CASE REPORT

Innovative approach for indirect anterior restoration- a case report done by injectable composite resin technique

Sakshi Jain[1], Shivani Deshwal[2], Unnati Mishra[2], Shivangi Sharma[1]

ABSTRACT

Indirect anterior restorations are essential for restoring esthetics and function in damaged teeth. Traditional methods often involve complex processes. The injectable composite resin technique offers a modern solution, allowing for greater precision and improved esthetic outcomes. The objective of this study is to evaluate the effectiveness of the injectable composite resin technique as an alternative approach for anterior esthetic restorations. A 22-year-old female reported to the outpatient Department of Conservative Dentistry and Endodontics, Kothiwal Dental College and Research Centre, Moradabad, presented with a chief complaint of fracture in the upper front tooth region due to accident. The injectable composite resin technique is a promising alternative for anterior aesthetic restorations, providing both aesthetic and practical advantages. This case report highlights its effectiveness and encourages further investigation into its use in clinical practice.

KEYWORDS: Injectable composite resin, anterior aesthetic restorations, case report, dental materials, esthetics, restorative dentistry.

Introduction:

In modern dentistry, silicone indices play a crucial role in restorative procedures, facilitating each phase from planning to tooth preparation and final restoration.[1] The injectable composite resin technique, which combines direct and indirect methods, utilizes a transparent silicone index to accurately translate diagnostic wax-ups into composite restorations.[2]

1. *Postgraduate student*
2. *Professor*

Department of Conservative Dentistry and Endodontics

Kothiwal Dental College & Research Centre

Moradabad, Uttar Pradesh

Corresponding author

Sakshi Jain

Post graduate student

Department of Conservative Dentistry and Endodontics

Kothiwal Dental College & Research Centre

This technique is versatile, suitable for both definitive and transitional restorations, allowing clinicians to assess changes in occlusal parameters over time. Additionally, it can help establish new vertical dimensions, restore fractured or worn teeth, and create provisional restorations.[3] Due to their consistency, flowable composites are favored over traditional composites for this technique, as they can fill the mold beneath the silicone index without requiring external pressure. This approach effectively eliminates issues related to index distortion and leads to more satisfactory final results.[4]

Both flowable and conventional composites demonstrate clinically acceptable physical properties. Recent studies have indicated no statistical or clinical differences in any evaluated outcomes during follow-up periods of up to three years.[4-7]

The injectable resin composite restorative technique offers a straightforward and efficient method for restoration. This technique involves creating a transparent matrix based on a wax-up,

featuring small holes that allow the material to flow into the tooth. It is a conservative and additive approach, meaning there's no need to remove healthy tooth structure.[8] Compared to direct and indirect restoration methods, this injectable technique is the least technique-sensitive. As a result, it can significantly reduce both the clinician's effort and time required, ultimately lowering the overall cost of the procedure.[9]

Key factors for the success of anterior restorations include gloss, surface roughness, and color stability. An aesthetic restorative material should effectively mimic the natural color of teeth and preserve that color over time.[10]

While it is acknowledged that flowable resins have limitations, such as lower wear resistance and color stability compared to conventional resin composites recent advancements in flowable resin formulations have led to the introduction of a new high-load version.[11-13] This new formulation claims to enhance wear resistance and maintain gloss. However, there are few long-term studies in the literature assessing this material.[14]

This report aims to present a clinical case involving the injectable resin composite restorative technique for a patient with aesthetic concerns regarding their anterior teeth.

Case Report

A 22-year-old female reported to the outpatient reported to the outpatient Department of Conservative Dentistry and Endodontics, Kothiwal Dental college and Research Centre, Moradabad, presented with a chief complaint of fracture in the upper front tooth region shown in Figure 1.

Dental history revealed that she met with an accident 2 days back resulting in an injury. Extraoral examination revealed no significant findings. During the intra-oral examination, a class II Ellis fracture of left maxillary central incisor was diagnosed. There was no other pathology associated with the injury. Mild calculus deposits were present but dental caries was not found. Intraoral periapical radiograph clearly shows enamel and dentin fracture without involvement of pulp in the tooth 21.

She identified as a vegetarian and denied any history of smoking, alcoholism, tobacco chewing, bruxism, or clenching, expressing a desire for aesthetic improvement. Her medical history was unremarkable.

The treatment plan for the involved teeth is indirect restorative technique with composite injection moulding technique by G-aenial Universal Injectable and Exaclear providing esthetic in order to restore the dental anatomy of anterior teeth.

Clinical steps

After clinical exam, impressions of maxillary and mandible arches were taken with alginate to obtain preliminary casts for diagnostic wax-up of anterior teeth as shown in Figure 2.
Based on the wax up, an intraoral mock-up was done to check guidance, functional parameters, aesthetics, and phonics. To get long lasting results, function needs to be planned in a correct way.
A clear silicone matrix (Exaclear, GC) of the diagnostic wax-up was made in the dental laboratory and pressurized in a hydro-flask for five minutes at two-bar pressure. The clear silicone was compressed against the wax-up using a spaced, Essix-style tray (Figure 3). The upper anterior teeth were cleaned and roughened with particle abrasion of 50-micron alumina powder (Etchmaster, Groman Dental) and isolated. The Vita shade guide (Vita classical A1–D4 shade guide, Vita Zahnfabrik) was used for shade selection in consultation with the patient. The B1 shades was selected shown in Figure 4. The teeth were etched using 35% phosphoric acid (Ultra Etch, Ultradent) and hybridised with a universal adhesive resin (G Premio Bond, GC) and a dental curing unit (D-Light Pro, GC) shown in Figure 5. Cotton was used to protect the teeth that were not to be etched and bonded. Holes were made through the clear silicone stent at the incisal edge level to allow the tip of the injectable composite through. The syringe of the composite was inserted and injected through the holes in the clear

stent once that was seated fully in the mouth as shown in Figure 5. The space to be filled in with the resin was visually inspected through the clear stent for any voids or bubbles and the resin was polymerised for 30 seconds through the other two were done. Once proximal and gingival excess was removed there would be minimal finishing as the anatomy was wax driven and not freehand. There may be a need for fine grit diamonds or discs on the cervical junction to avoid any ledges while a natural emergence is maintained. Finishing and polishing spirals (Eve Polishers, Trycare) are usually enough to achieve a high surface lustre. An additional step would involve a nylon brush (Goat hair brush, Micerium) and a felt wheel (Shiny felt wheels, Micerium) at 5,000rpm. The final result exhibited good surface texture and lustre while anterior guidance was maintained (Figure 7).

Figure 1 - Clinical pre-operative photograph

Figure 2 –Wax- Up of diagnostic cast

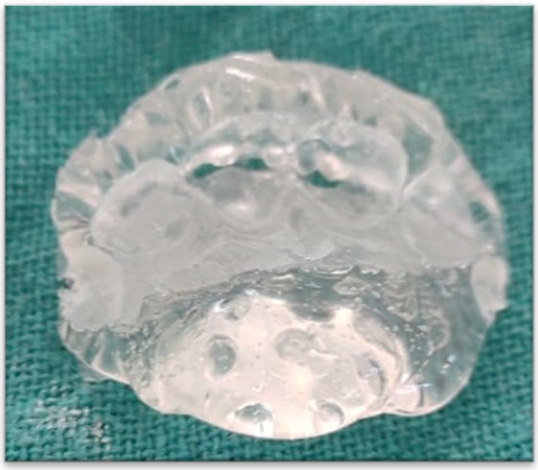

Figure 3 – Silicon exclear putty index

Figure 4 – Shade selection

Figure 5 – Etching the tooth surface

FIGURE 6 - G-aenial Universal Injectable (GC) was injected into the silicone key

Figure 7 -Result immediately after finishing the composite

Discussion

The present case report describes the successful use of the injectable composite resin technique. The ability to conduct a diagnostic wax-up enhances the predictability of outcomes when using the injectable resin technique. The transparent matrix ensures a high level of fidelity to dental anatomy, and the use of low-precision impressions supports the achievement of precise results.[9]

Flowable resins offer the advantage of better adapting to margins and effectively filling composite materials. However, despite ongoing efforts to enhance their properties, they typically contain fewer fillers than conventional resins. This limitation affects their mechanical properties, resulting in increased wear susceptibility, as well as reduced polishing quality and color stability.[12-13]

The injection moulding technique (IMT) involves injecting a low viscosity resin composite in a pressurised, transparent silicone index made from a diagnostic wax-up, aiming to replicate an already performed mock-up and an approved tooth form arrangement. In the IMT, their 'flowable' nature allows for filling the space within a silicone index with a resin under compression. Modern injectable resins, such as G-aenial Universal Injectable (GC), have a high filler content, wear resistance and gloss retention as well as full coverage silane coating of filler particles. The IMT has the advantage of replicating the excellent anatomy defined by a lab made diagnostic wax-up whereby it would be used for the fabrication of indirect restorations. Indirect restorations nevertheless are more time consuming and costly. Direct composite restorations require significant chair time, good operator skills and knowledge of the material used. Compared to freehand indirect restorations, the IMT provides quicker, more consistent results with less adjustments required.

The IMT aims at providing this copy/paste approach by using modern injectable resins. Alternative techniques include the index technique[3] and the partial and full moulding techniques.[14]

Each technique has its limitations and the IMT has the limitations of working best on mono-shade restorations and having a greater treatment time and cost than freehand composites. The IMT does require some finishing but significantly less than freehand restorations. Its main benefit after all is the replicated anatomy of a diagnostic wax-up. There is some excess material cervically and proximally but there should not be a need to alter the shape facially/incisally with discs and burs. It can be used for both purely additive or in subtractive/ additive techniques. However, it is mainly intended for fully additive direct restorations where a mock-up can be done to assess the proposed aesthetics and occlusion. Similarly, it is indicated for monochromatic restorations although layering is possible through cutback, a palatal silicone key or different stents made at different levels. This novel technique aims at copying the anatomy of the diagnostic wax-up. It is more consistent and predictable than freehand techniques while avoiding unpleasant surprises for the patient. Furthermore, it does not require complex clinical skills and it is easy to teach.[15]

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