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Original Research

Evaluation of shear bond strength of bonding material bonded with primer and without primer

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ABSTRACT

Background: To evaluate the shear bond strength of bonding material bonded with or without primer.
Materials & methods: A total of 80 extracted premolar teeth were divided into two groups: Group I and Group II, each of which contained two subgroups (with one subgroup pre treated with a primer and the other, not pre treated with the primer).
Results: In Group I, the mean bond strength of Transbond XT without primer (12.44MPa) was compared to that of Transbond XT with XT primer (13.06MPa).
Conclusion: The shear bond strength of the brackets bonded with Transbond XT and Phase II without using the primer was sufficient.

Introduction:

In orthodontic practice, it is crucial for obtaining a reliable adhesive bond between an orthodontic attachment and tooth enamel. Innovations in bonding technology have led orthodontists to incorporate new adhesives, composite resins and bonding techniques into clinical practice.(1) The conventional bonding procedure involves three steps, enamel etching and priming, followed by the use of an orthodontic adhesive for bonding the bracket on teeth. From a clinical standpoint, longer bracket placement time may lead to difficulty in moisture control causing greater chances of bond failure and loss of valuable clinical time for the orthodontist. (2)

The development of acid-etch technique by Buonocore in 1955 led to the direct bonding of orthodontic brackets with composite resin. (3) This development resulted in an improvement in orthodontic treatment that included greater comfort for the patient, elimination of pre treatment separation, decreased gingival irritation, easier oral hygiene maintenance, improved aesthetics, reduced chair side time, absence of post treatment band spaces, facilitation of application of attachments to partially erupted teeth, minimized danger of decalcification with loose bands, and easier detection and treatment of caries. The development of acid-etch technique over years has changed the practice of dentistry more than any other single principle formulated.(4)

The newer concepts of self etching primers and adhesives have proven to be good both scientifically and clinically. They reduce the clinical steps, can be placed inexpensively, provide adequate bonding to enamel and dentin, and, most importantly, ensure post operative comfort for patients.(5) In current times, development of new products is occurring at an unprecedented rate. Dentin adhesives are currently available as three-step, two- step, and single-step systems, depending on how the three cardinal steps of etching, priming and bonding to tooth substrate are accomplished.(6) Hence, the study conducted is to evaluate the shear bond strength of bonding material bonded with or without primer.

Materials & methods:

A total of 80 extracted premolar teeth were divided into two groups: Group I and Group II, each of which contained two subgroups (with one subgroup pre treated

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with a primer and the other, not pre treated with the primer). All the teeth were divided equally among the subgroups. The shear bond strength of Transbond XT Light Cure Adhesive used with Transbond XT primer and Phase II orthodontic two-paste system used with liquid primer was compared with that of those used without a liquid primer, respectively. The shear bond strength was evaluated using universal testing machine and the adhesive remnant scores were evaluated subsequently. The Student's t-test was done for comparison of the two groups.

Results:

In Group I, the mean bond strength of Transbond XT without primer (12.44MPa) was compared to that of Transbond XT with XT primer (13.06MPa). In Group II, the mean shear bond strength of Phase II two-paste system without primer (9.58MPa) was compared to that of Phase II two-paste system with primer (9.92MPa), and the values were statistically insignificant.

Group 1	Number	Mean	SD	T- Value
Transbond- XT without primer	20	12.44	1.75	1.16
Transbond -XT with primer	20	13.06	2.10	P > 0.04

Table 1: Statistical Analysis Of Bonding With Transbond XT (Group I)

Group 2	Number	Mean	SD	T- Value
Phase II without primer	20	9.58	1.36	0.5
Transbond- XT with primer	20	9.92	1.62	P > 0.04

Table 2: Statistical Analysis Of Bonding With Phase II (GROUP II)

Discussion:

Direct bonding of orthodontic brackets has transformed and enhanced the practice of clinical orthodontics. Bonding of brackets was a major advancement from the traditional banding of teeth for orthodontic purposes that helped in significantly decreasing the occurrence of white spot lesions and reduced the chair side time during appliance placement. It also proved to be more esthetic and comfortable for the patient.

However, further simplification of the bonding procedure is essential through evolution and improvement of existing methods without compromising the quality and effectiveness of the procedure. [7] In orthodontics, "shear" bond strength is assessed rather than peel, tension, torsion or cleavage because of its reproducibility and resultant reliability. [8] Group I and Group II showed bond strengths that were close to or equal to the minimal requirement. In our study, under ideal conditions, for Group I, the mean SBS required for bond failure for specimens treated with XT primer and without XT primer were 13.06 and 12.44MPa, respectively. Transbond XT when used with XT primer had slightly higher mean SBS but it was not statistically significant.

A study conducted aimed at assessing the adequacy of the early SBS acquired by the enamel-composite-bracket adhesion when the brackets were bonded by the use of composites (Transbond XT and Phase II composites) only and not their respective liquid resins. In the test

groups, extracted premolars were bonded with orthodontic brackets on their buccal surfaces using the aforementioned composites without their liquid resins, and in the control group, the specimens were bonded with the same composites but with the use of their respective liquid resins. The specimens were stored underwater at 37°C for 24h and were subsequently tested for their SBSs. The results of this study implied that the SBSs of the control group and the test group specimens did not show a statistically significant difference. It was concluded from their study that the mechanical retention derived from the resin tags, formed from the use of a liquid primer, may not be the lone significant mechanism by which adequate SBSs are achieved. [9,10] In our study, in the Group II, the mean shear bond strength of Phase II two-paste system without primer (9.58MPa) was compared to that of Phase II two-paste system with primer (9.92MPa), and the values were statistically insignificant.

An in vitro study that included 100 extracted premolars, divided into four groups, compared the SBSs of orthodontic brackets bonded using Transbond Plus hydrophilic resin and hydrophobic Transbond XT resin under two conditions each: under salivary contamination and under no salivary contamination. The results showed that Transbond Plus hydrophilic resin had greater SBS under both the conditions than Transbond XT. [11]

Conclusion:

The shear bond strength of the brackets bonded with Transbond XT and Phase II without using the primer was sufficient enough to withstand the masticatory forces.

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