



Case Report

ISSN: 2581-3218

IJDR 2024; 9(2): 64-67

Received: 07-06-2024

Accepted: 04-08-2024

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www.dentistryscience.com

doi: 10.31254/dentistry.2024.9207

Selective caries removal on two stage indirect pulp capping in mandibular permanent molar- A case report

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Abstract

Deep carious lesions are always a topic of discussion in the field of dental conservation. Preserving pulp tissue in cases of deep carious lesions is the main challenge for maintaining pulp vitality. Making a diagnosis of the clinical condition of pulp with deep caries is quite difficult. Indirect pulp capping (IPC) is one of essential management treatment to prevent pulp exposure. This case report reports the treatment management of indirect pulp capping on permanent mandibular molars using a two stage technique. The patient complained of moderate pain when eating, no persistent pain, no periapical lesions from radiological images. Caries excavation is carried out selectively by leaving a thin layer of affected dentin for remineralization. An application of calcium hydroxide liner material was placed for approximately 9 weeks, and at the follow-up visit the temporary filling was removed and a composite resin fixed restoration was applied. The patient did not complain of any complaints and was satisfied with the treatment. Indirect pulp capping treatment can be an option for cases of deep carious lesions. Selective caries excavation can reduce the possibility of pulp exposure and eliminate the possibility of further treatment in the form of root canal treatment (RCT).

Keywords: Indirect pulp capping, Caries removal, Step wise, Deep carious lesion.

INTRODUCTION

Deep carious lesions are always a topic of discussion in the field of dental conservation. Preservation of pulp tissue in cases of deep carious lesions is the main challenge to maintain pulp vitality. Establishing a diagnosis of the clinical condition of pulp with deep caries is quite difficult. The possibility of pulp tissue damage due to caries excavation is also very high. In cases of pulp exponentiation due to excavation, the prognosis and management are different from pulp tissue that has been infected [1].

Preservation of the vitality status of pulp tissue is a key factor for long-term dental success. Vital Pulp Therapy (VPT) is a technique for preserving and maintaining the vitality of pulp that has been compromised by caries stimuli, trauma or other restorative procedures. The aim of VPT is to stimulate the formation of tertiary dentin to maintain and maintain the tooth as a functional unit [2]. Management of VPT varies from conservative management such as direct pulp capping and indirect pulp capping to more invasive treatments such as partial pulpotomy and full pulpotomy [2].

Indirect pulp capping (IPC) is an essential maintenance management to prevent pulp exponentiation [1]. According to the European Society of Endodontology [3], IPC is the application of biomaterials over a thin layer of hard dentin, leaving no soft dentin or firm dentin and is more aggressive than selective carious tissue removal in one-stage and stepwise excavations [3]. IPC can be carried out with a single step or two stages (stepwise excavation). Single stage IPC can be performed in one visit by removing infected dentin tissue and leaving a thin layer of affected dentin, then liner material is applied and the restoration remains in one visit [3]. Research on this technique shows the conclusion that there is demineralized dentin hard tissue and no caries development [1]. There is a risk of pulp exponentiation in cases of two stage IPC, when removing caries remaining in the cavity at the second visit. Remineralization can be induced by placing a thin layer of calcium hydroxide which is bacteriostatic and bactericidal on the dentin and has become the golden standard commonly used for pulp capping [1].

Calcium hydroxide is traditionally used as the golden standard for DPC materials because of its biocompatibility, high pH, antibacterial effect and ability to form dentin bridges in cavity areas [4]. The use of calcium hydroxide as a pulp capping material has been proven to have a fairly high success rate in patient follow-up of more than 10 years [4]. Calcium hydroxide which has high alkalinity can trigger necrosis and inflammation in the pulp. The disadvantages of this material are its solubility and poor adhesion capabilities

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so that it cannot form an optimal seal even after the dentin bridge is formed. Calcium hydroxide also causes tunnel defects in dentin bridges, but several studies have shown that tunnel defects are useful for increasing the thickness of dentin bridges [4].

This case report will discuss a patient who came to the Dental and Oral Hospital (RSGM) of Padjadjaran University with complaints of cavities in the lower back teeth, often getting stuck in food and feeling sore. The patient was diagnosed with reversible pulpitis of teeth with normal periapical tissue. The treatment plan for this tooth is indirect pulp capping with follow-up class I composite restoration. This paper discusses the management of caries removal in cases and the selection of IPC treatment.

CASE REPORT

A 23 years old woman came to the department of conservative dentistry with complaints of a cavity in the lower right back tooth. Patients complain that food often gets stuck and it hurts, especially when eating sweet and cold foods. No history of lingering and sudden pain. The patient has never taken medication to relieve pain and has not yet gone to the dentist for treatment. The patient came to the dentist a week ago for scaling. The patient was aware of complaints of cavities since last year. Patients brush their teeth twice a day when showering and sometimes before going to bed. The patient denied any allergies, history of systemic illness and family history of similar illnesses. The patient wants to be examined and wants to be filled with a tooth-colored filling. Thermal test with ethyl chloride gave positive result with pain disappeared quickly. Percussion test was performed on teeth 47 and gave negative result. The diagnosis was pulpitis reversible with normal periapical.

Caries removal was performed in first appointment. Instruments Patients are instructed to use personal protective equipment (disposable gown, head cap, and shoe cover), rinse their mouth with povidone iodine, and sit in a dental chair in a reclined and comfortable position. Operators wash their hands according to the WHO 6 steps and wear level 2 personal protective equipment (gown, head cap and shoe cover). First step was isolate the patient's teeth with a cotton roll and saliva ejector and excavate caries with an excavator and low speed carbide burs with water coolant. Caries removal performed to excavate soft dentin until firm dentin or affected dentin.



Figure 3: Prepared cavity with spoon excavator and carbide bur

Clean the cavity with cotton pellets moistened with 2% chlorhexidine and then dry the cavity with air syringe. Apply a thin layer of Ca(OH)₂ to the deepest part of the cavity. Base GIC type 3 was applied after biomaterial Ca(OH)₂ placed on the cavity. The last step was to restore cavity with temporary restoration (cevitron).



Figure 1: Pre-operative teeth 47



Figure 4: Liners Ca(OH)₂ (hydcal) applied on firm dentin



Figure 2: Pre operative teeth and radiograph



Figure 5: Base GIC type 3 placed on the cavity



Figure 6: Cevitron applied as temporary restoration

The second appointment was instructed to patient after 9 weeks. Patient have no symptom and complaint, also temporary restoration still in good condition. Isolate the work area using a cotton roll and saliva ejector. Removing the temporary restoration. Liners GIC and Ca(OH)₂ are left in the cavity. Class I preparations are prepared, beveled with fissure bur and finishing bur to soften shard area on the cavity. Final restoration with composite was performed using incremental layering technique cusp by cusp. Making sure, the anatomies was perfectly contact and did not disturb previous occlusion. The last step was to finishing using bur fine and superfine.



Figure 7: Removal of temporary restoration and class I preparation was performed



Figure 8: Final restoration

Patient come again to the third appointment one week after, for polishing the composite restoration performed with rubber eve polishing. There is no complaint and patient had a great satisfaction.

DISCUSSION

A prospective multicenter study, stated that the management of deep caries in adult patients was classified based on the depth of the caries lesion (deep, extremely deep) measured by radiography as an inclusion criteria [5]. According to the European Society of Endodontology, deep

caries is defined as a carious lesion reaching an area within a quarter of the dentin with a zone of hard or firm dentin between the caries and pulp tissue, which can be detected via radiography on the interproximal or occlusal surfaces [5]. There is a risk of the pulp chamber roof opening during the operation. Meanwhile, extremely deep caries is a carious lesion that penetrates the depth of the dentin, can be detected by radiography, is located on the interproximal or occlusal surface and there is pulp exposures which cannot be avoided during the excavation process [5,6].

Research from the International Endodontic Journal describes a new classification system for pulpitis that is related to symptoms rather than depth based on radiographs [6]. The American Association of Endodontists, stated in 2013 that pulpitis is classified as reversible and irreversible based on clinical symptoms. Clinical symptoms of reversible pulpitis range from asymptomatic to a sharp sensation when exposed to hot/cold stimuli and the absence of tenderness on percussion. The sharp sensation will disappear when the stimulus is removed [5]. Based on histological examination, reversible pulpitis is characterized by the absence of bacteria and there is local coagulation and liquefaction necrosis spread around the irritant, while irreversible pulpitis is characterized by the presence of bacteria and bacterial toxins in the pulp and the appearance of predominantly neutrophil cells as acute inflammatory cells which indicates the emergence of chemotactic activity [7]. Lysosomal enzymes are produced by neutrophils due to suppuration and widespread tissue damage [7]. Pain that is spontaneous, spreads and does not disappear even after the stimulus is removed and causes disruption of activities such as eating and sleeping is an indication of irreversible pulpitis [5].

As science develops, the restoration management of caries lesions has evolved from the complete removal of carious tissue to obtain mechanical retention of amalgam filling material, eliminating bacteria and inhibiting the caries development process as well as taking demineralized dentin tissue or what is known as affected dentin, now shifting to minimally invasive management [8,9]. MI or minimally invasive is a principle used in clinical practice explaining that, with the development of restorative materials that are adhesive, bioactive and bio-interactive, massive tissue harvesting is no longer relevant, because it does not fulfill the function of mechanical retention [8,9]. The affected dentin structure is left on the cavity, because several studies stated that the demineralized zone of dentin can be remineralized and maintained [8]. The development of restorative management is now developing into controlling biofilm on teeth that have been restored to prevent secondary lesions, protecting the dentin-pulp complex and arresting caries activity by coating the coronal area with adhesive material and restoring the function, shape and aesthetics of the tooth [8]. The consideration for selective caries removal is to form a cavity and surface area sufficient to accommodate the restoration and bonding agent and maintain the strength of healthy tooth tissue structure to support adequate restoration and ensure the long-term success of the tooth complex with the restoration [10].

Indirect pulp capping is a treatment procedure that is commonly used in cases of deep cavities where there is a thin layer of caries-free dentin directly above the pulp chamber tissue and is coated with a biomaterial whose function is to prevent pulp exposure and further trauma to the pulp [4]. Indirect pulp capping can be divided into one stage and two stage. One stage IPC is a one-visit IPC treatment that removes caries tissue and initial restoration material in one visit. Meanwhile, two stage (step-wise caries removal) refers to removing caries by removing soft dentin caries and leaving firm dentin. Next, apply a biomaterial liner such as calcium hydroxide and cover it with a temporary restoration. The second visit is carried out in a few months if there are no complaints and clinical pathology in which the temporary restoration is dismantled and the remaining caries is removed then the permanent restoration is carried out [4]. Generally, there are two approaches to caries removal

from the carious lesion cavity, namely non-selective caries removal and selective caries removal.

1. Non-selective caries removal (complete caries removal)

This method is a traditional method used to remove soft dentin and firm dentin regardless of the location of the carious lesion in the pulp or until there is hard dentin. This method is also known as complete caries excavation or complete caries [11]. The aim of this method is to remove all bacteria and caries. Furthermore, this total excavation method allows for effective and adequate placement of restorative materials due to sufficient mechanical retention, however, this method is related and very susceptible to pulp exposure. This method is a non-conservative and extensive method and its validity is questionable. This technique is usually used for cases of carious lesions that are not deep and not close to the pulp [11].

2. Selective caries removal approach

This method uses a selective technique in removing carious tissue based on the location of the caries in the pulp and leaving a thin layer of soft and/or firm dentin. This technique is known as partial caries removal (PCR) [5]. This technique is divided into two, one step technique and two step method. The one step method describes a technique for selective removal of dentin caries and the cavity is immediately restored with a permanent restoration in one appointment. An example of this one stage method is the case of one visit indirect pulp capping (IPC) [5,12]. The two stage method is a technique for removing caries in two meetings. An example of the application of this technique is the stepwise method [5,12].

Stepwise method is a technique for taking caries tissue in two appointments. The soft dentin tissue is left just above the pulp at the first meeting and the peripheral dentin is prepared to reach the hard dentin to achieve an optimal sealer and provisional restoration so that it can last for more than 12 months [8]. The recommended temporary restoration material used is high-viscosity glass ionomer cement [8]. The junction of the two temporary restorations will be dismantled and the remaining carious dentin will be removed to the firm dentin boundary, which was formed during the caries process arrest period. There is clinical evidence that second-stage caries removal should be omitted because it increases the risk of pulp exposure. Second appointments also increase costs, time and potential discomfort to the patient [8]. The aim of choosing a selective caries removal method is to preserve pulp exposure and maintain pulp vitality. According to Bjorndal et al, the pulp exposure rate with the SW method tends to be lower than nonselective caries removal (21% vs 35.5%) [5,9].

CONCLUSION

The indirect pulp capping treatment procedure is carried out because teeth with deep caries without any signs of pulp degeneration and periapical pathology need to be treated conservatively with selective caries excavation using the principle of minimal intervention. This technique is used to preserve pulp vitality and prevent exposure of the pulp chamber. By coating a thin layer of dentin with calcium hydroxide, it is hoped that tertiary dentin, namely reparative dentin, will be formed.

Conflicts of Interest

The author reports no conflicts of interest.

Funding

None declared.

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HOW TO CITE THIS ARTICLE-

Putri CER, Fatriadi F. Selective caries removal on two stage indirect pulp capping in mandibular permanent molar- A case report. *Int J Dent Res* 2024; 9(2):64-67. doi: 10.31254/dentistry.2024.9207

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