Closure of Diastema and Gingival Recontouring Using Direct Adhesive Restorations: A Case Report

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ABSTRACT

One of the challenges in clinical esthetic dentistry is closing anterior diastemas without creating "black triangles" between the teeth. The success of a restorative treatment in anterior teeth depends on the esthetic integration between soft tissues and hard tissues. The conditioning of the interdental papilla is a simple, direct, predictable, and low-cost alternative. This paper reports a case on diastema closure in anterior teeth that was successfully treated using gingival recontouring and composite resin restorations.

CLINICAL SIGNIFICANCE

The closure of diastemas in anterior teeth using direct adhesive restorations and gingival recontouring is a viable option for the clinician because it restores esthetic harmony between soft and hard tissues.

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INTRODUCTION

Modern dentistry is constantly searching for esthetic excellence. New materials and techniques are often introduced, leading professionals to endless improvement while fulfilling their patients' esthetic demands.¹

For several decades, professionals all over the world have tried to find the perfect balance between white architecture (teeth) and pink architecture (gums) in the reproduction of anterior teeth, which should be esthetically pleasant and natural.² In that context, one of the difficulties encountered is closing diastemas without creating "black triangles" or wide gingival embrasures.³ Black triangles are spaces which appear between teeth when the gingival tissue does not follow the respective tooth contour and exposes the black background of the oral cavity.

Among the suggested options for the closing of diastemas, orthodontics, operative dentistry, and prosthodontics are the most suitable.⁴ Operative dentistry stands out by presenting simple, fast, predictable, and low-cost solutions. Orthodontics requires the use of fixed appliances, which means a more complex, longer, and more expensive treatment. Prosthodontics requires indirect and more invasive procedures with laboratorial involvement.

The purpose of this paper is to describe a case report in which the diastema closure was accomplished using direct adhesive restorations and gingival tissue recontouring.

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CASE REPORT

A 20-year-old female patient presented at the Federal University of Santa Catarina dental clinic complaining about the appearance of her smile (Figure 1).

A clinical examination revealed a moderate midline diastema between maxillary central incisors. A large size difference between maxillary central incisors and maxillary lateral incisors was also observed (Figure 1). Upon periodontal examination, no pocket was detected, and the patient's excellent oral hygiene was verified (Figure 2). The treatment plan to attain an esthetically favorable relation between the maxillary anterior teeth involved closing the diastema between central incisors, nonsurgical gingival recontouring of the interdental papilla, and increasing the length of the lateral incisors using composite resin restorations (Figure 3).

In spite of the moderate size of the diastema, the analysis of the length and of the width of the upper central incisors demonstrated an unfavorable proportion for its closure with composite resins. The resin increment itself would lead to excessive width of the central

incisors and a disparity with the golden proportion concept⁵ (Figures 4 and 5), especially if the reduced size of the lateral incisors is taken into account. Therefore, in a second restorative strategy, an optical illusion resource was used to virtually reduce the width of the central incisors (Figures 6 and 7). The labial embrasure of the central incisors was enlarged to preserve the natural width of the flat surface (Figures 8 and 9). When the facial embrasures are opened, it is possible to increase the area of light deflection (shadows) and to reduce virtually the tooth smooth surface width (area of light reflection).



Figure 1. Preoperative smile view. Note the presence of a moderate midline diastema and large size difference between maxillary central incisors and maxillary lateral incisors.



Figure 2. Preoperative frontal view (magnification ×2). Upon probing, no periodontal pocket was detected in teeth #8 and #9.



Figure 3. Preoperative smile view. Schematic illustration showing the treatment plan. It involved closing the diastema between central incisors (green area), gingival recontouring of the interdental papilla, and increasing the length of the lateral incisors using composites (blue area).



Figure 4. Preoperative frontal view. Schematic illustration simulating the restorative treatment of the upper central incisors (white lines). Observe that the width of the flat surface (white double-dashed arrow) is larger than the original one (yellow double arrow). This restorative strategy would provide excessively wide central incisors.



Figure 5. Preoperative occlusal view.



Figure 6. Preoperative frontal view. Schematic illustration simulating the second restorative strategy of the maxillary central incisors (green lines). Observe the decrease of the flat surface (green double dashed arrow) compared with the first restorative option (white double-dashed arrow).

Besides the creation of an esthetic proportion, another challenge involved how to prevent the formation of a black triangle between the central incisors. This required work in the gingival architecture based on the concepts of cervical contouring⁶ and location of the contact point.⁷ In this approach, a slight compression induced by the addition of composite resin increments



Figure 7. Preoperative occlusal view.



Figure 8. Preoperative frontal view. Observe that the opening of the labial embrasure and the lingual displacement of the contact point provide a flat surface (green double-dashed arrow) with dimension similar to the original one (yellow double arrow).



Figure 9. Preoperative occlusal view.



Figure 10. Preoperative frontal view (magnification $\times 2$). Schematic illustration showing the measurement of the distance from the bone crest to the gingival crest between central incisors.

results in alteration of the interdental papilla contour. Thus, the gingival tissues serve as sensors indicating a correct level of compression. Such compression must not create a permanent ischemic area and/or trauma. In order to determine the appropriate location of the contact point, the measurement of the distance between the bone crest and the gingival crest was accomplished. The patient was anesthetized, and an infiltrative needle was inserted in the gingival tissue until reaching the bone crest. A rubber stop was used to indicate the penetration depth of the needle in the tissue (Figure 10). The distance measured with a periodontal probe was of 3.5 mm (Figure 11). Based on such



Figure 11. Observe the detail of the periodontal probe used to measure the distance from the rubber stop to the end of the needle. This value was of 3.5 mm and it represents the distance from the bone crest to the gingival crest.



Figure 12. The dental cast was waxed up to establish the shape of the restoration and to create a silicone index.

distance, the contact point was defined as being at approximately 5.0 mm from the bone crest. This procedure is fundamental to verify the viability of papillary induction as well as the final result of the treatment.

Before the restorative procedure, the patient's upper arch was molded using an additional silicone impression material (Express, 3M ESPE, St. Paul, MN, USA) and poured with die stone. The dental cast was waxed so that a silicone index could be made and a plan of proposed esthetic treatment could be presented to the patient (Figure 12).



Figure 13. Postoperative frontal view. Silicone index try in.

Once the silicone index was positioned, the direct restorative procedure began (Figure 13) in teeth #8 and #9, respectively, and according to the protocol as follows. Isolation of the operative field with insertion of a gingival retraction cord and of Teflon tape (Figures 14



Figure 14. Operative field isolation of the maxillary central incisor using a retraction cord and Teflon tape. Phosphoric acid-etching of the tooth. Adhesive system application on the tooth.



Figure 15. Operative field isolation of the maxillary central incisor using a retraction cord and Teflon tape. Phosphoric acid-etching of the tooth. Adhesive system application on the tooth.



Figure 16. Operative field isolation of the maxillary central incisor using a retraction cord and Teflon tape. Phosphoric acid-etching of the tooth. Adhesive system application on the tooth.



Figure 17. Frontal view after light curing of adhesive system. Silicone index was positioned and composite resin was applied on the lingual enamel (A2 enamel).

and 15); acid etching with 37% phosphoric acid for 15 to 30 seconds; and water rinsing followed by the application of an adhesive system (Scotchbond Multipurpose, 3M ESPE) (Figure 16).

The adhesive was light cured, and the tooth was built with composite resin, shade A2 enamel (4 Seasons, Ivoclar Vivadent, Schaan, Liechtenstein), using an incremental technique (Figures 17–19). Finishing of the restoration was accomplished with sandpaper aluminum oxide disks (Diamond Pro, FGM Dental Products, Joinville, Brazil) and sandpaper strips (Epitex, GC America Inc., Alsip,



Figure 18. Frontal view after applying composite resin on the tooth (facial enamel).



Figure 19. Final light curing of the restoration.



Figure 20. Finishing and polishing of the restoration.



Figure 21. Operative field isolation of the maxillary lateral incisors using a retraction cord and Teflon tape. Phosphoric acid-etching of the teeth.

IL, USA) (Figure 20). In this step, the reactive layer of composite resin was removed to avoid bonding with the contact area of the adjacent tooth to be restored. After this stage, the same procedures were accomplished for tooth #9. In another session (2 days later), the restorations of the lateral incisors were performed with composite resins, shade A2 enamel, opalescent, and A3 dentin (4 Seasons, Ivoclar Vivadent) (Figures 21–28). Finishing and polishing was accomplished with rubber points (Astropol, Ivoclar Vivadent, Schaan, Liechtenstein), sandpaper aluminum oxide disks (Diamond Pro, FGM Dental Products), and sandpaper strips (Epitex, GC America Inc.) (Figures 29–31). Through this restorative approach, it was possible to obtain an



Figure 22. Operative field isolation of the maxillary lateral incisors using a retraction cord and Teflon tape. Phosphoric acid-etching of the teeth.



Figure 23. Operative field isolation of the maxillary lateral incisors using a retraction cord and Teflon tape. Phosphoric acid-etching of the teeth.



Figure 24. Silicone index was positioned and composite resin was applied on the lingual enamel (A2 enamel).



Figure 25. View after light curing of the composite resin.

appropriate esthetic result with perfect harmony between the tooth and gingival tissues (Figures 32–34).

DISCUSSION

Progress in dental techniques and materials has enabled the accomplishment of procedures that reestablish the esthetics, function, and biologic characteristics of oral tissues.²

Diastemas in anterior teeth can strongly affect the appearance of a smile. These can be closed or reduced with orthodontic treatment, restorative treatment, or with the combination of both.⁴ Depending on certain factors, such as the number and size of diastemas, direct adhesive restorations with composite resins or indirect restorations with porcelain veneers may represent an excellent alternative treatment.^{8,9} However, regardless of technique used, it is



Figure 26. Frontal view during the insertion of an opalescent composite, after building the lingual enamel, opaque halo, and dentin body of the maxillary lateral incisor.



Figure 27. Frontal view of the maxillary lateral incisor after building facial enamel (A2 enamel).



Figure 28. Final light curing of the restorations of the maxillary lateral incisor.

imperative to establish a treatment plan and determine the cause for the presence of diastemas.

The closure of diastemas through direct adhesive restorations is a recommended procedure, which is frequently accomplished in clinic. However, in cases where there is a wide space between the teeth, the simple closure may not offer a natural and pleasant solution to the patient. The remodeling with composite resin can solve the problem of tooth architecture, but because of the creation of a black triangle between the teeth, such remodeling may not solve the problem of gingival architecture.³ In this case, it is necessary to choose procedures that induce the formation of interdental papilla between the teeth, reestablishing harmony between soft and hard tissues.

The presence of diastemas is one of the causes of absence of interdental papilla.⁴ To study the influence of the distance between the contact point and the bone crest in the presence of interdental papilla,⁷ it was verified that when such distance was 5.0 mm, the papilla was present in almost 100% of the cases. When the distance was of 6.0 mm and of 7.0 mm, the papilla only appeared in 56% and 27% of the cases, respectively. Such numbers are important so that an appropriate positioning of the contact point for papillary induction at the moment of restoration can be determined.



Figure 29. Sequential pictures during the finishing and polishing of the restorations using rubber points, sandpaper disks, and sandpaper strips.



Figure 30. Sequential pictures during the finishing and polishing of the restorations using rubber points, sandpaper disks, and sandpaper strips.

The current literature suggests a variety of approaches for the creation of papillae.⁴ Such procedures can be classified as surgical and nonsurgical. The surgical procedures involve periodontics through a series of complex techniques that focus on specific or general tissue loss. The nonsurgical procedures involve orthodontics, operative dentistry, and prosthodontics in the repositioning and induction of tissues for the formation of new papillae. In certain cases, there is a need to combine surgical and nonsurgical procedures in order to obtain acceptable results.

Among the mentioned procedures, operative dentistry offers simple and predictable solutions.¹⁰ Through adhesive restorative procedures, it is possible to condition gingival tissue for the formation of papillae.^{11,12} In spite of the apparent simple technique, some basic requirements must be followed for obtaining appropriate esthetic results in anterior teeth.

A correct diagnosis and planning should be carried out before beginning the treatment.^{8,9} The



Figure 31. Sequential pictures during the finishing and polishing of the restorations using rubber points, sandpaper disks, and sandpaper strips.



Figure 32. Postoperative frontal view. Two months later, observe the final aspect of the restorative treatment. An adequate balance between soft and hard tissues is evident.



Figure 33. Postoperative frontal view. Two months later, observe the final aspect of the restorative treatment. An adequate balance between soft and hard tissues is evident.

procedure should be accomplished in cases of patients with excellent oral hygiene, and the restoration should be polished to a high gloss. Otherwise, there is a risk of losing control over gingival conditioning because of the inflammatory process, which occurs on the surface of the teeth, and the restorations as the result of the presence of bacterial plaque.¹³ Even being overcontoured, when the intrasulcular area of the restoration is properly polished, it does not cause adverse effects in the soft tissues of patients with appropriate oral hygiene.⁶

Regarding gingival esthetics, an aspect to be considered in the



Figure 34. Postoperative frontal view. Two months later, observe the final aspect of the restorative treatment. An adequate balance between soft and hard tissues is evident.

formation of interdental papilla is the presence of favorable gingival tissue. There should be minimum thickness of 3.0 to 5.0 mm of soft and elastic tissue, which allows its compression and settling.^{5,14} Such thickness is easily obtained by measuring the distance between the gingival crest and the alveolar crest. The appropriate location of the contact point is also of fundamental importance. According to studies, when the distance between the contact point and the bone crest is of 5.0 mm or less, there is presence of interdental papilla.⁷

Regarding tooth esthetics, there should be a favorable dental width/ length proportion for the execution of the restoration. That is important because an unbalance in the proportion of the anterior teeth is frequently observed after the closure of the diastema, which differs from the dimensions of the golden proportion concept.⁵ It is worth stressing that the visible width of an anterior upper tooth should not exceed 80% of its length.8 Thus, additive wax-up and mock-up restoration are fundamental tools of analysis.

DISCLOSURE

The authors do not have any financial interest in the companies whose products are included in this article.

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