Brief Communication

An alternative technique for fabricating a resilient gingival mask on a three-dimensionally printed implant cast

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Abstract

Accurately replicating the peri-implant and pontic site soft tissues in a master cast is essential for achieving optimal contours in an implant-supported prosthesis. An implant cast with soft tissue replication allows for seamless integration of the prosthesis with the natural oral anatomy, resulting in an ideal emergence profile and improved esthetics. Furthermore, it encourages proper oral hygiene, leading to improved overall gingival health. A flexible gingival mask is used for this purpose. There are well-established methods for fabricating these masks on dental stone casts in an analog method. On the other hand, there is only one method currently being used to fabricate gingival masks on three-dimensional (3D) printed implant casts, which is both labor intensive and time consuming. Therefore, the purpose of this article is to provide a quicker and more effective method for creating gingival masks for 3D printed implant casts.

Keywords: Gingival mask, implant digital model, three-dimensional printed implant model

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INTRODUCTION

Digital impressions are revolutionizing the field of dental implants. These impressions utilize cutting-edge scanning technology to generate accurate virtual models of a patient's implant positions, thereby eliminating potential inaccuracies associated with impression materials and techniques.[1] The use of three-dimensional (3D) printing technology to create working implant casts from scan data is gaining popularity due to its ability to offer customized solutions, ensuring an effective treatment outcome.[2,3] In addition, the use of 3D printing for multiple implant placements has made the complex procedure of replicating the positions on casts easier. Research has shown that the accuracy of implant analog placements in implant casts produced using digital technologies is comparable to that of gypsum casts.[4-6] Although conventional open-tray implant impressions are currently widely used for fabricating dental stone casts due to their accuracy, it is likely that 3D printed implant casts will substitute them in the near future. This is because of the rapid advancement of digitization and the availability of efficient digital workflow, along with benefits such as improved patient comfort and the ability to store and share data.[7,8]

The role of a gingival mask in the simulation of soft tissues around an implant on an implant cast is indisputable for

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its contribution in creating exceptionally precise implant superstructures and prosthesis.

A commonly used technique in the analog method for creating gingival masks involves taking an impression of the implant, and once the separating media is applied, the flexible gingival mask material is directly placed into the impression around the implant analog. After the gingival mask has hardened, the gypsum cast is poured.[9]

The process of fabricating gingival mask however differs in the digital system. Currently, the technique used to create 3D printed implant cast and gingival mask consists of two separate printing stages. In the first print cycle, the implant cast is fabricated using model resin on a 3D printer. The gingival mask is printed in a second printing cycle using a resilient material particularly formulated for 3D printing of gingival masks.[10] The necessity of an additional printing cycle to fabricate the soft gingival mask separately will inevitably take a longer time. Moreover, in an undesirable incidence of a misprint in the gingival mask, it becomes imperative to repeat the entire printing cycle. Due to the fact that this process necessitates replacing the model resin in the resin tank (VAT) with pink gingival mask material, it can also be arduous. To address these problems, this article presents a precise and well-defined alternative method in a step-by-step manner.

TECHNIQUE

1. Remove healing abutments from the implants and quickly complete the intraoral scan using intraoral scanner (Medit i500; Medit Corp, Seoul, South Korea). Scan the opposite arch and register occlusion
2. Position the scan bodies (Dentium; Korea) on the implants and subsequently perform a second intraoral scan
3. Import the scan data which include implant location, soft tissue volume, and occlusion into computer-aided design (CAD) software (DentalCAD 3.2 Elefsina; Exocad GmbH)
4. Fill the project sheet on the first window of the CAD software for modeling
5. Design the implant cast (Exocad model creator module)
6. Design gingimask positions on the model at the level of the implant platform
7. After the series of settings related to the model, the final command to run the model is clicked and the model is generated which is later saved as Standard Tessellation Language (STL) file
8. Import STL files into the 3D slicing software (ALPHA AI; Ackuretta Taipei, Taiwan)
9. Print the implant cast and gingival mask together in photocurable model resin (d-tech 3D Accuprint, Pune,

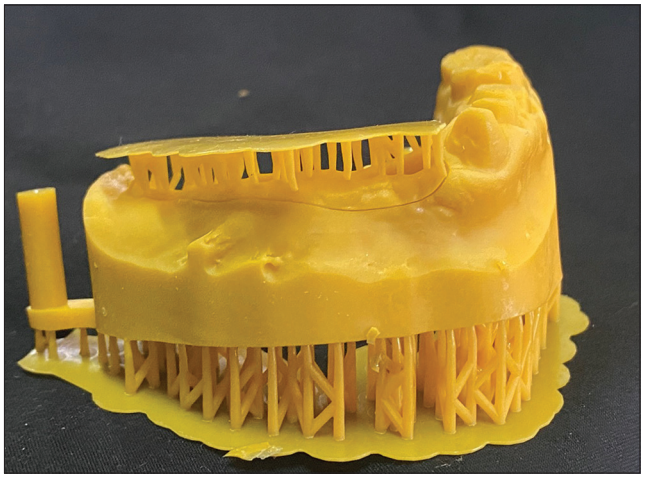

Figure 1: Three-dimensional printed implant cast and gingival mask (arrow) using model resin

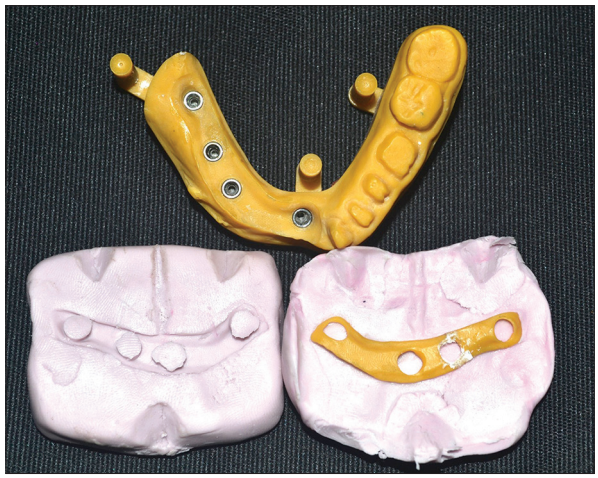

Figure 2: Three-dimensional printed implant cast

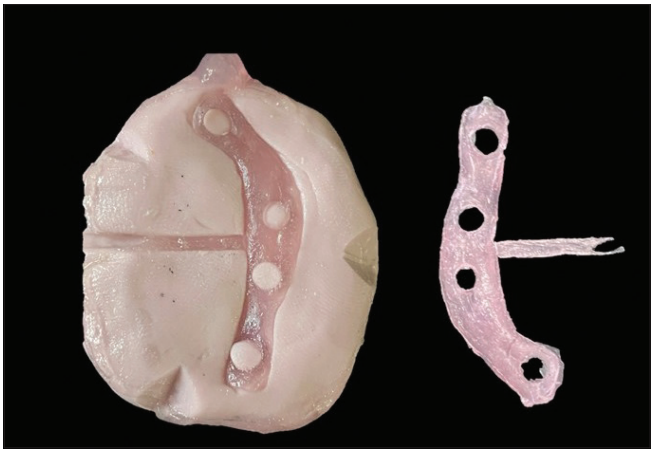

Figure 3: Packed and cured polyvinyl siloxane gingival mask

India) [Figures 1 and 2], using a vat polymerization 3D printer that utilizes LCD technology (Dentiq; Ackuretta, Taipei, Taiwan)
10. Perform the postprinting process as per the manufacturer's specifications
11. Digital implant analog is assembled in the 3D printed implant cast (Dentium; Korea)
12. Polish and verify the fit of the 3D printed gingival mask on the implant cast
13. Create a mold of the 3D printed gingival mask using silicone duplicating material (Zhermack, Zetalabor, Italy)
14. Mix the laboratory polyvinyl siloxane gingival mask material (Gingifast Rigid) in 1:1 ratio and pack it into the mold (Zhermack, Italy) [Figure 3]
15. Polish the gingival mask once it sets and carefully fit it on the implant cast [Figure 4].

DISCUSSION

The proposed technique offers a valuable advantage to both clinicians and laboratory personnel by enabling them to print implant casts and gingival masks simultaneously, using just one resin print material. In the subsequent step, a resilient gingival mask can be fabricated by duplicating the 3D printed gingival mask using addition silicone-based gingival mask material (Gingifast), employed in the analog method. The use of laboratory gingival masks is justified by the fact that, as we are still in the process of digitizing and are making the switch to a digital system, there may be instances where analog methods are required. Consequently, it is essential to have a suitable gingival mask material readily available on the shelf. Gingifast is the most commonly used and recommended material due to its excellent flow properties, ease of adjustment, and sculpting capabilities, as supported by studies.[11-14] Therefore, it can be reliably employed, eliminating the need for added expenses on a printable gingival mask and the additional time required for printing.

Figure 4: Resilient gingival mask fabricated with Gingifast elastic gingival mask material

CONCLUSION

As there is no need to run a second printing cycle to exclusively print the soft gingival mask, the suggested technique significantly reduces the printing time, saves labor, and minimizes expenses associated with the use of printable pink gingival mask material.

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Conflicts of interest
There are no conflicts of interest.

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