

## STATEMENT

by

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of MU – Varna**

**On dissertation for awarding the educational and scientific degree**

**“Doctor of Philosophy”**

**Topic: Single-photon emission computed tomography with  $^{99m}\text{Tc}$  MDP  
(methylene diphosphonate) of peri-implant bone tissue during the  
healing period after placement of intraosseous osseointegrating implants**

**Sphere of higher education:** 7. Health and sports

**Professional field:** 7.2. Dental Medicine

**Scientific specialty:** Therapeutic Dentistry

**Author:** Ivaylo Georgiev Hristov

**Form of doctorate programme:** regular

**Department:** Periodontology and Dental Implantology, FDM, MU – Varna

**Scientific supervisors:** Prof. Stefan Vasilev Peev, DMD, PhD, DSc

Assoc. Prof. Borislav Georgiev Chaushev, MD, PhD

## **GENERAL PRESENTATION OF THE PROCEDURE AND THE PHD STUDENT**

The presented set of documents and materials on electronic media is prepared correctly in compliance with the requirements of the LDASRB, the Regulations for its implementation, and the Regulations for the development of the academic staff at MU – Varna, and includes:

1. Enrollment order № P-109-86 / 01/02/2019;
2. European form of CV signed by the author;
3. Copy of the diploma of completed Master's degree;
4. Doctoral minimum exam report (in the specialty and English);
5. Protocol from the Department's Council №87 / 23/03/2022 with positive decision on the readiness for defense;
6. Deduction order № P-109-140 / 05/04/2022 for the right to defense;
7. List of publications in connection to the dissertation, signed by the author; copies of the same publications;
8. Declarations;
9. Dissertation;
10. Abstract.

### **Biographical data of the PhD student**

Dr. Ivaylo Georgiev Hristov was born on May 31<sup>st</sup> 1988. He graduated from high school in 2007 ("John the Exarch" Language School – Vratsa), and in 2013 he obtained a Master's degree in Dentistry at Medical University of Varna (diploma №003554). In 2020 he acquired a specialty in Dental Imaging Diagnostics. Since 2014 Dr. Hristov has been working as an assistant professor at the Department of Periodontology and Dental Implantology at the Faculty of Dental Medicine, MU – Varna, taking part in the educational course of Imaging Diagnostics, both in Bulgarian and English.

## **CHARACTERISTICS AND EVALUATION OF THE DISSERTATION**

### **Analysis of the structure of the dissertation**

The dissertation of Dr. Hristov is structured according to the requirements of the Regulations for the development of the academic staff at MU – Varna. It consists of 171 standard pages and it is illustrated with 11 tables, 30 pictures, 26 figures and 7 applications. The bibliography contains 402 literary sources, 9 of which in Cyrillic and 393 in Latin; 124 of them are published in the last 10 years.

## Relevance of the topic

Treatment with intraosseous osseointegrating dental implants is a contemporary therapeutic method that achieves complete recovery by fully restoring the patient's masticatory function and aesthetics. The success of implant treatment is associated with the process of osseointegration, and methods for studying this process are of interest to various researches. Radiographic methods for assessment of the healing process are considered inaccurate, and computed tomography determines bone density without measuring the vitality and functional state of bone structure. This can be achieved through nuclear medical research, which provides data on ongoing physiological processes and activities in different organs based on the accumulation of different markers.

Therefore dissertation like this one, presenting a methodology for assessing bone structure and healing process in implant treatment, is relevant.

## Literature review

**The introduction** is short and tight and directs us to the problem. **The literature review** presents the available information on the selected topic (30.85% of the literary sources are published in the last 10 years), as the emphasis is on the factors determining osseointegration and primary stability of implants – biocompatibility of materials, macroscopic and surface characteristics of implants, quality of bone, biomechanical factors and features of the surgical protocol, the patient's health status. Special attention is paid to the methods for examination of the jaw bones – X-ray (two-dimensional, conventional computed tomography and cone-beam tomography) and ultrasound, resonance frequency analysis, bone histomorphometry, scintigraphy and SPECT (single photon emission computed tomography). The production of radiopharmaceuticals is discussed, as well as the application of SPECT for monitoring the healing process after implantation and the factors that may affect its image. The analysis of the review points to the unresolved problems regarding the lack of a unified methodology for diagnosis and adequate assessment of the healing process in the peri-implant area.

## Aim and tasks

**The aim** of the dissertation is to assess the single-photon emission computed tomography with  $^{99m}\text{Tc}$  MDP of peri-implant bone tissue during the healing period after placement of intraosseous osseointegrating implants. To achieve the aim, **3 tasks** have been set, and they are completely sufficient.

## Materials and methods

Dr. Hristov performs his own research on 10 patients (5 men and 5 women) with a total of 23 implants. These individuals over the age of 18 and in good general health are selected from 51 subjects surveyed. Patients fill out a questionnaire and their oral status is registered focusing on the assessment of edentulous areas, occlusion and periodontal health. All of them undergo preliminary preparation and rehabilitation of the oral cavity. Before implantation, each patient undergoes a 3D imaging test – CBCT of the upper and lower jaw. After placement of intraosseous osseointegrating implants, the healing process is monitored by SPECT, and implant stability is measured by resonance frequency analysis. Additionally, bone density in the implantation areas is examined using CBST and a specially developed algorithm. The results are processed using a specialized package IBM SPSS Statistics 20 and are presented in graphical and tabular form.

## Results and discussion

Dr. Hristov finds in the **first task** that there is increased metabolic activity in the area of implants, which persists until the 60<sup>th</sup> day, and the very high osteoblast activity, accompanying the process of osseointegration in the first month, decreases over the next few months. The presented values confirm the literature data.

The results of the **second task** show a statistically significant difference in the bone density of the upper and lower jaw, but no correlation between the indicators of "bone density" and gender and age of patients. There is also a lack of association between "bone density" and "metabolic activity".

The analysis of the **third task** shows that there is a significant correlation between the results of the resonance frequency analysis and those obtained by single-photon emission computed tomography. There are no scintigraphic data for active reparative bone process in the third month – osseointegration is complete and the implants can be loaded. From the values obtained in the resonant frequency analysis, high implant stability is established, which is also an indicator of the achieved secondary stability.

Dr. Hristov supports the results of his research with many similar data from the specialized literature, which shows that the chosen design of bone density testing can be used as a reliable assessment tool in the clinical practice – as an additional guide in planning and monitoring of implant treatment.

## **Conclusions**

The 15 conclusions are a logical consequence of the obtained results. They are presented with scientific accuracy.

## **Contributions**

Dr. Hristov divides the contributions of his research into three groups – contributions with confirmatory and original for the world and for the country character. I believe that this formulation can be accepted.

## **Assessment of the publications**

The results of the study are promoted through 3 publications. Dr. Hristov is the first author of all of them. This proves that the research is a personal work.

## **Abstract**

The abstract of 75 pages is presented in the appropriate volume required by the rules set out in the Regulations for the development of the academic staff at MU – Varna. It is properly structured, well illustrated and corresponds to the individual sections of the dissertation.

## **Critical remarks**

My remarks are mainly regarding the layout of the dissertation – no model for describing the sources in the bibliography has been followed; spelling and punctuation errors have been made.

## **CONCLUSION**

Dr. Ivaylo Georgiev Hristov, doctoral student and an assistant professor at the Department of Periodontology and Dental Implantology at the Faculty of Dental Medicine – Varna has submitted for statement a completed dissertation.

The dissertation meets the criteria for acquiring the educational and scientific degree "Doctor of Philosophy", set out in the Law for development of the academic staff in the Republic of Bulgaria, the Regulations for its implementation, and the Regulations for the development of the academic staff at MU – Varna.

This gives me grounds for **positive assessment** and I propose to the esteemed **Scientific Jury** to award the educational and scientific degree **“Doctor of Philosophy”** to Dr. Ivaylo Georgiev Hristov.

Varna

17/05/2022

A handwritten signature in blue ink, consisting of several loops and a vertical stroke, positioned above a dotted line.

(Assoc. Prof. Miglena Balcheva-Eneva, DMD, PhD)