

Age Related Changes of Mandible and Maxilla In Human (Morphometric Study)

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Abstract

The properties of bones change during life and with age , it may improving in function, ,but in some times function deteriorates. Throughout development and aging, bone shape alters in response to load. This study provide information on the development and normal growth of dental arches in both sex.

Forty adult person of both sex were used. They divided in to 4 groups (A, B, C, and D). We will use different size of trays and take alginate impression material to get anatomical impression for the upper and lower jaw from the male and female and obtained a dental cast which is identical to the dental arch and make a table for all measurement that acquired.

The results showed that the age have a reliable degradation effect in both sex specially after 40 years old and except in the transverse measurement of female in mandible which started to decline after 30 years excluding the inter canine width which decrease after 40 years.

Keywords: human; Morphometric study ; Age Related Changes

Introduction

The skeletal system in the body consist of ligaments, cartilages, bones and other tissues that carry out critical roles for the human body. **Osseous** or bone **tissue**, is a dense, hard connective tissue that form the internal support structure of the body and shapes the majority of the adult skeleton, ⁽¹⁾. Osseous tissue are not a static tissue require to be regularly maintained and remodeled⁽²⁾. The bone mechanism are sustained in a balance to resist crack whereas optimizing the skeleton weight. As we age, the bones density initiates to reduce in both sex. This loss in density goes faster in women after menopause. Accordingly, in old age bones become more likely to break and delicate ⁽³⁾. About age 30, most people get to their peak bone mass. For a while following reaching peak bone mass, your body substitutes about as much as it loses. However less bone is replaced around age 40 and this causes the bones to be converted into weaker and thinner, increasing the risk for osteoporosis⁽⁴⁾.

In response to load throughout development and aging, the shape alters. As the shape changes (narrowing walls, shifting the center of gravity and lengthening), the functional capability may also be modified, the size of cortical bone, volume of trabecular bone and bone

strength turn down with age ^(5,6). There is some discuss in humans ⁽⁷⁾ as to whether the patterns of formation and resorption are comparable in both gender. It must be distinguished, however, in men the age-related loss is chiefly due to thinning of the individual struts, while the loss in women is due to a diminish in connectivity ⁽⁸⁾.

Material and Method

40 normal healthy person with normal occlusions from both sex (male &female), with age ranging from 20-60 years were taken from normal patient in dentistry clinic in Salahddin during period extending from October 2018 to April 2019. Patients were chosen with normal Class I occlusion and they don't have any discrepancy or disharmony in the arrangement of their teeth.

Those patient were divided in to 4 groups according to age and each group was composed of ten adults (5 male and 5 female) as follows:G1(20-29), G2(30-39), G3(40-49) and G4(50-59) year.

The stock tray is chosen for impressions⁽⁹⁾. Alginate possess the qualities of excellent surface detail and faster response at higher temperatures⁽¹⁰⁾. A dental impression is an imprint of the teeth and mouth from

which shaped items can be created(11), and after pouring the impression by stone a dental cast were made. The following measurement were made for the upper and lower dental cast to illustrate the changes that occurred in dental arch:

A. Transversal measurement:

Which include

Inter central incisor width(I1-I1)

Inter lateral incisor width(I2-I2)

Inter canine width(C-C)

Inter first premolar width {DM1(PM1)-DM1(PM1)}

Inter second premolar width {DM2(PM2)-DM2(PM2)}

Inter first molar width(M1-M1)

B. Anterior-posterior measurement:

Which obtained by

Incisor-canine distance(I1-C): the line between the most mesial end on the central incisor and the most distal end on the canine.

Canine-1st molar distance(C-M1): the distances between the most mesial spot on the canine and the most distal spot on the 1st molar.

Incisor-1st molar distance(I1-M1): the distances between the mesial dot on the central incisor and the distal dot on the 1st molar.

Total arch length(TAL): the total of the spaces between the most mesial spot on the canine and the most distal spot on the 1st molar on both sides.

Dental arch length(DAL): the area between the line of inter molar distance and the labial surface of the most prominent central incisor.

C. Vertical measurement:

Which mean palatal deepness of maxilla(PD)

We made the transversal and antero-posterior measurements as definite by Foster et al(12). Transversal measurements were obtained by calculating the means of the biggest and smallest distances between right and left identical teeth of the jaws. Antero-posterior

measurement were made only on left side. Palatal depth and dental arch length and their length above were taken by electronic digital caliper 100(4”).

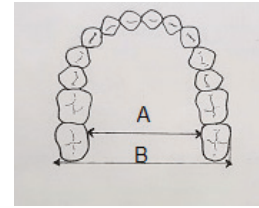


Figure (1): Transversal measurements were measured amid analogous teeth on each side of the dental arch . The width was calculated for each pair of teeth , as the mean of the maximum and minimum distances between them (A+B /2) .

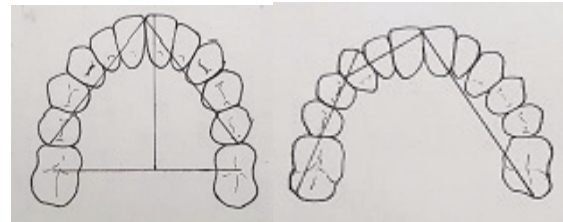


Figure (2): Dimensions of total arch length , Dental arch length , Incisor- canine , Canine – first molar , Incisor – first molar ,

Result

The analysis including the standard deviation values and their means shown in table 1. There is no significant differences in the result of *t* test which shown that ($p>0.05$) between males and females, except the inter canine width in the G1(20-29 years) which have a significant difference ($p<0.01$), inter first premolar width in G2(30-39) which have ($P<0.05$) and in G4 (50-59) there is difference in significant which was ($P<0.05$). The inter second premolar width also revealed a significantly difference of ($P<0.05$). The statistical analysis of male in four age groups revealed that the transversal measurement of dental arch enlarge starting from Group 1 to Group 2 but in G3 there is general decrease in all measurement of dental arch. While in female the statistical analysis shown that in G3 the all measurement began to decreased except in the inter first premolar and inter second premolar which start to decreased in the G2(30-39) and this revealed in table (1).

As can be seen in table 2 the all antero-posterior and vertical measurement of male in maxilla they exhibited significant increase from G1 to G2 but the G3 revealed a significant decrease in all above dimensions, while in female also there is significant increase in G1 to G2 and decrease in G3 except the incisor-first molar distance and total arch length there is a significant increase with aging from G1 to G4. Furthermore the palatal depth(PD)

show significant decrease

in G4 in female while in male began in G3. Also from table 2 we can see there is a significant difference in the G2 and G3 between both sex of (P<0.05) . A significant difference of (P<0.05) also seen in G2(30-39) in incisor-first molar and total arch length.

Measurement of table 3 exposed that in female revealed a universal decrease of all measurement in G2 except the inter-canine distance that start to decrease in G3 as in male . Also a comparison between male and female in the table three, which shown no difference of significantly between them excluding the inter first premolar in Group 2 and Group 4 which is (p<0.05), and inter second premolar in Group 2, Group 3, Group 4 of (p<0.05) in addition the inter first molar in Group 2.

The statistical analysis of table 4, show that the male in G3 have a significant decrease in incisor- canine and canine first molar distance and the all antero-posterior measurement show the decrease from G2, other than in female there is an increase from G1 to G2 and the decrease started in G3.

There is no significantly difference between male and female in antero-posterior measurement of dental arch except the canine first molar distance in G2 that have (p<0.05) , the incisor first molar distance and dental arch length illustrate a significantly difference (p<0.05*) in G1.

Discussion

Morphometric result in the dental arch including transverse, antero-posterior and vertical depth measurement agreed in a large degree with many others authors. Current research investigate the arch length, arch circumference, inter-molar, inter-premolar, inter-canine distances, width of all teeth and arch form on dental cast

from several orthodontic centers across Jeddah city in the western region of Saudi Arabia between April 2015 and May 2016 illustrate the arch width measurements were significantly greater in male subjects than in female subjects. This result supports the findings of several previous studies, Bishara et al⁽¹³⁾ which agreed with our finding except the inter canine width of mandible that greater in female in the G1 and G3 than the male and dental arch length in G3⁽¹⁴⁾.

A significant bone resorption with loss of projection of the maxilla in young and old patients demonstrated when Pessa ⁽¹⁵⁾ measured the maxillary angle (superior-to-inferior maxilla at the articulation of the inferior maxillary wing and alveolar arch) . A significant reduction of the maxillary angle with aging noted by Shaw and Kahn⁽¹⁶⁾ and this approve our study about the age changing of maxilla which increase in G1 and G2 but the resorption start in G3 and in female some measurement degenerate in G2.

The crowded of front teeth among the elderly caused by human jaw shrinks with age in a new study has found. Plaster molds prepared for the jaws of dental students in 1949 when the individuals were in their 20s, and record jaw molds of the same people made in 1959 and 1989 which done by swedish researchers “We found that over these 40 years there was less and less room for teeth in the jaw,” said in a university news release by Lars Bondemark, a professor of orthodontics at Malmo University. A few millimeters of shrinkage in both the length and width of the jaws, primarily the lower jaw occurred and this due to reduction in the amount of space for front teeth. Hereditary and anatomical factors affect the amount of jaw shrinkage which varies between individuals ⁽¹⁷⁾, this agreed with our study in which all the measurement increase from age 20 and 30 and started to decrease in 40 years except transverse measurement in female which started to decrease in 30 years.

Table (1). Mean and standard deviation in maxilla for transversal measurement in each gender for four age groups in millimeters(mm).

	sex	G1 20-29 Mean±SD	G2 30-39 Mean±SD	G3 40-49 Mean±SD	G4 50-59 Mean±SD
I1-I1	M	11.934 ±0.834*	12.250 ±0.774 _{ns}	11.63 ±1.11 ns	12.33 ±1.15 ns

Cont... Table (1). Mean and standard deviation in maxilla for transversal measurement in each gender for four age groups in millimeters(mm).

	F	10.44 ±1.20	11.688 ±0.774	11.417 ±0.382	11.75 ±1.06
I2-I2	M	22.625 0.968 ns±	23.50 1.63 ns ±	20.13 2.93 ns ±	22.92 2.53 ns±
	F	21.688 0.315 ±	22.25 2.06 ±	21.417 0.804 ±	23.13 1.24 ±
C-C	M	30.438** ± 0.515	31.70 ±2.42 ns	29.50 ±3.24 ns	31.08 ±2.90 ns
	F	26.688 ± 0.239	29.63 ±1.11	29.000 ±0.866	30.50 ± 1.41
PM1-PM1	M	35.61 ±1.48 ns	37.35* ±2.53	35.75 ±3.80 ns	37.25* ±1.09
	F	34.938 ±0.826	34.19 ±1.07	33.917 ±0.629	34.50 ±1.41
PM2-PM2	M	39.94 ±2.66 ns	41.85 ±1.41 ns	40.38 ±4.66 ns	40.00* ±1.73
	F	39.625 ±0.968	39.13 ±2.50	38.83 ±1.53	42.500 ±0.707
M1-M1	M	43.13 ±2.15 ns	45.95 ±3.97 ns	43.75 ±4.21 ns	46.00 ±4.50 ns
	F	43.38 ±1.74	44.13 ±2.50	43.00 ±1.73	47.00 ±1.41

n= (P>0.05)

*= (P<0.05)

**=(P<0.01)

Table(2) Mean and standard deviation of maxilla for Anterio-posterior & Vertical measurement for each gender in four age groups(in millimeters).

	sex	G1 20-29 Mean+SD	G2 30-39 Mea+DS	G3 40-49 Mean+SD	G4 50-59 Mean+SD
I1-C	M	23.00 +3.19 ns	23.00 +1.73 ns	21.250 +0.957 ns	20.33 +2.08 ns

Cont... Table(2) Mean and standard deviation of maxilla for Anterio-posterior & Vertical measurement for each gender in four age groups(in millimeters).

	F	21.250 +0.500	21.25 +1.71	21.00 +1.00	21.500 +0.707
C-M1	M	31.25 +1.26 ns	32.600 +0.894 *	30.38 +1.11 ns	29.33 +6.43*
	F	31.750 +0.500	31.125 +0.629	29.33 +1.15	22.250 +0.354
I1-M1	M	42.75 +2.22 ns	46.00 +2.24 *	41.63 +1.80 ns	42.33 +5.51 ns
	F	42.50 +1.73	42.75 +1.50	43.00 + 6.56	44.500 +0.707
TAL	M	42.38 +2.39 ns	45.70 +1.60 *	41.19 +2.32 ns	41.68 +3.48 ns
	F	43.000 +0.913	42.75 +1.94	43.75 +6.14	44.05 +4.36
DAL	M	33.38 +1.89 ns	35.20 +1.92 ns	32.00 +2.16 ns	33.00 +2.00 ns
	F	33.250 +0.957	33.75 +1.26	33.00 +2.65	31.500 +0.707
PD	M	19.25 3.4±	21.75 1.258 ±	21.0 3.61 ±	22.67 0.577±
	F	17.33 4.73 ±	18.25 1.258 ±	20.0 2.65 ±	19.0 1.41±

n= (P>0.05)

*= (P<0.05)

**=(P<0.01)

Table (3) Mean and standard deviation of mandible for transversal measurement in each gender in four age groups in millimeters (mm).

	sex	G1 20-29 Mean+SD	G2 30-39 Mean+SD	G3 40-49 Mean+SD	G4 50-59 Mean+SD
I1-I1	M	7.188 + 0.375 ns	7.438 + 0.515 ns	7.125 +0.250 ns	7.000 +0.500 ns

Cont... Table (3) Mean and standard deviation of mandible for transversal measurement in each gender in four age groups in millimeters (mm).

	F	9.08 + 3.84	7.500 + 0.612	7.417 + 0.520	6.750 + 0.354
I2-I2	M	15.688 +0.554 ns	16.250 + 0.500 ns	15.563 +0.515 ns	16.00 +1.64 ns
	F	16.08 +1.23	15.75 +1.55	15.58 +1.38	17.25 + 1.06
C-C	M	24.19 +2.21 ns	25.88 +1.31 ns	23.13 +1.38 ns	25.83 +2.57 ns
	F	25.250 +0.661	25.50 +2.08	24.50 +1.80	25.500 + 0.707
PM1-PM1	M	32.50 +1.87 ns	34.40 +1.95 *	31.25 +2.90 ns	35.33 +3.33 *
	F	33.167 + 0.764	32.13 +1.44	31.83 +1.89	31.25 +1.06
PM2-PM2	M	37.38 +1.97 ns	39.70 +2.86 *	36.75 +2.63 *	40.33 +2.36 *
	F	37.67 +1.61	36.63 +2.39	39.33 +2.75	36.500 +0.707
M1-M1	M	44.63 +1.44 ns	46.38 + 3.50 *	43.25 +2.10 ns	47.50 +3.50
	F	43.67 +2.08	42.00 +2.12	43.17 +2.31	43.75 +1.06

n= (P>0.05)

*= (P<0.05)

**=(P<0.01)

Table(4): Mean and standard deviation of mandible for Anterio-posterior measurement for each gender in four age groups in millimeters (mm).

	sex	20-29 Mean+SD	30-39 Mean+SD	40-49 Mean+SD	50-59 Mean+SD
I1-C	M	17.00 +0.816 ns	17.00 +0.816 ns	16.00 +0.816 ns	16.33 +2.08 ns
	F	16.67 +1.15	17.00 +0.707	16.00 +1.00	16.500 +0.707
C-M1	M	32.75 +1.50 ns	33.25 +1.50 *	32.25 +2.87 ns	31.67 +3.21 ns
	F	31.333 + 0.577	31.40+ 0.548	31.00 +2.65	31.500+ 0.707
I1-M1	M	42.25 +1.26 *	41.25 +2.22 ns	40.00 +2.16 ns	40.67 + 4.16 ns
	F	39.33 +1.53	39.80 +2.28	39.00 2.65	39.500 +0.707
TAL	M	41.63 +1.25 ns	41.25 +2.18 ns	39.38 + 2.17 ns	40.33 +3.88 ns
	F	39.33 +2.02	39.50 +2.37	38.67 +3.40	39.25 +1.06
DAL	M	31.00 +3.46 *	29.75 +1.71 ns	27.25 +2.22 ns	29.33 +3.79 ns
	F	26.667 +0.577	28.60 +2.41	26.00 +1.00	26.500 +0.707

n= (P>0.05)

*=(P<0.05)

**=(P<0.01)

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