

ORIGINAL RESEARCH

Assessment of shear bond strength of two different bonding materials bonded with primer and without primer - A comparative study

Neha Chandel¹, Prabhat Mandhotra², Tarush Thakur³, Aprajita Dogra⁴, Arun Patiyal⁵, Anuj K Sharma⁶

¹MDS (Orthodontics and Dentofacial Orthopedics), Private Consultant, Himachal Pradesh

²Reader, Department of Conservative Dentistry and Endodontics, Himachal Dental College, Sundernagar, Himachal Pradesh

³MDS (Orthodontics and Dentofacial Orthopedics), Private Consultant, Himachal Pradesh

⁴MDS (Orthodontics and Dentofacial Orthopedics), Private Consultant, Himachal Pradesh

⁵MDS (Orthodontics and Dentofacial Orthopedics), Medical officer (dental), Himachal Pradesh Government

⁶MDS (Conservative Dentistry and Endodontics), Medical officer (dental), YSGG Medical college, Nahan, Sirmaur, Himachal Pradesh

ABSTRACT:

Background: The procedure of acid etching and bonding had come to stay in orthodontics; this had indeed been endorsed by clinicians worldwide. Bonding is a technique sensitive procedure and moisture is cited as most common cause of bond failure. Hence; the present study was undertaken for assessing the shear bond strength of two different bonding materials bonded with primer and without primer. **Materials & methods:** a total of 100 tooth specimens were obtained. All the specimens were randomly and broadly divided into following study groups: Group A: Transbond XT with Primer, Group B: Transbond XT without Primer, Group C: Orthofix with Primer, and Group D: Orthofix without Primer. Cleaning of all the tooth specimens was done using pumice. Stainless steel 3M brackets were used in the present study. Etching of the tooth specimens was done for 60 seconds followed by rinsing and air drying. This was followed by bonding of brackets to the teeth with the respective adhesive and curing for 40 seconds with primer and without primer according to the group division. Debonding was done after 24 hours. Shear bond strength was assessed on digital analyst device. **Results:** Mean Shear bond strength of specimens of Group A, Group B, Group C and Group D was found to be 12.12, 7.96, 10.86 and 6.12 respectively. In the present study, while comparing the mean shear bond strength between group A and group B, between group A and group D, between Group B and Group C and between group C and group D, significant results were obtained. **Conclusion:** Shear bond strength of adhesives with primer was significantly higher in comparison to adhesives without primer indicating that sealant creates a mechanical bonding between the enamel and adhesive interface.

Key words: Shear bond strength, Orthodontic, Primer

Received: 12 January, 2020

Accepted: 21 January, 2020

Corresponding author: Dr. Prabhat Mandhotra, Reader, Department of Conservative Dentistry and Endodontics, Himachal Dental College, Sundernagar, Himachal Pradesh

This article may be cited as: Chandel N, Mandhotra P, Thakur T, Dogra A, Patiyal A, Sharma AK. Assessment of shear bond strength of two different bonding materials bonded with primer and without primer - A comparative study. Int J Res Health Allied Sci 2020; 6(2):164-166.

INTRODUCTION

The procedure of acid etching and bonding had come to stay in orthodontics; this had indeed been endorsed by clinicians worldwide. Today, most orthodontists either directly or indirectly bond attachments to the teeth; these are the most aesthetically superior options. The advantages and disadvantages of bonding versus those of banding of different teeth must be weighed according to practitioner's preferences, skill, and experience. Probably, the most important of these advantages of bonding are the improved appearance and hygiene, the decreased discomfort of the patient, and the ease of

application for the clinician.¹⁻³ Rapid strides in material science over the years produced the conventional two paste system, which provided good bond strength in dry conditions, but bond strength in wet conditions was unreliable and bonding procedure was time consuming challenging offer to the orthodontist. Bonding is a technique sensitive procedure and moisture is cited as most common cause of bond failure.⁴⁻⁶ Hence; the present study was undertaken for assessing the shear bond strength of two different bonding materials bonded with primer and without primer.

MATERIALS & METHODS

The present study was conducted for assessing the shear bond strength of different bonding materials bonded with primer and without primer. Only those patients were included in the present study which was scheduled to undergo fixed orthodontic treatment. A total of 20 patients who underwent dental extractions (all the first molars for orthodontic purposes) were included in the present study. Therefore; a total of 100 tooth specimens were obtained. All the specimens were randomly and broadly divided into following study groups:

- Group A: Transbond XT with Primer,
- Group B: Transbond XT without Primer,
- Group C: Orthofix with Primer, and
- Group D: Orthofix without Primer

Cleaning of all the tooth specimens was done using pumice. Stainless steel 3M brackets were used in the present study. Etching of the tooth specimens was done for 60 seconds followed by rinsing and air drying. This was followed by bonding of brackets to the teeth with the respective adhesive and curing for 40 seconds with primer and without primer according to the group division. Debonding was done after 24 hours. Shear bond strength was assessed on digital analyst device. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Student t test was used for evaluation of level of significance.

RESULTS

A total of 100 tooth specimens were obtained. All the specimens were randomly and broadly divided into following study groups: Group A: Transbond XT with Primer, Group B: Transbond XT without Primer, Group C: Orthofix with Primer, and Group D: Orthofix without Primer. Mean Shear bond strength of specimens of Group A, Group B, Group and Group D was found to be 12.12 7.96, 10.86 and 6.12 respectively. In the present study, while comparing the mean shear bond strength between group A and group B, between group A and group D, between Group B and Group C and between group C and group D, significant results were obtained.

Table 1: Mean shear bond strength

Primer	Bonding materials	Mean shear bond strength	SD
With primer	Transbond XT	12.12	1.42
	Orthofix	10.86	1.18
Without primer	Transbond XT	7.96	3.12
	Orthofix	6.12	2.47

Table 2: Comparison of mean shear bond strength

Group Vs Group	p- value
Group A Vs Group B	0.00*
Group A Vs Group C	0.13
Group A Vs Group D	0.00*
Group B Vs Group C	0.00*
Group B Vs Group D	0.09
Group C Vs Group D	0.00*

*: Significant

DISCUSSION

Contamination of etched tooth surface during orthodontic bonding procedure can result in poor bond strength hence control of moisture contamination is necessary. Saliva and blood contamination is major cause for bond failure. The maintenance of dry field is required for orthodontic bonding since most of the primers and adhesives have hydrophobic components.⁷⁻⁹ Newer self-etching adhesive materials have been introduced recently in orthodontics to simplify the bonding process by reducing the bonding steps and eliminating the need for etching and priming, thus lessening the risk of contamination and reducing the bonding time. These self-etching primers combine the conditioning and priming agents into one acidic solution and have shown advantages such as reduced loss of enamel, prevention of saliva contamination and less chair time.⁸⁻¹⁰

Hence; the present study was undertaken for assessing the shear bond strength of two different bonding materials bonded with primer and without primer.

In the present study, Mean Shear bond strength of specimens of Group A, Group B, Group and Group D was found to be 12.12 7.96, 10.86 and 6.12 respectively. John J et al evaluated the shear bond strength of brackets bonded with self-etching primer and moisture insensitive primer (MIP) and compare it with the conventional adhesive system. A total of 90 extracted human premolar teeth were selected and divided into three groups of 30 teeth each with two sub groups (dry and wet), of 15 teeth each. Each group was bonded with three different types of bonding systems namely visible light cure Clearfil Liner Bond 2V, MIP and Transbond XT. These groups were named SD, MD and CD in dry conditions and SW, MW and CW in wet condition and each of these groups were color coded. The shear bond strength of the bonding system in each group was tested using Universal testing machine Instron (Instron model:4206, Instron Corporation, USA). In dry condition all three groups showed good bond strength. Self-etch primer showed the average highest bond strength, followed by Transbond XT and then MIP. In wet condition MIP has highest bond strength, followed by self-etching primer and Transbond XT. Under dry conditions conventional primer is the material of choice.¹¹

In the present study, while comparing the mean shear bond strength between group A and group B, between group A and group D, between Group B and Group C and between group C and group D, significant results were obtained. Goswami A et al compared the in vitro shear bond strength (SBS) and debonding characteristic of moisture-insensitive primer (MIP) (Transbond MIP) (3M Unitek, South Peck Road, Monrovia, California, USA) and self-etching primer (SEP) (Transbond Plus SEP) (3M Unitek, South Peck Road, Monrovia, California, USA) in combination with a color changing adhesive system (Transbond Plus Color Change) (3M Unitek, South Peck Road, Monrovia, California, USA) under both dry and contaminated condition. One

hundred and twenty freshly extracted teeth for the purpose of orthodontic treatment were collected. Teeth were randomly assigned into four groups, each consisting of 30 specimen and stainless steel brackets were bonded using each primer-adhesive combination under different enamel conditions, that is, dry and enamel contaminated with natural saliva. SBS and adhesive remnant index were calculated for each group. Analysis of variance of SBS for both MIP and SEP under dry and contaminated condition showed no statistical significance ($P = 0.5$). Chi-square test showed significant difference in debonding characteristics among the test groups ($P < 0.001$). All the groups showed typical debonding characteristics of separation either at the bracket-adhesive interface or within the adhesive itself. Moisture contamination did not affect the SBS and adhesive remaining on tooth for both MIP and SEP.¹²

CONCLUSION

From the above results, the authors concluded that the shear bond strength of adhesives with primer was significantly higher in comparison to adhesives without primer indicating that sealant creates a mechanical bonding between the enamel and adhesive interface. However; further studies are recommended.

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