Enhanced aesthetics with metal-free ceramics and post systems—case reports

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INTRODUCTION

With an increasing interest in aesthetics and concerns about toxic and allergic reactions to dental alloys, both patients and dentists have been looking for metal-free tooth-coloured restorations. Failures of traditional cast metal post restorations are caused mainly by root canal fracture due to the very different modulus of elasticity of the tooth structure and cast metal post. The range of indications for a cast metal post-and-core system as an indirect prosthodontic procedure, indeed, has recently become smaller. Nowadays, metal-free posts have been introduced for post-and-core endodontic restorations.¹ Their dramatically different physical properties allow them to dissipate compressive, tensile, and shear stress, rather than transferring and concentrating excessive loading in the residual root structures as with metal posts.²

One of the modern metal-free posts is the glass-fibre post. This paper illustrates a technique for rehabilitation of an endodontically compromised tooth with a glass-fibre post and an 'all ceramic crown'.

CASE REPORT 1

A 32-year-old male reported with a chief complaint of fractured upper left front tooth with unsightly smile.

History of presenting complaints revealed traumatic injury in relation to 22 one year back. He underwent root canal treatment of 22 seven months back. Medical and personal history was non-contributory to the case. On smile analysis patient had a youthful smile with consonant smile arch. On smiling there was complete display of cervico-incisal length of maxillary anterior teeth along with interproximal gingiva which

gave an impression of optimal lip line. No gross abnormality was detected on extra-oral examination. Intra-oral examination revealed fractured 22 at the junction of cervical and middle third. Extrinsic stains were present in anterior teeth (Figure 1). Patient had full complement of teeth with no signs of any parafunctional habits. Occlusion of the patient was canine guided on both sides on pre-operative intra-oral examination. No other hard and soft tissue abnormalities were detected. Radiographic evaluation showed well-obtured root canal in relation to 22. Various treatment options were considered and treatment plan was formulated in accordance with the patient wish, which included the restoration of 22 with glass-fibre composite post, composite resin core, and all ceramic crown.

Treatment sequence started with shade matching at the pre-operative appointment. Removal of root canal filling was done leaving 4 mm of apical filling to maintain good apical seal and post space preparation was done with the help of Gates Glidden drill. Post system utilised was radiopaque and translucent glass-fibre reinforced composite post from RelyX™ Fiber Post (3M ESPE, USA). Size of the post selected was 0.70 mm in diameter at the apical end and 1.30 mm in diameter at coronal end with 3.44° of taper. Silane coupling agent was applied on fibre reinforced composite post and canal was prepared by etching and priming. Canal and glass-fibre post were coated with dual-cure adhesive resin cement and post was seated in to the canal. Cement was polymerised using light-cure unit. Translucent post allows light transmission to luting agent. Core was built up by composite resin. Tooth preparation was done, 1.5–2 mm of incisal reduction, 1–1.5 mm of labial and lingual reduction, 1–2 mm of axial reduction, and 1 mm deep shoulder margin.

Figure 1 Case 1: pre-operative view.

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Gingival retraction was done mechanically by using ultradent retraction cord. Full mouth impression was made and working cast was prepared on which all ceramic crown was fabricated. Pressable ceramic system (IPS e.max Press, Ivoclar Vivadent AG, Schaan) was used for the fabrication of all ceramic crowns, which included fabrication of coping with lithium disilicate glass-ceramic ingots and layering it with feldspathic porcelain. The firing cycle followed was as per manufacturer's instruction. The result was a crown with all the requisite translucency and shade matching with the adjacent central incisor (Figure 2). This crown was cemented to the tooth with the dual cured composite resin cement.

CASE REPORT 2

A 35-year-old female patient reported with a chief complaint of poor appearance due to discoloured filling in left upper front teeth.

History of presenting complaint revealed traumatic injury in her upper front teeth region two years back following which her upper front left teeth became discoloured. Endodontic treatment was performed one year back for 21, 22 and later on direct composite veneers was done in relation to 21, 22, and 23. Recurrent dislodgement and discolouration of these composite restoration occurred. Now the patient has reported to our department to replace these restorations to enhance her aesthetics.

Intra-oral examination revealed full complement of dentition with discoloured composite restoration in relation to 21, 22, and 23 (Figure 3). The anatomic form of the direct composite veneers was unsatisfactory. Composite veneers in relation to 21, 22, and 23 were interconnected in the interdental region leaving no embrasure space leading to unaesthetic appearance. No other hard and soft tissue abnormality detected. Radiographic evaluation showed well-obtained root canals in relation to 21, 22.

Various treatment options were considered keeping in view of patient's wish to receive a restoration of more life-like appearance. Treatment plan was devised which included restoring

21 and 22 with all ceramic crown as both were endodontically treated and restoring 23 with porcelain laminate veneers as 23 was a vital tooth hence partial coverage restoration was chosen over full coverage restoration to conserve the tooth structure. At the pre-operative appointment shade selection was performed. Tooth preparation for all ceramic restoration in relation to 21 and 22 and porcelain laminate veneer preparation for 23 were done keeping in view all the principles of biomechanical tooth preparation. Tooth preparation of 23 included reduction of 0.5 mm on facial and mesial surfaces following the anatomic contours of tooth. Long chamfer margin was placed. Proximal margin was placed lingually to the mesial contact area to include the existing composite restoration. Gingival retraction was done and putty wash impression technique was used for making final impression using polyvinyl siloxane impression material. Cast and die was prepared on which all ceramic crown and porcelain laminate veneers were fabricated using pressable ceramic system as described in the previous case. Restorations were luted with dual-cure resin luting agent (RelyX Unicem®, 3M ESPE, USA). Patient was pleased with the life-like appearance of her new crowns (Figure 4).

Figure 3 Case 2: pre-operative view.

Figure 2 Case 1: postoperative view.

Figure 4 Case 2: postoperative view.

DISCUSSION

The development of reinforced ceramics and non-metallic post systems made possible the generation of metal-free ceramic restorations in severely compromised anterior and posterior teeth. Various treatment options advocated for endodontically treated fractured and discoloured teeth are to restore it with either a custom made cast post-and-core or prefabricated post system if required and later rehabilitate it with porcelain fused to metal restoration or use more aesthetic material like all ceramic crown. As both patients aesthetic demands were high, the treatment option chosen was a more aesthetic all ceramic restoration. As the first case required post-and-core restoration, glass-fibre post and a composite core was used since using metal post system may lead to discolouration and shadowing on the gingival and cervical areas of the tooth. These metal-free post systems are capable of resisting occlusal loads and have light transmission characteristics similar to those of natural teeth hence giving more aesthetic and life-like appearance.³ The translucent glass-fibre post has a modulus of elasticity similar to that of dentin and offers adequate mechanical properties. Transmission of light through the post also makes it possible to light-cure the resin cement and the bonding system in only one clinical step, thus simplifying and shortening the clinical procedure. In the current cases, we have used a dual-cure adhesive resin luting agent and a glass-fibre-reinforced composite post. This technique can reinforce the restored parts, and probably, increase durability and survival. The results of in vitro and in vivo studies indicate that glass-fibre post restored root will be less prone to fracture because fracture risk of composite core and post were higher than those of root.⁴ With a modulus of elasticity similar to dentin, the fibre post can reduce the concentration of stress and thus the rate of catastrophic root fracture compared with cast posts.⁵ Non-metal posts can be used when coronal dentin remains and the crown is well supported by the remaining tooth structure. A small percentage of the population is hypersensitive to dental alloys containing noble and base metals, such as palladium and nickel. Metal-free ceramic systems also eliminate this problem.

All ceramic restorations are contraindicated when there is lack of required dimensions for the prospective connector resulting from restricted interocclusal distance, prospective abutment mobility, or severe parafunction. The other limitation is the lack of long-term clinical data on the success of these restorations.

There are many quality post-and-core options available to clinicians today. When faced with the prospect of performing aesthetic restorative dentistry that simultaneously requires endodontic support, the characteristics of the individual case will guide the clinician in choosing the most appropriate foundation for the restoration. Specifically, clinicians must take into account the patient's overall endodontic and periodontal condition, root length, and histological structure of the devitalised tooth. The aesthetic continuity of smile designs can be ensured when aesthetic glass-fibre posts are placed to support all ceramic restorations.

CONFLICTS OF INTEREST

None identified.

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