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Neurodevelopment and malocclusions: A literature review

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Abstract

Introduction: The evaluation of neurodevelopment in pediatric patients is essential, as alterations in this area can trigger the appearance of habits that favor the development of malocclusions.

Objective: To analyze the literature on neurodevelopment and its close relationship with the onset of malocclusions, observing their prevalence, etiology, diagnostic methods, and treatment alternatives in pediatric patients with cognitive development disorders.

Methodology: A search was carried out in the databases PubMed, SCOPUS and Google Scholar using the keywords Pediatric neurodevelopment, Malocclusion, Neurodevelopmental disorders, Oral etiology, Neuroimaging diagnosis, atypical oral behavior.

Results: The global prevalence of neurodevelopmental disorders is 16.9%, with children and adolescents being the most affected. Their etiology includes genetic, environmental, and functional factors that predispose individuals to carious lesions, periodontal disease, and malocclusions. Among the diagnostic methods, neuroimaging stands out, as it allows for the assessment of brain function and structures, as well as the identification of oral behaviors related to chewing, dental anxiety, and atypical oral sensorimotor development. Treatment should focus on a multidisciplinary approach and be prevention-oriented.

Conclusions: The approach to pediatric patients with neurodevelopmental disorders and comorbidities should be multidisciplinary, assessing neurological development and the risk-benefit ratio of each intervention, and incorporating preventive strategies that promote oral health and quality of life.

Keywords: Pediatric neurodevelopment, malocclusion, neurodevelopmental disorders, oral etiology, neuroimaging diagnosis, atypical oral behavior

1. Introduction

The initial assessment of pediatric patients will be essential, from their physiological status to their neurodevelopment. Currently, there are disorders that significantly affect the health status of patients, thereby contributing to a predisposition to pathologies or parafunctions due to increased multifactorial risk ^[1]. Neuroscience is becoming increasingly relevant in pediatric dentistry, helping us to understand orofacial pain, sensorimotor functions, dental anxiety, and sleep disorders in children ^[2]. As pediatric dentists, it is important to have extensive and specific training that allows us to gain a deeper understanding of neuroanatomy, pain, and the control of both the motor and autonomic nervous systems, in order to manage any complications that may arise in the dental office. The assessment of complex sensory, motor, and neurological deficits should be included, as these can lead to complications during dental treatment, patient safety, and the results to be obtained ^[3, 4].

This study reviewed the literature on neurodevelopment and its close relationship with the onset of malocclusions, observing their prevalence, etiology, diagnostic methods, and treatment alternatives in pediatric patients with cognitive development disorders.

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2. Methodology

Bibliographic searches were conducted to obtain relevant published studies through the PubMed, Scopus, and Google Scholar databases. The articles were analyzed, with an emphasis on the last 5 years, and their quality was evaluated using selection, identification, review, choice, and inclusion criteria. Systematic measurement tools were used, and the search was performed using Boolean operators such as AND, OR, NOT, with keywords such as pediatric neurodevelopment, malocclusion, neurodevelopmental disorders, oral etiology, neuroimaging diagnosis, atypical oral behavior.

3. Results

3.1 Prevalence

A neurodevelopmental deficiency predisposes to a high incidence of oral manifestations. Children with a deficit or syndromic condition that affects neuronal development, or with cognitive impairment, have a higher prevalence of caries, periodontal disease, and other oral pathologies [5, 6].

Neurodevelopmental disorders (NDDs) include attention deficit hyperactivity disorder, oppositional defiant disorder, anxiety disorders, depression, bipolar disorder, autism spectrum disorder, various genetic syndromes, sleep disorders, and obesity, all of which generate comorbidities that include neurological impairment [7].

Abnormal development leads to a number of factors, such as hygiene and eating habits, the use of potentially cariogenic drugs, and difficulty in obtaining dental treatment due to behavioral or sensory development problems, which increase the risk of comorbidity with bone disorders of the stomatognathic system [8, 9]. NDDs are among the most predisposing diseases in childhood. Worldwide, the rate of children and adolescents with some form of neurodevelopmental disorder is 16.9% [10, 11].

Sociodemographic factors should be considered in the assessment, as pediatric patients from lower socioeconomic strata are more affected, and this favors the coexistence of defects in normal neurodevelopment [12].

We must consider all comorbidities that favor the onset of malocclusions, from psychiatric, neurodevelopmental, and medical comorbidities in our patients, in order to provide them with the best possible care through multidisciplinary management, always aimed at resolving problems that may put their lives at risk or greatly affect their quality of life.

3.2 Etiology

There are a number of genetic, environmental, and functional factors that contribute to the development of malocclusions, including NDDs, which are strongly related to the onset of malocclusions because the syndromes that predispose to NDDs are often characterized by a series of dysmorphic facial features, which favors the appearance of malocclusions such as anterior, posterior, and crossbites, as well as the development of maxillary hypoplasia. They are also related to various specific patterns of malocclusion due to the craniofacial phenotype that presents [13-15].

Functional deterioration is closely related to the risk of malocclusions due to the parafunctional habits present in NDDs. Examples include involuntary movements, atypical swallowing, and mouth breathing, which are directly associated with the appearance of malocclusions such as open bite and deep bite. There are habits that patients develop that affect muscle development. These habits alter the forces of the orofacial muscles, complicating correct dental alignment

and proper bone growth. Examples of these habits include non-nutritive sucking, tongue posture, and the use of pacifiers or dummies, which, when used for prolonged periods of time, significantly increase the risk of malocclusion [16-18].

Socioeconomic factors also play an important role in the development of malocclusions in children and adolescents with NDDs, as not having adequate health insurance prevents them from receiving the necessary care, and their conditions further compromise normal physiological development [19, 20].

We can understand the relationship between NDDs and its impact on the appearance of various malocclusions in pediatric patients, as these generate a greater number of comorbidities that favor alterations in the neuromuscular and skeletal development of the stomatognathic system.

3.3 Diagnosis

Over time, advances in neuroscience have focused on understanding neural pathways and their proper functioning, as well as on neural responses to stimuli, such as in the case of injuries, pain, and rehabilitation of the developing pediatric nervous system [21].

Neuroimaging has enabled the study of brain function and structures, allowing us to understand oral behaviors, from chewing and dental anxiety to atypical oral sensorimotor development [22].

Sleep and neuroscience are becoming increasingly relevant in dentistry, as sleep disorders, such as obstructive sleep apnea, can present orofacial manifestations due to the impact on the development of craniofacial structures. Early identification and referral to the appropriate specialist can save lives, in addition to reducing the morbidity of malocclusions [23, 24].

For us, understanding the neurobiological substrates will allow us to guide behavioral and pharmacological strategies to improve cooperation. Education in neuroscience allows us as dentists to be trained to recognize and manage the neurological aspects of dental care [2, 25]. Recent research has confirmed the use of biomarkers, such as the dental matrix, as a method of reconstructing brain malleability, thereby providing us with a new method of identifying levels of neurodevelopment [26].

Assessing the state of neurological development will be essential, as there is a complex correlation between developmental deficits and oral health. Classifying this will allow us to take a more personalized approach to each patient, assessing risks in conjunction with care planning.

3.4 Treatment

When planning an appropriate treatment plan, we must take into account genetic neurodevelopmental disorders, which can have repercussions in the oral cavity, such as delayed eruption, abnormal tooth morphology, and sialorrhea, among other manifestations. These correlations between genotype and phenotype must be considered when planning personalized treatment for each patient [27, 28].

Neurodevelopmental disabilities in most cases present certain behavioral or medical complexities, which is why in many cases sedation or general anesthesia is required to perform treatments, without overlooking the precautions in patients who require multiple interventions with different anesthetics due to the risks that these can generate in high or excessive doses [29-31]. On the other hand, TND is mainly related to a higher incidence of carious lesions and periodontal disease. It is one of the challenges we face when providing care to children and adolescents with any of these deficits. That is why they must be given access to dental services, such as

specialized treatment plans and preventive measures that family members can use at home, in addition to the multidisciplinary treatment that tartar removal entails for children with these conditions [32-34].

The treatment plan for patients with neurodevelopmental disorders must be considered in a multidisciplinary manner, taking into account all factors that may predispose our patients to complications, as well as thoroughly evaluating the risk-benefit ratio of treatments and the alterations they may cause to the overall health of patients. We must also be clear that these patients should be offered active preventive consultations to control present and future oral pathologies that could cause more serious health problems.

4. Conclusions

The care of pediatric patients with neurodevelopmental disorders and various comorbidities requires a multidisciplinary approach that comprehensively considers the psychiatric, medical, and neurological factors that influence the onset of malocclusions and alterations of the stomatognathic system. A detailed assessment of neurological development allows risks to be identified and personalized treatment plans to be designed, always weighing the risk-benefit balance of interventions. It is also essential to incorporate active prevention strategies to control existing oral pathologies and reduce future complications, in order to improve the patient's quality of life and preserve their overall health.

Conflict of Interest

Not available

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