

STATEMENT

by

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Appointed a member of a Scientific Jury by Order No P-109-140/05.04.2022 under the procedure for acquiring educational and scientific degree “**Doctor**” in professional field 7.2. *Dental Medicine* in “*Therapeutic Dentistry*” PhD programme

Author: *IVAILO GEORGIEV HRISTOV*

Form of PhD studies: Self-Study

Department: Periodontology and dental implantology, FDM at MU– Varna

Topic: ONE-PHOTON EMISSION COMPUTED TOMOGRAPHY WITH 99MTCMDP (METHYLENE DIPHOSPHONATE) OF PERIIMPLANT BONE DURING THE HEALING PERIOD AFTER PLACEMENT OF INTRAOSSEOUS OSTEOINTEGRATABLE IMPLANTS

Supervisor:

PROF. DR. STEFAN VASILEV PEEV, DMS

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1. General Presentation of the Procedure and the PhD Student

The review of the documents demonstrates that the procedure for finalising the doctoral programme and the procedure for announcing the defence have been complied with, the documents have been prepared in accordance with the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations on the terms and conditions for acquiring scientific degrees and holding academic positions at Medical University – Varna. The PhD student has attached the required **three** full-text publications.

2. Biographical Data of the PhD Student

IVAILO GEORGIEV HRISTOV graduated from FDM of Medical University “Prof. Dr. Parasites Stoyanov”, Varna in 2013, acquiring a master’s degree “Dentist”. He has been working as an Assistant Professor at the Department of Periodontology and dental implantology at MU–Varna since 2014. In 2019 he was enrolled as a full-time PhD student at the same Department. In 2020 IVAILO

HRISTOV acquired specialty in dental imaging. In relation to the doctoral thesis, the candidate has published **three full-text scientific articles**, being the first author of the articles.

3. Relevance of the Subject and Significance of the Goals and Objectives Set

The development of the dissertation is highly relevant in scientific and applied terms. In modern dentistry, dental implants are often used to treat missing teeth. The success of the treatment depends on their primary stability and osseointegration into the bone. Osseointegration of dental implants, on the other hand, determines the possibility for additional load and prosthetic treatment.

Monitoring the healing process after dental implant placement determines the additional success of the treatment and is essential for its outcome. Healing processes are most often assessed by applying segmental radiographs, orthopantomography or computed tomography, which assess morphological changes in the bone, but are not applicable for monitoring of the functional processes in osseointegration.

One-photon emission computed tomography with ^{99m}Tc MDP (SPECT) allows objective assessment of osteoblast activity in the periimplant area. This provides an assessment of the healing process, as well as the ability to determine the time of implantation. All this appropriately justifies the goals and objectives set in the dissertation.

4. Knowledge of the Problem

The literature review of the dissertation is informative and consistently examines the processes of osseointegration of dental implants and the possibility of applying single-photon emission computed tomography to monitor the healing process after placement. Detailed description of the factors influencing the process of osseointegration, and the primary stability of implantation are discussed, carefully considering the factors of intraosseous implants, anatomical factors (bone quality) and factors related to the surgical protocol for dental implants. The second part of the review examines the methods of diagnosis before, during and after implantation and describes in detail the characteristics of single-photon emission computed tomography, as well as the possibility of applying this diagnostic modality in osseointegration of dental implants. It can be concluded that Dr. Hristov has thoroughly studied the topic.

At the end of the literature review, a summary analysis is presented, which clearly defines the estimates of the necessary parameters for peri-implant tissues in the healing period and the need for the application of additional assessment methods. This fact connects the review with the goal and tasks formulated by the PhD student.

5. Methodology of the Study

The aim is clearly formulated, and for its solution 3 logically selected tasks are proposed. 10 patients, who underwent a total of 23 dental implants have been used to resolve the tasks. The selection of participants is based on well-defined inclusion and exclusion criteria. In the first task, the doctoral student aims to study the periimplant tissue in the recovery period after implant placement using single-photon emission computed tomography [SPECT] with ^{99m}Tc -MDP. In task №2, a study of bone density in implantation areas is performed using CBCT and a comparison of the results of the SPECT study with bone density before implantation is presented. The third task evaluates the osseointegration of dental implants using resonance-frequency analysis, comparing the data with the results of the SPECT study.

The methods of conducting the research are described in detail. Statistical methods used to analyse the results ensure the reliability of the conclusions made.

6. Characteristics and Evaluation of the Dissertation

The dissertation is written on 162 standard pages and is illustrated by 11 tables, 26 figures, 30 photos and 7 annexes. The literature reference list includes 402 literary sources, of which 9 in Cyrillic and 393 in Latin.

The dissertation begins with a literature review of the problem, which is well designed, informative and consistently examines the factors that influence the process of osseointegration and the methods by which it can be followed-up and evaluated.

The review clearly highlights the most important problem, namely the lack of a functional assessment of osseointegration process and its importance for the future success of implant treatment.

This clearly leads to the formulation of the goal and tasks of the PhD student.

After formulating the goal and the three tasks, the dissertation presents the materials and methods used in the dissertation.

The results of clinical and laboratory tests obtained in the performance of tasks are correctly described and accompanied by well-structured tables and figures. The PhD student presents a rich photographic material illustrating the research. Although the PhD student has taken a very detailed periodontal status, these results are not discussed in the dissertation. Part of the discussion of the proposed diagnostic methods (resonance-frequency analysis) is presented in the material and methods of task 3, and not in the relevant section. Tables 4, 6 and 10 for Task 1, as well as Table 11 for Task 2, could be presented more accurately from a statistical point of view, presenting the mean value, minimum and maximum values, which are presented in the text of the tables.

I believe, throughout the development of the thesis, sufficiently significant results have been obtained, which enrich the existing knowledge about the diagnosis of peri-implant tissues after placement of osteointegrable dental implants. The discussion of the results is well presented and reflects the logical connection between them. A skilful comparison has been made between the data from own research in the dissertation and those in the literature. The formulated conclusions are reliable and largely reflect the contributions of the developed work.

7. Contributions and Significance of the Thesis to Science and Practice

There are 5 contributions of a confirmatory nature, one - of an original nature for the world and 4 contributions of an original nature for the country, which I partially accept.

The most important contribution is the development of a software algorithm for determining the average values of Hunsfield units in the evaluation of CBCT bone density.

The second important contribution is the application of single-photon emission computed tomography with radiopharmaceutical ^{99m}Tc MDP assessment of osteoblast activity in the periimplant area in the recovery period after placement of intraosseous osteointegrable dental implants, which is conducted for the first time in Bulgaria.

8. Evaluation of the Publications on the Dissertation

In connection with his dissertation, IVAILO HR. GEORGIEV has published three full-text articles. All three articles have been published in the East European Scientific Journal. The first paper presents the assessment of peri-implant bone during the healing process using the SPECT technique with ^{99m}Tc MDP. The second publication provides an overview of the application of SPECT research in implantology. The third article discusses the factors from the design of dental implants on their primary stability and osseointegration. The articles were published in 2021 and 2022.

9. Personal Involvement of the PhD Student

Undoubtedly, the PhD student personally participated in the work, results obtained and formulated contributions. It should be noted that although Dr. Hristov is a specialist in Dental Imaging, he has a

personal involvement both in the treatment of dental implants and in the development of a software algorithm. The dissertation includes specific research and treatments conducted in collaboration with specialists in nuclear medicine and dental implantology. With the assistance of specialists in medical equipment, electronic and information technologies in healthcare, an algorithm for comparing osteoblast activity (tested by SPECT) and bone density (tested by CBCT) was created.

These data are evidence of the true interdisciplinary nature of the thesis and in particular the PhD student's ability to work in a team. The collaboration with these specialists further enriches the PhD student's knowledge and contributes both to the completeness of the work and to the competent understanding and interpretation of this complex issue.

10. Abstract

The abstract reflects in a synthesised form the structure and content of the thesis development.

11. Critical Remarks and Recommendations

The SPECT study finds basic scientific application, but due to the additional exposure to radiation and its increased cost, it is not clinically applicable in everyday dental practice.

I think it would be useful from scientific point of view if the research was done just before implantation and then followed-up over time, thus examining the same area, and a comparison over time would be more relevant.

Given that SPECT provides measurement of osteoblast activity and bone healing, I recommend studies in the direction of conducting single-photon emission computed tomography to assess bone before implantation in areas after extraction of compromised teeth (diffuse periodontitis, severe periodontitis).

CBCT is a widely used method for assessing bone before implantation, but a method with significant limitations in measuring and diagnosing periimplantitis. SPECT provides information on bone function before structural changes occur. Thus, I recommend Dr. Georgiev to continue his research with single-photon emission computed tomography to diagnose the initial peri-implant changes in the bone.

12. Recommendations for Future Application of Dissertation Contributions and Results

I believe that the PhD student I. Georgiev, who demonstrates in his dissertation good knowledge of this specific diagnosis of peri-implant tissues, can and should continue his future research in this direction. As the most important contribution to his work, I consider the developed algorithm for comparing the morphological changes of CBCT and functional changes in bone, studied by single-photon emission computed tomography with ^{99m}Tc (MDP). I recommend Dr. Georgiev to continue his work in this direction by enriching the number of cases in which to conduct these diagnostic methods and to create a clinically applicable assessment of the area of implantation and one in which the process of osseointegration.


CONCLUSION

The dissertation thesis *contains scientific, research and applied results, which represent an original contribution to science* and **meets all the requirements** of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for implementation of ADASRB and the relevant Regulations of MU – Varna. The presented materials and thesis results **fully** comply with the specific requirements of MU – Varna.

The dissertation shows that PhD student IVAILO HRISTOV GEORGIEV **possesses** in-depth theoretical knowledge and professional skills, **demonstrating** qualities for independent scientific research.

Given the above, I confidently give my **positive assessment** of the research presented by the above reviewed dissertation, abstract, achieved results and contributions, and **I propose to the esteemed Scientific Jury to award the educational and scientific degree "Doctor"** to IVAILO HRISTOV GEORGIEV in "Therapeutic Dentistry" PhD programme.

17. 05. 2022

Reviewed by: 
Assoc. Prof. Dr. Blagovesta K. Yaneva, PhD