

Accuracy of digital intraoral impressions for complete dentures manufacturing: comparison of three different protocols

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The primary aim of this study was to evaluate the accuracy of three different digital intraoral impression protocols for the realization of a removable complete denture.

The secondary aim was to assess patients' comfort and the ergonomics of a fully digital workflow.

MATERIAL AND METHODS

After ethical approval (protocol number: PRODIG01) 12 adult patients (4 women and 8 men), aged between 64 and 82 years old, referring to the Prosthodontic Department of the Dental School of the University of Brescia, were included in this study. Inclusion criteria were: patients with one or both edentulous dental arches, no syndromes or cognitive deficits, no serious respiratory pathologies.

The study consisted of a clinical phase and a laboratory phase.

In the clinical phase three sessions of impressions were performed for each patient by a single operator. In each session two impressions of the edentulous arch were obtained: the first with an intraoral scanner (CS 3600[®], Carestream Dental, Atlanta, GA, USA) coupled with the NOLA Dry Field retraction system, and the second with Schreinemakers impression trays and alginate (gold standard).

In the first session an impression of the edentulous arch was obtained.

In the second session metallic landmarks were applied on the alveolar crest and on the hard palate before impressions acquisition.

In the third session the same metallic landmarks were applied landmarks in the vestibular fornix and in correspondence with the postdam.

At the end of the third session a colloquial interview was conducted among patients and operator opinion about digital workflow ergonomics, according to the experience gained during the trial.

In the laboratory phase alginate impressions were cast in stone models and digitally scanned (3Shape[®], Copenhagen, Denmark). Each scan was aligned with the corresponding STL files generated with the intra-oral scanner. Through the Splint Studio software (3Shape[®], Copenhagen, Denmark) a section was created in correspondence of six reference points (tubers, canine's prominences, median point of the third palatal ruga) and the discrepancy between the three overlapping impressions was measured.

Statistical analysis were performed with SPSS software (SPSS Inc., Chicago, IL). Data were normally distributed and were tested using one-way ANOVA, in order to highlight the presence of statistically significant differences between the three methods for each reference point: when ANOVA test was significant ($p < 0.05$), post-hoc Tukey test was applied to identify where the differences occurred between groups.

RESULTS AND CONCLUSIONS

A statistically significant difference between the three methods, comprised between 0.24 and 0.84 mm, was found only at the third palatal ruga reference point level.

Patients participating in the study and the operator unanimously expressed their preference for impressions detected with an intraoral scanner.

The use of metal reference point had no strategical effect on increasing impression accuracy.