

OPINION

by Assoc. Prof. Dr. Georgi Tomchev Tomov, PhD
Department of Periodontology and Oral Diseases, FDM, MU - Plovdiv

on dissertation for awarding
the educational and scientific degree "Doctor of Philosophy - PhD"

Field of higher education 7. Health and sports
Professional field 7.2 Dentistry
Doctoral program in Pediatric Dentistry

Author: Dr. Elitsa Romanova Veneva

Form of doctoral studies: self-preparatory form

Department: Pediatric Dentistry, FDM, MU-Plovdiv

Topic: "Non-pharmacological strategies for control of pain and anxiety associated with local analgesia in children"

Scientific supervisor: Prof. Dr. Ani Belcheva-Krivorova, PhD

General presentation of the procedure and the doctoral student

As an internal member of the Scientific Jury, I present an opinion on the defense of a dissertation pursuant to Article 32 of the Regulations for the implementation of the Law on the development of the academic staff in the Republic of Bulgaria, **order № P-66/18.01.2021** of the Rector of MU-Plovdiv and according to **protocol № 1 from a meeting of the Scientific Jury**.

The presented set of materials on the procedure on paper and electronic media are prepared correctly, complying with the requirements of the Law on the development of the academic staff in the Republic of Bulgaria and regulations of MU - Plovdiv and includes the documents: Abstract, dissertation and documents of the doctoral student - list and copies of publications related to the dissertation (3 pieces); autobiography; a copy of the diploma for completed Master's degree; enrollment order; doctoral minimum exam report; deduction order with the right to protection; protocol from the Department's Council with a positive decision on the readiness for defense; declaration of originality; declaration of authenticity of the submitted documents.

From the autobiographic reference of Dr. Elitsa Veneva it is evident that she graduated from FDM, MU - Plovdiv in 2013 and in the same year began to practice as a dentist (private practice). From 01.06.2016 she started specialization in pediatric dentistry, and in January 2017 after a competition she was appointed as an assistant professor at the Department of Pediatric Dentistry, FDM, MU-Plovdiv. She was

enrolled as a doctoral student in a self-study module on 23.07.2020, and was released from 21.12.2020 with the right to defense by order № P-7 / 06.01.2021 of the Rector of MU - Plovdiv.

Relevance of the topic of the dissertation

Pain control in dentistry is a serious challenge, especially in pediatric dentistry, where the first meeting with the dentist forms in the pediatric patient feelings and attitudes that affect further behavior and attitude towards dentistry. The demand (and supply) of new, alternative means of non-pharmacological pain control is significant and raises a number of questions about their safety and effectiveness - conditions that ensure quality dental treatment for children and maintaining their oral health. In this context, I consider the chosen topic of the dissertation to be indisputably relevant.

Structure of the dissertation

The dissertation of Dr. Elitsa Veneva is properly structured and contains all the mandatory elements for presenting a dissertation: content, abbreviations, introduction, literature review, purpose and objectives, materials and methods, results and discussion, summary, conclusions, contributions, bibliography and applications. The presented dissertation is written on **193 pages**, illustrated with **17 tables, 37 figures and 7 appendices**. The bibliography includes **214 literary sources, of which 16 in Cyrillic and 198 in Latin**. The exhibition is presented in very good professional language.

Knowledge of the problem

In the literature review Dr. Elitsa Veneva demonstrates in-depth knowledge of the developed topic. The review mainly considers the possibilities of conventional local anesthesia with anesthetics and non-pharmacological strategies to reduce injection pain through anesthetic preparation, site of application, choice of analgesic technique, use of physical methods, as well as good practices during local anesthesia in children before dental treatment. Dr. Elitsa Veneva makes an in-depth review of the recommendations of the European (EAPD) and American Academy (AAPD) in Pediatric Dentistry. The literature review is sufficiently informative (volume of 37 pages, with more than 50% of the authors from the last 10 years!) which is structured in such a way that in addition to providing summary information on scientific knowledge and practical experience, it analyzes contradictions and debatable issues, which naturally ends in formulation at the end of the review of unresolved issues, goal selection and research objectives.

Dr. E. Veneva aims to study the possibilities for non-pharmacological effects of pain and anxiety associated with local analgesia in pediatric patients. There are 5 objectives for fulfilling the stated goal:

- 1) To study the effectiveness of a vibrotactile device DentalVibe to reduce pain and anxiety in children;
- 2) To study the efficiency of a virtual reality device;

- 3) To compare the efficacy of these two devices for non-pharmacological treatment of pain by distraction of children;
- 4) To study the use of Er:YAG laser for biomodulation and achieving safe laser analgesia before dental treatment of children with two sub-objectives - SEM for morphological evaluation of enamel of extracted teeth after laser analgesia and a clinical study on the efficacy of a defined afterwards protocol for laser analgesia;
- 5) To prepare recommendations for non-pharmacological control of pain and anxiety associated with local analgesia in pediatric dental patients.

Methodology of the investigation

The section "Material and methods" is presented in order of the objectives. Appropriate research methods have been used for the defined objectives: sociological method (survey, observation, registration); clinical methods (determination of pulse rate, effects of local analgesia and laser analgesia, EPT, thermal diagnostics, non-pharmacological treatment of pain, respectively treatment of symmetrically selected teeth - surgical or conservative), experimental (SEM investigation on enamel morphology) and statistical methods IBM SPSS Statistics version 22, significance level $p < .05$ and graphical analysis Excel MS Office 2013).

The selected research methods allow achieving the set goal, obtaining a reliable answer to the objectives, as well as analysis of the results.

Characteristics and evaluation of the dissertation and contributions

The studies were conducted in the period 2017 - 2019. In its clinical part (tasks 1, 2, 3, 4.2) the dissertation is based on randomized, controlled, crossover clinical trials in which each patient is self-controlled (split-mouth design), which is a solid basis for the reliability of the results obtained. The inclusion criteria for patient selection are described in detail, as well as the methods used to obtain statistically reliable results. The tests were performed on 8-12 year old children - dental patients, selected according to certain criteria, which are defined as in need of extraction or treatment of carious lesions of symmetrical maxillary teeth. For tasks 1, 2, 3, 4.2, a visual analog scale (VAS) was used, consisting of a Wong-Baker FACES scale with facial expressions and a nominal scale (0-10). To assess subjective anxiety during local anesthesia, the Facial Image scale (FIS) was used - self-assessment using a picture scale with faces. The dynamics of the heart rhythm was also registered by using a pulse oximeter. A tool for self-assessment of dental fear - Dental Subscale of Children's fear Survey Schedule (CFSS-DS) was also used.

The results of the first task show that after successful completion of the two interventions - control and experimental, of the studied patients, most prefer anesthesia, accompanied by the device DentalVibe - 85.3%.

The results of the second task show that of the studied patients, most prefer analgesia accompanied by the VR-device - 71.87%.

The results of the third task - of the studied patients, most (82.5%) prefer analgesia, assisted by one of the two applied non-pharmacological methods.

Task 4 is divided into two subtasks, considering two important aspects. First, the morphology of the enamel surface after laser analgesia with Er: YAG laser at different parameters was studied by scanning electron microscope. Based on the conclusions of the morphological study, a safe protocol was selected, the efficacy of which was studied for achieving preemptive laser analgesia in pediatric patients according to the methodology described above.

Under Task 5, recommendations for non-pharmacological control of pain and anxiety associated with local analgesia in pediatric dental patients were developed.

The obtained results and their discussions are presented sequentially by tasks. Of special interest for laser dentistry is this part of the dissertation (subtask 4.1), which examines the morphology of the enamel after application of various parameters of laser energy. The conclusions are that the laser settings of 0.75 W / 15 Hz and 50mJ / 12 J cm² can be considered ablative from a distance of 10 mm, even with a maximum water spray! This part is interpreted in detail, as analytically and critically examined own results and literature. The discussion was done professionally and without unnecessary tautology and repetition of other people's thoughts.

The proposed recommendations for non-pharmacological control of pain and anxiety related to local analgesia in children are aimed at 4 target groups: parents, dentists, professional organizations and the faculties of dentistry. This determines the high practical significance of the work.

Five conclusions are formulated, which determine the efficiency of the vibrotactile device DentalVibe and the virtual reality device to reduce pain and anxiety in children during local infiltrative anesthesia, the similar efficiency of the two devices, considerations about structural changes in the enamel surface after laser application of analgesic protocol and insufficient clinical efficacy of preemptive laser analgesia, achieved with the proposed protocol. The conclusions are formulated according to their significance and not according to their numeral sequence.

Dr. Veneva identifies a total of 11 contributions, of which 7 original (scientific-theoretical, methodological and scientific-applied) and 4 of a confirmatory nature. It makes important original contributions, of which I put in the first place the characterization of various settings of the Er:YAG laser in order to find a suitable for preemptive laser analgesia without damaging the enamel tooth surface. Based on her morphological examination, the doctoral student proposes a safe clinical protocol for preemptive laser analgesia in children, applying a combined test of pulp sensibility and assessment of subjective and objective sensation of pain during treatment of carious with

Er:YAG laser. Additionally, Dr. E. Veneva unequivocally proves the non-pharmacological effect of vibrotactile and virtual reality devices on pain and anxiety in children during local infiltration anesthesia, the compared effectiveness of which is none in difference.

The dissertation contains conclusions based on scientific facts and recommendations that are applicable in clinical practice. They should be promoted among general and pediatric dentists to be used in the treatment of young patients.

Evaluation of the publications on the dissertation and the personal contribution of the doctoral student

A list of scientific reports related to the dissertation with the participation of Dr. Elitsa Veneva is added to the dissertation. 3 full-text publications on the topic of the dissertation are included - one scientific article in a Bulgarian collection (2018) and 2 in refereed international scientific journals (2018). For the short period of work as a doctoral student Dr. Elitsa Veneva has a very good publishing activity, and her personal participation is emphasized by the fact that in all reported publications and scientific reports she is the first author. The presented dissertation shows that Dr. Elitsa Veneva has in-depth theoretical knowledge, has achieved professional skills in the scientific specialty "Pediatric Dentistry" and can independently conduct research.

Author's abstract

The author's abstract reflects the content of the dissertation in a shortened volume of 51 pages, as its content and quality corresponds to the developed work and is made according to the requirements of MU-Plovdiv.

Recommendations

The dissertation work of Dr. Elitsa Veneva is methodically properly planned, conscientiously performed and professionally presented. My only recommendation to Dr. E. Veneva, which is not directly related to her dissertation, is to summarize the clinical recommendations of her work in a monograph, which has a better chance to reach a larger audience of dentists.

Conclusion

The dissertation of Dr. Elitsa Veneva presented to me for an opinion **meets the requirements** of the Law for development of the academic staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations of MU - Plovdiv.

The dissertation shows that the doctoral student Dr. Elitsa Romanova Veneva has in-depth theoretical knowledge and professional skills in the scientific specialty "Pediatric Dentistry". After the analysis, I give a **positive assessment** for the dissertation on "Non-pharmacological strategies for control of pain and anxiety associated with local analgesia in children" and **will vote "yes"** for the award of educational and scientific degree "**Doctor** of Philosophy - PhD" in the scientific specialty " Pediatric Dentistry "to Dr. Elitsa Romanova Veneva - Raychinova.



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Plovdiv

Assoc. Prof. Dr. Georgi Tomov, PhD
Department of Periodontology and Oral Diseases, FDM, MU-Plovdiv