Temporary Crowns: Repositioning Key as a New Technical Approach in the Clinical Relining Phase

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ABSTRACT

To accomplish prosthetic rehabilitation, a series of important procedures must be followed to achieve the correct final prosthetic outcome. The protocol presented in this article proposes a different approach that involves relining the temporary crowns during the provisional phase by means of a repositioning key. This approach is especially useful for therapeutic provisional restoration in patients with temporomandibular joint disorders.

CLINICAL SIGNIFICANCE

The methodology presented allows the exclusion of arbitrary repositioning in the three-dimensional space of the provisional restoration, considering it as a fixed starting point. Our results tend to emphasize this technique not only for the ease of use, but also for the shorter time required for the occlusal fitting procedures in the final finishing phases.

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The term *occlusal restoration* supposes the absence or loss of a function that will be restored through treatment. The dentist, together with the dental technician, uses different analytic systems to study each individual case.

In fixed prosthodontics, once the treatment has been planned, the realization of the programmed work starts with the preliminary temporary crown phase, which is necessary to follow prosthetic principles.[1] When restoration or replacement of maxillary anterior teeth is required, the development of an accurate anterior guidance is essential to achieve optimum esthetics, phonetics, an occlusion with minimal stress, functional efficiency, and comfort for the patient. The usefulness of provisionals is well demonstrated in perioprosthetic rehabilitation through the reaction of the tissue. In fact, every time provisionals are made in "the perfect way," the healing is complete.[2,3]

Our experience shows that often we have to change the occlusal pattern as previously defined in the articulator as a consequence of occlusal prematurities or deflective contacts after the relining of the provisional. This article describes a method that allows the clinician to maintain the prosthetic design previously established in the laboratory.

THE TECHNIQUE

Use of a repositioning key (Figures 1 and 2) is a technique that allows us to transfer the first provisionals in the same position as that planned on the model. After the provisional restoration has been fabricated by the laboratory, an extra hard, plaster key is taken (Figure 3). (Note that we exclusively recommend the use of plaster for the key because other materials tested gave poor results in terms of their elasticity; these data will be part of a future study.) Subsequently, the key is used in the clinical relining phase.

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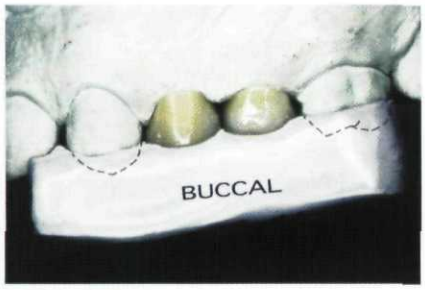

Figure 1. Repositioning key at the final stage showing the link between the key and the teeth on the cast. This is the correct position of the provisional.

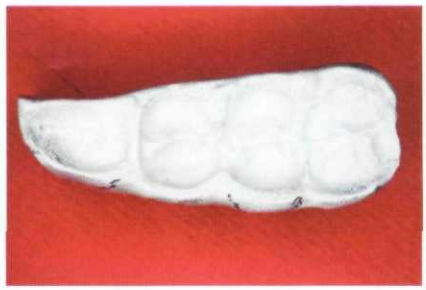

Figure 2. Detail of the inside of the repositioning key.

Figure 3. Example of the different positions that the provisional can assume during the relining phase in the three dimensions of space. Any roto-translation is possible with different positions of the provisional.

The residual teeth are used as supports and guides when seating the key, which normally extends to one tooth on either side of the abutment teeth to eliminate the three degrees of freedom (or dimensions) (Figure 4). The following equation suggests the impossibility of correctly positioning the provisional:

$$\chi a \epsilon A \subset R^3$$

$$p(\chi = a) = 0$$

where R^3 represents spatial dimensions, χ represents discretional positioning in R^3, a represents exact positioning in R^3, ϵ means *belong*, $\subset$ indicates *subset*, A represents the set of all possible positionings (an infinite set), and p represents probability. By using the physical law of the repositioning key, the position of the provisional will be exactly determined (Figures 5 and 6).[4] The final check consists of trying in the provisionals in situ with the key so that any interference that prevents the correct seating of the key can be noticed immediately and removed.

In the case shown in Figures 7 and 8, as the clinical and technical diagnoses suggest, we carried out the crown-lengthening surgical procedure in the second quadrant (the first and second biscupids) for esthetic and mechanical reasons.[5]

After the preparation of the abutment teeth, the repositioning key is tried in with and without the provisionals inserted into the plaster (Figures 6 and 9). Subsequently, the provisional crowns are filled with acrylic resin and relined (Figure 10). Shimstock 8µ (Shimstock HANEL, Germany), the metal foil for occlusion testing, is then used to check the result of the procedure (Figures 11 and 12).

DISCUSSION

The application of the fixed temporary crown is essential and represents one of the most delicate and important elements of all

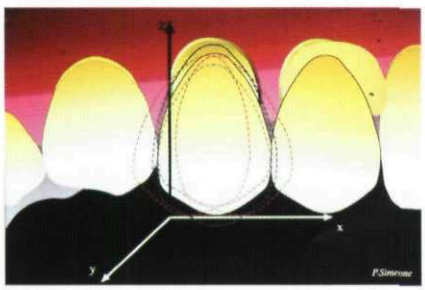

Figure 4. Dotted lines *represent the indefinite positions in the provisional relining phase.*

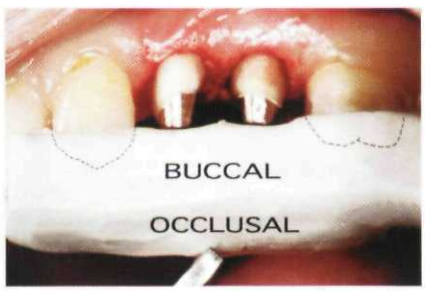

Figure 5. Clinical position is the same as that in the cast. In this case, the provisional position will be physically correct.

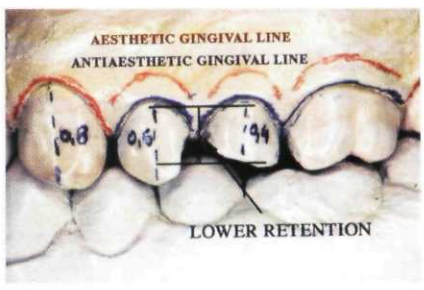

Figure 6. By analyzing the model, it is possible to understand the need for surgery for a better result, both esthetically and mechanically.

Figure 7. Intraoperative photograph taken toward the end of the surgery, with the sutures in place.

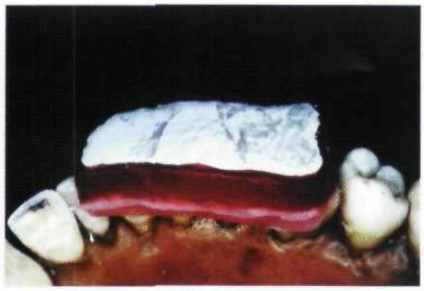

Figure 8. Technical laboratory phase: we recommend the exclusive use of plaster because other materials tested have not been satisfactory.

Figure 9. Clinical phase: the test phase with the provisional. Such a potential interference must be a warning signal that prevents the repositioning of the key; this interference must be removed prior to any relining procedure.

prosthetic therapies; therefore, it must be performed with the utmost care. This procedure represents a useful test for the dental team and an important source of information for the final reconstruction[6]; "in other words the temporary reconstruction must also be incorporated in the dental anatomy."[7]

From our clinical observations, we have verified the extreme efficacy of this proposed technique of using a repositioning key, which eliminates a major source of variability in the positioning of the provisional (i.e., the arbitrary provisional repositioning in a three-dimensional space). The use of a repositioning key is an appropriate approach to the final phases of prosthetic rehabilitation (Figure 13), and translates into standardization and simplification of procedures, especially in cases of complex rehabilitation.

We also use this technique in tissue-borne saddle situations. The only difference involves the length of the repositioning key since it is extended along the occlusal stop of three or four residual teeth (Figure 14). (The condition of balance for a lever requires that the momentums of the

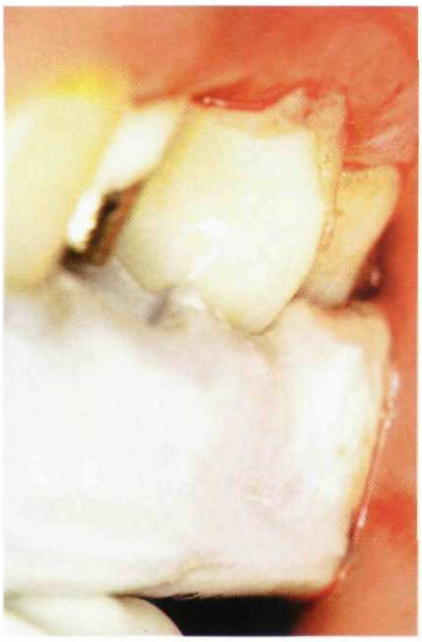

Figure 10. Provisionals positioned during the relining, with the repositioning key as a guide.

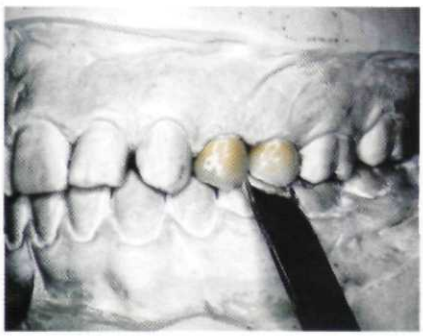

Figure 11. Check of the contacts using Shimstock paper.

Figure 12. Clinical control of the position in centric occlusion.

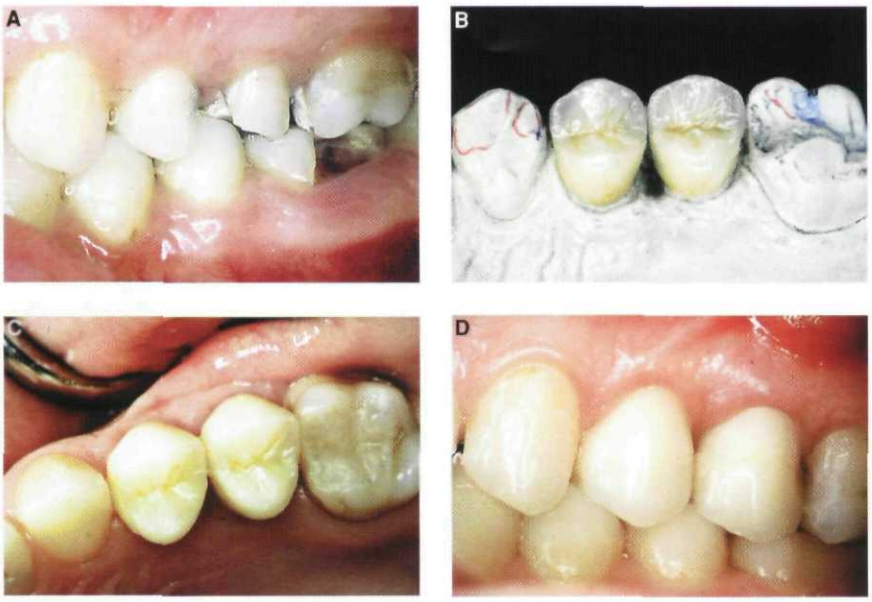

Figure 13. Several sequences of the treatment: A, *initial case;* B, *provisional completed;* C *and* D, *aspects of the final work.*

forces applied to the fulcrum are equal to zero. The condition necessary for the rotational balance depends on the condition of the momentum: an object is considered in rotational equilibrium when the sum of the momentums of the forces (force × the distance of the arm) is zero, measured in Newton meters.[4] It is important to note that our technique allows us to evaluate the validity of the treatment during therapy; thus, we are able to reevaluate the treatment plan and to modify it, if necessary, prior to the positioning of the final crowns.

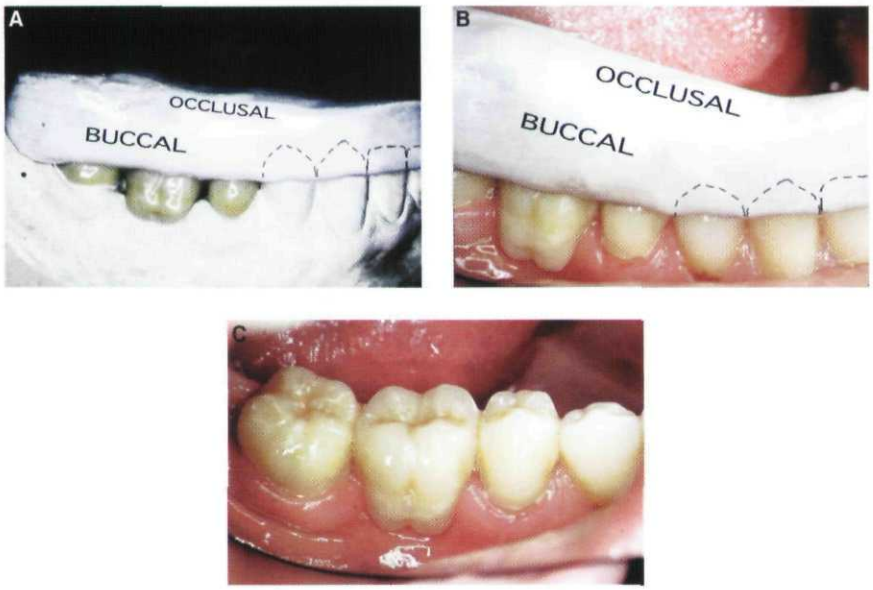

Figure 14. Different phases involving the use of the repositioning key with one of the medial extension supports: A, *laboratory phase;* B, *clinical repositioning;* C, *cementing.*

CONCLUSIONS

We have shown that by using the repositioning key technique, employed according to the described protocol, the following can be obtained: predictable and standardized results, a shorter time for clinical fitting and finishing of the provisionals, the possibility of using only one set of provisionals, reduced manufacturing costs and reduced stress for the patients, and simplicity and rapidity of construction.

In the case of patients previously treated for occlusal problems (muscular and/or osteoarticular), the final work aims to give maximum comfort to the patient with the correct position of the condyle-meniscus complex. This position corresponds to the correct neuromuscular balance. The maximal intercuspal position,when it becomes pathologic, can move the condyle backward or forward, resulting in internal derangement,[8,9] as with the resorption that leads to symptoms, also known as *regressive* remodeling.[10–14] Any prosthetic rehabilitation, starting with the provisional restoration, requires a correct occlusal function so that the

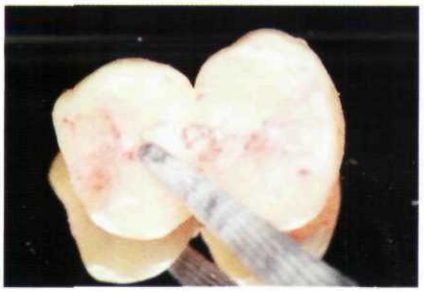

Figure 15. Often is necessary to modify the original project. The original design of provisional crown has been modified.

condyle receives adequate support. This prevents shifting of the condyle to the posterosuperior position, with the resulting anterior sliding of the disk.

We have also obtained great results in cases in which the vertical dimension was a key factor for the comfort of the temporomandibular joint, particularly in dysfunctional patients, in whom the provisionals are often used as test of the previously planned therapy. In these cases the provisional can also assume a therapeutic function.[15]

In restoring maxillary anterior teeth, it is important to contour the lingual surfaces of the provisional restoration in harmony with the envelope of function. The challenge then is to achieve the same functional performance in the final restoration; therefore, detailed communication with the laboratory technician is needed.

Last, the use of a repositioning key may affect the time required for a procedure. For example, the more significant the raising of the occlusion, the greater the necessary occlusal adjustment for a faster finishing procedure, which often results in an "underoccluded" prosthesis (Figure 15). We feel that the use of a repositioning key may help speed up the clinical process and increase the quality level of provisionals.

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