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EVALUATION OF SHEAR BOND STRENGTH OF TWO ORTHODONTIC ADHESIVE SYSTEMS ON BONDING OF CERAMIC BRACKETS: AN IN VITRO-STUDY

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ABSTRACT:

Aim: To evaluate the shear bond of two orthodontic adhesive systems (Light Bond ®,Resiliance Orthotechnology Products,Inc.USA),and (Light Bond ®, Heliosit Ivoclar-vivadent) on bonding of ceramic brackets. The result of the treatment with fixed orthodontic appliances depends on the effective bonding of orthodontic brackets onto the teeth surface. Resiliance (Orthotechnology Products,Inc.USA) is conventional bonding system while the Heliosit Orthodontic was developed to ease the bonding procedure of orthodontic attachments by eliminating the need for primer application both on the bracket base and the etched tooth surface.

Results: The mean shear bond strength of Resiliance was 12.08 MPa and that of Heliosit orthodontic was 8.61 MPa.The t-test revealed that there was a significant difference between the shear bond strength of the two groups.

Conclusion: The bond strengths of both the composites tested were greater than the recommended values of Reynolds for the composites to be clinically useful but Resiliance has bigger value of shear bond strength comparing to Heliosit.

Key words: Shear bond strength, Resiliance, Heliosit Orthodontic

INTRODUCTION:

The acid conditioning of enamel and the advent of composite resins were important developments that brought definitive changes to orthodontic practice.

Historically, Buonocore (1955)[1] showed that treating the enamel surface with 85% phosphoric acid for 30 seconds improved the adhesiveness between the enamel surface and the adhesive material.This approach resulted in improvements in orthodontic treatment such as greater comfort for patient, elimination of pretreatment separation, decreased gingival irritation, easier oral hygiene, improved esthetics, and reduced chair side time[2-3].

many new bonding agents have been developed such as composite resins, conventional glass ionomer cements, resin-modified glass-ionomer cements and polyacid modified composites (compomers)[4] with different polymerization mechanism such as chemically, light or dual curing.

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Composite resins are one of the most frequently used adhesives in orthodontic bonding [5]

Resiliance Orthotechnology Products,Inc.USA is conventional bonding system has been used for bonding of brackets and buttons in orthodontic practice because of its ideal consistency, light curing ability, superior tooth/bracket adhesion and availability.

Heliosit Orthodontic is a flowable composite initially intended for bonding of brackets ,flow composites merit great attention due to their clinical handling characteristics [6].These being non-stickiness, fluid injectability, adequate working time and short cure time. These properties make flow composites especially useful during indirect bonding of attachments.

Heliosit orthodontic as a bonding agent of brackets has been scarcely studied. The aim of the

present study was to evaluate and compare the shear bond strength of brackets bonded with Heliosit orthodontic and Resiliance.

MATERIALS AND METHODS:

Forty extracted premolar teeth well supported enamel were collected and stored in distilled water at room temperature.The teeth were divided randomly into two groups, 20 in each group.

Group 1 used a direct bond technique with a lightcured, orthodontic adhesive, Resiliance

Group 2 used a direct bond technique with a lightcured, orthodontic adhesive, Heliosit.

The brackets were a conventional Ceramic MBT 0.022-inch slot maxillary premolars(orthonet-france).

Teeth were embedded in molds made of chemically cured acrylic resin.we made ironic box(6x6)cm (Figure 2)to contain the acrylic molds (Figure 3).

A standard bonding procedure was applied for bonding of all brackets of Group 1.The teeth were etched with 37 % liquid phosphoric acid for 30 seconds, rinsed with water for 5 seconds, and dried with an oil-free air source.

After air drying, a thin coat of Resiliance primer was painted with a brush then light cured for ten seconds this was followed by the application of the Resiliance composite to the base of the bracket,this was followed by light curing for ten seconds each from the mesial and distal sides.

For Group 2, the same protocol was followed as that for Group 1, except that no primer was used before the flowable composite application. Also the Heliosit Orthodontic was light cured for 20 second each on both the mesial and distal side of the bracket as specified by the manufacturer.

Shear tests were made by universal testing machine (tecnotest T 665/N Italy) at speed of 1 mm/min (Figure1)

specifications:

· Max. force forward/reverse: 6 kN

· Speed range: 0.00001 – 12 mm/minute

· Different speeds may be selected for forward and reverse drive

· Speed/load limitations: none

· Displacement movements: 0.03 μ m

· Rapid approach speed (unloaded): 12 mm/min.

· Forward/reverse cycles: programmable up to 20 mm

· Number of cycles: no limit to number which may be programmed

· Microswitches prevent piston overtravel and dynamometer overload

· Leverage system allows applied weights to be amplified by 10, 9, 7.92 and 6.125

· A small handwheel serves to sustain/release the vertical load

· Supports are provided for transducers, dial gauges and dynamometers

RESULT:

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

The descriptive statistics revealed that the Mean SBS of Resiliance was 12.08 MPa and that of Heliosit orthodontic was 8.61 MPa (Figure 4).

The t-test revealed that there was a highly Significant Difference in between the SBS of the two groups as the P value was less than 0.001.

DISCUSSION:

Reynolds stated that the tensile bond strengths need to be in the range of 5.9–7.8 MPa to overcome normal intraoral forces and forces from orthodontic treatment[7]. Although strong bond that adhesive can offer is desirable in orthodontic practice, bond strength values higher then 9.7Mpa can lead to enamel fractures[8].

The bond strength of bracket -adhesive - enamel system in orthodontic bonding varies and depends on factors such as the type of adhesive, bracket base design, enamel morphology, appliance force systems and the clinician's technique. It is obvious that in vitro studies can not provide sufficient information regarding combination of forces and numerous factors involved in orthodontic treatment but they are useful as a guideline for the clinician in the selection of the bracket/adhesive system to be used in clinical settings [9].

Adhesives used in this study, Resiliance(Orthotechnology Products,Inc.USA), Heliosit(Ivoclar-vivadent) displayed clinically acceptable mean bond strength values with no enamel fractures Noticed.

In this study , Resiliance bonding system showed bond strength of (12.08 MPa) with a standard deviation of(2.630MPa) which matches results obtained in recent study[10].

The bond strength achieved in our study for Heliosit Orthodontic was(8.61 MPa) with a standard deviation of (1.327 MPa),This bond strength is higher than the ones achieved by Aasrum et al (6.4 MPa)[11] and Bradburn and Pender (7.22 MPa ± 2.11 MPa) [12], but considerably less

than those achieved by Joseph and Rossouw (17.80MPa ± 3.54 MPa) [13] and Schmidlin et al (16.6 MPa ± 6.4MPa) [14] and Bashir(10.54 MPa±1.86 MPa)[15]. This difference might be according to the kind of brackets that we used ceramic brackets.

CONCLUSION:

Within the limitations of this study, F360 single file respected original canal curvature well compared to PTU, and it prepared curved canals rapidly. The file number of rotary system influencd on the time required for instrumentation, in other word, the less file number were used, the less time was required for preparation.

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FIGURES:

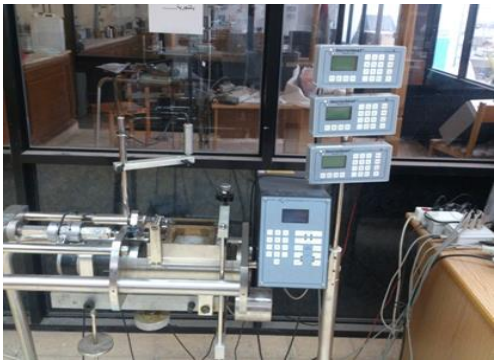

Figure1: tecnotest T 665/N Italy

Figure 2:acrylic molds in the ironic box

Figure 3:molds inside the machine

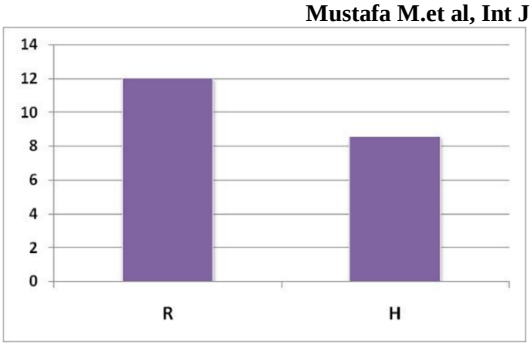

Figure 4: Mean shear Bond Strengths of Resiliance and Heliosit Orthodontic in Mega Pascals

TABLES:

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

		N	Mean	Std. Deviation	Std. Error Mean	T	dF	SIG (P-Value)
composite	Resiliance	20	12.08	2.630	.588	5.263	38	.000
	Heliosit	20	8.61	1.327	.297			