Occlusal characteristics of Class II division 1 patients treated with and without extraction of two upper premolars*

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Abstract

Introduction: The purpose of this study was to identify initial occlusal characteristics of Class II, division 1 patients treated with and without extraction of two upper premolars. **Methods:** For this purpose, 62 patients presenting with Class II, division 1 malocclusion were selected and divided into two groups according to treatment type. Group 1 consisted of 42 patients (23 females and 19 males) with a mean age of 12.7 years, who were treated without extractions, with fixed appliance and headgear. Group 2 was composed of 20 patients (6 females and 14 males) with a mean age of 13.5 years, also treated with fixed appliance combined with the use of headgear, but Group 2 treatment plan indicated the extraction of two premolars. In order to observe initial and final occlusal characteristics as well as changes throughout treatment the Treatment Priority Index (TPI) was used. TPI values were subjected to statistical analysis by the independent t-test to compare variables between groups. **Results and Conclusions:** The results showed that the degree of initial malocclusion was different in the two groups when assessed by the TPI, which was higher in the group treated with extraction of two upper premolars.

Keywords: Extraction of premolars. Class II, Division 1. Orthodontics.

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INTRODUCTION

The treatment of Class II malocclusion is widely discussed in the literature. Such interest is justified by the fact that most orthodontic patients present with Class II malocclusion.[12] A broad array of resources is therefore available for Class II treatment. Indication depends on the particular characteristics of each case, orthodontists' preference and patient acceptance.

One form of Class II, division 1 treatment is the use of fixed appliances associated with the use of extraoral appliances, combined or not with extractions. Should an orthodontist opt for a treatment without extractions, he will be confronted with mechanical difficulties in anteroposterior correction due to the influence of craniofacial growth and development.

Observation shows that Class II, in patients whose growth is nearing its end or who have stopped growing, a significant distal movement is required for molar correction. In these cases, patient compliance can prove essential for a successful treatment. Another treatment option involves the extraction of two upper premolars. It has been speculated that the success of non-extraction Class II treatments is associated with the severity of the anteroposterior discrepancy in the malocclusion.

Therefore, in order to investigate this speculation, the following null hypothesis will be tested: there is no difference between the initial occlusal characteristics of Class II, division 1 patients treated with and without extraction of two upper premolars.

MATERIAL AND METHODS

Material

Sample description

To evaluate both the initial characteristics and the occlusal improvements achieved by patients with Class II division 1 malocclusion, a sample was drawn from a total of two hundred and thirty patients, from the files of the Department of Orthodontics, School of Dentistry of Bauru, University of São Paulo. All subjects had been referred for orthodontic treatment to the students attending the Specialization Course in Orthodontics and Facial Orthopedics, starting in the years 1995 and 1997.

The sample consisted of a total of 62 patients divided into two groups according to their treatment modalities.

Group 1 consisted of 42 patients with Class II, division 1—19 males and 23 females, mean baseline age of 12.7 years—who were treated without extractions.

Group 2 was comprised of 20 patients—6 females and 14 males, mean baseline age of 13.5 years—also presenting with Class II, division 1 malocclusion, treated with the extraction of two upper premolars.

The additional criterion for inclusion in the sample was the requirement that their treatment be considered successful according to an analysis of the final models.

Methods

Data from the plaster study models

To evaluate the initial and final occlusal characteristics and their changes the Treatment Priority Index (TPI) developed by Grainger[6] was used, which is based on a sum of weights assigned to each type and degree of malocclusion severity.

Statistical Analysis

Method error

To assess the reliability of the results we repeated the measurements in 20 randomly selected patients. We used the paired t-test, introduced by Houston,[8] to detect systematic errors. The formula ($Se^2 = sum\ d^2 / 2n$), proposed by Dahlberg,[3] was applied for the assessment of random errors.

Statistical Analysis

We used Student's t-test to compare the indices found for each group. The groups' final indices were compared to assess their compatibility.

RESULTS

The results are presented in Tables 1, 2 and 3.

TABLE 1 - Mean ages of groups 1 and 2.

Groups	Mean age (years)	N
1	12.7	42
2	13.5	20
Total	13.8	62

TABLE 2 - Gender distribution in Groups 1 and 2.

Groups	Female	Male	N
1	23 (54.76%)	19 (45.24%)	42
2	6 (30.0%)	14 (70.0%)	20
Total	29	33	62

TABLE 3 - Results of Student's t-test for the comparison between Group 1 and Group 2 measurements, obtained from the study models.

Measures TPI	Group 1 (n=42)		Group 2 (n=20)		t	P
	$\bar{X}$	SD	$\bar{X}$	SD		
TPI final	1.74	0.97	1.35	1.13	1.40	0.167
TPI initial	5.94	2.17	7.12	1.09	-2.30	0.025*
TPI f-i	-4.20	2.52	-5.77	1.40	2.59	0.011*

(*) Statistically significant difference ($p < 0.05$)

DISCUSSION

Sample description

In order to minimize any bias that might arise in terms of treatment plan orientation and also to ensure that our sample was as recent as possible, the subjects were selected from patients referred for orthodontic treatment to students attending two consecutive specialization courses in orthodontics at the Department of Orthodontics, School of Dentistry of Bauru, which began in 1995 and 1997 and consisted of two hundred and thirty patients. Of this total, seventy-eight cases were classified as Angle Class I malocclusion cases, one hundred and forty-four, Class II and eight, Class III. Therefore, 62.6% of the total sample were Class II malocclusions, which confirms the high demand for treatment of this patient population.[7,4,5]

Among the Class II cases there were ten Class II, division 2 cases and thirty-four Class II, division 1 cases, who had a choice of several different treatment approaches. Fifty-eight cases were initially treated without extractions. Four subjects dropped out of treatment and some changes were made to the initial planning. Two cases were treated with extraction of one upper premolar, seven cases with extraction of two upper premolars and three cases with extraction of four premolars. Thus, only forty-two patients had their treatment completed without extractions. The extractions were introduced in the initial planning of the cases. In six cases, one premolar was extracted, in thirteen cases, two premolars, in eight cases combinations of three premolars were extracted, in thirty-one cases combinations of four premolars and in six cases combinations in which one or more first permanent molars were extracted. There was also one case involving the extraction of an upper right canine and in another case the upper lateral incisors were extracted. Among Class II, division 1 patients, we found four cases with agenesis, two with dental absence and four patients who did not use fixed appliances and underwent interceptive treatment only.

The patients our study focused on were those who had extractions indicated in their treatment plans or had had only the first two upper premolars extracted, as described below: (a) Patients treated without extractions, who were accepted because they produced comprehensive orthodontic documentation consisting of records, models and radiographs; (b) patients whom we initially planned to treat without extractions using the standard and pre-adjusted edgewise technique; (c) patients who had used headgear and who may or may not have used a functional appliance; (d) patients without

agenesis or loss of permanent teeth, who had completed the treatment. After applying the criteria above, we were left with forty-two patients (Group 1). Group 2 comprised twenty patients: (a) patients treated with extraction of the first upper premolars, who were also evaluated according to the same criteria; (b) patients whose treatment plans included the extraction of the first upper premolars and were treated using the standard or pre-adjusted edgewise technique, who may or may not have used headgear or a functional appliance; (c) patients who did not present with agenesis or loss of permanent teeth and had completed the treatment.

It was noted therefore that in the course of treatment without extractions a few patients had their treatment plans changed mainly due to the fact that treatment without extractions requires considerable patient compliance[1,2,9,10,11]. Extraction of the first upper premolars was the most prevalent treatment modality, accounting for 12.0% of all cases.

Group compatibility

The groups were compatible by the end of treatment, demonstrating that all were completed successfully. This is attested by the absence of statistically significant difference between the final TPI values of the two groups.

Discussion of occlusal results

The plaster models provided both baseline and final TPI values. The mean baseline TPI value for Group 1 was 5.94, indicating "definite malocclusion requiring elective orthodontic treatment".[6] The mean value for Group 2 reveals severe malocclusion "requiring highly desirable treatment" (Table 3).

A comparison of the baseline TPI values yields a statistically significant difference, which shows that the severity of Group 2 was greater than that of Group 1 and points to an increased difficulty in correcting severe Class II cases without extractions. From a practical point of view, the results suggest that orthodontists should not expect to correct severe Class II discrepancies without extractions. In order to achieve greater planning efficiency, professionals should only correct mild discrepancies without extractions and opt for the extraction of two upper premolars when discrepancies are moderate to severe. It might be added, in support of this argument that treatments involving the extraction of two premolars have been shown to provide greater change in indices (TPI values) between the beginning and end of treatment.

CONCLUSIONS

The null hypothesis was rejected because the degree of initial malocclusion assessed by the TPI in the group treated with the extraction of two upper premolars was higher than in the group treated without extractions.

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