Caries infiltration in daily practice - Esthetic implications

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Various enamel lesions are characterised by a loss of minerals below a seemingly intact surface. The porosities inside the lesion body result in the typically whitish appearance of these lesions, so-called white spots\(^1\). Carious enamel lesions on smooth surfaces are a frequent adverse effect of orthodontic treatment with fixed appliances\(^2\). Although adhesively bonded brackets simplify orthodontic treatment, they inhibit thorough cleaning of the surrounding tooth surfaces, thus promoting plaque accumulation and the formation of carious lesions in these areas\(^3\).\(^4\).

Even though the progression of these lesions, after removal of the brackets, may be inhibited with preventive measures such as topical fluoridation, the persistence of the white spot lesions in the visible areas frequently lead to severe esthetic impairment\(^5\). Other risk factors for the formation of smooth surface lesions include insufficient oral hygiene, hypo salivation, or xerostomia\(^6\). The standard treatment for white spot lesions includes topical fluoridation and improvement of the patient’s oral hygiene in order to promote the remineralisation of the demineralised enamel\(^7\). Due to the improved access of the smooth surface white spots after debonding, these non-operative measures show good results with respect to limiting the lesion progression. However, especially for deeper lesions, only a mere superficial remineralisation is achieved. These lesions often have a very pronounced and mineralised surface layer\(^8\).\(^9\). But the lesion body under this surface layer remains porous, thus the white appearance of the lesion persists\(^10\).\(^11\). During the remineralisation phase, pigments from food, beverages, or tobacco products can also penetrate this lesion causing dark or brownish discolorations\(^9\). Many patients perceive these brown spots as even more unaesthetic. Different methods to treat these lesions have been established with varying success. The micro abrasion technique removes superficial enamel portions using a slurry of 18 per cent hydrochloric acid and pumice\(^10\).\(^12\). Unfortunately, considerable amounts of enamel up to a depth of several hundred micrometers have to be sacrificed with this procedure in order to achieve satisfactory esthetic results\(^13\).\(^14\). Other invasive restorative techniques, such as ceramic veneers or direct composite restorations, require the removal of extensive amounts of non-carious enamel and are very costly for the patient. The caries infiltration method is a novel, alternative therapy approach for the treatment of white spot lesions, based on the concept of sealing the micro-porosities of the lesion body and thereby inhibiting the substrate supply to inhibit the progression of the caries. For this purpose, the hyper-mineralised surface layer is removed with a 15 per cent hydrochloric acid gel\(^15\). In a next

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‘The standard treatment for white spot lesions includes topical fluoridation’

‘DMG. A smile ahead.’
Table 1: Indications caries infiltration

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References

1. de Groot L, van der Velden U. Clinical Indications: Proximal infiltration Vestibular infiltration

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The refraction index of hard tissue, but still providing quick and effective treatment results for such lesions. 17 Clinical

The caries infiltration creates a diffusion barrier for cariogenic substrates inside the lesion, different from the traditional sealing method, which acts as a barrier on the surface. This procedure pre-

vents the creation of artificial plaque retention areas and the formation of marginal gaps. Before the infiltration composite is light-cured, any excess material should be removed. A positive result of the caries infiltration is that the enamel lesions will lose their whitish or brownish appearance and the unfavourable esthetic effect is neutralised. Once the microporosities are filled, the light refraction behavior adjusts to that of the surrounding healthy enamel. The light refraction behavior is described by the refraction index (RI).

The refraction index of healthy enamel (RI = 1.62) differs significantly from that of the air entrapments inside a lesion (RI = 1.00). This difference results in diffuse light scattering which is visually displayed in the afore-mentioned white spots. Filling the air entrapments with the infiltrant (RI=1.52), which has a refraction index similar to that of healthy enamel, eliminates the diffuse light scattering and removes the white spots. BROWN spots can be cleared through etching, which removes the embedded organic pigments. In vitro and in vivo studies have confirmed the effectiveness of the caries infiltration as a quick and effective treatment method, which preserves the hard tissue, but still provides very good to excellent esthetic results for such lesions.

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