The use of transillumination in the diagnosis of the lesion depth of enamel opacities

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The resin infiltration technique was developed originally to arrest the progression of non-cavitated carious lesions by creating a physical diffusion barrier of resin to prevent acid penetration and to limit further demineralisation.[1,2] Over the years, the indications for resin infiltration have evolved, including the aesthetic management of enamel opacities related to developmental defects of enamel (DDE).[3] The treatment outcomes of resin infiltration of DDE are unpredictable, with several potential influencing factors including variable porosity, variable hypermineralised surface layer thickness and increased organic component.[4] Among these parameters, the most important factor that influences the masking effect of resin infiltration remains the complete removal of the surface layer.[5] Thus, clinical evaluation of the lesion depth is mandatory to expose the lesion and to ensure an appropriate infiltration.[6]

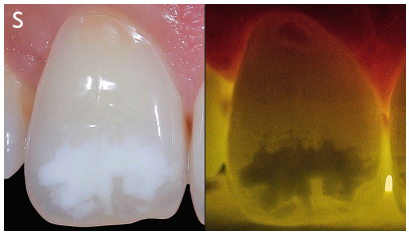

Fig. 1: Diagnosis of the depth of the lesion: superficial lesion

Recently, a transillumination-based infiltration concept was recently described for successfully managing enamel opacities related to DDE. In this proposed concept, transillumination is used in the diagnosis of the lesion depth and to guide the removal of the surface layer with the intention of exposing the lesion to the surface.[3] Clinically, the light source is transmitted perpendicularly from the lingual surface using a handheld LED transilluminator providing illumination of 125 lux (Oslux S2.1; Osram, Munich, Germany). The lesion is then observed from the buccal surface. Depending on the lesion depth, the appearance of the lesion will differ noticeably.[3,7,8] The presence of diffuse edges between healthy and unhealthy enamel suggests that the lesion is located deeply with a presence of a thick surface layer covering the lesion. This appearance is explained by the dispersion of light due to the optical properties of the translucent sound enamel throughout which the lesion is observed. In contrast, well demarcated edges between healthy and unhealthy enamel is related to a very superficial lesion with a thin surface layer that covers the lesion.

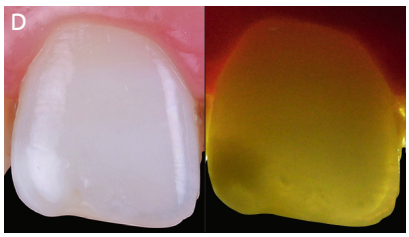

Fig. 2: Diagnosis of the depth of the lesion: deep lesion

The aims of this report are to describe how transillumination can be used for the diagnosis of the lesion depth and to explain the transillumination-based infiltration concept to achieve a predictable result when DDEs are treated with resin infiltration.

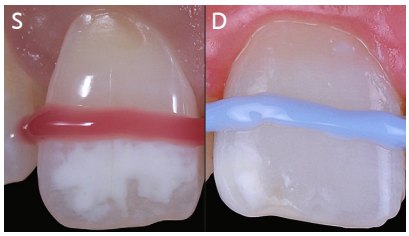

Fig. 3: Lesion isolation with liquid dam

Figure 1 and 2 show initial views of superficial (S) and deep (D) lesions observed in reflected and transmitted light condition. In transillumination, the superficial lesion (S) appears with very demarcated edges whereas the deep lesion (D) presents diffused edges suggesting a deep location with a thick surface layer covering the lesion that needs to be removed to expose the lesion.

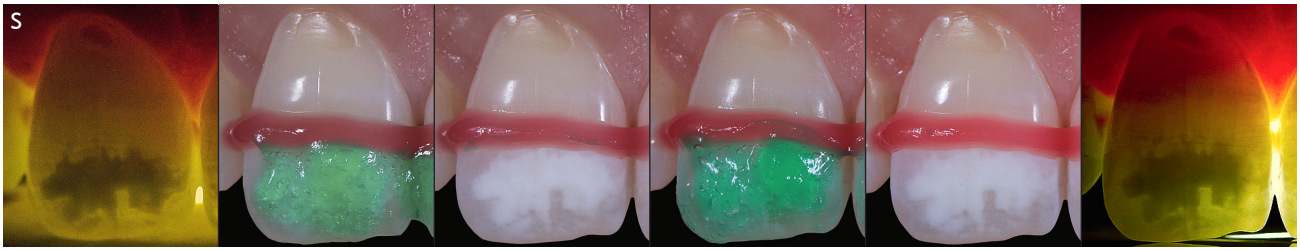

Fig. 4: Lesion transformation of a superficial lesion (surface layer removal step)

The lesion is isolated using a liquid dam (Fig. 3). The aim of this procedure is to be more conservative during the removal of the surface layer.[9]

For the superficial lesion (Fig. 4), repeated etching steps were sufficient to remove the thin surface layer that covers the lesion. The lesion was etched twice for 120 s using Icon Etch (15 % HCl, DMG). As the lesion is superficial, note the similar aspect of the lesion in transmitted light before and after erosive steps.

For the deep lesion (Fig. 5), a mild mutilation of the surface layer is needed to expose the lesion. Several methods were suggested to remove the surface layer such as micro-abrasion, sandblasting or repeated etching steps. In this report, a tapered-diamond finishing (Fig. 5.2) bur was preferred over other methods as it provides a more controlled and a more accurate elimination of the surface layer. This step was assessed under transillumination until a superficial lesion feature with demarcated interface is observed. Then, the exposed hypomineralised enamel was etched for 120 s using Icon Etch (15 % HCl, DMG) (Fig. 5.4). In transillumination, after abrasive and erosive steps, the lesion edges are now well demarcated suggesting a lesion transformation from a deep to a superficial lesion (Fig. 5.6).

Fig. 5: Lesion transformation of a deep lesion (surface layer removal step)

After the erosive step, the remaining hypomineralised enamel was washed for 30 s using triplex water spray and ethanol was then applied for 30 s to desiccate the lesion (Icon Dry; DMG). Anecdotally, if the hypomineralised lesion 'disappears' after ethanol application, this predicts a similar aesthetic change with resin infiltration. While some reports have suggested adding further etching steps if there was no change in lesion appearance after ethanol application, recent evidence shows that hypomineralised enamel can be infiltrated without additional enamel removal by increasing the infiltrant application time.[5, 10, 11]

The concept of topography assessment and lesion transformation is summarised in Fig. 9.

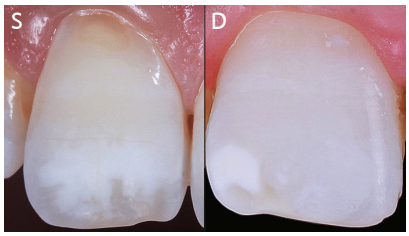

Fig. 6: Dehydration Step

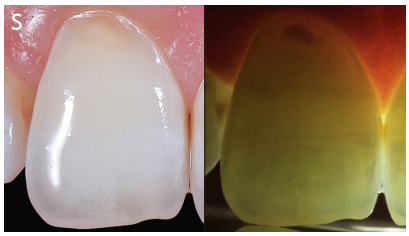

Fig. 7: Superficial lesion after infiltration in direct and transmitted light

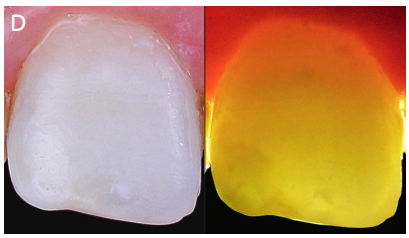

Fig. 8: Deep lesion after infiltration in direct and transmitted light

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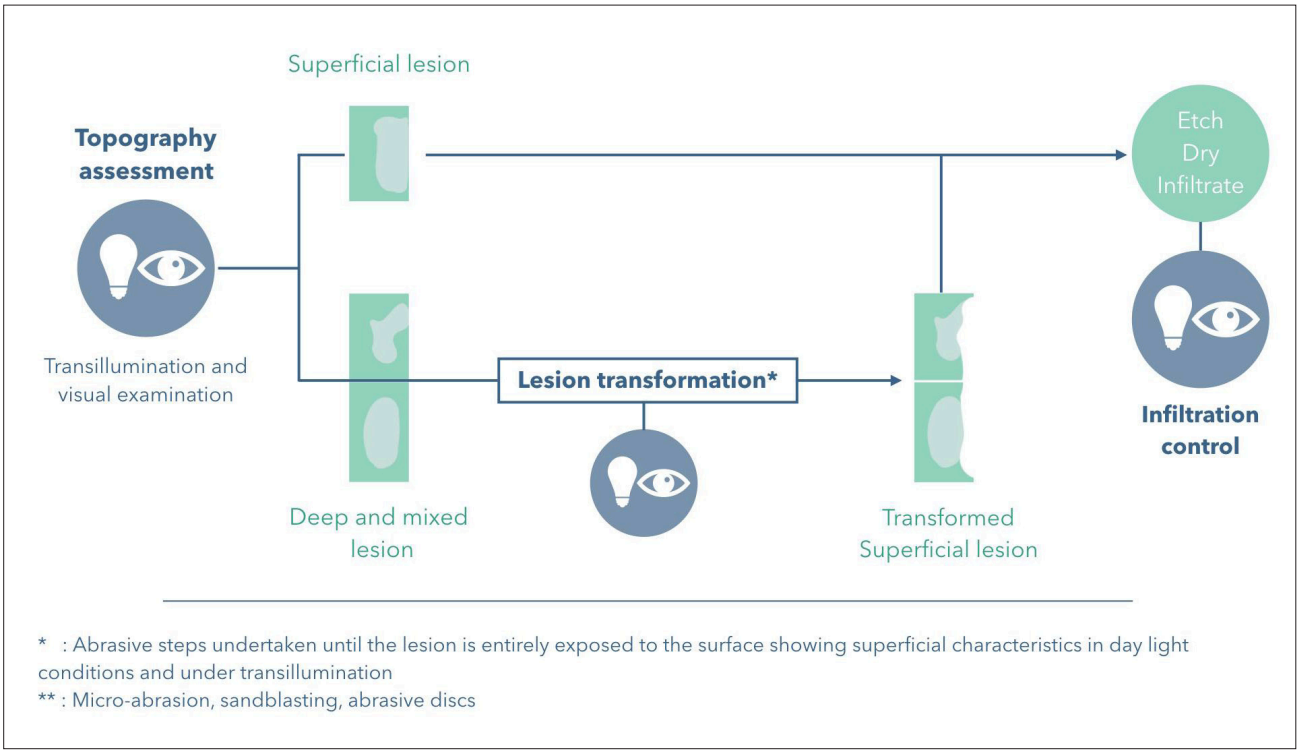

Fig. 9

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