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INDIRECT PULP CAPPING TREATMENT WITH CLASS I COMPOSITE RESTORATION FOLLOW-UP IN SECOND RIGHT MANDIBULLARY MOLAR

Perawatan Indirect Pulp Capping pada Gigi 47 dengan Follow-Up Restorasi Kelas 1 Komposit

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ABSTRAK

Pulp capping adalah perawatan proteksi kompleks dentin-pulpa yang dilakukan dengan mengaplikasikan material spesifik diantara bahan restorasi dan dentin untuk mencegah terbukanya pulpa secara iatroganik, toksisitas material restorasi, dan penetrasi bakteri. Perawatan indirect pulp capping dapat mempertahankan vitalitas pulpa dengan memfasilitasi terjadinya penyembuhan dan perbaikan jaringan pulpa dengan minginduksi terbentuknya dentin reparatif. Penelitian ini mengeksplorasi keberhasilan penanganan pulpitis reversibel melalui perawatan indirect pulp capping menggunakan Kalsium Hidroksida. Pasien laki-laki berusia 22 tahun memiliki keluhan nyeri tajam dan intermiten pada gigi molar kanan mandibula sejak 3 bulan yang lalu, tanpa riwayat nyeri spontan. Temuan klinis menunjukkan adanya lesi karies dalam yang mencapai dentin dan meninggalkan lapisan tipis dentin pada gigi 47. Uji vitalitas pulpa menunjukkan pulpa vital. Diagnosis yang ditegakkan adalah pulpitis reversibel dengan jaringan apikal normal. Perawatan indirect pulp capping dengan restorasi komposit kelas I lanjutan dilakukan dalam 3 kali kunjungan dan pada kunjungan ketiga pemeriksaan subjektif dan objektif menunjukkan hasil yang baik dan pasien merasa puas dengan perawatan yang diberikan. Laporan kasus ini menggarisbawahi keberhasilan perawatan indirect pulp capping dengan Kalsium Hidroksida dalam menangani pulpitis reversibel, meskipun demikian, penelitian di masa depan dan tindak lanjut yang lebih lama sangat disarankan.

Kata kunci*: pulp capping, kalsium hidroksida, restorasi kelas I komposit*

ABSTRACT

Pulp capping is a dentin-pulp complex protection treatment performed by applying a specific material between the restoration material and dentin to prevent iatroganic pulp opening, restoration material toxicity and bacterial penetration. Indirect pulp capping treatment can maintain pulp vitality by facilitating healing and repair of pulp tissue by inducing reparative dentin formation. This study explores the successful management of reversible pulpitis through indirect pulp capping treatment using Calcium Hydroxide. A 22-year-old male patient with complaints of sharp, intermittent pain in the right mandibular molar tooth since 3 months ago, without a history of spontaneous pain. Clinical findings revealed a deep carious lesion that reached the dentin and left a thin layer of dentin on tooth 47. Pulp vitality testing indicated a vital pulp. The diagnosis was reversible pulpitis with normal apical tissue. Indirect pulp capping treatment with follow-up class I composite restoration was carried out in 3 visits and at the third visit the subjective and objective examinations showed good results and the patient was satisfied with the treatment provided. This case report underscores indirect pulp capping

treatment efficacy with Calcium Hydroxide in managing reversible pulpitis, although future research and extended follow-ups are very recommended.

Keywords: pulp capping, calcium hydroxide, composite class I restoration

INTRODUCTION

The dental pulp is a complex connective tissue protected by mineralized tissues, namely enamel, dentin and cementum. The pulp has a close anatomical and functional relationship with dentin, and is often referred to as the dentin-pulp complex. Being protected in a mineralized chamber does not make the pulp immune to irritation. Pulp inflammation and necrosis can be caused by caries, trauma, anatomical defects and iatrogenic errors.[1]

Caries is a progressive disease of the hard tissues of the tooth and is the main cause of pulp disease. Pulp disease can cause discomfort and pain, so maintaining a healthy and vital pulp is an important aspect that must be considered in determining the success of the restoration procedure. For deep carious lesions, additional protection for the pulp is required through pulp capping treatment.[2], [3] The main goal of dental conservation treatment is to restore and maintain dental health by providing restorative treatments that aim to protect and restore pulp function.[4], [5]

Pulp capping is a dentin-pulp complex protection treatment performed by applying a specific material – in this case, calcium hydroxide, between the restoration material and the dentin to prevent iatroganic pulp opening, restoration material toxicity, and bacterial penetration.[4], [6] The main advantage of pulp capping treatment is the ability to maintain pulp vitality and prevent the opening of the roof of the pulp chamber.[3] There are two types of pulp capping procedures: direct and indirect pulp capping. Direct pulp capping is a treatment for vital pulp exposed due to caries, trauma, or iatrogenic factors. Indirect pulp capping is a treatment to prevent pulp exposure, for example in cases of deep caries.[2], [7] While there are various factors that influence the success rate of pulp capping procedures, a study conducted by Drouri and team concluded that the success rate of pulp capping can reach up to 90% at one month, 86% at three months, and 80% at six months. [8] Another in vivo study of 48 tooth conducted by Falster et al evaluated that the success rate of indirect pulp capping was up to 90% after 2 years.[9]

Indirect pulp capping treatment can maintain pulp vitality by facilitating the healing and repair of pulp tissue by inducing reparative dentin formation.[10], [11] In addition, indirect pulp capping has been shown tosignificantly prevent pulp exposure.[12]

In this case report, the author will present the findings of a case of indirect pulp capping treatment in one of the patients in the Endodontic Department of Padjadjaran University Dental Hospital.

CASE REPORT

A 22-year-old male patient came to the Endodontic Department of Padjadjaran University Dental Hospital with complaints of sharp pain that had occurred on the right lower jaw molar tooth since 3 months ago. Pain in the right lower jaw tooth is felt only when eating sweet food or drinking cold drinks and will disappear on its own. There are no factors that alleviate the pain and no history of spontaneous pain. The patient has not taken any medication to relieve complaints. The patient last visited the dentist 1 week ago for a filling of the left mandibular graham tooth. History of systemic disease and allergy was denied. The patient came with the expectation of relieving pain in the right mandibular graham tooth by filling the tooth.

Examination of the patient's general condition was good, and extra oral examination found no abnormalities. Intra oral clinical examination found occlusal media caries covering the entire fissure of tooth 47 and a shadow of discoloration was seen on the enamel around the fissure (Figure 1). Examination of pulp vitality with a cold test using chloretil was performed and the results obtained were positive, namely pain could be felt by the patient and the pain disappeared when the chloretil stimulus was removed. This finding indicated that the pulp was still in a vital condition. Percussion, palpation, and mobility examinations were negative.

First Visit

During the first visit on September 29th 2022, the operator performed infection control by disinfecting the work area and preparing sterile tools. Next, the operator made preparations, namely wearing a mask, performing 6-step hand washing according to WHO standards, and using a clean handscoon. The patient was then instructed to gargle with 0.1% povidone iodine solution and use a polybib. After subjective (anamnesis) and objective examinations, in this case an examination of the localized status of tooth 47, the diagnosis made was reversible pulpitis with normal apical tissue of tooth 47. The treatment plan to be carried out was a Class I Composite restoration of tooth 47. The treatment plan was then explained to the patient and after understanding the problem, patient agreed to carry out the treatment and patient signed the informed consent provided.

Next, the area around the tooth was cleaned and composite shade selection was performed using a shade guide. Universal Restorative Nanofilled Composite Resin in the shade A3 Dentin and A3 Email was chosen as the final restoration. The working area was then isolated with cotton roll.

A medium grit round diamond bur on a high speed handpiece was used to remove carious tissue throughout the fissure and enamel not supported by healthy dentin, forming a cavity that facilitated visualization and instrumentation. After reaching the depth of dentin, the patient complained of soreness during caries excavation. A round carbide bur and an excavator were used to excavate the soft dentin and leave the hard dentin tissue. After completing caries excavation, the shadow of the pulp chamber roof can be seen (Figure 2) so that indirect pulp capping treatment will be carried out to maintain pulp vitality. $Ca(OH)_2$ pulp capping material was selectively applied to the deepest cavities as a liner (Figure 3). GIC type III base was then applied as the base. The preparation was then dried and a temporary filling was made using Temporary Filling Material (Figure 5). The patient was scheduled for indirect pulp capping after 9 weeks.

Second Visit

At the second visit on November 29th 2022, infection control was carried out, operator preparation, then the patient performed asepsis with povidone-iodine 0.1%. On subjective examination of the patient, it was found that the patient did not feel discomfort or soreness in the teeth. Objective examination of the general condition is good, extra oral there is no abnormality, intra oral temporary fillings still cover the entire cavities (Figure 6). Localized status of tooth 47 obtained vitality examination with chloretil thermal test obtained vital pulp. Periapical tissue examination with percussion, palpation, and mobility tests found no abnormalities.

Temporary fillings, GIC base and $Ca(OH)_2$ liner were then removed using an excavator. Composite Class I cavities were prepared by beveling the cavosurface margin using a diamond fissure bur (Figure 7). The cavities were disinfected with 0.2% chlorhexidine. GIC was then applied as the base (Figure 8). Etching application (37% phosphoric acid) was performed starting from the enamel (Figure 9) for 10 seconds and applied to the dentin (Figure 10) and left for 15 seconds, then rinsed, and dried until

frosty white and dentin was moist. Bonding application was done using a microbrush and leveled with the help of an air syringe and light cure for 20 seconds (Figure 11). Class I composite restorations were then made using the incremental cusp-by-cusp technique with the paddle shaped and round condenser composite filling instrument with non-stick titanium coated tip to prevent polymerization shrinkage (Figures 12-13). The occlusion after restoration was checked using articulating paper. Areas of overexposure were reduced using a super fine grit diamond bur. The patient was instructed to come back after 7 days for control and polishing of the restoration.

Third Visit

On the third visit on December 6th 2022, the operator performed infection control, operator preparation, then the patient performed asepsis with povidone iodine 0.1%. On subjective examination of the patient, it was found that the patient did not feel any discomfort or soreness in the teeth. The restoration is not felt to be obstructed and is comfortable to chew. Objective examination of the general condition is good, extra oral there is no abnormality, intra oral composite restoration is good. Localized status of tooth 47 obtained by cold thermal examination using chloretil obtained vital pulp. Periapical tissue examination with percussion, palpation, and mobility tests showed no abnormalities.

Restoration polishing was performed using an twist shaped 2 step composite polishing burs (Figures 14-15). The patient was satisfied with the treatment provided.

Figure 1. Clinical Findings of Tooth 47 at First Visit

Figure 2. Caries Removal of Tooth 47 at First Visit

Figure 3. Aplication of $Ca(OH)_2$ on Tooth 47 at First Visit

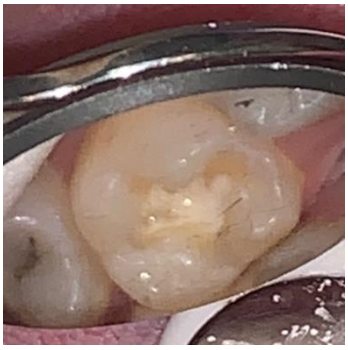

Figure 4. GIC Application on Tooth 47 at First Visit

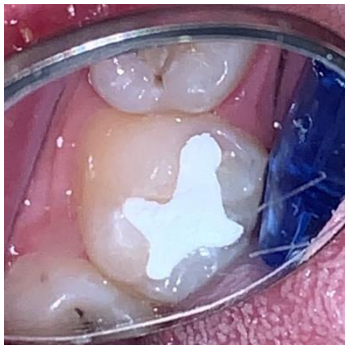

Figure 5. Application of Temporary Fillings on Tooth 47 at First Visit

Figure 6. Clinical Findings of Tooth 47 at Second Visit

Figure 7. Class I Composite Preparation of Tooth 47 at Second Visit

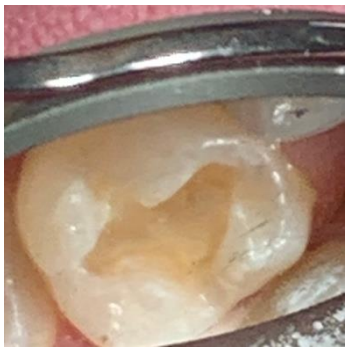

Figure 8. GIC Application on Tooth 47 at Second Visit

Figure 9. Tooth 47 enamel etching application at second visit

Figure 10. Dentin Etching Application of Tooth 47 at Second Visit

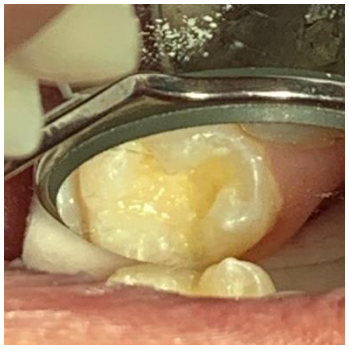

Figure 11. Bonding Application on Tooth 47 at Second Visit

Figure 12. Class I Composite Restoration on Tooth 47 at Second Visit

Figure 13. Class I Composite Restoration on Tooth 47 at Second Visit

Figure 14. Control and Polishing of Tooth 47 Class I Composite Restoration at Third Visit

Figure 15. Control and Polishing of Tooth 47 Class I Composite Restoration at Third Visit

DISCUSSION

There are various treatment options for caries cases with vital pulp, including minimally invasive vital pulp treatments that include pulp capping, partial and total pulpotomy, to more invasive pulp treatments such as pulpectomy and root canal treatment.[13] This case involves a 22 year old male patient who has the chief complaint of a sharp pain in the right lower jaw molar for the past three months. The pain occurred specifically when consuming sweet foods or cold drinks. The patient had not taken any medication to

relieve the pain. Clinical examination done on the first visit revealed an occlusal media caries on tooth 47, and a shadow of discoloration was observed on the enamel around the fissure. Pulp vitality testing indicated that the pulp was still in a vital condition. In this case, indirect pulp capping treatment using Calcium Hydroxide was chosen after in-depth history taking and clinical examination and findings. Indirect pulp capping treatment was chosen to prevent pulp exposure to external tissues.[14], [15]

Indirect ulp capping treatment can be performed on teeth when there is a history of thermal sensitivity and no history of spontaneous pain. Clinically, there is deep caries but no pulp exposure, the sensibility test is positive and there are no abnormalities in the periapical tissues.[3], [12], [16], [17]

There are many materials that can be used for indirect pulp capping treatment and Calcium Hydroxide has been the material of choice for many years as it is proven to form dentin bridges.[8], [18] Research conducted by Pedano et al. proved that calcium hydroxide and MTA pulp capping showed superior biocompatibility both in vitro and in vivo when tested on human and dental cells.[19] Calcium hydroxide acts as a physical barrier to prevent the exposure of pulp tissue to the oral cavity, thereby reducing the potential risk of irritation and infection.[20] Calcium hydroxide is alkaline because it has a pH of 12 and works by releasing Ca^{2+} and OH^- ions. Calcium hydroxide can induce remineralization by stimulating the formation of sclerotic dentin and reparative dentin in the necrotic zone and can protect the pulp from thermal stimulants and has antibacterial properties. Sclerotic dentin is primary dentin that has been altered by age or mild chronic irritation, such as slow progressing caries. Microscopically, the peritubular dentin becomes wider, gradually filling the tubules with calcified material that advances from the dentin junction towards the pulp. On the other hand, reparative dentin is newly formed dentin in response to irritation. Reparative dentin is also known as tertiary dentin, irritative dentin, or dentinal bridge. [4], [21]

The third visit demonstrated the success of indirect pulp capping treatment with Calcium Hydroxide, which aligns with previous research that was stated above. The patient reported no discomfort or soreness, as confirmed by the cold thermal examination and periapical tissue examinations. While the pulp capping treatment was functionally satisfactory, it is also important to ensure that the final restoration was done with excellence to set the seal on the longevity of the treatment. That is why the incremental cusp-by-cusp technique was chosen when performing the Class I composite restoration to minimize the effect of polymerization shrinkage.

CONCLUSION

In conclusion, the presented case highlights the successful management of reversible pulpitis in tooth 47 through a well-executed indirect pulp capping treatment with Calcium Hydroxide followed up with Class I composite restoration. The utilization of Calcium Hydroxide indirect pulp capping contributed to maintaining pulp vitality. Indirect pulp capping treatment is a safe, economical, and proven effective measure to protect and regenerate the pulp in a reversible pulpitis case on patients with no history of spontaneous pain. This case emphasizes the importance of a comprehensive approach to diagnosis, treatment planning, and execution in conservative dentistry. Further studies and longterm follow-ups could provide additional insights to the longevity and success rates of similar treatment approaches.

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