

9 Summary

The purpose of this study was to evaluate the effect of different insertion techniques of composite increments on the marginal integrity of Class II cavities with cervical margins in dentin. Therefore four different adhesive systems were applied in combination with a horizontal, diagonal or centripetal layering technique of the same composite.

Standardised Class II cavities were mesially or distally prepared into 96 extracted human caries-free premolars, stored in a 0,1 % thymol solution. The extension of each cavity was 4.0 mm in oral-vestibular direction, 1.5 to 2.0 mm in peripheral-central direction, and 6.0 mm in coronal-apical direction. The enamel margins were bevelled. The combination of the three layering techniques with the four adhesive systems resulted in 12 test groups with eight randomly assigned premolars each.

The following adhesive systems were applied according to the manufacturer's instructions:

- *OptiBond FL® (Kerr)* – etch&rinse-system/ three-step-application
- *Excite® (Ivoclar Vivadent)* – etch&rinse-system/ two-step-application
- *Clearfil™SE Bond (Kuraray)* – self-etch-system/ two-step-application
- *Adper™Prompt L-Pop™ (3M ESPE)* – self-etch-system/ one-step-application

The composite resin *Filtek™ Z250 (3M ESPE)* was applied in the following three insertion techniques using 4 increments each:

- centripetal layering
- oblique layering
- horizontal layering

Subsequently the composite restorations were finished and polished under direct view with aluminium oxide coated polishing discs. After 21 days of water storage, after thermocycling (TC, 2000 circles, 5° - 55°) and after a mechanical loading in a Munic chewing simulator (125 000 cycles/ 50 N/ 1,7 Hz), impressions were taken with a polyvinylsiloxan material and replicas were produced. These were cast with an epoxy resin and gold-coated in a sputter device for the quantitative margin

analysis by scanning electron microscope (SEM) using defined criteria at a magnification of 200X.

The statistical evaluation was performed by using the KRUSKAL-WALLIS-test with a BONFERRONI-adjustment and the WILCOXON-test ($p < 0.05$).

The analysis showed that none of the layering techniques affected or respectively improved the marginal integrity of the cervical margins in dentin. Therefore the data of the respective layering technique could be pooled. Regarding the used adhesive systems – including different areas of analysis “margin” and “angle” – significant differences of the margin quality were found. From the results of the horizontal margins the following conclusion could be obtained: The three-step etch&rinse-system *OptiBond FL* showed high percentages of the criterion “continuous margin” after applying both stresses (TC and mechanical loading). The self-conditioning two-step adhesive *Clearfil SE Bond* achieved an equally high percentage of continuous margins. The results of these two systems did not differ significantly from each other. The simplified application of the two step etch&rinse-system *Excite* showed significantly worse margin qualities than the adhesive systems *OptiBond FL* and *Clearfil SE Bond*. Only small amounts of continuous margins could be evaluated for the self-conditioning all-in-one adhesive *Adper Prompt L-Pop*, which were not statistically significant from the results for *Excite* but differed significantly from those for *OptiBond FL* and *Clearfil SE Bond*.

From this study it can be concluded that all three incremental insertion techniques are equally effective. However, the application of the adhesive systems *Excite* and *Adper Prompt L-Pop* should be considered critically due to the significantly worse margin qualities while the adhesive systems *OptiBond FL* and *Clearfil SE Bond* showed excellent results and should be preferred for clinical use at Class II cavities with cervical margins in dentin.