Clinical and structural considerations of some direct composite materials

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Abstract.

The "silent revolution in dentistry" (Jean-Francois Roulet) began in 1955, when Michael Buonocore applied orthophosphoric acid on enamel, thus opening a new era in the field of direct restorations. Although initially used in conjunction with acrylic resins, this clinical procedure is still widely used today.

The disadvantages of acrylics as filling materials have led to extended research, in order to obtain better materials. It is the merit of Raphael Bowen to synthesize a new monomer, namely Bis-GMA, which led to the introduction of the first commercially composite resin in 1963. Since then, composite resins have been continuously improved, in terms of both organic and inorganic phase. All these advancements determined the introduction of new direct composite materials. Ceromers (ceramic optimized polymers) have an improved inorganic phase, the first commercial product having five different filler types, fact that represented a novelty at the time of its launch on the market. Polyglasses contain multifunctional monomers, that improve the crosslinking ability of these materials, leading to better mechanical and chemical properties. Another step forward is represented by ormocers, whose monomers are inorganic-organic compounds, thus allowing a much lower polymerization shrinkage. Last but (surely) not least, siloranes were introduced as composite materials, with the lowest polymerization shrinkage. All the above mentioned composite materials require the use of an adhesive. The last generation, namely the one-step self-etch materials, have gained in popularity, especially due to their ease of use. In fact, they exhibit some drawbacks, such as increased hydrophilicity and chemical instability [1], which negatively influences the adhesion, especially to dentin. Moreover, the histological particularities of enamel and dentin, such as prismless enamel, the orientation of enamel prisms and dentinal tubules, play a crucial role in the mechanism and longevity of adhesion [2].

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The requested presentation time is 30 to 45 minutes.

References

[1] Malacarne J et al. Water sorption/solubility of dental adhesive resins. Dent Mater 22(10), (2006) 973-980.

[2] Tay FR, Pashley DH. Water treeing – a potential mechanism for degradation of dentin adhesives. Am J Dent 16 (2003) 6-12.

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