بسم الله الرحمن الرحيم

"قالوا سبحانك لا علم لنا الا ما علمتنا انك انت العليم الحكيم"

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Comparative Study On The Bonding Capacity of filled Self-etch and Total-etch Adhesives To Dentin

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During the last three decades clinicians have been confronted with a continuous and fairly rapid turnover in adhesive dentistry ***(van Meerbeek et al., 2001).*** Satisfactory bonds between the restorative material and tooth structure are necessary to produce an acceptable restoration which is resistant to staining, leakage, bacterial invasion and pulpal sensitivity ***(Gallo et al., 2001)***. These can be successfully achieved through three main steps namely; etching of tooth structure, priming and application of bonding agents which are low viscosity resins that form a resin/dentin hybrid layer.

A number of new adhesive systems have been developed in attempt to reduce the steps and simplify clinical bonding procedures. Two major simplified bonding approaches have been developed. The first utilizes the total-etching technique to simultaneously remove the smear layers from both enamel and dentin surfaces, followed by the application of a one-bottle agent that combines the primer and the adhesive in one solution.

The second approach is the use of self-etching primers. Their bonding mechanism is based upon the simultaneous etching and priming of the smear-covered dentin using an acidic primer, followed by the application of an adhesive resin. Recently, all-in-one adhesive systems have been also introduced to simplify the etching, priming and bonding procedures into one solution and one step ***(Ceballos et al., 2003)***.

Most of adhesives are unfilled resins but recently, some manufacturers use filled adhesives by addition of fillers such as glass, fumed silica or elastic-type polymer. Fillers have been added to adhesive systems to improve the bond strength by reinforcing the hybrid zone and reduce polymerization shrinkage of the resin during light curing. On the contrary, the addition of filler hampers the ability of resin to adequately

penetrate the etched dentin surface and form a hybrid layer so, bond strength may be compromised ***(Gallo et al., 2001).***

Many controversial results have been found in the literature regarding the effect of filler addition to different bonding systems on the bond strength. These controversies may have existed due to the difference in the bonding mechanism adopting in the previous researches.

Therefore, it was found interesting to study the effect of filler incorporation in self-etch and total-etch bonding systems on the bond strength to human dentin.

I. Materials:

I.1. Four bonding systems were used in this study:

a) One filled (two-step) self-etch bonding system: which is composed of Tyrian SPE as self-etchant primer and One-step Plus bonding agent (fig.1).

b) One unfilled (two-step) self-etch bonding system: which is composed of Tyrian SPE as self-etchant primer and One-step bonding agent (fig.2).

c) One filled total-etch bonding system: which is composed of Uni-etch as acid-etch, and One-step Plus bonding agent (fig.3).

d) One unfilled total-etch bonding system: which is composed of Uni-etch as acid-etch, and One-step bonding agent (fig.3)

I.2. One visible light activated resin composite (AELITE) was used.

Specifications, chemical composition and manufacturers of the used materials are listed in table (1).

Fig. (1): Tyrian SPE self-etchant primer and One-step Plus bonding agent.

Fig. (2): Tyrian SPE self-etchant primer and One-step bonding agent.

Fig. (3): Uni-etch acid-etch, One-step Plus and One-step bonding agent.

Table (1): Specifications, composition and manufacturer of the materials used

Product	Specification	Composition	Manufacturer
One-step plus	***Filled universal bonding agent***	**.**Biphenyl-dimethacrylate **.**Bisphenyl-glysidyl-methacrylate **.**2-hydroxyethyl-methacrylate **.**CQ p-dimethylaminobenzoic acid **.**Acetone **.**8-10% Dental glass fillers	**Bisco inc, USA**
One-step	***Unfilled universal bonding agent***	**.**Biphenyl-dimethacrylate **.**Bisphenyl-glysidyl-methacrylate **.**2-hydroxyethyl-methacrylate **.**Acetone	**Bisco inc, USA**
Tyrian SPE	***Self-etchant primer***	***Part A***: **.**Ethanol **.**Water **.**Thymol blue ***Part B***: **.**2-Acrylamido-2-methylpropanesulfonic acid **.**Bis(2-(methacryloyloxy)ethyl) phosphate **.**Ethanol **.**2,4,6(trimethylbenzoyldiphenyl phosphine)oxide	**Bisco inc, USA**
Uni-etch	***Acid-etch***	**.**32% Phosphoric Acid **.**Benzalkonium Chloride	**Bisco inc, USA**
AELITE	***Hybrid resin composite***	**.**Ethoxylated bisphenol A dimethacrylate **.**Triethyleneglycol dimethacrylate **.**50-90 % Glass Filler **.**1-20% Amorphous Silica	**Bisco inc, USA**

The aim of this research was to study the effect of fillers on bond strength of total-etch and self-etch bonding systems to human dentin.

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This research was designed to investigate the effect of fillers on bond strength of total-etch and self-etch bonding systems. A total of 92 intact, sound, and freshly extracted human molars were selected to conduct the study. Eighty molars were used for shear bond strength testing and 12 molars were used for scanning electron microscopic study. For shear bond strength testing, each tooth was horizontally embedded in a specially fabricated cuboidal shaped copper mould using self-curing acrylic resin and the buccal surfaces were ground to expose a flat superficial dentin surfaces. The prepared specimens were divided into two equal groups, 46 specimens each, according to the type of bonding systems (A) utilized. In the first group, (A_1) self-etch bonding systems were used. While in the second group, (A_2) total-etch bonding systems were used. Each group was further subdivided into two subgroups, 23 teeth each, according to the presence of filler in the bonding agent (B). In the first subgroup (B_1), an unfilled bonding system (One-step) was used. In the second subgroup (B_2), a filled bonding system (One-step Plus) was used. Resin composite (AELITE) build ups were constructed and light cured.

Specimens were then loaded to failure at the base of the resin composite using a specially constructed attachment fixed to a universal testing machine, at across head speed 0.5 mm/minute. The shear bond strength values were recorded, tabulated and statistically analyzed.

The remaining 12 samples were used to study resin-dentin interface. After various treatments 3 representive samples from each group, were examined using scanning electron microscope.

The results revealed that for both bonding techniques (total-etch and self-etch) the filled bonding systems (One-step Plus) showed statistically significantly higher mean shear bond strength values compared to their