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Original Article

A Relationship between Dental Crowding and Effective Base Lengths in Untreated Class II Subjects of Mandi Gobindgarh Population

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ABSTRACT

Aims: A study was conducted to find out a relationship between maxillary and mandibular base lengths and dental crowding in untreated Class II subjects in Mandi Gobindgarh, Punjab, population. **Study design:** Cross sectional. **Place of Study:** Department of Orthodontics and Dentofacial Orthopaedics, Desh Bhagat Dental College and Hospital, Desh Bhagat University Campus, Mandi Gobindgarh, Punjab. **Methodology:** This study included 32 Class II pre-treatment lateral cephalograms and study models of untreated subjects with complete bilateral dental class II malocclusion having all permanent teeth mesial to 1st molars & without any proximal decay and restorations. The maxillary and mandibular base lengths (Co-A and Co-Gn) were measured on pre-treatment lateral cephalogram & the tooth size-arch length discrepancies were measured on the pre-treatment dental casts. The measurements obtained from Class II subjects were further divided into two Groups each depending upon the severity of dental crowding. The obtained data was analyzed statistically with t-test and Pearson correlation coefficient (P=.05) to investigate any correlation between base length and dental crowding. **Results:** Patients with Class II malocclusion and moderate to severe crowding had significantly smaller maxillary and mandibular base lengths than subjects with same malocclusion and slight crowding. A weak inverse correlation was found between effective base lengths and severity of crowding. **Conclusion:** Decreased maxillary and mandibular effective lengths constitute an important factor associated with dental crowding in patients with Class II malocclusion.

Key words: Dental crowding, Class II malocclusion, and Apical base lengths.

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INTRODUCTION

Malocclusion has been seen to be associated with adverse physical, psychological and social effects including the longevity of the dentition and oral health and therefore, adversely affects the quality of life. Anterior crowding is one of the most common problems that motivate patients to seek orthodontic treatment[1].

Dental crowding occurs when the space required for the correct alignment of the teeth exceeds the space available in the dental arch. This usually results in rotated, ectopic, and/or impacted teeth. Dental crowding[1-13] can be defined as the deviation from the normal occlusion of the teeth due to the discrepancy in arch length and the tooth size. Many factors are found to be related to anterior dental crowding including arch width,[11-13] arch length,[10,14-16] mesio-distal tooth diameter[1,2,8,9,15,16] and dental proportions.[17-21]

Van der Linden et al as cited by Bishara et al[11] classified crowding on the basis of its etiology as primary, secondary,

and tertiary. He defined primary crowding as an inherent discrepancy between tooth size and the available arch length, which is mainly of genetic origin. Secondary crowding is caused by environmental factors influencing the dentition, such as caries and extractions. Tertiary crowding or late crowding occurs in the post-adolescent age.

Many studies has been conducted (table 1) in the past on the anterior crowding and mandibular length. In general, patients with Class II malocclusion have a smaller mandibular length than subjects with normal occlusion and Class I malocclusion.

Additionally, some cephalometric features[22,23] are associated with greater amount of dental crowding.

In general, patients with Class II malocclusion have a shorter mandibular length than patients with Class I malocclusion and normal subjects.[24-28]

Improvement of facial profile is always a part of the general protocol in the management of malocclusion.

Orthodontic treatment involves the analysis of a number of soft tissue and hard tissue cephalometric parameters, which includes effective maxillary and mandibular base lengths.[29]

Table 1

S no.	Year	Reference	Inference
1.	1972	Peck & Peck[14]	Conducted a study to find out whether the naturally well aligned mandibular incisors possess a distinctive dimensional characteristics. The results indicate that naturally well-aligned mandibular incisors do possess distinctive dimension characteristics, mesio-distaly and facio-lingualy. Comparison with crown dimensions of other population group also corroborate these findings.
2.	1989	Bishara et al[11]	longitudinal study was carried to determine the association between the changes in the maxillary and mandibular Tooth Size Arch Length Discrepancies (TSALD), and various dentofacial variables. it was found that mesio-distal diameter of different teeth and the changes in anterior and posterior facial heights were associated with the changes in the maxillary and mandibular tsald.
3.	2004	Turkkahraman H, Sayin MO.[22]	Observed that that crowding of the mandibular incisors is not only a tooth-arch size discrepancy, dentofacial characteristics also contribute to this misalignment. It was determined that patients with crowding had smaller lower incisor to NB angles, maxillary skeletal lengths, mandibular skeletal length, and mandibular dental measurements.
4.	2005	Sayin MO, Turkkahraman H.[23]	A cephalometric study was carried out to find a correlation between craniofacial features and severity of class ii malocclusion. It was found that cranial base angle was significantly larger in class ii div 2 malocclusion. Anterior and posterior cranial lengths were significantly shorter.
5.	2011	Janson et at [1]	Reported an inverse correlation between the apical base effective lengths and dental crowding, and also a positive correlation between maxillary and mandibular effective lengths.
6.	2014	Suja Ani G, Babu E.C.[30]	Found a positive correlation between NLA and Sl, Se, Co-A and Co-Gn. Also a statistically significant difference was observed between males and females in Se, Co-A,Co-Gn.

Therefore, the objective of this study was to evaluate a correlation of maxillary and mandibular base lengths to the amount of anterior crowding on the untreated subjects of Class II malocclusion in Mandi Gobindgarh population.

MATERIAL AND METHODS

SOURCES OF THE DATA

Pre-treatment dental casts and lateral cephalograms of the patients visiting the Department of Orthodontics and Dentofacial Orthopaedics, Desh Bhagat Dental College and Hospital, Desh Bhagat University Campus, Mandi Gobindgarh, Punjab.

METHOD OF COLLECTION OF DATA

Pre-treatment study casts and lateral cephalograms of adequate number of patients demonstrating Class II malocclusion were evaluated. Tooth size and arch length measurements were obtained from the study casts using digital vernier caliper.

Lateral cephalograms of the patients were traced on Acetate matte tracing paper (0.003 inches thick) with 3H drawing pencil.[29] Linear measurements were taken using geometric set squares.(figure 1)

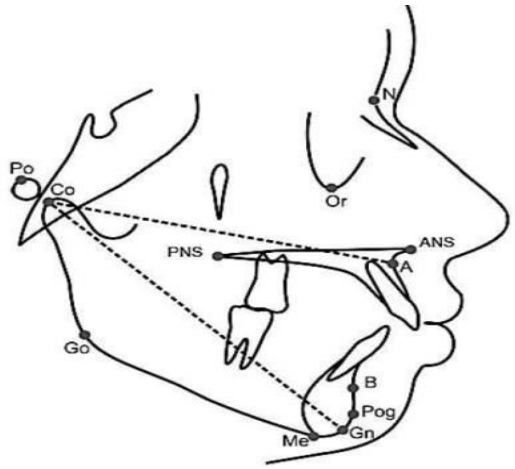

Figure 1: Cephalometric variables measured.

A correlation was derived among effective base lengths and dental crowding using the above derived statistical data.

SAMPLE SELECTION

The inclusion criteria for study was untreated subjects with complete bilateral Class I and complete bilateral Class II malocclusion (molar relation), Presence of all permanent teeth mesial to first molars and absence of proximal decay and restorations.

Exclusion criteria included deciduous or mixed dentition subjects, Subjects with unilateral Cass II malocclusion, Subjects with dental anomalies of number, size, form and position, and Subjects with any systemic disease.

Thirty two Class II subjects were selected which were further divided into two groups depending upon the severity of the mandibular crowding, upto 3 mm (12 subjects) and > 3mm (20 subjects).

STATISTICAL ANALYSIS

Standard statistical methods were applied to the derived data to obtain the results. The cephalometric variables were compared between the groups with t-tests. Correlation between maxillary and mandibular lengths and dental crowding severity was investigated with the Pearson correlation coefficient. (P=.05).

RESULTS AND DISCUSSION

The study was conducted with the objective of assessing skeletal and dental parameters in untreated class II malocclusion patients.

In this study we found an inverse correlation between the effective base lengths and dental crowding and also a statistically significant positive correlation between maxillary and mandibular effective lengths. The mean maxillary and mandibular effective lengths were found out to be 93.82 and 112.54 respectively in class II malocclusion (table 2).

Table 2: Class II subjects

	N	Mean	SD	Minimum	Maximum
CO – A	32	93.82	8.77	86	102
CO – GN	32	112.54	9.96	101	123

These values were in concordance with Janson et al.[1] Shorter maxillary and mandibular lengths have been reported in patients with incisor crowding. Carter[23] also observed small mandibular lengths in class II malocclusion patients in comparison to class I and normal occlusion subjects.

Berg R[24] also found significantly smaller mandibular length in patients with dental crowding. The dominant skeletal pattern observed in our study subjects was more mandibular retrusion and less maxillary protrusion in class II malocclusion.

However, in contrast to our findings and available literature, Rosenblum[26] found dominant skeletal pattern to be maxillary protrusion with a normal mandible in class II malocclusion.

Leighton and Hunter[28] also reported smaller found mandibular length in crowded cases with the mean value 57.9 in moderately crowded, 58.1 in severely crowded group and 61.83 in spaced group.

Table 3: correlations between apical base length and dental crowding (Pearson Correlations)

	Pearson's correlation – r	P value
Mandibular crowding x Co-A	-.390	0.001
Mandibular crowding x Co-Gn	-.358	0.004
Maxillary crowding x Co-A	-.590	<0.001
Maxillary crowding x Co-Gn	-.372	0.002
Maxillary crowding x Mandibular crowding	0.654	<.001
Co – A x Co – Gn	0.702	<.001

CONCLUSION

The results of our study suggests that besides tooth size and transverse arch dimensions, effective apical base length is also an important factor related to the amount of dental crowding.Subjects with complete Class II malocclusion and moderate to severe mandibular crowding have significantly smaller effective apical base lengths than subjects with the same malocclusion and slight mandibular crowding. There is a statistically significant inverse correlation between maxillary and mandibular apical base lengths and the severity of dental crowding.

ETHICAL APPROVAL

The Study plan was submitted to the Research and Ethics board of the institute for evaluation, and clearance was granted to carry out this non-invasive study.

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