Dentsply Sirona

Primeprint™ Solution

Studies and case report

Status July 2023

Learn more >

dentsplysirona.com/primeprint

Introduction

Primeprint Solution is a highly automated, end-to-end, medical grade 3D printing system for dentists and dental technicians who want to expand their treatment or service offerings. This excellent hardware and software solution is designed for dental applications and can run the entire printing process, including post-processing. The high level of automation helps to reduce handling times, allows for delegation, and offers a high level of productivity. Primeprint Solution enables the user to print biocompatible applications with reproducible and accurate results which is supported by the following studies.

Studies

Case Report

Studies

1 In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow
Author: Reich et al. **Year:** 2023 **Method:** In vitro
+ Read the Results | Click here to read more

2 Accuracy of guided implant surgery obtained using 3D printed surgical guides
Author: Herstell et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

3 Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer
Author: Berndt et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

4 Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer
Author: Reich et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow[1]

Back to overview

Author

Reich et al., RWTH Aachen University Hospital, Aachen, Germany

Year

2023

Method

In vitro

Results/Conclusions

Under in-vitro conditions the print workflow using a DLP printer revealed significantly better trueness and precision values compared to the alginate/gypsum-based workflow with respect to absolute mean and mean RMSE results.

Learn more about the study >

Study Background

- The full-arch accuracy of fully dentate gypsum and printed casts was evaluated with respect to the corresponding workflow.
- A fully dentate reference cast was scanned with ATOS scanner.
- Conventional impressions were made and resulting casts scanned by ATOS scanner.
- Preparation of cast via digital workflow incl. scanning with Primescan and 3D printing with Primeprint Solution. The 3D printed casts were scanned by ATOS scanner.
- Evaluation of accuracy (trueness and precision).

Talking Points

- Full arch trueness: The absolute mean deviation values were 68 µm (± 15 µm) for the conventionally produced cast and 46 µm (± 4 µm) for the 3D printed cast with statistically significant difference.
- The precision based on absolute mean deviation values was 56 µm (± 17 µm) for the conventionally produced cast and 25 µm (± 8 µm) for the 3D printed cast with statistically significant difference.
- The results were competitive to the present literature.
- Both, the gypsum and the 3D printed cast, produced clinically acceptable accuracy for orthodontic purposes.

1 Reich et al., In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow. PLoS One. 2023 Mar 15;18(3):e0282840.

Accuracy of guided implant surgery obtained using 3D printed surgical guides – An in vitro comparison of four evaluation methods[1]

Back to overview

Author

Herstell et al., 2022, RWTH Aachen University Hospital, Aachen, Germany

Year

2022

Method

In vitro

Results/Conclusions

3D implant deviations were comparable with findings in the literature or even lower. Low standard deviation values among all four measurement method groups indicated good reproducibility of the tested workflow.

Learn more about the study >

Study Background

- To test four different measurement methods to evaluate deviations between planned and actual implant positions.
- Gypsum model with missing left central incisor and right first molar was used incl. two integrated reference bodies.
- CBCT scan (Galileos ComfortPlus) and an intraoral scan with Primescan were done.
- Crown restorations were designed, and the implant position planned.
- CEREC Guide 3 surgical guides were planned and produced by Primeprint Solution.
- Accuracy evaluation was done by 4 methods:
  - Based on Implant Bed Congruency [ACP_BED]
  - Based on Inserted Implant [ACP_IMP]
  - Manual Measurements [MAN_MEAS]
  - Reverse Engineering [REVERSE]

Talking Points

- Mean angular deviations for the anterior group varied between 1.68 ± 0.75 degrees for [REVERSE] and 2.35 ± 1.13 degrees for [MAN_MEAS], absolute mean 3D deviations for the implant shoulder ranged from 0.26 ± 0.1.l mm for [REVERSE] to 0.40 ± 0.09 mm for [ACP_BED], while the implant apex deviations ranged from 0.52 ± 0.24 mm [REVERSE] to 0.75 ± 0.26 mm [ACP_BED].”
- For the posterior implant site, the angular deviations ranged from 1.86 ± 0.87 degrees for [MAN_MEAS] to 2.72 ± 0.98 degrees for [ACP_BED]. 3D deviations of the implant shoulder varied between 0.28 ± 0.07 mm for [REVERSE] and 0.45 ± 0.07 mm for [ACP_BED], while the deviations of the implant apex varied between 0.61 ± 0.27 mm for [REVERSE] and 0.91 ± 0.24 mm for [ACP_BED].
- Therefore, all four methods exhibited 3D deviations lower than the described values in literature.
- Low standard deviation values among all four measurement method groups indicated good reproducibility of the tested workflow.

1 Herstell et al., Accuracy of guided implant surgery obtained using 3D printed surgical guides - An in vitro comparison of four evaluation methods. Int J Comput Dent. 2022 Jul 19;25(2):161-172.

Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer[1]

Back to overview

Author

Berndt et al., 2022, RWTH Aachen University Hospital, Aachen, Germany

Year

2022

Method

In vitro

Results/Conclusions

The printed casts obtained from a DLP printer revealed significantly better full-arch trueness and precision results compared to conventionally fabricated casts.

Learn more about the study >

Study Background

- Investigate whether conventionally produced casts and printed casts for prosthodontic purposes show comparable full-arch accuracy.
- Reference cast missing the right first molar and with prepared left first premolar was scanned with ATOS scanner.
- Conventional impressions were made and resulting casts scanned by ATOS scanner.
- Preparation of cast via digital workflow incl. scanning with Primescan and 3D printing with Primeprint Solution. The 3D printed casts were scanned by ATOS scanner.
- Evaluation of accuracy (trueness and precision).

Talking Points

- Full arch trueness: The absolute mean deviation values were 69 µm (± 24 µm) for the conventionally produced cast and 33 µm (± 4 µm) for the 3D printed cast with statistically significant difference.
- The precision based on absolute mean deviation values was 74 µm (± 22 µm) for the conventionally produced cast and 32 µm (± 10 µm) for the 3D printed cast with statistically significant difference.
- “The printed casts obtained from a DLP printer revealed significantly better full-arch trueness and precision results compared to conventionally fabricated casts.”
- “The local trueness of inlay and crown preparations suggested the adequate usability of printed casts for checking the marginal fit of inlay and crown restorations.”
- “The full-arch and the local trueness of the FDP showed the usability for checking proximal and occlusal contacts of CAD/CAM fabricated restoration or for veneering purposes.”

1 Berndt et al., Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer. Appl. Sci. 2022, 12, 2619.

Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer[1]

Back to overview

Author

Reich et al., 2022, RWTH Aachen University Hospital, Aachen, Germany

Year

2022

Method

In vitro

Results/Conclusions

Trueness and precision values of the tested digital light processing printer were competitive to the results published for other printers when occlusal devices were evaluated. The results revealed a high precision and confirmed a good reproducibility referring to absolute deviations.

Learn more about the study >

Study Background

- Investigate the accuracy of CAD/CAM fabricated occlusal devices with different heights and volumes.
- Design of two different types of occlusal devices whereby the occlusal vertical dimension was increased by 2.5 mm for the first and by 4.5 mm for the second.
- 3D print and post processing was done with Primeprint Solution.
- Printed occlusal devices were digitized by ATOS scanner.
- Scan files were aligned with design files to evaluate trueness.
- Evaluation of precision by comparing each groups scans among each other.

Talking Points

- Evaluation of internal surfaces: The mean trueness was 59 µm (SD ± 5 µm) for [2.5_INTERNAL] and 80 µm (SD ± 9 µm) for [4.5_INTERNAL]. The precision, applying absolute deviation values, was 14 µm (SD ± 8 µm) for [2.5_INTERNAL] and 22 µm (SD ± 11 µm) for [4.5_INTERNAL].
- Evaluation of total surface: The mean trueness was 68 µm [SD ± 1 µm] for [2.5_TOTAL] and 90 µm [SD ± 10 µm] for [4.5_TOTAL]. The mean precision values, applying absolute deviation values, were 19 µm [SD± 10µm] for [2.5_TOTAL] and 26 µm [SD ± 13 µm] for [4.5_TOTAL].
- There were statistically significant differences between 2.5 mm and 4.5 mmm.
- A higher volume of printed objects resulted in increased deviations regarding trueness and precision.
- “The low precision values of all four data sets [2.5_TOTAL], [2.5_INTERNAL], [4.5_TOTAL], and [4.5_INTERNAL] confirmed a good reproducibility referring to absolute deviations.”
- “Trueness and precision values of the tested digital light processing printer were competitive to the results published for other printers when occlusal devices were evaluated.”

1 Reich et al., Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer. Appl. Sci. 2022, 12, 1576.

Digital impression, DVT, and 3D printing – implantology in the digital workflow[1]

Author

Gerd Frahsek

Year

2023

Method

In vivo

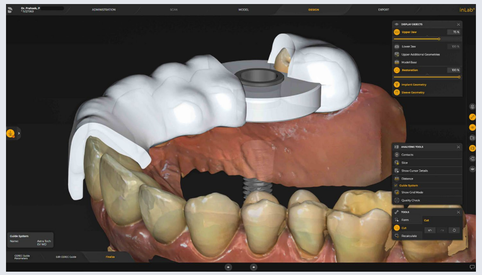
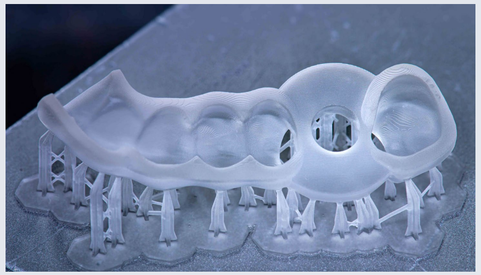
Results/Conclusions

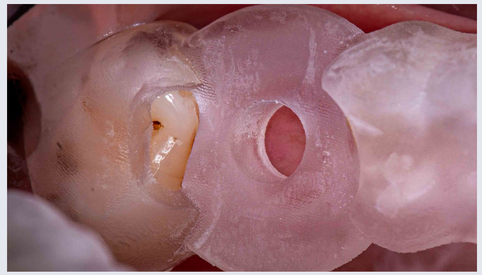
With the support of digital technology, it was possible to place the implant precisely, efficiently, and predictably, considering the neighboring structures at risk.

Case Report

- Patient was a 52-year-old women with removed tooth 26.
- A digital impression of both jaws was taken with CEREC Primescan, and jaw relation recorded by buccal scan in occlusion. A virtual crown was created by using CEREC Software.
- Digital implant planning was done in SICAT Implant 2.0.
- A surgical guide was designed in inLab 22.0 software and fabricated by using the Primeprint Solution.
- After trying the surgical guide in the patient's mouth, the implantation procedure was started. All drilling was guided by the sleeve in the surgical guide.
- The implant position was then digitally registered using CEREC Primescan with a titanium base and the matching scanbody attached to the implant.
- The precise position of the scanbody could be demonstrated by comparing the implant planning data with the intraoral scan made for the crown within the SICAT software.

Learn more about the study >




Click on an image to learn more

1 Frahsek G., Digital impression, DVT, and 3D printing – implantology in the digital workflow. Int J Comput Dent. 2023 Feb 24;26(1):89-99.

3D printing solution for practice and lab

Primeprint Solution™

Learn more >

Powered by DS CORE

Dentsply Sirona

SIRONA Dental Systems GmbH
Fabrikstraße 31, 64625 Bensheim, Deutschland
dentsplysirona.com

Subject to technical changes and errors within the text, 07/23.

THE DENTAL
SOLUTIONS
COMPANY™

Dentsply Sirona

Studies

1

In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow

Author: Reich et al. **Year:** 2023 **Method:** In vitro

Results: Under in-vitro conditions the print workflow using a DLP printer revealed significantly better trueness and precision values compared to the alginate/gypsum-based workflow with respect to absolute mean and mean RMSE results.

− Close the Results | Click here to read more

2

Accuracy of guided implant surgery obtained using 3D printed surgical guides

Author: Herstell et al. **Year:** 2022 **Method:** In vitro

\+ Read the Results | Click here to read more

3

Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer

Author: Berndt et al. **Year:** 2022 **Method:** In vitro

\+ Read the Results | Click here to read more

4

Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer

Author: Reich et al. **Year:** 2022 **Method:** In vitro

\+ Read the Results | Click here to read more

Studies

1 In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow
Author: Reich et al. **Year:** 2023 **Method:** In vitro
+ Read the Results | Click here to read more

2 Accuracy of guided implant surgery obtained using 3D printed surgical guides
Author: Herstell et al. **Year:** 2022 **Method:** In vitro
Results: 3D implant deviations were comparable with findings in the literature or even lower.
Low standard deviation values among all four measurement method groups indicated good reproducibility of the tested workflow.
− Close the Results | Click here to read more

3 Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer
Author: Berndt et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

4 Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer
Author: Reich et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

Studies

1
In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow
Author: Reich et al. **Year:** 2023 **Method:** In vitro
+ Read the Results | Click here to read more

2
Accuracy of guided implant surgery obtained using 3D printed surgical guides
Author: Herstell et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

3
Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer
Author: Berndt et al. **Year:** 2022 **Method:** In vitro
Results: The printed casts obtained from a DLP printer revealed significantly better full-arch trueness and precision results compared to conventionally fabricated casts.
− Close the Results | Click here to read more

4
Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer
Author: Reich et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

Studies

1
In-vitro accuracy of casts for orthodontic purposes obtained by a conventional and by a printer workflow
Author: Reich et al. **Year:** 2023 **Method:** In vitro
+ Read the Results | Click here to read more

2
Accuracy of guided implant surgery obtained using 3D printed surgical guides
Author: Herstell et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

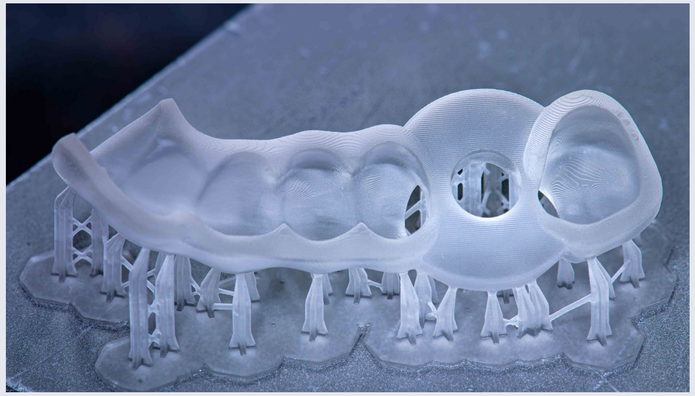
3
Accuracy of 3D printed Master Cast Workflow Using a Digital Light Processing Printer
Author: Berndt et al. **Year:** 2022 **Method:** In vitro
+ Read the Results | Click here to read more

4
Accuracy of 3D printed Occlusal Devices of Different Volumes Using a Digital Light Processing Printer
Author: Reich et al. **Year:** 2022 **Method:** In vitro
− Close the Results | Click here to read more
Results: Trueness and precision values of the tested digital light processing printer were competitive to the results published for other printers when occlusal devices were evaluated. The results revealed a high precision and confirmed a good reproducibility referring to absolute deviations.

Digital impression, DVT, and 3D printing – implantology in the digital workflow[1]

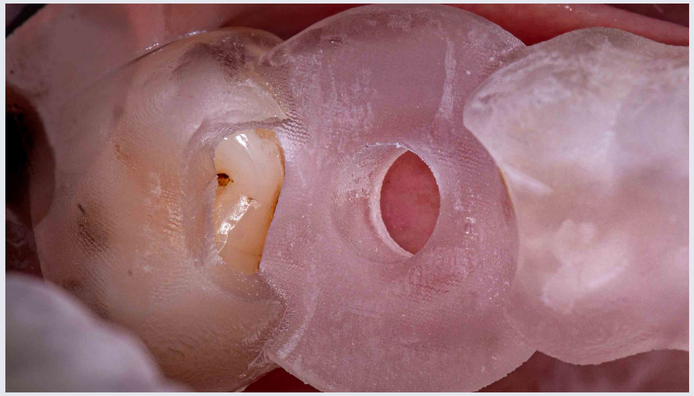
Gerd Frahsek, 2023

Complete design of the CEREC Guide in inLab 22.0.



CEREC Guide after 3D printing using Primeprint and post-processing in the Primeprint PPU.

Intraoral fitting of the CEREC Guide.



Precise position on the teeth at an inspection window...

...and at the frontal end in the area of the incisors.

Back to case

1 Frahsek G., Digital impression, DVT, and 3D printing - implantology in the digital workflow. Int J Comput Dent. 2023 Feb 24;26(1):89-99