Improvement in Peer Assessment Rating scores after nonextraction, premolar extraction, and mandibular incisor extraction treatments in patients with Class I malocclusion

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Introduction: Different treatment protocols implemented for correction of Class I malocclusion aim at achieving ideal occlusal characteristics. This study was planned to evaluate the improvement in the occlusal characteristics of Class I patients treated with nonextraction (NE), all first premolar extractions (PME), and mandibular incisor extraction (MIE) as assessed by the percentage of improvement in Peer Assessment Rating (PAR) scores. **Methods:** This retrospective cross-sectional study was conducted on the pretreatment and posttreatment dental casts of 108 subjects with Class I malocclusion. The total sample was divided into 3 equal groups according to the treatment protocol implemented: NE, PME, and MIE. The mean pretreatment and posttreatment PAR scores, and the percentages of improvement were compared among the 3 treatment modalities using Kruskal-Wallis and post-hoc Dunnett T3 tests. **Results:** The mean percentages of improvement in the PAR score were 75.8% $\pm$ 25.8% in the NE group, 73.1% $\pm$ 19.4% in the PME group, and 70.6% $\pm$ 24.1% in the MIE group. There was no significant difference ($P = 0.351$) in the percentages of improvement in PAR scores among the 3 treatment modalities. However, the mean pretreatment and posttreatment PAR scores varied significantly ($P < 0.001$) in the 3 groups. The average pretreatment and posttreatment PAR scores were highest in the MIE group and lowest in the NE group. **Conclusions:** The comparable percentages of improvement in PAR scores among the 3 groups denote that equivalent occlusal corrections were achieved in Class I patients treated with the NE, PME, and MIE protocols. (Am J Orthod Dentofacial Orthop 2017;151:685-90)

Dental crowding is a common complaint of orthodontic patients.[1-4] Those with mild crowding can be treated with a nonextraction approach that usually requires expansion of the dental arches, proclination of the incisors, or interproximal enamel reduction. Moderate to severe crowding in the mandibular anterior region may be treated with the extraction of 1 incisor. The decision for interproximal enamel reduction or the extraction of 1 mandibular incisor is validated by the Bolton discrepancy between the size of maxillary and mandibular teeth.[5] However, a significant number of patients with severe dental crowding require extraction of all first premolars.[1,6] Although the decision to extract teeth for orthodontic purposes is based on the assessment of several hard and soft tissue parameters, the severity of dental crowding in the mandibular arch is a critical factor in the selection of a treatment protocol.[7-9] The extraction of all first premolars effectively reduces the tooth size arch-length discrepancy in patients with severe dental crowding.[9]

Achieving optimum occlusal relationships is 1 objective of orthodontic treatment. The improvement in occlusal characteristics can be objectively assessed by using an index that compares the pretreatment and posttreatment dental occlusions. Several indexes have been introduced to evaluate the outcome of orthodontic treatment; however, the reliability and validity of many

of these have not been assessed.[10] The Occlusal Index provides a universally acceptable approach to evaluate the occlusal characteristics based on standardized terminology, concepts, and methodology.[11] However, later studies have shown that the Occlusal Index does not adequately describe the diagnostic criteria and does not apply in patients with missing first molars.[12,13] Other indexes such as the Eismann index,[14] Eismann-Farčnik index,[15] Index of Orthodontic Treatment Need,[16] and recently developed indexes such as the American Board of Orthodontics Objective Grading System[17] and the Index of Complexity, Outcome and Need[18] have proved to be reliable tools for assessing the dental occlusion. Nevertheless, most of them have certain disadvantages such as complicated measurement techniques, poor reproducibility, and time-consuming methodology. The Peer Assessment Rating (PAR) index was introduced by Richmond et al[10] in 1992. They claimed that it is simple and easy to grasp and at the same time has acceptable reliability and validity. Over the last 2 decades, the PAR index has established itself as a credible tool of assessment of dental occlusion.

Cansunar and Uysal[19] reported that the occlusal outcome after all premolar extractions (PME) treatment may not be as good as nonextraction (NE) treatment for Class I patients. On the contrary, Illeri et al[2] found the posttreatment dental occlusion to be comparable in both treatment modalities. Studies have shown that the esthetic outcome and stability of NE and 1 mandibular incisor extraction (MIE) treatments are comparable, yet there is a generalized hesitation among orthodontists to use MIE treatment in Class I patients.[2,20] Claims have been made that MIE treatment results in a less ideal posttreatment occlusion because it leads to increased overjet and overbite, poor buccal segment occlusion, lack of canine guided occlusion, and poor esthetics.[21]

Various treatment protocols have been implemented for the treatment of Class I patients with a tooth size arch-length discrepancy. The NE, PME, or MIE treatment protocol may be implemented to achieve optimal occlusal characteristics. The aim of this study was to evaluate the percentages of improvement in PAR scores among the 3 treatment modalities. The null hypothesis was that there is no significant difference in the percentage of improvement in occlusal characteristics in Class I patients treated with NE, PME, and MIE.

MATERIAL AND METHODS

This retrospective cross-sectional study was conducted on pretreatment and posttreatment dental casts of patients at our dental clinics at Aga Khan University Hospital, Karachi, Pakistan. The sample was calculated using the PASS Software (NCSS, Kaysville, Utah) based on the findings of Illeri et al.[2] The power of the study was kept at 90%, and alpha was set as 0.05 for sample size calculation, which showed that a minimum of 36 subjects were required in each group. Since there were 3 treatment groups—NE, PME, and MIE—the overall sample comprised the dental models of 108 patients (36×3). The mean ages of patients at the start of treatment were 18.9 ± 4.1 years for the NE group, 19.2 ± 3.6 years for the PME group, and 19.0 ± 2.3 years for the MIE group.

Dental casts of patients of Pakistani origin, aged 18 to 35 years, having Class I malocclusion were included in this study. All patients were treated by a team of orthodontic residents under the supervision of 2 consultants (A.S. and M.F.) using straight-wire appliance 0.022×0.028-in Roth prescriptions in both arches; they were ideally planned for NE, PME, or MIE treatment. Treatment was finished when the orthodontist was satisfied with the occlusal outcome. Patients treated with other than the straight-wire appliance or a combination of different appliances, and those with the history of missing teeth, dentofacial trauma, or craniofacial syndromes were excluded from the study. The dental casts of patients who underwent interdental stripping were also excluded from the study.

The pretreatment and posttreatment dental casts for each subject were evaluated using the PAR index. All study models were scored by 1 trained and calibrated investigator (A.T.K.) for the alignment of the maxillary and mandibular anterior segments, left and right buccal occlusions, overjet, overbite, and dental center lines.[7,22,23] The maxillary and mandibular anterior segments extended from the mesial contact point of the right canine to the mesial contact point of the left canine. The buccal occlusion was assessed from the canine to the last molar. Displacements were recorded as the shortest distance between the contact points of adjacent teeth parallel to the occlusal plane. Overjet was measured from the most prominent maxillary incisor by keeping the ruler parallel to the occlusal plane. The maximum vertical overlap of the mandibular incisors by the maxillary incisors was regarded as the overbite.

Different components of the PAR index were scored, and British PAR weightings[24] were assigned as follows: the maxillary and mandibular anterior segments and the right and left buccal occlusions were multiplied by 1, overjet was multiplied by 6, overbite was multiplied by 2, and the centerline was multiplied by 4. The sum resulted in the weighted PAR score.[24]

To test for intraexaminer reliability, 30 pretreatment and posttreatment casts were randomly selected, their