In vitro comparative study between full-arch abutment level implant impressions with different scan bodies – a pilot study.

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INTRODUCTION

The use of intraoral scanners (IOS) in restorative digital workflows for edentulous patients is not fully supported. The purpose of this vitro study is to measure and compare the accuracy of different full-arch digital implant impressions of BioHorizons titanium scan bodies with that of Elos Accurate scan bodies.

METHODS & MATERIAL

A reference mandibular model was used to place four implants (3.5mm Tapered Internal Plus Dental Implant, BioHorizons); multi-unit abutments were inserted into the implants and torqued to 30 N/Cm. Specimens were divided into different groups according to the impression technique used:

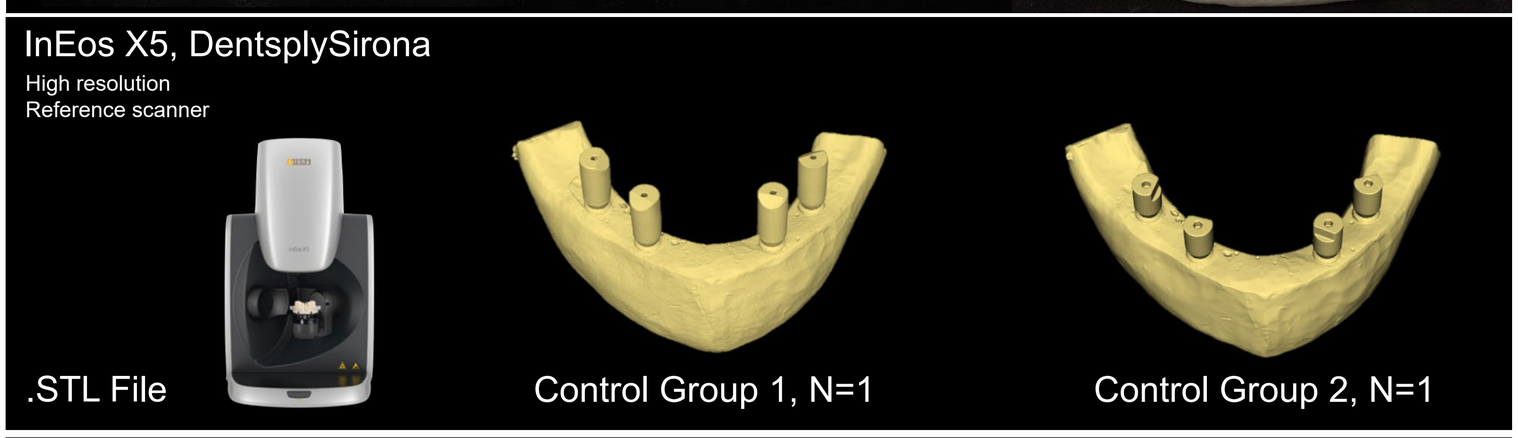
Group Control 1: Intraoral scan bodies (Elos Accurate multi-unit scan body) were positioned and tightened by hand on each implant abutment replica. The reference model was scanned with a high-resolution reference scanner (inEos X5, Dentsply Sirona) and a Standard Tessellation Language (.STL) file was obtained.

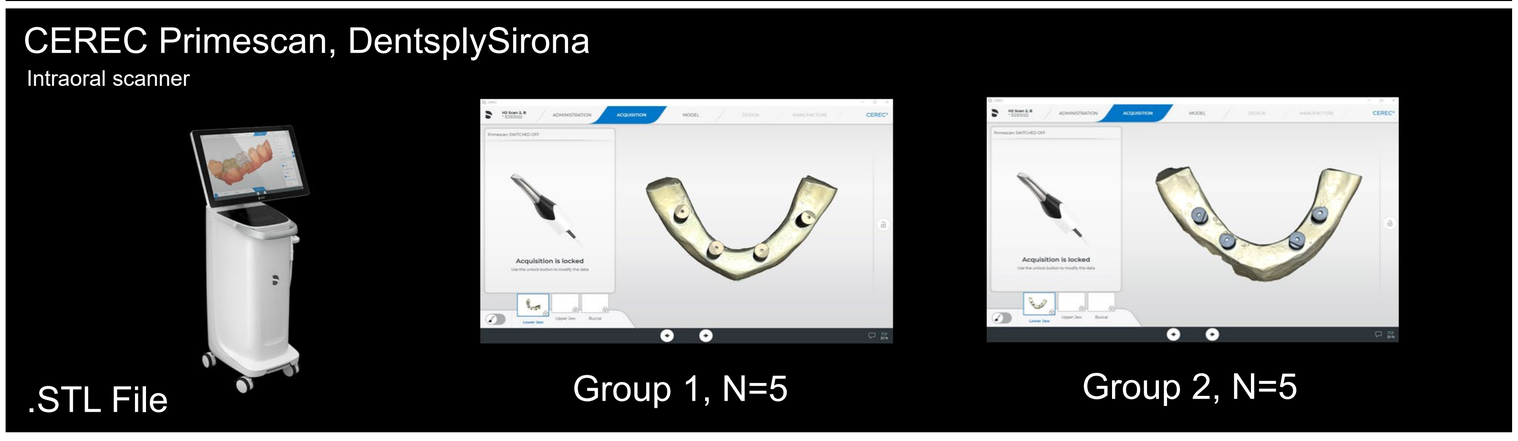
Group Control 2: Intraoral scan bodies (BioHorizons titanium scan body) were positioned and tightened by hand on each implant abutment replica. The reference model was scanned with a high-resolution reference scanner (inEos X5, Dentsply Sirona).

Group 1: Intraoral scan bodies (Elos Accurate multi-unit scan body) were positioned and tightened by hand on each implant abutment replica. Five intraoral scans (Primescan, DentsplySirona) were made at the abutment level (3.5mm multi-unit abutment, straight).

Group 2: Intraoral scan bodies (BioHorizons titanium scan body) were positioned and tightened by hand on each implant abutment replica. Five intraoral scans (Primescan, DentsplySirona) were made at the abutment level (3.5mm multi-unit abutment, straight).

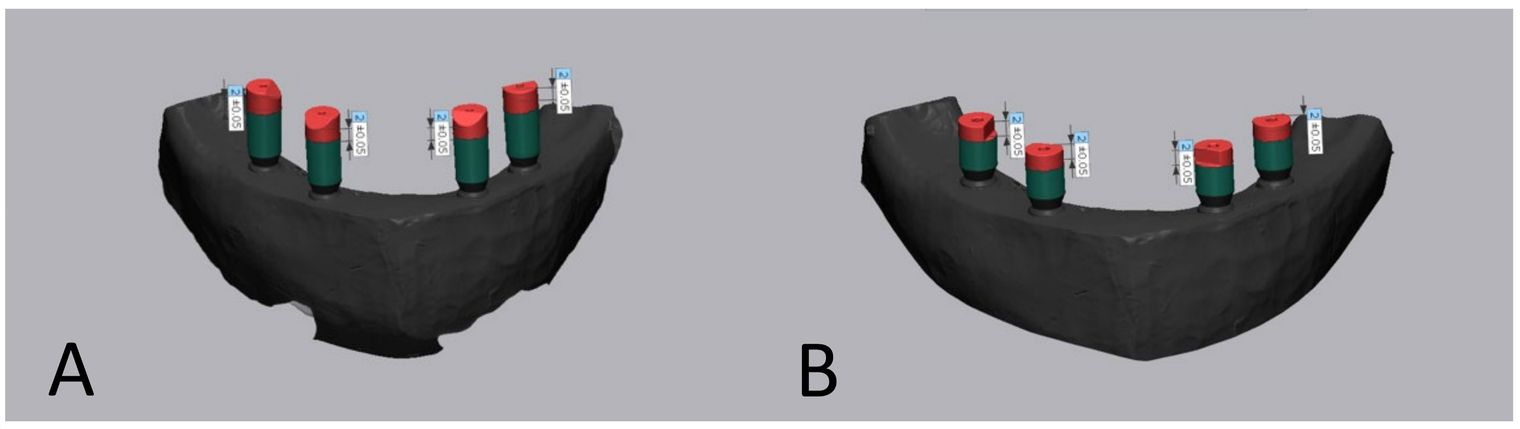
For all groups, the digital impression's .STL files were exported into a 3D inspection software. The digitized models from the different scan bodies were superimposed with the .STL file of their respective control. Root mean square values were calculated from the control and superimposed scans. The RMS values were analyzed with a one-way ANOVA analysis.





RESULTS

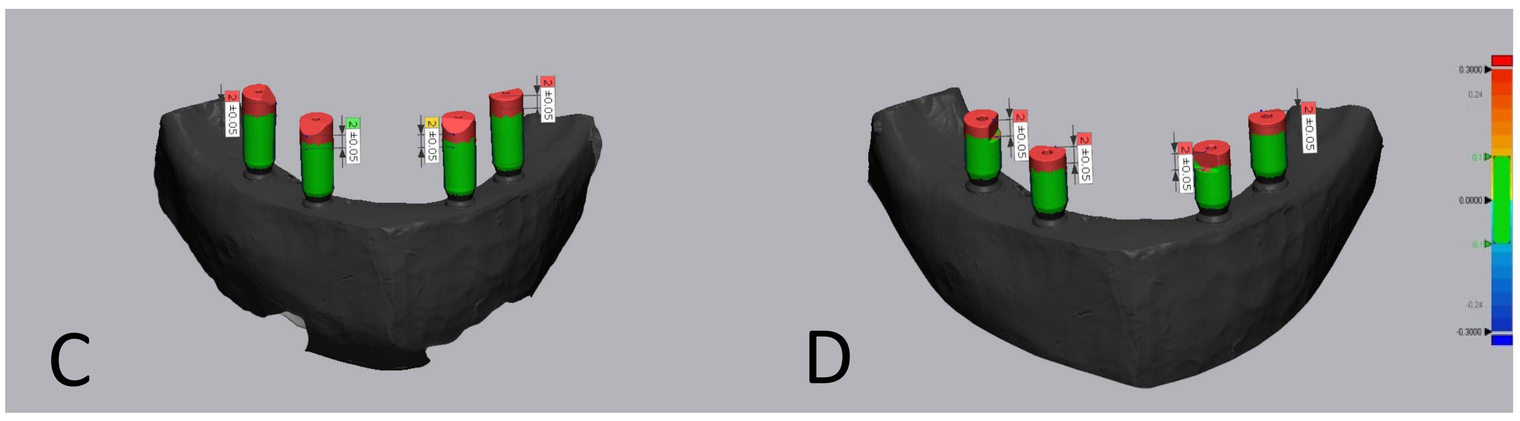
Using Geomagic Control X, root mean squared (RMS) values were calculated from superimposed control and digital scans. The BioHorizons titanium scan body group showed a lower RMS value (0.0028134) than the Elos Accurate scan body group (0.0053362). There was no significant difference found in the RMS values from the different scan bodies ($P>0.05$).



To minimize the variability of non-engaging scan bodies, the Control Group 1 (A) and Control Group 2 (B) scans were exclusively analyzed at the cylindrical portion of the scan body, 2 mm from the top. The region of comparison can be visualized in the highlighted teal region.

CONCLUSION

- Digital impressions using Elos Accurate multi-unit scan bodies seem to be as accurate as that of BioHorizons titanium scan bodies.
- Future studies should investigate the accuracy of scan bodies on milled frameworks made from full-arch digital implant impressions with intraoral scanning.
- The differences in the scan bodies' length and geometry may have led to an inaccurate comparison.



Using Geomagic Control X, digital impressions of the Elos Accurate scan bodies (C) and the BioHorizons titanium scan bodies (D) taken by Primescan were compared and superimposed to their respective control scans. Only one scan of each of the groups is shown here. Measurements between yellow and teal are within 300 microns of the control.

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