

STATEMENT

by

Prof. Dr. Tihomir Dobrinov Georgiev, DMD, PhD, DSc

Appointed as a member of the Scientific Jury according to an Order № P-109-298/24.09.2024, Regarding a dissertation for obtaining the educational and scientific degree "Doctor" in the field of higher education 7. Healthcare and Sports, professional field 7.2. Dental Medicine, PhD-program Orthopedic Dentistry.

I. Brief Biographical Data

Dr. Gabriela Rosenova Kirova was born on March 9, 1993, in Varna, Bulgaria. She completed her higher education in Dental medicine in 2019 at Medical University - Varna. Since 2019, she has been working as a full-time assistant in the Department of Prosthetic Dental Medicine. In 2023, she obtained a specialty in prosthetic dental medicine. Title of Dissertation „Laboratory Investigation of the Accuracy of Cemented Superstructures on Abutments Manufactured Using Different Impression Taking Protocols“ with Scientific Supervisor Assoc. Prof. Dr. Stoyan Georgiev Katsarov, DMD, PhD.

Dr. Kirova has been working at the University Medical and Dental Center (UMDC) since 2019. She is a member of the Bulgarian Dental Association. She is fluent in English and Spanish.

II. Volume and Structure of the Presented Dissertation

The PhD-thesis developed by Dr. Gabriela Rosenova Kirova, titled "Laboratory Investigation of the Accuracy of Cemented Superstructures on Abutments Manufactured Using Different Impression Taking Protocols" is highly relevant due to its scientific and applied nature. It consists of 191 pages, including 36 pages of literature review, 1 page for the aim and task, 113 pages of original research comprising materials and methods, results, and discussion, 3 pages for conclusion and concluding remarks, and is illustrated with 20 tables, 105 figures, and 3 appendices. The bibliography includes 299 references, of which 23 are in Cyrillic and 276 in Latin script.

The literature review thoroughly and systematically examines various types of impression materials, scanning systems, CAD/CAM technology, milling, 3D-printing, and more.

In the section "Conclusion on the Literature Review," the author highlights the unresolved issues: after thoroughly reviewing the available literature, it can be stated that the topic of the accuracy of implant-supported constructions made using different technologies is highly relevant.

The reviewed literature sources comprehensively address various issues related to laboratory work protocols, additive and subtractive manufacturing technologies and materials, as well as the possible errors that lead to deviations in accuracy.

There are several studies on this topic in the literature, but many factors can influence the research. One of these factors is the use of different measurement methodologies, with no specific guidelines on how measurements should be conducted. As a result, there is data showing variable results depending on the methodology used to analyze the data.

The impact of the type of manufacturing technique on the accuracy of prosthetic constructions has been studied in the literature, but the results of these studies are contradictory. Furthermore, there are more studies related to subtractive techniques compared to additive ones. There is no unanimous opinion on the protocol that should be followed regarding the cementation space during CAD design.

III. Aim and tasks

1. Aim

The aim of this dissertation is to conduct a comparative assessment of the accuracy of superstructures fabricated using different methods and impression-taking protocols, cemented onto abutments, and measured on microsections of laboratory micro-grinds.

2. Tasks

1. Survey Study

1.1. Conduct a survey among doctors of dental medicine regarding their awareness and preferences for impression techniques for transferring implant superstructures.

1.2. Conduct a survey among dental technicians regarding their awareness of protocols for transferring implant positions and fabricating fixed restorations on implant supports.

2. Comparative Assessment of the Accuracy of Implant-Supported Superstructures which involves measuring the thickness of the cement layer in copings transferred using two methods with an intraoral scanner and made from zirconium dioxide via subtractive technology.

2.1. Directly scanned abutment.

2.2. Directly with a scan body.

3. Comparative Assessment of the Accuracy of Implant-Supported Superstructures which involves measuring the thickness of the cement layer in copings transferred using two methods with an

intraoral scanner and made from Co-Cr alloy via additive technology—selective laser melting (SLM).

3.1. Directly scanned abutment.

3.2. Directly with a scan body.

4. Comparative Assessment of the Cement Layer Thickness between copings transferred using scan bodies and directly scanned abutments with an intraoral scanner, comparing subtractive and additive technologies.

The aim and objectives are clearly and precisely formulated, allowing the author to successfully carry out this work using the appropriate methods they have chosen.

IV. Significance of the topic and relevance of the aim of the dissertation

The topic of the dissertation is significant for the Bulgarian science and practice. Until recently, the most common way to restore various classes of defects in the dental arches was through removable prostheses or using natural teeth as abutments for constructing bridges. Nowadays, the issue of implant-supported prosthetic treatment for these defects is particularly relevant. Restoring large or small edentulous areas with prosthetic restorations supported by implants has become an integral part of modern dentistry, thus avoiding the abrasion of healthy dental hard tissues, which is unavoidable with the conventional approach.

Implant-supported prosthetic treatment (IPT) offers several advantages, with the most significant from a preventive perspective being the prevention of bone loss around functionally loaded implants, improvement in chewing efficiency, as well as the restoration of occlusal-articulatory balance, which greatly enhances patient comfort.

In this way, structural and functional changes following the loss of one or more teeth, as well as in completely edentulous jaws, are avoided, ensuring a durable restoration of the masticatory system and the aesthetic appearance of the dentition. Based on global and personal experience, the author analyzes results and creates a protocol for selecting the most appropriate treatment approaches. For this reason, the topic is both relevant and significant for Bulgarian dental science and clinical practice.

V. Results

Dr. Kirova presents the results of the conducted study comprehensively and analytically. The awareness and preferences for impression techniques used to transfer implant superstructures among dental technicians and doctors have been analyzed. A comparative assessment of the accuracy of superstructures supported by implants was made by measuring the cement layer thickness in crowns transferred in two ways using an intraoral scanner and made of zirconium dioxide using subtractive technology. Additionally, a comparative assessment was made of the accuracy of superstructures supported by implants by measuring the cement layer thickness in

crowns transferred in two ways with an intraoral scanner and made of Co-Cr alloy using additive technology – selective laser melting (SLM).

VI. Conclusions

Based on the reported and analyzed clinical results, Dr. Kirova makes the following conclusions.

1. Despite the widespread adoption of modern digital technologies, most of the surveyed dental practitioners still prefer conventional working methods.
2. Most of the surveyed dentists cannot determine whether there is a difference in the accuracy of restorations produced through digital protocols compared to traditional methods.
3. Most dental laboratories perform the scanning at the cast stage with a pre-selected abutment.
4. It is necessary to standardize and optimize the methods for transferring information between dental laboratories and dental practices, which can serve as a basis for future research aimed at improving communication and the precision of prosthetic construction fabrication.
5. A statistically significant difference has been established between the groups of scanned bodies and scanned abutments.
6. The use of scan bodies provides better marginal adaptation and accuracy of fit for implant suprastructures compared to scanning abutments, in both milling and selective laser melting technologies.
7. The geometry and optical properties of scan bodies ensure higher scanning precision and more accurate transfer of the implant position compared to scanning abutments.
8. It has been established that in the group of scanned abutment, the marginal fit accuracy shows higher values with both milling and selective laser melting technologies. These values are within clinically acceptable limits (under 100 μm).
9. It has been proven that the method of scan bodies provides higher accuracy compared to the method of scanning abutments.
10. It has been established that the fitting accuracy in both scanning methodologies and both manufacturing technologies is within the acceptable limits, providing marginal adaptation within the clinically acceptable threshold of 100 μm and fitting accuracy of less than 200 μm . The combination with the highest accuracy is the use of a scan body and milling, followed by scanned abutment and milling, scan body and selective laser melting, and finally scanned abutment and selective laser melting.

VII. Contributions

Based on the conducted research and the conclusions drawn, Dr. Kirova presents the following contributions to science and practice.

Scientific and applied contributions

Original contributions

1. For the first time in our country, a methodology has been developed to standardize the technology for investigating the adaptation accuracy of fixed superstructures using a machine for hard cuts.
2. It has been established that the strategy using a scanning analogue provides higher accuracy compared to the method of scanning the abutment.
3. It has been established that the marginal adaptation and fit accuracy, which need to be ensured during treatment with implant superstructures, are achieved with both scanning methodologies and manufacturing technologies. The combination of the scanning method and the manufacturing process are ranked according to the achieved accuracy. First is the group of scan body and milling, followed by scanning of abutments and milling, scan body and selective laser melting, and scanning of abutments and selective laser melting.

Confirming contributions:

1. The use of scan bodies provides better marginal adaptation and fit accuracy of implant suprastructures compared to scanning abutments, and this applies to both manufacturing technologies—milling and selective laser melting.
2. The geometric and optical characteristics of the scan bodies are key factors influencing the achievement of higher scanning precision and more accurate transfer of implant positions compared to abutments.

Applicable contributions:

1. A newly developed methodology for creating specimens for studying marginal adaptation and fit accuracy has been proposed, which can be used for future similar studies.
2. A classification of the combination of scanning method and manufacturing technology based on fit accuracy has been proposed, which can be successfully utilized in clinical practice.

VIII. Characteristics and evaluation of the PhD-thesis

The design of the study includes appropriately selected materials and research methods for all tasks, ensuring the reliability of the results and contributions of an original nature. Dr. Gabriela Kirova's dissertation is correctly structured, containing all the elements of a scientific development, and meets the requirements of the law for developing the academic staff in the Republic of Bulgaria and the Regulations for the Development of the Academic Staff at Medical University - Varna.

The results are accurately described and thoroughly analyzed. They cover all aspects of the tasks set, allowing for the achievement of the stated goal.

IX. Evaluation of the publications and the PhD candidate's personal contribution.

The list of publications provided by Dr. Gabriela Kirova consists of 3 full-text publications published in scientific journals. In all three publications, she is the first author, and in two of them, she is the sole author.

The dissertation is the personal work of the author, developed in good collaboration with scientific institutions working in this field.

The abstract has been developed in accordance with the accepted academic requirements. Its content and illustration cover all sections of the presented scientific work.

The dissertation candidate has taken into account the preliminary critical remarks.

X. Conclusion

What has been stated so far gives me grounds to draw the following conclusion:

My overall assessment of Dr. Gabriela Rosenova Kirova's PhD-thesis titled "Laboratory Investigation of the Accuracy of Cemented Superstructures on Abutments Manufactured Using Different Impression Taking Protocols" is unequivocally positive. The work meets the criteria for a dissertation for the award of the educational and scientific degree "Doctor" and makes a valuable contribution to dental medicine, particularly in prosthetic dental medicine. It clearly demonstrates that Dr. Kirova is well-versed in contemporary specialized literature across its width and depth, and possesses extensive clinical and research experience.

I give my affirmative vote and suggest to the respected members of the scientific jury to award Dr. Gabriela Kirova the educational and scientific degree "PhD".

Varna

19.11.2024

Member of the Scientific Jury

Prof. Dr. Tihomir Georgiev, DMD, PhD, DSc

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