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ORIGINAL RESEARCH

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Retrospective evaluation of upper mesiodentes by using 3D cone beam computed tomography scans: a cross-sectional study

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Abstract

Background: Mesiodentes are supernumerary teeth diagnosed around the midline, posing a challenge for clinicians. The aim of this study was to investigate the frequency and radiological characteristics of mesiodentes in the anterior maxilla in a group of Turkish children between the ages of 4 and 15 by employing cone beam computed tomography (CBCT). **Methods**: This retrospective study evaluated 207 CBCT images from patients aged 4–15. Mesiodens positions, tooth morphology (using anatomical landmarks, neighboring teeth, orientation), and complications with adjacent teeth (including eruption anomalies, rotation, and diastema) were recorded. Data were analyzed using the Chi-square and Mann-Whitney U tests at a 5% significance level. **Results**: Among 207 patients, 45 (21.7%) were found to have mesiodentes, with a total of 58 mesiodentes detected in these individuals. A statistically significant difference was noted between sexes in the prevalence of mesiodentes (36 males versus 9 females; p = 0.0095). The likelihood of mesiodens increased with the number of male patients (Odds Ratio = 2.97; 95% Confidence Interval: 0.26–6.57). There was no significant difference in age distribution between cases with and without mesiodens (p = 0.200). The majority of mesiodentes (63.8%) were located in close proximity to the incisive canal, and most were associated with the right and left upper permanent central incisors (44.8% and 51.7%, respectively). Nearly half of the mesiodentes exhibited a conical morphology (48.3%). Additionally, 20.7% of mesiodentes presented without complications, whereas 31.0% demonstrated eruption anomalies. A combination of eruption anomalies and rotations was identified in 13.8% of cases, while eruption anomalies combined with hyperplastic follicles and cysts were observed in 10.3%. **Conclusions**: This retrospective study found that mesiodens teeth are often linked to nearby anatomical structures and adjacent teeth, can lead to complications, and occur more frequently in males. Larger studies are necessary to confirm these findings.

Keywords

Cone beam computed tomography; Dental anomalies; Mesiodens; Supernumerary teeth

1. Background

Supernumerary teeth are a dental anomaly in which a person has more than the number of teeth both in primary and/or permanent dentition. In other words, it can be defined as the presence of more than the normal number of teeth or odontogenic structures on the upper and/or lower dental arches [1–6]. Supernumerary teeth may remain impacted in any region of the maxilla/mandible or may have partially or totally erupted into the oral cavity [4–7]. Although there is no definitive explanation for the etiology of supernumerary teeth, various theories have been proposed, including dichotomy of tooth bud, hyperactivity of the dental lamina, and a combination of genetic and environmental factors [8–10]. Also, there were previous studies stating that increased Wingless-related integration site (WNT)/β-catenin and Sonic Hedgehog (SHH) signaling and various syndromes are associated with the formation of supernumerary teeth [10–12].

Mesiodentes are generally defined as supernumerary teeth located between the maxillary central incisors [1, 2]. The presence of a mesiodens is likely to cause various complications such as over-retained primary teeth, delayed eruption, or eruption anomalies of permanent incisors in the anterior maxilla, pathological root resorption of the adjacent permanent teeth, or cystic degeneration of the mesiodens [13–15]. Therefore, early diagnosis of a mesiodens is very essential to prevent irreversible damage to the anterior maxillary region. However, it is very difficult to make a decision on the appropriate timing

for extraction of the mesiodens. On the other hand, there is no consensus on the optimal age or timing for surgical removal of mesiodentes [13, 16]. There were previous studies indicating that early extraction has various advantages over late extraction [17]. However, early extraction may not be the correct decision for a mesiodens that is centrally located, normally impacted, conical is shape, has a high probability of eruption, and is situated above the apex of the adjacent tooth. One of the most important problems with surgical removal of the mesiodens at an early age is the possible noncooperation of the patient [17–20]. In this case, surgical extraction under general anesthesia would be necessary, or the patient would need to be followed up until a later period. Another negativity is the risk of damage to the adjacent developing permanent incisors and their roots by surgical extraction of the mesiodens [17–22]. The American Academy of Pediatric Dentistry recommends postponing the extraction of the mesiodens to avoid irreversible surgical trauma to the root apex of the developing adjacent incisors until at least two-thirds of the root of the adjacent incisors has developed. Therefore, since not every age may be suitable for the surgical extraction of diagnosed mesiodentes, detailed follow-up of these teeth using appropriate imaging methods is very important to prevent further complications [15–22].

Radiological examination plays an important role in the diagnosis and treatment planning of mesiodens. Cone Beam Computed Tomography (CBCT) is used as an effective diagnostic tool for the evaluation of mesiodens [23]. It can provide important data about the position, eruption direction, morphology, condition of adjacent teeth, and the anatomical structures regarding the mesiodens. CBCT is also a useful tool for planning surgical operations after mesiodens diagnosis [24]. Since different surgical approaches have advantages, disadvantages, and applicability conditions, preoperative CBCT examination is recommended for an appropriate surgeon approach according to the characteristics of the mesiodens [25, 26].

CBCT provides the closest data to reality in a 3 dimensional (3D) environment; consequently, this study aimed to investigate the frequency of mesiodentes in the anterior maxilla in a group of Turkish children between the ages of 4 and 15 and to analyze factors such as age, sex, eruption status and direction, tooth shape, and associated complications by using 3-dimensional CBCT.

2. Methods

2.1 Study design, guidelines, and checklists

This retrospective study has a cross-sectional observational research design. Therefore, the current study was conducted in accordance with the STROBE (strengthening the reporting of observational studies in epidemiology—for cross-sectional studies) guidelines and checklists [27].

2.2 Sample size analysis

The required sample size was calculated by a priori power analysis using G*Power 3.1.9.7 (Buchner, Erdfelder, Faul, and Lang, Heinrich-Heine-University Düsseldorf, Düsseldorf, NRW, Germany) software. As a result of the analysis based on small effect size (Cohen's $d = 0.2$), 5% significance level ($\alpha = 0.05$), and 80% power ($1 - \beta = 0.80$) for one sample t-test, it was determined that a minimum of 199 CBCT scans should be included in the study.

2.3 Data collection

In this retrospective study, CBCT images of pediatric patients (ages 15 and under) who applied to the department of Oral and Maxillofacial Radiology of Ankara University Faculty of Dentistry between 2017 and 2023 for different reasons, such as impacted and supernumerary teeth or preoperative evaluation, were examined. Images in which the maxilla entered the imaging field and were of appropriate diagnostic quality were included in the study. CBCT scans were taken with a Promax 3D Max (CBCT scanner, Planmeca, Helsinki, Finland) CBCT device. Images were evaluated in a dimly lit room on a 15-inch Toshiba Qosmio (LCD monitor, Toshiba, Tokyo, Japan) set to 1920×1080 screen resolution and 32-bit color depth.

Two observers (dentomaxillofacial radiologists) examined the frontal, sagittal, axial, and cross-sectional CBCT scans. The initial 20 cases and scans were evaluated by two examiners and the examiners calibrated with each other. Afterwards, the inter-examiner reliability was determined as 0.9 (good reliability) and from then on, each examiner evaluated the scans on their own examination. 207 CBCT images taken from patients aged between 4 and 15 were included in the study. Insufficient view of the anterior maxilla and nasal cavity floor; low quality scans; history of trauma, tooth extraction and surgery in the anterior maxilla; cleft lip/palate and syndromic diseases were excluded from the study.

2.4 Evaluation of the findings

Findings regarding age, sex, number of supernumerary and mesiodens teeth, proximity to anatomical structures, shape of mesiodens, location characteristics, and associated complications were recorded. While evaluating the proximity to anatomical structures, the distances to the incisive canal and nasal cavity were examined as anatomical landmarks. Mesiodens shapes were classified into four groups: incisor round, conical, and tuberculate. In the evaluation of localization characteristics, the adjacent teeth were noted, and the direction of the mesiodens (horizontal, inverted, normal, and inclined) was also evaluated. In addition, the findings were evaluated in terms of complications due to the presence of mesiodens. Complications of adjacent permanent central incisors were classified as causing eruption anomalies (outside dental arch position), rotation, dilaceration, and diastema. Additionally, hyperplastic follicles and cysts were considered complications in the adjacent area of mesiodentes.

The positions of the mesiodens were evaluated separately in the frontal, sagittal, and axial planes. The mesiodens classification was made according to the mesiodens classification determined by Goksel *et al.* [28] in their study where they investigated the positions of the mesiodentes in three-dimensional planes using CBCT scans.

- The mesiodistal positions of the mesiodentes in the frontal plane were classified as Type A (straight long axis and no slope), Type B (crown in the midline, root in the distal), and

Type C (root in the midline, crown in the distal) (Fig. 1A).

- Superioinferior positions of the mesiodentes in the sagittal plane, displayed in Fig. 1B, are classified as Type I (fully erupted), Type II (partially erupted), Type III (impacted and in contact with the central incisor), Type IV (impacted and not in contact with the central incisor), Type V (in contact with the nasal cavity), and Type VI (in contact with the nasal septum).

- Anteroposterior positions of mesiodentes in the axial plane, displayed in Fig. 1C, are classified as Type a (from the labial to the dental arch), Type b (in the direction of the dental arch), Type c (in front of the nasopalatine canal, in contact with the nasopalatine canal), Type d (behind the nasopalatine duct and touching the nasopalatine duct), and Type e (behind the nasopalatine duct and not contacting the nasopalatine duct).

2.5 Data analysis

The data obtained in the current study were analyzed using SPSS 22 package software (IBM Corporation, Armonk, NY, USA). Odds ratio was used as a measure of risk of the outcome (complications). The relationship between categorical data was examined with chi-square analysis. Statistical comparisons regarding the age distribution of the cases with and without mesiodens were analyzed with the Mann-Whitney U test. The statistical significance level was taken as 5%.

3. Results

A total of 45 (21.7%) patients out of 207 had mesiodentes. The Frequency of mesiodens teeth was higher in males (27.9% of the total) than in females (11.5% of the total). When cases with mesiodens were evaluated within themselves, 80% of the cases with mesiodens were male and 20% were female. A statistically significant difference was observed between the sexes and the presence of mesiodens (p = 0.0095) (Table 1, Figs. 2,3,4,5). Logistic regression analysis revealed that male sex was associated with higher odds of having mesiodens (Odds Ratio (OR) = 2.97; 95% Confidence Interval (CI): 0.26–6.57), although this result was not statistically significant. Also, a total of 58 mesiodentes were detected in 45 patients. While 13 patients (28.9%) had two mesiodentes, 32 patients (71.1%) displayed evidence of one mesioden.

The ages of the patients diagnosed with mesiodens ranged from 9 to 15 years old, and the mean age was 12.42 years (Table 2). There was no significant difference in age distribution between cases with and without mesiodens (p = 0.200) (Table 2).

Characteristics of the mesiodentes were based on the number of teeth. Most of the mesiodens (63.8%) were in close contact with the incisive canal, while the majority were closely associated with the right and left upper permanent central incisors (44.8% and 51.7%, respectively). Additionally, nearly half of the mesiodens diagnosed in this study were conical in shape (48.3%). In terms of orientation, almost half of the mesiodentes were in normal position (44.8%), 22.4% were inverted, and 22.4% were inclined (Table 3).

The classification of mesiodens according to their location was analyzed based on the number of teeth. Additionally, for each classification type, the number of teeth belonging to male and female patients was indicated. According to the classification in the frontal plane, Type A had the highest incidence rate (65.5%). According to the axial classification, Type C, which is in front of the nasopalatine duct and associated with the duct, had the highest incidence rate (58.6%). In the sagittal plane, the highest incidence rate was found to be Type III (70.7%) (Table 4).

In the current study, mesiodentes were also evaluated for their associated complications. Complications were analyzed based on the number of teeth. Additionally, for each complication, it was indicated how many of the teeth with complications belonged to male patients and how many belonged to female patients. While 20.7% of the diagnosed mesiodentes had no complications, 31.0% had eruption anomalies. In 13.8% of the mesiodentes, eruption anomalies and rotations were combined

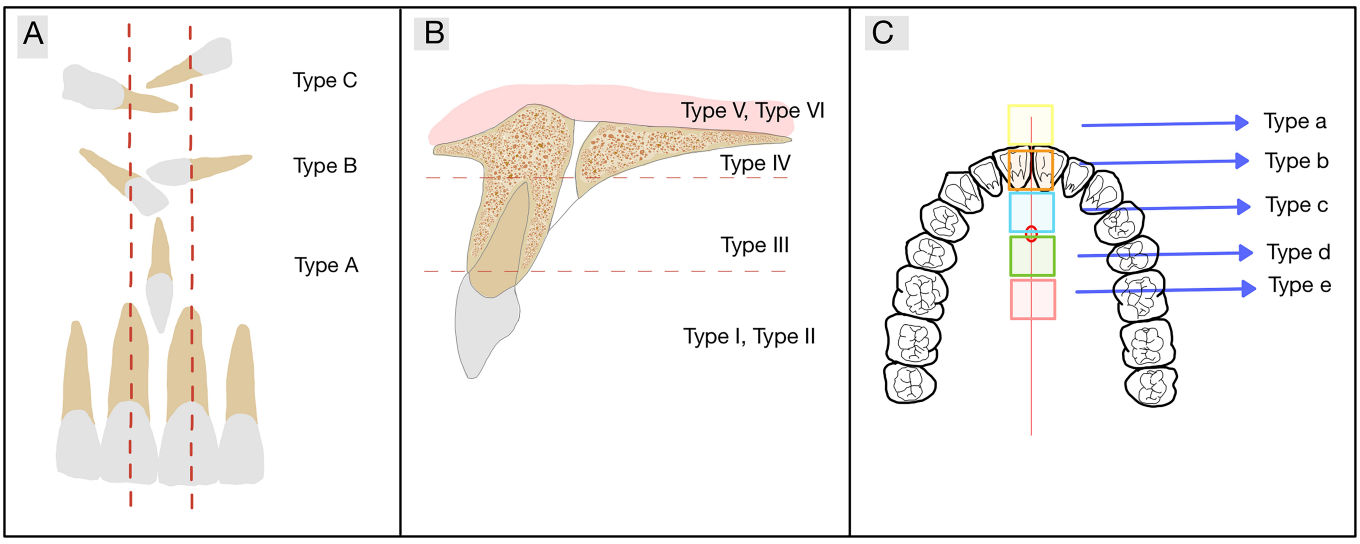

FIGURE 1. Schematization of the mesiodens classification. (A) Illustration of the mesiodens classification in the frontal plane. (B) Illustration of the mesiodens classification in the sagittal plane. (C) Illustration of the mesiodens classification in the axial plane.

TABLE 1. Sex distribution of mesiodens.

	Groups						χ^2 test	
	Mesiodens (+)		Mesiodens (−)		Total			
	n	%	n	%	n	%	χ^2	*p*
Sexes								
Male	36	27.9	93	72.1	129	100		
Female	9	11.5	69	88.5	78	100	6.72	0.0095*
Total	45	21.7	162	78.3	207	100		

**Statistically significant at $p < 0.05$.*
χ^2: Chi-Square.

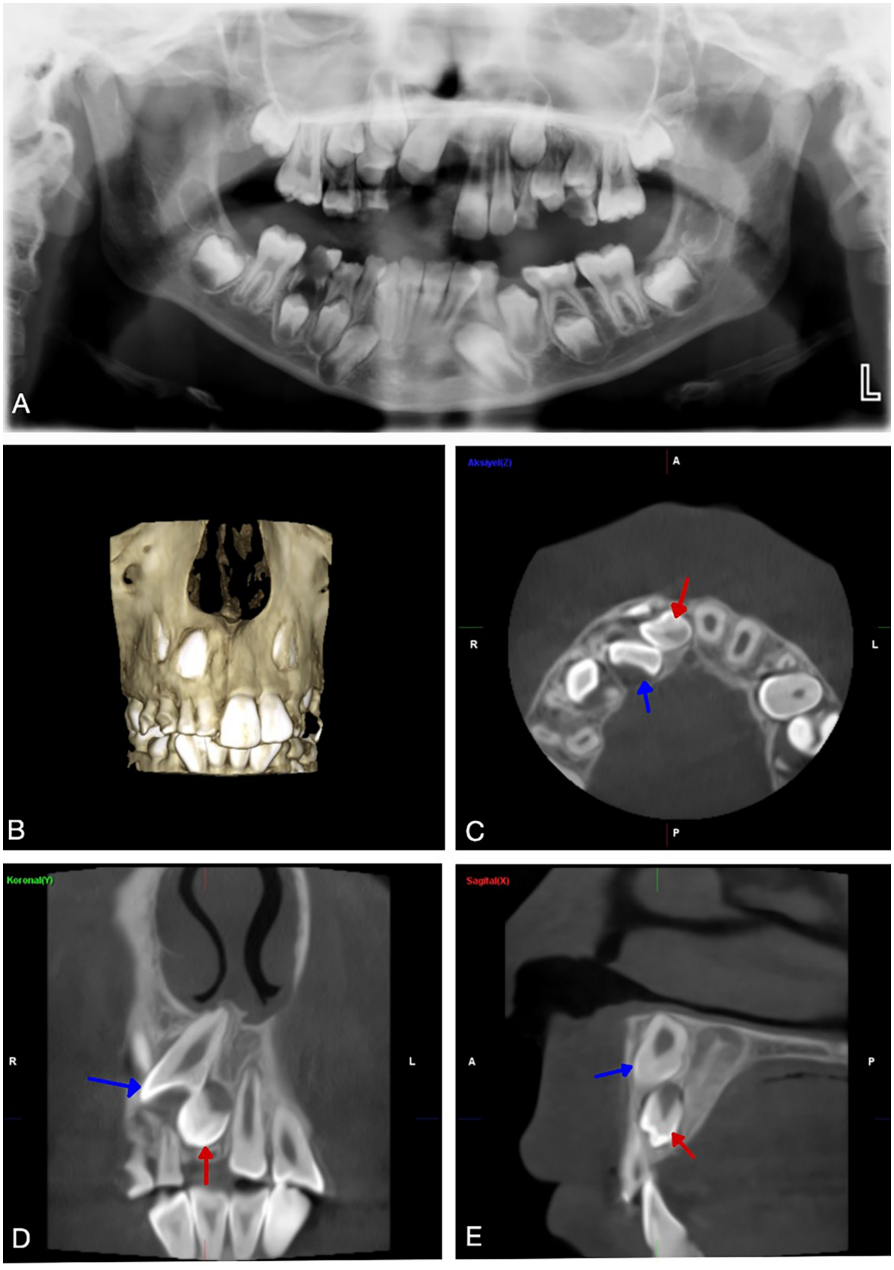

FIGURE 2. Radiographs of a sample case showing mesiodens causing eruption problems in permanent teeth. (A) Panoramic radiographic image. The position of the mesiodens could not be clearly observed. (B) 3D reconstruction image. (C) Axial CBCT image. Mesiodens was observed to the right of the midline. (D) Coronal CBCT image. (E) Sagittal CBCT image (blue arrows pointed to tooth #11, red arrows pointed to mesiodens).

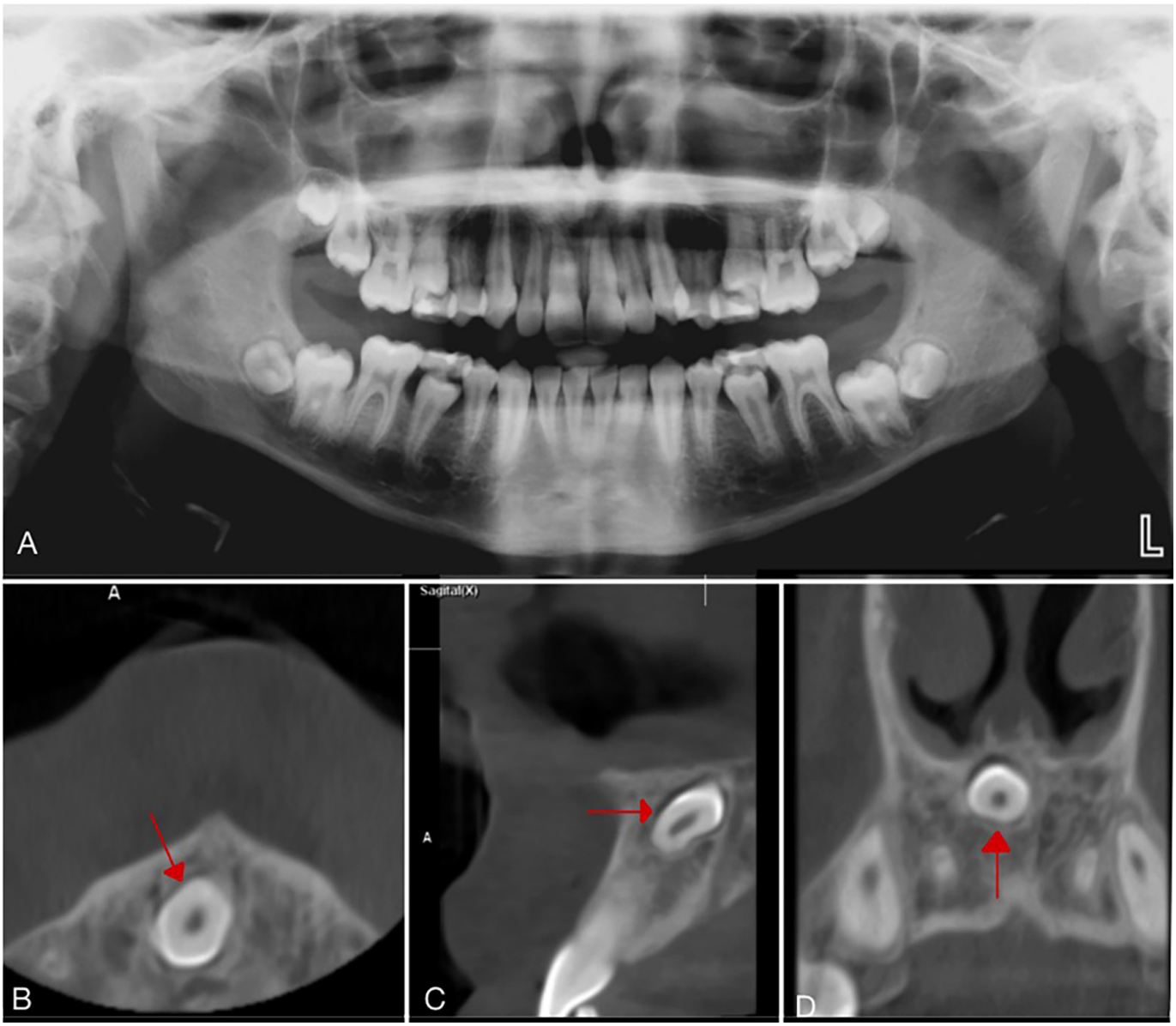

FIGURE 3. Radiographs of a sample case showing mesiodens without complications in permanent teeth. (A) Panoramic radiographic image. Mesiodens could not be observed clearly due to superposition of the hard palate. (B) Axial CBCT image. Mesiodens was observed in the midline inverted position. (C) Sagittal CBCT image. (D) Coronal CBCT image (red arrows pointed to mesiodens).

and detected, while eruption anomalies, hyperplastic follicles, and cysts were combined and detected in 10.3%. Additionally, eruption anomalies, rotation, hyperplastic follicles, and cysts were considered a combination in 3.4% of mesiodentes (Table 5).

There was no statistically significant difference between sexes in terms of complication rates (p = 0.077). Although not statistically significant, the complication rate was higher in males (89.1%) compared to females (10.9%). The odds of complications were 4.1 times higher in males than females (OR = 4.1; 95% CI: 0.9–18.7), though this result did not reach statistical significance (Table 6).

Regarding age groups, the complication rate was higher in the 11–15 age group (71.7%) compared to the 9–10 age group (28.3%). The p-value was close to the threshold for statistical significance (p = 0.051). The odds of complications were 1.36 times higher in the 11–15 age group (OR = 1.36; 95% CI: 1.1–1.6), and the confidence interval did not include 1, suggesting a potentially meaningful association despite the marginal p-value (Table 6).

4. Discussion

In the current study, mesiodentes were evaluated on the basis of sex, age, relation of mesiodens to anatomical landmarks and adjacent teeth, shape characteristics, location classifications, and various related complications. According to previous dentistry literature, sex has been reported as an important indicator for mesiodens cases. Previous data suggested that mesiodentes were likely to be observed more frequently in males than females. Kim *et al.* [19] reported that the diagnosis of mesiodens was 71.7% in males and 28.3% in females.

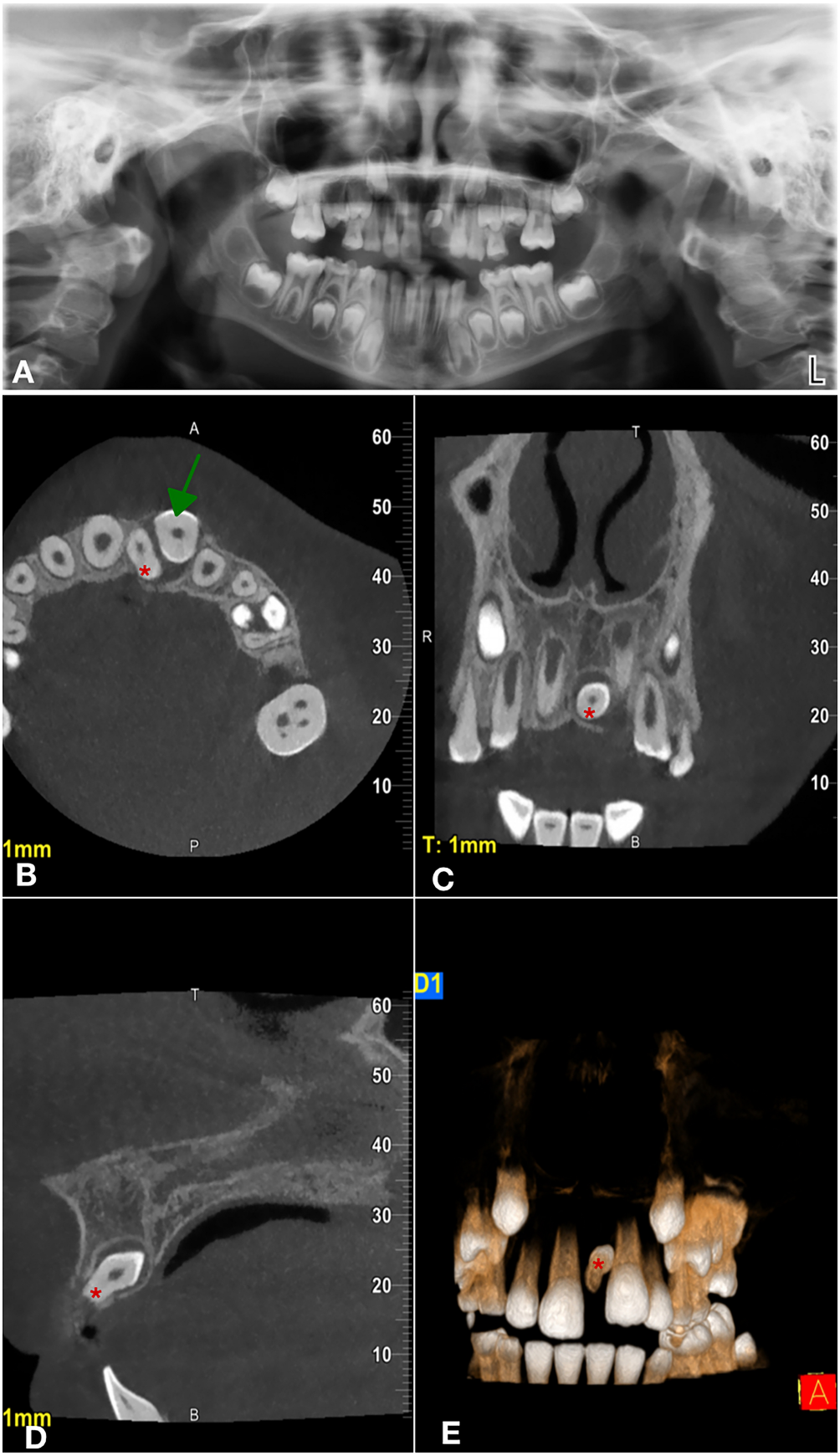

FIGURE 4. Radiographs of a sample case showing mesiodens causing complications in permanent teeth. (A) Panoramic radiographic image. Mesiodens was observed in the midline. (B) Axial CBCT image. Eruption problems and hyperplastic follicle were observed in tooth number #21. (C) Coronal CBCT image. (D) Sagittal CBCT image. Mesiodens was observed in the midline inverted position. (E) 3D reconstruction image (green arrows pointed to tooth #21, red stars pointed to mesiodens).

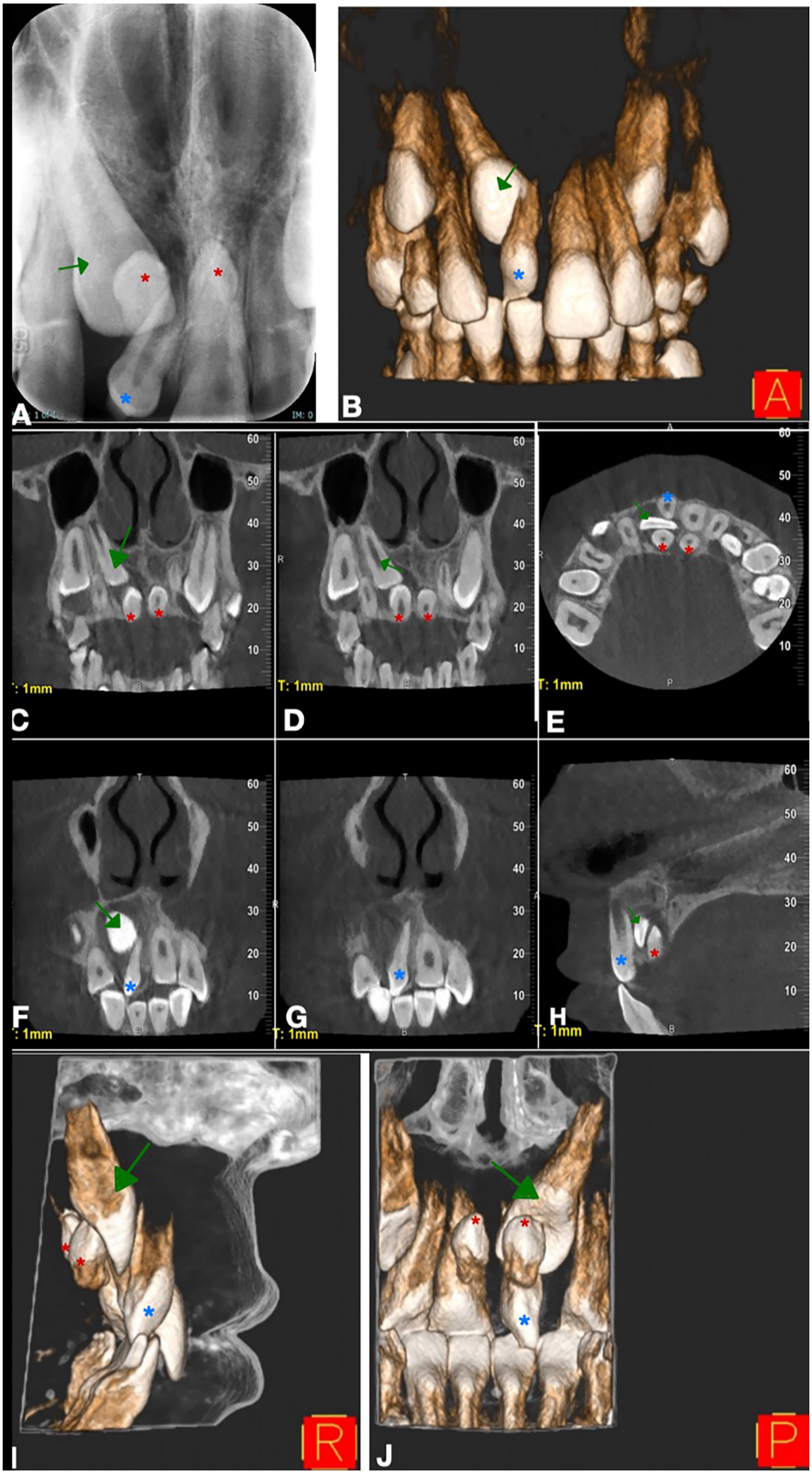

FIGURE 5. Radiographs of a sample case showing mesiodens causing complications (eruption problem, hyperplastic follicle) in permanent teeth. (A) Periapical radiographic image. The mesiodens in the buccal position (blue star) was clearly observed, but the mesiodens located in the palatal position (red stars) could not be clearly observed. (B) 3D reconstruction image. (C,D) Coronal CBCT image. (E) Axial CBCT image. A total of 3 mesiodens were observed, 1 (blue star) on the buccal and 2 (red stars) on the palatal of tooth number #11(green arrow). (F,G) Coronal CBCT image. (H) Sagittal CBCT image. (I) 3D reconstruction image (lateral). (J) 3D reconstruction image (posterior) (green arrows pointed to tooth #11, red and blue stars pointed at mesiodens).

TABLE 2. Age distribution of the cases with and without mesiodens.

Variables	Age distributions						Mann-Whitney U test		
	n	Mean	Median	Min.	Max.	SD	Mean Rank	U	*p*
Mesiodens (+)	45	12.42	13	9	15	2.20	94.06		
Mesiodens (−)	162	12.86	13	4	15	2.17	106.76	3197.5	0.200
Total	207	12.76	13	4	15	2.17	-		

Min.: Minimum; Max.: Maximum; SD: Standard Deviation.

TABLE 3. Relation of mesiodens to anatomical landmarks and adjacent teeth, shape characteristics.

Characteristics of the mesiodentes	Presence	
	n	%
Relation with the anatomical landmarks		
None	16	27.6
Incisive canal	37	63.8
Nazal cavity	2	3.4
Incisive canal and nasal cavity	3	5.2
Total	58	100.0
Shape of mesiodens		
Incisor-like	17	29.3
Round	3	5.2
Conical	28	48.3
Tuberculated	10	17.2
Total	58	100.0
Relation with the adjacent teeth		
#11	26	44.8
#12	1	1.7
#21	30	51.7
#22	1	1.7
#23	0	0.0
Total	58	100.0
Direction		
Horizontal	6	10.3
Inverted	13	22.4
Normal	26	44.8
Inclined	13	22.4
Total	58	100.0

TABLE 4. Classification of mesiodens according to their location.

Classifications	Presence	
	n	%
Frontal plane		
Type A	38 (M: 30, F: 8)	65.5
Type B	5 (M: 4, F: 1)	8.6
Type C	15 (M: 15, F: 0)	25.9
Total	58 (M: 49, F: 9)	100.0
Axial plane		
Type A	0	0.0
Type B	23 (M: 19, F: 4)	39.7
Type C	34 (M: 29, F: 5)	58.6
Type D	1 (M: 1, F: 0)	1.7
Type E	0	0.0
Total	58 (M: 49, F: 9)	100.0
Sagittal plane		
Type I	5 (M: 4, F: 1)	8.6
Type II	6 (M: 5, F: 1)	10.3
Type III	41 (M: 35, F: 6)	70.7
Type IV	3 (M: 2, F: 1)	5.2
Type V	3 (M: 3, F: 0)	5.2
Type VI	0	0.0
Total	58	100.0

n: number; M: male; F: female.

TABLE 5. Mesiodens and associated complications diagnosed.

	Presence	
	n	%
Associated Complications		
None	12 (M: 10, F: 2)	20.7
Diastema	3 (M: 2, F: 1)	5.2
Eruption anomalies	18 (M: 12, F: 6)	31.0
Rotation	3 (M: 3, F: 0)	5.2
Dilaceration	0	0.0
Eruption anomalies and rotation	8 (M: 7, F: 1)	13.8
Diastema and rotation	3 (M: 3, F: 0)	5.2
Eruption anomalies and hyperplastic follicles, cysts	6 (M: 5, F: 1)	10.3
Eruption anomalies and dilaceration	1 (M: 1, F: 0)	1.7
Diastema and hyperplastic follicles, cysts	1 (M: 1, F: 0)	1.7
Diastema and fusion	1 (M: 1, F: 0)	1.7
Eruption anomalies, rotation and hyperplastic follicles, cysts	2 (M: 2, F: 0)	3.4
External or internal root resorption	0	0.0
Total	58	100.0

n: number; M: male; F: female.

TABLE 6. Statistical comparisons and odds ratios for sexes and age groups regarding complications.

Variables	Complication (%)	*p*	OR	95% Confidence interval	
				Lower	Upper
Sex					
Male	89.1	0.077	4.1	0.9	18.7
Female	10.9				
Age (yr)					
9–10	28.3	0.051	1.36	1.1	1.6
11–15	71.7				

OR: Odds Ratio.

Similarly, Ersin *et al*. [29] emphasized that the mesiodens in males was three times higher than in females. In this study, 80.0% of the patients with mesiodens were male. Similar to the current study, Kolçakoğlu *et al*. [20] reported that mesiodens was diagnosed in 76.6% of males and Akay *et al*. [30] reported that it was detected in 74% of males in previous CBCT scans. Also, Itaya *et al*. [31] stated that 182 (75.2%) of 242 mesiodens diagnosed in their study were in males. However, in contrast, Colak *et al*. [32] stated that the prevalence of mesiodens was higher in females than in males. Mesiodens is more commonly diagnosed in males, as suggested by the additional data in the literature; additionally, there were also reports stating that mesiodens was more commonly diagnosed in females. The higher prevalence of mesiodens in males may be attributed to genetic predisposition, possibly involving autosomal dominant inheritance with incomplete penetrance, where not all gene carriers exhibit the trait. Additionally, hyperactivity of the dental lamina is thought to contribute by inducing the formation of extra tooth buds, leading to the development of supernumerary teeth [33, 34].

Patient age is an important parameter in the diagnosis of mesiodens, just like sex. Kim *et al*. [19] reported that the mean age of the cases was 6.8 years (82.52 ± 12.67 months) in their study, which included 293 Korean children diagnosed with mesiodens between the ages 4 and 10. The age factor has a very close relationship with the population included in the study methodology and the study design, and whether the study was conducted in a pediatric dental patient group is decisive in this regard. Indeed, the current study included previously obtained CBCT images of pediatric patients aged between 4 and 15 years, and the age of patients diagnosed with mesiodens ranged from 9 to 15 years (mean 12.42 years). Kolçakoğlu *et al*. [20] reported the mean age at diagnosis of mesiodens as 8.75 years in their retrospective study of CBCT images of patients aged 7–14 years. Although the ages at the time that mesiodentes were detected in this study were specified, these were the ages at the time that CBCT images were taken. This is an important limitation for the studies with this type of retrospective research design. Therefore, these ages should not be considered to be the onset age of mesiodens in these cases. However, pediatric dental patients in this age group generally undergo dental examinations regarding tooth eruption for the maxillary central incisors. Therefore, it is thought that the age of the onset and the diagnosis of mesiodens would be similar or correlated; however, it can be strongly emphasized that further and long-term prospective clinical studies addressing the correlation between the age of the diagnosis and the onset are needed.

Kazanci *et al*. [35], in a retrospective study of panoramic radiographs of 3351 pediatric dental patients examined, reported that 80% of the cases diagnosed with mesiodens had a single (one) mesiodens. Gündüz *et al*. [36] reported this rate as 76.8%, while Kim *et al*. [19] reported it as 69.2%. In the current study, 13 patients (28.9%) had two mesiodentes, 32 patients (71.1%) showed evidence of one mesiodense. In this context, the higher proportion of patients with a single mesiodense in the current study was consistent with previous studies in literature.

In the current study, the localizations of mesiodentes were evaluated in three different planes. Accordingly, the diagnosed mesiodentes were mostly localized in the area classified with Type A (straight long axis and no slope) in the frontal plane. Similarly, Goksel *et al*. [28] reported that 60% of the mesiodentes diagnosed on CBCT were localized in Type A. Kolçakoğlu *et al*. [20] also reported that the mesiodens they detected on CBCTs were mostly of type A classification in the frontal plane. In the sagittal plane, the highest incidence rate was found to be Type III (impacted and in contact with the central incisor). Similarly, this finding is similar to previous studies in the literature [20, 28]. When the dentistry literature was examined, it was seen that in the classification of the axial plane, mesiodens teeth were usually in Type B (in the direction of the dental arch) and Type C (in front of the nasopalatine canal, in contact with the nasopalatine canal). In this study, the diagnosed mesiodentes were mostly localized in the area classified with Type C. Similarly, Goksel *et al*. [28] reported that 46.15% of mesiodentes were localized in Type C, and in contrast, Kolçakoğlu *et al*. [20] reported that 71.3% of mesiodentes were localized in Type B. In this context, it was found that most of the diagnosed mesiodentes were in close relation with the nasopalatine canal, and the majority of them were impacted.

The shapes of mesiodentes were classified as incisor-like, conical, round, and tuberculated. As in most of the previous studies, the conical shape was the most common in the current study, followed by incisor-like and tuberculated [19, 20, 28]. In contrast, Akay *et al*. [30] stated that the rate of incisor-like mesiodentes was 38.5%, followed by the conical, the round, and the tuberculated types. Also, Leyland *et al*. [22] stated that tuberculate-type supernumeraries were the most frequent,

followed by the conical type. On the other hand, although many of the similar mesiodens studies in the literature included results in terms of shape, it is more valuable to examine the clinical significance. Tuberculated-form mesiodentes lead to eruption anomalies or complications, whereas conical teeth more commonly displace the adjacent teeth [19, 22].

The most common complication in the current study was eruption anomalies. These were followed by eruption anomalies with rotation combination and eruption anomalies with hyperplastic follicles and also cyst combination. The complication rates found in this study were mostly consistent with the previous literature [19, 20, 28, 29]. Additionally, odds ratios were calculated to evaluate the risk of complications in relation to sex and age. Being male increased the risk 4.1 times, while being in the 11–15 age group increased the risk 1.36 times, although neither association reached statistical significance.

This study has some strengths and limitations. The main strength of the current study is the evaluation of previously taken CBCT scans and the ability to perform a 3D evaluation that provides the opportunity to examine adjacent anatomical and dental structures in detail. However, due to the age of the patients included in the study, the sample size was lower, as tomographic examination with higher radiation doses is less frequently employed due to ethical considerations in this patient group. In this context, since only 45 cases with 58 mesiodens were identified in the study methodology, a regression analysis could not be performed to determine how much other variables associated with mesiodens constitute a risk of complications. However, further, and comprehensive investigations on this subject are recommended.

5. Conclusions

Within the limitations of this study, the findings obtained revealed that mesiodentes were closely associated with the anatomical structures and the adjacent teeth, which may cause various complications, and were diagnosed more frequently in males compared to females. On the other hand, further and broader-scale study designs are needed to confirm these results.

ABBREVIATIONS

SHH, Sonic Hedgehog; WNT, Wingless-Type MMTV integration site family; CBCT, cone beam computed tomography; STROBE, the strengthening the reporting of observational studies in epidemiology; 3D, 3-dimensional; SD, Standard Deviation; Min, Minimum; Max, Maximum; n, number; M, male; F, female; OR, Odd Ratio; CI, Confidence Interval.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

CE, AD and ŞS—conceived and designed the research; analyzed the data. CE, STG and DD—performed the analyses on CBCT scans. CE, STG and AD—prepared figures and/or tables. All authors authored and reviewed drafts of the article and approved the final draft.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Local Ethics Committee of Ankara University, Faculty of Dentistry (approval number: 15/03, decision date: 18 December 2023). Also, the current research was conducted in accordance with the principles of the Declaration of Helsinki. The retrospective data of the pediatric dental patients was analyzed, and the informed consent forms were signed by the patients and the parent(s) or legal guardian(s).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Davidson CL, Smit C, Nel S. Supernumerary teeth: a pictorial review and revised classification. Journal of Oral Biology and Craniofacial Research. 2025; 15: 454–462.

[2] Tapia Contreras P, Jollán Peña F, Díaz Abarza S, Matus-Miranda G. Minimally invasive intraoral removal of mesiodens via a transnasal, non-endoscopic approach: a systematic review on the purpose of 10 cases. Oral and Maxillofacial Surgery. 2024; 28: 1047–1054.

[3] Talaat DM, Hachim IY, Afifi MM, Talaat IM, ElKateb MA. Assessment of risk factors and molecular biomarkers in children with supernumerary teeth: a single-center study. BMC Oral Health. 2022; 22: 117.

[4] Pu P, Hou Y, Zhang Q, Hu X, Ding Y, Jia P, *et al*. Treatment and genetic analysis of multiple supernumerary and impacted teeth in an adolescent patient. BMC Oral Health. 2024; 24: 790.

[5] Li Y, Zhang Y, Gao L, Lyu M, Zheng B, Zhang F, *et al*. Risk prediction model of impacted supernumerary tooth-associated root resorption in children based on cone-beam computed tomography analysis: a case control study. BMC Oral Health. 2024; 24: 920.

[6] Li X, Gong X, Yu M, Gao X. Clinical features of non-syndromic late developing supernumerary teeth: a sign of the third dentition? BMC Oral Health. 2024; 24: 397.

[7] Wang ZY, Li M, Chen YQ, Shi H, Cui QY. A new surgical assistance aid for mesiodens extraction based on the ideal approach. Journal of Oral and Maxillofacial Surgery. 2024; 82: 325–331.

[8] Shetty V, Shetty RY, Mehrotra D, Usman A, Prabhu N. Management of impacted and inverted mesiodens—a report of two cases. Journal of Pharmacy and Bioallied Sciences. 2024; 16: S4120–S4122.

[9] Kim YR, Lee YM, Huh KH, Yi WJ, Heo MS, Lee SS, *et al*. Clinical and radiological features of malformed mesiodens in the nasopalatine canal:

an observational study. Dentomaxillofacial Radiology. 2024; 53: 189–195.

[10] Yusa K, Ishikawa S, Hemmi T, Kasuya S, Okuyama N, Kunii S, *et al*. Evaluation of radiographic characteristics and surgical removal of 147 mesiodens. Journal of Stomatology Oral and Maxillofacial Surgery. 2023; 124: 101427.

[11] Kantaputra PN, Tripuwabhrut K, Anthonappa RP, Chintakanon K, Ngamphiw C, Adisornkanj P, *et al*. Heterozygous variants in FREM2 are associated with mesiodens, supernumerary teeth, oral exostoses, and odontomas. Diagnostics. 2023; 13: 1214.

[12] Lubinsky M, Kantaputra PN. Syndromes with supernumerary teeth. American Journal of Medical Genetics Part A. 2016; 170: 2611–2616.

[13] Barham M, Okada S, Hisatomi M, Khasawneh A, Tekiki N, Takeshita Y, *et al*. Influence of mesiodens on adjacent teeth and the timing of its safe removal. Imaging Science in Dentistry. 2022; 52: 67–74.

[14] Mallineni SK, Aldhuwayhi S, Deeban Y, Almutairi KS, Alhabrdi SN, Almidaj MA, *et al*. Prevalence, occurrence, and characteristics of supernumerary teeth among the Saudi Arabian population using panoramic radiographs. Diagnostics. 2024; 14: 2542.

[15] Yang S, Zhang C, Shi Y, Yang H, Wang D. Effects of single unilaterally impacted mesiodens on maxillary central incisors: a 3D quantitative assessment based on cone-beam computed tomography. International Journal of Paediatric Dentistry. 2025; 35: 176–185.

[16] Li H, Cheng Y, Lu J, Zhang P, Ning Y, Xue L, *et al*. Extraction of high inverted mesiodentes via the labial, palatal and subperiostal intranasal approach: a clinical prospective study. Journal of Cranio-Maxillofacial Surgery. 2023; 51: 433–440.

[17] He L, Que G, Yang X, Yan S, Luo S. Prevalence, clinical characteristics, and 3-dimensional radiographic analysis of supernumerary teeth in Guangzhou, China: a retrospective study. BMC Oral Health. 2023; 23: 351.

[18] Meighani G, Pakdaman A. Diagnosis and management of supernumerary (mesiodens): a review of the literature. Journal of Dentistry. 2010; 7: 41–49.

[19] Kim Y, Jeong T, Kim J, Shin J, Kim S. Effects of mesiodens on adjacent permanent teeth: a retrospective study in Korean children based on cone-beam computed tomography. International Journal of Paediatric Dentistry. 2018; 28: 161–169.

[20] Kolçakoğlu K, Güzeldemirci EN, Okur GD, Kızılcı E. Analysis of the characteristics and complications of mesiodens with cone beam computed tomography: a retrospective study. Annals of Clinical and Analytical Medicine. 2023; 14: 1000–1005.

[21] American Academy of Pediatric Dentistry. Management considerations for pediatric oral surgery and oral pathology. In Casamassimo M, Fields H, Kennedy A, Nowak M (eds.) The reference manual of pediatric dentistry (pp. 523–532). 2024 edn. American Academy of Pediatric Dentistry: Chicago, IL. 2024.

[22] Leyland L, Batra P, Wong F, Llewelyn R. A retrospective evaluation of the eruption of impacted permanent incisors after extraction of supernumerary teeth. Journal of Clinical Pediatric Dentistry. 2006; 30: 225–231.

[23] Khambete N, Kumar R, Risbud M, Kale L, Sodhi S. Dentigerous cyst associated with an impacted mesiodens: report of 2 cases. Imaging Science in Dentistry. 2012; 42: 255–260.

[24] Kong J, Peng Z, Zhong T, Shu H, Wang J, Kuang Y, *et al*. Clinical analysis of approach selection of extraction of maxillary embedded mesiodens in children. Disease Markers. 2022; 2022: 6517024.

[25] Liu DG, Zhang WL, Zhang ZY, Wu YT, Ma XC. Three-dimensional evaluations of supernumerary teeth using cone-beam computed tomography for 487 cases. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology. 2007; 103: 403–411.

[26] Alberto PL. Surgical exposure of impacted teeth. Oral and Maxillofacial Surgery Clinics of North America. 2020; 32: 561–570.

[27] Vandenbroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, *et al*. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. PLOS Medicine. 2007; 4: e297.

[28] Goksel S, Agirgol E, Karabas HC, Ozcan I. Evaluation of prevalence and positions of mesiodens using Cone-Beam Computed Tomography. Journal of Oral & Maxillofacial Research. 2018; 9: e1.

[29] Ersin NK, Candan U, Alpoz AR, Akay C. Mesiodens in primary, mixed and permanent dentitions: a clinical and radiographic study. Journal of Clinical Pediatric Dentistry. 2004; 28: 295–298.

[30] Akay G, Özdede M, Güngör K. An evaluation of mesiodentes: a retrospective study with cone-beam computed tomography. Selcuk Dental Journal. 2018; 5: 203–211.

[31] Itaya S, Oka K, Kagawa T, Oosaka Y, Ishii K, Kato Y, *et al*. Diagnosis and management of mesiodens based on the investigation of its position using cone-beam computed tomography. Pediatric Dental Journal. 2016; 26: 60–66.

[32] Colak H, Uzgur R, Tan E, Hamidi MM, Turkal M, Colak T. Investigation of prevalence and characteristics of mesiodens in a non-syndromic 11256 dental outpatients. European Review for Medical and Pharmacological Sciences. 2013; 17: 2684–2689.

[33] Kantaputra P, Jatooratthawichot P, Kottege N, Anthonappa RP, Kaewgahya M, Tongsima S, *et al*. DKK1 is a strong candidate for mesiodens and taurodontism. Clinical Genetics. 2023; 103: 714–716.

[34] Srivastava M, Tripathi S, Astekar M, Singal D, Srivastava A, Vashisth P. Sex determination from mesiodens of Indian children by amelogenin gene. Journal of Forensic Dental Sciences. 2017; 9: 125–129.

[35] Kazanci F, Celikoglu M, Miloglu O, Yildirim H, Ceylan I. The frequency and characteristics of mesiodens in a Turkish patient population. European Journal of Dentistry. 2011; 5: 361–365.

[36] Gündüz K, Celenk P, Zengin Z, Sümer P. Mesiodens: a radiographic study in children. Journal of Oral Science. 2008; 50: 287–291.

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