DE GRUYTER OPEN

Journal of Interdisciplinary Medicine

ORIGINAL RESEARCH

PEDIATRIC DENTISTRY // ORTHODONTICS

Correlations between Chronological Ages and Dental Ages on a Group of Children with Down Syndrome

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ARTICLE HISTORY

Received: June 7, 2017
Accepted: July 1, 2017

ABSTRACT

Background: The number of studies on oral complications in children with Down syndrome is substantial, but they are focused rather on the prevalence of dental caries, periodontal disease, and hypodontia. The relationship between Down syndrome and dental eruption has been rarely approached. The causes of delayed eruption in children with Down syndrome are incompletely elucidated due to the incomplete identification of the factors that intervene in the physiological process of dental eruption. **Aim of the study:** To evaluate the correlation between Down syndrome and the delayed eruption of permanent teeth, in relation to the chronological age, in this category of patients. **Material and methods:** The study group included 94 children with mixed dentition, of ages between 6 and 12 years: 36 children with Down syndrome and 58 healthy children. Clinical and radiological examinations were performed, focusing on the relation between dental age and chronological age. **Results:** The presence of Down syndrome in children has a significant influence ($p < 0.001$) on the delayed eruption of permanent teeth, considering the chronological age, compared to healthy children. The weighted average of this delay in our study group was 1.27. **Conclusions:** It is necessary to monitor children with Down syndrome for an extended period of time, in order to ensure a high quality of life and to optimize their health as much as possible.

Keywords: Down syndrome, dental eruption, children

INTRODUCTION

Down syndrome or trisomy 21 is the most common genetic form of intellectual disability, and it represents the main cause of certain medical conditions and problems. The incidence of the disease is of approximately 1:800 in living newborns, the risk of disease occurrence being in strong connection with the mother's age.[1]

The appearance of a child with Down syndrome is typical, the diagnosis being established on the basis of associating certain modifications. The characteristic morphological features are microcephaly, flat occiput, flattened facial

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appearance, neuromuscular hypotonia, short neck, generous nuchal skin. The ears are significantly smaller, low-set, and the lobes are hypoplastic or absent; there are epicanthal folds, and the child manifests hearing difficulties. As far as the facial features are concerned, a child with Down syndrome presents upward-slanting palpebral fissures, flat nasal bridge, small and anteverted nares, as well as epicanthus.[2] The most frequent oral complications in such children are related to mouth breathing, macroglossia, open-bite, fissured tongue and lips, angular stomatitis, malocclusion, hypodontia, microdontia, lower prevalence of dental caries, and delayed eruption of both primary and permanent dentitions.[3–5]

Eruption is a parameter of morphological development, which can be determined through clinical examination or evaluation of radiographs. Chronological age represents the age of an individual expressed in years, while dental age represents the age determined by the dentition, and it is determined up to the age of eighteen years. The causes of delayed eruption in children with Down syndrome are unknown, due to an incomplete understanding of the factors that intervene in the normal process of eruption. Nevertheless, it appears to be influenced by genetic factors. There are proofs suggesting that the rate of eruption is influenced by the pulp vascularization of conjunctive tissue. Poor peripheral circulation might be a contributing factor in delayed eruption. At the same time, it can also be due to the delayed growth and development of the maxilla and the mandible, aspects which are characteristic to this syndrome. Some authors correlate the low weight at birth with delayed eruption. Other local factors, such as traumas, carious or periapical lesions of deciduous teeth, can also lead to delayed dental eruption.[6–8]

Although children with Down syndrome present a lower prevalence of dental caries, they frequently develop periodontal diseases. The insufficient manual dexterity creates difficulties in performing a proper toothbrushing, which results in dense accumulations of dental plaque that contribute to the development of gingivitis and other periodontal diseases.[9]

The number of studies on oral complications in children with Down syndrome is substantial, but they are focused rather on the prevalence of dental caries, periodontal disease, and hypodontia. The relationship between Down syndrome and dental eruption has been rarely approached.

The aim of our study is to evaluate the relation between Down syndrome and the delayed eruption of permanent teeth, in relation to the chronological age, in this category of patients.

MATERIAL AND METHODS

The research was carried out on a group of 94 children with mixed dentition, with ages between 6 and 12 years, divided in a study group, comprising 36 children with Down syndrome registered in the School for Inclusive Education No. 1 of Tîrgu Mureș and the Fundația Alpha Transilvană (Transylvanian Alpha Foundation), and a control group comprising 58 healthy children, without any general or serious disease, registered in the Integrated Center of Dentistry of the University of Medicine and Pharmacy of Tîrgu Mureș, Romania, who had regular check-ups or were at various stages of dental treatment.[10] Clinical and radiological examinations were performed, and the succession in permanent teeth eruption in the 4 quadrants of the oral cavity, as well as eruption disorders were evaluated. The data obtained were recorded in the dental examination sheets of the patients in both groups. For each patient involved in the study, we recorded the following: pathological and dental personal history, family history, state of dentition, and growth indices (dental age and chronological age).

The study was carried out between 2015 and 2016. The examinations were consented by the parents, the school management, and the foundation management, respectively. Dental age was determined by direct clinical examination, depending on the presence, absence, and number of permanent teeth in the oral cavity.

In order to identify the statistical relation between the presence of Down syndrome and the delayed age of tooth eruption compared to the chronological age of the patients, we used statistical calculus of correlations and regressions. Using the Stata 12 software (StataCorp LLC, College Station, USA), we analyzed the correlation factor between the presence of the disease and the delay in tooth eruption. In order to ensure that this relation is not affected by problems linked with multicollinearity, we carried out a test on the variation inflation factor (VIF test), which led to results that were much below the maximum acceptable limit of 10, and thus the data have been accepted without problems generated by multicollinearity. Secondly, in order to analyze the influence and the statistical significance of the adopted model, we used a simple ordinary least squares regression, which allows a correct measurement of the statistical relation between the independent and the dependent variables. The statistical model used the pattern of some fixed effects, which are adequate for the relation studied in this research. The level of statistical significance was set at $p < 0.05$.

RESULTS

After the clinical and radiological examinations of the patients belonging to the study group, we observed the following: of the 36 of the patients with Down syndrome, 9 children (25%) presented a concordance between the dental age and the chronological age. The highest number of children, 18 (50%), presented a one-year difference between the two ages. The greatest discrepancy of a 4 year difference between the two ages appeared in 3 children (8%); also, 6 children (17%) presented a difference of 3 years (n = 3) and 2 years (n = 3) respectively, between the dental age and the chronological age.

The examinations carried out on the control group indicated that 43 children (74.13%) presented a correspondence between the dental age and the chronological age. In 6 children we noticed a delay in tooth eruption of 1 year, while 4 children presented a 2-year delay. Early eruption was observed in 5 children (Figure 1).

In total, 27 children (75%) from the patients with Down syndrome, and only 10 children (17%) from the control lot presented delayed eruption, the difference being statistically significant. The correlation between dental age and chronological age was recorded in 9 children (25%) with Down syndrome and in 43 children (74.13%) from the control lot.

Analyzing the correlation factor between the presence of Down syndrome and the delay in teeth eruption, we obtained a correlation coefficient of 0.609, which is considered an average-to-high value of the relation between the two variables. Through the statistical calculus of regression, a predilection value of R2 equal to 0.37 and a statistical correspondence of the significance model at the level of 99% resulted. Regarding the direct relation between the presence of Down syndrome in children and the delay in tooth eruption, compared with the chronological age, we have identified a positive coefficient relation, statistically significant at the level of 99% ($p < 0.001$). The weighted average value of this discrepancy in the study group was 1.27 years.

DISCUSSION

The results of this study, significant from a statistical point of view, are correlated to other studies. In a study on 41 children with Down syndrome aged between 6 and 10 years, Asokan *et al.* also obtained a statistically significant value, which suggests a delay in tooth eruption in the study group ($p < 0.004$).[11]

A similar study was conducted by Diz and Limeres, in which they evaluated the discrepancy between the chronological age and the dental age in children with Down syndrome, and cerebral palsy and intellectual disability, respectively. The group of children with Down syndrome was composed of 37 patients, with ages between 3 and 17 years: 3 in 10 patients presented a delay of 2 years, 2.5 years, and 3 years, respectively , with a p value of 0.02 (95% level of confidence). The results refer only to female patients, since the boys included in the study did not present statistically significant results.[12]

Possible differences regarding the delay interval in eruption can be caused by factors such as regional differences, different structure of the study group, local and general factors. Among the comorbidities of the study group, a large number of patients presented mental handicap and

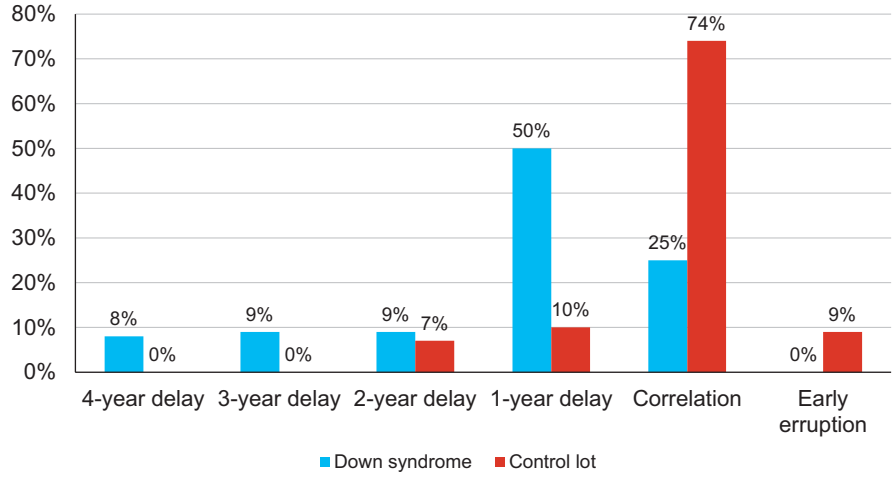

FIGURE 1. Delayed eruption of the permanent teeth in children with Down syndrome and the control group

requested a personal assistant. The development of the dental-facial complex is an extremely important indicator for the orthodontist and for the maxillofacial surgeon. Estimations regarding the stage of development of dental structures can help determine the optimal time for starting the orthodontic treatment. At the same time, these estimations can help the doctor decide on the surgical removal of temporary teeth.[12,13]

A delay in eruption can affect the precision of the diagnosis, as well as the decision on the right treatment plan. Therefore, the delay in dental eruption can have a significant impact on health.

CONCLUSIONS

The presence of Down syndrome in children has a significant influence on the delay in the eruption of teeth, in relation to the chronological age, compared with children who do not suffer from this syndrome. It is necessary to monitor children with Down syndrome for an extended period of time, in order to identify abnormalities in their dental eruption, but also in order to ensure a high quality of life and to optimize their health as much as possible.

CONFLICT OF INTEREST

Nothing to declare.

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