Post-endodontic hybrid ceramic restoration

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Introduction

Today, the use of the latest generation of ceramic materials and modern CAD/CAM systems gives us the opportunity to reconstruct damage to the hard tooth substance and to benefit from the enormous advantages of this technology in terms of:

- Precision
- Maximum accuracy
- Shorter, more comfortable patient treatment.

The aim of this article is to demonstrate the prosthetic restoration of an endodontically, restoratively and aesthetically compromised tooth in the digital workflow. The previous restoration with an old, functionally and aesthetically insufficient amalgam filling played a decisive role.

Case study

A 57-year-old male patient came to the dental practice for a check-up because he found the old restoration on his lower right first molar (LR6) unsightly. The clinical examination revealed a large amalgam filling that was about 20 years old.

Radiological diagnostics showed an insufficient endodontic treatment in the periapical region. After appropriate revision treatment, the tooth should be stabilised with glass fibre pins and a build-up filling with flowable composite.

A prosthetic restoration with a crown was then planned to restore the tooth's aesthetics, as well as resistance to chewing forces.

Endodontic revision and stabilisation

At the first treatment appointment, the amalgam filling was removed under a rubber dam and the root canals were completely revised and filled. In the same session, two glass fibre posts with dual-cure composite cements were adhesively placed in the distal and mesio-vestibular canals.

A build-up filling with flowable composite was then placed and the tooth crown was prepared with diamond instruments.

At the end of the session, a temporary restoration fabricated intraorally was finished, polished and cemented.

In the second session, the tooth shade was determined digitally using the Vita Easyshade V spectrophotometer, which proceeded precisely and simply by hand. This was followed by the digital impression with an intraoral scanner to produce a more precise temporary restoration that enabled optimal gingival shaping.

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Long-term temporary composite

The virtual data set was sent to the dental technician, who designed the new long-term temporary restoration using CAD/CAM. The restoration was manufactured from the Vita CAD-Temp composite block (Vita Zahnfabrik) in the determined tooth shade. The newly fabricated long-term temporary restoration was temporarily cemented.

After about three weeks, the gum tissue around the second temporary restoration had healed perfectly and formed, which is why a second optical impression could be taken with the intraoral scanner for the fabrication of the final crown.

The corresponding STL file of the crown preparation on LR6 was sent to the dental laboratory so that the CAD/CAM-supported fabrication could be implemented on this basis.

Final hybrid ceramic

For the fabrication of the final restoration, the clinical and dental technician team decided on the easy-to-process Vita Enamic HT Multicolor in shade 2M2. The hybrid ceramic consists of a porous, pre-sintered feldspar ceramic block (86% by weight), which is then infiltrated with polymer (14% by weight) under pressure and heat (He, Purton and Swain, 2011).

The result is a dual ceramic-polymer network that exhibits toothlike material properties, where microcracks in the ceramic are stopped at the polymer-interface (Coldea, Swain and Thiel, 2013).

The CAD/CAM material is not fired and can be characterised after production with the light-curing stains Vita Akzent LC.

In this case, the surface was sandblasted, silanised, painted and then finished with the light-curing glaze Vita Akzent LC Glaze.

Fully adhesive seating

After the try-in, the fully adhesive integration was carried out with the tailored, fully adhesive Vita Adiva F-Cem bonding system.

After the composite cement had cured, the occlusion was checked. Any grinding measures should always be carried out after final bonding.

This was followed by final finishing and polishing with the two-stage Vita Enamic Polishing Set Clinical, which enabled quick smoothing of the ground areas.

The excellent aesthetic result of the restoration was perfectly integrated into the adjacent teeth and the adjacent gingival anatomy.

Fig. 1: Initial situation with the amalgam-filled and highly discoloured tooth LR6

Discussion

The treatment and the success of the clinical case were made possible through the use of modern materials and digital workflows, which offer numerous advantages for users (clinical and technical) and patients.

The main advantages lie in the material properties, which became clear in the different treatment stages.

The long-term temporary material Vita CAD-Temp is a composite that is characterised by excellent aesthetics and high strength.

The decision in favour of a final restoration with the hybrid ceramic Vita Enamic Multicolor was made because of the natural aesthetics, but also because of the toothlike flexural modulus, which is a real advantage in terms of the long-term stability of the restoration.

The glass fibre post and the composite cement should also have a toothlike flexural modulus in order to be able to react to chewing forces with the same deformation as the residual tooth substance. This avoids stress peaks between the different restorative materials and the remaining hard tooth substance and prevents fractures between them.

A clinical long-term assessment of the success of the therapy is not yet possible in this particular case.

However, in countless studies, the hybrid ceramic has already shown its potential for long-term clinical success in teeth treated with root canals in terms of precision (Saglam, Cengiz and Karacaer, 2020; Elashmawy and Elshahawy, 2022) and resilience (Elashmawy et al, 2021; El-Refaay, Hassan and Mohammed, 2020; Elashmawy, Aboushelib and Elshahawy, 2021), in comparison to other materials,

Fig. 2: View into the pulp cavity after revision treatment and root canal filling with gutta percha

Fig. 3: Situation after inserting glass fibre pins and building up with flowable composite

Fig. 4: Radiological view of LR6 after endodontic treatment and crown build-up

Fig. 5: Clinical situation after preparation and before the intraoral scan

such as lithium disilicate and zirconia.

At the same time, the fabrication costs for hybrid ceramic restorations are significantly lower.

The integrated shade gradient is the basis for a natural aesthetic. The right shade is essential from a prosthetic point of view, which is why the Vita Easyshade V spectrophotometer can be described as indispensable for tooth shade determination.

Numerous clinical studies have shown that digital tooth shade determination with the Vita Easyshade V is more precise than visual shade comparison with the human eye (Hampé-Kautz et al, 2020; Lehmann et al, 2017; Igiel et al, 2017).

The Vita Adiva bonding system is very comprehensive and offers simple and reproducible handling for adhesive bonding for every user.

All steps are described in a comprehensible manner and broken down according to the type of restoration and substrate surface. Following the procedure is the basis for successful cementing.

After integration, the crown looked natural, and it reliably masked the severely discoloured stump.

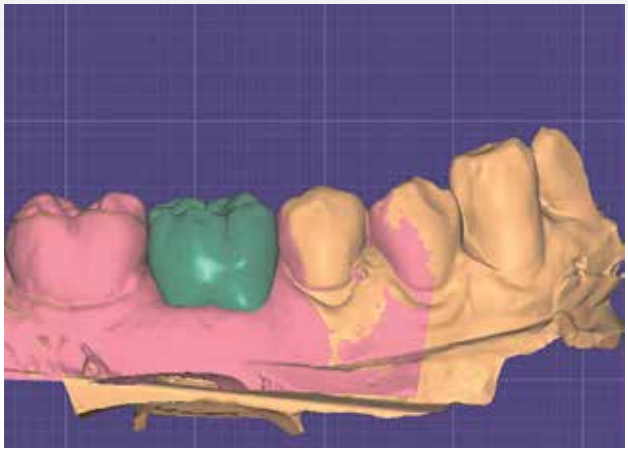

Fig. 6: Construction of the second temporary restoration of Vita CAD-Temp in the Exocad software

Fig. 7: The final crown made of the polychromatic hybrid ceramic Vita Enamic Multicolor

Fig. 8: The final crown made of Vita Enamic Multicolor and integrated with Vita Adiva F-Cem

Summary

A functional and aesthetic treatment result was achieved, thanks to new material properties in combination with reproducible digital technology.

It is advantageous to be able to work with increasingly powerful, modern materials. They enable clinicians and patients to receive treatment more quickly. Fabrication is easier than with the classic restoration forms, and the work for the practice team is made easier.

The patient immediately felt comfortable with his new hybrid ceramic restoration.

The first follow-up appointment was made for six months.

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