ECRONICON OPEN ACCESS

EC PAEDIATRICS
Review Article

Nutritional Management of Intrauterine Growth Restriction: Challenges, Conundrums and Controversies

Rajasri Seethamraju*

Consultant Neonatologist, Rainbow Children's Hospital, Hydernagar, Hyderabad, India

***Corresponding Author**: Rajasri Seethamraju, Consultant Neonatologist, Rainbow Children's Hospital, Hydernagar, Hyderabad, India.

Received: November 28, 2016; **Published:** December 20, 2016

Abstract

From diagnosis to the day to day management, dealing with an intrauterine growth restricted (IUGR) baby is challenging to say the least. Over the last few decades, in spite of extensive research giving us a good understanding of the intrauterine pathophysiology of these babies, there are still some aspects of this condition that demand greater clarity, right from recognition of the disease to timing of delivery. In addition, the nutritional management of the IUGR infant is still laden with controversies. This review will focus on those controversial aspects of the disease with emphasis on available evidence surrounding feeding the growth restricted neonate.

Keywords: *Intrauterine Growth Restriction; Nutrition; Feeding; Growth Restricted; Newborn*

Introduction

Managing a growth restricted neonate with optimal nutrition is like walking a tight rope. The challenge begins with the precise recognition of the growth restricted baby from among the small and sometimes the not so small babies. The controversy lies in the reams of research spanning the last few decades regarding the feeding practices to be adopted for these babies, which will balance the optimal establishment of enteral nutrition with the risk of necrotising enterocolitis. The conundrum, in the long run, is trying to decide if overzealous promotion of catch-up nutrition will in fact do more harm than good. Let us look at each of these in turn.

Diagnosis: IUGR or not IUGR?

The Intrauterine growth restriction (IUGR) is defined as 'a fetus that fails to reach its full growth potential [1]'. The definition is quite encompassing as it includes not only those infants who can be described as low birth weight (< 2.5 kg) but also those who have dropped centiles in utero but are still above the 2.5 kg mark. IUGR is an antenatal diagnosis that is made after at least two serial antenatal ultrasound scans looking at fetal biometry. A common fallacy is to use this term interchangeably with the small for gestational age (SGA) which is defined as birth weight less than 10% of the population norms for that particular gestational age, parity and gender on the growth chart. Some of the SGA infants may just be constitutionally small and not exposed to the pathology that makes them growth restricted. In other words, not all SGA are IUGR and not all IUGR are SGA. Though occasionally the prognosis for the two maybe somewhat similar, there is a risk that we may miss the growth restricted infant that is not quite SGA.

Feeding- Caution or Courage?

The threat of Necrotising Enterocolitis (NEC) looms large for every IUGR infant which makes nutritional management the most challenging and controversial aspect of the treatment. On one hand, the IUGR neonate needs quick and optimal enteral nutrition due to the lack of nutritional stores. On the other hand, chronic intrauterine hypoxia makes the gut of the baby vulnerable to necrotising enterocolitis. A large retrospective study of premature newborns found that both SGA and IUGR were independently associated with an increased risk of necrotising enterocolitis [2]. Therefore, factors like what milk to feed, when to start feeding, how fast to increment feeds etc. are all of vital importance.

What milk?

The first question is regarding the kind of feed. Breast milk has been proven to be the safest milk in all newborn, more than two and a half decades ago [3], with the risk of NEC being significantly higher in those receiving formula. There is no further data from randomised trials of formula milk versus maternal breast milk for feeding preterm or low birth weight infants. This may be due to difficulty in randomising a baby of a lactating mother to an alternative feed [4]. Maternal breast milk therefore remains the default choice of enteral nutrition. A meta-analysis of trials comparing feeding with formula milk versus donor breast milk [5], suggests that feeding with breast milk has major benefits for preterm or low birth weight infants which therefore gives impetus to using donor breast milk in preference to formula in these babies in the absence of maternal breast milk.

Early or Late?

Several studies were conducted to decide the optimal time to start feeds in growth restricted neonates. Feeds cannot be delayed for fear of NEC as this predisposes the neonates to more central catheter days, more parenteral nutrition, more acquired blood stream infection and delayed gut development [6]. A comparison has been made between early and late onset of enteral nutrition and this has shown that there is no significant difference in outcomes like NEC between the early (Day 2) vs late (Day 6) onset feeding [7-8]. In fact, early feeding reduced days of parenteral nutrition and hospital stay. This is true for majority of growth restricted babies < 35 weeks. However, a word of caution has to be said for those < 29 weeks. These babies are intolerant of feeds for a long time, reach full feeds quite late and have an increased incidence of NEC when enteral nutrition is started early [9].

How to advance feeds?

This is one of the most controversial aspects of feeding the growth restricted infant and extensive research has been done on the subject. There have been studies favoring both slow and fast advancement of feeds. A recent Cochrane review suggested that advancing enteral feed volumes at fast daily increments of 30 ml/kg to 35 ml/kg as opposed to slower 15 ml/kg, does not increase the risk of necrotising enterocolitis in very preterm (< 32 weeks) or VLBW infants [10]. Advancing the volume of enteral feeds at slow rates resulted in several days' delay in regaining birth weight and establishing full enteral feeds. However, the applicability of these findings to extreme preterms, extreme low birth weight and severely growth restricted babies is questionable.

Another approach is minimal enteral feeding (also known as trophic feeding or non-nutritive feeding). Here feeds are started at a minimal amount of 12 -24 ml/kg/day every 2 - 4 hrs but are not advanced in the first week of life. This is supposed to help in promoting gastrointestinal hormonal responses and motility and decreasing feed intolerance when compared to delayed feeds. However, a systematic review found no significant difference in the incidence of NEC in the very low birth weight infants randomised to either group [11].

An interesting concept has been observed over the last two decades which is that despite lack of consensus on a universally applicable and accepted feeding guideline, several centers have demonstrated a consistent decline of incidence in NEC by merely adopting a guideline and following it rigorously, irrespective of the specific details of the guideline. A meta-analysis of 6 observational studies showed that the risk of NEC could be reduced by 87% in babies weighing less than 2500 gms and 29% in those weighing < 1500 gms by instituting some feeding guidelines. Increased awareness of risk factors for NEC, increased vigilance for early signs of NEC, standardised approach to managing feed intolerance and consistency in advancing feeds may have led to reduced incidence of NEC rather than any specific aspect of the guideline itself [12-15].

Best mode of feeding

The next controversy is whether continuous feeds are superior to intermittent bolus feeds in feeding the growth restricted infant. Continuous feeds may reduce the expenditure of energy, reduce intolerance to feeds, and promote nutrient absorption and growth while the bolus feeds are more physiological, causing cyclical release of the gut hormones. However, a systematic review found no significant difference between continuous versus intermittent milk feeding methods in time to achieve full enteral feeding, in feeding intolerance, in somatic growth and in incidence of NEC [16].

What about Supplements?

There is a lot of research regarding the need for nutritional supplements in growth restricted and low birth weight infants. Despite a lack of consensus about the timing, duration and dosages, the following supplements have been recommended as necessary in these infants [17-18].

1. Calcium: All very low birth weight infants (< 2 kg) irrespective of gestation, once they are fully fed, should receive calcium supplementation to a total daily dosage of 120 -140 mg/kg/day, upto 3 kg or one month corrected gestational age, with due monitoring of the bone profile.

2. Iron: All low birth weight infants who are exclusively breast fed, need iron supplementation from 4 weeks of age at 2 - 3 mg/kg/day, upto 12 months of age

3. Multivitamins: All low birth weight infants who are exclusively breast fed, should receive multivitamins once fully fed, at a dose of 0.5ml/day of a standard preparation, upto 12 months of age

4. Vitamin D: All low birth weight infant, once fully fed, should receive 800-1000 IU of Vitamin D per day upto one year of age.

Catch up growth: Are we actually doing the right thing?

The current trend is to feed the IUGR neonates as best and as much as we can in order to achieve 'catch up growth', in the first decade of life. However rapid childhood growth in extremely growth restricted infants may lead to cardiovascular disease and type 2 diabetes in later life among other diseases. The 'developmental origins of adult disease' hypothesis, often called the 'Barker hypothesis' after one of its leading proponents, states that adverse influences early in development, and particularly during intrauterine life, can result in permanent changes in physiology and metabolism, which result in increased disease risk in adulthood. By overloading the extremely growth restricted infants with nutrition to promote catch up growth, we may actually be doing them a disservice in the long term [19].

Where to from here?

Once IUGR is carefully diagnosed and the baby is judiciously delivered, nutrition is the most challenging aspect of management. NEC is the big villain and irrespective of the conflicting research out there, there is irrevocable evidence that just by developing locally acceptable feeding guidelines and adhering to them brings down the incidence of NEC to a great degree. Emerging data shows that promoting rapid growth in extremely growth restricted infants may be counter-productive in the long term.

For now, it would be prudent to diagnose and deliver IUGR babies at the optimal time and then feed and supplement them consistently according to a feeding guideline.

Bibliography

1. "ACOG practice bulletin. Intrauterine growth restriction. N.12". *International Journal of Gynecology and Obstetrics* 72 (2001): 85-96.

2. Garite TJ., *et al*. "Intrauterine growth restriction increases morbidity and mortality among premature neonates". *American Journal of Obstetrics and Gynecology* 191.2 (2004): 481-487.

3. Lucas A and Cole TJ. "Breast milk and necrotising enterocolitis". *Lancet* 336.8730 (1990): 1519-1523.

4. Henderson G., *et al*. "Formula milk versus maternal breast milk for feeding preterm or low birth weight infants". *Cochrane Database of Systematic Reviews* 4 (2007): CD002972.

5. Quigley M and McGuire W. "Formula versus donor breast milk for feeding preterm or low birth weight infants". *Cochrane Database of Systematic Reviews* 4 (2014): CD002971.

6. Schurr P and Perkins EM. "The relationship between feeding and necrotizing enterocolitis in very low birth weight infants". *Journal of Neonatal Nursing* 27.6 (2008): 397-407.

7. Leaf A., *et al*. "Early or delayed enteral feeding for preterm growth-restricted infants: a randomized trial". *Abnormal Doppler Enteral Prescription Trial Collaborative Group Pediatrics* 129.5 (2012): e1260-e1268.

8. Morgan J., *et al*. "Delayed introduction of progressive enteral feeds to prevent necrotising enterocolitis in very low birth weight infants". *Cochrane Database of Systematic Reviews* 12 (2014): CD001970.

9. Kempley S., *et al*. "Feeding infants below 29 weeks' gestation with abnormal antenatal Doppler: analysis from a randomised trial". *Archives of Disease in Childhood - Fetal and Neonatal Edition* 99.1 (2014): F6-F11.

10. Morgan J., *et al*. "Slow advancement of enteral feed volumes to prevent necrotising enterocolitis in very low birth weight infants". *Cochrane Database of Systematic Reviews* 12 (2014): CD001241.

11. Bombell S and McGuire W. "Early trophic feeding for very low birth weight infants". *Cochrane Database of Systematic Reviews* 3 (2009): CD000504.

12. Scmolzer G., *et al*. "Multi-modal approach to prophylaxis of necrotizing enterocolitis: clinical report and review of literature". *Pediatric Surgery International* 22.7 (2006): 573-580.

13. Patole SK., *et al*. "Benefits of a standardized feeding regimen during a clinical trial in preterm neonates". *International Journal of Clinical Practice* 54.7 (2000): 429-431.

14. Patole SK and de Klerk N. "Impact of standardized feeding regimens on incidence of neonatal necrotizing enterocolitis: a systematic review and meta-analysis of observational studies". *Archives of Disease in Childhood - Fetal and Neonatal Edition* 90.2 (2005): F147-F151.

15. Wiedmeier SE., *et al*. "Center differences in NEC within one health-care system may depend on feeding protocol". *American Journal of Perinatology* 25.1 (2008): 5-11.

16. Premji SS and Chessell L. "Continuous nasogastric milk feeding versus intermittent bolus milk feeding for premature infants less than 1500 grams". *Cochrane Database of Systematic Reviews* 11 (2011): CD001819.

17. Steven A., *et al*. "AAP: Calcium and Vitamin D Requirements of Enterally Fed Preterm Infants". *Pediatrics* 131.5 (2013): e1676-e1683.

18. Agostoni C., *et al*. "Enteral Nutrient Supply for Preterm Infants: Commentary from the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition". *Journal of Pediatric Gastroenterology and Nutrition* 50.1 (2010): 85-91.

19. Barker D J P. "The developmental origins of well-being". *Philosophical Transactions of the Royal Society B: Biological Sciences* 359.1449 (2004): 1359-1366.

Volume 3 Issue 2 December 2016