Using in-office CAD/CAM technology and lithium disilicate to fabricate efficient and predictable restorations

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In today’s fast-paced world, instant gratification is expected to be synonymous with worthwhile results. This also applies to dental treatments. While there have been many recent technological innovations specifically for chairside restorations, dentists have faced complications when mastering complex and time-consuming protocols.

The E4D Dentist System (D4D Technologies) eliminates those obstacles by providing outstanding clinical results in a single visit using intuitive, efficient and state-of-the-art technologies.

The E4D Dentist System’s three-dimensional software simplifies designing and milling multiple restorations. This provides dentists with more control over the aesthetic process. The E4D in-office CAD/CAM system is equipped with a high-speed intraoral laser scanner for capturing digital impressions, which provides restorations with better-quality fit and function because it incorporates intraoral digital impressions, traditional impressions and models.

The E4D Dentist System streamlines work for dentists, who gain the enhanced confidence of producing reliable restorations for every patient case. Meanwhile, patients receive both enhanced and more efficient care with faster treatment times.

Contributing to efficiency and accuracy is the E4D design software, which facilitates required modifications to finalize restorative designs in record time.

Restorative designs are then sent to the E4D precision milling unit, which incorporates dual spindles and diamond burs to efficiently form CAD materials into restorations that exhibit exceptional fit, maximized strength and lifelike aesthetics. In fact, restorations fabricated using CAD/CAM processing have demonstrated less chipping or fracturing, which enhances the predictability of the restoration.

Among the materials that can be processed chairside with the E4D Dentist System is lithium disilicate (IPS e.max CAD, Ivoclar Vivadent), which is available for processing CAD/CAM restorations indicated for placement in the anterior and posterior.
The material is also indicated for an assortment of dental procedures, including partial and full coverage inlays and onlays, thin veneers (0.3 mm) and implant superstructures. Lithium-disilicate glass ceramic trumps traditional ceramic materials because of its durability and high flexural strength values.

**Case presentation**

A 55-year-old woman presented requesting removal of the maxillary left bicuspid and molar crowns. Their unsightly margins and the gold restorations were visible in her smile (Figs. 1 & 2), and the patient had grown weary of their unsettling and lackluster appearance. Her goal was to whiten her dull-looking teeth in order to reflect the brighter colour of her natural anterior dentition.

In-office CAD/CAM restorations (IPS e.max CAD) were discussed with and agreed to by the patient. The optical qualities of IPS e.max CAD, which include a fairly low refractive index, optimal light transmission and lifelike translucency, would provide natural appearing and highly aesthetic restorations.2, 3

**Preparation and digital impression taking**

The existing crown restorations were removed and the teeth were prepared for IPS e.max CAD crowns. Preparations included a 2 mm occlusal reduction and a 1–1.2 mm shouldered margin. A scan was performed of the patient’s arch and prepared teeth, and the margins were identified (Fig. 3).

Fig. 3. Scan of the patient’s prepared teeth with margins identified.

Fig. 4. View of the CAD proposals created utilizing Autogenesis.

Fig. 5. Buccal view of the CAD proposals.

Fig. 6. Optimization of CAD proposal to account for occlusion and contact pressure.

Fig. 7. Optimization of CAD proposal with model and occlusion in place.

The internal aspects of the crowns are cleaned, etched and silanated.

Fig. 8. Ceramic Etching Gel is applied for 20 seconds, rinsed with water and dried. In preparation for salinating using Monobond Plus primer.

Fig. 9.
Digital restoration creation

The autogenesis feature in the E4D DentaLogic intuitive software was used in conjunction with E4D CAD proposals (Fig. 4), which incorporated images of the buccal and occlusal aspects (Figs. 5 & 6) and contact intensity (Fig. 7).

The restorations were designed and then sent to the E4D milling unit, where lithium-disilicate hightranslucent (HT) blocks (IPS e.max) were milled. After completion, the monophasic crowns were first tried in the patient’s mouth to appraise fit, contour and anatomical harmony, then crystallized.

Customization

The restorations were removed from the furnace, then cleaned and dried. To fulfil the patient’s desired goal of having a more natural coloured smile, the restorations were appropriately stained and glazed. The ideal shade stain was placed on the tip of a hygienic brush and applied to the restorations.

Once staining was complete, the crowns were fully crystallized and fired. The case was ready for seating using universal cement (Multilink, Ivoclar Vivadent).

Cementation

Lithium-disilicate glass ceramic restorations (IPS e.max CAD) can be traditionally cemented or bonded adhesively. As a result, any restrictions that may be presented due to placement or location within the mouth are eliminated.4,5

The internal aspects of the crowns were cleaned with Ivoclean and etched with Ceramic Etching Gel. The Ceramic Etching Gel was applied for 20 seconds, rinsed with water and dried in preparation for silanating using the Monobond Plus Primer (Fig. 9).

The Monobond Plus Primer was applied with a microbrush for 60 seconds to the internal surfaces of the restorations to ensure a sound bond between the restorations and cement, as well as increase bond strength (Fig. 10). Excess primer was air dried.

The solution was then applied to the prepared teeth and allowed to sit for 40 seconds. The Multilink A&B solution (Fig. 11) was air blown gently to remove excess. Note that the patient’s surrounding gingival tissues may turn white temporarily (Fig. 12).
Next, the internal aspects of the IPS e.max CAD crowns were loaded with Multilink Automix (Ivoclar Vivadent) (Fig. 13) and seated on both the maxillary left bicuspid and molar with slight pressure applied. The “wave” technique was then used to cure the excess cement to a gel-like state, which enabled easy removal (Fig. 14).

Excess cement was removed from interproximal and cervical areas using a microbrush, after which complete polymerization was achieved by curing from the buccal, lingual and distal aspects.

**Conclusion**

The combination of lithium-disilicate blocks (IPS e.max CAD) and the E4D Dentist System is a state-of-the-art material and technology solution that enhances the predictability, aesthetics and ease-of-use of in-office CAD/CAM procedures. Restorations completed with this complementary combination demonstrate excellent fit, function and aesthetics (Figs. 15 & 16). As a result, dentists can provide progressive, one-day treatments tailored to the patient’s authentic esthetic characteristics.

**Editorial note:** A complete list of references is available from the publisher.

**Fig. 14.** The crowns are seated and the Wave technique used to facilitate easy cleanup of excess cement.

**Fig. 15.** Postoperative, buccal view of the patient’s restored smile, complete with more natural looking IPS e.max CAD lithium-disilicate crowns.

**Fig. 16.** Postoperative occlusal view of the final chairside fabricated E4D restorations.

(Photos courtesy of Dr John C. Schwartz)

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