SCIENTIFIC REPORT

Admira Fusion – Cell compatibility

VOCO GmbH, Knowledge Communication Department

Anton-Flettner-Str. 1-3
27472 Cuxhaven, Germany

Tel.: +49 (0)4721-719-1111
Fax: +49 (0)4721-719-109

info@voco.de
www.voco.dental

In direct filling therapy methacrylate-based restoratives are the only option in most of the cases. No other material is able to serve excellently such important parameters like aesthetics, stability, handling and polishability as this class of material. Furthermore, also the biocompatibility, meaning the compatibility for human and environment, is always in focus for both patient and dentist. Therefore, the manufacturers have great interest in increasing the biocompatibility of their materials continuously. At the University of Freiburg, VOCO's nano-hybrid ORMOCER® restorative material Admira Fusion has been examined and compared to traditional filling materials in regards to the compatibility to human gingiva cells.[1]

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

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

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

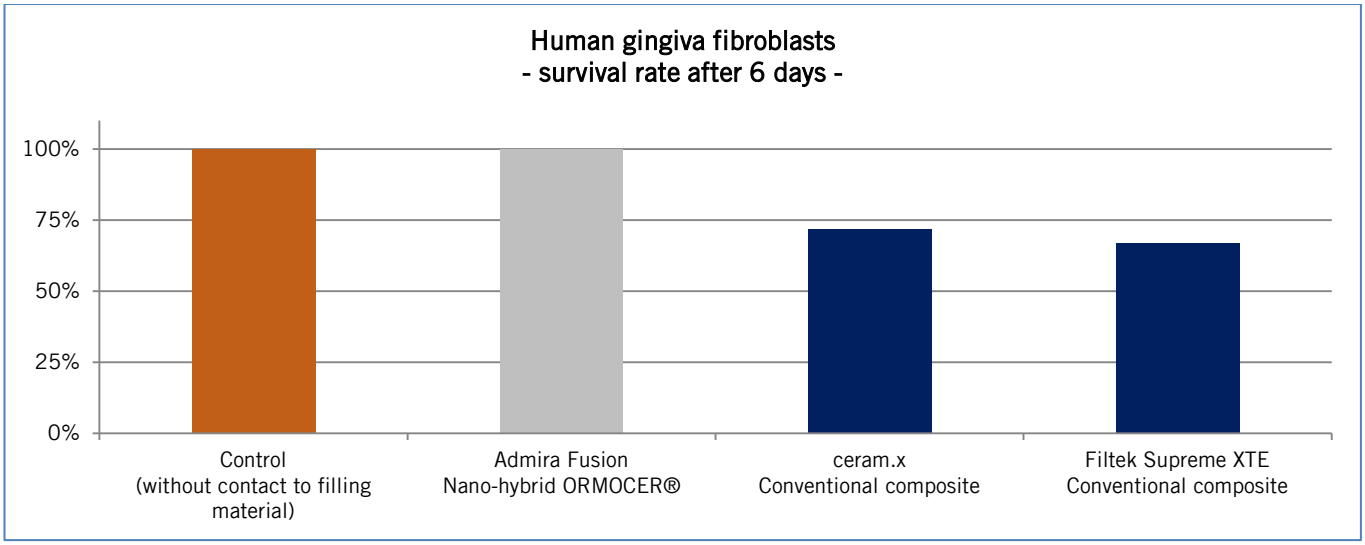

Figure 1: Survival rate of human gingiva fibroblasts after contact (6 days) with different restorative materials

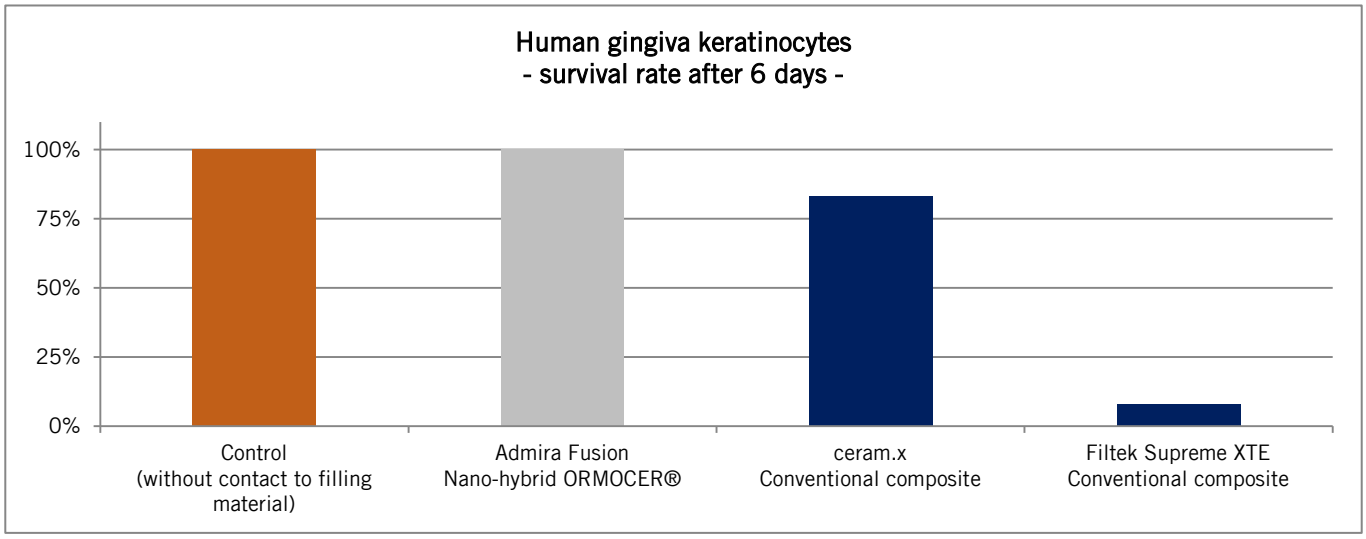

Figure 2: Survival rate of human gingiva keratinocytes after contact (6 days) with different restorative materials

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**.

[2] Schubert A, Ziegler C, Bernhard A, Bürgers R, Miosge N; *Clin Oral Invest*, **2018**. https://doi.org/10.1007/s00784-018-2419-9