Original Article

COMPARISON OF DURATION OF LEVELING AND ALIGNING IN DIFFERENT TYPES OF CROWDING IN LOWER ANTERIORS

[1]Lasya Genji, [2]Remmiya Mary Varghese, [3]Aravind Kumar Subramaniyan

[1]Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India. Email : 151701058.sdc@saveetha.com

Telephone no. : +91 7995129797

[2]Reader, Department of Orthodontics and Dentofacial Orthopedics Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India. Email: remmiyav.sdc@saveetha.com

[3]Department of Orthodontics and Dentofacial Orthopedics Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences Saveetha University, Chennai, India

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Abstract

Alignment and leveling of teeth generally constitute the most important preliminary clinical phase of any orthodontic treatment with fixed appliances. Leveling is the process in which the incisal edges of the anterior teeth and the buccal cusps of the posterior teeth are placed on the same horizontal level; and alignment is the lining up of teeth of an arch in order to achieve normal contact point relationships.The aim of the present study is to compare duration of leveling, aligning of different types of crowding in patients presented with lower anterior crowding. We reviewed 500 case sheets among which 60 case sheets were selected which included an equal number of patients with mild, moderate and severe crowding and duration for leveling and aligning were recorded and exported to excel sheets then the data is analysed statistically using SPSS software. From the results it is shown that the majority of the mild crowding cases were levelled and aligned within a span of 6 months followed by moderate crowding, 28% of the cases showed to attain desired results within 8 months and in case of severe crowding it ranged between 1-1.5 years.

Key words: leveling; aligning; duration; lower anterior crowding; innovative study; innovative techniques.

INTRODUCTION

Each human facial part of the skull and dental arches undergo various major changes during adaptation to the environment along with growing age. Relatively extensive and rapid changes occur on the mixed dentition period when compared to the permanent dentition growth, that continues until till all the permanent teeth appear. Age-related changes within the dental arches do not stop with the onset of adult- hood, but continue at a slower rate, throughout the adult life (1). Growth of the jaws is another major cause for teeth crowding. Since the traditional times people explored the expansion characteristics of the face and observed that growth is an exclusive and constantly volatile process of every person. If the mandibular incisors are not liberal to move forward due to the restraining influence of the upper arch, it is likely that they are going to become retroclined and crowded because the mandible increases in size, the lips exert greater pressure than the tongue creating a lingually directed force. It counteracts mesial forces and causes incisor crowding(2). Surgeons were likely to believe that erupting third molars can be a cause for crowding in the anterior region, and were therefore more likely to recommend prophylactic removal of third molars to prevent crowding of the teeth (3)

Treatment for crowded dental arch on non extraction basis, with negligible tooth reduction requires increase in arch perimeter to resolve crowding and achieve optimum alignment and leveling (4). Without active distal

movement, there will be active transverse expansion and proclination of the arch and teeth (5). The consequences of alleviation of dental crowding by orthodontic arch alignment and levelling on arch dimensions and mandibular incisor position have been defined for typical preadjusted edgewise appliance systems (6,7).

Many studies have reported on the factors contributing to dental crowding. Harvold, focused on the effect of soft tissue pressure and reported that the volume and position of the tongue are related to dental crowding(8). Moss and Picton, reported that tooth inclination was influenced by cheek pressure (9). Leighton and Hunter and Keeling, reported on the relationship between dental crowding and the morphological characteristics of the mandible (10). In a longitudinal investigation, Richardson pointed out that anterior movement of the erupted first molar is important for the late lower arch crowding (11). Furthermore, the anterior component of occlusal force and anterior occlusion such as overjet or overbite are also known to be associated with crowding (12,13).

However, previous studies mainly focused on the extent of dental crowding (ie, irregularity index or arch length discrepancy) and rarely referred to its pattern, treatment approach and their duration of treatment. Also, most of the contributing factors were related to morphology, with only a few related to the functional aspects.The aim of the present study is to compare duration of leveling, aligning of different types of crowding in patients presented with lower anterior crowding. Individuals with dental crowding are the most frequent patients to be reported to the orthodontic clinic. Therefore, it is useful for the planning of orthodontic treatment and the knowledge on duration of procedure based on severity of crowding.

MATERIALS AND METHODS

Study design and study setting:
The present study was conducted in a university setting (Saveetha dental college and hospitals, Chennai, India). Thus the data available is of patients from the same geographic location and have similar ethnicity. The retrospective study was carried out with the help of digital case records of 30 patients who reported to the hospital. Ethical clearance to conduct this study was obtained from the Scientific Review Board of the hospital. The ethical approval number for the present study is

Sampling:
Data of 61 patients were reviewed and then extracted. All patients with trigeminal neuralgia in the given duration of time period were evaluated. Only relevant data was included to minimize sampling bias. Simple random sampling method was carried out. Cross verification of data for error was done by presence of additional reviewers and by photographic evaluation. Incomplete data collection was excluded from the study.

Data collection:
A single calibrated examiner evaluated the digital case records of patients who reported to Saveetha Dental College. For the present study, inclusion criteria. Data such as age, gender, mild crowding, moderate crowding, severe crowding and time taken for complete levelling and aligning was recorded based on the pictures available in the DIAS. All obtained data were tabulated into Microsoft excel documents.

Statistical analysis:
The collected data was tabulated and analysed with Statistical Package for Social Sciences for Windows, version 20.0 (SPSS Inc., Vancouver style) and results were obtained. Categorical variables were expressed in frequency and percentage. Chi square test was used to test association between categorical variables. Chi square tests were carried out using age, gender and as independent variables and dependent variables. The statistical analysis was done by pearson chi square test. P value < 0.05 was considered statistically significant

RESULTS AND DISCUSSION

All the required data was collected and analysed using SPSS software. About 33% were male and 66% were female. Among the total 60 study population 55% belonged to 10- 20 years, 35% belonged to 21- 30 years, 6% belonged to 31- 40 years and 3% belonged to 41- 50 years (Table -1).

In this study we observed the type of crowding based on its severity among different age groups. The results are as follows. In the age group between 10 to 20 years ,16.67% had mild crowding, 18.33% had moderate crowding and 20% had severe crowding. In the age groups between 21 to 30 years, 15% had mild crowding, 11.67% had moderate crowding and 8.33% had severe crowding. In age groups between 31 to 40 years 1.67% accounted for mild crowding and severe crowding, 3.33% had moderate crowding. In age groups between 41 to 50 years, 3.33% of the patients had only severe crowding. Correlation between age and type of crowding- chi square (p) =.02 -p value < 0.05 -stastistically significant (Graph -1).

In association to gender, the analysed data revealed that, 68.3% of the female patients with various severity of crowding tend to take long duration for aligning and levelling of crowded lower anteriors ie., 21.6% took 8 months, 18% took 1 year, 13% took 6 months 6% took 7 months 3% took 9 months and 1.5 year respectively. when compared to the male patients which is around 31.67% that is 11% took 1 year, 8.33% took 6 and 8 months and 1.67% took 7 and 10 months respectively. Correlation between gender and duration for levelling and aligning of crowded lower anterior teeth - chi square (p) = .01 -p value < 0.05 - statistically significant (Graph -2).

When correlation between type of crowding and time taken for levelling and aligning were analysed the results showed that 21.67% of the mild crowding cases are levelled and aligned within 6 months of time period whereas 8.3% of the cases took 7 months and 1.67% of the cases were aligned and levelled in a span of 8 and 10 months respectively. In the case of patients with moderate crowding it is shown that 28.3% of the cases were levelled and aligned within 8 months and 3.33% of the cases took 9 months and 1.67% took 10 months. In case of severe crowding leveling and aligning ranged between 1- 1.5 years. Correlation between type of crowding and time taken for levelling and aligning - chi square (p) = .04 -p value <0.05 - statistically significant (Graph -3).

The irregularity index and the depth of the Spee curve are both directly connected to the amount of space required for occlusal levelling and are thought to be important factors in determining the degree of crowding during alignment and levelling.(14,15)**.** Type of crowding based on its severity the time for levelling and aligning the teeth will take place.

To reach a rectangular stainless steel working wire in the mandibular arch, the researchers employed a three-to-four-wire sequence (similar to that used in the Mandall and Flores- Mir studies). This took an average of five months of vibration (AD) or seven months of vibration-free time (PAD). However, age plays an important role in the duration of the treatment in terms of levelling and alignment. The disparity between our findings and those of Ong and colleagues may simply confirm their hypothesis that the difference in tolerance between.022" and.018" slots was responsible for the difference in alignment rate—especially since subsequent wires were inserted as quickly as possible in both studies(16–18).

We did not collect progress reports at time points marking the completion of levelling and alignment because this was a retrospective investigation. The dental parameters can be used as a tool for accurate gender determination in orthodontic corrections. However very few studies have been reported on this particular section, gender has a vital role in the leveling and alignment of the teeth during orthodontic corrections(19–21).

Our team has extensive knowledge and research experience that has translate into high quality publications(22),(23),(24),(25),(26),(27),(28),(29),(30),(31),(32),(33) ,(34–38) (39),(40),(41)

CONCLUSION

Within the limitations of the study, it can be concluded that the majority of the mild crowding cases were levelled and aligned within a span of 6 months followed by moderate crowding cases, 28% of the cases showed to attain desired results within 8 months and in case of severe crowding it ranged between 1-1.5 years. There is a high incidence of crowding in age groups between 10-20 years who are seeking treatment and female patients tend to take a long duration for alignment and leveling when compared to male patients. These results suggest that the duration of correcting crowding can be useful information for treatment planning and achieving dental stability.

AUTHOR CONTRIBUTIONS
Dr.Lasya Genji, carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis.
Dr.Aravind Kumar Subramaniyan aided in conception of the topic, has participated in the study design, statistical analysis and has supervised the preparation of the manuscript.
Dr.Remmiya Mary Varghese has supervised and coordinated in developing the manuscript. All the authors have discussed the results among themselves and contributed to the final manuscript.

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Conflict Of Interest:
There was no potential conflict of interest.

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TABLES AND GRAPHS

Age	**Percentage**
10 - 20 years	55%
21 -30 years	35%
31 - 40 years	6.67%
41- 50 years	3.33%
Gender	**Percentage**
Male	33.3%
Female	66.6%

Figure -1: Bar graph shows association between Age and time taken for levelling and aligning. X axis represents Age and Y axis represents the time taken for levelling and aligning. Black colour denotes 6 months, dark blue colour denotes 7 months, orange colour denotes 8 months, grey colour denotes 9 months, light blue colour denotes 10 months , pink colour denotes 1 year and yellow colour denotes 1.5 years. Age group between 10-20 years has shown to have better and faster results in a span of 6 months when compared to other age groups.

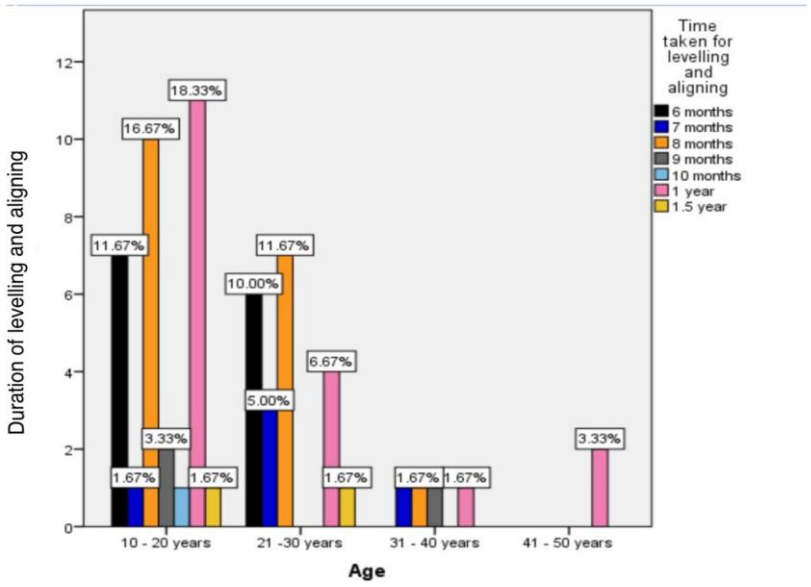


Figure - 2 Bar graph shows association between gender and time taken for levelling and aligning. X axis represents gender and Y axis represents time taken for leveling and aligning. Black colour denotes 6 months, dark blue colour denotes 7 months, orange colour denotes 8 months, grey colour denotes 9 months, light blue colour denotes 10 months , pink colour denotes 1 year and yellow colour denotes 1.5 years. Females showed to have better alignment and levelling in a short span of 6 months when compared to males.

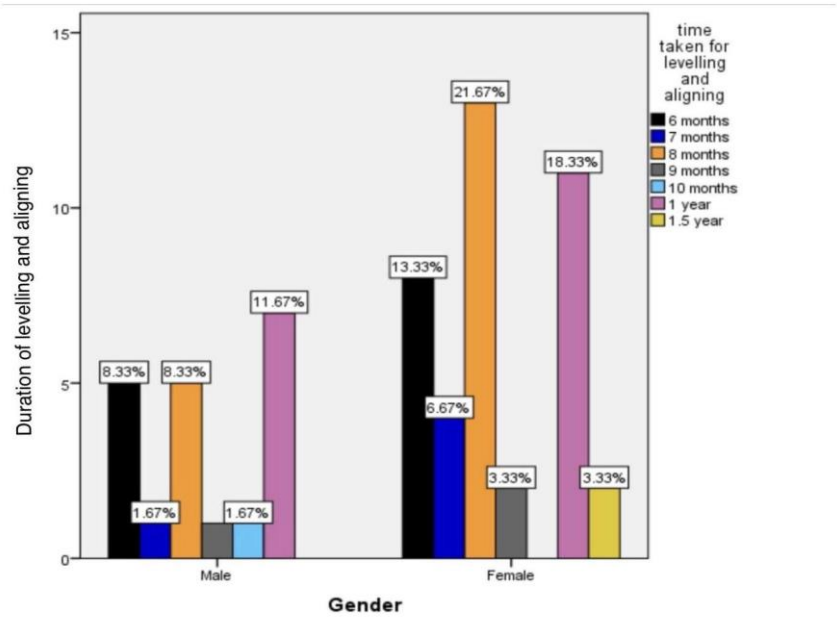
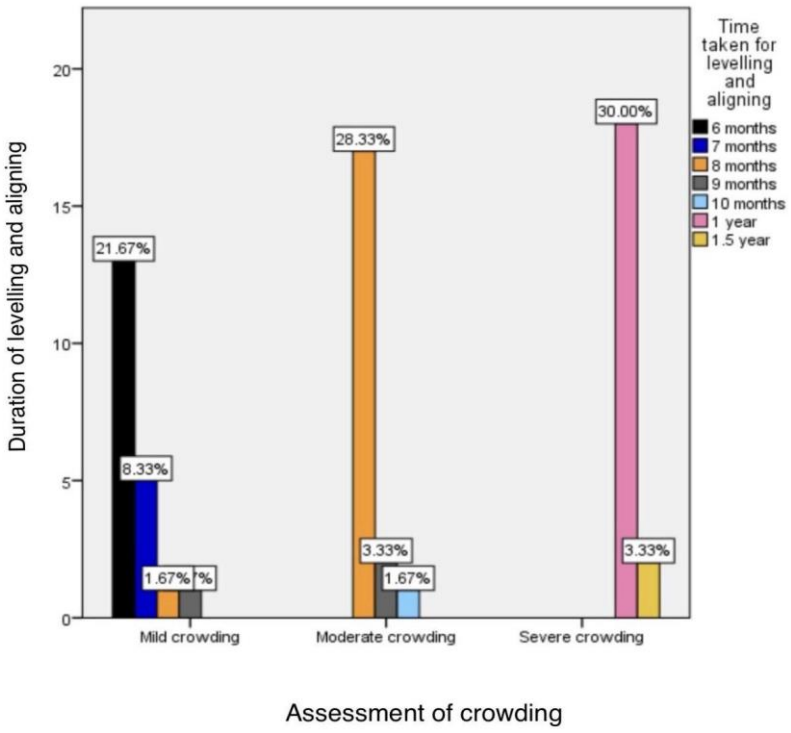


Figure - 3 Bar graph shows association between type of crowding and time taken for levelling and aligning. X axis represents type of crowding and Y axis represents time taken for leveling and aligning. Black colour denotes 6 months, dark blue colour denotes 7 months, orange colour denotes 8 months, grey colour denotes 9 months, light blue colour denotes 10 months , pink colour denotes 1 year and yellow colour denotes 1.5 years. It is evident that mild crowding tends to show faster results with a short span of treatment time when compared to moderate and severe crowding.



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