

Esthetic Rehabilitation of Peg-Shaped Lateral Incisors Using an Inject able Composite Technique - A Case Report

¹Dr. Bouchra Doumari, Assistant Professor, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

²Dr. Hafsa El Merini, Professor and Head of Department, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

³Dr. Zineb El Hajjioui, Specialist in Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

⁴Dr. Sofia Drouri, Professor, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

⁵Dr. Mouna Jabri, Professor and Head of Service, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

Corresponding Author: Dr. Bouchra Doumari, Assistant Professor, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Casablanca, Hassan II University, Casablanca, Morocco.

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Abstract

Background: Peg-shaped lateral incisors are a common developmental anomaly that compromises anterior esthetics and dental harmony. Minimally invasive restorative approaches are increasingly preferred to preserve tooth structure while achieving optimal esthetic outcomes. The inject able composite resin technique offers a guided and conservative alternative for anterior tooth rehabilitation.

Case Report: This clinical case describes the esthetic rehabilitation of peg-shaped maxillary lateral incisors in a 35-year-old female patient. Following clinical and esthetic evaluation, a treatment plan based on an inject able composite resin technique was selected. A diagnostic wax-up was performed and transferred

intraorally using a transparent silicone index. A highly filled flow able composite resin was injected into the index to reproduce the planned morphology with minimal tooth preparation. Finishing and polishing procedures were performed to optimize surface texture and integration.

Results: The treatment provided immediate improvement in dental proportions, smile symmetry, and overall esthetics. The restorations demonstrated good initial stability and satisfactory esthetic integration. At short-term follow-up, minor marginal staining was observed and successfully managed through polishing, with maintenance of satisfactory clinical results.

Conclusion: The inject able composite resin technique represents a conservative, efficient, and predictable

approach for the esthetic management of peg-shaped lateral incisors. It combines minimal invasiveness with high esthetic potential and good short-term clinical performance. Further long-term studies are needed to evaluate durability and color stability.

Keywords: Peg-Shaped Lateral Incisors, Inject Able Composite, Minimally Invasive Dentistry, Esthetic Rehabilitation, Flow Able Composite Resin.

Introduction

The continuous evolution of adhesive dentistry and resin composite technology has profoundly influenced contemporary esthetic restorative protocols. Advances in filler loading, polymerization systems, optical integration, and surface gloss retention have significantly improved the mechanical and esthetic performance of direct composite restorations¹. As patient expectations for conservative, cost-effective, and highly esthetic treatments increase, minimally invasive strategies that preserve sound enamel while delivering predictable outcomes have become a central focus of modern restorative dentistry².

Peg-shaped lateral incisors represent a relatively common developmental anomaly characterized by reduced Mesiodistal dimension and conical crown morphology. This alteration frequently disrupts anterior dental harmony, compromising width-to-height ratios, incisal embrasures, and smile symmetry³. Even after orthodontic alignment, morphological discrepancies often persist, requiring restorative intervention to achieve ideal esthetic proportions. The correction of peg-shaped lateral incisors is therefore not merely additive in dimension but must respect principles of dentofacial analysis, bio mimetic layering, and proportional balance within the anterior segment⁴.

Indirect ceramic restorations remain a well-documented option for the management of such cases, offering

excellent optical properties and long-term color stability. However, they involve irreversible tooth preparation, laboratory dependency, increased treatment time, and higher financial cost⁵. Conversely, direct composite resin buildups allow conservative and reversible correction of morphology in a single clinical session. Despite these advantages, conventional freehand layering techniques in the anterior region are highly technique sensitive and dependent on operator artistic skill, particularly when bilateral symmetry and precise anatomical reproduction are required⁶.

To enhance predictability and reproducibility, guided restorative approaches based on diagnostic wax-ups have been introduced. The inject able resin composite technique represents an evolution of these protocols. Using a transparent silicone index fabricated from a validated wax-up, a flow able composite resin is injected directly into the matrix, transferring the planned anatomy to the tooth surface with minimal manual sculpting. This “copy–paste” concept allows accurate replication of tooth contours, emergence profiles, and incisal morphology while remaining a purely additive and enamel-preserving procedure⁷.

Recent developments in highly filled flow able resin composites have broadened the indications of this technique in the anterior region. Improved filler content and optimized resin matrices aim to enhance flexural strength, wear resistance, polish retention, and color stability compared with earlier low-viscosity materials. Nevertheless, clinical evidence regarding the medium- and long-term behavior of inject able composite restorations in the esthetic management of peg-shaped lateral incisors remains scarce, particularly with respect to surface staining and maintenance protocols⁸.

Therefore, the aim of this clinical report is to describe the minimally invasive esthetic rehabilitation of peg-shaped

lateral incisors using the injectable resin composite technique, emphasizing clinical workflow, proportional analysis, and short-term follow-up outcomes.

Case Report

A 35-year-old female patient presented to our dental clinic with an esthetic concern related to peg-shaped lateral incisors (teeth #12 and #22). The patient reported dissatisfaction with the shape and appearance of these teeth, which were diagnosed as rizziform in morphology. The patient's general health was good, and no significant medical history was reported.

Clinical Examination

Extraoral examination revealed a well-balanced facial symmetry. Intraoral examination showed a healthy periodontium with no signs of inflammation. Occlusal analysis demonstrated a Class I canine and molar relationship bilaterally, with a horizontal overlap of 2.5 mm and a vertical overbite of 2 mm. Teeth #12 and #22 presented typical rizziform morphology, with reduced mesiodistal width and conical shape but were otherwise sound and free of caries or previous restorations (Figures 1).

Treatment Planning

After discussion of various options including indirect ceramic veneers and direct composite layering, the patient opted for a conservative, cost-effective approach based on the injectable composite resin technique. The advantages of minimal tooth preparation, reduced chair side time, and promising esthetic outcomes were explained and accepted.

Clinical Procedure

Initial intraoral photographs were taken using a digital camera. Impressions of both arches were made and poured with dental stone.

A diagnostic wax-up was fabricated on the working model to restore proper anatomical form and proportions of teeth #12 and #22, respecting ideal width-to-height

ratios and incisal edge position (Figure 2 and 3). A transparent silicone index (Elite Transparent, Zhermack) was then made over the wax-up, with small perforations created at the incisal edge to allow access for the injection of flowable composite resin (Figure 4 and 5).

The adjacent teeth were protected using Teflon tape. The teeth to be restored were cleaned with a fluoride-free prophylactic paste, then etched with 35% phosphoric acid for 30 seconds on enamel, rinsed, and gently dried. A universal adhesive system (Scotch Bond Universal, 3M Oral Care) was actively applied for 20 seconds and light-cured for 20 seconds (Figure 6).

A highly filled flowable composite resin was selected. The transparent silicone index was positioned intraorally, and the flowable composite was injected through the perforations to fill the mold corresponding to the wax-up anatomy (Figure 4). Light curing was performed for 30 seconds from both buccal and palatal aspects before carefully removing the index (Figure 7).

Minimal buccal reduction (0.5 mm) was performed (Figures 8), followed by enamel composite injection. Once all restorations were fully polymerized, a glycerin-based gel was applied and light-cured to eliminate the oxygen-inhibited layer. This step was performed according to the clinician's preference and is considered optional.

Finishing and Polishing

Initial finishing was performed using abrasive discs and intersproximal strips. Occlusal adjustments were checked with 100 µm articulating paper (Bausch), ensuring proper canine guidance and absence of interferences. Final polishing was accomplished using polishing rubbers and polishing paste. (Figures 9).

Outcome and Follow-Up

Immediate post-operative photographs showed well-contoured, natural-looking restorations with harmonious

integration into the smile (Figure 9). The patient expressed high satisfaction with the esthetic improvement.

At 2 week follow-up, the restorations remained intact with stable color and gloss. Mild staining was noted at the tooth-restoration margins, which was successfully removed with repeat finishing and polishing procedures using the same protocol. The restorations' surface smoothness and esthetic appearance were satisfactorily maintained, supporting the longevity of this minimally invasive technique (Figures 10).

Figures

Figure 1: Initial smile and intraoral view showing peg-shaped lateral incisors.



Figure 2: Diagnostic wax-up on stone model.



Figure 3: Impression tray selection and reconstruction of the occlusal plane.



Figure 4: Transparent silicone index with flow able composite injection.



Figure 5: Preparation of access openings in the silicone index at the level of the teeth scheduled for restoration.



Figure 6: Protection of adjacent teeth using PTFE (Teflon) tape.



Figure 7: Injection of the flow able composite resin through the transparent index.



(B)



Figure 8: Minimal Buccal reduction (0.5 mm) and subsequent enamel composite injection.



Figure 9: Immediate post-operative result after finishing with abrasive discs and inter proximal strips.



Figure 10: Definitive esthetic outcome one week after finishing and polishing procedures.



Discussion

Inject able composite technique in anterior esthetic rehabilitation

The inject able composite technique has gained increasing attention in contemporary restorative dentistry as a minimally invasive approach for the esthetic rehabilitation of anterior teeth. This method relies on the transfer of a diagnostic wax-up to the clinical situation using a transparent silicone index, allowing the direct injection of flow able composite resin to reproduce the planned tooth morphology. By enabling precise replication of anatomical contours, emergence profiles, and incisal morphology, the technique significantly reduces the operator-dependent variability commonly associated with conventional freehand composite restorations ⁹.

Traditional direct composite restorations require advanced manual skills to reproduce natural tooth anatomy and optical characteristics. Achieving bilateral symmetry and harmonious proportions in the anterior region can be particularly challenging when using conventional stratification techniques ¹⁰. In contrast, the inject able composite technique relies on a guided restorative workflow in which the morphology defined during the diagnostic wax-up is transferred directly to the tooth surface through the silicone index. This “copy–paste” concept improves the predictability and reproducibility of esthetic outcomes while reducing chair side time and technical sensitivity ¹¹.

Another major advantage of this approach is its compatibility with the principles of minimally invasive dentistry. Because the restoration is performed through an additive procedure, little or no tooth preparation is generally required. Preserving enamel is particularly beneficial in adhesive dentistry since bonding to enamel provides greater long-term stability compared with dentin

bonding. This aspect is especially relevant in the management of peg-shaped lateral incisors, where the available tooth structure is often limited but generally intact ¹².

Advances in resin composite materials have also contributed to the growing popularity of the inject able technique. Early flow able composites were limited by lower filler content and inferior mechanical properties ⁸. However, contemporary highly filled flow able composites demonstrate improved flexural strength, wear resistance, and polish retention, allowing their use in anterior restorations subjected to functional stresses. Furthermore, modern composites exhibit enhanced optical properties, facilitating seamless integration with surrounding tooth structures ⁸.

The transparency of the silicone index plays a crucial role in the polymerization process. Transparent matrices allow efficient light transmission during curing, ensuring adequate polymerization of the injected composite material. In addition, the creation of small access perforations within the silicone index allows controlled injection of the composite resin, reducing the risk of air entrapment and ensuring complete filling of the mold ¹³. Some clinical protocols also recommend reinforcing the silicone index with a thermoformed acetate shell to prevent deformation during injection and improve dimensional stability ¹⁴.

Despite its numerous advantages, the inject able composite technique still requires careful execution. The accuracy of the final restoration largely depends on the quality of the diagnostic wax-up and the precision of the silicone index. Any discrepancy at the wax-up stage may be transferred to the clinical restoration. Therefore, meticulous laboratory procedures and proper validation of the wax-up remain essential steps in the restorative workflow ¹⁵.

Another potential limitation relates to the long-term behavior of composite materials. Although modern composites demonstrate improved mechanical and optical properties, they may still exhibit marginal discoloration, surface wear, or loss of gloss over time compared with ceramic restorations. Nevertheless, one of the key advantages of composite materials lies in their repair ability. Composite restorations can be easily polished, modified, or repaired without significant additional tooth preparation, which contributes to their clinical longevity ¹⁶.

Comparison with conventional composite stratification and ceramic veneers

Several treatment modalities have been proposed for the esthetic management of peg-shaped lateral incisors, including direct composite stratification, injectable composite restorations, and indirect ceramic veneers. Each approach presents specific advantages and limitations regarding invasiveness, esthetic outcomes, longevity, and clinical complexity ¹⁷.

Conventional composite stratification remains one of the most widely used techniques for direct anterior restorations. This method involves incremental layering of different composite shades to mimic the optical properties of dentin and enamel ¹⁸. When performed by experienced clinicians, stratified composite restorations can provide highly satisfactory esthetic results. However, the technique is highly technique-sensitive and requires considerable clinical experience to reproduce natural tooth morphology and surface texture ¹⁸.

The injectable composite technique addresses many of these limitations by simplifying the sculpting phase. Because the morphology is predetermined by the diagnostic wax-up and transferred through the silicone index, the clinician can achieve consistent anatomical reproduction with reduced reliance on manual sculpting

skills. This guided approach also facilitates the simultaneous restoration of multiple teeth while maintaining symmetrical contours and proportions ¹⁹.

Indirect ceramic veneers represent another widely accepted treatment modality for the esthetic correction of anterior tooth anomalies. Ceramic materials offer excellent optical properties, high wear resistance, and superior color stability compared with composite materials. Long term clinical studies have reported survival rates exceeding 90% after 10 years for ceramic veneers when appropriate case selection and adhesive protocols are followed ²⁰.

However, ceramic veneers also present certain disadvantages. The procedure generally requires irreversible tooth preparation, laboratory fabrication, and multiple clinical appointments, which increases both treatment time and financial cost. In addition, the removal of sound enamel may compromise the conservative principles increasingly emphasized in modern restorative dentistry ²¹. In contrast, injectable composite restorations provide a reversible and minimally invasive solution that can often be completed in a single clinical session ¹⁹.

From a clinical perspective, the injectable composite technique may therefore be considered an intermediate option between conventional direct composite stratification and indirect ceramic veneers. It combines the conservative nature of direct composite restorations with the improved predictability offered by a guided restorative workflow ²².

Recent advances in digital dentistry have further improved the accuracy and efficiency of this technique. Digital smile design, intraoral scanning, and CAD-CAM technologies allow clinicians to perform virtual wax-ups and fabricate highly precise silicone indices using digital work flows. These technologies facilitate communication

between clinicians, technicians, and patients while improving treatment planning and predictability of esthetic outcomes²³.

Clinical indications for peg-shaped lateral incisors

Peg-shaped lateral incisors represent a developmental anomaly characterized by a reduced Mesiodistal dimension and conical crown morphology. This condition frequently disrupts anterior dental harmony and affects smile aesthetics by altering tooth proportions, incisal embrasures, and symmetry within the anterior segment. Restorative treatment is therefore often required to re-establish appropriate tooth proportions and improve the overall esthetic appearance of the smile.

The inject able composite technique is particularly indicated for the conservative management of peg-shaped lateral incisors because it allows additive correction of tooth morphology without aggressive preparation. This approach enables clinicians to increase the Mesiodistal width of the lateral incisors while maintaining enamel integrity, which is essential for optimal adhesive bonding²⁴.

One of the most common indications for this technique is the esthetic recon touring of peg shaped lateral incisors following orthodontic treatment. Orthodontic therapy often corrects spacing and alignment issues but does not modify the inherent morphology of the affected teeth. Consequently, restorative intervention is necessary to achieve ideal tooth proportions and harmonious integration within the smile²⁴.

The inject able composite technique may also be indicated for other anterior esthetic corrections, including closure of diastemas, correction of tooth size discrepancies, and reshaping of malformed teeth. Because the procedure is fully additive and reversible, it is particularly suitable for young patients or individuals who prefer conservative treatment options⁷.

Proper case selection remains essential to ensure optimal outcomes. The inject able composite technique is most suitable for patients with sufficient enamel for bonding, favorable occlusion, and good oral hygiene. In cases involving severe discoloration, extensive structural damage, or high functional demands, indirect ceramic restorations may offer superior long term durability²⁵.

Overall, the inject able composite technique represents a conservative and versatile approach for the esthetic rehabilitation of peg - shaped lateral incisors. By combining careful diagnostic planning, modern composite materials, and guided restorative workflows, clinicians can achieve predictable and highly satisfactory esthetic outcomes while preserving natural tooth structure¹⁷.

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