

CBCT Evaluation of Unilateral Accessory Mental Foramina: Under Reported Anatomic Variant in Children

Evaluación CBCT de Forámenes Mentonianos Accesorios Unilaterales: Variante Anatómica Poco Informada en Niños

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GHOUSIA, S. & FIRDOOSE, C. S. N. CBCT evaluation of unilateral accessory mental foramina: under reported anatomic variant in children. *Int. J. Odontostomat.*, 16(3):441-446, 2022.

ABSTRACT: The following manuscript presents two paediatric cases with incidental finding of unilateral accessory mental foramina. Both the cases illustrate CBCT evaluation of a unilateral accessory foramina on the left side of the mandible, one of which, is a 12-year-old baby girl with pre-diagnosed medical history of precocious puberty and oral findings of supernumerary teeth and the other is an 8-year-old boy with oral bifurcation cyst. The not so frequent presence of additional foramina and canals in the mandible are frequently undervalued in clinical procedures and to our knowledge has not yet been reported in paediatric cases in the literature so far. In these case reports, authors attempt to document a rare and first of its type ever reported anatomic variant of mandible in paediatric patients in the whole literature.

KEY WORDS: accessory mental foramen, mental foramen, CBCT, anatomic variations, buccal bifurcation cyst.

INTRODUCTION

Developmental anatomy is a powerful adjunct to an in-depth understanding of gross anatomical pattern. 'A knowledge of anatomy is only a dead weight if we do not know how to apply that knowledge with successful skill,' rightly quoted by Andrew Taylor, Founder of Osteopathy (Andrew, 1897). Oftentimes, paediatricians, paediatric dental professionals and paediatric craniofacial surgeons are faced with challenges during the investigation of normal physiology of bone and its clinical disorders or if it is a developmental anatomic variant. There is unfortunately a huge lack of knowledge about the growing young child, and the adolescents.

In children, location of the mental foramen (MF) is variable which modifies with age (Dotto *et al.*, 2006). An accessory foramen located in the region surrounding the mental foramen and showing a connection with the mandibular canal is defined as the

accessory mental foramen (AMF) and is believed to relate to the mental nerve (Sisman *et al.*, 2012). It has been assumed that such variation results from the ramification of the mental nerve before it passes the mental foramen (Ventorini *et al.*, 2013).

It is important to differentiate the accessory foramina from the nutrient foramina. The accessory foramina are defined as a bony opening originating from the mandibular canal. Whereas the nutrient foramina, on the other hand, do not originate from the mandibular canal, and their dimensions are significantly smaller (Mrozek *et al.*, 2020). Cone beam computed tomogram (CBCT) scan assessment of the present cases revealed the anatomical variations of accessory foramina originating directly from the mandibular canal.

At times, this anatomical variation can be detected in clinical practice using conventional periapical and

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panoramic radiographs but superimposition of anatomical structures causing distortion and magnification in panoramic radiography can lead to errors in identification by the diagnostician. CBCT on the other hand comes in as an unbelievably valuable imaging tool capable of providing in-depth information in evaluating detailed intricacies such as anatomical variations. It was possible to observe this in our cases because the presence of the additional mental foramina was misdiagnosed in the panoramic radiography.

This is the first case series ever documented of an accessory mental foramen in a paediatric patient with mixed dentition as incidental findings along with concomitant other oral health conditions. These accessory mental foramina were located only in the left side of the mandible. Case 1 illustrates a 12-year-old girl with history of precocious puberty along with mal-aligned supplemental, supernumerary teeth having the double additional mental foramina situated anterior and inferiorly to the main mental foramen, where as in Case 2 represents an 8 year old boy child with buccal bifurcation cyst where in both the accessory mental foramina were located supero posteriorly and infero posteriorly to the main mental foramen location.

The authors in the following case series presentation aim to present to the dental fraternity about a rare anatomic variant in paediatric patients along with few other unique clinical findings such as over retained deciduous teeth in mandibular anterior region with a unilateral supplemental premolar tooth bud in one case and another with co-occurrence of oral bifurcation cyst leading to incidental findings of accessory mental foramina in both as a part of pre investigatory reports prior attending to primary chief complaints of respective paediatric patients.

Case 1. A 12-year-old girl reported to our dental unit regarding unpleasantly looking teeth arrangement. She had no remarkable medical, drug or birth history. However, the event of precocious puberty at the age of 8 years was informed by the accompanying parent to the attending clinician. However, a familial history of precocious pubertal event had occurred in the child's paternal aunt. The past dental history of the patient was that the child was extremely unwilling to allow oral health diagnosis thereby not letting the previous clinician to render the treatment plan following which the delay of 2 years in seeking further oral health care till they approached the authors. The parents were counselled and taken into confidence following which the child was taken to treatment area which included multiple visits so the patient could desensitise and allow to get treated after familiarity sessions at the chair side clinic.

Clinical Findings: Bilateral over retained deciduous mandibular centrals and laterals in the anterior region and erupted 31,32,41,42. Maxillary over-retained right deciduous canine with orally erupting 13 causing aesthetic concern to the parents of the child and absolutely no space for the erupting 23 in the left side.

Radiological Findings: Panoramic radiograph (Fig. 1) illustrates unerupted bilateral mandibular canines (black dots) with multiple impacted supernumerary teeth, supplemental premolar tooth buds (red dots) and on the left side accessory mental foramen (yellow arrow) inferior and anterior placed along with the main mental foramen (blue arrow). (Fig. 1).

3D CBCT reconstruction demonstrates unerupted bilateral mandibular canines (black dots) with multiple impacted supernumerary teeth (red dots) bilaterally. (Fig. 2). Fig. 3. illustrates the axial section

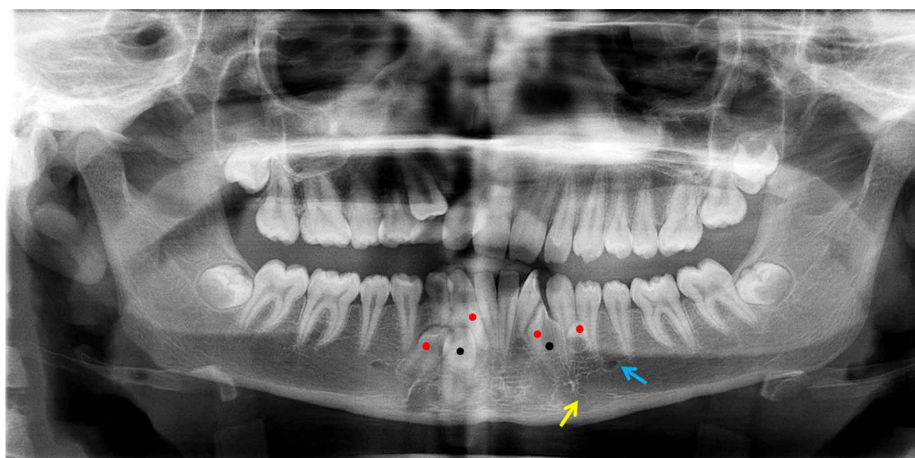


Fig. 1. Panoramic radiograph showing unerupted bilateral mandibular canines (black dots) with multiple impacted supernumerary teeth (red dots). Left sided accessory mental foramen (yellow arrow) along with the main mental foramen (blue arrow).

of mandible showing left sided accessory mental foramen (yellow arrow) anterior and superiorly. Fig. 4A and 4B shows the sagittal sections left sided accessory mental foramen (yellow arrow) exiting inferiorly and the main mental foramen (black arrow) exiting superiorly along with the main mental foramen (black arrow).

Treatment and Follow-up: Extraction of over-retained deciduous teeth was explained to parents and a regular follow-up for future orthodontic and surgical evaluation was advised.

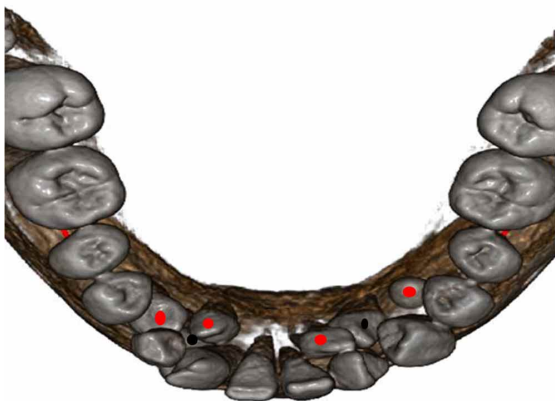


Fig. 2. 3D CBCT reconstruction showing unerupted bilateral mandibular canines (black dots) with multiple impacted supernumerary teeth (red dots) bilaterally.



Fig. 3. Axial section of mandible showing left sided accessory mental foramen (yellow arrow) along with the main mental foramen (black arrow) the red lines represent the inferior alveolar nerve within its canal.

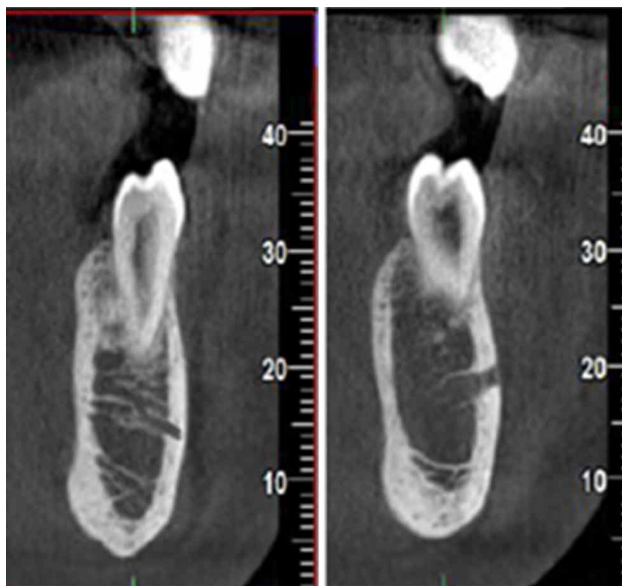


Fig. 4. Sagittal sections showing. **A.** Left sided accessory mental foramen (yellow arrow) exiting inferiorly and **B.** The main mental foramen (black arrow) exiting superiorly.

Case 2. An 8-year-old boy clinically presented with an acute pain and a unilateral well circumscribed swelling on the left side of the face over the mandibular region. The child had no significant medical or dental history. On intra oral examination, there was an obliteration of the left oral vestibule with no carious lesion on any of the mixed dentition teeth. The child was willing to sit through the investigations and probable surgical procedure at the chair side under local anaesthesia.

Radiographic findings: In an intra-oral periapical (Fig. 5A) and the panoramic radiograph (Fig. 5B), a solitary, well-defined unilocular, uniform radiolucent lesion was seen on the oral aspect of 36 extending to involve the peri-coronal space of the developing 37. There was evident oral cortical expansion and clear perforation of oral and crestal cortical plate. The associated tooth 36 is tilted such that the apices are displaced into the lingual cortical plate and the occlusal surface is toward the oral aspect. There was no involvement or displacement of inferior alveolar nerve canal. The lesion's location, homogenous nature and association with bifurcation area are consistent with oral bifurcation cyst. Other less likely possibilities of differential diagnosis include solitary bone cyst.

The incidental findings on 3D CBCT reconstruction of left side (Fig. 6) shows two accessory mental foramina, one superior and another inferior to the main mental foramen (black arrows), along with a large oral bifurcation cyst involving the lower left first permanent molar (red arrow).

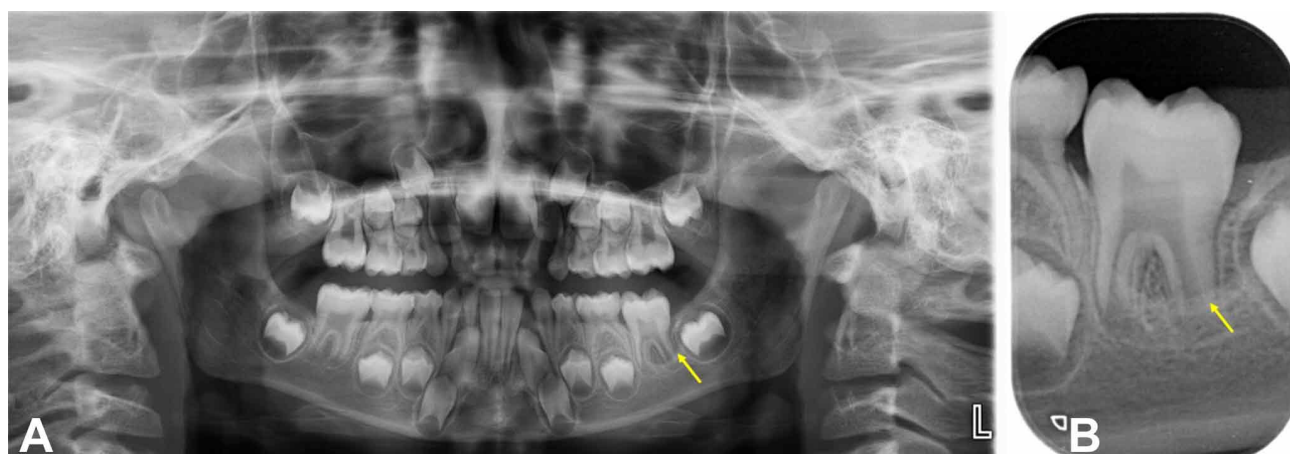


Fig. 5. **A.** Panoramic radiograph showing multiple unerupted permanent teeth. **B.** Intra oral periapical radiograph in relation to 36 shows a well-defined solitary unilocular, uniform radiolucent lesion extending to involve the peri-coronal space of the developing 37.

Treatment and follow up: The intra-oral excision of the lesion was scheduled with the maxillofacial surgeon specialized in paediatric cases for the same. The lesion was excised (Fig. 7) under local anaesthesia. The precise radiographic analysis facilitated the paediatric dentist to condition the patient accordingly as well as explain the parents thoroughly the surgical difficulties owing to the presence of anatomic variations. The follow up of 2 years 3 months was uneventful and the 36 and 37 erupted uneventfully.

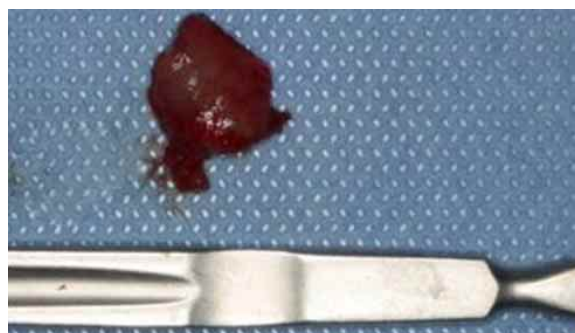


Fig. 7. Excised buccal bifurcation cyst.

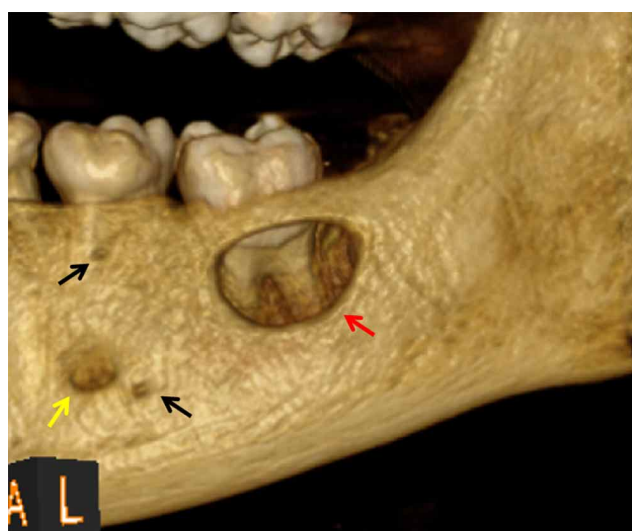


Fig. 6. 3D CBCT reconstruction of left side showing two accessory mental foramina, one superior and another inferior to the main mental foramen (black arrows), large buccal bifurcation cyst involving the lower left first permanent molar (red arrow).

DISCUSSION

The terminal part of the mental canal is represented by the mental foramen. In children, the location of mental foramen is variable and modifies with the increase in age. It is located inferiorly, between the first and the second deciduous molars (Madeira, 2003). Up to the 12th gestation week, the MF remains incomplete (Aher *et al.*, 2012), Brash pointed out that the opening of the mental foramina moves backwards in relation to the teeth during the years of growth, and linked the changes in direction of grooving, similar to conditions in the growth of nutrient foramina.

With the increase in age some modifications occur in the position of MF. The greater occurrence was found in the inferior third among the ages of 10 and 11 years old and the higher percentage was found in the middle third for individuals with 12 years old. Warwick finds that in foetuses the mental nerve is un-

tortuous in its course, whereas in the adult it is always tortuous. Furthermore, while in the new-born the direction of the nerve corresponds to the direction of the foramen, that is, anteriorly and superiorly. In the adult, the trunk of the nerve is directed posteriorly. This change is attributed to the functional factor of involved jaw movements.

An accessory foramen located in the region surrounding the MF and showing a connection with the mandibular canal is defined as the accessory mental foramen and is believed to relate to the mental nerve (Sisman *et al.*, 2012). AMF carries the mental branch and the medial inferior labial branch. Toh *et al.* (1992) considered that separation of the mental nerve being earlier than the formation of the MF could be a reason for the formation of the AMF (Sisman *et al.*, 2012). Incidence of AMF varies between ethnic groups (Singh & Srivastav, 2010). The most common position for the MF was between the first and second premolars, and an AMF was observed in four children (6.34 %). In another study, AMF were seen in 4.25 % of children and it stated the length and width of the MF to be significantly smaller in children aged 6 to 12 years when compared with children in older age groups. This may be related to the growing process. The distance between the MF and the alveolar ridge was also found to vary significantly among age groups (11.7 mm among children aged 6-12 years, 12.1 mm among children aged 13-15 years, 13.2 mm among children aged 16-18 years) (Orhan *et al.*, 2013). In children whose permanent teeth have yet to erupt, the MF is closer to the alveolar margin; during the eruption period, it descends to half-way between the base of the mandible.

Surgical extraction of a supernumerary tooth or removal of an odontoma near the mental foramen may also have a negative effect on neuro vascularization if particular care is not given to the exact location of the mental foramen. Although most surgeons take a more conservative approach to mandibular fractures in children than in adults, management of severe injuries follows the same protocols in both cases. Osteosynthesis may be indicated in cases of simple or multiple fractures with displacement, especially when possibilities of conservative fixation are limited. A miniplate may be positioned at the lower margin of the oral side of the mandible, taking into consideration the position of the MF and tooth germs. In cases of trauma, all mandibular fractures should be managed with care to ensure precise alignment of the neurovascular bundle and avoid impingement when the fracture is

healed. In cases where a second neurovascular bundle is in a different plane, alignment of the fragments becomes much more difficult (Cantekin & Sekerci, 2014).

The authors also attempt to emphasize that, unless the diagnostic information provided through CBCT improves treatment results, CBCT should not be recommended for use in children or adolescents (Bogdanich & McGinty, 2010). The recognition of the AMF is important to avoid complications during surgical procedures involving the MF and cheeks, such as nerve damage and haemorrhage. This may also prove difficult for adequate anaesthesia and correct diagnosis of bone lesions. The success of paediatric dental surgery may be affected by variations in the position of the MF and the presence of an AMF (Kastamoni *et al.*, 2020).

CONCLUSION

Its pertinent to have a good knowledge of additional mental foramina as it contributes to adequate anaesthetic techniques and to avoid misdiagnosis of bony lesions and eventual damage to the nerves and vessel during surgical procedures in that region. The localization of anatomic structures, as well as their eventual anatomical variations is of fundamental importance prior to any surgical and anaesthetic procedures. In case of mental foramen, innervations may lead to sensorial disturbances such as paraesthesia in the lower lip or cheeks, due to pressure on the mental foramen. Such alterations may lead to transient or permanent consequences, depending on how much the nerve is damaged. As the mental nerve supplies the skins of the chin and mucous membrane of the lower lip and gingiva, in the surgeries of the anterior region of the mandible, the surgeon should protect this major anatomical structure when the additional mental foramina are present.

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RESUMEN: El manuscrito presenta dos casos pediátricos con hallazgo incidental de forámenes mentonianos accesorios unilaterales. Ambos casos se refieren a la evaluación CBCT de un foramen accesorio unilateral en el lado izquierdo de la mandíbula, uno de los cuales era una niña de 12 años con antecedentes médicos

prediagnosticados de pubertad precoz y hallazgos orales de dientes supernumerarios y el otro un niño de 8 años con quiste de bifurcación bucal. La presencia no tan frecuente de forámenes y canales adicionales en la mandíbula se subestima con frecuencia en los procedimientos clínicos y, hasta donde sabemos, aún no se ha informado en casos pediátricos en la literatura hasta el momento. En esta serie de casos, los autores intentan documentar una variante anatómica rara y primera de su tipo de la mandíbula en pacientes pediátricos en toda la literatura.

PALABRAS CLAVE: foramen mentoniano accesorio, foramen mentoniano, CBCT, variaciones anatómicas, quiste de bifurcación oral.

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