Digital crown wizardry: Unleashing CAD-CAM sorcery.

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Abstract

Introduction: Computer-Aided Design / Computer Aided Manufacturing (CAD-CAM) technology in digital dentistry uses high-resolution scanners for precise 3D imaging of teeth. Advanced software designs custom restorations, and milling machines create them from ceramics or resins with micron-level accuracy. This technology reduces treatment times by enabling single-visit restorations, ensures high-quality results, and integrates aesthetics and functionality seamlessly. It signifies a transformative leap in dental care, enhancing efficiency, precision, and patient satisfaction.

Case characteristics: A female patient reported at the department with a concern of restoration. Patients drug, social and medical history were non-significant to existing condition.

Conclusion: With the advancement of technology, the upgradation of existing conventional skills can be possible. My case report utilises proper digitization in order to reduce laboratory steps and time by using CAD/CAM technology.

Keywords : CAD/CAM, digital dentistry, restoration, upgradation.

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Introduction

The history of CAD/CAM equipment in all-ceramic crown designing began with its adaptation from industrial applications to dentistry in the 1980s. Initially developed to improve the precision and efficiency of dental restorations, CAD/CAM systems underwent significant advancements. Digital scanners were employed to capture detailed 3D images of tooth structures, which were then used as a foundation for computer-aided design (CAD) software to create intricate crown designs. Subsequently, computer-aided manufacturing (CAM) technology automated the milling process of ceramic materials, ensuring precise replication of these designs with minimal human intervention.[1]

By the 1990s, CAD/CAM systems became more prevalent in dental practices worldwide. They offered dentists the capability to produce custom-fit, durable crowns that not only functioned effectively but also matched the natural aesthetics of patients' teeth. This technological integration has transformed the landscape of modern dentistry, enhancing treatment outcomes by reducing turnaround times, improving accuracy, and increasing patient comfort. Today, CAD/CAM technology continues to evolve, promising further advancements in materials, software capabilities, and procedural efficiencies within the field of dental restorations. A key objective of restorative treatment is achieving esthetics. For many years, dental ceramics have been used as restorative materials

because they excel in properties and closely resemble natural teeth compared to other materials.[2]

Case report

A thirty-year-old female patient reported to department of prosthodontics, Buddha Institute of Dental Sciences, Patna, whose chief complaint was unpleasing smile and desired replacement for same. She underwent root canal treatment one months ago. The patient had history of trauma two month ago. During the intraoral examination, a composite restoration was observed on tooth 21 (Figure 1). There were no signs of temporomandibular joint pain. The occlusion exhibited a Class 1 molar relationship with canine guidance. Non-severe gingivitis was present in the embrasure and interproximal areas, accompanied by melanin coloration. Radiographic study revealed reconditioning with widened periodontal ligaments and reduction in lamina dura (Figure 2).

Following a thorough evaluation and discussion of the treatment plan, which the patient approved, the initial visit involved scaling and polishing entire teeth, including the already present composite restoration. Tooth preparations were performed by following fundamentals od tooth preparation. (Figure 3). The shade B2 was chosen with the use of Vita Classic shade guide, and the finish line was positioned slightly below the gumline (subgingival).[3]

Before capturing the tooth preparation with a digital scanner (Cerac Prime Scan), a retraction cord (Medi-Pak 000 knitted nonimpregnated) was placed in the buccal gingival sulcus for 5 minutes and then taken away. Full-arch scans of the maxillary and mandibular teeth were taken using an intraoral scanner (Cerac Prime Scan) (Figure 4). Crowns of Zirconia were then designed using software of CAD(exocad) (Figures 5 and 6), followed by milling with an (inLab MCX5) and sintering.[4]

At the final visit, the crowns of Zirconia CAD/CAM were tried in the mouth of the patient, with adjustments made for occlusion, canine guidance, and functional movements before glazing.[5] The crowns which were glazed were cemented using Dual-cure resin cement (variolink dualcure Resin Cement) (Figure 7). All procedures for the cementation construction and production of the zirconia crowns followed the instruction given by manufacturer. A program following up the treatment was established to monitor the crowns' performance.[6]

Discussion

CAD/CAM zirconia ceramic prostheses offer advantages such as a translucency similar to natural teeth, outstanding biological compatibility with tissues of oral area and the periodontium, and an eroding pattern comparable to that of natural enamel of the tooth. These attributes are also commonly found in lithium silicate ceramics, which are versatile and used for various applications such as veneers, tabletops, single crowns, and small anterior bridges.[7]

To achieve aesthetic harmony in anterior teeth, several techniques are available. Previously, before advancements in the material properties of dental ceramics and resin stickness to enamel of the tooth and dentin, crowns of metal-ceramics were the go-to choice for aesthetic restorations.[8] However, metal-ceramic crowns are still a commonly used treatment in dental practices today. The use of entire-ceramic crowns produced through CAD/CAM equipment has been on the rise. The CAD/CAM chairside approach reduces the steps in laboratory, saving clinical time—a key patient requirement. All-ceramic crowns offer outstanding optical and mechanical properties, aesthetic appeal, biocompatibility, and color stability. [9] In this scenario, we have selected a zirconia milling disk (Cercon xt ML,B2 dentsply sirona), which featured a more

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translucent upper area and a less translucent lower area. The patient desired to address anterior aesthetic issues quickly and without the use of surgical intervention. The main challenge of this treatment was to demonstrate the final result effectively to the patient.

Conclusion

CAD/CAM zirconia restorative prostheses offer outstanding biocompatibility, minimal wear on opposing teeth, and long-lasting aesthetic appeal with stable color. These attributes can enhance a patient's self-esteem and confidence, leading to a more fulfilling public life. Restorations based on Zirconia represent a highly promising substitute to other prosthetic materials, demonstrating superior clinical, mechanical, and chemical performance.

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FIGURES

Figure 1

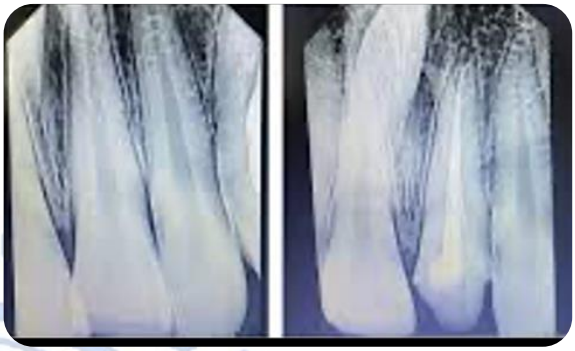

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7.