

## Evaluation of Mandibular Ramus Area According to Age and Gender Using Computed Tomography

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### Abstract

**Background:** Ramus area is an important landmark of the mandibular bone which influenced by gender, age and dental status.

**Objective:** To evaluate the changes occur in this part of the mandible (ramus height, ramus depth and bone density) to investigate the effect of age and gender on mandibular ramus shape and density using computed tomography.

**Patients and Methods:** A total 100 patients CT scan (prospective study) panoramic view were evaluated and divided into 4 groups each group includes 25 patients (1<sup>st</sup> male group 50 years, 2<sup>nd</sup> male <50 years, 3<sup>rd</sup> female group 50 years and 4<sup>th</sup> female group <50 years.) Ramus height, depth and bone density in this part were measured. All the samples were class I skeletal pattern and good dental status, All the sample was with semi- full set of teeth to avoid the effect of dental status on the results of this study as minimum as possible.

**Results:** The effect of age was obvious on ramus height, Bone Density was significant and highly significant respectively, while the depth non-significant at compare the age only not regarded to gender (50 sample young less than 50 years and the same older than 50 years). The effect of age with gender were compare female and male above 50y showed ramus height, Bone Density were significant and highly significant (p-value=0.01 and p=0.00) for bone density, while the ramus depth non-significant. Females with age had decreased in bone density and increased in ramus height rather than male with same age group (hormonal effect). Males groups comparison ramus height p=0.01 significant, Bone Density p=0.00 H. Significant. Ramus depth was non-significant (males groups) that explain the other factors like (smoking, nutrition, habit) affected this part in same pattern that hormonal effect on women.

**Conclusion:** This study explained the effect of age and gender on the ramus area the ramus height, bone density play important role in significances determination rather than ramus depth. This landmark (ramus area) could be implicating in forensic dentistry as an aid in gender determination.

**Keywords:** Ramus Height (RH), Ramus Depth (RD), Bone Density (BD), Computed Tomography (CT).

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## Introduction

The mandible is one of the body bones that affected by age processing and change in metabolic activity and hormonal disturbance like the other bones. The mandible bone divided into many areas in order to study of many analysis lines and angles (linear and angular measurements) examples on these areas gonial and antigonial area ramus condyle area [1].

Ramus area that part occupied by ramus bone and have many anatomical landmarks that can be explain the age and gender effect on this part of mandible bone .examples ramus length and ramus notch [1] [2].

In forensic dentistry the mandible regard good indicator for distinguishing of gender and age determination from either teeth or bone morphology changes (gonial angle, mandible cortex index , panoramic index) also this bone affected by osteoporosis (especially in post-menopausal females). The height and depth of ramus could be change according to the age and effectiveness of hormonal disturbance and dental status [3].

Ramus height and notch also affected by skeletal pattern (class I, II and III craniofacial) so this part of mandibular bone should pay a lot of attention from the dentist and the radiologist specially [4].

## Patients and Methods

In this study 100 CT scan for patient attained Baghdad Hospital in Baghdad city for different purposes were examined. Any patient complain from bone disease, TMJ disorder, excessive surgery in mandible ,thyroid abnormalities were excluded from the study in addition to edentulous or semi

edentulous patient. The sample divided in to 4 groups :

- 1-25 male with age range (20-30) years
- 2-25 male above 50 years
- 3-25 female with age range (20-30) years
- 4-25 female above 50 years

Measurement of ramus height was done by drawing two lines ,the 1<sup>st</sup> line was perpendicular to the ramus tangent line at the level of the most lateral image of the condyle and the other line was perpendicular to the tangent line (All measurements were in mm). The depth was measured by measuring the distance along perpendicular line from the deepest point of the notch concavity to the tangent line of the ramus [1]. The density of bone (HU) was measured by applying the density icon on the area around the centre of ramus depth in Hounsfield unit (HU). The measurement done on panoramic view of computed tomography .In this study mean of the right and left side were taken as one score for each sample.

## Statistical analysis

Statistical analysis was done by using SPSS software the version was 17.00. mean value and p value and t-test were calculated for categorical variable for effect and significance.

## Results

Regardless the gender ,comparison between (20-30) years and above 50 years subjects as explained by Table (1) the mean of RH elevated from 36.99 to 37.46 between 2 groups (t-test -3.59, p-value 0.001) significant. Ramus depth depressed between groups from

1.064 to 0.77 but it's not significant( p. value 0.13 t-test =2.536) Bone density depressed from 1908.52 to 1226.98 from young to old one( t-test =11.65) it was highly significant( p-value =0.00) that was.

The effect of gender on variables (regardless the age).as shown in Table (2) explain the mean of ramus height(RH) difference between male and female elevated from 34.03 to 37.42 and(t-test -2.927) this variable was significant (p-value =0.04)R.D depressed from 0.9 to 0.8 between males and females so the ( t-test 1.059) so it's not significant (p-value 0.292).B.D mean depressed from 1681.84 to 1453 between males and females( t-test 2.612 p-value 0.10) significant. In Table (3) only the bone density BD show significant differences between male and female below50y (p\_ value 0.11 and 0.12) even the mean value decreased from 2033.23 to 1783.72 other values were not significant. When a comparison done

between males and females >50(old age) RH and BD showed highly significant differences between males and females RH (p-value was 0.01 and 0.00) for BD .while the RD was non significant. According to Table (5) the compares between males (above and below 50y) showed that only the bone density was highly significant (p-value 0.00and the t-test 7.55) other variable showed no significant.

The Table (6) show compassion between females above and below 50y showed the mean value of RH elevated between 36.12 to 37.73 from <50y to >50y (t-test was -4.05 andp-value 0.00) highly significant.

RD the mean value depressed from 1.04 to 0.66 from <50y to >50y t-test was 2.32 p-value 0.1 significant .Bone density the mean depressed from 1783.72 to 1123.6 from <50y to >50y( t-test was 11.8 andp-value 0.00) highly significant.

**Table (1):** Distribution of test and control subjects according to age and parity

	Age	N	mean	T –test	P value	SD
RH	<50	50	36.99	-3.59	0.001	1.6
	>50	50	37.46	-3.59	0.001	1.4
RD	<50	50	1.064	2.536	0.13	0.9
	>50	50	0.77	2.536	0.13	0.68
BD	<50	50	1908.52	11.65	0.00	17
	>50	50	1226.98	11.65	0.00	11

**Table (2):** Statistical evaluation of variable according to gender

	Gender	n	mean	T test	p-value	SD
RH	Male	50	34.03	-2.927	0.04	1.4
	Female	50	37.42	-2.927	0.04	1.38
RD	Male	50	0.980	1.059	0.292	0.2
	Female	50	0.854	1.059	0.292	0.26
BD	Male	50	1681.84	2.612	0.1	11
	Female	50	1453	2.612	0.1	11.8

**Table (3):** Compare of variables between males and females in young samples (20-30.)years

Age	Variable	gender	N	Mean	T_test	P_value
<50	RH	male	25	36.86	-1.25	0.215
		Female	25	37.12	1.25	0.215
	RD	Male	25	1.084	0.22	0.827
		Female	25	1.044	0.22	0.827
	BD	Male	25	2033.23	2.64	0.11
		Female	25	1783.72	2.64	0.12

**Table (4):** Compare males and females variables in an old ages (above50years)

Age	variable	gender	n	mean	t-test	P_value
>50	RH	Male	25	37.204	-3.58	0.01
		female	25	34.82	-3.58	0.01
	RD	Male	25	0.876	1.466	0.144
		female	25	0.664	1.466	0.144
	BD	Male	25	1330.36	3.87	0.00
		female	25	1123.6	3.87	0.00

**Table (5):** Compare the variables between same gender (20-30)years and above 50 years in males

gender	Variables	Age	n	mean	t-test	p-value
Male	RH	<50	25	36.86	-1.66	0.102
		>50	25	37.24	-1.66	0.102
	RD	<50	25	1.08	1.26	0.21
		>50	25	0.87	1.26	0.21
	BD	<50	25	2033.3	7.55	0.00
		>50	25	1330.3	7.55	0.00

**Table (6):** Compare the variables between same gender (20-30)years and above 50 years in females

Gender	Variables	Age	n	Mean	t-test	p-value
female	RH	<50	25	36.124	-4.05	0.00
		>50	25	37.73	-4.05	0.00
	RD	<50	25	1.04	2.32	0.1
		>50	25	0.66	2.32	0.1
	BD	<50	25	1783.72	11.8	0.00
		>50	25	1123.6	11.8	0.00

## Discussion

Statistical analysis was carried out by using t-test ,p-value ,mean value comparison,correlation of age and gender on ramus of the mandible. In comparison the

age effect only (regardless the gender) showed RH was p-value 0.001 significant and BD was H.S p-value =0.00 while that agree with[6][1].RD non-significant

Compare male above 50 years. And female above 50 years according to Table (2) RH and BD showed highly significant differences between male and female above 50y.p-value 0.04 and 0.00 t-test =-2.927and2.621 for RH and BD correspond that mean the gender above 50years had direct effect on the height and bone density in this area of mandible that agree with Preston B el-al2002 [8].The comparison the female and male with 20-30years showed that only the bone density was significant differences in this area in same comparison female and male but above 50years. BD and RH was H.S p-value =0.00 t-test =-3.58, RH in old age female effect more than in male that agree with [5].

Hormonal disturbance osteoporosis , osteopenia ,repeated pregnancy , breast feeding had direct effect on the shape and density of bone that agree with [7][8].comparison of females group above and below 50y RH and BD were H.S p-value =0.00and RD was p-value= 0.1 significant that showed the effect of postmenopausal in females on this part of mandible that agree with Larhen et al.[9][10].

While comparison of males groups above and below 50 years. RH p-value =0.01 significant andBD was H.S p-value= 0.00andthe depth was no significant, that explained by other factors such as smoking ,nutritional factor habitats affected on the this area of mandible [11].many other factors may influence the bone density such body weight and vitamins especially D3,

calcium,play important role in bone density [4].

## Conclusions

Ramus area as a part of mandible had its own changes effect by age and gender and could be used in evaluation of age and gender in forensic dentistry.

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