

Title: A Comparative Study of the Dimensional Accuracy of Intra-Oral and Extra-Oral Scanners with cartesian coordinates (x, y, and z)

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Abstract

Introduction: In this study, we investigated and compared the inherent trueness and precision of intra-oral and extra-oral scanner systems in different dimensions, regardless of how scanners work and the conditions that can affect their accuracy. **Materials and Methods:** In this experimental study, a mandible training dental model was used with two standard Dio implants that center distance implants were placed approximately 14 mm in parallel and in the first premolar area and first molar. Data from Planmeca Emerald, 3Shape Trios, CEREC Omnicam, 3shape D850, Cerec inEos X5, Amanngirrbach Ceramill Map+ and CMM scanners were transmitted to STL format to Geomagic Qualify software and superimposed data from scans (test groups) and data from the CMM (control group) was performed with the *Best-Fit* algorithm and the calculations were performed to determine precision and trueness. **Results:** A significant difference was seen among the extra-oral scanners used in the estimation of displacement variables, the intervals between the implants (ΔD), posterior scan body (Δθ1), anterior scan body (Δθ2), and distance displacement (ΔY2) in terms of the amount of the trueness; in addition, there was a significant difference in estimates of

variable distance displacement (ΔY1) in terms of precision (P <0.05). In the estimation of variables ΔD and ΔΘ1, intra-oral scanners also had a significant difference in trueness level; furthermore, in the estimation of variables ΔD, there was a significant difference in terms of precision (p <0.05) and extra-oral scanners had better performance. **Conclusion:** Extra-oral scanners have better trueness and precision than intra-oral scanners.

Keywords: Intra-oral scanner; Extra-oral scanner; Trueness and precision.