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ROOT CANAL TREATMENT OF MAXILLARY PREMOLAR WITH IRREVERSIBLE PULPITIS AND DIRECT COMPOSITE RESTORATION: CASE REPORT

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ABSTRACT

Background: Irreversible pulpitis is an inflammatory process in the tooth that involves the pulp. Teeth with pulp inflammation requires root canal treatment to eliminate bacteria. Teeth that have undergone root canal treatment and have minimal hard tissue loss can be restored directly using composite materials. The purpose of this case report is to present several successful cases of root canal treatment for irreversible pulpitis restored using direct restoration techniques.
Case: Patient female came aged 47 years to RSGM Unimus, complaining frequent toothache when eating cold food and in the morning. Intraoral examination showed blackness on the cervical of tooth 14 with positive sondation. Radiographic examination showed radiolucency on the cervical buccal of tooth 14 with pulp depth.
Conclusion: The treatment performed showed good results, with root canal treatment in cases of irreversible pulpitis and direct restoration, so that it can maintain teeth, prevent further infection, provide good aesthetics and provide satisfaction to patients.

INTRODUCTION

Irreversible pulpitis is an inflammatory process in the tooth that involves the pulp. Irreversible pulpitis is characterized by spontaneous pain in the patient or an excessive response to heat or cold that persists after the stimulus is removed. The teeth involved usually have extensive restorations such as caries.[1] Teeth that experience pulp inflammation require endodontic therapy to eliminate pathogenic microorganisms and perform root canal debridement of necrotic and infected pulp tissue.[2]

Endodontic treatment is one of the treatments to maintain teeth longer in the oral cavity.[3] Success ratio of endodontic procedures shows quite good results of around 81% - 93% at the age of 10-37 years.[4] The success of endodontic treatment has several factors, namely the quality of the final restoration, the presence or absence of periapical lesions, adequate removal of microorganisms in the root canal, root type, periodontal tissue, and tooth location. In this case, root canal treatment was performed on premolar teeth with multiple root canals.[5]

Multiple root canal treatment is a difficult challenge because of the variation in the number and type of root canals, so it requires more expertise.[6,7] Root canal therapy procedures must fulfill the

principles of the endodontic triad, which includes the stages of cleaning and shaping the canal, disinfection and treatment, and hermetically closing the root canal through obturation.[8] The procedure after root canal treatment is the final restoration to close the cavity with permanent restoration material.[9] Permanent restorations are divided into two, namely direct and indirect restorations.[10] In this case, a direct composite restoration was performed.

The selection of post-root canal treatment restorations must be done carefully, because the remaining hard tissue structure of the teeth and the magnitude of the chewing load will affect the risk of fracture in teeth after root canal treatment.[11] Various types of restorations can be applied after root canal treatment. Significant advances in dental materials and the emergence of more modern restorative concepts have encouraged the use of adhesive materials, such as composite resins, which are known for their durability and high frequency of use. Post-endodontic restorations with composite resins can be performed using direct or indirect techniques, with the primary goal of strengthening the remaining hard tooth tissue and restoring optimal masticatory function.[12] A full crown restoration isn't always necessary for teeth that have undergone root canal treatment. If the remaining hard tissue structure or crown is adequate, direct restoration using composite resin can be an effective option for achieving good clinical results.[10]

The purpose of this case report is to convey the success of multiple root canal treatment in a case of irreversible pulpitis of the maxillary first premolar tooth with final restoration using direct composite restoration. The patient has agreed to publish his dental treatment case.

CASE

A 47-year-old female patient came to RSGM Universitas Muhammadiyah Semarang complaining of her upper right tooth looking blackish, the patient noticed it in the past 4 months ago. The patient was uncomfortable because when drinking cold drinks and in the morning the patient felt prolonged pain. The patient had never tried to treat the tooth before. The patient had a history of controlled hypertension; the patient had no allergies to drugs, food and weather. On intraoral examination there was a blackish color on the cervical buccal part of tooth 14 with positive sounding, negative palpation, negative percussion, positive vitality using ethyl chloride, and grade 0 mobility and there were no abnormalities in the occlusal and palatal parts (Figure 1 (a) and (b)).

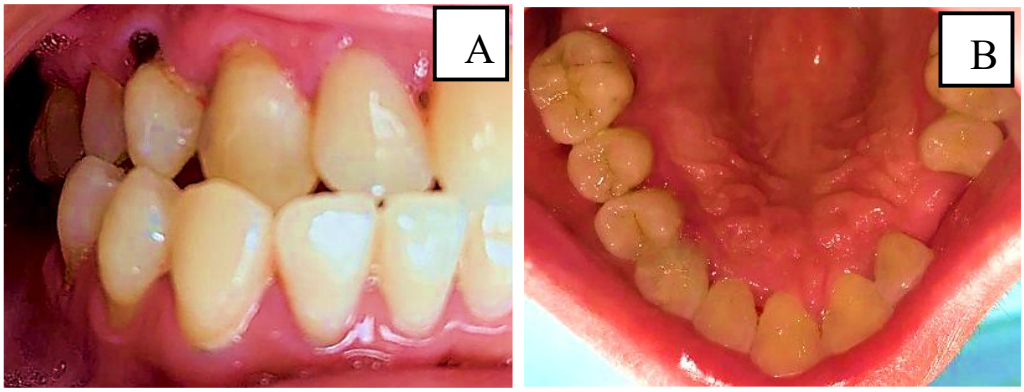

Figure 1. (a) Labial view of tooth 14, (b) Occlusal view of tooth 14

Radiographic examination, a radiolucent image was found in the cervical part of tooth 14 extending to 1/3 of the cervical root reaching the pulp, the number of roots was 2, root canals were 2, the root shape was straight, the periodontal membrane was widened in 1/3 of the cervical, the laminadura was broken in 1/3 of the mesial cervical root (Figure 2). For treatment in this case, root canal treatment was performed to clean the inflamed pulp tissue.

Figure 2. Periapical radiograph of tooth 14

CASE MANAGEMENT

On the first visit, subjective examination, objective examination, clinical and radiographic photos were taken. Then the diagnosis, treatment plan and time required were determined, after the patient agreed to all treatment plan procedures, it was continued with measuring the estimated working length using the radiographic observation method, obtaining the estimated working length of the buccal and palatal root canal of 21 mm. Then continued with the removal of caries in the cervical buccal part of tooth 14 using a high-speed diamond bur until clean (Figure 3 (a)), then filling was carried out using composite resin on the cervical part of tooth 14 (Figure 3 (b)). Before the open access procedure was carried out, infiltration anesthesia was performed on the buccal and palatal parts because the condition of the teeth was still vital.

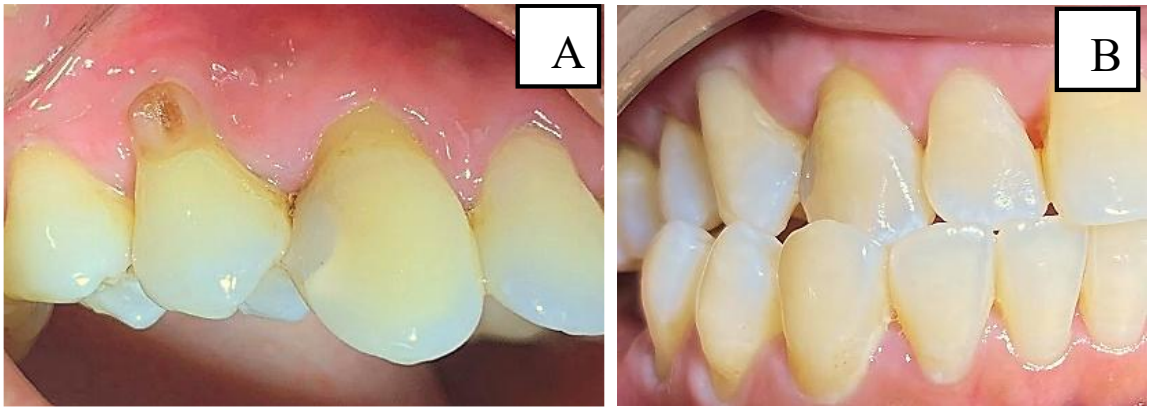

Figure 3. (a) Tooth 14 after preparation at the cervical buccal aspect, (b) Tooth 14 after restoration

The open access procedure was performed with an endo access bur on the occlusal part, an oval outline from buccal to palatal with the bur position perpendicular to the long axis of the tooth to the orifice, followed by root canal exploration using a miller needle according to the working length through the orifice, then pulp extirpation was performed using a K-file inserted up to 2/3 of the working length, which is 14 mm, rotate 180° clockwise, then pulled out, repeat until the pulp tissue is lifted. The root canal was then irrigated with 0.9% NaCl solution (Figure 4 (a)). The next stage of determining the initial apical file (IAF) was carried out by finding the first largest file that could enter the root canal according to the working length, starting from the smallest file until tug back was found (IAF in this case was #15 PK 21 mm). The actual working length was measured using a Dentsply electronic apex locator showing the distance of the file tip to the apical was 1 mm (Figure 4 (b)), then a periapical X-ray was performed (Figure 4 (c)), and the occlusal part of tooth 14 was covered with cotton soaked in eugenol and then a temporary filling was placed.

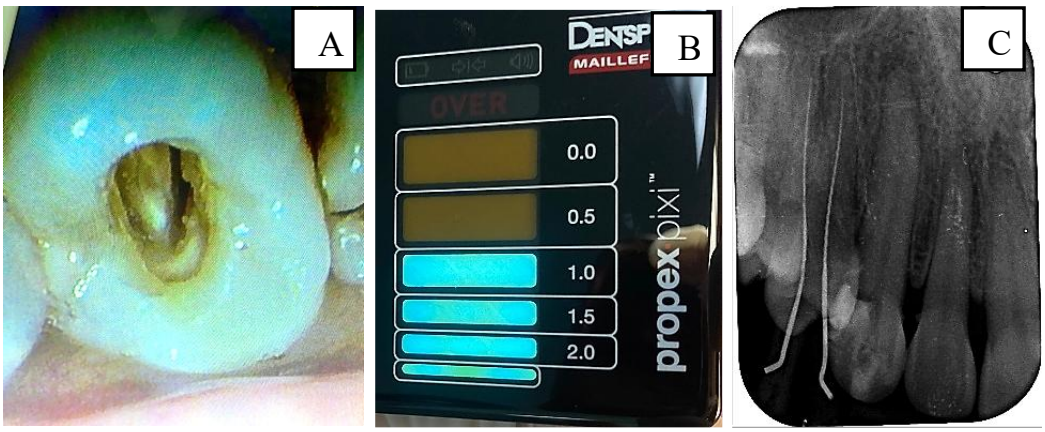

Figure 4. (a) Tooth 14 after pulp tissue removal, (b) *Electronic apex locator*, (c) Periapical radiograph determining IAF with PK 21 mm on the buccal and palatal

The second visit involved removing the temporary filling, then performing root canal preparation on the buccal root first, then continuing with the palatal root. Root canal preparation using ProTaper hand use up to the last file F2 according to the working length of 21 mm with a watch winding motion.

The preparation technique was with crown down with initial preparation SX with a working length of 14 mm to remove the remaining dentin in the pulp chamber, continued with 2/3 crown with a working length of 14 mm, then 1/3 apical with a working length of 21 mm, ending with finishing using files F1 and F2 with a working length of 21 mm. Each file replacement was irrigated with 17% EDTA, 0.9% NaCl, 2.5% NaOCl and re-examined using a number 15 file with a working length of 21 mm on the buccal and palatal roots. Then, it was dried with paper point and medicated with CaOH powder and liquid glycerin, followed by covering with a temporary patch and instructing the patient to check after 10 days after being given medication.

The third visit was conducted subjective examination whether the patient experienced pain in the tooth, and intraoral examination, perform percussion and see clinically whether there is leakage of temporary filling or not. Obturation can be performed if the patient has no complaints and percussion is negative and there is no leakage in the temporary filling. The obturation procedure in this case with a single cone technique, begins with dismantling the temporary filling, then cleaning the dressing material with H-file no. 15 followed by irrigation with 0.9% NaCl, dry with paper point F1 and F2. Then perform a gutta percha trial with size F2 according to the working length of 21 mm on the buccal and palatal roots, followed by periapical x-ray (Figure 5 (a)). Irrigate with 0.9% NaCl again, isolate the working area, dry with paper point size F1 and F2, followed by manipulation of AH Plus sealer (base and catalyst) with stainless steel spatula cement until it forms a paste, apply to the root canal wall using lentulo pulled coronally according to the working length of 21 mm, do it on the buccal root first, then apply gutta percha on the sealer according to the working length, then insert gutta percha into the buccal root canal, gutta percha is cut 2 mm below the orifice using a heated plugger. Then repeat the same obturation procedure on the palatal root canal. Ended with the application of GIC type III as a lining and do a temporary filling.

The fourth visit, obturation control was carried out, namely subjective and objective examinations, periapical X-rays were performed to see the results of obturation, and direct composite restoration. In this case, the patient had no complaints, the temporary filling was still in good condition, the periapical X-ray results of obturation showed hermetic results according to the actual working length (Figure 5 (b)). Then continued with direct composite restoration on the occlusal part of tooth 14 (Figure 5 (c)). The patient was also given patient education about the importance of maintaining dental and oral hygiene by brushing their teeth twice a day, especially after breakfast and dinner. Advice to have their teeth checked by a dentist every 6 months or once a year as a treatment for cavities and damaged fillings.

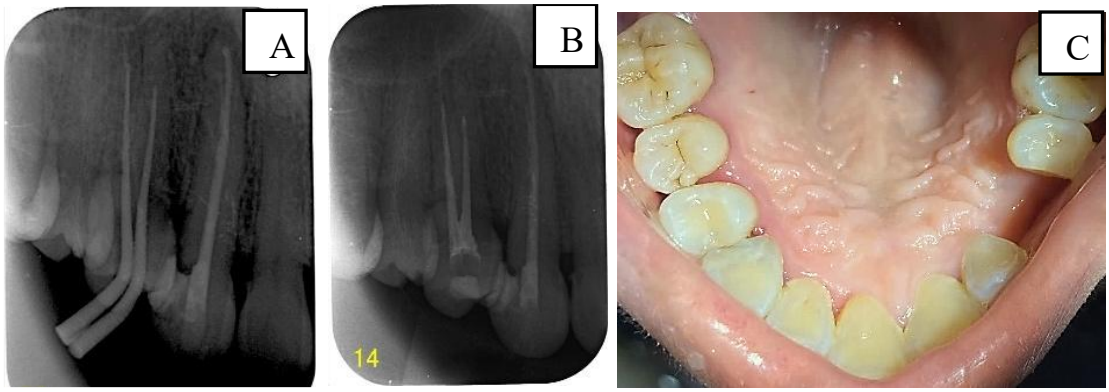

Figure 5. (a) Trial gutta percha tooth 14, (b) Obturation results tooth 14, (c) Direct composite restoration tooth 14

DISCUSSION

Root canal treatment of tooth 14 with a diagnosis of irreversible pulpitis was performed with several visits (multivisit). The tooth that experienced irreversible pulpitis was due to caries in the buccal cervical part of the tooth, the periapical X-ray results showed a radiolucent image in 1/3 of the cervical tooth pulp depth and the vitality results with ethyl chloride showed positive results, thus indicating that the tooth had irreversible pulpitis, and vital tooth root canal treatment was the most appropriate treatment in this case.

The initial stage of root canal treatment is the removal of inflamed pulp tissue, followed by root canal preparation using the crown down technique, which is a preparation that starts from 2/3 coronal of the root canal then continues towards the apically until an apical stop is obtained at the appropriate working length. This technique can reduce the risk of zipping, perforation, and apical transportation, especially in narrow root canals.[13,14] Another advantage of this instrument is that it improves consistent root canal cleaning and can shorten working time, reduce the risk of debris and bacteria coming out towards the apically and reduce the risk of fatigue in patients and operators. This is very different from preparation using conventional stainless-steel K-files, which require a long preparation time. K-files are more at risk of causing bacteria to escape from the apical area, and preparation errors, especially in narrow and curved root canals.[3] In this case, having multiple root canals on a premolar tooth, preparation required a short time, so ProTaper hand use was the choice to make it easier for the patient and operator to perform treatment and avoid treatment failure.[15]

After preparation, continued with filling the dressing material, in this case the dressing was done using calcium hydroxide material which can eliminate the growth of bacteria that still exist after biomechanical preparation, and this is related to peri radicular healing. The basic nature and release of hydroxyl ions are related to the antibacterial properties of calcium hydroxide. Hydroxyl ions will damage the structure of the bacterial cell membrane and can destroy bacterial DNA. The optimum time effect is seven days and works for two weeks.[16]

The obturation material used in the root canal is gutta percha combined with AH Plus sealer. This cement is made from resin which has advantages especially its good adhesion and has lower toxic properties compared to the very commonly used endomethasone. Endomethason has more toxic properties than AH Plus, because AH plus only releases relatively small formaldehyde.[17]

The type of final restoration that can be used depends on the remaining hard tooth tissue. Restoration on teeth after root canal treatment can be used for direct restoration using composite resin or amalgam materials, and indirect restoration using metal or porcelain materials. The ideal restoration should be able to protect the occlusal surface and replace the missing cusps to optimally protect the structure of the tooth crown and increase strength. In this case, there is enough remaining tissue so that direct restoration can be carried out using composite resin materials.[10] The advantages of direct composite restoration are minimal tooth preparation so that it can maintain the remaining hard tooth tissue, relatively short processing time and more affordable costs. In root canal treatment, the patient's cooperative aspect and financial ability are needed. The patient's motivation and ability to work together to maintain and maintain dental and oral hygiene to support the success of optimal treatment results.[18]

CONCLUSION

Vital root canal treatment in cases of irreversible pulpitis is the most appropriate action. This action is successful with the support of the patient's ability, knowledge, indications, diagnosis and cooperation. As well as the final restoration with direct restoration with consideration of the remaining hard tooth tissue as a consideration in performing tooth restoration. Direct composite resin restoration was successful, able to restore optimal tooth function, can maintain teeth, prevent further infection, good aesthetics and provide satisfaction to patients.

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