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CASE REPORT

Phased nutritional management and growth recovery following surgical necrotising enterocolitis in a preterm infant: a case report

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Introduction: Necrotising enterocolitis (NEC) remains a leading cause of morbidity and mortality among preterm infants. Nutritional management is central to survival and recovery, but is complicated by bowel rest, surgical resections and malabsorption.
Case presentation: A male infant born at 29 weeks' gestation (birthweight 1 150 g) developed Bell's stage IIB NEC on day 20 of life. He required prolonged parenteral nutrition (PN) and ileal resection with ileostomy, preserving 130 cm of small bowel. PN was continued postoperatively with cautious trophic expressed breast milk (EBM) feeds. Enteral nutrition was advanced gradually, later including semi-elemental formulas to manage malabsorption and high stoma output. Stoma reversal occurred on day 82, and full enteral autonomy was achieved by day 93. Despite severe growth restriction (< −3 *z*-score) on discharge, the infant demonstrated improved growth velocity (18 g/kg/day) following stoma reversal.
Discussion: This case illustrates phased nutritional management following surgical NEC. PN provided metabolic stability, while early cautious enteral feeding promoted intestinal adaptation.

Keywords: necrotising enterocolitis, surgery, preterm infants, nutritional management

Introduction

Necrotising enterocolitis (NEC) is the most common gastrointestinal emergency in preterm infants, affecting 5–12% of very-low-birthweight neonates and carrying mortality rates of up to 35% in surgical cases.[1] Nutritional management is both preventive and therapeutic, balancing the need for bowel rest and parenteral nutrition (PN) with the early reintroduction of enteral nutrition (EN) to stimulate adaptation.[2,3] Optimal nutritional management is essential to promote intestinal adaptation following surgical NEC.[2] According to the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) and the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines, early, carefully phased reintroduction of enteral nutrition supports mucosal recovery and reduces parenteral nutrition-related complications.[4] This case from Tygerberg Hospital NICU describes a structured, phased approach in alignment with ESPGHAN/ESPEN guidelines for surgical NEC recovery.

Case presentation

An infant was born at 29 weeks' gestation via normal vaginal delivery (NVD) to a 23-year-old primigravida (G1P1). The pregnancy was complicated by threatened preterm labour, requiring two hospital admissions prior to transfer to a tertiary centre. Apgar scores were 5 and 8 at 1 and 5 minutes, respectively. The infant's birthweight was 1 150 g and plotted as appropriate for gestational age (AGA) on the Fenton 2025 growth chart, corresponding to a *z*-score of 0.65 SD. Initial complications included respiratory distress syndrome, managed with continuous positive airway pressure (CPAP) and surfactant therapy.

Minimal enteral feeds with expressed breast milk (EBM) were initiated on day 3 and advanced to 150 ml/kg/day by day 15 of life. Prior to the onset of NEC, EBM was fortified with FM85 (1 g/20 ml) during advancement to full enteral feeds to optimise protein and energy intake in this very preterm infant. On day 20, the infant developed abdominal distension, absent bowel sounds, and metabolic acidosis. Abdominal radiography confirmed Bell's stage IIB NEC. The episode of NEC was initially managed medically with bowel rest, PN, and broad-spectrum antibiotics.

Blood cultures grew *Candida albicans*, which was sensitive to and treated with intravenous fluconazole. During the hospital stay, the infant received multiple blood transfusions, each of which was followed by feeding intolerance manifesting hours to days later, highlighting the potential association between transfusions and NEC exacerbation or enteral feeding intolerance in preterm infants. Despite initial improvement, recurrent vomiting and feeding intolerance persisted. A contrast study subsequently confirmed a post-NEC ileal stricture, necessitating surgical intervention (Figure 1).

At laparotomy on day 31, necrotic ileum was resected, leaving approximately 130 cm of viable small bowel and an intact ileocecal valve, with creation of an ileostomy. Postoperatively, PN was continued, with trophic EBM reintroduced after eight days. Stoma output ranged from 16–30 ml/kg/day, resulting in substantial fluid and electrolyte losses. Stoma reversal was performed on day 82 (weight 2 065 g), and by day 93 the infant achieved full enteral autonomy. On discharge (corrected gestational age 42 weeks; 2 950 g), the infant remained severely growth restricted (< 3rd centile), despite improved growth velocity following stoma reversal.

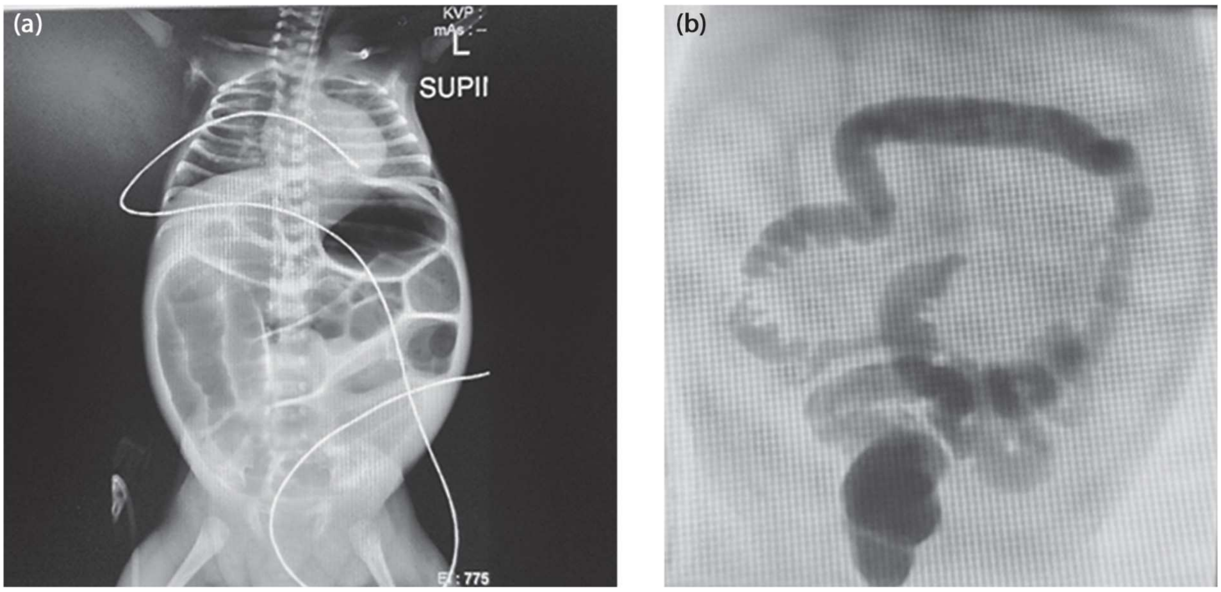

Figure 1: (a) Abdominal radiograph demonstrating multiple dilated bowel loops; (b) contrast study revealing the presence of an ileal stricture.

Nutritional management by clinical phase

Acute NEC and post-surgical phase (DOL 20–43)

During the acute phase of NEC (DOL 20–31), the infant remained nil per os (NPO) for 18 days. Parenteral nutrition (PN) was initiated and advanced to 150 ml/kg/day, providing 3.5–4 g/kg/day of protein and 90–100 kcal/kg/day. Micronutrient provision followed standard neonatal PN protocols and included vitamin D (400 IU/day) and phosphate (75 mg/kg/day) administered intravenously as part of the PN solution. Sodium replacement was provided to compensate for high-output ileostomy losses. Iron supplementation (6 mg/kg/day) was introduced enterally once feeds were established. This comprehensive macro- and micronutrient strategy was essential to prevent catabolism, support bone mineralisation and maintain electrolyte balance prior to surgical intervention.

The infant underwent exploratory laparotomy due to an ileal stricture, with preservation of approximately 130 cm of small bowel and creation of an ileostomy. Postoperatively (DOL 31–43), PN continued as the primary nutrition modality. Small-volume trophic feeds at 16 ml/kg/day of expressed breastmilk (EBM) were introduced once ileus resolved, prioritising its immunological and trophic properties. Stoma output was carefully monitored to guide fluid and electrolyte replacement; high-output ileostomy, $\geq$ 20 ml/kg/day, necessitated sodium supplementation and fluid restriction.

Enteral advancement and adaptation (DOL 43–82)

Enteral feeding was gradually advanced, starting with 5 ml EBM every 3 hours as bolus feeds, and increasing by 10–20 ml/day as tolerated. Clinical tolerance was assessed via abdominal examination, gastric residuals and stoma output. Due to persistent malabsorption – identified through clinical evaluation (loose, high-volume stoma output) and a positive reducing substances test – and suboptimal weight gain, defined as failure to achieve the expected 15 g/kg/day, a semi-elemental formula was introduced to improve nutrient absorption and reduce osmotic load. PN was tapered as enteral nutrition progressed, following ESPGHAN/ESPEN guidance for cautious advancement post-NEC.

Stoma reversal and recovery (DOL 82–93)

At stoma reversal, the infant weighed 2 065 g. PN was restarted perioperatively and withdrawn once enteral feeds were re-established. EBM was reintroduced and supplemented with a semi-elemental formula to support gut adaptation. By DOL 93, the infant achieved full enteral autonomy with enteral nutrition alone, without further parenteral nutrition support. Table 1 outlines the phased approach to nutritional support and its impact on growth, highlighting the transition from parenteral to enteral autonomy and corresponding changes in growth velocity.

Summary of nutritional strategy

PN dominated the early phases to prevent catabolism and support recovery post-NEC and surgery, while enteral

Table 1: Phased nutritional management and growth milestones.

Phase	Day of life (DOL)	Main nutrition	Key clinical focus	Growth response
Acute NEC & Post-surgical	20–43	PN + cautious trophic EBM	Metabolic stability, fluid/electrolyte monitoring	Weight maintenance (11–12 g/kg/day)
Enteral Advancement	43–82	Gradual EBM → semi-elemental formula	Monitor tolerance, manage stoma losses	Slow gain, persistent EUGR
Stoma Reversal & Recovery	82–93	EBM + semi-elemental formula	Gut adaptation, PN weaning	Improved growth velocity (18 g/kg/day)

EBM: expressed breast milk; EUGR: extra-uterine growth restriction (change in *z*-score of more 1.28 SD from birth)[5]; PN: parenteral nutrition.

nutrition, prioritising EBM and semi-elemental formulas, gradually assumed a greater role to promote gut adaptation and growth. The nutritional trajectory is illustrated in Figure 2.

Growth outcomes

Weight-for-age *z*-scores declined during PN dependence, with growth velocity averaging 11–12 g/kg/day. After stoma reversal, growth velocity increased to 18 g/kg/day, though the infant remained below the 3rd *z*-score on discharge (Figure 3).[6]

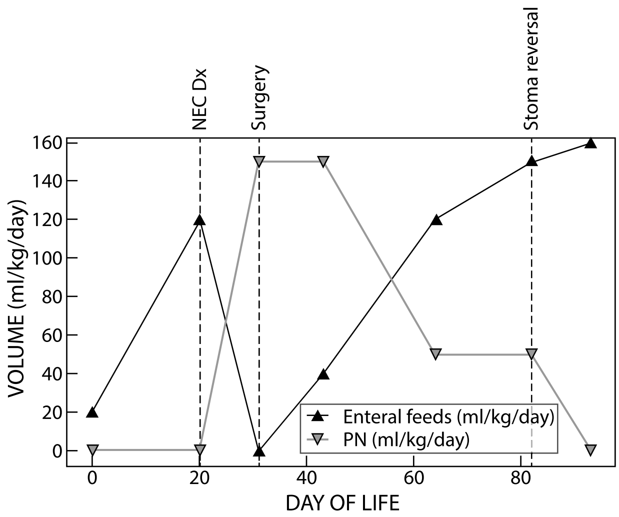

Figure 2: Enteral vs parenteral nutrition across admission. NEC Dx: necrotising enterocolitis diagnosis.

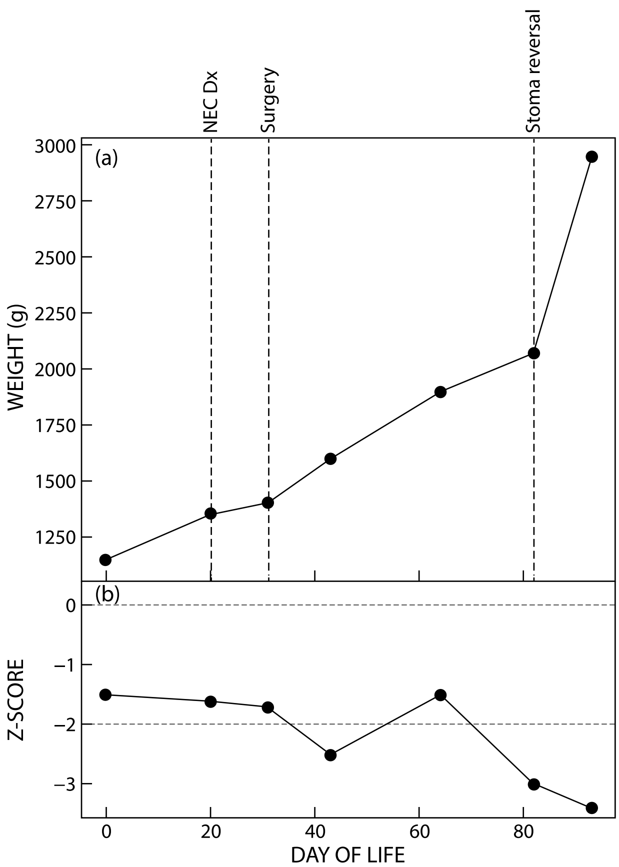

Figure 3: (a) Actual measured weight (g) and (b) the corresponding weight-for-age *z*-scores over time. NEC Dx: necrotising enterocolitis diagnosis.

Discussion and conclusion

This case highlights the complexities of nutritional management in surgical necrotising enterocolitis (NEC) and underscores the importance of a phased, evidence-based approach. Parenteral nutrition (PN) was indispensable in the acute and perioperative phases, ensuring metabolic stability despite the associated risk of infection. Early, cautious enteral feeding with expressed breast milk (EBM) supported gut adaptation, though stoma-related malabsorption limited nutrient absorption. The introduction of semi-elemental and specialised formulas improved tolerance, reduced stoma losses, and modestly enhanced growth, demonstrating the benefit of tailored enteral strategies alongside PN. Despite intensive nutritional support, the infant experienced severe extrauterine growth restriction (EUGR), a frequent complication among NEC survivors.[7] However, improved growth velocity following stoma reversal indicates potential for catch-up growth and gut adaptation when enteral nutrition is optimally phased. Episodes of feeding intolerance followed several red blood cell transfusions, consistent with reports describing a temporal association between transfusion and NEC (transfusion-associated NEC, TANEC).[8] Although causality remains uncertain, vigilance during transfusions in preterm infants is advised. Careful monitoring of transfusion timing, indications, and volumes is crucial, as transfusions may trigger or worsen intestinal injury in vulnerable preterm infants.

Recovery from surgical NEC requires meticulous nutritional planning aligned with international ESPGHAN/ESPEN guidelines. Key clinical considerations include balancing PN and enteral nutrition, prioritising breast milk, supplementing with specialised formulas as indicated, managing stoma output carefully, and monitoring growth using *z*-scores. In resource-limited South African neonatal units, pragmatic implementation of these evidence-based strategies is essential to optimise survival and long-term outcomes. Continued follow-up is recommended to assess growth, micronutrient status and neurodevelopment, supporting recovery beyond hospital discharge.

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