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MONOLITHIC ZIRCONIA BASED CROWNS FOR ESTHETIC REHABILITATION OF SEVERELY DAMAGED TEETH: A CASE REPORT

Dental Science

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ABSTRACT

Smile is the first contact in human relationship. A charming smile can open doors and knock down barriers. An attractive or pleasing smile clearly enhances the acceptance of the individual in the society and the character of the smile influences to a great extent the attractiveness and the personality of the individual. To achieve an esthetic result with conventional porcelain fused to metal crown can be a significant challenge. Zirconia crowns ensure optimum esthetic result with optimum strength. They produce consistent quality and superior marginal fit. In this article a 45-year male patient consults for an esthetically compromised smile and he requests esthetic smile rehabilitation, the presence of defective restorations excluded treatments modalities such as bleaching and veneers in favor of full ceramic crowns. Incisors and canines were restored with CAD/CAM zirconia based ceramic crowns.

KEYWORDS

INTRODUCTION

The rehabilitation of an unaesthetic smile in the anterior maxilla is always a clinical challenge, especially when teeth are of improper shape and size and defective restorations or discolorations are present.[1] With the advancement in technology and trends towards more conservative technologies, various options are available to patients and dentists which increase the range of choices and opportunities to restore teeth.[2] In recent years, monolithic zirconia has been commonly used for fabrication of dental prosthesis, ranging from a single crown to full arch restoration.[3] Owing to its high strength, it overcomes the fracture or chipping problems associated with veneering porcelain.[4] Monolithic zirconia with increased translucency has also been developed for use in esthetic regions.[5]

All-ceramic crowns have been used over the last four decades as an alternative for porcelain-fused-to-metal crowns to overcome their esthetic limitations. All-ceramic crowns can be made from different types of ceramics, which have different physical and esthetic properties.[6] Currently, high translucency zirconia is an option worth considering for restorations that need to be aesthetically superior and serve patient well for years.[7] The accuracy of computer-aided design/ computer- aided manufacturing (CAD/CAM) systems is linked to their technical characteristics and reliability for manufacturing the restoration designed.[8] In addition, different types of tooth preparations influence the marginal precision of zirconium-oxide based ceramic single crowns. In an in vivo study, the marginal fit of zirconium-oxide based ceramic CAD/ CAM crowns was evaluated and found to provide clinically acceptable results.[9]

CASE PRESENTATION

A 45-year healthy male patient presented for restoring his maxillary teeth. He complained about the bad appearance of upper front teeth and asked for an esthetic smile. He wanted to have best available treatment option for his teeth but in a limited budget.

Extra-oral examination showed no abnormal finding, no sign of pain or tenderness in the head and neck area and no clicking or tenderness in TMJ area or muscles of mastication.

Intra-oral examination showed fair oral hygiene, staining & general plaque accumulation, pocket depth (ranging 1-2 mm) with respect to anterior teeth and mild gingival recession in upper and lower anterior teeth. The central incisors, right lateral incisor and canine had undergone root canal therapy 3-4 months back. Extraction of upper and lower right and left first molar was done 2-3 years back due to caries. Amalgam restorations were done with relation to 24,27,37,47. 35 was carious and defective composite restorations were present with respect to 34,11,12,13,21,22,23. (Figures1 and 2)

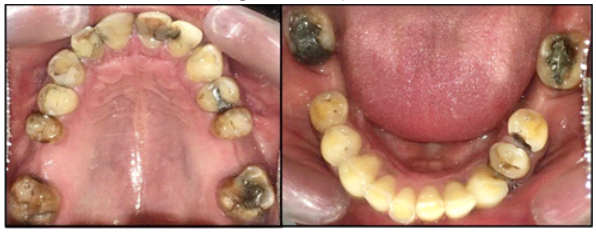


Figure 1: Occlusal view of maxilla and mandible

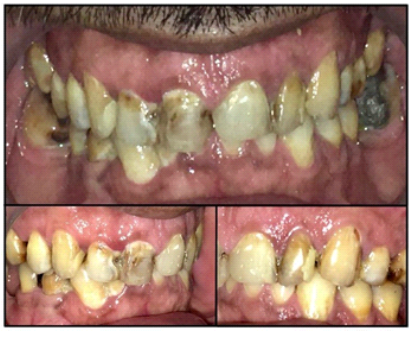


Figure 2: Frontal view, right lateral and left lateral view

FACIALANALYSIS (figure 3 and 4)

The facial analysis involves an assessment of the face as a whole. Facial analysis in the frontal plane, relates the facial midline with the midline of the central incisors and shows horizontal parameters relating the inter-pupillary line to the incisal edge position.(Fig.3) Full-facial analysis uses lines to assess parallelism and hence synergy in the various components of the face as related to the smile. Incisal edge position was determined by the use of phonetics and the "M" sound which helps to determine the position of the lips at rest. (Fig.4) The amount of tooth visible in this position is important as a baseline for designing the smile. The more tooth visible, the younger the look.

TREATMENT OPTIONS

Treatment options for this case could be implant restorations for

posterior missing teeth or fixed partial denture or removable partial denture and full coverage crowns for anteriors.

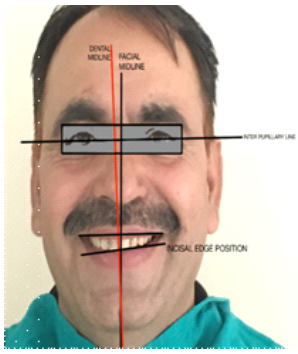


Figure 3: Facial analysis

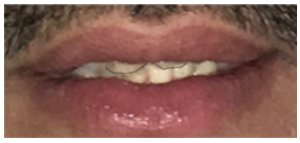


Figure 4: Incisal edge position

TREATMENT PHASE

Treatment phase included oral prophylaxis and preparation of intra oral records - photographs and diagnostic casts for maxillary and mandibular arches. Defective composite restorations were replaced. Shade selection was done prior to tooth preparations. Tooth preparation was done with respect to upper anteriors from canine to canine. (Figure 5).

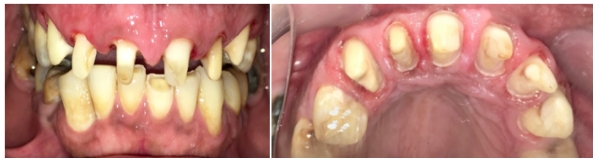
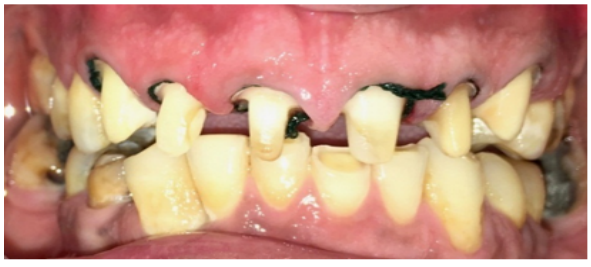


Figure 5: Tooth preparation anterior view and palatal view

Using single cord gingival retraction technique final impression was made using additional silicon (light body – light consistency, putty – medium consistency)in a single step. (figure 6 and 7)



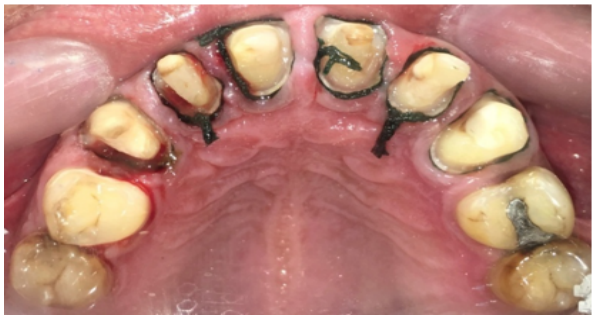


Figure 6: Single cord placed on prepared teeth (frontal and palatal view)

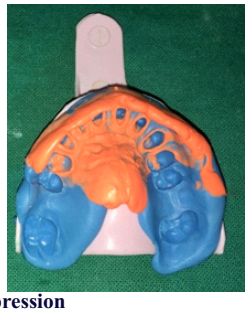


Figure 7: Final impression

TEMPORIZATION

Temporary crowns were made chairside after teeth preparation with tooth colored acrylic using indirect method. These temporary prostheses were well polished to serve occlusal and esthetic criteria as they must not interfere during the functional mandibular movements. They were checked, and rectified by subtraction or resin addition. After final adjustments and polishing the temporary crowns were cemented with zinc oxide eugenol cement. (figure 8)

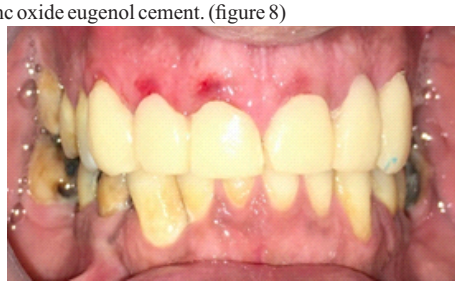


Figure 8: Temporization done chairside.

Crowns were designed with CAD/CAM (Computer assisted design/ Computer assisted manufacture) technology to enhance the smile. The so called "mock- up" of a planned cosmetic treatment also has been shown to be quite useful. It allows the clinician to visualise the desired results and solve potential problems before the final prosthesis. (figure 9)

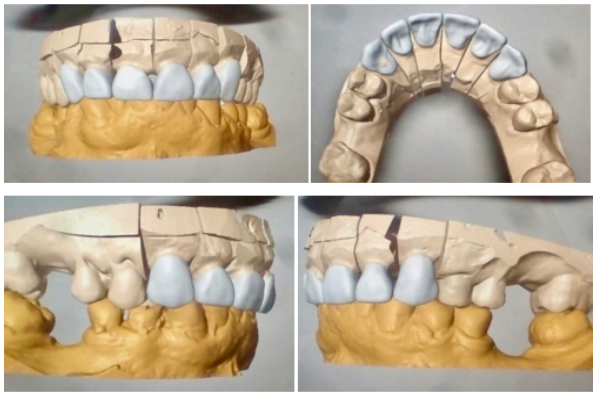


Figure 9: Fabrication of prosthesis with CAD/CAM

Zirconia crowns were made for final prosthesis. Try in was done at bisque stage (figure10). Final prosthesis was delivered after final glazing (figure 11). Glass ionomer cement was used to cement the prosthesis.

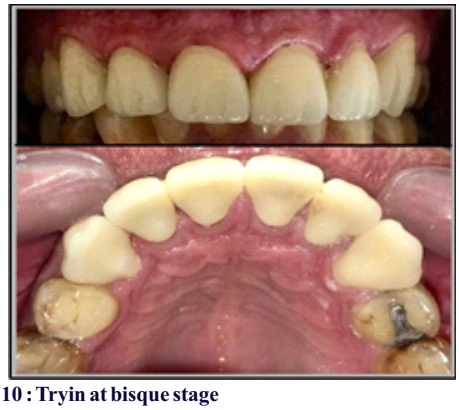


Figure 10 : Tryin at bisque stage

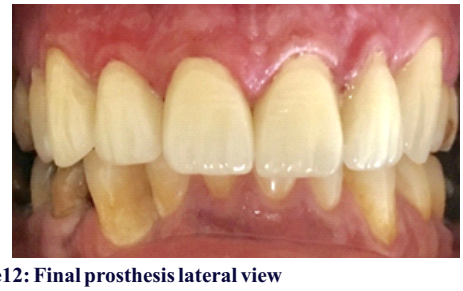


Figure12: Final prosthesis lateral view

Extra-oral view after prosthesis delivery showed parallel interpupillary line and incisal edge line. Corners of the mouth and buccal corridor spaces had adequate contrast in color between the teeth, tissues, and space. The dental midline coincided with the facial midline. The incisal edges were approximated to border of lower lip at rest (figure 13 and 14).

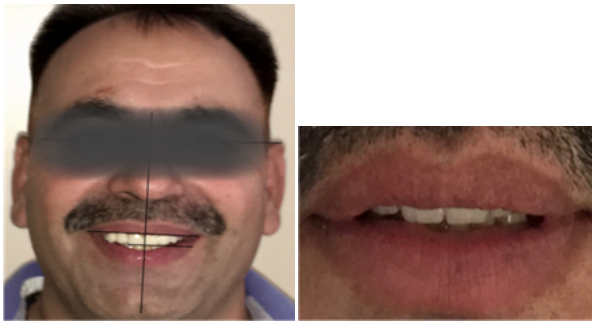


Figure 13: Post treatment extra-oral view

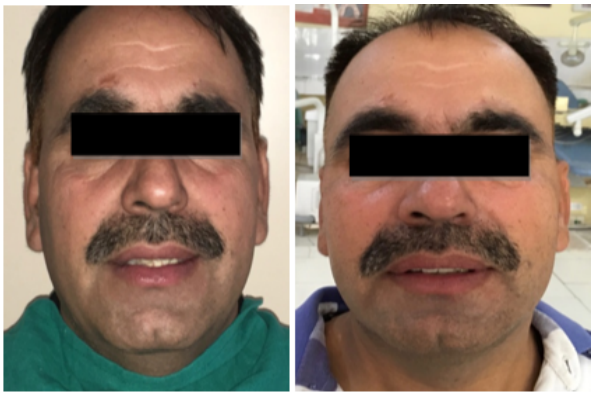


Figure 14: Pre and Post treatment photographs at rest

Figure 15: Pre and Post treatment photograph- smiling

DISCUSSION

The prime objectives of aesthetic dentistry are to achieve the best possible esthetic results and at the same time preserve the hard and soft tissue. Zirconia has been considered an opaque material compared to other all ceramics, but more esthetic alternative to porcelain fused to metals (PFMs) or cast gold restorations, in the areas with limited occlusal spaces.[10] The translucency of monolithic zirconia should be improved to make it a restorative option in the anterior region as well.[11-13] Zirconium dioxide (ZrO2) is used to fabricate prosthodontic restorations such as single crown, bridges, veneers, inlay, onlay, endodontic posts as well as Zirconia abutments for implants. Monolithic zirconia crowns have high fracture resistance and this allows the tooth restoration without excessive tooth preparation. This is one of the reasons monolithic zirconia crowns have become a reliable treatment alternative to porcelain-fused-to-metal and veneered crowns.

Today, CAD/CAM is the preferred method of producing durable tooth-colored and metal-free components in dental practice. CAD/CAM technology in the manufacture of Zirconia has become a reality that demonstrates important physical and mechanical properties of high strength, adequate fracture toughness, biocompatibility and esthetic outcome.[14,15] This technology allows the fabrication of esthetic restorations with high efficiency.

An in vitro study showed that the accuracy of margin fit was dependent on the scanning system. The direct digitalization was not superior to indirect digitalization for all tested systems.[16] But another study concluded that with both methods, the shorter the distance, the more accurate results were achieved. Virtual models obtained by digital impressions can be more accurate than their conventional counterparts.[17] Whatever the technique used, to optimize the result and the longevity, the proper support given to the veneering ceramic by the correct design of the zirconia framework could significantly reduce the risk of chipping during function.[18] In addition, marginal adaptation is essential for the long-term success of dental restorations, the more accurately the restoration is adapted to the tooth the lesser the chance of recurrent caries or periodontal disease.[19]

Distortion of zirconia framework is minimum during the firing procedure of the porcelain. There is no plaque accumulation on the surface of zirconia crowns because zirconium ceramic does not react to the protein in saliva.

Numerous clinical studies show that cohesive fracture of the veneer material is the main limitation of its use for fixed restoration. Regarding the available literature and some short-term clinical trials, core fractures were noticeably reported rarely in zirconia-based crowns over 1 to 3 years of follow up, while the veneer fracture proportion ranged from 0% to 15% . The incidence of chipping on zirconia based fixed restoration has been reported ranging from 0% to 4% in clinical studies with 20 to 60 months follow-up.

Limitations of using zirconia are that special milling centre is required for the scanning and processing, this phase of production is, to some degree, tedious. Case details such as framework thickness, configuration and shade may be specified in a script and sent to the milling centre to achieve the desired restorative goals. It is a very hard substance to adjust if occlusal premature contacts exist during cementation procedure.[20]

CONCLUSION

Esthetic demand of patients is widely increasing mainly in case of compromised anterior maxillary teeth in presence of defective restorations. Full coverage zirconia crowns are currently a suitable solution in such cases. This solution can offer an esthetic result since the zirconia is marketed with different translucencies and cosmetic ceramic can be retouched by ceramic makeup. In addition, ceramic zirconium offer good mechanical properties and a good long term behaviour, it is also a solution for anterior teeth when bonding cannot be indicated.[21]

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