

Adhesive procedures in Restorative Dentistry. Part 1: dental adhesives

Marcos Alexandre **FADANELLI**^{1,2}

(1) Specialist and Master in Dentistry, Specialization area in Dentistry, Faculdade São Leopoldo Mandic (Campinas/SP, Brazil).

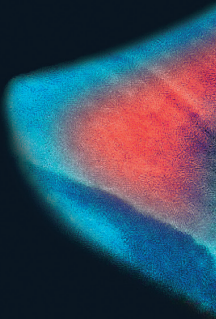
(2) Centro Universitário da Serra Gaúcha, Discipline of Dentistry I and II (Caxias do Sul/RS, Brazil).

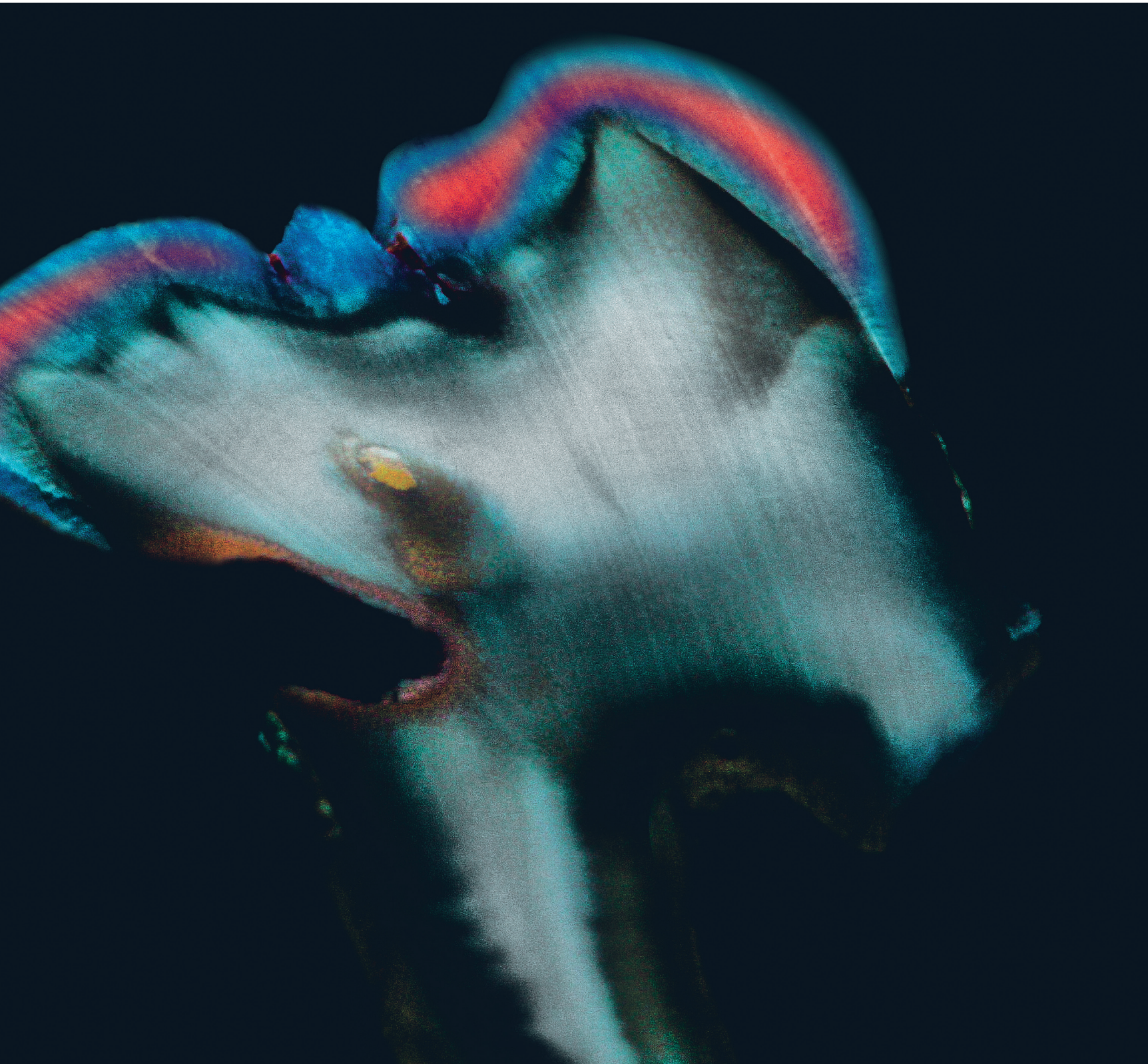
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E-mail: fadanelliodonto@gmail.com

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Hello, reader! One of the areas that advanced the most in Dentistry was the restorative one. Several materials, techniques and technologies have been developed in recent years. This advance aims to carry out faster, simpler and less invasive procedures in relation to dental. Therefore, adhesive procedures are extremely important for long-term success in the restorative chain. Understanding the structure of dental tissues, as well as the different types of adhesive systems, is essential for the restorative process. Enamel and dentin are particular tissues, distinct from each other and which, when put together, perform their function much better than when separated and isolated. Can you imagine if the enamel was not supported in dentin? It would certainly break more often. And the dentin without the enamel coating? It would wear out. In other words, they are complementary! However, due to their compositional characteristics, they must be treated differently when prepared to receive any restorative material, whether it is direct or indirect. Enamel, due to its crystalline structure and 96% formed by minerals, requires to be prepared (conditioned) with an acid strong enough

to allow penetration of the adhesive into its structure, causing mechanical adhesion with its substrate. Dentin has only 70% inorganic material. The other 30% are basically formed by collagen and water. Its tubular structure is due to the presence of odontoblast extensions. This composition makes this tissue more sensitive to preparation and hybridization procedures, compared to enamel. Furthermore, the conditioning strategy and the type of adhesive system can make a difference when thinking about the longevity of the adhesive process, without any damage to the tissue. We can classify adhesive systems in several ways; however, the



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simplest and most understandable one is based on the mechanism of interaction with the dental substrate. Soon, we will have three groups: total conditioning adhesives, self-etching adhesives and universal adhesives.

ADHESIVES FOR TOTAL CONDITIONING

This system was developed to be effective on previously conditioned tissues, whether they are enamel or dentin. Enamel does not require greater care for good adhesion, as it is not a tissue sensitive to the technique. It requires good cleaning and etching with 37% phosphoric acid for 20-30 seconds. After that, it must be washed with plenty of water

and dried with air. On the other hand, dentin requires some care. Due to its less mineral structure, with a lot of collagen and water, the conditioning time should be between 10 and 15 seconds, so that there is no great demineralization in depth, which would make it difficult to maintain the collagen fibers which were not collated, as well as penetration of resinous monomers in its mesh.¹ The depth of conditioned dentin also influences the quality of this hybridization, being the deepest most sensitive for adhesion, due to the amount of water, permeability, proximity to the pulp and less intertubular dentin available. As you can notice, the total conditioning technique

removes the entire smear layer, leaving thousands of dentinal tubules and a large area of collagen mesh exposed. The adhesive developed to be used in this technique must have the ability to penetrate this entire area opened by phosphoric acid, making it to become embedded in the collagen mesh, forming the hybrid layer and avoiding unfilled areas, which can result in failures such as postoperative sensitivity.² In other words, these adhesive systems are technically sensitive, which can lead to greater hybridization failures, which can result in postoperative sensitivity, accelerate marginal infiltrations and even cause early loss of the restoration.

SELF-CONDITIONING ADHESIVES

The development of this type of adhesive system was based on the removal of the most sensitive stage of hybridization in the total etching technique: etching with phosphoric acid at 37% of the dentin. An acidic functional monomer (AFM) was added to this system, which has the ability to condition the dentin substrate and then diffuse through it, promoting a complete mechanical union.³ In addition to this union, such functional monomers have the ability to chemically bond with the calcium in the dental tissue, dispensing and contraindicating the use of preconditioning in dentin. On the other hand, due to the low conditioning capacity of these monomers in enamel, it is recommended to pre-etch this tissue with 37% phosphoric acid for 20 seconds. This system promotes a homogeneous and efficient hybrid layer throughout the dentin tissue, avoiding postoperative sensitivity and long-term providing quality hybridization.

UNIVERSAL ADHESIVES

Universal adhesives entered the market with the idea that they can be used both in the total conditioning technique and in the self-etching technique. In other words, you choose, doctor! As in that saying: “You can! But it shouldn’t!” Let’s think about it: universal adhesives have acidic functional monomers in their composition; therefore, they have a compatible chemical behavior with self-etching adhesives, both in terms of conditioning the dentin tissue and its chemical interaction with calcium. So, do you really think we should condition the dentin beforehand? Removing a large layer of mineral? I don’t think so. Recent studies⁴ show that preconditioning the

dentin will result in a lower bond strength compared to no preconditioning. It is also scientifically known that, in the long term, the best results in dentin hybridization occur with the use of self-etching systems. Therefore, not pre-conditioning dentin with 37% phosphoric acid is beneficial when using universal adhesives.

In summary: if you are going to perform adhesive procedures on dentin, use self-etching or universal adhesives without preconditioning the dentin tissue, but always pre-condition the tooth enamel.

So long!

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