A Comparative Study of Arch Width, Overjet and Overbite between Bilateral Congenital Missing Lateral Incisor and Normal Class I Occlusion

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Abstract

Permanent lateral incisors have been considered as major missing teeth in the mouth. The main aim of the present study is to conduct a comparative study of maxillary and mandibular arch widths, overjet and overbite for a sample with missing lateral incisors and normal class I occlusion.

The sample of the study comprises sixty pairs of study models of both genders, which were separated into two groups. The first group consisted of thirty casts of bilateral congenital missing lateral incisors, while the second group consisted of thirty casts of the class I occlusion. The intercanine width, interpremolar width, intermolar width, overjet and overbite were measured for the sixty samples.

The results of this study demonstrate a significant reduction in maxillary and mandibular arch width in bilateral missing lateral Incisors as compared with normal class I group. The results also revealed a significant reduction in overjet and overbite in bilateral missing lateral incisors as compared with normal class I group. A significant difference was also reported between the two groups based on gender difference in the maxillary arch width. Conversely, non-significant difference was found in the mandibular arch width. The present study also shows non-significant difference based on gender difference in overjet and overbite in the two groups.

Keywords: *Congenital missing teeth, lateral incisors, Arch width, class I.*

Introduction

The missing lateral incisors has been considered as major congenital dental anomaly[1,2,3]. Missing teeth results in disturbances in developing occlusions, masticator verbal dysfunctions, and it affects aesthetics as well. Thus, a considerable number of associated consultants is required to cure such cases[4]. However, missing teeth etiology remains indefinite and requires more research. Nevertheless, it seems that a congenital missing tooth is thought to be strongly controlled by genes, and is associated with various syndromes[4]. It is commonly believed that upper lateral side incisors (excluding the third molar) are the most reported cases of missing teeth with incidence 5%[5-6].

Furthermore, the orthodontic treatments of patients experiencing bi-or unilateral congenitally missing lateral incisors has been considered as one of the challenges affecting the treatment plan. The two main alternates, the orthodontic close the space or open the space regarding the prosthetic replacements, might be comprising functions, periodontal health, as well as aesthetics[7].

Arch width discrepancy is an important diagnostic aid, which can expect the treatment outcomes of an orthodontic cases[8]. It is important for orthodontist to have information of the normal growth, dentition development, arch dimensions, and any variations from the normal[9].

The present study focuses on the study of maxillary and mandibular arch width, overjet and overbite of patients with bilateral missing lateral incisors and normal class I occlusion in both genders to identify differences in these two types of groups.

Materials and Method

In the present study, sixty patients we chosen either from a private orthodontic clinic, or from Orthodontic Department, Faculty of Dentistry, University of Anbar. Patients must be between (15-35) years of age, and their age mean was 26.3±0.3 years.

Care was taken to exclude the patients who have previous orthodontic treatment history, cleft lip and palate, serial extraction as well as history regarding the extraction of permanent teeth.

All the radiographs have been estimated on the dental viewer through one author to the patient. Furthermore, a tooth has been considered as congenitally missing lateral incisors in case no trace on radiograph is found. Treatment records were also checked to verify if the missing tooth was extracted or not. Impressions were taken by Alginate impression material and were poured by orthodontic plaster. All information about the patients ex. name, age, gender and radiograph were collected and attached to the records made for all patients.

Then the study sample was divided into two groups. The first group consisted of thirty pairs of patients with bilateral congenital missing lateral incisors equally divided between the genders (fifteen males and fifteen females), and the second group consisted of thirty pairs of patients with class I occlusion based on a class I skeletal relationship without any abnormality to be the control group of this study. These were also divided equally between the genders (fifteen females and fifteen males).

Measuring Technique: Measurements were made on the upper and lower study model by a single examiner using ecteronic digital caliper with sharpened tips which records up to 0.01 mm. The dental arch width was recorded by measuring intercanine width, interpremolar width, intermolar width, overjet and overbite.

The reference points for the measurements were marked by using the sharp-pointed pencil to create the exact landmark points. The reference points that were used as landmarks are presented as follows and as shown in (figure 1):

1. Intercanine width: The distance between the cusp tips of the maxillary right permanent canines and left permanent canines.
2. Interpremolar width: The distance between the first premolar of the left side to the right side at the distal end of its occlusal groove.
3. Intermolar width: The distance between the maxillary first permanent molars of the left side to the same of the right side at the central fossae on the occlusal surface.
4. Over jet: The extent of horizontal overlap of the maxillary central incisor over the mandibular central incisor.
5. Over bite: The extent of vertical overlap of the maxillary central incisors over the mandibular central incisors.

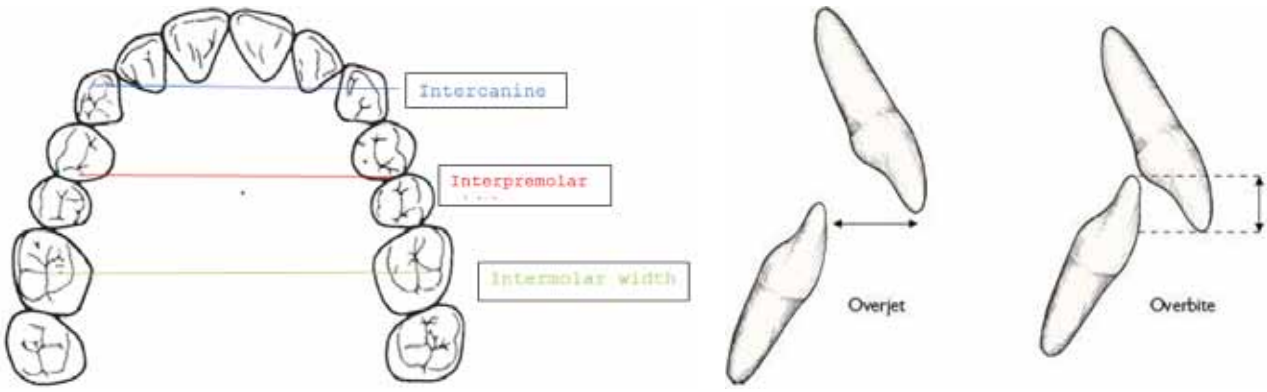

Figure 1: The landmarks used in this study

Statistical Analysis: The data were collected then statistically analyzed using SPSS software version 25 to calculate means and standard deviations of quantitatively collected data. The difference between the two means was identified using (t) test. The significance among means was calculated at $P<0.05$ critical level.

Reliability Test: The distance of twenty pairs of study models were measured randomly. After three weeks, the measurements were repeat to determine the reliability of the measurement by using intraclass correlation coefficient test, which showed excellent reliability (> 0.90).

Results

The chronological age range of the sample was (15-35) years. Table (1) displayed the results including the comparison of arch widths between bilateral congenital missing lateral incisors (BCMLI) with Class I normal occlusion in maxillary arch. The results indicated a significant difference between maxillary arch widths in both groups ($p<0.05$).

The comparison of arch widths between bilateral congenital missing lateral incisors (BCMLA) with Class I normal occlusion in mandibular arch is shown in the Table (2).

There was a significant difference in mandibular arch widths in both groups ($p<0.05$); however, intermolar distance shows non-significant difference ($p > 0.05$).

As shown in Table (3), there is highly significant reduction in overjet and overbite (≤ 0.001) in the bilateral congenital missing lateral incisors (BCMLA) when compare with normal class I occlusion.

Based on the results tabulated in (4), there was a significant variance between male and female in two groups ($p < 0.05$) in terms of the intercanine width, interpremolar width and intermolar width in the maxillary arch.

Conversely, non-significant difference $p>0.05$ in terms of intercanine width, interpremolar width and intermolar width in mandibular arch was revealed.

Table (4) demonstrates non-significant differences ($p>0.05$) according to gender in overjet and the overbite in the two groups.

Table (1) Illustrates the results of comparing arch widths between bilateral congenital missing lateral incisors (CMLA) and Class I normal occlusion in maxillary arch

Variable		BCMLA	Class I	P. value
Intercanine Width	Mean	26.32	30.11	0.001**
	S.D.	0.8	1.32	
Interpremolar Width	Mean	33.7	36.5	0.045*
	S.D.	1.6	1.32	
Intermolar Width	Mean	42.47	47.81	0.037*
	S.D.	1.8	1.26	

*Significant at $P < 0.05$., **Highly significant at $P \leq 0.001$

Table (2) Shows the comparison of arch widths between bilateral congenital missing lateral incisors (CMLA) with Class I normal occlusion in mandibular arch.

Variable		BCMLA	Class I	P. value
Intercanine Width	Mean	23.14	27.89	0.035*
	S.D	1.32	0.71	
Interpremolar Width	Mean	31.6	32.4	0.028*
	S.D	0.78	0.91	
Intermolar Width	Mean	40.87	43.2	0.069
	S.D	1.24	0.79	

*Significant at $P < 0.05$.

Table (3) Shows the comparison of overjet and overbite between bilateral congenital missing lateral incisors (BCMLA) with Class I normal occlusion.

Variable		BCMLA	Class I	P. value
Overjet	Mean	1.98	3.1	0.001*
	S.D.	0.81	0.68	
Overbite	Mean	0.89	2.11	0.001*
	S.D.	0.56	0.81	

*Highly Significant at ≤ 0.001.

Table (4) Reports gender effect results on bilateral congenital missing lateral incisors (BCMLA) with Class I normal occlusion.

Variable	BCMLA		P. value	Class I		P. value
	Female Mean SD	Male Mean SD		Female Mean SD	Male Mean SD	
Max. Intercanine	28.54	30.12	0.034*	31.76	32.8	0.025*
Width	1.98	0.67		1.92	2.12	

Max. Interpremolar	34.14	36.7	0.00**	35.8	38.1	0.01*
Width	1.87	1.67		1.97	2.65	
Max. Intermolar	41.1	43.1	0.04*	44.5	48.12	0.001**
Width	0.87	1.54		1.78	2.34	
Man.Intercanine	22.46	24.34	0.082	26.5	28.45	0.091
Width	0.32	0.76		1.32	0.65	
Man.Interpremolar	30.8	31.78	0.067	32.1	32.98	0.075
Width	0.87	0.43		0.67	1.34	
Man.Intermolar	40.1	41.12	0.092	43.23	44.1	0.086
Width	1.29	1.98		0.89	1.51	
Overjet	1.67	2.1	0.072	3.65	3.53	0.065
Width	0.67	0.32		0.75	1.02	
Overbite	1.94	0.86	0.065	3.12	2.96	0.078
Width	0.78	1.25		1.34	1.82	

*Significant at $P < 0.05$., **Highly significant at $P \leq 0.001$.

Discussion

The congenital missing teeth occur due to disturbance during the initial stage of tooth formation and proliferation. Missing one tooth or more is considered one of the most common developmental anomalies. Moreover, the most common missing type is the bilateral missing lateral incisors[10].

A significant reduction in the arch width between bilateral congenital missing lateral incisors and normal class I occlusion in the maxillary arch was revealed in this study. This could be due to the decrease in the number of the teeth, which in turn causes a reduction in the width of the maxillary arch[11,12,13].

In the mandibular arch, there was a significant reduction in the intercanine and interpremolar width, but non-significant reduction in the intermolar width was reported the cause of that the missing of the lateral incisors leads to make the canine erupted more mesially than the normal occlusion. This in turn leads to more deficiency of the width of intercanine and interpremolar width[14].

There was a significant reduction in overjet and overbite in bilateral congenital missing lateral incisors compared to normal class I occlusion. This result agrees with that obtained in [15,16], who found that the missing of lateral incisors leads to retroclination of the upper and lower incisor, and thus results in an increase in interincisal angle and more uprighting incisors appearing in the missing lateral incisors patients.

The maxillary arch was significantly greater in males than females in the two groups. This finding is also in agreement with[14,15,17,18,19]. This could be due to smaller and smoother bony ridge, the alveolar process of female, or due to weakness of musculature in female[20]. This result is not in line with the results obtained by[21,22], who found non-significant differences between males and females. This inconsistency could be due to using different landmarks, different sample size, age group, ethnic group and procedures.

The majority of the dental arch widths in mandibular arch revealed non-significant difference between males and females. This agrees with[23,24], but disagrees with[18,19,20]. The difference might be due to racial factor or the difference in the analyzing technique employed.

This study shows non-significant differences based on gender difference in overjet and overbite in the two groups. This result agrees with[24,25,26]: yet, it disagrees with[27,28].

The present study is important to the orthodontist to decide the most appropriate treatment plane to adopt in treating patients with bilateral congenital missing lateral incisors by open or closed the space with maintaining good esthetic to the patient by providing a correct arch width, overjet and overbite. [29]

Conclusions

The results indicated a significant reduction in arch width in maxillary and mandibular arch in bilateral missing lateral Incisors when compared with normal class I occlusion group.

There was a significant reduction in overjet and overbite in bilateral missing lateral Incisors as compared with normal class I group.

There was a significant variation between males and females in the two groups in the maxillary arch width. However, non-significant differences were reported in the mandibular arch width.

This study showed non-significant differences based on the gender difference in the overjet and overbite in the two groups.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

Conflict of Interest: The authors declare that they have no conflict of interest.

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