

CHAPTER I

INTRODUCTION

At present, the bonding technique using brackets is commonly used in fixed orthodontic treatment. This technique is more advantageous compared to the use of cemented metal bands because it has less periodontal problems, and because no band space is left to be closed after orthodontic treatment. During fixed orthodontic treatment, accurate bracket placement is an important step. Adhesives, both self-cured and light-cured, are used to bond orthodontic brackets to tooth surfaces.

The 'time-control' feature makes light-cured adhesives better than self-cured adhesives. Light-cured adhesives are more widely used and more popular in clinical practice than self-cured adhesives because the setting time of self-cured adhesives is uncontrollable. This condition limits the time a dentist has to accurately position the brackets and causes difficulty in removing excess adhesive. Also, two-phase self-cured adhesives require mixing of the two components to activate polymerization.

The mixing causes air traps in the material and affects the physical properties of the adhesives.¹

With light-cured adhesives, clinicians can control the setting time because photo-polymerization of a light-cured adhesive material can occur only when it is activated by light of a specific wavelength for the optimal curing time. A curing time of 20 to 40 seconds with conventional halogen lamps is required to complete the polymerization for bonding one bracket to tooth enamel; thus it would take a rather long period of time for full mouth bracket placement. And this means more risks of

bonding failure from contamination of the brackets or from displacement of the brackets on tooth enamel before complete polymerization of the adhesives. During the bonding process, contamination control is important to achieve maximum efficiency and to prevent bracket placement failure.

There are many ways to reduce working time during the bonding process for light-cured adhesives. For example, the use of self-etch adhesives eliminates the etchant rinsing process. Other methods are the use of one-step adhesives, the use of adhesive-pre-coated (APC) brackets, and the use of different light activated systems which produce high light intensity.

In 1995, Mill *et al.* proposed a light-emitting diode as another method of light curing in dentistry.² This high-intensity curing unit is an alternative to a conventional halogen lamp. The high-intensity reduces the curing time for complete polymerization of adhesives. Since less time is consumed during the bonding process, the risk of bracket failure can be decreased. It is also more comfortable for patients.

The adhesives should provide adequate bond strength to achieve the maximum efficiency during orthodontic treatment. Clinically optimum bond strength for bonding orthodontic brackets is 6 to 8 Mega Pascal (MPa).³ This investigation was directed to compare shear bond strength of adhesives cured by a high-power light emitting diode curing unit at various curing times in order to find the minimum curing time of a light-emitting diode curing unit compatible with adequate shear bond strengths for bonding orthodontic stainless steel brackets.

Purpose of the study

- 1) To compare shear bond strength of adhesives cured by a high-power light-emitting diode curing unit at various curing times for bonding orthodontic stainless steel brackets.
- 2) To measure the Adhesive Remnant Index (ARI) on enamel surfaces after debonding brackets which are bonded with adhesives at various curing times.

Null Hypothesis

There is no difference in the shear bond strength values of adhesives cured by a high-power light-emitting diode curing unit at various curing times for bonding orthodontic stainless steel brackets.

The null hypothesis will be rejected if there is a significant difference in the shear bond strength values of adhesives cured by a high-power light-emitting diode curing unit at various curing times.

Scope of the study

This experimental study was aimed to compare shear bond strength of adhesives cured by a high-power light-emitting diode curing unit at various curing times for bonding orthodontic stainless steel brackets.