Full-Arch Zirconia Screw-Retained Bridges

The Advantages of a Guided Surgical Approach

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Full-Arch Zirconia Screw-Retained Bridges: The Advantages of a Guided Surgical Approach

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Disclosure: Dr. Mirelez is the chief lecturer and chief clinician for GuidedSMILE V2R (Biomedical USA).

INTRODUCTION

When treatment planning full-arch reconstruction for a zirconia screw-retained implant bridge, implants can be placed either with a surgical guide or nonguided. While both guided and nonguided CBCT approaches can be successful, a guided approach offers certain advantages. These advantages include more precise alveoloplasty levels based on the prosthetic plan; more precise implant placement positions, especially with respect to the screw holes; and the availability to prefabricate a milled provisional for same (or next) day delivery. Considering that alveoloplasty levels and screw hole positions are crucial for success with full-arch zirconia bridges, a surgically guided approach can offer advantages over a nonguided approach when full-arch screw-retained implant bridges are treatment planned.

This article will outline the principles of utilizing guided surgery for full-arch screw-retained zirconia bridges, while demonstrating a unique reference pin-based guided system as an example of the principles discussed.

GUIDED VERSUS NONGUIDED APPROACHES

When a CBCT scan is utilized to plan a full-arch implant case, the CBCT information can be visually referenced to successfully perform proper alveoloplasty, osteotomy preparation, and implant placement without the use of a surgical guide (Figure 1). This has been termed the diagnostic freehand approach (by Dr. Scott D. Ganz), where the CBCT information is used, but without a guide for implant placement. This requires the ability to correlate the CBCT information with the patient’s ridge anatomy, and intuitively provide the surgical plan. One disadvantage of this nonguided CBCT approach is the subjectivity of surgical decisions, and the possibility of negative consequences of inadequate alveoloplasty or poor implant positions.

For example, inadequate alveoloplasty could translate into a zirconia implant bridge that is too thin and, therefore, susceptible to breakage. Or, it could also lead to poor aesthetics in a patient with a high lip-line because of the zirconia gingival interface being exposed when the patient smiles. Improper implant positions could create a poor anterior-posterior (A-P) spread, or screw holes that are not ideally directed, causing the need for multiunit abutments. While multiunit abutments serve many benefits, both straight and angled multiunit abutments are not mandatory for every case. Some clinicians prefer a nonguided approach, as it gives more freedom to...
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make intuitive decisions during surgery. A clinician can also use a technique in which a CBCT scan creates a surgical guide that is used to ascertain the implant positions and initial osteotomy sites, with the implants then being placed without the guide sleeves. This has been termed template-assisted surgery. This allows some clinicians the best of both worlds, maintaining a more intuitive and tactile feel for actual placement, yet having the key positions provided by the guide. The last option with surgical implant guides is to use the CBCT scan planned guide, placing the implants through guide sleeves. This has been termed full template guidance. One problem with full template guidance is that there is a loss of some tactile sensation during actual implant placement that could lead to implants that are not fixated adequately in the osteotomy position. When utilizing full template guidance, a surgical guide kit that is based upon the implant manufacturer’s specifications must be used.

This article will demonstrate the surgical guide system by GuidedSMILE V2R (Biomedical USA).

A Guided System With a Pin-Based Reference

The GuidedSMILE V2R system is unique in that it is the only guided system available that utilizes a pin-based reference for the amount of alveoloplasty and also for the implant surgical guide (Figure 2). This pin reference becomes important especially when a guide is being used after a complete arch of teeth is being extracted. The V2R system uses the pre-extracted teeth to reference guide pins that subsequently locate the alveoloplasty process and provide an implant placement guide. Other guide systems for full-arch implant placement rely on a CT-based virtual alveoloplasty that a surgical guide then sits on. The virtual alveoloplasty somehow must account for discrepancies when multiple teeth are extracted and the osseous anatomy changes due to atraumatic extractions. If the alveoloplasty guide in a nonpin-based virtual alveoloplasty system doesn’t fit as virtually planned, the subsequent surgical guide has the inherent potential to be inaccurate. The GuidedSMILE V2R system has a hard acrylic occlusal index to seat the guide and to allow for a verification based on the prosthetic plan for cases that don’t involve teeth extractions and the stable reference that teeth offer. Soft-tissue-supported guides without a pin reference have been shown to have inaccuracies. While the V2R pin-based guide system can be used for ridges that are edentulous or with teeth to start, the pin placement based on pre-extraction teeth is what makes this guide truly unique.

Treatment Planning

When treatment planning for full-arch implant placement with a surgical guide, the entire surgical plan must be based on the final tooth position. To do this correctly, pre-CBCT impressions, a face-bow, and records must be taken. In addition, a radiographic based scan appliance must be created that is based upon the final prosthetic tooth position.
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Pre-determined final surgical guides can then accurately guide the clinician for the correct amount of alveoloplasty, the correct implant positions based on angulations, and positions relative to the screw holes. An *online planning meeting* can then outline all surgical steps and parameters for success and deliver an accompanying printed plan. The GuidedSMILE V2R system planning involves considering the alveoloplasty pinhole positions and guide fixation pinhole positions. These pin positions must take into account the positions of pre-extracted teeth, and the patient’s nerve and vascular anatomy.

**Alveoloplasty/Implant Placement Principles**

Alveoloplasty is a key surgical step for success with a full-arch zirconia bridge and most full-arch screw-retained options. At least 12.0 mm of height must be obtained for a full-arch zirconia bridge, measured from the screw hole to the implant platform. The V2R guide system uses the pre-extracted teeth to demarcate CBCT-determined 2.0 mm holes in the bone to then create an alveoloplasty level (Figure 3). The bone is then reduced to this level, as determined by the surgical/prosthetic plan (Figure 4). Other guide systems are based on an alveoloplasty guide that is created from a virtual CBCT post-extraction ridge anatomy (Figure 5). One problem with a virtual plan is that, if bone is lost during the extraction process, the pre-determined CBCT-planned alveoloplasty guide may not fit. This will then impact the subsequent implant placement guide, causing a deviation from the original plan and creating multiple prosthetic problems. With the GuidedSMILE V2R system, once the alveoloplasty has been performed to a tooth-referenced pin-based level, the implant surgical guide can then be placed based utilizing the same pin reference positions (Figure 6). This continuity with the same tooth-referenced pin positions creates a certainty for the implant osteotomy and placement positions (Figure 7). This certainty of implant positions is true for either template-assisted or full template guided surgery.

**Provisional Delivery**

The GuidedSMILE V2R system provides a nanoceramic screw-retained provisional restoration as part of the package offered. This screw-retained provisional is now referenced into the same fixation pin locations that the surgical guide used and indexed to titanium interfaces (Figures 8 and 9). Instead of doing a traditional chairside reline of the prosthesis and awkwardly achieving the correct occlusal scheme, the GuidedSMILE V2R provisional is placed into pin references with a preplanned occlusal position (Figures 10 and 11). This is why it is important to have *accurate occlusal records* from the start of a case. A second clear duplicate of the provisional can also be picked up, allowing an accurate prosthetic record for use in the fabrication of the final prosthesis (Figure 12). This allows...
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for the entire appointment sequence to be as few as 4 appointments. The patient can have a well referenced, milled nanoceramic provisional delivered at the chair on the same (or next) day using the GuidedSMILE V2R system (Figure 13).

Tissue Closure Considerations
The tissue closure technique for full-arch guided surgery is dependent upon the timing of the delivery of the screw-retained provisional that is planned. If the screw-retained provisional is being delivered the same day of the surgery, then the tissue is sutured around straight or angled multiunit abutments. By suturing around multiunit abutments, it allows time for the provisional to be finished chairside, without collapse of the soft tissue. If healing caps are used to support the tissue without multiunit abutments the same day as surgery, then the tissue has a tendency to collapse when the healing caps are removed for provisional delivery. This makes delivery of the provisional very difficult on many levels. If the screw-retained provisional is being delivered the next day, then the surgeon can suture to either multiunit abutments or to healing caps alone. By the time a provisional is delivered the next day, the tissue has shrunk, and removing healing caps does not collapse the tissue, making delivery easier. One advantage of a guided surgical plan is that, since the implant screw holes are preplanned in a precise direction to the cingulum of anterior teeth and occlusal of posterior teeth, multiunit abutments are not always mandatory for screw hole redirection. This allows a clinician the option of utilizing multiunit abutment or not, especially when the provisional is being delivered the next day. Next-day delivery of a provisional also requires less chair time for the patient and doctor as the dental laboratory team can refine the provisional in a more controlled manner than can be done directly at the chair.

IN SUMMARY
CBCT-guided surgical templates for full-arch zirconia screw-retained implant bridges offer many advantages. Through proper surgical prosthetic planning, the correct amount of alveoloplasty can be performed, allowing for both an adequate thickness of the zirconia prosthesis and, in the maxilla, to hide the zirconia gingival junction when smiling. A CBCT surgical guide can also allow for implant positions that have both an ideal position for screw hole access and for angulations of distal implants for an improved A-P spread. These advantages of guided surgery for a full-arch zirconia screw-retained bridge are further benefited by a pin-based system that uses pre-extracted teeth for a pin-based reference for both alveoloplasty and guided implant placement. These referenced pin positions can also be used to place a pre-fabricated provisional restoration.

References
3. McAlarney ME, Stavropoulos DN. Determination of cantilever


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POST EXAMINATION QUESTIONS
1. When a tooth is loaded, stress concentrates in the cervical portion of the tooth, and this becomes more critical in the maxillary anterior as the load is off-axis to the tooth’s long axis.
   a. True  
   b. False

2. Endodontically treated teeth that have one or both marginal ridges of native tooth structure missing are always adequately restored using directly placed composite resin restorations.
   a. True  
   b. False

3. Fiber posts have a modulus of elasticity that more closely approaches that of dentin, making them a desirable choice when a post is indicated.
   a. True  
   b. False

4. Stiff metal posts create stresses concentrating at the apical tip of the post, with vertical root fracture being a frequent occurrence.
   a. True  
   b. False

5. According to the author and numerous studies, when restoring endodontically treated teeth, a properly designed ferrule is not needed, as long as adhesive dentistry principles are properly followed.
   a. True  
   b. False

6. The choice among all-ceramic materials is dependent on function, inherent material properties, and the aesthetic demands/needs of the patient.
   a. True  
   b. False

7. CAD/CAM-fabricated all-ceramic restorations do not require any modifications in preparation.
   a. True  
   b. False

8. Due to the nature of milling employed in CAD/CAM, it is easier to mill rounded interior aspects to the crown than sharp angles.
   a. True  
   b. False
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Please check the correct box for each question below.

1.  ☐ a. True.  ☐ b. False
2.  ☐ a. True.  ☐ b. False
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