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Original Research Article

Evaluation and Comparison of Mandibular Base Lengths and Dental Crowding In Patients with Class II Malocclusion

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Abstract

Aim and Objectives: To evaluate and compare the relationship between mandibular effective length and mandibular crowding in patients with Class II malocclusions.
Methods: A total 40 patients of age between 15 to 30 years were selected for the study. Measurements were performed on pre-treatment dental casts and lateral cephalograms. The sample was divided into two equal groups. Group 1 consisted of patients with crowding > 3mm. Group 2 consisted of patients with crowding < 3 mm. The effective mandibular length was measured as Co-Gn in lateral cephalogram and dental crowding was counted from dental casts. Comparison of both these parameters was done for all the patients.
Results: Mean mandible length was 102.125±7.37 and mean mandible crowding was 4.55±2.85. A comparison of the means with a one sample T-test revealed a P value of 0.0001, showing that both the variables were highly significant. Mandibular base length was larger in males as compared to females. A weak correlation was also found between mandibular base length and mandibular dental crowding.
Conclusion: Mandibular base length can be one of the contributing factors associated with dental crowding in patients with Class II malocclusion and this must be taken into consideration during diagnosis and treatment planning.
Keywords: Mandibular length, Mandibular crowding, Class II malocclusions, Cephalogram, Dental crowding, Dental casts.

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1. Introduction

Anterior crowding is one of the most common problems that motivate patients to seek orthodontic treatment, [1]. Etiology of malocclusion is fundamental to Orthodontics, since a problem can only be corrected once its source is known. Many factors have been evaluated and found to be related to dental crowding, including dental arch width and length, mesiodistal tooth diameter and base lengths. Dental crowding is identified as a disparity between tooth size and arch size that causes teeth to rotate impact or otherwise erupt in improper positions [1]. However, dental crowding is not only influenced by tooth and arch size discrepancy but numerous factors such as the direction of mandibular growth, head posture, inclination of teeth and the oral and perioral musculature may affect the development and severity of crowding [2].

Research into the relationship between crowding and cephalometric measurements has been sparse. However, the relationship between the base lengths of the jaws and dental crowding has been demonstrated with positive correlation. Studies have shown that short mandibular body lengths, irrespective of arch dimensions, are associated with crowding of the dentition. It is a correlation which exists as early as the early mixed dentition through to the late mixed dentition [2]. Longitudinal studies have also shown that mandibular crowding increases over time; the increases being greatest during adolescence and slowing down during adulthood [3,4]. Mandibular growth on the other hand, ceases to a great extent after adolescence. Since crowding increases with age regardless of changes in mandibular apical base length, it would make reduced base lengths in childhood a

possible indicator for dental crowding in adulthood if a positive correlation existed. Berg's research focused on class I malocclusion patients but more recently, Janson demonstrated weak to moderate correlation between the two variables in class II malocclusions as well [1].

Hence the present study was carried out with objectives to evaluate the amount of crowding and effective mandibular length in patients with class II malocclusion, also to compare the dental crowding and effective mandibular length in patients with class II malocclusion.

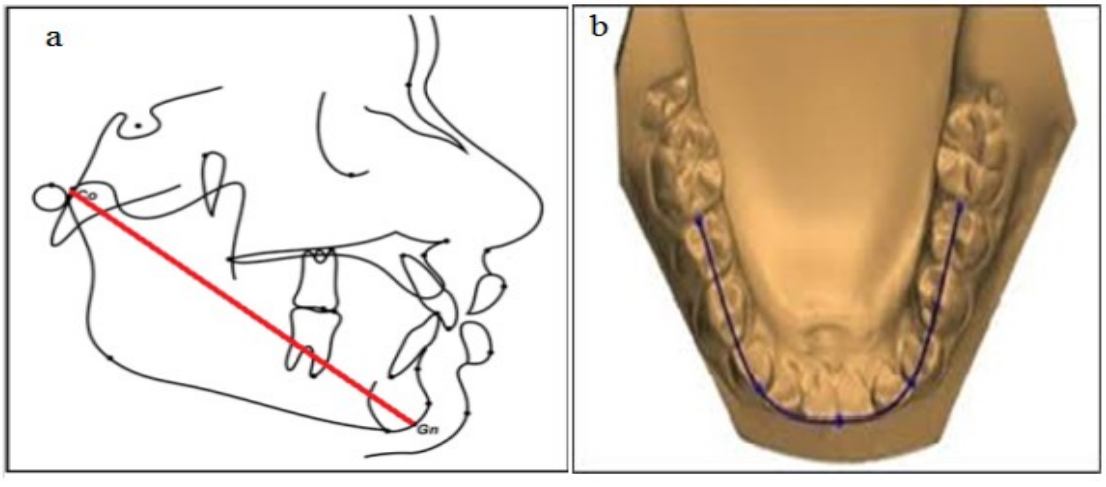
2. Materials and Method

After obtaining Institutional Ethic Committee approval and written inform consent from all the patients, present study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics, and Department of Oral Medicine and Radiology S.P.D.C., Wardha. Total 40 patients of age between 15 to 25 years were selected according to the inclusion criteria of a presence of all permanent teeth up to the first molars, class II malocclusion with no open bite and crossbite, absence of proximal decay, absence of dental anomalies of number, size, form and position. Patients with class I and class III malocclusion, craniofacial syndromes or systemic disease, neurological disorders, proclination in the mandibular dental arch and having no history of any orthodontic treatment were excluded from the study.

Complete history and clinical examination was done, upper and lower impressions were taken in Alginate (Lygin Chromatic, Dentamerica), poured in dental stone and casts were made for each patient. Patients were sent to the Radiology Department to obtain a lateral cephalogram by a single operator. Measurements were performed on pretreatment dental casts and lateral cephalograms.

Mandibular base lengths were measured on the lateral cephalograms by taking linear measurements from Condylion - Gnathion (Co-Gn, Figure 1).

Figure 1: a) Cephalometric Land Marks and Linear Measurement, b) Tooth material= greatest mesiodistal diameter



Co: Condylion; **Gn:** Gnathion; **Co-Gn:** Condylion to Gnathion

Arch length discrepancy (ALD) was calculated as the difference between the arch perimeter and the sum of tooth widths. The space available was measured as the arch perimeter from the mesial aspect of the permanent first molar to its antimere with a brass wire. Similarly, space required was measured as the sum of the individual tooth widths starting from the mesial aspect of the first permanent molar to its antimere using a digital vernier caliper with sharpened points. Negative values indicate crowding and vice versa. Comparison of both effective mandibular length and crowding was done for all the selected patients. All the patients were divided into two groups according to severity of mandibular crowding. Group 1 consisted of patients with crowding more than 3mm and Group 2 consisted of patients with crowding less than 3mm.

Data analysis was done. For the quantitative variables; age, mandibular effective length the mean and standard deviation were calculated. For the qualitative variables; sex and crowding, frequency and percentages were calculated. T-test was used to compare mean mandibular base lengths and dental crowding. P value of < 0.05 was considered significant.

3. Observations and Results

Total 40 patients of age ranged from 15-30 years were enrolled in the study with mean age of patients was 17.27±3.10 years. The maximum numbers of patients were in the age group of 15-20 years (90%). Out of 40 patients, 14 (35%) were males whereas 26 (65%) were females. Table 1 show the distribution of patients according to mandibular length and mandibular crowding and table 2 show the frequency of crowding among two mandibular crowding groups.

Table 1: Mandibular Length and Mandibular Crowding Distribution in both the groups

Co-Gn Length (mm)	Group 1 (n=20)		Group 2 (n=20)	
	Frequency (n)	Percent	Frequency (n)	Percent
<100	06	30	05	25
100-110	12	60	12	60
111-120	02	10	03	15
Mandibular crowding (mm)	**Frequency (n)**	**Percent**	**Frequency (n)**	**Percent**
1-5	20	100	06	30
6-10	00	00	12	60
11-15	00	00	02	10

Table 2: Frequency of Crowding (N=40)

Arch length discrepancy (mm)	Frequency (n)	Percent
Up to 3	20	50.0
>3	20	50.0

There was a statistically significant difference between mandibular base length and mandibular dental crowding, (p=0.0001) (Table 3), this show weak correlation between mandibular dental crowding and mandibular base length.

Table 3: Comparison of Means

Variable	Mean ± SD	Variable	Mean ± SD	P value
Mandible length	102.125±7.37	Mandible ALD	4.55±2.85	0.0001

One sample T-test P <0.05 is significant

Mean dental crowding was slightly higher in females as compared to males. Mean mandibular base length in males was 105.92±6.96 mm whereas in female was 100.07±6.75 mm. Mandibular base length was larger in males as compared to females (Table 4).

Table 4: Comparison of Means in both groups

Groups	Variable	Mean ± SD	Variable	Mean ± SD	P value
Group A	Mandible length	102.45±6.71	Mandible crowding	2.35±0.65	0.000
Group B	Mandible length	101.8±7.97	Mandible crowding	6.75±2.48	0.0012

4. Discussion

The cause of crowding is multifactorial; many attempts have been made to identify the most important factors involved, whether acting individually or in combination. It has been shown through the literature review process that dental diameters, [5-9] dimensions in width and length of dental arches [10-14] and the apical bases [15-19] are factors determining crowding in Class I malocclusion. One of the main goals of this study was to determine a correlation between mandibular base lengths with the severity of dental crowding among skeletal class II malocclusion.

The mean age of patient was 17.27±3.10 years. Fourteen patients were male while twenty six patients were female, thus the female predominance observed in the study. Analysis of the frequency of crowding revealed that 20 (50.0%) patients had crowding more than 3mm while 20 (50.0%) patients had crowding less than 3mm. Comparison of mandibular length and mandibular crowding was analyzed as; mean mandible length was 102.125±7.37 while mean mandible ALD was 4.55±2.85 and the P value was 0.0001 which showed that the mandibular length was highly significant in relation to the crowding. These mean values were in concordance with Janson et al [1] who proved the relationship between maxillary and mandibular effective lengths and dental crowding in patients with Class II malocclusions to be significant. Seipel [18] also observed small mandibular lengths in class II malocclusion patients in comparison to class I and normal occlusion subjects.

Khoja et al [20] proved dental crowding to be one of the most frequently encountered problems for an orthodontist. He concluded that mandibular base length was greater in males than females and an increase in amount of dental crowding was weakly associated with smaller skeletal base lengths. This is in concurrence to the present study. Numerous studies [7, 8,21-23] in the past have investigated the gender differences for dental crowding. Similar to the present study, Dorris et al [7] study did not find any significant difference for dental crowding between genders of subjects.

There was a weak correlation between the amount of crowding and mandibular base lengths. Based on the results of the present study, it can be speculated that mandibular base length (Co-Gn) would correlate to a given range of mandibular dental crowding. These results are similar to the results of previous studies conducted on samples with unspecified malocclusions [24,25]. Therefore,

effective lengths of the apical bases can be correlated to the amount of dental crowding independent of the type of malocclusion. The current results also suggest that besides tooth size and transverse arch dimensions, base length is also an important factor related to the amount of dental crowding, even in subjects with Class II malocclusion. Hence, this has to be taken in consideration during treatment planning. If dental crowding is mostly due to the first two problems and ranges from slight to moderate, treatment protocols such as inter-proximal stripping and/or arch expansion are more appropriately indicated.

5. Conclusion

The results of present study suggested that in addition to the several other contributing factors of dental crowding as investigated in the literature, mandibular effective length may also play a role in mandibular dental crowding. Therefore, during the selection of a suitable treatment strategy in patients presenting with varying severity of dental crowding, this factor should also be taken into consideration.

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