

Article

Compression Moulding Technique: A Silicone-Guided Modification of the Injection Moulding Workflow for Direct Composite Restorations

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Abstract

Background/Objectives: Injection moulding has become a predictable technique for transferring a diagnostic wax-up to direct composite restorations. However, conventional workflows that rely exclusively on injectable flowable composites may have limitations in material handling, mechanical performance, and the dimensional stability of the transparent silicone index. The purpose of this technical note was to describe a silicone-guided modification of the injection moulding workflow, referred to as the compression moulding technique, and to illustrate its clinical application in three representative cases. **Methods:** The proposed workflow combines a dual-layer silicone index consisting of a transparent polyvinyl siloxane material supported by a high-hardness bite-registration silicone with a preheated medium-viscosity resin composite. Following digital planning and diagnostic wax-up, the composite is positioned within the silicone index and adapted to the prepared tooth surfaces by controlled compression. Three clinical cases with different restorative indications were included to demonstrate the technique's versatility. **Results:** In all three cases, the proposed workflow enabled accurate transfer of the diagnostic wax-up while providing improved stabilization of the transparent silicone index during composite placement. The combination of controlled compression, a rigid supporting silicone, and preheated paste composite facilitated material adaptation, minimized manual sculpting, and produced predictable esthetic outcomes in a minimally invasive chairside procedure. **Conclusions:** The compression moulding technique represents a practical modification of the conventional injection moulding workflow for direct composite restorations. The proposed protocol may improve index stability, material handling, and clinical versatility while maintaining the advantages of silicone-guided restorative procedures. Because the present article is intended to describe a technical workflow supported by representative clinical cases, further prospective clinical studies with long-term follow-up are required before conclusions regarding clinical superiority or long-term performance can be drawn.



Academic Editor: Roberto Sorrentino

Received: 15 June 2026

Revised: 16 July 2026

Accepted: 4 August 2026

Published: 7 August 2026

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Keywords: injection molding; resin composites; flowable; minimal invasive dentistry; transparent silicone; esthetic

1. Introduction

In modern dentistry, achieving aesthetic, functional, and biologically sound oral rehabilitation remains a cornerstone of patient care. Restorative treatments are often necessary

due to caries, periodontal disease, trauma, tooth wear, or aesthetic disharmonies such as discolourations, diastema, and irregular shapes [1,2]. These needs are particularly significant in the anterior region, where natural-looking results are paramount [3]. Minimally invasive dentistry preserves natural teeth while effectively addressing dental issues. It prioritises prevention, early detection, and conservative treatment modalities, which align with current patient demands for procedures that preserve as much of the tooth as possible [4,5]. Among the available treatment options, direct resin composite restorations have become a cornerstone of minimally invasive esthetic dentistry because they preserve tooth structure while providing excellent esthetic and functional outcomes [6,7]. However, the conventional freehand technique demands a highly skilled clinician and is time-consuming [3,8]. Achieving optimal morphology, texture, and shade with this approach can be challenging, resulting in variability and potentially unpredictable outcomes [2,6,9]. Nevertheless, the quality of the final restoration remains highly dependent on the clinician's ability to reproduce the planned anatomy, making the procedure operator-sensitive and often time-consuming. Alternatively, indirect restorations, such as ceramic veneers, offer superior aesthetic outcomes and precision [4,10]. These types of restorations are crafted by dental technicians, ensuring consistent results. However, they are time- and cost-intensive, and often require more significant tooth removal, making them less conservative than resin-based approaches [6–8].

To improve the predictability of direct composite restorations, silicone-guided injection moulding techniques have gained increasing popularity over the past decade [1,3]. The first publication on moulding techniques was by Belvedere in 1980, regarding direct/indirect techniques for microfilled composites [10]. In 2014, Douglas Terry proposed an injection moulding technique that combines precision, aesthetics, and efficiency to address the limitations of both direct and indirect restorations [3]. By transferring the diagnostic wax-up directly into the clinical situation, these techniques reduce operator dependence and enable accurate reproduction of the planned tooth morphology. The injection moulding technique provides a simplified, precise, and predictable method for creating natural-looking composite restorations while significantly reducing chair time [2,7]. Digital workflows, transparent silicone indices, and injectable resin composites have further expanded the clinical applications of injection moulding, making it an attractive, minimally invasive restorative approach [5,6,9]. Despite these advantages, several technical limitations remain. Conventional injection molding protocols rely primarily on low-viscosity injectable composites, which may exhibit lower filler loading and inferior mechanical properties compared with conventional paste composites [4,9]. These include higher susceptibility to wear and diminished colour stability [1,6]. Over time, flowable composite restorations may exhibit chipping, discolouration, and surface degradation, which have been reported in the literature as potential causes of esthetic deterioration [9]. In addition, the flexible, transparent silicone index may deform during seating, potentially compromising the accurate transfer of the diagnostic wax-up [3,5]. Composite overflow, incomplete material adaptation, and technique sensitivity during index positioning may further influence the predictability of the final restoration. The technique also involves a relatively steep learning curve for clinicians unfamiliar with advanced composite handling and workflow optimisation [2,11,12]. Finally, challenges such as the need for super-fine 3D printing modes to avoid transferring layer sequences onto the composite veneer and the potential for excess material to accumulate in interproximal areas demand additional attention during the process [9].

Consequently, several authors have proposed modifications intended to improve the mechanical performance and clinical reliability of silicone-guided restorative workflows [13,14]. Although previous modifications have introduced medium-viscosity composites or alternative

silicone index designs, no standardised workflow has combined controlled compression with a dual-layer silicone index specifically intended to improve both index stability and composite adaptation while preserving the simplicity of the conventional injection moulding concept. Therefore, there remains a need for a clinically practical workflow that integrates the advantages of conventional injection moulding with improved material handling and enhanced support of the transparent silicone index.

The aim of this technical note was to describe a silicone-guided modification of the conventional injection moulding workflow, referred to as the compression moulding technique, and to illustrate its clinical application through three illustrative clinical cases with different restorative indications. The proposed workflow combines a dual-layer silicone index with a preheated medium-viscosity resin composite to improve index stabilisation, facilitate composite adaptation, and maintain a minimally invasive chairside restorative procedure. The three illustrative clinical cases were selected to demonstrate the applicability of the proposed workflow across different restorative scenarios and to highlight its technical versatility. The manuscript is intended to describe the clinical workflow rather than to establish the clinical superiority or long-term effectiveness of the technique.

2. Materials and Technical Workflow

2.1. Overview of the Technique

The compression moulding technique is a silicone-guided modification of the conventional injection moulding workflow for direct anterior composite restorations. The technique combines three key components: (i) a dual-layer silicone index consisting of a transparent addition silicone reinforced by a high-hardness bite-registration silicone, (ii) a preheated medium-viscosity resin composite, and (iii) controlled compression during seating of the silicone index. Together, these modifications are intended to improve index stability, facilitate composite adaptation, and preserve the advantages of a minimally invasive chairside restorative workflow.

2.2. Materials

The proposed workflow was performed using commercially available restorative materials selected to optimise optical properties, mechanical performance, and clinical handling. The materials employed in the present technique and their respective clinical functions are summarised in Table 1.

Table 1. Materials used in the proposed compression moulding technique and their clinical applications.

Material	Manufacturer	Purpose
Exaclear transparent addition silicone	GC Corp., Tokyo, Japan	Transparent silicone index
Zetalabor® 95 (Shore A 95)	Zhermack SpA, Badia Polesine, Rovigo, Italy	Reinforcement of the transparent index
G-aenial A'CHORD composite	GC Corp.	Preheated restorative composite
G-aenial Injectable	GC Corp.	Snowplow layer
G2-BOND Universal	GC Corp.	Adhesive system

The combination of a transparent addition silicone with a rigid bite-registration silicone constitutes the main modification of the proposed workflow, providing improved dimensional stability during seating while preserving optical transparency for light polymerisation. Similarly, the use of a preheated medium-viscosity composite aims to improve material adaptation without compromising the mechanical properties associated with conventional paste composites.

2.3. Silicone Index Fabrication

For procedural demonstration (Figure 1A), a plastic cast simulating varying degrees of anterior dental lesions was used. Following digital smile design and intraoral scanning, a diagnostic wax-up was fabricated and transferred to a three-dimensional-printed model (Figure 1B).

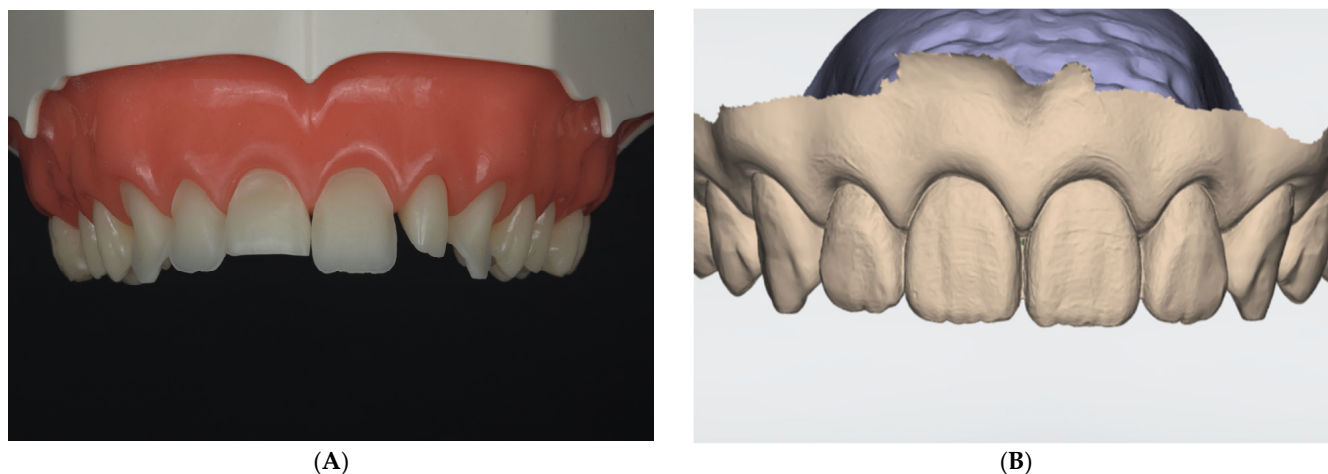


Figure 1. (A) Pre-operative portrait picture of the case, (B) digital wax-up for #13–23.

A transparent addition silicone (Exaclear, GC Corp.) was adapted over the wax-up to reproduce the planned tooth anatomy. Subsequently, the transparent silicone was reinforced with a high-hardness bite-registration silicone (>95 Shore hardness), resulting in a dual-layer silicone index (Figure 2A,B). This design combines optical transparency for light polymerisation with increased rigidity during seating, thereby minimising deformation of the transparent silicone and improving dimensional stability.

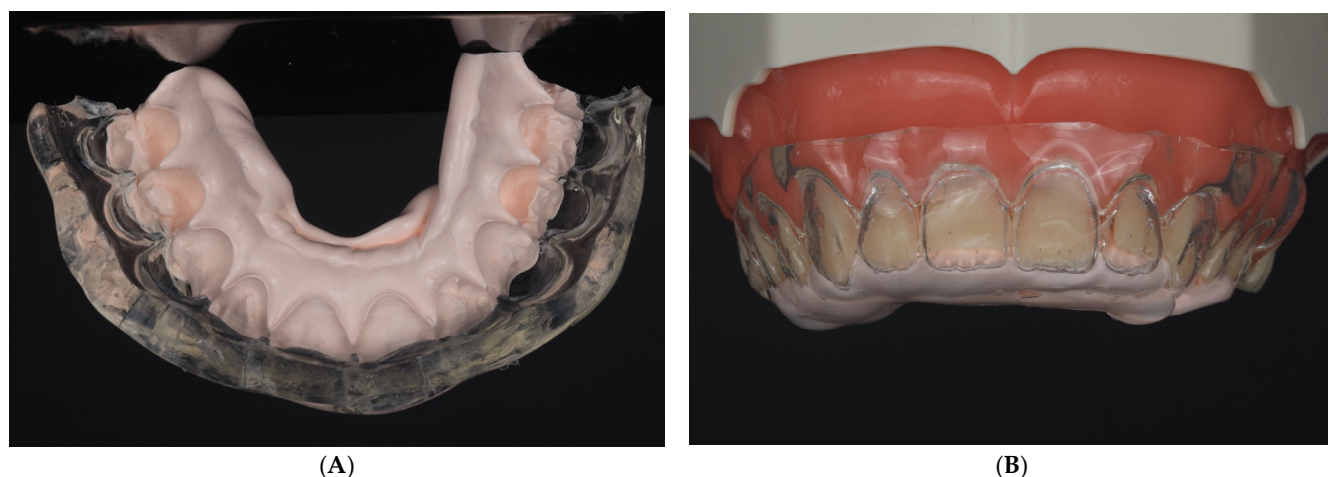


Figure 2. (A) The modified silicone key; (B) fit verification of the mold.

2.4. Clinical Workflow

Step 1. Clinical preparation. Shade selection was performed before rubber dam isolation. The operative field was isolated with a rubber dam, and adjacent teeth were protected with PTFE tape to facilitate isolation and prevent contamination of the composite. Enamel surfaces were etched with 37% phosphoric acid for 30 s, rinsed thoroughly, and gently air-dried. A universal adhesive (G2-BOND Universal, GC Corp.) was applied according to the manufacturer's instructions, air-thinned, and light-cured for 20 s using

an LED curing unit (Bluephase PowerCure, Ivoclar Vivadent, Schaan, Liechtenstein). Step 2. Composite loading. A medium-viscosity resin composite (G-aenial A'CHORD A2, GC Corp.) was preheated to approximately 50 °C using a composite heating device (Ena Heat, Micrium S.p.A., Avegno, Italy) immediately before placement into the transparent silicone index. Preheating reduces composite viscosity, facilitating adaptation while preserving the superior mechanical properties of conventional paste composites.

Step 3. Snowplow layer. Immediately before seating the silicone index, a thin layer of injectable composite (G-aenial Injectable, GC Corp.) was applied to the tooth surfaces according to the snowplow concept [15]. This low-viscosity layer enhances adaptation between the tooth and the preheated paste composite while minimising the formation of internal voids.

Step 4. Controlled compression. The loaded dual-layer silicone index was positioned over the teeth using continuous bilateral finger pressure until complete seating was achieved (Figure 3A,B). Compression was maintained throughout the initial polymerisation phase to ensure intimate adaptation of the restorative composite to the tooth surfaces and to control the extrusion of excess material. The rigid supporting silicone minimised deformation of the transparent index during compression. Although compression force was not instrumentally standardised, all procedures were performed by the same experienced operator using a consistent clinical protocol.

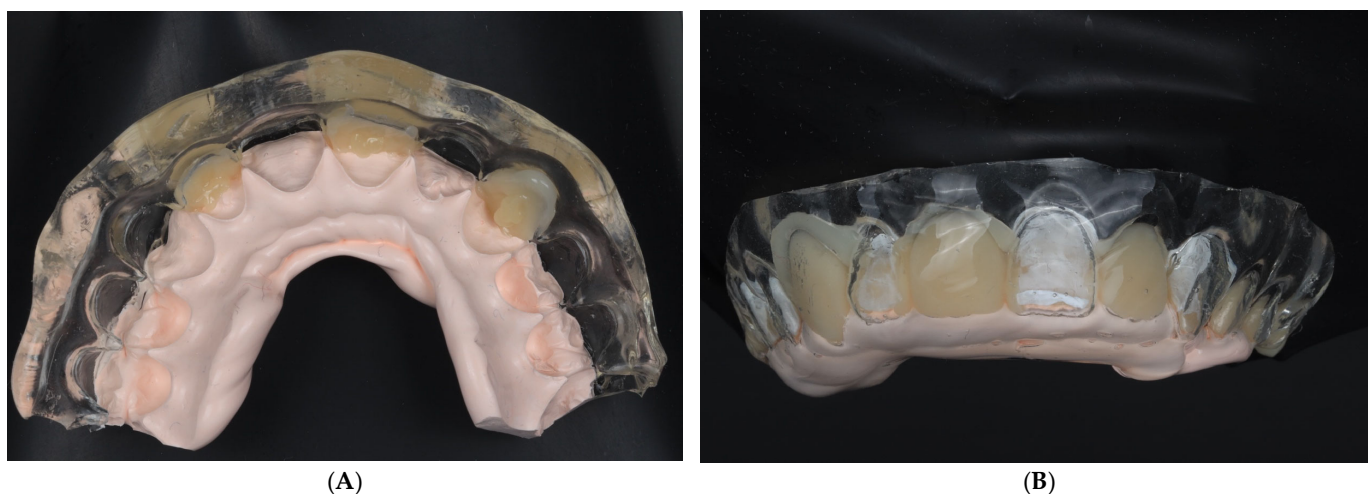


Figure 3. (A) Injection of composite resin in the silicone index, (B) Insertion of the silicone index.

Step 5. Polymerization. Polymerisation was performed directly through the transparent silicone index, following the manufacturer's recommended exposure time. Following removal of the silicone index, additional light curing was performed from the facial aspect to ensure complete polymerisation of the restorations.

Step 6. Finishing and polishing. Excess composite was removed with a No. 12 scalpel blade, then finishing burs, rubber disks (EVE Diacomp Plus Twist, Keltern, Germany), Soflex discs (3M ESPE, St. Paul, MN, USA), polishing wheels, and polishing pastes to achieve the desired contours and smoothness until the desired anatomical morphology and surface gloss were achieved (Figure 4A–D).

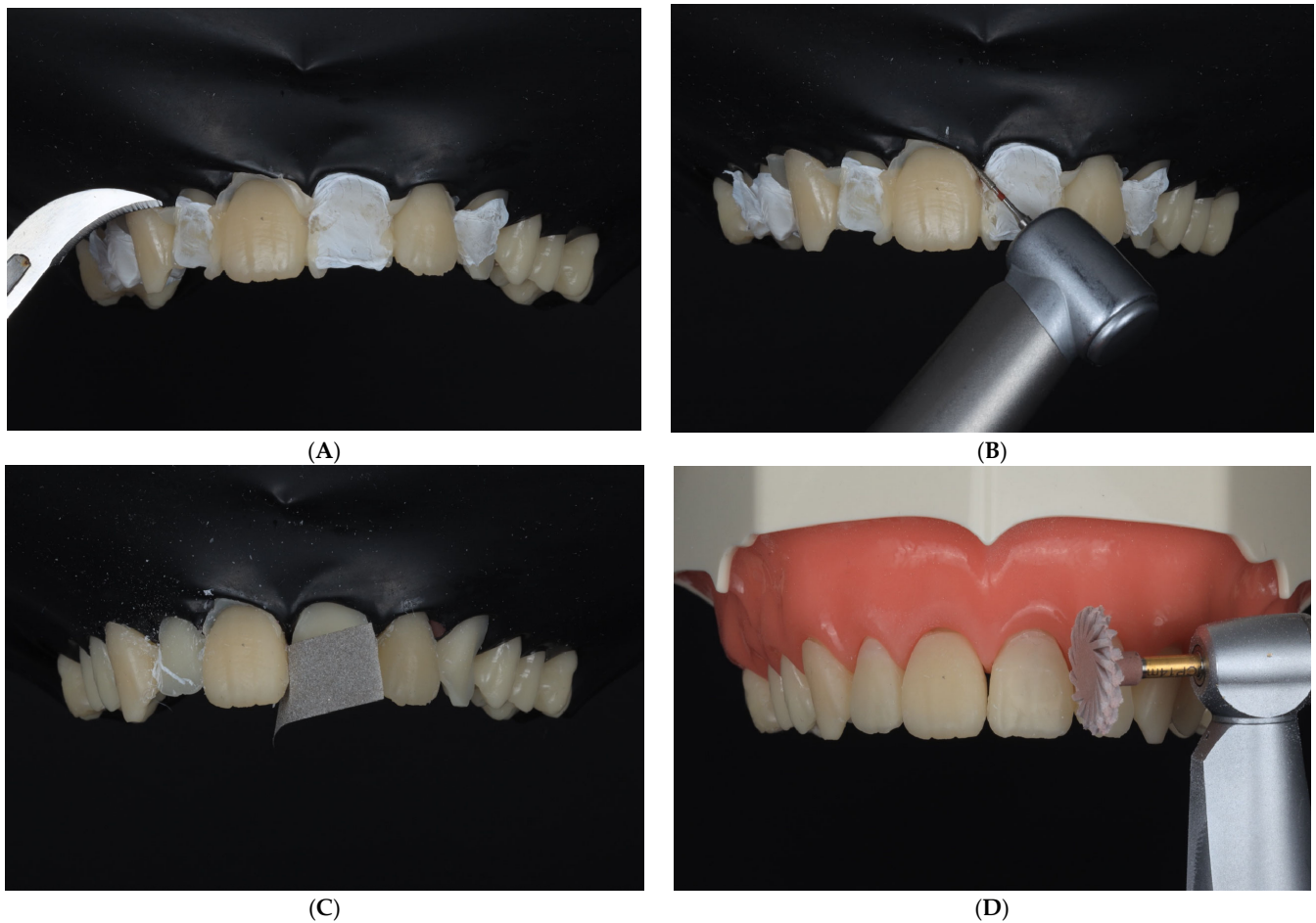


Figure 4. Finishing and polishing of the restored teeth. (A) Scalpel no 12. (B) Fine diamond bur. (C) Diamond metal finishing tape. (D) Rubber polishing disk.

The procedure was repeated for the remaining teeth. Protrusive and lateral movements, as well as occlusal contacts in maximum intercuspation, remained unchanged. The final portrait photographs of the restorations, as seen in Figure 5, illustrate the clinical outcome.



Figure 5. The final outcome.

The manuscript was prepared in accordance with the CARE reporting guidelines, adapted where appropriate to present multiple clinical cases [16]. Written informed consent

was obtained from all patients for treatment and for the publication of the accompanying clinical information and photographs.

2.5. Clinical Considerations

Several clinical steps were considered essential for the predictable implementation of the proposed workflow. Complete seating of the dual-layer silicone index, maintenance of composite temperature immediately before placement, continuous compression during the initial polymerisation phase, and careful removal of excess composite prior to finishing were identified as the most critical determinants of successful restoration fabrication.

Illustrative Clinical Applications:

The clinical cases included in this technical note were part of a research project approved by the Research Ethics Committee of the School of Dentistry, National and Kapodistrian University of Athens, Greece (Research Protocol No. 707/25.06.2025; Approval No. 82484). All patients provided written informed consent for treatment and publication of anonymized clinical photographs and clinical data.

3. Cases Reported

3.1. Case 1

Patient information. A 21-year-old female patient presented seeking improvement of her smile aesthetics because of minor fractures affecting both maxillary central incisors and dissatisfaction with the apparent small size of her anterior teeth. The patient was in good general health and exhibited no contraindications for adhesive restorative treatment. **Clinical findings.** Clinical examination revealed small enamel fractures involving the incisal edges of both central incisors without pulpal involvement. Tooth proportions were compromised, although periodontal tissues were healthy and occlusion remained stable.

Treatment planning: Following digital smile analysis and diagnostic wax-up, a minimally invasive additive restorative approach was selected. The compression molding technique was chosen to reproduce the planned anatomy while preserving sound tooth structure.

Clinical procedure. The dual-layer silicone index was fabricated according to the protocol described above. Following adhesive procedures, the restorations were completed using preheated medium-viscosity composite combined with a thin injectable composite layer according to the snowplow concept. Minor cutback characterisation and staining were subsequently performed to reproduce incisal translucency and natural optical effects.

Clinical outcome. The restorations reproduced the planned morphology with minimal need for chairside adjustments. Esthetic integration, marginal adaptation, and patient satisfaction were considered clinically satisfactory immediately after treatment (Figure 6).

3.2. Case 2

Patient Information. A 44-year-old female patient presented requesting improvement of her smile aesthetics because she was dissatisfied with the shape and proportions of her maxillary anterior teeth. The patient was medically healthy and exhibited no contraindications to adhesive restorative treatment. The patient expressed a desire for a brighter, more harmonious smile with improved tooth proportions, while avoiding extensive tooth preparation or indirect ceramic restorations.

Clinical Findings. Clinical examination revealed minor anatomical discrepancies affecting the shape and symmetry of the maxillary anterior teeth without significant structural defects. The teeth were vital, periodontal tissues were healthy, and occlusal relationships were stable, making the patient an appropriate candidate for a minimally invasive additive restorative approach.

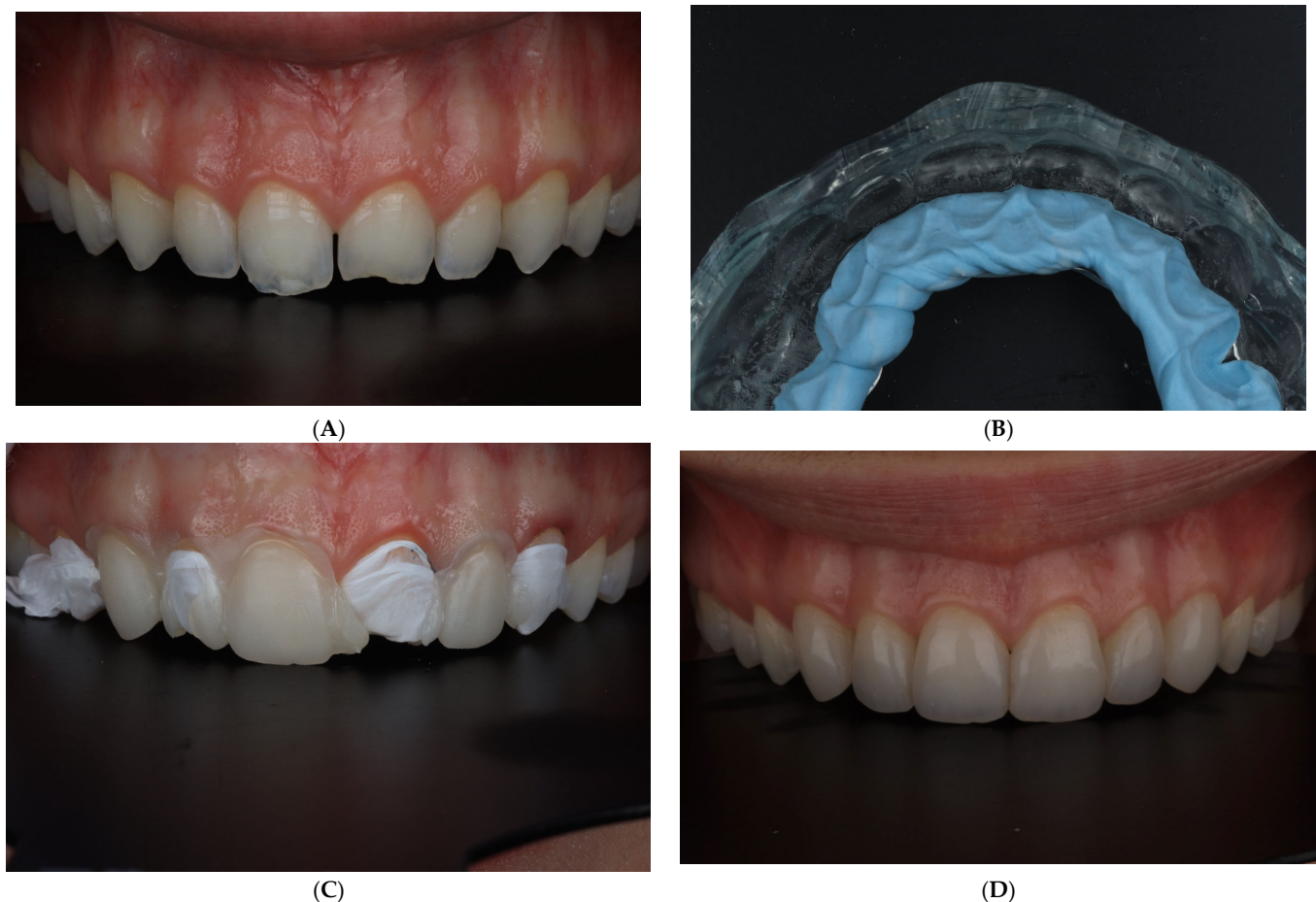


Figure 6. Clinical application of the compression moulding technique in Case 1. (A) Initial clinical presentation showing minor incisal fractures and reduced tooth proportions. (B) Dual-layer silicone index fabricated from the diagnostic wax-up. (C) Immediate appearance following removal of the silicone index after polymerization. (D) Final esthetic result following finishing, polishing, and individualized characterization.

Treatment Planning. Following digital smile analysis and fabrication of a diagnostic wax-up, the compression moulding technique was selected to reproduce the planned tooth morphology while preserving intact enamel. Considering the patient's preference for a simplified restorative approach and a brighter smile, a monoshade strategy using a preheated medium-viscosity composite was adopted without additional internal characterisation.

Clinical Procedure. A dual-layer silicone index was fabricated according to the protocol described above. After rubber dam isolation and adhesive procedures, the preheated composite was loaded into the silicone index and adapted to the tooth surfaces using controlled compression. A thin layer of injectable composite was applied according to the snowplow concept to improve adaptation between the restorative material and the tooth surface. Following polymerization, minimal finishing and polishing procedures were required to achieve the final anatomical contours and surface gloss (Figure 7).

Clinical Outcome. The proposed workflow enabled accurate transfer of the diagnostic wax-up while preserving the planned tooth morphology. The monoshade restorative approach provided a harmonious esthetic result with minimal chairside adjustments, fulfilling the patient's expectations for conservative and efficient treatment.

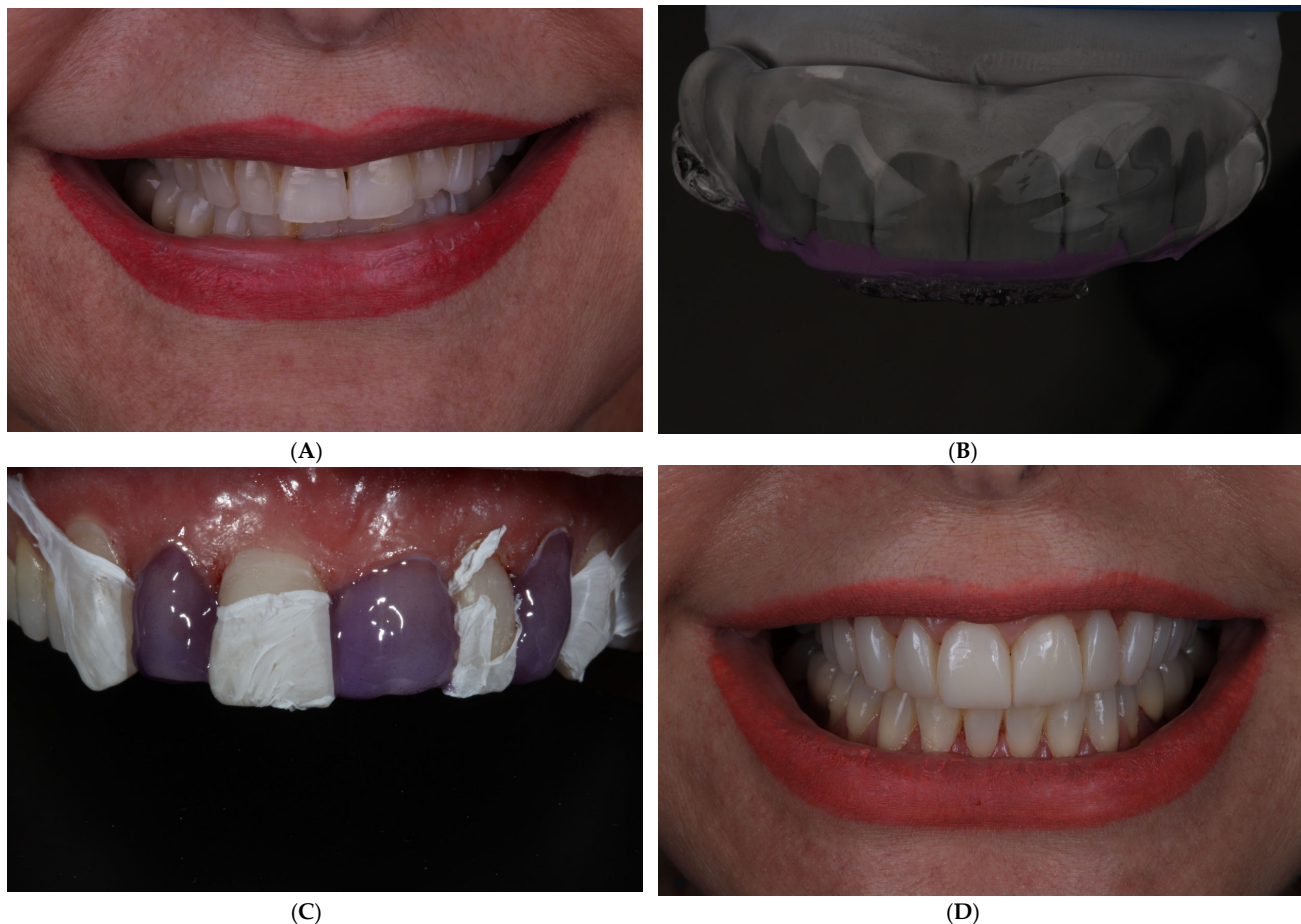


Figure 7. Illustrative clinical application of the compression moulding technique (Case 2). (A) Initial smile showing the preoperative tooth morphology. (B) Fabrication of the dual-layer silicone index from the diagnostic wax-up. (C) Adhesive procedures following rubber dam isolation and PTFE protection of adjacent teeth. (D) Final esthetic outcome after finishing and polishing.

3.3. Case 3

Patient Information. A 63-year-old female patient presented seeking improvement of both the esthetics of her smile and her masticatory function. The patient reported progressive tooth wear affecting the maxillary anterior dentition and expressed a preference for a conservative treatment approach that would avoid extensive tooth preparation and indirect restorations. The patient was dissatisfied with the worn appearance of her anterior teeth, reduced incisal length, and compromised smile esthetics. In addition, she reported concerns about chewing efficiency due to progressive loss of tooth structure.

Clinical Findings. Clinical examination revealed generalised wear of the maxillary anterior teeth, resulting in loss of incisal anatomy and reduced tooth proportions. Despite the structural wear, the remaining tooth tissues were considered suitable for adhesive restorative treatment. Periodontal tissues were healthy, and occlusal relationships allowed additive rehabilitation without extensive tooth preparation.

Treatment Planning. Following digital treatment planning and fabrication of a diagnostic wax-up, a minimally invasive additive rehabilitation was selected using the compression moulding technique. A preheated medium-viscosity composite was chosen to improve mechanical performance while accurately reproducing the planned anatomy. Because of the patient's esthetic expectations, individualised external characterisation was incorporated to reproduce the optical features of natural enamel.

Clinical Procedure. A dual-layer silicone index was fabricated according to the protocol described above. Following adhesive procedures, the preheated composite was inserted into the silicone index and adapted to the tooth surfaces using controlled compression. After polymerisation, minimal finishing procedures were performed, followed by individualised external staining and application of a thin enamel-shade composite layer to reproduce natural translucency and surface characteristics. Final polishing was carried out using a multistep polishing protocol (Figure 8).



Figure 8. Illustrative clinical application of the compression molding technique (Case 3). (A) Pre-operative intraoral view showing generalized anterior tooth wear and loss of incisal anatomy. (B) Isolation of the operative field using PTFE tape before adhesive procedures. (C) Seating the dual-layer silicone index during controlled compression of the preheated composite. (D) Final clinical outcome following finishing, polishing, and individualised external characterisation.

Clinical Outcome. The proposed workflow enabled accurate transfer of the diagnostic wax-up while restoring incisal length, tooth morphology, and smile harmony through a minimally invasive chairside procedure. The dual-layer silicone index provided stable positioning throughout composite placement, whereas the combination of external characterisation and finishing procedures resulted in a natural esthetic integration. Functional occlusal relationships were preserved without requiring extensive chairside adjustments.

3.4. Cross-Case Clinical Observations

Although the three illustrative clinical cases differed in patient age, restorative indication, and esthetic requirements, the same standardized compression moulding workflow was successfully applied in all cases. Case 1 demonstrated the use of the technique for the conservative restoration of fractured anterior teeth, with individualised characterization. Case 2 highlighted the efficiency of the workflow for minimally invasive esthetic shape modification using a simplified monoshade approach. Case 3 illustrated its applicability to the rehabilitation of worn anterior dentition that requires restoration of both esthetics and function.

Across all three cases, the dual-layer silicone index provided consistent stabilisation during seating and facilitated accurate transfer of the diagnostic wax-up to the clinical situation. The use of a preheated medium-viscosity composite, combined with a thin injectable composite layer according to the snowplow concept, resulted in satisfactory material adaptation with minimal need for freehand sculpting. Minor differences between the cases were limited to esthetic characterization procedures, including cutback, external staining, and layering techniques, which were adapted according to the individual restorative objectives.

Collectively, these clinical applications demonstrate the versatility of the proposed workflow across different anterior restorative indications while maintaining a minimally invasive chairside approach. Nevertheless, the presented cases are intended to illustrate the technical applicability of the compression moulding technique rather than to establish its long-term clinical effectiveness or superiority over previously described silicone-guided restorative workflows.

To facilitate comparison of the three illustrative clinical cases, the principal patient characteristics, restorative indications, treatment strategies, and immediate clinical outcomes are summarized in Table 2. Although the clinical presentations differed, the same standardised compression moulding workflow was successfully applied in all cases with only minor modifications according to the individual esthetic requirements.

Table 2. Summary of the three illustrative clinical cases demonstrating the application of the proposed compression moulding technique across different anterior restorative indications.

	Case 1	Case 2	Case 3
Patient age	21	44	63
Main indication	Incisal fractures	Shape modification	Tooth wear
Treatment objective	Esthetic restoration	Smile enhancement	Esthetic and functional rehabilitation
Composite approach	Characterized layering	Monoshade	Characterized layering + external staining
Degree of characterization	Moderate	Minimal	Extensive
Chairside workflow	Yes	Yes	Yes
Dual-layer silicone index	Yes	Yes	Yes
Preheated paste composite	Yes	Yes	Yes
Snowplow technique	Yes	Yes	Yes
Immediate clinical outcome	Satisfactory	Satisfactory	Satisfactory

4. Discussion and Clinical Implications

The present technical note describes a silicone-guided modification of the conventional injection moulding workflow that combines a dual-layer silicone index, a preheated medium-viscosity resin composite, and controlled compression during seating. The proposed protocol was illustrated through three clinical cases representing different anterior restorative indications. Collectively, these cases demonstrated that the workflow could be consistently applied while maintaining the minimally invasive philosophy of adhesive restorative dentistry.

The injection moulding technique provides a highly predictable approach for achieving aesthetic and functional composite restorations [1,3]. This predictability is attributed mainly to the precise replication of the diagnostic wax-up. A transparent silicone index moulded directly from the wax-up ensures that the final restoration mirrors the planned contours, dimensions, and occlusal anatomy with minimal deviation. This precise transfer of the wax-up into the oral cavity minimises errors, thereby reducing chairside time and the need for extensive adjustments [2,7]. Additionally, this precision enhances clinical efficiency and patient satisfaction by delivering restorations that align with the pre-planned design.

Several silicone-guided restorative concepts have been described to improve the anatomical transfer of diagnostic wax-up and reduce dependence on freehand composite sculpting. Terry et al. emphasised injection-based placement and inverse layering through a transparent silicone index, whereas Dietschi, Saratti and Ammannato et al. expanded moulding- and index-guided approaches for the additive rehabilitation of worn dentition. The principal characteristics of these workflows and their relationship to the present technique are summarized in Table 3 [3,13,14].

Table 3. Comparison of previously described silicone-guided direct composite techniques with the proposed compression moulding workflow *.

Feature	Terry et al.	Dietschi & Saratti	Ammannato et al.	Compression Moulding Technique (Present Study)
Primary restorative concept	Injection layering	Full molding	Index-guided restoration	Compression molding
Transfer of diagnostic wax-up	✓	✓	✓	✓
Medium-viscosity paste composite	No	Yes	Yes	Yes (preheated)
Dual-layer silicone index	No	No	No	Yes
Controlled compression	Not emphasized	Partial	Partial	Standardized
Chairside workflow	Yes	Yes	Yes	Yes
Main distinguishing feature	Injection technique	Full molding concept	Conservative index technique	Reinforced dual-layer index + preheated paste composite + controlled compression

* The comparison focuses on the principal features emphasised in the respective clinical descriptions. The absence of a feature from a previous technique indicates that it was not presented as a standardised or defining component of that workflow and does not necessarily imply that it could not be used clinically.

The proposed compression moulding technique should not be interpreted as replacing these established workflows. Its distinguishing feature is the systematic integration of three complementary elements: a transparent silicone index reinforced with a high-hardness bite-registration silicone, a preheated medium-viscosity paste composite, and controlled compression maintained during seating and initial polymerisation. The rigid supporting layer is intended to reduce deformation of the transparent index, whereas composite preheating facilitates the adaptation of the paste material. At the same time, the workflow remains compatible with the adjunctive use of an injectable composite when a low-viscosity interfacial layer is considered clinically advantageous. Therefore, the proposed protocol represents a further development within the broader family of silicone-guided direct composite techniques rather than an entirely unrelated restorative concept.

While flowable composites have been popular in injection techniques, their lower filler content might compromise mechanical properties. Using a medium-viscosity paste composite, as proposed in this modified approach, enhances the restoration's durability. Studies confirm that paste composites outperform flowable resins in terms of compressive strength, wear resistance, and long-term gloss retention [17]. Studies have consistently demonstrated that restorations made with paste composites have higher survival rates, particularly in high-stress areas, thereby reinforcing their recommendation for techniques that require both precision and long-term reliability [17].

Likewise, reinforcement of the transparent silicone index with a rigid bite-registration silicone aims to minimize deformation during seating, thereby improving dimensional stability and the accurate transfer of the diagnostic wax-up. This material provides controlled stability during placement, helping to maintain the correct positioning of the silicone index. Its high hardness enhances resistance to deformation, ensuring reliable support throughout the procedure. One of the most critical steps involves applying firm pressure to the buccal part of the index, which facilitates precise adaptation of the composite material to the tooth surface and promotes the extrusion of excess material. In this step, the bite silicone stabilises the index against distortion, ensuring that the composite conforms accurately to both buccal and palatal contours, reducing the risk of gaps or misfit.

Another significant component of the technique is the preheating of the composite material. Preheating the paste composite further facilitates its adaptation by reducing viscosity [18]. This step improves the material's adaptation to the tooth surface and minimises the risk of voids or bubbles during insertion [18]. These advantages contribute to a more efficient procedure and a restoration with potentially enhanced long-term stability. Although the present protocol primarily utilises a medium-viscosity paste composite to enhance mechanical performance and long-term durability, the technique is not limited to this material category. Injectable flowable composites may also be used within the same dual-silicone workflow, preserving the key advantages of both injection and compression moulding techniques. Furthermore, the technique remains entirely chairside, enabling clinicians to deliver highly aesthetic restorations without laboratory involvement. Consequently, the described technique should be viewed as a versatile restorative concept that accommodates different composite viscosities based on the clinician's clinical objectives, workflow preferences, and material selection, while maintaining the benefits of a predictable, efficient, and fully chairside restorative procedure. The proposed compression molding technique offers several potential clinical advantages while preserving the minimally invasive philosophy of adhesive restorative dentistry. By combining a dual-layer silicone index with a preheated medium-viscosity composite, the workflow aims to improve stabilization of the transparent silicone index during seating and facilitate adaptation of the restorative material to the tooth surface. The standardized transfer of the diagnostic wax-up reduces dependence on freehand composite sculpting and may improve the reproducibility of the planned tooth morphology. Furthermore, because the procedure is performed entirely chairside, it maintains the efficiency and conservative nature that have made silicone-guided restorative techniques increasingly popular in contemporary esthetic dentistry. Nevertheless, these potential advantages should be interpreted cautiously until confirmed by prospective comparative clinical studies.

Based on the present clinical applications and previously published silicone-guided restorative concepts, the proposed workflow appears particularly suitable for minimally invasive anterior restorative procedures in which accurate transfer of a diagnostic wax-up is desirable. Typical indications include direct composite veneers, closure of diastemata, correction of tooth shape and proportions, restoration of fractured incisal edges, rehabilitation of localised anterior tooth wear, and other additive esthetic procedures where preservation of sound tooth structure is a primary objective. The versatility demonstrated across the three illustrative clinical cases suggests that the workflow may be adapted to different restorative scenarios while maintaining a consistent clinical protocol.

Despite its potential advantages, the compression moulding technique remains operator-dependent and includes several technique-sensitive steps. Accurate digital planning, precise fabrication of the dual-layer silicone index, complete seating during controlled compression, maintenance of composite temperature immediately before placement, and careful removal of excess material are all essential for predictable clinical outcomes. In

addition, the present manuscript represents a technical note supported by three illustrative clinical cases rather than a prospective clinical investigation. Standardised clinical outcome measures were not recorded, and long-term clinical follow-up is currently unavailable. Consequently, no conclusions regarding restoration longevity or superiority over previously published silicone-guided techniques can be drawn. Clinicians already familiar with adhesive restorative procedures and silicone-guided techniques are expected to adopt the proposed workflow with minimal additional training. Nevertheless, appropriate case selection and familiarity with digital planning remain important prerequisites for predictable implementation.

Future research should focus on prospective clinical studies evaluating the long-term performance of the proposed workflow using standardized clinical outcome measures and patient-reported outcomes. Comparative investigations between compression molding and conventional injection molding techniques would be valuable to determine whether the proposed modifications result in measurable improvements in restoration survival, marginal adaptation, esthetic stability, treatment efficiency, and patient satisfaction. Further research may also explore the application of the workflow in more complex restorative situations and its integration with fully digital treatment planning protocols.

5. Conclusions

The compression moulding technique represents a silicone-guided modification of the conventional injection moulding workflow for direct anterior composite restorations. By integrating a dual-layer silicone index, a preheated medium-viscosity resin composite, and controlled compression during seating, the proposed protocol aims to improve index stability and facilitate composite adaptation while preserving the minimally invasive principles of adhesive restorative dentistry.

The three illustrative clinical cases presented in this technical note demonstrate the workflow's applicability across various anterior restorative indications, including incisal fracture restoration, esthetic tooth-shape modification, and rehabilitation of worn anterior dentition. Although the immediate clinical outcomes were satisfactory, these observations should be interpreted as illustrative examples of the technique rather than evidence of its clinical superiority or long-term effectiveness.

Author Contributions: Conceptualization, D.S.; methodology, D.S. and I.R.; validation, D.S. and I.R.; formal analysis, I.R.; investigation, D.S.; data curation, D.S. and I.R.; writing—original draft preparation, D.S. and I.R.; writing—review and editing, C.R.; visualization, D.S. and I.R.; supervision, C.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This study was reviewed and approved by the Research Ethics Committee of the School of Dentistry, National and Kapodistrian University of Athens, Greece (Research Protocol No. 707/25.06.2025; Approval No. 82484, 28 July 2025). The approved research project was entitled “Esthetic Restoration of Anterior and Posterior Teeth Using the Compression Molding Technique: Presentation of Clinical Cases.” The approval covered the use of anonymised clinical cases and photographic documentation for scientific publication.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to ethical reason.

Conflicts of Interest: The authors declare no conflicts of interest.

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