Impression and registration for full-arch implant dentures

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_Introduction_

Usually, a full denture is delivered following tooth extraction or implant insertion of a fully edentulous arch. A denture is usually used until the final restoration is performed. A well-designed full denture should fulfill the following criteria: 1) correct vertical height and maxilla-mandibular relationship; 2) accurate occlusion; 3) appropriate choice of teeth with regard to shape, length, width and position; 4) adequate lip support; and 5) proper function and aesthetics to meet the patient’s expectations. The final restoration should fulfill or surpass these requirements. Obtaining a correct impression and accurately evaluating the interocclusal relationship (e.g., interocclusal distance, occlusal recording and determination of the exact position of the placed implants) are often challenging and time-consuming tasks.1

The aim of the current report is to present an impression and registration technique that allows the transfer of the interocclusal relationship, occlusal recording and esthetics that were initially applied to produce a full denture as a template for the reconstruction of the final full-arch implant.

_Materials and Methods_

Following multiple extraction of a non-salvageable rest dentition and the placement of six dental implants in positions #4, #5, #6, #11, #12, #13, a full denture was fabricated. After the extraction sites had healed and denture sores were eliminated, impressions and bite records were taken in positions #4, #5, #6, #11, #12, #13, a full denture was fabricated. After the extraction sites had healed and denture sores were eliminated, impressions and bite records were taken in positions #4, #5, #6, #11, #12, #13, a full denture was fabricated. After the extraction sites had healed and denture sores were eliminated, impressions and bite records were taken in positions #4, #5, #6, #11, #12, #13.

After the implant was uncovered, attachments was planned. A duplicate of the denture (DentDu) was made out of clear resin (Paladur, Heraeus, Hanau, Germany, Fig. 1b). A trial of the DentDu was performed and minor occlusal discrepancies were corrected (Fig. 1c). Bite records were taken in centric occlusion with modeling resin (pattern resin®, GC, Alsip, IL; Fig. 1c), using the casts of the original denture. Afterwards, the DentDu was placed in an articulator and a controlling of the occlusion was made (Fig. 2a) with the bite records. A pickup transfer system consisting of a titanium impression post and a plastic impression sleeve was employed (Dentegris, Dausburg, Germany, Fig. 2b). The DentDu was carefully modified by creating internal clearance in the area of the implants so that it could be applied as an individualized custom tray. This permitted it to be fully seated when the impression posts were in place. Impressions were generated by a polymer material (Impregum, 3M ESPE, St. Paul, MI). During this process, the DentDu was kept in centric occlusion using the bite records (Fig. 3a).

The titanium impression posts were connected with the implant analogues and with the plastic impression sleeves (Dentegris), which were embedded in the impression material (Fig. 3b). A master cast was then fabricated and articulated with the help of the bite records (Figs. 3c, Figs. 4a & 4b).

Customizable abutments (Dentegris) were then fabricated and the implant abutments were determined using a silicon key fabricated from a pattern resin® (Paladur, Heraeus, Hanau, Germany, Fig. 1c), using the casts of the original denture. The new master cast was articulated with the help of the gold copings and served as the basis for the fabrication of electroformed puregold copings with a thickness of 0.25 mm (AOG Galaingold, Au > 99.9 %, Wieland, Waldaschaff, Germany, Fig. 6c). After casting, the customized implant abutments were grinded, polished and torqued to 35 Nm using a resin transfer key (pattern resin, GC, Figs. 7a & b). From this point on, the customized abutments remained fixed in order to avoid any possible inaccuracies. The electroformed copings were placed on the implant abutments (Fig. 7c). The mock-up was placed over the electroformed copings and the occlusion was checked with the bite records (Figs. 8a & b).

After the customization, the implant abutments were transferred, positioned on the implants and the new master cast was articulated with the help of the gold copings and the mock-up. The metal framework...
Porcelain is a possible material for veneering of fixed-denture frameworks. If the angulation of the implants does not allow for taking impressions in the above-described way and an open-tray impression is preferable, fenestrations can be fabricated into the DentDu (Fig. 14).

**Discussion**

The reconstruction of the fully edentulous arch with implant-retained dentures necessitates thorough planning and a precise and passive fit of the superstructure. A previous study demonstrated that a passive fit between the implant superstructure and the underlying abutments is essential for the long-term success of the implant prosthesis.1 To achieve a passive fit, an accurate positioning of the implant replicas in the master cast must be assured. The impression technique and the splinting of the implant copings are factors which may contribute to errors in the final positioning of the implant analogs, thus leading to inaccuracies in the fit of the final superstructure.1,6 Furthermore, the angulation or proximity of the implants may inhibit proper seating of the impression copings and caps, which may also have a detrimental effect on the registration of the implant position.6,12

The precise recording of the maxillo-mandibular, e.g. interocclusal relationship, is frequently responsible for achieving proper occlusion and a successful treatment outcome.16 The initially delivered denture allowed for the correction of the interocclusal relationship, tooth shape and color and angulations during the entire healing period. In this way, the patient was able to acclimatize to the function and esthetics of the denture. In the method described in this report, an accurate impression and recording of the full denture was achieved by using a duplicate as a custom tray for the impression. Therefore, it was not necessary to repeat all the steps usually needed for recording the interocclusal relationship, e.g. wax-up, etc., at the time of the fabrication of the final restoration.

If an open-tray impression is preferred, only minor changes to the procedure are necessary. This method is based on a previous publication.17 In cases such as this, it is advisable to fabricate two DentDus. The impression can be taken by the first DentDu; the second DentDu is used for the remaining steps. Customized abutments are fabricated to the final abutments are applied instead of a bar, galvano copings allow a precise transfer coping, and secondary telescopes as well as different technologies are employed for the transfer of implant positions and for the construction of the superstructure.

Customized implant abutments allows for better angulations and shape, for improved occlusal force transmission from the crown to the implant and the bone, and also for facilitating the fabrication of an esthetically pleasing implant-supported denture. Ways in which abutment design contributes to improved esthetics include changes in the location of the crown and changes in the dimension and/or form of the restorative platform.

Additionally, features of the abutment design contribute to the health and dimensional stability of the soft tissue. Current attempts to objectify define implant-restoration esthetics have focused on periimplant mucosal parameters.18 The introduction of the UCLA abutment provided a custom solution for implant restorations. This direct-implant restoration concept provides advantages of this method include the need for a highly qualified technical lab and higher technical costs relative to those associated with prefabricated titan implant abutments.

**Conclusion**

The method described here can be used for full arch restorations with both fixed and removable implant supported dentures. Accurate impressions can be accomplished and occlusions, vertical dimensions, as well as implant positions can be transferred while facilitating the full-arch restoration process. In addition, this technique resulted in a reduction of the required chair time.

Disadvantages of this technique lie in the fact that the quality of laboratory technician’s work meets higher demands than usual, and that the technician also needs to acquire some additional skills. Further disadvantages of this method include the need for a highly qualified technical lab and higher technical costs relative to those associated with prefabricated titan implant abutments.

To date, this method has not been applied in conjunction with immediate implant loading. However, dentists and patients have come to expect this level of rehabilitative accuracy, precision, long-term success and aesthetics.

**Note:** A complete list of references is available from the publisher.

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