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Preventive Resin Restoration in Child Patients:A Serial Case Report

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ABSTRACT
Dental caries is a significant global health challenge today because the pits and fissures in teeth provide an ideal place for bacteria and substrates that trigger caries. Preventive Resin Restoration (PRR) is an effective secondary prevention solution to stop the development of caries lesions. In the first case, a 4 year old girl complained of black lower right back teeth. The planned maintenance is IEC, PRR, and periodic control. The second case involved a 13 year old girl who complained of a white spot on her lower right back tooth. In this case, PRR Type A was chosen as the appropriate treatment. PRR, which involves using resin to fill damaged tooth tissue and sealing pits and fissures with a sealant, has been proven effective in restoring caries in these areas and preventing further progression. There are three different types of PRR (Type A, Type B, and Type C), with resin-based sealant being one of the main materials used because of its good retention resistance. The use of PRR is not only effective in treating caries cases, but also as a preventive measure to prevent pit and fissure caries in the future. It is important to follow the treatment protocol systematically, undergo regular check-ups, and maintain dental hygiene to ensure the success of the restoration and prevent further caries. Thus, PRR is an efficient and effective solution in the management of dental caries and prevention of related oral health problems.
Keywords: Preventive Resin Restoration, Adhesive Restoration, Preventive Adhesive Restoration.

INTRODUCTION

Dental caries constitutes a major global public health problem (Manohar et al., 2020; Rugg-Gunn, 2013; Yadav & Prakash, 2017). Despite there being significant advancements in dental public health, the problem of dental caries continues to affect the health of people across all age groups, becoming a primary concern for dental practitioners worldwide(Kumar et al., 2020). Many efforts in caries prevention have been made through methods such as dietary counseling, fluoride application, motivating oral hygiene maintenance, and improved access to dental facilities (Bader et al., 2004; Dogney, 2023; Weinstein et al., 2006). These methods have aided in controlling caries that occur on smooth surfaces, yet the prevalence of caries in pits and fissures remain high.

Pits and fissures are natural concavities and crevices in teeth that become a nest for bacteria and substrates (Moradi et al., 2021; Samuel et al., 2021). Due to their anatomical structure, these areas are highly vulnerable to caries. This vulnerability not only facilitates the spread of lesions, but also restricts the role of saliva whose tasked is to attenuate the

demineralization process and trigger remineralization. Though pits and fissures are present in only 12.5% of occlusal surfaces, they account for nearly two-thirds of caries in human teeth (Compton et al., 2021; Delezene et al., 2023). Caries that are found in the pits and fissures of teeth make up 80-90% of total caries in permanent teeth and 44% of total caries in primary teeth (Chabadel et al., 2021; Khatri, 2020).

Preventive Resin Restoration (PRR) is a secondary prevention measure that can halt the progression of carious lesions within the early stages, thus preventing further decay (Borges et al., 2020; Lakshmanan et al., 2020). This method integrates the preventive aspects of occlusal sealant therapy for caries-prone pits and fissures with therapeutic caries restoration on the same occlusal surface using composite resin (Pani, 2022).

CASE REPORT

Case One. A four-year-old female patient came to RSGM UMY accompanied by their mother complaining of a black spot on her lower right back tooth. This spot had been noticeable for a month prior to their appointment. The patient reported no pain. The patient brushes their teeth during morning and evening baths before bedtime and had never visited a dentist before. There were no suspicions of the patient having any systemic illness or allergies. The patient's parents also have no history of systemic disease. The patient enjoys consuming sweet foods.

The objective examination revealed a brownish-colored cavity spot on tooth 85, located on the occlusal surface, with a depth extending to the enamel tissue, upon examination by probing (-).

Figure 1. Cavity in the occlusal pit of teeth 85.

Based on the examination, the diagnosis for tooth 85 was a vital pulp with accompanying enamel caries. The treatment prognosis was estimated to be favorable, considering the patient's oral cavity condition, good oral hygiene, cooperative manner, positive parental motivation, and overall good health condition. The planned treatment was to be through Communication, Information, and Education. Subsequently, preventive resin restoration (PRR) was performed and followed by follow-up dental appointments.

The first visit consisted of both subjective and objective examinations. The patient's parents were provided with communication, information, and education regarding the patient's oral cavity condition and the planned treatment. A Tell, Show, Do approach was

employed. Oral prophylaxis was performed using pure pumice and followed by cleaning the carious tissue using a round dental preparation bur size 1. The treatment area was isolated using cotton rolls placed on the buccal and lingual sides of the area. Cavity cleanser (Bisco Cavity Cleanser) was applied using cotton pellets to the cavities and fissures of tooth 85 and subsequently cleaned with cotton pellets. Acid etching (3M ESPE Scotchbond Multi-Purpose Etchant) was applied to the cavities and fissures for 20 seconds using a microbrush, then rinsed with water for 10 seconds, and dried until moist. A sealant material (VOCO Dental Fissurit FX) was applied to the cavities and fissures. The material was leveled using a probe and light-cured for 20 seconds. After polymerization, the cotton rolls were removed, in which afterwards, the operator checked for occlusion using articulating paper. This process was followed by finishing and polishing using a round finishing bur and an enhance point bur, respectively. Once the procedure was completed, the patient and her parents were given post-treatment education.

The patient was scheduled for a follow-up appointment three weeks after the first. During the second appointment, both subjective and objective examinations were performed. The patient did not report any complaints following the treatment. The patient brushes their teeth twice daily, in the morning and evening. The objective examination indicated an opaque-colored filling on the occlusal surface of tooth 85, and the patient showed no signs of sensitivity upon probing.

Figure 2. Teeth 85 during follow-up appointment.

***Case Two*.** A 13-year-old female patient arrived for her first appointment at RSGM UMY, complaining of white spots on her lower right back tooth. The patient noticed these spots one week prior to her appointment. The patient did not experience any pain in the affected tooth, and her condition had not yet been examined by a dentist.

The patient brushes their teeth twice a day, in the morning before breakfast and at night before bedtime. The patient had prior experience visiting a dentist to receive fillings for their deciduous molars. The patient is in good health, with no suspected systemic illnesses or was not consuming any medication. The patient had never been hospitalized and had no history of allergies. The patient enjoys consuming sweet beverages and frequently consumes fruits and vegetables.

The objective examination discovered a cavitation extending into the enamel in the occlusal pit of tooth 45. The results of probing, percussion, and palpation were negative, while the vitality test showed a positive response with a lingering pain of 2 seconds. The treatment plan for the patient included providing Communication, Information, and Education (CIE) regarding the patient's condition, administering Preventive Resin Restoration (PRR) Type A treatment, and scheduling a follow-up appointment for monitoring and evaluation.

The PRR treatment began with management behavior to alleviate the patient's fears and ensure the smooth execution of the procedure. The treatment then proceeded with tooth 45 being prepared using a round size 1 bur. Preparation was performed at a single point in the pit area, followed by cleaning with pure pumice that was applied using a rotary brush. Subsequently, the pumice was rinsed off using water from a water syringe. The area of treatment was isolated using cotton rolls and suction. The next step involved applying etchant for 15 seconds, followed by rinsing and air drying until the area was moist. Subsequently, a resin-based sealant was applied inside the cavity and polymerized using light cure for approximately 20 seconds.

Traumatic occlusion check was performed using articulating paper. Since no traumatic occlusion was detected, the procedure concluded with finishing using finishing burs and polishing using enhance burs. The patient was instructed to come for a follow-up appointment one week after the PRR treatment.

Appointment 2

The patient came to RSGM UMY for a follow-up appointment after the PRR treatment. During the second appointment, the operator checked for any signs of detachment of the resin-based sealant that had been applied the week before. This was followed by a traumatic occlusion assessment. The results showed no signs of detached resin nor traumatic occlusion were detected. The patient was given Communication, Information, and Education on oral hygiene.

Figure 3. Preparation with Bur No. 1/4

Figure 2. Polymerization with light cure

RESULTS AND DISCUSSION

PRR is a widely accepted procedure used in the restoration of caries within pits and fissures, as well as for the prevention of caries progression. The procedure involves filing the damaged tooth tissues with resin while simultaneously sealing the pits and fissures with sealant materials (Weststrate et al., 2019).

Based on the results of the case studies, an objective examination revealed a small brownish cavity on the occlusal surface of tooth 85 with a depth reaching the enamel tissue upon probing (-). Type A PRR treatment was performed (Zafar et al., 2020).

PRR is a conservative treatment approach requiring limited preparation to remove carious tissue, restore cavities with composite resin, and to apply sealant on the surface of the restoration as well as the area surrounding the pit and fissure. PRR is classified into three categories based on its extent and depth. Simonsen has classified PRR into the following types8 :

Type A : Deep pits and fissures where caries are found only within the enamel. Local anesthesia is not required. Caries can be removed utilizing slow-speed bur movement at ¼ or ½ rotations of the bur, or with air abrasion technique. Sealant is then applied to the prepared surface and coated with acid.

Type B : Carious lesions that extend into the enamel or even into the dentin but are confined to pits and fissures, are small and limited in size, and can be treated using a round bur size 1 or 2. This type can be restored by applying flowable resin-based composite material to replace the lost tooth structure, followed by placement of sealant on the entire occlusal surface to prevent further decay. This conservative caries prevention method is now often referred to as "Microdentistry".

Type C : Larger carious lesions that have spread to the dentin require preparation using bur sizes larger than size 2. The appropriate liner is applied onto the dentin followed by restoration using resin composite. The cavities and fissures are subsequently sealed with sealant. Local anesthesia is required for this procedure.

For cavity preparation, a small round-ended burs with cavosurface margins not beveled is used. There are no specific rules to cavity design as this is a restoration bonding, and the primary objective is to remove caries with minimal loss of tooth structure. Small burs are employed to maintain minimal preparation. Beveling of the cavosurface margin is

unnecessary as it does not significantly affect the clinical performance of posterior composite resins.

For the case mentioned in this paper, prophylaxis was performed on the occlusal surface and cavity using a rotary brush instrument and pure pumice, followed by rinsing with water and drying (Zheng et al., 2022). Maximum bonding strength is reached when prophylaxis is conducted before acid application (Sano et al., 2020). Studies have clearly shown that prophylaxis using pumice or other fluoride-containing pastes does not significantly affect the bonding strength of composite resin.

Acid etching (Scotchbond multi-purpose etchant, 3M espe) was applied using a microbrush to the cavity and fissures for 20 seconds, rinsed with water for 10 seconds, and dried until moist. Etching on the tooth surface is key to tooth preparation in order to apply restoration. The recommended etching time for enamel surfaces is 60 seconds, but current standard etching times vary from 15 seconds to 60 seconds. The variation in etching time does not have a significant effect on fissure sealant retention; therefore, it may be wiser to etch teeth for a shorter duration than conventional recommendations. The teeth were then rinsed for about 30 seconds and air-dried for approximately 15 seconds. This process removes all residual acid etchant and aids in achieving a chalky white appearance on the enamel.

The application of sealant material (Fissurit FX, VOCO Dental) on the cavity and fissures was smoothened with a probe and then light-cured for 20 seconds. The occlusal surface that had been applied with acid and the restoration surface can be sealed and hardened using either chemical or light cure. Upon completion of the curing process, the retention and coverage of the sealant were examined. If the sealant can be dislodged from the pit or fissure with a probe, the tooth and restoration are re-etched for 10 seconds, rinsed, and dried, and a new coat of sealant is applied. The sealant was also examined for any gaps or bubbles and for any deficiencies or excesses in material placement. Applying sealant aids in preventing caries on pits and fissures not found in cavity preparations. The lamination technique of sealant on composite resin or glass ionomer cement helps minimize microleakage.

Once polymerization was completed, the cotton roll was removed, and the occlusion was examined using articulating paper. Finishing was performed using round-shaped finishing burs, followed by polishing using an enhance point bur. The occlusion was balanced once the sealant had been applied. Under-filled sealants will quickly wear off, while over-filled sealants are more resistant to abrasion, thus requiring removal of high points on the surface.

PRR is a conservative treatment requiring limited removal of carious tissue, restoration of excavated areas with composite resin, and application of sealant on the restoration surface as well as on the remaining, sound, and pits and fissures in close proximity. PRR was first suggested by Simonsen, wherein vulnerable fissures are prepared with small, tapered fissure burs to restore cavities using diluted composite. The advantages of sealing include lower costs compared to restoration and a nine-fold decrease in caries incidence compared to teeth not treated through PRR.

The findings reported in the second case report was a pit caries case treated with Type A PRR. PRR, based on the extent and depth of the lesion, is categorized into 3 types, namely: Type A PRR, Type B PRR, and Type C PRR. Type A PRR are suspicious caries found in pits and fissures where the only tissue removed is the enamel. Type B PRR are lesions that have reached the dentin area but are not deep and narrow. Type C PRR is a treatment type for when the lesion has reached the dentin and requires wider dentin preparation.

The techniques that can be utilized in this case include local anesthesia administration if necessary, isolation, caries tissue removal, providing pulp protection if needed, cleaning the occlusal surface, conditioning the occlusal surface, applying bonding, applying resin, applying sealant, and occlusal equilibration.

In the second case, local anesthesia was not administered. Isolation was achieved using cotton rolls and the removal of the caries tissue was performed using a bur sized ¼ without providing pulp protection as the lesion was limited to the enamel. Conditioning of the occlusal surface was carried out using 37% phosphoric acid liquid, and the cavity was sealed using resin.

Resin-based sealant is a hydrophobic material that requires proper isolation in order to apply an effective seal. The use of resin-based sealant aimed to enhance the retention of materials within the cavity. This aligns with previous research indicating that retention using resin-based sealant is superior when compared to using Glass Ionomer Cement (GIC). The application of resin-based sealant is considered a sensitive process due to the presence of hydrophobic Bis-GMA. This should be a concern for an operator whenever opting to use this material.

CONCLUSION

Preventive Resin Restoration (PRR) can serve as an efficient treatment for cases of dental caries as well as for preventing caries in pits and fissures. The treatment protocol must be systematically followed. Regular check-ups (dental appointments) and maintaining dental hygiene are factors contributing to the success of the restoration and can also prevent caries occurrence. In the two reported case studies, the retention of the resin-based sealant material was deemed satisfactory as there were no signs of resin detachment. Follow-up appointments and monitoring are also necessary in these cases.

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