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Case Report

Digital smile design for esthetic retreatment with zirconia and glass ceramic reatoration: A case report

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ABSTRACT

The ceramic veneer in Metal-ceramic crowns and FPDs have potential for fracture. Metal Ceramic Restorations (MCR) are one of most commonly used restorations used in fixed prosthodontics because of their casting accuracy, high strength properties of the metal, durability and the cosmetic appearance of porcelain. Considering the vast differences in modulus between metal and ceramic materials, it is not surprising that mechanical failure of this system can occur. Clinically, such failures often begin as chipping off metal ceramic, leading to failure. In present case, replacement of an extensive prosthesis was done by taking digital impression using CAD/CAM system for fabrication for chairside zirconia bridge using mock-up technique.

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1. Introduction

In anterior region of our oral cavity, aesthetics plays an important role along with function and space management, and achieving this can be challenging. Metal ceramic restorations (MC) have been one of most common restorations used in fixed prosthodontics because of their casting accuracy, high strength properties of metal, durability and cosmetic appearance of porcelain.¹

Considering vast differences in modulus between metal and ceramic materials, it is not surprising that mechanical failure of PFM system can occur. Clinically, such failures often begin as porcelain fracture that may be caused by inappropriate coping design, poor abutment preparation, technical errors, contamination, physical trauma or occlusal

prematurity.²

In spite of progress of dental materials in strength of bonding of PFM restorations, they still have 5% failure rate after 10 years^{3,4}. Patients may view loss or fracture of porcelain from crown or bridge as dental problem in need of urgent repair.⁵

The aesthetic retreatment of anterior teeth has always presented a challenge in clinical practice. Restorative material such as zirconia all-ceramic crowns and bridges has been chosen as an alternative to improve the oral condition and existing restoration.⁶ Anterior aesthetic rehabilitation with free metal-ceramic (MC) bridge improves the self-esteem, self-confidence of the patient and permitted him to return to satisfactory social life.⁷ Hence, a combination of both dentist and ceramist must follow a certain protocol to achieve maximum clinical success and long-lasting restoration.⁸

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During past decades, the recent restorative materials and new technologies in oral rehabilitation had improved the restorative dentistry field. They offer a variety of approaches to treat the difficult cases of symmetry, shape, position, proportion, alignment, surface texture and color of anterior teeth in our daily practices.⁹ All recent ceramic materials showed excellent physical, mechanical and biological clinical performances during last years. Aesthetic dentistry frequently means walking a tightrope between functional and aesthetic requirements. The patient requests for more aesthetic and biologically 'safe' materials that have led to an increased demand for all ceramic restorations.¹⁰

Ceramic cannot withstand tensile forces as well as metal and they are susceptible to brittle fractures. A new type of ceramic material, based on zirconium oxide, has been developed more recently.¹¹ Zirconia was introduced into dentistry in 1990s because of its good mechanical and chemical properties and is currently being used as material for frameworks, dowels, implants, abutments and orthodontic brackets.¹² It has both clinical popularity and high success rate. Due to its outstanding features with minimal complications and its high fracture toughness, zirconia has become a prevalent biomaterial in dentistry. In this case report, the patient's concern was his dissatisfaction with the appearance of his maxillary anterior teeth, and he opted to replace the tooth crown with Zirconia due to more advantages.

Digital impressions represent innovative methods that enable dentists to construct a virtual, computer-generated copy of the hard and soft tissues of the oral cavity, with the use of lasers and other optical scanning machines. The digital method captures impression data with great accuracy, in minutes, without the need for traditional impression resources that some patients find inopportune and messy. Numerous patients consider digital impressions to be an easier and more comfortable method, in comparison with classical impression techniques. The impression information is then moved to a computerized workstation that creates restorations. Once the impression is captured, it can be either sent to the laboratory/ in house manufacturing unit, or to the CAD/CAM application with the help of one click, and in a second, the laboratory or chairside system receives all the information needed.¹³

The following case presentation illustrates the use of CAD/CAM zirconia restoration to replace an existing metal ceramic bridge in the aesthetic zone. The advantages of this replacement were to create a maintainable healthy periodontal environment, improve facial appearance and restore his symmetrical teeth back to normal size in harmony with the existing occlusion.

2. Case Report

A 56-year-old male patient reported to our clinic with chief complain of lost aesthetic appearance of his old metal

ceramic crown which was placed 12 years ago. He wanted to have an aesthetic makeover to make him feel at ease to smile again. He wanted to have beautiful and uniform teeth with metal free crown. [Figure 1]



Fig. 1: Intra oral photograph

The radiograph and the thorough examination of the mouth revealed that the all-anterior teeth were asymptomatic and previously endodontic treated. [Figure 2]

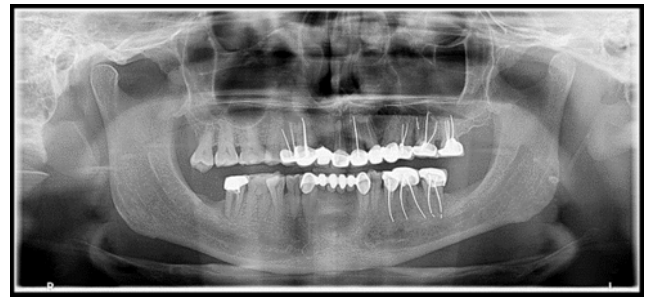


Fig. 2: OPG

Patient wished a permanent restoration on the anterior teeth without the disadvantage of chipping that had happened in the past. He was satisfied with the shape and size of the anterior teeth but was also extremely worried about the final aesthetic result that demanded to be natural so, sectional prosthesis for full mouth rehabilitation was planned for treatment. Previous metal ceramic prosthesis was removed and digital impression was planned. [Figure 3]



Fig. 3: Intra oral photograph after metal ceramic bridge removal

After clinical examination, minimal tooth preparation was done followed by scanning by intraoral scanner (Dentsply Primscan) to capture digital impression for

further processing in CEREC software. A Digital record of the segment with opposing arch was also recorded. Scanning provides easier, more intuitive, and precise 3D models in natural colours in less than 2 minutes.

Later digital mock-up was prepared for discussion with patient. [Figure 4a,b]

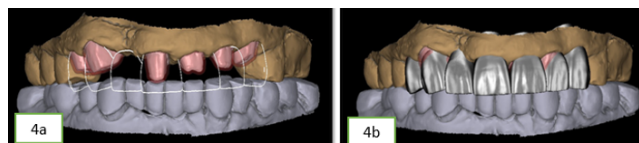


Fig. 4: a,b: Preparation of mock-up

Mock-up is a great tool in digital smile design that enables us to control the function of the end result without even beginning the work. The aim of this study was also to use Mock-up to show its effectiveness in communication, planning, and preparation to achieve the demanded aesthetic dental treatment.

The mock-up in the patient's mouth has helped him to understand what was offered to him, and he confronted it with what he was expecting. On the other hand, at the same time, we could control the function, occlusion, the posture of the lip, the smile line, and the phonetics. Surely, we could not only control the aesthetic of the teeth, but especially the harmony with the face in general. Posterior bite was raised by 1mm, planning was done by digital articulation.

After patient approval, upper 3-D digital mock-up was 3-D printed. Over this printed 3-D digital mock-up, precise fitting ESSIX retainer was fabricated. Temporization was done with temporary bis-acrylic resin (Structur Premium, VOCO, Cuxhaven, Germany), which was flowed into ESSIX retainer which was seated in patient mouth and cured then ESSIX retainer were removed. Prosthesis was cemented with temporary luting cement [Zinc polycarboxylate cement]. Chairside mock up temporization was kept for 1 week. Patient was happy with aesthetic and functional outcome, with good chewing and no TMJ issue.

In present case, sectional prosthesis was delivered. Fabrication was done in segments Firstly, left side upper 24,25,26,27 were delivered followed by 14 15 ,16,17. Next day patient was recalled for anterior segmental prosthesis 11,12,13, 21,22,23. Fitting, aesthetics, and characterization were checked in the patient's mouth. Then, the tooth was cleaned and prepared for luting with resin modified GI cement. Excess cement was removed from interdental spaces and group function occlusion was checked. The patient was given post-operative instruction. [Figure 5a,b]

Before and after photo graphs were compared. [Figure 6 a,b]



Fig. 5: a,b: Occlusion was checked

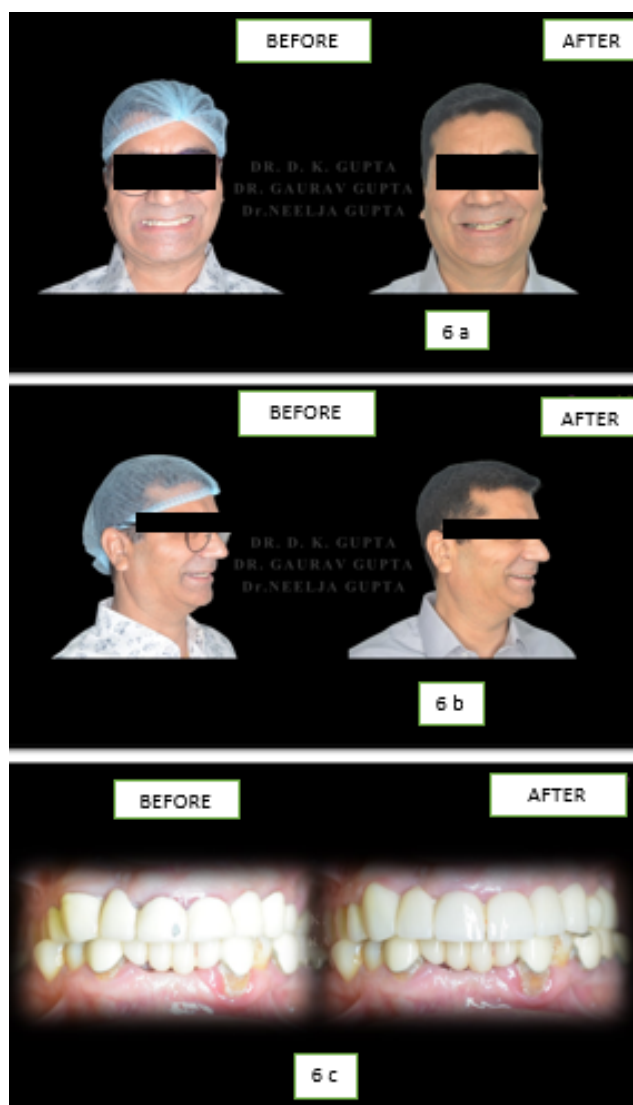


Fig. 6: a,b,c: Before and after comparison

3. Discussion

A smile is a gateway to success. The magic of an improved smile can in still confidence in a patient to a degree unimaginable. Since smile is a complex phenomenon which involves colors, illusions, proportions, etc. to achieve the desired result one has to encompass all the principles of aesthetics.¹⁴ It has become increasingly common in the clinical practice to come across patients who are in search of cosmetic procedures since the presence of an aesthetically pleasing smile directly affects the individual's social life. Therefore, it is extremely important that the professional is able to meet the demand of function and aesthetics as desired by the patient.¹⁵

The selection of zirconia crown bridge was upon both clinical considerations and patient's preference. With the help of CAD/CAM technique it designs and fabricates the anatomic full-contour zirconia crown with excellent marginal adaptation.¹⁶ With advancement in Zirconia material, its biocompatibility has high promoting health tissue response which later succeeded with chosen treatment.¹⁷ In contrast with porcelain crown, zirconia lasts longer, withstands wear and tear without chipping which further tolerates forces of mastication and bruxism. In addition, it also imitates more naturally looking appearance that addresses the main concern of the patient.¹⁸

Restoring the anterior segment generally with a prosthesis is considered to be difficult and in the aesthetic zone is even more challenging. Careful planning for the management of space for missing teeth in younger individuals is crucially important.¹⁹ The existing bridge was sectioned from the labial gingival portion, extend to the bucco-incisal, then lingually to the end of the crown. The technique was a complete comfort to the patient and non-traumatic to the abutment teeth. It had been selected to preserve the underlying tooth structure, the surrounding gingiva and periodontal tissues as mentioned by Al Moaleem et al,²⁰ and Al Moaleem MM.²¹

Metal-ceramic restorations have the potential to fracture. Ceramic failures have been reported as the second greatest cause for the replacement of restorations after dental caries.²² Furthermore, failures occur most frequently in regions that are quite visible, compromising aesthetics.²³

Zirconia-supported fixed prostheses are preferred as they have been used successfully for the past two to three decades due to their colour, excellent biocompatibility, and mechanical properties.²⁴ Also, they are more aesthetic than metal-supported prostheses.²⁵

In present case we have used mock -up technique. The mock-up is considered a fast, easy, and efficient tool for the diagnosis and planning of rehabilitating esthetic treatments. This technique should be used as a routine protocol by the clinician since it permits the professional to work with higher predictability of results and smaller margin of error in more complex cases.²⁶ The mock-up must also be seen

as a marketing tool to help the patient accept the proposed treatment, because one technique complements the other,²⁷ as in the case presented here.

In present case the replacement of an extensive prosthesis was done by taking digital impression using CAD/CAM system for fabrication for chairside zirconia bridge using mock -up technique.

4. Conclusion

The use of dental ceramics for anterior and posterior restorations has increased as a result of the desire for cosmetic restorations. However, ceramic is more prone to brittle fractures and cannot bear tensile stresses as well as metal. Based on zirconium oxide, this new kind of ceramic material has achieved clinical success and popularity, thanks to its exceptional mechanical and chemical properties that make it acceptable for use in medicine. Regarding the case of the patient, Zirconia-based crown was chosen because of its remarkable strength and aesthetic attributes. It is superior to porcelain fused to metal as a treatment of choice as it survives wear and tear without chipping.

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6. Conflict of Interest

None declared.

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