

PARACHUTE AND LATERAL PROPPING REACTIONS IN PRETERM CHILDREN

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ABSTRACT - A non-controlled, prognostic cohort study was performed with the aim of establishing markers of neurological development and defining a clinical and epidemiological profile of preterm newborns at 3, 6, 9, and 12 months of gestation-corrected age in terms of parachute and lateral propping reactions. Newborns with gestational age of up to 36 weeks and 6 days, weighing 2,000 g or less at birth, were included in the study. At 6 months of age, parachute and lateral propping reactions were present in 8.1% of the patients. At 9 months, the parachute reaction was present in 87.5%, and the lateral propping reaction was present in 90% of the children. It was possible to assess parachute and lateral propping reactions in preterm children in the first year of life. Alterations in trunk-limb coordination may be evidenced in the 1st year of life through postural reactions, which are maintained as prematurity markers until school age.

KEY WORDS: psychomotor performance, parachute, lateral propping, preterm newborn.

Reações de paraquedismo e apoio lateral em crianças prematuras

RESUMO - Com o objetivo de traçar um perfil clínico-epidemiológico e estabelecer marcos do desenvolvimento neurológico de recém-nascidos prematuros aos 3, 6, 9 e 12 meses de idade corrigida, quanto às reações do paraquedismo e do apoio lateral, foi realizado estudo de coorte não controlado, com enfoque prognóstico. Foram incluídos no estudo recém-nascidos com idade gestacional até 36 semanas e 6 dias, com 2000g ou menos de peso ao nascimento. As reações do paraquedismo e apoio lateral estavam presentes em 8,1% aos 6 meses, em 87,5% e 90% respectivamente aos 9 meses. Foi possível avaliar as reações posturais do paraquedismo e do apoio lateral em crianças prematuras no período de um ano. Alterações na coordenação tronco-membros pode ser evidenciada no 1º ano de vida através de reações posturais, que são mantidas como marcadores de prematuridade até a idade escolar.

PALAVRAS-CHAVE: desenvolvimento neurológico, paraquedismo, apoio lateral, recém nascido prematuro.

Prematurity is a risk factor for impaired neurological development. Even so, 80 to 90% of preterm children develop normally, provided no brain-compromising events occur¹⁻³. Among several risk factors for neurologic impairment, asphyxia and peri and intraventricular hemorrhage are especially important, due to their potential for causing neurological damage. The effect of perinatal anoxia on the central nervous system (CNS) depends on gestational age: in preterms, perinatal anoxia affects subcortical regions, and in term newborns, cortical regions. The presence of subependymal germinative matrix, which is richly vascularized and vulnerable to O₂ variations in preterms, explains the variable location of this type of lesion^{4,5}. The maturation of balance reactions requires a minimal knowledge of the body. Such knowledge is acquired through the exercise of laby-

rinthine reflexes, and generally of all reflexes, as well as through the accumulation of an adequate amount of impressions received from peripheral receptors, which allow the child to outline a sketch of the surrounding world. At 6 months, the child is already aware of his/her own body. There is a growing interest in hand movements, and gradually the hands change from toys to tools: the child is able to try efficacious balance reactions that involve a complex interrelation of the sensorial (proprioceptive, visual, and vestibular), cerebellar, and cortical pathways^{6,7}.

The parachute reaction occurs when the baby is suspended ventrally and dropped suddenly with the head directed towards a table. This prompts a defensive reaction in which the upper limbs are extended and the hands are opened in order to prevent the fall. This reflex appears starting at 6 months of age⁷⁻⁹.

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Lateral propping usually appears between 6 and 8 months of age, when the child is able to sit without assistance. If the infant is pushed sideways with an abrupt shove on one shoulder while sitting, s/he extends the appropriate arm and puts his/her open hands over the support plane near the legs or in the angle formed by them.

The evolutionary neurological evaluation (ENE) at 7 years of age in a group of preterms showed a statistically significant alteration in trunk-limb coordination in relation to term children¹⁰; other studies assessing school-age children born at term have also observed unaltered trunk-limb coordination^{11,12}. Our work aimed at verifying whether alterations in trunk-limb coordination can be observed in the 1st year of life in preterm children. For that, we described the clinical-epidemiological profile of preterm newborns at 3, 6, 9, and 12 months of gestation-corrected age in terms of the parachute and lateral propping reactions.

METHOD

This study was designed as a non-controlled cohort study. The factor under study was prematurity and its clinical effect on postural reactions. The sample was composed of preterm newborns born at Hospital de Clínicas de Porto Alegre, Brazil, from August 1995 to November 1998.

Children were followed for one year. They were assessed in the preterm clinic at 3, 6, 9, and 12 months of age (corrected for 40 weeks of gestation). A detailed neurological evaluation was carried out, including assessment of neuropsychomotor and language development, of the lateral propping and parachute reactions, and auditory and visual evoked potentials. Babies born with a gestational age of up to 36 weeks and 6 days, weighing 2,000 g or less, and who fulfilled the inclusion criteria were selected for the study. Gestational age was determined by Ballard's method¹³.

Exclusion criteria were: Apgar score <8 at the 5th minute, cerebral hemorrhage, seizures, alterations in consciousness, CNS lesions, congenital infections, genetic syndromes, and prenatal intoxication. Newborns presenting clinical intercurrents that could interfere with neurological development, such as severe sepsis, jaundice requiring exsanguination transfusion, and use of mechanical ventilation for more than 7 days were also excluded. In addition, children who presented intercurrents that could interfere with CNS development, such as seizures, traumatic brain injury with neurological symptoms, infection of the CNS, and altered neurological evaluation were excluded in the follow-up period. The results were analyzed using the Epi-Info and SPSS softwares.

RESULTS

Forty preterm newborns who fulfilled the inclusion criteria were assessed; 56.2% were female.

Table 1. Distribution of newborns according to gestational age.

Gestational age (weeks)	n	%
<30	10	25
30-34	19	45.5
>34	11	27.5
Total	40	100

Table 2. Distribution of newborns according to birthweight.

Birthweight (g)	n	%
<1000	11	27.5
1000-1500	18	45
>1500-2000	11	27.5
Total	40	100

Table 3. Intercurrences in preterm newborns.

Intercurrence	%
Mild jaundice	92.3
Sepsis	82.5
Apneas of prematurity	56.4
Use of continuous positive airway pressure	42.5
Mechanical ventilation	28.9

Mean maternal age was 29 ± 7.9 years. Gestational age was 30-34 weeks for 45.5% of the babies, and less than 30 weeks for 25% (Table 1). Concerning birthweight, 45% presented low weight, and 27.5% presented extremely low weight (Table 2). Intercurrences during the neonatal period were mild jaundice (92.3%), followed by sepsis (82.5%), and apneas of prematurity (56.4%) (Table 3); mean hospitalization time was 44 days. From 6 to 9 months we observed a major increase in the percentage of infants presenting parachute and lateral propping reactions (Table 4). We observed a similar frequency for the parachute and lateral propping reactions in all gestation-corrected ages (3, 6, 9, and 12 months); there were small differences resulting from the fact that some children missed one of the four evaluations.

DISCUSSION

Lateral propping and parachute reactions are a normal part of development. These postural reactions involve both the labyrinth and vision; however, it seems that the reaction is actually triggered by the visual stimulus, since blind children have been

Table 4 . Appearance of postural reactions and static balance according to the age.

Gestation-corrected age (months)	Parachute reaction (%)	Lateral propping reaction (%)	Sitting without assistance (%)
3	0	0	0
6	8.1	8.1	10.8
9	87.5	90	95
12	100	100	100

shown to take more time to develop it⁷. Capute et al.¹⁴ and Blasco¹⁵ emphasize the distinction between primitive reflexes and postural reactions. Primitive reflexes are triggered by sensorial stimuli, and they are highly stereotyped. The connections that are necessary for these reflexes are subcortical, located in the brain stem. Cortical maturation inhibits brain stem reflexes – they start to appear at 25 weeks of gestation and remain clinically evident until 3 to 6 months of life.

Postural reactions, on the contrary, are not true reflexes; they require cortical maturity. These movements are less stereotyped, and require a complex interrelation between cortical, cerebellar, and sensorial (proprioceptive, visual, and vestibular) pathways. Lateral propping and parachute reactions are observed from 6 months of age on. Our sample of preterms is considered at low risk for neurological impairment – despite the low birthweight and gestational age – because they did not experience any events that could interfere with neurological development. Even so, we found lateral propping and parachute reactions in only 7.5% of the children studied.

Amiel-Tison and Grenier⁹ report that lateral propping reaction appears when the child is able to sit without assistance; to Coriat⁷, it manifests itself when the child still requires assistance to sit, and reappears in special cases, after the child acquires the ability to sit without assistance. We consider the lateral propping reaction a postural reaction (not a reflex) for the maintenance of trunk balance; only at 12 months of age did all children in our sample present these reactions.

Balance is maintained through a complex physiologic mechanism, in which the osteoarticular system, proprioceptive sensitivities, cerebellar and vestibular functions have important roles⁶. The development of static balance in the 1st year of life requires maturation of this mechanism; at 6 months of age, 50% of the children sit unsupported, and at 9

months, 100% have acquired this ability¹⁶. In our sample of preterm newborns, only 10.8% sat unsupported at 6 months of age, and 95% at 9 months.

Postural reactions are mechanisms acquired to help balance maintenance. In this study, postural reactions were observed to appear late in most children, at 9 months of age (Table 3). Trunk and limb dyskinesia, which implies axial musculature dysfunction, is more visible when there is involvement of the cerebellar vermis, responsible for trunk balance. We conclude that alterations in trunk-limb coordination may be evidenced in the 1st year of life through postural reactions, which are maintained as prematurity markers until school age.

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