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Case Report

Improving aesthetic of a cast cobalt chrome partial denture with custom made porcelain tooth: a case report

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Abstract Replacing a single missing anterior tooth can be a challenge. Many factors need to be considered when choosing the appropriate treatment. Several treatment options are well established. This case report is to present the use of a cast cobalt chrome partial denture with custom made porcelain tooth to improve aesthetic. The overall shade of the artificial tooth were nicely matched with the adjacent teeth and definite enamel translucency could be achieved which would not be possible with acrylic or even with readymade porcelain tooth.

Keywords: missing tooth, partial denture, porcelain

Introduction

Replacing a single missing anterior tooth in the aesthetic area can be a challenge (Lyssova *et al*., 2008). Among the factors that need serious attention are shades matching with adjacent teeth, emergence profile, and status of the remaining alveolar bone and conservation of tooth structure. Several treatment options namely implant-retained crown (Schmitt and Zarb, 1993), conventional bridge, resin-bonded bridge (Cakan *et al*., 2009), fibre-reinforced bridge (Husein and Berekally, 2005) and removable partial denture are well established. Although it is generally accepted that implant-retained crown is the best and the most appropriate treatment option if the adjacent teeth are sound, adequate presence of alveolar bone at the potential implant site is crucial. Otherwise, some form of augmentation is needed that requires extra procedure and cost. In this instance, treatment procedure will also be prolonged that could be unacceptable to some patients. While replacing missing teeth with fixed partial denture (FPD), the procedure requires some form of tooth structure removal that is considered irreversible and not conservative; moreover, the cost of the FPD is considerably high compared with removable partial dentures (RPD). Therefore, in some cases, RPD to replace the missing teeth might be a better choice. However, one of the problems with the above option is the difficulty of matching the shade of the prefabricated denture tooth with the adjacent teeth, especially when the denture tooth is made of acrylic.

Some dentists prefer porcelain denture teeth to resin-based teeth (Appelbaum 1984; Shimoyama *et al.*, 1993); but they do not bond to polymethylmeth acrylate (PMMA) denture base resin (Suzuki *et al.*, 1990). Although there are reports of improving adhesion of porcelain to PMMA, usually porcelain denture teeth are joined to acrylic resin denture bases by mechanically retentive

features such as metal pins or diatoric undercuts. Unfortunately, these retentive features often have to be adjusted or removed because of lack of space. Lack of space may be the result of implant frameworks and bars, pendulous tuberosities, overdenture abutments, or lack of interarch distance (Marchack *et al.*, 1995). One possible solution is to build up conventional porcelain on metallic partial denture framework at the edentulous area. This case report is to present the use of a cast cobalt chrome partial denture framework on which custom made porcelain was fused at the edentulous space to improve aesthetic and other physical properties.

Case report

A 35-year-old male attended the Hospital Universiti Sains Malaysia's Specialist Dental Clinic for replacement of his 10-year-old partial acrylic upper denture with chief complaint of loose fitting of the denture. Intra oral examination revealed that his oral hygiene was good and all the remaining teeth were sound. There was also no mobility of the remaining teeth and occlusion was Class I. The adjacent teeth to the edentulous space were intact. However, it was also noted during intra oral examination that the shade of his existing denture was very homogenous and not similar with the adjacent teeth (Fig. 1). Although he did not have much problems with his existing denture for the past 10 years (except that it was loose), he would like to improve it especially in term of aesthetic.

All possible treatment options together with advantages and disadvantages were thoroughly discussed. Finally, it was agreed that the treatment of choice would be a cast cobalt chrome removable partial denture with tooth shaped fused porcelain on the metal framework at the edentulous space. The option was chosen as the patient was happy with wearing partial denture; however he would like a more natural appearance of the artificial tooth. Upper and lower primary impressions

Fig. 1 Intra oral photograph showing the existing acrylic partial denture in place (arrow).

Fig. 2 Intra oral photograph showing the try in cast cobalt chrome frame.

Fig. 3 Intra oral photograph showing the final prosthesis.

was made with alginate to produce study models. Upper study model was then used for special tray construction. Secondary impression was made with hydrophilic silicone impression material. Jaw relation record was not needed as occlusion was stable. After that, instructions were given to a laboratory technologist to construct a cast cobalt chrome partial denture frame to follow an approved design. Special feature of the frame was the presence of space for conventional porcelain builds at the edentulous area similar to constructing a porcelain-bonded to metal crown. Upon completion, the frame was inserted into patient's mouth for try-in purpose before the addition of porcelain (Fig. 2). During

the visit, porcelain shade was taken with the presence of a dental technologist. The selection of shade was incisal translucent, with body shade A2 and shade A3 at cervical area. The intraoral photograph with issued prosthesis is shown in Fig. 3. The patient was satisfied with the shade and contour of the prosthesis upon issued and during subsequent review visits.

Discussion

One of the major concerns with RPD is patient's tolerance, adaptability and hygiene care. Since the prosthesis covers a certain area of hard and soft tissue surfaces, the risk for caries and periodontal diseases increase as well. However, in this particular case the good oral hygiene had been maintained by the patient for the last 10 years and tolerance and adaptability had been achieved as well; thus it is expected the provided prosthesis would not produce any deleterious effect in future. In fact, patient can easily remove and can clean RPD and able to maintain oral hygiene in a convenient way. However, for patients with poor oral hygiene, the risk for major consequences is substantial. Therefore, proper patient selection as with other treatment options is paramount.

Porcelain is considered as heterogeneous material which contains transparent properties and metallic oxides that act as opacifiers. These porcelains modify light by absorption, transmission and reflection. Scattering occurs when light encounters interfaces between the materials (i.e., pigments and glass). Scattering light is necessary in dental porcelains to simulate the prismatic effect of enamel. In recent days, porcelain-veneered crowns are widely used in modern dentistry, and their fracture remains problematic, especially in all-ceramic systems (Kim *et al*., 2007). The most vulnerable area of fracture is the site where occlusal load is applied. Such kind of fracture could be avoided with this particular RPD as palatally it is only a metal surface and porcelain was fused to metal at labial surface which provide a natural appearance. As the denture framework is made of metal instead of acrylic base, the better longevity of the new prosthesis is also expected. In addition, the patient did not have any problems with bruxism or heavy occlusion that may jeopardize the prosthesis.

The patient was relatively young and the enamel of adjacent teeth have adequate translucency; particular advantages of porcelain are its high glaze property and life like translucency. The patient was highly satisfied with the shade and translucency of the new denture tooth. Certainly the other advantages of this technique are stain and wear resistance properties of the tooth shaped fused porcelain on metallic substructure. Conventional plastic/resin tooth would stain and wear at a faster rate than porcelain. In the event of porcelain fracture, repair can be carried out with relative ease as the prosthesis is removable. Another advantage of this prosthesis is that the porcelain can be changed with indirect composite resin or acrylic if there is a need to do so in the later stage.

In conclusion, conventional porcelain could be fused with cast cobalt chrome partial denture in cases where esthetic is a major concern as shown in this case report. The authors believe that the above procedure is simple, cost-effective and offers improved aesthetics compared with existing methods of replacing missing teeth.

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