

Monolithic Zirconia Crowns And Fixed Partial Denture In Anterior And Posterior Regions As A Prosthetic Solutions (CASE REPORT)

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ABSTRACT:

The increase in patient's demand for an esthetic natural like and a strong functional restoration now days, using of all-ceramic zirconia fixed partial denture for rehabilitation of missing posterior teeth has been increasing in daily dental practice, Although dental implants are the treatment of choice in most of our cases today, but it's not always executable for all patients due to many reasons such as, chronic smoking, alcoholism, uncontrolled diabetes, and most importantly poor oral hygiene. Monolithic, multilayer zirconia gave the desired mechanical strength that can withstand high masticatory forces, without having a negative effect on its esthetic appearance, which makes it the material of choice in our case.

KEYWORDS:

Monolithic zirconia, fixed partial denture, rehabilitation.

1. Introduction

Facing clinical cases in man's daily practice in need of rehabilitation of posterior teeth have been increasing in a manner that makes it a common case scenario nowadays. Especially with the increased exposure to dietary products, and habits that increase caries risk combined with poor oral hygiene, which are almost the two main causes of tooth loss in Egypt and even in the region. [1–3]

Increased patient's esthetic expectations gave the rise for development of all-ceramic indirect restorations that mimics the natural appearance of teeth. At present, the materials used in all-ceramic crowns mainly include glass-infiltrated alumina-based ceramics, glass ceramics by injection molding, and yttria-stabilized tetragonal

zirconia polycrystals (Y-TZP). Among these, Y-TZP has a flexural strength of 900 to 1200 MPa and a fracture toughness of 7 to 9 MPa. [4]

Yttria-stabilized Zirconia (3Y-TZP) ceramic is considered an acceptable material for prosthetic rehabilitation due to its high fracture resistance, biocompatibility, biomechanical stability, and better color matching compared to the traditional porcelain fused to metal restorations (PFM). The risk of delamination and chipping of ceramic veneer from such layered prostheses is a major concern. High masticatory load in posterior teeth, poor framework design, inadequate thickness of ceramic veneer, contamination of zirconia substructure, low elastic modulus and thermal conducting of zirconia compared to veneer porcelain could be some of the factors leading to such unacceptable failures. [5]

More recently, new monolithic multi-layer zirconia processed using computer-aided design computer-aided manufacturing (CAD-CAM) has been developed giving the desired functional and esthetic results, in addition to overcoming the chipping and delamination issues. which makes it the material of choice in the case at hand. [6, 7].

2. CASE AND METHOD

A 36-year-old male presented to the comprehensive care clinic, College of Dentistry at Arab Academy for Science, Technology, and Maritime Transport, Al-Alamein branch, complaining from sharp, and continuous pain at the upper left quadrant, lots of calculus and stains, discomfort in mastication due to missing posterior teeth in both maxillary and mandibular arches. After preliminary examination using all important diagnostic aids (patient medical and dental history, family history, extra and intra oral examination, mounted diagnostic castes, and radiographs) the suggested treatment

plan was set as follow. The main concern was to deal with the patient's chief complaint which was diagnosed as symptomatic irreversible pulpitis at tooth number #26, RCT was initiated first as an emergency situation in order to restore the tooth with monolithic zirconia FPD later on. Then old overhanging amalgam restorations at teeth number #24, and 25 were removed and restored with full coverage indirect monolithic zirconia FPD, and finally remaining root of tooth number #15 was extracted in order to restore the edentulous area with a monolithic zirconia fixed partial denture (FPD).

For mandibular arch, class II caries according to G.V BLACK classification was detected at tooth number #37 that was restored with direct composite restoration, remaining root of tooth number #36 that was extracted in order to restore the edentulous area with monolithic zirconia FPD, and finally class I caries were detected and restored using direct composite restorations as shown in Fig (1).



Fig. 1. Preoperative intra-oral pictures

Phase I (Control phase): Oral hygiene instructions are first mentioned to the patient. Periodontal therapy was done using 2R/2L curette for anterior teeth, 4R/4L for posterior teeth, and a SICKLE scaler for calculus removal along with the ultrasonic scaler. Caries removal at the mandibular right first and second molars, and placing direct composite restorations. Removal of the overhanging restorations at the maxillary left premolars, caries removal from tooth # 37 and temporization. Extraction of remaining roots maxillary right second premolar, and mandibular left first molar.

Phase II (Re-evaluation phase): Evaluate the healing of the extraction socket in order to proceed for the next steps in preparing the abutments of the FPD.

phase III (Definitive phase): Preparation of FPD abutments after healing of the sockets. Direct restorations have been done.

Restorative treatment was done under rubber dam isolation (*nictone rubber dam*) using round diamond stones for cavity preparation, selective enamel etching technique (*Octa-etch is a highly viscous & dark 38% phosphoric acid*), universal bonding system (*BISCO universal bond*), and successive cuspal build-up technique for composite (*DENTSPLY SIRONA NEO SPECTRA STLV*) application.

With the aid of Exo-CAD software prosthetic design was done for teeth number #14, 16, 24, 25, and 26 with non-anatomical allover reduction with 2 mm thickness with modified ridge lap pontic design to replace tooth number #15, subgingival rounded shoulder finish line as shown in Fig. (2).

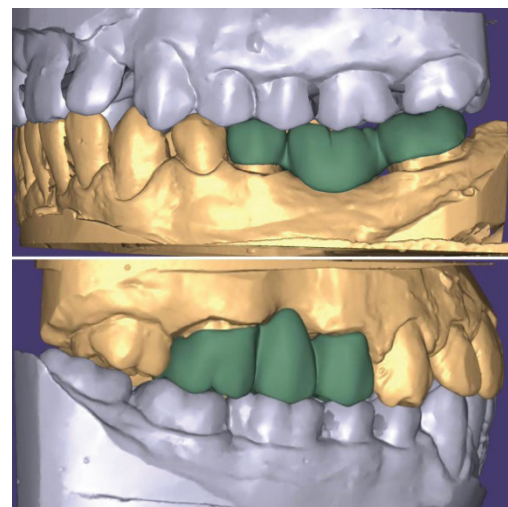


Fig. 2. CAD-CAM digital design for FPDs

Definitive impression was done using addition silicone material (*ZHERMACK ELITE HD+*), putty and wash technique. Final cementation was done using dual cure resin cement (*SUPERCEM*). While for teeth number #35 and 37 the same sequence was done with different pontic design which was modified sanitary design to replace tooth number #36. (8) (Fig. 3).



Fig. 3. Postoperative intra-oral pictures

Phase IV (Maintenance phase): Checking for any food impaction and evaluating the patients home care. Periodontal health evaluation along with immediate post-operative panoramic x-ray and recall visits were done at 1 week, 1 month and 3 months. (9) (Fig. 4).



Fig. 4. Extra-oral OPG x-ray before and after treatment

3. DISCUSSION

When restoring missing posterior single molar, the use of dental implants is the most reliable treatment option nowadays due to its high success rate over long-term results. (10, 11) Although it has a very high success rate in most of the cases meeting its indications, its use was not applicable in the case at hand because the patient was not willing to undergo any surgical treatment option.

All Ceramic fixed partial denture FPD particularly monolithic zirconia was the material of choice as the case requires a material that gives combination of good esthetics along with enough strength that makes it able to withstand masticatory forces made it a very good alternative to the traditionally used porcelain fused to metal (PFM) restorations. This showed almost insignificant differences in their survival rate over long period of time. (12, 13)

Monolithic zirconia crowns constructed using CAD-CAM technology was the material of choice due its high fracture resistance with respect to its high esthetic outcome along with elimination of

chipping and delamination issues. (14–16) In this case, full coverage monolithic zirconia crowns were used for esthetic functional and purposes of the teeth no. 24, 25 and 26 which were endodontically treated and severe discoloration of teeth no. 24 and 25 because of old overhanging amalgam restoration. (17, 18)

Preparation of the subgingival finish line was variable in the case at hand as we used feather-edge finish line in teeth no. 24 and 25 due to the presence of deep overhanging old amalgam restorations, and rounded shoulder finish line for the rest of the abutments, which showed the same clinical durability with no evidence of fractures. (19)

The most important challenge in such a case was dealing with wearing effect of monolithic zirconia on opposing natural teeth and other monolithic zirconia FPDs, which showed that the self-wearing is insignificant, the monolithic zirconia crown can cause wear of the antagonist teeth via occlusal or early contact significantly; the amount of wearing is higher than that of natural teeth and increases over time. The wearing mechanism is mainly abrasive and fatigue wear. which requires the researchers to be very careful and delicate in making sure that there were no high points in their prosthesis that could cause them a bigger problem over time. (20, 21)

4. CONCLUSION

The treatment plan set for this case has proven that it was the most suitable one. Monolithic zirconia gave the researchers strong indicators that it was the most reliable material in situations requiring a combination of strength along with acceptable esthetic outcome. The use of CAD CAM in monolithic zirconia manufacturing has increased with the elimination of chipping and delamination problems. Further research on long term period of time is required to evaluate the results of such cases.

CONFLICT OF INTEREST:

There are no conflicts of interest, according to the writers.

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