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Case Report
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Esthetic Restorative Dentistry with Composites

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Abstract

Function, form and esthetic are adequately restored in direct procedures with composite resins. In direct veneering technique, composite is directly applied to defective or lost tooth structure and artistically sculpted to correct color and contour defects. This will impact on their functional, aesthetic and psychological behavior. As aesthetic zone clinician must propose exact and minimally invasive treatment plan. Achieving promising result in both aesthetic and strength is the greatest desire for patient as well as for parents. This is the case of fractured permanent maxillary central incisors treated using Direct Composite Resin Restoration.

Keywords: Anterior Crown Fractures, Aesthetic, Psychological Behavior, Clinician, Treatment, Patient; Maxillary, Direct Composite Resin Restoration.

Introduction

For a long time, most of the destruction of the incisal angle was due to lesions of interproximal caries . They are more frequent in the upper anterior teeth of male adolescents With the emergence of acid conditioning in enamel in 1956 proposed by Buonocore, dentistry was never the same, a new vision was applied to restorative techniques and with the discovery of the hybrid layer by Nakabayashi in 1982 Dentistry entered the Conservative Era and much research in this line, they brought countless techniques and ways to preserve healthy dental structure in the execution of cavity preparations With the evolution in the adhesiveness of resinous systems, several types of direct restorations can be performed today with excellent longevity, also in fractures of incisal angles with accepted disocclusion . In the unavailability or impracticability of using the dental fragment, bonding is no longer an alternative treatment, where we will have the use of adhesive systems and composite resins for direct use . The growing technological innovation, current composite resins, especially nanoparticles, manage to gather functional mechanical characteristics for regions subjected to high stresses, with adequate optical properties to achieve aesthetic excellence in restoring anterior teeth. The longevity of restorations in anterior teeth depends on the preparation of the cavity, material used and technique developed. Coronal Fracture resulting from dental trauma most frequently occur to the maxillary anterior teeth of children and adolescents.

Adult teeth may also suffer but less frequently than adolescents. Direct and Indirect restorations are clinically successful treatment options for fractured anterior teeth. Direct restorations are performed without laboratory phases. They usually involve enamel /dentine acid etching technique with adhesive systems and one or more types of composite resins [1-10].

Figure 1: Initial Situation

In direct restorations of teeth using resin-based composites, correct shade taking is an important esthetic factor. Natural tooth is polychromatic, presenting a great variety of colors. Dental manufacturers have developed various composites with different color and/or translucency to meet the need of different shades4.

Searching for an ideal esthetic material for restoring teeth has resulted in significant improvements in esthetic materials and techniques . Resin composite had been proved to be the excellent esthetic and tooth-colored restorative materials.

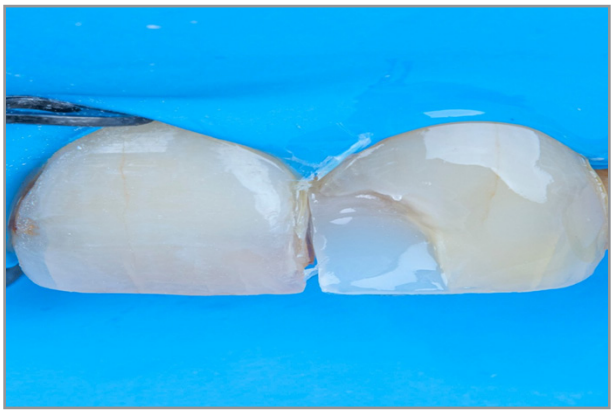

Figure 2: Palatal shell (LE enamel shade)

Class IV restorations have become predictably successful. With such restorations, one adds material directly onto the tooth, unlike with a veneer or crown. The rise of these restorations was a result of the evolution of composite materials with regard to strength and optical properties, allowing dentists to recreate beautiful, natural esthetics and durability. The silicate materials are inappropriate to use in a situation like this because they do not have predictable properties or appropriate optical properties, nor do they achieve the strength of the natural teeth along the incisal edge. In addition, after 1 or 2 years they would look like small chalky pieces of material on the corner of the tooth that had been fractured. They are soluble in oral fluids, and have poor surface characteristics, so they collect plaque and may discolor.

Figure 3: Proximal wall builds up (LE Enamel)

The direct bonded resin, bonding systems, and bonding materials have advanced to the point where they achieve predictable strong bonds between resin and tooth. In addition, the materials' chemistry has been altered over the years so that they can replicate the optical and physical properties of natural teeth. The objective of this work was to approach the direct hand restorative technique of class IV anterior teeth, emphasizing the clinical protocols, materials used, step by step of the restoration execution.

Case Report

A 49-year-old male patient expressed dissatisfaction with the appearance of his smile after recently performed direct composite resin restorations. During the examination, it was determined that the class IV composite resin restorations on both central incisors did not match in color, contour, or texture. A composite veneer was also placed on the left lateral incisor in order to "align the tooth" with the central incisors. All the restorations contained opaque white and translucent resin composite used in an attempt to simulate the natural appearance of dental tissues. The layering technique used was inadequate, and the final result was compromised. After discussion of alternative treatments, the patient decided on a direct bonding procedure because of fewer visits and affordable cost.

The patient presented with a fractured maxillary left central incisor. She expressed concerns about the esthetic impact and requested a restoration that would blend seamlessly with her natural dentition.

Clinical Examination

Extraoral Examination: No significant findings. Intraoral Examination: A noticeable fracture involving the incisal edge and extending into the middle third of the facial surface of the tooth. No signs of pulpal involvement. Adjacent incisor contains a mesial caries (class III). The periodontal status was healthy.Fig.1

Radiographic Examination
Periapical radiographs confirmed the extent of the fracture and ruled out any periapical pathology.

Diagnosis
Class IV fracture of the maxillary right central incisor.

Figure 4: Dentin shade (MD), tint white at the incisal edge to mimic the natural halo effect.

Treatment Plan: Fig.2,3,4.5
A direct composite restoration using a polychromatic technique was planned to achieve optimal esthetics. The restoration would involve the use of different shades of composite resin to mimic the natural tooth's translucency and color gradation.

Materials
- **Composite System:** Nano-filled composite resin (GC Essentia)
- **Shade Guide:** Vita Classical Shade Guide
- **Bonding Agent:** G2 Universal adhesive.
- **Finishing and Polishing Kit:** Twinkle polishing system from JOTA Swiss.

Procedure
- Multiple shades were selected to replicate the natural tooth's characteristics: MD shade for the dentin, LE Enamel shade for the incisal edge, and a OM translucent shade for the incisal halo.
- Isolation:
- The tooth was isolated using a rubber dam to ensure a dry working field.
- Preparation:
- Minimal preparation was done to create a bevel on the fractured edge, enhancing the bonding surface and esthetic blend.
- Etching and Bonding:
- The enamel was etched with 37% phosphoric acid for 15 seconds, rinsed, and air-dried.
- The universal adhesive was applied to the etched surface and light-cured for 20 seconds.

Composite Layering
- The LE enamel shade was used for palatal shell and proximal wall build up.
- A thin layer of MD dentin shade composite was applied as a core build-up and mamelons creation.
- Finally, a thin layer of translucent OM composite was applied to the incisal edge to mimic the natural translucency and light-cured. Followed by LE enamel shade for labial surface build-up.

Finishing and Polishing
The restoration was contoured, finished, and polished using twinkle polishing system.

Post-Operative Instructions
The patient was advised to avoid excessive biting forces on the restored tooth and maintain good oral hygiene practices. Regular dental check-ups were scheduled to monitor the restoration.

A wide range of placement protocols have been proposed for anterior resin composites. The general recommendation is to restore the central incisors first, one at a time. Once complete, restoration of lateral incisors and then canines are carried out. Composite increments may be injected from compiles or applied using a variety of instruments [11-15].

The thickness relationship of opaque dentine composites and translucent enamels is the key to successful layering techniques. The overall outcome is determined by the propagation of light as it passes through these layers to create an illusion of depth, equivalent to that seen in natural teeth.

The Following are the Basic Layering Techniques
Dual-Shade Layering Technique Fig.2,3,4.5
Inexperienced clinicians are recommended to use this technique using two shades i.e. dentine and enamel shade. Following etching and adhesive application dentine layer is applied and light cured. Palatal, labial and proximal enamel increments are then placed, contoured and light cured.

Multi-Layered (Polychromatic) Placement Technique
When aesthetic demands are high, the widely accepted stratification technique proposed by Lorenzo Vanini is recommended. The fundamental principle of polychromatic layering technique is to use different composite shades to replicate the layers seen in natural teeth. A palatal 'shell' of translucent enamel composite

is light cured using silicone template. Dentine build-up is done to avoid monochromatic appearance; dentine lobes are restored using progressive chromatic increments. When the translucent enamel material is subsequently applied and polished, it produces very natural appearances, such as the incisal 'halo effect'. Finally, a thin labial enamel layer is placed and light cured.

Shaping is a defining aspect in final appearance of the restoration. Initial shaping may be carried out using red-stripe (30-40 µm) composite finishing burs. When shaping a single central incisor, the adjacent tooth should be taken as reference for symmetry by making the reflective face of both teeth equal. Functional surface should be designed and contour in a way that both restoration and tooth can withstand occlusal forces.

Surface texture features may all be simulated in direct restorations, using a variety of equipment including Finer diamond or tungsten carbide composite finishing burs (yellow/white/purple stripe) to refine shape, Medium finishing discs to smooth the restoration and refine line angles, Fine polishing discs to create the attractive surface luster, Silicone rubber points and cups to introduce secondary anatomical features, Abrasive finishing strips to remove proximal excess and Sharp instruments, e.g. scalpels or scalers to remove unbonded excess, Goat's hair/chamois/felt wheels and brushes to develop a high shine, Specialized polishing pastes of varying particle size, e.g. Aluminum oxide. Fig.6

Discussion

Nanofill resin and the nanometric-sized range of materials have given most dentists a "universal material" that can be maintained and removed as needed. The resins allow a more than adequate finish and luster, reasonably extended wear on the tooth, and shine and surface qualities that last for a long time. If the case demands a more exacting result, the dentist may want to overlay a micro hybrid or a nano fill with a micro fill, and the micro fill will remain serviceable for a much longer time [16-20].

In relating function to esthetics with a class IV restoration, an important aspect is the overall impact of the incisal edges compared with the other teeth. Some people have excessive wear on their teeth. They have disocclusion on one of the incisal edges in protrusion. Others may have parafunctional habits. It is necessary to map out all these things and provide a restoration with predictable longevity and outcome. The contributing factors besides individual preference includes biologic status, which relates to the longevity of the work.

The indication for a class IV restoration is anyone with a fracture caused by a sports injury, incidental trauma, or accident. All of these could certainly be restored using a bonded class IV restoration.

The class IV restoration is considered a minimally invasive approach to restorative dentistry and is done by lightly adding material onto existing tooth.

Among the contraindications are parafunctional habits. If the patient has habits such as biting on bones or using the teeth to open bags, he or she must be warned that the restoration may not be successful.Fig.6

Patients who want bonded or cosmetic procedures done for anterior teeth should; (1) avoid tearing into hardgoods such as whole apples directly with the anterior teeth and
(2) refrain from parafunctional habits.

When doing a class IV restoration, the dentist should check the bite and centric relationship to make sure that there is adequate clearance and no protrusion that could cause additional trauma to the restoration. It is also necessary to ensure that the material chosen has adequate strength and flexural modulus and that the patient's occlusion will not cause fractures in that area thereafter. In addition, the dentist must examine the occlusion afterward to verify that there are no immaturities or interferences created by the restoration [21-30].

If the patient is wearing a night guard and the dentist has created a class IV restoration on a tooth that was chipped after the night guard was made, it is necessary to check the fit of the night guard for interferences. If it cannot be ensured that there is no additional interference, a new night guard should be fabricated to match the new occlusion.

When restoring a vital fractured anterior tooth, in most situations it is wise to build up the fragment using a bonded restoration.

Figure 5: LE enamel shade for the labial wall.

If a large portion of the tooth for instance, two thirds is missing, then the dentist may consider creating a ceramic crown, fortifying it, and establishing a good ferrule around the margins.[8] To build this compromises the durability of the restoration, as there is just a little bit of tooth structure and a very large restoration.

Figure 6: Final situation (6months follow up) (class IV for the left central incisor, class III for the right incisor).

A class IV restoration using a bonded resin is one of the most minimally invasive dental procedures being done. The material is bonded onto the tooth after creation of something as mundane as a bevel. The bite and occlusion are checked, the restoration is finished and polished, and the patient is done.

Restoration polishing is particularly important in order to delay the discoloration and aging processes of the composite, because higher smoothness and less porosity reduce the adherence of agents responsible for changing the color of composites, such as dental biofilm, food colorants, tobacco, and others. Oral habits such as tobacco use and certain, dietary patterns (for example, caffeine intake) may exacerbate the external discoloration of composite materials. Fig.6

Direct restorative procedure was presented as an effective and safe alternative for oral rehabilitation. Many factors, such as planning stage, knowledge and mastery of technique and finish and polishing materials decide the success of the restorations; monitoring and maintenance ensure the treatment longevity.

The different manufacturers 'resin composite and adhesive systems were combined to treat this patient; it has been demonstrated that etch-and rinse adhesive systems can be safely used with composites from different manufacturers without compromising bond strength. The three-step etch and- rinse adhesive system was used instead of the self-etching adhesive system supplied by the resin composite manufacturer because it provides a more reliable enamel bond and has been demonstrated in many clinical trials to be very effective. In addition, both manufacturers claim that the products used in this case are compatible [31-37].

Conclusion

Today for restorations on anterior teeth, the professional must learn the rules of aesthetics of natural teeth for the use of these materials. Treating that natural teeth are polychromatic, while composite resins are monochromatic. Given the existence of a wide variety of resins and technical possibilities, the following text proposes a clinical sequence of reconstruction of anterior teeth with compromised incisal angle due to fracture. The stratification with composite resin favors the naturalness so desired by the patient because the invisibility of the restorations achieved, leaving the smile more harmonious and beautiful, which certainly improves self-esteem. With the evolution of adhesive dentistry, it is possible to perform aesthetic procedures with greater longevity and naturalness already mentioned.

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Conflict of Interest

The authors declare they have no conflict of interest.

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