

# Clinical Pearl: Nutritional Management of a Micro-preemie without the need of a PICC line: A Case Report and Review of Literature

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## Abstract

More micro-preemie infants born with birth weight (BW) under 750 grams are surviving with advances in neonatal care. However, their management is challenging, often unclear, and fraught with wide variations in clinical practice. Nutritional care of these infants born at the edge of viability is a complex, multi-faceted issue. Their early nutritional status has short and long-term implications. For extended periods, the need for central access and dependence on parenteral nutrition (PN) places the preterm infant at risk for numerous complications. This case report discusses the nutritional management of a micro-preemie infant with a BW of 400 grams who did not require a peripherally inserted central catheter (PICC) for nutrition. This infant tolerated enteral nutritional advancement and was weaned off of PN by eight days of life.

**Keywords:** Extreme prematurity, Micro-preemie, Neonatal Nutrition, Nutrition/Growth Necrotizing enterocolitis, Small for gestational age

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## Introduction

The birth of an extremely low birth weight (ELBW) infant, born at a BW under 1000 grams, is considered a nutritional emergency. Their nutritional management is one of the most complex issues encountered during neonatal intensive care unit (NICU) courses. A better nutritional status has improved survival and long-term outcomes for this patient population (1). Limited fetal reserve coupled with higher

metabolic demands supports the idea of early initiation and preferably rapid advancement of enteral feeds. The prolonged use of PN has been shown to increase the risk of sepsis, cholestasis, persistent gut immaturity, and complications related to the PICC line (2). Multiple studies have supported early initiation and rapid advancements of enteral feed. These studies have also provided evidence that this feeding regimen is safe and leads to a better outcome in preterm infants (3). However, in clinical practice, adherence to these guidelines is quite inconsistent, traditionally for concerns of feeding intolerance and necrotizing enterocolitis (NEC).

Moreover, the criteria and significance of feeding intolerance are also unclear, resulting in frequent feeding interruptions (4). Ultimately, this culminates in prolonged use of PN through a PICC line once umbilical venous (UV) catheters are removed around one week. Most of the trials supporting early and rapid feeding advancements have studied infants with a birth weight of more than 750 grams. Evidence on the safety and efficacy of this feeding regimen in micro-preemies is quite scarce. In this case report, we discuss the feeding management of an infant with BW of 400 grams who attained full enteral feeds by the eighth day of life and did not require a PICC line to continue PN.

## Case Presentation

A 23-year-old white G2P1 pregnant mother presented at 24 weeks and two days to labor and delivery by direct transport from an outlying facility for decreased fetal movement, fetal bradycardic episodes, and anhydramnios. The pregnancy was also complicated by severe intrauterine growth restriction with an estimated fetal weight of only 280 grams. Pertinent maternal serologies were negative. Before transport, she was given one dose of betamethasone and placed on magnesium sulfate for fetal neuroprotection. Aside from prenatal vitamins, the mother was on no other medications. At 24 weeks and three days, an abnormal fetal heart tracing led to the emergent cesarian delivery of a 400 gram female infant. Apgar scores were 4, 6, and 7 at one, five, and ten minutes of life, respectively.

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The infant was intubated with a 2.0 ETT in the delivery room due to the absence of respiratory efforts and later received a dose of surfactant. She was stabilized and transported to the NICU on conventional pressure control ventilation. She remained hemodynamically stable and did not require any inotropic support. Umbilical arterial and UV catheters were placed shortly after, and stock PN with added calcium was started through the UV catheter. Trophic feedings (20ml/kg/day) of expressed breast milk (EBM) were initiated the following day at 24 hours of age. Feeding volumes of EBM/Donor breast milk (DBM) were advanced gradually by 20 ml/kg/day while her PN was tailored to manage her dyselectrolytemia. On the day of life seven, enteral feedings of EBM/DBM were fortified to 24 kcal/ounce while she was receiving 100ml/kg of feeds. On day eight, enteral feedings of 120 ml/kg/day were achieved without complication, and parenteral nutrition was discontinued. On the day of life nine, the UVL was removed, and enteral feedings increased to 140 ml/kg/day with added liquid protein. Feeding duration was gradually increased to two hours from 30-minute bolus feeds for occasional emesis of undigested feeds. There were no short-term feeding-related complications encountered with this feeding regimen, and we were able to avoid a PICC line placement. The requirement of significant ventilatory support complicated her NICU course, but she tolerated her feedings well with adequate growth. By three weeks of life, caloric density was increased to 27 kcal/ounce to meet her growing needs, and she continued to tolerate it well. At the time of writing this case report, she is 12 weeks old, weighing 1800 grams. She remains on non-invasive ventilatory support because of her Chronic lung disease.

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## Discussion

Optimal feeding practice in extremely preterm infants has remained a gray zone area. Previous studies had shown an increased risk of NEC in infants where feedings were advanced rapidly (5). However, the etiology of NEC, as we know, is multifactorial and results from a combination of factors like prematurity, sepsis, gut inflammation, and feedings (6). Exclusively breast milk has been one intervention proven to reduce the risk of NEC (7,8). Breast milk contains secretory immunoglobulin A, lysozyme, lactoferrin, growth factors, cytokines, and several antioxidant enzymes, which are all believed to protect infants against NEC (9). There are situations in NICU where infants often do not have maternal breast milk available. In these situations, donor breast milk (DBM) has been increasingly used in NICUs. Studies have shown

that the use of DBM reduces the rates of NEC compared with cow's milk formula (10). Probiotic is another promising tool shown to reduce NEC incidence (11). The protective effect of probiotics is believed to be through a reduction in Toll-like receptor-4 activation and subsequent inflammatory cascade (12). However, their use for the prevention of NEC is still limited. Moreover, the optimal method of probiotic administration, the strain, dose, timing, and durations are not clear.

Among various proposed causes of NEC, enteral feeding is the only modifiable factor. As such, wide variations in feeding protocols exist across different institutions (13). Most NICUs would start enteral feedings at 10-30 ml/kg/d within the first few days of life and gradually advance by 10-30 ml/kg/d. Most previous studies that linked rapid feeding advancements with NEC were not randomized control trials (RCT) and merely compared outcomes with historical controls. As we know, the etiology of NEC is multifactorial, and some of these factors could not be controlled when compared with controls from different study periods.

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***“Recent Cochrane reviews based on 14 RCT concluded that rapid advancements of enteral feeds do not increase the risk of NEC, death, or feeding intolerance (3). Moreover, initiating feeds early versus late decreases the risk of sepsis by 50% without increasing the risk of NEC (14).”***

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Recent Cochrane reviews based on 14 RCT concluded that rapid advancements of enteral feeds do not increase the risk of NEC, death, or feeding intolerance (3). Moreover, initiating feeds early versus late decreases the risk of sepsis by 50% without increasing the risk of NEC (14). Early feeding establishment also results in a shorter duration of PN, length of NICU stay, reduced rate of cholestatic jaundice, and better growth (2). Infants for whom prolonged PN is needed often require a PICC line. This procedure has numerous complications, including infection, malposition, extravasation into the pleural, pericardial, or peritoneal space, arrhythmia, and line fracture with embolization (15). Preterm infants have an increased risk of postnatal growth failure and poor neurodevelopmental outcomes (16). This risk may be decreased by the early introduction of enteral feeds (17). Despite this growing evidence, very conservative feeding practices are prevalent in many institutions.

Most early and rapid feeding trials included infants with BW of more than 750 grams. Very little data is available on the safety and efficacy of early and rapid feeding advancements in infants under 500grams of BW. Intra-uterine growth restricted (IUGR) preterm infants also deserve a special mention. These infants are born with an abnormal superior mesenteric artery blood flow velocity, associated with an increased risk of NEC (18). This observation and the noted feeding difficulties during the early introduction of enteral nutrition in the IUGR infants lead many NICUs to withhold enteral feeds for the first 24 to 48 hours of life (19). However, this practice is not evidence-based as no conclusive data supports the view that this strategy prevents NEC. Moreover, the most recent

metanalysis has failed to associate an increased risk of NEC with early and rapid feeding regimens in this group of infants (3,20).

When it comes to feeding an infant under 500 gram BW, even observational studies and case series are lacking. Most institutions are even more conservative on the feeding approaches in this group. However, this is not because of reluctance to follow evidence-based practice but because clear evidence to support early and rapid feeding regimens are lacking. Since most micro-preemies have similar physiology as their slightly mature counterparts, extrapolating results of other groups of preemies may not be inappropriate, especially when there is no good evidence to delay initiation and slowly advance enteral feedings in this group. Being a micro-preemie IUGR infant, our case may serve as an essential piece of evidence to support early initiation and advancement of enteral feeds without increasing the risk of feeding intolerance or NEC. With a target of attaining full feeds by 7-8 days of life, most of these infants could be saved from PICC line insertions and their potential complications as well as complications of extended PN.

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### Conclusions

Nutritional management of micro-preemie infants is often a challenging task. In the absence of clear evidence supporting early initiation and rapid/steady advancement in this group, consensus on optimal feeding management is lacking. Our case report may help boost the confidence of clinicians willing to adopt this feeding regimen. More RCTs are needed to evaluate the safety and effectiveness of early initiation and rapid/steady advancements of feeds in this group.

### Established Facts:

- Early initiation and rapid advancement of enteral feeds do not increase NEC risk in preterm infants weighing more than 750 grams at birth.
- There exist wide variations in feeding protocols across different institutions.

### Novel Insights:

- This case highlights that early initiation and steady advancement of enteral feeds is well tolerated even by an SGA Micro preemie infant.

- Early initiation and rapid advancement can help avoid a PICC line and its associated complications.

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