

Short Opinion

The Workflow in Digital Implant Surgical Guides

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Prosthodontic driven is the goal and expectation for implant surgery. For reaching this goal, a surgical guide is essential for implant surgery. Nowadays, digital techniques simplified and improved the accessibility of implant surgery planning and surgical guide fabrication. The author is a prosthodontist and runs quality control for all surgical guides sent from his home institution. In this short communication, the author will explain the workflow of implant surgical guide and brain maps about the pathway to select a proper surgical guide.

The workflow to fabricate a digital implant surgical guide including three steps:

Step 1: Gather the data of bone, surrounding tissue, and future restoration. In this step, the data of bone is Digital Imaging and Communications in Medicine (DICOM) file format from a Cone Beam Computerized Tomography (CBCT) while surrounding tissue condition evaluated by stereolithography (STL) file format from an optical scanner. The future restoration proposal is designed by professional software and exported as a 3D mesh file that should merge with the DICOM and STL files.

Step 2: Design the implant position. In general, most implant brands or CBCT companies have their design software specialized for their implant and machine. After the design, the implant position data need to be extracted and exported with the dental model. The file type at this step usually varies depending on the software, but it is critical to test the comparative of this implant position data with surgical guide design software.

Step 3: Design the implant surgical guide and fabrication. In this step, the surgical guide designed in dental professional software with the implant position data comes from the previous step. The final design of the surgical guide needs to export as an STL file and sent to mill or print.

This workflow could be general use to all kinds of digital implant surgical guides regardless of the brand and company. The key to the workflow is pretesting the comparative of data when it transfers between different software.

Three components are necessary to implement digital implant surgical guide workflow.

1. The data resource: an intraoral or laboratory scanned image of the dental condition and a CBCT.

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Submitted: 02 October 2021**Accepted:** 11 October 2021**Published:** 15 October 2021**Copyright**

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ISSN: 2573-1548**OPEN ACCESS**

2. The software to design restoration, implant position, and surgical guide.
3. The equipment to fabricate the implant surgical guide: a milling machine or a 3D printing machine.

The investigation decision needs to make to depends on the capability and the financial condition of the clinic. All three components are essential for build up the whole workflow in-house.

After building up the workflow of implant surgical guide, selecting the guide is critical for implementing the products. The brain maps to decide on guide selection is depends on the answers to two crucial questions.

1. Is there enough teeth or stable tissue characters that could serve as markers to merge with CT scan image?

If the answer is NO, a radiographic guide with radiopaque markers needs to fabricate to help merge.

If the answer is YES, the following question will be whether those markers distribute in the position could stabilize the surgical guide or not. The optical scan data could be merged directly with the CT scan data if the response is also positive. If this answer is negative, the case will need to treat as the initial answer is negative, adding radiopaque markers to assist the merging.

2. Is there abundant space to place both the guide and surgical instrument in the surgery site?

If the answer is NO, a virtual guide or freehand surgery will perform.

If the answer is YES, an implant surgical guide could fabricate.

In summary, this short communication was built on the practical experience of the author. This workflow and brain maps could help the clinician to develop their workflow on digital implant surgical guides.