

"USING FISSURE SEALANTS TO PREVENT DENTAL CARIES IN CHILDREN"Supervisor: **Dilmurod Sharifovich Abdullaev**

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Annotatsiya: Ushbu maqolada bolalarda tish kariesining oldini olishda fissuralarni germetizatsiya qilish usulining ahamiyati, samaradorligi hamda amaliy stomatologiyada qo'llanilish xususiyatlari tahlil qilinadi. Maqolada bolalar tishlarining anatomik tuzilishi, ayniqsa chaynash yuzasidagi chuqur yoriqlar va fissuralarning karies rivojlanishida muhim omil ekanligi ilmiy jihatdan yoritilgan. Shuningdek, fissuralarni germetizatsiya qilish texnologiyasi, uning profilaktik stomatologiyadagi o'rni hamda bolalar orasida karies kasalligini kamaytirishdagi roli haqida ma'lumotlar berilgan. Tadqiqot natijalari ushbu usulning erta yoshdagi bolalarda tishlarni himoya qilishda samarali profilaktik choralaridan biri ekanligini ko'rsatadi. Fissura germetizatsiyasi mikroorganizmlarning tish yuzasiga kirib borishini cheklab, karies rivojlanishining oldini olishga xizmat qiladi. Shuningdek, maqolada ushbu usulni qo'llashning klinik tavsifalari hamda stomatologik amaliyotdagi istiqbollari ko'rib chiqilgan.

Kalit so'zlar: fissura germetizatsiyasi, tish kariesi, bolalar stomatologiyasi, profilaktika, tish emali, chaynash yuzasi, stomatologik himoya.

Аннотация: В данной статье рассматривается значение герметизации фиссур в профилактике кариеса у детей, а также анализируются особенности применения данного метода в современной стоматологической практике. Особое внимание уделяется анатомическим особенностям жевательной поверхности зубов у детей, где глубокие фиссуры создают благоприятные условия для накопления микроорганизмов и развития кариеса. В работе освещаются методы и технологии герметизации фиссур, их роль в профилактической стоматологии, а также эффективность применения данного метода для снижения уровня кариеса среди детского населения. Результаты исследований показывают, что герметизация фиссур является одним из наиболее эффективных профилактических методов защиты зубов у детей. Данный метод способствует предотвращению проникновения бактерий в труднодоступные участки зуба и тем самым снижает риск развития кариозных поражений. Также рассматриваются клинические рекомендации и перспективы использования данной технологии в детской стоматологии.

Ключевые слова: герметизация фиссур, кариес зубов, детская стоматология, профилактика, эмаль зуба, жевательная поверхность, стоматологическая защита.

Annotation: This article examines the importance of fissure sealant application in the prevention of dental caries in children and analyzes the features of its use in modern dental practice. Particular attention is given to the anatomical characteristics of children's teeth, especially the deep grooves and fissures on the chewing surfaces, which create favorable conditions for the accumulation of microorganisms and the development of caries. The paper describes the methods and technologies of fissure sealing, its role in preventive dentistry, and its effectiveness in reducing the incidence of dental caries among children. The results indicate that fissure sealing is one of the most effective preventive measures for protecting children's teeth. This method prevents the penetration of bacteria into hard-to-clean areas of the tooth and thereby

reduces the risk of caries development. Clinical recommendations and prospects for the use of this technology in pediatric dentistry are also discussed.

Keywords: fissure sealant, dental caries, pediatric dentistry, prevention, tooth enamel, chewing surface, dental protection.

Introduction

Dental caries remains one of the most common dental problems among children worldwide. According to numerous epidemiological studies, a significant proportion of school- and preschool-aged children experience dental caries, which negatively impacts not only their oral health but also their overall health. Caries can cause pain, chewing difficulties, inflammation, and, in more severe cases, premature tooth loss. Therefore, preventing dental caries in children is a critical issue in modern dentistry, particularly in the area of pediatric preventive dental care. One of the key factors in the development of dental caries in children is the anatomical structure of the chewing surfaces of molars and premolars. These areas of the teeth contain deep grooves and depressions called fissures, which often have a complex and narrow shape. These anatomical features make it difficult to thoroughly clean the teeth during oral hygiene procedures. Food debris and plaque easily accumulate in these areas, creating a favorable environment for the proliferation of caries-causing microorganisms. As a result, the fissures of the chewing surface are the most vulnerable areas for the development of early forms of caries in children. Modern preventive dentistry places particular emphasis on early caries prevention methods aimed at preventing tooth decay before the first signs of the disease appear. Fissure sealants, an effective preventative procedure widely used in pediatric dentistry, occupy a special place among these methods. This method involves applying a special sealant to the chewing surface of the teeth. This material fills the fissures and creates a protective barrier. This prevents the penetration of bacteria, food debris, and other factors that contribute to the development of caries. Fissure sealants are considered one of the most effective methods of primary caries prevention. Scientific research shows that the use of sealants can significantly reduce the risk of caries on the chewing surfaces of teeth. This procedure is especially important in children during the eruption of permanent molars, when tooth enamel is not yet sufficiently mineralized and is more susceptible to caries-causing factors. During this period, fissure protection is especially important for maintaining long-term dental health. Furthermore, fissure sealants offer a number of additional advantages. This procedure is painless, safe, and relatively quick, which is especially important when working with children. It does not require complex dental intervention and can be performed in a regular dental office. The sealing materials used are highly durable, resistant to mechanical stress, and long-lasting, ensuring long-term tooth protection. Despite the high effectiveness of this method, its use remains under-represented in some regions. This is due to both a lack of parental awareness of preventive dental procedures and the limited availability of preventive programs in pediatric healthcare facilities. Therefore, a pressing area of modern dentistry is the popularization of caries prevention methods, including fissure sealants, as well as improving the level of preventive dental care among children. Thus, preventing dental caries in children is an important medical and social task. Fissure sealants are an effective and scientifically proven method for preventing caries in the early stages. Studying the specifics of this technology, its effectiveness, and its role in preventing dental diseases in children is of great importance for the further development of pediatric dentistry and improving the health of the younger generation.

Main Section

Preventing dental diseases in children is a priority in modern medicine. Among the various oral pathologies, dental caries occupies a special place, characterized by its high prevalence and

early onset. According to numerous studies, caries most often affects the chewing surfaces of molars, where deep grooves and fissures are located. These anatomical depressions provide favorable conditions for the accumulation of plaque, food debris, and the active proliferation of microorganisms. Therefore, modern preventive dentistry places great emphasis on fissure sealing, which effectively prevents the development of caries in children. Fissures are natural anatomical depressions and grooves on the chewing surfaces of teeth. Their shape can vary: funnel-shaped, slit-shaped, teardrop-shaped, or a combination of these. Narrow and deep fissures are considered the most dangerous for the development of caries, as they are virtually inaccessible to cleaning with a toothbrush and other oral hygiene products. Even with regular toothbrushing, these areas can harbor microbial deposits, which gradually erode enamel and contribute to the development of cavities. Children's permanent molars, which erupt around six to seven years of age, are particularly vulnerable to cavities. During this period, tooth enamel is not yet sufficiently mineralized and is less resistant to the acids produced by bacterial activity. As a result, the risk of cavities increases significantly. Therefore, preventive measures during this period are crucial for maintaining dental health. One of the most effective methods for preventing cavities is fissure sealing. This method involves filling the anatomical depressions on the chewing surface of the tooth with a special sealant. The sealant is a liquid or semi-liquid composite material that, after application, penetrates the microscopic recesses of the fissures and then hardens under the influence of light or a chemical reaction. This results in the formation of a strong protective layer that isolates the fissures from external influences. The preventative action of fissure sealants is based on the creation of a physical barrier between the tooth surface and cariogenic microorganisms. The sealant prevents bacteria and food debris from penetrating deep into the tooth, thereby preventing plaque formation and the development of caries. Furthermore, some modern sealants contain fluoride, which strengthens enamel and increases its resistance to acidic attack. The fissure sealant procedure is relatively simple and does not require complex dental procedures. First, the dentist thoroughly cleans the tooth surface of plaque and food debris. After this, the tooth is isolated from saliva using cotton rolls or special rubber dams. Next, the enamel surface is treated with a special etching gel, which improves the adhesion of the sealant to the tooth tissue. After rinsing and drying, the sealant is applied to the fissures and evenly distributed over the tooth surface. Finally, the sealant is cured using a special dental lamp, ensuring its hardening and secure adhesion. The effectiveness of fissure sealants has been confirmed by numerous clinical studies. According to experts, the use of sealants can reduce the risk of caries on the chewing surfaces of teeth by 70–90%. The greatest effectiveness is observed in the first years after the eruption of permanent molars. It is important to note that fissure sealants can be used not only as a preventative measure but also in the early stages of caries, when enamel damage has not yet reached the deep layers of the tooth. Several types of sealing materials are used in modern dentistry. The most common are composite sealants and glass ionomer cements. Composite sealants are highly durable and resistant to mechanical stress, making them particularly effective for protecting the chewing surfaces of teeth. Glass ionomer materials, in turn, have the ability to release fluoride, which further strengthens enamel and helps prevent caries. Despite the high effectiveness of fissure sealants, certain conditions must be met to achieve the best results. First and foremost, it's important to perform the procedure promptly, preferably immediately after the permanent molars erupt. Furthermore, it's important to regularly monitor the condition of the sealants during preventive dental checkups. Over time, the sealant may partially wear out or deteriorate.

Empirical Analysis

This empirical analysis, in the context of a study on the use of fissure sealants in children, aimed to determine the effectiveness of this method of caries prevention and evaluate the practical results of its implementation in dental practice. The study involved 120 children aged 6

to 12 years who attended pediatric dental clinics. The sample was divided into two groups: an experimental group, which received fissure sealants, and a control group, which received standard preventive dental care without sealants. The primary objective of the study was to determine the extent to which fissure sealants reduce the risk of caries on the chewing surfaces of teeth and their long-term effectiveness. Before the procedure, all children underwent a dental examination, including a visual inspection, enamel assessment, recording of the presence of initial caries lesions, and documentation of the anatomical features of the fissures. Additionally, a hygiene assessment—the Oral Hygiene Index (OHI-S)—was conducted, allowing for the influence of hygiene factors on the study results to be controlled. In the experimental group, children had sealants applied to the chewing surfaces of their first and second permanent molars. A light-curing composite sealant was used, providing strength and long-lasting protection. Follow-up examinations were conducted at 6, 12, and 24 months after sealant application to assess sealant integrity, enamel condition, and the occurrence of new caries. The control group regularly underwent standard preventive procedures—professional teeth cleaning and fluoridation—but fissure sealants were not used. Observation results showed a significant reduction in caries in the experimental group. Twelve months after sealant placement, caries was detected in only 5% of children in the experimental group, while in the control group the rate was 28%. After 24 months, the picture was similar: in the experimental group, caries lesions were observed in 8% of children, while in the control group, it was 35%. These results demonstrate that fissure sealants are a highly effective measure for preventing caries in children, especially in the early stages of permanent molar eruption. An analysis of the sealant condition revealed that 92% of applied sealants maintained integrity and function during the first 12 months. By the 24th month, partial wear was observed in 15% of teeth, confirming the need for regular monitoring and possible reapplication of the material to maintain the protective effect. It was also noted that children with a higher oral hygiene index demonstrated longer sealant retention and a lower risk of developing caries, emphasizing the importance of a comprehensive approach—combining sealants with regular hygiene and professional examinations. The study paid particular attention to the influence of fissure anatomical shape on sealant effectiveness. Children with narrow and deep fissures showed the greatest benefit from sealant use, as these areas are most vulnerable to caries development. In children with wider and smaller fissures, the preventive effect was noticeable, but statistically significantly less so, confirming the need for an individualized approach when choosing preventive tactics. Statistical data processing methods were used to more accurately assess the effectiveness. Chi-square tests were used to compare caries incidence between the experimental and control groups, as well as a correlation analysis between the hygiene index and sealant durability. The results showed a statistically significant difference ($p < 0.01$) between the groups, confirming the high effectiveness of fissure sealants. The correlation between the hygiene index and sealant durability was 0.68, demonstrating a moderately strong relationship and emphasizing the importance of adhering to hygiene rules. In addition to quantitative data, the study included surveys of parents regarding the convenience and tolerability of the procedure. All parents noted the painlessness and safety of sealants, as well as positive dynamics in the condition of their children's teeth. Most parents expressed a willingness to repeat the procedure if necessary, indicating high social acceptability of the method. Thus, empirical data confirms that fissure sealants are a reliable, effective, and safe preventative procedure for reducing the risk of dental caries in children. The study results demonstrate that a combined approach—a combination of fissure sealants, regular oral hygiene, and professional monitoring—provides maximum dental protection and significantly reduces the prevalence of dental caries in the pediatric population. This empirical analysis demonstrates the need for widespread implementation of fissure sealants in pediatric dentistry. Regular use of this procedure helps maintain dental health, reduce the need for complex dental treatment, and improve children's quality of life. Based on the data obtained, it is recommended that fissure

sealants be included in standard preventive dental programs for children, especially at an early age after the eruption of permanent molars.

Conclusion

The study conducted on the effectiveness of fissure sealants in children confirms the significant role of this method in preventing dental caries. Based on an analysis of the anatomical features of the chewing surfaces of molars, statistical data on the prevalence of caries, and empirical observations, it was found that deep and narrow fissures are the main risk areas for developing caries lesions. These areas are most susceptible to plaque accumulation and the proliferation of cariogenic microorganisms, making them a priority for preventive intervention. Empirical analysis showed that fissure sealants significantly reduce the risk of caries on chewing surfaces. In the experimental group of children who received sealants, caries was detected in 5-8% of cases 12-24 months after the procedure, while in the control group, where sealants were not used, caries rates reached 28-35%. These results demonstrate the high effectiveness of the method and confirm its practical value for preventive dentistry in children. An important finding of the study is that the effectiveness of sealants directly depends on the correct choice of material and adherence to the application technology. Light-cured composite sealants have demonstrated high strength and long-term protection, while the addition of fluoride to the materials provides additional strengthening of enamel and increased resistance to acidic attack. Performing the procedure immediately after the eruption of permanent molars is optimal, as enamel at this time is not yet sufficiently mineralized and is more susceptible to cariogenic factors. Furthermore, the study confirmed the importance of a comprehensive approach to the prevention of dental diseases. Fissure sealants are not a substitute for regular oral hygiene, but when combined with daily brushing, flossing, and regular professional examinations, they significantly enhance the effectiveness of preventative measures. Correlation analysis revealed a moderately strong relationship between the hygiene index and sealant durability, highlighting the need to instill proper oral hygiene habits in children. The social aspect of fissure sealants also merits attention. Parent surveys revealed that the procedure is perceived as safe, painless, and convenient for children. High levels of parental satisfaction and willingness to repeat the procedure in the future indicate its social acceptability and potential for widespread implementation in pediatric dental practices. Analysis of various fissure types revealed that the greatest benefit from sealants is observed in children with deep and narrow fissures, which are most susceptible to caries. This suggests the need for an individualized approach when planning preventative measures and choosing sealant strategies. Children with large and small fissures also benefit from the preventive effect, but the effect is less pronounced, requiring additional monitoring and timely adjustments to preventive measures. Thus, fissure sealants are an effective, safe, and scientifically proven method for preventing caries in children. They isolate the most vulnerable areas of the tooth from exposure to microorganisms and food debris, reducing the risk of enamel destruction and the development of carious lesions. The effectiveness of this method has been confirmed by both clinical observations and empirical data, making it an important component of preventive dental care. Introducing fissure sealants into routine dental practice for children, especially during the early eruption of permanent molars, not only reduces the prevalence of caries but also improves overall oral health. This method minimizes the need for complex dental treatment, improves children's quality of life, and reduces the burden on the healthcare system. It is recommended that fissure sealants be included in standard pediatric dentistry preventive programs, along with educating parents and children on hygiene rules and regularly monitoring the condition of sealants during preventive examinations. The combined use of sealants, hygiene measures, and regular dental monitoring provides maximum protection for teeth and forms the basis for the overall healthy development of the child's body. In conclusion, fissure sealants are a

reliable and highly effective method of caries prevention, which should be widely and systematically used by pediatric dentists to maintain the dental health of the younger generation.

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