CASE REPORT

GINGIVAL MARGIN ELEVATION AND INDIRECT RESTORATION IN MILLED COMPOSITE RESIN IN TOOTH WITH SUBGINGIVAL MARGIN: CASE REPORT

ELEVAÇÃO DE MARGEM GENGIVAL E RESTAURAÇÃO INDIRETA EM RESINA COMPOSTA FRESADA EM DENTE COM MARGEM SUBGENGIVAL: RELATO DE CASO

Débora Teresa Griebeler Carvalho Drebel[1], Silvana Pizzini Montenegro[1]

ABSTRACT

Currently, dentistry tends to be more conservative, preserving dental tissue. The use of direct restorations and indirect partial restorations in composite resin, associated with biomimetic protocols, are examples of minimally invasive procedures. Teeth with extensive cavities and subgingival marginal endings are challenges for clinical practice, and in the search for more conservative protocols, deep margin elevation (DME) may be indicated. This work aims to demonstrate, through a clinical case, the importance of DME associated with the milled indirect restoration in composite resin, using the CAD-CAM system, in a tooth with a margin located beyond the cement-enamel junction (CEJ). The present case report described the restorative treatment of the upper left second premolar, which initially presented extensive caries under a composite resin restoration on the occlusal and mesial surfaces; and, after its removal, had the cervical margin of the mesial surface allocated subgingivally. The treatment option was composite resin DME, followed by endodontic treatment, sealing of the canal entrances, composite resin core build-up, and final restoration type onlay, also in composite resin, produced through the digitally assisted design and manufacturing system (CAD-CAM). The proposed treatment demonstrated that DME allows for the perfect adaptation of the restoration directly to the tooth, eliminating the need for clinical crown lengthening (CCL). Thus, an effective, quick treatment with lower comorbidity and reduced financial cost to the patient was achieved. After four months, the clinical and radiographic evaluation of the restoration showed good marginal adaptation, pleasant aesthetics, good polishing, and gingival health, with no signs of inflammation.

Keywords: Composite resin, CAD-CAM, dental marginal adaptation, onlay dental, biomimetic.

RESUMO

A Odontologia atual almeja ser conservadora, preservando o tecido dental. O uso de restaurações diretas e parciais indiretas em resina composta, associado aos protocolos biomiméticos, são exemplos de procedimentos minimamente invasivos. Dentes com cavidades extensas e términos marginais subgengivais são desafios para a prática clínica, e na busca por protocolos mais conservadores, a elevação de margem gengival (DME) pode ser indicada. O objetivo deste trabalho é demonstrar, através de um caso clínico, a importância da DME associada à restauração indireta fresada em resina composta, utilizando o sistema CAD-CAM, em um dente com margem localizada além da junção cemento esmalte (JCE). O presente relato de caso descreveu o tratamento restaurador do segundo pré-molar superior esquerdo, que inicialmente apresentava cárie extensa sob uma restauração em resina composta nas faces oclusal e mesial; e, após sua remoção, teve a margem cervical da face mesial alocada subgengivalmente. A opção de tratamento foi a DME em resina composta, seguida do tratamento endodôntico, selamento da entrada dos condutos, núcleo de preenchimento de resina composta, e restauração final tipo onlay, também em resina composta, produzida através do sistema de design e fabricação assistida digitalmente (CAD-CAM). O tratamento proposto demonstrou que a DME possibilita a perfeita adaptação da restauração diretamente ao dente, eliminando a necessidade de aumento de coroa clínica (ACC). Assim, viabilizou-se um tratamento efetivo, rápido, de menor comorbidade e custo financeiro reduzido ao paciente. Após quatro meses, a avaliação clínica e radiográfica da restauração evidenciou boa adaptação marginal, estética agradável, bom polimento e saúde gengival, sem sinal inflamatório.

Palavras-chave: Resina composta, CAD-CAM, adaptação marginal dentária, onlay dental, biomimética.

[1] Dental Surgeon, Odontoclínica Central da Marinha (OCM), Marinha do Brasil, Rio de Janeiro, Brazil.

How to cite this article: Drebel DTGC, Montenegro SP. Gingival margin elevation and indirect restoration in milled composite resin in tooth with subgingival margin: case report. Nav Dent J. 2024; 51(2): 33-42.

Received: 09/05/2024
Accepted: 10/09/2024

INTRODUCTION

In search of increasingly conservative and minimally invasive procedures, biomimetic dentistry has been refining concepts aiming to preserve dental structure and vitality, increasing the longevity of the tooth and rehabilitative treatments (1,2). Restoring teeth with subgingival margins is challenging for clinical practice, whether with direct or indirect restorations (3). Cavity preparations that go beyond the cement-enamel junction (CEJ) can bring some problems, such as proximity to the bifurcation area (4,5), difficulty in isolation with a rubber dam, in polishing and the adaptation of inadequate restorations, leading to gingival inflammation and compromised adhesion due to the absence of enamel at the margins (4).

Deep margin elevation (DME) is a minimally invasive procedure that uses biomimetic protocols. Described in 1998 by Dietschi and Spreafico, this technique assists in resolving cases with cavities with subgingival margins (3,4,6), repositioning the cervical margin to a more favorable position through composite resin restorations (6–9). This procedure may replace clinical crown lengthening (CCL) and orthodontic extrusion or complement them in treating teeth with extensive loss of dental tissue in the gingival direction (7,8,10,11). In addition to being a more economical and comfortable alternative compared to CCL surgery and orthodontic extrusion (3,4), DME is compatible with periodontal health (6), once the composite resin is properly polished, without excess, with good margin contour (4) and respecting biological distances (11).

To ensure adequate DME, it is essential to perform a periodontal assessment to ensure gingival health (6). The gingival sulcus has an average of 0.69 mm, while the supracrestal attachment tissue is 2.04 mm, of which 0.97 mm corresponds to the junctional epithelium and 1.07 mm to the connective tissue (4). It is crucial to preserve biological distances without invading the connective tissue (11,12) and to ensure that the tooth has a band of keratinized gingiva approximately 2 mm wide (12).

Following the biomimetic protocol, assessing the presence of bio-rim, bio-dome, cracks, intercuspidal isthmus, cavity depth, and cusp thickness is important. Absolute isolation facilitates the removal of caries, the verification of wall thickness, and the restorative decision (5). The more structure is preserved during preparation, the better the mechanical properties and the greater the fracture resistance of the remaining part after restoration (13).

In DME, the restorative material is applied directly over the dentin margin, which presents challenges in adhesion due to its high organic content, high permeability, and low surface energy (14). Practices such as immediate dentin sealing (IDS), the use of conventional three-step adhesive systems and two-step self-etching (6), dentin sandblasting with aluminum oxide (15), and cavity cleaning with chlorhexidine are essential to improve marginal integrity and adhesive strength in dentin (4,11). The IDS is performed by applying an adhesive system with or without filler, associated or not with a flowable resin (resin coating) (6,16–18). The resin coating should be applied over the entire surface of the prepared dentin, thus reinforcing the IDS (11,16,17,19,20).

Direct composite resin restorations can be indicated for teeth with subgingival margins, or that extend beyond the CEJ. However, the indication usually falls on inlays/onlays in the chairside (5,6) technique, which offers good durability, marginal adaptation, and benefits gingival health (21) due to their excellent polishing.

DME may or may not be associated with indirect restorations and involves complex procedures with high technical sensitivity that depend on the execution and skill of the dental surgeon. This work aims to describe a clinical case, highlighting the importance of DME associated with the milled indirect restoration in composite resin, using the CAD-CAM system, in a tooth with a margin located beyond the CEJ.

CASE REPORT

The case report was submitted to the Marcílio Dias Naval Hospital Research Ethics Committee and approved by opinion number 7,082,166. The patient signed the informed consent form (ICF) and was selected through clinical and radiographic evaluation at the Prosthetics Clinic of the Odontoclínica Central da Marinha (OCM), in Rio de Janeiro, Brazil.

A 45-year-old Caucasian man, with madical history of kidney stones and hypothyroidism, sought care at the OCM for dental evaluation, as they would participate in an internal selection process. During the clinical evaluation, he reported pain to cold and when chewing, with a slow decline in the second upper left premolar. The patient had a composite resin restoration on the occlusal and mesial surfaces and decay under the restoration. The radiographic examination revealed extensive caries under the restoration, with pulp proximity (figure 1A). The carious lesion was removed, and the endodontic access was performed. However, the endodontics were not completed in the same appointment. The cervical margin of the mesial proximal box was located subgingivally (figure 1B). Radiographically, it was observed the distance between the bone crest and the carious lesion was approximately 2 mm, which allowed for the DME with composite resin, eliminating the need for CCL (figure 1A).

The procedure began with gingival anesthesia using 2% lidocaine with 1:100,000 epinephrine – Alphacaine (DFL, Rio de Janeiro, Brazil) and absolute isolation with modified clamps 202 on the upper left first molar and and 206 on the upper left second premolar, Sanctuary rubber dam (KDent, Santa Catarina, Brazil) and Teflon tape strip (figure 2A and 2B). The provisional zinc oxide restoration was removed with a spherical diamond tip reference 1014 (KG Sorensen, São Paulo, Brazil); and, with the cavity clean (figure 2C), the canal entrance was sealed with a small ball of Teflon tape, preventing any moisture from coming from inside the canal (figure 2C). The remaining dental structure was evaluated, and only the mesial wall – which ended below the gingival level – needed to be elevated coronally. The other surrounding walls were filled to prevent wear of the dental structure during preparation for indirect restoration type onlay.

A 0.5 cm wide steel matrix was selected and trimmed to better fit the mesial face margin. Then, the matrix was fixed with two anatomical wooden wedges (TDV, Santa Catarina, Brazil) and inserted through the buccal and palatal surfaces (figure 2C). With the metal matrix in position, conditioning was performed with 37% phosphoric acid Attack Acid (Iodontosul, Rio Grande do Sul, Brazil) for 30 seconds on enamel and 15 seconds on dentin, rinsing with water and drying with an endodontic suction device. The Adper® Scotchbond® Multi-Purpose adhesive system (3M ESPE, Minnesota, United States) was used for the adhesive layer, according to the manufacturer's instructions and photopolymerized with the Valo® device (Ultradent, Utah, USA) for 60 seconds. The composite resin type flow Applic (Maquira, Paraná, Brazil) was used to perform the resin coating and photoactivated for 40 seconds, followed by incremental layers with 1 mm thickness of composite resin Forma® shade A1E (Ultradent, Utah, USA) for margin elevation on the mesial face and reinforcement of the surrounding walls. Each increment was photoactivated for 60 seconds with the Valo® device, maintaining access to the root canals through the occlusal and continuing the endodontic treatment.

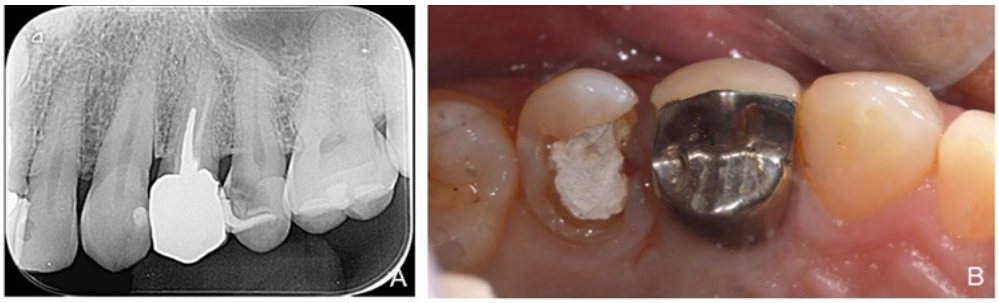

Figure 1: A) Initial X-ray; **B)** Initial assessment after removal of caries and pre-existing restoration. Observe the presence of the mesial subgingival margin.

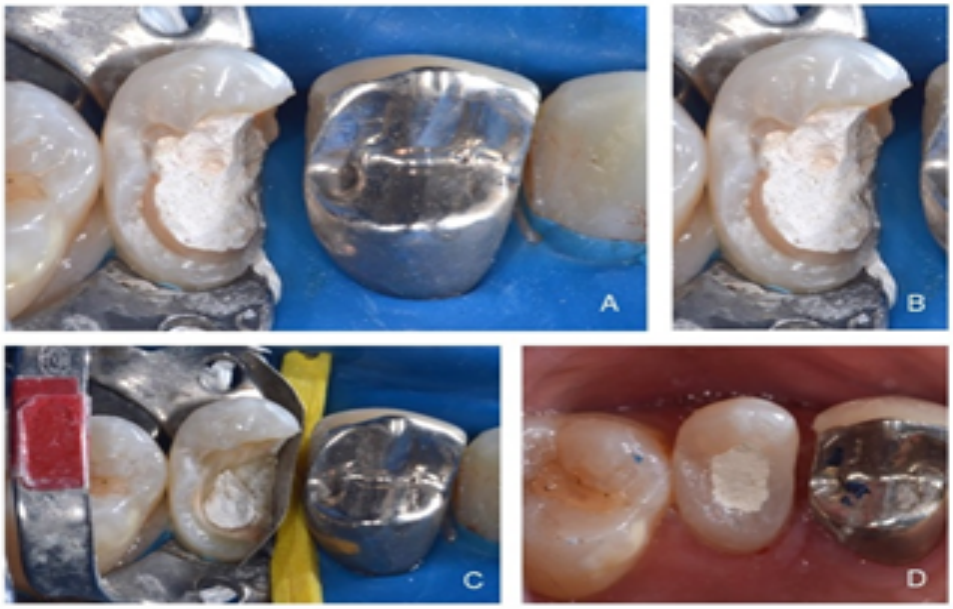

Figure 2: A) Absolute isolation installed. **B)** Detail of the isolation of the upper left second molar, with the insertion of Teflon tape to improve the adaptation of the rubber dam on the mesial surface of the tooth. **C)** After removing the dressing and cleaning the cavity, adaptation of the metal matrix and anatomical wooden wedge. Teflon tape placed at the mouth of the channel to prevent moisture. **D)** GME performed and sealing of the duct entrance with zinc oxide and eugenol cement.

The strand of Teflon tape was removed from the access to the ducts, which were irrigated with saline solution and dried with an endodontic suction device. Then, a delay dressing was applied with a cotton wick, tricresol, and provisional sealing with zinc oxide cement (figure 2D). For the external finishing of the DME, fine diamond tips, reference 2200F, and 1111F were used, in addition to red and orange Sof-Lex® Pop-on sanding discs and Sof-Lex® sanding strips (3M ESPE, Minnesota, United States).

The patient was referred to the clinic of Endodontics and underwent endodontic treatment in a single session. After two weeks, he returned to the Prosthetics Clinic to continue the restorative treatment. The digital periapical radiograph indicated compliance with the endodontic treatment and maintenance of the gingival margin elevation in composite resin previously performed (figure 3A).

Figure 3: **A)** Periapical radiograph after endodontic treatment, showing good adaptation of the mesial restoration for gingival margin elevation. **B)** Removal of the dressing and cleaning of the cavity after endodontic treatment. **C)** Filling completed. **D)** Tooth prepared for indirect restoration type onlay in milled composite resin.

The procedure was initiated with gingival anesthesia using 2% lidocaine with 1:100,000 epinephrine - Alphacaine (DFL, Rio de Janeiro, Brazil). Absolute isolation was performed with a rubber dam and modified clamp 206 on the upper left second molar, followed by made with glass ionomer cement. The cavity was cleaned with a conical trunk diamond tip, reference 4138F (KG Sorensen), maintaining the elevation of the mesial wall and the filling of the surrounding walls previously performed (figure 3B). Then, conditioning was done with 37% phosphoric acid (Attack Ácido, Iodontosul) for 1 minute on the resin and 15 seconds on the dentin, followed by washing with water and drying with an endodontic cannula. The adhesive system Adper® Scotchbond® Multi-Purpose (3M ESPE) was applied according to the manufacturer's instructions and light-cured for 60 seconds. After that, the flow Applic resin (Maquira) was applied, followed by the Forma® composite resin color A1E (Ultradent) for the filling core in horizontal increments of approximately 1 mm thickness, photopolymerized for 60 seconds (figure 3C).

Removed the absolute isolation, the tooth was prepared for an indirect restoration type onlay in milled composite resin. The mesial wall, where the elevation of the margin in composite resin was performed, received a partial preparation, maintaining the cavity finish in composite resin. The occlusal surface was reduced by approximately 2 mm, while the distal and buccal surfaces did not need to be reduced, as they were more than 2 mm thick (22). All preparation margins were kept in enamel, except on the mesial surface, where it was kept in composite resin, using diamond burs, reference 4138, 2131, and 4138F (KG Sorensen). The preparation was scanned on the CEREC Omnicam device (Dentsply Sirona, Charlotte, United States) (figure 4A). The

indirect restoration was designed in the CEREC 4.6.2 Software (Dentsply Sirona) on the virtual model (figures 4B, 4C, and 4D), and the Grandio Blocs 14L A3 LT shade nanohybrid resin block (VOCO, Cuxhaven, Germany) was milled in the InLab MCXL equipment (Dentsply Sirona, Bensheim, Germany). The milled part was polished with silicone tips

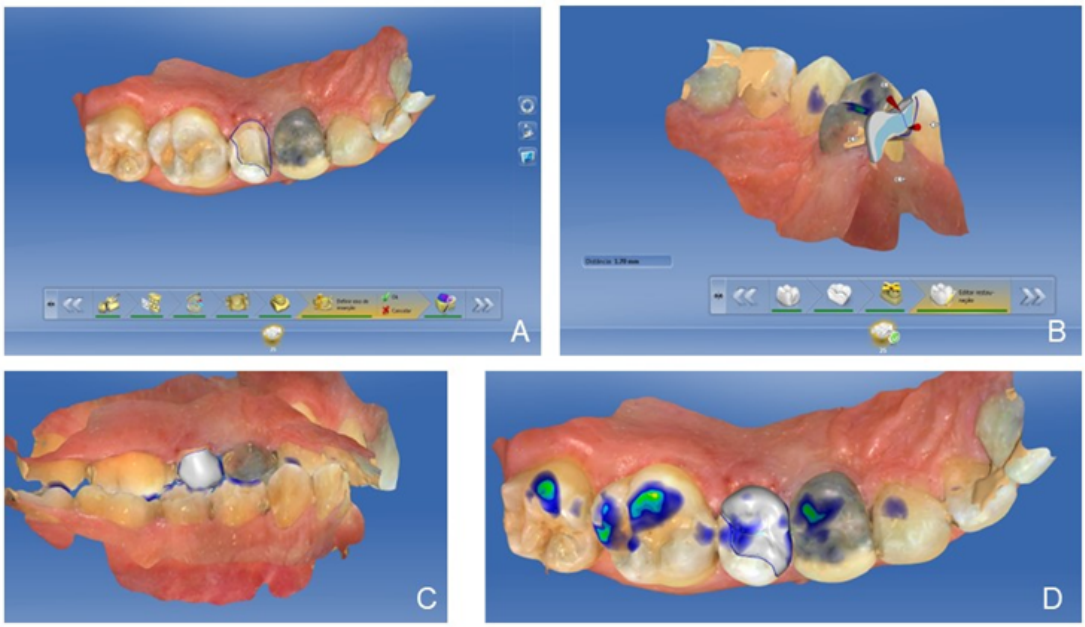

Figure 4: A) Image of the tooth after scanning with CEREC Omnicam and viewing through the CEREC 4.6.2 software. **B)** Evaluation of the thickness of the part after drawing. **C)** Evaluation of the part in lingual view. **D)** Evaluation of the piece in occlusal view.

impregnated with silica PPU 20 and PU30 (DhPro, Paraná, Brazil) and then taken for a trial in the mouth. After testing and verifying the marginal adaptation and proximal contacts, gingival anesthesia of the upper left first molar was performed to install absolute isolation. A rubber dam (Madeitex, São Paulo, Brazil) was used from the upper left first molar to the upper left canine, with the modified clamp 202 applied to the upper left first molar and a ligature with dental floss on the upper left second molar, aiming to adequately expose the cervical margin of the preparation (Figure 5A). Then, another test of the part was carried out to verify

Figure 5: A) IInstallation of absolute isolation for resin cementation of the indirect resin restoration. **B)** Cemented restoration, before finishing. **C)** After occlusal adjustment, finishing, polishing, and removal of the rubber dam. **D)** Vestibular view of the upper left second molar after final restoration.

the absence of interferences from the absolute isolation.

The part was prepared by roughening the internal surface with a diamond tip reference 4138F (KG Sorensen). Then, cleaning was done with 70% alcohol and the application of silane (Angelus, Paraná, Brazil) with the aid of a micro brush (KG Sorensen) for 60 seconds and dried with air jets. The 37% phosphoric acid (Attack Acid, Iodontosul) was applied for 30 seconds on the enamel and composite resin, followed by washing with water and drying with an endodontic cannula and gentle air jets. The bond of the Adper® Scotchbond® Multi-Purpose system (3M ESPE) was applied according to the manufacturer's instructions and polymerized with the Valo® device (Ultradent) for 60 seconds. The dual-cure resin cement AllCem® color A2 (FGM, Santa Catarina, Brazil) was applied with a mixing tip on the previously prepared piece and seated on the tooth. After removing the marginal excesses of the resin cement with brushes and dental floss, the piece was photoactivated with the Valo® device (Ultradent) for 2 minutes on each side (figure 5B).

Removed the absolute isolation, the occlusal adjustment was performed with Arti-Check 40mm carbon (Bausch, Cologne, Germany) and fine diamond tips reference 3118F and 2200F (KG Sorensen). The polishing was achieved using sequential abrasive rubber tips impregnated with Jiffy® silica (Ultradent, Utah, United States), Opal-L polishing paste no. 520-0001 (Renfert, Hilzingen, Germany), and a goat hair brush (American Burrs, USA) (figure 5C and 5D).

The tooth was re-evaluated clinically and radiographically after four months (Figures 6A and 6B) showing a good marginal adaptation and a healthy appearance of the gum, with slight bleeding after several probings at the mesial margin.

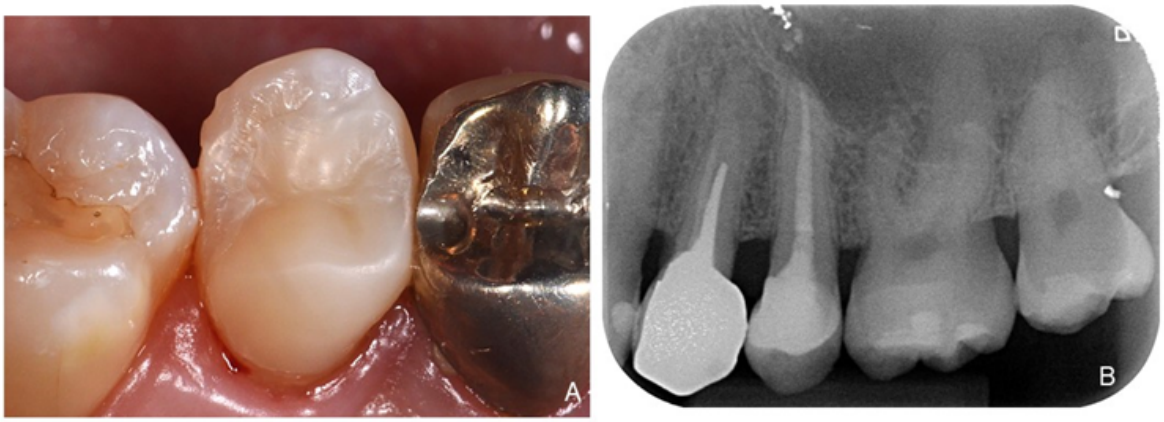

Figure 6: **A)** Clinical evaluation after 4 months. **B)** Radiographic evaluation.

DISCUSSION

The present case report described the restorative treatment of the upper left premolar, which initially presented extensive caries under a composite resin restoration on the occlusal and mesial surfaces. After removing the restoration, the cervical margin of the mesial face extended subgingivally. The treatment option was DME with composite resin, followed by endodontic treatment, sealing of the canal entrances, composite resin core build-up, and finally, the final restoration type onlay, also in composite resin, produced through the digitally assisted design and manufacturing system (CAD-CAM).

The case planning was developed after a thorough clinical and periodontal evaluation of the remaining dental structure. Periodontal assessment is essential to ensure gingival health (6). Three therapeutic approaches are suggested based on the distance between the cervical margin of the preparation and the connective insertion or bone level, in addition to the possibility of adequately isolating the tooth in a classification for restorations with subgingival margins (23,24). This is divided as follows: grade I, when it is possible to install the rubber dam in the gingival sulcus, and the margin can be completely visualized, DME is performed with approximately 1.5 mm thickness associated with the indirect restoration; grade II, when the rubber dam is not sufficient to retract the gingiva but the biological space is respected, surgical exposure of the preparation margin, DME, and indirect restoration are performed; grade III, when there is invasion of the biological space, CCL is necessary, followed by DME and indirect restoration (23,24).

The described case was classified as grade I since the sulcular probing identified 2 mm between the free gingival margin and the alveolar bone. Absolute isolation was sufficient to expose the preparation margin, adapt the metal matrix, and raise the margin with composite resin by approximately 1.5 mm. After adequate restoration and polishing, the gum reattaches to the tooth, forming a long junctional epithelium (4,7). A rigorous support therapy is of utmost importance for the success of the treatment,

with scheduled follow-ups and good oral hygiene, including the use of dental floss and interdental brush in the DME area (6,10,25). A study by Muscholl et al. concluded no increase in gingival or periodontal inflammation after three years of follow-up in patients using an interdental brush in the area where the DME was performed (10).

After the periodontal evaluation, the analysis of the dental structure allows for better utilization of the remaining part, avoiding unnecessary wear of the tooth. The cohesive strength of the dentin-enamel junction (DEJ) is 51.5 MPa, being an important structure to be preserved during cavity preparations. This force alters the direction of occlusal forces and prevents the formation and propagation of cracks in the dentin, minimizing dentinal stresses (26,27). The protective enamel dome, associated with the DEJ and dentin, forms the bio-dome on the occlusal surface of the tooth (28). When the bio-dome is lost, the tooth becomes weakened and may fail, commonly in the form of an oblique fracture, leading to the loss of the cusp (28). Like the bio-dome, the bio-ring reinforces the cervical region of the tooth or below the dental equator, where the enamel, the DEJ, and the dentin function as a support belt (28). When the bio-rim is preserved, as in preparation for onlay, the risks of tooth fracture are reduced, compared to the installation of a full crown, which requires the removal of this supporting structure. (28).

The thickness of the cusps should also be carefully evaluated to prevent fractures. For non-vital teeth, the minimum thickness of the working cusp wall should be 3 mm, while the other walls can be up to 2 mm thick (22). Forster et al. demonstrated that mesio-occluso-distal (MOD) cavities with up to 3 mm depth can be restored with composite resin, acquiring fracture resistance similar to that of a healthy tooth, regardless of the thickness of the walls (13). On the other hand, cavities with 5 mm or more in-depth, whether the teeth are vital or not, do not show the same resistance to fracture after direct restoration with composite resin, requiring indirect restoration (13). In the case of the reported upper left second premolar, the palatal wall was already fractured before the restorative treatment, possibly due to its reduced thickness (less than 2 mm), the depth of the cavity (approximately 5 mm), and the endodontic access performed.

The need for endodontic treatment should be assessed during the structural analysis of the tooth and treatment planning. Whenever possible, immediate dentin sealing (IDS) should be performed before endodontic treatment, as the irrigating solutions used can cause changes in the physical and chemical properties of dentin, affecting its hardness (29,30) and, consequently, the interaction of restorative materials with dentin (30). The most used irrigating solution, sodium hypochlorite, acts as a proteolytic agent that solubilizes the organic matrix of the dentin wall, causing a reduction in the bond strength of adhesive systems on exposed dentin, in addition to having a residual effect by releasing oxygen-inhibiting resin polymerization (31,32). In turn, the EDTA has a chelating effect, which causes the dentin's demineralization, the dentinal tubules' widening, and increased demineralization depth (29,32). In this way, the adhesive systems may not adequately penetrate the entire extent of the demineralized matrix, impairing adhesion.

These data reinforce the decision to perform IDS, DME, and the reinforcement of the buccal, palatal, and distal walls before the endodontic treatment in this case report. Although the tooth already had endodontic access, the cavity was cleaned again under absolute isolation; the remaining tooth structure was evaluated and then followed by the IDS, the resin coating, the DME, and the filling with composite resin, maintaining access to the root canal system. The filling with composite resin reinforced the existing dental structure, avoiding unnecessary structural wear. Furthermore, it facilitated absolute isolation for endodontic treatment, reduced the risk of dental fracture, and improved the adhesion of composites to dentin (5, 19).

To start the DME, the rubber sheet must be well adapted to avoid interference with the restoration (5,6). A metal matrix, whether steel or copper, can be applied partially or circumferentially from the cervical margin (5). The matrix must be larger than the level you want to raise the margin but narrow enough to reach the subgingival area without deforming (5). The matrix must be adequately stabilized using wedges, wedjets, rings, and even increments of composite resin (6). When it is impossible to adapt the matrix adequately, the DME should not be attempted due to the risk of microleakage and recurrent caries at the margins (6).

As the margins of the cavity extended beyond the CEJ, the adhesion of the DME occurred in the dentin, which contains more organic matter and fewer minerals than the enamel. A cohesive force of the magnitude found in the DEJ should be the goal of current adhesive systems about dentin (6,27). IDS reproduces DEJ by applying an adhesive system with or without filler and can be associated with a flowable resin (resin coating) (6,16-18). IDS reduces bacterial infiltration, the formation of gaps, and dentin hypersensitivity, as well as increases bond strength and reinforces the tooth structure. The resin coating interacts with the resin/resin cement that will be applied during cementation, reducing adhesive permeability, increasing the adaptation of

these cements, also of indirect restorations, besides to promoting higher micro tensile values of onlay-type restorations onlay. A study in vitro by Murata et al. on adhesive strength and types of fracture demonstrated that the fracture of ceramic onlay restorations occurred only at the interface between the cement and the dentin in the group where IDS was not applied, thus highlighting its effectiveness.

The selection of material for DME is relevant for the survival and performance of the restoration, especially regarding marginal adaptation and adequate continuity between the tooth and the restorative material. (7,14). Various materials have been indicated, including conventional composite resin, flow resin, bulk-type resin, glass ionomer cement, and glass ionomer-modified resins (8). In the reported case, the materials chosen for the IDS, DME, and resin core build-up were selected based on availability in the clinic. The good clinical performance of the composite resin (Forma - Ultradent), combined with the conventional three-step adhesive system (Scotchbond Multiuso - 3M ESPE), provides reliable adhesive results.

An in vitro study by Spreafico et al. compared the DME using nanohybrid composite resin (Filtek Supreme XTE – 3M ESPE) and flow resin (Filtek Supreme XTE Flowable – 3M ESPE). The results showed no significant difference between the groups before or after thermocycling, and the adaptation of resin or ceramic crowns on the DME was also similar (35). However, other authors indicate that fluid composites are more susceptible to degradation, although they have superior sealing compared to nanohybrid composites (6,8,14). For this reason, they are contraindicated for DME. A study in vitro by Bresser, Carvalho, and Naves revealed a higher incidence of catastrophic fractures when the DME was not used on ceramic inlays (21).

After the DME and the filling of the endodontic access, it was decided to use an onlay type restoration in composite resin manufactured using CAD-CAM technology. The use of indirect composite resin restorations, whether produced conventionally or by CAD-CAM, allows all stresses to be relieved before the cementation of the pieces, especially benefiting marginal adaptation. (11,23). Although glass ceramics, such as lithium disilicate and feldspathic ceramic, exhibit excellent mechanical and optical properties, they are brittle, crack under load and chip, are difficult to repair, and wear down the opposing tooth (2).

CAD-CAM type indirect resins have advantageous characteristics, such as modulus of elasticity and flexibility similar to dentin, aesthetic stability, better absorption of masticatory forces, less tendency to marginal fracture, lower cost, no need for firing in a special oven, and easy intraoral repair compared to ceramics. (36). These materials present a less sensitive and predictable technique, as they are more homogeneous and have fewer internal flaws. This results in greater reliability, good marginal adaptation, and superior clinical longevity compared to direct composite resin restorations (20,36). Besides these factors, the choice for indirect restoration assisted by CAD-CAM technology in this study aimed to optimize time, allowing the treatment to be completed in a single appointment without needing molding, provisional restoration, or external laboratory assistance.

A clinical study by Souza et al. demonstrated that ceramic and resin onlays showed no statistical differences in aesthetics, function, and biological properties after one year of function (36). Both materials exhibited marginal degradation, but this degradation was significant only for ceramics in terms of gloss, color matching, and translucency (36). Another study followed indirect restorations in composite resin and ceramic on DME for 10 to 12 years, revealing success rates of 80 and 88%, respectively (11). This study indicated a greater marginal degradation in indirect resin restorations (11). Elmoselhy et al. study followed indirect partial restorations of nano-hybrid resin and milled lithium disilicate (37). They evaluated the restorations' marginal adaptation, discoloration, and fracture. After six months, there was a better marginal adaptation of the resin, but at the 12 and 24-month follow-ups, no significant differences were found between the groups (37). This similarity can be attributed to the fact that the composite piece and the resin cement wear out at similar rates, allowing for a good adaptation (37). Ceramic restorations, on the other hand, are more brittle and present a higher risk of small marginal fractures (37).

There are few longitudinal studies on DME, mostly in vitro studies and case reports (4). When used in conjunction with indirect restorations, DME shows a higher survival rate than when CCL is performed, especially in non-vital teeth and indirect composite resin restorations (5). Among the main observed failures, marginal discoloration, caries infiltration (5,6), and fractures in both the tooth and the restoration stand out; however, there is no change in periodontal health (5). It is suggested that the operator's skill and execution technique significantly impact clinical success more than the restorative material used (6). Long-term, multicenter, and standardized clinical studies can provide valuable data that improves public health. Expanding evidence on DME can change the working philosophy of many dentists and increase the survival of extensively destroyed teeth.

CONCLUSION

The proposed treatment demonstrated that DME allows perfect adaptation of the restoration directly to the tooth, eliminating the need for CCL. Moreover, it favors the fabrication and adaptation of the indirect restoration to dental preparation. The restoration type onlay in composite resin on the DME contributed to preserving the remaining dental structure and distributing forces through the resin structure, reducing the risk of dental fracture. Thus, an effective, quick treatment with lower comorbidity and reduced financial cost was made possible for the patient. In the clinical and radiographic evaluation of the restoration, carried out after four months, good marginal adaptation, pleasant aesthetics, good polishing, and gingival health were observed, with no inflammatory signs.

The authors declare no conflicts of interest.

Correspondending author:
Débora Teresa Griebeler Carvalho Drebel
Address: Odontoclínica Central da Marinha - Av. Rodrigues Alves, 335 - Centro, Rio de Janeiro - RJ, 20091-000 – Brazil.
Email: deboracarvalho84@gmail.com

REFERENCES

1. Singer L, Fouda A, Bourauel C. Biomimetic approaches and materials in restorative and regenerative dentistry: review article. BMC Oral Health. 2023 Fev 16;23(1):105.
2. Suksawat N, Angwaravong O, Angwarawong T. Fracture resistance and fracture modes in endodontically treated maxillary premolars restored using different CAD-CAM onlays. J Prosthodont Res. 2024 Abr 8;68(2):290-8.
3. Langoni A, Almeida G, Mota I, Dietrich L, Nascimento F, Viana H. Deep Margin Elevation: a restorative possibility to be considered. Res Soc Dev. 2020;9(11):e3799119863.
4. Aldakheel M, Aldosary K, Alnafissah S, Alaamer R, Alqahtani A, Almuhtab N. Deep Margin Elevation: Current Concepts and Clinical Considerations: A Review. Medicina. 2022;58:1482. doi: 10.3390/medicina58101482.
5. Mugri MH, Sayed ME, Nedumgottil BM, Bhandi S, Raj AT, Testarelli L, *et al*. Treatment Prognosis of Restored Teeth with Crown Lengthening vs. Deep Margin Elevation: A Systematic Review. Materials. 2021;14:6733. doi: org/10.3390/ma14216733.
6. Samartzi TK, Papalexopoulos D, Ntovas P, Rahiotis C, Blatz MB. Deep Margin Elevation: A Literature Review. Dent. J. 2022;10:48. doi: 10.3390/dj10030048.
7. Felemban MF, Khattak O, Alsharari T, Alzahrani AH, Ganji KK, Iqbal A. Relationship between Deep Marginal Elevation and Periodontal Parameters: A Systematic Review. Medicina (Kaunas). 2023 Nov 3;59(11):1948.
8. El-Ma'aita AM, Radwan H, Al-Rabab'ah MA. Deep Margin Elevation - A Retrospective Clinical Study. J Adhes Dent. 2024 Jan 15;26(1):117-24.
9. Dietschi D, Spreafico R. Current clinical concepts for adhesive cementation of tooth-colored posterior restorations. Pract Periodontics Aesthet Dent. 1998 Jan-Feb;10(1):47-54; quiz 56.
10. Muscholl C, Zamorska N, Schoilew K, Sekundo C, Meller C, Büsch C, *et al*. Retrospective Clinical Evaluation of Subgingival Composite Resin Restorations with Deep-Margin Elevation. J Adhes Dent. 2022 Ago 19;24(1):335-44.
11. Bresser RA, Gerdolle D, van den Heijkant IA, Sluiter-Pouwels LMA, Cune MS, Gresnigt MMM. Up to 12 years clinical evaluation of 197 partial indirect restorations with deep margin elevation in the posterior region. J Dent. 2019 Dez;91:103227.
12. Sarfati A, Tirlet G. Deep margin elevation versus crown lengthening: biologic width revisited. Int J Esthet Dent. 2018;13(3):334-56.
13. Forster A, Braunitzer G, Tóth M, Szabó BP, Fráter M. In Vitro Fracture Resistance of Adhesively Restored Molar Teeth with Different MOD Cavity Dimensions. J Prosthodont. 2019 Jan;28(1):e325-31.
14. Ismail HS, Ali AI, Mehesen RE, Juloski J, Garcia-Godoy F, Mahmoud SH. Deep proximal margin rebuilding with direct esthetic restorations: a systematic review of marginal adaptation and bond strength. Restor Dent Endod. 2022 Mar 4;47(2):e15. doi: 10.5395/rde.2022.47.e15.
15. Sinjari B, Santilli M, D'Addazio G, Rexhepi I, Gigante A, Caputi S, *et al*. Influence of Dentine Pre-Treatment by Sandblasting with Aluminum Oxide in Adhesive Restorations. An In Vitro Study. Materials (Basel). 2020 Jul 7;13(13):3026.
16. Magne P. Immediate dentin sealing: a fundamental procedure for indirect bonded restorations. J Esthet Restor Dent. 2005;17(3):144-54; discussion 155.
17. Magne P, Kim TH, Cascione D, Donovan TE. Immediate dentin sealing improves bond strength of indirect restorations. J Prosthet Dent. 2005 Dez 1;94(6):511-9.
18. de Carvalho MA, Lazari-Carvalho PC, Polonial IF, de Souza JB, Magne P. Significance of immediate dentin sealing and flowable resin coating reinforcement for unfilled/lightly filled adhesive systems. J Esthet Restor Dent. 2021;33(1):88-98.
19. Magne P, So WS, Cascione D. Immediate dentin sealing supports delayed restoration placement. J Prosthet Dent. 2007 Set;98(3):166-74.
20. Murata T, Maseki T, Nara Y. Effect of immediate dentin sealing applications on bonding of CAD/CAM ceramic onlay restoration. Dent Mater J. 2018 Nov 30;37(6):928–39.
21. Bresser RA, Carvalho MA, Naves LZ, Melma H, Cune MS, Gresnigt MMM. Biomechanical behavior of molars restored with direct and indirect restorations in combination with deep margin elevation. J Mech Behav Biomed Mater. 2024 Apr;152:106459. doi: 10.1016/j.jmbbm.2024.106459.
22. Ferraris F. Posterior indirect adhesive restorations (PIAR): preparation designs and adhesthetics clinical protocol. Int J Esthet Dent. 2017;12(4):482-502.
23. Veneziani M. Adhesive restorations in the posterior area with subgingival cervical margins: new classification and differentiated treatment approach. Eur J Esthet Dent. 2010;5(1):50-76.
24. Ghezzi C, Brambilla G, Conti A, Dosoli R, Ceroni F, Ferrantino L. Cervical margin relocation: case series

and new classification system. Int J Esthet Dent. 2019;14(3):272-84.
25. Fichera G, Mazzitelli C, Picciariello V, Maravic T, Josic U, Mazzoni A, *et al*. Structurally compromised teeth. Part II: A novel approach to peripheral build up procedures. J Esthet Restor Dent. 2024;36(1):20-31.
26. Milicich G, Rainey JT. Clinical presentations of stress distribution in teeth and the significance in operative dentistry. Pract Periodontics Aesthet Dent. 2000 Set;12(7):695-700; quiz 702.
27. Urabe I, Nakajima S, Sano H, Tagami J. Physical properties of the dentin-enamel junction region. Am J Dent. 2000 Jun;13(3):129-35.
28. Milicich G. The compression dome concept: the restorative implications. Gen Dent. 2017;65(5):55-60.
29. Macêdo B, Sousa V, Verde G, Martins I, Lima L. Influência de substâncias irrigadoras endodônticas na microdureza da dentina radicular - revisão integrativa. OCC. 2021;20(2):52-7.
30. Saber SEDM, El-Askary FS. The Outcome of Immediate or Delayed Application of a Single-Step Self-Etch Adhesive to Coronal Dentin Following the Application of Different Endodontic Irrigants. Eur J Dent. 2009 Abr;3(2):83-9.
31. Moghaddas MJ, Moosavi H, Ghavamnasiri M. Microleakage Evaluation of Adhesive Systems Following Pulp Chamber Irrigation with Sodium Hypochlorite. J Dent Res Dent Clin Dent Prospects. 2014;8(1):21-6.
32. Haralur SB, Alqahtani MM, Alqahtani RA, Shabab RM, Hummadi KA. Effect of Dentin-Disinfection Chemicals on Shear Bond Strength and Microhardness of Resin-Infiltrated Human Dentin in Different Adhesive Protocols. Medicina. 2022 Set;58(9):1244.
33. Bresser RA, van de Geer L, Gerdolle D, Schepke U, Cune MS, Gresnigt MMM. Influence of Deep Margin Elevation and preparation design on the fracture strength of indirectly restored molars. J Mech Behav Biomed Mater. 2020 Oct;110:103950. doi: 10.1016/j.jmbbm.2020.103950.
34. Ozer F, Batu Eken Z, Hao J, Tuloglu N, Blatz MB. Effect of Immediate Dentin Sealing on the Bonding Performance of Indirect Restorations: A Systematic Review. Biomimetics (Basel). 2024 Mar 17;9(3):182.
35. Spreafico R, Marchesi G, Turco G, Frassetto A, Di Lenarda R, Mazzoni A, *et al*. Evaluation of the In Vitro Effects of Cervical Marginal Relocation Using Composite Resins on the Marginal Quality of CAD/CAM Crowns. J Adhes Dent. 2016;18(4):355-62.
36. Souza J, Fuentes MV, Baena E, Ceballos L. One-year clinical performance of lithium disilicate versus resin composite CAD/CAM onlays. Odontology. 2021 Jan 1;109(1):259-70.
37. Elmoselhy HAS, Hassanien OES, Haridy MF, Salam El Baz MAE, Saber S. Two-year clinical performance of indirect restorations fabricated from CAD/CAM nano hybrid composite versus lithium disilicate in mutilated vital teeth. A randomized controlled trial. BMC Oral Health. 2024 Jan 17;24(1):101.