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Case Note

Marathon of cosmetic dentistry: Emerging trends in esthetic restorations GV Black's I

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Abstract

Cosmetic dentistry is dental work that improves the appearance and function of a person's teeth. Dentistry is the art and science of improving the appearance (esthetics), function and health of the teeth and associated structures. Therefore, by definition, all dentists strive to improve the cosmetics/esthetics of the teeth keeping functional aspects in highest priority. The one outbreak in cosmetic/esthetic dentistry field is the introduction of composite resin restoration. This case report discusses the various procedures for GV Black's Class I esthetic restoration.

Key words: Esthetic restoration, GV Black's Classification - I, Composite resin restoration, Resin modified composite.

Introduction

Cosmetic dentistry is the art and science of improving the appearance (esthetics), function and health of the teeth and associated structures. The dentists strive to improve the esthetics of the teeth keeping functional aspect in highest priority. The interest of patients in having tooth colored restorations and the development of techniques and materials that make these restorations easier have contributed to make the esthetic restorations of the posterior teeth popular. The direct use of composite restorations in posterior teeth is technique sensitive. Some difficulties, nevertheless, can be overcome or at least minimized by a heedful clinician by paying thorough attention to the various stages of restorative technique. The direct posterior composite restorative technique offers the possibility of closely matching the natural optical characteristics of the lost tooth structure. The present and subsequent articles in this series "Marathon of cosmetic dentistry – Emerging trends in esthetic restorations" seek to review some concepts about this adhesive esthetic restorative procedure in and aimed at showing the potential of this technique. This article presents three step by step case reports of GV Black's class I and concepts related to the clinical procedures.

Case report

Case I: A 21 year old male complained of pain in the upper left region of the jaw since 2-3 days. Clinical examination revealed that 26 was carious. Pulp vitality test was normal for the teeth. Written informed consent was taken. After the removal of carious lesion and cavity preparation, the tooth was restored with composite resin.

Carious lesion present on 26 was removed using jet Carbide bur. Then the cavity walls were smoothened and bevelling was done using Diamond point FG Superfine bur so that no unsupported enamel was left at the cavosurface margin. Shade selection was done using the HUGE DENT Shade guide (EC/REP Company, China), A_2 shade was selected. After that, rubber dam was applied and Calcimol LC (CE 0482 Cuxhaven, Germany) was placed as base on the floor of the cavity to protect the dental pulp and cured for 10 seconds. Then the cavity was restored with the following procedure:

1. Bonding and priming was performed with SE Bond Clearfil repair.

Adequate amount of bonding and priming was applied

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to entire surface of cavity (enamel and dentin) using microbrush in a homogenous layer, without pooling. Then it was cured for 10 seconds using 3M Free light LED curing light unit (3M Dental Product, USA).

2. Operational procedure of composite resin-

A small amount of A_2 shade (TPH_3® Spectrum®) of composite resin was placed on the floor of the cavity and spread throughout the preparation with condenser and cured using 3M Freelight LED curing light to form the floor firstly. Then occlusal surface was restored. The composite material was applied using incremental technique, not exceeding 2mm; each layer was cured separately for 20 seconds.

3. Operational procedure of occlusal adjustment/ contouring/finishing and polishing system-

- The adjustment of occlusal surface and contouring of cured TPH_3® Spectrum® was done under running water. Occlusal adjustment and contouring was done using Diamond point bur.
- Occlusal surface was polished using Super-Snap rainbow polishing disc (SHOFU Dental Product, Japan). Dry technique was used.

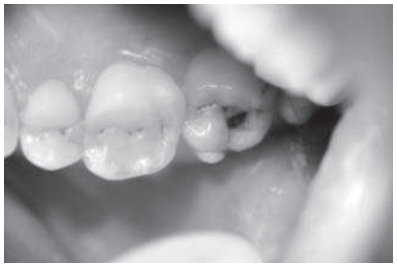

Fig 1: Preoperative view of the carious lesion

Fig 2: Removal of the decayed portion using carbide bur

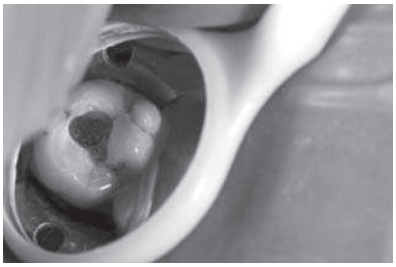

Fig 3: View of the finished preparations with all decay removed

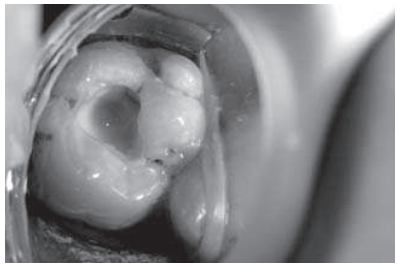

Fig 4: Calcimol LC was applied as a base on the pulpal floor

Fig 5: Cured with 3M Freelight LED curing light for 10s.

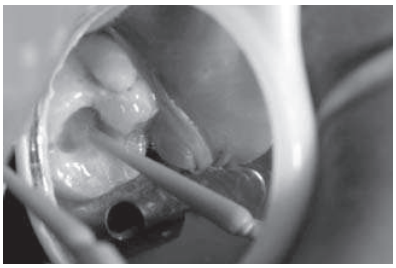

Fig 6: SE Bond Clearfil Repair (bonding agent) was applied to the prepared surfaces with a microbrush.

Fig 7: Dried with gentle air.

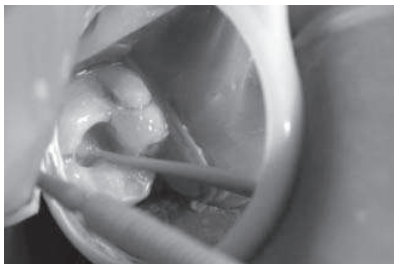

Fig 8: SE Bond Clearfil Repair (primer) was applied to the prepared surfaces with a microbrush.

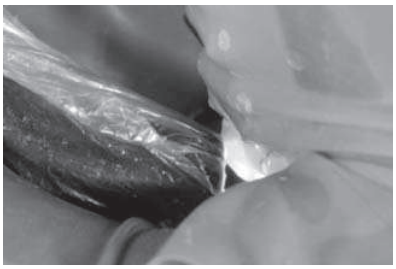

Fig 9: Cured with 3M Freelight LED curing light for 20seconds.

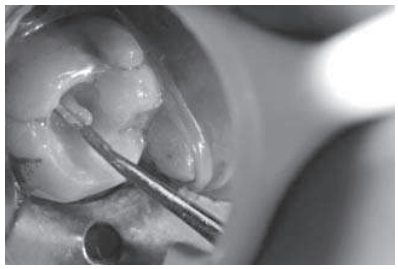

Fig 10: A condenser was used to spread the composite, after which it was light-cured for 40 seconds.

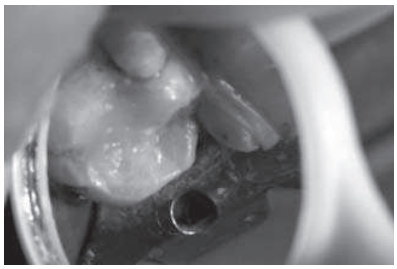

Fig 11: After placement of the transparent shade, and cups were used for final polishing the restorations were ready for finishing.

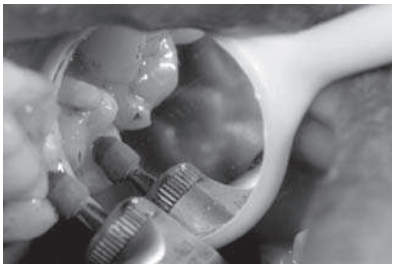

Fig 12: Astropol points of the finished composite

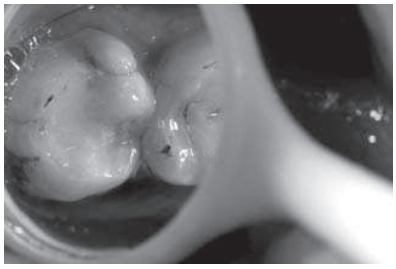

Fig 13: Immediate postoperative view of the completed composite restorations.

Case II

A 23 year old male complained of sensitivity in the lower left region of the jaw since 5-7 days. Clinical examination showed that 36 was occlusally and buccally carious. Pulp vitality test was normal for the tooth. After the removal of carious lesion and cavity preparation, the tooth was etched with Gluma®, bonding and priming was performed with Prime&bond®NT and cured for 10 seconds. Then A_2 shade of AP-X^{TM} composite resin was applied by using incremental technique. Each layer was cured separately for 20 seconds. After that finishing and polishing was performed.

Case III

A 25 years old female complained of sensitivity and food dislodgement in the upper front region of the jaw. Clinical examination showed that 11 and 21 were lingually carious. Pulp vitality test was normal for the teeth. After the removal of carious lesion and cavity preparation, the tooth was etched with Gluma®, bonding and priming was performed with Prime&bond®NT and cured for 10 seconds. Then A_3 (Duo E_2, Duo D_3) shade of Ceram-X^{TM} composite resin was applied by using incremental technique. Each layer was cured separately for 20 seconds. After that finishing and polishing was performed.

Fig 14: Before treatment (Case II)

Fig 15: After treatment (Case II)

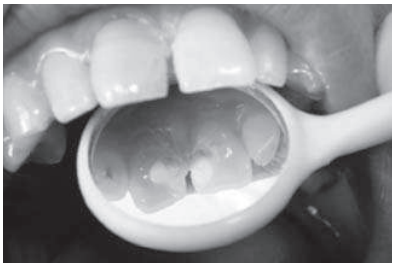

Fig 16: Before treatment (Case III)

Fig 17: After treatment (Case III)

Discussion

Since adhesive restoration is technique sensitive, its success is mostly determined by the ability of the dentists, beyond the performance of the material. Proper treatment planning for direct resin restoration includes strict adherence to clinical technique as well as proper armamentarium. Modern adhesive techniques and preparation designs, along with improved handling characteristics available from contemporary composite systems, have expanded today's treatment options[1].

Based on the current adhesion strategy, there are two major approaches to produce an effective bond between resin and dentin. The etch-and-rinse systems employ phosphoric acid to remove the smear layer, followed by primer/adhesive applications. On the other hand, non-rinsed self-etch systems utilize acidic monomers to modify the smear layer. The subsequent bonding process incorporates this modified smear layer within the resin–dentin bond[2]. The presence of the smear layer on ground dentin has been regarded as a barrier for resin infiltration during bonding. This zone of debris is a mixture of partly denatured collagen fibrils, other organic materials, and several minerals, according to the underlying dentin surface[3].

A bonding system which bonds to tooth sufficiently strong to withstand the internal and external stresses has been desired for long time. Bonding of resin based composite to dentin is mainly based on micro-mechanical retention, i.e. (1) on the formation of intratubular resin tags with anastomoses between the tubules, and (2) on the formation of a hybrid layer or 'resin-dentin interdiffusion zone' which is an admixture of demineralized collagen with the monomers of the primer and the adhesive[4,5]. Current dental adhesives are commonly based on a solvent. The most common solvents employed are water, ethanol, acetone, or mixtures of them. When a moist bonding protocol was followed, acetone-based primer-adhesives, like Prime&Bond NT, have shown higher bond strengths and reduced micro-leakage[6,7]. Clearfil SE Bond system is an aqueous mixture of acidic functional monomers and polymer components that demineralize the dentin and the smear layer that remains after cavity preparation and provides an infiltration of the underlying tooth substance[8]. Since the SE Bond primer contains acidic functional monomers and the pH of these solutions are low, the thickness of the demineralized layer might be affected by the application time. The hybrid layer formed by Clearfil SE Bond was thinner (0.5–1 mm) and the resin tags were shorter than that formed with one-bottle systems[9]. Therefore, it has been concluded that the quality, the homogeneity and the thickness of the resin-infiltrated layer should receive attention in future research[10]. According to Jacobsen and Soderholm[11] the water-based primers improved their bond strength with increased priming time, but without reaching the bond strength of the acetone based primers. Perdigao[12] stated that current one-bottle dentin adhesives usually contain acetone and/or ethanol, which can dislocate water from the dentin surface and form the moist collagen network, thus promoting the infiltration of resin monomers through the nano-spaces of the dense collagen web and enhancing bond strengths.

One-step adhesives do not seem to meet the high expectations regarding bonding performance. They have been documented with lower bond strengths and limited durability, especially to dentin. In addition, their adhesive layers often contain porosities and voids, due to either osmosis or phase separation[13]. In particular the osmosis phenomenon seems to be related to high permeability of the adhesive layer, possibly due to low conversion rates, and to the high hydrophilicity of components in one-step systems[14-16]. In a clinical situation excessive water in pulp-near dentin may also dilute the concentration of a self-etching primer and reduce its acidity leaving the underlying dentin partially undemineralized and consequently interferes with the infiltration of the primer and the polymerization of the monomers[17].

When self-etching (SE) primers are used, there is no need of etching, rinsing and drying so that the risk of over-etching and over-drying of the dentin is eliminated. Self-etching primers are extremely fast and simple to apply in clinical situations, and dramatically reduce the technique sensitivity of the bonding procedure. Postoperative sensitivity was the most frequent complication of early posterior composite restorations. With the introduction of adhesives, that are able to completely penetrate into decalcified dentin and/or to obdurate dentinal tubules, the incidence of postoperative sensitivity has dropped significantly. The SE/SP systems were clearly superior to the TE systems with respect to avoiding postoperative sensitivity by obtaining a better seal of the dentin surface than the TE systems[18]. One-step self-etch adhesives perform acceptably over a short time[19-20]. Etch and rinse systems remain better than self-etch systems with respect to microleakage scores[21].

The overall clinical success rate was determined by four key parameters: retention, marginal integrity, marginal discoloration and caries occurrence. With bonded restorations, achieving the correct dentin moisture content relies on clinical judgment and is an unreliable process. Bond strength testing can help dentists understand and predict the clinical behavior of the various adhesive systems[22].

There are no shortcuts to use when placing posterior RBCs (resin bond composite), and any compromise in the placement technique will have serious consequences

for the clinical performance. Even with the improved materials, the performance of the material cannot be overestimated to exceed that of a dentist. Therefore, it is still important for the clinician to practice appropriately and meticulously when using adhesive materials. Since the durability of the adhesive restoration showed good results clinically, we can conclude that the adhesive restoration may be suggested as the 'restoration of choice' that will be more and more preferred in the near future.

Conflict of interest

The Authors declare that they do not have any conflict of interest. This is entirely self funded work in academic interest. The authors do not have any financial interest in the materials discussed in this manuscript.

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