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New methods to analyze the accuracy of full arch scan

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Purpose: The aim of current study was to develop an experimental design to analyze the accuracy of full arch digital scan using intraoral as well as laboratory scanners.

Methods: A master model was fabricated using an acrylic maxillary model. Six teeth (both canines and second premolars and molars) were replaced with implant replicas, and a scanbody was connected on each implant replica. Three reference balls were fixed on the right posterior glandular area of the maxillary model to set a part coordinate system. The master model was digitally scanned with intraoral (Group IO) and laboratory (Group LAB) scanners to obtain 10 full arch digital models per each group. Reverse engineering software was used to compute the following datasets for each digital model: platform centroid (x_1, y_1, z_1) of each implant replica and projection angles ($\theta_{XY}, \theta_{YZ}, \theta_{ZX}$) of the long axis. Using a computerized coordinate measuring machine, the same datasets were computed 10 times for the patient model, which were then assigned as reference datasets (Group REF). One-way analysis of variance was performed for comparison of variables among Groups IO, LAB and REF ($\alpha=95\%$).

Results: Significant differences were noted in 12 of 18 coordinates and 5 of 18 projection angles between Groups IO and LAB. Compared to Group LAB, Group IO exhibited a smaller number of significant difference compared to Group REF.

Conclusion: Accuracy analysis of full arch scan data was accomplished using a new experimental design, in which the datasets of virtual model can be directly compared to those of a physical model. A more comprehensive analysis could be achieved by increasing the number of implant replicas.

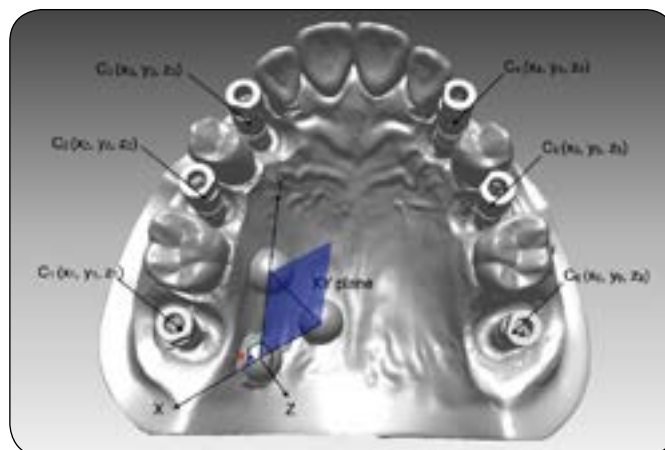


Fig. Definition of 3D coordinate system: The plane, which included the three center points of RB1, RB2, and RB3, was designated as the XY plane, and the origin was at the center of RB2. The line connected the centers of RB2 and RB3 was designated as X axis. $C_n(x_n, y_n, z_n)$ is the platform centroid of IR_n .

Recent Publications

1. W K Kim and Sunjai Kim (2018) Effect of the number of pontics and impression technique on the accuracy of 4-unit monolithic zirconia fixed dental prostheses. *J Prosthet Dent* 119(5): 860.e1-860.e7
2. Yu Lung Tang, Jee-Hwan Kim, June-Sung Shim and Sunjai Kim (2017) The effect of different cooling rates and coping thicknesses on the failure load of zirconia ceramic crowns after fatigue loading. *J Adv Prosthodont* 9(3):152-158.

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3. J H Cho, Sunjai Kim, June-Sung Shim, Sunjai Kim and Keun-Woo Lee (2017) Effect of zirconia surface treatment using nitric acid-hydrofluoric acid on the shear bond strengths of resin cements. J Adv Prosthodont. 9(2):77-84.
4. Jae-Seung Chang, Woon Ji, Chang-Hoon Choi and Sunjai Kim (2015) Catastrophic failure of a monolithic zirconia. J Prosthet Dent. 113(2):86-90.
5. Jee-Hwan Kim, Kyoung Rok Kim and Sunjai Kim (2015) Critical appraisal of implant impression accuracies. J Prosthet Dent. 114(2):185-92. e1.

Biography

Sunjai Kim has focused on digital dentistry for years. His major research interest is the accuracy digital impression.

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