Semidirect posterior composite restorations with a flexible die technique

A case series

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ABSTRACT

Background and Overview. Besides indirect use in the laboratory and direct use for restorations, composites can be used in semidirect procedures. The authors describe the semidirect composite restoration technique by using a flexible die for large lesions in posterior teeth.

Case Description. The authors present illustrations of the clinical steps and the outcomes immediately after the procedures. The authors placed chairside inlay, onlay, and overlay composite restorations. The final esthetic outcome, along with function and anatomic form recovery, demonstrated that this might be a viable cost-effective alternative technique to laboratory-fabricated indirect restorations.

Conclusions and Practical Implications. Clinicians can restore large preparations in posterior teeth successfully with semidirect composite restorations in a single appointment by using the flexible die technique, resulting in satisfactory function and esthetic outcome.

Key Words. Composite resins; semidirect restoration; dental esthetics; shrinkage.

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Composites have become popular in dentistry because of characteristics that allow them to mimic tooth structures, such as a wide range of color and translucency,[1] and good mechanical properties, such as flexural and tensile strength and fracture toughness.[2-4] Clinical study results show low failure rates for posterior composite restorations,[5-7] similar to those for amalgam restorations.[5,8] In addition, adhesive composite restorations allow preservation of remaining tooth structure because there is no need for additional retention in the final preparation, thus involving minimal intervention.[6,9]

Although investigators found similar clinical performance for small or medium cavities restored with direct and indirect composite restorations after 5 years,[10] the direct composite technique for large preparations on posterior teeth presents some disadvantages, such as difficulties in achieving proper contours, anatomic form, proximal and occlusal contacts, and marginal adaptation[11-16]; therefore, indirect techniques are usually preferable. Although ceramic inlays, onlays, overlays, or full crowns are the first choice for restoring posterior teeth with extensive structure loss,[17] semidirect composite restorations may be a viable treatment option for patients who need fast results with lower costs.

The semidirect technique of using a flexible die allows the chairside fabrication of a restoration,[14] thus eliminating the laboratory work. The clinician obtains an impression of the prepared and neighboring teeth with alginate and injects silicone inside the cast to obtain the die. After a few minutes, the silicone sets, and the clinician fabricates the composite restoration over the model; this method has the benefit of the restoration being light cured outside the mouth, allowing better cure of the composite, thus improving its conversion degree and increasing its microhardness and wear resistance.[18] Furthermore, in cases of indirect Class II restorations, proximal contact and contour are easy to make. Also, the restoration allows for better finishing and polishing because these steps are performed outside the mouth.[10]

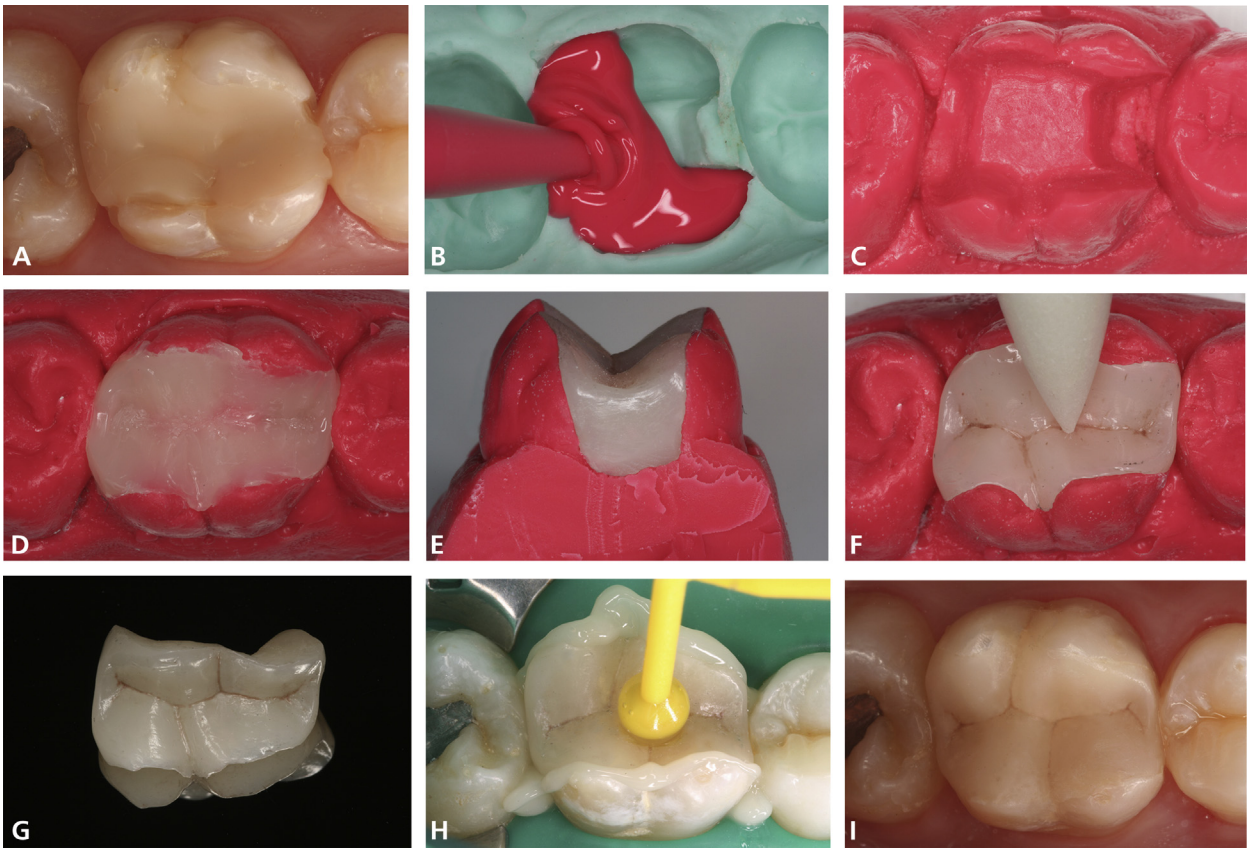

Figure 1. A. Initial condition showing defective Class II (mesio-occlusodistal) restoration on a mandibular molar. **B.** Model silicon being applied to make the elastic die. **C.** Flexible die showing tooth preparation. **D.** Reconstruction of the distal contact. **E.** Checking gingival cavosurface margin after separation of the mold. **F.** Finishing and polishing procedures. **G.** Final restoration. **H.** Cementation procedure. **I.** Restoration after adhesive cementation and adjustment.

Finally, the clinician cements the restoration into the preparation and adjusts the occlusion.

Besides the conventional light curing, semidirect restorations can also be exposed to light, heat, and pressure in a light-box oven, which increases their degree of conversion.[18] This method results in improved elastic modulus, higher microhardness, and wear resistance of these restorations, compared with those of direct restorations.[13,19,20] Also, because the clinician performs polymerization of the composite resin outside the mouth, shrinkage stress over the cavity walls is reduced[14,20] because it is related only to the curing of the resin cement. This method reduces marginal gaps and microleakage,[15,21,22] which are the main factors responsible for the occurrence of secondary caries, 1 of the most common reasons for restoration failure over time.[23,24] Compared with the indirect technique, the semidirect technique allows treatment to be performed in a single appointment, without laboratory cost,[14] thus providing a more cost-effective alternative to laboratory-fabricated restorations. Therefore, the aim of this clinical case series is to describe the technique of semidirect composite restorations by using the flexible model in large posterior preparations, illustrating the clinical steps and the clinical outcomes immediately after the procedures.

CASE REPORTS

We present a case series of 4 patients, aged 25 to 48 years, who needed large restorations in posterior teeth. We performed diagnosis and clinical assessment, and all patients signed an informed consent form, authorizing treatments and use of images. In case 1 (Figure 1), we replaced a defective Class II (mesio-occlusodistal) composite restoration on a mandibular first molar by using a semidirect inlay. In case 2 (Figure 2), we replaced a defective Class II (mesio-occlusal) amalgam restoration in a maxillary second molar and a Class II (disto-occlusal) glass ionomer restoration in a maxillary first molar by using 2 semidirect composite onlays. In case 3 (Figure 3), we replaced a defective Class II (mesio-occlusodistal) composite restoration in a mandibular first molar by using a semidirect onlay. In case 4 (Figure 4), we diagnosed large tooth structure loss on a maxillary first molar, with satisfactory endodontic treatment and