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Trueness and Precision of Four Intraoral Scanners in Oral Implantology: A Comparative in Vitro Study.

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Abstract

PURPOSE:

The aim of this study was to compare the trueness and precision of four intraoral scanners used in oral implantology.

METHODS:

Two stone models were prepared, representing a partially and a totally edentulous maxilla, with three and six implant analogues, respectively, and polyether-ether-ketone (PEEK) cylinders screwed on. The models were digitized with an industrial scanner (IScan D104I®) used as a reference, and with four intraoral scanners (Trios®; CS 3500®; Zfx Intrascan®; Planscan®). Five scans were taken for each model, using each different intraoral scanner. All datasets were loaded into reverse-engineering software (Geomagics 2012®), where intraoral scans were superimposed on the reference model, to evaluate general trueness, and superimposed on each other within groups, to evaluate general precision. General trueness and precision of any scanner were compared by model type, through an ANOVA model including scanner, model and their interaction. Finally, the distance and angles between simulated implants were measured in each group, and compared to those of the reference model, to evaluate local trueness.

RESULTS:

In the partially edentulous maxilla, CS 3500® had the best general trueness (47.8 μm) and precision (40.8 μm), followed by Trios® (trueness 71.2 μm, precision 51.0 μm), Zfx Intrascan® (trueness 117.0 μm, precision 126.2 μm), and Planscan® (trueness 233.4 μm, precision 219.8 μm). With regard to general trueness, Trios® was significantly better than Planscan®, CS 3500® was significantly better than Zfx Intrascan® and Planscan®, and Zfx Intrascan® was significantly better than Planscan®; with regard to general precision, Trios® was significantly better than Zfx Intrascan® and Planscan®, CS 3500® was significantly better than Zfx Intrascan® and Planscan®, and Zfx Intrascan® was significantly better than Planscan®. In the totally edentulous maxilla, CS 3500® had the best performance in terms of general trueness (63.2 μm) and precision (55.2 μm), followed by Trios® (trueness 71.6 μm, precision 67.0 μm), Zfx Intrascan® (trueness 103.0 μm, precision 112.4 μm), and Planscan® (trueness 253.4 μm, precision 204.2 μm). With regard to general trueness, Trios® was significantly better than Planscan®, CS 3500® was significantly better than Zfx Intrascan® and Planscan®, and Zfx Intrascan® was significantly better than Planscan®; with regard to general precision, Trios® was

significantly better than Zfx Intrascan® and Planscan®, CS 3500® was significantly better than Zfx Intrascan® and Planscan®, and Zfx Intrascan® was significantly better than Planscan®. Local trueness values confirmed these results.

CONCLUSIONS:

Although no differences in trueness and precision were found between partially and totally edentulous models, statistically significant differences were found between the different scanners. Further studies are required to confirm these results.