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A CAD/CAM flapless surgical technique and immediate prosthesis: a clinical report

ABSTRACT

Background This article describes a clinical report with a new system for guided surgical treatment and immediate load prosthesis in the flapless surgical technique.
Case report Based on a computed tomography (CT) of a 64 - year-old edentulous patient, the cross sections were reformatted and used to construct a virtual planning of the implants and a guide template in Dental Slice. Six dental implants were placed in the maxilla and mandible using a Slice Guide System. Following a 30-month in maxilla and 24-month in mandible healing period, the clinical and radiographic evaluation and computed tomography (CT) showed good clinical stability. The Slice Guide System proved satisfactory for the Flapless Surgical Technique in dental implants.

KEY WORDS Computer-aided surgery; Flapless surgery; Dental implants; Immediate loading.

INTRODUCTION

The rehabilitation success with osseointegrated dental implants involves a prolonged esthetic and functional maintenance. Therefore, to secure this, appropriate planning is an important factor (1, 2).
The predictability of the implant's final positioning, the oral rehabilitation esthetics and tissue stability are sought during the planning stage. Thus, study models, assembling of semi-adjustable articulators, diagnostic wax up and imaging tests are performed in order to obtain greater precision in rehabilitation (3). However, the relationship of the waxed teeth in the plaster model with the bone tissue, the final position of the implants resulting in a non-aesthetic prosthesis or patient postoperative discomfort, such as pain, edema and hemorrhage due to traumatic surgical procedures, are limiting factors in conventional procedures (4, 5).
Computerized tomography enables the reading of the bone tissue, of soft tissue and of the dental structures adjacent to the edentulous space, however, the cost of tomography exams, the amount of radiation and time were considered limiting factors for its use (6, 7). In order to overcome the disadvantages of conventional computerized tomography (CT), digital volume tomography was developed (6, 7). Another significant breakthrough was the development of software that enables manipulating the CT data and materializing prototyped guides quite accurately (7, 8). Thus, the virtual planning has become an important tool for the transferring of three-dimensional positioning of implants with the appropriate prosthetic relationship (9).
Following this line of planning, the implants can be placed by flapless surgery and in some cases the prosthesis is manufactured prior to surgery (10).
This study reports the virtual planning and installation of flapless implants in the maxilla and mandible, by means of the Dental Slice and Slice Guide system, with immediate loading.

CASE REPORT

A 64-year old male patient came to the Implantology specialization course clinic (APCD – Sao Paulo Association of Dentists, Araraquara, São Paulo, Brazil) with a total absence of maxillary and mandibular teeth. The clinical and radiographic evaluation showed a good balance of bone tissue. After evaluating the possible treatment options for this patient, the implant rehabilitation using the flapless technique was chosen. For this technique, preliminary impressions, new records and diagnostic waxing were performed. After the clinical trials, complete dentures were prepared with Gutta Percha radiopaque markings (Fig. 1) (10). These markings generated points of reference for the computed tomography, facilitating the positioning of the prosthesis in the three-dimensional software's for the virtual planning Dental Slice (Bioparts, São Paulo, Brazil) (Fig. 2). The planning included 6 maxilla and 6 mandible implants. After the virtual planning, the file was sent to the prototyped guide preparation stage. In the maxilla, a temporary prosthesis cemented on prepared abutments was prepared through the working model obtained by the prototyped guide, elaborated prior to surgery (10) (Fig. 3).

After local anesthesia using mepivacaine 2% with epinephrine 1:200,000, the surgical guide was positioned using polysiloxane impression material against the lower denture (Fig. 4). The surgical sequence was performed after placing the guide, as indicated by the Slice Guide manufacturer (Conexão Sistemas de Prótese, São Paulo, Brazil). The customized abutments were installed to receive the cemented prosthesis (Fig. 5a). Subsequently, the provisional was rebased and the support on the palate (Fig. 5b), which served to maintain the occlusal plane and vertical dimension, was removed (11) (Fig. 5c).

After 4 months of the upper rehabilitation, the same procedure in the mandible was performed (Fig. 6). Six implants and cemented prosthesis were also planned. Thus, the same procedures were performed for the maxilla, however the cemented temporary prosthesis

Fig. 1 *Prosthesis with radiopaque markers.*

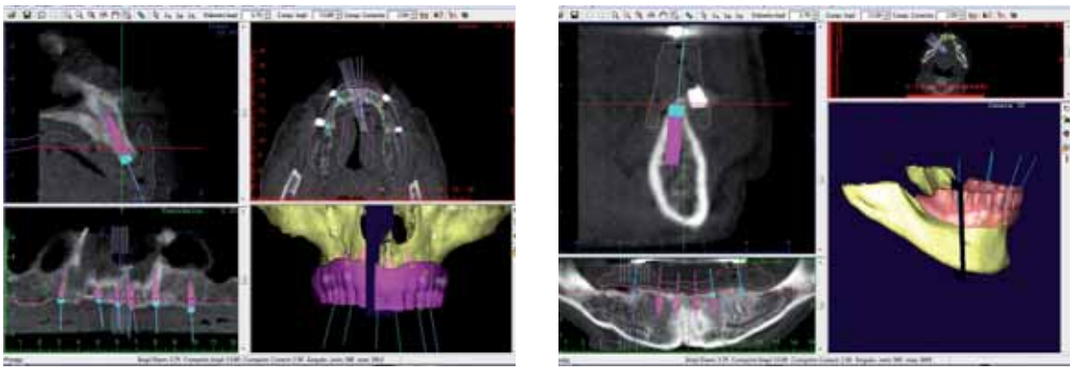

Fig. 2 *Virtual planning using the Slice Guide Software.*

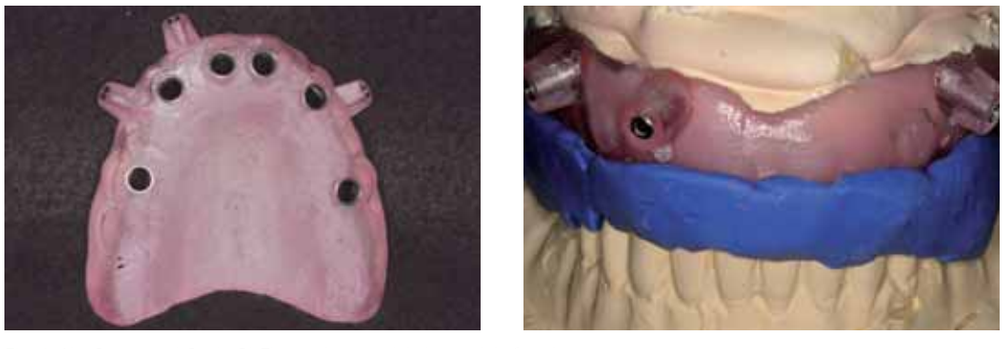

Fig. 3 *A) - Prototyped Guide. B) The working model obtained before the surgery.*

Fig. 4 *The placement of the surgical guide.*

Fig. 5 *A) Positioning of prepared abutments.*

Fig. 5 *B) support detail on the palate; C) Installing the provisory fixed prosthesis.*

Fig. 6 *Implant placement in the mandible.*

Fig. 7 *Lower temporary prosthesis.*

Fig. 8 *Initial (a) and final (b) case.*

was created by conventional transfer molding. The temporary prosthesis was placed in the maxilla after surgery and in the mandible after 24 hours (Fig. 7). Figures 8 show the initial and final clinical case, respectively.

DISCUSSION

Rehabilitation using osseointegrated dental implants has become a reality for patients and for dentists owing to its highly predictable success rates (12).

However, in many situations conventional postoperative surgery causes great discomfort for the patient, with facial edema, hemorrhage and pain (5). Over time there have been improvements in terms of defining the positioning of the implants prior to their installation (reverse planning) and less invasive techniques (3, 8).

The purpose of this study was to demonstrate the planning and implementation of complete maxilla and mandible rehabilitation by means of virtual planning and flapless surgery, enabled a comfortable postoperative period, without pain, bleeding and with mild edema. Thus, according to the literature, the flapless surgical technique has several advantages compared to the conventional surgical procedure, which includes the opening of a flap before implant insertion. Flapless surgery generates less postoperative bleeding, less discomfort for the patient, shorter surgery time and a reduced healing time (4, 5, 13).

Another important factor to be considered is the technique's proper indication, since studies have shown linear and angular errors (5, 7, 8, 14, 15). The soft tissue must also be carefully assessed, since the removal of keratinized tissue during the surgical protocol can later compromise the final facial aesthetic and peri-implant health (16, 17). Thus, when this technique is performed in patients with available bone and soft tissue, there is high functional and esthetic predictability (18).

Preparing the prosthesis prior to surgery is a sound procedure. Therefore, specific systems have been developed to minimize possible inadaptations (19). The impression procedure after implants placement should also be considered to reduce the possibilities of prosthetic inadaptations. In this case study all the implants showed good clinical function in 30 months for the maxilla and 24 months for the mandible. The prosthesis for the maxilla was prepared prior to surgery, with some devices in order to not lose the vertical dimension and occlusal plane reference during the adjustment and cementation periods (11). In the mandible, due to the low bone thickness in the ridge region, some implants had an infra-bone placement, thus there was interference from the bone ridge in the setting of the transfers. A bone profile drill was used to regularize the bone profile, for the appropriate setting of the transfers. The impression procedure was then performed and the prosthesis was installed the next day.

Both techniques proved to be sound prosthetic procedures. The first one enables installing the prosthesis immediately after surgery with small adjustments, resulting in more comfort for the patient. The second one requires molding after surgery and installing the temporary prosthesis after 24 hours.

The virtual planning and guided surgery performed using the Dental Slice and Slice Guide system proved to be useful in implant rehabilitation using the flapless technique, hence providing an additional possibility to implantologists and their patients. In addition, other perspective longitudinal studies should be conducted in order to evaluate parameters such as long-term success and divergent positioning of implants in the virtual planning and the situation resulting after the implant surgery.

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