AN OVERVIEW EFFICACY OF FLUORIDE APPLICATION POST BRACKET REBOUNDING

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Abstract:
One of the fluoride administration systems that is currently being marketed to orthodontic patients is a novel primer that is densely filled. This primer is effective in minimizing white spot lesions. It is necessary for the bond strength of orthodontic brackets that have been bonded to be sufficient in order to withstand the orthodontic forces that are delivered during treatment. The effectiveness of the adhesive substance in terms of improving the adequate bond strength is contingent upon the use of effective pretreatment techniques. In repeated bracket bonding, the fluoride-releasing and -recharging adhesive system with the self-etching primer demonstrated clinically sufficient shear bond strength. This discovery can assist orthodontists in reducing the likelihood of enamel injury occurring during the debonding process.

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Introduction:

Adhesive dentistry is a field that is continuously undergoing development. Over the course of several decades, the dentistry profession has been working toward the goal of achieving a high level of adhesion between the composite resin and the tooth structure [1].

It was possible to bond orthodontic brackets, which not only enhanced the patients' oral cleanliness and aesthetics but also significantly reduced the amount of time they spent sitting in the chair. Despite the fact that new bonding materials are always being developed, orthodontics is nonetheless making steady progress. Patients who have malocclusion have a significant number of plaque retention sites, which makes demineralization around orthodontic brackets a significant problem in these patients [2].

Because of this, it is essential for orthodontics to reduce the formation of carious lesions and white spots surrounding the brackets. The use of fluoride compounds, including as gel, toothpaste, mouth rinses, and varnishes, can help decrease or remove any carious sores that may be present around the brackets. As a result, preventative measures that are not dependent on the patient's cooperation have been created. These methods include bonding materials that include fluoride-releasing capabilities and discharge more fluoride near the brackets. These materials exhibit a typical pattern of fluoride release, with the greatest quantity of fluoride being released within the first few days of application, followed by a rapid decrease to lower levels due to the little amount of fluoride that is included, a phenomena that is referred to as the "burst effect" [3].

Review:

Fluoride varnishes are among the fluoride-releasing products that are utilized the most frequently across the world. As a means of extending the amount of time that fluoride is in touch with enamel, they were invented many years ago. In the 1960s, they were presented as Duraphat 5% sodium fluoride in a colophony base. In the 1970s, they were presented as fluorprotectorTM, which is a polyurethane lacquer that is translucent and clear and contains 0.1% weight fluoride ion as difluorosilane [4]. These are becoming increasingly popular due to the fact that they are simple to use and do not require the cooperation of the patient on their part. The use of fluoride varnishes has been seen to reduce the demineralization of enamel surrounding brackets; however, the necessity of reapplying these varnishes during the treatment process leads in an increase in both the cost and the amount of time spent in the clinical chair [50].

Fluoride-releasing glass ionomer cement (GIC), resin-modified GIC, and composite resins containing fluoride were finally produced as a result of the introduction of novel materials in the field of orthodontics [6].

Additionally, there is a formulation of orthodontic adhesives that possesses good physical qualities and minimal polymerization shrinkage, which makes the process of bonding significantly less difficult. One of the most widely used adhesives is called Transbond XT, which is manufactured by 3M Unitek. Brackets made of ceramic or metal can be bonded to the surface of the tooth using this method. In this particular field, the most recent products that have been developed are color-changing adhesives. These adhesives, in addition to their physical properties, have the significant advantage of making flash clean up easier. This is because any remnant of adhesive is visible at bracket seating. One example of this is the product known as TransbondTM Plus, which is manufactured by 3M Unitek [7]. One of the most important problems in orthodontics at the moment is preventing the demineralization of enamel while the patient is undergoing treatment. Consequently, the development of an adhesive system that is capable of preventing enamel demineralization and with a bond strength that is adequate is the most pressing demand during this time.

When it comes to achieving successful orthodontic treatment, it is vital to ensure that the bracket and the enamel surface that has been conditioned adhere to one another. During therapy, the necessity of replacing brackets slows down the progression of the treatment and implies costs for both the patient and the physician (time spent on appointments, cost of materials, and time lost that could have been spent educating) [8]. The preparation of the tooth surface, the placement of the bracket base, and the bonding substance all play a role in the adhesiveness of the bracket. [8] The bracket material, the type of adhesive system, the position of the brackets (anterior or posterior sector; maxilla or mandible), occlusion, and the patient's age are the elements that have the potential to influence the percentage of brackets that become detached.

Ceramic brackets have a higher shear strength than metallic brackets, due to the fact that ceramic brackets are made of this material. It is important for the clinician to take into consideration that the ideal orthodontic glue should include the following characteristics: sufficient bond strength to ensure that the brackets remain adhered to the teeth during the therapeutic process. In order to prevent the

tooth surface from being damaged when the appliance is removed, the ideal bond strength should not be excessively strong. The fracture of enamel can be caused by adhesive forces that are more than 13.5 MPa [9]. A failure that occurs between the adhesive and the bracket is preferable to a failure that occurs between the adhesive and the enamel since the latter can cause the enamel to fracture or develop cracks. This is because the former can cause the enamel to fracture or develop cracks. The bracket is easy to use, it protects against dental caries lesions, and it is available at a cost that is fair. For example, resin-modified glass ionomer cements or compomers are examples of composites that are already accessible [9].

It is also possible for the type of malocclusion to have an effect on the debonding of the brackets. The literature indicates that patients with Class II division 2 or patients with a deep bite have the highest prevalence of bracket debonding. This is due to the fact that the upper incisor brackets interfere with the lower brackets, which has led to the occurrence of bracket debonding. It is also important to consider the position of the brackets when determining the rate of debonding, with the mandibular first molar being the tooth that is damaged the most frequently. The bonding process can be affected by a wide variety of circumstances, including the contamination of saliva and the inappropriate handling of the products and materials. An isolated working field (equipped with cotton rolls, suction, and cheek retraction), a good bonding method, and the appropriate supplies are all necessary for an orthodontic practitioner to have in order to carry out an effective bonding protocol [10].

In the end, if it is not possible to bond the bracket in the correct position due to the kind of malocclusion, position deviations, or tooth rotations, the brackets need to be reattached. This is done in order to prevent the teeth from being positioned incorrectly and to limit the amount of bends that are required in the arch [10].

In situations when the bracket has become detached or where the initial bonding was not done correctly, the bracket should be reattached by adhering a new bracket or by reattaching the one that was removed. Tungsten drills, aluminum oxide blasting, finishing drills, bracket heating, and Softlex discs are some of the solutions that can be utilized in order to eliminate extra adhesive and resin. The bracket can achieve temperatures of between 600 and 800 degrees Celsius when it is heated using the heating process, which makes it more prone to deformation and changes in structure [11]. Aluminum oxide blasting has been demonstrated to be the method that achieves the highest adhesion strength among the ways that are accessible, according to a number of studies. This technique involves improving the adhesive strength of the bracket by micro-etching the surface of the bracket using a high-speed jet of oxide particles that is carried out using compressed air through the use of this technique [11].

Within the framework of the bracket repositioning process, the enamel surface must also be taken into consideration. Damage to the enamel is unavoidable during the process of detachment because of the mechanical bond that exists between the adhesive and the surface of the conditioned enamel. The combination of poor oral hygiene and a diet high in sugar can lead to enamel demineralization during fixed orthodontic treatment. This is because sugar-rich diets lower the oral pH, which in turn increases the activity of bacteria that are already present in the oral cavity, which ultimately leads to enamel demineralization owing to the combination of these two factors. According to the research that has been conducted, the percentage of individuals who have white spot lesions in their teeth who have fixed braces ranges from 11.7% to 25.6%. In light of the fact that removing brackets would invariably result in damage to the enamel, various preventative measures, such as fluoride, should be explored in order to safeguard the enamel. This decrease in adhesive strength can occur if fluoride is added before or after acid etching. This decrease in adhesion that was encouraged by the administration of fluoride, on the other hand, is refuted by other investigations. Furthermore, in order to improve clinical processes, additional research should be conducted on the protocols for bracket reattachment and the interference of fluoride administration on bracket bonding [12]. This is because there are already disagreements regarding these topics.

Chemical etching, self-curing composite resins, glass ionomer cements, and adhesives that cure with visible light are some of the products that have developed as a result of these early attempts. The quality of the bond that is formed between the brackets and the tooth or artificial subjects is continuously being improved via the development of new technologies that make use of newly discovered materials. There are new self-etching primers that have been introduced by manufacturers. These primers reduce the number of clinical bonding processes and chair time. The bonding process is made easier by self-etching primers, which combine acid and primer. These primers also eliminate the negative consequences that are associated with acid-etching. It has been demonstrated that etching with phosphoric acid

results in a higher loss of enamel [12]. The modern two-step self-etching primer and the newly developed one-step self-etching adhesive technologies are extremely appealing additions to the bonding arsenal of the physician. In order for the orthodontic bracket to be able to survive the forces that are applied during the orthodontic treatment, its bond strength must be sufficient. In the field of orthodontics, it would be preferable to have an appropriate bond that fails at the contact between the enamel and the composite material. This approach would make debonding and subsequent polishing considerably simpler [12].

Using a set of adhesive-removing pliers manufactured by 3M Unitek, all of the visible remaining glue was removed once the debonding process was completed. The sight of a smooth enamel surface that was devoid of any trace of composite was considered to be an indication that all of the glue that was still there had been completely removed. Two further bonding and debonding procedures were performed on the same tooth surface, each time using a different bracket. These procedures were repeated two more times. To ensure that the shear bond strengths of the teeth could be compared in the correct order, the teeth were kept in the same order throughout the experiment [12].

Following the completion of each shear bond strength test, the bases of the brackets and the enamel surfaces were inspected by a single investigator. This investigator utilized a stereomicroscope with an eightfold magnification in order to determine the adhesive remnant index (ARI). The adhesive residue index (ARI) scores ranged from 0 to 3, with 0 indicating that there was no adhesive left on the tooth surface, 1 indicating that less than half of the adhesive was left on the tooth surface, 2 indicating that more than half of the adhesive was left on the tooth surface, and 3 indicating that all adhesive remnants on the tooth surface had a distinct impression of the bracket base [13].

Conclusion:

Multiple studies have been conducted to investigate the impact of fluoride and CPP-ACP on the shear bond strength of orthodontic brackets prior to the bonding process. However, the findings have been inconsistent. By being aware of the fact that the fluoride-releasing and -recharging adhesive system with a self-etching primer had clinically appropriate shear bond strength in repeated bracket bonding, orthodontists may be able to reduce the likelihood of enamel being damaged. It is of the utmost importance to examine the qualities of the new materials that are being introduced into the field of orthodontics and to determine their utility based on those evaluations. Because of its color-changing property, the Transbond XT Plus adhesive that was employed in our research was able to provide a superior prescription for bracket location and flash clean-up. Additionally, it was found to provide a good bond strength. Furthermore, the utilization of fluoride varnish subsequent to the bonding of brackets did not have any impact on the SBS, so confirming that these materials can be safely employed for bonding purposes in order to prevent carious lesions without compromising the bond strength.

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