



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

COMPARISON OF EFFECTIVENESS OF TOTAL ETCH VS SELF ETCH DUAL CURE RESIN CEMENT FOR LUTING OF GLASS FIBER POST - AN IN VITRO STUDY.

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Manuscript Info

Manuscript History:

Received: 17 January 2016
Final Accepted: 19 February 2016
Published Online: March 2016

Key words:

Total etch, Self etch, Dual cure resin cement, Glass fiber post.

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Abstract

Introduction: The purpose of this study was to evaluate the influence of dual cure resins with total etch and self etch adhesive systems on the retention of fiber posts.

Method: 60 freshly extracted human maxillary incisors with straight roots were biomechanically prepared. Obturation was done with gutta percha. The post space was created. The specimens were divided into two groups of 30 teeth each according to the material used for luting of posts. Group 1 had dual cure resin cement with total etch adhesive (Relyx ARC cement), group 2 had dual cure resin cement with self etch adhesive (Panavia). Prepared samples were tested on the Universal testing machine for pull out strength.

Result: Among the cementing media the pull out strength obtained with group 1 (dual cure resin cement with total etch, Relyx ARC) and group 2 (dual cure resin cement with self etch, Panavia F) was the same.

Conclusion: Based on the results of this study it can be concluded that the dual cure resin cement with total etch as well as self etch were equally efficacious in the retention of post.

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Introduction:-

Endodontically treated teeth may present with extensive loss of tooth structure resulting from caries, endodontic access, previous restorations and fractures. The use of post and core in root canal treated teeth having insufficient remaining coronal tooth structure is an universally acceptable procedure. Posts provide retention for the core and increase the retention form of the tooth. But post should be used judiciously as its placement and preparation of post space can significantly weaken the root and lead to fracture (7).

Cement selection for luting of posts is critical for retention of all types of posts. Using fibre reinforced post with bonding agents allows for the preservation of maximum amount of dental structure. Resin cements can increase retention and provide strengthening of the root (14). Use of resin cement with a bonding agent when placing a post may help to limit microleakage.

Resin cements can be classified on the basis of their adhesive scheme as total etch and self etch. Total etch the older and more commonly used technique provides very high bond strength but the multi step application technique is complex and might compromise bonding effectiveness because each step presents a possible contamination point.

Self etch technique reduces the number of steps during application and thereby reduces operator error, technique sensitivity and is easier to use (12).

This study thus compared the effectiveness of total etch vs self etch dual cure resin cement for luting of glass fiber post.

Materials and method:-

Sixty freshly extracted human maxillary central incisors with straight roots were selected for this study. The specimens were stored in normal saline solution till they were used in the study. Coronal and cervical portions of each tooth were sectioned using a single faced diamond disk (Microdont technology, Germany) at low speed.

The working length was established 1mm short of the apex. Biomechanical preparation was done with protaper files. Shaping of the root canal was done with files S1 and S2 till full working length. Then finishing was done with the files F1, F2, F3 & F4 upto full working length. Irrigation of the root canal was done with 0.5% sodium hypochlorite after every subsequent use of the files. The canals were dried with paper points. Protaper gutta percha cones were used for obturation.

The preparation bur of a tapered glass fiber reinforced post (of diameter 1.5mm) was selected for post space preparation. Upon completion of the preparation, each specimen was embedded into chemically cured acrylic resin leaving 3mm of the most coronal portion of the specimen. After preparation, all the 60 specimens were randomly divided into two groups considering the strategies for post cementation.

Group 1: 30 Posts luted with Dual cure resin cement with Total etch adhesive system (Relyx ARC cement).

Group 2: 30 Posts luted with Dual cure resin cement with Self etch adhesive system (Panavia F)

The fibre glass posts were tested inside the post spaces for their fit in the post spaces.

GROUP 1 (Relyx ARC): Group 1 utilized the total etch technique. The post space was dried with multiple paper points. Etching of the preparation was done for 15 seconds. Then it was rinsed with abundant water. The canal was dried with the aid of paper cone and the drying of coronal enamel was done with a jet of air without over drying it. The bonding agent was then applied on the root canal walls with a micro brush and then light cured with an LED light curing unit for 20 seconds. Equal amounts of two pastes of Rely X were dispensed onto the mixing pad and were mixed with a cement spatula for 10 seconds.

GROUP 2 (Panavia F): Group 2 utilized the self- etch technique. The post space was dried with the help of multiple paper points. Equal amounts of ED primer IIA & B was then mixed and applied onto the post space. Then it was left as such for 30 seconds. It was gently air dried. Excess primer was removed with paper points. Equal amount of Panavia Paste A & B were then dispensed and mixed.

For both Group 1 and Group 2 the cement was then applied on to the root canal walls with the help of lentulospiral. The cement was also applied onto the posts with the spatula. Posts were then seated into the root canal with firm finger pressure. The excess cement was removed gently. The cement was then light cured using LED curing light (Figure 1).

After cementation, specimens were stored in distilled water at 37°C for 24 hours in Humidor.

Universal Testing machine was used for this study to test the pull out bond strength (Figure 2).

The obtained data were submitted to Anova, and t Test for statistical analysis.

Results:-

The mean value of pull out bond strength for Relyx ARC (Total etch) was 13.34 kgf and for Panavia F the value was 12.2 Kgf. The difference between the two groups Total etch adhesive system and Self etch adhesive cement was statistically insignificant.

Discussion:-

Restoration of endodontically treated teeth often gets complicated due to loss of tooth structure by caries, restorative procedures, fractures and endodontic access preparation. Endodontically treated teeth dry out over time and changes in collagen cross-linking also take place making them more susceptible to fracture. Therefore such teeth are weaker and have a lower life time prognosis. They require special considerations for final restoration particularly when there has been extensive loss of tooth structure. Posts are indicated when there is insufficient tooth structure remaining to support the final restoration.

Fiber-reinforced posts have been recommended because of their dentin like Young's modulus. So, the use of prefabricated fibre posts can potentially reduce the incidence of root fractures (6).

The quality of the cement is fundamental for post retention. Failure of the luting cement may lead to post failure that includes loosening of the post or root fracture.

Dual-cure resin cements were introduced to combine the favorable characteristics of self- and light-cured agents. The rationale was to develop a material with extended working time capable of reaching high Degree of Conversion in either the presence or absence of light.

Resin cements can increase retention, leak less than other cements, and provide strengthening of the root (14). It improves marginal adaptation with improved apical seal, increases post retention even with reduced post length, and relieves stresses within the root. Using resin as a cementing agent will provide adhesive bonding within the root canal space with polymer dentine bonding agents and resin cement of similar flexibility (4).

Current adhesive techniques and materials can create a monobloc of multilayered structures, where dentin, adhesive, resin cement, post, core and the final restoration are directly or indirectly bonded to each other, resulting in higher bond strength at each interface. The adhesive cement is the unifying bond between these components.

However, there are unfavourable conditions regarding the application of adhesive techniques within the root dentin predominantly because of inadequate access. A visual control is not possible in such cases. Thus, remnants of post space preparation and acid may remain within the root canal which may result in numerous voids and gaps within the cement interface.

Meanwhile, from the mechanical viewpoint, resin cements generally exhibit a better performance. Saupe et al. (1996) emphasized their strengthening effect on roots with thin walls (10).

Total etch adhesive system is a multiple application technique which increases the chances of operator error. In contrast in self etch technique which is a newer technique the number of steps are considerably reduced and is very convenient for the operator.

In the present study, bond strengths of luting agents to fibre posts were evaluated using a pull out bond strength test. The push-out force is compressive in nature and unlike the pull-out force which is tensile.

As in the present study many recent investigations did not show any significant difference in bond strengths to coronal dentin between an etch and rinse adhesive compared with a two step self etch adhesive, even after long term thermo-mechanical loading (8, 11).

In contrast to the present study in one study higher enamel bond strengths was reported when adhesive cements were combined with total-etch adhesives compared to the use of self-etch adhesives (3).

According to Bitter et al (2004) hybrid layer was detected in etch and rinse as well as in self etch adhesives though the thickness of the hybrid layer may vary. The exchange intensity induced by etch and rinse adhesives exceeds that of the self etch adhesives. This could explain the small hybrid layer thickness of the self etching adhesives in this investigation. The solvent of the self etching adhesives ED primer was water which might be reason for the reduced hybrid layer thickness. Another reason might be the more effective demineralization ability of phosphoric acid compared with the self etching adhesives which allowed a deeper penetration of the adhesive into dentin (2).

Another reason reported for the reduced hybrid layer thickness for self etching adhesive may be the inability to penetrate through thick smear layers, which are typical for prepared root canals.

According to Inoue et al (2001) thickness of hybrid layer is of minor importance for effectiveness of bonding (5,9,13). Alberto Albaladejo (2010) suggested the absence of correlation between hybrid layer thickness and bonding efficacy as long as a uniform demineralization front is created at the underlying dentin and it is fully impregnated by resin (1).

Thus, while the result of this study confirms those of previous studies in part, more comparative studies are indicated.



Figure 1: sample after luting of post.



Figure 2: universal testing machine for testing the pull out bond strength.

Conclusion:-

Within the experimental condition of this study it was concluded that both the dual cure resin cement with total etch as well as self etch adhesive cements were equally effective in retention of post. As self etch adhesive system is easier to use it can be used in place of total etch adhesive system.

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