

Aggressivity in Children with Hyperexcitability and Attention Deficit (ADHD). A Clinical and Qualitative Study

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Abstract

Forty infant patients ranging from 3 to 12 years-old with hyperexcitability and attention deficit and aggressivity were clinically studied. They were previously examined from the psychological point of view and exhibited some of the following associated comorbidities, such as perinatal hypoxia, low weight at birth, behavioral abnormalities, anxiety, auto- and hetero aggressivity, autism spectrum disorder, language, learning and hearing disorders, mainly hypoacusia and hyperphagia, Social isolation, cognitive deficit, sleeping disorders, perinatal hypoxia, talking during sleep, suicidal thoughts, planning and attempts and parenteral abuse of child. Some non-nervous system comorbidities, such as pulmonary diseases and allergic reactions were found. Pharmacological treatment of aggressivity and ADHD included, risperidone, haloperidol, sulbutiamine and Ginkgo biloba. Recovery from aggressivity was observed four to six weeks after treatment.

Keywords: *Aggressivity; Hyperexcitability; Attention Deficit; Clinical Study*

Introduction

Aggressive behavior, inattention, hyperactivity and impulsivity are cardinal dimensions of externalizing behavior problems of childhood. The predominant markers such as strong negativism, aggressivity, attention deficit, non-adequate reactions, hyperactivity, disorders of psychomotoric development, school maturation delay, poorer school results and social adaptation described children behavioral problems [1]. Possible causal associations between prenatal exposure to nicotine and conduct disorders in childhood are another strong reason for the primary prevention and smoking cessation in antenatal clinics [2]. Youth with current sleep disordered breathing (SDB) exhibited hyperactivity, attention problems, aggressivity, lower social competency, poorer communication and/or diminished adaptive skills [3]. Gilles de la Tourette’s syndrome shows poor emotional control, aggression, anxiety and depression, on the Rorschach test, compared to healthy controls [4,5]. Autistic-like findings associated with aggressivity and occasional hyperactivity and urea cycle disorder also is observed [6]. The degree of adoptee aggressiveness and conduct disorder has a significant genetic component. Tourette syndrome shows early and persistent severe behavior disorder consisting of hyperactivity, agitation, aggression and noncompliance [7]. The motor and phonic tics and other associated TS symptoms are necessarily a function of a more pervasive developmental disorder in a disturbed mentally retarded person. Aggressive behavior, defined as sudden, explosive outbursts of rage, has been reported as a clinical problem in

approximately 23% to 40% of Tourette syndrome (TS) patients. Attention-deficit hyperactivity disorder (ADHD) and obsessive-compulsive disorder (OCD) are also reported in 50% to 70% of TS patients. Aggressive behavior observed in children with TS may be associated with comorbid attention-deficit hyperactivity disorder (ADHD) or obsessive-compulsive disorder OCD [8].

Prolonged neonatal malnutrition (days 1 - 40) lead in adult rats to behavioural abnormalities (hyperactivity, stereotypy, decreased adaptability, aggressivity) associated with biochemical and electrophysiological alterations in the brain. But this multifactorial and long-term insult was not suitable for more precise analysis [9]. In previous communication to congresses we have analyzed the perinatal hypoxia [10], clinical genetic factors involved [11], associated comorbidities [12], the neuroscience correlation of the cortico-thalamic-striated nuclei and limbic system involved in ADHD [13] and the treatment of ADHD patients [14,15].

Material and Methods

Forty infant patients ranging from 3 to 12 years-old with hyperexcitability and attention deficit and aggressivity were clinically studied at the Clinical Neuroscience Institute of Clinical Home San Rafael of Maracaibo City in Venezuela. They were previously examined from the psychological point of view at our Psychology Department, at CETRO, or at different Public Psychology Centers of Maracaibo City.

Results

Forty infant patients with auto- and hetero aggressivity and hyperexcitability and attention deficit (AADHD) exhibited some of the following associated comorbidities: perinatal hypoxia, low weight at birth, behavioral abnormalities, anxiety, autism spectrum disorder, language, learning and hearing disorders, mainly hypoacusia, anorexia or hyperphagia. In addition, social isolation, cognitive deficit, sleeping disorders, talking during sleep, suicidal thoughts, parenteral abuse of child. Some non-nervous system comorbidities, such as pulmonary diseases and allergic reactions also were found. Some limb abnormalities, such as genu valgum and flat feet also were observed. The following risk factors were detected: perinatal hypoxia, maternal stress, placenta previa, conjugal conflicts, critical poverty, maternal diabetes, maternal high blood pressure and depression. Infant patients living in a non-traditional family in which one or both parents were absent showed aggressive behaviors. The electroencephalographic studies showed increased delta and theta activity. The motor and phonic tics and other associated symptoms of Tourette syndrome were not found in the patients examined.

Discussion

Neural correlates of child aggressive behavior

ADHD is characterized by multiple functional and structural neural network abnormalities including most prominently fronto-striatal, but also fronto-parieto-temporal, fronto-cerebellar and even fronto-limbic networks [16]. Evidence from longitudinal structural imaging studies has shown that ADHD is characterized by a delay in structural brain maturation [17]. Similar findings were observed in the present study.

According to Puiu., *et al.* [18], attention-deficit/hyperactivity disorder (ADHD), deviant prefrontal and cingulate functional activity, was associated with increased impulsive aggression (IA). Structural alterations were most pronounced in the cingulate cortex. Subjects with disrupted behavioral disorders (DBDs) showed marked cortico-subcortical dysfunctions. ADHD and DBDs share similar cortico-limbic structural and functional alterations. Dysfunctional response inhibition (RI) deficits in ADHD highlighted hypoactivity in the dorso/ventro-lateral PFC, insula and striatum, while the paralimbic system was primarily dysfunctional in DBDs. Across disorders, extensively altered cortico-limbic dysfunctions underlie impulsive aggression (IA), while RI was mostly associated with aberrant prefrontal activity.

During the aggression phase, higher aggressive responses of control children were accompanied by higher activation of the ventral anterior cingulate cortex and the temporo parietal junction [19]. Menks., *et al.* [20] reported microstructural white matter alterations in the corpus callosum of girls with conduct disorder.

Neurotransmitter involvement in aggression and ADHD

Attention-deficit/hyperactivity disorder (ADHD) research has long focused on the dopaminergic system's contribution to pathogenesis, although the results have been inconclusive. However, the involvement of the noradrenergic system and dopamine polymorphisms [21], which modulates cognitive processes, such as arousal, working memory and response inhibition, all of which are typically affected in ADHD. Dopamine and norepinephrine are the main neurotransmitters involved in the pathophysiology of ADHD. Patients showed significantly reduced dorsal caudate functional connectivity with the superior and middle prefrontal cortices as well as reduced dorsal putamen connectivity with the parahippocampal cortex [22].

Raine [23] has postulated a neuromoral theory of antisocial, violent and psychopathic behavior. The key areas implicated in both moral decision-making and the spectrum of antisocial behaviors include fronto-polar, medial and ventral prefrontal cortical regions and the anterior cingulate, amygdala, superior temporal gyrus and angular gyrus/ and temporo-parietal junction. It is hypothesized that different manifestations of antisocial behavior are characterized by differing degrees of neuromoral dysfunction, with primary psychopathy, proactive aggression and life-course persistent.

The involvement of cerebellum in aggressivity and ADHD

In relationship with the involvement of cerebellum in aggressivity and ADHD, the cerebellar regions showed functional connectivity with fronto-parietal, somatomotor and limbic networks. In ADHD, autism spectrum disorder (ASD) the clusters were part of dorsal and ventral attention networks; and in dyslexia, the clusters involved ventral attention, fronto-parietal and default mode networks. The results suggest that different cerebellar regions are affected in sensory processing abilities, ASD, ADHD and dyslexia and these cerebellar regions participate in functional networks that are consistent with the characteristic symptoms of each disorder [24].

Stoodley [25] results suggest that different cerebellar regions are affected in autism spectrum disorder (ASD), ADHD and dyslexia and that these cerebellar regions participate in functional networks that are consistent with the characteristic symptoms of each disorder. According to Wolafnczyk, *et al.* and Picazio and Koch [26,27] there is a causal role of the effective cerebellar-cortical connectivity in motor inhibition. Understanding the neurophysiological mechanisms that mediate motor inhibition through the cerebellum could be essential to design new rehabilitative protocols for treating several neurological and psychiatric disorders characterized by disinhibited behavior, such as addiction, schizophrenia, attention deficit hyperactivity disorder (ADHD) and Parkinson's disease.

The role of neighborhood impoverishment, neighborhood social processes and parental alienating behaviors

We observed that most children living in a non-traditional family in which one or both parents were absent increased the risk of aggressive behaviors. Similar observation was reported by Hsu, *et al.* [28]. The neighborhood impoverishment, neighborhood social processes and parenting practices are relate to the development of aggressive behavior among children aged 6 - 8 years raised in low-income neighborhoods.

Demirci, *et al.* [29] and have analyzed the relationship between aggression, empathy skills and serum oxytocin levels in male children and adolescents with attention deficit and hyperactivity disorder and conclude that oxytocin (OT) may play a role in aggression and empathy skills, affecting the social life of those with ADHD.

Children residing in neighborhoods with substantial poverty are at greater risk of developing aggressive behavior. Strong neighborhood social processes and high levels of parental supervision/monitoring are associated with lower levels of aggression. Despite the protective benefits of neighborhood social processes and high-quality parenting, neighborhood economic deprivation continues to elevate risk of developing aggressive behavior [30].

According to Martel, *et al.* [31], the behavioral impulsivity symptoms are core to the externalizing spectrum across most developmental periods.

Aggressive behavior and sleep problems

Aggressive behaviors of children with autism spectrum disorder (ASD) were significantly associated with two treatable factors: sleep problems and ADHD symptoms [32,33].

Anger reactivity did not predict children's aggressive behavior, with one exception: lower anger reactivity in 8-year-old males was associated with higher levels of proactive aggression. These findings support the hypotheses that anger and sympathy are differentially involved in reactive and proactive aggression and that these distinct affective correlates are evident by the preschool years [34].

Aggressive behavior, ADHD and ASD

In the present study we found patients with aggression and autism spectrum disorders (ASD) and attention deficit hyperactivity disorder (ADHD), which are two of the most common neurodevelopmental disorders, with a high degree of co-occurrence [20].

Pharmacological treatment of aggressivity and ADHD included risperidone, haloperidol, sulbutiamine and Ginkgo biloba [14,15]. Recovery from aggressivity was observed four to six weeks after treatment. A detail publication on pharmacological treatment of aggressivity and ADHD will be subject of a future publication.

Conclusion

In infant patients with auto and hetero aggressivity the following associated comorbidities were observed such as perinatal hypoxia, low weight at birth, behavioral abnormalities, anxiety, autism spectrum disorder, language and hearing disorders, mainly hypoacusia and hyperphagia. In addition, social isolation, cognitive deficit, sleeping disorders, talking during sleep, suicidal thoughts, planning and attempts and parenteral abuse of child. Some non-nervous system comorbidities, such as pulmonary diseases and allergic reactions also were found. Pharmacological treatment of aggressivity and ADHD included, risperidone, haloperidol, sulbutiamine and Ginkgo biloba. Recovery from aggressivity was observed four to six weeks after treatment.

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