Journal of Dentomaxillofacial Radiology, Pathology and Surgery

Summer 2022, Volume 11, Number 3

Case Report: The use of an aluminum shell for isolation and marginal elevation in a tooth with no proximal structure

Reza Tayefeh Davalloo[1], Seyedeh Maryam Tavangar[1], Hoorieh Alsadat Hosseini Basti[2*]

[1]*Associate professor, Dental Sciences Research Center, Department of Restorative Dentistry, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran*
[2]*Assistant professor, Dental Sciences Research Center, Department of Restorative Dentistry, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran*

Use your device to scan and read the article online

Citation: Tayefeh Davalloo R, Tavangar SM, Hosseini Basti H. The use of an aluminum shell for isolation and marginal elevation in a tooth with no proximal structure. Journal of Dentomaxillofacial Radiology, Pathology and Surgery. 2022; 11(3):16-20. http://dx.doi.org

http://3dj.gums.ac.ir

Article info
Received: 2022/06/15
Accepted: 2022/07/01

ABSTRACT

Deep margin elevation is a technique to solve the problem of localized sub-gingival margins of a tooth. It facilitates isolation and allows the use of adhesive materials. Otherwise, the tooth may not be restorable and the outcome of marginal integrity may remain questionable. Different methods have been suggested previously but they have disadvantages. This article describes the use of an aluminum shell as a matrix to restore a tooth with a sub-gingival margin. The aluminum shell is adapted to the remaining tooth contour and also extends beyond the margins to ensure the isolation and provide a matrix to restore the tooth.

Keywords:
Dental Caries
Dental Marginal Adaptation
Composite Resins

*** Corresponding Author:**
Hoorieh Alsadat Hosseini Basti
Address: Faculty of Dentistry, Lakan, Rasht, Guilan, IRAN
Tel: +98-1333486416
E-mail: hosseini.hurieh@yahoo.com

Journal of Dentomaxillofacial Radiology, Pathology and Surgery

Introduction

Nowadays, one of the major goals of restorative and operative dentistry is preserving intact tooth structure.(1) Restorations with margins in dentin and cementum are more prone to micro leakage and other complications like subsequent sensitivity, marginal staining and secondary caries.(2) Large proximal lesions extending cervically to the cement-enamel junctions are challenging to restore. Marginal replacement eases the procedures like the filed isolation, cavity preparation, impression making for indirect restorations and management of soft gingival tissues.(3) Cementation of indirect restorations with adhesive needs a dry environment to ensure a long term service.(4) The conventional approach consists of orthodontic extrusion, surgical exposure of the cervical margin, or a combination of both that can increase the possible invasion to the biological width and may cause inflammation in supporting periodontium and lead to recession. Orthodontic extrusion requires consideration for crown root ratio and is time consuming. The biologic width is the distance between the deepest area of marginal sulcus and the alveolar bone crest and the mean of that is 2.04 mm. Sub-gingival defects that are limited to the junctional epithelium have at least 1-1.5 mm distance from the alveolar crest. Crown lengthening procedure has problems such as violating the biologic width and anatomical complications like proximity to the furcations.(5, 6) A conservative approach for restoring deep marginal lesions is to apply an increment of composite resin over the preexisting cervical margin in order to relocate it coronally. This technique is called "deep margin elevation" (DME). It is also named with the terms "cervical margin relocation", "proximal box elevation" and "coronal margin relocation". DME and sub-gingival restorations are compatible with periodontal health as they are well-polished and refined .(7) Through DME, an unrestorable tooth can be saved. The concept of deep margin elevation was first presented by Dietschi and Spreafico in the year 1998.(8-10) The composite thickness in DME cases is the minimum required amount for bringing margin to a supra gingival position. This helps polymerization control and creates a restoration emergence profile with marginal adaptation.(11) Although DME seems a valuable technique, clinicians have not extensively applied it, therefore any manner of facilitating clinical procedures and reducing technique sensitivity should be seriously considered.(7) A direct restoration is used to elevate the cavity margin to a new equi gingival or supra gingival location. Moisture control is required for this purpose which can be achieved by a matrix system. Micro hybride and flowable composites are comparable in marginal sealing quality .(12) DME with resin modified glass ionomer reduced the extent of interfacial gap formation before and after the aging process.(13) A systematic review in 2021 concluded that DME yields a better survival rate than surgical crown lengthening(S-CL).(14) Deep sub-gingival proximal cavity elevation or coronal margin relocation are being increasingly used to manage deep defects with resin composites and provide promising results regarding the esthetic and mechanical properties.(15) One of the most challenging experiences in daily practice is achieving durable restorations in the cervically areas with moisture. (5) Methods which are currently used may not be useful to have the band against the tooth and also shaping the matrix for teeth with irregular forms may be impossible. The present case report describes the application of a conservative new technique that focuses on the local isolation and treating deep cavity margins which can be helpful to dental practitioner. This method has some advantages such as availability of shell with different sizes to adapt with tooth, create an isolation field and create an adequate tooth contour.

Clinical Technique

Prior to the treatment, it was important to evaluate the possibility of restoring the tooth without invading the biological width, so a pre operative peri apical radiography was required. (figure1)

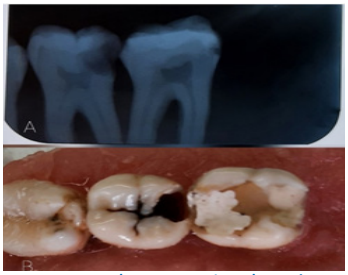

figure1:A: Pre-op X-ray. The margin location was sub gingival prior to elevation. B:Pre-op intra oral picture with extensive caries

Tayefeh Davalloo R, et al. The use of an aluminum shell for isolation and marginal elevation in a tooth with no proximal structure. Journal of Dentomaxillofacial Radiology, Pathology and Surgery. 2022; 11(3):16-20. http://dx.doi.or

In this case, field isolation was performed using green colour rubber dam (Sanctuary Latex Dental dam,Malaysia) and the preparation extended to sound tooth tissue in all areas except distal part, where it was difficult to isolation .The authors used an aluminum shell that was a temporary crown and mainly used to protect prepared teeth for crown insertion. This shell was made of malleable aluminum which was soft and easy to use and was available in different sizes in assortment packages. The proper amount of Aluminum shell (SHADI, made in IRAN) was cut and polished following the shape of the margin then trimmed with curved tip scissor (figure2).

figure2:A: Aluminum shell box B:An aluminum shell C and D: Preparing the aluminum shell (cutting with disk and scissor)

It was precisely adjusted to the contour of the remaining dental structure and extended beyond the margins to ensure complete adaptation and height using the height of the adjacent tooth as a guide. The band was then seated by applying sufficient vertical pressure and the wedge was placed so that the shell was extended beyond the sub-gingival margins and was stable. The purpose of this technique was to prepare an isolated operative field, allowing the use of the adhesive materials. Once the tooth was isolated (figure3), the adhesive procedure was carried out following the recommendation of the manufacturer. Enamel and dentin were etched (30 and 15 seconds, respectively) with 37% phosphoric acid gel (super etch,SDI,Australia) and then rinsed with water spray and dried. A two-step etch and rinse bonding agent (Ambar,FGM,Brazil) was applied for two layers according to the instruction and cured for 20 seconds (Blue dent LED light cure, light intensity 1500mw/cm2,wave length 410-490 nm, Bulgaria). Then the margin elevates to the new place using a flowable and condensable composite (Opallis, FGM, Brazil) (figure3).

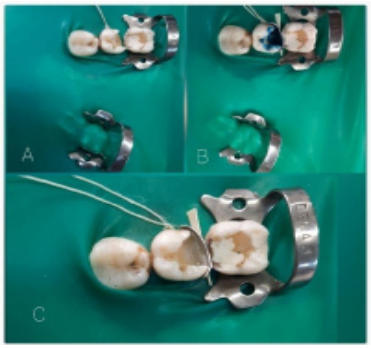

figure3:A:Isolating tooth with rubber dam B:Etching the tooth structure C: Deep margin elevated with restorative composite.

After tooth construction, the periapical radiograph picture was taken. The cavity was filled with composite using layering technique and each layer was cured for 20 seconds. After that finishing and polishing procedure was performed and so the buildup was completed (figure4).

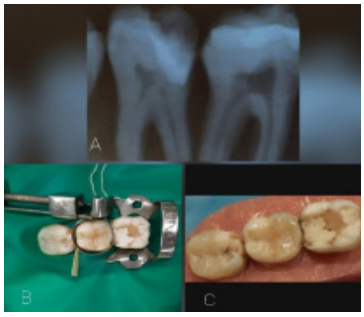

figure4:A:Post-op X-ray of margin elevation prior to final restoration being completed. B:Toffle mire matrix holder around the teeth C:Final intra oral picture

Discussion

Deep margin elevation is a solution to localize sub gingival margins for direct, semi-direct, and indirect restorations. This technique focuses on local isolation of the deep margin by using an aluminum shell. After cavity preparation, a matrix and wedge with adequate anatomy were inserted.(9) After etching, a layer of a bonding agent was applied to the exposed dentin and light polymerized. The deep margin was elevated to a supra gingival margin using flowable or condensable composite or a combination of both in a snow plow technique in which the application of a flowable composite as a liner was

recommended.(16, 17) Final polymerization through glycerin gel was also recommended to eliminate the oxygen inhibition layer. Then the preparation was rinsed with air-water spray and the composite excess was gently removed and polished. A post-operative periapical radiograph was necessary to ensure the absence of gaps or overhangs.(18) Ghezzi et al., say the deep margin elevation is a biologically sound and minimally invasive technique.(19)

According to studies, the main challenge for DME is adapting the matrix band to the base of the restoration. Special matrix systems have been suggested for this purpose. Regular matrix bands can be adapted on one side to help the band sit deeper. Different wedges, Teflon tape, and light cured rubber dam materials are also useful to achieve an acceptable seal.(8-10) Curved matrices are preferable because they provide a better gingival emergence profile compared to traditional ones.(20)Instability of matrix is equal to failure of the technique and the treatment plan needs to be reconsidered. The matrix dimensions should be higher than the desired elevation level and narrow enough to slip easily in the sub-gingival area. For this reason, it needs to be reduced by 2-3mm with scissors. In the case of severely deep localized lesions, the "matrix-in a matrix "technique seems more beneficial. In this technique, a sectional matrix is inserted vertically into the sub-gingival area through a loosened Toffle mire.(18) Belknap et al. introduced a technique to help with the adaptation of the matrix band. Belknap et al. placed a Teflon tape between the band and the adjacent teeth.(20) Although current usage of matrix and copper band is useful for isolation and prepares a suitable environment for adhesive technique but gingival tissue may be present between the matrix and tooth margin that causes overhangs. The use of copper band in inter proximal concavities and correcting these areas are extremely difficult. The authors of this study consider the use of an Aluminum shell as the suitable technique for restoring a tooth with sub-gingival margin. Aluminum shells (SHADI made in IRAN) are available in different sizes. This technique can be performed in all cases of deep proximal lesions with the working field isolation. Clinicians should ensure that the shell is properly adapted to the tooth structure and a perfect seal is achieved. A part of Aluminum shell is a matrix that can be shaped intimately to the dental structure in the sub-gingival area. The Aluminum shells are soft and easy to shaped around the tooth. Temporary crowns are pre finished and contoured and are less time-consuming. They are available for adult teeth and have an anatomical shape. Their size, enhanced shapes, gingival prefestooned shape and proper hardness are combined to offer faster adaptation. Use of an aluminum shell for deep margin elevation allows optimal condition for the adhesive technique. As previously proven, longevity of restoration depends on the marginal adaptation. Marginal gaps facilitate for the accumulation of the biofilm deposition that can lead to caries and periodontal diseases. In this method a favorable marginal adaptation is achieved and also final dental restoration is ideally made to blend smoothly with the contours of restored tooth. The recommended technique depends on the clinician's skill. Accurate adaptation of shell with inter proximal surface of the teeth should be carried out.

Conclusion

In this article authors used an aluminum shell to relocate the deep margin of a tooth. This method is useful for restoring a tooth with sub-gingival structures which needs deep margin elevation.

Acknowledgments

None

Authors' contributions

Reza Tayefeh Davalloo: Conceptualization, Methodology, Writing - Review & Editing **Seyedeh Maryam Tavangar:** Writing - Original Draft, Data Curation, Supervision **Hoorieh Alsadat Hosseini Basti:** Resources, Investigation, Visualization

Conflict of Interests

The authors declare no conflict of interest.

Ethical declarations

IR.GUMS.REC.1402.408

Financial support

None

Availability of data and material:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

References

1. Samartzi T-K, Papalexopoulos D, Sarafianou A, Kourtis S. Immediate Dentin Sealing: A Literature Review. Clinical, cosmetic and investigational dentistry. 2021;13:233. https://doi.org/10.2147/CCIDE.S307939 PMid:34188553 PMCid:PMC8232880

2. Maske T, Hollanders A, Kuper N, Bronkhorst E, Cenci M, Huysmans M. A threshold gap size for in situ secondary caries lesion development. Journal of-Dentistry.2019;80:36-40.https://doi.org/10.1016/j.jdent.2018.10.014PMid:30395875

3. Alhassan MA, Bajunaid SO. Effect of cervical margin relocation technique with composite resin on the marginal integrity of a ceramic onlay: a case report. General Dentistry. 2020;68(4):e1-e3.

4. Da Silva Gonçalves D, Cura M, Ceballos L, Fuentes M. Influence of proximal box elevation on bond strength of composite inlays. Clinical oral investigations. 2017;21(1):247-54.https://doi.org/10.1007/s00784-016-1782-7 PMid:26969499

5. Furtado S, Hegde V, Fanibunda U. Deep margin elevation: Raising the bar in adhesive restorations-A case series. 2021. https://doi.org/10.22271/oral.2021.v7.i3f.1327

6. Jepsen S, Caton JG, Albandar JM, Bissada NF, Bouchard P, Cortellini P, et al. Periodontal manifestations of systemic diseases and developmental and acquired conditions: Consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. Journal of clinical periodontology. 2018;45:S219-S29.https://doi.org/10.1111/jcpe.12951 PMid:29926500

7. Samartzi TK, Papalexopoulos D, Ntovas P, Rahiotis C, Blatz MB. Deep Margin Elevation: A Literature Review. Dentistry Journal. 2022;10(3):48.https://doi.org/10.3390/dj10030048 PMid:35323250 PMCid:PMC8947734

8. Marvaniya J, Agarwal K, Mehta DN, Parmar N, Shyamal R, Patel J. Minimal Invasive Endodontics: A Comprehensive Narrative Review. Cureus. 2022;14(6). https://doi.org/10.7759/cureus.25984 PMid:35859953 PMCid:PMC9287844

9. Bresser R, Gerdolle D, van den Heijkant I, Sluiter-Pouwels L, Cune M, Gresnigt M. Up to 12 years clinical evaluation of 197 partial indirect restorations with deep margin elevation in the posterior region. Journal of dentistry. 2019;91:103227.https://doi.org/10.1016/j.jdent.2019.103227 PMid:31697971

10. Sarfati A, Tirlet G. Deep margin elevation versus crown lengthening: biologic width revisited. Int J Esthet Dent. 2018;13(3):334-56.

11. Ilgenstein I, Zitzmann NU, Bühler J, Wegehaupt FJ, Attin T, Weiger R, et al. Influence of proximal box elevation on the marginal quality and fracture behavior of root-filled molars restored with CAD/CAM ceramic or composite onlays. Clinical oral investigations. 2015;19(5):1021-8.https://doi.org/10.1007/s00784-014-1325-z PMid:25248949

12. Köken S, Juloski J, Sorrentino R, Grandini S, Ferrari M. Marginal sealing of relocated cervical margins of mesio-occluso-distal overlays. Journal of Oral Science. 2018:17-0331.https://doi.org/10.2334/josnusd.17-0331 PMid:29695671

13. Moon W, Chung S, Chang J. Effect of Deep Margin Elevation on Interfacial Gap Development of CAD/CAM Inlays after Thermomechanical Cycling. Operative Dentistry. 2021;46(5):529-36.https://doi.org/10.2341/20-310-L PMid:34757375

14. Mugri MH, Sayed ME, Nedumgottil BM, Bhandi S, Raj AT, Testarelli L, et al. Treatment Prognosis of Restored Teeth with Crown Lengthening vs. Deep Margin Elevation: A Systematic Review. Materials. 2021;14(21):6733.https://doi.org/10.3390/ma14216733 PMid:34772259 PMCid:PMC8587366

15. Ismail HS, Ali AI. Periodontal health evaluation for deep margin elevation using bioactive composite versus bulk fill composite. A case report. International Journal of Medical and Dental Case Reports. 2021;9(1):1-4. https://doi.org/10.15713/ins.ijmdcr.160

16. Borouziniat A, Khaki H, Majidinia S. Retrospective evaluation of the clinical performance of direct composite restorations using the snow-plow technique: Up to 4 years follow-up. Journal of clinical and experimental dentistry. 2019;11(11):e964.https://doi.org/10.4317/jced.55639 PMid:31700568 PMCid:PMC6825734

17. Rocca GT, Rizcalla N, Krejci I, Dietschi D. Evidence-based concepts and procedures for bonded inlays and onlays. Part II. Guidelines for cavity preparation and restoration fabrication. Int J Esthet Dent. 2015;10(3):392-413.

18. Magne P, Spreafico RC. Deep margin elevation: a paradigm shift. Am J Esthet Dent. 2012;2(2):86-96.

19. Ghezzi C, Brambilla G, Conti A, Dosoli R, Ceroni F, Ferrantino L. Cervical margin relocation: case series and new classification system. Int J Esthet Dent. 2019;14(3):272-84.

20. Dietschi D, Spreafico R. Evidence-based concepts and procedures for bonded inlays and onlays. Part I. Historical perspectives and clinical rationale for a biosubstitutive approach. Int J Esthet Dent. 2015;10(2):210-27.