

Cone-beam computed tomography exploration and surgical management of palatal, inverted, and impacted mesiodens

MOUNIR OMAMI, ABDELLATIF CHOKRI, HAJER HENTATI, JAMIL SELMI

Abstract

Supernumerary teeth are extra teeth or toothlike structures which may have either erupted or unerupted in addition to the 20 deciduous teeth and the 32 permanent teeth. Mesiodens is one of these located in the midline between the two central incisors. Their presence may give rise to a variety of clinical problems. This paper describes a rare case of palatal placed, inverted and impacted mesiodens associated to two supernumerary teeth which were detected during a radiographic examination for delayed eruption of permanent central incisors in the case of a healthy 8-year-old girl monitored at the oral surgery service while discussing the usefulness of cone beam computed tomography for accurate diagnosis and management.

Keywords: Cone-beam computed tomography, inverted, mesiodens, palatal impaction, supernumerary tooth

Introduction

A supernumerary tooth is a development anomaly of number characterized by the presence of tooth in addition to the normal series.^[1,2] Its prevalence rates of reported in the literature vary between 0.1% and 3.6% in the permanent dentition depending on the respective population.^[3] However, in deciduous teeth, prevalence is lower amounting to 0.3–0.8%.^[3] Males are affected approximately twice as often as females.^[4] Supernumerary teeth can occur as singles, multiples, unilaterally, or bilaterally and in the maxilla, the mandible, or both.^[4,5] According to Alberti, the mesiodens is the most common type of supernumerary tooth.^[6] It is located between the two central incisors. Only 25% of all mesiodentes spontaneously erupt into the oral cavity.^[7] In general, they remain impacted and asymptomatic; and are commonly discovered during the routine radiographic examination.^[5,7] There are several hypotheses which have been proposed to explain the occurrence of supernumerary teeth, and their etiology remains unclear.^[8] A combination of environmental and genetic factors has been proposed

to explain supernumerary tooth occurrence.^[8] A range of complications varying from crowding to cyst formation can be caused by supernumerary tooth.^[8] Though, it is clear that early treatment can possibly prevent further complications.

Several studies have applied cone-beam computed tomography (CBCT) to accurately diagnose supernumerary teeth with the potential to overcome most of the technical limitations of the plain film projection and the capability of providing a high-resolution three-dimensional (3D) representation of the maxillofacial tissues in a cost and dose efficient manner.^[1,9] For the treatment, it depends on the type, position of supernumerary teeth, and the possibility to produce complications which are identified both clinically and radiographically.

The aim of this article was to describe a rare case of palatal placed, inverted, and impacted mesiodens associated to two supernumerary teeth delaying the eruption of permanent central incisors in the case of a healthy 8-year-old girl monitored at the oral surgery service while discussing the outcomes of using CBCT to diagnose the accurately position of supernumerary teeth and to choose the appropriate management technique.

Case Report

An 8-year-old female patient visited the university hospital due to delayed eruption of her right permanent maxillary

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central incisor. Her medical history revealed no systemic diseases, and the dental history proved no facial trauma or other tooth abnormalities have occurred. She avowed that she was operated on, at the age of seven years, for a supernumerary tooth delaying the eruption of the left permanent maxillary central incisor. A previous panoramic radiograph (one year ago) revealed the presence of a mesiodens associated to two supernumerary teeth [Figure 1].

Clinical examination revealed a mixed dentition and the absence of the right maxillary permanent central and lateral incisors [Figure 2]. The left ones have already erupted.

The patient was referred to CBCT examination of the maxilla to assist the localization and orientation of the mesiodens. CBCT images were requested for diagnosing accurately the morphology and exact location of the mesiodens and the radicular formation of the permanent maxillary central incisors. The images were created and viewed interactively using a dental computed tomography (CT) software program.

The 3D CBCT panorex showed the impaction of the right permanent maxillary incisor and the presence of a



Figure 1: Panoramic radiograph shows the impacted permanent upper central incisors and the presence of two supernumerary teeth and a mesiodens



Figure 3: The panoramic reconstruction (a), axial (b) and sagittal (c) slices of cone beam computed tomography show an impacted, palatal placed, and inverted mesiodens associated to a supernumerary tooth

supernumerary tooth; moreover, the axial slice image of CBCT revealed the palatal position of the impacted and inverted mesiodens and the sagittal slices showed that the supernumerary tooth was in palatal position over the impacted permanent maxillary central incisor [Figure 3].

A comprehensive treatment plan was formulated, which included surgical extraction of the mesiodens and the supernumerary tooth [Figure 4]. The patient was administered local anesthesia. Using a mucoperiosteal elevator, a full thickness palatal flap was raised. The supernumerary tooth was exposed, luxated, and removed. Hemostasis was achieved and the flap was replaced back and sutured. For the mesiodens, a simple palatal anteroposterior incision was done and the extraction



Figure 2: Intraoral photograph shows mixed dentition, clinical absence of the maxillary right central and lateral incisors

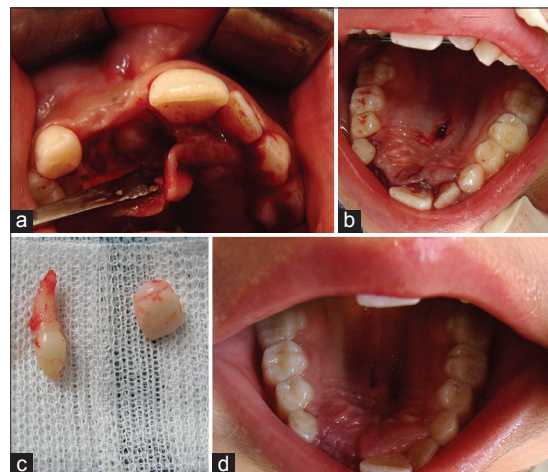


Figure 4: Progress photographs: Surgical removal of the supernumerary tooth and the mesiodens. (a) A palatal mucoperiosteal flap was reflected and the bone overlying the impacted supernumerary tooth was removed. (b) Anteroposterior incision to remove the mesiodens (indirect vision). (c) The mesiodens and the supernumerary tooth. (d) Suture removal and control after 1-week (indirect vision)

followed. Postchirurgical instructions were explained to the patient along a prescription of antibiotic and analgesic treatment. The recall visits were scheduled for the following week to remove suture and evaluate the healing process. The patient was kept under the observation until the successful eruption of permanent central and lateral incisors.

Discussion

Supernumerary teeth or hyperdontia can be defined as teeth that exceed the normal dental complement, regardless of their locations and morphologies.^[10] It is more common in the central region of the upper or lower jaw; however, its occurrence in the mandible is rare.^[11] Mesiodens is the most common type of supernumerary teeth and is located in the midline between the two upper central incisors. Its prevalence in general population ranges between 0.15% and 1.9% and it is reported to be more common in males rather than females.^[11,12] The frequency of mesiodens has been estimated to be 0.45% in Caucasians, 0.4% in Finnish, 1.43% in Norwegians, and 2.2% in Hispanic populations.^[13] Variations due to differences in demographic and environmental susceptibilities may have an impact on the reported prevalence.^[11]

Supernumerary teeth are classified based on morphology (conical, tuberculate, and supplemental), location (mesiodens, paramolar, distomolar, and parapremolar), position (buccal, palatal, and transverse), and orientation (vertical or normal, inverted, transverse, or horizontal).^[8] In our case, it was a conical, palatal, and inverted mesiodens.

The present case is unique in several aspects: First, the occurrence of mesiodens is very rare in the mid palatal region. It seems that due to the erupting force of the central incisor the tooth might have shifted to the mid-palatal region.^[14] Second, the presence of two supernumerary teeth delaying the eruption of upper permanent central incisors.

Although the abundant information is available on normal tooth development, the genetic etiology and molecular mechanisms that lead to congenital deviations in tooth number have not been clearly understood.^[10] The literature reports three theories concerning the cause of mesiodentes, but this subject remains controversial.^[15] The first one was a phylogenetic relic of extinct ancestors who had three central incisors known as phylogenetic reversion (atavism).^[10,15,16] The second theory known as dichotomy suggests that the tooth bud is split to create two teeth, one of which is the mesiodens.^[15,16] The third theory involving hyperactivity of dental lamina which was the most widely supported.^[15,16] Although no investigation proved the hereditary condition of mesiodens, genetics are also thought to contribute to its development, as such occurrence has been diagnosed in twins, siblings, and sequential generations of a single family.^[1,17] Sedano and Gorlin proposed a genetic theory in

which mesiodens is an autosomal dominant trait with the lack of penetrance in some generations.^[18] It has been suggested that the environmental factors might have an influence on genetic susceptibility which could probably be a cause for negative family history in our case.^[15] A sex-linked pattern has also been proposed, as males are affected twice as frequently as females.^[1] Mesiodens is frequently associated with several craniofacial disturbances, including cleft lip and palate, and cleidocranial dysostosis; and to a lesser extent with Gardner's syndrome or chondroectodermal dysplasia.^[13]

However, various complications might occur as a result of the presence of supernumerary teeth. A retrospective analysis showed 10% of cases with supernumerary teeth cases exhibited midline diastema.^[8] In addition, the supernumerary tooth is the common reason for the delayed or failure of eruption of permanent teeth in the premaxillary region.^[8,19] It can cause also crowding, displacement, and rotation of the adjacent teeth (28–60%).^[7,19] Furthermore, they may lead to dilaceration or root resorption in permanent teeth.^[3,19] Secondary alveolar bone grafting may be compromised due to the supernumerary teeth in patients with cleft lip and palate.^[8,19] Moreover, the presence of supernumeraries in a potential implant site may compromise implant placement.^[8,19] Occasionally, dentigerous cyst formation may occur (11% of the cases in an 11-year retrospective study of Asami *et al.*) or the extra tooth might erupt into the nasal cavity.^[11,19] In our case, the presence of supernumerary teeth had caused the failure of eruption of maxillary central incisors.

For preoperative examination, intraoral and panoramic radiography has been used. However, alone, they are insufficient for determining the exact location of supernumerary and impacted teeth, due to the image superimposition. In the present case, CBCT provided valuable information that helped us to determine the morphology and the exact 3D position of the mesiodens, supernumerary tooth, and the permanent maxillary impacted right central incisor. In fact, standard radiographs (periapical radiograph and orthopantomograph) could not provide information about the 3D relationship of these supernumeraries to the associated teeth and neighboring structures, which is important in making decisions about treatment options. In the past decade, detailed information has been obtained by CT which can provide highly detailed 3D information either directly or with the aid of dental software, avoiding superposition of bony and dental structures. However, the disadvantages of its relatively high cost and high radiation dose outweigh these advantages in the context of impacted and supernumerary teeth. Furthermore, CBCT provides a picture of supernumeraries in 3 planes and in relation to neighboring structures at a significantly lower radiation dose when compared with traditional spiral CT.^[20,21] Therefore, we recommend that CBCT be used routinely for the treatment of supernumerary teeth, especially for those cases with multiple impaction, those with local malocclusions, or with

high-situated supernumeraries. For those supernumeraries that should be removed, the comprehensive pictures in 3 planes provided by CBCT can assist surgeons in choosing the appropriate surgical approach, identifying the tooth that should be extracted, and reducing the amount of surgical trauma on the adjacent hard and soft tissues.^[9,20]

For the treatment, it depends on the type and location of the supernumerary teeth and on its potential effect on the adjacent hard and soft tissue structures. The management of a supernumerary tooth should form part of a comprehensive treatment plan and should not be considered in isolation.^[19] The timing of surgical removal of supernumerary teeth is contentious and two alternatives exist. First, to remove the supernumerary tooth as soon as it has been diagnosed and the second to leave the supernumerary tooth as such till the root development of adjacent teeth is complete in order to prevent damage to their root apices.^[22] If teeth are causing no complications and are not likely to interfere with orthodontic tooth movement, they can be monitored with the yearly radiographic review.^[4] The patient should be warned of complications, such as cystic change and migration with damage to nearby roots. If the patient does not wish to risk such complications, it is acceptable to remove supernumerary teeth. However, if supernumerary teeth are associated with complications, it is usual to extract such teeth, which usually involves a surgical procedure.^[4] Early extraction of supernumeraries, causing incisor impaction, may have the benefit of minimizing loss of eruptive potential, space loss, and centerline displacement. Rotberg recommended the removal of the supernumerary tooth as soon as it has been discovered and ideally before the age of 5 years so that root formation of the associated permanent incisors is incomplete.^[23] However, Koch stated that no immediate removal of supernumerary teeth is necessary if no pathology is present, no orthodontic treatment involving the region of supernumerary tooth is planned, and the child is seen regularly by a dentist: “Wait and see” behavior.^[23] Omer *et al.* reported based on a retrospective analysis the ideal age of removal of a supernumerary tooth is 6–7 years.^[8,24] Hogstrom and Andersson suggested two different opinions where the supernumerary tooth should be removed as early as upon identification or should wait until complete root formation of adjacent teeth.^[8] However, the potential disadvantages associated with this deferred surgical plan include loss of eruptive force of adjacent teeth, loss of space and crowding of the affected arch, and possible midline shifts.^[25] In the present case, surgical extraction of supernumerary teeth and mesiodens was made as soon as it was diagnosed, without any damage to adjacent teeth.

The majority of delayed permanent incisors erupt spontaneously if sufficient space is created at the time of removal of the supernumerary tooth and maintenance of postoperative space is needed.^[8] However, if there was not space for delayed tooth, we have to re-establish it by

orthodontic treatment. A spontaneous eruption of the impacted permanent maxillary central incisor following supernumerary removal is suggested to be in the range of 54–75% and within 16–18 months of the removal of the supernumerary tooth.^[22,25] Smailiene *et al.* have suggested that spontaneous eruption of impacted maxillary incisor has an advantage over its surgical-orthodontic treatment.^[22,26] A recent study revealed that if the supernumerary tooth was of conical form then the associated permanent incisor was almost twice as likely to erupt spontaneously as when the supernumerary was of the tuberculate form.^[23] A retrospective analysis of factors influencing the eruption of delayed permanent incisors after supernumerary tooth removal revealed that spontaneous eruption occurred in 89.4% of delayed permanent teeth.^[27] The mean time to eruption was 9.2 months (median = 7 months).^[27] However, there was no statistically significant association between tooth eruption and root maturity or the degree of vertical impaction.^[27] There was an association between eruption and the degree of the angle of impaction of the permanent incisor. Research data indicate that the spontaneous eruption of impacted maxillary incisor may take up to 3 years and sometimes orthodontic treatment is necessary to achieve adequate alignment of the erupted tooth in the dental arch.^[22] In the present case since the root was not completely formed it was desirable to wait for a spontaneous eruption.

Because children are more prone to vagal stimulation, bradycardia should be a consideration when palatal flaps are reflected for procedures such as removal of a mesiodens.^[28] It is caused by the stimulation of the trigeminovagal reflex: The afferent impulses are caused by the stimulation of the nasopalatine nerve and the efferent pathway is the vagus nerve. Therefore, the infiltration with local anesthesia of the nasopalatine nerve should block the response. Thus, bradycardia thought to be attributed to the trigeminovagal reflex. Management includes halting the procedure until normal sinus rhythm returns and administration of atropine and/or glycopyrrolate.^[28]

Conclusion

Supernumerary teeth are extra to normal complement in both dentitions. Males are predominantly affected by supernumeraries which are common in permanent dentition. Supernumerary teeth may occur unilaterally or bilaterally, single or multiple, and at any region of the dental arch. Mesiodentes are a common type of supernumerary teeth. A variety of complications was associated with their presence which range from crowding to cyst formation. CBCT yielded accurate 3D information relative to the orientation, sagittal position, local disorders, and neighboring anatomic structures. All these were of great significance for pretreatment evaluation of supernumeraries. Therefore, we suggest routine use of CBCT in cases of supernumeraries to choose the accurate diagnosis and management.

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Conflicts of interest

There are no conflicts of interest.

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