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Impact of mesiodens on transverse jaw dimension and nasal septum deviation in pediatric patients: a retrospective CBCT study

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Abstract

Background Mesiodens is the most prevalent type of supernumerary tooth and frequently interferes with the eruption of maxillary incisors. While its dental implications are well described, its potential impact on maxillofacial structures—such as nasal septum deviation (NSD) and transverse skeletal development—has not been thoroughly investigated. This study aimed to evaluate these effects in pediatric patients using cone-beam computed tomography (CBCT).

Methods A total of 102 pediatric patients with mesiodens and 102 age- and sex-matched controls were retrospectively evaluated. Maxillofacial parameters, including nasal base width, maxillary and mandibular transverse widths, and the presence of NSD, were assessed using CBCT. Statistical analyses involved independent t-tests, chi-square tests, and one-way ANOVA with post hoc comparisons ($p < .05$).

Results The presence of mesiodens was significantly associated with a narrower nasal base width ($p < .001$) and a higher prevalence of NSD ($p = .009$). No significant differences were observed between groups regarding maxillary ($p = .260$) or mandibular width ($p = .078$).

Conclusions These findings suggest that mesiodens may influence not only dental eruption but also broader craniofacial development. Early detection and comprehensive radiographic evaluation may help mitigate potential maxillofacial complications associated with this anomaly.

Keywords CBCT, Maxillofacial morphology, Mesiodens, Nasal septum deviation, Pediatric dentistry

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Background

Supernumerary teeth are additional teeth that develop beyond the normal dentition. Hyperdontia is observed at a frequency ranging from 0.15 to 3.9% in the general population, with considerable variation depending on diagnostic criteria, age group, ethnicity, and the use of imaging techniques such as CBCT, which is known to detect more cases compared to two-dimensional modalities [1, 2]. These teeth can appear in both primary and permanent dentitions; however, their occurrence in the primary dentition is approximately five times less frequent [3]. Supernumerary teeth located between the maxillary central incisors are termed mesiodens, and their prevalence ranges from 0.15 to 1.9% [4, 5]. A mesiodens may occur as a single tooth or multiple teeth (mesiodentes) and often remains unerupted [3].

Although the etiopathogenesis of mesiodens is not fully understood, genetic and environmental factors are believed to play a role in its development. Mechanisms such as hyperactivity of the dental lamina, division of tooth placodes, and epithelial-mesenchymal interactions have been reported to contribute to the formation of supernumerary teeth [6].

Moreover, familial cases have been documented, and autosomal dominant inheritance has been proposed as a potential contributor to mesiodens development [7]. However, further genetic and histological studies are needed to confirm these hypotheses.

Mesiodens commonly cause various clinical issues by interfering with the eruption of permanent maxillary incisors. This may lead to malocclusion [8], midline diastema [9], and root resorption of adjacent teeth [10]. If early diagnosis and appropriate treatment are not provided, complications such as ectopic eruption, displacement or rotation of the central incisors, root resorption, eruption into the nasal cavity, or cystic degeneration may occur [8, 11]. The presence of mesiodens is frequently associated with diastema formation [12].

Diagnosis is based on clinical and radiographic examination. The presence of mesiodens should be suspected, particularly when delayed eruption of the primary maxillary incisors is observed. Radiographic evaluation is recommended when permanent incisors fail to erupt or show displacement or rotation. Although periapical, panoramic, bitewing, and cephalometric radiographs are commonly used in diagnosis, these two-dimensional techniques may be insufficient in determining the anatomical localization of supernumerary teeth due to superimposition [4]. In recent years, cone-beam computed tomography (CBCT), which provides high-resolution three-dimensional imaging, has become a valuable tool for more accurate localization of mesiodens and surgical planning [13–15].

However, this advanced imaging modality also presents certain limitations. Children's increased radiosensitivity makes them more susceptible to long-term radiation-induced risks, including malignancy [16]. Moreover, CBCT involves higher radiation doses than conventional radiographic techniques; it is also more costly and may be less accessible, particularly in resource-limited or public healthcare settings. Therefore, CBCT should be considered for pediatric patients only when clinical examination and intraoral radiography fail to provide sufficient diagnostic information and when its diagnostic benefits clearly outweigh the potential risks [17]. The American Academy of Pediatric Dentistry (AAPD) likewise recommends limiting CBCT to cases with clear clinical indications and discourages its routine use for screening or diagnosis [18]. The growing presence of CBCT scanners in private clinics has led to increased utilization, underscoring the importance of prudent and responsible use. In this context, clinician training in the safe and appropriate use of CBCT for dentoalveolar imaging is essential, especially in pediatric populations [19]. The decision to use three-dimensional imaging should always reflect ethical and clinical responsibility, ensuring minimal radiation exposure and maximal diagnostic benefit.

Most studies on mesiodens-associated dental anomalies have focused on eruption problems and orthodontic outcomes [20–22]. However, the effects of these anomalies on craniofacial morphology have not been sufficiently investigated. For example, a recent study by Tadano et al. [23], evaluated intercanthal distance in children with mesiodens but did not assess hard tissue structures such as maxillary or nasal base widths. To date, no studies have systematically analyzed transverse skeletal dimensions or nasal septum deviation in pediatric patients with mesiodens. In particular, comprehensive evaluations of the impact of mesiodens on morphological parameters, such as maxillary width, mandibular width, and nasal base width distance, are lacking. This study aims to investigate the potential effects of mesiodens on maxillofacial structures in pediatric patients. The study's null hypothesis (H_0) is: "The presence of mesiodens does not cause any changes in maxillofacial morphology in pediatric patients." The alternative hypothesis (H_1) is: "The presence of mesiodens causes significant changes in maxillofacial morphological parameters such as maxillary width, mandibular width, and nasal base width."

Methods

This retrospective study was approved by the Local Ethics Committee of Van Yuzuncu Yil University (Protocol No: 2024/11–16). Archived CBCT scans obtained between January 1, 2017, and January 1, 2025, at the Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Van Yuzuncu Yil University were evaluated.

Selection of participants

Participants included in this study were children aged between 6 and 14 years who had high-quality CBCT images suitable for analysis. Only scans with a sufficient field of view (FOV) that allowed measurement of the nasal base, maxillary width, and mandibular width were selected.

Patients were excluded if they had distorted or incomplete CBCT data, a history of congenital syndromes or systemic diseases, or a history of trauma or surgical intervention in the maxillofacial region. CBCT scans with limited FOV that did not allow evaluation of relevant anatomical structures were also excluded. Furthermore, individuals with visually evident skeletal discrepancies—such as pronounced facial asymmetry, abnormal growth patterns, or severe skeletal Class II or Class III malocclusions—were not included. Additional exclusion criteria involved patients with documented craniofacial syndromes, upper airway pathologies requiring surgical intervention, or radiographic evidence of inferior turbinate hypertrophy. Finally, cases with documented upper airway obstruction (e.g., adenoidal hypertrophy) in their digital medical records were excluded to minimize airway-related confounding factors affecting maxillary morphology.

The study included 204 individuals (128 males, 76 females), divided equally into a mesiodens group and an age- and sex-matched control group. Skeletal classification was not used as a matching criterion because previous studies [24], have shown that transverse discrepancies and NSD can occur independently of sagittal skeletal patterns. Therefore, age and sex were the primary variables used for group matching in this study. Participants were classified based on the presence of a supernumerary tooth located in the midline between the maxillary central incisors.

Group 1 (mesiodens group)

Patients presenting with one or more mesiodentes located in the anterior maxillary midline.

Group 2 (control group)

Patients without mesiodens.

To explore possible age-dependent effects, participants were stratified into three age categories: 6–8 years, 9–11 years, and 12–14 years.

Data collection

All CBCT scans were performed using the KaVo 3D eXam device in compliance with the ALARA (As Low As Reasonably Achievable) principle. Imaging parameters were standardized for all patients: 120 kVp, 5 mAs, 7-second scan time, 0.4 mm voxel size, and a 130 mm FOV. The lowest voxel size (0.4 mm), which helps reduce radiation dose, was used. To further minimize exposure, all patients were provided with lead aprons, and imaging was performed only when clinically indicated. All CBCT scans were obtained with patients positioned using a cephalostat head fixation system to minimize involuntary head movement during scanning. Analyses were conducted using the eXam Vision software (KaVo Dental GmbH) by a single oral and maxillofacial radiologist with 12 years of experience.

Prior to measurement, all DICOM files were exported to a dedicated workstation and reoriented to a standardized head position using the Multi-Planar Reconstruction tool within the software. The Frankfort horizontal plane—defined by the bilateral orbitale and porion points—was adjusted to be parallel to the floor, and the midsagittal plane was aligned to the facial midline. This reorientation ensured anatomical consistency and minimized potential measurement errors resulting from patient head rotation during scanning.

All morphometric measurements were conducted in axial, sagittal, and coronal sections with a slice thickness of 0.4 mm. The analyses were performed under subdued lighting conditions using a 23-inch computer monitor, in reading sessions not exceeding three hours per day, in order to prevent visual fatigue and preserve grayscale sensitivity.

To ensure measurement consistency and reduce intra-observer variability, intra-examiner reliability testing was conducted prior to the commencement of the complete analysis. During this phase, 20% of the total images were randomly selected and re-evaluated by the same examiner after a two-week interval. The intra-examiner agreement, calculated using Cohen's kappa coefficient, was 0.86, indicating a high level of reliability [25].

Data assessment

All measurements were performed using axial, sagittal, and coronal sections of the CBCT scans. The anatomical and dental parameters assessed in this study were defined as follows:

Nasal base width (mm): Measured on the coronal plane as the maximum transverse width of the nasal cavity.

Maxillary and mandibular transverse widths (mm): Transverse skeletal dimensions were measured in accordance with the Rocky Mountain analysis method [26, 27] (Fig. 1). Maxillary width was defined as the distance between the right and left jugal points, and mandibular width as the distance between the right and left antegonial notches.

Presence of diastema: The presence or absence of a midline diastema was recorded for each subject. Diastema was specifically evaluated due to its

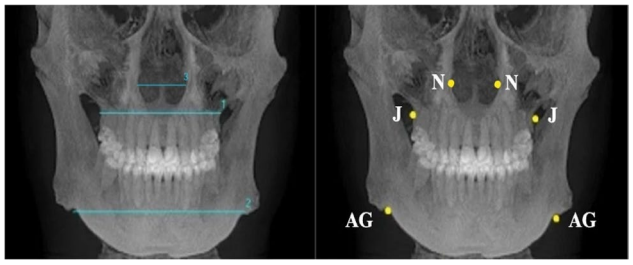


Fig. 1 Coronal CBCT section showing the measurement of transverse jaw dimensions: (1) Maxillary width, measured as the distance between the right and left jugal points; (2) Mandibular width, measured as the distance between the right and left antegonial notches; (3) Nasal base width, measured as the distance between the nasal cavity walls. Anatomical landmarks are marked with yellow dots and labeled accordingly (AG: antegonial notch; J: jugal point; N: nasal wall)

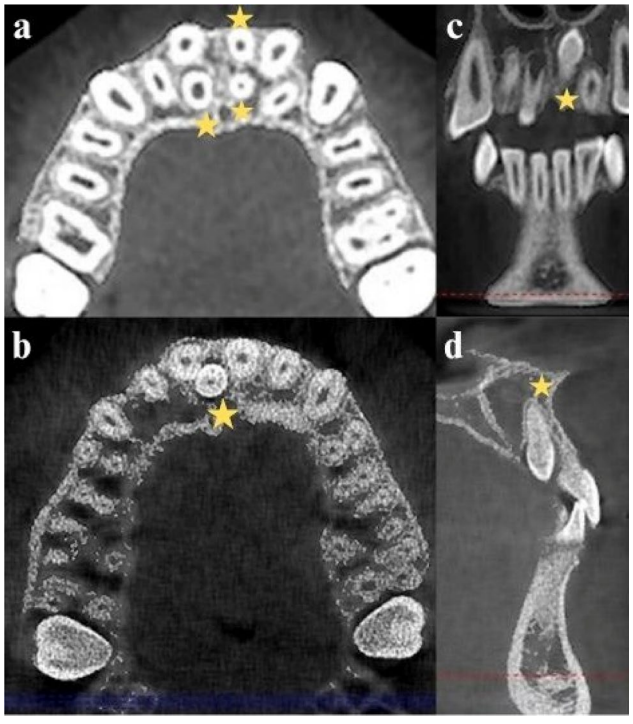


Fig. 2 Radiographic presentations of mesiodens: **a** Three mesiodentes with different positions in the same patient; **b** A palatally positioned mesiodens causing diastema; **c** An inverted mesiodens; **d** A normally oriented and erupted mesiodens indicated by yellow stars

anatomical proximity to mesiodens and its potential to reflect spatial disruption in the anterior maxilla.

Characteristics of mesiodens All mesiodentes were evaluated in terms of:

- Location (palatal, transverse, buccal, or within the nasal cavity),
- Number (single, double, or triple),
- Morphology (conical, tuberculate, or supplemental),

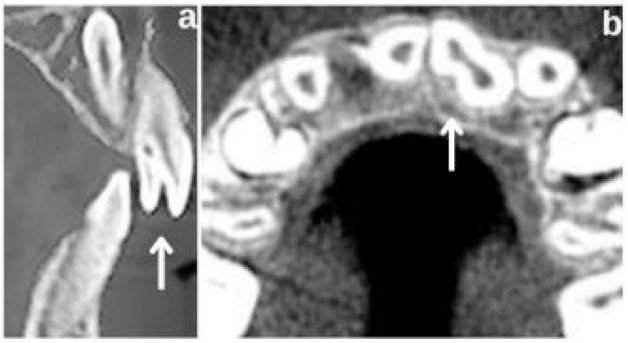


Fig. 3 Radiographic appearances of mesiodens with associated anomalies: **a** An inverted mesiodens accompanied by a talon cusp and dens invaginatus in the central incisor (white arrow); **b** A mesiodens fused with the maxillary central incisor (white arrow)

- Eruption direction (normal, inverted, horizontal) (Fig. 2).

Nasal septum deviation (NSD): NSD was recorded based on the visual asymmetry of the septum on coronal slices. Directionality (right or left deviation) was also documented.

Other dental anomalies: Additional anomalies, including ectopic eruption, transmigration, supernumerary teeth (other than mesiodens), dens invaginatus, and odontomas were identified when present (Fig. 3). These were classified descriptively and compared between groups.

Statistical analysis

All statistical analyses were conducted using IBM SPSS Statistics Version 26 (IBM Corp., Armonk, NY, USA). The normality of data distribution was assessed using the Kolmogorov–Smirnov test. As all continuous variables met the assumption of normality, parametric tests were applied for group comparisons. Independent samples t-tests were used to compare measurements between two groups, while one-way ANOVA followed by Bonferroni-adjusted post hoc tests was employed for comparisons among three age subgroups. For variables that did not meet homogeneity of variances or normality assumptions in specific subgroups, the Mann–Whitney U test was used. Categorical data were analyzed using the chi-square test or Fisher's exact test where appropriate. Effect sizes (Cohen's d or r) and 95% confidence intervals were reported to assess the clinical relevance of significant findings. A p-value of <0.05 was considered statistically significant.

Results

Among the 2040 pediatric CBCT records reviewed between 2017 and 2025, 102 patients with mesiodens and 102 age- and sex-matched controls were included in the analysis. There were no significant differences

between the groups in terms of age (10.2 ± 2.1 years in both groups; p =.317) or sex distribution (64 males and 38 females in each group; p = 1).

Within the mesiodens group, the most common location was the palatal region (n = 77, 75.5%), followed by the buccal side (n = 15, 14.7%), transverse position (n = 7, 6.9%), and nasal cavity (n = 3, 2.9%). A single mesiodens was observed in the majority of cases (n = 78, 76.5%), while 20 individuals (19.6%) had two mesiodentes and 4 individuals (3.9%) had three. Conical crown morphology predominated (n = 84, 82.4%), followed by tuberculate (n = 10, 9.8%) and supplemental types (n = 8, 7.8%). Most mesiodentes exhibited a normal eruption direction (n = 87, 85.3%), with inverted (n = 12, 11.8%) and horizontal (n = 3, 2.9%) orientations occurring less frequently. Diastema was observed in 60 patients (58.8%). When stratified by sex, no statistically significant differences were found in mesiodens location (p =.736), number (p =.506), crown morphology (p =.568), eruption direction (p = 1), or diastema frequency (p =.149). Although diastema was more frequent in females (68.4%) than in males (53.1%), this difference did not reach statistical significance. As diastema is directly related to the presence of mesiodens, this parameter was not assessed in the control group (Table 1).

In the comparison of craniofacial measurements between groups, nasal base width was significantly narrower in the mesiodens group compared to controls (23.52 ± 3.16 mm vs. 25.80 ± 2.89 mm; p <.001). No statistically significant differences were found in maxillary width (60.45 ± 4.54 mm vs. 59.79 ± 3.74 mm; p =.235) or mandibular width (79.69 ± 7.03 mm vs. 81.26 ± 5.61 mm; p =.079). Nasal septum deviation (NSD) was observed in 29.4% of individuals in the mesiodens group and 12.4% in the control group, representing a statistically significant difference (p =.013) (Table 2).

Age-stratified analysis showed that nasal base width was consistently narrower in the mesiodens group across all age categories, while maxillary width remained similar and a reduction in mandibular width was limited to the 9–11-year subgroup. Across all age groups, nasal base width ranged from 20.93 to 26.23 mm, maxillary width from 56.09 to 62.48 mm, and mandibular width from 72.65 to 84.85 mm. These values demonstrated an age-related increase in transverse maxillofacial dimensions across both groups. When analyzed by age subgroup, nasal base width was significantly lower in the mesiodens group compared to controls in all age categories: 6–8 years (p <.001), 9–11 years (p =.004), and 12–14 years (p =.031). No significant differences were noted in maxillary width in any age group. However, a statistically significant reduction in mandibular width was observed in the mesiodens group within the 9–11-year subgroup (p =.019), whereas no such difference was found in the 6–8 or 12–14-year subgroups (Table 3).

Nasal base, maxillary, and mandibular widths demonstrated a significant increase with age (Table 4). The nasal base width increased from 20.93 ± 3.71 mm in the 6–8 year group to 26.23 ± 3.52 mm in the 12–14 year group, with all age groups differing significantly from one another (p <.05). A comparable pattern was observed in maxillary width, where a significant difference was noted between the 9–11 year (59.09 ± 4.60 mm) and 12–14 year (62.48 ± 3.86 mm) groups, while the 6–8 year group (56.99 ± 3.25 mm) did not differ significantly from the 9–11 year group. Mandibular width showed the most pronounced age-related change, with all pairwise comparisons reaching statistical significance (72.65 ± 4.21 mm, 76.74 ± 4.69 mm, and 84.85 ± 4.34 mm for the 6–8, 9–11, and 12–14 year groups, respectively; p <.05). These findings indicate progressive transverse skeletal development, particularly in the mandible, during late childhood and early adolescence (Table 4).

NSD was observed in 43 out of 204 individuals (21.1%) overall. NSD was detected in 29.4% of individuals in

Table 1 Distribution of mesiodens characteristics by sex in the mesiodens group

Characteristic	Category	Female (n: 38)	Male (n: 64)	Total (n: 102)	p
Location	Palatal	29	48	77	0.736
	Transverse	3	4	7	
	Buccal	6	9	15	
	Nasal Cavity	0	3	3	
Number	Single	27	51	78	0.506
	Double	10	10	20	
	Triple	1	3	4	
Morphology	Conical	31	53	84	0.568
	Tuberculate	5	5	10	
	Supplemental	2	6	8	
Eruption Direction	Normal	33	54	87	1
	Inverted	4	8	12	
	Horizontal	1	2	3	
Diastema	Yes	26	34	60	0.149
	No	12	30	42	

p <.05, Fisher Exact Test

Table 2 Summary of age, sex, and clinical characteristics of participants by group

Variable	Group 1	Group 2
Number of participants, n	102	102
Age, years (mean ± SD)	10.2 ± 2.1	10.2 ± 2.1
Sex, n (Male/Female)	64/38	64/38
Nasal base width, mm (mean ± SD)	23.52 ± 3.16	25.80 ± 2.89
Maxillary width, mm (mean ± SD)	60.45 ± 4.54	59.79 ± 3.74
Mandibular width, mm (mean ± SD)	79.69 ± 7.03	81.26 ± 5.61
Nasal septum deviation, n (%)	30 (29.4%)	13 (12.4%)

Table 3 Comparison of transverse jaw dimension widths between groups by age group

Age Group	Group	Nasal Base Width (mm) (Mean ± SD)	Maxillary Width (mm) (Mean ± SD)	Mandibular Width (mm) (Mean ± SD)
6–8	1	20.93 ± 3.71	56.99 ± 3.25	72.65 ± 4.21
	2	25.24 ± 2.60	56.09 ± 2.46	74.07 ± 3.56
	p	< 0.001 *	0.356*	0.283*
Effect Size (95% CI)		1.37, CI: −6.58–2.10	0.32, CI: −1.09–2.93	0.38, CI: −4.16–1.28
9–11	1	23.56 ± 3.53	59.09 ± 4.60	76.74 ± 4.69
	2	26.23 ± 3.52	59.25 ± 2.83	79.10 ± 2.97
	p	0.004 **	0.864*	0.019 *
Effect Size (95% CI)		0.50, CI: NA	0.04, CI: −2.07–1.74	0.61, CI: −4.33–0.40
12–14	1	23.59 ± 3.45	62.48 ± 3.86	83.95 ± 6.10
	2	25.87 ± 3.41	61.32 ± 3.75	84.85 ± 4.34
	p	0.031 **	0.051*	0.602*
Effect Size (95% CI)		0.22, CI: NA	0.40, CI: −0.005–2.972	0.11, CI: −2.637–1.537

$p < .05$. NA: Not Available. ** *p*-value calculated using Mann–Whitney U test (non-parametric); all others(*) were tested using independent samples t-test

Table 4 Nasal, maxillary, and mandibular widths (mm) by age groups with statistical comparisons

Variable (mm)	6–8 years	9–11 years	12–14 years
Nasal Base Width	20.93 ± 3.71[a]	23.56 ± 3.53[b]	26.23 ± 3.52[b]
Maxillary Width	56.99 ± 3.25[a]	59.09 ± 4.60[a]	62.48 ± 3.86[b]
Mandibular Width	72.65 ± 4.21[a]	76.74 ± 4.69[b]	84.85 ± 4.34[c]

Values are presented as mean ± standard deviation (mm). Groups sharing the same superscript letter are not significantly different from each other, whereas different letters indicate statistically significant differences at $p < .05$ (Bonferroni-adjusted comparisons)

Table 5 Comparison of nasal septal deviation and anomalies between group 1 and group 2

	Nasal Septal Deviation			Total	*p*
	No	Right	Left		
Group 1	72	16	14	102	0.009
Group 2	89	6	7	102	
	Dental Anomalies			Total	*p*
	Yes	No			
Group 1	68	34		102	0.161
Group 2	62	40		102	

$p < .05$

Group 1 (15.7% right, 13.7% left) and 12.7% in Group 2 (5.9% right, 6.8% left). A significant association was found between the presence of mesiodens and NSD ($p = .009$), with higher NSD frequency in the mesiodens group. Dental anomalies were observed in both groups with varying patterns. In the mesiodens group, the most frequent anomalies were ectopic eruption (9.8%), fusion (3.9%), supernumerary teeth (2.9%), and dens invaginatus (2.9%). In the control group, ectopic eruption (15.7%), transmigration (4.9%), and pre-eruptive intracoronal resorption (4.9%) were most common. Overall, anomalies such as fusion and dens invaginatus appeared exclusively or more frequently in the mesiodens group. The frequency of dental anomalies was 33.3% in Group 1 and 46.1% in Group 2, and the difference was not statistically significant (Fisher–Freeman–Halton exact test, $p = .161$) (Table 5).

Table 6 Comparison of nasal base, maxillary, and mandibular widths between group 1 and group 2

Structure (mm)	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	*p*	Effect Size (Cohen's d/*r*)	95% CI for Difference
Nasal Base Width	23.52 ± 3.16	25.80 ± 2.89	< 0.001*	*r* = .33	-
Maxillary Width	60.45 ± 4.54	59.79 ± 3.74	0.235**	d = 0.17	−0.46–1.85
Mandibular Width	79.69 ± 7.03	81.26 ± 5.61	0.079**	d = 0.23	−3.21–0.31

$p < .05$. * Mann-Whitney U test, ** Student t test

The nasal base width was significantly lower in Group 1 (23.52 ± 3.16 mm) compared to Group 2 (25.80 ± 2.89 mm) (t = −5.416; $p < .001$). No statistically significant difference was found in maxillary width between Group 1 (60.45 ± 4.54 mm) and Group 2 (59.79 ± 3.74 mm) ($p = .235$). Although the mandibular width was slightly lower in Group 1 (79.69 ± 7.03 mm) than in Group 2 (81.26 ± 5.61 mm), the difference did not reach statistical significance ($p = .079$) (Table 6).

Discussion

The impact of mesiodens on maxillofacial structures, beyond its dental effects, has been scarcely addressed in the literature [23]. This study is among the first to evaluate its influence on NSD and nasal base width specifically. The null hypothesis (H_0) was rejected, and the findings supported the alternative hypothesis (H_1). However, no significant differences were found between the groups regarding maxillary and mandibular widths, suggesting that mesiodens may not directly influence maxillary dimensions.

In this study, CBCT records of 2040 pediatric patients were retrospectively reviewed, and mesiodens was identified in 102 individuals, yielding a prevalence of 5.0%. Although this rate is higher than that reported in general population studies, it aligns with CBCT-based findings in selected clinical samples. Previous studies have reported prevalence rates between 0.1% and 3%, with higher rates (> 5%) observed in CBCT-based cohorts [9, 28, 29]. The prevalence of hyperdontia observed in this study is close to the upper range of values reported in the literature (0.15–3.9%). This is primarily because our study was conducted using a CBCT archive. CBCT examinations are generally performed on patients with dental issues or

those requiring detailed evaluation; therefore, our sample does not represent the general population. As a result, prevalence rates may appear higher than those reported in studies based on routine panoramic radiographs or population-based samples. This factor should be considered when interpreting our findings. A male predominance is well-documented, with reported male-to-female ratios ranging from 1.5:1 to 3:1 [30, 31]. Consistently, our study showed 64 male (62.7%) and 38 female (37.3%) cases, corresponding to a ratio of 1.68:1. These findings suggest a possible sex-related etiological component. Timely diagnosis and imaging are essential to prevent complications such as delayed eruption, diastema, or root resorption.

While previous studies have mainly focused on the dental eruption complications of mesiodens [12, 32–34], data on its association with NSD are scarce. Most evidence comes from case reports describing mechanical effects of mesiodens on the nasal septum. For instance, Jones et al. reported an inverted mesiodens applying pressure to the septum [35], and Iacomino et al. described a deeply impacted mesiodens deviating the septum to the left, causing nasal obstruction [36]. These reports suggest that mesiodens can affect adjacent anatomical structures beyond the oral cavity. Our study is the first to demonstrate this association statistically in a systematic sample, showing a significantly higher prevalence of NSD in the mesiodens group compared to controls (p =.009). Unlike inverted mesiodens that protrude into the nasal cavity and exert direct pressure, normally oriented mesiodens may influence maxillary and adjacent skeletal structures indirectly, likely through disruption of local growth patterns and sutural dynamics rather than purely mechanical forces. Supporting the broader relationship between dental anomalies and nasal morphology, Shah [37], reported that impacted canines, particularly right-sided and bilateral cases, were significantly associated with septal deviation toward the right. Although mesiodens differs anatomically from canines, its proximity to the nasopalatine canal and nasal floor may similarly contribute to developmental alterations in the adjacent maxilla, explaining the increased NSD frequency observed in our cohort.

Regarding nasal base width, our findings revealed a significantly narrower nasal cavity in individuals with mesiodens. To date, no study has directly examined this association. Tadano et al. [23], evaluated whether certain facial morphologic features, including the distance between the maxillary central incisors, were linked to mesiodens presence. They found a significant correlation between intercanthal distance and mesiodens, and reported a broader nasal base in affected cases. In contrast, our study found a narrower nasal base, which may be due to differences in age, ethnicity, or growth patterns. Additionally, we observed a weak but positive correlation between nasal base and maxillary widths, supporting a developmental link. These findings fill a gap in the literature by suggesting that mesiodens may contribute to reduced nasal width.

No significant influence of mesiodens on maxillary and mandibular width was identified. This may be due to the multifactorial nature of maxillary width, which is influenced by genetics, orthodontic history, and individual growth characteristics. As mesiodens is anatomically localized in the maxilla, a direct effect on the mandible is not expected; however, the age-specific reduction in mandibular width observed in the 9–11-year subgroup in our study aligns with known mandibular growth patterns reported in the orthodontic literature [38]. Although mesiodens is confined to the maxillary region, mandibular width was also assessed to provide a more comprehensive evaluation of transverse skeletal relationships; this approach allowed for the detection of subtle skeletal changes that may extend beyond the immediate site of the anomaly and reflect broader craniofacial adaptations. Maxillofacial development is a multidimensional and interactive process, and compensatory skeletal adaptations may occur even in regions distant from the anomaly. Kaya and Tunca [24], also emphasized the importance of assessing both maxillary and mandibular widths when evaluating transverse skeletal balance.

The nasal septal cartilage plays a critical role in midfacial growth by guiding the development of the premaxilla and maxilla [39–41]. Both clinical and animal studies have shown that disruptions in this region—such as from pressure or spatial interference caused by mesiodens—may contribute to NSD and reduced maxillary width [42–44]. To better assess the developmental timing of these effects, patients were stratified into age subgroups (6–8, 9–11, and 12–14 years), and maxillofacial measurements were compared within each category. These subgroup analyses revealed that the nasal base width was consistently narrower in the mesiodens group across all age ranges (Table 3).

Although mesiodens is a dental anomaly, it can also cause pathologies such as rotation, displacement, root resorption, and delayed eruption in adjacent teeth [45]. Some cases have also reported cyst formation or, rarely, tooth eruption into the nasal cavity [6, 46]. Multiple supernumerary teeth are frequently found in individuals with mesiodens, suggesting a possible genetic predisposition [5, 47–50]. This study observed additional dental anomalies (e.g., ectopic eruption, transposition, dens invaginatus) in 33.3% of the mesiodens group. However, the difference compared to the control group was not statistically significant, indicating that mesiodens is not always associated with other anomalies and that the observed anomalies may arise from unrelated causes.

Other dental anomalies were observed infrequently and were not directly related to the anatomical parameters assessed in this study—namely, nasal base width, maxillary and mandibular transverse dimensions, and NSD. Therefore, these anomalies were presented descriptively without further analytical comparison.

This study has several limitations. First, the sample size was limited to 204 individuals; thus, larger and multicenter studies are needed to enhance the generalizability of the findings. The study's retrospective nature limits the ability to establish causality; only correlational outcomes could be drawn. Additionally, including CBCT images in the control group for various indications may have introduced potential selection bias. Furthermore, potential confounding factors such as malocclusion and airway obstruction, which may influence maxillary morphology, could not be fully controlled despite excluding patients with known severe craniofacial syndromes or advanced airway pathologies, due to incomplete clinical records. Moreover, behavioral and hereditary factors such as oral habits (e.g., mouth breathing) and genetic predispositions could not be assessed due to limitations in retrospective data; however, exclusion criteria were designed to minimize potential anatomical and airway-related confounders. Although a statistically significant association has been identified between mesiodens and NSD, whether this relationship is causal or stems from shared developmental mechanisms remains unclear. Clarification of this issue will only be possible through prospective and longitudinal studies. Additionally, as the study population was ethnically homogeneous, racial differences were not assessed, which may limit the generalizability of the findings to other ethnic groups.

Conclusions

This study demonstrates that mesiodens is not merely a localized dental anomaly, but may lead to measurable changes in maxillofacial structures. The observed narrowing of nasal base width and increased prevalence of NSD suggest that mesiodens could influence facial growth. These findings highlight the importance of early diagnosis and detailed evaluation using advanced imaging techniques such as CBCT. Timely detection and appropriate radiographic assessment may help prevent maxillofacial complications associated with mesiodens. Regular orthodontic and pediatric dental follow-up are recommended to monitor possible effects on facial growth and to plan necessary interventions. Incorporating these steps into clinical practice can improve treatment outcomes and support the long-term oral and facial health of patients.

Abbreviations

CBCT	Cone-Beam Computed Tomography
NSD	Nasal Septum Deviation
FOV	Field of View
SPSS	Statistical Package for the Social Sciences
SD	Standard Deviation
ALARA	As Low As Reasonably Achievable
AAPD	American Academy of Pediatric Dentistry
DICOM	Digital Imaging and Communications in Medicine

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Authors' contributions
BA and SK designed the study, analyzed the results, and drafted the manuscript. BA and SK revised the manuscript. BA and SK collected clinical data. BA and SK guided the research direction and reviewed the final manuscript. All authors read and approved the final manuscript.

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Data availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
This study was approved by Van Yuzuncu Yil University Non-Interventional Clinical Research Ethics Committee (Approval No: 2024/11–16).The study was performed according to the Helsinki Declaration.

Informed consent
Informed consent was waived by the Non-Interventional Clinical Research Ethics Committee of Van Yuzuncu Yil University due to the retrospective nature of the study.

Consent for publication
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Competing interests
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