

# Class II Composite Restorations and Proximal Concavities: Clinical Implications and Management

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## Clinical Relevance

Proper configuration of the proximal surface of a Class II composite restoration is essential for the preservation of dental and periodontal tissues and subsequent long-term success. Adequately customized or designed wedges can assist in reproducing an imitation of natural form in the interproximal area and ensure sufficient contact tightness with the adjacent tooth.

## SUMMARY

**Clinical experience supports the notion that the restoration of MOD cavities may pose a challenge to the practitioner. Proper placement of precontoured matrices and commercial wedges help the clinician to establish an optimal emergence profile and sufficient contours. However, the presence of proximal concavities in premolars or molars can turn the reproduction of previous cervical architecture**

**into an even more demanding task. Wedges with customized form or adequate design can precisely conform the matrix to the cavosurface area and prevent any gap formation. This article presents two different options that allow for successful and predictable reestablishing of anatomically correct contours and optimal proximal contacts in posterior teeth with proximal concavities.**

## INTRODUCTION

Recent technological advances in adhesive dentistry along with the increasing patient demand for tooth-colored restorations have forced the routine use of contemporary resin composites for the restoration of carious lesions. However, especially in Class II composite restorations, among the most difficult challenges to clinicians is achieving perfect adaptation of resin composite to the margins and the internal walls of the cavity or the prevention of

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overhangs at the cavosurface margin. Unlike amalgam, composite resins cannot easily be condensed into all regions of the prepared cavity, which in turn affects the establishment of sufficient proximal contacts. In addition to that, the cervical proximal margins in Class II restorations are often considered to be the Achilles' heel, as dentin bonding is often less predictable.

Established United States Public Health Services (USPHS) criteria evaluate anatomic form and marginal characteristics of restorations, implying that marginal and internal adaptation are crucial for the longevity and good prognosis of resin composite restorations.<sup>1-3</sup> Moreover, it is well documented<sup>4,5</sup> that the formation of overhangs provokes food impaction, subsequent recurrent caries, and periodontal problems. Consequently, clinical experience supports the notion that the proper placement of the matrix and wedge are of paramount importance in order to achieve ideal form, function, and esthetics for the success of posterior resin composite restorations.<sup>6</sup>

In recent decades numerous developments have been made in the field of matrices and wedges that are used in posterior teeth. As resin composite is becoming the most frequently used restorative material, many of these products are specifically targeted for improved results with those restorations.<sup>6</sup> The constant search for the "perfect" system is ongoing, as the diversity of clinical cases seems to be endless. One of the most demanding clinical challenges is the restoration of concave proximal cervical areas, which are most commonly located in the mesial aspect of the upper first premolars and first lower molars as well as the distal side of the upper first molars.<sup>7</sup> These prominent concavities occupy an area located cervical to the mesial contact area and extend to the corresponding tooth depression (Figure 1).<sup>7</sup> When the cervical margin of a Class II restoration is located in the area of proximal root invaginations, tooth contour seems "incompatible" with the convex shape of most matrices, as the latter are commonly used for the restoration of convex-shaped proximal areas.

As concave-shaped matrices have not been developed for such distinct clinical situations, the dental clinician has to rely on the proper shape of the wedge. Dental wedges usually serve to compress the matrix to the remaining healthy tooth structure across the entire buccolingual length, apical to the gingival cavosurface line angle.<sup>8</sup> A review of the literature revealed limited references on that topic, suggesting molding the wedge with compound,<sup>9</sup>



Figure 1. Proximal concavity at the mesial aspect of an extracted upper first premolar.

light-cured resin,<sup>10</sup> the utilization of elastic cords,<sup>11</sup> or the use of two wedges to seal the cavity.<sup>12</sup>

## PURPOSE

The purpose of this article is to recommend two different options that will enable the clinician to solve one of the main aforementioned issues regarding Class II composite restorations, that is, the adequate sealing of the gingival cavosurface margin when a proximal concavity exists. The following two clinical cases will illustrate two ways of conforming the matrix to the proximal concavity of the tooth, thus preventing an overhang and securing ideal contours of the restoration.

## DESCRIPTION OF TECHNIQUES

### Case 1: Customization of Wooden Wedge

A 35-year-old female patient presented with a carious lesion on the mesial aspect of her first upper

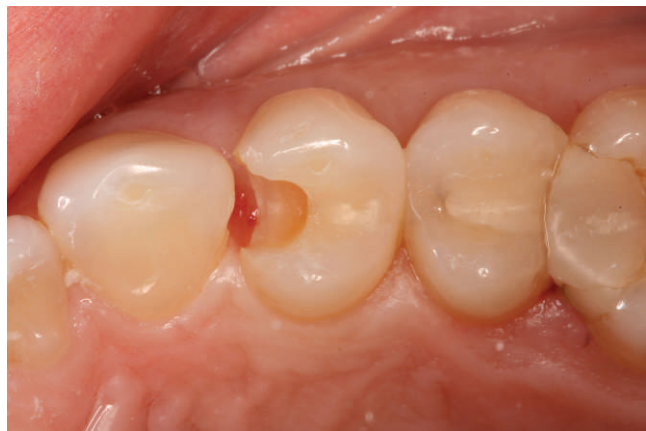


Figure 2. Occlusal view of the cavity preparation. Note the existence of a proximal concavity.

premolar. A conventional wooden wedge of adequate dimensions was placed during the preparation of the cavity (pre-wedging technique) in order to protect the soft tissues, separate the adjacent teeth, and ensure proper proximal contacts.<sup>13</sup> During the cavity preparation, special care was given so that the cavosurface margin finished on enamel, in order to minimize the microleakage (Figure 2). Upon completion, a proximal concavity made it impossible for the precontoured sectional matrix (Contact Matrix, Danville Materials, San Ramon, CA, USA) to maintain precise contact with the cavosurface margin. Therefore, a larger wedge (Kerr, Bioggio, Switzerland) than that needed was selected and customized with a #15 blade in a corresponding convex shape to accommodate the interproximal space (Figure 3).<sup>8</sup>

After the wedge was inserted in the proximal space, securing the matrix in place, proper marginal

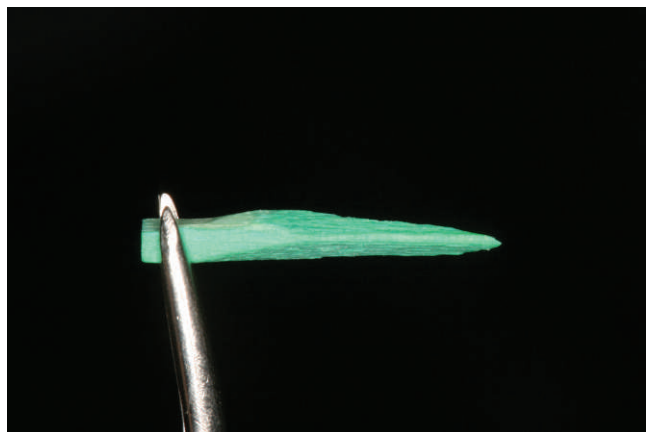


Figure 3. A selected wooden wedge was properly contoured with the use of a surgical blade.



Figure 4. The insertion of the customized wedge ensures adequate matrix adaptation.

fit was verified (Figure 4).<sup>8</sup> A ring maintained their positions, held the matrix against the tooth surfaces, and added to the wedge's separation capacity.<sup>6,14</sup> Subsequent burnishing of the matrix provided adequate configuration and contact with the adjacent tooth.<sup>6</sup> The total etch technique was used and the composite (Tetric EvoCeram, Ivoclar Vivadent AG, Liechtenstein) was preheated, then applied by incremental layering and polymerized in a soft-start mode (Figure 5) in order to improve adaptation and reduce shrinkage at the cervical interface.<sup>15,16</sup>

### Case 2: Plastic Wave-Wedge

A 40-year-old female patient presented to the clinic with a failing composite restoration that also had clinically unacceptable contours (Figure 6). After a rubber dam was placed the old restoration and secondary caries were removed and the outline form of the cavity preparation was assessed (Figure 7). Upon insertion of the conventional wooden wedge a



Figure 5. Postoperative view of the final restoration.



Figure 6. Preoperative occlusal view of the existing restoration.



Figure 7. After the removal of the restoration, a proximal concavity could be observed.

misfit between the matrix and the cavosurface margin was verified (Figure 8). A plastic wedge (Wave-Wedge, Triodent Ltd, Katikati, New Zealand) (Figure 9) that has been lately introduced<sup>17</sup> was



Figure 8. Placement of a conventional wooden wedge results in incomplete sealing of the cavosurface margin.



Figure 9. The Wave-Wedge (Triodent Ltd) in three different, color-coded sizes.

selected in the case in order to aid in the adaptation of the matrix. This wedge is designed with a wave curvature that allows for an optimal adaptation to the anatomy of the cervix of the tooth. Furthermore, its elasticity enables the wedge to expand after entering the critical interproximal area. For that reason, the wedge was forced beyond its central concavity to ensure proper sealing (Figure 10), to prevent any gap formation in the cavosurface area, and to facilitate composite layering (Figure 11). All the subsequent steps were carried out as mentioned above, and a radiograph verified the acceptable contours at the mesial aspect of the restoration (Figure 12).

### Potential Problems

The potential problems identified included the following: 1) difficulty in establishing sufficient contours of the wooden wedge (in the first case)



Figure 10. The Wave-Wedge's design allows for adequate sealing.



Figure 11. Occlusal view of the completed restoration showing optimal contours and proximal contact with the adjacent tooth.



Figure 12. The radiograph verifies the absence of an overhang at the cavosurface margin.

and 2) potential displacement of the plastic wedge or inadequate tooth separation (in the second case)

## DISCUSSION

Resin composites are considered to be the state-of-the-art materials with which to facilitate direct posterior restorations. However, the restoration of a MOD cavity is often a concern for the clinician, who has to overcome problems associated with

adequate handling of interproximal areas as a result of constraints in clinical access.<sup>6</sup> Given the aforementioned inherent limitations, the presence of any proximal anatomical variations in premolars or molars can pose a challenge to the practitioner.<sup>6</sup> Proper reproduction of the proximal concavity is largely dependent on the shape and relation of the sectional matrix and corresponding wedge.<sup>6,8</sup>

Among the basic requirements, a dental wedge must be able to cause tooth separation, provide resistance against the matrix, and precisely conform it to the anatomical surfaces of the tooth to be restored. Loose fit of the matrix allows oral fluids to contaminate both the cavity and the restorative materials. Therefore, this improper adaptation compromises the longevity of the restoration and induces its potential failure in the future. Furthermore, any gap formations will develop overhangs and unacceptable contours of the tooth in the interproximal space, leading to plaque accumulation.<sup>4,5</sup> This is even more important as the finishing burs and strips cannot approximate concave gingival margins,<sup>6</sup> and the difficulty in gaining access can definitely endanger the integrity of the adjacent teeth and the periodontium.

As the restoration's success lies in meeting the fundamental prerequisites, the custom wedge modifications with a bur or blade<sup>8</sup> or the utilization of precontoured wedges can present viable alternatives to conventional wedges and enhance the clinician's armamentarium.

## Summary of Advantages and Disadvantages

From a clinician's perspective, the two options illustrated above represent very effective ways of addressing such clinical situations, thus providing the practitioner with sufficient comfort at the same time.<sup>6</sup> Both wedge designs reflect the shape of the proximal concavities; thus, they may offer various advantages in an efficient and simplified manner. Their customized shape can easily be adapted to tooth contours, create a tight seal, and ensure matrix manipulation. In such a clinical situation the adequate transition from the concave cervical area to the convex shape of the contact area is mandatory. This individual reproduction of previous cervical architecture prevents any overhang formation and minimizes the need for lengthy finishing procedures.

In the authors' experience, the potential disadvantages of the present approaches could be the time needed for the techniques to be well adopted and

distortion of the matrix during the insertion of the wedge, as well as the cost of the plastic wedges.

### Conflict of Interest

The authors of this manuscript certify that they have 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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