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Use of feldspathic ceramics in a digital protocol: A clinical case

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Abstract
When starting to work within a digital protocol, especially with the ability to implement restorations directly at the patient's chairside, doctors face the challenge of selecting the appropriate material. The correct choice of block can help achieve a highly aesthetic and quality result in a short time. Modern CAD/CAM systems allow for the fabrication of a single restoration at the patient's chairside in just 10 minutes, as demonstrated in this clinical case.

Keywords: feldspathic ceramics, CAD/CAM, restoration

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Использование полевошпатной керамики в цифровом протоколе: клинический случай

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Резюме
Начиная работать в цифровом протоколе, особенно имея возможность реализовывать реставрации тут же, у кресла пациента, доктора сталкиваются с проблемой выбора того или иного материала. Правильный выбор блока поможет получить высокоэстетичный и качественный результат в короткие сроки. Современные CAD/CAM системы позволяют изготовить одиночную реставрацию у кресла пациента за 10 минут, что было продемонстрировано в представленном клиническом случае.

Ключевые слова: полевошпатная керамика, CAD/CAM, реставрация

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INTRODUCTION

A large number of companies offer CAD/CAM blocks, and for the first time, encountering such a variety of materials, names, and designations, users can become confused and end up purchasing what the distributor or a colleague who uses them recommended [1–3]. However, choosing and understanding the properties of the material allows you to create long-lasting restorations wisely [4]. CAD/CAM blocks from different companies may differ in composition, but each company has blocks made of various materials that have similar recommendations for processing, polishing, and individualization [1].

MATERIALS AND METHODS

Basic materials used during clinical appointments (Fig. 1) [5]:

– feldspathic ceramics;
– lithium disilicate;
– composite;
– hybrid ceramics;
– zirconia dioxide;
– PMMA.

The most commonly used blocks in my practice for single chairside restorations are feldspathic ceramics [6]. The main components of its composition are potassium feldspar (75–85%), quartz glass (12–25%),

and white clay (3–5%). Small quantities of various additives improve the processability of firing and impart the necessary optical properties. At temperatures above 1000°C, feldspar melts and turns into amorphous potassium aluminosilicate glass [7]. Kaolin and quartz, despite their higher melting points, begin to interact with the feldspar melt. As a result, after cooling, a translucent and solid material is formed.

Examples of materials based on feldspathic ceramics [8]:

– Vita Mark II;
– Vita Triluxe Forte;
– Vita Reallife;
– Ivoclar Empress CAD;
– CEREC blocks SIRONA.

CASE REPORT

Next, consider a clinical case implemented using a block of feldspathic ceramics.Initial situation: Tooth after endodontic retreatment (Fig. 2). An onlay with overlap of the tuberosities and vestibular surface is planned.

Procedure:

1. Cusp reduction was performed (Fig. 3).
2. An area of demineralized enamel was detected on the medial surface, and a dark area of tissue was visualized (Fig. 4).

Fig. 1. Available CAD/CAM blocks

Рис. 1. Доступные блоки CAD/CAM

A

B

Fig. 2. Initial sitation: *A* – occlusal view; *B* – side view

Рис. 2. Исходная ситуация: *A* – окклюзионный вид; *B* – вид сбоку

Fig. 3. Cusp reduction

Рис. 3. Редуцирование бугров

Fig. 4. Area of demineralized enamel

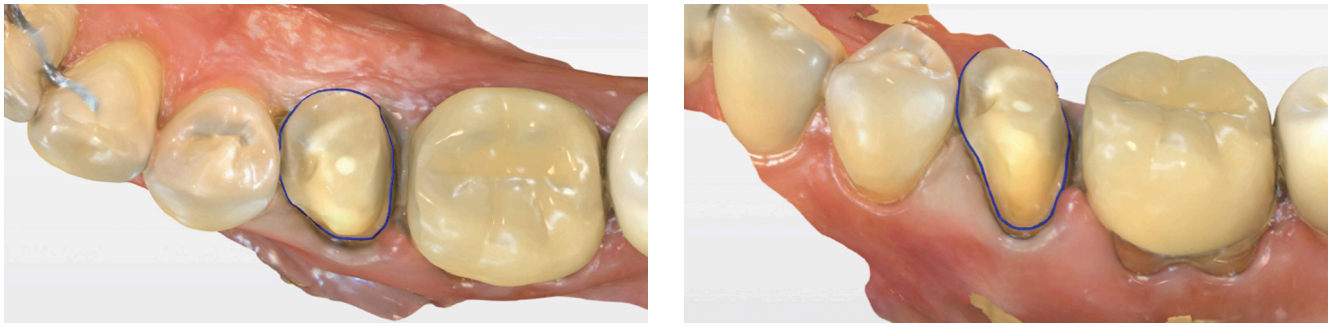
Рис. 4. Область деминирализованной эмали

Fig. 5. Caries detected
Рис. 5. Обнаруженный кариес

3. After removing the demineralized tissue, dentin caries were detected (Fig. 5).
4. In the final stage of preparation, the contact wall on the 36th tooth was smoothed out to create the correct profile for our onlay (Fig. 6).
5. A scan was carried out, and a digital design was made in the CEREC Design 5.1 program (Fig. 7, 8).
6. A block of grade II Vita feldspathic ceramics was milled for 10 minutes on a clinical milling machine MCXL (Dentsply Sirona) (Fig. 9).
7. After individualization with VITA AKZENT paints and glaze application in one firing (Fig. 10).
8. Isolation and fixation were performed (Fig. 11, 12).
9. The final view immediately after fixation (Fig. 13).
10. Checking occlusal contacts (Fig. 14).

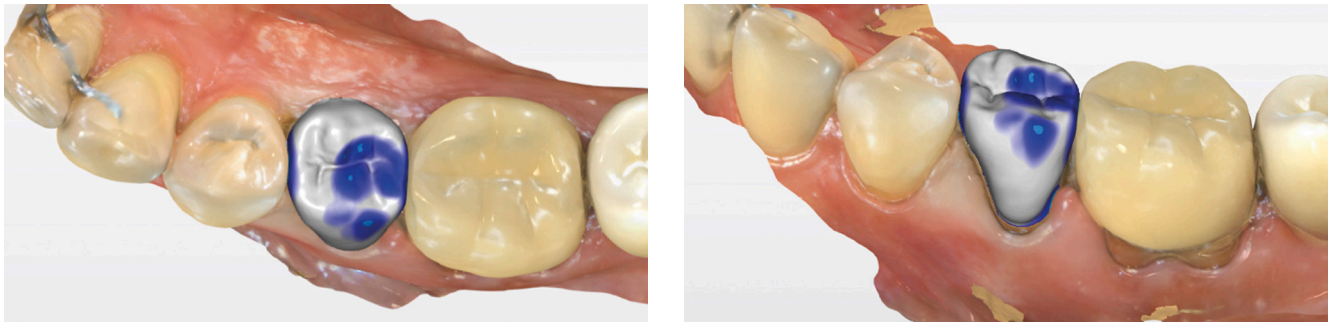
A **B**

Fig. 6. Final preparation: *A* – occlusal view; *B* – side view
Рис. 6. Финальное препарирование: *A* – окклюзионный вид; *B* – вид сбоку



A **B**

Fig. 7. Margin preparation determintation: *A* – occlusal view; *B* – side view
Рис. 7. Определение границ препарирования: *A* – окклюзионный вид; *B* – вид сбоку



A **B**

Fig. 8. Initial anatomy: *A* – occlusal view; *B* – side view
Рис. 8. Первоначальная анатомия: *A* – окклюзионный вид; *B* – вид сбоку

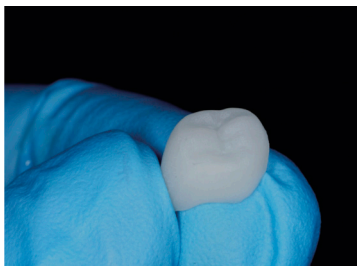


Fig. 9. Felspathic restoration

Рис. 9. Полевошпатная реставрация

Fig. 10. Try-in

Рис. 10. Припасовка

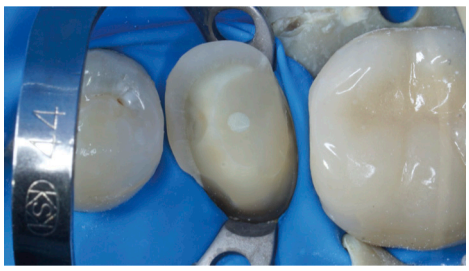


Fig. 11. Rubber dam isolation

Рис. 11. Изоляция системой коффердам

A

B

Fig. 12. Cemented restoration: *A* – occlusal view; *B* – side view

Рис. 12. Зафиксированная реставрация: *A* – окклюзионный вид; *B* – вид сбоку

Fig. 13. Restoration after rubber dam removal

Рис. 13. Реставрация после снятия системы коффердам

Fig. 14. Occlusal contact

Рис. 14. Окклюзионные контакты

DISCUSSION

Feldspathic ceramic blocks are essentially ready-made for work. If there is no need or desire to individualize the restorations, they can simply be polished and fixed in the patient's mouth without any heat treatment [9].

The color of the block is the color of the future restoration [10]. However, it's important to remember that the thickness of the material in the block is significant, which makes the colors appear more saturated. After milling, the thin restoration will be slightly lighter than the block itself.

If necessary, a feldspathic ceramic restoration can be painted and/or glazed [11].

Please note that successful work with feldspathic blocks cannot be guaranteed if the following guidelines are not followed:

1. Underestimation of the required minimum thickness of full-anatomical restorations.
2. Underestimation of the required minimum thickness of shortened restorations (Cut-Back reduction technique).
3. Exceeding the thickness of the maximum permissible layer when layering masses.
4. Using blocks in a CAD/CAM system that is incompatible with them.

CONCLUSION

Thus, the use of feldspathic ceramics for single restorations in clinical practice ensures high aesthetics and durability of the restorations. Thanks to modern CAD/CAM technologies, the manufacturing process becomes fast and efficient, allowing the creation of customized solutions directly in the doctor's office in a short time. The ability to individualize the blocks allows for an optimal match to the color and shape of natural teeth, which is especially important for the front teeth. Additionally, the use of feldspathic ceramics does not require complex heat treatment, simplifying the process and minimizing the risk of errors during operation.

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AUTHOR'S CONTRIBUTION

Oxana A. Naidyonova – a substancial contribution to the concept or design of the article; revised the article critically for important intellectual content; approved the version to be published.

ВКЛАД АВТОРОВ

О.А. Найденова – существенный вклад в замысел и дизайн исследования, критический пересмотр статьи в части значимого интеллектуального содержания, окончательное одобрение варианта статьи для опубликования.