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Replacement of a Defective Composite Restoration Using Tokuyama Composite Resin and PALFIQUE Bond System: A Clinical Case Report

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Abstract **Case Report**

Direct composite restorations are the mainstay of conservative restorative dentistry, combining adhesion, aesthetics, and functional reliability. Despite advances, replacement of defective restorations remains one of the most frequent clinical procedures due to marginal leakage, wear, secondary caries, or colour mismatch. This case report presents the replacement of a defective Class II composite restoration in the mandibular right f irst molar using Tokuyama PALFIQUE LX5 composite resin in conjunction with Universal Bond. The procedure involved stepwise removal of the old restoration, cavity refinement, adhesive application, incremental build up, cusp-by-cusp occlusal modelling, fissure staining, and polishing with EVE wheels. The final restoration demonstrated excellent anatomical morphology, proximal contact tightness, marginal adaptation, and aesthetic integration with adjacent teeth. This report highlights the clinical significance of PALFIQUE LX5's nano-filled resin technology, which provides superior polishability, gloss retention, wear resistance, and radiopacity. Combined with 10-MDP–based PALFIQUE Universal Bond, the system offers strong adhesion to both enamel and dentin. Clinical outcomes indicate that PALFIQUE LX5 is a predictable and durable option for the replacement of defective restorations in load-bearing posterior teeth.

Keyword: Defective Composite Restoration, Adhesive System, Marginal Leakage.

INTRODUCTION

Composite resins are the most widely used restorative materials in modern dentistry due to their aesthetics, ability to bond to tooth structure, and minimally invasive preparation requirements. However, despite their advantages, composite restorations are not free of limitations, and failure remains a common clinical outcome. The most frequent causes of composite failure are secondary caries, marginal degradation, restoration fracture, and wear [1]. Secondary caries is consistently reported as the leading reason for replacement, often resulting from marginal leakage or insufficient bonding integrity [2]. Other causes include colour mismatch, marginal staining, and loss of proximal contact, which compromise aesthetics and function [3]. The longevity of composite restorations has improved with advancements in adhesive dentistry and f iller technology. Clinical studies report median survival times ranging from 7 to 10 years for posterior composites, though this is influenced by factors such as tooth location, cavity size, patient caries risk, and operator skill [4]. Smaller restorations and those placed under strict adhesive protocols tend to 1 ISSN:0000 - 0000 Osol Journal of Medical Sciences (OJMS) DOI:Prefix/ojms/2023.00.000, pp[1-10] perform better. Incremental placement, proper isolation, and finishing protocols are critical to extending clinical survival [5]. Tokuyama composites, including PALFIQUE LX5, represent an evolution in composite resin technology. PALFIQUE LX5 is a light-cured nano-filled composite designed for both anterior and posterior restorations. Its filler system combines nano- and supra-nano spherical particles, providing superior polishability, gloss retention, wear resistance, and radiopacity [6]. The material demonstrates excellent handling and sculptability, making it suitable for precise anatomical reproduction in Class II restorations. Additionally, its wide shade system and optical blending properties allow for highly esthetic outcomes with minimal shade selection complexity [7]. When used in combination with PALFIQUE Universal Bond, which contains the 10-MDP functional monomer, the restorative system achieves reliable chemical adhesion to enamel and dentin, improving marginal sealing and long-term durability [8]. Thus, understanding the causes of

composite failure and incorporating advanced materials such as PALFIQUE LX5 with universal adhesives can significantly enhance the predictability and longevity of direct restorations.

CASE PRESENTATION

A 27-year-old male presented with recurrent food impaction and sensitivity in the mandibular right first molar (#46). Intraoral examination revealed a defective Class II composite restoration with marginal staining and proximal caries. Bitewing radiographs confirmed secondary caries beneath the existing composite. The treatment options of repair versus replacement were discussed. Due to the extent of marginal breakdown and secondary caries, full replacement was chosen. The decision was based on patient esthetic expectations, durability concerns, and risk of recurrent decay.

Clinical Procedure

Step 1: Preoperative situation

Fig. 1 Defective composite with marginal staining and food impaction

Figure. 2 Rubber dam placed for contamination-free environment.

Step 2: Isolation

Step 3: Removal of defective restoration

Figure 3: Old composite removed with carbide burs and ultrasonic tips, caries detector used.

Step 4. Cavity refinement

Figure 4: Enamel margins smoothed, unsupported ena mel removed, final outline prepared

Step 5. Matrix and wedge placement

Figure 5: Sectional matrix with separating ring and wedge used for tight contacts

Step 6. Adhesive protocol
Selective enamel etch with 37% phosphoric acid for 15 sec.

PALFIQUE Universal Bond applied with agitation for 10 sec → air-thinned → light-cured.

Figure 6: Universal flow 0.5 mm layer distributed on the all cavity for dentinal seal, Proximal wall restoration with OA2

Step 7. Composite build-up (PALFIQUE LX5)

- Proximal wall restored with OA2.
- IDS performed.
- Incremental layering (≤2 mm).

Figure 7: Cusp-by-cusp occlusal build-up

Step 8. Characterization and polishing Fissures stained and sealed,

Figure 8: polishing with EVE wheels/discs

Step 9. Final outcome

Figure 9: Restoration showed natural anatomy, functional occlusion, and excellent shade integration

DISCUSSION

Composite replacement is one of the most common clinical interventions, accounting for up to 60% of restorative procedures [1]. While repair may be an option in localized defects, complete replacement is indicated when marginal breakdown or caries compromise the restoration.

MATERIAL PERFORMANCE: PALFIQUE LX5 offers nano-filler technology, producing high gloss and

wear resistance comparable to ceramic restorations [9]. Its radiopacity aids in caries detection during follow-up.

Adhesion durability: PALFIQUE Universal Bond contains 10-MDP monomer, which forms stable calcium-phosphate complexes with hydroxyapatite, improving bond longevity [10].

Clinical protocol: Incremental layering and cusp-by-cusp modeling minimize polymerization stress and optimize occlusal morphology. IDS ensures sealed dentin tubules, reducing sensitivity [11].

Comparison with other composites: Clinical trials report that nano-filled composites like PALFIQUE LX5 maintain surface quality and esthetics longer than microhybrids [12].

CONCLUSION

This case demonstrates the successful replacement of a defective Class II composite with Tokuyama PALFIQUE LX5 and PALFIQUE Universal Bond, achieving esthetic and functional integration. With proper adhesive protocols, incremental build-up, and polishing, PALFIQUE LX5 provides a predictable, durable solution for posterior restorations.

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