Research Article

ASSESSMENT OF DENTAL CROWDING

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ABSTRACT

Assessment of dental crowding from study models by two different methods is attempted. A method which can be taken up when large numbers of study model analysis is to be carried out, in an orthodontic academic setup for research and thesis purposes, is discussed here.

Keywords: Assessment of Crowding, Dental Crowding, Crowding Measurement, Arch Analysis, Study Model Analysis, Study Model Measurements, Lundstrom Method, Nance Method

INTRODUCTION

Well aligned teeth have a significant influence in the perception of beauty. Teeth in well aligned arches are one of the objectives of orthodontic treatment according to White, Gardiner and Leighton (1996). So, in orthodontic diagnosis and treatment plan, the dental crowding is assessed with utmost care, to get a valid and reproducible estimate of the dental crowding in an existing malocclusion. Study model analyses to estimate the dental crowding in an existing malocclusion, will be discussed here in this article.

Rationale: Various considerations in study model analysis in search for an accurate, less time consuming feasible method in assessing the dental crowding, where large numbers of study models have to be analyzed, esp in thesis and research purposes, led to this study.

Assessment of crowding or spacing, and setting up of a treatment plan, is a part of the general treatment protocol in the management of malocclusions aimed to normalize the dental functions.

Thirty plaster study models of adult orthodontic patients (15 males and 15 females) who reported to the Department of Orthodontics at the Govt. Dental College, Thiruvananthapuram, for orthodontic treatment purposes was selected. The inclusion criteria for this study were presence of bilateral Class II malocclusion with no open bite or cross bite; presence of all permanent molars. The exclusion criteria were presence of proximal decay or restoration, dental anomalies, and any previous orthodontic therapy. The study models of males and females were taken as a single group. This study was conducted in March 2013.

MATERIALS AND METHODS

Methodology

Two different study model analyses were carried out on the available study models, using the armamentarium required in each method. Digital vernier caliper was used in the Lundstrom method, Digital vernier caliper and brass wire and scale were used in the Nance method. Divider and scale was used for both the methods when the methods were studied using a divider and scale instead of the digital vernier caliper. In the Lundstrom method, measurement was done with digital veneer caliper (Figure 1) and with the brass wire for the Nance method (Figure 2, 3, 4). The methods were studied using a divider and scale also, instead of the digital vernier caliper (Figure 5a, 5b). Measurements were taken, the measurements were checked for intra observer and inter observer errors, and data analyzed statistically. The t value and p value were calculated.

The amounts of crowding in maxillary and mandibular arches were calculated by measurements performed on pretreatment study models. The mandibular crowding was calculated as the difference between the arch perimeter and the sum of tooth widths, in order to determine the difference between the space available and the space required for tooth alignment. The two measurements needed in the maxillary arch analysis were:

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1. Calculation of the space required, by measuring the mesiodistal tooth widths from permanent first molar on one side to the permanent first molar on the other side.

2. Calculation of the space available by measuring the arch perimeter. The arch perimeter measurements were made from the distal aspect of the permanent first molar on one side to the distal aspect of permanent first molar on the other side.

The amount of crowding was calculated as the difference between the sum of the tooth widths (space required) and the arch perimeter (space available), to get a positive value in millimeters which indicated crowding.



Figure 1: Lundstrom method



Figure 2: Using dividers



Figure 3: Nance brass wire method







with digital caliper

Figure 4: Nance brass wire Figure 5a, 5b: The scale, divider and the brass wire

Lundstrom segmental analysis was used was carried out in the following manner: The dental arch is divided in to six straight line segments, including two teeth per segment, starting from distal aspect of permanent first molar. The mesiodistal width of twelve teeth was also recorded.

Summing up the individual tooth width of each segment and recording the available mesiodistal space separately for each segment on the study cast was done. Finally the sum of the difference between the space required (ideal length) and the space available (actual length) in each segment expressed the crowding (space relationships). The measurements were carried out with digital vernier caliper. The same procedure was followed for space analysis in the permanent dentition for the maxillary and mandibular arches.

Nance method for analysis was carried out in the following manner: Recording of the space available in the permanent dentition by Nance method used the measurement of the actual arch length with the aid of soft wire. This wire contoured to the individual arch form, it crosses the contact point in the posterior region and it follows incisal edges anteriorly. Arch perimeter mesial to the permanent first molar is measured in Nance method. Measurement of the mandibular and maxillary arch lengths were carried out in a similar manner.

Measurements for maxillary and mandibular arch are to be made for determining the difference between the space required and space available. The following are the steps for Nance analysis.

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1. Ideal arch length - calculated as the sum total of mesiodistal width of each tooth mesial to the first permanent molar.

2. Measurement if the actual length was done using a soft wire. The wire is contoured to the individual arch shape and placed on the occlusal surfaces over the contact points of the posterior teeth and incisal edge of the anteriors. The distance between the mesial contact points of the first permanent molars-recorded from the straightened wire- is the amount of space available in the dental arch (actual arch length).

3. Assessment of the space relationship is calculated by difference between the ideal and actual length.

A negative value denotes space deficiency and a positive value denotes space excess.

But for this study the ideal arch length was taken by recording the mesiodistal width of tooth from the distal aspect of first permanent molars. The assessment of crowding done as the difference between the ideal and actual length to get a positive value (sum of mesio distal width- arch length).

RESULTS AND DISCUSSION

Results

1. There was no statistically significant difference between the Nance and Lundstrom methods of measurement (Table 1 and Table 2) whether it is by digital method or by the divider method In this study, the Lundstorm method used with digital caliper as it taking less time as compared to the

In this study, the Lundstorm method used with digital caliper as it taking less time as compared to the Nance method.

Group	Mean	+ SD	t value	P value
Lundstrom method -Digital	0.20	3.70	1.406	> 0.05
NANCE method -Digital	-1.21	4.05		

Table 2: Mean of the readings by the divider method

Group	Mean	+ SD	t value	P value	
Lundstorm method - Divider	3.39	4.86	- 1.982	> 0.05	
NANCE method -Divider	5.95	5.16			

Discussion

Different methods by Johal and Battagel (1997) and Panchal Ronak for study model analysis like the Nance method, Lundstrom (1960) method by Lundstrom (1960) etc are available to access dental crowding. This helps us to determine the amount of space that would be required for proper alignment of teeth in the respective arches for orthodontic procedures, to help in attaining a normal arch form and correct positioning of the teeth in the respective arches.

According to Rakosi (1993), study model analysis can be done using the Nance and Lundstrom methods. However, brass wire method to measure the arch perimeter/length is not always possible, especially in academic purposes when large number of study model analyses is to be done.

Various study model analyses are used in orthodontics to aid diagnosis and treatment plan. The amount of crowing measured from study models, along with the data from other study model analyses namely, the Ponts, Korkhus, Howes and Boltons, and data from other diagnostic aids aid in finalizing whether extraction of teeth is required or not in orthodontic treatment to attain favorable arch form, alignment, for improvement of dental function and esthetics, with stable occlusion.

Johal and Battagel (1997) made a comparison of three methods of assessment for dental crowding. Panchar assessed the dental crowding in the mandibular region by three different methods. Profitt and Henry (1993) also described methods in assessment of crowding. Leroy (1962) had conducted a longitudinal study of mandibular arch perimeter. Methods of measurements used in this present study to

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assess crowding are the Lundstrom and the Nance methods. Of these, the less time consuming method would benefit in a setup where a large number of study models are to be analyzed. The Lundstrom method with the digital calipers can be used.

Conclusion

The Lundstrom method of study model analysis done with digital verneer caliper is a reliable, less time consuming, reproducible method that can be employed for orthodontic evaluation for our academic and clinical needs, where a large number of study models are to be analyzed for crowding in the orthodontic perspective.

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