

Sectional matrix: Step-by-step directions for their clinical use

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IN BRIEF

- Discusses the clinical technique for restoring Class II cavities using a sectional matrix.
- Suggests a higher separation than the matrix thickness must be achieved, which subsequently facilitates its proper placement.
- Advises that the matrix cannot be placed on the cavity floor; it has to exceed the gingival margin of the preparation.

The sectional matrix is the best way to achieve a strong contact point in Class II restorations with composite resin in the posterior dental sector. The pre-wedging is essential to get a separation between teeth which avoid the matrix deformation during its insertion. This article describes the clinical technique for restoring Class II cavities using a sectional matrix.

INTRODUCTION

In the posterior dental segment, the interproximal contact area is located in the middle third, or at the union of the occlusal third with the middle third of the proximal surfaces.¹ When a Class II restoration is performed, obtaining a strong and anatomical proximal contact area prevents food impaction and periodontal disease, helping to maintain papillary health. It also prevents dental migration and decay.^{2,3} The studies published up to this day support that, in Class II restorations with composite resin, the sectional matrix with rings provides more anatomical and stronger contact areas than a circumferential matrix.⁴⁻⁷

Isolation of the operative field with a rubber dam is recommended,⁸ although, there are clinical studies that did not find differences in the survival rate of restorations in the posterior sector where isolation was done with cotton rolls and aspiration, in comparison with a rubber dam.^{9,10}

This article describes the clinical technique for restoring class II cavities using the sectional matrix.

DESCRIPTION OF TECHNIQUE

Operative field preparation

The operatory field isolation is the first step; the authors prefer working with a rubber dam (Rubber dam. Hygenic.Coltène/Whaledent, OH, USA) to isolate the operatory

field. The isolation should be wide, to obtain better access and visibility¹¹ for the dentist and the assistant. The rubber dam is maintained in position with a large metal frame (Adult Rubber Dam Frame. Hu-Friedy Mfg. Co., Chicago, IL, USA).

To achieve a wide operating field, the clamp must be placed as far back as possible in the molars, and in premolars it should be placed at least two teeth distally to the tooth that is going to be restored. This avoids the clamp interrupting the proper placement of the wedge, matrix, or ring (Fig. 1). If this is not possible, the use of a wingless clamp or another that does not extend into the interproximal area would be indicated (Fig. 2). In the opposite direction, the authors like isolating up to the central incisor. In deep cavities, cutting the interproximal strip of the rubber dam may be indicated to prevent it from invading the gingival floor and hindering the clinical procedure.

Pre-wedging

In order to achieve a tight proximal contact the use of the pre-wedging technique is recommended.⁶ Before removing the decayed tissue, the use of protective wedges with a metal fin (FenderWedge, Directa AB, UpplandsVäsby, Sweden) is essential. They avoid damaging the wall of the adjacent tooth. Even so, the metal fin can be drilled while the cavity is being prepared.

A higher separation than the matrix thickness must be achieved, which subsequently facilitates its proper placement. Therefore, it is preferable to use wide wedges and insert them with a curved mosquito haemostat to make a strong pressure and insert them completely. Sectional matrices are very thin and easily deformed. The insertion of the wedge can cause a distance between the rubber dam and the tooth contour at that level.

Another way to achieve a separation between the teeth that need to be restored is by placing an orthodontic separator a few days before. These elastic separators are used in orthodontics for metallic bands insertion.



Fig. 1 Incorrect placement of the wedge and ring due to the interference of the clamp fin



Fig. 2 Isolation of the operative field with a wingless clamp which does not prevent the proper placement of the wedge

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Cavity preparation

The removal of carious tissue can result in unsupported enamel in the proximal cavity floor, which must be eliminated.¹² For this, a margin trimmer¹³ (Margin Trimmer MT26, Hu-Friedy Mfg. Co., Chicago, IL, USA) or a cylindrical burr (Komet 10839, Gebr. Brasseler GmbH, KG, Lemgo, Germany) that cuts only on the flat end was used. There can also be used a sonoabrasive system,¹⁴ with sonic tips for the preparation of interproximal cavities.

Once the cavity preparation is finished, the FenderWedge is removed. At this time, there is a direct view of the proximal surface of the adjacent tooth. If decay is located on the proximal surface, it can be treated directly without removing healthy tissue, like the marginal ridge.

Matrix placement

The matrix must be placed without pressure. Matrices are very thin (0.038 mm.) (Slick Bands, Garrison Dental Solutions, Spring Lake, MI, USA) and easily deformed if pressure is applied while placing them. If the matrix cannot be placed easily, a wide wooden wedge (Hawe Sycamore Interdental Wedges, KerrHawe, Orange, CA, USA) can be inserted, exerting a strong pressure with

a curved mosquito haemostat and waiting a short interval of time until there is enough separation. If the interference is located near the occlusal surface, it can be resolved with a metal composite instrument (Composite Instrument, PFI11, Hu-Friedy Mfg. Co., Chicago, IL, USA) in order to separate the teeth. The matrix cannot be placed on the cavity floor; it has to exceed the gingival margin of the preparation.

Once the matrix is positioned, a wooden wedge (Soft Wedges, Garrison Dental, Spring Lake, MI, USA) is inserted with a curved mosquito haemostat, applying the necessary force in order to adapt the matrix closely to the gingival contour of the proximal box (Fig. 3). It must also remain below the proximal cavity floor. If the wedge remains above the cavity floor, it will cause a convexity of the matrix towards the interior of the cavity. The wedge has a double function: to get a separation between teeth which compensates the matrix thickness for obtaining a strong interproximal contact, and to adapt the matrix intimately to the contour of the tooth all around the cavity floor. The insertion of the wedge can be done from either lingual¹⁶ or buccal¹⁵ side or even from both, provided that the matrix remains intimately adapted to the cavity floor. The sectional

matrix must be centred, with similar segments towards the buccal and lingual side.¹⁶ It is important to keep in mind that the matrix can be moved in the direction of the wedge insertion.

The Composi-Tight Soft-Face 3D Ring (Garrison Dental Solutions, Spring Lake, MI, USA) is now placed to seal the buccal and lingual embrasures. This ring has silicone ends with a wedge shape to adapt the matrix to the embrasures and avoid the overhang of the restoration (Fig. 4). It also has a space for the wedge to achieve a good fit to the gingival area (Fig. 5).

Frequently, these procedures can cause gingival bleeding, nevertheless, if the technique was adequate, there would never be contamination inside of the cavity even if the rubber dam is not used (Fig. 6). A watertight compartment has been achieved by the matrix being intimately adapted to the cavity walls. Due to the pressure caused by the ring or the wedge, small remains of gingival tissue or detached fragments of enamel may stay inside the cavity. They must be removed with an explorer and, with the same instrument, the sealing of the contour is checked.

Polishing phase

Once the restoration is finished, it needs to be polished. In the interproximal area, the authors prefer the use of diamond-metal finishing strips (Diamond Finishing Strips cxd3-superfine, Edenta AG, Hauptstrasse, CH Switzerland), due to their ability to pass more easily through the contact area without breaking. They have a sawtooth central fragment that is sometimes useful to introduce it from the occlusal side. In order to polish the embrasures and round off the marginal ridge, discs are employed, placing the active surface towards the head of the contra angle and separating the teeth with a metal composite placement instrument if there is not enough space for the disc. The



Fig. 3 (a) Absence of unsupported enamel. Proper matrix adaptation to the contour of the tooth and sealing of the embrasures. (b) Restoration completed with a correct contact area, checked with dental floss

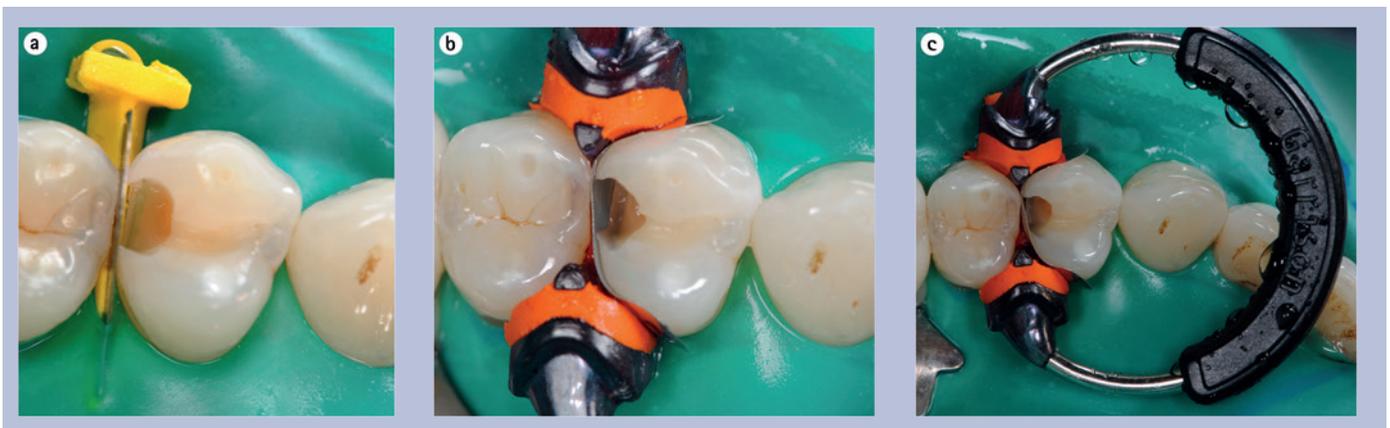


Fig. 4 (a) Distal decay in tooth 14. Pre-wedging and protection of the adjacent tooth with a wedge with a metal fin. (b) The ends of the ring have a wedge-shape, which adapts to the embrasures avoiding the overhang of the restoration. (c) If it is possible, the isolation should be done two teeth distally to the teeth that are going to be restored, and up to the central incisor

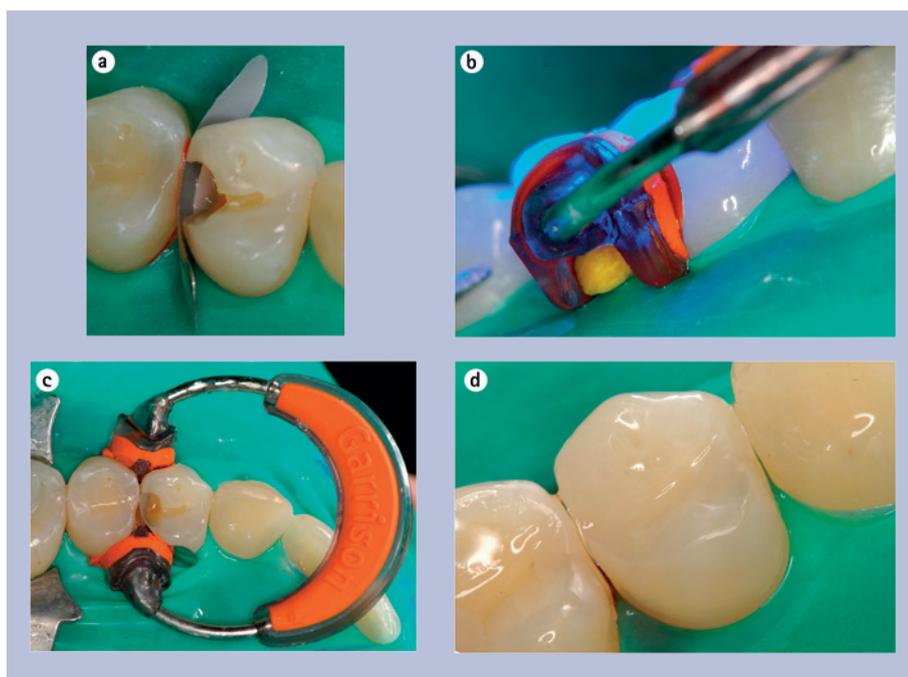


Fig. 5 (a) Matrix has to exceed the gingival margin of the preparation, with similar segments towards buccal and lingual. The removal of the wedge or the insertion of the matrix can cause bleeding. (b) Proper placement of the wedge and ring. The ends of the ring have a space for the wooden wedge. This allows a better gingival adaptation of the matrix. (c) Ring Composit-Tight Soft-Face 3D sealing the buccal and lingual embrasures. (d) The polishing of the interproximal surface and the effectiveness of the contact area is checked with dental floss. If it frays, it will indicate irregularities that must be corrected

recommended discs have a square centre which impedes the mandrill from rotating and not the disc (Polishing disc 12.7 DF-M, AXIS Dental, Crissier, Switzerland) (Fig. 7). Finally, the polishing of the interproximal surface and the effectiveness of the contact area are checked with dental floss.^{4,17} If it frays, it indicates irregularities that must be corrected.

DISCUSSION

An *in vitro* study comparing a different circumferential matrix with a sectional matrix (Palodent, DentsplyDetry GmbH, Konstanz, Germany) determined that the sectional matrix reproduces the strongest contact areas, but no system reproduced a similar form to an intact tooth.¹⁸ Another study done with plastic teeth from a mannequin model suggests that an undesirable concavity appears in the contact area when circumferential or sectional matrices are used, the latter showing a higher incidence of a concave contour.¹⁹ This may be because if there is not enough separation between the teeth, the sectional matrix is deformed by the marginal ridge of the adjacent tooth, producing said concavity. Therefore, an effective pre-wedging is essential and, once the matrix is placed, a wide wooden wedge must be placed for obtaining enough separation and avoiding this problem (Fig. 8).

It has been affirmed that the previous

separation of the teeth is more effective with rings than with wooden wedges^{20,21} and, therefore, is recommended by some manufacturers.²²⁻²⁴ By contrast, the authors consider the pre-wedging to be more effective.

The Triodent system, with the V3 Ring (Sectional Matrix System, Dentsply, Katikati, N.Z.) and Palodent Plus (Sectional Matrix System, Dentsply Caulk, Milford, DE, USA) are systems of sectional matrix with the same elements. Once the cavity is finished, both systems indicate removal of the metal fin of the wedge (WedgeGuard, Palodent Plus, Dentsply Caulk, Milford, DE, USA) and inserting the matrix with the wedge placed interproximally.^{24,25} The authors believe that the wedge must be removed before inserting the matrix, otherwise it is more complicated to insert the matrix behind the wedge and achieve a watertight compartment without deforming it.

We consider that previous teeth separation is essential to placing the matrix without changing its morphology. A clinical technique with an adequate placement of the matrix, as well as a proper positioning of the wedge and the ring, will avoid the irregularities on the cavity floor and the overhang on the embrasures.

There are conflicting studies in relation to the use of a sectional matrix in MOD restorations. Wirsching *et al.*²⁶ in a clinical study, say there are no differences in the strength



Fig. 6 Orthodontic patient where isolation with rubber dam is not possible. Despite this, a proper technique achieves a watertight compartment without the contamination of blood and saliva



Fig. 7 In order to polish, the embrasures discs are employed, placing the active surface towards the head of the contra angle. These discs have a square centre which impedes the mandrill from rotating and not the disc



Fig. 8 Small concavity in the matrix towards the cavity. This could be caused by the marginal ridge when the previous separation is not enough. A lack of adaptation of the matrix on the floor is seen. This is prevented by placing a wedge on the opposite side or with a wedge on each side



Fig. 9 Matrix and rings placed simultaneously in a MOD cavity without their proper location changes

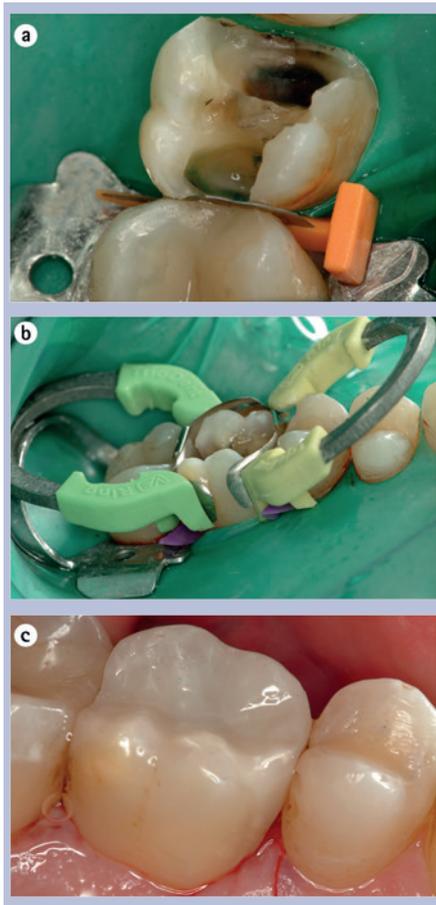


Fig. 10 (a) MOD cavity with complete loss of the mesial interproximal surface. The caries detector indicates the carious tissue that must be eliminated. (b) Restoration using the V3 ring whose wide ends were not introduced interproximally. (c) Adequate contact point achieved despite the extent of the cavity

of the contact area using a sectional matrix (Palodent) and pre-contoured circumferential matrix. By contrast, Saber *et al.*,²⁷ in an *in vitro* study concluded that stronger contact areas were obtained when matrices and rings (Palodent) were applied simultaneously for both proximal surfaces. This difference can be explained because circumferential matrices were employed without wedging in that study.

An *in vitro* study affirms that circumferential matrix produce less overhang when the proximal box is restored, compared with a sectional matrix with metal rings like the Contact Matrix ring (Danville Materials, San Ramon, California), the Composi-Tight Gold (Garrison, Spring Lake, MI, USA), and PalodentBiTine (DENTSPLY DeTrey GmbH, Konstanz, Germany), in which more overhang was detected.¹⁵

The Composi-Tight Soft-Face 3D ring could minimise this undesirable effect by having silicone ends with a wedge shape, which are introduced into the embrasures, preventing an excess of restorative material in this area. In MOD cavities, rings can be oriented in the same direction, without hindering the proper sealing of both embrasures (Fig. 9).

Matrices, rings, or wedges from different manufacturers can be combined, according to the clinical situation and the preferences of the operator.

The majority of the studies done to check the effectiveness of the contact areas with different types of matrix are performed in dental simulator models, with the limitations that they entail.^{27,18}

When the buccal-lingual width is very large, with complete loss of the proximal surface, the ends of the Composi-Tight Soft-Face 3D ring could be introduced into the cavity, completely deforming the matrix. In these cases, the use of rings without wedge-shaped ends avoids the introduction of the matrix into the cavity. For example, the ends of the V3 ring do not have a wedge shape and are located more medially on the lingual and buccal surface of the tooth (Fig. 10).

Nevertheless, when the lack of healthy dental tissue in the proximal surface is large, the authors considered the use of circumferential matrix, like MetaFix (Kerr Corporation, Orange, USA), to be more adequate. It would also be indicated when there is no adjacent tooth.

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