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Advantages of Three-Dimensional Imaging - an in-Vitro Study on Glass-Ionomer-Cements

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Objectives The investigation of surface roughness is of importance in many fields of dentistry. However, there are still different methods to investigate surface roughness which are not comparable. The aim of the present study is to investigate if there are differences in surface roughness between measuring a line of the surface (Ra) and measuring the whole surface (Sa).
Methods For this purpose, 50 samples were analyzed using a three-dimensional, optical surface measurement. Sa was analyzed using a picture field measurement (4mm x 4mm), while Ra was determined as lines with a length of 4mm at different points of the surface. For each sample, five measurements were taken each: horizontal, vertical, from the bottom right hand corner to the upper left hand corner, from the bottom left hand corner to the upper right hand corner and zick-zack. In sum, 1300 measurements were taken.
Results We could show that surface roughness was higher using Sa as measurement instead of Ra, except for zick-zack lines.
Surface roughness measured with Sa had a broader range than measured with Ra.
Conclusions Surface roughness is influenced by the kind of measurement itself. Improvements like measuring areas (Sa) instead of lines (Ra) may prevent errors. The present results support the assumption that surface roughness should be analyzed using Sa with disclosure of the measured size in future studies. Although Sa represents a higher surface roughness, it may better represent valid value of surface roughness.