**Esthetic Rehabilitation using Zirconia-Based All-Ceramic Crown – A Case Report and Review of Literature**

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### ABSTRACT

The dental practice is not only about prevention and treatment of oral diseases but also the fulfillment of demands of all who seek oral care, of which esthetics weighs more importance than any. To achieve excellence in the delivery of dental care, dentists rely on the vast array of modern advances in dental materials and restoration fabrication technologies. Need for more esthetical, metal-free and biocompatible material as restorative materials have led to the development of all-ceramic systems. Modern technology has enabled the all-ceramic systems to replace the cast metal alloy core of crowns used in the past. Zirconia ceramic crowns have the added advantages of superior esthetics, biocompatibility, and excellent mechanical properties. With the help of digital technology, zirconia ceramic systems have improved accuracy and marginal integrity thus enhancing the esthetics of the crowns. Zirconia-based fixed partial dentures can be used either as a single tooth or multi-unit prosthesis by virtue of the reliable properties of the material. This case report elaborates the placement and follow-up of zirconia-based all-ceramic crowns in relation to all non-vital maxillary incisors in a 22-year-old male patient following a road traffic accident.

**KEYWORDS:** Dental ceramics, Dental esthetics, Fixed partial denture, Traffic accident, Zirconia

### INTRODUCTION

Zirconia, the crystalline dioxide of zirconium as identified by German chemist ‘Martin Heinrich Klaproth’ in 1789 has properties as same as that of metals and has near comparable color as that of the tooth. By virtue of its superior mechanical properties, zirconia has been called as ‘ceramic steel’ as its mechanical properties are as same as that of stainless steel. Zirconia is used in dentistry as it forms a strong and rigid framework material in the fabrication of either single unit or multi-unit fixed partial prosthesis.

To maintain the quality of life, esthetics forms an essential component of any restorative material. The highly esthetic nature, superior mechanical properties, and biocompatibility of zirconia-based all-ceramic systems have made it possible not only to replace the metal-based restorations but also to meet the needs and demands of patients seeking oral care.

This report elaborates a case of the prosthetic rehabilitation done using zirconia-based all-ceramic crowns on all non-vital maxillary incisors of a patient who suffered a road traffic accident.

### CASE REPORT

A 22-year-old male patient who suffered a road traffic accident was brought to the Accident & Emergency Department. After investigations, the Medical officer had ruled out all possible injuries and fractures to the craniofacial area. Then the patient was referred to Dental Out-Patient-Department with the only possibility of dento-alveolar fracture. The patient complained of pain and mobility in relation to all upper front teeth region. On examination, it was found that the patient had multiple lacerations on lower lip and Grade II mobility in relation to all maxillary incisors. Following which an Orthopantomograph (OPG) was taken which showed no signs of luxation or any other fractures.

The patient was assessed and evaluated monthly for 3 months. After 3 months, pulp vitality test was carried out which showed that all the maxillary teeth were non-vital. Thus root canal therapy (RCT) was done in relation to all the maxillary incisors. As only one-third of the incisal portion of the crown was fractured in relation to both right and left maxillary incisors (**Figure 1**), so it was decided to do the only crown replacement. As the patient had higher demands for esthetics, zirconia-based all-ceramic crowns (Lava Premium 3M ESPE) were used for the restoration of the crown structure (**Figure 2**). The patient was recalled after a week for evaluation.
Review of Literature: Polack MA (2006)\textsuperscript{11} have reported of restoring maxillary incisors with the zirconia-based Lava system and have described the procedures involves in the fabrication. Madan N and Pannu K (2011)\textsuperscript{12} too had reported a case of prosthetic rehabilitation with Lava all-ceramic system in relation to the maxillary anterior region for the restoration of esthetics and functionality. Both the reports concluded the same success of the zirconia-based system in terms of esthetics.

In a case series as reported by Kollar A et al. (2008)\textsuperscript{13} in which fifty-two patients who received non-silica-based high-strength full ceramic crowns and short-span fixed partial dentures were evaluated for a period of 12 to 30 months, concluded that zirconia material could be used for various prosthodontic indications. Edelhoff D and Brix O (2011)\textsuperscript{14} reported improved functional and esthetic results with all-ceramic restorations even in severely discolored teeth.

Following a 3-year follow-up prospective clinical trial by Schmitt J et al. (2010)\textsuperscript{15} who evaluated 19 single unit zirconia crown restorations in relation to anterior maxillary region among ten patients, reported 100% survival and success rate. In a randomized prospective study conducted by Peláez J et al. (2012)\textsuperscript{16} evaluated the clinical performance of twenty 3-unit posterior fixed dental prostheses using zirconia (Lava) systems among 17 participants and at the end of 3 years it was concluded that all the restorations had a satisfactory rate of performance and compatibility to periodontal structures.

Monaco C et al. (2013)\textsuperscript{17} conducted a retrospective cohort study to assess the outcomes following placement of 1,132 zirconia-based single crown restorations among 398 patients treated over a period of 5 years. The study concluded that the cumulative survival rate was 98.1\%, and the cumulative success rate was 94.3\% for all the restorations placed. Ashima G et al. (2014)\textsuperscript{18} reported a case treated with ready-made zirconia crowns for extensively decayed primary maxillary primary incisors. The evaluation was carried over a period of 30-months, following which it was concluded that the crowns had an excellent retention and were esthetically satisfying.

Agrawal M et al. (2012)\textsuperscript{19} had reported of a complete mouth rehabilitation using zirconia-based all-ceramic crowns in a case with completely worn dentition and altered occlusal vertical dimensions, in which results obtained following the treatment were quite satisfying. Nam J and Tokutomi H (2015)\textsuperscript{20} too had reported a similar successful full-mouth rehabilitation treatment in terms of esthetics, functionality, and biomechanics for a worn dentition.

A systematic review conducted by Heintze SD and Rousson V (2010)\textsuperscript{21} concluded that the three-year survival of zirconia-based fixed partial dentures was 90\%. Based on the results a systematic review conducted by Raigrodski AJ et al. (2012)\textsuperscript{22} suggested that zirconia-based all-ceramic systems may replace the metal-ceramic fixed partial dentures for rehabilitation in relation to

DISCUSSION

Zirconia-based all-ceramic restorations provide with a better alternative to metal-based restorations due to its excellent clinical performance by virtue of its highly esthetic nature, superior mechanical properties, and compatibility with the oral tissues.\textsuperscript{6,8} Properties that make zirconia the material of choice for fabrication of crowns in fixed partial prosthesis are the esthetic nature, high mechanical strength (Resistance to traction = 900 – 1200 MPa; Compression resistance = 2000 MPa), toughness, corrosion resistance, resistance to altering temperatures and excellent compatibility.\textsuperscript{9,10}
anterior as well as the posterior region. Recent systematic reviews have concluded that the five-year survival rates for tooth-supported zirconia-based all-ceramic crowns range from 93.5% – 95.9% and for implant-supported zirconia crowns ranges from 97.1% – 100%.23,24

Koenig V et al. (2013)25 after retrospectively evaluating 147 zirconium-based tooth-supported and implant-supported fixed partial dentures over a period of 9 years concluded that the common failure associated with zirconia-based restorations was chipping. Results of a recently conducted systematic review by Koenig V et al (2015)25 concluded that the most common complication associated with tooth-supported and implant supported zirconia-based fixed partial dentures was veneering material fracture.

There is sufficient evidence in the literature about the high success rates obtained following treatment carried out using zirconia-based all-ceramic systems. This report based on a case of prosthetic rehabilitation using zirconia-based all-ceramic adds to the existing literature on the successful treatment after 2-years. Owing to its properties zirconia-based restorations holds a promising future in restorative care as it enhances the quality of life of an individual.

CONCLUSION

Zirconia-based all-ceramic restorations are reliable suggestive alternatives to metal-based restorations due to its superior mechanical and biological properties. The performance of zirconia-based systems depends on a number of factors such as selection of patient cases, clinician’s skill and adherence to technological protocols, which when coupled together results in a successful treatment outcome. Further research to overcome the shortcomings of this zirconia-based material and long-term evaluation of the same is recommended to ensure a perfect treatment option for patient seeking oral health care.

REFERENCES


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