

Smile Transformation with Composite Resin by Semi-Direct Technique: a Case Report

Transformação Do Sorriso Com Resina Composta Por Técnica Semi-Direta: Relato De Caso

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Abstract

Composite veneers stand out in modern dentistry for their practicality, time-saving and excellent optical properties. This work describes the operative steps for the realization of veneers in composite resin in an academic clinical environment using a semi-direct technique. A 21-year-old female patient attended the clinic-school complaining of aesthetic dissatisfaction with her smile. In the clinical dental evaluation, multiple diastemas were observed in the upper anterior teeth, and resin cement residues from orthodontic bracket bonding. In addition, the patient expressed an interest in having bigger and whiter teeth. In view of the complaints reported by the patient, the following treatment sequence was proposed: 1. Removal of residual resin cement from all teeth; 2. Tooth whitening; 3. Confection of composite resin veneers using the semi-direct technique on the upper teeth (canine to canine). The die stone that had already been made for the home bleaching procedure was used for esthetic rehabilitation. The 6 veneers were made using a nanoparticulate resin. The veneers were cemented and adjusted. The 12-month follow-up showed an excellent marginal adaptation and an excellent aesthetic and function quality. The semi-direct technique may be considered a therapeutic option based on the conservation of sound tooth structure, minimal emotional stress during clinical work and excellent final optical and mechanical properties. Simplicity and practicality of the technique allow reproducibility and excellent results at a lower cost when compared to dental ceramics.

Keywords: Composite Resins. Dental Veneers. Esthetics, Dental.

Resumo

As facetas em resina composta destacam-se na odontologia moderna por sua praticidade, economia de tempo e excelentes propriedades ópticas. Este trabalho descreve as etapas operatórias para a realização de facetas em resina composta em ambiente clínico acadêmico utilizando a técnica semi-direta. Paciente do sexo feminino, 21 anos, compareceu à clínica-escola com queixa de insatisfação estética com seu sorriso. Na avaliação clínica odontológica, foram observados múltiplos diastemas nos dentes anteriores superiores e resíduos de cimento resinoso proveniente da colagem de braquetes ortodônticos. Além disso, a paciente manifestou interesse em ter dentes maiores e mais brancos. Diante das queixas relatadas pela paciente, foi proposta a seguinte sequência de tratamento: 1. Remoção do cimento resinoso residual de todos os dentes; 2. Clareamento dental; 3. Confeção de facetas de resina composta pela técnica semi-direta nos dentes superiores (canino a canino). O modelo de gesso já confeccionado para o clareamento caseiro foi utilizado para a reabilitação estética. As 6 facetas foram confeccionadas utilizando resina nanoparticulada. As facetas foram cimentadas e ajustadas. O seguimento de 12 meses mostrou uma excelente adaptação marginal e uma excelente qualidade estética e funcional. A técnica semi-direta pode ser considerada uma opção terapêutica baseada na conservação da estrutura dentária sadia, mínimo estresse emocional durante o trabalho clínico e excelentes propriedades ópticas e mecânicas finais. A simplicidade e praticidade da técnica permitem reprodutibilidade e excelentes resultados a um custo menor quando comparado às cerâmicas odontológicas.

Palavras-chave: Resinas Compostas. Facetas Dentárias. Estética Dental.

1 Introduction

Nowadays, the emergence and notoriety related to the aesthetics of the smile has been gaining more space in the contemporary dentistry¹. Novel treatment materials and techniques have been coming on the scene in the search for aesthetic-functional outcomes to establish a beneficial solution within the scope of prescribed beauty standards socially. In this sense, many advances have occurred in the physical and optical properties of dental materials, ensuring the development of increasingly conservative techniques and producing more predictable results, increasing the patient's self-esteem².

Some procedures have been proposed to restore

esthetics, such as orthodontic treatment, bleaching, enamel microabrasion, direct and indirect veneers, both in composite resin and in ceramic³. However, despite being more conservative, orthodontic tooth alignment, bleaching and microabrasion are sometimes insufficient to meet the needs and expectations of patients. In such cases, a restorative method can be considered an excellent treatment option⁴. As an extremely versatile material, composite resins are generally intended to solve aesthetic and functional problems such as: treatment of dental dysmorphism or discoloration, closure of diastemas or correction of malpositioning of the teeth⁵.

Currently, composite resin stands out as a material of choice in various clinical situations. The aesthetic of this material

allows a variety of therapeutic and technical indications that continue to grow as a result of its beneficial characteristics such as: wide variety of commercial presentations; conservation of tooth structure due to the fact that the composite is retained by adhesive methods regardless of cavity design⁶. However, one of the most important limitations of this material is the high sensitivity of the technique, hence the need to control certain aspects such as correct indication, good isolation of the operative field, choice of the correct composite for each situation, use of a good adhesive protocol and proper polymerization. Controlling all these clinical factors turns out to be essential to obtain the best results with this material⁷.

An evolution of the composite resin restorative technique for veneers is the so-called semi-direct technique. Its concept is based on the use of daily composite resin, which is used in the direct technique, but it is made on the die stone or directly on the tooth (with or without preparation) and then removed and cemented. Some positive points are: extra-oral finishing and polishing, better finish quality of the veneer and the possibility of a heat treatment to improve the mechanical characteristics of the composite resin⁸. Semi-direct or indirect composite restorations are easy to make and repair, have a higher flexural modulus, lower cost, and are less abrasive to opposing teeth when comparing to ceramics⁹.

Thus, this work aims to describe the operative steps to perform composite resin veneers in an academic clinical environment at a Dentistry College using the semi-direct technique.

2 Case Report

A 21-year-old female patient attended the Clinic-School complaining of aesthetic dissatisfaction with her smile (Figure 1). In the dental clinical evaluation, multiple diastemas were observed in the upper anterior teeth, and resin cement residues from orthodontic bracket bonding (Figure 2a-c). In addition, the patient expressed an interest in having bigger and whiter teeth. In view of the complaints reported by the patient, the following treatment sequence was proposed: 1. removal of resin cement from all teeth; 2. tooth whitening; 3. confection of composite resin veneers using the semi-direct technique on the upper anterior teeth (canine to canine).

Figure 1 - Initial appearance of the patient's smile



Source: The authors.

Figure 2 - a. Frontal intraoral aspect of the patient; b. Right lateral aspect; c. left side aspect



Source: The authors.

Following the proposed plan, the resin cement from previous orthodontic treatment was removed in the first session. Removal was performed with multilaminated bur with 30 blades (Primma dental Ângelus, Londrina, PR, Brazil) in high speed under abundant irrigation (Figure 3a). After complete removal of resin cement (Figure 3b), the patient was molded with alginate and the die model was obtained. The silicone trays (1 mm in thickness) were made in a vacuum-forming (Essence Dental, Araraquara, SP, Brazil) machine for at-home bleaching. The bleaching protocol was 10% carbamide peroxide (10% Whiteness Perfect, FGM, Santa Catarina, Brazil), 2 hours a day for a period of 30 days (Figure 3c). Fourteen days after the at-home bleaching, the patient returned for the next step of treatment (confection of veneers in composite resin). In possession of the stone model that had already been made for the at-home bleaching, the previous esthetic rehabilitation was planned. Wax relief was made on the stone model to avoid the adhesion of composite in the stone model when making the veneers. Then, the 6 veneers were made with nanoparticulate resin (3M ESPE, St Paul, MN, USA) in the color WB (Whitening body) (Figure 4a). The veneers were then placed in a container with water and microwaved for 4 minutes at high potency (Figure 4b) and then finished and polished extraorally. At this point, the veneers were positioned and molding was performed with addition silicone (Adsil, Coltène, Whaledent, Altstätten) (Figure 4c). This mold was then used for the step of testing the shape of the teeth and approval by the patient (mock-up step) using bisacrylic resin (PRIMA, FGM, Santa Catarina, Brazil) (Figure 4d).

Figure 3 - a. Resin removal under irrigation; b. Resins removed; c. Appearance after home bleaching



Source: The authors.

Figure 4 - a. Veneers made on the die stone; b. Thermal treatment of veneers; c. Molding the model with the veneers; d. Mock-up with bisacrylic resin.

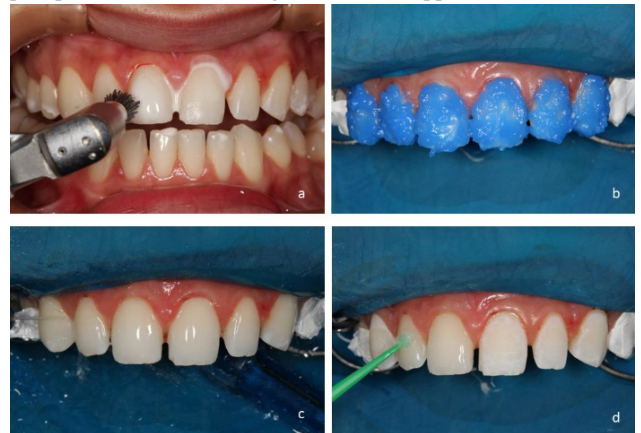


Source: The authors.

For the cementation step, the semi-direct veneers were tested without any product (dry proof) and with try-in cement (damp proof). Small adjustments in the internal part of the veneers were made when they did not have adequate adaptation. Then It was performed prophylaxis with pumice stone and water (Figure 5a), isolation of the operative field (modified rubber dam isolation) and the treatment of the substrate (roughening the surface with a diamond tip). Teeth conditioning was performed with 37.5% phosphoric acid (Ultra-Etch; Ultradent Products Inc, South Jordan, Utah) for 30 seconds (Figure 5b), washing for 60 seconds (Figure 5c), drying and application of an adhesive system (Ambar Universal, FGM, Santa Catarina, Brazil) (Figure 5d). The treatment of veneers was initially carried out by cleaning with phosphoric acid (Figure 6a), followed by abundant washing (Figure 6b) and application of silane (Prosil, FGM, Santa Catarina, Brazil) and adhesive (Figure 6c). The adhesive layer was not light cured, neither on veneers nor the teeth to prevent veneer maladjustment. The cementation was then performed with flow resin (Opus bulk fill flow resin, FGM, Santa Catarina, Brazil) (Figure 6d), positioning all six veneers at the same time and removing excess cement with a fine tip brush in the cervical region (Figure 7a) and interproximal flossing. The

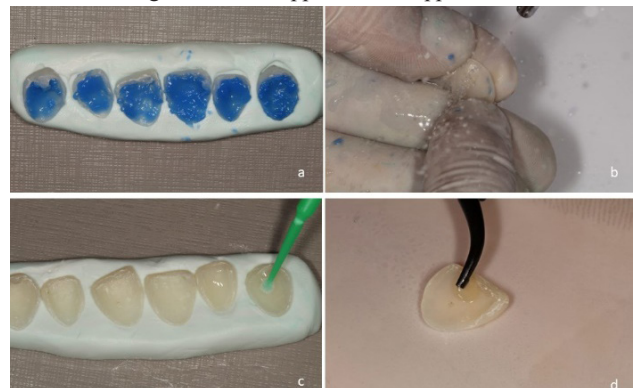
veneers were then light-cured (Radii-cal Photo-Activator, SDI, Victoria, Australia) (Figure 7b) successively in different directions to ensure excellent polymerization. During the entire photoactivation process, air spray was applied through the palatal surface to minimize heating. Finally, excess resin was removed and the veneers were finally polished with abrasive rubber (Azdental spiral, China) and felt with diamond paste (Diamond polish - Ultradent Products Inc, South Jordan, Utah), obtaining an excellent aesthetic and functional result (Figure 7c-d).

Figure 5 - a. Pumice and water prophylaxis; b. Etching with phosphoric acid; c. Washing; d. Adhesive application



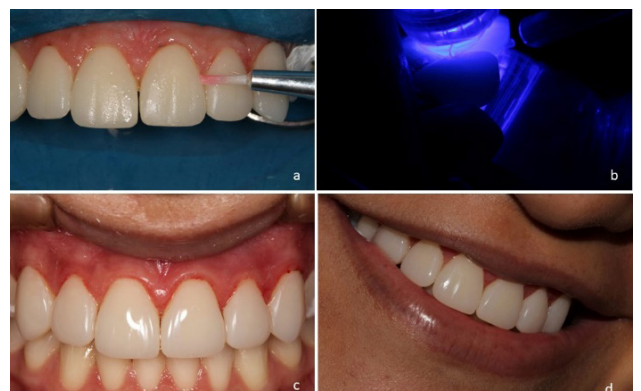
Source: The authors.

Figure 6 - a. Cleaning the inside of the veneers with phosphoric acid; b. Washing; c. Adhesive application; d. application of flow resin



Source: The authors.

Figure 7- a. Insertion of veneers and removal of excess; b. photoactivation using an air jet; c. Front view of cemented veneers; d. Immediate smile after cementation



Source: The authors.

After 12 months of treatment completion, the patient was asked to attend the clinic for monitoring and maintenance of the restorations. After this period, the general condition of the veneers was observed, with a repolishing to maintain smoothness and surface shine (Figure 8a-d).

Figure 8 - a. Aspect after repolishing in front view; b. side view; c. resting mouth position; d. smile



Source: The authors.

This case report was approved by the Research Ethics Committee of the State University of Montes Claros, Brazil (#5.105.587). Images and informations from participant were obtained through signed informed consent.

3 Discussion

The use of veneers to correct the color and/or shape of the tooth has been shown to have a positive effect on self-esteem, increasing self-confidence and happiness in a social environment. The normalization of appearance does not occur because it materializes the ideal of beauty imposed by society, it occurs because it does not produce frustrations and concerns¹⁰.

Recent advances in resin materials have enabled technical modifications to improve esthetic restorations within esthetic dentistry. When correctly used, contemporary composite resins can achieve esthetic results similar to ceramics, and at a more affordable cost to the patient⁸. In the last decades, characteristics of polishing, smoothness and gloss has been largely improved due to changes in the composition of composite resins (especially inorganic particle size and shape)¹¹ and constant advances in photocuring units¹². These improvements allow the dentist to make composite veneers chairside with aesthetic and mechanical characteristics similar to those produced in a laboratory environment. Thus, the techniques for making semi-direct veneers are becoming an important therapeutic alternative to overcome the technical difficulties encountered in direct restorations in composite resin⁸. However, semi-direct restorations are commonly used in posterior teeth^{13,14}, and there are few reports in the literature about their applicability in anterior restorations⁸.

The main advantages of using semi-direct restorations are low cost, finishing and polishing performed extra-orally, and

ease of adjustment and repair after cementation¹⁴. Marginal adaptation is also improved due to the fact that polymerization shrinkage is restricted to the cementing agent, which in turn is employed in an extremely thin layer, generating no additional stress on the tooth walls¹⁵.

This clinical case describes a non-invasive technique because no prepare was performed. The concept of no-prepare veneers is based on thin composite veneers used to change the color and/or shape of teeth when no tooth preparation is required. This technique is mainly indicated for slight morphological discrepancies that jeopardize the proportion, size, and even volume of the natural dentition⁸.

The mock-up step provides to the patient a pre-analysis of the final results to ensure it meets patient's expectations gaining acceptance and approval¹⁶. Also, this procedure guarantees predictability regarding to the correct proportion of teeth and the relationship with surrounding structures. The mock-up procedure is performed simply through a dense silicone guide of waxed teeth in the stone model or may also be performed directly from the handmade restorations, but not yet cemented, as in the present case report.

In the present study, the handmade veneers of composite resin were placed in a glass container and microwaved for 4 minutes, according to the already established protocol¹⁷. This post-cure heat treatment aims to increase the degree of conversion of the composite resin, which implies better physical, mechanical and color stability over time¹⁸, without compromising the surface roughness of the restoration¹⁷.

An important precaution when cementing veneers in composite resin is not heating the tooth structure during photoactivation, since there is a direct relationship between the amount of energy (J/cm^2) that reaches on the restorative material and the increase in pulp temperature¹⁹. In the present case report, a constant air spray was used with the triple syringe to avoid heating the dentin-pulp complex.

The clinical performance and longevity of composite resin restorations has been evaluated in studies showing that the main causes of failure are postoperative sensitivity, marginal failures, secondary caries, fractures, material wear and color²⁰. When the assessment is made specifically with veneers, the main causes listed are surface roughness and marginal discolorations²¹. Although ceramic restorations perform better than composite resin veneers in a 10-year clinical follow-up²² both in terms of restoration survival and in relation to the quality of the remaining restorations, composite resin is still an excellent therapeutic option due to the fact that failures are most often repairable, requiring proper maintenance of restorations²³.

This work has some limitations, such as the type of study, which does not allow to compare different products and techniques. In addition, it is necessary to understand that the results may not be the same for all cases depending on the individuality of each patient and the technical issue and the operator's skill with the technique. However, the study

demonstrates an extremely satisfactory and predictable result when the semi-direct technique is used for anterior teeth in an evaluation period of 6 months.

4 Conclusion

A harmonious smile affects the quality of life and self-esteem of patients. Small teeth and diastema are considered unsightly factors. In the present case report, the semi-direct technique for anterior teeth using composite resin is described as a therapeutic option based on the conservation of healthy tooth structure, minimal emotional stress during clinical work and excellent final optical and mechanical properties. The ease of use and practicality of the technique allow reproducibility and satisfactory results at a lower cost when compared to dental ceramics.

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