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A Proposition to Modify Commonly Utilized Indices of Treatment Need in Orthodontics

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Abstract

Orthodontic treatment need is based on a number of dental, esthetic, functional, facial morphological, psychosocial and self-perceptive factors. Normative indices have been developed and are in broad usage by state-sponsored dental health programs to allocate orthodontic services to select individuals, but commonly lack integration of psychosocial and self-perceptive variables. Objective: To investigate current indices regarding their inclusion of specific psychosocial and self-perceptive metrics in determining a level of treatment need. Materials and Methods: A pilot survey was distributed to orthodontic professionals to determine objective and subjective variables that play a role in determining treatment priority. Results were qualitatively cross checked with select indices. Results: Psychosocial and self -perceptive variables were found to be largely important for assessing orthodontic treatment need. This was, for the most part, not reflected in the indices investigated. Conclusions: Orthodontists' assessment that psychosocial factors and self -perception are important in determining treatment priority is in agreement with literature that demonstrates adverse effects related to those factors, but not in agreement with indices in broad usage by government programs in different parts of the world. This prompts us to make an appeal to the orthodontic community to carry out further studies that will allow a reasonable method of incorporation of these factors into a novel, more comprehensive index.

Keywords: Orthodontic treatment need index; Self perception; Medically necessary orthodontic treatment

Abbreviations: IOTN: Index of Treatment Need; DHC: Dental Health Component; AC: Aesthetic Components; DAI: Dental Aesthetic Index; HLD: Handicapping Labio lingual Deviation index Index of Complexity; ICON: Outcome and Need; OASIS: Oral Asthetic Subjective Index Scale; VAS: Visual Analog Scale

Introduction

It is well accepted that a number of factors determine an individual's orthodontic treatment need, including (but not limited to) psychosocial considerations, self-perception, facial balance, upper airway considerations, occlusal function, and dental irregularities [1]. The combination of these factors, coupled with the notion that malocclusion is not a pathologic entity, makes the quantification of orthodontic treatment need difficult. This notion is supported by a wide range of studies that demonstrate that orthodontic treatment has the potential to improve an individual's oral health related quality of life (OHRQoL) and self -perception [2-5]. In essence, the term "need" in orthodontics may better be understood as the potential to enhance well-being.

In an attempt to quantify orthodontic treatment need, various indices have been developed and are used with varying degrees of acceptance [6,7]. The primary purpose of such indices has been to assess treatment priority for individuals seeking treatment, and to provide epidemiological data for malocclusion severity in a given population [1,8].

Shaw and colleagues developed the Index of Treatment Need (IOTN) [6], which includes dental health (DHC) and aesthetic components (AC). In 2001 Burden et al. simplified the IOTN index. The modified IOTN is a two-grade scale (need/no definite need), (unlike the IOTN 5-grade scale) with 30 sub-categories. With the modified IOTN, every case with DHC score ≥ 4 and/or AC score ≥ 8 is classified as being in need of treatment [9].

In 1986 Cons and colleagues developed the Dental Aesthetic Index (DAI). The DAI links clinical and aesthetic components mathematically to produce a single score. This score reflects the malocclusion severity by using cut-off points to determine orthodontic treatment need. The DAI is based on a social acceptability scale of occlusal conditions. The lack of assessment of occlusal anomalies such as buccal crossbite, impacted teeth, midline discrepancy, and deep overbite weakens the index [9].

In 1960, Dr. Harry L. Draker developed the Handicapping Labio-lingual Deviation index (HLD), which was one of the first indices used in the United States to identify individuals with

handicapping malocclusions. The HLD selects deviations from ideal and these are scored and weighted. The HLD index has been modified by some states to determine and prioritize eligibility for the state-funded orthodontic treatment [9].

The Index of Complexity, Outcome and Need (ICON) was developed by Daniels and colleagues in 2000. It is a single assessment method to measure the orthodontic treatment complexity, outcome and need. According to authors, assessing the complexity of malocclusion helps to:

a. To identify the most proper setting in which the patient receives treatment (i.e. general practice, hospital or specialized practices)

b. To inform the patient of a treatment's likely success, and finally

c. To identify cases that are more difficult and are likely to take longer to treat. One drawback to this index is that the perception of treatment need varies between countries. For instance, Dutch orthodontists suggested changing the cut -off point to 52, instead of the recommended cut- off point of 43, to increase the validity of the index from their perspective and value system [9].

These indices have been broadly utilized as screening mechanisms and to allocate resources for orthodontic services in many government-subsidized dental health programs as well as in state - sponsored single or third party payer or insurance systems. A patient is accepted for coverage when dental and aesthetic components both indicate the need for treatment [10]. However, Järvinen and Väätäjä found that different indices selected different patients for treatment [11], thus highlighting a discrepancy in the need parameters inherent in the different indices.

In light of a seemingly increased public focus on facial esthetics, along with a clear demonstration of the negative psychosocial consequences of malocclusion, there is a deficiency in the current widely-used normative indices regarding the lack of inclusion of psychosocial and self-perception parameters. The advent of implementing various self -perception indices (in addition to the esthetic component of the IOTN), such as the oral esthetic subjective index scale (OASIS) and the visual analog scale (VAS) has partially addressed this deficiency, but Elsamipour and colleagues concluded that the sensitivity and specificity of these indices are not sufficient to classify them as primary screening tools, but are valuable tools in conjunction with validated normative indices [7].

Pilot Survey

Study design

A short survey was created on the Qualtrics research platform. The questionnaire was distributed to a group of orthodontists, who were asked to rank various clinical diagnostic parameters as well as psychosocial and self-perceptive factors on the basis of their importance of need to treat on a five- point scale (never requiring treatment, sometimes requiring treatment, requiring treatment about half the time, requiring treatment most of the time, and always requiring treatment). In total, 51 subjects completed the survey. The results of this pilot survey were qualitatively compared to the IOTN, DAI, HLD, and ICON. A summary of the areas of agreement between these indices as well as to the survey findings is highlighted below.

Results

Our survey identified six areas where at least a majority of orthodontists reported a high importance in their decision to treat. They are as follows:

a. Eruption Abnormalities (ectopias, impaction, supernumeraries, over retention of primary teeth, etc.) that will cause or contribute to malocclusion or pathosis,

b. Negative overjet (in the anterior sextant)

c. Individual anterior dental crossbite

d. Open bite

e. Buccal or lingual crossbite with a functional shift, and

f. Non-dental reasons such as: self -image, quality of life impairment (social/work), smile esthetics.

Discussion & Commentary Regarding Select Indices

It is widely accepted that malocclusion contributes to poor smile esthetics and has the potential to cause psychosocial, functional problems as well as adverse dental sequelae (such as periodontal disease, impaction-associated resorption, and susceptibility to trauma) [12-16]. This is despite the fact that malocclusion is not itself pathosis that requires treatment, except in extreme cases of skeletal disharmony, the presence of craniofacial anomalies that contribute to somatic/visceral consequences such as airway compromise, or specific dento-alveolar conditions causing negative sequelae such as a crossbite resulting in periodontal compromise. Orthodontics as a specialty largely exists to address the desire for enhanced image, and to mitigate the negative perceptions and social consequences associated with malocclusion. Evidence supporting this concept is widespread [1-5,17]. This desire for enhanced image spans the spectrum of simple cosmetic refinement to vast improvements in an individual's oral-health related quality of life.

The Index of Treatment Need (IOTN) for orthodontic treatment assigns five grades (1-5) based on malocclusion severity (1- no need, 2- little need (mild), 3- borderline need (moderate), 4 - need (severe), and 5- need (extreme) [6]. This mimics the five-point scale that we utilized in our survey. Our results are generally in agreement with the index, and qualitatively, large proportions of our sample reported a need to treat at least "most of the time" in cases of malocclusion severity corresponding to Grades 4 and 5. The non-dental factors yielded a high assessment of treatment need, with over 70% of respondents selecting a need for treatment "most of the time" for all factors except function/ improved chewing/swallowing (63%) and speech (51%). Interestingly, these two factors are partially addressed (although not comprehensively) by the IOTN and the New York State Medicad Program.

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The term "handicapping" is used by some state sponsored programs funding orthodontic services (HLD), to delineate the degree of malocclusion that is likely correlated with some of the aforementioned negative effects. The handicapping potential of a malocclusion is calculated as a function of severity of various components of malocclusion. Treatment funds are allocated to those subjects deemed by the calculation index to benefit the most from such treatment, whether comprehensive or interceptive. It has been demonstrated that even partial early treatment produces psychosocial benefits, so as to decrease the handicapping potential of a malocclusion [18,19]. Although the merit of reducing a dental handicap may be based on improved psychosocial well-being, the mode of calculating the handicap does not entirely incorporate psychosocial and self-perceptive factors. However, some of the factors are adjunct considerations for concurrent objective and quantifiable measures of malocclusion. Examples of such qualifying measures include "Overjet greater than 9mm with reported masticatory or speech difficulties" (rendered from the State of New York State Medicaid program handicapping index) even though masticatory and speech difficulties may exist with overjet measurements far less than 9mm. Another possible demonstration of a handicap that would not qualify under a handicapping index measurement is a patient with grossly malformed or oddly shaped teeth with large spacing and axial malpositioning, but with minimally positive overjet and overbite and no crossbites. Due to the lack of crowding, pathways to meet the threshold for qualification of handicapping would be nearly impossible although the patient may be ridiculed due to their dental condition.

For these purposes, we sought to identify whether orthodontic practitioners' assessment of treatment need correlates with those calculated by currently-used indices, and how important their perception of psychosocial and self-perceptive factors is in assessing treatment need.

The ICON index does incorporate upper arch spacing in its scoring system, and also considers Angle classification deviations from Class I in the buccal segments. The DAI is similar in considering a midline diastema and assessment of anteroposterior molar relation.

Conclusion

What appears to be agreed upon within the select treatment need indices are common objective variables such as crowding, excess overjet and overbite, and crossbites that have the potential to cause functional problems such as asymmetric deviations and trauma. Determinations for incorporating esthetic or psychosocial variables are not universally considered to be essential. While conclusiveness of any findings of this study are limited, we hope that this study provides a premise for further studies as the evolution is towards providing medically necessary orthodontic treatment; moreover, to develop an index with criteria to more comprehensively reflect the deleterious impact of some of the non -quantifiable psychosocial and self-perceptive measures of malocclusion.

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