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AN OVERVIEW ON MICROLEAKAGE AT THE CERVICAL MARGIN OF COMPOSITE CLASS II RESTORATION WITH DIFFRENT RESTORATIVE TECHNIQUES, LITERATURE REVIEW

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Abstract

Background: When restoring a cavity, the main goal of dentistry is to choose materials that have the least amount of toxic effect on the pulp and a satisfactory microscopic seal. Biocompatible materials with a tooth-like coefficient of thermal expansion, improved marginal sealing, a chemical link with the tooth structure, and improved color stability are all desirable for restorative dentistry. Microleakage is the most frequent reason for restorative material failure because it causes additional wounds and pulp irritation. The most common clinical practice issue that compromises restorations in conservative dentistry is microleakage.
Methods: The Medline, Pubmed, Embase, NCBI, and Cochrane databases were searched for studies of on microleakage at the cervical margin of composite class II Restoration with diffrent restorative techniques.
Conclusion: where there is still significant worry regarding microleakage near the cervical edge of Class II composite restorations. Many restoration techniques and materials, including implantation techniques, adhesive formulas, and layering plans, have been developed to solve this issue.

Keywords: Microleakage, Class II composite restorations, Bulk fill composites

Introduction

Tooth-colored restorative materials have become more popular in the past several years. The increasing popularity of composite resins can be attributed to advancements in their diverse physical qualities. Nonetheless, polymerization shrinkage persists in composite resins, potentially leading to stress at the material-tooth structure interface. Leakage happens at the contact when a marginal gap emerges and shrinkage stress surpasses bond strength (1). Pulpal discomfort, recurring caries, and marginal discolouration can all be caused by microleakage (2). There is a higher chance of microleakage when a preparation's gingival margin is in dentin. To enhance marginal adaptation and lessen microleakage at the gingival margin, numerous materials and techniques have been put forth. The bonded-base restorative procedure is one such approach. As the first step in the restoration process, an intermediate layer, such as a glass ionomer or a low

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modulus resin-based material, is positioned between the restorative material and the dentin floor (3) This intermediary layer can lessen the consequences of polymerization shrinkage because it absorbs tension. The open-sandwich technique refers to the employment of glass ionomer as an intermediate material that is left visible at the margin (4). Resin-modified glass ionomers (RMGIs) offer the advantages of chemical bonding to dentin, micromechanical bonding to composite resin, pulp protection, and possible carotestatic activity when used in the sandwich approach. According to certain research, RMGI reduces secondary caries, microleakage, and polymerization shrinkage (5). Because of their low viscosity, low modulus of elasticity, and ease of adaptability to tooth structure, flowable composite resins can minimize microleakage. Flowable composite (Grandio Flow: 6.85 Mpa) is less successful in reducing the effects of restorative material shrinkage than RMGI (Fuji II LC: 5.33 Mpa) due to its greater elastic modulus (6). However, when employed as intermediary materials, flowable composite resins and RMGI did not vary in the microleakage of Class II restorations. Using flowable composite resins as the foundation has been proven in numerous in vitro tests to reduce microleakage, but other research (7). have not improved marginal adaption. The goal was to compare the microleakage of new base materials used in bonded-base restorations along with bulk-fill composite resin, taking into account the inconsistent results obtained from different methods for Class II composite restorations, particularly the introduction of new products such as bulk-fill composite resins and various materials as bases. The null hypothesis stated that the methods and base materials utilized for installing Class II composite restorations do not significantly differ from one another.

Advantages and Disadvantages:

Resin composites' tooth-like appearance, affordability, lengthy working life and command cure, and acceptable clinical behavior have led to their widespread usage as direct restorative materials (8). Several clinical trials have revealed impaired marginal adaption and increased marginal discolouration as some of the drawbacks.3-5 Adhesion breakdown presents a risk to composite restoration lifespan because microleakage can result in secondary cavities (9). Research conducted on patients with tiny to moderately sized cavities has indicated that resin composite restorations yield superior outcomes. These restorations appear to be carried out more successfully in Because of their tooth-like look, low cost, extended working life, and preference for premolars over molars—where fracture and secondary caries are the most common causes of failure—resin composites have been utilized mostly as direct restorative materials. Furthermore, enamel around the edges of the cavities has been thought to be desirable since it creates a peripheral resin-enamel seal that prevents bacteria and external fluids from penetrating. The adhesive contact deteriorates more quickly when bacteria and water start to spread along the resin-dentin interface (10). Restoring proximal contact is a significant issue that physicians deal with while placing Class II composite restorations. The inability of composite materials to condense in relation to the thickness of the matrix band presents a difficulty in achieving sufficient interproximal contact. Numerous tools and methods have been created in an effort to address this issue (11). Among these, there have been reports of the employment of segmented matrices with elastic rings, pre-contoured instruments, and balls made of composite resin that has already been polymerized.

Th aims is to show a clinical instance of successfully completed Class II restorations using separation rings to create a tight proximal contact and pre-contoured sectional matrices. The restorations showed very acceptable clinical behavior after a two-year review (12).

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Challenges:

One analogy for the placing of a successful Class II composite resin restoration is the building of a three-legged stool. All three legs must be properly constructed, meaning they must all be the exact same length, positioned appropriately, and firmly affixed to the stool in order for it to work. The three challenges (legs of the stool) for a low-cost, well-placed Class II composite resin restoration are:

- Achieving a predictable contact.
- No or minimal post-operative sensitivity of short duration.
- Having access to a streamlined, quicker, and easier placement technique that yields a consistent, high-quality result.

Disscusion:

Composite resin is frequently used for direct restoration of posterior teeth. The longevity of these restorations has greatly increased due to improved dentist training and experience in restoration placement, increased understanding of appropriate adhesive technique, and advanced material development. According to certain clinical research, direct posterior composite restorations have a lifespan that is on par with or even better than amalgam restorations (13). Because composite resin restorations are frequently easily corrected without requiring replacement of the complete restoration, longevity can be further increased. This lowers the patient's expenses and prevents more damage to the tooth (14). It seems that the majority of the patient's and operator's reliance will determine how long restorations last when utilizing modern, sophisticated composite formulations.62 Practice-based longterm investigations, in contrast to clinical trials conducted by calibrated operators following stringent protocols, nevertheless indicate that amalgam fillings outlast composite restorations by a small margin (15). It should be mentioned that in practice-based research, different physicians with varying backgrounds and skill sets occasionally carry out restorations using different methods. Results may also be impacted by the time and money constraints that come with conducting studies in a private practice as opposed to one in an academic setting. It is evident that the entire process of placing posterior composite restorations needs to be simpler, faster, and easier without sacrificing marginal integrity, durability, adaptation, or any other aspect of a successful restoration in order for private practicing dentists to economically achieve consistently good results. Improvements in matricing techniques and the development and simplicity of adhesives have greatly enhanced the predictability of outcomes for these two essential elements of a successful Class II repair. The third component of the triad seems to have been completed with the advent of more recent "bulk fill" composite resins. But because these new materials deviate from the conventional practice of layering composite resin in increments of no more than 2 mm, further research is necessary to verify whether or not the manufacturers' claims of low shrinkage stress and high depth of cure—when placed in increments of 4 or, in the case of some materials, 5 mm—are accurate. The approach of layering traditional or universal composite resin in increments of no more than 2 mm is purportedly beneficial in reducing shrinkage stress, as evidenced by existing literature (16). Nevertheless, several studies have cast doubt on the effectiveness of gradual placement in lowering shrinking stress, and at least one study found that using this method actually makes it worse (17). However, it might still be necessary to apply conventional restorative composites in 2 mm layers in order to obtain a sufficient depth of cure and excellent adaption. When bulk-fill materials are compared to universal composites with 2 mm thicknesses, the existing literature on shrinkage stress for these

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materials primarily indicates that these materials at 4- or 5-mm thicknesses have similar or lower values. Shrinkage stress values for nine out of the eleven bulk fill materials tested in a thorough comparison of bulk-fill versus traditional multi-increment composite resins at the American Dental Association laboratory did not differ significantly from the two conventional composite resin controls. Since bulk fill composite resin materials are so new, long term clinical trials are lacking. Short term clinical trials, published and unpublished are just beginning to appear. According to preliminary data, bulk fill materials and 2 mm layered materials function comparably in terms of clinical outcomes. However, polls indicate that dentists are using the technology with strong rise in utilization and high early approval. Given the number of posterior composite restorations dentists place in practice, this growth (18).

Conclusion:

Because bonding to dentin and cementum is difficult, sealing is frequently less successful in the gingival region, where microleakage at the cervical margin of Class II composite restorations is still a major concern. To address this problem, a number of restorative methods and materials have been created, such as layering plans, placement methods, and adhesive formulations. Research indicates that while bulk-fill composites, matrix systems, and gradual stacking may lessen the possibility of microleakage, none of them do so totally. Furthermore, improvements in curing techniques and bonding chemicals can improve marginal sealing even more. Overall, enhancing the durability and clinical efficacy of Class II composite restorations requires careful selection of the appropriate materials and methods. However, long-term clinical trials are required to validate the most effective strategies for reducing microleakage.

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