Relationship between Orthodontic Treatment Outcome and Patient Satisfaction

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Abstract

The increasing demand for orthodontic treatments requires high-quality orthodontic care services. Quality of treatment can be assessed objectively with occlusal indices and subjectively with patient satisfaction evaluations. **Aim**: To evaluate the relationship between orthodontic treatment outcomes and patient satisfaction at the dental hospital of the Faculty of Dentistry in the University of Indonesia (RSKGM FKG UI). **Method**: The researchers recruited 55 patients (16 males and 39 females). The inclusion criteria were the following: patients who had completed orthodontic treatment with complete post-treatment study models and panoramic radiographs. This study used a validated questionnaire consisting of 16 questions about patient satisfaction with their orthodontic treatment outcome. The researchers analyzed the study model and panoramic radiograph with the American Board of Orthodontics model grading system (ABO-MGS). **Results**: 56.36% of orthodontic treatment outcome scores at RSKGM FKG UI were in the range of 20–30 according to ABO-MGS. The highest component score was alignment (6.72 ± 2.30) and the lowest component score was interproximal contacts (5.01 ± 3.14). The mean values for satisfaction with treatment outcomes were generally high (5.99 ± 0.52). Respondents scored highest on items about alignment (6.10 ± 0.55) and lowest on items regarding the marginal ridge (5.71 ± 0.98). There was no significant correlation between orthodontic treatment outcome score and patient satisfaction with treatment outcomes. **Conclusion:** Orthodontic patients at RSKGM FKG UI were satisfied with their orthodontic treatment outcomes, even though the ABO-MGS scores were not all good.

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Introduction

Malocclusion has a high prevalence around the world, including Indonesia.[1] The high prevalence of malocclusion is in line with the increasing demand for orthodontic treatment. The number of patients seeking orthodontic treatment in the orthodontic clinic of the Faculty of Dentistry's dental hospital at Universitas Indonesia (RSKGM FKG UI) increased from 245 patients in 2013 to 289 patients in 2014.

The Faculty of Dentistry, Universitas Indonesia, is an educational center located in Jakarta with an orthodontic specialist program where scholars are hoped to provide orthodontic treatment with quality results. RSKGM FKG UI is an academic hospital used as a field of education for future dentists and specialists.

Quality of care is defined as the quality of the implementation and the provision of health care.[2] The quality of orthodontic treatments can be evaluated objectively and subjectively. Objective evaluation usually uses an occlusal index, a standard measurement method. Subjective assessments are related to the patient's satisfaction about three aspects in treatment; specifically, structure, process, and treatment result.[3]

An occlusal index is a measuring tool used to numerically and categorically assess malocclusion, orthodontic treatment need in society, and malocclusion severity, and to evaluate orthodontic treatment progress.[4] Many occlusal indices have been developed in the orthodontic field, such as the peer assessment

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rating (PAR); the index of treatment need; the dental aesthetic index; and the index of complexity, outcome, and need.[5,6] Most of them are more suitable for measuring treatment need rather than evaluating orthodontic treatment outcomes. Because of this, in 1994, the American Board of Orthodontics (ABO) began to formulate a precise method for evaluating study models and panoramic radiographs after orthodontic treatment called the model grading system (MGS).[7]

The ABO officially began to use a new assessment system, called the objective grading system, in a case report selection in February 1999. The name of this method was officially changed to MGS in 2007. The ABO-MGS evaluates dental study models and panoramic radiographs through eight components/criteria, as follows: alignment, marginal ridges, buccolingual inclination, occlusal relation, occlusal contact, overjet, interproximal contacts, and root angulation.[9] The ABO-MGS method has been used in many studies, has been proven valid, and can be used without special training.[10-13]

The subjective assessment that is usually used to evaluate treatment quality is assessing the patient's satisfaction about the treatment result. Patient satisfaction can be defined as how well the treatment met the patient's expectation.[14] Subjective measurements of orthodontic treatment quality can be done using valid questionnaires.[15] Some studies have used questionnaires as a measuring tool to evaluate patient satisfaction, including aspects such as structure, process, and orthodontic treatment result.[16]

Many questionnaires have been developed in other studies about patient satisfaction post-orthodontic treatment. Those studies used different questionnaire models and measuring scales. Some of those studies modified a questionnaire model named the post-surgical patient satisfaction questionnaire (PSPSQ), which was introduced by Kiyak et al.[17] This questionnaire consists of 22 questions about patients' expectations and satisfaction after orthognathic surgery. They used a 1 to 7 scale of measurement with the labels "No Discomfort" at levels 1, 2, and 3; "So-so" at level 4; and "Much Discomfort" at the levels 5, 6, and 7.[17] A study by Bos et al. used a patient satisfaction questionnaire with 58 questions divided into 6 components: dentist-patient relationship, situation aspect, dentofacial correction, dental function, psychososial improvement, and other categories. The scale used was 1 (strongly disagree) to 6 (strongly agree). Some years after, Keles and Bos used the same questionnaire with a scale of 1 (strongly disagree) to 5 (strongly agree). Both studies indicated that the two biggest factors affecting patient satisfaction are the dentist-patient relationship during treatment and dentofacial correction obtained post-orthodontic treatment.[16]

In 2014, Feldman investigated patient satisfaction as related to an occlusal index in a study on 120 post-orthodontic–treatment patients in a Swedish Public Dental Service orthodontic clinic. The results found a significant but statistically small correlation between patient satisfaction about the correction obtained with the PAR index alteration after orthodontic treatment.[18]

Jazaldi studied the objective measurement of orthodontic treatment results at RSKGM FKG UI using the ABO-MGS method in 2006,[19] while subjective measurements of patient satisfaction on orthodontic treatment result at RSKGM FKG UI have not yet been studied. The purpose of this study is to analyze the association between ABO-MGS and patient satisfaction after orthodontic treatment in an orthodontic specialist clinic at RSKGM Fakultas Kedokteran Gigi Universitas Indonesia.

Method

Developing Research Questionnaire

Ethical approval was granted for this study (Universitas Indonesia Dental Faculty Committee on the Ethics of Human Research No. 71/Ethical Approval/FKGUI/XI/2015).

Questionnaire development preceded the retrieval of patient assessment data. The questionnaire consisted of a letter requesting patients to participate as research subjects, a statement of willingness for the patient to become a subject of the research, instructions for replying, and the list of questions. This research questionnaire consisted of sixteen questions (as shown in Table 1) about the patients' satisfaction regarding their orthodontic treatment results.

A scale of 1 to 7 was located next to each question. This scale method was inspired by the PSPSQ (Kiyak et al.). On each question, there

was a statement about the meaning of the higher numbers (maximum value of 7) and lower numbers (minimum value of 1). A higher number meant that the patient felt the treatment was improving, and a lower number meant that the patient felt the treatment was getting worse. Respondents circled the number that represented their feelings toward the treatment result.

Table 1. Sixteen Questions and Questionnaire scale (translated from Indonesian)

1. Are you satisfied with your dental appearance after orthodontic treatment?

Very Disappointed			Average			Very satisfied
1	2	3	4	5	6	7

2. Do you feel satisfied with the relationship between the upper and lower teeth on the right side?

Very Disappointed			Average			Very satisfied
1	2	3	4	5	6	7

3. Do you feel satisfied with the relationship between the upper and lower teeth on the left side?

Very Disappointed			Average			Very satisfied
1	2	3	4	5	6	7

4. Do you think your teeth are in good alignment after orthodontic treatment?

Still Crowding			Average			Very well aligned
1	2	3	4	5	6	7

5. Do you feel your smile looks more attractive after orthodontic treatment?

Unattractive			Average			Very attractive
1	2	3	4	5	6	7

6. Do you feel your back teeth on right side have the same height?

Not the same			Average			Same height
1	2	3	4	5	6	7

7. Do you feel your back teeth on the left side have the same height?

Not the same			Average			Same height
1	2	3	4	5	6	7

8. When you close your jaw, do your upper and lower back teeth make full contact?

No Contact			Average			Very good contact
1	2	3	4	5	6	7

9. When you close your jaw, do your upper and lower front teeth make full contact?

No Contact			Average			Very good contact
1	2	3	4	5	6	7

10. Do you feel more comfortable in chewing and eating after orthodontic treat

Very uncomfortable			Average			Very comfortable
1	2	3	4	5	6	7

11. Are all the spaces between your front teeth closed?

Many spaces			Average			All closed
1	2	3	4	5	6	7

12. Are all the spaces between your back teeth closed?

Many spaces			Average			All closed
1	2	3	4	5	6	7

13.When closing your jaw, do you think all of your back teeth are in good positions, or are some of them are out of alignment?

Many teeth out of alignment			Average			Very good position
1	2	3	4	5	6	7

14. When closing your jaw, do you think the distance between your upper and lower front teeth is approximately 2–3 mm?

>5 mm			3–4 mm			2–3 mm
1	2	3	4	5	6	7

15. Do you think all of your back teeth are straight, or are some of them tilting in/out of alignment?

Many teeth tilting in/out			Average			Very straight
1	2	3	4	5	6	7

16. Do you think all of your teeth are straight, or are some of them tilting to the right/left?

Many teeth tilt left/right			Average			Very straight
1	2	3	4	5	6	7

The 16 questions in the questionnaire focused on patient satisfaction with their alignment, marginal ridge, buccolingual inclination, occlusal contacts, occlusal relationships, overjet, interproximal contacts, and tooth angulation. These represent components of the ABO-MGS method's determination index.

The questionnaire trial was conducted on 20 respondents in accordance with the inclusion criteria for the different populations. The item-total correlation test was used for validity, and the minimum *r* deemed valid was *r*> 0.3. The test results demonstrate the validity of 14 questions with an *r* value > 0.3, while 2 questions were invalid with an *r* value.0.3.

The non-valid questions (questions number 2 and 10) were still included in the questionnaire because they were considered important by the investigators. The questionnaire's reliability test results showed a Cronbach's alpha of 0.90, indicating the measuring instrument was reliable. The validity and reliability results of the questionnaire showed that it was designed well enough to be used as a measure in the study.

Research Implementation

Subjects were selected in accordance with the inclusion criteria; namely, patients who had finished their treatment and had undergone debonding in the orthodontic clinic of RSKGM FKG UI from June 2014 to April 2016, had a good final study model, had a good final panoramic radiograph, and who were willing to be called back and become a research subject.

The selected research subjects were invited under the agreement to the orthodontic clinic of RSKGM FKG UI. Before filling out the questionnaire, the objectives, benefits, and research procedures were described to all respondents, as well as discomfort for participating in the study. After being given an explanation, respondents were asked to sign an informed consent form and to fill out the

questionnaire by circling the numbers that corresponded with their satisfaction. In addition, the post-orthodontic treatment dental models and panoramic radiographs were measured in accordance with the ABO-MGS method .

Statistical Analysis

The Bland-Altman method was used for conformance testing on interobserver measurements for six research subjects' dental models and panoramic radiographs to determine the accuracy of measurement repeatability using the ABO-MGS. Interobserver testing was performed to determine the accuracy of measurements by comparing the first researcher to the second researcher.

Statistical analysis was performed using the Special Package for Social Science (SPSS) 20.0 program. Statistical analysis was done by univariate and bivariate analysis. Univariate analysis was used to calculate the mean value, standard deviation, and range and to determine the minimum and maximum of each ABO-MGS component (alignment, marginal ridge, buccolingual inclination, occlusal contact, overjet, interproximal contacts, and root angulation) and each questionnaire component (alignment, marginal ridge, buccolingual inclination, occlusal contact, overjet, interproximal contacts, and root angulation). The Spearman test was used for the bivariate analysis to determine the correlation between the component value of the ABO-MGS and the value of each component of the questionnaire.

Results

ABO-MGS Score Measurement

This study was conducted from September 2015 until April 2016 and was held at the Orthodontic Specialist Clinic of the Faculty of Dentistry, Universitas Indonesia, Salemba, Jakarta. Samples were taken consecutively to meet the required sample size of 55 subjects.

The results of the univariate statistical test are presented in Table 2, which shows the mean value, standard deviation (SD), and the maximum and minimum values of the study model measurement using the ABO-MGS method.

The ABO-MGS categories that had the highest scoring average (worst) were alignment (6.72 ± 2.30) and occlusal contacts (5.01 ± 3.14). The component that had the lowest score (the best) was the interproximal contacts (0.380.73). The total average score of the ABO-MGS from the 55-unit sample was 25.47 ± 6.46.

Table 2. Total Average Score and Eight ABO-MGS Categories

Components	*n*	Mean	SD	Minimum	Maximum
Total score	55	25.47	6.46	13.00	38.00
Alignment	55	6.72	2.30	2.00	12.00
Marginal Ridge	55	3.05	2.24	0.00	11.00
Buccolingual Inclination	55	3.43	2.33	0.00	11.00
Occlusal Contact	55	5.01	3.14	0.00	13.00
Occlusal Relation	55	1.54	2.01	0.00	8.00
Overjet	55	1.49	1.35	0.00	4.00
Interproximal contacts	55	0.38	0.73	0.00	3.00
Root Angulation	55	3.81	1.90	0.00	8.00

The subjects were classified into the following categories: succesful treatment outcome (<20), borderline (20–30), and unsuccessful (>30), as shown in Table 3. Measured using ABO-MGS, the treatment results of research subjects were mostly in the borderline group with a total score of 20–30; this group contained 31 sample units or 56.36%. The sample group with very good scores (pass/succesful), or ABO-MGS < 20, had only 10 sample units (18.18%), and the worst sample group (not pass/unsuccesful), or ABO-MGS > 30, had 14 sample units (25.45%).

Table 3. Total All Samples ABO-MGS Score

Total ABO-MGS Score	***n***	**Percentage**
< 20	10	18.18%
20–30	31	56.36%
> 30	14	25.45%

The graph in Figure 1 shows the ABO-MGS interobserver conformance tests using the Bland-Altman test on 10% of the sample. The mean difference was 0.833, with IK 95% at - 0.19 up to 1.86. The limit of agreement amounted to -1.093 to 2.75 and was located between - 5 and 5, so the interobserver test had a good agreement.

Table 4 shows the results of univariate statistical tests carried out on 16 questions in the questionnaire, including the mean value, SD, and maximum and minimum values. Univariate statistical testing was also done based on eight components of the questionnaire, and Table 5 shows the mean value, SD, and the maximum and minimum values.

Measurement Questionnaire Score
Limit of agreement 2.75
IK95% = 1.86
X = 0.83
IK95% = -0.19
Limit of agreement -1.093

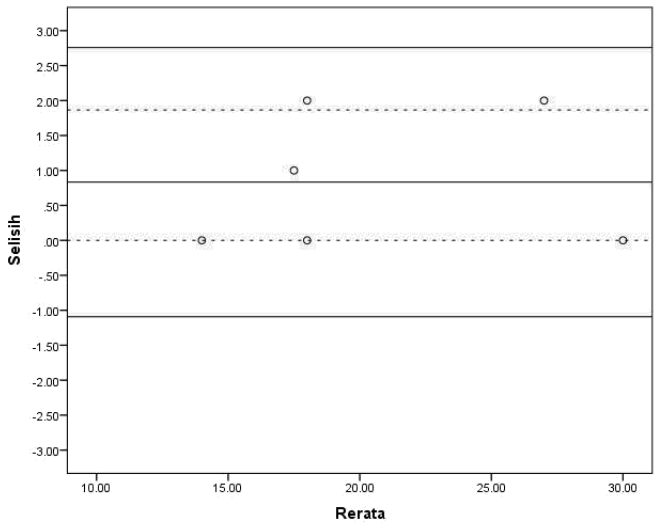

Figure 1. Inter observer Bland-Altman Conformance Test.

Table 4. Total average scores of 16 Questions in Questionnaire.

Question	*n*	Mean	SD	Minimum	Maximum
Total Score	55	95.77	8.53	75.00	111.00
Question No 1	55	6.24	0.81	5.00	7.00
Question No 2	55	5.83	0.79	4.00	7.00
Question No 3	55	6.05	0.76	4.00	7.00
Question No 4	55	6.11	0.69	5.00	7.00
Question No 5	55	5.96	0.84	4.00	7.00
Question No 6	55	5.64	1.03	3.00	7.00
Question No 7	55	5.79	1.03	3.00	7.00
Question No 8	55	6.18	0.82	4.00	7.00
Question No 9	55	5.64	1.26	3.00	7.00
Question No 10	55	6.16	0.86	3.00	7.00
Question No 11	55	5.90	1.05	3.00	7.00
Question No 12	55	5.70	1.07	3.00	7.00
Question No 13	55	6.12	0.82	4.00	7.00
Question No 14	55	6.33	0.86	3.00	7.00
Question No 15	55	5.98	0.99	3.00	7.00
Question No 16	55	6.07	0.88	3.00	7.00

The values obtained from the 16 questions in Table 4 were then associated with the appropriate components of each question, added together, and then averaged as shown in Table 5.

The total average score of the questionnaire was 5.99 ± 0.52, which showed that the patients were satisfied with the results of treatment. The best average patient ratings were on the occlusal contact component (6.18 ± 0.70) and alignment (6.10 ± 0.55).

The worst average patient ratings were the marginal ridge (5.71 ± 0.98) and interproximal contacts (5.81 ± 0.86) components. However, these values still fall within the range of good judgment (> 5).

The results of the patients' ratings were then put in a category of unsatisfied, medium satisfaction, and satisfied, as shown in Table 6. Medium satisfaction was obtained from 11 respondents and the remaining 44 respondents were satisfied with the results of their orthodontic treatment.

Table 5. Total Average Score of Eight Questionnaire Components

Questionnaire Components	*n*	Mean	SD	Minimum	Maximum
Total score	55	5.99	0.52	4.69	6.94
Alignment	55	6.10	0.55	5.00	7.00
Marginal Ridge	55	5.71	0.98	3.00	7.00
Buccolingual Inclination	55	5.98	0.99	3.00	7.00
Occlusal Contact	55	6.18	0.70	4.50	7.00
Occlusal Relation	55	5.92	0.71	4.00	7.00
Overjet	55	6.03	0.75	4.00	7.00
Interproximal contacts	55	5.81	0.86	4.00	7.00
Root Angulation	55	6.07	0.88	3.00	7.00

Table 6. Total Questionnaire Categories

Total Average Scores	*n*	Percentage	Mean	SD
Unsatisfied (1–2.5)	0	0%	0	0
Medium Satisfiction (> 2.5–5.5)	11	20%	5.21	0.23
Satisfied (> 5.5–7)	44	80%	6.20	0.35

Correlation Test Results between ABO-MGS Score and Questionnaire Score

Table 7 shows the results of the data normality test. The distribution of the obtained data was normal for the ABO-MGS total score, ABO-MGS alignment, ABO-MGS occlusal contact, and the total score of the questionnaire. Data in addition to the four categories was not normal. A correlation test was performed on the total score of ABO-MGS (numerical) to the total score of the questionnaire (categorical), and the correlation of each component was done through Spearman's test (nonparametric).

Table 7. Data Normality Test of ABO-MGS Score and Questionnaire Score.

ABO-MGS	Normality Test (*p*)	Questionnaire	Normaltity Test (*p*)
Total Score	0.306 (> 0.05)*	Total Score	0.295 (> 0.05)*
Alignment	0.173 (> 0.05)*	Alignment	0.012 (< 0.05)
Marginal Ridge	0.000 (< 0.05)	Marginal Ridge	0.000 (< 0.05)
Buccolingual Inclination	0.011 (< 0.05)	Buccolingual Inclination	0.000 (< 0.05)
Occlusal Contact	0.147 (> 0.05)*	Occlusal Contact	0.000 (< 0.05)
Occlusal Relation	0.000 (< 0.05)	Occlusal Relation	0.001 (< 0.05)
Overjet	0.000 (< 0.05)	Overjet	0.003 (< 0.05)
Interproximal contacts	0.000 (< 0.05)	Interproximal contacts	0.002 (< 0.05)
Root Angulation	0.05 (< 0.05)	Root Angulation	0.000 (< 0.05)

$p < 0.05$: statistically significant.

Table 8 shows the results of correlation between the ABO-MGS scores (alignment, marginal ridge, buccolingual inclination, occlusal contacts, occlusal relationships, overjet, interproximal contacts, and angulation of the root) and the questionnaire scores (alignment, marginal ridge, buccolingual inclination, occlusal contacts, occlusal relationships, overjet, interproximal contacts, and angulation of the root). Based on the significance value (*p*), there was no significant correlation between all of the components tested. Correlations were found between 0.0 - < 0.2, indicating that the correlation was very weak, which means that the value changes of the ABO-MGS score were not associated with changes in the questionnaire scores. There was a negative correlation to three components; namely, buccolingual inclination, occlusal contacts, and interproximal contacts. This indicates the increase in the value of ABO-MGS scores (decreasing ABO-MGS scores) very weakly correlates with the decline of questionnaire scores of the three categories.

Table 8. Correlation between Total ABO-MGS Scores and Total Questionnaire Scores of Eight Components.

Components		Correlation Coefficient (*r*)	Significance (*p*)
ABO-MGS	**Questionnaire Components**		
Total Score	Total Score	0.250	0.660
Alignment	Alignment	0.129	0.348
Marginal Ridge	Marginal Ridge	0.093	0.498
Buccolingual Inclination	Buccolingual Inclination	-0.042	0.761
Occlusal Contact	Occlusal Contact	-0.113	0.411
Occlusal Relation	Occlusal Relation	0.134	0.331
Overjet	Overjet	0.066	0.634
Interproximal Contacts	Interproximal Contacts	-0.041	0.767
Root Angulation	Root Angulation	0.090	0.512

$p < 0.05$: statistically significant.

Discussion

A total of 57 subjects were willing to fill out questionnaires about patients' assessments of their orthodontic treatment results. There were two subjects who did not meet the inclusion criteria for the sample as they did not have the final dental study models and final panoramic radiographs. A total of 55 subjects, 16 males and 39 females, participated in this study. The patients' age ranged from 15 to 46 years. The variables sex and age were not considered in this study. A linear regression analysis against the two variables resulted in an adjusted *r* of 0.140 ± 0.141, which was not significantly different, and the results of the correlation test was *r* = 0.141, meaning that both of these variables did not affect the results of the study assessed.

The total score of treatment outcomes was measured using the ABO-MGS method on research subjects treated by postgraduate students of the orthodontic clinic in the Faculty of Dentistry, Universitas Indonesia, from June 2014 to April 2016. This measurement showed that most of the treatment results (56.36%) belonged to the group with a total score of 20–30 (the borderline group). These findings are similar to research by Jazaldi, which mentioned that 58.63% of the sample was in the score range of 20–30.[19]

The results of treatment that did not pass (category score above 30) in this study was 25.45%, which was higher than the results of Jazaldi's research, where 18.39% of subjects were not satisfied with their treatment results. In this study, 18.18% of research subjects fell into the pass category, which was lower than the results in Jazaldi's research (22.98%).[19] According to the guidelines of the ABO-MGS method (revised in 2010), a total score that is equal to or less than 27 is a passing score, so over half of the treatment results from the postgraduate students of the Faculty of Dentistry, Universitas Indonesia, passed.

For the ABO-MGS method, the greatest value in this research was on the alignment and occlusal contacts components. The alignment component score was affected by disorderly arrangement of the maxillary and mandibular lateral incisor, the maxillary premolars, and the second molars. This is probably due to an inaccurate finishing stage. The detailed positioning of each teeth need to be considered in this phase. Moreover, poor second molar teeth alignment is due to the exclusion of second molars in orthodontic treatment.[19] The occlusal contact component was mostly caused by a lack of contact between the palatal cusp posterior teeth and the lower teeth, especially at the second molars. This is also probably due to a lack of detail during the finishing phase. Some teeth that are not in contact with the opposing teeth can be corrected by fixing the height or inclination through bracket repositioning, making a step-up bend, or torquing the wire.[20] In addition, the use of elastic settling can also correct the occlusal contacts of posterior teeth.[20]

The results in this study are similar to the ABO-MGS method test results by the ABO committee in 1994–1998, who found that the lateral incisor and second molar teeth are usually less organized. Errors on the occlusal contact component are commonly found on second molars.[21]

The average questionnaires total score was 5.99 ± 0.52, indicating that patients were satisfied with the results of treatment. Satisfaction was obtained from 11 respondents (20%), and 44 respondents (80%) felt satisfied with the results of treatment. Contrary to the ABO-MGS results, respondents were satisfied with both occlusal contact and alignment, and they said that the arrangement of their teeth was orderly, their smile more attractive, and their chewing more comfortable after orthodontic treatment. The lowest *r* value of the assessments were associated with the marginal ridge and interproximal contacts components.

The most common reason why respondents were unsatisfied with marginal ridge component was that they felt their posterior teeth weren't at the same height. For questions regarding the interproximal contacts, some respondents felt that there was still a gap in the posterior teeth where food was often stuck, especially on teeth-mounted molar bands.

However, the average assessment of the patient was still in the category of satisfied, although there were some whose minimum values reached a 3 (a medium satisfaction score) on the marginal ridge, buccolingual inclination, and interproximal contacts components. From these findings, it can be concluded that patients were satisfied with the outcome of their treatment even though some aspects fell short.

The results of the correlation test between the total score of the questionnaire and the total score of ABO-MGS showed no significant relationship between the two variables. The same was true for correlations between each component of the questionnaire to each component of ABO-MGS. However, there was a very weak negative correlation on the buccolingual inclination, occlusal contacts, and interproximal contacts components, indicating an increase in the value of ABO-MGS scores followed by a decrease in the questionnaire score on the three components.

Subjects were satisfied with the results of treatment even though the ABO-MGS measurement was unfavorable. This result is likely due to the patients paying more attention to the teeth that look better than before treatment and are also functionally comfortable. So, the elements that were highly rated by patients were a visibly neat arrangement (alignment) as well as comfort during occlusion and chewing (occlusal contacts).

In addition, the patients also considered whether there were gaps that reduce the aesthetic and comfort of their teeth while functioning (whether any food could be tucked in between teeth). An uncomfortable feeling produced low values in the interproximal contacts component. The orthodontic treatments performed by the residents in the period of June 2014 to April 2016 still need to be improved in regard to the alignment and occlusal contacts components. These are in contrast to the results of the questionnaire, which had high value scores of the alignment and occlusal contacts components. Several studies have examined patients' satisfaction or their subjective assessment of their orthodontic treatment outcomes in association with an occlusal index.

The results in this study are consistent with the study by Maia et al. in 2010, which measured the correlation of patients' satisfaction (subjective assessment) to their orthodontic treatment results in association with the PAR occlusal index. Maia's research found that there was no correlation between patients' satisfaction with their orthodontic treatment results to the PAR index before treatment, after treatment, as well as after changes in the final PAR index.[22]

In contrast, Feldmann found a correlation between patients' satisfaction (subjective assessment) with dentoalveolar changes and changes in the PAR occlusal index, although it was very small. However, there was also no correlation found with the PAR occlusal index after orthodontic treatment.[18]

The quality of treatment can be assessed through patient satisfaction in various aspects including structure, process, and outcome. The results of treatment as measured by the ABO-MGS method in this study did not correlate to patient satisfaction with treatment outcome. Determining patients' subjective assessments of the overall quality of care needs measurements from other factors in addition to the treatment results.

Conclusion

The total score of treatment results measured by the ABO-MGS method on 55 research subjects treated by orthodontic residents in Faculty of Dentistry, Universitas Indonesia, in the period of June 2014 to April 2016 showed that most of the treatment results (56.36%) were in the group with a total score of 20–30 (borderline category).

Patients' assessment on the treatment results had an average score of 5.99 ± 0.52 on satisfaction, and 80% of respondents felt satisfied with their treatment results. There was no significant relationship between the total score of the patients' satisfaction questionnaires with orthodontic treatment results measured by the ABO-MGS method, nor between each component in the questionnaires and the ABO-MGS.

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