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Case Report

Single visit biomimetic restoration with multilayered direct composite technique on maxillary central incisor

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ABSTRACT

Background: *Biomimetic restoration with multilayered composite gives the highest aesthetic result with the least invasive tooth structure. The goal of these techniques is to restore teeth while closely mimicking the micro- and macrostructure, chromatic properties, and tooth symmetry of the original dentition. These techniques need extra instruments and the clinician's experience.* ***Purpose:*** *This case study aims to describe a technique for repairing anterior defects in just one appointment.* ***Case:*** *A 24-year-old man complained about the color, asymmetry, and fracture of his anterior teeth. However, he does not have much time to wait for the indirect restoration procedure. A single-visit treatment was preferred for this case.* ***Case Management:*** *A manual wax-up for the palatal index followed by multilayered composite restoration was nicely done in a single appointment. Defects in anterior teeth could be repaired in a single appointment using multilayer direct composite restoration. This method could effectively replicate the teeth's morphology, symmetry, micro-macro structure, and chromatic properties. The quick manual wax-up and layering steps are critical to this procedure.* ***Discussion:*** *Currently, direct restorations for anterior teeth are completed in three stages: incisal edge and palatal wall shaping; interproximal wall creation utilizing a pre-contoured matrix technology; and buccal surface application of multilayered composite. Multilayered direct composite restoration technique with manual palatal index can be an alternative procedure to create immediate natural-looking anterior restoration. This technique offered a reduction of chairside time in a single-stage appointment, laboratory cost savings, and more predictable results.*

Keywords: *Biomimetic restoration; direct composite; aesthetic restoration*

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INTRODUCTION

The anterior teeth have a considerable impact on a person's appearance. When a patient has problems with their front teeth, such as fractures or poorly designed crowns, anatomical shape and color correction are required to restore their confidence.[1] Composite resin materials have advanced to become the preferred material for anterior tooth restorations.[2,3]

The advantages of composite resin include good mechanical fracture resistance and surface stability, biocompatibility, and non-toxic, along with good optical characteristics. The most recent technology in composite resin materials allows them to mimic the color and translucency of natural teeth.[4–6] The annual failure rates of direct composite restorations on permanent teeth range from 1% to 3% for posterior teeth and 1% to 5% for anterior teeth, demonstrating its durability.[7] Direct composite restorations are less expensive compared to indirect restorations and can be accomplished in a single visit, requiring little to no tooth structure removal.[8,9]

Ammannato et al. used the 'index cutback technique' to ensure the shape and thickness of central incisor restorations. the wax-up for the silicone index was prepared manually by a technician, and the restoration was completed over several visits.[10] Gao Yi et al. described a case of Class IV anterior tooth restoration using computer-aided design and 3D printing technology for the wax-up, followed by the construction of a palatal polysiloxane putty index, which also required multiple visits.[11] Both cases had great outcomes in replicating the natural form and color of the teeth, although these approaches are not always appropriate for all situations.

Single-visit treatment should be preferred for patients who have a tight schedule. Paolone et al. achieved excellent outcomes by restoring anterior teeth in a single appointment with a silicone index made by using the technician's wax-up.[12] The multilayer approach can be utilized to restore the teeth to their natural shape and color. This technique begins with the creation of a palatal shell, followed by the proximal wall and buccal surface using the multilayering technique.[13–15] The purpose of this case report is to describe the steps of

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direct composite restoration on anterior teeth using manual wax-up, palatal index creation, and multilayering technique in a single visit.

CASE

A 24-year-old man arrived at the Dental Hospital of Universitas Sumatera Utara with a complaint about asymmetrical and damaged upper front teeth. The patient stated that the teeth had been previously injured. After undergoing root canal therapy a couple of weeks ago, the front upper right tooth was covered with a crown. There were no issues regarding the tooth, but the size and color of the crown were inappropriate. The patient requested that his teeth be repaired immediately because he had a graduation ceremony the next day. The patient received the inform to consent and gave informed consent statement regarding the treatment and case reporting.

CASE MANAGEMENT

During a clinical examination, tooth 11 revealed an acrylic crown with inadequate adaptation. The color and size of the acrylic crown did not match the adjacent teeth. Percussion and palpation testing revealed no symptoms. Tooth 21 had mild incisal chipping (Figure 1A-B). The periapical radiograph showed radiolucency with acceptable obturation (Figure 1C). The treatment approach for this patient is immediate composite restoration because the patient is unable to wait for the laboratory process, which takes several days and is costly. After the patient gave informed consent, the acrylic crown was gently removed, and the leftover cement surrounding the cervical area of the tooth was cleansed. Despite having been prepared for a crown, the tooth remained in proximal contact. The button-try technique was used to select shades. A small amount of composite material was applied to the tooth's labial surface and cured without the use of an adhesive.

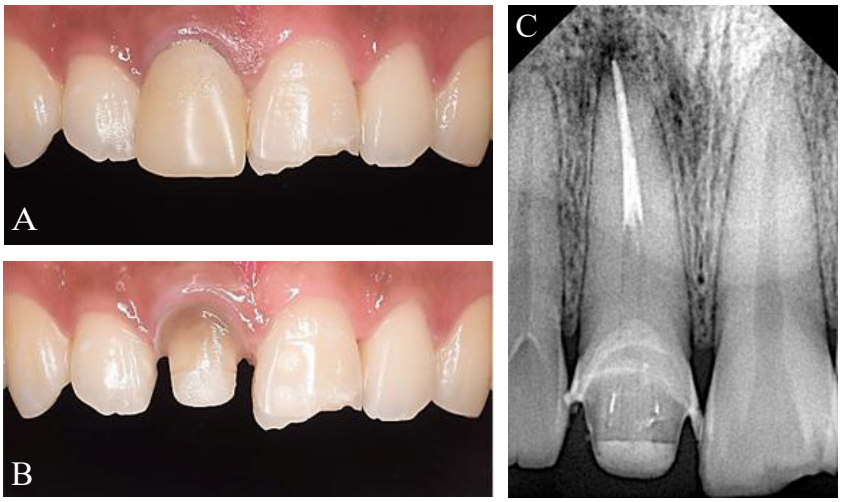

Figure 1. A. Preoperative view of an acrylic crown and damaged maxillary anterior teeth, B. View after acrylic crown removal, C. Initial periapical radiograph of involved teeth.

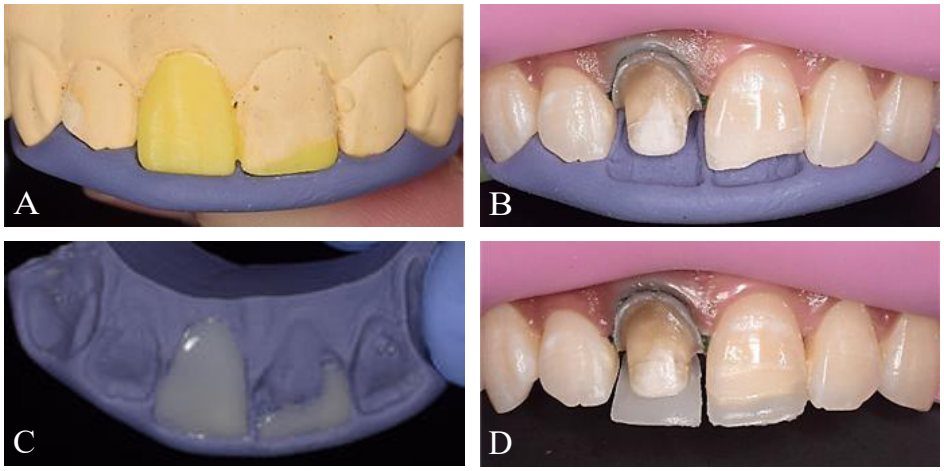

Figure 2. A. Extra-strong plaster casts and diagnostic wax-ups. B. Rubber dam isolation, gingival cord insertion, and silicone index trial. C. Composite is applied directly to the silicone index. D. The silicone index is removed as the palatal wall is formed.

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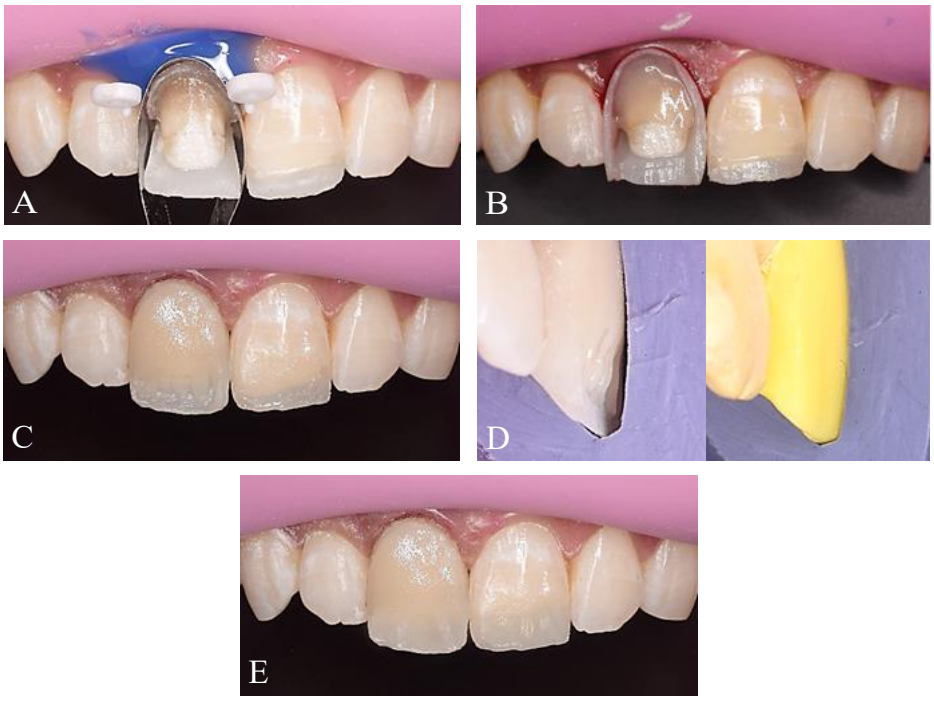

Figure 3. A. The pre-contoured matrix is applied and stabilized with wedges and gingival dams. B. Interproximal walls are constructed in a single stage. C. The dentinal body is complete. D. Checking the space for the enamel layer. E. Enamel layer applied.

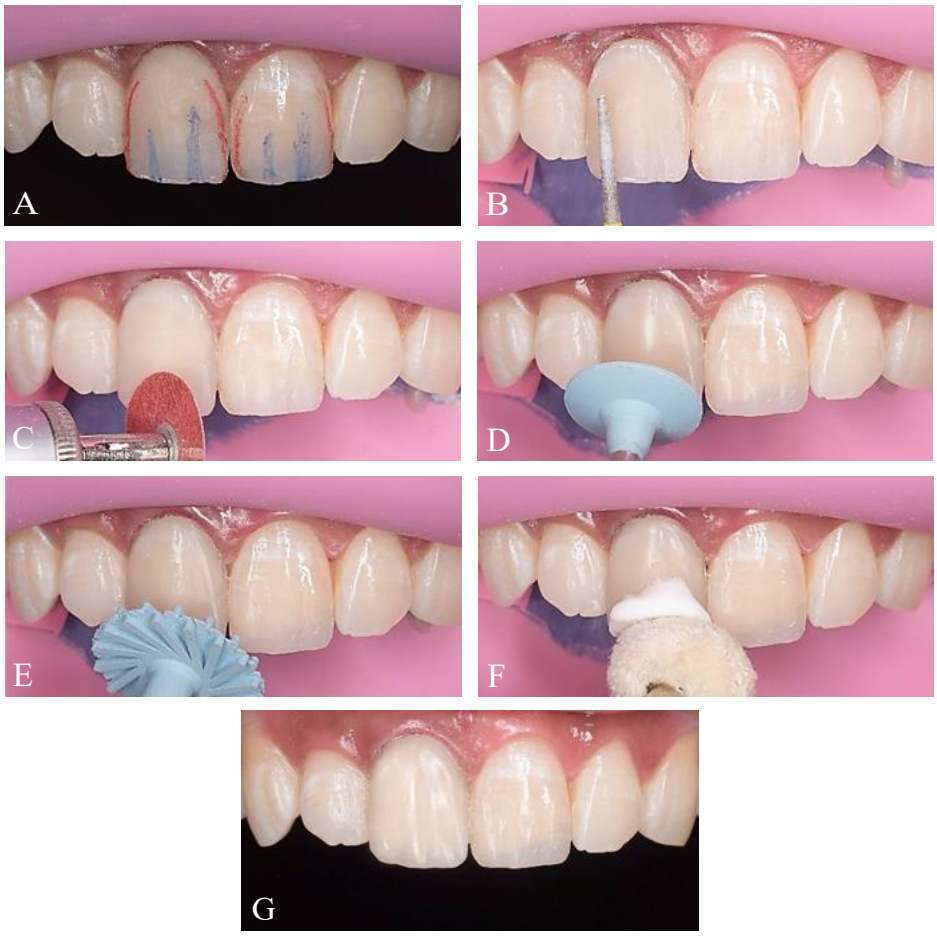

Figure 4. A. Drawing of anatomical outline with colored pencils. B–C. Burs and disks are used for shaping and finishing. D-E-F. Polishing procedure with rubber disk polishing kit and polishing paste. G. Post-operative appearance.

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After confirming the cleanliness of the cement material, the patient's upper and lower jaws were impressed using an alginate impression (Alginate impression material, Hygedent, Changping, Beijing). The upper and lower jaw models were created from Type III gypsum stone. The setup process takes about 30 minutes. The patient was instructed to wait in the waiting room. After stone models were set up, the dentist did a manual wax-up. The waxing process takes around 20 minutes. Following the wax-up, polyvinyl siloxane (I-Sil Putty Premium, Spident, Incheon, Korea) was used to construct a palatal index (Figure 2A). Following the split dam technique and gingival cord, the palatal index was tried to ensure there were no obstructions and that it fit the patient's tooth condition (Figure 2B). Teeth 21 and 11 were etched with 37% phosphoric acid (Any Etch™ (HV), Mediclus Co., Ltd, Chungbuk, Korea) for 15 seconds, followed by a water rinse. The teeth were softly dried with an air stream, and bonding agent (3M ESPE Single Bond Universal Adhesive, 3M, Minnesota, USA) was applied with a micro brush and dispersed with a light air stream, followed by curing with a light curing device (Curingpen-E, Eighteeth, Jiangsu, China). A thin layer of composite material (G-ænial Composite JE, GC dental, Tokyo, Japan) was applied to the silicone index (Figure 2C). The silicone index was carefully removed, and the created palatal wall was cut to prepare for the anterior matrix placement (Figure 2D).

The anterior matrix (Twin anterior matrices, TOR VM, Moscow, Russia) was inserted around tooth 21 and wedged in place. A gingival dam (Dentto-Dam, Mediclus Co., Ltd, Chungbuk, Korea) was employed to keep saliva from entering the cervical area (Figure 3A). A composite material (G-ænial Composite JE, GC dental, Tokyo, Japan) was applied to the edge of the anterior matrix and cured. The initial layer of composite material was applied in the cervical area (G-ænial Composite AO2, GC dental, Tokyo, Japan), using a low-translucent material to keep the cervical area's dark color from showing through (Figure 3B). The second layer of composite material (G-ænial Composite A2, GC dental, Tokyo, Japan) for dentin color extended from the cervical area to two-thirds of the tooth, leaving enough space for the final enamel layer. A sagittal putty index was used to determine the thickness of the enamel layer (Figures 3C–D). The third layer of enamel composite material (3M™ Filtek™ Z350 XT Universal Restorative, CT, Minnesota, USA) was placed based on the remaining space (Figure 3E).

A colored pencil was used as a guide for thorough tooth shaping to define the tooth's anatomical contour (Figure 4A). A diamond bur (DiaBurs TR-25EF, Mani Inc., Tochigi, Japan) was used for contouring, followed by a sand disk finishing (3M ESPE Softlex Disc Polishing, 3M, Minnesota, USA) (Figure 4B-C). The polishing procedure began with a rubber polishing kit (Optragloss, Ivoclar, Zurich, Switzerland) (Figure 4D-E). Polishing paste (ENA Shiny C, Micerium, Avegno, Italy) was used to create a glossy finish (Figure 4F). The final restoration appearance demonstrated appropriate anatomy and color matching (Figure 4G).

DISCUSSION

The silicone index method has been used to initiate direct restoration treatments on anterior teeth for many years. A palatal index is used to assist clinicians in replicating the palatal anatomy and incisal edge. However, most of these indices are created through a laboratory process that requires additional time and cost.[10,12–14] Developments in technologies such as digital CAD (computer-aided design) and 3D printing techniques for making wax-ups, 3D printing palatal templates, and even composite block milling for the palatal shell have yielded positive results but need more time and cost.[1,11,13] Buccal surface replication is a challenge for clinicians. Several aspects must be considered in this location, including the thickness of the restorative material, color matching of the material used, and replication of microanatomical patterns.[4,10,16] This section has a significant impact on patient satisfaction with the quality of restoration. In this case, the dentist performed a manual wax-up and palatal index in the office. This method can save time and money, and it can even be accomplished in one visit.

The biomimetic multilayering technique is a difficult method; therefore, various techniques have been developed, such as injectable composite resin with a transparent silicone index and prefabricated template technology, to make it easier. These methods necessitate digital laboratory processes and require multiple visits, increasing costs and time. [17] In this case, the multilayering procedure was carried out using a silicone index to ensure layer thickness. [16,18,19] This method produced good results, and the patient was pleased with his current appearance.

A multilayered direct composite restoration approach with a manual palatal index could be used to achieve an immediate natural-looking anterior restoration. The selection of appropriate techniques and instruments supported the success of treatment in this case.

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REFERENCES

1. Xia J, Li Y, Cai D, Shi X, Zhao S, Jiang Q, Yang X. Direct resin composite restoration of maxillary central incisors using a 3D-printed template: two clinical cases. BMC Oral Health. 2018;18(1):1-8.
2. Lempel E, Lovász BV, Meszarics R, Jeges S, Tóth Á, Szalma J. Direct resin composite restorations for fractured maxillary teeth and diastema closure: A 7 years retrospective evaluation of survival and influencing factors. Dent Mater. 2017; 33(4): 467-476.
3. Opdam NJ, Van De Sande FH, Bronkhorst E, Cenci MS, Bottenberg P, Pallesen U, Gaengler P, Lindberg A, Huysmans MC, Van Dijken JW. Longevity of posterior composite restorations: a systematic review and meta-analysis. J Dent Res. 2014; 93(10): 943-949.

4. Paolone G, Scolavino S, Gherlone E, Spagnuolo G, Cantatore G. The "pre-finishing" approach in direct anterior restorations. A case series. Dent J (Basel). 2021; 9(7): 79.
5. Cho K, Rajan G, Farrar P, Prentice L, Prusty BG. Dental resin composites: A review on materials to product realizations. Composites Part B: Eng. 2022; 230: 109495.
6. Elfakhri F, Alkahtani R, Li C, Khaliq J. Influence of filler characteristics on the performance of dental composites: A comprehensive review. Ceram Int. 2022; 48(19): 27280-27294.
7. Dias Furtado M, Immich F, Luiz De Oliveira Da Rosa W, Piva E, Fernandes Da Silva A. Repair of aged restorations made in direct resin composite – A systematic review. Int J Adhes. 2023; 124: 103367.
8. de Kuijper MC, Cune MS, Özcan M, Gresnigt MM. Clinical performance of direct composite resin versus indirect restorations on endodontically treated posterior teeth: A systematic review and meta-analysis. J Prost Dent. 2023; 130(3): 295-306.
9. Mazzetti T, Collares K, Rodolfo B, da Rosa Rodolpho PA, van de Sande FH, Cenci MS. 10-year practice-based evaluation of ceramic and direct composite veneers. Dent Mater. 2022; 38(5): 898-906.
10. Ammannato R, Ferraris F, Allegri M. The "index cutback technique": a three-dimensional guided layering approach in direct class IV composite restorations. Int J Esthet Dent. 2017; 12(4): 450-66.
11. Gao Y, Li J, Dong B, Zhang M. Direct composite resin restoration of a class IV fracture by using 3D printing technology: A clinical report. J Prost Dent. 2021; 125(4): 555-9.
12. Paolone G, Scolavino S, Gherlone E, Spagnuolo G. Direct esthetic composite restorations in anterior teeth: Managing symmetry strategies. Symmetry (Basel). 2021; 13(5): 797.
13. Liu J, Zhang J, Liu W, Liang S. Combining a CAD-CAM composite resin palatal wall with a direct composite resin layering technique for the restoration of a large Class IV fracture: A clinical report. J Prost Dent. Published online 2024.
14. D'Arcangelo C, Buonvivere M, De Angelis F. Anterior Esthetic Restorations with the Stratified Stamp Technique: A Case Report. Biomimetics. 2024; 9(5): 299.
15. Rao AS, Bhor S, Chhabra N. Comparative evaluation of aesthetic outcome of direct polychromatic composite layering and the "index cut-back technique" for restoring class IV defects using a newly patented simulated 3D printed mould: An in vitro study. J Oral Biol Craniofac Res. 2022;12(5):552-556.
16. Elzayat GA, Elsayed MM, Zoghby AFE. Clinical performance of direct anterior composite restorations using esthetic dual-shade versus polychromatic natural layering technique: A split mouth randomized controlled clinical trial. Braz Dent Sci. 2020; 23(4): 1-12.
17. Geštakovski D. The injectable composite resin technique: biocopy of a natural tooth-advantages of digital planning. Int J Esthet Dent. 2021; 16(3): 280-99.
18. Chandrapal A. Restoration of anterior teeth using polychromatic layering techniques. Dent Update. 2019; 46(4): 353-60.
19. Paolone G. Direct composite restorations in anterior teeth. Managing symmetry in central incisors. Int J Esthet Dent. 2014; 9(1): 12-25.

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