

# Mesiodens — Diagnosis and Management of a Common Supernumerary Tooth

- Kathleen A. Russell, BSc, DDS, MSc •
- Magdalena A. Folwarczna, BSc, DDS •

## A b s t r a c t

*Mesiodentes are the most common supernumerary teeth, occurring in 0.15% to 1.9% of the population. Given this high frequency, the general dentist should be knowledgeable about the signs and symptoms of mesiodentes and appropriate treatment. The cause of mesiodentes is not fully understood, although proliferation of the dental lamina and genetic factors have been implicated. Mesiodentes can cause delayed or ectopic eruption of the permanent incisors, which can further alter occlusion and appearance. It is therefore important for the clinician to diagnose a mesiodens early in development to allow for optimal yet minimal treatment. Treatment options may include surgical extraction of the mesiodens. If the permanent teeth do not erupt in a reasonable period after the extraction, surgical exposure and orthodontic treatment may be required to ensure eruption and proper alignment of the teeth. In some instances, fixed orthodontic therapy is also required to create sufficient arch space before eruption and alignment of the incisor(s). Early diagnosis allows the most appropriate treatment, often reducing the extent of surgery, orthodontic treatment and possible complications. This paper outlines the causes and modes of presentation of mesiodentes, and presents guidelines for diagnosis and management of nonsyndromic mesiodentes.*

**MeSH Key Words:** *incisor abnormalities; malocclusion therapy; tooth, supernumerary/diagnosis*

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Supernumerary teeth are teeth in excess of the normal number. The prevalence of hyperdontia is reportedly between 0.15% and 3.9%.<sup>1–5</sup> Extra teeth may present in both the permanent and the primary dentitions but are 5 times less frequent in the primary dentition.<sup>6,7,8</sup> A mesiodens is a supernumerary tooth located in the maxillary central incisor region; the overall prevalence of mesiodentes is between 0.15% and 1.9%.<sup>7–9</sup> Mesiodens can occur individually or as multiples (mesiodentes), may appear unilaterally or bilaterally, and often do not erupt.<sup>9</sup> Mesiodentes can significantly alter both occlusion and appearance by altering the eruption path and the position of the permanent incisors.<sup>9–11</sup> This paper outlines the causes and modes of presentation of mesiodentes and discusses their diagnosis and management. Whether there are one or multiple supernumerary teeth, management and treatment are the same.

### Incidence and Causes

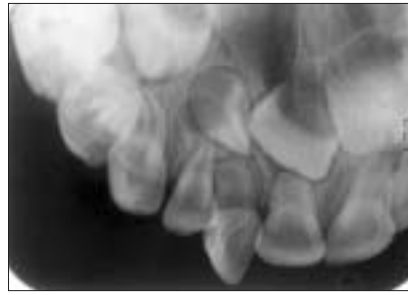
The literature reports that 80% to 90% of all supernumerary teeth occur in the maxilla.<sup>1,9,12</sup> Half are found in the anterior region.<sup>9–12</sup> One-third of all patients with a

mesiodens also have other supernumerary teeth; however, some patients present with mesiodentes in conjunction with congenitally missing teeth.<sup>11,13</sup> Mesiodentes are frequently associated with various craniofacial anomalies, including cleft lip and palate, Gardner's syndrome and cleidocranial dysostosis, but these conditions are beyond the scope of this paper.<sup>14</sup>

The literature reports 3 theories concerning the cause of mesiodentes but this subject remains controversial.<sup>9</sup> It was originally postulated that mesiodentes represented a phylogenetic relic of extinct ancestors who had 3 central incisors.<sup>11</sup> This theory, known as phylogenetic reversion (atavism), has now been largely discarded by embryologists. A second theory known as dichotomy suggests that the tooth bud is split to create 2 teeth, one of which is the mesiodens.<sup>7</sup> Supporters of this theory believe that dichotomy represents complete germination, which also occurs frequently in the anterior maxilla. The third theory, involving hyperactivity of the dental lamina, is the most widely supported.<sup>9</sup> According to this theory, remnants of



**Figure 1:** Tooth 51 is overretained, and asymmetric eruption of the permanent central incisors is evident. An enamel pearl can be seen overlying the crown of the unerupted tooth 11.



**Figure 2:** Teeth 11, 12 and 21 are unerupted, whereas tooth 52 is erupted. A supernumerary tooth 52 has erupted into the oral cavity, and a supernumerary tooth 12 is evident radiographically.



**Figure 3:** A conical mesiodens can be seen between teeth 11 and 21.

the dental lamina or palatal offshoots of active dental lamina are induced to develop into an extra tooth bud, which results in a supernumerary tooth.

Genetics are also thought to contribute to the development of mesiodentes, as such teeth have been diagnosed in twins, siblings and sequential generations of a single family.<sup>5,15</sup> Autosomal dominant inheritance with incomplete penetration has been the proposed genetic theory.<sup>7</sup> A sex-linked pattern has also been proposed, as males are affected twice as frequently as females.<sup>1,6,12,16</sup> In twins, unilateral mesiodentes may present as mirror images, and the same number of supernumerary teeth are located in similar regions of the mouth.<sup>17</sup>

## Diagnosis

### *Types of Mesiodentes*

Mesiodentes can be classified on the basis of their occurrence in the permanent dentition (rudimentary mesiodentes) or the primary dentition (supplementary mesiodentes) and according to their morphology (conical, tuberculate or molariform).<sup>9,16</sup> Enamel pearls, although much smaller than and developmentally distinct from mesiodentes, may also be sufficient to impede eruption of the permanent teeth (Fig. 1).<sup>18</sup>

Supplementary mesiodentes resemble natural teeth in both size and shape, whereas rudimentary mesiodentes exhibit abnormal shape and smaller size.<sup>9</sup> Supernumerary primary teeth are most often mesiodentes or supernumerary laterals.<sup>2,19</sup> If a supernumerary primary tooth is present clinically, a supernumerary permanent tooth is often evident radiographically (Fig. 2).

Conical mesiodentes usually occur singly. They are generally peg-shaped and are usually located palatally between the maxillary central incisors, tending to displace the erupting permanent central incisors (Fig. 3).<sup>9,12,16</sup>

Conical mesiodentes often have a completely formed root and can erupt into the oral cavity.<sup>9,20,21</sup> However, they may be inverted, with the crown pointing superiorly, in which case they are less likely to erupt into the oral cavity; inverted conical mesiodentes have occasionally erupted into the nasal cavity.<sup>22</sup> Tuberculate mesiodentes are barrel-shaped, with several tubercles or cusps, and have incomplete or abnormal root formation. In contrast to conical mesiodentes, tuberculate mesiodentes rarely erupt themselves but rather delay eruption of the permanent incisors.<sup>9,16</sup> They can develop either unilaterally or bilaterally and are commonly associated with other supernumerary teeth.<sup>12</sup> Tuberculate mesiodentes develop later than conical mesiodentes and usually occupy a more palatal position.<sup>23</sup> A third, much rarer type is the molariform mesiodens, which has a premolar-like crown and a completely formed root.<sup>9</sup>

### *Clinical and Radiographic Diagnosis*

A mesiodens should be suspected when there is asymmetry in the eruption pattern of the maxillary incisors; the maxillary primary incisors are overretained, especially if the over-retention is asymmetric; or there is significant ectopic eruption of one or both permanent maxillary incisors.<sup>9,11,24</sup> Given that only 25% of supernumerary teeth erupt, it is important to have a high index of suspicion in these situations.<sup>17</sup> Panoramic, maxillary occlusal and periapical radiographs are indicated to assist in the diagnosis of mesiodentes. A panoramic radiograph serves as a screening aid and provides additional information about the associated supernumerary or congenitally missing teeth that are frequently seen with mesiodentes, but this type of imaging often yields limited evidence of the mesiodens itself because of lack of clarity in the midline region. The most diagnostic radiographic method to identify and locate a mesiodens involves obtaining 2 periapical or maxillary occlusal films, which are analyzed according to the parallax rule.<sup>25</sup> Such



**Figure 4:** Labial eruption of tooth 11 has occurred after extraction of a mesiodens.



**Figure 5a:** An enamel pearl has prevented eruption of tooth 11. Consequently, teeth 21 and 12 have drifted into the space for the 11 central incisor, and a midline shift has also occurred.



**Figure 5b:** Tooth 11 is unerupted and teeth 21 and 12 have drifted into the arch space.

analysis of these films allows identification of the path of eruption (normal, inverted or horizontal) and the location (palatal or labial, superior or inferior) of the impacted mesiodens relative to adjacent structures and development of an appropriate treatment plan.

### Sequelae

Mesiodentes frequently interfere with the eruption and alignment of the maxillary incisors.<sup>6,26-29</sup> They can delay or prevent eruption of central incisors in 26% to 52% of cases; cause ectopic eruption, displacement or rotation of a central incisor in 28% to 63% of cases; and labially displace incisors in 82% of cases (Fig. 4).<sup>9,26</sup> Less common complications involving the permanent incisors include dilaceration of the developing roots, root resorption and loss of tooth vitality. Complications involving the mesiodens itself include eruption of the mesiodens into the nasal cavity; development of a dentigerous cyst has been reported in 4% to 9% of cases<sup>11,15,20-22,30-33</sup>

### Management

Only 25% of all mesiodentes spontaneously erupt into the oral cavity. If unerupted, the tooth can alter both the eruption of the permanent incisors and the resulting occlusion.<sup>12</sup> Furthermore, in 75% of cases, the incisor erupts spontaneously once the mesiodens has been removed.<sup>21,28</sup> Therefore, once a mesiodens has been diagnosed, the clinician must decide on treatment to minimize further sequelae. Management is discussed here according to the developmental stage of the dentition: primary, mixed or permanent.

Extraction of a supplementary mesiodens in the primary dentition is usually not recommended because supernumerary primary teeth often erupt into the oral cavity and surgical extraction of unerupted teeth may increase the risk of displacing or damaging the developing permanent incisors.<sup>34-36</sup> However, extraction during the *early* mixed dentition stage allows normal eruptive forces to promote spontaneous eruption of the permanent central incisors after the extraction.<sup>31,35,37</sup> Extraction of a mesiodens at a

time appropriate for promoting self-eruption in the early mixed dentition may result in better alignment of the teeth and may minimize the need for orthodontic treatment. Delayed treatment involves extraction of the mesiodens when the unerupted central incisor's apex is almost mature, usually around 10 years of age.<sup>36</sup> The later the extraction of the mesiodens, the greater the chance that the permanent tooth either will not spontaneously erupt or will be malaligned when it does erupt. Unfortunately, by this time the forces that cause normal eruption of the incisors are diminished, and surgical exposure and subsequent orthodontic treatment are more frequently required.<sup>31,37</sup> Also, space loss and a midline shift of the central incisors may have already occurred by this age, since the lateral incisors will have erupted and may have drifted mesially into the central space (Figs. 5a and 5b).<sup>12</sup> Thus, a significant delay in treatment can create the need for more complex surgical and orthodontic management.

Close monitoring of the dentition is required after the extraction of a mesiodentes. Approximately 6 months after extraction of a mesiodens, clinical and radiographic reassessment is recommended to determine if the tooth has erupted. Lack of eruption has been attributed to diminished eruption rate, significant root development, displacement of the tooth from its normal position in the alveolar bone or insufficient arch space into which the tooth can erupt.<sup>37</sup> When there is insufficient arch space, additional space can be created orthodontically by means of a compressed coil spring inserted before active eruption starts. If a tooth does not start erupting within 6 to 12 months after extraction of the mesiodens and sufficient arch space is available, surgical exposure and orthodontic eruption of the unerupted incisor are recommended. Closed exposure with simultaneous bonding of an orthodontic attachment allows for orthodontic eruption of the tooth along with its periodontal attachment.<sup>37,38</sup> Before the surgical procedure, orthodontic appliances should be placed on as many maxillary teeth as possible to serve as appropriate anchorage to facilitate eruption of the incisor. Before active orthodontic extrusion of the tooth begins, arch

alignment should have progressed to a stable arch wire that will maintain the integrity of the maxillary arch and prevent intrusion or canting of the maxillary teeth as the impacted incisor is erupted. Various elastic ligatures can be tied from the arch wire to the bonded bracket, with or without a chain on the unerupted incisor; this allows the tooth to be erupted by the application of light forces, which avoids sequelae such as root resorption, ankylosis or devitalization.<sup>39</sup> The eruptive process may take 6 to 18 months, depending on the original position of the tooth. Care must be taken to erupt the tooth along the correct path in 3 dimensions using only light forces; heavy forces may cause devitalization of the tooth, in addition to the known detrimental effects of heavy forces in orthodontic tooth movement.

As outlined above, in most cases the incisors will erupt spontaneously or can be orthodontically erupted following extraction of the mesiodentes. In some cases, the adjacent primary teeth may also have to be extracted to create sufficient space for eruption of the permanent teeth. In the rare case that a central incisor cannot be erupted orthodontically because of its position or ankylosis, 2 treatment options exist: surgical repositioning or extraction and placement of an implant. Prabhu and Manshi<sup>40</sup> recommended surgical repositioning when adequate space is available for the incisor, the mesiodens is located parallel to where the root of the aligned incisor would be, and slight modifications to the socket can be made to accommodate the incisor. Because there is a high risk of ankylosis after repositioning of teeth, any malocclusions should be diagnosed and comprehensive orthodontic treatment options presented to the patient or the parents before surgical repositioning is performed. Replacing an ankylosed tooth with an implant may be a better option, as the risks of root resorption, discolouration and periodontal compromise associated with repositioning may be reduced. In such cases, orthodontic treatment followed by prosthetic treatment with an implant may be the optimal treatment. However, treatment options must be considered individually in each case.

After eruption of the incisor(s), adjunctive procedures may be appropriate. For example, gingival surgery might be performed to recontour the attachment levels between the adjacent incisors, as the gingival heights are often not symmetric after delayed or orthodontic eruption. As well, because of the increased potential for tooth position to relapse once appliances have been removed, long-term retention is recommended. The increased risk of relapse most likely results from the significant initial displacement and rotation of the tooth. A bonded lingual retainer is often recommended if the occlusion (overbite) will allow its placement. If the occlusion is such that a bonded maxillary lingual retainer cannot be placed, a standard Hawley or vacuum form retainer may be used. Regardless of the type of retainer, a longer than average retention period should be used.

## Conclusions

Delayed, ectopic or asymmetric eruption of the central incisors should alert the clinician to the possibility of a mesiodens. The clinician should obtain accurate radiographs including panoramic, periapical and occlusal views. Early diagnosis of a mesiodens minimizes the treatment required and prevents development of associated problems. Extraction of the mesiodens in the early mixed dentition stage may facilitate spontaneous eruption and alignment of incisors, while minimizing intervention, space loss and midline shift. Should the incisors not erupt spontaneously, further surgical and orthodontic treatment may be required. ❖

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*Dr. Russell is associate professor and head, division of orthodontics, Dalhousie University, Halifax, Nova Scotia, and staff orthodontist, IWK Health Centre, Halifax, Nova Scotia.*

*Dr. Folwarczna is part-time instructor, Dalhousie University, Halifax, Nova Scotia.*

*Correspondence to: Dr. Kathleen A. Russell, Division of Orthodontics, Room 5164, Faculty of Dentistry, Dalhousie University, 5981 University Avenue, Halifax, NS B3H 3J5. E-mail: Kathy.Russell@Dal.ca.*

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