

Navigating Deep Carious Lesions in Permanent Dentition: Stepwise, Selective or Non-selective Removal Strategies

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Introduction

Caries, commonly known as tooth decay, is a prevalent dental condition affecting individuals of all ages worldwide. When left untreated, caries can progress to deeper layers of the tooth, leading to the development of deep carious lesions. Managing these lesions presents a challenge for dental professionals, as various approaches exist, each with its own set of benefits and considerations. In this article, we explore the strategies of stepwise, selective, and non-selective removal in handling deep carious lesions in permanent dentition, shedding light on their efficacy, indications, and implications [1].

Description

Stepwise removal involves a staged approach to caries excavation, aiming to preserve tooth structure while effectively eliminating infection. In the initial stage, the removal of infected dentin is limited to the outermost layer, leaving the affected dentin beneath intact. This partial excavation is followed by the application of a protective liner or base, such as calcium hydroxide or glass ionomer cement, to encourage dentin remineralization and provide a barrier against bacterial invasion. The subsequent stages involve periodic reassessment of the lesion's status, with further excavation performed if signs of progression are observed. This iterative process allows for the gradual elimination of carious tissue while minimizing the risk of pulp exposure and preserving vital tooth structure. Stepwise removal is particularly suitable for deep carious lesions approaching the pulp, where the preservation of pulpal vitality is a priority [2].

Selective removal entails the precise removal of carious tissue while preserving sound tooth structure. Unlike stepwise removal, selective removal involves complete excavation of infected dentin, guided by clinical and radiographic assessment of lesion depth and proximity to vital structures. The goal is to achieve caries-free margins that facilitate optimal restoration placement and long-term clinical success. Selective removal offers the advantage of complete eradication of carious tissue, reducing the risk of residual infection and promoting durable restoration outcomes. This approach is well-suited for deep carious lesions with sufficient remaining tooth structure to support definitive restorative treatment. However, careful judgment and clinical expertise are required to balance the removal of diseased tissue with the preservation of healthy dentin and pulp vitality [3].

Non-selective removal, also known as traditional or complete caries removal, involves the indiscriminate removal of both infected and affected dentin until sound tooth structure is reached. This approach aims to eliminate all carious tissue, minimizing the risk of disease recurrence and ensuring the longevity of restorations. Non-selective removal is typically indicated for shallow to moderately deep carious lesions where pulp exposure is unlikely and adequate tooth structure is available for restoration. While non-selective

removal offers the certainty of complete caries removal, it carries the potential risk of pulpal exposure, particularly in deep lesions with thin dentin walls. Therefore, meticulous technique and judicious use of dental instruments are essential to minimize trauma to the pulp and preserve pulpal vitality. Additionally, the choice of restorative material and technique plays a crucial role in sealing the cavity and preventing microleakage and secondary caries [4].

Preservation of pulpal vitality is a paramount concern in deep caries management. While stepwise and selective removal aim to minimize pulpal exposure, non-selective removal carries a higher risk of inadvertent pulp exposure, especially in deep lesions. Close monitoring of pulpal status through clinical and radiographic assessment is essential to detect signs of pulpal inflammation or necrosis promptly. The choice of restorative material and technique is integral to the success of caries management strategies. While stepwise removal may necessitate interim restorative materials such as liners or bases, selective and non-selective removal allow for direct placement of definitive restorations. Factors such as cavity size, location, and occlusal forces influence the selection of appropriate restorative materials, ranging from amalgam and composite resin to glass ionomer cement and resin-modified glass ionomers. Patient cooperation, dental anxiety, and systemic health considerations may influence the selection of caries removal strategies. While some patients may prefer a conservative approach with stepwise removal to preserve tooth structure and minimize discomfort, others may opt for complete caries removal for perceived long-term durability. Effective communication and patient education are essential in guiding treatment decisions and addressing patient concerns. Training and proficiency in caries removal techniques are vital for dental professionals to ensure optimal clinical outcomes and patient satisfaction. Continuing education and hands-on training programs provide opportunities for dentists to refine their skills and stay abreast of advancements in caries management strategies. Additionally, interdisciplinary collaboration with endodontists, pediatric dentists, and other specialists may enhance comprehensive patient care and treatment outcomes [5].

Conclusion

Advancements in dental technology, materials science, and minimally invasive techniques hold promise for refining deep caries management strategies and improving patient outcomes. Novel diagnostic tools, such as near-infrared imaging and laser fluorescence devices, offer non-invasive methods for caries detection and monitoring, facilitating early intervention and conservative treatment approaches. Furthermore, the development of bioactive materials and regenerative therapies may revolutionize pulp preservation and promote tissue repair in deep carious lesions. Navigating deep carious lesions in permanent dentition requires a nuanced understanding of lesion characteristics, patient preferences and treatment objectives. Whether employing stepwise, selective, or non-selective removal strategies, dental professionals must prioritize pulpal health, restoration longevity and patient comfort. By embracing evidence-based practices, interdisciplinary collaboration, and ongoing education, clinicians can optimize deep caries management and promote oral health and well-being for their patients.

Acknowledgement

None.

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Received: 20 February, 2024, Manuscript No. jma-24-134756; **Editor Assigned:** 22 February, 2024, Pre QC No. P-134756; **Reviewed:** 07 March, 2024, QC No. Q-134756; **Revised:** 12 March, 2024, Manuscript No. R-134756; **Published:** 19 March, 2024, DOI: 10.37421/2684-4265.2024.8.323

Conflict of Interest

None.

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How to cite this article: Xelina, Fransis. "Navigating Deep Carious Lesions in Permanent Dentition: Stepwise, Selective or Non-selective Removal Strategies." *J Morphol Anat* 8 (2024): 323.