

## 9 SUMMARY

Sealing of carious lesions with low viscous resins seems to be a promising approach of non-operative dentistry and bears eminent advantages over common treatment regimes.

The aim of the present study was to investigate the penetration behaviour of five commercial adhesives and a fissure sealant after 15 and 30 seconds treatment. Furthermore, the ability of the seal to protect the lesion against further demineralisation was analysed.

To visualize the penetration of the resins into carious enamel a technique for the visualisation of porous spaces in dental hard tissues by infiltration with a low viscous resin (VIRIN) and observation with CLSM was developed.

Specimens of bovine enamel were demineralised for 14 days (pH 5) and sealed with either one of the six adhesive materials. After a penetration time of 15 s and 30 s, respectively, the resins were light cured. Subsequently, one half of the specimen was exposed for further 14 d to the demineralising solution (pH 5), while the other half was protected with nail varnish. Then the halves were cut and infiltrated with a fluorescent resin in order to visualize all remaining porous structures. The specimens were evaluated using a Confocal Laser Scanning Microscope and lesion depths and penetration depths were measured (Image J).

Helioseal, Heliobond, Resulcin Monobond and Excite penetrated 48-92 % of the lesion body and showed compact layers of resin that were able to protect the lesion from further demineralisation. Solobond M and Adper Prompt L-Pop failed to seal the lesions sufficiently. An extension of penetration time from 15 s to 30 s improved penetration depths and compactness of the resin layer as well as the protection from further demineralisation.

Helioseal, Heliobond, Resulcin Monobond and Excite can be used to seal enamel lesions in vitro. A penetration time of 30 s should be preferred. The results should be confirmed in further studies with natural lesions in vitro, in situ and finally in vivo.

The visualisation technique VIRIN allows a sensitive estimation of the lesion depth and morphological investigations simultaneously. Moreover, a good correlation with the “gold standard” TMR could be shown. Therefore, VIRIN bears advantageous properties in the visualisation of porous dental hard tissues.