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## Aesthetic Restoration of the Premolar Light-Curing Composite Materials

**Conflict of interest:** nothing to declare.

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### Abstract

**Introduction.** Light-cured composites are widely used in dentistry due to their optimal aesthetic and physical properties. High-strength materials are used for filling chewing teeth.

**Purpose.** To evaluate the effectiveness of restoring significantly damaged premolars.

**The study material** was observations of clinical cases in a dental office equipped with modern equipment.

**Results** of the study show that compliance with treatment protocols and instructions for working with composite ensures high quality restoration, good resistance to chewing load for a long time.

**Keywords:** light-curing composite; premolar; esthetic restoration

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## Эстетическое реставрирование премоляров светоотверждаемыми композиционными материалами

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### Резюме

**Введение.** Композиты, отверждаемые видимым светом, широко используются в стоматологии благодаря оптимальным эстетическим и физическим свойствам. Для пломбирования жевательных зубов используют материалы повышенной прочности.

**Цель.** Оценка эффективности реставрирования значительно разрушенных премоляров.

**Материалы и методы.** Наблюдения клинических случаев в условиях стоматологического кабинета, оснащенного современным оборудованием.

**Результаты.** Соблюдение протоколов лечения и инструкций по работе с композитом обеспечивают высокое качество реставрирования, хорошую устойчивость к жевательной нагрузке в течение длительного времени.

**Ключевые слова:** светоотверждаемый композит, преомоляр, эстетическая реставрация

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## ■ INTRODUCTION

Up-to-date light curable composite is widely implemented in a therapeutic dentistry clinic due to its major characteristics, such as perfect adhesion to dental tissue, overall resistance to wear and excellent aesthetic qualities [1]. For the front dentures it is strongly recommended to use nano composite and micro hybrids to provide better polishing as well as natural coloration and luster of the enamel [2, 3]. For the filling of masticatory teeth, however, stronger packable polymers seem like a better option. The conterminal position in the row of teeth is occupied by premolars, which are subject to considerable stress while being perfectly visible in case of smiling [4, 5]. In accordance with the given situation, one must opt for the filling material, which would ensure both high aesthetic characteristics and resistance to external impact [6]. These requirements are fully met by light curable hybrid or nano composite, provided the basic liquid polymers are used as the adaptive layer.

## ■ THE AIM OF THE STUDY

Evaluate the effectiveness of restoration of significantly damaged premolars.

## ■ MATERIALS AND METHODS

The operation technique can be demonstrated with the help of the following clinical case. The 28-year-old patient B. complained of the sufficiently destroyed crown of a lower denture premolar, which was painful while in contact with the cold, but caused no inconvenience at all without the pain stimulus. The cavity was filled but shortly afterwards it split off together with the wall of the tooth. The patient checked out the latest dental restoration materials on the internet and decided on the light curable composite for her future treatment.

The external examination of the mouth cavity revealed a significant degree of decay for tooth 35 with the remnants of the filling material present and the bottom of the defect pigmented. The probing and thermometry were slightly painful. The percussion turned out to be negative. The final diagnosis was deep chronic caries of the dentin.

The patient was informed about the alternative methods of treatment, including the use of a ceramic prosthetic. After weighing up all the options available, she chose to opt for the light curable composite as a means of restoration for the premolar, the deal being settled by her signing the preliminary agreement to the method of treatment employed.

The good hygiene of the mouth cavity and the absence of inflammatory processes in the marginal gingiva allowed the dentist to get down to the treatment procedure during the same visit.

The scope of preparation and the choice of the light-activated composite were chosen in accordance with the size of the defect, the individual morphological and color-based characteristics of the premolar.

## ■ RESULTS

The mechanical preparation is carried out with the help of a brush covered with Klint gel, which is both oil and fluorine free, which is followed by a thorough oral rinsing. The selection of the proper shades of Grandio filling material requires natural lighting and the color standard with the psychological and physiological aspects of visual perception to be taken into account. Considering the scope and the size of the dentin-based defect OA2 opaque, A2 enamel and I transparent composite were chosen. The absence of erosion to the cusp surface presupposed the modelling of broad enamel, including the transparent layer.

The planning of a restoration tends to include the assessment of the crown size, the parameters of group membership, the geometrical shape of the buccal surface, the signs of belonging to the margin, the number and the shape of the cusps (the degree to which they are erased), the longevity of contacts between the teeth, the macrocontour as well as the look and the depth of the fissures, the cusp slope and the margin dentition. The classic reproduction of the premolar with two intact cusps was born in mind, the buccal cusp being higher than the tongue cusp. The interdental contact was precise. The definite dome of the crown was round in shape.

In order to make sure the work field is clean, the frame was equipped with a cofferdam, which got attached to a mouth cavity with the help of a klammer, attached to a molar, and the retraction lines.

Before the preparation process the proximal surface is fenced with a metallic matrix line kept in place by a small-size wedge, which is supposed to protect the tooth next to it as well as the interdental papilla from a possible trauma (Fig. 1). With the help of the globular diamond bore the necrology of the bottom and the walls of the defect are carried out, with the consideration for the precervical area.

In order to fix the filling and minimize the possibility the traumatizing of the dental and gingival papilla, the gingival parts are shaped at a sharp angle as much as possible. In order to avoid the appearance of cracks in the dentin as a result of the stress of polymerization all the inside angles smoothed over by the globular bore. With the help of the close-grained diamond tools are used to smooth over the surface of the cavity and the edges of the enamel. The obliquity of the enamel is not observed. After the instrumental processing of the dentin the protective metallic matrix got distracted (Fig. 2).

The cavity was rinsed by a water stream and dried.

The bottom of the cavity was then covered with the insulation layer made from the light curable glass ionomer material, which is predetermined by the size and the depth of the defect as well as the slight outward reaction to the painful reaction to the cold.

The filling of the cavity with the composite was preceded by the adhesive preparation of the dissected tissue. With the help of the brush a thin layer of the self-etching adhesive

bond was spread over the prepared surface by the air jet and polymerized by the light of a halogen lamp.

As the first portion of filling material liquid composite was applied through a cannula of a syringe and then evenly spread over the surface to form a layer of 3,0 mm. The layer was cured by the light of the polymerizing lamp for 10 seconds thus creating the adaptive layer between the hard tissues (as part of the complex relief of the tooth) and the photopolymer (Fig. 3).

In accordance with the algorithm, used to plan the size and shape, as well as the individual specifics of the premolar next came the modeling of the restoration, which requires the adequate reconstruction of the anatomic and physiological norms as the changes in the natural parameters tend to lead to the malfunction. For instance, in case of the faulty placement and modelling of the tubera solid food may spread beyond the occlusal field.

In the mesial part of the tooth opaque shades of the polymer are used. By rotating a piston one extrudes the composite from the syringe on to the tip of the smoother and presses it hard to the basic layer. The dentin color equal in amount to the dentin itself is used to fill the major part of the cavity. Each polymerized layer must not be thicker than 2,0 mm. The formation of the occlusal surface starts with the modelling of the foundation and the inner slopes of the tubera. The layers of the polymer are spread by narrow smoothers and cone-shaped pluggers by moving from the bottom towards the tips of the tubera.

The contact surface near the equator and towards the tubera is modelled by the enamel color. The thickness of the enamel layer of the composite in the occlusal contact areas is 1,0 mm according to the lack of abrasion. The tubera get covered with the 1,0 mm of basal enamel shade. The margin ridge in the distal area of the grinding surface is also modelled by the enamel color of the composite. The enamel fissure is shaped at the same time. Small horizontal notches are made to ensure the smooth motion of the supporting antagonist tuber. The coloration of the fissures is not required. A thin layer of transparent enamel composite is evenly spread all over the surface of the restoration.

After the material is cured the preparation sets in. The hybrid layer is removed from the surface, which is then shaped (the tubera, enamel rollers, edge indentations are added). The occlusal contacts with antagonist teeth are adjusted. For the polishing of the restoration it is recommended to use fine-grain finishing burs with white and yellow stripes and silicone finishing wheel-heads of various shapes including those with pointed tips. The flanks are finished with the help of diamond and plastic strips with diverse abrasive power.

After the cofferdam was removed, the state of the gingival area was assessed and the tooth around the restoration was covered with the fluorine lacquer.

Clinical case 2. The patient A. born in 1964 made an appointment complaining of etiological nagging pain. She was examined and diagnosed with chronic pulpitis of tooth 45. The treatment required the anesthetization. Next a cofferdam was placed and the tooth was dissected, the pulp of the crown and the root was amputated and the mechanical and medicinal treatment of the root-canal was carried out. The canal was filled with GP. Canason was used as a sealer. The X-ray inspection was arranged afterwards. The stages of the treatment were photographed with the help of a special mirror, which enabled the dentist to observe the object from two different perspectives.



**Fig. 1.** Clamp on the molar, matrix placed along the distal bone of the premolar



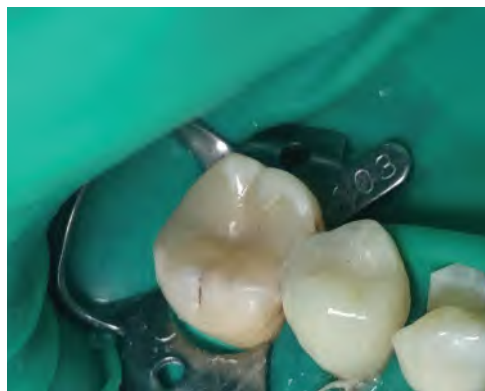
**Fig. 2.** Prepared cavity



**Fig. 3.** Layer-by-layer filling of the premolar



**Fig. 4.** Acid etching of the cavity sides



**Fig. 5.** Completed restoration

The endodontic procedures were preceded by the interpretation of the tooth color, the planning of sizes and shapes, the correction of the occlusion. By using the special color standards the shades of the opaque (OA3) and enamel (A3) composite were determined. The anatomic shape corresponds to the symmetrically located premolar, the buccal tuber being larger in size than the lingual one. Before the adhesive preparation of the hard dental tissue the root filling was isolated with the thin layer of the glass-ionomer dental cement, which was then cured by the light of the halogen lamp. Next stage was acid etching (Fig. 4). The surface was rinsed dried and saturated with the adhesive. The working zone was restricted by the Palodent Plus matrix system. The adaptive layer was represented by the photo polymerized composite. The liquid photocurable base component is recommended to use as the foundation in cavity types of class I and II. The main advantages of such a spacer consists in the possibility to apply it in one layer 4,0 mm thick and cure it over 10 seconds. The liquidity is the reason the adaptation is good while the polymerization stress is low. The material is compatible with all types of bonding and composite based on methacrylate. Special syringes and flow-capsules, equipped with a flexible cannula, are employed to secure the precision of the application.

Right after the portion of X-tra Base was applied to the bottom of the cavity, it got light cured. The following step was to model the restoration with the help of the light curable nano composite. The missing dentin was provided for by the A3 color. The worn-out enamel was modelled with A3 shade. The whole surface of the premolar was covered with a transparent layer. The treatment of the restoration was carried out by means of the finishing system. The definite finish line was polished after the removal of the cofferdam (Fig. 5). The tooth was then coated with a layer of Bifluorid 12 fluorine lacquer. The patient was fully satisfied with the result.

## ■ CONCLUSIONS

The use of the light curable composite for the sake of making aesthetic restorations of teeth, which happen to be under constant masticatory stress, allows a dentist to meet the demands for the optimal mechanical strength and natural-looking appearance. The formation of the base layer made of liquid material significantly decreases the time consumption for the work while at the same time improving the quality of a restoration. The indispensable condition for the efficacy of work is the isolation of the work field, strict observance of the application instruction for the materials used, the modelling of macro- and micro-relief and thorough finishing of the restoration to achieve the effect of natural gleam.

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