Bond and rebond strengths
an in vitro and in vivo evaluation

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ABSTRACT

New orthodontic adhesives should be put under vitro and vivo investigation to evaluate their efficiencies and disadvantages, so that, Concise, No Mix and Right On orthodontic adhesives were tested in vitro and evaluated clinically by treating (15) cases. These adhesives were used in bonding (10) human sound extracted premolars for each one according to the manufactures instructions, and then rebonded new brackets to these tested teeth after cleaning and polishing.

The adhesive were used in bonding the brackets to the 40 teeth clinically (five upper dental arches) for each type, according to their manufacturer's instructions. The lowest number of failure brackets was within the use of concise adhesive.

The shear bond and rebond strength were measured in compression test Machine in Mega Pascal (Mpa).

The results showed that the Concise adhesive had strongest bond and rebond strength in vitro and clinically than that No Mix and Right-On adhesives and the later adhesives had adequate bonds strength and more successful in bonding anterior brackets.

Key words: Orthodontic adhesives, bond strength, rebond strength.

الخلاصة

المواد اللاصقة التقويمية الحديثة يجب ان تخضع للفحص المختبرى والسريرى لتحديد كفائتها ومساوئها لذا المواد اللاصقة التقويمية Concise, No- Mix, Right on قد فحصت مختبريا وسريريا بمعالجة (15) خمسة عشر حالة – المواد اللاصقة قد استخدمت فى ربط (10) عشرة اسنان ضواحك مقلوعة وسليمة بالحاصرات التقويمية المعدنية لكل مادة وطبقا لتعليمات الشركات ومن ثم اعيد ربط الأسنان المفحوصة بحاصرات تقويمية جديدة بعد تنظيف الأسنان وصقلها .

المواد الاصقة قد استخدمت في ربط الحاصرات التقويمية على (40) اربعون سن سريريا (خمس حالات فك علوي) لكل نوع وطبقا لتعليمات الشركات قوى الربط والربط المعاد الافقية قد قيست بجهاز الأختبار الضاغط بوحدة ميكا باسكال .

اظهرت النتائج ان المادة اللاصقة Concise تمتلك معنويا اقوى قوة ربط والربط المعاد الافقية مختبريا وسريريا عن No-Mix , Right-on والاخيرتان تمتلكان قوى ربط والربط المعاد كافية .

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INTRODUCTION

Now a day there are many types of orthodontic adhesive in the markets. The most efficient adhesive is the composite, composite is refereed to a three dimensional combination of at least two chemically different materials, the inorganic filler had been added to amount of binder consisting of a cross-linking polymerizable organic resin [1].

The orthodontic composite adhesives can be divided into the chemically cured and light cured, the chemically cured composite is that resin set rapidly when activated [2]. The chemically cured composite (two pasts no mixed systems) had recommended in bonding the orthodontic brackets [3]. The light cured composite adhesive had adequate bond strength and can fix the bracket with short light exposure and wire can be placed immediately [4,5].

The aim of this study to investigate the shear bond and rebond strength of the three chemically cured composite adhesives in vitro, and clinical evaluation of their bond and rebond strength.

MATERIALS AND METODS

The materials are chemically cured composite adhesives; Concise (3M Co. U.S.A.) No Mix (Dntarum Germany) and Right-On (T.P Co. U.S.A.), (60) Stainless steel orthodontic brackets (T.P Co. U.S.A.), (30) human sound extracted premolars, and Compression test machines (Soil Co. U.S.A.).

The teeth are divided in three groups, the first, second and third groups are bonded with the brackets via, concise, No Mix and Right-On respectively according to the manufactures instructions. Shear bond and rebond strengths are measured in Mega Pascal (Mpa) by using the compression test machine.

The composite adhesives are investigated clinically by treating 40 orthodontic brackets (5 upper dental arches) with each type and the number of brackets failure in bonding & rebonding of brackets are recorded through (10) months of treatment.

The data are subjected to the descriptive analysis (mean and standard deviation) and variance analysis (ANOVA, Duncan and Students t-test) at significant level (0.05).

RESULTS

The mean shear bond strength of Concise had significantly higher than that of No-Mix and Right-On; and there were no significant variation in shear bond strength between the No-Mix and Right-On tables (1 and 2).

Table(1): The mean shear bond strength in Mega Pascal and the standard deviation of the composite adhesives.

Composite Adhesive	Samples No.	Mean, Shear Bond Strength	Standard Deviation
Concise	10	13.85	+/--3.22
No-Mix	10	11.68	+/--3.82
Right-On	10	10.86	+/--3.24

Table(2): Variance analysis (ANOVA and Duncan's test) of the shear bond strength in Mega Pascal of the composite adhesives.

ANOVA Test			Duncan's Test			
Sample No.	F Value	PR<F	Composite Adhesive	Samples No.	Mean Shear Bond Strength	Variance*
30	5.26	0.05	Concise	10	13.85	A
			No-Mix	10	11.68	B
			Right-On	10	10.86	B

* Variance: Same letters mean no significant and different letters express significant difference at level (0.05).

The mean value of the shear bond strength of the Concise, No-Mix and Right-On more than their shear rebond strength, but there were no significant difference between the shear bond and rebond strength tables (1, 3 and 4).

Table(3): The mean shear rebond strength in Mega Pascal of the composite adhesives.

Composite Adhesive	Samples No.	Mean Shear Rebond Strength	Standard Deviation
Concise	10	12.24	± 3.86
No-Mix	10	10.82	± 3.48
Right-On	10	9.76	± 3.52

Table (4): Variance analysis by student's t-test of shear bond and rebond strength (in Mega Pascal) of the composite adhesives.

Composite Adhesive	Samples No.	Mean Bond Strength	Mean Rebond Strength	Significant Level At > 0.05
Concise	10	13.85	12.24	N.S.
No-Mix	10	11.68	10.82	N.S.
Right-On	10	10.86	9.76	N.S.

N.S.: Means no significant difference

Clinical investigation of Concise, No- Mix and Right-On adhesives were showed that the Concise had strongest bond and rebond strength than that No- Mix 7 and Right-On adhesives, when each adhesive is used in bonding (40) orthodontic brackets for (10) months with showing adequate bond and rebond strength, and the fiular bonded and rebonded brackets were 4, 6, 7 respectively, table (5).

Table (5) Clinical investigation; brackets failure in bonding and rebonding with composite adhesives.

Composite Adhesive	No. of Brackets	Period in Month	No. of Fialur Bonded Brackets	No. of Fialur Rebonded Brackets
Concise	40	10	4	-----
No-Mix	40	10	6	-----
Right-On	40	10	6	1

DISCUSSION

The significant differences in bond strength between the concise (two pastes orthodontic adhesive) & the Right-On adhesive is confirmed by Pender *et. al.* (1988)[6]. While Smith & Shivapuja (1993)[7] were disagreed ; they found that the Right-On adhesive had stronger shear bond strength.

The non-significant rebond shear strengths of the tested orthodontic adhesives & their bond strengths were in accordance with the findings of other studies [8,9] when they investigated the shear bond & rebond strengths of the concise orthodontic adhesive.

The clinical evaluation of the bond & rebond strengths of the tested orthodontic adhesives showed that the concise orthodontic adhesive had less instances of bracket failure & enough resistance to the highly masticatory force at posterior teeth.

CONCLUSIONS AND SUGGESIONS

Concise orthodontics adhesive has the strongest bond and rebond strength than No Mix and Right-On. No Mix and Right-On adhesives have adequate bond and rebond strengths.

The Concise is highly recommended in bonding & rebonding posterior teeth with orthodontic brackets.

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