Dental Erosion in Cerebral Palsy Patients

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ABSTRACT

Purpose: The objective of this study was to evaluate the presence and severity of dental erosion in cerebral palsy (**CP**) patients.
Methods: A group of 48 noninstitutionalized individuals with CP, 2 to 18 years old (8.8±3.9 years), has been diagnosed with the disorder. Dental erosion was evaluated according to O'Brien.[16] Results were compared to a control group composed by 26 patients with no neurological damage aged 4 to 18 years (11.3±3.5 years).
Results: Presence of deep dental erosion was significantly higher in CP individuals when compared to the control group. Concerning motor disorder, no statistical difference has been observed between the types of CP. Most of the affected teeth observed in the study group were the upper and lower molars and upper incisors.
Conclusions: Cerebral palsy patients have a higher risk of dental erosion development.
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Dental erosion has been described as "the physical result of a pathologic, chronic localized loss of dental hard tissue that is chemically etched away from the tooth surface by acid and/or chelation without bacterial involvement."[1-4] Teeth affected by erosion become rounded and lose their surface characteristics, and any existing restorations become raised above the adjacent eroded occlusal surfaces. Once dentin is exposed, the "cupping" of "lesions" on the occlusal surface can be seen.[5]

Dental erosion can be the result of various systemic conditions, which often makes the etiology difficult to identify.[6] Those conditions include: upper gastrointestinal disorders with an acid diet (43%), upper gastrointestinal disorders (25%), an acid diet (24%), eating disorders (6%), and unknown causes (2%). Unfortunately, the cause of dental erosion often goes undiagnosed, or the presence of other factors such as abrasion and attrition make diagnosis more difficult to determine.[7]

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The underlying etiology of dental erosion is a source of acid, which may be intrinsic or extrinsic, acting on susceptible tooth. Extrinsic causes of dental erosion may arise from several sources, including occupational, medications, or through lifestyle practices.[8]

The propulsion of gastric contents into the mouth, such as in gastroesophageal reflux, is the most common source of intrinsic acids in the mouth. Since the stomach's acidity may be below pH 1, dental erosion has been observed in disorders associated with chronic vomiting, persistent regurgitation, or gastroesophageal reflux or with protracted rumination.[9]

This may be more significant in the etiology of tooth surface loss in children with CP than the parafunctional activity, which has been classically regarded as the cause. CP patients are known to have a high incidence of feeding difficulties with food loss due to excessive drooling, coughing, choking, and poor motor control; and difficulties with swallowing, vomiting, recurrent chest infections, and irritability.[10,11]

Oral motor skills are often dysfunctional in CP patients, and lingual dysfunction, specifically tongue thrust, is consistently observed. Other patterns of oral dysfunction include: hyperactive and hypoactive gag reflexes, oral hypersensitivity, and prolonged and exaggerated bite reflexes. Inadequate function of cheek and lip musculature may prevent

formation of an adequate oral lip seal, leading to food/liquid loss and inhibiting distal propulsion of an organized bolus.[12-15]

The objective of this study was to evaluate the presence and severity of dental erosion in cerebral palsy patients.

METHODS

Forty-eight noninstitutionalized patients (29 males and 19 females), aged 2 to 18 yrs (8.8±3.9) with a medical diagnosis of CP, who were being treated at the Disabled Individuals Division of the Cruzeiro do Sul University (UNICSUL), São Paulo, Brazil, were selected at random. (The characteristics of the CP patients evaluated in this study are shown in Table 3.) The Ethics Committee of the UNICSUL approved the study protocol and, before the data collection, a written informed consent was obtained from parents/care givers responsible for each child participating in the study.

From the patients' health chart, the authors obtained the following general information: name, birth date, gender, and clinical diagnosis regarding motor disorder and clinical patterns.

The control group consisted of 26 patients (14 males and 12 females), 4 to 18 years old (11.3±4.9) from similar socioeconomic backgrounds and with no neurological damage (Table 1). Dental erosion was evaluated according to O' Brien;[16] methodology using codes listed on Table 2.

Table 1. Control Group's Characteristics

	N (%)	Age (mean±SD)	Dental erosion (%)	
			Presence	Absence
Male	12 (46)	10.5±4.4	2 (8)	10 (38)
Female	14 (54)	12.3±4.8	0	1 (54)
Total	**26 (100)**	**11.3±4.9**	**26 (100)**	

Table 2. Diagnosis Criteria for Dental Erosion Index

Depth Code	CRITERIA
0	Normal
1	Enamel only; loss of surface characterization
2	Enamel and dentin; loss of enamel, exposing dentin
3	Enamel into pulp; loss of enamel and dentin, resulting in a pulp exposure
9	Assessment cannot be made

Table 3. Motor Disorder and Clinical Patterns of Involvement for Cerebral Palsy Group

Motor disorder	Clinical pattern	Female %	Male %	Age mean±SD	Total %
Spastic	Quadriplegia	8 (44)	13 (43)	8±4.1	21 (44)
	Diplegia	5 (28)	8 (27)	9.5±4.3	13 (27)
	Hemiplegia	2 (11)	2 (7)	6.7±3.8	4 (8)
	Double hemiplegia	2 (11)	0 (0)	11±0	2 (4)
Athetoid	—	1 (6)	5 (17)	10.2±1.8	6 (13)
Ataxic	—	0 (0)	2 (7)	11±2.8	2 (4)
Total		**18 (38)**	**30 (63)**	**8.8±3.9**	**48 (100)**

Both CP and control groups were examined at the dental clinic on a dental chair under appropriate light-reflector illumination with the teeth air dried and the help of a mirror. Intraexaminer reliability was established through the re-examination of 20 children at 2 different visits (κ=0.93).

Degree of tooth wear was evaluated and Chi-square analysis was used to compare the prevalence and depth of dental erosion in the CP group compared to a control group. The prevalence of erosion was also examined within the CP group by motor disorder. Alpha levels were set at P<.05.

RESULTS

Twenty-six patients (54%) from the CP group and 2 patients (8%) from the control group showed dental erosion. Thus significantly higher dental erosion was observed in CP patients when compared to the control group (P<.0001). Concerning gender, the authors observed dental erosion in the CP group in 11 females (58%) and 15 males (52%). In the control group, the authors observed the presence of dental erosion in only two of the boys (12%) and none of the girls. The authors did not observe a significant association between males and females in the CP group (P=.451) as well as in the control group (P=.280). Concerning motor disorder, no statistical difference (P=.282) was observed between spastic and dystonic types (athetoid and ataxic).

The findings related to depth of erosion showed that 17 (65%) patients from the CP group patients presented with code 1 and 9 patients (35%) presented with code 2. Chi-square test shows a statistical difference regarding depth of erosion between code 1 and 2 (P=.027) for the CP group.

In the control group, one patient (4%) presented with erosion depth code 1 and one presented with code 2 (4%). The CP group presented with significantly higher erosion depth code 1 (P=.001) and 2 (P=.005), however, when compared to the control group (Figure 1).

Most of the affected teeth observed in the CP group were upper molars (54%), lower molars (58%), and upper incisors (54%).

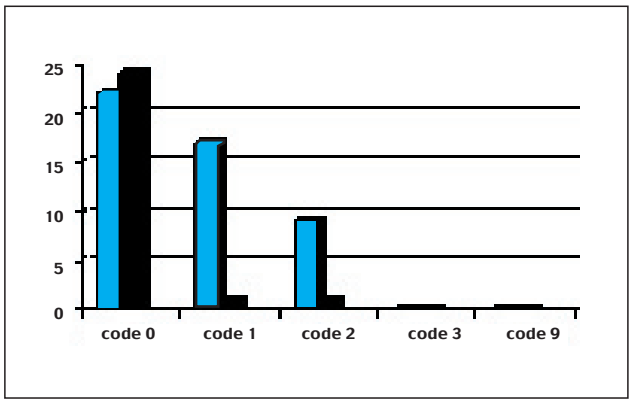

Figure 1. CP Group Control Group

DISCUSSION

The incidence of dental erosion in patients who have not shown any alteration of the neuromotor system is widely studied. Although this prevalence in CP patients is not yet known, studies have shown that gastroesophageal reflux occurs frequently in CP.[20-21] Gastric dysfunction, which is a problem in neurologically impaired children, is considered one of the principal risk factors associated with dental erosion.[11] Acidic fruit juices were shown to provoke reflux, and they may have, therefore, extrinsic and intrinsic effects.[20]

It is also acknowledged that the etiology of dental erosion is multifactorial. Extrinsic factors, such as diet, play a significant role. However, intrinsic factors like gastroesophageal reflux disease (GERD) and other medical conditions, as oral-motor disabilities, are also responsible for dental erosion.[18] The inability to produce the necessary motor skills for ingestion[10,19] leads to a longer permanence of food and beverages in the oral cavity. This makes it difficult to identify the true etiological factors through basic questionnaires, as one must consider the "silent refluxes." In this study, the result was extremely significant for dental erosion ($P<.0001$) in CP individuals. The maxillary teeth show a pattern of higher incidence and greater severity than the mandibular teeth.

The mandibular arch has a higher incidence of dental erosion on the premolars and molars, with minimal or no erosion of the lower anterior teeth.[21] This could be attributed to the fact that regurgitated gastric acid predominantly contacted the lingual surfaces of the upper anterior teeth. Due to the salivary glands' proximity, the tongue and the buffering ability of saliva may have protected the lower anterior teeth.[21] Premolars could not be evaluated because the majority of patients were in the mixed dentition, and premolars were not present.

Lack of early guidance and of prevention of dental deterioration caused by chemical agents can aggravate its prognosis. The early diagnosis and adequate management of dental erosion may prevent further dental tissue loss and consequently the diminished vertical dimension of occlusion and complex restorative treatments.

Since dental erosion is irreversible, the goal should be the immediate referral of the patient to a gastroenterologist, who can more accurately confirm the diagnosis and begin treating the disorder. Dental practitioners may be able to help minimize erosion in their patients through the clinical applications of fluoridated solutions, aiming at reducing erosion progression in enamel and dentin.[22]

CONCLUSIONS

Based on this study's results, the following conclusions can be made: this study demonstrates that dental erosion is common in cerebral palsy patients, and these results suggest that dentists should be alert to early signs of dental erosion in cerebral palsy patients and provide appropriate preventive therapy and referral for diagnosis and treatment of gastroesophageal reflux disease to avoid irreversible damage to the dentition.

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