

DENTAL TECHNIQUE

Flexible thermoplastic resin to add retention to tooth-supported stereolithographic surgical guides

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Surgical guides allow dental implant surgeons to relate the desired prosthetic outcome to the available bone and soft tissue volume. These guides vary between simple nonrestrictive guides to more complex fully restrictive surgical guides.¹⁻⁸ Fully restrictive guides can be fabricated either by means of an analog⁹ or a digital path.¹⁰⁻¹³ An example is a computer-aided design/computer-aided manufacturing (CAD/CAM) guide. There are multiple CAM techniques available. The stereolithography technique was developed for the aeronautical industry and found its way into medicine in the 1990s.^{14,15} In this process, liquid light polymerizing resin is selectively polymerized with a laser beam. The resulting object is a hard resin analog of the digital file that preceded it. Because a guide formed by

ABSTRACT

Surgical guides produced by stereolithography use hard resin. The hard resin prevents seating beyond the height of contour, hence these guides are not intrinsically retentive. By covering the guide with a flexible thermoplastic material that extends into the undercuts, the resulting guide now has a retentive feature. This allows it to maintain its position during surgery yet it can easily be removed and repositioned. (J Prosthet Dent 2015;114:479-481)

stereolithography consists of a hard polymer, it can neither flex over the heights of contours nor extend into undercuts. Consequently, this guide sits on the teeth without any intrinsic retention.

The surgical guide must be placed exactly as planned in the computer to derive the planned surgical outcome. Any deviation from that position will result in discrepancies between the planned and obtained outcome. Manufacturers allow for the placement of lateral pins or screws to secure the guide during surgery. This requires additional osteotomies and does not facilitate removal and repositioning during surgery. The described technique allows a nonretentive guide to be transformed into a retentive guide, which snaps in place and does not

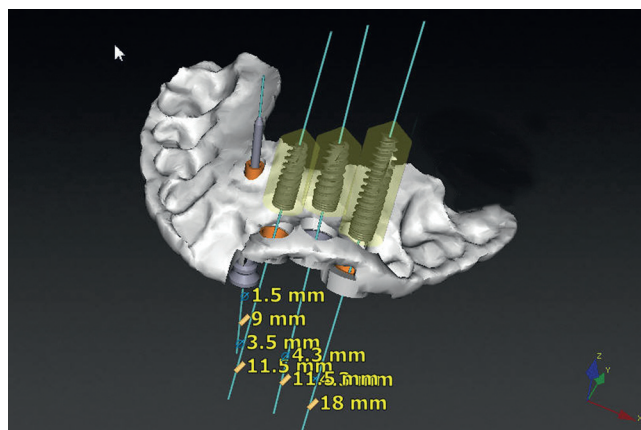


Figure 1. Virtual surgical guide, with planned position of dental implants visible.



Figure 2. Finished surgical guide in hard resin material.

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Figure 3. Guide repositioned on diagnostic cast.

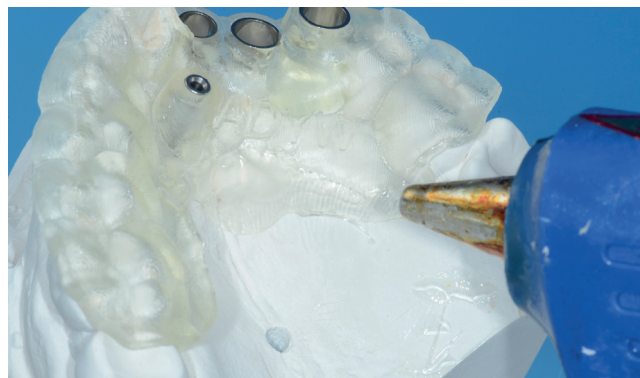


Figure 4. Guide secured to cast to prevent movement during vacuum-forming process.



Figure 5. Dual-layer vacuum-formed plastic has encapsulated stereolithographically produced surgical guide.



Figure 6. Excess thermoplastic material is removed.



Figure 7. Surgical guide is positioned intraorally. Vacuum-formed material extends into undercut areas.

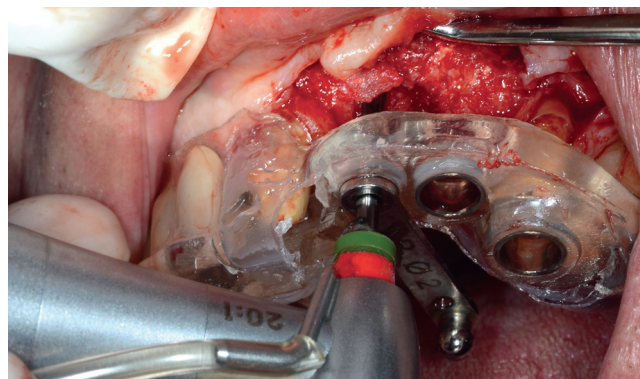


Figure 8. Guided surgery is performed, deploying retentive surgical guide.

need additional means of retention when sufficient natural teeth are present.

PROCEDURE

1. Make an impression with a material of choice and pour with dental stone (Earth Stone; Tak System

Inc) or polyvinyl siloxane material (Blu-Mousse/Mach-SLO; Parkell Inc).

2. Scan the cast with an optical scanner (NobelPro-cera 2G Scanner; Nobel Biocare).
3. Make a cone beam computed tomographic scan.
4. Enter both files into dedicated software (Nobel-Clinician; Nobel Biocare). Match both files and

plan implant positions. The software algorithm develops the surgical guide, which is fabricated with stereolithography (Fig. 1).

5. Position finished surgical guide on dental cast (Figs. 2, 3).
6. Secure guide onto cast with hot glue (Super-bonder; FPC Corp).
7. Block out metal cylinders with soft elastomer (Modelbloc; TAK Systems).
8. Create dual-layer vacuum-formed carrier. Collate 1 mm thermoplastic soft-guard material and 0.75 mm bondable material and heat together (Essix A+ and model duplication material; Dentsply Raintree Essix) (Figs. 4, 5).
9. Trim with hot knife (TrayMagic; American Dental Hygiene) (Fig. 6).
10. Place intraorally and perform surgery according to the digital planning (Figs. 7, 8).

SUMMARY

CAD/CAM-produced surgical guides made of hard resin are nonretentive and need alternative means to stay in place during surgery. Encapsulating such a guide in a thermoplastic vacuum-formed carrier adds a retentive element, as the vacuum-formed plastic can flex into the undercuts below the height of the contours of the supporting teeth.

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