MANILA CENTRAL UNIVERSITY

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MASTER OF SCIENCE IN DENTISTRY - ORTHODONTICS

THE SHEAR BOND STRENGTH BETWEEN PERFORATED LINGUAL BUTTON AND CONVENTIONAL LINGUAL BUTTON: AN ANALYSIS.

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Abstract

Introduction: Dentistry in general and orthodontics in particular strongly relies on advances in material science. Lingual buttons have many applications in orthodontics such as the application of elastics, crossbite correction, bonding impacted canine, extrusion of teeth, habit breaking, anchorage augmentation. **Methods:** In this study, different research instruments were used to determine the different shear bond strength of conventional and perforated lingual buttons. These instruments were human premolar teeth that had no caries, no restoration, and no cracks in the tooth surface. The study use 37% phosphoric acid gel Etching Solution manufactured by Ormco , Orth Solo was used as bonding agent and Ormco Enlight light cure adhesive composite and lingual buttons were used in this study. Instron Machine was used to measure the shear bond strength with the crosshead speed 1.5mm/min. **Results:** The results of the study showed no significant difference in the shear bond strength of conventional lingual buttons and perforated lingual buttons. Although there was a large amount of numerical difference in the mean values of the two types of lingual buttons, the results were not significant based on the t-test results. However, the standard deviation of both types of lingual buttons had parallel results.The bond strength of the perforated lingual buttons (8.09 MPa) was significantly higher than that of the conventional lingual buttons (6.52 MPa) and both were within the acceptable level for clinical use. **Conclusions:** The results suggest that the conventional and perforated lingual buttons are within the acceptable limits and can be use for orthodontic treatment purposes.This study recommends the use of perforated lingual buttons for clinical practice to save treatment time during orthodontic treatment as perforated lingual buttons lessen bonding failure when subjected to high forces.

Key words: lingual button, bonding failure,shear bond strength.

INTRODUCTION

Lingual buttons have many applications in orthodontics such as the application of elastics, crossbite correction, bonding impacted canine, extrusion of teeth, habit breaking, anchorage augmentation, and lingual bonded retainer. Lingual buttons are supplied as metal that maybe either curved or flat, which limits the use on all teeth. Some of the companies supply polyurethane aesthetic lingual buttons.Adhesive bonding of attachment is important for orthodontics, especially in terms of the fixation of attachment to teeth. This situation involves the joining of the solid substrates or adherents by an intervening layer of adhesive agent. Two things that are crucial here are surface interface characteristics and the inherent properties of the adhesive.

The study focused on the shear bond strength of conventional and perforated lingual buttons. It included human teeth without any caries, lesion, or restoration, without cracks and have smooth.-surface,.specifically upper, and lower premolars.

METHODS

This study used purposive sampling technique to determine the effectiveness of perforation in the lingual buttons on the shear bond strength. Thirty (30) human premolars were used as samples, fifteen (15) for each group.

GroupA: Conventional lingual button
GroupB: Perforated lingual button

According to the specification of Universal Testing Machine (Instron), acrylic blocks of thickness 10 mm, width 10 mm and height 25 mm were fabricated to mount the thirty (30) sample teeth. The acrylic blocks were made of a wax pattern made of the required dimension and rubber impression taken to make a mold. Mixing acrylic monomer liquid and powder was made and inserted into the mold. The premolar was inserted at the center on top, in a direction such that the long axis of the premolar and the vertical axis of the mold would be parallel, up to the height of 1mm, below the cementoenamel junction. The mesial and distal sides of the crown were facing the flat side of the block and the buccal and lingual surfaces towards the edges. The block was removed from the mold.The acrylic sets and any excess acrylic material and borders were trimmed. Acrylic blocks held the tooth while the Instron machine was used.

Figure 1. Group (A)
Conventinal lingual button.

Figure 1. Group (B)
Perforated lingual button.

The tooth was cleaned with pumice to remove surface debris and to expose a clean enamel surface to start the etching process by 37% phosphoric acid gel etching solution manufactured by Ormco for 30 seconds. Afterwards, the tooth was rinsed with water for 20 second and was dried. Second bonding agent ortho solo was applied on the tooth and light cure for 10 seconds. Adhesive material Ormco Enlight Light Cure Adhesive Composite was applied on the lingual buttons and light cure for 40 seconds. The tooth was kept soaked in saline solution in room temperature until testing .

Figure 3. Premolars embeded in the acrylic block

Figure 4. Perforated and convetional Lingual buttons attach to the teeth

Figure 5. Prepared acrylic blocks with embedded premolar and bonded lingual button loaded into Instron® Testing Machine.

RESULTS

The results of the present study revealed that there was no significant difference in the shear bond strength between the conventional lingual buttons and the perforated lingual buttons. The effect of the conventional and perforated lingual buttons on shear bond strength was not significantly different at p> 0.05 . The t- test results revealed that there was no significant difference in the shear bond strength between Conventional and Perforated Lingual Buttons as shown in table 1.

	Mean (MPa)	SD	t-test Two-tailed	Degree of freedom	p-value	interpretation
Conventional lingual button	6.52	3.43	-1.183	28	.247	Not Significant
Perforated lingual button	8.11	3.85				

Table 1 : The Difference in the Shear Bond Strength between Conventional and Perforated Lingual Buttons and t-test Results

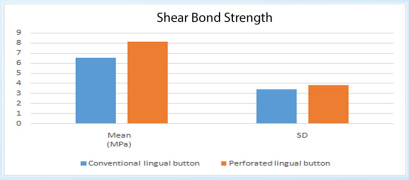

Figure 6. Paradigm showing the mean and standard devilation of the shear bond stregnth of conventional and perforated lingual buttons.

DISCUSSIONS

A shear bond strength of 6 to 8 MPa is reported to be adequate for most clinical orthodontic needs. These values are considered able to withstand masticatory and orthodontic forces. Lopez(1980) as well as Reynolds(1976) suggests that shear strength should be 6–8 MPa.

CONCLUSIONS

The shear bond strength of the perforated lingual buttons (8.09 MPa) was significantly higher than that of the conventional lingual buttons (6.52 MPa). Both the conventional and perforated lingual buttons were within the acceptable limit and can be used for orthodontic treatments. Orthodontists should choose the best lingual buttons that will cause less bonding failure for faster treatment time. This study recommends the use of perforated lingual buttons for clinical practice.