

# Metamorphosis of Traumatic teeth- Aesthetic Rehabilitation with Injection Moulding Technique: A Case Report

Shrija Pokhrel,<sup>1</sup> Senchhema Limbu,<sup>2</sup> Parajeeta Dikshit,<sup>3</sup> Manisha Malla<sup>4</sup>

<sup>1</sup>Junior Resident, <sup>2,3</sup>Professor, <sup>4</sup>Lecturer

<sup>1-4</sup>Department of Pedodontics and Preventive Dentistry, Kantipur Dental College/Hospital and Research Centre, Kathmandu, Nepal

## ABSTRACT

Dental trauma is unpredictable ranging from minor enamel chipping to complete tooth loss, often accompanied by disruptions to the supporting bone and surrounding soft tissues, potentially compromising aesthetics, function, and overall oral health. Individuals experiencing traumatic injuries to the anterior dentition often report compromised aesthetics, impacting their self-esteem and social interactions. This case report describes the use of injection molding technique, for the rehabilitation of incisor crown fractures. The injectable composite resin technique is a versatile treatment for achieving esthetic and functional tooth restoration. This minimally invasive technique can be precisely adjusted to individual needs to replicate natural tooth structures and functions. Here vacuum-pressed vinyl sheet splint has been used as a stent for the injection moulding technique.

Keywords: *Aesthetic Rehabilitation; injection moulding technique; inverse injection layering technique; minimal intervention dentistry; tray in technique; vacuum pressed vinyl sheet splint.*

## INTRODUCTION

Traumatic injuries to the teeth are common with crown fracture accounting for 92% of all these injuries to the permanent anterior teeth.<sup>1</sup> The esthetic and functional value of permanent incisors is unequivocal, thus treatment becomes a major concern for both, the patient and the dentist. Various treatment modalities have been practiced for fractured anterior teeth, including composite restorations, laminates, and crowns.<sup>2</sup> The injection moulding technique (IMT) also called as inverse injection layering technique is a minimal invasive indirect/direct procedure using flowable composite resin in a pressurized, transparent silicone index.<sup>3,5</sup> It is a straightforward process wherein the morphology can be ascertained beforehand, allowing for the prediction of the outcome.<sup>3</sup>

## CASE REPORT

A 9-year-old male patient came to the Department of Pedodontics and Preventive Dentistry with the chief complaint of dislodged filling of an upper front tooth done 7 months back. The composite veneer on the tooth fell off due to a plastic straw's pressure while having a cold beverage.

On clinical examination, fallen off restoration was seen in 21 with fractured teeth involving enamel and dentin (Figure 1) without any further complications. Intraoral Periapical Radiograph (IOPA) was taken which showed (Figure 2) normal tooth structure and surrounding tissues with no radiographical changes in the periapical region. The final diagnosis was Ellis Class II fracture with fractured restoration of 21. Due to fall of composite veneer previously, as per patient compliance and time limitation a minimally invasive and aesthetically satisfactory treatment plan was made where composite resin injection molding technique was advocated for restoration that comprises indirect/direct technique.

A preliminary impression of the teeth was made with alginate (Figure 3) and the cast was poured with type IV dental stone and sent to the lab. On the primary cast the, 'wax-up' / mockup of the fractured tooth was performed with an inlay wax to simulate the final tooth structure

## Correspondence



Dr. Senchhema Limbu

Professor,

Departments of Pedodontics and Preventive Dentistry

Kantipur Dental College Teaching Hospital, Kathmandu, Nepal

E-mail: senchhe@hotmail.com

## Citation

Pokhrel S, Limbu S, Dikshit P, Malla M. Metamorphosis of Traumatic teeth- Aesthetic Rehabilitation with Injection Moulding Technique: A Case Report. J Nepal Assoc Pediatr Dent. 2023;4(1):30-4.

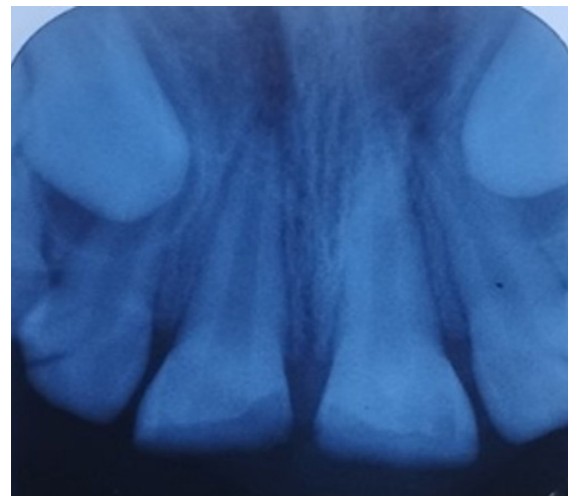
(Figure 4) following indirect reconstructive technique. The mocked-up cast's impression was made with alginate and the duplicated cast was fabricated with dental stone (Figure 5). Following total moulding technique, an occlusal splint that is to be used as a transparent stent was made with a plastic sheet that are made out of polypropylene or polyvinylchloride (PVC) material (Mouth Cavity Mould Slice) of 1.5 mm thickness which was pressurized in Dental Vacuum forming Molding Machine (EASY VAC) that acts as the soft liner material stent in the upper arch teeth (Figure 6).

The adjacent teeth 11 and 22 were isolated by the use of Teflon tape to protect them from not being etched and bonded. The tooth preparation of 21 was carried out by removing the smear layer with prophylactic paste followed by etching of the tooth with 37% phosphoric acid (Prevest Denpro) and then the bonding agent (Fusion BOND5) application was performed. An access hole was

made at the incisal edge of the transparent stent of 21 for insertion of the tip of the flowable composite syringe. Shade selection of flowable composite (Bright light Flow, DMP) was done under the natural light where A2 shade matched the tooth. The transparent stent fabricated was inserted and checked for proper fit, then direct reconstructive technique was started; where flowable composite was injected through the access hole, starting at the cervical third and progressing upward towards the incisal third (Figure 7). All the surfaces of the tooth were filled with flowable composite where resin flowing was visually inspected through this clear stent to avoid bubbles or voids and then light curing was done. Excess composite flowing out of the index was trimmed off (Figure 8). After carefully removing the clear index from the mouth, the rebuilt tooth was polished and finished by using fine disks sequentially (SHOFU, SUPER SNAP) (Figure 9). Final result obtained after finishing and polishing can be seen on Figure 10.



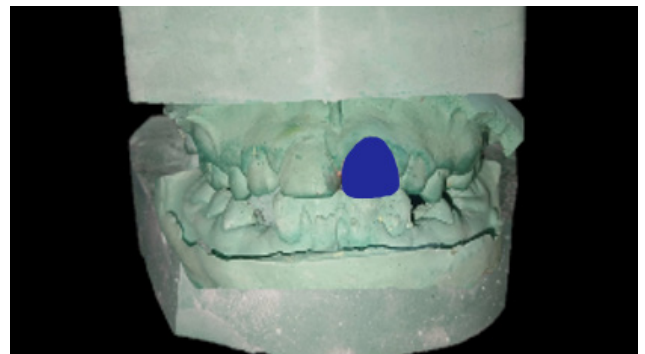
**Figure 1.** Anterior view of dislodged restoration 21



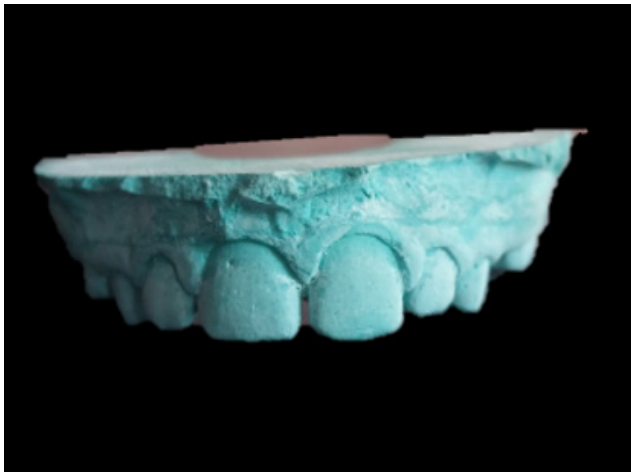
**Figure 2.** IOPA depicting normal surrounding tissues with no periapical changes in 21



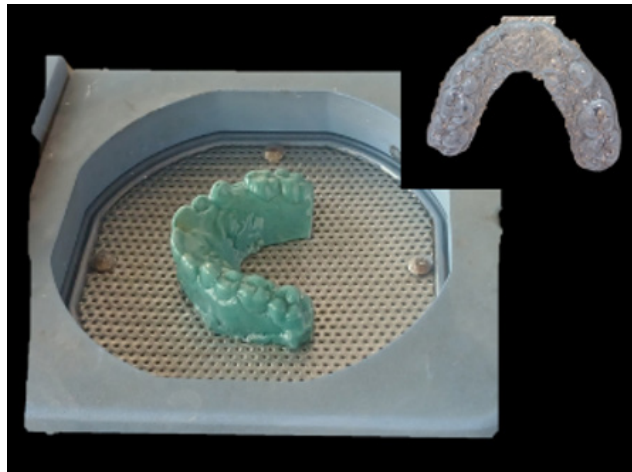
**Figure 3.** Cast fabrication after preliminary impression with alginate



**Figure 4.** Wax up/ Mock up done in 21 with inlay wax



**Figure 5.** Duplicated cast fabricated after Mock up



**Figure 6.** Fabrication of transparent index with Mouth Cavity Mould Slice in Dental Vacuum forming Molding Machine



**Figure 7.** Flowable composite resin application with tray in technique



**Figure 8.** Restored 21 with Tray in Technique



**Figure 9.** Finishing and Polishing performed with fine disks



**Figure 10.** Final Result after finishing and polishing in 21



## DISCUSSION

The aesthetic rehabilitation of traumatic anterior teeth includes techniques such as laminates, veneers, crowns and injection moulding techniques that are advocated in day to day practice.<sup>4</sup> The injection moulding technique also known as inverse injection layering technique described in this case follow the Minimally Intervention Dentistry philosophy where modification of transparent index is done with the use of soft lining occlusal splint.<sup>5</sup> Other silicone index types that are employed in injection molding technique include Exaclear (silicone index), transparent silicone keys which is composed of vinyl polysiloxane impression material.<sup>2,6</sup>

This innovative method includes one part as indirect technique (lab part) that seeks to use the diagnostic wax-up using inlay wax giving an advantage of accurate reproduction detail of the anatomy of teeth which is more consistent and predictable than freehand techniques thus avoiding unpleasant surprises for the patient.<sup>6</sup> Now-a-days this copying of anatomy is even possible with digital dentistry which is yielding more consistent results for wax up.<sup>7</sup> One of the highlights of this case includes the fabrication of the modified transparent stent using a Mouth Cavity Mould Slice of 1.5 mm thickness that was placed in dental vacuum forming molding machine, which is known for their uniform thickness and remarkable comfort during its insertion and are made of soft materials like silicone.<sup>8</sup> The even thickness of this vacuum-pressed vinyl occlusal splint allowed us to overcome the disadvantage of the other silicone index made from vinyl polysiloxane impression materials where thin areas can cause light scattering while thick areas can result in flow marks.<sup>6</sup>

The other part of this techniques (chairside) is the direct restorative method use for the rehabilitation which includes flowable composite material owing to its good aesthetic effects, proper flow and handling characteristics.<sup>9</sup> Clinical advantages of minimal/no preparation, cost effectiveness,

avoidance of multiple layering with packable composites and post restorations adjustments are seen with the use of direct technique with flowable composites.<sup>10</sup> The DMP Bright light flowable composite is used in this case which shows higher filler content, giving us the advantage of higher strength, less polymerization shrinkage and high polishability due to fine particles.<sup>7</sup>

Each technique has its limitations and the IMT has the limitations of working with mono-shade restorations and cost effectiveness as freehand composites but it has decreased treatment time.<sup>7</sup>

However, long term follow-up visits are required to check the discoloration, disintegration and longevity of the composite material. In addition, the outcome of the tray in/ injection moulding technique is influenced by technical understanding and long-term treatment management skills.<sup>11</sup> According to Terry et al. this innovative injectable composite moulding technique's long-term advantages remain to be determined, where the clinical outcomes obtained over the last 12 years for the next-generation nanocomposite flowable are encouraging.<sup>5</sup>

## CONCLUSION

The Injection Moulding Technique has become a successful technique in restoring the fractured anterior teeth by preserving the remaining enamel and dentin following minimally invasive dentistry. This technique offers a broad variety of applications for developing natural esthetic restoration, including both functional and aesthetic rehabilitation with highly flowable composite material which is simple, precise with reduced chairside time, making it a viable option for its use in Pediatric Dentistry.

**Conflict of Interest:** None

JNAPD

## REFERENCES

1. Andreasen FM, Steinhardt U, Bille M, Munksgaard EC. Bonding of enamel-dentin crown fragments after crown fracture. An experimental study using bonding agents. *Endod Dent Traumatol*. 1993 Jun;9(3):111-4. [[PubMed](#) | [DOI](#)]
2. Peumans M, Gestakovski D, Mattiussi J, Karagiannopoulos K. Injection moulding technique with injectable composites: quick fix or long-lasting solution?. *Int Dent – African ed*. 2023 Feb;13(1):14-22. [[Full text](#)]
3. Bahadır HS, Karadag G, Bayraktar Y. Minimally Invasive Approach for Improving Anterior Dental Aesthetics: Case Report with 1-Year Follow-Up. *Case Rep Dent*. 2018 Sep 6;2018:4601795. [[PubMed](#) | [DOI](#)]
4. Coachman C, De Arbeloa L, Mahn G, Sulaiman TA, Mahn E. An Improved Direct Injection Technique With Flowable Composites. A Digital Workflow Case Report. *Oper Dent*. 2020 May/Jun;45(3):235-242. [[PubMed](#) | [DOI](#)]
5. Terry DA, Powers JM, Blatz MB. The Inverse Injection Layering Technique: PART 2: Anatomical Form Defines Esthetics. *J Cosmet Dent*. 2019 Jul 1;35(2):40-9. [[FullText](#)]
6. Karagiannopoulos K. Injection moulding technique: A case study. *Int Dent-African ed*. 2021 Aug/Sept;11(4):46-52. [[Full text](#)]
7. Brenes C, Babb CS, Bencharit S, Romero M, Arce R. Digital approach to the fabrication of a wax prototype for full-mouth rehabilitation of a worn dentition: A clinical report. *J Oral Science Rehabilitation*. 2017 Dec;3(4):44-49. [[FullText](#)]
8. Ainoosah S, Farghal AE, Alzemei MS, Saini RS, Gurumurthy V, Quadri SA, Okshah A, Mosaddad SA, Heboyan A. Comparative analysis of different types of occlusal splints for the management of sleep bruxism: a systematic review. *BMC Oral Health*. 2024 Jan 5;24(1):29. [[PubMed](#) | [DOI](#)]
9. Re D, Augusti G, Amato M, Riva G, Augusti D. Esthetic rehabilitation of anterior teeth with laminates composite veneers. *Case Rep Dent*. 2014;2014:849273. [[PubMed](#) | [DOI](#)]
10. Harshita, V Asit, S Neha, KV Vijay, B Nikhil. Esthetic rehabilitation with direct composite veneering-two case reports. *International Journal of Applied Dental Sciences*. 2022;8(4):178-180. [[Full text](#) | [DOI](#)]
11. Apponi R, Murri Dello Diago A, Colombini V, Melis G. Direct versus Indirect Techniques to Menage Uncomplicated Crown Fractures of Anterior Teeth Following Dentoalveolar Trauma. *Dent J (Basel)*. 2021 Jan 20;9(2):13. [[PubMed](#) | [DOI](#)]