REVIEW

by Assoc. Prof. Dr. Greta Roussanova Yordanova-Kostova, PhD

regarding the dissertation for obtaining the scientific degree "Doctor", in the field of University education 7. Health and sports, professional management 7.2 Dental medicine and scientific specialty Orthodontics.

External member of the scientific jury according to order R-1116 / 16.05.22 of the Rector of MU, Plovdiv

Author of the dissertation: Dr. Konstantin Vanev Georgiev, Assistant Professor in the Department of Orthodontics, Faculty of Dental Medicine, Medical University – Plovdiv

Type of PhD: Independent training

Topic of the dissertation: Comparative assessment of the therapeutic effect of the application of class II elastics and myofunctional appliances in the correction of class II 1 malocclusion

Supervisor: Assoc. Prof. Dr. Silvia Krasteva, Ph.D.

General presentation of the documentation and the dissertation:

The set of documents provided to me in digital and paper format meets the requirements of the Academic Staff Development Act of the Republic of Bulgaria, the Regulations for its implementation, as well as the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions at the Medical University - Plovdiv.

The presented dissertation on **"Comparative assessment of the therapeutic effect of the application of class II elastics and myofunctional appliances in the correction of class II 1 malocclusion"** has been written on 194 pages. It is illustrated with 50 figures, 27 tables and 1 appendix. The dissertation is structured as follows: literature review (44 pages), aim and problems, material and methods, results and discussion (112 pages), conclusion, inferences and contributions (6 pages).

The references of the dissertation cite 242 literary sources, of which 16 in Cyrillic and 226 in Latin.

The **abstract** is written on 56 pages, appropriately illustrated with tables and figures, it is a summary of the dissertation in general and contains the main structural components. The overall content of the abstract meets all scientific and legal requirements.

Related to the dissertation, 3 scientific publications and 3 scientific participations in congresses and forums are attached, in all of which the PhD student is the first author.

Relevance of the topic

The dissertation deals with a problem related to the treatment of class II 1 malocclusion. It is known that these are the largest group of orthodontic patients of all orthodontic discrepancies. Contemporary orthodontics offers many different concepts for the treatment of distal bite based on mechanical, functional or myofunctional approaches. The myofunctional computer- and pre-fabricated appliances for the treatment of orthodontic discrepancies, which have become widespread over the last 20 years, have not been well studied by clinicians themselves. When utilizing these appliances, we rely on data from manufacturers or their laboratory tests. Since even non-specialist conduct interceptive treatments with these appliances, it is important to know in detail their capabilities. Therefore, it is necessary that orthodontists set the limits for the use of myofunctional appliances, their positive and negative effects and the options for combining them with other orthodontic devices or tools. In this regard, the PhD student has focused his research on a topic of direct clinical significance and the results would be useful not only as scientific data, but also in clinical work. Therefore, I can categorize the chosen topic as markedly theoretical-practical and contemporary.

The dissertation is structured correctly and contains all parts of a scientific study: literature review, aim and problems, material and methods, results and discussion, conclusions and inferences.

The **literature review** covers many aspects of the etiology, pathological disorders leading to distal occlusion, functional norms and deviations in these problems, the groups of appliances used for the treatment of distal occlusion, as well as the changes and adaptation in TMJ in patients with distal occlusion. An overview of the devices suitable for treatment of distal occlusion has been made, showing the advantages and difficulties of working with them. A detailed

classification of the functional devices medializing the lower jaw has been made and, more importantly, their biomechanics has been reviewed. In regards to this, the action of the intermaxillary elastics for medialization of the lower jaw, applied during treatment with fixed technique, is explained. For equivalency in the study the mode of action of myofunctional appliances, and in particular EF Braces, is presented with the same depth, and its advantages and disadvantages are again highlighted, according to the available literature. Comparing the action of these two methods to correct distal bite is of interest to orthodontists because both modalities require patient cooperation – one of the methods (elastics) can only work with fixed technique, while the other one is better known for its independent application. The conclusions made from the literature review show the importance of the problem and its abundance and provide sufficient grounds for conducting this study.

Evaluation of the dissertation

The **aim** is formulated clearly and concretely. With the present dissertation the author aims to compare the dento-alveolar and skeletal effects of the application of class II elastics and EF Braces myotrainer in adolescent patients with class II_1 retromandibulia in the main phase of treatment with fixed technique. The 4 set problems are in a logical sequence and consider the changes from different planes, the possible positive and negative effects from the action of the evaluated appliances.

1. To make a comparative cephalometric assessment of sagittal skeletal and dento-alveolar parameters in the treatment of class II 1 malocclusion with class II elastics and myofunctional appliances in achieving class I relationships.

2. To compare the vertical skeletal cephalometric changes between the two treatment methods.

3. To determine the changes in the transverse dimensions of the upper and lower dental arches on orthodontic models in the studied treatment modalities.

4. To create a model for predicting the treatment duration and the expected changes according to the skeletal age and vertical type of growth when using myofunctional appliances.

The **material and methods** for each of the problems are optimally selected to attain representative results. The analyzed material is sufficient, metric

measurements have been made on a significant number of parameters on both plaster models and lateral cephalogram. The patients were synchronously divided into two study groups, which allows their comparison. In the two main groups formed (treated with elastics and treated with EF Braces), patients exhibited almost synchronous distribution by sex and growth maturation.

The methods used in this study are described in detail and arranged logically as: 1. Treatment protocol; 2. Linear and metric methods for evaluation of lateral cephalogram and plaster models; 3. Applied method for estimating the bone age of patients; 4. Statistical methods and definition of the visual presentation of the results.

Therefore, the good preparation with the criteria for selection of material (patients) for research, the accuracy and precision of analytic methods guarantee obtaining a number of significant qualitative and quantitative results.

Results and discussion are presented for each problem, which allows them to be clearly perceived when reading the material. Each result is presented in tabular form to verify its statistical significance and is illustrated graphically to better grasp its dynamics. As far as parameters that compare two clinical methods are concerned, this is a very good solution because it immediately differentiates the clinical change from the action of one or the other method. Each statistical result is interpreted thoroughly, which facilitates the perception of information.

The results of 1 problem show that ∢SNA decreases in both methods of treatment, but with a significantly higher value of reduction in the treatment with class II elastics with a difference of - 1.84 °. ∢SNB increases in both treatment methods, but with a significantly greater change as a result of treatment with EF Braces with a difference of + 1.81 °. The effective length of the lower jaw is increased in both treatments, but with a significantly higher value in the treatment with the EF Braces appliance. No significant difference was found in the linear dental parameters related to the method of treatment, but higher values of change were found in the treatment with class II elastics.

The results of problem 2 show that no significant change in vertical angular parameters was observed in patients treated with the EF Braces appliance. While in the treatment with class II elastics a significant change was reported in two of the analyzed parameters, for example: in ∢MP / SpP it increases in the treatment with class II elastics with a difference of 1.85 °. There was a significant relation in the change in the S:Go parameter depending on the method of treatment, with an

increase in the treatment with EF Braces and a decrease in treatment with class II elastics with a difference of + 3.88 mm.

The results of problem 3 show that the change in the transverse dimensions of the upper jaw has a significant relation with the method of treatment mainly in the parameter - intercanine distance. Changes were observed regarding this parameter, respectively: an increase in the group treated with EF Braces and a decrease in the group treated with class II elastics. The change in the transverse dimensions of the lower jaw is more interesting as it showed changes in all three parameters. The intercanine distance increased in both cases, but with a significantly higher value in the treatment with EF Braces with a difference of +0.57 mm. Interpremolar and intermolar distances decreased during treatment with class II elastics and increased during treatment with EF Braces with a significant difference of 0.77 mm and 1.36 mm respectively.

The results of problem 4 exhibit expected for us dynamics of change, respectively related to the bone age of the patients. Accordingly, patients in CVM stage 4 show significant differences from the other two stages of growth - the duration of the treatment period is the shortest in this patient group and changes in skeletal parameters are the highest.

In the discussion of the results a comparison of their values with other authors is made and it is noticeable that Bulgarian authors are also used as a basis for comparison. In case of disagreement with their data or opinions, it is argued why, where the personal opinion of the PhD student on the issue is evident. The conclusions from the problems are well and clearly defined, the inferences from the whole research are concrete.

As a clinical significance, the dissertation provides guidance on the expected changes in skeletal parameters in the two different methods, one predominantly influencing the position of the lower jaw (EF), whereas the treatment with elastics leads to more pronounced dento-alveolar changes. These findings provide a clinical choice as to when to use each method according to the changes we need in the patient we will treat. The advantages of EF trainer, which affects facial height, makes it a better option in patients predisposed to OSA, while in hyperdivergent patients, care must be taken to ensure that their parameters do not deteriorate. Understandably, like all functional appliance the studied methods are most suitable for use during active growth. The only drawback to both modalities is that they require cooperation from patients, which is difficult to achieve during puberty.

In my review I want to highlight that the PhD student has made a large number of linear measurements on plaster models and lateral cephalograms, which shows his skills as a clinician and researcher. I also put an emphasis on the performed comparative analysis between the effectiveness of the two mandibular medialisation appliances. It is also important to me that the basis of this work is the treatment of a large number of patients by the PhD student. In my opinion, this accounts for the accumulation of a lot of clinical experience by the PhD student, which, together with the analysis of the data from these treatments, develops his critical thinking and scientific interpretation of all variations in the treatment of distal occlusion. He dealt marvelously with the scientific material and data processing, but my greatest admiration is his clinical work and the motivation of the patients included in the study, regarding their cooperation and achieving good end results.

After reading the paper, I am strongly convinced that treatment with EF trainer is more beneficial in oral breathing patients and ensures greater skeletal changes in the lower jaw, while treatment with intermaxillary elastics has a slight negative effect of maxillary retrusion. The negative effect of both methods is the protrusion of the lower frontal teeth.

Contributions and significance

The research related to the dissertation of Dr. K. Georgiev has both scientific and markedly practical and applied nature. The contributions of a purely scientific nature are:

1. For the first time in Bulgaria an in-depth study was conducted on the changes induced by EF Braces myotrainer.

2. For the first time in Bulgaria the skeletal and dento-alveolar transverse, sagittal and vertical effects of the application of class II elastics have been studied.

3. The skeletal and dento-alveolar transverse, sagittal and vertical effects of the EF Braces appliance were studied.

4. The therapeutic effects of Class II elastics and EF Braces myotrainer in the three planes were compared.

The contributions of the dissertation that are clinically applicable are:

5. Clear guidelines are given for choosing the application of the studied two treatment modalities depending on the desired clinical effect.

6. The average duration of sagittal treatment with the EF Braces appliance depending on the stage of skeletal maturation and the type of vertical growth was determined.

7. The average range of expected changes in the parameters ANB, SNB and Go-Gn depending on the stage of skeletal maturation and the type of vertical growth was determined.

Abstract

The abstract attached to the dissertation meets the requirements and reflects in abbreviated form the dissertation. The tables and figures presented give thorough information about the conducted research and the obtained results. It includes a list of 3 publications in scientific specialized publications and participation in 3 scientific conferences.

Critical remarks

I recommend Dr. Konstantin Georgiev to use his potential as a clinician and researcher and to organize the issuance of a methodological guide for planning treatments for class II1 occlusion with EF Braces combined with a fixed technique. This will fill the information gap and help orthodontists work with these appliances.

Personal impressions

I have known Dr. Konstantin Georgiev since his student years and I can say that he is a purposeful, persistent and strict colleague who has focused his research on the latest developments in the field of Orthodontics. I believe that he has the skills to combine clinical practice with high-level research with the use of contemporary equipment, statistical processing and competent analysis.

Conclusion

The dissertation on the topic: "Comparative assessment of the therapeutic effect of the application of class II elastics and myofunctional appliances in the correction of class II 1 malocclusion" for the award of the degree "Doctor" by Dr. Konstantin Vanev Georgiev, is a contemporary and useful modern scientific work of scientific and applied significance.

The dissertation is in accordance with the requirements for awarding scientific degrees and titles according to the Law for development of the academic staff of the Republic of Bulgaria and the Regulations for its application.

I positively assess the dissertation and its scientific contributions and propose to the esteemed scientific jury to award the degree of "Doctor" to Dr. Konstantin Vanev Georgiev in higher education 7. Health and Sports, Professional area 7.2 Dentistry and scientific specialty Orthodontics.

14.06.2022 г. Reviewer: .....

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