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# Deep Margin Elevation: A Review

**[1]Dr. Pradnya V. Bansode, [2]Dr. Seema D. Pathak, [3]Dr. M. B. Wavdhane, [4]Dr. Shruti Bajaj**
[1]Professor & Head, [2,3] Associate Professor, [4]Post Graduate Student,
Dept. of Conservative Dentistry and Endodontics,
Government Dental College and Hospital, Chhatrapati Sambhajinagar, Maharashtra, India

***Corresponding Author:**
**Dr. Shruti Bajaj**
Post Graduate Student, Dept. of Conservative Dentistry and Endodontics,
Government Dental College and Hospital, Chhatrapati Sambhajinagar, Maharashtra, India

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**Abstract**

Restoration of deep proximal lesions with subgingival margins remains a clinical challenge due to difficulties in achieving adequate isolation, moisture control, and adhesive cementation. Conventional approaches such as crown lengthening, orthodontic extrusion, and surgical extrusion, though effective, are invasive, time-consuming, and may compromise esthetics or periodontal support. Deep Margin Elevation (DME), first described by Dietschi and Spreafico in 1998, offers a conservative alternative by relocating the cervical margin coronally with composite resin. This technique enhances operatory conditions by improving rubber dam isolation, facilitating impression accuracy, and allowing predictable adhesive cementation of indirect restorations. Various protocols and matrix modifications, including the matrix-in-matrix (M-i-M) and Belknap band techniques, have been proposed to optimize marginal adaptation. While DME demonstrates significant advantages such as biological width preservation, reduced treatment time, and favorable restorative outcomes, it remains technique-sensitive and requires strict adherence to isolation, matrix adaptation, and preservation of periodontal tissues. Current evidence, largely from in vitro and short-term studies, supports its feasibility; however, long-term randomized clinical trials are essential to validate its efficacy and clinical reliability.

**Keywords**: Deep Margin Elevation; Cervical Margin Relocation; Subgingival Restorations; Adhesive Dentistry; Indirect Restorations; Biologic Width; Restorative Techniques

## Introduction

Dental clinicians have consistently faced challenges in restoring deep proximal lesions, as these are often accompanied by substantial defects and subgingival margins that extend beyond the cementoenamel junction (CEJ). The isolation of deep subgingival margins presents a significant clinical challenge, primarily due to the frequent presence of contaminants such as saliva, blood, and gingival crevicular fluid (GCF). Indirect restorations are generally preferred in such scenarios, as their extraoral fabrication enables improved esthetics, anatomical precision, superior physical and mechanical properties, and reduced polymerization shrinkage by relieving residual stresses.[1] Despite these advantages, managing subgingival margins remains problematic, largely due to difficulties in maintaining effective rubber dam isolation—often resulting in slippage over the margin and ongoing fluid leakage that hinders the restorative process.[2] Furthermore, adhesive cementation of indirect restorations in the presence of subgingival margins is equally demanding, as it is difficult to control excess cement in these areas, potentially compromising both periodontal health and restoration longevity.[2]

To overcome the difficulties posed by deep subgingival margins, several treatment strategies have been developed.

Conventional approaches typically involve orthodontic extrusion, surgical exposure of the cervical margin, or a combination of both, resulting in the apical displacement of supporting tissues to access the subgingival margin and create sufficient space for the reestablishment of the biological width.[3,4,5]

Surgical crown lengthening exposes subgingival margins through gingivectomy or an apically positioned flap, with or without crestal bone removal. Although predictable, this procedure is invasive, incurs additional costs, delays definitive treatment, and may be limited by adjacent teeth proximity or root furcation involvement. Moreover, it can compromise the crown-to- root ratio and adversely affect esthetics.[6]

Orthodontic forced eruption exposes subgingival margins but is time-intensive, costly, and requires patient compliance. Surgical extrusion repositions the root coronally to reveal the margin and create a ferrule, yet it risks root resorption, often necessitates root canal treatment in mature teeth, and is limited by the need for atraumatic luxation—restricting its use in multirooted or curved-root teeth.[7,8,9]

A more conservative approach—known as deep margin elevation (DME)—involves placing a composite resin base over the existing cervical margin to reposition it coronally.[2,10] This technique introduced in 1998 by Dietschi and Spreafico is also referred to as "cervical margin relocation", "proximal box elevation", and "coronal margin relocation".[2]

Deep margin elevation (DME) is a technique designed to shift the subgingival cervical margin to a supragingival position using a direct composite restoration.[11] As stated by Samartzi et al, "The rationale behind DME rests upon the coronal relocation of the restorative margin instead of displacing the margin of the periodontium according to the cavity limits".[11] DME enhances rubber dam isolation, improves moisture and bleeding control, facilitates accurate impressions and adhesive cementation, and allows for predictable management of excess cement.[12]

The concept of DME evolved from the open-sandwich technique, which was originally developed to improve marginal sealing in deep Class II composite restorations. In this method, the cervical portion of the cavity was restored with glass ionomer or resin-modified glass ionomer, which resulted in glass ionomer or resin - modified glass ionomer being exposed to the oral environment.[13,14]

In DME, a direct composite resin base is used to reposition the subgingival margin in an occlusal direction. The composite resin layer used to elevate the gingival margin in deep cavities can either be integrated into a direct restoration or act as a foundational base for subsequent placement of an indirect composite or ceramic restoration.[10]

This study aims to review the literature on the deep margin elevation technique, including the materials employed, as well as its associated advantages and limitations.

## DME Protocol

DME can be applied in all cases of deep proximal lesions. The criteria that should be met for a successful DME are:

1. complete isolation of the operative field must be achieved;
2. the matrix system must precisely adapt to the margins, ensuring an effective seal; and
3. the connective tissue component of the biological width must remain unviolated by the matrix.[2,15]

Accurate execution of this technique requires precise identification of the lesion floor relative to the alveolar crest, using both radiographic assessment and clinical probing. If the connective tissue component of the biological width is violated or the margin lies too close to the bone crest, the prognosis of the procedure may be compromised.[16] The use of magnification is well-documented as a valuable adjunct in restorative procedures, contributing to improved precision and more predictable outcomes in marginal elevation.[18]

Once the clinical conditions are appropriately met, the rubber dam isolation is kept in place and the carious lesion should be carefully excavated. The matrix must be positioned to ensure intimate contact with the cavity margins, free from interference by gingival tissue or the rubber dam. It should provide proper anatomical adaptation—avoiding both under- and over-contouring.[2] Curved matrices are preferred in this context, as they offer a more favourable gingival emergence profile compared to traditional flat



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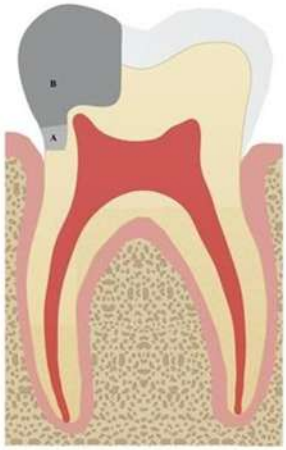
matrices, thereby enhancing both fit and restorative outcomes.[17] Ideally, the matrix should be taller than the intended elevation height to provide adequate support, yet narrow enough to slide easily into the subgingival space. To achieve the correct dimensions and fit, it may be necessary to trim the matrix by 2–3 mm using scissors.[2]

Following matrix placement, a thick layer of dentin bonding agent (DBA) is applied to the exposed dentin and light-cured according to the manufacturer's instructions, in line with the immediate dentin sealing (IDS) protocol, to enhance adhesion and protect the pulp during subsequent restorative steps.[19]

The deep margin is then elevated using a flowable composite, a packable composite, or a combination of both, depending on the clinical situation.[10,17,20] When using micro-hybrid or nano-hybrid composites, preheating is recommended to enhance adaptation, minimize interlayer gaps, and facilitate placement.[2] Importantly, the volume of composite applied should be limited to the minimum necessary to achieve the desired elevation.[20]

Excess composite is carefully removed using a No. 12 blade or a sickle scaler and the margins are polished using polishing strips and flexible disks. Interdental flossing is also performed to verify the absence of overhangs and ensure proper proximal contour and contact.[21] A postoperative bitewing radiograph is essential to confirm the absence of gaps or overhangs, thereby ensuring the quality of the restoration before proceeding to the final tooth preparation and impression-taking.[2]

**Fig. 1 Deep margin elevation (A) Layer of subgingival composite (B) Final restoration[21]**



## Techniques

A variety of materials and techniques have been employed in the execution of Deep Margin Elevation (DME), including the use of various matrix systems. The Toflemire band can be modified and used alone or in combination with a sectional matrix placed internally. Alternative matrix systems such as Stick Bands and the Reel Matrix have also been utilized. Additionally, sectional matrices adapted with Teflon tape are commonly used to enhance marginal adaptation. The 'snowplough technique' has been applied as well, in which a flowable composite and a more viscous composite resin are co-applied in an unpolymerized state, shaped simultaneously, and then light-cured together to achieve optimal integration.[24,25]

**Fig. 2 Toflemire matrix band modification[22]**



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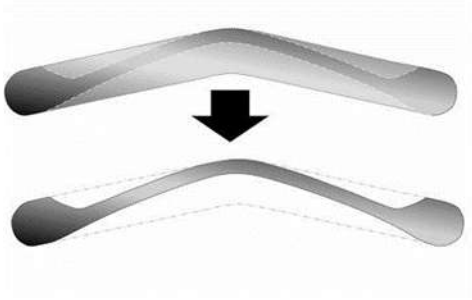
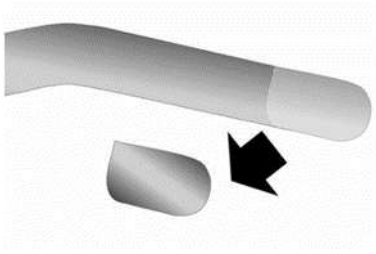


M-i-M for DME: matrix-in-a-matrix technique for deep margin elevation[22]

1. After rubber dam isolation and caries excavation, evaluate the condition of the subgingival box preparation.
2. The circumferential matrix band (Toflemire Universal) is trimmed with scissors to reduce its height and enhance its curvature for improved adaptation. The modified matrix is then secured in a holder and carefully positioned around the tooth to be restored. It should be inserted as cervically as possible and tightened to ensure proper stabilization throughout the procedure. This precise placement is essential for effective sealing and contouring during marginal elevation.
3. A small sectional matrix is prepared by trimming the terminal segment from a universal matrix, ensuring its width slightly exceeds that of the proximal defect for optimal coverage.

**Fig.3 Preparation of additional small matrix from end of matrix band[22]**



4. The circumferential matrix is then gently loosened to allow insertion of the sectional matrix between it and the prepared tooth, precisely at the site of the subgingival defect. The sectional matrix is carefully guided apically, extending beyond the gingival margin, and the circumferential matrix is slightly retightened to stabilize the sectional matrix in the desired position.
5. In cases where gingival concavities are present or adequate sealing is compromised due to fluid or bleeding, a small piece of sterilized Teflon tape (plumber's tape) may be inserted between the circumferential and sectional matrices using a cord-packing instrument or periodontal probe. The tape should be packed as apically as possible to ensure that the sectional matrix is pressed firmly against the gingival margin of the subgingival defect, thereby enhancing seal and stability.
6. Thoroughly dry the area and confirm that the margin is properly sealed, with no evidence of moisture or bleeding. Once hemostasis and marginal seal are confirmed, proceed with the bonding protocol, including immediate dentin sealing (IDS) and light polymerization.
7. The deep margin is then elevated using a restorative composite resin, placed in increments of 1 to 1.5 mm each. A microbrush, slightly moistened with the adhesive, may be used as a packing instrument to ensure optimal adaptation. Each increment should be light-cured for 20 seconds, followed by an additional 10-second cure after applying a glycerin gel layer to eliminate the oxygen-inhibited layer.
8. Following polymerization, remove both the circumferential and sectional matrices along with the Teflon tape.
9. Proceed with manual finishing using a No. 12 scalpel blade or a sickle scaler to carefully eliminate excess resin in accessible areas.
10. Assess the adaptation and fit of the direct elevation restoration using a bitewing radiograph.

**The Belknap band[23]**

1. Even after adapting the matrix band apically, achieving intimate contact with the tooth surface can remain difficult. In such cases, interposed gingival tissue between the matrix and the subgingival margin may prevent proper adaptation, increasing the risk of excess material extrusion and the formation of overhangs that are challenging to correct.



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2. To address this challenge, the 'Belknap band' technique may be employed, in which Teflon tape is placed between the matrix band and the adjacent tooth. This method, introduced by Dr. William Belknap, facilitates improved adaptation by displacing gingival tissue and enhancing matrix stability.
3. This approach ensures close adaptation between the matrix band and the tooth structure, thereby promoting accurate contouring of the restorative material during the margin elevation process.
4. Once the deep margin elevation is completed using the Belknap band technique, both the Teflon tape and matrix are removed, the newly established margin is refined, and the final direct or indirect restoration can be carried out.

**Advantages**

1. One of the key advantages of this technique over crown lengthening is the elimination of a mandatory post-surgical healing period before taking the final impression—which is typically required for at least 3 months, or until gingival margin stability is achieved in the esthetic zone[26,27,28], and at least 4 weeks in the posterior region when esthetics are not a concern.[29]
2. Additionally, crown lengthening often results in apical repositioning of the gingival margin[30,31] ,potential papilla involvement, and possible bone loss, among other drawbacks.
3. In contrast, this technique offers a quicker clinical workflow by avoiding a recovery period, and—when executed correctly—it preserves the periodontium, making it a highly favorable option.[32]

**Limitations**

Although this technique can simplify the restorative process, several critical limitations must be considered before its application.

1. One key requirement is maintaining a minimum distance of at least 2 mm from the alveolar ridge for proper execution.
2. Equally important is the ability to achieve effective isolation of the operative field and proper placement of matrices, which are essential for ensuring accurate contouring of the restoration. Inability to meet these conditions—such as insufficient light curing capability[33] , poor isolation, or improper matrix adaptation—serves as a contraindication for this technique.[2,18]
3. Furthermore, this procedure is highly technique-sensitive, depending heavily on factors like the type of adhesive system used, the restorative material selected, and the precision of incremental layering. Radiographic verification is essential to confirm correct contouring and finishing, which help prevent periodontal irritation or marginal leakage.[21,34]
4. Finally, the use of high-quality materials is imperative, as they play a vital role in preventing early restorative failure due to leakage, especially in the short term.[32]

**Conclusion**

Based on the limitations of the present study, the following conclusions can be drawn:

Deep Margin Elevation (DME) is a promising, conservative approach that coronally relocates the cervical margin, thereby enhancing operatory conditions such as field isolation, impression accuracy, and ease of cementation. It is applicable to both direct and indirect restorations.

However, the current body of evidence is predominantly limited to in vitro studies. Robust randomized clinical trials with long-term follow-up are essential to fully validate this technique and establish its effectiveness in clinical settings.

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