Avoiding energy and protein deficits according to AAP nutritional recommendations for VLBW infants reduces postnatal undernutrition at 36 weeks of corrected gestational age?

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BACKGROUND

Nutrient intakes recommended by the AAP[1] for very low birth infants (VLBW) seems not to be achieved since energy and protein deficits are observed during hospitalization according to our own data.

OBJECTIVE

To reduce postnatal growth failure providing a nutritional intervention in order to avoid deficits in energy and protein intakes early after birth or compensate them before the 36 weeks postmenstrual age.

DESIGN/METHODS: randomized clinical trial

Population: Newborns infants < 31 weeks gestational age and adequate for dates, were randomized to the standard group (SG) who received the recommendations of the AAP for energy and caloric intakes or an intensive intervention (IG), overpassing the usual guidelines, avoiding or compensating nutritional deficits. (Table 1)
Exclusion criteria: Patients with major congenital malformations, intrauterine infections and infants transferred to other institutions for surgery.

STATISTICAL ANALYSIS

Categorical variables were analyzed by chi square tests. Numeric variables were compared by a Student t test or by Mann-Whitney test. The differences between the protein and caloric intakes and deficits in both groups were analyzed through the ANOVA test.

Table 1. Nutritional intervention

	Standard Group (SG)		Intensive Group (IG)	
Parenteral Nutrition	Initial intake	Maximum	Initial intake	Maximum
Glucose	6 mg/kg/min	13 mg/kg/min	6 mg/kg/min	13 mg/kg/min
Amino acids	1.5 g/kg day 1	4 g/kg/d	2.5 g/kg day 1	4.8 g/kg/d
Lipids	0.5g/kg day 2	3.5 g/kg/d	1g/kg day 2	3.5 g/kg/d
Enteral Nutrition	10 ml/kg/d	180ml/kg/d	10ml/kg/d	200ml/kg/d

TPN was discontinued when 100 Kcal/kg/day enteral feeding was achieved in the IG and 80 kcal/kg/day in the SG.

RESULTS

From 7/2004 to 6/2005, 60 patients were born and 50 who survived up to the 36 weeks of postmenstrual age were evaluated, 28 in the IG and 22 in the SG. Clinical characteristics and morbility of both groups are shown in tables 2 and 3. Details of nutritional intakes and growth are shown in table 4 and 5.
Despite the differences in nutritional protocols, energy and protein intakes at 36 weeks postmenstrual age were not different, with zero caloric and protein deficit in 36% of the IG and 22% of the SG group (NS).
Hyperglycemia was present and required insulin treatment in 2 patients (9 %)in the SG, and 5 patients (17,8%) in IG. Mean triglycerides was 95 mg/dl (SD 46) and 84.6 mg/dl (SD 43.2) in SG and 62.8 mg/dl (SD15,3) and 92.4 (SD 62) in IG on day 4 and 8. One patient (4,5%) in SG and 3 patients (10,7%) had hypertriglyceridemia during TPN and the dose of IV lipids were reduced temporary.
Transient acute renal failure (ARF); creatinine > 1.3 mg/dl in the first postnatal week; was observed in one patients in SG and one patient in SG. Metabolic acidosis in nine (32%) in IG and three (13,6%) in SG , in these patients amino acids intake were reduced temporary. (Table 6)

Table 2. Population Characteristics

	Intensive Group (n=28)	Standard Group (n=22)
Gestational age in weeks, median (range)	28.2(±1.6)	28.1 (±1.4)
Birth Weight in grams, median (range)	1.098 (±265)	1.127(±255)
Length at birth, mean (SD)	35.4 (3)	35.9 (2.5)
Head circumference at birth in cm, mean (SD)	25.6 (1.9)	25.7(1.9)
Male sex, n (%)	13 (46.5)	9 (40.9)
Multiple birth, n (%)	8 (28.5)	8 (36.3)
Maternal steroids, n (%)	14 (50)	10 (45.5)
Surfactant treatment, n (%)	12 (42.8)	5 (22.7)

Table 3. Clinical outcome and morbidity

	Intensive Group (n=28)	Standard Group (n=22)
Days on mechanical ventilation, median (range)	11 (0-120)	7.5 (0-52)
O2 at 36 weeks postmenstrual age, n (%)	5 (17.8)	3 (13.6)
PDA, n (%)	17 (62)	9 (40)
NEC, n (%)	1 (3.5)	0
Late onset sepsis, n (%)	6 (21.4)	3 (13.6)
IVH > grade II, n (%)	0 (0)	1 (4.5)
cPVL, n (%)	2 (7.1)	1 (4.5)
ROP grade 3 or more, n (%)	1 (3.6)	0

PDA patent ductus arteriosus; NEC Necrotizing enterocolitis; IVH Intraventricular hemorrhage more than grade II, cPVL cystic periventricular leukomalacia, ROP retinopathy of prematurity.

Table 4. TPN onset and morbidity

	Intensive Group (n=28)	Standard Group (n=22)	p value
Days of parenteral nutrition, median (range)	11 (5-35)	12 (2-34)	NS
Age enteral feeds started in days, median (range)	2 (1-6)	1.5 (1-9)	NS
Age to achieve 120/kcal/d, median (range)	15 (8-40)	16.5 (10-30)	NS

Table 5. Early and late growth

	Intensive Group (n=28)	Standard Group (n=22)	p value
Postnatal growth failure at 36 weeks postmenstrual age, n (%)	16 (57.1)	14 (63.6)	NS
Body weight at 36 weeks postmenstrual age in kg, mean (SD)	2.15 (0.34)	2.12 (0.32)	NS
Length at 36 weeks postmenstrual age in cm, mean (SD)	42.5(2.29)	42.5(2.18)	NS
Head circumference at 36 weeks postmenstrual age in cm, mean (SD)	31.8 (1.3)	32.1 (1.4)	NS

Table 6. Metabolic complications

	Intensive Group (n=28)	Standard Group (n=22)	p value
Hyperglycemia was present and required insulin, n (%)	5 (17.8)	2 (9)	NS
Hypertriglyceridemia during TPN, n (%)	3 (10.7)	1 (4.5)	NS
Transient acute renal failure, n (%)	1 (3.6)	1 (4.5)	NS
Metabolic acidosis, n (%)	9 (32)	3 (13.6)	NS

CONCLUSIONS

This early and intensive intervention designed to avoid nutritional deficits by 36 weeks of post menstrual age, could not accomplished in our population and in consequence did not eliminate postnatal undernutrition.

References:
1. American Academy of Pediatrics. Committee on Nutrition. Nutritional needs of low birth-weight infants. Pediatrics 1985; 76:976.