Study design

In addition to Admira Fusion (VOCO), also the compatibility of ceram.x (Dentsply Sirona) and Filtek Supreme XTE (3M ESPE) were examined. Details of the materials can be found in table 1. For the compatibility test two different types of human gingiva cells were used: fibroblasts and keratinocytes. The used gingiva cells were taken off a healthy patient and immortalized by transfection afterwards.

Table 1: Examined restorative materials

<table>
<thead>
<tr>
<th>Restorative</th>
<th>Classification</th>
<th>Resin matrix</th>
<th>Filler content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admira Fusion (VOCO)</td>
<td>Nano-hybrid ORMOCER® restorative material</td>
<td>ORMOCER® (methacrylate-functionalized polysiloxane)</td>
<td>84.0 % w/w</td>
</tr>
<tr>
<td>ceram.x duo (Dentsply Sirona)</td>
<td>Nano-hybrid composite</td>
<td>Conventional methacrylate (Bis-EMA, Bis-GMA, EDDMA) organic functionalized siloxanes</td>
<td>77.0 % w/w</td>
</tr>
<tr>
<td>Filtek Supreme XTE (3M ESPE)</td>
<td>Nano-hybrid composite</td>
<td>Conventional methacrylate (Bis-GMA, UDMA, TEGDMA, Bis-EMA, PEGDMA)</td>
<td>78.5 % w/w</td>
</tr>
</tbody>
</table>

Cylindrical samples of the restorative (6 mm diameter, 2 mm thickness) were prepared, cured and polished by means of silicone forms. After cleaning with ethanol for 1 minute, then washing three times with sterile water for 2 minutes, the specimens were incubated with cell suspensions of human gingiva fibroblasts and keratinocytes (50,000 or 100,000 cells in each 0.5 ml nutrient solution). The cell suspensions with no specimens, which were incubated simultaneously, were used as the control group for the evaluation. The total incubation period of all groups was a maximum of one week. Afterwards, the nutrient solution was collected and the effects of the restoratives in regards to the quantity of cells and survival rate was determined by means of impedance measurement (xCELLigence - Real Time Cell Analysis). The results are shown in figures 1 and 2.
Results

![Figure 1: Survival rate of human gingiva fibroblasts after contact (6 days) with different restorative materials](image)

![Figure 2: Survival rate of human gingiva keratinocytes after contact (6 days) with different restorative materials](image)

The results show that the effect of the ORMOCER®-based restorative material Admira Fusion on the examined gingiva cells is lower compared to the conventional composites. The fibroblasts and the keratinocytes show a survival rate of 100 % after 6 days of incubation period. The conventional monomer technology based ceram.x and Filtek Supreme XTE only show a survival rate of 72 % and 67 % (fibroblasts) and 83 % and 7 % (keratinocytes). The slightly higher survival rates of ceram.x are probably due to the fact that the material contains to a small extent of approx. 12 % inorganic-based monomers in addition to conventional monomers.

In a recent study of Miosge et al. Admira Fusion achieved similar good results in comparison to conventional composites[2]. Both these and the results presented here confirm excellent biocompatibility of ORMOCER®-based restorative materials, which is important for both the dentist and the patient.

Conclusion: The ORMOCER®-based restorative material Admira Fusion compared to conventional restorative materials shows an excellent biocompatibility. This creates additional value for dentist and patient, which was not achievable with previous conventional restorative composites.

[1] Polydorou O; Evaluation of a new dental composite material on gingival cells, University Medical Center Freiburg, report to VOCO. 2016.
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