

Use of Transparent Tips for Obtaining Tight Proximal Contacts in Direct Class II Composite Resin Restorations

V Alonso • M Caserio • IL Darriba

Clinical Relevance

The use of the LM-Contact Former system, which uses transparent plastic cone-shaped tips, allows obtaining tight proximal contacts in posterior Class II composite resin restorations with a simple technique. Filling the remaining cavity after removing the transparent tip with a bulk-fill flowable resin-based composite decreases the total working time.

SUMMARY

This article describes the clinical technique of using the transparent plastic tips of the LM-Contact Former system for obtaining tight proximal contacts in direct Class II composite resin restorations using noncontoured circumferential matrix bands.

With this technique, the composite resin is pressed with the tip, which adapts intimately to the walls of the proximal box. Moreover, the total working time is reduced by filling the

cavity, which remains after removing the transparent tip, with a bulk-fill flowable resin-based composite.

INTRODUCTION

The area of the proximal contact in posterior teeth is located in the middle third or at the junction of the occlusal third with the middle third of the proximal surfaces.¹ Obtaining tight and anatomical proximal contacts in direct Class II composite resin restorations helps maintain the interdental papilla and prevent food impaction, periodontal disease, tooth movement, and caries.^{2,3} The interproximal contact is suggested to be contoured as an area buccolingually centered below the marginal ridges. The proximal surface contour should be very convex in the middle and occlusal thirds and flat or concave in the cervical third. Also, the interproximal tooth contacts maintain dental arch stability by transmitting forces along the long axis of the teeth.⁴

Currently, most clinicians consider that tighter proximal contacts are achieved by using sectional matrix bands in conjunction with separation rings,

*Victor Alonso, DD, DDS, PhD, University of Santiago de Compostela, Surgery and Medical and Surgical Specialties, Santiago de Compostela, A Coruña, Spain

Martin Caserio Valea, DDS, Dr Yañez Rebolo 107, Lugo, Spain

Iria Lopez Darriba, DDS, Entrerríos s/n, Santiago de Compostela, Spain

*Corresponding author: Dr. Teixeira, nº 11, 4º D, Santiago de Compostela, A Coruña 15701, Spain; e-mail: dentalinvestigation@yahoo.es

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Table 1: *List of Materials Used*

Material	Manufacturer
Rubber dam	Hygenic Dental Dam, Coltène/Whaledent, OH, USA
Wedge with a metal fin	FenderWedge Directa AB, Upplands Väsby, Sweden
Caries-detector dye	Caries Detector, Kuraray, Tokyo, Japan
Gingival margin trimmer	Margin Trimmer MT26, Hu-Friedy Mfg Co, Chicago, IL, USA
Cylindrical bur that cuts only on the flat end	Komet 108, Brasseler GmbH & Co, Lemgo, Germany
Circumferential matrix band	Hawe Steel matrice, Kerr, Orange, CA, USA
Matrix system	Hawe SuperMat, Kerr, Orange, CA, USA
Wooden wedge	Hawe Sycamore Interdental Wedges, Kerr, Orange, CA, USA
LM-Contact Former	LMDental, Parainen, Finland
LM-MultiHolder PK II	LMDental, Parainen, Finland
Adhesive system	Prime & Bond XP, Dentsply Detrey GmbH, Konstanz, Germany
Light-curing unit	Demi Plus, Kerr, Orange, CA, USA
Microhybrid resin composite	Herculite XRV Enamel Unidose refill, Kerr, Orange, CA, USA
Bulk-fill flowable resin-based composite	SDR, Dentsply Detrey GmbH, Konstanz, Germany
Diamond-metal finishing strips	Diamond Finishing Strips cxds3-superfine, Edenta AG, Hauptstrasse Switzerland
Polishing disc	Polishing disc 12.7 DF-M, AXIS Dental, Crissier, Switzerland

rather than using circumferential matrix band systems.⁵⁻⁸ However, this clinical technique is complex and is not useful when the proximal box extends onto buccal or lingual walls.⁹

Because it is difficult to contour a composite resin against the contact areas of adjacent teeth when circumferential matrix bands are used, some special instruments have been developed to apply pressure to the contact area during light curing.¹⁰ These include transparent cone-shaped tips (LM-Contact Former, LMDental, Parainen, Finland), special hand instruments, Contact Pro (CEJ Dental, San Juan Capistrano, CA, USA), PerForm (Garrison Dental, Uebach-Palenberg, Germany), and restoration inserts (beta quartz glass-ceramic inserts). The transparent plastic tips are inserted into the proximal box using pressure. Consequently, the composite resin is pushed against the walls of the cavity, and the matrix band is pressed against the proximal surface of the adjacent tooth.

In addition, the technique used to place the composite resin influences the achievement of anatomical proximal contacts. With the centripetal technique, the proximal wall is formed first, placing the composite resin on the inner surface of the matrix band from gingival to occlusal, and the cavity is then filled similarly to a Class I restoration. This technique minimizes the C-factor, the polymerization shrinkage, and the formation of marginal gaps.¹¹

Another problem in the performance of composite restorations is polymerization shrinkage, which can

cause marginal failure, discoloration, secondary caries, fractures, and postoperative sensitivity.¹² It is important to note that light curing at a distance can reduce mechanical properties and affect long-term durability of the composite restorations.^{13,14} The efficacy of polymerization also significantly decreases with increasing cavity depth.^{15,16}

Recently, bulk-fill flowable resin-based composites have been introduced, which can be placed in 4-mm-thick increments. This reduces the working time without increasing polymerization shrinkage, cavity adaptation, or the degree of conversion.¹⁷ Researchers have shown clinical results similar to those obtained with incremental filling techniques.^{18,19}

The aim of this article is to describe the clinical technique of using the transparent tips of the LM-Contact Former system in direct Class II composite resin restorations using noncontoured circumferential matrix bands.

CLINICAL TECHNIQUE

The materials used are listed in Table 1. The isolation of the operative field with a rubber dam must be extensive.²⁰ In distal caries, the clamp should be placed, if possible, on two teeth behind the tooth to be restored, to prevent the wings of the clamp from interfering with the proper placement of the wedge and/or the matrix band. If there are no posterior teeth, the use of a wingless clamp is indicated. The authors always isolate to the central incisor of the same side. Using heavy-gauge rubber dams is preferred because they may be stretched



Figure 1. Available sizes of the transparent tips of the LM-Contact Formers system (LMDental, Parainen, Finland).

without tearing and therefore may be passed easier through the interproximal spaces.

Prior to cavity preparation, a thick wedge with a metal fin (FenderWedge, Directa AB, Upplands Väsby, Sweden) is inserted into the interproximal space with curved mosquito forceps to separate and protect the adjacent tooth.⁶

For the removal of the dentin caries, a round tungsten bur with a diameter corresponding to the cavity size is used at low speed. Although caries-detector dye (Caries Detector, Kuraray, Tokyo, Japan) has some limitations, the operator uses it as a guide for removing the infected dentin.²¹ When the caries removal leaves unsupported enamel at the gingival wall, it is necessary to use a gingival margin trimmer²² (Margin Trimmer MT26, Hu-Friedy Mfg Co, Chicago, IL, USA) or a cylindrical bur that cuts on only the flat end (Komet 108, Brasseler GmbH & Co, Lemgo, Germany) to remove this thin enamel.

Once the cavity preparation is finished, the protective wedge is removed and a matrix band is placed to perform the restoration. A 0.03-mm-thick metallic noncontoured circumferential matrix band (Hawe Steel Matrices, Kerr, Orange, CA, USA) is used, adapted with the Hawe SuperMat system (Kerr).

Subsequently, a wooden wedge (Hawe Sycamore Interdental Wedges, Kerr) is inserted with mosquito forceps, applying the necessary force to adapt the matrix band closely to the gingival contour of the cavity. It must also remain apical to the gingival margin, because if the wedge remains above, it will cause a convexity of the matrix band toward the cavity. The wedge also achieves separation between the teeth to compensate for the thickness of the matrix band.

Table 2: LM-Contact Former Tips

Size	Length, mm	Diameter in the Widest Occlusal Area, mm
XS	5.30	2.30
S	4.5	2.6
M	6.0	3.3
L	6.8	4.3

Then, the largest possible transparent tip of the LM-Contact Former (LMDental, Parainen, Finland) that can be introduced into the cavity is selected (Figure 1; Table 2). The LM-MultiHolder PK II (LMDental, Parainen, Finland) is used to transport the tip and verify that the chosen size is adjusted to the cavity. When inserting the tip, some pressure must be applied so that the wider part is at the level of the proximal contact, and as a consequence, the matrix band will be adapted to the adjacent tooth. This is essential for obtaining an optimal location of the contact area, an anatomic proximal contour, and a healthy environment for the gingival papilla.

Once the adequate tip is selected, the cavity is acid etched. The adhesive (Prime & Bond XP, Dentsply Dentsply Detrey GmbH, Konstanz, Germany) is applied according to the manufacturer's instructions, and it is polymerized for 20 seconds with a light-curing unit (Demi Plus lamp, Kerr).

A layer of micro-hybrid composite resin (Herculite XRV Enamel Unidose refill, Kerr) is then placed at the bottom of the cavity, and the selected transparent tip is inserted with the LM-MultiHolder exerting pressure; thus, the composite resin is condensed against the cavity walls and the matrix band. The excess material in the occlusal area that prevents the tip from removal is removed, and the composite resin is light cured for 40 seconds. Then, the tip is removed with mosquito forceps, and the composite resin is light cured for another 20 seconds.

At that point, it may be observed that the composite resin is adapted to the cavity walls, except in the future proximal contact area, due to the pressure exerted by the transparent tip on the matrix band (Figures 2 and 3). If the cavity is a three-surface Class II, one of the proximal boxes is restored first, followed by the other box (Figure 4).

Once the tip is removed, the remaining cavity is filled with a bulk-fill flowable resin-based composite (SDR, Dentsply Detrey GmbH), except for the final occlusal layer. This is restored with the micro-hybrid composite resin (Herculite XRV Enamel Unidose refill, Kerr).

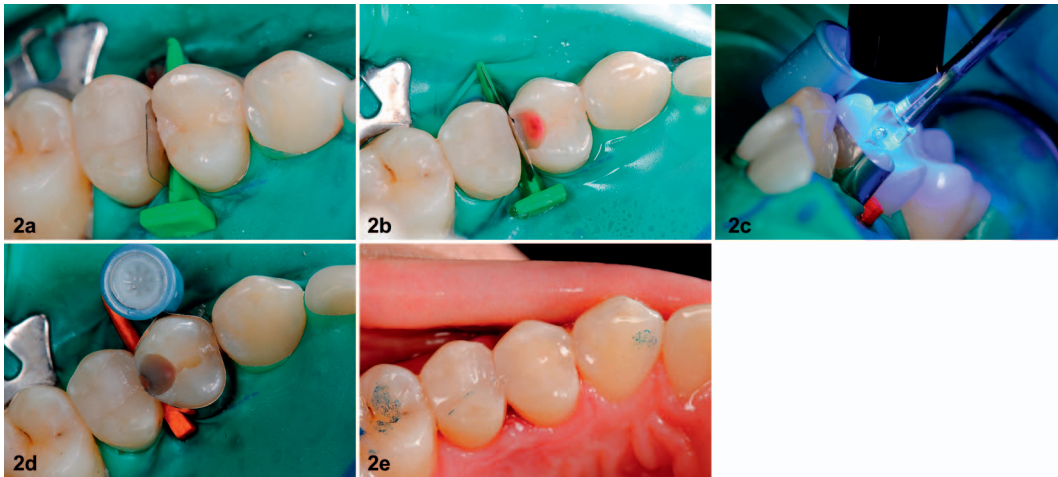


Figure 2. (a): Prewedging is done placing a thick wedge with a metal fin in the interproximal space to separate and protect the adjacent tooth. (b): The enamel without dentin support at the cavity floor is removed with a cylindrical bur that cuts only on the flat end. (c): The largest possible tip of LM-Contact Former (LMDental, Parainen, Finland) that can be introduced into the cavity is selected. The light tip should be placed on the end of the tip to minimize the loss of light intensity in the deepest areas of the cavity. (d): The composite resin is adapted to the cavity walls, unless in the area of the future proximal contact. This cavity is filled with a bulk-fill flowable resin-based composite until the last 2-mm occlusal layer that is restored with a micro-hybrid composite resin. (e): To polish the embrasures and round off the marginal ridge, discs with a square center are employed.

When the restoration is finished, the matrix band and the wooden wedge are removed, and then the restoration is polished. In the interproximal area, diamond-metal finishing strips (Diamond Finishing Strips cxds3-superfine, Edenta AG, Hauptstrasse, CH, Switzerland) are used because of their ability to pass more easily through the contact area without breaking. Also, they have a sawtooth central segment that is sometimes useful to introduce it from the occlusal side to polish the embrasures and round off the marginal ridge. Discs are also employed (Polishing Disc 12.7 DF-M, AXIS Dental, Crissier, Switzerland), placing the active face toward the head of the contra-angle and separating the teeth with a metal composite instrument (1/2 Trico composite instrument, Hu-Friedy Mfg Co) if there is not enough space for the disc. The discs used in this restoration have a square center, which prevents the mandrel from rotating without the disc rotating simultaneously. Finally, the polishing of the interproximal surface and the effectiveness of the proximal contact are checked with dental floss. If it frays, it will indicate irregularities that must be corrected. When the polishing is completed, the rubber dam is removed, and the occlusion is evaluated and adjusted as indicated. It is necessary to repolish the surfaces that required occlusal adjustment.

POTENTIAL PROBLEMS

There are no clinical studies that evaluate the efficacy of this technique.

In large Class II restorations, it is possible that the widest tip of the LM-Contact Former does not adjust to the proximal box. In these cases, it will be necessary to previously cure the composite resin in the medial wall to shorten the mesiodistal distance of the cavity.

The LM-Contact Former system has only four tip sizes. It would be necessary to have more dimensions to adapt to any cavity size.

SUMMARY AND ADVANTAGES AND DISADVANTAGES

This is a simple technique to restore Class II restorations with a composite resin and obtain tight proximal contacts using noncontoured circumferential matrix bands. Using the tips of the LM-Contact Former system, the composite resin is compacted onto the walls of the proximal box, and then the remaining cavity is filled with a bulk-fill flowable resin-based composite.

Advantages

- Proximal contacts obtained are tight, and the ideal anatomical shape of the proximal tooth surface is restored to recover its functionality.
- Appropriate contact between two adjacent teeth is essential to maintain tooth position and dentition stability, provide a food spillway, and facilitate hygienic cleaning. The relationship between contact type and food impaction has been confirmed,

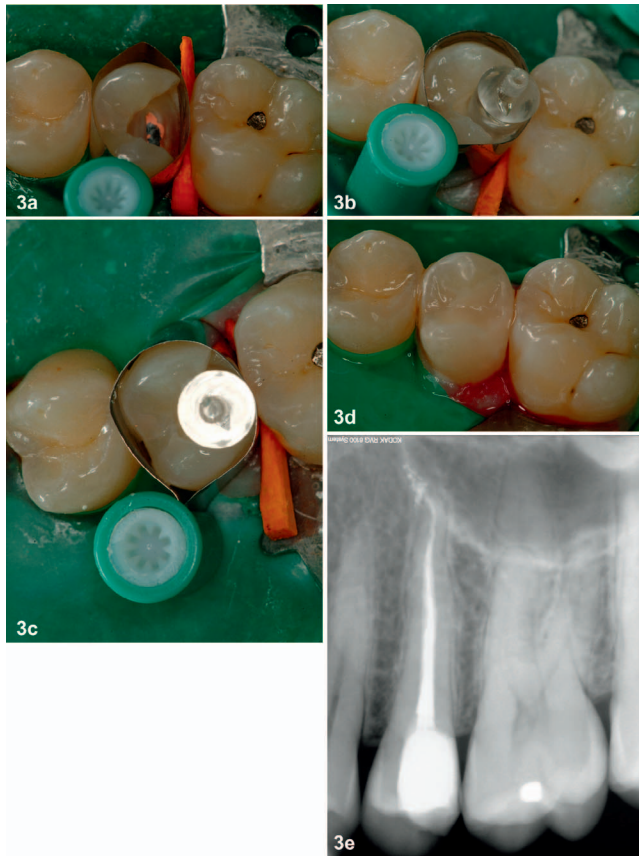


Figure 3. (a): A metallic noncontoured circumferential matrix band is adapted with the Hawe SuperMat system (Kerr, Orange, CA, USA) and a wooden wedge closely to the gingival contour of the cavity. (b): The corresponding tip of LM-Contact Former (LMDental, Parainen, Finland) to the cavity size is tried. (c): When inserting the tip with pressure, the matrix band is adapted to the adjacent tooth, and as a consequence, a tight proximal contact will be obtained. (d): Composite resin Class II restoration finished. (e): The proximal contact is located in the junction of the occlusal third with the middle third of the proximal surfaces.

reinforcing the significance of optimal proximal contact in preventing recurrent decay and periodontal problems.

- The placement and adjustment of a circumferential matrix band are simpler than that of a sectional matrix band, because it is easily deformed when placed, especially when it has not achieved a sufficient separation between teeth.⁹
- When inserting the tip into the cavity, the tip exerts pressure on the composite resin, which is pressed against the walls, avoiding the formation of voids.
- It is not necessary to place the composite resin in layers as in the incremental technique or the traditional centripetal technique.

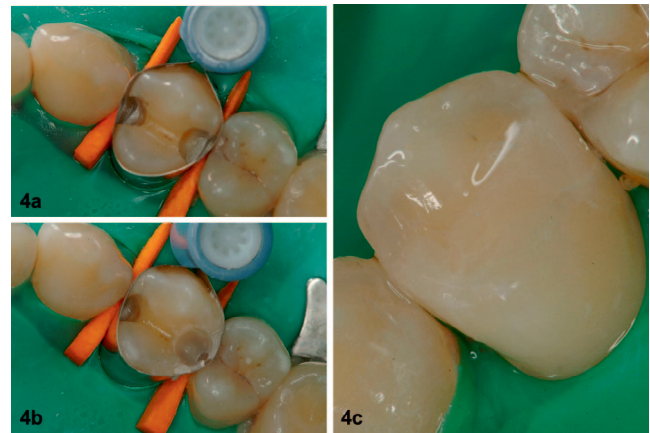


Figure 4. (a): Three-surface Class II cavity in 2.4. The matrix band must remain below the cavity floor, adapted closely to the gingival contour of the cavity. (b): The first of the proximal boxes is restored, followed by the other box. (c): Final aspect of the three-surface Class II restoration.

Disadvantages

- In teeth with large coronal destruction, this technique may not be indicated.
- If a lot of the composite is placed in the bottom of the cavity, when the tip is inserted, the excess goes up to the occlusal area. It can be removed before polymerizing or during the finishing and polishing of the restoration.

Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of the Department of Surgery and Medical and Surgical Specialties, Faculty of Medicine and Dentistry, University of Santiago de Compostela.

Conflict of Interest

The authors of this article 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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