A Comparison of Arch Width in Adults with Normal Class **I** Occlusion and Adults with Class **II** Division1 Malocclusion in Ramadi City

Zena Hekmat Al-Taee

M.Sc.,B.D.S. Orthodontist. College of Dentistry, University of Anbar

Abstract

Aim: The purpose of this study is to compare the arch width between normal class I occlusion and class II div 1 malocclusion in males and females in Ramadi city

Methods and Materials: Fifty-six pairs of study models samples were selected from Ramadi secondary school. The mean age of this group is 18.3±0.7 years. The 56pairs of study are divided into two groups. The first group consists of 28 study models of Class I occlusion.

The samples were divided evenly between the genders (14 females and 14 males). The second group consists of 28 study models of Class lI division1 malocclusion who were equally divided between the genders (14 males and 14 females) Measurements were made directly on upper and lower dental casts with an electronic digital caliper with sharpened tips. The dental arch width was recorded by measure intercanine width, intermolar width and interalveolar width to compare the two groups, the student's t-test was used with 95% confidence interval.

Results: The present study showed the maxillary intercanine and intermolar width were significant narrower in Class II Division 1 than that in Class I normal occlusion. The maxillary interalveolar widths showed no difference between the two groups. These results suggested that transverse discrepancy in Class II division 1 patients originated from upper posterior teeth and not from the maxillary alveolar base. On the other hand, the mandibular intercanine width was significant larger in Class II, Division 1 than that in Class I normal occlusion . The mandibular intermolar and Interalveolar width were significant larger in Class I normal occlusion subjects.

Conclusion: The arch widths were smaller in Class II, Division 1 malocclusion compared to Class I normal occlusion except mandibular intercanine width and the arch widths were larger in males than that of females.

Keywords: arch dimension, class II malocclusion, Ramadi city

Corresponding author: Zena Hekmat Al-Taee

Introduction:

The dimensions of a dental arch which include arch length and arch widths can have profound implications in orthodontic diagnosis and treatment planning, which affect the space available, dental aesthetics, and stability of the dentition. These considerations, in association with the anteroposterior movements of the dentition determine the requirements for extraction or non-extraction treatment.[1] The size and shape of the dental arches could be affected by many factors such as heredity, growth of the bone, eruption & inclination of the teeth, racial background and environmental factors such as muscle forces and function.[2,3,4] information regarding arch dimensions in human populations is important to clinicians in orthodontics prosthodontics, and oral surgery. It is also of interest to anthropologists and other students of human oral biology. [5]

Class II malocclusion was reported as the most frequent skeletal disharmony in an orthodontic population[6].

Clinical examination of patients with Class II, Division 1 malocclusions often reveals a transverse discrepancy between the dental arches generally attributed to a reduction in maxillary arch width[7]. Several studies investigated the arch width found the width of the dental arches in subjects with Class II, Division 1malocclusions to be either normal or narrower than the corresponding widths of normal subjects [8,910,11]

So this study shows a comparative study of maxillary and mandibular arch width between normal class l occlusion and class ll div 1 malocclusion in males and females in Ramadi city .However, there is little information regarding this issue among the this population where there is a relatively large demand for orthodontic treatment.

Subjects and Method
Sample Selection

56 pairs of study models samples were selected from Ramadi secondary school .The age of this group was (16-19) years old. The mean age of this group was 18.3±0.7 years.

The 56pairs of study were divided into two groups. The first group consisted of 28 study models of Class I occlusion based on a Class I skeletal relationship without any abnormality. The samples were divided evenly between the genders 14 females and 14 males). The second group consists of 28 study models of Class ll division1 malocclusion equally divided between the genders (14 males and 14 females)

The following characteristics were shared in both groups:

- All cases were in the permanent dentition
- No missing or supernumerary or extracted teeth (excluding third molars).
- No morphological anomalies
- None had undergone any form of orthodontic treatment
- All the subjects from Ramadi city.

Impressions were taken in Alginate impression material and were poured in orthodontic plaster within half an hour to avoid any shrinkage of impressions.

Measuring Technique

Measurements were made directly on upper and lower dental casts by one investigator with an electronic digital caliper with sharpened tips (Fig1), recorded accurate to 0.01 mm. The dental arch width was recorded by measure intercanine width, intermolar width and interalveolar width ,

The reference points for the measurements were marked using the sharp pointed pencil to establish the exact landmark points. Resulting facets were used as landmarks.

1. Maxillary intercanine width: Distance between the cusp tips of the maxillary right and left permanent canines.

2. Maxillary intermolar width I: Distance between the mesiobuccal cusp tips of the maxillary right and left permanent first molars.

3. Maxillary intermolar width II: Distance between the central fossae of the maxillary right and left permanent first molars.

4. Maxillary interalveolar width: Distance between the mucogingival junctions above the mesiobuccal cusp tips of the maxillary right and left permanent first molars.

5. Mandibular intercanine width: Distance between the cusp tips of the mandibular rightand left permanent canines.

6. Mandibular intermolar width I: Distance between the mesiobuccal cusp tips of the mandibular right and left permanent first molars.

7. Mandibular intermolar width II: Distance between the central fossae of the mandibular right and left permanent first molars.

8. Mandibular interalveolar width: Distance between the mucogingival junctions below the buccal grooves of the mandibular right and left permanent first molars.
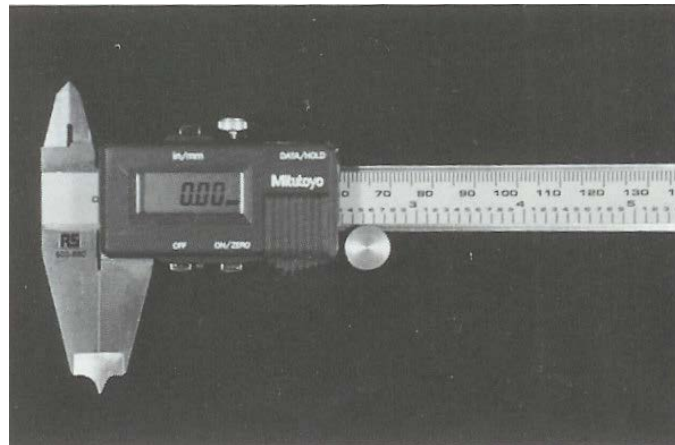
Result and Discussion:

Investigators, who studied growth changes in the arch widths, found that inter-canine and inter-molar widths did not change after the age of thirteen years in females and sixteen years in males while some have indicated that molar and canine arch widths were mostly stabilized after 13 years of age with very little or no changes thereafter.[12,13]

The present study shows that the mean values for the maxillary intercanine width were slightly greater in Class I normal occlusion subjects, were significant differences (Table1). The same was reported by [9, 14].

According to our results, inter-molar widths were found narrower in the Class II, division 1 group, A comparison between individual groups showed significant difference in maxillary intermolar widths between Class I and Class II division 1 subjects(Table1). This can be interpreted that Class II malocclusion subjects had the narrowest maxillary intermolar widths groups. Similar results were found by other authors [8,9,14,15] who reported a significant difference in intermolar widths between Class I and Class II malocclusions. This result is not in line with the observation of [11] who found no significant difference in the intermolar width between normal and Class II subjects.

Interalveolar widths showed no difference between the groups(Table1). These results suggested that transverse discrepancy in Class II, division 1 patients originated from upper posterior teeth and not from the maxillary alveolar base. Therefore, slow maxillary expansion may be considered before orthodontic treatment.This finding is in agreement with [8,9,11]

(Table1) Comparison of arch widths between Class II, Division 1 with Class I normal occlusion in maxillary arch

Variable		Class I	Class II	T. value	P. value
Intercanine	**Mean**	34.11	32.90	22.88	S
Width	**S.D**	0.18	0.2		P < 0.01
Intermolar	**Mean**	46.92	44.21	46.04	S
Width I	**S.D**	0.22	0.21		P < 0.01
Intermolar	**Mean**	42.48	40.21	40.45	S
Width II	**S.D**	0.20	0.21		P < 0.01
interalveolar	**Mean**	56.55	56.40	1.03	NS
Width	**S.D**	0.18	0.26		P < 0.05

S=significant difference   NS=non-significant difference

On the other hand, the mandibular intercanine width was significant larger in Class II, division 1 than that in Class I normal occlusion (Table2). This finding is in agreement with [8] and disagreement with [16,9] who reported that both Class II malocclusion subjects and normal occlusion subjects had similar mandibular intercanine width.

On the other hand, and the mandibular intermolar width were slightly greater in Class I normal occlusion subjects, (Table2). The same was reported by [8,9].

And disagree with [10] who found no significant difference in the intermolar width between normal and Class II subjects.

Interalveolar widths were slightly greater in Class I normal occlusion subjects which agree with[9] with finding of and disagree with[8] who reported that both Class II malocclusion subjects and normal occlusion subjects had similar mandibular Interalveolar widths.

(Table2) Shows comparison of arch widths between Class II, Division 1 with Class I normal occlusion in mandibular arch

Variable		Class I	Class II	T. value	P. value
Intercanine Width	Mean	25.98	26.40	7.035	S
	S.D	0.16	0.26		P < 0.01
Intermolar Width I	Mean	44.28	43.45	12.73	S
	S.D	0.25	0.23		P < 0.01
Intermolar Width II	Mean	40.77	40.33	40.45	S
	S.D	0.18	0.24		P < 0.01
Interalveolar Width	Mean	56.12	55.75	6.13	S
	S.D	0.24	0.20		P < 0.01

The results of the present study showed that the arch widths were slightly larger in the male subjects than that of the female subjects(Table3). This finding is in agreement with the results obtained by [9,15,17,18,19, 20] On the other hand, this result was not in line with the results reported

by[11,21,22]who found no significant difference between male and female subjects The difference in the results of these studies could be due to different landmarks, different sample size, age group, ethnic group and procedure .

(Table3) Comparison of arch widths between the male and female in Ramadi city

Variable		Male	Female	T. value	P. value
Maxillary Intercanine Width	**Mean**	33.90	32.98	11.74	S
	S.D	0.32	0.24		P < 0.01
Maxillary Intermolar Width I	**Mean**	51.45	47.21	2.64	S
	S.D	8.49	0.22		P < 0.05
Maxillary Intermolar Width II	**Mean**	45.14	43.46	5.27	S
	S.D	1.73	0.16		P < 0.01
Maxillary Interalveolar Width	**Mean**	57.14	54.95	43.98	S
	S.D	0.19	0.17		P < 0.01
Mandibular Intercanine Width	**Mean**	27.21	25.95	30.12	S
	S.D	0.16	0.15		P < 0.01
Mandibular Intermolar Width I	**Mean**	43.85	42.41	30.22	S
	S.D	0.16	0.19		P < 0.01
Mandibular Intermolar Width II	**Mean**	40.76	39.55	26.219	S
	S.D	0.13	0.20		P < 0.01
Mandibular Interalveolar Width	**Mean**	56.86	55.21	32.96	S
	S.D	0.19	0.18		P < 0.01

Conclusion

1) The arch widths were smaller in Class II, Division 1 malocclusion compared to Class I normal occlusion except mandibular intercanine width which was significant larger in Class II, Division 1 than that in Class I, normal occlusion .

2) As regards transverse discrepancy in Class II, division 1 patients originated from upper posterior teeth and not from the maxillary alveolar base.

3) The arch widths were larger in males than that of females

References

1. Lee RT. Arch width and form: a review. Am J Orthod Dentofacial Orthop. 1999; 115: 305-13.
2. Lavelle CL, Foster TD, Flinn RM. Dental arches in various ethnic groups. Angle Orthod .1971; 41:293-99.
3. 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.
4. Hassanali J, Odhiambo W. Analysis of dental casts of 6–8 and 12-year old Kenyan children. Eur. J.Orthod. 2000; 22: 135-142.
5. Younes SA.: Maxillary arch dimensions in Saudi and Egypt population sample. Am J. Orthod Dentofacial.Orthop 1984; 85: 83-8.
6. Ast DB, Carlos JR Cons DC. Prevalence and characteristic of malocclusion among senior high school students in up-state New York. Am J Orthod. 1965; 51:437-45.
7. Sassouni V. The Class II syndrome: differential diagnosis and treatment. Am JOrthod. 1969; 55:109-23.
8. Sayin MO, Turkkahraman H. Comparison of Dental Arch and Alveolar Widths of Patients with Class II, Division I Malocclusion and Subjects with Class I Ideal Occlusion. Angle Orthod.2004;74:356-6063.
9. Staley RN, Stuntz WR. Peterson LC. A comparison of arch widths in adults with normal occlusion and adults with Class II, division 1 malocclusion. Am J Orthod.1985; 88:163-69.
10. Frohlich FJ. A longitudinal study of untreated Class II type malocclusion. Trans Eur Orthod Soc. 1961; 37: 137-159.
11. Bishara SE, Bayati P, Jakobsen JR. Longitudinal comparisons of dental arch changes in normal and untreated Class II, Division 1 subjects and their clinical implications. Am J Orthod. 1996; 110: 483-89.
12. Snodell SF, Nanda RS, Currier GF. A longitudinal cephalometric study of transverse and vertical J. Med. Sci. 2009; 17:2 -77.
13. Cortella S, Shofer FS, Ghafari J. Transverse development of the jaws: norms for the posteroanterior cephalometric analysis. Am JOrthod Dentofacial Orthop 1997; 112: 519-522.

14. *Quraishi BA. Comparison of arch widths in adults with normal occlusion and adults with Class II Division 1 and Class III malocclusion [Dissertation].Karachi, Pakistan: College of Physicians and Surgeons Pakistan; 2004.*

15. *Al-Khateeb SN, Abu-Alhaija ESJ. Tooth size discrepancies and arch parameters among different malocclusions in a Jordanian sample. Angle Orthod 2006; 76: 459-65.*

16. *Huth j, Staley RN, Jacobs R, Bigelow H, Jakobsen J. Arch widths in Class II-2 adults compared to adults with Class II-1 and normal occlusion. Angle Orthod 2007; 77: 837-844.*

17. *Hashim HA, Al Ghamdi HS. Arch dimensions inClass I, II and III malocclusion: A pilot study. Pak J Orthodont Ped. and Comm. Dentistry 2002; 1: 21-6.*

18. *Burris BG and Harris EF. Maxillary Arch Size and Shape in American Blacks and Whites. The Angle Orthodontist. 2000; 70: 297–302.*

19. *Tamimi T and Hashim H. Odontometric study of tooth size ratio and arch dimensions in a Saudi sample with normal occlusion. [MS Thesis], College of Dentistry, King Saud University, 2000.*

20. *Mohammed H.S.maxillary arch dimension across section study between 9-17 years [MS Thesis], College of Dentistry, Baghdad University, 1993.*

21. *Raberin M.,Laumon B.,brunner F. and Martin J. Dimensions and form of dental arches in subjects with normal occlusions The Angle Orthodontist. 1`993; 104: 67–72*

22. *Lavelle,C.L.B.and Foster,T.D.Across section study into age changes of human dental arch .Archives of oral biology 1969 14:71-86.*