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Case Report

Aesthetic Anterior Composite Stratification: A report of Two Cases

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Abstract

This paper illustrates a protocol for esthetic restoration of fractured anterior teeth using direct composite stratification. Through two clinical cases, we demonstrate the importance of precision in color selection using the "button try-in" technique, meticulous preparation focusing on margin design, and controlled layering with nano-hybrid composite. The cases highlight the three-layer stratification technique to achieve natural translucency and masking of underlying discoloration. Key steps include rubber dam isolation, enamel and dentin shade selection, application of a universal adhesive, precise composite layering guided by a silicone index, and careful finishing and polishing. The described protocol, combining advanced adhesive materials and a systematic workflow, leads to predictable and esthetically pleasing outcomes in anterior restorations, ensuring durability and patient satisfaction.

Keywords: Dental Esthetics; Anterior Tooth; Tooth Fractures; Dental Restoration; Composite Resins; Adhesive Dentistry; Color Matching

Introduction

Restoration of fractured anterior teeth presents a significant clinical challenge, demanding a harmonious blend of esthetics, function, and long-term durability. Achieving natural-looking restorations in these cases requires meticulous attention to detail, a thorough understanding of dental anatomy and optical properties, and the skillful application of advanced adhesive techniques and materials.

This paper details a clinical protocol employing direct composite stratification, a technique that allows clinicians to mimic the natural layering and translucency of enamel and dentin.

Through two case reports, we demonstrate the critical steps involved in this approach, emphasizing precision in shade selection, margin design, and composite placement to achieve predictable and esthetically pleasing outcomes.

Case Presentation

Case N°1

A 25-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics at the Military Principal Hospital of Instruction, Tunis, Tunisia, for the management of fractured maxillary central incisors.

Following a clinical examination, a treatment plan was developed to restore teeth #11 and #21, which presented with uncomplicated coronal fractures secondary to recent trauma. Direct composite restorations, utilizing a stratification technique with a nano-hybrid resin composite, were selected to achieve an esthetic and functional rehabilitation.

Preoperative intraoral photographs were captured from both facial and palatal perspectives (Figure 1A, B) to serve as a baseline for future reference and comparative analysis.

Color selection was conducted to achieve an optimal color match between the natural teeth and the restorations. The color selection process was performed using the «button try» technique (Figure 1C), where composite beads were employed to determine the appropriate shades. Specifically, a button-try composite was applied to the cervical portion of the left maxillary central incisor for dentin and to the incisal third of the left lateral incisor for enamel, and then polymerized to verify the color accuracy.

Following color determination, the enamel shade was selected based on matching the incisal third of the left lateral incisor, while the dentinal shade was chosen by matching the cervical third of the left central incisor.

Subsequently, rubber dam isolation was implemented (Figure 1D) to ensure a controlled and aseptic environment. Following this, the restorative tooth preparation process commenced.

The tooth preparation involved the creation of a buccal chamfer and the flattening of both the palatal and proximal surfaces (Figure 1E). After that, the surfaces were polished, and the edges were softened.

Subsequently, direct composite restorations were performed on both central incisors, guided by a previously prepared silicone index derived from a diagnostic wax-up (Figure 1F).

Initially, both central incisors were etched with 37% phosphoric acid (FineEtch37, Spident) for 30 seconds to create a microretentive surface conducive to bonding (Figure 1G). The etching gel was then thoroughly rinsed off with water, and the surfaces were dried. A universal adhesive system (Ambar Universal APS, FGM) was subsequently applied (Figure 1H). To protect the proximal surfaces of the lateral incisors, Teflon tape was carefully placed as a barrier.

Then, the palatal walls were meticulously built with the aid of the silicone index, employing the chosen enamel mass TW (EsCom® 250, Spident). Following light curing of the palatal walls, the silicone index was carefully removed, leaving the composite material securely in place on the teeth.

Small polyester matrices were carefully placed in the areas corresponding to the interproximal spaces. The interproximal walls were subsequently built using the enamel mass TW (EsCom® 250, Spident), which was identical to the material employed for the palatal walls.

For the construction of the dentinal body, a dentin shade A2 (EsCom® 250, Spident) was utilized. This material was carefully applied to replicate the natural dentin structure.

Finally, the enamel shade TW (EsCom® 250, Spident) was applied as the final layer, completing the restoration. This step constituted the only non-guided phase of the restoration.

Each layer of resin composite was photopolymerized for a duration of 20 seconds. The final polymerization process was conducted under anaerobic conditions, with the addition of glycerin, and lasted for 40 seconds.

The immediate final step entailed a meticulous finishing and polishing protocol. Initially, abrasive discs, interproximal abrasive strips, and fine-grain burs were employed to progressively smooth the surface. Following this, polishing pastes were applied using silicone cups to achieve a high-gloss finish that closely mimicked the natural enamel appearance (Figure 1I).

Following the removal of the rubber dam, the final result showcased a successful aesthetic integration of the restorations (Figure 1J).

Figure 1A: Preoperative frontal view illustrating the fractured maxillary right and left central incisors.

Figure 1B: Preoperative palatal view revealing an amelodentinal fracture of both central incisors, characterized by the absence of pulp exposure.

Figure 1C: Selection of appropriate enamel and dentin shades using the "button try-in" technique.

Figure 1D: Placement of a rubber dam to isolate the operative field.

Figure 1E: Preparation of the fractured central incisors involving the creation of a buccal chamfer and flattening of the palatal and proximal surfaces.

Figure 1F: Try-in of a silicone index derived from a diagnostic wax-up.

Figure 1G: Etching with 37% orthophosphoric acid.

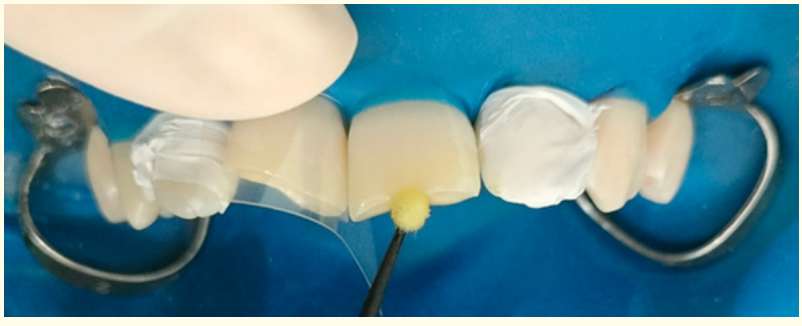

Figure 1H: After the etching gel was thoroughly rinsed and the surface dried, the procedure progressed to the application of a bonding agent. A universal adhesive was employed.

Figure 1I: The completed restorations present a high-gloss surface finish and a shape and volume that closely replicate the natural morphology of the teeth.

Figure 1J: The final outcome, after rubber dam removal.

Case N°2

A 7-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics at the Military Principal Hospital of Instruction Tunis, Tunisia, for the management of fractured maxillary central incisors. A non-invasive treatment plan, utilizing direct composite restorations, was recommended for teeth 11 and 21, which had sustained simple coronal fractures due to recent trauma (Figure 2A). The treatment plan involved the restoration of vital teeth 11 and 21 using the modern stratification technique with EsCom® 250 nano-hybrid resin composite (Spident). Alginate impressions were obtained to facilitate the creation of a diagnostic wax-up and the subsequent fabrication of a silicone index (Figures 2B,C). The color selection process was performed using the «button try» technique (Figure 2D). The final result exhibited a seamless aesthetic integration of the restorations, marked by a consistent color match and a natural appearance that blended harmoniously with the adjacent teeth. This successful outcome underscored the effectiveness of the treatment approach in replicating the natural dental aesthetics and ensuring a high level of patient satisfaction (Figure 2E).

Figure 2A: The final outcome, after rubber dam removal.

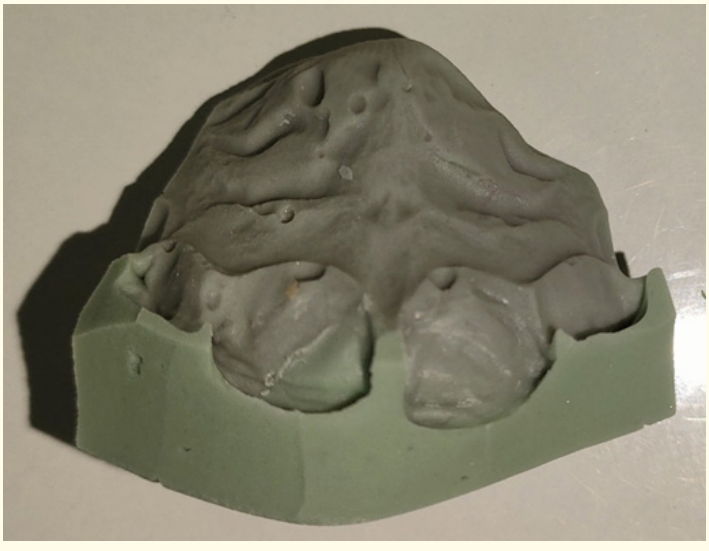

Figure 2B: Silicone Index.

Figure 2C: Silicone Index.

Figure 2D: Application of the "Button Try" method using composite resin to determine the optimal shades for enamel and dentin.

Figure 2E: Immediate postoperative photograph documenting the restorations immediately after completion of the finishing and polishing procedures.

Discussion

Attaining a superior aesthetic outcome in direct restorations necessitates the standardization of several key factors. These include precise color determination, a meticulous preparation process—particularly in terms of margin design—and careful control over the thickness of both dentin and enamel layers [1].

Color matching is a critical and complex step in cosmetic dentistry, especially for direct restorations, requiring a nuanced understanding of the color properties that contribute to the natural appearance of teeth. Tooth color perception is influenced by three fundamental dimensions : hue (the basic color tone), chroma (color intensity or saturation), and value (lightness or brightness). These elements interact intricately with the tooth's translucency and surface texture, rendering precise color determination crucial for achieving a natural appearance in restorations [2-4].

To achieve precision in color matching, both direct and indirect color evaluation methods are employed. Initially, a preliminary color assessment is conducted using a spectrophotometer, which provides an objective reference point by analyzing the tooth's spectral characteristics. Subsequently, a visual color assessment is performed using shade guides, during which clinicians meticulously observe individual variations across the tooth, including incisal translucency, proximal opacity, and any natural pigments or micro-cracks that may influence the final appearance. This detailed observation facilitates the creation of a comprehensive «dental color map,» which involves mapping different shades and translucent zones in areas such as the cervical, middle, and incisal thirds of the tooth [4,5].

To enhance accuracy in color matching, custom shade guides can be fabricated. These guides are composed of multiple layers with

varying colors, constructed from the same composite materials intended for the final restoration. This customization provides a more realistic reference for layering and color matching, facilitating a closer approximation to the natural color nuances of teeth.

The «button try-in technique» represents a recent advancement in color evaluation protocols, involving the placement of small composite pellets of varying shades on the facial surface of the tooth undergoing restoration. These samples are photo-polymerized in situ, allowing clinicians to assess the appearance of each shade post-curing. This method provides a preliminary «trial run» for color matching, facilitating any necessary adjustments prior to finalizing the restoration and ensuring that the selected composite integrates harmoniously with the adjacent dentition. This technique was successfully employed in Cases 1 and 2 to optimize color matching in both clinical situations.

Proper margin preparation is crucial for achieving a seamless interface between the restorative material and the natural tooth, thereby minimizing visible lines, enhancing durability, and optimizing aesthetic integration. Furthermore, meticulous control over the thickness of the dentin and enamel layers facilitates precise layering of composite materials, ensuring that the restoration replicates the natural translucency, shade, and light reflection properties of a healthy tooth. Standardizing these elements provides a consistent foundation, which is essential for achieving a natural appearance and enhancing the efficiency and predictability of the restorative procedure [7].

Consistently achieving the correct and uniform enamel thickness poses a challenge due to the underlying dentin design and thickness. A study by Vichi A. has demonstrated that the thickness of the cover layer significantly influences the perceived color of the restoration. Specifically, excessive enamel thickness can lead to a grayish appearance with reduced value, underscoring the importance of precise control over layer thickness to optimize aesthetic outcomes [8].

The three-layer stratification technique represents an advanced approach to composite layering, involving the strategic combination of opaque dentin, body dentin, and enamel materials to control light transmission effectively. This method requires precise selection of both the hue and thickness of the dentin and enamel layers to achieve a harmonious and aesthetically pleasing restoration. The use of opaque materials in this technique is particularly advantageous for masking discoloration in teeth affected by dyschromia, thereby ensuring a natural and uniform appearance that closely replicates the optical properties of healthy dentition [4].

In both clinical cases described, a nano-hybrid resin composite reinforced with nano-zirconia filler, specifically EsCOM 250 (Spident), was employed. This composite material offers several advantages, including enhanced flexural and compressive strength, which significantly contribute to its durability and resilience. Furthermore, EsCOM 250 provides an extended working time of 90 seconds, allowing for more precise manipulation during the restorative process. Its ease of handling and non-stick properties facilitate a smoother application, thereby streamlining procedures and improving the overall workflow for clinicians by reducing procedural complexity and enhancing efficiency.

The polishing and lustration procedures play a critical role in maintaining the mechanical integrity of composite materials by ensuring a high-luster, enamel-like surface texture. These steps extend beyond aesthetic benefits, as proper finishing is vital for preventing a range of clinical issues, including staining, plaque buildup, gingival irritation, recurrent caries, and heightened tactile sensitivity for the patient [9].

Conclusion

Restoring anterior teeth using direct composite techniques requires a meticulous approach to ensure both aesthetic and functional success. The cases presented underscore the importance of careful color selection, precise margin preparation, and the application of advanced layering techniques. By integrating modern adhesive materials, clinicians can create restorations that closely replicate the appearance and function of natural teeth, thereby ensuring enhanced durability and patient satisfaction.

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