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The Influence of Iron Supplementation on Tooth Eruption of the Newborn

Yenidoğanlarda Demir Desteğinin Diş Erüpsiyonu Üzerindeki Etkileri

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Abstract

Objective: Iron is needed for many enzymes to function normally, so a wide range of symptoms may eventually emerge in iron deficiency, including retardations in growth and maturation. Because of this it is reasonable to hypothesize that iron supplementation may affect the timing of tooth eruption. The purpose of this study was to examine the association between iron supplementation and tooth eruption.
Materials and Methods: This study included children under the age of 3, who were admitted to Gülhane Training and Research Hospital, Clinic of Paediatrics for the well child follow up. Their parents were asked to complete a questionnaire including questions about the first tooth eruption time and about the iron supplementation history of their child, along with questions about the factors known to influence tooth eruption process.
Results: There was a significant positive correlation between the duration of iron supplementation therapy of the children during infancy and eruption time of the first deciduous tooth (r=0.636 p=0.0001). While the duration of iron supplementation therapy increased, the eruption time of the first deciduous tooth was significantly later.
Conclusion: The length of time a tooth is present in the oral cavity affects its risk for dental caries. Iron deficiency may cause oral hygiene and periodontal disease in the manner above by causing early eruption of deciduous tooth. The physicians giving iron therapy for supplementation can inform and encourage the parents in this way, to prevent the deprivation of this vital supplement by the parents.

Öz

Amaç: Demir, pek çok enzimin normal işlev görmesi için gereklidir, bu nedenle büyüme ve gelişmedeki gecikmeler de dahil olmak üzere demir eksikliğinde çok çeşitli semptomlar ortaya çıkabilir. Bu nedenle, demir desteğinin diş erüpsiyonunun zamanlamasını etkileyebileceğini varsaymak mantıklıdır. Bu çalışmanın amacı demir desteği ve diş erüpsiyonu arasındaki ilişkiyi incelemektir.
Gereç ve Yöntemler: Bu çalışmaya, Gülhane Eğitim ve Araştırma Hastanesi Çocuk Sağlığı ve Hastalıkları, Sağlam Çocuk Bölümü'ne başvuran 3 yaş altı çocuklar dahil edildi. Anne babalarından, ilk diş erüpsiyon zamanı ve çocuklarının demir desteği hikayesi hakkında soruların yanı sıra, diş erüpsiyon sürecini etkilediği bilinen faktörler hakkında sorular içeren bir anket doldurmaları istendi.

Bulgular: Çocukların demir desteği tedavi süresi ile ilk süt dişi erüpsiyon zamanı arasında anlamlı pozitif korelasyon vardı (r=0,636 p=0,0001). Demir desteği tedavisinin süresi artarken, ilk süt dişi erupsiyon zamanının anlamlı bir şekilde arttığı görülmüştür.
Sonuç: Bir dişin ağız boşluğunda bulunduğu sürenin uzunluğu diş çürüğü riskini etkilemektedir. Demir eksikliği, süt dişlerinin erken erüpsiyonuna neden olarak, belirtildiği gibi oral hijyen ve periodontal hastalıklara neden olabilir. Demir desteği tedavisi veren hekimler, bu hayati desteğin ebeveynler tarafından yoksunluğunu önlemek için ebeveynleri bu şekilde bilgilendirebilir ve teşvik edebilir.

Introduction

Iron plays an important role in biology by forming complexes with molecular oxygen in hemoglobin and myoglobin. These two compounds are common oxygen transport proteins. Iron is also the metal at the active site of many important redox enzymes, which deal with cellular respiration and oxidation and reduction (1). Iron deficiency in young children is a common concern with an estimated 6 to 15 percent of toddlers being iron deficient. Prevention of this deficiency is critical in the early years of development. An iron-poor diet is the most likely cause in this age group and supplementation is often recommended (2).

Tooth eruption of humans is an excellent developmental process in the organism. The mechanism of eruption has never been understood fully and the scientific literature about this is extremely rare. Variations in the timing of eruption of the primary teeth are under strong genetic control, but the contribution of external factors are also very important (3). In the primary and permanent dentitions, eruption times have been studied clinically (4,5). In these studies, the coordination of osseous maturity and eruption times are investigated and it has been shown that there is an important correlation. Svendsen and Björk (6) hypothesized that third molar impaction in the mandible is a consequence of late third molar maturation and early skeletal maturation. They showed a strong correlation between eruption time and dental maturity. Teeth normally erupt when they have reached 2/3 root length (7). It is important to clarify that there is no data about which of these parameters affect the maturity of the teeth (8).

Tooth eruption is recognized as an aspect of human growth and development and could possibly be influenced by a number of factors (9). Because of this, it is reasonable to hypothesize that iron supplementation may affect the timing of tooth eruption. Factors like gender, race and physical development may influence tooth eruption, but there is a considerable variation in the literature data about this issue. Also, there is no information available about the influence of iron supplementation on tooth eruption (10). The purpose of this study was to examine the association between iron supplementation and tooth eruption.

Materials and Methods

The study was approved by the Ethics Committee of Gülhane Training and Research Hospital (25/02/2014, 50687469-1491-153-14/1648.4-421), and informed written consent was obtained from all parents of subjects. This study included children under the age of 3, who were admitted to Department of Paediatrics for the well child follow up, after the ethical committee approval of the same institution for the study. After the examination of children, their parents were asked to complete a questionnaire. The questionnaire included questions about the first tooth eruption time (month when the first deciduous tooth erupted) and about the iron supplementation history of their child, along with questions about the factors known to influence the tooth eruption process. For the purpose of this survey and in line with the literature, tooth eruption was defined as the first clinical evidence of the tooth's structure visible in the oral mucous membrane. The parents who had doubts concerning the correct period of eruption of the first deciduous teeth or about the iron supplementation history were excluded in order to assure reliability of the collected data. A total of 100 questionnaires were evaluated statistically to search whether iron supplementation has any influence on the first tooth eruption time of the children, alone or along with the other factors asked in the questionnaire, which are known to influence the tooth eruption process according to the literature.

Statistical Analysis

Analysis of data was carried out using Statistical Program for Social Science (SPSS Inc., Chicago, IL, USA) version 11.5 (Licenced SPSS program of University of Scince Health). For statistical analysis, the chi-square

test was used and p value <0.05 was considered significant in all analyses.

Results

The characteristics of the children are given in Table 1. There were 52 female and 48 male children. 87% of the children were supplemented with iron therapy and 97% of them were supplemented with vitamin D during their infancy, while the others were not. 93% of them were born with a normal newborn weight, 6% of them were between 1000-2500 gr and 1% of them was <1000 gr 53% of them were born with cesarean section, whereas the others were born with vaginal delivery. 51% of the children's mother were supplemented with vitamin D therapy, 66% of them were supplemented with iron therapy during their pregnancy and the others were not. The median eruption time of the first deciduous tooth was 7 months (3,5-12). When compared according to gender, iron supplementation, vitamin D supplementation, birth weight and delivery type, there were no statistically significant difference between groups in terms of the beginning of the eruption of first deciduous tooth. The median eruption time of the first deciduous tooth of the children whose mothers were supplemented with vitamin D therapy during their pregnancy, was statistically significantly later than those who were not supplemented (8 months and 6.5 months respectively, p=0.031). There was a significant positive correlation between the duration of iron supplementation therapy of the children during infancy and the eruption time of the first deciduous tooth (r=0.636, p=0.0001). In other words, while the duration of iron supplementation therapy increased, the eruption time of the first deciduous tooth was significantly later. There was also a significant positive correlation between the eruption time of the first deciduous tooth of the mothers and the children (r=0.704, p=0.0001). In such a manner that the eruption time of the first deciduous tooth of the children was significantly later; if their mother's eruption time of the first deciduous tooth was late (Table 2).

Discussion

Tooth eruption is the movement of a tooth from its position in the osseous crypt into the oral cavity. Although the exact mechanisms underlying this process are not entirely known, many factors appear to play a role. Demographic factors, such as race, gender, sex, physical development, birth weight, growth parameters, nutritional statusandage may influence the process (8). In agreement with the previously mentioned studies about deciduous tooth eruption time, the results of the current study also indicate the association between genetic and nutritional status (3,4).

However, interestingly, the results also indicate that iron supplementation therapy has an influence

Table 1. The characteristics of the children

Gender (n)	Female (52)	Male (48)	
Iron supplementation (%)	Yes (87)	No (13)	
Vitamin D supplementation (%)	Yes (97)	No (3)	
Newborn weight (%)	Normal (93)	1000-2500 gr (6)	<1000 gr (1)
Way of birth (%)	Cesarean (53)	Vaginal (47)	
Mother's vitamin D supplementation during pregnancy (%)	Yes (51)	No (49)	
Mother's iron supplementation during pregnancy (%)	Yes (66)	No (34)	

Table 2. Parameters that having statistically significant positive correlation between the eruption time of the first deciduous tooth of the children

Duration of iron supplementation therapy	The eruption time of the first deciduous tooth of the mothers'
0.636 0.0001	0.704 0.0001

on deciduous tooth eruption time, by causing it to be significantly later. It is known that, iron as an element maintain the integrity of the tooth structure. There is no data about the association between iron and tooth eruption. Beside the factors above, physiologic factors are also thought to be involved in deciduous tooth eruption time, including molecular signaling and several hormones and mediators that affect growth (11). Iron may play a role in this manner on the tooth eruption time.

On eruption, the ameloblasts are responsible for enamel formation, and then, they are lost and no further enamel remodelling is possible. Because of this, the enamel acts as a permanent registry of the interplay between environmental and genetic factors during its development. Obviously, the enamel will undergo physiological wear in time and sometimes pathological destruction. Thus, it is likely that earlier tooth eruption has a negative effect on enamel quality (12). In the manner above, iron deficiency may cause a negative impact on enamel quality by causing early eruption of deciduous tooth.

It is known that alterations in the timing of tooth eruption can significantly impact oral health due to its potential to cause malocclusion which may in turn lead to poor oral hygiene and periodontal disease. In addition, the length of time a tooth is present in the oral cavity affects its risk for dental caries. Iron deficiency may cause oral hygiene and periodontal disease in the manner above by causing early eruption of deciduous tooth. Prevention of iron deficiency is critical in the early years of development as decreased mental, physical and behavioral functioning could occur as a result (13). According to the current study, it can be said that oral hygiene and periodontal disease could also occur as a result of iron deficiency related early eruption of deciduous tooth.

Conclusion

The pyhsicans giving iron therapy for supplementation can inform and encourage the parents in this way, to prevent the deprivation of this vital supplement by the parents. Considering that there aren't many studies in the literature about the influence of iron over the period of tooth eruption, further studies should be carried out in order to evaluate and report the effect of possible changes in the iron metabolism on the pattern of regular eruption of the primary dentition.

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Ethics

Ethics Committee Approval: The study was approved by the Ethics Committee of Gülhane Training and Research Hospital (25/02/2014, 50687469-1491-153-14/1648.4-421).

Informed Consent: Informed written consent was obtained from all parents of subjects.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.A.M., Concept: O.G., İ.E., Design: E.A.M., C.A., Data Collection or Processing: E.A.M., İ.E., Analysis or Interpretation: O.G., C.A., Literature Search: E.A.M., İ.E., Writing: E.A.M, İ.E.

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