ANALYSIS Of Tooth Size Discrepancy and Arch Dimensions in A Group Of Iraqi Unilateral Cleft Lip and Palate (A cross-sectional, comparative study)

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Objective: To investigate differences in size of the maxillary permanent anterior teeth and arch dimensions between individuals with unrepaired unilateral cleft lip and palate (UCLP) and a matched control group representing healythy subjects.

Setting: cross-sectional,retrospective study

Patients And Method: Study casts of 30 patients with un repaired unilateral cleft lip and palate (UCLP) were collected . Thirty control subjects were collected study casts were analyzed with the use of manual caliper to measure the dimensions of the maxillary permanent anterior teeth, incisor chord lengths, and the inter canine and inter molar widths. The results were analyzed statistically using paired t-tests and analysis of variance (ANOVA).

Results: The mesiodistal widths of maxillary anterior teeth in the study group were smaller than the non cleft control group ($p < .01$). The dimensions of the cleft side maxillary incisors and incisor chord length were smaller ($p < .05$ and $p < .01$ respectively) compared with the noncleft side. The study group maxillary cleft side incisor chord length and maxillary intercanine width were narrower than the control group ($p < .01$).

Conclusions:
1- Anterior teeth are smaller mesiodistally in individuals with UCLP.
2-Maxillary incisors are smaller on the cleft side than the noncleft side.
3- UCLP subjects had smaller maxillary cleft side incisor chord lengths and intercanine widths than the control group.

Introuduction:

Variation in tooth size is influenced by genetic and evironmental factors. Some of the factors that contribute to this variability are race sex(1), hereditability(2), and the presence of syndromes (3). As in many other human attributes, teeth vary in size between males and females. Gender differences have been reported in the literature and may have clinical relevance.According to Seipel, cited by Lavelle(4) there are fewer gender differences in the primary dentition than in the permanent dentition. Male teeth are generally recognized to be larger than female teeth(5,6). In both the primary and permanent dentitions, the upper canines and upper central incisors show the greatest gender differences(6)whereas the upper lateral incisor and lower central incisor are the most homogenous(7). The literature reveals that has been a substantial amount of research into variations in tooth morphology associated with cleft lip and palate (CLP). Different approaches taken to perform the actual measurements of the study casts and techniques used to minimize random and systematic error may contribute to this variation.Foster and Lavelle (8) reported that, in both the upper and lower jaws, the permanent teeth in patients with CLP generally had significantly smaller crowns than the noncleft control group. Peterka and Mullerova's(9) investigation revealed no significant dimensional differences between mesiodistal widths of individuals with a cleft lip and palate and those without. However, only the teeth in the right quadrant, or in the cleft cases, the noncleft side, were measured. Markovic and Djordjevic (10) found that in the permanent dentition, the central and lateral incisors were significantly smaller in CLP, and that the canines, first/second premolars and first/second molars were smaller on the cleft side, but not to a statistically significant level.A number of studies have also investigated arch dimensions in cleft lip and palate. McCance et al(11) compared the study models of individuals with clefts of the secondary palate and a control group of noncleft individuals, using a reflex microscope. They found that there were significant differences in the tooth sizes, chord lengths, andarch widths, with the cleft group dimensions being generally smaller. In particular, they found that the teeth in the canine to incisor region were consistently smaller. They noted that there was no difference in the mean tooth widths between the left and right side in the cleft or the control groups.Athanasiou et al. (12) investigated the dental arch dimensions in patients with unilateral left lip and palate (UCLP) and found that all the maxillary interdental widths and lengths were significantly smaller than the control group dimensions at all ages in childhood in the cases collected by Moorrees (13) with the exception of the intermolar width at age 12 years. Blanco et al. (14)

looked at the maxillary dental arch in a group of CLP patients of both sexes over 12 years of age and compared them to a control group. They concluded that there was a significant reduction in all of the longitudinal arch dimensions and of the intercanine and intermolar widths in CLP patients.

The aim of study:

The aim of this study was to determine the differences in the size of the maxillary permanent anterior teeth and arch dimensions between individuals with un repaired UCLP and a matched control group representing the normal subjects.

Patients And Method   : patients with cleft lip and \or palate were Clinically examined.Some of these patients were referred for specialist evaluation and manengement.The data had been collected from each patient include: age,sex,range of deformity,compelete or in complete cleft,unilateral or bilateral cleft,Side of deformity,comprehensive history about medical and family history, Patient address and social status, with clinical examination and radiological investigation was performed for each patient..All patients were at permenant dentition stage . Only35 patients were included in this study (22 males and 13 females), age range (11.5-15) years who had a clinical diagnosis   of UCLP. Upper impression were taken for each one and study model have been prepared .

Inclusion criteria:
1-Iraqi (because there are racial tooth size variations)
2-No history of ABG(alveolar bone grafting).
3-No history of previous of orthodontic treatment.
Exclusion criteria:
1- Bilateral cleft lip and palate
2- Non Iraqi
3- Patients who had an ABG (alveolar bone grafting) .
4 Patients who had a history of orthodontic treatment
5- Patients associated with other anomalies or syndrome.
6-. Poor quality models
    The control group include 30 normal and healthy Iraqi individuals randomly chosen matching the age group of patients.This control group, who had not undergone any previous orthodontic treatment. Only 40 subjects were included in the current study(20males and 20females), age range (11.5-15) years

Criteria for selection of this group are the followings:

1. bilateral Cl I molar and/or canine relationship.

2. Full permanent dentition except 3rd molar

3. Normal overjet and overbite.

4. no crossbite or transverse anomalies.

5.No history of previous of orthodontic treatment

Measurements:
Linear measurement for the mesiodistal tooth widths and the intercanine,intermolar, and incisor chord lengths.were carried out on the study models of both groups using the following variables:
Landmark Definitions:

* Mesiodistal tooth widths—the maximum linear distance between the contact points .Axelsson and Kirveskari (15), Kieser et al.(16).
* Intercanine—linear distance between the central points of the canine teeth . Nelson et al.(17)
* Intermolar—linear distance between the central points of the first molar teeth (Nelson et al. 17)
*Incisor chord lengths—distance between the anterior landmark (the average mesial contact point between the central incisors, Battagel (18) and the central point of the canine.

A Boley gauge with a Vernier scale and precision reading to the nearest 0.1 mm was used to measure the teeth. The sharp tips of the calipers facilitated accuracy. The mesiodistal length was obtained by measuring the maximum distance between the mesial and distal contact points of the tooth on a line parallel to the occlusal plane. A single investigator measured each arch twice, from right first molar to left first molar. If the second measurement differed by more than 0.2 mm from the first measurement, the tooth was re measured. The criteria for selection of the models were that pretreatment orthodontic models have all permanent teeth present and fully erupted from first molar to first molar and that there be no mesiodistal loss or excess of tooth material as a result of caries, restorations, or prosthetic replacement. Casts showing gross dental abnormalities were rejected
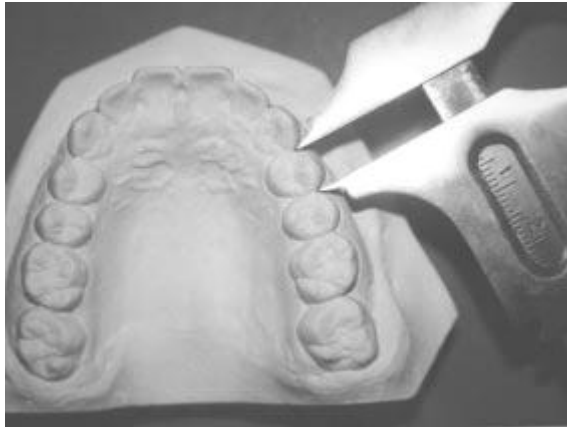
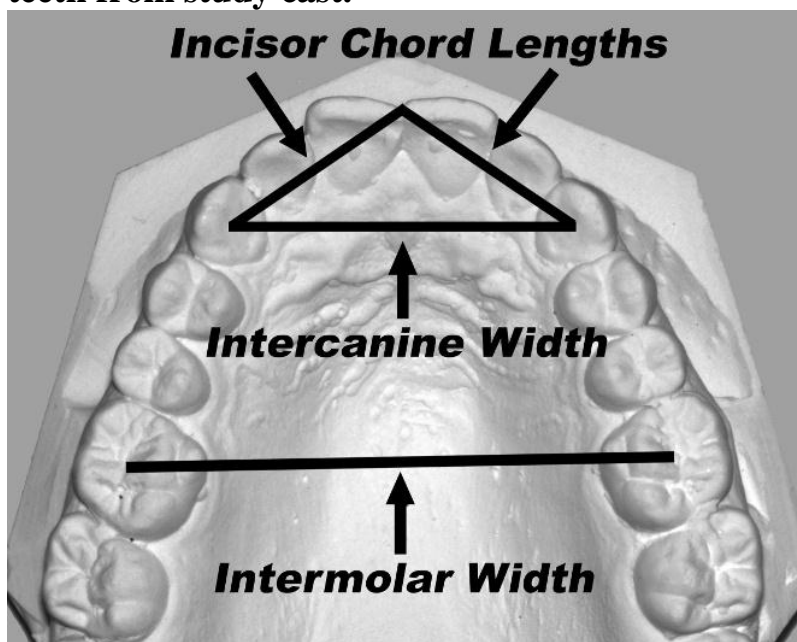**Figure-1: Calibration of the mesio- distal widths of teeth from study cast.**

Figure-2: Arch dimensions to be measured.

Statistical Analysis:

Measurement results were analyzed by means of SPSS 15.0 hg differences between the cleft side and the non cleft side in the study group Mean values and standard deviations were estimated for all variables . ($p<0.05$) . analysis of variance (ANOVA) was used to assess differences between the study and control groups.

RESULTS:

The cleft distribution is shown in table 1.there were 22 male and 13female subjects in the study group and 20 male and 20 female individuals in the control group . There was no statistical differences between both genders regarding the permanent teeth and the arch dimensions in the control and study groups this allowed the gender to be

combined to minimize the problems associated with multiple testing. The study and control dimensional means are displayed in table 2 which showed that the mesiodistal tooth dimensions of the study sample were smaller than the control group. For example, the mean maxillary central incisor width was 8.79 mm on the cleft side, 8.99mm on the noncleft side, and 9.73 mm in the control group. The arch dimensions recorded indicated that the mean intermolar widths were larger in the study group; whereas, the mean maxillary intercanine width and incisor chord lengths were smaller.Statistically significant differences were found between the maxillary central and lateral incisors and the maxillary incisor chord lengths of the cleft and noncleft sides. There was a general decrease in dental dimensions of the study group compared with the control, which was statistically significant. However, the maxillary intercanine width and maxillary cleft side incisor chord length were the only statistically significant arch dimension differences between the groups.

Table 1. Distribution of Subjects With Unilateral Cleft Lip and Palate

	Male	Female	Total
Left	14	8	22
Right	8	5	13
Total	22	13	35

Table 2. Control And Study groups:Maxillary Arch And Permanent Tooth Dimentions Measurement Results

Dimension	Control group			Study group					
				Cleft side			*Noncleft side*		
	Mean (mm)	*SD (mm)*	*95%CI**	*Mean (mm)*	*SD (mm)*	*95%Cl*	*Mean (mm)*	*SD (mm)*	*95%CI*
Intermolar width	43.33	1.74	0.94	43.64	2.84	1.38	43.76	2.84	1.22
Intercanine width	31.12	2.24	0.94	27.89	3.09	1.22	27.81	3.49	1.55
Incisor chord length	17.14	1.85	0.52	14.88	2.65	1.38	17.35	2.76	0.92
Central incisor	9.73	0.73	0.25	8.79	0.76	0.44	8.99	0.51	0.27
Lateral incisor	7.45	0.64	0.32	5.84	0.72	0.65	7.23	0.48	0.43
Canine	8.57	0.65	0.23	8.34	0.48	0.19	8.01	0.44	0.37

* CI = Confidence interval .

Table 3. Mean Differences Between the Cleft Side and Noncleft Side Groups

Dimention measured	Mean cleft side group (mm)	Mean non cleft side group(mm)	Difference between sides(mm)	significance
Incisor chord length	13.67	18.50	-4.83	**
Central incisor	8.12	8.64	-0.52	*
Lateral incisor	5.76	7.28	-1.52	*
canine	7.99	7.75	+0.24	NS

NS= Not significant
*: P< 0.05
** : P<0.01

TABLE 4.Mean Differences Between the Dimensions of the Study Group and the Control Group

Dimention measured	Mean study group(mm)	Mean control group(mm)	Difference between groups(mm)	significance
Cleft side central incisor	8.41	9.45	-1.04	**
Noncleft side central incisor	8.78	9.39	-0.61	*
Cleft side lateral incisor	5.88	7.13	-1.25	**
Noncleft side lateral incisor	7.11	7.76	-0.65	NS
Combined canine	8.01	8.51	-0.50	**
Cleft side incisor chord length	15.67	19.24	-3.57	**
Non Cleft side incisor chord length	18.64	18.87	-0.23	NS
Intercanine width	26.97	30.35	-3.38	**
Intermolar width	42.54	42.32	0.22	NS

NS= Not significant
*: P< 0.05
** : P<0.01

DISCUSSION

cleft lip and palate deformity one of the commonest congenital abnormalities of the oro-facial structures The occurance of oral clefts in united states has been estimated as 1 in 700 births Clefts exhibit interesting racial predilection,occurring less frequently in blacks but more so in Asians(19).) .cleft lip and palate predominates in males , isolated cleft palate more common in females (20) Oral clefts commonly affect the lip,alveolar ridge ,and hard and soft palates.Three fourths of clefts are unilateral deformities; one fourth are bilateral. The left side is involved more frequently than the right when the defect is unilateral(21). In the study sample, there were 22 male to 13 female subjects for a male:female ratio of 1.1:1, whereasthe left and right cleft ratio was 1.1:1.The intercanine and intermolar width, along with the incisor chord lengths, were calculated using the center of the canine and first molar teeth rather than a particular landmark such as the cusp tip on the canine and the mesiobuccal cusp tip of the molar (Nelson et al., (17).This was because the base of a canine or molar is larger than the occlusal surface, and any deviation in inclination or angulation .In this study, there were 30 study subjects and 30 controls. Previous research has been carried out on a varying number of participants McCance et al.,(11). The size of the study and control groups used in this investigation was statistically determined utilizing a Student's t test with p =.05, to be sufficient to show any true difference in size between the two groups. The results of this study are in agreement with Fosterand Lavelle (22) and Werner and Harris (23), demonstrating that the mesiodistal anterior tooth size dimensions of the individuals with UCLP were smaller, to a statistically significant level, than the control group. The only exception was the maxillary lateral incisor on the noncleft side, which was smaller but not to a statistically significant level. This may be explained by the fact that the maxillary lateral incisor has the highest degree of dimensional variability (Lysell and Myrberg,(24).When the cleft and the noncleft sides were compared, the maxillary incisor chord length and the maxillary central and lateral incisor mesiodistal dimensions were smaller to a statistically significant level on the cleft side. This result is comparable to published data, with Rawashdeh and Bakir (25) finding that in a Jordanian sample, the maxillary central and lateral were smaller on the cleft side, but only the lateral incisor was statistically significant. Sofaer (26) and Werner and Harris (22) also demonstrated statistically significant levels of asymmetry occurring between the cleft and noncleft sides. This study is in agreement with previous research (Foster and Lavelle,(22); Werner and Harris,(23); McCance et al.(11) in finding that the anterior mesiodistal tooth dimensions of individuals with UCLP were smaller than those of a control group to a statistically significant level. This contrasts with the

findings of Peterka and Mullerova (9) who found no statistically significant difference. However, it must be pointed out that the cleft subjects in their study had measurements taken only from the noncleft side (which in this study, and that of Werner and Harris (22), were found to begenerally larger than cleft side in the maxilla) and couldaccount for their findings. The asymmetry between thecleft and noncleft sides was found to be statistically andclinically significant for the maxillary central and lateralincisors but not for the maxillary canine. This is similar tothe conclusions made by Werner and Harris (22) with the exception that they also found the maxillary canine showed significant asymmetry. When the arch dimensions were examined, it was found that the only statistically significant difference in dimensions between the individuals with UCLP and the control group was the maxillary intercanine widthand the incisor chord length on the cleft side. Further research would be required to identify the cause of the inadequate intercanine width. Tooth size discrepancies can also be corrected by the enlargement of the diminutive teeth with the addition of restorative materials. When comparing the mean values for the cleft side and the noncleft side, it was shown that only the maxillary lateral incisor varied to a clinically significant degree with a difference of 1.52 mm. The maxillary central incisor was almost at the clinically significant level with a difference of 0.52 mm, and it must be remembered that these are the average differences, and that individual variation could be more marked.

CONCLUSIONS
The following conclusions can be made from this investigation:

1.The mesiodistal dimension of the maxillary permanent anterior teeth in the individuals with UCLP was significantly smaller than the control group
2.The maxillary incisor chord length and the maxillary central and lateral incisor mesiodistal dimensions of the cleft and noncleft sides were significantly different in size, with the cleft side being smaller.
3. the maxillary central and lateral incisors on the cleft side had mean values that were smaller than the control group
4. this study sample had narrower maxillary intercanine widths and cleft side maxillary incisor chord lengths than the control group.
5.this study sample had maxillary intermolar widths and noncleft side incisor chord lengths that were not significantly different from the control group.

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