Review Article

A NOVEL USE OF EXTRACTED OR FRACTURED TEETH FOR RESTORATION OF SEVERELY MUTILATED PRIMARY TEETH

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Abstract

Restoration of primary teeth, severely destroyed by trauma or caries is a commonly faced problem in a pediatric dental clinic. In the past, the only option would have been to extract the affected teeth and replace them with prosthetic substitutes. Anterior tooth loss eventually leads to speech disturbances, development of parafunctional habits and psychological problems. Satisfactory restoration of these teeth, improving esthetics, along with the management of function has always been a challenge for pediatric dentist. An ever increasing demand for esthetics has led to innovation and development of newer treatment modalities for these problems. In an attempt to widen the treatment options as biologically and conservatively as possible, tooth structure is used as a restorative material to rehabilitate severely destroyed tooth crowns. This technique consists of bonding sterile dental fragments, obtained either from the patient or from a tooth bank, to the teeth. Such a technique was termed as 'biological restoration'. This article aims at reviewing the evolution, techniques and outcome of such biological restorations.

Key words: Biologic restoration, Natural teeth, Pediatric dentistry, Tooth fragment.

Introduction

The pediatric dentist who is presented with a patient with caries or trauma is faced with a difficult task of restoring the child's dentition to good health. Because of reduced coronal tooth structure, direct adhesive restorative procedures do not always give satisfactory results. In the past, the most expedient treatment was to remove the involved teeth. This treatment was justified on the basis that the permanent teeth would eventually replace the extracted ones. However, the importance of preserving the integrity of primary dentition until the appropriate exfoliation time is well recognized.[1] Trauma in a highly aesthetic region, such as the central incisors, may result in impacts on the quality of life of an individual, such as behavioral changes in social relationships, low self-esteem and may lead to depression.

In recent decades, dentistry has shown many scientific and technological advances in relation to restorative materials.[2] Therefore, several authors suggest the use of natural teeth fragments as a restorative option to traumatized anterior teeth or the combination of these fragments with other restorative techniques.[3,4,5]

The homogenous bonding, a situation in which the dental fragment can be bonded to the remaining tooth, consists in a simple and fast technique, with excellent cosmetic results.[6,7] On the other hand, when the fragment is not present or it is not in a good condition, there is a possibility to use a teeth obtained from an human teeth bank, technique known as "biological restoration," which is more suitable for large reconstructions.

The present article is a brief review on 'biological restorations' its advantages, disadvantages and clinical techniques.

Biologic Restoration

Santos and Bianchi[8] in 1991 coined the term "biological restoration" while the first paper reporting the use of fragments of extracted teeth as dental restorative materials was published in 1964 by Chosak and Eidelman.[9] Ramires-Romito *et al* used teeth from the human tooth bank of Sao Paulo University Dental School to be used as natural posts and crowns to fit into the roots and replace the crowns as well.[10]

The technique consists of bonding sterile dental fragments teeth with large coronal destruction. Adhesive materials retain the tooth fragment in the non-retentive cavity which is present as a result of extensive loss of tooth structure. Fragments obtained either from the patient or from a tooth bank may be used as a safe and reliable alternative to restore dental anatomy and function with excellent biomechanical properties.[11] With the great evolution of dental adhesive materials and composite resins, highly resistant and esthetic, the biological restoration technique can be safely used, once after cementation of the biological pin to the remaining tooth structure, forms a Mono Block system between the cement and tooth structure which help distribute the occlusal forces during mastication.[12] Macari *et al* reported that Scotchbond multipurpose adhesive system produces a good homogenous hybrid layer and similar characteristics, involving resin penetration of peritubular and intertubular dentin matrix.[13] Regardless of the material used for fragment bonding, rubber dam placement is essential for a high-quality restoration. Periodical clinical-radiographic follow-up until primary tooth exfoliation is mandatory for long-term success. Not only is the technique simple, but it also allows the preservation of sound tooth structure and provides excellent esthetics compared to composite resins and stainless steel crowns, especially regarding translucency. In addition the clinical chair time for fragment bonding procedures is relatively short, which is very interesting when treating paediatric patients.

Technique of Biological Restoration

The technique for restoration of carious posterior teeth by nature crown was described by K Sanches *et al*.[14]. Remove all the carious lesions and flatten the cavity walls and

margins. Protect the tooth with calcium hydroxide liner and glass ionomer cement base; make an impression using irreversible hydrocolloid material. On the stone cast obtained measure the mesio-distal, cervico-occlusal and buccolingual dimensions of the tooth using a compass, in order to select an extracted tooth from stock, whose coronal dimensions best fitted the prepared tooth. Color matching is also taken into account. The tooth which is selected is decoronated and the coronal fragment is adjusted with diamond points at high-speed under air/water spray coolant until it fits the cavity. The prepared fragment is autoclaved at 120ºC for 20 minutes.

In the second clinical appointment check the adaptation of the fragment to the tooth. Etch both the cavity and the fragment with a 37% phosphoric acid gel for 30 seconds, rinse and then dried. Bonding agent is applied to the cavity and fragment. Adapt the fragment to the prepared tooth and light cure each surface for 60 seconds. The small imperfections are corrected with light-curing composite resin and the occlusion is checked with articulating paper.

Ramires *et al* described the technique for restoration of anterior teeth.[10] Perform endodontic treatment of affected anterior teeth, and prepare the canals to receive intracanal dentin post. Select the natural post (tooth) and prepare it to fit into the roots. Etch both the root canal and dentin post with 37% phosphoric acid for 15 seconds to receive dentin adhesive. Cement the dentin post to the root canal using dual cure adhesive material. Cemented post is protected with the provisional material till next session.

A silicon impression of the prepared teeth is taken to aid in selection of natural crowns in the tooth bank. After autoclave sterilization the prepared crown is cemented with dual cure resin composite. The cervical margins of the restoration are polished with rotary instruments and resin composite polishing disks.

Reattachment of Fractured Anterior Tooth- Biologic Restoration

Reattaching the fractured tooth fragment back to its original position enhances the durability of the restoration, since the fragment wears at the same rate as that of the remaining portion of the same tooth. The natural enamel translucency and surface finish of the fragment provides better aesthetics. Chosack and Eidelman introduced the procedure in dentistry.[9]

In addition, tooth fragment reattachment allows restoration of the tooth with minimal sacrifice of the remaining tooth structure. Furthermore, this technique is less time-consuming and provides a more predictable long-term wear than when direct composite is used. Anterior tooth fragments have since been reattached using composite, interlocking minipins and light-cured resins. The success of reattachment depends on certain factors like the site of fracture, size of fractured fragment, periodontal status, pulpal involvement, status of the root formation, biological width invasion, occlusion, time passed since trauma and materials used for reattachment.[15]

The possible post-operative complications include discolouration of the reattached fragment and fracture to labial horizontal forces with new trauma. Hence, regular follow-up is necessary.

Advantages

The use of bonded tooth fragments as biological restorations constitutes a viable restorative alternative for teeth with extensive coronal destruction. This technique is simple, provides excellent esthetics as well as preserves natural tooth color compared to composite resins and stainless steel crowns, allows the preservation of sound tooth structure and has low cost. The enamel of the biologically restored tooth has physiologic wear and offers superficial smoothness and cervical adaptation compatible with those of surrounding teeth. Biological restorations not only mimic the missing part of the oral structures, but are also biofunctional.[16] The length of each appointment is reduced because natural teeth are prepared previously. Clinical chair time for fragment bonding procedures is relatively short, which is a merit especially while dealing with paediatric patients.[17]

Disadvantages

However, as any indirect restorations, biological restorations require a laboratorial phase that may become a critical step if not properly handled. Hence, in spite of being simple, the technique requires professional expertise to adequately prepare and adapt the natural crowns to the cavity.

There is a difficulty in obtaining teeth with the required coronal dimensions and characteristics, problems inherent to indirect restorations and matching fragment color with tooth remnant color. Also, having fragments from other people's teeth in their mouth is not a pleasant idea for some patients and many of them refuse to receive this treatment.[18] It is important that the parents are informed that the tooth fragments used for biological restoration are previously submitted to a rigorous sterilization process that completely eliminates any risk of contamination or disease transmission to the child receiving the fragment. Presently, secure methods of sterilization and storage are available to ensure the safety of teeth or tooth fragments coming from tooth banks.[18]

There is a possibility of fracturing the selected extracted tooth during its sectioning for the obtainment of the crown, as well as the difference in color after bonding. In order to minimize such risks, the teeth used in biological restorations should be kept hydrated throughout all procedures. However, all these factors are not contraindications of the technique.

Conclusion

It is not the equipment, but the dentist who makes the difference. The technique for biological restoration is simple, less time consuming, allows the preservation of sound tooth structure and provides natural look compared to **composite** resins and stainless steel crowns, especially

regarding translucency. It offers excellent esthetic, functional and **psychosocial** results, which justify the use of this technique to achieve the morpho-functional recovery of extensively damaged teeth. Biological restoration serves as an effective treatment alternative in restorative dentistry as it fulfils all three FDI criteria for evaluation of restoration, i.e., aesthetic, functional and biological aspects.

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