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THE VALUE OF BRAINSTEM EVOKED POTENTIAL IN CLINICAL DECISION OF A PATIENT WITH HYPOXIC-ISCHEMIC ENCEPHALOPATHY

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ABSTRACT - Establishing a prognosis for hypoxic-ischemic encephalopathy during the neonatal period is extremely difficult, as the neuroplasticity of the developing brain makes it almost impossible to measure the affected area. This case report describes a newborn with severe perinatal asphyxia and neonatal neurological syndrome including absent suck reflex. Normal brainstem auditory evoked potential led the diagnosis towards a transitory dysfunction of deglutition, and the subject received daily stimulation in the hospital environment. Suck developed satisfactorily by day of life 30 and the patient was released without having to be tube fed. Neurophysiologic tests can be of value in the clinical decisions and analysis of functional prognosis of patients with hypoxic-ischemic encephalopathy.

KEY WORDS: hypoxic-ischemic encephalopathy, evoked potential, prognosis, newborn.

O valor do potencial evocado auditivo em decisão clínica em paciente com síndrome hipóxico-isquêmica

RESUMO - Estabelecer o prognóstico da encefalopatia hipóxico-isquêmica durante o período neonatal é extremamente difícil, devido à neuroplasticidade do cérebro em desenvolvimento que impede a medida exata das áreas afetadas. Este relato descreve um recém-nascido a termo com grave asfixia perinatal e síndrome neurológica pós-natal, incluindo ausência do reflexo de sucção. O potencial evocado auditivo do tronco cerebral foi normal, sugerindo o diagnóstico de disfunção transitória da deglutição. Após estimulação diária no hospital a sucção foi obtida satisfatoriamente, e o paciente recebeu alta sem necessidade de alimentação enteral. Os testes neurofisiológicos podem ser de grande valor em decisões clínicas e análise funcional prognóstica de pacientes com encefalopatia hipóxico-isquêmica.

PALAVRAS-CHAVE: encefalopatia hipóxico-isquêmica, potencial evocado, prognóstico, recém-nascido.

Perinatal asphyxia is considered one of the main risk factors for global developmental delay. The neonatal neurological syndrome is frequently associated with severe asphyxia and is the major clinical indication of brain tissue lesion due to insufficient oxygen supply, i.e. hypoxic-ischemic encephalopathy (HIE). Common symptoms are: variable change in level of alertness, including stupor or coma; ventilatory disturbances; disorders in brainstem vital reflexes; hypotonia; and seizures[1]. Although neurologists frequently perform prognostic evaluations of newborns with HIE, accurate prediction of neurologic outcome in survivors remains difficult. One major obstacle is the lack of data for evaluating the intensity of insults, as the vast majority occur during the intrauterine period[1-3]. Various studies have attempted to correlate outcome with indicators such as blood biochemical markers, for example lactate and pH; Apgar scores; neonatal neurological syndrome characteristics; findings from neurodiagnostic methods such as ultrasound, CT scan, and MRI and results of neurophysiologic tests such as electroencephalogram and evoked potentials[3]. The latter neurophysiologic methods are particularly useful in evaluating brain maturity in both preterm and full-term newborns[4-5].

We present a full-term newborn with asphyxia at birth and neonatal neurological syndrome, in whom brainstem evoked potential proved useful in the prognosis of a transitory disturbance in deglutition.

CASE

The subject is a full-term baby girl born via vaginal delivery. The mother (first pregnancy) received prenatal care and suffered no complications during pregnancy. There was no use of illegal drugs, alcohol or tobacco, and no evidence

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of any other personal or familial medical condition. Electronic fetal monitoring performed a short time prior to delivery revealed sustained fetal bradycardia and, a few minutes later, absence of heartbeat. Emergency caesarian section was performed secondary to possible abruptio placentae.

Apgar score was zero at 1 minute. Resuscitation consisted of positive pressure ventilation of O_2 to 100%, cardiac massage and two doses of adrenalin. Following resuscitation efforts, heartbeat rose to over 100 beats per minute. Apgar score was 2 at 5 minutes.

The subject was admitted to the neonatal intensive care unit (NICU) on mechanical ventilation, presenting with generalized hypotonia and irregular respiratory movements. During the first hour of life, pH from systemic arterial blood was 6.75; CSF analysis was normal. Before 12 hours of life, the patient suffered an episode of clonic seizure activity which was successfully controlled with phenobarbital.

The subject was released from the NICU on day of life 14. After clearance of sedatives, neurologic evaluation revealed absent search and suck reflexes. On day of life 14, the subject underwent an evoked otoacoustic emissions test which showed normal cochlear activity. CT scan (Fig 1) performed on day of life 15 showed large areas of white matter hypodensity. EEG (Fig 2) performed on day of life 15 revealed low voltage and bursting of 1 to 2 seconds consisting of high-voltage sharp waves/spikes in background activity (suppression burst pattern), suggesting severe diffuse encephalopathy.

For prognostic purposes, brainstem auditory evoked potential exam (Fig 3) was conducted on day of life 24 and showed preserved brainstem activity. Stimulation of the subject's reflexes was subsequently intensified in order to develop the suck process, which was obtained by day of life 30. She was subsequently released from the hospital on day of life 39. A gastric feeding tube was not required.

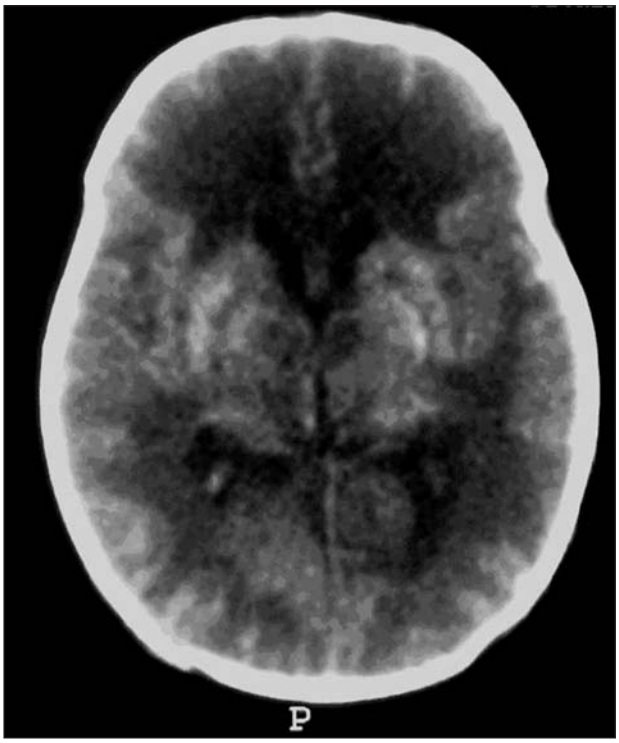

Fig 1. Unenhanced CT showing large areas of the white matter hypodensity and bilateral basal ganglia hemorrhage.

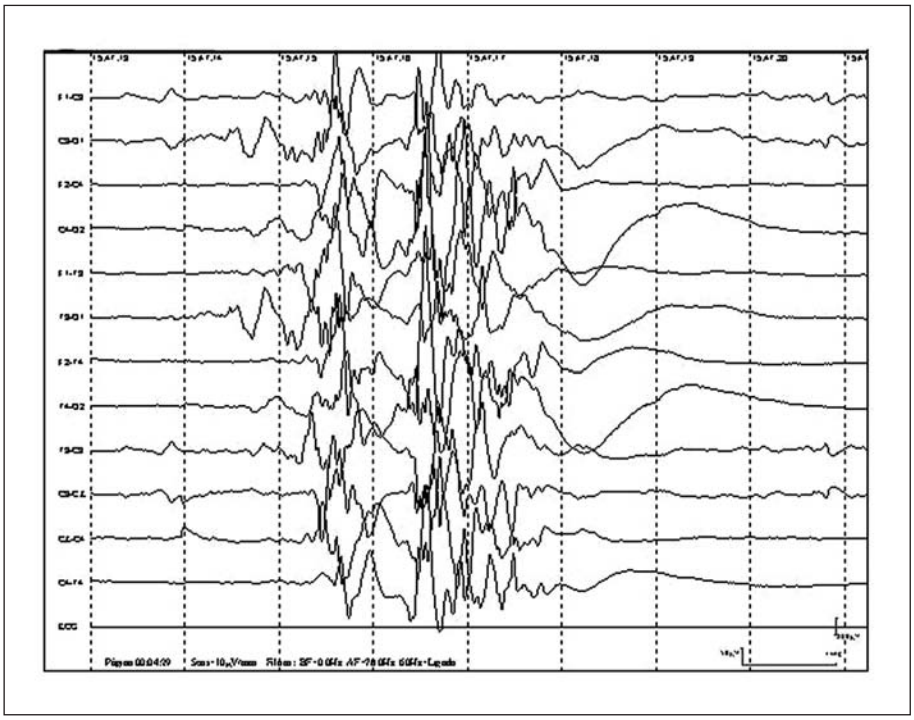

Fig 2. EEG showing suppression-burst pattern.

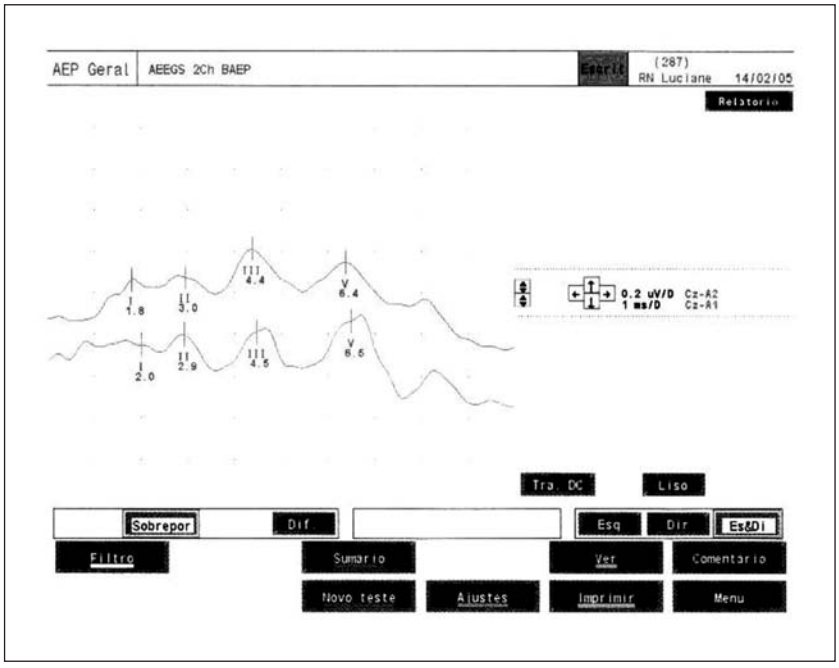

Fig 3. Brainstem auditory evoked potential reveals normal.

DISCUSSION

Hypoxic-ischemic encephalopathy during the neonatal period remains an important problem because of both its prevalence and its impact on neurodevelopment. Prognostic evaluation is challenging, as it is often not possible to measure the extent of the lesion nor to quantify the capacity of the brain to recover from the injury[1-2].

The first publications reporting evoked potential methods date back to the 1970s[5]. Some studies aimed to verify the neurological prognostic value of evoked potentials in patients with HI insults. The relationship between degree of asphyxia and altered response in visual and somatosensory evoked potentials was well established[6-8]. A study using a multimodality of evoked potentials demonstrated the accuracy of visual and somatosensory evoked potentials in predicting the likelihood of neurologic sequelae[9]. A study analyzing brainstem auditory evoked potential responses in asphyxiated newborns found abnormalities in this exam in children with signs of brainstem dysfunction[10]. The signs described in this case showed unequivocal evidence of HIE with apparent clinical damage to the brainstem. The suck reflex is a major clinical sign of vitality in the newborn. Sucking requires function of cranial nerves V, VII and XII; swallowing requires IX and X and the tongue requires XII. Feeding demands synchrony of sucking, swallowing, and the act of breathing. All of these functions are controlled by the brainstem and their elements are intimately related[1]. In the present case, integrity of the central auditory pathway indicated brainstem function in spite of physiologically evident clinical signs to the contrary. The disturbance was therefore interpreted as a temporary dysfunction secondary to ischemic events. As time is of the essence in initiating the oral feeding process, the results of the brainstem auditory evoked potential exam supported the plan of immediate treatment through increased stimulation. Risks associated with tube feeding, for example the increased risk of sudden infant death and the negative impact of tube feeding on the mother-child bond[11-12], were thus avoided.

Anand et al.[13] correlated brainstem auditory evoked potential to prognosis in children and newborns in coma after anoxic and/or traumatic encephalopathy. It was also related to poor prognosis when presented as abnormal; however, a normal test did not exclude the possibility of severe neurological sequelae[13]. In the present case, follow-up of the subject after six months confirmed an abnormal neurologic outcome with global developmental delay and symptomatic epilepsy, although the wave latency values registered in the auditory evoked responses were within normal limits.

This report reinforces the importance of neurophysiologic methods in the clinical and prognostic evaluation of hypoxic-ischemic encephalopathy. Results of these exams can guide interventions to optimize developmental potential.

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