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ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Timing of clinical eruption of permanent teeth in children with molar incisor hypomineralization

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SUMMARY

Introduction/Objective Molar incisor hypomineralization (MIH) is a developmental defect and it has a multifactorial etiology; there could be variations in dental eruptions in the children with this condition. The aim of this study was the comparison of the clinical eruption status of the permanent teeth in children with MIH and patients without MIH.

Methods The study group comprised a total of 300 children (176 females and 124 males aged 6–12 years) who had been diagnosed with MIH but had no systemic disease. The control group comprised 300 age- and sex-matched children without MIH. In the study and control groups, the eruption of the permanent teeth (excluding third molars) was evaluated and compared. In addition, this comparison was performed separately for the males and females in the study and control groups. The independent samples t-test was used for statistical analysis.

Results No statistically significant difference was found between the mean age of the dental eruptions of the children with MIH and that of the children without mineralization disorders ($p > 0.05$). Regarding the mean age of the dental eruptions, the sex-matched comparison revealed no statistically significant difference between the study and control groups ($p > 0.05$).

Conclusion Although there was no statistically significant difference in the MIH group and the healthy control group regarding the mean age of the eruption of all teeth, a trend of accelerated dental development in the MIH group was observed.

Keywords: tooth eruption; molar incisor hypomineralization; developmental enamel defect

INTRODUCTION

Molar incisor hypomineralization (MIH) is defined as the hypomineralization of one or more permanent first molar. It is also sometimes associated with affected incisors. It is a developmental enamel defect without a definite etiology or general distribution. It is thought to be caused by ameloblasts that have been affected by local and systemic factors during the formation of enamel [1]. Studies have reported on eruption disorders in patients with developmental enamel defects other than MIH [2, 3]. The eruption is a dynamic process that begins at the initial positioning of the tooth in the alveolar bone and continues until the final positioning at which it is occluded by a dental antagonist. This is an important part of the developmental period [4]. MIH, which is thought to occur in relation to factors encountered in the development process, appears to be an important health problem. Because MIH is a developmental defect and it has a multifactorial etiology, there could be variations in dental eruptions in children with this condition. This study was planned after the literature survey identified the absence of evaluations of the effect of MIH on the timing of clinical eruption.

The purpose of this study was the comparison of the clinical eruption status of the permanent teeth of children with MIH and the patients without MIH. In addition, the timing of permanent tooth eruption in children with MIH was investigated.

METHODS

The study was approved by the Clinical Research Ethics Committee of Zonguldak Bulent Ecevit University (Protocol No.: 2017-75-09/08). To establish the study and control groups, 385 patients were examined and diagnosed with MIH. They had all applied for dental examinations at the Department of Pedodontics at Zonguldak Bülent Ecevit University between August 2017 and August 2018. In addition to the dental evaluation of all patients, medical anamneses were also taken. The study excluded patients with permanent teeth that were missing for reasons other than the extraction of the permanent first molars because of MIH (e.g., congenitally missing teeth or trauma). Other exclusions were children outside the age range of 6–12 years who exhibited localized pathology and severe malocclusion (e.g., marked skeletal mismatch or obstructed teeth), were already undergoing orthodontic treatment, presented with any systemic disease, and exhibited dental mineralization disorders other than MIH.

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The study group comprised a total of 300 children (176 females and 124 males aged 6–12 years) who had been diagnosed with MIH but had no systemic disease. The control group comprised 300 age- and sex-matched healthy children with no systemic disease or dental mineralization disorder.

Examination and assessment

In the present study, the permanent first molars and permanent incisors of children aged 6–12 years were examined for the presence of MIH. Halogen reflector lighting, a mirror, and a probe were used in the dental unit in accordance with the criteria established by Ghanim et al. [5]. The criteria include the presence or absence of demarcated opacities, destruction of enamel after eruption, atypical caries, and MIH-induced tooth extractions. The examination for MIH was conducted without drying the teeth. If necessary, cotton pellets were used to remove any residue on the teeth. The diagnosis of MIH was based on the detection of at least one affected permanent first molar.

The patients with only affected incisors were not diagnosed with MIH because these defects can be caused by local factors, such as trauma and caries [6, 7]. For the patients who lacked the teeth under examination because of extraction, the presence or absence of demarcated opacities in the other teeth was ascertained. If the other teeth had demarcated opacities, then the patient was considered to be affected by MIH. In this study, amelogenesis imperfecta (AI), dentinogenesis imperfecta, hypoplasia, diffuse opacities, white spot lesions, tetracycline-induced colorings, and fluorosis were considered to be the differential diagnosis.

In the study and control groups, permanent tooth eruption was evaluated in accordance with the criteria of Pahkala et al. [8]. According to these criteria, the eruption of each permanent tooth is evaluated on the basis of four codes:

Code 0: the tooth is not visible in the oral cavity;

Code 1: at least one tubercule of the tooth is visible in the oral cavity;

Code 2: the entire occlusal surface or mesiodistal width of the tooth is visible;

Code 3: the tooth is in occlusion.

In comparison of the eruption ages of the permanent teeth of the children in the study and control groups, tooth eruption was assumed to have occurred if any part of the crown was visible on the oral mucosa (Codes 1, 2, and 3). For each participant in the study and control groups, the eruption ages of teeth 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35, 36, 37, 41, 42, 43, 44, 45, 46, and 47 were recorded. The mean age of dental eruption in the children in the study group was compared with that of the control group. In addition, this comparison was performed separately for the males and females in the study and control groups.

Statistical analysis

The data were analyzed with IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). The independent samples t-test was used for the intergroup comparison of the ages. The results of the analysis of the quantitative data are presented as the mean ± standard deviation. For the qualitative data, they are presented as frequencies (percentages). The level of significance was set as $p < 0.05$.

RESULTS

The distribution of the mean ages of the patients in the study and control groups according to their sex is presented in Table 1.

Table 1. Distribution of the mean age of the patients and control group subjects in the study according to sex

Group	Females mean age ± SD	Males mean age ± SD	Total mean age ± SD
MIH	8.97 ± 0.14	8.7 ± 0.14	8.83 ± 0.1
Control	8.99 ± 0.14	8.96 ± 0.14	8.97 ± 0.1

MIH – molar incisor hypomineralization

Table 2. Mean age of permanent tooth eruption in patients and control group subjects

Tooth	MIH mean age ± SD	Control group mean age ± SD	Difference mean age ± SD	p
11	9.15 ± 0.1	9.36 ± 0.1	-0.21 ± 0.14	0.138
12	9.8 ± 0.1	9.89 ± 0.11	-0.09 ± 0.15	0.553
13	11.42 ± 0.16	11.37 ± 0.14	0.05 ± 0.21	0.797
14	10.51 ± 0.15	10.76 ± 0.14	-0.26 ± 0.21	0.233
15	11.01 ± 0.16	11.23 ± 0.14	-0.22 ± 0.22	0.314
16	8.98 ± 0.1	9.02 ± 0.1	-0.04 ± 0.14	0.759
17	11.89 ± 0.12	11.78 ± 0.13	0.11 ± 0.18	0.541
21	9.11 ± 0.1	9.35 ± 0.1	-0.25 ± 0.14	0.086
22	9.81 ± 0.1	9.88 ± 0.11	-0.07 ± 0.15	0.621
23	11.62 ± 0.11	11.41 ± 0.12	0.21 ± 0.16	0.195
24	10.56 ± 0.14	10.78 ± 0.12	-0.22 ± 0.19	0.245
25	11.13 ± 0.13	11.26 ± 0.14	-0.14 ± 0.19	0.480
26	8.96 ± 0.1	9.02 ± 0.1	-0.06 ± 0.14	0.652
27	11.89 ± 0.13	11.62 ± 0.12	0.27 ± 0.19	0.161
31	8.95 ± 0.1	9.04 ± 0.1	-0.09 ± 0.14	0.526
32	9.22 ± 0.1	9.41 ± 0.1	-0.19 ± 0.14	0.092
33	10.93 ± 0.14	11.21 ± 0.11	-0.28 ± 0.18	0.123
34	10.82 ± 0.15	10.98 ± 0.13	-0.15 ± 0.2	0.441
35	11.04 ± 0.15	11.23 ± 0.14	-0.18 ± 0.21	0.377
36	8.94 ± 0.1	9.02 ± 0.1	-0.08 ± 0.14	0.554
37	11.9 ± 0.11	11.68 ± 0.1	0.21 ± 0.16	0.179
41	8.97 ± 0.1	9.05 ± 0.1	-0.08 ± 0.14	0.561
42	9.21 ± 0.1	9.47 ± 0.1	-0.26 ± 0.15	0.075
43	10.83 ± 0.14	11.08 ± 0.12	-0.26 ± 0.19	0.178
44	10.74 ± 0.14	10.88 ± 0.14	-0.14 ± 0.2	0.475
45	11.22 ± 0.14	11.19 ± 0.14	0.02 ± 0.2	0.905
46	8.93 ± 0.1	9.02 ± 0.1	-0.09 ± 0.14	0.524
47	11.92 ± 0.1	11.75 ± 0.1	0.17 ± 0.15	0.243

MIH – molar incisor hypomineralization

The mean ages of the erupted permanent teeth (except for the third permanent molar) of the children in the study and control groups were compared. No statistically significant difference was found between the mean age of the dental eruptions of the children with MIH and that of

Table 3. Mean age of permanent tooth eruption in females in the patients and control group subjects

Tooth	MIH mean age ± SD	Control group mean age ± SD	Difference mean age ± SD	p
11	9.18 ± 0.14	9.46 ± 0.14	-0.28 ± 0.2	0.150
12	9.88 ± 0.14	9.94 ± 0.14	-0.06 ± 0.2	0.778
13	11.44 ± 0.22	11.29 ± 0.17	0.15 ± 0.27	0.583
14	10.48 ± 0.2	10.73 ± 0.18	-0.25 ± 0.27	0.344
15	11.01 ± 0.21	11.27 ± 0.15	-0.26 ± 0.25	0.307
16	9.07 ± 0.14	9.07 ± 0.14	0.01 ± 0.2	0.978
17	11.8 ± 0.17	11.68 ± 0.15	0.12 ± 0.24	0.610
21	9.14 ± 0.14	9.44 ± 0.14	-0.3 ± 0.2	0.129
22	9.86 ± 0.15	9.97 ± 0.14	-0.11 ± 0.2	0.574
23	11.65 ± 0.13	11.37 ± 0.15	0.28 ± 0.2	0.158
24	10.73 ± 0.18	10.89 ± 0.14	-0.16 ± 0.23	0.487
25	11.22 ± 0.16	11.21 ± 0.17	0.01 ± 0.24	0.977
26	9.04 ± 0.14	9.06 ± 0.14	-0.02 ± 0.19	0.900
27	11.81 ± 0.16	11.54 ± 0.15	0.27 ± 0.23	0.257
31	9.03 ± 0.14	9.1 ± 0.14	-0.06 ± 0.19	0.746
32	9.25 ± 0.14	9.62 ± 0.14	-0.38 ± 0.2	0.059
33	10.92 ± 0.17	11.18 ± 0.14	-0.26 ± 0.22	0.242
34	10.95 ± 0.17	11.02 ± 0.16	-0.07 ± 0.23	0.778
35	11.26 ± 0.17	11.11 ± 0.18	0.15 ± 0.25	0.552
36	9.01 ± 0.14	9.07 ± 0.14	-0.06 ± 0.19	0.752
37	11.83 ± 0.13	11.64 ± 0.12	0.19 ± 0.19	0.313
41	9.07 ± 0.14	9.11 ± 0.14	-0.04 ± 0.19	0.837
42	9.25 ± 0.14	9.57 ± 0.14	-0.32 ± 0.2	0.105
43	10.82 ± 0.17	11.03 ± 0.15	-0.21 ± 0.23	0.368
44	10.87 ± 0.18	10.96 ± 0.17	-0.09 ± 0.25	0.721
45	11.37 ± 0.16	11.31 ± 0.15	0.06 ± 0.22	0.775
46	9 ± 0.14	9.09 ± 0.14	-0.09 ± 0.2	0.645
47	11.88 ± 0.13	11.71 ± 0.13	0.17 ± 0.19	0.377

MIH – molar incisor hypomineralization

Table 4. Mean age of permanent tooth eruption in males in the patients and control group subjects

Tooth	MIH mean age ± SD	Control group mean age ± SD	Difference mean age ± SD	p
11	9.09 ± 0.15	9.21 ± 0.14	-0.12 ± 0.21	0.569
12	9.68 ± 0.14	9.8 ± 0.16	-0.12 ± 0.22	0.571
13	11.39 ± 0.19	11.63 ± 0.19	-0.24 ± 0.28	0.400
14	10.58 ± 0.24	10.86 ± 0.24	-0.28 ± 0.35	0.432
15	11.01 ± 0.26	11.09 ± 0.34	-0.07 ± 0.43	0.868
16	8.85 ± 0.14	8.95 ± 0.14	-0.11 ± 0.2	0.603
17	12.03 ± 0.12	12.16 ± 0.14	-0.13 ± 0.19	0.523
21	9.05 ± 0.15	9.23 ± 0.14	-0.17 ± 0.21	0.399
22	9.73 ± 0.14	9.73 ± 0.16	0 ± 0.22	1.000
23	11.54 ± 0.18	11.52 ± 0.2	0.02 ± 0.27	0.956
24	10.26 ± 0.22	10.53 ± 0.24	-0.27 ± 0.32	0.399
25	10.94 ± 0.23	11.43 ± 0.2	-0.5 ± 0.32	0.136
26	8.85 ± 0.14	8.96 ± 0.14	-0.12 ± 0.2	0.571
27	12.12 ± 0.15	11.88 ± 0.18	0.25 ± 0.25	0.356
31	8.84 ± 0.14	8.96 ± 0.14	-0.12 ± 0.2	0.542
32	9.1 ± 0.15	9.33 ± 0.15	-0.23 ± 0.21	0.275
33	10.94 ± 0.28	11.27 ± 0.16	-0.33 ± 0.32	0.302
34	10.59 ± 0.26	10.88 ± 0.25	-0.29 ± 0.37	0.429
35	10.88 ± 0.28	10.86 ± 0.16	-0.03 ± 0.37	0.941
36	8.85 ± 0.14	8.96 ± 0.14	-0.11 ± 0.2	0.577
37	12.12 ± 0.15	11.83 ± 0.16	0.29 ± 0.25	0.262
41	8.83 ± 0.14	8.96 ± 0.14	-0.13 ± 0.2	0.503
42	9.15 ± 0.15	9.32 ± 0.15	-0.17 ± 0.21	0.408
43	10.85 ± 0.25	11.23 ± 0.19	-0.38 ± 0.33	0.250
44	10.54 ± 0.2	10.74 ± 0.28	-0.19 ± 0.34	0.566
45	10.94 ± 0.24	10.9 ± 0.34	0.04 ± 0.41	0.923
46	8.85 ± 0.14	8.94 ± 0.14	-0.09 ± 0.2	0.655
47	12.03 ± 0.12	11.86 ± 0.16	0.18 ± 0.21	0.419

MIH – molar incisor hypomineralization

the children without mineralization disorders ($p > 0.05$; Table 2). Regarding the mean age of the dental eruptions, the sex-matched comparison revealed no statistically significant difference between the study and control groups ($p > 0.05$; Tables 3 and 4).

The data from these comparisons showed that the patients with MIH in the study group had a lower mean age of dental eruption than those in the control group. The statistically insignificant difference was $p > 0.05$.

DISCUSSION

It is important for dentists to understand the timing of the clinical eruptions of permanent teeth because children's dental development is a progressive and changing process that can be affected by a variety of factors [9, 10]. During mixed dentition, permanent tooth eruption occurs in chronological order, thereby providing an occlusal connection. A delayed, accelerated, or modified eruption sequence could be associated with malocclusions [4]. Potential deviations in the sequence or timing of the eruption may be related to complications, such as malocclusion, crowding, impaired oral hygiene, and periodontal diseases that require dental and orthodontic treatments [4, 11]. An understanding of the normal eruption process and the possible concomitant problems is important for the diagnosis and treatment plans for eruption disorders. The dental eruption is a process that can be affected by multiple factors; thus, deviations in the timing of eruption could indicate underlying local disorders or systemic diseases. Dentists should therefore consider the timing of eruption when designing dental treatment plans for children [9]. Knowledge about dental eruption is also important for determining children's growth and developmental levels. Dentists often use this information in the treatment of and surgical interventions in orthodontic patients. This information can also be used in forensic dentistry to predict a child's chronological age [12].

The close relationships among the components of dental germ development during odontogenesis have been highlighted [4]. The disorders that might occur during amelogenesis could affect dental development by causing developmental disorders or abnormalities in the various components of the developing teeth. For example, regional odontodysplasia is a rarely seen non-hereditary developmental anomaly that affects the dental ectodermal and

mesodermal layers. The shapes of the affected teeth are usually atypical, and the structures are hypoplastic and hypocalcified. In addition, the teeth could exhibit delayed eruption or impaction. It was reported that the eruption disorders observed in such patients could be the result of structural dental anomalies [13]. It is therefore conceivable that a disorder occurring during enamel formation, which is a part of dental development, could cause variations in the eruption times of children with MIH. In addition, the teeth affected by MIH are generally very sensitive and may undergo rapid enamel loss. In some cases, tooth extraction might be a preferred treatment option [14, 15]. Because of the clinical and pathological effects of MIH, the precise prediction of dental development and eruption is very important for the design of an appropriate treatment plan.

In the evaluation of an eruption, the visibility of any part of the dental crown in the oral mucosa is often used as a clinical marker for eruption [16]. In most clinical evaluations, tooth eruption is indicated if one of the tubercules or the incisal edge is visible on the oral mucosa [17, 18, 19]. A study by Moslemi et al. [19] in Iran in 2013 compared the timing of permanent tooth eruption in a patient group comprising 207 individuals, 96 males and 111 females aged 6–19 years, with cerebral palsy to that in an age- and sex-matched healthy control group. If the clinical examination revealed that any part of the crown was visible in the mouth, tooth eruption was assumed to have occurred. In 2017, Dashash and Al-Jazar [17] investigated the timing of permanent tooth eruption in 1211 children aged 5–13 years in Syria. In accordance with the criteria established by Pahkala et al. [8], they evaluated the eruption of permanent teeth in four stages. Tooth eruption was assumed to have occurred if any part of the tooth was visible on the oral mucosa. In Uganda in 2013, Kutesa et al. [20] investigated the correlation between the timing of permanent tooth eruption and children's heights and weights. The clinical examination of permanent tooth eruptions was performed, and the intraoral eruption stage of each permanent tooth was evaluated in accordance with the four codes established by the criteria of Pahkala et al. [8]. If any part of the dental crown was visible on the intraoral mucosa, tooth eruption was assumed to have occurred.

In the present study, the intraoral status of the teeth was evaluated on the basis of the criteria of Pahkala et al. [8]. The comparison of the eruption times of the permanent teeth of the children with MIH and the children who were healthy was performed on the basis of the aforementioned evaluation. There was no statistically significant difference in the MIH and healthy control groups regarding the mean age of the eruption of all teeth. However, most of the teeth of the patients with MIH were found to have erupted earlier than those of the control group. Tunç et al. [21] compared the development of the permanent teeth of 105 children aged 7–11 years with a diagnosis of severe MIH to that of an age- and sex-matched healthy control group. Dental development was evaluated through panoramic radiographs in accordance with the dental age estimation method of Demirjian et al. [22]. As was found in the present study, there was no statistically significant difference in dental development between the MIH group and the sex-matched healthy control group. The absence of a difference in dental development in the patients with MIH suggests that there may not be a difference in the eruption status. Thus, the present study supports previous findings. As is the case in the present study, Tunç et al. [21] did not find a statistically significant difference between the groups; however, they reported a trend of accelerated dental development in the males and females in the MIH group.

Seow [23] evaluated the correlation between AI, a developmental anomaly associated with eruption disorders, and permanent tooth development. The study comprised 23 patients (10 males and 13 females under the age of 16 years) diagnosed with AI and a control group of healthy age- and sex-matched individuals. The study reported that the AI cases exhibited faster dental development than the healthy individuals. The mean increase in the duration of dental development was approximately one year. Similar results were obtained for all the affected patients regardless of the type of AI. Vuorimies et al. [24] compared the timing of permanent tooth eruption in children diagnosed with osteogenesis imperfecta (OI), a disease associated with mineralization disorders, with that in the age- and sex-matched healthy control group. The patients with OI had a greater number of erupted teeth, faster eruption of the permanent teeth, and a more advanced dental age than the healthy controls. This was especially the case for the patients with OI type 1, which occurs concurrently with dentinogenesis imperfecta. Another study that evaluated the incidence of craniofacial and dental anomalies in children with OI reported a delay in the dental development of 21 percent of patients with OI type 3; however, 23 percent of patients with OI type 4 exhibited faster dental development [25].

In the present study, the trend in favor of an earlier eruption in children with MIH, albeit not statistically significant, can be attributed to the effects of the irregularity in enamel formation during the dental development process. A factor affecting the maturation phase of the enamel has been considered to be involved in the formation of MIH [15]. The enamel maturation stage is a slow progression throughout two-thirds of the entire enamel formation period [26]. An irregularity at this stage could affect dental development and thus eruption time. There was no statistically significant difference between the eruption times of the MIH and control groups. In addition, a comparative analysis of the results could not be performed because the literature review did not reveal any studies that had evaluated the eruption times of patients with MIH.

In most evaluations of eruption times, permanent tooth eruption was found to occur earlier in females than in males [8, 27]. Moslemi [18], who investigated the timing of permanent tooth eruption in 3744 children aged 4–15 years, found that the mean age of eruption was lower in females than in males. In Lithuania, Almonaitiene et al. [28] examined the timing of permanent tooth eruption in 3596 children aged 4–16 years. Eruption was found to have occurred significantly earlier in females than in males. The range was 1–10 months depending on the type of tooth. A similar study concluded that permanent tooth eruption

occurred earlier in females than in males. The eruption times ranged 4–6 months depending on the type of tooth [16]. A study of 1491 children (773 females and 718 males aged 5–15 years) by Bayrak et al. [29] in Turkey reported that the permanent teeth of females tended to erupt earlier than those of males. The reason has not yet been elucidated. However, the sex-related differences in the physical developmental stages and the earlier physical development and maturation of females are thought to contribute to the earlier occurrence of permanent dentition in females [30].

Given these differences, a sex-matched evaluation of the groups was performed. This obviated the confounding factor of sex in the comparisons of the timing of permanent tooth eruption in the MIH and healthy patients. The results for the two sex-matched groups were not statistically significant. The mean age of the eruption of a majority of the teeth was lower in the MIH group.

CONCLUSION

MIH, an important clinical problem with a recently increased incidence, is an issue that concerns not only dentists but all healthcare professionals. Because of the rapid and severe destruction of teeth affected by MIH, the treatment approach should be multidisciplinary. An accurate understanding of dental development and eruption times is important for predicting possible anomalies and applying appropriate treatment. In addition, eruption time in children is an important issue for both forensic medicine and medical doctors who follow the general health of the child. The review of the literature indicated a lack of studies on the clinical importance of MIH, which is currently a common disease, the eruption process, which is the most important part of dental development, and the time of the eruption in patients with MIH. Therefore, there is a need for further large-scale studies to evaluate the eruption times of various types of populations.

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REFERENCES

1. Garot E, Rouas P, Somani C, Taylor GD, Wong F, Lygidakis NA. An update of the aetiological factors involved in molar incisor hypomineralisation (MIH): a systematic review and meta-analysis. Eur Arch Paediatr Dent. 2022;23(1):23–38. [DOI: 10.1007/s40368-021-00646-x] [PMID: 34164793]
2. Velan E, Sheller B. Oral health in children with chronic kidney disease. Pediatr Nephrol. 2021;36(10):3067–75. [DOI: 10.1007/s00467-020-04913-9] [PMID: 33528633]
3. Hirst L, Abou-Ameira G, Critchlow S. Hypophosphataemic Rickets Secondary to Raine Syndrome: A Review of the Literature and Case Reports of Three Paediatric Patients' Dental Management. Case Rep Pediatr. 2021;2021:6637180. [DOI: 10.1155/2021/6637180] [PMID: 33505751]
4. Bastos VC, Gomez RS, Gomes CC. Revisiting the human dental follicle: From tooth development to its association with unerupted or impacted teeth and pathological changes. Dev Dyn. 2022;251(3):408–23. [DOI: 10.1002/dvdy.406] [PMID: 34324745]
5. Ghanim A, Elfrink M, Weerheijm K, Mariño R, Manton D. A practical method for use in epidemiological studies on enamel hypomineralization. Eur Arch Paediatr Dent. 2015;16(3):235–46. [DOI: 10.1007/s40368-015-0178-8] [PMID: 25916282]
6. Lygidakis NA, Garot E, Somani C. Taylor GD, Rouas P, Wong FSL. Best clinical practice guidance for clinicians dealing with children presenting with molar-incisor-hypomineralization (MIH): an updated European Academy of Paediatric Dentistry policy document. Eur Arch Paediatr Dent. 2022;23(1):3–21. [DOI: 10.1007/s40368-021-00668-5] [PMID: 34669177]
7. Hočevar L, Mandinić Z, Mandić J, Pavlič A. Developmental hypomineralization of the enamel of the first permanent and the second deciduous molars – report of two cases. Srp Arh Celok Lek. 2021;149(5–6):370–4. [DOI: 10.2298/SARH200206017H]
8. Pahkala R, Pahkala A, Laine T. Eruption pattern of permanent teeth in a rural community in northeastern Finland. Acta Odontolog Scand. 1991;49(6):341–9. [DOI: 10.3109/00016359109005930] [PMID: 1776401]
9. Bernardi S, Angelone AM, Macchiarelli G. Anatomy in dentistry: From the beginnings to contemporary reality. Clin Anat. 2022;35(6):711–22. [DOI: 10.1002/ca.23869] [PMID: 35368109]
10. Hazar Bodrumlu E, Avşar A. Molar incisor hypomineralization in children with systemic diseases. Srp Arh Celok Lek. 2019; 147(1–2):17–22. [DOI: 10.2298/SARH180118036B]
11. Fekonja A. Evaluation of the eruption of permanent teeth and their association with malocclusion. Clin Exp Dent Res. 2022;8(4):836–42. [DOI: 10.1002/cre2.544] [PMID: 35157778]
12. Kaul B, Vaid V, Gupta S, Kaul S. Forensic Odontological Parameters as Biometric Tool: A Review. Int J Clin Pediatr Dent. 2021;(3):416–9. [DOI: 10.1016/j.ajodo.2017.08.015] [PMID: 29602343]
13. Roulias P, Kalantzis N, Doukaki D, Pachiou A, Karamesinis K, Damanakis G, et al.Teeth Eruption Disorders: A Critical Review. Children (Basel). 2022;9(6):771. [DOI: 10.3390/children9060771] [PMID: 35740708]
14. Somani C, Taylor GD, Garot E, Rouas P, Lygidakis NA, Wong FSL . An update of treatment modalities in children and adolescents with teeth affected by molar incisor hypomineralization (MIH): a systematic review. Eur Arch Paediatr Dent. 2022;23(1):39–64. [DOI: 10.1007/s40368-021-00635-0] [PMID: 34110615]
15. Somani C, Taylor GD, Garot E, Rouas P, Lygidakis NA, Wong FSL. An update of treatment modalities in children and adolescents with teeth affected by molar incisor hypomineralisation (MIH): a systematic review. Eur Arch Paediatr Dent. 2022;23(1):39–64. [DOI: 10.1007/s40368-021-00635-0] [PMID: 34110615]
16. Kurosaka H, Itoh S, Morita C, Tsujimoto T, Murata Y, Inubushi T, et al. Development of dentition: From initiation to occlusion and related diseases. J Oral Biosci. 2022;64(2):159–64. [DOI: 10.1016/j.job.2022.02.005] [PMID: 35231627]
17. Dashash M, Al-Jazar N. Timing and sequence of emergence of permanent teeth in Syrian schoolchildren J Investig Clin Dent. 2018;9(2):e12311. [DOI: 10.1111/jicd.12311] [PMID: 29214733]
18. Moslemi M. An epidemiological survey of the time and sequence of eruption of permanent teeth in 4–15-year-olds in Tehran, Iran. Int J Paediatr Dent. 2004;14(6):432–8. [DOI: 10.1111/j.1365-263X.2004.00586.x] [PMID: 15525312]
19. Moslemi M, Vejdani J, Sadrabad ZK, Shadkar MM. A study on the eruption timing of permanent dentition in patients with cerebral palsy. Spec Care Dentist. 2013;33(6):275–9. [DOI: 10.1111/j.1754-4505.2012.00304.x] [PMID: 24164225]
20. Kutesa A, Nkamba EM, Muwazi L, Buwembo W, Rwenyonyi CM. Weight, height and eruption times of permanent teeth of children aged 4–15 years in Kampala, Uganda. BMC Oral Health. 2013;13(15):2–8. [DOI: 10.1186/1472-6831-13-15] [PMID: 23497340]
21. Tunç ES, Ulusoy AT, Bayrak S, Cankaya S. Dental development in children with severe molar-incisor hypomineralization in Samsun,

Turkey. J Oral Sci. 2013;55(3):203–7. [DOI: 10.2334/josnusd.55.203] [PMID: 24042586]
22. Demirjian A, Goldstein H, Tanner JM. A new system of dental age assessment. Hum Biol. 1973;45(2):211–27. [PMID: 4714564]
23. Seow WK. Dental development in amelogenesis imperfecta: a controlled study. Pediatr Dent. 1995;17(1):26–30. [PMID: 7899098]
24. Vuorimies I, Arponen H, Valta H, Tiesalo O, Ekholm M, Ranta H, et al. Timing of dental development in osteogenesis imperfecta patients with and without bisphosphonate treatment. Bone. 2017;94:29–33. [DOI: 10.1016/j.bone.2016.10.004] [PMID: 27725317]
25. O'Connell AC, Marini JC. Evaluation of oral problems in an osteogenesis imperfecta population. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1999;87(2):189–96. [DOI: 10.1016/s1079-2104(99)70272-6] [PMID: 10052375]
26. Zalite V, Lungevics J, Vecstaudza J, Stipniece L, Locs J. Nanosized calcium deficient hydroxyapatites for tooth enamel protection. J Biomed Mater Res B Appl Biomater. 2022;110(6):1354–67. [DOI: 10.1002/jbm.b.35005] [PMID: 34965008]
27. Yamunadevi A, Pratibha R, Rajmohan M, Mahendraperumal S, Ganapathy N, Srivandhana R. First Molars in Permanent Dentition and their Malformations in Various Pathologies: A Review. J Pharm Bioallied Sci. 2021;13(1):23–30. [DOI: 10.4103/jpbs.JPBS_744_20] [PMID: 34447037]
28. Almonaitiene R, Balciuniene I, Tutkuviene J. Standards for permanent teeth emergence time and sequence in Lithuanian children, residents of Vilnius city. Stomatologija. 2012;14(3):93–100. [PMID: 23128492]
29. Bayrak S, Sen Tunc E, Tuloglu N, Açıkgöz A. Timing of permanent teeth eruption in Turkish children. J Clin Pediatr Dent. 2012;37(2):207–11. [DOI: 10.17796/jcpd.37.2.8v072017534j0191] [PMID: 23534332]
30. Mohamedhussein N, Busuttil-Naudi A, Mohammed H, UlHaq A. Association of obesity with the eruption of first and second permanent molars in children: a systematic review. Eur Arch Paediatr Dent. 2020;21(1):13–23. [DOI: 10.1007/s40368-019-00452-6] [PMID: 31144286]

Време ницања сталних зуба код деце са моларно-инцизивном хипоминерализацијом

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САЖЕТАК

Увод/Циљ Моларно-инцизивна хипоминерализација (МИХ) развојни је дефект глеђи са мултифакторијалном етиологијом, а код деце са овим стањем могу постојати разлике у времену ницања зуба.

Циљ овог истраживања био је да се упореди клинички статус времена ницања сталних зуба код деце са МИХ-ом у односу на децу без МИХ-а.

Методе Студијску групу чинило је укупно 300 деце (176 девојчица и 124 дечака узраста 6–12 година) којима је дијагностикован МИХ, али нису имали системску болест. Контролну групу чинило је 300 здраве деце подударне старости и пола. У студијској и контролној групи процењено је и упоређено време ницања сталних зуба (искључујући треће моларе), посебно за девојчице и дечаке. За статистичку анализу коришћен је *t*-тест независних узорака.

Резултати Није утврђена статистички значајна разлика између средње вредности времена ницања зуба код деце са МИХ-ом и деце без поремећаја минерализације ($p > 0,05$). Поређењем по полу, није откривена статистички значајна разлика у средњој вредности времена ницања зуба између испитиване и контролне групе ($p > 0,05$).

Закључак Иако није установљена статистички значајна разлика у средњој вредности у времену ницања сталних зуба код деце са МИХ-ом и контролне групе, приметан је бржи тренд развоја зуба код деце са МИХ-ом.

Кључне речи: ерупција зуба; моларно-инцизивна хипоминерализација; развојни дефект глеђи