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Direct Esthetic Resin Restorations of Anterior Coronal Fractures: A Case Report

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Case Study

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ABSTRACT

Replacing tooth structure that is lost due to trauma to the anterior teeth remains a challenge to the restorative dentist. The restorations must not only be able to withstand masticatory forces and stress but also be esthetically pleasing and acceptable. Materials and techniques have been developed and continue to be developed to improve the outcomes of our services.

Although there is still no restorative material available that fulfills all requirements, recent advancements in resin technology provide some improvement in treatment outcomes. In terms of esthetic dentistry, direct composite resins offer many advantages such as treatment in a single visit, not requiring preliminary models or wax-ups, not involving laboratory fees, cause less stress on the opposing dentition, and able to be repaired easily. However these materials have less color stability, less resistance to fracture and less shear and compressive strength. They are contraindicated for the patients with parafunctional forces and habits, Class III end-to-end occlusion, or with large diastemas.

We report on a patient with dental aesthetic problems due to crown fractures on maxillary anterior teeth and treated with direct aesthetic composite resin restorations. Direct composite resin restorations, with proper case selection, using appropriate technique and aesthetic materials, can yield highly aesthetic and long lasting results.

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1. INTRODUCTION

The development of composite resins has advanced over past decade, while the demand for esthetic direct restorations continues to grow [1]. Improved materials and techniques are being introduced in order to achieve better restorations while fulfilling patient esthetic expectations [2,3]. Compared to earlier materials newer composite resins have superior physical properties, a wide range of "Vita shades", translucent/opaque shades and gloss-like polishing capacity. Light initiated composite resins were more color-stable than earlier self-cured ones and had smaller filler particles improving wear resistance [4]. Microfill resins were introduced with submicron average particle size that resulted in high polishing and improved wear properties. Continued improvements brought reduction in particle size and increase in filler loading resulting in light-cured resins that could be used for anterior and posterior restorations [5]. However the search continues for an ideal restorative material which will be similar to natural dental structure and its resistance to occlusal forces and have similar physical and mechanical properties [6]. Whereas early composite resins offered only "body" shades that appeared dull and dense, contemporary materials offer a wide range of shades and opacities designed especially for layering [7-9]. In current practice composite restorations must replicate the natural dentin and enamel tissues in thickness, color and morphology [10]. This requires the use of aesthetic composite materials that are optically similar to each dental layer [9,11,12].

This report describes a direct technique using esthetic composite resins for treatment of a trauma to the anterior maxillary dentition.

2. CASE REPORT

The patient is a healthy 15-year-old male referred for treatment of Class II fractures of his maxillary right central and lateral incisors. According to the World Health Organization a Class II fracture involves enamel and dentin but does not involve the dental pulp [13] (Fig. 1). Pulp tests on both teeth tested vital and no pathology was observed on radiographic examination. A carious lesion on the mesial proximal surface of the left lateral incisor was also seen on both the clinical and radiographic examinations.

Fig. 1. Crown fractures on teeth #12 and #11

After reviewing the patient's medical history and assessing the fractures, direct composite partial veneer restorations on the maxillary right central and lateral incisors and a composite resin restoration on the maxillary left lateral incisor was planned. A nanoparticle reinforced anterior esthetic composite resin, Clearfil Majesty Es-2 Premium (Kuraray, Japan) was decided on to be used as the restoration material. The shade selection chosen was A2D and A1E in daylight and temporary restorations were made. A polyvinil siloxane based dental silicone was applied on the temporary restorations in order to create a palatal silicone for silicon matrix preparation. The teeth were covered with rubber dam (OptiDam, Kerr, USA) and irregular bevelings were prepared by using green-banded diamond burr (Acurata, Japan) on cavo-surfaces labial enamel (Fig. 2).

Fig. 2. Irregular bevelings on enamel, isolation with rubber dam and application of silicone matrix

As the retention is much more important in complex anterior restorations [7], in order to enhance it, 37% phosphoric acid (Etching Gel, Kerr, USA) was applied for 15 seconds to the enamel surfaces for selective etching, washed

with a water spray, and dried with air spray. A single bottle bonding agent (Single Bond Universal Adhesive, 3M ESPE, USA) was applied on etched surfaces and polymerized for 20 seconds with a led light generator (Demi Led Light Curing System, Kerr, USA). A1E transparent shade was applied lightly in a silicone matrix, placed intraorally and polymerized creating palatal composite resin walls (Fig. 3).

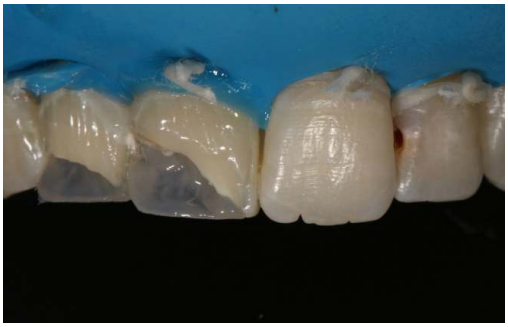

Fig. 3. Palatal composite resin walls

Natural dentin tissue simulated as incisal edge notches, labial surface grooves and mamellons were shaped by using A2D body shade resin for both teeth (Fig. 4).

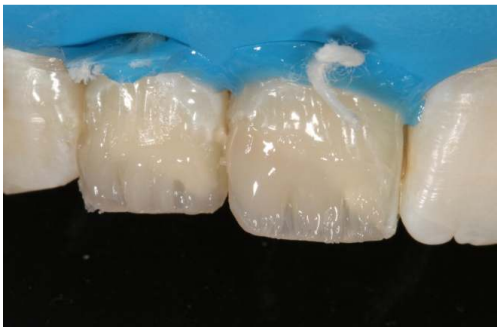

Fig. 4. Natural dental tissues simulated by creating incial notches, surface grooves and mamellons

A1E shade translucent resin was used as top labial layer of the restorations. Finally, a Class 3 cavity preparation and direct composite resin restoration (A1E and A2D shades, Clearfil Majesty Es-2 Premium, Kuraray, Japan) was applied on maxillary left lateral incisor. Finishing procedures were achieved by using polishing discs (OptiDisc, Kerr, USA) for contact areas and spiral polishing discs (Twist Dia, Kuraray, Japan) for labial and palatal surfaces with low speed handpiece (DURAtec 2068D, Germany) (Fig. 5).

Fig. 5. Final restoration

The necessity for good patient oral hygiene was stressed and recall appointments were given. At 1-year recall, no sensitivities or discolorations were detected on the teeth or restorations (Fig. 6).

Fig. 6. 1-year recall

3. DISCUSSION

There is no restorative material that fulfills all requirements being aesthetic, economical, functional, long lasting, and needing with less clinic time to place [14]. However recent advancements in composite resin technology can provide some solutions for these problems. [9,15,16] In terms of aesthetic dentistry, direct composite resins offer many advantages. These restorations can be placed in a single visit, often do not require preliminary models or wax-ups and do not involve laboratory fees that increase the costs [17]. Direct composite restorations less negatively impact on the opposing dentition compared to older porcelains [18] and in the event of fracture, can be more easily repaired compared to the costly and time-consuming repairs for the ceramic alternatives [19]. Disadvantages of current cosmetic direct composite resins are few but should be noted.

Compared to indirect porcelain alternatives most composite materials possess less fractural resistance, less shear and compressive strength, and are not ideally suitable for high-stress areas [20,21]. Presence of parafunctional forces such as clenching and grinding, Class III malocclusion, large diastemas, or habits such as nail biting may potentially jeopardize the longevity of those restorations [12,22].

A three-step layering technique was used in our case in order to mimic the multi-layered structure of human teeth as well as to create natural looking restorations. Specialized composite resins developed for stratification as the one used in this case have shades for enamel and dentin [23]. As previously mentioned this was a complex crown fracture requiring that the whole portion of the missing crown be reconstructed. Absence of palatal tissue on both teeth made it impossible to use a two-step layering technique. Enamel shade for the palatal wall, dentin shade for the inner layer, and enamel shade for the most labial surface was used to simulate natural human tooth layering. Though recent formulations have markedly improved the color stability of these materials, direct resin restorations are still not as inert as glazed ceramics and depending on quality of polish, are more likely to discolor with chronic exposure to chromogenic diets [24,25]. In the case presented, although it is still in the short-term for evaluation, the patient at 1-year recall demonstrated no discolorations. There was no sensitivity reported by the patient at time of recall even though the crown fractures were complex. Nanoparticle reinforced composite resins such as the one used in tis case (Clearfil Majesty Es-2 Premium, Kuraray, Japan) have high mechanical resistance, superior adhesion capability, superior polishing properties, as well as high optical properties [26]. As a result, the well-adapted restorations and well-implemented polishing procedures provided smooth and sound restoration surfaces as well as an acceptable and pleasing aesthetic outcome. Although located in a critical area such as the incisal edges of the teeth of a 15-year-old child, no restoration fractures were noted at recall. Another possible reason for a successfull case is in patient selection. The patient presented with a stable Class I occlusion and with no excessive occlusal forces or habits.

4. CONCLUSION

Proper patient selection and careful treatment planning are critical for obtaining a successful case outcome and patient satisfaction [27,28]. Accordingly, this case report demonstrates that with proper case selection using appropriate materials and technique direct composite resin restorations can provide highly aesthetic and durable results that are functional and pleasing to the patient.

CONSENT

Author declared that ‘written informed consent was obtained from the patient (or other approved parties) for publication of this paper and accompanying images.

ETHICAL APPROVAL

Author hereby declared that all experiments have been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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