Editorial

The Concept of Resin Infiltration Technique and Its Multiple Applications

The concept of infiltrating carious lesions at an early stage is not new. The first attempt to infiltrate porous demineralized enamel used a resorcinol-formaldehyde-based formulation in the 1970s' but, due to its toxic nature, it was substituted for commercially available adhesives. However, due to its variable penetration coefficient, the poor ability of these materials to effectively penetrate natural carious lesions limits their use as agents for caries infiltration. The idea of resin infiltration is not to create a surface sealing on lesion, but to penetrate the affected porous tissue, providing it mechanical support and increasing its resistance to a further acid attack.

After a series of experiments with different monomer mixtures, in order to optimize its penetration coefficient and adequate hardening, allowing its effective and rapid infiltration into porous enamel, two researchers from Charité Medical University in Berlin — Sebastian Paris and Hendrik Meyer-Lueckel — developed the so-called 'infiltrant' product (commercialized under the brand name Icon by DMG Dental Company). Caries infiltration is considered a noninvasive treatment that aims to arrest early noncavitated demineralized enamel. The principle is based on the penetration of a low-viscosity resin within the porous tissue by capillary forces, in order to occlude the diffusion pathways for the cariogenic acids. To enhance resin infiltration within the porous lesion body, acid etching must be performed on the pseudo-intact surface layer, since its relatively low pore volume hampers resin penetration. Caries infiltration has been proved efficacious in several laboratorial, *in situ* and clinical studies.

A positive side effect of the infiltration technique is that it changes the optical properties of demineralized enamel. The low-viscosity resin refractive index is more close to the sound hydroxyapatite compared with air and water refractive indexes, thus, when the porosities are resin infiltrated, it results in a masking effect making it closer to the appearance of the surrounding nonaffected enamel. This is highly desirable in esthetically relevant areas, since even arrested white spot lesions usually continue be clinically visible after remineralization. This masking effect was initially observed in caries-affected enamel, with satisfactory esthetic outcomes demonstrated in different clinical situations. Recently, its use was extended to mask some tooth developmental defects, as fluorosis and traumatic hypomineralization lesions, since these lesions also present a subsurface reduced mineral content, similar to an early carious lesion. Attempts to reinforce and/or mask molar incisor hypocalcified lesions have also been tested; nevertheless, the more complex nature of these lesions, with high protein content hampers infiltration. In general, the resin infiltration masking potential is dependent on the histology and severity of the lesions and, in many cases, especially in mild and some moderate lesions, esthetic improvement is accomplished. Nevertheless, in the more severe cases, color masking is usually not complete, although some degree of patients' satisfaction is usually observed.

Additionally, the infiltration technique can be combined with the conventional restorative technique using composite resins, since they are both methacrylate-based materials. In cases of demineralized enamel defects adjacent to structural loss areas or white spot lesions adjacent to cavitated enamel, both techniques can be used together.

Alessandra Bühler Borges DDS, MS, PhD
Assistant Professor
Department of Restorative Dentistry
Institute of Science and Technology
São Paulo State University — UNESP
São José dos Campos, SP, Brazil