

# Nanocomposite for minimally invasive restorations

Maximillian Kollmuß and Julia Goeke

## Introduction

A form of dentistry that aims for minimally invasive treatment makes high demands on the materials that are used in all respects. Latest generation composite materials, the so-called nano hybrid composites, are specifically used for the direct restoration of carious lesions. These materials are distinguished by their excellent physical properties such as abrasion stability, coloring and polishability. An outstanding high lustre finish and a low surface roughness are facilitated by a filler kernel size in the wavelength range of visible light. The results are lasting, highly aesthetic restorations. What's more, these materials are user-friendly and easy to handle thanks to their compatibility with modern adhesive systems.

The NanoPaq system from Schütz Dental combines a nano hybrid composite with a high filler content and a modern two-step adhesive system in the total etch technique which dissolves the smear layer. The material is available with a choice of two viscosities („flowable“ and „packable“) for different indications.

The following case study shows the use of the NanoPaq system in the clinical practice for a patient with a typical diagnosis.

## Clinical Case

The 22-year old female patient came to our practice for a routine check up. She reported neither pain nor discomfort. The oral hygiene can generally be described as very good, with the exception of a few interdental spaces. Tooth 26 showed a slightly insufficient sealing of the distal fissure. As the last x-ray for the detection of interdental lesions was taken in the patient's early life, we decided to take bitewing images of all four quadrants. The digital x-ray image showed a carious lesion in the area of the mesial interdental contact of tooth 26. This lesion had already reached the outer half of the dentin („D3 lesion“).

# Nanocomposite for minimally invasive restorations

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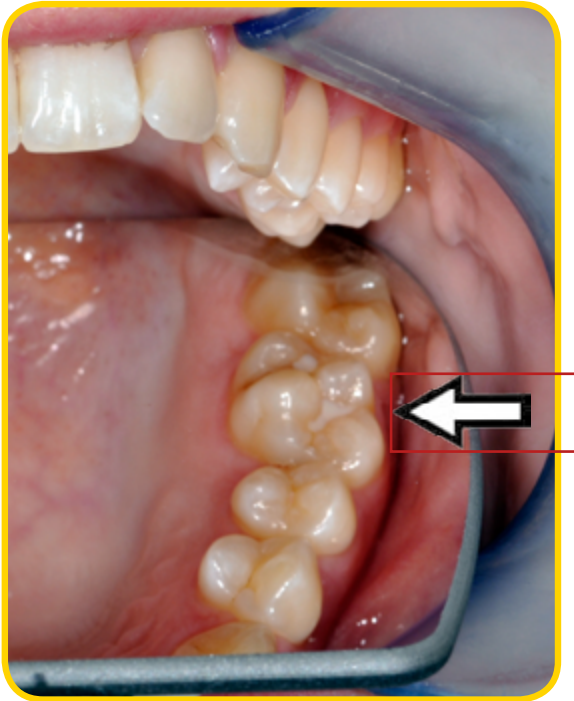


Fig. 1 Initial situation

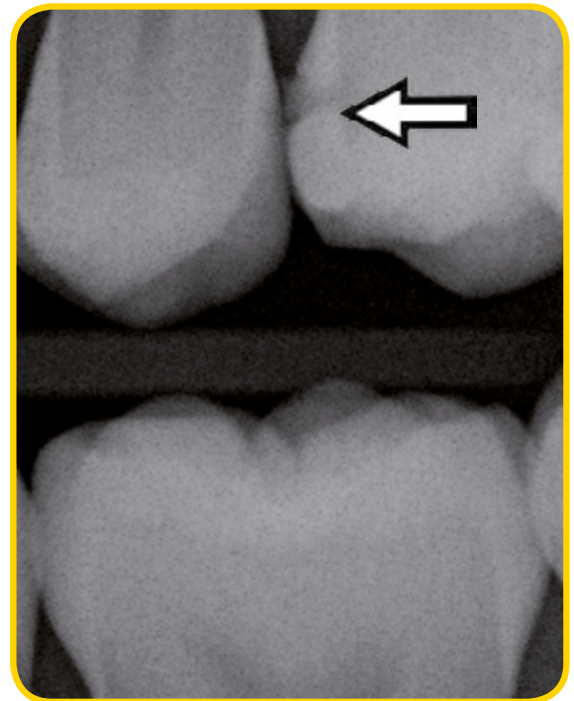


Fig. 2 Digital x-ray image

After informing the patient of the diagnosis, the carious lesion was to be opened and restored directly with a composite. The treatment was going to include the interdental caries and the insufficiently sealed fissure.

# Nanocomposite for minimally invasive restorations

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After applying a local anaesthetic, the old fissure seal was removed and the interdental carious lesion accessed.



**Fig. 3 Old fissure seal removed and carious lesion accessed**



**Fig. 4 Excavated caries**

The secondary caries in the distal fissure of tooth 26 which could not be detected clinically underneath the old fissure seal was now obvious. In the following, the carious hard tooth substance was removed with round steel burs. Subsequently, the cavity margins in the interdental area were smoothed with help of a diamond preparation tool.

Next, rubber dam was applied to keep the cavity absolutely dry to ensure a safe adhesive bond between filling material and hard tooth substance. A sectional matrix was also placed along with a small wooden wedge to create a sufficiently strong contact point to the adjacent tooth.

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**Fig. 5** Placement of rubber dam, sectional matrix and wooden wedge

Afterwards, the hard tooth substance is conditioned with 37 % phosphoric acid (according to the manufacturer's instructions: enamel 30 sec., dentin 15 sec.) in line with the „total etch technique“.



**Fig. 6** Application tip for etching gel



**Fig. 7** Etching gel applied



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Then, the cavity was treated with the adhesive NanoPaq Bond twice for 30 seconds each. Each layer of NanoPaq Bond was light-cured with an LED curing light for 20 seconds each.



Fig. 8 Application of NanoPaq Bond

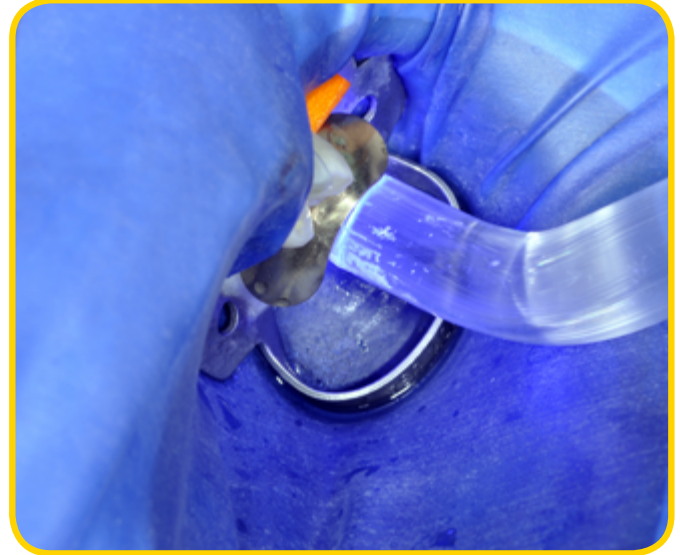


Fig. 9 Light-curing of the bonding layer

The fissures and pits were sealed with NanoPaq Flow to create an extensive fissure seal. This material from Schütz Dental coats the fissure relief well and thus ensures a dense seal of the fissure system. NanoPaq Ceramic was used in several layers to fill the interdental cavity. Each layer was cured with an LED curing light for 40 seconds. Any excessive material at the margins was removed with a sharp sickle scaler without any problem.

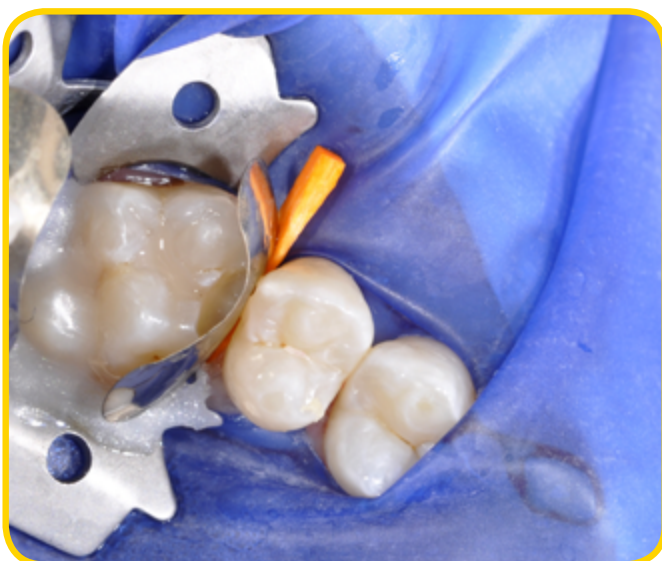


Fig. 10 First composite layer



Fig. 11 Finished filling

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After removing the rubber dam, the occlusal height of the filling was checked and adjusted. As a high strain on the margins can lead to cracks in the filling, we ensured that there were no occlusion contacts in this area or only very slight ones.



**Fig. 12 Occlusal contact points**

The restoration was finished with hard metal finishers. Subsequently, it was polished with a two-step silicon polisher system suited to composite materials.



**Fig. 13 Finished filling**



**Fig. 14 Finished filling**

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## Conclusion

With help of the NanoPaq system from Schütz Dental, a minimally invasive restoration can be created while preserving a maximum of the natural tooth substance. The use of the materials is easy and time-saving, thanks to their ideal viscosities. The range of available shades helps to produce an exact reconstruction of the lost hard tooth substance. What's more, the final photographs show a natural brilliance of the restoration surfaces which results from the excellent polishability of the filling material.

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