



REVIEW OF SUPERNUMERARY TEETH IN THE MAXILLARY INCISOR REGION

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ARTICLE INFO

Article History:

Received 8th August, 2016
Received in revised form 18th
September, 2016 Accepted 24th
October, 2016 Published online 28th
November, 2016

Key words:

Supernumerary Teeth, Incisor,
Prevalence, Maxillary, Mesiodens

ABSTRACT

The maxillary incisor region is the most frequently reported area for the location of supernumeraries. When a supernumerary tooth is located in the midline of the maxilla it is called mesiodens. The prevalence of mesiodens has been reported to range from 0.15-4 percent and was found to be more often in males than in females. The aetiology of supernumerary teeth in the maxillary incisor region is yet to be substantiated, but there is a strong evidence of gene involvement. There are two types of supernumerary teeth in the maxillary central incisor region, the conical and tuberculate type. It has been shown that there were remarkable differences between these two types, especially regarding their degree of root formation, their eruption and their effect on the eruption of the associated permanent maxillary central incisors. The tuberculate type was usually unerupted, positioned palatal to the maxillary central incisor and frequently delayed the eruption of the permanent maxillary central incisor and with a lack of root formation, which was apparent much later in development than the permanent maxillary central incisor and the supernumerary conical type. On the other hand, the conical type was frequently erupted, most often situated between the maxillary central incisors, although not always in the midline, and did not usually delay the eruption of the associated permanent maxillary central incisors. Several sequelae can be ascribed to the presence of supernumerary teeth in the maxillary incisor region such as, external resorption of the crowns of supernumeraries, cyst formation; delayed/ ectopic eruption, rotation, crowding, inclination of the neighbouring teeth, and diastema. Early diagnosis of supernumerary teeth in the maxillary incisor region is important to aid their management and prevent any iatrogenic effects on the permanent maxillary incisors.

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INTRODUCTION

The maxillary incisor region is the most frequently reported area for the location of supernumeraries.¹⁻⁶ Stafne¹ found, in 500 cases with supernumerary teeth, the maxillary central incisors were involved in 45.4 percent of these cases (see Table 1).

DiBiase⁷ surveyed the records of 7,186 consecutive patients examined at the North East Metropolitan Regional Orthodontic Centre at Whipps Cross Hospital, and in centres at Chelmsford, Colchester and Southend during the years 1960-1967. He found 188 supernumerary tooth cases in the maxillary incisor region and studied 165 with full records. The age range was 6.5-14 years. Sixty six percent of the cases were male (the male to female ratio in this study was 2:1). Forty six were found to be bilateral. A supernumerary tooth associated with a cyst was found in 9 cases (5.4%) and all of these were inverted supernumeraries. Regarding the relationship of supernumerary features to central incisor eruption, DiBiase⁷ reported the findings summarised in Table 2 below.

Defective calcification and invaginations of the enamel have been seen in some tuberculate types.

Mesiodens

Prevalence

When a supernumerary tooth is located in the midline of the maxilla it is called mesiodens which is usually of a conical shape. Mesiodens was found to be the most common supernumerary tooth.^{2, 8-15} The prevalence of mesiodens has been reported to range from 0.15-4 percent.^{1, 2, 14, 16-23}

These supernumerary teeth very often occur in pairs.^{1, 24, 25} Eight to twenty seven percent of mesiodens cases have been found to occur in multiples.^{2, 4, 14, 26} They are found more often in males than in females.²⁷ The prevalence proportion ranges from 2:1^{11, 14, 17, 18, 26, 28} and 2.6:1,^{4, 29} to as high as 5.5:1 on the maxillary anterior supernumeraries of Japanese school children.³⁰

Characteristics

Mesiodens are usually small in size, with a peg-shaped or conical crown and short roots. These teeth do not always erupt;^{2, 4} one study reports 11.6 percent eruption.¹ They are often found to be in a palatal position to the permanent incisors;^{4, 26} although sometimes may be positioned labially or

in the line of the dental arch.^{26,31} Out of 33 mid-line supernumeraries, Parry and Iyer²⁵ found 17 were between the maxillary central incisors and 16 were above and behind their roots. Their direction might be normal or inverted;^{32,33} it is less common to find them in a horizontal position.^{4,26,31} Stafne¹ stated that 114 out of 200 mesiodentes were inverted. Gardiner²⁴ found that 8 out of 40 were found in this position.

Aetiology

The aetiology of the mesiodens is yet to be substantiated. Supernumerary teeth, including mesiodens, can occur in association with systemic conditions such as cleidocranial dysostosis, Gardner's syndrome and cleft lip and palate. There is a strong evidence of gene involvement for this anomaly, as there have been several cases of familial incidence of mesiodens.³⁴⁻³⁸ Moreover, Sedano and Gorlin³⁹ noticed that in some cases more than one sibling was affected. Although the anomaly has been seen to run in families it sometimes skips a generation. Thus, Sedano and Gorlin³⁹ suggested that this trait was autosomal dominant, with a lack of penetration in some generations. An alternative explanation for their origin is continuous growth of the dental lamina.^{2,36} Foster and Taylor⁴⁰ also suggested that it arises as offshoot of the dental lamina.

Sequelae

Some abnormal features of the dentition can be ascribed to the presence of mesiodens, such as delayed/ ectopic eruption of the neighbouring teeth, disturbance of alignment of the permanent maxillary incisors (rotation, crowding or inclination),^{2-5,20,24,26,36,37,41-44} and diastema.^{2-5,20,24,26,36,37,41-44} Cyst formation,^{32,39,45-48} pericoronal space or external resorption of the crown have also been detected on radiographs of mesiodens, particularly in older age groups.^{1,4,26} Occasionally root resorption of the permanent teeth adjacent to supernumeraries can occur.⁴⁹

Types of supernumerary teeth in the maxillary incisor region

DiBiase⁷ identified two types of supernumerary teeth. The earlier type he called it 'mesiodont' and the later type he called it 'palatodont'; the features of which can be summarised in Table 3. He suggested that the earlier type of supernumerary teeth could arise from the free mesial margin of the dental lamina in the midline region, separated by elongation of the deeper portions at 14 weeks of intra-uterine life. Thus, this type often occurs before the permanent central incisor forms (at 24 weeks of intra-uterine life). Hence, it might cause ectopic budding or displacement of the dental lamina. This type could become palatally placed due to the progressive development of the dentition erupting downwards, forwards and mesially. The later supernumerary could arise by a budding of epithelium from the permanent central incisor palatally, in a similar way to the development of the permanent central incisor from the epithelium of the primary predecessors at about 24 weeks of intra-uterine life. The lack of root formation in this type suggests that its development could occur some time after the central incisor tooth germ has developed. Delayed eruption of the central incisor associated with this type of supernumerary could be attributed to the close association of this type with the crown of the central incisor.

Seventy six supernumerary teeth in the maxillary central incisor region in 52 patients were studied by Foster and Taylor⁴⁰ to assess their characteristics. They were divided into two types, conical and tuberculate. It has been shown that there were remarkable differences between the types, especially

regarding their degree of root formation, their eruption and their effect on the eruption of the associated permanent maxillary central incisors. These differences were found to be statistically significant. The tuberculate type was usually unerupted and frequently delayed the eruption of the permanent maxillary central incisor.^{2,40} There was a lack of root formation, which was apparent much later in development than the permanent maxillary central incisor and the supernumerary conical type. It was positioned palatal to the maxillary central incisor. On the other hand, the conical type was frequently erupted, most often situated between the maxillary central incisors, although not always in the midline, and did not usually delay the eruption of the associated permanent maxillary central incisors.^{2,50,51} Thus, Foster and Taylor⁴⁰ argued that maxillary anterior tuberculate supernumerary teeth may represent part of the post-permanent dentition because of their palatal position to the maxillary incisors and their much later root development.

From the data available we can briefly describe the characteristics and the differences between the two types of supernumerary teeth in the maxillary incisor region, the conical and the tuberculate:

Position: Conical-shaped supernumerary teeth are usually located between the permanent maxillary central incisors, but rarely appear labially. The tuberculate-shaped supernumerary teeth may be unilateral or bilateral, and usually erupt on the palatal aspect of the permanent maxillary central incisor.

Eruption: The conical type is most often found erupted during childhood, whereas the tuberculate type rarely erupts in childhood.

Development: The conical type has a complete root formation and it develops before or at the same time as those of the adjacent teeth, whereas the tuberculate type has incomplete (stunted) or totally absent root formation, and develops later than the conical supernumerary or the permanent adjacent teeth.

Eruption of the adjacent teeth: The conical type rarely delays eruption of the adjacent central incisors but may cause malposition of these teeth, whereas the tuberculate type delays the eruption of the permanent maxillary central incisors.

Size: The conical type is usually smaller in size than the tuberculate type.

Association with other supernumeraries: The conical type is more often found associated with other types of supernumeraries than the tuberculate type.

Supernumerary teeth in the maxillary lateral incisor region

In the maxillary lateral incisor region many authors have stated that supernumerary teeth were supplemental resembling normal incisors.^{1,52-55} In each of these cases the supernumerary tooth was found to be preceded by a supplemental deciduous lateral incisor. In Gardiner's study,²⁴ 18 cases out of 25 patients with supplemental teeth were found to have supplemental teeth in the maxillary lateral incisor region with 4 cases preceded by supplemental deciduous laterals.

Diagnosis

A thorough clinical and radiographic examination is required to detect the presence of any supernumerary tooth in the maxillary incisor region.⁵⁶ Clinical examination involves a systematic approach in dental charting, intra-arch alignment

of the maxillary anterior teeth including their rotation, crowding and inclinations, palpation of the buccal and palatal mucosa and visual observation of any abnormalities. A suspicion of the presence of a supernumerary tooth should be raised in the case of disruption in the eruption sequence of the maxillary incisors, significant delays in their eruption taking in consideration the degree of dental development of the individual, the presence of significant asymmetry/ discrepancy in the eruption times (more than 6 months) and over retention of the maxillary primary incisors.^{2,4,21,56} The clinical examination should then be supplemented by a radiographic examination which should include a panoramic view especially when this view is needed as part of an orthodontic assessment as well as an upper anterior view or periapical views of the maxillary incisors. Localisation of the supernumerary tooth/ teeth is important in 3 dimensions of space to aid their management. The classical approach to identify the bucco-lingual position of any unerupted tooth including supernumeraries is to use the well-known parallax technique^{57,58} either the vertical or horizontal one.

obstruction to the normal development of the adjacent teeth and eliminate the need for future orthodontic treatment, others suggest to delay the surgical removal of such supernumerary teeth until near the completion of root development of the maxillary incisors^{63,64} to prevent any damage to these roots during the surgical extraction. The disadvantage of the latter approach is that the maxillary impacted incisor will have a low chance of eruption due to the loss of eruptive force following the completion of root development. Furthermore, a space loss and midline shift may occur due to mesial drifting of the neighbouring teeth to the impacted tooth.⁵ Regular clinical examination supplemented with radiographic views as required should be arranged to monitor the spontaneous eruption of the adjacent incisors which could take up to 3 years⁵⁹ depending on type and location of the unerupted supernumerary tooth, the space available in the dental arch as well as the stage of root development of the adjacent maxillary incisors. However, it has been shown that in 75% of cases the impacted permanent incisor erupts spontaneously following the removal of the supernumerary tooth.^{41,50}

Table 1 Figures on the incidence and distribution of 500 supernumerary teeth (Stafne, 1932).

	Central Incisors	Lateral Incisors	Canines	Premolars	Paramolars	Fourth Molars	Total
Maxilla	227	19	2	9	58	131	446
Mandible	10	0	1	33	0	10	54

Table 2 The relationship of supernumerary features to central incisor eruption.

	Supernumerary Features Associated with Central Incisor Eruption	Supernumerary Features Associated with Delayed Eruption of Central Incisor
Morphology	Conical, incisiform	Tuberculate, odontome
Relative size	Small	Large
Root formation	Complete	Absence, incomplete
Direction	Variations and inversions	Vertical
Mesiodistal position	Mesial	Central, distal
Vertical position	Partially erupted, apex third, apex of incisor and palate	First and second third of normal incisor root position
Labiopalatal position	Palatal	Palatal

Table 3 Features of mesiodont and palatodont supernumerary teeth.

Feature	Mesiodont (earlier type)	Palatodont (later type)
Morphology	Conical or incisiform	Tuberculate, conical or odontome
Relative size	Smaller	Larger
Root formation	Complete	Reduced, incomplete
Direction	Variations and inversions	Vertical, occasionally transverse
Mesiodistal position	Mesial to central incisor, may migrate	Associated with central incisor
Vertical position	Variable, may be erupted or deep	Superficial, unerupted
Labiopalatal position	Palatal or intra-alveolar, rarely labial	Palatal to central incisor
Eruption of permanent central incisor	Normal or minimal delay	Delay and failure

Management

The majority of supernumerary teeth in the maxillary incisor region remain unerupted.³⁷ Management of supernumerary teeth in the maxillary incisor region will depend on various factors such as, type and location of the supernumerary tooth, associated abnormalities of the adjacent permanent incisors such as, delayed eruption/ impaction, displacement, pathological changes to the roots of the adjacent permanent incisors i.e. root resorption/ dilacerations, cyst formation, and interference with orthodontic treatment/ appliances. In the case of any signs of associated abnormalities to the adjacent permanent incisors the earlier the removal of the supernumerary tooth the better prognosis.⁵⁹ However, there are some controversies regarding the timing of the removal of the supernumerary tooth. While some authors advocate the early removal in the early mixed dentition stage^{12,60-62} to prevent any

If following a sufficient period of watchful wait (normally within 6 to 12 months) no significant change in the position of the unerupted supernumerary tooth, then a surgical exposure and an enforced eruption should be instituted using orthodontic means which could take 6 to 18 months, depending on the original position of the tooth. If, however, the impacted incisor did not respond to orthodontic traction which rarely occur, then two treatment options could be considered, either surgical repositioning, or extraction of the impacted tooth and placement of an implant.⁶⁵

It is generally recommended for the unerupted supernumerary teeth in the maxillary anterior region to be left in situ with periodic monitoring if they are symptomless, have had no impact on the eruption of the adjacent teeth and located in a position where their surgical extraction may cause damage to the roots of the adjacent teeth or anatomical structures.⁶⁶

CONCLUSIONS

1. The maxillary incisor region is the most frequently reported area for the location of supernumeraries. When a supernumerary tooth is located in the midline of the maxilla it is called mesiodens.
2. The prevalence of mesiodens has been reported to range from 0.15-4 percent and was found to be more often in males than in females.
3. The aetiology of supernumerary teeth in the maxillary incisor region is yet to be substantiated, but there is a strong evidence of gene involvement.
4. There are two types of supernumerary teeth in the maxillary central incisor region, the conical and tuberculate type with significant differences between these two types, especially regarding their degree of root formation, their eruption and their effect on the eruption of the associated permanent maxillary central incisors.
5. Several sequelae can be ascribed to the presence of supernumerary teeth in the maxillary incisor region such as, external resorption of the crowns of supernumeraries, cyst formation, delayed/ ectopic eruption, rotation or inclination of the neighbouring teeth, and diastema.
6. Early diagnosis of supernumerary teeth in the maxillary incisor region is important to aid their management and prevent any iatrogenic effects on the permanent maxillary incisors.

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