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STUDY TO KNOW THE IN VIRTO-SHEAR BOND STRENGTH OF HELIOSIT ORTHODONTIC AND TRANSBOND XT WITH THEIR COMPARISON

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Abstract:

Objective: *The purpose of this study was to evaluate the shear bond strength of Heliosit Orthodontic and then compare it with the control group of Transbond XT.*

Study Design: *A Retrospective Comparative Study.*

Place and Duration: *The was conducted Orthodontics department of Bibi Aseefa Dental College Hospital, Larkana for one year duration from November 2018 to November 2019.*

Methods: *The study comprises of Groups A and B of 80 human premolar teeth each bonded with mesh based metal brackets. The bonding agent used in group A was Transbond XT and that of group B was Heliosit Orthodontic. Every effort was made to control the cofounding variables including force of application of bracket, light tip distance, orientation of bracket in the acrylic block and storage of teeth before and after bonding this was followed by debonding of the brackets by shearing in a testing machine made universally.*

Results: *It was found that the Transbond XT mean shear bond strength was 25.5 MPa and that of Heliosit orthodontic was 10.54 MPa. The t-test revealed that there was a static variation between the shear bond strength of the two groups.*

Conclusion: *In conclusion, both composites bond strengths were tested which observed to be greater than the recommended values of Reynolds for the composites to be clinically useful. It is recommended that the bond strength and the viscosity of the Heliosit Orthodontic be increased for it to be clinically as effective as Transbond XT.*

Key words: Heliosit Orthodontic, Transbond XT, Shear bond strength.

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INTRODUCTION:

The evolution of the bands to the brackets in the daily orthodontic practice was due to the efforts of Buonocor and Newmann who proposed BIS-GMA as a bonding substance, which suggested etching for the addition in teeth to metal supports[1]. There has been great progress in adherence technology since then, but there is a long way to go. The most common problem encountered by orthodontists in the world is to keep fixed apparatus on the enamel surface during orthodontic treatment. The Transbond XT coupling system (3M ESPE St. Paul, Minnesota, USA) has become the gold standard for bonding brackets and buttons in orthodontic practice thanks to its ideal consistency, light curing capability, superior adhesion and availability of teeth / brackets[2]. Because of the difficulty in comparing the properties of the materials and the brackets between different studies, most researchers used Transbond XT as a control group[3]. This helps directly compare the material to be tested with the Transbond XT in the same environment and in the test parameters. The search for overcoming the shortage of traditional filled composites results in great use of "fluid composites". Flow composites deserve great attention due to their clinical management feature[4]. These are non-sticky, liquid injectable, short curing time and adequate working time. These properties make the flow composites particularly useful during the indirect addition of the inserts. Heliocide Orthodontic, a fluid compound, has initially been designed to adhere to the brackets, but has been proven to be used as an adhesive to bond linguistic retainers and even as a luting cement for the prosthesis[5]. As a parantetic binding agent, Heliosit orthodontic have been studied very little. The aim of this study was to evaluate and compare the resistance of the brackets connected with Heliosit Orthodontic and Transbond XT to the shear bonds. The purpose of this analysis was to compare and evaluate the strength of the transbond XT and Heliosit Orthodontic. With the null hypothesis that the shear bond strength of Heliocyte orthodontics will differ insignificantly from Transbond XT.

MATERIALS AND METHODS:

This Retrospective Comparative Study was held in the Orthodontics department of Bibi Aseefa Dental College Hospital, Larkana for one year duration from November 2018 to November 2019.

Eighty premolar teeth were extracted from the arch or on the side with a strong enamel and well supported. Any teeth with evidence of crack lines, decay, hyposplasia, or any other enamel deviation were removed from the sample. The collected teeth were thoroughly washed under running water and stored in formaldehyde to disinfect them and prevent drying. Randomization software was used to divide the total tooth population from two to forty groups (A and B). The group A, the teeth joined by the Transbond XT, and the B group represented the teeth connected with the Heliosit Orthodontic. The teeth of the two groups were stored in different containers with normal saline solution. Although every effort has been made to control the prejudice in the study, no blanking was possible during the consolidation of the parentheses. A standard bonding procedure was used to combine all the brackets of Group A. The first step was to polish the each tooth buccal surface with a cup of polishing rubber and non-fluorinated pumice powder in a slow hand tool. Then tooth was dried to dryness completely. Further for 15 seconds it was done with 37% phosphoric acid bathing. Then for half minute under running water acid was then rinsed. After air-drying, a thin Transbond XT primer was stained with a brush supplied by the manufacturer in the Transbond XT binding kit. The primer was light cured for ten seconds, then the Transbond XT compound was applied to the bottom of the support. Subsequently, by a tooth positioning guage the support was placed firmly 3.5 mm (mm) away from the occlusal surface (Sialkot, Pakistan, Falcon Medical Instruments) on the buccal ridge of the premolar tooth. The thrust force against the clamp is measured by a compression/ tension measuring device (Pforzheim, Dentaurum, Germany). All remaining materials were removed by the carver. This was followed by photopolymerization for ten seconds from the mesial and distal sides with the photopolymerization gun (CU-100A Rolence Enterprises Taiwan). The light curing unit light intensity was calibrated with a digital light intensity meter at 800 milliwatts / centimeter2 + 25 milliwatts / centimeter2 every ten minutes. For group B, the same procedure was applied as for group A, but no primer was used prior to flowable composite application. Similarly, Heliosit Orthodontic was light cured on both the distal and mesial sides for 20 seconds, as indicated by the manufacturer.

The strength of the cutting bond of the orthodontic support was tested on a universal testing machine (Canton, Instron Corporation, USA Massachusetts) at a load range of 0.04-20. Kg and a cross-head speed of 0.5 mm per minute (Figure I).

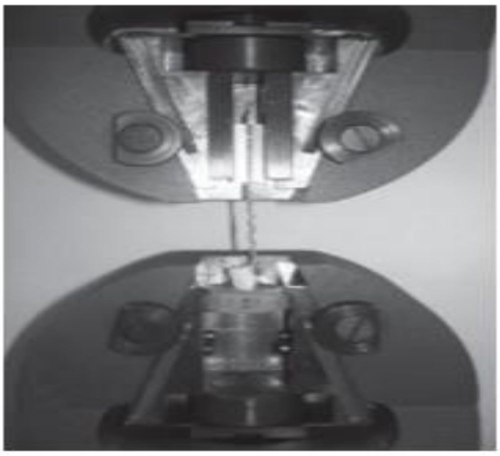

Fig 1: The tooth held in the crossheads of the universal testing machine before the de-bonding

For statistical analysis SPSS 17.0 program was used. The variable in this analysis is the shear force per unit area measured in MPa. Descriptive statistics included in the study included standard deviation (SD), mean, variance, range, maximum and minimum SBS (MPa). To determine the statistical difference between the shear bond strength of the two groups Student's t test was used. All statistical tests significance was maintained at $P < 0.05$.

RESULTS:

The mean, standard deviation and maximum bond strength values of the two groups are summarized in Table 1.

TABLE 1: MEAN, STANDARD DEVIATION, MINIMUM AND MAXIMUM SHEAR BOND STRENGTH OF THE TWO GROUPS IN MEGAPASCALS

Groups	N	Mean	Std. deviation	Minimum	Maximum
Transbond XT	40	25.4962	1.6942	22.00	28.92
Heliosit Orthodontic	40	10.5445	1.8676	6.55	14.48

The results of the Student t test are summarized in Table 2.

TABLE 2: STUDENTS T-TEST TO EVALUATE THE SIGNIFICANCE OF SHEAR BOND STRENGTH BETWEEN TWO GROUPS

(I) Groups	(J) Groups	Mean difference (I-J)	Std. error	Significance
Transbond XT	Heliosit orthodontic	14.9517*	.4662	.000

*Significant Value $P < 0.05$

The mean difference is of very high significance at $P < 0.001$

Mean values of the two groups Descriptive statistics revealed that the mean SBS of Transbond XT was 25.5 MPa and the mean orthodontic Heliocyte was 10.54 MPa. The T test revealed that there was a significant difference between the SBS of the two groups because the P value was less than 0.001.

DISCUSSION:

The purpose of this study is to reduce the time required for joining brackets and to improve the bonding and deboning process by eliminating the need to apply primer / resin on the tooth before placing the bracket. Further, it is expected that the time spent for cleaning the teeth after removal of the supports is to be shortened, since after the supports, the compound waste is eliminated without jeopardizing the ability to retain the binding force during the separation process[6-8]. effects on dental structure without being clinically beneficial and causing damage. After the analysis of the results, we will refute our hypothesis that the resistance of Heliocyte Orthodontic binding is similar to Transbond XT, but that there is a significant difference between SBS and two binding agents[9-11]. Reynolds suggested a minimum strength of 6-8 MPa for orthodontic braces to support orthodontic and occlusal forces during orthodontic treatment. Although both composites tested were found to be higher than the values recommended by Reynolds, the authors believed that Heliosit Orthodontic SBS should be improved to be the same as that of time-tested Transbond XT[12-14]. The adhesion strength of Heliosit Orthodontic was 10.54 MPa with a standard deviation of 1.86 MPa. This binding force is greater than that obtained with Aasrum and others 13 (6.4 MPa) and Bradburn and Pender14 (7.22 MPa ± 2.11 MPa), but is significantly lower than that obtained by Joseph and Rossouw15 (17.80 MPa ± 3.54 MPa) and Schmidlin et al. . . (16.6 MPa ± 6.4 MPa)[15].

In our study, the average resistance of Transbond XT to shear bond was 25.5 MPa ± 1.69 MPa. This was higher in some previous studies. It can be seen that the standard deviation in our study (S.D.) is quite low.

CONCLUSION:

In our study, there was a significant difference in the shear strength bonding of Heliosit Orthodontic and Transbond XT. Although the binding forces of both composites are greater than the proposed values of Reynolds, a recommendation of the authors is that Transbond XT is preferred for the combination of orthodontic attachments due to higher bond strengths. We also recommend that these composites be tested in vivo in a randomized clinical control trial.

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