

New techniques and tools for “back-to-back” Class II restorations: A clinical Case with Palodent® Plus and SDR®.



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The increasing demands of patients and clinicians regarding esthetic restorations together with the improvements in adhesive materials, composite resins and dental porcelains have brought the possibility of conservative long-lasting esthetic treatments.¹ Composites restorative materials are frequently selected for the esthetic restorations of the posterior dentition due often to their potential for adhesion^{2,3} tooth reinforcement and lifelike appearance.⁴

Posterior composite restoration can be challenging a procedure especially in relation to the formation of a tight proximal contact as well as the attainment and maintenance of the marginal seal (marginal integration). Poor or lack of proximal contact is promptly recognized an inconvenience by the patient due to the potential and likelihood of food impaction, whereas a lack of marginal integration, manifested clinically as white lines, poor marginal adaptation and later interfacial staining, is the most common reason for failure of adhesive resin-based restorations, and it predisposes the restorations to retention failures and recurrent caries.^{6,7}

Nevertheless, modern dental adhesives have the potential to impart remarkable and clinically proven retention and marginal seal.^{5,6,7,8,9} A relatively recent scientific publication has shown a promising survival rate of 89% for class V bonded composite restorations after 12 year.⁵ Following the recommendations of the American Dental Association (ADA) guidelines, this recent study⁵ was designed to evaluate the bond strength to dentin on *non-beveled* class V preparations. That is, preparations which have not received any type of extension or beveling on enamel. Such a protocol (no bevel) is quite common for studies primarily investigating clinical bond strengths to dentin. Under the yet disputable premise that beveling the enamel margins may

increase the marginal seal^{10,11} and fracture resistance^{12,13} as well as to reduce the occurrence of micro-cracks¹⁴ and increase the surface area¹⁵ it is then plausible to assume that class V restorations placed according to clinical guideline; that is, restorations placed on beveled Class V preparations have the potential to show an even higher survival rate than the 89% after 12 years as reported on the study mentioned above.⁵

Continuing forward with this rationalization, once *accepted* that there is potential for long-term and successful bonding to tooth structure, the operator's next logical step should be to master a restorative technique, which allows him to obtain an immediate, effective and successful integration between tooth and restoration. In order to accomplish that, one needs to obtain excellent internal and marginal seal at the restoration margins throughout the whole operative procedure, seal of which should be maintained during the effective life of the restoration. Microleakage, not retention, is the primary cause of clinical failure in noncarious cervical restorations⁹ and no method of handling an adhesive restoration can ensure that it is "leak proof."^{6,8,9} Nonetheless, it is clinically feasible to obtain and maintain marginal integrity throughout the placement procedure as well as through the life-time of the restoration, as the authors of the 12-year recall and many other investigators have repeatedly attested.^{5,9,15,17}

This clinical case report aims to address a few techniques and to a minor extent also materials, in order to illustrate the *modus operandi* of the authors, their simple approach aiming a swift, effective and successful restoration of complex clinical cases on the posterior quadrant. More specifically, the authors focus on their approach to establish and maintain marginal Integrity, which may increase the longevity of the restoration.^{5,11,12,14,16,17} Additionally, a technique will be described for the effective and simultaneous formation of proximal contact point between teeth number 46 (DOB) and 47 (MOB) which may be easier than one might expect given the right technique and materials.

Clinical Case: Patient of 32 years of age with no relevant medical history presents with temporary restorations and failed composite restorations in teeth number 46 (DOB) and 47 (MOB). The teeth presented secondary caries radiographically. It was decided to use the new Sectional Matrix System Palodent Plus (DENTSPLY) which allows for the simultaneous restoration of back-to-back class two due to its integration between the ring and the wedge. The restoration was performed with Amaris Flow High Opaque (VOCO), SDR Smart Dentin Replacement (DENTSPLY), and Ceram.X Mono+ Universal Nano-Ceramic Restorative in shade M2 (DENTSPLY).



Fig 1. Lingual View. Failed composite restorations and provisional material on teeth number 46 (DOB) and 47 (MOB).



Fig. 2A, 2B and 2C Cavity preparation principles and procedure.

The removal of the previous restorations was performed following the principles of minimally invasive dentistry. The old restorations as well as the demineralized enamel were removed with a round stone in high-speed and infected dentin was eliminated with a slow-speed round carbide bur. Care was taken not to molest or remove the affected dentin, which is firm and is not easily removed with a dental excavator but it could be easily removed by a rotary instrument. We used a round diamond stone to remove the defective restoration to prepare the enamel and a round carbide bur with light pressure for the removal of caries and infected dentin.



Fig 3A and 3B. Final preparation.

Note the maintenance of the sclerotic and affected dentin, especially on tooth number 36. The presence of affected dentin was confirmed with a dental excavator and blunt dental explorer (non-sharp probe). No beveling was performed on the margins, except that any acute angle present was slightly rounded with a diamond stone in slow speed in order to facilitate the subsequent composite adaptation and to ensure marginal integration. Nevertheless, the authors tried to be very conservative and avoid a removal of more than 0.2 mm of enamel, by using very light pressure and avoiding extended bur contact with a certain enamel area for any given time. Also, the "toilet" of the cavity was concomitantly performed, which consists in removing any internal stains or dark spots which might become visible through the final restoration. This is made with a diamond bur in slow speed (for tissue preservation) to ensure or at least aid to a seamless marginal integration and to avoid unnecessary replacements of this restoration by dentists who might mistake these harmless discolorations as for secondary decay and therefore indicate a restoration replacement.



Fig 4. Placement of the Palodent Plus matrix band.

This step is a good example of where good materials can synergistically propel good techniques to a better result. The matrix band has been designed with holes in the top and at the sides to use them in conjunction with Palodent Plus Pin-Tweezers; this way, it is easier to place and remove the matrix band properly.



Fig 5. Placement of the second Palodent Plus interproximal matrix band, observing that this was done after the Palodent Plus Wedge insertion.

This is only possible thanks to the unique design of this particular wedge, which does not aim to achieve a separation between the teeth, but actually to seal the cervical-gingival wall of the proximal box. It is important to note that this feature is applied to specific clinical cases and in some other cases the wedge should be placed after the placement of the ring.



Fig 6A and B. Placement of a secondary Palodent Plus wedge to securely seal the gingival and proximal walls of the respective adjacent proximal boxes.

Although recommended, this step is optional. It is also important to note that the Palodent Plus wedges are stackable and design to impart lateral seal rather than to separate the teeth. The subsequent ring placement will impart all the necessary tooth separation, in a predictable and effective manner, so that a successful proximal contact can be obtained. Actually, more than two wedges can be securely stacked in the same inter-proximal area if need be.



Fig 7. Etching and adhesive application (XP BOND, DENTSPLY).

After acid etching with phosphoric acid 36% (minimum of 15 seconds on enamel and an additional maximum of 15 seconds on dentin), XP BOND was applied .



Fig 8. Placement of SDR (DENTSPLY) as a base material after the application of the flow opaque material.

The opaque flowable material was applied over the dark sclerotic dentin areas for masking effect.²⁰ SDR was applied as a base over all the dentinal areas and cervical enamel. SDR imparts remarkable low shrinkage stress and allows a maximum depth of cure of 4 mm. SDR self-adapting feature avoids unnecessary handling or modeling of the material, which enables the operator to save precious operative time. With more time to spare, the operator is more likely to strive for a more precise and optimal placement of the occlusal layer using a composite of choice.



Fig 9. Adaptation of SDR.

Notice the good fit obtained after the placement of the base material SDR. There was neither inclusion nor presence of air bubbles as well as no visible imperfections. With the time savings that SDR provides, one can concentrate more readily in subsequent and more critical parts of the restoration, as the formation of the lateral (buccal and lingual) grooves, cusp ridges as the creation of the marginal ridge and secondary grooves and ridges. Ceram.X Mono+ shade M2 was the material of choice for complete build up of the occlusal layer. As M2 is a body-shade composite, it presents ideal translucency, being able to emulate both dentin and enamel, it imparts a chameleon like property making it an ideal material for the posterior composite restorations. Here we see the simultaneous placement and adaptation of the composite material to the distal marginal ridge of tooth number 46 and to the adjacent mesial ridge of tooth number 47.

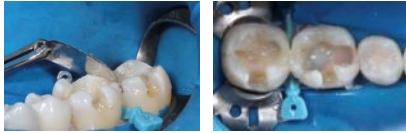


Fig 10A and B. Simultaneous restoration of the marginal ridges.

Note the accurate placement and optimal formation of the buccal and lingual embrasures. Given the simplified and swift approach it is also remarkable the absence of excess material and of gaps between the restoration and the tooth surface. The application of SDR base material and the simultaneous restoration of the marginal ridges were carried out in just less than four minutes.



Fig 11A, B, C and D. Placement of the occlusal increments

Each cusp (occlusal or buccal) and ridge was individually restored with individual oblique increments and provisionally tack cured for 3 seconds each (step-cure technique).^{18,19} This technique not only significantly reduces the stress of polymerization and probably the subsequent formation of white lines, but it also significantly reduces the working time.²⁰ Please, notice that no attempt was made to restore the buccal and occlusal surfaces at the same time. Instead, the occlusal ridges and anatomy was given priority in order to maximize accuracy and avoid excess placement, which causes excess occlusal adjustment. The buccal areas were restored by separate (and therefore more accurate) increments, which were also tack-cured for 3 seconds each. After placement and finishing of the occlusal surface, all increments in each restoration were simultaneously light-cured for 20 seconds each using a curing light with output greater than 800 mW/cm².



Fig 12. Application of tint material (Kerr Dental)

The application of the tint material demonstrates the formation of detailed esthetic and functional anatomy including the central fossae, primary and secondary grooves as well as secondary ridges. This step is performed with didactical purposes in mind and has little if any value for the patient himself.



Fig 13. Final polymerization of each restoration for 20 seconds with a minimum output of 800 mW/cm².



Fig 14. Finishing performed with Enhance® (DENTSPLY).

Enhance Finishing System is an aluminum-oxide based material which finishes the composite to a matt luster. Enhance has the interesting ability of not scratching or harming enamel as being able to remove the composite material well enough for finishing of the margins and well as to small to medium adjustments (gross or large adjustments should be performed with a fine or extra-fine diamond or finishing carbide bur). The buccal and lingual embrasures were minimally finished (because little excess was present) with an experimental finishing disk.



Fig 15A and 15B. Immediate final results after minor occlusal adjustment and polishing with PoGo® (One Step Diamond Micro-Polisher, DENTSPLY).

It was necessary to carry out minor adjustments using a fine-grit finishing diamond on the distal-buccal cusp of the second lower molar. Polishing was accomplished with PoGo and Prisma® Gloss™ Polishing Pastes (aluminum-oxide based, DENTSPLY). The natural anatomy and the obvious resulting marginal integration are excellent, with no post-operative sensitivity detected. Moreover, the restoration boasts a natural secondary anatomy as well as a correct and functional anatomy of the cusp ridges and buccal surfaces. Because these structures are corresponding to a natural anatomy and are occlusally adjusted, the restoration will most likely be more resistant since it was possible to add more composite to the whole area of the restoration without incurring on interferences during the mandibular excursions.

DISCUSSION AND CONCLUSIONS

The use of an evidence-based and simplified technique greatly facilitates and reduces working time allowing for predictable and assured results. A reduced work time ensures better accuracy and acuity, which translate into predictability and reproducibility. The right materials also have a remarkable potential to synergistically interact with the right techniques, culminating in easier and fast restorations. The minimal invasive technique used to prepare the teeth promotes tissue conservation and maintenance of undermined enamel, which greatly reduces the external extension and size of the preparation.^{5,6,7} The preservation of the affected dentin minimizes potential for pulpal inflammation or pulpal necrosis. In addition, several studies have demonstrated that smaller composite restorations impart a higher survival rate and the clinician should therefore maintain as much sound tissue as possible, even if that means unsupported enamel (unsupported enamel can be reinforced with a base or regular composite material). The toilet of the cavity promotes better adhesion as well as cleaner surfaces to bond to and therefore have an esthetic appeal. The use of round burs prevents the formation of acute angles, which might induce to stress areas and induce crack formation and propagation.

The use of a dental adhesive based on tertiary-butanol solvent (XP BOND, DENTSPLY) allows for a larger window of opportunity regarding the control of dentinal moisture prior to the adhesive placement.

The immediate dentinal sealing technique (SDR, DENTSPLY) protects the dentinal bond obtained and ensures for long-term retention, as far as the dentinal bonding is concerned.

The use of a sectional matrix system with integrated wedge system such as Palodent Plus allowed for a somewhat unprecedented procedure involving the restoration of two class II restorations simultaneously using the same ring and the same wedge for both preparations.

Further, the Palodent Plus Sectional Matrix System allowed for a natural contour of the bands, a better control of the points of contact and minimized finishing and polishing. The use of the base material SDR, which presents self-leveling, self-adaptation, 4-milimeter increment application and low-shrinkage stress allows the clinician to operate in a user-friendly, predictable, consistent and reproducible manner. Incidentally, the time spared with the base build-up allows the operator to dedicate more time for an effective and more realistic occlusal restoration, which – on its turn – favoring a final restoration with less occlusal adjustments and finishing requirements.

Composites restorative materials are frequently selected for the esthetic restorations of the posterior dentition due often to their potential for adhesion^{2,3} tooth reinforcement and lifelike appearance.

With the right materials and technique, the clinician can not only accomplish a biological, mechanical and esthetic restoration, but also in an effective and swift manner and actually enjoy it and have fun during the process.

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