

## Utilization of Bonded CAD/CAM Restorations for Minimally Invasive Treatment of the Posterior Teeth

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When a patient presents with caries or failing restorations, the clinician has to carefully conduct the diagnostic phase in order to determine how treatment should be conducted. Historically, he or she was forced to balance the appropriate response between arresting the disease process and maintaining healthy tooth structures that would be sacrificed in the event that a full-coverage was selected. While metal inlay/onlays represent an alternative treatment option, these materials often result in less-than-ideal aesthetics. Using single-visit CAD/CAM systems such as CEREC 3D (Sirona Dental Systems, Charlotte, NC), however, clinicians now can use metal-free, bonded, intracoronal restorations as a conservative treatment option.

Figure 1



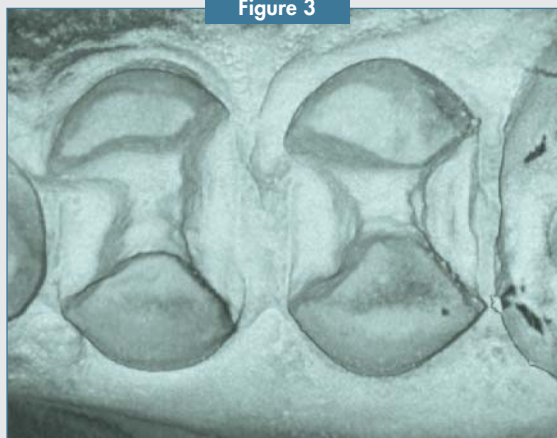
Preoperative view of defective amalgam fillings. The treatment plan included a direct composite buildup on the adjacent canine and a single visit, CAD/CAM-fabricated porcelain inlay/onlay for the premolar teeth.

Figure 2



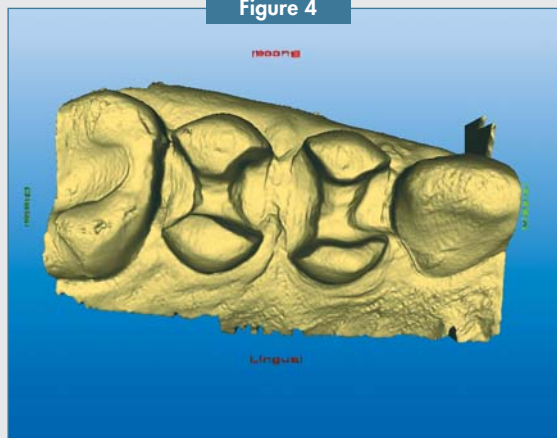
Tooth preparation included removal of the amalgam fillings, all caries, and the unsupported enamel. Margins were well-defined, and a minimum of 1 mm of sound, supportive dentin was maintained.

Figure 3



The adjacent canine was restored with composite resin, and the premolar teeth were sprayed with a titanium dioxide reflective powder to facilitate transfer of critical data to the computer software.

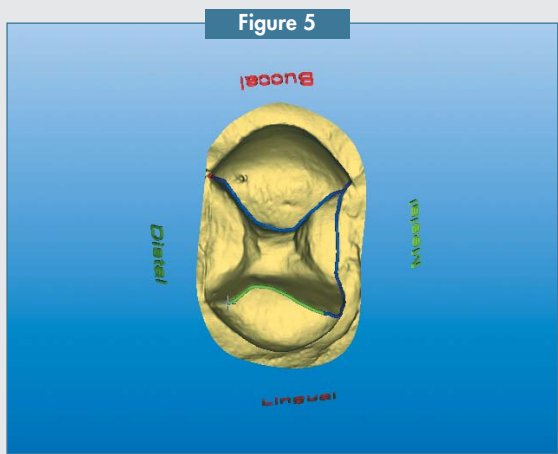
Figure 4



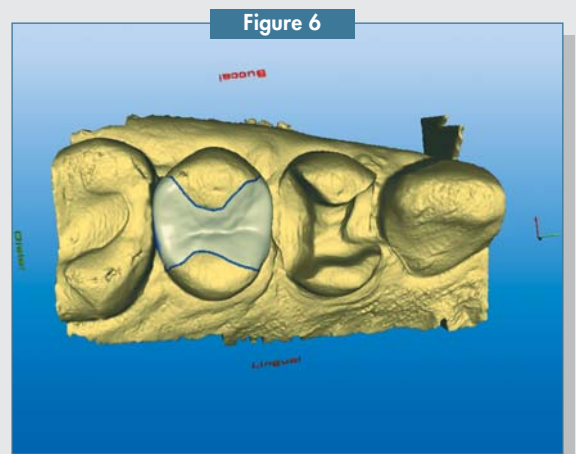
In the CAD process, the scanned images of the preparations were combined to form a quadrant view, as in this example using the newest proprietary software (Biogeneric 3.01, CEREC, Sirona Dental Systems, Charlotte, NC).

## Conservative Aesthetic Inlays: CAD Process

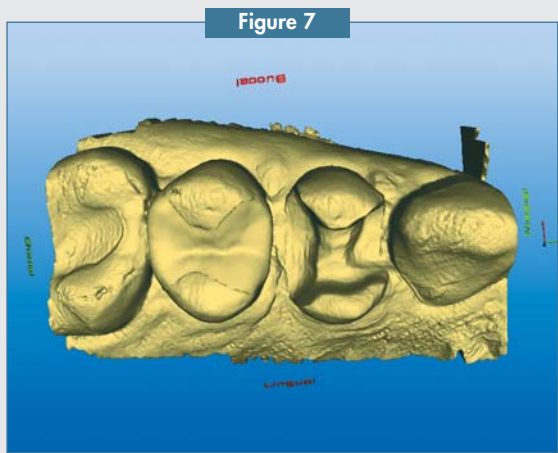
A minimally invasive approach is often difficult to deliver in the posterior region due to the need to remove sufficient tooth structure to provide subsequent support for the restoration. The advent of CAD/CAM restorations allows the clinician to maintain an optimal amount of existing tooth structure while providing adequate support. The computerized design process further enables the maintenance of underlying tooth structure by allowing the clinician to modify the preparation's design on screen prior to final milling. The practitioner can immediately visualize the amount of tooth structure that is required to maintain the restoration, and remove only the amount needed.



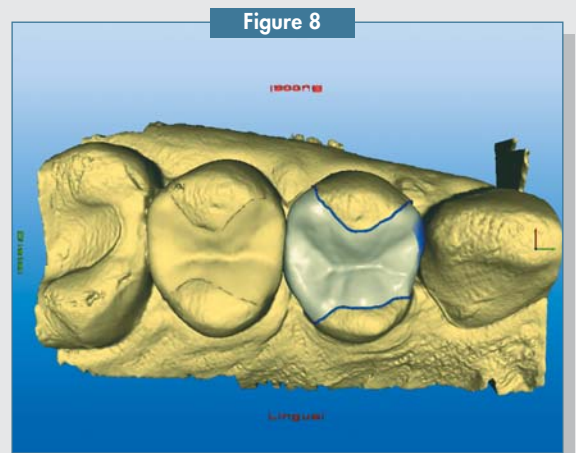
Using the computer software (ie, CEREC 3D, Sirona Dental Systems, Charlotte, NC), the second premolar was removed from the quadrant and its margins were clearly identified.



Milling was initiated within 30 minutes of patient seating. The CAD software was used to determine the placement of the sprue attachment on the mesial aspect, upon which the restoration would have a final connection with the porcelain block in the milling chamber.



Tooth #4 was fabricated in approximately 11 minutes. The efficiency of the procedure allowed the clinician to design tooth #5 using the quadrant feature of the software, so its anatomy could be precisely fabricated as the restoration for tooth #4 was being milled.



The inlay/onlay restoration for tooth #4 was observed using the quadrant view, so that the contacts and anatomy of tooth #5 could be accurately fabricated.

## Adhesive Cementation and Final Finishing

Once the restoration is tried in, minimal modifications will be required to ensure an optimal fit. Occlusal contacts should be verified prior to seating; the predictability of these restorations does, however, result in a reduced need to perform adjustments prior to cementation. A self-etching adhesive material can then be used to ensure reliable adhesion, high physical strength, minimal linear expansion, and optimal marginal integrity. Finishing and polishing can then be performed to ensure removal of excess cement and to ensure a smooth finish with a natural luster.

Figure 9



Once the attachment sprues were removed from the milled restorations, the inlays were tried in with minimal contact adjustment. Additional modifications were not required.

Figure 10



The underlying tooth structures were etched with hydrofluoric acid and rinsed prior to silanization. The porcelain was marked with a pencil to ensure correct orientation prior to cementation.

Figure 11



The cement material was removed using dental floss, a scaler, and a composite knife prior to light curing. Occlusion was verified, and the porcelain was adjusted with a finishing diamond and a stone under copious irrigation and light pressure.

Figure 12



Postoperative appearance following three years of function demonstrates aesthetic maintenance of the occlusal surfaces. The conservative nature of the restorations equipped the practitioner with a variety of treatment options should additional treatment be required.

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