Original Article

Arch Widths in Adults with Class I Crowded and Class III Malocclusions Compared with Normal Occlusions

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ABSTRACT

Objective: To test the hypothesis that there is no difference between adults with Class I crowded (CICR), Class III (CIII), and Class I normal (CIN) occlusions with respect to (1) arch widths, (2) width of the maxillary and mandibular arches, (3) gender dimorphism within groups, and (4) gender comparisons.

Materials and Methods: Samples of 39 CICR subjects, 40 CIII subjects, and 40 CIN subjects were studied. All subjects were white Americans with no history of orthodontic treatment. An analysis of variance and Duncan's test statistically compared the groups and genders.

Results: The CICR group had mean maxillary and mandibular intermolar and alveolar arch widths significantly smaller than the CIN group. The CIII group had mean maxillary intermolar and alveolar arch widths significantly smaller than the CIN group. Mean maxillary and mandibular intercanine arch widths were similar in the three groups. The CICR and CIN groups had similar mean maxillary/mandibular intermolar and alveolar differences significantly larger than the negative differences observed in the CIII group. Gender dimorphisms were identical in the CIII and CIN groups. The CICR group differed by not having a gender dimorphism in the maxillary alveolar width and having a gender dimorphism in the mandibular intercanine width. Gender comparisons between groups were similar in intercanine widths but differed in other widths.

Conclusions: The hypothesis was rejected by the findings of this study.

KEY WORDS: Arch width; Intercanine; Intermolar; Alveolar

INTRODUCTION

Previous studies that compared arch widths in adult subjects having Angle[1] Class I crowded (CICR) and Class III (CIII) malocclusions and Class I normal (CIN) occlusions have left unanswered questions.

Mills[2] compared the arch widths of crowded and well-aligned Class I occlusions in young American white men. The 18 men with crowding had maxillary and mandibular second premolar arch widths significantly smaller than the 32 men with ideal alignment. Howe et al[3] compared the arch widths of 54 CIN subjects with 50 subjects having gross dental crowding (no Angle class was given). Maxillary and mandibular canine and molar alveolar arch widths were significantly larger in the CIN group in both genders.

Two studies compared the arch widths of adolescents with crowding (CR) and without crowding (NC) but did not specify the Angle class. Radnzic[4] compared the maxillary and mandibular intermolar widths in 60 British and 60 Pakistani boys aged 13 to 15 years. Maxillary intermolar widths were significantly smaller in the CR group than in the NC group in both samples. Mandibular intermolar widths were significantly smaller in the CR group than in the NC group in only British boys. Chang et al[5] compared the arch widths of 74 males and females with crowded arches (CR) and 89 Chinese males and females with good alignment. The average age of the subjects was 15

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Table 1. Comparison of Arch Width Studies[a]

Widths	IN vs ICR	ICR vs III	IN vs III
Maxilla			
Intercanine	Kuntz IN = ICR P, ♂, ♀ Chang NC = CR ♂ Chang NC < CR ♀	Kuntz ICR = III P, ♂, ♀ Al-Khateeb ICR = III P	Kuntz IN = III P, ♂, ♀ Herren IN = III P Uysal IN = III P
Intermolar	Kuntz IN > ICR P, ♂, ♀ Chang NC > CR ♂, ♀ Radnzic NC > CR ♂ Br, Pk	Kuntz ICR = III P, ♂, ♀ Al-Khateeb ICR = III P	Kuntz IN > III P, ♂, ♀ Herren IN > III P Uysal IN > III P
Alveolar	Kuntz IN > ICR P, ♂ Kuntz IN = ICR ♀ Howe IN > CR ♂, ♀	Kuntz ICR = III P, ♂, ♀	Kuntz IN > III P, ♂ Kuntz IN = III ♀ Uysal IN > III P
Mandible			
Intercanine	Kuntz IN = ICR P, ♂, ♀ Chang NC > CR ♂ Chang NC = CR ♀	Kuntz ICR = III P, ♂, ♀ Al-Khateeb ICR = III P	Kuntz IN = III P, ♂, ♀ Herren IN = III P Uysal IN < III P
Intermolar	Kuntz IN > ICR P, ♀ Kuntz IN = ICR ♂ Chang NC > CR ♂, ♀ Radnzic NC > CR ♂ Br Radnzic NC = CR ♂ Pk	Kuntz ICR < III P, ♀ Kuntz ICR = III ♂ Al-Khateeb ICR = III P	Kuntz IN = III P, ♂, ♀ Herren IN = III P Uysal IN < III P
Alveolar	Kuntz IN > ICR P, ♂, ♀ Howe IN > CR ♂, ♀	Kuntz ICR < III P, ♂, ♀	Kuntz IN = III P, ♂, ♀ Uysal IN = III P

[a] IN indicates Class I normal; NC, noncrowded; ICR, Class I crowded; CR, crowded; III, Class III; P, genders pooled; ♂, male; ♀, female; Br, British; Pk, Pakistani.

years. Genders were not pooled. The maxillary intercanine widths of both groups were similar in males but larger in CR females. The mandibular intercanine widths of both groups were similar in females but larger in CR males. The maxillary and mandibular intermolar arch widths were smaller in the CR group in both genders (Table 1). The CR group had no gender dimorphism in widths. The NC group had dimorphism (male > female) in all widths. The maxillary gender comparisons for male intercanine and intermolar widths were, respectively, CR = NC, CR < NC; for females, CR > NC, CR < NC. Mandibular comparisons for male intercanine and intermolar widths were, respectively, CR < NC, CR < NC; for females, CR = NC, CR < NC (Table 1).

Herren and Jordi-Guilloud[6] compared the arch widths of 30 CIII and 30 ideal occlusion subjects. All were white Germans with permanent dentitions including erupted second molars. The researchers found that the maxillary intermolar width of CIII subjects was slightly smaller (minimally significant) than those with ideal occlusion. Other arch widths were similar in the two groups. Uysal et al[7] compared arch widths in a large sample of CIII Turkish subjects with an average age of 15 years with subjects with normal occlusions who averaged 21 years of age. They reported that the maxillary intercanine widths were similar in CIII malocclusions and CIN occlusions. The maxillary intermolar and molar alveolar widths were smaller in CIII than in CIN occlusions. In the mandible, CIII malocclusions had larger intercanine and intermolar widths than CIN occlusions, and the two groups had similar molar alveolar widths (Table 1). Al-Khateeb and Abu Alhaija[8] compared arch widths in 13- to 15-year-old Jordanian students with CICR and CIII malocclusions. They reported that maxillary and mandibular intercanine and intermolar widths were similar in both groups (Table 1).

Buschang et al[9] reported arch widths for CICR adult females but performed no comparisons with normal or CIII occlusions. Nojima et al[10] and Kook et al[11] compared arch widths in Class I, Class II, and Class III malocclusions in different populations but not within each population.

Previous studies have compared samples with genders pooled[6–8] or separated.[2–5] No previous study has described gender dimorphism in CIII subjects nor compared genders between CIII and CIN. No previous study has reported on differences between maxillary and mandibular arch widths in CICR and CIII malocclusions. The objective of this study is to test the hypothesis that there is no difference between adults with CICR, CIII, and CIN occlusions with respect to (1) arch widths, (2) differences between maxillary and mandibular arch widths, (3) gender dimorphism within groups, and (4) gender comparisons. For comparison with previous studies, results will include gender-pooled and gender-specific analyses.

MATERIALS AND METHODS

All subjects were white Americans with no history of orthodontic treatment. A statistical analysis based on data collected from previous arch width studies was used to determine the sample size for the power of the tests.[12–14] It concluded that a sample size of approximately 20 subjects for each gender gave adequate power. Records for 119 subjects included plaster casts with intact and fully erupted permanent incisors, canines, premolars, and first molars. The CICR subjects were randomly selected from 55 males and 73 females who met inclusion criteria, and the CIII subjects were randomly selected from 27 males and 38 females who met inclusion criteria; all presented for treatment in the Department of Orthodontics between 1960 and 1992. The control subjects were physically normal children unselected with respect to facial-dental characteristics.[15] Angle classification was determined in centric occlusion.

A sample of 39 CICR subjects, 20 males and 19 females (1 subject was rejected for insufficient crowding), was selected using the following inclusion criteria: (1) bilateral Class I canine and molar relationships, (2) 2.3 mm and greater mandibular crowding, and (3) no anterior or posterior open bite or crossbite.

A sample of 40 CIII subjects, 20 males and 20 females, was selected using the following inclusion criteria: (1) bilateral Class III canine and molar relationship, the mesiobuccal cusp tip of the maxillary first molar occluded within 1 mm of the distal marginal ridge of the mandibular first molar, and (2) no tooth crowded out of the arch (to avoid confusion in Angle classification).

A control sample of 40 CIN subjects, 20 males and 20 females with excellent to good occlusion, consisted of all available subjects from the Iowa Facial Growth Study who met the following inclusion criteria: (1) bilateral Class I molar and canine relationships, (2) 1.5 mm or less crowding and no more than 2.4 mm of spacing in the mandibular arch, and (3) no anterior or posterior open bite or crossbite.

To differentiate the CICR sample from the CIN sample, mandibular crowding was calculated by subtracting the sum of the mesiodistal widths of teeth from the sum of six arch length segments mesial to the first molars. Positive remainders indicated spacing; negative remainders indicated crowding. An analysis of variance revealed significant differences ($P < .0001$) between occlusion groups computed with genders pooled. The CICR sample had significant crowding: mean −7.0 ± 3.1 mm, minimum −2.3 mm, and maximum −18.1 mm. Two males (10%) and two females (10.5%) had moderate crowding of −4 mm or less; those more negative than −4 mm (89.7% of the pooled sample) had severe crowding, after the guidelines proposed by Hunter and Smith for Class I crowding.[16] The CIII group had significantly less crowding than the CICR group did: mean −1.4 ± 4.0 mm, minimum +9.7 mm, and maximum −10.7 mm. The CIN group had significantly less crowding than the CIII group: mean 0.2 ± 1.0 mm, minimum +2.4, and maximum −1.5 mm.

Table 2. Ages of the Subjects in Years

Occlusion Group	n	Mean	Minimum	Maximum
Class I crowded males	20	21.5	16.1	38.3
Class I crowded females	19	21.1	14.7	29.2
Class III males	20	22.3	16	38.2
Class III females	20	19.3	13	32
Class I normal males	20	22.5	16.6	27.9
Class I normal females	20	18.3	13.4	29.4

The minimum age of the subjects chosen for this study was based on evidence reporting no significant change in the first molar and canine arch widths after age 13 in females and 16 in males.[17–21] The ages of the subjects are shown in Table 2.

The following six arch width measurements were taken with a dial calipers on the dental casts of each subject: (1) maxillary intercanine width between cusp tips, (2) maxillary intermolar width between the mesiobuccal cusp tips of the first molars, (3) maxillary alveolar width at the mucogingival junctions above the mesiobuccal cusp tips of the first molars, (4) mandibular alveolar width at the mucogingival junctions below the buccal grooves of the first molars, (5) mandibular intermolar width between the points on the main buccal grooves located vertically at the middle of the buccal surfaces of the first molars, and (6) mandibular intercanine width between cusp tips (Figure 1). Mandibular arch widths were subtracted from maxillary arch widths to calculate the maxillary/mandibular arch width differences.

All cast measurements were taken with Mitutoyo digital calipers (Mitutoyo Corporation, Kawasaki, Japan) capable of measuring to the nearest 1/100th of a millimeter. One investigator (Dr Kuntz) took two measurements of each variable. Pearson correlation coefficients between his first and second measurements ranged from $r = .96$ to $r = .99$. A second measurer took double measurements in 15% of all subjects. Student *t*-tests for interexaminer error showed only three significant differences, all in variables used to compute mandibular crowding: second premolar widths and left incisor arch length. The mean differences were 0.1 mm. Averages of the measurements by Dr Kuntz were used in all subsequent statistical analysis. A 2 × 3 factorial analysis of variance and Duncan's tests were used to compare the two genders and three occlusion groups. An alpha of .05 was chosen.

RESULTS

Gender-Group Interactions

None of the gender-group interactions were significant (analysis of variance [ANOVA]).

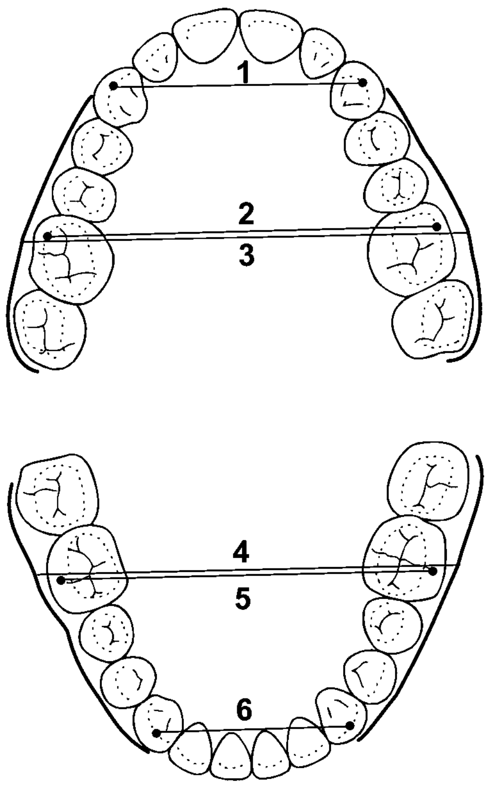

Figure 1. Measurement of widths: (1) maxillary intercanine, (2) maxillary intermolar, (3) maxillary alveolar, (4) mandibular alveolar, (5) mandibular intermolar, and (6) mandibular intercanine.

Arch Width Comparisons in the Maxilla

With genders pooled, no differences were observed between groups in mean intercanine widths. The mean intermolar and alveolar widths in the CICR and CIII groups were both similar and significantly smaller (ANOVA $P \leq .002$ and $P \leq .0001$, respectively) than the CIN group (Table 3).

Arch Width Comparisons in the Mandible

With genders pooled, no differences were observed between groups in mean intercanine widths. The mean intermolar width of the CICR group was significantly smaller (ANOVA $P \leq .0005$) than the mean intermolar widths of the CIII and CIN groups, which had similar means. The mean alveolar width of the CICR group was significantly smaller (ANOVA $P \leq .0001$) than the mean alveolar widths of the CIII and CIN groups, which had similar means (Table 3).

Gender Dimorphism and Comparisons

In the maxilla, no gender dimorphism was observed for intercanine width in all three groups (Table 3). Males had significantly larger intermolar arch widths than females in all three groups. Males in the CIII and CIN groups had significantly larger alveolar widths than females, but the CICR group had no gender dimorphism (Table 3).

In the mandible, CICR males had significantly larger intercanine widths than CICR females, but no gender dimorphism occurred in the CIII and CIN groups for this width. Males had significantly larger intermolar

Table 3. Comparison of Arch Widths in Class I Crowded (CICR) and Class III (CIII) Malocclusions and Normal Occlusions (Genders Pooled)

Variable	N	*F* Value	$P < F$[a]	Duncan's Letter[b]	Mean ± SD, mm	n	Group	Gender Dimorphism[c]
Maxillary intercanine width	119	1.97	.1441	A	34.1 ± 2.2	40	Normal occlusion	No
				A	33.4 ± 2.5	39	CICR	No
				A	32.9 ± 3.1	40	CIII	No
Maxillary intermolar width	119	6.89	.0015	A	51.7 ± 2.8	40	Normal occlusion	M > F
				B	50.0 ± 3.9	40	CIII	M > F
				B	49.6 ± 3.1	39	CICR	M > F
Maxillary alveolar width	119	10.73	.0001	A	58.8 ± 3.8	40	Normal occlusion	M > F
				B	56.3 ± 2.8	39	CICR	No
				B	55.9 ± 3.5	40	CIII	M > F
Mandibular intercanine width	119	1.86	.1602	A	25.5 ± 1.6	40	Normal occlusion	No
				A	25.4 ± 1.7	40	CIII	No
				A	24.8 ± 2.3	39	CICR	M > F
Mandibular intermolar width	119	8.23	.0005	A	51.8 ± 3.4	40	CIII	M > F
				A	51.2 ± 2.5	40	Normal occlusion	M > F
				B	49.6 ± 3.0	39	CICR	M > F
Mandibular alveolar width	119	10.96	.0001	A	56.7 ± 3.3	40	CIII	M > F
				A	56.5 ± 2.6	40	Normal occlusion	M > F
				B	54.5 ± 2.8	39	CICR	M > F

[a] Probability value *F* test, significance at $P \leq .05$.
[b] Significant differences at $P \leq .05$; groups with same letter do not differ.
[c] Significant differences at $P \leq .05$, Duncan's test.

Table 4. Gender Dimorphisms and Comparisons in Arch Widths Between Occlusion Groups (N = 119)[a]

Width	*F* Value	*PR* < *F*[b]	Duncan's Letter[c]	Mean ± SD, mm	n	Occlusion Group
Maxilla						
Intercanine	5.09	.0260	A	34.9 ± 2.3	20	Normal males
			AB	33.9 ± 2.1	20	CICR males
			AB	33.3 ± 1.7	20	Normal females
			AB	33.3 ± 3.6	20	CIII males
			B	33.0 ± 2.9	19	CICR females
			B	32.6 ± 2.4	20	CIII females
Intermolar	31.99	.0001	A	53.4 ± 2.3	20	Normal males
			B	51.4 ± 2.6	20	CICR males
			B	51.1 ± 4.0	20	CIII males
			BC	50.3 ± 2.2	20	Normal females
			CD	48.9 ± 3.6	20	CIII females
			D	47.7 ± 2.4	19	CICR Females
Alveolar	25.41	.0001	A	60.8 ± 3.9	20	Normal males
			B	57.6 ± 3.0	20	CICR males
			BC	56.9 ± 3.8	20	CIII males
			BC	56.9 ± 2.3	20	Normal females
			C	55.0 ± 2.0	19	CICR females
			C	54.8 ± 2.9	20	CIII females
Mandible						
Intercanine	8.16	.0051	A	25.9 ± 1.5	20	CIII males
			A	25.8 ± 1.9	20	Normal males
			A	25.4 ± 1.9	20	CICR males
			AB	25.1 ± 1.1	20	Normal females
			AB	25.0 ± 1.9	20	CIII females
			B	24.1 ± 2.5	19	CICR females
Intermolar	45.36	.0001	A	53.0 ± 3.1	20	CIII males
			A	52.8 ± 2.0	20	Normal males
			AB	51.6 ± 2.3	20	CICR males
			BC	50.7 ± 3.4	20	CIII females
			C	49.6 ± 1.9	20	Normal females
			D	47.6 ± 2.3	19	CICR females
Alveolar	54.80	.0001	A	58.4 ± 1.8	20	Normal males
			A	58.0 ± 2.0	20	CIII males
			B	56.2 ± 2.1	20	CICR males
			B	55.4 ± 3.2	20	CIII females
			B	54.7 ± 1.8	20	Normal females
			C	52.6 ± 1.3	19	CICR females

[a] CICR indicates Class I crowded; CIII, Class III.
[b] Probability value *F* test, significance at $P \leq .05$.
[c] Significant differences at $P \leq .05$; groups with the same letter do not differ.

and alveolar widths than females in all occlusion groups (Table 3).

In the maxilla, gender comparisons revealed similarity in intercanine width (Table 4). Comparisons for intermolar width were CICR = III < CIN in males and CICR < CIN, CIII = CIN, in females. Comparisons for alveolar width were CICR = CIII < CIN in males and CICR = CIII = CIN in females (Table 4).

In the mandible, gender comparisons revealed similarity in intercanine width. Comparisons for intermolar width were CICR = CIII = CIN in males and CICR < CIII = CIN in females. Comparisons for alveolar width were CICR < CIII = CIN in males and CICR < CIII = CIN in females (Table 4).

Maxillary Minus Mandibular Arch Width Differences

With genders pooled, the three groups had similar mean intercanine width differences (Table 5). The CIII group had a significantly smaller (ANOVA $P \leq .0001$) and more negative mean intermolar width difference than the other groups, which had similar differences. The Class III group had a significantly smaller (ANOVA $P \leq .0001$) and negative mean alveolar width difference than the other occlusion groups, which had similar and positive differences (Table 5).

No gender dimorphisms were observed in the differences between maxillary and mandibular intercanine, intermolar, and alveolar widths (Table 5).

Table 5. Comparison of Maxillary Minus Mandibular Arch Width Differences (Genders Pooled)[a]

Variable	N	*F* Value	$P < F$[b]	Duncan's Letter[c]	Mean ± SD, mm	n	Group	Gender Dimorphism[d]
Intercanine difference	119	2.77	.0669	A	8.7 ± 2.8	39	CICR	No
				A	8.6 ± 1.6	40	Normal occlusion	No
				A	7.5 ± 2.8	40	CIII	No
Intermolar difference	119	15.00	.0001	A	0.7 ± 1.3	40	Normal occlusion	No
				A	−0.1 ± 1.4	39	CICR	No
				B	−1.8 ± 3.0	40	CIII	No
Alveolar difference	119	14.71	.0001	A	2.3 ± 2.9	40	Normal occlusion	No
				A	1.8 ± 2.7	39	CICR	No
				B	−0.9 ± 2.8	40	CIII	No

[a] CICR indicates Class I crowded; CIII, Class III.
[b] Probability value *F* test, significance at $P \leq .05$.
[c] Significant differences at $P \leq .05$; groups with the same letter do not differ.
[d] Significant differences at $P \leq .05$, Duncan's test.

DISCUSSION

The null hypothesis for arch widths was rejected, except for maxillary and mandibular intercanine widths. The null hypothesis for maxillary/mandibular differences was rejected, except for intercanine difference. The null hypothesis for gender dimorphism was not rejected, except for maxillary alveolar and mandibular intercanine widths. The null hypothesis for gender comparisons was rejected except for maxillary and mandibular intercanine widths, maxillary alveolar widths in females, and mandibular intermolar widths in males.

The nonsignificant interaction between the gender and occlusion group is explained by the similarity in gender dimorphism observed in these groups. Gender dimorphisms were identical in the CIII and CIN groups. The CICR group differed from the other groups by not having dimorphism in maxillary alveolar width and having dimorphism in the mandibular intercanine width.

The findings of this study agreed with those of Mills.[2] Although the present study measured arch widths across the first molars rather than the second premolars, these teeth are adjacent in the arches. The findings of this study for intermolar widths in the CICR and CIN groups agreed with the findings of Radnzic,[4] assuming the British males had Class I occlusions. His results in Pakistani males differed from this study (Table 1). The findings of Chang et al[5] for maxillary intercanine width in males and intermolar widths in both genders agreed with this study. Their findings for mandibular intercanine and intermolar widths in females agreed with this study. Comparisons with the work of Chang et al[5] assume that the NC and CR samples had Angle Class I occlusions. The comparison of maxillary alveolar widths in the CIN and CICR groups in this study agreed with the findings of Howe et al[3] for males but not for females; mandibular alveolar comparisons of this study agreed with Howe et al (Table 1). Comparisons with Howe et al[3] assume that the crowded sample had Angle Class I occlusions.

The report by Herren and Jordi-Guilloud[6] on maxillary and mandibular intercanine and intermolar widths of Class III and ideal occlusions was supported by this study. The findings of this study comparing CIII and CIN agreed with those of Uysal et al[7] in maxillary intercanine, intermolar, and alveolar widths and mandibular alveolar widths. The findings of this study did not agree with Uysal et al[7] for mandibular intercanine and intermolar widths. The comparisons of this study between CICR and CIII agreed with those of Al-Khateeb and Abu Alhaija,[8] except for mandibular intermolar width (Table 1).

The similarity in mandibular intercanine widths in the occlusion groups of this study agreed with Chang et al[5] in females, Herren and Jordi-Guilloud,[6] and Al-Khateeb and Abu Alhaija.[8]

Only Chang et al[5] reported information about gender dimorphism. The CIN and NC samples agreed in intermolar widths but disagreed in intercanine widths. The CICR and CR samples agreed only in maxillary intercanine width (Table 6). The NC and CR samples of Chang et al[5] had a similar dimorphism within each alignment group for all arch widths; the NC sample exhibited dimorphism, and the CR sample had no dimorphism. Dimorphism in the CIN and CICR samples differed only in mandibular intercanine width. Differences between this study and Chang et al[5] may be explained by Angle class and population differences.

Howe et al[3] and Chang et al[5] compared genders. This study disagreed with the study by Howe et al in maxillary alveolar widths but agreed in mandibular alveolar widths. This study differed from the study by Chang et al in three of eight comparisons (Table 1).

Differences between the results of the present study and those reported by Radnzic[4] for Pakistani males, Chang et al,[5] Uysal et al,[7] and Al-Khateeb and Alhija[8] probably represent population differences.

Table 6. Gender Dimorphism in the Present Study (Kuntz et al) and in the Chang et al[5] Samples[a]

Arch Width	Kuntz CIN	Chang NC	Kuntz CICR	Chang CR
Maxillary canine	♂ = ♀	♂ > ♀	♂ = ♀	♂ = ♀
Maxillary molar	♂ > ♀	♂ > ♀	♂ > ♀	♂ = ♀
Mandibular canine	♂ = ♀	♂ > ♀	♂ > ♀	♂ = ♀
Mandibular molar	♂ > ♀	♂ > ♀	♂ > ♀	♂ = ♀

[a] CIN indicates Class I normal; CICR, Class I crowded; NC, noncrowded; CR, crowded; ♂, male; ♀, female.

The results of this study showed that the growth and etiology of Class I crowded malocclusions involves narrower than normal intermolar and alveolar arch widths in both arches. The growth and etiology of Class III malocclusions involves narrower than normal maxillary intermolar and alveolar arch widths.

The difference calculated in this study between maxillary and mandibular intermolar widths assumes a Class I molar relationship as the goal of treatment. The mean difference between the maxillary and mandibular intermolar widths in CICR adults (genders pooled) was −0.1 mm, minimum −4.0 mm, and maximum +3.0 mm. The negative differences in this sample without posterior crossbites imply that some CICR patients without a posterior crossbite could benefit from widening of the maxillary arch. The mean difference between the maxillary and mandibular intermolar widths in CIII patients (genders pooled) was −1.8 mm, minimum −9.1 mm, and maximum +3.9 mm. The negative differences observed in this sample of Class III adults suggest that some of the patients whose goal in treatment is a Class I molar occlusion could benefit from expansion of the maxilla during treatment.

CONCLUSION

- The hypothesis was rejected by the findings of this study.

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