

# THE SURVIVAL RATE OF THE FIXED PROSTHESIS WITH DEEP MARGIN ELEVATION TECHNIQUE OR RESTORATION: SYSTEMATIC REVIEW

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## ABSTRACT

Modern dentistry nowadays is concerned with minimally invasive approaches in multiple specialties concerning the normal biology of human nature and cost-effectiveness. The nature of the teeth is attached to the supporting bone by many layers with biological dimensions for every part, these dimensions vary between different literatures. This study aims to assess the survival rate of the deep margin elevation technique among teeth with sub-gingival defects restored with composite resin or glass ionomer. A systematic review was designed with an extensive search to answer the PICO question "Is the deep margin elevation reliable and have long longevity?" By using PubMed, and Google Scholar with keywords. We included 22 Publications from 2013 to 2022 in the English language of aggregated literature in this systemic review. In conclusion, the DME technique may be a good alternative for the treatment of mutilated teeth with deep margins according to the literature evidence that we have.

**Key words:** Deep margin elevation, Coronal margin relocation, Cervical margin relocation, Proximal box elevation.

## Introduction

Modern dentistry nowadays is concerned with minimally invasive approaches in multiple specialties concerning the normal biology of human nature and cost-effectiveness. The nature of the teeth is attached to the supporting bone by many layers with biological dimensions for every part, these dimensions vary between different literatures [1]. However, this cannot be achieved in the case of badly decayed teeth. In such cases, surgical crown lengthening (surgical) or orthodontic forced eruption (non-surgical) can be solutions to facilitate rubber dam application, and digital, and conventional impression taking. But every one of them has its drawbacks, resulting in anatomical complications in cases of root concavity and furcation involvement [1]. Dietschi suggests elevating the deep margins of the teeth as a minimally invasive technique with a layer of composite to facilitate the final impression and avoid surgical or orthodontic intervention [2]. Deep margin elevation is a procedure used to raise and elevate the subgingival margin with different materials to achieve maximum bond strength and marginal integrity [3].

In the present study, we therefore, carried out case reports, in vitro studies, and cross-sectional studies of all available evidence from experimental studies to assess the survival rate of the deep margin elevation technique, determine the success rate, and determine whether its reliability has a

longer lifetime than surgical techniques among teeth with sub-gingival defects restored with composite resin or glass ionomer. The large number of patients with mutilated teeth with deep margins and the medical and socioeconomic status of some patients that prevent the other interventions are the reasons for conducting this topic

## Materials and Methods

### Search strategies

A systemic review was designed with an extensive search to answer the PICO question, "Is the deep margin elevation reliable and has long longevity?" Three authors independently performed a literature search using the PubMed and Google Scholar databases up to September 24, 2022. In this systematic review, we included 22 publications from 2013 to 2022. The search terms used were "deep margin elevation", "coronal margin relocation", "cervical margin relocation", and "proximal box elevation" in the English language of the aggregated literature in this systemic review

### Study selection criteria

Published articles were included according to the following criteria 1- adult human teeth 2- clinical or in vitro research using DME 3-minimum follow-up of 6 months (for the clinical articles) 4- English language. Any non-English articles, non-human, follow-up less than 6 months, and

systematic reviews are excluded.

#### Data extraction and quality assessment

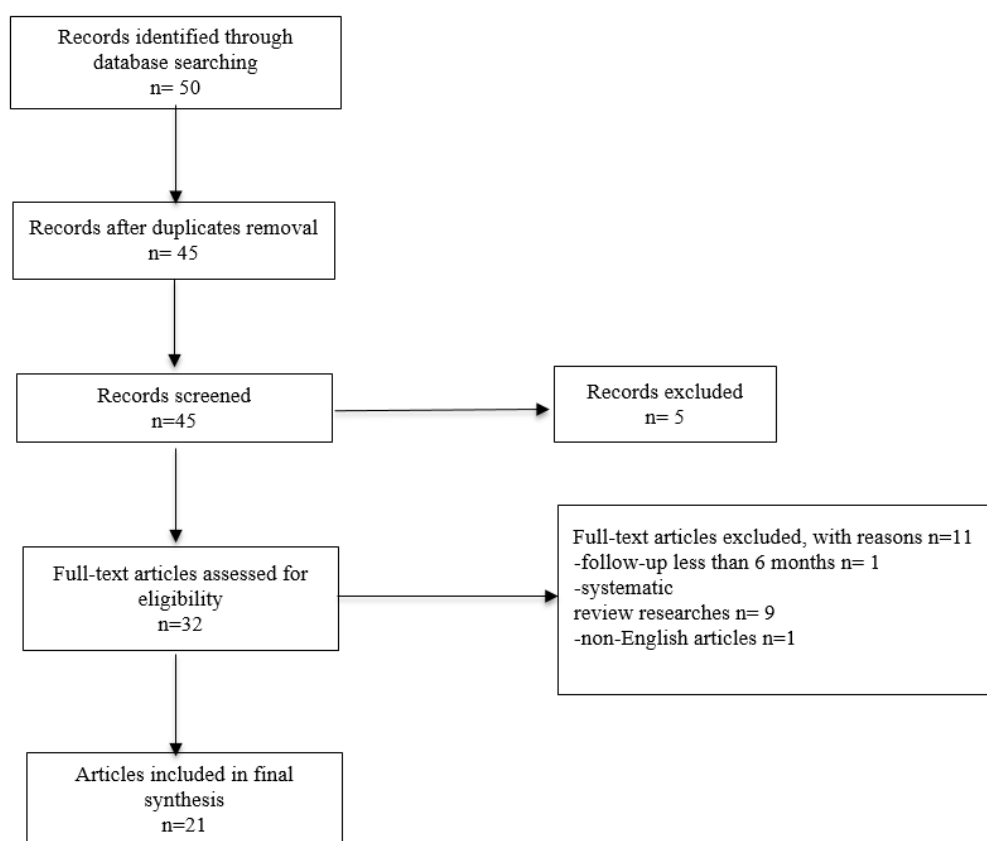
Two authors independently evaluated all of the studies retrieved from the databases. Any discrepancies between the two reviewers were solved by a joint reevaluation of the manuscript. If there were multiple publications from the same study, the most comprehensive one that could provide detailed information for subgroup analysis was selected, using other publications to clarify the methodology or characteristics of the population. Discrepancies between the two reviewers were solved by a joint reevaluation of the original article. The following information from each included study was extracted: the first author's name, year of publication, research title, type of study, study design, and main findings. The quality of each study was assessed independently by three reviewers. The reviewers resolved

any dissimilarities via discussion. If a decision cannot be achieved the supervisor was consulted to reach a consensus.

## Results and Discussion

#### Search results and study characteristics

**Search Results and Study Characteristics:** A total of 50 citations were identified through the literature search. Among the 50 citations, 32 were potentially relevant. Among the 32 full-text articles, one study was excluded because the follow-up was less than 6 months. Also, nine systematic review studies and one non-English study were excluded based on our exclusion criteria. Finally, a total of 21 articles were included in this systematic review (**Figure 1**).



**Figure 1.** Flow diagram

A study by R.A. Bresser, *et al.* included 197 indirect restorations combined with DME in a total of 120 patients. They used a three-step adhesive system followed by a hybrid nanofiller composite under the rubber dam isolation for DME and lithium disilicate or multiphase resin composite materials were used for the indirect restorations. All the DMEs were done by a single operator and all the indirect restorations were made by a single technician. The restorations were evaluated by three calibrated evaluators. The evaluators used USPHS parameters for the evaluation. Restorations were in place in the follow-up visits were

counted as success. Any restoration with secondary caries, root caries, pulpal necrosis, fracture of the tooth, or the restoration, debonding, or severe periodontal breakdown was counted as a failure. The results revealed that 8 failures have been detected between 46-57 months. Five failures were secondary caries, one pulpal necrosis, one fracture, and one severe periodontal breakdown. The overall survival rate was 95.9% after ten years and longer. Only two patients experienced postoperative sensitivity. Forty-five teeth had endodontic treatment before the restorative treatment and the authors showed that there is no statistical difference

between the vital or non-vital teeth (93.3% versus 96.7%). 144 restorations were made of lithium disilicate and 53 restorations were made of indirect composite material. There was no significant difference in the estimated survival curve between the two materials. Regarding the DME profile on the intra-oral radiographs, 82 indirect restorations had poor DME profiles. No evident effect of good or bad DME profile was observed by the authors. Also, no evident effect of open contact points was observed by the authors. The proper contact points were presented in 175 indirect restorations and 21 had open contact points. The authors observed signs of degradation over time and marginal discoloration (more than 3 years versus less than 3 years) [4].

A case series study done by Shen Furtado *et al.* includes seven patients and 12 teeth treated with DME using composite provides preliminary evidence that the DME technique could be a promising approach for achieving successful and durable restorations in cases with subgingival margins. The clinical and radiographic evaluations showed good results. The clinical evaluation consists of marginal adaptation, gingival inflammation, probing depth, and plaque accumulation. Radiographic evaluation includes marginal integrity and secondary caries. The teeth have been evaluated at baseline, 3 months, and 6 months after treatment. The results showed that all the treated teeth were in good condition. None of the treated teeth showed any sign of marginal failure, secondary caries, gingival inflammation, or plaque accumulation [5].

Another study done by Bertoldi *et al.* aimed to assess the clinical and histological responses of periodontal tissues to subgingival resin composite restorations. The study included 29 subjects with a single tooth requiring subgingival restorations. The study found that subgingival resin composite restorations are compatible with gingival health, with levels of inflammation similar to those associated with untreated root surfaces. The authors concluded that the deep margin elevation procedure produces favorable clinical and histological outcomes, allowing for its routine utilization in reconstructive dentistry [1].

C Frese *et al.* published a case report study of a 75-year-old female with subgingival caries extending apical to the CEJ distal to a premolar. They restored the tooth with two layers of direct composite. The first layer is done by the Snowplough technique (placing flowable composite on the cavity margins and then adding and adapting packable composite over it before curing). The second layer was to build up the tooth directly using composite. Post-operative radiograph revealed biological width (supra-crystal tissue attachment) violation (The distal margin of the restoration close to the bone by 0.5-1mm). After 12 months of follow-up, the tooth was still vital, probing depths were 2mm and no bleeding was detected. Radiographic examination during the follow-up revealed a distance of 1mm between the

restoration and the bone. Only minimal bone loss was observed. The authors concluded that the advantages of DME are in providing an additional treatment option for the restoration of deep cavities reaching below the CEJ, distinct oral hygiene (including the use of accurately fitting interdental brushes) in patients with deep restorations invading the biological width is necessary to achieve a noninflammatory clinical situation, the extent of biological width violation may play a role in the biological reaction of the tissues (limited proximal area versus complete circumferential margin) [6].

Another study done by Ghezzi *et al.* included 15 patients who needed cervical marginal relocation (DME). The authors divided the participants into three groups according to the ability to isolate the margins. The three groups are Class 1: Nonsurgical DME Class 2a: Surgical DME (gingival approach) Class 2b: Surgical DME (osseous approach). After a mean follow-up time of 5.7 years, all the dental restorations remained functional. The mean PD at baseline for Class 1 was  $3 \pm 0.71$  mm, 2a was  $3.6 \pm 1.14$  mm and 2b was  $3.6 \pm 0.71$  mm, and these values decreased to  $2.4 \pm 0.55$  mm,  $2.8 \pm 0.84$  mm, and  $2.4 \pm 0.55$  mm respectively. One year after DME, the patients were followed for different periods. The periods range between two and eight years. At the last follow-up visit, the PD for Class 1 was  $2 \pm 0$  mm,  $2.6 \pm 0.55$  mm for Class 2a, and for Class 2b was  $2.4 \pm 0.55$  mm. No considerable differences were detected between the three groups regarding the PD at any time point. BOP decreased from 100% at baseline to 40% in all groups one year after DME treatment, with no differences between the groups. The authors conclude that CMR (DME) doesn't affect the periodontal tissues negatively if the supra-crystal tissue attachment is respected [7].

An in vitro study done by Veronika Müller *et al.* included 24 intact extracted molars. Standardized MOD cavities were prepared on all the molars. Both margins were beyond the CEJ and one of the margins in each tooth was elevated using a 2 mm layer of composite. The 24 molars were then divided into three groups based on the luting composite. The inlays of all the groups were made of composite resin blocks using a CAD/CAM system. All the teeth were subjected to thermomechanical loading simulating 5 years of clinical wear. No significant differences ( $p > 0.05$ ) before and after Thermomechanical loading (TML) were found between the three groups for bonding the inlay to dentine or DME by composite [8].

Another in vitro study done by Köken *et al.* includes 39 molars with standardized prepared MOD cavities. The mesial margins of the molars were below the CEJ by 1mm, and distal margins were above the CEJ by 1mm. The molars were randomly assigned to three groups. In group 1 the mesial margins were elevated by hybrid composite, the mesial margins of group 2 were elevated by flowable composite, and group 3 (Control) was kept with no DME (CMR). The overlays were cemented adhesively. The

interfacial leakage was quantified by scoring the depth of silver nitrate penetration. The results show insignificant differences between the two composites ( $P = 0.279$ ) but, group 3 (Control) shows significantly lower interfacial nanoleakage. Furthermore, in all groups, the enamel interface shows significantly lower non-leakage compared to the dentin interface. According to the author's conclusions, the marginal sealing ability of flowable and micro-hybrid resin composites' composite viscosities is similar for DME. Furthermore, it seems that "luting overlays directly to dentin is a better way to limit marginal leakage beneath CAD/CAM overlays [9].

A case report of a six-year follow-up published by B Hammond *et al.* presents a case of a 65-year-old female patient with extensive proximal margin of mandibular second molar that was treated previously by an amalgam restoration. In this study, they used RMGI to elevate the mesial deep stained margin and lithium-disilicate onlay as a definitive restoration. The follow-up includes visual examination (annually), PA, and BW radiographs (biennial). No evidence of caries, pulpal pathology, periodontal inflammation, fracture of the restoration, or the tooth has appeared. The authors summarized their results as all the restorative dentistry main goals have been accomplished in this case which are the conservation of tooth structure, supporting tissues, and maintenance of pulpal vitality [10].

Another in vitro study done by Spreafico *et al.* involved 40 sound third molars. The teeth are endo-treated and standardized preparation in which all the margins on enamel except the mesial margin were placed below the CEJ by 2mm. The teeth were separated into 4 groups. For groups 1 and 3 flowable composites (Filtek Supreme XTE Flowable resin (3M ESPE)) were used to elevate the mesial margin. For groups 2 and 4, Filtek Supreme XTE resin was used. The molars were restored using the Cerec 3 CAD/CAM system. RNC blocks were milled for groups 1 and 2 specimens, while LD blocks were for groups 3 and 4. A chewing simulator was used for the thermomechanical aging of the specimens. The authors found no statistically significant differences among the groups ( $p=0.108$ ). Also, no significant differences have been found in the marginal integrity for the different resin composites between margins with and without DME ( $p > 0.05$ ). Furthermore, there were no significant differences in marginal integrity for RNC or LD crowns before or after Thermomechanical testing ( $p > 0.05$ ), and with or without DME. The results of this in vitro study support the hypothesis that DME is an adequate clinical procedure for deep marginal boxes [11].

Also, Frankenberger *et al.* constructed an in vitro study that included 48 intact third molars. The standardized preparations (MOD) included margins above the CEJ by 2mm mesially and deep boxes below the CEJ by 2-3mm distally. The deep distal margins were elevated by different resin composites. IPS Empress CAD glass-ceramic inlays

were cemented as definitive restorations. The specimens were then tested by thermomechanical loading in an artificial oral environment. After the test, another impression of the teeth has been taken, making another set of replicas for each restoration. Then examined under an SEM at  $\times 200$  magnification. In all groups, thermomechanical loading resulted in a high deterioration of marginal quality for both enamel and dentin margins. Defects between the ceramic and luting resin composite ranged below 2%, defects between DME composite and luting composite were also only observed in  $<2\%$  of the total transition lengths. Enamel marginal quality was not different between the groups ( $p>0.05$ ). The measured luting gap widths were not significantly different for all luting systems ( $p>0.05$ ). After TML, gap-free margins in the teeth in which ceramic luted to dentin directly were 92% (conventional luting technique). Bonding the glass-ceramic inlays with sandblasted three layers of resin composite that covered dentin achieved 84% gap-free margins and was significantly better than the other groups ( $p<0.05$ ). PBE with one layer of resin composite was equal to RelyX Unicem and superior to G-Cem and Maxcem Elite ( $p<0.05$ ). Proximal box elevation (DME), according to the authors, can be a useful tool for making adhesive luting of ceramics to deep proximal locations easier. As DME, three 1-mm layers exhibit the best marginal quality in relation to dentin. For this indication, self-adhesive resin cements are not advised [12].

An in vitro study done by TJ Vertolli *et al.* included forty intact third molars. The molars have been divided into four categories and designated according to the margin as follows: enamel margin; cementum margin; GI margin; and RMGI margin. Standardized class II ceramic inlay preparations done. The major finding at X3 magnification was bulk fracture of the ceramic inlays in the cementum group and none for the RMGI group had ceramic fracture following thermomechanical loading. Also, marginal integrity was preserved between ceramic, GI, RMGI, and tooth structure. This study shows that DME decreased the ceramic fracture when the preparation margins were below the CEJ. Proposing DME as a valid treatment option for clinicians to consider when dealing with an indirect restoration with subgingival margins.

No significant differences were found between margin elevation with GI or RMGI [13].

Another in vitro investigation by Köken S *et al.* contained 20 molars that were separated into two groups and had standardized MOD cavities with proximal borders created 1 mm below CEJ. Distal margins were not increased in either group, but mesial margins showed an elevation with a flowable composite. A resin composite was used to create and cement composite CAD/CAM overlays. A three-step total-etch adhesive was employed for the second group, while universal adhesive in selective enamel etch mode was used for the first group. Higher ratings for microleakage at

CMR (DME) locations are obtained for Group 1. There were no discernible variations between CMR and non-CMR margins in Group 2. Conclusion: A major element influencing microleakage at the interface beneath the CEJ is the adhesive system and the CMR technique used for luting indirect restorations [14].

Juloski J *et al.* included in their in vitro study 14 intact molars. Deep (MOD) cavity preparations were created for ceramic inlays and partial crowns. The molars are separated into two groups based on the adhesive material employed. For group 1 the deep mesial margins were elevated with two increments of 1 mm layer of flowable composite bonded with a 3-step total-etch bonding. Group 2 was also elevated by two increments of a 1mm layer of flowable composite but bonded with a universal bonding agent. The marginal quality was examined by SEM at 50× and 200× magnifications. The authors observed both the adhesive interfaces with DME at the mesial side and without DME at the distal side. When DME and non-DME scores were compared to each other, significantly lower values of microleakage were present at distal sides (the side with no DME). The authors came to the conclusion that directly gluing the repair to the dentin appears to offer a more sufficient seal than CMR (DME). The adhesive materials used for CMR determine the sealing ability. The SEM analysis of the marginal adaptation might not be able to predict the functional sealing of the margins [15].

Ali S *et al.* presented a study that included 24 human sound lower first molars, endodontically treated. Standard endocrown preparations were done with a deep proximal box preparation done on the mesial surfaces. Then divided into two groups regarding the material used, group (M) using IPS e.max CAD ceramic blocks and group (V) using Vita Enamic ceramic blocks; then divided into two subgroups, (ME, VE) with marginal elevation and (MN, VN) without marginal elevation. All specimens have been thermally aged in a water bath with 10000 cycles between 5°C- 55°C. Calculation of the mean gap done by the evaluation of the marginal adaptation using a stereomicroscope. Study results revealed that deep marginal elevation enhances both marginal adaptation and fracture resistance of IPS e.max CAD and Vita Enamic. IPS e.max CAD has higher fracture resistance while Vita Enamic has better marginal adaptation [16].

Alahmari *et al.* conducted an in vitro investigation utilizing 40 upper premolars to assess the marginal integrity and strength of ceramic crowns made with IPS e.max CAD technology. Gingival margin position (enamel and cementum) and margin relocation restorative material (Flowable composite, Composite, and IPS e.max CAD) were their independent factors. Four groups were created from the teeth. For groups B, C, and D, the cervical margins were extended 2 mm on both sides below the CEJ, while for group A, all of the cervical margins (CM) were positioned 1 mm above the CEJ. Group B utilized flowable composite to

fill the mesial and distal proximal boxes, whereas groups C and D filled theirs with composite resin fillings. Each crown's marginal integrity was assessed both before and after the aging process. Interfaces for marginal integrity reveal notable variations between groups. Group D had the most significant compressive fracture force (2203 N), while Group B had the lowest significant compressive fracture force (1671 N), with a p-value of less than 0.01. There was some similarity between groups A and C (1981 and 1866 N, respectively). In all groups, there was a high rate of catastrophic fracture (60–80%), which was followed by line-form cracking (10–30%). The authors concluded that CMR is a useful clinical method for instances with profound marginalization [17].

Another in vitro investigation by Zhang *et al.* included eighty sound maxillary premolars with standardized Class II cavities on mesial surfaces, which were subsequently divided into four groups at random. The proximal edges of groups E1, E2, and E3 were positioned 2 mm below the CEJ, while group E4's margin was positioned on the enamel above the CEJ, serving as a control group. Bulk-fill Smart Dentin Replacement (SDR), a visible light-cured resin composite, was administered in group E1 for margin elevation of the proximal cavities or the DME, while group E2 received a conventional resin composite. As a negative control, Group E3 had simply a ceramic crown treatment. In every group, CAD ceramic end crowns were adhesively luted, and fracture resistance, failure mode, and microleakage were evaluated. The findings indicate that in DME groups E1 and E2, fracture resistance values were higher than those in group E2, independent of the materials utilized ( $P = 0.038$  and  $0.010$ , respectively, vs. E3). Seventy percent of teeth failed catastrophically when PBE was absent. Supragingival group E4 had a lower frequency distribution of microleakage than group E3 ( $P = 0.031$ ). There was no discernible rise in the percentage of microleakage in the DME-treated groups [18].

#### *Correlations between indirect CAD/CAM type of restorations and DME*

There are many concerns regarding the longevity of indirect restorations fabricated by the new CAD/CAM technologies for teeth with cervical margin relocation. The concern of DME Technique failure is dependent on the coefficient of thermal expansion and the shrinkage of the material used, the operator skills, and the biological width, regardless of the type of indirect restoration and method of fabrication. According to evidence-based practice, there is no study to evaluate the DME technique and its correlation with the longevity of indirect restoration with different routes of fabrication: conventional ways and CAD/CAM technologies. The main step to enhance the prognosis is to enhance the moisture control of the cemented indirect restoration [4, 9, 13, 19].

Some of the studies show that contamination of directly cemented indirect restorations in deep margins may have a



higher probability of contamination than restorations cemented after DME. Furthermore, DME may facilitate caries control and maintain the tooth structure. One of the major drawbacks of the DME technique that correlates with CAD/CAM restorations is the modulus of elasticity under mechanical loading, which can affect the weak points between the applied composite and the luting cement. We can consider the technique as a medium-term treatment option with an acceptable annual failure rate and possible margin deterioration. Unfortunately, further clinical trials may be needed to clarify this correlation and evaluate new approaches to restorations including different types of CAD/CAM printers and milling machines, different luting cements, materials used for DME and the forces applied to the samples [11, 13].

#### *Materials biocompatibility*

One of our limitations in this systematic review is the limited number of clinical studies conducting DME. Which could be considered a new technique with unpredictable outcomes from different materials, case selection, and technique sensitivity. The results of the studies clearly show that the best survival rate and marginal seal are found in the enamel-restoration interface compared to the dentin-resin interface due to the ease of etching the enamel and less probability of contamination. In this research, we are trying to investigate which material and technique of DME may provide the best survival rate and marginal seal to practice in such cases. The cut-off point for whether the margin can be elevated or not depends on whether the margin could be isolated before elevating by the DME technique or not.

On the other hand, the different types of material play an important role in tooth prognosis and better adaptation to minimize leakage, and there remains a lack of consensus regarding the superior material and technique. Usually, flowable resin, heated micro hybrid or nanohybrid composite, bulk fill flowable composite, and RMGI provide a good adaptation regardless of the longevity of the result [7, 9]. In comparison to the types of restorations used in this technique, the low modulus of elasticity and coefficients of thermal expansion of RMGI are closely related to tooth structure with strong chemical bonds and biocompatibility. Resin composite restorations could withstand the lateral forces as shown in many studies and no significant differences were found between margin elevation with GI and RMGI [13]. A study showed that the changes in packable composite resin with aging are greater than those in flowable composite resin. On the other hand, the flowable restoration showed the lowest compressive fracture force [17]. So, the snow plow technique (adding packable composite over flowable composite before curing) utilized with an acceptable outcome in the one-year follow-up of the PBE case report shows the advantages of using this technique, including using a bulkfill flowable composite with better adaptation and low polymerization shrinkage, followed by nanofilled composite restoration to withstand the masticatory forces [5, 6].

Spreafico R noted that there were no significant differences between using flowable, micro-hybrid, or nanohybrid composite at the interface between crown and dentin as a comparable performance [11]. Zhang Hong found that the longevity of teeth crowned after DME had a low life span compared to the control group, which includes direct cementation of the crowns to a deep and smooth finishing line with a good handling technique [15, 18]. This is supported by an old published paper by Frankenberger that showed 92% gap-free crown cemented directly to the deep margin compared to 84% gap-free DME with resin composite and was significantly better than other groups [12]. The main point noticed in the studies conducting the DME technique was that the key to technique success is creating a good profile using a sectional matrix with proper restorative technique in a good moisture control field with further follow-up and good oral hygiene [3].

#### *Adhesive system*

The adhesive system and the DME technique represent significant factors affecting microleakage at the interface below CEJ. The quality of the marginal seal and probability of leakage of composite located below CEJ strongly depend on the type of adhesive and the technique. Newly published papers showed the highest outcome of using universal bonding and its ability to bond to dentin. A study showed the universal adhesive applied in a selective enamel etch mode had a noted negative influence on microleakage compared to the 3-step total-etch adhesive mode with the DME technique [14]. According to Da Silva, Ceballos, and Fuentes (2021), the adhesive strategy used in DME can influence the sealing ability of the restorations. Universal adhesives with self-etching adhesives showed better sealing ability than etch-and-rinse adhesives when the gingival margins were located on dentin. However, gingival margins located on enamel and bonded with either etch-and-rinse adhesive or self-etching adhesive had the best overall sealing ability [20].

#### *The periodontal reaction to DME*

DME procedures appear to not negatively impact periodontal health status with an acceptable annual failure rate if they are limited to the junctional epithelium and not extended to connective tissue, which may lead to biological width invasion [5, 7, 21]. The proper technique with the ideal guidelines of the DME technique can produce favorable clinical and histological outcomes.

#### *Following up and long-term success of DME*

In a short-term follow-up, only two studies were found. Follow up after 12 months of DME technique, and the tooth is vital and there is no inflammation or bleeding on probing; even the biological width is violated; and radiographs show there is a 1mm between the restoration margin and alveolar crest [6]. Another study showed clinical and radiographic evaluations of all restorations were in good condition at 3 months and 6 months after treatment. There were no signs of marginal failure, plaque accumulation, gingival

inflammation, or secondary caries [5].

Two other studies with long-term follow-up were reported. A 6-year follow-up of a case report of a tooth with DME with RMGI showed an acceptable result with no caries, periodontal inflammation, or fracture and a good impact on the remineralization of stained dentin [10].

## Conclusion

In conclusion, the DME technique may be a good alternative for the treatment of mutilated teeth with deep margins according to the literature evidence that we have. DME technique could provide a long-term success rate of 95.9% (N=197) over 10 years. Furthermore, teeth treated with DME technique didn't show any sign of marginal failure, secondary caries, gingival inflammation, or plaque accumulation. Also, another study showed DME technique with and without different surgical approaches (gingival approach and osseous approach) and after a mean follow-up time of 5.7 years, all the dental restorations (N=15) remained functional. Moreover, using RMGI for DME may show a success rate of up to six years according to case report evidence. Further research and investigations are required to effectively assess the reliability of the DME technique.

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