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An Appraisal of Orthodontic Borderline Treatment Need Using GBON (Guide for Borderline Orthodontic Treatment Need) Index and AI (Aesthetic Index) in Local Select Population

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ABSTRACT

Objective: The objective of this study was to assess and compare the Orthodontic Borderline treatment need using the "Guide for orthodontic borderline treatment need" index (GBON) and the Aesthetic Index (AC) of DHC 3 (Dental health component) in order to compare the reliability, ease of use, and appropriateness of these indices in a local, selected population.

Materials and methods: This research is a descriptive analysis of a cross-sectional population. A group of ten skilled orthodontists evaluated 37 cases of borderline malocclusions using the GBON and AC indices, and answered to a questionnaire.

Results: Assessors were 60% women, 30% males. By gender, IOTN calibration, and index order, GBON and AC scores were compared. Differences were assessed using chi-square. Significant category differences were found with a Chi-square value of 52.96 (P-value = 0.0339). The inter-rater reliability of each index was evaluated using Cronbach's α coefficient. GBON and AC indices had acceptable reliability scores, with AC ranking higher. The GBON Index found 8 of 37 patients needed therapy. With the AC index, 22 of 37 patients require therapy. GBON and AC indices agree well within the same rater, with a kappa value of 0.253.

Conclusion: GBON and AC demonstrated equal inter- and intra-examiner reliability. AC was better at identifying malocclusal features requiring therapy than GBON. GBON was proven to be more user-friendly and suitable for assessing DHC 3 malocclusions than AC.

INTRODUCTION

Over four decades ago, it was recognized that a thorough analysis of the impact of malocclusion on appearance is crucial for accurately assessing the need for orthodontic treatment.[1] Accurate assessments of dental aesthetics are crucial for evaluating the social and psychological consequences of malocclusion, as determined by previous research.[2] Decisions about treatment become more difficult when the misalignment of teeth is just somewhat problematic and primarily focused on improving appearance. When considering information on

morphology and the aesthetic importance of diversity, visual stimuli may be more easily understood than verbal explanations.[3] The primary driving force behind the need for orthodontic treatment is the desire to enhance one's looks.[4-7] Evaluations of dental aesthetics are intricate, subjective, and significantly differ across people.[8-11] The perception of a satisfactory dental look might vary from person to person. Efforts have been made to provide objective criteria for assessing dental aesthetics in order to address these issues.[4,12-15] Using these criteria helps prioritize those with the greatest need for orthodontic care when resources are limited, while also protecting those with minor issues from unnecessary treatment risks.

The Index of Orthodontic Treatment Need (IOTN), developed in 1989, is a widely used tool to assess the severity of occlusal issues and prioritize orthodontic treatment. It consists of two main components: the Dental Health Component (DHC), which evaluates clinical need, and the Aesthetic Component (AC), which assesses appearance. While the DHC is well-regarded and clearly defines borderline cases (DHC 3), the AC is limited, showing only three of six relevant traits, making its effectiveness in identifying borderline treatment needs uncertain. [2,13]

Decisions on the treatment of borderline malocclusions based solely on appearance might be challenging [16,17]. In 2006, a prioritization system was implemented in England and Wales. This approach allowed individuals with borderline conditions, namely those with a DHC score of 3 and AC scores of 6 and higher (referred to as score 3.6),[18] to get treatment inside the National Health Service. Nevertheless, the validation of pictures 5 and 6 has not been conducted with the sole purpose of determining their suitability as thresholds for accessing therapy. Several writers have proposed that the criteria for receiving therapy should be revised to cover lower grades, such as 5 and maybe even 4.[19-22]

A novel index, known as the "guide for borderline orthodontic need" (GBON)[23] has been suggested as a tool for distinguishing the need of orthodontic treatment based on aesthetic considerations in borderline cases ("Appendix 2"). The GBON comprises a chart including eight photos, each depicting malocclusions with a DHC score of 3. The images included in the GBON index were chosen based on clear consensus among orthodontic, dental, and lay panels of judges about whether or not these patients required treatment for aesthetic reasons. The primary purpose of the GBON is to assist doctors in evaluating borderline DHC 3 patients, rather than assessing oral aesthetics. Standardized dental photographs have been demonstrated to be a valid representation of dental attractiveness.[2]

The aim of the present study was to assess and compare Orthodontic Borderline treatment need using 'Guide for orthodontic borderline treatment need' index (GBON) and Aesthetic Index (AC) of DHC 3 (Dental health component) in terms to compare the reliability, ease of use and appropriateness of these indices in local select population.

Materials and Methods: The study was ethically approved by the Institutional Ethics Committee of Dr. D. Y. Patil Dental College and Hospital, Pune. A convenience sample of 37 intraoral anterior-view photographs of adult patients (aged 18+) with DHC 3 borderline malocclusions was selected from departmental archives. Ten experienced orthodontists (with over 10 years of practice) were recruited to assess the photos.

Photos were printed and compiled into two separate albums labeled "AC" (Aesthetic Component of IOTN) and "GB" (GBON index). Assessors were divided into two groups to counterbalance the order of album review and reduce bias. Each group evaluated the photos using both indices, switching albums after the first round.

Assessors used provided reference materials but were blinded to the purpose of the GBON index, unaware that the cases were all DHC 3 and that GBON was designed to assess borderline malocclusions. They were instructed to score based on "attractiveness" (AC) and "appearance" (GBON), without knowledge of the treatment thresholds embedded in the GBON index. The chief investigator supervised all evaluations.

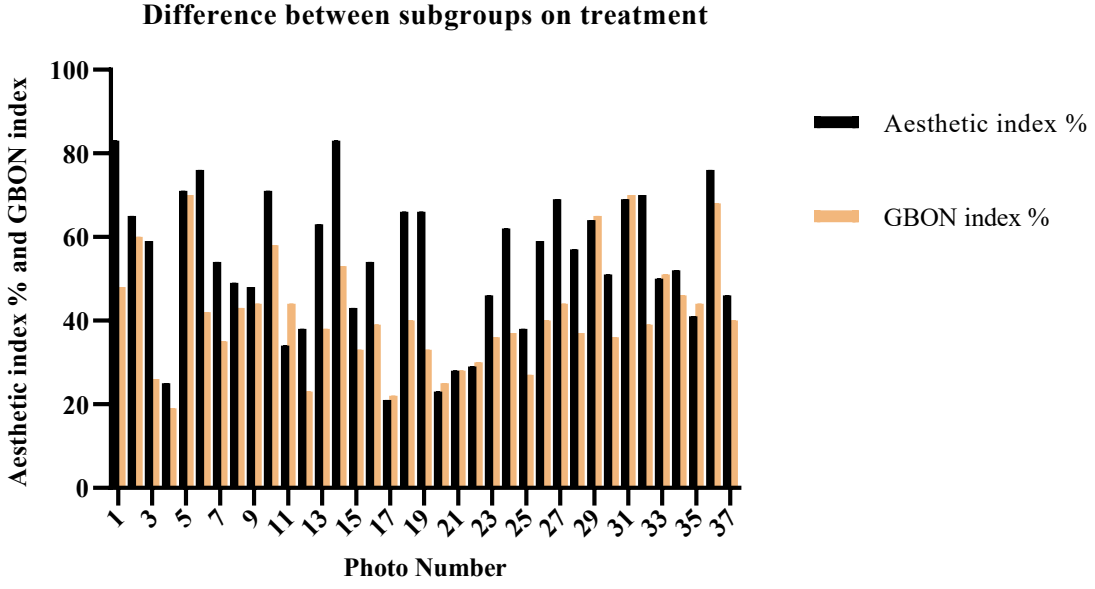
Questionnaire: The questionnaire included separate tables for the AC scores and GBON scores, along with questions regarding gender and prior attendance at an IOTN calibration course. After completing the assessments, two additional questions were asked verbally. This was done to minimize bias and ensure that assessors evaluated the photographs solely based on objective criteria, without allowing their personal opinions to influence their scoring:

1. Which index did you find more user-friendly?
2. Which index did you find to be the most suitable for these specific malocclusions?

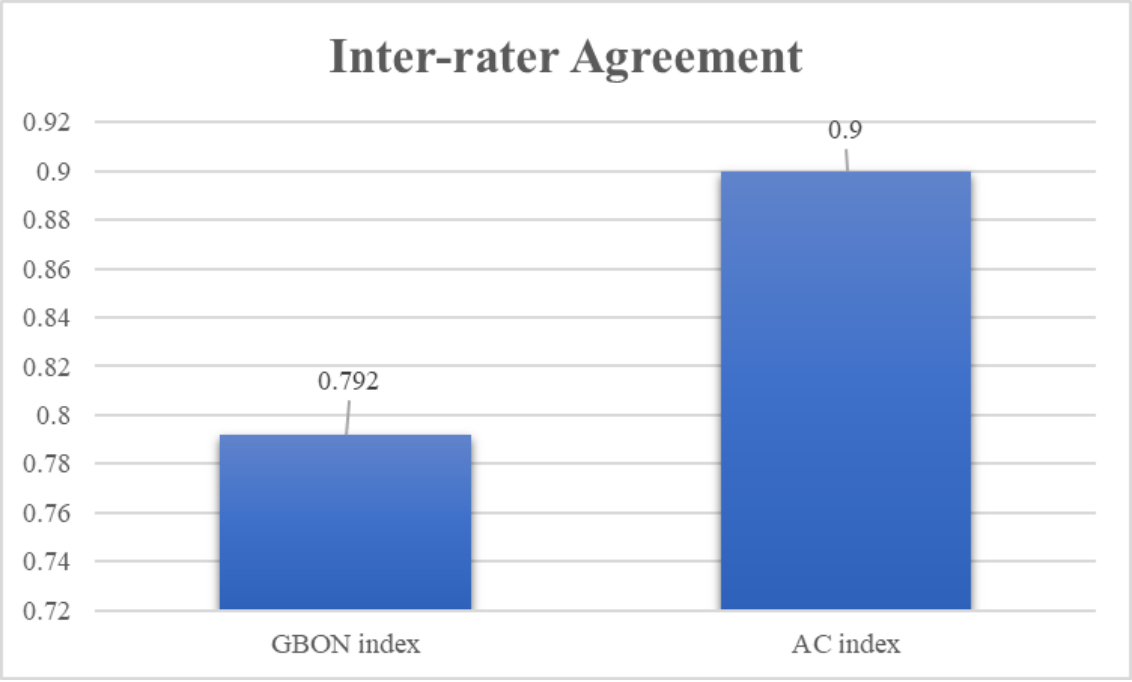
Statistical analysis: The analysis of the data from the present study was performed in IMB SPSS statistics version 20 software. Chi-square analysis, kappa analysis, and Cronbach's α reliability analysis were employed. An expert in statistics was consulted to provide guidance on study design and statistical analysis.

Results:

Difference between subgroups on treatment need decisions: Among the assessors, 60% were female and 30% were male. The GBON and AC scores were compared based on gender, IOTN calibration, and the order in which the index was used. The disparities were evaluated by a chi-square test. There were statistically significant (P-value = 0.0339) disparities seen among the groupings, with a Chi-square value of 52.96. (Figure 1)



Inter-rater agreement: The reliability of each index was evaluated using Cronbach's α reliability coefficient (Table 1). Both the GBON and AC indices demonstrated quite satisfactory α reliability scores, with the AC index achieving a higher score (Figure 2).



Agreement on treatment using GBON and AC indices: The treatment needs are highlighted using grey shading in Table 2, based on the treatment need according to GBON and AC index. The GBON Index identified that 8 out of 37 cases required treatment. When using the AC index 22 out of 37 cases need treatment.

Intra-rater agreement: The kappa value between the GBON and AC indices is 0.253, indicating a fair level of agreement within the same rater. The GBON and AC computed the percentage agreement and kappa score, as indicated in the table 3, for the intra-rater agreement on treatment need. This was done using the GBON index and AC index.

Table 1: Chronbach's α reliability scores for GBON and AC indices.

	GBON index	**AC index**
Reliability (α)	0.792	0.9

Table 2: Percentage of assessors that allocated summarize calculation with the mean difference interval from mode to highest ratio index in he GBON index, compared to the AC index

Photo number	AC index %	GBON index %
2	65	60
10	71	58
36	76	68.88889

Table 3: The kappa agreement scores between the GBON index and AC indices.

	GBON versus AC
Perfect agreement	47.5%
Kappa score	0.253

DISCUSSION

Malocclusion is the irregularity of the teeth or an impaired relationship of the dental arches beyond the range of what is accepted as normal[24]. The primary purpose of the AC of the IOTN was to determine the degree of aesthetic impairment that was brought on by malocclusions, which may range from moderate to severe. Neither the design nor the testing of the AC was done with the explicit goal of deciding which borderline malocclusions should be treated and which should not be treated. On the other hand, it is essential to point out that the eight images that were selected for the GBON [22] were subjected to a comprehensive examination by a broad group of specialists, which included dentists, orthodontists, and individuals who were not specialists in the field. These panels, which consisted of a total of seventy-five judges, reached a decision that was unanimous in nature on whether or not the people shown in the images needed treatment. There was no space for ambiguity involved. It has been shown that the GBON is a binary guide that is simple to use and may assist in determining whether or not borderline malocclusions need treatment purely on the basis of their appearance.

It is essential to point out that the 37 borderline malocclusions that were investigated in this study did not necessarily act as an accurate representation of the frequency with which these characteristics are seen in the local select community of individuals who have DHC 3 malocclusions. The goal was to cover a wide range of characteristics, although it is possible that these characteristics do not adequately reflect the frequency of these characteristics. This was done with the intention of determining whether or not the GBON is capable of evaluating different types of borderline malocclusions.

Inter-Rater Agreement: To validate the indices, both inter-rater and intra-rater agreements were assessed. The GBON and AC

indices showed acceptable reliability, with Cronbach's α values indicating adequate internal consistency. The GBON's strong reliability is notable, given it focuses on a narrow range of treatment cases.

Intra-Rater Agreement: The kappa test revealed a moderate level of agreement between the GBON and AC indices when evaluated by the same raters. There was a 77.5% agreement between raters using both indices, and the kappa value of 0.253 confirmed a moderate level of inter-rater reliability.

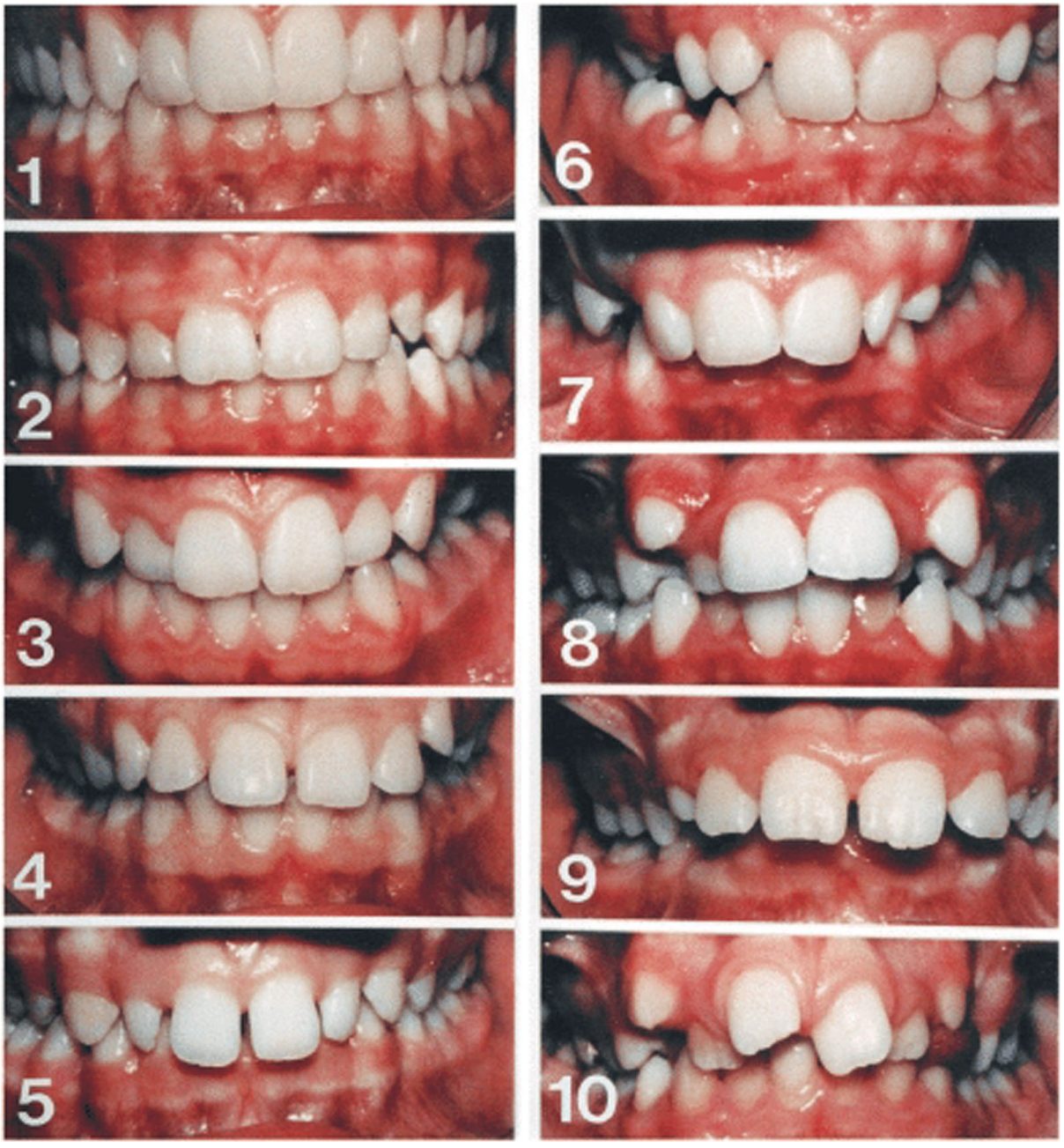
Treatment Needs According to GBON and AC Indices: The GBON Index identified 8 out of 37 cases as requiring treatment, while the AC Index identified 22 cases. This discrepancy suggests that the AC may overestimate treatment need, possibly because it includes images that are not truly borderline (DHC 3). It has been suggested that the threshold for treatment using the AC index may need revision.

Representation of Borderline Malocclusion Traits: The AC index lacks representation of three key borderline malocclusion traits: reverse overjets, crossbites, and open bites.In contrast, the GBON highlights all six traits associated with DHC 3 malocclusions, though crossbites are only depicted when combined with reverse overjets. Nonetheless, all traits were deemed to require some form of clinical intervention.

Convenience and Suitability of the GBON Index: Despite no prior exposure to the GBON index, orthodontists (both male and female) found it easy to use and well-suited for assessing borderline malocclusions. This suggests that the GBON index is practical and adaptable for everyday orthodontic evaluations.

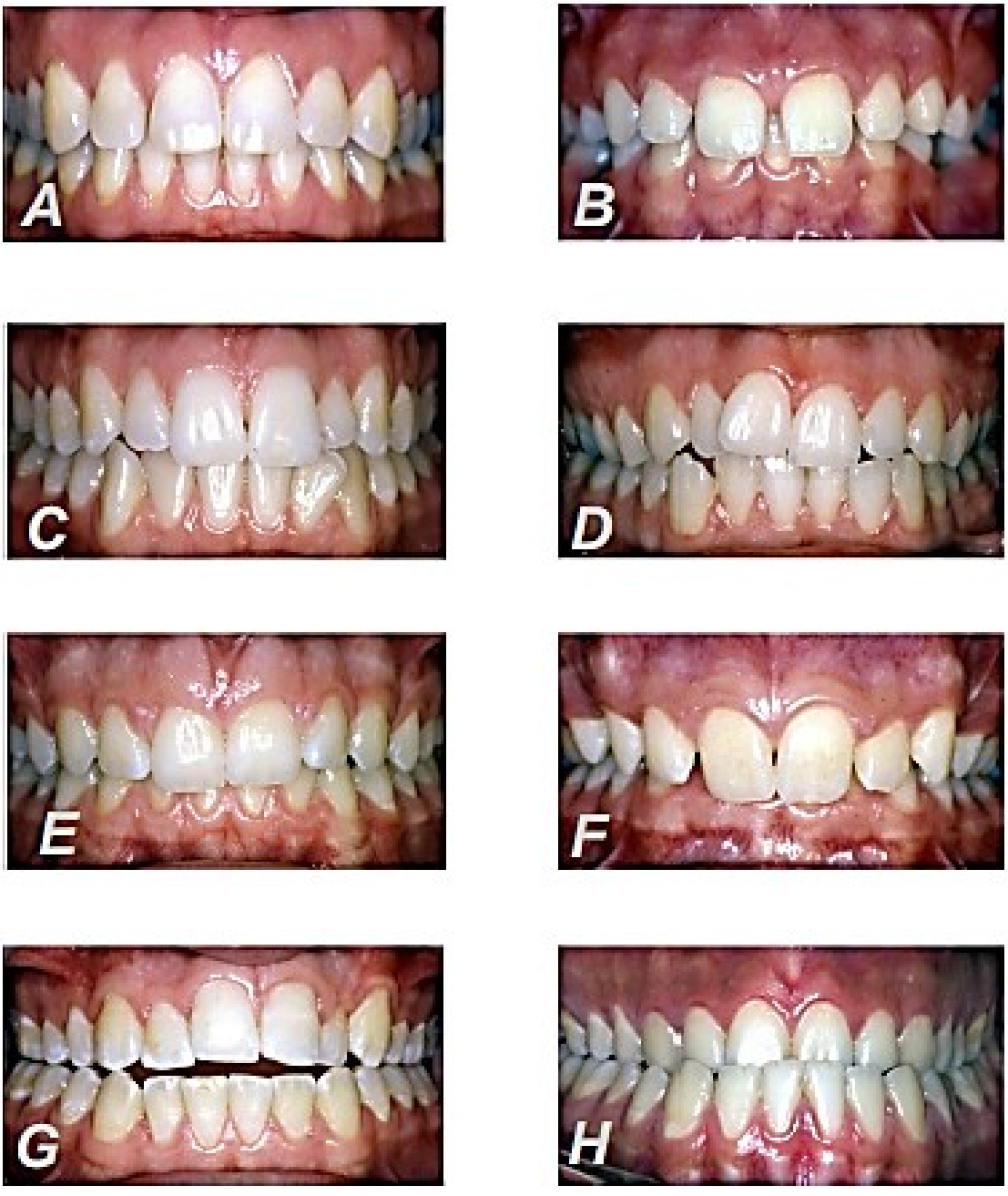
Conclusion: When it came to inter- and intra-examiner dependability, both GBON and AC demonstrated strong and similar levels of reliability. A greater number of DHC 3 malocclusions that needed treatment were found by the AC index as compared to the GBON index. In general, both of the indices are simple to apply and provide improved judgment on the level of therapy that is required for instances with DHC 3 malocclusion.

Appendix 1: The aesthetic component (AC) scale of the index of orthodontic treatment need (IOTN)



Guide to Borderline Orthodontic Need (GBON)

This Guide is only suitable for patients assessed as Grade 3 of the Dental Health Component of the Index of Orthodontic Treatment Need



Please record which photo is closest in appearance to the dentition being assessed.

Please note, these photos are not ranked in order of attractiveness.

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