



## Introduction:

Asked for the most important properties of restoratives dentists favorise (1) a composite that has a low shrinkage, cures fast, is easy to handle, exhibits a stable viscosity, has a high plaque resistance, and a good polishability. The last requirement can be detailed in a short polishing time and an easy polishing process to achieve a highly glossy surface. But the natural shine of the tooth is not the only advantage of a sleek surface. Studies have shown that a low medium surface roughness reduces among other parameters the early plaque build up and thereby the proliferation of initial microorganism bonded to the tooth (2). These are responsible for the biggest part of the microbe-mass on the tooth surface. Therefore it is interesting to analyse if there are significant differences in the polishing abilities of chair-side polishing systems and if these tools behave differently for different composite based restoratives.

## Objective:

1. The analysis of reflection and roughness of the microhybrid composite Venus™ (Heraeus Kulzer) polished with the 4-step system Sof-Lex™ (3M-Espe), the 3-step system Astropol™ (Ivoclar-Vivadent), the 3-step system Polishing-system Komet 4323 (Gebr. Brasseler), the 3-step system OptiDisk™ (Kerr Hawe), the single-step system PoGo™ (Dentsply-Caulk), and the single-step system iPol™ (Heraeus Kulzer).
2. The analysis of reflection and roughness of Tetric Ceram™ (Ivoclar-Vivadent), EsthetX™ (Dentsply) and Point 4™ (Kerr) polished with one of the best and one of the worst of the polishing systems.

## Method:

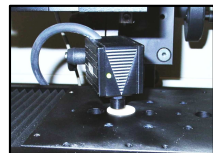
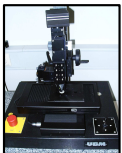


Figure 1:  
Microfocus UBM  
Laserscanner

All composite samples (20 mm in diameter, 1.0 mm thick) were cured with Translux-Energy™ (Heraeus Kulzer), roughened by a carbide bur at 30.000 rpm for 30 sec and polished according to the manufacturers instructions for use. Polishing time was 40 sec for each step. Eight spots (3,0x1,0 mm) were analysed by a Microfocus laser scanner (UBM, Ettlingen, GER) to determine roughness and gloss. Medium surface roughness was determined according to ISO 4287/1.

## Results:

Letters indicate statistical difference by ANOVA and Duncan ( $p = 0,05$ ).

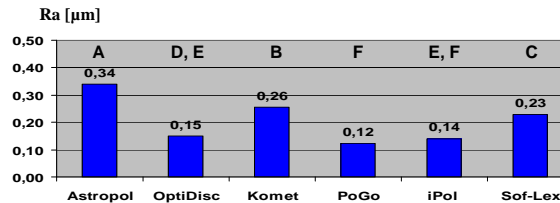


Figure 2: Medium roughness Ra of the Venus samples polished

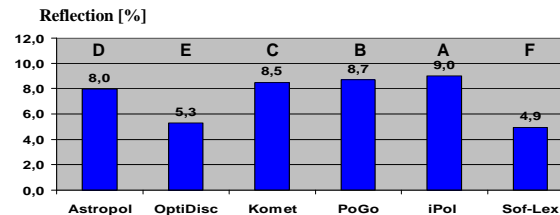


Figure 3: Reflections of the Venus samples polished

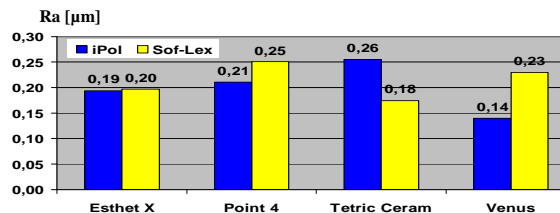


Figure 4: Medium roughness Ra of EsthetX™, Point4™, Tetric Ceram™, and Venus™ samples polished

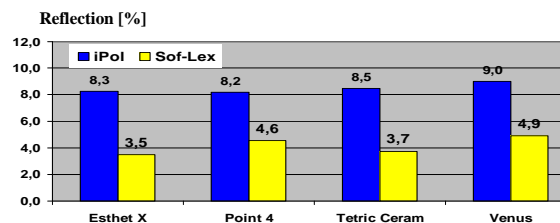


Figure 5: Reflections of the EsthetX™, Point4™, Tetric Ceram™, and Venus™ samples polished

## Conclusion:

Regarding surface roughness the Astropol™, Komet™ and Sof-Lex™ multi-step systems showed in combination with Venus™ significantly the highest roughness whereas the multi-step system OptiDisk™ and the two single-step polishing systems iPol™ and PoGo™ performed best for Venus™.

The single-step polishing systems iPol™ and PoGo™ performed best in the reflection analysis followed by the multi-step systems Komet™ and Astropol™. Sof-Lex™ showed significantly the lowest value of the analysed group. Surprisingly the OptiDisk™ polishers that gave a low surface roughness resulted in a low reflection.

Under the limitations of this study the time saving single step polishing systems performed better compared to the multi-step ones that may consume up to 4 times the operating time of their competitors.

The additional analysis of the polishing properties of iPol™ and Sof-Lex™ on top of the surface of the micro-hybrids EsthetX™, Point4™, and Tetric Ceram™ showed, that the polishing results depend on the match between composite and polishing system.

Regarding surface roughness, EsthetX™ performed equal with iPol™ and Sof-Lex™, Point4™ worked better with iPol™, and Tetric Ceram™ gave smoother surfaces with Sof-Lex™.

The results of the reflection analysis have been much more consistent; the reflection of the samples polished with iPol™ have been between 3,7 % and 4,9 % above those polished with Sof-Lex™.

Overall the Venus™/iPol™ combination resulted in the highest reflection and the lowest surface roughness in the second part of the comparison - so the preconditions for a low level of plaque build-up and additionally at the same time a high initial surface gloss seem to be given.

For future research it would be interesting to reassess the technical findings of this investigation by a microbiological in-vitro plaque-adhesion study.

## References:

- (1) Heraeus Kulzer customer survey 2004
- (2) M. Tschernen, PHD Thesis, Munich, 2003 and literature cited:
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  - H.N. Newman, Br Dent J 136, 491 – 497, (1974)
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