschisis (in Spanish). *Cir Pediatr.* 29(2):49-53.
- Novotny DA, Klein RL, Boeckman CR. Gastroschisis: an 18-year review. *J Pediatr Surg.* 28(5):650-2. doi: 10.1016/0022-3468(93)90022-d.
- Sangkhatat S, Patrapinyokul S, Chiengkriwate P, et al. Infectious complications in infants with gastroschisis: an 11-year review from a referral hospital in southern Thailand. *J Pediatr Surg.* 43(3):473-8. doi: 10.1016/j.jpedsurg.2007.10.026.
- Alali JS, Tander B, Malleis J, et al. Factors affecting the outcome in patients with gastroschisis: how important is immediate repair? *Eur J Pediatr Surg.* 21(2):99-102. doi: 10.1055/s-0030-1267977.