

Comparison of viscosity of different orthodontic bonding agent -invitro study

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Abstract:

Aim: To compare the 3M Unitek Transbond XT andOrmco Enlight Light Cure Adhesive's bonding agents' viscosities.

Materials and method: contact angle of the bonding agent of 3M Unitek Transbond XT andOrmco Enlight Light Cure Adhesive's bonding agents' was found using contact angle goniometer.

Results: The average contact angle for Ormco Enlight Light Cure Adhesive was 25.74 degrees and the average contact angle of 3M Unitek Transbond XT was 43.27 degrees

Conclusion: The low viscosity bonding agent Ormco Enlight Light Cure Adhesive can be conveniently applied for bonding orthodontic brackets.

Keywords: Contact angle, enlight light cure, Transbond XT, bonding agent, viscosity

Introduction

Orthodontic resins that are readily available on the market come in a variety of viscosities and filler particle concentrations. In order to adhere brackets to the enamel surface, it is used in conjunction with orthodontic adhesive primer(1). The difference between orthodontic primer and composite resin is the lack of filler particles. Primers are essential for the bonding process because of their viscosity and their dispersion into the enamel rods. Each primer's viscosity and consistency will produce various bonding properties for orthodontic brackets(2).

Since the development of the acid-etch method by Buonocore and the bonding of orthodontic brackets by Newman(1), numerous bonding adhesives have been produced. The first and most popular bonding resins were chemical curing bonding solutions. One notable drawback of self-cure adhesive systems is the inability to regulate the composite resin's setting time(3).

The use of light-cured polymers in vitro for orthodontic bonding was initially explained by Tavas and Watts(4). Because the tooth structure transmits visible light, the direct bonding approach uses both trans-illumination and direct illumination to cure the material inside metal-based brackets(5). Visible light causes rapid polymerization, which is of considerable benefit since it creates a "command set" with a practically infinite working time that enables more precise bracket placement(6).

Orthodontics has recently benefited from the availability of more sophisticated self-etching adhesive materials that streamline the bonding process by reducing the number of bonding steps and eliminating the need for etching and priming, thereby reducing the risk of contamination and accelerating the bonding process(7). These self-etching primers have showed advantages such lower enamel loss, decreased saliva contamination, and decreased chair time since they blend the conditioning and priming chemicals into a single acidic solution(8,9).

Additionally, a consistent flow of adhesive primer during bracket seating is necessary to guarantee the right bracket position(10). The position of the orthodontic bracket may rotate due to uneven adhesive(10,11). A correct bracket position could be altered by excessive adhesive flow during bracket seating. An uniform flow of glue is necessary for a bracket base to sit properly on the tooth surface. This is why there have been numerous attempts to enhance adhesive resin through the creation of new primers (monomers) and resins (filler)(12)

Since the 1960s, orthodontic treatment has routinely included acid etching of tooth surfaces to encourage the bonding of orthodontic attachments to the enamel(13). The past fifty years have seen the introduction of numerous kinds of orthodontic etchants and etching methods. There is a notable lack of agreement regarding the clinical outcomes of various dental etchants and etching procedures, despite the abundance of material on this topic that has been published(14).

The purpose of this study was to evaluate and compare two different orthodontic bonding agents.

Materials and method:

Two widely using orthodontic light cure bonding agent from ormco enlight and 3m transbond XT light cure adhesive system were compared for the study. single operator were handling the study to avoid bias. Contact angle of the prepared sealer materials were assessed by a sessile drop method using a goniometer (Ossila). Contact angle readings were recorded by placing 5 μ L of water in drops on the dried sealer material samples at five different regions. The average contact angle readings were reported.

Results and Discussion:

Table 1: Represents contact angle Ormco Enlight Light Cure Adhesive

Left Angle (°)	Right Angle (°)	Average Angle (°)	Left Contact Point (Pixel)	Right Contact Point (Pixel)	Droplet Width (Pixels)
28.06	23.41	25.74	598.3	1193.8	595.6
28.01	22.98	25.61	598.8	1194.3	595.8
28.12	23.62	25.24	601.1	1193.2	595.3

Table 2: Represents contact angle 3M Unitek Transbond XT

Left Angle (°)	Right Angle (°)	Average Angle (°)	Left Contact Point (Pixel)	Right Contact Point (Pixel)	Droplet Width (Pixels)
42.54	43.99	43.27	835.5	1290.1	454.6
41.89	43.64	43.01	832.7	1291.6	454.2
42.67	43.91	42.95	894.3	1290.5	454.7

Figure 1: contact angle Ormco Enlight Light Cure Adhesive

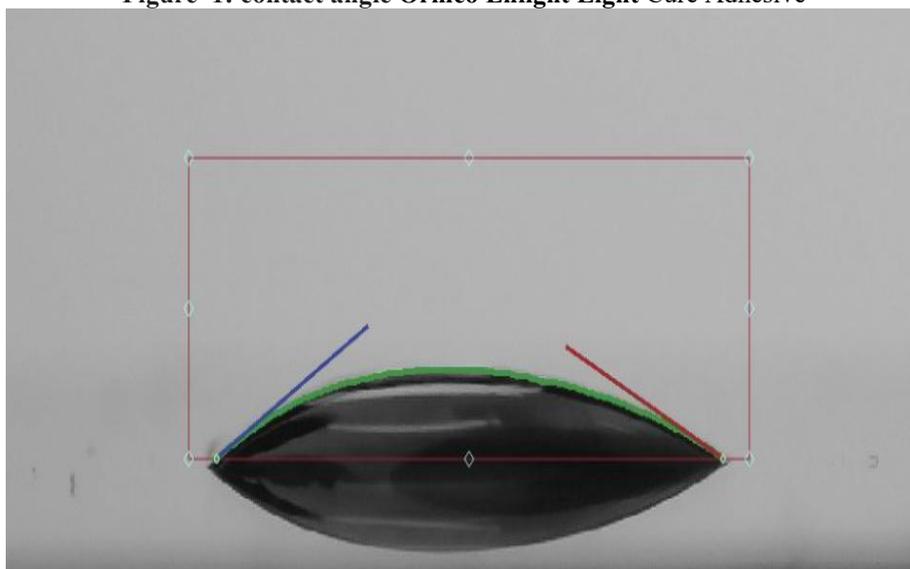
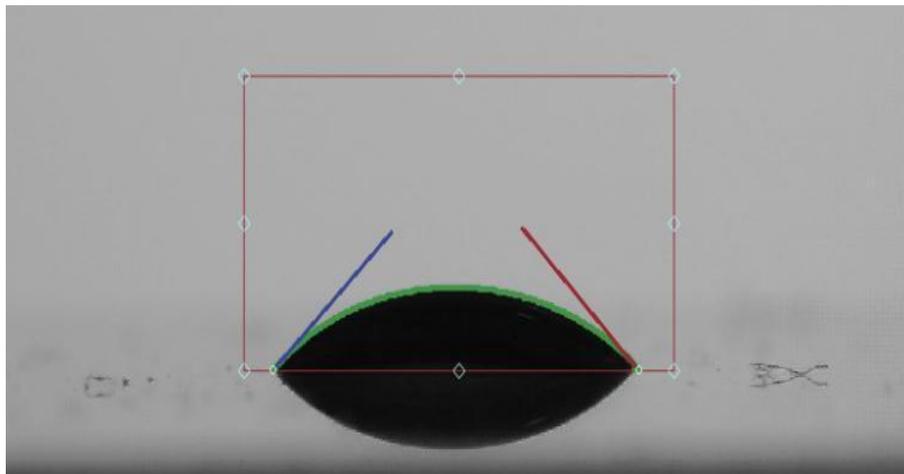


Figure 2: Represents contact angle 3M Unitek Transbond XT



From the study results low viscosity bonding agent produces the least contact angle which has better adhesive properties. The invention of enamel bonding for use in orthodontic applications in 1965 is regarded as a crucial turning point in orthodontic care. According to Owens and Miller, Buonocore, Bowen, Tavas, and Watts made it possible to directly bond orthodontic brackets to enamel(4). These scholars made significant contributions to the development of techniques and supplies that led to the current norms in orthodontic adhesives. Acid-etching, self-cure composite resins, glass ionomer cements, and visible light-curing adhesives have evolved from these initial efforts, and new technologies using unusual materials are continually improving the connection between brackets and natural or artificial items(15).

The orthodontic bracket's bond strength needs to be strong enough to withstand the forces used during orthodontic therapy. The innovative one-step self-etching adhesive system and the contemporary two-step self-etching primer are appealing additions to the clinician's bonding toolbox. An appropriate bond that fails at the enamel-composite contact would be preferred in orthodontics since it would make debonding and subsequent polishing considerably simpler.(16,17).

An orthodontic adhesive's bond strength should be sufficient to withstand the forces applied by the archwires, mechanical impact from chewing, biochemical changes in the oral cavity, as well as allow controlled tooth movement in all three planes, in order to reduce unexpected debonding during treatment. Once the procedure is complete, debonding should be trouble-free and without enamel damage.(18).

Conclusion:

The low viscosity bonding agent Ormco Enlight Light Cure Adhesive significantly low contact angle than the 3m unitek transbond XT light cure adhesive, hence ormco bonding agent can be conveniently applied for bonding orthodontic brackets.

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