Evaluation of Mandibular Third Molar Position by Using Space-Width Ratio Method

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ABSTRACT

Background: The prediction of changes in the mandibular third molar position and eruption is an important clinical concern because third molar retention may be beneficial for orthodontic anchorage. The aims of this study were to assess the mandibular third molar position by using medical CT scan and lateral reconstructed radiograph and evaluate gender differences.

Materials and Methods: The sample of present study consisted of 39 patients (18 males and 21 females) with age range 11-15 years who were attending at Al-Suwayra General Hospital/ the Computerized Tomography department. The distance from anterior edge of ramus to distal surface of permanent mandibular second molar and mesio-distal width of developing mandibular third molar were measured in both three dimensional volumetric and two dimensional CT derived lateral images. The statistical analyses included: means, standard deviations. Paired t-test was used to compare between the two methods and independent t-test was used in verifying the genders difference.

Results: The results showed that there was high significant method difference between 3D CT and 2D image and gender differences were observed in values of linear measurements of present study, as males showed higher mean values than females.

Conclusion: There is high accuracy of measurement on CT images, so C.T. scan is advisable during the diagnosis and treatment plan of orthodontic cases.

Key words: Mandibular third molar, space width ratio method. **(J Bagh Coll Dentistry 2016; 28(4):168-171)**

INTRODUCTION

A wisdom tooth or third molar is one of the three molars per quadrant of the human dentition. It is the most posterior of the three. Wisdom teeth generally appear between the ages of 17 and 25 [(1)]. The mandibular third molar has the greatest variability in development, morphology (shape and size), eruption and occlusion [(2)].

There is great correlation between the eruption of mandibular third molar and malocclusion, like crowding of the lower anterior teeth which occur as a result from the mesial force that exerted from the mandibular third molar. Presence or absence of mandibular third molars in patient is relevant to orthodontic treatment planning [(3)].

Orthodontic therapy in maxillary and mandibular arches may need distal movement of both first and second molars by either tipping or translation, which may result in impaction of third molar. So to avoid impaction of third molar and to facilitate retraction, it is advisable in some cases to remove third molars before starting teeth retraction [(4)].

There are many indications for retention of unerupted mandibular third molar, when there are medical reasons to avoid surgery if there is a likelihood of subsequently losing the second molar because of a large restoration, periodontal disease, or extensive caries, other indications is in orthodontic patients in whom four premolars have already been extracted and removal of third molars would reduce the dentition by a total eight teeth. Finally, there may be instance in which the orthodontist may need these teeth for anchorage [(5)].

In an attempt to predict the probability of third molar eruption, many studies have been done; most of them using dissected skulls, lateral cephalic radiographs or orthopantomograph [(6)].

The aims of this study were to assess the mandibular third molar position by using medical CT scan and lateral reconstructed radiograph and evaluate gender differences.

MATERIALS AND METHODS

Sample

The sample of the present study consisted of 39 patients (18 males and 21 females with mean age of 13 years) who were attending at Al-Suwayra General Hospital/ the Computerized Tomography department, who met a special selective criteria were selected**.**

The following criteria were used in the selection of the total sample:

1. Iraqi Arab subject their age from 11-15 years.
2. Normal general health status, by taking medical history from parents.
3. Normal skeletal relationship assessed in three planes of space [(7)]**.**
4. No history of dentofacial deformities, pathologic lesions in the jaws or facial trauma.

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5. Full set of teeth with developing mandibular third molar.
6. No congenital missing or supernumerary teeth
7. Normal overbite and over jet (2-4 mm) measured by sliding caliper (Dentarum ® – Germany).
8. No shifting in dental midline.
9. Mild crowding (not more than 2 mm) measured by sliding caliper (Dentarum ® – Germany).
10. Mild spacing (not more than 2 mm) measured by sliding caliper (Dentarum ® – Germany).
11. No previous orthodontic treatment like habits breaker or chin-cap.

Methods

For every patient in the sample; a clinical examination and computerized tomographic imaging had been done using **Brilliance™ 16 CT (Philips C, Netherland**), then the CT images were collected from the workstation of the CT unit of and the imaging data were analyzed with the software provided by the manufacturer.

Firstly, the mesio-distal crown dimension of mandibular 1st molar was measured clinically using vernier. This is done to compare it with the measurements obtained from the 3D and 2D images.

On each image, the distances from the anterior border of ramus to distal surface of the permanent mandibular second molar **(AB)** and the mesio-distal width of developing mandibular third molar **(CD)** were measured. The ratio of AB/CD [8] was used to determine the lower third molar position.

Olive and Basford [8] founded that if the AB/CD ratio equaled or more than 1, the space was enough for eruption of mandibular third molar and if it was less than 1, the space is not enough.

Statistical Analysis

All the data of the sample was subjected to computerized statistical analysis using **SPSS** version 19 for windows XP. The statistical analysis included:

A. Descriptive statistics

- Means.
- Standard deviations.
- Statistical tables.

B. Inferential statistics

Paired sample t-test: it was used to compare the measurements between the CT and the reconstructed lateral view. Independent sample t-test was used to verify the gender differences.

RESULTS

Table 1 and 2 showed the descriptive statistics and gender difference of the measured variables in 3D and 2D images. Generally, the mean values were slightly higher in males than females with a significant gender difference for the mesio-distal width of developing mandibular third molar.

Comparing the two methods of measurements revealed highly significant difference between them in all measurement with 3D measurements slightly larger than 2D (Table 3).

. A high significant difference was found between the direct clinical measurements and the 2D image and between the 3D and 2D methods with the same mean value for the clinical and 3D methods as seen in table (4).

Table 1: **Descriptive statistics and gender difference for the variables measured in 3D image**

Measurements	Descriptive Statistics						Gender Difference (d.f.=37)		
	Total sample (N=39)		Males (N=18)		Females (N=21)				
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean Difference	t-test	p-value
Ramus to 7 (AB)	10.25	0.73	10.34	0.79	10.18	0.68	0.16	0.67	0.507 (NS)
MD of 8 (CD)	9.42	0.24	9.52	0.24	9.34	0.22	0.18	2.54	0.015 (S)
Ratio of AB/CD	1.08	0.08	1.08	0.09	1.09	0.07	0.01	0.20	0.844 (NS)

Table 2: **Descriptive statistics and gender difference for the variables measured in 2D image**

Measurements	Descriptive Statistics						Gender Difference (d.f.=37)		
	Total sample (N=39)		Males (N=18)		Females (N=21)				
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean Difference	t-test	p-value
Ramus to 7 (AB)	9.13	0.72	9.24	0.79	9.03	0.66	0.21	0.91	0.369 (NS)
MD of 8 (CD)	8.63	0.25	8.72	0.26	8.54	0.23	0.18	2.32	0.026 (S)
Ratio of AB/CD	1.05	0.08	1.06	0.10	1.05	0.08	0.01	0.12	0.907 (NS)

Table 3: Descriptive statistics and image difference for the variables measured

Measurements	Descriptive Statistics				Image comparison (d.f.=38)		
	3D image		2D image				
	Mean	S.D.	Mean	S.D.	Mean difference	t-test	p-value
Ramus to 7 (AB)	10.25	0.73	9.13	0.72	1.13	49.21	0.000 (HS)
MD of 8 (CD)	9.42	0.24	8.63	0.25	0.80	116.24	0.000 (HS)
Ratio of AB/CD	1.08	0.08	1.05	0.08	0.03	10.65	0.000 (HS)

Table 4: Descriptive statistics and measurements difference for the MD width of permanent mandibular first molars

MD of 6 measurement	Descriptive Statistics		Measurements difference (d.f.=38)		
	Mean	S.D.	Mean difference	t-test	p-value
3D image	10.28	0.31	0.80	125.73	0.000 (HS)
2D image	9.48	0.30			
Clinical	10.28	0.32	-0.001	-0.007	0.994 (NS)
3D image	10.28	0.31			
Clinical	10.28	0.32	0.799	11.531	0.000 (HS)
2D	9.48	0.30			

DISCUSSION

It is important to mention that direct comparisons with results from other studies will not be always possible, since this study represents the first approach to compare the 3D CT and the 2D reconstructed lateral view in the assessment of mandibular third molar position.

The age of samples ranged between 11-15 years old because development of mandibular third molar was not completed at this age, early removal of third molar at this age is simple and atraumatic [9].

About the distance from anterior border of ramus to distal surface of permanent mandibular second molar (AB), the result of the study showed that there was gender difference in the mean value of this measurement, with the mean value of this measurement in males higher than females, this comes in agreement with finding of other researches [10-12].

About the mesio-distal width of developing mandibular third molar (CD), the result of the present study agreed with the finding of Abu Alhaija et al. [11]. There was significant difference between males and females, this can be explained by the fact that the teeth dimensions in males are larger than females and this comes in accordance with the finding of Bindayel [2].

Furthermore, the ratio of AB/CD in the present study was agreed with the finding of Zelic and Nedeljkovic [13] who found no significant gender difference. This finding can be related to the age of the group in the sample and this ratio may be increase with age of patients due to remodeling and growth.

Regarding the mean value of the ratio, it is more than 1 and this indicated the presence of adequate space for the eruption of the lower third molar.

In this study, all the measurements on 3D and on 2D images showed statistically high significant difference. This may be explained by that the two dimensional diagnostic imaging including the reconstructed lateral view have certain analysis limitations such as geometric distortion, superimposition of structures, rotational errors and linear projective transformation.

To compare between the clinical and image method of measurement, the mean value of the width of mandibular 1st molar measured clinically and by 3D image is coincide, while it is about 0.8 mm smaller than 2D image. This result gives an impression about the accuracy of 3D image in measurement and diagnosis of orthodontic problems. Although the method difference is statistically significant but clinically is of no value (0.3).

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