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A Restorative Approach for Class II Resin Composite Restorations: A Two-Year Follow-up

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Clinical Relevance

Successful resin composite restorations can be achieved when a careful restorative technique is employed. Use of a sectional matrix band and elastic ring helps achieve a tight proximal contact, and the centripetal restorative technique can help to obtain contour and anatomy, minimizing the use of rotary instruments during the finishing procedures.

SUMMARY

This clinical report describes a restorative technique used to replace two Class II resin composite restorations on the upper premolars. A sectional matrix band was used in conjunction with an elastic ring (Composi-Tight) to obtain tight proximal contact. A nanofilled resin composite (Filtek Supreme Ultra) was incrementally applied using oblique layers to reduce the C-factor, each layer being no more than 2 mm thick, and then light cured for 20 seconds with a light-emitting diode lamp (EliparFreeLight 2 LED Curing Light) with a power density of 660 mW/cm^2. A centripetal technique was used to restore the lost tooth structure from the periphery toward the center of the cavity in order to achieve a better contour and anatomy with less excess, thereby minimizing the use of rotary instruments during the finishing procedures. Finally, the resin composite restorations were finished and polished, and a surface sealer (Perma Seal) was applied to fill small gaps and defects that may have been present on the surfaces and margins of the restorations after the finishing and polishing procedures.

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INTRODUCTION

Resin composites have been used largely as direct restorative materials because of their toothlike appearance, low cost, long working time/command cure, and acceptable clinical behavior.[1,2]

Among the disadvantages, increased marginal discoloration and reduced marginal adaptation have been reported in several clinical studies.[3-5] Breakdown of the adhesive bond poses a challenge to the longevity of composite restorations as microleakage can lead to secondary caries.[5,6]

Clinical studies have suggested that resin composite restorations present better results in small to moderate-sized cavities.[1,2,4] The performance of these restorations seems to be more successful in premolars than in molars, with fracture and secondary caries being the most common reasons for failure.[6-9] Also, the presence of enamel along the cavity margins has been considered an ideal condition because it allows for a peripheral resin-enamel seal that retards ingress of external fluids and bacteria. Once water and bacteria diffuse along the resin-dentin interface, they accelerate the degradation of the adhesive interface.[10]

Another important problem faced by clinicians when performing Class II composite restorations is to reestablish proximal contact. The lack of condensability of composite materials allied to the thickness of the matrix band poses a challenge when trying to achieve adequate interproximal contact. Several instruments and techniques have been developed in an attempt to solve this problem.[11,12] Among them, the use of pre-polymerized resin composite balls, pre-contoured instruments, and sectional matrices with elastic rings have been reported.[12-14] The aim of this report is to present a clinical case in which successful Class II restorations were achieved using pre-contoured sectional matrices and a separation ring to obtain a tight proximal contact. At a two-year evaluation, the restorations presented very satisfactory clinical behavior.

CASE REPORT

A 28-year-old man in excellent oral health was referred for an oral examination at the dental clinic of Schulich Medicine & Dentistry, Western University, London, Canada. His chief complaint was related to sensitivity in the left maxillary premolar region when ingesting sweet food. Although no recurrent caries was visualized on the bite-wing radiographs, deficient marginal adaptation was clinically detected on the old resin composite restorations of teeth 14 and 15 (Figure 1). Because of the conservative size of the cavity preparation and the patient's good oral hygiene allied to the esthetic requirement, it was agreed to replace these defective resin composite restorations with the same material.

Isolation was performed using a rubber dam. The old composite restorations were removed, and the preparations were refined with a No. 245 carbide bur. Bevels were placed at the facial and lingual walls of the proximal box using a diamond needle bur (DET-CEF, Brasseler, Quebec, Canada). Unsupported enamel at the gingival margins was finished with gingival margin trimmers (Hu-Friedy Mfg Co, Chicago, IL, USA) (Figure 2).

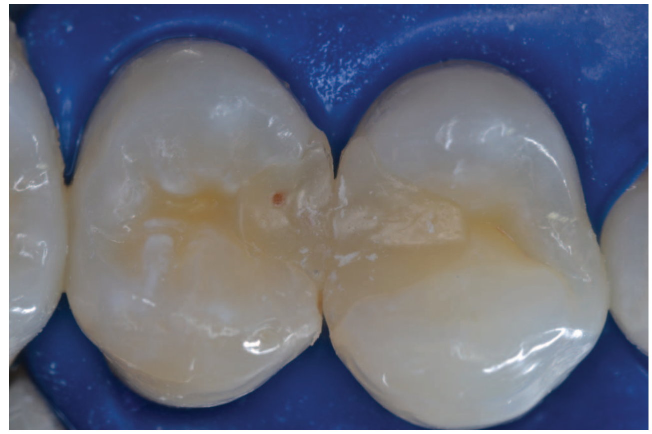

Figure 1. *Initial aspect of the defective resin composite restorations. Note the presence of unsatisfactory contour and marginal gap at the mesiofacial margin of tooth 15.*

A sectional pre-contoured matrix system with an elastic ring (Composi-Tight ring, Garrison Dental Solutions, Spring Lake, MI, USA) was applied, and a ball burnisher was used to verify contact with the adjacent tooth. The restorative procedures can be visualized step-by step in Figure 3a-h.

The cavity preparation was conditioned with 37% phosphoric acid for 15 seconds in the dentin layer and 30 seconds in the enamel layer, after which the cavity was rinsed and gently dried with an air syringe, leaving a slightly moist surface. The dentin bonding agent was applied (Single Bond adhesive, 3M/ESPE, St Paul, MN, USA), gently air dried to evaporate the solvent, and light cured for 10 seconds with a light-emitting diode lamp (EliparFreeLight 2 LED Curing Light, 3M/ESPE) with a power density

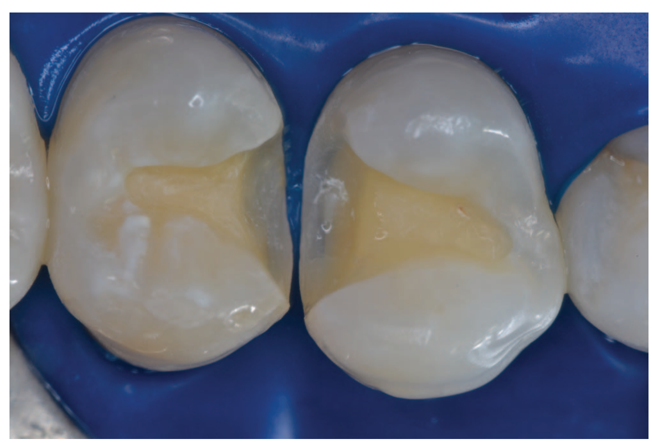

Figure 2. *Restorations were removed and the preparations were refined with a No. 245 carbide bur. Note the presence of enamel around all margins of the cavity preparation. Obtuse angles were developed at the proximal margins to increase the number of enamel rods exposed for the acid conditioning.*

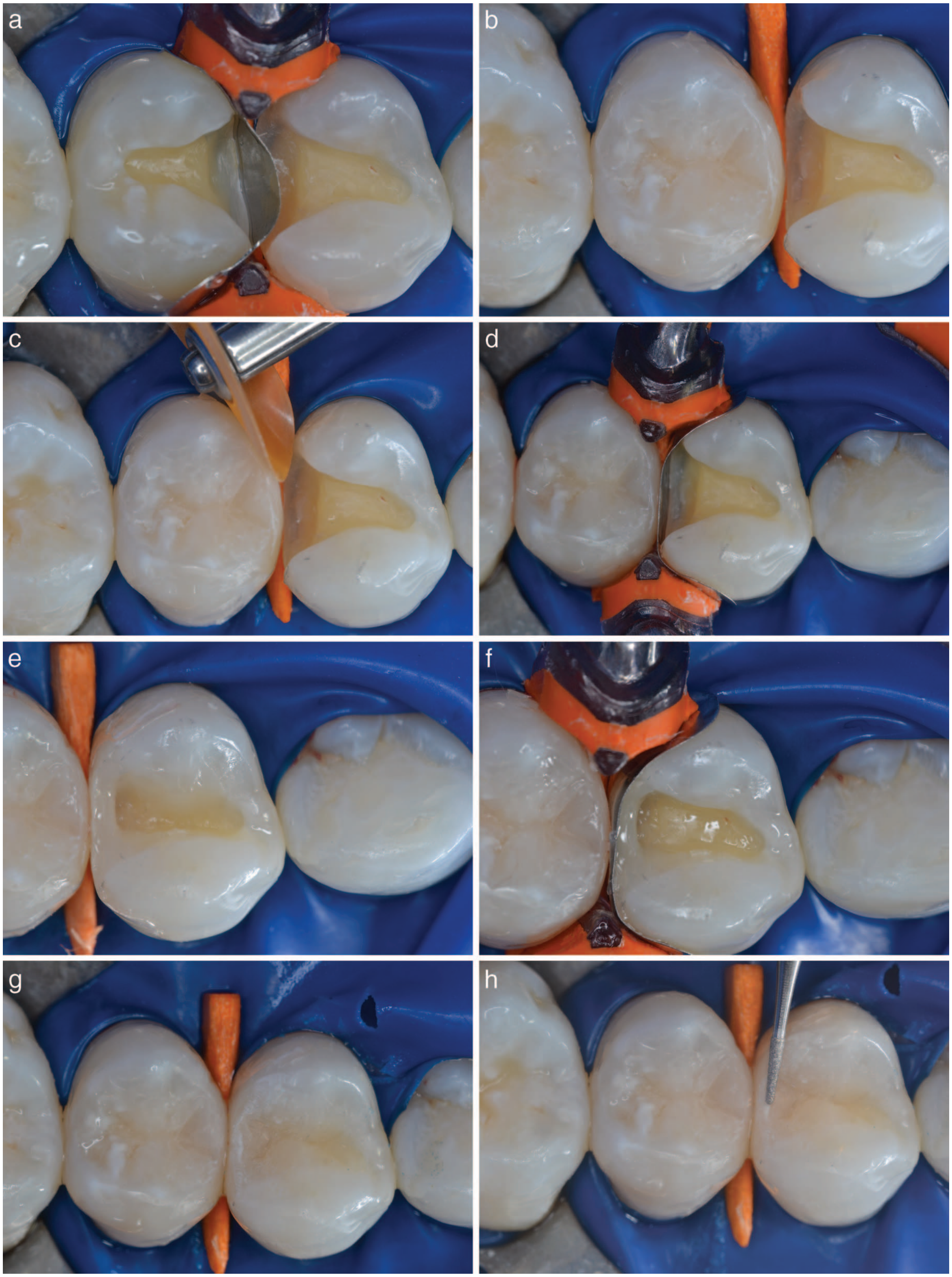

Figure 3. *Restorative procedure. (a): Sectional matrix, wedge, and elastic ring were positioned on tooth 15. (b): Aspect of the final restoration. (c): Proximal and occlusal embrasures were refined with fine disks before starting the restorative procedure on the neighboring tooth. (d): Sectional matrix, wedge, and elastic ring were positioned on tooth 14. (e): Resin composite was applied from the periphery to the center of the cavity (centripetal technique). (f): After proximal contour was reestablished, the matrix was removed to promote better access and visualization to the occlusal box. (g): Aspect of the restoration immediately after its conclusion. (h): A diamond bur was used to refine contour and remove any small excess.*

of 660 mW/cm^2. The nanofilled resin composite (Filtek Supreme Ultra, 3M/ESPE) was incrementally applied in oblique layers no more than 2 mm thick to reduce the C-factor, and then light cured for 20 seconds. The resin composite was applied from the periphery to the center of the cavity preparation in order to first reestablish the proximal contact. After proximal contact was reestablished, the matrix band and elastic ring were removed, and the occlusal box was restored. The centripetal technique has the advantage of transforming the Class II into a Class I, and facilitating visualization and access because the matrix band is removed immediately after the proximal box is restored.

Finishing and polishing procedures were accomplished with the use of a diamond bur (DET-CEF, Brasseler) followed by rubber points (Pogo Points, Dentsply Caulk, Milford, DE, USA). Proximal and occlusal embrasures were refined with fine disks (Sof-lex Finishing/Polishing Kit, 3M/ESPE). After polishing, a surface-penetrating sealant was applied to each restored tooth (Perma Seal, Ultradent, South Jordan, UT, USA). The resin composite surfaces, including the margins, were etched with 35% phosphoric acid for 5 seconds, rinsed and dried. A thin layer of a surface sealer was then rubbed into the surfaces, gently air thinned, and light-cured for 20 seconds (Figure 4).

At one and two years after treatment, the restorations were checked. The patient was satisfied with the result (Figure 5).

DISCUSSION

Although resin composite materials are considered easy to handle, reestablishing proximal contact is sometimes a challenging procedure, especially when the clinician is placing large Class II restorations. Unlike amalgam, which can be laterally condensed to obtain an optimal proximal contact, esthetic composite materials depend entirely on the contour and position of the matrix and wedge.[11,15] The lack of condensability because of the visco-elastic properties of the composite materials makes reestablishment of proximal contact more difficult and requires much care in adapting the matrix and wedge.

Different types of matrix systems have been specially developed for use with composite restorations. Compared with plastic matrices, metal matrices are considered easier to install, maintain their shape better, are thinner, and can be burnished to the adjacent tooth, so the interproximal contacts can be more easily developed.[16]

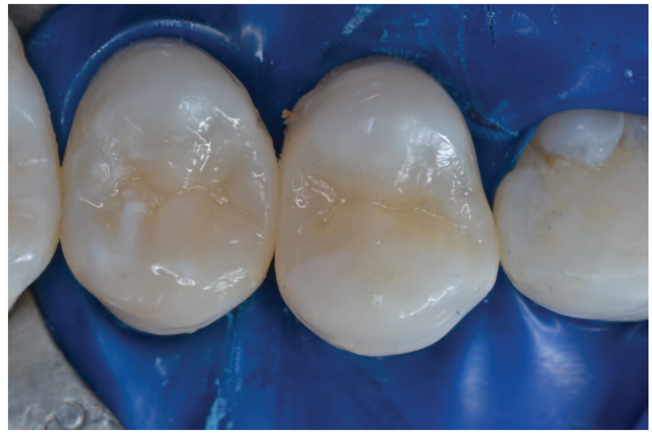

Figure 4. *Final aspect of the Class II restorations after application of the surface sealer.*

More recently, sectional matrices, which feature a short piece of steel matrix that is designed for single proximal-surface restorations, were designed with the intention of simplifying the matrix placement procedure. The great advantage of this system is the presence of an elastic ring that holds the contoured matrix in place. These rings provide progressive

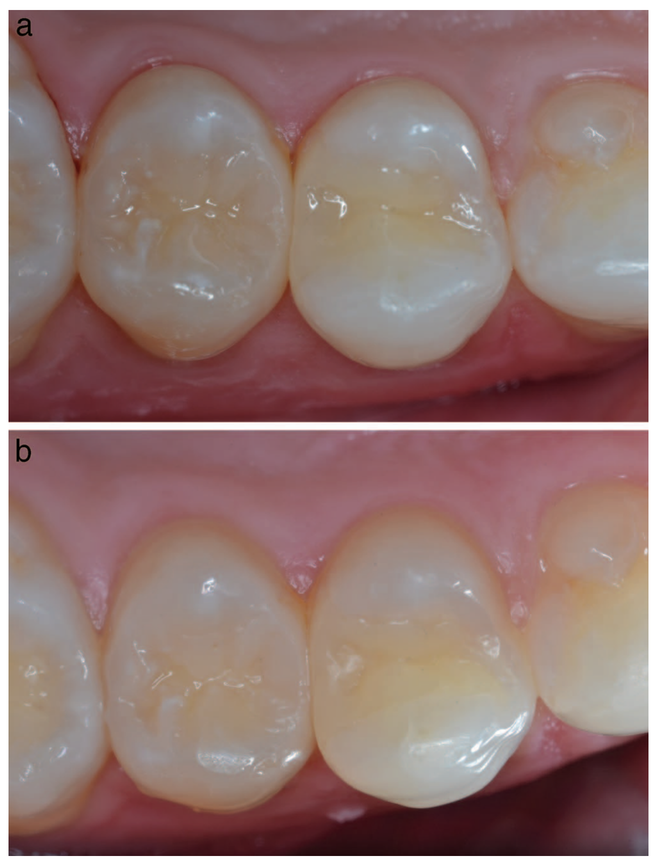

Figure 5. *Aspect of the restorations. (a): After one-year clinical evaluation. (b): After two-year clinical evaluation.*

tooth separation, resulting in an efficient contact.[11,13,15]

Although the use of pre-contoured instruments can help reestablish interproximal contact when circumferential matrices are used, previous studies have shown that the greatest increase in tightness is achieved when elastic rings are used.[11-15] The separation promoted by the rings can compensate for the thickness of the matrix band and allows for good adaptation of the composite material to the neighboring tooth.

To reduce the stress generated during the polymerization contraction, oblique increments contacting the maximum of two walls were used to reduce the C-factor.[17] Additionally, the incremental placement technique is necessary to ensure full curing of the entire bulk of composite and to facilitate the anatomic buildup of the restoration. Increments were applied to replace one cusp at a time. The uncured composite was contoured to the final anatomy of the cusp and then light-cured. This procedure allowed for the achievement of an ideal contour without the need to use the bur extensively during the finishing procedure. The use of the centripetal technique also contributed to the better access of the occlusal box once the matrix and ring were removed, allowing better visualization and positioning when replacing the missing dental structures at the cusps. This technique was first described in 1994 by Bichacho[18] and was intended to restore the lost tooth structure from the periphery toward the center of the cavity in order to achieve a better contour and anatomy with less excess, thereby minimizing the use of rotary instruments during the finishing procedures.

The use of rotary instruments when contouring and finishing the composite restorations' surfaces may create defects on the surface.[19] The use of surface sealers has been advocated to fill small gaps and defects that may be present on the surfaces and margins of restorations after the finishing and polishing procedures.[19,20] Surface sealers are light-cured materials that present greater fluidity and penetration capacity. The surface sealant can seal the margins and any microscopic gaps or defects in the surface, promoting better marginal adaptation and extending the restoration's longevity by protecting the underlying composite and delaying its exposure to the oral environment.[20-22] Some *in vitro* studies have also shown reduced wear[23] and decreased microleakage of resin composite restorations that have been sealed with resin surface sealers.[21,22]

In the present case, both restorations were conditioned with a 35% phosphoric acid for 5 seconds to facilitate impregnation of a fluid resin with a high-penetrating capacity to fill possible marginal discrepancies that might have been generated during the finishing and polishing procedures.

CONCLUSION

Successful resin composite restorations can be achieved once the characteristics and limitations of these materials are understood and taken into consideration. Because of the peculiar features of resin composite materials, such as the stress generated as a result of polymerization shrinkage, viscoelastic properties that preclude proper condensation, thickness/cure ratio, and technique sensitivity of the bonding protocol, a careful restorative technique should be used. In conclusion, all phases involved in the restorative procedure should be meticulously implemented to ensure the success of the resin composite restorations.

Conflict of Interest

The author of this manuscript certifies that there is no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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