



Trifid Mandibular Canal with 2 Accessory Mental Foramens: Report of Exceptional Anatomical Variations

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ABSTRACT

Mandibular nerve engages in the mandible from mandibular canal and exits anteriorly from mental foramen on each side of mandible. Any bifurcation or trifurcation in mandibular canal and more than one mental foramen on any side is considered as anatomical variation which is uncommon or rarely seen. A 54-years male was presented to our hospital for dental implant simulation. Three-dimensional CBCT scan of the patient was done on Planmeca 3D Mid ProFace scanner, which revealed one mental foramen with two accessory mental foramen and trifurcation of mandibular canal on right side of the mandible. Any variation in normal anatomical structures can complicate or may result in failure of dental procedures done in the concerned area. Hence, a detailed radiographic evaluation should be done prior to any surgical procedure to avoid post operative complications.

Keywords: Mandibular canal, Bifurcation, Trifurcation, Accessory mental foramen.

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INTRODUCTION:

Anatomical landmarks are the reference that defines or delineates the normal anatomy of human body. Mandibular canal (MC) and mental foramen (MF) are two such anatomical landmarks in oral radiography. MC is track down in the mandible between mandibular foramen and MF on the mandible. It contains mandibular nerve (MN) as well as Blood vessels. Either Bifurcation or trifurcation of mandibular canals are rare variations of the normal anatomy of MC. BMC were observed in 0.08-0.95% of the reported cases on Orthopantomogram and 10.2-65% of the reported cases on CBCT scans evaluation whereas TMC were rarely reported. (1,2)

MF is present bilaterally in the mandible body, most commonly between first and second premolar. Inferior alveolar nerve gives a branch known as mental nerve which exit through MF and supply mental region of mandible. Detection of auxiliary foramen in MF region is rare and referred as Accessory mental foramen (AMF). (3)

Favorable outcome of numerous dental treatments and surgical practices such as orthognathic surgeries like osteotomy and genioplasty, and rehabilitation with dental implant, precise diagnosis of MC furcation and AMF is of utmost importance. With the increasing application of dental implants, determining the correct anatomy and possible deformations plays an important role. This case report will highlight a case of TMC and 2 AMF, not yet documented in the literature, and this case report will discuss in detail the various morphological analysis of the MC and MF including the classifications reported by various authors in past. Hence, this will help the radiologist and clinicians in implant simulation on software and also in person to avoid any postoperative complications and injury to neurovascular bundle and bleeding at the affected site. (3)

CASE REPORT

A 54-years male was referred for implant simulation due to maxillary partial edentulism to the Department of Dentomaxillofacial Radiology, Faculty of Dental Sciences, SGT University, Gurugram, Haryana. Intra-oral and extra-oral examinations showed no significant findings. No medical comorbidities were reported. On CBCT scan, whilst tracing the MC for implant placement, a variation was found in the course of the canal. The main canal was extending from mandibular foramen on medial side of ramus of

mandible heading forwards and downwards towards the opening of mental foramen between the apices of mandibular premolars.

A trifurcation of MC was appreciated on the right side (Figure-1). The first furcation (Figure-2) was seen on the ramus-molar region approximately 17.64 mm from the anterior border of external oblique ridge. (Figure-3) The canal was seen coursing forward up till the 2nd molar region. The second furcation (Figure-4) was appreciated in the 1st molar region, approximately 9.6mm (Figure-5) from the alveolar crest coursing forward and upwards towards the root apex of 2nd premolar.

In the right side, MC before exiting through mental foramen gave branches to 2 accessory foramina (Figure-6) which were present medial and lateral to the main MF. The main MF and medial accessory foramen are present between 1st and 2nd premolars and above the level of apices of adjacent teeth whereas lateral accessory foramen present in vicinity of the distal aspect of root of 2nd premolar and above the root apex of adjacent teeth.

The above findings are suggestive of presence of Trifid mandibular canal with two accessory foramina on right side of mandible.

Other findings seen on CBCT scan were Partial edentulism wrt 11, 12, 13, 17, 21, 22, 27 and mucosal thickening of the floor and postero-lateral wall of the left maxillary sinus suggestive of chronic sinusitis.

DISCUSSION

Normal anatomy and morphology refers to the shape, size and site most commonly found in general population. Any deviation from this normal anatomy is noted as Anatomical variation. Several anatomical and radiological studies and reported cases show anatomical variants such as the MC furcation or AMF. Earlier researches were mostly done with dry mandibles but with evolution of 2-dimensional and 3-dimensional radiography, radiologic studies have acclaimed popularity. (1,4,5)

The MC contains the inferior alveolar vessels and nerve. It generally seems as a linear structure on radiograph with radiopaque superior as well inferior borders (1). According to Chávez-Lomeli *et al.* during embryonic maturation, Inferior alveolar nerve has 3 separate branches as inferior dental nerves which innervate the mandibular teeth and get fused together to make a single nerve in the later stages. Any disturbance during the fusion of those nerves results in BMCs and TMCs. The incidence of BMC is unusual but of the TMC is rare, suggested by the literature. (6,7) (Table-1)

Studied 46 dry mandibles and observed only 1 case of TMC which gives a 2.2% prevalence rate [8]. TMC in Turkish population with a 2.4% prevalence rate. Rashuren *et al.* detected seven cases of TMC out of CBCT images of 500 patients (6,8)

TMC classification which includes 5 types. According to this classification, Type-D of TMC seen on the right side of the mandible in this case report. (8)

Table-1: A review of various cases reported with BMC, TMC or both.

Name	Year	Gender	Age (in years)	BMC (side of mandible)	TMC (side of mandible)
Auluck <i>et al</i>	2005	Female	48	-	Left side
Mizbah <i>et al</i>	2012	Male	26	Left side	Right side
Adisen <i>et al</i>	2013	Male	63	-	Left side
Ozgedik <i>et al</i>	2017	Female	38	Left side	Right side
Quang Do <i>et al</i>	2020	Male	90 [cadaver]	-	Left side

The MF is an oval or circular opening on the lateral aspect of the mandible body, where the MC ends. This foramen is an egress for the mental nerve and vessels which supplies hard and soft tissues anterior to it. Radiographically, the MF presents as a bilaterally single, ovoid or elliptical radiolucent structure in the region of mandibular premolars but racial differences have been clearly demonstrated by comparative studies among Indian, European and Chinese populations, which disclose that MF is located more backwardly in blacks than whites. [9-11].

The MF is usually single on each side of mandible, multiple MF is uncommon and considered as Accessory mental foramen (AMF) (6). Balcioglu and Kocaelli addressed a rate of prevalence ranging from 1.4-10% and proclaimed that Caucasians have a much lower rate of prevalence for AMF than Non-Caucasians (12). Upto 12th week of embryonic life, MF is partially formed and the mental nerve differentiates into several fasciculi at this stage. Differentiation of the mental nerve before the MF is fully formed may be responsible for the development of the AMF. (9,13) (Table-2)

Table-2: A review of various cases reported with unilateral or bilateral AMF.

Name	Year	Gender	Age	Number of AMF	
				Right side	Left side
Igarashi et al	2004	Male	52	1	-
Cagirankaya et al	2008	Female	62	-	1
Balcioglu et al	2009	Female	48	1	-
Neves et al	2010	Male	47	-	1
Neves et al	2010	Female	14	-	1
Thakur et al	2011	Male	40	1	-
Sekerci	2014	Male	42	2	1
Torres et al	2015	Male	63	1	-
Avsever	2017	Male	52	1	2

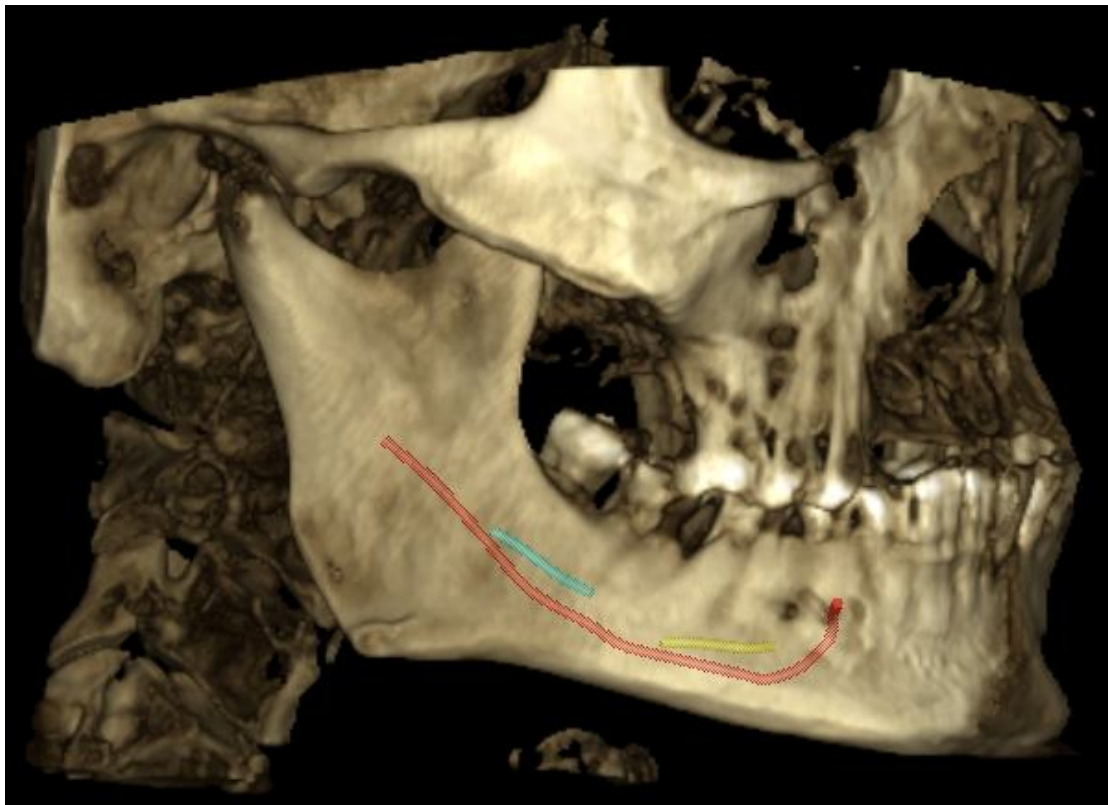


Figure-1: 3-D reconstructed CBCT image with tracing of the MC showing trifurcation and the openings of MF and two AMF on the right side.

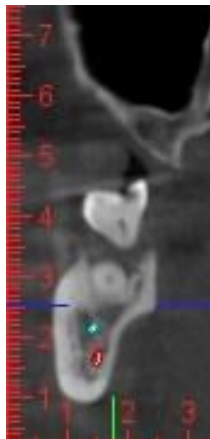


Figure-2: Coronal section of CBCT scan showing relation of first furcation (blue) with the main MC (red).



Figure-3: Coronal section of CBCT scan showing the distance of first furcation from the anterior border of external oblique ridge is approximately 17.64 mm.

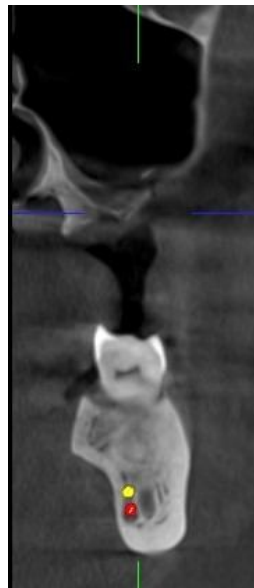


Figure-4: Coronal section of CBCT scan showing relation of second furcation (yellow) with the main MC (red).

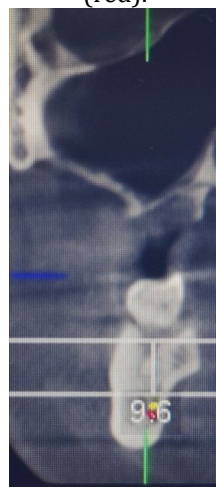


Figure-5: Coronal section of CBCT scan showing the distance of second furcation from the alveolar crest in region between 1st molar and 2nd premolar is approximately 9.6mm.

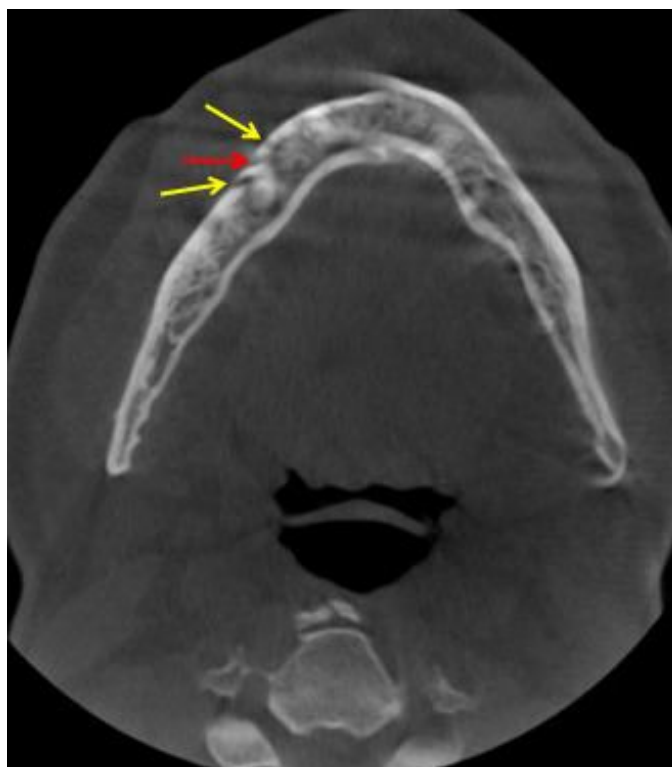


Figure-6: Axial section of CBCT scan showing mental foramen (red) with 2 accessory mental foramina (yellow).

CONCLUSION

Accurate diagnosis and identification of anomalous courses of the MC and presence of an extra MF are of foremost importance to spot out the surgical insufficiency such as inadequate anesthesia when preparing for tooth extraction, disimpaction, endodontic treatment and to avoid injury to the neurovascular bundle which can be the reason for complications namely bleeding, numbness and neuropathy. Detection of these disparities need extra attention hence, a thorough 3-dimensional radiographic assessment with the help of CBCT should be done prior to dental implant insertion and any other surgical procedures involving the mandible such as mentoplasty, orthognathic surgeries, to obtain favorable results (5). TMC and AMF have been reported individually in literature, but co- occurrence has not yet been reported, so this case is a subtle evidence of both variations existing together.

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