

***Crown & Implant
Restorations Workflow***

Contents

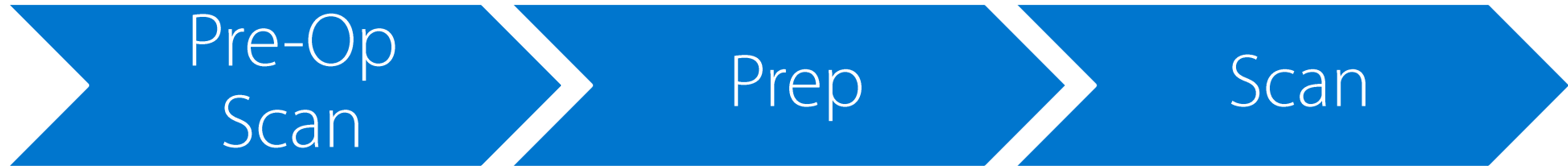
1 Crown Restoration Workflow

2 Implant Restoration Workflow



Crown Restoration Workflow

Crown Restoration Workflow



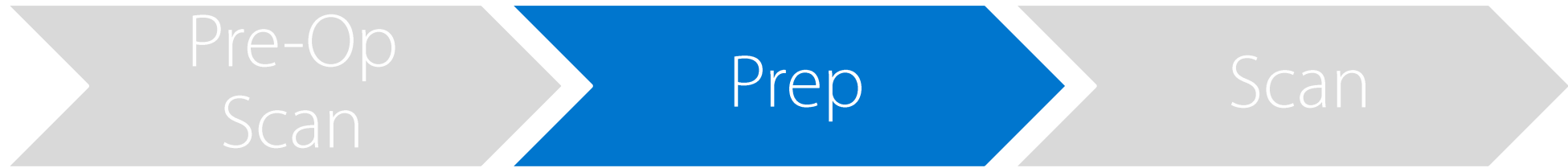
- ✓ *THE SAME WORKFLOW CAN BE APPLIED TO OTHER PROSTHESIS CASES!*

Crown Restoration Workflow



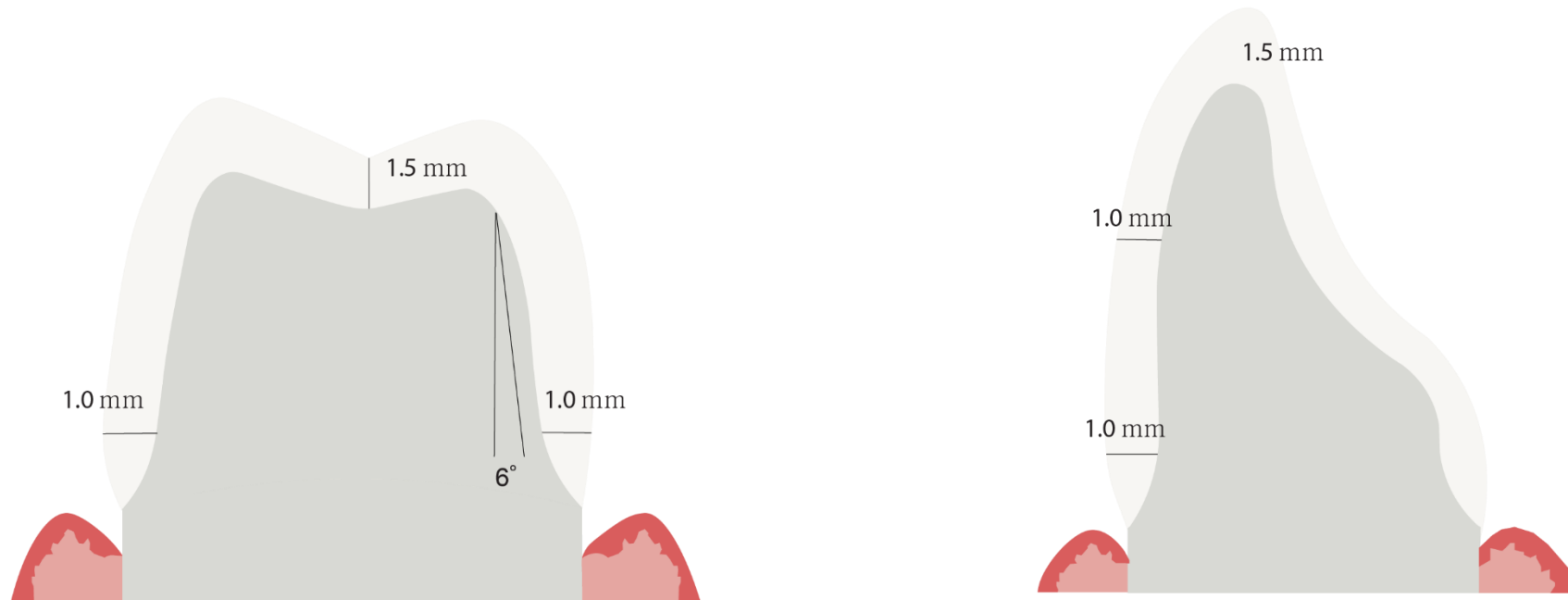
- ✓ *SCAN MAXILLA, MANDIBLE AND OCCLUSION AT **PRE-OP SCAN STAGE***

Crown Restoration Workflow

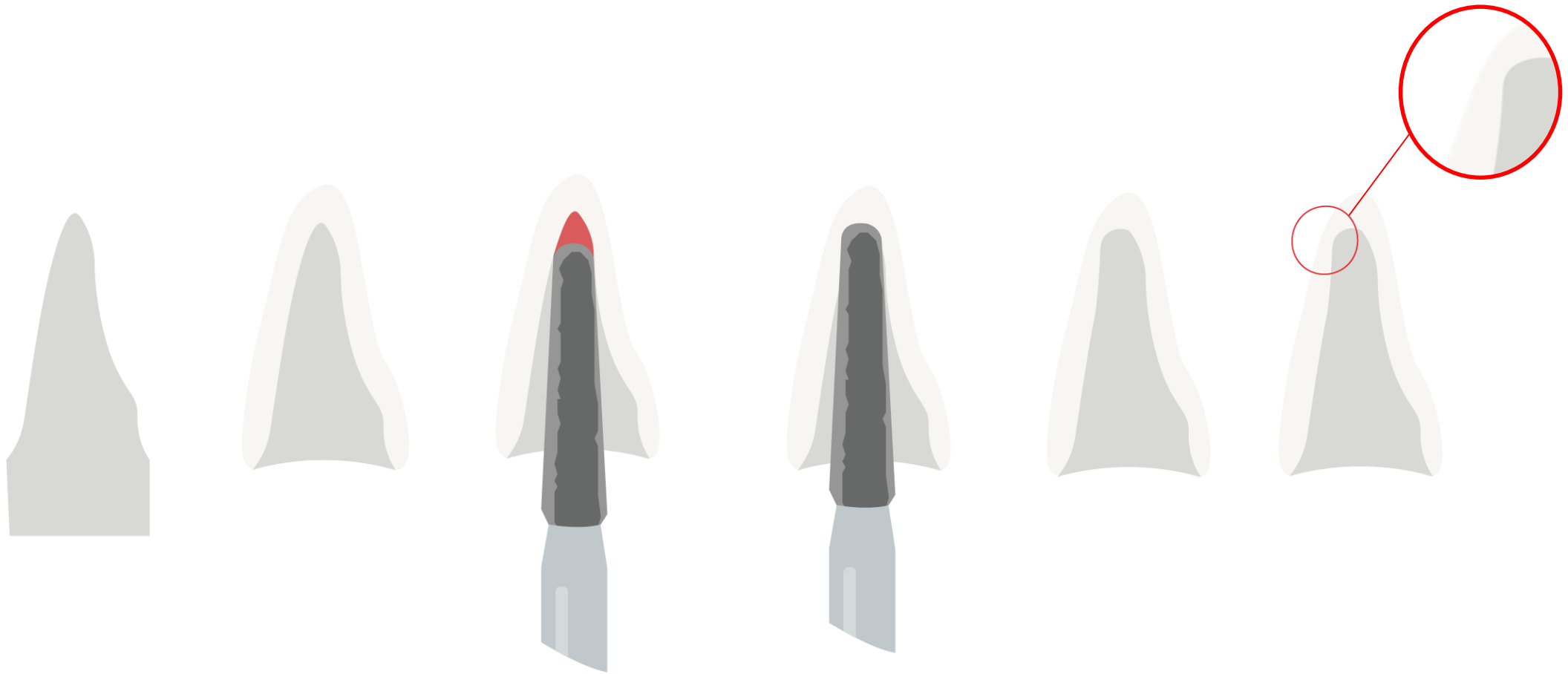


- ✓ *PREP THE ABUTMENT CONSIDERING THE THICKNESS OF THE TEETH, MARGIN LINE*

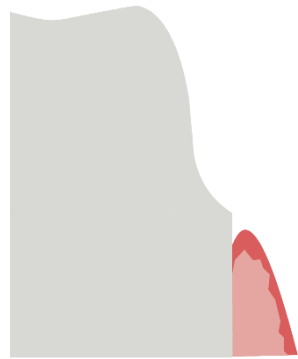
Crown Restoration Workflow - Prep



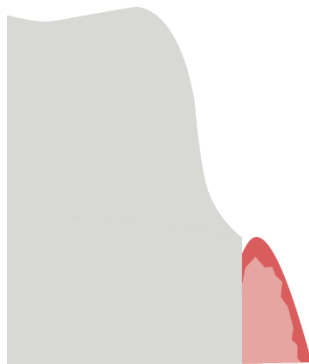
Crown Restoration Workflow - Prep (1) Anterior



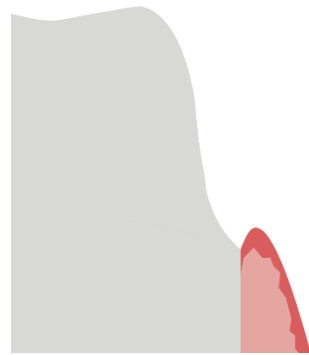
Crown Restoration Workflow - Prep (2) Posterior



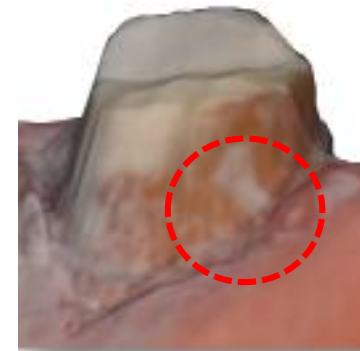
Supra Margin



EQ Margin

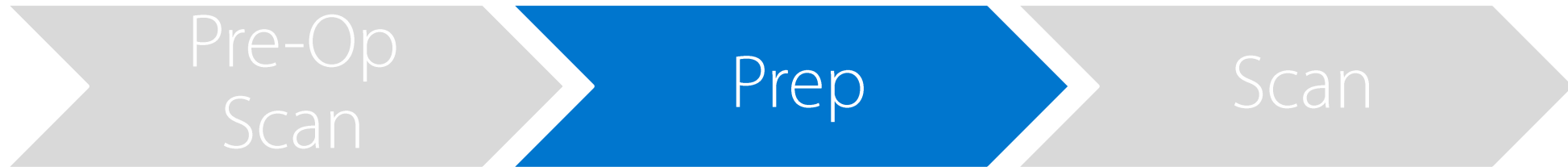


Sub Margin



Cord Packing

Crown Restoration Workflow



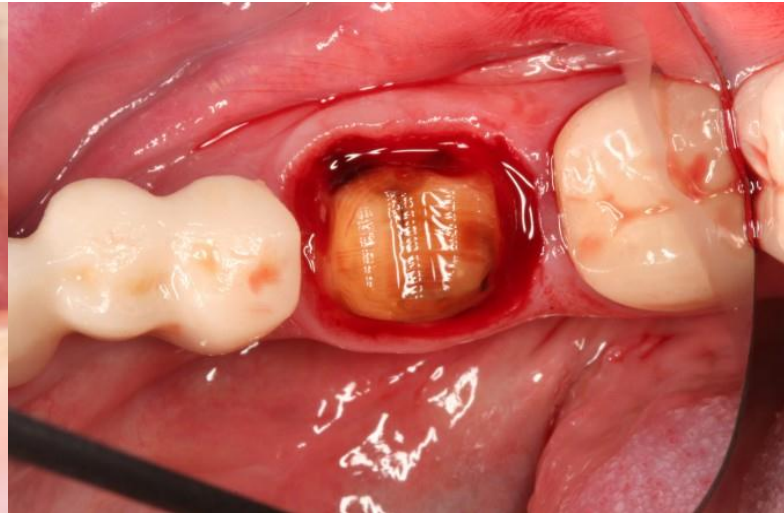
- ✓ *PREP THE ABUTMENT CONSIDERING **THE THICKNESS OF THE TEETH, MARGIN LINE***
- ✓ *CHECK IF THE PREPPRED AREA ARE **HEALTHY AND WET-DRY STATE FOR SCANNING***

Crown Restoration Workflow - Fluid Control

Wet dry



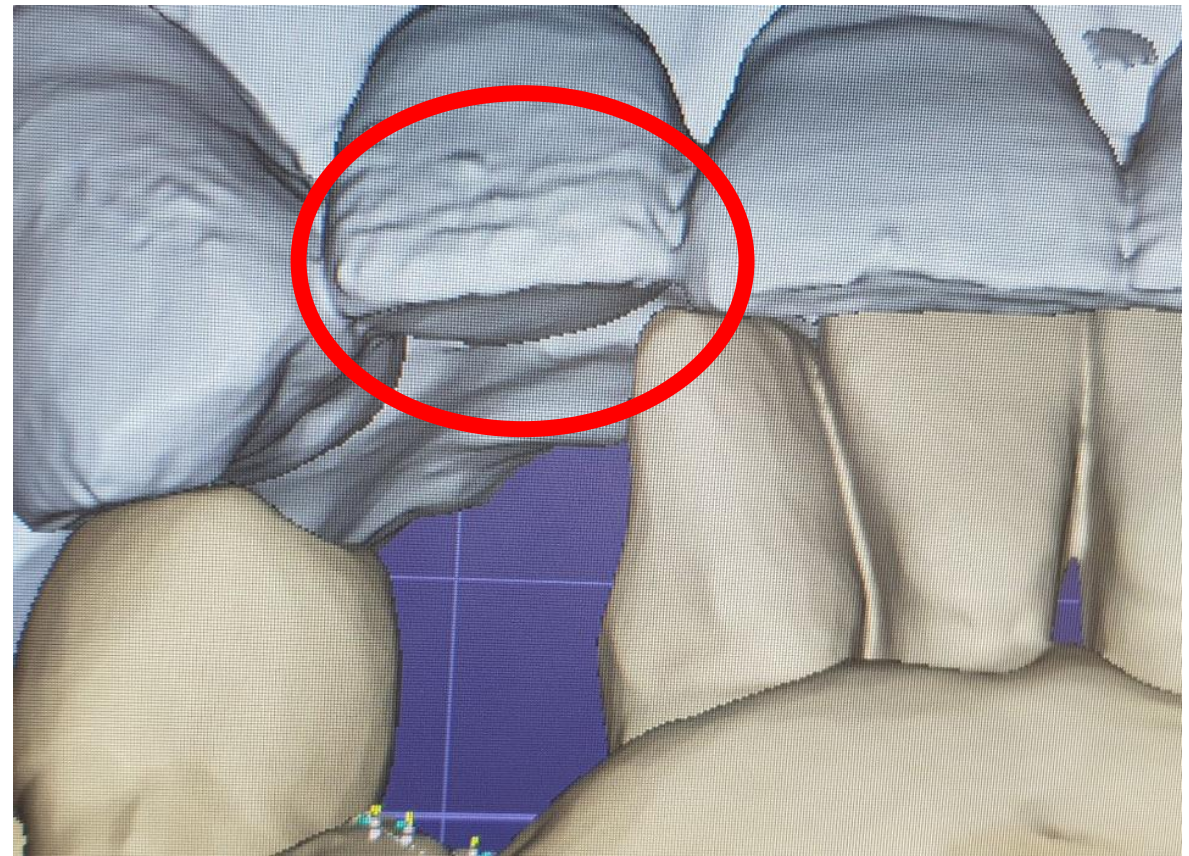
Hemostasis



Healthy gingiva



Crown Restoration Workflow - Fluid Control

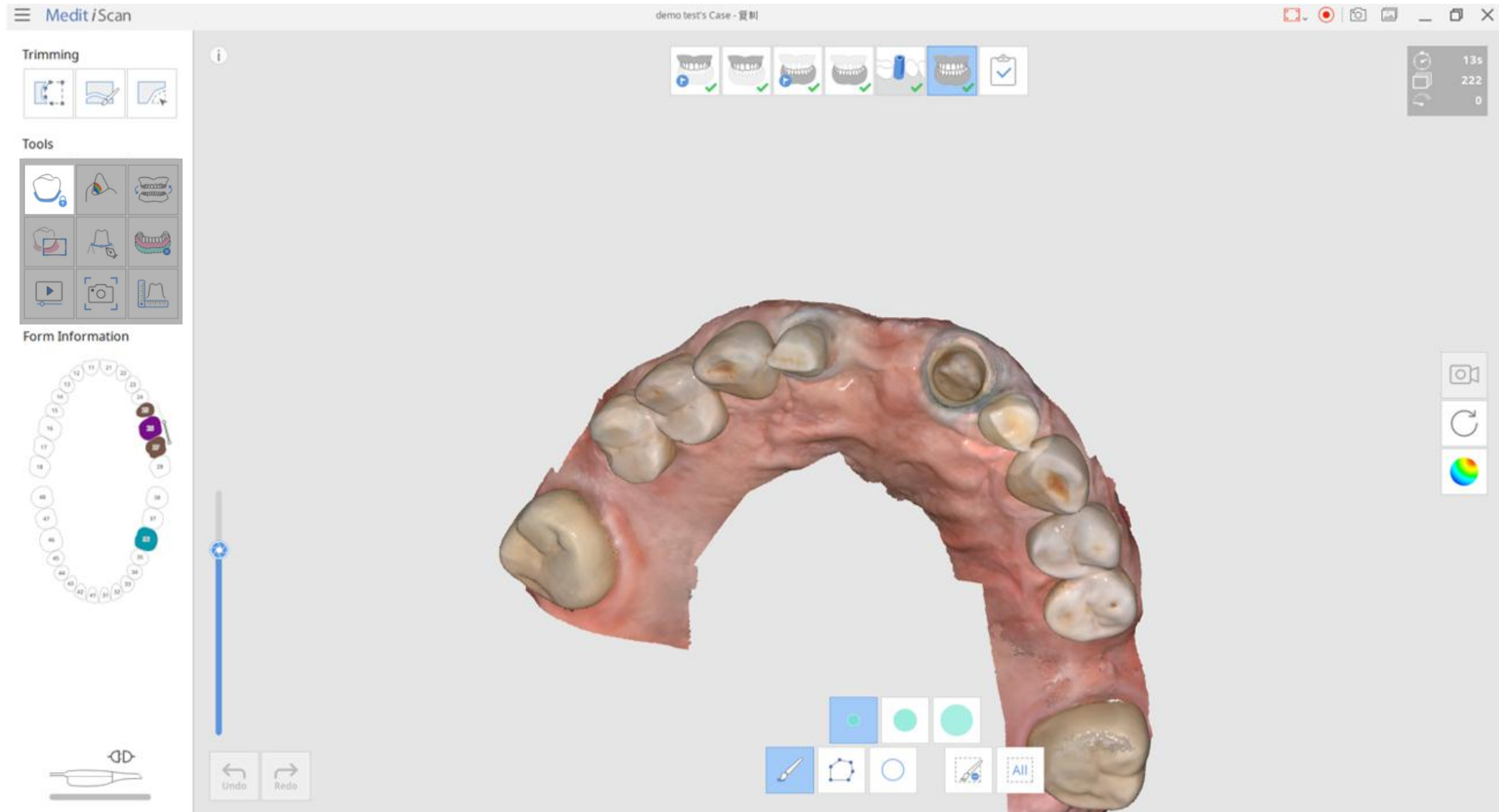


Prosthesis Workflow



- ✓ DELETE THE PREPPED TEETH AREA USING **TRIMMING TOOL**
- ✓ ADD SCAN ON THE ABUTMENT AREA USING **HD SCAN**
 - ✓ **SCAN DEPTH, LOCK AREA**

Crown Restoration Workflow - Scan



Crown Restoration Workflow



- ✓ DELETE THE PREPPED TEETH AREA USING **TRIMMING TOOL**
- ✓ ADD SCAN ON THE ABUTMENT AREA USING **HD SCAN**
 - ✓ **SCAN DEPTH, LOCK AREA**
- ✓ CHECK THE SCAN DATA USING **RELIABILITY MAP**

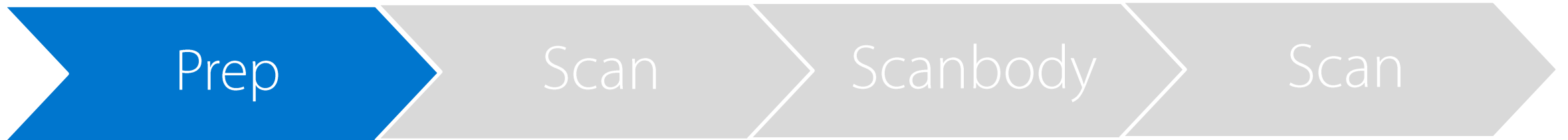


Implant Restoration Workflow

Implant Restoration Workflow

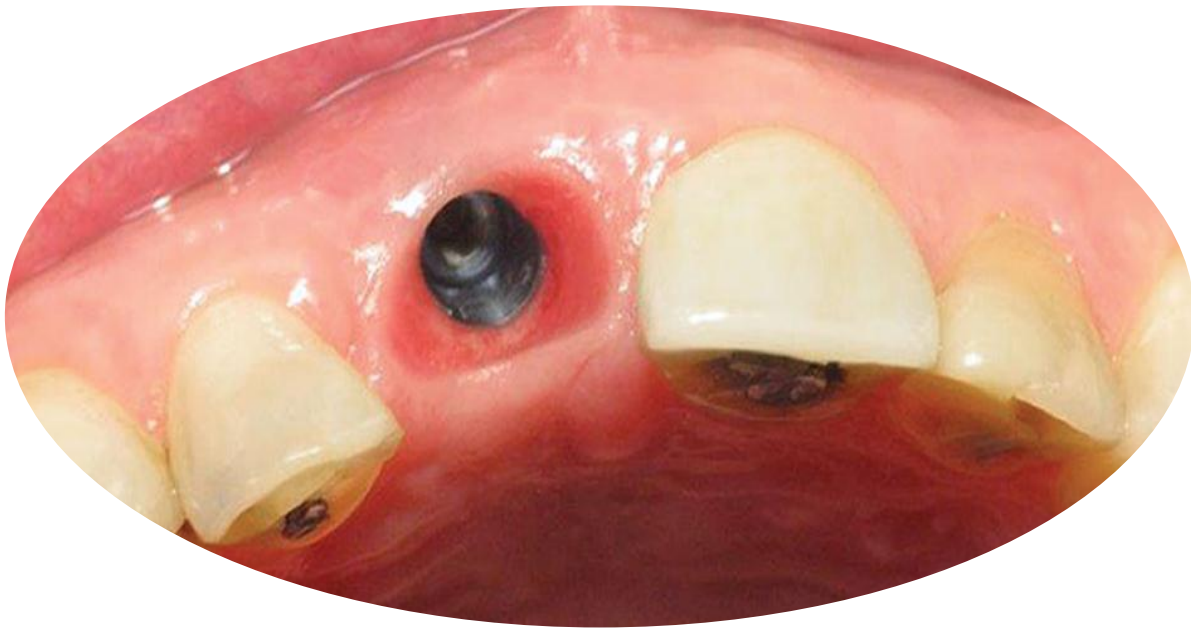


Implant Restoration Workflow



- ✓ *CHECK EMERGENCE PROFILE AND GINGIVA STATE*
- ✓ *CHECK IF THE INTRAORAL ENVIRONMENT IS HEALTHY AND WET-DRY FOR SCANNING*

Implant Restoration Workflow – Prep



Implant Restoration Workflow



- ✓ *SCAN MAXILLA, MANDIBLE AND OCCLUSION BEFORE PLACING A SCANBODY*

Implant Restoration Workflow



- ✓ *PLACE A SCANBODY INTO A FIXTURE*
- ✓ *MAKE SURE A MATCHING POINT OF THE SCANBODY FACES LINGUAL OR BUCCAL SIDE*

Implant Restoration Workflow - Scanbody

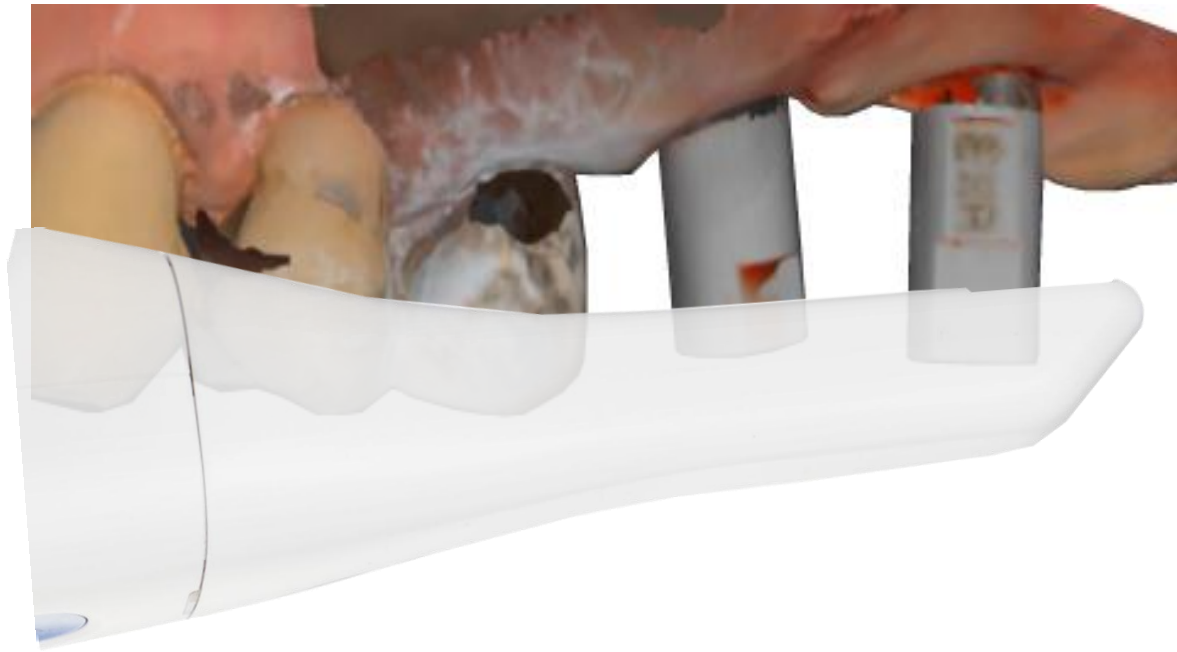


Implant Restoration Workflow

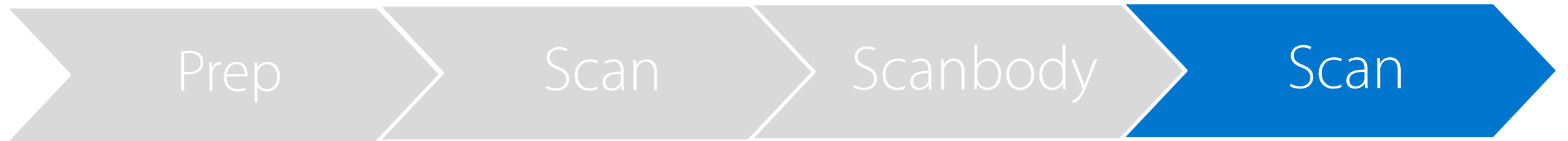


- ✓ *PLACE A SCANBODY INTO A FIXTURE*
- ✓ *MAKE SURE A MATCHING POINT OF THE SCANBODY FACES LINGUAL OR BUCCAL SIDE*
- ✓ *MAKE SURE THERE IS NO BLOOD OR FLUID REMAINING ON THE SURFACE OF THE SCANBODY*

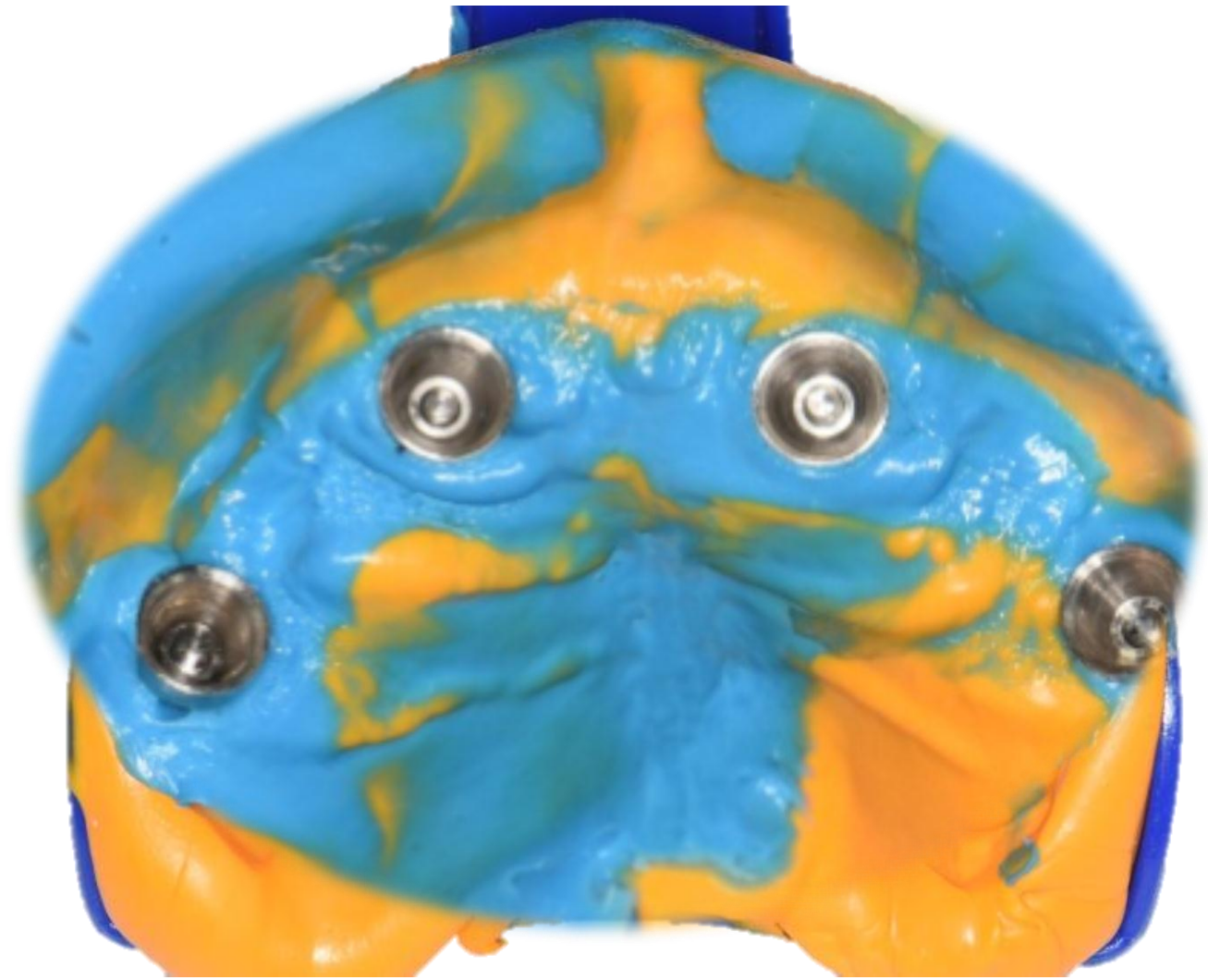
Implant Restoration Workflow - Scan



Implant Restoration Workflow



- ✓ *SCAN SCANBODIES USING **AI SCANBODY MATCHING***
- ✓ *CHECK THE SCAN DATA USING **RELIABILITY MAP***



Accuracy of Conventional and Digital Impressions for Full-Arch Implant-Supported Prostheses

Accuracy of Conventional and Digital Impressions for Full-Arch Implant-Supported Prostheses

Journal of Prosthodontic Research
Journal homepage: www.elsevier.com/locate/jpor

Original article
Full arch digital scanning systems performances for implant-supported fixed dental prostheses: a comparative study of 8 intraoral scanners

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ABSTRACT

Purpose: Compare the accuracy of maximal digital impression in full-arch implant-supported fixed dental prostheses acquired with eight different intraoral scanners (IOS).

Methods: A polyacryloyl methacrylate acrylic model of an edentulous mandible with six occlusal units was used as a master model and its dimensions measured with a coordinate measuring machine. Eight different IOS were used to generate digital impressions: True Definition, True, Carestream, 3D Progress, CS300, CS400, Planeca Intra and Dental Wings. Eighteen digital impressions were made. A software called 'Fitscanner' was developed to analyze and compare the digital impressions with the master model, obtaining the scanning accuracy. The three-dimensional (3D) position and distance analysis were performed.

Results: Mean values of the 3D position analysis showed that the True Definition (11 μm ± 8 μm) and True (12 μm ± 6 μm) had the best performance of the group. The Carestream (78 μm ± 55 μm), CS300 (61 μm ± 16 μm) and CS400 (61 μm ± 28 μm) had a middle performance. The CS300 (103 μm ± 28 μm) and Planeca Intra (103 μm ± 38 μm) showed a middle-low performance, while the 3D Progress (164 μm ± 121 μm) and Dental Wings (148 μm ± 64 μm) show the low performance. The 3D distance analysis showed a good linear relationship between the error and occlusal distance only with the True Definition and CS300.

Conclusion: Not all scanners are suitable for digital impression in full-arch implant-supported fixed dental prostheses and the weight of the output file is independent from the accuracy of the IOS.

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1. Introduction

The positive fit is a primary factor for long-term clinical success and survival of an implant-supported fixed dental prosthesis (FDP). The precise transfer of the three-dimensional (3D) intraoral implant relationship to the master cast is a critical step to achieve a positive fit [1,2]. The insufficient accuracy during the impression-making technique and/or manual steps during prosthesis fabrication may lead to malfit or malocclusion and subsequent technical, mechanical, and biological complications [1–3]. In

literature different authors tried to define the malfit numerically, but there were many opinions. It is remarkable that [4] concluded that the malfit should be not more than 10 μm, Jensen [5] declared that a malfit around 150 μm will be acceptable. However, different reviews affirmed that there is still no consensus on the value of malfit [6,7]. Today, conventional impression with different techniques and materials represent a commonly used procedure in general dental practice [8–10], but with the development of the intraoral digital impression many traditional prosthetic procedures have been eliminated [11,2]. The main factor for the use of digital intraoral impression is their equivalent accuracy to traditional impression. Regarding the digital intraoral impression for single dental crown [13–15] and for single-implant crown [16] several authors have showed that no statistical significant difference was found between the marginal fit of dental crown

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Journal of Prosthodontic Research
CLINICAL ORAL IMPLANTS RESEARCH

Digital vs. conventional full-arch implant impressions: a comparative study

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Hans Peter Weber
Matthew Finkelstein
Khaldil R. Ruffie
Yukio Kudam
Panos Papaygyridakis

Keywords: dental implant, digital denture, digital implant impression, edentulous, full arch implant impression

Abstract
Purpose: To test whether or not digital full-arch implant impressions with two different intraoral scanners (IOS) (Carestream and True Definition) have the same accuracy as conventional ones. The hypothesis was that the updated operating technique would be more accurate than digital full-arch impressions.

Methods and materials: A three-master cast representing an edentulous mandible using the intraoral scanner implant analog (Strumann Bone Line 40, Bone, Switzerland) was held central. The three master cast implants were parallel to each other, the left for left jaw had 10°, and the right digital 10° distal angulation. A updated operating technique was used for the conventional and digital impressions ($n = 18$ for Group 1, Digital impressions ($n = 10$) were taken with two intraoral scanners (IOS): Carestream and True Definition; other conventional impression was taken in the master cast with conventional impression test cast. A master cast and conventional impression test cast were digitalized in a high-resolution reference scanner (Shimadzu 800 scanner; Scan Optix, Buchen, Germany) to obtain digital files. Standardized technique (language (IOS) derived from the two last groups of digital and conventional impressions were superimposed with the IOS master from the master cast to assess the 3D distance. Distances were recorded at non-occlusal areas. To compare the master cast with conventional and digital impressions at the implant level, Mandibular First was used together with German Lowered post hoc test.

Results: Group 1 had a mean value of 12.03 μm (SD 8.33), Group 1 (Digital) had a mean value of 46.41 μm (SD 3.82), Group 1 (True Definition) had a mean value of 14.10 μm (SD 2.37). Mandibular First was used together with the German Lowered post hoc test.

Conclusion: A significant difference between the groups ($P < 0.05$). The data showed that digital impressions were significantly more accurate than the conventional impression with the updated operating technique. Additionally, the digital impressions with the True Definition scanner had significantly less 3D distance when compared with the Carestream.

It is generally accepted that digital full-arch implant impressions are more accurate than conventional impressions. However, the accuracy of digital impressions is still a matter of debate. The accuracy of digital impressions is still a matter of debate. The accuracy of digital impressions is still a matter of debate.

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Digital Impressions for Full-Arch Implant-Supported Prostheses

CLINICAL ORAL IMPLANTS RESEARCH

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Digital vs. conventional full-arch implant impressions: a comparative study

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Keywords: dental implants, digital dentistry, digital implant impressions, edentulous, full-arch implant impressions

Abstract
Purpose: To test whether or not digital full-arch implant impressions with two different intra-oral scanners (CEREC Omnicam and True Definition) have the same accuracy as conventional ones. The hypothesis was that the updated open-tray impressions would be more accurate than digital full-arch impressions.

Material and methods: A stone master cast representing an edentulous mandible using the internal connection implant analog (Streamline Bone Level RC, Bred, Switzerland) was fabricated. The three median implants were parallel to each other, the far left implant had 10°, and the far right had 10° distal angulation. A updated open-tray technique was used for the conventional polyether impressions (n = 10) for Group 1. Digital impressions (n = 10) were taken with two intra-oral optical scanners (CEREC Omnicam and True Definition) after covering polymer cast bodies to the master cast for groups 2 and 3. Master cast and conventional impression test casts were digitized with a high-resolution reference scanner (Actix 980 scanner; Smart Optics, Bochum, Germany) to obtain digital files. Standard tessellation language (STL) datasets from the three test groups of digital and conventional impressions were superimposed with the STL dataset from the master cast to assess the 3D deviations. Deviations were recorded as root-mean-square error. To compare the master cast with conventional and digital impressions at the implant level, Welch's F-test was used together with Games-Howell post hoc test.

Results: Group 1 had a mean value of 140.93 µm (SD 18.27), Group 2 (Omnicam) had a mean value of 46.61 µm (SD 7.36) and Group 3 (True Definition) had a mean value of 19.32 µm (SD 2.77). Welch's F-test was used together with the Games-Howell test for post hoc comparisons. Welch's F-test showed a significant difference between the groups (P < 0.001). The Games-Howell test showed statistically significant 3D deviations for all three groups (P < 0.001).

Conclusion: Full-arch digital implant impressions using True Definition scanner and Omnicam were significantly more accurate than the conventional impressions with the updated open-tray technique. Additionally, the digital impressions with the True Definition scanner had significantly less 3D deviations when compared with the Omnicam.

It is generally accepted that optimal fit of an implant-fixed complete dental prosthesis (ICDP) is beneficial for its long-term accuracy, thus, construction of an accurately fitting waxcation is of significant importance (Jent & Håkansson 2013). The accuracy of the implant master cast affects the positive fit of the ICPD, and the accuracy of the impression technique primarily affects the accuracy of the implant master cast (Jent & Håkansson 2013; Galucci et al. 2014; Papaygyridakos et al. 2015). An accurate implant impression is an integral prerequisite for obtaining an accurate master cast which is the key for the fabricating an accurately fitting prosthesis (Papaygyridakos et al. 2014). There are various implant impression techniques that have been utilized to fabricate a definitive cast that will result in the production of an accurately fitting ICPD. A systematic review on the accuracy of implant impression techniques reported that splinting of the impression copings prior to impression-taking produces a more accurate definitive cast than non-splinting for both partially and completely edentulous patients (Papaygyridakos et al. 2014). Moreover, it has been stated that there is no difference in

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Impl Impressions for Resin: An In Vitro Study

Moonis S. Patel, Anny J. ...

Journal of Prosthodontic Research, Volume 8, Number 4, October 2014

The aim of this study was to evaluate the accuracy of digital impressions for resin-retained implant impressions. The study was conducted in a laboratory setting using a high-resolution reference scanner and two different intra-oral optical scanners. The results showed that the digital impressions were significantly more accurate than the conventional impressions. The study also evaluated the accuracy of angular deviations and found that the digital impressions were significantly more accurate than the conventional impressions.

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Accuracy of Conventional and Digital Impressions for Full-Arch Implant-Supported Prostheses

ARTICLE IN PRESS



CLINICAL RESEARCH

A combined digital and stereophotogrammetric technique for rehabilitation with immediate loading of complete-arch, implant-supported prostheses: A randomized controlled pilot clinical trial

María Peñarocha-Díaz, PhD,^a José Carlos Balaguer-Martí, DDS,^b David Peñarocha-Oliva, PhD,^c José Francisco Balaguer-Martínez, PhD,^d Miguel Peñarocha-Díaz, PhD,^e and Rubén Agustín-Panadero, PhD^f

Stereophotogrammetry could be incorporated into dental practice, where it can be used for digital impressions in restorations involving complete-arch, implant-supported fixed prostheses.¹ In conventional digital impression techniques, as the number of implants to be installed in the impression increases, precision decreases, since the individual measurement error for each of them is cumulative.² Computer-aided design and computer-aided manufacturing (CAD-CAM) processing can reduce human error and improve the fit of the prosthesis,^{3,4} but impressions still have a margin of error in the position of the implants,⁵ particularly with complete-arch restorations. Such problems are reduced with photogrammetry⁶ because the discrepancies with this technique are small; they

Abstract
Statement of problem: Traditional impressions for complete-arch restorations are complex and time-consuming, and they can be uncomfortable for the patient. New digital techniques, such as stereophotogrammetry, may mitigate this.
Purpose: The purpose of this randomized controlled pilot clinical trial was to compare the patient and dentist satisfaction and work times of traditional impressions (control group) and digital impressions with stereophotogrammetry in complete-arch, implant-supported prostheses. Success rates, implant survival, marginal bone loss around the dental implants, and postheal survival were also analyzed.
Material and methods: This randomized controlled pilot clinical trial included 18 participants who received 121 dental implants. Implant impressions in the experimental group were made with stereophotogrammetry (8 participants with 66 implants), while traditional impressions were made in the control group (10 participants with 65 implants). Working times were measured in minutes starting from removal of the healing abutments to their replacement after the impression. Patient and dentist satisfaction was analyzed using a questionnaire with a visual analog scale, and implant success was assessed using the Blaser success criteria. Prosthesis survival was defined as the presence of the prosthesis in the mouth, without screw loosening or fracture.
Results: The work times were 15.6 (experimental group) and 20.5 minutes (control group) ($P < 0.01$). The patient satisfaction scores were 8.0 in the experimental and 7.9 in the control group ($P = 0.2$). The dentist satisfaction scores were 9.1 in the experimental group and 8.5 in the control group ($P = 0.3$). The implant success rate was 100% in both groups. Marginal bone loss was 0.6 ± 0.5 mm (experimental group) and 0.6 ± 0.2 mm (control group) ($P = 0.72$).
Conclusions: Digital impressions using stereophotogrammetry may be an alternative to traditional impressions. Patient and dentist satisfaction improved, and the work time was reduced in the experimental group. No statistically significant differences were found in terms of the implant success rate, implant survival, marginal bone loss, or prosthesis survival between the 2 groups. (J Prosthet Dent 2017;117:344-351)

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Accuracy of Conventional and Digital Impressions for Full-Arch Implant-Supported Prostheses



Original Article

Accuracy of digital impressions for implant-supported complete-arch prosthesis when using an auxiliary geometry device

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KEYWORDS
 Digital dentistry;
 Digital impression;
 FB;
 Framework;
 Implant;
 Intraoral scanner

Abstract Background/purpose: Digital impressions using intraoral scanners have recently gained popularity. The aim of the present study was to evaluate the fit of full-arch screw-retained cobalt-chromium frameworks fabricated via two different digital impression methods. Methods: An edentulous resin master model with four dental implants was fabricated. Forty cobalt-chromium superstructures were fabricated and evaluated according to four groups. In Group 1, the superstructures were evaluated using an intraoral scanner to generate digital impressions. Group 2 relied on the help of an auxiliary geometric appliance in generation of digital impressions via intraoral scanner. The traditional method of splinted open-tray conventional impressions was designated for Group 3. Finally, the control group (Group 4) relied on scanning of the master model directly with a laboratory scanner. Vertical marginal discrepancy was evaluated, and data obtained were statistically analyzed. Results: The highest mean vertical marginal gap value (32.66 ± 50.06 μm) was observed for Group 1 and statistically higher than Group 2, 3, and 4 ($P < 0.05$). The lowest mean vertical marginal gap value (8.98 ± 26.33 μm) was measured from Group 4 and statistically similar to Group 2 and 3 ($P > 0.05$). Conclusion: It has been suggested that the use of auxiliary geometric appliances yields increased scanning accuracy. Frameworks fabricated using the traditional splinted open-tray technique were more reliable compared to those frameworks from digital impressions.

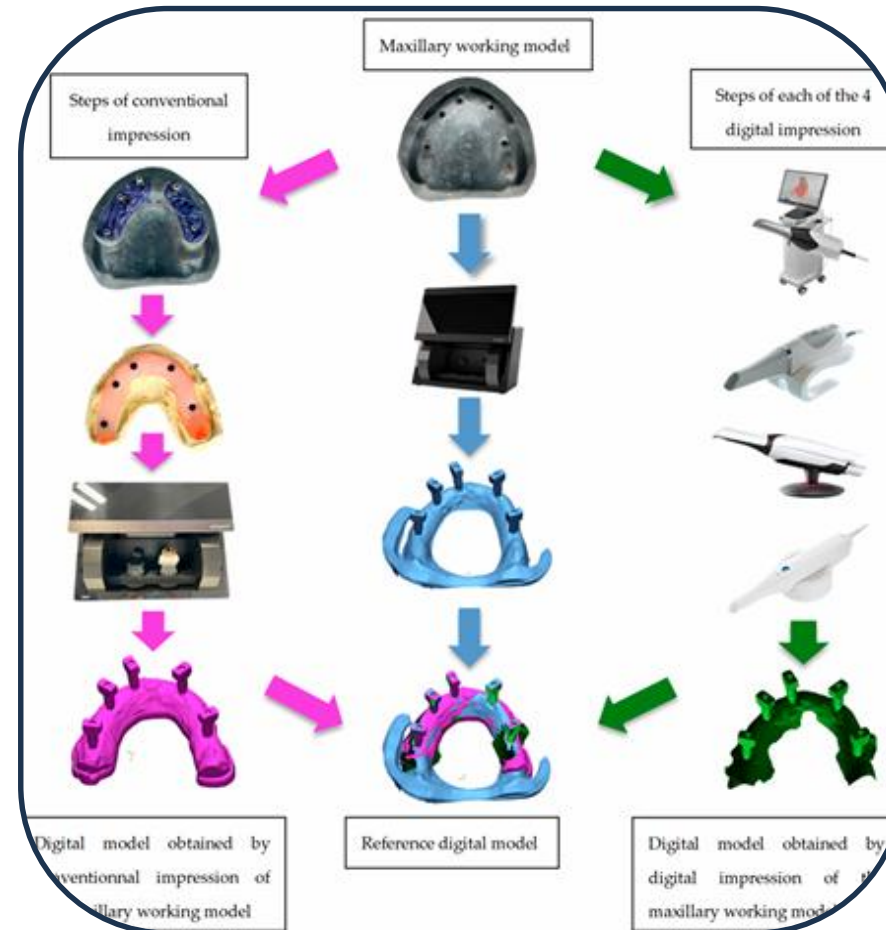
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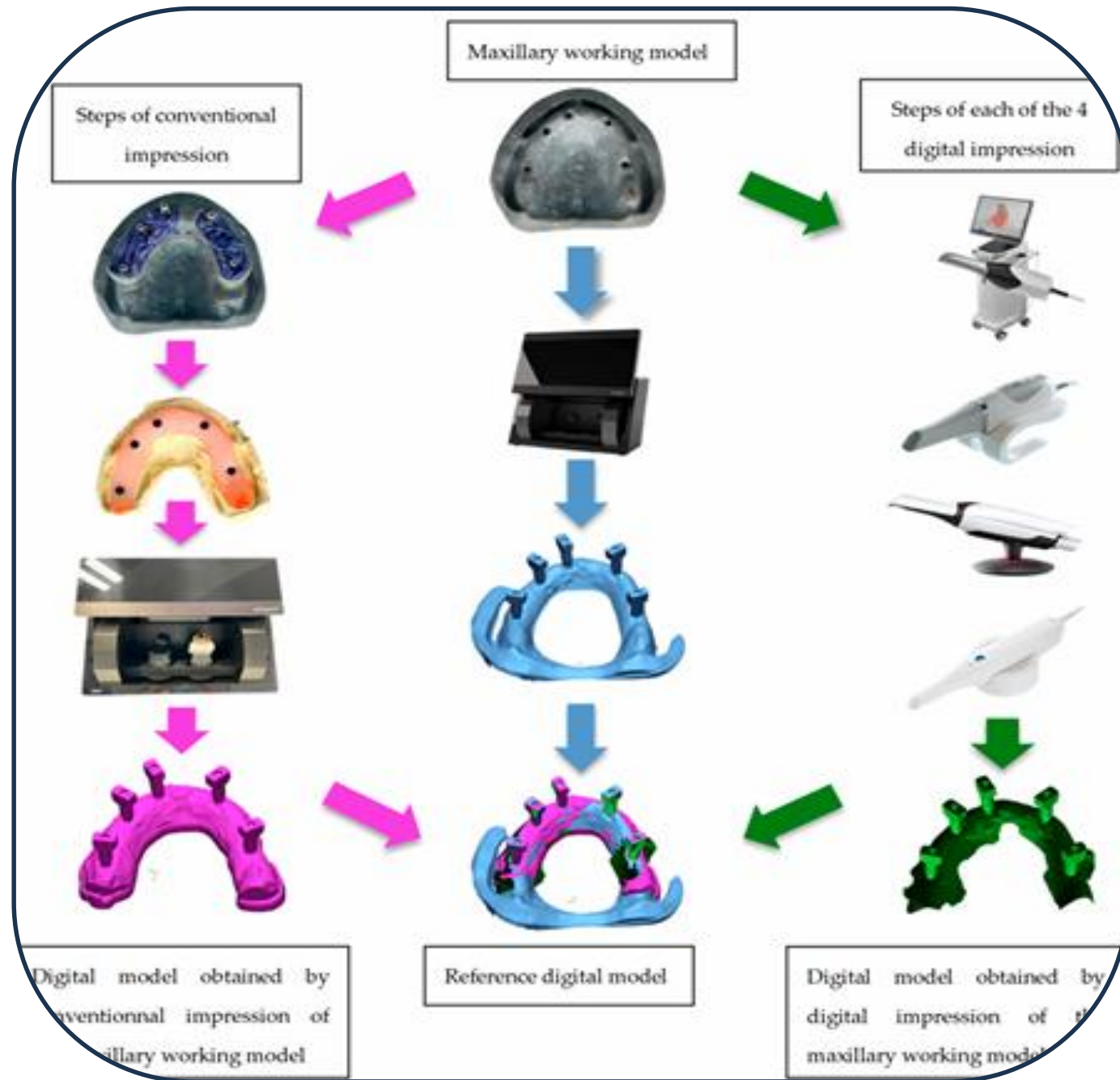


Fig. 1. Full-arch digital scanning systems performances for implant-supported fixed dental prostheses: a comparative study of 8 intraoral scanners.

J. Prosthodont Res 2023; 13(1): 1-12. <https://doi.org/10.1016/j.jds.2022.08.012>

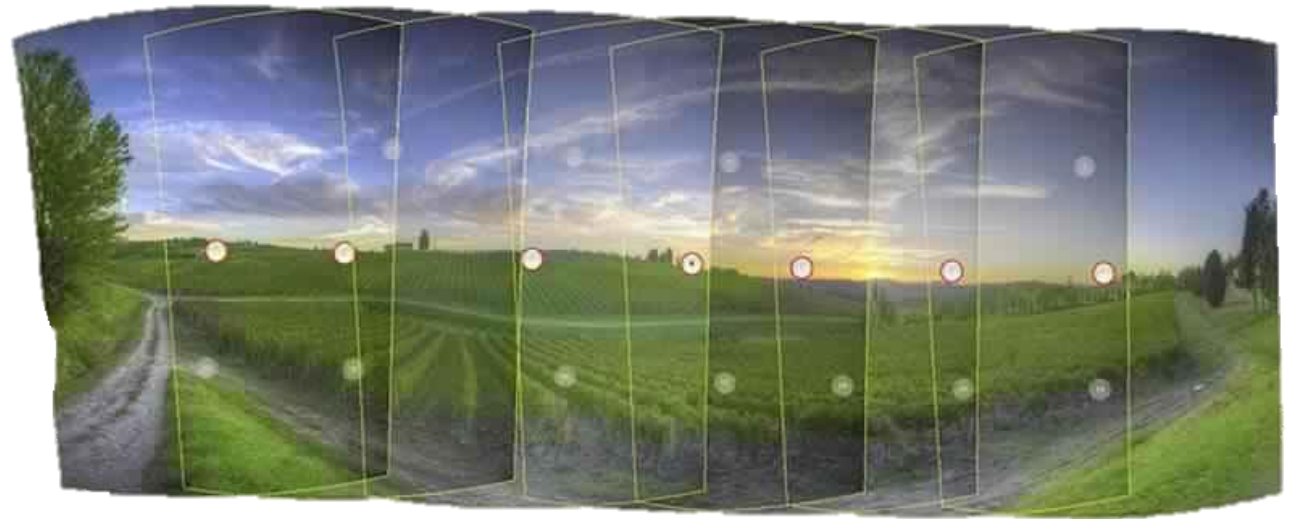
Accuracy of Conventional and Digital Impressions for Full-Arch Implant-Supported Prostheses





Stitching

the technique of using a computer to merge images together to create a large image, preferably without it being at all noticeable that the generated image has been created by computer.



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The presence of long and homogeneous surfaces between implants, especially in edentulous patients, negatively affects the digital impression accuracy.



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auxiliary geometry device

Accuracy of digital impressions for implant-supported complete-arch prosthesis when using an auxiliary geometry device



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**Accuracy of digital impressions for
implant-supported complete-arch prosthesis
when using an auxiliary geometry device**

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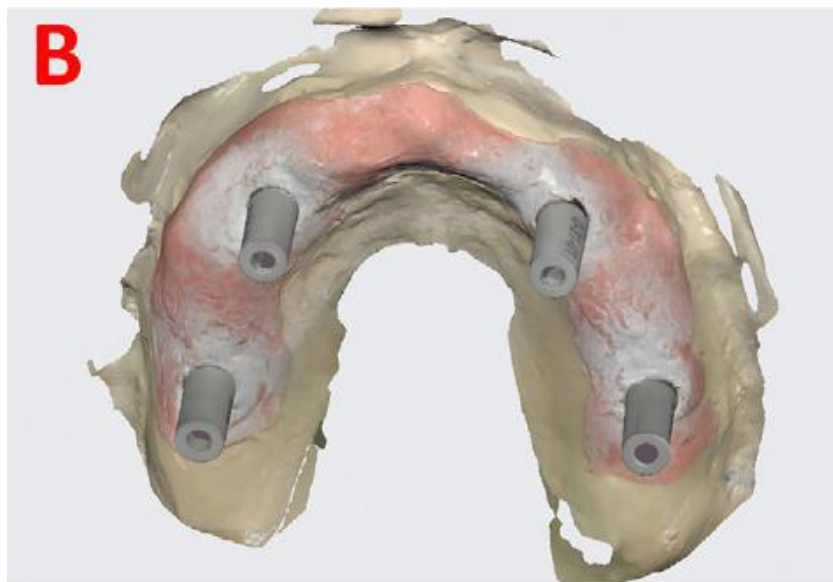
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A



B



Accuracy of digital impressions for implant-supported complete-arch prosthesis when using an auxiliary geometry device

Hale Arıkan^a, Mehmet Muhtarogullari^a, Sema Merve Uzel^a, Mustafa Baris Guncu^a, Guliz Aktas^a, Lindsay Simone Marshall^b, Iser Turkyilmaz^{c*}

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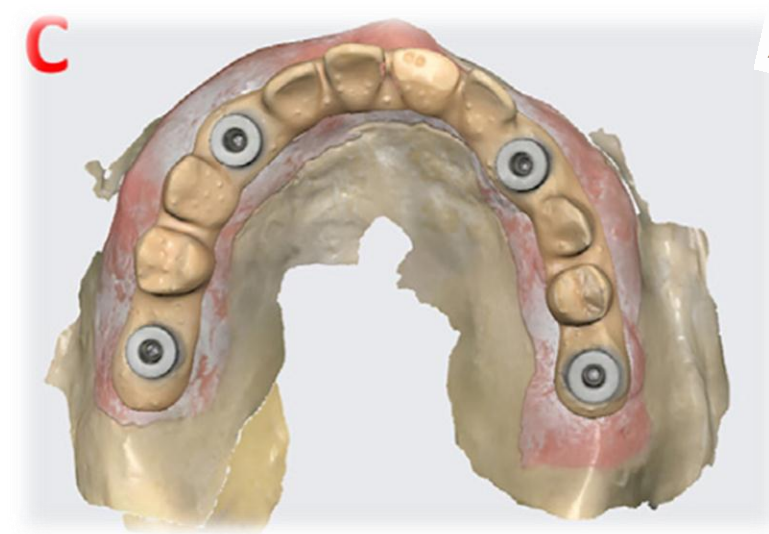
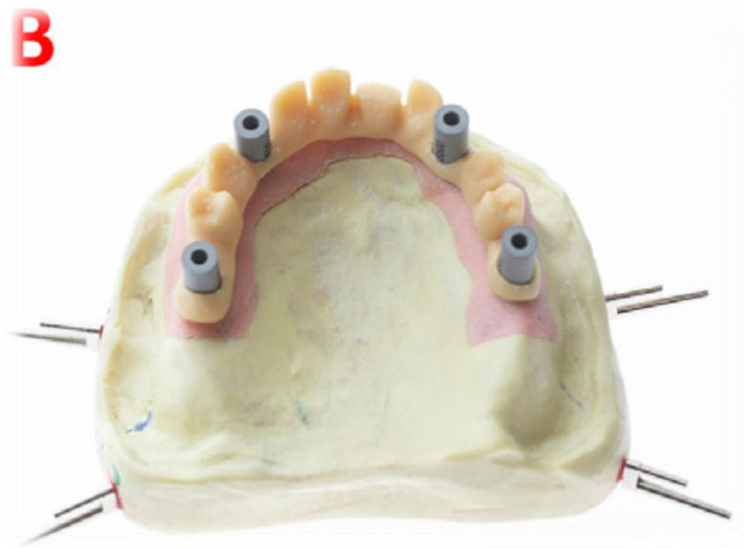


Accuracy of digital impressions for implant-supported complete-arch prosthesis when using an auxiliary geometry device

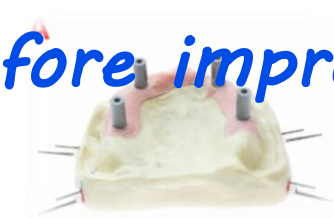
Hale Arikan^a, Mehmet Muhtarogullari^a, Sema Merve Uzel^a, Mustafa Baris Guncu^a, Guliz Aktas^a, Lindsay Simone Marshall^b, Ilser Turkyilmaz^{c*}

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Creating a continuous reference point with the use of auxiliary geometric appliance increases the scanning sensitivity, therefore improving stitching accuracy during scanning.



A combined digital and stereophotogrammetric technique



Accuracy of complete-arch digital implant impression with intraoral optical scanning and stereophotogrammetry: An in vivo prospective comparative study
Alessandro Pozzi^{1,2} | Paolo Carosi³ | German O. Gallucci⁴ | Katalin Nagy⁵ |
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THANKS