

INCREASING THE CONNECTION OF COMPOSITE RESIN WITH BIOMATERIALS: A CASE REPORT

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Abstract

Aim: Traumatic dental injuries are one of the most common pathologies after dental caries in childhood. It is important for dentist to correctly determine the damage after trauma in dental tissues, to apply the appropriate treatment and to provide aesthetics which is lost. Narrow and shallow cavities are often the nightmare of dentists due to the difficulty of providing aesthetics during restorative work. This case report describes the application of a silane coupling agent to increase the bond strength of the composite resin with MTA in permanent incisors which were damaged by trauma and have undergone Cvek pulpotomy.

Case report: The treatment was completed by applying silane coupling agent to the interproximal surface in order to increase the MTA composite connection in a 9-year-old girl who underwent Cvek pulpotomy with MTA due to a crown fracture in her upper incisors. The treatment was checked after 6 months.

Conclusion: It is seen that silane coupling agents can be used for increasing the composite MTA bond strength in narrow and shallow cavities and in cases where aesthetics is difficult to provide.

Key words: Anterior Composite Restoration, Biomaterial, Pediatric Dentistry, Silane Coupling Agent, Trauma.

Introduction:

Dentoalveolar injuries are difficult type of cases for the dentist to treat, while also being highly stressful conditions for the family and the child. Trauma causes deterioration of the existing healthy tooth structure and affects the patient's self-confidence and quality of life. It is also reported that both children and parents have more aesthetic concerns than concerns for symptomatic findings. (1-3) However, sufficient preparation cannot be made especially for the purpose of providing aesthetics in anterior teeth due to the small cavity in children. (4) While inadequate

preparation causes an insufficient coverage to be provided, the bacteria might penetrate the pulp and cause treatment to fail if good coverage is not achieved. (5) After pulp capping, composite resins are the first choice when choosing a restorative material suitable for the tooth, especially in areas where aesthetics are important. It is also a suitable restorative material to be applied on the pulp capping material since it requires low condensation force during restorative material placement (4). While studies have shown that the bond strength of composite resins and

biomaterials is not sufficient, a study (6) found that silane coupling agents increase the bond strength between calcium silicate-based biomaterials and composite resin.

This case report describes the application of silane coupling agent to increase the bond strength of composite resin and the construction of a restoration in permanent incisors that have been damaged due to trauma and undergone MTA and Cvek pulpotomy.

Case Report:

After a clinical and radiographic examination of a 9-year-old girl who applied to the clinic with the complaint of complicated crown fracture in upper incisors, Cvek pulpotomy was performed on the left and right upper incisors.



Fig.1.: Upper middle incisors that are broken due to trauma

After the local anesthesia with 4% Articaine HCL + 1: 200.000 Ephynephrine HCL (Sanofi Aventis, Istanbul, Turkey), the cavity was opened under high speed water cooling with a 801G diamond rond drill (Meisinger GmbH, Neuss, Germany). The 2 mm part of the pulp which is located in the incisal was extirpated under water cooling with diamond rond drill. After ensuring bleeding control with cotton rolls, MTA (Angelus, Londrina, Brasil) was placed to cover the pulp.



Fig.2: Appearance of MTA after applying cvek pulpotomy

After the MTA hardened, the silane coupling agent Clearfil Ceramic Primer (Kuraray, Ibaraki, Japan) was applied to the MTA surface in the cavity with the help of a bond brush, and spread slightly with air.



Fig.3: After applying silane coupling agent

After applying Self-etch adhesive Single Bond Universal (3M ESPE, Seefeld, Germany) it was hardened by applying 20 seconds of light. After the application of Nanofil-containing composite resin Filtek Ultimate (3M ESPE, Seefeld, Germany) to the cavity, the restoration was completed by polishing.



Fig. 4.: The construction of the restorations and the final view

When the patient came back for examination 6 months later, it was observed that the restoration

worked successfully in the mouth and there was no coloration and marginal deterioration.



Fig. 5: Restorations after 6 months

Discussion:

Traumatic dental injuries are one of the common pathologies in childhood. Studies show that dental trauma prevalence is high in children between the ages of 6 and 12. (7) While the most common form of trauma in deciduous teeth is concussion (8), crown fractures are the leading injuries due to trauma in children in mixed dentition. (9)

While material loss is low especially in anterior region for kids, insufficiency of dentine and enamel tissues might cause difficulties with regards to gaining back the lost aesthetic in cases where endodontic treatments such as Cvek pulpotomy are necessary. Due to the small size of the cavity, adequate coverage cannot be achieved (4), and as a result, bacteria can penetrate the pulp.(5) Therefore it is seen that, although studies have been carried out to improve the MTA composite connection, the studies generally focus on the composite resin bond strength of the materials containing calcium silicate(5,10-12). However, a recent study found that after applying Silane coupling agents to the composite MTA interface, the binding resistance increased by 25.37% to 49.15%.(6) The reason for increased resistance is that Silane binding agents are materials developed to increase the bonding of silicium and silicate-containing structures to composite resins, and the silicon atom takes place in the organic and inorganic structure and bridges the two structures. Therefore, in this case, silane coupling agent was applied to increase the bond strength between MTA and the composite.

3-Methacryloxypropyltrimethoxysilane (MPS) is a silane coupling agent that is frequently used to

bind silicon and silicate-containing structures to composite resins. It is generally used in water or ethanol in 1-5 vol%. However, silane coupling agents that consist of two bottles and contain acids are also commercially available (13). Oskoe et al. (14) in the studies of ProRoot MTA, where they evaluated the effect of acid application on composite resin shear bond strength, found that samples where acid was applied and unapplied had similar values. On the other hand, the cements containing calcium silicate are sensitive to the acidic environment (15) and acid application-washing can cause the material to displace, the filler particles to separate, the structure to dissolve and degrade (10). Therefore, in this case it was found more suitable to choose Self-etch adhesives with a single bottle and acid-free silane coupling agent.

Conclusion:

Silane coupling agents are materials developed to increase the bonding of silicium and silicate-containing structures to composite resins. In cases where it is difficult to provide aesthetics and where cavities are narrow and shallow, it is possible to achieve successful aesthetic results by using them between MTA and composite resins.

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