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DENTAL ARCH SYMMETRY IN UNILATERAL AND BILATERAL POSTERIOR CROSSBITE IN EGYPTIAN CHILDREEN

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ABSTRACT

The aim of this study was to compare between the symmetry of upper dental arch in unilateral and bilateral posterior crossbite in early mixed dentition.

Thirty children with posterior crossbite in early mixed dentition were incorporated in this study; 18 patients with unilateral posterior crossbite, and 12 patients with bilateral posterior crossbite. Impressions were taken before orthodontic treatment. The control group consisted of 30 casts of children in the same age group with accepted normal occlusion. To assess the dental arches, two lines were recorded on the cast; Medial line and Transversal line perpendicular to each other. In the sagittal plane, perpendicular distances of reference points from the transverse line were measured. In the transverse plane perpendicular distances of reference points from the median line were measured.

The results indicated that, in the unilateral posterior crossbite group, there exist clinically significant asymmetries in 33% of patients, i.e. 67% show asymmetry less than 2 mm. In bilateral posterior crossbite, the distal segment seems predominantly symmetrical while prominent asymmetries were found in anterior segment. The control group with relatively regular dental arch shows a certain degree of asymmetry which does not manifest itself clinically, significant asymmetries in anterior and posterior segment were not found. This study concluded that posterior crossbites in unilateral and bilateral

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cases are mainly due to symmetrical contraction of the upper dental arches rather than dental arches asymmetry.

INTRODUCTION

The term posterior crossbite is the result of malocclusion on the transverse plane, it indicates that there is an abnormal buccolingual relationship of the teeth in which the buccal cusps of upper molars articulate between the buccal and lingual cusps of lower molars. Unilateral and bilateral posterior crossbites may present functional, esthetic and therapeutic problems.[1]

The mandibular guidance is not fixed yet in the period of early mixed dentition, therefore a patient with narrowed upper dental arch is able to perform several different ways of mouth closing and several occlusal relations. Dental occlusion with the maximum number of teeth contacts becomes gradually fixed. First it is neuro muscular, later morphological fixation. If a patient in early mixed dentition guides the mandible into an abnormal asymmetric position, in the following development of the dentition the growth is affected due to neuro muscular adaptation mechanisms. Asymmetric adaptation alterations on the dento-alveolar or skeletal level occur. Thus the originally symmetric dental arches become the asymmetric ones.After the transition of dentition is finished as well as the growth, the anomaly is morphologically fixed.[2,3]

Children who present with a posterior crossbite may be predisposed to long-term detrimental consequences if the condition is left untreated[4,5]. It was proved that the mandible reacts to the crossbite with the asymmetric growth . They found that in children with unilateral crossbite longer ramus of the mandible on the unaffected side. After expansion of the upper dental arch, the ramus of the mandible of the affected side grew significantly and both sides become equal.[6]

Malocclusions involving asymmetries are found in a large population of deciduous and mixed dentition[7] .It is necessary to look for posterior crossbite and plan the treatment with regard to their incidence.

The aim of the present study was to assess the symmetry of upper dental arch in unilateral and bilateral posterior crossbite in the early mixed dentition period in Egyptian children.

Material & Methods

Thirty children with posterior crossbite in the early mixed dentition period, 18 unilateral & 12 bilateral (fig.1,2), were included in this study with mean age of 7 years, 9 months. None of the children was orthodontically treated before the impressions were taken. A control group of 30 casts was provided. The set did not include craniofacial malformations, syndromes, clefts and Class III malocclusion.

In the unilateral crossbite group, the first permanent maxillary molar was present in the crossbite and the unilateral posterior crossbite affected two or more teeth.

In the bilateral posterior crossbite group, both permanent maxillary molars were included within the crossbite and the bilateral posterior crossbite involved two or more teeth.

In the control group, the mean age was 7 years, 11 months and the group was established according to the following criteria:

- Class I early mixed dentition.
- All deciduous cuspids and molars present
- No teeth were extracted.
- No crossbite was manifested.

Impressions of the maxilla and the mandible by means of alginate impressions material were performed for everyone. The impressions were cast within two hours after they were taken. To avoid random errors, measurements were taken twice and the mean reading was taken. Assessment of asymmetries of the dental arches was performed using the method applied by Maurice and Kula [8,9] .

Two lines were recorded on the cast: Medial line (ML) and Transverse line (TL) perpendicular to each other. In the upper dental arch, the medial line was presented by palatine raphe and in the lower dental arch by lingual frenum. The median line was drawn onto the cast. The transverse line (TL) presented the line running distal the first permanent molars perpendicular to the medial line. Reference points were pointed into the cast. Distances of reference points from the medial line (ML) were measured in the transversal plane while in the sagittal plane perpendicular distances of reference points from the transverse line (TL) were measured. Readings on both right and left sides were done (fig.3).

fig.1: Unilateral posterior crossbite

fig.2: Bilateral posterior crossbite

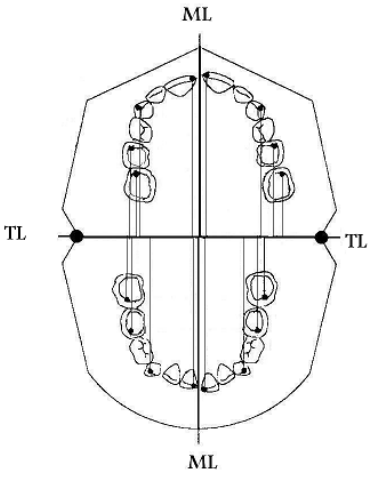

fig.3a: Sagittal plane

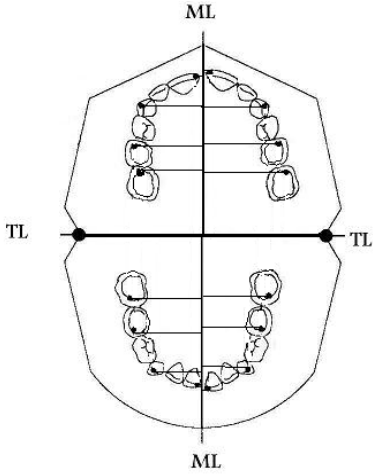

fig.3b: Transverse plane

Reference points:

- 1+, +1: Mesioincisal corner of the maxillary central incisor (right & left).
- C+, +C: Cusp tip of deciduous maxillary canine (right & left).
- E+, +E: Mesiobuccal cusp tip of the maxillary second deciduous molar (right & left).
- 6+, +6: Mesiobuccal cusp tip of the maxillary first permanent molar (right & left).
- 1-, -1: Mesioincisal corner of the mandibular central incisor (right & left).
- C-, -C: Cusp tip of deciduous mandibular canine (right & left).

- E-, -E: Mesiobuccal cusp tip of the mandibular second deciduous molar (right & left).
- 6-, -6: Mesiobuccal cusp tip of the mandibular first permanent molar (right & left).

RESULTS

The results of the present study showing that in the unilateral posterior crossbite group in comparison with control group there is significant higher number of asymmetries in the transversal plane. The transversal asymmetries over 2mm appear in the upper dental arch in about 33% of cases. This means that in 67% the measures in the upper dental arch are symmetrical.

The frontal part of the lower dental arch shows transversal asymmetry only in 17% of cases. Larger asymmetries are found in the area of lower deciduous molars (22%). Higher asymmetry was found in the lower molars (50%). (table1,3)

In addition, the bilateral posterior crossbite group in comparison with the control group in the transversal plane showing that, there are asymmetries in the upper frontal segment whilst the distal portion seams predominantly symmetrical. The symmetrical contraction of the upper dental arches is considerably more significant than in unilateral posterior crossbite group.

In the bilateral crossbite group significant asymmetry (over 2mm) was found in the frontal part of the upper dental arch in the transversal plane. Strong asymmetry is found in the area of maxillary incisors (41% of cases), in the area of upper cuspids (66% of cases), and in the area of lower canines 27% while distal parts of upper dental arch shows nearly the same prevalence of asymmetries in the control group and that with bilateral group.(table 1,4)

The results of the present study show increase of asymmetries in the sagittal plane in unilateral crossbites in comparison with that of control group. The sagital asymmetries over 2mm appear in the upper dental arch in about 35% of cases. The large number of significant sagittal asymmetries was found in the distal part of the lower dental arch (38%), while the smallest number was found in the area of incisors (6%).(table2,3)

In addition, the bilateral posterior crossbite group in comparison with the control group in the sagittal plane showing that, sagittal asymmetries are found within the whole upper dental arch (25-33%) and in the distal parts of the lower arch (25%), while the lower frontal part is very symmetrical (table2,4).

Table 1: Differences between the left and right sides in control group, unilateral and bilateral groups, measured in the transverse plane.

Measures from (ML) median plane	Control group (trans. plane)				Unilateral group (trans. plane)				Bilateral group (trans. plane)			
	Sample number	Mean difference left&right side	SD	Signif.	Sample number	Mean Difference left&right side	SD	Signif.	Sample number	Mean Difference left&right side	SD	Signif.
1+1	30	-0.09	0.80	ns	18	0.87	2.19	*	12	1.39	1.78	***
C+C	30	-0.20	1.59	ns	16	-0.80	0.89	***	12	2.21	2.77	**
E+E	30	-0.39	0.68	ns	18	-0.71	0.99	***	12	0.31	1.19	ns
6+6	30	-1.21	1.19	**	18	-1.25	1.79	***	12	-1.01	2.26	ns
1-1	30	-0.20	0.89	ns	18	0.45	1.79	ns	12	0.11	1.58	ns
C-C	30	-0.14	0.50	ns	17	-0.09	1.09	ns	11	-0.61	1.65	ns
E-E	30	-0.50	0.89	**	18	0.25	1.59	ns	12	-0.32	1.17	ns
6-6	30	0.25	1.29	ns	18	0.41	2.59	ns	12	0.31	2.72	ns

Student t-test: *-p<0.05; **-p<0.01; ***p-<0.001; ns-p>0.05

Table 2: Differences between the left and right sides in control group, unilateral and bilateral groups, measured in the sagittal plane.

Measures from (TL) transverse plane	Control group (sagittal plane)				Unilateral group (sagittal plane)				Bilateral group (sagittal plane)			
	Sample number	Mean difference left&right side	SD	Signif.	No.of subjects	Different left&right side	SD	Signif.	Sample number	Mean difference left&right side	SD	Signif.
1+1	30	0.07	0.71	ns	18	-0.55	1.31	***	12	-0.58	1.59	ns
C+C	30	0.09	0.82	ns	16	-1.29	1.87	***	12	1.41	2.49	*
E+E	30	-0.06	0.98	ns	18	-1.21	1.79	**	12	-1.15	1.59	***
6+6	30	-0.55	1.18	**	18	-1.18	1.88	***	12	-0.49	1.78	ns
1-1	30	-0.16	0.59	ns	18	0.19	0.89	ns	12	0.31	0.81	ns
C-C	30	-0.08	0.90	ns	17	0.16	1.19	ns	11	-0.19	0.88	ns
E-E	30	-0.06	0.86	ns	18	-0.21	2.08	ns	12	-0.55	1.69	ns
6-6	30	-0.31	1.35	ns	18	-0.15	2.29	ns	12	-0.04	1.87	ns

Student t-test: *-p<0.05; **-p<0.01; ***p-<0.001; ns-p>0.05

Table3: Comparison of prevalence of differences over 2 mm in the unilateral posterior crossbite group and in the control group in both transverse and sagittal planes.

	Transverse plane			Sagittal plane		
Measures	**Unilateral group IxI>2mm(%)**	**Control group IxI>2mm (%)**	**Signif.**	**Unilateral group IxI>2mm (%)**	**Control group IxI>2mm (%)**	**Signif.**
1+1	33.33%	10.00%	*	11.11%	0.00%	*
C+C	31.25%	10.00%	*	37.50%	3.33%	***
E+E	27.78%	13.33%	*	33.33%	10.00%	*
6+6	33.33%	20.00%	ns	33.33%	10.00%	*
1-1	16.67%	13.33%	ns	5.56%	3.33%	ns
C-C	17.64%	3.33%	*	6.25%	3.33%	ns
E-E	22.22%	0.00%	**	27.78%	10.00%	*
6-6	50.00%	30.00%	*	38.89%	16.67%	ns

Chi-square: *-p<0.05; **-p<0.01; ***p-<0.001; ns-p>0.05

Table4: Comparison of prevalence of differences over 2 mm in the bilateral posterior crossbite group and in the control group in both transverse and sagittal planes.

	Transverse plane			Sagittal plane		
Measures	**Bilateral group IxI>2mm(%)**	**Control group IxI>2mm(%)**	**Signif.**	**Bilateral group IxI>2mm(%)**	**Control group IxI>2mm(%)**	**Signif.**
1+1	41.67%	10.00%	**	33.33%	0.00%	**
C+C	66.67%	10.00%	***	25.00%	3.33%	**
E+E	16.67%	13.33%	ns	25.00%	10.00%	*
6+6	16.67%	20.00%	ns	33.33%	10.00%	*
1-1	16.67%	13.33%	ns	8.33%	3.33%	ns
C-C	27.27%	3.33%	*	8.33%	3.33%	ns
E-E	8.33%	0.00%	ns	25.00%	10.00%	*
6-6	25.00%	30.00%	ns	25.00%	16.67%	ns

Chi-square: *-p<0.05; **-p<0.01; ***p-<0.001; ns-p>0.05

DISCUSSION

In the unilateral posterior crossbite group, the upper dental arch show clinically significant asymmetries in about 33% of patients. That means that 67% of measurements of upper dental arches in the early mixed dentition show asymmetry less than 2mm. therefore, we may say that in the first phase of natural replacement of the teeth the unilateral crossbite is mostly characterized by symmetrical transversal contraction of the upper dental arch. This finding is in accordance with the finding of other study [8].

The present study suggests that, the asymmetrical expansion is not necessary in the treatment of most cases of unilateral posterior crossbite. In addition, the more significant asymmetry is manifested in lower permanent molars in about half of the patients. This might be due to the fact that erupting lower first molars adapt themselves to the posterior crossbite by the change of their axial location. [10-14] Early treatment of posterior crossbite in deciduous dentition is very important because it may prevent asymmetrical adaptations both in the maxilla and the mandible and avoid the eruption of the permanent molars into incorrect position on thus fixation of the defect may start[15] .

In the bilateral posterior crossbite group, there are asymmetries in the upper frontal segment whilst the distal portion seams predominantly symmetrical. The symmetrical contraction of the upper dental arches is considerably more significant than in unilateral posterior crossbite. The lack of the space in the frontal part is manifested with a great degree of crowding and asymmetry in the frontal segment [16]. In addition, in comparison with the control group, there is an increase of asymmetry in deciduous canines in the lower dental arch. This may be due to significant irregularities in the upper frontal part to which the mandibular canines adapt their positioning.

Unilateral and bilateral posterior crossbite groups have apparent and similar location of asymmetries in the sagittal plane within the whole upper dental arch and they reach the maximum of 37%. Further they are manifested in the lower distal segment. On the other hand, the lower frontal part seems the least asymmetrical in the sagittal plane in both cases. Asymmetries in the sagittal plane may be due to mesial movements of the teeth in the distal part as a result of early loss of deciduous molars and due to crowding in the frontal segment. [17]

The optimum period for the treatment of posterior crossbite is the phase of deciduous and early mixed dentition. At this age we should concentrate on the

function and correction of occlusal relations to avoid negative growth changes. Insufficient expansion in bilateral crossbite treatment results in the change of bilateral crossbite into unilateral one with forced guidance of the mandible [18]. If there are not appropriate conditions for a sufficient expansion then it is better to left bilateral crossbite untreated and thus prevents the asymmetrical function. Surgical treatment or prosthetic arrangement may be considered in such cases.

In the control group, the more significant asymmetries (over 2mm) in the upper and lower first permanent molars were not found. This is true for both transverse and sagittal planes, while a certain degree of asymmetry in the sagittal plane as well as in the transversal was present. However, the asymmetry doesn't manifest itself clinically. These results agree with the works of other study that measured 320 dental arches and found an asymmetry in most of them [10]. In addition, within the control group there is a tendency to right side narrowing in almost all the measured areas. The same result was arrived at by other studies[8, 9, 11]. This finding does not support the finding of other study[10] that refers prevalence in the left side narrowing. Which side is affected with asymmetry doesn't mean much for the clinical practice. It is necessary to examine every patient for whether the arch is symmetrical and if not in which side it is contracted.

This study concluded that bilateral posterior crossbites appears as the symmetrical narrowing of the upper dental arch with a prominent crowding of the frontal segment. On the other hand, unilateral posterior crossbite is often due to symmetrical narrowing of the upper dental arch but it may be also due to asymmetry of the upper dental arch. It is necessary to establish a good diagnosis in order to adopt the treatment that will achieve the greatest efficiency and the most stable results possible.

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