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Mesiodens: narrative review and management of two supernumerary teeth in a pediatric patient

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ABSTRACT

Aim Supernumerary teeth are a developmental anomaly defined as the excess number of dentitions. This review aimed to analyze the estimated prevalence of mesiodens through the data present in the literature, with the following presentation of a case in a pediatric patient managed by a surgical approach.
Material and Methods A literature search was conducted through three databases PubMed/MEDLINE, the COCHRANE and Google Scholar library databases, and gray literature.
Results Fouty-four articles were included as they were compatible with the inclusion criteria. A statistical analysis of the results was carried out. Analyzing the results, we reported a prevalence of mesiodens at 1.12%, with a male/female ratio of 2.07 in favour of the male population.
Conclusions An early diagnosis and a minimally invasive therapeutic approach are crucial to achieving clinical success. The objective should aim to minimize future complications and improve the prognosis.

INTRODUCTION

Supernumerary teeth are a developmental anomaly in the excess number of teeth that can develop in dental arches (1). In particular, mesiodens represent the most frequent type of supernumerary teeth and generally develop in the anterior maxillary area (2). Furthermore, they can develop unilaterally or bilaterally, and familiarity appears to be a predisposing factor (3). The mesiodens prevalence reported in the literature varies between 0.3% and 0.8% in deciduous dentition and between 0.1% and 3.8% in permanent dentition. The reported male/female ratio is 2:1(4). The variability of these data is due to the different survey methods used in the various studies.
In most cases, a clinical evaluation is not sufficient to observe mesiodens. Therefore, radiographic examinations are the most useful tool for diagnosing mesiodens. Findings are usually incidental on radiographs taken for other diagnostic purposes. Periapical, occlusal, and panoramic radiographs are widely used to have an initial diagnostic picture (5). An outstanding radiographic investigation that can increase precision and simplify the clinician's diagnostic phase is cone beam computed tomography (CBCT). Specifically, it can provide data regarding the three-dimensional relationship between the mesiodens and adjacent teeth and surrounding anatomical structures (6).
Mesiodens have heterogeneous shapes, but the most common types are conical or peg-shaped, tubercular, and supplementary (with a structure similar to a fully formed tooth) (3,7).
The eruptive process of the mesiodens is highly variable; in fact, they can erupt normally, remain impacted, or erupt in an inverted manner. Mesiodens are reported in ectopic position, and the eruptive form is more prevalent in the primary dentition (8). It is probable, but with a much lower percentage, that the mesiodens erupt in multiple ways and, in cases where they do not erupt in the arch, they interfere with the eruption of the other permanent teeth, predisposing the patient to a malocclusion (9).
The etiology of mesiodens is yet to be clarified, but some etiopathogenetic hypotheses have been advanced (10). A correlation between some genes and mesiodens has been hypothesized. Some genes could affect the risk of dental anomalies, and in particular, when mesiodens occur in syndromic patients, the genetic basis could play a fundamental role (11) (12). A genetic aspect has also been observed that suggests heredity as a possible etiological factor associated with the influence of environmental factors that can influence genetic susceptibility (13). Specifically, the possibility of transmission of an autosomal dominant trait with incomplete penetration has been observed. An inheritance linked to the X chromosome has been hypothesized, which could

explain the greater prevalence of mesiodens in males (14). The most accredited hypothesis from the pathogenetic point of view is the theory of the hyperactivity of the primitive dental lamina, which would lead to the formation of two buds from a single bud, one of which leads to the formation of the mesiodens (15).
Generally, the main complications that can occur following the formation of mesiodens include delayed eruption or impaction of perms, dentofacial disharmony with crowding or multiple diastemas. Moreover, abnormal root formation of perms, cystic lesions, infections, and tooth root reanalysis adjacent or even eruption of the incisors in the nasal cavity can occur. (16) Seddon et al. (17) estimated that the presence of supernumerary teeth could cause a delayed eruption in 26-52% of cases and displacement of adjacent teeth in 28-63% of cases. A close correlation was observed between dental anomalies in the primary and permanent dentitions, with a 50% association between the two dentitions (18). Early diagnosis is essential to minimize the possibility of complications. Some authors suggest the possibility of making a diagnosis starting as early as two years of age (18). Mesiodens should be questioned when there is asymmetry and excessive retention of the primary maxillary incisors or ectopic eruption of one or both permanent maxillary incisors (15). One of the main causes of the diagnostic delay of mesiodens may be attributable to the difficulty of detection by caregivers. It is, in fact, very common that primary mesiodens erupt and exfoliate normally before diagnosis and are confused with processes of budding or fusion anomalies (19).
On the other hand, in permanent dentition, the diagnosis is much simpler, but detecting supernumerary teeth requires a thorough clinical and radiographic examination. The 2D panoramic, maxillary occlusal, periapical radiographs and the 3D cone beam are important for a more in-depth second-level investigation (12).
This work aimed to analyze the estimated prevalence of mesiodens through the data present in the literature, with the following presentation of a case in a pediatric patient managed by a surgical approach.

MATERIALS AND METHODS

Research strategy and study selection

Three reviewers independently conducted a literature search (MP, AI, GS) through PubMed/MEDLINE, the COCHRANE and Google Scholar library databases, and gray literature. Moreover, using the following keywords combined by Boolean operators: mesiodens OR teeth supernumeraries OR mesiodens supernumerary AND prevalence OR epidemiology.
Citations acquired through the literature search were registered, any duplicates were eliminated using EndNote, and titles and abstracts were independently screened by three reviewers (MP, AI, GS). Available full texts meeting the inclusion and exclusion criteria described below were also independently screened for potentially eligible studies. Any conflicts between reviewers were resolved by discussion and consensus.

Inclusion criteria:
Source: studies published in the English language from January 1932 to 1 November 2022
Study design: case series, analytical observational studies.
Study Population: Subjects with mesiodens (no age or gender restrictions)
Analyzed data: prevalence of mesiodens in a specific sample
Sample size: > 20 patients

Exclusion criteria:
Source: Studies published before January 1932.
Study intervention: unspecified prevalence of mesiodens either as a percentage or in absolute terms.
Sample size: < 20 patients.
No attempt was made to contact the Authors due to missing information or the unavailability of the full text.
In disagreement, the majority assessment (two out of three reviewers) was considered.
The search and selection of studies were conducted for the gray literature, as already described.

Data Extraction

An eight-question data extraction form was currently used by three independent reviewers (AI, GS, MP) to record for each of the included studies: source, study design, sample size, male/female ratio, percent of mesiodens, the absolute number of mesiodens in the sample of each study, number of patients with mesiodens in each study, age of patients included in the study. All papers were cataloged and tabulated by author, year, sample size, group age, number and percentage of supernumerary teeth, and male/female ratio (Table 1).

Quality assessment

The included studies were assessed for quality using the ROBINS-I (Risk Of Bias In Non-randomised Studies of Interventions) tool.

RESULTS

Study selection

From an initial search, 680 articles relating to the keywords entered were selected. Of these, 180 were excluded as duplicates or full-text not available. Of the remaining articles, 126 were considered eligible, but 82 were excluded because, following the full-text analysis, they were case reports of mesiodens or not epidemiological studies. At the end of the screening, 44 were considered eligible for the qualitative analysis (Fig. 1).

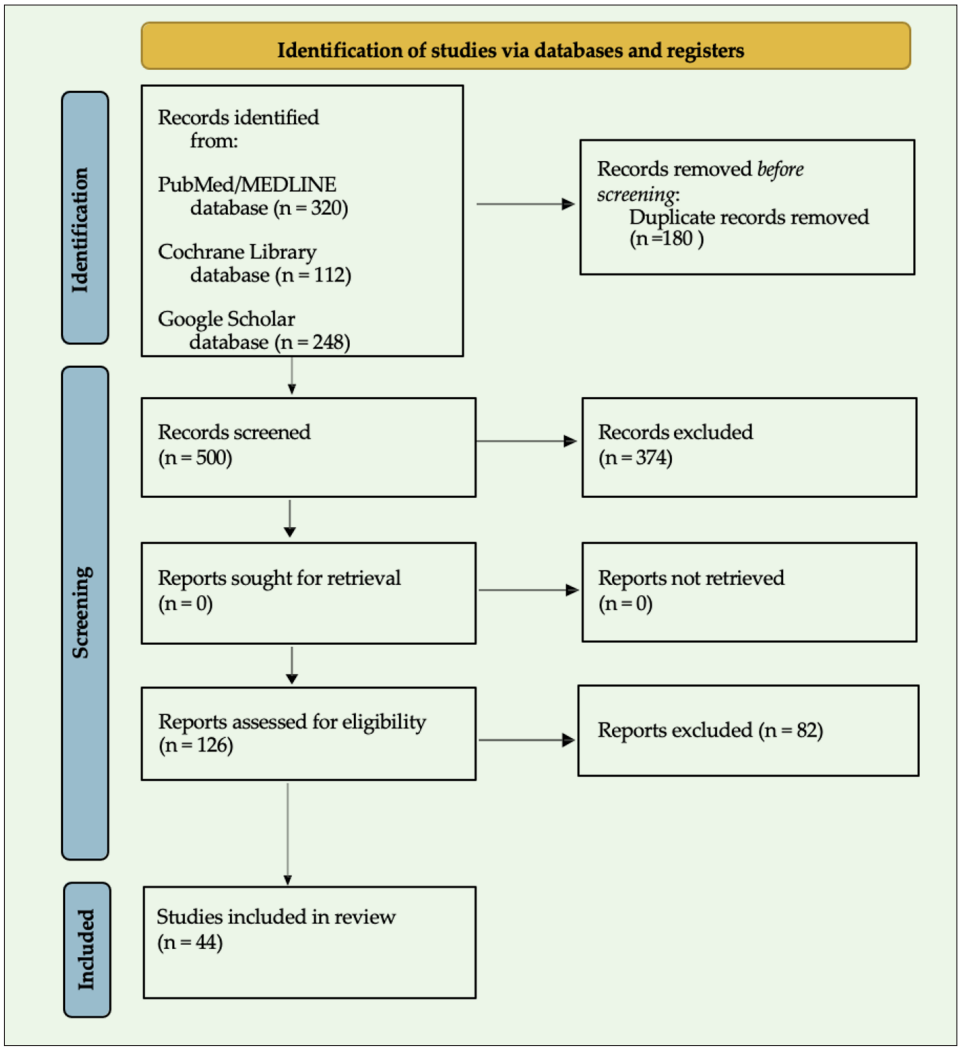

FIG 1
Study selection flowchart

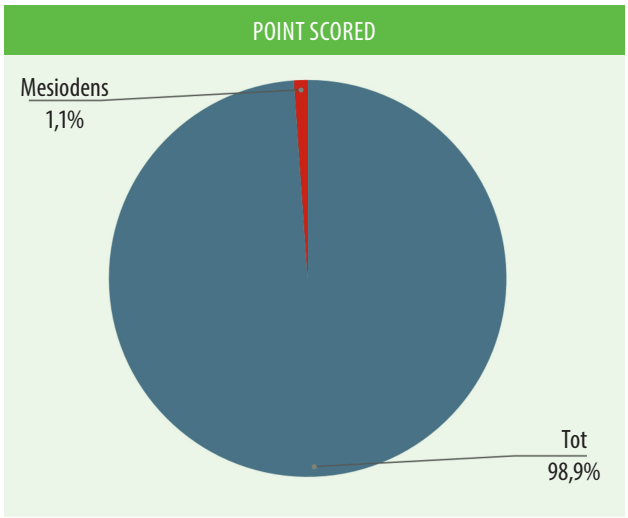

FIG 2 The prevalence of mesiodens.

Characteristics of the studies and summary of the reported results

Forty-four epidemiological studies and case series meeting the eligibility criteria were included in the present systematic review and detailed in Table 1; currently, no clinical trials have been retrieved.

The prevalence of mesiodens in the present study was 1.12% (Fig. 2), and the average male/female ratio is 2.07 in favor of the male population. The subjects of the total population sample reported in the literature range in age from 1 to 98 years.

CASE REPORT

A 9-year-old female patient, M.A., was presented for a dental visit, complaining of transient pain sensations in the area of the maxillary incisors. Upon clinical examination, a cone-shaped crown was evident on the palatal side of the upper central incisors. Based on the location of the supernumerary tooth, after the parents signed informed consent, it was decided to proceed by requesting a second-level CBCT 3D radiographic diagnostic examination. The examination was carried out to analyze the relation-

Author	(year)	Size of Sample	Age group	Hyperdontia / N/%	Number of teeth	Male/ Female ratio*
(20)	1932	48550	all	198 0.41%	246	-
(21)	1943	2835	4-14	0,52%	-	1.03
(22)	1955	2209	2-6	0.25%	-	-
(23)	1956	3557	3-12	1.9%	-	0.89
(24)	1961	1173	3-5	0.3%	-	1.08
(25)	1967	1558	1-9	32 2.5%	36	1.4
(26)	1971	1500	3-12.5	23 1.5%	28	1
(27)	1971	4564	3-3.5	22 0.48%	26	1
(28)	1973	1530	6-13	13 0.85%	13	2.3
(29)	1973	6398	7-13	77 1.2%	-	-
(30)	1978	21609	all	344 0.02%	422	1.7
(31)	1980	28000	6-14	29 0.01%	39	-
(32)	1981	1141	3-4	0.04%	-	-
(10)	1981	-	-	- 0.15-0.19%	-	-
(33)	1984	2043	6,9,12	25 1.2%	32	1.7
(19)	1985	11500	1-80	- 1.4%	-	2.3
(34)	1984	2439	2-20	- 0.4%	-	-
(35)	1984	5000	17-26	68 1.36%	-	All men
(36)	1984	-	6-9.5	204 -	274	5.4
(37)	1992	543	2.5-7	39 7.8%	50	2.55
(38)	1992	90	10-70	- -	113	2.6
(39)	1998	3523	4-18	- 2.2%	-	-
(40)	2000	8122	3-6	4 0.05%	-	-
(41)	2000	30	-	- -	-	1.5
(42)	2001	739	7	14 1.9%	-	0.27
(43)	2001	1875	6-18	1.92%	-	-
(44)	2001	-	-	- 0.09-0.64%	-	-
(45)	2004	2241	2-55	103 -	-	-
(46)	2004	24	children	34 -	-	3
(9)	2004	200	3-84	256 -	-	2.8
(47)	2005	11500	3-15	- 0.8%	-	-
(2)	2006	1577	6-10	-	-	2

Author	(year)	Size of Sample	Age group	Hyperdontia / N/%	Number of teeth	Male/ Female ratio*
(48)	2008	23000	4-14	69 0.3%	85	2.1
(3)	2006	36057	5 - 56	- 0.15%	-	-
(49)	2010	2500	3-12	25 1%	27	1.7
(50)	2011	7932	children	- 0.8%	-	1.78
(51)	2011	3351	8-16	10 0.3%	12	1.5
(4)	2013	11256	15-55	15 0.13%	15	4.36
(52)	2013	4133	4-15	57 1.4%	-	1.8
(53)	2018	58142	6-14	59 0.1%	83	2.3
(54)	2018	50	7-61	50	65	2.8
(55)	2019	14400	4-14	71 -	82	2.2
(56)	2021	48700	1-98	606 1,2%	757	2.94
(57)	2022	960	-	41 4,27%	-	-

TABLE 1. Included study characteristics: Author, year, sample size, study participants' age, number of teeth, and gender ratio; IR indication(s), outcomes and follow-up

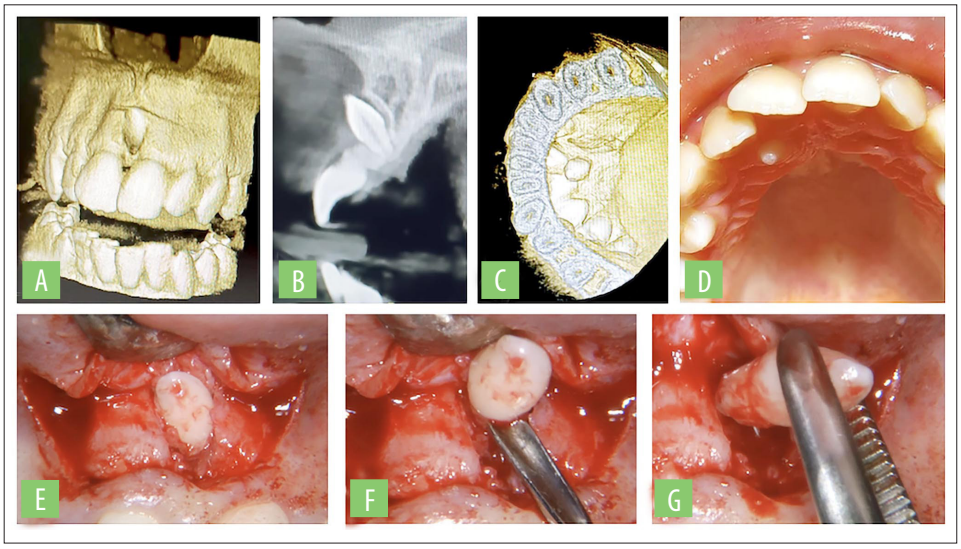

FIG. 3 3A, 3B: CBCT showing the buccal mesiodens between the maxillary central incisors. 3C: CBCT showing the palatal mesiodens 3D: Picture of the palatal mesiodens. 3E, 3F, 3G: some pictures during the surgery, extraction of the buccal mesiodens

ships of the supernumerary tooth with the adjacent structures and with the adjacent teeth. Clinical examination reveals a second supernumerary dental element, with a conical shape, in a horizontal position located at the level of the middle thirds of the maxillary central incisors. The diagnosis was established as two mesiodens present in the maxillary arch in the frontal area (Fig. 3). The operation was done for the removal of the two mesiodens to avoid problems of an orthodontic-pathological type affecting the contiguous teeth.

After delivering the anesthesia, the palatal mesiodens were first removed using an elevator. Then a suture was performed with a 4.0 monofilament. Then, a palatal-thick marginal vestibular flap was performed to highlight the vestibular mesiodens. Next, using the operating microscope and piezosurgery, the peripheral bone to the mesiodens crown was removed conservatively, avoiding damage to the adjacent teeth. Subsequently, using a small elevator, it was possible to remove the mesiodens without damaging the adjacent teeth. A 5.0 monofilament interrupted suture followed the last step.

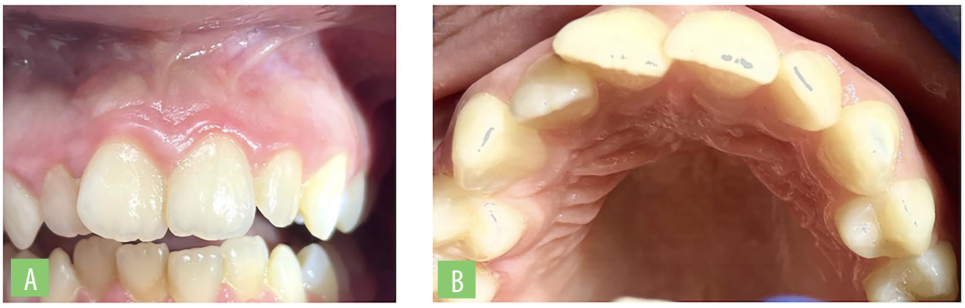

FIG. 4
4A: buccal view three months follow-up showing complete healing; 4B: palatal view three months follow-up showing healthy palatal tissue at the surgery site

Finally, the clinical follow-up at 2 months, shows a good healing without surgical scar, and most importantly, the two central incisors respond positively to the vitality test (Fig. 4).

DISCUSSION

Mesiodens are considered the most common dental anomaly affecting permanent dentition and less frequently the primary dentition (8).
Analyzing the results, we reported a prevalence of mesiodens at 1.12%. According to our findings, the prevalence of mesiodens varies between 0.09% and 2.05% in different studies (58). Kara et al. found a prevalence of mesiodens at 0.27% in a multicenter study involving 35,108 patients (59). Lara et al reported a prevalence rate of mesiodens in the sample corresponded to 1.5% with a male-female ratio of 1.5:1, among the affected patients, 80% had only one mesiodens and 20% had two mesiodens (60).
The discovery of these findings usually occurs following an objective examination of the oral cavity or a routine radiographic examination, or one requested due to an upper incisor's failure/altered eruption (54, 61). Complications may include the delayed eruption of the adjacent tooth (usually central incisors), persistent midline diastema, root resorption of adjacent teeth, cyst formation, eruption into the nasal cavity, persistent rhinosinusitis, and pain (57, 62). According to Nagaveni, mesiodens may occur as an isolated finding or can be associated with other odontogenic anomalies (63).
Furthermore, in the literature, the most frequent complication of the presence of supernumerary teeth is the malposition of the teeth of the patient's normal dentition, which can lead to clinical consequences of orthodontic or surgical interest (64).
For the correct management of the case, it is essential to enumerate and identify the teeth present clinically and radiographically before a definitive diagnosis and formulating a treatment plan (65). Two-dimensional but, above all, three-dimensional radiographic examinations play a role of fundamental importance, as seen in the reported clinical case, in the exclusion or, on the contrary, in the discovery of impacted supernumerary teeth. Moreover, radiography played a crucial role in analyzing their relationship with the roots of adjacent teeth or with anatomical structures of interest (66-68). In the presented clinical case, the three-dimensional cone beam computer tomography radiographic examination allowed an accurate diagnosis relating to the positioning of the impacted supernumerary and the consequent minimally invasive management of the surgical phases of the avulsion in order to maintain the vitality of the contiguous elements, facilitate the postoperative course and avoid aesthetic problems during the healing phase (4).
Certainly, the mesiodens' localization and pathological processes affecting the teeth of the patient's normal dentition and age are determining factors (69-72). Furthermore, they must guide the clinician in the therapeutic choice (12).
According to various authors, in the event that the supernumeraries are correctly placed in the arch, as they do not cause any occlusal, functional, or aesthetic problems, one could opt not to implement any therapy, leaving the mesiodens in situ (55). An approach that can also be adapted for impacted teeth that cause local or general disturbances to the patient, limiting themselves to periodic radiographic checks and postponing (52). For example, the surgical removal of the mesiodens waiting for the growth of the pediatric patient, thus avoiding possible damage to germs in the mixed dentition of the perms during the surgical phases (51). In brief, according to other authors, a delayed approach would complicate the patient's rehabilitation or orthodontic treatment.

CONCLUSIONS

From the studies analyzed, it emerged that the prevalence of mesiodens was 1.12%. This anomaly occurs more frequently in males, with a ratio of 2.07. An early diagnosis and a minimally invasive therapeutic approach are crucial to achieving clinical success. The objective must be to minimize future complications and improve the prognosis. This goal was possible in the reported clinical case owing to modern approaches and new technologies such as the operating microscope and piezosurgery and the appropriate use of three-dimensional radiographic investigations.

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