Clinical evaluation of all-ceramic crowns fabricated from intraoral digital impressions based on the principle of active wavefront sampling.

Syrek A, Reich G, Ranftl D, Klein C, Cerny B, Brodesser J.


Abstract

OBJECTIVES: The aim of the present study was to compare the fit of all-ceramic crowns fabricated from intraoral digital impressions with the fit of all-ceramic crowns fabricated from silicone impressions.

METHODS: Twenty patients agreed to take part in the study to receive two Lava crowns each for the same preparation. One crown was fabricated from intraoral scans using the Lava Chairside Oral Scanner (Lava C.O.S.), and the other crown from a two-step silicone impression. Prior to cementation the fit of both crowns was clinically evaluated by two calibrated and blinded examiners; the marginal fit was also scored from replicas. Data from the replica scores were analysed by Anderson-Darling test, Levene's test and Mann-Whitney test. All tests were performed with alpha-level of 0.05.

RESULTS: Median marginal gap in the conventional impression group was 71microm (Q1:45microm; Q3:98microm), and in the digital impression group 49microm (Q1:32microm; Q3:65microm). Mann-Whitney test revealed a significant difference between the groups (p<0.05). No differences were found regarding the occlusion, and there was a trend for better interproximal fit for the digitally fabricated crowns.

CONCLUSIONS: 1. Crowns from intraoral scans revealed significantly better marginal fit than crowns from silicone impressions. 2. Marginal discrepancies in both groups were within the limits of clinical acceptability. 3. Crowns from intraoral scans tended to show better interproximal contact area quality. 4. Crowns from both groups performed equally well with regard to occlusion.

Dentistry a la carte: in-office CAD/CAM technology.

Kachalia PR, Geissberger MJ.


Abstract

This article examines the differences among four in-office computer-aided design/computer-aided manufacturing restorative technologies. Two acquisition media systems, 3M ESPE’s Lava COS and Cadent's iTero, are compared and contrasted. Additionally, two acquisition and manufacturing media, Sirona's CEREC
AC and D4D's E4D, are examined. Image acquisition techniques and cast fabrication methodologies are compared between Lava COS and iTero. In addition, image acquisition, cast fabrication, and restoration fabrication methodologies are discussed as related to CEREC AC and E4D. Strategies for computer-aided design/computer-aided manufacturing incorporation into practice are explored.

A systematic review of the clinical performance of CAD/CAM single-tooth restorations.

Wittneben JG, Wright RF, Weber HP, Gallucci GO.


Abstract

PURPOSE: This systematic review sought to determine the long-term clinical survival rates of single-tooth restorations fabricated with computer-aided design/computer-assisted manufacture (CAD/CAM) technology, as well as the frequency of failures depending on the CAD/CAM system, the type of restoration, the selected material, and the luting agent.

MATERIALS AND METHODS: An electronic search from 1985 to 2007 was performed using two databases: Medline/PubMed and Embase. Selected keywords and well-defined inclusion and exclusion criteria guided the search. All articles were first reviewed by title, then by abstract, and subsequently by a full text reading. Data were assessed and extracted by two independent examiners. The pooled results were statistically analyzed and the overall failure rate was calculated by assuming a Poisson-distributed number of events. In addition, reported failures were analyzed by CAD/CAM system, type of restoration, restorative material, and luting agent.

RESULTS: From a total of 1,957 single-tooth restorations with a mean exposure time of 7.9 years and 170 failures, the failure rate was 1.75% per year, estimated per 100 restoration years (95% CI: 1.22% to 2.52%). The estimated total survival rate after 5 years of 91.6% (95% CI: 88.2% to 94.1%) was based on random-effects Poisson regression analysis.

CONCLUSIONS: Long-term survival rates for CAD/CAM single-tooth Cerec 1, Cerec 2, and Celay restorations appear to be similar to conventional ones. No clinical studies or randomized clinical trials reporting on other CAD/CAM systems currently used in clinical practice and with follow-up reports of 3 or more years were found at the time of the search.
Accuracy testing of a new intraoral 3D camera.

Mehl A, Ender A, Mörmann W, Attin T.


Abstract

Surveying intraoral structures by optical means has reached the stage where it is being discussed as a serious clinical alternative to conventional impression taking. Ease of handling and, more importantly, accuracy are important criteria for the clinical suitability of these systems. This article presents a new intraoral camera for the Cerec procedure. It reports on a study investigating the accuracy of this camera and its potential clinical indications. Single-tooth and quadrant images were taken with the camera and the results compared to those obtained with a reference scanner and with the previous 3D camera model. Differences were analyzed by superimposing the data records. Accuracy was higher with the new camera than with the previous model, reaching up to 19 microm in single-tooth images. Quadrant images can also be taken with sufficient accuracy (ca 35 microm) and are simple to perform in clinical practice, thanks to built-in shake detection in automatic capture mode.

Accuracy of intraoral data acquisition in comparison to the conventional impression.

Luthardt RG, Loos R, Quaas S.


Abstract

The achievable accuracy is a decisive parameter for the comparison of direct intraoral digitization with the conventional impression. The objective of the study was therefore to compare the accuracy of the reproduction of a model situation by intraoral digitization vs. the conventional procedure consisting of impression taking, model production, and extraoral digitization. Proceeding from a die model with a prepared tooth 16, the reference data set of the teeth 15, 16 and 17 was produced with an established procedure by means of extraoral digitization. For the simulated intraoral data acquisition of the master model (Cerec 3D camera, Sirona, Bensheim), the camera was fastened on a stand for the measurement and the teeth digitized seven times each in defined views (occlusal, and in each case inclined by 20 degrees, from the mesio-proximal, disto-proximal, vestibular and oral aspect). Matching was automated (comparative data sets B1-B5). A clinically perfect one-step putty-and-wash impression was taken from the starting model. The model produced under defined conditions was digitized extraorally five times (digi-SCAN, comparative data sets C1-C5). The data sets B1-B5 and C1-C5 were assigned to the reference data set by means of best-fit matching and the root of the mean quadratic deviation (RMS; root mean square) calculated. The deviations were visualized, and mean positive, negative and absolute deviations calculated. The mean RMS was 27.9 microm (B1-B5) or 18.8 microm (C1-C5). The mean deviations for the prepared tooth were 18 microm/-17 microm (B1-B5) and 9 microm/-9 microm (C1-C5). For tooth 15, the mean deviations were 22 microm/-19 microm (B1-B5) and 15 microm/-16
The intraoral method showed good results with deviations from the CAD starting model of approx. 17 microm, related to the prepared tooth 16. On the whole, in this in-vitro study, extraoral digitization with impression taking and model production showed higher accuracy than intraoral digitization. Since the inaccuracies in the conventional impression under real clinical conditions may be higher than the values determined above, a comparison under clinical conditions should be performed subsequently.

Evaluation of different methods of optical impression making on the marginal gap of onlays created with CEREC 3D.

da Costa JB, Pelogia F, Hagedorn B, Ferracane JL.


Abstract

OBJECTIVES: This study evaluated the marginal gaps on several surfaces of onlays created with the Cerec 3D system using one intraoral and two extraoral optical impression methods.

METHODS: A human molar (#19) was mounted with its adjacent teeth on a typodont (Frasaco) and prepared for a MODL onlay. The typodont was assembled in the mannequin head in order to simulate clinical conditions. The same operator took 36 individual optical impressions using a CEREC 3D camera. For group 1 (IP), a thin layer of titanium dioxide powder (CEREC powder-VITA) was applied directly onto the surface of the preparation for imaging (n = 12). For group 2 (EP), a sectional impression was taken with hydrocolloid Identic Syringeable (Dux Dental), a die made with polyvinylsiloxane KwikkModel Scan (R-dental Dentalerzeugnisse GmbH) and powdered with titanium dioxide for imaging (n = 12). For group 3 (ES), a sectional impression was taken with PVS and a sectional stock tray, a die fabricated in stone (Diamond die- HI-TEC Dental Products) and the die being imaged without powdering (n = 12). One operator designed and machined the onlays in VitaBlocks Mark II for Cerec (VITA) using a CEREC 3D. The marginal gaps (microm) were measured with an optical microscope (50x) at 12 points, three on each surface of the MODL. The results were analyzed by two-way ANOVA/ Tukey's (p = 0.05).

RESULTS: The overall mean marginal gaps (microm) for the three methods were: IP = 111.6 (+/- 34.0); EP = 161.4 (+/- 37.6) and ES = 116.8 (+/- 42.3). IP and ES were equal, but both were significantly less than EP. The pooled mean marginal gaps (microm) for the occlusal = 110.5 (+/- 39) and lingual = 111.5 (+/- 30.5) surfaces were equivalent and significantly less than the distal = 136.5 (+/- 42.5) and mesial = 161.1 (+/- 43.3).

CONCLUSION: The marginal gap of CEREC 3D onlay restorations was not different when the optical impression was taken intraorally vs extraorally using a stone cast that does not require powdering. The lingual and occlusal surfaces showed the lowest gaps.