UNIVERSITY TEKNOLOGI MARA

THE EFFECT OF CURING METHODS AND LOADING TIME ON SHEAR BOND STRENGTH OF ORTHODONTIC BRACKETS

FAISAL ISMAIL EL-SAYED BAHNASI

Thesis submitted in fulfilment of the requirements for the degree of Master of Dental Science Faculty of Dentistry

November 2010
Candidate’s Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree to be subjected to the disciplinary rules and regulation of University Teknologi MARA.

Name of Candidate: FAISAL ISMAIL EL-SAYED BAHNASI
Candidate’s ID No.: 2008792275
Program: Master of Science in Dentistry
Faculty: Dentistry
Thesis Title: The Effect of Curing Methods and Loading Time on Shear Bond Strength of Orthodontic Brackets

Signature of Candidate: ........................................
Date: November 2010
Abstract

The introduction of light cured materials in dentistry had led to the development of different curing devices with different curing times. **Objectives:** to evaluate the effect of light curing units, curing times and the effect of delay loading on shear bond strength (SBS) of orthodontic brackets. **Methods:** 120-extracted human teeth were divided into 12-groups of 10-teeth each and bonded with stainless-steel brackets by using 3M Unitek Transbond XT composite. Specimens were cured with halogen, LED and plasma arc lights with different times. 6-groups of the specimens were tested after 5min in shear with Shimadzu Precision Universal Tester at a cross-head speed of 1mm/min until brackets debonded. The rest of specimen were stored in distilled water at 37°C for 24h and then subjected to the same loading. The bond strength was calculated by dividing the force in Newton to the surface area. Data were subjected to statistical analysis to identify differences in mean SBS with respect to curing time and time of force loading. **Results:** There was no significant difference between 6-groups with debonded force after 5min. However the other 6-groups with debonded force after 24h showed a statistically significant difference, group 10, LED 20s was significantly higher than LED 10s, plasma arc 6s and plasma arc 10s. **Conclusion:** SBS of all curing light devices with applied force after 5 min gave values more than the normal range; therefore arch wire can be inserted at the same visit. Within limit of this study, halogen (20 and 40s), LED (10 and 20s) and plasma arc (6 and 10s) can be used to bond brackets, however if high is needed, LED 20s with loading time after 24h is recommended.
# Table of Contents

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE PAGE</td>
<td>ii</td>
</tr>
<tr>
<td>AUTHOR'S DECLARATION</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>v</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiv</td>
</tr>
<tr>
<td>LIST OF PLATES</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 1: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>1.2 PROBLEM STATEMENT</td>
<td>6</td>
</tr>
<tr>
<td>1.3 OBJECTIVES</td>
<td>6</td>
</tr>
</tbody>
</table>
1.4 SCOPE OF WORK

1.5 SIGNIFICANT OF RESEARCH

CHAPTER 2: LITERATURE REVIEW

2.1 Composite Resin and Curing Systems
   2.1.1 Background
   2.1.2 Chemically-Cured Composite System
   2.1.3 Light-Cured Composite System

2.2 Curing Devices and Times
   2.2.1 Background
   2.2.2 Curing Devices
   2.2.3 Preliminary Studies

2.3 Bond Strength
   2.3.1 Background
   2.3.2 Bracket Design
   2.3.3 Adhesive Remnant Index (ARI)

2.4 Time of Loading
   2.4.1 Background
   2.4.2 Preliminary Studies

CHAPTER 3: MATERIAL AND METHODS

3.1 Preparation of the Sample