

Fabrication of Indirect Chairside Composite Inlay

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Abstract

Adhesive dentistry advances have increased the use of indirect restorations. In some situations, indirect composite techniques prove more advantageous than direct composite filling techniques. They help in creating proper occlusal and interproximal contacts, reduce chances of polymerization shrinkage, and promote the degree of conversion. In the present article, a case of premolars and molars with extensive loss of tooth structure is restored by the composite inlay to achieve a proper anatomic form and rehabilitate chewing function. Such case enables the clinician to manage large decay of posterior tooth conservatively. The functional and esthetic results obtained demonstrate the promising accomplishment of restorative dentistry.

Keywords: Chair side composite, Composite inlay, Indirect technique, Posterior restoration.

INTRODUCTION

The evolution of adhesive technologies and restorative materials has created newer approaches for restoring posterior teeth. Novel tooth-colored restorations have substituted metal restorations not only for esthetics but also for more conservative preparations.^[1]

The major advantages of composite inlays against ceramic include various shades and multiple translucencies (layering technique), are repairable, show minimal wear to occluding enamel, and are easily polishable outside or inside mouth.^[2,3]

Indirect technique involves fabricating the restoration outside the oral cavity, using an impression of the prepared tooth.^[4] This technique overcomes some of the disadvantages of direct resin composites, such as polymerization shrinkage to the width of the luting gap.^[5] Furthermore, it provides better physical and mechanical properties by post-curing the inlay with light or heat, ideal occlusal morphology, proximal contouring, and wear resistance.^[6,7]

This report presents cases involving the restoration of an extensive cavity in premolars and molars through an indirect chair-side composite technique and 6 months follow-ups.

The cases for this study were selected from the patients referred to the Department of Endodontics. The cases were treated under faculty supervision after medical and dental history reviews. Conventional radiographs were taken before and after the treatment. Additional curing silicon (VOCO. GmbH. Cuxhaven, Germany) was used to make the die after

taking the impression.^[8] Chair side indirect composite inlays were prepared using Flowable Bulk Fill (VOCO Grandioso).^[9]

CASE REPORTS

Case 1

A 46-year-old male patient reported to the department of conservative and endodontics with the complaint of food lodgment and sensitivity of the tooth in the right lower posterior tooth region. The clinical examination of the tooth incorporation with radiographic examination revealed a wide mesioocclusodistal caries in the right lower second premolar which was the reason for food lodgment to the patient. The margins of the tooth were supragingivally located and the distobuccal width of the proximal region was significantly wide, which drew the treatment plan toward indirect restoration instead of direct for better prognosis.^[10]

For the patient, esthetics was a concern, so a composite inlay was planned to restore the defect which was also economical to the patient. Caries was removed by low speed carbide burs and sharpened spoon excavator.^[11] The cavity preparation was

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done using the principles of cavity preparation. Figure 1 shows a mesioocclusodistal inlay cavity preparation in 45. After cavity was prepared, the impressions were made using alginate. Fast setting silicone die material (GrandioSO Inlay System, Voco, Cuxhaven, Germany) was injected into the alginate. Indirect composite inlay was fabricated incrementally using Flowable Bulk Fill (VOCO Grandioso).^[12,13] Each layer was polymerized for 10 s with a light-emitting diode curing unit (Woodpecker Led D Curing Light Cure Unit) with light irradiance of 1000 mW/cm². Figure 2 shows composite inlay prepared on silicone die.^[14]

The intraoral fit was checked and the excess was removed each time after checking with an articulating paper. For sculpting the occlusal morphology, we referred to the existing neighboring premolar. In addition, the cast of the upper arch was also used for adjusting the occlusion.^[15]

The final occlusal anatomy was reconstructed and incorporated with a resin staining kit (Tetric color, Ivoclar Vivadent, Schaan, Liechtenstein), which was used for internal staining to mimic the fissures of a natural tooth. After finishing and polymerization, the composite inlay was removed from the silicone die and cured from the all the surfaces for 40 s.^[16]

Then, the inlay was tried in and the fitness was checked.

The prepared inlay restoration was conditioned with 37.5% phosphoric acid gel (Gel Etchant, Kerr, Orange, CA, USA) for 15 s. After the etchant gel was rinsed, the composite inlay was cleaned with 75% ethanol present in spirit for 3 min. Moreover, the tooth was selectively etched with 37.5% phosphoric acid gel (Gel Etchant, Kerr, Orange, CA, USA) for 15s, rinsed with water spray and air dried.^[17]

The self-etching adhesive and dual-cured luting composite (Multilink N system, Ivoclar Vivadent, Schaan, Liechtenstein) were used for final cementation. Polymerization was performed for 40 sec per surface.^[16,17] After removal of cotton rolls and suction tube, the occlusal contacts were adjusted and checked with articulating paper. Finally, the restoration was finished by fine-grained diamond burs and polished by Shofu Super Snap Finishing and Polishing Kit. Figure 3 shows composite inlay cemented on 45.^[17]

A radiograph was taken to examine whether any overhang existed at the gingival margin. Figure 4 shows the radiograph of the patient after the cementation of composite inlay on



Figure 1: Cavity preparation in 45



Figure 3: Composite Inlay cemented on 45



Figure 2: Prepared Silicone Die on 45



Figure 4: No overhang or excess cement 45

45, showing proper occlusal anatomy and marginal fit with phenomenal proximal contact and contour with no overhangs, which will help the gingiva to remain healthy. The damage was replaced with an esthetically healthy restoration, which rejuvenated the tooth with all its forms and functions. At the 6-month recall, the restoration maintained its esthetic and chewing function.

Case 2

In another case, a female patient aged 53 years came to the department of conservative and endodontics with the complaint of food lodgment, the clinical and radiographic evidence showed caries in the proximal portion of the right lower second molar tooth. On excavating, all the caries of the tooth became an absolute indication for indirect restoration, as the decay involved a large area of tooth which might get fractured if direct restoration was attempted. The cavity was designed, impression of the arch was taken, die was prepared, and a chair side indirect composite inlay was made. The inlay restoration was etched, silanated, and cemented on the concerned tooth in the same way as done in case 1.

Case 3

A 22-year-old male student visited the department of conservative and endodontics with the complaint of dislodgement of lower right posterior tooth restoration. He had received direct composite resin filling 3 years ago, but the old restoration was dislodged while eating popcorn 2 days earlier. Clinical examination revealed food impaction over the large distal cavity of the lower right second molar with gingival inflammation. The pulp vitality test was normal with no symptoms or signs. Radiographic examination revealed distal decay in proximity to the pulp horn while no obvious abnormal apical findings were noted. After oral hygiene reinforcement, we discussed with the patient that composite inlay might be a choice for his esthetic and financial concerns. The cavity was designed, impression of the arch was taken, die was prepared, and a chair side indirect composite inlay was made. The inlay restoration was etched, silanated, and cemented on the concerned tooth in the same way as done in the previous cases.

DISCUSSION

Interest in bonded tooth-colored restoration has been increasing in recent years. Although the color stability and wear resistance of resin composites are not as good as those of ceramic restorations, both are routinely considered by clinicians in their daily practice.^[18] Due to the chemical compositions, ceramics are harder and thus more wear resistant, but they can cause more wear than usual to the opposing tooth.^[18,19] In addition, ceramics are brittle and more prone to fracture than composites in the case of thin-layer thickness. Using resin composites is easier for intraoral repairs. From an economic perspective, composite resins are a more attractive option than ceramics.^[19]

A restoration can be placed either directly or indirectly, and an indirect restoration is more favorable for restoring the

morphology and function of a compromised tooth structure. The indirect technique was used outside the oral cavity, taking an impression and fabricating the composite restoration on a die model.^[20] Internal build up by resin composites before tooth preparation can prevent excessive loss of sound tissue, which is crucial in practice because the goal of restorative dentistry is to prepare the cavity as conservatively as possible. Using a quick-setting flexible silicone die, instead of stone die, could allow a more effective treatment which could be performed on a chair side.^[21]

The indirect method could reduce the time of intraoral adjustment and overcome some difficulties of the direct method, especially when dealing with severely destroyed posterior tooth or with multiple cavities at the same visit. Moreover, this technique was favored over the direct technique because it could easily reconstruct the anatomy of tooth structure and enable a more appropriate occlusal and interproximal contour.^[22] Optimal curing from all directions and outside the oral cavity can also improve the degree of conversion and enhance its physical and mechanical properties. Furthermore, the indirect method might reduce the polymerization shrinkage stress, resulting in a relatively ideal marginal adaption and reduced microleakage, which are the main factors responsible for the occurrence of secondary caries.^[22,23]

The main purposes of reproducing the natural morphology of posterior tooth are to enhance the mastication function. The restorations must fit into the pre-existing occlusal scheme, where grinding paths are established. This can ensure that iatrogenic interference does not occur due to dental treatment. At the 6 month recall in the cases reported, the restoration could potentially withstand physiological chewing force without fracture, debonding, or marginal discoloration. Although the observation time was limited to only 6 months, this technique showed satisfactory clinical performance; accordingly, it can enable dental clinicians to restore the tooth to functional and esthetic outcomes.^[24]

CONCLUSION

Improvements in adhesive and restorative materials may enable the use chair-side indirect composite inlays to restore an extensively damaged posterior tooth. The indirect composite technique enhances the esthetics and enables clinicians to achieve conservative tooth preparations. This technique also overcomes difficulties of the direct composite technique, such as improper occlusal and interproximal anatomy, polymerization shrinkage stress, and insufficient curing. The clinical success of this technique at the 6 month recall could be attributed to adequate occlusion reconstruction, well performing adhesive systems and highly wear-resistant resin composites.

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