Archives of Orofacial Sciences
The Journal of the School of Dental Sciences, USM

Arch Orofac Sci (2016), **11**(2): 49-53.

Case Report

Minimum intervention dentistry with indirect fibre-reinforced composite bridge: a case report

Yanti Johari[a]*, Zaihan Ariffin[a], Haslina Taib[a], Norehan Mokhtar[b]

[a] School of Dental Sciences, Universiti Sains Malaysia,16150, Kubang Kerian, Kelantan, Malaysia.
[b] Advanced Medical & Dental Institute, Universiti Sains Malaysia, Bertam, 13200 Kepala Batas, Pulau Pinang, Malaysia.

* Corresponding author: yjohari@usm.my

Submitted: 10/10/2016. Accepted: 01/12/2016. Published online: 01/12/2016.

Abstract Resin-bonded fibre-reinforced composite bridges provide many advantages over the conventional bridges or implant treatment in the management of a traumatically or congenitally missing anterior tooth. Furthermore, there is an increasing demand towards providing a metal free resin-bonded bridges over the alloy-based restorations in order to meet the aesthetic needs especially in the anterior region. Advances in the adhesive technology and tooth colored materials offer improved bonding system and better aesthetic outcome. Nevertheless, careful selection of cases to receive this type of approach is also one of the key factor to ensure the clinical survival of fibre-reinforced composite bridges. This report aims to present the use of fibre-reinforced composite to construct indirect cantilever fibre-reinforced composite bridges as part of minimum intervention dentistry.

Keywords: fibre-reinforced composite bridge, minimum intervention dentistry, resin-bonded.

Introduction

Congenital absence of the maxillary lateral incisor is the second most common occurrence of dental agenesis. It affects approximately 2% of the world population and often occurs bilaterally (Stamatiou and Symons, 1991; Polder *et al*., 2004). This condition affects the aesthetic zone of the patient hence it raises concern in patient and their families to seek treatment.

Fibre-reinforced composites are resin based materials comprising fibres to enhance their physical properties. The use of this material in dentistry had been discussed as early as 1960s when glass fibres were used to reinforce polymethyl methacrylates in denture base acrylic. Different fibre types, such as carbon, kevlar, polyethylene and glass fibres have been incorporated into composite materials to enhance their properties. The use of these fibres extends across the dental field for various applications namely for splinting the teeth, endodontic post, repair of the denture and bridge fabrication. The main advantages of fibre-reinforced composite bridge are the aesthetics outcome due to its alloy free composition, preservation of tooth structure and essentially reversible. This is an alternative to base metal bridge framework which offer strength and durability however are more susceptible to debonding problem due to its high modulus elasticity. In young patients, this approach is favourable in view of its conservative nature and gives a short to medium temporary restoration whilst waiting for a more definitive treatment in the future upon completion of growth.

Despite this known benefit, the role of resin-bonded bridges as a permanent solution remains debatable due to lack of long term prospective data regarding their success. Recent systematic review reported the five-year survival rates for bridgework as 87.7% for resin-bonded prostheses (Pjetursson *et al*., 2008) meanwhile the success rate for 2-unit cantilever resin-bonded restorations with a follow-up of at least two years is about 95% (Wyatt, 2007).

Hence, in order to ensure the success of the treatment, case selection for resin-bonded fibre-reinforced composite bridge is important. Patient factors such as health, age of the patient, their expectation and local factors as for all treatment procedures should be taken into consideration. Secondly, the assessment of abutment teeth should be carried out to ensure the endodontic and periodontal status. And lastly the occlusal factors is also essential to make certain that one has adequate space for pontic and to detect any damaging parafunctional forces that will lead to the failure of prosthesis.

This paper presented the work on a single abutment, single pontic cantilever fibre-reinforced composite bridge to replace bilaterally missing maxillary lateral incisors using Ceramage (Shofu, Japan) with glass fibres namely Fibrex Lab Pontic System (Angelus, Brazil) which is incorporated as the fibre-reinforcement of the bridge frame. Indirect fabrication of this prosthesis in laboratory gives a better finish and aesthetic outcome than the direct technique in clinic.

Case report

A healthy 19-year-old girl was referred by orthodontist to prosthodontics clinic at the School of Dental Sciences, Universiti Sains Malaysia for a restorative management to replace her congenitally missing maxillary permanent lateral incisors (Fig. 1). Both maxillary central incisors and canines were unrestored and free from periodontal diseases. A slight open bite around tooth 11 and 21 was noted and it was an advantage if resin-bonded bridges are to be considered. One third incisal of the central incisors appeared slightly translucent which was a concern should an alloy-based restoration is to be the treatment of choice. Mesiodistal space of the left lateral incisor region was also slightly wider than the contralateral side causing asymmetrical concern. The maxillary lateral incisors sites had sufficient interocclusal clearance but the thickness of the labial plate appeared quite thin in which great caution was deemed necessary if implant placement is in mind (Fig. 2). All the treatment options had been discussed ranging from removable denture, resin-bonded bridges, conventional bridges to implant-retained prosthesis.

With all factors taken into consideration, the missing lateral incisors would be replaced with indirect 2-unit cantilever fibre-reinforced composite bridges. Both central incisors were chosen to be the abutments. Patient was made aware of the risks and limitations of resin-bonded bridges and frequent follow up over the years.

Tooth preparation for both lateral incisors followed the classical design with minimal palatal preparation limited to enamel (0.5 mm), maximum coverage (180 degrees wrap around) of palatal surface as much possible however not to compromise the aesthetic component (Durey *et al*., 2011). Proximal grooves were not done for the present case in view of recent quality bonding system as a result of technology advance in adhesive dentistry. The issue with the mesiodistal space of left lateral incisor which was too wide had been overcome by adding direct composite resin (IPS Impress Direct, Ivoclar Vivadent, USA) on the mesial of the left upper canine to narrow down the distance (Figure 4b).

Using a special tray, a complete final impression of the arch with polyvinyl siloxane elastomeric impression material (Aquasil, Dentsply/Caulk, Milford, DE) was registered. The work had been sent to laboratory for the fabrication of the bridges. The fibre-reinforced composite bridge was constructed using Ceramage (Shofu, Japan) with glass fibres namely Fibrex Lab Pontic System (Angelus, Brazil) which was incorporated as the fibre-reinforcement of the bridge frame. Ceramage is a zirconium silicate integrated indirect restorative material.

At the insertion appointment, flowable nanohybrid composite namely G-aenial Universal Flo (GC, America) was used to cement the cantilever bridges (Fig. 3). Teeth were isolated with rubber dam before cementation procedure. 2-steps etch-and-rinse technique was used to prepare the palatal surfaces of both central incisors. The seating and marginal adaptation of both prostheses was checked and excess of material was removed prior to light activated with LED LCU (EliparFreelight 2, 3M ESPE, Germany). Minor occlusal adjustment was performed where needed.

The patient was happy and satisfied with the treatment received (Fig. 4). A 6-monthly follow-up was scheduled. However, the right side of the bridge broke at the connector and had to be remade. It was noted that her anterior teeth had come into contact possibly due to lip pressure causing interference to the cantilever fibre-reinforced composite bridges. Since then, the clinical condition remained stable and without any complication.

Fig. 1 Intraoral photograph showing missing maxillary right and left lateral incisors.

Fig. 2 Lateral view of missing maxillary right **(a)** and left **(b)** lateral incisors.

Fig. 3 Palatal view showing the cemented 2-unit cantilever fibre-reinforced composite bridge.

Fig. 4 Frontal view: (a) Preoperative, (b) Postoperative, (c) Left prosthesis in place, (d) Right prosthesis in place. Addition of composite was shown by the arrow on the mesial of maxillary left canine.

Discussion

Fibre-reinforced composite bridge adopts the concept of minimum intervention dentistry and makes the most of the technology advance in adhesive dentistry. Such restorations offer less morbidity and minimize the biological and financial burden whilst offering aesthetic outcome comparable to conventional bridges and implants. The movements during function in the two abutments as in the case of 3-unit resin-bonded bridges can lead to risk of debonding (Chai *et al*., 2005; Botelho *et al*., 2006). In case of two abutments, often only one retainer fails however the bridge remain in place long enough for caries development. A cantilever bridge may reduce the interabutment forces hence overcoming the problem of the retainers debonding. Assessment of occlusion prior to decision making is very crucial to optimize the success of cantilever fibre-reinforced composite bridges. Patient with canine guidance or group function would demonstrate a better prognosis with this type of treatment. Lateral and protrusive interferences should also be minimized with slight to no overbite is preferred around the pontic area. Furthermore, the author would like to suggest a 2-3 months recall initially is crucial in the case of post-orthodontic treatment to detect any changes in occlusion that might jeopardize the survival of the prosthesis.

In the present case, flowable composite had been used to cement the bridges as opposed to luting resin cements. A study found that the use of flowable composites was comparable to the luting cements for bonding porcelain laminate veneers that were less than 2mm in thickness (Barceleiro *et al*., 2003). Dentists are using flowable composites for a wide variety of applications due to its cost effectiveness and versatility. In general, flowable composites have low viscosity with less filler than the common packable composites. As a result, they demonstrated lower mechanical properties but more flexible than the packable composites. Due to this flexibility, the material is suitable not only for restorations purpose but also for cementation of bridges.

In conclusion, indirect fibre-reinforced composite bridges can offer an alternative treatment for patients who cannot afford implant or as a short to medium term temporary prosthesis while waiting for implant treatment later in life. While definitive long-term evidence about their clinical performance is limited, indirect fibre-reinforced composite bridges appear to be a valuable option in the conservative treatment of short span edentulous space. The authors would like to encourage research on the performance and factors that influence the success of indirect cantilever fibre-reinforced composite bridges.

Acknowledgements

This report has been supported by the short term grant of Universiti Sains Malaysia 304/PPSG/61313117.

References

Barceleiro Mde O, De Miranda MS, Dias KR, Sekito T Jr (2003). Shear bond strength of porcelain laminate veneer bonded with flowable composite. *Oper Dent*, **28**(4): 423-428.

Botelho MG, Leung KC, Ng H, Chan K (2006). A retrospective clinical evaluation of two-unit cantilevered resin-bonded fixed partial dentures. *J Am Dent Assoc*, **137**(6): 783-788.

Chai J, Chu FCS, Newsome PRH, Chow TW (2005). Retrospective survival analysis of 3-unit fixed-fixed and 2-unit cantilever fixed partial dentures. *J Oral Rehabil*, **32**(10): 759-765.

Durey KA, Nixon PJ, Robinson S, Chan MF (2011). Resin bonded bridges: techniques for success. *Br Dent J*, **211**(3): 113-118.

Pjetursson BE, Tan WC, Tan K, Brägger U, Zwahlen M, Lang NP (2008). A systematic review of the survival and complication rates of resin-bonded bridges after an observation period of at least 5 years. *Clin Oral Implants Res*, **19**(2): 131-141.

Polder BJ, Van't Hof MA, Van der Linden FP, Kuijpers-Jagtman AM (2004). A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol*, **32**(3): 217-226.

Stamatiou J, Symons AL (1991). Agenesis of the permanent lateral incisor: distribution, number and sites. *J Clin Pediatr Dent*, **15**(4): 244-246.

Wyatt CC (2007). Resin-bonded fixed partial dentures: what's new? *J Can Dent Assoc*, **73**(10): 933-938.