

Modern Filling Materials for Sealing Fissures

Ubaydullaeva Shafolat

2nd year student, Samarkand Medical University

Shukurova N. T.

Samarkand Medical University

Abstract: Fissures are special natural grooves and grooves located on the tooth enamel of the chewing surface of the teeth between the chewing tubercles. The sealing method consists of obturation fissures and other anatomical depressions

Healthy teeth with adhesive materials in order to create a barrier to external cariogenic factors.

Keywords: fissure sealing, caries prevention, composite materials.

Purpose of the work: to hermetically protect dental fissures from caries

Fissure sealing functions : creates a barrier for cariogenic bacteria; has a remineralizing effect on enamel if the sealant contains active fluoride ions.

Four types of fissure structure : Funnel-shaped fissures are more open, well mineralized, do not retain food debris due to free washing with oral fluid, are caries-resistant . Cone-shaped fissures are mainly mineralized due to oral fluid, but conditions for the retention of food debris and microorganisms appear. Mineralization of drop-shaped and polyp-shaped fissures occurs mainly from the side of the tooth pulp. This process is less intense than mineralization due to oral fluid, and the fissures remain hypomineralized for a long time . Given the high caries resistance of hard tissues, sealing is not recommended in teeth with a high initial mineralization level (IML) of fissures . General hygienic measures are sufficient. For teeth with an average IML, immediately after eruption, it is recommended to conduct a month-long course of local application of calcium- phosphate-containing and fluoride-containing drugs, followed by sealing with a composite sealant . For teeth with low fissure IUM , it is not recommended to use composite sealants using 38% orthophosphoric acid as an etching agent. In this case, glass ionomer sealants are used, or invasive sealing with a composite sealant , or, according to indications, a preventive filling method. The presence of pigmented fissures and natural depressions in teeth at the maturation stage, in contrast to teeth with mature enamel, indicates an active process and requires invasive sealing methods.

Initial caries is an indication for invasive sealing with composite sealants.

Contraindications to sealing: presence of intact wide, well-connected fissures ; teeth with healthy pits and fissures , but having carious lesions on the approximal surfaces; pits and fissures that remain healthy for 4 years or more do not require sealing; poor oral hygiene.

Indications for sealing and preventive procedures for fissures of erupting teeth with immature enamel based on fissure enamel electrometry values (μA): Low IUM (up to 8 μA) - hygienic measures, observation; average IUM (from 9 to 20 μA) - hygienic measures, a course of

fluoride- and calcium-phosphate-containing preparations, fissure sealing ; high IUM (up to 20 μ A) - hygienic measures, a course of fluoride- and calcium-phosphate-containing preparations, fissure expansion , preventive filling.

For fissures after enamel maturation: 0 μ A, healthy enamel - hygienic measures, observation 1-2 μ A, initial caries - hygienic measures, a course of fluoride- and calcium phosphate-containing preparations, fissure sealing ; up to 8 μ A, progressive initial or superficial caries - hygienic measures, a course of fluoride- and calcium phosphate-containing preparations, fissure expansion , preventive filling.

The indicated integrated approach is taken into account by the world's leading manufacturers of preventive means. The company VOCO (Germany, Cuxhaven) produces the fluoride-containing rinse " Profluorid M", the gel for applications " Profluorid Jelly", the two-component self-hardening multi-purpose fluoride-containing varnish " Bifluorid 12", the series of sealants " Fissurit " and the unique highly filled sealant based on ormoker " Admira Seal".

High efficiency (preventive effect of fissure sealing) is estimated by different authors from 55% (Going , Coti ,

Hough , 1976) to 99.1% (Buonocore 1974) and the low cost of the fissure sealing method in combination with general comprehensive prevention of dental diseases will significantly reduce the growth of dental caries in the area of fissures and pits.

Currently, for the purpose of sealing blind pits and fissures of teeth, sealants are used that belong to three classes of materials: composite chemically and photocurable materials, glass ionomer cements and compomers .

fissure sealing (sealant) is usually a special composite resin that is cured chemically or by light. Due to its high fluidity, unfilled Sealants easily penetrate even very narrow and deep fissures to their very bottom, leveling the chewing surface of the tooth and facilitating its hygiene. They have better marginal adaptation, longer-term retention, wear out and wear out faster. Filled sealants have a smaller penetration depth, a smaller micromechanical adhesion area, shorter retention periods, but are more resistant to abrasion. They are used for invasive sealing technology, but their technological process of application is relatively complex, lengthy and sensitive to moisture. Sealants do not have a negative effect on the normal process of enamel mineralization. Mineral elements from oral fluid can freely diffuse along the edge and partially through the coating substance itself. This ensures a physiological level of metabolic processes in the hard tissues of the tooth under the coating, while preventing the penetration of large protein molecules. The material is waterproof and very durable, which allows for a long time (up to 5-8 years) to protect teeth from fissure caries. In addition, the sealant promotes saturation of tooth enamel and the periodontal environment with fluoride in an ion exchange reaction due to the soluble salt (fluorides) added to the composition for 1-28 days .

Types of composite sealants : 1) Self-polymerizing or chemically curing « Concise White Sealant . " " Delton " (Johnson and Johnson), Delton , Fis Sil (Russia); 2) Photopolymerizable Estisial LC (Kulrer), Sealant (Bisco), Fissurit , Fissurit F (Voco), Delton -S, Fis Sil-S (Russia), Heli SEAL , Prisma Sheild. 1. Opaque (not transparent) - easy to control, but do not imitate the color of the tooth and it is impossible to observe the condition of the enamel underneath them; 2. Transparent - aesthetic, allow you to observe the condition of the enamel underneath them, but are poorly distinguishable when monitoring the safety; a) Colored (chameleons) have a bright color only at the time of polymerization, and then match the natural tone of the tooth or are transparent ClinPro Sealant " (3M ESPE, USA), " Heli SEAL Cler Chroma » (Ivoclar Vivadent); b) Non-colored. A. Fluoride-containing (Fissurit); B. Fluoride-free (Fissurit F).

The third generation of CPMs are materials that harden under the influence of visible light with a wavelength of 430 to 490 nm (Fissurit , Heli SEAL , Estisial LC), are single-component , the

working time is long, the completeness of polymerization is determined by the exposure of light, the risk of destruction during the curing test is minimal. These materials are based on low-viscosity methacrylic acid derivatives. Borosilicate glass with a particle size of 99% less than 1 µm is used as a filler in the preparations, which ensures good penetrating properties.

Moreover, the release of fluoride from Fissurit F and its entry into the enamel continues for more than 190 days; during this period, Fissurit F releases 4-5 mg of fluoride to strengthen the enamel and dentin.

Another product from VOCO (Germany, Cuxhaven) with fluoride, the light-curing sealant "Admira Seal" contains spatially inorganic-organic copolymers (ormomers), providing excellent mechanical properties and ideal biocompatibility (absence of toxic resin).

fissure sealing procedure begins with thoroughly cleaning the tooth from plaque with a brush and paste, and then drying with air. Next, the fissures are treated with 32% orthophosphoric acid for etching (a process in which the core or shell of the enamel prisms is destroyed under the action of acid) for 30-40 seconds, washed with distilled water and dried again. Then they are filled with the liquid phase of the composite filling material. Under the action of a special lamp, the material hardens in 40-45 seconds, after which the excess is removed with a hard carborundum head and the material is ground on the chewing surface.

The preventive effectiveness of materials is determined by the degree of their preservation in fissures and the retention of this class of sealants ranges from 20 to 90% and depends on the accuracy of the sealing technology.

Glass ionomer cements – Dyract seal (Dentsply), Prima flow (DG), Vitacryl (Medpolymer), ASPA (Dentsply), Fuji (WHS), Glass Ionomer (Shofu Inc.), Alfa-dent, Aqua Ionoseal (Voco) have a caries-static effect due to the contained F, Al, Zn, Ca, due to the release of fluoride, these materials have a pronounced caries-static effect. GICs are chemically fixed on the tooth surface, do not require enamel etching before the procedure, have high biocompatibility, less demanding than CPM for drying the working field, but have a number of technological inconveniences (the need for mixing, difficulty in placement, short working time, long curing), low aesthetic properties, low fluidity, large marginal leakage, are not strong enough compared to composites, and quickly wear out. For sealing purposes, type II glass ionomer cements (intended for filling teeth) can be used for loaded restorations. Some studies prove that the use of glass ionomer materials as sealants fissures may be appropriate in newly erupted teeth with extremely low fissure mineralization. The difficulty in such cases is associated with the need for longer enamel etching followed by the use of composite sealants. If preventive filling is necessary (when the probe tip gets stuck in the fissure during examination), a condensable highly aesthetic Glass ionomer cement - "VOCO Ionophil Molar" - has three excellent properties. They are easy to use and less sensitive to the technique of execution, which allows them to be used without etching and using an adhesive. Classic glass ionomers that do not contain plastics have a thermal expansion coefficient similar to dentin, in addition, they have the so-called "battery" effect of constant release of a significant amount of active fluorides. The safety of GIC after 1, 6, 12, 24 months. It is 90, 80, 60 and 20% respectively, after 3 years – 10% (composite sealant – 90%), but, nevertheless, GICs provide a high level of reduction of caries of occlusal surfaces – 80-90% in 2 years, teeth, even after macroscopic loss of material, have half the risk of caries than teeth not covered with GICs.

Compomers are light-curing composite materials that, due to their composition, have some of the properties of glass ionomer cements, namely, slightly greater hydrophilicity than composites, fluidity, and the ability to release a small amount of fluoride upon contact with oral fluid. The sealant is Dyract material Seal (Dentsply).

It is used with NRC (Non-Rise) leave-in conditioner. Conditioner) and the fifth-generation adhesive system Prime&Bond NT, which provides deeper sealing of fissures with polymer. The NRC conditioner simultaneously partially dissolves mineral components and primes tooth tissues, Prime&Bond NT is applied on top of it, to which the sealant itself is fixed. The developers of this system consider this technique as an alternative to invasive fissure sealing . Wear of compomer sealants are higher, and the retention is lower than that of the CPM. Over 2 years, the preservation of the composite sealant is 32%, the sealant-compomer is 0%; the total loss is 10 and 38%, respectively, but after the loss of the compomer, caries develops less frequently than after the loss of the CPM.

The effectiveness of caries prevention has been confirmed by many studies. Coating teeth with fluoride-containing varnish resulted in a reduction in caries growth on treated surfaces by up to 70% and a decrease in the KPU by up to 35%. The highest effectiveness of caries prevention is provided by the fissure sealing method : the reduction in the growth of fissure caries over the year was 92.5%.

Achieving high results in prevention through sealing is due to the performance of two main functions of sealants :

1. Creation of a physical barrier on the tooth surface against cariogenic factors.
2. Remineralization of enamel in the fissure area , if the sealant contains active fluoride ions.

Conclusion: Evaluation of the effectiveness of sealants showed that the reduction in the growth of dental caries depends on the retention of sealants on the occlusal surfaces of teeth, the ability to release fluoride ions into tooth tissue and oral fluid, and the effectiveness of caries prevention in permanent teeth increases significantly when combining fissure and pit sealing with local fluoride prophylaxis and oral hygiene.

Scientific studies have proven that the procedure, if performed correctly, is 100% effective in protecting tooth surfaces from caries, as it serves as a physical barrier to possible destruction. The effectiveness of the procedure is suspended or stopped when the adhesive substances between the film and the tooth are destroyed, or part of them are lost. However, teeth that have been sealed are much less susceptible to caries in the future than those that have never been treated. Sealing is effective for 5 years, but can retain its properties for up to 10 years. Doctors' reports show that 7 years after sealing, about 49% of teeth remain completely sealed. But sealing should not be considered a permanent procedure. Regular visits to the dentist for preventive examinations are necessary, which will allow you to monitor the condition of the sealed teeth. The essence of fissure sealing is to protect teeth from plaque , which is a precursor to caries.

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