



## **Study of the Effect Age and Gender of the Bone Height on the Position of the Inferior Dental Canal Using Cone Beam Computed Tomography**

Resha Jameel <sup>(1)</sup>

Alaa S. Mahdi <sup>(2)</sup>

Omar Basheer Taha Al-Tekreeti <sup>(3)</sup>

(1,2,3) Department of Oral and Maxillofacial Radiology, College of Dentistry.

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### **Corresponding Author:**

**Name:** Omar B. Taha Al-Tekreeti

**E-mail:**

**Tel:** 07705141048

**Affiliation:**

(1,2) Asst. Lec. University of Baghdad, Iraq.

(3) Lec., Tikrit University, Iraq.

### **Abstract**

Inferior alveolar canal considered as one from the most important vital structures exist in the mandible and any injury to the (IAC) during the surgical procedures should be avoided, knowing the exact position of the (IAC) can help in avoiding the injury of the (IAC). The sample was consist of 100 patients divided into 2 main groups 1<sup>st</sup> group consist of 50 males (25 males dentulous, 25 males edentulous), and the 2<sup>nd</sup> group consisted of 50 females (25 females before menopause & 25 females after menopause). Two measurements were taken the 1<sup>st</sup> from the crest of alveolar ridge to the superior rim of the (IDC), and the 2<sup>nd</sup> from the inferior rim of (IDC) to the lower border of the mandible in both right and left sides of the mandible. Results: the stastical analysis of the distance from the crest of alveolar ridge to the superior rim of the (IDC) for both males & females groups showed that there were highly significant difference between male (edentulous versus dentulous) the mean values less in edentulous groups ,and female ( before menopause versus after menopause) the mean values are greater in the ( before menopause ) groups, the stastical analysis of the distance from the inferior rim of (IDC) to the lower border of the mandible showed that the mean values in case of dentulous in males groups was less in edentulous group than dentulous group (right side) with non-significant difference while in the measurement of left side the mean value was higher in the edentulous group with non-significant difference and in females groups the mean values were greater in( before menopause) groups. Conclusion : it can be concluded that the position of the inferior dental canal heavy influenced by the due to the dental status ,due to the teeth loss , age and hormonal changes affect the bone height which is also affected by gender. the vertical distance from the crest of the alveolar ridge to superior rim of (IAC)., the vertical distance from the crest of the alveolar ridge to superior rim of (IAC) , and the distance from lower rim of (IAC) to the lower border of the mandible would be smaller due to the effect of bone height.

## Introduction:

Inferior alveolar canal considered as one from the most important vital structures exist in the mandible and any injury to the (IAC) during the surgical procedures like dental implant<sup>(1)</sup>, sagittal split ramus osteotomy<sup>(2)</sup>, and genioplasty<sup>(3)</sup> should be avoided, knowing the exact position of the (IAC) can help in avoiding the injury of the (IAC). Cone beam computed tomography (CBCT) considered as a reevaluation in the world of oral and maxillofacial diagnosis since this modern technology has the advantages over the computed tomography regarding the decreasing in the x-ray dose and cost, the images of the teeth and the structures surrounding them can be displayed with high spatial resolution<sup>(4)</sup>, the precision of the diagnosis of the Computed Tomography approved to be higher than the conventional radiology<sup>(5)</sup>, the precise position of the inferior dental canal (IDC) and the measurement of the distance from the crest of alveolar bone to the superior rim of the inferior dental canal and the distance from the inferior rim of the inferior dental canal to the base of the mandible can be achieved exactly using (CBCT)<sup>(6)</sup>. The loss of the bone (osteoporosis) can occur due to local factors as wearing prosthesis<sup>(7)</sup>, and tooth extraction<sup>(7)</sup> and systemic factors such as hormonal disturbance, post menopause, and old age<sup>(8)</sup>, since the dentists are using the diagnostic x-ray routinely in the dental clinic for various reasons as (endodontic treatment, impaction teeth removal, implant, etc) so the 1<sup>st</sup> indicator of the osteoporosis is considered to be the jaw bones<sup>(9)(10)(11)</sup>, this article aimed to study the inferior dental canal position and the effect of losing of teeth in male groups and the effect of menopause in the female groups on the position of the inferior dental canal through the measurements of the mandible bone at two certain positions the 1<sup>st</sup> is from the alveolar crest to the superior of the inferior dental canal (IDC), and the 2<sup>nd</sup> from the inferior rim of the (IDC) to inferior cortical bone of the mandible, to evaluate the measurement of the bone in dentulous and

edentulous males groups, and in the females groups after and before the menopause,

### Aim of study:

- 1- Enable the dentist and surgeon to localize the IDC and avoid injury during surgical procedure.
- 2- Define the relation between age, gender and bone height.

## Material and method:

### The sample

The study is retrospective study, from private clinic of CBCT, done by the assessment of 100 (cases) 50 male divided into (25) dentulous and (25) edentulous 30- 60 years old, and the other 50 cases were females, (25) under the age of 45 (before menopause) and the other (25) females were over 45 years old (after menopause), they are attended to the x-ray clinic to take CBCT images (SOREDEX) for implant treatment or any other routine dental treatment.

### The exclusion criteria:

1. Large pathologic lesion in the jaw.
2. tooth with root canal treatment
3. Tooth with local pocket or periodontal disease
4. Fractured jaw
5. Bone augmentation
6. Fractured root or tooth
7. Impacted tooth
8. Retained root
9. Implant treatment

The data was collected and examined from sordex device with cranex 3D system.

## Method:

The radiographic images were examined by the 3D On Demand software supplied by the manufacture, cross section of the area of the mandible at the point between lower first and second molar in both sides of the mandible for each sides (right left) two measurements were taken the 1<sup>st</sup> point is in the distance from superior border of the (IDC) to the alveolar crest, and in perpendicular manner, and the 2<sup>nd</sup> measurement was in the distance from

the inferior border of the (IDC) to the inferior border of the lower jaw in perpendicular manner. Statistical analysis of the data using SPSS version 13 program installed in personal computer, the comparisons were done between males groups (dentulous & edentulous), and between females groups (after menopause & before menopause), there was no comparison done between males groups and females groups because of the difference in the cause of bone loss border of the (IDC) to the inferior border of the lower jaw as in Fig. (1) & (2). Statistical analysis of the data using SPSS version 13 program installed in personal computer, the comparisons were done between males groups (dentulous & edentulous), and between females groups (after menopause & before menopause), there was no comparison done between males groups and females groups because of the difference in the cause of bone loss.

### **Results:**

The independent sample test was used for all the comparison, the results of the comparison between the measurements of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone (sup. Crest) between male dentulous and edentulous for the right side was as in Table (1) with highly significant difference P value 0.000. The results of the comparison between the measurement of the distance from the inferior border of the inferior dental canal to the inferior border of the mandible (inf.inf) between male dentulous and edentulous for the right side were as in Table (2) with non-significant difference P value 0.813. The results of the comparison between the measurements of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone (sup. Crest) between male dentulous and edentulous for the right side were as in Table (3) with highly significant difference P value 0.000. The results of the comparison between the measurement of the distance from the inferior border of the inferior dental canal to the inferior border of the mandible (inf.inf) between male dentulous and edentulous for the left

side were as in Table (4) with non-significant difference P value 0.231. The results of the comparison between the measurements of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone (sup. Crest) between female before menopause and after menopause for the right side were as in Table (5) with highly significant difference P value 0.000

The results of the comparison between the measurement of the distance from the inferior border of the inferior dental canal to the inferior border of the mandible (inf.inf) between female before menopause and after menopause for the right side were as in Table (6) with non-significant difference P value 0.168

The results of the comparison between the measurements of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone (sup. Crest) between female before menopause and after menopause for the right side were as in Table (7) with highly significant difference P value 0.000. The results of the comparison between the measurement of the distance from the inferior border of the inferior dental canal to the inferior border of the mandible (inf.inf) between female before menopause and after menopause for the left side were as in Table (8) with highly significant difference P value 0.003.

### **Discussion:**

Several studies have been reported the validity and reliability of CT in imaging the inferior dental canal (IDC) and the measurement which consider the (IDC) as reference point <sup>(12,13)</sup>. Our study showed that the measurements of the distance of the superior rim of (IDC) to the alveolar crest had highly significant difference in both males and females groups with the mean values in case of edentulous regarding males groups and older than 45 years old(after menopause) in females groups lower than the mean values in edentulous groups in males groups (dentulous) and younger than 45 years (before menopause) respectively and a those results come in according with the studies of Kieser JA et al in 2004<sup>(14)</sup>.

Yashar et al in (2012)<sup>(1)</sup>, and S. Haghanifar et, al in 2017<sup>(15)</sup>. The mean values of the distance from the lower rim of the (IDC) to the inferior border of the mandible in male groups were less in edentulous group than dentulous group (right side) with non-significant difference and those agreed with the studies mentioned above<sup>(14,1,15)</sup>, while in the measurement of left side the mean value was higher in the edentulous group with non-significant difference and this disagreed with the studies mentioned above<sup>(14,1,15)</sup> since the loss of teeth and older age lead to osteoporosis<sup>(12,13)</sup> small size of data may be the reason of this result and in other hand in the male groups the age was the same but the variable the losing of teeth only and this may the reason for this result, in female groups as the variable was the age (1<sup>st</sup> group younger than 45 & 2<sup>nd</sup> group older than 45) so the mean values of the right and left sides were greater in (before menopause) groups in the measurement of the distance of inferior rim of (IDC) to the inferior border

of the mandible with highly significant difference in the left side and those come in accordance with the studies mentioned above<sup>(14,1,15)</sup>. S. Haghanifar et, al in 2017<sup>(1)</sup> stated that as the age increased the inner canal calcification increased too and this may also be the reason of the lower mean values as the age increased.

### Conclusion:

From this study it concluded that the position of the inferior dental canal heavy influenced by the osteoporosis rather than the type of the osteoporosis local (teeth loss) or systemic (after menopause), the vertical distance from the crest of the alveolar ridge to superior rim of (IAC), and the distance from lower rim of (IAC) to the lower border of the mandible would be smaller due to the effect of osteoporosis.

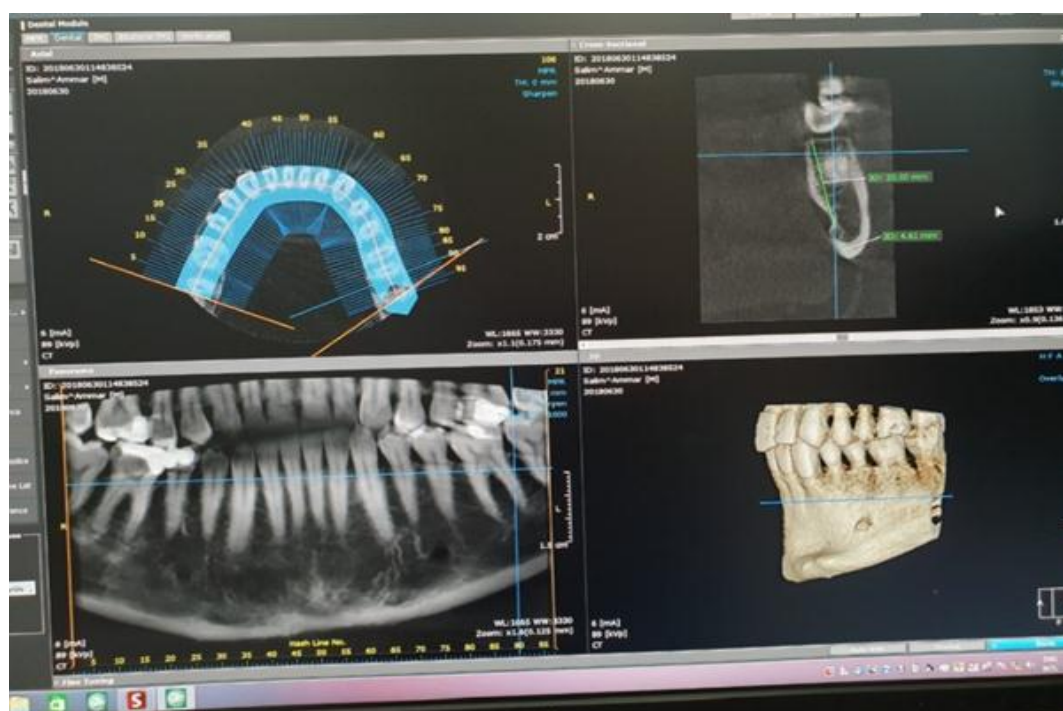


Fig. (1): Cross section of the mandible in the area between 1<sup>st</sup> & 2<sup>nd</sup> molar with measurement in dentulous patient (male).

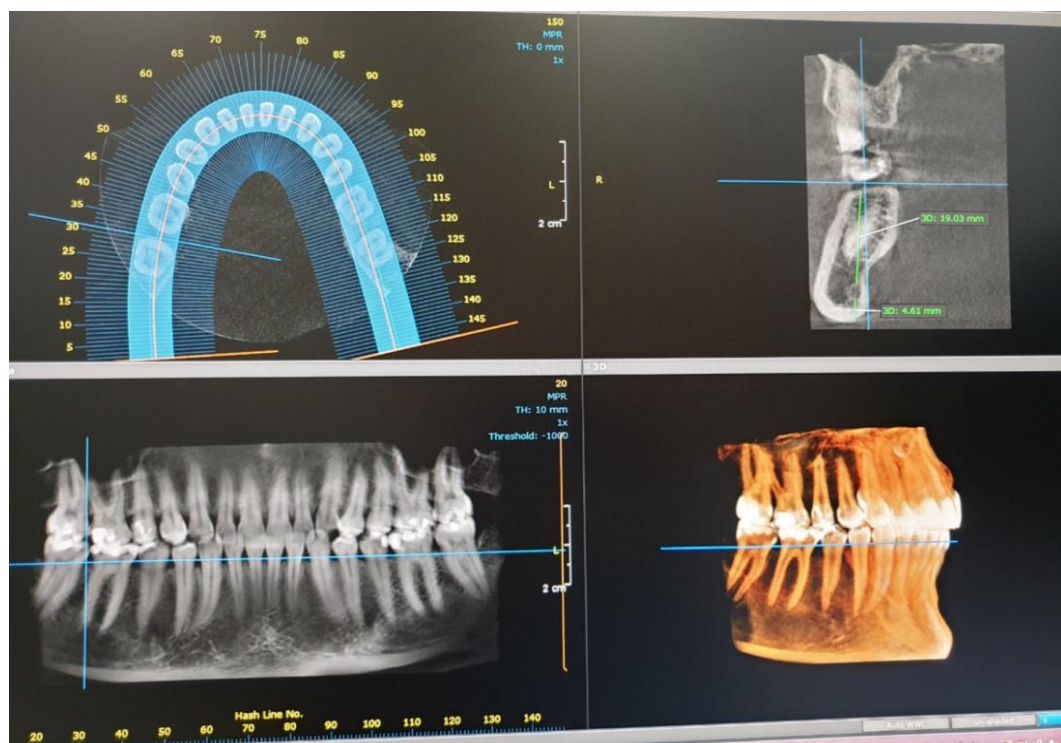


Fig. (2): Cross section of the mandible in the area between 1<sup>st</sup> & 2<sup>nd</sup> molar with measurement in dentulous patient (female)

Table (1): Stastical analysis of the measurement of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone( sup.crest) between male dentuluos and edentulous for the right side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
R_sup_Crest	Dentulous	25	17.4572	2.12831	.42566	.000
	edentulous	25	13.7240	2.38123	.47625	

Table (2): Stastical analysis of the measurement of the distance from the inferior border of the inferior dental canal to inferior border of the mandible( inf.inf) between male dentuluos and edentulous for the right side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
R_inf_Inf	Dentulous	25	11.0144	1.91318	.38264	.813
	Edentulous	25	10.8800	2.08826	.41765	

Table (3) stastical analysis of the measurement of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone( sup.crest) between male dentulous and edentulous for the left side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
L_sup_Crest	Dentulous	25	16.9840	2.38828	.47766	.000
	Edentulous	25	13.8100	2.04368	.40874	

Table (4) stastical analysis of the measurement of the distance from the inferior border of the inferior dental canal to inferior border of the mandible( inf.inf) between male dentulous and edentulous for the left side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
L_inf_Inf	Dentulous	25	10.8296	1.14356	.22871	.231
	Edentulous	25	11.2684	1.40043	.28009	

Table (5) stastical analysis of the measurement of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone( sup.crest) between female before menopause and after menopause for the right side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
R_sup_Crest	<45	25	10.6004	1.69842	.33968	.000
	> 45	25	13.5652	1.15955	.23191	

Table (6) stastical analysis of the measurement of the distance from the inferior border of the inferior dental canal to inferior border of the mandible( inf.inf) between female before menopause and after menopause for the right side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
R_inf_Inf	< 45	25	9.2840	1.68193	.33639	.168
	> 45	25	9.9228	1.54394	.30879	

Table (7) stastical analysis of the measurement of the distance from the superior border of the inferior dental canal to the crest of the alveolar bone( sup.crest) between female before menopause and after menopause for the left side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
L_sup_Crest	< 45	25	10.8040	1.35491	.27098	.000
	>45	25	12.8976	1.31351	.26270	

Table (8) stastical analysis of the measurement of the distance from the inferior border of the inferior dental canal to inferior border of the mandible( inf.inf) between female before menopause and after menopause for the left side.

	Type	N	Mean	Std. Deviation	Std. Error Mean	P value
L_inf_Inf	<45	25	8.7660	1.25021	.25004	.003
	> 45	25	9.9832	1.49557	.29911	

## References

- 1-Haghanifar S, Amouyian B, Yaghoobi S, Bijani A. Assessment of the Mandibular Canal Position in the Mandibular Body using Cone Beam Computed Tomography. *J Babol Univ Med Sci.* 2017;19(3):21-8.
- 2-Ahmet Ercan Sekerci and Halil Sahman, Cone Beam Computed Tomographic Analyses of the Position and Course of the Mandibular Canal: Relevance to the Sagittal Split Ramus Osteotomy, Hindawi Publishing Corporation, BioMed Research International Volume 2014, Article ID 945671, 11 pages.
- 3-Hooman Khorshidi, Saeed Raofi, Janan Ghapanchi, Shoaleh Shahidi, Maryam Paknahad, Cone Beam Computed Tomographic Analysis of the Course and Position of Mandibular Canal, *J. Maxillofac. Oral Surg.* (July–Sept 2017) 16(3):306–311, DOI 10.1007/s12663-016-0956-9
- 4-Ghaeminia H, Meijer GJ, Soehardi A, Borstlap W.A, Mulder J Berge SJ. Position of the impacted third molar in relation to the mandibular canal.
- 5-Mengel R, Candir M, Shiratori K, Flores-de-Jacoby L. Digital volume tomography in the diagnosis of periodontal defects: An in vitro study on native pig and human mandibles. *J Periodontol.* 2005;76(5):665-73.
- 6-Kelly, E. Changes caused by a mandibular removable partial denture opposing a maxillary complete denture. *J Prosthet Dent,* 1972; 27: 140 - 150.
- 7-Rowe DJ. Bone loss in the elderly. *J Prosthet Dent.* 1993; 50:607-610.
- 8-Xia Q, Wolf J, Aimamo A. (1997), quantitative assessment of vertical heights of maxillary and mandibular bones in panoramic radiograph of elderly dental and dentulous subjects scanned. 55:155-61
- 9-Grethe Jonasson and Marianne Rythén, alveolar bone lose in osteoporosis ; a loaded and cellular affair ?, clinical, cosmetic and investigational dent J, 2016: 8 95-103.
- 10-Salgam A.A. (2002): the vertical heights of maxillary and mandibular bone in panoramic radiography of dentl and edentulous subjects. *Quintessence Int.* 33(0):433-8.
- 11-Alaa Salman Mahdi, Omar Basheer Taha Al-Tekreeti, Farah Abdul Salam Hadi, Areej Najm, Sharan Leon Samson Wisam al-Hamadi. Measurement Height of Mandible Body in Male and Female of Iraqi Sample Using Panoramic Radiograph. *Medical Journal of Babylon Vol. 14- No. 2 : 374 – 381 , 2017*

12-Massey ND, Galil KA, Wilson TD. Determining position of the inferior alveolar nerve via anatomical dissection and micro-computed tomography in preparation for dental implants. Can Dent Assoc. 2013;79:d39.

13-Kamburoğlu K , Kiliç C, Ozen T, Yüksel SP. Measurements of mandibular canal region obtained by cone beam computed tomography: a cadaveric study. Oral Surg Oral Pathol Oral Radiol Endod. 2009;107(2):e34-42

14-Kieser JA, Paulin M, Law B. Intrabony course of the inferior alveolar nerve in the edentulous mandible Clin Anat. 2004;17(2):107-11.

15-S. Haghanifar , B. Amouyian , S. Yaghoobi , A. Bijani Assessment of the Mandibular Canal Position in the Mandibular Body using Cone Beam Computed Tomography, J Babol Univ Med Sci Vol 19, Issu 3; Mar 2017. P:21-28