CLINICAL BRIEFS

Quick considerations for treatment success.

Single-Visit Quadrant Dentistry with Chairside CAD/CAM Restorations

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CAD/CAM dentistry should not be thought of as the future of dentistry, as it is happening right now in tens of thousands of dental offices and laboratories throughout the world.[1,2] When the first chairside CAD/CAM restoration system came to market some 20 years ago, the scope of restorations it could produce was extremely limited, and required a steep learning curve and a lot of time to master. Therefore, CAD/CAM was thought of as a novelty and also as something that could only be afforded by a select few dentists ("early adopters") who prided themselves on having the latest technologies, regardless of cost or range of clinical application.

However, CAD/CAM has improved since then, and now a system such as the CEREC® Acquisition Center (AC) powered by Bluecam (Sirona Dental Systems, Charlotte, NC) has become a chairside "workhorse" that is capable of producing a full range of restorations for any clinical indication, including inlays, onlays, crowns, and veneers—restoration types that are often referred to as "bread-and-butter" dentistry because they are the restorations dentists place most frequently on a daily basis. CEREC AC is an affordable addition to any dental office, providing dentists with a variety of system configurations, budget price points, and practice integration options, thus making CAD/CAM available for everyone. Additionally, a CEREC return-on-investment calculator is available at the Patterson Dental Web site.

Today, chairside CAD/CAM systems are expanding their repertoire of clinical indications even further by providing capabilities such as full-arch digital impressions, which allows dentists to perform efficient and effective single-visit quadrant dentistry. This expansion may be attributed to advances in the optical precision and accuracy of image-acquisition cameras that "take" digital impressions, coupled with the enhanced speed and rendering efficiency of 3D dental modeling software, such as that found in the new CEREC AC powered by Bluecam.[3]

The following case illustrates an example of chairside CAD/CAM fulfilling the functional and esthetic needs of a full-arch restorative case.

PATIENT HISTORY

The patient, a 51-year-old woman, presented with the desire to have the amalgam restorations in her upper and lower arches replaced completely with conservative (non-crown), esthetically pleasing restorations that matched the appearance of her natural dentition (Figure 1). The patient had no pretreatment symptoms outside of irritated soft tissue. Treatment consent was discussed and any risk factors of either restorative treatment or the risks associated with doing nothing were reviewed. After having two all-ceramic, single-visit CAD/CAM onlays placed on the upper left premolars (Figure 2), she was so happy with the experience (the patient experienced no postoperative symptoms) and the results that she decided to have all of her existing amalgams replaced this way.

TREATMENT PLAN

Because of the number of restorations required, it was deemed best to approach this case using a quadrant-dentistry technique. Chairside CAD/CAM systems with full-arch capability facilitate the process rather well. The entire arch need only be scanned one time, and the teeth to be restored can then be prepared all at once, and as one crown is being milled, another one can be designed. Additionally, with multiple scans with the CEREC AC, the software will automatically identify the reference frame image for best optical stitching between preparation, antagonist bite registration, and correlation catalogues.

CLINICAL TECHNIQUE

As mentioned in the patient history section, the patient had previously received two CEREC restorations on her first and second premolars, teeth Nos. 12 and 13, and wanted to replace all her amalgams this way. To start, tooth No. 15 was conservatively prepared and all amalgam was removed (Figure 3). Tooth No. 14 had an

Figure 1 Original condition: amalgams on teeth Nos. 12, 13, and 15, and a PFM crown on tooth No. 14.

Figure 2 Two all-ceramic CAD/CAM crowns were placed before this appointment.

Figure 3 Tooth No. 15 was conservatively prepared to accommodate the all-ceramic CAD/CAM onlay.

Figure 4 The bite registration was taken with the PFM crown in place.

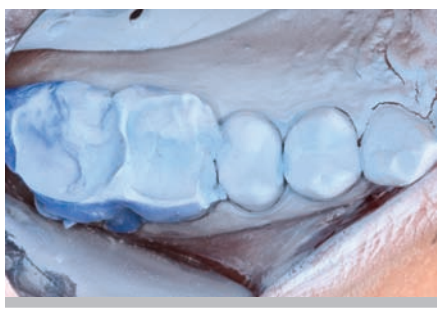

Figure 5 OptiSpray opaquing agent was applied to facilitate the optical impression.

Figure 6 Tissue troughing was achieved with a diode laser to create clean, crisp margins.

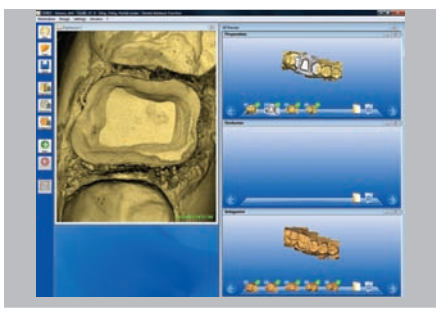

Figure 7 A digital impression of the entire quadrant was taken with the CEREC AC's Bluecam LED acquisition camera.

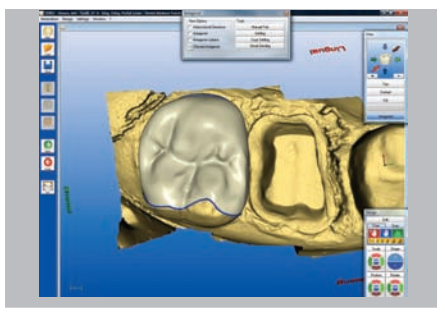

Figure 8 The CEREC AC System automatically proposed an onlay restoration design for tooth No. 15.

existing crown that was removed, but before removing the crown, a bite registration was taken (Figure 4).

First, LuxaBite™ bite registration material (Zenith Dental, Englewood, NJ) was used to physically capture the registration, followed by application of Optispray opaquing agent (Sirona), which facilitates the optical impression process (Figure 5). These steps were taken to ensure proper occlusion and avoid temporomandibular joint drift.

Next, the old porcelain-fused-to-metal crown on tooth No. 14 was removed, revealing subgingival margins and inflamed interproximal soft tissue. Laser soft-tissue troughing was accomplished using an Odyssey® Navigator® diode laser (Ivoclar Vivadent, Amherst, NY) (Figure 6). This was done to create clean and crisp margins, as well as provide "tissue welding" for hemorrhage control. Optispray opaquing agent was applied to the preparations and another digital impression was acquired with the CEREC AC's Bluecam camera (Figure 7). The Bluecam's stabilization trigger feature facilitates a full-quadrant impression in less than 10 seconds. The dentist simply positions the camera lens over the operating field and the camera automatically senses when the ideal image is in view, thereby triggering an "automatic shutter" that instantly captures the digital impression without user intervention (ie, there are no buttons or foot pedals to press).

With the digital impression acquired, the CEREC AC system automatically proposed an onlay restoration for tooth No. 15 (Figure 8). The automatic design and proposal of the restoration is based on the system's comprehensive biogeneric database of human tooth morphology; in this case, no further modifications to the proposed design were necessary. The system's unique bite registration "virtual grinding" feature was activated to set occlusal contact strength to precisely the dentist's desired preference, also taking into account the digital bite registration that was captured first and used by the system to ensure a proper occlusal profile.

Satisfied with the design of the onlay for tooth No. 15, the restoration was milled from a single, solid block of all-ceramic B1 HT IPS e.max® CAD material (Ivoclar Vivadent). The lithium disilicate (e.max) ceramic was chosen for the molars because of its documented functional strength characteristics.[4,5]

While the second molar restoration was milling, the CEREC AC software sequentially proposed the next restoration, a full crown, on tooth No. 14 (Figure 9). The design was accepted, and the restoration was milled using the same material as No. 15. Once milled, each restoration was tried in for fit; notice the well-formed interproximal contacts and "gold-like" margin fit (Figure 10). No modifications were needed.

Next, the connective sprues were removed with a grinding wheel, and the restorations were characterized employing a single-step stain-and-glaze crystallization process, using e.max stain shades and glaze (Figure 11). The finalized restorations were then bonded using a post-preparation dentin seal with SURPASS™ (Apex Dental Materials, Lake Zurich, IL) and G-Cem™ automix A2 (GC America, Alsip, IL) for completion of the cementation process. Per the material manufacturer's recommendation, bite check was evaluated in the intermediate phase (after initial milling, but before staining/glazing and firing), adjusted where necessary, and then crystallized and glazed. The patient was extremely happy with the results (Figure 12). A comparison of preoperative and postoperative radiographs shows excellent margin adaptation of the all-ceramic CAD/CAM restorations (Figure 13 and Figure 14).

CONCLUSION

Chairside CAD/CAM restorations have become a practical means of providing patients with high-strength, clinically proven, all-ceramic indirect restorations.[6] Because there is no laboratory involvement, most cases can be completed within a single appointment.[7] Likewise, quadrant cases with extensive restorative needs such as this can be performed one quadrant at a time, or, depending on the patient's individual needs and wants, an entire full arch can be restored in a single day. Recent advancements in chairside CAD/CAM have resulted in reduced milling times (as few as 4 minutes per crown with the CEREC AC and MC XL milling unit), greater optical impression precision, and increased software speed and accuracy that render 3D tooth proposals requiring very little to no adjustment by the dentist. All of these recent CAD/CAM system performance enhancements have combined to help make quadrant dentistry with chairside CAD/CAM restorations a practical and sensible application in any practice.

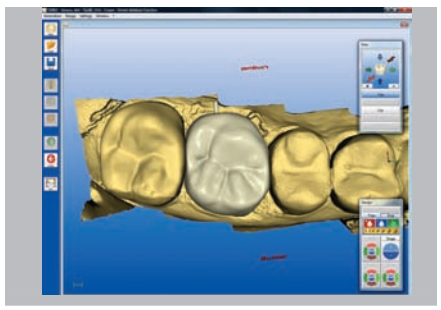

Figure 9 The CEREC AC System automatically proposed a full-crown restoration design for tooth No. 14.

Figure 10 The uncharacterized lithium disilicate CAD/CAM restorations were tried in for fit.

Figure 11 The restorations went through stain-and-glaze crystallization to add strength and natural characterization.

Figure 12 The final restorations were cemented in place; the entire quadrant was now complete.

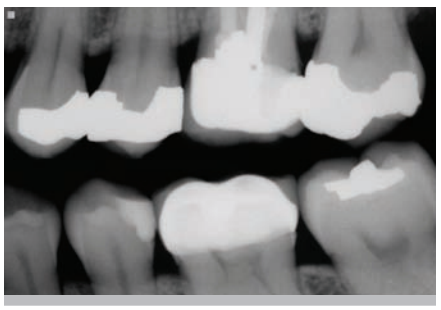

Figure 13 Preoperative radiograph showed amalgams in teeth Nos. 12 through 15.

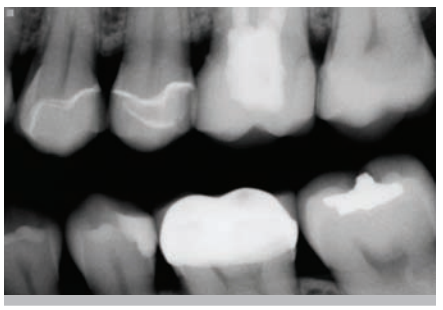

Figure 14 Postoperative radiograph showed excellent marginal adaptation of the all-ceramic CAD/CAM restorations on teeth Nos. 12 through 15.

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