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The application of cad - cam techniques for the "Toronto bridge" prosthesis.

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Abstract

Objective:

The aim of this case report is to evaluate the advantages deriving from the use of the new CADCAM technologies for the realization of the Toronto Bridge prosthesis.

Clinical Considerations:

The Toronto Bridge prosthesis is indicated in all those cases in wich it is necessary to replace not only the teeth, but also the support tissues, that subsequently the loss of teeth, are subject to remodeling and resorption.(1) This type of prosthesis is characterized by the presence of a bar. In the past, it was made using the "lost wax" technique. This technique involves numerous and long passages and moreover, the bar is often inaccurate and does not match the position of the implants. The case of a patient rehabilitated with a toronto bridge prosthesis, made with the new CAD-CAM technique, allowed us to evaluate how this technique entails a reduction in processing times and above all the creation of a bar that perfectly adapts to the implants.

Conclusions

The new CAD-CAM methods gave us the possibility to create a highly precise bar. The new CADCAM techniques have given us the possibility of creating a bar that does not have to be separated and subsequently welded because it does not perfectly fit the implants. But through this technique it is possible to obtain a very precise bar that avoids further passages and inaccuracies that can affect the final work. Therefore, the steps have been reduced and a highly precise structure has been created, satisfying from an aesthetic and functional point of view with a low economic cost.

Key words: CAD/CAM, Implants, Prosthodontics, Laboratory Technology, Digital Dentistry.

Introduction

Since the 1960s, with the introduction of the osteointegration concept by Branemark,(2) recognized by the scientific community as a valid and reproducible process, dental implants are widely used for the rehabilitation of partially and completely edentulous patients, representing a valid alternative to the removable dental prosthesis. Implant therapy (3,4) has rapidly evolved in recent years. We can distinguish two important philosophies: screwed and cemented. Different studies have shown disadvantages and advantages for both types. (5,6,7)

Toronto bridge prosthesis (8,9) are indicated to overcome the issues of both types of restoration, cemented and screwed, benefiting from their advantages. This type of prosthesis is a screwed-in mesostructure on a variable number of implants. The element of discrimination against a fixed Prosthetics is represented by prosthetic replacement of soft tissue, which are essential in order to obtain optimal esthetic results in case of marked atrophy; reduction of vertical dimension and miss-match between the implant and prosthetic emergencies.

Initially, the metal support structure was carried out using the "lost wax" technique. A dental artifact is first built and modeled in wax. In a second step the wax is replaced by the metal. The metal is melted and injected into the form left by the wax which in the meantime has been "lost" with heat. The resin, composite or ceramic is then applied to the metal structure obtained and finished. This technique involved numerous and long passages and often due to the inaccuracy of the structure it was necessary to separate and weld it later. Furthermore, the innumerable inaccuracies with time could cause problems to the implants. These problems have been overcome by the introduction of the CAD-CAM technique. By means of which, starting from a single block of metal, the metal structure is obtained through software and milling machines.

The objective of this case report is to show how the new CAD-CAM technique has remedied the inaccuracies obtained through the lost wax technique and the innumerable stages necessary for the construction of the Toronto Bridge prosthesis.

CASE REPORT

A 63-year-old woman comes to us looking for a fixed prosthetic rehabilitation. The patient is subjected to: physiological anamnesis, which shows the absence of allergies, the absence of risk factors: pathological: Diabetes, metabolic syndrome, HIV, neutropenia; environmental: medications, smoking, alcohol and stress; behavioral: Lifestyle and oral hygiene; past pathology anamnesis, the patient does not report: cardiovascular diseases, diabetes, coagulation disorder, hypertension; next pathology anamnesis: the patient complains that she cannot adapt to the use of the removable dental prosthesis, for this reason the patient asks if there is the possibility of making a total fixed prosthesis. The evaluation of satisfaction perceived by patient was assessed by completing a questionnaire. (10) The extraoral examination shows the counterclockwise rotation of the jaw resulting from the absence of dental elements, from vertical bone resorption, from bone resorption in a centripetal direction for themaxilla and centrifuge for the mandible. (Fig. 1)

Fig. 1 The extraoral examination shows the counterclockwise rotation of the jaw resulting from the absence of dental elements.

In the intraoral examination there is the absence of lesions of the mucous membranes, the patient is totally edentulous following the extraction of all the teeth carried out about 9 months earlier resulting from chronic periodontitis.

The patient, to our observation, has a complete removable dental prosthesis upper and lower and she requires treatment to replace the removable prosthesis with a fixed implant prosthesis.

Firstly, the TC dentalscan has allowed to highlight, both in the maxilla and mandibular, the presence of an enough quantity of bone in order to make possible the placement of 6 implants to the upper arch and 6 to the inferior arch. In cases of large prosthetic rehabilitations, a surgical guide is often used. The surgical guide helps us during the surgery, because it has holes at the points where the implants will be inserted. In this case, the removable prosthesis of the patient was duplicated for the construction of the surgical guide, since it was considered suitable. The implant is positioned on the receiving site with a maximum torque of 35 N / cm. The implants used are conical implants Adin Touareg S AB / AE. (11,12,13,14)

Once the implants have been placed, we have to wait for the osseointegration 3 months and during that period the patient makes use of her old denture as a temporary prosthesis. After 3 months, we proceed to the exposure of these and we verify the complete osseointegration of all the implants through: clinical examination:

absence of pain, absence of mobility, absence of history of infection; radiographic examination: absence of radiographic bone loss<2mm(Fig.2).

Fig. 2 Radiographic evaluation after three months and after the placement of the TMA abutments.

We proceed with the positioning of theTrans Mucosal Abutments System TMA (Fig. 3),

Fig. 3 Lower arch with TMA type abutments positioned.

which have transgingival heights ranging from 1 to 5mm and angles of 0 °, 17 ° and 30 °. The use of TMA is recommended in cases where the inadequate thickness and bone height prevent implant placement in a prosthetically correct position or when multiple implants are placed it is difficult to position them with similar gingival depth. Therefore, different depths and non-parallel angles can be modified by TMA. Thus, they allow to compensate for the divergence of the positioned implants and to create a unique insertion plan.

After this, the impression is taken bymeans of a custom-made tray with perforations, according to the technique of the impression with open tray or "pick-up". Before taking the impression, TMA transfers are screwed to the abutments and rigidly blocked together to avoid possible movement in the impression during the screwing phase of the laboratory analogue. The technique used to block the transfers involves the use of calcinable resin applied between the transfers on a silk floss passed between them. The impression was made through the use of polyvinylsiloxane according to the single step double mix technique impression. Subsequently, to define a correct intermaxillary relationship, occlusal registration plates were made. These consist of a resin base and a wax rim of rigid consistency and with the same resin a plate was made to make it adhere to the occlusal fork and facilitate the registration of the facial arch. While through the registration plates the vertical dimension was recorded, which is determined exclusively by the dentist. Moreover, the Occlusal Plane has been identified. Once the recordings are finished, the rims are locked between them. The teeth used are Acry Smart artificial teeth in PMMA resin. Acry Smart has the occlusal surfaces of the rear teeth designed following the new concept of wide tripodization and superior grinding efficiency is maintained over time. The teeth assembly takes place by means of "substitution". Assembly is finalized, observing that there is a right relationship between esthetics and function. The group function is opted for the occlusal scheme.

In order that the bar, obtained from 6AL-4V titanium disks (Grade 5), can be made, a scan of the models, of the gingival portion and of the upper and lower prosthetic project was performed. (Fig. 4a)

Fig.4A Scan of the upper prosthetic project.

Fig. 4B Scan of the lower prosthetic project.

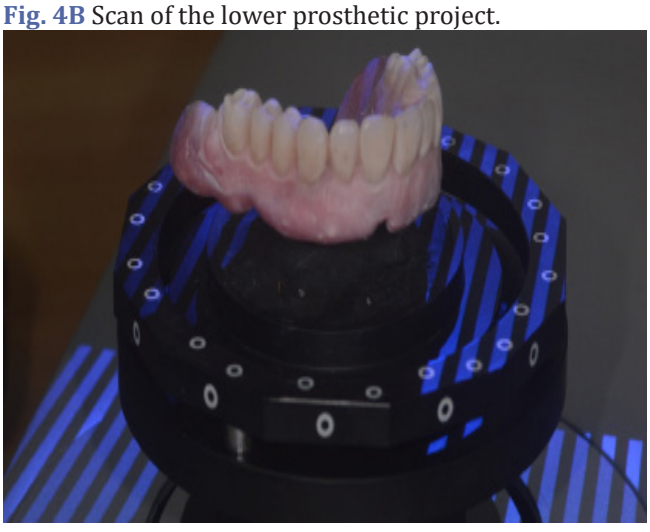


Fig. 4C Scan of the gingival portion.

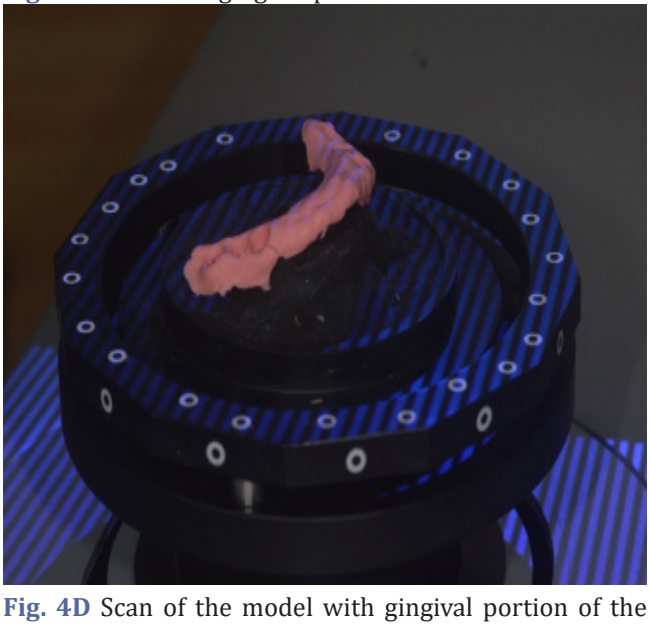


Fig. 4D Scan of the model with gingival portion of the lower arch.

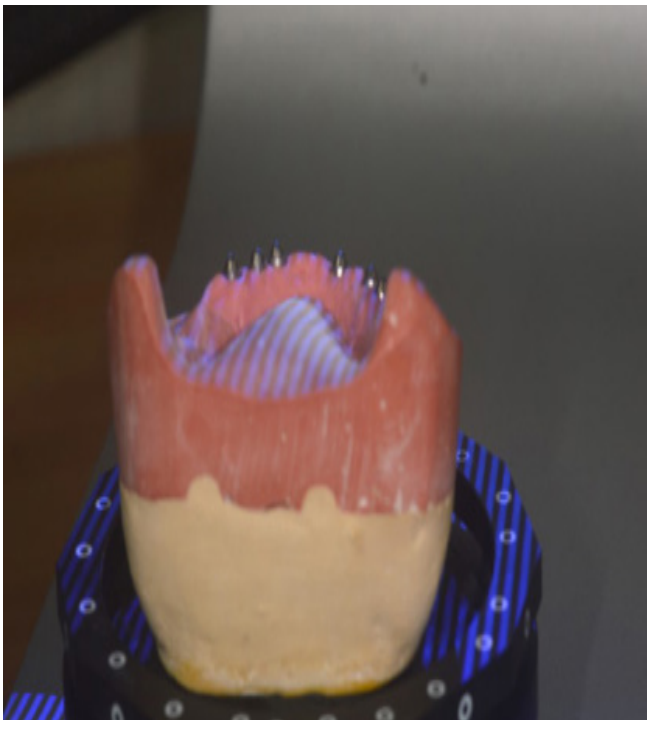


Fig. 4E Scan of the model with gingival portion of the upper arch.

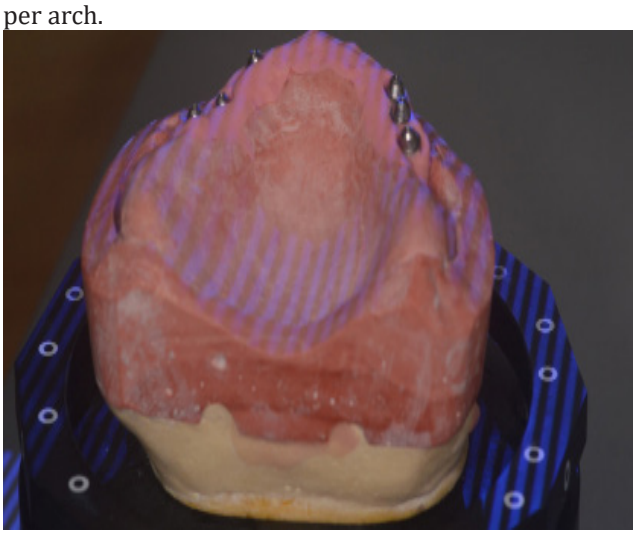
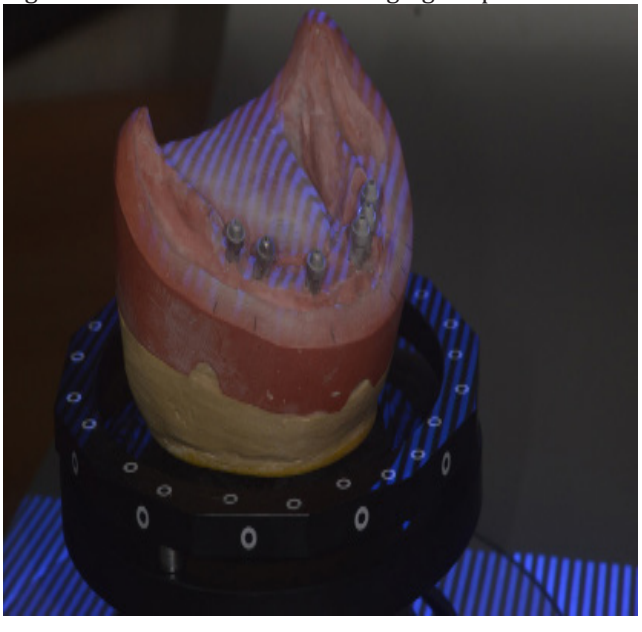


Fig. 4F Scan of the model without gingival portion.



In addition, to transfer the position and orientation of the implants from the model to the software exocad, we use the scanmarkers. The design of the bar, made using exocad (Fig. 5a),

Fig. 5A Design of the structure of the lower arch using Exocad software.

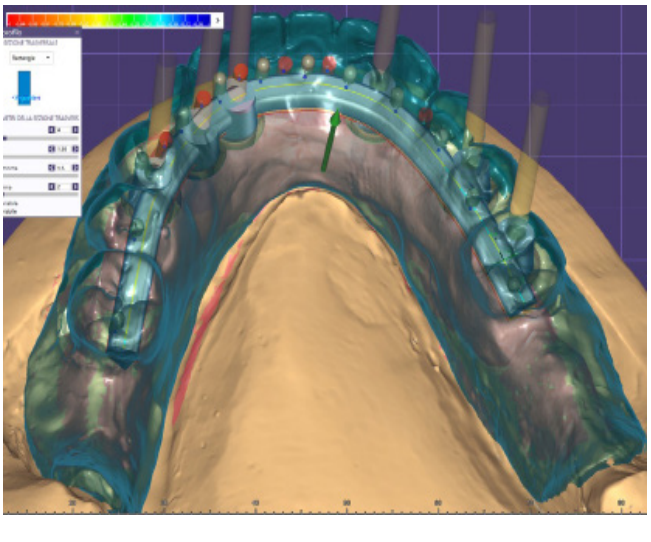


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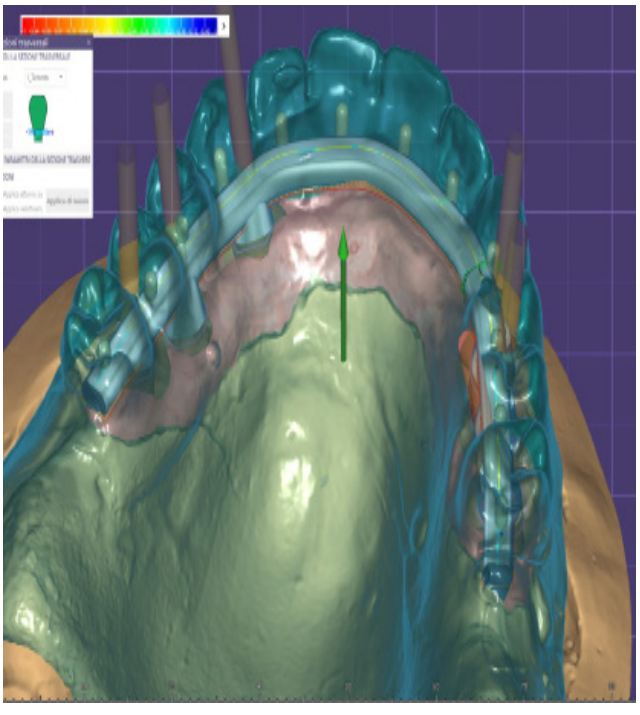
Fig. 5B Design of the structure of the upper arch using Exocad software.



must take into account the position and orientation of the implants and, in particular, of the prosthetic project. Since, starting from the prosthetic project itself, the thicknesses necessary for the construction of the bar are obtained, in such a way as to obtain a prosthesis that respects all the previously performed recordings. Finally, the bar has been milled by using the CAM software hyperDENT. After, it was prepared for the final stages of processing, namely: staining of the bar with special opaque (Fig. 6);

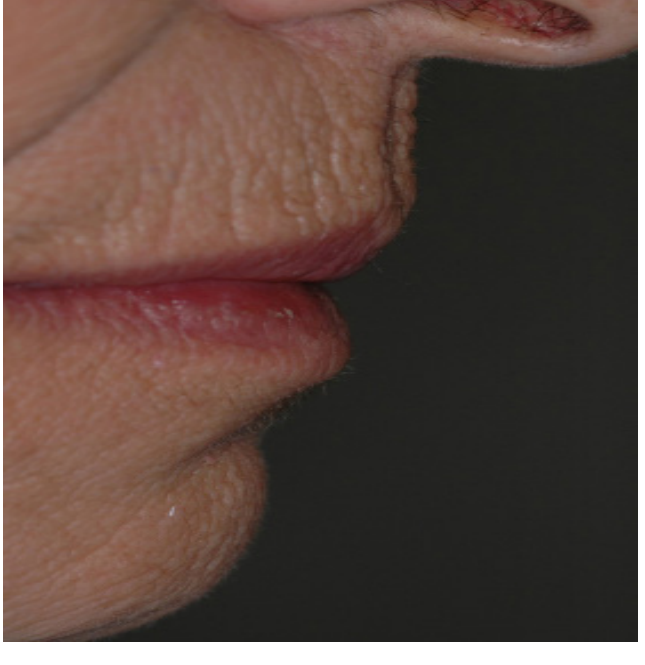
Fig. 6 Upper arch bar with opaque coloring.

choice and positioning of mobile prosthesis teeth, following the previous prosthetic project; finally, the Toronto Bridge was finished and polished (Fig. 7).

Fig. 7 Toronto bridge completed.

The complete work was screwed to the abutments by applying a maximum torque of 15N/cm and at delivery the actual presence of the necessary space between the gingiva and the prosthesis was verified. On delivery, the patient expressed to be very satisfied with the esthetic result, as going to restore also the gingival component, the lip support was recreated. (Fig. 8)

Fig. 8 profile with the new prosthesis.



DISCUSSION

The Toronto bridge prosthesis turns out to be a valid prosthetic solution in cases where implants can be inserted, but at the same time there is a marked atrophy of the soft tissues. The real innovation is the application of the new CAD-CAM methods for the construction of the bar. Through a careful study of the case and the precision of the steps, especially as regards the dental impression, it was possible to build, using the CAD-CAM technique, a highly precise bar. As shown in the case report, there was no need for separation and subsequent welding of the structure. This not only has reduced the phases, but more important is the absence of inaccuracies that can over time also create problems for the plants. separating and welding the bar is not wrong, but obtaining a single structure in which there are no weaknesses and which is perfectly adapted to the implants has been observed to be even more performing. Therefore, we reduced the steps and obtained a highly precise structure, aesthetically and functionally satisfactory with a with a low economic cost.

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