

CASE REPORT

Esthetic and Function Improvement by Direct Composite Resins and Biomimetic Concept

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ABSTRACT

Aim: This case report describe a resin layering restorative technique based on biomimetic concept to improve esthetics in a patient with dental defects that affected both enamel and dentin in anterior teeth.

Background: Severe structural defect in anterior teeth compromises esthetics and it is a high challenge to become the defect imperceptible after the restoration.

Case description: A clinical sequence of applying different composite resin layers allowed the reproduction of the interaction between hard dental tissues and the restorative material.

Conclusion: This technique achieved a satisfactory final esthetic outcome, preserving sound teeth structure and at same time, improved the quality of life of the young patient.

Clinical significance: The utilization of the biomimetic concept to increase a disharmonic smile with dental defects is based in a conservative approach, which reached a satisfactory and esthetic outcome.

Keywords: Esthetics, Biomimetics, Composite Resins.

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INTRODUCTION

The goal of dental reconstruction is to restore teeth that are decayed with abnormalities, as well as broken teeth with partial loss of structure.¹ These procedures can be achieved by direct form in the oral cavity utilizing materials and techniques or involve other professionals and materials by

an indirect approach.² Apart of the way of reconstruction, full knowledge is needed in relation to the structure to be restored.³

When the adhesion procedure was not well established, the restoration technique was performed removing sound tissue to reach retention of the restoration and reasonable esthetic appearance. With the development of the adhesive systems, the trend of conservative approach related to dental preparation allowed a better biomechanic match between tooth and restoration, optimization of esthetic outcomes and full function of the restored tooth.⁴

The exact reproduction of the sound structure should be based on the natural model. The study of the characteristics of the sound teeth are the main elements to find parameters, and to search for new techniques and materials that have the principle as 'mimetics' or nature reproduction. Nowadays, the goal of esthetic treatment has become imperceptible to the differentiation between artificial and natural tooth due to excellence of the outcomes.⁵

In science, to mimetize involves the process to allow a model copy that in field of dentistry, is undoubtedly the sound teeth.⁶ The aim of this present study is to report an esthetic approach in permanent teeth with shape abnormalities. This case was conducted based on biomimetic philosophy aiming save sound structure and improve both esthetics and function.

CASE REPORT

A 12-year-old girl was referred to the Pediatric Dentistry Clinic, Araraquara Dental School, Universidade Estadual Paulista (UNESP) due to the anterior tooth shape abnormalities in her left permanent central and lateral incisors. The shape and color defects of the teeth resulted in a decrease of both esthetic and function.

The patient's mother reported a trauma history in the anterior region when she was 3 years old. The anterior permanent teeth erupted with enamel and dentin deformity in the incisal third, and the left central permanent incisor had the whole vestibular crown affected (Fig. 1).

The anomalous teeth showed pulpal integrity with no pathological signs in the periapical region. The clinical treatment started with the preparation of the teeth using a diamond bur #3145 (KG Sorensen, Cotia – SP Brazil)

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Fig. 1: Initial appearance of the maxillary incisors with dental defects



Fig. 2: Rubber dam isolation in position



Fig. 3: Neutralization of the central element #21 body with application of an opaque resin



Fig. 4: Translucent resin applied to reproduce palatal portion of the teeth by using a palatal guide

aiming to remove dental enamel to gain enough space to insert a sufficient layer to reach the thickness uniformity of restorative material and increase the masking of substrate color in relation to homologous tooth. A study case was performed and a palatal guide impression was obtained using a silicone matrix (Zetalabor-Zhermack, São Paulo-SP Brazil) to optimize the shape of the incisors.

After making a gingival flap, the rubber dam was positioned to gain access to subgingival area to be restored (Fig. 2). Prior to the restorative procedure, 15 seconds of etching with 37% phosphoric acid (UltraEtch-Ultradent Products, Indaiatuba-SP Brazil) was applied, followed by a water rinse. Then, the adhesive system step was performed in accordance to manufacturer's instructions. To the hybrid layer an application of 2-bottle adhesive system (Scotchbond MP, 3M ESPE St Louis MA-USA) was elected. The deformity of the distal area was restored with a flow composite resin (Revolution-Kerr, Orange CA-USA) achieving the enlargement of the cavity once the small defect dimension could be easily filled. An opaque composite resin (Pink Opaquer- Cosmedent, Chicago IL-USA) was used to neutralize and mask the substrate body of the central element aiming to avoid undesirable outcomes (Fig. 3).

The dentin was rebuilt using the incremental technique with a thin layer (Vit-L-escence-Ultradent Products,

Indaiatuba-SP Brazil) in the cervical area followed by a lingual surface made with a colorless resin (Trans Mist-Vit-L-escence) positioned over the silicone palatal guide (Fig. 4). For reproduction of tooth mamelons, a dentin resin shade A2 was employed (Vit-L-escence) (Fig. 5) and an Iridescent Blue (Vit-L-escence) was used in the crop areas to reach an opalescent effect in the incisal surface (Fig. 6). A pearly layer PN (Vit-L-escence) was applied to the entire buccal area (Fig. 7) and a finishing and polishing steps were performed (Figs 8 and 9).

After 2 weeks, the finishing and polishing procedures were performed correcting primary morphology. The restoration had its surface polished with diamond burs and a silicon carbide brush (Jiffy Brush-Ultradent). After this, soft brush plus polishing pastes were used for achievement of a shiny restoration. The final result demonstrated an excellent shape and similar color to the natural dentition of the patient (Figs 10 and 11).

DISCUSSION

Tooth appearance is an important feature in determining the face attractiveness and plays an important role in human-social interactions. As following patient's opinion, an esthetically pleasing smile is dependent of tooth color, size, shape and position. In this context, composite resins become



Fig. 5: Reproducing of dentin mamelons with a dentin shade A2 resin composite



Fig. 6: An iridescent blue layer was applied to achieve an opalescent effect in the regions corresponding to incisal translucency



Fig. 7: A pearly layer was applied to the shades for reproducing the buccal enamel



Fig. 8: Initial finishing of the restored elements



Fig. 9: Polishing of the restored teeth



Fig. 10: Approximate view of the restored teeth 21 and 22 showing mimetism of the restored structures with natural dentition of the patient



Fig. 11: Re-establishment of the esthetic relationship between shape and shade of the affected incisors 21 and 22

widely used in dental practice because of exceptional esthetics, conservative tooth preparations and acceptable longevity for the treatment of anterior teeth.⁷ Moreover, they offer good predictability of clinical performance, durability, load resistance being less expensive for the patient also, the time spent at the dental office be reduced as well.⁸⁻¹⁰

The introduction of new resin composites with improved mechanical and optical properties has allowed the establishment of indistinguishable aspect of the restored teeth from the natural dentition. However, the main difficulties to achieve an imperceptible restoration remain in the shade, hue, translucency and proper opacity.¹¹

In the present case, the procedure based on the natural layering technique, also called 'anatomic buildup technique' or 'natural layering concept', reached a satisfactory esthetic result.^{5,6,9,12} To achieve this result, the spatial arrangement, relation and appearance of restoration were respected. To match the shade of the tooth, the main difficulty according to Vanini (2004),¹³ which is determined by the correlation between enamel and dentin and light during the process of refraction and reflection of the light wave. In this case, the use of the contralateral tooth was an interesting option because the natural polychromatism presented.

The excellent outcomes reached with this technique are in agreement with previous case reports.^{10,11,14} To follow the statement that the central incisors should present similar characteristics to natural teeth to allow a harmonious and balanced esthetic smile,¹⁵ we need to select the resin color and shade properly, and also the natural appearance was reached upon the correct thickness of restorative material. In natural teeth, there is a progressive reduction of hue from the cervical to the incisal region, as well as from the inner to the outer portions of the tooth. In respect to these differences, the use of more opaque resin (shade A3) was performed at the cervical third and inner portion of the restoration to compose the artificial dentin inside the restoration and more translucent resin (Trans Mist) at the middle and incisal thirds. To the reproduction of dentinal mamelons, a less opaque dentin was used (shade A2 dentin), being the artificial enamel restored with a thin pearly final layer (PN).

The clinical performance of this restorative process have been showed favorable results, also the technique allows a greater conservation of tooth structure compared to indirect restorative materials.¹⁶⁻¹⁸ It is important point that the key of the success of this procedure depends on the understanding of the intimate structure of the natural teeth, because it constitutes the basis of knowledge in the field of conservative dentistry.¹⁹

People with tooth color/shape alteration may actually be judged more negatively by their peers.^{20,21} The psychosocial impact of amelogenesis imperfecta was found with high levels of social avoidance, distress, particularly among adolescents.²² Treatments that improve dental esthetics in regions highly visible (i.e. central incisors) have been found to increase patient quality of life and psychosocial status.²⁰

Due to early age of the patient and the immature and weak aspect of the affected dental structure, the demand for cosmetic improvement had to be carefully balanced against the need for a minimally invasive technique and acceptable approach. The layering technique based upon a biomimetic concept could maintain a considerable sound tissue and

at the same time, providing a harmonic esthetic smile. It is important point that the literature still lacks long-term scientific information on this procedure. The results at 5 years for color match, translucency/opacity and surface smoothness were favorable.¹⁶ However, both patient and the parents, should be aware that loss of anatomic form, occurrence of incisal chipping, shade and texture of the material can be changed over the time. Thus, the need of restoration replacement has to be taking into account in the plan of treatment.

CONCLUSION

To create a restoration that is integrated with the natural dental tissues in an imperceptible way is a reality in the esthetic field. The new resin composites with unique properties that simulates the polychromatism and adequate optical characteristics of the enamel and dentin with different shades allowed a natural esthetic outcome. Utilizing a technique that saved sound structure, becoming natural in smile and at the same time, restored both function and harmony of shades, shape and texture was achieved in the present case by the biomimetic philosophy.

CLINICAL SIGNIFICANCE

The utilization of the biomimetic concept to increase a disharmonic smile with dental defects is based in a conservative approach, which reached a satisfactory and esthetic outcome.

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