

# Indirect Composite Resin Inlays-Onlays: A Clinical Report

Saida Ziada<sup>1</sup>, Mohamed Chebil<sup>2</sup>, Neyla Zokkar<sup>3</sup>, Lotfi Bhouri<sup>4</sup>

<sup>1</sup>DDS

<sup>2</sup>Assistant Professor, Department of Fixed Partial Denture, Faculty of Dental Medicine of Monastir

<sup>3</sup>Professor, Department of Conservative Dentistry and Endodontics, Faculty of Dental Medicine of Monastir

<sup>4</sup>Professor, Head of the Department of Conservative Dentistry and Edodontics, Vice Dean of the Faculty of Dental Medicine of Monastir

**Abstract:** Restorations of the teeth with the minimal sacrifice of dental structure form the basis of the practice of dentistry today. The adaptation of this principle leads us to focus on the vital teeth direct and indirect restorations with the composite. Direct restorations with composite resins for large cavities, and despite real progress in recent years, however, pose a number of esthetic and functional problems such as the difficulty of obtaining a satisfactory point of contact, to reach the proximal limits during polymerization and aging. Indirect restorations, in addition to their esthetic properties, can provide greater durability through more precise control of cervical margins, preservation of surface condition, anatomical shape, marginal integrity and occlusion and therefore decrease postoperative sensitivities. The objective of this article is to detail, through a clinical case report, the steps of indirect restoration of a dilapidated teeth by composite resin inlays-onlays.

**Keywords:** nanofilled composite, dental esthetic, inlays-onlays, laminate, bonding

## 1. Introduction

Composites, the only alternative for aesthetic patients, had too many deficiencies: low resistance to wear, problematic bonding to dentin and contraction to polymerization.(1,2).

Today, composite resins have seen their mechanical and optical properties improve as well as adhesive techniques that have undergone a biological revolution with the possibility of bonding to enamel and especially to dentin. These two developments have resulted in an extension of their scope. (3-4).

However, the contraction in the polymerization of the resinous matrix of these materials remains a crucial problem. Therefore, these materials are used in the direct technique for filling small and medium-sized substance loss only. To overcome these disadvantages, other restorative options, such as indirect techniques, have been developed for large and deep cavities, but their success is based on the materials used, the gluing procedure and the methodology. (5,6)

The purpose of this article is to detail, through a clinical case report, the steps of indirect restoration of dilapidated tooth by composite resin inlays-onlays.

## 2. Clinical Report

A 45-year-old patient in good general health consults in our conservative dentistry and endodontic department at the Monastir Dental Clinic for the restoration of the dilapidated tooth 26.

The dental history reveals that the reason for consultation is purely aesthetic and that the restoration dated back more than six years with the absence of any symptomatology. The

endobuccal examination revealed sufficient hygiene with the absence of any gingival inflammation.

Examination of the consultation reasoning tooth revealed to the inspection the existence of a defective restoration with the composite resin: the filling didn't restore the occlusal contacts nor the proximal contact (Figure1, 2)



**Figure 1:** Intraoral view showing a defective restoration at the level of the tooth 26



**Figure 2:** The restoration of the tooth 26 didn't restore the occlusal contacts nor the interproximal contact

The probing showed the existence of a deterioration of the tooth material seal.

The opposing tooth has an occlusal average occlusal closure to the laminated composite resin by the direct technique

The pulp vitality test used is the cold test. The test was positive.

The other axial and transverse percussion tests were negative. Radiological examination revealed a retracted pulp with no carious recidive under obturation or pathological changes in the deep periodontium (Figure 3)



**Figure 3:** Periapical Radiograph showing a retracted pulp with no carious recidive under obturation

According to the data of the clinical and radiological examination the diagnostic retained was that of a reversible pulpitis lesion site 2stade 4 (classification of Munt and Hume). An informed consent from the patient was gotten on the same day. The patient was informed of all possible therapeutic modalities and the final decision was to restore the tooth by the indirect technique with a composite resin onlaysinlay. At the same session, the old faulty restoration was removed and a slight recess of the cavity was then removed to insert the inlay onlay. Also, a glass ionomere cement-based cavity bottom was placed for to obtain a flat cavity bottom, to protect the pulp and to avoid any post operative sensitivities. (figure 4,5)



**Figure 4:** Occlusal view of the tooth 26 after elimination of the defective restoration



**Figure 5:** Placement of the light cured glass ionomer cement at the bottom of the cavity.

Then, a double simultaneous impression was made at the maxillary arch and an alginate impression at the mandibular arch.

Finally, the temporization was carried out by making a provisional inlay onlaychemopolymerisable composite resin which was temporarily sealed with a cement without eugenol (Figure 6, 7).



**Figure 6:** View of the temporary prosthesis



**Figure 7:** Provisional sealing of the temporary prosthesis

Then we went to the making of the prosthetic piece. We started by the casting of the impression by the extra hard plaster then the cutting of this working model. We thus obtained the unitary positive model on which we will laminate the composite resin. (figure 8.9)



**Figure 8:** view of the working model

Subsequently, the micro-charged nano-hybrid composite resin was laminated while respecting the relationship of antagonism and contiguity.(figure9,10).



**Figure 9:** Lamination of the composite resin



**Figure 10:** Lamination respecting the relationship of antagonism and contiguity

Finally, for a better retention of the restoration, an aluminum oxide sandblasting of the prosthetic piece was performed (figure11).



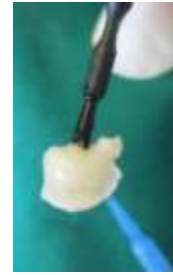
**Figure 11:** Treatment of the intrados of the inlay onlay by sandblasting

In a next visit ,after isolation with rubber dam,we made the collage of the inlay-onlay in three steps.

The first step consists of the surface treatment of the intrados of the prosthetic piece and the cavity to be restored. The adhesion system used is the three-stroke system or MR3 (Figures12,13).



**Figure 12:** Bonding using the MR3 system



**Figure 13:** Application of adhesive in the intrados of the inlay-onlay

The next step consists of the actual bonding by the dual-cure resin cement (figure 14).



**Figure 14:** Application of the dual-cure resin cement inside the cavity

The delicate insertion of the prosthetic piece represents the last step and any resin cement excess must be removed quickly and carefully before the photo-polymerization (Figure15).



**Figure 15:** Insertion of the inlay onlay

Once the bonding of the inlay-onlay had been accomplished, the occlusion verification was completed. The restoration must restore the relationship of antagonism and contiguity (figure16,17).



**Figure 16:** Final view of the inlay-onlay in occlusal



**Figure 17:** Final occlusal of the inlay-onlay

It was terminated by the finish of the restoration and a post polymerization of 40seconds.

The clinical follow-up showed the successful integration of the prosthetic piece and the preservation of the pulp vitality.

### 3. Discussion

Today, the development of adhesive dentistry and the emergence of nanotechnology have brought significant changes in the treatment of decayed teeth in conservative dentistry (7).

To be successful, it is important to determine the material and the proposed restoration technique. Indeed, this choice will determine the architectural parameters of our preparation, the dental and prosthetic surface treatments and the assembly material. (8)

According to Dietschi D et al, in 1997, the ideal restorative material must meet the following specifications: allow the most conservative approach of healthy tissue possible, when fitting the necessary prosthetic space, restore a natural and functional morphology of the tooth ; restore mechanical resistance to the restored tooth, compatible with its function; ensure optimum adaptation at the edges and interfaces; be biocompatible; be radiopaque and ensure the longestlife.(9)Metal alloys, composite resins and ceramics are the three materials that meet these specifications. Each of these materials has some advantages and disadvantages that will guide our choice.In our present clinical case, the reason for consultation is purely aesthetic and rather than functional.For this reason our choice of material was limited between two families composites and ceramics.

The composite resin is more tolerant to handling and can be modified, repaired by composite additions in direct technique. As a result, it offers greater serenity to beginning practitioners in inlays-onlays practice. This is his main advantage. An onlay-inlay composite resin will be recommended for patients with parafunctions (presence of facets of wear on the teeth), in case of reduced prosthetic space or when the opposing teeth are reconstituted by a material of less resistance to abrasion as precious alloys, amalgam or composite. As the case of our patient who presented a tooth antagonist to the tooth to restore, reconstituted by composite resin. (9)

Dietschi and Spreafico compared the properties of composites and ceramics in the case of partial unit restorations and concluded that: the superior mechanical properties of glass-ceramics are preferred in all other cases

where there are no contraindications of ceramics to ceramics. partial posterior restorations seen and the best durability of their esthetic integration and occlusal and interdental contacts.(table 1)(9)

**Table 1:** Comparison of the properties of composites and ceramics in the case of partial unit restorations(9)

Parameters	Ceramic	Composites
Ease of clinical procedures	+	++
Ease of laboratory procedures	+	+++
Intraoral repairs and retouching	0	++
Polishing	+	++
Wear resistance of the material	+++	++
Fragility	++ ++	++
Coefficient of thermal expansion	+++	+
Effectiveness of the bonding	++	++
Chemical stability	+++	+
biocompatibility	+++	++
Cost	0	+
Aesthetics: - short term - long term	+++ +++	+++ ++

In our clinical case we chose the composite resin as a restorative material. Composite resins could be used for posterior teeth with different techniques: direct, semi-direct (intraoral and extraoral) and indirect.

According to Marco veniziani (2017 )they exist general and local parameters that guide us in the choice of the technique to realize.

General parameters include the age of our patient ,the oral hygiene, the motivation, caries risk assessment, the eating habits, the functional activity,and finally ergonomics and financial resources.

In other hand the local parameters include the shape of the cavity, the thickness of the remaining walls, the position of the cervical edges, the presence of cracks, the position, the presence of cervical lesions of the tooth, the evaluation of the element in preprosthetic function and the presence of pulpal or periodontal lesions.(10)

Adhesive bonding of restorations made using indirect techniques using dual hardeners or dual resins minimizes the marginal gap and compensates for the inevitable shrinkage of the composite resin. In addition, indirect techniques allow for more easily ideal proximal contacts and anatomical morphology and the possibility of an occlusion assessment with an articulator (11).

Once we choose the material and the adopted restoration technique we must look for the success factors of this indirect restoration to composite resin type inlay onlay.In fact, the success of our restorative treatment depends mainly on the method of elaboration and treatment of the inlay onlay in the laboratory but also of the gluing procedure.

Beginning with the lab steps of the confection of our composite inlay onlay:

The indirect technique greatly reduces the curing shrinkage that occurs outside the cavity, improving the marginal seal. The only remaining hardening shrinkage is in the thin layer of resin cement, moreover, the photothermal treatment (130

° C for 7 min) improves the degree of transformation of the composite and the physicochemical properties of the restoration. (12,13).

In order to ameliorate the retention of the restoration, an aluminum oxide sandblasting of the prosthetic piece was performed.

Finally, the temporization was carried out by making a provisional inlay on chemopolymerisable composite resin which was temporarily sealed with cement without eugenol. This temporization holds the key for the success of the bonding procedure thereafter.

Lets move to the bonding procedure: The first step consists of the surface treatment of the intrados of the prosthetic piece and the cavity to be restored. The adhesion system used is the three-stroke system or MR3. Several authors agree that this system offered the best results in comparison with the others system.

Simplifying the clinical procedure can be a time saver immediate but it often leads to a loss of effectiveness of membership to more or less short term. However, SAM 2 systems are getting closer to this standard while having some clinical benefits like ease of use and reduced sensitivity of the technique.

New adhesives called "all-in-one" are easier to use but can not compete with the traditional multi-step adhesives because of their behaviors such as semi-permeable membranes that attract water and therefore the interface is destroyed faster. Moreover during the evaporation of the solvent, the ratio monomer / water can change and so lead to phase separations and formation of bubbles. (14, 15)

The adhesive procedure is a short step of the restorative treatment but is crucial because a small error in the handling of the bonding material can be the cause of postoperative sensitivities and lead to a significant reduction in the longevity of the restoration. The durability of bonded restorations thus depends to a large extent on the value of the bonding. The indirect techniques using dual hardeners or dual resins minimize the marginal gap and compensate for the inevitable shrinkage of the composite resin.

To conclude we can say that there are few long-term in vivo studies on the behavior of composite resin inlays. The authors agree on the survival rate close to 80 to 100% over periods of 1 to 7 years, which makes today reliable techniques provided strictly follow the operating procedures and perform regular monitoring. This is why an operational methodology with a strict protocol makes it possible to obtain predictable and reproducible results, while meeting the biological, aesthetic and functional requirements of adhesive dentistry. (16)

#### 4. Conclusion

Technological advances in bonding and materials allow bonded restorations to become a reliable alternative for medium and large-scale material loss.

They allow us to be more economical in dental tissues and restore cohesion of the dental organ.

To guarantee success, it is necessary to know and respect the operating protocol.

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