International Journal of Oral Health Dentistry 2023;9(4):303–306

Content available at: https://www.ipinnovative.com/open-access-journals

International Journal of Oral Health Dentistry

Journal homepage: www.ijohd.org

Case Report

Smile renaissance: Monolithic marvels with cad-cam crown

Varun Kumar[1]*, **Kedar Deole**[1]

[1]*Dept. of Prosthodontics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India*

ARTICLE INFO

Article history:
Received 18-12-2023
Accepted 28-12-2023
Available online 16-01-2024

Keywords:
Aesthetics
CADCAM
CEREC
Lithium Disilicate
Monolithic

ABSTRACT

Progress in materials science, bonding protocols, and innovative manufacturing techniques promotes the creation of new ceramic materials. These advancements aim to address the growing need for fixed prosthodontics restorations that are not only highly aesthetic but also biocompatible and durable. The recently launched ALD ceramic, designed for the "Chairside Economical Restoration of Esthetic Ceramics" (CEREC) system, yields restorations that are both aesthetically satisfying and superior clinically. The reduced processing time, coupled with elevated flexural strength, enhances efficiency of chairside workflows. In this particular case report, restoration was deemed necessary for anterior tooth. This tooth underwent preparation, scanning, and design processes using CEREC-Omnicam, with subsequent fabrication using MCXL The rehabilitation accomplished with the ALD blocks resulted in a visually pleasing and functionally sound outcome. Notably, this approach contributed to a more efficient overall treatment time, resulting in heightened satisfaction for both the patient and the practitioner.

1. Introduction

In the modern era, dental health is discerned not only for its functional implications but also as an indispensable component of aesthetics. The notability of aesthetics in dentistry has risen in recent years, with increased expectations from patients in this aspect. However, meeting patients' aesthetic proclivity extends beyond surface-level considerations. Material selection, procedure of preparation, cementation, and production techniques are fundamental factors in corroborating the lasting success of aesthetic dental restorations. At the same time, accentuating the significance of professional oral care and the patient's comprehension of oral hygiene is essential.[1]

Metal-supported ceramic systems bespoke their efficacy in crown and bridge restorations. The constraints related to biocompatibility and optical properties in metal-supported ceramics have driven the evolution of dental ceramics. The rapid escalation of aesthetic standards has heightened the popularity of dental ceramics as a preferred material in the field of dentistry.[2]

The use of CAD (Computer-Aided Design) and CAM (Computer-Aided Manufacturing) technology in creating restorations, incorporating ceramic blocks shaped during the fabrication process and reinforced with advanced technology, is becoming increasingly common in dental practice. The "digital workflow" captures both sets of teeth, allowing clinicians to carefully examine tooth preparation and design restorations in accordance with the planned treatment. Before progressing to the next stage, any necessary adjustments can be made, facilitated by uploading digital files to a cloud server for swift communication with technicians. This technique is generally time-efficient, eliminating the need for traditional impression materials and often enabling the completion of the entire procedure in a single appointment.[3]

* *Corresponding author*.
E-mail address: drvarun_smile@yahoo.co.in (V. Kumar).

https://doi.org/10.18231/j.ijohd.2023.056

Lately, there has been an increasing inclination toward the adoption of monolithic restorations as a preventive measure against the chipping of veneering ceramics on oxide ceramic frameworks. Lithium disilicate (LS2) ceramics, renowned for their excellence in both esthetics and strength, have emerged as the most commonly employed materials in chairside processing. Examples of widely accepted and utilized products include CEREC Tessera from Dentsply Sirona in Charlotte, USA, and IPS e.max CAD from Ivoclar Vivadent in Schaan, Liechtenstein.[4,5]

Lithium disilicate (LS2) ceramics are versatile and fitting for a wide range of scenarios, encompassing full coverage crowns, partial coverage restorations and even implant-supported restorations. These materials can be used to construct 3-unit fixed partial dentures (FPDs) extending up to the first premolar, as illustrated by products such as IPS e.max CAD from Ivoclar Vivadent in Schaan, Liechtenstein.[6]

This case report illustrates the fabrication of monolithic single tooth restoration using advanced lithium disilicate. This ALD ceramic possesses a unique microstructure which comprises LS2 and virgilite embedded in a glass matrix with zirconia. The LS2 crystals provide high tensile strength, counteracting crack propagation while the virgilite crystals augment the biaxial flexural strength.

Figure 1: Intraoral preoperative view

Figure 2: Vitapan classic shade guide

2. Case Report

A 21-year-old male patient reported to the department of prosthodontics and crown & bridge complaining of discoloured tooth in maxillary anterior region with a history of trauma. Tooth 21 underwent endodontic treatment, and X-ray diagnostics indicated a satisfactory treatment extending to the apex without any apical issues. The patient reported being free of pain. Favourable treatment options were assorted which comprised of fabrication of porcelain fused to metal full coverage crown or all ceramic full coverage restoration. The patient expressed a desire to expedite their treatment completion and emphasized the preference for using the most aesthetically pleasing material available. Therefore, considering the expectations of the patient, fabrication of all ceramic crown with CAD/CAM technology was planned.

The shade selection was performed using a conventional shade guide (Vitapan classic, Vita Zahnfabrik, Bad Säckingen, Germany) (Figure 2). Tooth preparation was done with 21 for all ceramic crowns (Figure 3). Final impression was made with putty and light viscosity rubber base material (Aquasil TM, DECA Regular Set, Dentsply) and master cast was obtained (Figure 4).

The maxillary, mandibular arch and buccal bite registration were scanned (name of scanner) (Figure 5). The restoration proposals automatically determined by the software have significantly improved with recent updates, providing reliable restorations that require minimal modifications. The optical impression, transferred to the computer, was utilized to mark the restoration boundaries, and the volume and shape of the intended restoration were determined. Following the shade selection, CEREC tessera blocks C14 (18 × 14 × 12 mm) were chosen in the HT A2 shade. The Tessera blocks are procurable in a range of shades and two translucencies. HT (High Translucency) blocks are suitable for fabricating inlays, onlays and anterior restorations whereas MT (Medium Transluceny) blocks are well suited for posterior restorations. CEREC MC XL (Figure 6) production unit was employed for the milling of the block, following which the fabricated was detached from the retention pin and the connecting area was refined. Later on the restoration underwent staining using DS Body Stain S1, DS Incisal Stain I1, and DS Overglaze High Flu from Dentsply Sirona in Charlotte, USA (Figure 7). The restorations were positioned on a firing tray with a firing pad (DeguDent, Hanau-Wolfgang, Germany) and subjected to firing at 760°C (Figure 8). The restorations underwent examination to assess both marginal and interproximal fit.

The ceramic surfaces were cleaned and the inner surfaces were etched with 5% hydrofluoric acid (IPS Ceramic Etching Gel, Ivoclar Vivadent, Schaan, Liechtenstein) for 30-second, following which the surfaces were cleaned in a water beaker and dried with air spray. Subsequently the surface was coated with silane coupling agent for

60 seconds. The restoration was cemented using adhesive resin cement (Calibra Ceram, Dentsply Sirona, Charlotte, USA). The excess cement was removed and excess cement was removed and was followe by tack-curing. Static and dynamic occlusion were evaluated (Figure 9).

Figure 3: Tooth preparation

Figure 4: Master cast

Figure 5: CEREC omnicam

3. Discussion

Excessive dental tissue loss resulting from trauma can lead to a myriad of issues, encompassing esthetic, functional, and physiological concerns. While prioritizing the alleviation of pain, the passage underscores the growing significance of addressing esthetic considerations. Various treatment

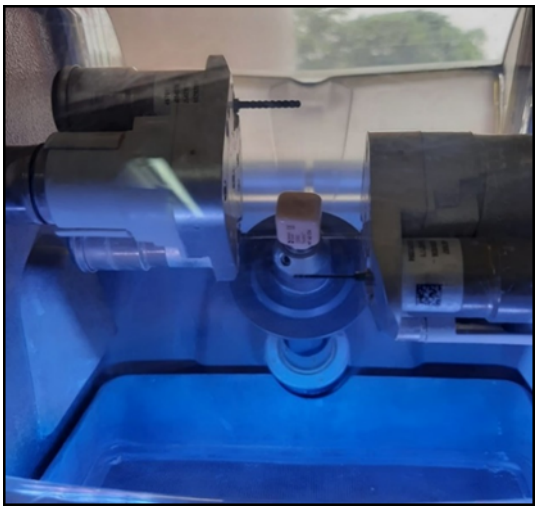

Figure 6: CEREC MC XL milling unit

Figure 7: Stains and glaze

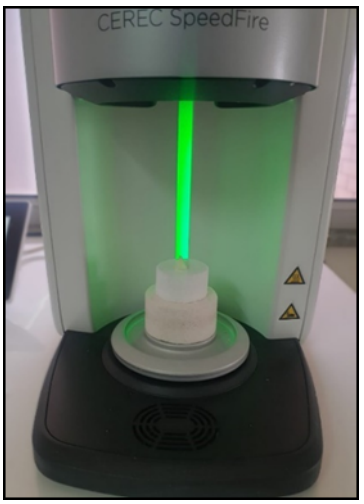

Figure 8: CEREC SpeedFire

Figure 9: Final restoration

options exist for crown fractures, each presenting its own set of advantages and disadvantages.[7,8]

E-max crowns are distinguished by several noteworthy advantages when compared to porcelain fused to metal crowns. Regarded as the optimal match for natural teeth, E-max crowns boast a transparent colour and lifelike appearance, seamlessly blending in with one's own dentition. Notably, the absence of a metal alloy base eliminates the occurrence of an unsightly grey line around the gum line, contributing to a more aesthetically pleasing result. Beyond their cosmetic benefits, E-max crowns are recognized for their strength and durability, outperforming many other types of crowns. Their resilience makes them less prone to cracks or fractures, ensuring a long-lasting solution for individuals seeking both functional and visually appealing dental restorations.[9]

The automation inherent in CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) technology serves to minimize inaccuracies, ensuring precise results in the creation of dental restorations. Additionally, these systems contribute to a reduction in the hazards associated with infectious cross-contamination, thereby promoting a higher level of safety in dental procedures. Notably, machinable zirconia ceramics emerge as particularly well-suited materials for CAD/CAM techniques. These ceramics can be effectively designed and milled in their soft pre-sintered state, allowing for intricate shaping and customization. Subsequent sintering of the milled restorations further enhances their physical properties, making machinable zirconia ceramics a versatile and reliable choice in the realm of dental prosthetics.[8]

4. Conclusion

Recent advancements in laboratory techniques have notably enhanced the effectiveness of ceramic restorations, presenting a highly esthetic and minimally invasive solution for the rehabilitation of fractured central incisors. A case report, documenting the restoration of fractured central incisor, emphasize the clinical success of this approach by effectively addressing both functional and aesthetic concerns. This restoration not only demonstrate long-term durability but also meet patients' aesthetic expectations, underscoring the crucial role of patient satisfaction in dental procedures. The favorable outcomes underscore the growing importance of these techniques in restorative dentistry, providing practitioners with a viable and successful option for treating fractured central incisors.[6]

5. Source of Funding

None.

6. Conflict of Interest

None.

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Author biography

Varun Kumar, Professor & HOD https://orcid.org/0000-0002-5478-9591

Kedar Deole, PG Student

Cite this article: Kumar V, Deole K. Smile renaissance: Monolithic marvels with cad-cam crown. *Int J Oral Health Dent* 2023;9(4):303-306.