

# Replacement of Multiunit Joined Porcelain Fused to Metal Crowns with an Esthetic Separated CAD/CAM All Ceramic Crowns: Clinical and Technical Report

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**Abstract:** *Improper treatment plan, designing of the restorations and the selection of the restorative materials resulted in patient unsatisfactory. **Objective:** The purpose of this report is to create a hygienic and esthetic restoration to increase his social life. **Case Report:** Individual all ceramic zirconia crowns were fabricated for 54 male patients attended to the clinic with a multiunit joined porcelain fused to metal restoration. **Conclusions:** The esthetic treatment with all ceramic CAD/CAM zirconia based crowns resulted in improved facial aesthetics; psychological status and social life of the patient. The patient can practice standard oral hygiene in the present of separated crowns.*

**Keywords:** PFM crowns. CAD/CAM, zirconia, replacement

## 1. Introduction

Full-coverage porcelain fused to metal (PFM) restorations are still viewed as the standard for teeth restorations, they have disadvantages, such as decreased likelihood of retention, associated soft-tissue pigmentation and an opaque-to-darkish appearance in the cervical area of the crowned teeth.<sup>[1]</sup> Exposed metal crown margin of old PFM restorations might be an esthetic problem. Therefore, all ceramic crown systems are used for replacing the existing restorations and it is the more prudent choice<sup>[2&3]</sup>

As a part of the treatment planning, clinicians should be able to choose the appropriate restorative materials to achieve excellent esthetic as well as proper biomechanics and durability.<sup>[4]</sup>

All ceramic systems can be used as alternative to PFM system. During last decade, zirconia – based computer-aided design and computer-aided manufacturing (CAD/CAM) system which have superior mechanical properties, high flexure strength and fracture resistance were used for anterior and posterior teeth.<sup>[5&6]</sup>

The esthetic treatment of anterior teeth has always presented a challenge in clinical practice. Restorative material such as zirconia all ceramic crowns have been chosen as alternative to improve oral condition and existing esthetic.<sup>[7]</sup> Anterior esthetic rehabilitation with all ceramic crowns improved the self-esteem and self-confidence of the patient and permitted her to return to a satisfactory social life.<sup>[8]</sup> So the dentist and ceramist must follow a proper protocol to achieve higher clinical success rate and long-lasting restoration.<sup>[9]</sup>

The natural jaws bear a definite relation to each other both at rest and during function. In nature dentition the presence of

teeth makes it easy to determine the relationship of jaws to each other.<sup>[10]</sup> Replacement of the existing restorations by new one should be in harmony with the existing occlusal vertical dimension and the inter occlusal relationship.<sup>[11&12]</sup>

Fiber reinforced composite posts (FRC) had adequate mechanical properties as recent studies suggested that FRC posts contributed to the reinforcement and strengthening of endodontically treated teeth under full coverage crown restorations.<sup>[13]</sup>

This article demonstrates the use of CAD/CAM zirconia crowns replacing an existing joined multiunit PFM crowns in the esthetic zone. The separated crowns resulted in esthetic and hygienic restorations with increasing of the social life of the patient.

## 2. Case Report

A 54 year old male patient attended to the Specialty Clinics in College of Dentistry, King Khalid University (KKU). The patient requested long-term solution for esthetic problem arising after intraoral composite repair of fractured PFM retainer of tooth #11. Intraoral examinations showed multiunit joined PFM crowns extending from tooth #13 to tooth #23 and from tooth #33 to tooth #43 (figure, 1)(figure, 2). No pain in TMJ was detected. Generalized attrition of occlusal surface of all teeth was obvious. Class I molar relationship and occlusal canine guidance occlusion were observed. Mild gingivitis in the interproximal and embrasure areas with gray pigmentation at the free gingiva of the crowned teeth was detected. Radiographic examination showed multiunit joined PFM crowns in both maxillary and mandibular teeth (figure, 3).

After examination of the patient and collecting date, the steps of treatment plan sequences and the replacement of the joined crowns were discussed with the patient, his agreement was taken.

The treatment was begun by maxillary and mandibular impression with alginate dust free impression materials. At this visit scaling and polishing of teeth were done including the crowned teeth. From the poured impression models, diagnostic wax-up were prepared with the helping of the dental technician and ceramist (figure, 4). Then rubber base indexes were prepared from the diagnostic wax-up models.

The removing of the joined PFM retainers were started with sectioning of the existing crowns from buccal to lingual using coarse diamond burs (Meisinger, Germany) as recommended by Rosenstiel et al, 2006.<sup>[11]</sup> The sectioning was done without local anesthesia. All the abutment teeth were non vital (figure, 5), so root canal treatments were done by an endodontic. Following the canal shaping the roots received fiber reinforced composite post (Relaxy Fiber Post, 3MESPE, Germany). The cores of all teeth were built with composite resin (Tetric-N-Ceramic, Ivoclar Vivadent, Lichenestine) to close the access opening of RCT.

Modifications of the preparations of the endodontically treated teeth were done. Provisional crowns were constructed (Success SD, PROMEDICA NEUMUNSTER, Germany) and cemented with temporary cementation (Temp-Bond<sup>NT</sup>, Italy) (figure, 6).

After one month removals of the provisional restorations were done, all the interproximal areas around the prepared teeth were healthy. Maxillary and mandibular final impressions were taken with addition silicon (Virtual Ivoclar Vivadent, Lichtenstein) using double mixing techniques (figure, 7). Pouring the maxillary and mandibular final impression were done with CAD/CAM special stone (BEGO/ Germany), die preparation, ditching and finish line exposure were done. The master casts were mounted on laser scanner (CYNOPROD/CANADA) for scanning and capturing the preparation. The scanner is connected to computer screen by software program 1.3 EVLOTION (CYNOPROD/CANADA) for milling the zirconia core. The cores build-up was done with Vita In-Ceram YZ Disc (Vita Zahnfabric/Germany) (figure, 8).

Try-in for the milled cores were done in the patient mouth. Then shade guide selection using the digital shade guide VITA System 3D-Master (Vita Easyshade<sup>(R)</sup> Compact, Vita, Germany) was done, the selected shade was (2R1.5-3D master).

The maxillary and mandibular master casts with the tried cores were mounted on semi-adjustable articulator (Hanau TM Waterpik (R) Technologies, Fort Collins, CO) using face bow. Porcelain build-up were done with porcelain VITA VM<sub>(R)</sub>9 (Vita Zahnfabric/Germany). The final shape of the porcelain crowns were the same as in the diagnostic wax-up.

At the final step, porcelain try-in of the individual crowns in the patient mouth were done, inter occlusal adjustment,

canine guidance as well as protrusive and lateral movements were checked before glazing (figure, 9).

Cementations of the glazed individual crowns were done with resin cement (Relaxy XTM, Unicem Appli Cap Resin Cement, 3M ESPE, Germany) (figure, 10). All the steps of constructions, fabrications and cementation of the all ceramic crowns were following the manufacturer instructions. The case was followed up for maintenance.

### 3. Discussion

The darkness associated with PFM crowns is one of the main causes that lead the patient to replace them with all ceramic crowns (1). The operative removal of existing PFM restorations from teeth that are to receive new restorations can be traumatic for the patient and stressful for clinician. Often the restorations must be cut completely through high speed rotary instruments (11). The operator and clinical assistant are exposed to debris, even wearing surgical masks. Protective eyewear for the patient and dental team is recommended to prevent eye injuries from projectile matter, so the patient should be informed that there is a degree of uncertainty about the outcome before proceeding.

The esthetic treatment of anterior teeth has always presented a challenge in dental practice. With the improvement of dental materials such as zirconia based restorations becomes available, in this circumstance, dentists and patient must choose the best alternative to improve oral condition and existing esthetic (7)

As dental materials continue to evolve, new all ceramic materials with superior mechanical properties, such as high flexure strength, high fracture toughness, and biocompatibility facilitating gingival response, are continuously being introduced to the market, such as zirconia-based CAD/CAM systems, which have been introduced recently (14).

Individual crown should be considered during the treatment plan, with the simplicity of the treatment plane to facilitate to the patient to practice oral hygiene at the interproximal area. The evaluation of the integrity of the crowns during maintenance phase can be easy with separated crowns (11). Replacements of the restorations with new all ceramic zirconia restoration should be in harmony with the existing occlusion. Coincide with the maximum inter-cuspation, putting in consideration that the type of existing occlusion of the patient (canine guidance occlusion) (11).

The fiber reinforced composite posts with composite resin cores establish a good bond with the remaining tooth structure which enables homogenous transmission of occlusal forces and thus potentially strengthen the coronal structure (15). Additionally, the core build-up procedure could be completed in the same visit.

The clinical significant of this case is, all ceramic restorations resulted in marked improvement of the esthetic areas and also enhance periodontal health, so the patient can

practice slandered oral hygien emeasurements between the restorations. Also the need of retreatment can be carried easily. The size resulted from all ceramic restoration improve the lip position regarding to smile line.

#### 4. Conclusion

Understanding the restorative materials options for esthetic replacement of an existing PFM anterior restoration is a must to results in creative esthetic restorations, increasing self-esteem, confidence of the patient and promoted to return to a satisfactory social life.

Zirconia based restorations are a promising prosthodontics alternative material to PFM restorations, and showed excellent clinical performance.

One principle should kept in mind in the treatment plane of prosthetic restorations, is the design of the restorations should be simple as possible for prognosis and the retreatment if needed during follow-up phases.

#### 5. Lists of Figures and Legends



Pre-operative status of patient



Lateral view



Panoramic view with joined crowns



Diagnostic wax-up



Teeth after removing of PFM joined crowns



Teeth with provisional crowns



Final impressions



Master casts with cores



Crowns during try-in and before cementation

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