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EVALUATION OF VERTICAL AND HORIZONTAL POSITIONS OF MAXILLARY FIRST MOLAR BASED ON VERTICAL AND SAGITTAL FACIAL GROWTH PATTERN ON CEPHALOGRAMS OF PATIENTS WITH VARIOUS DENTOFACIAL DISCREPANCIES

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ABSTRACT

Aim: The study was performed to compare maxillary first molar horizontal and vertical distances on the basis of sagittal and vertical skeletal growth patterns on lateral cephalograms of adult patients having different dentofacial discrepancies. **Materials & Methods:** For the study, 45 Lateral cephalograms (20 male, 25 female) which were divided as Skeletal (15 Class I, 15 Class II, 15 Class III) and as Vertical growth (20 normodivergent, 10 hypodivergent, 15 hyperdivergent). For evaluation of sagittal skeletal features ANB and occlusal features were utilized. For evaluation of vertical skeletal features Jarabak values were used. The horizontal position of the upper first molar was evaluated considering the distance of its distal aspect to the vertical pterigomaxilar line, while the vertical position was evaluated considering the distance perpendicular to the Frankfurt plane at the level of the occlusal plane. . ANOVA test was used to determine the molar position in the different groups with respect to sagittal and vertical patterns. **Results:** The molar vertical position was not significantly affected by sagittal and vertical facial growth type, age or their interaction. The first molar horizontal position was 1.8 mm more posterior in Class III and 3.17 mm more anterior in Class II compared with Class I (20.73mm)

KEYWORDS : Maxillary molar position, Lateral cephalogram, Sagittal and vertical skeletal patterns

INTRODUCTION

Association between sagittal and vertical growth has been reported with the corresponding vertical and horizontal first molar positions. According to Andria et al, as the Palatal plane increases the position of molar moves forward in relation to the cranial base and maxillary complex1,2. Where in, as the PPL decreases, the position of molar moves posterior relatively. In a study conducted by Arriola-Guillen and Flore-Mir3,4 it was observed that compared to the controls the group with skeletal open bite had an increased vertical molar position. This may likely due to increased posterior discrepancy. But in the study only hyperdivergent cases were evaluated, in which the position of molar may be altered due to remarkable skeletal divergence amongst mandibular and palatal planes. Though many studies have done the evaluation of vertical and horizontal position of maxillary molars in adult patients, not many studies have evaluated the influence of maxilla-mandibular divergence where open bite is not detected5. Thus the present study compares the vertical and horizontal position of first molar based on the vertical and sagittal skeletal growth patterns on lateral cephalograms of adult patients with normal overbite and various dentofacial deformities.

MATERIAL and METHODS

Firstly 45 subjects divided into 3 group as per skeletal discrepencies:(Group A: 15 Class I malocclusion,15 Group B: Class II malocclusion Group C:15 Class III malocclusion). The same subjects were also divided according to the vertical growth (Table1). Vertical skeletal divergence was defined based on Bjork and jarabak values as normodivergent (360 + 6), hypodivergent (<390), hyperdivergent (>402). These values were defined as the sum of the following angles: N-S-Ar (sella angle), S-Ar-Go (articular angle), Ar-Go-Me (gonial angle). The horizontal position of the maxillary first molar will be evaluated considering the horizontal distance from the first molar distal contact point to a perpendicular line to the Pterigomaxilary point (Ptm) with respect to the Frankfurt Plane (FP) and its distal surface. And the vertical perpendicular line to FP distance and the buccal groove if the molars at the level of the two molars at the level of the Occlusal plane (OP) will be considered for measuring the vertical distance of the first and second maxillary molars. (Figure 1).

The inclusion criteria were, adult patients with complete permanent dentition including 3rd molars. Patient were with maximum intercuspation when the Lateral cephalograms were taken. The patients with marked skeletal asymmetries, posterior crossbites, patients undergoing orthodontic treatment or with craniofacial syndromes were not included in the study.

The classification of the subjects in 3 groups according to sagittal skeletal pattern and malocclusion according to Angle: Class I with (ANB = 2°±2, bilateral Class 1 molar relation), Class II with (ANB≥ 5° , Class II divison 1 malocclusion , bilateral Class II molar relations and overjet of more than 6mm), Class III with (ANB ≤ -1° , bilateral Class III molar relation and overjet less than -2mm). The angles and the points that were used in the present study were according to Steiner9 and Riolo et al[10].

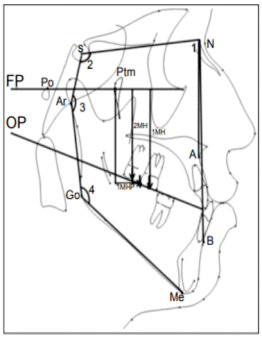

Figure 1. FP: Frankfort plane (horizontal reference); OP: Occlusal plane; Ptm: Pterigomaxilar perpendicular line form

FP) 1MH: First molar maxillary horizontal height from FP a 2MH: Second molar maxillary height from FP; 1MHP: First molar horizontal position. *1.ANB: ANB angle; 2.N-S-Ar: Sella angle; 3.S-Ar-Go: Articular angle; 4.Ar-Go-Me: Gonial angle

STATISTICAL ANALYSIS

All statistical analyses were performed using SPSS version 2.0 for Windows (IBM SPSS, Chicago, Illinois USA). One way Analysis of Variance (ANOVA) was performed to determine whether there was difference in the 3 groups in relation to sagittal and vertival growth patterns.

RESULTS

According to the sample described in Table2, the first molar horizontal distance compared to Class I – 20.73mm was 1.8mm more posterior in Class III – 18.93mm whereas it is 3.17mm anterior in Class II – 23.9mm. These differences were statistically significant for the sagittal skeletal relations (p = 0.005) (Table2)

Whereas no such significant difference was found for sagittal and vertical growth for first and second molar (Table3,4).

DISCUSSION

The purpose of this study was to assess the vertical and horizontal positions of maxillary first molar while observing the sagittal as well as the vertical facial growth pattern variations amongst adult patients that possess normal overbite.

Many studies have indicated that throughout the fourth and fifth decades of life continuation of alveolar growth occurs. The present study indicates that on completion of normal growth in the subjects possessing normal overbite, the sagittal position of maxillary first molar varies based on the sagittal skeletal malocclusion significantly6. While for the maxillary molar position based on vertical skeletal tendencies there were no difference observed. It was observed that in the subjects with normal overbite or in absence of open bite, the facial skeletal type is not significantly associated with molar vertical position. In previous studies it was observed that the vertical position of molar is increased only in subjects with a skeletal open bite when compared to their counterparts with adequate overbite3,7. It can also be drawn from the present study that for the successful treatment of individuals with vertical tendencies, along with achieving normal overbite focus should also be given to position the maxillary first molar in its expected vertical position.

In the present study horizontal position of the first molar was significantly affected in relation to sagittal pattern, it was observed that horizontal molar position was 1.8mm more posterior in Class III and 3.17mm anterior in Class II compared to Class I (20.73mm).

In this study subjects selected did not possess skeletal open bite. According to the study conducted by Arriola-Guillen and Flores-Mir4 the subjects having skeletal open bite had about an extra of 4mm and 3mm maxillary and mandibular molar eruption when compared to those with normal overbite. According to Kucera et al in their study it was established that no significant difference lies in upper or lower molar vertical position amongst dentally compensated open bite group and dentally non compensated open bite group, at the same time the differences were observed with the control group with adequate overbite. It was observed that increase in molar eruption is common in only the subjects with skeletal openbite8. In the present study, since the cases selected were dentoalveolarly compensated, factors like the ANB angle, age, sagittal position and Bjork value did not have any effect in the vertical position of the maxillary molar.

CONCLUSION

The maxillary first molar horizontal position varies remarkably on the basis of the sagittal skeletal malocclusion. It was positioned more anteriorly in Class II cases where as more posteriorly in Class III cases with normal overbite.

The vertical position of maxillary molars was not significantly influenced by neither horizontal nor vertical facial growth in cases with normal overbite.

Table 1. Gender wise distribution in Skeletal Growth and Vertical Growth

Growth Pattern		Male	Female	Total
Skeletal Growth	Class I	6	9	15
	Class II	3	12	15
	Class III	11	4	15
	Total	20	25	45
Vertical Growth	Normodivergent	7	13	20
	Hypodivergent	5	5	10
	Hyperdivergent	8	7	15
	Total	20	25	45

Table 2. 1st molar horizontal position wise distribution in Skeletal Growth and Vertical Growth

Growth Pattern		Number	Mean	SD	F Value	P Value
Skeletal Growth	Class I	15	20.733	2.3366	18.191	≤ 0.05 *
	Class II	15	23.900	1.3784		
	Class III	15	18.933	2.8777		
Vertical Growth	Normodivergent	20	21.800	3.1136	1.242	> 0.05 **
	Hypodivergent	10	21.450	3.5859		
	Hyperdivergent	15	20.200	2.4770		

Level of significance ≤ 0.05, * Significant result, ** Non significant result

Table 3. 1st molar vertical distance wise distribution in Skeletal Growth and Vertical Growth

Growth Pattern		Number	Mean	SD	F Value	P Value
Skeletal Growth	Class I	15	46.967	2.2557	0.535	> 0.05 **
	Class II	15	47.633	2.0999		
	Class III	15	46.633	3.5075		
Vertical Growth	Normodivergent	20	46.225	3.1350	2.512	> 0.05 **
	Hypodivergent	10	47.100	2.1833		
	Hyperdivergent	15	48.200	1.8879		

Level of significance ≤ 0.05, * Significant result, ** Non significant result

Table 4. 2nd molar vertical distance wise distribution in Skeletal Growth and Vertical Growth

Growth Pattern		Number	Mean	SD	F Value	P Value
Skeletal Growth	Class I	15	45.833	3.6629	0.217	> 0.05 **
	Class II	15	46.600	2.6939		
	Class III	15	46.033	3.4768		
Vertical Growth	Normodivergent	20	45.050	3.7937	2.719	> 0.05 **
	Hypodivergent	10	46.300	2.6162		
	Hyperdivergent	15	47.533	2.3181		

Level of significance ≤ 0.05, * Significant result, ** Non significant result

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