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COMPARATIVE CHARACTERISTICS OF DIRECT RESTORATION AND ORTHOPEDIC INLAY

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Annotation
The article considers a comparative characteristic of the effectiveness of direct composite restoration and ceramic inlays.

Keywords: inlays, direct restoration, orthopedics.

Materials and Methods

In the process of work, the content of journals and books on dentistry was studied, an analysis of domestic and foreign articles, websites and dissertations was carried out.

In aesthetic dentistry, the main task remains to restore the natural appearance of a damaged tooth, unfortunately , restorations of teeth made of composite materials quickly fail and become unusable, and after half a year about 32% of the fillings become defective, and after a year 50%, after two years already up to 70%.

In connection with this factor, ceramic inlays began to gain great popularity in aesthetic dentistry. In the following article, we will study the positive and negative properties of direct composite restorations, evaluate the positive and negative qualities of using ceramic inlays, and evaluate both methods of restoring the original appearance of the tooth. This work is based on the analysis of domestic and foreign dissertations, as well as the content of books on dentistry.

An important problem in the work of a dentist today is the pathology of hard tissues of the tooth. One of the important causes of crown defects is the complications of caries, traumatic injuries, as well as irreversible processes of destruction of tooth tissues. On the proximal parts of the tooth, filling cavities is one of the most difficult tasks for the doctor , since the number of difficulties increases when restoring contact surfaces.

Composites are actively used for the restoration of chewing groups of teeth due to the best process in the field of adhesion. The composition of the materials includes an inorganic filler that is combined with an organic matrix. Despite the fact that the phases of the material are interconnected, the connection between them is the weak point of the material, since the strength becomes low. In the world, many types of filling material have been developed, especially in the last decade, with a variety of dispersed filler and organic matrix in their composition.

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The main objective of scientific research was to create materials not only with good polishability , but also would have a long wear resistance, while also having increased strength.

Due to this, after the appearance of hybrid and then microhybrid composites, highly hybrid microfilled composites , which contain 80% mineral filler based on glass particles ranging in size from 0.04 to 0.3 microns. To achieve optimal polishability , to achieve the least abrasion , as well as to achieve the best physical and chemical properties, material particles of different sizes are distributed in a certain order.

Composite materials, thanks to the latest advances in dental technology, have positive aesthetic properties , but despite this, they also have disadvantages, one of which is a violation of the marginal fit, as well as depressurization due to shrinkage of the material during polymerization . All these factors can subsequently lead to the exfoliation of the composite material from the walls of the tooth cavity, the appearance of microcracks, crevices and, as a result, lead to the formation of secondary caries. Restorations made of composite materials become unusable quite early, after a year, up to 50% of the fillings become untenable, which led to the extraction of a tooth in 35% of patients, the result of the removal is poor-quality or inadequate treatment . Patients also experienced repeated loss of composite restorations, as well as the appearance of secondary caries, usually on the contact surfaces of the teeth.

I would like to note that repeated filling of the tooth cavity leads to its expansion and, as a result, thinning of the walls. As a consequence, large cavities require the greatest amount of material and despite the layering of the composite into the cavity, excessive stress between the material and the prepared tooth cannot be avoided . In his research papers, Watts D. _ Noted that the cavity configuration factor or C-factor is defined as the ratio of the number of surfaces that interact with the material during polymerization to the number of free ones. In this case, the lower the C-factor, the lower the possibility of separation due to internal stresses, if, for example, as in cavities located in proximal surfaces of the tooth C-factor is high, then only adhesive-retained restorations can reduce these risks.

Based on the above disadvantages of direct composite restorations, the best method for restoring large cavities of the tooth, and in particular class 2 according to Black , the best method for recreating the cusp structure would be the manufacture of ceramic inlays. The density of ceramics allows you to restore the strength of the crown as well as a good fit of the edges due to the accuracy of inlay manufacturing and milling of the restoration. Many researchers note the advantages and disadvantages of tabs, such advantages as lack of shrinkage and non-polarized bonds, while in composite materials there are from 5% to 20%, biocompatibility with the human body, no shrinkage, color fastness, abrasion resistance, which prolongs the service life.

From a hygienic point of view, the inlay does not collect plaque and is inert to oral tissues.

With the help of special devices, it is possible to make porcelain inlays, crowns , bridge-like prostheses, as well as veneers . Typically, the device consists of 2 parts - the first of which is a personal computer for receiving and processing the patient's personal data and the second part is a grinding unit in which the future tab is directly made. To obtain an accurate 3D image, these devices are equipped with 3D intraoral cameras . Thanks to computer simulation, it is possible to achieve more accurate fabrication and restoration of the crown part of the tooth.

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Depending on what kind of defect needs to be eliminated and restored, the doctor can choose a certain type of tabs:

“ Inlay ” - located only inside “ Onlay ” - micro -prostheses covering the occlusal surface of the tooth and at the same time entering at different depths into its hard tissues. “ Overlay ” - covering most of the crown from the outside . At the same time, the restoration process can be completed in one visit to the doctor's office[1].

Due to the progress in the field of adhesion, composites are actively used in the restoration of chewing groups of teeth. They consist of an organic matrix reinforced with an inorganic filler. These phases are interconnected, but the connection between them is the weak point of the material, because has low strength. Over the past decade, a variety of filling materials have been developed that differ in the composition of the organic matrix and the dispersion of the filler.

Basically, scientific research was aimed at creating composites that, in addition to good polishability , would have good strength and wear resistance. So there were first hybrid, then micro hybrid and, finally, highly filled microhybrid composites, which contain in their composition 80% by weight of a mineral filler based on glass with an average particle size of 0.04 to 0.3 μm [2]. To achieve optimum polishability and abrasion resistance, as well as physical and chemical characteristics, particles of different sizes are distributed in a certain order. Thanks to the achievements of modern dentistry, composites have good aesthetic properties, but also have disadvantages, first of all, this is a violation of the marginal fit, the main reason is depressurization due to shrinkage of the material during polymerization. This can lead to the exfoliation of the composite from the walls of the cavity and the appearance of microcracks, microcracks and, as a consequence, the development of secondary caries [3,4]. Composite restorations become defective early: after six months, 30% of fillings fail, after a year - more than 50%, after 2 years - 70% [1]. In 34.6% of patients, the reason for the extraction of teeth was poor-quality treatment, repeated loss of composite restorations, the presence of secondary caries, which most often occurs on contact surfaces [5]. Frequent replacement of restorations leads to an increase in the size of the cavity, and repeated preparation thins the walls [4]. Larger cavities require more material, and even when using a layered composite technique, excessive stress between the bonded surfaces cannot be avoided. In his study, Watts D. noted that the so-called C-factor (cavity configuration factor) is defined as the ratio of the number of surfaces that interact with the material during polymerization to the number of free ones. The lower the C-factor, the lower the possibility of tearing due to internal stresses, and when the C-factor is high (as, for example, in cavities located on the proximal surfaces of the tooth), only adhesively cemented restorations can reduce this risk [6,7].

Based on these shortcomings of direct composite restorations, the best method for restoring large cavities (especially class 2 according to Black), to recreate the cusp structure, would be the production of ceramic inlays. The rigidity of the ceramic allows restoration of crown strength and good marginal fit due to the precise milling of the restoration.

Many authors note the advantages of inlays - high strength, lack of shrinkage and non-polarized bonds (from 5 to 20% are present in composite materials), biocompatibility with the human body, color fastness , abrasion resistance and long service life [7,8]. From the point of view of hygiene, it does not

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accumulate plaque, and it is inert to the tissues of the oral cavity. CEREC (Chairside economic Restorations of aesthetic Ceramic) is a device for economic and aesthetic ceramic restoration [8, 9], with which porcelain inlays, crowns, bridges and veneers are made [10, 11].

The device consists of two parts: the first is a personal computer for receiving and processing personal data and the second is a grinding unit in which the future inlay is made. To obtain a three-dimensional image, the device has an intraoral camera. Thanks to computer modeling, a more accurate restoration of the destroyed crown part of the tooth is possible. Depending on which defect needs to be restored, different types of inlays are used: " Inlay " - located only inside, "Onlay " - microprostheses covering the occlusal surface of the tooth and at the same time entering at different depths into its hard tissues and " Overlay " - covering a large outside part of the tooth crown [12]. The dental restoration process takes place in one visit. The preparation of teeth for an inlay made on the Cerec apparatus is the same as for any [13]. The prepared cavity is covered with a thin layer of anti-reflective powder, and a picture is taken using a 3D camera. A picture of the tooth appears on the monitor screen, and the doctor begins to model the missing part. The 3D image, enlarged by 12 times, allows you to model the structure more accurately. After drawing all the lines, the computer calculates the volume of the inlay and transfers this data to the grinding block; after 10–20 minutes, the inlay is ready and you can start fitting and fixing it [14, 15]. Cerec porcelain inlays do not require special care, it is enough to follow basic hygiene rules and doctor's advice.

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