Maxillary Arch Dimensions in an Iraqi Population Sample

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Abstract:

Objectives: To determine the maxillary arch dimensions in an Iraqi (Salah Aldin city) sample aged (17-27) years with CL I(class one) normal occlusion and show the sex difference in this sample and compare these values of this group (males and females) combined with other studies in middle eastern population sample(Saudi and Egyptian population sample).

Materials and Methods: The observation concerning maxillary arch dimensions were taken from 80 study models (40males and 40 females) the measurement distances from canine to canine (C-C), molar to molar (M-M), molar to canine (M-C) and molar to incisor (M-I) according to Mack criteria . The measurements were made by means of vernier calipers with sharpened points to the nearest 0.05mm. Statistical analysis of the collected data was performed; the t .test was used when two groups were compared. level of significance was chosen (p<0.05,p<0.01 , p<0,001).

Results: The greater mean values of inter cusp distances from canine to canine, molar to molar , molar to canine and molar to incisor were significantly higher in Iraqi males than Iraqi females , and this result is similar to result of sex difference in Saudi and Egyptian samples . While the comparison of the results of Iraqi and Saudi sample reveals no significant difference for Iraqi sample (both males and females)than for the Saudi sample (both males and females) in all measurements except (C-C) distance which shows significant difference . While higher statistically significant differences in (C-C), (M-M) distances for Egyptian sample than Iraqi sample while (M-I) difference is greater in Iraqi sample than Egyptian sample.

Conclusion: The Iraqi maxillary arch dimension was greater in males than in females.There is a similarity between the Iraqi and Saudi maxillary arch dimensions, except a very little difference in (C-C) distance. The Egyptian maxillary arch dimensions (African group)was greater than that of the Iraqi sample (Asian group) except in (M-C) distance which has no difference ,while (M-I) distance the difference is greater in Iraqi sample than Egyptian sample.

Key words: Maxillary arch dimension, Iraqi population, Salah Aldin city.

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Introduction:

Knowledge of standard dimensions which concerns the dental arch in human populating are very useful to clinicians in different fields of dentistry in orthodontics, prosthodontics and oral surgery and they are of great interest to anthropologists in studying the dental arch growth and development in relation to different environmental , genetic and physical factors for different population [1-5].

A survey of arch size may help the clinician in choosing correctly shaped stock impression trays for prosthodontic treatment. In addition to the selection stock trays, the size of artificial teeth and the overall form of the artificial dental arch at the wax trial stage are amenable to modification by the dental surgeon in orthodontic treatment [6]. Each dental arch describes a graceful curve and the teeth in these arches are well arranged to be in

harmony with their fellows in the same arch as well as with those in the opposite.

This harmony in size and relation of dental arches are important in maintaining normal occlusion of teeth besides the influence of the or facial musculature labially,buccally and lingually [7-9] .The size and shape of the maxillary and mandibular arches have considerable implications in orthodontic diagnosis and treatment planning affecting the space available , dental esthetics , and stability of the dentition [10].

Materials and Methods:

The study was done on 80 dental casts of normal occlusion (40 males and 40 females), the sample was collected from patients attending Tikrit university , college of dentistry , department of orthodontics ,and from outpatient clinic . These samples are minimum age of 17 years and maximum age of 27 years , none of the subjects underwent any orthodontic treatment . Permanent incisors, canines, premolars and molars are fully erupted in all subjects. None of the teeth were rotated or out of the arches. The sample selected according to the following criteria [11, 12, and 13] .

1-Bilateral class I molar relationship in centric occlusion.

2-Well aligned maxillary or mandibular arches with less than 2 mm spacing or crowding.

3-Class I soft tissue profile.

4-Normal over bite and over jet relationship (≥ 1 and $\leq 4mm$) [14].

5-No missing teeth (except wisdom teeth).

6-Absence of posterior cross bite (even limited to a single tooth).

Measurements used in this study are as follows [15]:

1-Maxillary inter canine width:-the distance between the cusp tips of right and left maxillary permanent canines (C-C).

2-Maxillary inter molar width: - the distance between the distobuccalcusp tips of right and left maxillary permanent first molars (M-M).

3-Molar – canine distance:-the distance from canine cusp tip to the distobuccalcusp cusp tip of the first permanent molar (M-C).

4- Incisal – molar distance:-the distance from the mesial edge of central incisor to the distobuccalcusp cusp tip of the first permanent molar (M-I).(fig1)[15]
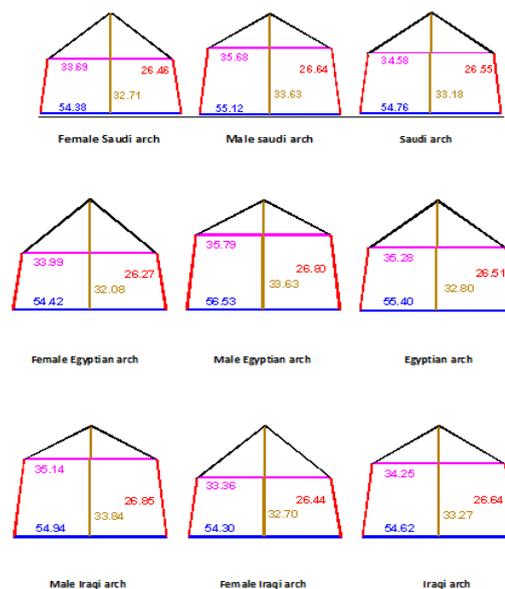

Fig1:Distances from canine to canine , molar to molar ,molar to canine, molar to incisor respectively for three groups of samples which are Saudi ,Egyptian and Iraqi samples(all these distances in millimeters).

The measurements were made by means of vernier calipers with sharpened points to the nearest 0.05mm.A fifteen randomly selected casts of males and females are the premeasured after 1 month for reliability of measurements and the difference between the first and the second measurements was statistically insignificant. Statistical analysis of the collected data was performed using SPSS computer program version 10.1. The t .test was used when two groups were compared. Level of significance was chosen (p<0.05, p<0.01, p<0,001).

Results:

The variables of maxillary arch dimensions for the total sample were subjected to the descriptive analysis including mean, standard deviation and t-tests (tables 1-3).

The greater mean values of inter cusp distances from canine to canine , molar to molar, molar to canine ,and molar to incisor were significantly higher in Iraqi males than Iraqi females as shown in table (1) .

While the comparison of the results of Iraqi and Saudi sample reveal no significant difference for Iraqi sample(both males and females) than for the Saudi sample (both males and females)in all measurements except (C-C)distance which shows significant difference (Saudi sample had greater inter cusp distance than Iraqi sample) as illustrated in table (2).

Also the comparison of Iraqi sample with Egyptian sample shows higher statistically significant differences in (C-C) , (M-M) distances for Egyptian sample than Iraqi sample while(M-I)the difference is greater in Iraqi sample than Egyptian sample ,but the difference in(M-C) distance was not significant as shown in table (3). Different analysis of maxillary arch dimensions is carried out in millimeters according to sex and ethnic difference.

Table (1): Comparisons of maxillary arch dimensions in (mm) of male and female (Iraqi sample).

Inter cusp distance	male		female		t
	mean	SD	mean	SD	
C-C	35.14	1.34	33.36	0.97	***
M-M	54.94	2.19	54.30	1.26	**
M-C	26.85	0.62	26.44	0.41	*
M-I	33.84	1.23	32.7	1.45	***

Level of significance *p<0.05,**p<0.01 ,*** p<0.001

The greater mean values of intercusp distances from (C-C),(M-M),(M-C)and (M-I) were significantly higher in Iraqi males than Iraqi females.

Table (2)

Comparisons of maxillary arch dimension of Iraqi sample (both males and females) with Saudi sample (both males and females).

Inter cusp distance	Iraqi sample		Saudi sample		
	mean	SD	mean	SD	t
C-C	34.25	1.28	34.58	1.59	*
M-M	54.62	1.89	54.76	1.93	NS
M-C	26.64	0.5	26.55	0.5	NS
M-I	33.27	1.31	33.18	1.29	NS

NS not significant *$p<0.05$,**$p<0.01$,***$p<0.00$

No significant differences for Iraqi sample than for Saudi sample in all measurement except (C-C)distance which show significant difference (Saudi sample had greater intercusp distance than Iraqi sample).

Table (3)

Comparisons of maxillary arch dimensions (mm) between Iraqi sample (both males and females) and Egyptian sample (both males and females).

Inter cusp distance	Iraqi Sample		Egyptian sample		t
	mean	SD	mean	SD	
C-C	34.25	1.28	35.28	1.94	***
M-M	54.62	1.89	55.40	1.81	***
M-C	26.64	0. 59	26.51	0.54	NS
M-I	33.27	1.31	32.80	1.54	**

NS not significant*$p<0.05$, **$p<0.01$, ***$p<0.001$

Higher statically significant differences in (C-C),(M-M) distances for Egyptian sample than Iraqi sample while (M-I) the difference is greater in Iraqi sample than Egyptian sample ,but the difference in (M-C) distance was not significant.

Discussion:

Many factors such as heredity, growth of the bone, eruption and inclination of the teeth, external influences, function, and ethnic background may affect the size and shape of the dental arches [16-19].

Investigators who studied growth changes in the transverse arch width found that molar and canine arch widths did not change after age 13 years in female subjects and age 16 years in male subjects [20-23].

The minimum ages of the subjects measured in this study were chosen on the basis of these previous studies, therefore, we assume that the maxillary arch dimensions of the subjects studied were fully developed. The first result of this study demonstrates that the maxillary arch dimensions are greater in males than females in Iraqi sample. This result is similar to the result of sex difference in Saudi and Egyptian samples.

This may be due to physical characteristics and strongest musculature in males than females which play role in facial development (width and height of the maxillary arch).

Comparison of data on dental arch dimensions from different studies hampered the fact that it is not easy to tabulate all date on different land marks [24].

Therefore, the most popular land marks have been selected to be used in this study to enhance the comparison with other different studies in different ethnic groups which are the (C-C) , (M-M), (C-M) , (M-I) , similar to land mark chosen by Younes,s [15] , to make a comparison with her study which was based on Mack criteria [25].

Therefore when camparing this study data with Younes,s study we show that the Iraqi samples are similar in all dimension measurements to Saudi samples except the(C-C) distance which shows a slight difference (low significant difference) , This similarity may be related to the same environment factors and functional basis for those populations which are located geographically in the same area (Asia) while this study shows higher statically significant differences for the Egyptian samples than for the Iraqi samplers in (C-C) , (M-M), (M-I) distances , but the difference in (M-C) distance was not a significant difference. This difference may come from different environmental , genetic and physical factors for different population located in different geographic area Asia and Africa (ethnic different)[1,4,15].

Finally knowledge of the arch size and shape is of a particular interest to orthodontist and prosthodontist in clinical dental field [26] ,and these similarities and differences may be useful to clinicians in orthodontics , prosthodontics and oral surgery to choose correctly shaped of stock trays ,artificial teeth and also useful to

students of human oral biology for identification of the possible genetic and development association of congenital deformities in the human maxillary arch [27-29].

Conclusions:-

1-The Iraqi maxillary arch dimension is greater in males than in females.

2- There is a similarity between the Iraqi and Saudi maxillary arch dimensions, except a very little difference in (C-C) distance.

3- The Egyptian maxillary arch dimension (African group)is greater than that of the Iraqi samples (Asian groups) except in (M-C) distance which has no difference, while Iraqi (M-I) distance is greater than that of Egyptian sample

References:-

1. Knott VB. size and form of the dental arches in children with good occlusion studied longitudinally from age 9 years to late adolescence . Am J phys Anthropol 1961;19:163-184.
2. Richardson A , Ana JR .occlusion and malocclusion in lagos .J Dent 1973 ;1:134-137.
3. Wood head CM .the mesiodistal diameter of permanent maxillary incisor teeth and their prosthetic replacement .J Dent 1977;5:93.
4. Diwan R and Elahi JM .Acomparative study between three ethnic groups to derive some standards for maxillary arch dimensions . J Oral Rehabilitation 1990;17;43-48.
5. Meredith HV, Hopp WM .A longitudinal study of dental arch width at the deciduous second molars on children 4-8 years of age .J Dent Res. 1956;35;879-889.
6. Braun S , Hnat WP, Fender DE , Legan HL.The form of the human dental arch . Angle Orthod. 1998;68; 29-36.
7. Hagerty RF, Andrews EB , Hill MJ , Clacot CE , Karesh SH ,Lifschiz JM and Swindler DR . Dental arch collapse in cleft palate . Angle orthod. 1964 ; 34:25-36.
8. Angle GM . Classification of malocclusion : 1889 . Dental cosmos; 41 :248-264 . cited by Mitchell L. Carter N . An introduction to orthodontics. oxford university press ; 1996 .
9. Sved A . The application of engineering methods to orthodontics . Am J Orthod Dentofac Ortrop 1952 ; 38 : 399-421 .
10. Lee RT . Arch width and form . Am J Orthod Dentofac Orthop 1999 ; 115 : 305-313 .
11. Sayin MO , Turkkahraman H .Comparison of dental arch and alveolar widths of patients with

class II division 1 malocclusion and subjects with class I ideal occlusion . Angle Orthod. 2004; 74:356-360.

12. Marian Almyra Seville Naranjilla,DMD,MA,DipOrtha;Ingrid Rudzki-Janson,Prof Dr med dentb :Cephalomtric Features of Filipinos With Angle Class I Occlusion According to the Munich Analysis. Angle Orthodontist, Vol 75, No 1, 2005.

13. M.Ozgur Sayin, DDSa; Hakan Turkkahraman, DDSa: Comparison of Dental Arch and Alveolar Widths of Patients with Class II, Division 1 Malocclusion and Subjects with Class I Ideal Occlusion. Angle Orthodontist, Vol 74, No 3, 2004.

14. Christipher J.Lux ,DDS, Dr Med Dent a;Christain Conradt ,PhD; Donald Burden,BDS,MSc,PhD,FDSRCSc;Gerda Komposch,dds,PhDa:Dental Arch Width and Mandibular –Maxillary Base Widths in Class II Malocclusions Between Early Mixed and Permanent Dentitions.Angle Orthodontist ,Vol 73 ,No 6 ,2003.

15. Younes SAES . Maxillary arch dimensions in Saudi and Egyptian population sample .Am J Orthod Dentofac Orthop . 1984;85:83-88.

16. Lavelle CL ,Flinn RM, Foster TD ,Hamilton MC.An analysis into age changes of the human dental arch by amultivariate technique .Am J Phys Anthropol.1970;33 :403-411.

17. Lovelle CL , Foster TD , flinn RM . Dental arches in various ethnic groups . Angle Orthod .1971;41:293 -299.

18. Bjork A, Brown T , Skieller V . Comparison of craniofacial growth in Australian aboriginal and Danes , illustrated by longitudinal cephalometric analysis. Eur J Orthod . 1984 ;6;1-14.

19. Hassanali J . Odhiambo W . Analysis of dental casts of 6-8 and 12-years old Kenyan children Eur J Orthod .2000;22:135-142.

20. Knott VB . Longitudinal study of dental arch widths at four stages of dentition . Angle Orthod .1972;42:387-394.

21. Dekock WH . Dental arch depth and width studied longitudinally from 12 years of age to adulthood . Am J Orthod. 1972; 62:56-66.

22. Sillman JH . Dimensional changes of the dental arches : longitudinal study from birth to 25 years . Am J Orthod 1964;50:824- 842.

23. Moorrees CFA . The dentition of the growing child .Cambridge, Mass : Harvard university press :1959;87-110.

24. Sinclair PM and R.M .little . Maturation of untreated normal occlusion . Am J Orthod .1983;83:114-123).

25 . Mack PJ :maxillary arch and central incisor dimensions in Nigerian and British population sample .J Dent 1981;9:67-70

26. John Y.K Ling ;Ricky W. K. Wong . Dental arch widths of Southren Chinese . Angle Orthod. 2009;79:54-63.

27. Akapata AS Jackson D. Over jet of children and young adults in Lagos . Oral Epidemiol. 1979;7:174-177.

28. Henshaw NE, Adenubi JO .The increase in dental disease in the northen states of Nigeria and its man power implications . J Dent .1975;3: 243-246.

29. Tappen NCA :A functional analysis of the facial skeleton with split – line technique . Am J Phys Anthropol .1953;11:503-532.