OVERVIEW OF MESIODENS –A REVIEW

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ABSTRACT

Mesiodens is the most common supernumerary tooth in the maxillary anterior region which occurs less frequently in the primary dentition. Many theories have been put forward to explain the occurrence of mesiodens but the most acceptable from all of them is the hyperactivity theory with genetic theory gaining popularity. There is a vast classification for mesiodens that is explained with the help of a flowchart and diagrams in this paper. The main classification is according to morphology. Diagnosis of mesiodens is best done by clinical and radiographic examination. Management of mesiodens can be done either by extraction or by retention and observation of mesiodens. Early extraction is the best treatment option as it may prevent further complications. This paper reviews about mesiodens with comprehensive classification, clinical diagnosis and its management.

KEY WORDS: impacted supernumerary, Mesiodens, supernumerary tooth, supplemental supernumerary tooth.

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INTRODUCTION

Supernumerary teeth is a developmental alteration in the number of teeth characterized by presence of additional teeth than the normal number. The prevalence of a supernumerary tooth varies between 0.15%-3.9 %. [1] A supernumerary tooth in the maxillary anterior incisor region is termed as “mesiodens”. The occurrence of mesiodens in mandibular region is rare. Multiple mesiodens are known as “mesiodentes”. It occurs in primary as well as permanent dentition with 5 times less frequency in the primary dentition. [2-4] 80% of all supernumerary teeth accounts for mesiodens with an overall prevalence of 0.15%-1.9%. [3-5] Mesiodens may occur as a single isolated tooth or may be associated with syndromes such as cleft lip or palate, downs syndrome, cleidocranial dysplasia, Gardner syndrome etc. It may erupt normally into the oral cavity or may remain unerupted i.e. impacted. Mesiodens may occur unilaterally or bilaterally. It can alter the occlusion and appearance by altering the path and position of the eruption of permanent central incisors. The best way to diagnose a mesiodens is by the combination of clinical and radiographic examination.

ETIOLOGY

The etiology of mesiodens is quite unclear but few theories have been put forward to understand its occurrence. [5] The originally postulated theory, ‘phylogenetic reversion’ also known as ‘atavism’ suggested that mesiodens represented a phylogenetic relic of extinct ancestors who had 3 central incisors, has been discarded by the embryologists. [6] Another theory known as the ‘dichotomy theory’ suggested that splitting of tooth bud in two equal or unequal sections may either form two equal sized teeth or one normal and one dysmorphic tooth. [3] It is believed that dichotomy represents complete germination and is mostly commonly found in maxillary anterior region. [7] The most accepted theory known as the ‘hyperactivity theory’ suggests that the induction of the remnants of dental lamina or palatal offshoots to develop into an extra tooth bud gives rise to a supernumerary tooth. [5] ‘Genetic theory’ has also been proposed to explain the cause of supernumerary teeth. In some syndromes such as cleidocranial dysostosis and Gardner syndrome where mesiodens occur as a part of its symptoms, genetics might play an important role. [8] Genetic theory suggests an X linked autosomal dominant pattern with incomplete penetration which explains the occurrence of anomaly twice as common in males than in females. [3] Occurrence of mesiodens in twins, sibling and sequential generations of a single family highlights heredity as an etiological factor that does not follow a simple Mendelian pattern. It is believed that environmental factor might have an influence on genetic susceptibility. [9]

CLASSIFICATION OF MESIODENS

Mesiodens can be classified according to occurrence, number, appearance, eruption pattern, orientation, position and morphology. According to occurrence it may occur as a single isolated tooth or may be associated with syndromes like Cleft lip and palate, Gardner syndrome, Down syndrome, Cleidocranial dysplasia. Etc. According to number it may be classified as single (Fig 1) or multiple (Fig 2). Presence of more than one mesiodens is known as ‘mesiodentes’. Mesiodens can also be classified according to their appearance. It may appear only on one side i.e. unilateral (Fig 3) or on both the sides i.e. bilateral.(Fig 4) [10,5] According to eruption pattern it may be fully erupted on both sides (Fig 5), partially erupted on both sides (Fig 6), fully unerupted i.e. impacted (fig 7) or may occur in a combination of the above(fig 8) According to the orientation it may be straight (Fig 9), inverted (Fig 7) or rotated (Fig 10). According to position it may be vertical or horizontal. [11, 12] The main classification is according to morphology. If mesiodens occur in permanent dentition, it is known as ‘dysmorphic mesiodens’ also known as ‘rudimentary mesiodens’. If it occurs in primary dentition it is known as ‘eumorphic mesiodens’(Fig 11) or ‘supplementary
mesiodens'. Eumorphic mesiodens are similar to natural teeth in size and shape, resembling a central incisor. Dysmorphic or rudimentary mesiodens on the other hand show abnormal shape and size. It can further be classified as conical (Fig 12), tuberculate (Fig 13) and molariform (Fig 14). Conical mesiodens is the most common type of mesiodens and mostly occur singly in the palatal region between two maxillary central incisors. Morphologically it is peg shaped with root formation at a stage ahead of or equal to the stage of root formation of central incisors. They mostly do erupt in the oral cavity and they tend to displace the erupting permanent central incisors. There is a chance that mesiodens don’t erupt in the oral cavity because it may be inverted with crown positioned more superiorly.

In such a case there is a possibility of conical mesiodens to erupt in the nasal cavity. Tuberculate mesiodens also known as multicusped mesiodens is more common in permanent dentition. They occur either unilaterally or bilaterally and commonly are associated with other supernumerary teeth. Morphologically it is barrel shaped with abnormal or incompletely developed roots. They occur more palatally and usually later than the conical mesiodens. Tuberculate mesiodens might erupt at times but mostly remain unerupted. They cause delayed eruption of permanent incisors. The rarest of all types is the molariform mesiodens. Morphologically the crown is premolar like with a root that is completely formed.
Figure 1
*Picture representing single mesiodens.*

Figure 2
*Picture representing multiple mesiodens.*
Figure 3
*Picture representing unilateral and straight mesiodens*

Figure 4
*Picture representing bilateral mesiodens.*
Figure 5
*Picture representing fully erupted mesiodens on both sides*

Figure 6
*Picture representing partially erupted mesiodens on both sides*
Figure 7
*Picture representing inverted and impacted mesiodens*

Figure 8
*Picture representing fully erupted mesiodens on one side and partially erupted on other side*
Figure 9
*Picture representing Straight mesiodens*

Figure 10
*Picture representing rotated mesiodens*
Figure 11
*Picture representing eumorphic mesiodens*

Figure 12
*Picture representing conical mesiodens*
**DIAGNOSIS**

Clinical and radiographic examination can help in the thorough diagnosis of mesiodens. Diagnosis of mesiodens is possible as early as the age of 2 and thereafter.\(^{20}\) Mesiodens can be suspected when the maxillary incisors show asymmetry in the erupting pattern. There can be asymmetrical over retention of the primary incisors or ectopic eruption of one or both the permanent maxillary incisors.\(^{5, \ 6, \ 21}\) Radiographs act as an important component in identifying mesiodens. The radiographs that are indicated to assist in the diagnosis of mesiodens are panoramic, maxillary occlusal.
and periapical radiographs. Panoramic radiograph apart from acting as an important screening aid also helps by providing added information about any other supernumerary teeth or congenitally missing teeth usually associated with the mesiodens. The demerit of using a panoramic radiograph is the clarity of the midline region that gives limited evidence of the mesiodens itself. The most useful radiograph in the diagnosis of the mesiodens are the periapical and maxillary occlusal radiographs. The erupting path i.e. normal, inverted or horizontal as well as the location of the impacted mesiodens i.e. labial, lingual ;superior, inferior can be identified on the periapical and maxillary occlusal radiograph by using the horizontal tube shift technique also known as parallax technique. [22, 23]

**MANAGEMENT OF MESIODENS**

Management of mesiodens depends on the developmental stage of dentition, type of mesiodens, its position and its eruption pattern i.e. erupted or unerupted. [24, 25] There are two ways by which mesiodens can be managed. It can either be extracted or retained and kept under observation.

**Extraction**

There are three methods of extraction; immediate extraction, early extraction i.e. before root formation of permanent incisors or late extraction i.e. after root formation of the permanent incisors [14]. Immediate extraction is indicated in situations such as delayed eruption of the primary or permanent teeth, displacement of adjacent teeth, any pathological condition, hindrance to orthodontic appliance or in cases of spontaneous eruption of the mesiodens. Yague-Garcia et al and Munns stated that the best way to manage mesiodens to prevent complications is early removal of the mesiodens. [26] Few of them believe that early extraction during primary dentition period is not recommended as there are risks of disturbing or damaging the developing permanent incisors during surgical intervention. [27-29] Delayed extraction is recommended around the age of 10yrs [27]. If the treatment is further delayed, then it increases the chance that the permanent tooth might not erupt spontaneously or will be malaligned during eruption. This would call for more complex surgical and orthodontic management because by this time the forces that leads to normal eruption of the incisors are reduced. [30,35] This might also be associated with loss of space and midline shift of central incisors due to eruption and mesial drifting of the already erupted lateral incisors [32]. Extraction of mesiodens during the early mixed dentition is advisable as during this stage the normal eruptive forces allows spontaneous eruption and alignment of the permanent incisor after extraction. This will result in reduced need for orthodontic treatment. The average time of an unerupted tooth to erupt in the oral cavity after extraction of the mesiodens is 6months to 3yrs [33]. Retention and observation of the mesiodens: Garvey suggested that mesiodens can be retained and observed under following conditions: normal eruption of the succeeding teeth, absence of pathological condition and associated risk of damaging the vitality of the pulp of the related teeth. Mesiodens that are unerupted and do not show any symptoms are best retained and kept under observation [16].

**COMPLICATIONS**

Complications associated with the presence of mesiodens are crowding, spacing, midline diastema, rotation, dilacerations, infections present intraorally, ectopic eruption or eruption of mesiodens in the nasal cavity [34], development of cystic lesions, absence or delayed eruption of the central incisors, abnormality in the root formation, path of incisors may be altered or incisors may be impacted. 

**DISPLACED, DELAYED OR UNERUPTED MAXILLARY INCISORS**

Whenever there is failure, delayed or displaced eruption of maxillary incisors presence of a mesiodens should be suspected. Review by Scheiner and Sampson stated that conical mesiodens cause displacement of the maxillary incisors whereas tuberculate mesiodens cause delayed eruption of maxillary incisors. [35]
Delayed eruption of the incisors may be due to palatally positioned tuberculate mesiodens. Seddon et al stated that presence of supernumerary teeth delays eruption by 26%-52%. [36]

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CROWDING AND SPACING
Due to the presence of mesiodens there may be crowding and spacing which compromises the aesthetics. Spacing in the form of midline diastema is also very common. [7]

DILACERATION AND ROOT RESORPTION
Dilaceration is an abnormal angulation or bend in the root or less frequently the crown of the tooth. At times the tooth may also lose its vitality. in rare situations there may be root resorption of adjacent teeth because of the presence of supernumerary tooth. [39]

FORMATION OF A CYST
An 11 yr. retrospective study done by Asaumi et al [41] reported that in 11% of cases there was cyst formation due to presence of supernumerary teeth

CONCLUSION
Mesiodens is a supernumerary tooth occurring mostly in the maxillary incisor region. There are various theories put forward to explain the occurrence of mesiodens with dichotomy theory being the most accepted one. Genetic theory has also been proposed to explain the occurrence of mesiodens. There is a wide range of classification of mesiodens which has been clearly shown in the flowchart. Mesiodens can be best diagnosed with the help of periapical and maxillary occlusal radiograph. According to the understanding of the topic it can be suggested that the extraction of mesiodens at an early age prevents further complication.

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