

DENTAL TECHNIQUE

M-i-M for DME: matrix-in-a-matrix technique for deep margin elevation

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Localized subgingival margins constitute a challenge when preparing a tooth for direct, semidirect, or indirect restorations, especially in patients with large class 2 restorations. Endodontics, tooth preparation, isolation, impression making, and restoration delivery are all affected by the problem of subgingival margins, which has traditionally been resolved by a surgical approach (apical displacement of supporting tissues).¹⁻³ However, this resective approach has serious limitations because of anatomic considerations such as the adjacent cemento-enamel junction, teeth with short root trunks, and adjacent root concavities and furcations. Maintaining such structures after they are exposed by surgery is challenging and can generate serious problems such as sensitivity, caries, or periodontal disease. The surgical approach is also not without consequences for the periodontal support of adjacent teeth. Surgery can potentially be avoided by the deep margin elevation (DME) technique,⁴ the principle of which was first described by Dietschi and Spreafico in the late 1990s.⁵ The subgingival margin is moved occlusally by a directly placed composite resin restoration base. The procedure gained popularity and was supported by subsequent publications identifying its safety and efficacy from a clinical, biological, histological, and mechanical standpoint.^{4,6-22} The fundamentals of DME have been described elsewhere.²³ One of the tenets, however, is the successful isolation of the deep margin by using a modified circumferential matrix.⁴ An evolution of the technique, the matrix-in-a-matrix technique (M-i-M),^{4,23}

ABSTRACT

Deep margin elevation is a solution to the problem of localized subgingival margins when preparing a tooth for direct, semidirect, or indirect restorations. The technique focuses on the local isolation of the deep margin by using a modified circumferential matrix. An evolution of the technique is presented, the matrix-in-a-matrix technique, to facilitate the isolation and fit of the subgingival matrix by adding a sectional band inside the circumferential matrix and packing Teflon tape between the 2 bands. Resective surgeries, invasive restorative procedures, and even sometimes extractions can all potentially be avoided by this modified deep margin elevation, allowing ideal conditions for scanning or impression making. (J Prosthet Dent 2021;■:■-■)

facilitates the isolation and fit of a subgingival matrix by adding a sectional matrix inside the modified circumferential matrix and further adapts the matrix by packing Teflon tape between the 2 matrices. This modification of the DME procedure should improve performance, minimizing the need for resective surgeries, invasive restorative procedures, and even sometimes extractions. Significant socioeconomic impact is also expected.

TECHNIQUE

1. Evaluate the preoperative situation with the subgingival box preparation, in this case for a mesio-occlusal inlay (Fig. 1).
2. Trim a circumferential matrix band (Tofflemire Universal, Miltex-Integra) by using scissors to decrease its height and increase its curvature (Fig. 2).
3. Isolate the tooth with a dental dam or another isolation system (Isovac 2; Zyris, Inc), place the modified matrix in a holder (Type 72, Hu-Friedy), and insert around the tooth to be treated (Fig. 3). Push the matrix as cervically as possible, and tighten to hold in position. Note the lack of a seal (arrow in Fig. 3).

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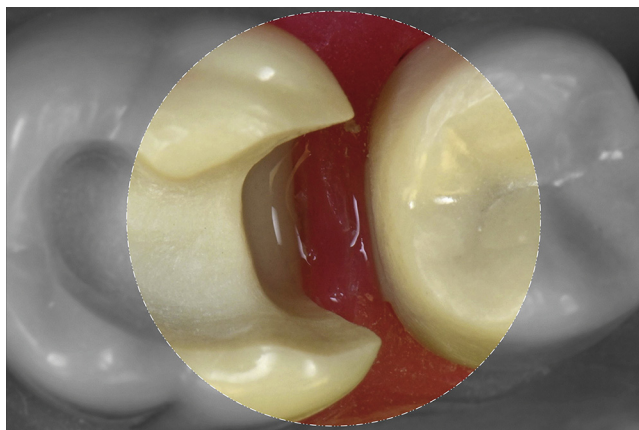


Figure 1. Localized subgingival margin in mesio-occlusal inlay preparation simulated on Typodont.

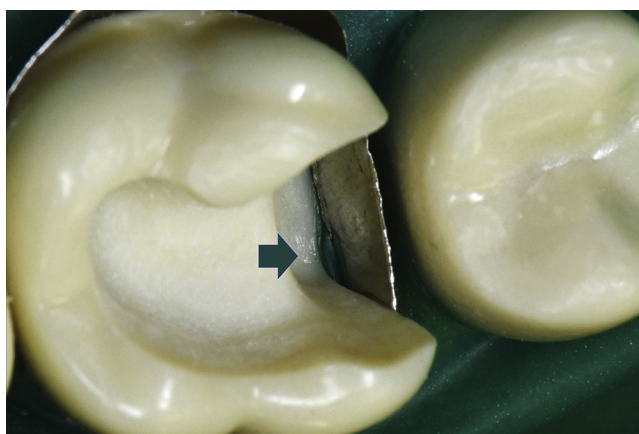


Figure 3. Modified matrix in place. Note residual gap at deepest part of gingival margin (arrow).

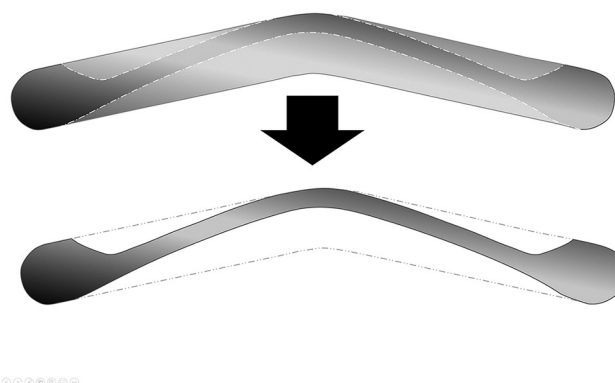


Figure 2. Regular Tofflemire matrix band modification (according to B. Gergis, Adelaide, Australia) for deep margin elevation.

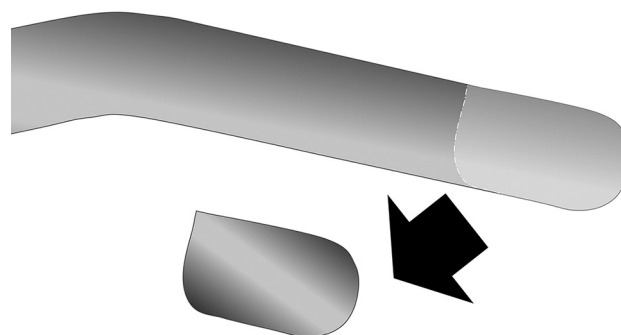


Figure 4. Preparation of additional small matrix from end of matrix band.

4. Prepare a small sectional matrix by cutting the end segment from a universal matrix (Fig. 4). The width of the matrix must be slightly greater than the size of the proximal defect.
5. Loosen the circumferential matrix, and insert the sectional matrix between the circumferential matrix and the prepared tooth in the area of the subgingival defect. Slide the sectional matrix apically beyond the gingival margin (Fig. 5). Slightly tighten the circumferential matrix to hold the position of the sectional matrix.
6. In teeth with concavities or without a gingival seal (fluid, bleeding), use a cord-packing instrument or periodontal probe to insert a small piece of Teflon tape (sterilized plumber's tape) between the circumferential and sectional matrices (Fig. 6). Pack the Teflon tape as apically as possible to ensure that the sectional matrix is pushed against the gingival margin of the subgingival defect (Fig. 7).

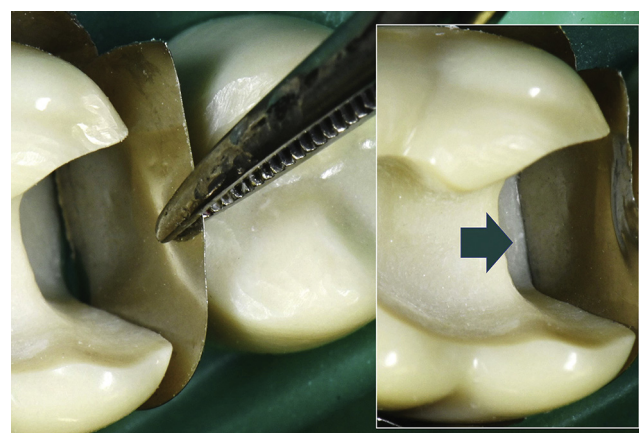


Figure 5. Insertion of additional small matrix between tooth and circumferential matrix band. Gingival margin now closed (arrow in inset).

7. Remove any blood or debris by cleaning the gingival margin by using an oscillating instrument, preferably hemispherical (Sonicflex Microtip #32



Figure 6. For patients with root concavities or insufficient seal by inner matrix, use thin instrument to insert small piece of Teflon tape between 2 matrices.

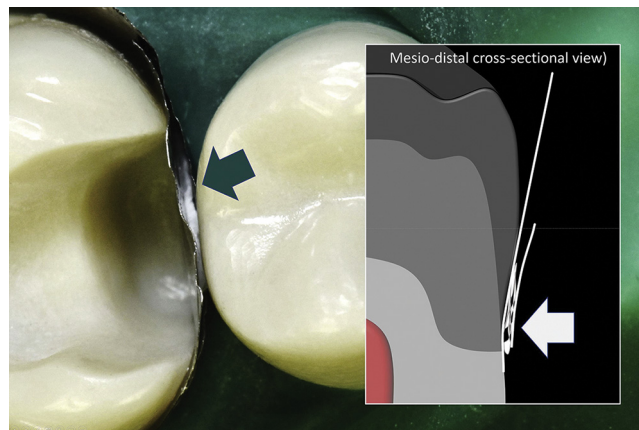


Figure 7. Teflon tape packed at gingival level between 2 matrix bands to secure seal. Cross-sectional view showing packed Teflon tape pushing inner matrix against margin for optimal seal (arrow in schematic inset).

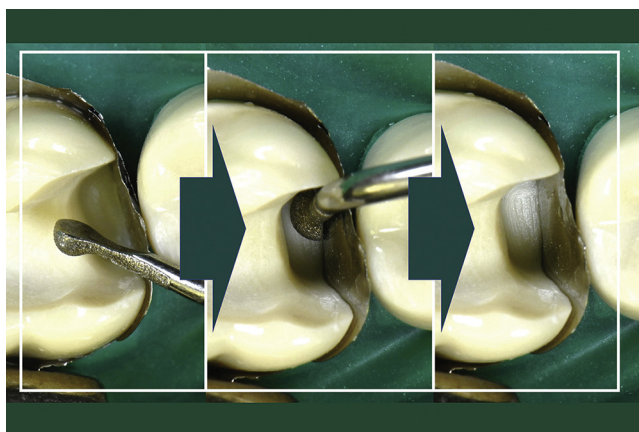


Figure 8. Any blood or debris cleaned with hemispherical oscillating instrument. Margin sealed and freshly cut for bonding (right inset).

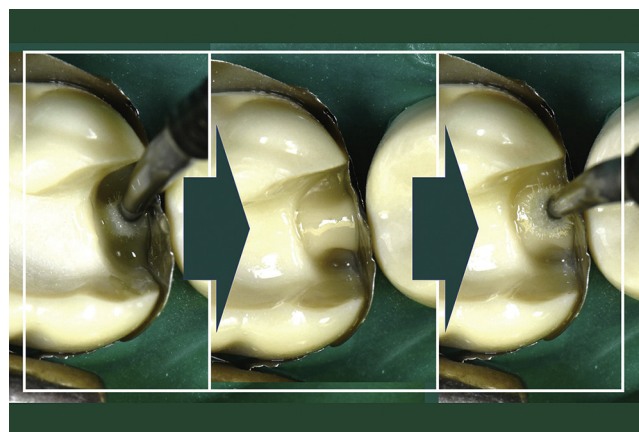


Figure 9. Following bonding steps (IDS), placement of 1 to 3 increments of elevation composite resin.

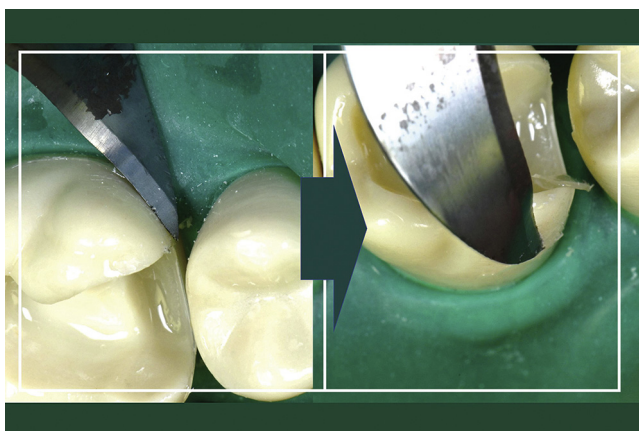


Figure 10. Following air-blocking, polymerization, and removal of matrices and Teflon tape, hand instruments (scaler or modified #12 scalpel blade) used to remove resin flash in accessible areas.

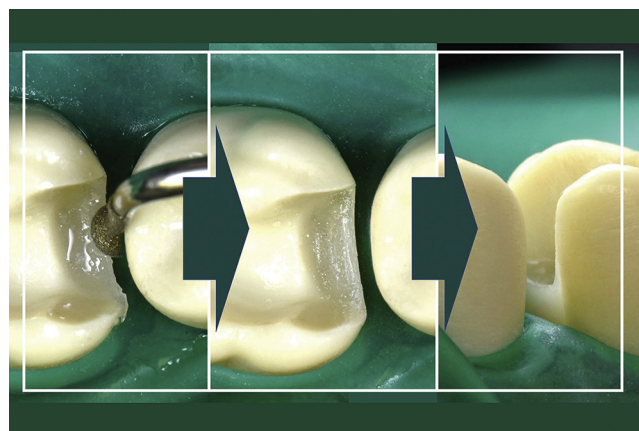


Figure 11. Flash at gingival margin removed with hemispherical oscillating instrument.

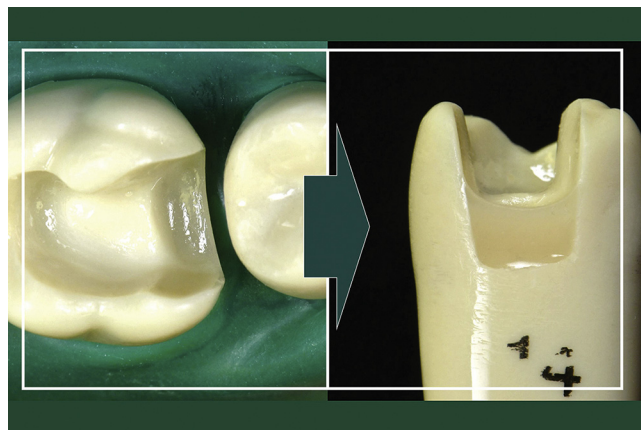


Figure 12. Ideal margin is now easily accessible for scanning or impression (*left*). Tooth removed from Typodont (*right*) to show smooth surface of elevation composite resin and optimal adaptation from matrix fit (no polishing used).

and #33, Kavo) (Fig. 8). Rotary instruments can be used too but might damage the internal surface of the sectional matrix.

8. Dry and ensure that the margin is sealed, with no fluid or bleeding.
9. Proceed to bonding steps (IDS including light-polymerization), by using preferably a filled radio-opaque adhesive system (Optibond FL Unidose, Kerr) and placement of elevation restorative composite resin (Fig. 9), 1 to 3 increments of 1 to 1.5 mm each. Use a microbrush (included in Optibond FL Unidose package) slightly moistened with adhesive (adhesive, Optibond FL Unidose) as the packing instrument. Light-polymerize each increment for 20 seconds and an additional 10 seconds after air-blocking the surface with glycerin gel (K-Y, Johnson & Johnson).
10. Remove both matrices and Teflon tape, and proceed to hand-instrument finishing by using a #12 scalpel blade (Hu-Friedy) to remove resin flash in accessible areas (Fig. 10).
11. Remove any excess at the gingival margin by using an oscillating instrument (Fig. 11), preferably hemispherical (Sonicflex Microtip #32 and #33) or tapered for inlays (Sonicflex Microtip #51 and #52).
12. Evaluate the fit of the direct elevation restoration with a bitewing radiograph. Here, the tooth was removed from the Typodont to demonstrate an excellent margin and smooth composite resin surface shaped by the inner sectional band (Fig. 12).

SUMMARY

A technique is presented to facilitate isolation of deep subgingival margins in class 2 preparations by using a modified circumferential matrix band and the M-i-M technique. A sectional matrix was added inside the modified circumferential matrix band, and Teflon tape was packed apically between the 2 matrices. When followed by proper adhesive procedures and elevation of the margin with composite resin (DME), those teeth can be treated more conservatively (direct or inlay or onlay restorations) as opposed to the traditional approaches (complete coverage crowns and/or surgical crown lengthening).

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