

Composite Plastering Technique (CPT) for Anterior and Posterior Restorations

SUMMARY

Composite plastering technique (CPT) is a novel restoration improvement technique for eliminating and re-contouring the marginal defects. Restoration-related interproximal contour deficiencies such as dark triangles beneath the contact point following direct class II restorations, the gaps at the interproximal cavity step following indirect cementations, and the gaps at the interproximal wall following class III restoration layering procedures can be corrected using the CPT. The technique may also be used as a layering step during the free-hand layering in diastema closure restorations. Contour deficiencies on interproximal surfaces which lead to the renewal of restoration and periodontal damages can be prevented by additional direct composite build-up using the CPT. The technique can be performed either immediately after the restoration directly or long after by using the composite repair protocol. It focuses on filling and re-contouring the surface of the deficiency by using a mylar strip actively under rubber-dam isolation. Composite is loaded between the strip and the tooth surface and the strip is pulled slightly in palato-buccal or the opposite direction depending on the location of the defect, to fill it by plastering the composite. It may contribute the longevity of the restoration by improving the emergence profile and correcting the interproximal contour. Re-contouring of the interproximal surface defects by CPT is a useful approach to improve the esthetics as well as the function of anterior and posterior direct and indirect restorations which may also prolong the longevity.

Key Words: Composite Plastering Technique, CPT, Composite Build-up, Emergence Profile, Marginal Deficiency, Re-contouring

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REVIEW PAPER (RP)

Balk J Dent Med, 2023;8-14

Introduction

Direct and indirect restorations can be performed with resin-based composite materials¹. However, both restoration types have some difficulties in clinical application procedures². The contact/contour problems and gap formations might be generally observed at interproximal surfaces of the restoration, resulting in several esthetic and functional problems^{3,4}.

These restoration-related problems can generally be observed in direct posterior OD, OM and MOD restorations, Class III restorations, and direct diastema closure restorations, clinically⁵. While managing

the interproximal and cervical surfaces during the incremental layering of direct posterior restorations⁶, proper polymerization is a real challenge⁷. Bakhsh *et al.* mentioned the polymerization shrinkage of resin-based composites as a major influencing factor for the gap formation⁸. Especially, the accumulation of 2 mm increments at the marginal area may cause some deficiencies reaching the outer restoration surface between the layers and at the gingival cavity floor⁹. Also, while performing the incremental layering technique, depending on the matrix system, the marginal contact point might be located occlusally, thereby providing contact/contour problems¹⁰. This mis-location may provide a huge space

beneath the contact point, resulting in a dark triangle. Although, an ideal self-contoured matrix system may prevent such contact-related problems, in case of these cases the situation is usually irreversible¹¹.

Regarding the Class III restorations, interproximal surface gaps might be observed frequently at the palatal side of the restoration. Whereas these gaps or contour deficiencies might be observed palatally or labially for the diastema closure restorations, especially when using the free-hand layering technique, depending on the stratification technique of the clinician¹². If layering starts from the vestibular surface the deficiency will probably be seen at the palatal surface, while the opposite is valid for the palatally initiated layering.

In terms of the free-hand layered diastema closure restorations, the layering is generally divided into two steps⁴. The clinician can restore either the labial or the palatal surface initially, aiming to generate the best possible surface contact^{4,13}. However, the emergence profile is also a very important issue for such cases due to the potential of influencing the health of adjacent periodontal tissues. Especially the lack of the composite material in such area during the restorative procedure may lead to important clinical complications¹⁴. Therefore, the second step of the layering is restoring the un-restored palatal or labial surface, aiming to provide a good emergence profile^{4,13}. The proposed technique might be used as an effective alternative method for the second layering step of the direct diastema closure⁴.

The deficiencies at the interproximal/cervical cavity step can be observed during the indirect restorative procedures, such as onlay and overlay restorations¹⁵. Although the digital Cad/Cam restorations have advantages than the analog indirect restorations in terms of the level of distortion of the impression¹⁶, both type of restorations might have such interproximal gaps due to several reasons^{17,18}. One of the common reasons is the wear of the resin-based, low-filled flowable composite (the cement) away from the cervical gingival cavity floor following the cementation procedure¹⁹. The manipulation of the dental floss to remove the excessive resin material from the marginal area, might be the reason of this wear. Moreover, the level of polymerization is generally low on the restoration - cervical cavity floor conjunction, due to the location of this area²⁰. Therefore, the potential inadequate curing of the cement may lead to the wear away process by dental floss application. Another reason might be the inconsistency of the impression or the restoration with the clinical cavity formation.

Such defects may lead to the unwilling gap formations or rough surfaces at the interproximal surfaces, frequently resulting in periodontal problems, food impaction, microleakage, surface staining, post-operative sensitivity, recurrent caries and partial or complete loss of the restoration in long-term^{15,17,21-25}. An easy technique for filling and re-contouring of these

deficiencies clinically would be useful to increase the quality and prolong the longevity of the anterior and posterior restorations⁴. Composite plastering technique (CPT) is a novel restoration improvement technique which can eliminate the interproximal surface deficiencies by re-contouring the marginal surface of a restoration with composite build-up, following the direct and indirect restoration types⁴. CPT can be performed immediately after the restoration directly or long after the restoration by using the composite repair protocol.

Clinical requirements for CPT

The clinical application protocol of CPT has some necessities. It should be performed under rubber-dam isolation to provide a clear operating field while retracting the cervical gingival tissues and controlling the moisture²⁶. In case of the need for repeating the CPT protocol, the rubber-dam isolation works as a safety belt, in terms of bleeding and salivary flow. Additionally, CPT is performed by using the paste-type resin composites which don't have a high level of stiffness but not highly flowable as well. Finally, a thick and transparent mylar strip is needed for the clinical application of the CPT.

CPT for Class III restorations

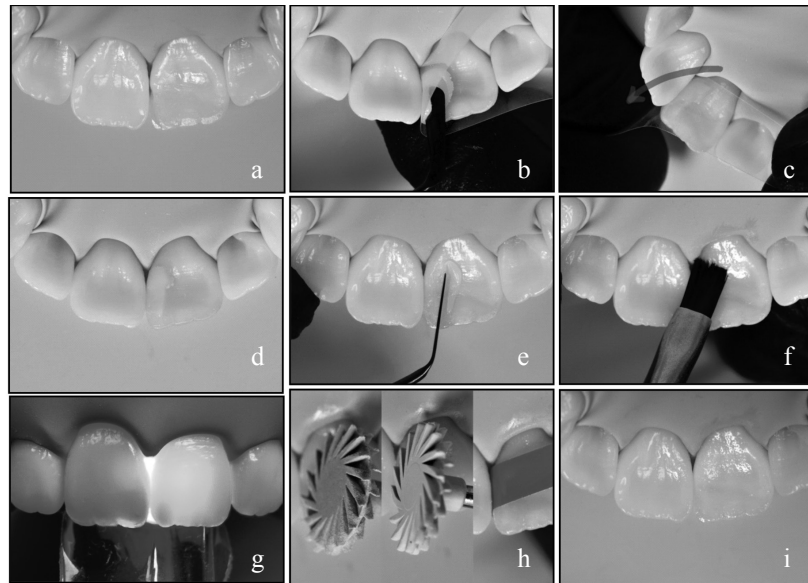
Gap formations or layering deficiencies might be generated in either labial or palatal surfaces of the restoration, according to the selected layering technique in Class III restorations (Figure 1a). In such cases, a transparent mylar strip is placed between the rubber-dam and the cervico-gingival surface, into the sulcus of tooth without using a wedge. Then the selected resin composite is loaded between the mylar strip and the tooth (Figure 1b), and the strip is slightly pulled aside while wrapping the marginal tooth surface (Figure 1c). The direction of pulling should be from the side of the defect to the counter side. Resin composite is directed by the strip and moved towards the gap to fill it homogeneously. Excessive composite material is removed by using a restorative instrument and/or a composite brush before the curing (Figures 1d-f). Following the polymerization (Figure 1g), the restoration is polished (Figure 1h, i).

CPT for diastema closure restorations

CPT can be used as a second layering step, especially during two-step free-hand layering technique in diastema closure restorations. (Figures 2a-c)²⁷. A thick (0.05 mm) transparent mylar strip is placed between the rubber-dam and the margin of tooth, inside the sulcus, without using a wedge. The same shade of the resin composite is gently loaded between the strip and the tooth, inside the deficient area (Figure 2d). The strip is bended to cover the marginal surface of the tooth (Figure 2e) and pulled slightly from palatal to buccal direction (Figure 2f).²⁷ The strip should always touch the cervical surface during the pulling procedure. The aim is to carry the additional composite

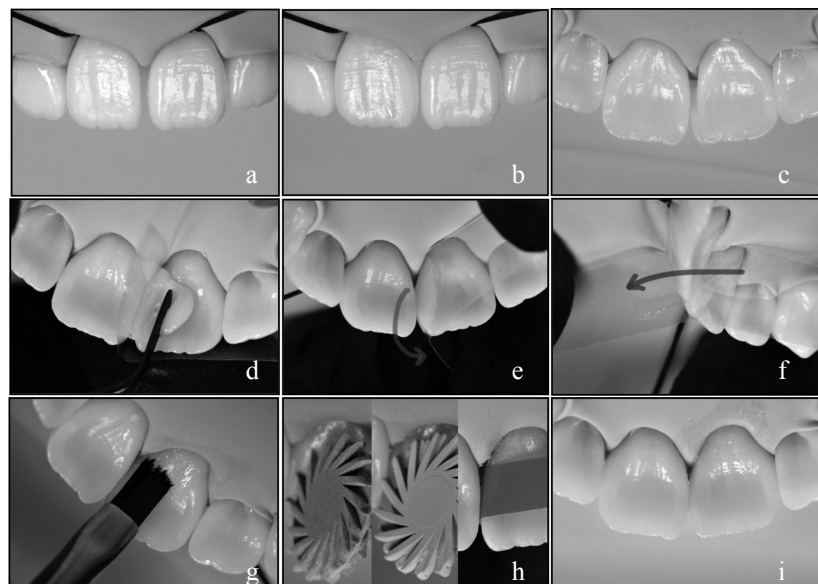
material with the mylar strip and fill the gaps on the marginal surface. Then the excessive composite is gently removed from the palatal surface using a restorative instrument and/or a composite brush (Figure 2g). The additional composite build-up is polymerized using a curing unit from labial and palatal surfaces. Excessive

composite can be removed from the cervical area by using a scalpel if needed. Palatal surface embrasures are formed by using composite polishing discs and the surface is polished by using spiral composite polishing wheels (Figure 2h). Then the interdental surface is polished using interdental strips (Figure 2h, i).



Figures 1a-i. Application of the CPT technique for Class III restorations

- a) The layering deficiency on the palatal surface immediately after class III restoration; b) Placement of the transparent mylar strip into the sulcus and composite loading between the strip and marginal surface; c) Pulling the strip in palato-buccal direction for the composite plastering
d) Removal of the mylar strip; e) Removal of the excessive composite on the palatal surface; f) Surface adjustment on the palatal surface using a composite brush; g) Photo-polymerization; h) Pre-polishing and high-shine polishing of the palatal surface using medium- and fine-grit spiral wheels and interdental polishing using interdental strips; i) Restoration final after the CPT



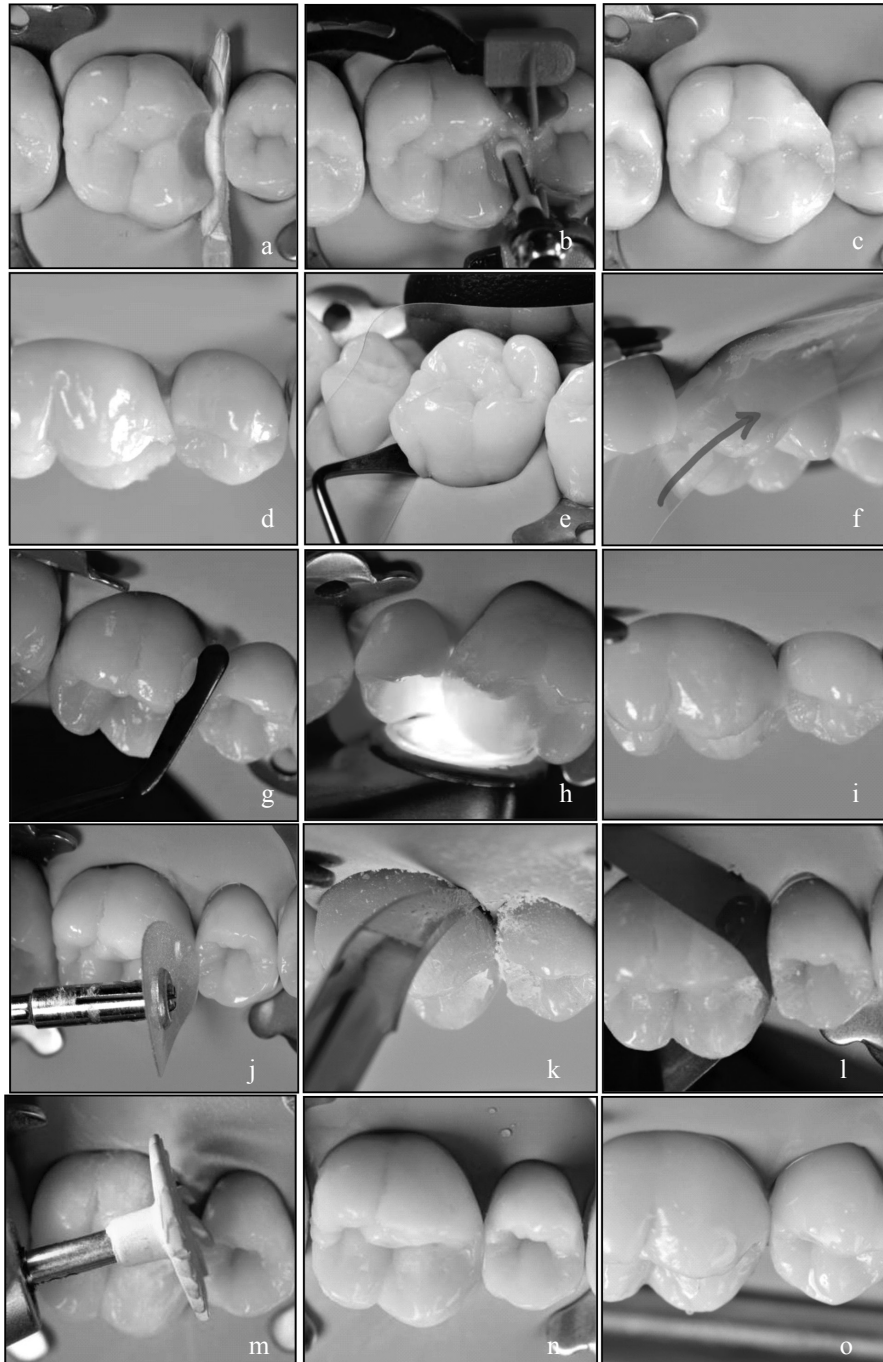
Figures 2a-i. Application of the CPT technique for diastema closure restorations

- a) Major diastema / rubber- dam isolation; b) First step / composite build-up on the labial surface; c) Layering deficiency on the palatal interproximal surface; d) Placement of the transparent mylar strip into the sulcus. Composite loading between the strip and marginal surface and removal of the excessive material; e) Bending the strip to cover the marginal surface of the tooth; f) Pulling the strip in palato-buccal direction for the composite plastering; g) Removal of the excessive composite, surface adjustment using a composite brush, and photo-polymerization; h) Pre-polishing and high-shine polishing of the palatal surface using the medium- and fine-grit spiral wheels and interdental polishing using interdental strips; i) Restoration final after the CPT

CPT for direct posterior restorations

The contour deficiencies and related dark triangles beneath the contact point are frequent due to the selection of non-contoured marginal matrix bands and are very difficult to manage clinically. An easy and effective alternative way to modify or re-shape the contact surface

might be the CPT immediately after the incremental layering (Figures 3a-d). Generally, because of the oxygen inhibition layer, no additional procedure is needed for the adhesion. But, in case of contamination of the interdental surface, the adhesive protocol must be repeated.



Figures 3a-o. Application of the CPT technique for direct posterior restorations

a) Class II cavity preparation and the placement of wedge and sectional matrix system; b) Incremental composite layering; c) Completion of the layering and the removal of the matrix; d) The deficiency at the interdental area due to the occlusally located contact point (palatal view); e) Placement of the transparent mylar strip into the sulcus and additional composite loading between the strip and marginal surface; f) Pulling the strip in bucco-palatal direction for the composite plastering; g) Removal of the excessive composite; h) Photo-polymerization; i) Immediately after the composite plastering; j) Re-shaping of the marginal ridges and embrasures with the polishing discs; k) Minor reductions to correct the emergence profile using scalpel #12; l) Interdental polishing using interdental strips; m) High-shine polishing of the surface using the fine-grit spiral wheel; n) Restoration final (occlusal view); o) The interdental area and contact point after the CPT (palatal view)

A transparent mylar strip is placed between the rubber-dam and the cervico-gingival surface, into the sulcus without using a wedge (Figure 3e). Then the selected paste-type resin composite is loaded between the mylar strip and the tooth (Figure 3e). The strip is actively pulled either from buccal to lingual direction or from lingual to buccal direction while wrapping the marginal surface (Figure

3f). The direction of pulling depends on the location of the defect and the morphology of the tooth. CPT fills the deficiencies with composite and thereby corrects the marginal surface contour simultaneously. The excessive composite material is removed before curing (Figures 3g, h). Following the polymerization, the whole surfaces of the restoration are polished (Figures 3i-o).

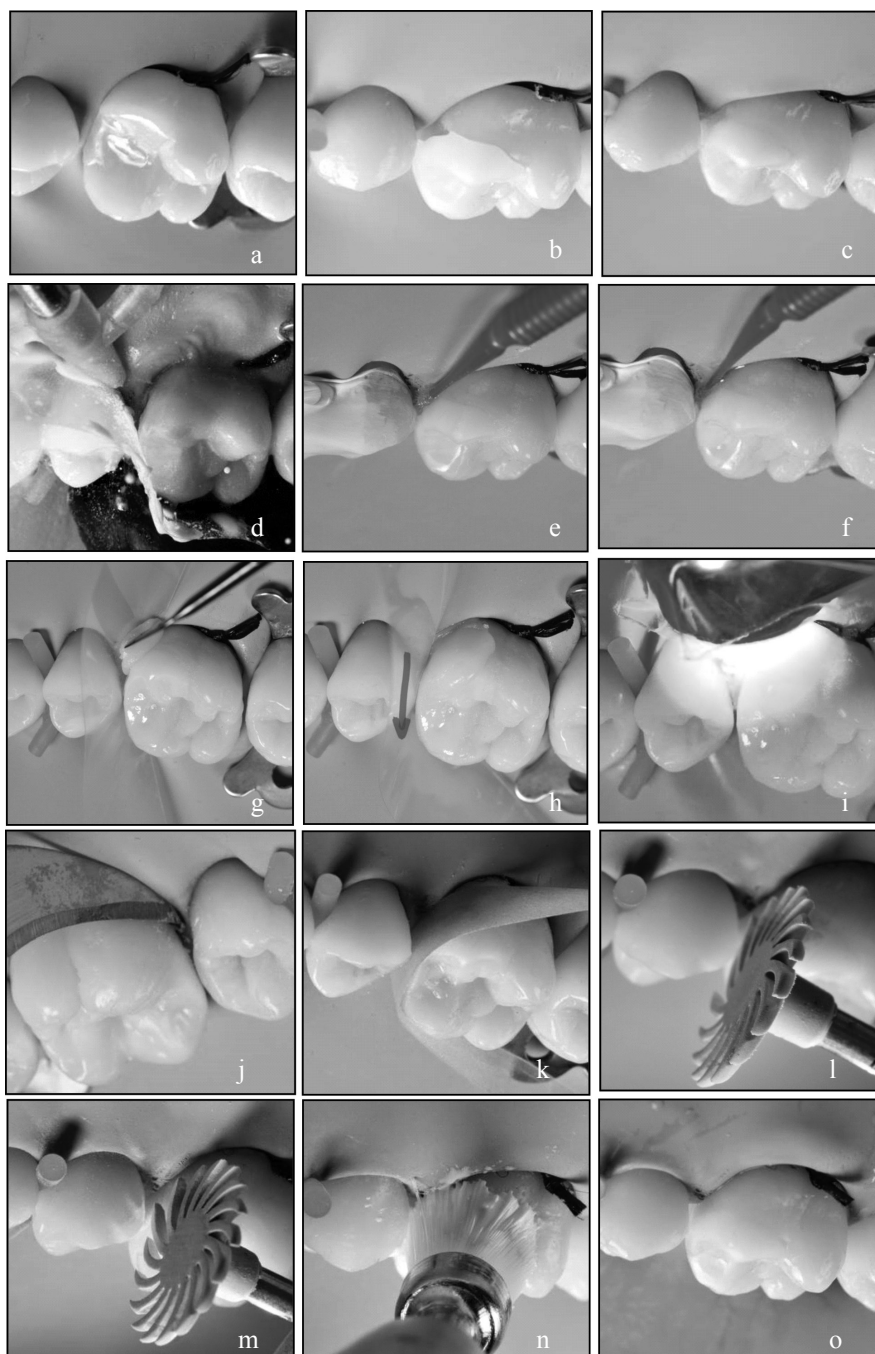


Figure 4a-o: Application of the CPT technique for indirect posterior restorations

a) Cavity preparation; b) Trial of the indirect restoration and the observation of the gap at the cavity step; c) The deficiency at the interproximal area following the cementation procedure (palatal view); d) Surface abrasion using the 'AquaCare' air-abrasion (53 μ aluminum oxide particles); e) SSilane application; f) SAhesive agent application; g) SPlacement of the transparent mylar strip into the sulcus and composite loading between the strip and marginal surface; h) SPulling the strip in palato-buccal direction for the composite plastering; i) SPhoto-polymerization; j) SRemoval of the excessive composite on the palatal cervical area using scalpel #12; k) SInterdental polishing by using interdental strips; l) SPre-polishing of the surface using the medium-grit spiral wheel; m) SHigh-shine polishing of the surface using the fine-grit spiral wheel; n) SFinal polishing of the occlusal surface with the polishing brush and paste; o) SRestoration final after the CPT

CPT for indirect posterior restorations

Marginal surface gaps may also be observed following the indirect restoration cementation procedures. The contour deficiencies between the marginal cavity step and the restoration are very difficult to manage clinically (Figures 4a-c). CPT might be used to fill such gaps following the cementation procedure for the indirect restorations generated from resin-based composites or hybrid materials, and thereby might prolong the longevity of the restoration.

Before the CPT application, the surface of the indirect restorative material must be abraded using air-abrasion even if it is a resin-based material (Figure 4d). Additionally, silane (primer) application (Figure 4e) is recommended before the adhesive application (Figure 4f). Then a transparent mylar strip is placed into the sulcus. A paste-type resin composite is loaded between the mylar strip and the tooth (Figure 4g). The strip is pulled either from buccal to lingual direction or from lingual to buccal direction and the composite is carried aside by the strip tilling the gap at the step completely (Figure 4h). The composite loading procedure by the strip may be repeated if needed. The excessive composite material is removed, and the additional composite is cured and polished (Figs. 4i-o). The entire procedure may also be performed for the direct posterior restorations suffering from marginal deficiency between the cavity step and the restoration, due to the limitations of the selected layering technique.

Conclusions

The novel restoration improvement technique CPT is considered clinically useful and effective for posterior Class II restorations, posterior indirect restorations, and anterior Class III restorations suffering from contour deficiencies at the interproximal surfaces. The technique may also be used as a layering step for the anterior free-hand build-up restorations such as diastema closure effectively. By covering and re-contouring the interproximal surfaces of the restoration, CPT may contribute the esthetics, function, and therefore the longevity through a simple and non-invasive clinical application protocol.

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Received on December 26, 2022.

Revised on January 10, 2023.

Accepted on January 2, 2023.

Conflict of Interests: Nothing to declare.

Financial Disclosure Statement: Nothing to declare.

Human Rights Statement: None required.

Animal Rights Statement: None required.

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