Review Article

DEEP MARGIN ELEVATION: SYSTEMATIC REVIEW AND META-ANALYSIS OF IN-VITRO STUDIES

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ABSTRACT

This review aims to create an evidence-based resource for DME that a practitioner can use in their clinical work. Additionally, this systematic review will examine all the DME-related issues and debates. An electronic literature search was performed by two different reviewers up to July 2022 using MEDLINE through PubMed, Web of Science, SCOPUS, and EMBASE. We only considered in-vitro research that examined the impact of Deep Margin Elevation Material on fracture resistance. Software (Review Manager v5.4.1; The Cochrane Collaboration, Copenhagen, Denmark) was used to conduct a meta-analysis. Each study's bias risk was evaluated using another systematic review's criteria. From all databases, 517 pertinent papers were selected. Twenty-two publications were left after the title and abstract evaluation for qualitative analysis. Five studies were left after these for the meta-analysis. With composite restorations, the fracture strength of teeth undergoing deep margin elevation was statistically higher than the control ($p = 0.04$). Most analyses revealed significant heterogenicity. The in vitro evidence indicates that, compared to teeth restored directly with indirect restorations without the DME technique, the deep margin elevation procedure tended to improve the teeth' fracture resistance.

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

Introduction

Most dental practices have shifted towards a more conservative approach during the last ten years. In the modern period, pulp capping has taken the role of automated root canal therapy, partial preparation forms are employed instead of peripheral preparations, and root post-and-core treatments are less commonly required, regardless of the depth of the cavity. An obstacle to a conservative strategy is figuring out whether to change the tissue around a tooth's contour to repair it or when to remove a tooth rather than restore it [1]. Dental restorations may be completed in the posterior area using various treatment techniques. The qualities of the restoration material, the health of the supporting teeth, the patient's habits, and the established clinical practices all have a role in how long dental restorations last in this area [2]. Indirect restorations are used to lessen stresses within the tooth, minimize fracture, and increase margin adaptation to lessen microleakage [3, 4]. The cervical edge of the repair should, in general, be positioned within an unbroken enamel layer. Nevertheless, if moisture control can be achieved [5], composite resin restorations may be done efficiently in deeper cavities, even when restorative margins are placed below the cementoenamel junction (CEJ) [6].

Subgingival margins, on the other hand, remain challenging to treat because of poor accessibility, rubber dam sliding over the margin, and persistent leaking of saliva, crevice fluid, and blood [6]. The traditional method involves surgically exposing the cervical margin, exposing the subgingival margin with orthodontics, or using both methods to expose the subgingival margin and provide enough space to determine biological width (BW) [4, 6-8]. The approaches, as mentioned earlier, often result in further attachment loss, root concavities, furcations being exposed to the oral environment, dentin hypersensitivity, an unfavorable crown-to-root ratio, and poor aesthetics. The delivery of the final restoration may also often be delayed due to this procedure [4, 6-8]. Applying a base of composite resin over the original cervical margin to shift it coronally is another, a more conservative method known as "deep margin elevation" (DME) [9, 10]. The terms "cervical margin relocation," "proximal box elevation," and "coronal margin relocation" are also used to describe this technique, which Dietschi and Spreafico introduced in 1998. The use of a rubber dam and subsequent moisture management, the simplicity of impression-taking, the effectiveness of bonding, the ease with which extra material may be removed, and the avoidance of unnecessary tissue sacrifice are just a few of the benefits of this method [10-12].

Aim of the study

This study aims to provide an evidence-based resource for DME that a practitioner may use in their clinical work. Additionally, this systematic review will examine every aspect and debate surrounding the DME procedure.

Materials and Methods

Protocol and registration

The International Prospective Register of Systematic Reviews (PROSPERO) of the National Institute for Health Research received the study protocol for this systematic review and meta-analysis (registration number CRD42022376414). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement's standards were followed in the text's organization [13].

Source of the information
An electronic literature search of numerous databases, including MEDLINE through PubMed, Web of Science, SCOPUS, and EMBASE up to July 2022, was carried out by two independent reviewers (A.A. and A.A.). **Table 1** displays the terms and search approach used in PubMed.

Table 1. Keywords and search strategy used in PubMed.

Search Strategy
#1 Deep margin elevation OR proximal box elevation OR cervical margin relocation OR coronal margin relocation
#2 Fracture strength OR Fracture resistance OR tooth fractures OR tooth fractures*
#3 Composite restoration OR GIC OR RMGI restoration OR flowable composite restoration OR Bulkfill composite restoration OR resin restoration OR self-adhesive resin restoration OR onlay restoration OR inlay restoration OR Indirect ceramic restoration OR lithium disilicate OR microhybrid Composite OR Posterior resin composite inlays OR IPS Empress CAD glass ceramic inlays OR feldspatic ceramic blocks OR composite resin blocks OR leucite-reinforced glass-ceramic blocks OR hybrid ceramic computer-aided design/computer-aided manufacturing (CAD/CAM) blocks
#4 #1 and #2 and #3

According to PRISMA 2020 standards, the current systematic review and meta-analysis were published utilizing the PICOS framework [14] **(Table 2)**.

Does the deep margin elevation consider a successful treatment option compared to the direct approach without using this technique for in-vitro studies?

Table 2. PICO framework

Population	**Teeth with deep margins.**
Intervention	Deep Margin Elevation.
Comparison	Direct approach i.e., direct cementation of indirect restoration.
Outcome	Success, survival rate, and marginal integrity.
Types of studies	In-vitro studies

Design and methods
According to Preferred Reporting Items for Systematic Reviews and Meta-Analyses, this systematic review was documented (PRISMA). This will guarantee precise data information and adhere to the standards used in research with similar designs.

Screening method
We checked three significant electronic databases. Combinations of controlled terms and keywords were employed wherever feasible for the PubMed library. The MeSH keywords were represented by "[mh]" in the google searches, while the title and abstract were represented by "[tiab]". Filters were also used, and some phrases were not added to the MeSH index. Since this was the case, the important words were (Deep margin elevation OR cervical margin relocation, partly OR proximal box elevation AND coronal margin relocation. English; in vitro research; human.

Eligibility criteria
Due to the scarcity of studies with appropriate randomization and prospective assessments, the screening procedure had to be extensive. The following inclusion criteria: "in-vitro studies" were satisfied by articles to be included in this systematic review. To further evaluate the studies that were chosen, several variables, including the study design, the number of teeth included, the number of samples and any other intervention strategies, the assessing criteria and other conditions that might affect the outcome, the kind of intervention, and the type of DME material, were noted and extracted. However, all other investigations were disregarded.

Data items
Items 18–20 of the PRISMA checklist (Appendix S1), namely the characteristics of the individual studies, (ii) the risk of bias within the individual studies, and (iii) the outcomes of different studies, were retrieved as data from the individual studies. The lead author of each research was identified, together with information on the tooth type, cavity margins, adhesion methodology, DME material, kind of analysis, group of trials, indirect restorative material, and aging process of the study participants. The actual intervention's specifics comprised the following: I

assessment standards, (ii) restoration kind, (iii) indirect material type, and (iv) intervention type.

Extraction of data

Using a standardized sheet, the information from the included documents was retrieved. When this information was presented in publications as graphs, the relevant data were calculated and obtained using the WebPlotDigitizer 4.0 program.

Quality evaluation

Another systematic review analyzed the risk of biased characteristics for each included research by two authors (A.A. and A.A.). The following parameters were evaluated for their potential for bias: random sequence generation, single-operator protocol execution, control subjects' presence, blinding of the testing machine operator, standardization of sample processing, failure mode assessment, use of substances following manufacturer's instructions, and clarifying of sampling size calculation. The research was given a "YES" if the author provided the studied parameter. On the other side, the parameter got a "NO" if data was absent. Each study's risk of bias was categorized based on the total number of "YES" responses: 1 to 3 was considered high risk, 4 to 6 was considered medium risk, and 7 to 8 was considered low risk.

Statistical analysis

With the software Review Manager v5.4.1, a meta-analysis was carried out. A meta-analysis only included papers rated as having a low or medium risk of bias. The analysis was conducted using the random-effects model by comparing the standardized mean difference in fracture resistance between DME repaired with indirect restorations and deep margins restored directly with indirect restorations. Pooled effect estimates were then derived. Statistical significance was defined as 0.05 or less level of significance. The Cochran Q test and the inconsistent I2 test were used to assess heterogeneity [15].

Results and Discussion

In all databases, 517 papers were acknowledged. **Figure 1** displays a flowchart outlining how the PRISMA Statement was used to select the studies. After deleting the duplicates, the literature research returned 254 papers for the first review. After reviewing the titles and abstracts, 229 papers were eliminated, leaving 23 articles to be evaluated by full-text reading [15-36]. Five of these papers [16, 18, 19, 25, 32] were utilized in the meta-analysis after one research [37] was excluded for qualitative analysis, the reasons for which are provided in the PRISMA flow diagram.

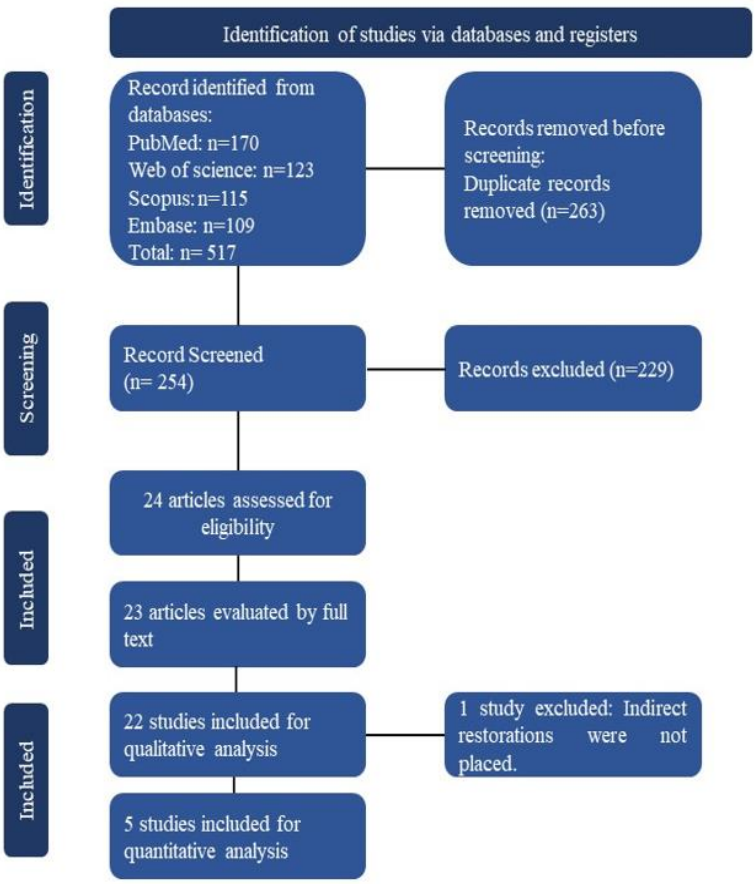

Figure 1. PRISMA flow diagram to screen the selected articles

The meta-analysis revealed that deep margin elevation teeth' fracture strength was statistically substantially greater than the control (p = 0.04) **(Figure 2)**.

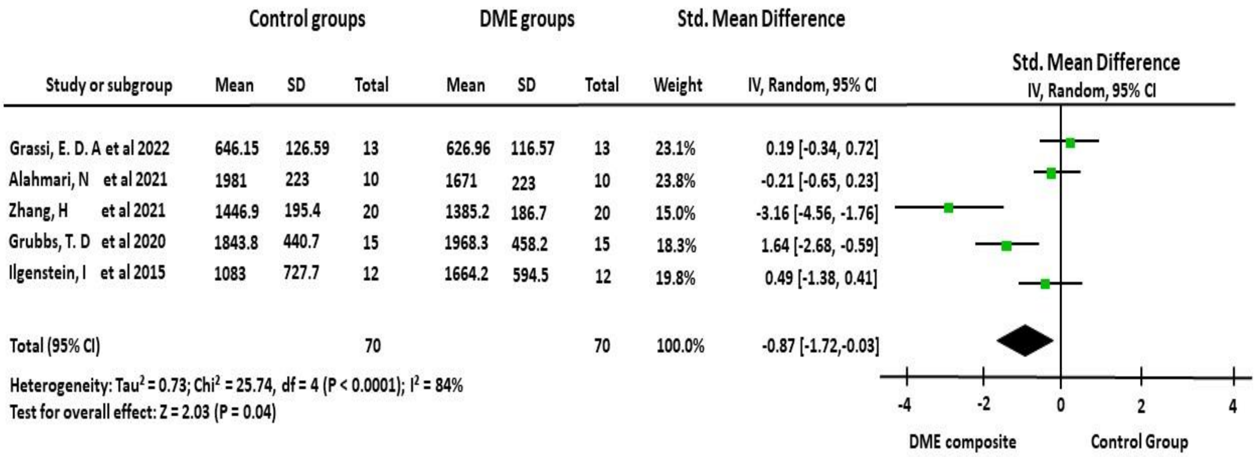

Figure 2. Summary of the findings from each included study

This systematic review concludes with a qualitative analysis of the papers that were taken into consideration in **Table 3**.

Table 3. Information about the included studies' demographics and research methodology.

Study	Tooth type	Adhesive procedure	DME material	Material of indirect restoration	Cementation material	Outcomes
Baldi, A *et al.* 2022 [15]	Human upper molar	A two-step self-etch adhesive technique combined with selective enamel etching.	Filtek Supreme XTE, and highly-filled flowable composite	lithium disilicate.	N/A	Shear stress and normal pressure were determined via a micro CT scan and FEM analysis, respectively.

Grassi, E. D. A *et al.* 2022 [16]	Human maxillary third molars	Fast dentin bonding was accomplished using a self-etching universal bond system. A thin coating of Admira Fusion Flow, produced by VOCO, a flowable bulk-fill resin composite, was resin-coated onto each specimen.	A portion of the Admira Fusion Flowing flowable composite resin.	Leucite-reinforced glass–ceramic blocks , and resin composite blocks.	The double general bonding agent and dual-cure resin cement serve as cement.	Fatigue behavior and stress distribution through SEM
Chen, Y. C *et al.* 2021 [17]	Premolar model of human first premolar	Not mentioned	DME layer was developed as a particular kind of flowable resin.	Three different inlays materials-composite resin ceramic, and lithium disilicate-were was taken into consideration.	Not modeled	Finite element analysis was utilized to evaluate the mechanical performance of the tooth and inlay under a compressive load. The factors that affected the stress the materials underwent were then identified using the analysis of variance. The response surface technique was then used to analyze the stress responses of the restored tooth employing varied design parameters.
Alahmari, N *et al.* 2021 [18]	Human maxillary first premolars	Syntac Primer, Syntac Adhesive, Heliobond, enamel, dentine etching, and bonding were completed. The Composite was then placed and allowed to cure.	The mesial and distal edges of the distal boxes at group B samples expanded 2 mm, with 1 mm above the CEJ. The cavities were filled with composite layers of 3 mm in the shape of two increments to replicate the CMR procedure. Ivoclar Vivadent Microhybrid Tetric to fill all of the MOD cavities, while Kerr of the United States used a flowable composite called Premise Flow.	e.max crowns	self-adhesive resin	fracture forces and failure type

Zhang, H *et al.* 2021 [19]	Human maxillary premolars	The enamel margins in group E4 received a 37% phosphoric acid treatment Methodologies for instant dentin sealing and Tetric N-Bond self-etching bonding resin was used.	Dentsply Caulk in Milford, Delaware provided the 3 mm thick bulk-fill SDR flowable composites for group E1, while 3MESPE in St. Paul, Minnesota, provided the 1.5 mm thick Filtek Z350XT conventional resin composites for group E2.	lithium disilicate reinforced ceramic.	Variolink II composite cement with the dual curing	outflow, failure mechanism, and fracture resistance.
Da Silva, D *et al.* 2021 [20]	Human third molars	ERA and SEA Adper Scotchbond 1 XT 3M	A layer of Filtek Z250 .	Inlays made of resin composite were created with Gradia Indirect.	RelyX ARC 3M Oral Care, St. Paul, MN, USA	Nano-leakage test
Vertolli, T *et al.* 2020 [21]	Human third molars	Not mentioned.	The 10teeth in the GI margin group had 2 mm of deep-margin elevation to the CEJ with self-cure GI, and the 10 teeth in the RMGI margin group, had 2 mm of deep-margin elevation to the CEJ with dual-cured RMGI	CEREC Blocks were used to design and mill feldspathic porcelain inlays.	Nexus NX3 resin cement	marginal integrity through a Hirox digital microscope.
Bresser, R *et al.* 2020 [22]	Human Mandibular molars	Sealed right away using an etch-and-rinse adhesive resin "Two steps." On top of the Optibond FL Adhesive, a thin coating of the flowable composite was used to cover the IDS layer.	A composite layer that is 2 mm thick. Utilizing Essentia Universal composite, This layer was created	(IPS e.max CAD, Ivoclar Vivadent, Schaan, Liechtenstein)	Composite resin cement	Fracture strength and failure type

Scotti, N *et al*. 2020 [23]	Maxillary premolars	specific enamel etching + Using the manufacturer's directions, a two-step self-etch bonding system was then administered.	Group 1: The cervical edge was covered with a flowable resin layer that was 1 mm thick and horizontal. After that, 2-mm-thick oblique layers of the nanofiller composite were applied to complete the repair The cervical border was covered with a 1-mm-thick horizontal layer of ormocer flowable resin. After that, the repair was completed using two oblique layers of 2-mm-thick nano-filled ormocer. The same method used in Group 1 was utilized in Group 3, but with 2 mm of flowable composite. The identical method used in Group 2 was utilized in Group 4, but with 2 mm of flowable ormocer Group 5: 2-mm-thick oblique layers of a nanohybrid composite were applied. Group 6: Filtek Bulk-Fill Posterior, a bulk nano-filled composite, was used to undertake a bulk restoration.	Not mentioned	Not mentioned	tridimensional interfacial gap evaluation through Micro-computed Tomography
Grubbs, T. D *et al*. 2020 [25]	First or second human mandibular molar	A cavity Conditioner was used on the specimens in the GI and RMGI groups following product directions. Chemicals were then introduced into the distal boxes with a little adjustment to reduce voids. While the RMGI substance in the RMGI group samples obtained light polymerization for 20 seconds from the occlusal; after the expulsion of the matrix band followed by etching. The GF material in the GI group samples was allowed to self-polymerize for 6 minutes. Scotchbond Universal Etchant was used to selectively etch the RBC and BF groups. Then, they were washed, dried, and covered with Scotchbond Universal Adhesive.	GI group placed in a single 3-mm increment, resin-modified glass ionomer the group was placed in two 1.5-mm increments, resin-based composite group placed in two 1.5-mm increments, bulk-fill group placed in a single 3-mm increment, and control group (no PBE).	Lava Ultimate onlays	RelyX Ultimate	Margin quality through scanning electron Microscopy, and fracture resistance

Jelena JULOSKI *et al*. 2020 [24]	Human molars	Group 1: "gold standard" 3-step total-etch bonding System. Group 2: universal bonding agent Adhese Universal in selective enamel etch mode.	Group 1: Two increments with a flowable composite Premise flowable Group 2: Two increments with Tetric EvoFlow® Bulk Fill	Hybrid ceramic computer-aided design/computer-aided manufacturing	NX3 Nexus™ Third Generation in combination with the same Adhesive with Variolink Esthetic DC	quality of gingival margins through microleakage test and SEM.
Köken. S *et al*. 2019 [26]	Human third molars	Both groups: universal bonding agent G-Premio Bond + immediate dentin sealing (IDS) a universal adhesive G-Premio Bond was used in selective enamel etch mode.	Both groups: Two increments of 1 mm each with G-anial Universal Flo. Group 2: Two increments of 1 mm each with G-anial Universal Flo	GC Cerasmart	G-CEM LinkForce	Microleakage through a digital microscope
Köken S, *et al*. 2018 [27]	Human molars	Group 1: universal bonding agent G-Premio Bond. Group 2: bonded with a universal bonding agent G-Premio Bond	Group 1: Essentia MD Group 2: G-ænial Universal Flo	GC Cerasmart	G-CEM LinkForce	Microleakage through a digital microscope

Müller, V *et al.* 2017 [28]	Human molars	In group A, Scotchbond Universal Etchant was used to etch the whole cavity for 15 seconds before Scotchbond Universal Adhesive was applied for 20 seconds and thinned for 5 seconds with air. The whole cavities in group B were similarly etched for 15 seconds, then gently dried after being washed with air-water spray. Ivoclar Vivadent's Syntac Primer was applied for 15 seconds, softened with air, and followed with Syntac Adhesive for 10 seconds. Finally, Heliobond pretreatment was applied to the cavities. No cavity preparation was required for group C.	Then, one of the margins was elevated with Filtek Supreme XTE in layers of 2mm, as recommended by the manufacturer	composite resin blocks.	Rely X Ultimate And Variolink II . And Panavia SA Cement	marginal quality through scanning electron microscopy
Da Silva Gonçalves, D *et al.* 2017 [29]	Random human molars	The floor of the proximal box was covered with the adhesive system Adper Scotchbond 1XT following the protocol described.	Two sheets of 1 mm thick resin composite Filtek Z250 were introduced.	Gradia Indirect was used to create the indirect composite fillings	RelyX ARC is a total-etch resin cement, or G-Cem, a self-adhesive resin cement.	Failing method analysis and the test for micro tensile bond issues
Spreafico, R *et al.* 2016 [30]	Human third molars	There were carved holes As per the manufacturer's recommendations, the substrates were prepared using the three-step etch-and-rinse adhesive Optibond FL	For groups 1 and 3, Filtek Supreme XTE Flowable resin , For groups 2 and 4, Filtek Supreme XTE resin.	RNC blocks	A dual-curing resin cement	marginal quality through marginal and internal adaptation

Sandoval, M. J *et al.* 2015 [31]	Human third molars	etch-and-rinse den-tin binding agent in three steps	For this, either a flowable nano-filled resin in groups FS and FP or a nano-hybrid composites restoration resin was utilized. A2 in group P, Kerr.	glass-ceramic blocks combined with leucite	Restorative resin Premise®	marginal and internal adaptation
Ilgenstein, I *et al.* 2015 [32]	Human mandibular molars	A three-step etch-and-rinse adhesive.	Two 1-mm layers of composite	feldspathic ceramic blocks. And composite resin blocks	RelyX Ultimate.	Load to fracture and Fracture analysis
Zaruba, M *et al.* 2013 [33]	Human molars	Adhesive system was applied according to the manufacturer's instructions.	Composite layers were applied in group DE-1In with one 3 mm and in group DE-2In with two 1.5 mm thick Increments.	feldspatic ceramic blocks	hybrid composite	Marginal integrity through scanning electron microscopy
Frankenberger, R *et al.* 2013 [34]	Human third molars	bonded with AdheSE	RelyX Unicem G-Cem, Maxcem Elite, or Clearfi Majesty Posterior, were the substances used for PBE and were available in one or three sheets.	IPS Empress CAD glass–ceramic inlays.	The use of Syntac and Variolink II for adhesive luting was carried out.	using scanning electron microscopy, mediocre quality

Roggendorf, M. J *et al*. 2012 [35]	Human third molars	bonded with AdheSE (Ivoclar Vivadent, Schaan, Principality of Liechtenstein,	G-Cem, Maxcem Elite, or Clearfil Majesty Posterior were the substances used for PBE and came in 1 or 3 coatings.	Clearfil Elegance Composite Resin Inlays for the Posterior	The use of Syntac and Variolink II for bonding luting was carried out.	using SME, mediocre quality
Rocca, G. T *et al*. 2012 [36]	Human third molars	"etch & rinse" multi-functional adhesive system	a layer of tissue repair substance	The same microhybrid composite was used to make all of the inlays		marginal and internal adaptation through scanning electron microscopy

All of the studies were evaluated as having a moderate risk of bias based on the criteria for the included studies' risk-of-bias evaluation, making them appropriate for meta-analysis **(Table 4)**. However, most research articles should have disclosed the additional data: operator blinding, single operator, and sample size computation.

Table 4. Synthesis with a focus on qualitative data (risk of bias assessment).

Study	**Specimen Randomization**	**Single Operator**	**Operator Blinded**	**Control Group**	**Standardized Specimens**	**Failure Mode**	**Manufacturer's Instructions**	**Sample Size Calculation**	**Risk of Bias**
Grassi, E. D. A *et al*. 2022	YES	NO	NO	YES	YES	YES	YES	YES	Medium
Alahmari, N *et al*. 2021	YES	NO	NO	YES	YES	YES	YES	NO	Medium
Zhang, H *et al*. 2021	YES	NO	NO	YES	YES	NO	YES	NO	Medium
Grubbs, T. D *et al*. 2020	YES	NO	NO	YES	YES	YES	YES	NO	Medium
Ilgenstein, I *et al*. 2015	YES	NO	NO	YES	YES	YES	YES	NO	Medium

A systematic review and meta-analysis were carried out to provide an evidence-based reference for DME for a practitioner to use in their clinical practices. The comprehensive investigation showed that composite increased the deep margin elevation teeth' resistance to fracture.

Because there were substantial changes in fracture resistance when employing indirect ceramic or composite materials without using the DME method, the null hypothesis examined in this research was rejected.

This study only examines some relevant aspects. Although little to no enamel is often present in the cervical region, the subgingival extension complicates adhesive operations.

Worldwide, it is acknowledged that adhesion on enamel is trustworthy and effective [38]. However, it is less so on dentin owing to substrate morphology [39], additionally impacted by the kind of adhesive [40] and the application method [41]. Another factor that must be considered is the possibility that thermo-mechanical stress conditions might hasten bond deterioration in this crucial region, which would eventually result in restoration failure [42, 43].

As with direct restorations, ceramic inlays also need adhesive cementation to improve over time. Therefore, isolation must be considered a key component [44]. As a result, and following the findings of the current investigation, deep margin elevation with highly-filled flowable resin composites might be effectively used beneath ceramic inlays to facilitate isolation and cementation operations and minimize stress concentration [45-48]. The DME method has several benefits. One is the efficient method of obtaining optical and conventional impressions of supragingival borders [49, 50].

Additionally, PBE makes it easier to isolate properly using a rubber dam and, as a result, to manage moisture during the whole luting process [51, 52]. Additionally, moving the boundary supragingival improves control over removing extra luting composite [53, 54]. Last but not least, a base or liner put underneath inlays and onlays helps to prevent needless tissue sacrifice to fulfill the geometrical limits of indirect restorations and serves as the best protection for the pulp-dentinal complex during the temporary period [55-59].

From a clinical perspective, increasing a deep margin with resin composite has neither a good nor a negative impact on the repaired tooth's mechanical performance. Therefore, it is justified to carry out this technique as it can provide clinical benefits like greater gingival margin visibility, more accurate impressions, and easier rubber dam isolation [60-62].

Additionally, this method stays away from bulky restorations, which greatly restrict access to curing light in deep cavities [63, 64].

Additionally, if the margins are moved supragingival, removing excess luting composite, one of the most important aspects of the cementation operation, may be better managed [65]. Additionally, the stresses brought on by insertion, polymerization shrinkage, or functional loading may be lessened by the proximal composite base [66].

The justification for placing a base or liner under substantial indirect class II restorations, particularly when cervical margin relocation (CMR) is involved, is multifaceted. The preservation of the dentin during the temporary phase and cementation [67-69], the convenience of clinical procedures, a more conservative preparation, and the biomechanical benefit of a "stress breaking" layer idea are potential benefits [70].

This technique can preserve and minimize subject time, cost, and surrounding biological tissues [71].

Factors that may play role in the success of the technique include Remaining enamel available, margin location (enamel, dentin, or cementum adhesion), the material used for DME, and type of material according to light cure, thickness, and increments of the material applied as DME, type of adhesion protocol under rubber dam placement, SAT (suprarenal attached tissue) violation, irritation and inflammation of material subgingival, and testing methods in the in-vitro studies.

Because a moist atmosphere and masticatory pressures quickly cause material debonding in clinical settings, the conclusions of this study should be interpreted with care. With the help of the periodontal tissues, teeth may withstand these stresses. High heterogeneity was also discovered across all comparisons, which required a cautious interpretation of these findings.

The DME materials utilized in the literature to achieve a high fracture resistance were examined based on the in vitro data found in this research. It should be underlined that materials are the primary cause of the DME procedure's failure. The DME material is essential to overall success. It is crucial to note. So the long-term clinical effectiveness of restorative therapy depends on building a stronger fracture resistance to DME tooth.

Since few randomized clinical trials examine this variable, in vitro research, like the papers gathered by this systematic review, provides the greatest data to date.

Future randomized clinical studies that evaluate the clinical effectiveness of DME teeth that have been repaired utilizing resin composites created especially for this method are greatly sought.

Conclusion

In conclusion, under the constraints of the lengthy time between laboratory investigations and randomized clinical assessments, the in vitro data reveals that the deep margin elevation method tended to increase the fracture resistance of the teeth, in comparison with teeth repaired directly using indirect restoration without DME technique.

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