

Long-term stable restoration of severely discoloured anterior teeth

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Fig. 1: Frontal view of initial situation. Seriously impaired aesthetic appearance due to extreme discoloration and malpositioning of the maxillary central incisors. **Fig. 2:** Palatal view of the initial situation. As well as micro-leakage around the margins, secondary caries is also evident under the composite fillings, which were placed more than five years ago.

Introduction

Severely discoloured endodontically treated maxillary incisors can have a considerable detrimental impact on aesthetic appearance and also present a particular challenge for the restorative team. When planning treatment, the focus is firmly on reconstruction of the biomechanical and visual properties of the affected teeth combined with minimal biological cost. In a well-coordinated approach, internal bleaching measures, the use of a fibre post (depending on the degree of destruction), selected adhesive build-up materials and a preparation technique tailored to the restoration material can be combined to achieve a satisfactory treatment result which, compared to classic full crown preparations, can significantly reduce the loss of hard tooth structure.

In the following case report, the restoration of two maxillary central incisors using bleaching measures, insertion of DT ILLUSION XRO SL fibre posts with direct composite build-ups and final restorative treatment with 360° glass ceramic-based veneers is illustrated and documented after a clinical service period of 7 years.

Case report

Initial situation

A 28-year-old male patient presented with the demand to have his endodontically treated and severely discoloured maxillary central incisors restored. He stated that since undergoing an apicoectomy a number of years ago, he no longer experiences any symptoms on the two anterior teeth. However, he expressed his discontent with the appearance

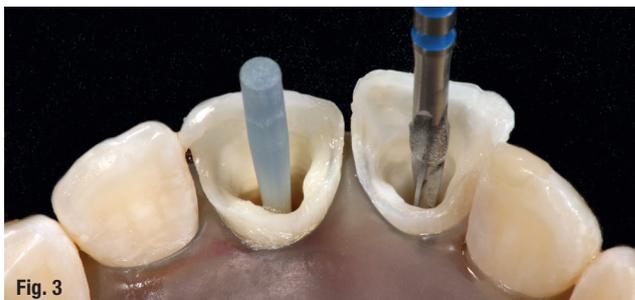


Fig. 3: Post preparation for the DT ILLUSION XRO SL Post (diameter 2.2 mm, blue). The marginal post section becomes translucent upon trying-in in the root canal as it is warmed up to body temperature. **Fig. 4:** DT ILLUSION XRO SL post (diameter 2.2 mm, blue). The post is translucent when warmed up to body temperature, here in the apical third area after being handled.

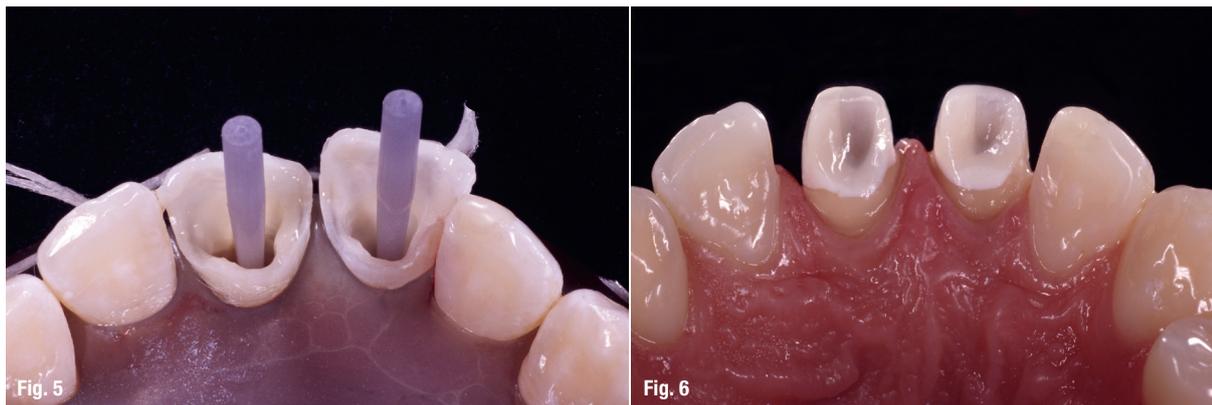


Fig. 5: Palatal view of try-in of both DT ILLUSION XRO SL posts on the prepared incisors. The marginal post section of the DT Post is already translucent upon trying-in in the root canal as it is warmed up to body temperature. **Fig. 6:** Palatal view of the built-up incisors prepared for the full veneers (360° circular veneers). The DT ILLUSION XRO SL posts were translucent when warmed up to body temperature.

of his teeth resulting from the considerable aesthetic imperfections (Fig. 1). After evaluating the clinical findings and the X-ray images, root canal fillings presented in compliance with the state-of-the-art were diagnosed on teeth 11 and 21. Root canal posts were not present. However, the extensive composite fillings in both teeth showed micro-leakage and secondary caries had begun to develop (Fig. 2). The patient explained that the fillings on the two affected incisor teeth had been placed more than five years ago.

The particular challenges presented by this initial situation arose from the patient's demand for a prompt improvement of the aesthetic imperfections and, with this, restoration of an adequate tooth shade and position and, as far as possible, permanent stabilisation of the remaining hard tooth structure.

Treatment planning

Prior to planning the definitive treatment, the insufficient composite fillings in both anterior teeth were replaced and the secondary caries was removed. This was a key prerequisite to obtaining a good overview of the degree of destruction of the teeth and to rule out possible contamination of both root canals with micro-organisms as a result of the insufficient and leaking fillings over the

years. As both root canal fillings were sealed tight by separate adhesive fillings at the cement-enamel junction, there was no need to inspect the canals.

Following the initial laboratory and clinical analysis, the patient and treatment team opted for the following treatment plan:

Firstly, the malpositioning (crowding) and the existing tooth proportions were to be corrected with a diagnostic wax-up. During the pre-treatment phase, the affected teeth were to be lightened to a shade that harmonises with the adjacent teeth by means of internal bleaching measures. Given the pronounced nature of the defects, the adhesive technique was to be used for the post-endodontic structure with the aid of fibre-reinforced posts in the direct technique. For the final restoration of the severely damaged anterior teeth, adhesively placed 360° veneers based on glass ceramic were to be used.

Pretreatment and preparation

After cleaning the coronal pulp chamber, an additional seal for the root canal fillings was created on the level of the enamel-cement junction in order to rule out penetration of the subsequently applied bleaching agent into sensitive areas. Internal bleaching was performed

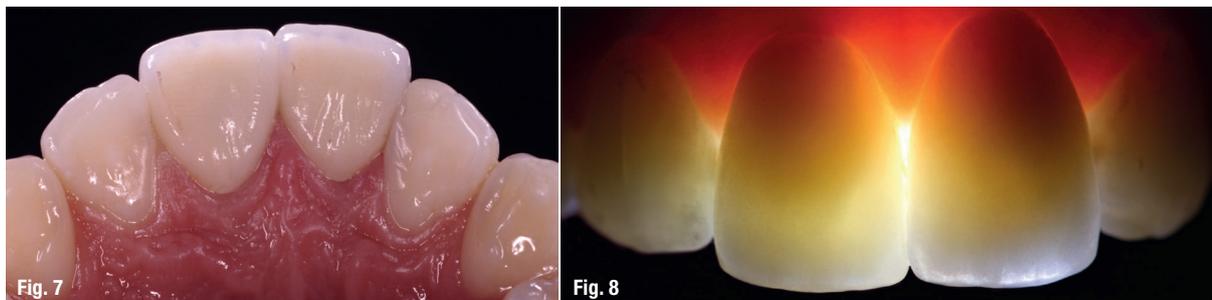


Fig. 7: Palatal view of try-in of full veneers (360° circular veneers) made of glass ceramic. The underlying abutment teeth could be masked extremely well even with a minimal layer thickness. **Fig. 8:** Transmitted light image of the maxillary anterior teeth following finalisation and insertion. Thanks to the combination of the DT Post with translucent build-up materials and glass ceramic veneers, light transmission was achieved, which corresponds to that of natural teeth.

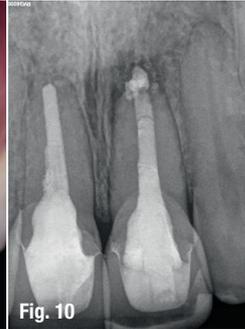


Fig. 9: Follow-up examination seven years after insertion. Even after seven years of clinical service, a highly satisfactory situation from both an aesthetic and functional perspective can be perceived. (Dental technician: Oliver Brix, Bad Homburg, Germany) **Fig. 10:** Tooth radiograph after 7 years of clinical service. The dense structure of the post anchor is evident together with an excess of root filling material on tooth 21.

using a mixture of sodium perborate powder and distilled water applying the walking bleach method. The palatal access to the coronal pulp chamber was sealed using a cotton pellet soaked in bonding agent and low-viscosity composite and the patient was requested to return in one week's time. During this session, the bleaching agent was changed again in order to extend the exposure period by another week. After the second week of exposure, the shade of both abutment teeth was satisfactorily improved. In order to neutralise the bleaching agent, a calcium hydroxide preparation (CalciPure) was applied to the pulp chamber. Following this neutralisation phase, post-endodontic build-up of the abutment teeth could be commenced. To this end, the coronal seals on the root canal fillings were firstly removed and standard holes for fibre-reinforced posts (type: DT ILLUSION XRO SL, diameter 2.2 mm, colour at 21°C: blue) were created (Fig. 3). The DT ILLUSION XRO SL posts are coloured according to their size at room temperature; this colouring disappears following insertion and when warmed up to body temperature. If the post needs to be removed, the colouration can be rendered visible again by cooling gently, e.g. with an air spray (Fig. 4). The DT Posts were secured in place using a fully adhesive technique with a multiple-step adhesive system (Fig. 5). The direct build-ups were created in two stages; after covering the posts with a low-viscosity (flowable) composite, a pre-warmed (54°C) highly filled viscous composite of shade Bleach XL was used for the main volume of the build-up. The minimally invasive preparation was produced with the guidance of a template derived from the diagnostic wax-up (deep-drawn film); this template contained all the information for correction of the malpositioning and the outer contour of the subsequently definitive restorations (Fig. 6).

Temporary restoration

The temporary direct veneers were produced using a reusable diagnostic template and Bis-GMA-based temporary restoration material. After a four-week evaluation phase of the tooth shape and position determined in the wax-up by means of the temporary prosthesis, a

precision impression of the prepared teeth and an impression of the opposing jaw were taken. These were sent to the laboratory together with the facebow, the maxillomandibular relationship record and a photo of the prepared abutment teeth.

Try-in and insertion of the glass ceramic veneers

After removing the provisional restorations, the preparation surfaces were freed from all remains of the bonding agent using cleaning brushes and a fluoride-free cleaning paste (Zircate, Dentsply Sirona). To check the shape and shading, the restorations were tried in with a coloured glycerine gel. As such, perfect masking of the abutment teeth was possible, resulting in a uniform appearance irrespective of the subsurface (Fig. 7).

For final insertion, the inner surfaces of the glass ceramic veneers were etched with hydrofluoric acid and then coated with an silane coupling agent. A multiple-step dentine adhesive system was used on the tooth side.

Conclusion

Thanks to the combination of translucent build-up materials with glass ceramic veneers, light transmission was achieved, which corresponds to that of natural teeth (Fig. 8). The final inspection of the functional and aesthetic parameters showed that all patient's demands could be fulfilled. The tooth shade harmonised perfectly with the neighbour teeth. Alongside rectification of the extreme discolouration of the hard and soft tissue structures, malpositioning and tooth proportions were also satisfactorily corrected. The patient was fully satisfied with the aesthetically pleasing result and experienced no phonetic problems whatsoever due to the corrected positioning of the incisors. After a clinical wearing period of seven years, no loss of retention of the post, build-ups or veneers was evident nor were there signs of bonding problems in the X-ray image (Figs. 9 & 10).

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