

 <p>ISSN NO. 2320-5407</p>	<p>Journal Homepage: - www.journalijar.com</p> <h2 style="text-align: center;">INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</h2> <p style="text-align: center;">Article DOI: 10.21474/IJAR01/9174 DOI URL: http://dx.doi.org/10.21474/IJAR01/9174</p>	 <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) ISSN 2320-5407 Journal Homepage: http://www.journalijar.com Article DOI: 10.21474/IJAR01/9174</p>
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RESEARCH ARTICLE

A CASE SERIES ON RESTORATION OF LARGE CARIOUS DEFECT IN POSTERIOR TEETH USING INDIRECT COMPOSITE RESIN.

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Manuscript Info

Manuscript History

Received: 24 March 2019

Final Accepted: 26 April 2019

Published: May 2019

Keywords:- Indirect Resin Composite, Composite Inlay Restoration, Polymerization Shrinkage, Degree of Conversion.

Abstract

Modern restorative dentistry offers many methods of restoring the carious teeth. The advancements in adhesive dentistry have brought significant changes in the treatment of caries. Dental composite formulations have been continuously evolving ever since BISGMA was introduced to dentistry by Bowen in 1962. The composite materials can be divided into direct and indirect resin composites (IRC). In some situations, indirect composite techniques are more advantageous than direct composite filling techniques, such as establishing proper occlusal and inter-proximal anatomy, reducing polymerization shrinkage stress, and promoting the degree of conversion. Indirect composite restorations are usually recommended in posterior teeth requiring large restorations. The given functional and esthetic outcomes demonstrate the promising applicability of the indirect composite technique.

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Introduction:-

Owing to the evolution of adhesive technologies and restorative materials, approaches and treatment plans for restoring posterior teeth have been considerably innovated.¹ Although amalgam and gold have demonstrated persistent clinical success and biocompatibility, tooth colored restorations are increasingly replacing metal restorations not only for esthetic concerns but also for more conservative preparations.²

Direct restorations in composite resin represent the most common method of dental rehabilitation. However, the posterior region has some complications and limitations to perform this technique namely :- polymerization shrinkage, microleakage, marginal gap formation, color instability, difficulties in rebuilding ideal proximal contact and contour, and insufficient mechanical property.^{2,3,4} The above mentioned issues influence the clinical success and longevity of composites resin restorations. The rehabilitation of decayed or fractured posterior teeth through an indirect technique overcame some difficulties associated with direct composite filling, resulting in better occlusion, a desired tooth form, possibilities for repair, complete curing and reduced shrinkage of composite resins in the deepest regions can be achieved.⁴ These indirect composite restorations are a great alternative for large restorations of posterior teeth.⁵ The scientific literature has evidenced numerous reports of clinical success cases when using this technique.⁶⁻¹⁰

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This paper presents the clinical cases in which indirect composite inlays were fabricated as contouring of direct composite restoration was difficult.

II. Case Description

Case 1

A 25-year-old female patient complained of food lodgement in the lower right back tooth region since 1 month. Patient's medical history was non-contributory. Intra-oral examination revealed caries involving the proximal surface (Mesial) of 46 (Figure 1). Clinical and radiographic examination revealed caries approximating the pulp. The electric pulp testing for 46 was done. Radiographic examination revealed a large mesial decay in proximity to the pulp horn (Figure 1.1). After oral hygiene reinforcement, we discussed with the patient that composite inlay might be a choice. After obtaining signed consent, it was decided to restore the tooth with indirect composite resin inlay.



Figure 1:-Pre-operative clinical picture of lower right first molar with large cavity over mesial side

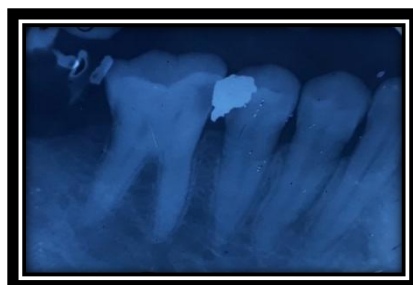


Figure 1.1:- Pre-operative periapical radiograph shows caries in proximity to the pulp horn.

First visit:-

After administration of local anesthesia with 2 % lignocaine in 1:80,000 adrenaline, the caries was excavated at slow speed using round carbide bur. The unsupported and weak enamel was removed. Following the principles of tooth preparation to receive inlay, the cavity was prepared with carbide bur number 271 and 171L bur. The cavity walls were made divergent with rounded internal line angles and the width of the cavity was made 1/3-1/2 of the intercuspal distance. As the axial wall was nearer to the pulp chamber, a protective sub-base of calcium hydroxide and base of glass ionomer cement was applied on the axial wall. After final tooth preparation, the cavity was cleansed and dried. The impression was made with a polyvinyl siloxane material (Aquasil/Densply) and one step/two viscosity technique. Afterwards a direct provisional restoration was placed using temporary zinc oxide eugenol cement. The positive replica of this impression was made using die stone. Shade selection was done using Vitapan shade guide and the casts and shade prescription was sent to the laboratory for fabrication of the inlay.

Second visit:-

On second visit, the provisional restoration was removed and the cavity was cleansed. The cavity was acid conditioned with 37% phosphoric acid for 15 seconds, followed by washing for 30 seconds and drying with air jets. The self-adhesive resin cement (ParaCore - Coltene) was inserted into the internal restoration face, which was adapted to the tooth. After the excesses were removed using a 12 number surgical blade, photoactivation was performed for 20 seconds on each face of the restoration, resulting in restoration of tooth shape and esthetics. The finishing and polishing was done using a composite finishing kit (Shofu). Afterwards, the occlusion was evaluated.

and the patient was informed about the limitation of the technique and was asked to maintain regular maintenance visit.



Figure 1.2:- Tooth Preparation for Indirect Composite



Figure 1.3:- Fabricated Indirect Composite Resin Inlay Restoration.

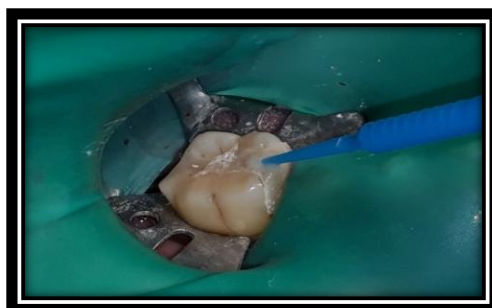


Figure 1.4:- Trial of Fabricated Indirect Composite Resin Inlay Restoration.



Figure 1.5:- Final cementation the Indirect Composite Resin Inlay Restoration.

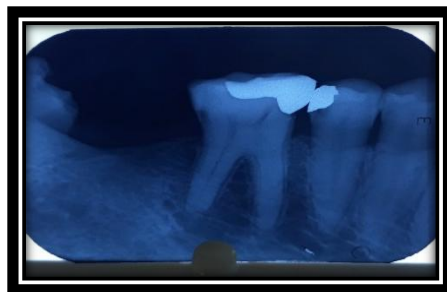


Figure 1.6:- Post-operative periapical radiograph of Indirect Composite Resin Inlay Restoration.

Case 2

A 28-year-old female patient complained of sensitivity in the lower right back tooth region since 15 days. Patient's medical history was non-contributory. Intra-oral examination revealed caries involving the buccal surface of 46 (Figure 1). Clinical and radiographic examination revealed caries approximating the pulp. The electric pulp testing for 46 was done. Radiographic examination revealed a large decay on the buccal surface (Figure 1.1). After oral hygiene reinforcement, we discussed with the patient that composite inlay might be a choice. After obtaining signed consent, it was decided to restore the tooth with indirect composite resin inlay.



Figure 2:- Pre-operative clinical picture of lower right first molar with large cavity over buccal surface.



Figure 2.1:- Pre-operative Occusal Radiograph of lower right first molar with large cavity over buccal surface

First visit:-

After administration of local anesthesia with 2 % lignocaine in 1:80,000 adrenaline, the caries was excavated at slow speed using round carbide bur. The unsupported and weak enamel was removed. Following the principles of tooth preparation to receive inlay, the cavity was prepared with carbide bur number 271 and 171L bur. The cavity walls were made divergent with rounded internal line angles and the width of the cavity was made 1/3-1/2 of the intercuspal distance. As the axial wall was nearer to the pulp chamber, a protective sub-base of calcium hydroxide and base of glass ionomer cement was applied on the axial wall. After final tooth preparation, the cavity was cleansed and dried. The impression was made with a polyvinyl siloxane material (Aquasil/Densply) and one step/two viscosity technique. Afterwards a direct provisional restoration was placed using temporary zinc oxide eugenol cement. The positive replica of this impression was made using die stone. Shade selection was done using Vitapan shade guide and the casts and shade prescription was sent to the laboratory for fabrication of the inlay.

Second visit:-

On second visit, the provisional restoration was removed and the cavity was cleansed. The cavity was acid conditioned with 37% phosphoric acid for 15 seconds, followed by washing for 30 seconds and drying with air jets. The self- adhesive resin cement (ParaCore - Coltene) was inserted into the internal restoration face, which was adapted to the tooth. After the excesses were remove using a 12 number surgical blade, photoactivation was performed for 20 seconds on each face of the restoration, resulting in restoration of tooth shape and esthetics. The finishing and polishing was done using a composite finishing kit (Shofu). Afterwards, the occlusion was evaluated and the patient was informed about the limitation of the technique and was asked to maintain regular maintenance visit.



Figure 2.2:- Tooth preparation and Dycal as base on axial wall



Figure 2.2:- Fabricated Indirect Composite Resin Inlay Restoration.



Figure 2.3:- Final cementation the Indirect Composite Resin Inlay Restoration.



Figure 2.4:- Post Operative Occlusal Radiograph of Indirect Composite Resin Inlay Restoration

Discussion:-

Interest in bonded tooth-colored restoration has been increasing in recent years. Initially composites were applied in direct restorations, but since the '80s, indirect resin composites (IRCs) were also introduced in Dentistry.¹³ The composition of indirect composite resin systems is similar to that of direct systems, differing by the use of different methods of additional polymerization, which allows a higher degree of conversion. These additional polymerization procedures can involve photo-activation, heat, pressure, and nitrogen atmosphere.¹⁴

Several studies were initiated to assess the clinical performance of IRCs. Compared to ceramic materials, IRCs exhibit better stress distribution, reparability, lower cost and ease of handling.¹⁵ On the other hand, they show inferior long term surface characteristics, such as surface roughness and esthetics and they are more prone to color changes.^{16,17} When compared to direct composites, their advantages are esthetics, color stability and reduced post-operative sensitivity.¹² The adhesive cementation of restorations fabricated from IRCs, by means of dual curing cements, minimizes the marginal gap and compensates for the unavoidable polymerization shrinkage. Additionally, it is easier to achieve ideal proximal contacts and anatomic morphology using indirect restorations.¹⁵ An important advantage of using this indirect restoration method is increased resistance to compression, increased surface hardness and reduced risk of fractures and cracks in the internal structure of the material.¹⁸ A positive feature of the indirect restorations is the possibility of extra-oral working. It allows for obtaining a high degree of surface smoothness. Composite inlays additionally allow for precisely-contoured restoration of tooth structure, such as points of contact, or the correct anatomical form of the occlusal surface of molars and premolars. The exact restoration of the walls and occlusal surface in aesthetic terms is not possible with the direct technique.¹⁸ Based on their characteristics, IRCs cover nowadays a wide range of indications, including inlays, onlays and as a repair material for a variety of restorations.¹² The use of the indirect method is indicated in the following situations:-

1. Destruction of at least one cusp of the tooth
2. Cavities exceeding the dimension of 1/3 to 1/2 of the inter cuspal distance
3. Difficult to restore points of contact
4. Teeth after endodontic treatment, with sound remaining hard tissues
5. Cavities located above the gingiva.

Conclusion:-

It can be concluded that the method of indirect composite restorations is a recommended procedure and versatile solution in many difficult situations. It is a good alternative to direct composite restorations. With the indirect method, we can offer patients an aesthetic and above all, durable and functional composite restoration in posterior dental arches.

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