Effect of premolar extractions on vertical dimension in borderline extraction case - A retrospective study

Swetha Sridharan, S. Aravind Kumar*

INTRODUCTIONS

Crowding within the dental arch is a common symptom found in most orthodontically treated patients. Therapy options include conservative methods such as the distalization of molars or the transversal expansion of the dental arch as well as the extraction of permanent teeth.[1] Whereas the extraction of carious teeth to solve space problems within the dental arch was proposed as early as 1771 by Hunter,[2] the benefits and necessity of systematic extractions of healthy and sound premolars as enforced by Tweed[3] are still a matter of controversy. Within the last decades, the indication of extraction treatment has come to be based on the individual situation of the patients.[4] The decisive criteria are generally considered to be dentoalveolar configuration, individual growth dynamics and especially the aesthetics of profile,[5,6] which have become increasingly important from a social perspective. Thus, cephalometric parameters evaluating the soft tissue profile such as the nasolabial relation or the esthetic line according to Ricketts, are commonly used for the evaluation of extraction therapy.[6,7] Today, the primary indication for extraction treatment is severe dental crowding due to a difference of tooth size and the size of the apical skeletal base.[8] In 80% of orthodontic patients, this occurs predominantly in the canine region[9] and is mainly treated by asymmetric extraction of the 1 or 2 premolars in all 4 quadrants.[10] Additional indications are a distinct sagittal overjet due to severe proclination of the upper incisors, which can be reduced by the space gained after premolar extraction,[8] as well as a severe open bite situation. The relative contraindications of extraction treatment are considered to be deep bite, horizontal growth type as well as a concave lip profile and a prominence of the nose. This consensus is founded on the general belief that loss of vertical dimension and a negative impact on facial profile have to be expected after premolar extractions.[11-13] Recently, we observed a trend in orthodontics to avoid premolar extraction despite its clear indication to solve primary crowding problems caused by a disharmony of tooth size and space.

ABSTRACT

Aim: Aim of this study is to investigate the short-term effects of systematic premolar extraction in borderline cases for extraction therapy on vertical dimension. Materials and Methods: Inclusion criteria: Overjet of 6–9 mm and crowding of >6 mm 50 had first premolars extracted, 50 were non-extraction patients. Patient selection by multivariate cluster analysis ensured homogeneity at baseline regarding dentoalveolar parameters. Parameter changes were determined with the models and compared between the extraction and non-extraction group. Results: The systematic extraction of premolars in borderline patients with a distinct sagittal overjet and crowding did not significantly influence vertical dimension. Discussion: We found that the vertical overbite increased slightly in the extraction patients while decreasing in the non-extraction patients. This group difference was also reported by Kinzinger et al. but could not be statistically validated in our study. Most studies on the contrary report a significant decrease of vertical overbite after premolar extraction. In most of these cases, however, the patients had an increased overbite at the beginning of treatment. Conclusions: The influence of premolar extractions on vertical dimension is often overestimated, since only slight changes in are to be expected. In integrated treatment planning, the extraction decision should not be primarily based on concerns about the aggravation of vertical dimension.

KEY WORDS: Borderline extraction, Integrated treatment, Premolar, Systematic extraction

Received on: 17-08-2018; Revised on: 19-09-2018; Accepted on: 25-10-2018
size of the skeletal base. Causes are presumably the desire to increase patient comfort by complying with the patients wish to avoid tooth extractions, often used as an economical marketing concept, and the insecurity of practitioners regarding the consequences of premolar extraction. In addition, orthodontists are increasingly confronted with advertisements of new bracket systems stating that orthodontists “can now treat most cases without extraction.”[14,15] Tang et al.,[16] however, who studied the success of one of these systems in extraction and non-extraction cases, found that in all non-extraction cases, diagnosed with the need for premolar extraction, the orthodontic treatment outcome had to be considered unsuccessful. In the light of this development and the still controversial discussion about the repercussions of extraction therapy,[10,11,17-19] particularly in borderline patients for extraction or non-extraction therapy, the present study investigated the short-term effects of a extraction of all four premolars in borderline patients for extraction therapy with an increased sagittal overjet (5–9 mm) and severe dental crowding (>6 mm), especially on the vertical dimension and the facial soft tissue profile. We aim to give evidence-based data regarding the repercussions on cephalometric and facial parameters to aid orthodontists in the difficult orthodontic extraction decision when faced with borderline cases for extraction therapy.

**MATERIALS AND METHODS**

For a meaningful comparison of the effects of extraction versus non-extraction treatment on facial profile, a high degree of homogeneity is necessary regarding the patient collective, especially with respect to the parameters age and type of growth, to minimize their confounding influence and to gain generalizable results. Inclusion criteria were as follows: Complete diagnostic records, no preceding or ongoing orthodontic treatment at baseline exam, no lack of tooth germs or permanent teeth as well as the absence of congenital anomalies relating to the dentition and craniofacial growth. We defined borderline cases for extraction/non-extraction treatment according to an overjet between 5 and 9 mm and a total crowding of over 6 mm, which were determined by an orthodontic study model analysis by means of a digital caliper. Based on the above-mentioned criteria, the sample size was 10 patients with non-extraction treatment (age 2.1 ± 1.3 years) and 10 with extraction treatment of all 4 premolars (age 11.8 ± 1.2 years) were selected of both sexes between 9 and 15 years of age at baseline (equally distributed between groups) that showed the least discrepancies in cephalometric parameters. All the subjects have had labial orthodontics with 0.022” slot. Space closure was performed throughout with sliding mechanics using the MBT system (buccal braces, 0.022” slot) in combination with a rectangular
there were no dropouts. Thus, no missing data and no loss to follow-up had to be addressed. The extraction group consisted of 10 patients with ages between 9.6 and 14.1 years. The non-extraction group comprised 10 patients between 9.1 and 14.2 years of age. The age median was in both groups 11 years and 50% of the patients of each group were between 10 and 12.4 years of age (interquartile range). The surveillance period coinciding with the period of orthodontic treatment was 2.4–4.9 years (median 2.9 years) for the extraction group and 2.6–4.5 years (median 2.8 years) for the non-extraction group. Method error as calculated by Dahlberg’s formula was between 0.32 mm and 0.68 mm. The vertical overbite showed a significant decrease only within the non-extraction group.

DISCUSSIONS
Our study evaluated the short-term effects of systematic extraction of all four premolars in juvenile borderline patients for extraction treatment with an increased sagittal overjet and severe dental crowding. We found that the vertical overbite increased slightly in the extraction patients while decreasing in the non-extraction patients. This group difference was also reported by Kinzinger et al. but could not be statistically validated in our study. Most studies, on the contrary, report a significant decrease of vertical overbite after premolar extraction. In most of these cases, however, the patients had an increased overbite at the beginning of treatment.

CONCLUSION
Systematic premolar extraction in patients with a pronounced sagittal overjet (6–9 mm) and crowding >6 mm does not lead to a significant reduction of
vertical dimension compared to non-extraction treatment (control) in the short term. The influence of premolar extraction on facial profile and vertical dimension is generally overestimated and should not be the decisive argument for non-extraction treatment.

REFERENCES

22. Basciftci FA, Usumez S. Effects of extraction and nonextraction treatment on class I and class II subjects. Angle Orthod 2003;73:36-42.

Source of support: Nil; Conflict of interest: None Declared