Esthetic and Functional Recovery of Extensively Decayed Posterior Teeth Through Conservative Treatment

Barroso SD* / Jales TS** / Corrêa-Faria P*** / Alcântara CEP**** / Botelho AM***** / Tavano KTA******

The case exemplifies the combination of two important principles in dentistry: 1) the maintenance of pulp vitality by the partial excavation of the contaminated dentin followed by the application of a biomaterial; and 2) esthetic and functional recovery based on biological restoration. Tooth vitality was confirmed two months after pulp treatment and restoration was accomplished with a fragment of a tooth extracted from another individual. This method is easy to perform and offers esthetic, functional, emotional and social benefits to the patient.

Keywords: *dental pulp capping, permanent dental restoration, recovery of function*

INTRODUCTION

One of the greatest challenges in restorative dentistry is the maintenance of dental vitality through the protection and recovery of pulp tissue and tooth morphology. As the characteristics of pulp tissue are favorable to conservative therapy, such an approach may reduce the need for invasive intervention, such as endodontic treatment.[1,2] Indirect pulp capping may be considered for deep carious lesions with the risk of pulp exposure. This procedure consists of the partial excavation of the carious tissue and the application of calcium hydroxide to induce dentin-pulp repair.[3,4,5]

A variety of materials and techniques are indicated for the reconstruction of teeth with extensive carious lesions, such as direct composite resin or amalgam restorations and indirect restorations involving porcelain, metal or resin. A number of authors regard biological restoration (the bonding of dental fragments) to be an adequate alternative.[6-9] The aim of this technique is to adapt a dental fragment from a properly sterilized donated extracted human tooth to the remaining portion of a prepared tooth in the oral cavity.[7] Biological restoration is considered a conservative procedure that allows the recovery of chewing function as well as the matching of natural properties, such as color, shape, physiological wear, surface smoothness and brightness, thereby providing an excellent esthetic outcome.[7,8,10]

This paper reports the preservation of the vitality of a permanent posterior tooth through indirect pulp capping, followed by biological restoration.

Case report

A 13-year-old patient was referred to the Restorative Dentistry Clinic of the Federal University of Vales do Jequitinhonha e Mucuri, reporting discomfort in tooth 16 caused by physical stimuli, with no history of spontaneous pain. The clinical exam revealed extensive caries involving the occlusal and buccal surfaces (Figure 1A). The thermal pulp sensitivity test (Endo-ice; The Hygienic Corporation, Akron, OH, USA) was performed, to which the response was positive. The radiographic exam of tooth 16 revealed a deep carious cavity with no involvement of the coronal pulp (Figure 1B). Based on the findings, atraumatic treatment was adopted, involving the partial excavation of the carious dentin.

Under rubber dam isolation, prophylaxis was performed for plaque removal. The carious dentin tissue was then partially and cautiously removed with sharp curettes from the periphery to the center of the cavity, thus minimizing the risk of exposure of the pulp tissue. The deep layer of the dentin was maintained and the cavity was cleaned with calcium hydroxide diluted in saline. Due to the proximity to the pulp tissue, a layer of calcium hydroxide cement (Hydro-C, Dentsply International Inc., Milford, Del., USA) was deposited on the wall of the pulp cavity to protect the pulp-dentin complex. The cavity was then conditioned with polyacrylic acid, washed, dried and morphologically reconstructed with glass ionomer cement (Vidrion R- SSWhite, Rio de Janeiro, RJ, Brazil) (Figure 1C). A radiograph was taken for comparison purposes and the evaluation of treatment.

After two months with no reports of pain, a second thermal sensitivity test also achieved a positive response. The radiographic

* Sheila Daiane Barroso, DDS. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil
** Talita Santos Jales, DDS. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil
*** Patrícia Corrêa-Faria, MS. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil
**** Carlos Eduardo Pinto de Alcântara, MS. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil
***** Adriana Maria Botelho, PhD. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil
****** Karine Taís Aguiar Tavano, PhD. Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Brazil

Send all Correspondence to: Patrícia Corrêa-Faria, Rua da Glória, 187, Diamantina, Brasil CEP: 39100-000

Phone: +55 38 3532-6099
Fax: +55 38 3532 6099

E-mail:Patriciafaria.faria09@gmail.com

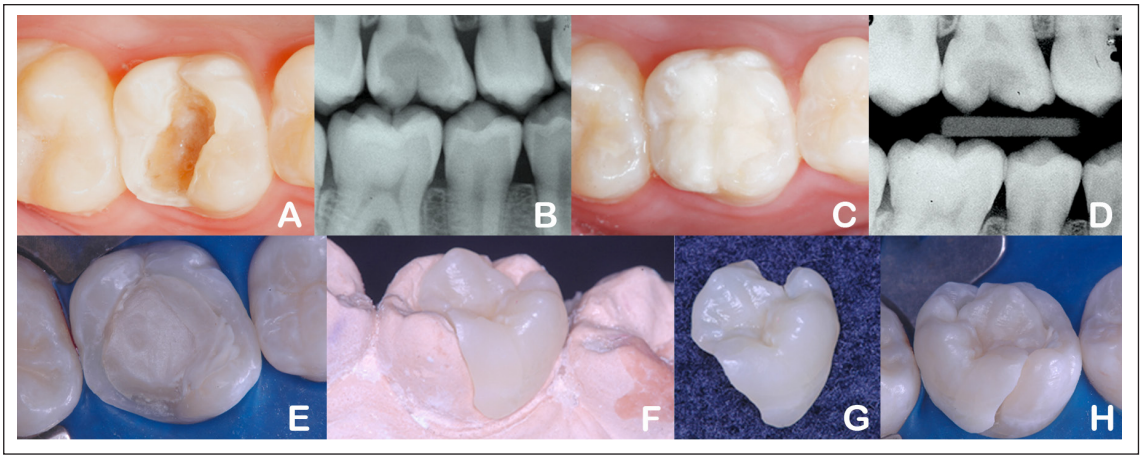

Figure 1A. Occlusal view of carious lesion; B- Initial radiographic aspect; C- Glass ionomer reconstruction; D- Control radiograph after two months; E- Cavity preparation; F- Fragment adapted to plaster model; G- Cut fragment; H- Fragment adaptation to remaining tooth.

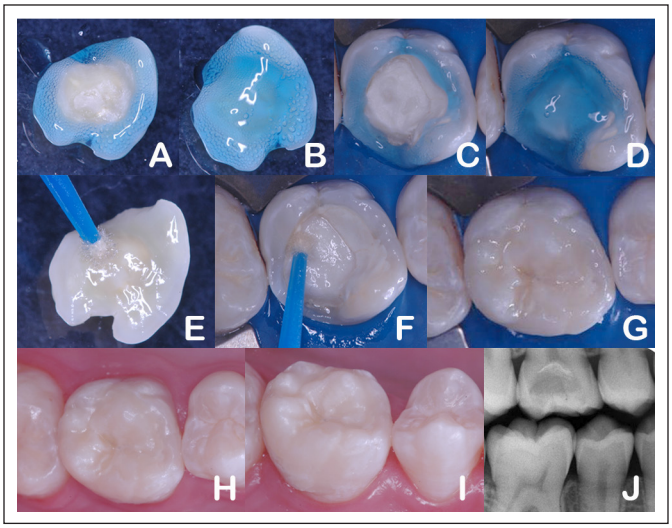

Figure 2A-D. Phosphoric acid etching of tooth and fragment; E and F- Application of bonding system; G- Fragment cementation with self-curing resin; H and I- Final clinical aspect; J- Final radiographic aspect.

exam revealed no progression of the carious lesion (Figure 1D). Following the success of pulp therapy, we discussed the possibility of maintaining the restoration with glass ionomer cement or performing an indirect restoration using a fragment from an extracted tooth for the recovery of dental esthetics. The patient and parents were informed regarding possible restorative techniques, including biological restoration, its degree of safety and ethical principles. After agreeing to this technique, a consent form was signed authorizing the procedure.

Preparation of the tooth consisted of approximately 2 mm of wear in the occlusal-buccal direction to achieve slightly expulsive walls and a chamfered cervical end on the enamel (Figure 1E). In the same session, functional impressions of both the prepared and antagonist regions were taken for subsequent modeling on a semi-adjustable articulator. A temporary acrylic resin restoration was made and cemented with calcium hydroxide cement (Hydro-C, Dentsply, International Inc., Milford, Del., USA).

A duly donated, extracted permanent right first molar with color, anatomy and dimensions similar to the tooth to be restored was obtained from the Dental Surgery Clinic of the university. The selected tooth was autoclaved at 121 °C for 15 minutes and maintained hydrated in physiological solution until the cutting and bonding of the fragment. The root was separated from the crown using a diamond disk. The crown portion was worn down with diamond burs under intense cooling until the fragment was suitably adapted to the cavity (Figure 1F and G). The fragment was further adjusted on the model with composite resin to achieve a better clinical adaptation. To facilitate this procedure, the initial occlusal adjustments were performed in the laboratory.

In a second session, following the removal of the temporary restoration and placement of the rubber dam, the fragment was adapted to the remaining tooth, which had been previously cleaned and dried for subsequent cementation (Figure 1H). Both the dental fragment and prepared tooth were etched with 37% phosphoric acid [enamel for 30 seconds (Figure 2A and C) and dentin for 15 seconds (Figure 2B and D)], then washed and dried. The bonding system (Adper Single BOND2; 3M ESPE, Irvine, CA, USA) was applied to both portions (Figure 2E and F). After 20 seconds of

polymerization, the fragment was cemented with self-curing resin cement (C&B Cement; Bisco, Schaumburg, IL, USA) (Figure 2G). The excess cement and rubber dam were removed and the occlusion was evaluated and adjusted to avoid excessive strain on the restoration. After obtaining the desirable result (Figure 2 H-J), the patient received instructions regarding the need for oral hygiene and periodic follow up of the restoration.

DISCUSSION

The reestablishment of pulp vitality and sound dental structure is one of the challenges of dentistry when caries lead to tissue loss with either direct or indirect pulp involvement. Following an accurate clinical/radiographic assessment and correct diagnosis, the partial excavation of carious dentin tissue may be indicated for young permanent teeth with deep caries. Besides causing little or no pain or discomfort, this procedure allows greater preservation of the tooth structure and the incomplete removal of the carious dentin reduces the risk of pulp exposure.[11] The removal of softened carious tissue and capping of the dentin near the pulp with a biocompatible material prevents the progression of the carious process and stimulates both healing and repair. Calcium hydroxide is a reasonable choice in conservative treatment due to its biological and therapeutic properties, which stimulate the formation of a sclerotic reparative dentin barrier and protect the pulp against aggressive thermal stimuli.[3,12]

For a satisfactory prognosis with indirect pulp capping, the tooth should be restored with proper cavity sealing. In the case presented herein, biological restoration was the treatment of choice. This method employs a fragment from an extracted donor tooth and offers advantages over other restorative treatment options, such as the recovery of an optimal anatomic shape as well as natural color, texture, surface smoothness and wear.[6-9] The technique also allows the restoration of chewing function and has a positive emotional impact on the patient due to the feeling of having a sound tooth again.[7,9,13]

However, biological restoration has limitations, such as the difficulty in ethically acquiring a sound extracted tooth with shape, size and color similar to the tooth to be restored and the possible refusal on the part of the patient to accept a tooth donated by another person.[9] Teeth can be obtained from tooth banks, which are nonprofit institutions that provide teeth for teaching, clinical and scientific purposes.[14]

Biological restorations require care on the part of the patient regarding hygiene and diet. When subjected to considerable effort or traumatic dental injury, the restored tooth can fracture like any other restorative material and can be affected by carious lesions like natural teeth. Prior occlusal surface sealing of the tooth fragment can help avoid the occurrence of caries.[9] It should be stressed that biological restoration is an alternative technique for the restoration of greatly destroyed teeth and not a substitute for the other traditionally employed restorative techniques.[6-9] Nonetheless, this approach has considerable social reach, especially in the teaching institutions that offer care to low-income groups and where patients need to pay for indirect restorations with materials such as porcelain.[9,15]

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