ORIGINAL RESEARCH

# Comparison between the ICON index and the esthetic component of the IOTN to determine the need for orthodontic treatment

## Comparación de los índices ICON y el componente estético del IOTN para determinar la necesidad de tratamiento ortodóncico

María Fernanda Cruz López,* María Fernanda Gutiérrez Rojo,*
Jaime Fabián Gutiérrez Rojo,§ Alma Rosa Rojas García§

**ABSTRACT**

Some indexes have been used in the international scientific community in response to the need for information about the severity of malocclusion and the perceived need for orthodontic treatment. The ICON index and aesthetic component of IOTN help clinicians to determine the need of treatment according to different parameters. **Material and methods:** The ICON index and the aesthetic component of IOTN were used to assess pretreatment orthodontic patients in study models of the *Universidad Autónoma de Nayarit*. The study universe was 986 models and the sample was 166 study models. The Microsoft Office Excel 2007 program was used to tabulate the information and perform descriptive statistics; the Kappa test was performed between the two indexes. **Results:** The mean for ICON was 40.38 and for the aesthetic component of IOTN, 4.03 points. The result of kappa test between the two indexes was good (0.789), both coincide in 89.46% of the evaluations. **Conclusions:** Both indexes may be used to determine the need for orthodontic treatment.

**RESUMEN**

Algunos índices han sido empleados en la comunidad científica internacional como respuesta a la necesidad de información acerca de la severidad de la maloclusión y la necesidad de tratamiento ortodóncico percibido. Los índices ICON y el componente estético del IOTN ayudan al clínico a determinar dicha necesidad de tratamiento según parámetros distintos. **Material y métodos:** Se utilizó el índice ICON y el componente estético del IOTN para evaluar los modelos de estudio pretratamiento de ortodoncia de pacientes de la Universidad Autónoma de Nayarit. El universo de estudio fue 986 modelos y la muestra fue 166 modelos de estudio. Se utilizó el programa Microsoft Office Excel 2007 para tabular la información y realizar la estadística descriptiva, se realizó la prueba de Kappa entre ambos índices. **Resultados:** La media del ICON fue de 40.38 puntos y la del componente estético del IOTN fue de 4.03 puntos. El resultado de la prueba Kappa entre ambos índices fue bueno (0.789), ambos índices coinciden en el 89.46% de las evaluaciones. **Conclusiones:** Ambos índices se pueden utilizar para determinar la necesidad de tratamiento de ortodoncia.

**Key words:** ICON, IOTN, orthodontic treatment.
**Palabras clave:** ICON, IOTN, tratamiento ortodóncico.

## INTRODUCTION

The correct identification of patients in need of orthodontic treatment since early ages of life allows interceptive treatments to prevent the increase in the severity of the disorders and the need for more complex and expensive corrective orthodontic treatments.

Within orthodontic treatment malocclusion is the protagonist,[1] and its concept has evolved over time. Guilford spoke of malocclusion to refer to any deviation from the ideal occlusion. It has a multifactorial origin, not having a single etiological cause, but many interacting with each other.[2,3]

In response to the need for information about the prevalence of malocclusions and as a method to quantify the magnitude of the various features of malocclusion, as well as measure their severity objectively, several indexes have been suggested. They describe a situation concerning health or disease in a given population and its degree of severity, which make it possible to assess the deviation from normal or ideal occlusion in terms of perceived need for treatment.[4,5]

* Student.
§ Professor.

Orthodontics Specialty of the Autonomous University of Nayarit.

Different indexes for malocclusion measurement and need for treatment have been used such as the occlusal index, the index of treatment priority (ITP), the World Health Organization (WHO) (malocclusion index), index of dental esthetics (IDE), index of orthodontic treatment priority by Richmond S *et al* (IOTN), index of severity of malocclusion and NHANES III, US (measurement of the occlusal characteristics) as well as the ones proposed by Jenny J and Cons NC, Grainger, Brook PH, Shaw WC, Daniel *et al.*[4,6,7]

The index of orthodontic treatment need (IOTN) with the dental health component (DHC), classifies between functional disability, and occlusal discrepancy and the standard component of aesthetic need (SCAN) which consists in a series of 10 photographs organized by level of attractive, being the degree 1 the most attractive and the grade 10 the less attractive are the tools most frequently used to measure the need for treatment.[8,9]

Within the standard component of aesthetic need, it was found that according to professional opinion grades 1-4 did not represent a need for treatment; grades 5-7 were borderline cases for necessity of treatment and grades 8-10 definitely needed orthodontic treatment.[9]

Daniels, Richmond *et al.* in the year 2000 proposed the index of complexity, outcome and need ICON with the aim of developing an index that was able to assess the complexity and need for orthodontic treatment. This is based on the perception of the need for treatment by 97 orthodontists of 9 countries who assessed 240 dental models to evaluate the need for treatment and 98 pairs of models of treatment cases before and after assessment of the results. It values 5 occlusal traits to which a score established by the author is assigned, depending on the degree of severity or normality. These scores are multiplied by the corresponding weighting factor and, finally, are added together to obtain a final score.[7,10]

This index provides a means to compare the beginning of treatments in different countries and will serve as the basis for quality standards in orthodontic treatments.[11]

## MATERIAL AND METHODS

The ICON index and the esthetic component of the IOTN were used in order to assess the pretreatment orthodontic study models of patients from the Autonomous University of Nayarit. The study universe was 986 models. The sample was calculated with a confidence level of 95%, an error of 5% and a proportion of 10%, resulting in a sample size of 162 study models.

The pretreatment orthodontic study models that were included in the sample were those with fully erupted permanent dentition (with the exception of third molars). All study models were made in the same laboratory. Patients with a history of previous orthodontic treatment and study models that presented fractures or modifications of dental structures were excluded.

The material used for the study consisted in a computer, a Surtek brand digital caliper and pretreatment orthodontic study models. The ICON index and the esthetic component of the IOTN for each of the study models was calculated. The Microsoft Office Excel 2007 program was used to tabulate the information and perform the descriptive statistics. The Kappa test was performed between the two indexes.

## RESULTS

The sample was made up of 62.65 per cent women and 37.34 men; the average age was 17.2 years. The mean of ICON was 40.38 ± 25.21 points and for the esthetic component of the IOTN it was 4.03 ± 2.58 points. Descriptive statistics are listed in *table I*.

When documenting the type of treatment with the ICON, it was found that 73.48% of the cases were considered as mild or moderate and 26.49% as difficult or very difficult. With the index of dental aesthetics of the IOTN 65% had no need or little need of orthodontic treatment; 9.03% presented a moderate need for orthodontic treatment and 25.30% had a major need for orthodontic treatment *(Figure 1)*.

The ICON index revealed that 62.5% of the population had no need for treatment and 37.34% needed orthodontic treatment. With the esthetic component of the IOTN, 65% of the sample did not need orthodontic treatment and 35% required treatment *(Figure 2)*. The result of the Kappa test between the two indices was good (0.789); both indices coincide in 89.46 per cent of the evaluations.

**Table I.** Descriptive statistics of the ICON and the esthetic component of the IOTN (EC).

|  | ICON | EC |
| --- | --- | --- |
| Mean | 40.38 | 4.03 |
| Standard deviation | 25.21 | 2.58 |
| Maximum | 104 | 10 |
| Minimum | 7 | 1 |

## DISCUSSION

It is necessary for dental services to have a rigorous knowledge of oral disease and health care needs of the population. Therefore in the present investigation, the need for orthodontic treatment of malocclusions in patients who attend the Clinic of the Orthodontics Postgraduate Course at the Autonomous University of Nayarit was assessed. The ICON index and the esthetic component of the IOTN were used as an indicator of need for orthodontic treatment, making a comparison between them.
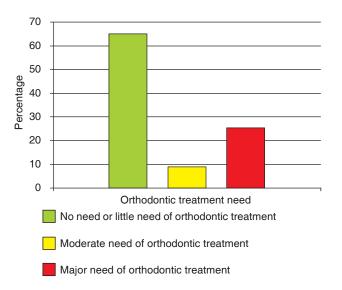


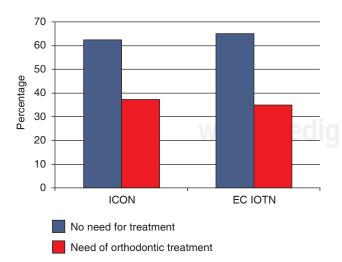**Figure 1.** Orthodontic treatment need with the esthetic component.



**Figure 2.** Orthodontic treatment need of the ICON index and the esthetic component (EC) of the IOTN.

In Iran in the year 2011 Borzabadi-Farahani and Borzabadi-Farahani conducted a study in 502 subjects (253 girls and 249 boys between the ages of 11 and 14 years) in which they found a mean in the ICON index of 44.6 points, which is similar to that of the present study. However when they compared the ICON with the esthetic component of the IOTN using the Kappa test both indices agreed on most occasions; the value of Kappa obtained in the investigation in Iran was 0.55 and in this study it was 0.78.[12]

A study was conducted in the Orthodontics Unit at Lagos University Teaching Hospital, Nigeria. In a population of 150 patients between the years 2011 and 2012 the need for orthodontic treatment was analyzed with the ICON index. It was observed that 38% of the studied population needed orthodontic treatment while 62% had no need of treatment. This result is similar to that of Borzabadi-Farahani and of the present study.[13]

In an investigation conducted in the year 2009 in Valencia Spain by Manzanera, Almerich-SillaMontiel-Company, and Gandia, 363 children under the age of 12 years and 292 of 15 to 16 years of age were studied using the IOTN index of treatment. No significant differences were found in terms of age. In children of 12 years of age the treatment need was 23.5%, and in the ages of 15-16 years, it was 18.5%. These values are similar to those of this study.[14]

Oliviera, Sheiham, Tsakos and O'Brien in the year 2008 in the United Kingdom conducted a study in which 87 children participated with a mean age of 12.21 years. They were evaluated by the IOTN index of treatment and the obtained results showed that 64.2% had a high need for orthodontic treatment; 21.4%, a moderate need, and 14.4% had little need for treatment, which differs from the results of the studied population in this research.[15]

Fox et al. in 2002 found that the ICON index identifies more cases in need of orthodontic treatment than the esthetic component of the IOTN.[16] We agree with this study, although the difference was only 2.5% between the ICON and the EC of the IOTN.[16]

## CONCLUSIONS

Both indexes showed a similar assessment to evaluate malocclusions. Using the ICON 62.5% of the studied population had no need for orthodontic treatment and with the IOTN, 65%.

The indexes agreed in their assessments of 89.46% of the cases so either two may be used to determine the need for orthodontic treatment. However in the case of using the ICON, the esthetic component of the

IOTN is one of the five elements required to calculate it, so it would be just as useful and faster to use only the esthetic component of the IOTN to determine the need for orthodontic treatment.

## REFERENCES

1. González V, Alegret M, González Y. *Convención Nacional de Salud*. Cuba Salud 2015. Palacio de Convenciones de la Habana. Available in: http://www.convencionsalud2015.sld.cu/index.php/convencionsalud/2015/
2. Di Santi de Modano J, Vázquez V. Maloclusión clase I: definición, clasificación, características clínicas y tratamiento. *Rev Latin de Ortod y Odontoped* [Internet]. 2003 [citado 12 de octubre 2015]. Available in: http://www.ortodoncia.ws/publicaciones/2003/art8.asp?print=true
3. Ortiz M, Lugo V. Maloclusión clase II división 1; etiopatogenia, características clínicas y alternativa de tratamiento con un configurador reverso sostenido II (CRS II). *Rev Latin de Ortod y Odontoped* [Internet]. 2007 [citado 12 de octubre 2015]. Available in: https://www.ortodoncia.ws/publicaciones/2006/pdf/art14.pdf
4. Alemán-Estévez MG, Martínez-Brito I, Pérez-Lauzurique A. Necesidad de tratamiento ortodóncico en escolares. Aplicación del índice DAI. *Rev Med Electrón* [Internet]. 2011 [citado 12 de octubre 2015]; 33 (4): 441-447. Available in: http://scielo.sld.cu/scielo.php?pid=s1684-18242011000400006&script=sci_arttext
5. Elizondo-Dueñaz R, Yudovich-Burak M, Aguilar-Saavedra M, Meléndez-Ocampo A. Propuesta de un índice de maloclusiones invalidantes con potencial de deterioro y su aplicación. *Rev Odont Mex*. 2011; 15 (2): 77-95.
6. Mafla AC, Barrera DA, Muñoz GM. Maloclusión y necesidad de tratamiento ortodóntico en adolescentes de Pasto, Colombia. *Rev Fac Odontol Univ Antioq*. 2011; 22 (2): 173-185.
7. Delgado-Carrera L, Llanes-Rodríguez M, Rodríguez-González L, Fernández-Pérez E, Batista-González NM. Antecedentes históricos de los índices epidemiológicos para prioridad de tratamiento ortodóncico. *Rev Haban Cienc Méd*. 2015; 14 (1): 60-69.
8. Avilés-Beltetón M, Huitzil-Muñoz E, Fernández M, Vierna-Quijano JM. Índice de necesidad de tratamiento ortodóncico (IOTN). *Oral*. 2011; 39: 782-785.
9. Hunt O, Hepper P, Johnston C, Stevenson M, Burden D. The Aesthetic Component of the Index of Orthodontic Treatment Need validated against lay opinion. *Eur J Orthod*. 2002; 24 (1): 53-59.
10. Firestone AR, Beck FM, Beglin FM, Vig KW. Validity of the Index of Complexity, Outcome, and Need (ICON) in determining orthodontic treatment need. *Angle Orthod*. 2002; 72 (1): 15-20.
11. Ochi C, Idaboh G. Orthodontic treatment complexity and need at the University College Hospital, Ibadan, Nigeria, according to the Index of Complexity, Outcome and Need (ICON): a pilot study. *Pediatric Dental Journal*. 2006; 16 (2): 128-131.
12. Borzabadi-Farahani A, Borzabadi-Farahani A. Agreement between the index of complexity, outcome, and need and the dental and aesthetic components of the index of orthodontic treatment need. *Am J Orthod Dentofacial Orthop*. 2011; 140 (2): 233-238.
13. Utomi IL, Onyeaso CO. Orthodontic treatment complexity and need in a Nigerian teaching hospital. *Oral Health Dent Manag*. 2014; 13 (3): 562-567.
14. Manzanera D, Montiel-Company JM, Almerich-Silla JM, Gandía JL. Diagnostic agreement in the assessment of orthodontic treatment need using the Dental Aesthetic Index and the Index of Orthodontic Treatment Need. *Eur J Orthod*. 2010; 32 (2): 193-198.
15. de Oliveira CM, Sheiham A, Tsakos G, O'Brien KD. Oral health-related quality of life and the IOTN index as predictors of children's perceived needs and acceptance for orthodontic treatment. *Br Dent J*. 2008; 204 (7): 1-5; discussion 384-385.
16. Fox NA, Daniels C, Gilgrass T. A comparison of the index of complexity outcome and need (ICON) with the peer assessment rating (PAR) and the index of orthodontic treatment need (IOTN). *Br Dent J*. 2002; 193 (4): 225-230.

Mailing address:
**María Fernanda Cruz López**
E-mail: mafercruz27@gmail.com