Endodontic treatment, retreatment and permanent cementation of full ceramic CAD/CAM crown in one visit

Clinical case

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Introduction
One visit dentistry is becoming more and more popular among patients nowadays. The reasons behind are various – lack of time due to work, unwillingness to come several times, parking issues, and many others. A rising demand for treatment that includes as few steps as possible is becoming a strong trend among patients. In some cases, all that needs to be done is acquire more knowledge on endodontic treatments, a suitable rinse protocol and usage of FRC pins. As far as the prosthetic work is concerned, modern chairside CAD/CAM systems allow to achieve a very endodontic, permanent cementation of full ceramic crown, using MyCrown.

Patient first contact
52 years old woman came to our dental clinic with broken tooth no. 14 and asked for emergency treatment as the tooth is in the smile area and the patient stated she felt deficient and uncomfortable when working and speaking with people. (Fig. 1, Fig. 2) After taking an introral X-ray and status analysis, we suggested RCRT (root canal endodontic retreatment), followed by treatment with FRC (fiberglass reinforced composite) post and reconstruction with ceramic crown, made by CAD/CAM system MyCrown.

Endodontic treatment
During the treatment with Zeiss Openi Pico microscope, it was found, that the palatal root canal was not treated at all. Subsequently, the vestibular root canal retreatment and palatal root canal treatment were performed using a standard rinse protocol using 5% NaOCl, 0.2% CHX and EDTA. To fill the root canals M-2 system ISO 25/06% – gutta-percha and E-2 and E-2 Fill system were used. (Fig. 3)

Immediately after the endodontic treatment, the palatal part of the gingiva was removed by electrotoque. The FRC ENA post was placed in the palatal root canal. After removing a portion of gutta-percha from the filled root canal, 6mm deep, the dentin was etched with orthophosphoric acid for 30 seconds and then rinsed with water from syringe for 30 seconds. The ENA bond was mixed with the polymerization activator in a 1:1 ratio and applied to the dentin with microbrush and also to the pre-slained pin. Subsequently, ENA CEM - dual curing resin cement was applied to the duct and FRC post was introduced. Illumination with curing light 30 seconds. The crown part of the tooth was rebuilt by the same ENA CEM - dual curing cement. Thus, the tooth was ready for shoul- der preparation before the digital impression (Fig. 4)

Cingiva management
After shoulder preparation and pres-ervation of all parameters for the next restoration, the tooth was prepped for digital impression. Firstly, it is most important to make the edge of the preparation as clear as possible. This is the most important thing in defining the future resto-ration. This has resulted in proper gingival management. In this case, a two-cord technique was used. (Fig. 5) A thinner fibre was first put into sul- cus without haemostasis solution. Subsequently, a fibre with thickness 3, impregnated with aluminium chloride, was put for faster and bet- ter haemostasis and retraction. After 5 minutes, the thicker fibre is drawn, the thinner one is left and the edge of the preparation is clearly visible.

Treatment with MyCrown
The scanning area must be dry be- fore every digital impression. For better access to the oral cavity we use Optracure. By using DryTips, the sa- liva of gl. parotis is stopped. Lingua- Fix tongs the tongue while removing saliva with suction from the sublin- geal gland. (Fig. 6)

After drying the area of interest and applying sufficient amount of HD IONA spray, scanning can begin. First, the area of restoration is scanned, then the opposite jaw, and finally a bucal scan to register the occlusion. After correlating the...
models with the software; the edge of preparation is drawn (Fig. 7) and after defining the insertion axis, the crown is designed.

MyCrown Design software calculates the first proposal based on the surrounding teeth and gives a patient-specific and aesthetic restoration proposal. A quick adjustment was required due to a small improvement of contact points with neighbouring teeth (Fig. 8).

After crown modelling, contact points and occlusal contact points satisfaction, we went to the next step - Manufacture (Milling process). Once the milling was over, we polished the tooth and sat it on the preparation. After checking the points of contact and occlusion, the crown could be cemented. Cementation was done by Variolink by Ivoclar due to its great cementation shade/opacity control and adhesive attributes.

Result
The colour of the crown seems to be darker after cementation. Lighter shade of the neighbouring teeth is caused by loss of moistness due to the length of the procedure (Fig. 9). We asked the patient to come in several hours or the next morning to check the colour. She called only to say everything is perfect and she is very satisfied with this restoration. We have to rely on her judgment and believe that the colour really is satisfying.

Conclusion
This clinical example demonstrates, that if we have sufficient knowledge of latest dental trends and suitable equipment, we can help the patient in one session, even in more complicated cases that would otherwise require multiple appointments. MyCrown allowed to create a perfectly fitting restoration within one visit. The initial software proposal of the crown design was approved allowing to place the restoration into the patient mouth within minutes of its completion. We should always consider every patient is different and should be treated with a unique approach, based on the indication. MyCrown illustrated the benefit of being able to offer restorative treatment in a single visit.

Aesthetic rehabilitation and tissue preservation in the anterior region

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While there are often several adequate prosthetic treatment options to choose from for one single case, there are some cases where none of the proven solutions seems to be perfectly suitable. The prosthodontist and his team have to balance the pros and cons for each available option – they have to decide which treatment is best suited to fulfill the needs of the specific patient. This was the case with a 16-year-old female patient who presented at the Department of Prosthodontics of the Ludwig Maximilians University of Munich, Germany in 2015. An orthodontic treatment had just been completed and a further prosthetic rehabilitation was required.

Background
At the age of 10, the patient had suffered an anterior tooth trauma with avulsion and replantation of the maxillary central incisors (teeth 11 and 21, FDI notation). Despite all efforts, it had not been possible to preserve tooth 22. The former dentist had replaced it with a four-unit metal-ceramic adhesive bridge (Mar-yland bridge) (Figs 1 & 2).

Unfortunately, the distal prognosis for tooth 21 was confirmed in the course of treatment; it had to be extracted during orthodontic therapy. In order to replace both central incisors for the duration of this therapy, a provisional bridge with artificial gingiva was manufactured and attached to the fixed orthodontic appliances (Fig. 3).

Prosthetic treatment plant
At the patient’s first visit in the private dental office of the LMU Munich, the lateral incisors had large composite restorations not only on the vestibular surfaces, but – due to the previous rehabilitation with an adhesive bridge – also on the palatal surfaces (Fig. 4).

Tooth 22 had received an endodontic treatment. This fact significantly limited the prosthetic options and had a negative effect on the prognosis of this tooth. The developmental stage of the cervical vertebrae assessed by the orthodontist using lateral cephalometric radiographs revealed that only minimal transversal and horizontal growth was still to be expected for this patient. Due to this fact and the unfavourable prosthetic value of the abutment teeth, the prosthodontic team – in consultation with the patient – decided to place an all-ceramic adhesive bridge with two wings bonded to teeth 12 and 22. The aim of this treatment was to postpone the placement of implants as long as possible in order to ensure that the patient was fully grown when this intervention was carried out. By use of a fixed restoration, the team strive for the best possible support and preservation of the surrounding soft and hard tissues.

First steps
After removal of the fixed orthodontic appliances, the direct restorations of the maxillary lateral incisors were replaced by new composite restorations. Tooth preparation had already been carried out on these teeth to place the former metal-ceramic bridge. Hence, it was not necessary to remove large amounts of additional tooth structure; however, the existing palatal preparations required refinement. Subsequently, gingiva management was carried out with retention paste. An impression was taken with the J-M True Definition Scanner and uploaded to the Zfx Connection Center. The patient received a removable provisional prosthesis (Fig. 5).

Laboratory procedure
In the dental laboratory, the digital impression file was downloaded, a physical model ordered and the data set imported into the Zfx CAD-Software for the design of the adhesive bridge framework. The bridge was designed in full contour. The recommended parameters (minimum wall thickness, connector strength etc.) for the selected material – J-M Lavina Plus High-Translucency Zirconia – were entered into the software. Then, the bridge was automatically reduced to the framework (Fig. 6). This procedure is beneficial in that it provides for a uniform strength and optimal support of the veneering porcelain. The framework was milled, thinned out at the margins using a fine diamond rubber polishing material, individualised with dyeing liquids, and sintered. The precise fit of the wings to the palatal tooth surfaces was confirmed on the model before the porcelain layering was performed (Fig. 7). Figure 8 shows the situation at the biscuit bake try-in.

Finally, the adhesive bridge was finished and glazed. On the model, a highly accurate fit was obtained (Fig. 9), and the restoration showed a natural appearance (Fig. 10). This is in part due to the high translucency of the material framework (Fig. 11).