Achieving Esthetic Perfection by Zirconia : A Case Report

Karishma Shori[1], Tony Shori[2], Deepa Shori[3], Rahul Chavan[4]

1- MDS (Prosthodontics), Private Practitioner, Nagpur. 2- MDS (Periodontics), Associate Professor, Department of Periodontics, VSPM's Dental College & Research Centre, Nagpur. 3- MDS (Conservative Dentistry & Endodontics), Professor & PG Guide, Department of Conservative Dentistry & Endodontics, VSPM's Dental College & Research Centre, Nagpur. 4- MDS (Periodontics), Private Practitioner, Mumbai.

Correspondence to:
Dr. Deepa Shori (MDS - Conservative Dentistry & Endodontics), Professor & PG Guide, Department of Conservative Dentistry & Endodontics, VSPM's Dental College & Research Centre, Nagpur-19.

ABSTRACT

Need for esthetic restorations have resulted in augmented utilization of dental ceramics for restoring anterior and posterior teeth. Earlier, use of all-ceramic restorations was limited only to the anterior teeth but now-a-days, they can be used for restoring any teeth either in the maxillary or mandibular arch. However, the traditional ceramics have certain drawbacks in their physical and mechanical properties. To overcome such shortcomings, newer ceramic materials and techniques have been established during past few years. Of these, Zirconia is one such modification. Alterations in the field of dentistry to lifelike restorations that parodist or imitate the natural tooth structure is unquestionable, and zirconia crowns are considered "cosmetic" or " beautifying '' in nature compared to other alternative crown materials that are used. Based on patient's esthetic demand, the choice of material to be used has vividly moved to "metal-free" wherever promising. This vivid movement is sarcastic, since dental zirconia is precisely an oxidized metal, considered metal-free, giving better esthetic results, thus fulfilling the need of the patient and the dentist. The current case report summarizes the use of Zirconia crown for achieving the best possible Esthetics.

KEYWORDS: Esthetics, Dentistry, Zirconia

INTRODUCTION

The advancement of new technologies for the creation of biomaterials has been inspired by the demand for materials, capable of bearing new specifications and applications. The use of ceramics as biomaterials started in the 1970's, and since then, a continuous improvement of these materials, in several applications, have been noted.[1,2]

Since few years ago, significant advances were obtained in the development of dental restoration techniques using implantation sys¬tems composed of ceramic materials, also called "metal free" systems. These materials exhibit advantages due to the exceptional performance of its serviceable properties, primarily aesthetic, bio-compatibility and chemical resistance. There is a tendency of replacing the metallic restoration substructure by reinforced ceramic materials, marking the prosthesis aesthetic enhancements.[1,3]

Ceramic materials based on alumina (Al_2O_3) and zirconia (ZrO_2) are used as materials of dental infrastructure due to their excellent properties, such as strength, corrosion resistance and biocompatibility.

Zircon has been known as a gem since ancient times. The name of metal zirconium, comes from the Arabic Zargon, which means golden colour. Zirconia, the metal dioxide (ZrO_2), was identified in 1789 by the German chemist Klaproth. Zirconium has a oncentration of about 130 mg/kg within the earth's crust and about 0.026 µg/L in sea water, though it is never found in nature as a native metal. Zircon is a by-product of the mining and processing of the titanium minerals ilmenite and rutile, as well as tin mining. Pure zirconia cannot be used in the fabrication of constituents, deprived of the addition of stabilizers.[1]

CASE REPORT

A female patient, aged 26 years came with the chief complaint of missing central incisors and protruded anterior teeth (Figure 1).

Figure 1 (Pre treatment Photograph)

Because of less bone in the anterior region orthodontic treatment was contraindicated. The patient was ready for all ceramic restoration in the anterior region for esthetic

How to cite this article:
Shori K, Shori T, Shori D, Chavan R. Achieving Esthetic Perfection by Zirconia : A Case Report. Int J Dent Med Res 2015;1(6):146-149.

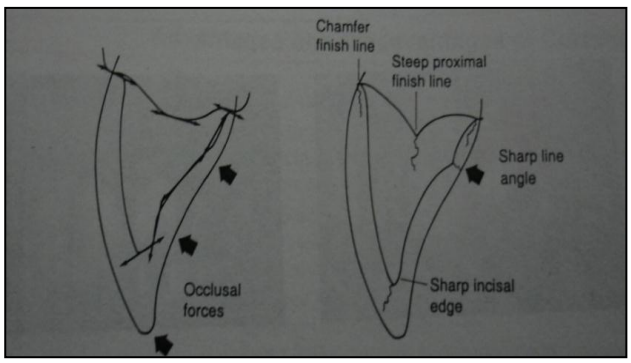
purpose. The crown lengthening was done along with osteotectomy. All ceramic preparations were done for the laterals and canine.

ALL CERAMIC RESTORATIONS

All ceramic restoration preparation is more conservative than porcelain fused to metal preparation as space for metal is not required. It is esthetically better than porcelain fused to metal because of its opaque property which is not there for metal. It requires a bevel shoulder preparations for labial, lingual, mesial and distal margins. All the line angles and point angles should be rounded off. The taper should be 5 to 15 degree.

The burs used for the preparation of the tooth are diamond cutting burs. We first break the contact with a tapered fissure diamond bur. Then we prepare the buccal lingual mesial and distal surface with a straight fissure and inverted cone bur. We prepare the occlusal surface with a disk shaped bur. The shoulder preparation is afterwards finished with a shoulder finishing bur. The shoulder should be prepared on all surfaces like buccal, lingual, mesial and distal unlike PFM in which, there is chamfer preparation on the lingual surface for the metal. The occlusal clearance should be 1.5 to 2mm. It is checked with the help of modelling wax sheet.[1,2] We place the sheet in the patient's mouth and ask the patient and if the clearance is sufficient the sheet won't perforate (Figure 1 to Figure 5).

Figure 2 (The background shines through the translucent zirconia)



CORRECT INCORRECT

Figure 3 (Ideal all ceramic preparation)

Figure 4 (Shoulder Margin Design)

Figure 5 (Tooth preparation done for all ceramic restoration)

Gingival retraction cords were placed for proper marginal impressions (Figure 6).

Figure 6 (Gingival retraction cords placed)

Figure 7 (Rubber base Impression made)

Figure 7 (Rubber base Impression made)

Temporary crowns were given to the patient (Figure 8). The scanning was done with a CAD/CAM machine and fed in the software. Zirconia copings try-in was done in patient's mouth (Figure 9). There are various materials used for coping, among which zirconia-based coping materials are widely recommended (Figure 10). These are prepared by milling machines (Figure 11).

Figure 8 (Temporary restoration)

Figure 9 (Try in)

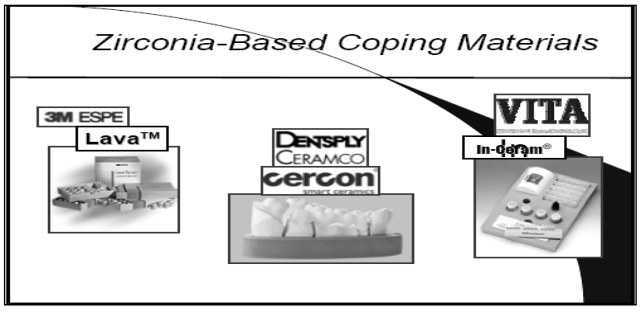


Figure 10 (Materials used for coping)

Figure 11 (Milling machine used to make zirconia coping)

After the coping is tried for fit in patient's mouth the porcelain layers are added on the zirconia coping. All ceramic crowns were cemented (Figure 12,13).

Figure 12 (Extra oral view)

Figure 13 (Intra oral view)

LUTING CEMENTS

Cement generally used for cementation of zirconia crown is dual cure resin bonded cement. First the crown has to be etched with hydrofluoric acid and then a silane coupling agent is applied and then air dried. The tooth surface should also be etched and bonded normallyas we do for light cure. Resin bonded glass ionomer cement and zinc phosphate can also be used for cementation. Compressive strength of zinc phosphate is 104 MPa, for glass ionomer it ranges from 53-96 MPa, for dual cure resin cement it ranges from52-224 MPa. Since the compressive strenght of dual cure resin is more than GIC and zinc phosphate cement, so dual cure resin bonded

cement should be the first choice for luting zirconia made restorations.[1,2,4]

DISCUSSION

Zirconium: It is a chemical element with the symbol Zirconium and atomic number 40. It is a strong transition metal that resembles titanium. It is never found as a innate metal, but as a substitute, obtained mainly from the mineral zircon, which can be purified by chlorine. It was first isolated in an impure form in 1824 by Jöns Jakob Berzelius. It forms both inorganic and organic compounds like zirconium dioxide and zirconocene dibromide, individually.

Zirconium dioxide appears as a monoclinic, cubic or tetragonal polymorph. At room temperature only the monoclinic ZrO2 exists. This phase is stable up to 1170°C when it inverts to a tetragonal, metastable phase, whereas above 2370°C it turns into a cubic

Characteristics : Zirconium is a lustrous, grayish-white, soft, ductile, and malleable metal. Highly resistant to corrosion by alkalis, acids, salt water, and other agents. Melting point of is 1855°C **.** Boiling point is 4409°C.

High flexural strength - more than 1000 MPa. Hardness - 1200–1400 Vickers. Weilbull modulus of 10–12.

General Uses: Used as an alloying agent. Zirconium dioxide (ZrO_2) is used refractory material. Zircon ($ZrSiO_4$) is cut into gemstones for use in jewellery. Used as nuclear reactors, space vehicle parts for their resistance to heat**,** some abrasives and sandpaper, weapons, kitchen knives**,** industrial cutting tools**,** aviation and car manufacturing.

Uses in Dentistry: Zirconium dioxide (ZrO2) – zirconia –is used in dentistry to produce prosthodontic restorations, endodontic posts, reconstruction with Zirconia Implants and Zirconia Crowns.

Advantages: The painstaking steps of waxing, casting and metal finishing are transferred to the milling centre for processing. No die spacer or die hardener is preferred for the scanning process. Spend more time preparing cases as they come into the laboratory, as well as veneering and finishing steps. There is no distortion of the framework when it is fired in the porcelain oven. Zirconium ceramic does not react to protein in saliva. Plaque does not accumulates on the surface of these crowns.

Limitations: 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 with your case to achieve your restorative goals. It is a very hard substance to adjust.[3,4,5]

CONCLUSION

Considering the patient's age, gender, profession and her interest and awareness out of all the metal free restorations available we chose zirconia restoration considering the advantages. The treatment fulfilled patient's esthetic and functional demands and boosted her confidence towards life.

REFERENCES

1. Babic JZ, Carek A, Jakovac M. Zirconium Oxide Ceramics in Prosthodontics. Acta Stomatol Croat 2005;39(1):25-28.
2. Diego AA, Santos CD, Landim KT, Elias CN. Characterization of Ceramic Powders Used in the InCeram Systems to Fixed Dental Prosthesis. Mater Res 2007;10(1):47-51
3. Jun IK, Koh YH, Song J, Lee SH, Kim HE. Improved compressive strength of reticulated porous zirconia using carbon coated polymeric sponge as novel template. Material Letters 2006;60:2507-2510
4. Bilton B. Introduction to Zirconia Powder Market. http//www.cfcl.com.au Cited: 29 February 2008
5. Brian L. Edelbach, A. K. Fazlur Rahman, Rene J. Lachicotte, William D. Jones. Carbon-Fluorine Bond Cleavage by Zirconium Metal Hydride Complexes. Organometallics 1999;18:3170-3177

Source of Support: Nil
Conflict of Interest: Nil