OPEN ACCESS
Global Journal of Research in Dental Sciences
ISSN: 2583-2840 (Online)
Volume 04 | Issue 06 | Nov. – Dec. | 2024
Journal homepage: https://gjrpublication.com/gjrds/
Case Report

Multi-Shade Composite Layering: Case Report

[1]Dr.Abdulgani Azza, [1]Dr. Qawasmeh N., [1]Dr. Alsagheer M., [1]Dr. Abdulgani M., [2]Dr.Abu-Hussein M. *

[1]Palestine Polytechnic University, School of Dentistry, Hebron, Palestine.
[2]Practice limited to Children's Dentistry, Aesthetics Dental Clinic, Athens, Greece.

DOI: 10.5281/zenodo.14680239 **Submission Date:** 10 Nov. 2024 | **Published Date:** 30 Dec. 2024

***Corresponding author:** Dr. Abu-Hussein M.
DDS, MScD, MSc, MDentSci(PaedDent), FICD
Practice limited to Children's Dentistry, Aesthetics Dental Clinic, Athens, Greece.
ORCID ID: 0000-0002-4961-5044

Abstract

Composite resin bonding is the quickest, most conservative and affordable method to repair minor tooth fractures and replace old anterior fillings. Thanks to improvements in color and strength, the dentist has ultimate control over the final outcome of this transformation. Layering of different colors and opacities allows the composite to mimic natural dentin and enamel. These composites can exhibit an accurate reproduction of the chroma, opacity, and translucency of natural dentin and enamel. Providing a patient with a multi-shade anterior composite can increase their self-esteem. This article discusses the use of a multi- shade layering technique in a 19-year-old patient.

Keywords: *Class IV anterior composite, multi- shade composite layering, freehand resin bonding, anterior tooth fracture, color matching, Case Type IV.*

Introduction

Oro-facial trauma, the second most common cause of tooth loss, has a significant negative effect on patient's appearance and mastication. It mainly affects the children and adolescents, especially their maxillary central incisors, which are the most visible. The most common risk factors are falls, automobile/bicycle accidents, collisions, gender and age, some behavioral characteristics, physical and sporting activity .[1]The worldwide prevalence of traumatic dental injuries ranges between 6%-37% .[1-6] Seasonal variations in the prevalence of trauma have also been reported.[507]Dental trauma (DT) of the incisors and their supporting tissues, which is one of the most challenging dental emergency situations, requires immediate assessment and management due to psychological and physical reasons .[4,6] This is especially important for young permanent teeth because of continuing development in order to minimize undesired complications. The treatment of dental trauma is sometimes neglected, although it might lead to pain, difficulty in articulation and mastication as well as having considerable negative effects on patient's self-esteem. [7,8] However, aesthetics of the anterior teeth are very important aspects of human appearance and could be affected by many factors including the presence of fillings, tooth color, position, alignment, shape and number. [8-9]

Coronal fractures of permanent incisors represent 18-22% of all trauma to dental hard tissues, 28- 44% being simple (enamel and dentin) and 11-15% complex (enamel, dentin and pulp). Of these 96% involve maxillary central incisors.[6] Traumatized anterior teeth require quick functional and aesthetic repair. [3,6] The presence of fracture of anterior tooth severely compromises the aesthetic value of the patient. A complete understanding of the desire of the patient is absolutely critical for success. [5,6]

Intensity of trauma, direction of the trauma, elasticity of the substance, and tolerance of the soft tissue are the major factors that determine the extent of the fracture [5]. Various injuries may occur on dentition and cause fractures of different classifications [6]. The most frequent type is enamel-dentin fracture with or without pulp exposure [3], the predictable esthetic restoration of broken incisal edge of maxillary central incisors is a demanding and technique

sensitive procedure. Its success is dependent on operator's skills and knowledge and on adhering to a systematic and problem solving approach [4]. A logical method is used to build up morphologically correct composite restorations by careful selection of composite shades, tints and opaquer. In accurate combinations, an illusion of varying translucencies and opacities become visible over natural tooth structure [1-9].

The dental composite has emerged as a top ranked material over other direct restorative counterparts [8]. Their evolution since their introduction in dentistry has resulted in better bonding, optical and handling properties. Their performance has also been supported by many longevity studies [11,12].

In the present article, an esthetic rehabilitation of fractured anterior teeth restored with direct composite resin is presented. This article discusses the use of a multi- shade layering technique in a 19-year-old patient.

Case Report

A healthy 19-year-old female presented for an initial checkup and evaluation (Fig 1); she was changing dentists because she had moved from out of state. Her last dental prophylaxis and examination had occurred more than a year earlier. A comprehensive examination and a full mouth series of radiographs showed no abscesses, no caries, and no periodontal disease. She had some gingival inflammation due to not having had a prophylaxis for 12 months and not angling her toothbrush correctly at the gum line to facilitate plaque removal. **Figure-1**

She had fractured tooth #8 in a swimming accident several years earlier and her previous dentist had re- paired it with a composite resin filling. The filling was unsightly, chipped at the junction of the facial margin, and very opaque. **Figure-1**

Figure-1: Pre operative view11

The natural color of adjacent tooth #9, however, had a great deal of translucency. Both maxillary anteriors were determined to be vital, with normal response to cold.

Figure-2: Shade Matching

The patient was told of the open margin on #8 and the benefits of replacing the filling, which included restoring the tooth to a lifelike color as well as sealing the junction between the filling and the tooth to prevent recurrent decay. Because there was so much crowding and some gingival inflammation, she was informed of the health benefits of orthodontics and was referred to an orthodontist for a consultation. The treatment plan was geared toward restoring her to ideal dental health with a focus on prevention while improving esthetics. As the patient was a minor, the treatment plan was also discussed with and agreed to by her father. She received a prophylaxis with brushing and flossing instructions and her missing sealants were replaced. The composite filling on #8 would then be replaced with a multi-layered resin that would provide an ideal seal and a more natural-looking restoration.

Shade Matching: The existing filling on #8 was con- toured to an ideal incisal lingual form using diamond burs. A putty mold was fabricated from the lingual and incisal shapes of #8 and #9; this was a critical step in designing a blueprint for the framework in which the layering would reside. A body shade of A1 taken from the unrestored #9. The composite material itself was placed on the tooth and light-cured to verify the correct shade. This was done because composite shades rarely match the commercial shade guides.13 The most accurate shade guide would be one that is composed of the actual composite material.13 **Figure- 2**

The patient was anesthetized with 1.7 ml lidocaine hydrochloride 2% with epinephrine 1:100,000. Isolation was achieved with an Optra gate. The entire filling on #8 was removed and confirmed to be caries-free. A 2-mm bevel was placed facially to serve as a plane on which to blend the internal and external colors of composite with the natural dentin and enamel shades. **Figure-3,4:**

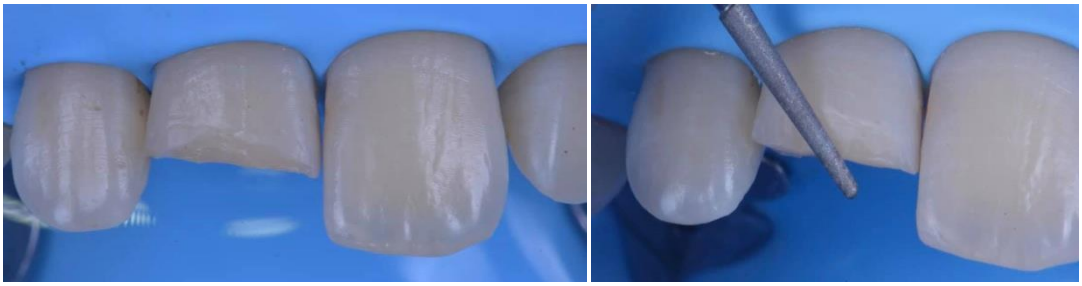

Figure-3, 4:

Etching and Bonding: Tooth #8 was etched with 37% phosphoric acid (Etch gel, Henry Schein) for 12 seconds and then rinsed with water for 12 seconds. The acid etch was applied to the entire pre- pared surface and carried past the bevel. A bonding material was ap- plied to #8 with a micro brush. The bonding agent was scrubbed in for 10 seconds, then air-dried and light-cured for two 10-second intervals. **Figure- 5,6**

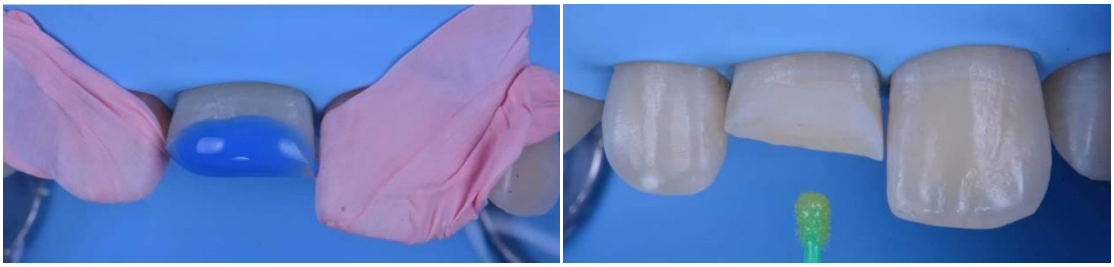

Figure- 5, 6: Etching and Bonding

Layering: IPS Empress Direct nanohybrid composite was chosen for all layers of the restoration due to its strength, color, and polish ability. The evolution of nanohybrid composites, a combination of small and large particle fillers, has given dentists the opportunity to obtain excellent esthetics and strength.14 A very thin layer of Empress Direct A1 Enamel was placed directly into the putty mold outside of the mouth and sculpted to form a lingual shelf and incisal edge using an interproximal carver. **Figure- 7**

Figure 7.: Incisal palate enamel shape was inserted 11

The lingual shelf layer was sculpted as thin as possible without perforating the composite, into the putty. The putty mold was then placed back into the mouth, making sure the composite adapted to the tooth and light-cured for two 10-second intervals. **Figure- 8** The putty mold was removed and the thin transparent lingual shelf remained bonded to the lingual enamel of #8. A layer of A2 Dentin was placed to recreate the dentin lobes and was carried up just over the bevel to hide the fracture line. The lobes were shaped to mimic the lobes on #9, which is important for esthetics.

Figure 8.: Incisal halo (UD2)

This layer was cured for two 10-second intervals. A layer of translucent shade (Trans 30) was used to fill in the area between the lobes at the incisal and distal portion and cured for two 10-second intervals. The translucent layer was used to preserve the dentin lobe effect and impart incisal translucency. Figure 9 A layer of A1 Enamel was used to cover the incisal portion of the dentin and a layer of A3 Enamel was placed midfacial over the dentin to blend with the more chromatic area of the tooth's central aspect. This layer was cured for two 10-second intervals.

Figure 9.: Dentine UD2 and UD3

Finally, a layer of Trans 30 was placed over the entire section of the composite to recreate the facial enamel form. This was cured for two 10-second intervals. **Figure 10**

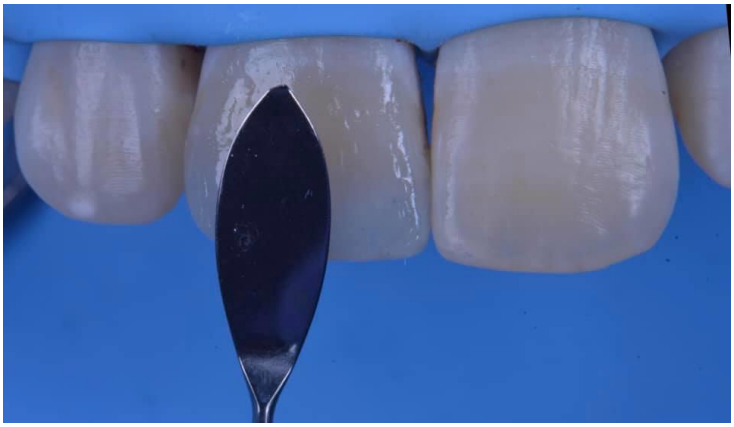

Figure 10.: OBN and enamel GE3, After layering

Contouring and Polishing: The Optragate was removed and the composite was shaped and contoured with a red-striped, flame-shaped diamond bur. The line angles and incisal edge position were traced with a pencil to mimic the angles of #9.16 The primary anatomy was formed using coarse and medium FlexiDiscs and FlexiStrips. Contours were checked from right, left, and incisal views. Occlusion was verified for adequate protrusive and lateral excursions with AccuFilm

II. Polishing was completed in three sequential steps, the sequential aspect being key to composite longevity:17 A fine FlexiDisc was used first, then a super-fine Fluidics, alternating between dry and wet fields. **Figure 11** Finally, a FlexiBuff felt polishing disc was used with Enamelize polishing paste.

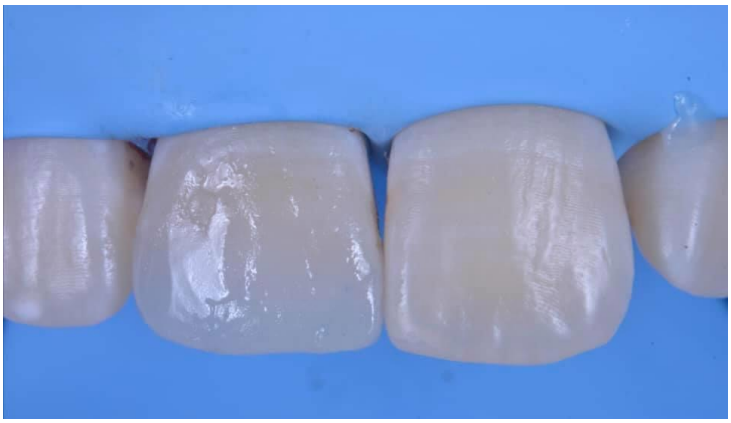

Figure11.: After finishing with disc, Akransaqs and interproximal strips

Discussion

Dental traumas are estimated an increasing public health problem that affects permanent dentition among children and teenagers. The majority of dental injuries happen in the anterior region, affecting mainly the maxillary central incisors that can have a significantly negative functional, esthetic and psychological influence. Several techniques can be used for restoring fractured teeth, either by indirect or direct restorations, or in some situations by reattachment of the fragment. Direct composite restorations for non-complex crown fractures with missing fragment represents the most minimally invasive method [11,12].

Figure12.: Final view of restoration 11

Composite restorations offer a cost effective treatment alternative where esthetics is a major concern [2,3,12]. The survival rates of these anterior composites were reported to be extremely satisfactory even in patients with worn dentition. With improvements in the bonding chemistry and introduction of nano-composites, it is speculated that the success rate of composites will improve even further [3,13,14]. **Figure 12**

Current direct adhesive restorative systems have numerous advantages such as reversibility, durability, low cost, and speed of treatment. In the patient presented, the restoration was placed in a single appointment and finished and polished in a subsequent appointment. Maximum tooth structure was conserved when the existing restoration was removed, thus preserving enamel at the margins of the preparation and favoring the adhesion and longevity of the adhesive procedure.[15] The dentist should choose the restorative system according to each situation. The system used for the present patient was recently introduced and has not been tested in many studies. However, results appear to be comparable with those of other available systems. [16,17]

Natural teeth possess translucency, opalescence, and fluorescence, all of which must be replicated by the restorative material to achieve clinical success. Enamel translucency varies from tooth to tooth and from individual to individual. The presence or absence of color, enamel thickness, degree of translucency, and surface texture is an essential component in determining translucency. [18,19] The system used provides variable shades and opacities that allow the reproduction of the chromaticity and translucency/opacity of enamel and dentin. The manipulation of the thickness of the enamel and

dentin increments selected without using the VITA shade guide system allows the correct characteristics of the dental structures to be reproduced in a simplified way, as demonstrated in the present treatment. [20,21] **Figure 13**

Figure13.: 2yeasrs follow up without polishing

In the treatment presented, the white stain was used. These stains should be applied carefully with a fine brush as demonstrated in this treatment to avoid excess material that can lead to an unsightly appearance or decrease in cohesive strength between the resin increments. [22,23]

The dentin resins in the restorative system used have a micro hybrid composition, while the enamel resins are nanohybrid, providing increased polish ability for the external layer of the restoration. The color of the composite resin is not influenced by when the restoration is polished (immediately or later).[24] Thus, the final polishing time can be scheduled according to the preferences of the clinician.[25] In the presented patient, the definitive finishing and polishing were performed in the next session to allow rehydration of the tooth and time for the clinician to determine the need for additional resin increments.[26,27]

Clinical protocol for direct restorations in the anterior area Restorations in the anterior area of the oral cavity involve the biomimetic reproduction of the natural teeth characteristics in order to achieve aesthetic restorations as well as integrated into the dental arcade. For this, two essential steps are needed: dental color determination and selection of composite resin materials to be layered. a) Color evaluation in cosmetic dentistry is one of the most difficult stages in direct restoration [11,28].

Color should be understood as a result of the interaction of three dimensions known as hue, saturation and brightness. Determination of dental color can be done by direct or indirect methods. A preliminary determination of the dental color will be done with the spectrophotometer to have a reference point, followed by the visual dental color determination with shade guides, aiming at the same time to observe the individual aspects (areas of incisal or proximal translucency, increased opacities, pigments, cracks, etc.). It is recommended to use customized and individualized shade guides, layered in different color and thicknesses, made from the same material as the future filling [1,2,7,29].

In addition to choosing the stratification technique, it is important to select properly the materials, as to obtain chromatic effects of depth, that characterize the natural teeth. Layering methods used for direct anterior teeth restorations [5,30].

- One-layer layering techniques is a common and simple layering technique, that involves a single group of materials, either dentin or enamel, to restore the defective natural tooth. It is usually used for masking the white spots on the teeth. [4,5]
- Two-layer stratification techniques require a higher level of clinical skill, because it uses both dentin and enamel materials during the restoration. It is indicated in case of cervical lesions or for direct composite veneers. [4,5,80
- Three-layer stratification techniques: this is the advanced level of the layering technique, when opaque dentin, body dentin and enamel materials are used in combination to block the transmission of light. As opaque materials are used, a good selection of the hue and thickness of the dentin and enamel layers are essential to achieve an aesthetically successful result. It is used to mask the discoloration of teeth with dyscromies. [4,5,21,28]
- Complex layering techniques involves materials with special color effect (pigments) in restorations. These materials are usually placed between the dentin and enamel layers of natural teeth or of the restorative materials. [4,5,29,30]
- Anatomical layering technique involves using successive layers of dentin, enamel and incisal composite, so that more realistic color depth could be obtained. In the same time, surface and optical characteristics that mimic nature are aimed. [4,5,8]
- Blended shading technique. This technique uses two or more shaded restoration materials to match the actual hue of a tooth in different regions. Restorative materials with different colors are used and mixed with overlapping surfaces to create the desired effect. [4,5,21,27,28]
- Natural layering technique. The concept was introduced in 1995 by Prof. Dr. D. Dietschi. It is based on a simplified and more reliable layering technique with only two layers (dentin and enamel) to perfectly mimic the structure and appearance of the tooth. [26,31,32] This new approach allows the combination of different enamel and dentine nuances with immediate comparison with the natural tooth. Clinical applications and stratification of the composites

uses only one universal dentine shade (with the opacity close to that of a natural tooth) with several levels of chromacity and three types of enamel for young, adults and old patients, with different shades and levels of translucency. [4,5,26] **Figure 13**

Aesthetic restorations can be provided directly and conservatively, with respecting the optical properties of natural dental structures. [31,32] Nowadays, the evolution of dental resin composites, is based on improved reliability and clinical simplification. To achieve aesthetic excellence, dentists should understand and apply the art and scientific principles when layering the composite materials. **Figure 1,12**

Conclusions

A simplified layering technique with only two composite opacities can solve most of our anterior restorations, if we respect the biology and the shape of the restoration. To achieve good aesthetic results, and to do a fast and efficient job, smart materials, products and instruments should be used to facilitate our daily work. As a result of advances in adhesive techniques, composite resins have become the primary restorative materials in modern dentistry. Resin restorations have a strong ability to replicate anatomical shape, color, dentin and enamel opacity levels, opalescence effects, and characterizations (e.g., stains and cracks), as well as good mechanical resistance. However, their use is not without challenges. Clinicians must consider various factors, including material selection, application methodologies, accurate color matching, and layering techniques. In addition, they must thoroughly understand the various materials' characteristics and how they influence final esthetics to select the most appropriate materials for case-specific direct composite veneer restorations.

CONFLICT OF INTEREST: Nil
SOURCE OF FUNDING: Nil
ETHICAL CLEARANCE: Not required for case report manuscript.

References

1. Andreasen FML, E.; Andreasen, J.O. In: Jens O. Andreasen FMA, Lars Andersson, editor. Textbook and Color Atlas of Traumatic Injuries to the Teeth, 5th Edition. Chichester, UK: Wiley-Blackwell; 2019. p. 327–355.
2. Goldstein, R.E. (2014); Esthetics in dentistry (2 vols). PMPH-USA.
3. Jordan RE. (1993); Mosby-Year book, Inc:Esthetic Composite Bonding Techniques and Materials, 2nd ed. St. Louis: ;84-6,1324,140,150
4. Abu-Hussein Muhamad, et al. (2019); Anterior Esthetic Restorations Using Direct Composite Restoration; a Case Report. Dentistry & Dent Pract J, 2(1): 180008
5. Abu-Hussein Muhamad et al. (2019); Restoring Fractured Anterior Tooth Using Direct Composite Restoration: A Case Report. Global Journal of Dental Sciences1:1
6. Abdulgani Azzaldeen, Abdulgani Mai, Abu-Hussein Muhamad (2017); Fractured Anterior Tooth Using Direct Composite Restoration: A Case Report. IOSR Journal of Dental and Medical Sciences 16(10): 61-65
7. Abu-Hussein M, Nezar W, Azzaldeen A. (2016);Traumatic dental injuries to permanent anterior teeth, relation with age and gender among 9-12 years schoolchildren of Arab Israeli community: An epidemiological study. Int J Public Health Res.
8. Abdulgani Azz., Abdulgani M., Abu-Hussein M (2024); Minimally Invasive Approach for Anterior Dental Aesthetics: Case Report, Journal of Medical and Dental Science Research ,11,8: 31-36
9. Muhamad AH, Azzaldeen A. (2021); The Concept of the Golden Proportion in Dentistry. J Dent Med Sci 2021;2
10. Abu-Hussein Muhamad, Abdulgani Azzaldeen, Abdulgani Mai (2015); Step-by-Step Approaches for Anterior Direct Restorative. Int J Dent Health Sci 2(6): 1305-1310
11. Muhamad Abu-Hussein, Nezar Watted, Azzaldeen Abdulgani (2015); Gummy Smile and Optimization of Dentofacial Esthetics. Journal of Dental and Medical Sciences 14(4): 24-28.
12. Abu-Hussein Muhamad, Abdulgani Azzaldeen, Abdulgani Mai (2016); Esthetics of Class IV Restorations with Composite Resins. Journal of Dental and Medical Sciences 15(1): 61-66.
13. Abu-Hussein M, Watted N, Abdulgani A, Abu- Shilabayeh H (2015); Anterior Dental Esthetics in Primary Teeth. International Journal of Public Health Research 3(1): 25-36
14. Abu-Hussein Muhamad, et al. (2019); Anterior Esthetic Restorations Using Direct Composite Restoration; a Case Report. Dentistry & Dent Pract J, 2(1): 180008.
15. Muhamad A, et al. (2022); Aesthetic Rehabilitation with Nano Composite Material-Case Reports. Dentistry & Dent Pract J, 5(1): 180035.
16. Abdulgani Azzaldeen, Alsaghee Maria, Abu-Hussein Muhamad. (2021); Aesthetic Management of Fractured Anteriors: A Case Report. American Research Journal of Dentistry.; 3: 1-6.
17. Qawasmeh Nour, Abdulgani Azzaldeen, Abdulgani Mai, Abu-Hussein Muhamad. (2024); Digital Technologies in Dentistry. J Oral Dental Care. ;1(1):1-2.
18. Muhamad AB. (2024); Midline Diastema Closure in a Single Visit: Case Repot. Dentistry & Dent Pract,6(1),180052

19. Abu-Hussein Muhamad, Hanali Abu Shilbayih(2023);Minimally Invasive Approaches of Median Diastema with Putty Matrix Technique; A Case Report, J Res Med Dent Sci, , 11(5):22-26
20. Nour Q, Azzaldeen A, Mai A and Abu-Hussein Muhamad (2024); Midline Diastema Closure in a Single Visit: Case Repot. Dentistry & Dent Pract journal, vol6,1,1-6
21. Abdulgani Azz., Abdulgani M., Abu-Hussein M (2024); Restorative Management of Microdontia - A Case Report. Journal of Medical and Dental Science Research,11,8: 57-62.
22. Fahl N Jr. (2011); Step-by-step approaches for anterior direct restorative challenges: mastering composite artistry to create anterior masterpieces—part 2. J Cosmetic Dent.;26(4):42-55.
23. Blank, JT. Esthetic anterior composite restorations. Dent Academy Cont Ed. (2011); Sep:1-12. Available from: https://www.den- talacademyofce.com/courses/2193/PDF/1108cei_dentsply_Res- torations.pdf
24. Peyton J. (2002); Direct restoration of anterior teeth: review of the clinical technique and case presentation. Pract Proc Aesthet Dent. Apr14(3):203-10.
25. Fahl N Jr. (2007); A polychromatic composite layering approach for solving a complex Class IV/direct veneer-diastema combination: part II. Pract Proced Aesthet Dent. Jan-Feb;19(1):17-22.
26. Dietschi D. (2001); Layering concepts in anterior composite restorations. J Adhes Dent. 2001 Mar 1; 3 (1): 71-80.
27. Abdulgani Azzaldeen, Abdulgani Mai, Dr.Abu-Hussein Muhamad(2024); "Resin Composite—State Of The Art". Journal of Dental and Medical Sciences, 23, 8 ,4,15-23.
28. Abdulgani M, Azzaldeen A, Nour Q and Muhamad AH (2024); Recent Advances in Dental Composites: An Overview.DDPJ,6,2,1-17
29. Abdulgani Azz., Abdulgani M., Abu-Hussein M (2024); Restorative Management of Microdontia - A Case Report, Journal of Medical and Dental Science Research, 11,8: 57-62
30. Abdulgani M., Qawasmeh N., Abdulgani Azz., Abu-Hussein M (2024); Reattachment of Fractured Tooth Segment in Minimally Invasive Way - A Case Report, Journal of Medical and Dental Science, 11,8: 24-30.
31. Becker E. Esthetics as a Subset of Anterior Guidance [lecture]. Continuum Level C2E, Pankey Institute; Key Biscayne, FL, May 5, 2003.
32. American Academy of Cosmetic Dentistry (AACD). Diagnosis and Treatment Evaluation in Cosmetic Dentistry: A Guide to Accreditation Criteria. MadiSon, WI: AACD; 2001.

CITATION
Abdulgani A., Qawasmeh N., Alsagheer M., Abdulgani M., & Abu-Hussein M. (2024). Multi-Shade Composite Layering: Case Report. In Global Journal of Research in Dental Sciences (Vol. 4, Number 6, pp. 14–21). https://doi.org/10.5281/zenodo.14680239