Aesthetic Restoration of Traumatized Deciduous Anterior Teeth Using Custom Fabricated Zirconia Crowns - A Case Report

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INTRODUCTION

Loss of anterior teeth in children can adversely affect the aesthetics, decrease masticatory efficiency, cause speech disturbance and result in the development of parafunctional habits and psychological problems. There are various complete crown coverage restorations like polycarbonate crowns, stainless steel crowns (SSC), open-faced SSC, commercially veneered SSC, Figaro crowns and Zirconia crowns. The superior aesthetics, inertness, and biocompatibility of ceramics have made them acceptable as a dental restorative material by clinicians. Zirconia ceramics have become a frequently employed biomaterial in dentistry due to their enhanced aesthetics and mechanical properties.

The aesthetic management of decayed and traumatized deciduous anterior teeth using complete coverage restoration in children is strenuous owing to their limited size, proximity to the pulp, decreased surface area for bonding, teeth isolation difficulties and lack of cooperation. Structural loss of anterior teeth affects aesthetics, impairs mastication and phonetics, causes erosion disturbance of permanent teeth and leads to the development of non-nutritive habits. This may result in a psychosocial crisis in the patient including reduced self-esteem.

Full coronal restorations like polycarbonate crowns, strip crowns, and modifications of stainless-steel crowns including the open-faced and pre-veneered crowns are being used by clinicians to restore discoloured incisors. However, they are often associated with technical, functional, or aesthetic limitations. Over the past decades, advancement in different technologies in the sphere of dentistry and the immense booming of dental materials have always resulted in a continuous reassessment of different treatment principles so employed. Paediatric zirconia crowns were introduced in 2010 and have gained popularity for aesthetic considerations.[1] Zirconia crowns are clinically justifiable and with greater parental gratification when compared with other full coverage coronal restorations. Zirconia crowns express high strength, aesthetics, durability, biocompatibility, reduced wear of opposing teeth, and cause less gingival irritation.

PRESENTATION OF CASE

A boy of 3 years of age, accompanied by his parents addressed to the Department of Paediatric Dentistry with the chief complaint of pain in relation to upper front teeth. He suffered from a fall a few months back and the parents observed the discoloration of teeth from white to a dark yellow over a period of time and for which treatment was initiated in an outside clinic.

The medical history of the child was non-contributory and there was no significant habit history or bruxism. The intraoral periapical radiograph of 51 and 61 revealed periapical changes and an emergency access opening was performed.
Once the symptoms subsided, obturation was done using endoflas and permanently restored with GIC. Since a sufficient amount of tooth structure prevailed and parents were aesthetically demanding, a zirconia crown was opted for a full-coverage restoration. Diet counselling and oral hygiene instructions were advised, and oral prophylaxis was performed. This was followed by the removal of root canal filling material by less than one-third of the canal length and was finally sealed using glass ionomer cement.

An occlusal clearance of about 2mm was provided by the reduction of the incisal edge. A two-plane reduction was done on the labial surface, thereby, following its anatomical contour. The adjacent teeth were considered for reducing the proximal surfaces and thereby creating parallel mesial and distal walls. The subgingival preparation extended 1-2 mm subgingivally with feather-edge finish margins. Sufficient reduction of the cingulum was carried out on the palatal aspect. Tooth preparation was done to adapt to the zirconia crown as crumbling of zirconia crowns was restricted completely and as it demanded a passive fit. Occlusion was checked to ensure there is adequate clearance from opposing dentition and the shade selection was done. Maxillary and mandibular arch impressions were taken using alginate and cast poured. The custom-made zirconia crowns were ensured for their passive fit and cemented using Type 1 glass ionomer cement. The importance of diet and oral hygiene maintenance was reinforced. The parents were also instructed to maintain the recall visits. The wear of the opposing teeth due to the zirconia crown was evaluated during these subsequent visits. No wear of the opposing dentition was noticed during this period.

**DISCUSSION**

The greatest dilemma is choosing the best treatment modality for a particular patient and the clinical scenario depends on various factors like the age of the patient, parental motivation, the child's behaviour in the dental clinic and the socio-economic status of the patient. Over the last two decades, there is an exponential increase in the aesthetic demands by parents when concerned with the rehabilitation of their child's carious or traumatized teeth. Resin strip crowns, polycarbonate crowns, and stainless steel crown modifications, including the open-faced crowns and pre veneered crowns have been indicated as alternatives for the anterior preformed metal crown. Each of these restorations has inherent advantages and disadvantages.

Open-faced stainless-steel crowns are durable and esthetic however, the technique is time-consuming and requires additional preparation and the use of multiple materials.[5] Also, poor gingival health, haemorrhage of gingival tissue and visibility of metal margin around composite remains an issue.[3] Pre-veneered or resin veneered crowns can be placed in a single appointment, requires reduced chairside time and are aesthetically appealing. But they tend to chip off when subjected to occlusal forces as they are not flexible and are brittle. The main drawback of bonded celluloid strip crowns is technique sensitivity and low colour stability, though they are aesthetic. Another treatment modality for aesthetic full coverage coronal restoration is the use of biological crowns obtained from extracted primary teeth. The need for a tooth banking system, donor and recipient agreement, technique sensitivity and the mandatory requirement of a cross infection prevention protocol possess a greater challenge to this technique. The choice of the restorative material is dependent upon various factors which include the dentist's choice, aesthetic demands raised by parents, the child's behaviour, and moisture and haemorrhage control possible in the operating field.

Zirconia crowns are also called "ceramic steel" and they possess enhanced aesthetics and strength and are comparable to that of the available metal crowns. They are frequently applied for the restoration of permanent teeth in various forms like crowns, fixed partial dentures, implant abutment, inlay, onlay, CAD/CAM etc. They have become the better choice for dentists who aim to provide their patients with the most technologically advanced metal-free dental restorations. The wider array of available milling puck allows greater shade translucencies that closely resemble natural teeth. Zirconia is a crystalline dioxide form of zirconium. Zirconia crowns impart higher strength and possess low conductivity of heat and thermal expansion, imparting them a thermostable nature. Cyclical stresses are also well tolerated by this extremely biocompatible material.[4] The well-polished surface provided by zirconia prevents the accumulation of plaque, debris, and staining. The tooth preparation for zirconia crown consumes more time and the crown cannot be altered at will. It cannot be cramped like a conventional stainless-steel crown and demands a passive fit onto the tooth. The thickness of paediatric zirconia crowns is more than preformed metal crowns and the subgingival preparation required for the same affects the periodontal health of the child. Oral hygiene maintenance of the patient after the crown cementation also influences periodontal health. The opposing tooth wear due to the zirconia crown should also be considered. Although several in vitro and in vivo studies have recommended that ceramic crowns result in more wear on the opposing dentition, no hastened attrition wear of the opposing tooth was observed in our case report.

A good balance of strength, precision, and translucency allows zirconia-based restorations to accommodate a variety of clinical situations.[5] However, a prolonged follow up is mandatory to assess the durability, abrasive effect and fracture resistance and retention of the zirconia crowns when used as full coverage restorations.
Zirconia crowns show promising clinical results in restoring anterior teeth. CAD/CAM technology in the manufacture of Zirconia has become a reality in a dental practice that demonstrates important physical and mechanical properties of high strength, adequate fracture toughness, biocompatibility and greater aesthetics outcome.

REFERENCES