Adhesive Restoration in Posterior Teeth using Semidirect Technique

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ABSTRACT

Aim: The aim of this article was to present a detailed case report of semidirect composite restoration in tooth #36 and its anatomical and aesthetic reestablishments. Semidirect restorative technique is an alternative with many advantages for both clinicians and patients. It can improve esthetics with minimal dental tissue removal, reduce polymerization contraction, improve marginal sealing, reduce infiltration and postoperative sensitivity, and enhance the restoration longevity. Moreover, it is a low-cost technique and carried out in a single session. A female patient reported with sensitivity and discomfort in tooth #36 region; clinical evaluation showed marginal infiltration and restoration loss, and thus, semidirect restoration technique was recommended. The impression was carried out using precision alginate, and a semirigid addition silicone model was obtained. Semidirect restoration was performed using a model outside the mouth. Semidirect restoration is a viable alternative improving dental esthetics with conservative treatment, reducing polymerization shrinkage, improving marginal sealing, reducing infiltration and postoperative sensitivity, and enhancing restoration quality.

Clinical significance: Semidirect restoration is a low-cost technique with advantages, such as polymerization control, esthetic refinement, and facilitating of occlusal and contact point adjustments.

Keywords: Dental esthetics, Esthetic dentistry, Indirect–direct restoration.


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INTRODUCTION

The search for beauty standards has increased the concept of esthetic values among people. Moreover, an esthetic smile has also been considered important and demanded by patients in dental surgeries. Nowadays, esthetic conservative treatments have been proposed and are based on minimally invasive dentistry with minimal healthy dental tissue removal.

Direct restoration using composite resins is indicated when tooth destruction is not large, such as small–medium cavity with proximal walls slightly divergent to proximal. However, composite resin restorations present limitations, such as polymerization shrinkage (causing cracks at tooth–restoration interface and increasing marginal leakage risk), and in addition, it is not indicated in large dental destruction with proximal walls and cusps involvement; thus, to solve those problems, indirect adhesive restorations are indicated.

Indirect adhesive restorations require more than one clinical session and a laboratory step. Clinicians send the preparation and antagonist teeth impressions to a dental laboratory, and then the technician makes an indirect restoration. An alternative method to indirect technique is the semidirect restoration, which uses both direct and indirect restoration principles.

Semidirect restoration is accessible, a simple technique with restorative quality, and mainly depends on the clinician’s ability. The treatment time is higher than direct restoration; however, semidirect restoration is performed in a single session. This principle of this technique provides an adhesive restoration without a laboratory step and high-cost inlays and/or onlays restorations. Therefore, the aim of the present case report was to describe a detailed semidirect restoration confection in tooth #36 and its anatomical esthetic reestablishment using a semirigid die.

CASE REPORT

A female patient reported with sensitivity and discomfort in tooth# 36 region, and clinical evaluation showed marginal infiltration and restoration loss (Fig. 1).

After evaluation, the semidirect restorative technique was the chosen treatment. First, tooth preparation was carried out using diamond burs at high speed under irrigation (Fig. 2). Semidirect restoration technique follows some indirect restoration principles, such as expulsive preparation with smooth wall and an occlusal box presenting 1.5 to 2 mm depth, rounded internal angles and sharp external angles, or presenting a 90° angle.

After tooth preparation, an impression was carried out using a Hidrogum V (Zhermack, Badia Polesine, Italy). The impression was poured using a Hidrobond 4 (Zhermack, Badia Polesine, Italy) and a 1:1 ratio of Bis-acrylic resin (Exacron, Zhermack, Badia Polesine, Italy), and the occlusion was adjusted. After adjustment, the restoration was removed and the composite material was placed directly in the mouth using a low-light curing machine (Ivoclar Vivadent, Lucerne, Switzerland). The restorative material was cured for 20 seconds, and the restoration was polished using a prophylaxis cup and diamond polishing disks (Komet, Bad Schildberg, Germany). The final restoration was evaluated, and the patient was satisfied with the esthetic result (Fig. 3).
Italy) high-precision alginate (Fig. 3), and semirigid addition silicone (Die Silicone – Voco, Cuxhaven, Germany) cast was obtained. During the cast, 36 region was kept smooth, and retentions were performed underneath the adjacent teeth. Glycerin-based insulation was applied in 36 region. A barrier made of condensation silicone was placed around silicone model to provide stability during tooth #36 separation using a scalpel blade #11 to obtain a die (Fig. 4).

After obtaining the die model, mesial–occlusal–distal restoration was performed using composite resin (GrandiOSO-VOCO, Cuxhaven, Germany) and light cured for 40 seconds for every 2 mm thickness at each increment (Fig. 5). The semidirect restoration was light-cured in both internal and external faces. Then, restoration was tried and adjusted in the mouth.

Afterward, luting procedure was performed following three steps: Internal rough surface and decontamination, prophylaxis and hybridization, and luting.

Internal restoration surface was prepared using diamond bur to obtain a rough surface. After that, the surface was decontaminated using 37% phosphoric acid for 1 minute and then rinsed.

Adhesive luting protocol was followed, absolute isolation was carried out, and prophylaxis tooth was acid etched with 37% phosphoric acid (FGM Produtos Odontológicos Ltda., Joinville, SC, Brazil) for 30 seconds (enamel) and 15 seconds (dentin) and rinsed; after that, an adhesive system was applied according to manufacturer’s instructions and light cured using a light-emitting diode system (LED Bluephase; Ivoclar Vivadent, Schan, Liechtenstein, AL) with 1.200 mW/cm² light intensity.

Semidirect restoration was luted using a dual-cure cement (Allcem FGM, Joinville, Brazil). After its insertion into the cavity, excesses were removed and cement
was light-cured. Occlusal and proximal contacts were adjusted, and semidirect restoration was submitted to final polishing (Fig. 6).

DISCUSSION

Composite resin has been widely used since it provides an esthetic and conservative treatment. Many studies have been conducted to improve composites’ mechanical behavior, reduce polymerization shrinkage, and polish maintenance. Polymerization shrinkage may cause marginal gaps or even cracks in dental structure or restoration due to internal stress occurrence when internal forces exceed tooth restoration–interface bond strength. Moreover, polymerization shrinkage is an important factor to be considered during restorative technique selection, since shrinkage controlling will minimize some postoperative problems, such as sensitivity, pain, and discomfort.3

Semidirect technique is indicated to minimize polymerization shrinkage and also when posterior teeth access is difficult, large dimensions cavities, or limited number of teeth.1

Therefore, semidirect restorations are recommended for: Teeth with expulsive cavities, avoiding unnecessary cavity preparation; large cavities with preserved anatomical references, such as cusp tips; defective restoration replacements, mainly indirect ones; limited number of teeth; posterior tooth with difficult access; low-cost restorations; and when a single session is needed and does not require a temporary crown confection.

• Semidirect technique has advantages: Incremental technique is not used similar to direct restorations; thus, air bubbles are not included; polymerization process is improved and polymerization shrinkage occurs outside the mouth; it improves physical properties of material, reducing marginal gaps and postoperative sensitivity; it is low in cost in comparison with indirect techniques; intra- and extraoral session times are reduced; composite resin material can be added to enhance proximal contacts; and there is the possibility to obtain better surface smoothness and esthetic result since finishing and polishing procedures are performed outside the mouth providing better adaptation and marginal sealing;
• However, it also presents some disadvantages: It requires longer working time than direct technique; preparation must be homogeneous and expulsive; more materials are required; the technique is more difficult and depends on the ability of the clinicians; and dental structure wear and treatment session time are higher than direct technique.

Both semi-direct and indirect restorations follow the same technical principles. When restorations need to be changed, e.g., amalgam restoration replacement, the cavity has already been performed, and the preparation must be adapted to semi-direct and indirect restorations.

Hydrogum 5 high-precision alginate is the choice material for the impression of semidirect tooth restorations. Semirigid addition silicones can be employed to obtain an immediate model (Die Silicone, VOCO) similar to the present study.

An additional polymerization can be performed after the last increment light curing. This additional step is carried out to improve the composite mechanical properties. Some in vitro studies4 have reported that the composite resin hardness and wear resistance were improved after that additional step. It can be performed using maximum light curing on all faces, or after photothermal treatment at 120°C for 7 minutes, or thermal postpolymerization using an autoclave or microwave oven.5,6 Magne7 suggests the use of an oven at 220° for a few minutes. In the same article, the author states that the esthetic potential and anatomy of extraoral composites are greatly improved by the possibility of performing more sophisticated layering than can be accomplished intraorally. In addition to improving restoration adaptation and seal because the main polymerization shrinkage is achieved without stress on the adhesive interface, the initial goals of semidirect techniques were also to facilitate clinical procedures and improve occlusal anatomy, contact points, and related function.

Tonetto et al8 indicate this kind of restorative treatment for cases in which the rehabilitations with full covering with ceramics for reanatomizations are contraindicated, as in the use in children and adolescents. The authors believe that semidirect restorations are a viable alternative because of the low cost, the advantage of extraoral polymerization, advantage of extraoral polymerization, and esthetic refinement as they are prone to be repaired easily.
Related to durability, Spreafico et al. evaluated the clinical performance and marginal adaptation of direct and semidirect class II composite restorations in a split-mouth design over 3.5 years, and the clinical results exhibited a retention rate of 100% after 3.5 years. No fractures were observed or even sensitivity compared with an equal number of restorations done directly (22 restorations performed). Recurrent caries was not detected too. The authors believe that the results achieved for semidirect restorations are related to its effectiveness of limiting polymerization stress because the only amount of composite to be cured \textit{in situ} is the cementing gap. This will improve the restoration adaptation and seal. Several authors agree with them too.\textsuperscript{10-13}

This case report showed that semidirect restoration improves esthetics with minimal dental tissue removal and it reduces polymerization shrinkage. Moreover, it allows postpolymerization as an additional step, which improves the composite mechanical properties and marginal sealing, reducing infiltration and postoperative sensitivity, thus contributing to restoration longevity.

A semirigid die provides a better contact point adjustment and marginal adaptation quality; however, it depends on the clinician ability also.

Therefore, semidirect technique is a viable alternative for the restoration of large cavities with one or a limited number of teeth performed in a single session, presenting both direct and indirect restoration advantages at low cost.

CONCLUSION

Semidirect restorative technique is a viable alternative with many advantages for both the clinician and patient. It can improve esthetics with minimal dental tissue removal, reduce polymerization shrinkage, improve the marginal sealing, minimize infiltration and postoperative sensitivity, and enhance restoration longevity.

Clinical Significance

Semidirect restoration technique using semirigid die is a viable alternative to obtain an adjusted contact point and a marginal adaptation performed in a single session.

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REFERENCES