

Trifid Mandibular Canal and Lingual Accessory Mental Foramen: A Case of Two Rare Anatomical Variations

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Abstract

Objective: Trifid mandibular canal as well as lingual accessory mental foramen are two of the rarest anatomical variations. The location and configuration of mandibular canal and mental foramen has important clinical implications. This case report presents two rare cases of trifid mandibular canal and lingual accessory mental foramen which detected by CBCT. The main purpose of this report is to pay attention to possible anatomical variations.

Case Report: A 38-year-old female referred to our clinic with a complaint of maxillary and mandibular partial edentulism. Intraoral and extraoral examinations showed no significant issues. On panoramic examination it was observed that the bone height and anatomical structures were normal. The CBCT was performed before dental implant rehabilitation for preoperative radiologic evaluation. On CBCT image, it was observed a trifid mandibular canal and lingual accessory mental foramen on the right side of mandible, and a bifid mandibular canal on the left side.

Conclusions: The trifid mandibular canal and accessory mental foramen are very rare condition and frequently misdiagnosed in routine panoramic radiographic examinations. Increasing the knowledge about anatomical structures and their variations will provide the clinicians to avoid complications during surgery procedures. Hence, comprehensive and detailed preoperative radiologic evaluation should be applied by using appropriate radiologic technique.

Keywords: Anatomic Variation; Cone-Beam Computed Tomography; Mandible

Introduction

The term "Anatomical variation" is used to describe a difference in anatomical structures. The location and the configuration of the anatomical variations such as mandibular canal variations and accessory mental foramina are important in surgical procedures such as genioplasty, implant placement, extraction of the impacted third molar and sagittal split ramus osteotomy [1]. The mandibular canal is situated between mandibular foramen and mental foramen. It also contains alveolar inferior nerve as well as artery and vein [2,3]. It is known as a bilateral single anatomical structure. The term "Normal" in anatomy refers to the shape and

position most frequently found in individuals. Although it is rare but sometimes it may be encountered with the cases which deviated from the normal. The trifid mandibular canal is a variation of mandibular canal as well as bifid mandibular canal. Trifid is derived from the Latin word and means as "Divided or cleft into three parts or branches" [4].

The mandibular canal variations have been investigated by several authors [1-3],[5-9]. The bifid mandibular canal is defined as uncommon variation but not rare as being thought by some authors [1,2]. According to literature there are various reports and studies which indicate bifid mandibular canal but only a few cases of trifid mandibular canal have been reported [10-12]. The mental foramen is the one of the most important anatomical landmarks of dentomaxillofacial area. It is located on mental area and gener-

ally found between the roots of first and second mandibular premolars [13-15]. The accessory mental foramen is a rare variation of mental foramen. The general incidence of multiple mental foramina appears to range from 2% to 10% depends on ethnicities according to the literature [16]. It is defined as presence of additional foramen(s) in mental foramen region. Accurate diagnosis of mental foramen and its accessory variants will help clinicians to avoid complications such as bleeding, hemorrhage and paresthesia [13,17].

Whether it is defined as normal or variated, it is very important to localize to avoid complications in surgical procedures such as implant rehabilitation or mandibular third molar extraction. For this purpose, accurate radiologic assessment is necessary and several radiologic modalities are used such as panoramic [2,18-20], Computed Tomography (CT) [4-7] or Cone Beam Computed Tomography (CBCT) [1-3,8,9]. Panoramic radiography is used routinely in dentistry but due to its limitations such as providing two dimensional images from three dimensional objects, magnifications, distortions and superimpositions, mandibular canal variations or accessory mental foramen are not always observed. To avoid two dimensional modalities' disadvantages and to reveal more accurate informations of correct anatomy, cross-sectional and multiplanar evaluation is needed. Therefore, CBCT has been used as diagnostic imaging modality to obtain exact information of anatomy and its variations [1,6]. The aim of this report is to describe three rare anatomical variations which were not noticed on conventional radiographic technique but incidentally found in CBCT images in the pre-operative assessment of a patient.

Case Report

A 38-year-old female referred to the Department of Dentomaxillofacial Radiology, Health Sciences University, Faculty of Gulhane Dentistry, Ankara, Turkey with a complaint of maxillary and mandibular partial edentulism. She had no history of any systemic disease and did not use any medication. Intraoral and extraoral examinations showed no significant issues. On panoramic examination it was observed that the bone height and anatomical structures were normal. It was also noticed that there was bilaterally mandibular canal variation. (Figure 1) On the left side of mandible, a bifid mandibular canal was clearly seen. On the right side, it was detected a mandibular canal variation but was not clearly seen whether it was bifid or trifid. In order to determine the appropriate surgical approach and to obtain more detailed information, it was decided for an examination by 3D Accuitomo 170 (3D Accuitomo; J Morita Mfg. Corp., Kyoto, Japan). A reconstructed three-dimensional image revealed incidentally a trifid mandibular canal.

On CBCT image, it was observed a trifid mandibular canal variation on the right side of the mandible (Figure 2,3). At the same side, on premolar region, it was seen a bifurcation of the mandibular canal. The buccal exit of canal produces the right mental foramen. In addition to this common structure, a smaller bony exit located on lower lingual surface of mandible was also detected (Figure 3,4,5). This small bony exit was not seen on panoramic evaluation. Furthermore, a bifid mandibular canal on the left side of the mandible was clearly observed on the sagittal and coronal slices of CBCT (Figure 6,7). A three-dimensional reconstructed image presented on (Figure 8) helped us to easily follow the location and configuration of mandibular canal. In light of this findings, a comprehensive and detailed dental implant treatment planning was performed in order to avoid neurovascular bundle damage.

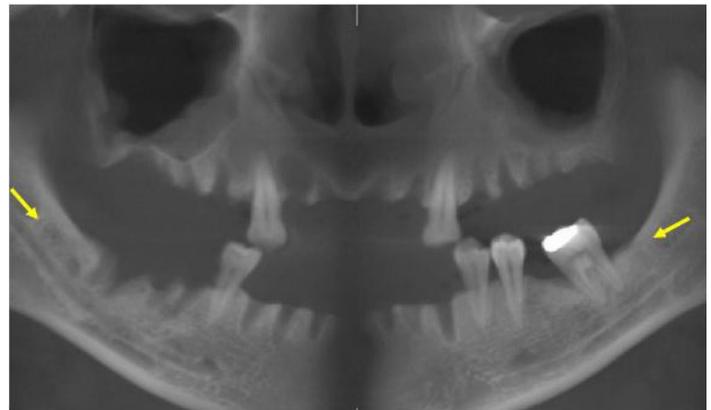


Figure 1: A panoramic radiograph was obtained from the patient who was referred for dental implant rehabilitation. It was detected bilateral mandibular canal variations (arrows).

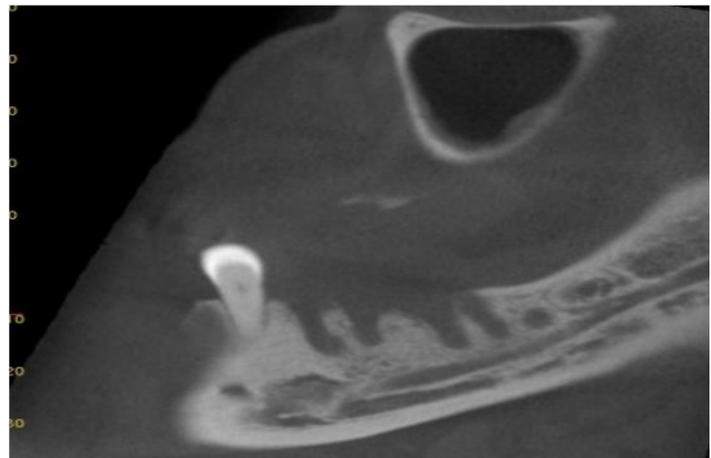


Figure 2: Sagittal view of trifid mandibular canal.

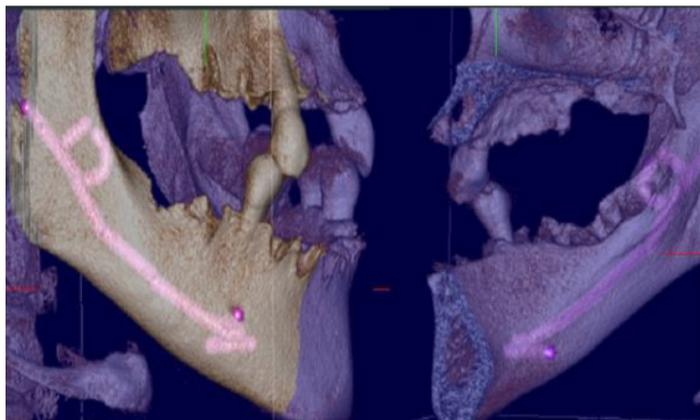


Figure 3: 3D reconstructed view of trifid mandibular canal. On 3D reconstructed image it was also seen mental foramen and lingual accessory bony opening(lingual accessory mental foramen).

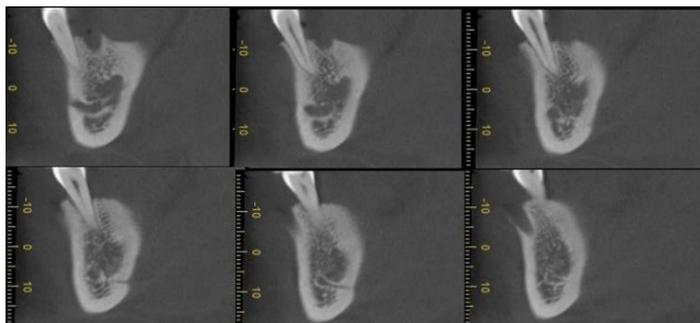


Figure 4: Cross-sectional slices of mental foramen and lingual accessory mental foramen.



Figure 5: Axial view of lingual accessory bony opening.

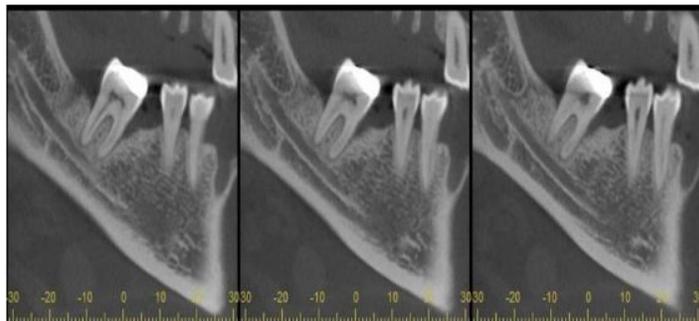


Figure 6: Sagittal slices of bifid mandibular canal on the left mandible.

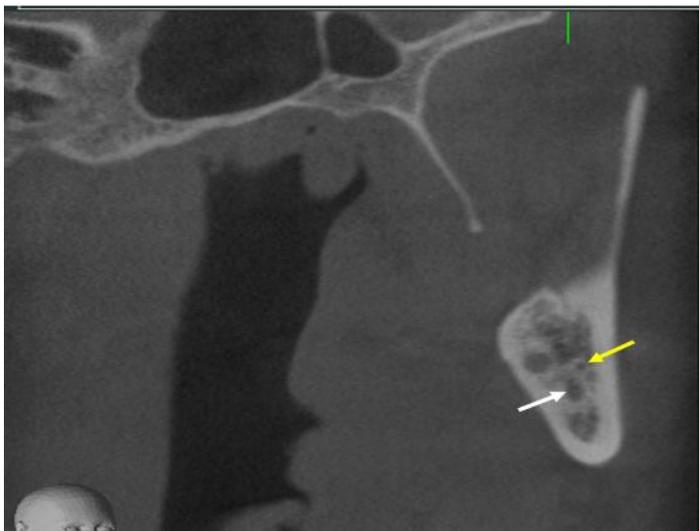


Figure 7: Cross-sectional view of bifid mandibular canal White arrow shows mandibular canal, yellow arrow shows variation on cross-sectional slice.

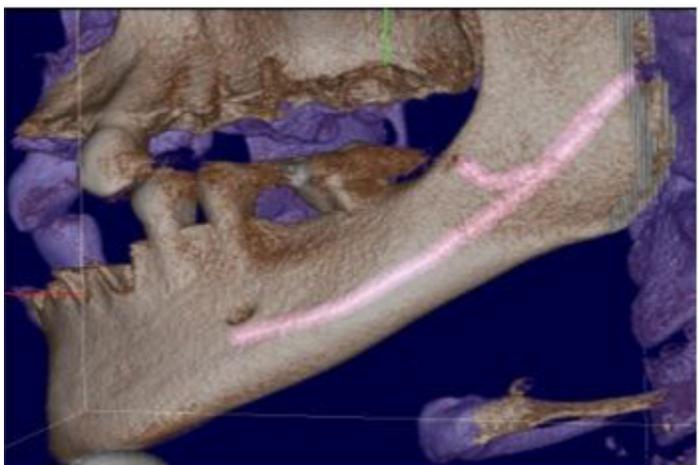


Figure 8: 3D reconstructed view of bifid mandibular canal.

Discussion

Various studies and case reports of anatomical variations such as mandibular canal variations or accessory mental foramen are found in the literature. The studies which published in literature were frequently performed with dry mandibles, but radiologic studies were relatively less common [21]. However, along with increasing the use of CBCT, radiologic studies have gained popularity. Since the last 10 years, many studies and case reports which used of CBCT have been published.

The mental foramen presents as a single circular or elliptical buccal bony opening in the mandibular premolar region. The absence of mental foramen is a rare condition as well as the presence of multiple mental foramens [21,22]. Multiple mental foramen or accessory mental foramen is the presence of more than one accessory foramina in mental foramen area. The presence of a ramification of mental nerve before it passes through the mental foramen, and runs along to the surface of mandible with an accessory bony opening is described as a variation of mental foramen in literature. In addition, it is important to differentiate the accessory mental foramen from a nutritious foramen. The nutritious foramen described as a foramen which is not originated from mandibular canal. But the accessory mental foramen is originated from the mandibular canal as observed in this case. According to the literature, accessory mental foramen generally presents in the buccal surface of the mandible but to the best of our knowledge there is only one report in the literature which were described in the lingual surface [21]. In the present case we observed an accessory bony opening originated from mandibular canal which located in the lingual cortical surface. Hence, this report is assumed as the second case of lingual accessory mental foramen.

The mandibular canal is one of the most important anatomic structures of mandible. It contains the inferior alveolar nerve and the associated vessels. It runs along between the mandibular foramen and mental foramen [23]. It oftenly appears as a dark, linear line with radiopaque superior and inferior borders in radiographs [3].

Although this structure has generally been observed as single for each side of the mandible, some variations which known bifid or trifid mandibular canal have been reported since 1973 [2,5,18]. There are several studies of bifid mandibular canal in literature. They were found in 0.08%-0.95% of the cases in panoramic radiographs, and 10.2%-65% of the cases in CBCT evaluation [1,2,9,24]. Although, Naitoh et al. [1]. Classified the bifid mandibular canals according to their location into four subgroups-retromolar, dental, forward and buccolingual type- by using CBCT, trifid mandibular canal were not included to the classification. Rashsuren et al. [24]. stated that the most frequently found subtype of bifid mandibular canal was retromolar type as observed in our case report, but Orhan et al. [3]. Found the most common type was forward type. In literature, occurrence of trifid mandibular canal is much rarer

relatively than bifid mandibular canal and only a few case reports are available [8,11,12]. In our case report we observed two divided branches of mandibular canal which run along upward through the alveolar ridge in the right and a retromolar type of bifid mandibular canal was found in the left side of the mandible.

Identifying the accurate position and course of mandibular canal and its variations is important to avoid from potential complications such as bleeding, hemorrhage and paresthesia during dental surgical procedures [13,17,23]. Accurate diagnosis of the anatomical structures and their variations is only made by using radiographic modalities. Bidimensional imaging modalities such as panoramic and periapical techniques have been using routinely in dental practice. Despite of some disadvantages of conventional radiographs like distortions, magnifications or superimpositions, anatomical structures and variations can be detected [2]. However, Naitoh et al. [1] stated that only two of five semimandibles in which bifid canals detected in panoramic evaluation. In addition, the big differences in frequency rates which mentioned above should be considered as the greatest evidence of the effectiveness of 2D and 3D imaging modalities. With the development of three dimensional imaging modalities such as CT and CBCT, detailed multiplanar evaluation of maxillofacial region can be conducted for further analysis of these anatomical variations [13,17]. Moreover, CBCT has been gained popularity in dentistry by the meaning of compensate the shortcomings of the CT, such as higher radiation dose, lower spatial resolution and the higher costs [2,25].

In conclusion, the present report describes two rare cases of lingual accessory mental foramen and trifid mandibular canal. The variations of anatomical structures could be frequently missed in conventional radiographs. The limitations of conventional imaging modalities should be known and especially in suspected cases, multiplanar imaging modalities should not be ignored as an alternative approach for accurate information. Accurate diagnosis and correct identification of this anatomical variations will provide the practitioners to avoid nerve damages, bleedings and complications. Hence, comprehensive and detailed preoperative radiologic evaluation should be applied by using appropriate imaging modality. In addition, increasing the knowledge of the head and neck anatomy will provide clinicians to reach to success in performing treatment planning and to avoid misinterpretations or malpractice.

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