



Effects of the Residues from the Endodontic Sealers on the Longevity of Esthetic Restorations

¹Matheus C Bandeca, ²Milton C Kuga, ³Ana CS Diniz, ⁴Keren CF Jordão-Basso, ⁵Mateus R Tonetto

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INTRODUCTION

The substances used in the root canal treatment, especially sodium hypochlorite solution and oxidant agents, can negatively interfere on the bond strength of the adhesive systems to dentin and on the dental crowns fracture resistance.^{1,2} In order to minimize these effects, the application of antioxidants, such as sodium ascorbate and alphatocopherol has been proposed.^{3,4} Other procedures carried out after the endodontic treatment can also influence the adhesion, as the type of the method and substances are employed in the removal of the residues from endodontic sealer in the pulp chamber immediately after the root canal obturation.⁵ However, the knowledge and the consequences from this interaction are still poorly understood.

Chemical methods are the principal way for the pulp chamber cleaning, and the use of ethanol or isopropyl

alcohol is routinely employed.⁶ In contrast, the persistence of residues on the dentin is directly related to the chemical composition of the root canal sealer and the type of solution used for its removal.⁶⁻⁸ Eucalyptol, 95% ethanol, 70% isopropylalcohol, and 70% ethanol are unable to completely remove the resinous-based sealer residues from the dentin surface.⁶ Moreover, 95% ethanol is inefficient to completely remove the epoxy-based (AH Plus), methacrylate-based (Epiphany SE), and salicylate-based (Sealapex) sealers residues of dentin.⁹ These residues present its setting time after a determined period and can be a physical barrier to the formation of the hybrid layer in the dentin–adhesive system interface.¹⁰⁻¹² So, what is the importance of these residues on the adhesion of the adhesive systems to pulp chamber dentin?

The formation of a suitable hybrid layer in dentin is fundamental for the longevity of the direct esthetic restorations.^{13,14} One suggestion is to use the adhesive system prior to the root canal obturation, although this condition presents the persistence of residues from endodontic sealer on the adhesive system.⁸ But, these residues may be possibly removed when the acid etching is immediately performed after the dentin cleaning.¹⁵ The doubt is about the exact time for the adhesive system application, because if it is immediately applied and the esthetic restoration is delayed, the adhesion will be damaged once a new cleaning procedure and/or chemical substances from the temporary restoration may negatively interfere on the bond strength of the composite materials.¹⁶ But if the acid etching is delayed, it is possible that the residues from the endodontic sealer will not be properly removed, compromising the formation of the hybrid layer due to its physical interposition between the dentin and the adhesive system.

This is critical point because many clinicians perform only the endodontic treatment and then the patient is referred to another professional. New intermediate restorative materials, such as bulk-fill resin can be a solution

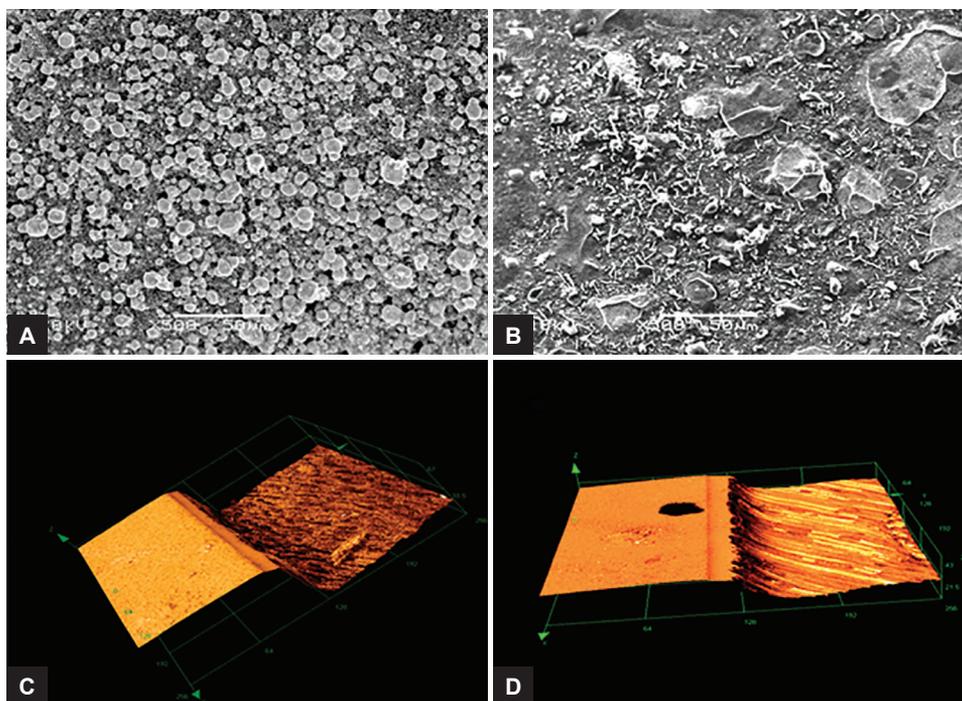
^{1,2,5}Professor, ^{3,4}Student

^{1,3}Department of Postgraduate Program in Dentistry, CEUMA University, São Luis, Maranhão, Brazil

²Department of Restorative Dentistry, School of Dentistry, Univ Estadual Paulista, Araraquara, São Paulo, Brazil

^{4,5}Department of Postgraduate Program in Integrated Dental Science, University of Cuiabá, Mato Grosso, Brazil

Corresponding Author: Matheus C Bandeca, Professor Department of Postgraduate Program in Dentistry, CEUMA University, São Luis, Maranhão, Brazil, e-mail: mbandeca@gmail.com



Figs 1A to D: (A) The presence of residues of endodontic sealer on the dentin; (B) on the dentin bonding after cleaning protocols; (C) the absence of the hybrid layer; and (D) the presence of hybrid layer in dentin interface/adhesive system

since it presents easy application and also prevents the cusp fracture of the endodontically treated teeth with mesial-occlusal-distal (MOD) cavity.¹⁷ Therefore, in order to remove these residues in the pulp chamber after endodontic treatment, it is interesting to adapt the dentin etching method, i.e., the use of the self-etching adhesive system immediately after the dentin cleaning protocols and if it is possible the esthetic restoration confection or at least the pulp chamber filling using the bulk-fill composite. However, further studies should be conducted to evaluate the effects of these factors on the adhesion of the adhesive systems to dentin in order to develop a dentin cleaning protocol after the endodontic obturation. (Figs 1A to D).

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