

PREDISCHARGE GROWTH PATTERNS IN VLBW INFANTS

Mariana Boia^{1,2}, Otilia Marginean^{1,2}, Aniko Manea^{1,2}, Delia Maria Nicoara²

Abstract

Introduction: VLBW preterm infants with postnatal growth restriction have a higher risk of morbidity and mortality. **Objectives:** The goal of this study was to determine the degree of extrauterine growth restriction in selected VLBW infants admitted during January 2011-December 2012 in the Neonatal Ward. **Methods:** Z-scores for birth weight and discharge weight were computed using Fenton's reference. They were compared to the median weight of a fetus of comparable gestational age based on an intrauterine growth reference. **Results:** The studied newborns were delivered with birth weight ranging from 700g to 1480g (mean birth weight = 1200g) between 26 to 32 weeks (mean gestational age = 29.2 weeks). 33% were small for gestational age. Mean z-score at discharge (-1.4), was lower than the mean z-score at birth (-0.58). Twice as many babies (68% vs 33%) were growth restricted at discharge compared to at birth. 87% of these experienced feeding intolerance and acute infections therefore requiring parenteral nutrition and invasive procedures as part of their management. **Conclusion:** The majority of the studied VLBW infants experienced a growth lag during their stay in the Neonatal Ward mostly as a reflection of their feeding intolerance and concurrent morbidities.

Key words: preterm VLBW, z score, growth restriction

Introduction

Very low birth weight (VLBW) infants represent about 1–1.5% of all liveborn infants in developed countries [1], and they constitute the large majority of the population in neonatal intensive care units (NICUs). Infants born VLBW are at increased risk for impaired growth, due to certain prenatal factors [2] and to concurrent morbidities. The prevention of postnatal growth restriction of these infants is extremely important because of its impact on the subsequent psychomotor development [3], and still represents a challenge for neonatologists [4].

Objectives

The aim of the present study was to determine the prevalence and degree of predischarge growth restriction in selected VLBW infants and to identify the factors affecting growth.

Methods

We conducted this retrospective study on a number of 62 selected preterm infants with birth weight less than 1480g. Data regarding birth-weight, discharge-weight and morbidities was extracted retrospectively from neonatal database of VLBW infants admitted between 1/1/2011 and

31/12/2013 in the Neonatal Ward of the Children's Hospital "Louis Turcanu" Timisoara. Exclusion criteria included the presence of major chromosomal or congenital anomalies, necrotising enterocolitis and surgery within the first month of life. Z-scores for birth weight and discharge weight were computed using Fenton's reference. They were compared to the median weight of a fetus of comparable gestational age based on an intrauterine growth reference.

Results

The studied newborns were delivered with birth weight ranging from 700g to 1480g, with a mean birth weight of 1200g. The gestational age ranged between 26 to 32 weeks with a mean of 29.2 weeks. There was no significant gender difference in the prevalence: 57% were male and 43% were female.

One third of these infants were small for gestational age (SGA).

Detailed nutritional data were collected daily. Composition and volume of intravenous solutions, and type and volume of enteral feedings, including caloric additives, were recorded. The majority of infants weighing less than 1200g had difficulties regarding their digestive tolerance therefore requiring partial or total parenteral nutrition. Of those with enteral tolerance only approximately 42% received maternal milk accompanied by human milk fortifiers, the rest were fed with adequate artificial milk formulas for preterms.

Mean z-score at discharge (-1.4), was lower than the mean z-score at birth (-0.58). Twice as many babies (68% vs 33%) were growth restricted at discharge compared to at birth. 87% of those with postnatal growth restriction experienced feeding intolerance and acute infections therefore requiring parenteral nutrition and invasive procedures as part of their management (central venous lines, numerous venous blood samples, long-term use of broad spectrum IV antibiotics, endotracheal intubation and mechanical ventilation).

Discussions

Preterm infants are at risk for potential nutritional compromise due to their limited nutrient reserves, immature metabolic pathways, and increased nutrient demands that can rarely be met [5]. Extrauterine growth in VLBW infants begins with a period of weight loss usually up to 15% body weight, that will most commonly be regained in the next 14-21 days of life [5]. In our case the mean initial weight loss was ~ 13.7%, and it was regained in the first 17-24 days of life in the majority of cases.

¹University of Medicine and Pharmacology "Victor Babes" Timisoara

²Emergency Hospital for Children "L. Turcanu" Timisoara

E-mail: marianaboia@yahoo.com, omarginean@ymail.com, aniko180798@yahoo.com, delia.nicoara@gmail.com

Implementation of early parenteral and enteral nutrition to low birth weight infants during the first 24 hours of life results in higher weight velocity, and earlier achievement of full enteral feedings [6]. However, this strategy is often limited by the infant's ability to metabolize the nutrients and by the potential complications that may arise from hyperhydration (eg, the likelihood of patent ductus arteriosus or chronic lung disease that) [7,8]. In our Ward the tendency was to avoid sodium administration in the first 24-48h, unless there were major electrolyte imbalances, in order to avoid delayed contraction of the extracellular fluid.

In the past the Lubchenco growth chart was the most commonly used in NICUs, which was not gender specific. Of late, the Fenton fetal-infant chart has received more attention, based on more recent infant data, from a more wider geographical area. Using this chart the preterm's growth can be monitored up to 50 weeks postmenstrual age with better confidence in the extreme percentiles [9].

The recommended growth velocity of 15 g/kg per day is intended to approximate intrauterine growth rates [10]; however it is often not achieved [11].

Predictors of postnatal growth restriction in preterm infants include lower birth weight and gestational age at birth, illness severity at birth, nosocomial infections, prolonged respiratory support need [12] and feeding tolerance. The infants from the study with gestational age under 30 weeks were the most affected by postnatal growth restriction, as the majority of them associated feeding intolerance, infectious intercurrents and the need for assisted ventilation. Feeding intolerance, recognized by the

presence of gastric residuals, occurs frequently in very low birth weight infants [13]. The inability to sustain enteral feedings contributes to extended periods of parenteral nutrition, often requiring central venous access, and increasing the risk of infection [5]. However, tolerating adequate enteral nutrition is difficult due to the immaturity of the VLBW infants' gastrointestinal system [5]. In our case, the infants with gestational age above 30 weeks, that presented enteral tolerance, were initially started on nasogastric feeding, proceeding later on at bottle feeding as soon as they developed swallowing reflex and breathing-swallowing coordination (35-36 weeks postmenstrual age).

Mean z-score at discharge (-1.4), was lower than the mean z-score at birth (-0.58), with twice as many babies (68% vs 33%) being growth restricted at discharge compared to at birth. This may be due to the accumulation of significant energy, protein, mineral and other nutrient deficits during their hospital stay correlated to their concurrent morbidities.

However, in the vast majority of the cases, once they reached 2000g the growth velocity increased significantly.

Conclusion

Extrauterine growth restriction remains a serious problem in critically ill VLBW premature neonates.

The majority of the studied VLBW infants experienced a growth lag during their stay in the Neonatal Ward. The most important factors contributing to poor postnatal growth were low gestational age, the need for assisted ventilation, and concurrent morbidities such as anemia, sepsis and respiratory disorders (bronchopulmonary dysplasia).

References:

1. Donna L. Hoyert, T.J. Mathews, Fay Menacker, DrPHa, Donna M. Strobino, PhDb, Bernard Guyer, MD, MPHb Annual Summary of Vital Statistics: 2004. Pediatrics. Vol. 117 No. 1 January 1, 2006 pp. 168 -183
2. Saluja S, Modi M, Kaur A, Batra A, Soni A, Garg P, Kler N. Growth of very low birth-weight Indian infants during hospital stay. Indian Pediatr. 2010 Oct;47(10):851-6. Epub 2010 Mar 15.
3. Tudehope DI, Burns Y, O'Callaghan M, Mohay H, Silcock The relationship between intrauterine and postnatal growth on the subsequent psychomotor development of very low birthweight (VLBW) infants. Aust Paediatr J. 1983 Mar;19(1):3-8.
4. Stoll BJ, Hansen NI, Bell EF, Shankaran S, Laptook AR, et al. Neonatal outcomes of extremely preterm infants from the NICHD Neonatal Research Network.2010. Pediatrics 126: 443-456
5. Cloherty J.P., Eichenwald E.C., Hansen. A.R. Manual of Neonatal Care. Lippincott Williams & Wilkins, 2012 – Medical. Chapter 21 Nutrition.
6. Donovan R, Puppala B, Angst D, Coyle BW. Outcomes of early nutrition support in extremely low-birth-weight infants. Nutr Clin Pract.2006;21(4):395– 400
7. Oh W, Poindexter BB, Perritt R, et al. Association between fluid intake and weight loss during the first ten days of life and risk of bronchopulmonary dysplasia in extremely low birth weight infants. J Pediatr.2005;147 (6):786– 790
8. Van Marter LJ, Leviton A, Allred EN, Pagano M, Kuban KC. Hydration during the first days of life and the risk of bronchopulmonary dysplasia in low birth weight infants. J Pediatr.1990;116 (6):942– 949
9. Tanis R Fenton: A new growth chart for preterm babies: Babson and Benda's chart updated with recent data and a new format. BMC Pediatr. 2003; 3: 13
10. Anderson DM. Nutritional assessment and therapeutic interventions for the preterm infant. Clin Perinatol.2002;29 (2):313– 326
11. Clark RH, Thomas P, Peabody J. Extrauterine growth restriction remains a serious problem in prematurely born neonates. Pediatrics.2003;111 (5 pt 1):986– 990
12. Euser AM, de Wit CC, Finken MJJ, Rijken M, Wit JM. Growth of preterm born children. Horm Res 2008;70:319–28.
13. Dollberg S, Kuint J, Mazkereth R, Mimouni FB. Feeding tolerance in preterm infants: randomized trial of bolus and continuous feeding. J Am Coll Nutr. 2000 Nov-Dec;19(6):797-800.

Correspondance to:

Mariana Boia,
University of Medicine and Pharmacy "V. Babes" Timisoara
Gospodarilor Street, nr. 42, Giroc
Timisoara 300778,
Romania
E-mail: marianaboia@yahoo.com