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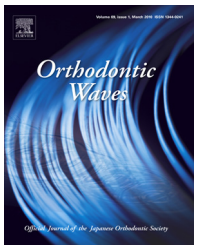

Original article

Relationship between Discrepancy Index and the Objective Grading System in Thai board of orthodontics Patients

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ABSTRACT

Objective: Using the American Board of Orthodontics system (ABO), this study determined whether there was any relationship between the Discrepancy Index (DI) and Objective Grading System (OGS) scores. Second objective was to determine the correlation between the objective scores by ABO system and subjective scores judged by candidates.
Materials and methods: 200 records from 25 candidates for Thai board of orthodontics were evaluated using (1) DI and (2) OGS. Candidates were asked to evaluate their own cases on 2 parameters: (1) difficulty level and (2) Satisfaction visual analog scale (VAS). Spearman correlation coefficients were computed to assess the relationship among these 4 variables. In addition, 3 subgroups of DI scores (low, medium, high) were tested if there were any association with 3 subgroups of OGS (passing, undetermined, failing), using Chi-square test.
Results: Mean DI was 23.48 (SD 15.39), OGS was 26.39 (SD 9.77), Satisfaction VAS was 62.81 (SD 8.04) and median of difficulty level was 2.15. There were no correlation between DI and OGS, OGS and Satisfaction VAS, DI and Satisfaction VAS. However, difficulty level was, at low level, significantly correlated with DI and Satisfaction VAS (p-value $<.05$). Percentage distribution of DI; low was 10%, medium was 42% and high was 48.0%, and of OGS; passing 26%, undetermined 45% and failing 29%. There were no association among 3 subgroups of DI with 3 subgroups of OGS.
Conclusions: DI could not be used as a weighted factor for OGS in determining if the case would pass or fail in ThBO cases.

1. Introduction

Assessment of orthodontic treatment outcomes is a challenging task for board certification process. In order to find out valid and reliable orthodontic outcome measures, various indexes and rating systems had been proposed such as occlusal index [1], peer assessment rating index (PAR) [2,3], and the American Board of Orthodontics (ABO) system [4].

The American Board of Orthodontics (ABO), one of the world renowned organization has established national standards of orthodontic case examination throughout a systematic certification process. The ABO examination process for board cases utilized an objective system [5,6]. The 3 systems

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which were developed since 1998 and currently being used by the ABO were (1) the Discrepancy Index (DI); to assess the pretreatment complexity (2) the Objective Grading System (OGS); to assess the posttreatment outcomes of the clinical examination board cases and (3) case management evaluation [7,8].

DI was used to define whether pretreatment cases were complex enough to be considered for the certification process. It comprised 12 characteristics of malocclusion and dento-skeletal relationship. The OGS was used in determining whether cases presented by orthodontists had posttreatment discrepancies scores that were considered to be passing or failing in board examination [9].

Many studies agreed that DI was a reliable tool for evaluation of the pretreatment case complexity if the measurer has practiced training for measuring properly [10–12]. High DI scores were found to be one of several factors that was correlated with increased treatment duration [11,13].

The OGS scored the discrepancies of posttreatment dental casts and panoramic radiographs using ABO measuring gauges and OGS score sheet with detailed instructions [14]. The candidates would score their own treatment results which allowed them to recognize whether the quality of the cases submitted could meet the standard of the ABO. Many studies showed that the improvement in reliability of OGS could be achieved throughout training [10,12,15–18].

Practitioner may assume that a more complex case may be associated with greater discrepancies at posttreatment. Question was raised regarding this issue, whether there was any correlation between DI and OGS. If a positive correlation was found, and the incremental amount of predictability was known, then DI could become a weighted factor in determining if the board case was of passing quality or not. In another word, the practitioner might be able to estimate the quality of treatment or improvement of the treated cases.

To date, there were only a few studies investigating the relationship between DI and the OGS, however, the results were contradicting. Campbell et al. [12] and Pulfer et al. [10] found a positive weak correlation of between DI and OGS ($r = 0.2$ and $r = 0.17$ respectively). Campbell et al. [12] stated that for every 1 point increase in the DI, the OGS increased by $0.23 + 0.06$ points. Besides, They suggested that DI and OGS were correlated for the most severe malocclusions and DI was an important indicator for estimating the difficulty expected in achieving an optimal outcome [10,12]. In contrast, Vu et al. [11] reported that there was no correlation between DI and OGS. Hence, it would be beneficial for orthodontic society to have more research conducted on this controversial issue.

Our research question was whether DI could be used as a weighted factor for OGS. In addition, the Thai board of orthodontics had been seeking an unbiased and more objective method to evaluate the quality of orthodontic cases submitted for certification. The results of this study would serve as a baseline for future adjustment for Thai Board Orthodontics (ThBO) regulations.

The purposes of this study were as follows.

1. To determine whether there was any correlation between DI and OGS scores.
2. Secondly, to determine if any significant correlation existed between objective scores of ABO system (DI and OGS) and subjective judgment by candidates (difficulty level and satisfaction VAS).
3. To explore the percentage of various levels of case complexity classified by DI and percentage of cases submitted that would pass or fail, classified by OGS score.
4. To determine if there might be any positive association between DI and OGS which were to be categorized according to their severity.

2. Methods and materials

2.1. *Sample size calculation*

Sample size was calculated based on correlation between DI and OGS, which was 0.17 [10] and 0.2 [12] from previous studies. Using correlation coefficient of 0.2, 2-sided type I error of 0.05 and type II error of 0.2 (80% power), a sample of 194 cases was required.

Two investigators were initially trained in DI and OGS by the online tutorial using the ABO gauge and calibration of measurements were made on 15 records.

2.2. *Data collection*

The material for this study was obtained from records of 200 patients submitted by 25 candidates of Thai board of orthodontics year 2014. Each candidate would submit 8 cases according to malocclusion type specified by ThBO. All cases were treated during residency training from 5 universities in Thailand. Pretreatment and posttreatment records included study casts, panoramic radiographs, lateral cephalometric radiographs. Examiners who scored the models and radiographs were blinded. Name of candidates, institutions and patients were covered. Outcome assessment by ABO's objective score and candidates' subjective evaluation were gathered as follows.

2.2.1. *Objective score (DI and OGS)*

Two hundred pretreatment models, lateral cephalometric and panoramic radiographs were assessed for case complexity with the ABO Discrepancy Index score sheet according to instructions. The scoring was recorded for (1) overjet, (2) overbite, (3) anterior openbite, (4) lateral openbite, (5) crowding, (6) occlusal relationship, (7) lingual posterior cross bite, (8) buccal posterior cross bite, (9) ANB, (10) SN-MP, (11) lower incisor to MP and (12) others.

Two hundred posttreatment models were assessed with the Objective Grading System (OGS) score sheet using the ABO measuring gauge, by scoring 8 targets on dental casts and panoramic radiographs as follows; (1) alignment/rotations, (2) marginal ridges, (3) bucco-lingual inclination (4) overjet, (5) occlusal contacts, (6) occlusal relationships, (7) interproximal contacts, and (8) root angulation.

2.2.2. *Subjective score: difficulty level and Satisfaction visual analog scale (VAS)*

Based on actual situation, without any specific details given the 25 candidates were asked to evaluate 8 cases using their