Clinical Efficacy of CEREC® 3 All-ceramic Restorations:

A 20-Year History of Peerless Performance

It is now nearly two decades after the market introduction of the CEREC System for the manufacture of all-ceramic dental restorations. CEREC can fabricate restorations for all single-unit clinical indications: inlays, onlays, partial crowns, crowns (posterior & anterior), and veneers. With over 9,000,000 restorations placed since the introduction of CEREC technology in 1987, CEREC is one of the most researched restorative systems on the market, with documented success rates of more than 90% after 10 years. Unlike other indirect processes, CEREC restorations are milled from solid, homogenous blocks of all-ceramic material. The production process for CEREC blocks ensures optimal consistency with very little variation in strength or quality. Ceramics used for CEREC restorations display enamel wear characteristics more comparable to natural tooth enamel than other materials. CEREC materials, manufactured by Vita, Ivoclar, and 3M ESPE, are available in a wide array of shades and translucencies. The studies featured in this document highlight the exceptional clinical performance and longevity of CEREC all-ceramic restorations.

FIT

During the CEREC System's nearly 20-year history, there have been three generations of equipment. CEREC 1 was introduced in 1987 to produce inlays; CEREC 2 was launched in 1994 and ultimately offered all single-unit indications; and CEREC 3 was born in 2000, adding a 3-dimensional operating system in 2003. Given the product evolution timeline, it is obvious that most mid- and long-term studies focus on the CEREC 1 and CEREC 2 Systems. The studies below outline the clinical fit performance of these systems, and newer studies are showing even better results for CEREC 3D.

Gen Dent. 2003; 51(5).

Scanning electron microscope evaluation of CEREC II and CEREC III inlays.

Estafan D, Dussetschleger F, Agosta C, Reich S.

In response to an increased public demand for esthetic restorations, dentists are using computer-aided design/computer-aided manufacture (CAD/CAM) technology to fabricate inlay/onlay, crown, and laminate veneers. ***This study evaluated the fit at the gingival margin of surface inlay restorations milled by the CEREC II as well as the more recently developed CEREC III. The marginal fit of inlays milled by the CEREC III was more accurate than the fit of those milled by the CEREC II, although both were within the ADA specifications of 50µ.***

Int J Prosthodont. 2003; 16(3): 244 – 248.

Marginal and internal fit of CEREC 3 CAD/CAM all-ceramic crowns.

Nakamura T, Dei N, Kojima T, Wakabayashi K.

PURPOSE: The purpose of this study was to examine the effects of the occlusal convergence angle of the abutment and the computer's luting space setting on the marginal and internal fit of CEREC 3 computer-aided design/manufacturing (CAD/CAM) all-ceramic crowns. MATERIALS AND METHODS: Mandibular second premolar all-ceramic crowns were fabricated for nine different conditions using CEREC 3: all combinations of abutments with three different total occlusal convergence angles (4, 8, and 12 degrees) with three different luting space settings (10, 30, and 50 microns). The completed crowns were seated on the abutments, and the marginal gaps were measured. The internal gaps between the crowns and abutments were also measured, using test-fit silicone paste. RESULTS: When the luting space was set to 10 microns, the marginal gaps of the crowns were greater than when it was set to 30 or 50 microns. When the luting space was set to 30 or 50 microns, the ***marginal gaps ranged from 53 to 67 microns and were not affected by the occlusal convergence angle of the abutment***. The internal gaps were within a range of 116 to 162 microns and tended to decrease as the occlusal convergence angle of the abutment decreased. CONCLUSION: When the luting space was set to 30 microns, ***crowns with a good fit could be fabricated on the CEREC 3 System, regardless of the occlusal convergence angle of the abutment.***

Eur J Oral Sci. 2003; 111(2): 163 – 169.

Clinical and SEM evaluation of all-ceramic chair-side CAD/CAM-generated partial crowns.

Bindl A, Mörmann WH.

The effect of hardware and software on the quality of CEREC all-ceramic partial crowns was investigated in this cross-sectional study. Partial crowns (n = 818) had been adhesively placed in 496 patients between 1993 and 1997 using CEREC 1 and CEREC 2 units (groups 1 and 2) as well as CEREC 2 with wall-spacing software (group 3). From each group, 25 randomly selected partial crowns were evaluated using modified United States Public Health Service (USPHS) criteria. Of these, 12 were randomly selected in each group, replicas taken and examined in a scanning electron microscope for marginal interfacial width and for continuous margin adaptation. Interfacial width of group 1 (308 +/- 95 microns) was significantly larger than those of groups 2 (243 +/- 48 microns) and 3 (207 +/- 63 microns). Continuous margin adaptation at the tooth-luting composite and luting composite-restoration interfaces showed only minor differences in groups 1 (94.5 +/- 8% and 95.5 +/- 2%), 2 (98.1 +/- 1% and 97.5 +/- 1.4%) and 3 (96.8 +/- 3% and 96.8 +/- 2%). ***Pooled clinical rating was excellent or good at 97% for all groups***, indicating acceptable restoration quality except for one breakage in group 1.

LONGEVITY

Many advances in dental technology have taken place since the introduction of CEREC in 1987. As CEREC has evolved, so have adhesive bonding techniques and methods. The studies below attest to the longevity of CEREC restorations. While these results attest to the longevity of CEREC, it is important to note that improvements in both CEREC technology and bonding techniques promise to produce even better results for restorations being placed today and in the future.

J Am Dent Assoc. 2004 May; 135(5): 605 – 612.

Clinical performance of large, all-ceramic CAD/CAM-generated restorations after three years: a pilot study.

Reich SM, Wichmann M, Rinne H, Shortall A.

BACKGROUND: Adhesively luted all-ceramic restorations preserve and stabilize weakened tooth structure, but there is little published information about the clinical performance of large, all-ceramic restorations. METHODS: In this pilot study, the authors placed 58 large, single-tooth, all-ceramic restorations in 26 patients using a computer-aided design/computer-aided manufacturing, or CAD/CAM, system (CEREC 2, Sirona Dental Systems GmbH, Bensheim, Germany). They documented the maximum height of the restoration and remaining cemento-enamel junction, or CEJ. In 21 cases, rubber dam isolation was not possible during adhesive luting. They re-evaluated the restorations after three years according to the U.S. Public Health Service criteria. RESULTS: After three years, ***the authors rated 56 (97 percent) of the 58 restorations as Bravo or better in regard to marginal integrity, secondary caries (four could not be rated), discoloration and anatomical form***. One restoration was rated as Charlie because of poor marginal integrity, and one restoration had to be replaced owing to a bulk fracture. ***The authors rated the adequacy of proximal contact and occlusal relationships as acceptable-to-good for all restorations.*** Neither the extent of the remaining enamel at the cavity margin nor application of a rubber dam had any statistically significant influence (chi2 test, $P > .05$) on the clinical performance of the restorations after three years. ***CONCLUSION: At the three-year recall appointment, the authors found that the adhesively luted all-ceramic restorations had successfully repaired large coronal defects, irrespective of the cavity margin location (that is, coronal or apical to the CEJ). CLINICAL IMPLICATIONS: Tooth-colored, all-ceramic CAD/CAM-generated restorations are an alternative to conventional restorations if large coronal defects need to be treated.***

Eur J Oral Sci. 2004 Apr; 112(2): 197 – 204.

Survival rate of mono-ceramic and ceramic-core CAD/CAM-generated anterior crowns over 2-5 years.

Bindl A, Mörmann WH.

Anterior mono-ceramic (Mk II, n = 18) and ceramic core (In-Ceram Spinell, n = 18) crowns were CAD/CAM-fabricated using Vitablocs with the CEREC 2 CAD/CAM System and bonded in 24 patients. All crowns were rated using modified United States Public Health Services (USPHS) criteria at baseline and after a service time of 2-5 years. Survival of the crowns, regarding fracture, was analyzed (Kaplan-Meier) after 44.7 +/- 10.3 months. Gingival health at crowns was assessed using plaque and bleeding scores. One core crown and one mono-ceramic crown had fractured after 42.5 months and 12 months, respectively, ***with survival rates of 91.7% for In-Ceram Spinell and 94.4% for Mk II; the difference was not statistically significant***. Between baseline and follow-up examinations, non-significant shifts from A- to B-ratings occurred, particularly for marginal adaptation, for both crown types. Plaque and bleeding scores did not differ between the ceramic crown types but showed significantly less plaque and less bleeding at ceramic crowns than control teeth at follow-up. ***The clinical performance of mono-ceramic crowns was judged to be similar to that of ceramic core crowns***.

Int J Prosthodont. 2004 Mar-Apr; 17(2): 241 – 246.

A 10-year prospective evaluation of CAD/CAM-manufactured (CEREC) ceramic inlays cemented with a chemically cured or dual-cured resin composite.

Sjogren G, Molin M, van Dijken JW.

PURPOSE: The present follow-up study was carried out to evaluate the performance of Class II CEREC inlays after 10 years of clinical service. MATERIALS AND METHODS: Sixty-six Class II CAD/CAM ceramic inlays were placed in 27 patients. Each patient received at least one inlay luted with a dual-cured resin composite and one inlay luted with a chemically cured resin composite. At the 10-year recall, 25 (93%) patients with 61 (92%) inlays were available for evaluation using a slight modification of the USPHS criteria. ***RESULTS: Fifty-four (89%) of the 61 inlays reevaluated still functioned well at the 10-year recall.*** During the follow-up period, seven (11%) of the inlays required replacement because of: four inlay fractures, one cusp fracture, endodontic problems in one case, and

postoperative symptoms in one case. All the replaced inlays had been luted with the dual-cured resin composite. The fractured inlays were all placed in molars. ***The estimated survival rate after 10 years was 89%, 77% for the dual-cured resin composite-luted inlays and 100% for the chemically cured resin composite-luted ones.*** The difference was statistically significant. ***CONCLUSION: Patient satisfaction with and acceptance of the CEREC inlays were high, and the performance after 10 years of clinical service was acceptable, especially regarding the inlays luted with the chemically cured resin composite. The properties of the luting agents seem to affect the longevity of the type of ceramic inlays evaluated.***

Int J Comput Dent. 2003; 6(3): 231 – 248.

Longevity of 2328 chairside CEREC inlays and onlays.

Posselt A, Kerschbaum T.

In a dental practice, 2328 ceramic inlays were placed in 794 patients. The restorations were manufactured chairside using CEREC technology and adhesively inserted at the same appointment. The clinical performance of the restorations was evaluated with the Kaplan-Meier analysis. The probability of survival was 95.5% after 9 years; 35 CEREC restorations were judged as failures. The prognosis for success was not significantly influenced by restoration size, tooth vitality, treatment of caries profunda (CP), type of tooth treated, or whether the restoration was located in the maxilla or mandible. The most common type of failure was the extraction of a tooth. In a clinical follow-up light-microscopic examination of 44 randomly selected restorations, an average composite joint width of 236.3 microns was found. 45.1% of the restorations exhibited a perfect margin, and 47.4% of the investigated joint sections showed underfilled margins.

Int J Prosthodont. 2002; 15(2): 122 – 128.

Computer-aided direct ceramic restorations: a 10-year prospective clinical study of CEREC CAD/CAM inlays and onlays.

Otto T, De Nisco S.

PURPOSE: The objective of this follow-up study was to examine the performance of CEREC inlays and onlays in terms of clinical quality over a functional period of 10 years. MATERIALS AND METHODS: Of 200 CEREC inlays and onlays placed in a private practice between 1989 and early 1991, 187 restorations were observed over a period of 10 years. The restorations were fabricated chairside using the CEREC-1 computer-aided design/manufacturing (CAD/CAM) method and Vita MK I feldspathic ceramic. An adhesive technique and luting composite resin were used for seating the restorations. After 10 years, the clinical performance of the restorations was evaluated using modified USPHS criteria. The results were used to classify success and failure. RESULTS: According to Kaplan-Meier analysis, the success rate of CEREC inlays and onlays dropped to ***90.4% after 10 years***. A total of 15 (8%) failures were found in 11 patients. Of these failures, 73% were caused by either ceramic fractures (53%) or tooth fractures (20%). The reasons for the remaining failures were caries (20%) and endodontic problems (7%). The three-surface CEREC reconstructions were found to have the most failures. CONCLUSION: The failure rate of 8% and the drop of the ***survival probability rate to 90.4% after 10 years of clinical service of CEREC-1 CAD/CAM restorations made of Vita MK I feldspathic ceramic appear to be acceptable in private practice. This is particularly true in light of the very high patient satisfaction.***

J Adhes Dent. 2001; 3(1): 45 – 64.

Longevity of restorations in posterior teeth and reasons for failure.

Hickel R, Manhart J.

PURPOSE: This article compiles a survey on the longevity of restorations in stress-bearing posterior cavities and assesses possible reasons for failure. MATERIALS AND METHODS: The dental literature predominantly of the last decade was reviewed for longitudinal, controlled clinical studies and retrospective cross-sectional studies of posterior restorations. Only studies investigating the clinical performance of restorations in permanent teeth were included. Longevity and annual failure rates of amalgam, direct composite restorations, glass ionomers and derivative products, composite and ceramic inlays, and cast gold restorations were determined for Class I and II cavities. ***RESULTS: Annual failure rates in posterior stress-bearing restorations are: 0% to 7% for amalgam restorations, 0% to 9% for direct composites, 1.4% to 14.4% for glass ionomers and derivatives, 0% to 11.8% for composite inlays, 0% to 7.5% for ceramic restorations, 0% to 4.4% for CAD/CAM ceramic restorations,*** and 0% to 5.9% for cast gold inlays and onlays. CONCLUSION: Longevity of dental

restorations is dependent upon many different factors that are related to materials, the patient, and the dentist. The principal reasons for failure were secondary caries, fracture, marginal deficiencies, wear, and postoperative sensitivity. A distinction must be made between factors causing early failures and those that are responsible for restoration loss after several years of service.

J Adhes Dent. 1999; 1(3): 255 – 265.

Clinical evaluation of adhesively placed CEREC endo-crowns after 2 years – preliminary results.

Bindl A, Mörmann WH.

PURPOSE: Non-vital endodontically treated posterior teeth with complete loss of coronal hard tissues were prepared with a circular equigingival butt margin and central retention cavity of the entire pulp chamber ("endo-preparation"). Computer-generated ceramic corono-radicular restorations (CEREC endo-crowns) were bonded to these preparations. The purpose of this study was to evaluate the survival rate and the clinical quality of CAD/CIM endo-crowns after 2 years. MATERIALS AND METHODS: 19 CEREC endo-crowns (4 premolars and 15 molars) in 13 patients were examined using modified USPHS criteria at baseline and after an average time of 26 months. The ratings of the two examinations were compared. RESULTS: The service time of the 19 endo-crowns was 14 to 35.5 (mean +/- SD: 26 +/- 6) months. One molar endo-crown failed after 28 months because of recurrent caries. CONCLUSION: The overall clinical quality of the CEREC endo-crowns was very good, and so far, the clinical concept appears feasible.

Dent Mater. 1999; 15(1): 54 – 61.

Clinical performance of CEREC ceramic inlays: a systematic review.

Martin N, Jedynakiewicz NM.

OBJECTIVE: This systematic review of clinical trials seeks to identify the clinical performance of intra-coronal CEREC restorations luted with an adhesive composite technique. The focus of the review is to establish the survival rate of these restorations and to identify the factors that may cause them to fail. METHOD: A comprehensive literature search was undertaken, spanning from the year of introduction of the technology—1986 to 1997. This review identifies universal indicators of the clinical performance of intra-coronal CEREC restorations luted with an adhesive composite technique. Throughout the critical appraisal, each individual study was analyzed identifying the aims, the methodology and materials used and the results obtained. RESULTS: 29 clinical reports were identified in the search. The systematic analysis reduced the focus of review to 15 studies. ***The data available establishes ceramic intra-coronal restorations machined by the CEREC System as a clinically successful restorative method with a mean survival rate of 97.4% over a period of 4.2 years.*** The review also highlights the reasons and the rates of failure for this type of restoration. The predominant reasons for failures are fracture of the ceramic, fracture of the supporting tooth, postoperative hypersensitivity and wear of the interface lute. SIGNIFICANCE: Machinable ceramics, as used by the CEREC System, provide a useful restoration with a high success rate. These restorations are color-stable and wear at a clinically acceptable rate. Wear of the luting composite on occlusal surfaces leads to the phenomenon of submargination. Ceramic fracture, wear at the interface and post-operative hypersensitivity remain a problem which requires further investigation.

STRENGTH

Indirect all-ceramic restorations have proven to be strong, reliable restorative techniques. However, it is difficult to reproduce exceptional strength and composition through traditional means. CEREC materials are different. They are industrially manufactured under controlled conditions and are pre-sintered. This ensures that the ceramic blocks have consistent particle size, porosity, and strength throughout. The evaluations below highlight the strength inherent in materials used for CEREC restorations.

J Adhes Dent. 2004 Autumn; 6(3): 239 – 245.

Stabilization effects of CAD/CAM ceramic restorations in extended MOD cavities.

Mehl A, Kunzelmann KH, Folwaczny M, Hickel R.

PURPOSE: Using extended, standardized MOD preparations, it was the aim of this in vitro study to examine the performance of CAD/CAM ceramic inlays in comparison to composite inlays after mechanical and thermal fatigue loading in terms of

marginal quality and stabilization of the remaining tooth structure. MATERIALS AND METHODS: Standardized cavities with different wall thicknesses were prepared in 90 extracted premolars; 10 additional premolars remained untreated. Composite inlays (Tetric) and CAD/CAM restorations (CEREC II; Vita Mark II) were adhesively placed in the cavities. After loading in a chewing simulator, quantitative and qualitative marginal gap examinations were conducted and fracture resistance determined. ***RESULTS: The results show that ceramic inlays provide significantly greater stabilization and better marginal quality than do composite inlays. CONCLUSION: Chairside-fabricated ceramic inlays inserted using adhesive technology are able to stabilize weakened cusps.*** In the case of very thin remaining walls (about 1.3mm), however, the marginal quality and the cusp-stabilizing effect are also reduced.

Am J Dent. 2001; 14(4): 216 – 220.

Molar fracture resistance after adhesive restoration with ceramic inlays or resin-based composites.

Bremer BD, Geurtsen W.

PURPOSE: To determine the fracture resistance of teeth, following treatment with various types of adhesive restorations. MATERIALS AND METHODS: 50 caries-free, extracted human molars were randomly divided into five groups consisting of 10 molars each. MOD cavities were prepared in 40 molars with a width in the facio-lingual direction of 50% of the intercuspal distances. The cavities were filled with the following materials: CEREC or IPS Empress ceramic inlays, Arabesk or Charisma F resin-based composite (RBC) restorations. The control group consisted of 10 sound, non-restored molars. ***All 50 teeth were loaded occlusally until fracture using a tensile testing machine.*** The statistical analysis included ANOVA, Kolmogorov-Smirnov test, Scheffe test, and boxplots. ***RESULTS: There was no significant difference (P > 0.05) between the mean values of the sound teeth (2,102 N) and the teeth with the CEREC ceramic inlays (2,139 N).*** However, both groups demonstrated a significant difference (P < 0.05) when compared with the teeth with IPS Empress ceramic inlays (1,459 N) and Arabesk RBC restorations (1459 N). No significant differences were found between the last two groups. Molars restored with Charisma F composite restorations (1,562 N) revealed no significant difference when compared with all other groups including controls (P > 0.05). A stabilization of molars is possible by means of an adhesive restoration in the form of an "internal splinting" regardless of the restorative material used.

J Dent. 2000; 28(7): 529 – 535.

Structural reliability of alumina-, feldspar-, leucite-, mica-, and zirconia-based ceramics.

Tinschert J, Zwez D, Marx R, Anusavice KJ.

OBJECTIVES: The objective of this study was to test the hypothesis that industrially manufactured ceramic materials, such as CEREC Mark II and Zirconia-TZP, have a smaller range of fracture strength variation and therefore greater structural reliability than laboratory-processed dental ceramic materials. METHODS: Thirty bar specimens per material were prepared and tested. The four-point bend test was used to determine the flexure strength of all ceramic materials. The fracture stress values were analyzed by Weibull analysis to determine the Weibull modulus values (m) and the 1 and 5% probabilities of failure. RESULTS: The mean strength and standard deviation values for these ceramics are as follows: (MPa+/-SD) were: CEREC Mark II, 86.3+/-4.3; Dicor, 70.3+/-12.2; In-Ceram Alumina, 429.3+/-87.2; IPS Empress, 83.9+/-11.3; Vitadur Alpha Core, 131.0+/-9.5; Vitadur Alpha Dentin, 60.7+/-6.8; Vita VMK 68, 82.7+/-10.0; and Zirconia-TZP, 913.0+/-50.2. There was no statistically significant difference among the flexure strength of CEREC Mark II, Dicor, IPS Empress, Vitadur Alpha Dentin, and Vita VMK 68 ceramics (p> 0.05). The highest Weibull moduli were associated with CEREC Mark II and Zirconia-TZP ceramics (23.6 and 18.4). Dicor glass-ceramic and In-Ceram Alumina had the lowest m values (5.5 and 5.7), whereas intermediate values were observed for IPS-Empress, Vita VMK 68, Vitadur Alpha Dentin and Vitadur Alpha Core ceramics (8.6, 8.9, 10.0 and 13.0, respectively). CONCLUSIONS: Except for In-Ceram Alumina, Vitadur Alpha and Zirconia-TZP core ceramics, most of the investigated ceramic materials fabricated under the condition of a dental laboratory were not stronger or more structurally reliable than Vita VMK 68 veneering porcelain. ***Only CEREC Mark II and Zirconia-TZP specimens, which were prepared from an industrially***

optimized ceramic material, exhibited m values greater than 18. Hence, we conclude that industrially prepared ceramics are more structurally reliable materials for dental applications although CAD-CAM procedures may induce surface and subsurface flaws that may adversely affect this property.

J Prosthet Dent. 1999; 82(4): 468 – 475.

Effects of surface finish and fatigue testing on the fracture strength of CAD-CAM and pressed-ceramic crowns.

Chen HY, Hickel R, Setcos JC, Kunzelmann KH.

STATEMENT OF PROBLEM: All-ceramic molar crowns can be fabricated with CAD-CAM or laboratory methods with different materials, and a polished or oven-glazed surface. PURPOSE: This in vitro study determined the fracture strength of various all-ceramic crowns, with and without prior cyclic loading. MATERIAL AND METHODS: Standardized molar crowns were fabricated with a CAD-CAM machine (CEREC 2), software with machinable ceramic materials (Vita Mark II and ProCAD), and also conventional heat-pressed IPS Empress crowns fabricated at 2 dental laboratories. Groups of 40 crowns of each material were manufactured with either a polished or an oven-glazed surface finish. Cyclic loading that simulated oral conditions were performed on half of each group. Afterward, all crowns were loaded until catastrophic failure. RESULTS: Fracture loads of the polished ProCAD crowns without prior cyclic loading was 2120 +/- 231 N, significantly higher than that of the polished Vita Mark II crowns (1905 +/- 235 N), but was not significantly different from the strength of 2 laboratory-fabricated Empress crowns. Oven-glazing of ProCAD crowns improved the fracture strength significantly, up to 2254 +/- 186 N. ***Prior cyclic loading decreased the strength of all tested crowns significantly, but the reduction was less for the CEREC crowns than the Empress crowns. CONCLUSION: CEREC ProCAD crowns demonstrated significantly greater strength than the Vita Mark II crowns, better resistance to cyclic loading and lower failure probability than the laboratory-fabricated IPS Empress crowns. Prior cyclic loading significantly reduced the strength of all-ceramic crowns, but had less effect on CEREC crowns than on the IPS Empress crowns.*** Oven-glazing of ProCAD crowns resulted in significantly higher strength and higher resistance to cyclic loading than surface polishing.

WEAR CHARACTERISTICS

In addition to being well-fitting, long-lasting, and strong, CEREC restorations have among their qualities enamel-like wear characteristics. Enamel wears at different rates against different restorative materials. The studies below illustrate how CEREC ceramics are less abrasive to opposing dentition than other restorative options.

J Dent. 1998; 26(5-6): 487 – 495.

Investigation of human enamel wear against four dental ceramics and gold.

Al-Hiyasat AS, Saunders WP, Sharkey SW, Smith GM, Gilmour WH.

OBJECTIVES: This in vitro study compared the wear of enamel against aluminous porcelain, bonded porcelain, low fusing hydrothermal ceramic, feldspathic machinable ceramic, and cast gold. METHODS: Fifty pairs of tooth-material specimens were tested in a dental wear machine, under a standard load (40 N), rate (80 cycles min-1) and for 25,000 cycles in distilled water. The amount of wear was determined by measuring the height loss of the tooth, and the depth of wear track of the restorative materials. RESULTS: There was a significant difference in wear among the groups for both enamel and materials ($p < 0.001$). Follow-up comparisons (95% CI significance level) showed that gold caused significantly less enamel wear than all ceramics tested. The amount of enamel wear in the aluminous and bonded porcelain groups was significantly higher than with the hydrothermal and machinable ceramic groups. There was no significant difference between the amount of enamel wear produced by the aluminous and bonded porcelains nor between that produced by the hydrothermal and machinable ceramics. Furthermore, the wear of the aluminous and bonded porcelains was significantly greater than that of the hydrothermal ceramic, the machinable ceramics and gold. No significant difference in wear was found between aluminous and bonded porcelains, hydrothermal and machinable ceramics, or between machinable ceramic and gold. However, the hydrothermal ceramic had significantly greater wear than gold. ***CONCLUSIONS: It was concluded that the hydrothermal and the machinable ceramics were significantly less abrasive and more resistant to wear than the conventional aluminous and bonded porcelains.*** Gold was the least abrasive material and most resistant to wear, although the ***difference in wear between the machinable ceramic and gold was not statistically significant.***

POST-OPERATIVE SENSITIVITY

Patients request CEREC restorations for many reasons: long-lasting, single-appointment convenience, tooth-colored, biocompatibility, etc. Another benefit of CEREC materials is the documented lack of post-operative sensitivity. Satisfied patients provide quality referrals and are more likely to accept future treatment plans.

CRA Newsletter. 1999; 23(11): 2.

Post-op sensitivity related to type of restoration and material.

Data from 8 different CRA clinical studies conducted over 11 years were compiled in this study. Approximately 45 restorations each for 31 material brands were placed by about 20 different dentists in each of the studies. ***CEREC inlay/onlay restorations machined from Vita Mark II feldspathic porcelain showed 0% post-operative sensitivity.***

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