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Use of flapless guided surgery for implant rehabilitation in fully edentulous patients

Uso de cirugía guiada sin colgajo para la rehabilitación protésica mediante implantes en pacientes edéntulos totales

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ABSTRACT

Nowadays the use of dental implants constitutes the gold standard in the prosthetic rehabilitation of edentulous patients. Especially in fully edentulous patients, proper three-dimensional implant placement is important to guarantee adequate functional and aesthetic results. In recent years, the use of computer-guided surgical systems has allowed the placement of implants with precision nearly exact prediction of the final surgical/prosthetic outcome. The present case describes a flapless approach for the complete rehabilitation of edentulous patients through the double scan protocol for the virtual planning of implant placement and design of the surgical guide for implant rehabilitation in fully edentulous patients. Guided surgery is currently an alternative that allows, in appropriate cases, to perform flapless approach, which reduce patient discomfort, surgical time, and enhance implant placement accuracy by reducing operator error.

RESUMEN

Hoy en día el uso de implantes dentales constituye el estándar de oro en la rehabilitación protésica de pacientes edéntulos. Especialmente en los pacientes totalmente edéntulos, es importante una correcta colocación tridimensional de los implantes para garantizar unos resultados funcionales y estéticos adecuados. En los últimos años, el uso de sistemas quirúrgicos guiados por ordenador ha permitido la colocación de implantes con una precisión casi exacta del resultado quirúrgico/protésico final. El presente caso describe un enfoque sin colgajo para la rehabilitación completa de pacientes edéntulos mediante el protocolo de doble escaneo para la planificación virtual de la colocación de implantes y el diseño de la guía quirúrgica para la rehabilitación de implantes en pacientes totalmente edéntulos. La cirugía guiada es actualmente una alternativa que permite, en los casos adecuados, realizar un abordaje sin colgajo, lo que reduce las molestias del paciente, el tiempo quirúrgico y mejora la precisión de la colocación del implante al reducir el error del operador.

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Introduction

Oral rehabilitation supported by osseointegrated implants represents a valuable therapeutic strategy both from an esthetic and a functional point of view, to optimize implant placement and to reduce surgical complications, the clinician must have full knowledge of oral bone anatomy so that any osseous topography and bone volume excesses or deficiencies can be corrected before implant therapy.[1,2] Recently, emphasis has shifted from freehanded implant placement techniques in adequate available host bone, assessed by the surgeon at the time of surgery, to placing implants with nearly exact prediction of the final surgical/prosthetic outcome by means of computer-guided surgical systems.[2]

Computer-guided implant surgery has been defined as using a static surgical template to limit the intraoperative modification of implant placement and guide the placement to the preplanned location on the basis of the prosthetically driven surgical plan formulated in the virtual implant planning software. Computer-guided surgery offers patients the benefits of successful implant placement without flap elevation and less postoperative pain and discomfort than with conventional implant surgery.[3] Dental implants have become a predictable treatment option for the patient with

complete or partial edentulism. As a variation from the protocol introduced by Maló et al,[4] several authors have applied the guided surgery protocol for the all-on-4 procedure, where a surgical guide is made based on data obtained through cone-beam computed tomography (CBCT)[5] and implant surgery is performed through flapless approach maximizing patient comfort by minimizing trauma.[5]

Figure 1: *Initial situation of the patient showing partial maxillary edentulism with the presence of remaining teeth 13 and 23.*

The objective of this case report is to present a case of flapless approach through the use of a surgical guide for the complete rehabilitation of edentulous patients.

Case report

A 50-year-old female patient attended to the Oral and Maxillofacial Unit, with the chief complaint of bimaxillary partial edentulism in search of complete rehabilitation of her teeth. Her medical record was unremarkable. On clinical examination it was observed maxillary partial edentulism with the presence of canines with poor prognosis, as well as total mandibular edentulism *(Figure 1)*. A panoramic X-ray was requested, observing the presence of remaining teeth 13 and 23 with poor prognosis, due to these findings, the treatment plan chosen was to extract those teeth and immediate guided rehabilitation under the all-on-six in maxilla and all-on-four concept for mandible. Initially, the patient was assessed by the prosthodontist, where both arches were recorded and impressions were taken with alginate.

A CBCT scan along with an extraoral scanning of the bimaxilar models (Ceramill Map 300, Amann Girrbach, Austria) were obtained in order to get the DICOM and STL files respectively. A double scanning technique was performed: the first CT scan, was performed with a prepared prosthesis in the patient's mouth and the second scanning through a prosthesis with marks. The virtual planning was started using the Blue Sky Plan software (Blue Sky Bio, USA) to match both files an

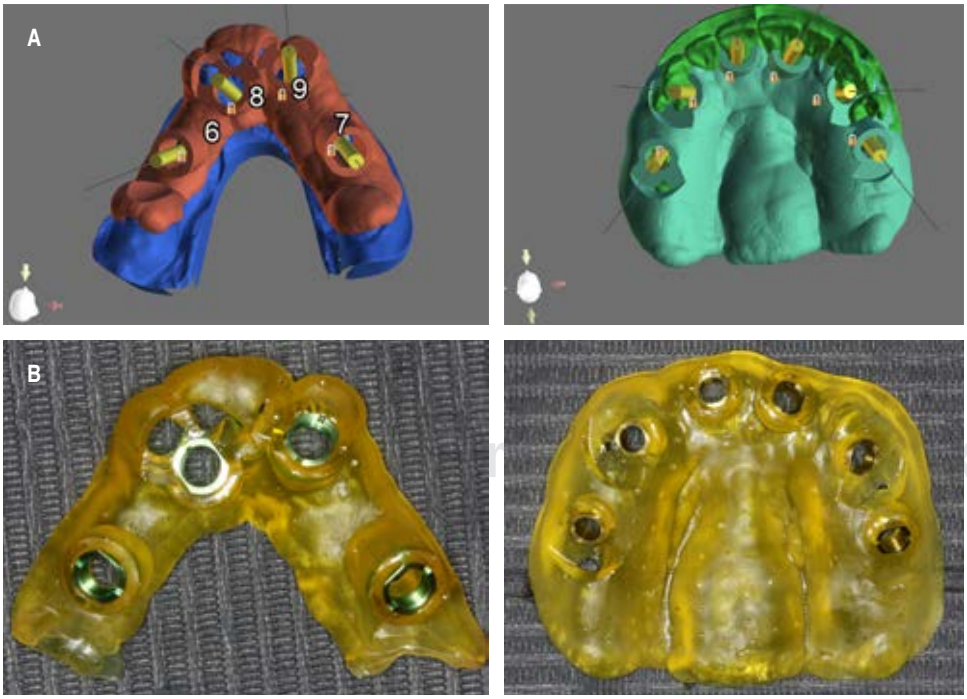

Figure 2:

Surgical guides obtained from the virtual planning of implant placement through the double scan protocol. ***A)*** *Maxillary and mandibular surgical guide design.* ***B)*** *Printed surgical guides.*

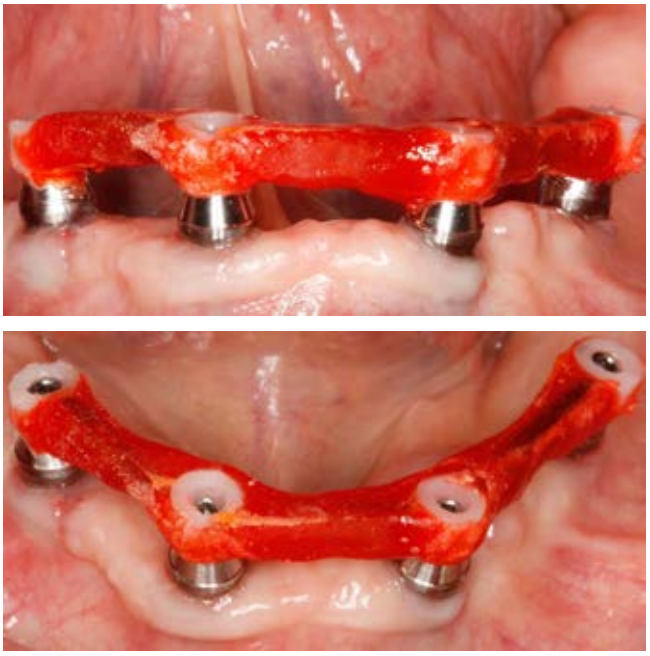

Figure 3: *Resin pattern designed to obtain the metallic structure.*

initiate the virtual implant placement guided prosthetically. During this process, a (measurement implants selected), in order to obtain primary anchorage in the remnant bone tissue.

After that, a surgical guide was designed and printed in a desktop 3D printer (Any Cubic Photon, China) *(Figure 2)*. Under moderate sedation and local anesthesia, the extraction of remaining teeth 13 and 23 was performed, then the surgical guide was placed and the drilling sequence was initiated through a flapless approach, the drilling depth was controlled by a drill stop on the shank that corresponded to the sum of the implant length, the gap between the guiding sleeve and the implant, and the guiding sleeve height. Six implants were placed in the maxilla and four implants in the mandible with guidance provided by the surgical template. In contrast to the all-on-4 protocol, the implants were left to heal without loading.

After five months, the failure of the implants in position of remaining teeth 23 and 44 was evidenced, for which the implant placement in the lower arch is planned. After implant placement, the multi-units were placed with a torque of 25 Ncm and the temporary prostheses was loaded. The final impression was taken, after splinting using a resin pattern, to obtain the metallic structure *(Figure 3)*. The definitive prosthesis was obtained and installed in the patient successfully *(Figure 4)*.

Discussion

With the long-term success of full arch implant-supported fixed complete denture supported by four to six implants patients with failing dentitions are able to be rehabilitated using prostheses that look, feel, and perform similar to the natural dentition. Clinicians have investigated the use of fewer numbers of implants per arch with great success. Maló and colleagues reported cumulative implant survival rate of 95.4%, and prosthetic survival of 99.7% after seven years of service of fixed implant-supported prostheses using the all-on-4 treatment concept. The success of this technique is based on implant length and distribution, which provides a broad dispersal of functional force acting on the implants and bone.[6,7]

The rehabilitation of the completely edentulous jaw by combining four implants, two straight medially and two tilted distally, was developed to overcome the anatomic limitations related to bone loss, which would otherwise be difficult to treat without more complex augmentative techniques.[3,8]

With the introduction in the early 2000s of computerized tomographic (CT) guided dental implant planning software and workflows, the fabrication of corresponding surgical guides to accurately transfer the plan to the patient at surgery has become increasingly available. Additionally, the development of implant specific guided surgical instrumentation by multiple manufacturers and guided flapless techniques have made procedures more predictable and routine.[9,10] Flapless insertion of dental implants has been found to have success rates comparable to conventional implant placement procedures, while minimizing the potential complications with soft-tissue elevation such as bone loss, infection, and soft and/or hard tissue necrosis.[9,11]

Flapless guided implant surgery has been found to have success rates comparable to conventional implant placement procedures.[4] Obviously, the absence of factors such as incision, flap reflection, determination of implant location, drill depth control, and suturing procedures contribute to reduce surgical time in the flapless computer-guided surgery. Besides that, flapless computer-guided surgery appears to offer other

Figure 4: *Definitive prosthesis obtained and installed successfully.*

benefits, such as maintenance of both soft and hard tissues, decreased postoperative pain and bleeding, faster recovery, and improved patient comfort.[9,12] In our case we consider the amount of attached gingiva in the planned implant surgical site, because if a thick zone of attached gingiva was present, we use tissue-punches for removing islands of keratinized soft tissue before fully guided implant placement. Contrary to our case, if situations such as insufficient attached gingiva in the planned implant surgical site, a small miniflap should be made to preserve the attached gingiva present or soft-tissue grafting should be planned; in addition, if flapless surgery does not enable the clinician to access to the irregular alveolar crest and perform osteoplasty before implant surgery, a flap should be made too.[9]

Although there is currently a trend to simplify and reduce treatment times in order to achieve greater acceptance by patients and stable long-term results, there are requirements to determine the possibility of applying immediate loads in these patients, being the primary stability the main one. It is recommended that the insertion torque be at least 30 Ncm[13] or a sum of 120 Ncm to consider immediate loading, otherwise, it is preferred to wait for the healing process and perform the loading in a second time. Due to these prerequisites, despite the fact that immediate loading is considered the option to be achieved, in our case, as it did not reach the insertion torque figures recommended in the literature, it was decided to carry out a conventional loading of them.

Regarding to loading protocol, Papaspyridakos et al.[14] investigated in a systematic review that included 2,695 patients with 13,653 implants, the effect of immediate loading of implants with fixed prostheses on their implant survival, failures and complications in edentulous patients, compared with early and conventional loads. They found an estimated 1-year cumulative survival range of 99.2% and 99.3% in implants with immediate loading in the fully edentulous maxilla and mandible, respectively; while in the conventional protocol an estimated cumulative survival range of one year of 99.6% and 99.7% was found in the maxilla and mandible. In this way, they determined that no significant differences were found in the survival rate between the loading protocols. In our case, despite having failed an implant in the upper jaw, the implants distribution allows the load on five implants. In the case of the implant corresponding to remaining teeth 44, due an adequate insertion of torque achieved and the presence three adjacent osseointegrated implants, the immediate loading of the implant was decided.

Flapless guided implant surgery constitutes an ideal method for the total rehabilitation of edentulous patients. Guided surgery is currently an alternative that allows, in appropriate cases, to perform flapless approach, which reduce patient discomfort, surgical time, and enhance implant placement accuracy by reducing operator error.

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