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Research Article

## STUDY TO KNOW THE EFFECTIVENESS OF LITHIUM DISILICATE ONLAYS FOR TEETH RESTORATION WITHOUT OR WITH FIBER POST UP BUILD AFTER IN VITRO FRACTURE

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**Abstract:**

***Objective:** The purpose of this analysis was to compare the strength of the fracture of the human teeth managed with lithium disilicate onlays without or with post-fiber accumulation.*

***Study Design:** A comparative study.*

***Place and duration:** In the Department of Prosthodontics of Punjab Dental Hospital, Lahore for one-year period from December 2017 to December 2018.*

***Methods:** 20 human mandibular molars were sectioned horizontally and into 2 groups were divided (n = 10). In Group A; no treatment was given. Endodontically, group B teeth were treated formed using a composite core or fiber post and providing a 1 mm circumferential chamfer were prepared. The lithium layers of disilicate were bonded and pressed to the teeth using a double-cured cementing compound. Under static load; Teeth were examined. Failure loads are graded as recoverable or non-recoverable. By a one-way variance analysis; Failure loads were determined. Using Pearson Chi-square tests; failure modes were compared.*

***Results:** 1383.5 N for group A was the mean load of fracture and for group B it was 1286.3 N (p = 0.6). 90% of the fractures were graded as non-recoverable in these groups (p = 0.8).*

***Conclusions:** The presence of fiber post accumulation to give power and retention does not affect the strength of fracture of the teeth managed by lithium disilicate layers and adhesive procedures.*

***Keywords:** Ferrule effect; all ceramic; onlays; lithium disilicate refraction test.*

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## INTRODUCTION:

Extensive caries lesions, inadequate restorations and the presence of dental fractures led to controversy over the adequate restoration method. When all anatomy of the tooth is deranged and must be restored (Fig. 1), the conventional protocol forms the crown with a stem post and with an indirect restoration it covers (onlay or prosthetic crown) [1-2]. This treatment is deemed compulsory to provide a suitable geometric configuration to permit restoration of the tooth, in particular the form of retention and resistance, and the restoration of a ferrule effect for the restored tooth biomechanical success [3]. This method requires teeth to be managed endodontically that may otherwise be harmful. An opposite method may be to cement the remaining tooth indirect coverage area [4]. In recent years, indirect treatment methods that have been linked with adhesives for the prosthesis treatment have been recommended [5]. Although, less invasive methods have become famous and have led to dental preparations that do not have conventional geometric properties [6]. Research is needed to compare the interface of the adhesive restoration with a dental prosthesis and traditional prosthesis concept. Under this vision, the ideal choice is ceramic materials; they can be glued to the teeth by providing a perfect integration to the tooth tissues [7-8]. In the literature, there is no data on the performance mechanically of restoration with indirect adhesive bonded to the teeth without sufficient build-up to ensure accurate geometric configuration [9].

## MATERIALS AND METHODS:

This comparative study was held in the Department of Prosthodontics of Punjab Dental Hospital, Lahore for one-year period from December 2017 to December 2018. 20 mandibular molars removed were collected for periodontal purpose after removal of the teeth with previous restorations or cavities. Only the  $10 \pm 1$  mm buccal size teeth with average and mesial-distal  $11 \pm 1$  mm size were selected. After dental plaque removal, periodontal tissues removed by ultrasonic instruments, in physiological solution the teeth were stored for next time use. In horizontally sectioned teeth were 2 mm above the CEJ with a diamond disc as shown in Figure 8. Into two groups the teeth were divided randomly ( $n = 10$ ): group (group A) above and (group B). In group A the teeth were not treated.

Endodontically, group B teeth were treated formed using a composite core or fiber post and providing a 1 mm circumferential chamfer were prepared. The chamber roof was removed and the channel length was determined by K # 15 file (Ballaligues, Dentsply Maillefer, Switzerland) in the root canal from the

apical foramen until the tip was visible. 1 mm shorter was the working length which was set. Using manual Ni-Ti rotary tools (Dentsply Maillefer, ProTaper Universal, Ballaligues, Switzerland) and K files (Ballaligues, Switzerland) all root canals were prepared up to 30 sizes. The device was operated as per manual given. With 10% ethylenediamine tetraacetic acid and 5.25% sodium hypochlorite solution at  $37^\circ\text{C}$  root canals were diluted during instrumentation. With hot gutta-percha and a channel sealant (AH Plus, Dentsply) the channels were sealed using a vertical technique of condensation after formation. The gutta-percha is then provided with a handpiece up to 5 mm for apical foramen and a no. 2 drills (3M Seefeld, ESPE AG, Germany). Into the distal root canal; translucent glass fiber post was inserted and with a diamond bur to cover the 1 mm occlusal of composite resin the appropriate length was made. In ethanol; posts were carefully purged and with oil-free air and water dried. A double-cured cementing compound (Ivoclar Vivadent AG, Multilink Automix, Liechtenstein, Schaan) was applied in an apical-coronal direction to the root canal by using tip. In the root canals; the poles were placed and the surplus cement was discarded. For 40 seconds; resin cement was cured along the pole coronal portion by halogen hardening light (SDS / Kerr, Optilux 501, CT, Danbury, USA). On a handpiece, a Arkansas cutter mounted which was used for removing excess cement. After 30 minutes dilution of the enamel with 30% orthophosphoric acid and abrasion of the dentin for 10 seconds, a primer was applied with a clean micro-brush (Optibond FL, Kerr, USA) and lightly dried. A gluing resin (Kerr, Optibond FL, USA) was then applied and for 20 seconds it was light cured. The nucleus was made by micro hybrid resin compound (Micerium, Enamel Plus HFO). The core occupied the middle of the tooth and was 2 mm high. Each tooth was then prepared 1 mm above the CEJ and 1 mm below the core deposition with circumferential chamfer of 1 mm. A 1 mm circumferential ferrule is made in this way (Figure 9). A layer was placed on every tooth and then in lithium disilicate ceramic was hot pressed (IPS e. Ivoclar Vivadent max PRESS Liechtenstein, AG, Schaan). Onlay was high as 3 mm and for all teeth it had the same occlusal anatomy. According to the instructions manual the spacer was applied. Double cemented cementing compound (Ivoclar Vivadent AG, Multilink Automix, Liechtenstein, Schaan) helps in cementing. The ceramic coatings intaglio surface was scraped by hydrofluoric acid 20% (Ivoclar Vivadent AG, IPS ceramic gel, Liechtenstein, Schaan) for 20 sec and then in pure alcohol rinsed for ten minutes in an ultrasonic bath. Therefore, with a universal primer the surface was

managed (Ivoclar Vivadent AG, IPS ceramic gel, Liechtenstein, Schaan)) for one minute and for 60 seconds dried in hot air. The teeth were dried and cleaned and applied with a brush (30 ml) adhesive and for 10 seconds it was dried. At 37 ° C in a physiological solution for 7 days the teeth were saved. At 45 ° C compression Both groups were tested in static testing to break at a 1 mm / min crosshead speed (Figure 10). The Newton (N) value in the failure was determined and taken as failure of fracture repair. Failures were graded as recoverable

or non-recoverable, depending on whether they were limited to extended or restoration to dental tissues, respectively.

Fault loads and fault modes in Newton (N) were analyzed statistically by SPSS version 18.0. To verify the normal data distribution; Kolmogorov-Smirnov test was applied. To confirm the homogeneity of variances, using Pearson's Chi-square tests the modes were compared, and the significance level was determined to be 0.06.

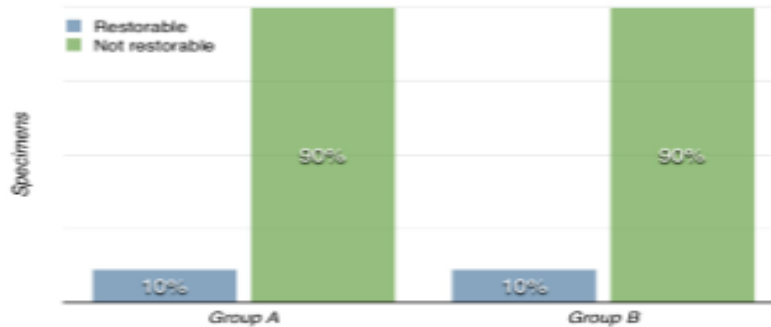
## RESULTS:

The standard deviations and averages of loads of failure are given in Table 1.

**Table 1. Means and standard deviations of failure loads (Newtons).**

Groups	Mean (Standard Deviation)
Group A	1383.5 (359.4)
Group B	1286.3 (524.8)

No significant difference was noted among groups ( $p = 0.5$ ). In Figure 2; failure mode distribution is given.



**Figure 2. Failure mode distribution.**

Significant differences were found ( $p = 0.8$ ). Figures 3 and 4 show typical fractures of samples in groups A and B, respectively. Figures 5 and 6 show the increase of the same fractures.



**Figure 3. Typical fracture of a specimen from group A after the test.**



**Figure 4. Typical fracture of a specimen from group B after the test.**

No difference significantly was noted ( $p = 0.8$ ). Figures 3 and 4 show typical fractures of samples in groups A and B respectively. Figures 5 and 6 show the increase of the same fractures.



Figure 5. Optical microscope analysis of a specimen from group A after the test.



Figure 6. Optical microscope analysis of a specimen from group B after the test.

### DISCUSSION:

The effect of ferrule is considered mandatory to give biomechanical resistance to traditionally restored teeth<sup>10</sup>. The tooth is mostly described as unrecoverable, If a ferrule not obtained. Such an assumption is derived from the resistance form a tooth needs and classical retention principles for high restoration ratio. Various studies done in vitro have demonstrated the preservative importance of an allele in successively restored teeth<sup>11-12</sup>. The absence of ferrule and coronal structure may rise failure risk of posterior and central restorations in recent meta-analysis<sup>13</sup>. Another analysis have similar conclusion. However, are these principles still necessary when bonding procedures are applied, even though they are beneficial for restorations delivered with non-adhesive conventional cements<sup>14</sup>. Raised evidence shows that adhesive ceramics can improve structurally as well as anatomically. Of course, lithium disilicate provides a real sticky cementation. For this reason the production of indirect restorations is made by this material as lithium disilicate. The good mechanical aesthetic properties are of Lithium disilicate is a completely ceramic material. It shows excellent outcomes when compared with other materials. Despite its excellent performance recoded as mechanically, lithium disilicate will be glass ceramic in nature, so it can be scraped with hydrofluoric acid<sup>15</sup>. The engraving of the Intaglio surface significantly increases the tooth tissues adhesion using the resin. Strict follow-up of the fixing procedures is critical to improving the adhesive interface productio and the restorations survival. In this study, an oblique static load was applied to the restored teeth until fracture. Oblique loads are the worst to hold the teeth and are chosen to

highlight the system. The results showed that there was no difference in the fracture resistance between the "traditional" group (with a post and ferrule effect) and the post and non-splincal "new" group. In the last group, the adhesive interface absorbed the whole load and saw it as a geometric preparation group.

### CONCLUSION:

Within the limits of this in vitro study, for teeth restored with lithium disilicate onlays and adhesive procedures, resistance, retention and shape for the teeth restored with lithium disilicate onlays and adhesive procedures have no effect on the failure ratio.

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