

All Ceramic Fixed Partial Denture to Replace Missing Maxillary Anterior Tooth

Humaira Shah^{1*} Richa Sharma² and Sadhvi Pujara²

¹Department of Prosthodontics, College of Dental Sciences, India

²Department of Prosthodontics, College of Dental Sciences, India

ARTICLE INFO

Received Date: May 28, 2019

Accepted Date: August 30, 2019

Published Date: September 06, 2019

KEYWORDS

Pontic

Retainer

Dental porcelain

Zirconia

Resin cement

Copyright: © 2019 Humaira Shah et al., Journal Of Case Reports: Clinical & Medical. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation for this article: Humaira Shah Richa Sharma and Sadhvi Pujara. All Ceramic Fixed Partial Denture to Replace Missing Maxillary Anterior Tooth. Journal Of Case Reports: Clinical & Medical. 2019; 2(3):136

Corresponding author:

Humaira Shah,

Assistant Professor, Department of Prosthodontics, College of dental sciences, Karnataka, India,

Email: huma.amber1@gmail.com

ABSTRACT

The use of dental porcelain is a routine material for restorative dentistry. Combination of alloy with ceramic has one of the main success stories in restorative dentistry during the last few decades. Advances in Zirconia reinforced ceramic has been seen as a substitute to alloys when a short span fixed partial denture is designed. A young boy reported with missing left maxillary central incisor. The existing occlusal conditions demonstrated favorable prognosis for use of an all ceramic fixed partial denture (LAVA, 3M ESPE). A CAD/CAM designed coping was first tried clinically following which feldspathic porcelain was fused to match adjacent and opposing teeth. The patient was highly satisfied with the aesthetic outcome of the prosthesis.

INTRODUCTION

Advances in the strengthening of dental porcelain have increased the scope of all ceramic restorations to be used as a short span fixed partial denture. The traditional feldspathic ceramics that were reinforced with base metal alloys have shown excellent clinical performances in terms of annual failure rate [1]. Their use has ranged from short span to long span fixed partial denture in any type of occlusion, even in cases of unfavorable occlusal conditions [2]. However, the effect of alloy on the shade of the overlying ceramic that imparts grayish hue to ceramic have limited their indications in esthetically conscious and demanding patients [3]. This has given rise to the development of a tooth colored core material on which feldspathic porcelain can be fused to minimize the effect of low translucency of metals. All ceramic prosthesis has now been seen as a significant substitute for metal based ceramic restorations [4]. The advantage of ceramic core over the metal core is biologically accepted since ceramic shows excellent biocompatibility with surrounding periodontium [5] However, due to the low fracture toughness of these ceramic cores, their use is limited to anterior fixed partial denture or single crown restorations. The use of Zirconia reinforced all ceramic fixed partial denture requires an adequate thickness to be provided in the design to overcome the problem of low fracture toughness. The material has a high elastic modulus which does not permit it to undergo flexion as it often happens in a fixed partial denture [6]. With the cementing media having the same shade that of a natural tooth, the natural effect of translucent tooth can be easily implemented, which improves patient acceptance to the prosthesis [7] Such aesthetic combination of restoration with cement enhances patient's self image similar to the various

characterization types, a clinician imparts on a fixed partial denture. Staining characterization within the fixed partial denture is an example to duplicate smoking stains [8]. Replacing a maxillary central incisor in a young patient is challenging in terms of stomatognathic functioning since incisors have an important role of discluding the posterior teeth in eccentric movements [9]. Treatment options for a single missing central incisor include single implant supported restoration [10] resin bonded fixed partial denture, partial veneer supported fixed partial denture or a spring fixed partial denture [11]. Economical preferences include an interim removable partial denture or a cast partial denture. This article in the form of a clinical case report presents a case of restoration of a missing anterior tooth with an all ceramic fixed partial denture and discusses all the pros and cons of various treatment options and the reasons for selection of the current treatment option.

CASE REPORT

A young adult boy aged 25 years reported to the department of prosthodontics with a chief complaint of poor appearance due to loss of a front tooth. Patients medical and social history was non contributory to the existing condition. Extra oral examination demonstrated normal clinical features. Intra oral examination disclosed a Kennedy class 3 partial edentulous situation with maxillary left central incisor missing. The maxillary anteriors were proclined slightly with an increased overjet and decreased overbite with the opposite anterior teeth (Figure 1A). After radiographic and mounted diagnostic cast evaluation, two basic treatment options were presented to the patient in the order of preference, fixed or removable prosthesis. Fixed options included a single implant supported crown for missing left central incisor, a spring fixed partial denture, resin bonded prosthesis, partial veneer retained fixed partial denture, a conventional metal ceramic fixed partial denture or an all ceramic fixed partial denture. The choice of all ceramic restoration was based on the balance between the occlusal biomechanics and esthetics. The patient declined implant supported prosthesis due to time restraints and opted for an all ceramic three unit fixed partial denture (LAVA, 3M ESPE). A diagnostic cast was obtained from an Irreversible hydrocolloid (CA 37; Cavex, Haarlem, Holland) primary impression which was then mounted on a semi-adjustable articulator (Whip Mix series 3000; Elite Dental Services, Inc,

Orlando, Fla). Tooth preparation was done under local anesthesia for all ceramic restorations (Figure 1B,C). Definitive impression for maxillary arch was made using medium and light body addition silicone elastomeric impression material (Virtual Ivoclar Vivadent, Lichtenstein). A temporary fixed partial denture was fabricated from self-cure tooth colored denture resin (Success SD, Promedica Neumunster, Germany) which was cemented in place using a temporary cement (TempBondNT, Italy) (Figure 1D). The maxillary final impression was poured in dental stone recommended for CAD/CAM (BEGO/Germany). The master cast was then scanned using a laser scanner (Cynoprod Canada Inc. Listings, Montreal, Canada) and with the help of a software 1.3 EVLOTION (Cynoprod Canada Inc. Listings, Montreal, Canada), milling of Zirconia rectangular block for fixed partial denture were done. After a clinical trial of the milled fixed partial denture, shades of different teeth in different areas were selected (Vita 3D master, Compact, Vita, Germany). Conventional feldspathic porcelain VITA VM (R) 9 (VitaZahnfabric /Germany) was then fused to the Zirconia core. Occlusal adjustment was done during a porcelain trial following which glazed porcelain fixed partial denture was cemented in place using a resin cement (Relaxy XTM, UnicemAppliCap Resin Cement, 3M ESPE, Germany) (Figure 1E). The patient was asked to follow up the treatment outcome for a period of three months. The patient was satisfied with the outcome of the restoration.

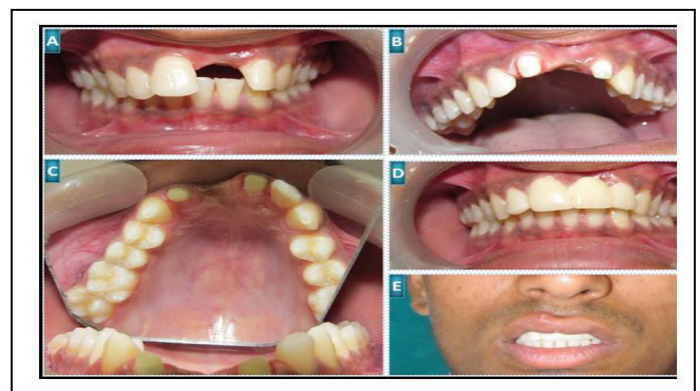


Figure 1: A) Intra oral view of missing left central incisor
B) Labial view of all ceramic tooth preparation
C) Palatal view of all ceramic tooth preparation
D) Temporary fixed partial denture
E) Definitive all ceramic fixed partial denture

DISCUSSION

This article describes a case of an adult boy with a missing central incisor in an otherwise healthy oral cavity with no sign of caries or periodontal disease. The only negative finding in the case being perhaps the bimaxillary protrusion due to which maxillary anteriors were flared, which in turn rendered the anterior guidance ineffective in terms of posterior disclusion during protrusion. There are various treatment options that can be done in such situations. The most ideal being an implant supported single crown, the advantage of which is the conservation of adjacent abutments. However, investment in terms of money and time renders such treatment least desired especially by youth. The patient in this case refused to implant treatment since he was not ready to wait for months till he sees results. Biomechanically, although the choice of implant was ideal, still we feel that the flaring of the anterior maxilla would have created esthetic problems with the replaced crown. Two further treatment options demand consideration, namely springs cantilever bridge and resin bonded bridge. Both were not considered since the patients age was less and the flaring of pontics in both cases would have imparted additional stresses on the cement tooth interface. A partial retainer (three fourth crown) as a retainer for a fixed partial denture was deemed to fail in terms of prosthesis longevity in young patients. Proclined maxillary incisors result in increased overjet and decreased overbite in natural occlusion. It is important that anteriors disclude posterior teeth during protrusion of mandible. Since maxillary teeth are placed far away from the fulcrum therefore horizontal forces in such cases are least damaging to the tooth. However, distribution of stresses to the anterior teeth is well resisted if the anteriors have the proper contacts between them. The present case lacked such contacts in the anterior region and the correction of them were possible only through the use of full crown retainers.

Digitization of building restorations with the use of computers and scanning methods has reduced the fabrication time for restorations. Traditional burnout machines which were less accurate has been replaced by precision technology. CAD/CAM fabricated zirconia restorations are accurate in terms of marginal discrepancy as they do not develop the shrinkage associated with conventional metal ceramic [12]. The case presented in this article is that of a young adult male who

had lost a front tooth due to which his facial esthetics were impaired. Restoring a missing central incisor with all ceramic fixed partial denture has many challenges. The first challenge is the diagnosis in terms of occlusal analysis. Other difficult procedures include shade selection (core, fused porcelain, multiple teeth), morphology and gingival contours [13]. The choice of using Zirconia reinforced ceramic is based on the evidence that the transformation toughened Zirconia is a successful alternative to other all ceramic systems [14]. For a short span fixed partial denture, the core material should have a high flexural strength. Any flexure of the underlying core breaks overlying fused ceramic and repair, then becomes impossible since porcelain cannot be added directly in the mouth. The Zirconia reinforced core ceramic has a flexural strength of 900 to 1200 Mpa, which permits it to withstand occlusal forces without flexing [15,16]. An important consideration for designing all ceramic fixed partial denture is the thickness of the connector between the pontic and the retainer [14]. This should be evaluated by the clinician during the try in of the coping. One should also know the difference in the cementation of Zirconia reinforced fixed partial denture [17,18]. Zirconia is basically a polycrystalline ceramic material without any glass phase, which renders acid etching prior to cementing useless [15]. Therefore, to gain mechanical areas for cement retention one should air abrade the coping with alumina oxide abrasive particles.

CONCLUSION

The use of all ceramic for short span fixed partial denture can be used in replacing a missing tooth provided existing occlusal conditions are favorable. Special attention needs to be given to the occlusal clearance between prepared tooth and the size of the connectors.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the efforts of various dental technicians of the college during the fabrication of the prosthesis.

REFERENCES

1. Pjetursson BE, Sailer I, Makarov NA, Zwahlen M, Thoma DS. (2015). All-ceramic or metal-ceramic tooth-supported fixed dental prostheses (FDPs)? A systematic review of the survival and

- complication rates. Part: multiple-unit FDPs. *Dent Mater.* 31 :624-639.
2. Brar A, Mattoo KA, Jain P. (2014). Designing Cantilever Prosthesis: A Case Study. *RRJoD.* 5: 5-9.
 3. Lucas LC, Lemons JE. (1992). Biodegradation of restorative metallic systems. *Adv Dent Res.* 6: 32-37.
 4. Heintze SD, Cavalleri A, Zellwegera G, Buchler A, Zappin G. (2008). Fracture frequency of all-ceramic crowns during dynamic loading in a chewing simulator using different loading and luting protocols. *Dent Mater.* 24: 1352-1361.
 5. Mattoo KA, Garg R, Gupta A, Jain N. (2012). Toxicology and biocompatibility of dental materials: A Review. *Res J Pharmac Biol Chem Sci.* 3 :1091-1099.
 6. Rosenstiel S, Land M, Fujimoto J. (2006). *Contemporary Fixed Prosthodontics.* 4th ed. St. Louis: Mosby Elsevier. 323-327.
 7. Mattoo KA, Brar A, Jain S. (2014). Utilizing resin cement to conserve the natural tooth structure in partial veneer retainers. *Med Res Chron.* 1: 110-114.
 8. Kumar S, Mattoo KA. (2010). Staining of a fixed partial denture to restore pre extraction self-image *JIDA.* 4: 573-574.
 9. Mattoo AK, Garg N. (2017). Significance of Anterior Guidance in Selection of Posterior Teeth. *J Dental Sci.* 2: 1-3.
 10. Mattoo KA, Singh M, Goswami R. (2014). "Resin Bonded Loop Connector Fixed Partial Denture – A Subtle Solution to Maintain Midline Diastema." *International Journal of Dental Sciences and Research.* 2: 168-170.
 11. Kumar L, Mattoo KA, Goswami R. (2017). Spring Fixed Partial Denture Designing. *Int J Med Res Pharm Sci.* 4 :1-3.
 12. Alhavaz A, Jamshidy L. (2015). Comparison of the marginal gap of Zirconia-fabricated copings generated by CAD/CAM and Copy-Milling methods. *Dental Hypotheses.* 6: 23-26.
 13. Prathyusha P, Jyoti S, Kaul RB, Sethi N. (2011). Maryland Bridge: an interim prosthesis for tooth replacement - a case report. *Int J Clin Pediatr Dent.* 4: 135-138.
 14. Wittneben JG, Robert FW, Weber HP, Gallucci GO. (2009). A Systematic Review of the Clinical Performance of CAD/CAM Single-Tooth Restorations. *Int J Prosthodont.* 22: 466-471.
 15. Della Bona A, Kelly RJ. (2008). The clinical success of all-ceramic restorations. *J Am Dent Assoc.* 139: 8-13.
 16. Tinschert J, Zvez D, Marx R, Anusavice KJ. (2000). Structural reliability of alumina-, feldspar-, leucite-, mica- and zirconia-based ceramics. *J Dent.* 28: 529-535.
 17. Filser F, Kocher P, Weibel F, Lüthy H, Schärer P, et al. (2001). Reliability and strength of all ceramic dental restorations fabricated by direct ceramic machining (DCM). *Int J Comput Dent.* 4: 89-106.
 18. Mattoo KA, Kapoor A, Sivach A. (2014). Selecting the right cement for cast post core crowns – a dental students Quandary. *J Med Sci Clin Res.* 2: 2323-2327.