Brief Report

Using zinc oxide-based temporary materials as contrast methods: a practical and simple approach for planning prosthetically driven sinus elevation

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Abstract: Endosteal implants are a well-established treatment modality to rehabilitate partially and completely edentulous patients. Contemporary regenerative materials and surgical techniques such as direct sinus elevation permit placing endosteal implants predictably in ridges with severe vertical deficiencies. One of the biggest challenges related to this augmentation procedure occurs during the planning stage, when the access to the maxillary sinus, and the number of implants required are tailored specifically for the clinical situation. To minimize the morbidity and maximize post-surgical recovery the extension of lateral window must correspond with the planned implant positions and should not be extended beyond. When establishing these positions, the dentist in charge of the planning the case must be able to clearly visualize the proposed contours of the restorations, their long axes, and their relationship with the residual ridge and the underlying maxillary sinus anatomy. Traditionally, radiographic templates involving contrast agents such as barium sulfate, and tin foil have been used for this purpose; however, the use of these materials often involves extensive dental laboratory procedures. This brief report presents an alternative use for zinc-oxide-based dental materials that permits visualizing the desired prosthetic contours at the diagnostic stage and ensures the placement of the graft material in prosthetically favorable positions.

Keywords: Dental implants; dental materials; contrast medium; implant planning; sinus elevation

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Introduction

Adequate communication between the restorative dentists and surgeon is necessary to ensure adequate preparation of the receptor site subsequent and implant placement (1-5). Radiographic templates combined with cone beam computerized tomography (CBCT) are valuable tools to visualize the relationship between the planned restoration with the bone and other important anatomical structures (6,7). Traditionally, surgical and radiographic templates used radiopaque materials to show the contours of the planned restoration in the tomographic exam. Temporary restorative materials, gutta percha, barium sulfate, radiopaque putty, radiopaque artificial teeth, lead foil, steel, and amalgam have been used successfully (8,9). However, some of these materials are relatively expensive, require specific equipment

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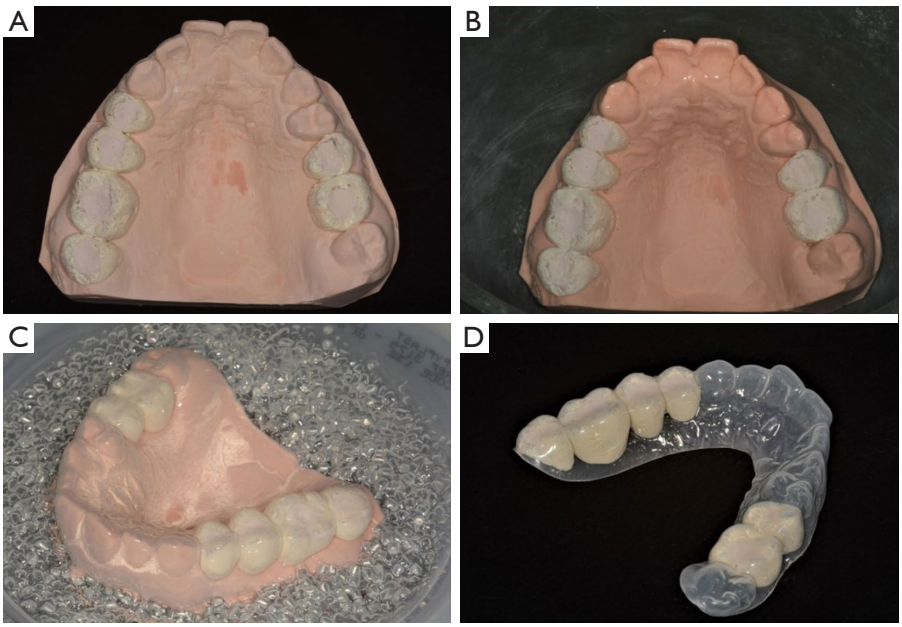

Figure 1 Radiographic template fabrication. (A) Maxillary cast with artificial teeth arrangements. (B) Maxillary cast, and artificial teeth arrangements immersed in lukewarm water. (C) Maxillary cast, and artificial teeth arrangements, after thermoplastic polymer application via pressure molding. (D) Finished radiographic template.

to be used, or can be hard to apply properly to recreate the desired contours of the proposed restorations (6-9). This article presents the use of zinc oxide-based restorative materials as a radiopaque medium to aid the planning and execution of a bilateral sinus elevation. This alternative is a feasible and straightforward option for the clinical situation where modern techniques such as guided surgery are not an option (5). This article was presented in accordance with the MDAR reporting checklist (available at https://fomm.amegroups.com/article/view/10.21037/fomm-23-11/rc).

Technique

In the present brief report, no human experiments were conducted, therefore no ethics committee approval was necessary. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). As part of routine dental care, this patient gave consent to radiographic imaging and photography at The Ohio State University College of Dentistry and agreed to share the images for scholastic purposes.

(I) Make maxillary and mandibular preliminary impression using irreversible hydrocolloid (Geltrate; Dentsply Sirona, Charlotte, NC, USA) and fabricate preliminary casts using fast-setting type IV dental stone (Snap Stone; WhipMix Corp., Louisville, KY, USA).

(II) Articulate the maxillary and mandibular casts and create artificial teeth arrangements using the manufacture method of your preference.

(III) Make sure the artificial teeth arrangements have a channel in their long axes for radiographic reference; a cylindric laboratory carbide cutter (H79Q.11.040 HP Q Cutter Carbide; Brasseler USA, Savannah, GA, USA) can be used for this purpose. If possible, extend the artificial teeth arrangements posteriorly to ensure posterior occlusal contacts to stabilize the radiographic template intraorally during the CBCT procedure. If needed apply a small amount of cyanoacrylate resin (Gorilla super glue brush & nozzle; Gorilla Glue Co., Cincinnati, OH, USA) to fix the artificial teeth arrangements to the cast.

(IV) Apply a thin coat of zinc oxide-based temporary cement (TempBond NE; Kerr Dental, Brea, CA, USA) to the surface of the artificial teeth arrangements and fill the channel of the artificial teeth with zinc oxide-based temporary filling material (Cavit temporary filling material; 3M ESPE, St Paul, MN, USA) (*Figure 1A*).

(V) Immerse the cast and artificial teeth arrangements

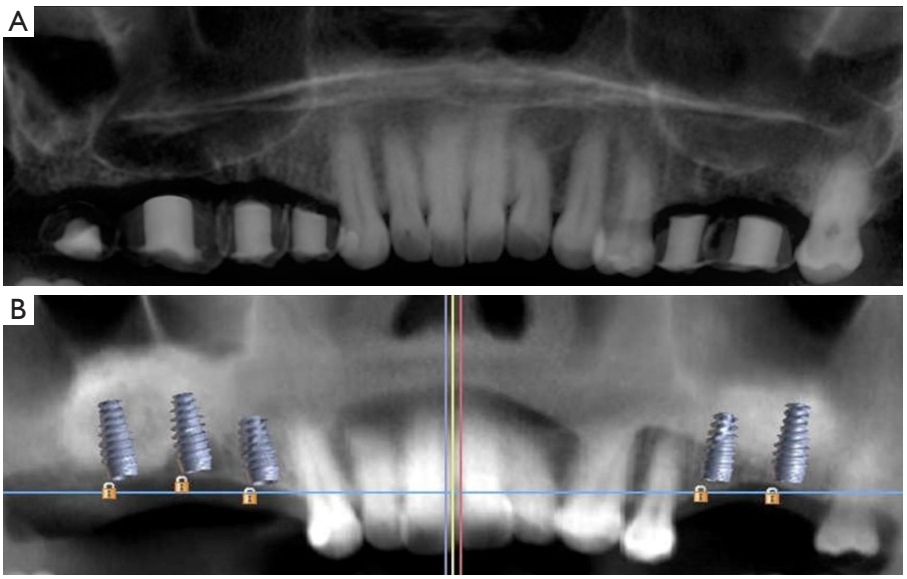

Figure 2 Cone-beam computerized tomography assessment. (A) Preoperative panoramic projection. (B) Postoperative panoramic projection.

in a rubber mixing bowl (Patterson Flex Mixing Bowl; Patterson Dental, Mendota, MN, USA) with lukewarm water to accelerate the setting of the zinc oxide-based restorative materials (*Figure 1B*). This step simplifies the separation of the artificial teeth arrangements from the casts at later stages since the bond between the teeth and the stone is decreased by water immersion.

(VI) Using a pressure-molding device (Biostar Scan with LCD Display; Great Lakes Dental Technologies, Buffalo, NY, USA) create the external surface of the template using a thermoplastic polymer (Clear Splint Biocryl 1 mm/125 mm; Great Lakes Dental Technologies) (*Figure 1C*).

(VII) Finish and polish the radiographic templates using laboratory carbide cutters and abrasive brushes (25525HP Fine Scotch Brite Brush: Patterson Dental) (*Figure 1D*). Make sure not to over trim the template material extending below the height of contour to ensure satisfactory mechanical retention of the artificial teeth arrangements within the template when removed from the cast.

(VIII) Perform CBCT with the patient using the radiographic template (*Figure 2A*). The radiographic template can be used as a reference during surgery to estimate the amount of augmentation required for the subsequent rehabilitation (*Figure 2B*).

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Footnote

Reporting Checklist: The authors have completed the MDAR reporting checklist. Available at https://fomm.amegroups.com/article/view/10.21037/fomm-23-11/rc

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Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://fomm.amegroups.com/article/view/10.21037/fomm-23-11/rc). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This brief report is not a research

manuscript involving human experiments, hence ethical approval was not necessary. As part of routine dental care, this patient gave consent to radiographic imaging and photography at The Ohio State University College of Dentistry and agreed to share the images for scholastic purposes.

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