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Effect of Different Surface Treatments on the Light Transmission and Adhesion of Two Types of Glass Fiber Posts

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ABSTRACT

Purpose: The purpose of the current study was to compare the effect of different surface treatments on the light transmission and adhesion of two types of posts. **Materials and Methods:** Two groups of glass Fiber post specimens (Glassix) Conventional glass fiber post and (Glassix plus) Translucent glass fiber posts were prepared 10 mm length and 1.5 mm diameter (n = 40). The groups were classified into four sub groups (n=5): Group 1: Did Not receive any treatment; Group 2: treated with hydrofluoric acid (HF) 9.6%. Group 3: treated with 110 μm Al_2O_3; Group 4: exposed to (Er-Cr:ySGG) laser. The light transmittance of the specimens was compared using a spectrophotometer and bond strength measured for each post at (middle-apical-coronal) using universal testing machine. **Results:** there was no significant effect of surface treatments on light transmittance of posts ($P > 0.001$) control group had the highest values while the HF group had the lowest value. Surfaces treatment had significant effects on bond strength of posts ($P < 0.001$) translucent post had bond strength higher than conventional post. **Conclusion:** Application of surface treatments had no significantly effect on the translucence property of fiber posts but significaly Affected bond strength.

KEYWORDS

Fiber post,
Laser,
Light transmittance,
Surface treatment

INTRODUCTION

Endodontically treated teeth restored with all-ceramic units in high demand esthetic zone, led to the production of esthetic fiber posts as glass fiber posts (FRC), and zirconia- posts.(1) FRC posts made from fibers (carbon, quartz, silica, zirconia, or glass) in a resin matrix with a silane coupling agent binding the fibers and matrix together(2).

Paper extracted from thesis titled "Effect of Different Surface Treatments on the Light Transmission and Adhesion of Two Types of Glass Fiber Posts "

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The amount of translucency differs from one type of fiber posts to anther some fiber posts was recorded Limited or did not transmit the light. [3] Ability of the post to transmit the light was evaluated. [4] This concept was raised depending on the ability of posts to pass the light to allow enough curing of resin cements in deep portion of the root.

Mechanical and chemical treatment of post have been tried to overcome post–cement adhesion failure. Mechanical surface treatment such as air abrasion of the post surface under high pressure was conducted. It relies on particles abrasion with different particle sizes to remove superficial layer resulted in irregular surface that increase the degree of adhesion [5]. Airborne-particles abrasion was reported to significantly improve adhesion of fiber posts [6]. Recently laser treatment technology has become available as an alternative method to enhance the bond strength of dental substrates and materials [7].

MATERIALS AND METHODS

Prefabricated glass fiber posts (Glassix(*n* =20) and Glassix plus (*n* =20)were prepared for 10 mm length and 1.5 mm diameter and divided into four groups .Group 1, not receive any treatment, and for Group 2, posts were exposed to 9.6% hydrofluoric acid for 60 second and washed with running water for 2 min , In Group 3, the samples were abraded with 110 μm Al_2O_3 particles. In Group 4 the posts were exposed to 1.5 W Er-Cr laser the time of exposure at 10s, and at the distance10 mm. Moreover the hand piece applied air and water that was adjusted to a level of 85% air and 85% water during the lasing of the specimens. Light transmission was measured using spectrophotometer.

Preparation of samples:

Circular teflon molds were fabricated about 10mm in length and 3mm in diameter with central hole was fabricated to centralized the post. Cementation of post using RelyX Unicem. The excess of cement removed. Then curing for 40 seconds. After complete setting of the cement acrylic resin block former was used for construction acrylic resin block. Each block sectioned into three parts (middle apical and coronal) bond strength measured by universal testing machine Figure(1).

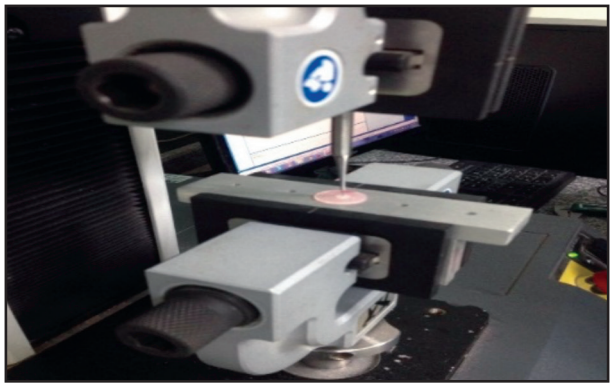

Figure (1) Push out test

RESULTS

Statistical analysis by a one-way (ANOVA) revealed no significant difference of translucence parameter values within Table(1). The bond strength mean values, within groups are presented in Table (2). The bond strength mean values regarding to root segments are presented in are presented in Table (3)

Table (1): *Comparing the translucence parameter mean values of surface treatments within groups.*

Groups / Sub groups	Control	Laser	AA	HF	P
Glassix(Sd)	1.29	.28	1.37	0.33	0.118
Glassixplus(Sd)	2.6	1.6	1.6	2.1	

** Significant at P ≤ 0.05, non-significant at P> 0.05*

Table (2) *Comparison between the bonding strength mean values of surface treatments.*

Control (C)		Laser (L)		Air abrasion		9.5 % Hydrofluoric acid		*P*
Mean	SD	Mean	SD	Mean	SD	Mean	SD	
12.2	2.5	13.2	4.3	16.1	2.5	10.9	2.5	0.001*

** Significant at P ≤ 0.05, non-significant at P> 0.05*

Table (3) *Comparison between the bonding strength values regarding to root segments*

Coronal		Middle		Apical		*P*
Mean	SD	Mean	SD	Mean	SD	
13.45	3.7	12.95	3.3	11.98	3.4	0.761

** Significant at P ≤ 0.05, non-significant at P> 0.05*

DISCUSSION

Several studies suggested that loss of bond between the post and resin materials due to loss of retention as a result of inadequate bond strength [8].Some authors suggested that failures occurred between post and cement[9]. Some factors have effect on the bond of post to resin as methods of pretreatment, manufacture of the post and the composite resin cement.

Previously, few reports have evaluated the light transmitting ability of posts [10]. No research evaluated the effect of surface treatment including laser treatment on light transmitting property of posts. Therefore, the tested null hypothesis was the surface treatment of fiber posts adversely affect translucence property of fiber posts. The bonding strength values of the current study showed that air abrasion surface treatment significantly improved the bonding strength compared to untreated group. This result explained that air abrasion results in increased surface roughness and surface area. In this research, evaluated the use of laser with wave length(1.5Hz) on the bonding of post to composite resin restoration. Some authors evaluated different powers of the laser. By using 1.5W laser for (20 pulses/sec) [11] result in irregularities on surface of the post.

The effects of application of hydrofluoric acid within different concentrations and on post have been investigated [12]. It has been shown that the concentration of 4%[13] and 5% of acid gel for 60sec increased the bond of post .the concentration of 9.5 of HF used by Some authors [14,15] for 20sec, this results in increasing the bonding strength . In this study, 9.6 % acid was added to types of post. In comparison with previous studies,[16,17] quartz fiber post exposed to HF acid were reported high bonding strength. But for glass type showed the low bonding strength. this study showed that no difference in the bond strength among root regions. This conclusion are consistent with other studies that reported that bond is not affected by the root region [18].

On the contrast to another study [19] found that the cervical region have high bond but the apical region have low bond strength. This results show that there are difficulty in penetration of cement in to the deep region. reduction in bond strengths in middle and apical region resulting in decrease in light transmission which lead to decrease in the curing of the luting cements.

Another study [20], found different in bond strength related to root part. Irrespective of post type, this result achieved in the superficial region, have the high strength values whereas the deep region have low bond strength.

CONCLUSION

1. The surface treatments of fiber post might have non-significant effects on light transmitting properties.
2. Surface treatment with Al_2O_3 increase the bond strength however 9.5% of acid gel application for 1min decrease the bond between the post and resin material.
3. Laser1.5Wused in this study enhance the bonding between the post and resin material.

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