

## Case Report

### Impact of anterior guidance in designing of All-ceramic anterior fixed partial denture - Case Report

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#### **ABSTRACT:**

All ceramic restorations were expected to replace metal-ceramic restorations very fast since the obvious advantage of possessing improved esthetics was thought to be groundbreaking. Both theoretically and practically though, metal-ceramic has withstood the competitive challenge of all ceramic restorations and is still the choice of restoration in most of the posterior missing teeth. An important consideration for an all ceramic three unit fixed partial denture is the existing occlusion of the patient. This article in the form of a case report presents a case of a missing maxillary left central incisor that was successfully restored with an all ceramic three unit zirconia reinforced ceramic. The influence of anterior guidance in the design of such prosthesis is also discussed.

**Key words:** metal- ceramic, zirconia, alumina, resin cement, tooth preparation.

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#### **INTRODUCTION**

As the population of the world is increasing from century to century, there is a growing understanding and awareness of human about facial aesthetics and the role of natural teeth in enhancing one's self-image. The trend is so unique that even elderly people are fully aware about the aesthetics of a dental prosthesis and their role in patient satisfaction.<sup>1</sup> Fixed prosthesis in dentistry has revolved around metal-ceramic since 1970<sup>2</sup> and continues to rely on the same technology even at the beginning of this century. The impact of underlying metal on the overlying ceramic was recognized and a search for a tooth colored coping brought the use of zirconia and alumina reinforced ceramics in dentistry.<sup>3</sup> Since its inception in fixed prosthodontics, the use of zirconia reinforced ceramics has been theoretically limited to the use of a short span fixed partial denture or a single crown. These are mainly due to the brittle nature of zirconia and its poor flexure strength as compared to the metal. However, practitioners continue to give all ceramic fixed partial dentures posteriorly irrespective of the state of occlusion. Presently there

are varied types of all ceramic restorative options in the market like the Celay copy milling system, procera CAD/CAM, different generations of CEREC and IPS impress which allow the clinician to fabricate an all ceramic crown and bridge very easily. The application of all ceramic in one's practice has brought very rich financial dividends, which understandably has led to its misuse rather than proper use in the indicated situations. This prompted us to revisit the all ceramic fixed partial denture fabrication through this case report.

#### **CASE REPORT**

A young male patient aged 33 years reported to the department of prosthodontics with a chief complaint of poor aesthetics of the existing maxillary natural dentition since last one year due to extraction of a front upper tooth. The tooth suffered a trauma in which the tooth had fractured within the bone. Medical, social, drug and other related histories were non-contributory to the dental treatment. All parameters of systemic health were within the normal range. Dental history

revealed the patient had extracted maxillary left central incisor after which he was wearing a removable partial denture which was lost recently. Extra oral examination had normal features except the patients low lip line exposed around 4 to 5 mm of maxillary anterior teeth during normal speech. Intra oral examination revealed missing left central incisor with a smooth well rounded residual alveolar ridge and a mesially migrated right central incisor (**Fig 1A, B**). Occlusal examination showed a class 1 malocclusion with class 1 molar and canine relation. Functional examination demonstrated slight supraeruption of mandibular anteriors resulting in an incisal plane alteration and anterior teeth contacting during the act of protrusion. Right and left eccentric movements showed a functional canine guidance with anterior and posterior disclusion. A preliminary diagnostic impression of maxillary and mandibular arch was made using irreversible hydrocolloid (CA 37; Cavex, Haarlem, Holland), following which the diagnostic casts were mounted on a semi adjustable articulator (Whip Mix series 3000; Elite Dental Services, Inc, Orlando, Fla) using a face bow and interocclusal centric relation record. The articulator was then programmed according to the patients protrusive and lateral interocclusal records. After thorough evaluation, the patient was presented with a primary treatment plan of a single implant supported restoration for missing central incisor, which due to financial and time constraints was not consented by the patient. Alternate options presented were a three unit metal-ceramic or all ceramic fixed partial denture, a resin bonded fixed partial denture or a cast partial denture as the last option. The patient consented for an all ceramic three unit fixed partial denture after the pros and cons of each option were described in details to the patient. The treatment of a three unit fixed partial denture started by correction of the incisal plane on the articulator so as to allow natural canine and right lateral incisor to bear occlusal contact in protrusion. A clear acrylic splint was then prepared over corrected incisal guidance and the mandibular incisal plane was then corrected in the patient taking the guidance for correction from the splint. Once the mandibular incisal plane was corrected, the tooth preparation for all ceramic retainer was done in relation to maxillary right central incisor and the left lateral incisor (**Fig 1 C,D**). A temporary restoration was cemented with non-eugenol temporary cement (PreVision Cem; Heraeus Kulzer) (**Fig 2**). The temporary fixed partial denture was designed in such a way so as to allow the distal end of abutment contact the opposing incisal surface. The three unit temporary restoration was analyzed for occlusal contacts in centric and eccentric mandibular positions. After correction of temporary the patient was discharged and recalled after a period of 4 weeks. The anterior guidance was thus developed in the temporary fixed partial denture through use in a similar way as that done for a full mouth rehabilitation case.

Definitive fixed partial denture was designed to provide minimum protrusive contact with the fixed

partial. This was achieved by keeping an edge to edge contact between the pontic and the mandibular anteriors without incorporating any part of the palatal surface of fixed partial denture to contact mandibular anteriors. A second alginate impression was made, from which an occlusal guiding cast was procured. This cast provided the external surface form of the final restoration. Final impressions were made using a dual mix technique which was poured with a CAD/CAM special stone (BEGO/Germany) following which die preparation was completed for both abutments.



**Figure 1:** Intra oral examination showing missing maxillary left central incisor (A) and occlusal view (B). Tooth preparation for all ceramic three unit fixed partial denture (C and D).



**Figure 2:** Temporary three unit fixed partial denture made of tooth colored self-cure denture base acrylic resin.

The master casts were then mounted on a laser scanner (Cynoprod Canada Inc. Listings, Montreal, Canada) for scanning and capturing the preparation. The zirconia coping was thus manufactured following which the remaining core built up was done with Vita In-ceram YZ (Vita/Germany). Fused porcelain VITA VM (R) (Vita/Germany) was used for final fixed partial denture fabrication. The three unit fixed partial denture was then cemented with resin cement (Relaxy XTM, 3M ESPE, Germany). Instructions regarding follow up and fixed partial denture maintenance were given to the patient. At a distant recall visit, the patient was highly satisfied with the aesthetic outcome of the all ceramic fixed partial denture since he was comparing it with the removable partial denture he was wearing earlier.



**Figure 3:** Completed three units all ceramic fixed partial denture cemented with resin cement

## DISCUSSION

Facial aesthetics are multi-dimensional, as pointed by Kumar,<sup>4</sup> and all three dimensions (biological, bio-mechanical and psychological) need to be considered while designing a fixed partial denture in the anterior maxillary region, especially in a patient where a low lip line exposes more than normal amount of anterior teeth.<sup>4</sup> The term 'all ceramic' refers to any restoration that is composed exclusively of ceramic although as a single entity or in combination.<sup>5</sup> Compared to metal-ceramic the all ceramic have the advantage of increased translucency, fluorescence, increased contribution of underlying color and cement besides general advantages of ceramics. However, all ceramic are technique sensitive, have the problem of firing shrinkage, are brittle and less resistance to fracture than ceramo-metal restorations. All ceramic restorative materials have seen a continuous improvement in physical properties and the main focus has been to improve its strength so that it can be applied in posterior teeth or long span fixed partial dentures. Zirconia oxide reinforced is a type of core material that was identified by a German scientist named Klaproth.<sup>6</sup> It has a flexural strength that approximates between 900 to 1100 Mpa which is why it has found application among short span anterior fixed partial dentures.<sup>7</sup> Its advantages over other types of all ceramic reinforced materials include minimal firing shrinkage, high flexural strength, less wear of opposing teeth and extremely biocompatible.<sup>8</sup> Its main disadvantage is its economic viability since it requires specialized equipment. Another disadvantage is its increased opacity due to which the underlying coupling may be visible through the overlying translucent enamel.

The importance of functional occlusion in the fabrication and designing of a fixed partial denture is basic to the long term successful treatment. When replacing missing anterior tooth/teeth one should take into consideration the role of existing anterior guidance in that particular occlusion. The contacts of anteriors both individually and as a single unit in centric, during protrusive and extreme protrusion will determine the opposing restoration designing. The contact in lateral excursion also has a major role to play and depends largely on the missing tooth. The role of overjet and overbite in natural dentition should be duplicated in the planned fixed partial denture. The incisal plane

correction is the fundamental difference to achieve a well balanced anterior guidance that won't result in harmful stresses on the connector of the maxillary fixed partial denture.<sup>9</sup> Incisal edge of the fixed partial denture should be planned for width, angulation and the contact area that mandibular anterior teeth will have. All contacts in protrusion should be towards the distal end of each abutment which has contact with posterior natural teeth so that the detrimental horizontal forces are dispersed in the direction where they can be resisted without damaging periodontium. The basic properties of dental restorative materials play a significant role in the long term success of the fixed partial denture. Any partial denture design should have a goal of surviving in the oral cavity for a minimum of 20 to 25 years without causing undue harm to retentive or supporting elements of the restoration. The functioning of a protective anterior guidance is a normal feature of ideal occlusion and should be preserved when a fixed partial denture features incorporation of a new or modified anterior guidance.

## CONCLUSION

All ceramic restorations are expensive treatments and should not be done vaguely without considering the above mentioned occlusal factors since long term success of these partial dentures is dependant on the forces generated by occlusion in centric and eccentric.

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