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Role of molar in anterior proclination of teeth – A retrospective study

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ABSTRACT

Objectives:

1) To establish if a correlation exists between the position of the molar and anterior proclination of central incisors in Indian population.
2) To broaden our treatment options for gaining space to correct malocclusion.
3) Emphasise the importance of stable posterior occlusion.

Material and methods: The sample consisted of 400 lateral cephalograms of patients reported to CMCH, Vellore for diagnosis and treatment of malocclusion. The interincisal angle and the molar position in maxillae were measured using Kodak software and values were tabulated on Excel worksheets. All statistical analysis were done using Statistical Software STATA version 13.1.
Results: Regression coefficient indicates that 0.4% decrease in the interincisal angle (increase in proclination) for every unit increase in the molar position which is statistically significant at 5% level of significance. The interincisal angle will be 3% higher for male than female which is statistically not significant.
Conclusion:

1) Molar position in maxillae is affected by various factors and its position has an effect on anterior proclination with 0.4% decrease in interincisal angle for every unit increase in molar position which is statistically significant.
2) Anterior occlusion is dependent on posterior occlusion, hence a stable posterior occlusion is a requisite for stability of occlusion.
3) Since the anterior occlusion varies with posterior occlusion other modalities of treatment like distalization of molars and TAD's to decrease anchor loss can be an alternative/addition to extraction protocol respectively.

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1. Introduction

Malocclusion is the abnormal position of the teeth in the mouth resulting from increased or decreased space between the teeth which causes a variety of dental diseases like caries, gingivitis, periodontics, etc. The US National library of Medicine/National institute of health (Medline) states that malocclusion means 'the teeth are not aligned correctly'' the main aim of orthodontics is to improve aesthetics, although function is considered.[1] Edward Angle postulated that the upper first molar were the key to occlusion and definition and classification of malocclusion is based on the relation of upper and lower molars and its associated aberration. There is a lot of literature published that explains the aetiology of all classes of malocclusion. This includes the dental and skeletal causes and its inter relationship.[2–10] One of the variables that affect the occlusion is the labiolingual angulation of the upper and lower incisor teeth which is an important factor in the treatment of malocclusion. Andrews had stated that the degree of the labiolingual crown angulation of the upper and lower incisor teeth influences both posterior occlusion and anterior aesthetics.[11] An association between upper incisor angulation and change in molar relationship was found in a study by Sangcharearn and Ho.[12] The position of molar in upper arch has been established to be age ±3 mm from a vertical line drawn from PtergoMaxillary fissure (PTV) to distal of upper first molar (Ricketts) and the interincisal angel to be 131° (Stieners analysis). But it has been found that the age, cranial base length, maxillary position length had a positive correlation with molar position placing molar more forward as their dimension increases and angles had a negative influence: palatal, mandibular, interjaw angle, as angle increases the molar was located more posteriorly.[13] Hence this study was designed to retrospectively study 400 pretreatment lateral cephalogram of Indian origin patients who reported to Christian Medical College and Hospital for orthodontic treatment. The lateral cephalograms were evaluated to understand the degree of correlation between the molar position and proclination of teeth and give a regression equation for the same, which would not only pave way for better understanding of the cause of malocclusion in Indian origin patients but also broaden our treatment modality for correction of malocclusion and understand the importance of stable posterior occlusion. All the previous studies were analysed on Caucasian population, however since malocclusion varies with ethnic groups, a specific study on a particular population for further use is more clinically significant. The purpose of the present study was to test the null hypotheses that may affect the position of upper and lower anterior teeth irrespective of the class of malocclusion.

1) The position of molars in the maxillary arch will not have any effect on the anterior teeth proclination.

2. Aim and objectives

1) To establish if a correlation exists between the position of the molar and anterior proclination of central incisors in Indian population.
2) To broaden our treatment options for gaining space to correct malocclusion.
3) Emphasise the importance of stable posterior occlusion.

3. Material and methods

The study was approved by CMCH ethical committee. The sample was selected from patients who reported to CMCH, Vellore for consultation and treatment of malocclusion from 2011 to 2016. The pretreatment lateral cephalogram (PLC) of 400 patients were studied. The sample consisted PLC of 200 male and 200 female patient with Skeletal Class I malocclusion.

Inclusion criteria for selection of the sample were as follows:

1) Indian origin patients, since CMCH is a tertiary care centre, naturally included Patients from other than Tamil Nadu.
2) Patient with complete permanent dentition (third molar excluded)
3) Age of patients used in the study was between 12 and 18 years.
4) Patients with significant transverse skeletal asymmetry including posterior cross bites, craniofacial syndromes, severe dentoalveolar anomalies were not included.
5) Patients under previous orthodontic treatment or history of previous orthognathic surgery were also not included in this study.

The digital lateral cephalogram were taken with patients in standard head position in trophy Dicom; carestream LS 8000c machine and is programmed with Kodak software.

The upper molar position is the linear distance between the most distal point of the maxillary first permanent molar and the pterygoid vertical (PTV) measured parallel to occlusal plane.

The linear distance between the PTV to distal of the upper molar according to Ricketts Norm is:

The patient's age in years plus 3 mm (at least 21 mm of maxilla ±3 mm is needed in later years for eruption of second and third molars lower values indicate impaction of teeth).

Interincisal angle: The axial inclination of the maxillary and mandibular incisors measures the degree of procumbency of the incisor teeth. Lines are drawn through the long axis of the teeth and the inside angle is measured.[14]

The molar position and interincisal angle were measured using the Kodak software[15] and the values were tabulated on excel worksheet. Simple linear regression analysis was used to find the relationship between interincisal angle and molar position. Significance was predetermined at $p < .05$. The regression equation $Y = a + bx$ was formulated to predict the change in molar position when the interincisal angle changed.

Y = change in molar position, x = interincisal angle a = y intercept, b = slope.

All statistical analysis were done using statistical software STATA version 13.1.

Analysis and the results were expressed as scatterplot graphically and regression equation was derived.

Table 1 – Regression analysis of inter incisal angle (degree) with molar distance from PTV (mm) and gender.

Inter incisal angle (logged)	Unadjusted		Adjusted	
	Reg. Coeff.[a] (95% CI)	*p*-Value	Reg. Coeff.[a] (95% CI)	*p*-Value
PTV	−0.004 (0.006, −0.001)	0.002	−0.004 (0.007, −0.001)	0.002
Gender (1 – female, 2 – male)	0.03 (0.002, 0.05)	0.06	0.03 (0.001, 0.05)	0.057

[a] Regression coefficient indicates expected change in the outcome variable for every unit increase in the predictor variable.
Interpretation: Regression coefficient indicates that 0.4% decrease in the inter incisal angle for every unit increase in the PTV which is statistically significant at 5% level of significance. The inter incisal angle will be 3% higher for male than female which is statistically not significant.

4. Results

The data was analysed using simple linear regression analysis. The regression coefficients, slope and intercept were estimated.

Regression coefficient: Indicates that 0.4% decrease in the interincisal angle (increase in proclination) for every unit increase in the molar position which is statistically significant at 5% level of significance.

The interincisal angle will be 3% higher for male than female which is statistically not significant (Fig. 1 and Table 1).

5. Discussion

The introduction of Angle's classification of malocclusion in the late 19th century was the most important influence in orthodontics.[1] He stated that the maxillary first molar "furnishes more nearly than any other tooth or point in the anatomy an exact scientific basis from which to reason on malocclusion." The second chapter of Angle's seventh edition is on malocclusion, where he presented and discussed the classification of malocclusion.

Angle, therefore, believed that malocclusions are of mandibular in origin. Studies reveal that the age, cranial base length, maxillary position length had a positive correlation with molar position placing molar more forward as their dimension increases.[13] Previous studies revealed that the maxillary molars vertical position was not affected by vertical or horizontal facial growth in cases with normal overbite (OB) but the horizontal position of maxillary first Molar varies significantly based on the sagittal skeletal malocclusion. It was more anteriorly positioned in class II cases with normal OB.[16] Hence in our study Skeletal Class I patients were considered since skeletal malocclusion directly affects the dental occlusion, with few exception cases.

Studies have also found a stable position of the maxillary molar in different dental classes of malocclusion but used angles to locate the molar's position.[5,8] Angular values have an advantage of being proportional and are not affected by linear variation brought on by individual size differences. Unfortunately, it would be improper to use angles when studying variations in one plane of space.[2] Hence linear measurement from distal of upper first molar to PTV was selected for measuring the molar position in maxilla.

The interincisal angle gives information on relative proclination of anterior teeth. Andrew explained that the degree of labiolingual crown inclination of upper and lower incisor teeth influences both posterior occlusion and anterior aesthetics. Studies on Indian population have concluded bimaxillary protrusion in their samples, but showed normally related maxilla and mandible to cranial base and the jaws were normally related to each other.[17–19] However no studies have been carried out so far to determine the variation in molar position and its effect on the anterior proclination in patients of Indian origin.

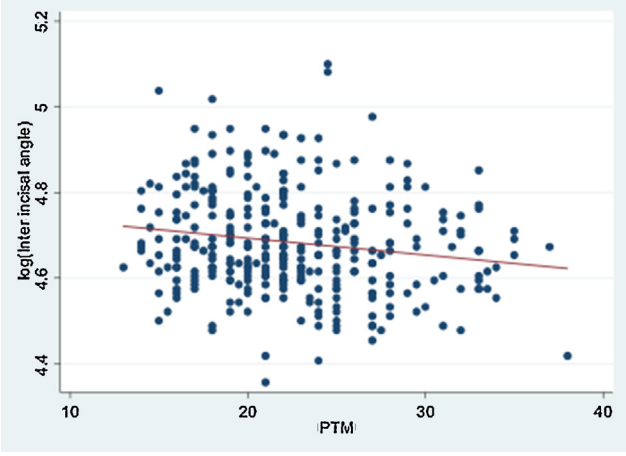


Fig. 1 – Graph: Scatterplot between logged inter incisal angle (degree) and PTV – molar distance (mm) and the fitted regression line.

6. Conclusion

1) Molar position in maxillae is affected by various factors and its position has an effect on anterior proclination with 0.4% decrease in interincisal angle for every unit increase in molar position which is statistically significant.
2) Anterior occlusion is dependent on posterior occlusion, hence a stable posterior occlusion is a requisite for stability of occlusion.
3) Since the anterior occlusion varies with posterior occlusion other modalities of treatment like distalization of molars and TAD's to decrease anchor loss can be an alternative/addition to extraction protocol respectively.

Conflicts of interest

The authors have none to declare.

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