The use of indexs objective grading system and smile line for evaluating the balance functional occlusion in orthodontic treatment

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ABSTRACT

The main purpose of ortodontic treatment is to reach balanced functional occlusion and to create a harmonic esthetic face. Several studies indicate that orthodontic treatment influences smile esthetics, especially the smile arc and the buccal corridor. One third of the treated patients showed flat smile arcs and orthodontic treatment with extraction resulted in excessive buccal corridors. The purpose of this research is to evaluate the difference of the Objective Grading System index, developed by the American Board of Orthodontics (ABO) and smile aesthetics in patients with Class I dentoskeletal malocclusion before and after orthodontic treatment. Twenty dental casts, panoramic radiographs and group of pre and post treatment. Were chosen / selected according to the inclusion criteria that have been determined Dental casts and panoramic radiographs are scored according to the guidelines of the Objective Grading System. Extra-oral photographs were assessed by the researcher using modified Goldstein dentofasial analysis. Result of measurements were evaluated using statistical t-test. Results of the research indicate that Objective Grading System index and score of smile esthetics before and after orthodontic treatment are different statistically (for Objective Grading System index P = -1121 > 2.09 and for smile esthetics P = 5.15 > 2.09), but weak relationship was found between Objective Grading System index and Aesthetics smiles (231).

Key words: Objective Grading System index, smile esthetics, modified Goldstein dentofacial analysis, class I dentoskeletal malocclusion.

ABSTRAK

Tujuan utama perawatan ortodonti adalah mencapai oklusi fungsional yang seimbang dan menciptakan estetika wajah yang harmonis. Beberapa hasil penelitian menunjukkan bahwa perawatan ortodonti berpengaruh terhadap estetika senyum, terutama terhadap garis senyum dan koridor bukal. Sepertiga dari kasus ortodonti yang pernah dirawat menghasilkan garis senyum yang datar sebagai akibat dari perawatan ortodonti. Sedangkan perawatan ortodonti dengan ekstraksi berpengaruh terhadap melebarnya koridor bukal. Tujuan penelitian ini adalah untuk mengevaluasi perbedaan indeks Objective Grading System, yang dibuat oeh American Board of Orthodontics dan estetika senyum pada pasien dengan maloklusi kelas I dentoskeletal sebelum dan setelah perawatan ortodonti. Dua puluh model studi, foto panoramik dan foto ekstra oral saat tersenyum pasien dipilih berdasarkan kriteria inklusi yang

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telah ditentukan. Masing-masing dikelompokkan sebelum dan setelah perawatan. Model studi dan foto panoramik dinilai dengan menggunakan indeks Objective Grading System. Foto ekstra oral dinilai oleh peneliti dengan menggunakan analisis dentofasial metode Goldstein yang telah dimodifikasi. Selanjutnya hasil pengukuran diuji dengan menggunakan uji statistik t-test. Hasil penelitian menunjukkan bahwa indeks Objective Grading System maupun skor estetika senyum sebelum dan setelah perawatan ortodonti menunjukan adanya perbedaan yang bermakna secara statistik (untuk indeks Objective Grading System t-hit= -11.21 lebih besar dari t-tab = 2,09 dan untuk estetika senyum t-hit = 5,15 lebih besar dari t-tab = 2,09). Tetapi hubungan antara skor indeks Objective Grading System dengan Estetika senyum menunjukkan hubungan yang lemah(0,231).

Kata kunci: *indeks Objective Grading System, estetika senyum, analisis dentofasial dari Goldstein, kelas I dentoskeletal.*

INTRODUCTION

An attractive physical appearance is one of the important things in a social life, and facial aesthetics is the main key. One attempt to get facial aesthetics is by executing an orthodontic treatment.[1] Facial and smile aesthetics show a strong relationship with each other.[2] Goldstein describes the parameters for measuring an aesthetic smile are facial analysis, dentofacial analysis, and dental analysis, as well as other supported parameters. Facial analysis includes the assessment of the relationship between widely smiling lips and facial components (inter pupil line, occlusal area, face median line), lips position at rest position, and facial profile. Dentofacial analysis covers lips position when smiling, smile line, maxillary teeth position to the lower lip, the numbers of teeth visible when smiling, the relationship of maxillary incisive teeth against filtrum, the relationship of the median line of maxillary incisive teeth and lower jaw, as well as bilateral buccal corridor. Teeth analysis covers the proportion of maxillary central incisive teeth and central incisive, lateral incisive with maxillary canines.[2]

A successful orthodontic treatment has many meanings in the field of orthodontics.[3] To the patient, a treatment considered successful is determined from the aesthetics view. However, the main demand of the patients performing orthodontic treatments is to obtain an aesthetical face, one of them can be seen from the smile. But according to the Objective Grading System developed by American Board of Orthodontics (ABO), the success of a treatment is determined by the functional occlusion position seen in the study model with good articulation, accompanied by root alignment in panoramic photo.[3]

American Board of Orthodontics established an assessment system for evaluating an orthodontic treatment result based on eight characteristics measured from study models and panoramic photo, namely (1) teeth alignment, (2) marginal edge height, (3) buccolingual inclination, (4) occlusal relationship, (5) occlusal contact, (6) overjet, (7) teeth interproximal contact, and (8) root angulation.

Study models and panoramic photos after the treatment are examined and measured by the characteristics mentioned before, and the values are reduced (-1 or -2) based on how far the teeth deviate from the standard set by ABO. Generally, reports of cases that lose 30 values or less is considered failed in clinical test; case reports lose 20 values or less is considered passed. Case reports lose 20-30 values will be re-evaluated or considered failed by ABO.[4]

Most orthodontic treatments require the removal of four first premolar teeth in order to obtain the needed space. The result suggests that orthodontic treatment with removal of teeth can cause a constriction in dental arch that can create a wide buccal corridor and black triangles at the corner of mouth when smiling. Black triangles are seen when smiling and will look less aesthetics.[5] Kim and Gianelly[6] state that removal of premolars in orthodontic treatment can change the shape and the width of dental arch, especially anterior teeth, so that it will affect the harmony between the curvatures of lips and teeth.

MATERIALS AND METHODS

This study is an analytic descriptive study. The populations of the study are all patients who had completed orthodontic treatment in Orthodontics Department of Faculty of Dentistry of Padjadjaran University between the years of 2000-2008.

A total of twenty samples consist of study models, panoramic photo, and pictures of smiling patients are selected based on the inclusion criteria determined. Then, each group is divided into two groups; the group before treatment and after treatment group. Based on the study models and panoramic photo before and after treatment the Objective Grading System score is determined. Specifically, Evaluation of the study models cover: alignment, occlusal contact, marginal edge, occlusal relationship, buccolingual inclination, overjet, and interproximal contact, while in the panoramic photo, the root alignment is evaluated.

Extra oral photos when smiling are then scanned using Cannon 3000 Ex scanner and is directly imported to the available image editing software program (Adobe Photoshop CS 3, Adobe System Inc., San Jose, CA). Each extra oral photo is scanned in maximum dots per inch to enhance image quality. In extra oral photo with patients in smiling position, a vertical line is drawn from the face median line, that is from the nasion point to gnation point. The photo is then cropped so that only one third of the lower face area is seen. The image result is edited by Photoshop using healing brush tool to remove skin defects, skin irregularities, or other marks that can affect the assessor during image evaluation. After the editing process finished, each image is saved in JPEG file and then is printed in photo paper size 3R. The smile photos that have been printed are assessed by the researcher using the modified Goldstein's dentofacial method analysis.

RESULTS

Comparison between the Objective Grading System index and smile aesthetics before and after treatment can be found in Appendix 1. The raw data in appendix 1 is then calculated. The difference occurs according to the study variable is shown in Table 1 and Table 2. The t-test paired data is used to determine the difference between the Objective Grading System index and smile aesthetics. All of the assessment result for both study variables; the Objective Grading System index and smile aesthetics score before and after orthodontic treatment show a statistically significant difference.

Based on Table 1, it can be seen that the Objective Grading System index value before treatment is -77,05±19,82 the Objective Grading System index value after treatment is -24,15±7,41. According to the T-Test result, the t count is obtained at -11,21 bigger than the t table that is at 2,09. It can be concluded that there is a difference in the value of Objective Grading System index between before and after treatment.

Based on Table 2, it can be seen that smile aesthetics value before treatment is 33,15±0,93. Smile aesthetics value after treatment is 1,85±1,04. Based on the t-test, the t count is obtained at 5,15 bigger than the t table that is at 2,09. A conclusion can be drawn that there is a significant difference in smile aesthetics between before and after treatment.

Table 1. Analysis of index value change of the objective grading system index before and after treatment.

Mean			Difference	t Count
n	Before	After		
20	-77,05±19,82	-24,15±7,41	-52,9±21,10	-11,21*

The relationship between the Objective Grading System index (x) with the smile aesthetics score (Y) is Y = -0,061 + 0,026 X. This model shows that if the Objective Grading System index score increases/decreases one unit, then the smile aesthetics score will also increase/decrease by 0,026 unit. As seen in Table 3. The weak relationship between the Objective Grading System index score and the smile aesthetics is 23,1%.

Table 2. Analysis of value change of smile aesthetics before and after treatment.

Mean			Difference	t-Count
n	Before	After		
20	33,15±0,93	1,85±1,04	1,3±1,13	5,15*

Note: n = sample size; OGS = Objective Grading System; r = correlation coefficient between Y and X1 or other X.

Table 3. Analysis of value change of the objective grading system index and the value change of smile aesthetics.

	Before	After	r	r^2
Indeks OGS	-77.05	-24.15	0.481	0.231
Smile aesthetics	33.15	1.85		

DISCUSSION

A successful orthodontic treatment has many meanings in the field of orthodontics.[3] To the patient, a treatment considered successful is determined from the aesthetics view. one of them can be seen from the smile. But when an orthodontics handles a treatment and discusses the need for treatment to the patient, He is more focused on the discrepancies of the occlusal relationship in patients.[9] Orthodontic treatment nowadays must own a broader scope, which is the achievement of an ideal occlusion and the aesthetic factors (Sarver and Hills). Consequently, smile aesthetics needs to be considered and included after the treatment as the basic components from the orthodontic treatment result.[2]

To assess the result of an orthodontic treatment, there are several ways for measuring it. One of them is by using the Objective Grading System index created by the American Board of Orthodontics. The objective grading system index is an index used for measuring the result of an orthodontic treatment. The Objective Grading System index is completed with a measuring device called ABO measuring gauge, so that it can measure the result of an orthodontic result objectively and trustworthily.[4,5] To assess smile aesthetics, some methods can be used. In this study, Goldstein's dentofacial analysis method which has been modified is used.

The result of this study shows the Objective Grading System index and smile aesthetics before and after treatment has a statistically significant difference. This is indicated by the t count value obtained is bigger than the t table value (2,09 for 95% confidence level) that is -11.21 for the Objective Grading System index and 5,15 for smile aesthetics. This means, the orthodontic treatment conducted at the Orthodontics Specialist Clinic of Faculty of Dentistry of Padjadjaran University to patients with dentoskeletal class I malocclusion gives a positive result to the Objective Grading System index, as well as to the smile aesthetics.

The assessment of the Objective Grading System index includes 8 criteria: (1) teeth alignment; (2) marginal edge height; (3) buccolingual inclination; (4) occlusal relationship; (5) occlusal contact, (6) overjet; (7) teeth interproximal contact; (8) teeth root angulation. Of the eight criteria, teeth alignment, buccolingual inclination, overjet, and teeth root angulation are the criteria which have significant change before and after orthodontic treatment. The average of the Objective Grading System index in dento-skeletal class I malocclusion patients charged at the orthodontics specialist clinic of Faculty of Dentistry of Padjadjaran University is 24,15, it is included in medium criteria (Appendix 2).

As for the smile aesthetics assessment, it covers 7 components; (1) lips position when smiling; (2) smile line; (3) the position of maxilla to the lower lips; (4) the numbers of teeth visible when smiling; (5) the relationship of the median line of maxillary incisor teeth to the filtrum; (6) the relationship of the median line of maxillary incisor teeth and lower jaw; and (7) bucal bilateral corridor. Of the 7 components of smile aesthetics, smile line, the relationship of the median line of maxillary incisive teeth to the filtrum, the relationship of the median line of maxillary incisive teeth and lower jaw are the components which have significant differences before and after treatment. The average score of smile aesthetics in dentoskeletal class I patients charged at the Orthodontic Specialist Clinic of Faculty of Dentistry of Padjadjaran University is 1,85, it is included to criteria good (Appendix 3).

If it is connected with some studies that show that orthodontic treatment with premolar removal causes a flat smile line, the result of this study is contradicted with the statement. Due to this result, smile lines show a significant positive change between before and after treatment.

The relationship between the Objective Grading System index (x) with the smile aesthetics score (y) shows that if the Objective Grading System index score increases/decreases one unit, then the smile aesthetics score will also increase/decrease for 0,026 unit. The strong relationship between the Objective Grading System index score with the smile aesthetics is for 23,1%. This means there is weak relationship between the Objective Grading

System index with smile aesthetics. This is caused by the Objective Grading System index does not evaluate soft tissues at all, both the intraoral soft tissue and the extraoral soft tissue. The Objective Grading System index from ABO is considered valid for assessing the result of orthodontic treatment viewed from the occlusion assessment on the study models, but the assessment system of the Objective Grading System does not specifically consider the study model cannot explain the picture of human face or lips' soft tissues.

CONCLUSION

There is a difference in the Objective Grading System index before and after dento-skeletal class I orthodontic treatment using the Standard Edgewise device. And there is a weak relationship between the Objective Grading System index variable with the smile aesthetics before and after dento-skeletal class I orthodontic treatment using the Standard Edgewise device.

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