Evaluation of Retention for copy post in Endodontically treated teeth cemented by different types of cement for over-denture abutments

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ABSTRACT:

Objective: the aim of this study was to evaluate the retention of the copy post in endodontically treated teeth cemented by three different types of cement for over-denture abutments: An in-vitro study.

Method: nine recently extracted human mandibular canines and premolars were endodontically treated and randomly divided into three groups of three specimens each. Group I: the copy posts were cemented by zinc phosphate cement (ZPC), Group II: the copy posts were cemented by Fuji cement (FC) and Group III: the copy posts cemented by core x composite cement (CXFC). Universal Testing Machine was used for retention test of copy posts. The data was collected and statistically analyzed by one way ANOVA with Tukey's post hoc multiple comparison tests.

Result: By compression of retentive forces between different types of cement, The highest retentive value was shown in combination of the copy post with zinc phosphate cement with p value less than 0.05 ($p = 0.03$), followed by fuji cement while the core X flow cement showed The lowest retentive value.

Conclusion: within the limitation of the present study, the selection of proper cement is critical for success and survival of the core post system to support over-denture, and the ZPC showed the highest retentive value in combine with core post in compare with FC and CX FC.

Keywords: Over-denture, Metal Copy Post, Luting cement, Retention test

INTRODUCTION:

Over-denture treatment is a removable complete or partial denture that cover and rest on remaining retained teeth, tooth roots or dental implants. This treatment is not a new concept and practitioners have successfully employed existing tooth structures or retained roots to assist with complete denture treatment for more than a century. [1] Bone maintenance is the most significant advantage of a tooth borne over-denture because the maintenance of bone volume and vertical height can produce increased prosthetic retention and stability. It also gives patient better function and control because of intact proprioception. [2]

Heartwell's has described the method preparation of overdenture abutments. They could be Short coping: 2-3 mm long and normally requires endodontic therapy or Long coping: 5-8 mm long, an attempt is made to circumvent endodontic therapy by conservative reduction. [3] The teeth are generally compromised can be used for over-dentures after root canal therapy and de-coronation. [4]

Posts have been advocated to strengthen weakened endodontically treated teeth against intraoral forces within the radicular dentin for supporting the tissue along their roots and frequently a core is fabricated to retain the final restoration.[5]

The posts that used in the root canals can generally be divided into two main subgroups, depending on how retention is achieved. Active posts derive their primary retention directly from the root dentine by the use of threads. Passive posts on the other hand gain retention as their name suggests by passively seating in close proximity to the post hole walls, and rely primarily on the luting cement for their retention.[6] Each post type can further be subdivided according to its general shape, that is whether it is tapered or parallel sided. Post choice should therefore be dictated by each clinical situation. [7]

Cast copy post is the gold standard when restoring a grossly destructed tooth. Cast copy post has multiple advantages, especially the retention and resistance they provide and strength they impart to the already weakened tooth structure. [8] The fitting of cast post-and-core restorations is critical to ensure good adaptation and passivity of fit. [9]

The retention is the most important single factor that can affect the prognosis of a post retained prosthesis. The retention value of

various post systems had been investigated in laboratory study. The retention of cast post increases as the length of the post increases. A post that is too short will be failed. As Stockton declared, ideally the post should be as long as possible without influencing the apical seal. There are different guidelines for the ideal length of metal posts: The post should equal the occluso-cervical length of the crown, The post should be two thirds or four fifths the length of the root and The post should be one half of the length between crestal bone.[10]

Luting agent, can influence the retention of the metal posts.[11] Zinc phosphate cement is considered as the gold standard and other cements mostly compared to zinc phosphate. Zinc phosphate and glass ionomer have comparable retentive properties, however, the retention values of polycarboxylate and composite resin are slightly less than the retention value of zinc phosphate. [12] Reddy et al, [13] has testified of retentive strengths of zinc phosphate, poly carboxylate and glass ionomer cements with stainless steel crowns by using Instron testing machine.

Therefore, the current study deals with evaluated the retention for copy post cemented by three different types of cement for teeth supported over-denture.

MATERIALS AND METHODS

Freshly extracted nine canines, first and second mandibular premolars teeth were used in the study. The teeth were free of any type of cervical lesions and root defects and without previous endodontic treatment. the teeth were washed by 5.25% sodium hypochlorite and preserved in a 10 per cent formalin (lysoformin 3000, Berlin/Germany) solution from the time of extraction to the time of preparation for disinfection. The teeth were then stored in physiological saline (Normal saline, Alfath, borage Alarb, Egyptian) until the time of testing.

The access cavity preparation was performed using a diamond bur to establish a straight line path to the canal system. Apical patency was verified using a size 10 K-file. The working length of each tooth was determined visually by subtracting 1 mm from the length of an ISO size 10 K-file placed at the apical foramen. The canals were instrumented using rotary ProTaper

files. The S1 and S2 instruments were used in 2/3 of the root canal followed by six instrument for further enlargement of the coronal part of the root canal. The entire series of ProTaper system (S1, S2, F1, F2, F3) was used for the preparation in the working length. The teeth were obturated using lateral compaction of gutta-percha

After the endodontic cement fully set, the self-polymerizing resin was mixed and placed into PVS cylindrical tube, and then tooth was embedded in it (Acrostone, England). The teeth were prepared standerzed proximately with same size as possible with 2mm of crown length. The canal preparation for post space was performed by Gates-Glidden bur (Nordin, Swiss) and special post drill (Dentsply, Maillefer, America).

Teeth prepared to receive copy post with extended 2/3(12mm) root length of the root. After that the impression of the post spaces were taken by plastic burnout post patterns,(Fig 2) Then, the copy of abutment teeth constructed from wax then left together for investing casting and finished. The copy posts were cemented with three types of cement materials according to the manufacturers' instructions Fig 3. Finally medium-sized cones and sealer(ADSEAL, Meta Biomed, Korea) by the technique of gutta-percha lateral condensation (Fig 1). The Periapical radiographic for obtruded tooth root canal with gutta-percha was taken. Finally, teeth were placed into room temperature for a period of 48 hours.

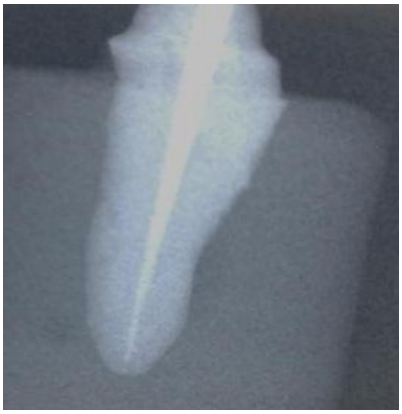


Fig 1: Periapical radiographic for obtruded tooth root canal

the specimens were then stored in room temperature of 37°C for a period of 72 hour. The retention test was performed using NEXGEN from LLloyd instruments. Retention measured by Universal Testing Machine (Model LRX-Plus, L Lloyd instruments, Fare ham, UK)with a load cell of 5 KN. Data were recorded using computer software (Nexygen-MT-4.6.; Lloyd instruments).The upper plate of the machine included a specially designed retention measuring device (Jackob s chuck) to which the vertical hook was attached.

The device was subjected to a slowly increasing vertical load (0.5 mm/min) until failure. The application of a vertical dislodging loading force was similar to the technique used in previous study by Fakiha et, al.[14] The load at failure manifested by total dislodgment of the post and confirmed by a sharp drop at load-deflection curve recorded using computer software (Nexygen-MT-4.6, L Lloyd instruments), and this value was recorded in Newton(N). The data ate was analyzed using the computer program SPSS.

Fig 2: impressi on taking.

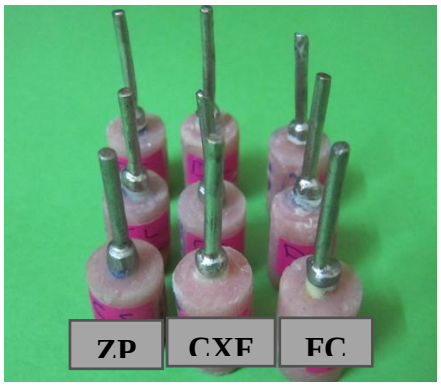


Fig 3: Copy post ready for ng.

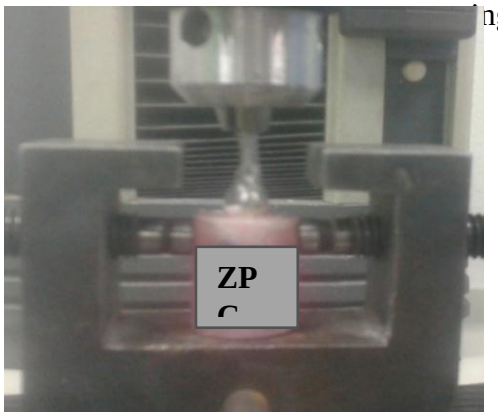


Fig 4: Copy post Sample in LLOYD testing Machine

Statistical analysis

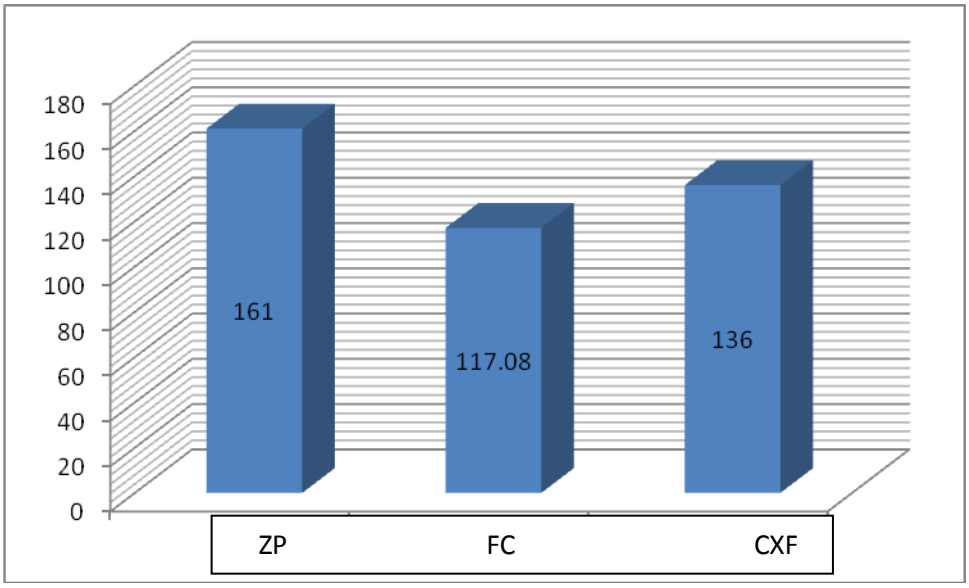
The retention value were analyzed using a statistical software package (SPSS v11.0, SPSS Corp., Chicago, IL, USA). One-way ANOVA with Tukey's post hoc multiple comparison tests were employed, with the probability level set at α_{ϵ} = 0.05 for statistical significance.

Result:

The mean retention value (MPa) achieved on pull out test of the posts from the root in each group are illustrated in Fig. 5.

The highest retentive value was shown in combination of the copy post with zinc phosphate cement with p value less than 0.05 (p =0.03), followed by fuji cement while the core X flow cement showed The lowest retentive value.

Figure 5 effect of the type of the cement on the retentive value of the core post.



Discussion:

The present study is in-vitro study, was conducted to evaluate the effect of different types of cements on the retention of the copy posts on the abutments of over-dentures. Zinc phosphate cement, glass ionomer cement, Core•X flow cement, Fuji cement

and Polycarboxylate cement were chosen for comparison for this study as they are commonly luting cements used for copy post cementation in clinical particle. Whereas, the zinc phosphate cement has been the most popular luting material for more than 90 year, excellent clinical performance has been reported for indirect restorations cemented with it .[15] So, it has better choice of luting agent for copy post as said by Hill .[16] Also the Fuji cement were selected in this study because it is wide used , easy to manipulate, ability to adhere to dentin, and strength properties [10]

While the Resin cement represent by Core•X flow was used in this study to compare it with zinc phosphate cement because it has a high compressive and tensile strength and strong micromechanical bond to dentin where compared to other cement and for those situations requiring increased retention. But the resin cement is still sensitive technique and high cost.[16] Core•X flow was testing against the other reported cement due to the difficulties of transmitting light to the apical region of the post space, Core•X flow a dual polymerizing dentin bonding agent with a dual-polymerized resin luting agent which was used as Core•X flow cement. [17]

Although the present study is an in-vitro study, so it does not directly reflect an intra-oral strength that leads to the dislocation of a post, it can address their retentive value. Although many authors have conducted studies of the retention strength of different cements, the ideal retentive strength for cementation posts in endodontically treated teeth is yet to be found.

The present study result showed that the zinc phosphate cement has the highest retentive force with copy posts rather than other cement tested (CXFC and FC). This may be attributed to that the zinc phosphate cement provides casting retention by micromechanical interlocking or friction into the casting and the dental surface. Also the retention of zinc phosphate cement depends on height and surface area, it is an important factor for cement retention as reported by Abbo et,al[18] and Cohen et,al.[19]

While the core x flow cement has lowest retentive force than other cement tested (ZPC and FC) may be attributed to explained by sensitivity technique of adhesive systems is individual and locational variation in dental structural characteristics and mechanical properties of dentin with regard to their high impact on

dentin bonding that reported by Marshall et, al. [20]

The result of current study demonstrated higher retentive force for cemented with Fuji cement than Core•X flow cement. This was confirmed with Ghazy et, al **[21],** they concluded that the Fuji cement has a higher retentive force than zinc phosphate cement followed by resin cement. On other hand, it was disagreement with study described by Elsayed et,al**[22]** whose studied the retention of over-denture posts cemented with resin, and Fuji cements and they found that the resin cement has a higher dislodgement force than Fuji cement.

CONCLUSION

Within the limitation of the present study, the selection of proper cemen is critical for success and survival of the core post system to support over-denture, and the Zinc phosphate cement showed the highest retentive value in combine with core post in compare with Fuji cement and Core X Flow composite cement.

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