Radiological Assessment of Mandibular Retromolar Canal (MRMC) Using CBCT-Radiographs in a Sample of Iraqi Patients

Jamal Abid Mohammed, B.D.S., M.Sc. (1)
Zainab H. Al-Ghurabi, B.D.S., M.Sc. (2)

ABSTRACT

Background: Because of its clinical and surgical importance and lack of precise information about this rare and important anatomical landmark, this study was designed to detect the presence, configurations and length of Mandibular Retromolar Canal (MRMC) with aid of CBCT visualization.

Materials and methods: In this retrospective study the data was obtained from Specialist Health Center in AL-Sadder city in Baghdad for (100) patients with 200 inferior dental canal, all of them referred to CBCT scan (Kodak 9500, French origin). The scanning was done with tube voltage 90 kVp, tube current with 10mA and exposure time was 10 s., the field of view was measured with 5cm x 3.7cmwith 0.03mm voxel size

Results: In the present study the prevalence of MRMC was 12% , 2 patients have (two) bilateral MRMC and 10 patients have a unilateral canal, there was asignificant difference between two sides (left and right), the right side was 64.29% and left 35.71%, regarding to gender also there was a significant difference , female 33.3% and male 66.7%. In this study there were three types of MRMC and there was a significant difference between them, the mean length (hight) was 11.78 mm and mean horizontaldistance from canal to distal surface of the second molar was 18.5 mm.

Conclusions: MRMC also detectedin this study within the global percentage and configurations and should be taken with consideration in oral surgical procedures and radiological interpretations.

Key words: Retromandibular canal, anatomical variation, cone beam computed tomography. (J Bagh Coll Dentistry 2016; 28(3):99-103).

INTRODUCTION

Details and fine knowledge of anatomical structures and anatomical variations are important for surgeon and radiologist and since there are important surgical procedures in the posterior region of the mandible such as insertion of dental implant, sagittal split osteotomy, bone harvesting procedures, and removal of impacted third molar [1,2], so identification of the anatomical variations which may present in this area should be precisely studied.

However mandibular retromolar canal (MRMC) is a rare anatomic variation in the posterior mandibular region [3,4]. This canal is believed to contain neurovascular bundle which supply additional innervations to the mandibular molars, the probability of injury to these vessels could be happen during surgery is present [1,5,6], so clinicians should be depend on radiographic examination to identify MRMC before surgical procedures involving the posterior mandibular area. Although panoramic radiograph is acceptable in general scanning and evaluation of the jaw, but it still give us two dimension, overlap and poor resolution image [7,8].

Identification and localization of MRMC on panoramic radiograph may be difficult or not accurate because of the mandible ramus region would overlap with the opposite side and superimposition of the soft tissue, magnification geometric distortion can led to limitation in identification of this structure

Recently cone beam computed tomography (CBCT) is well established as an alternative technology in the imaging of oral and maxillo-facial region [9], CBCT supply three dimension (3D), undistorted image for teeth and surrounding structure with high accuracy, so it give very well visualization of the anatomical structure of bone that enable us to visualize the inferior dental canal and any variation with it [10].

Because of its clinical and surgical importance and lack of information about this rare and important anatomical structure, this study was designed to detect the presence, types and prevalence of MRMC with aid of CBCT visualization.

MATERIALS AND METHODS

Patients

In this retrospective study the data was obtained from Specialist Health Center in Al-Sadder City in Baghdad for (100) patients scan37 male and 63 female with 200 hemi-mandible, all of them referred to CBCT for different diagnostic purpose, radiographic were examined to identify the presence or absence of MRMC and its configuration according to Patil et a [24].

This study begins at February 2014 to December 2015. This study had been approved by College of Dentistry\ University of Baghdad, every patient informed about research and they sign for this.

(1) Assistant Professor, Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Baghdad.
(2) Lecturer, Department of Oral Diagnosis, College of Dentistry, University of Baghdad

Imaging

The scanning was done with (Kodak 9500, France) tube voltage 90 kVp, tube current with 10mA and exposure time was 10 s., the field of view was measured with 5cm x 3.7 cm with 0.03mm voxel size. .

MRMCs were scanned or diagnosed with three multiplanar views, coronal, sagitta,and axial, in addition to reconstructed panoramic view.

The CBCT radiograph (sagittal, panoramic views) of the mandible were viewed for the presence or abscence, configuration and types according to the direction of the canal. linear measurements (mm) were taken by using the sagittal view of the CBCT images ,for the canal length (height) the distance from the orifice to its origin from the upper border of the canal,and for horizontal distance from the mesial surface of the retromolar canal to the distal surface of the lower second molar (figure-1,B).

Bilateral sides of the mandibleradiographs (CBCT)were evaluated to determine presence, abscence,cofiguration and position of the MRMC.

Image evaluation

All radiographs were evaluated toensure the presence, absence of MRMC and its type (cofiguration) obtained by agreement between oral surgeon and oral and maxillofacial radiologist for consensus agreement.

Statistical analyses

The identification, measurements (means, range) and standard deviation supjected to statistical analysis using SPSS 16 for statistical analysis and use Excel under windows XP:

-Desicrptive statistic: mean, SD, range, minimum and maximum.

-Inferential statistcs: Pearson's Chi-square test and Z-score test.

RESULTS

In this study, according the accuracy of CBCT the MRMC was found in 12 of 100 patients (12%), of which 5 on the left side (35.71%), 9 on the right side (64.29%) (Table 1), two of them have (two) bilateral MRMC and 10 have a unilateral MRMC (table 2) and (table 4). There was a significant difference between left and right sides, the right side was (9) 64.29% and left (5) 35.71% (Table 4).

Regarding to gender also there was a significant difference between female (4) 33.3% and male (8) 66.7%. In this study there were three types of MRMC and there was a significant difference between them, the mean length (hight) was 11.78 mm and the mean horizontaldistance from canal to distal surface of the second molar was 18.5 mm.

After scanning it was found that, there were three configuration of MRMCs which involve: type one,the MRMC was emerge from the inferior dental canal and return to retromolararea fig 8 (c), type two, itemerges from inferior dental canal and direct upword (verticaly) fig 8 (B) and type three emerge from the inferior dental canal and directed medially toward the teeth (Figure-8 A).

Table 1: Number and percentage of patients

Patients	No.	%
Male	63	63%
Female	37	37%
Total	100	100

Table 2: Distribution of patients with unilateral/bilateral occurrence of MRMC

	Patients No.	%
Bilateral	2	16.67
Unilateral	10	83.33
Total	12	100

Table 3: distribution of affected sample according the gender

Patients	No.	%
Male	8	66.7
Female	4	33.3
Total	12	100

Table 4: Distribution of MRMC canals according to side

Side	No.	%
Left	5	35.71
Right	9	64.29
Total	14	100

***Chi-square =9.983 p=0.002**
P<0.05 Significant

Table 5: Distribution according to canal type

Types	Males		Females		Comparison	
	No.	%	No.	%	Z-test	p-value
Type 1	1	14.29	4	57.14	-1.67	0.095
Type 2	4	57.14	2	28.57	1.08	0.28
Type 3	2	28.57	1	14.29	0.65	0.516
Total	7	100	7	100		

Z - score test

Table 6: Length (vertical) of MRMC, and Horizontal distance (mm) linear measurements

	Length	Horizontal
Mean	11.78	18.5
SD	5.58	7.38
Min	7	9
Max	28	30
Range	21	21

Fig. 1: CBCT, reconstructed panoramic view show type3 of MRMC which emerge from the inferior dental canal and directed medially toward the teeth

Fig. 2: CBCT, reconstructed panoramic view show type2 of MRMC which emerge from the inferior dental canal and directed upward

Fig. 3: CBCT sagittal view show type1 of MRMC which emerge from the inferior dental canal and directed to retromolar area

Fig. 4: CBCT coronal view show the inferior canal and MRMC

Fig. 5: CBCT cross section show the inferior canal and MRMC

DISCUSSION

The present study documented the presence of MRMC in this Iraqi population sample, and the present percentage (12%) of this canal(MRMC) somewhere within the range reported in other studies related to many different populations like, Turkish [21], Italian [4], Indian [22], Brazilian [23] and Japanese [24]. the incidence of MRMCs in osseous and CBCT studies has been found to range from 6.1%-72% among different populations [11-17] and this difference can be related to types of the studies for detection of the canal ,different samples used, hereditary and environmental reasons.

Regarding the gender, this result (table 1, 3) showed that MRMC more common (significant) in males than females, the male percentage (66.7%) which was higher than female percentage (33.3%) as clear in table 3, there was a significant difference (p value <0.005), and this result is come in accordance with Meera [19] and in disagreement with Arx et al. [15,20,24] in which they found there was no significant difference in gender although the female number was more

than male, and this may be because race difference or sample distribution between the two studies, reflecting that no agreement on gender prevalence because of the different results of many reports regarding this canal.

Regarding the side(left and right),in this study, it was found a significant difference between the two sides, the left side was 35.71% while right side percentage was 64.29% (tables 2 and 4).

2 patients (16.67%) have bilateral (two) MRMCs and the remaining 10 (83.33%) have a unilateral (one) (table 2) , this result was neer to many studies [15-17], all these studies found that, the unilateral side involvement with MRMC was higher than bilateral sides, this come in accordance with Arx et al. [15].

In the current study, three types of MRMCs were observed according to their configuration and direction: type 1 emerges from inferior dental canal and return to retromolar area fig 3, type 2 directed vertically from inferior dental canal fig. 2 and type 3 directed medially toward the teeth after emrging from inferior dental canal (fig 1).

In coronal view and cross section, MRMC type couldnt recognized only the orifices of the canals (fig 4 and 5) respectly.

reviewing of many of the recent studies [15,24-26] using CBCT for MRMC evaluation regarding the types of those canals reveal thatthere were no agreement about the description of the MRMC patteren, recording a varieties ranging from three to nine types and subtypes ,so from the findings of these studies and the current study we can conclude that there was no consensus descriptive dominant pattern applied to describe this anatomical landmark using the radiographic imaging, reflecting that there was a lot of different configurationsrelated to this anatomical landmark which need further investigations .

This study shows that, Type 1 found in 5 (35.7%) patients, type 2 found in 6 (42%) patients and type 3 (21.4%) found in 3 patients as clear in (table 5) with a significant difference in the prevalence among these three types (table 5) in a very recent study [26] with large sample using CBCT they found nine types of MRMC ,but more than half of these canals in their study was in accordance with the current study regarding the predominance of type one and type two.

Regarding to the measurements of the canals, the length was measured from the origin of the MRMC from inferior dental canal to the end of it at crest of the bone, the mean length was11.78mm with range (7 to 28) mm, while the horizontal distance was measured from the mesial surface of the canal to the distal side of the second molar, the mean distance measurement was 18.5mm with rang (9 to 30)mm, as clear in (table 6), these measurements was higher than other studies [11,14, 15,20]. The cause of these difference may be explained on that, these studies measure the reteomolar foramen rather than MRMC and someauthors measure the horizontal distance to the third molar or to the anterior border of the ramus of the mandible.

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