

Multidisciplinary esthetic approach for multiple anterior diastema: 36-month clinical performance

Abordagem estética multidisciplinar para múltiplos diastemas anteriores: desempenho clínico de 36 meses

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ABSTRACT

The presence of diastema, between anterior teeth, distorts a pleasing smile by concentrating the observer's attention on the spaces. The patient's needs and expectations must be considered in the process of treatment planning to ensure satisfaction with the treatment outcomes. There are many forms of therapy that can be used for diastema closure. A carefully developed diagnosis, which includes a determination of the causal elements and advanced treatment planning, allows the most appropriate treatment to be selected for each case. The aim of this paper is to present a multidisciplinary approach as a solution to multiple diastemata in the anterior region using gingival tissue recontouring and direct adhesive restorations, with minimum wear of the dental structure, after the orthodontic intervention, discussing the minimal intervention to obtain imperceptible and aesthetic final restoration. Thirty-six months after the treatment was carried out, the final aesthetic was maintained with all dental element details and gingival tissue harmony, without recurrence of periodontal pockets and the preservation of the tooth color and shape.

KEYWORDS

Composite resins; Diastema; Gingivoplasty.

RESUMO

A presença de diastemas, entre dentes anteriores, distorce um sorriso agradável, concentrando a atenção do observador para os espaços. As necessidades e expectativas do paciente devem ser consideradas no processo de planejamento para garantir a satisfação no resultado do tratamento. Existem muitas formas de tratamento que podem ser utilizadas para o fechamento de diastemas. Um diagnóstico desenvolvido cuidadosamente, que inclui a determinação dos elementos causais e planejamento avançado do tratamento, permite a seleção do tratamento mais adequado para cada caso. O objetivo deste artigo é apresentar uma abordagem multidisciplinar como solução para diastemas múltiplos na região anterior usando o recontorno gengival e restaurações adesivas diretas, com mínimo desgaste da estrutura dental, após a intervenção ortodôntica discutindo a intervenção mínima para a obtenção de restaurações finais estéticas e imperceptíveis. Trinta e seis meses após o tratamento foi avaliado, a estética final foi mantida com os detalhes do elemento dental e harmonia tecido gengival, sem recorrência de bolsas periodontais e preservando a cor e forma dos dentes.

PALAVRAS-CHAVE

Resinas compostas; Diastema; Gingivoplastia.

INTRODUCTION

Patients are constantly searching for aesthetic excellence and this includes dental

aesthetics. Consequently, this kind of treatment is often required in dental offices. A very common situation that negatively affects dental and face harmony is the presence of anterior diastemata.

The etiology, in adults, is multifactorial and is related to dental anomalies in size and shape, dentoalveolar and Bolton discrepancies [1]. In addition, other factors can be involved in the etiology of acquired or congenital diastema: hereditary characteristics, deleterious habits or unbalanced muscle function, physiologic or pathologic dental migration, pathological conditions such as partial agenesis, supernumerary teeth, odontomas, cysts, palatal clefts, accentuated vertical overlap, defects in intermaxillary suture, and enlarged labial frenum [1].

There are different ways to treat these patients, which may include orthodontics, periodontics, restorative dentistry, or a multidisciplinary approach involving each of these three specialties. A careful diagnosis and an adequate treatment plan, established after a detailed smile analysis using the Gold Proportion, diagnostic casts, diagnostic wax-ups, and digital photographs allow a correct and particular approach for the best outcomes. In some situations, only the orthodontic intervention is not sufficient and restorations are required.

Direct resin composite restorations are an important tool in dentistry, especially when aesthetic correction with a maximal tooth-saving approach is necessary [2]. It is generally unnecessary to prepare teeth when closing diastemata due to the proximal surface rounds into the vestibular surface and a natural "bevel" exists for shade blending and retention [3]. Resin composite is reported to have promising results when applied in the anterior area because it offers excellent aesthetic and acceptable longevity, costing much less than equivalent ceramic restorations [2].

Gingival manipulation can assist in the appropriate proportion between the height and width of the teeth that will be restored. Gingival tissue can be modified with periodontal surgery to reproduce the natural architecture of the gingival contouring. Resective or regenerative surgeries are recommended when discrepancies in soft tissues interfere with the aesthetic proposal.

This paper presents a multidisciplinary approach as a solution to multiple diastemata

in the anterior region using gingival tissue recontouring and direct adhesive restorations after the orthodontic intervention discussing the minimal intervention to obtain imperceptible and aesthetic final restoration.

DESCRIPTION OF CASE

Complaints about harmony smile, especially about the presence of anterior diastemata that remained even after the orthodontic treatment and gingival smile, are frequent (Figure 1).



Figure 1 - Patient's smile showing the presence of anterior diastemata and gingival smile.

Harmony smile dissatisfaction due to anterior multiple diastema and gingival smile can be changed using an integrated planned treatment. The treatment plan should consist of the following aesthetic guidelines that include impressions, diagnostic casts, diagnostic wax-ups, digital photographs, detailed smile analysis, and periodontal analysis.

Presence of adequate interocclusal relationship and uniform diastema distribution achieved by orthodontic treatment are essential for clinical longevity success. In these cases, at the periodontal tissue examination, it is possible to observe the presence of false pockets in the anterior upper and lower teeth (Figure 2), resulting from a hyperplasia of gingival tissue that occurred during orthodontic treatment,

which did not allow for the appropriate diastema closure, maintaining adequate and aesthetic width X height proportion.

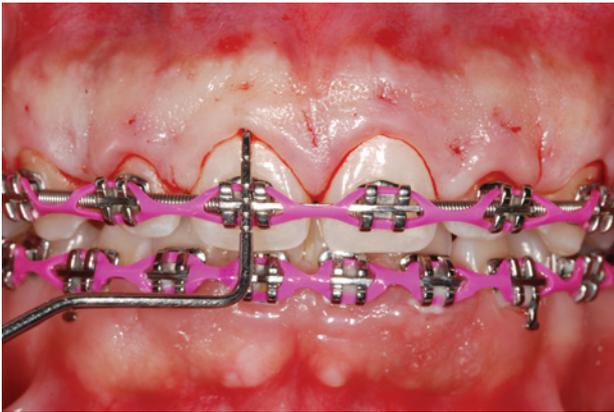


Figure 2 - The clinical examination revealed deeper probing depth in the buccal sulcus of the anterior region.

Gingivoplasty can be performed, according to the technique described by Goldman in 1951, which determines the removal of gingival sulcus corresponding the measurement obtained during the clinical periodontal probing [4]. Commonly, after 21 days of completion the operation in the maxillary arch, the same procedure for the removal the false pockets in lower arch, can be performed (Figures 3 to 5).

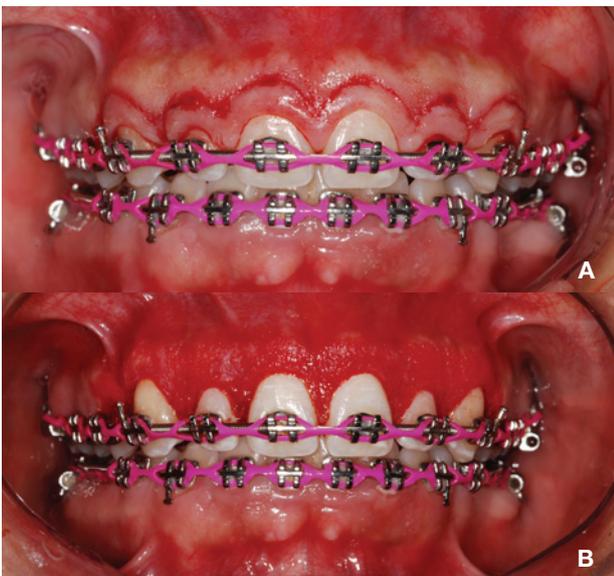


Figure 3 - a) Gingivoplasty technique in the maxillary arch. b) The final result after the procedure.



Figure 4 - a) b) c) After 21 days the surgery was done in the maxillary arch, the same procedure was performed in the lower arch.



Figure 5 - a) b) c) After 21 days the surgery was done in the maxillary arch, the same procedure was performed in the lower arch.

Improving teeth aesthetics, bleaching treatment can be done, certainly, before closing anterior diastema with composite resin. The in-office bleaching performed with hybrid light, using hydrogen peroxide can present some advantages (Figures 6a and 6b), as



Figure 6 - a) Dental in-office bleaching was performed using hydrogen peroxide at a high concentration. b) Result obtained immediately after the in-office bleaching.

the simplicity and easy applicability, allows treatment control and possible compromises, for being held in short clinical time and in several teeth simultaneously, in addition presents initial good results and prognosis.

It is advisable to wait a period of 15 days to perform the restorations. The presence of oxygen inside the enamel and dentin may result in a decrease in bond strength of resin-based restorative materials to the dental tissues if the restoration is performed immediately after bleaching, due to the inhibition of material polymerization. In addition, the color stability is reached after 7 to 15 days of the bleaching [5].

Tooth color should be determined by custom composite samples in the vestibular area (Figure 7a). Modern composite resin is

increasingly being used in clinical practice due to its superior aesthetic qualities and satisfactory color stability. Materials and methods of application have been improved to the point that a survival of 5 to 10 years would be expected for such restorations [6]. These modern resin composites allow excellent aesthetic results to be achieved with relatively simple application and layering methods. It includes the use of dentin and enamel-like masses, which are completed with effect materials in well-selected indications. This simplified approach potentially extends the aesthetic benefit of modern resin composites to a much larger number of practitioners and patients [6].

The chromatic expression of natural teeth is dynamic and depends on the interaction of enamel, dentin, and pulp during light reflection and refraction phenomena. Dentin is an opaque (less translucent) and complex core, rich in hue, chroma, and fluorescence. It is covered by enamel, which is translucent and opalescent. The variety of features and changes of enamel and dentin explain the unique nature of the appearance of a natural tooth. Enamel, dentin, and pulp suffer noticeable changes during an individual's lifetime [7].

The enamel of an adult's natural anterior teeth is thinner and more translucent, and presents less microtexture than the enamel of young individuals. Usually, bluish and orange shades are clearly visible. The tips of dentin mamelons are closer to the incisal edge, and may even be exposed [8].

Color of natural teeth is usually determined by the three dimensions of color: hue, chroma, and value. Hue is defined as the main name of the color perceived by the observer, such as green, red, yellow, or blue and is represented by the letters A, B, C, and D. Chroma is the saturation degree or the intensity of the hue, such as light green and dark green, and is represented by numbers whose order is crescent

in saturation. Value is the dynamic dimension of the bodies and corresponds to the luminosity of the color, and is related to the amount of the existing white or black pigments [9].

Color can be identified by conventional methods, such as shade guides, by automatic shade guide systems or by custom composite samples at the vestibular area, which is the best method to select the color and should be applied to clean teeth with the natural humidity of the oral cavity. The natural humidity is necessary because water plays a fundamental role in the final color outcome [10]. Enamel dehydration reduces its translucency by 82 %, misleading the clinician to select a lighter and more opaque resin than the natural tooth color. The influence of water in enamel translucence is the result of the exchange of water by air around the enamel prisms. As the rate of refraction of light in water (1.33) and in air (1.0) is different, drying the enamel causes the air to surround the interprismatic spaces and to perceive a lighter and more opaque tooth [11].

However, there are other extremely important factors regarding chromatic expression that cannot be disregarded, such as translucency, fluorescence, opalescence, counter-opalescence, and surface texture [7].

A new type of resin composite for direct use has been developed: the nanohybrid resin composite, which has an average filler particle size between 0.02 and 2.5 μm and nanoclusters with an average particle size between 4 and 20 μm with 58 % in volume and 75 and e 77 % in weight of inorganic particles. Filler particles provide excellent optical and mechanical properties that guarantee high radiopacity, exceptional polishing and natural appearance, in addition to maintaining the mechanical resistance of traditional microhybrids resins. Silica nanoparticles increase the wear resistance and polishability, and improve the clinical

management (according to the product technical profile) [12].

This resin composite enables the re-creation of natural tooth aesthetics with one body shade composite for the entire restoration. Simplifying the composite restoration process is an advantage of the material because it contains multifaceted fillers that reflect and refract light, mimicking the opacity, translucency, and optical characteristics of tooth structure. In thinner areas, such as the incisal edge, it appears translucent; on the main tooth body, it absorbs and refracts light to impart dentin-like depth. Only one shade is needed to complete an entire natural-looking restoration. The material's fillers reflect light from surrounding tooth structures, creating a seamless integration and making restorations nearly invisible (according to the product's technical profile).

Long-term aesthetic durability is also predicted on material polishability [13]. Microhybrid and nanohybrid composites demonstrate enhanced luster and polish; microfills remain unmatched for polishing ease and longevity. Selecting appropriate direct composites also entails evaluating handling, sculptability, and viscosities, which affect final restorative outcomes and influence specific manipulation techniques [13].

A custom-made diagnostic wax-up can be used as a dimensional guide for composite placement. It has the advantage of providing harmonic gingivo-incisal and mesiodistal dimensions previously visualized in the wax pattern; appropriate control of the thickness of the resin increment; better visualization of the final dimensions of the tooth (width and length) in an early stage of the restoration; and enough support to restore the lost palatal enamel [9].

After color selection, a rubber dam is used to isolate the intraoral working field and the

silicone matrix was tried in to access fit. The use of rubber dam facilitates control of saliva and crevicular fluid and has the advantage of slightly retracting the interdental soft tissue helping to establish a correct emergence profile [14]. A two-step adhesive system includes etching with phosphoric acid for 30 seconds, rinsed for the same period of time and dried gently with air. The application of primer and adhesive with a disposable brush can be used according to the manufacturer's instructions (Figures 7b and 7c).

The main advantage of the self-etching technique is its ability to demineralize the dentin simultaneously to the adhesive monomer penetration. This is especially interesting in deep dentin cavities, close to pulp tissue [15-17]. This supposedly would generate a lower postoperative sensitivity [16]. However, there is a lower monomers penetration capacity of these acidic monomers through the enamel [15]. This would create a weak link, with less retention and greater possibility of microleakage, represented clinically by a higher marginal staining. Due to this, the adhesion to enamel is better when the etching is performed with phosphoric acid. The phosphoric acid etching prior to the adhesive application allows a more efficient and durable bond [18]. The demineralization process selectively dissolves the enamel rods, creating microporosities, which are readily penetrated, even by ordinary hydrophobic bonding agents, by capillary attraction. Upon polymerization, this micromechanical interlocking of tiny resin tags within the acid-etched enamel surface still provides the best achievable bond to the dental substrate [18].

The silicone matrix should be positioned and held firmly against the teeth (Figure 7d), while the composite (IPS Empress Direct – Ivoclar, Vivadent) with transparent

characteristics for artificial enamel is carefully sculpted to conform to the matrix boundaries. This step established a thin lingual shell that was light-cured. The polymerized lingual composite shell provides a framework for the subsequent application of the next layers of composite for dentin reproduction, with more opaque characteristics (Figure 7e). After light-curing (Radii-Cal, SDI), the silicone matrix is removed and increments of the composite is applied to the facial aspect and the restoration is gradually built up by layering the composite resin material.

In cases of diastema closures the challenge to establish a reliable bond to dentin and manage the shrinkage stress is not present due to the resin composite being bonded to the enamel surface and the low configuration factor of the restorations [19]. Consequently, it will be difficult to present any microleakage [20].

The restorations are finished initially with a number 12 scalpel blade to remove gingival excess and interproximal strips to polish the interproximal areas (Figure 7f). The polishing procedures were performed 24 hours after the restorative procedures. Finishing discs are used sequentially to establish proper primary anatomy. This is corrected until the final desired surface morphology is achieved. A fine diamond bur could create the surface texture and replicate a youthful enamel pattern. Silicone polishers for composites finesse the restorations, which were subsequently polished with a felt disc and polishing paste (Figures 8a and 8b). The treatment session ends with oral hygiene instructions on how to clean the new restorations with dental floss. Postoperative results presented optimal aesthetics and harmonious integration of form, color, and surface gloss (Figures 9a and 9b).



Figure 7 - a) Shade selection was performed by inserting the resin composite direct at the tooth surface. b) Etching with phosphoric acid for 30 seconds. c) The application of primer and adhesive with a disposable brush. d) Each increment of the composite was applied with a flat spatula, distributing it uniformly. e) Reproduction of the deepest artificial dentin with more opaque characteristics. f) The restorations were finished initially with a number 12 scalpel blade to remove gingival excess.

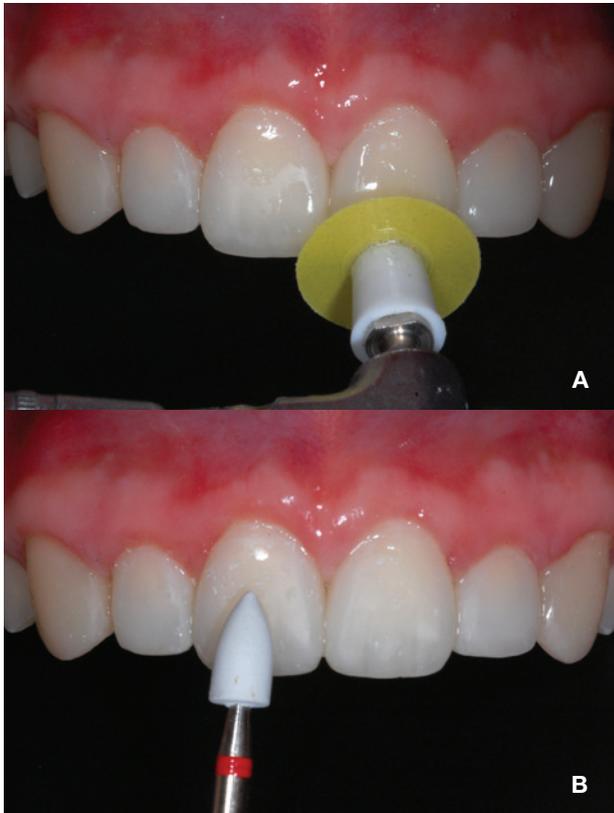


Figure 8 - a) Finishing discs were used sequentially to establish proper primary anatomy. b) Rubber points was used.



Figure 9 - a) Final esthetic outcome of the smile. b) Close up and lateral view of the smile.

Thirty-six months after the treatment was carried out, the final aesthetic was maintained with all dental element details and gingival tissue harmony, without recurrence of periodontal pockets and the preservation of the tooth color and shape (Figures 10a and 10b). Larger average proportions, symmetry, and central position give the central incisors a natural dominance, providing a harmonic dental composition.

Direct resin composite restorations have become an important tool in dentistry, especially for healthy teeth that need aesthetic correction with a maximal tooth-saving approach. Patients and dentists can benefit from the numerous advantages offered by this treatment option: tooth shape, color, and position can be corrected with an immediate restoration in one treatment session; the technique is non-invasive or minimally invasive; the technique is reversible,



Figure 10 - a) After 36 months of the treatment was verified the color stability and the maintenance of the esthetic form. b) Close up smile view after 36 months.

as restorations can be removed and teeth can be returned to their original state, if necessary; in case of minor failure, the restoration can be repaired; in case of major failure, loss of the restoration, numerous other treatment options (lamine veneers, crowns) can be applied; and the technique is cost-effective, requiring no laboratory work [12].

To satisfy new demands regarding tissue conservation, function, and aesthetics, treatment parameters must be defined for all kinds of smile deficiencies concerning young patients with healthy dentitions, particularly following orthodontic treatment. A more comprehensive case analysis including long-term prognoses should be undertaken to offer the patient the best available solution with minimal tissue sacrifice [6]. Generally, composite resin restorations are reported to have promising results. When applied in the anterior area, composite resin materials offer excellent aesthetic potential and acceptable longevity, costing much less than equivalent ceramic restorations [2]. In clinical cases where maximally conservative, aesthetic corrections of anterior teeth are indicated, direct composite buildups are the treatment option to be favored. It must be emphasized that survival and quality of this type of direct restoration is influenced mainly by application of appropriate clinical techniques during the fabrication process. Nevertheless, compared with alternative treatment options as laminate veneers and ceramic crowns, this restorative method shows a beneficial relation between minimal invasiveness, aesthetic results, clinical effort, and longevity [20]. Today, it is often preferable to use conservative treatments with minor, known aesthetic limitations that will clearly benefit the long-term biomechanical behavior of the teeth [6].

This new nanohybrid composite helps the creation of aesthetic direct composite restorations by providing a single-shade option. This resin composite represents an innovative time- and money-saving alternative for

delivering expected aesthetic restorations that satisfy dentist and patient expectations. The case presented demonstrates simplified protocol and results that can be achieved using this recently introduced composite.

CONCLUSION

A multidisciplinary approach involving orthodontic, periodontal and restorative dentistry may be necessary when only the orthodontic treatment is not feasible. A correct treatment plan is essential to obtain good results in long term.

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