Fabrication of Dental Crown from Tooth Preparation with Subgingival Finish Line Scanned Using Optical Coherence Tomography: A Pilot Study

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Objectives: Digital impressions have been studied for better gingival retraction in including the under subgingival finish line condition. Here, we employed swept-source optical coherence tomography (SS-OCT) of 1310 nm wavelength, which is capable of noninvasive, high-resolution, and high-speed, to discern the utilization-possibility for supporting the fabrication of the dental crown.

Methods: A three-dimensional (3D) abutment was used at the 0.5 mm of the subgingival finish line below the level of the gingiva. The SS-OCT system scanned a field of view of 10 mm×10 mm using the 3D working model by the depth-directional three focal points. The obtained 1500 images of OCT cross-sections, which are 1221×1220 pixels, were rendered to the 3D model for the effective design of a virtual crown. Then, the ceramic crown was fabricated through a milling machine with a computer-aided design and computer-aided manufacturing (CAD/CAM) software.

Results: The marginal fit of the crown was evaluated $219.1 \pm 48.9 \mu\text{m}$ by a silicone replica technique.

Conclusions: Although the marginal fit is not sufficient for the clinical allowable gap at one resin typodont, this study can be anticipated to encourage further research for the enhanced fabrication of dental crown under subgingival finish line conditions.

Keywords: Swept-source optical coherence tomography, Virtual crown, Subgingival scanning, Two-dimensional image stack, Three-dimensional modeling