

CHAPTER I

INTRODUCTION

The conventional orthodontic bonding to enamel includes several steps. First, the enamel surface is prophylactically cleaned and then etched with 37% phosphoric acid for 15-30 seconds. The enamel surface is then rinsed with water and dried until a chalky appearance is shown. Finally, a layer of primer is applied to the enamel, and a bulk of composite resin is applied on the bracket base before positioning the bracket.¹ The disadvantages of this technique are as follows: long operating time, risk of saliva contamination and inconvenience of patient and operator. Recently, self-etching adhesive systems have been introduced by combining the etching and priming steps. These systems reduce bonding time, eliminate the rinsing step and allow easy moisture control.¹ Some researchers have claimed that bond strength values with self-etching adhesive systems were not significantly different from those with total-etching adhesive systems.²⁻⁶ Furthermore, the self-etching adhesive systems have gained acceptance in clinical use.²⁻⁶ There was no difference in the survival rate of brackets between total-etching adhesive system and self-etching adhesive system.⁷ Moreover, Vicente *et al.*⁶ have reported that self-etching adhesive systems left significantly less adhesive remnant on tooth surfaces than did the total-etching adhesive systems. On the other hand, some studies have reported that bond strength values with self-etching adhesive systems were significantly lower than those with total-etching adhesive systems.^{5,8-10}

Self-etching adhesive systems can be classified into two-step and one-step application procedures. One-step self-etching adhesive systems were developed to reduce the number of steps during bonding procedures by combining etchant, primer and bonding agents into one compound. Some researchers¹¹ have claimed that the shear bond strength of one-step self-etching adhesive systems was lower than that of two-step self-etching adhesive systems, whereas others^{12,13} have shown that the shear bond strength of one-step self-etching adhesive systems was not significantly different from that of two-step self-etching adhesive systems.

Originally, brackets were made of metal. The disadvantages of metal brackets are lack of aesthetics and long curing time.¹⁴ Most patients search for esthetics during treatment, so the ceramic bracket system was later introduced.^{15,16} Ceramic brackets are transparent and color stable. Ceramic brackets are strong, difficult to deform, resistant to compressive strengths, and require less curing time.^{17,18}

Adhesive Precoated brackets (APC, 3M Unitek Dental Products, Monrovia, Cal., USA) were introduced in 1992.¹⁹ They provide uniform thickness of resin composite at the bracket base, reduce operating time of bonding procedures, reduce contamination, and easier cleanup after bonding.¹⁹ Recently, the new APC Plus system (3M Unitek Dental Products) provides increased tolerance to moisture, and releases fluoride.

The use of one-step self-etching adhesive systems combined with ceramic precoated brackets may improve bonding efficiency, provide less operating time by reducing the intermediate steps in the bonding procedure, increase cost effectiveness and maximize esthetics for patient satisfaction. However, the clinical use of these

combination systems is controversial. So, this research was directed to compare mean shear bond strength values of a total-etching adhesive system, a two-step and a one-step self-etching adhesive system for bonding uncoated ceramic and precoated ceramic brackets.

Purposes of the study

1. To compare mean shear bond strength values among a total-etching adhesive system, a two-step self-etching adhesive system and a one-step self-etching adhesive system for bonding uncoated ceramic brackets.
2. To compare mean shear bond strength values among a total-etching adhesive system, a two-step self-etching adhesive system and a one-step self-etching adhesive system for bonding precoated ceramic brackets.
3. To compare mean shear bond strength values between precoated and uncoated ceramic brackets bonded with a total-etching adhesive system, a two-step self-etching adhesive system and a one-step self-etching adhesive system.
4. To evaluate the adhesive remnant index (ARI) on tooth surfaces after debonding.

The hypothesis for this study was:

There is no significant difference in mean shear bond strength values among a total-etching adhesive system, a two-step and a one-step self-etching adhesive system for bonding ceramic brackets.

The hypothesis will be rejected if there are significant differences and then, a multiple comparisons test will be used to analyze the differences at the same significance level.

Anticipated benefits

1. Providing information for the selection of proper bonding adhesive systems with ceramic brackets for orthodontic bonding procedures
2. Basic knowledge for further studies

Scope of the study

This *in vitro* study was aimed to investigate the mean shear bond strength values of a total-etching adhesive system, a two-step and a one-step self-etching adhesive system for bonding uncoated and precoated ceramic brackets. The amounts of residual adhesive on de-bonded enamel surfaces were also evaluated.