

**To the Chairman of the Scientific Jury,  
determined by Order № P-1442/07.09.2021  
of the Rector of the Medical University - Plovdiv**

I present : **A review**

for the procedure for obtaining **educational and scientific degree “Doctor“**  
with candidate **Dr. Elena Kostadinova Vasileva** on the topic:

**Comparison of two types of press ceramics with different composition of  
the crystalline phase**

**Review drawn up by: Prof. Yavor Kalachev, DMD, PhD**

Scientific specialties: **General and Prosthetic Dentistry**

Institution: **MU-Plovdiv, Faculty of Dental Medicine, Department of  
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## REVIEW

of

**Prof. Yavor Kalachev, DMD, PhD, Department of Prosthetic Dentistry,  
Faculty of Dental Medicine, Medical University – Plovdiv, Bulgaria**

of a dissertation for the award of a **educational and scientific degree “Doctor“**  
**professional direction:** Dental medicine

**Doctor’s program:** Prosthetic Dentistry

**Author:** Dr. Elena Kostadinova Vasileva

**Form of dissertation:** self-preparation

**Topic:** „Comparison of two types of press ceramics with different  
**composition of the crystalline phase”**

**Scientific Supervisor:** Prof. Angelina Vlahova, DMD, PhD

### **Short CV data of the doctoral candidate:**

Dr. Elena Kostadinova Vasileva was born on July 7, 1985 in Asenovgrad. She graduated “Vasil Levski” High School in Smolyan with biology, chemistry and German language in 2004.

In 2010 she graduated Dental Medicine in MU - Plovdiv. She was working in private dental practice from 2012 till now. She is a member of BDA.

In 2016 Dr. Vasileva starts working as an Assistant Professor in the Department of Prosthetic Dentistry, FDM, MU - Plovdiv.

The dissertation presented to me for review contains 230 standard typewritten pages with a bibliography of 291 authors, of which 33 in Cyrillic and 258 in Latin and 17 appendices. The dissertation is well structured, which made it easier for me to prepare the review.

The **Introduction** points out the fact that after their introduction in 1960, metal-ceramic restorations proved their versatility and strength. This makes them the first choice in prosthetic treatment. Despite their good mechanical properties, they do not always meet all the requirements of patients. Today, their application is increasingly being replaced by all-ceramic restorations. The

verification of time, late clinical observations and the results of the application of new alternative materials prove that dental ceramics allow the production of restorations that are at the same time strong, long-lasting and highly aesthetic. Research is gradually focusing on highly aesthetic materials, in particular lithium disilicate and zirconia-based ceramics, to show the properties, indications and limitations of their use.

The above facts give grounds for the candidate to formulate:

**The aim** of the dissertation: is to make a laboratory comparative evaluation of the press ceramics with crystalline phase of lithium disilicate and lithium silicate.

**The materials and methods** of the study are correctly and adequately selected, the use of a sufficient number of modern **statistical methods** for processing the obtained data ensures that reliable and objective **results** are attained.

In order to meet the set aim, **5 tasks** have been formulated and completed.

**Task №1.** Study of dentists' awareness about the indications and application of different types of ceramic materials.

- ❖ The dentists are not familiar with the technology of processing of different ceramic materials.
- ❖ Most of the dentists do not make all-ceramic restorations (crowns, veneers, bridge restorations).
- ❖ Most of the dentists are not well known with the advantages and indications of press ceramics. The dentists' knowledge of press ceramics and in particular of the possibility of constructing three-unit bridge restorations from them is limited.
- ❖ The corrections of ceramic restoration is a serious clinical problem for the dentists.
- ❖ The most commonly used technique when is necessary correction of the ceramic restoration in the patient's mouth is finishing and polishing

**Task №2.** Development of a method for determining the potential of pressing of press ceramics.

- ❖ The compressibility of glass-ceramic materials processed by pressing is an extremely important property for obtaining accurate and defect-free

restorations. Adherence to the work protocol defined by the company producing the used ceramics is essential for the ultimate success in working with these materials. The LSCs have better compressibility than LDSCs.

- ❖ The complete pressing of a given structure is determined by the crystal size of the used press ceramics. The reproduction accuracy of the structure is higher with a smaller crystal size. LSC is characterized by better compressibility, which is determined by the smaller size of the crystals in its structure.

**Task №3.** Laboratory study and comparison of optical properties (absorption, light reflection and refractive index) of the two types of press ceramics.

- ❖ A fundamental characteristic of any material is its refractive index for the corresponding wavelength. Almost all other optical characteristics of the studied object depend on it.
- ❖ The refractive indices of two ceramics differ by about in almost the entire visible spectral range (400-700 nm) and increase slightly towards the red and infrared regions of the optical range.
- ❖ The lower refractive index measured for LSC also corresponds to lower values for the reflection coefficient and the degree of light absorption.
- ❖ Peaks in the values of these parameters at wavelengths of 480, 520 and 640 nm are observed in the measured spectral dependences of the reflection and absorption coefficient for LDSC. The presence of these peaks can be attributed to the presence of fluorescent ingredients in the composition of this ceramic.
- ❖ Both types of press ceramics reflect almost equally the incident light, which is indicated by the very close values of the reflection coefficient.
- ❖ In the range of 540-620 nm, practically both ceramics have the same reflectivity of the standard material and in this range of illumination would not give indications of a difference in color perception to the material with which we compare them.
- ❖ When illuminating the studied materials in the blue-green region (400-520 nm) differences in color perception between the two materials would be observed. To a less extent this difference would be observed in the range 620-700 nm, while for the range 540-640 nm the two ceramics are practically indistinguishable in color.

**Task №4.** Two-dimensional (2D) study of the possibilities for polishing test samples of lithium disilicate and lithium silicate press ceramics with a classical profilometer.

- ❖ After treatment of the ceramic surface, regardless of the used polishing protocol, the smoothness of the glazed ceramic surface can't be achieved.
- ❖ The particle size of the ceramic material affects the surface relief.
- ❖ The type of used bur, the addition of diamond polishing paste and the time taken for polishing affect the relief of the ceramic surface.

**Task №5.** Three-dimensional (3D) study of the possibilities for polishing lithium disilicate and lithium silicate press ceramics with and atomic-force microscope and a scanning electron microscope.

- ❖ The type of the bur with which the correction is made is important for the obtain smoothness of the restoration after polishing. The use of finer-grained burs results in a smoother surface after polishing.
- ❖ The polishing protocol affects the final results.
- ❖ Polishing with a polishing kit and diamond paste results in a smoother surface than polishing only with polishing kit.
- ❖ Regardless of the polishing protocol, a smoothest surface can only be obtained by re-glazing the treated ceramic surface.
- ❖ The type of crystalline phase and the size of the crystals affect the ability of polishing of the ceramic material. LSCs have a better ability to be polished than LDSCs.
- ❖ The polishing process does not heat the ceramic surface.

## **Contributions**

### **Current contributions**

- ❖ For the first time in Bulgaria was conducted a survey among the dentists about the different types of ceramic materials and their use, establishing a deficit of knowledge related to the indications and their application.
- ❖ For the first time in our country is created a method for determining the compressibility of glass-ceramics processed by pressing.
- ❖ For the first time in our country the properties of two types of press ceramics with different composition of the crystal phase are compared.

- ❖ For the first time in our country was made a study of some of the properties (optical, mechanical) of press ceramics with crystalline phase of lithium silicate, reinforced with 10% zirconium dioxide.

#### **Confirmatory contributions**

- ❖ The claim that the polishing of the ceramic surface after correction cannot achieve the smoothness of the glazing is confirmed.
- ❖ It has been proved that the particle size in the composition of the ceramic material has an effect on its properties.
- ❖ It has been proven that LDSC and LSC have excellent optical properties to recreate aesthetics.

#### **Applied-scientific contributions**

- ❖ It is proven that LSCs have better polishing capabilities than LDSCs.
- ❖ A method for assessing the compressibility of ceramic materials has been developed.
- ❖ It is proved that polishing with the use of diamond paste in LSC and LDSC makes the ceramic surface smoother

#### **Assessment of publication activity**

In connection with the dissertation, **Dr. Elena Kostadinova Vasileva** presents 4 publications. This fact proves that the topic developed in the dissertation is his personal work.

**The author's summary** objectively reflects the dissertation. It is drawn up in accordance to the requirements of the law for the development of the academic staff.

I have no critical remarks on the reviewed thesis.

#### **Conclusion:**

The thesis of Dr. Elena Kostadinova Vasileva is a detailed study about comparison of two types of press ceramics with different composition of the crystalline phase

The obtained results are valuable for clinical practice and can be a basis for future research.

Due to the above, I confidently give my **positive assessment** to award an educational and scientific degree “Doctor“ to Dr. Elena Kostadinova Vasileva in PhD program of Prosthetic Dentistry.

Plovdiv  
5.10.2021



(**Prof. Yavor Kalachev, DMD, PhD**)