

Diagnosis and Management of Supernumerary (Mesiodens): A Review of the Literature

G. Meighani¹, A. Pakdaman^{2, 3}✉

¹Assistant Professor, Department of Pediatric Dentistry, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

²Assistant Professor, Dental Research Center, Tehran University of Medical Sciences, Tehran, Iran

³Assistant Professor, Department of Community Oral Health, Faculty of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

Abstract:

Supernumerary tooth is one of the developmental problems in children. Mesiodens is a supernumerary tooth present in the midline between the two central incisors. It usually results in oral problems such as malocclusion, food impaction, poor aesthetics, and cyst formation. The prevalence of mesiodens varies between 0.09% and 2.05% in different studies. This paper reviews current literature on etiology, prevalence, diagnosis, and management of this problem. Accordingly, early diagnosis and treatment is suggested to prevent orthodontic and pathologic complications.

Key Words: Tooth, Supernumerary; Child; Review; Diagnosis; Disease Management

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✉ Corresponding author:
A. Pakdaman, Department of
Community Oral Health, Faculty
of Dentistry, Tehran University
of Medical Sciences, Tehran,
Iran.
pakdaman@sina.tums.ac.ir

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INTRODUCTION

By definition, supernumerary teeth are extra teeth in comparison to normal dentition. It is more common in the central region of the upper or lower jaw; however, its occurrence in the mandible is rare. The most common type of supernumerary tooth as indicated by Alberti et al [1] is mesiodens. Mesiodens may occur as single, multiple, unilateral or bilateral. The presence of multiple supernumerary teeth is called 'mesiodentes' [2]. In some syndromes, mesiodens may present as a part of the symptoms; however, this condition might be seen in normal individuals. It seems that positive family history is one of the predisposing factors [3].

Prevalence

It is important for dentists as well as anthropologists, geneticists and other health professionals to know the prevalence of dental anomalies in different communities. A few epidemiological studies have been conducted and there is considerable variation between their findings. The reported prevalence in general population ranges between 0.15% and 1.9% and it is reported to be more common in males rather than females [4].

Variations due to differences in demographic and environmental susceptibilities may have impact on the reported prevalence. It has been reported that in a study carried out on 9-year-old children in Italy, the prevalence of this defect has increased from 0.64 to 1.06 in recent years [1].

The occurrence of mesiodens in primary dentition is quite rare despite the fact that in permanent dentition it has even been considered as the most common dental abnormality [5]. It has been reported that in 82% of the cases it occurs in the maxilla, specifically in the premaxillary region [6]. Only a few studies have

reported the occurrence of mesiodens in the anterior region of the mandible. In permanent dentition, a 0.15 to 3.8% incidence of mesiodens has been reported, with a two-fold risk of occurrence in the male population compared to the female population [5].

Morphologically, mesiodens may have heterogeneous forms. Three common types; namely, conical or peg shaped, tuberculate and supplemental (tooth like) have been reported, of which the conical form is the most common type [2,3,7].

In some subjects, mesiodens erupt normally, but usually they remain impacted or erupt in an inverted position. It is also probable that these teeth follow an abnormal path of eruption or even take an ectopic position. Ray reported erupted primary supernumerary teeth in a 4-year-old child. It seems that the erupted form is more prevalent in deciduous dentition [5]. It is less probable for mesiodens to erupt if it occurs in multiples [8]. In one fourth of the cases, mesiodentes do spontaneously erupt into the oral cavity. In the cases that have not erupted, they interfere with eruption of the other permanent teeth causing malocclusion [9].

Evidence suggests that a higher frequency of dental anomalies is more likely in some races. In primary dentition, the review of the literature by Miyoshi showed that the prevalence of supernumerary teeth in primary dentition varies between 0.05 and 0.64 in different populations. In this review, the prevalence of supernumerary teeth was reported as less as 0.05% in Japanese children to 0.64% in Canadian pupils [10].

The prevalence of supernumerary teeth in permanent dentition for the Caucasian general population has been reported between 0.1 and 3.8% [11]. The estimated prevalence in the sub-Saharan Africa and Asian population is reported between 2.7 and 3.4% [12]. The general prevalence of mesiodens in Iranian children was found 1.6% as reported by Mieghani

[13]. In this study, the prevalence of mesiodens was higher in the male population in comparison with the female population [13].

Gender difference was also reported in some other studies. Rajab and Hamdan [11] reported a sex ratio of 2.2:1 in the study population of Jordanian children. In this study, it has been shown that the male population was more likely to be affected than the female [11]. A higher ratio of 6.5:1 was also reported by Davis of the occurrence of supernumerary teeth in Hong Kong children [14]. The occurrence of supernumerary teeth in permanent dentition is twice in males compared to females; however, no significant gender distribution has been reported in primary dentition. In the Caucasian population, gender difference has also been reported in favor of males. Mighani [13] reported the sex ratio of 5:1 in favor of males in the Iranian population.

Reported prevalence in different studies and male/female ratios have been summarized in Table 1. The prevalence of mesiodens varies between 0.09 and 2.05% in different studies. Different results may be a result of different study settings (Table 1) [1,8-10,19-37].

Etiology

The first documented report of supernumerary teeth has been found in ancient human skeletal remains since the Lower Pleistocene era [38]. Until recently, the most primitive evidence of the presence of mesiodens goes back to 13000 years ago when it was found among the remains of an Australian aboriginal [39]. It has also documented the presence of an inverted mesiodens erupted into the nasal cavity in the archeological remains that was found during the 7th century in Germany [39].

The etiology of mesiodens remains unclear; however, a few theories have been suggested [8]. It may be seen as an isolated finding or as part of a syndrome, specially cleft lip and palate, cleidocranial dysostosis and Gardner's syndrome [11].

A genetic basis for supernumerary teeth was suggested considering observation of a higher rate of hyperdontia among related families [40]. Current research shows that some genes might change the risk of occurrence of dental anomalies, each expressed differently. In some syndromes, such as cleidocranial dysostosis and Gardner's syndrome, when mesiodens occurs as part of its symptoms, the genetic basis might play an important role [41]. The observation that supernumeraries are more common in family members suggests heredity as an etiologic factor; however, it does not follow a simple Mendelian pattern. It has been suggested that environmental factors might have influence on genetic susceptibility [42].

The possibility of genetic transmission via an autosomal dominant trait with lack of penetration has been observed and an X-linked inheritance has even been documented which can explain sex dominance in this anomaly [43]. It has also been mentioned that environmental factors might play a role in the occurrence of mesiodens as well as splitting of the tooth bud or the dichotomy theory. According to the dichotomy theory, Taylor argued that splitting of the tooth bud into two equal or unequal sections may either form two equal sized teeth or one normal and one dysmorphic tooth [11]. The hyperactivity theory, which is the restricted increase in the activity of dental lamina, may be considered as the most acceptable

Table 1. Reported prevalence of mesiodens in studies employing radiographic survey in primary, mixed, and young permanent dentition.

Author	(year)	Size of Sample	Age group	Hyperdontia		Number of teeth	Male/Female ratio*
				N	%		
Stafne	(1932)	48550	all	198	0.41	246	—
Byrd	(1943)	2835	4-14	—	0.52	—	1.03
Menczer	(1955)	2209	2-6	—	0.25	—	—
Clayton	(1956)	3557	3-12	—	1.9	—	0.89
Grahnen & Granath	(1961)	1173	3-5	—	0.3	—	1.08
Randle	(1967)	1558	1-9	32	2.05	36	1.4
Mc Kibben	(1971)	1500	3-12.5	23	1.5	28	1
Ravn	(1971)	4564	3-3.5	22	0.48	26	1
Ravn & Neilsen	(1973)	1530	6-13	13	0.85	13	2.3
Thilander & Myrberget	(1973)	6398	7-13	77	1.2	—	—
Jarvinen	(1981)	1141	3-4	—	0.4	—	—
Bodin	(1978)	21609	all	344	0.02	422	1.7
Heling	(1980)	28000	6-14	29	0.00	39	—
Jarvinen	(1981)	1141	3-4	—	0.4	—	—
Primosch	(1981)	—	—	—	0.15-1.90	—	—
Hurlen & Humefelt	(1984)	2043	6,9,12	25	1.2	32	1.7
Grover & Lorton	(1984)	5000	17-26	68	1.36	—	all men
Tay	(1984)	—	6-9.5	204	—	274	5.4
Huang	(1992)	543	2.5-7	39	7.8	50	2.55
Miyoshi	(2000)	8122	3-6	4	0.05	—	—
Roychoudhury	(2000)	30	—	—	—	—	1.5
Backman	(2001)	739	7	14	1.9	—	0.27
Gábris K	(2001)	1875	6-18	—	1.92	—	—
Valmaseda	(2001)	—	—	—	0.09-0.64	—	—
Salcido	(2004)	2241	2-55	103	—	—	—
Ersin	(2004)	24	children	34	—	—	3
Asaumi JI	(2004)	200	3-84	256	—	—	2.8
Alberti G	(2006)	1577	6-10	—	—	—	2
Gündüz K	(2008)	23000	4-14	69	0.3	85	2.1

* without radiographic evaluation, — not reported, N= Number

etiologic factor in the development of mesiodens [11].

Complications

Various complications might occur as a result of the presence of mesiodens, including delayed eruption, crowding, spacing, impaction of permanent incisors, abnormal root formation, alteration in the path of eruption of permanent incisors, median diastema, cystic lesions, intraoral infection, rotation, root resorption of the adjacent teeth or even eruption of incisors in the nasal cavity [44].

Delay in the eruption of permanent teeth and displacements of permanent maxillary incisors are more common complications, while crowding, diastema, dilaceration of permanent teeth are less common. Occasionally, cyst formation may happen or the tooth might erupt into the nasal cavity. Seddon et al [47] reported that the presence of supernumerary teeth might cause delayed eruption in 26-52% of the cases and displacement or rotation of adjacent teeth in 28% to 63% of the cases. He also reported other complications such as resorption of the adjacent roots, crowding, development of dentigerous cysts, diastema, dilaceration, and ectopic eruption of permanent teeth into the nasal cavity [45].

In case of any alteration in the eruption path of the central incisors or even asymmetric eruption, the clinician must evaluate the possibility of an extra tooth. It is much easier to pick up dental anomalies in primary dentition during the routine dental check up. Moreover, a close correlation has been reported between dental anomalies in the primary and permanent dentition; presence of dental anomaly in primary dentition in 50% of the cases significantly affects permanent dentition [46].

Failure of Eruption

The presence of a supernumerary tooth is the most common cause for failure of eruption of maxillary incisors. It has been stated that the

tuberculate type of mesiodens more likely causes delay in eruption due to its position, which is mostly located palatally related to the maxillary incisors [47]. Bartolo et al [48] reported that 63% of patients with unerupted incisors had hyperdontia.

Displacement or Rotation

In some cases, displacement of the incisors is a common finding, which might delay its eruption. In Scheiner and Sampson's review [49], it has been mentioned that it is more probable that tuberculate types of mesiodens produce delayed eruption, and conical types often cause displacement of the adjacent tooth. It is important to check the presence of any supernumerary tooth prior to treatment of rotated incisor or diastema [50].

Crowding or Abnormal Diastema

Eruption of supernumerary teeth often causes crowding. A supernumerary lateral incisor may increase the crowding potential and may cause an aesthetic problem in the upper anterior region. Retained deciduous teeth and abnormal diastema have also been reported [11].

Root Abnormalities

Root resorption of the adjacent teeth due to the presence of supernumerary teeth may occur quite rarely [51]. Dilaceration is a developmental anomaly in the tooth shape and its structure, which may happen as sharp bending of the tooth in either the crown or the root portion. Loss of tooth vitality has been reported in rare conditions [52,53].

Cyst Formation

Asaumi et al [9] in an 11-year retrospective study reported that cyst formation due to supernumerary teeth was observed in 11% of the cases.

Eruption into the Nasal Cavity

Another complication reported to be asso-

ciated with mesiodens is ectopic eruption, even in the nasal cavity. Radiography in addition to clinical examination helps the clinician in the diagnosis. Clinically, a white mass may be seen in the nasal area, radiographically appearing as a tooth-like radiopacity [54].

Diagnosis

It is discussed in the literature that the sooner the diagnosis the better the prognosis. The clinician's knowledge of common anomalies and their location in the primary and mixed dentition will result in early diagnosis and may consequently prevent further complications. The diagnosis may be possible as early as age 2 and onwards as recommended by some authors [46]. In case of asymmetry, mesiodens should be suspected. It is also probable that over-retention of the maxillary primary incisors, especially if asymmetric or in case of significant ectopic eruption of one or both permanent maxillary incisors is due to the presence of mesiodens [11]. In primary dentition, mesiodens often have normal shape and erupt normally and this is the reason why these teeth are often overlooked. The other possible reason for the less frequent reporting of primary mesiodens might be the difficulty in its detection by the caregiver. It is common that anterior primary mesiodens erupts and exfoliates normally before detection and could be mistaken with gemination or fusion anomalies [55].

In permanent dentition, diagnosis is much easier following eruption of the permanent anterior teeth. However, in permanent dentition, detection of supernumeraries needs thorough clinical and radiographic examination. Panoramic, maxillary occlusal and periapical radiographs are recommended to assist the process of diagnosis of mesiodens. Although panoramic radiograph is the best screening tool, clarity in the midline region is still limited for the diagnosis of mesiodens. For precise view in the incisor region, anterior occlusal or periapical radiograph is also helpful. With parallax tech-

nique (horizontal tube shift technique), the bucco-lingual position of the unerupted mesiodens can be evaluated [54].

Tay et al [30] found most of the mesiodens erupted in an inverted position, but Liu believed most of the mesiodens erupted normally. It is possible that an unerupted mesiodens without significant effect on the adjacent teeth may be found during a routine radiographic check-up, but usually mesiodens are discovered when adjacent teeth are displaced or have delayed eruption [29,56].

Number and Location

Supernumerary teeth are usually single and unerupted. In 76-86% of the cases, single supernumeraries occur, while double supernumeraries occur in 12-23% and the incidence of multiple supernumeraries is less than 1% of all cases [57]. If positioned in the anterior location, more problems will be caused due to altered growth and development in the area. Impaction of the permanent incisors due to the presence of mesiodens is common. These teeth usually erupt spontaneously after extraction of the mesiodens [2,3].

Classification

The classification of supernumerary teeth is usually based on their morphology together with their location in the dental arches. According to the shape and size, two subclasses are considered in the classification of mesiodens; namely, eumorphic and dysmorphic. The eumorphic subclass is usually similar to a normal-sized central incisor, whereas the dysmorphic teeth have different shapes and sizes and are categorized into conical, tuberculate, supplemental and odontomes. Therefore, supernumerary teeth might vary from a normal tooth to a dysmorphic mass [4].

Management

Management of supernumerary teeth depends on the type and position of the tooth. Imme-

mediate removal of mesiodens is usually indicated in the following situations; inhibition or delay of eruption, displacement of the adjacent tooth, interference with orthodontic appliances, presence of pathologic condition, or spontaneous eruption of the supernumerary tooth. Munns [58] stated that the earlier the mesiodens is removed, the better the prognosis.

There are two methods for extraction of mesiodens; early extraction before root formation of the permanent incisors and late extraction after root formation of the permanent incisors [11]. Some authors recommend extraction of mesiodens in the early mixed dentition in order to facilitate spontaneous eruption and alignment of the incisors [59-61].

There is controversy in the literature regarding the time of removal of any unerupted mesiodens. The immediate removal versus delay in surgical intervention following root development of the central incisor and the lateral incisor about the age of eight to 10 years has been mentioned [62].

In order to promote eruption and proper alignment of adjacent teeth, it is recommended to extract mesiodens in the early mixed dentition, which may reduce the need for orthodontic treatment. It might take six months to three years for an unerupted tooth to erupt after removal of the mesiodens [58]. Henry and Post [63] suggested delayed extraction of the mesiodens about the age of 10 when the apex of the central incisor nearly forms. If treatment is postponed after this age, more complex surgical and orthodontic treatment may be necessary. The type and position of the unerupted tooth, the space available in the dental arch, in addition to the stage of root development may influence how long it takes for an impacted tooth to erupt after surgical removal of the mesiodens.

Garvey recommended monitoring of mesiodens in the following situations; satisfactory eruption of the succeeding teeth, absence of

any associated pathologic lesions and risk of damage to the vitality of the related teeth. It has also been recommended to keep unerupted symptomless mesiodens, which do not affect the dentition. These teeth, which are usually found by chance, are better left in place under observation [64].

Clinician should consider patient condition in the final decision, however a recent study of Yagüe-García et al [65] emphasized that the early removal of the supernumerary teeth in order to prevent complications is the treatment of choice.

CONCLUSION

Mesiodens as the most prevalent form of supernumerary teeth in permanent dentition is not a rare condition. Evidence regarding etiology of mesiodens indicates that genetic susceptibility together with environmental factors might increase the activity of dental lamina leading to formation of the extra tooth/teeth. Extraction of mesiodens in the early mixed dentition helps spontaneous alignment of the adjacent teeth; however, symptomless cases could be left untreated along with regular check up.

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