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Somatosensory evoked potentials in children with autism

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KEYWORDS

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Abstract *Introduction:* Autism is a neurodevelopmental disorder in the category of pervasive developmental disorders (PDD), which is characterized by widespread abnormalities of social interactions, communication, and severely restricted interests and highly repetitive behavior. **Children with autism show sensory and perceptual abnormalities. They have either hyposensitivity or hypersensitivity to sensory, auditory, and visual stimuli.**

Objectives: The aim of this work was to study somatosensory evoked potential (SSEPs) changes among children with autism, and their relation to somatosensory manifestations and severity of autism.

Subjects: Thirty children with autism aged 2–12 years were included in the study, all of them fulfilling criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM–IV–TR).

Methods: All cases were subjected to thorough history taking including autistic symptoms and sensory abnormalities, comprehensive medical examination, psychiatric assessment according to DSM–IV–TR criteria for diagnosing autism, assessment of severity of autism using Childhood Autism Rating Scale (CARS) and measurement of somatosensory evoked potentials elicited by median nerve stimulation at wrist.

Results: The majority of the cases were males (86.7%), according to CARS 53.3% were classified as mild to moderate autism, while 46.7% were severe. Sensory abnormalities were present in 56.7% of cases.

Abbreviations: PDD, pervasive developmental disorders; ASD, autism spectrum disorders; DSM-IV-TR, diagnostic and Statistical Manual of Mental Disorders, 4th edition; SEPs, somatosensory evoked potentials; CNS, central nervous system; CARS, Childhood Autism Rating Scale.

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Somatosensory abnormalities were present in 36.76% of the cases. There was a statistically significant relationship between sensory symptoms with SSEP abnormalities ($P = 0.040$). The presence of abnormal SSEPs was not statistically associated with higher score in CARS.

Conclusions: Children with autism have abnormal SSEP changes and were significantly related to the presence of sensory abnormalities, indicating central cortical dysfunction of somatosensory area. On the other hand, these abnormal SSEP changes were not related to the severity of autism.

1. Introduction

Autism is a neurodevelopmental disorder in the category of pervasive developmental disorders (PDD), which is characterized by widespread abnormalities of social interactions, communication, and severely restricted interests and highly repetitive behavior.[1] These conditions are suggested to be present at birth and are diagnosable by 18 months of age.[2]

Children with autism show sensory and perceptual abnormalities. They have both hyposensitivity and hypersensitivity to sensory, auditory, and visual stimuli.[3] Sensory disorders are included among the most prominent features of Pervasive Developmental Disorders and are reported to play an important role in children's intervention planning, as well as outcome. Sensory disturbances were reported in Kanner's original description of autism[4], and have been reported consistently in the clinical literature.[5,6] Though not currently part of the diagnostic criteria for Autism spectrum disorders (ASD), the presence of unusual sensory behaviors has been proposed for inclusion in updated diagnostic criteria for The Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V), highlighting emerging consensus that sensory abnormalities are central features of ASD. Reports of abnormal sensory function that span the visual, auditory, gustatory, and tactile domains reinforce the "multisensory" nature of sensory processing alterations in ASD[7], and emerging evidence suggests that abnormalities also extend to the selective integration of information across the different sensory modalities.[8]

Sensory processing involves the ability to take in, organize and make sense of different kinds of sensations received by the brain. Rates of sensory processing dysfunction may be as high as 90% in individuals with Autism Spectrum Disorder.[9–12]

Somatosensory perception plays a central role in the early stages of human development. Impaired somatosensory processing is found in a range of neurodevelopmental disorders and is associated with deficits in communication, motor ability, and social skills in these disorders. Given the central role of touch in early development, both experimental and clinical approaches should take into consideration the role of somatosensory processing in the etiology and treatment of neurodevelopmental disorders.[13] Somatosensory evoked potentials (SEPs) would be expected to provide information about somatosensory function in children with autistic disorder. Somatosensory Evoked Potentials (SEPs or SSEPs) are useful, noninvasive means of assessing somatosensory system functioning. Somatosensation has four main submodalities, touch, proprioception, pain, and thermal sensation. Distinct receptor neurons transmit information further to the central nervous system (CNS).[14,15]

The aim of this work was to study somatosensory evoked potential changes among children with autism, and their relation to somatosensory manifestations and severity of autism.

2. Subjects

Thirty children with autistic disorder were included in this study, aged 2–12 years, all of them fulfilling the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM–IV–TR).[16] The sampled children were recruited from outpatient neurology clinic at Alexandria University Children's Hospital.

Exclusion criteria included: Children with other psychiatric disorders, and children with other pervasive disorders such as Rett syndrome, childhood disintegrative disorder.

Thirty normally developing age and sex matched controls were included in the study for comparison of somatosensory evoked potentials .They were recruited from those attending outpatient clinics at Alexandria University Children's Hospital other than neurology clinic.

An informed consent was obtained from the parent or caregiver before the procedures.

3. Methods

All children included in the study were subjected to the following:

1- Thorough history taking including the socio-demographic characteristics of the child, information on prenatal history, developmental milestones, and family history, history of autistic disorder, onset, presenting symptoms, and the course of the illness,
2- Comprehensive medical examination.
3- Psychiatric assessment according to DSM-IV-TR criteria for the diagnosis of children with autism[16], and assessment of the severity of the autistic disorder using the Childhood Autism Rating Scale (CARS).[17] The severity of autistic symptoms was categorized according to child's total score to mild- moderate $\leqslant 37$ and severe $\geqslant 37$.
4- Interview of child and parents for assessment of sensory abnormalities.
5- Somatosensory Evoked Potentials (SSEP).[18] using Nihon Kohden Corp Electrodiagnosis Apparatus (MEB- 710 2 K, made in Japan).

EEG electrodes were used for recording. We applied an electrical stimulus to the median nerve at wrist on both sides.