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Case Report

Modern Stratification Technique with Nano-Hybrid Composite Resin in Anterior Teeth

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Abstract

Aesthetic anterior composite stratification is a technique that often seems challenging to practitioners. The first proposed stratification schemes were overly complex but produced and continue to produce interesting results for experienced dental practitioners.

Constant evolution and progress of materials (adhesive systems, composite resins, etc) in restorative dentistry have allowed to simplify the daily lives of dental practitioners and to improve the treatments that patients benefit from.

As composite resins have evolved, more adapted and simpler stratification protocols have been proposed. The objective of this article is to describe the most recent protocol for anterior stratification of composite resins through two clinical cases. This will enable a better understanding and easier implementation of this modern technique.

Keywords: Composite Resin; Anterior Teeth; Adhesive System; Anterior Restorations; Fracture

Introduction

The anterior resin composite stratification may be indicated as part of a "therapeutic gradient" approach, which is tailored to various clinical situations. These include a coronal fracture resulting from trauma, the replacement of a defective restoration, a carious lesion, or even the correction of a defect in the shape or shade of teeth to harmonise a smile [1].

The advent of advanced restorative dental techniques has resulted in a notable reduction in the necessity for tissue preparation. This has evolved from the utilization of costly restorations that necessitated extensive peripheral preparation to the implementation of aesthetic composites in direct technique, which does not entail significant preparation [2].

Although these approaches are appealing due to their tissue preservation, the restoration of anterior teeth using stratified composite resin remains a complex and time-consuming process. Achieving a consistent and reproducible aesthetic result represents a significant challenge [3].

The objective of this article is to present the most recent protocol for anterior stratification of composite resins, illustrated by two clinical cases treated in our department of Conservative Dentistry and Endodontics. The key steps to achieve the most predictable outcome while adhering to biological, mechanical, functional, and aesthetic criteria are highlighted.

Case Presentation

Case N°1

A 18-year-old male patient consulted the Department of Conservative Dentistry and Endodontics at the Military Principal Hospital of Instruction, Tunis, Tunisia.

The patient requested a non-invasive aesthetic treatment of teeth 11, 21, and 22 with simple coronal fractures resulting from a recent trauma. (Figure 1)

The therapeutic decision was to restore teeth 11, 21 and 22, which were vital, using the modern stratification technique with the nano-hybrid resin composite EsCom® 250 (Spident).

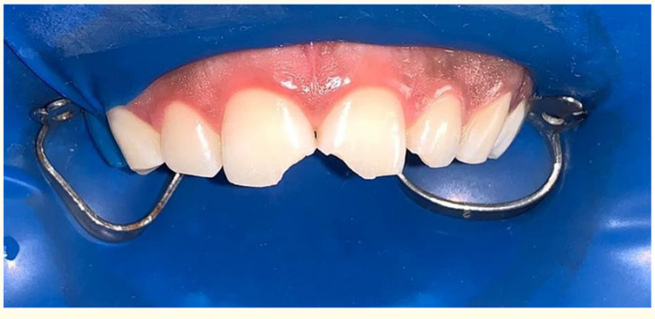

Figure 1: A preoperative facial view showing the fractured maxillary right and left central incisors and the maxillary left lateral incisor. A rubber dam was applied.

Preoperative analysis

Prior to commencing a restoration of an anterior tooth, it is essential to complete a preoperative analysis.

In general, an aesthetic diagnosis is made by a thorough clinical examination, with attention to details. This

allows the observer to observe the anatomy of the remaining tooth as well as the morphology of the adjacent teeth, which serve as references for the shape of the tooth and for the analysis of the different aspects of tint. Photographs and plaster model can also be made [4,5].

Analysis and shape recording

The reproduction of the general shape of the restoration is facilitated by the use of a silicone guide in both the frontal and sagittal directions [5].

The silicone guide is either made from [6]

- **A lab wax-up:** In the event of a more significant loss of the substance or a modification in the anatomy of multiple teeth, a wax-up will be required. (Figure 2, 3 and 4)

An existing restoration with a proper shape aesthetically and functionally.

- **A mock-up:** it's a composite reconstitution realized directly on the tooth without surface treatment when there is a little loss of the substance or that the dental anatomy needs to be slightly modified.

The silicone guide is essential for guiding the realization of a functional lingual face and accurately reproducing the general contour of the initial tooth, as well as the location of the free edge and the embrasures [6].

The silicone guide is meticulously cut to ensure that it does not extend beyond the distal face of the canines or the palate-gingival junction, thus facilitating its insertion.

The silicone guide should be cut to expose the vestibular side of the tooth and reduced to a height of 2 mm above the free edge. This method allows for the simplification of a complex cavity into a simple cavity through the use of the silicone guide.

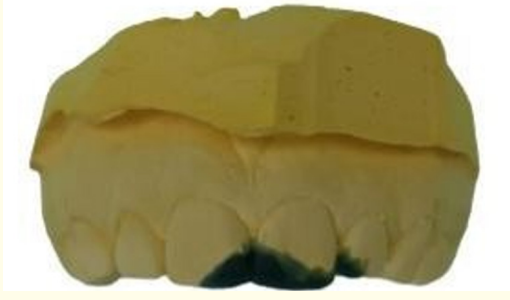

Figure 2: Impression was taken for creating a plaster model and perform the wax up.

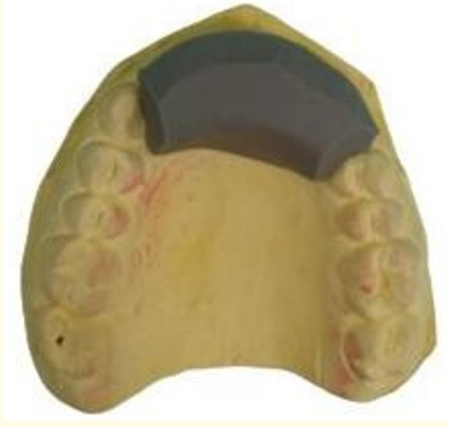

Figure 3: Elaboration of the silicone guide.

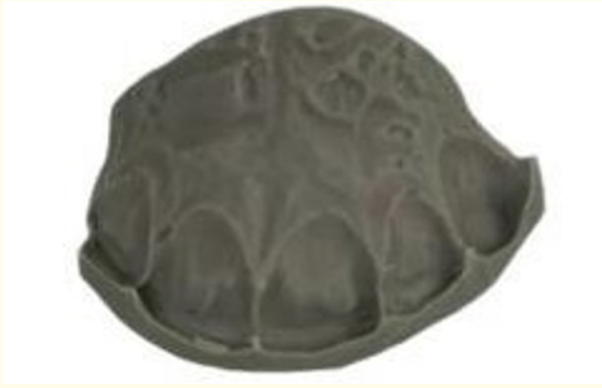

Figure 4: The silicone guide was fabricated on the waxed-up model to build composite palatal shell.

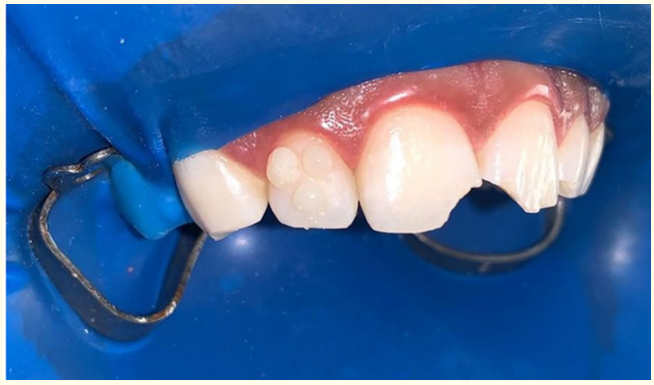

Figure 5: To match the color, we used the "button try technique" by putting and curing little amounts of composite resins on the tooth 12.

Tooth color determination

The color determination is conducted during the initial session, in the presence of natural light, prior to the commencement of any operative procedure [4].

The tooth must first be cleaned using a mixture of water and pumice stone or polishing paste to remove the exogenous film acquired on its surface.

This procedure should be completed prior to the placement of the dam to prevent the tooth from dehydrating, which would result in a change in color.

In order to achieve an aesthetically pleasing smile, it is essential to select composites with a wide range of dentin and enamel shades, in addition to suitable physical and mechanical properties. These may include micro-hybrid or nano-hybrid composites.

In the conventional approach, color matching is achieved through the use of a shade guide corresponding to the composite material in question. Nevertheless, for a more precise assessment of the shade, one technique called "button try technique "involves placing a composite pellet on the tooth to be restored (without surface treatment) and polymerising it [7].

In our clinical case, the "button try technique" was employed on tooth 12. (Figure 5).

The fundamental color of the restoration is derived from the dentin body, which is replicated by dentin masses. The term "basic chromaticity" is used to describe the color perception of a tooth, and is determined primarily in the cervical region, where the enamel thickness is the lowest. This region has a minimal effect on the perception of color.

The selection of this fundamental color is of paramount importance, as it serves to determine the final color of the restoration (Vanini 1996).

Secondly, the enamel mass in the median region of the tooth is selected [5].

The age of the patient and the clinical observation of the adjacent teeth assist in determining the brightness degree of the enamel mass. The enamel is lighter in younger patients. Conversely, the enamel will become more translucent with age [8].

Composite plots are positioned in the cervical region for the dentin color and in the median third for the enamel color, after which they are photopolymerised in order to ascertain and corroborate the accurate selection of colors.

It is of the utmost importance to give special consideration to the internal architecture of the free margin. Its translucency and its opalescence need to be recorded. The aforementioned anatomy must then be replicated in order to achieve an accurate biomimetic replication of the restoration [8].

Once the shade has been confirmed, the composite pellets can be readily removed using a spatula.

Tooth preparation

In order to achieve the most aesthetically pleasing result, it is essential to prepare the teeth in a way that makes the limit between the composite and the natural tooth indistinguishable.

The preparation consists of a buccal chamfer and flattening of the palatal and proximal surfaces. The surface is polished, and the edges are softened to prepare for the restoration.

In this clinical case, we proceeded with the aforementioned steps.

This chamfer allows for the following benefits: The reduction of micro-leakage at the tooth/composite junction, the improvement of adhesion by increasing the etched surface area, the achievement of better aesthetics by enabling enamel coverage with a larger quantity of material and the enhancement of light diffusion between the tooth and the restoration.

It is important to note that the shape and the depth of the chamfer should not be uniform, but rather tailored to the shape of the preparation and the tooth [9].

This preparation remains very conservative (compared to indirect techniques) and stays in complete agreement with the principles of minimally invasive dentistry while maximizing aesthetic prognosis.

After completing the tooth preparation, a silicone guide is positioned to mark the palatal limit. A simple "scratch" is created using a probe, serving as a guide for applying the first layer of composite onto the key [4].

Application of the adhesive system

During the process of composite layering, the majority of the bonding area is located on the enamel. Consequently, the selection of adhesive is inclined towards a universal adhesive with prior etching.

Indeed, only the application of 37% phosphoric acid for 30 seconds on the enamel enables a sufficient etching and thus adhesion [10]. In our clinical case, we utilized FineEtch37 (Spident). (Figure 6).

Subsequently, the acid is thoroughly rinsed with water, and the tooth is dried but not dehydrated. It is important to maintain a slight moisture level on the tooth, neither wet nor dry [5].

Subsequently, the adhesive should be applied in accordance with the manufacturer's instructions. Typically, the adhesive should be applied for 20 seconds, lightly dried, and finally light-cured for 20 seconds. In our clinical case, we utilized the adhesive EsBond™ (Spident).

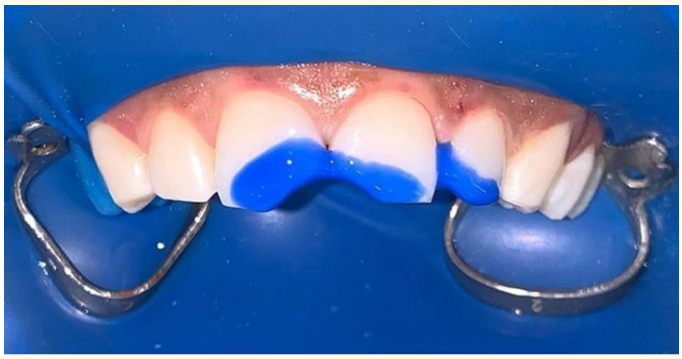

Figure 6: The enamel was etched for 30 seconds using FineEtch37 (Spident).

Simplified stratification protocol

In the present era, we are witnessing a simplification of the stratification process, which is conducive to enhanced comprehension and greater efficiency in time management. The most prevalent technique is the "Natural Layering Concept," which entails the reconstruction of the diverse hard tissues of the dental organ through the use of specific composite resins [11].

In the clinical case presented, a nano-hybrid resin composite reinforced with a nano-zirconia filler, namely EsCOM 250 (Spident), was employed. The advantages of this nano-hybrid resin composite include improved flexural and compressive strength, an extended working time (90 seconds), ease of handling, and non- stickiness.

Preparation of the palatal wall: [6]

It is essential to ascertain the correct insertion of the silicone guide. (Figure 7).

The layering progresses from the palatal surface towards the vestibular surface. We began by reconstructing the palatal wall using the translucent composite resin TW EsCom250 (Spident), with the assistance of the previously prepared silicone guide.

The chosen translucent composite was applied onto the silicone guide up to the mark made at the end of the preparation to avoid an over contour.

The translucent composite thickness should not exceed 0.5mm to be rigid enough to resist breakage during the subsequent layering.

This specific composite was selected to augment the natural translucency of the teeth and enable light transmission through the surface.

Subsequently, the key was inserted into the mouth, and the adaptation of the composite to the marginal line was verified. The initial stratification layer was polymerised for a period of 30 seconds. (Figure 8).

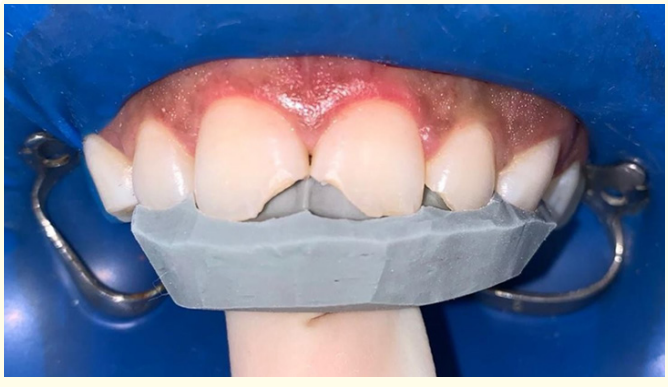

Figure 7: Verification of the adaptation and the retention of the silicone guide.

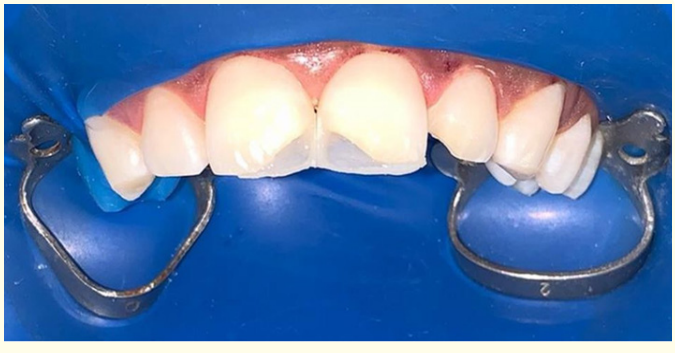

Figure 8: Elaboration of the palatal wall.

Preparation of the proximal walls

The interproximal walls were constructed using the translucent composite resin TW EsCom250 (Spident) that was identical to the palatal wall. The composite was placed on transparent matrix bands, which were preferably curved, in order to recreate the emergence profile and contact point [6].

Placement of dentin masses

The dentin body of the tooth was built up using composite dentin masses A1 EsCom250 (Spident), respecting thicknesses and anatomy. This involves a three-dimensional placement starting from the palatal wall with small increments of dentin composite. There must be a true homothety between the shape of the tooth and the dentin mass.

The dentin composite was applied to the enamel bevel in order to mask the joint between the restoration and the tooth [4].

The space required for the subsequent application of vestibular enamel is evaluated by measuring the distance from the incisal edge to the boundaries of the preparation. Consequently, it is imperative to maintain regular control of the thickness of the increments, both vestibularly and axially.

Consequently, as the restoration progresses, the lobes, mamelons, and grooves are reproduced, thereby creating spaces for the internal opalescence. It is possible to use brushes (conventional or silicone) and micro- brushes to smooth the composite before polymerisation. It is of paramount importance to apply the various increments of composite resin with precision, ensuring that porosities are excluded, in order to achieve a successful restoration [5]. Each layer of composite is polymerized after application.

Formation of the enamel wall

The composite layer was applied on the vestibular surface using a brush. This layer was achieved with a translucent composite mass, identical to that used for the palatal and proximal walls.

It was applied to complete the vestibular profile and provide the desired translucency to the restoration. The thickness of this layer should be 0.5 mm. It will be very thin, similar to natural enamel, with a thinner section at the cervical region than at the incisal region. This is to avoid interference with the final shade.

The final polymerisation process was conducted for a duration of 30 to 40 seconds under anaerobic conditions, with the addition of glycerin to inhibit the oxygen layer and facilitate the complete polymerisation of the surface layer [5].

Occlusion control

It is essential to monitor and correct both static and dynamic occlusion using diamond burs. This step is typically brief due to the use of the silicone guide, yet it is important not to overlook it.

Finishing and polishing

The sculpting and polishing sequence is of paramount importance for the integration of aesthetic and functional restoration, yet it is also the most challenging to achieve.

It is essential to identify and document the macro features (transition lines, contours, anatomy of the free edge, etc.) and the micro features (roughness, surface condition) of the tooth. It is essential to observe these characteristics in all three spatial dimensions in order to effectively manage them [4].

The finishing process is initiated on the day of layering and is completed using low-grit diamond burs (red, yellow, and white rings) and/or discs. Once the tooth has regained its contours, the polishing stage commences. This is achieved through the use of silicone cups (from most abrasive to least abrasive), discs paired with polishing pastes, and silicon carbide brushes (Figure 9).

Figure 9: The postoperative appearance is indicative of the harmonious integration of composite resin with the natural tooth structure.

Case N°2

A 13-year-old patient consulted the Department of Conservative Dentistry and Endodontics at the Military Principal Hospital of Instruction, Tunis, Tunisia.

The patient requested a solution for his fractured maxillary right central incisor. (Figure 10).

The therapeutic decision was to restore tooth number 11, which was vital, using a modern resin composite stratification technique with the nano-hybrid resin composite EsCom® 250 (Spident). (Figure 11 and 12).

In these two clinical cases, the restorations were completed in two visits. The first visit was for taking an impression and wax-up, and the second visit for the restorations.

Figure 10: An intraoral examination was conducted to analyse the fractured tooth number 11.

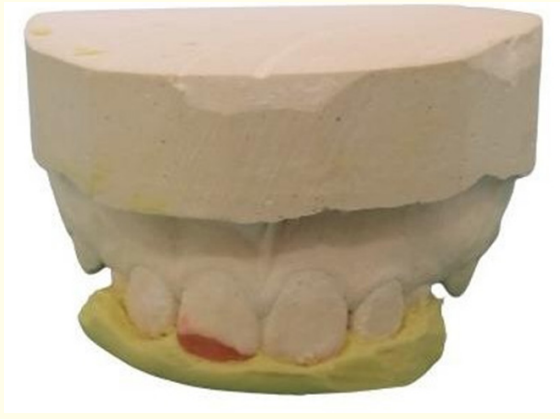

Figure 11: Once the wax-up was complete, a silicone palatal key was created to transfer the future design to the patient's mouth.

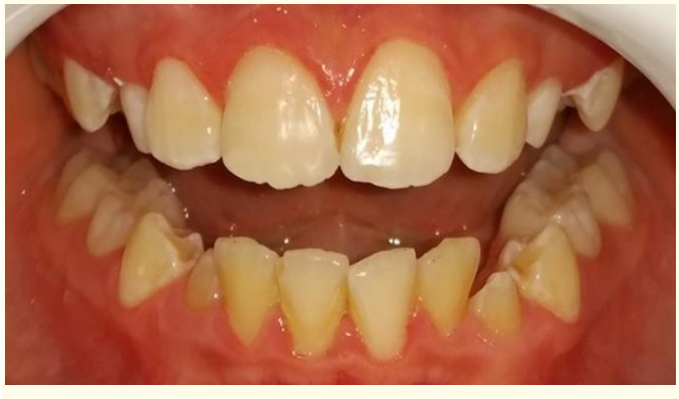

Figure 12: The final situation, with correct shape, shade and contour.

Conclusion

Like all adhesive techniques, direct composite restorations are operator dependent. They must meet biological, mechanical, and aesthetic requirements. To achieve these objectives, it is essential to follow a rigorous

restorative protocol.

In these two clinical cases, we were able to achieve satisfactory results for both patients and practitioners by listening carefully to patients, observing their teeth, choosing the right restorative materials and using the modern stratification technique.

Bibliography

1. Tirlet G and Attal JP. "Stratification de composite dans le secteur antérieur : indications actuelles et choix des matériaux". *Information Dentaire* 92.43 (2010): 21-27.

2. Abou R. "Stratification des composites en antérieur: simplification et nouveaux concepts". *Le Fil Dentaire* (2010).

3. W Saracinelli M and Manauta J. "Composite in everyday practice: how to choose the right material and simplify application techniques in the anterior teeth". *The European Journal of Esthetic Dentistry* 5.1 (2010): 102-124.

4. Devictor H., *et al*. "Les restaurations antérieures en résine composite: une approche simplifiée et efficiente. Restaurations adhésives modernes: efficacité au quotidien". *Février* (2018).

5. Roux T., *et al*. "La stratification des composites esthétiques: Quelle méthode pour quel résultat?" *L'Information Dentaire* (2012): 27.

6. Bernard C. "Composite antérieur: la clé palatine, indispensable outil de simplification de la stratification". *L'Information Dentaire* (2018).

7. Spreafico R. "Composite resin rehabilitation of eroded dentition in a bulimic patient: a case report". *The European Journal of Esthetic Dentistry* 5.1 (2010): 28-48.

8. Vanini L. "Light and color in anterior composite restorations". *Practical Periodontics and Aesthetic Dentistry* 8.7 (1996): 673-82.

9. Guerrieri A and Decup F. "Intégration esthétique des composites antérieurs Cl III (site 2)". *Information Dentaire* 91.30 (2009): 1633-1640.

10. Degrange M. "Les systèmes adhésifs amélo-dentinaires". *Réal Clinic* 16.4 (2005): 327.

11. Dietschi D. "Layering concepts in anterior composite restorations". *The Journal of Adhesive Dentistry* 3.1 (2001): 71-80.