



Correlation of mandibular canal wall resorption with angular cortical thickness among edentulous patients using panoramic radiographs (A comparative study between male and female)

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Abstract

Background

Resorption of alveolar bone is the best recognized feature of mandibular aging in the edentate subject. The aim of this study is to evaluate the mandibular canal wall resorption using panoramic radiographs among edentulous male and female.

Material and method

The sample of this study was collected from patients who attended Teaching Hospital of the College of Dentistry at Al- Mustansiria University and panoramic radiographs were taken in Al-Karama specialized center for dentistry. Forty three patients were selected in this study with age range between 59-85 years (25 males and 18 females) . Panoramic radiographs for all patients and sides were examined and evaluated .

Results

Chi-square between males and females of angular cortical thickness (ACT) \geq 1mm and ACT \leq 1mm was (37.06) which statistically significant with p-value (0.008) and between resorption (grades) and age of males was(34.72) which it statistically significant p-value(0.049) also between resorption (grades) and age of females was(15.6) which was statistically significant p-value (0.003) . Spearman correlation showed statistically significant moderate correlation between gender and age ($r=0.581, p\text{-value}=0.01$) and there was a moderately statistical significant correlation between the grades of mandibular canal resorption and the angular cortical thickness measurements in both gender ($r=0.532, p\text{-value}=0.033$).

Conclusion

The resorption of the wall is found more often in edentulous females than in the males due to hormonal imbalance.

Keywords: Mandibular canal , edentulous, hormonal imbalance, panoramic.

Introduction

The human mandibular canal is a canal within the mandible that presents a course that begins in the mandibular foramen on the medial surface of the ascending mandibular ramus, runs obliquely downward and forward in

the mandibular ramus, then horizontally forward in the body of the mandible, and ends where the mental foramen opens ⁽¹⁾ , within the mandibular canal , the inferior alveolar

nerve, artery, vein and lymphatic vessels⁽²⁾.

In general bone formation (anabolism) exceeds bone resorption (catabolism) during growth and convalescence, levels off during most of adult life and is exceeded by catabolism during disease and old age⁽³⁾.

Residual ridge resorption is not a disease, but a normal physiologic process which continues throughout the remaining life of the patients and continuous residual ridge resorption makes the patients "dental cripples" with this mandibular canal wall also gets affected causing dehiscence of mandibular canal⁽⁴⁾. Systemic factors that contribute to residual ridge resorption are: hormonal imbalance, metabolic bone disease, postmenopausal hormonal disturbances in women, age, sex, etc⁽⁵⁾. Resorption of alveolar bone is the best recognized feature of mandibular aging in the edentulous subject⁽⁶⁾. The rate of atrophy varies greatly between different individuals and even within one and the same person at different times or in different regions within the jaw. However, atrophy is greatest during the first year after tooth loss; the reduction of the residual ridge is a lifelong process but the rate of bone loss does decrease^(7,8). Surgeries and dental implants in the mandible is directly linked to the anatomical knowledge of this region as well as to the proper evaluation of bone quality and quantity. The mandibular canal is primarily evaluated by dentists and oral surgeons based upon conventional panoramic and intraoral films⁽⁹⁾.

Aim of the study

1-To compare the mandibular canal wall resorption between male and female according to the grades in edentulous patients.

2-To assess the relation between cortical bone thickness $\geq 1\text{mm}$ or $< 1\text{mm}$ in the region of angle with the resorption of mandibular canal in both gender.

Materials and methods

A forty three panoramic radiographs were taken for a forty three patients with age range between 59-85 years (25 males and 18 females), who attended Teaching Hospital of the College of Dentistry at Al- Mustansiria university and panoramic radiographs were taken in Al-Karama specialized center for dentistry. Normally the crest of the residual ridge above both the mental foramen and mandibular canal. The mandibular canal on each side of the edentulous mandible was graded according to following criteria⁽⁴⁾, figures (1,2,3) showed these grades.

The cortical thickness at the mandibular angle was assessed by two tangential lines were drawn, one touching the lower border of mandibular body and angle of mandible and the second one posterior border of ramus and posterior border of condyle so the angle formed and bisecting line to this angle at which the thickness was measured by vernier caliper and the measurement analysis as $\geq 1\text{mm}$ or $< 1\text{mm}$ ⁽¹⁰⁾, as shown in figure (4).

For all patients the duration of edentulousness greater than 3 years and less than 15 years. All data were analysis statistically.

Results

The results of this study showed that patients with ACT $\leq 1\text{mm}$ were more in both gender and in female was more thinner. Chi-square between males and females of ACT $\geq 1\text{mm}$ and $\leq 1\text{mm}$ was (37.06) which statistically significant with p-value (0.008), table (1) and figure (5) showed that.

Chi-square between resorption (grades) and age of males was (34.72) which statistically significant p-value (0.049) and also between resorption (grades) and age of females was (15.6) which was statistically significant p-value (0.003), resorption increased in females more than males in grade III with ACT I 1 as shown in table (2,3) and figure (6).

Spearman correlation showed statistically significant moderate correlation between gender and age ($r=0.581$, $p\text{-value}=0.01$) and there is a moderately statistical significant correlation between the grades of mandibular canal resorption and the angular cortical thickness measurements in both gender ($r=0.532$, $p\text{-value}=0.033$), table (4) showed this results.

Discussion

The mandible has been widely used as an osteointegrated implant receptor site, which makes the anatomical knowledge of this region extremely significant and essential to the accurate location of the mandibular canal ⁽¹¹⁾. Anatomic conditions of the jaws, systemic factors such as sex and age, hormonal balance, local inflammations and masticatory habits are supposed to act as co-factors in the development of residual ridge resorption after tooth loss ⁽⁸⁾.

In this study resorption affected by gender that increased in female, this phenomenon could be explained with the effect of the menopausal activity in women on the alveolar residual ridge resorption. Resorption increased with age and with thinner cortical thickness. Yamada and Kimmel in (1991) ⁽¹²⁾ and Bresin et al. in (1999) ⁽¹³⁾ showed that women had reduced masticatory function compared with males, because women had greater amount of mandibular bone reduction which is

associated with reduced cortical thickness, and resulted in reduction in bone height which is in similarity with the finding of this study. Conversely, Elsubeihi et al. in (2001) had reported that it is not known, if mandibular bone loss observed in the edentulous mandible in association with estrogen deficiency ⁽¹⁴⁾, results from increased bone resorption alone or the combined effect of increased bone resorption and reduction in bone formation rate ⁽¹⁵⁾, also sexual hormone between male and female are different. However, both of them affected bone growth ⁽¹⁶⁾. Different from male, the aging process in female comes earlier ⁽¹⁷⁾. Estrogen deficiency plays a very important role on menopause as a cause of bone mass decrease ⁽¹⁸⁾. Estrogen prevents osteoporosis by inhibiting the stimulation effect on specific cytokines in the osteoclast ⁽¹⁹⁾. Decreased level of estrogen will increase the sensitivity of osteoclast to parathyroid hormone. Moreover, estrogen deficiency affects the active vitamin D synthesis in renal tubules and lead to reduction of calcium absorption ⁽²⁰⁾. There are morphological changes of the mandible in osteopenic and osteoporotic edentulous females, indicating that the thickness of the cortical mandibular bone is highly influenced by age ⁽²¹⁾, also the thickness showed change with age in this study. Xie et al in 1997a ⁽²²⁾, done a study on 128 edentulous elderly subjects (32 men and 96 women) and the findings suggest that gender and the systemic diseases involved in this study play important roles in resorption of the mandibular canal wall which conformed with the result of present study. In 1997b, Xie et al. ⁽²³⁾ had found that females have more alveolar residual ridge resorption than males. Basker et al. reported that the amount of bone resorption in edentulous area is eight times than that in dentate area in the same subject ⁽²⁴⁾. A study done to

evaluate resorption of 127 subjects (64 women and 63 men) by Vaishnav et al. in 2010⁽⁴⁾, which concluded that resorption was found more in women than men that was in agreement with finding of this study.

Conclusions

- 1-The resorption of the wall was more in edentulous females than in males.
- 2-In both females and males, the resorption increased with increased age.
- 3-Resorption increased in patients with ACTI 1mm in both genders and was higher in females.

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Figure (1) : Grade (I) the crest of the residual ridge above the mandibular canal and the mental foramen at the top of residual ridge with or without a partially resorbed border.

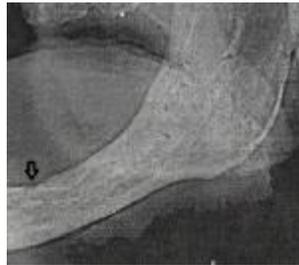


Figure (2) : Grade (II) the superior border of the mandibular canal at the top of residual ridge and the mental foramen with or without a partially resorbed border .

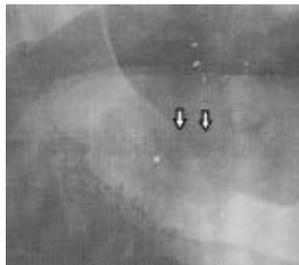


Figure (3) : Grade (III) the superior border of the mandibular canal partially resorbed and the borders of the mental foramen totally resorbed .

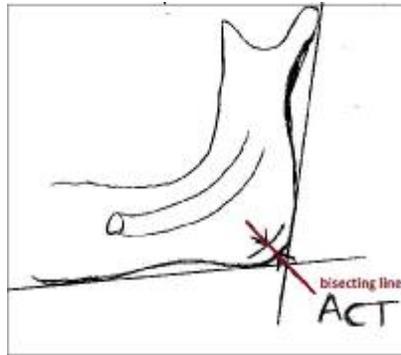


Fig (4) : Measurement method of angular cortical thickness

Table (1): Descriptive of male and female by ACT evaluated by sides

	ACT \geq 1	ACT<1	Total
Female	6	30	36
Male	14	36	50
Total	20	66	86

Chi-square between male and female of ACT \geq 1mm @ACT<1mm

Chi-square=37.06

P-value=0.008 Significant

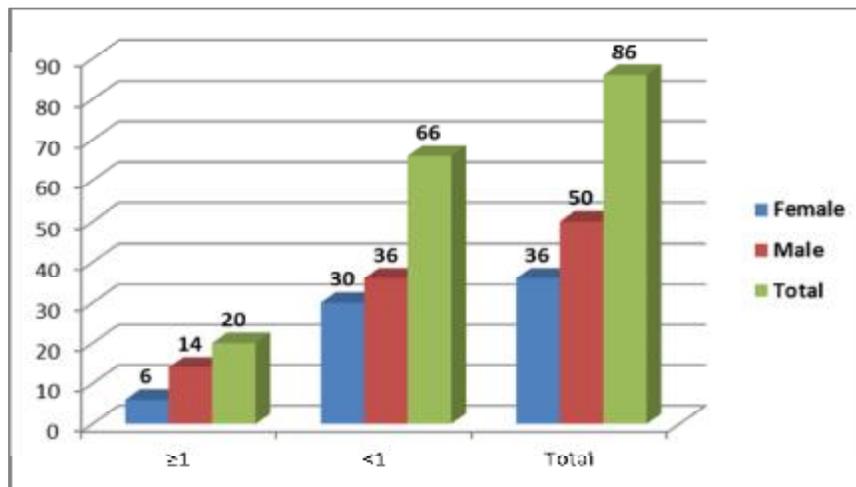


Figure (5): Show male and female by ACT

Table(2):Descriptive of male and female by grade and ACT evaluated by sides

	GradeI		GradeII		GradeIII		Total
	ACT \geq 1	ACT<1	ACT \geq 1	ACT<1	ACT \geq 1	ACT<1	
Female	3	2	3	10	0	18	36
Male	11	2	3	20	0	14	50
Total	14	4	6	30	0	32	86

Table(3):Chi-square between Grade and age of male and female

	Chi-square	P-value	Sig
Female	15.6	0.049	S
Male	34.72	0.003	S

Significant * p<0.05

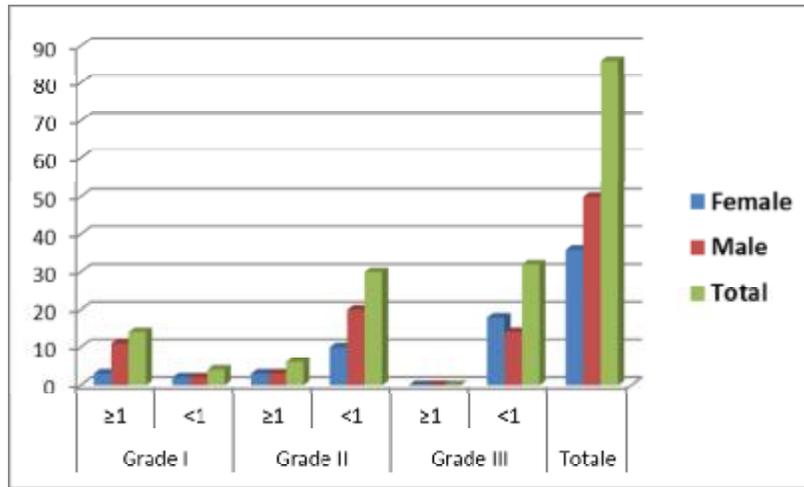


Figure (6):Show ACT at grades by male and female.

Table : Show Spermans correlation (r)

	R	p-value	Sig
Between gender and age	r=0.581	P=0.01	S
Between ACT in both gender with grades	r=0.531	P=0.033	S