Dental trauma in individuals with severe cerebral palsy: prevalence and associated factors

Cristina Batista Miamoto[a]
Maria Letícia Ramos-Jorge[b]
Meire Coelho Ferreira[b]
Marise de Oliveira[c]
Raquel Gonçalves Vieira-Andrade[b]
Leandro Silva Marques[a]

[a] Department of Orthodontics, School of Dentistry, University of Vale do Rio Verde (UNINCOR), Três Corações, MG, Brazil.

[b] Department of Pediatric Dentistry, School of Dentistry, Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, MG, Brazil.

[c] Department of Orthodontics, School of Dentistry, Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, MG, Brazil.

Abstract: The aim of the present study was to determine the prevalence of dental trauma and associated factors among a sample of patients with severe cerebral palsy. The sample was made up of 120 individuals equally divided into two groups. The group with cerebral palsy was made up of 60 patients diagnosed with the spastic form of the disease. The control group was made up of 60 individuals with no mental impairment. Questionnaires were used to collect information on individual, socioeconomic and behavioral characteristics. Dental trauma was assessed based on the clinical chart of each participant, on a questionnaire and on a clinical evaluation to determine past injuries. Mouth mirrors and millimeter periodontal probes (Community Periodontal Index probe) were used to measure overjet. Lip seal and breathing type were determined during the clinical exams and interviews. Statistical analysis involved the chi-square test ($p \leq 0.05$) and multivariate logistic regression (forward stepwise procedure). The prevalence of dental trauma was greater among individuals with cerebral palsy (18%) than in the control group (5%), with the difference achieving statistical significance ($p = 0.023$). Individuals with lip incompetence had a greater chance of exhibiting dental trauma (OR [CI 95%] = 3.81 [1.19-12.24]). The prevalence of dental trauma among individuals with cerebral palsy was high. A lack of lip seal was identified as a factor directly associated to this prevalence.

Descriptors: Prevalence; Tooth Injuries; Cerebral Palsy.

Introduction

Cerebral palsy is an umbrella term for a group of conditions characterized essentially by motor dysfunctions that may be associated with sensory or cognitive impairment stemming from a non-progressive brain lesion originating in the prenatal, perinatal or postnatal period.[1,2] Cerebral palsy is the most common cause of severe physical disability in childhood, and occurs in approximately 2 to 2.5 of every 1000 live births.[3,4] The cause is unknown in 50% of cases, but premature birth is the risk factor most frequently associated with this condition. Mental, seeing and hearing impairments and eating difficulties are among the main problems related to cerebral palsy.[3]

The classification of cerebral palsy depends on the predominant motor alteration and encompasses three main types:

- spastic,

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Corresponding author:
Leandro Silva Marques
Email: *lsmarques.prof@gmail.com*

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- athetoid and
- ataxic.

These types are differentiated by the symptoms, which generally reflect the region of the brain that suffered the injury. Spastic cerebral palsy is the most common type and is characterized by a lesion in the cerebral cortex, with a reduction in muscle strength and an increase in tonus. Athetoid cerebral palsy is characterized by involuntary movements. Ataxic cerebral palsy is characterized by difficulties in motor coordination, and patients experience tremors when performing complex motor tasks. Moreover, the mixed type involves characteristics of two types of cerebral palsy at the same time.[5]

Impairment stemming from cerebral palsy ranges from mild (little difficulty) to severe, in which the child completely depends on others for activities of daily living.[6] Although such individuals do not participate in contact sports, they may have a high prevalence of dental trauma due to physical and mental impairments that reduce defensive reflexes.[7,8] A number of aspects related to dental caries, periodontal status and oral hygiene among individuals with cerebral palsy are widely discussed in the literature.[9-11] With regard to the prevalence of dental trauma, however, most epidemiological studies involve the assessment of healthy individuals[4,12] and little is known regarding this prevalence among individuals with cerebral palsy,[8,13] especially those with severe cerebral palsy who are completely dependent upon caregivers for all activities of daily living.

The aim of the present study was to determine the prevalence of dental trauma and associated factors among a sample of patients with severe cerebral palsy.

Methodology

The present cross-sectional study was carried out with a sample made up of 120 subjects with an average age of 10.4 years. Sixty Brazilian patients [28 boys and 32 girls; mean age 11.2 (± 5.01) years] with a medical report confirming the diagnosis of severe spastic cerebral palsy were included in the cerebral palsy group. These patients were randomly selected from among 1846 individuals registered at the Center for Physical Rehabilitation of the Nossa Senhora da Saúde Hospital of Diamantina (state of Minas Gerais, Brazil) and had mental impairment, little or no control over their arms and legs, no ability to execute activities without assistance and no past history of orthodontic intervention. The control group was made up of 60 individuals [19 boys and 41 girls; mean age 9.6 (± 2.36) years] without cerebral palsy, who were randomly selected from among patients with various malocclusions awaiting orthodontic treatment at the Specialization Course in Orthodontics of the Itaúna School of Dentistry (Brazil).

Information on the individual characteristics (age, gender, medical and dental trauma history), as well as socioeconomic and behavioral characteristics of all participants, was collected using a questionnaire administered in interview form to parents or guardians. A clinical exam was then performed on all participants with the aid of sterile mouth mirrors (Duflex, Rio de Janeiro, Brazil) and millimeter periodontal probes (Golgran, São Paulo, Brazil) (the Community Periodontal Index probe) for the measurement of overjet. Teeth were considered to exhibit trauma when fractured, missing, displaying discoloration and/or lack of vitality. All these conditions were to be associated with parents' reports of previous trauma from falls, as well as confirmation through radiographic examination. Lip incompetence was assessed using the method described by Ballard: mandible in physiological resting position in juxtaposition (sealed), with no contraction of the orbicular muscles of the mouth or mentalis.[14] Lip incompetence was recorded in cases in which the child needed to contract the orbicular muscles of the mouth and mentalis vigorously in order to achieve lip seal. Lip competence/incompetence and breathing type (nasal or mouth) were determined during the clinical examination and interview with the parent or guardian when the child thought he or she was not being observed.

The data were analyzed using SPSS Software *(Statistical Package for Social Science* for Windows, version 17.0, SPSS Inc., Chicago, USA). The chi-square test ($p \leq 0.05$) was used for comparisons between groups as well as between the independent variables (gender, age, caregiver's schooling,

breathing type, lip seal and overjet) and the dependent variable (dental trauma). Variables with p-values ≤ 0.20 were included in the multivariate logistic regression model (forward stepwise procedure). The null hypothesis was the inexistence of an association between the variables.

The study received approval from the Ethics Committee of the university Vale do Rio Verde (UNINCOR). Parents/guardians of the participants were informed as to the objectives, risks and benefits of the study and, after agreeing to participate, signed terms of informed consent.

Results

The prevalence of dental trauma was greater among the individuals with cerebral palsy (18%) than in the control group (5%). Having cerebral palsy (p = 0.023) and an absence of lip seal (p = 0.018) were indicative of dental trauma (Table 1).

No statistically significant associations were found between dental trauma and gender, age, caregiver's schooling, breathing type or overjet. Thus, the variables group and lip seal were included in the multivariate logistic regression model, which revealed that individuals with cerebral palsy (p = 0.031) had a fourfold greater chance of exhibiting dental trauma than the individuals in the control group. Moreover, lip incompetence (p = 0.025) increased the risk of dental trauma approximately threefold (Table 2).

Discussion

The present study assessed the prevalence of dental trauma and its possible correlation to gender, age, lip competence, breathing type (nasal or mouth) and overjet among individuals with the spastic form

Table 1 - Distribution of independent variables in relation to dental trauma.

	Dental Trauma		Total n (%)	p*
	Absent n (%)	Present n (%)		
Group				
• Control	57 (95.0)	3 (5.0)	60 (100)	**0.023**
• Cerebral palsy	49 (81.7)	11 (18.3)	60 (100)	
Gender				
• Female	66 (90.4)	7 (9.6)	73 (100)	0.377
• Male	40 (85.1)	7 (14.9)	47 (100)	
Age				
• < 10 years	52 (92.9)	4 (7.1)	56 (100)	0.149
• ≥ 10 years	54 (84.4)	10 (15.6)	64 (100)	
Caregiver's Schooling				
• > 4 years	62 (88.6)	8 (11.4)	70 (100)	0.923
• ≤ 4 years	44 (88.0)	6 (12.0)	50 (100)	
Lip Seal				
• Present	72 (93.5)	5 (6.5)	77 (100)	**0.018**
• Absent	34 (79.1)	9 (20.9)	43 (100)	
Breathing Type				
• Nasal	77 (91.7)	7 (8.3)	84 (100)	0.082
• Mouth	29 (80.6)	7 (19.4)	36 (100)	
Overjet				
• < 4 mm	65 (90.3)	7 (91.7)	72 (100)	0.416
• ≥ 4 mm	41 (85.4)	7 (14.6)	48 (100)	

*Chi-square test

Table 2 - Multivariate logistic regression (forward stepwise procedure) for dental trauma.

	Unadjusted OR (95% CI)	p	Adjusted OR* (95% CI)	p
Group				
• Control	1.00		1.00	
• Cerebral palsy	4.26 (1.12-16.17)	0.033	4.71 (1.15-19.26)	**0.031**
Lip Seal				
• Present	1.00			
• Absent	3.81 (1.19-12.24)	**0.025**		

*Adjusted for gender and age

of cerebral palsy with severe physical and mental impairments. These patients were completely dependent upon caregivers for all activities of daily living. Thus, comparisons with other studies should be interpreted with caution.

In the present study, the prevalence of dental trauma was higher among the individuals with cerebral palsy than in the control group. Previous studies have demonstrated a greater prevalence of tooth injuries among patients with cerebral palsy, mental handicaps and physical handicaps in comparison with healthy individuals, even when taking into account the fact that these individuals do not practice contact sports or radical physical activities.[8,11,15-17] These findings serve as a warning to caregivers of individuals with mental disabilities and encourage a search for preventive measures, such as the use of mouth guards, the padding of objects and hard surfaces and the safe transport of these individuals in wheelchairs.[16]

Regarding the risk factors associated to dental trauma, the most common are falls, collisions, automobile accidents, seizures, tooth grinding, dental caries, accentuated overjet and a lack of lip seal.[15,18,19] In the present study, the frequency of dental trauma from falls was not significantly correlated to gender, age, breathing type (nasal or mouth) or overjet in the individuals with cerebral palsy. However, lip incompetence was highly associated to a greater prevalence of dental trauma. The uncontrolled movements of the head that are characteristic of cerebral palsy increase the risk of dental trauma, since the teeth may strike against hard objects.[8] Thus, lip seal seems to act as a protective factor, which underscores the importance of early intervention by speech pathologists. Moreover, these results indicate a need for greater attention on the part of caregivers of patients with cerebral palsy, who can actively participate in preventing accidents among this specific group of individuals.

A number of authors state that overjet is a predisposing factor for injury to the maxillary incisors, with a greater degree of overjet leading to a greater chance of dental trauma.[18,19-22] However, the present study is in contrast with this finding, since accentuated overjet was not associated to a greater prevalence of tooth injury. Although the data of the present study are in disagreement with the majority of studies that correlate overjet with dental trauma, other studies involving patients with cerebral palsy and healthy schoolchildren have also not detected this association.[8,23]

The prevalence of dental trauma reported in some papers may be related to the socioeconomic level of the population studied. A large part of the records used in the present study pertain to individuals with a low socioeconomic status (monthly household income of up to US$325) who reside in distant neighborhoods or other cities and require public transportation to get to dental appointments. It is therefore possible that mild dental trauma may be overlooked on the part of parents or guardians, who may have not sought immediate dental care due to the distance and expense of bringing the patients to a treatment center.[13] Studies report that the time elapsed between dental trauma and the seeking of dental care ranges from three hours to five years, and the rate of parents/guardians who seek treatment in the first 24 hours following a trauma is only high when the affected individual is a young child.[24-28]

Conclusions

The present study demonstrates that the prevalence of dental trauma among individuals with cerebral palsy is greater than that found in healthy individuals. A lack of lip seal was a determinant factor of this type of trauma in the population studied.

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