

Accuracy of 3D Printed Casts from Digital Implant Scan versus Stone Casts from Conventional Impressions: A Comparative Study in the Anterior Maxilla

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Introduction

An accurate impression is a prerequisite to produce an error-free stone cast, which contributes to the fabrication of a definitive restoration with accurate fit.^(1,2) Several factors impact the three-dimensional (3D) accuracy of implant impressions: the properties of the impression material, the type of impression coping, the impression technique, the implant angulation, and the connection type.^(3,4) However, the risk of patient suffocation, gagging, and taste irritation are among the drawbacks of conventional impressions.⁽⁶⁾

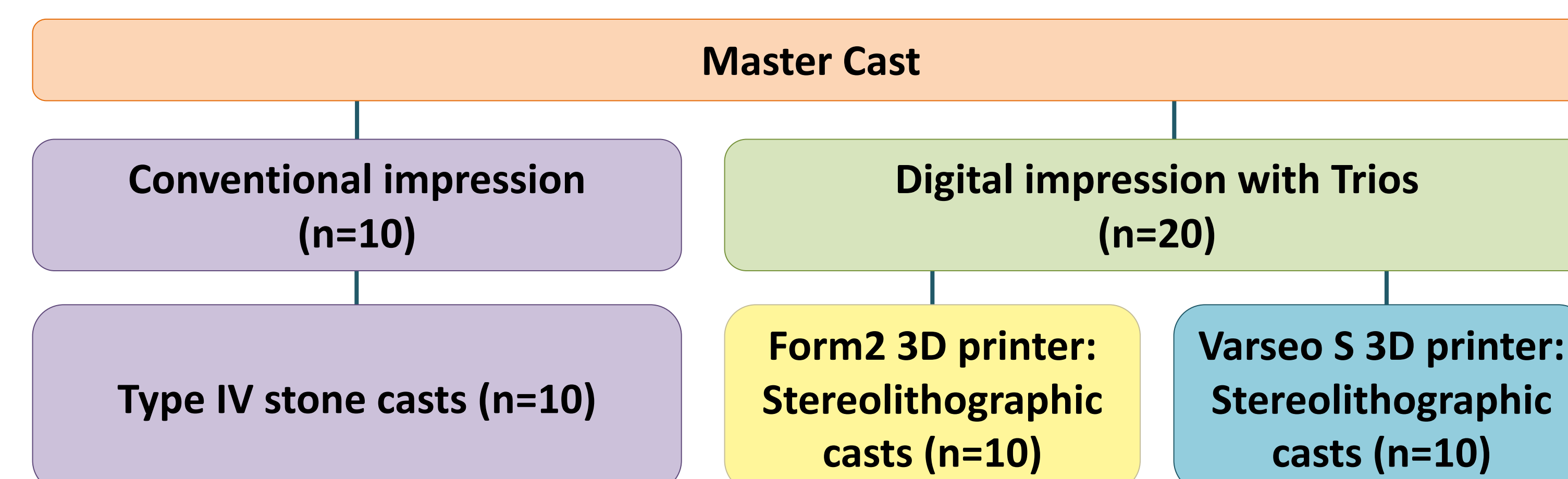
Intraoral scanners (IOS) is an alternative approach to the conventional impression technique. IOSs produce standard tessellation language (STL) files that can be further used to fabricate casts and/or dental restorations through milling or 3D printing.⁽⁶⁾ Although IOSs can offer the clinician a complete digital workflow without the need for a physical cast, some complex prosthodontic procedures, especially in the anterior maxilla, may still require physical casts.⁽⁷⁾

Objective

- To conduct an in-vitro comparison of the amount of 3D deviation of 3D printed casts generated from two 3D printers with different printing technology to stone casts made from conventional impressions.

Materials and Methods

- The Master cast was fabricated with two implants placed at 5-degree angulation to each other in order to simulate a clinical scenario of a partially edentulous anterior maxilla that would be restored with a 4-unit implant-supported fixed dental prosthesis.
- The master cast was scanned with the scan bodies tightened on the implants using an IOS, Trios3Shape, to create a reference STL file.



Materials and Methods



Standardized conventional impression



Scan bodies for digital implant scan with the IOS, Trios3Shape

- Digitizing the casts from the three groups:



Conventional cast

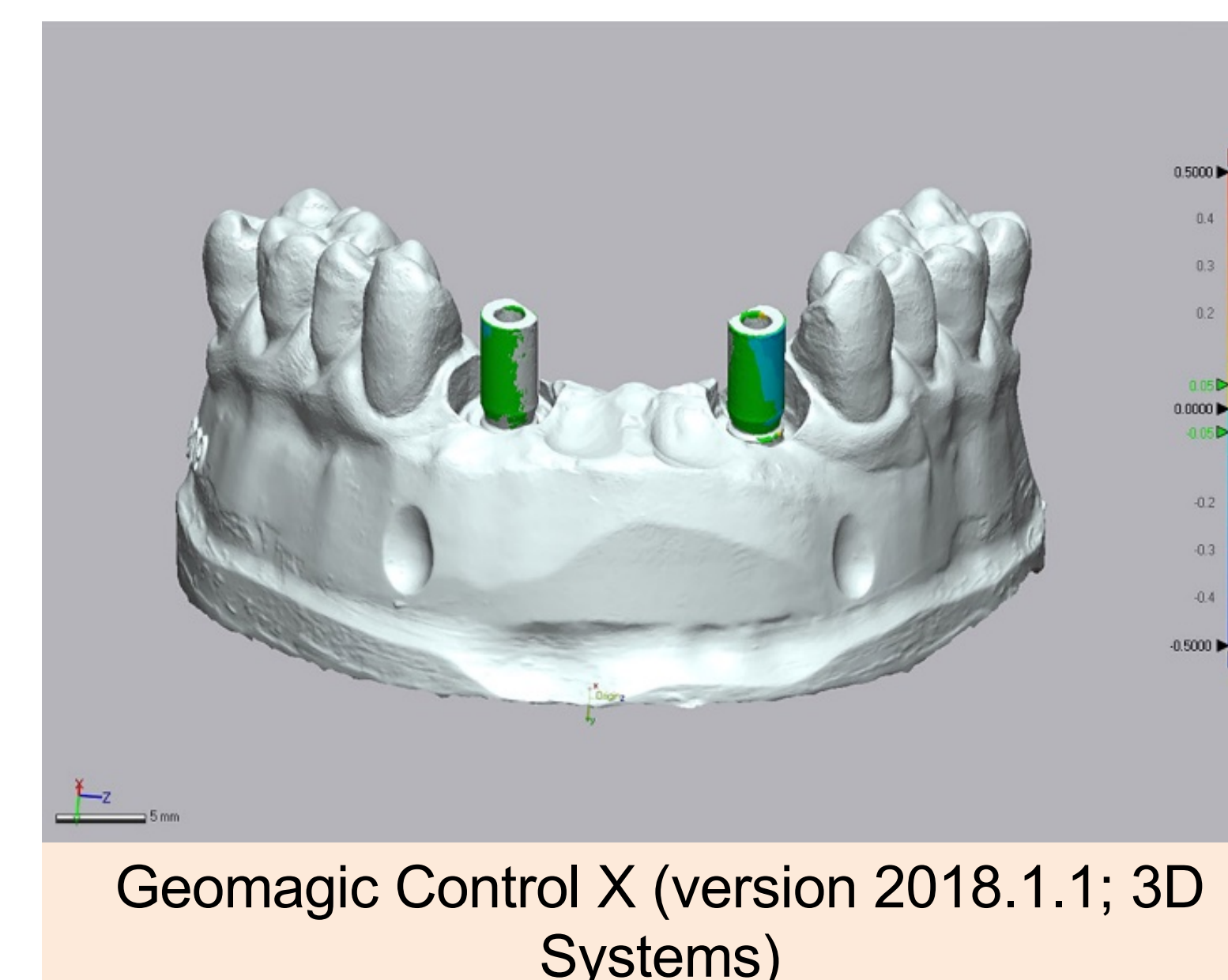


SLA cast: Form 2



SLA cast: Varseo S

- STL superimposition procedures:



Results

- The independent-Samples Kruskal-Wallis test showed significant difference ($p=0.018$).
- Post-hoc Dunn's test with Bonferroni correction showed a significant difference between Varseo S and Form 2 ($p = 0.009$).

Type of cast	Mean	Median	SD
Conventional	85.9 μm	77.7 μm	30.24 μm
Form 2	111.8 μm	98.8 μm	26.09 μm
Varseo S	89.5 μm	77.5 μm	55.06 μm

Conclusion

- The results of this study indicated that stone casts and 3D printed casts had similar accuracy only with the Varseo S printer.
- Casts generated with the DLP printer, Varseo S, had better 3D accuracy than did those generated with the SLA printer, Form 2.
- The amount of 3D deviation in all the groups were below the reported clinically acceptable implant framework misfit (150 - 200 μm).^(8,9)
- This indicates that 3D printed casts might be clinically acceptable and can potentially be used to fabricate implant-supported, fixed dental prostheses in a digital workflow.

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