

Clinical Technique/Case Report

Composite Veneering of Complex Amalgam Restorations

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Clinical Relevance

Composite veneering of complex amalgam restorations could be an easy-to-perform, less expensive technique that merges the esthetic appearance of composite with the improved mechanical properties of amalgam.

SUMMARY

In large posterior cavities, indirect restorations could provide improved performance when compared to direct restorations, but with higher cost and removal of sound tooth structure. Improved mechanical properties have resulted in good clinical performance for amalgam in large cavities but without an esthetic appearance. Resin composites have become popular for posterior restorations, mainly because of good esthetic

results. A restorative technique is presented that combines the esthetic properties of directly bonded resin composite and the wide range of indications for amalgam in stress-bearing areas.

INTRODUCTION

Despite the increased application of tooth-colored dental materials in posterior teeth, amalgam remains a popular material for direct posterior restorations, especially in developing countries.¹ The popularity of amalgam relies on its good mechanical properties, such as wear resistance,² good sealing ability,³ easy handling, low technique sensitivity and low cost.⁴ Moreover, the material has a long history of clinical usage, with proven longevity.⁵ However, some shortcomings have been related to amalgam placement. Since the material has no adhesion to tooth substrates, the removal of healthy dental structure is required for adequate cavity preparation.⁶ Esthetic concerns and constant improvements in resin composites have also led to the replacement of amalgam.⁷

The adhesion of composite to tooth structure minimizes the removal of sound tissue structure and improves fracture resistance of the restored tooth.⁸ Also, composites show an annual failure rate similar to amalgam.⁵

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DOI: 10.2341/06-8

Nevertheless, the bonding breakdown in dentin margins due to polymerization shrinkage and the ability to obtain adequate proximal contacts are some problems related to posterior composite restorations.⁹ Moreover, placement of the composite in larger cavities will reduce its survival, when compared to smaller cavities.⁷

Combined amalgam-composite restorations could be a good alternative in some situations, merging the good properties of both materials. Demarco and others³ observed improved marginal sealing using “amalcomp” restorations (cervical third with amalgam) in Class II cavities, comparing them to direct composite restorations. The composite reinforcement of weakened tooth structure could improve the fracture resistance of teeth restored with amalgam.¹⁰ Other studies have described the application of resin-based materials as a veneer for amalgam restorations,¹¹⁻¹³ combining the esthetics of composites with the mechanical properties of amalgam. Also, restoration repair could be an option within the scope of minimally invasive dentistry,¹⁴ and resin-based materials could be used to repair fractured amalgam restorations.

This clinical report will describe a case where an esthetic veneer of composite was made for an extensive amalgam restoration placed in a stress-bearing area.

CASE REPORT

A 24-year old man was treated at the Operative Dentistry Clinic of the Federal University of Pelotas. The patient's primary claim was extensive caries in the right maxillary molar, with mesial-buccal cusp loss. A written consent was obtained from the patient. Vitality testing and radiographic examination revealed a vital pulp without need of endodontic therapy. After local anesthesia, rubber dam isolation was performed. Carious dentin was removed using a dentin curette and round carbide burs under air-water cooling. The cervical margin was located at the dentin-enamel junction level, and the cavity configuration was self-retained (Figure 1). A high-copper alloy (Dispersalloy—Johnson-Johnson) was used to restore the large cavity preparation. The cavity was previously cleaned with 2% chlorhexidine digluconate. An auto-matrix system was used and stabilized with godiva and wooden wedges. After carving and burnishing, the matrix was removed for finishing (Figure 2). Occlusal adjustment was made following removal of the rubber dam. A lateral view of the buccal surface is shown in Figure 3. After seven days, the patient returned for polishing of the restoration, but he claimed that, when smiling, the amalgam was visible and he was worried about this unaesthetic effect. During discussion with the patient a veneered restoration was proposed, with composite replacing the buccal surface of the amalgam restoration, thus improving the esthetic appearance without impairing the mechanical properties. The



Figure 1. Cavity preparation after caries removal and prior to finishing of the margins.



Figure 2. Carved and burnished amalgam restoration after matrix removal.



Figure 3. Buccal view of the restoration after removal of the rubber dam.

patient agreed with the treatment proposed. Then, the color shade was taken and the rubber dam was placed. The buccal amalgam surface was ground to a depth of 2 mm using diamond burs (#4138, KG-Sorensen, Barueri, SP, Brazil). With a #1090 cylindrical diamond bur (KG-Sorensen, Barueri, SP, Brazil), two small holes were placed in the ground amalgam surface to improve mechanical retention (Figure 4). Powder and



Figure 4. Buccal amalgam surface reduced and two retentive areas placed.

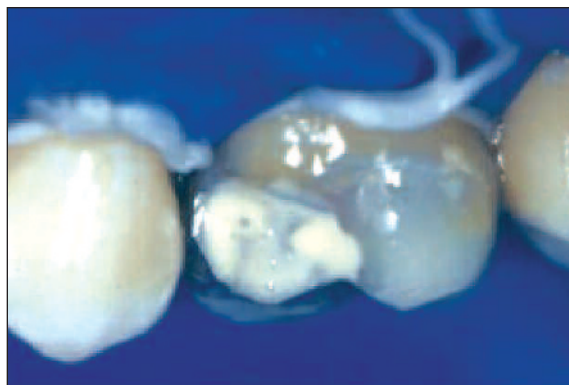


Figure 5. Thin layer of RMGIC applied over cut amalgam surface.



Figure 6. Composite placed in two increments following enamel etching and application of adhesive system.



Figure 7. Buccal view of composite veneer after rubber dam removal.

liquid of the resin-modified glass ionomer cement (RelyX Luting Cement, 3M/ESPE, St Paul, MN, USA) were mixed, and a thin layer was applied into the retention holes (Figure 5) and photo activation was conducted for 40 seconds. The enamel was conditioned with 37% phosphoric acid for 20 seconds, followed by washing, and two layers of Adper Single Bond (3M/ESPE) were applied, which were photo activated for 20 seconds. The veneer was built with composite (Filtek Z250, 3M/ESPE), with two increments 1 mm each, each of which were polymerized for 40 seconds (Figure 6). The rubber dam was removed, the occlusion was checked and finishing and polishing were completed with multilaminated burs and rubber points (amalgam) and disks (Sof-Lex, 3M/ESPE) for the composite (Figures 7 and 8). After six months, the patient returned, and the restoration was evaluated, exhibiting good esthetic and functional results (Figures 9 and 10).

DISCUSSION

The case reported shows a technique that combines the improved esthetic appearance of composites with the excellent mechanical properties of amalgam. In this case, the large cavity was located in a stress-bearing

area and a cusp was lost; amalgam was selected as a direct restorative material. In such a situation, the clinical failure of direct composite restorations has been reported to increase significantly.⁷ Some previous reports^{11-12,15} have presented similar approaches for this technique, with practical results. It should be considered that indirect restorations should be the first choice for extensive cavities, in that they exhibit better longevity,⁵ however, indirect restorative techniques involving cast metals, ceramics or resin-based materials are expensive compared to directly placed restorations.¹⁵

The suggested technique could also be a reliable alternative to repair large, aged amalgam restorations that have suffered fractures but remain in clinical service.¹⁶⁻¹⁷ Such a technique is within the scope of minimally invasive dentistry¹⁴ and it may avoid the repetitive restorative cycle.¹⁸

Evaluating combined amalgam-composite Class II restorations in deciduous teeth, Holan and others¹⁹ observed a similar performance to composite restorations, alone. However, the authors suggested that amalgam could cause an esthetic problem, since the combined restorations could have a grayish appearance. To



Figure 8. Occlusal view of the polished amalgam/composite restoration.



Figure 9. Six-month buccal view of the restoration showing an adequate esthetic result.



Figure 10. Six-month occlusal view showing good esthetic and functional result.

prevent such an adverse effect, the application of an opacifying agent could be used between the amalgam and composite, masking the dark color of amalgam.^{3,19} A good esthetic result was obtained when a thin layer of resin-modified glass-ionomer cement (RMGIC) was applied as the intermediate material.¹² In this report case, a thin layer of RMGIC was applied with a twofold purpose: 1) to mask the restoration, opacifying the amalgam background and 2) to use a material that could provide adhesion to both materials, amalgam and composite, since RMGIC has a bonding capacity to both materials.⁶ RMGIC seems to be an option with more advantages than other intermediate materials, such as adhesive resin cement or adhesive systems used for the amalgambond technique.⁶ Masking or opacifier resin agents, as intermediate materials, could also be used to improve the esthetics; however, there is no adhesion of these materials to aged amalgam, making mechanical retention mandatory.

To provide some mechanical retention between the materials used in this case, the amalgam surface was ground with a diamond bur. Eidelman and others²⁰ stated that the bonding system could penetrate into the roughened surface produced by the diamond bur, creat-

ing a micromechanical interaction with the composite. Also, small holes were prepared in the ground amalgam surface, similar to the amalgapin technique.²¹ These holes should improve the resistance to displacement of the composite veneer caused by occlusal forces.²²

One shortcoming of the veneering technique is the production of an additional composite/amalgam interface, because there is no chemical interaction between these materials.¹⁰⁻¹¹ However, Demarco and others³ observed that microleakage occurred between the two materials and not between the material/tooth interface. In addition, with RMGIC, the interface will be filled with a compatible material, so that the composite, amalgam and interface will be sealed.⁶ In the case reported here, acid etching the amalgam surface was avoided, since some studies have found a reduction in bonding resistance between materials,²³ thus increasing microleakage.²⁴

Another problem with the combined technique is the increase in working time and the need for more clinical sections compared to direct amalgam or composite restorations.³

It is important to highlight that in a meta-analysis regarding the longevity of materials placed in posterior teeth, Manhart and others⁵ observed a similar annual failure rate for composite and amalgam. A similar clinical performance could help to prevent premature failure, which could happen with materials presenting different behaviors.

CONCLUSIONS

Composite veneering represents a good alternative for the esthetics improvement of complex amalgam restorations.

Acknowledgement

The authors thank Dr John M Powers for his suggestions during the preparation of this manuscript.

(Received 26 January 2006)

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