

Endocrown in premolar using lithium disilicate-reinforced ceramic: a case report

Endocoroa em pré-molar utilizando cerâmica reforçada por dissilicato de lítio: um relato de caso

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Abstract

This clinical case presents the restoration of an endodontically treated tooth using an endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system. Case of a female patient, 48 years old who presented coronal fracture of an endodontically treated tooth. Restoration with endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system was indicated. The crowns were evaluated using a California Dental Association (CDA) quality assessment system at baseline and at follow-up examination. Endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system was a reliable restorative alternative for an endodontically treated premolar. The minimally invasive prepare for endocrown preserves maximum tooth structure as a gold standard for tooth restorations. In addition, such restorative alternative is advantageous in comparison to conventional full post-and-core supported crown since it presents appropriate mechanical performance and longevity as a lower cost and faster clinical procedure.

Keywords: CAD, CAM, ceramic, tooth, nonvital

Resumo

Este caso clínico descreve a restauração de um dente tratado endodonticamente com uma endocoroa em cerâmica de dissilicato de lítio fabricada pelo sistema CAD/CAM. O caso é de uma paciente do sexo feminino, 48 anos, que apresentava fratura coronária de um dente tratado endodonticamente. Uma restauração com endocoroa em dissilicato de lítio fabricada pelo sistema CAD/CAM foi indicada. As coroas foram avaliadas usando um sistema de avaliação de qualidade da Associação Dental da Califórnia e exame de acompanhamento. Uma endocoroa cerâmica em dissilicato fabricada por CAD/CAM foi uma alternativa de tratamento restaurador confiável para um pré-molar tratado endodonticamente. O preparo minimamente invasivo para endocoroa que preserva o máximo de estrutura dentária é considerado padrão ouro para restaurações dentárias. Ainda, tal alternativa restauradora é mais conservadora em comparação à coroa total com retentor intrarradicular e apresenta apropriado desempenho mecânico e longevidade com um menor custo e rapidez no preparo.

Palavras-chaves: CAD, CAM, cerâmica, dente tratado endodonticamente

Introduction

Restoration with endocrown has been suggested as an alternative treatment for endodontically treated posterior teeth (1-4). This technique is based on tooth reconstruction associating both coronal and core restoration in a one-piece crown, which will be anchored into pulp chamber and cervical margins. Chamber walls provide macro mechanical retention while bonding cementation provides micro mechanical retention without using intracanal retainers (2,5-7). This restoration has showed appropriate retention, stability and, mechanical performance besides reduced stress on dentine and resin cement (2,5,8,9). Bindl and Mormann (6) conducted a 28-month longitudinal study and reported failure in only one endocrown due to caries recurrence and success for 19 endocrowns, including 4 in premolars and 15 in molars of 13 patients.

The endocrowns are indicated for those cases presenting reduced intermaxillary space (8) or short clinical crowns with poor retention and stability; and also for teeth with severely curved root canals, which avoids insertion of intracanal retainers (10). However, this restorative alternative is counter-indicated when bonding cannot be achieved and also for teeth with pulp chamber with less than 3 mm in depth or with cervical margins thinner than 2 mm (10).

Assuming the lack of studies about this innovative technique for restoration of endodontically treated premolars with endocrowns, the aim of this study was to report a clinical case about restoration of an endodontically treated tooth using an endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system.

Case Report

A female patient, 48-years old, reported fracture of an endodontically treated tooth. After clinical and radiographic exam, it was observed coronal fracture and endodontic treatment in the left maxillary second premolar. Endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system was indicated (11). Preliminary maxillary and mandibular impressions were taken with polyvinyl siloxane (Express XT, 3M/ESPE, St Louis, USA) for mounting of diagnostic casts in the articulator (Bio Art Equipamentos Odontológicos Ltda, São Carlos, SP).

The external preparation of the remaining crown was done with a diamond bur (KG Sorensen, Barueri, SP) in order to get a chamfer finish line with sharp and defined margins at 1.0 mm supragingivally. Internally, the restorative material was completely removed from the pulp chamber with a round diamond bur (#1012, KG Sorensen, Barueri, SP), preserving a smooth chamber wall and divergent axial walls between 6 and 8 degrees towards the occlusal surface (#2215F, KG Sorensen, Barueri, SP). The

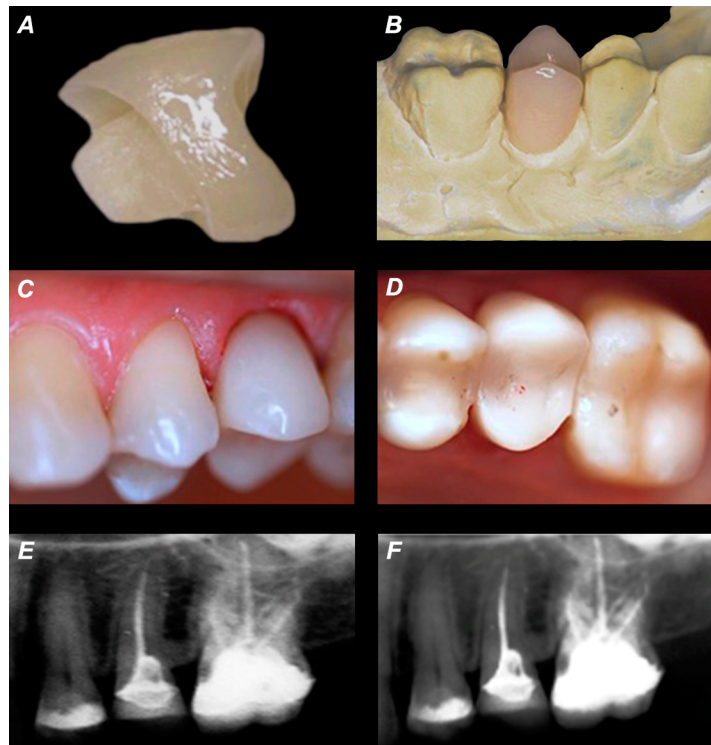
intracanal restorative material was removed at 3.0 mm in depth using drills Largo #1 to #3 (Dentsply; Maillefer, Petrópolis, RJ). A 1.5 mm layer of glass ionomer (Vitremar, 3M/ESPE, St Paul, MN, USA) was used to seal the root canal and plan the chamber wall. Then, gingival retraction was done (#00, Ultrapack, Ultradent, South Jordan, UT, USA) for maxillary impression with polyvinyl siloxane (Express XT, 3M/ESPE, St Louis, USA). The master cast in stone type IV (Durone, Dentsply; Maillefer, Petrópolis, RJ) was mounted in an articulator (Bio Art Equipamentos Odontológicos Ltda, São Carlos, SP). A provisional endocrown was fabricated with self-curing acrylic resin (Duralay, Reliance Dental Mfg Co, Alsip, Ill, USA) and cemented with non-eugenol temporary cement (RelyX TEMP NE, 3M/ESPE, St Paul, MN, USA). Ceramic shade was selected using a shade guide (Vitapan 3D-Master, Vita Zahnfabrik, H. Rauter GmbH & Co, Bäd Sackingen, Germany).

The casts were scanned (Cerec AC Bluecam, Sirona Dental Systems GmbH, Bensheim, Germany) and the 3D restoration was planned and designed on the digital cast using designing tools of the software Cerec (version 4.02, Sirona Dental Systems GmbH, Bensheim, Germany). The restoration was machined in lithium disilicate-reinforced ceramic (IPS e.max CAD; Ivoclar Vivadent, Schaan, Liechtenstein) (Figure 1A and 1B), mechanically polished (CeramiPro Dialite W16DM; Brasseler, USA) and glazed (IPS e.max CAD Cristal/Glaze, Ivoclar-Vivadent, Schaan, Liechtenstein).

After trial and adjustments, the internal surface of the restoration was sandblasted with 50µm aluminum oxide particles (Polidental Ltda, Cotia, SP), cleaned with 96% ethanol and air-dried. Then, etching with 10% hydrofluoric acid (Condac, FGM, Joinville, SC) was done for 20s, followed by washing with air/water spray for 30s. Previously to cementation, silane (Ceramic Primer-Silano RelyX; 3M/ESPE) was applied for 1 min and air dried.

Tooth was etched with 37% phosphoric acid (Condac, FGM, Joinville, SC) for 15s under rubber dam isolation and then washed for 15s and gently dried to maintain dentine humidity. Dual-cure adhesive system (Excite F DSC, Ivoclar-Vivadent, Barueri, SP) was applied on dentine using a microbrush (KG Sorensen, Barueri, SP), gently dried and then light-cured for 10s (650mW/cm² power density) (Radii Plus SDI North America Inc., Ill, USA).

The base and catalyst pastes of the resin cement (Variolink II, Ivoclar Vivadent, Barueri, SP) were mixed and applied onto the restoration internal surface before positioning on the tooth. Then, endocrown were cemented and cement excess was removed with scalpel blade #12 (Figure 1C and 1D). A periapical radiograph immediately after cementation was taken (Figure 1E). A clinical evaluation of the endocrown at baseline and at 2 years follow-up was performed using California Dental Association (CDA) criteria (12). Figure 1F shows the result of the restorative procedure after 2 years.



Legend

- Figure 1A. Endocrown machined in lithium disilicate-reinforced ceramic.
1B. Endocrown positioned in the model after machining.
1C. Endocrown cemented: buccal view.
1D. Endocrown cemented: occlusal view.
1E. Periapical radiograph immediately after cementation.
1F. Periapical radiograph after 2 years cementation.

Discussion

The longevity and success of endocrowns depends on prepare characteristics, bonding and restorative material. So, in the present study, tooth prepare was done to provide parallel axial walls in order to enhance resistance to stress at tooth long axis while the pulp chamber provided retention and stability (10,13). In addition, the occlusal layer of the endocrown presented a ceramic thickness of 8.0 mm (2,6).

The retention of endocrowns is based on mechanical anchoring into pulp chamber associated with bonding. Thus, the advancement of this restoration for endodontically treated teeth lies on bonding provided by effective adhesive systems (14). The dual-cure resin cement used in this case report has presented good results for cementation of endocrowns (1,15).

The main disadvantage of this technique is debonding and risk to root fracture as a consequence of different elasticity modulus between ceramic and dentine (3,5). Thus, a ceramic material that provides appropriate acid etching for bonding to dentine

is beneficial to guarantee restoration stability (1) The lithium disilicate-reinforced ceramic used in the present case has been considered as one of the best restorative materials for fabrication of endocrowns (9). Considering Weibull parameters, bonding seems to be more reliable in lithium disilicate endocrowns, for both axial and lateral loading, than for those fabricated with multiphase resin composite (16). Compared to feldspathic porcelain, this material presented higher fracture strength (17). Lithium disilicate endocrowns have also exhibited better bonding to tooth structure and higher compressive strength in comparison to endodontically treated teeth restored with crown and intracanal retainer as a consequence of less interfaces between the different restorative alternatives (9).

In the present case report, although the endocrown had been indicated for restoration of a premolar (18) with smaller surface area in comparison to molars, the 2-year follow-up confirmed its clinical success based on all careful steps established for conclusion of the case. Restoration of premolar with endocrown in lithium disilicate-reinforced ceramic fabricated by CAD/CAM system seems to be a reliable alternative for rehabilitation of endodontically treated teeth.

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