INDIRECT PULP CAPPING VERSUS STEPWISE EXCAVATION

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REVIEW

ABSTRACT

The removal of carious dentin is one of the fundamental procedures in restorative dentistry. Managing deep carious lesions in vital teeth is challenging and crucial as any adversity caused during the treatment might lead to pulp exposure. Treatment for deep carious lesions is empirical, involving a great deal of inconsistency. Therefore, this comprehensive review aims to provide a detailed description of two treatment protocols for deep carious lesions involving indirect pulp capping versus stepwise caries excavation.

Keywords: *Caries, Dentin, Indirect Pulp Capping, Stepwise Excavation*

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INTRODUCTION

A tooth's longevity and the best possible health of the dynamic oral cavity depend on its retention in the arch in a healthy functional state. Once the tooth's vitality is threatened, we are forced to undergo a difficult procedure that is not very cost-effective. The definition of deep caries needs a special mention here as it points toward the potential exposure of the pulp. The treatment of such lesions presents a considerable challenge to the practitioner in terms of decision-making.

There are two schools of thought in treating deep carious lesions – one which includes complete caries removal even if the procedure involves an associated risk of pulp exposure through indirect pulp capping (IPC) and another which follows remineralization therapy of carious dentin through stepwise excavation (SE). Both have their advantages and disadvantages, and it's important to understand when to use one over the other.[1]

PRE-TREATMENT DATA

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Two criteria need to be taken into consideration before a tooth with deep carious lesion is approached with IPC or SE. The tooth should still be functional without any residual or severe pain. Other tests including percussion, palpation, and movement have to be within typical physiological bounds. There should be no sinus drainage tract. On radiograph, there should be no apical periodontitis indicating pulp necrosis and infection. The carious radiolucency should not go past the pulpal quarter of the dentin and should be separated from the pulp by a clearly defined radiopaque zone of non-demineralized dentin.[2]

INDIRECT PULP CAPPING

John Tomes in 1859 referred to indirect pulp capping as a conservative alternative treatment for the dentin-pulp complex in primary and permanent teeth. The technical approach for IPC involves the differentiation between infected and affected dentin. According to Massara et al (2002), dentin that is moist, softened, yellow or light brown, and does not provide resistance to manual excavation should be removed. Less softened, darker, and harder consistency dentin that comes out in scales or chips can be left in place because the technique fosters a physiological remineralization process.

The method entails leaving the pulp wall's deepest dentin on purpose while merely removing the softened and wet dentin, which provides no resistance to hand extraction. Numerous studies have already demonstrated that this dentin is capable of remineralization through the appearance of tougher texture, darker color, and less unviable bacterial growth.

It is a one-step, effective eradication method. In this method, the carious dentin is removed up to 1 mm from the pulp while leaving a thin layer of caries above the pulp at the deepest areas of cavity preparation (residual carious dentin). The main goal of this method is to prevent pulp tissue exposure, which would occur if all cavities were removed, which would lead to pulp exposure. As part of this process, an agent is also applied to the dentin next to the pulp to protect it from further damage and to encourage the growth of secondary dentin, which will aid in the pulp’s healing and regeneration.

IPC is recommended as the best course of action for primary teeth with profound caries diagnosis when there are no signs of pulpitis. Since the primary tooth has a well-defined

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biological cycle in the oral cavity, this approach can be regarded as definitive in the developing age group.[3-5]

STEPWISE EXCAVATION

Stepwise carious tissue removal entails two stages and two appointments. The first is to alter the environment, slow the progression of caries, permit remineralization, and promote the deposition of tertiary dentin. The second is to finish a slightly deeper excavation before the final restoration, preparing the cavity for a long-lasting restoration.

First stage: Selective removal with pulp-covering soft carious tissue. To enable a sealing repair, the peripheral dentin at the cavity edges must be thoroughly excavated. A temporary restoration (such as glass ionomer cement) is used to fill the cavity, and it should last for 3 to 12 months. It is anticipated that between visits, the number of live bacteria, the lesion activity, and the possibility of the formation of tertiary dentin will all significantly decline. The patient should be instructed to visit the dentist again if they experience any symptoms of pulp or periapical irritation following early tooth sensitivity.

Second stage: During the second excavation, the cavity should be examined, and any softened dentin that is still there should be carefully removed without exposing the pulp. Normally, the previously softened dentin is firm and deeply pigmented, thus further removal of this tissue before final restoration may not be required. [6-9]

The number of intraoperative exposures discovered during the initial excavation in SE is minimal, making it a better and safer means of treating deep carious lesions than IPC. However, its two-step procedure makes SE time-consuming which is a major drawback for pediatric patients.

	IPC	SE
Advantages	Minimally invasive and preserves the vitality of pulp Less time consuming Less traumatic and painful, causing no discomfort	Failure of pulp response to treatment leads to further decay A single insulating layer may not provide complete protection
Disadvantages	Avoids chances of pulp exposure Maintains structural integrity of tooth Removes all caries from the affected area	Time-consuming and expensive Require multiple appointments Discomfort and extensive experience with pediatric patients

Table 1 Advantages and Disadvantages of IPC and SE

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CONCLUSION

In conclusion, both caries excavation procedures are successful in repairing the tooth and shielding the pulp from damage in severe carious lesions. Thus, both IPC and SE have their demerits and merits and should be used as a treatment plan based on the severity of deep carious lesions and the patient's cooperation. Further randomized controlled clinical trials will be needed in the future to reach well-established evidence to conclude which is better than another.

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