Prevalence of mesiodens in orthodontic patients with deciduous and mixed dentition and its association with other dental anomalies

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Objective: To determine the prevalence of mesiodens in deciduous and mixed dentitions and its association with other dental anomalies.

Material and Methods: Panoramic radiographs of 1,995 orthodontic patients were analyzed retrospectively, obtaining a final sample of 30 patients with mesiodens. The following aspects were analyzed: gender ; number of mesiodens; proportion between erupted and non-erupted mesiodens; initial position of the supernumerary tooth; related complications; treatment plan accomplished; and associated dental anomalies. The frequency of dental anomalies in the sample was compared to reference values for the general population using the chi-square test (χ^2), with a significance level set at 5%.

Results: The prevalence of mesiodens was 1.5% more common among males (1.5:1). Most of the mesiodens were non-erupted (75%) and in a vertical position, facing the oral cavity. Extraction of the mesiodens was the most common treatment. The main complications associated with mesiodens were: delayed eruption of permanent incisors (34.28%) and midline diastema (28.57%). From all the dental anomalies analyzed, only the prevalence of maxillary lateral incisor agenesis was higher in comparison to the general population.

Conclusion: There was a low prevalence of mesiodens (1.5%) in deciduous and mixed dentition and the condition was not associated with other dental anomalies, except for the maxillary lateral incisor agenesis.

Keywords: Supernumerary tooth. Child. Prevalence.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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INTRODUCTION

The term mesiodens refers to supernumerary teeth located in the pre-maxilla region, precisely between the maxillary central incisors (Figs. 1 and 2). Mesiodens is the most frequent type of supernumerary tooth.[1,2] The prevalence of mesiodens reported in the literature varies from 0.15 to 7.8% (Table 1), with a higher prevalence in males, with a proportion of 2:1.[3-10] Although it has not been precisely established, its etiology seems to be related to genetic factors, given the records of family recurrence.[4,11-13] A dominant autosomal trait has been suggested, with incomplete penetrance in some generations[13] and x chromosome linked inheritance due to the higher prevalence among males.

The mesiodens is often unique[3,4,5,7,14] and anomalous in size and shape,[11] but may vary in morphology from a small rudimentary conical shape[4,7,8,9,14,18] to a complex form with several tubercles. It rarely erupts spontaneously,[8,10,14,17] which only occurs in situations in which the mesiodens faces the oral cavity. Most often, the mesiodens is inverted, with the crown positioned towards the nasal cavity and the root apex facing the oral cavity.[3,8,9] The presence of mesiodens can lead to local irregularities of which the most common are: delayed eruption or impaction of adjacent teeth, displacement or rotation of adjacent teeth, development of dentigerous cysts, resorption of adjacent roots, crowding, midline diastema or maxillary incisors root dilaceration.[1,3,4,5,7-11,14,17]

Studies have suggested a genetic and hereditary background in the etiology of dental anomalies of number, size and position. Such evidence comes from investigations carried out with families, monozygotic twins and the observation of associations in the occurrence of certain anomalies.[11,19,20] Tooth agenesis is often associated with other dental anomalies, such as microdontia, ectopia and delayed dental development.[19,20,21] Peck[20] has recently denominated the association of these occurrences as dental anomaly patterns (DAP), as a single mutant gene may be responsible for more than one morphological or functional trait.

Two previous studies verified the association between supernumerary teeth in general and other dental anomalies, including tooth agenesis, microdontia and ectopic eruption.[19,21] The findings revealed that the frequency of supernumerary teeth was not higher in patients with hypoplastic dental anomalies.[19,21] However, no previous study has investigated the exclusive association of mesiodens with other dental anomalies.

Thus, the aim of the present study was to verify the prevalence of mesiodens in children with deciduous and mixed dentitions and its association with other dental anomalies.

Figure 1 - Mesiodens erupted in the oral cavity.

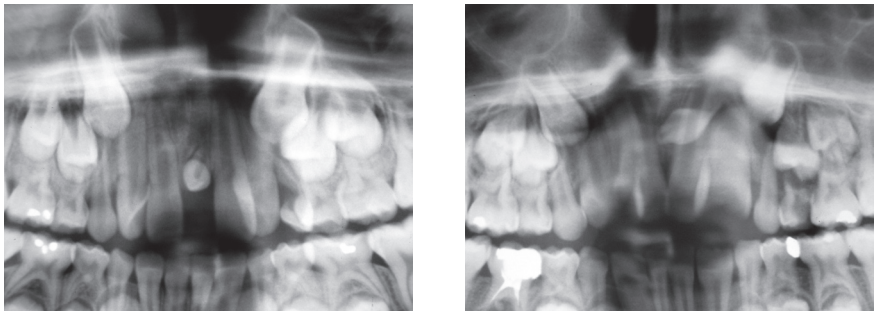

Figure 2 - Radiographic image showing mesiodens.

MATERIAL AND METHODS

The orthodontic records of 1,995 patients with deciduous and mixed dentition, taken from the archives of the Profis Preventive and Interceptive Orthodontics Course (Bauru, SP, Brazil) were retrospectively analyzed. Panoramic and periapical radiographs were analyzed by a single examiner. The inclusion criteria were: patients aged between 4 and 13 years old; with deciduous or mixed dentition; presence of at least one supernumerary tooth in the midsagittal region of the maxilla. The exclusion criteria were: presence of craniofacial anomalies; presence of syndromes; history of tooth extraction and incomplete documentation. After the initial analysis, a sample of 30 patients with mesiodens and a mean age of 8 years and 3 months was obtained.

The following aspects were analyzed in the orthodontic records of the sample: 1) sex; 2) number of mesiodens; 3) proportion between erupted and non-erupted mesiodens; 4) initial position of the supernumerary tooth; 5) related complications; 6) treatment planning accomplished; and 7) associated dental anomalies. The associated dental anomalies investigated included agenesis of permanent teeth, microdontia, ectopic eruption of permanent maxillary first molars, tooth transpositions, palatally displaced canines (PDC), distoangulation of mandibular second premolar, infraocclusion of deciduous molars, delayed tooth development and supernumerary teeth (in addition to mesiodens).

Diagnosis of palatally displaced maxillary canines followed the radiographic parameters suggested by Lindauer et al[22] confirmed by the interpretation of periapical radiographs by the tube shift method of object localization using two projections with significantly different x-ray tube angulations. Considering the findings of Ericson and Kurol[23] in which the attempt to determine the eruption path of maxillary canines radiographically is generally of little value in children under 10 years old, those subjects whose only diagnostic records were from an age under 10 years were excluded from the sample when evaluating palatally displaced canines. Diagnosis of distoangulation of mandibular second premolars followed the criteria described by Shalish et al[24] using the lower edge

Table 1 - Prevalence of mesiodens reported in previous studies and in our study sample.

Author	Number of subjects analyzed	Age range	Method	Origin of the sample	Prevalence of mesiodens
Montenegro et al[1]	36,057	5 to 56y	Analysis of patient's file	Unidad Ambulatoria de Cirurgía Bucal (Spain)	0.15%
Gündüz et al[14]	23,000	4 to 14y	Radiographic	Ondokuz Mayis University (Turkey)	0.3%
Buenviaje and Rapp[15]	2,439	2 to 20y	Radiographic	University of Pittsburgh (USA)	0.4%
Järvinen and Lehtinen[16]	1,141	3 to 4y	Clinical	University of Kuopio/ Public Health Centre (Finland)	0.4%
Tyrologou et al[9]	11,500	3 to 15y	Clinical and radiographic	Department of Paediatric Dentistry – Institute for Postgraduate Education (Sweden)	0.8%
Hurlen and Humerfelt[17]	63,029	9 m to 80y	Clinical and radiographic	University of Oslo (Norway)	1.4%
Salcido-García et al[18]	2,241	2 to 55y	Radiographic	Facultad de Odontología UNAM (Mexico)	1.6%
Kaller[6]	3,523	4 to 18y	Clinical and radiographic	Los Barrios Community Clinic – Hispanic area of Dallas (USA)	2.2%
Huang et al[5]	543	2.5 to 7y	Clinical and radiographic	Chang Gung Memorial Hospital (China)	7.8%
Present study	**1,995**	**4 to 13y**	**Radiographic**	**Universidade de São Paulo (Brazil)**	**1.5%**

of the mandible as a base line. The maxillary lateral incisor was considered as presenting microdontia when the maximal mesiodistal crown diameter was smaller than that of the opposing mandibular lateral incisor in the same patient.[19] This category also included conical maxillary lateral incisors.

The prevalence of dental anomalies in the sample was compared with reference values for the general population by means of the chi-square test (χ^2), with the significance level set at 5% ($P < 0.05$). The odds ratio (OR) was calculated with 95% of confidence intervals to measure the strength of associations between supernumerary mesiodens and the presence of other dental anomalies.

RESULTS

The prevalence rate of mesiodens in the sample corresponded to 1.5% with a male-female ratio of 1.5:1 (Tables 1 and 2). Among the affected patients, 80% had only one mesiodens and 20% had two mesiodens (Table 3). Three out of four mesiodens were unerupted and in an upright position (facing the oral cavity), and more than 80% had extraction indication (Table 5). The most common complications related to mesiodens included delayed eruption of maxillary central incisors and midline diastema (Table 5). No association was found between mesiodens and other dental anomalies, except for maxillary lateral incisor agenesis (Tables 6).

DISCUSSION

This study retrospectively assessed the complete orthodontic records of 1,995 patients who presented deciduous or mixed dentition at orthodontic treatment onset. A total of 36 mesiodens were diagnosed in 30 patients (average of 1.2 mesiodens per patient), corresponding to 1.5% of the overall sample. This prevalence was similar to that described in studies by Hurlen and Humerfelt[17] (1.4%) and Salcido-García et al[18] (1.6%), and is very close to the mean frequency observed for the prevalence values compiled in Table 1 (1.67%).

With regard to sex distribution, mesiodens was more common among males, with a male to female proportion of 1.5:1 (Table 2), which corroborates previous reports.[5-10,14] A retrospective study carried out in India,[8] on a sample of 30 patients with mesiodens, found the same male to female proportion of 1.5:1, whereas a proportion of 2:1,[9] 2.5:1[5] and even 4:1[7] male-female proportions have been described in other studies. Sexual differences in the prevalence of mesiodens disagreed with what has been found for tooth agenesis. Tooth agenesis is more frequent among females, at an approximate proportion of 2:1.[19,25]

Table 2 - Gender distribution of the sample comprised of children with mesiodens.

Sex	Number of individuals	%
Male	18	60
Female	12	40
Total	30	100

Table 3 - Number of mesiodens per patient in the sample.

Number of mesiodens	Number of individuals	%
1	24	80
2	6	20
Total	30	100

Table 4 - Eruption condition, position and treatment planning for mesiodens in the sample.

Eruption condition	Number of mesiodens	%
Unerupted	27	75
Erupted	9	25
Total	36	100
Position	**Number of mesiodens**	**%**
Normal	27	75
Inverted	5	13.9
Horizontal	4	11.1
Total	36	100
Treatment	**Number of mesiodens**	**%**
Extraction	31	86.1
Follow-up	5	13.9
Total	36	100

Table 5 - Complications associated with mesiodens in the sample.

Complications	Number of cases (%)
Delayed eruption of maxillary permanent incisors	12 (34.28%)
Midline diastema	10 (28.57%)
Rotation or axial inclination of erupted permanent incisors	6 (17.14%)
Resorption of teeth adjacent to mesiodens	1 (2.85%)
Root anomaly	2 (5.57%)
None (asymptomatic)	4 (11.42%)
Total	35 (100%)

A single mesiodens was found in 80% of the sample, whereas the remaining 20% presented two mesiodens (Table 3). A very similar proportion was described in a clinical and radiographic study involving 90 patients and 113 mesiodens,[10] in which the majority of patients (78%) had a single mesiodens while the remaining patients had two. Kim and Lee[7] described a similar tendency with 75% of patients exhibiting only one mesiodens and 25% exhibiting two mesiodens. A patient with three mesiodens was described in a retrospective study involving Japanese children.[3]

Among the 36 mesiodens in the sample, 27 (75%) were unerupted while nine (25%) had erupted in the oral cavity (Table 4). Studies are unanimous in demonstrating that the majority of mesiodens remains impacted[6,8-10,14,18] and are often discovered only in routine radiographs requested for other reasons.[9] Mesiodens may also be identified in radiographs requested for follow-up of maxillary incisors trauma or due to delayed eruption of maxillary permanent incisors. These factors are the most common causes of mesiodens diagnosis.[9]

A mesiodens is most often in an upright position with the crown facing the oral cavity (normal position), but mesiodens can be found in inverted or even in a horizontal position.[4,5,9,14] In the present sample, the normal position (vertical, with the crown positioned towards the oral cavity) was found in 75% of the cases, followed by the inverted and horizontal positions (Table 4), which is in agreement with the literature.[4,9,14] These results, however, diverge from a study carried out with Korean children, in which the most common direction was the upright position with the crown facing the nasal cavity (inverted) observed in 52% of the sample, followed by normal (38%) and horizontal (10%) positions.[7] This same tendency was found in a sample of 200 Japanese children with 256 mesiodens, in which the inverted position (67%) predominated over normal (27%) and horizontal (6%).[3]

The most common treatment planning for mesiodens is extraction.[4,7] The removal of mesiodens in the deciduous dentition is not generally recommended due to the risk of injuring the developing maxillary incisors as well as due to lack of patient

Table 6 - Prevalence of dental anomalies in the sample compared with reference values.

Dental Anomaly	Prevalence rate in the sample	n	Reference values	n	χ^2	P	Odds Ratio	Confidence interval	
Tooth agenesis (excluding third molars)	10.00%	3/30	5.00% Grahnen[27]	53/1064	1.51	0.219	2.12	0.62	7.21
Mandibular second premolar agenesis	3.33%	1/30	3.00% Polder et al[25]	1479/48274	0.01	0.932	1.09	0.15	8.01
Maxillary second premolar agenesis	3.33%	1/30	1.50% Polder et al[25]	722/48274	0.69	0.407	2.27	0.31	16.70
Maxillary lateral incisor agenesis	10.00%	3/30	1.90% Le Bot and Salmon[28]	109/5738	**10.28**	**0.001**	**5.74**	1.71	19.20
Small maxillary lateral incisor	3.33%	1/30	4.70% Baccetti[21]	47/1000	0.12	0.726	0.70	0.09	5.24
Mandibular second premolar distoangulation	3.33%	1/30	0.19% Matteson et al[29]	52/26264	**14.64**	**<0.001**	**17.38**	2.32	129.99
Palatally displaced canines (PDC)	3.33%	1/30	1.70% Dachi and Howell[30]	25/1450	0.44	0.507	1.97	0.26	15.00
Supernumerary teeth	10.00%	3/30	3.90% Baccetti[21]	39/1000	2.77	0.096	2.74	0.80	9.41

cooperation during this stage.[4,9] Thus, the clinical and radiographic follow-up can also be indicated in cases in which the mesiodens is not causing a malocclusion or will not interfere in the orthodontic treatment.[9,14] In the present study, 86.1% of the mesiodens were surgically removed right after diagnosis, whereas the remaining 13.5% were followed-up radiographically due to the absence of any interference in the dental development (Table 4).

The main complications associated with mesiodens were: delayed eruption of permanent incisors (34.28%), midline diastema (28.57%) and rotation or axial inclination of permanent incisors (17.14%). Other local disorders were also associated with the presence of mesiodens as shown in Table 5. Similar findings have been previously reported.[7,9,14]

Regarding the presence of other dental anomalies associated with mesiodens, 22 patients (73.3% of the sample) did not exhibit any associated dental anomaly.

The other eight patients (26.7%) exhibited 12 associated dental anomalies including microdontia of maxillary lateral incisors, other supernumerary teeth, delayed development of second premolars, distoangulation of mandibular second premolars and tooth agenesis (Table 6).

The statistical analyses revealed that patients with mesiodens did not have an increased prevalence of permanent tooth agenesis in general or microdontia of the maxillary lateral incisors (Table 6). However, the prevalence of agenesis of maxillary permanent lateral incisors was approximately five times higher in the sample when compared with the general population. This uncommon association between a supernumerary mesiodens and the agenesis of maxillary lateral incisor has been described in a case report previously published and the interpretation of the authors regarding this association was a possible transposition between a malformed lateral incisor and the central incisor.[26]

One patient (3.3%) in the sample exhibited distal angulation of the mandibular second premolars. Due to the small prevalence of this anomaly in the general population (0.19%), this result was considered statistically significant (Table 6). However, considering the small size of the sample, this result could have randomly occurred and should be interpreted with caution. Larger samples are needed to confirm such association.

Ectopic eruption of maxillary canines was diagnosed in one patient. However, since the patient was eight years old and the diagnosis of ectopia in panoramic radiographs is more reliable among patients over the age of 10,[23] this anomaly was not considered.

CONCLUSION

1. The prevalence of mesiodens in the deciduous and mixed dentition corresponded to 1.5%, with a male to female proportion of 1.5:1.
2. Mesiodens was associated with local disorders, such as maxillary incisor rotation, delayed eruption or impaction of maxillary incisors, midline diastema, permanent incisor root resorption and dilaceration.
3. Mesiodens was associated with other dental anomalies in 26.7% of the sample.
4. The prevalence of maxillary lateral incisor agenesis was higher in children with mesiodens in comparison to the general population.

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