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DENTAL TECHNIQUE

Lithium silicate endocrown fabricated with a CAD-CAM system: A functional and esthetic protocol

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ABSTRACT

An endocrown restoration is an alternative approach to complete crowns with intraradicular cores or dowels for the restoration of endodontically treated teeth. Endocrowns conserve tooth structure and require fewer dental visits. This approach has been widely used, and various materials and techniques have been reported. Computer-aided design and computer-aided manufacturing (CAD-CAM) systems can generate and store libraries of teeth with various anatomies in their database, and diagnostic tooth waxing may not be required. However, occlusal adjustments after the cementation of indirect restorations are often frustrating. Thus, a rapid and efficient way of addressing this challenge is necessary. This clinical report presents a protocol for the fabrication and delivery of an endocrown by using the biogeneric design mode with lithium silicate-based ceramic adjusted before its complete sintering. (J Prosthet Dent 2017;118:131-134)

An endocrown restoration is characterized by a 1-piece restoration that uses the pulp chamber for retention as an alternative to intraradicular cores or dowels. Additionally, the finish line is placed at the supragingival level to preserve tooth structure. An endocrown restoration is a conservative and straightforward alternative to crowns that uses new materials and therapeutic options based on adhesive dentistry.[1-3]

The occlusal anatomy of a restoration is always a challenge for both the clinician and the technician, requiring time and often extensive adjustment.[2] Computer-aided design and computer-aided manufacturing (CAD-CAM) systems have a wide variety of anatomy options and standardized tooth morphologies in their databases. They are selected by the software and can be efficiently adapted to the area to be restored with the biogeneric option.[4] Thus, the diagnostic waxing step is not needed. However, even with these advantages, occlusal adjustments are often necessary. Such adjustments may damage the ceramic or remove the restoration's characterization. Thus, additional ceramic application or laboratory adjustments may be necessary.[5] An efficient clinical protocol is needed to overcome these issues.

Recently, a presintered lithium silicate reinforced with zirconia particles has become available for CAD-CAM systems.[6] The material is extrinsically characterized, with excellent esthetics, allowing for customized restorations.[5,6] This report presents a protocol for the fabrication of a lithium silicate-based endocrown, using the CAD-CAM biogeneric technique.

TECHNIQUE

1. Evaluate the quality of the endodontic treatment from a radiograph. Discuss with the patient the endocrown as a treatment option. Select the color of the ceramic block before dehydration of the teeth (Fig. 1).
2. Remove existing restorations. Note the extent of the coronary chamber and the amount of enamel remaining at the margins. Reduce the cusps with a diamond rotary instrument (TR19 Dia-Burs; Mani

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Figure 1. Initial view. Right mandibular first molar with endodontic treatment and fractured distolingual cusp.

Figure 2. Occlusal view after cavity preparation.

Inc) to provide sufficient volume for the porcelain (approximately 1.5 mm). Use a conical diamond rotary instrument (Dia-Burs; Mani Inc) to obtain the appropriate finish of the mesial and distal walls and to remove any unsupported enamel. Finish the cavity with the same rotary instrument used during preparation at a low rotation speed. Round all internal walls with the TR19 instrument (Dia-Burs; Mani Inc) to facilitate impression making and restoration placement and removal. Note the central region inside the pulp chamber, which provides retention (Fig. 2).

3. Make maxillary and mandibular polyvinyl siloxane impressions (Flexitime; Heraeus-Kulzer GmbH), which are then digitized. Select the biogeneric option to define the anatomy according to the database of the CAD-CAM system (Ceramill Motion 2; Amann Girrbach AG). Insert the lithium disilicate (Suprinity 1M1 HT; VITA Zahnfabrik) block into the machine and mill the restoration (Fig. 3).
4. Place the restoration in the patient's mouth (Fig. 4) and evaluate the interproximal contacts, and marginal integrity. Mark with articulating film (AccuFilm II; Parkell, Inc) to evaluate the occlusal contacts. Adjust the restoration with a low-speed handpiece equipped with a ceramic stone (ZZag; Frank Dental). Reinsert the restoration and re-mark. When evenly distributed occlusal contacts are observed, start the finishing process with a rubber cup at mild pressure and low-speed rotation (ZZag; Frank Dental).
5. Sinter the restoration according to the manufacturer's instructions (Fig. 5).
6. Use pigments (IPS e.max Ceram Shade; Ivoclar Vivadent AG) and glazing materials (IPS e.max; Ivoclar Vivadent AG) to characterize and glaze the restoration.

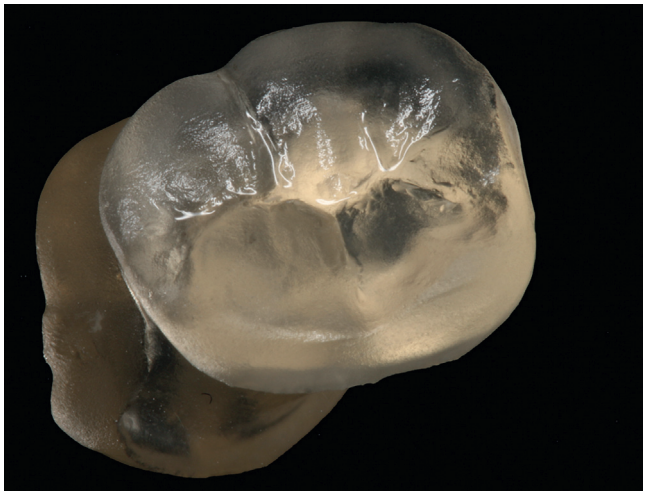

Figure 3. Lithium silicate block (Vita Suprinity), presintered after being machined in biogeneric mode with anatomy selected by software database.

7. Isolate and clean the cavity and adjacent teeth (Fig. 6). Etch the intaglio of the restoration with hydrofluoric acid (5% Condac Porcelana; FGM) for 20 seconds. Rinse for 20 seconds; dry and coat with a silane (Prosil; FGM), thinning with a gentle air stream for 60 seconds. Protect the adjacent teeth with a polyester strip; etch the enamel, and apply the adhesive system (Single Bond Universal; 3M ESPE) according to the manufacturer's instructions and polymerize.
8. Apply the cement (Rely X Ultimate; 3M ESPE) and seat the restoration. Remove excess cement from the proximal surfaces with dental floss and from the buccal and lingual surfaces with an explorer. Polymerize the cement (Figs. 7, 8).

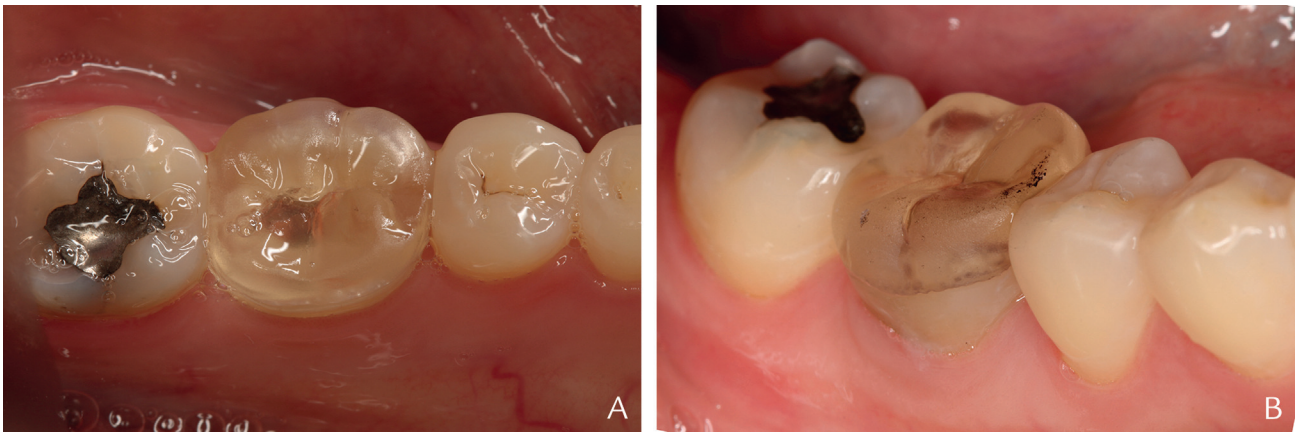

Figure 4. Intraoral evaluation of presintered restoration A, Occlusal view. B, Buccal view after occlusal marking. Note occlusal anatomy and marginal adaptation.

Figure 5. Restoration after being sintered.

Figure 6. Restoration positioned in cavity for evaluation of color mapping.

DISCUSSION

This dental technique presents a protocol for the fabrication and delivery of a lithium silicate endocrown in a single visit. Recent studies have reported the 12-year outcome for endocrown restorations made with Cerec 3 and Vita Mark II feldspathic ceramic in a CAD-CAM system,[7,8] with an estimated success of 90.5% for molars and 75% for premolars in 55 patients.[7]

According to Biacchini et al,[9] endocrowns promote adequate function and esthetics and maintain the biomechanical integrity of nonvital posterior teeth. The restoration is reported to be less susceptible to the adverse effects of degradation of the hybrid layer.[9] Additionally, the treatment is more conservative than a traditional complete crown with a foundation restoration, since it preserves the supragingival tooth structure. Swift et al[10] have defined the limitations of CAD-CAM restorations as excessive occlusal forces, where moisture contamination is inevitable, and deep subgingival margins.

Figure 7. Preparation isolated for adhesive cementation.

In the situation presented here, the restorative treatment was performed in a single visit because the pulp chamber was used for retention instead of an intraradicular core or a dowel and a core. A significant portion

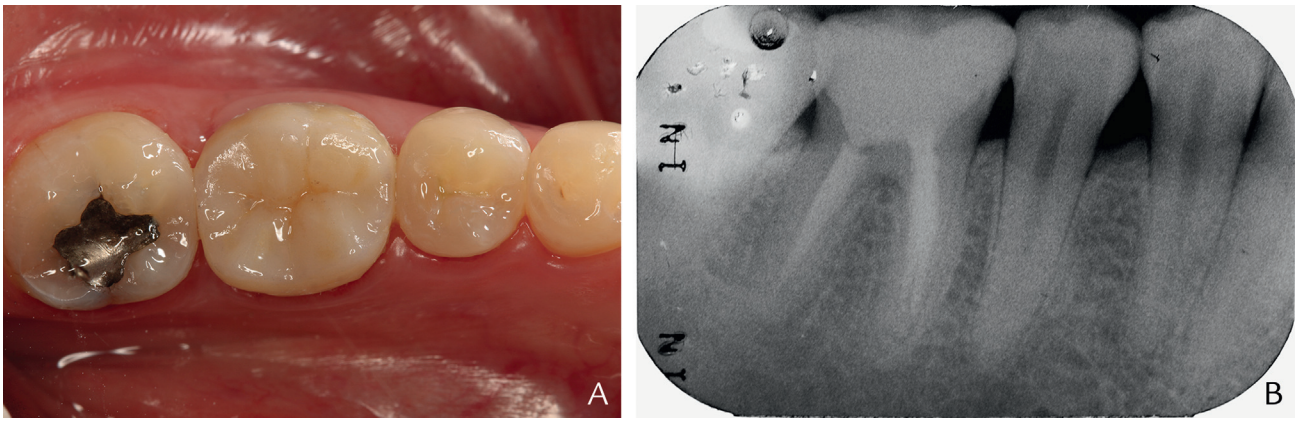

Figure 8. Definitive restoration. A, Occlusal view. B, Periapical radiograph.

of the coronal structure of the prepared tooth was preserved, especially the buccal surface, thus preserving the enamel at the restoration margin and enhancing bonding.

Many systems can be used to prepare endocrown restorations with heat-pressed or milled ceramic.[2,11] The heat-pressing procedure is more time-consuming. The CAD-CAM system used in this treatment (Amann Girrbach AG) has a biogeneric option, which is a database that allows for the selection of occlusal anatomy that better adapts to the scanned preparation and antagonist anatomy, thereby eliminating the need for diagnostic waxing. In the treatment presented, a traditional impression was made and then scanned. This provides an alternative when the dentist does not have an intraoral scanner but only a laboratory scanner.

SUMMARY

A protocol for the fabrication of a lithium silicate-based endocrown by the CAD-CAM biogeneric technique was described. With this protocol, the occlusal anatomy can be easily adjusted before final sintering, and shade customization and predictable characterization can be performed in a single visit.

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