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CLINICAL REPORT

Deep margin elevation in anterior teeth: A clinical report

Elisa D.A. Grassi, DDS, MS,[a] and Marco M.M. Gresnigt, DDS, PhD[b]

ABSTRACT

Subgingival fractures in the anterior region present challenges for adhesive ceramic restorations. The deep margin elevation (DME) technique, using composite resin to elevate subgingival margins before indirect restoration preparation, has been reported to improve outcomes while maintaining esthetic and functional integrity. Developed for posterior teeth, DME aligns with minimally invasive principles and leverages adhesive material advancements. Its use in anterior teeth preserves gingival architecture, supports periodontal health, and ensures precise adhesive protocols, essential for successful rehabilitation. This report outlines DME's systematic application for managing anterior subgingival fractures. (J Prosthet Dent xxxx;xxx:xxx-xxx)

Trauma to anterior teeth is common among children and adolescents,[1] with increasing severity of trauma leading to more complex restorative procedures associated with increased tooth structure loss and poorer prognoses.[2] Extensively damaged teeth present significant challenges for rehabilitation,[3] necessitating meticulous selection of restorative approaches to ensure treatment success. Complete coverage crowns have been a common choice,[4–7] particularly when more than 50% of hard dental tissue is lost,[8] and their reliability has been well-documented.[7,9–13] However, the preparation for complete coverage crowns involves substantial removal of tooth structure, potentially compromising tooth longevity.[14] Preservation of tooth structure is critical for maintaining the lifespan of the teeth and the durability of restorations.[15–18] While partial coverage restorations require the removal of 35.5% to 46.7% of healthy tooth structure, complete coverage crowns demand significantly more, removing between 67.5% and 75.6%.[13,19]

Advancements in adhesive materials have driven minimally invasive dentistry, allowing for less invasive preparations without the need for macro-mechanical retention.[20] However, extensive tooth structure loss and subgingival defects present challenges in moisture control and achieving isolation, both critical for optimal adhesive bond strength and a dry working environment.[21–24] Deep subgingival cavities further complicate restorative procedures, making isolation difficult.[25] Subgingival margins can be managed through clinical crown lengthening or orthodontic extrusion,[14,26,27] but these techniques present biomechanical and esthetic drawbacks[28–30] and are generally recommended as last-resort options when conservative alternatives are not feasible.[31]

The deep margin elevation (DME) technique provides a minimally invasive alternative by elevating intrasulcular margins to supragingival positions using composite resin and modified matrices.[32,33] DME improves visibility, facilitates dental dam isolation, cement removal, intraoral scanning, and shaping, while preserving tooth structure, making it suitable for indirect partial coverage restorations.[32,33] DME has been widely studied in the posterior region[20,32,34–41] and is indicated for extensive direct composite resin restorations and preparations for indirect partial coverage restorations.[36] This approach enhances conservative restorative procedures, lowers the risk of pulp exposure, is favorable to tooth structures, and yields esthetic results.[42] From a periodontal perspective, the DME technique has been considered safe.[43–45]

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[a]External Collaborator, Department of Restorative Dentistry and Biomaterials, Center for Dentistry and Oral Hygiene, University Medical Center Groningen, Groningen, the Netherlands; and PhD student, Department of Dental Materials and Prosthodontics, Institute of Science and Technology, São Paulo State University (USP), São José dos Campos, Brazil.
[b]Associate Professor, Department of Restorative Dentistry and Biomaterials, Center for Dentistry and Oral Hygiene, University Medical Center Groningen, Groningen, the Netherlands.

Figure 1. Initial frontal view after trauma.

Initially developed for posterior teeth, the DME technique can also offer significant advantages for anterior restorations. Complete coverage crown preparations on anterior teeth can lead to a loss of up to 72% of healthy structure.[19,46,47] By combining DME for subgingival margin reconstruction with ceramic veneer preparations, healthy structures can be preserved while minimizing further damage. This study presents a 6-year follow-up on the rehabilitation of anterior tooth trauma using DME with ceramic laminate veneers.

CLINICAL REPORT

A 19-year-old healthy woman presented to Martini Hospital Groningen (The Netherlands) with maxillary anterior trauma from a bicycle accident (Fig. 1). Her clinical examination revealed fractures of the maxillary central and lateral incisors, with the fracture on the distopalatal of the right maxillary central incisor extending subgingivally. Preexisting composite resin laminate veneers were noted on both central incisors, with no history of endodontic treatment. Examination, including periodontal probing, radiographic imaging, and clinical photography, identified 5-mm probing depths and pulp necrosis in both central incisors and the right lateral incisor. Consequently, pulpectomies were performed by an endodontist as the initial treatment phase for these 3 teeth (Fig. 2). After the pulpectomies, a gingivectomy was performed to remove proliferative gingival tissue at the fracture site. Dental dam isolation was achieved from first premolar to first premolar. Managing DME on the palatal aspect posed challenges; however, thinning the matrix with scissors and using Teflon tape for anatomical adaptation improved the intrasulcular fit.[48] Microscope with 16x magnification (ZEISS OPMI pico; Zeiss) enhanced visualization of the operative field, facilitating precise isolation of deep margins.[49,50] On right central incisor, a matrix band (Garrison) was positioned between the gingiva, dental dam, and the tooth to assist in elevating the gingival margin. The defect was airborne-particle abraded with 50-μm alumina oxide (AquaCare Twin; Velopex International), followed by the application of a 3-step adhesive system (Optibond FL; Kerr Corp) using total-etch conditioning. For margin elevation, a flowable composite resin (A1 Clearfil Majesty Flow; Kuraray) was applied to close gaps between the matrix and tooth, followed by preheated resin (A1B Filtek Supreme XTE; 3M) to relocate the margin to a supragingival position. The restoration was light-polymerized for 20 seconds (SmartLite Pro; Dentsply Sirona). Subsequently, the lingual morphology of the teeth was restored using direct composite resin (Fig. 3).

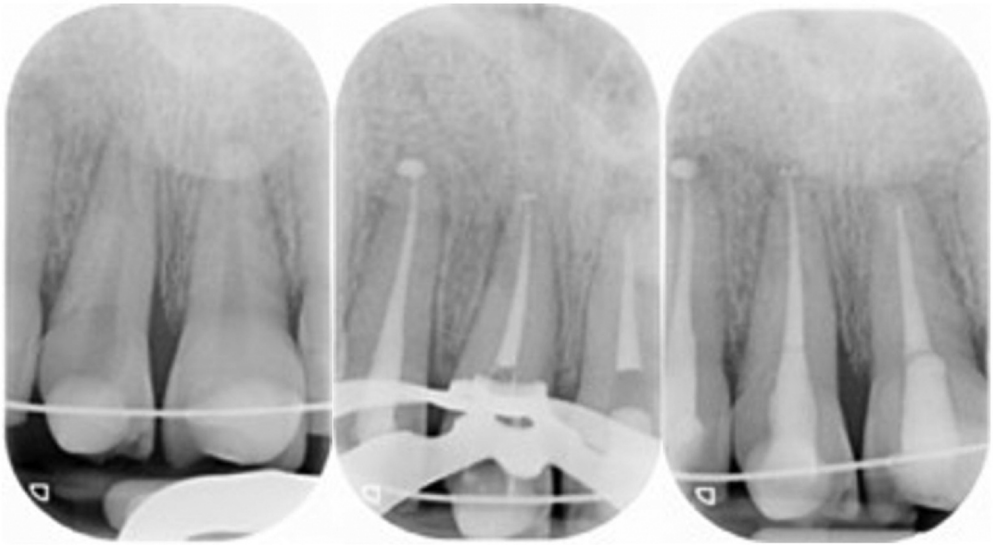

Figure 2. Radiographs after trauma and during endodontic treatment.

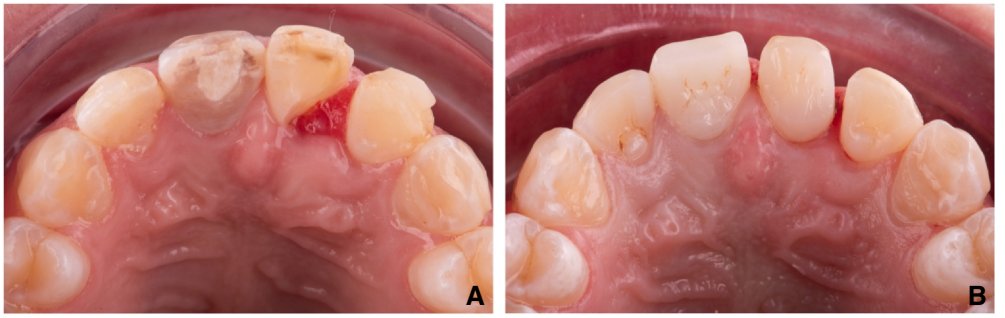

Figure 3. Deep margin elevation and restoration of palatal surface with composite resin. A, Initial appearance of palatal surface of teeth after trauma. B, Appearance after reconstruction of palatal surface with direct composite resin.

Figure 4. Facial aspect of preparations.

Figure 6. Definitive restorations immediately after adhesive cementation.

A 6-month follow-up was performed to assess tissue adaptation after the trauma. With healthy gingiva (2-mm probing depth), no signs of infection, inflammation, or tooth mobility, the treatment progressed to esthetic and functional planning. Digital Smile Design (DSD) was employed using intraoral and extraoral photographs and videos to enable precise, individualized planning.[51,52] A trial restoration was used to guide conservative tissue removal, ensuring proper contouring and preservation of tooth structure,[53–55] thereby supporting the preparation of the maxillary central and lateral incisors for ceramic veneers, in accordance with minimally invasive preparation principles (Fig. 4).[54] To optimize shade selection, cross-polarized photography was utilized, enhancing dentin color visualization through improved contrast.[56] The Elab System further refined the accuracy of color matching for the restorations.[57] After fabrication, the ceramic veneers were trial-fitted to the preparations (Fig. 5A). Once proper adaptation had been confirmed, the luting procedure began. The tooth preparations were airborne-particle abraded with 50-μm alumina oxide and silica to improve adhesion between the resin on the DME and the palatal surfaces.[54,58,59] A preheated composite resin (HFO UD1; Micerium S.p.A.) was used as the adhesive cementation agent (Fig. 5B).[60,61] The definitive rehabilitation met the patient's esthetic and functional expectations, without

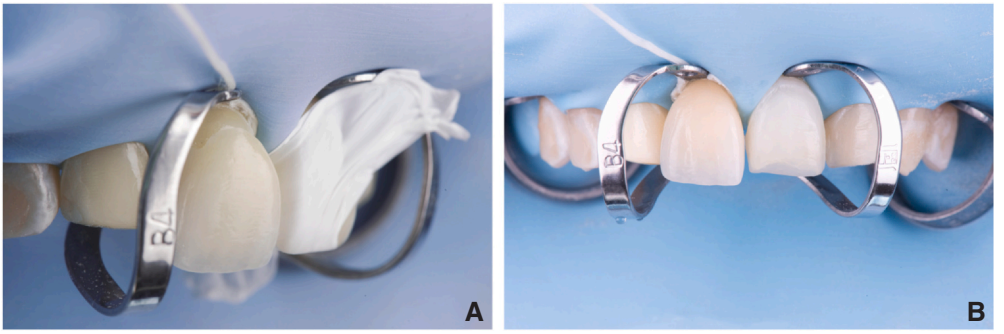

Figure 5. Adhesive cementation procedure. A, Ceramic veneer placement. B, Postoperative aspect after removal of excess luting material.

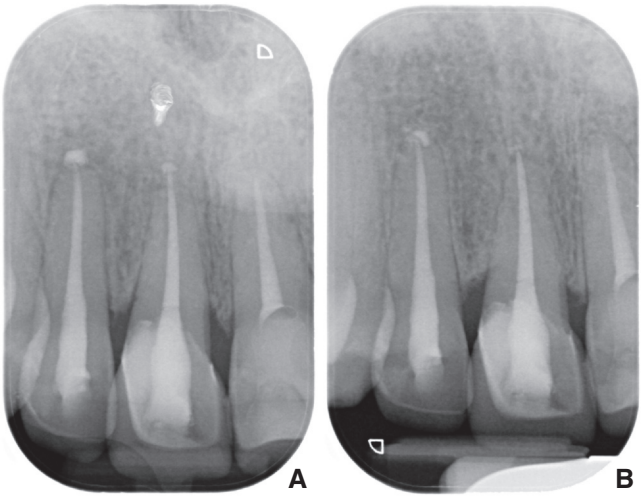

Figure 7. Periapical radiograph. A, After adhesive cementation restorations. B, After 6 years of follow-up.

excessive contour (Fig. 6). Periapical radiographs after cementation showed optimal contours, with no excess material or issues (Fig. 7A). A 6-year follow-up revealed good adaptation of the DME with minor bone remodeling (Figs. 7B, 8). The ceramic veneers and direct resin composite restorations on the palatal side showed no degradation, and DME did not cause periodontal inflammation or recession (2-mm probing depth) (Fig. 8).

DISCUSSION

DME can provide a conservative and esthetic alternative to crown lengthening surgery and orthodontic extrusion by eliminating the need for gingival and bone removal, allowing completion in a single appointment.[62,63] Clinical and review studies have reported the safety of DME safety for soft tissues,[26,34,41,43,64,65] as supported by the 6-year follow-up in this clinical report. The gingiva had no tissue changes, showing no alterations in color, texture, or bleeding, and radiographs revealed no significant bone loss. Bone remodeling was consistent with post-traumatic healing. Studies are needed to assess biomechanical behavior and marginal quality in of DME in anterior teeth, as in posterior applications.[35–38,66–71]

Concerns about gingival inflammation from intrasulcular composite resin elevation are mitigated by evidence indicating that appropriately polished restorations without over-contouring did not provoke such responses.[44,72] While Ferrari et al[73] suggested DME may lead to gingival bleeding, potentially linked to factors like poor hygiene or restoration techniques, Bertoldi et al[44] reported that subgingival composite restorations were safe regarding plaque, bleeding, and probing depth, supporting the integration of veneers with DME as a conservative and effective restorative solution.

SUMMARY

This 6-year clinical follow-up demonstrated that DME can effectively manage deep margins, enhancing visibility and providing a dry working field for partial ceramic restorations in the anterior region. The composite resin material exhibited no significant degradation and did not induce gingival inflammation.

PATIENT CONSENT

Complete written informed consent was obtained from the patient for the publication of this study and accompanying images.

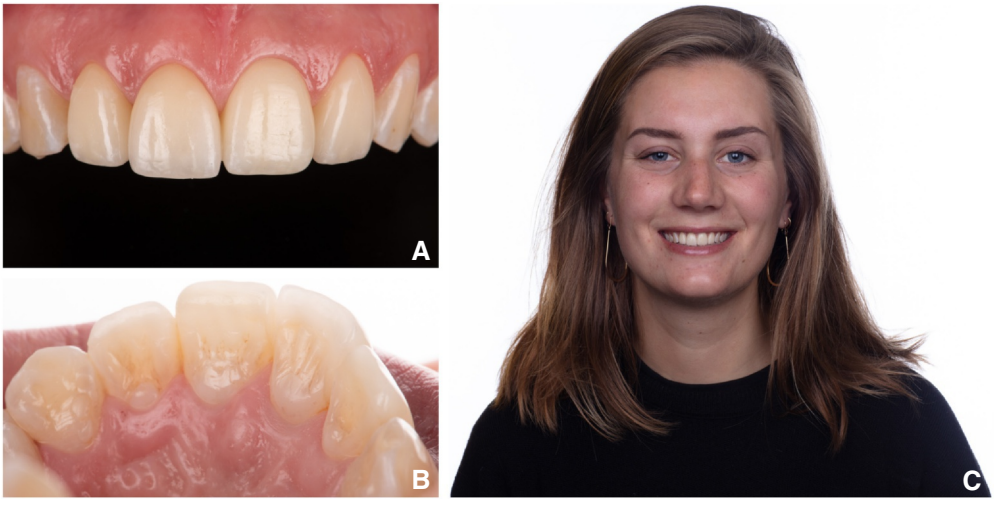

Figure 8. Six years of follow up. A, Ceramic veneers. B, Palatal reconstruction in resin composite without repolishing (note distal-palatal part of right central incisor). C, Full face view 6 years after treatment.

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Corresponding author:
Dr Marco M. M Gresnigt
Department of Restorative Dentistry
Center for Dentistry and Oral Hygiene
University Medical Center Groningen
Hanzeplein 1
Groningen 9713 GZ
THE NETHERLANDS
Email: m.m.m.gresnigt@umcg.nl

CRediT authorship contribution statement
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