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Research Report

A Comparison of class I malocclusion treatment outcomes with and without extractions using an ABO grading system for dental casts and radiographs

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ABSTRACT

Background: *Class I malocclusion can be treated with or without resort to extraction. However, despite the indications, a controversy is still ongoing as to whether one option is preferable to another. One of the most frequent controversies centers on whether treatment involving extractions will produce superior results than treatment not culminating in extraction.* ***Purpose:*** *This study aimed to compare the results of treating class I malocclusion with extractions and those without extraction using an ABO grading system.* ***Methods:*** *Comparing ABO scores in patients' dental casts and radiographs with class I malocclusion with and without extraction. Observational research incorporating case control methods was conducted involving 40 patients with class I malocclusion. Samples were divided into two groups, one treated with extraction (group E) and the other without extraction as the control group (K). The results of the treatment were measured and assessed using eight variables of the ABO Grading System.* ***Results:*** *The total score for the group treated with extractions was 23.65±7.82, while that for group K was 26.50±7.02. There was no significant difference in the total score between the two groups. Nevertheless, class I malocclusion treated with extraction had a lower score than without extraction.* ***Conclusions:*** *There was no difference in the total score of the ABO grading system for class I malocclusion patients treated with and without extractions.*

Keywords: *class I malocclusion; extraction; non extraction; grading system ABO*

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INTRODUCTION

There has been an increase in the prevalence of malocclusion over the last few decades, constituting, in addition to dental caries, periodontal diseases and dental fluorosis, one of the most common dental problems. In Tanzania, 93.6% of 1.601 children with an average age of between 12 and 14 years presented the class I molar relationship and 63.8% of the population had at least one anomaly.[1] The patterns of skeletal and dental malocclusion in 602 orthodontic patients in Saudi Arabia revealed that the most common pattern of skeletal malocclusion was the Class I variety at 51.7%.[2] Meanwhile, the prevalence of Class I malocclusion in the Deutro-Melayu Indonesian population was 48.8%, class II 33.1% and class III 18.1%.[3]

Class I malocclusion treatment can be performed with or without extraction. Controversies over the resort to extraction have been ongoing since the beginning of the 20th century. In attempting to arrive at treatment-related decisions as to whether or not to perform extractions, there several factors require consideration, including: occlusion stability, as well as the characteristics of dental arches and facial aesthetics. Moreover, the resulting effects on the dentofacial complex also need to be explained.[4,5]

The extent to which orthodontic treatment is believed to prove successful still varies among clinicians. Efforts to reduce the degree of subjective assessment of particular malocclusion include the use of a particular malocclusion

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index during the conducting of assessments. This can be employed to objectively assess the severity of the malocclusion and the degree to which the treatment will be successful.[6]

A grading system represents a parameter for the success of orthodontic treatment proposed by the American Board of Orthodontics (ABO) in 1999. This parameter assesses the efficacy of treatment on the research model and the panoramic radiography. There are eight criteria to be assessed within this parameter, namely: alignment, marginal ridge, buccolingual inclination, occlusal relationship, occlusal contact, overjet, interproximal contact, and root angulation.[7,8]

This study aimed to compare the results of the treatment of class I malocclusion with extractions and control using the ABO grading system. It involved comparing eight ABO parameters and the total ABO score for both treatment groups.

MATERIALS AND METHODS

For the purposes of the retrospective research, measurements were performed on 20 samples of dental casts and radiographs for each group taken from Dental Hospital, Faculty of Dentistry, Universitas Sumatera Utara. Ethical approval was obtained from the Ethical Comittee Faculty of Dentistry Universitas Airlangga. The inclusion criteria comprised: class I malocclusion, A point–nasion–B point angle (ANB = 2° ± 2°), complete teeth (except the third molars), the absence of growth abnormalities, treatment performed using standard edgewise brackets and no history of oral cavity trauma. The eight grading system parameters were measured in accordance with standard ABO measurement using an ABO measuring gauge (Figure 1 and 2). Measurement was performed on the research model whose treatment and panoramic radiography of each sample had been completed. The total measurement results were subsequently calculated, with the treatment being deemed successful if the total score of each sample was ≤27. The sample of each group was classified into one of two categories, namely; successful or unsuccessful. Each parameter was measured by two raters and thereafter, the inter-rater reliability was examined. Inter-rater reliability was determined by means of Cohen's Kappa. Differences between the groups were examined using the Mann-Whitney test with a confidence level of 0.05.

Figure 1. ABO measuring gauge.[8]

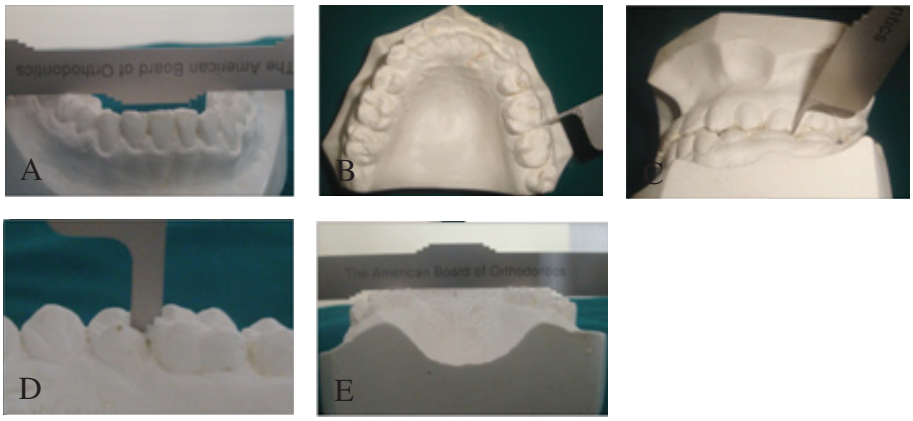

Figure 2. Measuring with ABO measuring gauge. (a) Measuring buccolingual inclination of mandibular molars (b) measuring alignment of molar (c) measuring overjet in posterior segment (d) measuring marginal ridge (e) measuring buccolingual inclinations of maxillary molar.

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RESULTS

Cohen's Kappa as an inter-rater reliability test generated 100% similarity for the two observers. The success of the treatment given to the group subjected to extractions and the control group was equal at 60%. The Mann-Whitney test for the total score suggested that the group treated with extractions and the control group were not significantly different (p=0.15; p>0.05) (Table 1).

A Mann-Whitney test was conducted for each parameter to examine differences between the group treated with extractions and the group treated without extractions (Table 2). The test results showed that the significant difference was found only in the parameter marginal ridge (p=0.03; p <0.05). Nevertheless, overall, each parameter of group K had a higher mean than the parameters of group E (Figure 3).

DISCUSSION

Selection of treatment for patients with class I malocclusion involving the use or otherwise of extractions has raised controversies among clinicians. Selection of extraction-based treatment requires careful consideration of various aspects, including: the facial profile and the crowding level prior to treatment.[9]

A considerable volume of research comparing extraction-based treatment to that without extractions has been conducted.[10,11] One factor affecting the duration of orthodontic treatment is extractions. Patients undergoing extractions will require orthodontic treatment of longer duration those whose treatment does not include this procedure. The length of the treatment is also associated with the number of teeth extracted. The treatment in patients requiring the extraction of four premolars is of longer duration than that of patients who need two premolars to be removed.[10]

Treatment of malocclusion is successful if the ABO score is 27 or less.[7,8] Overall, the mean of the results of the class I skeletal malocclusion treatment was equal to 23.65 ± 7.82 for group E and 26.50 ± 7.02 for group K. The results of both E and K groups suggest that the treatment of Class I malocclusion among orthodontic patients treated in the orthodontic department of Faculty of Dentistry Universitas Sumatera Utara proved successful. The results also indicate that, overall, treatment group K had a higher score than group E.

Table 1. Differences in the total score between the group treated with extractions and the group treated without extractions

Variable	Treatment	Total score		*p-Value*
		Mean	SD	
Score	with extractions	23.65	7.82	0.15
	without extractions	26.50	7.02	

Table 2. Differences in the scores for the mean and the standard deviation of each variable receiving treatment with extractions and treatment without extractions

Variable	Treatment	Mean ± SD	*p-Value*
Alignment	extractions	1.65 ± 1.69	0.12
	non extractions	2.55 ± 1.93	
Marginal ridge	extractions	3.30 ± 2.47	0.03*
	non extractions	4.35 ± 1.35	
Buccolingual inclination	extractions	2.90 ± 1.89	0.37
	non extractions	3.65 ± 2.41	
Overjet	extractions	5.10 ± 3.06	0.41
	non extractions	6.40 ± 3.97	
Occlusal contact	extractions	1.70 ± 1.63	0.46
	non extractions	2.45 ± 2.56	
Occlusal relationship	extractions	4.85 ± 3.18	0.89
	non extractions	4.80 ± 3.04	
Interproximal contact	extractions	1.20 ± 1.67	0.34
	non extractions	0.75 ± 1.29	
Root angulation	extractions	2.20 ± 1.64	0.74
	non extractions	2.30 ± 1.59	

* Significant according to the Mann-Whitney Test. $p<0.05$

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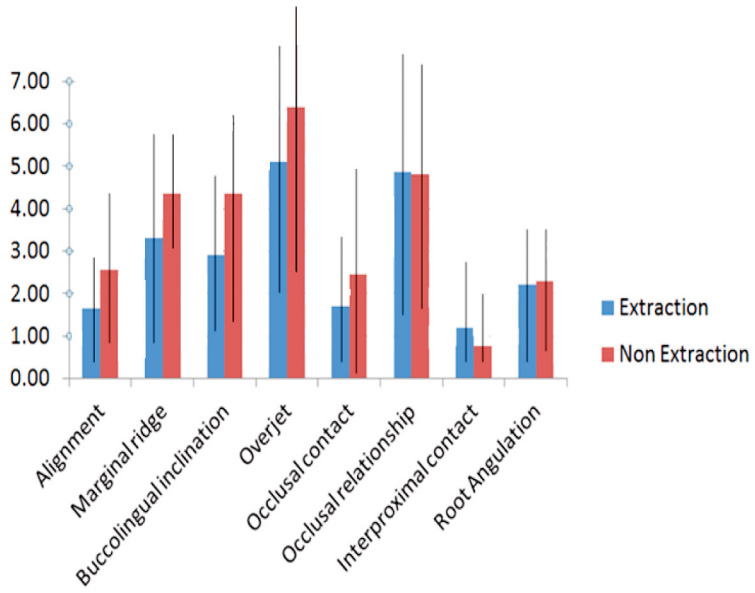

Figure 3. Differences in the mean of each variable for the group treated with extractions and the group treated without extractions.

Long-term research to determine the respective effect of treatment with and without extractions argued that post-treatment changes in both groups were the same. The results of treatment involving the extraction of differing numbers of premolars suggest that patients having two premolars removed enjoyed superior results than their counterparts undergoing the extraction of four premolars.[10,12]

The research reported here revealed no significant difference between the two groups. It is consistent with the research conducted by Anthopoulou, there are no significant differences in dental alignment, symmetry of the median line, overjet, overbite and posterior occlusion.[12] In the present research, the marginal ridges of group E and group K were significantly different. This was because in group K the second molar was not included in the treatment. Consequently, the marginal ridge between the first and second molars was not corrected. Meanwhile, the variable overjet in both groups generated the highest score; 5.1 for group E and 6.4 for group K. This was because the treatment in both groups was performed using standard edgewise brackets which do not exert any torque control, especially on the posterior segment. Treatment using brackets prescribed by Roth results in better posterior tooth angulation than does the treatment using standard brackets. Therefore, it is crucial for clinicians to pay more attention to torque, especially on the posterior segment, in order to avoid large overjet.[8]

Within the present research, the interproximal contact generated the lowest scores, namely 1.2 and 0.7 for E and K groups respectively. This suggests that space closure was the most basic problem which orthodontists might overcome with little difficulty. The variable alignment, marginal ridge, occlusal contacts, buccolingual inclusion and overjet had higher values in group K than in group E, although the significant difference was present only in the variable marginal ridge. This may be because, in the case of group E, clinicians had more room to adjust the position of the teeth so as to create the better position and interdigitation than those of group K.

In this research, group E produced better scores than group K. However, in the case of class I malocclusion, extractions are not a decisive factor for satisfactory treatment outcomes in the event that only the eight parameters of the grading system are taken into account. Overall, group E generated lower scores than group K. The significant difference was only found in the variable marginal ridge. In conclusion, there was no difference in the total score of the ABO grading system for class I malocclusion patients treated with and without extractions.

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