Evaluation of Psychomotor, Behavioral and Sensory Development in Hypoxic Ischemic Encephalopathy Patients

Selin AKYÜZ OKTAY[1], Kıvılcım GÜCÜYENER[2], Azime Şebnem SOYSAL ACAR[1]

[1]Gazi University Faculty of Medicine, Department of Pediatrics
[2]Gazi University Faculty of Medicine, Department of Pediatric Neurology

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INTRODUCTION

Hypoxic ischemic encephalopathy (HIE) is the most common reason of neonatal encephalopathies and seen in 1,3-1,9 out of 1000 live births (1). Moderate and severe HIE can cause cerebral palsy (CP), visual and auditory impairments (2). Lately, several studies are focused on motor, cognitive, behavioral and sensory problems on mild HIE patients (2). Magnetic Resonance Imaging (MRI) in early neonatal period (3,4) , and tests such as Bayley Scales of Infant Development (BSID), Prechtl's Assessment of General Movements (GMs), Alberta Infant Motor Scale (AIMS) and Hammersmith Infant Neurological Examination (HINE) which are applicable in infancy and predictive for motor deficits in HIE patients. Special education requirement is increased compared to the control groups along with problems in reading, spelling and learning (1,5). BSID is the gold standard evaluation method for cognitive disorders and provides an opportunity for early interventions (6).

It has shown that prevalence of Autism Spectrum Disorders (ASD), Attention Deficiency and Hyperactivity Disorders (ADHD), externalizing problems, anxiety and depression are increased in HIE patients (1,2). Sensory processing is the perception, regulation, separation of the stimulus in central nervous system, coming from the environment and received by the sensory organs, and creating behavior towards this stimulus (7-9). Sensory processing disorders are correlated with behavioral disorders. No study was found in which sensory processing disorder was directly evaluated in HIE patients.

OBJECTIVES

The objective of this study is to determine patients' neurodevelopmental status, to evaluate behavioral and sensory processing disorders and identifying the correlations between these disorders.

MATERIALS & METHODS

This descriptive study was carried out in Gazi University Faculty of Medicine, Department of Pediatric Neurology between December 2020 and January 2021. Approval for the study was obtained from Gazi University Clinical Research Ethics Committee. The study has conducted with 49 patients. Demographic information, clinical characteristics, laboratory and imaging findings, AIMS, GMs, HINE and BSID data were obtained retrospectively from archives. The data of the questionnaires and retrospective archive analysis of each patient were recorded in the patient follow-up form by the researcher.

Evaluation Methods

1. Aberrant Behaviour Checklist (ABC): The scale consists of 58 questions in total and provides evaluation in irritability, lethargy-social withdrawal, stereotype, hyperactivity and inappropriate speech behaviours. Parents answer the questions from 0 (there is no such problem) to 3 (disturbingly) according to the patients' behaviour. It's a 4 points likert scale Cronbach Alpha score: 0,921
2. Biel&Peske's Sensory Checklist (BPSC): The scale provides evaluation in tactile stimulus, proprioceptive perception, vestibular, hearing, vision and taste-smell senses. According to their children's reactions, parents answer the questions by choosing one of four different options: "avoidance", "seeking", "mix" and "neutral". Cronbach Alpha Score: 0,941
3. BSID: applicable at 16 days-42 months, cut-off score is 70 for both motor and cognitive subunits
4. AIMS: applicable at 0-18 months, cut-off score is %10
5. HINE: applicable at 2-24 months, cut-off score is 70
6. GMs: applicable at 3-5 months, absence in fidgety movements accepted as neurodevelopmental delay

RESULTS & DISCUSSION

%4,1 of the patients were Sarnat stage 3, %51 were stage 2 and %44,9 were stage 1. %51,0 of them received total body cooling and %18,4 received cool cap. MRI has performed to %85 of the patients; among them %7,1 had basal ganglia involvement and %54 were normal. BSID data of %79,6, AIMS data of %53, HINE data of %57,1 and GMs data of %24,4 patients were available. No relation were found between any of the tests and the Sarnat stage and hypothermia method. Only AIMS scores were found to be related to MRI findings. Two patients had below the cut-off scores from all of the neurodevelopmental tests. Both of them had CP and they both had basal ganglia involvement in their MRI scans. Although there were no statistically significant relation, these patients showed us how important it is to perform these tests at infant age to predict long term outcomes. AIMS, GMs and cognitive BSID scores were found to be related to special education requirement suggesting that these tests are predictive for cognitive disorders as well as motor disabilities.

Hyperactivity and irritability scores were highest in ABC among all categories. These two behaviour coexisted in the same patients and most of them were Sarnat stage 1, had neurodevelopmental delay on at least one of the tests. ABC results were found not to be related to Sarnat stage and hypothermia method and there were no difference between age and gender groups.

BPSC results showed no difference in sensory orientation between age and gender groups and were not related to Sarnat stage.

Irritability behaviour was found to be related to hearing and vestibular senses whereas hyperactivity was found to be related to hearing sense.

There were five patients with a score of >5 from any subunit of ABC, all of them had the scores from irritability and hyperactivity behaviour all of whom dominant sensory profile were seeker or mixed. All of them had neurodevelopmental delay at least one of the tests. Three patients were Sarnat stage 1, two patients were stage 2.

CONCLUSIONS

It is very important to perform neurodevelopmental tests as early as possible so the interventions could be made at the right time for long term prognosis.

It would be beneficial to examine behavioral and sensory problems as well as motor and cognitive problems in these patients and to increase the awareness by informing parents about this issue. Especially patients with neurodevelopmental retardation can be reintegrated into society by evaluating them in terms of behavioral and sensory problems and providing psychiatric support and rehabilitation in the early period if necessary.

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CONTACTS

Selin AKYÜZ OKTAY, E-mail: selinakyuz93@gmail.com