Real-virtual modelling of CEREC temporary crowns: A new approach

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The creation of a functional occlusion is the goal of any prosthetic treatment and can be very difficult to achieve in cases of full-mouth rehabilitation, especially in the case of temporomandibular joint (TMJ) dysfunction. In these clinical situations, provisional restorations are an excellent diagnostic instrument. Aesthetics, phonetics and function, after evaluation and acceptance by the patient after try-in of the provisional restorations, should be accurately transferred to the final restorations to ensure the same clinical success.$^{1-2}$

The aim of this study is to demonstrate the manner in which individual movement characteristics of a patient’s TMJ can be included in traditional CEREC temporary crown fabrication. New occlusal relations need to be created with respect to the individual characteristics, such as mandibular and hinge axis positions, Bennett and sagittal angles. The incorporation of occlusal plane formation principles is essential to improve and ease a patient’s adaptation to new occlusal relations, as well as to reduce the probability of TMJ dysfunction. However, CEREC software does not enable the inclusion of TMJ parameters.

Following, we describe a technique that enables the fabrication of temporary CEREC restorations with respect to a patient’s TMJ parameters.
Step I: Electronic axiography and lateral X-rays

Computer analysis of jaw movements with electronic axiography is useful for determining the joint parameters (Fig. 1). Using mechanical tracing, axiography enables the collection of data on a patient's TMJ, such as curve and inclination of the condylar path, mouth opening, Bennett and sagittal angles, mandibular protrusion and course of the medioptusive tracks. Lateral X-rays provide data on movement by including the condylar tracks (Figs. 2a & b).

Step II: Slavicek analysis

We used CADIAX (Gamma Dental) to analyse the X-rays in detail (Fig. 3). Here, the distances, spaces and tooth relations are of considerable importance. The vertical dimension and the special position of the occlusal plane, the Spee's curve and the various occlusal tables of the laterals were determined. In the lateral X-ray, we paid particular attention to the occlusion tables of the molars, especially tooth #6.

Step III: Partial wax-up

A partial wax-up of the individual occlusal surface was modelled on the master casts with respect to the TMJ angles and occlusal pattern of sequential functional guidance occlusion with canine dominance (Figs. 4 & 5).4–6

Step IV: Scanning

The partial wax-up was scanned and combined with the virtual images of the teeth stumps and virtual restorations from the CEREC software database. Thus, we were able to easily control the form, cusp position and inclination of the teeth with respect to individual TMJ movement characteristics and peculiarities of the facial skeleton. We used the diagnostic display with display options for virtual modelling using CEREC software (Fig. 6).

Step V: Milling

The temporary restorations were traditionally milled (Fig. 7).

Conclusion

The method of real-virtual modelling described in this article enables us to guide the anatomical form of restorations using wax reference points with respect to the dynamic TMJ parameters of the patient. The method is a combination of a partial wax-up in the articulator and virtual computer modelling. With CEREC software, we are able to create temporary restorations with respect to individual jaw movements.

Editorial note: A complete list of references is available from the publisher.

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