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CASE REPORT

RESTORING ANTERIOR ESTHETICS WITH ZIRCONIA - A CASE REPORT

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ABSTRACT:
The esthetic and functional rehabilitation of a missing anterior tooth is one of the greatest challenges that the dentist faces. Generally accepted treatment modalities include implant-supported prosthesis or fixed dental prosthesis. Recent advances in technology and dental materials have prompted the use of all-ceramic crowns which offers the potential for improved aesthetic results compared to conventional ceramo-metal crowns. Silica/glass-based all-ceramic crowns are more translucent and have better optical properties. However, they are mechanically weaker and need to be used in conjunction with resin bonding cements. To overcome such shortcomings, newer ceramic materials like Zirconia have been established during past few years which have better mechanical and optical properties. This case report summarizes the use of Zirconia crown for achieving the best possible esthetic rehabilitation of a missing upper right central incisor in a 35 year old female patient.
Key words: Zirconia, transformation toughening, metal free ceramics.

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INTRODUCTION:

Over the past two decades, dentistry has seen the development of many new all-ceramic restorative systems. The drive for such materials and restorative techniques has been precipitated by patient expectations for excellent esthetic results and also by concerns about the biocompatibility of metals intraorally. Ceramic materials based on alumina and zirconia are used as materials of dental infrastructure due to their excellent properties, such as strength, corrosion resistance and biocompatibility.

Three different materials were developed for use in dentistry. The first two ceramics are materials with at least two ZrO2 t- phases as a minor phase and the latter is essentially a t-ZrO2. Although many types of zirconia-containing ceramic systems are currently available, only three are used to date in dentistry. These are yttrium cation-doped tetragonal zirconia polycrystals, magnesium cation-doped partially stabilized zirconia and zirconia toughened alumina.

This case report is of a 35 year old female patient who reported to our department with complaint of clinically missing upper right central incisor. Due to the unwillingness of the patient to experience invasive implant surgery, fixed partial denture was suggested. Prosthetic rehabilitation of an upper right maxillary central incisor was done with Zirconia all ceramic (Lava) partial denture.

CASE-REPORT:

A 35 year old female patient reported to our department with chief complaint of missing upper right central incisor (Figure: 1). Fixed partial

denture with Zirconia was planned. Before tooth preparation, occlusion was analyzed. Shade selection was carried out in a properly lighted environment to match the adjacent normal teeth using Vitapan Classic shade guide.

The burs used for the preparation were diamond cutting burs. After breaking the contact with a tapered fissure diamond bur, 1.5-2 mm incisal reduction, 1.0-1.5 mm lingual reduction, 1.0-1.5 mm labial reduction was done. Care was taken to give rounded internal line angles with no sharp edges or undercuts. Shoulder with rounded internal angle was given as finish line. Taper of 5 to 15 degree was given. Occlusal preparation is done with a disk shaped bur. The occlusal clearance of 1.5 to 2mm was done which was checked with the help of modelling wax sheet. Gingival retraction cords were placed for proper marginal impressions. After gingival retraction, impression was taken by putty wash technique with addition silicone material (Figure: 2).

Figure 1: Pre-operative photograph

Figure 2: Tooth preparation

Figure: 3 – Post-operative photograph

Temporary crowns were given to the patient. After a week, temporary crown was removed and zirconia bridge was cemented with resin cement after checking fit and aesthetics. Final results were satisfactory and patient was quite satisfied with the appearance (Figure 3).

DISCUSSION:

All-ceramic crowns belong to one of two families:

1. Non-etchable, alumina- or zirconia-based systems - Their strength is not significantly affected by the cement used and can be used with either a conventional cement or a resin cement. Examples include: Procera (NobelBiocare, Sweden), Lava (3M ESPE, Minn, USA), In-Ceram (Vita, Germany), Zircon (DCS, Switzerland).
2. Etchable silica/glass based systems - Their strength is increased significantly by etching and use of a resin bonding and should always be used with a resin bonding cement. Examples include: IPS Empress and IPS e.Max (Ivoclar Vivadent, Lichtenstein), Authentic (Jensen, CT, USA), Finesse (DENTSPLY Ceramco, PA, USA), traditional feldspathic porcelain.[1]

The zirconia material typically used today by most manufacturers is a tetragonal polycrystalline zirconia, partially stabilized with yttrium oxide. Zirconia has high biocompatibility and no local (cellular) or systemic adverse reactions to the material were reported.[2] 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. It has high flexural strength of more than 1000 MPa, Hardness of 1200–1400 Vickers.[3]

During the manufacturing process, a stabilising agent, yttrium oxide (Y2O3) is added to zirconium oxide and the resultant Y-TZP exhibits excellent material properties for clinical application by, resisting fracture by a process termed 'transformation toughening', whereby any stress fractures created within the material cause a transformation of configuration of the zirconia to another one of its three forms, thereby minimising crack propagation.[4]

Zirconium dioxide (ZrO2) or zirconia is used in dentistry to produce prosthodontic restorations, endodontic posts, reconstruction with Zirconia Implants and Zirconia Crowns. Zirconia based ceramic restorations are widely used for anterior and posterior fixed partial denture. Tooth reduction

is less than that for PFM or traditional all-ceramic crowns because zirconia is very strong (>1000 MPa) and no opaque layer is required. Also, the handling is very similar to PFM and easier than glass ceramic restorations. The tooth-colored framework allows supra-gingivial margins with easier handling, easier preparation control, easier impressioning and easier cementation. Because the restorations are metal-free, darkening at the margin is no issue. Even after long clinical service or periodontal therapy, tooth-colored zirconia margins stay unremarkable. This makes it easy to maintain optimal gingival esthetics.

Guidelines such as occlusal convergence, rounded internal and external line angles in tooth preparation enhances longevity of zirconia based restoration. Zirconia based crowns can be cemented with traditional cements or with adhesive resin cements. Preparation of zirconia internal surface before cementation found to be necessary for better adhesion with the tooth. Self-adhesive resin cements offer less technique sensitivity than traditional cements, making them excellent choices for the cementation of zirconia-based ceramic restorations. When additional retention is required adhesive resin or dual-cured esthetic resin cementa are recommended.

Based on the exceptional mechanical properties of zirconia, Y-TZP is the most recent framework material for the fabrication of all-ceramic FPDs either in anterior or posterior sites. The load bearing capacity of Y-TZP FPDs was found to be significantly higher than other conventional all-ceramic systems, such as lithium-disilicate glass ceramics and zirconia-reinforced glass-infiltrated alumina and it has been reported that fracture resistance was further increased after veneering.[5]

CONCLUSION

In dentistry, zirconia has been indicated and used for making crowns, bridges, abutments and implant prosthesis infrastructures. The introduction of stabilized zirconia has created a real possibility and promise for the application of ceramics in dental reconstructions. Several positive characteristics of zirconia, such as biocompatibility, color and mechanical properties, make the material suitable for use in modern dentistry. However, ceramic bonding, ageing, light transmission and manufacturing processes need to be further evaluated.

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