



BIOLOGICAL RESTORATIONS: AN IN-VITRO HYPOTHESIS

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ABSTRACT

Background: Tooth restoration materials are constantly evolving with latest research and technology. The aim remains to replicate the properties of natural tooth structure. In the light of artificial materials, few scientists have suggested the use of fragments of natural teeth as restorative material to gain the desired results at affordable costs.

Materials and Methods: Extracted and preserved natural teeth were used to restore teeth as Jacket crowns, post and core, post and crown and laminates *in-vitro*. Recipient teeth were prepared to receive these restorations after matching with size, shape and shade. **Results:** We achieved aesthetically pleasing restorations which can serve as viable alternatives to artificial tooth restorative materials.

KEYWORD: Tooth fragments, Biological restorations, Aesthetics, Endodontics.

INTRODUCTION

Primary and permanent maxillary teeth dominate the physical appearance. Their structural loss affects not only aesthetics but also leads to compromised mastication, poor phonetics, development of aberrant habits, neuromuscular imbalance and difficulty in social adjustment.^[1,2] Recent developments in restorative materials, placement techniques, preparation designs and adhesive protocols have facilitated restoration of mutilated incisors to quite an extent. However, no synthetic restorative material that can replicate the esthetical characteristics or colour stability of the natural tooth structure.^[3] In 1900s, clinicians utilized various procedures like pin retained resin, orthodontic bands, modified three quarter crowns, porcelain jacket crowns, porcelain inlays etc. for the restoration of fractured crown.^[4] These restorations compromised esthetics and served only functional purpose. Currently used traditional hybrid and microfill composites serve the esthetic requirements. They require use of feather edge, chamfer, shoulder or long bevel preparation designs to

improve the strength, durability and polishability. These materials are expensive and often lead to incisal breakdown, staining and loss of retention.^[5]

The first reattachment was done in 1964 when Chosack and Eidelman used a cast post and conventional cement to reattach an anterior crown segment on a 12 year old boy.^[6] In subsequent years, many new techniques have been described for reattachment by natural tooth parts. This paper describes various new techniques by which Biological Restorations can be used.

Aims and Objectives

To propose an *in-vitro* hypothesis for the use of natural teeth as biological restorations

MATERIALS AND METHODS

Extracted primary and permanent teeth and armamentarium were used to perform restorations. Samples were placed in physiological saline for use as restorative material.

1. As Post and Crown

A. Pulp tissue was removed



B. POST prepared using Crown preparation kit (Shofu).



- C. Sealing of POST periapically with light cure composite/GIC. The roots that were shaped to function as post were strengthened by retro filling of flowable composite material.



- D. Tooth to be restored was prepared by:
- RCT of tooth
 - Obturation
 - Remove 1/3rd of obturated material
 - Cementation of post with flowable composite/ GIC

2. As Jacket Crown (Figures 1-6)

- A. Tooth was sectioned at cervical margin



- B. Pulp tissue scooped out from pulp chamber



- C. Pulp chamber irrigated with normal saline



- D. Dentin scooped out of pulp chamber using a tapered bur



- E. Tooth prepared to crown shape similar to the jacket crown or pre fabricated polycarbonate Crown



- F. Tooth to be restored was prepared by crown cutting



- G. Prepared crown cemented.

3. As Laminate (Figures 7-9)

- A. Root portion of tooth was sectioned at cervical level



- B. Tooth section prepared on Arkansa stone



- C. Tooth was grinded from palatal or lingual side so that the thickness of the laminate was 1.5-2 mm



- D. Laminate/Veneer was finished with composite polishing kit so that it is slightly concave on the palatal or lingual side.



- E. Crown reduction with wing preparation of the tooth to be restored was done with feather finish line.



- F. Laminate was cemented to the prepared tooth using flowable composite/ Light cure GIC.

4. As Post and Core (Figures 10-16)

- A. Pulp tissue was removed



- B. POST prepared using Crown preparation kit (Shofu).



C. Sealing of POST periapically with light cure composite/GIC. The roots that were shaped to function as post were strengthened by retro filling of flowable composite material.



D. Tooth to be restored was prepared by:

- RCT of tooth
- Obturation
- Remove 1/3rd of obturated material
- Cementation of post with flowable composite/ GIC



E. A new Jacket Crown was fabricated and cemented.

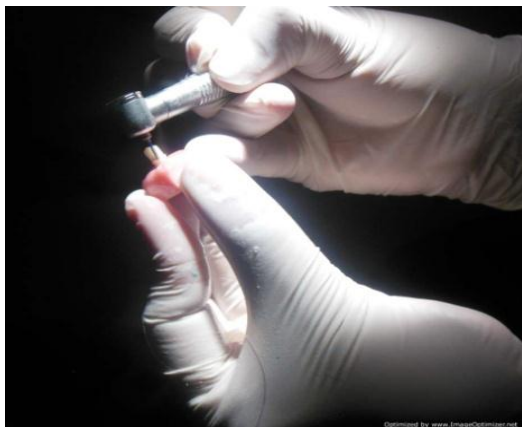


Figure: 1 Preparation of recipient tooth



Figure: 4 Jacket crown (Labial view)



Figure: 2 Jacket crown (Proximal View)



Figure: 5 Jacket crown (Lingual view)



Figure: 3 Jacket crown (Apical View)



Figure: 6 Completed restoration with Jacket crown



Figure: 7 Laminate



Figure: 8 Prepared tooth for receiving laminate



Figure: 9 Completed restoration with laminate



Figure: 10 Post and core prepared for insertion



Figure 11 - Tooth prepared for receiving post and core



Figure 12 - Radiograph of tooth prepared to receive post and core

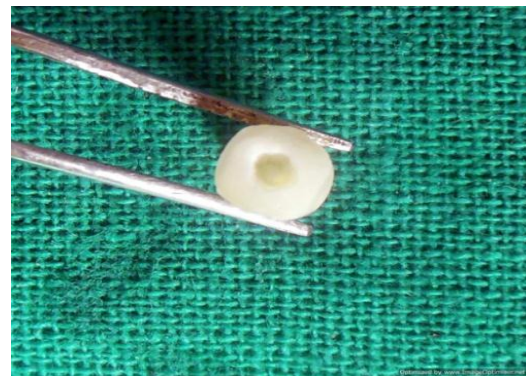


Figure 13 - Occlusal view of prepared tooth to receive post and core

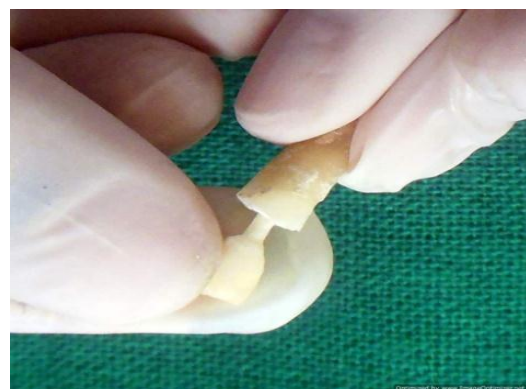


Figure: 14 Attachment of post and core

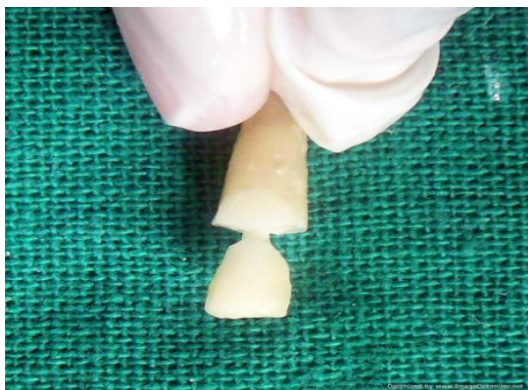


Figure: 15 Fixed post and core with prepared tooth



Figure 16 - Radiograph of post and core fixed on prepared tooth

DISCUSSION

This article suggests the use of natural teeth as Biological restorations in the form of post and core, post and crown, jacket crowns and laminates. Several studies have proved that the fracture strength of natural tooth material remains unchallenged. However, almost equivalent strength is being achieved by Zirconia based systems,^[7] but it cannot compete with the economical viability of the donated natural tooth as treatment of choice.^[8] Re-attachment techniques are being tested around the world as a viable substitute for artificial materials.^[9]

The earliest documented evidence of an attempt to restore a fractured central incisor was done by Simonsen (1982).^[1] Since then, not many attempts have been made in this direction. The dental scientific community is still trying to achieve a material that can replicate the physical and mechanical properties of a natural tooth. Ashkenazi et al (2007) have suggested various solutions in which extracted or lost teeth can be preserved.^[10] However, a specific media for preservation of teeth for biological restorations has not yet been identified. The limitations of these natural teeth remain in the form of difficulty in shade selection, viability after storage and most important, the strange feeling encountered by the patient of having someone else's teeth in his mouth.

CONCLUSION

Biological restorations can serve as a viable technique for restoring teeth in form of jacket crowns, post and

core, post and crowns and laminates. The advantages include cost effectiveness, desired physical properties and mechanical strengths. Since there is very few literature on the subject, more studies are required to compare the properties in both in-vitro and in-vivo settings.

LIMITATIONS

This hypothesis is limited by the lack of armamentarium to measure the mechanical strengths of the restorations. More studies need to be done in the area before patient trials can be done.

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