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Case Report

Corono-radicular biological restoration of maxillary central incisors by direct method

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ABSTRACT

This case report refers to the esthetic and functional restorations of extensively damaged maxillary central incisors with dental caries in a 32-year-old woman, with the use of posts and crowns made from natural extracted teeth. Proper restoration of such teeth with the use of natural teeth fragments are known as "biological restoration." Biological restorations can be done by using the fragments of the patients own tooth and if that is not available, tooth fragment can be obtained from an extracted tooth. These biological posts and crowns present a low cost option and an alternative technique for the morphofunctional recovery of extensively damaged teeth. There are limitations with the use of natural extracted teeth (homogenous bonding) for restoration such as the difficulty of finding teeth with a similar color and shape as that of the destroyed element, or patient may refuse to accept a tooth fragment from another patient, which prevents execution of the restoration.

Key Words: Biological restoration, extracted teeth, teeth fragment

INTRODUCTION

A satisfactory smile can be achieved by using several techniques and esthetic materials such as resin and porcelain.[1] Restorations such as laminate, veneers or full coverage restorations tend to sacrifice healthy tooth structure and challenge the clinicians to match the adjacent unrestored teeth. There will be difficulties to match the color with composite restorations, which also present higher wear than enamel structure.[2]

The term "biological restoration" to describe an alternative technique that uses adhesive capabilities of materials in combination with strategic placement of parts of extracted human teeth was introduced.[3,4] The first paper reporting the use of fragments of extracted teeth as dental restorative materials was published in 1964 by Chosack and Eidelman.[5] Ramires-Romito *et al*. used teeth from the human tooth bank of Sao Paulo University Dental School as natural posts and crowns to fit into the roots and replaced the crowns as well.[6] Therefore, in an attempt to widen as biologically and conservatively as possible, the treatment options to rehabilitate severely destroyed tooth crowns with the use of tooth structure as a restorative material has been suggested.[7]

The reattachment of the fragment, autogenous or homogenous, represents a good option as an alternative treatment as it is a simple and inexpensive method, which allows the maintenance of the incisal function, provides an esthetically favorable and more durable result, maintains the color of the tooth, reproduces the details of the dental surface and thus re-establishes the chewing function.[8]

A proper coronary reconstruction that produces satisfactory esthetic and functional conditions for endodontically treated and extensively damaged teeth is still a challenge for restorative dentistry, considering

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that, to achieve these conditions, the making of an intracanal retention, aimed at a better retention and stability of the dental fragments, becomes imperative. This retention can be performed by using posts from several materials, such as fiberglass, carbon fiber, metal and ceramic.[1] However, no commercially available pre-manufactured posts meet all ideal biological and mechanical properties. The use of biological posts made from natural, extracted teeth represents a feasible option for the strengthening of the root canal, thus presenting the potential advantages:

1. Does not promote dentin stress,
2. Preserves the inner dentinal wall,
3. Presents total biocompatibility and adapts to conduct configuration, favoring greater tooth strength and greater retention of these posts when compared to pre-manufactured posts,
4. Presents resilience comparable to the original tooth and
5. Offers excellent adhesion to the tooth structure and composite resin at low cost.[1]

The aim of this study was to restore grossly destructed endodontically treated upper central incisors by using biological posts and crowns as an alternative restorative modality.

CASE REPORT

This was a case report of a 32-year-old Indian woman who was reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of decayed upper front teeth. The clinical and radiographic examinations revealed that both upper central incisors had suffered a significant loss of tooth structure due to caries involving pulp chamber [Figure 1a] along with midline diastema. Vitality tests of both central incisors gave a negative response. Radiographs showed radiolucency involving pulp and periapical area in relation to right central incisor and thickening of lamina dura in relation to left central incisor [Figure 1b]. Decision was made to treat both central incisors endodontically followed by restoration with biological posts and crowns with simultaneous correction of midline diastema. Biological posts were made from the roots cutting of extracted and properly sterilized canines. Biological crowns were made from the crown of maxillary central incisors that had been previously extracted and donated.

Patient received instructions regarding the advantages and disadvantages of biological restoration as well as information on other treatment options. After agreeing upon the proposed treatment, a consent form was duly signed by the patient and ethical clearance was also obtained. First, carious tissues were removed [Figure 1c], followed by endodontic treatment. For giving restorative treatment, 4 mm of Gutta-percha was left inside the canals and remaining was removed for preparing post space.

Extracted donated canines, after having been autoclaved (Sun® Dental Autoclave Sterilizer 12 L Vacuum Steam, Pressure Steam Sterilization), at 121°C for 15 min, were selected to construct the posts [Figure 1d]. Using a diamond disk, crown portion was separated from a portion of the root and the root was sectioned mesiodistally along the long axis of the tooth. Each part of the root was cut in such a way as to form biological posts. Direct wax pattern molds for each canal involved were obtained directly in order to get the impressions of the post spaces which were used as references orienting shape, thickness and length of the dentin post [Figure 1e].

With the help of diamond points rotating in airrotor, the intraradicular posts had been cut and suitably shaped to the direct wax pattern by comparing with it; they were then tried in the prepared post space and discrepancies were corrected [Figure 1f] by using articulating paper. Biological posts were checked for any crack with the help of composite light curing unit. After confirming the satisfactory adaptation of the posts to the canals, through clinical and radiographic analyses, the cementing stage was begun. Posts and inner portion of the canals were conditioned with 37% of phosphoric acid for 15 s, followed by washing, drying and application of the adhesive system (Prime and Bond NT, DENTSPLY CAULK, Milford, DE, United States) and light curing. Use of dual cure adhesive system would be a better option which would further add on to the strength. However, because of non-availability of the same and patient urgency to get the treatment on the same day, we used Prime and Bond NT along with etchant. Every precaution was taken in order to avoid filling of post space with the bonding agent. Before light curing, the post was placed inside post space to check the fit again and evenly distributing the bonding agent. Post was removed and bonding agent was light cured. Dual cured resin cement (RELY X™ U100, 3M ESPE, Dubai, U.A.E.) was applied to the inner portion of the canals with the help of a lentulo spiral and lightly applied to the surface of the posts, which were then

inserted into the canals under constant digital pressure with the help of the index finger until the end of the cement polymerization [Figure 1g-i].

The clinical crown portions of the teeth under treatment were prepared presenting a chamfered cervical end, mainly in enamel with the help of crown cutting burs and points.

Extracted central incisors that were preselected to make biological crowns were autoclaved at 121°C for 15 min (Sun® Dental Autoclave Sterilizer 12 L Vacuum Steam, Pressure Steam Sterilization). Crowns were obtained by removing root portion. Pulp chamber was removed with the help of diamond points. Crown was then tried over the core to check the fit and necessary corrections was made both internally as well as on the cervical portion with help from the articulating paper, using a diamond points under intense cooling. After checking the adaptation on the clinical crown and making necessary adjustments, the coronal portion of the remaining tooth and the inner part of the biological crown was conditioned with 37% phosphoric acid for 15 s, washed and dried [Figure 1j and Figure 2a and b]. The adhesive system (Prime and Bond NT, DENTSPLY, CAULK, Milford, DE, United States) was applied and the crowns were filled with the dual cured resin cement (RELY X™ U100 3M ESPE, Dubai, U.A.E) [Figure 2c]. They were brought into position and maintained under digital pressure with the help of the index finger and light curing was done [Figure 2d]. Cervical marginal discrepancies were then filled by using light cured hybrid composite resin (Z250, 3M ESPE Dubai, U.A.E). Finally, occlusal interferences checked, necessary adjustments were done and instructions to the patient regarding hygiene and diet were carried out [Figure 2 e-g]. 1 year follow-up, showed preserved adaptation of crowns and posts which was confirmed both clinically and radiographically, along with proper tooth function, occlusion and maintenance of esthetics [Figure 2h-j]. This examination was done subjectively by three endodontists.

DISCUSSION

In the present case report, the restorations of grossly decayed maxillary central incisor teeth were done using biological posts and crowns made from natural, extracted teeth. As the destruction has extended to the cervical third, intraradicular reinforcement was deemed necessary to provide retention and stability to the crowns. Dentin posts made from roots of canines allowed a juxtaposed adaptation to the root canals with the same biomechanical behavior as restored teeth thus reducing stress. The adhesion provided among the "Biological Post," the cementing agent and the dental structure allows one to attain a sole biomechanical system (monoblock).[1] Dentin posts were fabricated by using roots of extracted and donated canines. Although roots of maxillary incisors and premolars were also tried for making posts, but because of short length were omitted for the restoration of these central incisors.

Furthermore, the present case report utilized a direct technique for adaptation of the biological posts and crowns which may have a drawback in terms of slightly increasing the chair side time, but it eliminated the need for a lengthy and laborious lab

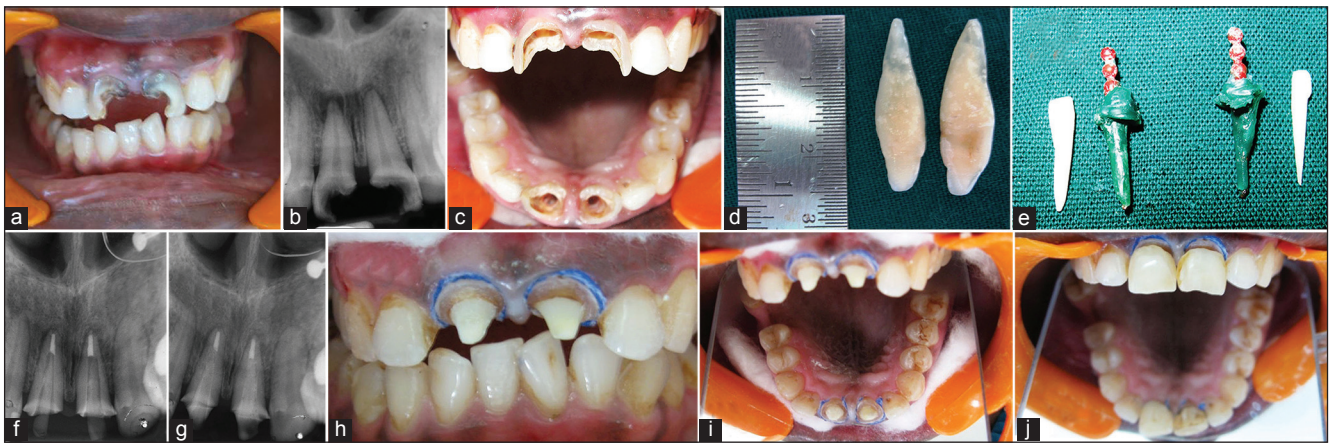

Figure 1: (a) Pre-operative view (b) after caries excavation (c) pre-operative radiograph (d) measurement of tooth length Wih scale (e) wax pattern and biological posts (f) biological posts - try in radiograph (g) post cementation radiograph (h) cemented biological posts- facial view (i) cemented biological posts - palatal view (j) try in - biological crowns

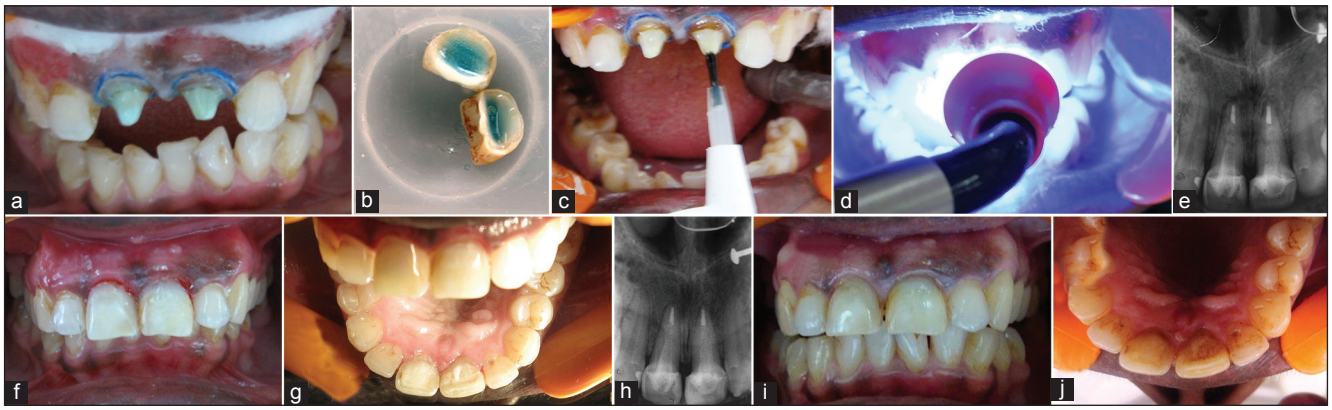

Figure 2: (a) Acid etching of the prepared tooth (b) acid etching of biological crowns (c) application of bonding agent (d) light curing of biological crowns (e) post-operative radiograph (f) post-operative — facial view (g) post-operative — palatal view (h) follow-up radiograph (i) follow-up — facial view (j) follow-up — palatal view

procedures that is making impression, casts and then adapting fragments on the casts. In addition, treatment was finished on the scheduled day and patient was recalled only for evaluation purposes.

Although biological crowns return excellent esthetic and functional results to fractured teeth (such as smoothness and shine of the surface, anatomical contour, natural color, hardness and resistance to wear), both the teeth and the posts require the patient to pay special attention to hygiene and care to avoid excess pressure on teeth, which could in turn cause fractures. "Biological restorations" take on a special importance in restorative dentistry, as they are less expensive. Removing the cost of laboratory and assistant also can do a lot of help in reducing chairside time, which makes this practice a feasible option within schools of dentistry that attend mostly to people of a lower economic level.[1]

Major problem with the adaptation of fragment from an extracted tooth is the possibility of cross-sectional infection.[9] It is important to note that, before the manipulation of any of these extracted dental elements, the teeth were properly cleaned, stored and sterilized by autoclaving at 121°C for 15 min, ensuring all biosecurity standards.[1]

The use of natural extracted teeth (homogenous bonding) for restoration does present some more limitations, such as the difficulty of finding teeth with a similar color and shape as that of the destroyed element, or patient may refuse to accept a tooth fragment from another patient, which prevents execution of the restoration.[3]

In general, the reattached tooth will not achieve a fracture resistance similar to that of the sound tooth.[9] In this case report, 5th generation bonding agent (Prime and Bond NT) and a dual cured resin cement were used. Reattachment solely with the bonding agent should be avoided due to the low recovering of strength.[9]

CONCLUSION

The biological restorations are an alternative technique for restoration of extensively damaged teeth that provides highly functional and esthetic outcomes in a cost-effective manner. However, further research is still required to assess the long-term clinical performance of these posts and crowns so as to better understand the benefits of this technique and making it a more acceptable practice among dentists and patients.

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