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DENTAL TECHNIQUE

Use of a surgical template for minimally invasive second-stage surgery: A dental technique

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ABSTRACT

The introduction of new techniques and new technology has been directly related to successful outcomes in implant dentistry. Merging information from high-quality cone beam computed tomography images and detailed prosthetically driven digital planning translates into computer-guided surgery. A surgical template is a guide used to assist in the proper surgical placement and angulation of dental implants. However, a surgical guide not only facilitates implant placement but can also be used for other purposes, including diagnosis, treatment planning, and even second-stage surgery. In situations where multiple implants have been placed through computer-guided implant surgery, the preexisting surgical template can be used to perform the second-stage surgery with a flapless approach if the patient's soft tissue condition permits. (J Prosthet Dent 2019;121:37-40)

The success rate and predictability of dental implants have made them popular for different clinical situations. However, successful implant-supported restorations depend on optimum placement of the dental implants. Cone beam computed tomography (CBCT) images have become popular whenever implants are involved because it provides a 3-dimensional view of the jaws before surgery. With CBCT imaging, the evaluation and treatment planning of the surgical field becomes more precise.[1-4]

Merging the information collected from high-quality CBCT images and detailed prosthetically driven digital planning translates into computer-guided surgery, defined as "the use of a static surgical template that reproduces virtual implant position directly from computerized tomographic data and does not allow intraoperative modification of implant position." Computer-guided surgery is indicated during the treatment planning process when complex anatomy is present to avoid damage to vital anatomic structures (such as the maxillary sinus and inferior alveolar nerve), to perform minimally invasive surgery, and to improve communication with the patient in terms of understanding the restorative needs and treatment options.[1,2,5-10]

Because guided surgery should always be prosthetically driven, a radiographic template (obtained from diagnostic waxing, the duplication of a preexisting dentition/restoration, or digital software) is used to be later transformed into a surgical template.[1,10-12] According to the Glossary of Prosthodontic terms,[13] a surgical template is "a guide used to assist in proper surgical placement and angulation of dental implants." For implant placement, a completely restrictive surgical guide obtained from computer-assisted design and computer-aided manufacturing (CAD-CAM) provides the highest level of accuracy and technique, especially when used with fixation screws and a flapless approach.[8,10,11,14-17] Despite being the most accurate, CAD-CAM surgical templates are the least used guides.[11] For most patients, they are discarded or stored with the patient's files after they have been successfully used during implant surgery. However, the surgical guide could be reused in the second-stage surgery.

Second-stage surgery should aim to preserve the continuity of the keratinized (even attached) mucosa on both the buccal and lingual aspects to avoid creation of defective tissue margins. This is to obtain an implant-supported restoration with symmetric contours and stable soft tissue conditions.[18-21] The surgery for implant exposure is technique sensitive. The preservation and modification of the soft tissue contour depend on the clinician, and the definitive restorative result will also be

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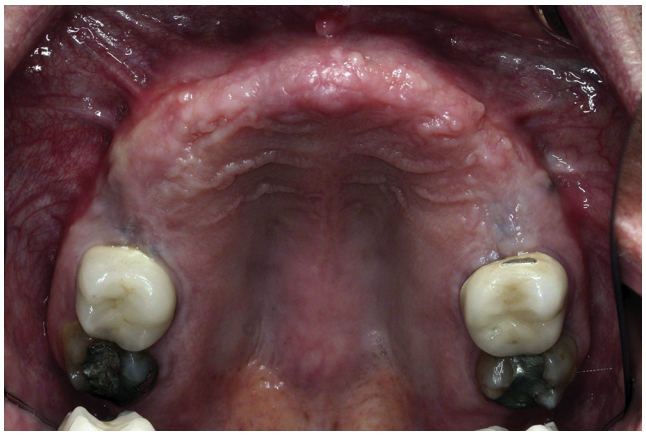

Figure 1. Initial occlusal view of maxillary arch before second-stage surgical procedure.

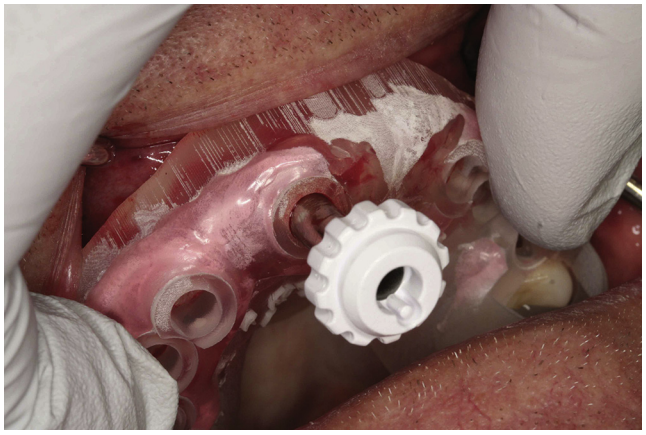

Figure 3. Minimally invasive approach of using soft tissue punch and surgical stent.

influenced by the viability of the blood supply, undisturbed wound healing, tissue biotype, and optimal implant positioning.[18,21,22-25]

Different methods have been described for implant exposure surgery, based on the technique (additive, subtractive, combination, incisional, and excisional) or the main purpose of the surgery (increase of the keratinized mucosa and preservation or regeneration of interdental papilla).[18,21,23,26] Subtractive or excisional techniques are indicated only if adequate attached gingival tissue is present. They consist of the removal of the keratinized tissue overlying the cover screw by using a scalpel, laser, or soft tissue punch.[18,26]

This article describes a technique to simplify the second-stage surgery of multiple implants with the same surgical template used for implant placement and a minimally invasive surgical approach.

TECHNIQUE

The surgical procedure described was conducted under infiltration anesthesia by using local anesthetic.

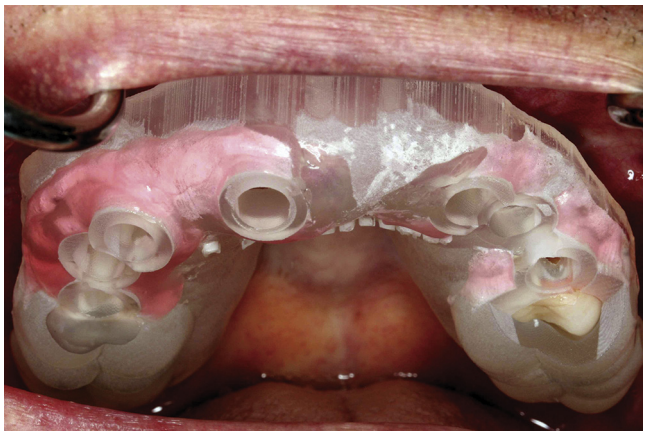

Figure 2. Placement of surgical stent.

1. When an appropriate healing time after implant placement (Fig. 1) has passed, insert the preexisting surgical stent in the patient's mouth. Make sure the stent is fully seated and in the proper position before the surgical procedure is started (Fig. 2).
2. Choose an appropriate tissue punch based on the diameter of the platform of the implant to be exposed. In this example, a 5.2-mm soft tissue punch (REF 32Z2002; Nobel Biocare) was used.
3. Firmly hold the surgical stent in place while the initial round incision is made with the tissue punch (Fig. 3).
4. Expose the entire cover screw with the blunt side of a sharp curette (Miller Curette #10; Henry Schein) and remove the incised soft tissue. Repeat steps 3 and 4 until all the cover screws are exposed.
5. Remove the surgical stent from the patient's mouth.
6. Make sure the cover screw has been exposed entirely before its removal so that the total view of the implant is not compromised and then remove the cover screw.
7. Place the corresponding healing abutment depending on the height of the surrounding mucosa. Carefully displace the soft tissue in all directions (mesial, distal, buccal, and lingual) to avoid impingement of the mucosa between the healing abutment and the implant platform. Steps 6 and 7 should be performed one implant at a time until all cover screws are replaced by the appropriate healing abutment.
8. Confirm the correct fit of the healing abutment radiographically and clinically (Fig. 4).
9. Adjust the interim prosthesis if needed. Resume prosthetic treatment after 1 to 2 weeks.

DISCUSSION

Every step of implant surgery is highly technique sensitive. Adequate training, treatment planning, and

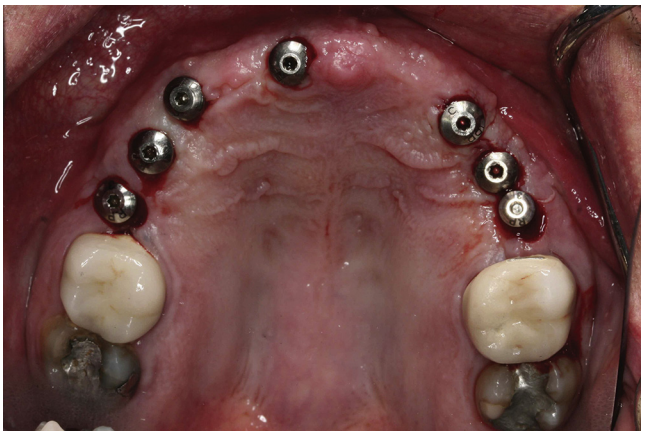

Figure 4. Occlusal view of maxillary arch after completion of second-stage surgery.

understanding of every phase involved in the process are mandatory for successful, predictable, and long-term results. Minimally invasive methods are appealing because there is no need for sutures, minimum bleeding is expected, and time can be saved during the surgical procedure.[14-16] However, the act of uncovering the cover screw when the clinician may preserve, reconstruct, or modify the soft tissue architecture around the implant components for a better outcome should not be neglected.

The technique described promotes a flapless approach with the use of a surgical stent and a soft tissue punch. Completely limiting designs, such as the one used in this patient, do not allow modification of the implant position because it restricts the instruments used during the osteotomy in a buccolingual and mesiodistal plane.[6] Nevertheless, successful transfer of the presurgical digital implant planning to the surgical site will greatly depend on the accuracy and stability of the guide position before and during the surgery. If the arch to be treated is partially edentulous, as in this situation, the template is positioned and stabilized by the remaining teeth. In the treatment of a completely edentulous arch, the guide should extend onto unreflected soft tissue regions, and the use of fixation pins is recommended to reduce the chance of displacement.[8,10,17] A soft tissue punch should only be used when ideal soft tissue conditions are present. Hence, unless the original surgical template is used to locate the precise location of the cover screws, a soft tissue punch could cause unnecessary loss of keratinized and attached mucosa, jeopardizing the soft tissue architecture.

Problems associated to computer-guided surgery are usually related to poor treatment planning, errors during scanning, misuse of the software, or incorrect transfer of the prosthetic information. Early recognition of inaccuracies and good patient selection can minimize problems and optimize treatment.

SUMMARY

The success of every implant restoration strongly depends on proper implant position, which is more predictable when a surgical stent is used. A well-made surgical stent not only facilitates proper implant position and angulation but could also simplify the second-stage surgery. In situations where multiple implants have been placed through computer-guided implant surgery, the preexisting surgical template can be used to perform the implant exposure surgery with a flapless approach if the patient's soft tissue condition allows it. This technique can lead to predictable results and healthy peri-implant keratinized soft tissue if patient selection is appropriate.

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Noteworthy Abstracts of the Current Literature

Implant survival in the edentulous jaw: 30 years of experience. Part II: A retro-prospective multivariate regression analysis related to treated arch and implant surface roughness

Jemt T

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Purpose. To report retro-prospective, long-term data on the prevalence of implant failures related to maxillary and mandibular arches and to different implant surfaces in a large number of edentulous patients.

Material and methods. Altogether, 3,493 and 1,092 edentulous arches were consecutively treated with implants with turned (1986-2002) or moderately rough (2003-2015) surfaces, respectively, during two time periods at one referral clinic. All implant failures were consecutively identified during routine follow-up, and a multivariate logistic regression analysis was performed to analyze implant failure related to arch and implant surface.

Results. Overall cumulative survival rates (CSR) for arches treated with turned surface implants were 75.7% and 94.6% for the maxilla and mandible, respectively. The corresponding 10-year CSRs for arches treated with implants with a moderately rough surface were 91.9% and 96.1%, respectively. The strongest significant association ($P<.05$) with risk for implant failure was the maxilla, and this was more pronounced for implants with a turned surface. Age at surgery, implant surgeon, calendar year of surgery, and time of follow-up also had significant associations with risk of implant failure ($P<.05$).

Conclusions. Risk for implant failure was significantly higher for treatment in the maxilla, but this risk was decreased significantly when using implants with a moderately rough surface. The impact of surface was not so obvious for treatment in the mandible. Risk for late implant failures after the first year was lower for implants with a moderately rough surface in the maxilla, but this risk seemed to be comparable for the different surfaces in the mandible.