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Case Report

Chipped veneer restoration: a full digital workflow utilizing intraoral scanner and lithium disilicate CAD/CAM blocks material

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ABSTRACT

Background: *Chipped veneers are a typical dental problem that affects both appearance and function. Advances in digital dentistry, particularly intraoral scanning and CAD/CAM technology, have transformed restorative procedures, allowing for quicker, more precise, and least invasive treatments.* ***Purpose:*** *The purpose of this article is to illustrate the use of a comprehensive digital workflow to restore damaged veneer, with a focus on process efficiency and precision.* ***Case:*** *A 32-year-old male patient come to clinic with a chipped veneer on the maxillary lateral incisor. The patient expressed concerns about aesthetics and desired a swift, minimally invasive solution. Clinical examination confirmed the need for restoration without replacing the entire veneer.* ***Case management:*** *The restoration process began with shade guide taking and removing the excess cement in the tooth and gingival management using retraction cord, after the preparation performed intraoral scanning process begin, which provided an accurate digital imprint of the damaged tooth and surrounding dentition. The scan results were used to design the repair with CAD software, assuring the best fit and aesthetics. The restoration was made from lithium disilicate utilizing a chairside milling machine. The veneer piece was polished, treated, and then cemented to the tooth. The whole approach reduced chairside time while producing a useful and appealing result.* ***Conclusion:*** *A full digital method that incorporates intraoral scanning and lithium disilicate milling provides a consistent, efficient, and patient-friendly approach to chipped veneer repair. This case demonstrates the potential for digital dentistry to improve clinical results while lowering procedural complexity.*

Keywords: *CAD/CAM, Chipped veneer, Intraoral scanner, Lithium disilicate, Restoration*

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INTRODUCTION

Chipped veneers are a common problem in dentistry, generally caused by trauma, wear, or occlusal stresses. These flaws jeopardize the cosmetic harmony and functionality of the teeth, prompting patients to seek quick and efficient treatment. Traditional restoration procedures, while efficient, can need substantial time and effort, requiring complicated impressions, laboratory work, and possible veneer replacement.[1]

High-quality digital impressions from intraoral scanners serve as the basis for exact veneer designs. Dentists may digitally design restorations that are suited to the patient's anatomy thanks to this data's smooth integration with CAD software. After that, the restoration is machined using premium materials, such lithium disilicate, which is renowned for its strength and beauty.[2]

Because of its superior mechanical and aesthetic qualities, lithium disilicate ceramics have emerged as the preferred material for restorations. These polymers are durable enough to resist oral stresses while mimicking the natural translucency of enamel. They provide a reliable and effective way to repair chipped veneers when paired with a computerized workflow.[3]

This article presents a case of a chipped veneer restoration utilizing a full digital workflow. By integrating intraoral scanning and CAD/CAM technology, the case demonstrates the advantages of this approach in achieving a functional, aesthetic, and time-efficient outcome.

CASE

A 57-year-old male patient came to the Conservative Dentistry Clinic, Universitas Airlangga Dental Hospital with chief complaint of chipped veneers after trauma when playing football. The patient did not feel any spontaneous pain and discomfort. The patient wanted to be treated because he is not confident about his appearance.

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Intraoral examination revealed chipped veneers on the right lateral incisor (Figure 1). The patient has porcelain veneer restorations on tooth 15, 14, 13, 12, 11, 21, 22, 23, 24, 25 on the upper jaw and on tooth 35, 34, 33, 32, 31, 41, 42, 43, 44, 45 on the lower jaw. Vitality on tooth 12 was positive, percussion and bite test are negative. Periapical radiographic examination showed no symptoms and no crack on tooth 12.

CASE MANAGEMENT

First, photos were taken and shade of the surrounding teeth were taken using a shade guide (VITA 3D). It was found that the surrounding teeth veneer shade was BL2 (Figure 2A). Then, the remaining cement on tooth 12 was cleaned using a fine finishing diamond bur and polished using rubber cup. then soft tissue management is carried out using a retraction cord to obtain clear edges of the preparation when scanning.

An intraoral scan is performed to obtain a digital impression (Figure 2B and 2C). An intraoral scan was performed on the upper jaw first starting from the right posterior region, anterior to left posterior region. Then, the scan is continued on the lower jaw with the same steps.

Figure 1. Initial condition of the patient showing chipped veneer on tooth 12.

After the scan results of the upper jaw and lower jaw are obtained, the patient is then instructed to bite and a scan of the patient's bite record is carried out by scanning the buccal area when the patient is in occlusion. Then a temporary veneer restoration is performed to cover the prepared area (Figure 2D).

After the digital impression results are obtained, the impression results were sent to the dental laboratory to make the veneers. Digitally making veneers is done using software that can adjust the anatomical shape of the veneer as desired (Figure 3A). After the veneer design is suitable, the milling process is carried out to make veneer made from lithium disilicate (Figure 3B and 3C). Fresh cut veneer after milling is still purple so it must be roasted to change the color of the veneer ingot. then, the veneer is stained to get a color that matches the color of the patient's teeth (BL2). The staining results are then baked again to set that color.

The next step is a try-in, a try-in is carried out to ensure whether the anatomical shape and shade of the veneer match what is desired (Figure 3D). Try in is carried out using cement try in where the shade of the veneer is the same as the shade of the resin cement (Variolink, Ivoclar-Vivadent, Liechtenstein) that will be used during cementation later. After the try-in is complete and the results are desired, the next step is veneer preparation for cementation. Treatment of the veneer is carried out by administering 9.5% hydrofluoric acid for 1 minute then rinsing and drying, then silane is applied to the inner surface of the veneer and then air dried (Figure 3E-G). The tooth to be cemented is isolated using a rubber dam, then etching and bonding are applied to the tooth (Figure 3H and 3I). After that, cement is applied to the inside of the tooth according to the shade of the try-in cement given previously and then the veneer is cemented on the surface of the tooth (Figure 3J). Then an initial cure is carried out for 1 second and the excess cement is cleaned, after cleaning then a final cure is carried out for 20 seconds. After the final cure, the patient's occlusion was checked and the veneer surface was polished (Figure 3K and 3L). The patient was instructed for control 1 week later.

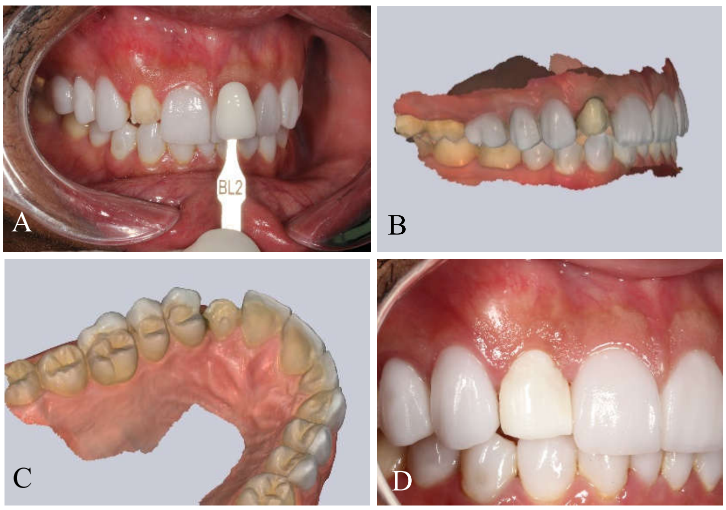

Figure 2. (A) Shade taking using VITA 3D Master (BL2); (B) (C) Digital Impression using Intraoral Scanner; (D) Temporary restoration using resin composite.

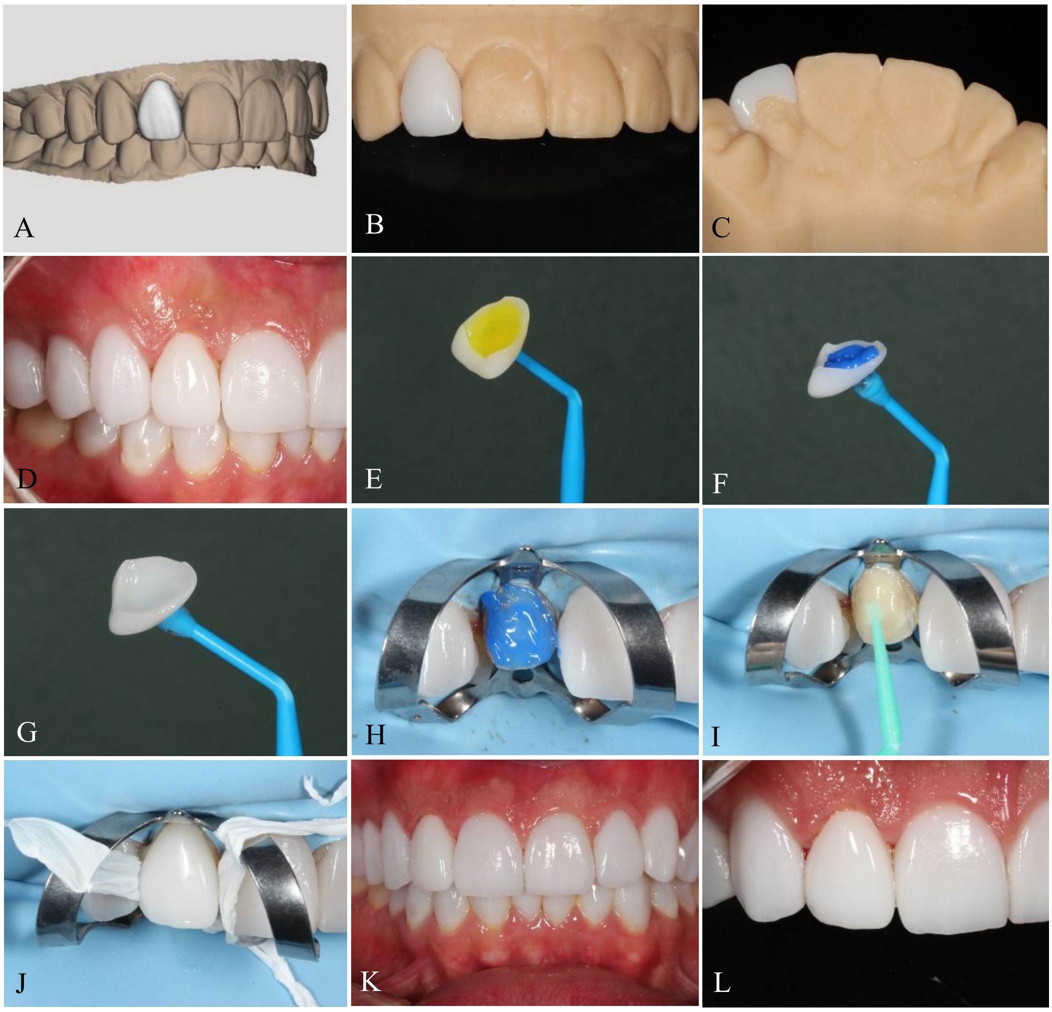

Figure 3. (A) Veneer digital design; (B) Lithium disilicate veneer labial view; (C) Lithium disilicate veneer palatal view; (D) Veneer try-in; (E) Veneer pretreatment using hydrofluoric acid 9.5% 90 second; (F) Veneer pretreatment using phosphoric acid 37% 20 second; (G) Veneer pretreatment using silane; (H) Pretreatment on teeth using phosphoric acid 37% 20 seconds; (I) Bonding; (J) Cementation of the veneer using resin cement; (K & L) Final results after cementation

DISCUSSION

Chipped veneers are a prevalent challenge in aesthetic dentistry, often resulting from a combination of mechanical, biological, and behavioural factors. Excessive occlusal forces, such as those generated by bruxism, clenching, or improper bite alignment, are among the leading causes of veneer fractures. Traumatic incidents, including accidental impacts or biting on hard objects, can also compromise veneer integrity. Additionally, deficiencies in the original veneer placement, such as inadequate bonding, insufficient tooth preparation, or material selection, increase the risk of chipping. Over time, wear from abrasive toothpaste, acidic diets, and poor oral hygiene can weaken the veneer surface, further predisposing it to damage.[4]

There are both aesthetic and technical challenges in restoring chipped veneers. Achieving smooth integration between the restoration and the existing veneers, especially with regard to shade, translucency, and contour, is a significant task. Using direct restorative materials, such composite resin, which might not be able to recreate the optical qualities of ceramics, makes this particularly challenging. Furthermore, exact methods and materials are needed to restore the veneer's mechanical integrity without completely removing and replacing it. Manual impressions, laboratory work, and several patient visits are just a few of the time-consuming and inconvenient operations that are frequently a part of traditional workflows.[5]

The method of veneer restoration has changed as a result of developments in digital dentistry, which offer answers to many of the conventional problems. Intraoral scanners enable clinicians to capture precise digital impressions of the affected tooth and adjacent structures, eliminating the need for conventional impression materials. CAD software may be utilized to create restorations using these digital models, guaranteeing a precise fit and the best possible aesthetic results.[6]

Lithium disilicate ceramics are ideal for digitally fabricated restorations due to their exceptional mechanical strength and aesthetic properties. Restorations can be made and installed in a single visit with chairside CAD/CAM milling technologies. The restoration procedure is streamlined by this entirely computerized approach, which also improves accuracy, shortens treatment times, and increases patient happiness. Additionally, physicians can achieve very predictable results by digitally previewing and adjusting the restoration before to milling.[7]

The success of veneer restorations depends significantly on the bonding protocol, which ensures a durable and aesthetic outcome. The cementation process involves several critical steps including, veneer surface preparation, the inner surface of the lithium disilicate veneer is etched with hydrofluoric acid (porcelain etch) to create micro-retentive patterns. A silane coupling agent is then applied to chemically bond the ceramic surface with the resin cement. Tooth surface preparation performed, the tooth surface is cleaned with pumice to remove contaminants and ensure optimal adhesion. Isolation is essential to prevent contamination by saliva or moisture during cementation.

Cement application and seating steps is very crucial. A dual-cure resin cement, is applied to the etched and primed veneer. The veneer is seated on the prepared tooth and any excess cement is gently removed. The final step is curing and finishing. The cement is light-cured from multiple angles to ensure complete polymerization. After curing, the restoration margins are polished to eliminate residual cement and achieve a smooth, aesthetic finish.[8]

A very effective and reliable restoration procedure is produced by combining an optimized bonding approach with a digital workflow. It minimizes patient discomfort and treatment complexity while guaranteeing the veneer's exceptional mechanical strength and beauty. When combined, these developments in digital technology and material science offer a substantial improvement in the handling of chipped veneer cases.

In conclusion, the restoration of a chipped veneer using a full digital workflow demonstrates the efficacy and precision of modern digital dentistry. By leveraging intraoral scanning, CAD/CAM technology, and lithium disilicate material, the restoration achieved excellent functional and aesthetic outcomes while minimizing chairside time and patient discomfort. The use of an optimized bonding protocol, including porcelain etch and resin cement, ensured a durable and seamless bond, further enhancing the longevity and integration of the restoration. This case highlights the advantages of a digital approach in simplifying complex restorative procedures, delivering predictable results, and elevating the standard of care in aesthetic dentistry.

REFERENCES

1. Zhao W, Luo J, Zhang S, Zhang Z, Su Z, Fu B, Jin X. Occlusal veneer restoration treatment outcomes of cracked tooth syndrome: A 22.4-month follow-up study. Clin Oral Investig. 2024; 28(7):368.
2. Yildrim L. Digital restorative procedures in dentistry: digital dentistry. Brazilian Journal of Implantology and Health Sciences. 2024; 6: 191-221.
3. Streit G, Sykes L. Overview of Lithium Disilicate as a restorative material in dentistry. South African Dental Journal 2022; 77: 495-499.
4. Kruzic JJ, Arsecularatne JA, Tanaka CB, Hoffman MJ, Cesar PF. Recent advances in understanding the fatigue and wear behavior of dental composites and ceramics. Journal of the Mechanical Behavior of Biomedical Materials 2018; 88: 504-533.
5. Galiatsatos P, Galiatsatos A. The Role of Porcelain Veneers in the Aesthetic Restoration of Discolored Endodontically Treated Teeth. Clin Pract 2024; 14(5): 2080-2088.
6. Richert R, Goujat A, Venet L, Viguie G, Viennot S, Robinson P, Farges JC, Fages M, Ducret M. Intraoral scanner technologies: a review to make a successful impression. J Healthc Eng 2017: 8427595.
7. Kahnamouei M. Laminate Cementation, Passed up to Now: An Overview. Journal of Electrical Systems 2024; 20: 72-79.
8. Hassan A, Hamdi K, Ali AI, Al-Zordk W, Mahmoud SH. Clinical performance comparison between lithium disilicate and hybrid resin nano-ceramic CAD/CAM onlay restorations: a two-year randomized clinical split-mouth study. Odontology 2024; 112(2): 601-615.

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