

Restoration of posterior tooth with single shade composite: A case series

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Abstract

Composite restoration is a popular material to restore tooth structure due to dental caries as there is an increasing demand for aesthetic restoration. With the advancing technologies, it has excellent physical characteristics which increases its longevity. However, the appropriate case selection also influences the outcome as composite is technique sensitive. This material can be offered to patient seeking less time-consuming procedure, better preservation of tooth structure, affordable but acceptable aesthetic outcome. These three cases presented shows the possibility of creating a good aesthetic result in posterior tooth restoration with the use of single shade composite.

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Introduction

Dental caries is one of the most common dental diseases with a prevalence of 90%, especially among people in rural area despite having accessible dental health care services (Esa *et al.*, 2014). Nowadays, there is also an increasing demand for esthetic restoration to replace amalgam. The improved property of composite, such as increase hardness, wear resistance and translucency, makes the restoration an excellent choice for small and medium sized posterior cavities with annual failures of 1-

3% depending on the cavity size (Zhou *et al.*, 2019; Lassila *et al.*, 2020). Alvanforoush *et al.*, (2017), reported an improved overall success rate of their long-term clinical studies for composite in posterior tooth. The reasons of failure have also change from secondary caries, postoperative sensitivity and unsatisfactory adaptation to composite fracture, tooth fracture and endodontic treatment for the past decade (Alvanforoush *et al.*, 2017). The success of composite restoration relies on knowledge of adhesives, operator's technique and skills,

size of cavity and location of tooth (Velo *et al.*, 2016).

The application of composite in oblique incremental layer has lower values of shrinkage factors and lesser debonding tendency which reduces the polymerization shrinkage stress effect. This eliminates microleakage leading to secondary caries development and postoperative hypersensitivity (Kaisarly *et al.*, 2020). Regarding the types of composite resin used, the nanoparticles and micro hybrid resins has better clinical performances compared to compactable resin. In addition, the nanoparticles resins also have a lower polymerization shrinkage and good polishing capabilities due to its higher inorganic load percentage. The adhesive system used will create a hybrid layer between adhesive systems and enamel or dentin layer for micromechanical bonding, thus, allows the tooth preparation to be minimally invasive and tooth structure can be preserved (Velo *et al.*, 2016).

Composite restoration in posterior tooth requires assessment of the patient's characteristics, tooth preparation needed, matrix utilization in Class II case and composite composition-dentin bonding. It is also susceptible to excessive wear and marginal fracture when placed in areas of high function or high masticatory stress, hence, caution must be taken when treating patient with history of teeth grinding or clenching. The composite-tooth interface is subjected to both chemical and mechanical stress during masticatory function. Over time, this leads to deterioration of the composite properties, such as covalent bond breaking, which leads to restoration failure (Bohaty *et al.*, 2013).

The tooth position also has an effect on the clinical performances and longevity. For example, premolar has a lower failure rate than molar due to increase in masticatory forces and stress (Bohaty *et al.*, 2013). Opdam *et al.*, (2014), also states this in the Kaplan-Meier graph and that failure occurs over time. However, the most common cause was secondary caries and fracture. Regardless of this limitation, composite can

still be considered in cases where esthetic and minimally prepared restoration is required. Another factor of failure for posterior composite is secondary caries at restorations margin which indicates inadequate seal at the composite-tooth interface, hence causing inability to resist physical, chemical, and mechanical properties. This also creates an area for plaque retention and bacteria can penetrate into the exposed dentinal tubules leading to recurrent caries, hypersensitivity, and pulpal inflammation (Bohaty *et al.*, 2013).

The purpose of this study is to present three different cases that uses single shade composite to restore carious posterior tooth.

Case description

Case 1

A 27-year-old female patient came with complaints of sensitivity and food stuck after meal on her lower left back tooth. She is medically fit and healthy. Intraoral examination revealed caries on disto-occlusal of tooth 36 (ICDAS code 05). Pulp sensibility testing was done, and the tooth responds normally to both electrical pulp test (EPT) and cold test. The diagnosis made was reversible pulpitis. Upon discussion with the patient, it was decided to restore the tooth with single shade composite restoration. After obtaining the patient's consent, local anesthesia infiltration with one cartridge of 2% mepivacaine with 1:100 000 epinephrine was given. Shade selection was done, and Kerr SimpliShade Medium (Kerr Company, USA) was selected. Then, multiple teeth isolation was done with rubber dam on tooth 35 until 37. Clamp was ligated with floss and placed on tooth 37.

Removal of caries was done with round bur mounted on high-speed handpiece. Any unsupported enamel was removed. Prior to restoration of the proximal wall, Garrison sectional matrix and wedge was placed and stabilized. Since the caries removal reveals some pulpal shadowing, a thin layer of calcium hydroxide liner (CaOH) or dycal was placed as base at the deepest cavity with Glass Ionomer Cement (GIC) Fuji VII as liner.

Then, the tooth was etched with Kerr's etchant (Kerr Company, USA) of 37.5% phosphoric acid for 30 seconds on enamel and 15 seconds on dentine and washed thoroughly and dried. Kerr OptiBond Universal (Kerr Company, USA) was placed with microbrush and cured for 10 seconds. Kerr SimpliShade Medium (Kerr Company, USA) is placed into cavity incrementally and cured according to the manufacturer. Any excess was trimmed with white stone bur

mounted on high-speed handpiece. Rubber dam was removed, and occlusion was assessed with articulating paper. Final restoration was polished with Soflex disc course and Eve Diacomp Twist. Patient was encouraged to maintain a good oral hygiene and advised to attend dental clinic once a year for maintenance. Patient was satisfied with the restoration and did not experience any pain or sensitivity at one week review visit



Figure 1. Pre-operative: Disto-occlusal cavity of tooth 36 with no restoration



Figure 2. Caries removal and cavity preparation: Caries removal was done on disto-occlusal of

36



Figure 3. Composite placement: Garrison sectional matrix was placed on distal of 36 and Kerr SimpliShade Medium was used to restore the cavity



Figure 4. Composite placement: Kerr SimpliShade Medium was used to build the tooth occlusal contour



Figure 5. Excess removal: Any excess composite was trimmed with white stone bur



Figure 6. Final restoration: Occlusion was assessed with articulating paper and polishing with Soflex disc course and Eve Diacomp Twist was done

Case 2

A 25-year-old female Malay came with a complaint of food stuck and sensitivity on her upper left back tooth. She is medically fit and healthy. Upon intraoral examination, there is caries on occlusal and mesial of tooth 26 (ICDAS code 04). There is no pain on palpation and percussion. Pulp sensibility reveals a positive response with no exaggerating pain on both electrical pulp test (EPT) and cold test. The diagnosis made was reversible pulpitis. Upon discussion with the patient, it was decided to restore the tooth with single shade composite restoration. After obtaining the patient's consent, local anesthesia infiltration on buccal and palatal mucosa with one cartridge of 2% mepivacaine with 1:100 000 epinephrine was given. Shade selection was done, and Kerr SimpliShade Medium (Kerr Company, USA) was selected. Then, multiple teeth isolation was done with rubber dam on tooth 24 until 26. Clamp was ligated with floss and placed on tooth 37.

Caries was removed with round diamond bur mounted on high-speed handpiece. Any

unsupported enamel was removed. Sectional matrix and wedge were placed on mesial of tooth 26 before restoring with composite. Then, the tooth was etched with Kerr's etchant (Kerr Company, USA) of 37.5% phosphoric acid for 30 seconds on enamel and 15 seconds on dentine and washed thoroughly and dried. Kerr OptiBond Universal (Kerr Company, USA) was placed with microbrush and cured for 10 seconds.

Kerr Simplishade Medium (Kerr Company, USA) composite was placed incrementally and cured according to the manufacturer. Occlusion was checked and any high bite or discomfort was removed with white stone bur mounted on high-speed handpiece. Once satisfied, the restoration was polished with Soflex course and fine disc and Eve Diacomp twist. Post-operative instruction was given, and patient was advised to visit dental clinic annually for maintenance of oral health. Patient was satisfied with the restoration and there was no pain or sensitivity at one week review visit.



Figure 7. Pre-operative: Occlusal and mesial caries on tooth 26 without any restoration



Figure 8. Caries removal and cavity preparation: Caries was removed on mesial and occlusal of 26



Figure 9. Composite placement: Composite placed incrementally and shaped to mimic tooth anatomy



Figure 10. Excess removal: Minor adjustments were made prior to removing rubber done



Figure 11. Final restoration: Removal of any high bite and final composite polishing

Case 3

A 35-year-old female patient came to dental clinic complaining of sensitivity and food stuck after meal on her upper left back tooth. She is medically fit and healthy. Intraoral examination showed presence of amalgam restoration on disto-occlusal of 25 with excess on the distal inter-proximal area and deficiency on the restoration-tooth interface (ICDAS code 43). The tooth responds normally to both electrical pulp test (EPT) and cold test, hence, a diagnosis of reversible pulpitis was made. It was decided to restore the tooth with single shade composite restoration and the patient provided consent for the treatment. Local anesthesia infiltration with one cartridge of 2% mepivacaine with 1:100 000 epinephrine was given. Shade selection was done, and Kerr SimpliShade Medium (Kerr Company, USA) was selected. Then, multiple teeth isolation was done with rubber dam on tooth 24 until 26. Clamp was ligated with floss and placed on tooth 26.

Round diamond bur mounted on high-speed handpiece was used to remove amalgam restoration of tooth 25. Then, caries was removed, and any unsupported enamel was

removed. Sectional matrix and wedge were placed on distal of tooth 25 before restoring with composite. Following caries removal, some pulpal shadowing can be seen, hence, a thin layer of calcium hydroxide liner (CaOH) or dycal was applied at the deepest cavity as base with Glass Ionomer Cement (GIC) Fuji VII as liner. Selective etching with Kerr's etchant (Kerr Company, USA) of 37% phosphoric acid was done on enamel for 15 seconds and rinsed thoroughly and dried. Kerr OptiBond Universal (Kerr Company, USA) was placed with microbrush, lightly blew, and cured for 10 seconds.

Kerr Simplishade Medium (Kerr Company, USA) composite was placed incrementally and cured adequately. Occlusion was checked with articulating paper and any high bite or discomfort was removed with white stone bur mounted on high-speed handpiece. Once satisfied, the restoration was polished with Soflex course and fine disc and composite rubber polisher. Post-operative instruction was given, and patient was advised to visit dental clinic annually for maintenance of oral health. Patient was satisfied with the restoration and did not have any pain or sensitivity at one week review visit.



Figure 12. Pre-operative: Disto-occlusal amalgam restoration with excess on distal and deficiency on restoration-tooth interface.



Figure 13. Caries removal: Amalgam restoration removed and caries removal



Figure 14. Final restoration: Removal of high bite and final composite polishing

Discussion

With the advancing technologies in dental materials property, a single shade composite can achieve an excellent outcome. Although the shade selection of composite resin with surrounding teeth remains difficult, it can still provide a satisfactory aesthetic result for both patient and clinicians. The problems in colour matching of composite and tooth also depends on clinician's skills, knowledge, and experience. Hence, it is important to determine the tooth shade prior to application of rubber dam as prolong drying of teeth causes the tooth shade to become lighter (Kobayashi *et al.*, 2021).

Tooth colour is also affected by some factors, such as age, site, type of tooth, and status of tooth. Light diffusion and transmission properties of resin composite, enamel margin configuration, enamel prism orientation and age of restored tooth also influences the colour shifting at the composite margin (Kobayashi *et al.*, 2021). The enamel and dentin also have different light wave characteristics due to their structural differences. Enamel is more translucent as it has a higher mineralized prismatic structure, low organic content, and lesser water, hence causing higher light transmission than dentin (Morsy *et al.*, 2020).

Following a reliable composite shade guide system is difficult due to different company colour classifications and shade guide materials. Most shade guides use plastic with different thickness which hinders the clinician capabilities to evaluate the colour responses when transilluminated. These differences are not limited to hue and chroma but includes nature and size of filler, materials thickness, dentin fluorescence, dentin's degrees of opacity and enamel's degree of translucency, opalescence, and refractive index (Paolone *et al.*, 2014).

Besides that, composite thickness of enamel shell can also affect the aesthetic outcome whereby it affects the optical properties, such as translucency. Hence, care towards material thickness for enamel should be

taken. The outcome of a multilayer composite restoration is also determined by the layer and dentinal proportion thickness and shade translucency. One of the suggestions was to create a custom-made shade guide which uses composite. It should have the capabilities to overlap enamel and dentin that allows the clinician to test the behaviours of different enamel thickness. The thickness should be realistic with a maximum of 0.7mm, a shank that does not restrict shade selection, and a standardized shape for every tooth with predetermined thickness (Paolone *et al.*, 2014).

Aside from that, blending effects which refers to the small colour differences between composite resin and natural tooth when observed in isolation also increases with decreasing size of cavity and increasing dental material translucency. Morsy *et al.*, (2020), also stated that the blending effect of single shade universal resin composite is promising, and it manage to match the shade of enamel in a Class V restoration. In addition, the use of nanofilled composites has excellent polishing abilities as it has smaller surface roughness, thus creating a higher initial gloss (Morsy *et al.*, 2020).

The advantages of single shade composite are it reduces the need for clinician's abilities to colour match and treatment time. The size, depth, and darker colour of the cavity floor can also affect the final appearance of restoration. This problem is eliminated by using an opaque composite prior to placement of a more translucent composite (Kobayashi *et al.*, 2021). With consideration of the primary aesthetic features of tooth, simplification of the restoration with single shade composite should provide adequate reflecting and refracting light with good longevity (Fahl, 2012).

Conclusions

In conclusion, single shade composite restoration can provide a satisfactory aesthetic result, especially for non-critical area like posterior teeth. This reduces clinical time and patient's discomfort

without compromising the outcome. It is also a suitable alternative to indirect restoration, whenever indicated, as it is less time consuming and cheaper. Selection of the correct color and evaluation of the need for opaquer is essential to achieve a good result.

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