

Detecting Erosive Wear Using an Intraoral Scanner and Different Methods of Scan Alignment

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Objectives: To evaluate the erosive tooth wear caused by different energy drinks with the help of an intraoral scanner (IOS) system and clinical indexes. Secondly, to compare different methods of scan alignment.

Methods: Extracted human teeth with no defects were mounted on six semi-arch models and scanned at different times with an IOS (3Shape TRIOS 4) before and after immersion in energy drinks, followed by toothbrushing for evaluating erosive/abrasive wear. At the same time, tooth models were scored according to BEWE and TWES 2.0 clinical indexes by two calibrated examiners. Scans were subsequently superimposed using an IOS software (3Shape TRIOS Patient Monitoring, version 2.2.3.3, 3Shape A/S, Denmark), and tooth-comparison (best fit), fillings and the palatal rugae (reference best fit) of each model used as different alignment methods. Surface profile differences were calculated in a cross-section view. Non-parametric Kruskal Wallis test and Spearman's correlation coefficient were used to assess statistical differences in tooth loss at different times and between different energy drinks, compared with IOS software and clinical indexes. Using different scan alignment methods, the nonparametric Kruskal Wallis test was used to assess statistical differences in tooth loss measurements.

Results: A correlation between tooth surface loss and time of immersion in energy drinks was found ($r_s = 0,571$, $p < 0.01\%$). Different energy drinks provoke surface damage of different severity. A profile surface loss from 0.01 to 0.69 mm was observed. No difference was found between the two clinical indexes ($r_s = 1$, $p < 0.01\%$). No statistically significant differences ($p < 0.05$) were observed among the alignment methods.

Conclusion: The IOS system is reliable for monitoring tooth substance loss. When reference alignment is impossible, tooth comparison best fit is a reliable option. More in vivo studies should test this method's limits.